TPSys 2.4+ Release Notes

English

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Contents

1. Introduction

This document describes the main differences between TPSys 2.3 and TPSys 2.4.5.

TPSys 2.4 was released to provide:

- Support for Agilis Linear Magazines.

- Support for the new larger HYDRA reference background HRB-23LSC.

- Autoteach of illumination and vision data for packages.

- Improved support for large components.

- Barcode handling of trays and tray positions.

TPSys 2.4+ (2.4.3 and later) was released to provide:

- Increased machine throughput.

- Increased mount accuracy due to new calibration routine.

- Simplified user interface for operators.

- Support for AT-CPU PF2.

2. New Functions in TPSys 2.4+

- Support for Narrow Line Scan Images in Autoteach

- Improved Place Area Calibration

- Support for New Installation Component

- Trackball Support in the Web Interface

- Simplified User Interface for Operators

- Faster Conveyor Board Change

- Faster Component Rejection

- Faster Board Level Measurement with Indicator Tools

- Improved Joystick Support

3. New Functions in TPSys 2.4.5

- Single Barcode Label for Multiple Boards in Serial Start

- Read Event Log in Real Time Using TRP

4. Corrections in TPSys 2.4.5

A number of bugs in earlier versions of TPSys have been fixed in TPSys 2.4.5. These include:

- On machines with AT CPU PF2 (PIII 700MHz) the video could become slow after the machine had been running for a while. (TPSys 2.4.4c Patch 1)

- Fast board change in combination with board train was not always robust. TPSys could mistake a small gap between two boards in a train as the end of the train. TPSys would then stop loading/unloading. TPSys now measures the length of the board train as it enters the machine and uses this information during the unload sequence. (TPSys 2.4.4c Patch 2)

- When running fast board change the stop position of the board was not stable, it could vary a few millimeters. This could cause automatic fiducial mark search to fail. (TPSys 2.4.4c Patch 2)

- When the trackball was used both as a joystick in TPSys and as a mouse in the web interface the trackball could stop working from time to time. TPSys 2.4.4c Patch 3 solved some of the problems but it could still happen that the trackballs stopped working even with the patch installed.

- In certain emergency stop situations the machine could ask the operator to remove a component from the Z-unit nozzle while it was pushing a component down onto a PCB or picking from a magazine. In TPSys 2.4.5 the Z-unit will move up before the operator is asked to remove the component.

- When TPSys was run in high-resolution mode on machines with AT CPU PF2 (PIII 700MHz) the colors could get corrupted.

- If the first component picked from a magazine after insertion was a component with a non-zero tool to top offset, TPSys measured an incorrect height of the magazine. This could later cause problems with picking other components from the magazine.

- TPSys did not handle errors correctly when a bar code reader on an external conveyor was used together with the board train function. If one or several PCB-id bar codes in the board train could not be read TPSys falsely assumed that the missed bar codes always belonged to the last boards in the train. This is not necessarily true. If this error occurs TPSys now asks the operator for all bar codes.

- The TPSys web interface was slow when accessed on networks with certain firewalls.

- If the TPSys web server was not running the keyboard did not work after reboot. The reason was that the web browser produced a pop-up about the missing web server. This pop-up stole the keyboard focus from TPSys. To get the keyboard to work again the user had to switch to terminal two and back again.

5. Differences Between TPSys 2.3 and 2.4

Autoteach of Illumination and Vision Data for Packages

Background

It can sometimes be hard to manually find proper vision settings for packages. To help avoid this problem, a new feature has been added to Autoteach in TPSys 2.4. This new feature makes it possible to automatically find good vision settings for packages.

Description

As in TPSys 2.3, Autoteach is activated on a package by highlighting it in the package editor and pressing <F5>. The window in *Figure 1* then appears on the screen. As before, the user can select which type of package to teach, and where the component should be picked. In TPSys 2.4, a new field called *Teach* has been added to the window. This field lets the user specify what kind of data shall be taught. The user can select if Autoteach should teach both geometrical and vision data, only geometrical data or only vision data. If geometrical data is chosen, Autoteach will measure the positions of the leads, the dimension of the leads and so on. If vision data is chosen, Autoteach will determine good vision settings for the package.
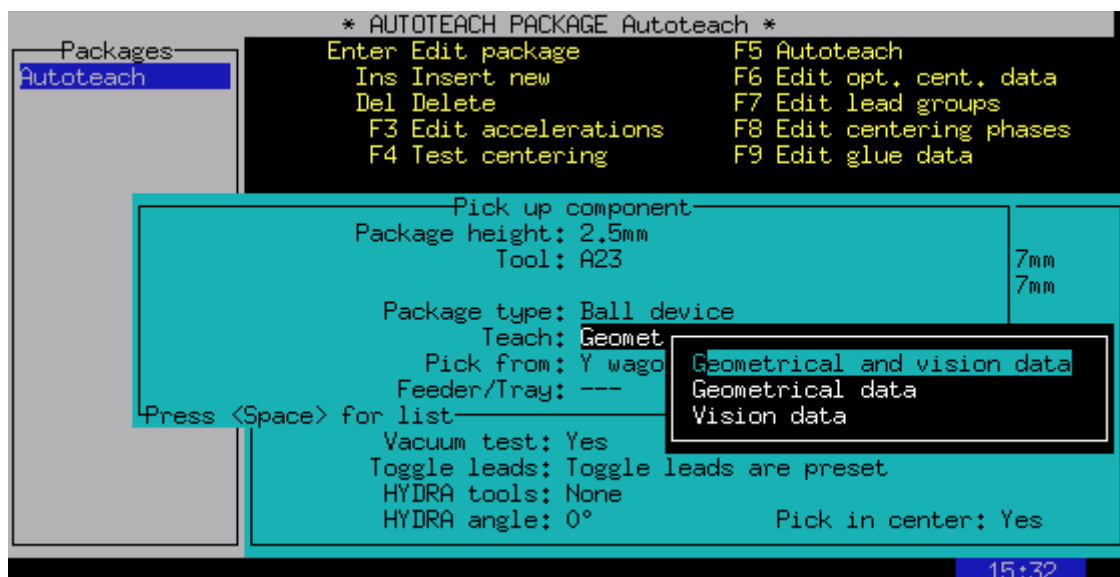
Figure 1. A new field called Teach has been added to the window that appears when Autoteach is activated on a package. This field lets the user specify if Autoteach should teach geometrical data, vision data or both

Teach of geometrical data

If only geometrical data is chosen in the window in *Figure 1,* Autoteach will proceed in the same way as in TPSys 2.3 and only measure the mechanical data of the package. The illumination and vision settings for the

package will not be changed by this operation. To only teach geometrical data could be a good idea if there already is a package in the package editor for which vision centering works well and that is similar in appearance to the new package. In such case, make a copy of the existing package and run Autoteach of only geometrical data. Creating the package this way saves the time spent trying to find a good illumination. If the vision settings do not work well enough for the new package, one can always teach the vision data later.

Teach of vision data

If there is a package for which the geometrical data is correct but for which optical centering does not work due to poor vision settings, one can run Autoteach and choose to teach only vision data. The geometrical data of the package except the lead dimensions will be left unchanged by this operation. The lead dimensions of the package may have to be adjusted since the size of a lead in the image varies with illumination.

When choosing to teach only vision data and leaving the pop-up in *Figure 1,* the machine picks the component and a new pop-up appears, see *Figure 2*. This pop-up lets the user choose which camera to teach the vision settings for. After choosing camera, the machine moves to the camera and starts looking for proper vision settings. This procedure includes taking several images of the component using different illumination settings. The procedure may take a couple of minutes and can be aborted using <Esc>.

In this step, one shall use the camera that shall be used to vision center the package during production since Autoteach only sets up the vision data for the chosen camera. The illumination settings for other types of cameras are left unchanged. For example, teaching a package in a linescan camera does not imply that it will automatically work in the SVC or OVC.
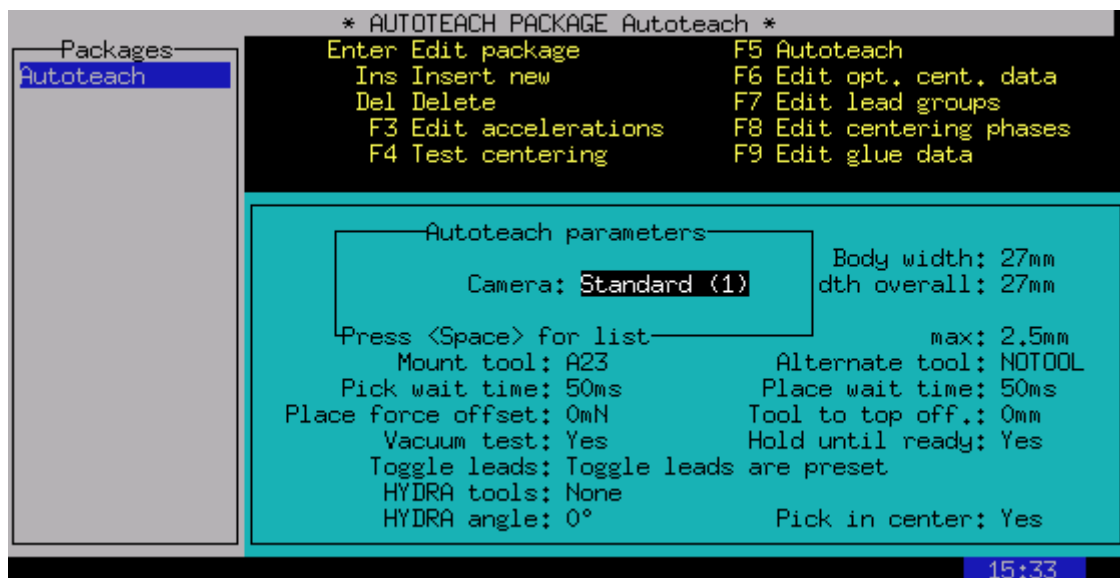
Figure 2. If teach of vision data is chosen, the user also has to specify for which camera the vision data shall be taugh.

When teaching vision data and using the DVC, TPSys needs to know the position of the component in the image. If the component is picked from the Y wagon this is no problem since one needs to locate three corners of the component for the machine to be able to pick it. If teaching both geometrical and vision data there is also no problem since the positions of the leads have been detected. However, if one teaches only vision data and the component is picked from a feeder, the position of the component in the image will be unknown. This makes it necessary for the user to first locate the component in the image. Autoteach therefore takes an image of the component and asks the user to locate the corners of the component in the image using the trackball or the joystick. On some machines, part of the image taken with the DVC lies outside the screen. This means that it is possible for a corner of the component to lie outside the part of the image that is immediately visible. Remember that it is possible to move the image with the arrow keys when

holding down the <Ctrl> key and that it is possible to zoom out and in with <Ctrl>+<PgUp> and <Ctrl>+<PgDn>.

Due to the complexity of the vision centering, it is impossible for Autoteach to test all possible combinations of vision settings for a package. Remember that it is still possible to adjust the vision settings manually as in TPSys 2.3 and earlier.

Teaching both geometrical and vision data

It is possible to teach both geometrical and vision data in the same run. Autoteach first measures the geometrical data and shows the result to the user. If the user approves of the measured geometrical data, Autoteach then proceeds to teach the vision data.

Teach of vision data for chip packages

There are two different ways a chip component can be centered by vision. The vision centering can be done either by looking at the whole chip outline or by looking only at the leads. For chip packages, the user has to choose which method should be used before the teach of package vision data is performed. This is done in a pop-up that appears on the screen before the vision teach begins. In this pop-up, TPSys asks the user how the image points should be distributed. If *Standard* is chosen the whole component outline will be used. If *Leads only* is chosen, the vision system will only look at the leads on the chip. Looking only at the leads is useful when the whole component outline is hard to see in the image, for example if the component has a dark body.

Autoteach of Chip and Outline Packages

Background

In TPSys 2.4, the possibility to teach geometrical data for chip and outline packages has been added to Autoteach.

Description

When activating Autoteach on a package the pop-up in *Figure 3* appears on the screen. As seen in the figure it is now possible to choose *Chip* and *Outline* as the package type. As for leaded and BGA packages, it is possible to teach chip or outline packages by picking from the Y wagon or a feeder. For chip and outline packages, Autoteach only needs to know the length and width of the package to create a package description. If Y wagon is chosen, the user is asked to locate three corners of the package using the X-wagon camera and the joystick. Since we only need the package length and width there is no need to show the package to the camera since the data can be calculated from the corners located by the user. If the package is picked from a feeder however, we need to use a camera to extract the data. In such case, Autoteach asks the user to choose a camera. The machine then picks the package and takes an image of it with the chosen camera. The user is then asked to locate the corners of the package in the image using the joystick. The length and width are then calculated from these corners.

> Remember that it is possible to zoom out and in with <Ctrl>+<PgUp> and <Ctrl>+<PgDn>.
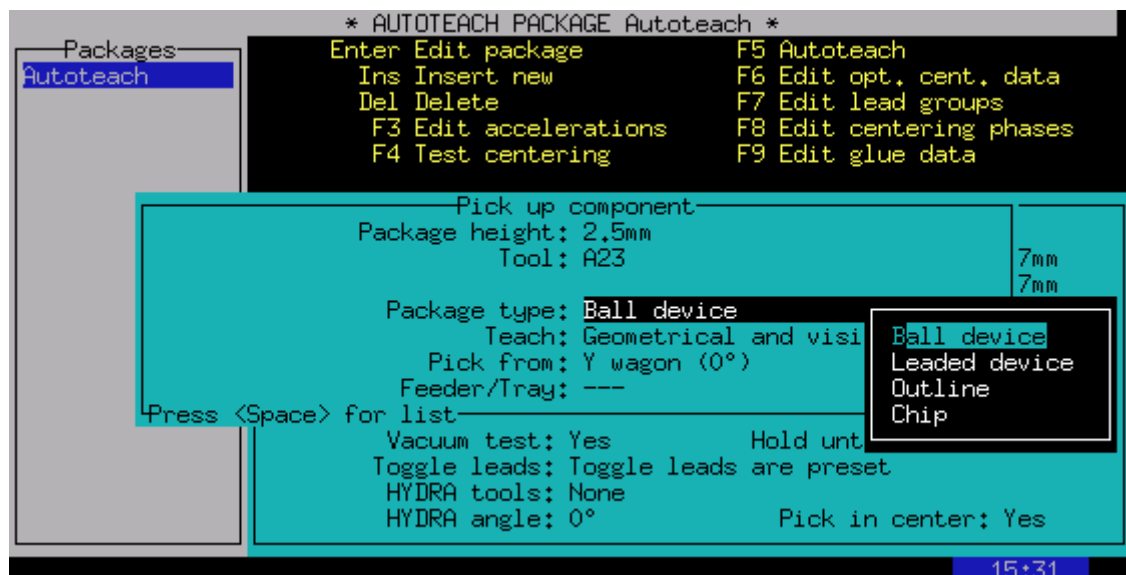
Figure 3. It is now possible to teach chip and outline packages with Autoteach

When the teach is done, a window that shows the measured length and width of the package appears on the screen and the user is asked if the data should be saved or not.

Interactive Add and Remove in Autoteach

Background

When using Autoteach to create new packages, it sometimes happens that Autoteach fails to detect some leads or detects features that are not leads. In TPSys 2.3 it was possible to ask Autoteach to add or remove one lead by pressing the <+> or <–> key. If this failed, the only way to fix the created package was to manually edit it in the package editor. To make it easier to correct errors, a new feature has been added to Autoteach in TPSys 2.4. It is now possible to interactively add and remove leads using the trackball or the joystick.

Description

When the Autoteach result is shown on the screen, the user can now choose to edit the detected leads by pressing <F1>. A cursor then appears on the screen. The position of the cursor can be controlled with the joystick or the trackball. If Autoteach has marked a feature that is not a lead, pointing at the mark and pressing <Delete> deletes the mark. If Autoteach has missed one or more leads they can be added by pointing with the cursor at the position of the lead and pressing <Insert>.

For components with solder balls such as BGAs, the only information needed to add a lead is the position of the lead. However, for leaded packages, information about the direction of the lead is also needed. For this reason the shape of the cursor is different for ball and leaded packages. For components with solder balls the cursor is drawn as a cross but for leaded components the cursor has the same shape as the outline of the lead. For leaded components, the orientation of the cursor can be changed by pressing the + or the – key, see *Figure 4*.
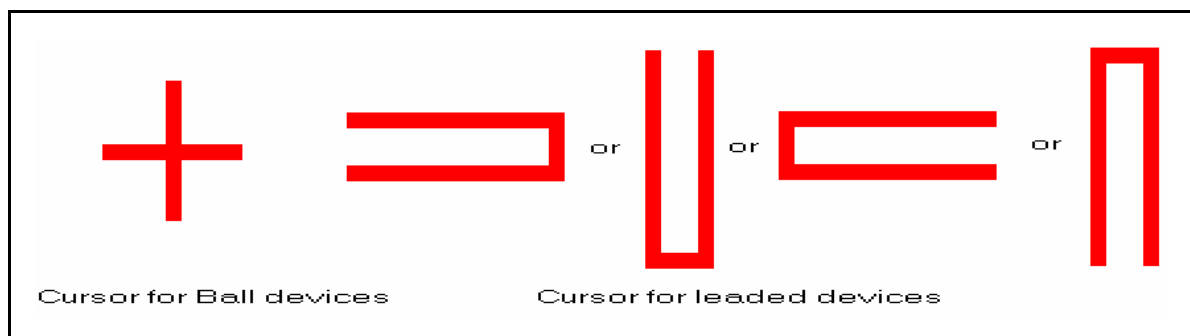
Figure 4. The shape of the cursor used to add and remove leads differs for ball and leaded packages

When adding leads to a leaded package, one must first align the orientation of the cursor to the orientation of the lead that shall be added and then press <Insert>. When deleting leads the orientation does not matter, just point the tip of the cursor at the tip of the lead that shall be removed and press <Delete>.

After leads have been added and/or removed, the edit must be confirmed by choosing *Ready* in the menu in the upper left corner of the screen. It is also possible to abort the changes at any time during the interactive add/remove by choosing *Cancel* in the menu or by hitting <Esc>.

Support for Narrow Line Scan Images in Autoteach

New in TPSys 2.4+.

Background

In TPSys 2.4.2 and earlier it was not possible to teach mechanical or vision data for components that require narrow linescan images. Support for these types of components have now been added to Autoteach.

Description

Components longer than 76 mm cannot be centered using a normal linescan image. Instead a narrow linescan image has to be used. With this type of image it is possible to vision center components that are longer than 76 mm, as long as they are not wider than 26 mm. Support has now been added to Autoteach for these types of components.

If the component is picked from the Y wagon TPSys will know the size of the component since the user has to locate three corners of the component in order for the machine to able to pick it. In this case Autoteach is able to automatically check if the component requires a wide or narrow linescan image or not.

If the component is picked from a feeder, the user has to choose which type of image that shall be used. To make this possible a new field has been added to the window that appears before Autoteach, see *Figure 5* below. The default choice of this field is *No* since a wide linescan image works for most components.

Figure 5: When Autoteaching and picking from feeder the user can now choose between using a narrow or a wide linescan image

The same behavior has also been applied to Autoteach with dual shot in the SVC or HRC. If the component is picked from the Y wagon, Autoteach will automatically check if dual shot is needed. In earlier versions the

user always had to choose if dual shot should be used or not. Now the user has to choose only if the component is picked from feeder.

Support for HYDRA Reference Background HRB-23LSC

Background

TPSys 2.4 supports HYDRA mounting of larger components than TPSys 2.3. TPSys can now mount components with a diagonal up to approximately 21 mm.

☞ This feature requires the LSC and a new larger HYDRA reference background.

Description

The HYDRA unit can be fitted with three different reference backgrounds (HRB): type 14, type 14LSC and type 23LSC. Type 14 can only be used with the HYDRA camera, type 14LSC can be used with both the HYDRA camera and the linescan camera and type 23LSC can only be used with the linescan camera. The difference between the two types that can be used with the linescan camera is the size of the components they can handle. Type 14LSC has an inner diameter of 14 mm and type 23LSC has an inner diameter of 23 mm. For the machine to know which HRB is on the machine, the correct background has to be selected in the `hwconf` program.

Which components can be picked

Whether a component can be picked or not by a HYDRA with a certain HRB depends on:

- The hole diameter of the HRB.

- The size of the component.

- The component carrier (tape/vibratory stick).

In TPSys 2.4, a check has been added before picking components with the HYDRA. Since TPSys does not know the exact shape of components, all components are assumed to be rectangular and it is the diagonal that is compared with the hole diameter of the HRB. Some tolerances are also added so that components can be picked even if they are not exactly centered in the pick position.

The largest components that can be picked have a diagonal of approximately 12 mm for the type 14 and 14LSC background and 21 mm for the type 23LSC background.

If a component is so large that there is a risk that it will collide with the HRB during mounting, TPSys will not pick it with the HYDRA but use the Z-unit instead.

HYDRA and shared databases

Sharing package and component data between machines with different HRB types is no problem with TPSys 2.4. If you have a component that can be picked with the HYDRA on one machine it might not be possible to pick with the HYDRA on another machine if it has a different background. This could theoretically be a problem, however with the check described in the previous section, TPSys knows if a component can be picked or not on a certain machine and uses the Z-unit if the component is not possible to mount with the HYDRA.

Picking large and heavy components

Large components are more likely to be heavy. It is important to have the right tool for the component in question.

If HRB type 23LSC is used, then the largest components the HYDRA can pick would collide with each other if they were picked with adjacent HYDRA heads. TPSys does not allow components to collide and will therefore not pick the largest components with adjacent heads.

Large components would also be able to collide with the HYDRA tools on adjacent heads. When having an ATE, TPSys will therefore automatically leave some heads without tools to be able to pick the large components. If the HYDRA does not have an ATE and you have special tools for the large and heavy components, make sure to put them far apart so that the HYDRA can pick several large components in the same pick. Also leave heads empty so that the tool is not limiting the pick. If you put them too close, one of the tools will not be used. Even if two components can be next to each other in a magazine they might collide later when the HYDRA is rotating them during placement. It is also good to load magazines so that components can be picked at the same time with the set of fixed HYDRA tools.

HYDRA Pick from TM-Flex and Vibratory Magazines

Background

The range of magazines from which the HYDRA can pick has been extended to include TM-Flex and vibratory magazines.

Description

As for HYDRA pick from other magazines, a component in a TM-Flex or vibratory magazine is considered for HYDRA mounting if a HYDRA tool has been chosen for the corresponding package.

☞ To get the best result with the HYDRA, one shall strive to load the components in the magazines so that the distance between the components is a multiple of 10 mm. The reason for this is to make it possible for the HYDRA to pick several components at a time.

New parameters

Parameter	Description
171.0428	Specifies the maximum distance components can move in vibratory magazine sticks. (Feeder play)
84:0210	Controls if HYDRA is allowed to pick from vibratory magazines.

Improved Place Area Calibration

New in TPSys 2.4+.

Background

The place area calibration in TPSys 2.4.2 and earlier versions did not always fully exploit the accuracy of the MYDATA machines. To avoid this unnecessary limitation the place area calibration has been redesigned in TPSys 2.4.3.

Description

A new calibration routine has been developed in order to fully take advantage of the accuracy of the MYDATA machines. The new calibration routine requires two new pieces of calibration hardware. The first piece, is a large black calibration background plate, to be placed on the Y wagon. The second is a thin gray calibration plate with fiducial marks that the machine automatically moves to different locations on the black calibration background. The part numbers are:

- D-012-1122 – D-012-1131 for the black calibration background plate. There are 10 different sizes available in order to fit all Y wagon models.

- L-015-0450 for the gray calibration plate.

The old calibration routine is still available and can be used if the new calibration hardware is not available. The old calibration routine requires the Accur board (L-029-0243-2).

New versions of the X-wagon camera calibration and the coarse measurement of Z-unit offset have also been developed that are compatible with the new place area calibration routine.

Preparations

The gray calibration plate contains three different circular fiducial marks. Import their definitions from the file `/home/tpsys/lib/DefData/CalibData.gen`.

X-wagon camera calibration

The calibration patterns for the different X-wagon camera models have been integrated into the gray calibration plate. When starting the X-wagon camera calibration, TPSys first asks if the gray calibration plate is available. If the plate is not available, the old calibration routine is used. If the plate is available, the user is asked to put the calibration plate on the Y wagon. Insert the plate approximately aligned to the X axis. The user is then asked to locate the two fiducial marks A and B on the calibration plate and to select a suitable position for board level measurement. The machine picks up a tool (C23) and rotates the calibration plate so that it becomes accurately aligned to the X axis. Then it moves to the camera calibration pattern and calibrates the X-wagon camera.

☞ By default the machine is configured for the new calibration routine. If you use the old method, or if you are upgrading a machine and have restored a backup, you may have to change parameter 75.0141 (X wagon camera calibration / calibration plate characteristics / white on black) to match your calibration plate.

Coarse measurement of Z-unit offset

Because the machines needs to move the calibration plate during the place area calibration, it needs to have reasonably accurate mount tool offset parameter values (27.0101 and 27.0102). A new version of this measurement has been implemented that uses the gray calibration plate. The user is asked to insert the plate and locate the A and B fiducial marks and a position for the board level measurement. The machine then measures the mount tool offsets automatically.

The old Z-unit offset measurement routine is also available for users that do not have the new calibration hardware. A pop-up asks which version to use.

☞ This measurement is still only an approximation. The "fine tune Z-unit offset" measurement is the important one. You only have to run the coarse measurement if the initial parameter values are so wrong that the fine tune measurement fails.

Place area calibration

When selecting *Utility > Installation > Place Area Calibration*, TPSys first asks if the gray calibration plate is available. If the plate is not available, the old accur board based calibration is used. If the plate is available, the new calibration routine is invoked. The calibration consists of a number of steps:

If the required fiducial marks are not available in the fiducial list, the user is asked if the default calibration data should be imported. If the user agrees, TPSys automatically imports the file `CalibData.gen`.

The user is asked to insert the calibration plate on the Y wagon.

The user is asked to locate the left, lower, right and upper edges of the area to be calibrated. The area should be made as large as possible for best results, but it must be possible to place the gray calibration plate everywhere inside the area to be calibrated. So do not make the area so large that the machine tries to put the calibration plate on top of the board supports at the edges of the black background plate. If it is hard to locate appropriate edge coordinates on the black background, place the gray calibration plate manually along the edges and use it as a guide.

☞ This step normally only has to be done once (except when the Y wagon is physically removed) because TPSys remembers the edge coordinates in parameters 63.0721, 63.0722, 63.0731 and 63.0732.

The user is asked to locate the two fiducial marks A and B on the calibration plate and to select a board level measurement position.

The machine makes a coarse measurement of the Z unit offset, so that it can later move the calibration plate to different places on the Y wagon.

The user is asked if the Y wagon alignment measurement shall be performed. This procedure measures the angle between the X and Y axes, and tells the user how much the Y wagon should be adjusted to make the axes perpendicular. This measurement is not critical for good placement accuracy, but it is needed to make

sure the Y wagon does not collide with the covers when moving. Normally this step can be skipped unless the Y wagon has been physically removed.

If the Y wagon alignment measurement was performed, the user is asked to re-confirm the edges of the area to be calibrated, since they may have changed slightly if the Y wagon was adjusted mechanically.

The calibration measurements are started. During the calibration, a progress bar is displayed and includes information about elapsed time and estimated remaining time.

New Parameters

Parameter	Description
63.0164	Warm-up time. How long to run warm-up before starting the real measurements.
63.0192	Tool to use when moving the calibration plate.
63.0193	Overlap factor. Defines how many times the calibration plate is moved during the calibration. Larger values mean more moves and longer calibration time, but also makes the calibration less sensitive to random measurement errors. Normally there is no reason to change this value.
63.0711 63.0712	Calibration table pitch. Defines the spacing in the X and Y directions for the calibration tables. The default values should be fine.
63.0721 63.0722 63.0731 63.0732	Defines the area to be calibrated. The smallest and largest X and Y coordinates are stored here. These parameters are used to suggest default values for the edges of the place area. They are updated automatically when new edge coordinates are selected by the user.
63.0401	Defines the length of the calibration plate.
63.0402	Defines the width of the calibration plate.
63.0141	The fiducial mark name for the fiducial marks along the lower edge of the calibration plate.
63.0411	The fiducial mark name for the "A" fiducial on the calibration plate.
63.0412 63.0413	The X/Y coordinates for the "A" fiducial on the calibration plate.
63.0421	The fiducial mark name for the "B" fiducial on the calibration plate.
63.0422 63.0423	The X/Y coordinates for the "B" fiducial on the calibration plate.
63.0431	The number of fiducial marks in the row along the lower edge of the calibration plate.
63.0433 63.0434	The X/Y coordinates for the first fiducial in the row along the lower edge of the calibration plate.
63.0436 63.0437	The X/Y distance between fiducial marks in the row along the lower edge of the calibration plate.
63.0457 63.0458 63.0459 63.0460 63.0461 63.0462	The X/Y coordinates for the center of the X wagon camera calibration patterns. (Pattern number 3, 4 and 5.)

Support for New Installation Component

New in TPSys 2.4+.

Background

In order to improve the accuracy and reliability of various calibration steps, a new calibration component (L-010-0166-1) has been developed. The component is 8 x 8 mm, has four round fiducial marks on the top side and a 4 x 4 mm rectangle on the bottom side. This component will be shipped with all TPSys 2.4.4 upgrade kits and replaces the thin metal component that was shipped with previous versions of TPSys. The installation steps that previously used the thin metal component have been modified to use the new component. A new calibration step has also been introduced, which improves the accuracy of the Z unit mount head when placing components close to the left edge of the Y wagon.

Description

Package data and fiducial marks for the calibration component are included in the file `/home/tpsys/lib/DefData/CalibData.gen`. If some installation routine does not find what it is looking for in the package database or the fiducial database, a popup is displayed giving the user the possibility to automatically import this file.

Coarse measurement of Z-unit offset

This installation step no longer uses a chip component. Instead, the new calibration component is used. The operator is first prompted to insert a board on the Y wagon and to select a place position on the board. TPSys then asks the user to insert the component manually on the nozzle, centers the component mechanically, places it on the board and locates the component using the X wagon camera.

☞ The component should be placed directly on a clean board, no adhesive spray should be used, as it will make the component dirty.

Mechanical centering unit alignment

The purpose of this calibration step is to mechanically align the mechanical centering unit to the rotational center of the Z unit mount tool. This step is now a separate menu item in the installation menu. In older versions of TPSys, this measurement happened at the same time as the 'Fine tune Z-unit offset' measurement.

The user is prompted to insert a board on the Y wagon, put the calibration component on the board, locate the component and to select a suitable place position. The machine then does the required measurements and displays the C misalignment. If the misalignment is too big, the user is told to adjust the mechanical centering unit.

Fine tune Z-unit offset

This installation step still measures the Z-unit mount tool offset, in other words the distance from the X wagon camera center to the rotational center of the Z unit mount tool. The C misalignment is no longer measured in the step, since it has been moved to a separate menu item. The X hysteresis is not measured either, since a better hysteresis test is available in the *Utility > Diagnostics* menu.

The user is first prompted to insert a board and the component. The user is then asked to locate the component and select a place position. The machine then does the required measurements and displays the measured values together with the old values, TPSys then asks the user if the new values should be saved or not.

Optical centering camera offsets

The only difference in this installation step is that the new calibration component is used instead of the thin metal component. The user no longer gets to select which package to use from the package list.

Mount tool offset calibration

This is a new calibration step that is designed to improve the accuracy of the Z-unit mount head when placing components close to the left edge of the Y wagon.

The user is first prompted to insert a board on the Y wagon, to insert the calibration component on the board and to locate the component. Next, the user is asked to select the leftmost and rightmost place positions to use for the calibration measurements. TPSys suggests default left and right positions. For best results these positions should not be adjusted by the operator.

The machine then performs the required measurements. During the calibration, which takes approximately 5 to 10 minutes, a progress indicator is displayed on the screen.

☞ During this calibration step the calibration component will be placed at different X-coordinates. For the machine to be able to place the component at all positions the board needs to be larger than approximately 130 x 50 mm.

HYDRA / Measure centering offset for HYDRA / linescan camera

The only difference in this installation step is that the new calibration component is used instead of the thin metal component. The user no longer gets to select which package to use from the package list.

HYDRA / Measure HYDRA tool offsets

This installation step has been changed to use the new calibration component and has also been changed so that no vision camera is needed for the measurements. Therefore, the user no longer gets to choose which package to use and which camera to use.

The user is first prompted to insert a board and the component and to locate the component and the place position. The machine then does the required measurements and displays the measured values together with the old values and asks the user if the new values should be saved.

New Parameters

Parameter	Description
66	**Install HYDRA tool offsets**
66.0015	The package name to use when doing hydra mount tool offset and HYDRA centering camera offset measurements. The default value is *Install-8x8mm* and that package definition is included in the CalibData.gen file.
66.0013	The name of the fiducial mark to use for searching the fiducial marks on the top side of the calibration component. The default value is *CalibComp* and that fiducial is included in the CalibData.gen file.
66.0014	Distance between fiducial marks on the calibration component.
67	**Install Z-unit offset**
67.0015	The package name to use when doing Z unit mount tool offset and centering camera offset measurements. The default value is *Install-8x8mm*.
67.0016	The package name to use when doing the C misalignment measurement. The default value is *Install-8x8mm-mech* and that package definition is included in the CalibData.gen file.
67.0013	The name of the fiducial mark to use for searching the fiducial marks on the top side of the calibration component. The default value is *CalibComp* and that fiducial is included in the CalibData.gen file.
67.0014	Distance between fiducial marks on the calibration component.
77	**Mount tool offset calibration**
77.0001	Number of components to place. How many placements to do for each place position in the calibration measurements.
77.0002	Reference measurement interval. How often to re-measure the reference position during the calibration. Re-measuring the reference position periodically makes it possible to compensate for temperature drift during the calibration measurements.
77.0011	Distance between placement positions. The mount tool offset is measured at many different X positions and the distance between two adjacent X positions is given by this parameter.
77.0021	Leftmost X position. The default value for the X coordinate of the left side of the interval to be calibrated.
77.0022	Rightmost X position. The default value for the X coordinate of the right side of the interval to be calibrated.
77.0023	The default value for the Y coordinate to use as place position during the calibration.
77.0031	Number of samples for average calculations / Drift. Specifies how many measured values to use in the averaging formula when computing the temperature drift compensation.
77.0032	Number of samples for average calculations / Calibration table. Specifies how many measured values to use in the averaging formula when computing the mount tool offset calibration tables.

Light Level Calibration for SVC and HRC

Background

The amount of light emitted by the DVC illumination module at a certain light level in TPSys may vary from camera to camera. This can have the effect that it becomes difficult to share package data between machines.

Description

To avoid this lighting problem, a calibration of the DVC illumination module has been added to TPSys 2.4. The light calibration is performed at the same time as the calibration of the camera optics and using the same calibration plate. The calibration is performed by stepping through the light levels of the illumination unit and calculating two parameters for each LED-group (dark field, ambient and front light). The first parameter is the gain factor of the group, the other parameter is a translation parameter. The translation parameter compensates for the fact that the illumination unit often does not start to emit light until the (uncalibrated) TPSys light level 5-10%. The translation parameter translates the light curve so that the unit starts to emit light already at the (calibrated) TPSys level 1%. The calibrated TPSys value will depend on the calibration parameters as:

$$C = gU + t$$

where C is the calibrated value, U the uncalibrated value, g the gain factor and t the translation parameter.

Since different cameras can emit different amounts of light, the maximum available light level will vary from camera to camera. For some cameras it will be possible to get a light level higher then the calibrated TPSys level 100%, others may not reach 100%. Due to this fact, the range of the DVC light level field in the package editor has been changed from 0-100% to 0-1000%. If one sets a level that is higher than a specific camera can handle, the light level used by the camera will be the maximum level of the camera. If an optical centering fails and the illumination is set to a higher level than the camera can handle, a warning is given on the message log.

☞ In order for the light calibration to perform as intended, the calibration needs to be performed with the latest revision of the calibration plate. This calibration plate has a copper pattern on a dark background. **Do not use an older calibration plate** that has a gold pattern or a black pattern on a white background. If the wrong calibration plate is used, the illumination calibration will not work as intended.

Conversion of Package Data

When the illumination parameters of the camera have been calibrated, all package DVC illumination settings will correspond to a different illumination in the camera than before the calibration. This may have the effect that some already defined packages cannot be centered with the camera.

To avoid this problem a program called `illumConv` has been added to the distribution of TPSys 2.4. This program converts the illumination settings of the packages to the new calibrated scale. This program will make sure that the camera will use the same illumination level before and after the calibration. You should normally only run the illumConv program once on every machine.

To convert the packages into the new calibrated illumination scale, first export the package list to a file. Then go to the directory where you put the exported file and make a backup copy, in other words give the command:

```
cp pck.pck packListYYMMDD.pck
```

where *pck.pck* is the name of the file you just created and *packListYYMMDD.pck* is the desired name of the backup copy. Make sure to keep the copy for future reference.

We are now ready to do the conversion; this is done by giving the command:

```
illumConv –i pck.pck –o new.pck
```

Where *new.pck* is the name of the new package list file that shall be created. The new file should then be imported back into TPSys.

☞ The conversion program shall only be run **once** on a package list. When the conversion program has been run, the package data has been converted to the calibrated scale once and for all. Even if the camera is replaced the conversion program shall **not** be run again.

New Parameters

Parameter	Description
53.0405	Light translation parameter for the dark field group of SVC1.
53.0406	Light translation parameter for the ambient group of SVC1.
53.0407	Light translation parameter for the front light group of SVC1.
54.0405	Light translation parameter for the dark field group of HRC1.
54.0406	Light translation parameter for the ambient group of HRC1.
54.0407	Light translation parameter for the front light group of HRC1.
55.0405	Light translation parameter for the dark field group of SVC2.
55.0406	Light translation parameter for the ambient group of SVC2.
55.0407	Light translation parameter for the front light group of SVC2.
56.0405	Light translation parameter for the dark field group of HRC2.
56.0406	Light translation parameter for the ambient group of HRC2.
56.0407	Light translation parameter for the front light group of HRC2.

Toggle Fiducial Mark Outline on/off

Background

When locating small fiducial marks manually, the graphics drawn to mark the outline of the fiducial mark can occlude too much of the mark and make the adjustment difficult.

Description

When locating fiducial marks manually it is now possible to toggle the graphics marking the outline on and off using <Ctrl>+<F3>.

Toggle Fiducial Mark Outline on/off

Teach and Verify Area Active When Teaching a Fiducial Mark

Background

Teaching of fiducial marks was in some aspects non-interactive in TPSys 2.3 and earlier. Teach area and verify area for fiducial marks were specified in mm or inches before the actual teach.

The fiducial mark teach has been modified in TPSys 2.4 in order to make the process more interactive.

Description

The fiducial mark teach works in the following way in TPSys 2.4. As before, the user initiates a fiducial mark teach by pressing <F7> in the fiducial mark editor. The camera is then turned on and the user is asked to center the crosshairs over the fiducial mark using the joystick or trackball. When the crosshairs is in the center of the fiducial mark, the position should be confirmed by pressing <Enter>. A yellow rectangle then appears in the image and the user is asked to adjust the teach area. The size of the teach area can be controlled with the joystick or the trackball. When the yellow rectangle has been adjusted so that it covers the whole mark, the size should be confirmed by pressing <Enter>. The fiducial mark is then taught and the result is shown on the screen. The user is then asked to adjust the verify area in the same way as the teach area.

Improved Vacuum Test

P-010-0813E-EN

Description

The vacuum test in the TPSys *Diagnostics* menu has been improved. The max and min vacuum values are no longer displayed, only the difference between the max and min values is displayed. The absolute values do not matter for the functionality of the vacuum system. Because of the design of the electronics involved, the absolute values are not even the same on different machines. The absolute values are still visible from the service program.

Find Mount Position in PCB Editor

Background

If you were about to do something with a mount position for a certain package or component, for instance view that mount position, in TPSys 2.3 and earlier there was no way to find such a mount position except manually scanning the mount list in the PCB editor.

In order to make this task easier, a new function *Find position* has been added to the PCB editor.

Description

The *Find* function is available in the PCB editor and pressing <F6> activates it. When activated, a pop-up appears where you can select what type of information to search for, see *Figure 6* below. There are three types of information to search for; component, package and location designator. There is an associated field for each information type where the search value for that type is given. The associated field is unlocked when the corresponding type is selected, otherwise it is locked.


```
                    Find: Package
                 Package: BGA225-15x15-1.5
               Component: ---
      Location designator: ---
```
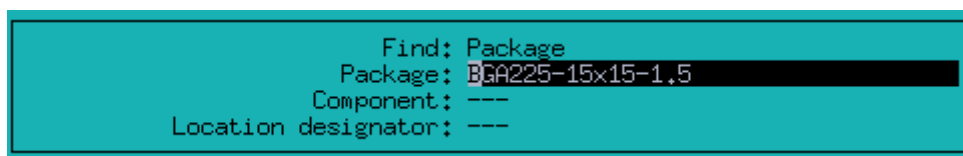
Figure 6. Search pop-up in the PCB List Editor

When <Enter> is pressed in the associated value field, the PCB is searched for a position that matches the search criterion. The search starts from the position after the currently highlighted position. If such a position is found, the cursor is moved to that position but the search pop-up remains open. Pressing <Enter> again will repeat the search. This can be repeated until no more matching position is found; then you will get a pop-up that asks if you want to continue searching from the top of the list. If you accept to start searching from the top of the list but no matching position is found, indicating there is no matching position in the list, there will be a red pop-up saying this. The search pop-up is exited by pressing <Esc>.

Smart Previous/Next Keys in View Mount Position

Background

The View mount position function in the PCB editor in TPSys is useful for verifying the mount result.

Since TPSys does not mount in the mount position order due to optimization reasons, it could in TPSys 2.3 be a tedious task to find and look at only the mounted positions on a PCB that is partly mounted. To make this task easier, a function for looking at only the mounted positions has been added. One can also choose to look at only the not mounted positions or only the glued positions. It is also possible to look at only one type of package or component.

Description

When you select *View mount position* in the PCB editor, you will see a new field in the control window in the upper left corner of the screen. The new field is called *Browse by*. The value of this field controls which mount positions shall be visited. See *Figure 7.*
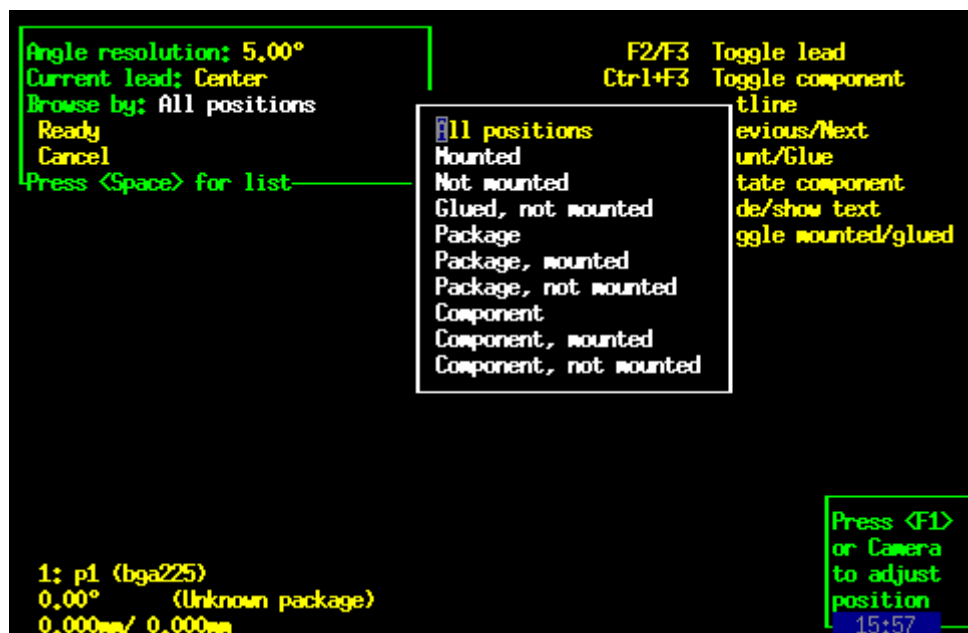
Figure 7. Control window for View mount position

You can change the value of the *Browse by* field by selecting it and pressing <Space> to get a list of available values to choose from. When you press <PgUp> or <PgDn> to go to the previous or next position you will only visit positions that have the same value of the characteristics that is selected by the *Browse by* field. If the *Browse by* field is set to *All positions* no restriction of positions to visit is added. Below is a description what happens for different values.

Selection	Behavior
All positions	Step among all mount positions.
Mounted	Step among all position with status 'Mounted'.
Not mounted	Step among all positions with status 'Not mounted'.
Glued	Step among all positions with status 'Glued'.
Package	Step among all positions that with the same package as the current position.
Package, mounted	Step among all positions with mount status 'Mounted' and with the same package as the current position.
Package, not mounted	Step among all positions with mount status 'Not mounted' and with the same package as the current position.
Component	Step among all positions that have the same component as the current position.
Component, mounted	Step among all positions with mount status 'Mounted' and with the same component as the current position.
Component, not mounted	Step among all positions with mount status 'Not mounted' and with the same component as the current position.

Automatic Creation of a Layout When a New Board is Created

Background

When a board was created in TPSys 2.3 from the PCB or Panel List editor, it was not inserted into a layout. A board always needs to be included in a layout for the machine to be able to assemble the board. As a consequence, the X-wagon camera could not be used to program such a board until it had been inserted into a layout.

When a board was inserted into a layout in TPSys 2.3, the fiducial marks sometimes had to be located twice, first when the board was inserted and later when you wanted to add a component to the board using the X-wagon camera.

Description

Inserting a board from the PCB or Panel List editor

When a board is created in the PCB or Panel List editor it is now possible to automatically insert the board into a layout.

When inserting a new board in the PCB or Panel list editor, the pop-up in *Figure 8* appears.
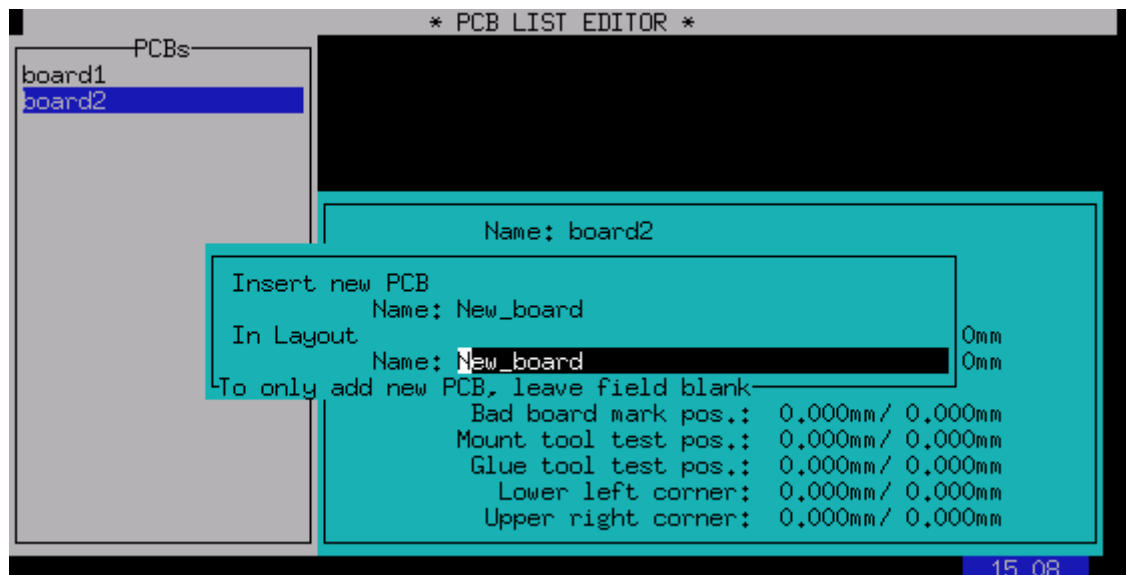
Figure 8. When inserting a new board the pop-up above appears. The user has to specify the name of the new board and can also specify the name of the layout in which the board shall be inserted

In the *Insert new PCB – name* field one should specify a name for the new board. In the *In Layout – name* field one should specify the name of the layout in which the board should be inserted. TPSys will suggest the same as the name of the new board. It is also possible to edit the layout name. If you only want to add a board without inserting it into a layout, it is possible to do so by leaving the field blank.

It is only possible to insert a new board into a layout if the current user has the right to do so according to the user access system. A user without layout modification access will see the old behavior.

If a layout with the specified name already exists in the layout list, you will be asked if you want to add the board to the existing layout. The default answer is *No*. If you answer *No* you must change the name of the layout. If you answer *Yes* the board is added to the layout. In other words you have the option to add a new board to an existing layout but it is not recommended. We recommend first loading the layout and then adding a new board to the loaded layout.

If TPSys is unable to insert the new layout in the Layout List, you will be asked if TPSys should delete the created board. There can be two reasons for this: network problems with reaching a remote data server or another user inserted a new layout with the same name before you.

If TPSys is in online mode, you will be asked if the layout should be loaded. If the layout is loaded you will be able to use the X-wagon camera to search for fiducial marks on the board. When the board has been created it will be trimmed and present in the machine.

Inserting a board into a layout

If a board is inserted into a layout from the Layout editor, the fiducial marks will only have to be trimmed once. No extra trimming will be needed to be able to add components to a PCB or to insert a PCB in a panel.

Select Multiple Items for Export

Background

The export utility in TPSys is used to export the contents of TPSys databases into a well-defined ascii format. For most databases it has been possible to either export all items in a database or to export one single item. These two alternatives have been replaced by a new function that includes the previous ones.

Description

As before, export is activated by selecting *Utility > Export* and then choosing the database from which data shall be exported, for example the package database. After choosing the export channel: *DOS*, *UNIX/NFS* or *FTP* (and *Directline* for Directline format), an editor view for the chosen database is shown. It is now possible to control which items should be exported in the following way:

- By pressing <Space> the current database item is selected/deselected for export.

- By pressing <Ctrl>+<A> all database items are selected/deselected for export.

Each item that has been selected for export is marked with a star to the left of the name, see *Figure 9*.
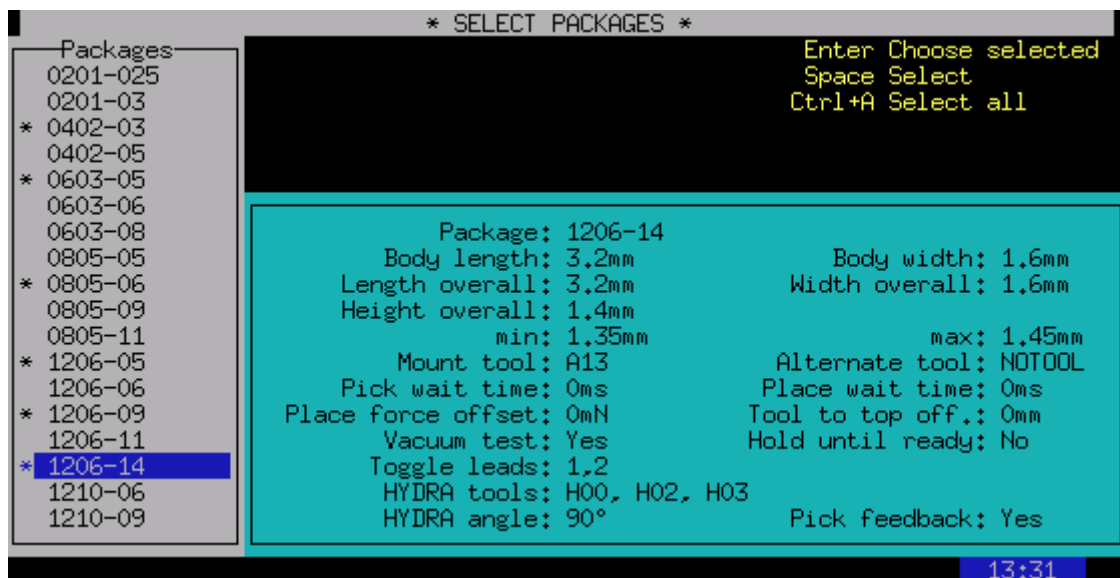
Figure 9. It is now possible to export several database items at once by marking them using <Space>

When the items to be exported have been marked, they can be exported by pressing <Enter>. The export will then continue in the usual way.

Reject Bins on the Y wagon

Background

In previous versions of TPSys it was possible to have four reject bins. Each reject bin had its own x-coordinate. With this system it was possible to place reject bins in the frames of the machine. The limitation was that if the frames hosted cameras or a glue station, there was no room left for reject bins without using magazine positions.

Now one can have reject bins on the Y wagon and the number of reject bins in the system has been increased to eight.

Description

It is now possible to have up to eight reject bins. Bins 1-4 are always of type *Frame* as in previous versions. Bins 5-8 can be set to *Not used* or *Y wagon*.

The frame type bins work as in previous versions. When throwing components in such a bin, the Z or HYDRA head will move to the reject bin's x-position and throw the component. When throwing components in a reject bin of type Y wagon, the Z or HYDRA head will move to the reject bin's x-position and the Y wagon will move to the reject bin's y-position before throwing the component.

Which reject bin to throw a component in is selected in the component editor. Only the reject bins of other type than *Not used* are selectable.

Installation

Bins 1-4, which are of frame type, are installed in autoInstall as in previous versions.

Bins 5-8 are by default set to *Not used*. This can be changed in parameter file 32 *Reject positions*. The position of a Y-wagon type bin is adjusted by selecting *Installation > Adjust Y-wagon Reject Bins* and then selecting the bin you want to adjust. The position of the reject bin can then be interactively set by pointing the Z-head at the desired location using the joystick.

New Parameters

Parameter	Description
32.0012	Manual reject position.
32.00x1	Reject position type.
32.00x2	Reject bin x-position.
32.00x3	Reject bin y-position.

Careful Put Back of Components in Trays

Background

The put back handling of small components into trays has not been optimal in earlier versions of TPSys. Since the vacuum system is "reversed" after the Z-axis has moved down to the tray, the components near the tool tip could move around and some times be blown away when the Z-axis started to move up again.

Description

From the average user's point of view, nothing is changed. For users who are using the tray concept for very small components (like 0603, 0402, 0201, small flip chips or small bare dies), the parameter 22.0015 can be used to equalize pressure before Z moves up after a put back. A suitable value could be approximately 300 - 700 ms.

New Parameters

Parameter	Description
22.0015	Equalize pressure at put back. Specifies a wait time in milliseconds to wait for pressure equalization before moving Z up from the tray.

When the parameter 22.0015 is changed, it changes the put back speed for all packages. The default value 0ms is good enough for all put back handling down to the size equivalent to 0805 components.

Different Pitch in X- and Y-direction for Generic BGAs

Background

Generic BGAs must have the same pitch in the x- and y-direction in TPSys 2.3 and earlier but there are packages with all the characteristics of a generic BGA but with different pitch in x and y. By adding handling of separate pitches, these packages can be programmed more easily.

Description

The pitch field in the generic BGA editor has been replaced with two new fields *X-wise pitch* and *Y-wise pitch*. These new fields work like the old pitch field, if either of them is changed the center of the package must be re-defined.

Support for different pitches in the x- and y-direction has also been added to Autoteach of BGAs. As can be seen in *Figure 10,* the single pitch field has been replaced with two pitch fields, one for the x-direction and one for the y-direction. These two fields work in the same way as the single field did in TPSys 2.3. If *Auto* is chosen in the field, Autoteach will automatically measure the pitch in that direction. If the pitch is known it may also be entered directly into the field.

Figure 10. There are now two pitch fields in the window that controls Autoteach of ball devices, one for the x-direction and one for the y-direction

When the teach is done and the result is shown, the pitch is now displayed in two different fields, one for each direction.

This change only affects Autoteach of ball devices, leaded devices are still assumed to have the same pitch in both x- and y-direction.

Barcode Handling of Trays and Tray Positions

Background

Loading of components into feeders and magazines has been possible with a hand held barcode scanner in previous versions of TPSys. However tray magazines have not been included in this functionality. In TPSys 2.4, functionality has been added that makes it is possible to also load tray magazines with a hand held barcode scanner. This function makes it possible for MYLabel to handle trays and this functionality has been added in MYLabel 3.0.

Description

Editor handling

In TPSys 2.3 and earlier, Y-wagon trays and tray-wagon trays were local to each machine. The Y wagon and tray-wagon position databases were also local to each machine. In TPSys 2.4 it is possible to share Y-wagon and tray-wagon trays and tray positions. This is done by setting parameter 181:0131 *YW/TW Trays* to *Yes*.

Since all trays in the system may be shared, the presentation of trays in the editors is made in the same manner as for other magazines. This means that it is now possible to toggle the sort order, trays can be sorted either by name or by host.

For tray positions it is also possible to toggle the sort order by host or name. It is also possible to display only positions local to the machine. Even if tray positions are shared between machines and possible to read, only positions local to a machine can be used for that specific machine when assigning positions to trays.

On a stand-alone server, the tray position editor is limited to presenting and deleting tray positions.

Making a tray present or not present

In TPSys 2.3, a tray was made present either by trimming it with the camera system or by highlighting it in the editor and pressing <Space> once. A tray was made non present by highlighting it in the editor and pressing <Space> once. Even if the tray was present, it had to be trimmed before it was possible to pick components from it.

In TPSys 2.4, a tray can be made present in a machine either by trimming the tray or by assigning a tray position and an orientation to it. The orientation is given by defining where the corner with the first component in the tray is located, see *Figure 11*. When a tray is present it is possible to pick components from it.
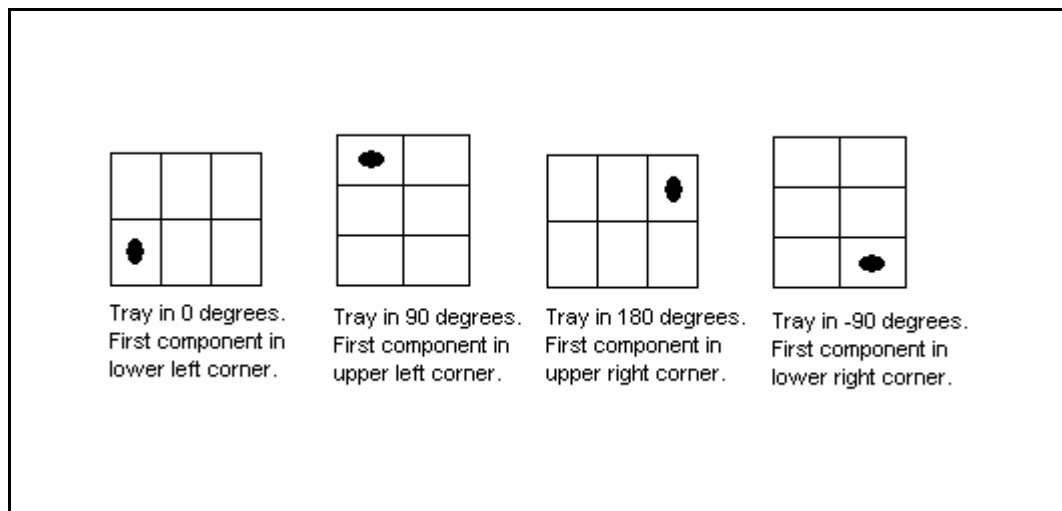
Figure 11. Definition of tray orientation

A tray is removed (made not present) by highlighting it in the editor and pressing <F7>.

Barcode for trays and tray positions

Barcode functionality for trays and tray positions has also been added to TPSys 2.4. In tray editors and tray position editors, it is possible to edit barcode fields by using a hand held barcode scanner. The tray barcode field is the same as the tray name field. For tray positions, an extra barcode field has been added.

Inserting a tray in TPSys via the hand held barcode scanner is done by first scanning the tray name barcode and then scanning a tray position barcode belonging to the machine in question.

For pallet trays, the load sequence ends with the scanning of a pallet.

It is possible to scan the angle of the tray between the scanning of the tray and the tray position. This defines the orientation of the tray in the tray position. If no angle is scanned 0 degrees will be used, in other words the location of the first component will be in the lower left corner.

It is possible to scan quantity number and batch identity between the scanning of the tray and the tray position. Batch and quantity may be scanned in any sequence. A special quantity value exists: *Full Tray* which means that the remaining number of components in the tray is set to the tray type definition of columns*rows.

Upgrade/import of TPSys 2.3 ascii data

During upgrade, the tray names will be auto generated. The name will be the old name plus a number at the end (*Name-Nr*). The number is needed since a tray with the same name may exist on several machines in TPSys 2.3.

New Parameters

Parameter	Description
123.0531	Y wagon tray prefix.
123.0532	Tray wagon tray prefix.
123.0533	Pallet tray prefix.
123.0534	Y wagon tray position prefix.
123.0535	Tray wagon tray position prefix.
123.0536	Pallet tray position prefix.
123.0537	Single pallet prefix.
123.0538	Double pallet prefix.

Warning on Large Magazine Fiducial Mark Offset

P-010-0813E-EN

Background

TPSys holds information about the position of all magazine slots in the machine. The system also holds information about the location of the fiducial marks on each magazine. So when magazines are located, TPSys knows the approximate position of the fiducial marks. In TPSys 2.3 and earlier, no check was made to see if a detected fiducial mark position is reasonable. In TPSys 2.4 a check has been added.

Description

TPSys now gives a warning if the location of a magazine fiducial mark varies more than expected (a few mm) from the nominal position. This could happen if the slot position is badly adjusted or if the fiducial mark was not located correctly. If TPSys detects a large offset, the following message is given in the message log:

`I-MHPR-3: Large fiducial offset for magazine` *<Magazine name>/<slot number>*

Improved Electrical Verifier

Background

Previously, the electrical verification in TPSys used slightly different algorithms for measurement and verification of a component. Since components are non-ideal this could lead to different results for the same component depending on if the value was measured or only verified. A typical example would be that the verification failed but a measurement showed that the component was ok. (Verification checks that the value of a component lies within a certain range and measure measures the actual value of the component).

Description

The behavior described above has been eliminated in TPSys 2.4 by introducing a new algorithm that uses the same basic technique for both measurement and verification.

Furthermore, the old, now obsolete, measurement algorithm sometimes gave noisy results for some components like small capacitors. To compensate for the noisy measurements it was possible to take the mean of several measurements. Since the new algorithm always gives a noise free result, this behavior, called enhanced measurement, has been removed along with its switch 1001:0021.

Automatic Location of Fiducial Marks on Inserted Magazines

Background

In TPSys 2.3 and earlier, it is possible for the machine to pick from a magazine although the magazine has not been located. Picking from a magazine that has not been located may lead to high pick failure rate. To avoid this problem, TPSys now automatically locates all magazines before picking from them.

Description

All types of vibratory and tape magazines are located automatically before use. Every time a magazine is inserted it is marked as not located. If TPSys fails to locate the magazine automatically while assembling, the magazine is disabled and a Message log message and an operator alert are generated. The assembly continues using other magazines. The Operator should locate the magazine to enable it again and finish the layout. If automatic location of the magazine fails in interactive situations, the operator is asked to locate the magazine manually. Automatic location can be turned off for each individual magazine by setting the field *Fiducial mark* to *No*.

Change Package for all Components Having a Specific Package

Background

When maintaining the Package List, the operator sometimes needs to remove a duplicate of a package. Before a package can be removed from the Package List the operator must change the package for all components that use that package. Sometimes the package is used by many components. In TPSys 2.3 and earlier, this could be a tedious task since a package can be used by many components and all components had to be edited one by one. To avoid this problem, a new function has been added to TPSys 2.4. This function makes it possible to automatically change package for all entries in the Component List that use that package.

Description

The new function is activated by pressing <F9> in the Component List editor. A pop-up with two fields then appears on the screen. In the first field the package that shall be exchanged shall be entered. In the second field the package that shall replace the old package shall be entered. When pressing <Enter> in the second field, TPSys searches through the component database and a new pop-up appears. In this pop-up TPSys outputs the number of components that were found to have the package and the user is asked to confirm the change.

Pre-pick Inspection for Components in Trays

Background

In TPSys, optical component inspection with any centering camera is based on the assumption that the component is not going to be picked too displaced in relation to the tool rotation center. This is done to shorten inspection time by reducing the image area where image processing will be performed.

The maximum pick displacement is controlled by two system parameters *41:0031 Max angle deviation* and *41:0032 Max positional deviation*. These parameters are common to all packages since they are functions of package, mount tool and magazine properties.

For some components, especially small flip-chips or bare dies in trays, position and angle offsets from the theoretical ones can exceed these systems parameters. For flip-chips in trays this is due to too large tray pockets that allow relatively large translations and rotations of the component inside the pocket. This could lead to a failed optical inspection or even a failed component pick.

Some components can now be pre-inspected using the X-wagon camera and the pick position and the presentation angle to the centering camera can be automatically adjusted accordingly.

Description

A component can be inspected with the X-wagon camera and inspection data used to adjust pick position if:

  – It has a rectangular shape.

  – It is not bigger than the X-wagon camera FOV.

  – It lies in a tray.

It is also assumed that the component cannot rotate freely in the tray pocket since it is not possible to distinguish between rotational symmetrical angles. For example, one cannot distinguish between a component lying in 0 degrees and a component lying in 180 degrees.

Activation of this function and modification of parameters necessary for the optical inspection with the X-wagon camera are performed in the Tray Type editor, see *Figure 12.*
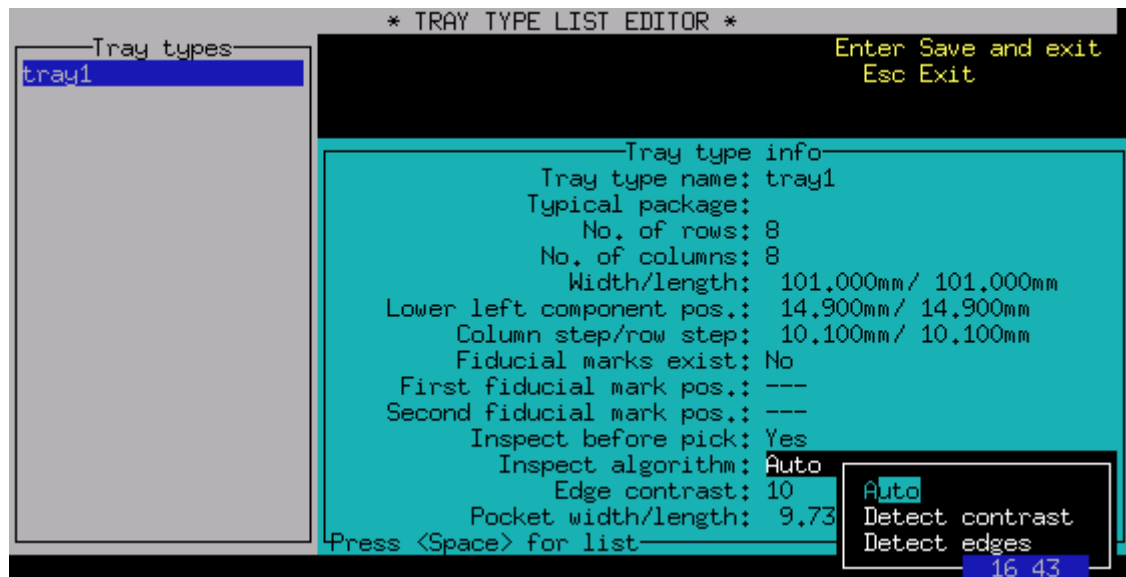
Figure 12. Tray Type editor in TPSys 2.4

Inspect before pick

> Activates/deactivates optical inspection before pick. Default value is *No*.

Inspect algorithm

> *Detect contrast*: Finds component by separating component from background if there is enough contrast between them, in other words the component appears clearly darker or brighter than the tray background.

> *Detect edges:* Detects local contrast changes (edges) and finds those that belong to the component outline to calculate its position. This method is slower but can be used when the component appears to have approximately the same brightness as the background, but the contour between the component and the tray can still be discerned.

> *Auto:* First tries to separate object from background using contrast. If that fails, it tries to locate the component by detecting the edges.

Edge contrast

> This value is used when detecting edges to select which edge contrast is required. The lower the value the more edges are found. If there are edges in the middle of the components, for example text, they can be filtered out by increasing the edge contrast requirement. If the contour is very indistinct you have to reduce this value.

Pocket width/length

> The width and length of the pockets of the tray. Can be measured using the X-wagon camera by pressing <F1> when this field is highlighted.

If the component cannot be found on the tray, an error message is generated and the machine does not try to pick the component.

It is possible to see images taken with the X-Wagon camera during the Pre-pick inspection operation by setting the parameter *41.0001 View mode* to 'Yes'.

☞   Remember to set the paramter back to 'No' when you are done since having the view mode set to 'Yes' considerably decreases the mounting speed.

If the machine stops after a centering attempt you will see a composed image like the one shown in *Figure 13*. The top image is the one taken by the centering camera, in this case an HRC. In the lower part there are three images if the *Detect contrast* algorithm was chosen:

1. On the left a sub sampled image of the one taken by the X-wagon camera surrounded by a red rectangle and showing:

   – In green, the contour of the region of the image the vision system considers belongs to the component.

   – In red a rectangle fitted to the contour drawn in green. This will be used as the detected position of the component. The visible corners and the center of the component are marked with red crosses.

2. In the middle an image where what might be the object is marked in white and the background in black.

3. On the right an image histogram is drawn in red. Normally the *Detect contrast* method is chosen when two clear maxima are found in the histogram as in the one in *Figure 13*.
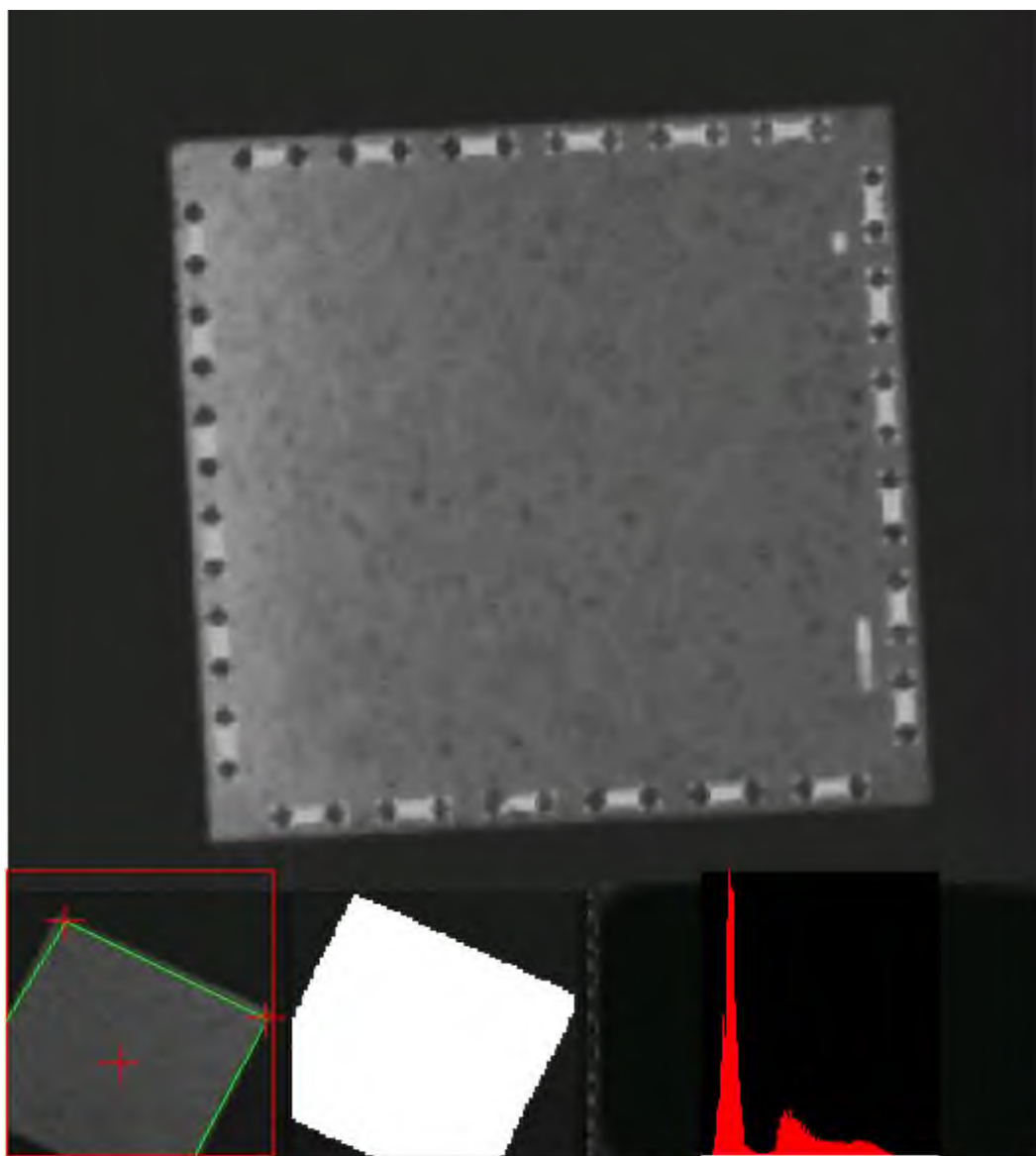
Figure 13. Images seen when the Detect Contrast algorithm is applied when and the view mode parameter has been set to 'Yes'

If the *Detect edges* algorithm is selected only the left image is added to the one taken by the centering camera showing:

  – In green the detected edge points in the image.

  – In red the visible part of a rectangle representing the component. The visible corners and the center of the component are marked with red crosses.

In *Figure 14* it can be seen that edge points were found along three of the component sides. Some edge points were also found in the body of the component. This data is enough to calculate the component position.

Decreasing the *Edge contrast* requirement might result in finding the whole fourth side but maybe at the expense of finding lots of edge points in the body of the component and possible a failed component search.

Increasing the requirement would maybe get rid of the edge points in the component body but also less edge points would be found on the right side of the component.
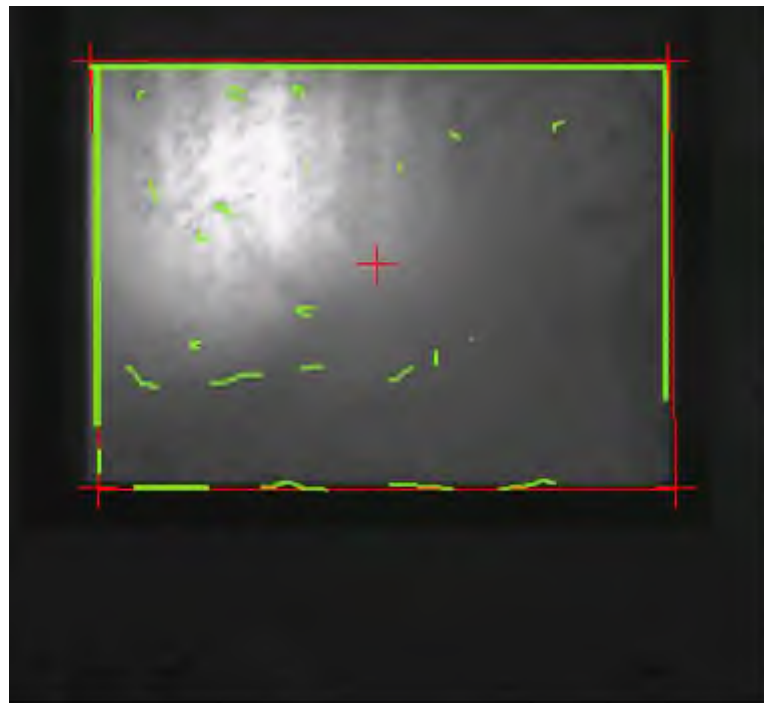
Figure 14. Image shown by the Detect Edges algorithm when the view mode parameter has been set to 'Yes'

Improved Test Centering

Background

The test centering function that was introduced in TPSys 2.3 has been improved in TPSys 2.4. The function now outputs statistics collected by the image process in numerical and graphical form. This new function is a powerful tool when programming vision packages.

Description

After test centering a package, TPSys now goes into a view mode where the operator can see the image acquired along with collected statistics from the optical centering. In the image TPSys also marks using color graphics: the mechanical model of the package, the vision search areas and the detected features. Model data is drawn in red and detected features are drawn in green. The user is able to zoom and pan around in the image and is also able to toggle the graphics that show the mechanical model data and/or the found features on and off. Note however that panning and zooming the image only works with machines with VVG2 hardware. An example of a test centering in TPSys 2.4 is shown in *Figure 15*.
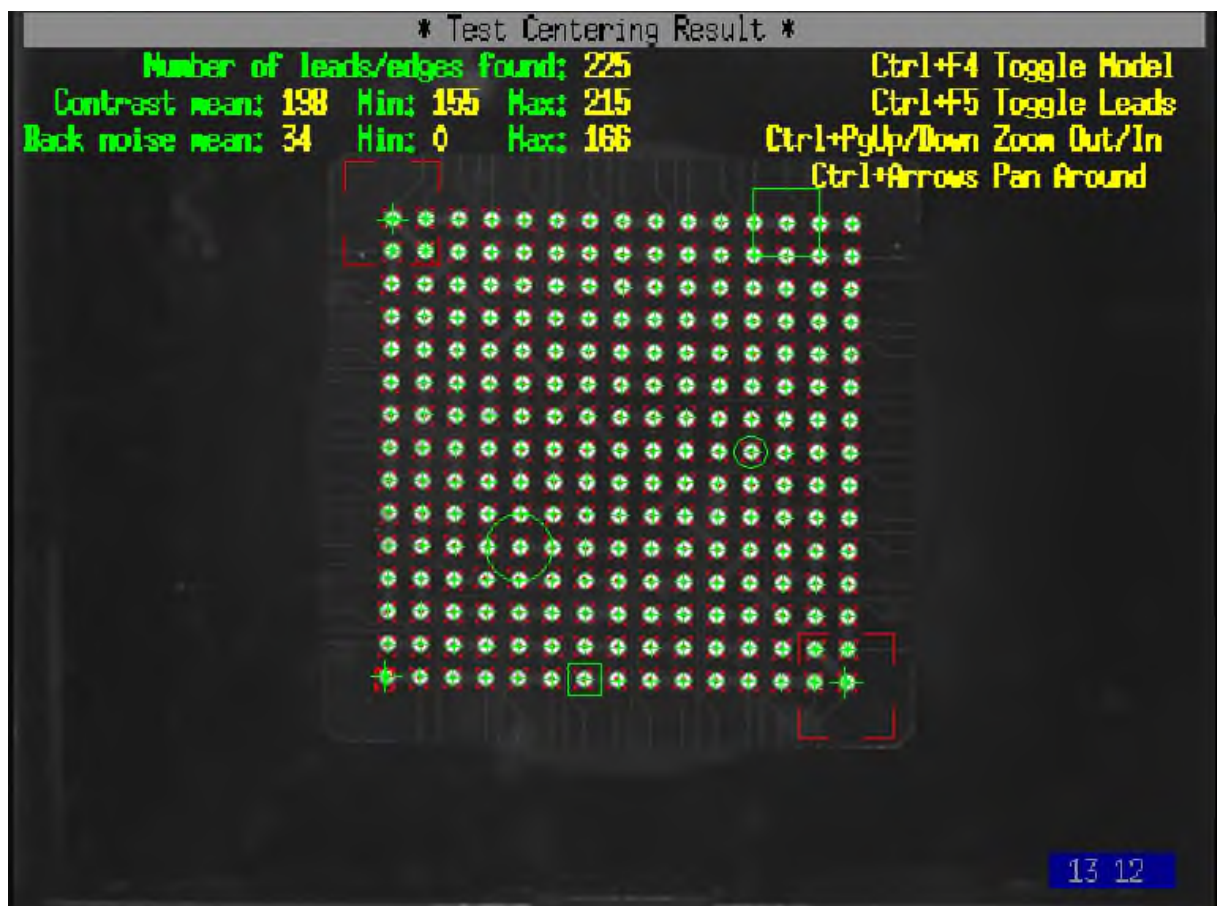
Figure 15. The result of running test centering on a component in TPSys 2.4

In the upper-left corner of the screen TPSys outputs:

- The total amount of leads/edges found in the image.

– Mean, minimum and maximum values for the contrast and background noise for the found leads (edge points in case of outline and chip components).

The model data, shown in red include:

– The coordinates of the leads/edges according to the mechanical model described in the package data. Shown as small crosses.

– Areas where the coarse search is performed. Shown as rectangles in the image.

– Areas where each individual lead is searched. Shown as small rectangles around each lead.

The found features, shown in green include:

– All found leads during the coarse search step. Marked with green crosses at 45 degrees (X) with a size corresponding to the package data (ball diameter for ball components, half pitch for outline/chip components or lead width for leaded components).

– The leads that have been found to correspond to the outer leads of the component are marked with large green crosses (+) if the coarse alignment method *standard* is used. For outline packages, the detected corners of the component are marked with large green crosses.

– All found leads during final inspection. Marked with green crosses (+) with a size corresponding to the package data (ball diameter for ball components, half pitch for outline/chip components or lead width for leaded components).

– The leads with the maximum and minimum contrast. The minimum value is marked with a circle with a diameter equal to the lead/edge-point pitch and the maximum value with a circle with twice that diameter.

– The leads with the maximum and minimum background noise. The minimum value is marked with a square with a side length equal to the lead group/edge-point pitch and the maximum value is marked with a square with twice that size.

– Not detected leads, leads with too high noise, too low contrast or that deviates more than the specified value from the nominal position are marked with a green arrow.

Improved Handling of Large Components

Background

In previous versions of TPSys, the user had to manually specify a centering level for large components. The user also had to modify the centering level parameter manually to make TPSys move the component to the correct height. If the height for the centering level was not chosen correctly, centering would not succeed. In some cases the component could even hit the mechanical centering device and the machine would drop the component.

Now TPSys automatically runs the component to the correct height in the machine for all components that only use vision centering. TPSys will also refuse to mount vision components that it detects will collide with the mechanical centering device or other parts of the machine.

Description

Definition of large component

A component is regarded as large if it does not fit or if it cannot be rotated inside the mechanical centering device.

When TPSys decides if a component is large, it uses the overall size of the package. TPSys assumes in this case that the component is picked in the center. If a component is not picked in the center then the overall width and/or length must be adjusted for TPSys to handle the component correctly.

In the left example in *Figure 16* below the component is picked in the center. In this case one should input the value *w* as the overall width of the package and the value *l* as the overall length of the package. In the example to the right in *Figure 16* the component is picked off center in the x-direction with an offset equal to *xOffset*. For TPSys to handle the component correctly in this case, the overall width of the package must be set to include the dashed part of the figure, in other words the overall width should be set to *w+2*xOffset.* A new field called *Pick in center* has been added in the package editor. If a component shall not be picked in the center defined by the package, this field must bet set to 'No'.
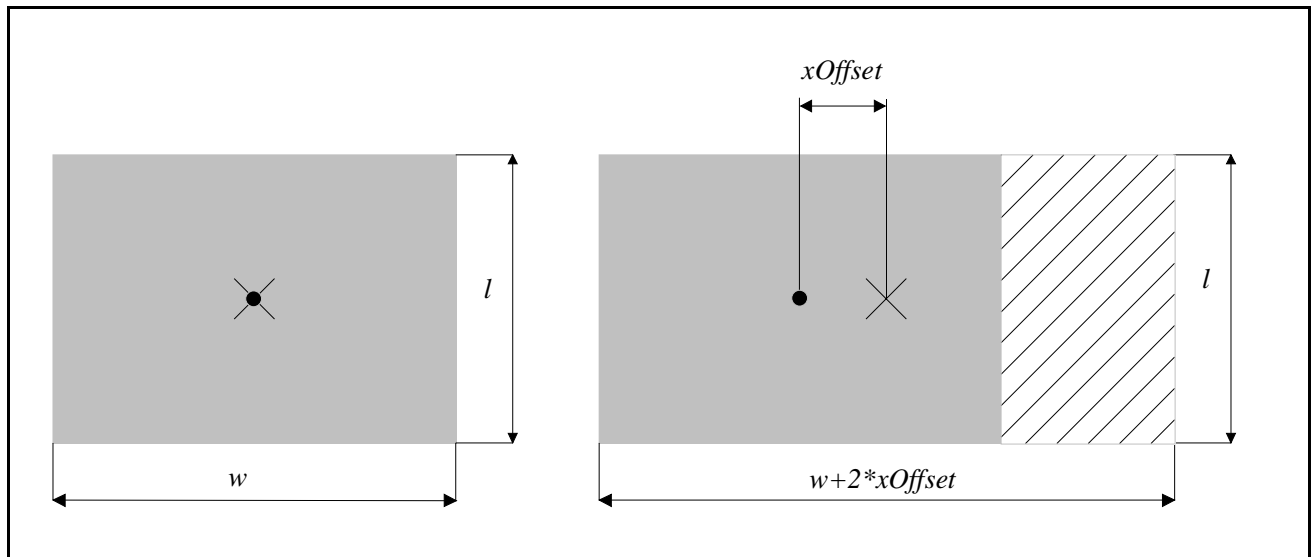
Figure 16. The component to the left is picked in the center, indicated by a cross. The component to the right is picked off center, also indicated by a cross. For TPSys to handle the component correctly the overall width of the component has to be modified to compensate for the pick offset.

How to setup the machine to handle large components

There are some cases when large components can be centered using a non-lifted mechanical centering device (this is the standard configuration) but in most cases the mechanical centering device needs to be lifted 6 or 12 mm. In all cases TPSys will handle centering of the component automatically, in other words. run the component to the correct height in the machine.

All that has to been done to setup the machine to handle large components is done by autoInstall. Four measurements have been added to autoInstall. The added measurements are described below.

Measurement: 21.0205, Z-pos. of the lowest part of the X wagon.

Text: Measure Z-position of the lowest point of the X wagon, in a circle with radius 50 mm around the ZFi-unit. Usually the linescan reference line.

What to do: Move the X wagon to a position where it is easy to reach the ZFi-unit. You can do this with the arrow keys or the joystick. Put a flat hard object under the part that corresponds to the lowest part of the X wagon in a circle with radius 50 mm around the ZFi-unit. On machines prepared for linescan camera or that have a linescan camera this corresponds to the linescan reference line. Then move the ZFi-unit down and measure the position.

Measurement: Diameter of the outer part of the ZFi-unit.

Text: Measure with a slide caliper the outer diameter of the lower part of the ZFi-unit.

What to do: Use a slide caliper to measure the outer diameter of the lower part of the ZFi-unit, see *Figure 17.*
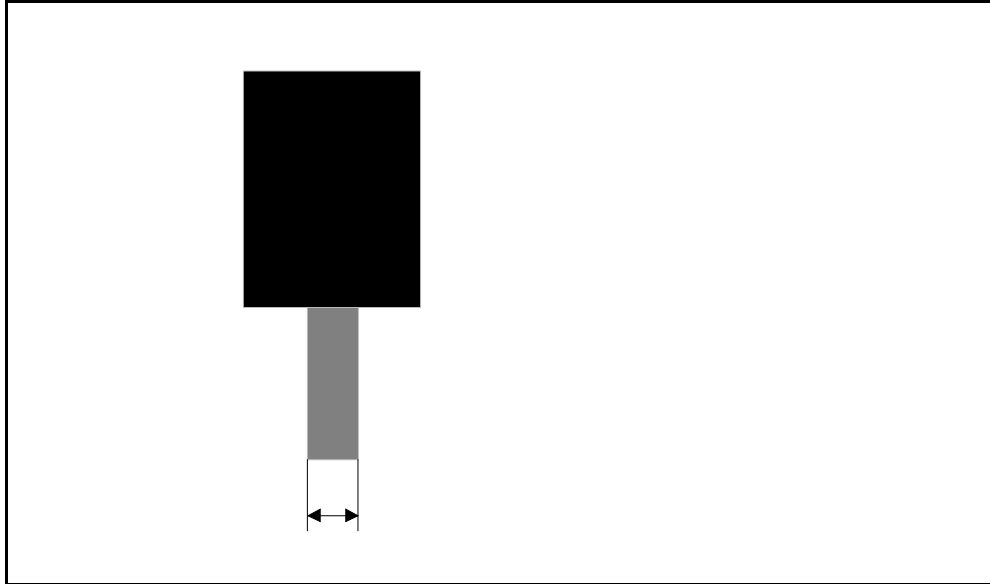
Figure 17. Use a slide caliper to measure the diameter of the lower part of the ZFi-unit

Measurement: 21.0204, Min distance from the ZFi-unit to the part in 21.0205.

Text: Measure with a slide caliper the horizontal distance between the outer edge of the lower part of the ZFi-unit and the lowest part of the X wagon within a circle with radius 50 mm around the ZFi-unit. The lowest part is usually the linescan reference line.

What to do: Use a slide caliper to measure the horizontal distance from the edge of the lower part of the ZFi-unit to the object in measurement 21.0205. On machines prepared for or that have a linescan camera this corresponds to the linescan reference line. See *Figure 18* below.
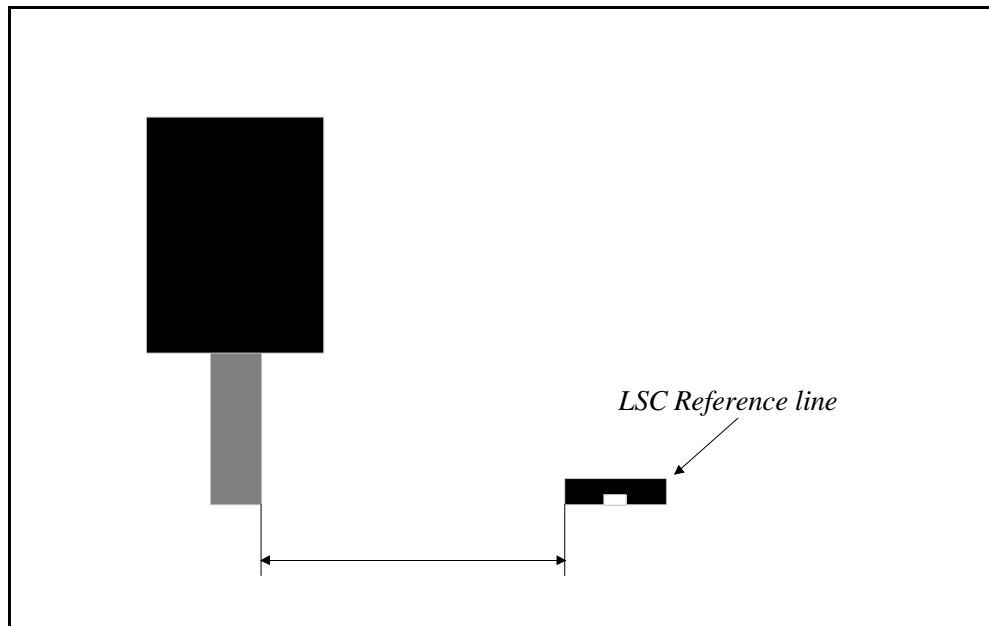
Figure 18. Use a slide caliper to measure the distance from the lower part of the ZFi-unit to the lowest part of the X wagon within a circle with radius 50 mm around the ZFi-unit

Measurement: 21.0203, Max Y under X wagon.

Text: Measure with a slide caliper the horizontal distance between the lower part of the ZFi-unit and the glass plate.

What to do: Use a slide caliper to measure the distance from the edge of the lower part of the ZFi-unit to the glass plate, see *Figure 19*. On some machines there is a metal frame on the lower edge of the glass plate. If there is such a frame on the machine and the metal is closer to the ZFi-unit than the glass, the distance to the metal frame should be measured instead.
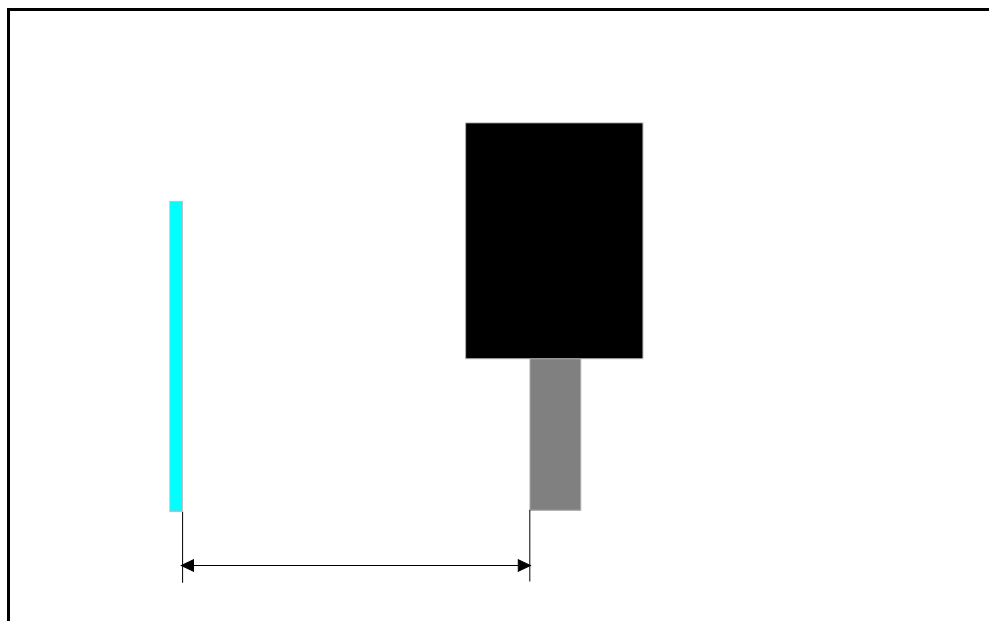
Figure 19. In this measurement the distance between the glass plate and the lower part of the ZFi-unit shall be measured using a slide caliper

How to setup centering for a large component

Centering levels are no longer used for the optical centering phase. TPSys will automatically move the component to the correct height and rotate it under any obstacles on the X wagon. When mounting a board containing a large component, TPSys examines the pick and place angles of the component and checks if the component can be mounted or not for each position. If the component cannot be mounted in some position, an operator alert is generated. In some cases it is possible for the machine to mount the component if the pick or place angles are changed. This can be achieved for example by rotating the tray that contains the component or by rotating the board on the Y wagon. Try rotating the board and/or the component so that the longest side of the component is aligned along the x-direction.

Components that are larger than 100 mm will only be able to mount if they are aligned along the x-direction.

For components larger than 100 mm it may be necessary to supply the component in more than one tray. This is due to the fact that they cannot be rotated 90 degrees. For example take a board with a large component that is mounted at two positions one with a mount angle equal to 0 degrees and one with a mount angle equal to 180 degrees. It will then be impossible for the machine to mount the board if the component is only supplied in one single tray. This due to the fact that the machine has to rotate the component more than 90 degrees to mount the component in at least one of the two mount positions. If however two trays are loaded one with components oriented in 0 degrees and one with components oriented in 180 degrees it will be possible for the machine to mount the PCB.

If a mechanical centering phase is added to a large component that does not fit in the mechanical centering device, TPSys will try to run the component to the centering level, of that mechanical phase. When the machine moves to the height of the centering level, the component can hit the mechanical centering device and the component could be dropped. Ensure the component fits in the centering device before adding a mechanical centering phase that will move the component into the centering unit. This behavior is preserved in order to make it possible to mechanically center large components using an object on top of the component, see *Figure 20*.

Figure 20. No check is made on overall length or width for mechanical centering. This is done to make it possible to mechanically center components like the one above. The component can be mechanically centered by moving the top part of the component into the centering unit.

Using SVC or EVC

When using the standard vision camera or the extended vision camera to center a large component, dual shot is needed. Dual shots are taken if the overall length or width is larger than parameter 53.0461 or 55.0461.

Using the linescan camera

If a component does not fit in the mechanical centering device when centered with the linescan camera, the component must fit between the linescan camera focal plane and the mechanical centering device. To handle such components, the machine must have a lifted mechanical centering device.

The linescan camera can take images with different field of views. In one mode the FOV is equal to 76 x 66 mm, in another mode the FOV is equal to 156 x 26 mm. TPSys will use the appropriate FOV for

each component. All the image features that are supposed to be located on the component must be within the camera FOV for the machine to be able to vision center the component.

Test centering and Autoteach

Centering levels are not used when test centering or Autoteaching a package. The size of the package is used to run the package to the right Z-position. For this reason it is very important that the overall width and length of the package are pointed out when Autoteaching and picking from the Y wagon. It is also very important that the correct height is entered into the package editor before running Autoteach.

When test centering a package, one can now choose to pick the package in 0 or 90 degrees from the Y wagon. This is very useful for some large components since they cannot be picked in an arbitrary angle.

Support for Agilis Linear Magazines

Background

TPSys 2.4 supports two new types of magazines, Agilis Linear Magazine 8 for 8 mm tape and Agilis Linear Magazine 1216 for 12 and 16 mm tape.

The main new feature of these magazines is the capability to feed tape in steps of variable length. For example this makes it possible to adjust the pick position for a feeder not only in the x-direction but also in the y-direction.

Description

The Agilis Linear Magazines 8 mm, ALM8, use the same feeders as Agilis Magazine AM8. The Agilis Linear Magazines 1216, ALM1216, use new 12 and 16 mm feeders. They are similar to the 8 mm feeders but can handle larger components.

Instead of cogwheels that feed the tape in AM8 magazines, the new ALM magazines have a wagon that moves back and forth with pins that move up and down. This configuration makes it possible to feed tape with steps of arbitrary length.

The ALMs have two magazine fiducial marks, one on each side of the wagon. They are round 1 mm diameter, black on white. Both fiducial marks are searched when the magazine is located. All older types of magazines only have one fiducial mark on the left side.

As mentioned above, the new magazines have the ability to step feeders with an arbitrary step length. This makes it possible to adjust the pick position in both the x- and y-direction without having to make mechanical adjustments to the magazine. When adjusting feeder positions in the new magazines, one therefore has to locate the pick position both in the x- and y-direction. As in TPSys 2.3 and earlier, a pick position adjustment is activated by pressing <F1> on the corresponding entry in a magazine. The X-wagon camera then runs to the feeder in question and shows a live image of the feeder. As in TPSys 2.3 and earlier, a yellow outline that shall be aligned to the component is now drawn on the screen. However it is now possible to adjust the pick position both in the x- and y-direction. Notice that when adjusting in the y-direction the component does not move in the image, instead the yellow graphic moves according to the input from the trackball or joystick.

☞   When adjusting a pick position one should strive to align the graphical overlay to the component in the tape and not to the tape pocket.

Magazine Steps Replaced with Step Length

Background

In earlier versions of TPSys, the user had to specify the number of steps a feeder in a tape magazine shall be stepped for each feed. The user also had to specify if fine pitch steps should be used or not. This method was not the easiest way for the user to program feeders since the operator had to know the step length of each magazine type. Another problem with specifying the number of steps is that it is not relevant for the Agilis Linear Magazines.

Description

Instead of entering the number of steps for a feeder, the user now enters the distance the tape shall be advanced for each component as a step length in millimeters. TPSys then automatically calculates how many steps a feeder in a magazine shall be advanced for each component.

For each magazine type, TPSys knows which step lengths apply to that particular magazine. When setting the step length the user is presented with a list containing the step lengths that are available for the magazine in question.

This approach has made the fine pitch field obsolete and it has therefore been removed.

Number of steps has also been replaced by step length in the default load data for components and in the barcodes used to load components with a hand held barcode scanner.

Web Browser on TPSys Machine

Background

There has been an active web server on the TPSys machines for a while. This server it has made it possible to access data on the machine through the web interface. Among many other useful functions, the web interface provides graphical presentations of packages and PCBs. However to access the web pages the user has been forced to use a non-TPSys computer for web browsing. In TPSys 2.4 it is possible to run a web browser directly on the machine.

Description

To get the web browser up and running, the user has to turn on the high-resolution mode of TPSys. This is done by selecting *Utility > Desktop resolution > High resolution*. Setting the resolution to high will enable high-resolution mode. To activate the change the user will be prompted to restart the system. Before that, the user gets an opportunity to check whether the monitors are capable of running the high-resolution mode or not.

The high-resolution mode can be turned off using the same function. Setting the resolution to normal will disable the high-resolution mode unless the current language requires high-resolution. To activate the change of desktop resolution, the user will be prompted to restart the system.

The following screens are available in high-resolution mode:

Alt-F1

  Online TPSys terminal, in other words the window from which the machine is operated.

Alt-F2

  Represents a general-purpose X environment. The web browser is always running on this terminal and is not possible to shut down. It may however be iconified. If the web browser is exited by user action, a new web browser will start automatically. The start page of the web browser will always be the web interface on the MYDATA machine itself. If the online documentation package is installed on the machine it will install both documentation files and a pdf reader. The pdf reader will be automatically loaded when required.

  The root menu is displayed by clicking the left mouse button. Two applications are available, xterm that is a terminal program for the X Window system and a calculator. Xterm may be used to issue UNIX commands to the Linux system. The rest of the choices in the root menu have to do with window operations and configuration of the X environment.

Alt-F3 - Alt-F6

  Simple terminals where offline TPSys terminals may be started.

Limitations

High-resolution mode is only possible on VVG2 machines.

New Parameters

Parameter	Description
234.0203	Desktop resolution

Trackball Support in the Web Interface

New in TPSys 2.4+.

Background

In previous versions of TPSys 2.4 it was not possible to control the web browser on terminal-2 with the trackball. This made it necessary to install a mouse for use with web interface. Having both a mouse and a trackball could be confusing and also required extra space at the operator work place.

Description

In TPSys 2.4.3 and later it is possible to share the trackball between TPSys and X windows, thus eliminating the need for an extra mouse for use with the web interface.

Configuring sharing of the trackball between TPSys and X windows is done with the utility `setPorts`. When answering *Yes* to the trackball question the system now asks if the trackball should be used both as a joystick and a mouse.

When enabling the trackball to work as a mouse the X server needs to be restarted in order for the changes to take effect. The X server can be restarted with <Ctrl>+<Alt>+<Back space> or by rebooting the machine.

Individual Vibration Duration for Components in Vibratory Magazines

Background

In previous versions of TPSys, all feeders belonging to the same group in a vibratory magazine had to have the same vibration duration. This sometimes gave non-optimal behavior. This due to the fact that for a group one had to use the maximum time needed by any component in the group.

Description

It is now possible to set individual duration for each feeder in a vibratory magazine.

The frequency and amplitude are still common group properties and, as before, altering either frequency or amplitude for one feeder in a group will alter the whole group.

Individual vibration time for each feeder makes it possible to mix components of different length in the same group. As previously, amplitude and frequency constraints may make it impossible to mix certain components.

No Longer Possible to Change Board Present Status to *Untrimmed*

Background

In TPSys 2.3, one could change the present status for a board to *Present*, *Not present* and *Untrimmed*. The latter status is not really required and could be mixed up with the *Not present* status. To make the system easier to understand, it is no longer possible to change the status to *Untrimmed*.

Description

In the Layout and Panel List editors the toggle order for the board present status is now:

Untrimmed $\rightarrow$ Present $\rightarrow$ Not present $\rightarrow$ Present

If the board has been detected as bad by the bad board detection:

Bad $\rightarrow$ Present $\rightarrow$ Not present $\rightarrow$ Present

New Version of the Network Configuration Program Netsetup

Background

The netsetup program used for setting up the network configuration on a machine/server has been improved in TPSys 2.4. The new version supports more advanced network configurations.

Description

As in earlier versions of TPSys netsetup is started from the UNIX prompt by giving the command netsetup. When you start netsetup, the screen shown in *Figure 21* is shown.
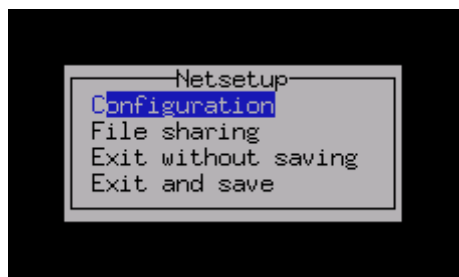
Figure 21. When netsetup is started this menu appears on the screen

The configuration window

If one chooses *Configuration* in the menu in *Figure 21* the network configuration window will appear on the screen, see *Figure 22*. In this window it is possible to set up the basic network configuration of the machine/server. The different fields are described below.

Figure 22. The configuration window in which the network configuration of the machine/server can be set up

Configuration type

> This field can be set to one of three values *No network*, *Fixed IP* and *DHCP client*. If *No network* is chosen, all network functions for the machine/server will be turned off. This option shall be chosen if the machine/server is not hooked up to a network. *Fixed IP* shall be chosen if the machine/server is hooked up to a network and the machine/server shall have fixed network parameters. *DHCP client* means that the machine/server will get its network settings from a DHCP server. For this to work there must be a DHCP server running on the network that the machine/server is hooked up to.

Host name

> The name that the machine/server will receive on the network.

IP address

> The ip address that the machine/server will receive on the network. This field only applies if you have chosen *Fixed IP* as the configuration type. If the machine/server has been set up as a DHCP client the ip address will be received from the DHCP server. All machines in the network must have different ip addresses.

Netmask

> The netmask address of the net that the machine/server is hooked up to. This field only applies if you have chosen *Fixed IP* as the configuration type.

Gateway

> The gateway address on the net that the machine/server is hooked up to. This field only applies if you have chosen *Fixed IP* as the configuration type.

Nameserver

> The address of the nameserver on the network the machine/server is hooked up to. This field only applies if you have chosen *Fixed IP* as the configuration type.

Domain name

> The domain name for the machine/server (company.com). This field only applies if you have chosen *Fixed IP* as the configuration type.

Network bridge

> This field only applies to stand-alone servers and is therefore only visible on the screen if netsetup is run on a stand-alone server. If the stand-alone server has two network cards it can be set up to act as a bridge towards an external network by enabling this field.

The file sharing window

If one chooses *File sharing* in the menu in *Figure 21,* the file sharing window will appear, see *Figure 23.* In the file sharing window, it is possible to set up file sharing between the machine/server and other Linux or Windows computers. The different fields of the window are described below.
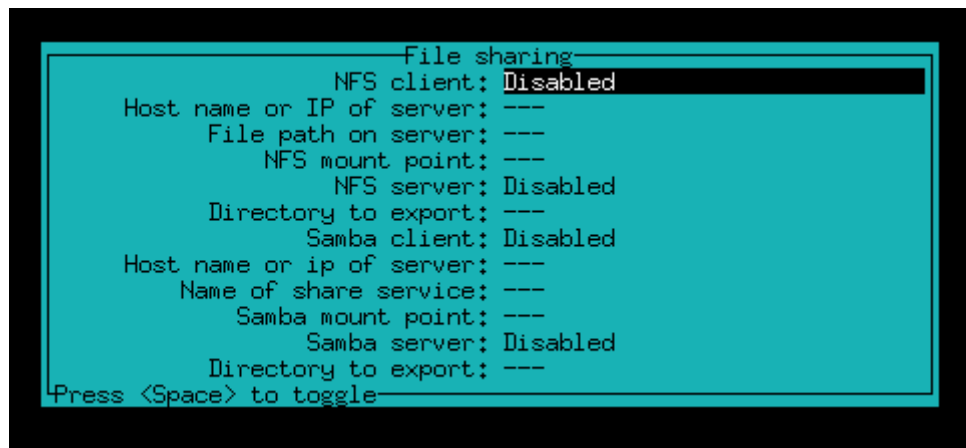
Figure 23.   In the file sharing window it is possible to set up sharing between the machine/server and other computers

NFS client

> This field enables and disables a NFS client on the machine, in other words you can access a file tree on another computer on the network. NFS is a common file sharing protocol for *NIX platforms.

Host name or IP of server

> If the NFS client has been enabled, this field shall contain the host name or ip address of the computer that contains the files that you want to access from this machine/server.

File path on server

> If the NFS client has been enabled, this field shall contain the file path of the directory that you want to be able to access.

NFS mount point

> If the NFS client has been enabled, this field shall contain the directory on the machine/server were you want the remote directory to be mounted.

NFS server

> If you want to share a directory on the machine/server with other computers on the network using NFS, you should enable this field.

Directory to export

> If the NFS server has been enabled, this field shall contain the path to the directory that you want to share.

Samba client

> This field enables and disables a Samba client on the machine, in other words you can access files or services on other computers on the network using Samba. Samba is an open source implementation of the Microsoft file sharing protocol.

Host name or IP of server

> If the Samba client has been enabled, this field shall contain the host name or ip address of the computer that contains the files or service that you want to access from this machine/server.

Name of share service

> If the Samba client has been enabled, this field shall contain the name of the service that you want to access on the Samba server.

Samba mount point

If the Samba client has been enabled, this field shall contain the directory on the machine/server where you want the remote directory to be mounted.

Samba server

If you want to share a directory or resource on the machine/server with other computers on the network using Samba, you should enable this field.

Directory to export

The path of the directory or resource that you want to share with other computers on the network using Samba. Netsetup will create a Samba share service called 'tpsys' representing this directory.

Example 1: Sharing a directory between two machines using NFS

Suppose that we want to share a directory between two machines called my19n019 and my15n015 using NFS. The directory lies on the machine my19n019 and is called '/home/tpsys/share'. We want to be able to access it on my15n015 in the directory '/home/tpsys/my19n019'. On the server side (my19n019) we would then enter the configuration in *Figure 24* in netsetup. That is, we shall enable NFS server and enter the path of the directory we want to share in the directory field.
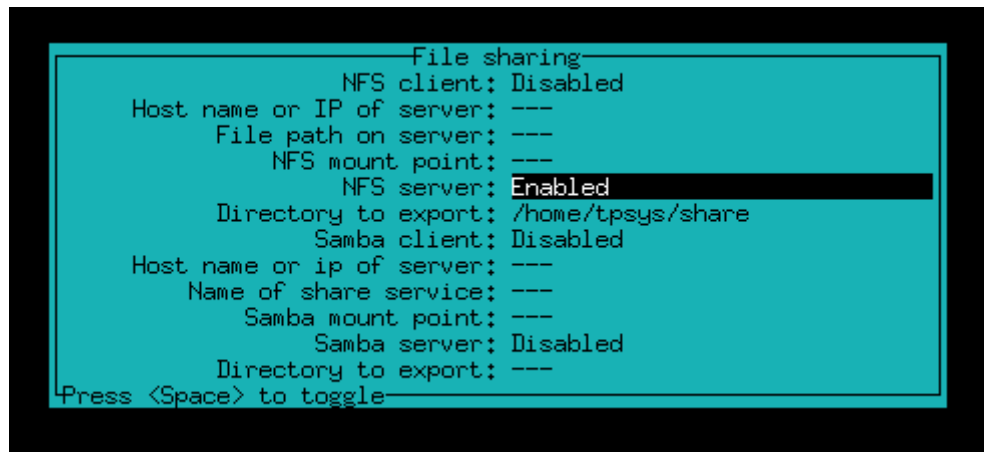
Figure 24. NFS settings on the server side (my19n019)

On the client side, in other words on my15n015, we would enter the configuration shown in *Figure 25* in netsetup. That is, we enable the NFS client, enter the file path of the directory that we want to access on my19n019 and enter the directory were we want the remote directory to be mounted.
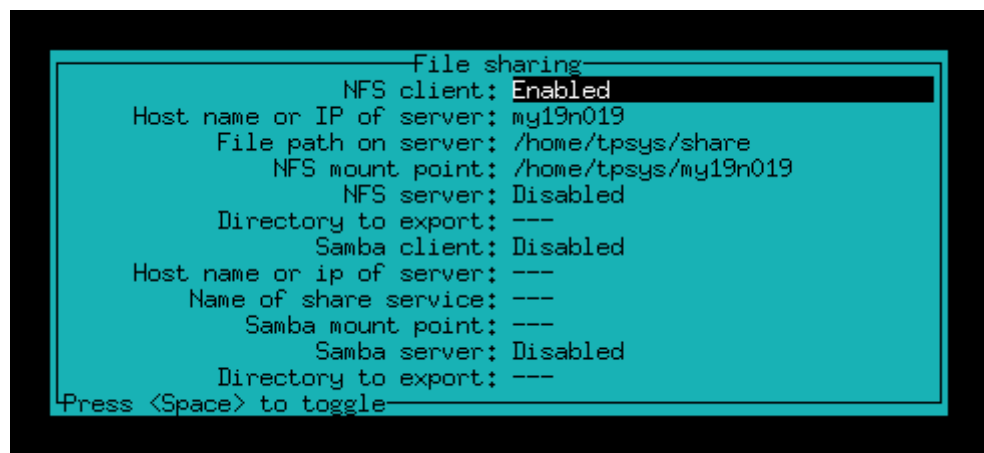
Figure 25. NFS settings on the client side (my15n015)

Example 2: Sharing a directory between two machines using Samba

Suppose that we want to share a directory between two machines called my19n019 and my15n015 using Samba. The directory lies on the machine my19n019 and is called '/home/tpsys/share'. We want to be able to access it on my15n015 in the directory '/home/tpsys/my19n019'. On the server side (my19n019) we would enter the configuration in *Figure 26* in netsetup. That is, we shall enable Samba server and enter the path of the directory we want to share in the directory field. This will enable a Samba server on the machine and create a share service called 'tpsys'.

Figure 26. Samba settings on the server side (my19n019)

On the client side (on my15n015) we would enter the configuration shown in *Figure 27* in netsetup. That is, we enable the Samba client, enter the name of the share service that we want access on my19n019, remember that it is called tpsys, and enter the directory were we want the remote directory to be mounted.
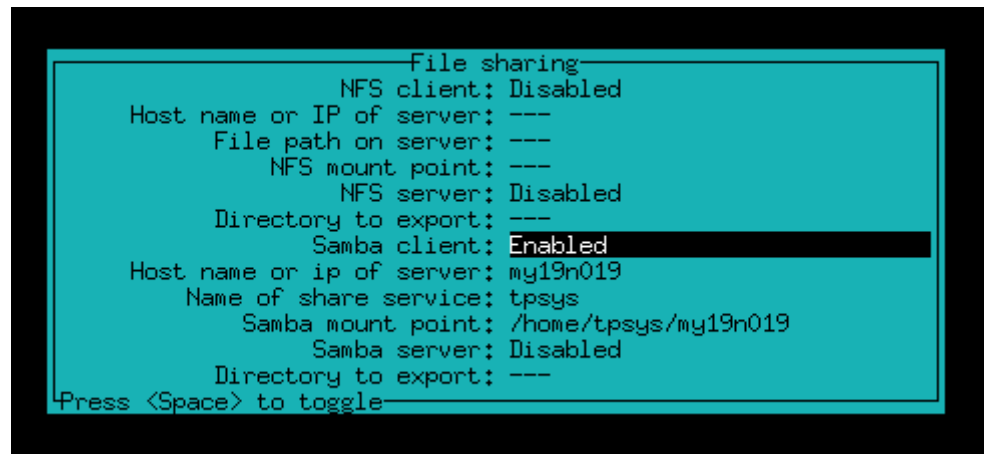
Figure 27. Samba settings on the client side (my15n015)

More Information in Magazine Optimization

Background

The Magazine optimization print out in earlier versions of TPSys did not show magazine types and feeder types for the components that are not loaded in any magazine. This information is important since it tells what more magazines you need and in what type of magazine each component can be placed. This information has been added together with a summary.

The number of mount positions with a given component has also been added in the print out. This information can be used for rough decisions about where to put each component. Typically you put the most frequent component close to the Y wagon. For an accurate magazine optimization, use MySpeed.

Description

Components not found in any magazine

There are three more columns for each component in this table: C*omment*, Q*uantity per layout* and *Magazine/Feeder type*. The table is sorted by *Magazine/feeder type*, *Quantity per layout* and *Component,* see *Figure 28*.

Summary by feeder type of components not found in any magazine

This table shows how many components there are of each feeder type in the layout which are not found in any magazine, see *Figure 28*.

Figure 28. The magazine optimization as shown in the web interface

New Parameters

Parameter	Description
133.6702	Components not found in any magazine/Component width.
133.6703	Components not found in any magazine/Comment width.
133.6704	Components not found in any magazine/Quantity per layout width.
133.6705	Components not found in any magazine/Magazine feeder type width.
133.6752	Components not found in any magazine/Show component.
133.6753	Components not found in any magazine/Show comment.
133.6754	Components not found in any magazine/Show quantity per layout.
133.6755	Components not found in any magazine/Show magazine feeder type.
133.6802	Summary of components not found/Magazine feeder type width.
133.6803	Summary of components not found/Number of feeders width.
133.6852	Summary of components not found/Show magazine feeder type.
133.6853	Summary of components not found/Show number of feeders.

Feeder Number Shown for Components in Layout Preparation

Background

In layout preparation, the feeder number was not shown for components in not inserted magazines. By adding this it is easier to find those components.

Description

In the Layout Preparation table that shows the components in not inserted magazines, a column that shows in which feeder the component is inserted has been added, see *Figure 29*.
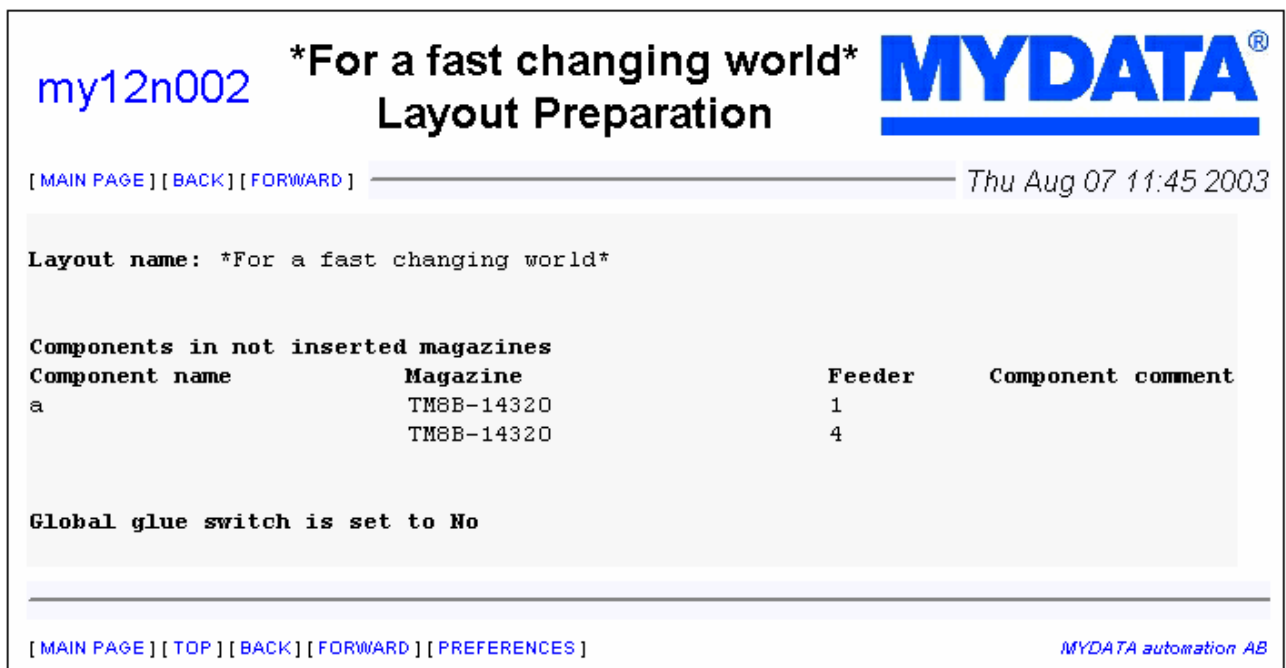
Figure 29. Layout preparation as shown in the web interface

New Parameters

Parameter	Description
133.6902	Layout preparation/Not inserted mag/Component width.
133.6903	Layout preparation/Not inserted mag/Magazine width.
133.6904	Layout preparation/Not inserted mag/Feeder no. width.
133.6905	Layout preparation/Not inserted mag/Comment width.
133.6952	Layout preparation/Not inserted mag/Show comp. name.
133.6953	Layout preparation/Not inserted mag/Show mag. name.
133.6954	Layout preparation/Not inserted mag/Show feeder no..
133.6955	Layout preparation/Not inserted mag/Show comment.

Global Grouping

Background

In TPSys 2.3 and earlier, grouping only applied to the mount order within a single PCB. This could cause problems when having a panel with several PCB's. This due to the fact that on a panel the machine may need to place a part last on the entire panel, not just on an individual PCB.

Description

In TPSys 2.4 a parameter *1002:0028 Global grouping* has been added in the assembly switches. If this parameter is set to *Yes* TPSys will consider the grouping for all PCB's currently on the Y wagon when placing components. If the parameter is set to *No* the behavior is the same as in TPSys 2.3 and earlier.

New Parameters

Parameter	Description
1002.0028	Turns global grouping on and off

Simplified User Interface for Operators

New in TPSys 2.4+.

Background

TPSys has a lot of functionality that helps the operator, production engineer and service technician in many situations. But in some situations it is easier not to have all the menu alternatives present at the same time. When an operator runs production the only needed functionality is that which handles loading of magazines and start and stop of production.

There is now a reduced user interface which only presents the functions that are required for loading magazines and producing boards.

Description

User Data

Which user interface to display is controlled by a new setting in user data. The new setting is called *Interface* and can have two values *Minimal* and *Standard*. If the user has *Minimal* Interface the reduced user interface will be shown when that user is logged in.
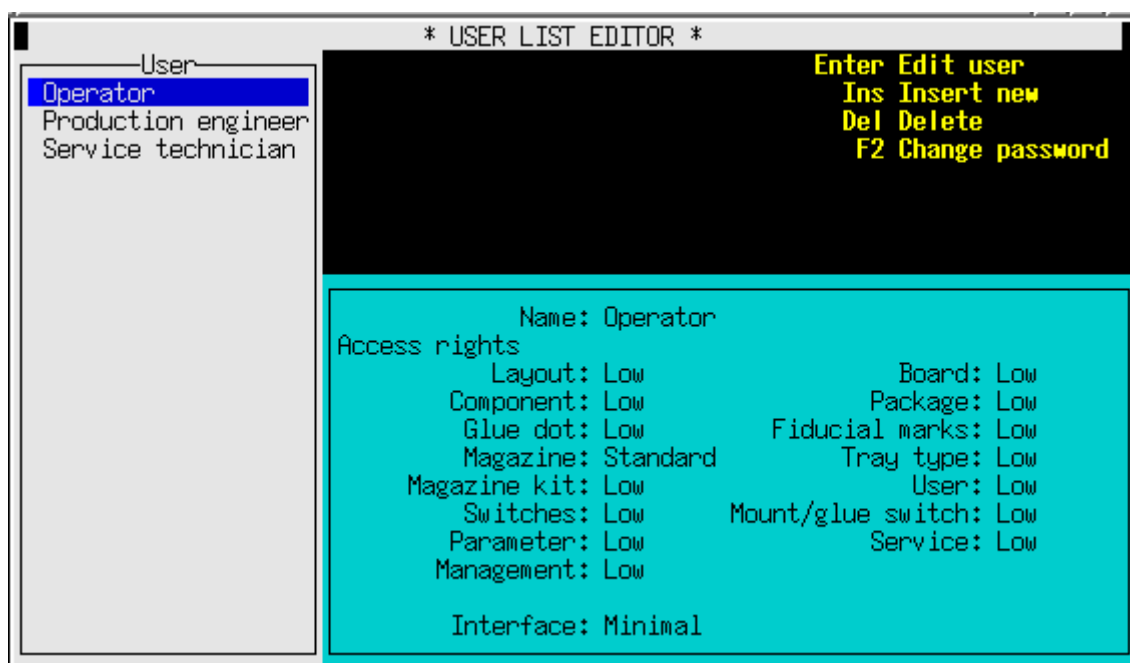
Figure 30. The new user list editor with the Interface setting

Login and Logout

Login and logout has been removed from the *Utility* menu. Logout is now present in the *Exit* menu and login is not a menu alternative at all. When the user access system is active a login pop-up will always be shown when no user is logged in.

Interface

The following pictures shows the menus that are available when the minimal interface is selected.
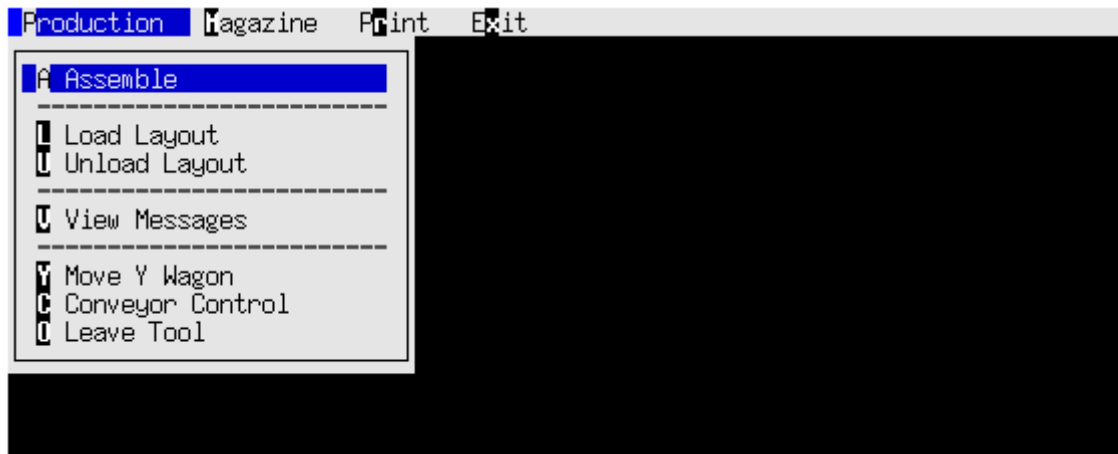
Figure 31. Production menu
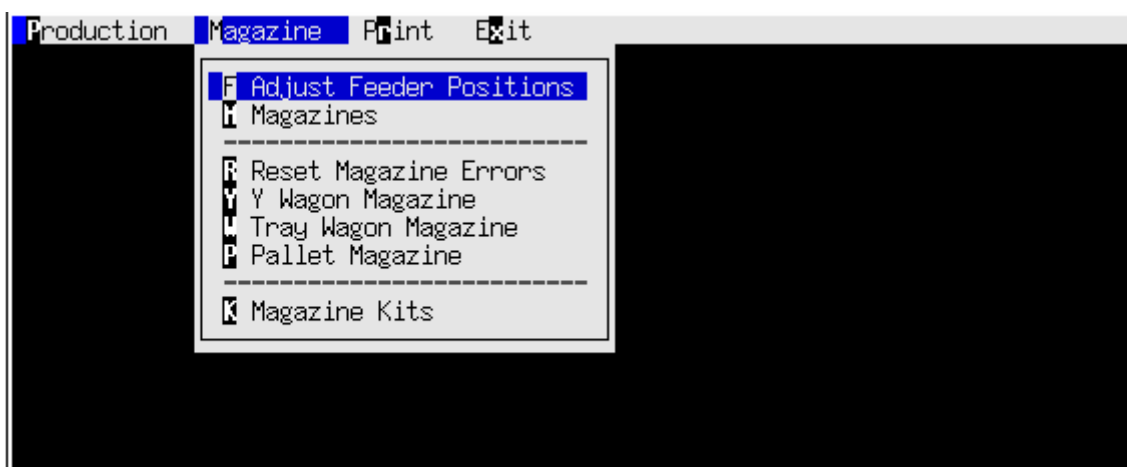
Figure 32. Magazine menu

Figure 33. Print menu
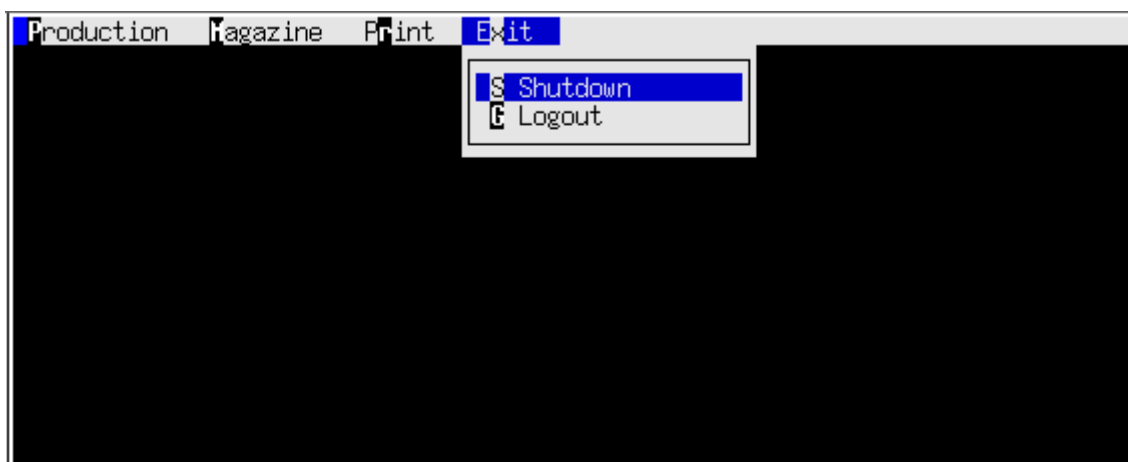
Figure 34. Exit menu

The menus that have been removed in the minimal interface are also removed from the hot key menu, when the minimal interface is selected.

Faster Conveyor Board Change

New in TPSys 2.4+.

Background

In earlier versions of TPSys, it has been possible to speed up board changes by setting parameter 92.0041, (Board Handler / Preliminary Y target after change). Setting this parameter to a non-zero value made TPSys start moving the Y wagon before the board was clamped. However, it was hard to set this parameter to a good value when running many different board sizes. So in most cases the parameter has not been used.

Description

To make board changes faster, after a board has been loaded from the external conveyor, the machine can clamp the board at the same time as it moves the Y wagon towards the first fiducial mark. To enable this function in earlier TPSys versions, you had to set parameter, 92.0041, that specified the approximate position for the first fiducial mark. This parameter has been removed. TPSys now instead uses the fiducial mark position from the layout data to decide where to move the Y wagon.

This function is now used even if parameter 92.0032 (fast board change), is set to *No*. The fast board change parameter controls if boards are loaded and unloaded at the same time, but a new parameter, 92.0201 (run Y wagon with unclamped board), controls if the Y wagon can be moved before the board is clamped. Moving Y with an unclamped board is safe for T-style conveyors, but may cause problems on a fast PT-style conveyor.

New Parameters

Parameter	Description
92.0201	Run Y wagon with unclamped board. This parameter is applicable for 500T/420PT/400PT conveyors. If set to *Yes*, the Y wagon will start to move to the first fiducial mark at the same time the conveyor starts to clamp the board. This makes board changes up to 900ms faster.
92.0041	Obsolete. This parameter is no longer needed and has been removed.

Faster Component Rejection

New in TPSys 2.4+.

Background

When rejecting a component by throwing it in a dump bin, parameters 22:0014 and 25:0014 control the wait time TPSys uses to equalize the pressure in the mount tool.

In previous versions of TPSys these parameter values have been very large in order to handle all types of components. This has caused the rejection time to be much longer than necessary for many components.

Description

In TPSys 2.4.3 and later parameters 22:0014 and 25:0014 have been reduced significantly. The range has also been decreased for both parameters.

Machines that are upgraded from TPSys 2.4.2 and earlier will by default have values on these parameters that are outside the new range. This implies that upgraded machines will automatically be modified with the new default parameter settings.

To handle components that need a longer vacuum equalization time TPSys now adds the package place wait time to the total throw wait time.

Faster Board Level Measurement with Indicator Tools

New in TPSys 2.4+.

Background

In TPSys 2.4.2 and earlier TPSys did not take full advantage of spring loaded tools when measuring the board level. This caused the time spent measuring the board level to be longer than necessary.

Description

A new method for measuring the board level has been implemented in TPSys 2.4+. This new method takes full advantage of spring loaded mount tools. This new method reduces the time spent for board level measurement if a spring loaded tool is used.

New Parameters

Parameter	Description
26:0007	Speed after indicator hit.
26.0008	Speed after EOF for indicator tool.
26:0009	Indicator offset.

Improved Joystick Support

New in TPSys 2.4+.

Background

The joysticks on the assembly machines are connected to an 8 bit AD converter. In earlier TPSys versions, the joystick driver assumed that the range of AD converter output values was +-48 units. This caused problems when a new joystick model that reported a bigger range of values (+-127) was introduced.

Description

A new parameter, 121.0008 (Joystick / Range), has been added. This parameter describes the range of output values reported from the AD-converter connected to the joysticks. The default value is 48, which works for all current joystick models in the field.

Single Barcode Label for Multiple Boards in Serial Start

New in TPSys 2.4.5

Background

Serial start provides a convenient way to change job when the batch size is small and job changes frequent. One drawback is that there must be room for a barcode label on each board.

Description

If a layout barcode contains the following pattern directly after the layout prefix:

```
REPEAT nnn;;;
```

where "nnn" is a positive number, the rest of the barcode is repeated nnn number of times.

Typically the customer would not actually have a barcode string that contains the above pattern. If so, a barcode translation file is used to translate the customer's barcode string containing a layout name and No. of layouts to produce into a barcode string starting with a layout prefix, followed by the above pattern and finally followed by the layout name.

Note that the barcode string must have a layout prefix to be recognized as a layout by the barcode system. The layout prefix is specified in the parameter file 123:0511-0513, the default prefix is "L".

Example

If the layout name is "Layout", there are three boards and the layout prefix is "L" the barcode should look like:

```
LREPEAT 3;;;Layout
```

More formal description of the pattern

The word "REPEAT" followed by exactly one space followed by a positive integer followed by three semicolons.

Read Event Log in Real Time Using TRP

New in TPSys 2.4.5

Background

The TPSys event log can be used to extract and collect various types of data. The export mechanism is however not well suited for real time monitoring since the export mechanism can not reliably be used to export information added since last export.

Description

It is now possible to subscribe to the event log using a TRP (TPSys Remote Protocol) connection. The subscription is started with the TRP command "`ActivateUnsolicited`". See the TRP documentation in the *TPSys 2.4 Software Manual (P-010-0814-EN)* for details.

TPSys Offline MMI on Serial Line Removed

The possibility to run a TPSys offline mmi on a serial line has been removed in TPSys 2.4.

Support for Tray Elevator Removed

The support for the Tray Elevator has been removed in TPSys 2.4.
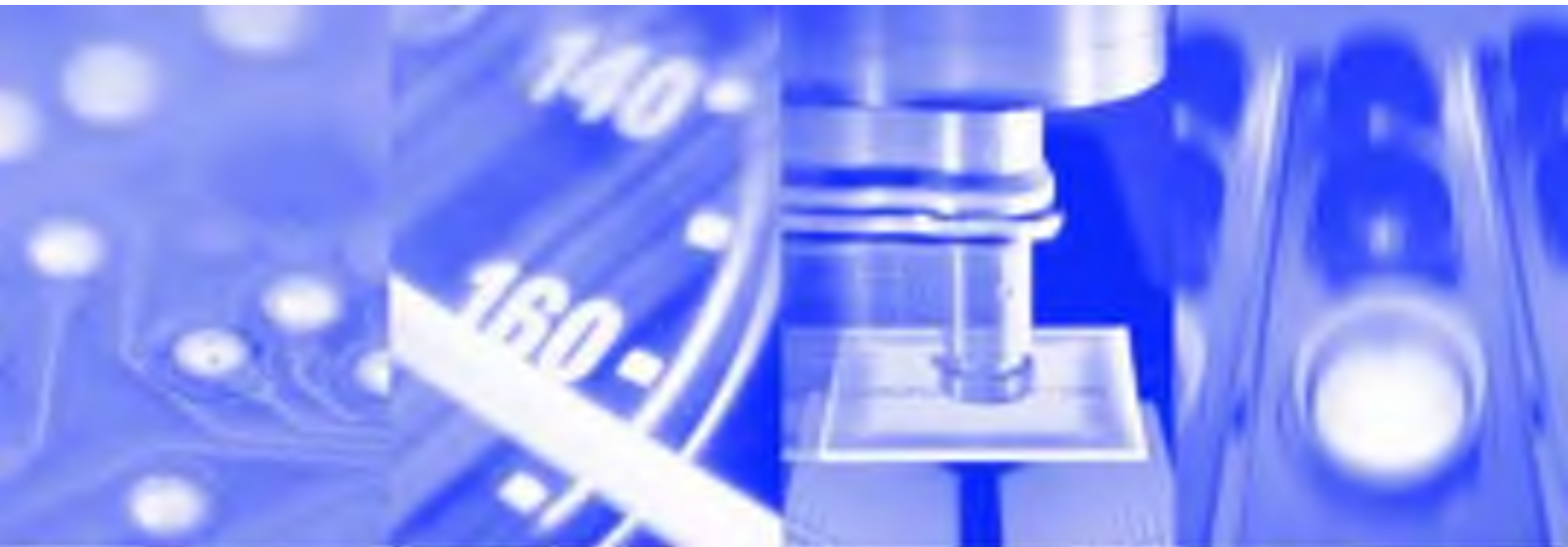
Software Manual
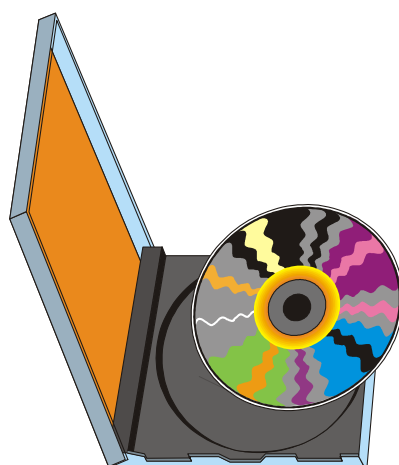
TPSys® Version 2.4

MY Series & TP Series

Component Placement Machines

English

For a fast changing world **MYDATA®**

Software Manual

TPSys Version 2.4

MY Series and TP Series

of

MYDATA Component Placement Machines

–

English

This document is intended for MYDATA component placement machines. These machines can be run with MYDATA SYS program version 2.9 or MYDATA TPSys program version 1.x and 2.x. This document applies to the MYDATA TPSys version 2.3.

This document describes a standard machine and optional equipment available for the machine and magazines. Depending on your system you may lack some of the features described.

This system uses the ms unit for time. Length is measured in mm, but inch can be selected.

National special characters and some non-letter/non-figure characters cannot be entered into the system, e.g. in board names, layout names, etc. However, this version of TPSys allows the following characters to be used:
" ' ` \ $; ^ @

In this document angle brackets < < > > are used to indicate certain key names contrary to a sequence of key strokes. Example: <Del> = the Del(ete) key, Del = the D, e, l key sequence.

Hardware and software mentioned in this document are subjected to continuous development and improvement. Consequently, there may be minor discrepancies between the information in the document and the performance or design of the product. Specifications, dimensions and other statements mentioned in this document are subject to changes without prior notice.

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Contents

System Requirements

TPSys 2.4 requires:

- Pentium 75MHz or faster

- 64MByte of RAM

- 2GB of available hard-disk space

- CP5 with VVG2 or CP4

1. New Features Overview

TPSys 2.4 was released to provide:

- Support for Agilis Linear Magazines

- Support for the new larger HYDRA reference background HRB-23LSC

- Autoteach of illumination and vision data for packages

- Improved support for large components

- Barcode handling of trays and tray positions

Auto Teach Of Illumination And Vision Data For Packages

To find proper vision settings for packages, a new feature has been added to Autoteach in TPSys 2.4. This new feature makes it possible to automatically find good vision settings for packages.

The user can select if Autoteach should teach both geometrical and vision data, only geometrical data or only vision data. If geometrical data is chosen Autoteach will measure the positions of the leads, the dimension of the leads and so on. If vision data is chosen Autoteach will determine good vision settings for the package.

Auto Teach Of Chip And Outline Packages

The possibility to teach geometrical data for chip and outline packages has been added to Autoteach in TPSys 2.4.

As for leaded and BGA packages it is possible to teach chip or outline packages by picking from the Y-wagon or a feeder. For chip and outline packages Autoteach only needs to know the length and width of the package in order to create a package description. If Y-wagon is chosen the user is asked to locate three corners of the package using the X-wagon camera and the joystick. Since we only need the package length and width there is no need to show the package to the camera since the data can be calculated from the corners located by the user. If the package is picked from a feeder however we need to use a camera to extract the data. In such a case Autoteach asks the user to choose a camera. The machine then picks the package and takes an image of it with the chosen camera.

Interactive Add And Remove In Autoteach

When using Autoteach to create new packages it sometimes happens that Autoteach fails to detect some leads or detects features that are not leads. In TPSys 2.3 it was possible to ask Autoteach to add or remove one lead by pressing the <+> or <−> key. If this failed the only way to fix the created package was to manually edit it in the package editor.

To make it easier to correct errors a new feature has been added to Autoteach in TPSys 2.4. It is now possible to interactively add and remove leads using the trackball or the joystick.

When the Autoteach result is shown on the screen the user can now choose to edit the detected leads by pressing <F1>. A cursor then appears on the screen. The position of the cursor can be controlled with the joystick or the trackball. If Autoteach has marked a feature that is not a lead, pointing at the mark and pressing <Delete> deletes the mark. If Autoteach has missed one or more leads they can be added by pointing with the cursor at the position of the lead and pressing <Insert>.

Support For Hydra Reference Background Hrb-23lsc

TPSys 2.4 supports HYDRA mounting of larger components, with a diagonal up to approximately 20mm.

The HYDRA unit can be fitted with three different HRB's: type 14, type 14LSC and type 23LSC. Type 14 can only be used with the HYDRA camera, type 14LSC can be used with both the HYDRA camera and the Linescan camera and Type 23LSC can only be used with the Linescan camera. Type 14LSC has an inner diameter of 14mm and type 23LSC has an inner diameter of 23mm. In order for the machine to know which HRB is on the machine the correct background has to be selected in the hwconf program.

Which components can be picked?

Whether a component can be picked or not by a HYDRA with a certain HRB depends on: the hole diameter of the HRB; the size of the component and the component carrier (tape/vibratory stick).

In TPSys 2.4 a check has been added before picking components with the HYDRA. Since TPSys does not know the exact shape of components all components are assumed to be rectangular and it is the diagonal that is compared with the hole diameter of the HRB. Some tolerances are also added so that components can be picked even if they are not exactly centered in the carrier.

The largest components that can be picked have a diagonal of approximately 12mm for the type 14 and 14LSC background and 20mm for the type 23LSC background.

If a component is so large that there is a risk that it will collide with the HRB during mounting TPSys will not pick it with the HYDRA but use the Z-unit instead.

Hydra Pick From Tm-flex And Vibratory Magazines

The range of magazines from which the HYDRA can pick has been extended to include TM-Flex and vibratory magazines. Components in a TM-Flex or vibratory magazine is considered for HYDRA mounting if a HYDRA tool has been chosen for the corresponding package.

Light Level Calibration For SVC And HRC

The amount of light emitted by the DVC-illumination module at a certain light level in TPSys may vary from camera to camera. This can have the effect that it becomes difficult to share package data between machines. To avoid this lighting problem, a calibration of the DVC-illumination module has been added to TPSys 2.4. The light calibration is performed at the same time as the calibration of the camera optics and using the same calibration plate.

The calibration needs to be performed with the latest revision of the calibration plate. This calibration plate has a copper pattern on a dark background. Do not use an older calibration plate that has a gold pattern or a black pattern on a white background.

Conversion of package data

When the illumination parameters of the camera have been calibrated, all package DVC-illumination settings will correspond to a different illumination in the camera than before the calibration. This may have the effect that some already defined packages cannot be centered with the camera.

A program called *illumConv* has been added to the distribution of TPSys 2.4. This program converts illumination settings of the packages to the new calibrated scale. This will ensure that the camera will use the same illumination level before and after the calibration. You should normally only run the *illumConv* program once on every machine and it should be done after calibrating both the SVC and the HRC for the first time in TPSys 2.4.

To convert the packages into the new calibrated illumination scale first export the package list to a file. Then go to the directory where you put the exported file and make a backup copy:

```
cp pck.pck packListYYMMDD.pck
```

where `pck.pck` is the name of the file you just created and `packListYYMMDD.pck` is the desired name of the backup copy. Make sure to keep the copy for future reference. We are now ready to do the conversion:

```
illumConv -i pck.pck -o new.pck
```

Where `new.pck` is the name of the new package list file that shall be created. The new file should then be imported back into TPSys.

The conversion program, illumCon, shall only be run once on a package list. When the conversion program has been run the package data has been converted to the calibrated scale once and for all. Even if the camera is replaced the conversion program shall not be run again.

Toggle Fiducial Mark Outline On/off

When locating small fiducial marks manually, the graphics drawn to mark the outline of the fiducial mark can occlude too much of the mark and make the adjustment difficult.

It is now possible to toggle the graphics marking the outline on and off using <ctrl-F3>.

Teach And Verify Area Active When Teaching A Fiducial Mark

The fiducial mark teach has been modified in TPSys 2.4 in order to make the process more interactive.

As before the user initiates a fiducial mark teach by pressing <F7> in the fiducial mark editor. The camera is then turned on and the user is asked to center the crosshairs over the fiducial markl. When the crosshairs are in the center of the fiducial mark the position should be confirmed by pressing <Enter>. A yellow rectangle then appears in the image and the user is asked to adjust the teach area. The size of the teach area can be controlled with the joystick or the trackball. When the yellow rectangle has been adjusted so that it covers the whole mark the size should be confirmed. The fiducial mark is then taught and the result is shown on the screen. The user is then asked to adjust the verify area in the same way as the teach area.

Improved Vacuum Test

The vacuum test in the TPSys diagnostics menu has been improved. Max and min vacuum values are no longer displayed, only the difference between the max and min values. The absolute values do not matter for the functionality of the vacuum system. Because of the design of the electronics involved, the absolute values are not even the same on different machines. The absolute values are still visible from the service program.

Find Mount Position In Pcb Editor

A new function *Find position* has been added to the PCB editor. You can select the type of information to search for: *Component*, *Package* and *Location designator*. There is an associated field for each information type where the search value for that type is given.

When Enter is pressed in the associated value field the PCB is searched for a position that matches the search criterion. If such a position is found, the cursor is moved to that position but the search window is not closed. Pressing Enter again will repeat the search. This can be repeated until no more matching position is found; then you will get a pop-up that asks if you want to continue searching from the top of the list. If you accept to start searching from the top of the list but no matching position is found, i.e. there is no matching position in the list, there will be a red pop-up saying this. The search window is exited by pressing <Esc>.

Smart Previous/next Keys In View Mount Position

The 'View mount position' function in the PCB editor in TPSys is useful for verifying the mount result. A function for looking at only the mounted positions has been added. One can also choose to look at only the not mounted positions or only the glued positions. It is also possible to look at only one type of package or component.

When you select *View mount position* in the PCB editor you will see a new field in the control window in the upper left corner of the screen. The new field is called *Browse by*. The value of this field controls which mount positions shall be visited.

When you press <PgUp> or <PgDn> to go to the previous or next position you will only visit positions that have the same value of the characteristics that is selected by the *Browse by* field.

Automatic Creation Of A Layout When A New Board Is Created

A board created from the PCB or Panel list editor earlier, was not automatically inserted into a layout. A board must always be included in a layout for the machine to be able to assemble it. As a consequence the vision system could not be used to program such a board until it had been inserted into a layout.

When a board is created in the PCB- or Panel list editor it is now possible to automatically insert the board into a layout. This is only possible if the user authorized to do so according to the user access system. A user without layout modification access will see the old behavior.

If a layout with the specified name already exists in the layout list, you will be asked if you want to add the board to the existing layout. The default answer is 'No'. If you answer 'Yes' the board is added to the layout, but it is not recommended. We recommend first loading the layout and then adding a new board to the loaded layout.

If TPSys is unable to insert the new layout in the layout list, you will be asked if TPSys should delete the created board. There are two reasons for this; network problems with reaching a remote data server or another user inserted a new layout with the same name before you.

If TPSys is in online-mode you will be asked if the layout should be loaded. If the layout is loaded you will be able to use the X-wagon camera to search for fiducial marks on the board. When the board has been created it will be trimmed and present in the machine.

Inserting a Board into a Layout

If a board is inserted into a layout from the layout editor, the fiducial marks will only have to be trimmed once. No extra trimming will be needed to be able to add components to a PCB or to insert a PCB in a panel.

Select Multiple Items For Export

The export utility in TPSys is used to export the contents of TPSys databases into a well-defined ascii format. For most databases it has been possible to either export all items in a database or to export one single item. These two alternatives have been replaced by a new function that includes the previous ones.

As before, export is activated by selecting **Utility** > **Export** and then choosing the database from which data shall be exported. After choosing the export channel: DOS, UNIX/NFS or FTP (and 'Directline' for Directline format) an editor view for the chosen database is shown. It is now possible to control which items should be exported in the following way:

– By pressing <space> the current database item is selected/deselected for export

– By pressing <ctrl-a> all database items are selected/deselected for export

Each item that has been selected for export is marked with a star to the left of the name. When all items that shall be exported are marked they can be exported by pressing <Enter>. The export will then continue in the normal way.

Reject Bins On The Y-wagon

In previous versions of TPSys it was possible to have four reject bins. With this system it was possible to place reject bins in the frames of the machine. If the frames host cameras or a glue station there is no room left for reject bins. Now one can have reject bins on the Y-wagon and the number of reject bins in the system has been increased to eight.

Bins 1-4 are always of type 'Frame' as in previous versions. Bins 5-8 can be set to 'Not used' or 'Y-wagon'.

When throwing components in a reject bin of type Y-wagon the Z or HYDRA head will move to the reject bin's x-position and the Y-wagon will move to the reject bin's y-position before throwing the component. Reject bin is selected in the Component editor.

Put Back Handling Without Blowing Away Components In The Tray

The vacuum system is "reversed" after the Z-axis has moved down to the feeder (i.e. tray) the components near the tool tip could move around and some times be blown away when the Z-axis started to move up again.

If the tray concept is usd for very small components (such as 0603, 0402 or 0201), the parameter 22.0015 can be used to equalize pressure before Z moves up after a put back. A suitable value could be approximately 300 - 700 ms. The parameter changes the put back speed for *all* packages. The default value 0ms is good enough for all put back handling down to the size equivalent to 0805 components.

Different Pitch In X- And Y-direction For Generic Bgas

There are packages with all the characteristics of a generic BGA but with different pitch in X and Y. By adding handling of separate pitches, these packages can be programmed more easily.

The pitch field in the generic BGA editor has been replaced with two new fields *X-wise pitch* and *Y-wise pitch*. These new fields work like the old pitch field, if either of them is changed the center of the package must be re-defined.

Support for different pitch in the X- and Y-direction has also been added to Autoteach of BGAs. When the teach is done and the result is shown, the pitch is now displayed in two different fields, one for each direction. This change only affects Autoteach of ball devices. Leaded devices are still assumed to have the same pitch in the X- and Y-direction.

Barcode Handling Of Trays And Tray Positions

In TPSys 2.4 functionality has been added that makes it possible to load tray magazines with a hand held barcode scanner.

Earlier, Y-wagon trays and tray-wagon trays were local to each machine. The Y-wagon and tray-wagon position databases were also local to each machine. In TPSys 2.4 it is possible to share Y-wagon and tray-wagon trays and tray positions. This is done by setting parameter 181:0131 (YW/TW Trays) to 'Yes'.

Since all trays in the system may be shared the presentation of trays in the editors is made in the same manner as for other magazines. This means that it is possible to toggle the sort order either by name or by host. For tray positions it is also possible to toggle the sort order by host or name or to only show local positions. Even if tray positions are shared between the machines and possible to read, only positions local to a machine can be used for that specific machine when assigning positions to trays. On a stand-alone server the tray position editor is limited to presenting and deleting tray positions.

Making a tray present or not present

Earlier a tray was made present either by trimming it with the camera system or by highlighting it in the editor and pressing <space> once. A tray was made non present by highlighting it in the editor and pressing <space> once. Even if the tray was present it had to be trimmed before it was possible to pick components from it.

In TPSys 2.4 a tray can be made present in a machine either by trimming the tray or by assigning a tray position and an orientation to it. The orientation is given by defining where the corner with the first component in the tray is located. When a tray is present it is possible to pick components from it. A tray is removed by highlighting it in the editor and pressing <F7>.

Barcode for trays and tray positions

Barcode functionality for trays and tray positions has also been added to TPSys 2.4. In tray editors and tray position editors it is possible to edit barcode fields by using a hand held barcode scanner. The tray barcode field is the same as the tray name field. For tray positions an extra barcode field has been added. Inserting a tray in TPSys via the hand held barcode scanner is done by first scanning the tray name barcode and then scanning a tray position barcode belonging to the machine in question.

For pallet trays the load sequence ends with the scanning of a pallet.

It is possible to scan the angle of the tray between the scanning of the tray and the tray position. This defines the orientation of the tray in the tray position. If no angle is scanned 0 degrees will be used, i.e. the location of the first component will be in the lower left corner.

It is possible to scan quantity number and batch identity between the scanning of the tray and the tray position. Batch and quantity may be scanned in any sequence. A special quantity value exists: *Full Tray* which means that the remaining number of components in the tray is set to the tray type definition ofcolumns*rows.

Upgrade/import of TPSys 2.3 ascii data

During upgrade the tray names will be auto generated. The name will be the old name plus a number at the end (Name-Nr). The number is needed since a tray with the same name may exist on several machines in earler vrsions of TPSys.

Warning on large magazine fiducial mark offset

TPSys now gives a warning if the location of a magazine fiducial mark varies more then expected (a few mm) from the nominal position. This could happen if the slot position is badly adjusted or if the fiducial mark was not located correctly. If TPSys detects a large offset the following message is given in the message log:

```
I-MHPR-3: Large fiducial offset for magazine <Magazine name>/<slot number>
```

Improved electrical verifier

Previously the electrical verification in TPSys used slightly different algorithms for measurement and verification of a component. This could lead to different result for the same component depending on if the value was measured or only verified. A typical example would be that the verification failed but a measurement showed that the component was OK. (Verification checks that the value of a component lies within a certain range, and measure measures the actual value of the component).

The behavior described above has been eliminated in TPSys 2.4 by introducing a new algorithm that uses the same basic technique for both measurement and verification. Furthermore, the old, now obsolete, measurement algorithm sometimes gave noisy results for some components like small capacitors. To compensate for the noisy measurements it was possible to take the mean of several measurements. Since the new algorithm always gives a noise free result this behavior, called enhanced measurement, has been removed along with its switch 1001:0021.

Automatic Location Of Fiducial Marks On Inserted Magazines

It wss earlier possible to pick componets from a magazine that was not located. Picking from a magazine that is not located, may lead to a high misspick rate. To avoid this problem TPSys now automatically locates all magazines before picking from them.

All types of vibratory and tape magazines are located automatically before use. Every time a magazine is inserted it is marked as not located. If TPSys fails to locate the magazine automatically while assembling, the magazine is disabled and a Message log message and an operator alert are generated. The assembly continues using other magazines. The Operator has to locate the magazine to enable it again and finish the layout. If automatic location of the magazine fails in interactive situations the operator is asked to locate the magazine manually. Automatic location can be turned off for each individual magazine.

Change Package For All Components Having A Specific Package

When maintaining the Package List it is sometimes needed to remove a duplicate of a package. Before a package can be removed from the Package List the operator must change the package for all components that use that package. Earlier this could be a tedious task since a package can be used by many components and all components had to be edited one-by-one.

Itis now possible to automatically change package for all entries in the component list that use that package.

The new function is activated by pressing <F9> in the Component list editor. A pop-up with two fields appears on the screen. In the first field the package that shall be exchanged shall be entered. In the second field the package that shall replace the old package shall be entered. When pressing <Enter> in the second field TPSys searches through the component database and a new pop-up appears. In this pop-up TPSys outputs the number of components that were found to have the package and the user is asked to confirm the change.

Pre-pick Inspection For Components In Trays

In TPSys, optical component inspection assume that the component is not going to be picked off center. This is done to shorten inspection time by reducing the image area where image processing will be performed.The maximum pick displacement is controlled by two system parameters, 41:0031 max angle deviation and 41:0032 max positional deviation. These parameters are common to all packages since they are functions of package, mount tool and magazine properties.

For some components, position and angle offsets from the theoretical ones, can exceed these systems parameters. This can lead to a failed optical inspection or even a failed component pick.

Some components can therefore now be preinspected using the X-wagon camera. The pick position and the presentation angle to the centering camera can be automatically adjusted accordingly.

A component can be inspected and inspection data used to adjust pick position if:

 – It has a rectangular shape
 – It is not bigger than the PVC FOV
 – It lies in a tray.

It is also assumed that the component cannot rotate freely in the tray pocket.

Activation of this function and modification of parameters necessary for the optical inspection with the PVC are performed in the Tray type editor.

Improved Test Centering

The test centering function has been improved in TPSys 2.4. The function now outputs statistics collected by the image process in numerical and graphical form. This new function is a powerful tool when programming vision packages.

After test centering a package TPSys now goes into a view mode where the operator can see the image acquired along with collected statistics from the optical centering. In the image TPSys also marks using color graphics: the mechanical model of the package, the vision search areas and the detected features.

Model data is drawn in red and detected features are drawn in green. The user is able to zoom and pan around in the image and is also able to toggle the graphics that show the mechanical model data and/or the found features on and off. Note however that panning and zooming the image only works with machines with VVG2 hardware.

Improved Handling Of Large Components

In previous versions of TPSys the operator had to manually specify a centering level for large components. The operator also had to modify the centering level parameter manually to make TPSys move the component to the correct height. If the height for the centering level was not chosen correctly centering would not succeed. In some cases the component could even hit the mechanical centering device and the machine would drop the component.

Now TPSys automatically runs the component to the correct height in the machine for all components that only use vision centering. TPSys will also refuse to mount vision components that it detects will collide with the centering unit or other parts of the machine.

A component is regarded as large if it does not fit or if it cannot be rotated inside the mechanicl centering unit.

When TPSys decides if a component is large, it uses the overall size of the package. TPSys always assumes that the component is picked in the center. If a component is not picked in the center then the overall width and/or length must be adjusted for TPSys to handle the component correctly. A new field called *Pick in center* has been added to the package editor. If a component shall not be picked in the center this field must bet set to *No*.

All that has to been done to setup the machine to handle large components is done by *autoInstall*. Four measurements have been added to *autoInstall*.

Support For Agilis Linear Magazines

TPSys 2.4 supports two new type of magazines, Agilis Linear Magazine 8 for 8mm tape and Agilis Linear Magazine 1216 for 12 and 16mm tape.

Agilis Linear Magazines do not use cogwheels to feed the tape. This makes it possible to feed tape with steps of arbitrary length. This for isntance, makes it possible to adjust the pick position for a feeder not only in the X-direction but also in the Y-direction. This without having to make mechanical adjustments.

The Agilis Linear Magazines 8mm, ALM8, use the same feeders as Agilis Magazine AM8. The Agilis Linear Magazines 1216mm, ALM1216, use new 12 and 16mm feeders. They are similar to the 8mm feeders but handle larger components.

The ALMs have two magazine fiducial marks, one on each side. They are round, 1 mm diameter black on white. Both fiducial marks are searched when the magazine is located.

When adjusting feeder positions in the new magazines, the pick position both in the x- and y-direction must be located. A yellow outline that shall be aligned to the component is drawn on the screen. The yellow graphic moves according to the input from the trackball or joystick.

☞ When adjusting a pick position one should strive to align the graphical overlay to the component in the tape and not to the tape pocket.

Magazine Steps Replaced With Step Length

Instead of entering the number of steps for a feeder – the distance the tape shall be advanced millimeters is entered. TPSys then automatically calculates how many steps a feeder in a magazine shall be advanced for each component.

For each magazine type TPSys knows which step lengths apply to that particular magazine. When setting the step length the user is presented with a list containing the step lengths that are available for the magazine in question.

This approach has made the fine pitch field obsolete and it has therefore been removed.

Number of steps has also been replaced by step length in the default load data for components and in the barcodes used to load components with a hand held barcode scanner.

Web browser on TPSys machine

There has been an active web server on the TPSys machines for a while. Using this server it has been possible to access data on the machine through the web interface. Among many other useful functions the web interface provides graphical presentations of packages and PCBs. However to access the web pages the user has been forced to use a non-TPSys computer for web browsing. In TPSys 2.4 it is possible to run a web browser directly on the machine.

To get the web browser up and running, the user has to turn on the high-resolution mode of TPSys. This is done by selecting **Utility** > **Desktop resolution** > **High resolution**. To activate the change the user will be prompted to restart the system. Before that, the user gets an opportunity to check whether the monitors are capable of running the high-resolution mode or not.

The high-resolution mode can be turned off using the same function. Setting the resolution to normal will disable the high-resolution mode unless the current language requires high-resolution. To activate the change of desktop resolution, the user will be prompted to restart the system.

Alt-F1

Online TPSys terminal, i.e. the window from which the machine is operated.

Alt-F2

Represents a general-purpose X environment. The web browser is always running on this terminal and is not possible to shut down. It may however be iconified. If the web browser is exited by user action, a new web browser will start automatically. The start page of the web browser will always be the web interface on the MYDATA machine itself. If the online documentation package is installed on the machine it will install both documentation files and a pdf-reader. The pdf-reader will be automatically loaded when required.

The root menu is displayed by clicking the left mouse button. Two applications are available, *xterm* that is a terminal program for the X Window system and a *calculator*. Xterm may be used to issue unix commands to the linux system. The rest of the choices in the root menu have to do with window operations and configuration of the X environment.

Alt-F3 - Alt-F6

Simple terminals were offline TPSys terminals may be started.

High-resolution mode is only possible on VVG2 machines.

Individual Vibration Duration For Components In Vibratory Magazines

It is now possible to set individual duration for all feeders in a vibratory magazine.

The frequency and amplitude are still common group properties and, as before, altering either frequency or amplitude for one feeder in a group will alter the whole group.

Individual vibration time for each feeder makes it possible to mix components of different length in thesame group. As previously, amplitude and frequency constraints may make it impossible to mix certain components.

No Longer Possible To Change Board Present Status To 'untrimmed'

The present status for a board – *Untrimmed* – is not really required, and can be mixed up with the 'Not present' status. To make the system easier to understand, *Untrimmed* has been deleted.

In the Layout and Panel editors the toggle order for the board present status is:

Untrimmed – Present – Not present – Present

and

Bad – Present – Not present – Present

New Version Of The Network Configuration Program Netsetup

The netsetup program used for setting up the network configuration on a machine/server has been improved in TPSys 2.4. The new version supports more advanced network configurations than the old version.

More Information In Magazine Optimization

The Magazine optimization print out in earlier versions of TPSys did not show magazine types and feeder types for the components that are not loaded in any magazine. This information is important since it tells what more magazines you need and in what type of magazine each component can be placed. This information has been added together with a summary. The number of mount positions with a given component has also been added in the print out. This information can be used for rough decisions about where to put each component. Typically you put the most frequent component close to the Y-wagon. For an accurate magazine optimization use MySpeed.

Feeder Number Shown For Components In Layout Preparation

In layout preparation the feeder number was not shown for components in not inserted magazines. By adding this it is easier to find those components.

In the table that shows the components that are in not inserted magazines a column that shows in which feeder the component is inserted has been added

Global grouping

Earlier grouping only applied to the mount order within a single PCB. This could cause problems when having a panel with several PCB's. This due to the fact that on a panel the machine may need to place a part last on the entire panel, not just on an individual PCB.

In TPSys 2.4 a parameter called *Global grouping* (1002:0028) has been added in the assembly switches. If this parameter is set to *Yes* TPSys will consider the grouping for all PCB's currently on the Y-wagon when placing components.

Tpsys Offline Mmi On Serial Line Removed

The possibility to run a TPSys offline mmi on a serial line has been removed in TPSys 2.4.

Support For Tray Elevator Removed

The support for the tray elevator has been removed in TPSys 2.4.

2. Software overview

This chapter contains a brief overview of software used to run MYDATA pick and place machines.

For more information about the various software modules mentioned in this chapter, see the following chapters:

Linux is described in Chapter *3 Linux*.

TPSys is described in Chapter *4 TPSys*.

Service software is described in Chapter *8 Service Program*.

Remaining software is described in Chapter *9 Communication*.

Software structure

The entire software structure used for the MYDATA placement machine system is shown in Figure 2-1.
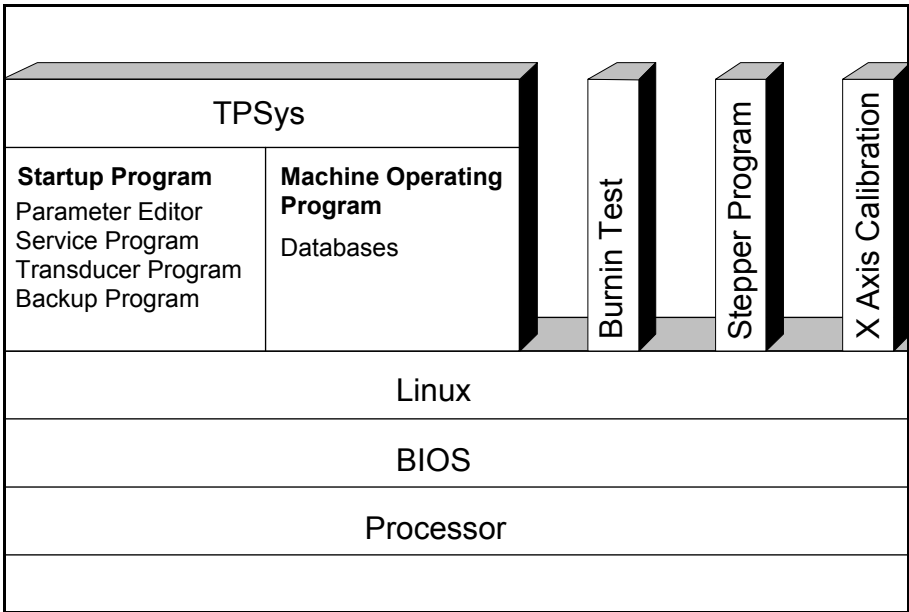
Figure 2-1.   Software structure

BIOS

Closest to the processor is the BIOS (Basic Input/Output System). The BIOS works as an interface between high-level program instructions from the Linux operating system and low-level processor instructions.

The system setup program is included in the BIOS. Because of various types and versions of the BIOS, the setup layout and contents may differ somewhat depending on what motherboard is used.

Linux
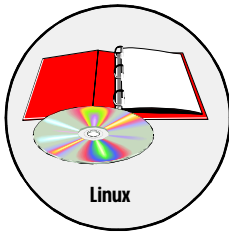
The operative system used between the BIOS and MYDATA developed program modules is Linux.

Linux has been the operating system from TPSys version 2.0.

Linux is a multi-user and multi-tasking operating system, which the TPSys utilizes by using many terminals and running several processes simultaneously.

The Linux operating system is described in Chapter 3.

TPSys
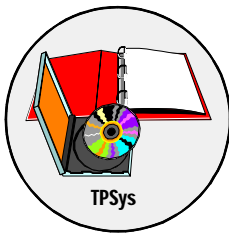
TPSys is a MYDATA developed software for controlling all the types of the MYDATA placement machines. TPSys controls all the systems and supports all the MYDATA optional systems.

TPSys requires the Linux operating system (from TPSys version 2.0).

The TPSys software is described in Chapter 4.

Service Program

A service program is integrated with the TPSys software and is used for installation, calibration, troubleshooting and fault finding.

Besides the service program, there is a set of software tools that are activated from the Linux prompt, see Figure 2-1, and used for troubleshooting and fault finding.

The most useful of these software tools are:

- Burnin test

- Step-by-step pick and placing

- X axis calibration

The service program is described in Chapter 8.

Additional Software

Linux, TPSys and the Service programare essential for the operation of a MYDATA pick and place machine. They are therefore always provided with a machine.

There is software available for communication with machines in a network, convert placement data from CAD systems, share databases between machines, calculate board assembly time for quotations, and to set up service communication in order to solve problems remotely.

MYCam
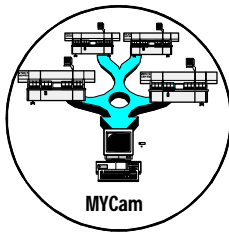
MYCam is a software package used to communicate and transfer data to and from MYDATA machines in a network from a remote PC.

The MYCam software is also mentioned in Chapter 9.

CAD Conversion
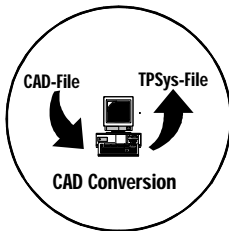
CAD Conversion is a software package used to convert CAD files containing placement data to TPSys in order to use the data for component placing.

The CAD Conversion software is also mentioned in Chapter 9.

The CAD Conversion software package includes a comprehensive *CADConversion User's Manual*.

Shared Databases
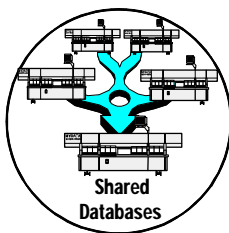
This software feature is used to connect several machines to the same databases in order to share the data. The same kind of data can thus be stored and edited in one database only.

Shared databases can e.g. contain the following information:

- Component data

- Package data

- Magazine data

- Tray data

- Layout data

- PCB data

- User data

The software for shared databases is also mentioned in Chapter 9.

MYSpeed
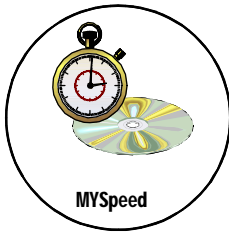
MYSpeed is a software package used for the planning of coming jobs. This can be such as, planning changeover from on job to anoter, optimising a machine or line and so on. This software can also balance jobs between different machines or machine lines.

The MYSpeed software is also mentioned in Chapter 9.

The MYSpeed software package includes a comprehensive *MYSpeed User's Manual*.
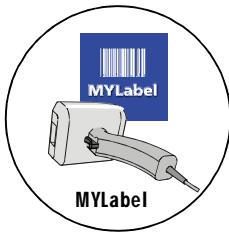
MYLabel

MYLabel keeps track of component carriers (tapes, sticks) used in production with MYDATA machines, by use of bar codes. MYLabel use an identification bar code linked to a database with component names, quantities and batch information on tape reels to be used by TPSys. The database also contains information related to the component, such as stock location and owner.

The MYLabel software package includes a comprehensive *MYLabel User's Manual*.

MYLink
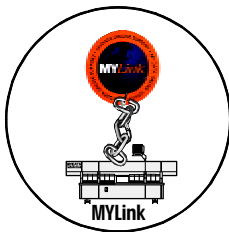
MYLink is a software feature used to connect a machine to the MYDATA Customer Support service.

In order to solve a problem, a MYDATA service engineer can, by means of the MYLink feature, access the machine remotely via modem and get the machine status.

The MYLink software is also mentioned together with an installation guide in Chapter 9.

3. Linux
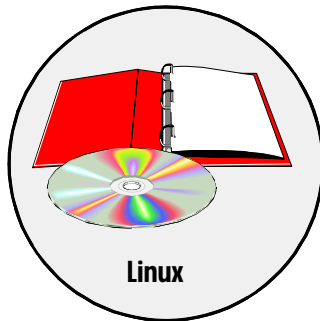
This chapter briefly describes the Linux operating system.

Linux is a multi-user and multi-tasking operating system distributed by several vendors. Linux operating system based on *Red Hat 4.1* is used for the TPSys software. The multi-tasking feature is utilized by TPSys by using many terminals and running several processes simultaneously.

The most important components of the Linux operating system, and for the TPSys usage of Linux, are listed below. They are described on the following pages in this section.

- Linux kernel

- Users and the root

- Drivers

- Files and directories

- The 'bash' program

- Standard I/O

- Process environment and symbols

- Symbolic links

- Pipes

- The 'proc' file system

Linux Kernel

The main part of the Linux system is the Linux kernel, which is the program that is started when Linux is booted. The term "boot" means to load and initialize the operating system on a computer.

The Linux kernel provides, among other things, the following:

- A file system.

- A time sharing system for parallel processing.

- A method to start programs (processes).

- Device drivers for hardware interface.

- Basic security such as user identification, file ownership and access privileges.

- A configurable initialization procedure.

Programs are stored as files in the Linux file system. Once a program is started it becomes a Linux process. There may be more than one process that run the same program.

In this chapter 'programs' means programs stored in the file system and 'processes' means Linux processes.

The configurable initialization procedure normally starts a number of processes. Some of these processes start logon sessions on the terminal lines. A logon session is a program that waits for a user to type a user name and, optionally, a password.

Users and Root

On a Linux system there are several users defined. A user is identified by a user name and a user ID. The user ID is a number and the user name is associated with a user ID in the `/etc/passwd` file. All users in the system are listed in this file.

A very important user in the Linux system is the root, which has access to all files and all system commands in the Linux system.

In the TPSys system a user named `tpsys` (lower case) is created at installation.

Drivers

Linux is designed to be run on any type of hardware. This means that the Linux kernel must be configured for all types of hardware platforms. This is achieved by using drivers, which are portions of code written to access specific hardware. Drivers are loaded into the Linux kernel. If a new type of hardware is connected, a new Linux driver has to be installed in the Linux kernel to access this hardware.

MYDATA uses several proprietary drivers for the communication with motor computers, frame grabber etc.

Files and Directories

In the Linux file system files are identified by inode numbers rather than by file names. File names are translated to inode numbers.

A file name is sometimes referred to as a link to a file. Several file names may be linked to the same file (or inode number). A file is deleted when there is no file name linked to it. For example the command for removing files, `rm`, removes only the link to the file but not the file itself.

Files are very important components in the Linux system. Device files such as terminal lines and disk drives can be opened, read, written, and closed like any file with the exception that they are often owned by the root and cannot be accessed by a user with the usual privileges.

Important Files

This is a short list of especially important files in Linux:

`/etc/inittab`	This file is read at the initialization. This file is generated automatically and it contains information about automatic logon etc. When the TPSys is installed, it modifies this file to automatically log on `tpsys` to tty1.
`/etc/passwd`	This file contains information about all users in the system. When the TPSys is installed, `tpsys` and `tpspool` are added as new users in this file.
`/usr/lib/terminfo`	This file contains information about all terminal types known in the system. The terminal types are stored under a sub directory with an one-character name that is equal to the first character in the terminal type name, e.g. vt100 is found under `/usr/lib/terminfo/v/vt100`.
`.profile`	If this file is present in the home directory, it is executed at logon (similar to *AUTOEXEC.BAT* in MS-DOS). TPSys uses this file to start the system when 'tpsys' is logged on to tty1.

Important Directories

This is a short list of especially important directories in Linux:

`/bin`	A directory in which most of the Linux standard program files are stored.
`/dev`	A directory in which all devices appear. Devices are treated as files in Linux.

The 'bash' Program

The 'bash' program is started by the logon procedure when somebody logs in. The *bash* program is the standard command interpreter for the Linux system. The command interpreter is also called the *shell*. The shell reads a command typed by the user and executes the command, or starts a program that executes the command.

☞ If `bash` is typed (lower case) at the command prompt, then another shell is started as a child-process to the first shell.

Changes in the current working directory or environment symbols will not affect the parent shell. A shell is terminated by entering a command (exit) or by pressing <Ctrl>+D.

Standard I/O

A Linux process will have at least one input and two output channels. The channels are referred to as I/O-streams.

The input stream is referred to as 'stdin' (standard in). Standard in is typically the keyboard.

The two output streams are referred to as 'stdout' (standard out) and 'stderr' (standard error). Standard out is the normal program output and is typically the monitor. Standard error is reserved for error reports and is typically the monitor. These streams can be redirected by using the command line interface.

To redirect standard in from a file, enter:

```
command <filename
```

The process started by command will now read its standard input from the 'filename' file.

To redirect standard out to a file, enter:

```
command >filename
```

The output to standard out from the process started by command will now be written into the 'filename' file. If the 'filename' file already exists, then it will be replaced.

To redirect standard error to a file, enter:

```
command 2>filename
```

The output to standard error from the process started by command will now be written into the 'filename' file. If the 'filename' file already exists, then it will be replaced.

If double brackets (>>) are used instead of a single bracket (>) in the redirection command, then the data will be appended to the file.

Process Environment and Symbols

Every process in Linux has a private data area called the process environment. The data area contains various information and is accessible to the process. One type of data in the process environment is symbols.

A process can create and read its own symbols but most of the symbols are normally inherited from the parent in Linux. If a process starts another process, the started process is referred to as the 'child' process and the starting process is referred to as the 'parent' process. The purpose of symbols is to be able to define a symbol that contains e.g. a file name. If the file name is changed there is no need to change in the program because it uses the symbol and the symbol is easy to change.

Symbol names are, as a convention, usually written in upper case.

To set a symbol, enter:

```
SYMBOL=value
```

The SYMBOL symbol is now modified in the shell environment. If programs, started by the shell, have access to the symbol, then it has to be exported. Export by entering:

```
export SYMBOL
```

To show the value of a symbol in the shell, enter:

```
echo $SYMBOL
```

The $ sign informs the shell that the symbol name is to be translated.

The set command prints a list of all symbols.

Some common symbols are:

HOME	Contains the home directory of the user. If you type cd without a parameter, then you are moved to the path set in the HOME symbol.
TERM	Contains the name of the current terminal description.
PARAMETERPATH	Defined in TPSys and contains the path to the current parameter files.
	Hint: `cd $PARAMETERPATH` takes you to the parameter files.

Symbolic Links

In Linux 'symbolic links' are used. A symbolic link is a file that 'points' to another file. The symbolic link has its own inode number but appears as the file it points to, when used in commands.

A symbolic link is created by giving the s switch to the ln command like this:

```
ln -s afile alink
```

The ls -l alink command returns the following result.

```
lrwxrwxrwx 1 tpsys tpsys   11 Jun 18 08:50 alink -> afile

-rwxr-xr-x 1 tpsys tpsys 1384 Jul 23 10:50 afile
```

Pipes

In Linux the output of one process is often used as input to another. This is realized with a 'pipe' from the first process to the second. To pipe the output from command1 to command2, enter:

```
command1|command2
```

Pipes are frequently used in shell scripts.

The 'proc' File System

In Linux a 'proc' file system is used. This is is found in the '/proc' directory in the file system. Files in this directory are not standard files. They can be accessed like files but the information is not stored on the hard disk but generated by the kernel.

The command less /proc/cpuinfo returns the following information about the CPU:

```
processor     : 0
cpu           : 586
model         : Pentium 75+
vendor_id     : GenuineIntel
stepping      : 12
fdiv_bug      : no
hlt_bug       : no
fpu           : yes
fpu_exception : yes
cpuid         : yes
wp            : yes
flags         : fpu vme de pse tsc msr mce cx8
bogomips      : 47.82
```

Linux Installation

Installing software in Linux is a complicated procedure that may involve modification of system files and configuration files. To make this easier, the software is distributed as a software package, which is installed (and can be removed) using a command (rpm) in the Red Hat Linux.

The installation and removal procedures for a package does not only copy and delete files but may also modify system files.

When installing TPSys for the first time, Linux and all required packages are installed automatically.

Common Linux Commands

This section contains a small summary of basic Linux commands, which may be helpful during service and software maintenance.

The following commands are included in this section:

cat	Catenate, concatenate
cd	Change directory
cp	Copy
diff	Difference
dmesg	Show boot messages
emacs	Start text editor
fdformat	Format floppy disk
grep	Match patterns
less	Page portion
lpr	Line printer
ls	List
mcopy	Copy file to/from DOS disk
mdir	List DOS disk
mformat	Format a DOS disk
mkdir	Make directory
mv	Move, rename
rm	Remove file
rmdir	Remove directory
pwd	Print what directory
tar	Read and write from disk
top	Display most active processes
tty	Terminal path and name
vi	Start text editor
who	Which terminals are used
who am i	Which terminal is this

Before reading the descriptions of the commands, study the following section about flags, arguments and special characters.

Flags and Arguments

Linux commands are often followed by modifying flags and major arguments.

Example:
```
ls lib
```
'`ls`' is the command and '`lib`' is the major argument.

Example:
```
ls -l lib
```
Flag '`-l`' follows the command and precedes the major argument.

Special Characters

There are a few special characters that are not interpreted as arguments to the command.

Useful for service purposes may be:

> `>`   Direct output to a file

> `>>`   Appends output to end of a file

> `|`   Pipes output to another command

Example 1   `ls > myfile`

Creates a file named `myfile` and prints the result of the directory listing into it.

Example 2   `ls -l >> myfile`

Appends a new long format listing to the end of `myfile`.

To see the result, type:
```
cat myfile
```

To remove the file, type:
```
rm myfile
```

Wild Cards

`?`   A question mark indicates a character (anyone).

`*`   An asterisk indicates any number of any characters.

Command Descriptions

This section contains a list of the most commonly used Linux commands with syntax and examples. The command selection, the descriptions and the examples refer to the TPSys usage for the MYDATA placement machines.

For further information about the commands, enter the man command for the desired command, for example `man cat`.

Note that Linux is sensitive to lower and upper case characters.

All the following examples presuppose you are in the home directory `/home/tpsys`.

The DOS commands to the left shows similar commands in DOS.

cat - Catenate, concatenate

DOS: TYPE · Reads files and prints on the monitor.

Syntax:
```
cat file
```

Ex.:
```
cat lib/params/axis
```
The `axis` file is printed on the monitor.

cd - Change directory

DOS: CD and CHDIR · Changes to indicated directory.

Syntax:
```
cd [path]
```

Ex.:
```
cd lib/params
```
Moves to the 'params' directory.

Note: space period period · Ex.:
```
cd ..
```
Moves to the `lib` parent directory.

Ex.:
```
cd
```
Moves to the 'tpsys' home directory.

cp - Copy

DOS: COPY and XCOPY   The mode of the source file is transferred to the copied file.

Syntax:

```
cp sourcefile newfile
```

Ex.:

```
cp lib/params/axis testdir
```
The `axis` file is copied to the `testdir` directory.

Ex.:

```
cp lib/params/axis testdir/axiscopy
```
The `axis` file is copied as `axiscopy` to the 'testdir' directory.

diff - Difference

DOS: FC   Compares two files and shows the differences.

Syntax:

```
diff [-b] file1 file2 [or dir1 dir2]
```

`-b` Ignore end spaces

Ex.:

```
diff lib/par-tp9/caxis lib/params/caxis > cdiff
```
Creates the `cdiff` file in the `tpsys` directory containing the differences between the default file `/home/tpsys/lib/par-tp9/caxis` and the used file `/home/tpsys/lib/params/caxis`.

`dmesg` - **Show boot messages**

Shows all messages when the system is booted.

Syntax:
```
dmesg
```

Ex.:
```
dmesg|less
```
All messages are printed on the monitor.

`emacs` - **Start text editor**

Starts a display oriented text editor named `emacs` that is included in the Linux operating system.

Syntax:
```
emacs
```

Ex.:
```
emacs
```
Starts the editor, that has a comprehensive on-line help and a tutorial on how to use the editor.

To exit the editor, press <Ctrl>+X and then <Ctrl>+C.

`fdformat` - **Format floppy disk**

DOS: FORMAT Low-level formats floppy disks.

Syntax:
```
fdformat /device/floppy, drive, density, floppy density
```

Ex.:
```
fdformat /dev/fd0h1440
```
Formats the floppy disk as follows:

```
/dev Device
fd   Floppy disk
0    Drive A
h    High density floppy disk.
1440Kilobytes on the floppy (1440 = 1.44 MB).
```

In TPSys 2.0 the following two devices can be used when formatting floppy disks: `/dev/fd0def` and `/dev/fd1def`.

Ex.:
```
fdformat /dev/fd0def
```
The floppy is formatted to its size automatically.

grep - Match patterns

DOS: FIND   Searches for indicated pattern in files.

Syntax:
```
grep pattern file
```

Ex.:
```
grep speedScale lib/params/caxis
```

Result:
```
I speedScale:   320   E   7   32768 0
```
This line in the `caxis` file has a matching word.

less - Page portion

DOS: MORE   Portions an output stream to the monitor.

Syntax:
```
command |less
```

Ex.:
```
cat lib/params/mountComp | less
```
The `mountComp` file is shown. Press <Space> to proceed pagewise, or use the arrow keys to move up or down in the file.

Ex.:
```
less lib/params/mountComp
```
Simplified way to enter the same command.

lpr - Line printer

DOS: PRINT   Prints out indicated file.

Syntax:
```
lpr file
```

Ex.:
```
lpr lib/params/axis
```
The `axis` file is printed out.

`ls` - List

DOS: DIR Lists the files in the directory. By default in alphabetical order.
Syntax:

```
ls [-CF] [-l] [-i] [-s] [directory]
```
-CF Lists files in columns and append an asterisk (*) to all executable files and a slash (/) to all directories.
-l One line of information for each file.
-i Adds inode file number to the list.
-a Lists all files in the directory.

Ex.:
```
ls
```
Files in the current directory is listed in alphabetical order, except files that start with a period (.).

Ex.:

```
ls -l lib
```
Files in the `lib` directory is listed in long format.

Ex.:
```
ls -i file 1 file 2
```
Reveals if two file names are linked to the same file.

`mcopy` - Copy file to/from DOS disk

DOS: COPY Copies files from DOS formatted disks to the Linux system, or from the Linux system to DOS formatted disks.

Syntax:
```
mcopy file1 file2
```

Ex.:
```
mcopy myfile A:
```
The `myfile` file is copied to a DOS disk in drive A.

Ex.:
```
mcopy * A:
```
All files in the current directory (maximum eight characters, see below) are copied to a DOS disk in drive A.

Ex.:
```
mcopy LongFileName A:longfile
```
The `LongFileName` file in the current directory is copied as LONGFILE to a DOS disk in drive A.

Ex.:
```
mcopy A:mountcom NewMount
```
The 'mountcom' file in the A drive is copied to the current directory in Linux as the `NewMount` file.

☞ Only files with maximum eight characters in the file name can be copied to a DOS disk. Rename the files as shown in the second last example if the file names are longer than eight characters.

`mdir` - **List DOS disk**

DOS: DIR   Lists the contents of DOS disks.

Syntax:
```
mdir unit
```

Ex.:
```
mdir A:
```
The files are listed on the monitor.

`mformat` - **Format a DOS disk**

Low-level formats a DOS disk.

Syntax:
```
mformat drive
```

Ex.:
```
mformat a:
```
Low-level formats a DOS disk in drive A.

`mkdir` - **Make directory**

DOS: MKDIR and MD   Creates new directories. Requires write permission mode.

Syntax:
```
mkdir directory
```

Ex.:
```
mkdir testdir
```
A new directory named `/home/tpsys/testdir` is created.

`mv` - **Move, rename**

DOS: MOVE and REN   Moves/renames files. Note that existing files may be overwritten.

Syntax:
```
mv path1 path2
```

Note space and period   Ex.:
```
mv testdir/axiscopy .
```
The `axiscopy` file is moved to the `tpsys` directory.

Ex.:
```
mv axiscopy testdir
```
The `axiscopy` file is moved back to the `testdir` directory. If the `testdir` directory does not exist, then the file is renamed to `testdir`.

Ex.:
```
mv testdir/axiscopy testdir/newname
```
The `axiscopy` file is renamed to `newname`

rm - Remove file

DOS: DEL Removes indicated files.

Syntax:
```
rm [-i] file [file...]
```
-i Interactive confirmation (y) for each file to be deleted.

Ex.:
```
rm -i testdir/newname
```
The `newname` file in the `testdir` directory is deleted.

Ex.:
```
rm -i testdir/*
```
All files in the `testdir` directory are deleted.

rmdir - Remove directory

DOS: RMDIR and RD Removes directories, provided that they are empty.

Syntax:
```
rmdir directory
```

Ex.:
```
rmdir testdir
```
The `testdir` directory is removed, if empty.

pwd - Print what directory

Displays the path of the current directory.

Syntax:
```
pwd
```

Ex.:
```
pwd
```
Current directory path is shown.

`tar` - **Tead and write from disk**

Reads and writes to/from disks (this command was originally called 'tape archive').

Syntax:

```
tar [cvf] [xvf] [tvf] file
```

[cvf] Writes
[xvf] Reads
[tvf] Lists

Ex.:

```
tar cvf /dev/fd0 filename
```
Writes to disk in drive A.

Ex.:

```
tar xvf /dev/fd0 filename
```
Reads from disk in drive A.

Ex.:

```
tar tvf /dev/fd0 filename
```
Lists content in archive.

`top` - **Display most active processes**

Displays the most active processes.

Syntax:

```
top
```

Ex.:

```
top
```
Shows CPU and memory usage.

`tty` - **Terminal path and name**

Responds the terminal path and name.

Syntax:

```
tty
```

Ex.:

```
tty
```
Current terminal path and name is shown, for example `/dev/tty3`.

vi - Start text editor

Starts a display oriented text editor named 'vi' that is included in the Linux operating system.

Syntax:

```
vi
```

Ex.:

```
vi
```

Starts the editor. The most important commands for simple editing are listed in the following table.

Command	Function	Example
vi	Start command	vi *file*
i	Text insert mode	i *text*
<Esc>	Exit text mode	i *text* <Esc>
x	Delete character	x
:	Command mode	: *command*
q	Exit, not modified	:q
q!	Exit without saving	:q!
w	Save	:w
wq	Save and exit	:wq
u	Undo (the last)	:u
/	Search	/*text*

who - Which terminals are used

Responds the terminal names that are currently used.

Syntax:

```
who
```

Ex.:

```
who
```

Responds all invoked terminals, for examlpe tty1, tty2, tty8.

who am i - Which terminal is this

Responds the own terminal name.

Syntax:

```
who am i
```

Ex.:

```
who am i
```

Responds your currently used terminal, for examlpe tty2.

The 'lpr' Command

In Linux we use the lpr command to send files to the printer. lpr is an acronym for line printer. The 'filename' file is sent to the printer by entering:

```
lpr filename
```

The print command adds page header/footer and page brakes to the file.

If the lpr command is entered without a file name, then the 'standard in' will be read and printed. The following example:

```
echo "Donald Duck for president!" | lpr
```

prints the text 'Donald Duck for president!' on the printer.

Since there may be several printers in a Linux system, the destination printer may be specified using the option -P to the lpr command. If no destination is specified there is a default destination. TPSys frequently uses the 'raw' destination, which is the default printer destination but with no header, footer or page breaks. Header, footer and page breaks are added by the TPSys print program.

Printer Commands

All print jobs in the print queue can be shown in an information box by entering the lpq command:

```
lp is ready and printing
Rank      Owner    Job  Files                    Total Size
active    tpsys      2  messages                 15327 bytes
1st       tpsys      3  myComponent.cmp          270   bytes
```

To remove a job, use the lprm command followed by the job number.

Example: lprm 3 removes the myComponent.cmp job from the printer queue.

Administration of the printer is performed by using the lpc line printer command. You can, e.g. disable all printer jobs by entering the following commands (provided you are logged on to the root):

```
su
lpc disable all
```

For further information about this command, enter the man lpc command.

Shutdown

Never reset the computer on the machine computer box, or turn the power off before you have shut down the Linux system.

Shut down the Linux system from the command line by entering the following commands:

```
su
halt
```

You can safely turn off the power after the following message:

```
System halted - press Ctrl-Alt-Del to reboot
```

Rebooting

If you want to reboot the system, enter the following commands:

```
su
shutdown -r now
```

4. TPSys
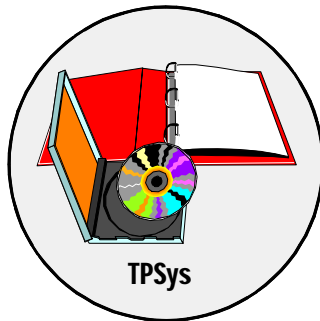
This chapter describes the TPSys software, which is developed by MYDATA and used to control all the MYDATA placement machines.

The description is divided in two main parts:

- General software description, including the software structure, terminal and system hang-up instructions, running more than one TPSys version, etc.

- Parameter description, including the parameter structure, parameter editor and password.

☞ *This chapter contains information about how to modify parameters. Note that most of the system parameters are to be changed by authorized MYDATA service engineers only.*

Software Description

This section contains information about how to handle and navigate in the TPSys software, some useful settings, hang-up instructions, etc. The contents is divided into the following parts:

- Virtual terminals (tty)

- Logon instructions

- Hang-up instructions for terminal hang-up as well as for system hang-up

- Time setting

- Machine data

- Time lock

- TPSys Startup programs

- Running different versions of TPSys on the same machine

- The TPSys directory structure

- Running TPSys off-line

- Running

- er feature

- Logoff and system shutdown instructions

TPSys requires the Linux operating system, which is described in Chapter 3.

Virtual Terminals

A terminal (monitor and keyboard) on a machine running TPSys can operate up to seven virtual terminals, i.e. up to seven independent Linux terminal processes can be used from the machine terminal.

Description of the seven terminals:

`/dev/tty1`	This terminal is used to run TPSys on-line. TPSys is set up to start automatically on this terminal. This is set up in /etc/inittab and /home/tpsys/.profile.
`/dev/tty2`	This terminal can be used to run the Web-interface. This require that TPSys runs in high resolution. Ifhigh resolution is notavailble. this terminal is same as /dev/tty3 below.
`/dev/tty3`	This terminal can be used to run TPSys off-line, e.g. for programming purposes.
`/dev/tty4`	Same as /dev/tty3.
`/dev/tty5`	Same as /dev/tty3.
`/dev/tty6`	Same as /dev/tty3.
`/dev/tty8`	This terminal is used as console for system messages.

To switch between the terminals press <Alt>+F#, where # is the number of the desired terminal.

Example: <Alt>+F2 switches to the `/dev/tty2` terminal.

Normally, these terminals are mentioned with the device part omitted, that is `tty1`, `tty2`, etc.

Logon

Linux allows you to log on the system in the following two different levels:
- Root
- TPSys

Root

Root is the highest logon level. In most systems the root is protected with password, accessible to a system administrator as super-user only. However, the TPSys is an open system in which no password is required to log on the root level.

From the root, everything in the system is accessible, changeable and erasable. So, *the root should not be entered unnecessarily*. Only authorized personnel with experiences in Linux should use this level.

☞ *Do not log on the root level unless you are very familiar with the system.*

To log on the root level, log on as: `root`.

The root prompt is a hash mark: *#*

The root is exited by entering: `exit`

TPSys
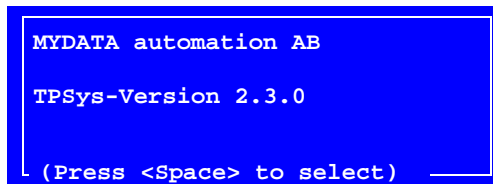
The TPSys logon level is used for the following purposes:

System supervision

Terminal `tty8` is automatically selected as console and reports process information without being logged on.

Startup programs and TPSys operation

Terminal `tty1` is logged on as `tpsys` automatically. When TPSys is started the following startup entry is shown:

```
MYDATA automation AB

TPSys-Version 2.3.0


(Press <Space> to select)
```

Press <Space> if you want to access the *Startup* menu. Otherwise, the hardware initiation dialog box is shown:

```
OK to initiate hardware?
          OK
```

After initiation, the TPSys main menu is shown.

If you have exited to Linux from TPSys, restart TPSys by entering the exit command.

Linux operation

Login as `tpsys` on either of the `tty2` to `tty6` terminals. These terminals can be used for off-line purposes.

Hang-Up

This section describes what to do if you get a terminal hang-up or a system hang-up.

Terminal Hang-Up

If a terminal does not respond to key pressings, kill the current process as follows:

1. Switch to another terminal by pressing <Alt>+<F#> (# = the desired terminal number) and log on as `tpsys`.

2. Further information about terminals is found in the *Virtual Terminals* section on page 4-3.

3. Enter the following command at the Linux prompt ($):

   `ps -x`

   A table of running processes at the time you gave the `ps` command is shown, which may look like this:

   ```
   PID TTY STAT TIME COMMAND
   371   2 ?    0:01 -bash
   521   2 S    0:05 mhproc
   525   3 S    0:02 dmpmotlog
   529   3 S    0:01 -bash
   533   3 S    0:00 ps -x
   ```

   where:
`PID`	Process identification number
`TTY`	Terminal
`STAT`	Process status
`TIME`	Used processor time
`COMMAND`	Command for the running process

   The question mark under `STAT` means that the status for the hanged-up process is not known.

4. Read off the lowest process number for the hanged-up terminal. In the above example it is 371 for terminal `tty2`.

5. Terminate the process by entering a kill command and the process number as argument, in this case 371:

   `kill -9 371`

The tty1 terminal only

6. If the hang-up happened on the TPSys on-line `tty1` terminal during assembling, then inspect the machine to see if there is an incomplete layout.

7. An incomplete layout can be resumed and completed by loading the Layout Status for the layout. This is further described in the *TPSys Operator's Manual*.

System Hang-Up

If no terminal responds to any key pressings, then you have a system hang-up.

☞ *Do not press the reset button on the computer box.*

Exit the system as follows:

1. Open the front cover and withdraw the electronic shelf.

2. Turn the power off.

3. Watch the hard disk indicator LED on the computer box. It should indicate activity within one minute.

Hard disk activity

If it does, wait until all indicating LEDs on the computer box are permanently out, and then turn the power on again.

No hard disk activity

If it does not, turn the power on again and press the Reset button on the computer box.

Normally, the system comes up again after resetting. But, in worst case it does not. A complete software installation and calibration may be necessary. Please contact MYDATA Customer Support in this situation.

If there is a backup, the parameter measuring and setting part of the calibration can be restored.

If there is a complete data backup, all data can be restored.

> Never press the Reset button on the computer box after the operating system has been booted.

Time Setting

The system clock on the computer motherboard indicates current time to various processes in the system. This section shows how to set the current time to this clock.

1. Exit TPSys by selecting the **Exit TPSys** option in the TPSys **Exit** menu.

```
Exit
S Shutdown
R Restart TPSys
X Exit TPSys
M Exit To Service
```
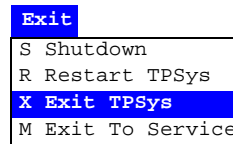
2. Enter the following commands at the prompt.

```
su
timesetup
```

The following popup box is shown:

```
                    Note
You have to reboot to make sure that all
processes recognize the time change.

            Reboot now?
    Yes             No
```
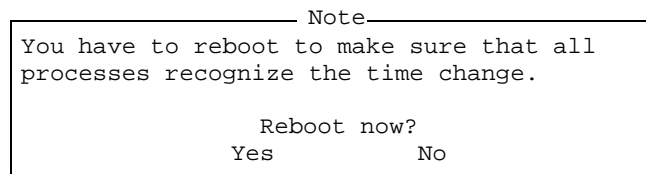
3. Reboot the system for the changes to take affect by selecting *Yes* in the popup box.

Machine Serial Number

The following command is a TPSys command, but it is executed from Linux. It shows the machine type and serial number.

`serial` - **Serial number**

Returns or checks the machine serial number, name or model.

Syntax:

```
serial [-s] [-n] [-a]
```
-s Test of the device (silent).
-n Print the serial number.
-a Print the machine name in ASCII format.
-m Print the machine model.

Ex.:

```
serial -n
```
Prints the machine number on the monitor.

Ex.:

```
serial -a
```
Prints the machine name on the monitor.

Ex.:

```
serial -m
```
Prints the machine model and serial number on the monitor.

The machine serial number is also accessible from within the TPSys main menu. Select **About... >This Machine**. This gives a pop-up window showing the machine name, number, and available options.

Time Lock

The Time lock feature makes it possible for MYDATA to allow each installation of TPSys to function for a limited period. Only authorized MYDATA representatives may modify the parameters specifying this period.

When the time lock is activated, the machine will not be able to mount any components, but other functionality is undisturbed.

Time lock functionality can be disabled altogether in the case of upgrades to existing installations.

Parameters

Parameters involved:
    0241.0001 Magic time word
    0241.0011 Infinite time
    0241.0012 End year
    0241.0013 End month
    0241.0014 End day

The date given by the above parameters is the date upon which the lock will activate unless the infinite time parameter is set to "true" and the magic word is valid.

TPSys Startup Programs

When the TPSys is started or restarted, the following dialog box is shown a few seconds:

```
MYDATA automation AB

TPSys-Version 2.3.0


(Press <Space> to select)
```
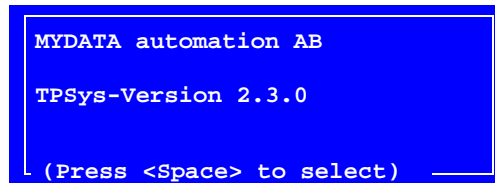
If the space bar is pressed during this time, then a collection of service, installation and backup programs are accessible from the *Startup* menu shown.

```
TPSys
Parameters
Service
Show Transducers
Backup
Restore
UNIX
Software Upgrade
Measure TEX
System shutdown
System reboot
MyLink
```
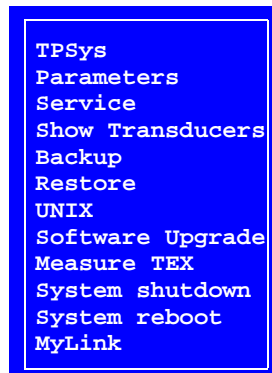
The programs accessible from this menu are:

- **TPSys**
  Starts TPSys.

- **Parameters**
  An editor for setting parameters during installation and service without initiating the machine.

- **Service**
  A service program for test of various functions.

- **Show Transducers**
  A position program for installation and service.

- **Backup**
  A backup tool for TPSys databases, parameters and calibration.

- **Restore**
  A restore tool for the TPSys databases backed up with the Backup feature.

- **UNIX**
  Moves to the Linux. To restart TPSys in Linux, type exit and press <Enter>.

- **Software Upgrade**
  A program for upgrading TPSys with software patches from the CD-ROM unit.

- **Measure TEX**
  A service program for reinstallation of the TEX Tray Exchanger.

- **System shutdown**
  Shutdown command to exit both the TPSys and the Linux. The TPSys is then automatically restarted.

- **System reboot**
  Shutdown and restart command for TPSys and Linux.

- **MyLink**
  A software feature used to connect a machine to the MYDATA Customer Support service.

TPSys Versions and Directory Tree

This section describes the links to more than one TPSys version and the TPSys directory tree.

To understand the directory tree in Linux you first have to understand the use of symbolic links.

Symbolic links are described in the *Symbolic Links* section in Chapter 3.

The home directory for tpsys is `/home/tpsys`, for usage in scripts the symbol BASE is defined.

`/home/tpsys` is a symbolic link to the directory that holds the current TPSys version.

More Than One TPSys Version

More than one TPSys version can be installed, but only one can be used at a time.

Entering the `ls -l` in `/home` command TPSys returns a list like this:

```
drwxr-xr-x    5 tpsys     tpsys      1024 Jul 20 15:25 backup
drwxr-xr-x    5 root      root       1024 Jun 18 07:51 httpd
drwxr-xr-x    2 root      root      12288 Jun 18 07:49 lost+found
lrwxrwxrwx    1 root      root         11 Jun 18 08:50 tpsys -> tpsys-2.0.6
drwxr-xr-x   13 tpsys     tpsys      1024 Jun 18 08:15 tpsys-2.0.5
drwxr-xr-x   15 tpsys     tpsys      1024 Jul 23 10:50 tpsys-2.0.6
lrwxrwxrwx    1 root      root         11 Jun 18 08:50 tpsys-orig -> tpsys-2.0.5
```

In this list you can see that tpsys is linked to tpsys-2.0.6, that is TPSys 2.0.6 is the currently used TPSys version.

☞ Do not change the TPSys version by re-linking `/home/tpsys`.

To change the TPSys version, use the `swadmin` version manager.

TPSys Directory Tree

TPSys software is located under the Linux operating system in a directory tree shown in Figure 4-1. The directory tree can vary depending on optional features and equipment.
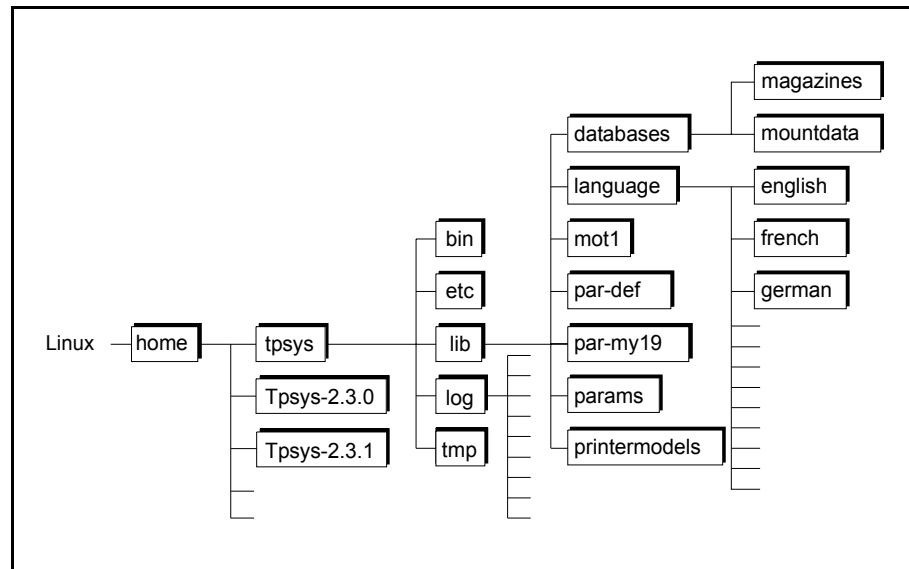
Figure 4-1.   TPSys directory tree

The main directories contain:

/home

The Linux system directories and the `tpsys` home directory.

/home/tpsys

Symbolic link to the current home directory for TPSys.

/home/tpsys-2.3.X

Home directory for TPSys version 2.3.X. The directory pointed out from `/home/tpsys` is the current home directory for TPSys.

/home/tpsys/bin

Binary execution files for starting and running the TPSys and the Startup programs. The `go` file is used to automatically start TPSys from Linux.

/usr/tpsys/etc

Execution files for TPSys and the Startup programs. It also contains software tools started from Linux, such as Burnin, Stepper and X Calibration programs.

/usr/tpsys/lib

Administration data for databases, languages, etc.

/usr/tpsys/log

Log files created by the various programs under TPSys.

/home/tpsys/tmp

Temporary files for logging and saving various status.

/home/tpsys/lib/databases

Contains database directories for magazines, components, packages, layouts, boards, etc

/home/tpsys/lib/databases/magazine

Contains the magazine database, i.e. magazine feeder data and and tray data.

/home/tpsys/lib/databases/mountdata

This directory is built by the system and it contains mount data for PCBs, panels and layouts.

/home/tpsys/lib/databases/language

Language managing files for different languages.

/home/tpsys/lib/databases/language/english

English text files for TPSys screen and printer.

/home/tpsys/lib/databases/language/french ... german

Text files in various languages for TPSys screen and printer.

/home/tpsys/lib/mot1

This directory contains MOT servo files.

/home/tpsys/lib/par-XXXX

Default parameter files for the machine type (XXXX = machine type).

/home/tpsys/lib/params

This directory is created during the TPSys installation. It contains individual calibrated parameter files for the machine.

/home/tpsys/lib/printermodels

Default parameter files for printers.

Off-Line Terminal

In TPSys, terminal `tty2` to `tty6` can, after logging on as `tpsys`, be used as TPSys off-line terminals by entering the following command:

`go`

In addition to the virtual terminals, a standard PC can be used as an external off-line terminal (which is further described in the *External Off-Line Terminal* section in the Machine Manual.

Digitizers cannot be used on off-line terminals.

The Startup program cannot be run from an off-line terminal.

Off-line terminals do not slow down the machine performance because on-line processes have higher priority than off-line processes.

The off-line main menu is reduced in comparison to the on-line main menu, see Figure 4-2

Figure 4-2.   Off-line terminal main menu

The off-line menu options are also reduced in comparison to the on-line menu options. The off-line menus are shown below (the menu options are described in the *Appendix A - Menu Reference Guide* in the *Operator's Manual* and in the *Programming Manual*).

- The *Production* menu is not available in off-line mode.

- The *Magazine* menu is reduced to nine options:

```
Magazine
M Magazines
--------------------------
G Removable Feeders
T Tray Type
Y Y Wagon Magazine
W Tray Wagon Magazine
P Pallet Magazine
X TEX
--------------------------
K Magazine Kits
C Create Magazine Kit
H HYDRA Preparation
```

- The *Editor* menu is reduced to eight options:

```
Editor
C Components
P Packages
--------------------
L Layouts
A Panels
B PCBs
--------------------
F Fiducial Marks
G Glue Dots
U Users
```

- The *Print* menu is the same as in on-line mode:

```
Print
C Component
P Package
M Magazine
B PCB
Y Components In Layout
E Messages
R Parameters
-----------------------
N Management Data
O Magazine Optimization
K Magazine Kit
L Layout Preparation
T Removable Feeder
-----------------------
A Cancel All Printouts
```

- The *Utility* menu is reduced to eight options:

```
Utility
I Import
X Export
G Login / Logout
----------------------------
B Backup
R Restore
S Save System Status
U Units
L Language
```
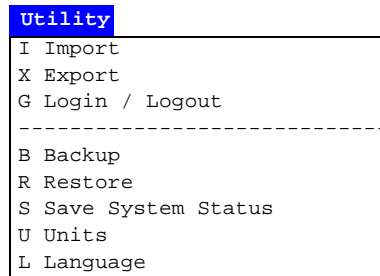
- The *Exit* menu is reduced to one option:

```
Exit
X Exit TPSys
```
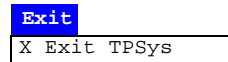
- The *About* menu is the same as in on-line mode:

```
About...
M This Machine
T TPSys
D Databases
S System Statistics
E Temp. Statistics
C Motor Controllers
```
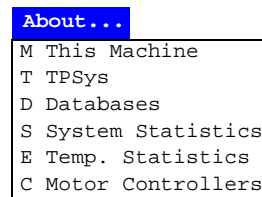
Stepper Feature

The Stepper Feature creates an interruption after each single step of the assembling cycle.

The board assembling can thus be performed step by step with confirmation of each step, or run with a delay that causes the machine to pause before each step enabling examination of each step.

The Stepper Feature can also be used to single step all machine movement sequences. This is useful for troubleshooting.

Other range of use can be to...
– Check machine installation.
– Check parameter settings.
– Check for badly programmed packages.

Running the Stepper

Start and stop the Stepper as follows:
– Start Stepper by pressing <Ctrl>+S .
– Leave Stepper by pressing <Ctrl>+E.

☞ If the user access system is in operation, the user currently logged in must have "Service" rights set to "High".

F6	Grab/Release	Normal mode.
F7	Front/Back	Single step mode.
F8	Toggle Pin	Step with 50ms delay.
Page Up	PgUp	Increase delay time.
Page Down	PgDn	Decrease delay time.
F3	Glue	Toggle messages on/off.
F9	F9	Toggle units SI/machine units (ticks).

Positions, forces, torques and speeds are given in metric units (SI) or machine units (ticks). To toggle units press <F9>.

The messages sent from TPSys to the servos will be displayed at the bottom of the screen. The colour of these messages is significant.

– If a message is diplayed in white, then the message has already been sent to the servo.
– If a message is displayed in yellow, then the message is next in line to be sent when you allow the machine to step.

Logoff and System Shutdown

This section describes how to log off a terminal from Linux, and how to shut down the system completely from TPSys and Linux.

Logging Off From Linux

To log off from Linux, enter simply the following command:

```
exit
```

The terminal is then logged off.

Shutdown From TPSys

It is not necessary to log off from other terminals before shutting down the system.

To shut down the system, select the **Shutdown** option in the TPSys **Exit** menu or in the *Startup* program menu.

```
Exit
S Shutdown
R Restart TPSys
X Exit TPSys
M Exit To Service
```

The following popup box is shown:

```
System power down?
     Yes     No
```
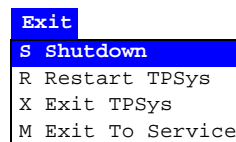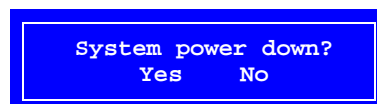
Select **Yes** to power down the system.

The power can be turned off when this message is shown:

```
System halted - - press Ctrl-Alt-Del to reboot
```

Shutdown From Linux

If TPSys is not running, enter the following command at the Linux prompt ($):

```
su root
```

Enter the following command at the root prompt (#):

```
halt
```

The power can be turned off when this message is shown:

```
System halted - - press Ctrl-Alt-Del to reboot
```

User List

In TPSys there is a user security feature in which passwords are used to prevent from unauthorized data modification. User names, passwords and individual data modification privileges are used for this feature.

The user security is configured in a User List Editor, described overleaf.

The user security feature can be enabled or disabled from the TPSys main menu (description on page 4-28).

System locking

Question: Can I manipulate the user security feature and thereby lock everyone out from the system so that nobody can access it again ?

Answer: No, it is not possible to lock the system for all users by manipulating the security feature. However, in a network system with shared *User* database, the client system might be locked if manipulating the user privilege levels and the log on/off feature in the client and server systems. But, a locked client system can always be accessed again by changing the *User* privilege level in the server system.

User List Editor

User information in the User List can be modified when the security is either disabled or enabled.

- If disabled, any user can modify the security information without logging on.

- If enabled, the user must be logged on with the *User* privilege level set to *High*.

The currently logged on user name is shown at the bottom of the screen.

The User List Editor is opened by selecting **Editor** > **Users**.

The User List Editor is shown in Figure 4-3.

Function keys in the User List Editor:

Edit user

By pressing <Enter> the highlighted user privilege levels can be modified.

Insert new

A new user can be added by pressing <Ins> and typing a new name and password.

Delete

The highlighted user can be deleted by pressing <Del> and confirming the deletion in a popup box, provided the user is not currently logged on, which is indicated with an asterisk (*) in the user list.

```
                         * USER LIST EDITOR *
      ┌─User─────┐
      │ Bill     │                              Enter  Edit user
      │ *Brian   │                                Ins  Insert new
      │ David    │                                Del  Delete
      │ Eric     │                                 F2  Change password
      │ John     │
      │          │
      │          │
      │          │       ┌───────────────────────────────────────────┐
      │          │       │         Name: Brian                        │
      │          │       │   Access rights                            │
      │          │       │       Layout: High          Board: Standard│
      │          │       │    Component: High        Package: High    │
      │          │       │     Glue dot: High  Fiducial marks: High   │
      │          │       │     Magazine: Standard   Tray type: High   │
      │          │       │ Magazine kit: Low             User: High   │
      │          │       │     Switches: Low  Mount/glue switch: High │
      │          │       │    Parameter: High         Service: High   │
      │          │       │   Management: High                         │
      └──────────┘       └───────────────────────────────────────────┘
                                              Brian              12:36
```
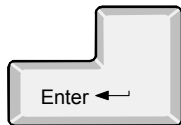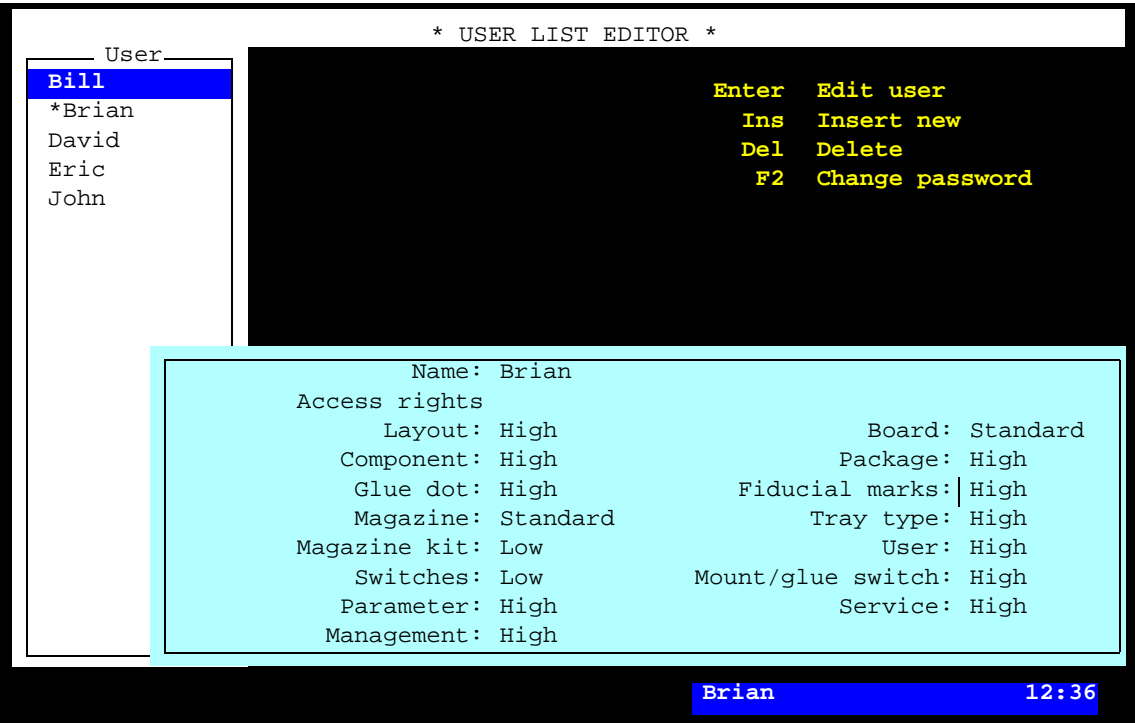
Figure 4-3.   User List Editor

F2

Change password

The password for the highlighted user can be changed after pressing
<F2>. Passwords are sensitive to upper/lower case.

Esc

Exit

Press <Esc> if you want to exit the User List Editor and return to
the the main window.

Entries in the User List Editor:

User

The users defined in the system.

Use the arrow keys or <PgUp>, <PgDn>, <Home>, or <End> to
select user.

* A user currently logged on is marked with an asterisk (*). Only one
user can be logged on the system in on-line mode. Several users can,
however, be logged on the system in off-line mode.

Name

User name, which must be a unique name for each user.

Access rights

Privilege levels for the highlighted user can be set individually for a number of system actions, further described below.

The privilege levels are selected by pressing <Space>.

High and *Low* privilege levels can be chosen for most of the actions. For some of the actions, an additional *Standard* privilege level can be selected.

The three privilege levels are intended for the following purposes:

Low
> Intended for minimal trained operators. It allows to run the system, locate boards and re-load components, but it does not allow to change any settings.

Standard
> Intended for trained operators and it allows also to modify the contents of the magazines, and to modify board positions in panels.

High
> Intended for programmers and service personnel. It has no limitations, i.e. any placement and system settings can be changed.

Actions allowed for the three privilege levels are described below. *Standard* points out only what is allowed in addition to the *Low* level. *High* is not included since it has no limitations.

Layout: Low

Layout Editor
- Move the board position fiducial marks.

Board: Low

PCB Editor
- Toggle the 'D' and 'M' status in the *Items* list.

- All actions in the *View position* mode except for changing the component position.

Board: Standard

PCB Editor
- Modify the component angle, position and local fiducial mark positions.

- Modify the following PCB header information:

  – *Bad board mark pos.*
  – *Mount tool test pos.*
  – Glue tool test pos.

Panel Editor
- Move the PCB position fiducial marks.

- Modify the following panel header information:
  – *Bad board mark pos.*
  – *Mount tool test pos.*
  – *Glue tool test pos.*

Component: Low

Component List Editor
- No modification is allowed, but the *F6* feature can be used.

Package: Low

Package List Editor
- No modification is allowed.

Glue dot: Low

Glue Dot List Editor
- No modification is allowed, but you can apply and view a glue dot using the *Apply and view* option in the menu.

Fiducial marks: Low

Fiducial Mark List Editor
- No modification is allowed but you can verify a fiducial mark using the *Verify* option in the menu.

Magazine: Low

Magazine List Editor
- Perform the following magazine actions:
  – *Locate magazine*
  – *Vibrate magazine*
  – *Vibrate all magazines*

Y-Wagon Magazine Editor
Tray Wagon Magazine Editor
Pallet Magazine Editor
- Perform the following actions:
  – *Reload*
  – *Remove from magazine*

- Modify the following tray information:
  – *Quantity*
  – *Position*

TEX List
- Perform the following actions:
  – *Locate pallet position*
  – *Refill all trays*

Tray Elevator
- No restrictions (the Tray Elevator is not controlled by the user security feature). However, the pallet trays are restricted.

Magazine: Standard

Magazine List Editor • Modify all feeder contents information accessed by selecting the *Edit feeder contents* option in the menu.

Y-Wagon Magazine Editor
Tray Wagon Magazine Editor
Pallet Magazine Editor

• Perform the following actions:
  – *Insert new*
  – *Delete*
  – *Toggle sort order*

• Modify the tray information, i.e. *Name/barcode, Comment, Batch ID* etc.

Magazine Kit List Editor • Load a Magazine Kit into a Magazine List by selecting the *Apply* option in the menu.

Tray type: Low

Tray Type List Editor No modification is allowed.

Magazine kit: Low

Magazine Kit Editor • No modification is allowed, but you can change the sort order by selecting the *Toggle sort order* option in the menu.

User: Low

User List Editor • No modification is allowed, neither of any user privileges nor passwords.

☞ To avoid the risk of locking everyone out from the system, the currently logged on user cannot set his own *User* level to Low.

Switches: Low

No modification is allowed of the switches accessed by selecting the *Switches* option in the *Production* menu.

Mount/glue switch: Low

No modification is allowed of the mount and glue switches accessed by selecting the Mount/Glue Switches in the *Production* menu.

Parameter: Low

Parameter List Editor No modification is allowed of the parameters accessed by selecting the *Parameters* option in the *Editor* menu.

Schedule Backup No access is given to the *Schedule Backup* feature in the *Utility* menu.

Service: Low

Service tools   No access is given to the *Installation* and *Diagnostics* service tools in the *Utility* menu.

Management: Low

If this field is set to *Low* then the following actions are, contrary to the above descriptions, **not** allowed to be performed:

- Clear the event log (the *Clear Event Log* option in the *Utility* menu).

- Clear management data (the *Clear Management Data* option in the *Production* menu).

- Delete management data (the *Delete Management Data* option in the *Utility* menu).

Security On/Off

The security can be switched on/off from the TPSys main menu in on-line mode, provided the *User* privilege level is set to *High* for the currently logged on user.

To enable or disable the feature, select **Utility >User Access System**,and the desired option for enabling or disabling the user security feature ...

```
┌─── User Access System ───
N On
F Off
```

... then, enter your name in the popup box shown:

This dialog box is not shown if a user with *User* privileges set to *High* disables the feature.

```
┌──────── User with HIGH access right ────────┐
│          Name: Brian                        │
│      Password: ******                       │
└─────────────────────────────────────────────┘
```

Or, you can simply press <Enter> and select user from the list. Enter the password and press <Enter>.

An information box will indicate that the user security feature is switched on or off.

Note that only users for which the *User* privilege level is set to *High* are allowed to switch the user security feature on or off.

Log On/Off

How to log on and log off is described in the *Operator's Manual*.

Parameters

This section contains information about:
- The parameter structure
- The parameter editor
- Parameter modification

Parameter Structure

The TPSys parameters form a structure with the following three levels:
- Parameter heading
- Parameter group
- Parameter

Parameter heading

The top level contains parameter headings, for instance *Mount component* in the figure.

```
                         Parameter Groups
Axis
     0001 Axis
     0002 C axis
     0003 Theta axis
     0004 X axis
     0005 Y axis
     0006 Z axis
     0007 HYDRA Z axis
     0008 HYDRA Theta axis
Mount component:
     0021 Z-mount component
     0022 Z vacuum
     0023 Tool manager
     0024 HYDRA-mount component
     0025 HYDRA vacuum
     0026 Measure board
     0027 Mount tool offsets
     0028 HYDRA unit
     0029 HYDRA tool manager
     0030 HYDRA tool geometry
     0031 HYDRA tool bank geometry
Vision:
     0041 Vision
```

Parameter group

The second level contains parameter groups, for example *0021 Z-mount component*.

Parameter

The third level consists of specific parameters, which are described on page 4-34.

Parameter Editor

Note that most of the system parameters are to be changed by *authorized MYDATA service engineer* only. A password may be required to save modifications made in parameters.

An adequate access level is required to change parameter data. Each user can be set to a personal password and individual access level. Further information about user access is found in the *User List* section, page 4-21.

A parameter editor can be opened either from within TPSys by selecting **Editor** > **Parameters**...

... or from the *Startup* menu by pressing <Space> before the TPSys is started and then selecting the **Parameters** option. This option is a way of editing parameters without initiating the machine.

```
TPSys
Parameters
Service
Show Transducers
Backup
Restore
UNIX
Software Upgrade
Measure TEX
System shutdown
System reboot
MyLink
```
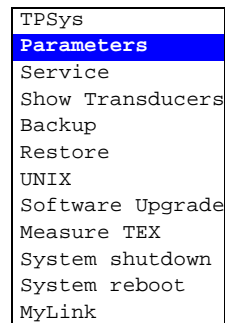
You can also press the <Shift>+<F10> keys or just <F10> in any text mode, and select the **Parameter Editor** option in the hot menu shown.

The parameter editor is shown in Figure 4-4.

Function keys in the Parameter Editor:
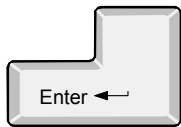
Edit parameter

The parameters included in the highlighted parameter group are shown and can be modified after pressing the <Enter> key.

Print parameter group

The parameters included in the highlighted parameter group can be printed out by pressing <F7>. The printout facility is available only if the parameter editor is opened from within TPSys with the *Parameters* option in the *Editor* menu.

```
                    * PARAMETER LIST EDITOR *
          ┌── Parameter Groups ──┐
  Axis                                 Enter  Edit parameter
       0001 Axis                          F7  Print parameter group
       0002 C axis                        F8  Print all parameter groups
       0003 Theta axis
       0004 X axis
       0005 Y axis
       0006 Z axis
       0007 HYDRA Z axis
       0008 HYDRA Theta axis
  Mount component
       0021 Z-mount component
       0022 Z vacuum
       0023 Tool manager
       0024 HYDRA-mount component
       0025 HYDRA vacuum
       0026 Measure board
       0027 Mount tool offsets
       0028 HYDRA unit
       0029 HYDRA tool manager
       0030 HYDRA tool geometry
                                        Brian                    13:06
```

Figure 4-4.   Parameter editor

Print all parameter groups

All parameters can be printed out by pressing <F8>. This option is available only if the parameter editor is opened from within TPSys with the *Parameters* option in the *Editor* menu.

Entry in the Parameter Editor:

Parameter Groups

This box contains a list with all the parameter headings (e.g. *Mount component*) and associated parameter groups (e.g. *0022 Z vacuum*).

Use the arrow keys or <PgUp>, <PgDn>, <Home>, or <End> to select the desired parameter group.

You can also select a parameter group by simply entering the first characters of the parameter group name.

Parameter Modification Window

If <Enter> is pressed in the Parameter Editor (page 4-31), then the following parameter modification window is shown:

```
                              ─ 0001 Axis ─
 0001 Motor home transducer value ............................... 2048
 0002 Motor home transducer tolerance ......................... 8
 0003 Motor home check period ................................. 0
 0004 Wait loop delay ......................................... 10ms
                          Save and exit




                                             Brian            13:06
```
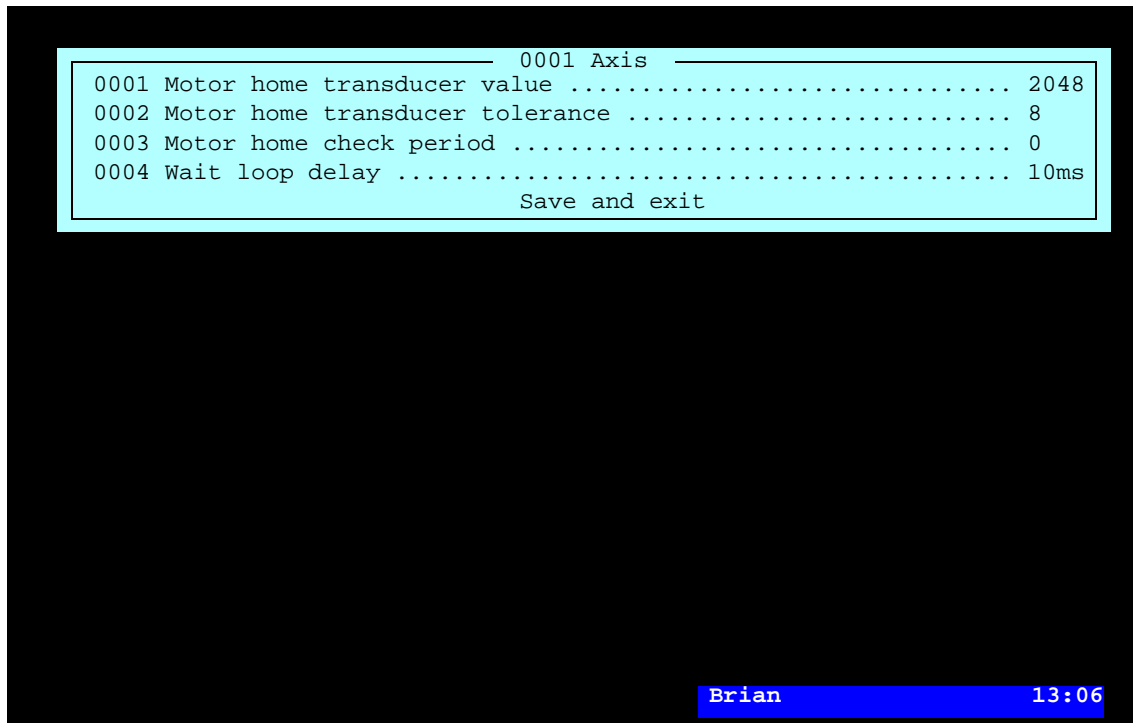
Figure 4-5.   Parameter modification window

Figure 4-5 shows four parameters in parameter group *0001 Axis* which is one of the parameter groups in the *Axis* parameter heading.

Use the arrow keys or <PgUp>, <PgDn>, <Home>, or <End> to select the desired group. You can also select a parameter group by simply entering the first characters of the parameter name.

Parameter modification

Change the desired parameter by entering a new value or toggling another option as described in the information line at the lower left box border.

Note that minimum and maximum values shown in this information line are not always adequate to the capacity of the machine but more of mathematical limitations.

Exit without saving

Press <Esc> if you want to exit the parameter window without saving modifications.

Save and exit

If you want to save modifications, move the cursor to the Save and exit field and press <Enter>. Password may be required.

Taking Effect

Most of the parameters take effect immediately after modification.

Some parameters require a system restart to take effect. These parameters inform about that a system restart is required.

Miscellaneous Parameter Information

This section contains the following parameter information not associated to the previous sections:

- Parameter password

- Parameter file location

- Parameter backup

- Units and tics

Password

Password for parameters accessed either from the *Parameters* option in the *Editor* menu, or from the *Parameters* option in the *Startup* menu is "anders" (lower case). This password is stored in the 'directory.PW' file in the /home/tpsys/lib/params directory. The password can be changed or deleted. A deleted password means that no password is required.

File Location

Parameter groups used by the system are stored in the following directory:

```
/home/tpsys/lib/params
```

If you modify a parameter using the parameter editor, you change a file stored in this directory.

If a parameter group is copied (in Linux) from:

```
/home/tpsys/lib/par-XXXX
```

to:

```
/home/tpsys/lib/params
```

then included parameters are set to the default values.

☞ Some of the parameters are measured and set to individualized values during installation and commissioning. Such parameters should not be copied.

Backup

A backup should be done each time a parameter that controls an essential function has been modified, see chapter 5 for information regarding backup.

Units

The following metric units are used in the TPSys parameters:

Angle	**mDeg**	Millidegree
	°	Degree
Angular speed	**°/s**	Degrees per second
Force	**mN**	Millinewton
	N	Newton
Length	**mm**	Micrometer
	mm	Millimeter
Speed	**mm/s**	Millimeters per second
Time	**ms**	Millisecond
	s	Second
Torque	**mNm**	Millinewtonmeter

Tics

The word 'tic' is common in some of the parameters. It signifies one step from a digital incremental transducer.

5. Backup/Restore TPSys
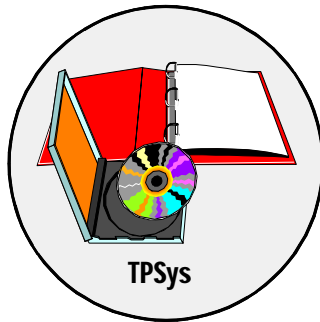
This chapter describes the TPSys backup/restore feature.

The backup/restore feature is used to save data from TPSys databases to the machine hard disk, to another machine in a network or to floppy disks.

The backup feature stores all the databases used for placing components, handling the user security, management data, parameters, calibration data, etc.
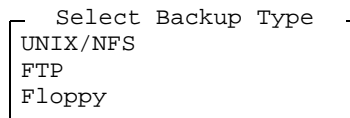
The backup feature includes also a scheduled backup feature, which is described on page 5-7.

Backup data can be restored in all, specific databases, or items of specific databases. This is described on page 5-11.

Backing Up

To make a TPSys backup, select **Utility** > **Backup** menu.

Select type of backup in the following popup menu:

```
       ┌─ Select Backup Type ─┐
       │ UNIX/NFS             │
       │ FTP                  │
       │ Floppy               │
       └──────────────────────┘
```
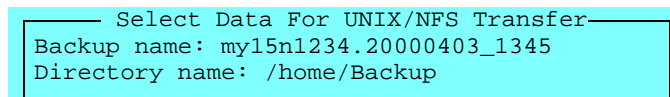
The backup types in the popup menu are described below.

UNIX/NFS

This option is selected if you want the backup to be stored locally on the machine hard disk or, if NFS (Network Files System) is used, on a hard disk of another machine in the network.

The default information in the popup box shown can be changed.

```
┌──── Select Data For UNIX/NFS Transfer────┐
│ Backup name: my15n1234.20000403_1345     │
│ Directory name: /home/Backup             │
└──────────────────────────────────────────┘
```

When ready with the information in the popup box (see below), press <Enter> to start the backup procedure, see page 5-5.

Backup name

The name of the backup target file.

The default name is set in the *0208.0030 Backup base name* parameter found in the *0208 Backup/Restore* parameter group. If there is no file name in this parameter, then the machine type, number, date and time form a file name (see the example above).

Directory name

The destination for the backup target file. The default destination is set in the *0208.0032 Backup directory* parameter.

FTP

This option is selected if you want the backup to be stored on a host machine in a network using the FTP (File Transfer Protocol) format.

The default information in the popup box shown can be changed.

```
┌──────────── Select Data For FTP Transfer────────────┐
│ Backup name          : my15n1234.20000403_1345      │
│ Directory name       : /home/Backup                 │
│ Host name or IP address: my19n456                   │
│ User name            : tpsys                         │
│ Password             : ******                        │
└─────────────────────────────────────────────────────┘
```

When ready with the information in the popup box (see below), press <Enter> to start the backup procedure, see page 5-5.

Backup name

The name of the backup target file.

The default name is set in the *0208.0060 Backup base name* parameter found in the *0208 Backup/Restore* parameter group. If there is no file name in this parameter, then the machine type, number, date and time form a file name (see the example above).

Directory name

The destination for the backup target file. The default destination is set in the *0208.0061 Backup directory* parameter.

Host name or IP address

The name of the host machine in the network, or the IP address for external transfer using the FTP protocol. The default host name or IP address is set in the *0208.0062 Host name or IP addr* parameter.

User name

The user name for logging on the host system. The default user name is set in the *0208.0063 User name* parameter.

Password

The password for logging on the host system. The default user name is set in the *0208.0064 Password* parameter.

Floppy
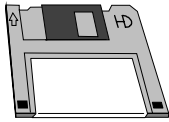
This option is selected if you want the backup to be stored on floppy disks in the disk drive.

The following popup box is shown after selecting this option. The default information in this box can be changed.

```
Which diskette drive do you want to use?
      A:        B:      Cancel
```

A: Select this drive letter for 3.5" 1.44MB floppy disks, which is the standard disk type in the machine.

B: This drive letter may be used if the machine has an old 5.25" 1.2MB disk drive.

Before starting the backup, make sure that you have formatted disks for the entire backup (normally 1 – 3 disks). You can use disks formatted either in DOS or in Linux.

If you do not have formatted disks, select *Yes* in the following dialog box:

```
Do you want to format a diskette?
      Yes      No      Cancel
```

If you choose to format disks, follow the instructions on the screen.

If you do not want to format any disks (or further disks), select **No** in the dialog box to start the backup procedure, see page 5-5.

Starting the Backup Procedure

When the desired backup type is selected (see the previous pages), the system starts collecting data for the backup, which can take some time:

```
┌──────────────── Collecting data────────────────┐
│ Database: Package                               │
│ No. of items: 279                               │
│  ###################.......................... │
└─────────────────────────────────────────────────┘
```

If you have selected *Floppy* then ensure that you have inserted a formatted disk in the selected disk drive:

```
┌─────────────────────────────────────────────────┐
│ Please make sure that a formatted diskette is inserted. │
│                    Yes     Cancel               │
└─────────────────────────────────────────────────┘
```

If more than one disk is required, then change disk when the system asks for it.

If you need more than one disk, mark the disks (see page 5-6).

When the backup is completed, i.e. when all data is collected and written to the target file, the following box is shown.

```
┌─────────────────┐
│ Backup complete │
│       OK        │
└─────────────────┘
```

Press <Enter> to return to the TPSys main window.

Disk Formatting

Disks must be either DOS or Linux formatted, see page 5-4.

You can also DOS format disks in a PC under DOS or Windows (FAT format).

Disk Labels

Always mark backup disks with proper identification information, date and disk number if more than one disk. It is important to know the disk order when restoring data.

This is an example of a disk label which contains the most essential information:

```
┌─────────────────────────┐
│          BACKUP         │
│   Machine: MYDATA No. 8  │
│        2000-04-03       │
│                         │
│        Disk 1 of 2      │
└─────────────────────────┘
```

Disk Overwriting

Note that the backup feature overwrites all existing information on the disks without alerting the operator.

Scheduled Backup

TPSys has a scheduled backup feature that can be configured to back up automatically in a preset time interval.

Scheduled backup can be set by selecting **Utility** > **Schedule Backup**, and configuring the backup type and schedule in the box shown:

The entries in the configuration box are described overleaf

```
        Type of automatic backup:  UNIX/NFS
           Max. number of backups:  10


UNIX/NFS backup data
           Base name of the backup:  John
         Store backup in directory:  /home/Backup


FTP backup data
           Base name of the backup:  ---
         Store backup in directory:  ---
           Host name or IP address:  ---
                        User name:  ---
                    User password:  ---


Time settings
         Use day of week or date:  Week day,Date
                      Day of week:  Every day of week
                             Date:  ---
                             Hour:  Every hour
                           Minute:  0
```

After configuring a *UNIX/NFS* or *FTP* backup, the setting parameters, i.e. path, transfer protocol, etc. can be verified by selecting *Yes* in the following popup box:

```
Test parameters
   Yes    No
```

The scheduled backup configuration is completed after saving the settings made:

```
Save changes?
  Yes    No
```
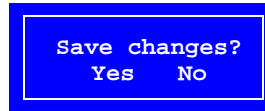
Scheduled backup configuration box

The scheduled backup configuration box is described below.

```
        Type of automatic backup:  UNIX/NFS
          Max. number of backups:  10

UNIX/NFS backup data
          Base name of the backup: John
        Store backup in directory: /home/Backup

FTP backup data
          Base name of the backup: ---
        Store backup in directory: ---
        Host name or IP address:   ---
                     User name:    ---
                 User password:    ---

Time settings
        Use day of week or date: Day of week
                   Day of week:  Every day of week
                          Date:  ---
                          Hour:  Every hour
                        Minute:  0
```

All entries in the backup configuration box have default parameters in the *0208 Backup/Restore* parameter group in the same way as described in the previous section. However, these parameters cannot be modified in the Parameter Editor. They only indicate what has been entered in this configuration box.

Type of automatic backup

Select the desired type of backup from a menu shown by pressing <Space>:
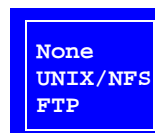
```
None
UNIX/NFS
FTP
```

UNIX/NFS

> Select this option if you want the backup to be stored locally on the machine hard disk or, if NFS (Network Files System) is used, on a hard disk of another machine in the network.

FTP

> Select this option if you want the backup to be stored on a host machine in a network, or be transferred via an IP address, using the FTP (File Transfer Protocol) format.

Max. number of backups

To avoid filling the disk with backup files, this entry sets the maximum number of backups to be stored. When this number is reached, the oldest backups are deleted as new backups are saved.

UNIX/NFS backup data

Base name of the backup

The base part of the backup target file name. The system adds date and time to the name set. If you e.g. enter *John* in this field, then the backup file name will be John_A.20000403_1100' which means a scheduled automatic (A) backup file created April 3rd, 2000 at 11.00.

Store backup in directory

The destination of the backup target files.

FTP backup data

Base name of the backup

The base part of the backup target file name. The system adds date and time to the name set. If you e.g. enter *John* in this field, then the backup file name will be John_A.20000403_1100' which means a scheduled automatic (A) backup file created April 3rd, 2000 at 11.00.

Store backup in directory

The destination for the backup target files.

Host name or IP address

The name or IP address of the host machine in the network.

User name

The user name for logging on the host system.

User password

The password for logging on the host system.

Time settings

Use day of week or date

You can choose either *Date* or *Day of week* by pressing <Space>.

Select *Date* for backing up the same day or days every month, e.g. the 1st and 15th day each month, or *Day of week* for backing up the same day or days every week, e.g. every Friday and Tuesday.

Day of week

This option is enabled only if *Week day,Date* is selected. You can choose *Every day of week* or a specific day, or several days, of the week from a popup menu shown by pressing <Ins>:

```
         Sunday
         Monday
        Tuesday
       Wednesday
       Thursday
         Friday
        Saturday
  Every day of week
```

Date

This option is enabled only if *Date* is selected. Choose *Every day* or a specific date, or several dates, from a menu shown by pressing <Ins>.

Hour

Choose *Every hour* or a specific hour, or several hours, from a menu shown by pressing <Ins>.

Minute

Type the desired minute at which the backup is to be started.

Restoring

To restore data from a backup file, select **Utility** > **Restore**.

Select which type of backup to be restored in the following popup menu:

```
┌──── Select Backup Type ────┐
│ Last saved backup          │
│ UNIX/NFS                   │
│ FTP                        │
│ Floppy                     │
│                            │
└────────────────────────────┘
```

The backup types in the popup menu are described below.

Last saved backup

This option selects automatically the last saved backup type. If the last saved backup was *Floppy* then the system informs about that.

UNIX/NFS

This option is used to restore a *UNIX/NFS* backed up file stored locally on the machine hard disk, or if NFS (Network Files System) is used, on a hard disk of another machine in the network.

The following popup box is shown:

```
┌──────── Select Data For UNIX/NFS Transfer ────────┐
│ Backup name:                                      │
│ Directory name: /home/Backup                      │
└───────────────────────────────────────────────────┘
```

Type the backup file name and directory, or simply press <Enter> and select backup file from the menu shown, see the *Selecting Backup File* section on page 5-13.

FTP

This option is used to restore a *FTP* backed up file stored on a host machine in a network.

The following popup box is shown:

```
┌──────────── Select Data For FTP Transfer────┐
│Backup name          :                        │
│Directory name       : /home/Backup           │
│Host name or IP address: my19n456             │
│User name            : tpsys                  │
│Password             : ******                 │
└──────────────────────────────────────────────┘
```

Type the backup file information. The backup file name and directory can be selected by simply pressing <Enter> and selecting from a menu shown, see the *Selecting Backup File* section on page 5-13.

Floppy
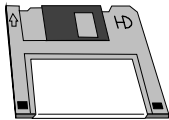
This option is used to restore a *Floppy* backed up file stored on a floppy disk.

The following popup box is shown:

```
┌──────────────────────────────────────────────┐
│Which diskette drive do you want to use?      │
│        A:        B:     Cancel               │
└──────────────────────────────────────────────┘
```

A: Select this drive letter for 3.5" 1.44MB floppy disks, which is the standard disk type in the machine.

B: This drive letter may be used if the machine has an old 5.25" 1.2MB disk drive.

The following information box is shown:

```
┌──────────────────────────────────────────────┐
│   Please insert the first backup diskette    │
│              Yes    Cancel                    │
└──────────────────────────────────────────────┘
```

Insert the backup disk (disk number 1 if more than one) in the disk drive and select *Yes*.

If the backup is stored on more than one disk, then change disk when the system asks for it.

When the backup is completely read from the disk you can select database from a menu, see the *Selecting Database* section on page 5-14.

Selecting Backup File

After pressing <Enter> in the restore dialog box for either *UNIX/NFS* or *FTP* restore, the following backup file menu is shown:

```
┌──────────────── Select file ────────────────┐
│ ..                                      (Dir)│
│ my15n1234.20000324_1345                      │
│ my15n1234.20000325_1345                      │
│ my15n1234.20000326_1345                      │
│ my15n1234.20000327_1345                      │
│ my15n1234.20000328_1345                      │
│ my15n1234.20000329_1345                      │
│ my15n1234.20000330_1345                      │
│ my15n1234.20000331_1345                      │
│ my15n1234.20000401_1345                      │
│ my15n1234.20000402_1345                      │
│ my15n1234.20000403_1345                      │
│ my15n1234.20000404_1345                      │
└──── Dir: /home/Backup ───────────────────────┘
```

Select file to restore and press <Enter>. Then, you can select the desired database to restore, see the next section.

Selecting Database

The following information box indicates the backup file selected ...

```
┌──────── Backup information ────────┐
│ From machine    : my15n1234        │
│ TPSys version   : 2.1.XX           │
│ Created         : Wed Apr 4 13:45:00 2000 │
└────────────────────────────────────┘
```

... and the following menu contains the options for selecting database to be restored:

```
┌── Select what to restore ──┐
│ All databases              │
│ Specific database          │
│ Parameter groups           │
│ Specific parameter group   │
└────────────────────────────┘
```

All databases

Select this option if you want all databases to be restored into TPSys. When the restore procedure is completed the information box depicted on page 5-17 is shown.

Specific database

Select this option if you want a specific database to be restored into TPSys, see page 5-15.

Parameter groups

Select this option if you want all parameter groups to be restored into TPSys. When the restore procedure is completed, the menu above is shown again.

Press <Esc> if you want to exit the restore mode and return to the main window.

Specific parameter group

Select this option if you want a specific parameter group to be restored into TPSys, see page 5-16.

Selecting Specific Database

By selecting *Specific database* in the previous menu (page 5-14), the following database menu is shown:

```
┌─── Select what to restore ───┐
│ Layout                (  39) │
│ Panel                 (   3) │
│ PCB                   (  42) │
│ Component             (1247) │
│ Package               ( 279) │
│ Glue Dot              (  15) │
│ Fiducial Mark         (  33) │
│ Magazine Kit          (  13) │
│ Magazine              (  36) │
│ Pallet                (  11) │
│ Tray Type             (   9) │
│ YW Tray               (  13) │
│ TW Tray               (   9) │
│ YW Tray Position      (  13) │
│ TW Tray Position      (   1) │
│ Pallet Tray Position  (   0) │
│ Management Data       (  12) │
│ User                  (   5) │
│ TEX                   (   1) │
└──────────────────────────────┘
```

Select the desired database to be restored, press <Enter>, and choose if you want to restore specific data or all data:

```
┌─ Select what to restore ─┐
│ Restore specific data    │
│ Restore all data         │
└──────────────────────────┘
```

Restore specific data

Select this option if you want specific items of the database to be restored into TPSys. Choose items by pressing <Ctrl>+A (all items) or <Space> (selecting/unselecting single items) in the list:

```
┌──── Select items to restore ────┐
│ * 000149                        │
│ * 000254                        │
│ * 000255                        │
│   000501                        │
│   000502                        │
│   000503                        │
│   000511                        │
│   000513                        │
│   000514                        │
│   000517                        │
│ <Space> select  <Ctrl>+A select all │
└─────────────────────────────────┘
```

Asterisks (*) indicate selected items in the box.

Press <Enter> to start the restore procedure. When it is completed the information box depicted on page 5-17 is shown.

Restore all data

Select this option if you want the entire selected database to be restored into TPSys. When the restore procedure is completed the information box depicted on page 5-17 is shown.

Selecting Specific Parameter Group

By selecting *Specific parameter group* in the previous menu
(page 5-14), the following database menu is shown:

```
┌──── Select parameter group ────┐
│ Axis:                          │
│     0001 Axis                  │
│     0002 C axis                │
│     0003 Theta axis            │
│     0004 X axis                │
│     0005 Y axis                │
│     0006 Z axis                │
│     0007 HYDRA Z axis          │
│     0008 HYDRA Theta axis      │
│ Mount component:               │
│     0021 Z-mount component     │
│     0022 Z vacuum              │
│     0023 Tool manager          │
│     0024 HYDRA-mount component │
│     0025 HYDRA vacuum          │
│     0026 Measure board         │
│     0027 Mount tool offsets    │
│     0028 HYDRA unit            │
│ Vision:                        │
│ 0041 Vision                    │
└────────────────────────────────┘
```

Select the desired parameter group to be restored and press
<Enter>.

When the restore procedure is completed the menu in the *Selecting
Database* section on page 5-14 is shown.

Completing the Restore Procedure

When the following information box is shown, the restoring procedure is completed:

<div align="center">

Restore complete
OK

</div>

Press <Enter> to confirm and view the previous menu.

Press <Esc> if you want to exit the restore mode and return to the main window.

6. Import/Export TPSys
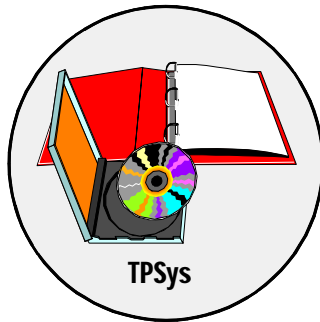
The TPSys import feature is used to import data into the TPSys databases. Data can be imported from the machine hard disk, another machine in a network, or from floppy disks.

The TPSys export feature is used the other way round, that is to export data from the TPSys databases to the machine hard disk, another machine in a network, or to floppy disks.

The import and export features include all the databases used for placing components, handling the user security, management data, etc.

The import and export features can include all data in a specific database, or selected items of a specific database.

Import and export formats are described on page 6-2.

The import feature is described on page 6-3.

The export feature is described on page 6-8.

Importing mount data from a CAD system is another import feature that is not described in this manual. A description is found in the *CADConversion, User's Manual* which is provided with the MYDATA CADConversion software package.

Import and Export Formats

The import and export formats used, TPSys and Directline, are described below.

TPSys Format

TPSys is a MYDATA developed ASCII format.

For further information about the TPSys format, see the MYDATA P-010-0787-EN document and Appendix C.

Directline Format

Directline is an old MYDATA developed format.

☞ When data is exported in Directline format, some information is lost.

For further information about the Directline format, see the *Directline Manual*.

Importing Data

All data in TPSys or Directline format, i.e. all exported data from a TPSys system, can be imported into the same or another TPSys system of the same or later version.

Imported items, e.g. layouts and PCBs, will keep their names, if not changed by the user during the import procedure. The item names are not to be confused with the file names.

☞ If you import items with already existing names, then the old data will be overwritten without any notice.

To import data to the TPSys databases, select **Utility** > **Import**, and select database as described in the next section.

Selecting Database

Select database and format in the following menu:

```
┌─────────────── Import ───────────────┐
│ E General        (TPSys Format)      │
│ M Mount List     (Directline Format) │
│ K Component      (Directline Format) │
│ A Mount And Comp.  (Directline Format) │
└──────────────────────────────────────┘
```

When the desired database is selected, choose import channel in the popup menu shown, see the next section.

Specific information about the *General   (TPSys Format)* entry is found below.

General   (TPSys Format)

By selecting this option, you can import data to several databases in the same procedure, e.g. to the layout, panel, PCB, component and package databases.

☞ *This option has to be selected when importing underlying data.*

Underlying data is described on page 6-13.

Selecting Import Channel

Select the desired import channel in the following menu:

```
        Choose Import Channel
DOS-diskette
UNIX/NFS
FTP
Directline
```

The import options in the menu are described below.

When ready, press <Enter> and enter the source file name, see the next section.

DOS diskette

Select this option if you want to import from a floppy disk in the disk drive.

The default path is set in the *0201.0102 DOS disk* parameter found in the *0201 Import/Export* parameter group.

UNIX/NFS

Select this option if you want to import from the local hard disk or, if NFS (Network Files System) is used, from a hard disk of another machine in the network.

The default path is set in the *0201.0101 Unix* parameter found in the *0201 Import/Export* parameter group.

FTP

Select this option if you want to import from a host machine in a network or import via an IP address by using the FTP (File Transfer Protocol) format.

The default FTP export parameters are set in the following parameters found in the *0202 Ftp transfer* parameter group:

– *202.0001 Host name*

– *202.0002 Login name*

– *202.0003 Password*

– *202.0004 Directory*

Directline

Select this option if you want to import using the Directline format.

This option is only included in the menu if an option with the Directline format is selected in the *Import* list (page 6-4).

Entering Source File Name

After selecting import channel, you will be asked to enter the complete source file name and path in the following box:

```
Enter file name to import or press <Enter> for directory list
a:\TV-ALL.gen
```

Enter the file name and path. The above example shows an import file from a floppy disk in the disk drive.

Or, you can simply press <Enter> and select one or several files from the list shown:

```
┌──────── Choose files to import ────────┐
│   cmp.cmp                              │
│ * TV-ALL.gen                          │
│   TV1.gen                             │
│   TV2.gen                             │
│   TV2-P2.gen                          │
│   TV2-P2x2.gen                        │
│   TV2x2.gen                           │
│   TV3B.gen                            │
│   TV3G.gen                            │
│   TV3R.gen                            │
│   TV3RGB-P3.gen                       │
│   pck.pck                             │
│   usr.usr                             │
└ <Space> select  <Ctrl>+A select all ─┘
```

Select by pressing <Ctrl>+A (all files) or <Space> (selecting/unselecting single files).
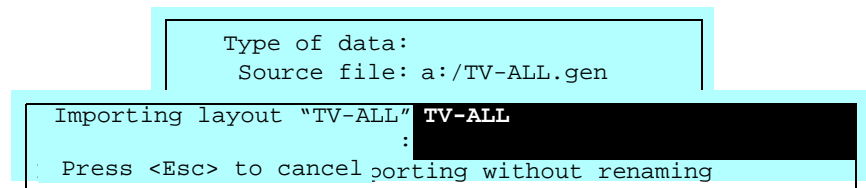
Asterisks (*) indicate selected files in the box.

The file types corresponding to the various databases are found in the *File extensions* parameters in the *0201 Import/Export* parameter group.

When ready, press <Enter>. In the next step, you can change the names of the included items.

Renaming Items

After entering the source file name, you can change the name of each included item in the following dialog box:

```
        Type of data:
         Source file: a:/TV-ALL.gen
  Importing layout "TV-ALL" TV-ALL
                         :
  Press <Esc> to cancel porting without renaming
```

Type a new name for each item to be imported if you want to change the names, otherwise the existing names will remain.

☞ Existing items in the system will be overwritten if you enter the same names.

You are, however, informed in the dialog box if there is an existing file with the same name.

Press <Esc> if you want to exit the import mode and return to the TPSys main window.

Press <Enter> to start the import procedure.

When the import procedure is completed the *Import* list (page 6-4) is shown again.

The renaming feature can be enabled or disabled by setting the *0201.0204 Ask for new name (rename)* parameter to *Yes* or *No*.

Exporting Data

To export data from the TPSys databases, select **Utility** > **Export**, and select database as described below.

Selecting Database

Select database and format in the following menu:

```
┌─────────── Export ───────────┐
│ L Layout          (TPSys Format)      │
│ P Panel           (TPSys Format)      │
│ B PCB             (TPSys Format)      │
│ C Component       (TPSys Format)      │
│ H Package         (TPSys Format)      │
│ Z Magazine        (TPSys Format)      │
│ F Removable Feeder (TPSys Format)     │
│ T Tray Type       (TPSys Format)      │
│ A Tray Magazine   (TPSys Format)      │
│ O Tray Position   (TPSys Format)      │
│ G Glue Dot        (TPSys Format)      │
│ R Fiducial Marks  (TPSys Format)      │
│ D Management Data (TPSys Format)      │
│ Q Magazine Kit    (TPSys Format)      │
│ X TEX List        (TPSys Format)      │
│ U User List       (TPSys Format)      │
│ E Event Log       (TPSys Format)      │
│ M Mount List      (Directline Format) │
│ K Component List  (Directline Format) │
│ N Management      (Directline Format) │
└───────────────────────────────┘
```

When the desired database is selected, choose export channel in the popup menu shown, see the next section.

If you are about to select *Tray Magazine   (TPSys Format)* or *Tray Position   (TPSys Format)* then you will be asked to choose magazine or pallet as described on the next page.

Tray Magazine   (TPSys Format)

When exporting tray magazines, you can select the following options:

```
┌─────────── Export Tray ───────────┐
│ Y Y Wagon Magazine                │
│ T Tray Wagon Magazine             │
│ E Pallet Magazine                 │
└───────────────────────────────────┘
```

Y Wagon Magazine

>Select this option if you want to export all the trays in the Y Wagon Magazine.

Tray Wagon Magazine

>Select this option if you want to export all the trays in the Tray Wagon Magazine.

Pallet Magazine

>Select this option if you want to export the trays on a single pallet or the trays on all the pallets.

Tray Position   (TPSys Format)

When exporting tray positions, you can select the following options:

```
┌──────── Export Tray Position ────────┐
│ Y Y Wagon Magazine                   │
│ T Tray Wagon Magazine                │
│ E Pallet Magazine                    │
└──────────────────────────────────────┘
```

Y Wagon Magazine

>Select this option if you want to export a single tray position or all the tray positions in the Y Wagon Magazine.

Tray Wagon Magazine

>Select this option if you want to export a single tray position or all the tray positions in the Tray Wagon Magazine.

Pallet Magazine

>Select this option if you want to export a single tray position or all the tray positions for trays on pallets.

Selecting Export Channel

Select the desired export channel in the following menu:

```
        Choose Export Channel
DOS diskette
UNIX/NFS
FTP
Directline
```

The export options in the menu are described below.

When ready, press <Enter> and choose if you want to export single items or all data, see the next section.

DOS diskette

Select this option if you want to export to a floppy disk in the disk drive. A DOS formatted disk is required (a disk formatted in Linux cannot be used).

The default path is set in the *0201.0102 DOS disk* parameter found in the *0201 Import/Export* parameter group.

UNIX/NFS

Select this option if you want to export to the local hard disk or, if NFS (Network Files System) is used, to a hard disk of another machine in the network.

The default path is set in the *0201.0101 Unix* parameter found in the *0201 Import/Export* parameter group.

FTP

Select this option if you want to export to a host machine in a network.

The default FTP export parameters are set in the following parameters found in the *0202 Ftp transfer* parameter group:

- *202.0001 Host name*

- *202.0002 Login name*

- *202.0003 Password*

- *202.0004 Directory*

Directline

Select this option if you want to export using the Directline format.

This option is only included in the menu if an option with the Directline format is selected in the *Export* list (page 6-8).

Selecting Items or Complete List

After selecting export channel, select a single item or all data to be exported in the following menu:

```
Select specific Layout
Select all data
```

The above menu is an example of an layout export, i.e. where *Layout (TPSys Format)* was selected in the *Export* list (page 6-8).

The options in the menu is described below.

When ready, press <Enter>. The dialog box indicated below will be shown after this menu.

Select specific...

Select this option if you only want a single item of the selected database to be exported, e.g. a single layout, panel, PCB, component, etc. You can choose the desired item in an editor window, see Figure 6-1 on page 6-12.

Select all data

Select this option if you want all the data of the selected database to be exported, i.e. all layouts, panels, PCBs, components, etc.

After selecting this option, you will be asked to enter the destination file name, see page 6-14.

However, if you are about to export any of the following data types:

– *Layout*   *(TPSys Format)*

– *Panel*   *(TPSys Format)*

– *PCB*   *(TPSys Format)*

– *Package*   *(TPSys Format)*

... then you will be asked to choose if you want to export the selected data only, or also the underlying data, see page 6-13.

Selecting Single Item

An editor window is shown by choosing the *Select specific..* option in the previous menu (page 6-11). Figure 6-1 shows an example of such an editor window, which in this figure is applicable to a layout, i.e. the *Layout   (TPSys Format)* database was selected earlier.


```
                         * SELECT LAYOUT *
  ┌─── Layout ───┐                        Enter   Select layout
  │ TV-ALL       │                          Ins   Insert new
  │ TV1          │                           F9   Copy
  │ TV2          │
  │ TV2-P2       │
  │ TV2-P2x2     │
  │ TV2x2        │
  │ TV3B         │          ┌─── Layout Information ───┐
  │ TV3G         │          │ Name:   TV-ALL           │
  │ TV3RGB-P3    │          │                          │
  │              │          │ Comment:  Bare boards BB1, BB2x2, BB3x3
  │              │          │         :                │
  │              │          │         :                │
  │              │          │         :                │
  │              │          │         :                │
  │              │          │         :                │
  │              │          │         :                │
  │              │          │         :                │
  │              │          │         :                │
  └──────────────┘          └──────────────────────────┘
                                  Brian              17:26
```
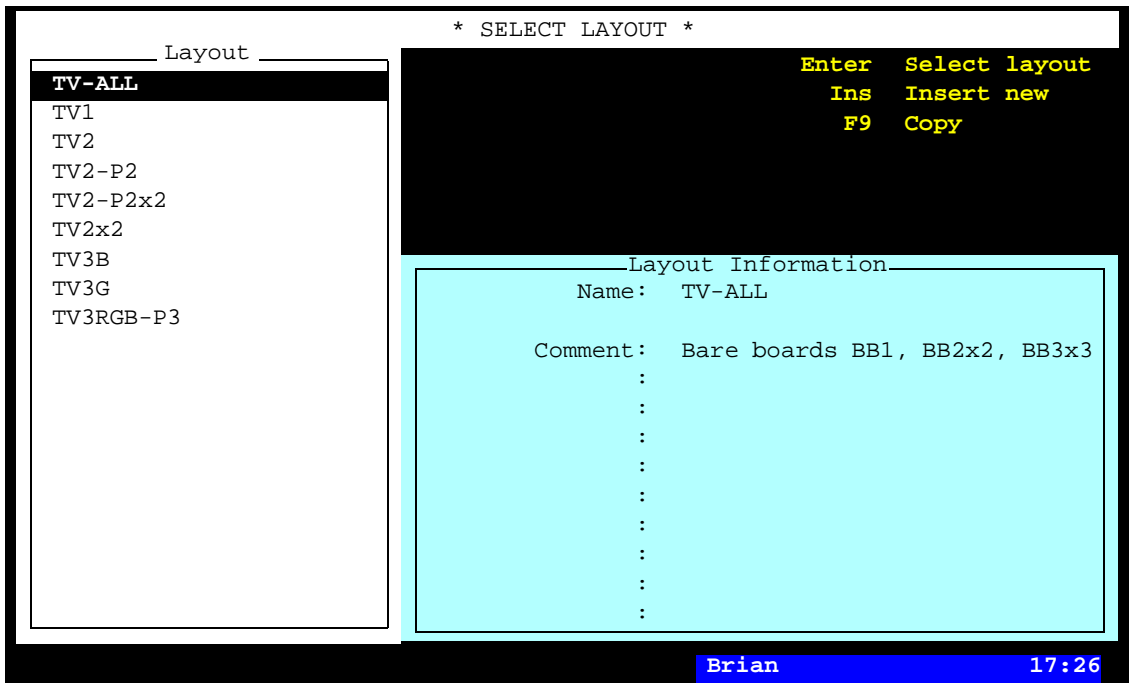
Figure 6-1.   Selecting layout

After selecting the desired item to be exported (e.g. the *TV-ALL* layout in Figure 6-1), you will be asked to enter the destination file name, see page 6-14.

However, if you are about to export any of the following data types:

– *Layout   (TPSys Format)*

– *Panel   (TPSys Format)*

– *PCB   (TPSys Format)*

– *Package   (TPSys Format)*

... then you will be asked to choose if you want to export the selected data only, or also the underlying data, see page 6-13.

Exporting Underlying Data

If you have chosen to export all data in the menu on page 6-11 or only the desired item in the editor window on page 6-12 and, if you are about to export any of the following data types:

- *Layout*   *(TPSys Format)*

- *Panel*   *(TPSys Format)*

- *PCB*   *(TPSys Format)*

- *Package*   *(TPSys Format)*

... then you will be asked to choose if you want to export the selected data only, or also the underlying data in the following menu:

```
Export Layout only
Export with underlying data
```

The options in the menu is described below.

After selecting the desired option, you will be asked to enter the destination file name, see page 6-14.

Export... only

Select this option if you only want the specific data of the selected database or item to be exported.

Export with underlying data

Select this option if you also want all the underlying data of the selected database or item to be exported. The following data will be included:

Layout   *(TPSys Format)*

> Most of the data required for assembling the layout, i.e. data for the layout and data for panels, PCBs and components included in the layout. Machine dependent data, e.g. package data, is not included.

Panel   *(TPSys Format)*

> Most of the data required to be able to assemble the panel, i.e. data for the panel and data for PCBs and components included in the panel. Machine dependent data, e.g. package data, is not included.

PCB   *(TPSys Format)*

> Most of the data required to be able to assemble the PCB, i.e. data for the PCB and data for components included in the PCB. Machine dependent data, e.g. package data, is not included.

Package   *(TPSys Format)*

> Data for the package and data for glue dots included in the package.

Entering Destination File Name

If you have chosen to export all data in the menu on page 6-11 or only the desired item in the editor window on page 6-12 or if you are about to export any of the data types for which the underlying data can be selected in the menu on page 6-13 then you will be asked to enter the complete destination file name in the following box:

```
Enter file name
a:\TV-ALL.gen
```

The above box shows an example of an export to a floppy disk in the disk drive.

When ready, press <Enter> to start the export procedure.

When the export procedure is complete the *Export* list (page 6-8) is shown again.

Press <Esc> if you want to exit the export mode and return to the TPSys main window.

7. Hardware Configuration

TPSys 2.3 introduced a new program, `hwconf`, to handle the configuration of the machine. This program replaces much of the functionality in the previous postinstall program, and all of the `servoConfig` program. It is run whenever the hardware is changed or when TPSys is upgraded.

The program has two main tasks:
– to identify the servo controllers present in the machine and choose the appropriate servo software for them.
– to configure the machine parameters correctly, given the installed hardware on the machine.

☞ *Note that servo release 8.0 or newer is required for operation of TPSys 2.3 or newer.*

The first time `hwconf` is run, or hardware has been added to or removed from the machine, you will have to perform the operations described below manually. For upgrades to subsequent new versions of TPSys, the program will perform these steps automatically.

TPSys View Of the Machine

TPSys views the machine as a set of units, subsystems, with which it can communicate. Each subsystem is configured by selecting the appropriate module type, an actual physical implementation of the subsystem. If there are more than one possible module type available, the operator needs to pick the correct one.

To communicate with the subsystems, TPSys uses a number of controllers, or servo boards. The `hwconf` program automatically detects the various controller types on the machine.

Hwconf Main Window

Start by typing `hwconf` at the prompt and you get the following start screen:

Figure 7-1.   Hwconf menu

To exit the program select **Exit** in the **Exit** menu.

For more information about the functionality of the program, please see the *Machine Manual*.

8. Service Programs

This chapter contains descriptions on available service programs and tools which can be used to check various functions and be useful at fault finding.

These are:

- **Service Program**

  This program is integrated with the TPSys software and is used for installation, calibration and fault finding (page 8-2).

- **Transducer Program**

  A software tool that shows the various axes positions.

- **Burnin Program**

  A software tool which can be used to detect intermittent faults.

- **Stepper Program**

  A software tool that makes it possible to run the assembly cycle step by step to examine the result of each step. This program has been integrated in TPSys and is described in the *Stepper Feature* section in Chapter 4.

- **X-axis calibration**

  A software tool used to calibrate the X-axis transducers.

Procedures that causes the machine to make movements are marked with this sign next to the text. It means that you have to keep fingers and arms away from the machine and also check the following, wherever applicable:

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

And, if you get the following message when booting Linux:

```
Non-System disk or disk error
```

a disk is probably left in disk drive A.

Service Program

The *Service Program* is a collection of various service tools selectable from a main menu with the following options:

Board

To control the boards of the various movements of the machine, including:

- Show status
- Reset magazine and motor controller
- Load magazine and motor controller

Motor

To control the various axes of the machine, including:

- Initiate motors
- Read positions
- Control locks and latches for standard and HYDRA tools
- Measure frictions

Magazine

To control tape and vibrator magazines, including:

- Step magazines
- Poll magazines
- Test magazines

Vacuum

To control the vacuum pump and the valves for vacuum and air pressure for the standard mount tool and the HYDRA mount tools. The vacuum and force sensors can also be shown from this option.

Conveyor

To control the Y-wagon conveyor features.

Camera

To control the various vision lamps and cameras.

Utilities

To control and indicate:

- Voltages
- PAIB board
- Measure cog play

Exit

To exit the Service Program.

Service Program Main Window

If you are currently running TPSys, then you can select the
Exit To Service option in the **Exit** menu ...
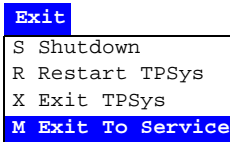
```
Exit
S Shutdown
R Restart TPSys
X Exit TPSys
M Exit To Service
```

... or select the **Restart TPSys** option in the **Exit** menu and press
the space bar to get the *Startup* menu.

```
Exit
S Shutdown
R Restart TPSys
X Exit TPSys
M Exit To Service
```

In the *Startup* menu, select the **Service** option.

```
TPSys
Parameters
Service
Show transducers
Backup
Restore
UNIX
Software upgrade
Measure TEX
System shutdown
System reboot
MyLink
```
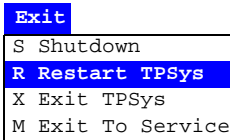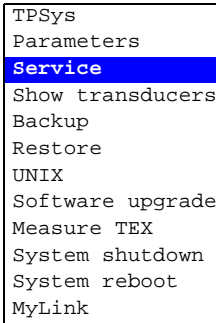
The *Service Program* main window (see Figure 8-1) is shown.
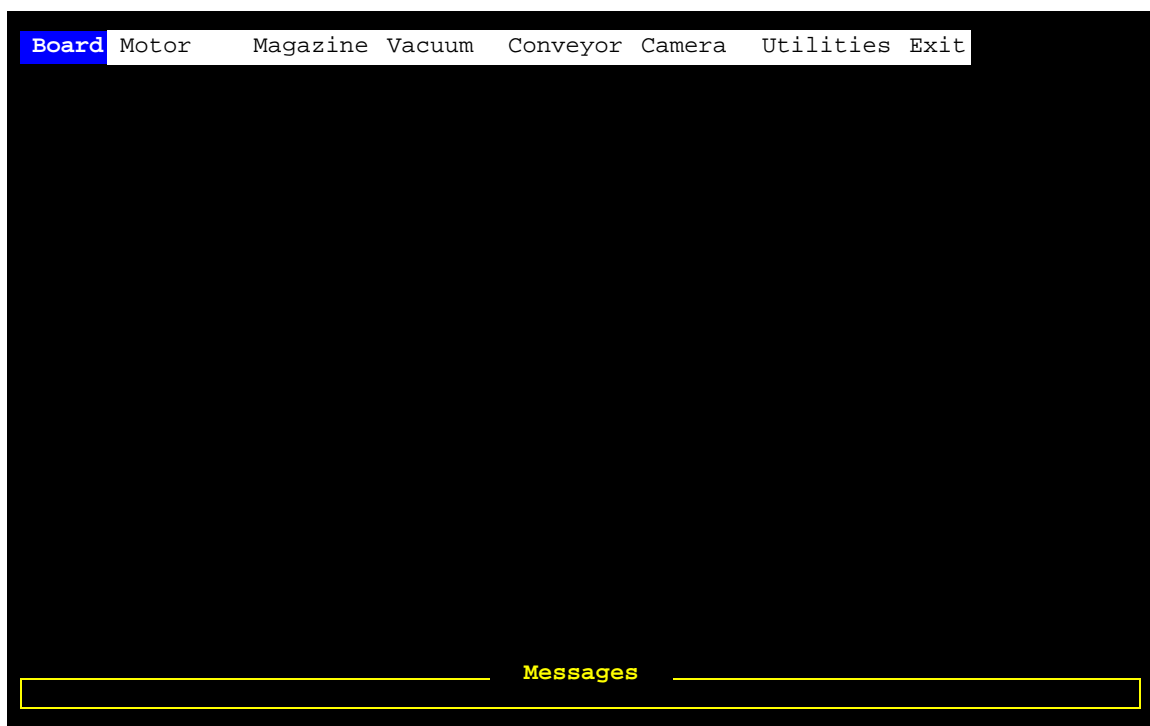
Figure 8-1.   Off-line terminal main menu

The Service program and its options are described in the *Machine Manua*l.

To exit the program select **Exit** in the **Exit** menu.

For more information about the opretaions and functions of the Service program, please see the *Machine Manual*.

9. Communication

This chapter contains an overview of the MCS, MYDATA Communication Solution. It also specifies how to install MYLink.

To be able to use some of the optional software mentioned in this section the machine will require a *Magic Word* to use the particular feature.

The *Magic Word* is simply a kind of password that has to be entered into TPSys to be able to use the feature.

The *Magic Word* is provided when you purchase the software feature.

MYDATA Communication Solution

MYDATA Communication Solution includes the following software products, which are also illustrated in Figure 9-1.

- MYCam

- CADConversion

- MYSpeed

- MYLink

- Shared Databases

- Production Line
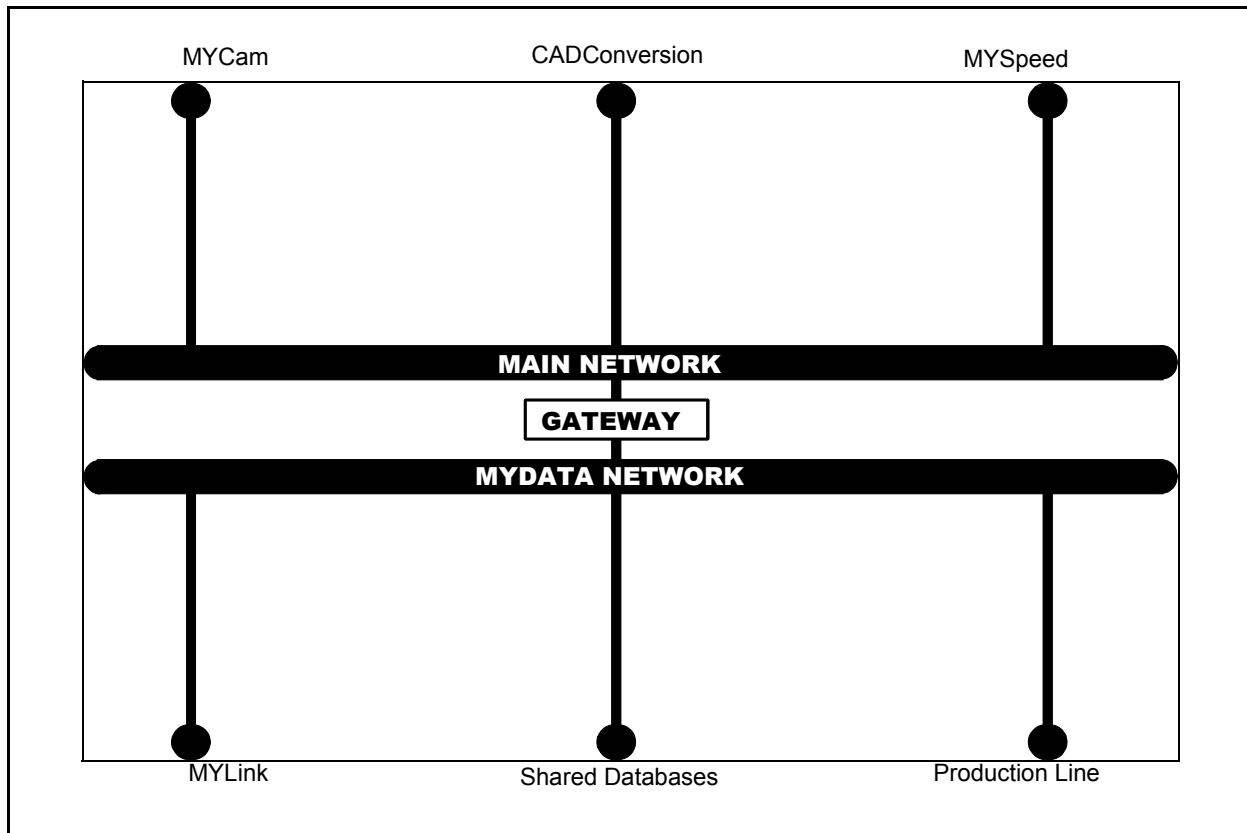
Figure 9-1.   MYDATA Communication Solution

These products are described below.

MYCam
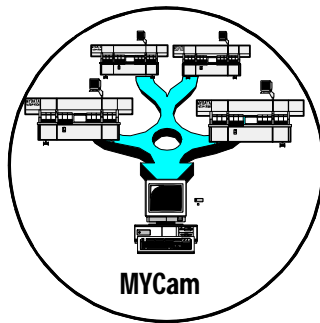
MYCam is a separate MYDATA software package for a standard PC.

MYCam makes it possible to transfer data between MYDATA machines in a network and remote computers.

The following transfer procedures can be performed by using MYCam:

- Transfer of converted CAD files to MYDATA machines
- Retrieval of production data
- Server backup

MYCam is designed for the TCP/IP network protocol.

CADConversion
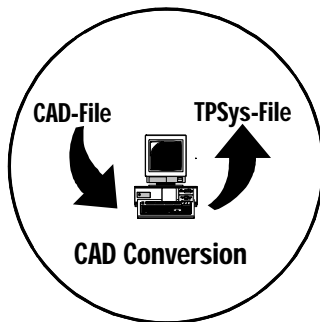
CADConversion is a separate MYDATA software package for a standard PC running Windows 95/98/NT/XP/2000.

CADConversion is used to convert CAD files, containing placement data, to MYDATA TPSys format in order to use the data for component placing.

The main purposes for this product are to:

- Decrease programming time
- Give programming accuracy
- Optimize assembly programs

The CAD Conversion software package includes a comprehensive *CADConversion User's Manual*.
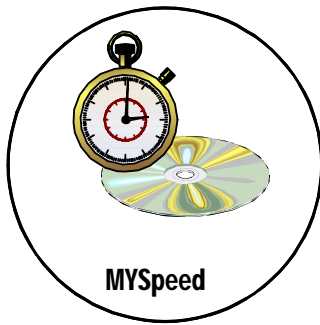
MYSpeed

MYSpeed is a separate MYDATA software package for a standard PC running Windows 95/98/NT 4/XP/2000.

The MYSpeed software is used to calculate assembly times for boards that have not yet been assembled in order to get information for quotations and production planning. This software can also balance jobs between different machines or machine lines.

The main purposes for MYSpeed are:

- Real time balancing

- Optimize feeder configurations

- Calculation of assembly times.

The MYSpeed software package includes a comprehensive *MYSpeed User's Manual*.

MYLink
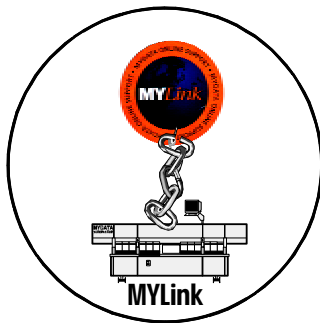
MYLink is an optional feature included in the TPSys software. To be able to use this feature, the *Magic Word* (see page 9-1) for the machine has to include this feature.

In order to solve a problem, a MYDATA service engineer can, by means of the MYLink feature, access the machine remotely via modem and get the machine status.

See *The MYLink Concept*, page 9-6, for information on how to install MYLink.

Shared Databases
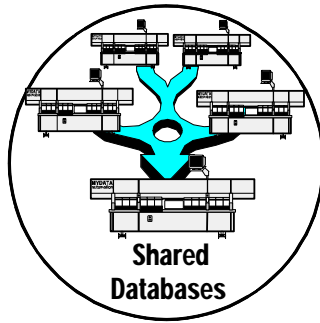
Shared Databases is an optional feature included in the TPSys software. To be able to use this feature, the *Magic Word* (see page 9-1) for the machine has to include this feature.

The Shared Database feature connects several machines to the same databases in order to share the data. The same kind of data can thus be stored and edited in one database only.

Shared databases can e.g. contain the following information:

- Component data

- Package data

- Magazine data

- Tray data

- Layout data

- PCB data

- User data

Shared Databases is designed for the TCP/IP network protocol.

Production Line
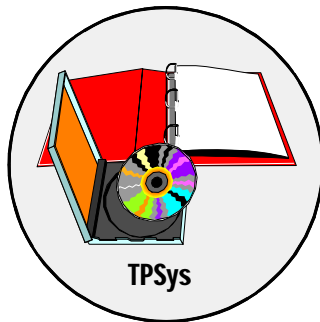
This feature includes software for handling several machines and conveyors connected in production lines.

The required software for this feature is included in the TPSys software.

The MYLink Concept

MYLink is a tool for MYDATA service centers, worldwide, to connect to a customer's MYDATA machine using a modem line. When a connection is established, the service technician can do off-line programming, alter parameters and look into log files.

Compatibility

MYLink can be used with all MYDATA machines running TPSys version 1.5 or later. This document is however only valid for TPSys 2.0 and later.

Modem Type

MYLink require a Hayes compatible modem. It is recommended to use a US Robotics Sportster modem. Support for other modem types can be added and will be described later in this document.

Installation of a Modem in the MYDATA Machine

This chapter describes how to install a modem in a MYDATA machine step by step.

Connecting the Modem

The modem should be connected to a free serial port on the machine. To see which of the serial ports that are occupied, give the following command at the prompt:

```
prparam | grep tty | grep -v 2220002
```

You can get the following result:

```
1220001 Device name............................./dev/ttyS7
1230105 Device name............................./dev/ttyS6
1240001 Device name............................./dev/ttyS4
2230001 Device name............................./dev/ttyS3
```

In this case serial port *0, 1, 2* and *5* are not used by TPSys and therefore free to use.

Use the 6/6 modular to DSUB-25 cable included with the multi serial board to connect the modem to any free serial port. Then connect the telephone line to the modem.

MYLink Parameters

The final step in the installation is to set the MYLink parameters in TPSys.

Open the Parameter Editor in TPSys and go to *0222 MyLink* and set the parameters as follows:

222.0001 Telephone number

Telephone number should be set to the telephone/modem number to the MYDATA service center. To add a pause in the dialing sequence on most Hayes compatible modems, use the "=" character. See your modems documentation for more information.

222.0002 Device name

Device name should be set to the serial port used for the modem, for instance " /dev/ttyS5" if serial port 5 is used.

222.0003 Device Speed

Device Speed should be set to the speed used to communicate with the modem, for example "38400".

222.0010 Modem type

You can select one of the predefined modem types. You can also choose or *Custom* and modify *Custom modem script* below.

222.0011 Custom modem script

See the next section.

Adding Support for Additional Modems

If none of the predefined modem types works with your modem you need to add support for the new type.

Select *Custom* in parameter *222.0010 Modem type* and modify *222.0011 Custom modem script*.

Consult your modem manual for the appropriate initialization string or use the Web to find such strings (http://www.usr.com contains information about US Robotics modems). See the manpage for `chat(3)` for more information on how to write chat scripts.

The following script can be used with most Hayes compatible modems, but will not use any special features:

```
REPORT CONNECT ABORT BUSY ABORT 'NO CARRIER' '' 'ATE1Q0'
'OK' ATDT\T 'CONNECT'
```

For a US Robotics Sportster v34 (28.8 kbaud), try this script:

```
REPORT CONNECT ABORT BUSY ABORT 'NO CARRIER' '' 'ATE1Q0'
'OK' 'AT&F0&A3&B1&H1&K3&S1X4S40=2' 'OK' 'ATS0=0' 'OK'
ATDT\T 'CONNECT'
```

☞ *If you add support for a new modem type please write a comment in MYDATA Service conference with the new definition so that we can build a library of supported modems.*

Changing Modem Setup Manually

Manual modem setup may be needed, if the factory defaults for your modem are not suitable for MYLink. In this the case do the following:

1. Login as `tpsys` on an offline terminal.

2. Switch on the modem and start `myterm`.

3. Now type the following after the `myterm>` prompt:

   `set line /dev/ttyS1`   (If Port 1 is used)

   `set speed 19200`   (Speed between modem and myterm)

   `connect`   (Connect and start talk to the modem)

You are now connected to the modem and can configure it according to your manual.

4. To save your settings into the modems non volatile memory type:

   `AT&W`

5. When you are done, exit myterm terminal mode by pressing **<Ctrl> + <C>.**

6. Logout from the offline terminal by typing `exit` at the prompt.

Connecting with MYLink

This section describes how to establish a MYLink connection. There are two different ways to do this which are described below.

From startup menu

1. Select **Restart TPSys** from the **Exit** menu.

2. At the Linux prompt type: `go`

3. When the startup messages showa press <Space>.

4. Select *MYLink* from the menu and press <Enter>.
   A message is shown: `dialling`

A call is now placed to the telephone number entered in the MYLink parameters.

From a UNIX terminal

1. Login as `"tpsys"` on an offline terminal.

2. At the prompt type:
   `remoteservice`
   A message will be displayed: `dialling`

A call is placed to the telephone number entered in the MYLink parameters.

Troubleshooting

This section describes the most common pitfalls and troubles with MYLink. Please report any other problems to MYDATA Service in Sweden.

Connection Problems

Modem inactive

If the modem is inactive for more than 30 seconds after selecting MYLink, or after typing `remoteservice`, do the following:

- Check all cables and connections.

- Check the MYLink parameters.

- You may need to configure your modem manually. Start `myterm` according to chapter *Changing Modem Setup Manually*, page 9-10. When giving the command "`ATZ`" you should get *OK* as response. If not, perfom a mnual setup.

- There may be problems with the initialization string for your modem type. Check the definitions according to *Changing Modem Setup Manually*.

Problems With Slow Machine

Switch off the modem if the machine is extremely slow after running MYLink. Under certain circumstances, the modem can generate continous interrupts, which slows down the machine.

Modem specific information

The following section describes modem specific information.

US Robotics Sportster 28.8

This modem needs to be configured manually according to *Changing Modem Setup Manually*, see page 9-10.

When connected to the modem type:

```
AT&F0&W0
```

You should get an *OK* response. This will disable hardware flowcontrol. If you have no response from the modem turn the modem on and off and try again.

Appendix A - Messages Reference Guide

Appendix A contains messages that can be displayed by TPSys version 2.4. Each entry is accompanied with information about the message.

If a message appears that is not included in this document, please contact MYDATA support and describe the message.

TPSys generates a message when something unexpected happens, or as a feedback to an operator action. An unexpected message usually indicates that there is an error and that operator intervention may be required. Messages that function as feedback to operator actions are only informational.

Messages are displayed at the bottom of the screen and stored in a message log for later printout.

Message Severity

There are four severity classes of messages:

- **Information**
  Information to the operator not indicating any problem. These messages are mainly feedback to operator actions, for instance magazine inserted.

- **Warning**
  Indicates that something has happened that may require operator intervention but the machine operation can continue.

- **Error**
  Indicates that something has happened that will require operator intervention. The machine operation may continue but will eventually stop and the current assembly cannot be completed.

- **Fatal**
  Indicates that something has happened that prevents further operation without operator intervention.

☞ *The message severity or class is not part of the message itself. The severity of a specific message will often depend on current machine status.*

General Message Format

Error messages are displayed in the following format:

`<class>-<group>-<number>:<message text>`

<class> – Message severity class which can be:

F   Fatal message
E   Error
W   Warning
I   Information

<group> – Identifies the message group, see table on page A-3.

<number> – Message number.

Note that the MOT group has special format for message number. See documentation for the MOT group.

<message text> – Message text.

This is a free format text that may include additional information. The additional information is inserted in the text and may be magazine feeder number, component name and such. The message text is usually translated to the local language.

Example:

`E-ACCUR-1:Didn't find lead`

This is a message in the `Error` class, `ACCUR` group, number `1` and the message text: `Didn't find lead`.

Message Groups

The messages in TPSys are grouped. Messages in the same group are in some way related and usually have a common source. Each message group has a mnemonic that is used in the message to identify the group.

Group	Description
AUTOREF	Messages from automatic fiducial mark search routines
AUTOTEACH	Messages from Autoteach of packages
AXIS	Machine high level errors
BADBOARD	Messages from bad board search routines
BACKUP	Messages from the automatic scheduled backup routine
BC	Messages from bar code utility
BRDH	Messages from the board handler logic (controls conveyor system)
CAME	Messages from camera system
DATAS	Messages from data server
DOS	Messages from DOS floppy read/write
EXORD	Messages from internal executor order routines
EXP	Messages from export
FTP	Messages from FTP transfer routines
GLU	Messages from the glue pot
GRAP	Messages from graph system
HOPT	Messages from the HYDRA optimization
HRDW	Machine hardware control errors
HTLM	HYDRA tool manager errors
HWICLIENT	Messages from the HWI (hardware interface) client side
HYDRA	Messages from HYDRA vision routines
IMAGE_ORDER	Messages from process communication related to image processing process
IMGPROC	Messages from image processing process
IMP	Messages from data import routines
IMPORTD	Messages from import daemon
LSCD	Messages from the line scan camera process
MAGREF	Messages from magazine fiducial mark search routines
MHPR	Messages from magazine handler process

Group	Description
MIPR	Messages from magazine interface process
MMI	Messages from man machine interface process
MONT	Messages from mounter
MOT	Messages from the motor control computer software
MOTIONDEV	Messages from motion devices (joystick trackball etc.)
MOTQ	Messages from the low level communication with the motor control computers
OPTCENT	Messages from optical centering
OPTCORR	Messages from optical calibration routines
OPTP	Messages from optimizer process
ORGP	Messages from organizer process
OSM	Operating system messages. These are messages forwarded from the operating system and no list is available
PARFILE	Messages from parameter file reader
QWIN	Messages from internal operator interface utility
SERCOM	Messages from serial communication routines used by directline communication
SERSTART	Messages from serial start facility
SHDB	Messages from shared databases
SYSCALL	
TCP	Messages from shared database communication routines
TEX VISION	Messages from TEX vision routines
TLMN	Tool manager errors
UCOPY	Messages from UNIX copy routines
UNIX	Messages originating from the UNIX system itself
VACC	Messages from the vacuum system
VER	Messages from the electrical verifier
VISION	Messages from vision hardware

AUTOREF Group

These messages are generated by the automatic fiducial mark search routines.

AUTOREF-0: Internal error in function autoRefLearn in the vision library

Software error during teach of fiducial mark.

- Make a savestat disk and contact MYDATA support.

AUTOREF-1: Not enough horizontal correlation information

AUTOREF-2: Not enough vertical correlation information

During the teach operation, the algorithm could not find enough information about the fiducial mark in the horizontal direction. This will happen if a horizontal line is to be taught.

- Fiducial mark too small. A fiducial mark cannot be too small.

- Teach area too small. Increase teach area, the fiducial mark must fit within the teach area.

- Too low contrast between fiducial mark and background.

- Camera focus not properly adjusted or board level out of focus.

AUTOREF-3: Fiducial mark is not symmetric

The fiducial mark to teach was expected to be symmetric, but it was not.

- The fiducial mark is not symmetric. Change the description.

- Teach area too big. The teach area contains more than the fiducial mark.

- Teach area too small. The fiducial mark must fit within the teach area.

- Camera calibration database corrupt. Re-calibrate camera.

AUTOREF-4: Cannot update fiducial mark list

The fiducial mark data cannot be written to the database.

- The data server is not running. Restart TPSys.

- The database is corrupt.

- Version mismatch between TPSys and the dataserver.

AUTOREF-5: Bad teach area definition

The size of the teach area is wrong.

- The teach area is bigger than the scan area or the field of view of the x-wagon camera.

- The default magnification for the x-wagon could be wrong. Check parameters 41.2341 – 42, 41.2441 – 42, 41.2541 – 42 dependent on the installed x-wagon camera.

- Version mismatch between TPSys and the dataserver.

- The database is corrupt.

AUTOREF-6: Id: *\<Id\>* Bad fiducial mark definition (Re-teach)

\<Id\>
> Fiducial mark name.

The data about the fiducial mark is not correct.

- The database could be corrupt.

- Version mismatch between TPSys and the dataserver.

AUTOREF-7: Id: *\<Id\>* Fiducial mark not found

\<Id\>
> Fiducial mark name.

The fiducial mark was not found at all.

- There is no fiducial mark at all within the scan area.

- X wagon lamp broken.

- Hardware problem. The acquired image contains no information at all.

AUTOREF-8: Id: *\<Id\>* Correlation too low (*\<Value1\>*). Expected *\<Value2\>*

\<Id\>
> Fiducial mark name.

\<Value1\>
> Measured correlation value.

\<Value2\>
> Value required for a successful fiducial mark search. The fiducial mark editor sets this value.

The fiducial mark search failed.

- The correlation limit is set too high.

- The found fiducial mark in PCB is damaged.

- The fiducial mark type is not correct.

AUTOREF-9: Id: *<Id>* Unknown fiducial mark

<Id>
> Fiducial mark name.

The fiducial mark was not found in the database.

- Define and teach the fiducial mark using the fiducial mark editor.

AUTOREF-10: Id: *<Id>* Fiducial mark is never taught

<Id>
> Fiducial mark name.

The fiducial mark is defined in the database but it is not taught.

- Teach the fiducial mark.

AUTOREF-11: Id: *<Id>* Bad scan area definition

<Id>
> Fiducial mark name.

The size of the scan area is bad.

- The scan area is bigger than the field of view of the camera.

- The length and/or the width of the scan area is zero (0).

- The database could be corrupt.

- The default magnification for the x-wagon could be wrong. Check parameters No. 41.2341 – 42, 41.2441 – 42, 41.2541 – 42 dependent on the installed x-wagon camera.

- Version mismatch between TPSys and the data server.

AUTOREF-12: Bad object filter size definition

The object filter size is out of bounds.

The object filter size sets the limit for the smallest object of interest in the teach area. Must be between 0.001 and 1mm.

- The fiducial mark editor allowed the operator to enter an illegal value.

- The default magnification for the x-wagon could be wrong. Check parameters No. 41.2341 – 42, 41.2441 – 42, 41.2541 – 42 dependent on the installed x-wagon camera.

- The database may be corrupted.

AUTOREF-13: Cannot read the correction data. (Try to re-calibrate camera)

The database containing data about the distortion of the lens of the X-wagon camera cannot be read.

- The camera is not calibrated.

- The database is corrupt.

- Version mismatch between TPSys and the dataserver.

AUTOREF-14: Phase error

Synchronization error between the client process (Mounter) and the server process (Img).

- Internal software error. Make a 'savestat' diskette and it send to MYDATA.

AUTOREF-15: Result is invalid

Synchronization error. The client process (Mounter) tries to read the result of a fiducial mark search before the result is valid.

- Internal software error. Make a savestat diskette and send it to MYDATA.

AUTOREF-16: Too low contrast

The contrast between the fiducial mark and the background is too low.

- Too much or too little light.

- The materials in the fiducial mark and the background does not give a good enough contrast.

AUTOREF-17: Bad shape definition

Defined shape is not a circle.

- Check shape definition.

AUTOREF-18: Bad circle search area definition

The size of the search area is bad.

- The scan area is bigger than the field of view of the camera.

- The length and/or the width of the scan area is zero (0).

- The database is corrupt.

- The default magnification for the x-wagon could be wrong. Check parameters No. 41.2341 – 42, 41.2441 – -42, 41.2541-42 depending on the installed x-wagon camera.

- Version mismatch between TPSys and the data server.

AUTOREF-19: Bad correlation definition

Required correlation value is outside valid limits (<0 or >100%).

- Corrupt fiducial mark database.

- Internal software error.

AUTOREF-20: Bad resolution definition

Pixel size defined as smaller than $1\,\mu$ or greater than $100\,\mu$m.

- Parameters 51.0310 and 51.0311 are not correct.

- Internal software error.

AUTOREF-21: Bad radius definition

Circle radius smaller than 0 or greater than half search area.

- Fiducial mark data not correct.

AUTOREF-22: Bad tolerance definition

Radius tolerance less than 0.

- Fiducial mark data not correct.

AUTOREF-23: Bad contrast polarity definition

Unknown polarity definition (not one of white-on-black or black-on-white).

- Corrupt fiducial mark data.

- Internal software error.

AUTOREF-24: Bad minimum contrast definition

Required contrast less than 0 or greater than 256.

- Corrupt fiducial mark data.

- Internal software error.

AUTOREF-25: Bad number of directions definition

Internal software error.

AUTOREF-26: Bad No. of edges on direction definition

Internal software error.

AUTOREF-27: Correlation too low. Decrease contrast or correlation

No circle was found with the requested radius and with requested contrast and correlation.

- Board not present.

- No reference mark visible within the search area.

- Requested correlation and/or contrast too high.

AUTOREF-28: Invalid teach area. Move fiducial mark to the middle of the image

The size of the teach area is wrong.

- The teach area is bigger than the scan area or the field of view of the x-wagon camera.

- The default magnification for the x-wagon could be wrong. Check the 41.2341 – 42, 41.2441 – 42, 41.2541 – 42 parameters depending on the installed X-wagon camera.

- The database is corrupt.

AUTOREF-29: Not enough edges. Increase tolerance or decrease contrast

No fiducial mark was found with the requested radius and with requested contrast and correlation.

- Board not present.

- No fiducial mark visible within the search area.

- Radius tolerance to low.

- Requested correlation and/or contrast to high.

AUTOREF-30: Internal error in function match in the vision library

Internal software error.

AUTOREF-31: Internal error in function nGetEdgeMask in the vision library

Internal software error.

AUTOREF-32: Internal error in function nCircleModel in the vision library

Internal software error.

AUTOREF-33: Internal error in function nDrawCircle in the vision library

Internal software error.

AUTOTEACH Group

These messages are generated by Autoteach.

AUTOTEACH-0: No leads found

The method failed to find any solder balls or leads; this was probably caused by to small a contrast between the solder balls and the component body.

- Adjust the illumination and run Autoteach again. For the "light on dark" algorithm you want the solder balls to be lighter then the component body without amplifying objects like text or wirering. For "bright on bright" you want to illuminate the component in such a way that a dark ring is formed around each solder ball. A high proportion of front light generally achieves this ring. For leaded devices you want a high contrast between the lead and the background around the lead.

- For solder ball packages one can try to specify the number of balls on the package manually and try different algorithms.

AUTOTEACH-1: Failed to measure pitch

The method failed to measure the pitch of the component.

- The component may lack a grid.

- Autoteach has detected to few solder balls or leads to measure the pitch.

- Enter the pitch manually.

AUTOTEACH-2: Error in camera parameter file

There is an error in the camera parameters that prevents Autoteach from transforming the measured image coordinates of the balls / leads to metric coordinates.

- Check the parameters for the camera in question and recalibrate the camera if necessary.

AUTOTEACH-3: Unable to load camera parameter file

Autoteach failed to load the parameter file for the camera.

- Check that the file exists, if not restore the parameter file with a backup copy.

AUTOTEACH-4: No more leads to remove

The user tried to delete a lead but there are no more leads left to delete.

AUTOTEACH-6: Unable to adjust the leads to a grid with the pitch *<Pitch>*mm

<Pitch>

> The measured or manually entered pitch.

The measured or manually entered pitch is out of range.

- If the pitch field in the parameter window was set to *"Auto"* try entering the pitch manually.

AUTOTEACH-7: Could not find all leads

This error occurs if the user has specified the number of leads manually in the Autoteach parameter window but the method didn't find the specified number of leads.

- Check that the number of entered leads is correct.

- Teach the component using a better illumination, see advice for "No leads found" above.

- Teach the component using a different algorithm.

AUTOTEACH-8: Failed to load camera correction data

Autoteach was unable to load the calibration data for the camera.

- Recalibrate the camera

AUTOTEACH-10: Cannot teach vision data for a package without leads

It's not possible to teach package vision data for a package that doesn't have any leads.

- Correct the package definition in the package editor and try to teach vision data again.

- Run Autoteach of mechanical and vision data for the package.

AUTOTEACH-11: Failed to teach illumination and vision parameters

Autoteach failed to find illumination and vision parameter that makes the part pass optical centering.

- The mechanical model of the package may be incorrect. Check the package definition.

- It may not be possible to vision center the package in the camera used. Try teaching the package in another camera.

- The package may have been picked off center or rotated. When teaching only vision data it's important to locate the corners of the component correctly.

- The component rotates on the tool. It's important that the component can't rotate on the tool during the teach. Make sure to use an appropriate tool

AXIS Group

These messages are generated by the routines that control the machine movements. Most messages may contain an axis identifier. The identifier is one of:

Identifier	Description
C-Axis	The mechanical centering.
Theta-Axis	The rotating movement for the standard mount head.
X-Axis	The X movement.
Y-Axis	The Y wagon.
Z-Axis	The vertical movement for standard mount head.
Traywagon	The TWM tray magazine Y movement.
ConWidth-Axis	The conveyor board width movement.
HZ-Axis	The HYDRA vertical movement.
Htheta-Axis	The rotating movement for the HYDRA heads.
ConTransp-Axis	The conveyor board transport movement.
ConHold-Axis	The conveyor board hold movement.

AXIS-<*Axis*>/0: parameter file read error

<Axis>
One of the axis identifiers defined above.

Failed to read parameter.

- Parameter file corrupted.

- Software problem.

- Corrupted file system.

AXIS-<*Axis*>/1: Timeout in wait for axis to reach above specified position

<Axis>
One of the axis identifiers defined on page 4-10.

The axis did not reach a specified position.

- High friction.

- Obstacles in axis path.

- Parameter problem.

- Problem in the package/assembly data.

☞ Above and below refers to counter values and not to physical posi-

tions. For example the Z and HZ axis lower values are at the physical upper position.

AXIS-<*Axis*>/2: Timeout in wait for axis to reach below specified position

<Axis>
>   One of the axis identifiers defined on page 4-10.

The axis did not reach a specified position.

- High friction.

- Obstacles in axis path.

- Parameter problem.

- Problem in the package/assembly data.

👉 Above and below refers to counter values and not to physical positions. For example the Z and HZ axis lower values are at the physical upper position.

AXIS-Z/3: Timeout in wait for Z indicator reaction

The Z indicator did not register a hit on the board or component in feeder.

- Dirt in tool holder.

- Other hardware problem.

AXIS-C/4: Not properly out when expected

The centering jaws did not open properly.

- High friction.

- Mechanical centering jaws does not move freely.

- Other hardware problem.

AXIS-<*Axis*>/5: Not properly up when expected

<Axis>
>   Z or HZ axis.

The axis is not above safe position when expected.

- Axis does not move correctly.

- Parameter problem.

- Hardware problem.

AXIS-X/6: Not in a safe position when expected

The X axis not in proper position for initialization of Z axis.

- Hardware problem.

AXIS-Theta/7: Axis not stable

The Theta axis did not stop at correct position after a MOVGO movement.

- Hardware problem.

AXIS-<*Axis*>/8: Timeout in wait for axis to be idle

<Axis>
> One of the axis identifiers defined on page 4-10.

The axis did not reach idle status within specified time.

- Hardware problem.

AXIS-<*Axis*>/9: Axis has unstable zero point

<Axis>
> One of the axis identifiers defined on page 4-10.

The zero position differs too much from the last measurement.

- Transducer problem.

- Cabling problem.

- Transducer not properly fitted.

- Hardware problem.

AXIS-Z/10: Axis hot too long

If the Z motor gets too hot the system waits for it to cool down. This message indicates that it did not cool down fast enough,

- Transducer problem.

- Cabling problem.

- Transducer not properly fitted.

- Hardware problem.

BACKUP Group

These messages are generated by the scheduled automatic backup routine.

BACKUP-1: Scheduled backup failed.

BACKUP-2: Scheduled backup failed to collect data.

BACKUP-3: Scheduled backup failed to write data.

BADBOARD Group

These messages are generated by the bad-board vision routines.

BADBOARD-0: Search area too big

The width (X-wise) of the search (scan) area is too big.

- TPSys has allowed the user to enter a bad number. Check the number.

- The default magnification for the x-wagon could be wrong. Check parameters No. 41.2341 – 42, 41.2441 – 42, 41.2541 – 42 depending on the installed x-wagon camera.

BADBOARD-1: Search area too big

The same as for BADBOARD-0.

BADBOARD-2: Search area too big

The height (Y-wise) of the search (scan) area is too big.

- TPSys has allowed the user to enter a bad number. Check the number.

- The default magnification for the x-wagon could be wrong. Check parameters No. 41.2341 – 42, 41.2441 – 42, 41.2541 – 42 dependent on the installed x-wagon camera.

BADBOARD-3: Indata 'dim min' out of range

The software calculates, from the size of the scan area, the size of the smallest detectable object in the scan area. The shortest side of the scan area (in pixels) is divided by 3. The calculated value must be within the range 3...100

- The size of the scan area is too small or too big.

- The default magnification for the x-wagon could be wrong. Check parameters No. 41.2341 – 42, 41.2441 – 42, 41.2541 – 42 dependent on the installed x-wagon camera.

BADBOARD-4: Parameter 'Mark max&min contrast' is illegal. Check parameter file: Vision

The value of parameter 21.0012 is out of bounds. Must be within the range 0…3.

- A bad value has been entered by editing the parameter using a text editor.

- The parameter file is corrupt.

BADBOARD-5: Too small search area

The scan area is too small.

- TPSys has allowed the user to enter a bad number. Check the number.

- The default magnification for the x-wagon could be wrong. Check parameters No. 41.2341 – 42, 41.2441 – 42, 41.2541 – 42 dependent on the installed X-wagon camera.

BADBOARD-6: Didn't find any contrast at all

Not used

BADBOARD-7: Phase error

Synchronization error. The client process (Mounter) tries to read the result of a fiducial mark search before the result is valid.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA.

BADBOARD-8: Result is invalid

Synchronization error. The client process (Mounter) tries to read the result of a fiducial mark search before the result is valid.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA.

BC Group

These messages are generated by the barcode utility

BC-1: Serial communication error
Not used.

BC-2: Barcode *<Barcode>* unknown
<Barcode>
>   The barcode read by the barcode reader.

The prefix on the barcode did not match any known pattern.

- Barcode label damaged or dirty.

- Prefix for component or batch id not correctly specified in parameter group (Barcode).

BC-3: Magazine *<Barcode>* unknown
<Barcode>
>   The barcode read by the barcode reader.

The barcode does not match a known magazine.

- Magazine not in database.

- Barcode label damaged or dirty.

BC-4: Component *<Barcode>* unknown
<Barcode>
>   The barcode read by the barcode reader.

Barcode does not match any component barcode.

- Component not in database.

- Barcode label damaged or dirty.

BC-5: Component *<Barcode>* already exist
<Barcode>
>   The barcode read by the barcode reader.

The barcode is already used for another component.

- Component not in database.

- Barcode label damaged or dirty.

BC-6: Layout *<Layout>* unknown

<Layout>
> The name of the layout read by the barcode reader.

Not used.

BC-7: Barcode Read Error

Failed to read the barcode.

- Barcode label damaged or dirty.

- Faulty barcode reader.

BC-8: Failed to load *<Component>* in *<Magazine>*

<Component>
> Component name.

<Magazine>
> Name of a magazine in the magazine list.

Failed to modify magazine load data.

- Internal software error.

BC-9: Feeder *<Feeder>* in magazine *<Magazine>* occupied

<Feeder>
> Feeder number.

<Magazine>
> Name of a magazine in the magazine list.

Feeder in magazine already loaded with another component.

- Use another feeder or remove old component from feeder.

BC-10: Cannot edit magazine *<Magazine>* (in other machine)

<Magazine>
> Name of a magazine in the magazine list.

The magazine is inserted in another machine. To reduce the risk of mount failures it is not allowed to modify the feeder contents in a magazine inserted in another machine.

- Locate magazine and remove.

BC-11: Magazine *<Magazine>* is full

<Magazine>
> Name of a magazine in the magazine list.

No empty feeders in magazine to insert component in.

- Locate magazine and remove.

BC-12: Magazine *<Magazine>* has less than *<Number>* feeders

<Magazine>
> Name of a magazine in the magazine list.

<Number>
> Integer number.

A feeder number outside magazine range is specified.

- Select a feeder number within range.

BC-13: Component *<Component>* reloaded in *<Magazine>*, feeder *<Number>*

<Component>
> Name of a component in the component list.

<Magazine>
> Name of a magazine in the magazine list.

<Number>
> Integer number.

Verification message: The component was reloaded in magazine feeder.

BC-14: Component *<Component>* loaded in *<Magazine>*, feeder *<Number>*

<Component>
> Name of a component in the component list.

<Magazine>
> Name of a magazine in the magazine list.

<Number>
> Integer number.

Verification that component was loaded in magazine feeder.

BC-15: Too large step length (*<Length>* > *<Max>*)

> Step length read from barcode.

<Max>
> Maximum allowed step length

Step length read from barcode is too large.

- Set step length to the correct value.

BC-16: User not authorized

The user have scanned data which he is not authorized to change according to his user access levels.

BC-17: Removable feeder *<Feeder>* unknown

Not used.

BC-18: Removable feeder barcode *<Feeder>* is invalid

<Feeder>
    Serial number of a removable feeder.

The barcode starts with a prefix for removable feeders, but the barcode does not contain a valid serial number for a removable feeder.

BC-19: Barcode must consist of digits only

This message follows BC-18. The barcode, which is expected to be a removable feeder serial number, must only contain digits.

BC-20: Invalid barcode length

This message follows BC-18. The barcode, which is expected to be a removable feeder serial number, does not have the expected length.

BC-21: Component *<Component>* loaded in removable feeder *<Feeder>*

<Component>
    Name of a component in the component list.

<Feeder>
    Barcode of a removable feeder.

Verification that component was loaded in a removable feeder.

BC-22: Magazine *<Magazine>* already exist

<Magazine>
    Name of a magazine in the magazine list.

An existing magazine barcode was scanned when a new magazine barcode was expected.

BC-23: Layout *<Layout>* already exist

<Layout>
    The name of the layout read by the barcode reader.

An existing layout barcode was scanned when a new layout barcode was expected.

BC-24: Component *<Component>* reloaded in removable feeder *<Feeder>*

<Component>
>   Name of a component in the component list.

<Feeder>
>   Barcode of a removable feeder.

Verification message: The component was reloaded in a removable feeder.

BC-25: Feeder for demonstration use only

The scanned removable feeder is for demonstration use only. It can not be loaded in the machine.

BC-26: Prefix *<Barcode prefix>* is already used

A barcode prefix is used twice for different types of objects.

- A prefix can only be used for one type of object.

BC-27: Too small step length (*<Length>* < *<Min>*)

>   Step length read from barcode.

<Min>
>   Minimum allowed step length.

Step length read from barcode too small.

- Set step length to the correct value.

BC-28: Y wagon tray *<Name>* is unknown

<Name>
>   Name/barcode of a tray.

A non existing y wagon tray has been scanned.

- Define the tray in the Y wagon magazine editor.

BC-29: Tray wagon tray *<Name>* is unknown

<Name>
>   Name/barcode of tray wagon tray.

A non existing tray wagon tray has been scanned.

- Define the tray in the tray wagon magazine editor.

BC-30: Pallet tray *<Name>* is unknown

\<Name\>
> Name/barcode of pallet tray.

A non existing pallet tray has been scanned.

- Define the tray in the pallet magazine editor.

BC-31: Y wagon tray position *<Name>* is unexpected

\<Name\>
> Name of Y wagon tray position

A Y wagon tray position was scanned without being expected by the system.

- A position may be scanned in a tray position editor. It may also be scanned in the tray editor (in the position field) or as a part of a load sequence.

BC-32: Y wagon tray position *<Barcode>* is unknown

\<Barcode\>
> Barcode of a Y wagon tray position

An unknown Y wagon tray position was scanned.

- Define the tray position in the Y wagon tray position editor.

BC-33: Tray wagon tray position *<Name>* is unexpected

\<Name\>
> Name of tray wagon tray position

A tray wagon tray position was scanned without being expected by the system.

- A position may be scanned in a tray position editor. It may also be scanned in the tray editor (in the position field) or as a part of a load sequence.

BC-34: Tray wagon tray position *<Barcode>* is unknown

\<Barcode\>
> Barcode of a tray wagon tray position

An unknown tray wagon tray position was scanned.

- Define the tray position in the tray wagon tray position editor

BC-35: Pallet tray position *<Name>* is unexpected

<Name>
        Name of pallet tray position

A pallet tray position was scanned without being expected by the system.

- A position may be scanned in a tray position editor. It may also be scanned in the tray editor (in the position field) or as a part of a load sequence.

BC-36: Pallet tray position *<Barcode>* is unknown

<Barcode>
        Barcode of a pallet tray position

An unknown pallet tray position was scanned.

- Define the tray position in the pallet magazine tray position editor

BC-37: Y wagon tray *<Name>* already exists

<Name>
        Name/barcode of a Y wagon tray

An attempt to insert a new Y wagon tray with an already existing name/barcode was made.

- Use a new name for the new Y wagon tray.

BC-38: Tray wagon tray *<Name>* already exists

<Name>
        Name/barcode of a tray wagon tray

An attempt to insert a new tray wagon tray with an already existing name/barcode was made

- Use a new name for the new tray wagon tray.

BC-39: Pallet tray *<Nname>* already exists

<Name>
        Name/barcode of a pallet tray

An attempt to insert a new pallet tray with an already existing name/barcode was made

- Use a new name for the new pallet tray.

BC-40: Y wagon tray *<Name>* inserted in *<Host>*

<Name>
>   Name/barcode of Y wagon tray.

<Host>
>   Host name of machine where the tray was inserted.

The tray was inserted in the Y wagon on the host and the components are available.

- A loading attempt was successful.

BC-41: Tray wagon tray *<Name>* inserted in *<Host>*

<Name>
>   Name/barcode of tray wagon tray

<Host>
>   Host name of machine where the tray was inserted

The tray was inserted in the tray wagon on the host and the components are available.

- A loading attempt was successful.

BC-42: Pallet tray *<Name>* inserted in *<Pallet>*

<Name>
>   Name/barcode of pallet tray

<Pallet>
>   Name of a pallet

The tray was inserted in the pallet and the components will be available when the pallet is placed in a TEX.

- A loading attempt was successful.

BC-43: Y wagon tray *<Name>* re-inserted in *<Host>*

<Name>
>   Name/barcode of Y wagon tray

<Host>
>   Host name of machine where the tray was re-inserted

The tray was re-inserted in the Y wagon on the host and the components are available.

- A re-loading attempt was successful.

BC-44: Tray wagon tray *<Name>* re-inserted in *<Host>*

<Name>
> Name/barcode of tray wagon tray

<Host>
> Host name of machine where the tray was re-inserted

The tray was inserted in the tray wagon on the host and the components are available.

- A re-loading attempt was successful.

BC-45: Pallet tray *<Name>* re-inserted in *<Pallet>*

<Name>
> Name/barcode of pallet tray

<Pallet>
> Name of a pallet

The tray was re-inserted in the pallet and the components will be available when the pallet is placed in a TEX.

- A re-loading attempt was successful.

BC-46: Y wagon tray position *<Name>* already exists

<Name>
> Name of a Y wagon tray position.

An attempt was made to assign an already occupied barcode to a Y wagon tray position.

- Use another barcode for the position.

BC-47: Tray wagon tray position *<Name>* already exists

<Name>
> Name of a tray wagon tray position

An attempt was made to assign an already occupied barcode to a tray wagon tray position.

- Use another barcode for the position

BC-48: Pallet tray position *<Name>* already exists

<Name>
> Name of a pallet tray position

An attempt was made to assign an already occupied barcode to a pallet tray position.

- Use another barcode for the position

BC-49: Failed to insert *<Name>* into the Y wagon magazine on *<Host>*

<Name>
> Name of Y wagon tray

<Host>
> Host name of the machine where the insertion failed.

An attempt to insert a Y wagon tray into the Y wagon on the specified host failed.

- Probably a database error

BC-50: Failed to insert *<Name>* into the Tray wagon magazine on *<Host>*

<Name>
> Name of Y wagon tray

<Host>
> Host name of the machine where the insertion failed.

An attempt to insert a tray wagon tray into the tray wagon on the specified host failed.

- Probably a database error

BC-51: Failed to insert *<Name1>* into the *<Name2>* pallet magazine

<Name1>
> Name of pallet tray

<Name2>
> Name of pallet magazine where the insertion failed.

An attempt to insert a pallet tray into the specified pallet failed.

- Probably a database error

BC-52: Tray type *<Name>* is non existing

<Name>
> Name of a tray type.

An attempt was made to load a tray which was referring to a non existing tray type.

- Check the tray definition and modify the tray type reference to an existing tray type.

BC-53: Quantity *<Number1>* is greater than maximum quantity *<Number2>* for tray type *<Name>*

\<Nnumber1>
>   A number greater or equal to zero.

\<Number2>
>   A number greater or equal to zero.

\<Name>
>   Name of tray type

An attempt was made to set the quantity (number1) of an tray with tray type (name) to a value greater than the maximum quantity (number2) for the tray type.

- Set the quantity to no more than the maximum quantity which is Rows*Columns for the referred tray type.

BC-54: Pallet *<Name>* unexpected

\<Name>
>   Name of a pallet.

A pallet was scanned without being expected by the system.

- A pallet may be scanned as a part of a load sequence only.

BC-55: Removed Y wagon tray *<Name1>* from tray position *<Name2>*

\<Name1>
>   Name of a Y wagon tray.

\<Name2>
>   Name of a Y wagon tray position.

The Y wagon tray was disconnected from the Y wagon tray position.

- A Y wagon tray was inserted by using the tray position occupied by this tray.

BC-56: Removed Tray wagon tray *<Name1>* from tray position *<Name2>*

\<Name1>
>   Name of a tray wagon tray

\<Name2>
>   Name of a tray wagon position.

The tray wagon tray was disconnected from the tray wagon tray position.

- A tray wagon tray was inserted by using the tray position occupied by this tray.

BC-57: Removed Pallet tray *<Name1>* from tray position *<Name2>*

<Name1>
> Name of a pallet tray

<Name2>
> Name of a pallet tray position

The pallet tray was disconnected from the pallet tray position.

- A pallet tray was inserted by using the tray position occupied by this tray.

BC-58: Invalid step length

The scanned step length was invalid for the magazine. The default component step length will be used instead.

BC-59: Invalid default step length for component *<Name>*

<Name>
> Name of component

The default component step length was invalid for the magazine. A value of 4mm will be used instead.

BC-60: Step length is ignored for vibratory magazines

A step length barcode was scanned together with a vibratory magazine. The step length is ignored.

BRDH Group

These messages are generated by the board handler routines.

BRDH-1: Not initiated

Board handler software on MOT-board not initiated.

- Software error.

BRDH-2: Board fetch aborted

Board fetch aborted by operator.

BRDH-3: Board leave aborted

Board leave aborted by operator

fThe fast change algorithm requires identical fetch and leave positions. If the positions are not identical the routines will fall back to normal leave/fetch.

Re-adjust the fetch/leave positions for conveyor.

BRDH-5: Conveyor sensors activated after board change

After a board was fetched from the external conveyor, the internal conveyor sensors indicated a board jam situation.

- The conveyor sensors are incorrectly adjusted or broken.

- A board has been left half-way inserted in the internal conveyor.

BRDH-6: Measured board height too small. Board lost?

After clamping a board in the internal conveyor, the measured board thickness was very small (less than 0.2mm)

- The board was lost during transport.

- The board is thinner than the system can handle.

- The conveyor height axis zero point was not measured correctly during conveyor initialization.

BRDH-7: Incorrect sensor reading detected

When loading or unloading a board in the internal conveyor, the conveyor board detection sensors are giving incorrect sensor readings.

- The board was lost during transport.

- Parameter 92.0014 is set to a too high speed.

- The conveyor sensors are incorrectly adjusted or broken.

CAME Group

Camera system interface routines

CAME-0: Parameter file read error

Cannot read parameter.

- Corrupted parameter file.

- Software error.

DATAS Group

Not documented.

All messages in this group indicate an internal software error. If a message from this group appears make a "savestat" disk and send to MYDATA support.

DOS Group

These messages are generated by DOS floppy read/write.

DOS-1: Operation failure. Please check disk

Floppy read or write has failed.

- Format floppy and try again.

- Replace floppy and try again.

DOS-2: Operation may be incorrect. Please check disk

Floppy read or write may have failed.

- Try again.

- Replace floppy and try again.

DOS-3: Cannot initialize

Cannot initialize floppy drive for read/write.

- Cables not properly attached.

- Floppy unit broken.

DOS-4: Cannot open file. Permission denied

The application does not have permission to read file.

- Internal software error. Report to MYDATA support.

DOS-5: File not found

Requested file not available on floppy.

- Misspelled file name.

- Wrong floppy disk.

DOS-6: Cannot open. No such device or address

The application cannot find floppy disk device.

- Internal software error. Report to MYDATA support.

DOS-7: Cannot open. Read-only file system

The floppy is write protected.

DOS-8: Disk full

The floppy is full.

DOS-9: Bad target

DOS-10: Not a directory

DOS-11: Not a DOS formatted disk

EXORD Group

These messages are generated by the internal executor order routines.

EXORD-1: Wait called without current order

Internal software problem.

- Make a savestat disk and contact MYDATA support.

EXORD-2: Order already executing

Internal software problem.

- Make a savestat disk and contact MYDATA support.

EXP Group

These messages are generated by export.

EXP-900: Empty layout

The layout can't be exported in mount list format since there are no PCBs orpanels in the layout.

EXP-901: Cannot export layout in mount list format. Different boards

The layout can't be exported in mount list format since it contains more than one type of PCB or panel or a mix of PCBs and panels.

EXP-902: No PCB in layout

There is a panel in the layout, but the panel does not contain any PCBs. A layout with no PCBs can not be exported on mount list format.

EXP-903: Cannot export layout in mount list format. Different PCBs.

There is a panel in the layout, but it conatains more than one type of PCB. A layout can't be exported on mount list format if it contains more than one type of PCB.

EXP-904: Exported layout contains an unknown PCB.

A layout with an unknown PCB type has been exported on mount list format.

EXP-905: Cannot export layout in mount list format. Unknown panel.

The layout can not be exported on mount list format since it contains an unkown panel.

FTP Group

These messages are generated by the ftp transfer routines.

FTP-1: Connection refused

FTP server refused to open a connection.

- Server not up.

- Wrong server name specified.

- Problem with FTP service in server.

- Network problem.

FTP-2: Login incorrect

FTP-3: Login failed

FTP login failed.

- Wrong user name and/or password specified.

FTP-4: No such file or directory

Wrong directory specified

FTP-5: Please login with user name and password

FTP login failed.

- Wrong user name and/or password specified.

FTP-6: Not connected

FTP connection failed or terminated by server.

- Check server.

- Try again.

Some ftp servers disconnect after a specific time so the connection may be lost.

FTP-7: Unknown host

FTP server host name unknown.

- Wrong host name specified.

- Host name not specified in configuration files.

FTP-8: No plain file

FTP-9: Permission denied

FTP-10: No route to host

FTP server host name not reachable.

- Wrong host name specified.

- Network configuration error.

GLU Group

Glue station control routines

GLU-0: Parameter file read error

Cannot read parameter.

- Corrupted parameter file.

- Software error.

GRAP Group

Graphic interface routines

GRAP-0: Parameter file read error

Cannot read parameter.

- Corrupted parameter file.

- Software error.

HRDW Group

These messages are generated by the hardware control routines.

☞ Most messages in this group will always appear in the context of messages from other groups that indicates the source of the problem.

HRDW-0: Initiating hardware

Information message. The message indicates that the system is downloading software to the motor control computers.

HRDW-1: Error during software download to board *<Board>*. Loadmot returned *<Error number>*

<Board>
        Controller board name X, Y, Z, C, or M.

<Error number>
        Error number returned from download operation.

Cannot download program to a board.

- Board not inserted or not properly inserted.

- Hardware error.

HRDW-2: Hardware initiation failed

Failed to initialize motors.

- Hardware error. (Previous messages should give more information about the source of the error).

This is in some cases normal system behavior. Always check previous messages for the cause of the error.

HRDW-3: Hardware not initiated

The application tried to move an axis or send some other message before the hardware was initiated.

- Operator choose not to initiate the hardware.

- Software problem, unless this happens in combination with messages that indicate that there is a hardware problem somewhere in the system.

HRDW-4: Hardware initiation ready

Information message. This message indicates that software download to motor computers is ready.

HRDW-5: Emergency stop button not released

An application tried to move a axis while emergency button was pressed, machine cover open or a conveyor hood open.

- Operator error.

- Hardware problem with the emergency buttons or some other related hardware.

This message may appear when the rear conveyor hood is not properly closed.

HRDW-6: Calibrating HYDRA indicators

Information message.

HRDW-7: HYDRA indicator calibration ready

Information message.

HRDW-8: Light curtain test failed

The test of the light curtain has failed. This test is performed every time during hardware initialization. If the parameter 4:1101 "disable X if light curtain test fails" is set to "yes" the hardware initialization will also fail.

- Hardware problem with the light curtain.

HRDW-100: Mount interrupted

Some hardware or parameter check has failed and the system cannot safely operate the machine.

HRDW-101: Focal distance of HYDRA camera lower than maxSafePos

The 52.0204 parameter is outside safe limits.

- Check parameters.

HRDW-102: FirstPickEof (Z-axis) not 200μm greater than maxSafePos

The 6.1002 parameter is outside safe limits.

- Check parameters.

- Use the "autoInstall" routines to set parameters.

HRDW-103: All system voltages are not within limits

Some system voltage is outside specified limits.

- Check fuses.

- Check system voltages.

HRDW-104: Focal distance of linescan camera lower than maxSafePos

The 0204 parameter for the linescan camera is outside safe limits.

- Check parameters.

HRDW-200: Initiating conveyor

Information message. The message indicates that the system is downloading software to the conveyor motor control computer.

HRDW-201: Conveyor initiating failed

Failed to initialize conveyor motor.

- Hardware error. (Previous messages should give more information about the source of the error).

HRDW-202: Conveyor initiation ready

Information message. This message indicates that the software download to the conveyor motor control computer is ready.

HTLM Group

These messages are generated by the HYDRA tool manager routines.

HTLM-1: HYDRA tool no. *<Number>* is missing

<Number>
	Number 1-8.

TPSys has checked for the presence of a HYDRA tool and none was found.

HTLM-3: Tool fetch fail. Group front, tool *<Number>*. (set to error)

<Number>
	Number 1-8.

TPSys has failed to fetch the given tool from the HYDRA tool bank.

- The HYDRA tool tube may not have been able to move down far enough into the tool bank. Check for obstructions, or something stuck in the tool bank.

- No tool tip was found when checking after the fetch. It either fell off or there was no tool in the tool bank.

HTLM-4: Tool fetch fail. Group back, tool *<Number>*. (set to error)

<Number>
	Number 1-8.

As above.

HTLM-5: HYDRA tool length wrong for tool tube *<Number>*. Expected tool length *<Length1>*mm. Tool length found *<Length2>*mm.

<Number>
	Number 1-8.

<Length1>
	Tool length in mm.

<Length2>
	Tool length in mm.

The tool length measured was not the expected value.

- The wrong tool may be on the tool tube.

- The tool present may be damaged (tip broken off, for example).

HTLM-6: Cannot fetch entire row in tool bank *<Name>*

<Name>
>   Tool bank name.

The tool bank does not lie "sufficiently parallel" to the line of the HYDRA tools, so fetching of the tools must be performed in smaller groups, instead of fetching all tools at once.

HTLM-7: Bad transform for HYDRA tool bank *<Name>*. Uninstalled

<Name>
>   Tool bank name.

The positions of the reference points on the tool bank are not in the expected ratio.

- The wrong points may have been selected during installation.

- The wrong type of tool bank may have been selected.

- The scaling factors for the X-wagon camera may be wrong (recalibrate the camera).

HTLM-8: Unknown tool present for head *<Number>*

<Number>
>   Number 1-8.

TPSys expected no tool to be found on the tube, but something was found.

HTLM-9: HYDRA tool change turned off due to bad parameters.

The parameter file hydratoolman is corrupt or missing.

HTLM-10: HYDRA tool bank *<Name>* is *<Length>*ìm too low

<Name>
>   Tool bank name.

>   Distance in ìm.

The HYDRA unit is unable to reach far enough down to change tools in the tool bank.

- Re-install the tool bank in a higher position.

HTLM-11: HYDRA tool *<Number>* remains up at tool change

<Number>
> Tool number 1-8.

HYDRA tool latch wasn't released when asked for.

- Hydra indicators are not working.

- Hydra latches are not working.

- Error in parameter 29.0062.

HTLM-12: Error reading file %s

Cannot read file with current HYDRA tool state information.

- Corrupted file (currenthtools).

- Could also be a software error.

HTLM-13: Error writing file %s

Cannot write to file with current HYDRA tool state information.

- Corrupted file (currenthtools).

Could also be a software error.

HTLM-14: Parameters for HYDRA tool banks are not consistent

The tool types in the parameter file do not make sense. Contact MYDATA service.

HTLM-15: Uninstall all HYDRA tool banks, and reinstall

This is advice which can follow one of the above errors.

HTLM-16: Could not go down in HYDRA tool bank keyhole

The HYDRA tool tube was unable to move far enough down in the tool bank to leave a tool.

- Check for obstructions.

HTLM-17: Tool leave fail. Group front, tool *<Number>*. (set to error)

<Number>
> Number 1-8.

This is information on which tool has failed. It is accompanied by error message 16.

HTLM-18: Tool leave fail. Group back, tool *<Number>*. (set to error)

<Number>
> Number 1-8.

As above.

HTLM-19: HYDRA tool *<Number>* unexpectedly down at tool change

<Number>
> Tool number 1-8.

HYDRA tool latch was released unexpectedly.

- Hydra indicators are not working.

- Hydra latches are not working.

- Error in parameter 29.0062.

HWICLIENT Group

These messages are generated by the HWI (hardware interface) client side software.

HWICLIENT-1: Write error

Communication error between client process and the hwi process.

- Internal software error.

HWICLIENT-2: Read error

Communication error between client process and the hwi process.

- Internal software error.

HWICLIENT-3: Protocol violation

Internal software error.

- Internal software error.

HWICLIENT-4: Stepper killed me

Aborted by stepper.

- Operator action

HYDRA Group

These messages are generated by the HYDRA vision routines

HYDRA-0: Phase error

Synchronization error between the client process (Mounter) and the server process (Img).

- Internal software error. Make a 'savestat' diskette and send it to MYDATA.

HYDRA-1: Frame grabbing failed

The frame grabber hardware failed to acquire an image from the HYDRA camera.

- The coaxial cable from the camera is not connected to the frame grabber.

- Hardware error (the frame grabber board, the camera box, interrupt conflicts...).

- The speed of the x-wagon is above 1m/s when it passes the HYDRA camera. Check parameter 24.0204.

- Parameter 24.0203 (Min dist. between EOF & flash) may need to be increased.

- Software error.

HYDRA-2: Cannot read correction data. (Try to re-calibrate camera)

The database containing data about the distortion of the lens of the HYDRA camera cannot be read.

- The camera is not calibrated.

- The database is corrupt.

- Version mismatch between TPSys and the data server.

HYDRA-3: Unknown device (Check the Package database)

The package is not defined in the package database.

- The package is not defined or the package name is misspelled in either the package or the component database.

HYDRA-4: Presentation angle not 0, 90, 180 or 270 degrees

The component must be presented to the HYDRA camera in 0,90, 180 or 270 degrees.

- The component is programmed to be stored in the magazine in an angle that is not a multiple of 90 degrees.

- Software error.

HYDRA-5: Too many lead groups (Check the Package database)

The package has too many lead groups. The package must not have more than 8 lead groups.

- Correct the package definition.

HYDRA-6: Bad noise or contrast parameters (Check the Package database)

One or more of the parameters Measure noise, Measure contrast, Search noise or Search contrast were detected as being less than or equal to zero.

- The package database is corrupt. The package editor should check that the parameters are within the limits.

HYDRA-7: Unknown or not an implemented lead type

The package has a lead type that is not possible to inspect with the HYDRA camera.

- The package definition is not correct. The HYDRA camera can only inspect the lead types, CHIP, SMALL_CHIP, GULLWING, FLAT, J_BEND and LEADLESS.

HYDRA-8: Bad number of leads in lead group. Check the package data

One or more of the lead groups contains too many leads.

- The package definition is not correct. A package that is to be inspected by the HYDRA camera may not contain more than 30 leads per lead group.

HYDRA-9: Illegal number of image points.

The number of image points is not within the range 8 thru 120. This message concerns components with lead types CHIP or SMALL_CHIP.

- The package database may be corrupt. The package editor should check that the number of image points is within the limits.

HYDRA-10: Lead group angle not 0, 90, 180 or 270 degrees.

The lead groups must have an angle of 0, 90, 180 or 270 degrees.

- The generic package editor has been used to create a package. Check that the lead group angles match 0, 90, 180 or 270 degrees.

HYDRA-11: Bad lead group definition. (Check the Package database)

One or more of the parameters pitch, lead length or lead width were detected as being less than or equal to zero or the number of leads in a lead group is less than or equal to one.

- The package definition is wrong. This message concerns leaded components only (not CHIP and SMALL_CHIP).

HYDRA-12: Bad crosswise or lengthwise parameters. Check the Package data

One or both of the max. crosswise or lengthwise parameters is less than or equal to zero.

- The package definition is wrong.

HYDRA-13: Bad lead group dimensions. (Check the Package database)

The lead width in one or more lead groups is less than or equal to zero.

- The package definition is wrong.

HYDRA-14: Failed to allocate memory

There is no more memory available to the image process.

- Internal software error.

HYDRA-15: Lead group not found <Slot/Feeder> L:<Lead> B:<Background noise> C:<Contrast> D:<Deviation>

<Slot/Feeder>
> Slot and feeder where component was picked.

<Lead>
> The number of the first lead or image point in the lead group that was not found.

<Background noise>
> The measured background noise.

<Contrast>
> The measured contrast.

<Deviation>
> Not valid in this message.

It was not possible to find the component or any of its lead groups at all or the background noise and/or contrast was outside limits. The deviation (D) parameter is not valid in this message.

Dirt or components on the HYDRA camera lens.

- Too low contrast or too much background noise. Check the limits in the package list and check that there are no disturbing objects behind the component in the image.

- Check the length and the width of the leads.

- Pick failure.

HYDRA-16: Lead not found <Slot/Feeder> L:<Lead> B:<Background noise> C:<Contrast> D:<Deviation>

<Slot/Feeder>
> Slot and feeder where component was picked.

<Lead>
> The number of the first lead or image point in the lead group that was not found.

<Background noise>
> The measured background noise.

<Contrast>
> The measured contrast.

<Deviation>
> Not valid in this message.

One of the leads was not found. This messages is only valid for leaded packages. The deviation (D) parameter is not valid in this message.

- Dirt or components on the HYDRA camera lens.

- Too low contrast or too much background noise. Check the limits in the package list and check that there are no disturbing objects behind the component in the image.

- Check the length and the width of the leads.

- Pick failure.

HYDRA-17: Cross-wise dev. too big <Slot/Feeder> L:<Lead> B:<Background noise> C:<Contrast> D:<Deviation>

<Slot/Feeder>
> Slot and feeder where component was picked.

<Lead>
> The number of the first lead or image point in the lead group that was not found.

<Background noise>
> Not valid in this message.

<Contrast>
> Not valid in this message.

<Deviation>
> This value indicates how much the lead is bent.

On a leaded package; the lead is bent too much. On a chip package; the width of the package is not within the limits. The background var.(B) and the contrast (C) parameters are not valid in this message.

- Dirt or components on the HYDRA camera lens.

- The lead is bent or if a chip package, the width is wrong. Check the Max crosswise deviation parameter.

- The nozzle is damage and may disturb the optical inspection.

- Pick failure.

HYDRA-18: Length-wise dev. too big \<Slot/Feeder\> L:\<Lead\> B:\<Background noise\> C:\<Contrast\> D:\<Deviation\>

\<Slot/Feeder\>

Slot and feeder where component was picked.

\<Lead\>

The number of the first lead or image point in the lead group that was not found.

\<Background noise\>

Not valid in this message.

\<Contrast\>

Not valid in this message.

\<Deviation\>

This value indicates how much the lead length deviates from the nominal value.

On a leaded package; the length of the lead is not within the specification. On a chip package; the length of the package is not within the limits. The background var.(B) and the contrast(C) parameters are not valid in this message.

- Dirt or components on the HYDRA camera lens.

- The lead is too long or to short or if a chip package , the length is wrong. Check the Max lengthwise deviation parameter.

- The nozzle is damage and may disturb the optical inspection.

- Pick failure.

HYDRA-19: Bad in parameters to inspection algorithm

A parameter like the lead type holds an invalid data.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA.

HYDRA-20: Internal error: Package type not implemented

The package type is not implemented to be handled by the HYDRA vision system.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA.

HYDRA-21: Too many bad/not found leads in group *<Slot/Feeder>*

<Slot/Feeder>
>   Slot and feeder where component was picked.

On a chip package (lead type CHIP or SMALL_CHIP) 70% of the image points must be found, otherwise the component is rejected.

- Dirt or components on the HYDRA camera lens.

- Bad contrast between the component and the background. Try to reduce the Measure contrast parameter or change the Image point distribution parameter to LEADS_ONLY.

- The nozzle is damaged and may disturb the optical inspection.

- On small chips (<0603) it may be necessary to set the Lead type parameter to SMALL_CHIP.

HYDRA-22: Internal error: Wrong tool mode

Internal error.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA.

HYDRA-23: Failed to calculate tool positions

Internal error.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA.

HYDRA-24: Failed to locate fiducial marks

The software was not able to find the position of one or more of the fiducial marks.

- Dirt or components on the HYDRA camera lens.

- The fiducial mark is damaged.

- The plastic cover above the LED boards is visible in the FOV of the camera.

HYDRA-25: Invalid coordinate transform. (Check the parameter file):Vision

The coordinate transform used to transform between object coordinates and pixels is not correct.

- TPSys not properly installed.

- Parameter files 41 and/or 52 are/is corrupt.

HYDRA-26: Internal error: Bad search mask maxX

Internal error.

- This error may appear if a two-pole chip package is defined with a lead type that is not CHIP or SMALL_CHIP.

HYDRA-27: Internal error: Bad search mask minX

The same as for HYDRA-26.

HYDRA-28: Internal error: Bad search mask maxY1

The same as for HYDRA-26.

HYDRA-29: Internal error: Bad search mask minY1

The same as for HYDRA-26.

HYDRA-30: Internal error: Bad search mask maxY2

The same as for HYDRA-26.

HYDRA-31: Internal error: Bad search mask minY2

The same as for HYDRA-26.

HYDRA-32: Internal error: Bad search area

The same as for HYDRA-26.

HYDRA-33: Bad lead pitch value

Internal error.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA.

HYDRA-34: No component found

The software didn't find any component at all on the tool.

- Dirt or components on the HYDRA camera lens.

- Pick failure. The pick position is not located or there are no components left in the feeder. The nozzle could be damage.

IMAGE ORDER Group

These messages are generated by the image order process.

IMAGE_ORDER-0: Error in process communication

There was an error in the communication to the image process.

- Internal software problem.

IMAGE_ORDER-1: Timeout in process communication

There was an error in the communication to the image process.

- Internal software problem.

IMGPROC Group

These messages are generated by the img process.

IMGPROC-0: Fatal process error. Restart system

A fatal system error has occurred. The image process has terminated.

- Software error.

- Hardware error.

IMP Group

These messages are generated by import routines.

Common import

IMP-1: Unexpected data at line *\<Number\>*

\<Number\>
> Number of the line in the imported file where the error occurred.

The line does not comply with any of TPSys import formats.

IMP-2: Error parsing line *\<Number\>*

\<Number\>
> Number of the line in the imported file where the error occurred.

The line does not comply with the TPSys import format.

IMP-3: Unexpected end of file

End of file occurred before all mandatory lines of the imported type had been read.

IMP-4: No such file

The file specified for import does not exist.

IMP-5: Barcode *\<Barcode\>* is not unique. Used by *\<Component\>*

\<Barcode\>
> Imported barcode which is already used.

\<Component\>
> Component which already has the imported barcode.

The imported barcode is already used by a component.

Layout import

IMP-100: Layout *<Layout name>* already exists

IMP-101: Layout *<Layout name>* imported

IMP-102: Failed to import layout *<Layout name>*

IMP-103: Layout list is protected

If the user access system is active, a user needs access level "HIGH" for layouts to be able to import one.

IMP-104: Barcode *<Barcode>* already exists. Used by *<Layout name>*.

Panel import

IMP-200: Panel *<Panel name>* already exists

IMP-201: Panel *<Panel name>* imported

IMP-202: Failed to import panel *<Panel name>*

IMP-203: Panel list is protected

If the user access system is active, a user needs access level "HIGH" for boards to be able to import one.

PCB import

IMP-300: PCB *<PCB name>* already exists

IMP-301: PCB *<PCB name>* imported

IMP-302: Failed to import PCB *<PCB name>*

IMP-303: PCB list is protected

If the user access system is active, a user needs access level "HIGH" for boards to be able to import one.

TEX import

IMP-350: TEX *<TEX name>* **already exists**

IMP-351: Failed to import TEX *<TEX name>*

IMP-352: Importing TEX *<TEX name>*

IMP-353: TEX list is protected

If the user access system is active, a user needs access level "HIGH" for TEXs to be able to import one.

Component import

IMP-400: Component *<Component name>* **already exists**

IMP-401: Component *<Component name>* **imported**

IMP-402: Failed to import component *<Component name>*

IMP-403: Component list is protected

If the user access system is active, a user needs access level "HIGH" for components to be able to import one.

Traytype import

IMP-450: Traytype *<Traytype name>* **already exists**

IMP-451: Failed to import traytype *<Traytype name>*

IMP-452: Importing traytype *<Traytype name>*

IMP-453: Tray type list is protected

If the user access system is active, a user needs access level "HIGH" for tray types to be able to import one.

Glue dot import

IMP-500: Glue dot *<Gluedot name>* **already exists**

IMP-501: Failed to import glue dot *<Gluedot name>*

IMP-502: Importing glue dot *<Gluedot name>*

IMP-503: Glue dot list is protected

If the user access system is active, a user needs access level "HIGH" for glue dots to be able to import one.

Management data import

IMP-550: Management data for layout *<Layout name>* already exists

IMP-551: Management data for *<Layout name>* imported

IMP-552: Failed to import management data for layout *<LayoutName>*

IMP-553: Management data is protected

If the user access system is active, a user needs access level "HIGH" for management data to be able to import this.

Mount list import

IMP-600: Invalid U line *<Line>*

<Line>
　　　　　The line in the imported file

IMP-601: Invalid Q1 line *<Line>*

IMP-602: Invalid M1 line *<Line>*

IMP-603: Invalid M2 line *<Line>*

IMP-604: Invalid B line *<Line>*

IMP-605: Too many B lines *<Line>*

IMP-606: Invalid O line *<Line>*

IMP-607: Too many O lines *<Line>*

IMP-608: Too many CX lines *<Line>*

IMP-609: Invalid coordinate *<Line>*

IMP-610: CX line too long *<Line>*

IMP-611: Missing name or PCB coordinates

IMP-612: PCB without position in panel

IMP-613: B line number 11 does not have a ";"

IMP-614: Failed to import mount list

IMP-615: Mount lists are protected

If the user access system is active, a user needs access level "HIGH" for layouts and boards to be able to import a mount list.

Package import

IMP-700: Package *<Package name>* **already exists**

IMP-701: Package *<Package name>* **imported**

IMP-702: Failed to import package "*<Package name>***"**

IMP-703: Camera *<Camera name>* **used inconsistently by package** *<Package name>*

The given camera is in both the usable and non-usable camera lists for this package.

IMP-704: Camera type *<Cameratype name>* **in banned list for package** *<Package name>*

Camera types cannot appear in the banned list, only specific cameras.

IMP-705: Package list is protected

If the user access system is active, a user needs access level "HIGH" for packages to be able to import one.

Magazine import

IMP-800: Component *<Component name>* **already exists**

IMP-801: Component *<Component name>* **imported**

IMP-802: Failed to import component "*<Component name>***"**

IMP-803: Magazine *<Mag. name>* **is inserted, cannot import it**

IMP-804: Failed to import magazine *<Mag. name>***, serial number** *<Serial number>*

IMP-805: Removed duplicated barcode *<Barcode>***, magazine** *<Mag. name>*

IMP-806: Magazine list is protected

If the user access system is active, a user needs access level "HIGH" for magazines to be able to import one.

IMP-807: Failed to import pallet *<Pallet name>*

IMP-808: Pallet list is protected

If the user access system is active, a user needs access level "HIGH" for magazines to be able to import a pallet list.

IMP-809: Failed to import tray *<Tray name>*

IMP-810: Tray lists are protected

If the user access system is active, a user needs access level "HIGH" for magazines to be able to import a tray list.

IMP-811: Inconsistent data for magazine *<Mag. name>*, **feeder group** *<Feeder group number>*.

IMP-812: Magazine *<Mag. name>* **with serial no.** *<Mag. serialnumber>* **and type code** *<Typecode number>* **exists. Cannot import magazine** *<New mag. name>* **with different type code.**

<Mag. name>
> Name of magazine already in databases.

<Mag. serialnumber>
> The serial number which both magazine have.

<Typecode number>
> Type code number of the magazine already in databases.

<New mag. name>
> Name of magazine being imported.

There already exists a magazine with the same serial number as the one being imported, but the type code differs. That is not allowed. The magazine will not be imported.

IMP-813: Magazine named *<Mag. name>* **exists. Renaming import to** *<New mag. name>*.

<Mag. name>
> Name of magazine already in databases.

<New mag. name>
> Name created by TPSys for the magazine being imported.

The database contains another magazine with the same name as the magazine being imported. The one being imported will be renamed, with the new name shown in the message.

Kit list import

IMP-900: Kit list *<Kitlist name>* **already exists**

IMP-901: Kit list *<Kitlist name>* **imported**

IMP-902: Failed to import kit list "*<Kitlist name>***"**

IMP-903: Magazine kit list is protected

If the user access system is active, a user needs access level "HIGH" for kit lists to be able to import one.

IMP-904: Invalid magazine type *<Type>* in kit list *<Kitlist name>*

An invalid magazine type code was specified in the imported data. Use the kit list editor to correct the kit list.

User import

IMP-950: User *<User name>* already exists

IMP-951: Failed to import user *<User name>*

IMP-952: Importing user *<User name>*

IMP-953: User list is protected

If the user access system is active, a user needs access level "HIGH" for users to be able to import one.

Removable feeder import

IMP-6: Removable feeder *<Name>* already exists

<Name>
     Removable feeder name which already exists.

The imported removable feeder name is already in use.

IMP-1000: Failed to import removable feeder *<Feeder name>*

IMP-1001: Imported removable feeder *<Feeder name>*

IMP-1002: Removable feeder list is protected

If the user access system is active, a user needs access level "HIGH" for magazines to be able to import a removable feeder.

Tray position import

IMP-1050: Tray position *<Traypos name>* already exists

IMP-1051: Failed to import tray position *<Traypos name>*

IMP-1052: Importing tray position *<Traypos name>*

IMP-1053: Tray position lists are protected

If the user access system is active, a user needs access level "HIGH" for magazines to be able to import a tray position.

IMP-1054: Tray position barcode *<Barcode>* already exists

<Barcode>
> Barcode that already exists.

The imported barcode is already used.

Fiducial mark import

IMP-1100: Failed to import fiducial mark *<Mark name>*

IMP-1101: Fiducial mark list is protected

If the user access system is active, a user needs access level "HIGH" for fiducial marks to be able to import one.

IMPORTD Group

These messages are generated by the import demon.

IMPORTD-1: Cannot access watch directory *<Directory name>*

<Directory name>
> Name of watch directory

The directory which the import demon shall watch can not be accessed.

- Parameter 207.0002 'Import daemon/Directory to monitor' is not correctly set

- The watch directory does not exist.

- TPSys does not have proper access to the watch directory.

IMPORTD-2: Watch directory *<Directory name>* is not a directory

<Directory name>
> Name of watch directory

The watch directory is not a directory.

IMPORTD-3: Cannot access file *<File name>*, skipping it

<File name>
> Name of file found in watch directory.

A file found in the watch directory cannot be accessed.

TPSys does not have proper access to the file.

IMPORTD-4: Processing file *<File name>*

<File name>
        Name of file found in watch directory.

File found in watch directory and being processed.

IMPORTD-5: File *<File name>* processed and removed

<File name>
        Name of file found in watch directory.

File found, successfully imported and removed.

IMPORTD-6: File *<File name>* processed and kept

<File name>
        Name of file found in watch directory.

File found but import failed. The file is not removed from the watch directory.

IMPORTD-7: Failed to remove file *<File name>*

<File name>
        Name of file found in watch directory.

File found, successfully imported and but it could not be removed.

IMPORTD-8: Cannot open directory *<Directory name>*

<Directory name>
        Name of watch directory

The watch directory could not be opened for read.

TPSys does not have proper access rights to the watch directory.

LSCD Group

LSCD-0: Failed to initialize Line Scan Camera hardware

The hardware controlling the LSC could not be initialized.

- Failed to read database containing calibration data for line scan camera. Re-calibrate camera.

- Failed to read parameters for camera. Check parameter files 57 and 58.

- Failed to download data to LSC hardware. TPSys or LSAD/VVG2 board not properly installed.

- Hardware error in LSAD and/or VVG2

LSCD-1: Failed to map frame grabber memory. Terminating

Could not allocate memory for frame grabber.

- TPSys not properly installed.

- Hardware error in VVG2 or LSAD.

LSCD-2: Failed to open /dev/frame. Terminating

Could not access frame grabber hardware.

- TPSys not properly installed.

- VVG2 not properly inserted.

- Hardware error VVG2 or CP5 boards.

MAGREF Group

These messages are generated by the magazine fiducial mark search vision routines.

MAGREF-0: Bad inparameters

Search area outside image boundaries.

- Parameter Length of scan line (41.0053) is larger than image width.

- The absolute value of parameter vertical offset (41.0052) is larger than half the image height.

MAGREF-1: Bad scan length

Obsolete error message.

MAGREF-2: Fiducial not found

Fiducial mark could not be found within search area.

- No fiducial mark in image.

- Bad fiducial mark.

- Check if the Min width, Max width, Min Length and Max length parameters in the Vision (41.0056 – 41.0059) parameter group corresponds to the physical dimensions of the magazine fiducial mark.

- The Check length (41.0060) parameter in the Vision parameter group is set to Yes in the case where all of the fiducial marks (length-wise) is not visible in the camera image. Change the parameter setting to No.

MAGREF-3: Cannot read the correction data. (Try to re-calibrate camera)

The camera's correction data could not be read.

- Camera is not calibrated. Redo the camera calibration.

- Correction data is corrupt.

MHPR Group

These messages are generated by the magazine handler process.

MHPR-10: Magazine *<Mag. name>* inserted in slot *<Mag. position>*

<Mag. name>
>> Name of magazine.

<Mag. Position>
>> Magazine position number.

A magazine has been inserted in the machine. Information message.

MHPR-11: Magazine *<Mag. name>* removed from slot *<Mag. position>*

<Mag. name>
>> Name of magazine.

<Mag. Position>
>> Magazine position number.

A magazine has been removed from the machine. Information message.

MHPR-12: Unknown Magazine type (type: *<Mag. type code>*)

<Mag. type code>
> Decimal magazine type code.

A magazine with an invalid type code has been inserted.

- A faulty magazine has been inserted.

- Software problem in the MOT-M servo program.

- Electrical problem on the magazine bus.

MHPR-13: New magazine, serial No.: *<Mag. serial>* type: *<Mag. type code>*

<Mag. serial>
> Magazine serial number.

<Mag. type code>
> Decimal magazine type code.

A new magazine, not currently in the magazine database, has been inserted. Information message.

MHPR-14: Failed to pick *<Number>* components in sequence from *<Mag. name>*/*<Feeder>*. Feeder shutdown!

<Number>
> Integer number

<Mag. name>
> Name of magazine.

<Feeder>
> Magazine feeder number.

A feeder has had several successive pick failures in sequence. The feeder will not be used again until the operator intervenes.

- The component reel is empty.

- The located feeder position is bad.

- The magazine fiducial mark has not been located.

- The feeder is loaded with wrong components.

MHPR-15: Component *<Component>* not available

<Component>
> Component name.

A component that is needed is not available in the machine.

- Component not loaded in the machine.

- Feeder with component has been shutdown by the system due to high failure rate or manually by the operator.

MHPR-16: Wrong component value *<Mag. name>/<Feeder>*

<Mag. name>
    Name of magazine.

<Feeder>
    Magazine feeder number.

A feeder had several successive electrical verification errors. The feeder will not be used again until the operator intervenes.

- The feeder is loaded with wrong component.

- Component batch is bad.

- The electrical verifier doesn't work properly.

MHPR-17: Fatal process error id:*<Source file>*:*<Line number>*. Restart system

<Source file>
    Source file name.

<Line number>
    Line number in source file.

The magazine handling system crashed. The system has to be restarted.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA.

MHPR-20: Magazine *<Mag. name>/<Mag. position>* ready to remove

<Mag. name>
    Name of magazine.

<Mag. position>
    Magazine position number.

The system will not pick components from this magazine again, so it is safe to remove the magazine. Information message.

- The magazine button was pressed.

MHPR-21: Magazine *<Mag. name>*/**<Mag. position>** ready

<Mag. name>
    Name of magazine.

<Mag. position>
    Magazine position number.

The machine is ready to pick from the magazine. Do not remove the magazine without pressing the magazine button first.

The magazine button was pressed.

MHPR-22: Magazine *\<Mag. name>*/*\<Mag. position>* faulty. Remove mag

\<Mag. name>
> Name of magazine.

\<Mag. position>
> Magazine position number.

The magazine failed to step. The magazine will not be used again until it is removed and inserted again.

- The magazine is broken.

- Electrical problem on the magazine bus.

MHPR-23: Magazine Fiducial mark on magazine *\<Mag. name>*/*\<Mag. position>* is not located.

\<Mag. name>
> Name of magazine.

\<Mag. position>
> Magazine position number.

The magazines fiducial mark has not been located in this magazine position. The fiducial mark should be located before trying to pick components from the magazine.

- The magazine was removed and inserted in another magazine position.

MHPR-24: Too many feeders/trays in machine

The internal data structures cannot hold all feeder/tray information. During normal operation can only happened if the tray data defines an unrealistic amount of trays on a TEX, YWM or TWM tray magazine.

- Tray data corrupt or contains unrealistic data.

- Magazine data corrupt.

MHPR-25: Failed to pick *<Number1>* of last *<Number2>* components from *<Mag. position>/<Feeder>*. Feeder shutdown!

<Number1>
> Integer number.

<Number2>
> Integer number.

<Mag. position>
> Magazine position.

<Feeder>
> Magazine feeder number.

The reject rate for the specified feeder is above the maximum allowed reject rate set for the magazine type in the parameter file. The feeder will be shutdown and not used by the machine until the operator has reset the magazine error. Depending on the magazine type the maximum allowed reject rate before feeder shutdown is set by parameter 84.104, 84.204 or 84.252.

MHPR-25: Warning! *<Number1>* picks of last *<Number2>* failed from *<Mag. position>/<Feeder>*

<Number1>
> Integer number.

<Number2>
> Integer number.

<Mag. position>
> Magazine position.

<Feeder>
> Magazine feeder number.

The reject rate for the specified feeder is above the warning level set for the magazine type in the parameter file. Depending on the magazine type the maximum allowed reject rate before feeder shutdown is set by parameter 84.105, 84.205 or 84.253.

MHPR-30: <No. pallets> pallets inserted in TEX <Mag. name> / <Mag. position>

<No. pallets>
> Number of pallets detected by the TEX magazine.

<Mag. name>
> Name of magazine.

<Mag. pos>
> Magazine position number.

Reports the number of pallets detected in a TEX unit. Information message.

MHPR-31: TEX *<Mag. name>/<Mag. position>* **deactivated**

<Mag. name>
    Name of magazine.

<Mag. Position>
    Magazine position number.

Information message. The system will not pick components from this TEX again.

- The button on the TEX was pressed.

- The TEX door was opened or the safety covers were removed when the TEX was activated.

MHPR-32: Pallet position of TEX *<TEX name>/<Mag. position>* **is not located**

<TEX. name>
    Name of TEX.

<Mag. position>
    Magazine position number.

The pallet corners have not been located for this TEX in this magazine position. The corners have to be located before the machine can pick from the TEX pallets.

- A new TEX unit was inserted in the machine.

- A TEX unit was removed and reinserted in a different magazine position.

MHPR-33: Invalid barcode in TEX <Mag. name> / <Mag. position> / <Pallet position>

<Mag. name>
    Name of magazine.

<Mag. position>
    Magazine position number.

<Pallet position>
    Position of pallet in TEX.

The barcode reader in the TEX has detected pallets with invalid barcodes. The pallets will not be used by the machine.

- The barcode is damaged.

- The barcode reader is not correctly installed.

- The barcode reader is broken.

MHPR-34: Attempting step error recovery. Slot *<Slot>* feeder *<Feeder>*.

Obsolete.

MHPR-35: Serial number of removable feeder in slot *<Slot>* feeder *<Feeder>* is bad.

<Slot>
> Slot number.

<Feeder>
> Removable feeder number.

The given removable feeder has a bad serial number, or an error occurred while reading it.

MHPR-36: Feeder *<Feeder>* in slot *<Slot>* for demonstration use only

<Feeder>
> Removable feeder number.

<Slot>
> Slot number.

The given removable feeder is only usable for demonstrations, not production.

MHPR-37: Large fiducial offset for magazine *<Mag. name>*/*<Slot>*

<Mag. name>
> Magazine name.

<Slot>
> Slot number.

Magazine fiducial not found where expected. This distance between the detected position and the nominal position is larger than expected.

- The fiducial on another magazine was found.

- The magazine is damaged.

- The magazine slot is not adjusted correctly.

MIPR Group

These messages are generated by the magazine interface process.

MIPR-1: Unknown magazine type. Slot:*<Mag. position>*: No.:*<Mag. serial>* type:*<Mag. type>*

<Mag. position>
> Magazine position number.

<Mag. serial>
> Serial number reported by magazine.

<Mag. type>
> Type code reported by magazine.

A magazine with an invalid type code has been inserted.

- A faulty magazine has been inserted.

- Software problem in the MOT-M servo program.

- Electrical problem on the magazine bus.

MIPR-2: Fatal error. Reloading motor controller M

The MOT-M servo program does not respond to commands and servo program is automatically reloaded.

- Software problem in the MOT-M servo program.

- The MOT-M or MI board is broken.

MIPR-3: Cannot load motor controller M.

Reloading the MOT-M board failed. The system cannot work properly without a loaded MOT-M board.

- The MOT-M (or MI) board is broken.

- The servo distribution was not correctly installed.

MIPR-7: Bad magazine in slot *<Mag. position>*. Contact MYDATA service

<Mag. position>
> Magazine position number.

There is some problem with the magazine, preventing it from working correctly.

- The magazine is broken.

- The magazine is too old and is only compatible with TPSys 1.4 and older.

- The MOT-M and/or MI-board is broken.

MIPR-12: Fatal process error id:*<Source file>*:*<Line number>*. Restart system

<Source file>
> File name for source code where the error occurred.

<Line number>
> Line number in the source code where the error occurred.

The magazine interface system crashed. The system has to be restarted.

- Software problem. Make a 'savestat' diskette and send it to MYDATA.

MIPR-13: Feeder *<Feeder serial number>* communication error at slot *<Mag. position>*, feeder *<Feeder position>*.

<Feeder serial number>
> Feeder serial number.

<Mag.. position>
> Magazine position number.

<Feeder position>
> Feeder position number.

There is some problem with the feeder, preventing it from working correctly.

- The feeder is broken.

- The MOT-M and/or MI-board is broken.

MIPR-20: System voltage *<Voltage value>* measured *<Measured value>*V (outside limits)

<Voltage value>
> Nominal value of voltage measured.

<Measured value>
> Actual value measured.

A system voltage deviates too much from the nominal value. The machine will refuse to run.

- Electrical problem in the machine.

- The MI (or MOT-M) board is broken.

- Wrong voltage limits specified in parameter group 141 (Voltage check).

MIPR-21: System voltages are within limits

All system voltages are OK. The machine can safely run again. Information message.

MIPR-30: Loading TEX software at slot *<Mag. position>*

<Mag. position>
> Magazine position where TEX is inserted.

A TEX unit with no software loaded has been found. The software is automatically loaded. Information message.

MIPR-31: Initiating TEX hardware at slot *<Mag. position>* ...

<Mag. position>
> Magazine position where TEX is inserted.

The TEX hardware initiation has started. Information message.

MIPR-32: TEX at slot *<Mag. position>* ready

<Mag. position>
> Magazine position where TEX is inserted.

The TEX is ready to be used. Information message.

MIPR-33: Cannot initiate TEX hardware at slot *<Mag. position>*

<Mag. position>
> Magazine position where TEX is inserted.

Initiation of the TEX hardware failed. The system will not be able to use this TEX. Follows another message explaining why the initiation failed.

- Pallets were present on the shuttle unit.

- Mechanical or electrical problem with the TEX.

MIPR-34: Cannot load TEX software at slot *<Mag. position>*

<Mag. position>
> Magazine position where TEX is inserted.

Loading the TEX servo program failed. The system will not be able to use this TEX.

- Electrical problem on the magazine bus.

- The servo distribution was not correctly installed.

- The MOT3 board on the TEX is broken.

MIPR-35: Cannot read TEX EEPROM data from slot <*Mag. position*>

<Mag. position>
        Magazine position where TEX is inserted.

The system couldn't read parameters from the TEX EEPROM memory. The system will not be able to use the TEX.

• The EEPROM memory in the TEX is broken.

• Communication problem with the TEX unit.

MIPR-36: TEX parking sequence failed at slot <*Mag. position*>

<Mag. position>
        Magazine position where TEX is inserted.

The system could not restore the pallets to the mother unit and move the mother unit to the parking position. Follows another message explaining why the parking sequence failed.

• See explanation for the accompanying message.

MIPR-37: Reloading motor controller M

The MOT-M motor controller software is being reloaded. Information message.

MIPR-38: TEX at slot <*Mag. position*> is loaded

<Mag. position>
        Magazine position where TEX is inserted.

A TEX with already loaded software is detected by the system. Information message.

MIPR-39: TEX palette scan failed at slot <*Mag. position*>

<Mag. position>
        Magazine position where TEX is inserted.

The system could not read any TEX pallet barcodes. Follows another message explaining why the pallet scanning failed.

• See explanation for the accompanying message.

MIPR-40: TEX failed to fetch pallet at slot <*Mag. position*>

<Mag. position>
        Magazine position where TEX is inserted.

The TEX was not able to fetch the requested pallet from the mother unit. Follows another message explaining why the pallet fetch operation failed.

• See explanation for the accompanying message.

MIPR-41: Inconsistent palette scan data from TEX at slot *<Mag. position>*

<Mag. position>
>   Magazine position where TEX is inserted.

The information from the barcode reader is not consistent with the information from the inductive sensors on the TEX door. Some pallets will not be used by the system.

- A pallet with an unreadable barcode was found.

- The barcode reader is not properly installed.

- The inductive sensors are not properly installed.

MIPR-42: Pallet left on Y unit at slot *<Mag. position>*. Remove it

<Mag. position>
>   Magazine position where TEX is inserted.

A pallet was found on the TEX shuttle unit when a palscan operation was performed, and no suitable free position in the mother unit was found.

- The operator opened the TEX door or removed the safety covers when the TEX unit was activated.

- TPSys previously crashed when pallets were present on the shuttle unit.

MIPR-43: TEX hardware initiated at slot *<Mag. position>*

<Mag. position>
>   Magazine position where TEX is inserted.

The TEX hardware initiation was successfully completed. Information message.

MIPR-44: Cannot read valid serial number from magazine in slot *<Mag. position>*

<Mag. position>
>   Magazine position where TEX is inserted.

The TEX unit doesn't have a valid serial number. The TEX will not be used by the system.The TEX EEPROM memory is broken.

- Communication problem with the TEX.

MIPR-45: Cannot mix pallets with different sizes

The system detected both normal and extra wide pallets in the same TEX unit. The system will not use the TEX.

- Some pallets have incorrect barcodes.

MIPR-46: TEX door open at slot *<Mag. position>*

<Mag. position>
> Magazine position where TEX is inserted.

The TEX door was opened when the TEX was activated.

- The operator forgot to deactivate the TEX before opening the door.

- Electrical or mechanical problem with the safety switches.

MIPR-47: TEX front hood open at slot *<Mag. position>*

<Mag. position>
> Magazine position where TEX is inserted.

The TEX front hood was removed when the TEX was activated.

- The operator forgot to deactivate the TEX before removing the hood.

- Electrical or mechanical problem with the safety switches.

MIPR-48: TEX rear hood open at slot *<Mag. position>*

<Mag. position>
> Magazine position where TEX is inserted.

The TEX rear hood was removed when the TEX was activated.

- The operator forgot to deactivate the TEX before opening the hood.

- Electrical or mechanical problem with the safety switches.

MIPR-49: Magazine not supported by hardware. Type *<Typecode number>* **Slot** *<Slot number>* **No.***<Mag serialnumber>*

<Typecode number>
> Type code number of the magazine.

<Slot nnumber>
> The slot where the magazine is inserted.

<Mag serialnumber>
> The serial number of the magazine.

The magazine is not supported by the hardware in the machine.

- You need to upgrade the hardware in the machine to use this magazine.

MMI Group

These messages are generated by the man machine interface process.

MMI-1: Disk space low on *<Directory>*: *<Number>* Kbytes left

<Directory>
       Name of directory that is almost full.

<Number>
       Number of kbytes left of disk.

The system is running out of disk space.

- Hard drive almost full, exit system and remove files not used.

MMI-2: Out of disk space on *<Directory>*, Exit and clean up

<Directory>
       Name of directory that is full.

The system is out of disk space.

- Hard drive full, exit system and remove files not used.

MMI-4: Too large deviation. x: *<X offset>*μm y: *<Y offset>*μm, angle: *<Theta offset>*m°. Measurement ignored.

<X offset>
       Placement error in the X direction, in micrometers.

<Y offset>
       Placement error in the Y direction, in micrometers.

<Theta offset>
       Placement theta error, in millidegrees.

During HYDRA installation, the installation component was not placed with high enough accuracy.

- Mechanical problem. Try to clean the HYDRA tool tips.

- Parameter 66.0051 and/or 66.0052 have too low values.

MONT Group

These messages are generated by the mounter routines.

MONT-0: Parameter file read error

Cannot read one of the parameters.

- Corrupted parameter file.

- Could also be a software error.

MONT-1: Fatal error: exception on exception

An error occurred while the system tried to recover from an earlier error.

- See previous messages in log.

MONT-2: Exception

An error occurred in the motor control system.

- See previous messages in log.

MONT-4: Stopkey pressed

Operator pressed stop key. Information message.

MONT-5: Wrong type of tool for mounting

The tool specified for mount is not a mount tool.

- Parameter error.

- Error in package data.

- Software problem.

MONT-6: Wrong type of tool for gluing

The tool specified for glue dispense is not a glue tool.

- Parameter error.

- Error in package data.

- Software problem.

MONT-7: No tool at all present when one expected

No tool available when board level should be measured.

- No tool installed.

- Software problem.

MONT-8: Board measurement position (x,y) not set

The position where board level should be measured is not set.

- Software problem.

MONT-9: Measured board level out of bounds

The board level measured is outside specified limits.

- No board present on Y wagon.

- Board position not measured correctly (tool misses board).

- Board level test position on PCB wrong (tool misses board).

- Board level nominal value and/or tolerances set wrong (parameters).

- Z/hZ friction too high or specified force too low.

MONT-10: Timeout while waiting for component pick-data

Internal wait time for data from magazine lookup expired.

- Software problem. Make a 'savestat' disk and send to MYDATA support.

MONT-11: Component feed canceled

Assembly interrupted. Information message.

MONT-12: Timeout while waiting for component feed

Internal wait time for data from magazine step expired.

- Software problem. Make a 'savestat' disk and send to MYDATA.

MONT-13: Level too high in pick

Pick level too high with Z head.

- Obstacle on feeder.

- Tolerance too tight (parameter).

MONT-14: Level too low in pick

Pick level too low with Z head.

- Nothing loaded in feeder.

- Tolerance too tight (parameter).

MONT-15: Bad vacuum in pick

Vacuum level too low after pick of component.

- Nothing loaded in feeder.

- Uneven surface on package cause air to leak between tool tip and package (remove vacuum test from package).

- Tolerance too tight (parameter).

- Faulty vacuum system.

MONT-16: Failed to pick

Failed to pick a component.

- Nothing loaded in feeder.

- Faulty ISIC indicator.

MONT-17: Component dim *<Measured value>* µm out of bounds (*<Min>* - *<Max>* µm)

<Measured value>
>   Measured dimension in μm.

<Min>
>   Min allowed dimension in μm.

<Max>
>   Max allowed dimension in μm.

Package size outside limits.

- Nothing loaded in feeder.

- Mechanical size tolerances in package data too tight.

MONT-18: Component electrical properties out of bounds

Wrong electrical properties for component.

- Wrong component loaded in feeder or programmed in the wrong angle.

- Component specification wrong.

MONT-19: Component lost (dim = 0)

Component lost or failed to pick component.

- Nothing loaded in feeder.

- Fail to pick not detected because vacuum and pick level tests turned off.

MONT-20: Level too high in place

Place level higher than expected

- Component already placed.

- Tolerance too tight.

- Board surface uneven or warped.

- Board level measurement wrong.

MONT-21: Level too low in place

Place level lower than expected.

- Placement missed board (error in PCB data).

- Board not loaded.

- Tolerance too tight.

- Board surface uneven or warped.

- Board level measurement wrong.

MONT-22: Failed to place

Failed to place component.

- Placement missed board (error in PCB data).

- Board not loaded.

- Faulty ISIC indicator.

MONT-24: Specified centering sequence is impossible to perform

This can only happen when using a tool that can only pick in a fixed angle. (for example tools for melfs). This error will never happen if the machine is equipped with a Midas unit.

- Error in package data.

MONT-26: Component lost (bad vacuum)

A error in vacuum level indicates that the component has been lost during transport from pick to place position.

- Acceleration codes set too high for package.

- Error in vacuum system/measurement.

MONT-27: Failed measuring centering device level

Failed to find centering device during centering level installation.

- Indicator faulty.

- Centering device faulty.

MONT-28: Automatic fiducial mark search doesn't converge

Failed to complete a fiducial mark search using a non-calibrated X-camera (if parameter 43.0003 is greater than 0).

- X wagon camera installation not correct.

- X wagon camera loose.

MONT-30: Optical centering does not converge

When using iterative optical centering the algorithm cannot find the correct position.

This centering method is used if the parameter 21.0251 (Z-mount component: Optical centering/Max loops) is set to a value greater than 0. This is required only for TP9/2 and older machines.

MONT-32: Resistance = *<Value>* Ohm

<Value>
        Result from electrical value measurement.

Information message.
These messages reports results from the electrical verifier when used to measure a component value.

MONT-33: Capacitance = *<Value>* Farad

The same as for MONT-32.

MONT-34: Low voltage capacitance = *<Value>* Farad

The same as for MONT-32.

MONT-35: Polarized capacitance = *<Value>* Farad

The same as for MONT-32.

MONT-36: Diode voltage drop = *<Value>* Volt

The same as for MONT-32.

MONT-37: Diode leakage current = *<Value>* Ampere

The same as for MONT-32.

MONT-38: Zener voltage = *<Value>* Volt

The same as for MONT-32.

MONT-39: NPN hfe = *<Value>* times

The same as for MONT-32.

MONT-40: PNP hfe = *<Value>* times

The same as for MONT-32.

MONT-41: Calibrating verifier

Information message. This message indicates that the system re-calibrate the verifier hardware.

MONT-42: No tray wagon magazine present when needed

Internal software problem.

The tray wagon was not installed when the software expected it to be.

- Make a 'savestat' disk and send to MYDATA.

MONT-43: Putback not allowed in this magazine

Information message. Reject action PUT BACK was specified for an component that was not picked from a feeder where put back is possible.

The system will revert to manual leave.

MONT-45: Turning diode

A warning message when the system detects a diode that has wrong polarity and should be turned 180°.

The message will only appear if electrical test is specified and turned on and parameters 21.0241 (Z-Mount component: Diode handling/Turn if el. Test failed) and 21.0242 (Z-mount component: Diode handling/Warn when turning) is on.

Turning the diode reduce performance.

MONT-56: Z measure unstable

The system does not get stable result when it measures a Z level using the Z axis.

- Z transducer error.

MONT-57: Glue level too low

The measured glue level is lower than the 101.0009 "Glue pot: Max glue depth (from EOF)" parameter.

MONT-58: No HYDRA on this machine

The system tried to used the HYDRA but no HYDRA is present on the machine.

- Internal software error.

MONT-59: Bad magazine type for HYDRA

The system tried to use HYDRA for pick from matrix tray.

- Internal software error.

MONT-60: HZ measure unstable

The system does not get stable result when it measures a Z level using the HYDRA Z axis.

- HZ transducer error.

MONT-61: HZ force sensor faulty, tool *<Head>*

<Head>
 HYDRA head number counted from left to right.

The HYDRA force sensor did not register impact during HYDRA tool Z offset measurement.

- HZ transducer error.

MONT-62: HZ nozzle (*<Head>*) friction too high. Might lose components

<Head>
 HYDRA head number counted from left to right.

The system detected a high friction for one of the HYDRA heads.

- Check HYDRA head for damage (use HYDRA service program)

MONT-63: Failed to place with nozzle *<Head>*

<Head>
 HYDRA head number counted from left to right.

The system did not detect board impact when placing with the HYDRA.

- Check PCB programming.

- Check HYDRA indicators.

MONT-64: Component may be stuck in the centering device

The system has detected that the centering device cannot move freely. This may be because a component is stuck somewhere in the centering device. Assembly is interrupted to avoid damage.

- Make sure that the centering device can move freely.

MONT-65: Bad vacuum

Vacuum level low, component pick probably failed.

- Nothing loaded in feeder.

- Uneven surface on package cause air to leak between tool tip and package (remove vacuum test from package).

- Tolerance too tight (parameter).

- Faulty vacuum system.

MONT-66: Extended verifier calibration (may take a few minutes)

The verifier calibration failed the first time and the system tries to recalibrate.

If the calibration does not finish within a minute, press STOP.

- Faulty or instable verifier board, contact MYDATA service.

MONT-67: FirstPickEof (Z-Axis) not 200μm greater than PosZTurnBig (Z-Mount)

The system detected an inconsistency in the parameters. This may cause damage to the system.

The parameter 06.1002 (Z axis: Z settings/EOF in first pick) must be set to at least 200 μm higher than parameter 21.0201 (Z-Mount component: Centering/Big comp. Turn pos).

- Check both parameter values and set to correct values according to procedures described in the service manual.

MONT-68: Tool is bad

The system tried to use a tool that is not installed or not present.

- Internal software error. Make a savestat disk and send to MYDATA support.

MONT-69: Distance between pick and centering too small

The system has detected that the space between the pick level and the centering device is too small to be able to turn the component.

- The pick position is too high.

- The component is too thick.

MONT-70: HZ reached upper end point

Failed to measure the hzz-offsets since the axis reached the upper end point before mechanical stop. The hzz-offsets has to be measured at a position where the HZ axis can reach the surface to measure on.

MONT-71: Failed to pick calibration plate

The system failed to pick the calibration plate during optical centering unit calibration.

MONT-72: Calibration plate dropped

The system dropped the calibration plate during optical centering unit calibration.

MONT-73: Throw position <*Throw position*> not reachable with X. Check the parameters

<Throw position>
       Throw position number.

A throw position is specified outside the area that X axis can reach.

- Check parameters 04.1002 through 04.1005 (X axis:X settings/Reject X pos 1...4)

MONT-74: No throw position is reachable with X. Check the parameters

There is no throw position specified inside the area that X axis can reach.

- Check parameters 04.1001 (X axis:X settings/Manual reject/pick/tool X pos) and 04.1002 through 04.1005 (X axis:X settings/Reject X pos 1...4)

MONT-75: Manual throw pos. is not reachable with X. Check the parameters

The manual throw position is specified outside the area that X axis can reach.

Check parameter 04.1001 (X axis:X settings/Manual reject/pick/tool X pos)

MONT-76: Manual leave instead of put back due to regrip

Put-back is specified but cannot be used since the system has moved the component position on the tool.

This should never happen for a component that is centered using vision centering and will be very rare for mechanically centered components.

MONT-77: Did not get wanted tools in HYDRA tool change

The HYDRA unit has attempted to change mounting tools, and one or more of the attempted changes has failed.

- Check for obstructions in the HYDRA tool bank

- Verify that the tools are correctly installed

MONT-79: No allowed tool present for measuring the board level.

The tools specified as Level measure tools, are not present or not installed.

- Error in PCB/Panel data

MONT-80: Failed to pick, timeout

Failed to pick a component, the servo returned timeout.

- Nothing loaded in feeder.

- Faulty ISIC indicator.

MONT-81: Failed to pick, no indicator hit

Failed to pick a component, the indicator tool did not indicate a hit.

- Nothing loaded in feeder.

- Faulty ISIC indicator.

MONT-82: Failed to pick, no hit

Failed to pick a component, the tool did not hit.

- Nothing loaded in feeder.

MONT-83: Failed to place, force is out of range for tool

The placement force for a component, specified by the parameter 21:0311 and the package force offset, is not available with this tool.

- Check package data and parameters 21:0311 and 21:0306.

- Try setting the package force offset to 0.

MONT-84: Align, pick, center and place angles

The component can't be picked or placed without hitting an object in the machine.

- The pick angle and the place angle must be aligned with each other. Try putting the longest side of the component in the X direction of the machine. Also try to turn the PCB so that the component when placed also is aligned with the X direction.

MONT-85: Failed to pick, no component within reach

Z-Fi or Midas cannot reach low enough to pick the component. (This may happened when using tools A23 and A24 and picking from ALM1216.)

- In package data, choose a longer tool to pick the component.

- Make sure that the position of the lower Z-lock was correctly measured during the installation of TPSys. To measure the position of the lower Z-lock exit TPSys and run *autoInstall*. Then go to "23.0203 and 06.1004 Z position of lower lock" Verify that lower lock is locked, move Z all the way down with the joystick and press enter.

MONT-86: Pre-pick inspection requested but option is not enabled

No attempt is done to pick a component on a tray because the tray type data says the component should be inspected by the PVC, but this TPSys option is not enabled in the magic word.

- Request a new magic word from MYDATA

- If no pre-pick inspection is necessary select 'No' in the field 'Inspect before pick' in the tray type data corresponding to the tray containing the component.

MOT Group

For each command sent to a motor control computer a status is returned.

To understand the meaning of a status message the command that generated the status is required. The messages in the MOT group are combinations of the commands and the status returned.

To handle this TPSys display the MOT group messages in slightly different format.

For historical reasons this group is labeled MOT but it applies to messages generated from MOT1, MOT2, MOT3 and CMOT boards

MOT Message Number Format

The message number format for MOT group messages are:

MOT-<Command> <Axis/Board> /<Status code>

<Command>
>A code for the command that generated the status.

<Axis>
>The logical axis or physical MOT/CMOT board which the command was sent to. Note that some MOT/CMOT boards may control more than one logical axis.

<Status code>
>The status returned.

To analyze a message you have to check both the command and the message.

MOT Commands

This is a list of commands sorted alphabetically.

Command	Description
AUXILLARY FUNCTION 1	Read name of auxiliary function 1 of a CMOT board
AUXILLARY FUNCTION 2	Read name of auxiliary function 2 of a CMOT board
AXISFORCE	Read minimum and maximum valid axis force
AXISRANGE	Read minimum and maximum valid axis positions
BLOCKREC	Receive file from a CMOT board
BLOCKSEND	Send file to a CMOT board.
BOOSTER	Disable/enable X motor booster
CALIBSENSORS	Calibrate board edge sensors and/or set sensor trig levels
CHECKIDLE	Find out if an axis is idle
CITYTIME	Read the clock of a CMOT board
CLEAR	Software reset for a given MOT/CMOT board
CLEARMAGPOLL	Initialize the magazines.
CLEARCITY	Initialize the command id table of a CMOT board
CONHOLD	Control conveyor board support for MOT controlled conveyors
CONSTAT	Read conveyor sensor status for MOT controlled conveyors
DMPLOG	Create a log file containing a history of the last 1000 commands sent to the motor controllers
EANNUMBER	Read the EAN number of a CMOT board
FAN	Control cooling fans
FILESIZE	Read the size of an internal log file
FORCECAL	Calibrate the force sensor system for mount tools
GENERICCAN	Send generic command to a CMOT board
GENERICMOTQOM	Send generic command to a MOT board
GETMAXERROR	Get max error log from an axis
GETSMEMA	Read conveyor smema signals.
HAIR	Open/close air valve for HYDRA Z
CAMERAFLASH	Waits for X axis to reach a specified position and then trigger HYDRA or linescan camera.
INCSTEPCNT	Increment step counter value in ALM magazines.
INDPOS	Reads hZ position of first indicator hit for the HYDRA.
LAMP	X wagon camera lamps off /on

Command	Description
LATCHPOS	Reads the lowest latch position for the HYDRA.
LIGHTCURTAINTEST	Test light curtain.
LISTMOT	Create a listmot log for an axis
LOADBRD	Load/unload board to/from conveyor for MOT controlled conveyors
LOAD	Load software to MOT/CMOT board
LOGMAXERROR	Start/stop max error log
MAGAXISRANGE	Read minimum and maximum valid magazine axis positions
MAGFEED	Step one or more feeders in a magazine simultaneously
MAGFEEDOFFSET	Feed one or more feeders in an ALM magazine with a step and an offset.
MAGGONE	Notify the MOT-Board M that a component has been picked. This message exists for the magazine control system in the TP9SYS 2.92 system.
MAGINIT	Initialize a magazine.
MAGLINK	Send/Receive maglink messages (i.e. TEX commands)
MAGMOVEGO	Similar to MOVEGO but with a specified magazine. Only valid for magazines with linear movement.
MAGPOLL	Check magazine bus for inserted/removed magazines
MAGREAD	Read data from magazine port
MAGREADLONG	Read Agilis feeder serial number from magazine port.
MAGREADPAR	Read magazine parameter
MAGREADUSER	Read the 8 user data bytes in the keeloq chip in an Agilis feeder
MAGSETPAR	Set magazine parameter
MAGSOLTEST	Activate a solenoid in magazine. Used for test.
MAGSTEP	Send a "step feeder" order to a magazine on the magazine bus
MAGSTEPOFFSET	Step one feeder in an ALM magazine. The command includes a Y offset to fine tune the step length.
MAGVIBTEST	Vibrate magazine. This command is used when testing a vibratory magazine.
MAGWRITE	Write data to magazine port
MCALIB	Calibrate electrical verifier board
MCOMP	Command to the electrical verifier
MOVE	Move axis to a specified position
MOVEGO	Move axis to a specified position with reduced speed and force

Command	Description
MOVEIND	Move axis to a specific position and run with reduced speed and force until indicator hit
MOVEINDVACWAIT	Move axis to a specific position, continue with reduced speed and force until indicator activated and turn vacuum on or off.
MOVESEND	Move axis to a specified position and continue with reduced speed and force
MOVESENDHOLD	Like a MOVESEND, but use a lower hold force once the axis has stopped
MOVESLOWMOVE	Move axis to a specified position but reduce speed over a specified interval (go fast – go slow – go fast to final position)
MOVETOIND	Move a board on the conveyor transport belt relative to a conveyor sensor
MSETDYN	Initiate axis
NODEFUNC	Read name of the primary function for a CMOT board
NODENAME	Read CAN version of a CMOT board
NODESTARTED	Check startup status for a CMOT board
PASSIV	Turn off all motor currents for an axis
PINOFF	Turn magazine push-up solenoids off
PINON	Turn a magazine push-up solenoids on
POTSTART	Start the glue pot rotation
POTSTOP	Stop the glue pot rotation
PUMP	Start/stop the vacuum pump
READCALIBLEV	Read conveyor board edge sensor calibrated level
READCOUNT	Read transducer count of an axis
READEEPROM	Read eeprom data from a CMOT board
READIND	Read status of all conveyor board detection sensors
READINDEX	Read the axis position where the index pulse was last found. Used for detecting encoder drift. Currently only implemented for CAN-Y hardware.
READMAGINDEXPOS	Read index pulse position and its limits in an ALM magazine.
READMAGREV	Read revision codes from ALM magazines.
READPAR	Read parameter values
READPORTS	Read status ports from a CMOT board
READPOS	Read axis position
READSERVOPAR	Read internal servo parameter
READSIZESWITCH	Read the size switch on the conveyor
READSTAT	Read the status on an axis

Command	Description
READSTEPCNT	Read step-counter value from an ALM magazine
READVERSION	Read the servo version
READVOLTLEV	Read the internal voltage and current levels
REINITIALIZE	Read configuration files in the hwi process
RELEASEBOARD	Release a board in a conveyor by moving the hold axis downwards or the width axis outwards. This command works even if the axis in uninitialized.
RESET	Perform a hardware reset on the motor controller board.
RESETCOUNTER	Reset the position counter for the conveyor transport belt
SAFE	Check the safety switches
SAVEEEPROM	Write eeprom data to a CMOT board
SERNUMBER	Read serial number for a CMOT board
SETACTIONMODE	Set run mode of a CMOT board
SETCURRENT	Set current at any output stage for a CMOT board
SETLATCHH	Set HYDRA latches
SETLOGMODE	Set the hwi logging mode
SETLOGSET	Start internal logging in servo
SETMAGLED	Set leds of a magazine
SETSERVOPAR	Set servo parameter
SETSMEMA	Set conveyor smema signals
SETTRIGOFFSET	Set board edge sensor trig level
SETVALVH	Control HYDRA vacuum valves
SOFTWARE VERSION	Read Altera version of a CMOT board
STARTCITY	Start CMOT board
STARTUPSTATUS	Read the startup status of a CMOT board
TEST	Send special command to a process on a MOT board
TESTDM	Send special command to process D on MOT board M
TESTEM	Send special command to process E on MOT board M
TRANSF	Send special message to a MOT board
VACSENS	Read vacuum and force sensors for axis
VALVA	Open/close air valve for Z
VALVP	Open/close vacuum valve for Z
VIBR	Resume/hold vibratory magazine operation
WAITFORIND	Wait for a specified state on one or more of the conveyor board detection sensors.

Command	Description
WAITPOS	Wait for axis to reach a specified position
WAITPOSLATCHHZ	Waits for HYDRA Z axis to reach a specified position and then sets HYDRA latches
WAITSMEMA	Wait for a smema signal
ZEROTIME	Restart the clocks on the CMOT boards
ZLOCK	Open/close Z lock

Status Codes

This is a list of the status codes returned. A command can only return a selected set of status codes.

The status code 0 means "OK". This status is never displayed in the message log.

MOT-Command/1: Mechanical stop (movind, movsend, movgo, magstepoffset)

Indicates that movement stopped before time-out.

- Friction high.

- Force or speed to low (may be controlled by parameter).

- Mechanical problem.

MOT-Command/2: Time out (movind, movsend, movgo)

Indicates that movement stopped by time-out.

- Force or speed to low (may be controlled by parameter).

- Mechanical problem.

MOT-Command/3: At target (movind, movgo)

Information message.

- Force or speed to low (may be controlled by parameter).

- Mechanical problem.

MOT-Command/4: Mechanical stop after ind. (movind)

Information message.

- Force or speed to low (may be controlled by parameter).

- Mechanical problem.

MOT-*Command*/17: Cannot activate magazine LEDs

No contact with magazine.

- Hardware problem.

MOT-*Command*/**18: Cannot access magazine hardware**

No contact with magazine.

- Hardware problem.

MOT-*Command*/**19: Cannot read from magazine**

No contact with magazine.

- Hardware problem.

MOT-Command/**20: Magazine missed stop position**

Error in magazine step operation.

- Magazine hardware problem.

MOT-*Command*/**21: Illegal magazine**

Unknown magazine type.

- Magazine hardware problem.

MOT-*Command*/**22: Illegal magazine**

Unknown magazine type.

- Magazine hardware problem.

MOT-*Command*/**23: Couldn't find calibration value at all**

Cannot read force sensor on 3PT1 board.

- Hardware problem (check 3PT1 board).

MOT-*Command*/**24: Calibration signal too shaky**

Force sensor signal not good during calibration.

- Hardware problem (check 3PT1 board).

- Electrical noise cause signal problem.

MOT-*Command*/**25: Z indicator shaky**

Force sensor signal not good.

- Hardware problem (check 3PT1 board).

- Electrical noise cause signal problem.

MOT-*Command*/**26: Z indicator uncalibrated**

A message was sent that involved the Z indicator but the Z indicator is not calibrated.

- Software problem.

MOT-*Command*/27: Message wait timeout

No reply from MOT-board.

- Hardware problem (communication failed).

- MOT-board faulty.

- More than one process tries to communicate with the servo programs.

MOT-*Command*/28: Couldn't find Z indicator value at all

Hardware problem.

MOT-*Command*/29: Illegal magazine

Unknown magazine type.

- Magazine hardware problem.

MOT-*Command*/30: Illegal magazine

Unknown magazine type.

- Magazine hardware problem.

MOT-*Command*/31: Missed flash position

X Axis receives HYDFLASH command too late to be able to serve it.

- Wrong parameters.

- Software error.

MOT-*Command*/32: Error in HYDB communication

Failed to communicate with the HYDB-board.

- Error in serial communication hardware on Board Z.

- Error in HYDB board.

- HYDB board not properly connected.

- Other hardware problem.

MOT-*Command*/33: No magazine in slot

Tried to step magazine that was not inserted.

- Software error.

MOT-*Command*/34: Magazine type not supported

Unknown or old magazine type.

- Magazine hardware problem.

MOT-*Command*/**35: Transducers out of sync**

Indicates a transducer synchronization problem for the X transducers.

- Faulty transducers.

- Transducers connection problem.

- Electrical noise cause transmission problems.

Hint: Redo the xCalibrate procedure.

MOT-*Command*/**36: Transducer drift too big**

Indicates that the HYDRA theta belt slips in the drive wheel.

- HYDRA Theta belt spring too weak.

- HYDRA Theta belt dirty.

MOT-*Command*/**37: Unreasonable latchpos measured**

Measured HYDRA Z axis latch position value during initialization out of bounds.

- Mechanical problems (HYDRA Z axis).

MOT-*Command*/**38: Latchpos measurement not repeatable**

Measured HYDRA Z axis latch position value during initialization not stable.

- Mechanical problems (HYDRA Z axis).

MOT-*Command*/**40: Illegal servo program**

Servo program not compatible with hardware.

- Configuration error.

MOT-*Command*/**41: Illegal MOT board version**

Servo program not compatible with motor controller of this version.

- Configuration error.

MOT-*Command*/**42: Motor off but still moving**

Motor is moving when it should stand still.

- Current amplifier offset.

MOT-*Command*/**50: Z axis not in uppermost position**

Z axis not in safe position while HYDRA Z is activate.

- XWB3 board faulty.

- Bad supply voltage.

MOT-*Command*/51: HZ axis not in uppermost position

HYDRA Z axis not in safe position while Z is activate.

- XWB3 board faulty.

- Bad supply voltage.

MOT-*Command*/60: TZ path safety sensor activated.

TZ path safety sensor indicates that TEX Z axis cannot be moved.

- Pallet stuck in TEX.

- Sensor faulty.

MOT-Command/61: TEX EEPROM does not respond correctly

MOT-Command/62: TEX EEPROM write protected

MOT-Command/63: Servo command parameter length mismatch

MOT-Command/64: Cannot move TZ because TY1 or TY2 is not in free area

MOT-Command/65: Internal TEX servo error, command not initiated

MOT-*Command*/66: Cannot follow/match the calculated moving curve

MOT-*Command*/67: Critical servo error

MOT-*Command*/68: Axis already occupied with another move

MOT-*Command*/69: Motor relay does not follow orders. Relay stuck.

MOT-*Command*/70: Error when calculating way planning of move

MOT-*Command*/71: Bad data in EEPROM

MOT-Command/128: Board jammed in conveyor

System failed to load/unload board.

- Board stuck in conveyor.

- Wrong Y-axis servo program (configuration error).

MOT-*Command*/**129: No such command in this motor controller**

Illegal command sent to MOT board.

- Software error.

- Configuration error.

MOT-*Command*/**137: Cannot calibrate force sensor**

Force sensor level not within limits.

- Force sensor dirty (inside Z tool holder).

- Bad force sensor connection.

MOT-*Command*/**139: Magazine blocked or lost connection**

Cannot step magazine. Magazine does not respond correctly.

- Magazine hardware problem.

MOT-*Command*/**140: Tried to use a nonexisting magdriver**

Unrecognized magazine type.

- Internal software error.

MOT-*Command*/**141: Checksum error in load transfer**

Failed to load software to MOT-board.

- MOT board faulty.

- Communication hardware problem (electrical noise).

MOT-*Command*/**143: Position out of bounds, lower end**

Specified position not within range.

- Parameter error.

- Configuration error.

- Software error.

MOT-*Command*/**144: Position out of bounds, upper end**

Specified position not within range.

- Parameter error.

- Configuration error.

- Software error.

MOT-Command/149: Bad MCALIB command

Wrong parameters for electrical verifier.

- Internal software problem.

MOT-*Command*/153: Tried to address a nonexisting feeder

Tried to step a magazine feeder that does not exist.

- Internal software problem.

MOT-Command/156: Motor timeout

Did not reach specified position.

- Hardware problem.

MOT-*Command*/157: Magazine slot No. out of bounds

Tried to step magazine in a position that does not exists.

- Internal software problem.

MOT-*Command*/159: Result buffer overflow

MCALIB internal error.

- Internal software problem.

MOT-*Command*/160: Fatal error, NMI in NMI

Controller error.

- Internal software problem.

- Hardware error.

MOT-*Command*/161: CODSP not present

The CODSP board on MOT3 is missing.

- Missing or broken CODSP board.

MOT-*Command*/162: DSP DL_CALC timeout

Internal DSP error.

- Internal software problem.

MOT-*Command*/163: Illegal value of DSP command argument

Servo command caused illegal value in DSP code.

- Internal servo program error.

- Illegal servo command parameter (TPSys error).

MOT-*Command*/**164: DSP command error**

Servo command caused a DSP command error.

- Internal servo program error.

MOT-*Command*/**165: DSP reserved error**

Not yet used.

MOT-*Command*/**166: DSP controller error**

The DSP servo cannot control the motor(s) properly.

 Problem with power supply, motor current too low.

- Mechanical problem, friction too high or tool stuck in Z.

MOT-*Command*/**167: DSPLink protocol violation**

Internal DSP servo error.

- Internal software problem.

MOT-*Command*/**168: DSP software failure**

Internal DSP software failure.

- Internal software problem.

MOT-*Command*/**169: DSP hardware error**

Hardware problem with DSP board or MOT3 board.

- Hardware error.

MOT-*Command*/**173: Motor warm too long**

Simulated motor temperature over safe limit too long.

- Transducer drift cause high currents.

- Software problem.

MOT-*Command*/**186: Transducers do not agree**

X axis transducers difference too high.

- Faulty transducer.

- Transducers connection problem.

- Electrical noise cause transmission problems.

- Configuration error (wrong X servo program).

MOT-*Command*/**187: Motor hot**

Simulated motor temperature over critical limit.

- Transducer drift cause high currents.

- Software problem.

MOT-*Command*/188: No glue station present

Tried to start glue station when no glue station present.

- Internal software problem.

MOT-*Command*/189: Magazine tape collector blocked

Failed to complete magazine step operation.

- Magazine hardware problem.

- MOT board M problem.

- MI-board problem.

MOT-*Command*/190: Servo program not initiated

Information message. This is not always an error.

- Magazine hardware problem.

- MOT board M problem.

- MI-board problem.

MOT-*Command*/195: Conveyor support motor cannot stop

The conveyor support movement did not stop when requested.

- Conveyor hardware problem.

- MOT board M problem.

- MI-board problem.

MOT-*Command*/196: LOADBRD with support down sensor NOT activated

Conveyor load interrupted because support down sensor not activated.

- Support-down sensor faulty.

MOT-*Command*/197: No board to fetch

Conveyor load interrupted because support down sensor not activated.

- Support-down sensor faulty.

MOT-*Command*/198: Board positioning failed

Conveyor load interrupted because support down sensor not activated.

- Support-down sensor faulty.

MOT-*Command*/**199: Board too long**

Conveyor load interrupted because support down sensor not activated.

- Support-down sensor faulty.

MOT-*Command*/**200: Board lost during transport**

Conveyor load interrupted because support down sensor not activated.

- Support-down sensor faulty.

MOT-*Command*/**201: Board has disappeared**

Conveyor load interrupted because support down sensor not activated.

- Support-down sensor faulty.

MOT-*Command*/**202: Conveyor motor cannot stop**

Conveyor load interrupted because support down sensor not activated.

- Support-down sensor faulty.

MOT-*Command*/**203: Board stuck**

Conveyor load interrupted because support down sensor not activated.

- Support-down sensor faulty.

MOT-*Command*/**204: Cannot get rid of board**

Conveyor load interrupted because support down sensor not activated.

- Support-down sensor faulty.

MOT-*Command*/205: Motor speed out of control
Motor speed deviates from expected speed.

- Problem with power supply, motor current too low.

- Mechanical problem, friction too high or tool stuck in Z.

MOT-*Command*/**214: Illegal precision code**

Precision code for motor move operation not defined.

- Internal software problem.

MOT-*Command*/**217: Illegal transducer correction data**

Illegal values in X servo internal calibration tables.

- X belt damaged.

- Internal software problem in Xcalibrate.

MOT-*Command*/218: Illegal value of parameter 0

Illegal parameter for command.

- Parameter error.

- Internal software error.

MOT-Command/219: Illegal value of parameter 1

Illegal parameter for command.

- Parameter error.

- Internal software error.

MOT-Command/220: Illegal value of parameter 2

Illegal parameter for command.

- Parameter error.

- Internal software error.

MOT-*Command*/221: Timeout requesting MagLink channel

- Internal software error.

MOT-*Command*/222: Data size calculation error

- Internal software error.

MOT-Command/223: MagLink call timeout

- Internal software error.

MOT-*Command*/224: Data verification error while sending

- Internal software error.

MOT-*Command*/225: Data error while receiving

- Internal software error.

MOT-*Command*/226: Address of client reply does not match

- Internal software error.

MOT-*Command*/227: Bad format of address from client

- Internal software error.

MOT-*Command*/228: Bad format of error code from client

- Internal software error.

MOT-*Command*/**229: Bad length word format**

- Internal software error.

MOT-*Command*/**230: Short timeout waiting for reply has expired**

Contact with maglink unit (TEX) broken.

- Internal software error.

MOT-*Command*/**231: Error storing command for polling**

Contact with maglink unit (TEX) broken.

- Internal software error.

MOT-*Command*/**232: Bad hardware type detected**

Contact with maglink unit (TEX) broken.

- Internal software error.

MOT-*Command*/**233: Short timeout waiting for transmit has expired**

Contact with maglink unit (TEX) broken.

- Internal software error.

MOT-*Command*/**234: Protocol violation**

Contact with maglink unit (TEX) broken.

- Internal software error.

MOT-*Command*/**240: Power down**

Not used.

MOT-*Command*/**241: Motor controller internal s/w error**

- Internal software error.

MOT-*Command*/**242: PAIB problems**

- Internal software error.

MOT-*Command*/**243: Y-wagon safety switch activated**

Y covers not closed.

- Operator action

MOT-*Command*/**244: Emergency stop button activated**

Emergency switch activated.

- Operator action.

MOT-*Command*/245: Motor drive inhibited

X belt motor drive (ELMO amplifier) unexpectedly shut off.

- ELMO supply voltage too low.

- Supply voltages from Booster to PAIB board too low.

- PAIB board failure.

- ELMO failed.

- Problem with main supply voltage.

MOT-Command/246: Light curtain triggered

Light curtain activated.

- Obstacles in X path.

- WSR/TST board problem.

MOT-*Command*/247: X wagon fan not working

Obsolete.

- Obstacles in X path.

- WSR/TST board problem.

MOT-*Command*/248: Door open

X covers open.

- Operator action.

MOT-*Command*/250: Light curtain test failed

Sender or receiver failed during test of light curtain either in active or passive state.

- Solder blob S1 on TST2 board not removed.

- Light curtain disconnected.

- Electrical problem.

MOT-*Command*/1008: Command buffer full

Too many multiple commands sent to servo.

- Internal software error, TPSys/servo.

MOT-*Command*/1010: Axis is busy (not idle)

Axis is occupied, unable to service command.

- Internal software error, TPSys/servo.

MOT-*Command*/1012: Command timeout

Time limit expired in command.

- Internal servo software error.

MOT-*Command*/**1019: Invalid command argument**

Wrong command argument sent to servo.

- Internal software error, TPSys/servo.

MOT-*Command*/**1021: Command parameter error**

- Internal software error, TPSys/servo.

MOT-*Command*/**1027: Cannot follow reference trajectory, speed too low**

Speed to low.

- Axis blocked.

- Motor damaged.

MOT-*Command*/**1029: Controller signal is saturated**

Maximum output used during movement.

- Axis blocked.

- Friction too high.

- Motor damaged.

MOT-*Command*/**1030: Error in GENMOVE entry 0**

Motion trajectory calculation error

- Internal software error

MOT-*Command*/**1034: 5 volt MI too low. Magazine bus deactivated**

5 volt on magazine bus was detected too low. Magazine bus deactivated.

- Short circuit on magazine bus.

MOT-*Command*/**1035: MCU probably connected wrong (5 volt MI too low after power up)**

Short time after power up, 5 volt detected to low. Magazine bus deactivated.

- Short circuit on magazine bus..

MOT-*Command*/**1036: Multiple controllers connected to the magazine bus (5 volt MI too high before power up).**

Detected 5 volt before power up. Magazine bus not activated.

- Multiple controllers connected to magazine bus..

MOT-*Command*/**1037: Short circuit in magazine bus, bus was shut down**

Current measured too high on magazine bus. Magazine bus deactivated.

- Short circuit on magazine bus.

MOT-*Command*/**1038: Timeout in command queue**

Time limit expired in command queue.

- Internal servo software error.

MOT-*Command*/**1039: Index pulse missing**

Index pulse not found during initialization.

- Index pulse not adjusted.

- Movement blocked.

- Transducer faulty.

MOT-*Command*/**1040: Axis is moving while issuing RESETCOUNTER command**

Axis is moving when RESETCOUNTER command received.

- Internal software error, TPSys/servo.

MOT-*Command*/**1043: Position too small**

Target position outside limits.

- Internal software error, TPSys/servo.

MOT-*Command*/**1044: Position too large**

Target position outside limits.

- Internal software error, TPSys/servo.

MOT-*Command*/**1051: Tasklist full**

Too many tasks to handle in servo.

- Internal servo software error.

MOT-*Command*/**1052: Resource already locked**

Resource could not be used. Resource already locked by another task in servo.

- Internal software error, TPSys/servo.

MOT-*Command*/**1053: Invalid function call**

Command could not be executed by servo.

- Internal software error, TPSys/servo.

MOT-*Command*/**1054: Wrong state in the internal state machine**

- Internal servo software error.

MOT-*Command*/**1055: Index pulse has wrong position**

Index pulse not within limits.

- Index pulse not adjusted.

- Movement blocked.

MOT-*Command*/**1056: Feeder friction too high**

Force too high during magazine stepping.

- Feeder jammed.

- Magazine movement blocked.

MOT-*Command*/**1057: Magazine revision not handled by servo**

Revision of magazine not compatible with servo.

- Revision selector set wrong in magazine.

- Servo not updated.

MOT-*Command*/**1058: Magazine movement too long**

During initialization of magazine, movement was found too long.

- Type selector set wrong in magazine.

- Mechanical stop removed.

MOT-*Command*/**1059: Magazine movement too short**

During initialization of magazine, movement was found too short.

- Magazine movement blocked.

- Type selector set wrong in magazine.

MOT-*Command*/**1182: Cooling fan failure. Open circuit**

Current level too low to fan.

- Fan not connected.

- Cable failure.

MOT-*Command*/**1183: Cooling fan failure. Short circuit**

Current level too high to fan.

- Short circuit in cable or motor.

MOT-*Command*/**1230: Front hood open**

MOT-*Command*/**1231: Rear hood open**

MOT-*Command*/**1232: Hood switches error**

Hood switches is not working correctly

- Front or back hood is not fully closed

- Hood switches misaligned

- Hood switches broken or cable broken

MOT-*Command*/**1233: External conveyor hood open**

MOT-*Command*/**1234: Motor relay error**

Motor relay is not responding correctly.

- Relay cable error.

- Relay broken

MOT-*Command*/**1236: Motor amplifier error**

Motor amplifier has tripped or is broken.

MOT-*Command*/**1237: Amplifier phasing failed**

Motor amplifier failed during initialization

MOT-*Command*/**1238: Y-amplifier not phased**

Amplifier is not initialized

MOT-*Command*/**1240: Unknown Y-unit (Y-mass data missing)**

Unrecognized Y-unit. Hardware configuration is wrong.

MOT-*Command*/**1242: Linear encoder error**

The linear encoder is faulty.

- Encoder is not correctly adjusted

- Linear encoder scale is dirty or damaged

- Encoder is broken

MOT-*Command*/**1243: Linear encoder cable error**

Encoder cable is not connected or it is broken.

MOT-*Command*/**1245: J3 cable error**

J3 cable on YMB is broken or disconnected.

MOT-*Command*/**1246: J2 cable error**

J2 cable on YMB is broken or disconnected.

MOT-*Command*/**1248: Amplifier setup error, programming during startup failed**

Amplifier firmware update has failed.

MOT-*Command*/**1300: Unknown conveyor type**

Conveyor type rotary switch is incorrectly set.

MOT-*Command*/**1302: The indicator mask was met too early**

The board edge sensors are confused.

- PCB may have moved out of position on the conveyor band

- Board handler parameters may be incorrectly set

MOT-*Command*/**1320: The feeder has not received a solenoid**

Communication error between TPSys processes

- Internal software error.

MOT-*Command*/**32000: No command specified**

Communication error between TPSys processes

- Internal software error.

MOT-*Command*/**32001: Unknown command**

Communication error between TPSys processes.

- Internal software error.

MOT-*Command*/**32002: Bad arguments**

Communication error between TPSys processes.

- Internal software error.

MOT-*Command*/**32003: No free message identifiers**

- Internal software error.

MOT-*Command*/**32004: Message wait timeout**

No reply from MOT-board

- Hardware problem (communication failed)

- MOT-board faulty

MOT-*Command*/32005: Write error

Failed to write to CMOT-board

MOT-*Command*/32006: Read error

Not used.

MOT-*Command*/32007: No available hardware

TPSys attempted to send a command to a nonexistent hardware unit.

- Incorrect hardware configuration. Run `hwconf`.

- Software error.

MOT-*Command*/32008: File transfer busy

Not used.

MOT-*Command*/32009: Internal file transfer error

Communication error between hwi and a CMOT board.

- Software error

MOT-*Command*/32010: Cannot open file

Communication error between hwi and a CMOT board.

- Software error

MOT-*Command*/32011: Incorrect axis

- Internal software error.

MOT-*Command*/32012: Pack error

- Internal software error.

MOT-*Command*/32013: Internal startup error

- Internal software error.

MOT-*Command*/32014: Ioctl error

Failed to reset MOT board.

- Hardware problem

MOT-*Command*/32015: Reset error

MOT board did not answer after reset.

- Hardware problem

MOT-*Command*/**32016: Position underflow**

An application tried to move an axis to a negative position.

- Error in parameter setup

- Error in package or assembly data.

- Software problem

MOT-*Command*/**32017: Position overflow**

An application tried to move an axis to a position greater than allowed by the message protocol.

- Software problem

- Error in parameter setup

- Error in package or assembly data.

MOT-*Command*/**32018: Cannot read parameter file**

Not used.

MOT-*Command*/**32019: Hardware busy**

An application tried to use hardware that was already in use by some other application.

- Operator action

MOT-*Command*/**32020: Illegal acceleration code**

Invalid acceleration code was used.

- Software error

MOT-*Command*/**32021: System call failed**

TPSys tried to run another program and failed.

- Software error

MOT-*Command*/**65004: Busy with file transfer**

TPSys tried communicate with CAN node during file transfer

- Software error

MOT-*Command*/**65100: One or more config. file(s) checksum error.**

Configuration file(s) corrupt.

- Software error

MOT-*Command*/65101: One or more config. file(s) of wrong type.

Wrong configuration file(s) loaded to CAN node. E.g. conveyor software loaded to a magazine controller.

- Software error

MOT-*Command*/65102: Configuration using one or more configuration files failed.

Problems during configuration of a CAN node

- Software error

MOT-*Command*/65200: Power up selftest (POST) failed.

Problems starting a CAN node after configuration.

- Hardware or software error

MSETDYN Status Codes

This is a list of the status codes returned by the msetdyn command.

MOT-MSETDYN/1: msetdyn returned 1

Servo program returned invalid status code.

- Software problem.

MOT-MSETDYN/2: lower end point not repeatable

End stop position not constant (checked during initialization).

- Mechanical problem.

- Check end stop hardware for loose screws etc.

MOT-MSETDYN/3: upper end point outside limits

The measured mechanical range for axis is not within specified limits.

- Mechanical problem.

MOT-MSETDYN/4: transducer ch. 1 ptp value too low

Transducer signal not within limits or dead.

- Problem with transducer connection.

- Problem with motor connection.

MOT-MSETDYN/5: transducer ch. 2 ptp value too low

The same as for MSETDYN-4.

MOT-MSETDYN/6: transducer ch. 1 ptp value too high

The same as for MSETDYN-4.

MOT-MSETDYN/7: transducer ch. 2 ptp value too high

The same as for MSETDYN-4.

MOT-MSETDYN/10: lower end point outside limits

Mechanical range not within specified limits.

- Mechanical problem.

MOT-MSETDYN/11: upper end point outside limits

Mechanical range not within specified limits.

- Mechanical problem.

MOT-MSETDYN/12: position counter dead

The servo program tries to move an axis but there are no signals from the transducers.

- Problem with transducer connection.

- Problem with motor connection.

MOT-MSETDYN/13: msetdyn returned 13

Servo program returned invalid status code.

- Software problem.

MOT-MSETDYN/14: msetdyn returned 14

Servo program returned invalid status code.

- Software problem.

MOT-MSETDYN/15: msetdyn returned 15

Servo program returned invalid status code.

- Software problem.

MOTIONDEV Group

Joystick and trackball interface routines

MOTIONDEV 0: Parameter file read error

Cannot read parameter.

- Corrupted parameter file.

- Software error.

MOTQ Group

These messages are generated by the MOT communication interface library.

MOTQ-0: Send byte-timeout

Failed to send data to a MOT-Board.

- Hardware problem.

MOTQ-1: Receive byte-timeout

Failed to read data from a MOT board.

- Hardware problem.

MOTQ-2: Too long message received

A message was received that contained more data than the protocol allows.

- Internal software problem.

- Software error in motor control program.

- Hardware problem.

MOTQ-3: Bad message number

An application tried to send a message that is not defined.

- Internal software problem.

MOTQ-4: Tried to send too long message

An application tried to send a message that contains more data the protocol allows.

- Internal software problem.

MOTQ-5: Board did not wake after reset

Not used.

MOTQ-6: Board A did not wake after reset

Not used.

MOTQ-7: Board C did not wake after reset

The MOT board in position C did not answer after reset.

- Hardware problem.

MOTQ-8: Board M did not wake after reset

The MOT board in position M did not answer after reset.

- Hardware problem.

MOTQ-9: Board T did not wake after reset

Obsolete.

MOTQ-10: Board X did not wake after reset

The MOT board in position X did not answer after reset.

- Hardware problem.

MOTQ-11: Board Y did not wake after reset

The MOT board in position Y did not answer after reset.

- Hardware problem.

MOTQ-12: Board Z did not wake after reset

The MOT board in position Z did not answer after reset.

- Hardware problem.

MOTQ-13: Stepper killed me

Aborted by stepper.

- Operator action.

MOTQ-14: Position underflow

An application tried to move an axis to a negative position.

- Error in parameter setup.

- Error in package or assembly data.

- Software problem.

MOTQ-15: Position overflow

An application tried to move an axis to a position greater than allowed by the message protocol.

- Software problem.

- Error in parameter setup.

- Error in package or assembly data.

OPTCENT Group

These messages are generated by the optical centering vision routines when using LSCs or DVCs to take the image or when using a LSC to perform a calibration.

OPTCENT-0: Phase error

Synchronization error between the client process (Mounter) and the server process (Img).

- Internal software error. Make a 'savestat' diskette and send it to MYDATA.

OPTCENT-1: Unknown device

The package is not defined in the package database

- The package is not defined or the package name is misspelled in either the package or the component database

OPTCENT-2: Invalid coordinate transform

Not used so far.

Error in camera parameter file (no. 53-58)

- Corrupt parameter file

- Software error

OPTCENT-3: Cannot read correction data. (Try to re-calibrate camera)

Error in calibration data

- Re-calibrate the camera

OPTCENT-4: Failed to initialize Linescan Camera

Not used so far

The system failed to send data to line scan camera hardware

- Hardware error

- Connectors not properly inserted

- Software problem

OPTCENT-5: Frame grabbing failed

The frame grabber hardware failed to acquire an image from the selected camera.

- The coaxial cable from the camera is not connected to the frame grabber

- Hardware error (the linear encoder, the frame grabber board, the camera box, interrupt conflicts...)

- For the linescan cameras: The speed of the x-wagon is too high (>2.1m/s). Check parameter 57:0211 or 58:0211.

- Software error

OPTCENT-6: Uninitialized correction data

Internal error.

The selected camera not properly calibrated.

- Software error

OPTCENT-7: Uninitialized image buffer

Internal error. Buffer for image not initialized.

- Software error

OPTCENT-8: Wrong tool model. Inspection aborted

Internal software error.

- Software error

OPTCENT-9: Wrong package type. Inspection aborted

Selected package not in package list.

- Check package data

- Check component data

OPTCENT-10: Internal error while accessing package database

Internal software error.

- Software error

OPTCENT-12: Calibration I/O error

Error during calibration.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA

OPTCENT-13: Invalid image in calibration

Can not acquire a proper image during calibration

- Calibration plate damaged

- Linear encoder damaged or not properly installed

- Linear encoder scale dirty

- Earlier phase in calibration failed (LUT tabled not calibrated)

OPTCENT-14: Invalid state during LSC calibration

Internal error. during calibration of line scan camera.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA

OPTCENT-15: Unknown state during LSC calibration

Internal error during calibration of line scan camera.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA

OPTCENT-16: Failed to write calibration data to database

The system could not update or create the database file containing calibration data for the Line scan camera.

- There is no space on the hard disk

- Hard disk failure

OPTCENT-17: Component too big for camera field of view

Required a field of view too large for camera

- Error in package data

- Error in component list

- Error in camera parameter file (no. 53-58). Check the kxx and the kyy values (parameters xx:0310 and xx:0311)

OPTCENT-18: Different pixel sizes. Damaged sensors

The calibration routine has read a distorted image.

- Linear encoder damaged or not properly installed

- Linear encoder scale dirty

OPTCENT-19: Bad reference plate

The system cannot find reference marks on background.

- Reference plate dirty or damaged

- Reference plate not properly aligned

OPTCENT-20: Calibration plate misaligned

The calibration plate was not displayed in the correct angle or position.

- Calibration plate pick failed

- Calibration plate hit some object after pick

OPTCENT-21: Internal error during LSC calibration.

Internal error during calibration of line scan camera.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA

OPTCENT-22: LUT calibration failed

The LUT calibration phase failed

- Retry calibration

- Calibration plate damaged

OPTCENT-23: Failed to read parameter file

During calibration of the Line scan camera the system failed to read the cameras parameter file. This is file no. 57 or 58.

- Check if the file is corrupt. Run the HW config program.

OPTCENT-24: Internal error. Wrong type of LSC calibration order

Internal error.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA

OPTCENT-25: Too high deviation in rotation center measurements

When measuring the Hydra tool "Centering offsets" the standard deviation of the measurements for one or more heads is bigger than the value given by parameter 41.0151.

- Linear encoder damaged or not properly installed

- Linear encoder scale dirty.

- Change synchronization source of the LSC to "X motor sensor" (parameter 57.0481 or 58.0481) if the linear encoder cannot be used.

OPTCENT-26: Not enough frame grabber memory for this operation

The image that was going to be acquired from the selected camera was too big.

- HW error on the frame grabber board

- Wrong version of the frame grabber board

- Error in camera parameter file (no. 57-58). Check the kxx values (parameters xx:0310)

OPTCENT-45: Package presentation angle not in [0, 90, 180, 270]deg

Package presentation angle not an even multiple of 90 degrees. This error can only happen in the Z-head offsets installation routine.

- Check parameter 67:0012

- Internal error

OPTCENT-46: Number of lead groups in package data negative or zero

The package definition holds less than one lead group.

- Package was defined without lead groups. A probable cause is that a generic BGA package was defined and accidentally all lead groups were deleted.

- Package data corrupt.

OPTCENT-47: Too few number of leads in lead group.

One or more lead groups contain too few leads/bumps.

- An outline package was defined with a too big "Edge point pitch". It should not be longer than half of the length of the shortest side of the package.

- A lead group was defined holding less than one lead/bump. This is unlikely to happen, as the package editor should check for these errors.

OPTCENT-48: Incorrect group flag

Internal error. Should not happen.

- Internal software error . Make a 'savestat' diskette and send it to MYDATA

OPTCENT-49: Incorrect lead position

Not used.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA

OPTCENT-50: Lead diameter or lead group pitch negative or zero

One or more lead groups were detected as having leads with diameters less than or equal to zero or a lead pitch less than or equal to zero.

- Error in package data.

OPTCENT-51: Lead group pitch negative or zero

The pitch defined for the package in the package database is negative or zero.

- Error in package data.

OPTCENT-52: Lead diameter greater than or equal to lead group pitch

One or more lead groups were defined with a lead/bump diameter greater than or equal to the lead group pitch. This means that the leads/bumps overlap.

- Error in package data.

OPTCENT-53: Lead diameter greater than or equal to pitch

The defined lead diameter is larger than the defined pitch for one or more lead groups in the package.

- Error in package data.

OPTCENT-54: Parameter maxCrosswiseDev OR maxLengthWiseDev negative or zero

One or more lead groups were defined with a value of the max crosswise or the max lengthwise deviation less than or equal to zero.

- Error in package data

OPTCENT-55: Package data 'Search noise' or 'Search contrast' negative or zero

One or both of the parameters Search noise / Search contrast, subsection Optical Centering Data, were detected as being less than or equal to zero.

- Error in package data

OPTCENT-56: Package data 'Measure noise' or Measure contrast' negative or zero.

One or both of the parameters Search noise / Search contrast, subsection Optical Centering Data, were detected as being less than or equal to zero.

- Error in package data.

OPTCENT-57: Internal preparation error

Not used.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA

OPTCENT-58: Number of measure groups negative or zero

Not used.

- Make a 'savestat' diskette and send it to MYDATA

OPTCENT-59: Could not allocate memory

Not used.

- Make a 'savestat' diskette and send it to MYDATA

OPTCENT-60: Lead group angle not in [0, 90, 180, 270]deg

Lead group orientation not equal to a multiple of 90 degrees.

- This is most likely to happen for a generic package of type BGA. Check that all lead group angles, package parameter Angle in subsection Lead Group, exactly matches 0, 90, 180 or 270 degrees.

OPTCENT-61: Warning singular user transform

A coordinate transform failed due to a singular or near singular transformation matrix.

- One or more of the parameter files 53-58 may be corrupt.
  If this is the case one or more of the parameters xx:0441, xx:0442, xx:0441 and xx:0442 have an illegal value.

OPTCENT-62: LSC reference pattern not found

The system could not find reference pattern in the picture

- Reference pattern damaged or dirty

- Linear encoder damaged or not properly installed

- Linear encoder scale dirty

- The calibration of the line scan camera has failed

OPTCENT-63: Chip corner not found. Number:*<Corner number>* B:*<Background noise>* C:*<Contrast>*

<Corner number>
> First not found chip corner

<Background noise>
> The measured background noise.

<Contrast>
> The measured contrast.

A chip package corner was not found with a contrast above the specified limit and a background noise level below the specified limit.

- Contrast limit, Search contrast subsection Optical Centering Data, is too high.

- Noise limit. Search noise in subsection Optical Centering Data, too low.

- Bad contrast between chip package and background. Adjust light levels and or light pattern.

OPTCENT-64: Singular angle search data, cannot calculate package angle.

Software was unable to accurately calculate the component angle.

- This error can only occur for very small components with few leads or too sparse distribution of edge points around the component outline.

OPTCENT-65: Lead group angle not within +-45deg

The component was estimated to have an angle larger than ±45 degrees.

- All leads were found but the data used for calculating component angle is unreliable.

OPTCENT-66: Lead contrast below limit. G:<Group> L:<Lead> B:<Background noise> C:<Contrast> D:<Deviation>

<Group>

Lead group

<Lead>

The number of the first lead or image point in the lead group that was not found

<Background noise>

The measured background noise.

<Contrast>

The measured contrast.

<Deviation>

Not valid in this message

A lead / bump was found with a contrast below the specified limit.

- The inspected component has a missing lead / bump.

- Contrast limit, Measure contrast subsection Optical Centering Data, is too high.

- Component and package bump configuration match but package definition needs fine-tuning, e.g. lead diameter.

- Bad contrast between leads/bumps and background. Adjust light levels and or light pattern.

OPTCENT-67: Background variance above limit. G:*<Group>* L:*<Lead>* B:*<Background noise>* C:*<Contrast>* D:*<Deviation>*

<Group>

Lead group

<Lead>

The number of the first lead or image point in the lead group that was not found

<Background noise>

The measured background noise.

<Contrast>

The measured contrast.

<Deviation>

Not valid in this message

A lead / bump was found with a background variance above the specified limit.

- The inspected component has a missing lead / bump.

- Contrast limit, Measure variance subsection Optical Centering Data, is too low.

- Component and package bump configuration match but package definition needs fine-tuning, e.g. lead diameter.

- Bad contrast between leads/bumps and background. Adjust light levels and or light pattern.

OPTCENT-68: Too high deviations. Could not fit package

Bent leads detected and the best-fit algorithm failed to fit package.

OPTCENT-69: Cross-wise dev. too big. G:\<Group\> L:\<Lead\> B:\<Background noise\> C:\<Contrast\> D:\<Deviation\>

OPTCENT-70: Length-wise dev. too big. G:*\<Group\>* L:*\<Lead\>* B:*\<Background noise\>* C:*\<Contrast\>* D:*\<Deviation\>*

\<Group\>
>   Lead group

\<Lead\>
>   The number of the first lead or image point in the lead group that was not found

\<Background noise\>
>   The measured background noise.

\<Contrast\>
>   The measured contrast.

\<Deviation\>
>   Deviation in μm

One or more leads have a lead cross-wise or length-wise deviation compared to the package model that is larger than the specified limit.

- The inspected component has one or more leads/bumps misaligned.

- Parameter Lead deviation subsection Lead Group, is too low.

- Component and package bump configuration match but package definition needs fine-tuning. Try adjusting the lead diameter for a tighter match.

- The calibration of the camera has failed. Recalibrate the camera.

OPTCENT-71: Could not locate index mark

The index mark defined in subsection Optical Centering Data could not be found.

- The component picked was misaligned in the tray.

- The component lacks an index mark.

- Adjust the parameters related to the index mark definition in subsection Optical Centering Data.

OPTCENT-72: No leads in model

Package does not hold any leads to inspect.

- The package was defined having no leads / bumps.

OPTCENT-73: Failed to locate component.

Software was unable to locate component.

- Component under inspection does not match package definition.

- Component and package bump configuration match but package definition needs fine-tuning, e.g. lead diameter.

- Bad contrast between leads/bumps and background. Adjust light levels and or light pattern.

- Bad component pick. Component offset outside specified limits Max angle deviation and Max positional deviation in parameter file Vision.

OPTCENT-74: Failed to match located leads with model

Software located leads within search areas but could not match these to the package model.

- Component under inspection does not match package definition.

- Component and package bump configuration match but package definition needs fine-tuning, e.g. lead diameter.

- Bad contrast between leads/bumps and background. Adjust light levels and or light pattern.

- Bad component pick. Component offset outside specified limits Max angle deviation and Max positional deviation in parameter file Vision.

OPTCENT-75: Mask outside image boundaries

Too big package model for the camera FOV. A component feature in the package model is too close or outside the image.

- Correct the model or use a camera with a bigger FOV.

OPTCENT-76: Incorrect package format

Internal error.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA

OPTCENT-77: Coplanarity limit exceeded, G:*<Group>* L:*<Lead>* B:*<Background noise>* C:*<Contrast>* D:*<Deviation>*

<Group>
  Lead group

<Lead>
  The number of the first lead or image point in the lead group that was not found

<Background noise>
  The measured background noise.

 <Contrast>
  The measured contrast.

<Deviation>
  Deviation in μm

Too high lead deformation

- Check max length-wise deformation in package data

OPTCENT-78: No component found

The software didn't find any component at all in the image

- Pick up error

- No components in the feeder

- Component lost.

OPTCENT-79: Failed to locate fiducial marks

Fiducial marks were not found in the Hydra tool reference background.

If image blurred in the Y coordinate:

- Linear encoder damaged or not properly installed

- Linear encoder scale dirty.

Change synchronization source of the LSC to "X motor sensor" (parameter 57.0481 or 58.0481) if the linear encoder cannot be used.

OPTCENT-80: Dark field level *<Light level>* is above camera max, (max= *<Maximum light level>*)

<Light level>
> The light level for the package.

<Maximum light level>
> The maximum light level that the camera illumination unit can produce.

The dark field light level specified for the package is above the maximum dark field level that the camera used to center the package can produce. If the reject rate is high for the package one can try the following.

- Check the vision settings for the package.

- Run Autoteach of vision data on the package.

- If possible run the package in another camera.

OPTCENT-81: Ambient light level *<Light level>* is above camera max, (max= *<Maximum light level>*)

<Light level>
> The light level for the package.

<Maximum light level>
> The maximum light level that the camera illumination unit can produce.

The ambient light level specified for the package is above the maximum ambient light level that the camera used to center the package can produce. If the reject rate is high for the package one can try the following.

- Check the vision settings for the package.

- Run Autoteach of vision data on the package.

- If possible run the package in another camera.

OPTCENT-82: Front light level *<Light level>* is above camera max, (max= *<Maximum light level>*)

<Light level>
> The light level for the package.

<Maximum light level>
> The maximum light level that the camera illumination unit can produce.

The front light level specified for the package is above the maximum front light level that the camera used to center the package can produce. If the reject rate is high for the package one can try the following.

- Check the vision settings for the package.

- Run Autoteach of vision data on the package.

- If possible run the package in another camera.

OPTCORR Group

These messages are generated by the optical correction vision routines.

OPTCORR-0: Didn't find first point

The software didn't find the first point (the leftmost point on the monitor) in one or more rows in the calibration pattern.

- The parameters for contrast and background noise are too low or too high. Check parameter groups 64,65,68-70 or 75 depending on the camera. For HYDRA the parameters are 64.0136 and 64.0137.

- The contrast polarity (white on black) is wrong. For HYDRA the parameter to check is 64.0141.

- The calibration pattern is damaged.

- The light from the LEDs causes reflections in the calibration pattern.

- Wrong pattern is used.

OPTCORR-1: Failed to locate all points

The software didn't find all points in the calibration pattern.

- The parameters for contrast and background noise are too low or too high. Check parameter groups 64,65,68-70 or 75 depending on the camera.

- Check parameter group No. 41. For pattern No. 7 (HYDRA) the parameters to check are 41.2721 and 2722.

- The contrast polarity (white on black) is wrong. For pattern No.7 (HYDRA) the parameter to check is 41.2731.

- The calibration pattern is damaged.

- The light from the LEDs causes reflections in the calibration pattern.

- Wrong pattern is used.

OPTCORR-2: Bad point to point distance

The distance between the points in the image doesn't match the model.

- Wrong pattern is used.

- The magnification is wrong. Adjust the focus of the camera.

OPTCORR-3: Failed to allocate enough memory

There is no more memory available to the image process.

- Probably a software error.

OPTCORR-4: Invalid type of calibration plate

The number of the calibration pattern is not valid. Calibration patterns are numbered 0...1.

- Check in parameter group 64, 65, 68 – 70 or 75, depending on the camera, which pattern should be used for the selected camera.

OPTCORR-5: Failed to update the correction database

The software failed to save the result of the calibration.

- TPSys not properly installed. The directory where the database is stored is missing.

- The hard disk is full or bad.

OPTCORR-6: Failed to calibrate DVC-illumination unit

TPSys failed to calibrate the dvc-illumintiaon unit of the camera.

- Make sure that the correct revision of the calibration plate was used. The illumination unit cannot be calibrated with old calibration plates with black marks on a white background.

- Check that all LED-groups of the camera are working.

OPTP Group

These messages are generated by the optimizer process.

OPTP-1: Component *<Component>* not available

<Component>
> Component name.

The specified component is not available for assembly.

- Check magazine data.

- Check that magazine is inserted.

OPTP-3: Start assembling

Information message: Assembly is started.

OPTP-6: Stop. -All components mounted

Information message. Assembly stopped and layout is finished.

OPTP-7: Stop. -Missing components

Information message. Assembly stopped because there are components missing and the layout is not finished.

OPTP-8: Stop. -Missing components in lower group

Information message. Assembly is stopped because there are missing components and there are components that cannot be mounted because the mount positions not mounted have a lower group number.

OPTP-9: Stop. -Stopped or aborted

Information message. Assembly interrupted by operator.

OPTP-10: Stop. –Error

Assembly interrupted by an error.

OPTP-11: Component *<Component>* available

<Component>
      Component name.

Information message. The specified component is available again.

OPTP-12: All positions glued

Glue dispense operation finished.

OPTP-13: Stop. Nothing to glue

Glue dispense operation was started but there where no dispense information in the layout.

OPTP-14: Start gluing

Glue dispense operation started.

OPTP-15: Unknown package *<Package>* specified

<Package>
      Package name.

The assembly data contains a component with an unknown package.

OPTP-16: Unknown glue dot *<Glue dot>* for package *<Package>*

<Glue dot>
      Glue dot type name.

<Package>
      Package name.

A glue dot of unknown type was specified for the specified package.

OPTP-17: Tool *<Tool>* not present

<Tool>
      Tool name.

The specified tool that is required for this layout is not present.

OPTP-18: Tool *<Tool>* not installed

<Tool>
      Tool name.

The specified tool that is required for this layout is not installed.

OPTP-19: Component *<Component>* not defined

<Component>
    Component name.

A component specified in the current layout is not specified.

OPTP-20: Mount data modified

The assembly information has been modified during assembly and the current layout status is no longer valid.

OPTP-21: HYDRA option not active. HYDRA ignored

HYDRA has been specified but the HYDRA option is not activated.

OPTP-22: Electrical measure option is off

Electrical measure was specified in the PCB data but the electrical measurement option is not on.

Note! The "measure" option saves the measured values in the event log while the "verifier" option on checks the value against specified limits in the component data.

OPTP-23: Missing glue data for package *<Package>*

<Package>
    Package name.

No glue dot information was specified for the specified package.

OPTP-24: Force too low for package *<Package>* with *<Tool>* (*<Force>*)

<Package>
    Package name.

<Tool>
    Tool name.

<Force>
    Placement force.

The selected placement force for the package is insufficient to overcome friction and cannot be used.

• Increase the selected placement force.

OPTP-25: Force invalid for package *<Package>* with *<Tool>* (*<Force>*)

<Package>
        Package name.

<Tool>
        Tool name.

<Force>
        Placement force.

The selected placement force offset for the package plus the global placement force is too high for the tool spring, which would cause the spring to compress completely, allowing the Z unit to press with the globally set placement force on the component. This effectively overrides the aim of having indicator tools.

- Make the placement force offset for the package more negative.

OPTP-26: Can not mount comp. *<Component>*, try to rotate pick/place angle.

<Component>
        Component name.

The component can't be picked or placed without hitting an object in the machine.

- The pick angle and the place angle must be aligned with each other. Try putting the longest side of the component in the X direction of the machine. Also try to turn the PCB so that the component when placed also is aligned with the X direction.

OPTP-50: Fatal process error id:*<Source file>*:*<Line number>*. Restart system

<Source file>
        Source file name.

<Line number>
        Line number in source file.

The optimization process crashed. The system has to be restarted.

- Internal software error. Make a 'savestat' diskette and send it to MYDATA.

ORGP Group

These messages are generated by the organizer process.

ORGP-1: Fatal process error id:<*File*>:<*Line*>. Restart system

<File>
　　　　Source code file where the error was detected.

<Line>
　　　　Line number in source code file where the error was detected.

A fatal error has occurred.

- Restart system.

ORGP-2: Changed electrical test method for <*Component*>

<Component>
　　　　Name of a component.

If a capacitor test has been specified that cannot handle the specified capacitance value the system will switch to a test that can handle the value and display this message.

- Check component data.

ORGP-3: El. test <*Test*> didn't match any cent. angle for <*Component*>

<Test>
　　　　Electrical test No. (1 or 2).

<Component>
　　　　Name of a component.

An electrical test has been specified for an angle that is not used in any centering phase specified for the package. The system will not have any opportunity to test the value during assembly and the test will not be preformed.

- Check component data.

- Check package data for component.

ORGP-4: Unknown glue dot type *<Glue dot>* specified for *<Component>*

<Glue dot>
  Name of a glue dot type.

<Component>
  Name of a component.

An unknown glue dot type has been specified in the package data for specified component.

- Check package data for component.

- Check glue dot list.

ORGP-5: Option flags are invalid

The magic word does not correspond to the options and machine number.

The machine can still be used but all options are turned off.

- Check the 'Options' parameters.

- Check machine number hardware.

ORGP-6: Auto fiducial mark search option is off

The system attempted to perform an automatic fiducial mark search when the automatic fiducial mark search option is not turned on.

- Check the 'Options' parameters.

- Check magic word.

ORGP-7: Electrical test option is off. Component *<Component>*

<Component>
  Name of a component.

Electrical test specified and the electrical test switch is turned on but the electrical test option is off. No electrical test will be preformed.

- Check the 'Options' parameters.

- Check magic word.

ORGP-8: Transistor test option is off. Component *<Component>*

<Component>
  Name of a component.

Transistor test specified and the electrical test switch is turned on but the transistor test option is off. No test will be preformed.

- Check the 'Options' parameters.

- Check magic word.

ORGP-9: Mechanical cent. phase after optical cent. phase skipped for component *<Component>*

<Component>
    Name of a component.

Mechanical centering operations are specified after the optical centering phase for a package. Since mechanical centering invalidates the optical centering completely this is not allowed and the mechanical centering is skipped.

• Check package data for component.

ORGP-10: Optical centering option is off. Component *<Component>*

<Component>
    Name of a component.

Optical centering is specified but the optical centering option is off.

• Check package data for component.

ORGP-11: No usable optical centering cameras defined for *<Component>*

<Component>
    Name of a component.

The system could not find a centering camera for the specified package.

• Check package data for component

ORGP-12: Tool to top offset too big for package *<Package>*

<Package>
    Name of a package.

The tool-to-top offset specified for package is greater than specified package height.

• Check package data.

ORGP-13: Error mounting component *<Component>* from feeder *<Slot/Feeder>*

<Component>
    Name of the component.

<Slot/Feeder>
    Slot and feeder where component was picked.

An error occurred while mounting the component picked from the position indicated in the message. The mounter will give a message indicating the nature of the problem.

ORGP-14: Error mounting component *<Component>* from tray *<Tray mag type>/<TrayID>*

<Component>
> Name of the component.

<Tray mag type>
> Type of tray magazine the component was picked from. This will be YW for the Y wagon or TW for a tray wagon magazine.

<TrayID>
> The ID number in the tray database of the tray the component was picked from.

An error occurred while mounting the component picked from the position indicated in the message. The mounter will give a message indicating the nature of the problem.

ORGP-15: Error mounting component *<Component>* from TEX *<Slot>/<PalletID>* pallet *<TEX row>/<TEX column>*

<Component>
> Name of the component.

<Slot>
> Slot where the TEX is installed.

<PalletID>
> The ID number in the pallet database of the pallet the component was picked from.

<TEX row>
> Row in the TEX where this pallet is inserted

<TEX column>
> Column in the TEX where this pallet is inserted

An error occurred while mounting the component picked from the position indicated in the message. The mounter will give a message indicating the nature of the problem.

ORGP-19: Error mounting comp. *<Component>* from feeder *<Slot/Feeder>* with nozzle *<nozzle>*

<Component>
> Name of the component.

<Slot/Feeder>
> Slot and feeder where component was picked.

<Nozzle>
> The Hydra nozzle used to pick the component.

An error occurred while mounting the component picked from the position indicated in the message with the stated Hydra nozzle. The mounter will give a message indicating the nature of the problem.

ORGP-20: Failed to locate magazine in slot
<Name>/<Slot>

<Name>
> The name of the magazine.

<Slot>
> The slot where the magazine is inserted

TPSys failed to locate the magazine. If the parameter "Locate magazines before use" (84:0520) is set to *"Always"* the magazine will not be used until it has been located.

- Check the fuducial mark on the magazine so that it is not damaged.

- Locate the magazine manually.

PARFILE Group

These messages are generated by parameter file reader.

Not documented.

PARFILE-1: Error parsing *<Number>.<ParId>* in parameter file "*<File>*"

<Number>
> Parameter group number.

<ParId>
> Parameter number in file.

<File>
> Name of parameter file.

The system failed to parse a parameter file.

- File corrupted. Create a 'savestat' disk and call MYDATA support.

PARFILE-2: Parameter file "*<File>*" not found

<File>
> Name of parameter file.

The system tried to read a parameter file but the file did not exist.

- Software problem. Create a 'savestat' disk and contact MYDATA support.

PARFILE-4: Unknown type code in parameter file "*<File>*", line *<Line>*

<File>
Name of parameter file.

<Line>
Line in parameter file.

Parse error in parameter file.

- File corrupted. Create a 'savestat' disk and call MYDATA support.

PARFILE-5: Invalid ModifyAction in parameter file "*<File>*"

<File>
Name of parameter file.

Parse error in parameter file.

- File corrupted. Create a 'savestat' disk and call MYDATA support.

PARFILE-6: No parameter *<Number>.<ParId>* in parameter file "*<File>*"

<Number>
Parameter group number.

<ParId>
Parameter number in file.

<File>
Name of parameter file.

Parameter missing from file.

- File corrupted. Create a 'savestat' disk and call MYDATA support.

PARFILE-7: Invalid file number in parameter file "*<File>*"

<File>
Name of parameter file.

Unexpected file number in parameter file.

- File corrupted. Create a 'savestat' disk and call MYDATA support.

PARFILE-8: Parameter *<Number>.<ParId>* outside limits in file "*<File>*"

<Number>
Parameter group number.

<ParId>
Parameter number in file.

<File>
Name of parameter file.

A parameter has an illegal value.

- Use "pared" (stand alone parameter editor) to correct problem.

PARFILE-9: Unknown parameter file name "*<File>*"

<File>
>   Name of parameter file.

The system tried to read a parameter file but the file did not exist.

PARFILE-10: Unknown parameter file number *<Number>*

<Number>
>   Number of parameter group.

The parameter group number is not listed as a valid parameter group number.

- Software problem. Create a 'savestat' disk and contact MYDATA support.

PARFILE-11: Attempt to write illegal value to parameter *<Number>.<ParId>*

<Number>
>   Parameter group number.

<ParId>
>   Parameter number in file.

The system tried to write a value outside allowed limits to a parameter.

- Software problem. Create a savestat disk and contact MYDATA support.

QWIN Group

These messages are generated by an internal operator interface utility.

All messages of this type indicate an internal software error. Create a 'savestat' disk and contact MYDATA support.

SERCOM Group

These messages are generated by the serial communication routines user for directline format host communication.

SERCOM-0: Error opening communication

Failed to open device for serial communication. For more details check previous and following messages.

SERCOM-1: Error closing communication

Tried to close an already closed serial communication channel.

- Internal software error. Make a 'savestat' and contact MYDATA support.

SERCOM-2: Receive timeout

Errors in serial communication. For more details see the accompanying messages.

SERCOM-3: Receive error

Errors in serial communication. For more details see the accompanying messages.

SERCOM-4: Transmit timeout

Errors in serial communication. For more details see the accompanying messages.

SERCOM-5: Transmit error

Errors in serial communication. For more details see the accompanying messages.

SERSTART Group

These messages are generated by the serial start facility.

SERSTART-0: Received signal *<Signal number>*. Terminating

Received a UNIX software signal. This will cause the process to terminate.

- Software error.

SERSTART-1: Failed to establish signal handlers. Terminating

Internal problem in software.

- Software error.

SERSTART-3: Directory *<Directory name>* is not accessible

Specified directory cannot be accessed.

- Error in parameter.

- Error in installation procedure.

- Software error.

SERSTART-4: Cannot open file *<File name>* for write

File cannot be opened for write.

- Error in parameter.

- Software error.

SERSTART-5: Cannot write to file

File cannot be opened for write..

- Software error.

SERSTART-6: Barcode option flag is invalid

Barcode option is not set (required for this function).

- Error in magic word.

- Option not available on this machine.

SERSTART-7: Unknown layout barcode *<Barcode>*

<Barcode>
        Scanned layout barcode.

No layout has the scanned barcode.

- Wrong barcode in layout.

SERSTART-8: *<Barcode>* is not a layout barcode

<Barcode>
        Scanned barcode.

The barcode does not have the expected layout barcode prefix.

- Check parameter 223.0032

- Broken barcode.

SERSTART-9: *<Barcode>* is not a PCB id barcode

<Barcode>
        Scanned barcode.

The barcode does not have the expected PCB id barcode prefix.

- Check parameter 223.0041

- Broken barcode.

SERSTART-10: Prefixes are needed when only one device is used

Both serial start and PCB id uses the same device but one of them or both does not use barcode prefix.

- Check parameter 223.0031.

- Check parameter 223.0032

- Check parameter 223.0041

- Check parameter 223.0042

SERSTART-11: Cannot open device *<Device>*

<Device>
        Name of the barcode device.

The serial device cannot be opened.

SERSTART-12: Unknown barcode *<Barcode>*

<Barcode>
>   Scanned barcode.

The scanned barcode is not a layout or PCB id barcode.

- Error in parameter 123.0511

- Error in parameter 123.0512

- Error in parameter 123.0513

- Error in parameter 123.0521

- Error in parameter 123.0522

- Error in parameter 123.0523

SHDB Group

These messages relate to shared databases.

SHDB-1: Bad host name for data server

The given server host name is not a known host.

- Name server problem

- Network problem

SHDB-2: dataServer: invalid magic word

Invalid magic word. Can't share databases.

SHDB-3: dataServer protocol version mismatch

The data server protocol on the server does not match the one on this machine.

- Different TPSys versions on server and machine.

- Problem with network or network board on machine or server.

SHDB-4: Server dataServer protocol version name is empty

The data server process on the server does not respond.

- Software problem on the server.

- Problem with network or network board on machine or server.

SHDB-5: Lost network connection to remote dataserver

Lost network connection with server.

- Problem with network or network board on machine or server.

TCP Group

These messages are generated by the shared database communication

TCP-1: Host *<Host name>* is unknown. Unable to connect

<Host name>
> Name of host for TCP connection.

Tried to share data with an unknown host.

- Error in parameter.

- Specified host not reachable (host or network down).

TCP-2: Lost connection with dataserver at host *<Host name>*

<Host name>
> Name of host for TCP connection.

The communication with host was broken.

- Network error.

TCP-3: Unable to connect to TCP socket

Cannot find network connection.

- Network support not installed.

TCP-4: Unable to connect to dataserver at host *<Host name>*

<Host name>
> Name of host for TCP connection.

Host does not appear to accept data server connections.

- Selected host is not a TPSys machine or TPSys data server.

TCP-5: Connected to dataserver at host *<Host name>*

<Host name>
> Name of host for TCP connection.

Information message.

TCP-6: Network connection with host *<Host name>* reestablished

<Host name>
> Name of host for TCP connection.

Information message.

TEX VISION Group

These messages are generated by the TEX vision routines.

TEXVISION-0: Phase error

Synchronization error between the client process (Mounter) and the server process (Img).

- Internal software problem. Make a 'savestat' diskette and send it to MYDATA.

TEXVISION-1: Failed to locate corner

A TEX palette corner was not found.

- No point in image with enough correlation was found. Decrease Correlation minimum (42.0X31), decrease Sparse Sample Period (42.0X21) or try a Corner Mask Type with lower precision (42.0X03).

- Pallet corner lies out of search area. Check parameters 41.0072 – 75.

- Image level for background, and objects are too demanding; decrease object level and/or increase background level (42.0X11 – 2). Or they were estimated wrongly, check parameters 42.0100 – 14.

TEXVISION-2: Image size negative or zero

Size of the image to be grabbed is negative or zero.

- Parameters 41.1011 and/or 41.1102 are negative or zero.

TEXVISION-3: Image scale negative or zero

Image scale factors from metric to pixel space are negative or zero.

- Parameters 41.2X41 and/or 41.2X42 are negative or zero. Where X is the calibration pattern number corresponding to the X-Wagon camera.

TEXVISION-4: Histogram step size out of bounds

Internal error.

Sample period used for creating image gray-scale histogram lower than 1 or bigger than image size dimensions.

- Parameter 41.0111 out of bounds.

TEXVISION-5: Histogram image levels out of bounds

Histogram gray minimum and/or maximum levels out of bounds or inconsistent.

- Parameters 41.0112 – 3 out of bounds or Max level <= Min Level.

TEXVISION-6: Histogram bins too few

Too few bins selected for creating image histogram.

Parameter 41.0114 is lower than 2.

TEXVISION-7: Sample period out of bounds

Sample period used when rough searching and/or fine searching pallet corner out of bounds or inconsistent.

- Parameters 42.0X21 – 22 lower than 1 or sparse sample period lower than close sample period. Where X is the pallet type number.

TEXVISION-8: Object and/or background level out of bounds

Image gray levels estimated for background and object out of bounds.

- Parameters 42.0X11 – 12 out of bounds. Where X is the pallet type number.

TEXVISION-9: Correlation out of bounds

Minimum correlation for accepting a possible pallet corner out of bounds.

- Parameters 42.0X31 < = 0 or > = 100.Where X is the pallet type number.

TEXVISION-10: Bad search area

Palette corner searching area lies partly out of image.

- Parameters 41.0072 – 75 too big.

TEXVISION-11: Failed to convert object mask

Failed to convert any TEX corner searching mask to pixel coordinates.

- Internal software error.

- `File /home/tpsys/lib/palletmaskdata` was modified and a mask without points was defined.

TEXVISION-12: Bad mask boundaries

Mask lies out of image boundaries after conversion to pixel coordinates.

- Internal software error.

- `File /home/tpsys/lib/palletmaskdata` was modified and a mask without points was defined.

TEXVISION-13: Failed to estimate image intensity levels

Failed to estimate background and object intensity levels in the image.

- TEX search area is incorrect, i.e. wrong size or offset. Check parameters 41.0072 – 0075.

- TEX histogram parameters are wrong. Check for consistency in parameters 41.0111 – 0114.

- Two histogram max were not found, e.g. no object in image.

TEXVISION-14: Object ambiguity

Two or more points were found with maximum and equal correlation. TPSys could not decide which is the palette corner.

- Locate pallet again.

TEXVISION-15: Failed to use data in pallet vision parameter file

Failed to read or parse a TPSys parameter file. Most likely the file containing parameters related to the pallet vision software "palletVision."

- File `/home/tpsys/params/palletVision` is missing.

- This file has been modified and its syntax is incorrect.

TEXVISION-16: Pallet type not valid

The selected TEX pallet type is not valid.

- The selected pallet type is not defined in the Pallet Vision parameters (42.0X02) or its parameters declared as not valid (42.0X01).

TEXVISION-17: Failed to read pallet mask data file

Failed to read or parse the "palletmaskdata" file. This file contains the descriptions of the masks used for searching the TEX pallet corners.

- File `/home/tpsys/lib/palletmaskdata` is missing.

- The file above has been modified and its syntax is incorrect.

TEXVISION-18: Mask type in pallet vision parameter file unknown

The selected mask for searching the TEX pallet corner is not found in the "palletmaskdata" file. The selected mask is specified by parameters 42.0X03 and 42.0X04 where X is the pallet type number.

- The mask name specified by parameters 42.0X03 and 42.0X04 is not defined in the "palletmaskdata" file.

TLMN Group

These messages are generated by the tool management routines.

TLMN-0: Parameter file read error

Cannot read parameter.

- Corrupted parameter file (toolmanager).

- Could also be a software error.

TLMN-1: Tool identifier out of range

The application tried to access a tool that does not exist.

- Internal software problem.

TLMN-2: Tool type out of range or tried to manipulate generic tool

The application tried to fetch or leave a tool that was not specified in parameter 'toolmanager' file.

- Internal software problem.

TLMN-3: Tried to manipulate uninstalled tool

The application tried to fetch or leave a tool that was not installed.

- Internal software problem.

TLMN-4: Failed to fetch tool automatically

Automatic tool fetch failed.

- Hardware problem.

- Too much or too little grease on tool.

TLMN-5: Failed to leave tool automatically

Automatic tool leave failed.

- Hardware problem.

- Too much or too little grease on tool.

TLMN-6: Failed to fetch tool

Could not fetch tool automatically or automatic tool fetch failed and operator refused to insert tool manually.

- Operator action.

TLMN-7: Failed to leave tool

Could not leave tool automatically or automatic tool leave failed and operator refused to remove tool manually.

- Operator action.

TLMN-8: Z force sensor faulty

Z force sensor did not respond to calibration.

- Hardware error.

- Dirt on sensor.

- The system failed to fetch tool properly.

TLMN-9: Failed preliminary fetch during installation

Failed to fetch tool for tool position measurement.

- Operator error. Check that tool is present and retry.

TLMN-10: Failed position search during installation

Automatic tool position measurement failed.

- Operator error, try again.

- Problem with the preliminary fetch.

- Hardware problem.

TLMN-12: Parameter file write error

Failed to update parameter values after installation.

- Internal software problem.

TLMN-13: Measured tool length too short

The tool length measured by the system is shorter than the limit specified in parameter group 23 (Tool Manager).

- Z friction too high or force too low.

- Check minimum length parameter for specific tool.

TLMN-14: Tried to manipulate a non-present tool

The system tried to use or install a tool that is marked as "not present" in the parameter group 23 (Tool Manager).

- Software error.

TLMN-15: No tool check position defined

The software tried to perform an action that involves checking a tool, but no check position was defined.

- Tool bank installation not properly completed.

TLMN-16: Checking Z position failed when cycling tool

Fetch or leave failed during automatic test after checking Z position.

- Hardware problem.

- Too much or too little grease on tool.

TLMN-17: Measuring Z position failed when cycling tool

Fetch or leave failed during automatic test after measuring Z position.

- Hardware problem.

- Too much or too little grease on tool.

TLMN-18: Failed to reach toolbank level

Z unit did not reach tool bank during tool installation.

- Hardware problem.

UCOPY Group

These messages are generated by the UNIX copy routines.

UCOPY-1: No such file or directory

Attempt to write a file with illegal name.

- Directory specified does not exist.

- File name contain illegal characters.

UCOPY-2: Permission denied

Not allowed to write file to specified directory.

- The selected directory is not owned or writable by user TPSys.

- A file with the specified name already exists and this file is not writable by user TPSys.

UNIX Group

The messages in this group are generated by the operating system inside the SW. A message of this type typical indicates an internal SW error.

☞ Most of these messages are not explained or commented because the exact meaning of each message is determined by the context in the source code. For more information, see a UNIX software developer manual.

UNIX-2: ENOENT: No such file or directory

The system tried to access a file or a directory that does not exist.

UNIX-6: ENXIO No such device or address

This might indicate a hardware problem where the Linux kernel did not detect all necessary hardware at boot time. The most common problem is a connector or board not properly plugged in.

VACC Group

Vacuum system interface routines

VACC-0: Parameter file read error

Cannot read parameter.

- Corrupted parameter file.

- Software error.

VER Group

These messages are generated by the electrical verifier interface routines.

VER-0: Parameter file read error

Cannot read parameter.

- Corrupted parameter file.

- Software problem.

VER-1: Parameter file write error

Cannot update parameter values.

- Software problem.

VER-3: The verifier is not calibrated

Hardware not calibrated when electrical measurement/verify operation started.

- Software problem.

- Hardware problem in MOT board Z.

VER-4: Tried to measure without preparation

Measurement data not prepared when data should be sent to MOT board Z.

- Internal software problem. Make a 'savestat' disk and contact MYDATA support.

VER-5: Tried to verify without preparation

Verify data not prepared when data should be sent to MOT board Z.

- Internal software problem. Make a 'savestat' disk and contact MYDATA support.

VER-6: Illegal electrical test code

Non-existing test code specified.

- Internal software problem. Make a 'savestat' disk and contact MYDATA support.

VER-7: Range selection failed

Electrical values are outside specifications.

- Operator error. Check electrical properties in component data against specification.

VER-8: Measure failed (no value obtained)

Unable to perform measurement.

- Hardware problems.

- Measured property not compatible with component type.

- Actual component value too far from expected.

VER-10: Verifier calibration failed (considered bad)

Failed to calibrate hardware.

- Hardware problem.

VER-11: Verifier failed for *\<Component\>*

\<Component\>
        Name of component.

Verify or measure failed for specified component. The reason is specified in a previous message.

VISION Group

These messages are generated by the vision routines.

VISION-0: Parameter file read error

Cannot read parameter for vision routines (parameter group 41).

- Corrupt parameter file.

- Missing parameter file.

- Wrong parameter file version.

- Software error.

VISION-1: Camera is not installed

The requested camera is not installed/enabled.

- In each parameter group (51 – 58) for the different cameras there is a "present" parameter that must be set to "Yes". This is normally done automatically when TPSys is installed.

VISION-2: Error in camera parameter file

The image process has detected an error in the parameter file for selected camera. Normally the parameter file reader (PARFILE) should detect this type of errors.

- Check the different data in the parameter file against the limits. Check especially the kxx and kyy values.

XINSP group

Messages generated when inspecting components on trays with the PVC.

XINSP-0: Did not find package on tray

Software could not find package on tray pocket when using the PVC.

- No component on tray pocket.

- Software could not discern between component and tray pocket.

XINSP-1: Unknown package

The package is not defined in the package database

- The package is not defined or the package name is misspelled in either the package or the component database

XINSP-2: Package larger than camera FOV

Package dimensions are larger than the PVC field of view at the current presentation angle on the tray.

- Package covers the whole image and its position cannot be calculated with a single PVC image. Check if the package fits the PVC field of view if the tray is rotated 90 degrees, otherwise select 'No' in the "Inspect before pick" field in the tray type editor.

XINSP-3: Package out of camera focal depth

After a successful pick and centering it is discovered that the package was picked on the tray at a height too far from the PVC focal depth.

- Tray positioned too low or too high relative to the mounting height. Adjust tray height on the wagon.

XINSP-4: Component not found on board

Software could not find component on the board when using the PVC.

- Background noisy around the component on the board

- No component on board on this board position

Appendix B – Parameters

0007 HYDRA Z axis

Z to HZ offsets

0007.1411 – 0007.1482 Z to HZ offsets

Z to HZ offsets is measured for the exchangeable tools without the nozzles. Note. There is no difference for the permanent tools (H00).

0023 Tool manager

23.1215 Tool list; A12; Mount tool; Angle between symmetries

Identifies tools with rotational symmetry (typically MELF tools). Specify different types of rotational symmetry for tools using the parameter. Choices are:
  – *Rotational symmetric* (the angle of the tool is not important)
  – *90°* (there are four possible rotational positions for the tool- e.g. a square one)
  – *180°* (two positions- e.g. MELF)
  – *360°*

23.xx15 Angle between symmetries

Angle between symmetries can be set for all tools used in the machine xx above is the tool number. See 23.1215.

0027 Mount tool offsets

HYDRA tool offsets

27.0210-0282 HYDRA tool offsets; tool 1; X – HYDRA tool offsets; tool 1; tool 8; Y

Meassures the HYDRA tool offsets, and fine tunes the offstes, between the individual HYDRA tools and the defined zero points.

0028 HYDRA unit

B - 2

HYDRA tool centering offsets

28.0011 HYDRA tool centering offsets; tool 1; X – 28.0082 HYDRA tool centering offsets; tool 1; tool 8; Y

Hydra tool centering offsets

28.0200 Ref. background height

Hydra ref. background height

0029 HYDRA tool manager

29.0041 Manual intervention; X position

X positions to use when performing a manual insert or remove of HYDRA nozzles.

29.0042 Manual intervention; HZ-level

HZ level to use when performing a manual insert or remove of HYDRA nozzles.

HYDRA tool tubes status

29.0101 HYDRA tool tubes status; 1 – 29.0108 HYDRA tool tubes status; 8

Parameter to use when you want to turn a specific HYDRA head off. If turned off the HYDRA head will not be used anywhere in TPSys. Options are:
  – *Disabled*
  – *Enabled*

0041 Vision

Linescan Camera Inspection

41.0045 Linescan Camera Inspection; Image length for Hydra

Object length when acquiring image of HYDRA

41.0046 Linescan Camera Inspection; Light level for Hydra tool

Light level for HYDRA tool.

Hydra calibration with LSC

41.0141 Hydra calibration with LSC; Images for background height

Number of images acquired to calculate ref. background level.

41.0143 Hydra calibration with LSC; Reference line width

Width of reference line.

41.0144 Hydra calibration with LSC; X-distance between reference marks

X distance between reference marks.

41.0145 Hydra calibration with LSC; Y-distance between reference marks

Y distance between reference marks.

41.0146 Hydra calibration with LSC; Ref. line to Rot. center Y-distance

Distance between ref. line and HYDRA tool rot. centers.

41.0147 Hydra calibration with LSC; Reference background type

Reference background type:
  – Type A (Narrow)
  – Type B (Wide)

41.0148 Hydra calibration with LSC; Narrow backgr. approx. ref. line position

Narrow background approx. reference line position.

41.0149 Hydra calibration with LSC; Wide backgr. approx. ref. line position

Wide background approx. reference line position.

41.0151 Hydra calibration with LSC; Max. Std. Dev. of Hydra rot. centers

Max. Standard Deviation of HYDRA rotation centers.

0045 Autoteach

Default bright on dark illum DVC, SVC, OVC

The first parameters specify the illuminations that Autoteach chooses between when the Illumination field has been set to Auto.

45.0101 Default bright on dark illum DVC, SVC, OVC; Light level

Specifies the light level for the DVC, SVC and OVC when detecting bright solder balls on a dark background.

45.0102 Default bright on dark illum DVC, SVC, OVC; Dark field

Specifies the dark field level for the DVC and SVC when detecting bright solder balls on a dark component body.

45.0103 Default bright on dark illum DVC, SVC, OVC; Ambient light

Specifies the ambient light level for the DVC and SVC when detecting bright solder balls on a dark component body.

45.0104 Default bright on dark illum DVC, SVC, OVC; Front light

Specifies the front light level for the DVC and SVC when detecting bright solder balls on a dark component body.

Default bright on bright illum DVC, SVC, OVC

45.0201 Default bright on bright illum DVC, SVC, OVC; Light level

Specifies the light level for the DVC, SVC and OVC when detecting bright solder balls on a bright background.

45.0202 Default bright on bright illum DVC, SVC, OVC; Dark field

Specifies the dark field level for the DVC and SVC when detecting bright solder balls on a bright component body.

45.0203 Default bright on bright illum DVC, SVC, OVC; Ambient light

Specifies the ambient light level for the DVC and SVC when detecting bright solder balls on a bright component body.

45.0204 Default bright on bright illum DVC, SVC, OVC; Front light

Specifies the front light level for the DVC and SVC when detecting bright solder balls on a bright component body.

Default dark on bright illum DVC, SVC, OVC

45.0301 Default dark on bright illum DVC, SVC, OVC; Light level

Specifies the light level for the DVC, SVC and OVC when detecting dark solder balls on a bright component body

45.0302 Default dark on bright illum DVC, SVC, OVC; Dark field

Specifies the dark field light level for the DVC and SVC when detecting dark solder balls on a bright component body.

45.0303 Default dark on bright illum DVC, SVC, OVC; Ambient light

Specifies the ambient light level for the DVC and SVC when detecting dark solder balls on a bright component body.

45.0304 Default dark on bright illum DVC, SVC, OVC; Front light

Specifies the front light level for the DVC and SVC when detecting dark solder balls on a bright background.

Default Flip-chip-illumination DVC

45.0401 Default Flip-chip-illumination DVC; Light level

Specifies the light level for the DVC, SVC and OVC when detecting solder balls on flip-chip components.

45.0402 Default Flip-chip-illumination DVC; Dark field

Specifies the dark field light level for the DVC and SVC when detecting solder balls on flip-chip components.

45.0403 Default Flip-chip-illumination DVC; Ambient light

Specifies the ambient light level for the DVC and SVC when detecting solder balls on flip-chip components.

45.0404 Default Flip-chip-illumination DVC; Front light

Specifies the front light level for the DVC and SVC when detecting solder balls on flip-chip components.

Default leaded device illum DVC, SVC, OVC

45.0501 Default leaded device illum DVC, SVC, OVC; Light level

Specifies the light level used when teaching leaded devices with the DVC, SVC and OVC.

45.0502 Default leaded device illum DVC, SVC, OVC; Dark field

Specifies the dark field light level used when teaching leaded devices with the DVC and SVC.

45.0503 Default leaded device illum DVC, SVC, OVC; Ambient light

Specifies the ambient light level used when teaching leaded devices with the DVC and SVC.

45.0504 Default leaded device illum DVC, SVC, OVC; Front light

Specifies the front light level used when teaching leaded devices with the DVC and SVC.

Default bright on dark illumination LSC

45.1001 Default bright on dark illumination LSC; Light level

Specifies the light level for the linescan camera when detecting bright solder balls on a dark background.

45.1003 Default bright on dark illumination LSC; Ambient light

Specifies the ambient light level for the linescan camera when detecting bright solder balls on a dark component body.

45.1004 Default bright on dark illumination LSC; Front light

Specifies the front light level for the linescan camera when detecting bright solder balls on a dark component body.

Default bright on bright illumination LSC

45.1101 Default bright on bright illumination LSC; Light level

Specifies the light level for the linescan camera when detecting bright solder balls on a bright background.

45.1103 Default bright on bright illumination LSC; Ambient light

Specifies the ambient light level for the linescan camera when detecting bright solder balls on a bright component body.

45.1104 Default bright on bright illumination LSC; Front light

Specifies the front light level for the linescan camera when detecting bright solder balls on a bright component body.

Default dark on bright illumination LSC

45.1201 Default dark on bright illumination LSC; Light level

Specifies the light level for the linescan camera when detecting dark solder balls on a bright background.

45.1203 Default dark on bright illumination LSC; Ambient light

Specifies the ambient light level for the linescan camera when dark solder balls on a bright component body.

45.1204 Default dark on bright illumination LSC; Front light

Specifies the front light level for the linescan camera when detecting dark solder balls on a bright component body.

Default leaded device illumination LSC

45.1401 Default leaded device illumination LSC; Light level

Specifies the light level used when teaching leaded devices with the linescan camera.

45.1403 Default leaded device illumination LSC; Ambient light

Specifies the ambient light level used when teaching leaded devices with the linescan camera.

45.1404 Default leaded device illumination LSC; Front light

Specifies the front light level used when teaching leaded devices with the linescan camera.

Standardised pitches for BGA packages

These parameters define the standardized pitches Autoteach chooses between when measuring the pitch and aligning the solder balls to a grid. Fifteen standardized pitches can be defined for each package type.

45.2001 Standardised pitches for BGA packages; pitch1 – 45.2015 Standardised pitches for BGA packages; pitch15

Standardized pitches for BGA packages. If the parameter is set to -1 the system ignores this entry.

Standardised pitches for leaded devices

45.2101 Standardised pitches for leaded devices; pitch1 – 45.2115 Standardised pitches for leaded devices; pitch15

Standardized pitches for leaded devices. If the parameter is set to -1 the system ignores this entry.

Standardised pitches for Flip-Chip packages

45.2201 Standardised pitches for Flip-Chip packages; pitch1 – 45.2215 Standardised pitches for Flip-Chip packages; pitch15

Standardized pitches for flip-chip packages. If the parameter is set to -1 the system ignores this entry.

ROI-illumination for DVC, SVC, OVC

Autoteach takes two images of every package that is being taught. The first image is used to detect what type of package that is being taught and if the component was picked from a feeder to determine what part of the image that contains the component. This part of the image is referred to as the *Region of Interest* (ROI). The illumination used when taking this image is controlled by the parameters below.

45.2501 ROI-illumination for DVC, SVC, OVC; Light level

Specifies the light level to use for the DVC, SVC and OVC when calculating ROI and detecting what type of package that is being taught.

45.2502 ROI-illumination for DVC, SVC, OVC; Dark field

Specifies the dark field level to use for the DVC and SVC when calculating ROI and detecting what type of package that is being taught.

45.2503 ROI-illumination for DVC, SVC, OVC; Ambient light

Specifies the ambient light level to use for the DVC and SVC when calculating ROI and detecting what type package that is being taught.

45.2504 ROI-illumination for DVC, SVC, OVC; Front light

Specifies the front light level to use for the DVC and SVC when calculating ROI and detecting what type of package that is being taught.

ROI-illumination for LSC

45.2601 ROI-illumination for LSC; Light level

Specifies the light level to use for the LSC when calculating ROI and detecting what type of package that is being taught.

45.2603 ROI-illumination for LSC; Ambient light

Specifies the ambient light level to use for the LSC when calculating ROI and detecting what type package that is being taught.

45.2604 ROI-illumination for LSC; Front light

Specifies the front light level to use for the LSC when calculating ROI and detecting what type of package that is being taught.

CBGA detection limits

To determine what type of package that is being taught Autoteach looks at the brightness of the component body. How bright the component body has to be in order to be classified as a CBGA component, i.e. a component with bright solder balls on a bright component body, is controlled by the two parameters below. If PBGA components are falsely being classified as CBGA components the limit should be raised and vice versa.

45.2701 CBGA detection limits; CBGA detection limit for the SVC

Specifies how bright a component has to appear in the DVC camera to be classified as a CBGA package.

45.2702 CBGA detection limits; CBGA detection limit for the LSC

Specifies how bright a component has to appear in the LSC camera to be classified as a CBGA package.

0052 HYDRA camera

Position

52.0204 Position; Centering level

To measure the height of the HYDRA camera, to be able to calculate the centering level of the camera.

52.0206 Position; X position

To measure the X-wise coordinate of the HVC so the center of the CCD coincides with the center of the ZFi-head.

Characteristics

To calibrate the optical system of the HYDRA camera. The calibration measures non-linearities and distortions in the optical system and creates a coordinate transformation between image coordinates and real world coordinates.

52.0310 Characteristics; KXX

X-wise resolution of the HYDRA camera system. Unit: my/pixel

52.0311 Characteristics; KYY

Y-wise resolution of the HYDRA camera system. Unit: my/pixel

0053 Optical centering camera standard

53.0461 Dual image(shot) centering; Component dimension limit

A component with a value of the 'Max dimension' bigger than this parameter will be centered using the dual-shot. The 'Max dimension' is defined in the centering phase entry in the package list.

53.0462 Dual image(shot) centering; X-offset for first image

The x-wise offset of the component relative the camera when grabbing the first image. This parameter is not editable.

53.0463 Dual image(shot) centering; X-offset for second image

The x-wise offset of the component relative the camera when grabbing the second image. This parameter is not editable.

0054 Optical centering camera HRC

54.0461 Dual image(shot) centering; Component dimension limit

A component with a value of the 'Max dimension' bigger than this parameter will be centered using the dual-shot. The 'Max dimension' is defined in the centering phase entry in the package list.

54.0462 Dual image(shot) centering; X-offset for first image

The x-wise offset of the component relative the camera when grabbing the first image. This parameter is not editable.

54.0463 Dual image(shot) centering; X-offset for second image

The x-wise offset of the component relative the camera when grabbing the second image. This parameter is not editable.

0055 Optical cent. camera standard 2

55.0461 Dual image(shot) centering; Component dimension limit

A component with a value of the 'Max dimension' bigger than this parameter will be centered using the dual-shot. The 'Max dimension' is defined in the centering phase entry in the package list.

55.0462 Dual image(shot) centering; X-offset for first image

The x-wise offset of the component relative the camera when grabbing the first image. This parameter is not editable.

55.0463 Dual image(shot) centering; X-offset for second image

The x-wise offset of the component relative the camera when grabbing the second image. This parameter is not editable.

0056 Optical centering camera HRC 2

56.0461 Dual image(shot) centering; Component dimension limit

A component with a value of the 'Max dimension' bigger than this parameter will be centered using the dual-shot. The 'Max dimension' is defined in the centering phase entry in the package list.

56.0462 Dual image(shot) centering; X-offset for first image

The x-wise offset of the component relative the camera when grabbing the first image. This parameter is not editable.

56.0463 Dual image(shot) centering; X-offset for second image

The x-wise offset of the component relative the camera when grabbing the second image. This parameter is not editable.

0057 Linescan camera

Illumination

57.0403 Illumination; Ambient light gain

LSC1: Ambient light gain factors.

57.0404 Illumination; Front light gain

LSC1: Front light gain factors.

Camera synchronization

57.0481 Camera synchronization; LSC sync. source

LSC1 synchronization source. Alternatives are:
– Linear encoder
– X-wagon sensor

0058 Linescan camera 2

Illumination

58.0403 Illumination; Ambient light gain

LSC2: Ambient light gain factors.

58.0404 Illumination; Front light gain

LSC2: Front light gain factors

Camera synchronization

58.0481 Camera synchronization; LSC sync. source

LSC2: synchronization source. Alternaives are:
  – Linear encoder
  – X-wagon sensor

0064 HYDRA camera calibration

Measure reference background

64.0041 Measure reference background; Max X displacement

Max X displacement. This controls the displacement from the ordinary x-position where the pictures are taken.

If the system has problems finding reference points or components, you can try lowering this value.

64.0042 Measure reference background; Max Z displacement

Max Z displacement. This controls the displacement from the nominal z-position where the pictures are taken.

64.0043 Measure reference background; Number of pictures per measurement point

Number of images per measurement. By taking a number of pictures, a better measurement can be made with an average of the pictures.

Calibration plate characteristics

64.0101 Calibration plate characteristics; Thickness

The thickness of the calibration plate should be measured with a vernier caliper and entered as this parameter.

64.0111 Calibration plate characteristics; Position of fiducial mark 1; X

-27.05mm

64.0112 Calibration plate characteristics; Position of fiducial mark 1; Y

-10.85mm

64.0121 Calibration plate characteristics; Position of fiducial mark 2; X

27.05mm

64.0122 Calibration plate characteristics; Position of fiducial mark 2; Y

-10.85mm

64.0130 Calibration plate characteristics; Pattern number – 64.0141 Calibration plate characteristics; white on black

Calibration plate charecteristics

64.0201 Tool to use

Tool to use when fetching the calibration plate.

0066 Install HYDRA tool offsets

66.0001 Number of components to place

Number of components to place, default is 12. Number of components per tool. An average is drawn.

66.0002 Use auto-search

Use auto-search. Set this to *Yes* to use auto-search.

66.0003 Number of centering measurements

Number of centering measurements, default is 6.
By doing the measurement a number of times per tool, and drawing an average, a better measurement of the centering offsets can be made.

Defaults

66.0012 Defaults; Installation place angle increment

Installation place angle increment, default value is 90°.
This is the angle increment between components. A setting of 180° will place all components in 0° on the board. A setting of 90° will place the components according to the picture. The 90° setting is preferable.
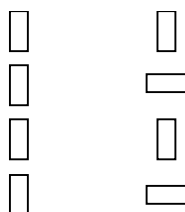
Increment: 180°   90°

Distance between placed comps.

66.0021 Distance between placed comps.;   X

X distance between comps, default is 6 mm.
The distance between the columns of the placed components.

66.0022 Distance between placed comps.;   Y

Y distance between comps, default 6 mm.
The distance between the rows of the placed components.

Simulated pick positions

66.0031 Simulated pick positions; Left

Left simulated pick pos, default -300 mm.
This is a position offset from which the X wagon will come before
placing.

66.0032 Simulated pick positions; Right

Right simulated pick pos, default 300mm.
This is a position offset from which the x-wagon will come before
placing.

0084 Magazine

Tape magazines

84.0104 Tape magazines; Reject percent

Operator Alerts will be printed on the screen when errors on a feeder
have reached the warning percent level and also when a feeder is shut
down. Default value is 5.

84.0105 Tape magazines; Warning percent

Default value is 1.

84.0106 Tape magazines; Reject history length

Default value is 200.

Vibratory magazines

84.0204 Vibratory magazines; Reject percent

Default value is 5.

84.0205 Vibratory magazines; Warning percent

Default value is 1.

84.0206 Vibratory magazines; Reject history length

Default value is 200.

Trays

84.0252 Trays; Reject percent

Default value is 5.

84.0253 Trays; Warning percent

Default value is 1.

84.0254 Trays; Reject history length

Default value is 200.

84.0500 Alarm on reels

Notify the operator when the number of components left in a feeder or tray is below a certain level. When the *Alarm on reels* function is activated, it is possible to specify in the editors an alarm level at which the operator should be notified. To notify the operator, a message is displayed in the operator alerts box.

0122 Digitizer

Digitizer settings below are found in the manual enclosed with the device. We here indicate the settings used for the CalComp 34180 digitizer.

122.0001 Device name

Name of the device – do not change.

122.0002 Baud rate

Choose from a list: 300 - 38400.
For the CalComp 34180 digitizer set: *9600*.

122.0003 Data size

For the CalComp 34180 digitizer set: *7*.

122.0004 Stop bits (output)

For the CalComp 34180 digitizer set: *1*

122.0005 Parity

Choose from a list: None – Even
For the CalComp 34180 digitizer set: *Even*

122.0006 Flow control (input)

For the CalComp 34180 digitizer set: *Yes*

122.0007 Length of input string, including LF

For the CalComp 34180 digitizer set: *12*

122.0008 Initiation string

0171 HYDRA optimizer

HYDRA tools to use

171.0531 Diagnostics options; HYDRA tools to use; Tool 1 (leftmost) – 171.0538 Diagnostics options; HYDRA tools to use; Tool 8 (rightmost)

Specifies which tool types the HYDRA is allowed to use. Possible selections are:
- *H00*
- *H01*
- *H02*
- *H03*
- *H04*
- *ALL*

0172 HYDRA preparation

172.0101 Misc; Treat unknown feeder types as

Decides how to treat components with an unspecified magazine and/or feeder type. Possible values are:
- *Unknown* (default)
- *8mm*
- *FP8mm*
- *12mm*
- *16mm*

172.0103 Misc; Include skipped components

Decides if components marked as skipped in the component list or the PCB list shall be included in the preparation

172.0301 Available HYDRA tool types; H00

172.0302 Available HYDRA tool types; H01

172.0303 Available HYDRA tool types; H02

172.0304 Available HYDRA tool types; H03

172.0305 Available HYDRA tool types; H04

Defines which HYDRA tools are to be considered available when calculating the preparation. Each HYDRA tool type (H00, H01, H02, H03 and H04) can be set to available or not available.

0191 Options

191.0025 Options; Z High Speed

With the *Z High Speed* option the standard mount head currently gives a max speed of about 6500 CPH, without the option the max speed is about 4800 CPH.

191.0026 Options; HYDRA High Speed

With the *HYDRA High Speed* option the HYDRA mount head gives a max speed of about 21000 CPH, without the option the max speed is about 14000 CPH.

191.0011 Options; Digitizer

Specifies if a digitizer is available – set to *Yes* when isntalling digitizer.

0231 Colors

Camera mode

231.0107 Camera mode; Fiducial mark color

Color used to draw the fiducial mark.
A graphic overlay of a fiducial mark (the edge points or a circle) is shown when:
  – *Doing a manual trim of a board.* Either when locating a board manually or after failing to locate a fiducial mark when locating a board optically (Auto).
  – *Selecting View (F1) when going through the fiducial mark list.* In order to ease the search of a taught fiducial mark in the list.

231.0108 Camera mode; Error lead color

Sets the colors used for drawing the error leads.

231.0109 Camera mode; Correct lead color

Sets colors used for drawing the correct leads.

0233 Operator attention signals

The desired combinations of lamp and buzzer signals, for the signal tower, for each machine state are set in the this parameter group. It is possible to configure the lamp and buzzer for each machine state. The lamp and sound indication can be steady or intermittent with a desired frequency. Default setting of the frequency is 1Hz (blink rate set to 1000ms).

For each machine state there is a hexadecimal number representing 16 bits. The 8 lowest bits, the rightmost, tell if a connected lamp/buzzer should be on (1) or off (0) for the machine state. The 8 highest bits, the leftmost, tell if corresponding lamp or buzzer should blink/be intermittent (l), or have steady light/continues sound (0).

233.0001 Blink rate

233.0011 Running; and everything is ok

233.0012 Running; but will stop shortly

233.0013 Running; but with bad performance

233.0021 Waiting; for PCB load/unload

233.0031 Stopped; idle

233.0032 Stopped; need help to continue

233.0033 Stopped; fatal error

Parameter table

Par. value	Attention signal
0x0206	Steady green + flashing yellow.
0x0004	Steady green.
0x0404	Flashing green.
0x4246	Steady green + flashing yellow + intermittent buzzer.
0x0041	Steady red and buzzer.
0x0001	Flashing red.
0x0002	Steady yellow.
0x0202	Flashing yellow.
0x0606	Flash green + flashing yellow.
0x0007	Steady red + steady yellow + steady green.
0x4747	Flash red + flashing yellow + flashing green + intermittent buzzer.
0x4041	Steady red + steady yellow.
0x0006	Steady green + steady yellow.
0x0203	Steady red + flashing yellow.
0x0303	Flashing red + flashing yellow.
0x0403	Steady red + steady yellow + intermittent buzzer.
0x4243	Steady red + flashing yellow + intermittent buzzer.
0x0505	Flashing green + flashing red.
0x0105	Steady green + flashing red.

Examples

Hexadecimal number 00 04 (= 00000000 00000100 binary), means green lamp (bit 2) on with constant light.
Hexadecimal number 40 4 1 (= 0 100000 1 0 100000 1 binary), means intermittent buzzer (bit 6) and constant red light (bit 0).

0241 Time Lock

Allow each installation of TPSys to function for a limited period of time. Only authorized MYDATA representatives may modify these parameters. When time lock is activated, a machine will not be able to mount any components, but other functionality is undisturbed. Time lock can be disabled altogether in the case of upgrades to existing installations.

241.0001 Magic time word

String used to check the validity of the other parameters and to protect against unauthorized meddling

241.0011 Time lock details; Infinite time

A boolean parameter which enables the time lock function

241.0012 Time lock details; End year

The year upon which the lock will activate unless the infinite time parameter is set to "true" and the magic word is valid.

241.0013 Time lock details; End month

The month upon which the lock will activate unless the infinite time parameter is set to "true" and the magic word is valid.

241.0014 Time lock details; End day

The day upon which the lock will activate unless the infinite time parameter is set to "true" and the magic word is valid.

B - 24

Appendix C – Event Log Export Format

This chapter describes the ASCII format used by TPSys for the Event Log export.

The Event Log is used to record events related to machine operation. The two main uses for event log is to extract management data (component loss, machine uptime etc.) and quality data (trace component batch to boards etc.).

We will describe the following:

- General format information

- Header line format

- Line formats

General Format Information

This format does not follow the *TPSys General Ascii Format Rules* document.

The main reason for this is that size is an issue.

☞ *Like other TPSys data formats this format is not intended for humans and requires post processing to be intelligible.*

The format is line oriented and all lines have the same general format, a line type followed by a number of data fields separated by semicolon :

```
<line_type>;<;-separated data fields>
```

The `<line_type>` identifies the type of event logged. The line type code is typically one, two or three letters. A special type code is "–" (dash), this type code indicates that this line is a continuation of last line.

Character Substitution

The data may contain characters that may be confused for delimiters ";" (the semicolon) or other characters that should, for some reason, not be printed. These characters are written as a percent sign followed by two hex digits that identifies the ascii code in ISO Latin 1 character set.

Two common examples:

%3B   Semicolon(;)

%25   Percent sign(%)

Comment for Parser Implementors

A common idiom in the data format is that a list of data (e.g. components) is presented once and lines below contains data fields containing numbers used as index in this list.

This implies that the list format must be parsed from the start to the end of the data and most format parser will require a memory.

Header Line Format

The first line of the data is always the header line. The header line is special, this line tells from which machine and until which point of time the data is exported.

```
Q1;<machine name>;<time-and-date>
```

Where:

<machine name>is the name of the machine (always one word without spaces)

<time-and-date>Time and date stamp. Point of time when the data was exported from the machine, seconds since 1/1 1970. Exist to make it easier to use the "-since" argument in TRP. Gives remote applications a possibility to synchronize their clock with the machine.

Line Formats

The lines are grouped into five groups:

Time stamp

Special line type that has two properties: Divides the data into "chunks" and marks the time

Mount information lines

Lines that log events in some way "internal" to the machine. Start and stop of assembly is also included here.

Magazine data lines

Lines that describe magazine contents, pick problems, magazine insert/extract etc. The information in these lines is required to parse the Mount information lines.

Data modification lines

These lines describe modifications made in the loaded layout, panels and PCBs. This information is required to correctly parse Mount information lines if lines are added/removed in a loaded PCB.

External event lines

These lines log external events such as operator intervention and wait for external conveyor system.

Time Stamp

T - Time stamp

Sets a time stamp in the data.

```
T;<time-and-date>   <time-and-date>
```

Time and date stamp. Seconds since 1/1 1970.

Mount Information Lines

LL - Layout loaded

Marks the event of a layout load in the machine. The data contains layout name as well as a batch id. If a layout is loaded this line also implies an LU-line (see below) later. This line is always followed by a PL-line.

```
LL;<name>;<time-and-date>   <name> Name of layout
```

<time-and-date> Time and date when layout was loaded. Seconds since 1/1 1970.

LU - Layout unloaded

Marks the event of a layout unload.

```
LU;<time and date>   <time and date>
```

Time and date when layout was unloaded. Seconds since 1/1 1970.

PL - PCB list

This line specifies all PCBs in the layout specified in last LL-line. The PL-line always follow an LL-line.

```
PL;<;-separated list of PCB names>
```

<;-separated-list-of-PCB-names> A list of PCB names which is a part of the loaded layout. The list will contain one PCB for each PCB in the layout. Even PCBs not present will be part of the list. The order of the PCBs in the list will be the same as the order in which they appear in the layout list. If there are panels in the list the PCBs will be inserted in the same order as they appear in the panel.

This list will define the PCBs for subsequent references in the M- and D-Lines.

PCB - PCB contents

Lists location designators (comments) in line number order to make it easy to associate line number with location designator. This line is supposed to be a complement to the mount event line (M). There exist one PCB line for each PCB in the layout.

```
PCB;<PCB-name>;<;-separated-list-of-location-designators>
```

 <PCB-name> Name of the PCB

<;-separated-list-of-location-designators> Location designators in line number order separated by ";".

PID - PCB id

PCB id for a physical PCB. If PCB ids are used there is one PID-line for each present PCB in the layout.

```
PID;<PCB>;<PCB ids>
```

<PCB> PCB offset in the pcb list from last PL-line.

<PCB ids> PCB id of the physical PCB.

PBS - PCB skipped

There is one PBS-line for each skipped PCB in the layout. A PCB is skipped if it is bad or not present. The PBS lines are repeated after each assembly start, i.e. after an STA event.

```
PBS;<PCB>
```

<PCB> PCB offset in the pcb list from last PL-line.

STA - Assembly start

Marks start of assembly. This line show at what time the assembly started.

☞ *If the assembly contains both gluing and mounting the gluing is done first and then the mounting.* In the eventlog one will find a pair of Assembly start and Assembly stop events even though the assembling was not started and stopped.

```
STA;<time-and-date>;<id-code>;<batch>
```

<time-and-date> Start time and date. Seconds since 1/1 1970.

<id-code> A string used to distinguish this specific layout. This string could be used to track a layout that is assembled in different machines in a line.

<batch> Batch id for assembly.

STP - Assembly stop

Marks stop of assembly. Assembly stop events occur when all components are mounted or if the assembly is stopped because of some kind of error.

☞ *If the assembly contains both gluing and mounting the gluing is done first and then the mounting.* In the eventlog one will find a pair of Assembly start and Assembly stop events even though the assembling was not started and stopped.

```
STP;<time-and-date>;<reason>
```

<time-and-date> Stop time and date. Seconds since 1/1 1970.

<reason> Reason for stop:

- – REDY Assembly ready

- – STOP Stopped by operator

- – NOCP Components missing

- – NOCG Components missing and these missing components blocks mount of components with higher group No.

- – MERR Stopped by system error.

CLR - Clear assembly status

Clear status of current layout. The status for all mount positions is cleared and the current layout is abandoned.

```
CLR;<time-and-date>
```

<time-and-date> Time and date. Seconds since 1/1 1970.

M - Mounted

Position mounted.

```
M;<time>;<PCB>;<line>;<Feeder Id.>;<mount-tool>
```

<time> Total time for operation in ms.

<PCB> PCB offset in the pcb list from last PL-line.

<line> PCB Line No.

<Feeder Id> Feeder Index. Corresponds to a feeder Id as specified in a ML-line (see below)

<mount-tool> Tool number. A numeric value where 0 represents Z and 1..8 represents a nozzle number for the Hydra.

D - Dispensed

Position dispensed.

```
D;<time>;<PCB>;<line>
```

<time> Total time for operation in ms.

<PCB> PCB offset in the last PL-line.

<line> PCB Line No. Specifies offset in the PCBs designator list.

ME - Mount error

An error occurred during mount/dispense.

```
ME;<time-and-date>;<error-type>;<Feeder Id>;<mount-tool>
```

<time-and-date> Time and date when the mount error occurred. Seconds since 1/1 1970.

<error-type> Type of error:

- PICK Failed to pick. Attempt to pick component from magazine failed. This includes failed vacuum-test

- MDIM Wrong mechanical dimension. Component mechanical dimensions not within spec

- ELVE Failed electrical verification.

- OPTC Optical centering failed.

- STEP The magazine can not be stepped. Probably a HW error

- LSFE Local site fiducial search failed

- OTHER Other errors such as package not mountable etc.

<feeder Id> Magazine feeder index. Refer to a feeder index in one of the ML lines that occurred since last STA-event.

<mount-tool> Tool number. A numeric value where 0 represents Z and 1..8 represents a nozzle number for the Hydra.

TC - Tool change

Tool change event. Show the tool changes in the machine.

☞ A change from NOTOOL to NOTOOL may occur if TPSys starts in an unknown state. Probably caused by a system crash.

```
TC;<time>;<from tool>;<to tool>
```

<time> Total time for operation in ms.

<from tool> Tool before change.

See section "Tool type code" in "TPSys Ascii Data Formats" for possible tools.

<to tool> Tool after change.

See section "Tool type code" in "TPSys Ascii Data Formats" for possible values

HTC - Hydra tool change

Hydra tool change event. Show the hydra tool changes in the machine. This type of event handle up to eight hydra tool changes.

```
HTC;<time>[;<pipette_no>;<typeOfTool>;<toolTipPosition>.
..]
```

<time> Total time for operation in ms.

<pipette_no> Hydra pipette number. The hydra pipettes are numbered from 1 up to 8.

<typeOfTool> Type of hydra tool tip

<toolTipPosition> Fetch position for the tool tip.

RS - Fiducial mark search

Fiducial mark search. Automatic reference search line.

```
RS;<time>
```

<time> Total time for operation in ms

LRS - Local fiducial mark search

Local site fiducial search. Shows time spent on local fiducial mark search.

```
LRS;<time>
```

<time> Total time for operation in ms

MEV - Measure electric value

Measured a component electrically..

```
MEV;<typeOfTest>;<result>;<PCB>;<line>;<Feeder
Id.>;<StdDev>
```

<typeOfTest> Type of electric test.

- R Resistance test. result in Ohm.
- C Capacitance test. result in Farad.
- C1 Low voltage capacitance test. result in Farad.
- CP Polarized capacitance test. result in Farad.
- DF Diode voltage drop. result in Volt.
- DB Diode leakage. result in Ampere.
- Z Zener diode voltage drop. result in Volt.
- TN NPN transistor current gain test. result in hfe.
- TP PNP transistor current gain test. result in hfe.
- NO No test. Should never appear in the "eventlog".

<result> The result of the measurement. The unit of the result is depending on the type of the test.

<PCB> PCB offset in the pcb list from last PL-line.

<line> PCB Line No.

<Feeder Id> Feeder Index. Corresponds to a feeder Id as specified in a ML-line (see below)

<stdDev> Standard deviation of the measurement. Note! This field is only valid if the enhanced measure method is used.

Magazine Data Lines

ML - Magazine load

Describes magazine load data. Many other events contain fields that refer to a feeder index that are declared in this line. There are as many ML lines as there are magazines in the machine.

☞ *This line only handle magazines that contain components that are used in the currently loaded layout. No magazine information is saved about magazines that are not needed in current layout.*

```
ML;<type>;<mag-name>;<mag-serial>;<fdrId>;<feederNo.>;<c
omponent>;<batch>[;<fdrId>;<feeder>;<component>;<batch>.
..]
```

<type> Magazine type. One of:

  – REM Removable vibratory or tape magazine
  – YW Y-wagon magazine
  – TW Tray wagon magazine
  – TE Tray elevator magazine (old type)
  – TEX Tray elevator magazine (TEX-type)

<mag-name> Magazine name

<mag-serial> Magazine serial number. This field is only valid for magazine type REM and TEX.

<fdrId> Feeder Index. Used for later reference to the feeder.

<feederNo.> Feeder number.

<component> Component name.

<batch> Batch info.

☞ Feeders not explicitly mentioned in the line are not affected.

FI - Feeder information

Gives more information about the feeders used in magazines with removable feeders. Follows a ML line if the ML line contains data for a removable feeder magazine.

```
FI;<mag-serial>;<feeder>;<fdr-name>;<fdr-serial>
[;<feeder>;<fdr-name>;<fdr-serial>...]
```

<mag-serial> Magazine serial number.

<feeder> Feeder position in the magazine.

<fdr-name> Feeder name.

<fdr-serial> Feeder serial number.

MI - Magazine inserted

Magazine inserted event. Magazine type is always a removable vibratory or tape magazine. This line is always followed by an ML-line.

```
MI;<mag-name>;<mag-pos>;<mag-serialno>
```

<mag-name> Magazine name.

<mag-pos> Magazine position number. Specifies in which slot the magazine is inserted.

<mag-serial> Magazine serial number. This is a number is used to identify magazine.

MR - Magazine removed

Magazine removed event. Magazine type is always a removable vibratory or tape magazine.

```
MR;<type>;<mag-serial>
```

<type> Type of magazine, see Magazine Load

<mag-serial> Magazine serial number. This is a number is used to identify magazine.

Data Modification Lines

IL - Insert line

Insert line in a PCB mount list. This event is recorded to make it possible to match mounted lines with lines in PCB mount list event if edits is made during assembly.

```
IL;<PCB-name>;<line>;<location-designator>
```

<PCB-name> Name of PCB

<line> Line number. where new line was inserted (first line is line 1)

<location-designator> Location for new line

RL - Remove line

Remove line from a PCB mount list. This event is recorded to make it possible to match mounted lines with lines in PCB mount list event if edits is made during assembly.

```
RL;<PCB-name>;<line>
```

<PCB-name> Name of the modified PCB.

<line> Removed line number.

IP - Insert PCB.

Insert PCB in current layout. This event is recorded to make it possible to match mounted lines with lines in PCB mount list event if edits is made during assembly.

```
IP;<PCB-name>;<pos>
```

<PCB-name> Name of the inserted PCB

<pos> Position in PL-list where PCB is inserted.

RP - Remove PCB.

Remove PCB from current layout. This event is recorded to make it possible to match mounted lines with lines in PCB mount list event if edits is made during assembly.

```
RP;<pos>
```

<pos> Position in PL-list of removed PCB

External Event Lines

TST - TPSys start

TPSys start event. Show time and date when TPSys was started.

```
TST;<time-and-date>
```

<time-and-date> Time in seconds since 1/1 1970.

TSP - TPSys stop

TPSys stop event. Show time and date when TPSys was shut down.

```
TSP;<time-and-date>
```

<time-and-date> Time in seconds since 1/1 1970. The time when TPSys were shut down.

BC - Board change

Board load/unload. This event will only appear if the machine is connected to a conveyor. The event specifies the time for a complete board change. BC will include the time that the machine has waited for the conveyor.

```
BC;<time>;<result>
```

<time> Time in ms. The time from assembly stop until next board is loaded and it's possible to start a new assembly.

<result> Reason for end of wait:

- OK The board change went well.
- ABORT   Aborted

CUW - Conveyor unload wait

External conveyor wait to deliver board. This event exists if the machine has to wait for the conveyor when trying to deliver a board to the conveyor.

```
CUW;<time>;<result>
```

<time> Time in ms. The amount of time that the machine has waited for a new board.

<result> Result for end of wait:

- OK Board unloaded
- ABORT   Wait aborted.

CLW - Conveyor load wait

External conveyor wait to accept board. This event shows how long the machine has waited for the conveyor when loading a new board.

```
CLW;<time>;<result>
```

<time> Time in ms. The amount of time that the machine has waited for a new board.

<result> Result for end of wait:

- OK Board loaded.
- ABORT   Wait aborted.

FE - Feeder error

Signal that it's not possible to pick components from this feeder anymore. The feeder is unusable until a "feeder ok" event occur.

```
FE;<time-and-date>;<Feeder Id>
```

<time-and-date> Time and date. Seconds since 1/1 1970.

<Feeder Id> Feeder index for feeder that fails. Refer to a feeder index specified in one of the ML-lines.

FO - Feeder ok

Signal that a feeder is "back in business". The problem that caused the feeder error has been taken care of by the operator. It's now possible to pick components from the feeder again.

```
FO;<time-and-date>;<Feeder Id>
```

<time-and-date> Time and date. Seconds since 1/1 1970.

<Feeder Id> Feeder Id for feeder that is now OK. Refer to a feeder index specified in one of the ML-lines.

MTC - Manual tool change

Manual tool change. This includes the time from the operator signal (popup) until the operator press ok. This line always follow an TC-line. The TC-line show which tool changes that have occurred.

```
MTC;<time>
```

<time> Total time for operation in ms. The time it took for the operator to change tool.

MRS - Manual fiducial mark search

Manual adjustment of fiducial mark search. Will appear if the automatic fiducial mark search fail or if the operator selects to adjust the reference points manually.

```
MRS;<time>;<result>
```

<time> Time in ms. Time that the operator used to search for the fiducial mark.

<result> Result of the reference search:

– OK Adjust ready.
– ABORT Adjust aborted.

OW - Operator wait

Wait for operator. This is a "catch all" event that logs an event where the machine waits during assembly for operator to do something that does not fit any event above.

```
OW;<time>;<event>
```

<time> Time in ms.

<event> A description of type of event. Example could be: "Wait for OK to initiate HW".

ULI - User log in

User logged in to the system.

```
ULI;<time-and-date>;<user>;<tty>
```

<time-and-date> Time and date when the user "logged" in. Seconds since 1/1 1970.

<user> Name of the user that "logged" in to the system.

<tty> The tty that was used.

ULO - User log out

User logged out from the system.

```
ULO;<time-and-date>;<user>;<tty>
```

<time-and-date> Time and date when the user "logged" out. Seconds since 1/1 1970.

<user> Name of the user that "logged" out of the system.

<tty> The tty that was used.

ASO- User access system on

User access system was activated.

```
ASI;<time-and-date>
```

<time-and-date> Time and date when the user access system was activated. Seconds since 1/1 1970.

ASF- User access system off

User access system was deactivated.

```
ASF;<time-and-date>
```

<time-and-date> Time and date when the user access system was deactivated. Seconds since 1/1 1970.

MYDATA reserves the right to change or eliminate any specifications and/or prices without prior notice.

Appendix D – Import/Export Data Formats

This chapter specify the general properties of formats used by TPSys for import/export of data.

Formats

The formats are all ASCII-based with typically multiple lines of data for each item (an item would be a component, magazine or such).

Data Line Format

A line has the following format:

```
Id data
```

`Id` – the line id. The line id is composed of one or two letters followed by one or more digits and optional extra characters.

Examples:

```
C01
```

```
M1
```

```
P08a
```

```
M30-TR
```

Note that leading zeros in numbers are significant for the Id field. C1 is not the same as C01.

`data` – is the data for this line. The format and type of data is defined by the line Id.

☞ A line is optional if it is followed by the text "(Optional)" in the documentation. An optional line can be left out.

General Data Formats

The data part of a line contains items separated by space (spaces or tabs).

The types of data items are:

– Numerical

Numerical data usually define a physical property. See below for units. Unless otherwise specified the format can be integer, decimal or floating point.

– Text data

A text, usually with a specified max length. Leading and trailing spaces are ignored and multiple spaces and tabs are treated as a single space. Text data that contain spaces must be surrounded by double quotes ("). The double quotes are optional if the text data is the last (or only) data on the line. The characters back slash (\) and double quote (") are coded with a preceding back slash, i.e. \\ and \".

– Enumerated data

Same as a text data but only a selected set of strings accepted.

– Boolean

Special type of enumerated data that express a true/false data item. The "true"-value can be represented with one of:

TRUE

YES

Y

1

The "false"-value can be represented with one of:

FALSE

NO

N

0

Comparison is not case sensitive.

Optional data

Optional data items are surrounded by brackets([]).

Example:

```
I30 type-code serial-No [magazine-name]
```

The data field `magazine-name` is optional and can be left out.

Lists

A data item followed by two dots represents a list of data items. The list is space separated.

Example:

```
P04 lead-No.. first-lead-offs
```

This line contains of a list of lead-No data items followed by a first-lead-offs data item.

Comments

The data format accepts comments and empty lines. Comments are lines starting with a hash-mark ("#").

Example:

```
# This is a comment line and will be ignored.
```

Default units for numerical data

The numerical data type usually define some physical property with the following default units:

- Angle – millidegrees.

  Positive angle is clockwise and zero degrees straight up (or positive Y-direction in the machine). Angles are always specified as integer values

- Force – mN (milliNewton)
- Length – μm (micrometer)

  See "The unit specification line" below.

- Speed – mm/s (millimeter per second)
- Time – ms (millisecond)

  In most data fields the actual resolution is 10ms.

- Torque – mNm (milliNewtonmeter)

The unit specification line

Some formats contain a unit specification line. This allows length to be specified in something else than μm (micrometer). Format:

```
U unit-code
```

`unit-code` – defines the unit. It can be:

- *nn*

  nn is a positive decimal or floating point number. All length data is multiplied by this number and the result is interpreted as μm.

- *nnI*

  Where nn is an optional positive decimal or floating point number with default value of 1. All length data is multiplied by this number and the result is interpreted as thousands of an inch (mil)

Examples:

```
U 1000
```
Unit is mm (millimeter)

```
U I
```
Unit is thousands of an inch (mil)

```
U 1000I
```
Unit is inch

```
U 1e3I
```
Same as above

```
U 1000.0I
```
Same as above

```
U1000I
```
Same as above (the space after "U" is optional)

☞ The unit specification line is never exported.

Recommendation

Since the unit specification line is not available for all formats and only for the length property we recommend to used it only when no option is available. The internal format is an integer representing μm which mean the U line can not be used to increase resolution.

Special Enumerated Data Types

Some enumerated data types used in related documents.

Magazine type code

The magazine type can have the following values:

- UNKNOWN

  Magazine type is not known

- TAPE_MAG

  Tape magazine

- VIB_MAG

  Vibratory magazine

- TRAY_MAG

  Matrix tray magazine

Tool type code

The tool type can have one of the following values:

A12, A13, A14, A23, A24, A34, B12, B13, B14, B23, B24, B34, C12, C13, C14, C23, C24, C34, D12, D13, D14, D23, D24, D34

Hydra Tool type code

The hydra tool type can have one of the following values:

H00, H01, H02, H03, H04, H06

Component Data Format

This section defines the ascii format of the Component data file used for import/export of component data to/from TPSys internal databases.

Lines

Unless otherwise stated:

The lines should appear in the order indicated below. There should be exactly one line of the specified type

C00 name

Component name.

- *name* – Text data. Specifies the name of the component. Leading and trailing spaces are ignored and the name is truncated to 35 characters. The name field is not allowed to be empty.

C01 package-name

Package type for the component specified in the last C00 line.

- *package-name* – Text data. The name of the components package. Leading and trailing spaces are ignored and the name is truncated to 25 characters.

C02 comment (Optional)

Optional comment line for component specified in last C00 line. Not exported if the comment field is empty.

- *comment* – Text data. Comment about the component. Leading and trailing spaces are ignored and the text is truncated to 40 characters.

C03 skip-mount skip-dispense

Status of mount and dispense flags for the component.

- *skip-mount* – Boolean data value that represents mount skip flag. If "TRUE", the component is not mounted. Exported as "TRUE" or "FALSE".

- *skip-dispense* – Boolean data value that represents dispense skip flag. If "TRUE", the component is not dispensed. Exported as "TRUE" or "FALSE".

C05 pol-mount not-used reject-action

Polarization and reject action line.

- *pol-mount* – Boolean data. Value that represents the polarization flag If "FALSE", the machine may mount the component 180 degrees from the specified mount angle if it finds it convenient. If "TRUE" the component is always mounted in the specified angle.

- *not-used* – Value not used. Ignored at import and always exported as "0". For compatibility reasons only.

- *reject-action* – Enumerated data. Value that defines how and where to get rid of bad components of this type. Value may be one of:

  MANUAL
  Move the component to manual reject position and prompt operator to remove component

  BIN_1
  Throw component in throw position 1

  BIN_2
  Throw component in throw position 2

  BIN_3
  Throw component in throw position 3

  BIN_4
  Throw component in throw position 4

  BIN_5
  Throw component in throw position 5

  BIN_6
  Throw component in throw position 6

  BIN_7
  Throw component in throw position 7

  BIN_8
  Throw component in throw position 8

  PUT_BACK
  Put component back in magazine. This option is available only for matrix trays.

  CLOSEST_BIN
  The system will try to find the closest bin and throw the component there.

C06 el-test not-used angle nominal max min (Optional)

Optional electrical test line. There may be zero, one or two C06 lines.

- *el-test* – Enumerated data. Represents the electrical test code. Value may be one of the following:

  NO
  No test

  R
  Resistance test

  C
  Normal capacitance test

  C1
  Low voltage capacitance test

  CP
  Polarised capacitance test

  DF
  Diode forward voltage drop test

  DB
  Diode reverse leakage current test

  Z
  Zener diode voltage test

  TN
  NPN transistor amplification test

  TP
  PNP transistor amplification test.

- *not-used* – Boolean data. Not used. Should be set to "FALSE" at import, always exported as "FALSE".

- *angle* – Integer numerical data. Specifies the centering angle where it is possible to perform the specified electrical test. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

- *nominal* – Integer numerical data representing the nominal value for the electrical test. The value is expressed in Ohms (R), Farads (C, C1 and CP), Volts (DF, Z), Amperes (DB) or gain (TN and TP).

- *max* – Integer numerical data representing max acceptable value for the electrical test. For unit, see "nominal" above.

- *min* – Integer numerical data representing min acceptable value for the electrical test. For unit, see "nominal" above.

C07 bar-code (Optional)

Optional bar code data. The C07 line is not exported if the bar code field is empty.

– *bar-code* – Text data representing the bar code for the component. Leading and trailing spaces are ignored and the text is truncated to 40 characters.

☞ A bar code made up of minus signs is ignored at import (Example: "C07 ----" will for example be ignored) .

C08 feeder-type (Optional)

Optional feeder type line. The feeder type data is used for magazine preparation and optimization. It is not used by the system during assembly.

– *feeder-type* – Text data that represents the type of feeder this component is loaded in. Leading and trailing spaces are ignored. The following values are recognized by the system:

For tape magazines

8mm
8mm tape feeder

fp8mm
8mm fine-pitch tape feeder

12mm
12mm tape feeder

16mm
16mm tape feeder

24mm
24mm tape feeder

32mm
32mm tape feeder

44mm
44mm tape feeder

56mm
56mm tape feeder

72mm
72mm tape feeder

st32mm
32mm surf tape feeder. Obsolete. Not exported.

custom
other feeder type

For vibratory magazines
None.

For matrix trays
None.

C081 magazine-type (Optional)

Optional magazine type line. The magazine type is used together with the feeder type for magazine preparation and optimization. It is not used by the system during assembly.

– *magazine-type* – Enumerated data that represent the type of magazine this component is stored in. Leading and trailing spaces are ignored. (See section "Magazine type code" in "TPSys Ascii Data Formats")

C09 Servo Adjustment (Optional)

Optional servo adjustment line for Agilis Linear Magazines. The servo adjustment is used when trimming tape guides in Agilis Linear Magazines. It represents how much extra a tape has to be feed for the magazine to feed the component to the desired location.

– *Servo Adjustment* – Integer data. Servo adjustment in um.

C10 default-tape-angle default-vib-angle (Optional)

Optional default load angles line. The values are used when the component is loaded in a magazine.

– *default-tape-angle* – The default load angle for tape magazines

– *default-vib-angle* – The default load angle for vib magazines

C11 default-steps finepitch (Optional)

(*TPSys 2.3 only*) Optional default steps line. The values are used when the component is loaded in a magazine.

– *default-steps* – The number of steps.

– *finepitch* – Boolean data representing the finepitch flag. Exported as "TRUE" or "FALSE".

C12 default-step-length (Optional)

Optional default step length value.

– *default-step-length* – The step length in micrometers.

Component Data Examples

Example 1

Simplest possible. A component called 123-000 in a 1206 package:

```
C00 123-001

C01 1206-07

C02 A component

C03 FALSE FALSE

C05 FALSE 0 BIN_1
```

Example 2

A 1MOhm 5% 1206 resistor delivered in 8mm tape with component name 123-001, skip-dispense flag set to true and bar-code set to R123-001:

```
C00 123-001

C01 1206-07

C02 RES 1Mohm

C03 FALSE TRUE

C05 FALSE 0 BIN_2

C06 R false 90000 1e+06 1.05e+06 950000

C07 R123-001

C08 8mm

C081 TAPE_MAG
```

Example 3

A 10nF capacitor with component name 123-002 and electrical properties 10nF +100-10%:

```
C00 123-002

C01 1206-07

C02 10nF cap.

C03 FALSE FALSE

C05 FALSE 0 BIN_2

C06 C false 90000 10e-9 20e-9 9e-9

C08 8mm

C081 TAPE_MAG

C10 90000 0

C12 4000
```

Gluedot Data Format

This section defines the ascii format for the Gluedot data file used for import/export of Gluedot data to/from TPSys internal databases.

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be exactly one line of the specified type

G00 name

Gluedot name line. Must be first line of file.

– *name* – Text data. The name of the gluedot, not allowed to be empty. Leading and trailing spaces are ignored and the name is truncated to 15 characters.

G01 [comment] (Optional)

Optional comment line.

– *comment* – Text data. Short description about the Gluedot. Leading and trailing spaces are ignored and the name is truncated to 35 characters. Optional, may be empty. An empty comment is not exported.

G02 tool

Dispense tool line. Specifies which tool to use.

– *tool* – Enumerated data representing type of dispense tool to use. See section "Tool type code" in "TPSys Ascii Data Formats" for valid tools.

G03 depth-offset wait-time up-distance up-force up-speed

Glue fetch data line.

– *depth-offset* – Integer numerical data. Dip depth offset in glue-pot, in micrometer (um).

– *wait-time* – Integer numerical data. Wait-time in glue, in milliseconds (ms).

– *up-distance* – Integer numerical data. Distance to run slowly when going up from glue-pot, in micrometer (um).

– *up-force* – Integer numerical data. Max force when going up from glue-pot in mN.

– *up-speed* – Integer numerical data. Speed when going up from glue-pot in mm/s.

G04 X-wait-time wait-time up-distance up-force up-speed

Glue place data line.

– *X-wait-time* – Integer numerical data. Wait-time before and after X-wagon movement in milliseconds (ms).

– *wait-time* – Integer numerical data. Wait-time on board in milliseconds (ms).

– *up-distance* – Integer numerical data. Distance to run slowly when going up from the board in micrometer (um).

– *up-force* – Integer numerical data. Max force when going up from the board slowly in mN.

– *up-speed* – Integer numerical data. Speed when going up from the board slowly in mm/s.

Examples

A gluedot called DOT0.5mm, which should be applied with the C12 tool.

```
G00 DOT0.5mm
G02 C12
G03 0 64 1200 5000 80
G04 0 0 1200 5000 80
```

Kit List Data Format

This section defines the ascii format of the Kit List data file used for import/export of KitLists to/from TPSys internal databases.

Special Enumerated Data Types

Some enumerated data types are used in more than one place in this format:

Acceleration code

The acceleration codes can have one of the following values:

- ACC_HIGHEST
  Highest possible acceleration

- ACC_HIGH
  High acceleration (will only reduce acceleration on the fastest machines)

- ACC_LOW
  Low acceleration

- ACC_LOWEST
  Lowest possible acceleration

Magazine type codes

The magazine type code can have one of the following values:

- 002
  VM30 magazine. Vibratory magazine

- 011
  TM8 magazine. 8 mm tape magazine

- 021
  TM8 magazine. 8 mm tape magazine

- 025
  TM1216 magazine. 4X12mm plus 4X16mm tape magazine

- 026
  TM24 magazine. 24mm tape magazine

- 027
  TM12 magazine. 12 mm tape magazine

- 030
  TM16 magazine. 16mm tape magazine

- 031
  TM32 magazine. 32mm tape magazine

- 032
  TM44 magazine. 44mm tape magazine

- 033
  TM5632 magazine. 2X56mm plus 1X32mm tape magazine

- 034
  TM8F magazine. 8 mm tape magazine for tape with 2mm pitch

- 035 036
  TMX magazine. Custom magazine

- 040
  TMFLEX magazine. Flexible tape magazine

- 041
  STM32 magazine.

- 042
  VM30B magazine. Vibratory magazine

- 060
  AM8 magazine. Agilis 8mm magazine

- 062
  ALM8 magazine. Agilis Linear magazine 8mm

- 063
  ALM1216 magazine. Agilis Linear magazine 12/16mm

- 100
  YW magazine. Y-wagon magazine

- 101
  TW magazine. Tray wagon magazine

- 102
  TE magazine. Tray elevator magazine

Magazine type names

The magazine type name can have one of the following values:

- -
  Not specified or not a valid type name.

- ALM8
  Agilis Linear magazine for 8mm tape guides

- ALM1216
  Agilis Linear magazine for 12/16mm tape guides

- AM8
  Agilis magazine for 8 mm tape guides

- TM8
  8 mm tape magazine

- TM8F
  8 mm tape magazine for tape with 2mm pitch

- TM12
  12 mm tape magazine

- TM1216
  4X12mm plus 4X16mm tape magazine

- TM16
  16mm tape magazine

- TM24
  24mm tape magazine

- TM32
  32mm tape magazine

- TM44
  44mm tape magazine

- TM5632
  2X56mm plus 1X32mm tape magazine

- TMFLEX
  Flexible tape magazine

- VM
  Vibratory magazine

- AM8
  AGILIS 8mm magazine

- YW
  Y-wagon magazine

- TW
  Tray wagon magazine

- TE
  Tray elevator magazine

- TMX
  Custom magazine

- STM32

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be exactly one line of the specified type

I10 name

Kit List name. Must be first line of file.

- *name* – Text data. The name of the kitlist, an empty name field is not allowed. Leading and trailing spaces are ignored and the name is truncated to 35 characters.

I20 [comment] (Optional)

Optional comment line.

- *comment* – Text data. An optional comment about the kitlist. Leading and trailing spaces are ignored and the name is truncated to 35 characters. An empty comment is not exported.

I30 type-code serial-No [magazine-name] (Optional)

Optional magazine line. This line defines the magazine for the lines following up to the next I30 line or end of file. If the magazine does not exist, the lines up to next I30 line or end of file are ignored. Exported as "I30 - 0" if the magazine isn't specified.

- *type-code* – Magazine typename or typecode. The magazine name is always exported, i.e. never exported as an integer type code. If type code: Integer numerical data between 0 to 255. (See Magazine type codes above). If type name: Text data. (See Magazine type names above)

- *serial-No* – Integer numerical data. Magazine serial number between 0-65535. If serial No is 0 the magazine is not specified.

- *magazine-name* – Text data. Optional magazine name. This parameter is optional when importing. Leading and trailing spaces are ignored and the name is truncated to 35 characters.

☞ If the serial number is valid the type-code and magazine-name is ignored.

I30-X type [pallet]

A special version of the I30 line that defines a matrix tray magazine. See I30 line comment for more info.

- *type* – Text data. Type of tray magazine. Allowed types:

  `YW`
  Magazine is a Y-wagon magazine.

  `TW`
  Magazine is a Tray-wagon magazine.

  `TE`
  Magazine is a Tray-elevator magazine pallet.

  `XS`
  Magazine is a Tray-elevator magazine pallet.

  `XD`
  Magazine is a Tray-elevator magazine pallet.

- *pallet* – Optional text data. Name of pallet. Required only if the tray-magazine-type is a tray elevator magazine pallet. Ignored otherwise.

I31 slot (Optional)

Optional magazine position. Optional line that defines a magazine position for the magazine. This line must follow a I30 line if present. This line is used to advise the operator where to put the magazine. There may be zero or one I31 line for each I30.

- *slot* – Integer numerical data. Magazine slot number. Allowed values are depending on machine type.

I40 feeder-No angle component

Defines feeder contents. One line for each feeder. The lines must follow a I30 line or a I31 if present. This line also specifies feeder for the optional I41, (I42,) I45 and I43 lines following this line. Line I42 is not exported any more but can still be imported.

- *feeder-No* – Integer numerical data. Feeder number. Range depends on magazine type. No feeder number but a dash mark (-) is exported if the magazine is unspecified or the magazine is of an invalid type. Default value: 0.

- *angle* – Integer numerical data. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

- *component* – Text data. Component name. Empty names are not allowed. Leading and trailing spaces are ignored and the name is truncated to 35 characters.

I40-X tray-type angle component [tray-name]

Defines feeder contents for matrix tray magazine. This line defines the feeder contents for a magazine. This line is allowed only if magazine was specified using a I30-X line. I40-X also specifies matrix tray for the I41-X line following this line.

– *tray-type* – Text data. Tray type name. "-" means that no tray type is specified.

– *angle* –Integer numerical data. The angle is with respect to the matrix tray. 0 degrees is pointing into the machine when the tray-type is defined.

– *component* – Text data. Component name. An empty component name is not allowed. Leading and trailing spaces are ignored and the name is truncated to 35 characters.

– *tray-name* – Text data. Optional tray name. Always exported. Leading and trailing spaces are ignored and the name is truncated to 35 characters. If omitted, a tray name will be generated from the component name.

I41 x-offset (Optional)

Optional x-offset line. This line is only valid if component was specified using a I40 line. Follows I40 if present.

– *x-offset* – Pick position X offset for feeder. Offset in um from magazine reference mark.

I41-X x1 y1 x2 y2 (Optional)

Optional tray position line. Defines position of tray in tray magazine coordinate system. This line is only valid if component was specified using a I40-X line. Follow I40-X if present.

– *x1 y1* – Integer numerical data. Position of lower left corner of tray.

☞ Lower left as defined when the tray type was defined, not necessarily the lower left for current position.

– *x2 y2* – Integer numerical data. Position of upper right corner of tray.

☞ Upper right as defined when the tray type was defined, not necessarily the upper right for current position.

I41-XP tray-position-name [orientation] (Optional)

Optional tray position line. Defines position as one of the predefined tray positions. This line is only valid if component was specified using a I40-X line. Follow I40-X if present.

– *tray-position-name* – Text data. Name of tray position for tray. Leading and trailing spaces are ignored and the name is truncated to 20 characters.

– *orientation* – Optional enumerated data. The orientation of the tray in the tray position given as the corner where the first component is located. Allowed values are:

```
LOWER_LEFT
UPPER_LEFT
UPPER_RIGTH
LOWER_RIGHT.
```

I41-XA auto-refill (Optional)

Optional autorefill line.

– *auto-refill* – Boolean data.

I42 steps (Not exported. Imported if there.)

Optional steps data line. This line is not exported but still supported in import.

– *steps* – Integer numerical data. Number of steps per feed Valid only for tape magazine.

I42 amplitude time [frequency] (Not exported. Imported if there.)

Optional step data line. There are two versions of this line depending on magazine type. This line is obsolete but still supported in import.

– *amplitude* – Integer numerical data. Vibration amplitude. Value between 0 and 100. Normal values 50-60. Valid only for vibratory magazine.

– *time* – Integer numerical data. Vibration time in seconds. Valid only for vibratory magazine.

– *frequency* – Integer numerical data. Optional vibration frequency. Valid only for vibratory magazine. Default value: -1. Not exported if value is equal to -1.

I42-F fine-pitch (Not exported. Imported if there.)

Optional fine pitch step line. Follow I42 if present. This line is obsolete but still supported in import.

– *fine-pitch* – Boolean data. The steps are fine pitch steps if this values is true. Valid only for tape magazines with removable feeder.

I45 steplength (Optional)

Optional step length data line.

- *steplength* – Integer numerical data. Length of feed in um. Valid only for tape magazine.

I45 amplitude time [frequency] (Optional)

Optional step length data line. There are two versions of this line depending on magazine type.

- *amplitude* – Integer numerical data. Vibration amplitude. Value between 0 and 127. Normal values 50-60. Valid only for vibratory magazine.

- *time* – Integer numerical data. Vibration time in seconds. Valid only for vibratory magazine.

- *frequency* – Integer numerical data. Optional vibration frequency. Valid only for vibratory magazine. Default value: -1. Not exported if value is equal to -1.

I43 quantity (Optional)

Optional load quantity line. If quantity line is specified this data will be used as loaded quantity when kit list is activated.

- *quantity* – Integer numerical data. Loaded quantity.

I44-X yAcc zAcc (Optional)

Optional acceleration codes for tray magazines. This line is only valid if component was specified using a I40-X line. Follow I40-X if present.

- *yAcc* – Enumerated data. Y acceleration to use when handling the package.

- *zAcc* – Enumerated data. Z acceleration to use when handling the package.

Layout Data Format

This section defines the ascii format of the Layout data file used for import/export of layout descriptions to/from TPSys internal databases.

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be exactly one line of the specified type

S1 name

Layout name line. Must be first line of file.

- *name* – Text data. The name of the layout. Leading and trailing spaces are ignored and the name is truncated to 35 characters. An empty name is not allowed.

S1B bar-code (Optional)

Optional bar code line.

- *bar-code* – Text data. The barcode of the layout.

S2 info (Optional)

Optional layout info line. There may be any number of S2 lines.

- *info* – Text data. Layout information line. Leading and trailing spaces are ignored and the text is truncated to 35 characters.

U unit-code (Optional)

Optional unit line. This is a line that defines the length unit used in the file. If the line is omitted the unit is assumed to be um (micrometer). This line is never exported.

- *unit-code* – Text data. Defines the unit. See section "The unit specification line" in "TPSys Ascii Data Formats".

S3B name (Optional)

Optional board name line. There may be any number of S3B lines but each S3B line should be followed by at least one S4 line.

- *name* – Text data. The name of the board. Leading and trailing spaces are ignored and the name is truncated to 35 characters.

S3P name (Optional)

Optional panel name line. There may be any number of S3P lines but each S3P line should be followed by at least one S4 line.

– *name* – Text data. The name of the panel. Leading and trailing spaces are ignored and the name is truncated to 35 characters.

S4M machine-name (Optional)

Optional machine name line. If present it will follow an S3B or an S3P line.

– *machine-name* – Text data. Name of the machine.

S4 x1 y1 x2 y2 [x3] [y3] (Optional)

Optional panel/board fiducial mark positions. This line specifies the coordinates of the fiducial marks for the panels/boards in the layout. There should be one S4 line for each panel or board in the layout. The S4 lines may follow an S3B, S3P or S4M line.

– *x1* – Floating point numerical data. X position of fiducial mark 1.

– *y1* – Floating point numerical data. Y position of fiducial mark 1.

– *x2* – Floating point numerical data. X position of fiducial mark 2.

– *y2* – Floating point numerical data. Y position of fiducial mark 2.

– *x3* – Floating point numerical data. Optional X position of fiducial mark 3.

– *y3* – Floating point numerical data. Optional Y position of fiducial mark 3.

S5 conveyor-width (Optional)

Optional conveyor width specification line. Max one S5 line per S1 line.

– *conveyor-width* – Integer numerical data. Width of the conveyor.

S6 conveyor-board-type (Optional)

Optional conveyor board type specification line. Max one S6 line per S1 line.

- *conveyor-board-type* – Enumerated data. Value that defines how to handle the board in the conveyor. Value may be one of:

  NORMAL
  For normal boards. Parameters 92.0121-92.0127 control how this board type is handled.

  SMALL
  For small boards. Parameters 92.0141-92.0147 control how this board type is handled.

  LARGE
  For large boards. Parameters 92.0161-92.0167 control how this board type is handled.

  SPECIAL
  For special boards. Parameters 92.0181-92.0187 control how this board type is handled.

Layout Data Examples

Our exemple is a layout, named "test4x2", which contains only one PCB also named "test4x2". After the PCB name line follows three different fiducial mark lines, one for an unspecified machine and two where the machine is specified.

```
S1 test4x2

S2

S3B test4x2

S4 2685 2270 239720 429748 240121 2366

S4M tp11n000

S4 3192 2452 240634 430019 240677 2489

S4M tp94n064

S4 2685 2270 239720 429748 240121 2366
```

Magazine Data Format

This section defines the ascii format of the Magazine data file used for import/export of Magazine descriptions to/from TPSys internal databases.

Line Type Combinations

The ascii representation for magazine data consists of a number of different line types. These line types are only valid in a limited number of combinations. The different line type combinations are specified below.

Special characters

The special characters are not a part of the file format. They are just used to specify the combination of the line types.

* means repeat 0 or many times.

[] means optional.

() just to mark several lines as a unit.

Line type combinations for magazine data (with respect to line types).

Below the line type combinations follow. For a specification of each line type, see Lines below.

```
M00

    (M01)*
```

A format used before TPSys 1.5. Not exported any more but possible to import.

```
M10

    [M15]

    (M20 [M30-TM [M35-TM] ] )*
```

Current tape format.

```
M10

    [M15]

    (M20 [M30-VM] )*
```

Current vibratory magazine format

```
M10

    [M15]

    (M20 [M30-TR [M99-TR] ] )*
```

Tray format for y wagon and tray wagon trays. Used up to TPSys 2.3. Not exported any more but possible to import.

```
M10
```

```
    [M15]
```

```
    (M20 [M30-TP [M99-TP] ] )*
```

Tray format for pallet trays. Used up to TPSys 2.3. Not exported any more but possible to import.

```
M10
```

```
    [M15]
```

```
    (M20-C [M30-TR [M40-T [M99-TC] ] ] )*
```

Current format for y wagon and tray wagon trays

```
M10
```

```
    [M15]
```

```
    (M20-C [M30-TP [M40-T [M99-TC] ] ] )*
```

Current format for pallet trays

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be exactly one line of the specified type.

M10 type-code serial-No fiducial-mark-X name [bar-code] [step-count] [fiducial-mark-Y-left] [fiducial-mark-Y-right]

Magazine data line. Must be first line of file.

– *type-code* – Integer numerical data. Type code of the magazine. Allowed type codes for a magazine is:

`-1`
Y wagon magazine.

`-2`
Tray wagon magazine.

`-3`
Pallet

`1`
Tape magazine 16*8. Obsolete type code.

`2`
Vibratory magazine VM30.

`5`
Tape magazine 4*12+4*16. Obsolete type code.

`6`
Tape magazine 5*24. Obsolete type code.

`7`
Tape magazine 8*12. Obsolete type code.

`8`
Tape magazine 8*16. Obsolete type code.

9

Trimmable tape magazine TM8.

13

Trimmable tape magazine TM1216. Obsolete type code.

14

Trimmable tape magazine TM24. Obsolete type code.

15

Trimmable tape magazine TM12. Obsolete type code.

16

Trimmable tape magazine TM16. Obsolete type code.

17

Tape magazine TM8B.

21

Tape magazine TM1216B.

22

Tape magazine TM24B.

23

Tape magazine TM12B.

24

Tape magazine TM16B.

25

Tape magazine TM32B.

26

Tape magazine TM44B.

27

Tape magazine TM5632B.

28

Tape magazine TM8FB.

32

Tape magazine TMFLEX.

34

Vibratory magazine VM30B.

48

AGILIS magazine AM8.

50

AGILIS linear magazine ALM8.

51

AGILIS linear magazine ALM1216.

– *serial-No* – Integer numerical data. The magazine serial number as encoded in the magazine PAL. This number has no meaning for the Y-wagon magazine, the Tray-wagon magazine or pallets.

– *fiducial-mark X* – Integer numerical data. The magazine fiducial mark X offset relative to the slot position. This number has no meaning for the Y-wagon magazine, the Tray-wagon magazine or pallets.

– *name* – Text data. The name of the magazine. Leading and trailing spaces are ignored and the name is truncated to 35 characters. In the pallet case the name is truncated to 25 characters. If the pallet has no name it will be set to "" on export. The name has no meaning for the Y-wagon magazine and the Tray-wagon magazine. On export it will however be set to YW and TW respectively.

- *bar-code* – Text data. Optional field. Leading and trailing spaces are ignored and the bar code is truncated to 40 characters. If the pallet lacks a name bar-code will be set to "" on export. On export bar-code will be set to YW for Y-wagons and TW for T-wagons.

- *step-count* – Optional integer numerical data. Number of times a feeder has been stepped. Used for service.

- *fiducial-mark Y left* – Optional integer numerical data. The Y offset of the left fiducial mark relative to the pick position. This number has no meaning for the magazines other than the ALM type.

- *fiducial-mark Y right* – Optional integer numerical data. The Y offset of the right fiducial mark relative to the pick position. This number has no meaning for the magazines other than the ALM type.

M15 machine-No slot-No

Second magazine data line. This line is not read on data import. It is for information only.

- *machine-No* – Integer numerical data. The machine number or 0 if not inserted.

- *slot-No* – Integer numerical data. The slot number or -1 if not inserted.

M20 number kit-flag feeder-type [angle] [quantity] [component] [batch-id] [low-on-components] (Optional)

Optional feeder contents line. There should be one M20 and one of the M30 line for each feeder/tray in the magazine/pallet. Empty feeders will not be present in exported data. Non-present feeders in imported data will be emptied.

- *number* – Integer numerical data. The feeder/tray number.

- *kit-flag* – Boolean data. Obsolete. Always false when exported. Ignored when imported.

- *feeder-type* – Text data. The feeder type. Ignored if the feeder type is fixed.

- *angle* – Integer numerical data. The angle of the component. The component angle of vib feeders defaults to 0, all other to 90 degrees. Optional (not present if feeder is empty). (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

- *quantity* – Integer numerical data. Remaining number of components in the feeder/tray. Default value is 0. Optional (not present if feeder is empty).

- *component* – Text data. The component name. Leading and trailing spaces are ignored and the name is truncated to 35 characters. Optional (not present if feeder is empty).

- *batch-id* – Text data. Batch ID. The batch id is truncated to 35 characters. Optional (not present if feeder is empty).

- *low-on-components* – Integer numerical data. Remaining number of components in the feeder/tray when the system warns for low on components.

M20-C carrier kit-flag feeder-type [angle] [quantity] [component] [batch-id] [low-on-components] (Optional)

Optional feeder contents line. There should be one M20 and one of the M30 lines for each feeder/tray in the magazine/pallet. Empty feeders will not be present in exported data. Non-present feeders in imported data will be emptied.

- *carrier* – Text data. Unique carrier identifier. Maximum 35 characters

- *kit-flag* – Boolean data. Obsolete. Always false when exported. Ignored when imported.

- *feeder-type* – Text data. The feeder type. Ignored if the feeder type is fixed.

- *angle* – Integer numerical data. The angle of the component. The component angle of vib feeders defaults to 0, all other to 90 degrees. Optional (not present if feeder is empty). (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

- *quantity* – Integer numerical data. Remaining number of components in the feeder/tray. Default value is 0. Optional (not present if feeder is empty).

- *component* – Text data. The component name. Leading and trailing spaces are ignored and the name is truncated to 35 characters. Optional (not present if feeder is empty).

- *batch-id* – Text data. Batch ID. The batch id is truncated to 35 characters. Optional (not present if feeder is empty).

- *low-on-components* – Integer numerical data. Remaining number of components in the feeder/tray when the system warns for low on components.

M30-TM x-offset step (Not exported. Imported if there.)

Optional feeder data line for tape feeders. There should be one M20 and one M30-TM or M35-TM line for each tape feeder in the magazine. M30-TM is obsolete but still supported.

- *x-offset* – Integer numerical data. Feeder X-wise offset relative to the magazine fiducial mark in um.

- *step* – Integer numerical data. Number of steps per feed.

M35-TM x-offset step-length

Optional feeder data line for tape feeders. There should be one M20 and one M35-TM line for each tape feeder in the magazine.

- *x-offset* – Integer numerical data. Feeder X-wise offset relative to the magazine fiducial mark in um.

- *step-length* – Integer numerical data. Length of feed in um.

M30-TP x1 y1 x2 y2 auto-flag z-acc y-acc [tray-type] (Optional)

Optional feeder data line for tray-pallet trays. There should be one M20-C and one M30-TR line for each tray-pallet.

- *x1* – Integer numerical data. X position of the lower left corner of the pallet in um.

- *y1* – Integer numerical data. Y position of the lower left corner of the pallet in um.

- *x2* – Integer numerical data. X position of the upper right corner of the pallet in um.

- *y2* – Integer numerical data. Y position of the upper right corner of the pallet in um.

- *auto-flag* – Boolean data. Auto refill flag. If "true", auto refill mode will be enabled for this pallet.

- *z-acc* – Enumerated data. Acceleration code for Z. For allowed values see Acceleration code in section Ascii representation for Package Data

- *y-acc* – Enumerated data. Acceleration code for Y. For allowed values see Acceleration code in section Ascii representation for Package Data

- *tray-type* – Optional text data. The name of the type of this tray-pallet. Leading and trailing spaces are ignored and the name is truncated to 20 characters.

M30-TR x1 y1 x2 y2 auto-flag [tray-type] (Optional)

Optional feeder data line for trays. There should be one M20-C and one M30-TR line for each tray.

- – *x1* – Integer numerical data. X position of the lower left corner of the tray in um.

- – *y1* – Integer numerical data. Y position of the lower left corner of the tray in um.

- – *x2* – Integer numerical data. X position of the upper right corner of the tray in um.

- – *y2* – Integer numerical data. Y position of the upper right corner of the tray in um.

- – *auto-flag* – Boolean data. Auto refill flag. If "true", auto refill mode will be enabled for this tray.

- – *tray-type* – Optional text data. The name of the tray-type of this tray. Leading and trailing spaces are ignored and the name is truncated to 20 characters.

M30-VM x-offset amplitude duration frequency (Optional)

Optional feeder data line for vibratory feeders. There should be one M20 and one M30-VM line for each vibratory feeder in the magazine.

- – *x-offset* – Integer numerical data. Feeder X-wise offset relative to the magazine fiducial mark in um.

- – *amplitude* – Integer numerical data. Vibration amplitude.

- – *duration* – Integer numerical data. Vibration time for each feeder in milliseconds.

- – *frequency* – Integer numerical data. Vibration frequency in Hz.

M40-T inserted-In [tray-position] [orientation] (Optional)

Optional feeder data line for trays.

- – *inserted-In* – Integer data. The machine number where the tray is inserted. 0 means not inserted in any machine. Pallet trays always have 0 as value.

- – *tray-position* – Optional text data. The name of the tray position of this tray. Leading and trailing spaces are ignored and the name is truncated to 20 characters.

- – *orientation* – Optional enumerated data. The orientation of the tray in the tray position given as the corner where the first component is located. Allowed values are:

  LOWER_LEFT

  UPPER_LEFT

  UPPER_RIGTH

  LOWER_RIGHT

M99-TR status tray-position (Optional)

Optional feeder data line for trays. This line is not exported.

- *status* – Integer numerical data. Available status codes are:

  0

  Error

  1

  Tray not present

  2

  Tray empty

  3

  Tray ok

- *tray-position* – Optional text data. The name of the tray position of this tray. Leading and trailing spaces are ignored and the name is truncated to 20 characters.

M99-TC status (Optional)

Optional feeder data line for trays.

- *status* – Enumerated data. The status of the tray. Allowed values are ERROR and OK.

M99-TP status tray-position (Optional)

Optional feeder data line for tray pallet trays. This line is not exported.

- *status* – Integer numerical data. Available status codes are:

  0

  Error

  1

  Tray not present

  2

  Tray empty

  3

  Tray ok

- *tray-position* – Optional text data. The name of the tray-type of this tray. Leading and trailing spaces are ignored and the name is truncated to 20 characters.

Magazine Data Examples

```
M10 17 10419 279 "TM8B-10419"

M20 0 false 8mmtape 90000 0 "0603-Hydra"

M35-TM 14180 4000

M20 1 false 8mmtape 90000 0 "0603-Hydra"

M35-TM 24203 4000

M20 2 false 8mmtape 90000 0 "0603-Hydra"

M35-TM 34154 4000

M20 3 false 8mmtape 90000 0 "0603-Hydra"

M35-TM 44214 4000

M20 4 false 8mmtape 90000 0 "0603-Hydra"

M35-TM 54200 4000

M20 5 false 8mmtape 90000 0 "0603-Hydra"

M35-TM 64228 4000

M20 6 false 8mmtape 90000 0 "0603-Hydra"

M35-TM 74300 4000

M20 7 false 8mmtape 90000 0 "0603-Hydra"

M35-TM 84378 4000

M20 8 false 8mmtape 90000 0 "1206-Accur"

M35-TM 94300 4000
```

Management Data Format

This section defines an ascii format of the Management data file used for import/export of Management data to/from TPSys internal databases.

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be exactly one line of the specified type.

MD00 layout-name

The header line. Must be first line of file.

 – *layout-name* – Text data. Contains the layout name. Leading and trailing spaces are ignored. Not allowed to be empty.

MD01 machine-name

The machine name line.

 – *machine-name* – Text data. Contains the machine name. Leading and trailing spaces are ignored.

MD02 layouts-assembled

Layouts assembled line.

 – *layouts-assembled* – Integer numerical data. The number of layouts actually assembled.

MD03 boards-assembled

Boards assembled line. Specifies number of assembled boards in the layout specified in the MD00 line.

 – *boards-assembled* – Integer numerical data. The number of boards in the layout that have been assembled.

MD04 total-time dispense-time assembly-time

Time used for layout.

 – *total-time* – Integer numerical data. Total time in milliseconds layout has been loaded.

 – *dispense-time* – Integer numerical data. Total time in milliseconds used for dispense.

 – *assembly-time* – Integer numerical data. Total time in milliseconds used for component mount.

MD05 component-name (Optional)

Optional component name line. There may be several MD05 lines or none if nothing has been assembled yet. When exported there is one MD05 line for each component.

– *component-name* – Text data. The name of the component that has been mounted/dispensed.

MD06 placed time bad-dimension bad-electric bad-picked bad-placed bad-other (Optional)

Optional component statistics line. The MD06 line always follows the MD05 line and there are always as many MD06 lines as there are MD05 lines. The MD06 line contains general statistics about the component specified in the previous MD05 line.

– *placed* – Integer numerical data. The number of components of the type specified in line MD05, placed on the PCB.

– *time* – Integer numerical data. The amount of time that was required for placing all placed components of this type.

– *bad-dimension* – Integer numerical data. The number of components of specified type rejected because of incorrect dimension.

– *bad-electric* – Integer numerical data. The number of components of specified type rejected because of failed electrical test.

– *bad-picked* – Integer numerical data. The number of failed pick operations for component of specified type.

– *bad-placed* – Integer numerical data. The number of failed place operations for component of specified type.

– *bad-other* – Integer numerical data. The number of times a mount cycle failed for some other reason than the previous reasons

MD07 dispensed time (Optional)

Component statistics line. The MD07 line is optional. When specified, it should follow the MD06 line. The MD07 line contains dispense statistics about the component specified in line MD05 previous to the MD07 line.

– *dispensed* – Integer numerical data. The number of components of the type specified in line MD05 that has been dispensed.

– *time* – Integer numerical data. The amount of time that was required for dispensing all components of this type.

Management Data Examples

```
MD00 toolchange

MD01 tp94n064

MD02 7

MD03 7

MD04 9652550 0 182260

MD05 comp 1

MD06 21 35860 0 0 0 0 0

MD07 0 0

MD05 comp 2

MD06 21 36630 0 0 0 0 0

MD07 0 0

MD05 comp 3

MD06 24 54180 1 0 12 0 0

MD07 0 0

E
```

Package Data Format

Some enumerated data types are used in more than one place in this format:

Acceleration code

The acceleration codes can have one of the following values:

- ACC_HIGHEST
  Highest possible acceleration

- ACC_HIGH
  High acceleration (will reduce acceleration only on the fastest machines)

- ACC_LOW
  Low acceleration

- ACC_LOWEST
  Lowest possible acceleration

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be exactly one line of the specified type

P00 name

Package name. Must be first line of a package.

- *name* – Text data representing the name of the package. Leading and trailing spaces are ignored and the name is truncated to 25 characters.

P000 package-type (Optional)

Optional package type line. If present, it follows the P00 line.

- *package-type* – Enumerated data. The type of the package. Allowed values are:

  ```
  PT_GENERIC
  PT_TWO_POLE
  PT_THREE_POLE
  PT_TWO_SYM
  PT_FOUR_SYM
  PT_TWO_PLUS_TWO
  PT_FOUR_ON_TWO
  PT_BGA
  PT_FLIP
  PT_GENERIC_BGA
  ```

P01 body-length body-width overall-length overall-width nom-height max-height min-height

General dimensions line.

– *body-length* – Integer numerical data. The length of the package body.

– *body-width* – Integer numerical data. The width of the package body.

– *overall-length* – Integer numerical data. The overall length of the package including leads. If body-length is greater than overall-length, overall-length is set to body-length.

– *overall-width* – Integer numerical data. The overall width of the package including leads. If body-width is less than overall-width, overall-width is set to body-width.

– *nom-height* – Integer numerical data. Nominal seated height of the package.

– *max-height* – Integer numerical data. Max seated height of the package. If nom-height is greater than max-height, max-height is set to nom-height.

– *min-height* – Integer numerical data. Min seated height of the package. If nom-height is less than min-height, min-height is set to nom-length. (For units, see section "The default units for numerical data" in "TPSys Ascii Data Formats")

P02 mount-tool pick-wait place-wait place-force mount-precision [tool-to-top-offset]

Pick and place data line.

– *mount-tool* – Tool type code data. What mount tool to use. (See section "Tool type code" in "TPSys Ascii Data Formats")

☞ Care must be taken to specify a valid mount tool even though the data format allows any tool.

– *pick-wait* – Integer numerical data. Extra vacuum wait time for pick. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

– *place-wait* – Integer numerical data. Extra vacuum wait time for place. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

– *place-force* – Integer numerical data. Extra force to use when placing. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

- *mount-precision* – Integer numerical data. Mount precision code. Allowed values are:

0

Normal precision

1

Extra high precision (will be slower)

2

Extra low precision (might be faster).

- *tool-to-top-offset* – Integer numerical data. Extra distance between mount tool and top of package. Default value is 0. Optional.

P021 alternate-mount-tool (Optional)

Optional alternate mount tool line.

- *alternate-mount-tool* – Enumerated data. Tool type code. What mount tool to use as alternate mount tool. (See section "Tool type code" in "TPSys Ascii Data Formats")

☞ Care must be taken to specify a valid mount tool even though the data format allows any tool.

P03 skip-vacuum theta-acc x-acc z-acc hold [y-acc] [hz-acc] [theta-acc] [zup-acc] [zup-dist] [tape-acc] [pick-in-centre]

Handling flags and accelerations line.

- *skip-vacuum* – Boolean data. Vacuum test skip flag. If "true", vacuum tests will not be performed during mount.

- *theta-acc* – Enumerated data. Theta acceleration to use when handling the package. See "Acceleration code specification" above.

- *x-acc* – Enumerated data. X acceleration to use when handling the package. See "Acceleration code specification" above.

- *z-acc* – Enumerated data. Z acceleration to use when handling the package. See "Acceleration code specification" above.

- *hold* – Boolean data. Hold-until-ready flag. If "true", the package will be held by the centering jaws while X runs.

- *y-acc* – Enumerated data. Y acceleration to use after the package has been mounted. Optional. Default value if not supplied is "ACC_HIGHEST". See "Acceleration code specification" above.

- *hz-acc* – Enumerated data. Z acceleration to use when handling the package with HYDRA. Default value if not supplied is same as z-acc. See "Acceleration code specification" above.

- *htheta-acc* – Enumerated data. Theta acceleration to use when handling the package with HYDRA. Default value if not supplied is same as theta-acc. See "Acceleration code specification" above.

- *zup-speed* – Integer data. Z speed to use when moving up after placing the package. Min value 15mm/s. Max value 1m/s. Default

value if not supplied is 1 m/s.

- *zup-dist* – Integer data. Distance in micro m to move using zup-speed after placing the package. After this move to safe position using "ACC_HIGHEST". Default value is 0.

- *tape-acc* – Enumerated data. Acceleration to use for feeding the tape containing the package. Default value is "ACC_HIGH". Optional. See "Acceleration code specification" above.

- *pick-in-centre* – Boolean data. Pick in centre flag. "True" if the package is picked in centre, "false" if picked off centre. Default value if not supplied is "true". Optional.

P031 hydra-mountable hydra-angle (Optional)

Optional hydra data line. This line is never exported. It is an old line that exists only for compatibility reasons.

- *hydra-mountable* – Boolean data. If "true", the package is hydra mountable. If the package is hydra mountable, hydratool H00 is selected as mount tool.

- *hydra-angle* – Integer numerical data. Angle between zero degrees and the long axis of the package. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

P032-1 hydra-angle (Optional)

Optional hydra angle line.

- *hydra-angle* – Integer numerical data. Angle between zero degrees and the long axis of the package. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

P032-2 hydra-tool (Optional)

Optional hydra mount tool line. From zero up to four P032-2 lines may be specified for a package. Zero P032-2 lines means that the package is not hydra-mountable.

☞ It's possible to select hydratool H00, with the P031 line by setting the package to "hydra-mountable". This opportunity should not be used.

- *hydra-tool* – Hydra tool type data. Which HYDRA mount tool to use. (see section "Hydra Tool type code" in "TPSys Ascii Data Formats")

P04 lead-No.. first-lead-offset (Optional)

Optional line containing lead data for "toggle pin" function.

- *lead-No..* – A space-separated list of lead numbers to visit when "toggle-pin" function is used. Max 8 leads can be specified. Duplicated lead numbers are removed from the list.

- *first-lead-offset* – Lead number of first lead in first lead group. (Lead groups specified below)

☞ First-lead-offset is always the last data in the P04 line.

P051 lead-type leads x-offset y-offset angle (Optional)

Optional lead group position line. There should be one P051 and one P052 line for each lead group. Any number of lead groups may be specified.

– *lead-type* – Enumerated data representing type of the leads in this group Allowed value is one of:

J_LEAD
Same as J-BEND in the TPSys programming manual or the package editor.

FLAT
Flat pack leads.

GULLWING
Typical lead for SO-type packages.

LEADLESS
No visible leads.

BGA
Same as CBGA in the TPSys programming manual or the package editor.

BGAB
Same as PBGA in the TPSys programming manual or the package editor.

PIN
Same as I-LEAD in the TPSys programming manual or the package editor.

FLIP
Looks at component outline.

CHIP
Chip packages mounted with Hydra, typically 0603-1210.

CGA
Column Grid Array.

SMALL_CHIP
Small chip package mounted with Hydra (0402 only).

– *leads* – Integer numerical data representing number of leads in this lead group.

– *x-offset* – Integer numerical data representing X offset from package mid point to the first lead in the group. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

– *y-offset* – Integer numerical data representing Y offset from package mid point to the first lead in the group (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

– *angle* – Integer numerical data representing angle of the lead group. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

P052 nom-len max-len min-len nom-width max-width min-width pitch max-x-error max-y-error max-length-error (Optional)

Lead dimensions line. There should be one P051 and one P052 line for each lead group.

- *nom-length* – Integer numerical data representing nominal lead length.

- *max-length* – Integer numerical data representing maximum lead length. If nom-length is greater than max-len, max-len is set to the same value as nom-length.

- *min-len* – Integer numerical data representing minimum lead length. If nom-length is less than min-len, min-len is set to the same value as nom-length.

- *nom-width* – Integer numerical data representing nominal lead width.

- *max-width* – Integer numerical data representing maximum lead. If nom-width is greater than max-width, max-width is set to the same value as nom-width.

- *min-width* – Integer numerical data representing minimum lead width. If nom-width is less than min-width, min-width is set to the same value as nom-width.

- *pitch* – Integer numerical data representing lead c-c distance.

- *max-x-error* – Integer numerical data representing length-wise deviation.

- *max-y-error* – Integer numerical data representing cross-wise deviation.

- *max-length-error* – Integer numerical data representing max deviation between highest and lowest lead. (For units, see section "The default units for numerical data" in "TPSys Ascii Data Formats")

P061 method (Optional)

Optional centering method line. There should be one P061 and one P062 line for each centering phase. MECHANICAL centering phases also require a P063 line. 0 to 12 centering phases may be specified.

- *method* – Enumerated data representing what centering method to use. Allowed value is one of:

  `OPTICAL`
  Optical centering.

  `MECHANICAL`
  Mechanical centering.

  `PUSH`
  Push centering. Obsolete centering method. Possible to import but never exported. PUSH centering is always converted to MECHANICAL centering. Don't use this value.

P062-M angle level position force (Optional)

Optional mechanical centering phase data. There should be one P061, one P062-M and one P063 line for each MECHANICAL centering phase. 0 to 12 centering phases may be specified.

- – *angle* – Integer numerical data. Component angle for this centering phase. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

- – *level* – Integer numerical data between 0 and 11. Centering level number to use.

- – *position* – Enumerated data representing device position code. Allowed value is one of:

  ```
  POS_UPPER
  POS_LOWER
  POS_MIDDLE
  POS_1QUARTERB
  ```

- – *force* – Enumerated data representing the force applied to the jaws when centering. Allowed value is one of:

  ```
  HIGH_FORCE
  MIDDLE_FORCE
  LOW_FORCE
  NO_FORCE
  ```

P062-O light-standard [light-DVC] (Optional)

Optional optical centering phase data. There should be one P061 and one P062-O line for each OPTICAL centering phase. 0 to 12 centering phases may be specified.

- – *light-standard* – Integer numerical data. Percent value for light level to use with standard illumination. Value must be between 0 and 100. If light-standard is outside the specified limits, the value is changed to nearest limit.

- – *light-DVC* – Integer numerical data. Optional value. Percent value for light level to use with DVC illumination. Value must be between 0 and 1000. If light-standard is outside the specified limits, the value is changed to nearest limit.

P062-O3 illumination-pattern relative-dark-field-illum relative-ambient-light-illum relative-front-light-illum(Optional)

Optional optical centering phase data. Follows P062-O2. If P062-O is omitted P062-O3 shouldn't be present either.

– *illumination-pattern* – Enumerated data. The type of illumination to be applied to the package. It might be a specific one (BGA, CBGA, FLIP_CHIP ...) where the relative dark field, ambient light and front light illuminations cannot be changed or a GENERIC where these parameters can be changed by the operator.

– *relative-dark-field* – Integer numerical data between 0 and 100. The relative intensity of the LEDs generating Dark Field illumination expressed in percent. The absolute value is obtained by multiplying it with light-DVC.

– *relative-ambient-light* – Integer numerical data between 0 and 100. The relative intensity of the LEDs generating Ambient Light illumination expressed in percent. The absolute value is obtained by multiplying it with light-DVC.

– *relative-front-light* – Integer numerical data between 0 and 100. The relative intensity of the LEDs generating Front Light illumination expressed in percent. The absolute value is obtained by multiplying it with light-DVC.

P062-O4 light-LSC illumination-pattern-LSC relative-ambient-light-illum-LSC relative-front-light-illum-LSC (Optional)

Optional optical centering phase data for the Linescan camera. Follows P062-O3. If P062-O is omitted P062-O4 shouldn't be present either.

– *light-LSC* – Integer numerical data. Optional value. Percent value for light level to use with DVC illumination. Value must be between 0 and 100. If light-standard is outside the specified limits, the value is changed to nearest limit.

– *illumination-pattern-LSC* – Enumerated data. The type of illumination to be applied to the package. It might be a specific one (BGA, CBGA, FLIP_CHIP ...) where the relative dark field, ambient light and front light illuminations cannot be changed or a GENERIC where these parameters can be changed by the operator.

– *relative-ambient-light* – Integer numerical data between 0 and 100. The relative intensity of the LEDs generating Ambient Light illumination expressed in percent. The absolute value is obtained by multiplying it with light-LSC. This absolute percentual value is then used to generate a light intensity level between 0 and 15 where 0 % corresponds to 0 level and 100 % corresponds to a 15 level.

– *relative-front-light* – Integer numerical data between 0 and 100. The relative intensity of the LEDs generating Front Light illumination expressed in percent. The absolute value is obtained by multiplying it with light-LSC. This absolute percentual value is then used to generate a light intensity level between 0 and 15 where 0 % corresponds to 0 level and 100 % corresponds to a 15 level.

P063 nom-size max-size min-size mechanical electric (Optional)

Optional general centering phase data. There should be one P061, one P062-M and one P063 line for each MECHANICAL centering phase. 0 to 12 centering phases may be specified.

– *nom-size* – Integer numerical data. Nominal dimension. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

– *max-size* – Integer numerical data. Maximum dimension. If nom-size is greater than max-size, max-size is set to the same value as nom-size. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

– *min-size* – Integer numerical data. Minimum dimension. If nom-size is less than min-size, min-size is set to the same value as nom-size. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

– *mechanical* – Boolean data, "true" or "false". Mechanical verification flag. If "true", mechanical verification will be performed in this centering phase.

– *electric* – Boolean data, "true" or "false". Electrical verification flag. If "true", electrical verification is allowed in this centering phase. Electrical verification will take place if any verification for this angle is specified in the component data and if it is not done in any previous centering phase.

P07 best-fit sub-pixel noise-search contrast-search noise-measure contrast-measure

Optical centering data.

– *best-fit* – Boolean data, "true" or "false". Use best-fit algorithm flag. If "true", the best-fit algorithm will be applied.

– *sub-pixel* – Boolean data, "true" or "false". Use sub-pixel algorithm flag. If "true", the sub-pixel algorithm will be applied.

– *noise-search* – Integer numerical data between 0 and 1500. Allowed noise level while searching the first lead in a group. If value is outside the specified limits, the value is changed to nearest limit.

– *contrast-search* – Integer numerical data between 0 and 200. Required contrast level while searching the first lead in a group. If value is outside the specified limits, the value is changed to nearest limit.

– noise-measure – Integer numerical data between 0 and 1500. Allowed noise level while searching additional leads in a group. If value is outside the specified limits, the value is changed to nearest limit.

– *contrast-measure* – Integer numerical data between 0 and 200. Required contrast level while searching additional leads in a group. If value is outside the specified limits, the value is changed to nearest limit.

P071 camera (Optional)

Optional centering camera specification line. Any number of P071 lines is allowed.

– *camera* – Text data representing type or name of a centering camera that may be used to center the package. Allowed values types are:

standard

```
LOW *
high res.
HIGH *
linescan
LINESCAN *
```

Allowed values names are:

```
SVC
HRC
LSC
OVC1
OVC2
OVC3
OVC4
OVC5
EVC1
EVC2
```

Types marked with an * are allowed in imported files for backward compatibility, but they are never written in exported files.

P072 banned-camera (Optional)

Optional banned centering camera specification line. Any number of P072 lines is allowed.

– *banned-camera* – Text data representing the name of a centering camera which may not be used to center the package (i.e. it is banned from use). Allowed values come from the same file as those for line 071, but the types are not allowed, only names.

P073 hydra-camera (Optional)

Optional hydra centering camera specification line. Any number of P073 lines is allowed.

- *hydra-camera* – Text data representing the name of a hydra centering camera that may be used to center the package. Allowed value types are:

  hydra

  linescan

  LINESCAN *

  Allowed value types are:

  LSC

  HVC1

  Types marked with a * are allowed in imported files for backward compatibility, but they are never written in exported files.

P074 illumination-pattern-LSC-Hydra (Optional)

Optional optical centering phase data for the Linescan camera with the Hydra tool. Follows P073. Any number of P074 lines are allowed.

- *illumination-pattern-LSC-Hydra* – Enumerated data. The type of illumination to be applied to the package. It might be a one of (Full, Front or Ambient).

P075 light-level-Hydra (Optional)

Optional optical centering phase data for the Hydra camera. Follows P073. Any number of P075 lines is allowed.

- *light-level-Hydra* – Enumerated data. The Hydra camera intensity level to be applied to the package. It might be a one of (Min, Max).

P08 index-type (Optional)

Optional index mark type line.

- *index-type* – Enumerated data representing type of index mark. Allowed value is one of:

  NONE

  CORNER

  NOCORNER

  MARK

P081 pos-x pos-y size var-corner dev-corner dev-mark (Optional)

Index mark data line. If P08 is omitted P081 shouldn't be present either.

– *pos-x* – Integer numerical data. X-offset from the center of the component to the center of the index search area in micrometer.

– *pos-y* – Integer numerical data. Y-offset from the center of the component to the center of the index search area in micrometer.

– *size* – Integer numerical data between 0 and 30000. Size of the index search area in micrometer.

– var-corner – *Integer numerical data between 0 and 100. Allowed* contrast variance in percent when searching for index corner.

– *dev-corner* – Integer numerical data between 0 and 100. Required contrast in percent when searching for index corner.

– *dev-mark* – Integer numerical data between 0 and 100. Required contrast in percent when searching for index mark.

P082 camera (Optional)

Optional centering camera specification line. Any number of P082lines is allowed. This line is obsolete but still supported in import.

– *camera* – Text data representing type or name of a centering camera which may be used to center the package. Allowed values are the same as for the P071 line.

P083 location-algorithm

Optical centering data. Algorithm used to locate a package.

– *location-algorithm* – Enumerated data. The type of algorithm used to roughly locate package position offset and angle. Allowed value is one of:

STANDARD
Position calculated matching the most external found leads with the model description.

CENTERED
Package is assumed to be centered at the tool rotation center and package leads are directly searched.

OUTLINE
Position calculated by detecting a rectangular outline of a package.

MULTIPLE_LEADS
Information on the external leads neighbours are used for matching the found leads with the model .

P09 x-offset y-offset type (Optional)

Optional glue dot line. There should be one P09 line for each glue dot. 0 to 8 glue dot lines may be specified.

- *x-offset* – Integer numerical data. X-offset from the center of the component to the glue dot in micrometer.

- *y-offset* – Integer numerical data. Y-offset from the center of the component to the glue dot in micrometer.

- *type* – Text data. Name of the glue dot. Leading and trailing spaces are ignored and the name is truncated to 15 characters.

Panel Data Format

This document defines the ascii format of the Panel data file used for import/export of panels to/from TPSys internal databases.

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be exactly one line of the specified type

P1 name

Panel name line. Must be first line of file.

– *name* – Text data. The name of the panel. Leading and trailing spaces are ignored and the name is truncated to 35 characters. An empty name is not allowed.

P2 info (Optional)

Optional panel info line. A commentary line that could be used to describe the panel. It's possible to use more P2 lines than one at import but it's only the first that is actually imported. This line is not exported if the info field is empty.

– *info* – Text data. A panel info line. Leading and trailing spaces are ignored and the text is truncated to 35 characters.

U unit-code (Optional)

Unit line. This is an optional line that defines the length unit used in the file. This line should follow the P2 or the P1 lines. If the line is omitted the unit is assumed to be um (micrometer). This line is never exported.

– *unit-code* – Text data. Defines the unit. See section "The unit specification line" in "TPSys Ascii Data Formats".

P21 level-measure-tool-type (Optional)

Level measure tool line. Zero to "n" P21 lines may be specified for a panel. Where "n" is the number of selectable tools.

– *level-measure-tool-type* – Type of tool possible to measure the level of the panel with. Allowed types are:

`All_Tools`

`All_Indicator_Tools`

`Tool type code` (See "tool type code" in "TPSys Ascii Data Formats") .

`Hydra tool type code` (See "Hydra tool type code" in "TPSys Ascii Data Formats")

P3 xcoord ycoord [name]

Fiducial mark line. There must be two or three P3 lines in one panel specification.

– *xcoord* – Floating point numerical data. X coordinate of fiducial mark.

– *ycoord* – Floating point numerical data. Y coordinate of fiducial mark.

– *name* – Text data. Optional name of fiducial mark. Leading and trailing spaces are ignored and the name is truncated to 10 characters.

P4 xcoord ycoord

Optional coordinate line for the lower left corner of the panel. This line should follow the P3 lines.

– *xcoord* – Floating point numerical data. The x position of the lower left corner of the panel.

– *ycoord* – Floating point numerical data. The y position of the lower left corner of the panel.

P41 xcoord ycoord (Optional)

Optional coordinate line for the upper right corner of the panel. This line should follow the P3 lines.

– *xcoord* – Floating point numerical data. The x position of the upper right corner of the panel.

– *ycoord* – Floating point numerical data. The y position of the upper right corner of the panel.

P5 xcoord ycoord

Glue tool board level test position. This line should either follow after a P4- or a P41-line.

- *xcoord* – Floating point numerical data. X coordinate of the glue tool test position.

- *ycoord* – Floating point numerical data. Y coordinate of the glue tool test position.

P6 xcoord ycoord

Mount tool board level test position. This line should either follow after a P5- or a P51-line line.

- *xcoord* – Floating point numerical data. X coordinate of board level test position.

- *ycoord* – Floating point numerical data. Y coordinate of board level test position.

P6B xcoord ycoord (Optional)

Optional bad board mark position. This line is optional and should follow the P6 line. If the line does not exist, the bad board mark position is set to (0,0).

- *xcoord* – Floating point numerical data. X coordinate of bad board mark.

- *ycoord* – Floating point numerical data. Y coordinate of bad board mark.

P7 pcb-name (Optional)

Optional line that specifies a PCB on the panel. This line should follow a P6 or P8 line. There may be any number of P7 lines (including zero).

- *pcb-name* – Text data. The name of the PCB. Leading and trailing spaces are ignored and the name is truncated to 35 characters.

P8 x1 y1 x2 y2 [x3] [y3] (Optional)

Optional line. PCB fiducial mark positions. There should be one P8
line for each PCB of the same type as the last P7 line.

- *x1* – Floating point numerical data. X position of fiducial mark 1.

- *y1* – Floating point numerical data. Y position of fiducial mark 1.

- *x2* – Floating point numerical data. X position of fiducial mark 2.

- *y2* – Floating point numerical data. Y position of fiducial mark 2.

- *x3* – Floating point numerical data. Optional X position of
  fiducial mark 3.

- *y3* – Floating point numerical data. Optional Y position of
  fiducial mark 3.

Panel Data Examples

This example is a panel named "demo4-2" with two fiducial marks, b1
and b2. The panel consists of two PCB:s, both named "demo4".

```
P1 demo4-2

P3 0 0 b1

P3 111989 201520 b2

P4 0 0

P5 0 0

P6 9910 7160

P6B 16750 17000

P7 demo4

P8 16747 16955 95337 95885

P8 16588 105765 95191 184672
```

PCB Data Format

This section defines the ascii format of the PCB data file used for import/export of PCB:s to/from TPSys internal databases.

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be exactly one line of the specified type

F1 name

Board name line. Must be first line of file.

– *name* – Text data. The name of the board. Leading and trailing spaces are ignored and the name is truncated to 35 characters. An empty name is not allowed.

F2 info (Optional)

Optional board info line. Must follow the F1 line if present.

– *info* – Text data. Board info line. Leading and trailing spaces are ignored and the text is truncated to 35 characters.

U unit-code

Unit line. This is an optional line that defines the length unit used in the file. This line should follow the F2 line if it's present else it follow the F1 line. If the line is omitted the unit is assumed to be um (micrometer). This line is never exported.

– *unit-code* – Text data. Defines the unit. See section "The unit specification line" in "TPSys Ascii Data Formats".

F21 level-measure-tool-type (Optional)

Level measure tool line. Zero to "n" F21 lines may be specified for a PCB. Where "n" is the number of selectable tools.

– *level-measure-tool-type* – Type of tool possible to measure the level of the PCB with. Allowed types are:

`All_Tools`

`All_Indicator_Tools`

`Tool type code` (See "tool type code" in "TPSys Ascii Data Formats")

`Hydra tool type code` (See "Hydra tool type code" in "TPSys Ascii Data Formats"

F3 xcoord ycoord [name]

Fiducial mark line. There may be two or three F3 lines.

– *xcoord* – Floating point numerical data. X coordinate of fiducial mark.

– *ycoord* – Floating point numerical data. Y coordinate of fiducial mark.

– *name* – Text data. Optional name of fiducial mark. Leading and trailing spaces are ignored and the name is truncated to 10 characters.

F4 xcoord ycoord (Optional)

Optional coordinate line for the lower left corner of the PCB. This line should follow the F3 lines if present.

– *xcoord* – Floating point numerical data. X coordinate of lower left corner.

– *ycoord* – Floating point numerical data. Y coordinate of lower left corner.

F41 xcoord ycoord (Optional)

Optional coordinate line for the upper right corner of the PCB. This line should follow the F3 lines or the F4 line if present.

– *xcoord* – Floating point numerical data. X coordinate of upper right corner.

– *ycoord* – Floating point numerical data. Y coordinate of upper right corner.

F5 xcoord ycoord (Optional)

Optional glue tool board level test position.

– *xcoord* – Floating point numerical data. X coordinate of test position

– *ycoord* – Floating point numerical data. Y coordinate of test position.

F6 xcoord ycoord (Optional)

Optional mount tool board level test position.

– *xcoord* – Floating point numerical data. X coordinate of test position

– *ycoord* – Floating point numerical data. Y coordinate of test position.

F7 xcoord ycoord (Optional)

Optional bad-board test position.

- *xcoord* – Floating point numerical data. X coordinate of test position

- *ycoord* – Floating point numerical data. Y coordinate of test position.

F8 xcoord ycoord angle group mount-skip dispense-skip component (Optional)

Optional mount position line. There may be any number of F8 lines (including zero).

- *xcoord* – Floating point numerical data. X position of component

- *ycoord* – Floating point numerical data. Y position of component

- *angle* – Integer numerical data. Angle of component in millidegrees. Zero degrees is in positive y direction and positive angles are clockwise.

- *group* – Integer numerical data. Assembly group number. A number between 0 and 255.

- *mount-skip* – Boolean data. Mount skip flag. If "true", the component is not mounted.

- *dispense-skip* – Boolean data. Dispense skip flag. If "true", the component is not dispensed.

- *component* – Text data. Component name. Leading and trailing spaces are ignored and the component name is truncated to 35 characters.

F9 comment (Optional)

Optional comment line for the mount position specified in the last F8 line. If present the F9 line follows the F8 line.

- *comment* – Text data. Mount comment. Leading and trailing spaces are ignored and the comment is truncated to 40 characters.

F10 xcoord ycoord name (Optional)

Optional local fiducial mark for the mount position specified in the last F8 line. There may be between zero and 7 F10 lines following a F9 or, if F9 absent, F8 line.

- *xcoord* – Floating point numerical data. X coordinate of local fiducial mark.

- *ycoord* – Floating point numerical data. Y coordinate of local fiducial mark.

- *name* – Text data. Name of fiducial mark. Leading and trailing spaces are ignored and the name is truncated to 10 characters.

F11 flags-string (Optional)

Optional special flags line for the mount position specified in the last F8 line.

- – *flags-string* – A set of flag keywords that are set for mount position specified in the last F8 line. The keywords are separated by spaces. The flags are true for each keyword, false for each non-present. Valid keywords are:

  TBZD
  Turn before Z down flag.

  SMEV
  Save electric value in eventlog flag.

  NOHYDRA
  Forbid use of hydra.

Pcb Data Examples

In this example the PCB is named "tsoplay". The PCB has two fiducial marks, both of type "square".

Lower left corner, glue tool test position and bad board test position are all placed on the first fiducial mark, coordinate (0,0).

The PCB only contains two mount positions, the component "tsoptest" should be mounted on both positions.

```
F1 tsoplay

F3 0 0 square

F3 205860 -103630 square

F4 0 0

F5 0 0

F6 3930 100

F7 0 0

F8 145848 -8930 0 0 Y N tsoptest

F8 145932 -21590 0 0 N N tsoptest
```

Fiducial Mark Data Format

This section defines the ASCII format of the fiducial mark data file used for import/export of fiducial mark descriptions to/from TPSys internal databases.

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be exactly one line of the specified type

R00 camera-Id taught name

Package name line. Must be first line of file.

- *camera-Id* – Integer numerical data between 0 and 65535. Camera identifier.

- *taught* – Boolean data. 1 if fiducial mark is taught, 0 if not.

- *name* – Text data. The name of the fiducial mark. Leading and trailing spaces are ignored and the name is truncated to 10 characters. *Name* is not allowed to be empty.

R00-1 machine-name (Optional)

Optional machine name line. If the taught field in the R00 line is set to 1 and the field machine-name matches the name of the machine to which the data should be imported, the fiducial mark is treated as "taught".

- *machine-name* – Text data. Name of the machine from which the fiducial mark data were exported. Leading and trailing spaces are ignored.

R01 comment

Comment line.

- *comment* – Text data. A comment about the fiducial mark. Leading and trailing spaces are ignored and the comment is truncated to 40 characters.

R02 teach-area-x teach-area-y search-area-x search-area-y object-size contrast-polarity correlation-threshold symmetric-fiducial-mark [fiducial-mark-type]

Specify the sizes of the teach area and the search area. Both areas are centered in the frame grabber image.

- *teach-area-x teach-area-y* – Positive integer numerical value. The size of the teach area in micrometer.

- *search-area-x search-area-y* – Positive integer numerical value. The size of the search area in micrometer.

- *object-size* – Positive integer numerical value. Expected object max size in micrometers.

- *contrast-polarity* – Boolean data value. Contrast polarity. If 1, white on black. If 0, black on white.

- *correlation-quality* – Integer numerical value between 0 and 100. Correlation quality. A found reference point is accepted when the correlation factor is above this quality.

- *symmetric-fiducial-mark* – Boolean data value. Symmetric fiducial mark flag. If 1, it's a symmetric fiducial mark.

- *fiducial-mark-type* – Integer value. 0 means 'No defined shape'. 1 means 'Circle'. (Optional)

R03 object-size-x object-size-y min-object-x-size [min-object-y-size] min-edge-contrast nom-background-level x-offset y-offset

Found fiducial mark specification line.

- *object-size-x object-size-y* – Integer numerical data. The size of the found object in the x and y directions in micrometer.

- *min-object-x-size min-object-y-size* – Integer numerical data. The minimum object size in the x and y directions in micrometer. min-object-y-size is optional because it should be possible to import data from older versions of TPSys. If min-object-x-size is missing min-object-x-size is copied to min-object-y-size.

- *min-edge-contrast* – Integer numerical data. The edge minimum contrast, expressed in grey levels.

- nom-background-level – *Integer numerical data. The* background nominal level, expressed in grey levels.

- *x-offset y-offset* – Floating point numerical data. Offset values for X and Y.

R04 x-gradient-M1 x-gradient-P1 y-gradient-M1 y-gradient-P1

This line specifies values for the four gradients.

– *x-gradient-M1* – Floating point numerical data. The value of xGradM1.

– *x-gradient-P1* – Floating point numerical data. The value of xGradP1.

– *y-gradient-M1* – Floating point numerical data. The value of yGradM1.

– *y-gradient-P1* – Floating point numerical data. The value of yGradP1.

R05 xcoord ycoord contrast edge-mean edge-quality background-mean background-variation x-correction y-correction (Optional)

Optional line that define all found (true) edges on the right side of the fiducial mark. There must be one line for each edge. 0 to 8 R05 lines are allowed.

– *xcoord ycoord* – Integer numerical data. The X and Y coordinate of the edge.

– *contrast* – Positive integer numerical data. The contrast level, expressed in grey levels.

– *edge-mean* – Positive integer numerical data. The edge mean value.

– *edge-quality* – Positive integer numerical data. The edge quality value.

– *background-mean* – Positive integer numerical data. The background mean value.

– *background-variation* – Positive integer numerical data. The background variation.

– *x-correction* – Floating point numerical data. Correction factor x-wise.

– *y-correction* – Floating point numerical data. Correction factor y-wise.

R06 xcoord ycoord contrast edge-mean edge-quality background-mean background-variation x-correction y-correction (Optional)

Optional line that defines all found (true) edges on the lower side of the fiducial mark and there must be one line for each edge. 0 to 8 R06 lines are allowed.

- *xcoord ycoord* – Integer numerical data. The X and Y coordinate of the edge.

- *contrast* – Positive integer numerical data. The contrast level, expressed in grey levels.

- *edge-mean* – Positive integer numerical data. The edge mean value.

- *edge-quality* – Positive integer numerical data. The edge quality value.

- *background-mean* – Positive integer numerical data. The background mean value.

- *background-variation* – Positive integer numerical data. The background variation.

- *x-correction* – Floating point numerical data. Correction factor x-wise.

- *y-correction* – Floating point numerical data. Correction factor y-wise.

R07 xcoord ycoord contrast edge-mean edge-quality background-mean background-variation x-correction y-correction (Optional)

Optional line that define all found (true) edges on the left side of the fiducial mark and there must be one line for each edge. 0 to 8 R07 lines are allowed.

- *xcoord ycoord* – Integer numerical data. The X and Y coordinate of the edge.

- *contrast* – Positive integer numerical data. The contrast level, expressed in grey levels.

- *edge-mean* – Positive integer numerical data. The edge mean value.

- *edge-quality* – Positive integer numerical data. The edge quality value.

- *background-mean* – Positive integer numerical data. The background mean value.

– *background-variation* – Positive integer numerical data. The background variation.

– x-correction – Floating point numerical data. Correction factor x-wise.

– y-correction – Floating point numerical data. Correction factor y-wise.

R08 xcoord ycoord contrast edge-mean edge-quality background-mean background-variation x-correction y-correction (Optional)

Optional line that define all found (true) edges on the top side of the fiducial mark and there must be one line for each edge. 0 to 8 R08 lines are allowed.

– *xcoord ycoord* – Integer numerical data. The A and Y coordinate of the edge.

– *contrast* – Positive integer numerical data. The contrast level, expressed in grey levels.

– *edge-mea*n – Positive integer numerical data. The edge mean value.

– *edge-quality* – Positive integer numerical data. The edge quality value.

– *background-mean* – Positive integer numerical data. The background mean value.

– *background-variation* – Positive integer numerical data. The background variation.

– *x-correction* – Floating point numerical data. Correction factor x-wise.

– *y-correction* – Floating point numerical data. Correction factor y-wise.

R09 diameter diameter-tolerance circle-contrast (Optional)

Optional line that defines the parameters for a fiducial mark of type 'Circle'.

– *diameter* – Diameter of the fiducial mark in mm.

– *diameter-tolerance* – Tolerance of the diameter expressed in percent.

– *circle-contrast* – The minimum contrast required between the fiducial mark and the background.

Fiducial Mark Data Examples

```
R00 0 1 Accur

R01

R02 1300 1300 1800 1800 300 1 80 1

R03 122 121 24 21 18 0.704658 0.821492

R04 0.071428 0.058824 0.055556 0.062500

R05 -45 0 26 36 1 20 14 -45.001295 -0.050672

R05 -32 -30 20 31 1 20 16 -32.106614 -29.731848

R05 -34 30 22 32 1 20 16 -34.133808 29.651590

R05 -42 -15 19 28 1 18 3 -42.078496 -14.897629

R05 -43 15 21 34 1 22 5 -43.071011 14.799027

R05 -38 -23 18 30 1 18 6 -38.088118 -22.809193

R05 -44 -8 23 33 1 21 7 -44.025001 -7.964395

R05 -45 8 22 33 1 21 13 -45.006741 7.873832

R06 0 -44 26 34 1 20 1 0.045787 -43.611670

R06 -31 -34 17 32 1 22 5 -31.104154 -33.700292

R07 45 0 16 34 1 24 19 44.865860 0.142113

R07 35 -30 18 30 1 17 15 35.021506 -29.731735

R08 0 46 28 35 1 17 7 -0.048098 45.529147

R08 -31 34 22 29 1 18 7 -31.145977 33.605861
```

Removable Feeder Data Format

This section defines the ascii format of the Removable feeder data file used for import/export of removable feeders descriptions to/from TPSys internal databases.

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be exactly one line of the specified type

TG00 serial-number [name]

Removable feeder name and serial number line. Must be first line of file.

- *serial-number* – Numeric data. The removable feeders serial number.

- *name* – Optional text data. The name of the removable feeder. Leading and trailing spaces are ignored and the name is truncated to 35 characters.

☞ If no name is present, the name of the removable feeder is set to the removable feeders serial number.

TG20 comment (Optional)

Optional comment line.

- *comment* – Text data. User defined comment about the removable feeder. Leading and trailing spaces are ignored and the comment is truncated to 50 characters. Optional, may be empty. An empty comment is not exported.

TG25 stepPerFeed finePitch (Not exported. Imported if there)

Optional steps per feed line. This line sets the number of steps the tape should be advanced every feed. Also sets whether the steps are fine pitch ones or normal ones. This line is obsolete but still supported.

- *stepsPerFeed* – Unsigned integer numerical data. Number of steps per feed for the tape guide.

- *finePitch* – Unsigned integer boolean data. 1 if fine pitch steps are to be used, 0 otherwise.

TG26 step-length [x-offset] [servo adjustment](Optional)

Optional step length and offset line. This line sets the length the tape should be advanced every feed, offsets to use when picking from tape guide and required servo adjustment.

- *step-length* – Unsigned integer numerical data. Length of feed in um for the tape guide.

- *x-offset* – Unsigned integer numerical data. Distance between left edge and pick position in um.

- *servo adjustment* – Integer numerical data. Represents how much extra a tape has to be feed for the magazine to feed the component to the desired location.

TG30 component batch angle quantity low-on-components (Optional)

Optional component data line.

- *component* – Text data. The name of the component in the tape. The component name is truncated to 35 characters.

- *batch* – Text data. The components batch information. The batch information is truncated to 35 characters.

- *angle* – Integer numerical data. The components angle in the tape.

- *quantity* – Integer numerical data. Number of components left in the tape.

- *low-on-components* – Integer numerical data. Remaining number of components in the feeder when the system warns for low on components.

TG40 magazine-serialNo feederNo (Optional)

Optional magazine information line. Ignored at import.

- *magazine-serialNo* – Integer numerical data. The serial number of the magazine where the tape where inserted.

- *feederNo* – Integer numerical data. Feeder position in the magazine where the removable feeder is inserted. The first position is 0.

Removable Feeder Data Examples

In this example we have a removable feeder with serial number 12 and named test3. The removable feeder was inserted in magazine 1023, feeder position 3, when exported. The tape contained the component 1206-a.

```
TG00 12 "test3"

TG20 C12

TG30 "1206-a" "" 90000 151 2000

TG40 1023 3
```

TEX Data Format

This section defines the ascii format of the TEX data file used for import/export of TEX descriptions to/from TPSys internal databases.

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be one line of the specified type.

X00 name

Tex name line. Must be first line of file.

– *name* – Text data. Name of the TEX. Leading and trailing spaces are ignored and the name is truncated to 15 characters.

X01 comment (Optional)

Optional comment line. An empty comment is not exported.

– *comment* – Text data. A comment about the TEX. Leading and trailing spaces are ignored and the name is truncated to 50 characters.

X02 serial-number

TEX serial number line.

– *serial-number* – Integer numerical value. Serial number of the TEX.

X03 machine slot pallet-width kxx kx0 kxy kyy ky0 kyx (Optional)

Optional TEX trim data line. There may exist zero, one or two X03 lines, one for each TEX column.

– *machine* – Integer numerical value. Machine number where the TEX is inserted. -1 if not inserted.

– *slot* – Integer numerical value. Slot number where the TEX is inserted. -1 if not inserted.

– *pallet-width* – Integer numerical value. Width of pallet used to trim the TEX column.

– *kxx* – Floating point numerical value. Transform data AC to TC. X scale factor.

– *kx0* – Floating point numerical value. Transform data AC to TC. X offset.

  – *kxy* – Floating point numerical value. Transform data AC to TC. X:s Y dependence.

  – *kyy* – Floating point numerical value. Transform data AC to TC. Y scale factor.

  – *ky0* – Floating point numerical value. Transform data AC to TC. Y offset.

  – *kyx* – Floating point numerical value. Transform data AC to TC. Y:s X dependence.

Tray Position Data Format

This section defines the ascii format of the Tray position data file used for import/export of Tray position descriptions to/from TPSys internal databases.

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be one line of the specified type.

TP00 name

Tray position name line. Must be first line of file.

– *name* – Text data. The name of the tray position. Leading and trailing spaces are ignored and the name is truncated to 20 characters.

Empty names are not allowed.

TP01 xcoord ycoord angle

Tray position data line.

– *xcoord* – Integer numerical data. Tray corner x-coordinate.

– *ycoord* – Integer numerical data. Tray corner y-coordinate.

– *angle* – Integer numerical data. Angle of tray position. The angle of a tray that is placed with its lower left corner in this tray position. (See section "The default units for numerical data" in "TPSys Ascii Data Formats")

TP02 type

Type code line.

– *type* – Integer numerical data. Type code. Allowed type codes for a magazine is:

`-1`

Y wagon magazine.

`-2`

Tray wagon magazine.

`-3`

Pallet magazine.

TP03 machine-number [bar-code]

Tray position machine number

– *machine-number* – Integer numerical data. Machine number owning this position. Set to 0 for pallet tray positions.

– *bar-code* – Text data. Optional bar code for tray position. Max 35 characters.

Tray Position Data Examples

```
TP00 Pos1

TP01 2000 100000 0

TP02 -1

TP03 11173
```

Tray Type Data Format

This section defines the ascii format of the Tray type data file used for import/export of Tray type descriptions to/from TPSys internal databases.

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be exactly one line of the specified type.

T00 name

Tray type name line. Must be first line of file.

– *name* – Text data. The name of the tray type. Leading and trailing spaces are ignored and the name is truncated to 20 characters.

☞ An empty name is not allowed.

T01 package-name (Optional)

Optional package name line. This line is not exported if package-name is empty.

– *package-name* – Text data. Name of a typical package to use the tray type for. Leading and trailing spaces are ignored and the name is truncated to 25 characters.

T02 width length

Tray type dimension line. The tray type coordinate system is defined by the corners. Follow the T01 line if present else it follow the T00 line.

– *width* – Integer numerical data. The tray type width (x-wise) in micrometer.

– *length* – Integer numerical data. The tray type length (y-wise) in micrometer.

T03 columns rows x-first y-first column-step row-step

Tray type layout line.

- *columns* – Integer numerical data. Number of columns (x-wise) on tray type.

- *rows* – Integer numerical data. Number of rows (y-wise) on tray type.

- *x-first* – Integer numerical data. X distance from lower left corner to mid-point of first component in micrometer.

- *y-first* – Integer numerical data. Y distance from lower left corner to mid-point of first component in micrometer.

- *column-step* – Integer numerical data. Distance between columns (x-wise) in micrometer.

- *row-step* – Integer numerical data. Distance between rows (y-wise) in micrometer.

T04 x y (Optional)

Fiducial mark line. There may be zero, one or two T04 lines.

- *x* – Integer numerical data. x-distance from lower left corner to fiducial mark in micrometer.

- *y* – Integer numerical data. y-distance from lower left corner to fiducial mark in micrometer.

T05 pocket-width pocket-length

Size of the tray pocket that contains the component.

- *pocket-width* – Integer numerical data. The tray type pocket width (x-wise) in micrometers.

- *pocket-length* – Integer numerical data. The tray type pocket width (y-wise) in micrometers.

T06 inspect algorithm contrast

Optical inspection parameters.

- *inspect* – Boolean. Whether optical inspection will be performed before picking the package or not

- *algorithm* – Enumerated data. Algorithm to use when optical inspecting the package on the tray. Allowed value is one of:

  `AUTO`

  Automatically select one of the algorithms below

  `DETECT_CONTRAST`

  Find component by separating component from background

  `DETECT_EDGES`

  Find component by detecting its edges

- *contrast* – Integer numerical data. Contrast required to detect features in the image. A value between 1 and 30

Tray Type Data Examples

```
T00 FC48-8x8

T01 FC48D-63-DC

T02 100200 100200

T03 8 8 15000 15000 9500 9500

T05  9710 9710

T06 1 AUTO 10
```

User Data Format

This section defines the ascii format of the user data file used for import/export of user descriptions to/from TPSys internal databases.

Lines

Unless otherwise stated the lines should appear in the order indicated below. There should be exactly one line of the specified type.

U00 user-name

User name line. Must be first line of file.

– *user-name* – Text data. Name of the user. Leading and trailing spaces are ignored and the name is truncated to 35 characters.

U01 password

User password line.

– *password* – Text data. The users encrypted password. Leading and trailing spaces are ignored and the password is truncated to 15 characters.

U02 layout-access board-access

User access rights line for layout and board data.

– *layout-access* – Enumerated data. Users rights to modify layout data. Allowed values are: LOW or HIGH.

– *board-access* – Enumerated data. Users rights to modify pcb and panel data. Allowed values are: LOW, STANDARD or HIGH.

U03 component-access package-access gluedot-access fiducial-mark-access

User access rights line for component, package, gluedot and fiducial mark data.

– *component-access* – Enumerated data. Users rights to modify component data. Allowed values are: LOW or HIGH.

– *package-access* – Enumerated data. Users rights to modify package data. Allowed values are: LOW or HIGH.

– *gluedot-access* – Enumerated data. Users rights to modify gluedot data. Allowed values are: LOW or HIGH.

– *fiducial-mark-access* – Enumerated data. Users rights to modify fiducial mark data. Allowed values are: LOW or HIGH.

U04 magazine-access traytype-access kitlist-access

User access rights line for magazine, tray type and kitlist data.

– *magazine-access* – Enumerated data. Users rights to modify magazine data. Allowed values are: `LOW`, `STANDARD` or `HIGH`.

– *traytype-access* – Enumerated data. Users rights to modify tray type data. Allowed values are: `LOW` or `HIGH`.

– *kitlist-access* – Enumerated data. Users rights to modify kitlist data. Allowed values are: `LOW` or `HIGH`.

U05 user-access

User access rights line for user data.

– *user-access* – Enumerated data. Users rights to modify user data in the user editor. Allowed values are: `LOW` or `HIGH`.

U06 switch-access mount-glue-switch-access

User access rights line for switches and mount-glue switches.

– *switch-access* – Enumerated data. Users rights to modify switches. Allowed values are: `LOW` or `HIGH`.

– *mount-glue-switch-access* – Enumerated data. Users rights to modify mount-glue switches. Allowed values are: `LOW` or `HIGH`.

U07 params-access service-access

User access rights line for parameter editor and service program.

– *params-access* – Enumerated data. Users rights to modify parameters. Allowed values are: `LOW` or `HIGH`.

– *service-access* – Enumerated data. Users rights to run service program. Allowed values are: `LOW` or `HIGH`.

U08 management-access

User access rights line for management and eventlog data.

– *user-access* – Enumerated data. Users rights to delete management and eventlog data. Allowed values are: `LOW` or `HIGH`.

U100-0 checkstring

Checksum line. This line contains an encrypted version of all user data. This line is intended to ensure that imported data has the same values as it had when it was exported.

☞ Import fails if imported user-data doesn't agree to the checkstring.

– *checkstring* – Text data. Encrypted text string describing the users access rights

Appendix E – TPSys Remote Protocol

This chapter describes the TPSys Remote Protocol (TRP). This protocol makes it possible to access TPSys internal databases, load layouts to mount or examine hardware and software options at the machine. When a connection is established, it is possible to extract and modify all information that is stored in the databases.

Establish Connection

The TRPserver is not running all the time although it's a server. It is started by the the inet-daemon when a socket-connection is made on port 6549 on a TPSys machine with TRP installed. After a message has been received, the command is executed and the result is sent back. The server terminates when receiving a Terminate command from the process that opened the connection or that the connection is closed. It is possible to have more than one TRPServer running on a machine at the same time.

☞ The TRPserver terminates if TPSys internal dataservers terminates.

General Command Format

All commands are line oriented follow the format :

 <Command-name> [<parameter>...]

– *Command-name* – Text string that contain the name of the command.

– *Parameter* – The Command-name may be followed be a number of parameters which depends on which type of command it is. Optional and non-optional parameters exist.

All commands are line oriented. The TRPserver accepts commands that follows the syntax specified in Command reference. The TRPserver is case insensitive, all commands can be represented by a mix of lower or upper case characters, example "getdata" is equivalent to "GetData" or "GeTDaTA".

The same applies for parameters and data also, the only exception is when a name is used as a parameter.

For detailed information about all available commands see Command reference.

Special line types

There are some special lines that are returned from the TRPserver, or in some cases accepted by the server also.

The special lines are :

`ack`

Acknowledgement line. Returned as a response on some commands. The line indicates that the command was successfully executed.

`ackd`

Acknowledgement line. Returned as a response on some commands which returns some kind of data. The line indicates that the command was successfully executed.

`nack`

Error line. Returned if something went wrong when the command was executed. Indicates that the command failed. The line has following format:

`nack <error-number>[<error-text>]`

- *error-number* – Type of error.

- *error-text* – Error description. Only returned if verbose mode is activated. See VerboseMode on page E-17.

`E`

End of data line. Indicates that all requested data is transmitted. Two commands, `PutData` and `PutEcho`, that send data to the server must be ended with this line.

Command reference

ActivateUnsolicited

`ActivateUnsolicited` *type-list*.

Will activate one or more unsolicited messages. The command will be active immediately after the `ACK` Errors reported message. *Not implemented*.

Parameters:

– *type-list* – List of unsolicited messages that server should send.

Errors reported

`300`

Channel does not support unsolicited

`301`

Unknown message type

`302`

Can not connect to eventserver

`303`

Can not start subscription

Returned Data

None

DeActivateUnsolicited

`DeActivateUnsolicited` [*type-list*]

Will deactivate one or more unsolicited messages. The specified unsolicited messages will be deactivated immediately after the `ACK` has been received. *Not implemented*.

Parameters

– *type-list* – List of unsolicited messages that server should stop sending. If this parameter is omitted all messages are stopped. Errors reported:

`301`

Unknown message type

Returned Data

None

Delete

Delete *data-type name* ...

Delete data in TPSys internal databases.

Parameters

–   *data-type* – Type of data. See Tpsys Data Types on page E-21 for allowed data types.

–   *name...* – List of items to delete.

Errors reported

6

Illegal parameter value. Probably a missing parameter.

100

Unknown data type.

101

Item <name> does not exist.

Even if only one of the items does not exist no data will be deleted .

103

<name> in use, can not delete.

Even if only one of the items can not be deleted no data will be deleted.

305

Dataserver is not running.

The dataserver must be running for this type of request.

Returned Data

ack-line if all selected items, specified by the name-parameter, has been deleted from the database.

ExitRemoteMode

ExitRemoteMode

Exit remote mode. *Not implemented*.

Parameters

None

Returned Data

None

GetData

GetData [*-s time*] [*-ext*] *data-type* [*name ...*]

Get data from TPSys internal databases.

Options / Parameters

- *-s time* – Optional. If omitted, all available data for specified datatype is transmitted. If the parameter exist, only data that is modified since *time* is transmitted. The *time* format must be on MMDDhhmm[[CC]YY][.ss] where:

  MM

  Month number 01 - 12

  DD

  Day number in month (date) 01 - 31

  hh

  Hour 00 - 24

  mm

  Minute 00 - 59

  CC

  Century part of year. Optional.

  YY

  Year 00 - 99. Optional.

  ss

  Second 00 - 59. Optional.

- *-ext* – Optional. Get data in extended format.

- *data-type* – Type of data to get. See Tpsys Data Types on page E-21 for allowed data types.

- *name ...* – Optional list of items to get data for. If list is omitted all data for specified data type is transmitted.

Errors reported

6

Illegal parameter value. Probably bad "since usage".

100

Unknown data type.

101

Item <name> does not exist.

☞ Even if only one of the items does not exist no data will be transmitted .

305

Dataserver is not running

☞ The dataserver must be running for this type of request.

Returned Data

ackd followed by requested data. All lines of transmitted data is preceded by '>' and ends with newline. Data ends with the E-line.

GetDataVersion

```
GetDataVersion
```

Get (current) data version. The data version is equivalent to the system release name and number.

Parameters

None

Returned Data

`ackd` followed by data version information. Data ends with the E-line.

GetListOf

```
GetListOf
```
data-type

Get a list of available data items for a specific data type

Parameters

- *data-type* – Type of data to get. See Tpsys Data Types on page E-21 for allowed data types.

Errors reported

6

Illegal parameter value.

100

Unknown data type.

305

Dataserver is not running.

☞   The dataserver must be running for this type of request.

Returned Data

`ackd` followed by a list of available data with one item per line. All items are preceded by a ">". Data ends with the E-line.

GetListSize

`GetListSize` *data-type*

Get size of list for a specific data type

Parameters

– *data-type* – Type of data to get. See Tpsys Data Types on page E-21 for allowed data types.

Errors reported

`6`

Illegal parameter value.

`100`

Unknown data type.

`305`

DataServer is not running

The dataserver must be running for this type of request.

Returned Data

`ackd` followed by the number of items of the specified type. Data ends with the E-line.

GetModifiedCount

`GetModifiedCount` *data-type*

Get a modified count for the specified datatype. The modified count is changed every time data is modified in database. This counter could be used to detect changes for the specific datatype in TPSys internal database.

This command is not possible to use on datatype "eventlog".

Parameters

– *data-type* – Type of data to get modified count for. See Tpsys Data Types on page E-21 for allowed data types.

Errors reported

`100`

Unknown data type. Error code 100 is returned if "GetModifiedCount" is used with datatype "eventlog"

`305`

Dataserver is not running.

The dataserver must be running for this type of request.

Returned Data

`ackd` followed by the modified counter for specified datatype. Data ends with the E-line.

GetProtocolVersion

`GetProtocolVersion` [*ALL*]

Get (current) protocol version of TRP.

Parameters

- *ALL* – Optional. *ALL* will instruct command to return a list of available protocol versions.

Returned Data

`ackd` followed by either :

- If *ALL* not specified:
  A string containing protocol version info. For this version it will be "1.0"

- If *ALL* specified:
  A new-line separated list of protocol versions supported. Data ends with the E-line.

GetTime

`GetTime` [`UNIX`]

Get the current time and date on the machine/server where the TRP server is executing.

Parameters

- *UNIX* – Optional. If present the returned time is given in UNIX style, i.e. as seconds since 00:00:00, Jan 1, 1970, otherwise as a string with time and date explicit. See *Returned data* below for details.

Errors reported

6
Illegal parameter value.

Returned Data

`ackd` followed by a time and date string.

If no parameter is given the time and date string is given on the format `MMDDhhmmCCYY.ss` where:

MM
Month number 01 - 12

DD
Day number in month (date) 01 - 31

hh
Hour 00 - 24

`mm`

Minute 00 - 59

`CC`

Century part of year.

`YY`

Year 00 - 99.

`ss`

Second 00 - 59.

If *UNIX* style is specified the returned time and date string is an integer representing the number of seconds since 00:00:00, Jan 1, 1970. Data ends with the E-line.

Help

`Help` [*COMMAND*|*ACK*] [*ALL*| *Command-name*]

Help command. This command returns help about the current version of theprotocol. *Not implemented*.

Parameters

– *COMMAND | ACK* – Select help for *ACK*-values or *COMMAND*-formats. Default id *COMMAND*

– *ALL | Command-name* – If parameter 1 is *COMMAND* this parameter specifies the command to get help for.

☞ The command " Help " without parameters is equivalent to: Help COMMAND Help

Returned Data

Information about requested item.

LoadLayout

`LoadLayout` *layout-name*

Load layout to assemble. Layout will be loaded as soon as the current assembly (if any) is finished and board unloaded.

☞ If there exist a layout queue, that queue will be removed when `LoadLayout` is called.

Parameters

– *layout-name* – Name of layout to load

Errors reported

`400`

No such layout.

`1000`

Can not find the queue directory.

Returned Data

`ack` if the layout was successfully inserted first in the layout queue.

MachineInfo

`MachineInfo` [*VERBOSE|QUIET*]

Request information about the machine and HW/SW options. The request will take a while to process.

Parameters

– *VERBOSE | QUIET* – Optional switch that controls if prompt-texts will be added to return data to make it human readable. The default value depends on the current "verbose mode" setting. See VerboseMode-command on page E-17.

Returned Data

– There are two formats, VERBOSE and QUIET . If format is VERBOSE a prompt will precede each data. If format is QUIET no prompt is added. The data format is shown here with the prompt.

`Machine type:`	*machine-type*
`Name:`	*machine-name*
`Serial No.:`	*serial-No.*
`SW options:`	*list-of-SW-options*
`Magic word:`	magic-word
`Y placement:`	*Y-wagon-position*
`Y width:`	*Y-wagon-width*
`OC camera:`	*Camera-type*
`Tray mags:`	*Tray-magazine-list*
`Hydra option:`	*YES|NO*

– *machine-type* – The machinetype or DATASERVER if the databases are located on a standalone dataserver.
– *machine-name* – The name of the machine. For example tp18n032. A DATASERVER will have name set to "dataserver".
– *serial-No.* – Machine serial No. (will be set to 0 for DATASERVER)
– *list-of-SW-options* – Lists the available SW options separated by a comma (,).
– *magic-word* – Magic word.
– *Y-wagon-position* – Leftmost magazine position occupied by Y-wagon
– *Y-wagon-width* – No. of magazine positions occupied by Y-wagon.
– *Camera-type* – Type of camera for optical centering
– *Tray-magazine-list* – List of available Tray magazines.

Data ends with the E-line.

Ping

`Ping`

No operation. Used to check channel.

Parameters

None

Returned Data

`ack` is returned if channel is ok.

PutData

`PutData` [*PARSE_FLAG*...]

Send data to TPSys data bases. The sent data must follow the specifications in TPSys external interfaces specifications. Data sent to the TRPserver must end with the E-line.

It's possible to send special parse flags to the server that will affect how the data lines that follow will be imported into TPSys.

Example

Inserting a layout named testlayout in the databases :

`PutData`

`S1 testlayout`

`E`

Parameters

– *PARSE_FLAG* – One or more "parse flags" that will affect how the data is imported. The flags should be "space separated". Valid values for the flags:

`MAG_UPDATE_ONLY`

This "flag" is only valid for magazine data. If the flag is given as an argument to `PutData`, the magazine contents will not be cleared. This means that only feeders specified in the data lines that follow, will be modified. All other feeders are unchanged and will keep their old values.

Errors reported

102

Data parse error at line <line No>

104

Unexpected line at line <line No>

105

Unexpected end of file

106

Invalid argument

305

DataServer is not running

The dataserver must be running for this type of request.

Returned Data

`ack` if data was ok and saved in the database.

PutEcho

`PutEcho` [*Parameters ...*]

Return same parameters and data that was sent. Sent data must end with the E-line.

Parameters

– *Parameters* – If parameters are supplied they will be returned as data.

Returned Data

`ackd` followed by the command follow by an empty line followed by each parameter word. Data ends with the E-line.

QueueLayout

`QueueLayout` *layout-name*

Insert layout in queue of layouts to assemble. Layout will be added to a queue of layouts that are loaded in the same order as they are sent. If a LoadLayout message arrives it will first clear the queue and then insert its own parameter in the queue.

Parameters

– *layout-name* – Name of layout to load

Errors reported

`400`

No such layout.

The layout could not be found in TPSys databases.

`1000`

Can not find the queue directory.

Returned Data

`ack` if the layout was inserted in the layout queue.

RemoveLayoutFromQueue

`RemoveLayoutFromQueue` [*LAST*]

Remove the first (last) layout name in queue.

Parameters

– *LAST* – Optional. Switch that cause command to remove last layout in queue instead of first.

Errors reported

`6`

Illegal parameter value. In this case probably illegal lastflag.

`401`

Layout queue empty.Can not remove items from a non existing queue.

`1000`

Can not find the queue directory.

Returned Data

`ack` if a layout is removed from the layout queue.

SetProtocolVersion

`SetProtocolVersion` *version*

Set protocol version. Does nothing in present version but can be used in future to make protocol behave as older versions. The protocol version affects the command structures.

Parameters

– *version* – String containing protocol version . Only valid value is "1.0"

Errors reported

`6`

Illegal parameter value. Invalid protocol version.

Returned Data

`ack` if successful request.

ShowAlerts

`ShowAlerts`

Get current alert data. Returned data format will depend on verbose mode. *Not implemented.*

Parameters

None

Errors reported

> 200
>
> This is not a TPSys machine

Returned Data

Not yet defined.

ShowCurrentStatus

`ShowCurrentStatus`

Get current assembly status. *Not implemented.*

Parameters

None

Returned Data

Data about current status. If mode is not VERBOSE the text before the colon on each line is removed.

`Current layout:`	*current-layout*
`Status:`	*status*
`Total to mount:`	*Total-to-mount*
`Left to mount:`	*No.-left-to-mount*
`Not available:`	*Not-available*
`Not mountable:`	*Not-mountable*
`Layout produced:`	*Layouts-produced*
`Boards produced:`	*Boards-produced*

- *current-layout* – Is the name of the current layout (or empty string if none loaded)

- *status* – Is one of ASSEMBLE or IDLE

- *Total-to-mount* – Is the total No. of components in layout

- *No.-left-to-mount* – Is the number of mount positions left to mount

- *Not-available* – Is number of mount positions that can not be mounted since component is missing

– *Not-mountable* – Is number of mount positions that can not be mounted since component is not mountable

– *Layouts-produced* – Is accumulated No. of layouts produced

– *Boards-produced* – Is accumulated No. of boards produced

ShowLayoutQueue

`ShowLayoutQueue`

List queue of layouts that should be assembled. The queue is created with the commands LoadLayout or QueueLayout.

Parameters

None

Errors reported

`1000`
Can not find the queue directory.

Returned Data

`ackd` followed by a newline-separated list of all layouts in the queue. All layout lines start with S1;. Data ends with the E-line.

ShowMessages

`ShowMessages` [*message-Id*]

Get messages. Optional messages newer than a specific Id. *Not implemented.*

Parameters

– *message-Id* – Id of last message received. Transmit only messages newer than this Id.

Returned Data

A list of message Id:s and messages. The format is one line per message containing: Message-Id Message The Id of the last message could be used in next call to make sure the same message is not transmitted twice.

ShowParameters

`ShowParameters` *ParameterFileNumber* [*ParameterNumber* ...]

Get parameter data.

Parameters

- *ParameterFileNumber* – Parameter file number.

- *ParameterNumber* – Optional parameter numbers. Space separated argument list with parameter numbers

Errors reported

`500`

Failed to fetch all parameters in selected parameter file.

`501`

Invalid parameter file number. Selected ParameterFileNumber is not a valid parameter file number.

`502`

Wrong number of arguments, the command needs at least a parameter file number.

`503`

Invalid parameter number. Selected parameter number is not a valid parameter number in selected parameter file.

Returned Data

If no parameter number given: A complete list of all parameters in selected parameter file. One number-value pair per line. Otherwise, only the selected parameter.

Returned data follow the format:
`ParameterFileNumber:ParameterNumber parameterValue`

The values are expressed in the internal units.

ShowRemoteMode

`ShowRemoteMode`

Find out if remote control is on or off and if

Parameters

None

Returned Data

`ackd` followed by :

`ON` – if remote mode is enabled

`OFF` – if remote mode is disabled

`WAITING` – if remote mode is enable and machine is waiting for a board or a layout name. The WAITING mode is not implemented and will therefore never be exported. Data ends with the E-line.

ShowRunningStatistics

```
ShowRunningStatistics
```

Get number of machine cycles and run-times. *Not implemented.*

Parameters

None

Returned Data

Not yet defined

Terminate

```
Terminate
```

Terminate connection. After this command is sent (and `ack` received) no further commands are accepted.

Returned Data

`ack`

VerboseMode

```
VerboseMode mode
```

Sets verbose mode. Default is `OFF`. Some commands return data in a different format if verbose mode is `ON` or `OFF` .

Parameters

– *mode* – Verbose mode. Allowed values are :

`ON`

Turn verbose mode on. More information in error messages and returned data.

`OFF`

Turn verbose mode off. Minimum of information in returned data.

Errors reported

`6`

Illegal parameter value

`110`

Can not change to verbose mode

Returned Data

`ack` if verbosemode has been changed to desired value.

Quick reference

ActivateUnsolicited *type-list*

DeActivateUnsolicited [*type-list*]

Delete *data-type name ...*

ExitRemoteMode

GetData [*-s data-type* [*name ...*]

GetDataVersion [*ALL*]

GetListOf *data-type*

GetListSize *data-type*

GetModifiedCount *data-type*

GetProtocolVersion [*ALL*]

GetTime [*UNIX*]

Help [*COMMAND*|*ACK*] *Command-name*]

LoadLayout *layout-name*

MachineInfo [*VERBOSE*|*QUIET*]

Ping

PutData

PutEcho [*Parameters*]

QueueLayout *layout-name*

RemoveLayoutFromQueue [*LAST*]

SetProtocolVersion *version*

ShowAlerts

ShowCurrentStatus

ShowLayoutQueue

ShowMessages [*message-Id*]

ShowParameters [*ParameterNumber*]

ShowRemoteMode

ShowRunningStatistics

Terminate

VerboseMode *mode*

US: MessageLog *mtime mess*

US: Status *newstatus*

List of errors

Error code	Meaning	Explanation	Returned by
1	Unknown command.	Returned if the command is not a valid TRP command.	
6	Illegal parameter value	Given parameter has an illegal value.	Delete, GetData, GetListOf, GetListSize, GetTime, RemoveLayoutFromQueue, SetProtocolVersion, VerboseMode
100	Unknown data type	Specified datatype is unknown, i.e. not a valid data type in TPSys.	Delete, GetData, GetListOf, GetListSize, GetModifiedCount
101	Item <name> does not exist	Selected item does not exist in the database.	Delete, GetData, ShowParameters
102	Data parse error at line <line No>	Sent data is not following the syntax specified in TPSys external interfaces specification.	PutData
103	<name> in use, can not delete.	Not allowed to delete items that currently is in use by TPSys.	Delete
104	Unexpected line at line <line No>	Sent data does not follow the syntax specified in TPSys external interfaces specification.	PutData
105	Unexpected end of file	Sent data is not ended as expected.	PutData
106	Invalid argument	Invalid argument was given to PutData, probably a non valid "parse flag".	PutData
110	Can not change to verbose mode		VerboseMode
200	This is not a TPSys machine		ShowAlerts
300	Channel does not support unsolicited		ActivateUnsolicited
301	Unknown message type		ActivateUnsolicited, DeActivateUnsolicited
302	Can not connect to eventserver		ActivateUnsolicited
303	Can not start subscription		ActivateUnsolicited

Error code	Meaning	Explanation	Returned by
305	DataServer is not running	TPSys dataservers are down, it is not possible to extract data from them.	Delete, GetData, GetListOf, GetListSize, GetModifiedCount, PutData
400	No such layout	Selected layout is unknown, i.e. does not exist in TPSys databases.	LoadLayout, QueueLayout
401	Layout queue empty	The layout queue does not contain any layouts	RemoveLayoutFromQueue
500	Failed to fetch all parameter values	No parameter values were found in the selected parameter file. This error will appear if the parameter file only contains of hidden parameters or if some internal error occur.	ShowParameters
501	Invalid parameter file number	Selected parameter file number is not a valid parameter file number.	ShowParameters
502	Wrong number of arguments	The command needs more arguments.	ShowParameters
503	Invalid parameter number	Selected parameter number is not a valid number in selected parameter file.	ShowParameters
1000	Can not find the queue directory.		LoadLayout, QueueLayout, RemoveLayoutFromQueue, ShowLayoutQueue

Tpsys Data Types

The following datatypes are valid as parameters in TRP:

- `Component`
- `Eventlog`
- `Gluedot`
- `Kit`
- `Layout`
- `Management`
- `Magazine`
- `Package`
- `Pallet`
- `Panel`
- `Pcb`
- `Refpoint`
- `TapeGuide`
- `Pallettray` or `TEtray` (Not valid for the following commands: getdata, getlistof.)
- `Pallettraypos` or `TEtraypos`
- `Tex`
- `Traytype`
- `TWtray`
- `TWtraypos`
- `YWtray`
- `YWtraypos`
- `User`

Unsolicited messages

US: MessageLog

US: MessageLog *mtime mess*

Indicates a message written to message log. *Not implemented.*

Parameters

– *mtime* – A time stamp in hh:mm:ss-format (24 hour clock)

– *mess* – The message

US: Status

US: Status *newstatus*

Indicates current machine status. The machine status contains information about the need for operator intervention . *Not implemented.*

Parameters

– *newstatus* – The current (new) status. newstatus can have one of the following values:

IDLE

The machine is in idle.

OK

Machine running. No problem.

NEED_OPERATOR

The operator is required but the machine is still mounting (typically: a feeder has run out)

STOPPED

The machine has stopped for some reason and requires operator.

Index

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Operator's Manual
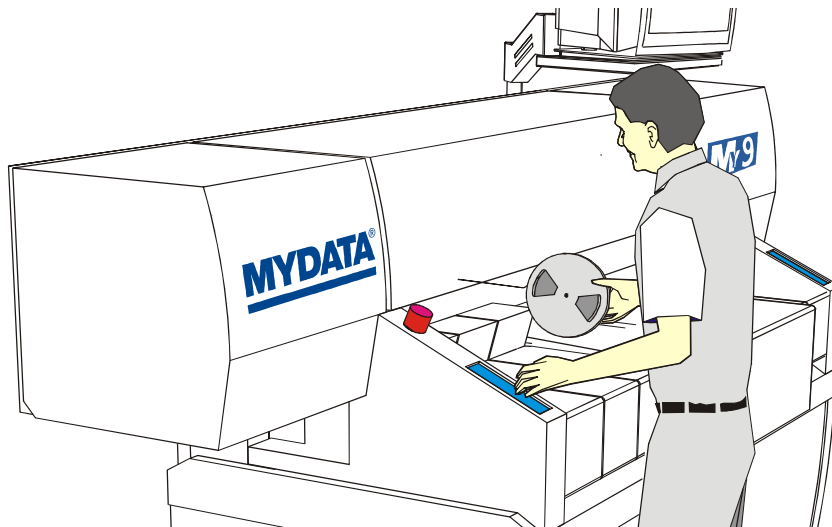
TPSys® Version 2.4

MY Series and TP Series

MYDATA Component Placement Machines

English

For a fast changing world **MYDATA®**

Operator's Manual

TPSys Version 2.4

MY Series and TP Series

of

MYDATA Component Placement Machines

–

English

This document is intended for MYDATA component placement machines. These machines can be run with MYDATA SYS program version 2.9 or MYDATA TPSys program version 1.x and 2.x. This document applies to the MYDATA TPSys version 2.4.

This document describes a standard machine and optional equipment available for the machine and magazines. Depending on your system you may lack some of the features described.

This system uses the ms unit for time. Length is measured in mm, but inch can be selected.

National special characters and some non-letter/non-figure characters cannot be entered into the system, for instance in board names and layout names. However, this version of TPSys allows the following characters to be used: " ' ` \ $; ^ @

In this document angle brackets < > are used to indicate certain key names contrary to a sequence of key strokes. Example: <Del> = the Del(ete) key, Del = the D, e, l key sequence.

Hardware and software mentioned in this document are subjected to continuous development and improvement. Consequently, there may be minor discrepancies between the information in the document and the performance or design of the product. Specifications, dimensions and other statements mentioned in this document are subject to changes without prior notice.

Federal Communications Commission (FCC)
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

IMPORTANT

Read the *Safety* chapter before starting the machine.

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Contents

New Features in TPSys 2.4

Main features added to TPSys version 2.4 are:

Hardware   Support for the Agilis Linear Magazines, see Chapter 4.

Automatic location of fiducial marks on inserted magazines, see Chapter 5.

Autoteach   Illumination and vision data for packages, see the *Programming Manual*.

Chip and outline packages

Interactive add and remove of leads

Miscellaneous   Bar code handling of trays and tray positions

Pre-inspection before pick for components in trays

Different pitch in X and Y direction for generic BGAs

Change package for all components with specific package

WWW access from MYDATA machine

HYDRA   Pick from TM-flex and vibratory magazines

About This Manual

MYDATA strives to provide documentation that is complete, accurate, informative and friendly. Your feedback is welcome. Please email your comments to: docs@mydata.se.

For clarity, the manual uses several conventions to present information of special importance.

Lists of items, points to consider, or procedures that do not need to be performed in a specific order appear in bullet or hyphenated format:

- Item 1
- Item 2

or

    – Item 1

    – Item2

Procedures that must be performed in a specific order appear in numbered steps:

1. Perform this step first

2. Perform this step second

Specific keyboard keys ar depicted in <-bracket, for example <Esc>. If more than one key should be pressed simultaneously, the notation appears as <Key1> + <Key2>, for example <Ctrl> + <F1>.

Screen menus and window names appear in **bold** type. Where you need to access a submenu, the syntax is **Menu** > **Submenu**.

For example **Editor** > **Component** mean: You open the Editor pull-down menu and select Component.

Fields within editors or boxes appear in *italics*. For example: *Name*

Program code appears in standard Courier font, for example:

```
Login: tpsys
$ go
```

A pointing finger notes important information.

A warning to alert you to potentially harmful consequences.
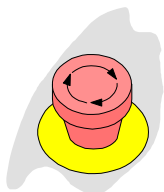
This icon means that an emergency stop button should be pressed down or the power turned off.

1. Safety

Before starting the machine, it is necessary that the operator, foreman and any other personnel involved in the machine operation, maintenance or service understand and follow these points:

- This machine is designed to pick components from their packaging and place them onto printed circuit boards, and to apply adhesive. The machine must be used exclusively for these two purposes and nothing else.

- The machine must be operated by trained personnel only.

- All personnel involved in machine operation must understand the use of the emergency stop buttons and how to manually move machine elements in case of emergency. See the sections entitled *Emergency Stop Buttons* and *Emergency Movement of Machine Elements* in this chapter.

- Anyone operating this machine must obey all warning signs. See the *Warning Signs* section in this chapter.

- At least one manual that describes the warning signs of the particular machine type must always be kept, for instance if the machine is upgraded with a later TPSys version.

- Apart from the daily maintenance described in the *Operator's Manual*, the machine is to be serviced by authorized maintenance engineers only.

- Excess component tape from the tape magazines shall be cut from the front of the machine when it is not in operation.

- Tools shall be inserted or removed from the rear of the machine when the tool bank is located on the rear of the Y wagon. For machines where the tool bank is located somewhere else, tools can be changed from the front of the machine. When inserting or removing tools to or from the tool bank, the emergency stop button shall be pressed down.

- An emergency stop button shall be pressed down when a tool or component is manually inserted or removed from the X wagon of the machine.

- If there is a risk that any unauthorized personnel might alter the system settings and thus the behaviour of the machine, then the logon facility for individual access rights has to be used.

- Ensure that all covers and shields are intact, mounted and closed while the machine is in operation.

- Do not disable or disengage any safety switch or sensor.

- Do not configure or modify MYDATA machines or devices without consulting MYDATA. The machines, devices or the interfaces between them might be unsafe.

- Do not use chemicals or other substances which may have any influence on the operator or other personnel involved in the machine operation.

- Handle the CRT monitors carefully. They contain glass electron tubes evacuated from air which may implode if damaged.

Emergency Stop Buttons

All MYDATA placement machines have emergency stop buttons that are red and stop all machine movements immediately when pressed down.

All MY machines have two emergency stop buttons located at the front of the machine frame. These emergency stop buttons are released by being turned clockwise.

The TP9-2U machine has one emergency stop button located at the front of the machine frame. This emergency stop button is released by being pulled up.

Important

An emergency stop button must always be pressed down when hands, fingers, tools or other objects are within a shielded area or in the risk area of movable machine elements such as Y wagon or Tray Wagon Magazine.

Emergency stop buttons on all MYDATA optional devices, such as TEX Tray Exchanger and conveyor systems, have the same function, that is to switch all motors off and release movable machine elements.

Activating a stop system in an optional device, for instance opening a TEX Tray Exchanger door, stops only the optional device. The placement machine is not stopped by such an action.

Restart

To restart a machine after an emergency stop button has been released, enter a command on the keyboard.

Emergency Movement of Machine Elements

MY9, MY12, MY15 and MY19

On the MY machines, the X wagon, Y wagon, and Tray Wagon can be moved manually after pressing **both** the emergency stop buttons down, provided that the power is on.

If an accident has occurred and an emergency movement of a machine element is required, use the following procedure:

Learn this by heart!

> **1. Press both the emergency stop buttons down.**
>
> **2. Leave the power on.**
>
> **3. Move the machine element away by hand.**

TP9-2U

On the TP9-2U machine, the X wagon, Y wagon, and Tray Wagon can be moved manually after pressing the emergency stop button down, provided that the power is on.

If an accident has occurred and an emergency movement of a machine element is required, use the following procedure:

Learn this by heart!

> **1. Press the emergency stop button down.**
>
> **2. Leave the power on.**
>
> **3. Move the machine element away by hand.**

Warning Signs

The warning signs on the machine must be observed as this machine contains fast moving parts and high voltage.

The machine has warning signs placed as shown on the following pages. The figure numerals refer to the following descriptions.

Note that at least one manual that describes the warning signs of the particular machine type must always be kept, for instance if the machine is upgraded with a later TPSys version.

Optional devices have the warning signs shown in their manuals except for the TEX unit which has the warning signs detailed in the *TEX Tray Exchanger* section in Chapter 5 of the *Operator's Manual*.

All signs must be kept clean and readable.

MY9 and MY12 Warning Signs

Figure 1-1. MY9 and MY12 warning signs

MY9 and MY12 have the same set of warning signs. Figure 1-1 shows the MY12 machine.

Number and position of each sign type is described in the following text. If a sign is missing, it must be replaced immediately. Part numbers are printed on the signs, but can also be read from this description.

MY15 and MY19 Warning Signs

Figure 1-2. MY15 and MY19 warning signs

MY15 and MY19 have the same set of warning signs. Figure 1-2 shows the MY15 machine.

Number and position of each sign type is described in the following text. If a sign is missing, it must be replaced immediately. Part numbers are printed on the signs, but can also be read from the following description.

①

Sign 1 (D-010-0051-ENA/ENE America/Europe) warns of the fast X-wagon movement. No hands, fingers, or other objects are allowed beyond the glass shield.

This sign is applied as follows:

MY9, MY12

– 2 signs on the glass shield.

MY15, MY19

– 4 signs on the glass shield.

②

Sign 2 (D-010-0052-ENA/ENE America/Europe) warns of the optional Tray Wagon Magazine movements.

This sign is applied as follows:
– 2 signs on the Tray Wagon Magazine (optional).

Sign 3 (K-049-0073) warns of electric shock. Units on which this sign is placed contain dangerous voltage levels. Power must be switched off before opening the unit. Only authorized service personnel are allowed to operate the machine when such a unit is open.

This sign is applied as follows:
– 1 sign at the mains switch.
– 1 sign on the power supply unit at the rear of the machine.

Sign 4 (D-049-0047-EN) alerts that only MYDATA approved equipment is allowed to be connected to the power supply unit outlet.

This sign is applied as follows:
– 1 sign on the power supply unit at the rear of the machine.

TP9-2U Warning Signs

Figure 1-3. TP9-2U warning signs

Number and position of each sign type is described in the following text. If a sign is missing, it must be replaced immediately. Part numbers are printed on the signs, but can also be read from the following description.

①

Sign 1 (D-010-0051-ENA/ENE America/Europe) warns of the fast X-wagon movement. No hands, fingers, or other objects are allowed beyond the glass shield.

This sign is applied as follows:
– 3 signs on the glass shield.

②

Sign 2 (D-010-0052-ENA/ENE America/Europe) warns of the Y wagon and the optional Tray Wagon Magazine movements.

This sign is applied as follows:
– 2 signs on the Y-wagon base plate (front and rear).
– 2 signs on the Tray Wagon Magazine (optional).

③

Sign 3 (D-010-0053-ENA/ENE America/Europe) warns of the fast X-wagon movement. Do not open any part of the cover while the machine is in operation, or start the machine if any part of the cover has been removed. Only authorized service personnel are allowed to open covers and expose moving parts.

This sign is applied as follows:
– 5 signs on the rear of the X-wagon covers.

④

Sign 4 (K-049-0073) warns of electric shock. Units on which this sign is placed contain dangerous voltage levels. Power must be switched off before opening the unit. Only authorized service personnel are allowed to operate the machine when such a unit is open.

This sign is applied as follows:
– 1 sign at the mains switch.
– 1 sign on the power supply unit at the rear of the machine.

⑤

Sign 5 (D-049-0047-EN) alerts that only MYDATA approved equipment is allowed to be connected to the power supply unit outlet.

This sign is applied as follows:
– 1 sign on the power supply unit at the rear of the machine.

Type Plate

The type plate shows the name and address of the manufacturer, the machine type and serial number, and manufacturing year and country. An example of a type plate is shown below.

Figure 1-4. Machine type plate

On the MY machines, the type plate is found on the rightmost machine stand (see '5' in Figure 1-1 and Figure 1-2).

On the TP9-2U machine, the type plate is found at the rear of the machine (see '6' in Figure 1-3).

Warnings in the Manual

Throughout the manual this symbol is used to call your attention to commands that starts machine movements. The symbol refers to the warning signs, which must be obeyed to eliminate the risk of injury.

If there are instructions accompanying this symbol, they must be followed.

Also, to avoid damage, this symbol means that the operator must be observant of the following:

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

Noise

For all the MY machines, the equivalent continuous sound pressure level is measured in accordance with EU directive 89/392/EEC to be 62dB(A).

For the TP9-2U machine, the machine noise is less than 70dB(A).

2. Machine Operation

In this chapter system basics are described that you have to know in order to be able to control the machine. After reading this chapter, you can start assembling as described in the next chapter, *Assembling*.

Basic Terminology

A pick-and-place machine is designed to pick electronic components and place them in the correct position on a printed circuit board (PCB). PCBs are found inside most electronic equipment, such as personal computers, videos an so on.

X axis

MY-machines are designed around a split-axis concept. A high speed *X wagon*, moves from left to right (the X axis) at the top of the machine.
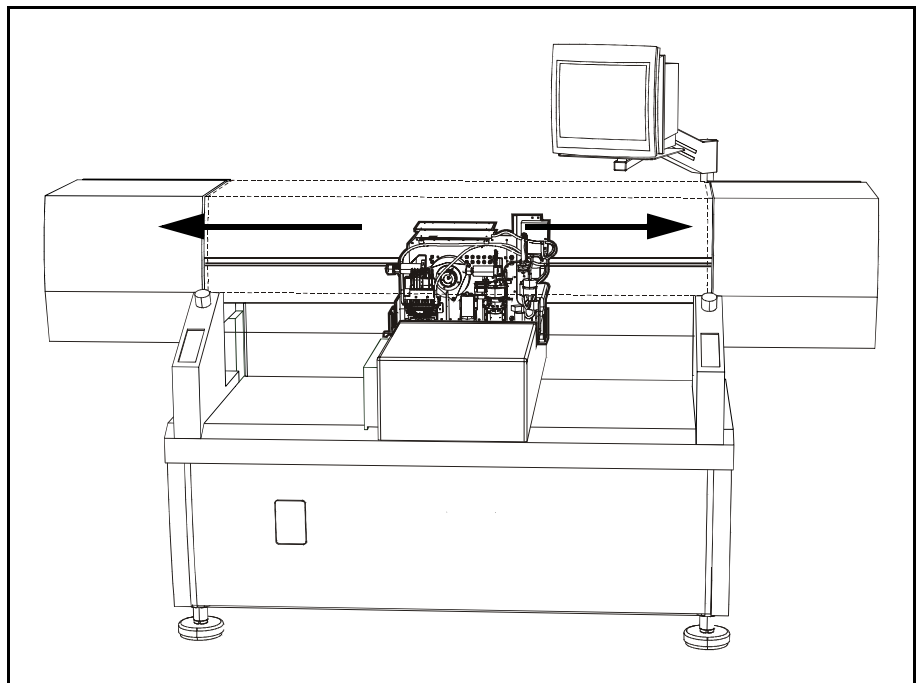
Figure 2-1. X wagon

Z axis

Mount heads are located on the X wagon. They move up and down (the Z axis), and also rotate. *Tools* for the picking of components are attached to these mount heads. There are the Single Mount Head and the HYDRA mounthead.
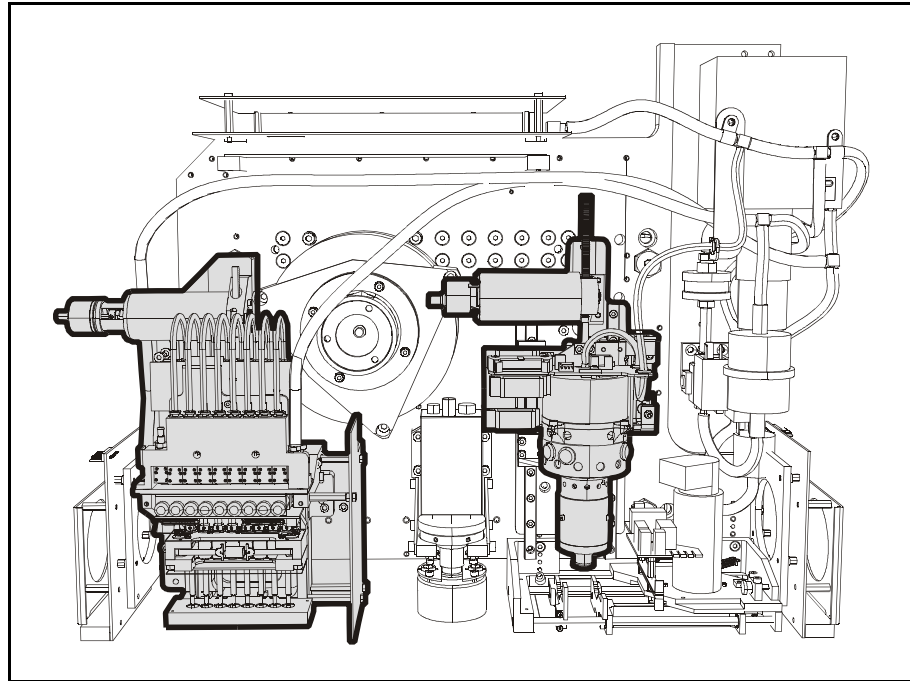
Figure 2-2. Mount heads

Y axis

Finally there is the *Y wagon*, moving "back and forth" on the machine (the Y axis). This holds the PCBs to be assembled.
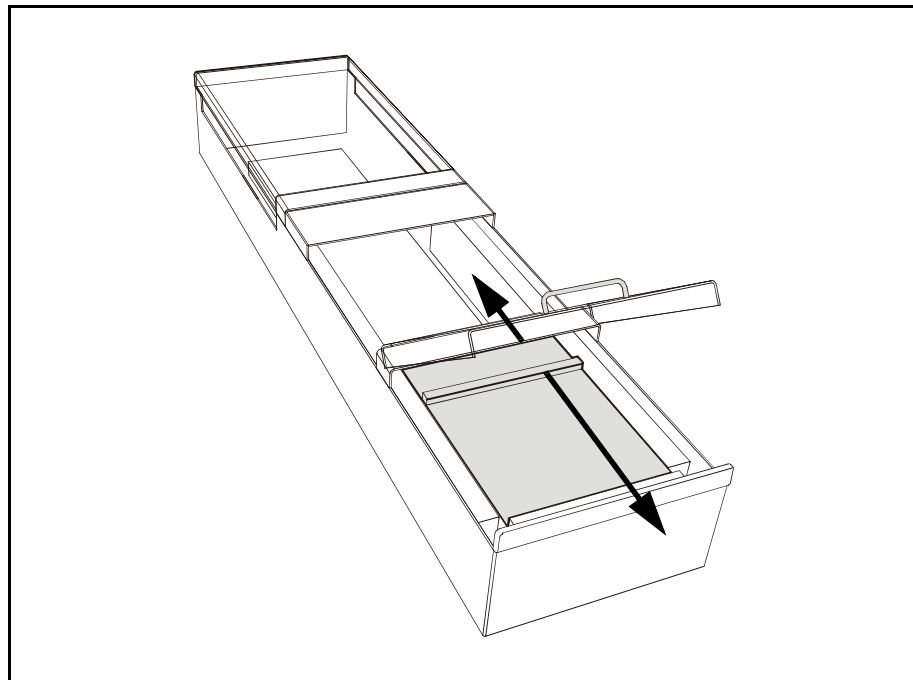
Figure 2-3. Y wagon

Components are supplied in tape reels, component sticks, or on trays. These are loaded into various *magazines* that position the component in a pick position directly in the path of the X wagon. Magazines are described in Chapter 4
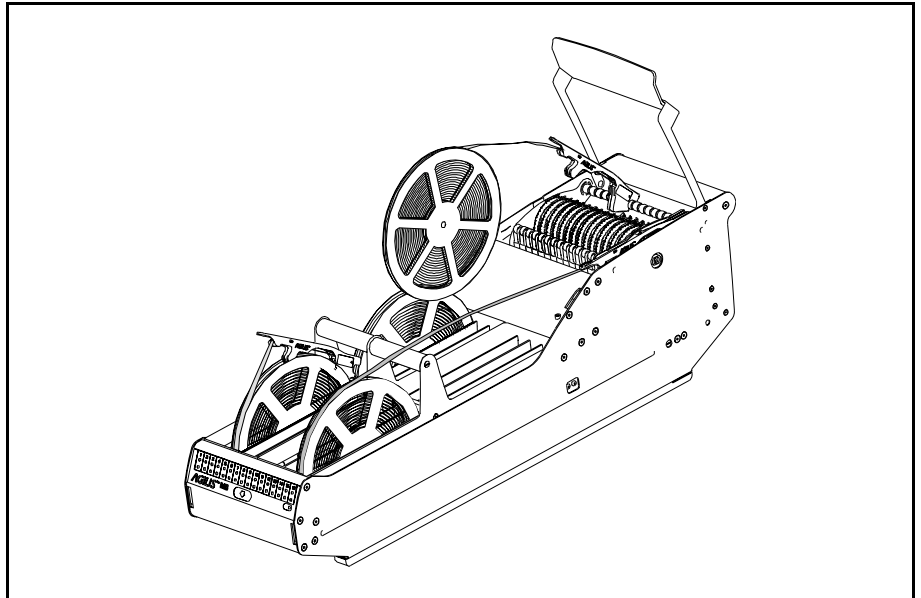
Figure 2-4. Tape magazine

A Mount Cycle

– The magazine positions a component in the pick position.

– The X wagon moves above the magazine to the pick position.

– The mount head is lowered, and the component is sucked onto the tool.

– The mount head lifts up the component, and the X wagon moves over towards the Y wagon which carries the PCB.

– Each component must be placed with a very high precision. Component positions, in tape-pockets or trays, can vary. The tool may therefore pick components with some offset. To correct this components are centered before placement. This can be either mechanical or optical centering. During optical centering the components position on the tool is measured via a camera and adjusted for when placed. In mechanical centering, two centering jaws push the component to the middle of the tool tip. During centering the dimensions are measured. The mechanical centering device can also measure the electrical properties of the component.

– During the pick-up and centering movements, the Y wagon carrying the PCB positions itself at the correct position for the component to be placed.

– Finally, the mount tool lowers and places the component in the correct position.

Machine Configuration

Machines can be configured with either an in-line conveyor system, or a manual load system, to load or unload PCBs. These are further detailed in Chapter 6.

On manual load systems (Y wagons) the PCBs are fixed into position using magnetic supports. Any number of sizes or shapes can be mounted simultaneously at any angle.

Figure 2-5. Manual Y wagon

The MYDATA machine can be an integral part of an in-line concept. This makes use of an internal conveyor on the Y wagon together with external conveyors. Empty PCBs can be loaded, transferred to the machine, aligned, have components mounted and then transported to an oven.

On in-line systems magnetic supports are also used. They prevent boards from flexing during assembly.

The in-line configuration is either *Tee style* or *Pass through*.
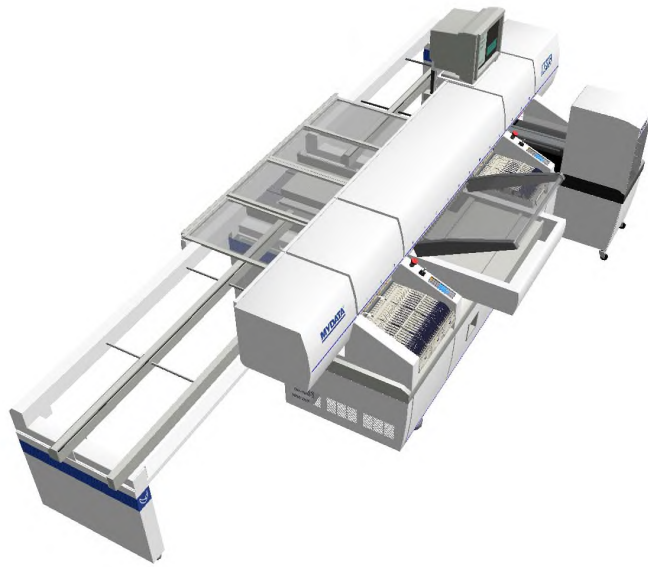
Figure 2-6. Tee style configuration

In Tee style the entire line passes along the back of the machine, allowing the front to be accessible to the operator.
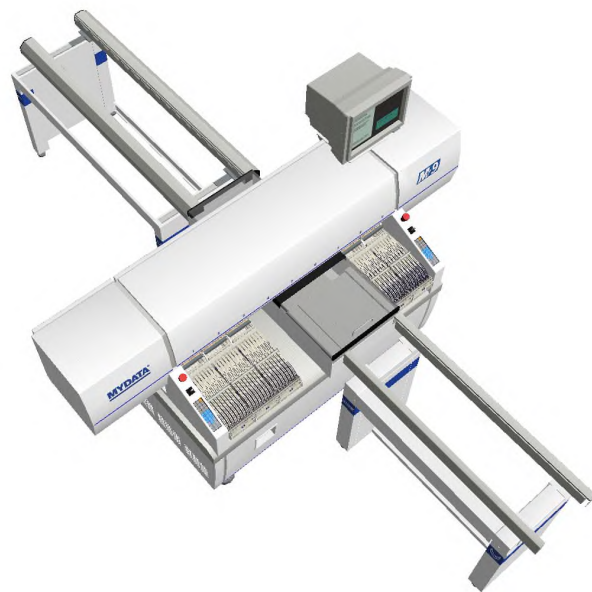
Figure 2-7. Pass through configuration

In Pass through style the line passes through the machine. This style have the advantage of using shorter conveyors than the Tee style.

Operating Controls

MYDATA component placement machines are entirely processor controlled. All functions are controlled using keyboard, machine keypad and joystick. Two or three monitors display menus, current processes and messages. Some of the features can also be run off-line.

The assembly process is controlled by software called TPSys that takes information from numerous lists. These lists contain information about the components, their packages, the magazine in which the components can be found, and where the components are to be placed.

Mount programs, component, package, and magazine lists, operating data and system parameters are stored on an internal hard disk. Assembly, magazine and user information can be shared by many MYDATA machines provided that these machines are equipped with the TPSys network option.

The system, and thereby the machine, is controlled using keyboard, trackball, machine keypad and joystick (located on the machine), barcode reader, and monitors.
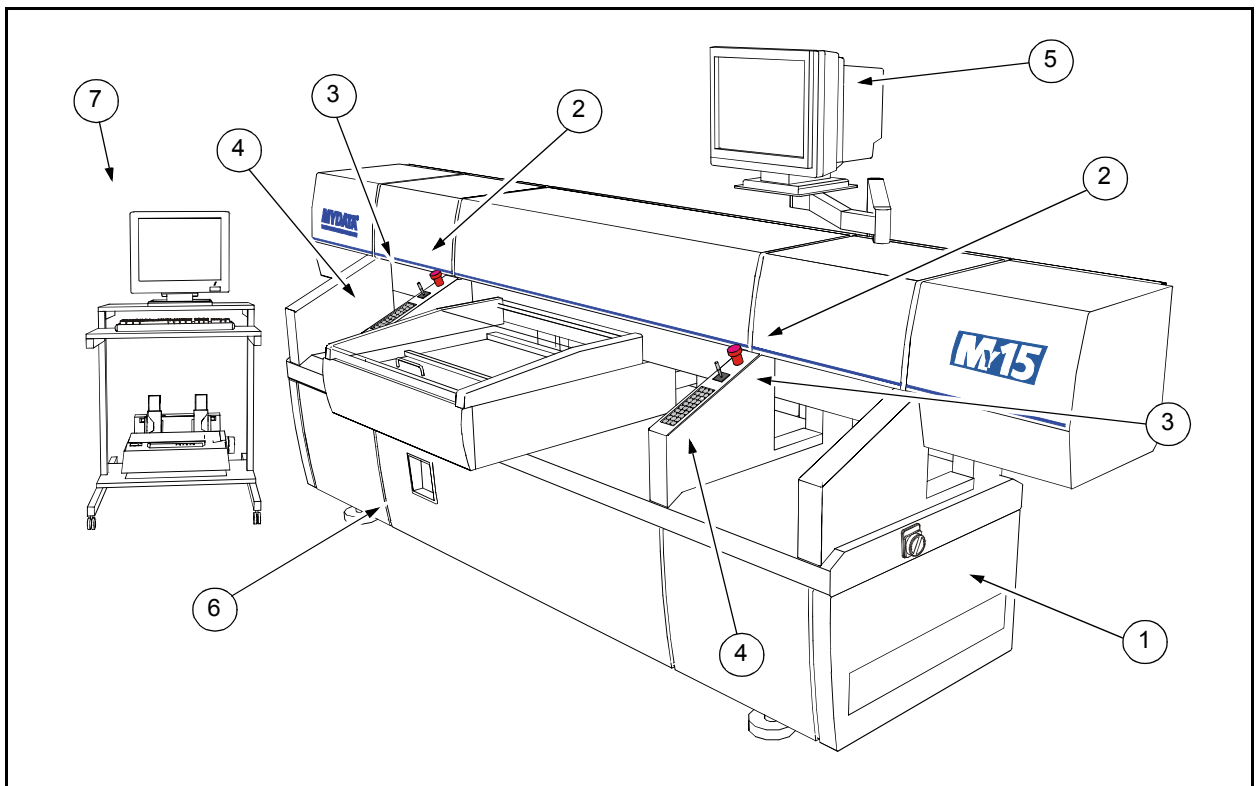
Figure 2-8. Machine controls

Key

1. Main power switch.

2. Emergency stop buttons.

3. Joysticks.

4. Machine keypads.

5. Monitor.

6. Disk- and CD-rom drives.

7. Off.line terminal with trackball and printer.

Trackball
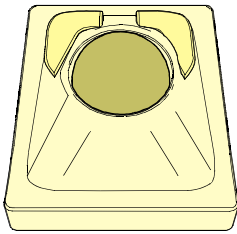
The trackball controls the X and Y movements of the machine and is operational when the cross hairs are shown on the monitor.

The trackball buttons have the following functions:

- Pressing the left button, restrict movements to the Y axis only.

- Pressing the right button restrict movements to the X axis only.

- Pressing both buttons together increase the trackball movement speed by five times.

In some modes <F1> must be pressed to activate the trackball. A message is shown when this is the case.

Joystick

The joystick has the same function as the trackball on the keyboard, that is to locate board fiducial marks, magazine feeders and tray positions.

The joystick is operational when cross hairs are shown on the monitor.

In some modes <F1> must be pressed to activate the joystick. A message is shown when this is the case.

Both the trackball and joystick are also used when programming packages.

Machine Keypad

Each of the MY series of machines has two machine keypads with 30 keys located on the machine frame.

TP9-2U has a single machine keypad with 18 keys, also located on the machine frame.

Other machine types have machine keypads with either 18 or 30 keys.

The machine keypads have the major operational commands for assembling PCBs. The machine keypads are shown in Figure 2-9.

The keyboard and the machine keypads have parallel functions.

The machine keypad differs from the keyboard in that it lacks alphabetical keys. On the other hand, commands that require many keystrokes on the keyboard, can be given with a single keystroke.

The key functions, with the exception of the numerical and arrow keys, are detailed on page 2-10.
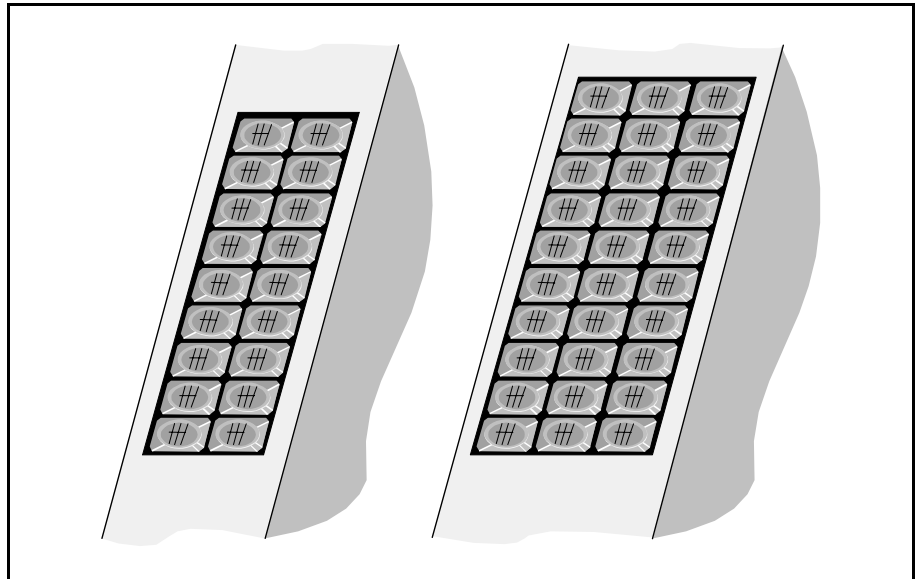
Figure 2-9. Machine keypads with 18 and 30 keys

Machine keypad key	Function	Equivalent keyboard command
Backspace	Backspace	\<Backspace\>
Camera	Activates vision system	\<F1\> at the *Press \<F1\> for camera* prompt
Clear status	Clears layout status	*Clear Layout Status (Production)*
Enter	Acceptance	\<Enter\>
Esc	Escape	\<Esc\>
Front/Back	Assembly table to front and back toggling	*Front* and *Back* (*Production/Move Y Wagon*)
Glue	Glue dot application	\<F5\> *Mount/glue* (Mount List)
Grab/Release	Conveyor grab and release toggling	*Conveyor Load/Grab* and *Conveyor Release & Unload* (*Production/Conveyor Control*)
Leave tool	Leaves tool	*Leave Tool (Production)*
Load	Loads layout	*Load Layout (Production)*
Magazine	Adjusts magazine feeders	*Adjust Feeder Positions (Magazine)*
Mount	Mount current component	\<F4\> *Mount/glue* (Mount List)
PgDn	Scrolls down	\<PgDn\>
PgUp	Scrolls up	\<PgUp\>
Shift	Shift key functions	–
Stop	Stops assembling	\<Enter\> \<Esc\>
Toggle	Space/toggle	\<Space\>
Toggle pin	Pin position indexing	\<F3\> *Toggle lead* (Mount List)
Trim	Locates fiducial mark	*Locate Boards (Auto) (Production)*
Unload	Unloads layout	*Unload Layout (Production)*

Numerical and arrow keys are omitted in this table.

Vital Keys
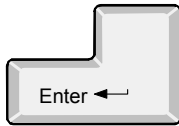
Enter

Normally, <Enter> means to confirm.

In some cases <Enter> is used for special functions. When this is the case, instructions are provided.

In various editors <Enter> is used to move to the next field, meaning that the previous field is confirmed.

Esc

In contrast to <Enter>, the <Esc> key is used to cancel the current activity without saving the data.
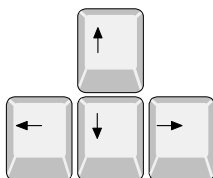
<Esc> is also used to return to a previous window. If <Esc> is pressed several times in any window, the main window will be shown.

Insert

The insert key is used to insert new items in various editors and dialog boxes.

Also, the <Ins> key toggles between insert and overwrite mode. Pressing the <Ins> key in a text field makes all fields in the window to change between insert and overwrite mode.

Arrow keys

Generally, the arrow keys are used to move the cursor in the direction indicated by the arrow. This is used to select options in menus and to move the cursor in lists containing many fields.

If there is no field to the left of the cursor, <left arrow> will act as <up arrow>. Similarly, if there is no field to the right of the cursor, then <right arrow> will act as <down arrow>.

Signal Tower

An optional signal tower that has red, yellow, green and white light in addition to a buzzer can be used to indicate the operational status of the machine.

The combination of light and buzzer signals for various machine states can be customized to match individual needs. Configuration of the light and buzzer is further detailed in the *Machine Manual*. The default setting is shown in the table below.

| Default signal	Machine state	Description
Green steady light.	Running	Normal mounting or gluing operation.
	Waiting	The machine is running but it waits for loading or unloading the board.
Green steady light + yellow blinking + intermittent buzzer.	Bad performance	The machine is running but components cannot be picked from at least one magazine feeder which may be out of components. The same component type is however available in another magazine feeder.
	Stops soon	The machine is running but components cannot be picked from at least one magazine feeder which may be out of components. The layout will not be completely mounted.
Yellow steady light.	Idle/stopped	The machine has not been started yet or: – it has finished a layout. – it is stopped by the operator.
Red steady light and buzzer.	Operator needed	The machine cannot complete the assembly without help from the operator. Normally caused by lack of components.
	Error	The machine is stopped due to a fatal error or by an emergency stop button.

Disk Drives

This system uses an internal hard disk, and one or more disk drives.

Hard Disk

The internal hard disk stores programs, parameters and various lists such as Component List, Package List, Magazine Lists, Mount Lists for various layouts, Fiducial Mark List and Glue Dot List.

Disk Drive
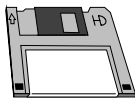
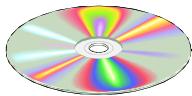The machine is equipped with one 3.5" disk drive for 1.44MB disks (marked HD).

Disks may be formatted for Linux or DOS, as the Linux system can handle DOS formatted disks.

Disks can be DOS formatted by TPSys in the machine disk drive (described in the *Disk Formatting* section in Chapter 3 of the *Programming Manual*).

The disk drives are used to make backups, and to import/export data. The system can also be booted from the disk drive.

The format for import/export data is specified in the MYDATA P-010-0779-EN *Software manual*.

CD-ROM Drive

The machine is equipped with a CD-ROM drive, from which the required software (for instance TPSys) can be installed and updated.

Printer
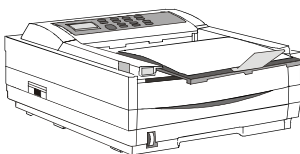
A printer is used for producing hard copies of various lists such as component status, messages, management data and parameter data.

Starting the System

About 15 seconds after the power has been turned on the first message is shown on the monitor. During the next minute approximately, when the Linux operating system is loaded, a number of messages are shown. TPSys is then loaded automatically.

Press <Alt>+<F2> to access a web interface. This interface provides graphical presentations of packages and PCBs. It also makes manuals and a calculator available.

To return to TPSys, press <Alt>+<F1>.

Working in TPSys off-line means that a reduced selection of the menus are available and no activities in the machine can be started or stopped.

To manually start TPSys from an on-line terminal, log on to the system as 'tpsys' as follows:

```
Login: tpsys
```

To manually start TPSys from an off-line terminal, log on to the system as 'tpsys' and type 'go' as follows:

```
Login: tpsys
$ go
```

If the system does not respond to commands, ensure that the keyboard is properly connected.

A start failure may be caused by a diskette left in a disk drive.

When the system is running the following dialog box is shown:

```
OK to initiate hardware?
          OK
```

Before initiating the machine, check the following:

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

You **must** understand the safety instructions in Chapter 1 before confirming this initiation.

Press <Enter> to confirm initiation. This will cause machine movements. The main window will be displayed on the monitor.

Occasionally, the system need to be re-initiated to solve for instance an internal electrical, mechanical or servo problem. The dialog box above can thus be shown even after the start-up initiation. If this happens, just confirm the initiation and continue assembling.

Manual Insertion/Removal of Tools/Components
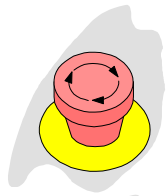
An emergency stop button shall be pressed down when a tool or component is manually inserted or removed from the X wagon of the machine.
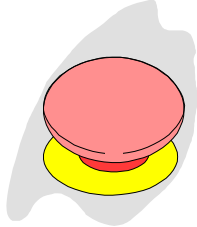
In addition to the safety instructions found in the *Safety* chapter, follow any safety information displayed on the screen.

> **You have to read the Safety chapter before operating this machine.**

TPSys Main Window

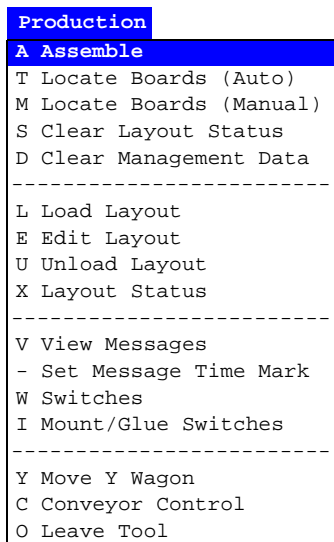*Figure 2-10. Main window*

The menu in the main window, see Figure 2-10, has a number of options, and one of which is highlighted. The highlight moves by pressing the <left arrow> or <right arrow> key.

The options in the main menu window have sub-menus that are shown if <Enter> or <down arrow> is pressed. Or, you can select desired option by simply pressing one of the highlighted shortcut letters. You can use either upper-case or lower-case letters.

The *Production* menu options are shown in the next section.

Main Menu Options

The *Production* menu found in the main window looks like this:

```
 Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

The options in the menu can be selected by moving the highlight with <up arrow> or <down arrow> and pressing <Enter>, or by simply pressing the shortcut letter, either upper-case or lower-case.

Popup Menus

```
H00
H01
H02
H03
H04
```

In some editors, there are popup menus that are shown by pressing a key, for instance the <Ins> key or the <Space> bar. The upper figure is an example of a popup menu in which HYDRA tools can be selected.

Confirming and Canceling Commands

Example 1, Confirming a command

- From the main window, press **U** or, using the arrow keys, move the highlight to **Utility** and press <Enter> or <down arrow>.

- Press **U** or, using the arrow keys, move the highlight to **Units** and press <Enter>.

```
Utility
I Import
X Export
T Installation
D Diagnostics
M Re-Initiate Motor Controllers
O Re-Initiate Conveyor
C Conveyor Pass-Through Mode
G Login / Logout
A User Access System
W Web Interface Setup
E Clear Event Log
N Delete Management Data
------------------------------
B Backup
R Restore
H Schedule Backup
S Save System Status
F Format DOS Diskette
U Units
L Language
```

- Using the arrow keys highlight the **Inch** option.

- Confirm the command by pressing <Enter>.

Now, the system will display measures in inch.

Example 2, Canceling a command

- From the main window, press **R** or move the highlight to **Print** and press <Enter> or <down arrow>.

- Press **M** or move the highlight to **Magazine** and press <Enter>:

```
Print
C Component
P Package
M Magazine
B PCB
Y Components In Layout
E Messages
R Parameters
-----------------------
N Management Data
O Magazine Optimization
K Magazine Kit
L Layout Preparation
T Removable Feeder
-----------------------
A Cancel All Printouts
```

- Highlight the **Print Selected Magazine** option.

- Press <Enter>.

- Cancel the command by pressing <Esc>.

The command procedure is canceled and the main window is shown again.

Messages

The main window has a message box that can display up to six system messages. You can show/hide this box by pressing <Shift>+<F2> simultaneously.

More messages are, however, stored in the system and can be displayed in a full screen window by selecting the **View Messages** option in the **Production** menu:

```
Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```
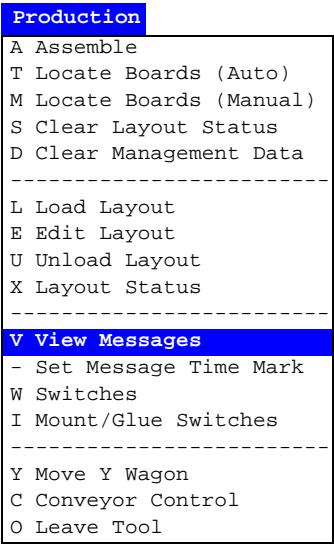
The full screen message window is shown in Figure 2-11.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ Production  Magazine Editor   Print    Utility Exit     About...          │
│────────────────────────────────── Messages ──────────────────────────────│
│ I-MHPR-10: Magazine RGB inserted in slot 6                                │
│ I-MHPR-10: Magazine Video inserted in slot 8                              │
│ F-AUTOREF-9:Id: ´Ro-1.0´ Unknown fiducial mark type                       │
│ F-AUTOREF-8:Id: ´Ro-1.0´ Correlation too low (72). Expected 80            │
│ I-OPTP-3: Start assembling                                                │
│ W- OPTP-6: Stop. -All components mounted                                  │
│ I- OPTP-3: Start assembling                                               │
│ W- OPTP-6: Stop. -All components mounted                                  │
│ I- OPTP-3: Start assembling                                               │
│ W- OPTP-6: Stop. -All components mounted                                  │
│ I- OPTP-3: Start assembling                                               │
│ W- OPTP-6: Stop. -All components mounted                                  │
│ I- MHPR-11: Magazine Audio removed from slot 3                            │
│ I-MHPR-10: Magazine Audio inserted in slot 3                              │
│ F- AUTOREF-7:Id: ´Ro-1.0´ Fiducial mark not found                         │
│ I- OPTP-3: Start assembling                                               │
│ W- OPTP-6: Stop. -All components mounted                                  │
│ I- OPTP-3: Start assembling                                               │
│ W- OPTP-6: Stop. -All components mounted                                  │
│ I- OPTP-3: Start assembling                                               │
│ W- OPTP-6: Stop. -All components mounted        Bill            13:19      │
└─────────────────────────────────────────────────────────────────────────┘
```

Figure 2-11. Full screen message window

Use the <up arrow>, <down arrow>, <PgUp>, and <PgDn> keys to scroll the text for further messages, if any.

Return to the main window by pressing <Esc>.

Messages can be printed out by selecting the **Messages** option in the **Print** menu. You can choose to print all existing messages or messages from a specific period defined by the *Enter time in minutes* prompt.

A complete list of messages that can be shown in this window is found in the *Software Manual*.

User Access

The system can be set up with a user access system. This in order to hinder unauthorized persons from altering data, which may ruin the work and change the behavior of the machine.

Each user can be set up with a personal password and an individual access level. Information on how to set up the user access is found in the *User List* section of the *Programming Manual*.

It is recommended to use this feature to keep a high safety level.

When using the access feature, everyone has to log on with a password to be able to change vital data or parameters.

To log on, select the **Login** / **Logout** option in the **Utility** menu:

```
Utility
I Import
X Export
T Installation
D Diagnostics
M Re-Initiate Motor Controllers
O Re-Initiate Conveyor
C Conveyor Pass-Through Mode
G Login / Logout
A User Access System
W Web Interface Setup
E Clear Event Log
N Delete Management Data
------------------------------
B Backup
R Restore
H Schedule Backup
S Save System Status
F Format DOS Diskette
U Units
L Language
K Desktop Resolution
```

Select **Login** ...

```
——— Login / Logout ———
I Login
O Logout
```

... and enter your name and password:

```
————————————Login————
    Name: Bill
Password: ******
```

To select the name from a list of registered users, just press <Enter> in the *Name* field.

After a successful logon the user name is displayed on the screen, see the name *Bill* in Figure 2-11 on page 2-20.

No access right

The following information is shown if you have no access right or no right to modify data:

Protected

This is applicable if the user access is on, and you are not logged on, or, you have logged on with no access right for the current feature.

Logging Off

If you want to log off without exiting TPSys, then select the **Login** / **Logout** option in the **Utility** menu:

```
Utility
I Import
X Export
T Installation
D Diagnostics
M Re-Initiate Motor Controllers
O Re-Initiate Conveyor
C Conveyor Pass-Through Mode
G Login / Logout
A User Access System
W Web Interface Setup
E Clear Event Log
N Delete Management Data
------------------------------
B Backup
R Restore
H Schedule Backup
S Save System Status
F Format DOS Diskette
U Units
L Language
```

Select **Logout** ...
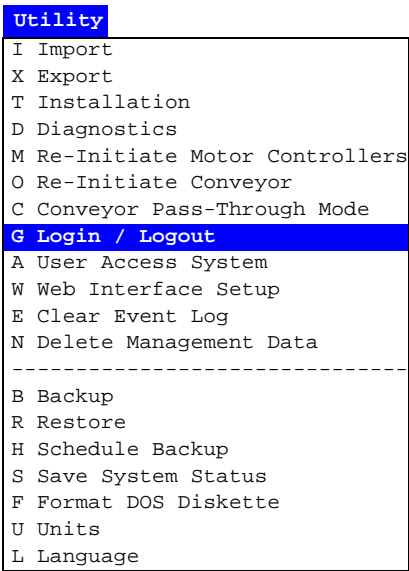
```
── Login / Logout ──
I Login
O Logout
```
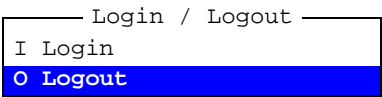
... and **Yes** in the following box.

```
Logout user Bill
   Yes   No
```
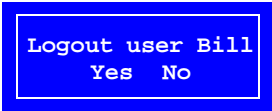
Exiting the System

☞ *Never turn the power off while the TPSys is running.*

To exit, shut down the system, or restart the system, use the *Exit* menu.

```
Exit
S Shutdown
R Restart TPSys
X Exit TPSys
M Exit To Service
```

For further details on the *Exit* menu, see *Appendix A – Menu Reference Guide*.

As you exit TPSys, you are automatically logged off.

If you selected **Shutdown**, the machine will go through a shutdown procedure. It is safe to turn the machine power off after a message is displayed stating you can press <Ctrl>+<Alt>+<Del> to reboot.

3. Assembling

This chapter is a training guide for assembling a layout.

You can perform the assembling if you have read the previous chapter, *Machine Operation*, provided that all required components are available in the machine and that all programming is done.

To load magazines, work with tools and perform other operations you will need further information about the system. That information, divided into the following main parts, is found in the following chapters in this manual.

- Magazines – loading in Chapter 4:
  - Loading the various magazine types.

- Magazines – usage in Chapter 5
  - Magazine utilization.
  - Magazine errors.
  - Magazine optimization.
  - Magazine Kit.
  - HYDRA preparation.
  - Glue station.

- Board Handling in Chapter 6
  - Manual Y wagons
  - In-line systems

- Tools in Chapter 7:
  - Standard mount and glue tools.
  - HYDRA mount tools.
  - The HYDRA Speedmount ATE system.

- Other features in Chapter 8:
  - Board location.
  - Mount and glue switches.
  - Layout preparation.
  - Alert messages.
  - Layout status.
  - Management data.
  - X wagon to outermost positions.

- TPSys menu reference guide in *Appendix A*

The Assembling Procedure

The assembling procedure is performed in the following steps:

– Load components, see Chapter 4
– Apply kitlist (optional)
– Trim pick positions, see Chapter 5
– Load layout
– Load boards
– Start Assemble
– Check the board locations
– Assemble the layout

Board and layout programming is not included in this manual. See the *Programming Manual* for information about how to program boards, panels and layouts.

Loading Layout

Layouts can be loaded either manually or automatically.

Loading a Layout Manually

- Select the **Load Layout** option in the **Production** menu:

```
Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

A layout list, which contains all stored layouts in the system, is displayed (see Figure 3-1).
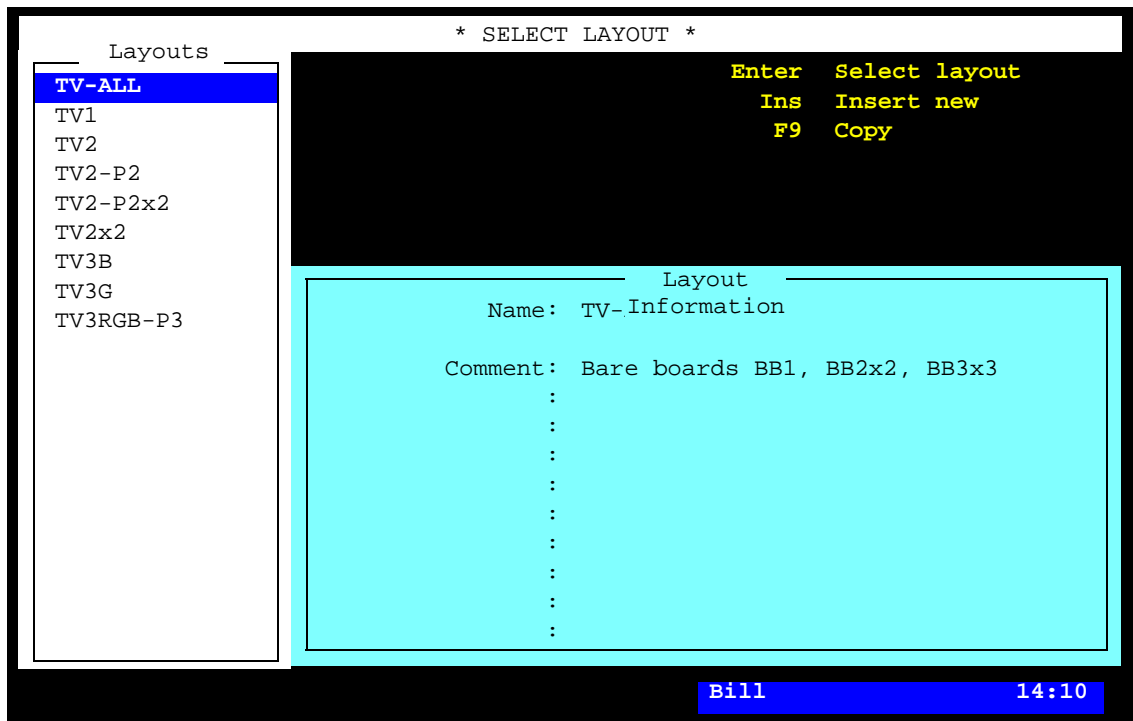
Figure 3-1. Loading layout

- Select the desired layout by using the arrow keys or simply type the first characters of the name and select the layout.

- Press <Enter> to load the selected layout.

Loading a Layout Automatically

- Choose **Assemble** in the **Production** menu

- Scan the barcode

  You can either use a handheld barcode reader or a serial device mounted on a conveyor.

- When the barcode is scanned TPSys will automatically load the correct layout.

Loading Boards

If the Y wagon is not in the front position, move it to the front position in one of the following ways:

– Press the *Front/Back* key on the machine keypad.

– Press the <Ctrl> and Y keys on the keyboard simultaneously.

Ctrl   Y

– Select the **Move Y Wagon** in the **Production** menu:

```
 Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

... and the **Front** option:

```
 Y Wagon Move
F Front
B Back
```

Place the boards included in the layout on the assembly table. If you want to save time when locating the boards, then place the boards in the same way as last time the layout was used.

If the machine is equipped with conveyor, then select the **Conveyor Load/Grab** option in the **Production** menu.

☞ *Do not mix boards of different thickness in the same layout.*

Locating Boards

Select the **Locate Boards (Auto)** option in the **Production** menu.

```
   Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

This will perform an automatic fiducial mark search, which will be performed provided that the fiducial marks are learned by the system.

☞ *Note that non-present board markings are cleared by this procedure.*

So, if you have marked non-present boards, do not perform this procedure, or you have to run the manual fiducial mark search again and remark the desired non-present boards. This is described in the *Marking Board As Non-Present* section in Chapter 8.

Automatic board location is further described in Chapter 8, see the *Automatic Fiducial Mark Search* section. Manual board location is described in Chapter 8 see the *Manual Fiducial Mark Search* section.

Assembling the Layout

Select the **Assemble** option in the **Production** menu.

Not to be confused with
number of boards.

Enter the number of layouts in the batch and the batch name, if any:

```
┌─────────────────────────── Select Layout ───────────────────────────┐
│         Layout: TV-ALL                                               │
│                 Bare boards BB1, BB2x2, BB3x3                        │
│   Number of layouts                                                  │
│          to produce: 10                                              │
│           Batch ID: 123                                              │
└─────────────────────────────────────────────────────────────────────┘
```

This example indicates 10 layouts, each of which containing 3 boards. A total number of 30 boards will thus be assembled.

After entering the batch name, the following menu is shown:

```
┌───────────────────────────┐
│ Start Assembling          │
│ Locate Boards (Manual)    │
│ Clear Non-Present Flags   │
│ Glue Boards               │
│ Mount Boards              │
│ Print Management Data     │
│ View Alert Data           │
│ Locate Boards (Auto)      │
│ Clear Layout Status       │
└───────────────────────────┘
```

Start Assembling

Before entering this command, check the following:

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

After entering this command, the machine will start assembling the first layout.

If the machine is equipped with a conveyor system, it will automatically change boards when needed. If it is equipped with a manual load system, the machine stops after having assembled the first board. It will prompt for change of boards.

The system displays the following statistics continuously during assembling:

```
┌─────────────────────────────────────────────────────────────────────┐
│         Layout:  TV-ALL                                             │
│                  Bare boards BB1, BB2x2, BB3x3                      │
│          Batch:  123                                                │
│            Layouts produced:   5   (of:10  )                        │
│               PCBs produced:  15   (of:30  )                        │
└─────────────────────────────────────────────────────────────────────┘
```

If an error occurs, or a magazine runs out of components, an alert message will be displayed (alert messages are detailed in Chapter 8):

```
                          Operator Alerts
 000149 (100pF) not available
 000254 (680pF) not available
 Packages specified without tool




                        Magazine Utilization
 TW  2  3  |  4  5  6         YW       10 11 12  |  13 14  15
```

In the *Magazine Utilization* box, magazine information is also displayed (magazine utilization is further detailed in Chapter 5).

☞ You can stop the assembling by pressing the *Stop* button on the machine keypad or the <Enter> key on the keyboard.
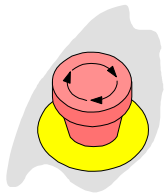
> **IMPORTANT**
> All machine movements can be stopped immediately by pressing an emergency stop button down.

Locate Boards (Manual)

Performs a manual fiducial mark search, similar to the one performed by selecting the *Locate Boards (Manual)* option in the *Production* menu.

Manual board location is further described in Chapter 8, see the *Manual Fiducial Mark Search* section.

Clear Non-Present Flags

Clears non-present board markings set during the manual fiducial mark search.

This feature is further described in Chapter 8, see the *Marking Board As Non-Present* section.

Glue Boards

Glue is applied for components for which the *Glue* field is set to *Yes* in the PCB Mount List.

Select this option to exclusively apply glue.

If no glue is applied, see the *Mount and Glue Switches* section in Chapter 8.

Mount Boards

Components are mounted on the boards included in the current layout without glue, as no glueing is performed with this option.

Print Management Data

Prints management data. See the *Management Data* section in Chapter 8.

View Alert Data

This option lets you see in which magazine missing components are loaded. See the *Layout Status* section in Chapter 8.

Locate Boards (Auto)

Performs an automatic fiducial mark search, similar to the one performed by selecting the *Locate Boards (Auto)* option in the *Production* menu, provided that the fiducial marks are learned by the system.

Automatic board location is further detailed in Chapter 8, see the *Automatic Fiducial Mark Search* section.

Clear Layout Status

Clears saved layout status, if exists. This feature is further described in Chapter 8, see the *Layout Status* section.

Alert Messages

Alert messages inform about components which cannot be mounted and other notable events during assembly.

Each entry in the alert message box contain the component name and comment text, and the reason to why the component cannot be mounted (see the figure).

```
┌──────────────── Operator Alerts ────────────────┐
│ 000149 (100pF) not available                     │
│ 000254 (680pF) not available                     │
│ Packages specified without tool                  │
│                                                  │
│                                                  │
│                                                  │
│             ─── Magazine Utilization ───         │
```

| TW | **2** | **3** | | **4** | 5 | 6 | YW | 10 | 11 | 12 | | **13** | **14** | 15 |

The Magazine Utilization box is detailed in Chapter 5.

You can also see in which magazine or tray missing components are loaded by selecting the *View Alert Data* option in the *Assemble* menu:

```
Start Assembling
Locate Boards (Manual)
Clear Non-Present Flags
Glue Boards
Mount Boards
Print Management Data
View Alert Data
Locate Boards (Auto)
Clear Layout Status
```

Select the desired component in the *Operator Alerts* box. Magazines and feeder numbers for missing components are shown like this:

```
Component loaded in:
T17S7295 /15
T23S6867 /1
```

For components on trays, the magazine position, pallet names and feeder numbers are shown.

View Message Log
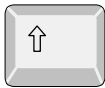
If you want to read messages without leaving the assembling mode, then press the <Shift>+<F10> keys simultaneously, or just the <F10> key, to open the hot menu:

```
_____ Hot Menu _____
Reset Magazine Errors
Package List Editor
Component List Editor
Magazine List Editor
Parameter Editor
Switches
Mount/Glue Switches
Fiducial Mark List Editor
Y Wagon Magazine
Tray Wagon Magazine
Pallet Magazine
Select Unit
View Messages
Set Message Time Mark
HYDRA Tool Utility
```

Select the **View Messages** option.

When ready, press the <Esc> key to close the messages window and return to the assembling window.

4. Magazines – Loading

Components are supplied in tape reels, component sticks, or on trays. These are loaded into various *magazines* that position the component in a pick position directly in the path of the X wagon. This chapter describes how to load the various magazines:

- **Tape magazines**

  – Agilis AM and ALM magazines, page 4-2.

  – TM magazines, page 4-19.

  – TM Flex magazines, page 4-25.

- **Vibratory magazine**, page 4-28.

- **Y-Wagon Magazine**, page 4-29.

- **Tray Wagon Magazine**, page 4-31.

- **TEX Tray Exchanger**, page 4-33.

Tape magazines

There are three different tape magazine families available for MYDATA pick and place machines.

– The *Agilis* type of magazines use removable feeders (see page 4-13), bringing the components to the placement head. It makes loading and reloading of components fast and easy. The removable feeder is an intelligent unit, which can be loaded with a component tape before it is inserted into the magazine. The feeders are easily moved from one feeder position to another, as well as between Agilis magazines.

– The *TM* magazine is a tape magazine with fixed feeders. It is available for tape sizes from 8mm to 56mm.

– The *TM Flex* magazines is a magazine that provides a flexible, non-permanent configuration. It allows the mix of various feeder sizes in a single magazine. The tapes are loaded and unloaded in these magazines in the same manner as the TM magazines.

Agilis Magazines

Two types of Agilis magazines are available. The linear type (ALM) and the non-linear type (AM).
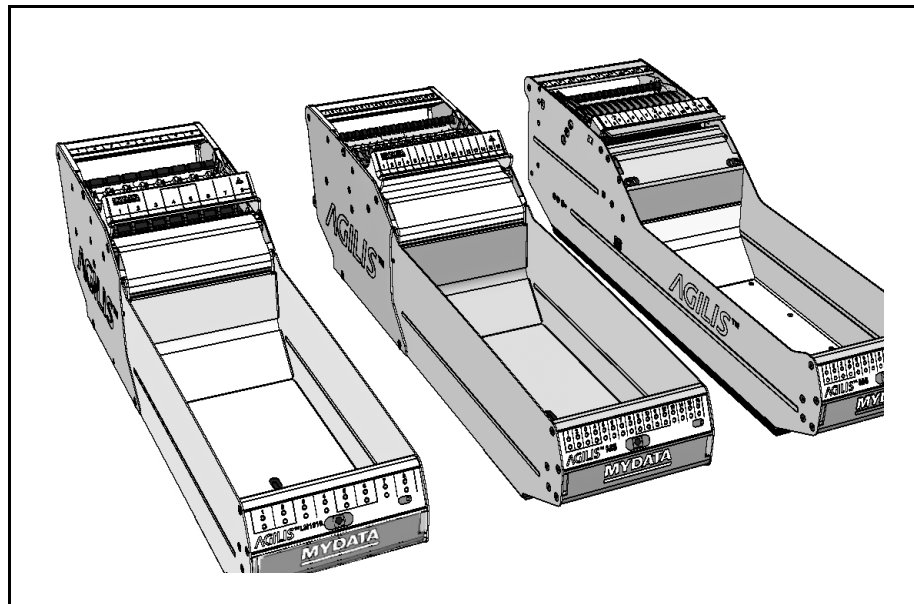
Figure 4-1. Agilis tape magazines

The Agilis Linear Magazine 8 (ALM8) and Agilis M8 (AM8) use the same feeders. They take the same number of tapes and feeders, that is a total of 16 reels and feeders each.

The ALM1216 magazine is for 12 and 16mm wide tape and have eight feeder positions. Feeders for 12 and 16mm tape can be mixed freely within this magazine.

In the ALM magazines, the feeding wheels found in AM8 magazines are replaced by a linear motion mechanism.
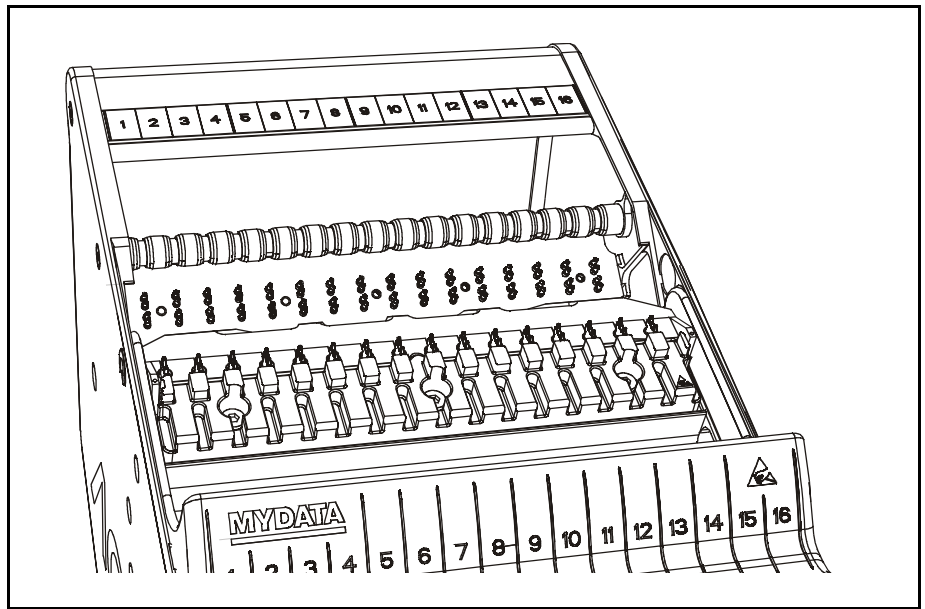
Figure 4-2. Agilis linear magazine – ALM8

Mechanical adjustments of the pick line are not necessary for this type of magazine.

In the following sections, this icon will indicate things that are specific for the ALM type of magazines.

Loading the Magazine

1. Lift the safety clamp.
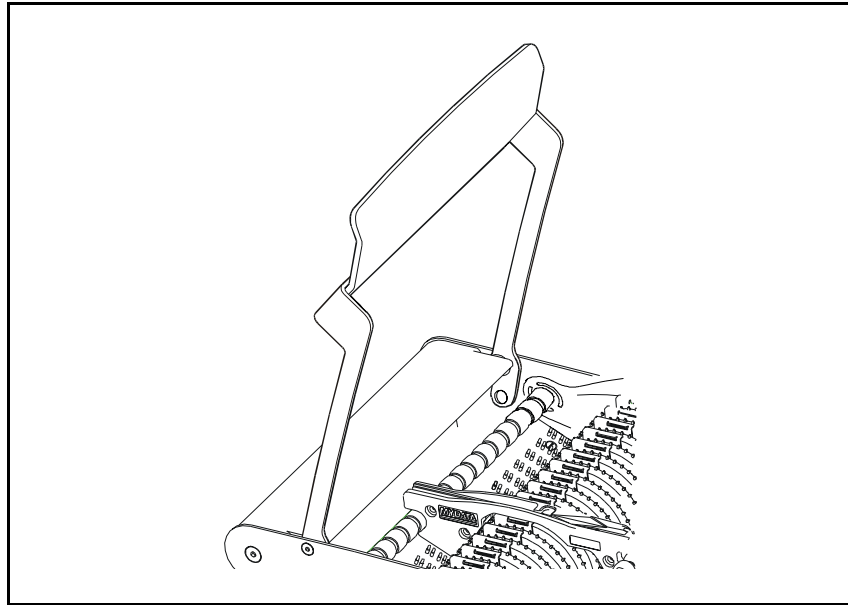
Figure 4-3. Lifting the safety clamp

2. Put the component tape reel and feeder into a bin.

3. Lift the bin into the magazine. On newer bins there is a text. This side must be directed as shown in Figure 4-4.
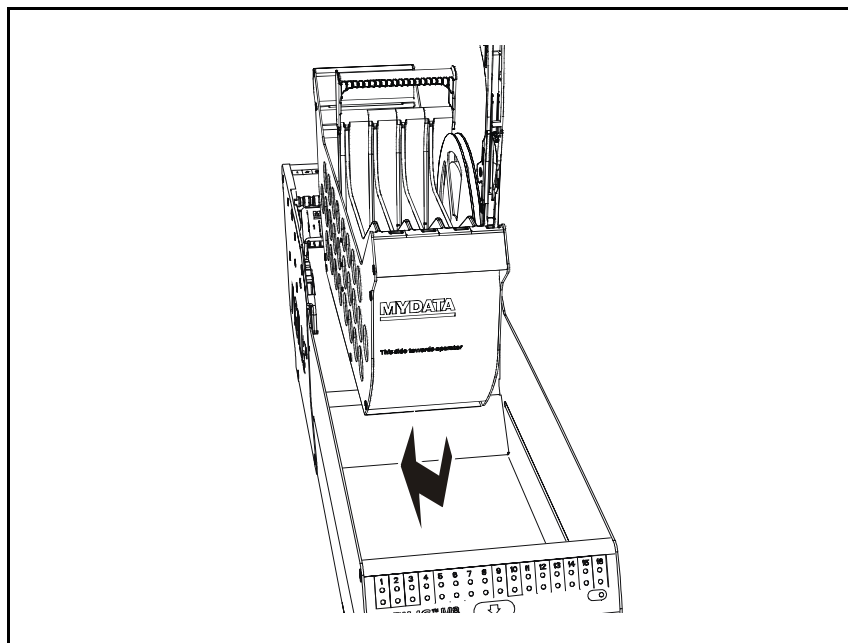
Figure 4-4. Place the bin in the magazine

4. Place the feeder in any empty feeder position.
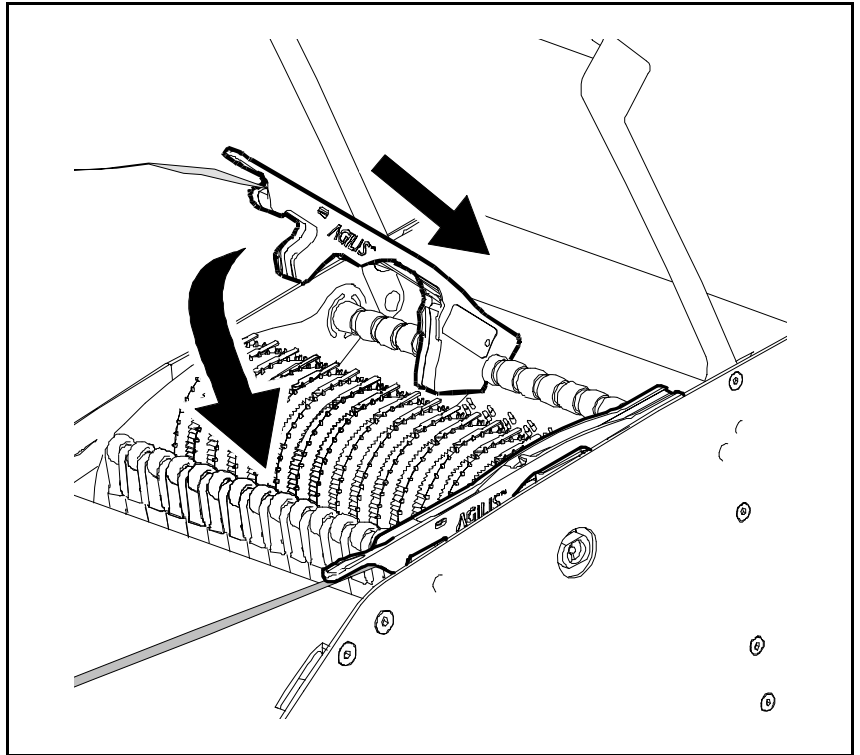
Figure 4-5. Installing feeder into the magazine

5. Push the feeder down until it locks in position (see Figure 4-5).

It is very important that you ensure that the feeder wheel teeth engage the component tape perforations on Agilis AM8. Just before locking the feeder in place, pull on the tape gently forwards and backwards to ensure it has engaged the feeder wheel teeth correctly.

On the ALM-magazines all adjustments will be handled by the machine as there are no feeder wheels.

6. Gently push the safety clamp down.

The purpose of the safety clamp is to prevent you from putting your fingers between the feeder and the mount tool, which could cause serious injuries.

It is very important that:

– All the feeders are locked in position.

– The safety clamp is pushed all the way down.

If not, the mount tool might hit the feeders and cause serious damage to the machine.

Inserting Magazine Into the Machine

To insert the magazine in the machine, do the following:

1. Pull or fold out the waste shelf in front of the magazine.
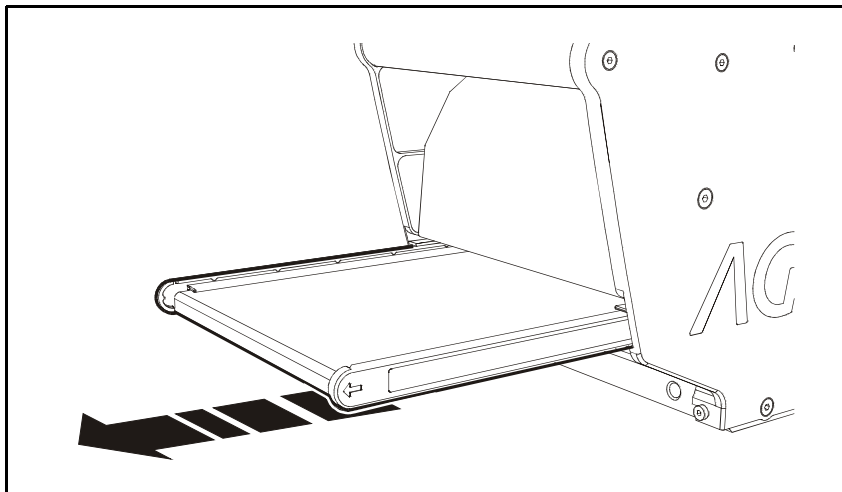
Figure 4-6. Pull out the waste shelf – ALM magazines
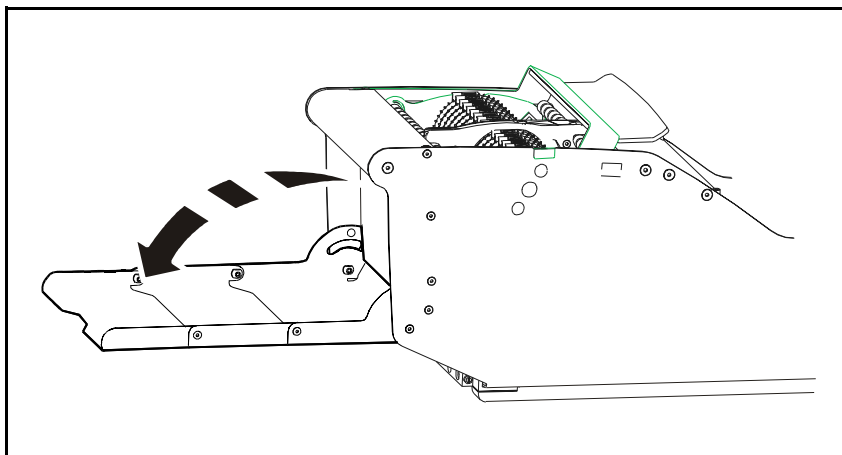
Figure 4-7. Folding out the waste shelf – AM magazines

2. Place the magazine in any of the empty magazine positions and push it gently forward as far as it goes.

3. Make sure the green LED in the bottom right corner (see Figure 4-10) and green LEDs for loaded feeder positions are on.

Removing the Magazine From the Machine

To remove an Agilis magazine do as follows:

1. Press the release button, see Figure 4-8. This tells the machine not to pick components from the magazine.
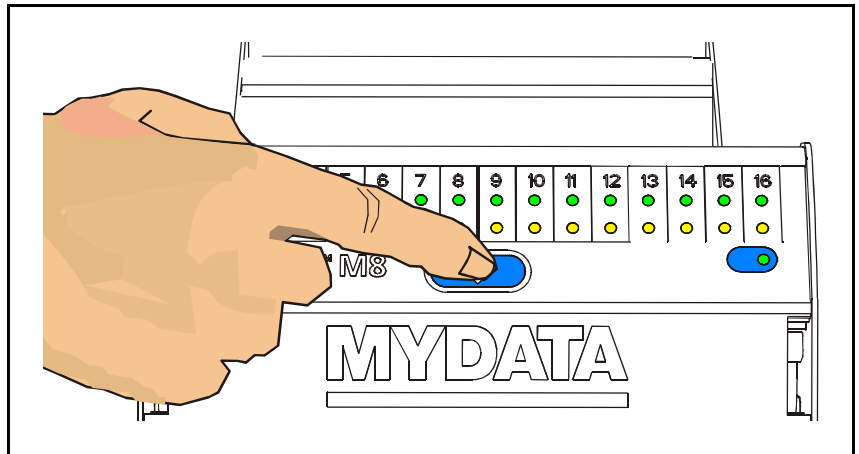
Figure 4-8. Press the release button

2. Wait until the green indication LED in the bottom right corner is off, see Figure 4-9.
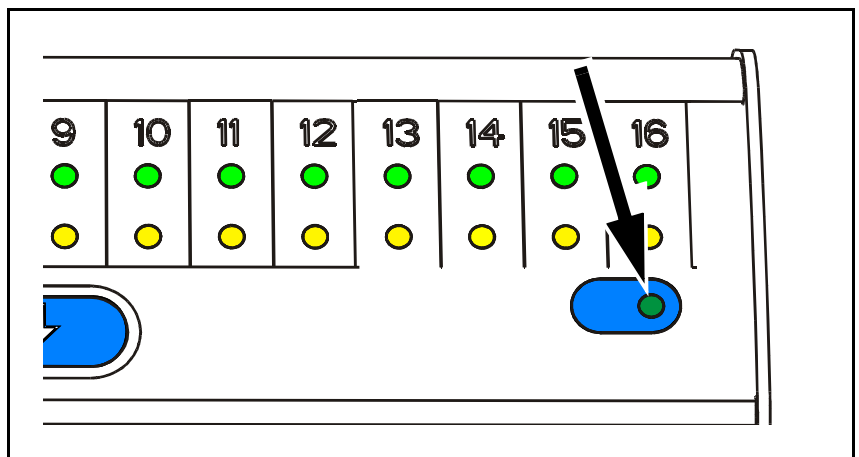
Figure 4-9. Agilis indication LED

3. Pull the magazine out from the machine.

Release Button and Status LEDs

The Agilis magazines have an info panel with green LEDs ('1' in
Figure 4-10) and yellow LEDs (2) showing the status for each feeder.
The panel also has a release button (3) from which you can order the
machine not to pick components from the magazine. Finally there is
a LED indicating the magazine status (4).
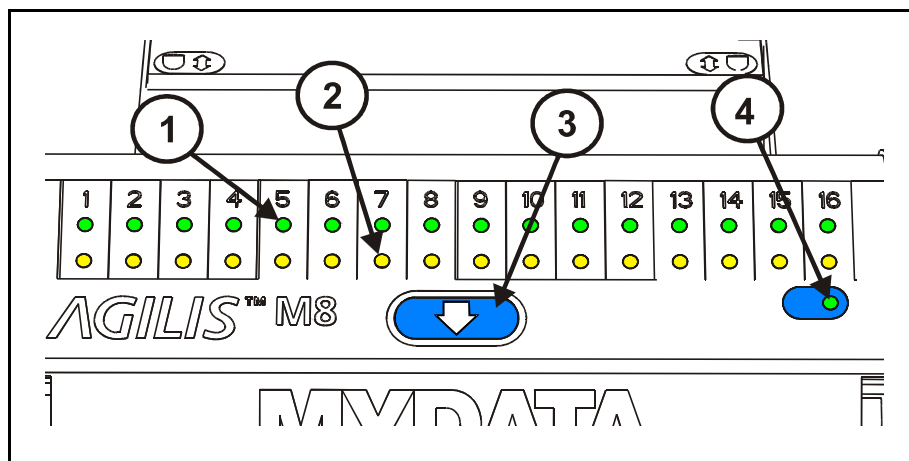
Figure 4-10. Information panel

Green LED (1)

On   A feeder is loaded and can be used by the system.

FlashingThe component reel is running out of components.

Off   No feeder loaded in the position.

Yellow LED (2)

On   A pick failure has occurred.

Off   Normal operation.

Release button (3)

The release button resets magazine errors for the magazine. This is equivalent to removing or inserting the magazine. Pressing the release button tells the machine not to pick components from the magazine.

Indication LED (4)

The green indication LED in the bottom right corner is on when the magazine is inserted into the machine. It starts blinking when the release button is pressed, and is off when the magazine is ready to be pulled out.

Make sure the green LED in the bottom right corner and the green LEDs for loaded feeder positions are on before starting assembly.

Always wait until the green indication LED in the bottom right corner is off before moving the magazine. Removing the magazine from the machine while the green LED is on may damage the placement head.

Loading Removable Feeders

You can load an Agilis feeder with components using one of the following methods:

Method 1:

1. Strip off the cover tape approximately 2 – 3cm from the component tape. Make sure not to drop the exposed components, see Figure 4-11.
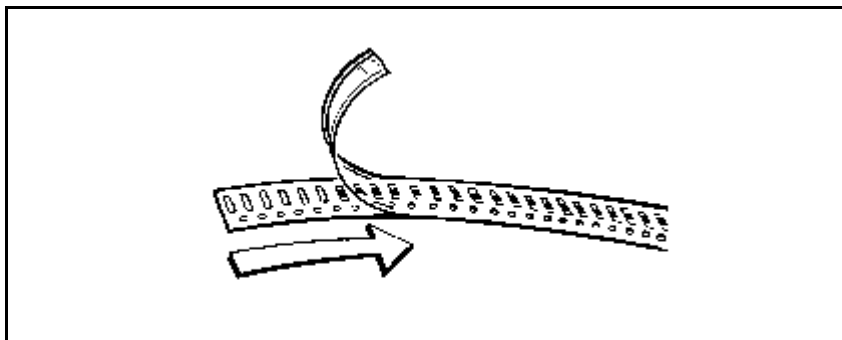
Figure 4-11. Stripping the cover tape

2. Thread the component tape into the feeder. Press the cover tape in position with your finger. The carrier tape is supposed to run below, and the cover tape above, the feeder rail, see Figure 4-12.
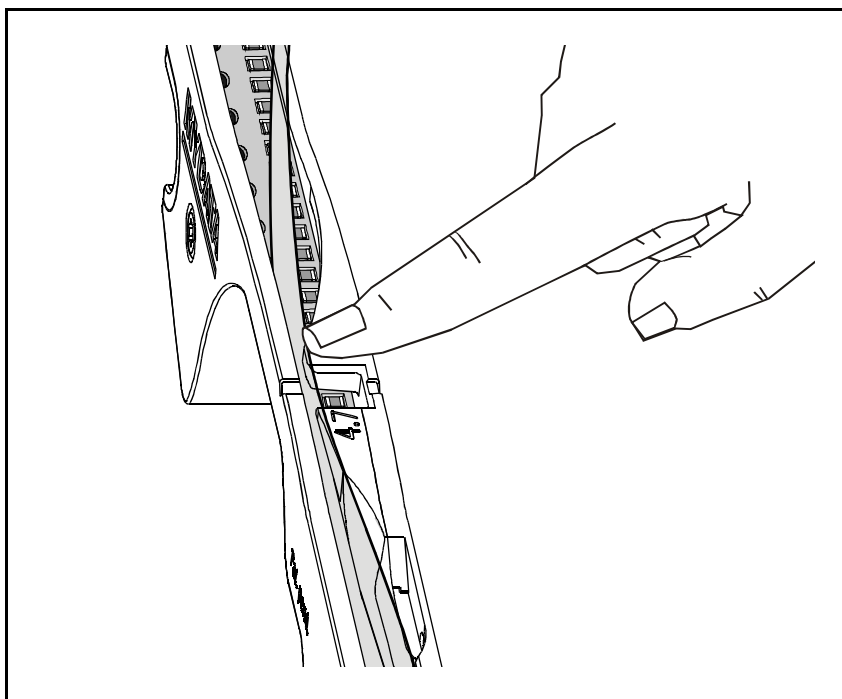
Figure 4-12. Pressing the cover tape into place

Proceed with step 3.

Method 2:

1. Cut the tape straight off with a pair of scissors. Then push the tape into the feeder. Make sure the carrier tape is running below, and the cover tape above, the feeder rail, see Figure 4-13.
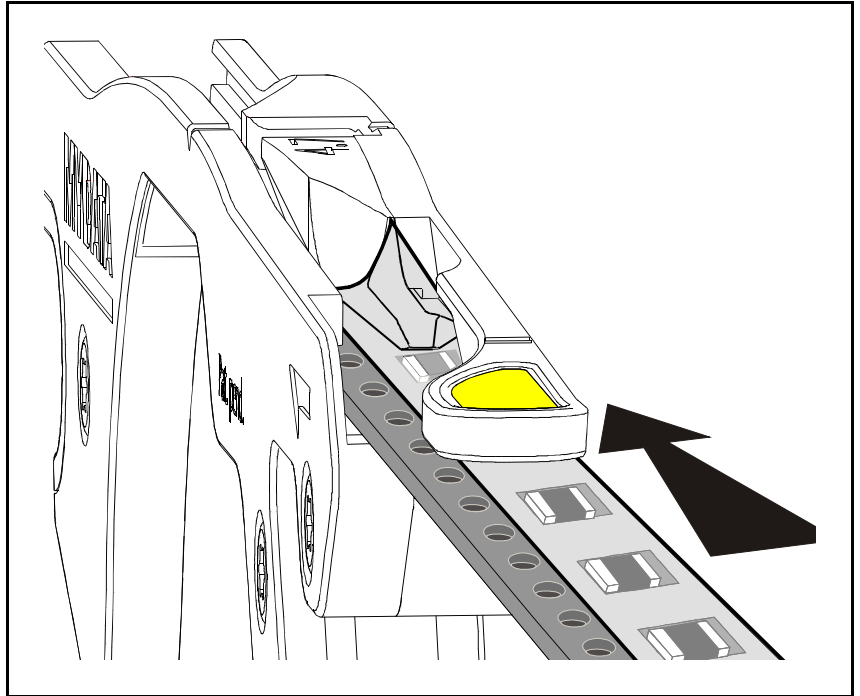
Figure 4-13. Threading tape onto feeder

2. Keep pushing the component tape onto the feeder and the cover tape will open, see Figure 4-14.
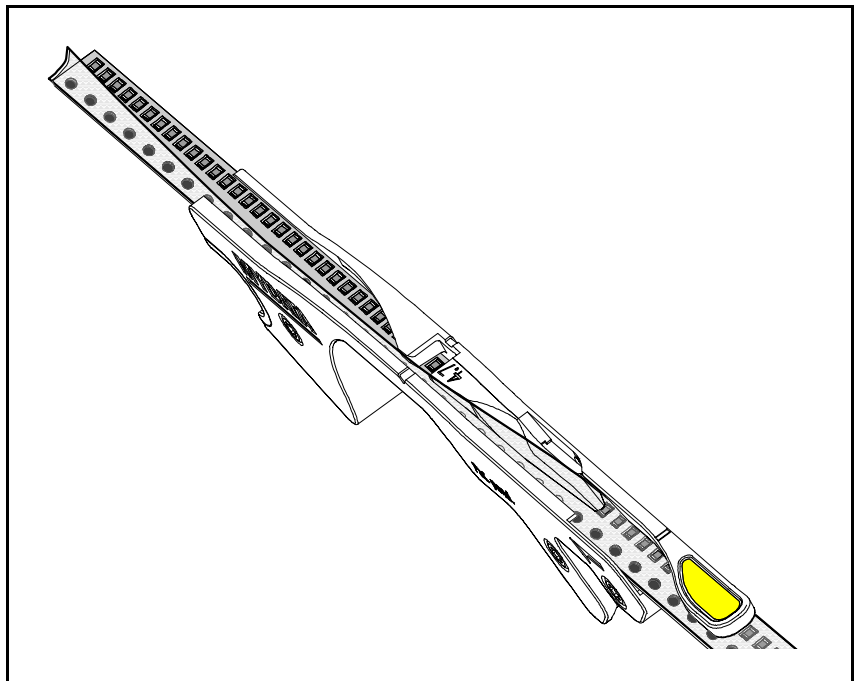
Figure 4-14. Pushing tape onto feeder

Proceed with step 3.

3. Adjust the position so that the las empty pocket is placed between the two marks at the edge of the feeder.
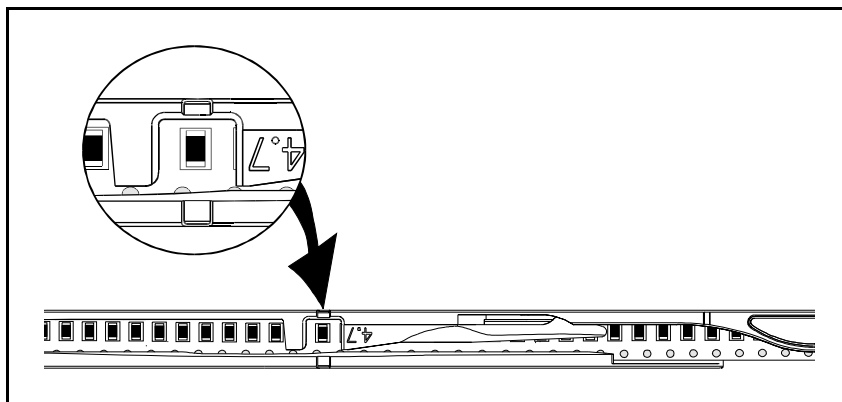
Figure 4-15. Component between marks at edge of feeder

Inserting Tape in Adjustable Feeders

1. Adjust the feeder to its most narrow position. Insert tape as described above.
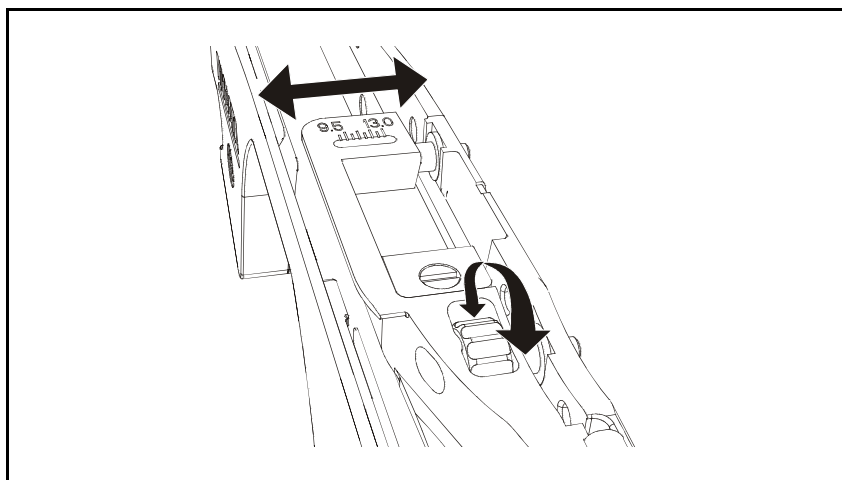
Figure 4-16. Adjustable feeder

2. Use the adjustment wheel to move the feeder rail until the component is fully exposed. The scale shows which width the feeder is set to.

Only for 16mm tape with 4mm component pitch. Move the component cover to its lower position to make sure that only one component is exposed in the pick position.

Choosing Agilis feeder

The Agilis feeder is an intelligent, removable unit in which you load the component tape before inserting it into the magazine. Feeders can easily be moved from one feeder position to another.

The feeder has a barcode and a unique ID number, which is also stored in its electronic part, see Figure 4-17. Hereby TPSys identifies the feeder, which type of component it holds and defines in which feeder position of the magazine it is placed.
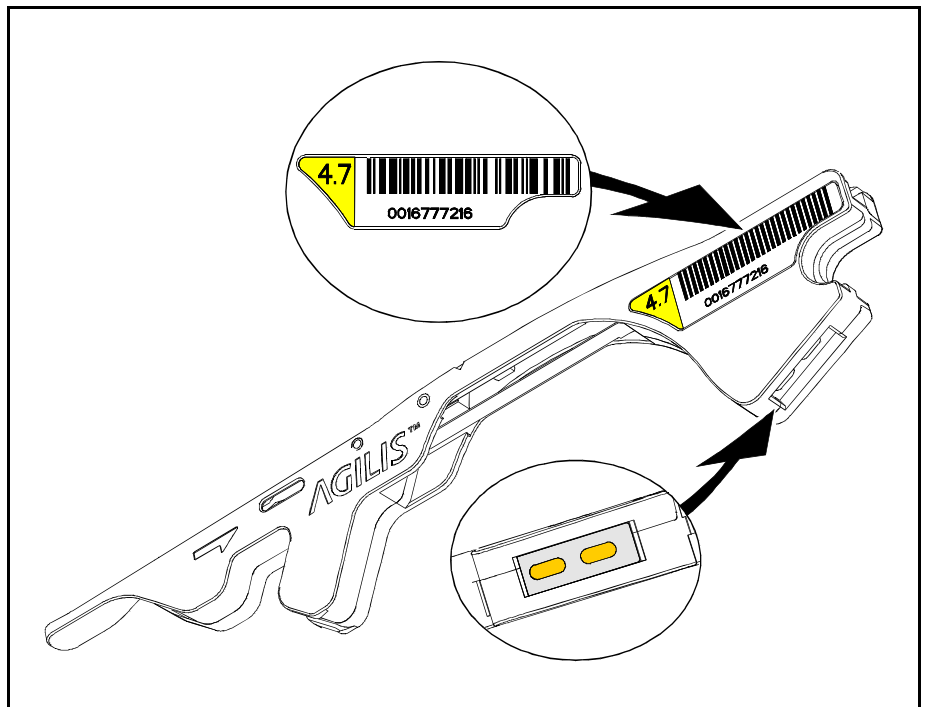
Figure 4-17. Feeder barcode and electronic part

The Agilis feeders are made in different fixed sizes to fit various component tapes. There are also adjustable feeders which can be adjusted to fit all kind of tape variations.

The fixed sizes are categorized based upon how much of the component tape they expose. For example Agilis feeder 4.7 expose 4.7mm of the tape. The adjustable feeders are categorized in the same way by the range they can handle.

There are a number of different Agilis feeders available:

- **3.7**   **Green** – Very narrow rail
- **4.0**   **White** – Narrow rail.
- **4.7**   **Yellow** – Standard rail.
- **5.4**   **Red**   – Wide rail.
- **3.7-5.5 Black** – Adjustable 3.7 to 5.5mm for 8mm tape
- **8.5**   **Yellow** – Standard rail for 12mm tape.
- **12.5**   **Yellow** – Standard rail for 16mm tape.
- **7.5-9.5 Black** – Adjustable rail 7.5mm to 9.5mm for 12mm tape
- **9.5-13 Black** – Adjustable 9.5mm to 13.0mm for 16mm tape

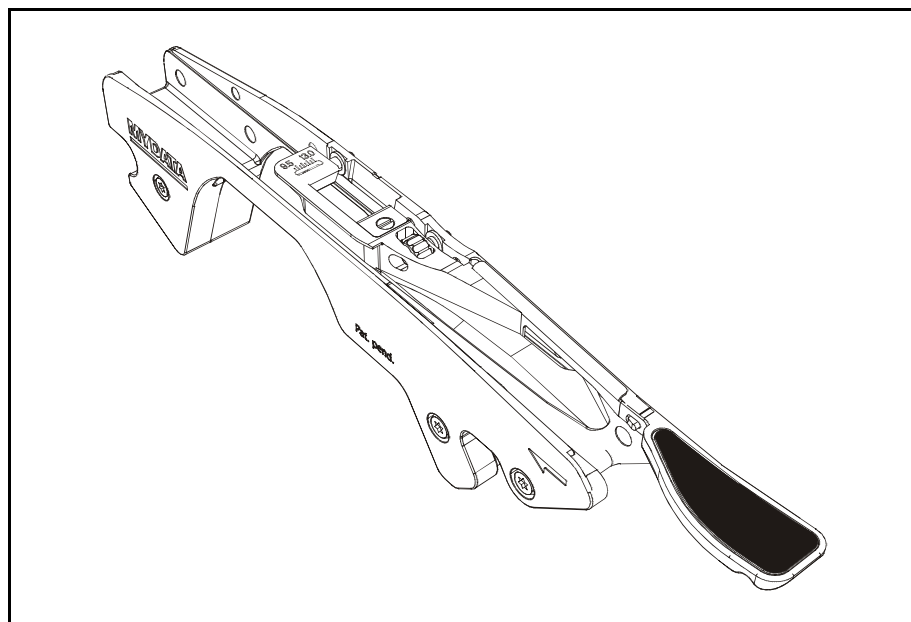An adjustable feeder 9.5-13 is depicted in Figure 4-18

Figure 4-18. Adjustable feeder

The difference is the width of the rail stripping the cover tape from the component tape. The reason for this is that cover tapes vary in width for different component tapes. To make sure the cover tape is efficiently stripped, it is important to choose the right feeder.

The table below shows the recommended feeders for common packages and tape widths.

Tape width	Component package	Agilis feeder 8					Agilis feeder 1216			
		3.7	4.0	4.7	5.4	3.7-5.5	8.5	7.5-9.5	12.5	9.5-13
8mm	0201	■				■				
	0402	■	■			■				
	0603		■			■				
	0805			■		■				
	1206			■		■				
	1210			■		■				
	MELF 2012			■		■				
	MELF 3514				■	■				
	SOT-23			■		■				
	SOT-143			■		■				
12mm	All						■	■		
16mm	All								■	■

You have most likely chosen a suitable Agilis feeder if:

– The component is exposed and can be picked in the pick position.
– One side of the cover tape stays attached to the component tape after the pick position.

Tape Bins

Bins are used in Agilis magazines to hold the tapes. There are two sizes of bins available, one for 7" reels and one for 13" reels.
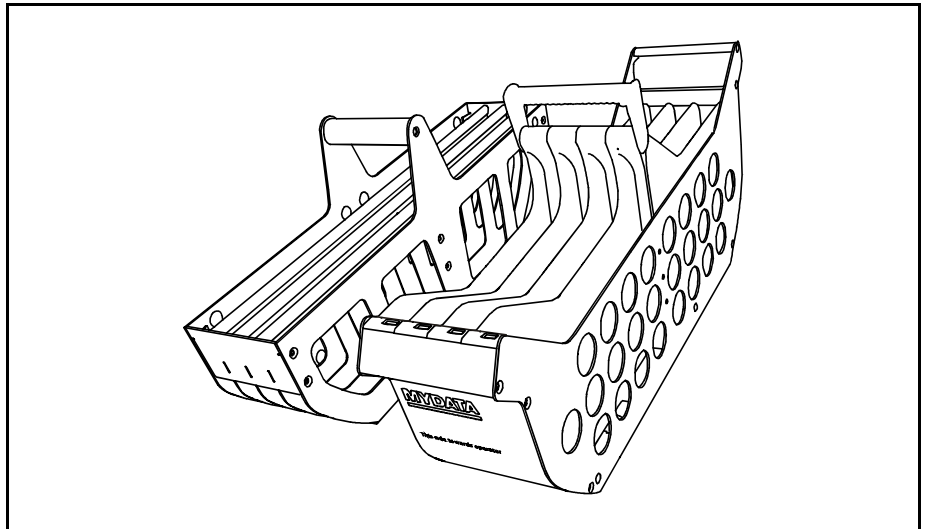
Figure 4-19. Bins for 7" reels

The bin for 7" reels can hold up to 8 reels.
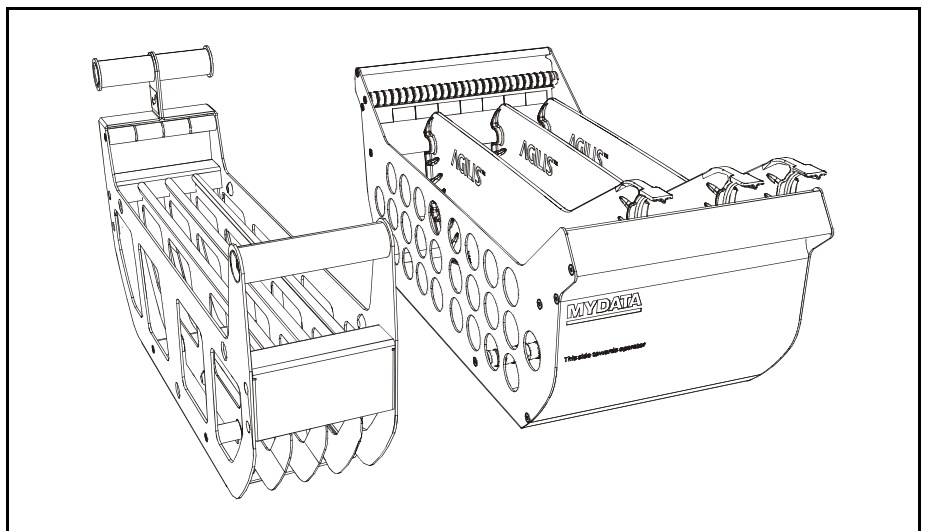
Figure 4-20. Bins for 13" reels

The narrow 13" bin can hold up to four reels. The wider type of 13" bin can hold up to 8 reels.

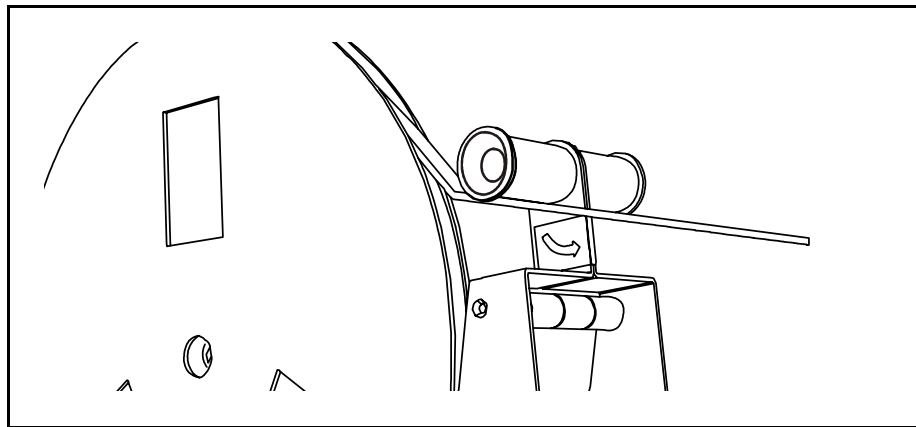On narrow 13" bins, the tape must run under the front handle.

Figure 4-21. Tape under front handle on older bin for 13" reels

Wide 13" bins have the same width as the magazine and movable inner walls. Two or more reels can be placed between each wall.
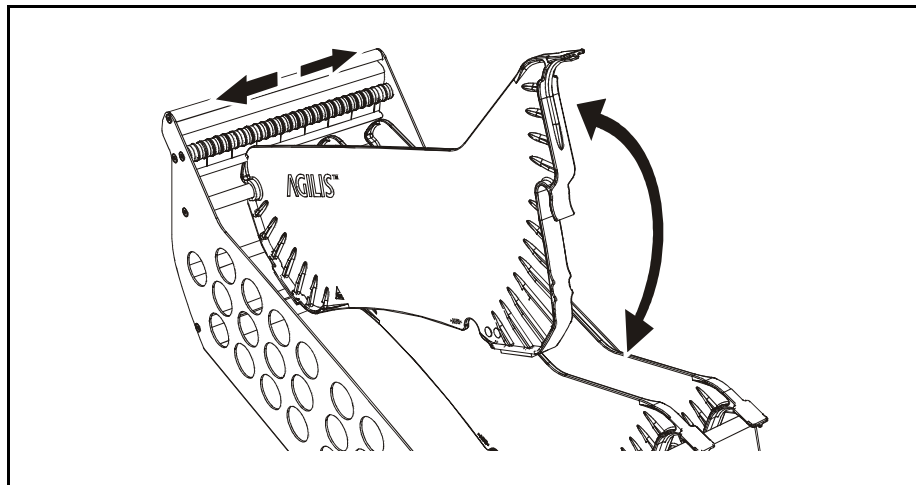
Figure 4-22. Movable inner walls on newer 13" bin

The later generation of bins have slots where feeders can be parked when not in use.
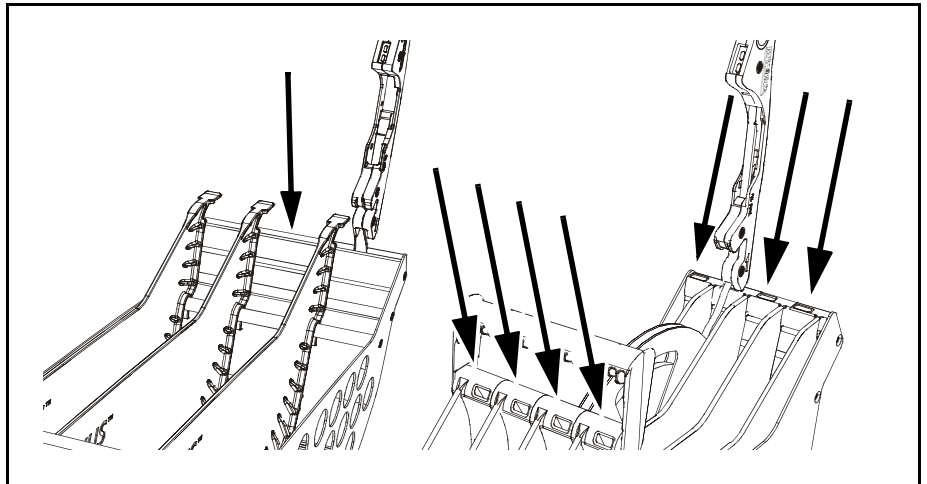
Figure 4-23. Parking removable feeders when not in use

Tape Seal – Re-Sealing Tape
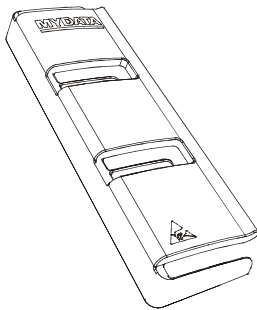
A plastic tape seal is available for re-sealing tape. This will make make handling of tape removed from feeders more secure.
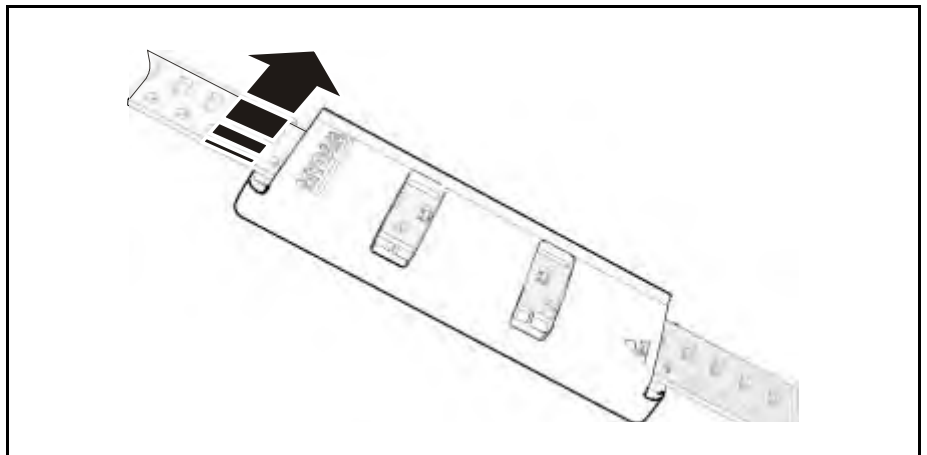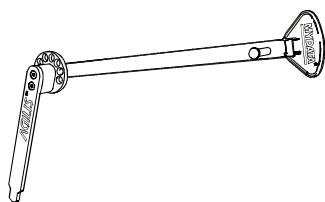

Figure 4-24. Tape seal

Slip the seal onto the tape. Be sure to attach it between pockets and from the left side. The tape seal should now protect the components left in pockets.

Large Reel Attachment

The Large Reel Attachment, LRA, is used as a complement to the bins. It can handle big and/or very heavy reels.

The LRA can be attached in four different positions on the magazine and the arm can be adjusted to a suitable angle.
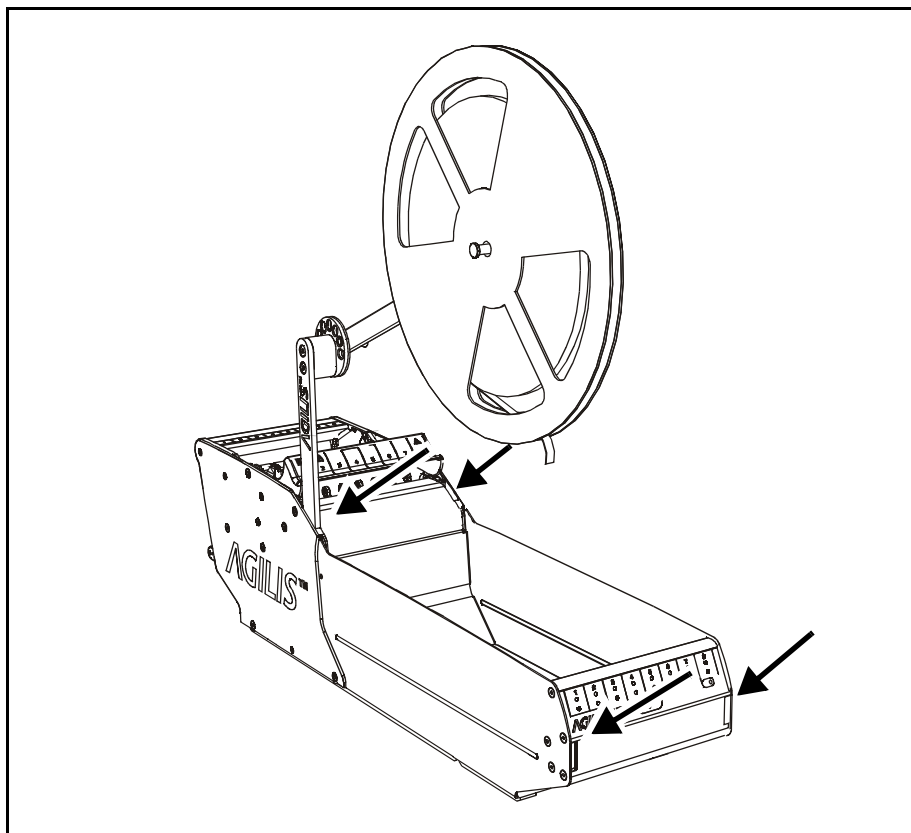

Figure 4-25. LRA attachment points

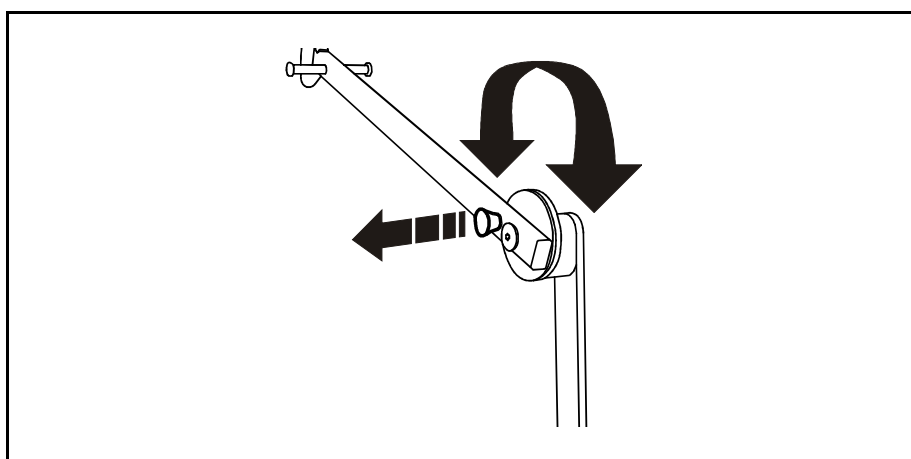Pull out the black knob to set the desired angle of the arm.

Figure 4-26. Adjusting the Large reel attachment

TM Magazines

This section contains information about handling TM magazines.

The TM magazine is a tape magazine with fixed feeders.

We will cover the following:

- Release button and status LEDs.

- Loading magazines.

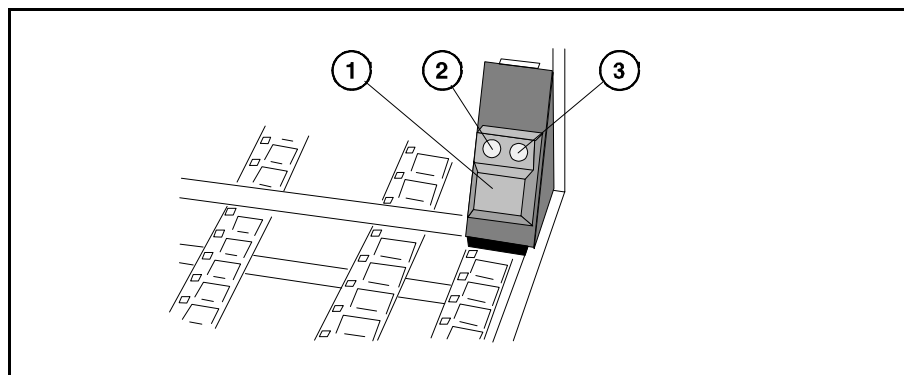# Release Button and Status LEDs

Figure 4-27. Release button and status LEDs

TM magazines must be equipped with a release button ('1' in Figure 4-27) which has a green LED (2) and a yellow LED (3).

Release button (1)

Press this button and **wait until the green LED is off** before removing the magazine from the machine.

This button resets magazine errors for the magazine, equivalent to removing or inserting the magazine.

Green LED (2)

Steady light: The magazine is recognized by the system and will be used.

Flashing: The release button has been pressed.

Off: The system does not use the magazine.

Yellow LED (3)

Steady light: At least one feeder is empty or a pick error has occurred.

Off: In operation.

Loading TM Magazine

To load a tape magazine, make sure the green LED is off (see page 4-20) and then remove it from the machine. Load the magazine as follows:
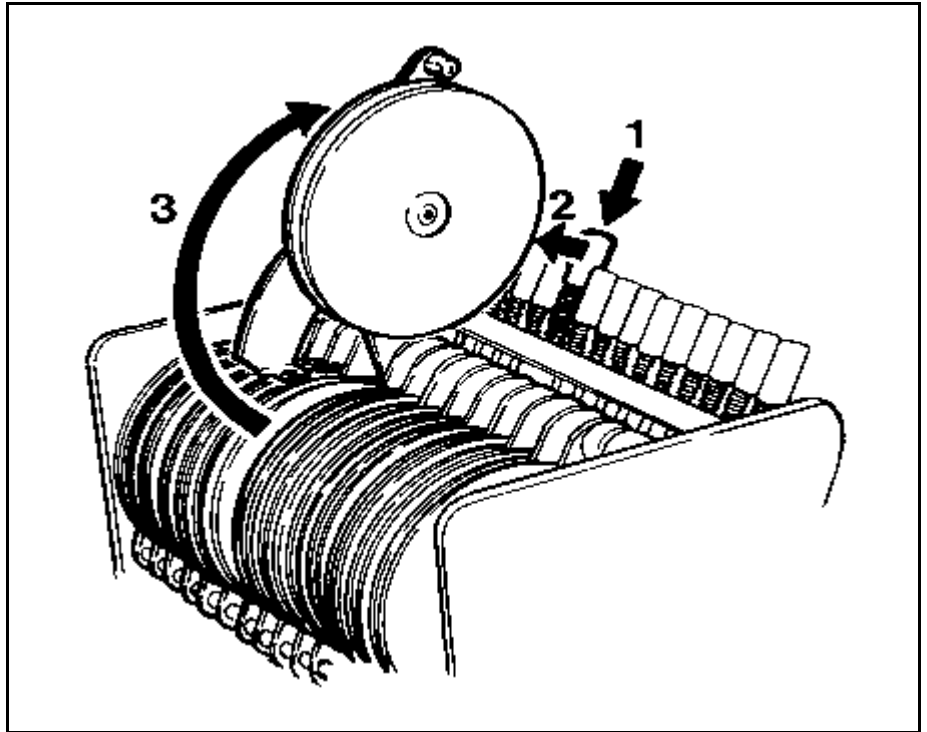

Figure 4-28. Lifting up the cover tape take up reel

1. Press down the lock button for the feeder to be loaded.

2. Pull the button forward while holding it down. When the button is released the locking mechanism will be released, allowing the button to come up as shown in Figure 4-28.

3. Lift up the cover tape take up reel. If this is not empty remove it from the magazine by pulling it off the hub and empty it.
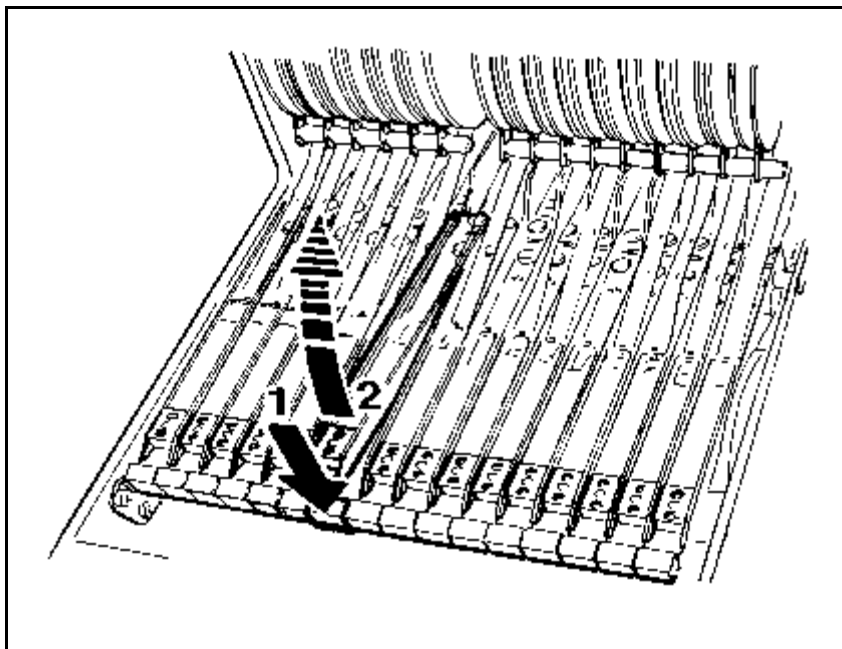
Figure 4-29. Lifting up the pick-up rail

4. Press the pick-up rail toggle ('1' in Figure 4-29).

5. Lift up the pick-up rail (2).

6. Strip off the cover tape 10cm approximately from the new component tape (Figure 4-30) without dropping the uncovered components into the magazine.
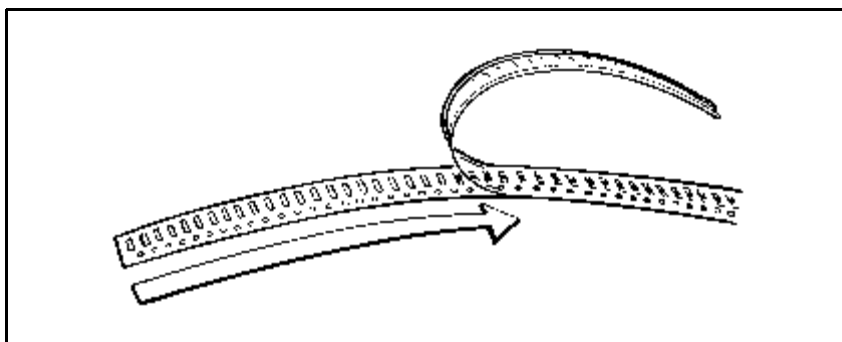

Figure 4-30. Stripping the cover tape

Figure 4-31. Positioning the tape in the feeder
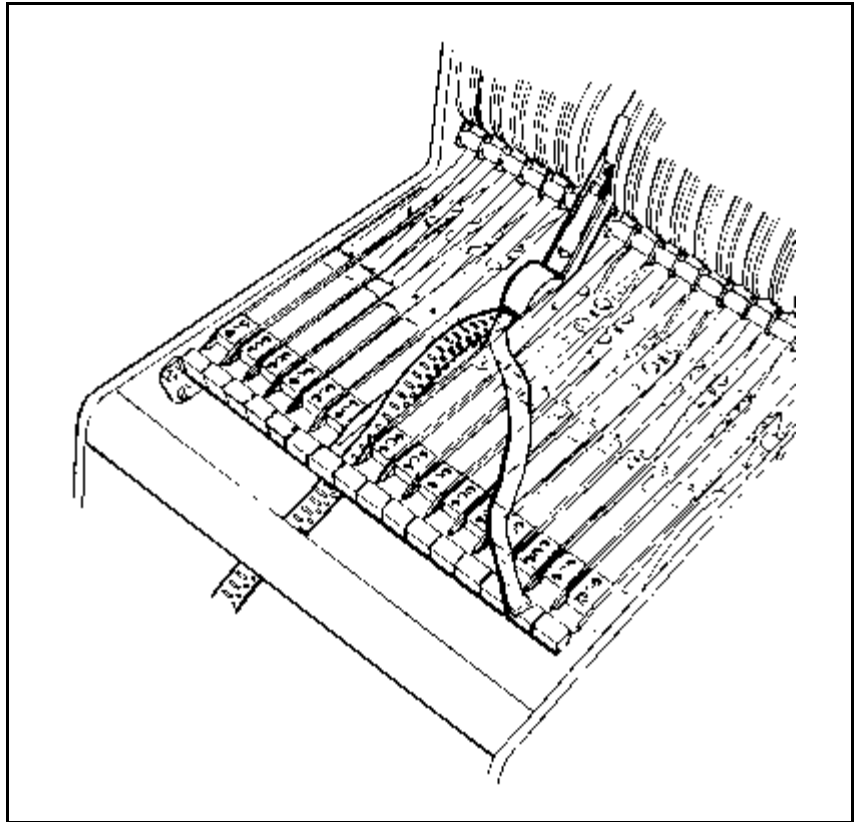
7. Load the component reel into the magazine and pull the tape (together with the cover tape) to the feeder rail (Figure 4-31).

Pull the tape down so that the feeder wheel teeth engage the tape perforations.

8. Thread the cover tape through the opening and under the spring of the feeder rail ('1' in Figure 4-32).

9. Push down the feeder rail until locked (2).
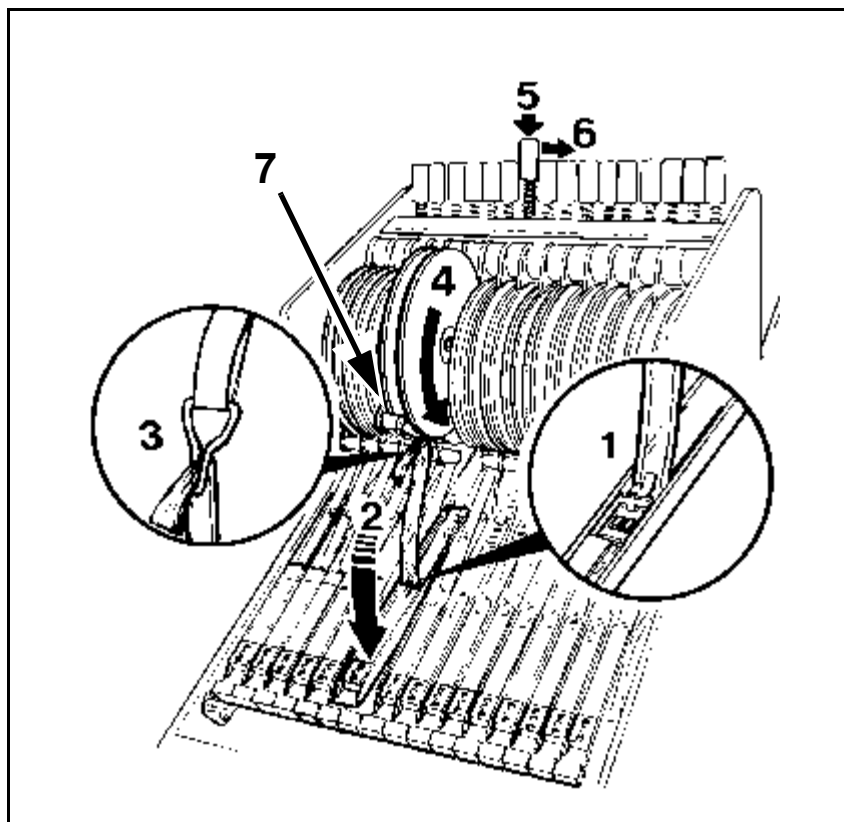
Figure 4-32. Excess of cover tape onto the reel

10. Fix the cover tape to the clip (3).

11. Roll up excess cover tape and pull the take up reel down (4). Ensure that the cover tape is pulled *under* the brass dowel (7). This to avoid that the cover tape is torn off or tape fed every time the take up reel moves.

12. Press the lock button (5).

13. Pull the button back into its locked position (5). When the button is released it will stay down.

To calibrate the component pick position after loading, see the section Manually Calibrating Pick Positions in chapter 5.

Flexible Tape Magazines

The TM FLEX magazine is a flexible tape magazine that allows mixing feeder units for 8, 12, 16, 24, 32, 44, 56 and 72 mm tape widths in the same magazine. The maximum number of feeder units that can be fitted depends on the module size of each feeder unit. There is room for up to 13 feeders in each magazine.

Single, dual, and quad feeder mechanisms are available. There is also an adjustable feeder that can take a tape up to 136mm wide.

The TM FLEX is loaded in the same way as standard tape magazines.

The TM FLEX magazines are equipped with release buttons and status LEDs like the standard tape magazines, see page 4-20.

This section describes only how to mount the TM FLEX feeder mechanisms because the other handling is similar to the standard tape magazines.

Mounting Feeder Mechanism
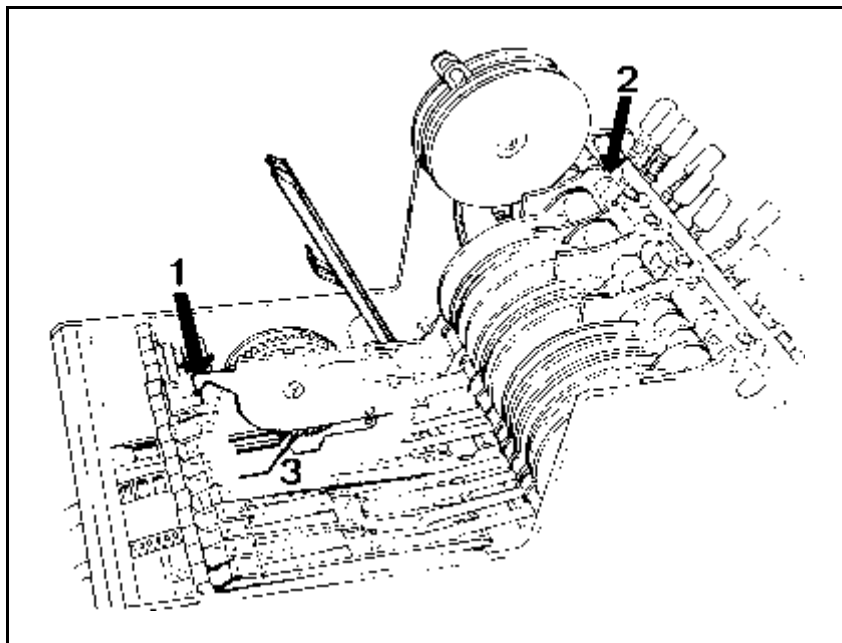
Figure 4-33. Inserting the feeder mechanism

1. Hold the cover tape take up reel and the pick-up rail and position
the feeder in the magazine. First, position the lower bracket to
the axle groove ('1' in Figure 4-33) and then the upper bracket (2).

If you mount a multi-feeder, make sure that the separation sheet
(or sheets if more than two feeders) enters between the feed
bushings (3).

Figure 4-34. Lower bracket   *Figure 4-35. Upper bracket*
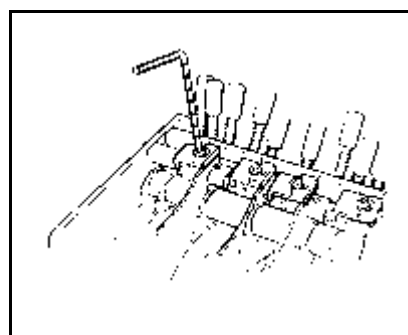
2. Fasten the lower bracket (Figure 4-34) and then the upper
bracket (Figure 4-35). Some feedertypes may lack the lower
bracket, for instance the 56 mm type. In these cases you only
fasten the upper bracket.

Do not fasten the brackets in the reverse order.

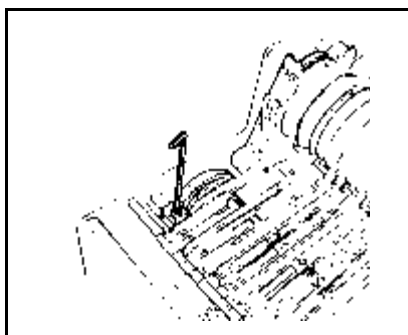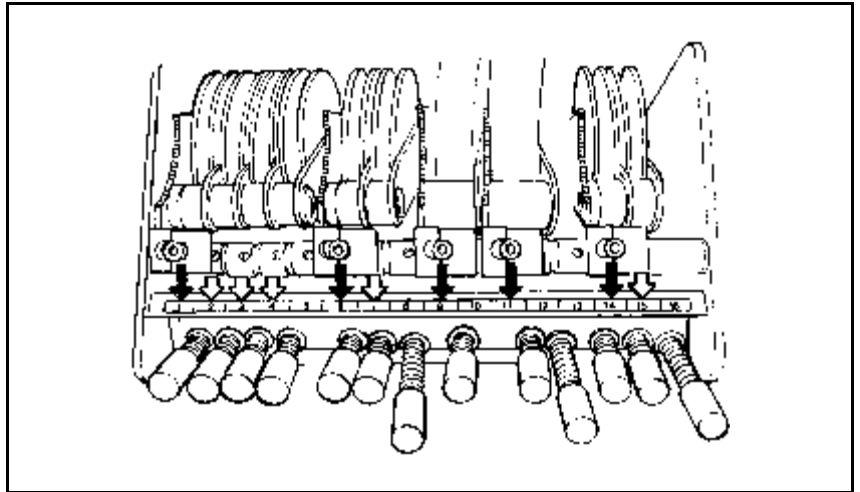*Figure 4-36. First feeder number at the screw*

3. Update the Magazine List according to the *Tape and Vibratory Magazine List* section in Chapter 6 of the *Programming Manual*.

4. The feeder number is read at the center of the upper screw (Figure 4-36). This applies to the first feeder number of a multi-feeder mechanism.

Adjustable Flex Feeder

The Adjustable flex feeder is used with the TMD Flex magazine. It can be used with tape widths of 32mm up till 136mm.

Raise the cover tape arm when inserting the feeder, see figure 4-37. Adjust the width by sliding the free side on the shafts. The feeder is fastened with two M3 screws on the top.
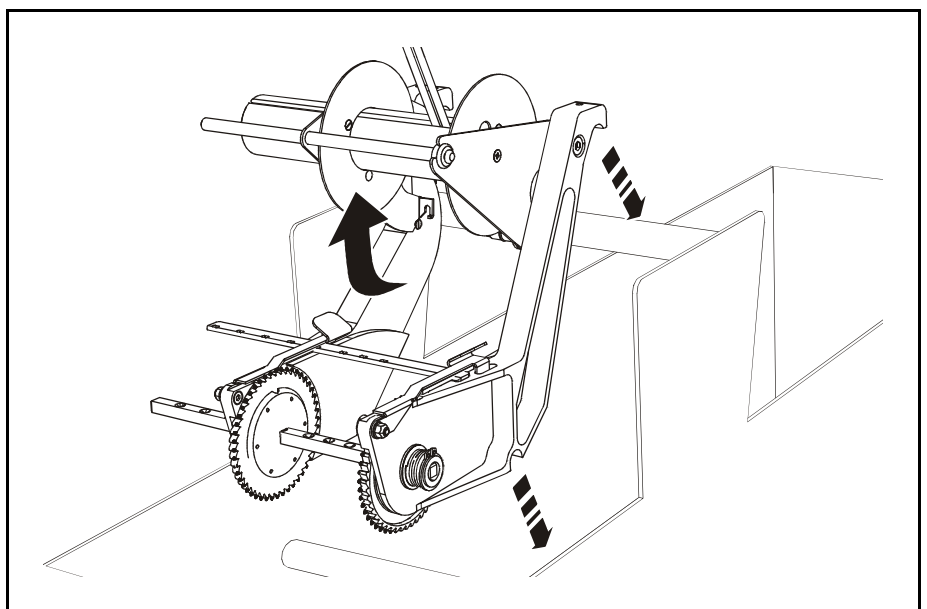
Figure 4-37. Adjustable flex feeder

Vibratory Magazines

A vibratory magazine is loaded by replacing the plastic tubes.

Change to a different package type as follows:

1. Mount the tube fork intended for the package.

2. Insert the component tube and push the first component to stop.
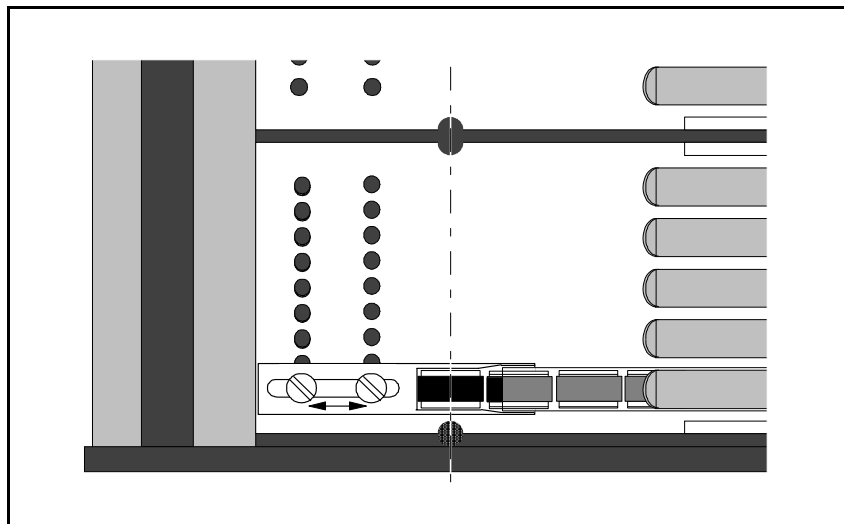
Figure 4-38. Vibratory magazine tube fork

3. Ensure that the component is located in correct pick position. The center of the pick position is marked with a notch in the tube fork and recesses in the bottom plate (Figure 4-38).

4. Adjust the tube fork position if the component is not in correct pick position.

The pick position must be calibrated if the tube fork is changed or moved. This is described in chapter 5, the section Manually Calibrating Pick Positions.

Y-Wagon Magazine

Y-Wagon Magazine means that trays are placed on top of the assembly table.

This section describes how to install the Y-Wagon Magazine and how to renew empty trays.

Magazine Installation

No additional equipment is required to install the Y-Wagon Magazine, only that the option is active. Use the *About...* menu for information on active options (see *Appendix A – Menu Reference Guide*). TPSys version 2.3 comprises all software required.

Install the Y-Wagon Magazine as follows:

1. Make sure the component is included in the Component List and the Package List.

2. Place the tray on the Y wagon.

   The tray must be placed on a support, which should have a height of 20 – 30mm. MYDATA tray supports are recommended. The tray must be fixed horizontally. Vertically, the tray weight is enough.
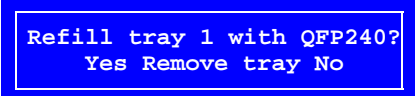
3. Define the tray in the Tray Type List.

   The Tray Type List is detailed in Chapter 6 of the *Programming Manual*.

4. Select the defined tray in the Y-Wagon Magazine List, complete the remaining information and position the tray with the camera.

   The Y-Wagon Magazine List is described in Chapter 6 of the *Programming Manual*.

Renewing Empty Tray

To call your attention that a tray needs to be reloaded, the following dialog box is shown after the tray is out of components, provided the *Auto refill* field in the Y-Wagon Magazine List is set to *Yes* for the tray:

```
┌─────────────────────────────────┐
│   Refill tray 1 with QFP240?    │
│        Yes Remove tray No       │
└─────────────────────────────────┘
```

1. Renew the empty tray without changing the position.

2. Update the component quantity by selecting the appropriate option in the dialog box:

'*' in the Trays list.　　　– *Yes*
Updates the component quantity to the value set in the Y-Wagon Magazine List.

' ' in the Trays list.　　　– *Remove tray*
Does not update the quantity, but marks the tray as non-present in the Y-Wagon Magazine List. This option is used if you do not intend to mount further of this component from this tray.

'–' in the Trays list.　　　– *No*
Does not update the component quantity. The tray is kept present in the Y-Wagon Magazine List but marked as not available for picking.

3. If the new tray has been moved more than a couple of millimeters from the position of the previous tray, then you have to reposition the tray, see the Y-Wagon Magazine List.

The Y-Wagon Magazine List is described in Chapter 6 of the *Programming Manual*.

Tray Wagon Magazine
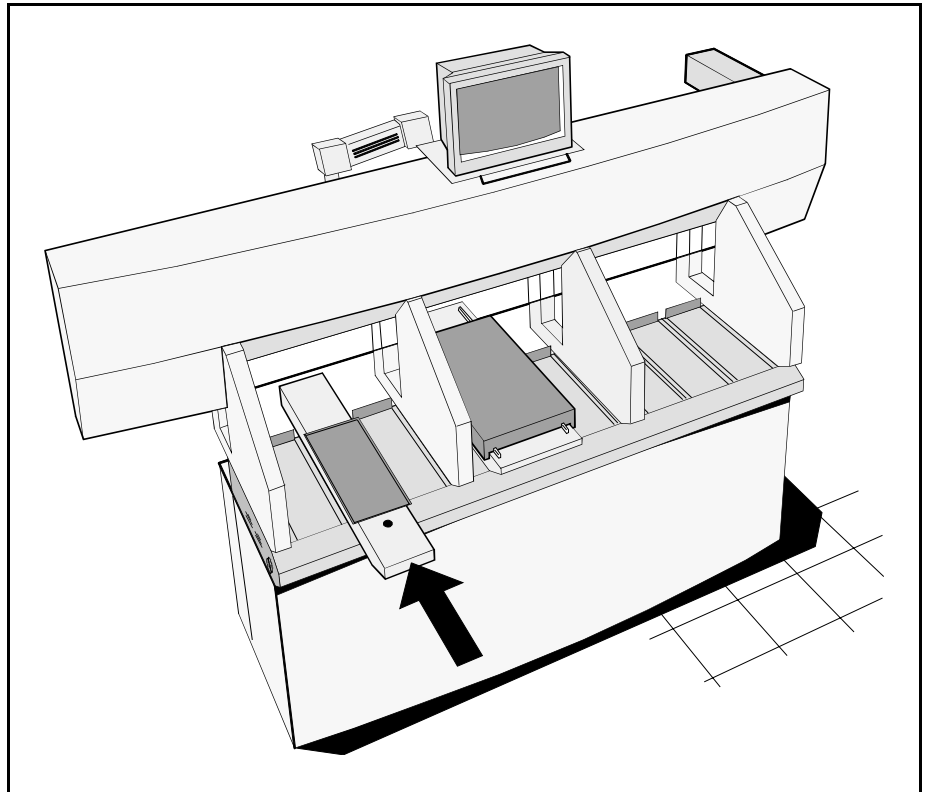
Figure 4-39. Tray Wagon Magazine

The Tray Wagon Magazine is inserted in a magazine position of the machine.

The Tray Wagon Magazine can be used on all the MYDATA placement machines. Figure 4-39 shows the Tray Wagon Magazine in a TP9-UFP machine.

The Tray Wagon Magazine has a Y movement of its own.
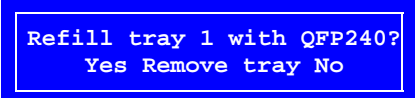
Restart any off-line terminal. The installation extends some of the TPSys menu options. Any off-line terminal that has been active during the installation must be restarted to make the installation take effect in the off-line menu system.

Lock the trays in position on the tray wagon using magnetic strips. Ensure that the strips are not higher than the tray, or they may interfere with operation of the X wagon.

This section describes how to renew empty trays.

Renewing Empty Tray

To call your attention that a tray needs to be reloaded, the following dialog box is shown after the tray is out of components, provided the *Auto refill* field in the Tray Wagon Magazine List is set to *Yes* for the tray:

```
┌─────────────────────────────────┐
│                                 │
│   Refill tray 1 with QFP240?    │
│       Yes Remove tray No        │
│                                 │
└─────────────────────────────────┘
```

1. Renew the empty tray without changing the position.

2. Update the component quantity by selecting the appropriate option in the dialog box:

'*' in the Trays list.
   – *Yes*
Updates the component quantity to the value set in the Tray Wagon Magazine List.

' ' in the Trays list.
   – *Remove tray*
Does not update the quantity, but marks the tray as non-present in the Tray Wagon Magazine List. This option is used if you are not intended to mount further of this component.

'–' in the Trays list.
   – *No*
Does not update the component quantity. The tray is kept present in the Tray Wagon Magazine List but marked as not available for picking.

3. If the new tray has been moved a couple of millimeters or more from the previous tray position, then you have to update the tray position in the Tray Wagon Magazine List.

The Tray Wagon Magazine List is described in Chapter 6 of the *Programming Manual*.

TEX Tray Exchanger
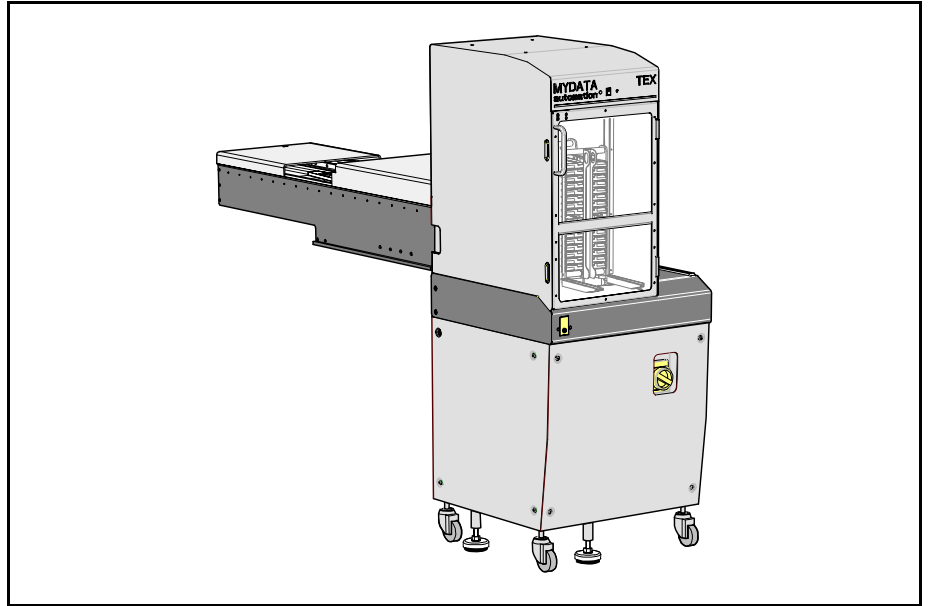
Figure 4-40. TEX Tray Exchanger

The TEX Tray Exchanger handles a large variety of tray components. Up to 32 JEDEC trays can be loaded, in two parallel and separately controlled tray tracks.

For handling larger trays a cassette with double width is available.

As a cassette is placed in the TEX unit and TEX is activated, a barcode reader automatically scans the contents in the cassette.

This section describes first the TEX Tray Exchanger in general and then how to start up and load trays. A typical work flow, the TEX List, pallet management, and troubleshooting are also included in this section.

Instructions on how to reinstall, remove, move TEX to another machine, and maintain the TEX unit are found in the *TEX Tray Exchanger, Service Manual*, MYDATA part # P-024-0162-EN.

Main Parts
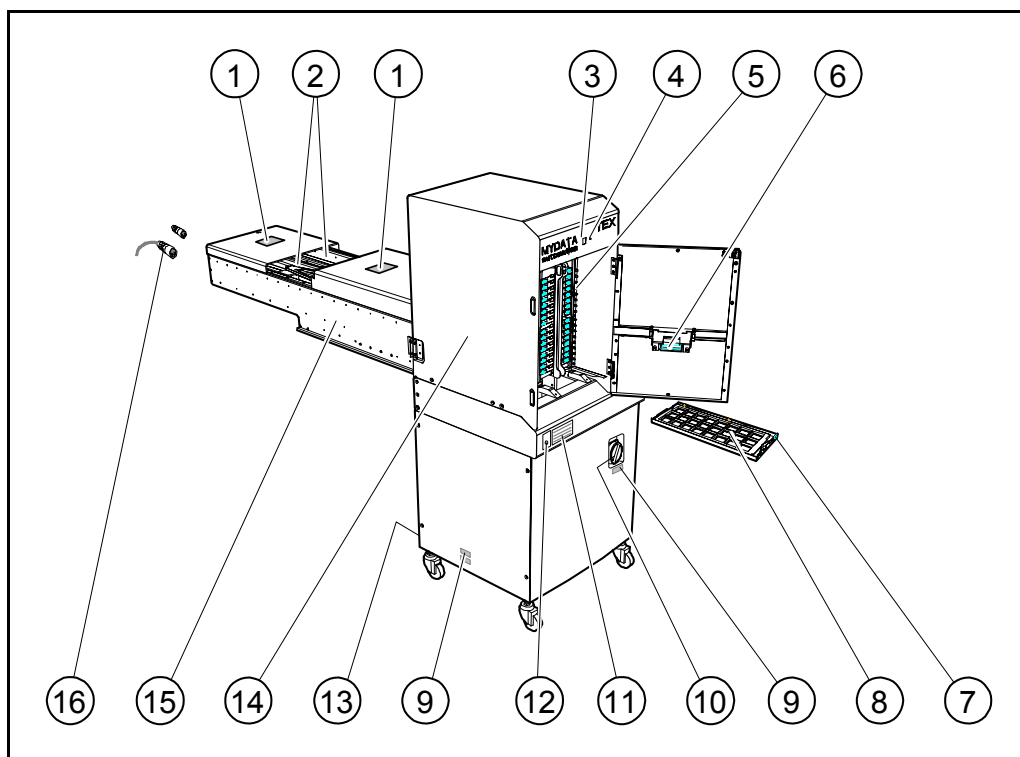
Figure 4-41. TEX components

Key

1. Rear and front safety hoods with warning signs.
2. Tray tracks.
3. Release button.
4. Power indicator.
5. Pallet LEDs.
6. Barcode reader.
7. Pallet.
8. Component matrix tray.
9. Warning signs.
10. Mains power switch.
11. Laser certification sign.
12. Ground jack for wrist strap.
13. Mains power inlet.
14. Mother unit.
15. Shuttle unit.
16. Emergency stop cable and termination plug.

Warning Signs

The warning signs are located as shown in Figure 4-41.

(1)
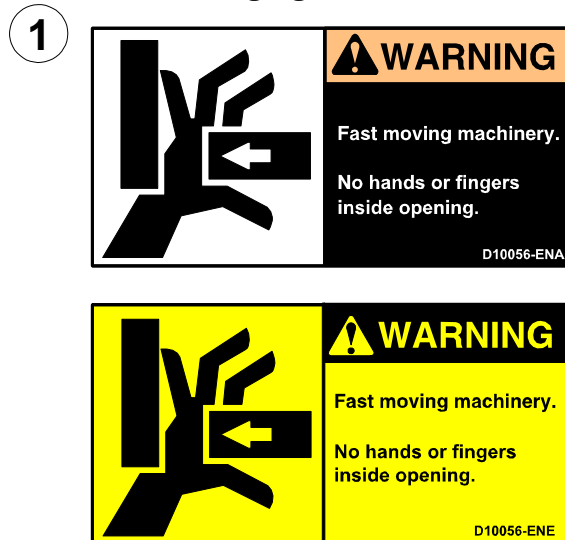
Sign 1 (D-010-0056-ENA/ENE America/Europe) warns of the fast shuttle movement. No hands, fingers, or other objects are allowed beyond the shield.

Two warning signs are applied on the safety hoods as shown in Figure 4-41.

(9)

Sign 9 (K-049-0073) warns of electrical circuits behind the panels still being alive, even after the mains power switch ('10' in Figure 4-41) is turned off.

Two warning signs are applied as shown in Figure 4-41.

If a warning sign is missing, it must be replaced immediately. Part numbers are printed on the signs, but can also be read from this description.

(11)

CLASS 1 LASER PRODUCT IEC 825-1
CLASS I LASER PRODUCT 21 CFR 1040.10

MYDATA automation AB certifies that this product complies with 21 CFR 1040.10
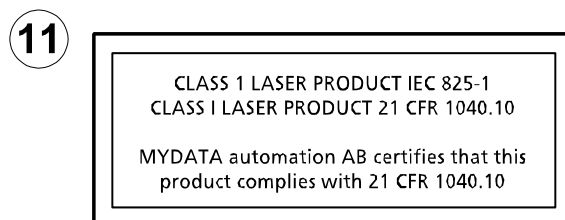
Sign 11 (D-024-0345) states the laser classification for TEX units equipped with laser barcode reader. One certification sign is applied as shown in Figure 4-41.

Emergency Stop

There are safety switches at the two hoods and at the door. When a switch is activated all movements in TEX are stopped immediately. The placement machine is not affected by these switches.

When an emergency stop button on the placement machine is pressed down, the TEX is also stopped.

TEX can thus be stopped in four different ways:

– The door is opened.

– The front cover is opened.

– The rear cover is opened.

– An emergency stop button on the placement machine is pressed down.

Release Button and Indication LEDs
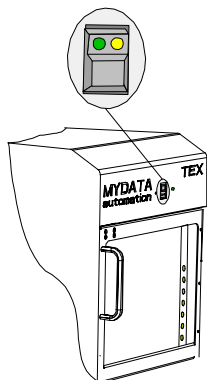
The release button with the status LEDs is shown in the figure.

Release button

Pressing the release button when the green LED is off and the door closed will make the TEX initiate and start a pallet barcode scan. The TEX is now active and reports present pallets to the system, and turns on the green LED.

Pressing the button when the green LED, or both the green and yellow LEDs are on will move the cassettes to their home positions, turn the LEDs off, deactivate the TEX, and allow opening the TEX door.

☞ *Do not open the door until the LEDs are off and any cassette movement has stopped.*

Green LED

On   TEX is active and can be used by the system.

FlashingTEX is initiating.

Off   TEX is not active, the door can be opened.

Yellow LED

On   A pick failure on a tray has occurred. Press the release button, wait until the green LED is off and open the door to inspect the problem.

Off   Normal operation.

Pallet LED

Behind the door there are two columns of yellow LEDs. One LED for each pallet position.

On   An empty tray on that pallet

FlashingA pick failure from a tray on that pallet.

Off   Normal operation.

Power indicator

On   Mains power is switched on.

Off   Mains power is switched off.

Starting Up
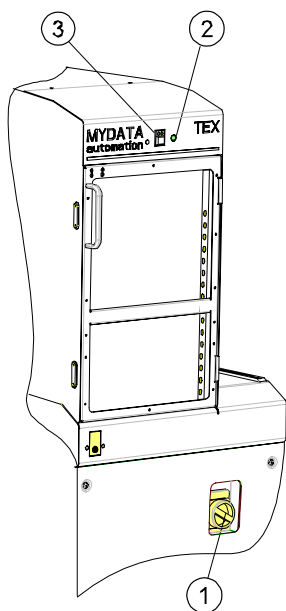
1. Switch the mains power on ('1' in the figure) and make sure the power indicator (2) is lit.

2. Wait approximately 30 seconds for TPSys to load the TEX software. This procedure is reported in the TPSys message box, ending with a message that the TEX is deactivated.

3. Make sure the door is closed and press the release button (3) to initiate the TEX hardware.

4. Press the release button again and wait for the green LED to go off.

5. Open the door and load the cassettes.

6. Close the door and press the release button. Wait for the green LED to go on with a steady light (it may take approx. 5 seconds to start the barcode reader, if it has not been used recently).

7. As the TPSys message box has reported the number of pallets found in the TEX unit, it is ready for use.

Loading

☞ *To keep components in correct positions on the trays, always handle cassettes and trays carefully.*

A cassette with components is heavy to handle and must not be tilted. Note that the pallets only are secured in the cassette by the magnet behind the hinged lever at the front.

☞ *Be careful not to damage the barcode labels when handling pallets.*

Load the TEX as follows:

1. Press the release button. Wait for the cassettes to move to their home positions and the green LED to go off.

2. Open the door.

3. Take the cassette out, by first lifting it a few millimeters and then sliding it out on the bottom rails (or continue to load with the cassette still in place). *Lift in the center handle.*

4. Fold out the hinged lever.

5. Pull the pallets out to refill or replace the trays.
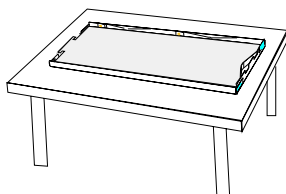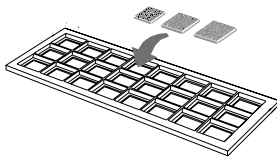
6. Place the pallet on a stable surface.
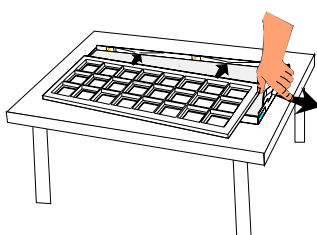
7. Press the short end spring of the pallet with a finger and carefully slide the tray down and towards the two springs at the long side of the pallet. The pallet springs are designed for JEDEC trays. For smaller trays, use magnetic supports to lock the tray in position.

8. Make sure all components are in their correct positions on the tray.
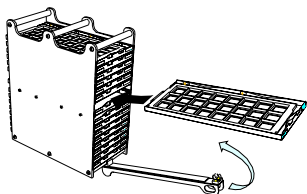
9. Carefully, insert the pallets in the cassette. Do not push the pallets all the way in.

10. Fold the hinged lever up and let it push the pallets to their final position. Secure the lever gently with the top clamp.

11. Lift the cassette in the center handle and carefully reinstall the cassette (if previously removed). Make sure it goes down into the bottom groves.
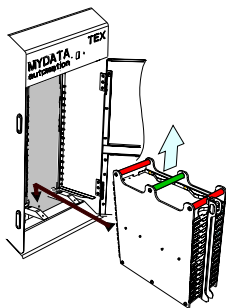
12. Make sure no pallet has been pushed too far in. The short end of the pallets must rest against the hinged lever.

13. Close the door.
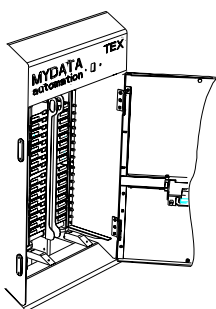
14. Press the release button and wait for the green LED to show a steady light.

15. In the TEX List Editor or in the Pallet Magazine Editor, update the component quantity.

Typical TEX Work Flow

This section describes a typical work flow for setting up a new assembly process.

The various lists and editors mentioned below are found in Chapter 6 of the *Programming Manual*.

1. Place the pallet, with a tray of the desired type, in the TEX.

2. Define the tray type by selecting magazine (<F6> and TEX) in the Tray Type Editor and then entering tray name, tray design, tray size, a typical component and its position.

3. In the TEX List (see chapter 5), fill the TEX.

4. In the Pallet Magazine Editor, select a component and link this component to a tray type and a pallet. Then, set the desired acceleration codes for the TEX movement and adjust the position. Note that several trays can be placed on the same pallet.

Continue with the ordinary assembly procedure.

Troubleshooting

Problem	**Remedy**	**TPSys message**
No response from TEX.	Make sure the mains power switch is on.	*Magazine nn removed from slot x*
	Press the release button and wait till the green LED shows a steady light.	*TEX nn/x deactivated* (Pallet not inserted)
	1. Make sure the door is closed. 2. Make sure both the shuttle safety hoods are in place. 3. Make sure main emergency stop buttons are released.	*Emergency stop button activated*
	1. Deactivate the TEX with the release button. 2. Wait for the green LED to go off. 3. Activate the TEX with the release button.	
	1. Deactivate the TEX with the release button. 2. Switch the TEX mains power off. 3. Wait till TPSys reports TEX deactivated and removed. 4. Switch the mains power on again. 5. Wait till TPSys reports TEX deactivated. 6. Remove any cassette left in the TEX unit. 7. Activate the TEX with the release button. 8. Wait for the green LED to shine steady.	
	Verify that the emergency stop cable or termination plug is connected.	*Emergency stop button activated*
TEX does not initiate.	Make sure no pallet is left in the shuttle unit. If so: – Switch the TEX off. – Remove the transparent plastic safety hood (front). – Remove the pallet. – Remove any casette left in the TEX. – Fit the safety hood and restart.	*TZ path safety sensor activated.*
Components are not picked correctly.	Vibrations may have moved components out of their positions on the tray. Try the following: Check for components out of positions on each pallet. Incorrect component position indicates uncarefully loading procedure. Check each pallet after it has been transported on the shuttle unit. Indicates if there is a problem in the TEX unit, which should be investigated by trained service personnel.	

5. Magazines – Usage

After the magazines have been loaded an inserted into the machine, TPSys needs information. This chapter describes how to indicate quantities, locations and such to the system.

The glue station and the barcode reader are also included in this chapter, which is divided into the following main parts:

- **Tape and Vibratory magazines**, page 5-2

  Magazine adjustments, page 5-16

- **Y-wagon magazines**, page 5-25

- **Tray wagon magazines**, page 5-35

- **Tex List**, page 5-37

- **Magazine Utilization**, page 5-40.
  Information about magazines for the current layout.

- **Magazine errors**, page 5-41.
  Recorded errors caused by for instance empty magazines, rejected components and loss of vacuum.

- **Magazine optimization**, page 5-42.
  Creates a magazine combination proposal for a layout.

- **Magazine Kit**, page 5-44.
  Magazine load information for layout assemblies.

- **Barcode reader**, page 5-51

- **Glue station**, page 5-60

Tape and Vibratory magazines

After the magazines have been loaded and inserted into the machine, their contents must be updated in the system.

Connecting Agilis Feeder to Component Type

There are five ways to inform TPSys which type of component is inserted in a specific Agilis feeder:

- TPSys barcode reader.

- Removable Feeder List Editor.

- Magazine List Editor.

- Magazine Kit list.

  This list store information about the contents of the magazines used for various layouts. Prior to the next assembling, load the magazines as detailed on the printout and apply the Magazine Kit. See page 5-44 for more information on Magazine Kits.

- MYLabel

  MYLabel keeps track of component carriers (tapes, sticks) used in production by use of barcodes. See the *MYLabel User's Manual* for more information.

  ☞ *If MYLabel 2.0 is installed, then component loading must be done by using the MYLabel 2.0 barcode reader.*

Using TPSys barcode reader

The most convenient way is to use the optional TPSys barcode reader:

1. Make sure the barcode function is activated, see page 5-51.

2. Scan the barcode on the component reel.

3. Scan the barcode on the Agilis feeder.

You will hear a beep and the connection is completed.

This reading can be done on stand-alone data servers so that more operations can be carried out simultaneously. Note that the barcode option must have been purchased for at least one of the machines on the network.

Using Removable Feeder List and Magazine List Editor

The Removable Feeder List shows which component type is loaded into a specific Agilis feeder. See the *Removable Feeder List Editor* on page 5-3.

The Agilis Magazine is a tape magazine and included in the *Tape and Vibratory Magazine List* section on page 5-6.

Removable Feeder List Editor

Selecting the **Removable Feeders** option in the **Magazine** menu opens the Removable Feeder List Editor.

The Removable Feeder List Editor is shown in Figure 5-1.

Function Keys in the Removable Feeder List Editor:

Edit removable feeder

By pressing <Enter> the contents of the highlighted removable feeder can be updated.

Delete

The highlighted feeder can be deleted by pressing <Del> and confirming the deletion in a popup box, provided the feeder is not inserted in a magazine that is inserted in a machine.

Clear component data

Pressing <F7> clears the contents of the highlighted feeder.

Edit feeder header

By pressing <F2> the highlighted feeder header information in the Removable feeder header box can be edited.

Toggle sort order

By pressing <Space> the sort order in the Removable feeders list is changed.

The default sort order is alphabetical, sorted by feeder name (see Figure 5-1). By pressing <Space> once, the sort order is changed to show all feeders inserted in magazines or machines first, also sorted by name. Removable feeders not inserted in magazines or machines come last.

Figure 5-1. Removable Feeder List Editor

Entries in the Removable Feeder List Editor:

Removable Feeders

This list shows the removable feeders in the machine system, and in the machine network if shared databases are used. The magazines they are inserted in are shown in brackets, if inserted in a machine. No position number is shown for feeders registered but not inserted.

Feeder information box

The feeder information box in the lower right part of the Removable Feeder Editor window contains data for the highlighted feeder.

Component

The name of the component in the highlighted feeder. You can change a component by selecting from the Component List, which is opened by entering the first characters of the component name and pressing <Enter>.

Package

The package type of the highlighted component.

Comment

User comment text read from the Component List.

Batch ID

This field is intended for component batch number found on, for instance, the tape reel, plastic tube, storage box or delivery note.

The batch number can either be typed into this field or read, using a TPSys barcode reader.

Angle

The component angle in the feeder. Can be either 0°, 90°, 180°, or 270°/-90°.

Quantity

The component quantity in the highlighted feeder.

The quantity is to be updated when loading the removable feeder. The value is then counted down each time a component is taken. The remaining number of components is indicated in this field. The quantity can either be typed into this field or read by using a TPSys barcode reader.

Alarm

The component quantity level at which the operator is notified in the Operator alerts box that the magazine feeder is low on components. The quantity can be set in this window.

This feature can be enabled or disabled by setting the *84.0500 Alarm on reels* parameter to *Yes* or *No*. When disabled, this entry is not shown in the magazine feeder window.

Type

The type of the highlighted removable feeder.

Name

The name of the highlighted removable feeder. The default name is the serial number, but this can be changed.

Comment

User comment for the highlighted removable feeder.

Step length

The step length of tape advanced is defined by this setting. The step length is defined in mm.

Tape and Vibratory Magazine List

The Tape and Vibratory Magazine List is opened by selecting the **Magazines** option in the **Magazine** menu.

The Tape and Vibratory Magazine List Editor is shown in Figure 5-2.

Function keys in the Tape and Vibratory Magazine List Editor:

Edit feeder contents

By pressing <Enter> the contents of the highlighted magazine can be updated, see page 5-10.

Delete magazine

The highlighted magazine can be deleted by pressing <Del> and confirming the deletion in a popup box, provided the magazine is not inserted in the machine. All magazine information is erased if the magazine is deleted.

Locate magazine

By pressing <Ctrl>+<F1>, the X position of the highlighted magazine is calibrated using automatic fiducial mark search. If the automatic fiducial mark search fails, you can center the fiducial mark manually. Further information is found in the *Locate All Magazines* section under *Magazine* in *Appendix A – Menu Reference Guide*.

Edit magazine name/barcode

The highlighted magazine can be renamed and the barcode can be changed by pressing <F2> and typing a new name or reading a new barcode (see below).

Vibrate magazine

To vibrate an inserted vibratory magazine, select magazine and press <F5>.

Figure 5-2. Tape and vibrator Magazine List Editor

Vibrate all magazines

To vibrate all inserted vibratory magazines, press <Ctrl>+<F5>.

Toggle sort order

By pressing <Space> the sort order in the *Magazines* list is changed.

The default sort order is alphabetical (see Figure 5-2).

By pressing <Space> once, the sort order is changed to show all magazines inserted in the machine, sorted by magazine positions. These magazines are followed by magazines inserted in other machines, sorted by machine and magazine positions.

By pressing <Space> again, the sort order is changed to show those magazines which contain components included in the loaded layout.

Exit

Press <Esc> if you want to exit this window and return to the main window.

Entries in the Magazine List Editor:

Magazines

This box shows the magazines in the machine system, and in the machine network, if shared databases are used. The magazine position numbers are shown in brackets, if inserted in the machine. No position number is shown for magazines registered but not inserted, see TM8C-1234 in Figure 5-2.

Figure 5-2 shows a machine with four registered magazines, three of which are inserted.

( ) If shared databases are used, then the machine number is also shown in brackets for magazines inserted in other machines, for instance (tp9n491/8) if the magazine is inserted in magazine position 8 in a TP9 machine with serial number 491.

* An asterisk (*) indicates that the magazine contains components included in the currently loaded layout.

Magazine information box

The magazine information box in the lower part of the Magazine List Editor window contains data for the highlighted magazine, which is is read from the magazine and thus not editable, except for the magazine name and the barcode which can be changed after pressing <F2>.

Name

User name of the magazine. If no user name is assigned, this field shows the magazine type followed by the serial number, for instance TM8C-1234.

You can rename the highlighted magazine after pressing the <F2> key.

Barcode

A barcode reader can be used, for example, to select magazine when loading or refilling components. The barcodes, which are unique to each TM8 magazine, are printed on the magazine barcode labels. These unique codes can be linked to the user magazine names. In Figure 5-2 the barcode 5001 is linked to the *Video* magazine.

Barcode can be used to inform TPSys which type of component is inserted in a specific Agilis feeder. All Agilis feeders have a unique barcode label. Scan the barcode on the component reel and the barcode on the Agilis feeder.

Barcode reading is described in the *Barcode Readers*.

Fiducial mark

Indicates if automatic magazine fiducial mark search is active or not.

Type

The magazine type, for instance VM for vibratory magazines, TM for 8mm tape magazines or ALM8 for Agilis Linear M8. The magazine type is read from the magazine and cannot be changed in this box.

Serial No.

Shows the magazine serial number. The serial number is read from the magazine and cannot be changed in this box.

No. of feeders

Shows the number of feeders in the magazine, for instance 16 for an 8mm tape magazine and 30 for a vibratory magazine. The feeder number is read from the magazine and cannot be changed in this box.

Tape Magazine Contents

By pressing <Enter> in the Tape and Vibratory Magazine List Editor (page 5-7), a tape magazine contents window is opened.

The tape magazine contents window is shown in Figure 5-3.

Function keys in the tape magazine contents window:

Edit/insert component

By pressing <Enter> the highlighted feeder load information can be changed or updated.
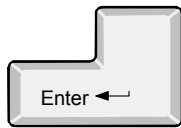
Clear component data

The highlighted component can be removed from the list by pressing <F7> and confirming the deletion in a popup box.

Adjust pick position

The feeder pick position can be calibrated by pressing <F1>. The procedure is described in the *Manually Calibrating Pick Positions*.

For Agilis magazines, the feeder list will show only removable feeders that are inserted in the magazine. The component name is shown in brackets.

However, in this case the system will go directly to the feeder that contains the highlighted component.

Locate magazine

By pressing <Ctrl>+<F1>, the X position of the current magazine is calibrated using automatic fiducial mark search. The Y position is adjusted mechanically for Agilis M8 and TM magazines, see *Pick Line Adjustment – Agilis AM8* and the *Machine Manual* for TM magazines. The Agilis ALM type magazines are adjusted by using the joystick. If the automatic fiducial mark search fails, you can center the fiducial mark manually. Further information is found in the Locate All Magazines section under *Magazine* in *Appendix A – Menu Reference Guide*.

Clear component data for all feeders

A magazine can be cleared from all components by pressing <F9> and confirming the deletion in a popup box.

Copy feeder contents

The magazine feeder contents can be copied from another magazine by pressing <Shift>+<F9> and typing the magazine name to copy from in a popup box (or pressing <Tab> or <Enter> and selecting magazine from a popup magazine list).

```
                        * FEEDER CONTENTS FOR MAGAZINE Video *
    Pos.: component
 * 1: 000149                 Enter   Edit/insert component
   2: 000254                    F7   Clear component data
   3: 000255                    F9   Clear component data for all
   4: 000501                         feeders
   5: 000502              Shift+F9   Copy feeder contents
   6: 000503              Ctrl+F1    Locate magazine
   7:                         F1     Adjust pick position
   8:                        Space   Toggle component/comment/package
   9:
  10:
  11:
  12:
  13:                        Component: 000149
  14:                          Package: 1206-06
  15:                          Comment: 100pF
  16:                         Batch ID: 123456789
                                Angle: 0.00°
                             Quantity:1338            Alarm: 100

                             Step length: 1

                                           Brian                13:56
```
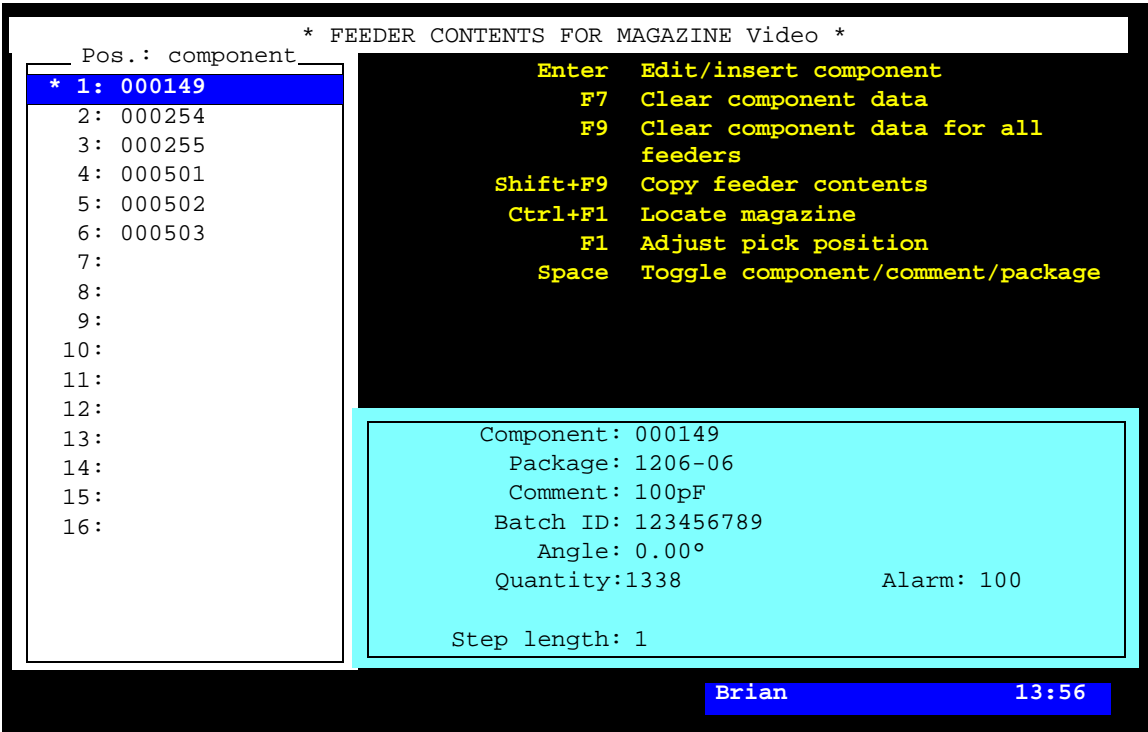
Figure 5-3. Tape magazine contents

Toggle component/comment/package

By pressing <Space> the *Pos.: component* box, indicating component names, is changed to *Pos.: comment* indicating component comments. A second press on the <Space> bar changes to *Pos.: package* indicating packages. A third press shows the component names again.

Exit

Press <Esc> if you want to exit this window and return to the Magazine List Editor (page 5-7).

Entries in the magazine contents window:

Pos.: component, Pos.: comment, Pos.: package

This box shows the components loaded in each magazine feeder. The component names, component comments, or component packages can be displayed by pressing <Space>.

* An asterisk (*) in the first position of a line indicates that the feeder is loaded with a component included in the currently loaded layout.

Component

The name of the highlighted component in the feeder list. The component name is referred to in the Component List.

You can search for a component from the Component List, which is opened by entering the first characters of the component name and pressing <Enter>, or by simply pressing <Enter>.

Package

Package name set in the Component List.

Comment

User comment text read from the Component List.

Batch ID

This field is intended for component batch number found on, for instance, the tape reel, plastic tube, storage box or delivery note.

The batch number can be either typed into this field or read using a TPSys barcode reader.

The TPSys barcode reader is described in the *Barcode Readers* section.

Angle

The component angle in the feeder. Can be 0°, 90°, 180°, or 270°/-90°.

Quantity

The component quantity for the feeder.

The quantity is to be updated when loading the magazine feeder. The value is then counted down each time a component is taken from the feeder. Remaining parts are thus indicated in this field.

The quantity can be either typed into this field or read using a TPSys barcode reader.

The TPSys barcode reader is described in the *Barcode Readers* section.

Alarm

The component quantity level at which the operator is notified in the *Operator Alerts* box that the magazine feeder is low on components. The quantity can be set in this window.

This feature can be enabled or disabled by setting the *84.0500 Alarm on reels* parameter to *Yes* or *No*. When disabled, this entry is not shown in the magazine feeder window.

Step length

Number of mm tape advancement per component feed, which can be set in this window.

The Agilis M8 Magazine

The Agilis M8 magazine contents window has the same entries as the tape magazine window, except for some entries related to removable feeders detailed below

```
                    * FEEDER CONTENTS FOR MAGAZINE AM8-3013 *
   Pos.: component (feeder)
   9: (AF 0016777239)         Enter   Edit removable feeder
   8: (AF 0016777241)           Del   Remove feeder
                                 F8   Remove all feeders
                                 F7   Clear component data
                                 F9   Clear component data for all feeders
                             Ctrl+F1  Locate magazine
                                 F1   Adjust pick position
                                 F2   Edit feeder header
                              Space   Toggle component/comment/package

                              Component: 0016777239
                                Package:
                                Comment:
                               Batch ID:
                                  Angle: 90.00°
                               Quantity: 0                  Alarm: --

                                   Type: Agilis F8 4.7
                                   Name:
                                Comment:
                            Step length:

                                                  Brian            13:58
```
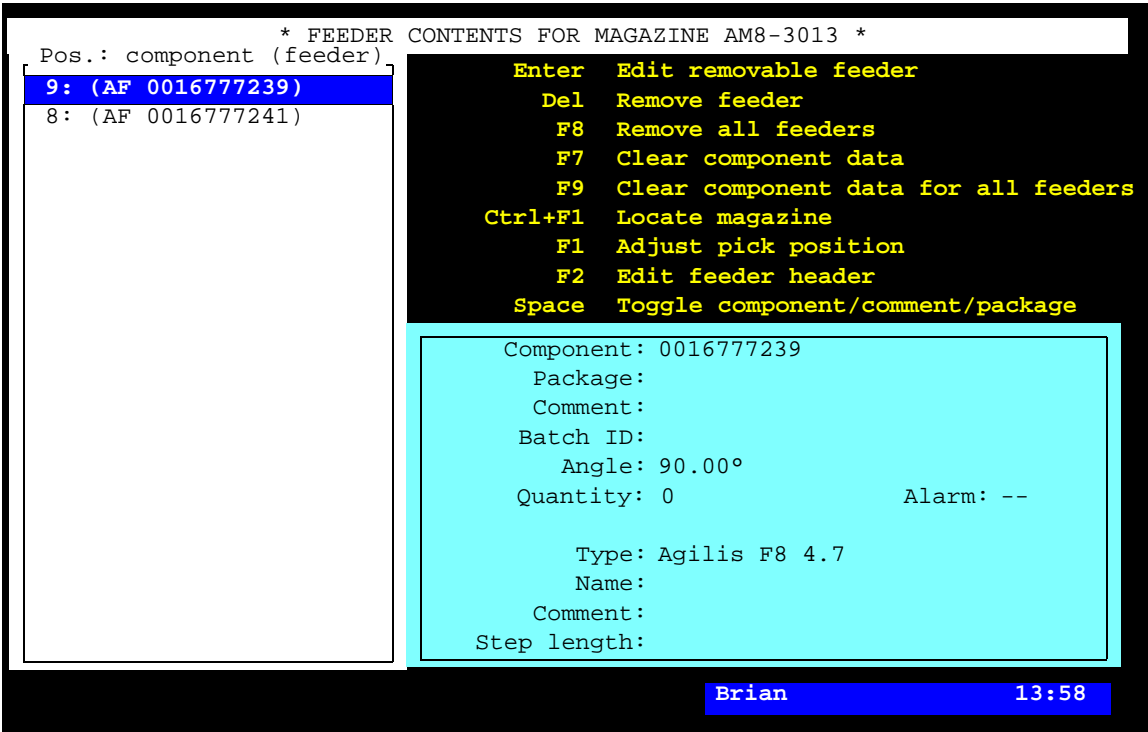
Figure 5-4. Tape magazine contents

Remove all feeders

F8

Removes all feeders from a magazine provided the magazine is not inserted in the machine.

Clear component data

F7

Deletes component from feeder.

Edit feeder header

F2

By pressing <F2> the highlighted feeder header information in the Removable feeder header box can be edited.

Entries in the magazine contents window:

Type

The type of highlighted removable feeder, for instance Agilis F8 4.7, Agilis F8 3.7.

Name

The name of the highlighted removable feeder. The default name is the serial number, but this can be changed.

Comment

User comment for the highlighted feeder.

Step length

The length of tape advanced per step is defined by this setting. It is specified in mm.

Vibratory Magazine Contents

The vibratory magazine contents window has the same entries as the tape magazine window, except for some vibratory related entries detailed below.

```
        Component: MB1501PF
          Package:
          Comment: PLL
         Batch ID: 123456789
            Angle: 0.00°
         Quantity:13                    Alarm: 5


        Amplitude: 10
         Duration: 1000 Vibrate Magazine
        Frequency: 57
```

Amplitude

Vibrator amplitude value. The setting range is 0 – 127. This setting affect all feeders in a group.

Duration

Vibration time in ms. The setting range is 0 – 6000ms (0 – 6 seconds). This is set for each individual feeders

Frequency

Vibrator frequency in Hz. The setting range is 10 – 99Hz. This setting affect all feeders in a group.

Magazine Adjustments

Before the magazines can be used, they have to be adjusted as to their positions, pick line and pick positions.

We will describe:

- Automatic Location of Inserted Magazines, page 5-17

- Manually Calibrating Pick Positions, page 5-18

- Pick Line Adjustment – Agilis AM8, page 5-20

- Phase Displacement – Agilis AM8, page 5-24

Automatic Location of Inserted Magazines

If the machine picks from magazines that have not been properly located, it may lead to missed picks. TPSys will therefore locate all magazines automatically before picking.

Every time a magazine is inserted it is marked as not located. If TPSys fails to locate the magazine automatically while assembling, the magazine is disabled and a Message log message and an operator alert is generated. The assembly continues using other magazines.

The Operator must locate the magazine to engage it again and finish the layout. If automatic location of the magazine fails in interactive situations the operator is asked to locate the magazine manually.

Manually Calibrating Pick Positions

This section describes how to calibrate the pick positions for tape and vibratory magazines.

1. Select the **Adjust Feeder Positions** option in the **Magazine** menu.

2. Select the desired magazine:

```
┌──────── Magazines ────────┐
│ Audio (3)                 │
│ RGB (6)                   │
│ TM8C-1234                 │
│ Video (8)                 │
│ VM30-9867 (7)             │
└                           
```

3. Select the desired feeder, or all feeders:

```
┌───────────────────────────┐
│ All feeders               │
│ All loaded feeders        │
│ All currently used feeders│
│ Feeder 1 *(000149)        │
│ Feeder 2 *(000254)        │
│ Feeder 3                  │
│ Feeder 4                  │
│ Feeder 5   (000519)       │
│ Feeder 6                  │
│ Feeder 7                  │
│ Feeder 8                  │
│ Feeder 9                  │
│ Feeder 10                 │
└───────────────────────────┘
```

4. If the magazine position is not located, then you have to do it by replying **Yes** in the following box:

```
┌──────────────────────────────────────────┐
│ Magazine fiducial mark not located. Locate now?│
│                 Yes     No                 │
└──────────────────────────────────────────┘
```

If the magazine calibration fails, center the cross hairs on the fiducial mark manually and press <Enter> when **Ready** is highlighted.

5. Center the cross hairs on the component in the pick position by using the trackball or joystick, see Figure 5-5. Figure 5-5 shows a vibratory magazine, but tape magazines are centered in the same way.
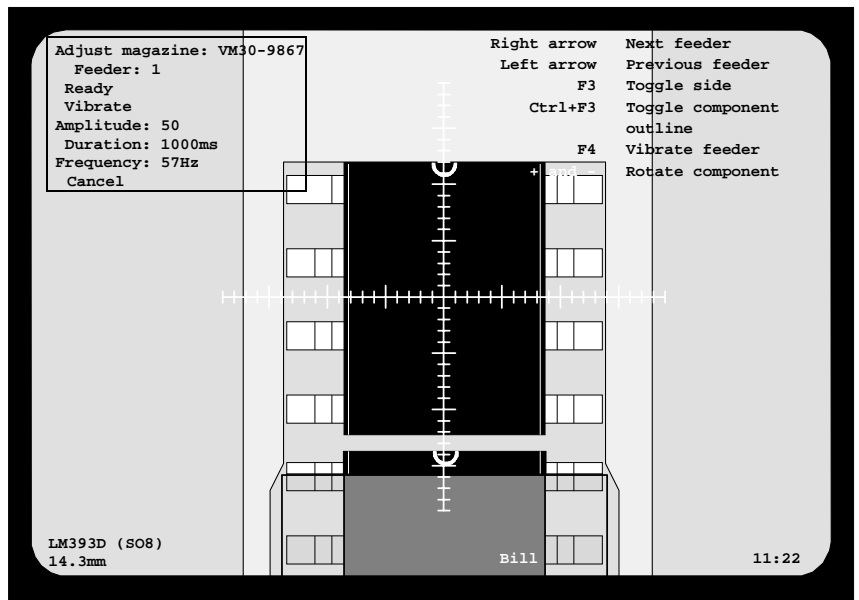
Figure 5-5. Component pick position

The menus in the upper part of the screen are detailed on page 5-21.

In the lower left corner of the screen, the component and package names are shown on the first line. The distance between the magazine fiducial mark and the current position is shown on the second line.

6. Press <Enter> when **Ready** is highlighted.

This procedure calibrates the feeder position in *both* the X- and Y-direction on ALM magazines.

For all other magazine type, this procedure only calibrate the feeder in the X-direction. To calibrate the Y-coordinate position, a mechanical adjustment is required. See page 5-20 for adjustment of the Agilis M8 magazine and the *Machine Manual* for other magazine types.

Pick Line Adjustment – Agilis AM8

The pick line in Agilis AM8 magazines is adjustable in Y direction mechanically.

To adjust the pick line Y direction use two Allen screws positioned on top of the magazine near the feeders, see Figure 5-6. You can do the adjustment with the magazine inserted in the machine and instantly see the result on the screen. We recommend you to adjust feeder position 1 first and then feeder position 16. Use a 3mm Allen key.

Use the step feeder function, key <F4>, to assure that the component is in pick position before you make the adjustment.
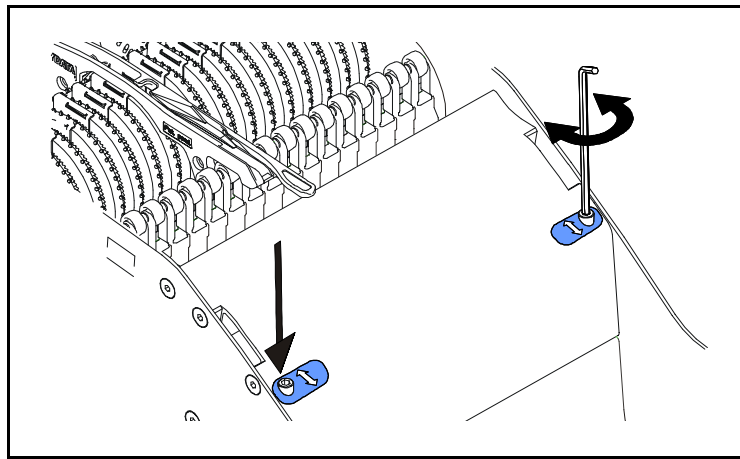
Figure 5-6. Adjusting pick line Y direction

Calibration menus, tape magazines

The following menu box is shown in the upper left corner of the screen if a tape magazine is selected:

```
Adjust magazine: TM8C-1234
  Feeder: 1
 Right side
 Ready
 Step
Step length 1
 Cancel
```

The menu entries are:

Adjust magazine

Current magazine name.

Feeder

Current feeder number.

Right side, Left side

This text is shown only after moving to the right or left position using the <F3> *Toggle side* key.

Ready

Confirms the position.

Step

Performs a component feeding in the magazine.

Step length

Tape advancement length in mm. per component feed.

Cancel

Cancels the calibration mode.

Calibration menus, vibratory magazines

The following menu box is shown in the upper left corner of the screen if a vibratory magazine is selected:

```
Adjust magazine: VM30-9867
  Feeder: 1
 Ready
 Vibrate
Amplitude: 50
 Duration: 1000ms
Frequency: 57Hz
 Cancel
```

The menu entries are:

Adjust magazine

Current magazine name.

Feeder

Current feeder number.

Ready

Confirms the position.

Vibrate

Performs a component feeding, that is one feeder section vibrates with the selected amplitude, duration and frequency.

Feeder section 1 vibrates if feeder 1 – 10 is selected, section 2 if feeder 11 – 20 is selected, and section 3 if feeder 21 – 30 is selected.

Amplitude

Vibrator amplitude value, 0 – 127.

Duration

Vibration time for each component feed, 0 – 8000ms (0 – 8 seconds).

Frequency

Vibrator frequency, 10 – 99Hz.

Cancel

Cancels the calibration mode.

Arrow and function keys in the menu shown in the upper right corner of the screen:

Next feeder

The <right arrow> key moves the cross hairs to the next feeder.

Previous feeder

The <left arrow> key moves the cross hairs to the previous feeder.

Toggle side

The position is changed between the center, the left-hand side, and the right-hand side of the component each time the <F3> key is pressed. Left and right positions are indicated in the menu box, see above.

This option is shown only if the loaded component type has at least two defined lead groups in the Package List.

Toggle component outline

A graphic outline of the component can be displayed by pressing <Ctrl>+<F3>. The graphic symbol is a rectangle with a dot for each lead. Lead 1 is marked with a rectangle. This symbol indicates the correct component type and angle.

The graphic symbol may differ somewhat from the actual component size.

Step feeder, Vibrate feeder

<F4> performs a component feeding. This option is shown only if there are components in the magazine. The same function can also be carried out with the *Step* option in the menu box, see above.

Jog feeder

Small steps with the feeder, to move the pick position on the tape back into phase with the placement head, is performed every time <F5> is pressed.

Rotate component

When locating a component in a tape or vibratory magazine it is possible to rotate the component in steps of 90 degrees by pressing <+> or <->.

Phase Displacement – Agilis AM8

It is possible to load a standard, 4mm pitch component tape so that the placement head will try to pick from between the component pockets. This is known as a phase displacement.
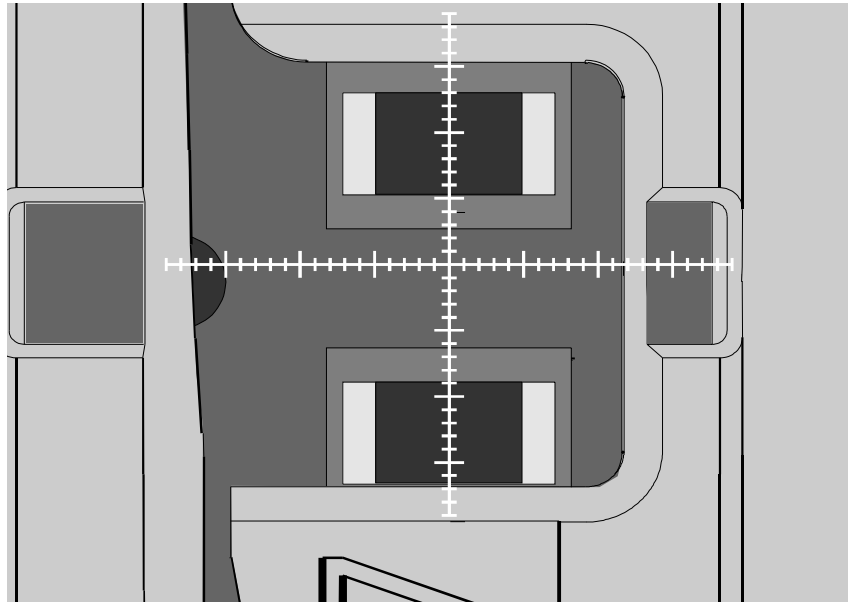
Figure 5-7. Phase displacement

This can be adjusted by making a small (2mm) step with the feeder in the adjust feeder position operation. Select the *Jog* option, in the top left menu of the screen. This will move the pick position on the tape back into phase with the placement head.

If the phase displacement remains when the component picking begins, a step error recovery feature in TPSys will automatically start. After a few unsuccessful attempts to pick components, the magazine will take a 2mm step before returning to normal 4mm steps, provided the placement head finds the component.

The ALM type magazines will correct any phase displacements like this automatically.

Y-wagon Magazines

The Y-Wagon magazine is a component tray placed on the assembly table. Before it can be used, the position and contents of it must be reported to TPSys. The Y-Wagon Magazine Editor is used for this purpose.

It is possible to share y-wagon and tray-wagon trays and tray positions. Since all trays in the system may be shared the presentation of trays in the editors is made in the same manner as for ordinary magazines. This means that it is possible to toggle the sort order either by name or by host. For tray positions it is also possible to toggle the sort order by host or name or to only show local positions. Even if tray positions are shared between the machines and possible to read, only positions local to a machine can be used for that specific machine when assigning positions to trays.

Y-wagon Magazine Editor

Open the editor by selecting the **Y Wagon Magazine** option in the *Magazine* menu and selecting the **Trays** option.

The Y magazine Editor is shown in Figure 5-8.

```
┌─ Y Wagon Magazine ─┐
T Trays
P Tray Positions
```
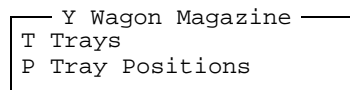
For more information about this editor, please see the *Y-Wagon Magazine List* section in the *Programming Manual*.

Edit tray

By pressing <Enter> the highlighted tray can be modified.
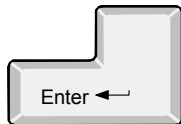
Toggle sort order

Toggle the sort order in the list.

Locate position

The tray position on the assembly table can be located by positioning two tray corners, two components on the tray, or two fiducial marks. To locate the tray, press <F1> when the *Position* field is highlighted.

Reload

The component quantity for the highlighted tray can be updated by pressing <F6> and confirming or changing in a dialog box, see *Quantity* below.

Remove from magazine

Remove a tray (make not present) by highlighting it and press <F7>.

Remove all from magazine

Removes all trays from a magazine.

Exit

Press <Esc> if you want to exit this window and return to the *Y Wagon Magazine* sub menu above.

Press <Esc> again to return to the main window.

```
                        * Y-WAGON MAGAZINE EDITOR *
   ___ Trays By Name ___
      4 ABC111(my9n476)    Enter  Edit tray          Space   Toggle sort order
   -  1 ABC123               Ins  Insert new           F6   Reload
   *  2 ABC123               Del  Delete               F7   Remove from magazine
   *  3ABC123(my12n123)      F1   Locate position      F8   Remove all from magazine
                                       ___Tray Information___
                               Name/barcode:  ABC111
                                  Component:  QFP120
                                    Package:  ASIC-32
                                    Comment:
                                   Batch ID:
                            Component angle:  0.00°
                                  Tray type:  QFP120-3*8
                                   Quantity:  14                Alarm:   5
                                Auto refill:  Yes


                                    Machine:  my9n476
                                   Position:  * UNKNOWN *
                     First component location:  ---
                           Lower left corner:  92.642mm/ 221.673mm
                           Upper right corner:  117.331mm/ 245.746mm

                                                 Brian              14:13
```
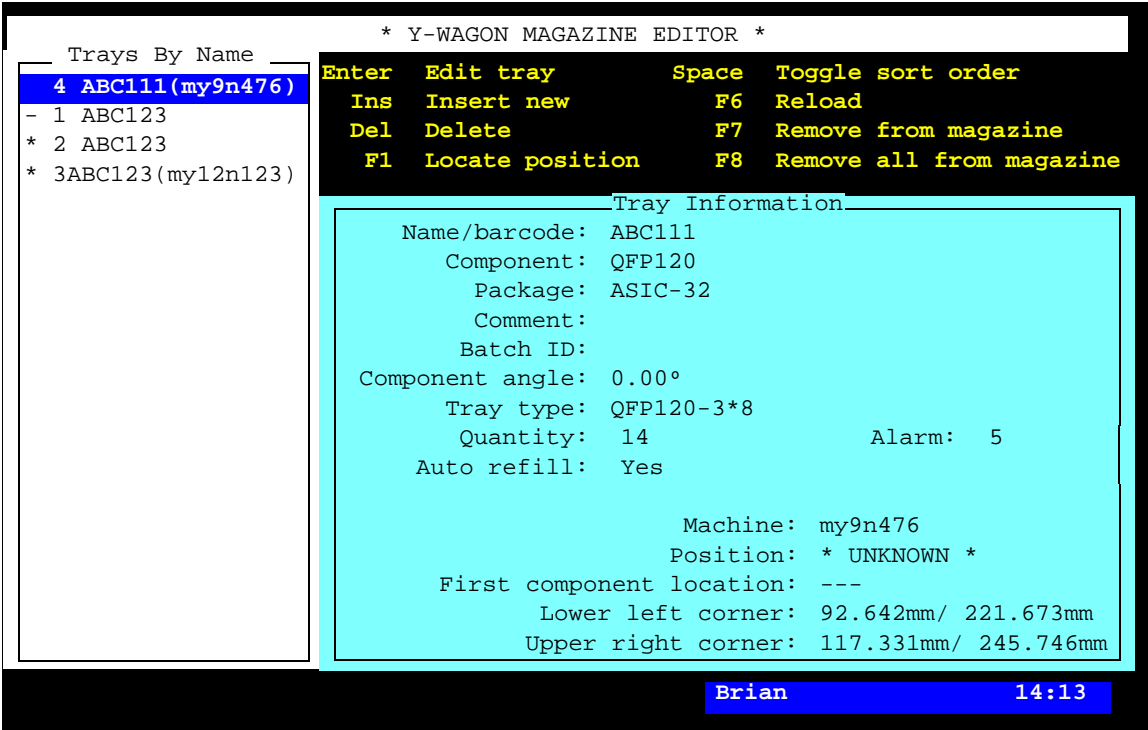
Figure 5-8. Y-Wagon Magazine Editor

Trays By Name

This box contains defined trays. In the first position of the list, one of the following characters can be shown:

* The tray is marked as present on the assembly table.

– The tray is marked as present but empty.

! A pick error has occurred.

No character in the first position indicates that the tray is non-present on the assembly table. The system does not pick from such a tray.

Figure 5-8 shows one non-present tray and three present trays, one of which is empty. A tray can be shared with other machines. If so, the serial number of the machine where it is loaded will be displayed.

Tray Information

This box contains information about the highlighted tray.

Name/barcode

You can search for a component from the Component List, which is opened by entering the first characters of the component name and pressing <Enter>, or by simply pressing <Enter>.

Component

Component loaded in tray.

Package

The components package type.

Comment

User comment text read from the Component List.
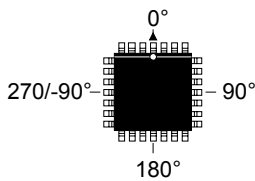
Batch ID

This field is intended for component batch number found on, for instance, the tray, storage box or delivery note.

The batch number can be either typed into this field or read using a TPSys barcode reader.

The TPSys barcode reader is described in the *Barcode Readers* section.

Component angle

The component angle referred to the tray, see the figure.

You can search for a tray from the Tray Type List, which is opened by entering the first characters of the tray type name and pressing <Enter>, or by simply pressing <Enter>.

Tray type

Type of tray, for instance 3*8 indicating number of rows.

Quantity

The component quantity for the tray.

To update the quantity, press <F6> and confirm or change the quantity value in the dialog box:

```
┌──────── Reload tray────────┐
│     Component: ABC123      │
│     Tray type: QFP208-3*8  │
│      Quantity: 24          │
│      Batch ID: 123456789   │
└────────────────────────────┘
```

The quantity is counted down each time a component is picked from the tray. So, the quantity field indicates always the remaining number of components on the tray.

Maximum quantity is defined by the row and column numbers in the Tray Type List.

☞ If you set a quantity less than full tray, for instance 10 for a 3x8 tray, the system starts picking after the missing components, in this case from component number 15.

You can also set negative numbers, which means the number of missing components on the tray. If you set –3 for a 3*8 tray, then the system will pick 21 components, starting from number 4.

Alarm

The component quantity level at which the operator is notified in the *Operator Alerts* box that the magazine is low on components.

Auto refill

Enables or disables messages when trays are out of components.

Yes – If the tray is marked as present (*), then a dialog box is shown that calls the operator's attention to refill the tray.

No – No dialog box is shown.

To toggle between *Yes* and *No* press <Space>.

Machine

Indicates machine into which the tray is installed.

Position

A newly inserted tray has an unknown position indicated with the text: * *UNKNOWN* *.

To locate the tray, you can either use the camera, or select a pre-defined position.

Locate the tray using the camera ... To locate the tray using the camera, press <F1> and select two corners, first and last component, or two fiducial marks for positioning, see page 5-31.

The following text is displayed after the tray has been located on the assembly table using the camera:

Position: * LOCATED *

... or select a pre-defined position. To make the use of trays more convenient and fast, defined tray positions on the assembly table can be saved and stored in the Y-Wagon Position List (page 5-33). To use a pre-defined position from the Y-Wagon Position List, enter a few characters of the position name and press <Enter>, or simply press <Enter>:

```
┌─ Positions By Name ─┐
│ * UNKNOWN *         │
│ Point 1             │
│ Table corner        │
│                     │
```

Choose position and press <Enter>.

... or using a bar code reader Scan the tray name barcode and then scan a tray position barcode belonging to the machine in question.

First component location

Indicates the position of first component in tray and thereby the trays orientation. Can be selected from a list by pressing <Space>. The alternatives are:

– Lower left corner

– Upper left corner

– Upper right corner

– Lower right corner

Lower left corner

The current X/Y coordinates of the lower left tray corner.

Upper right corner

The current X/Y coordinates of the upper right tray corner.

Locating Trays on the Y wagon

A tray on the assembly table is located by positioning two tray corners, two components on the tray (if defined, see below), or two fiducial marks (if defined, see below). This is carried out when *Position* in the Y-Wagon Magazine Editor is highlighted.

F1

Press <F1> and choose whether you want to locate the tray by positioning corners, fiducial marks, or components:

```
_____ Select Points To Use _____
Tray corners
First and last component position
Fiducial marks
```

The *First and last component position* option is shown only if the tray is defined in the *Tray Type List*, see the *Programming Manual*.

The *Fiducial marks* option is shown only if *Fiducial marks exist* is set to *Yes* in the *Tray Type List*.

☞ If a tray contains big components, then use the corners or fiducial marks, if defined. But, if the components are small or the tray has bad corners, then use first and last component.

The tray shown in the following figures is defined in the *Tray Type List*.

Tray corners

Figure 5-9 shows the cross hairs on the lower left corner at the first component (1), and on the upper right corner at the last component (2).
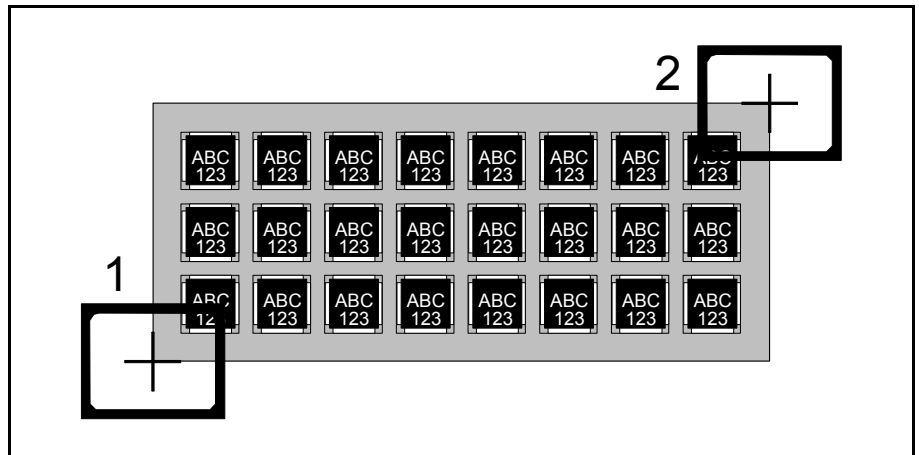

Figure 5-9. Positioning two tray corners

First and last component position

Figure 5-10 shows the cross hairs on the first component (1) and on the last component (2).

The tray is located by centering the cross hairs on the center of the components and on those leads which are defined in the *Toggle leads* field in the Package List. Change leads by pressing the <F3> key.

☞ When positioning the first component, the system does not know at what angle the tray, and thus the component, is. This means that the toggle-lead function may behave a bit strangely.
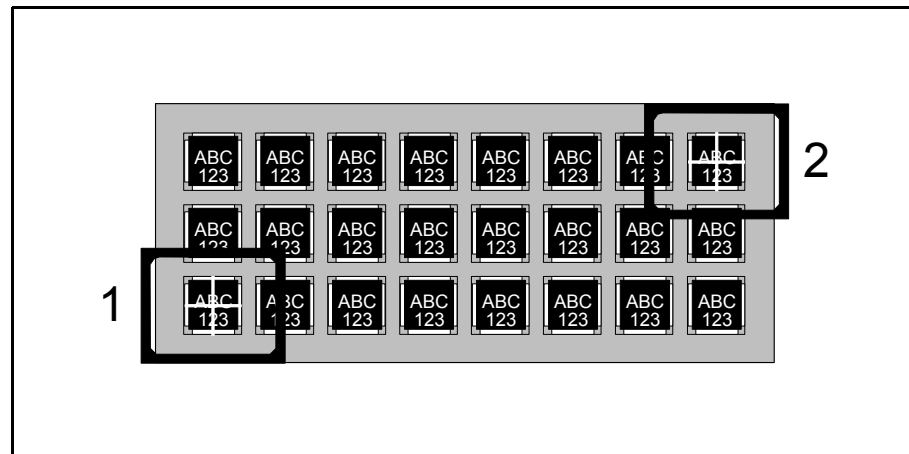

Figure 5-10. Positioning first and last component

Fiducial marks

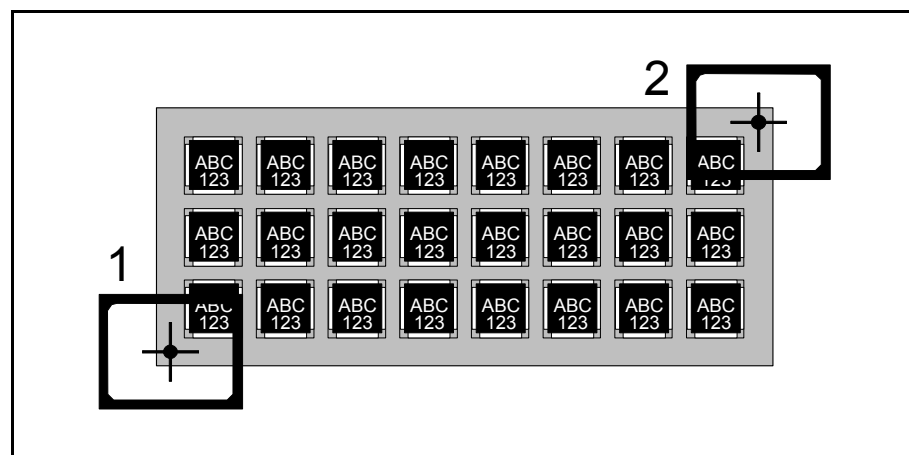Figure 5-11 shows the cross hairs on the first fiducial mark (1) and on the second fiducial mark (2).

Figure 5-11. Positioning fiducial marks

Pre-Defined Tray Positions

To reduce the locating time for tray positions, a Y-Wagon Position List feature lets you pre-define and store several tray positions, which can be used directly with no camera location.

Define a point ... By defining a point somewhere on the Y-wagon assembly table and place one of the tray corners at this point, the tray position is settled.

... put a tray corner at the point ...

... and tell the system which corner. That's all. The system must, however, get information about which corner you have placed at the defined point. Figure 5-12 shows the lower left tray corner placed at the lower left assembly table corner. Figure 5-13 shows the four corner options: *Lower left* (1), *Upper left* (2), *Upper right* (3), and *Lower right* (4).
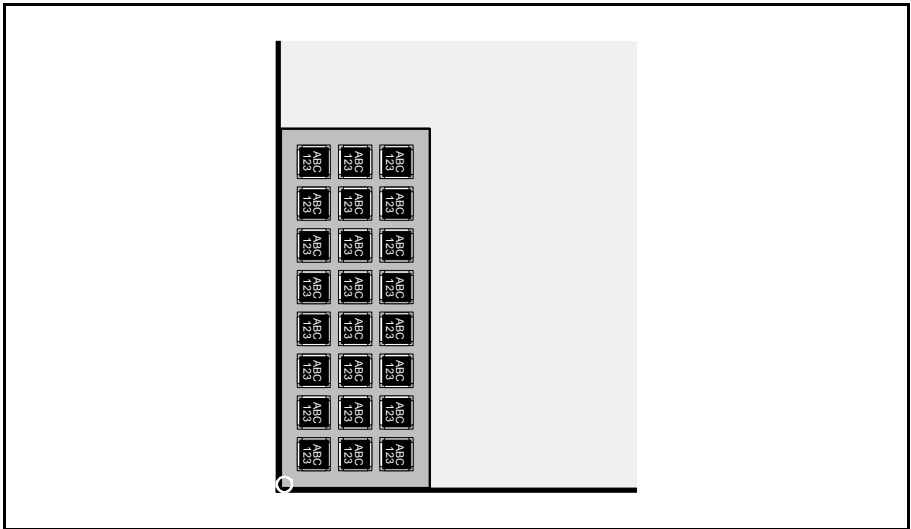

Figure 5-12. Tray at the lower left table corner

To be able to define a point on the assembly table and select a tray corner, see the *Y-Wagon Position List* section in the *Programming Manual* .

Bar code scanning ... Inserting pallet trays via the hand held barcode scanner is possible by scanning the tray name followed by a scanning of a tray position barcode.
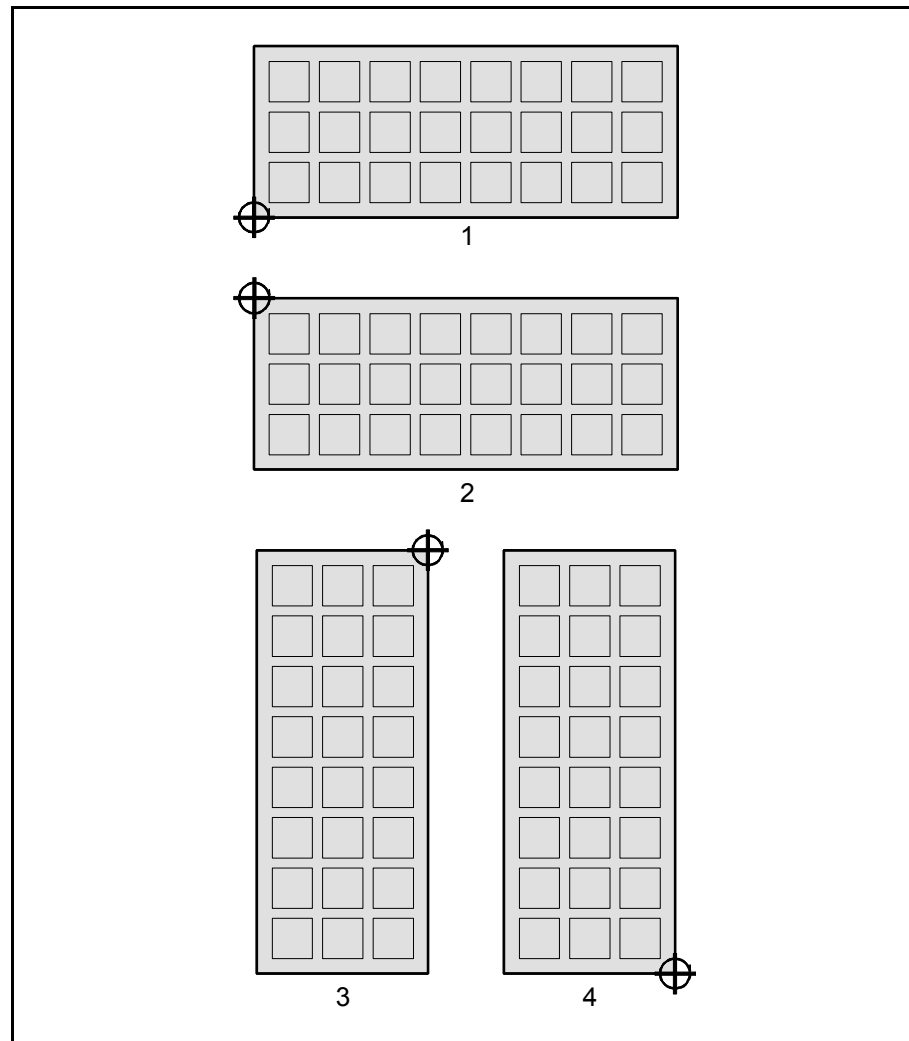
Figure 5-13. Tray corner at position point

As shown in Figure 5-13 the lower left corner is always the lower left corner, no matter how the tray is turned, and the upper left corner is always the upper left corner, no matter how the tray is turned.

The orientation can also be given by defining where the corner with the first component in the tray is located.

.
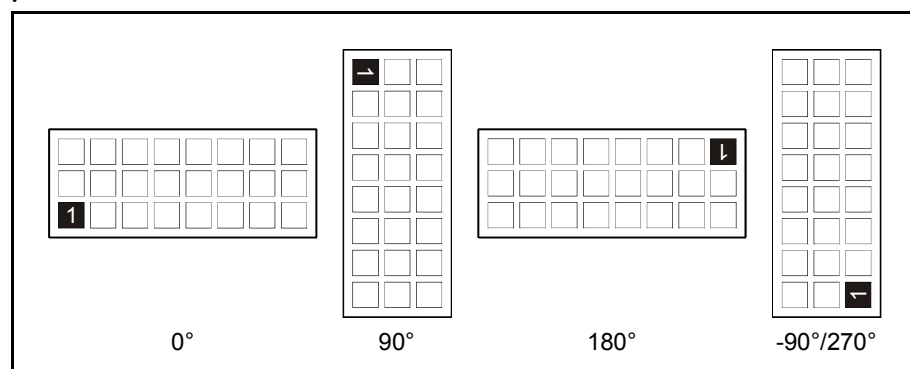
Figure 5-14. Tray orientation by defining location of first component

Tray wagon magazines

The Tray wagon magazines are handled more or less like the Y-wagon magazines. They must be located and quantities reported in a similar way.

Locating Trays on the Tray Wagon

A tray on the tray wagon is located by positioning two tray corners, two components on the tray (if defined), or two fiducial marks (if defined). This is carried out when *Position* in the Tray Wagon Magazine Editor (see above) is highlighted.

F1

Press <F1> and choose if you want to locate the tray by positioning corners, components, or fiducial marks in the same way as described for the Y-Wagon Magazine on page 5-25.

Tray Wagon Position List

To reduce the locating time for tray positions, a Tray Wagon Position List feature lets you pre-define and store several tray positions, which can be used directly with no camera location.

Define a point ...   By defining a point somewhere on the tray wagon table and place one of the tray corners at this point, the tray position is settled.

... put a tray corner at the point ...

... and tell the system which corner. That's all.   The system must, however, get information about which corner you have placed at the defined point.

Figure 5-15 shows the lower left tray corner placed at the lower left tray wagon table corner.

Figure 5-15. Tray at the lower left table corner
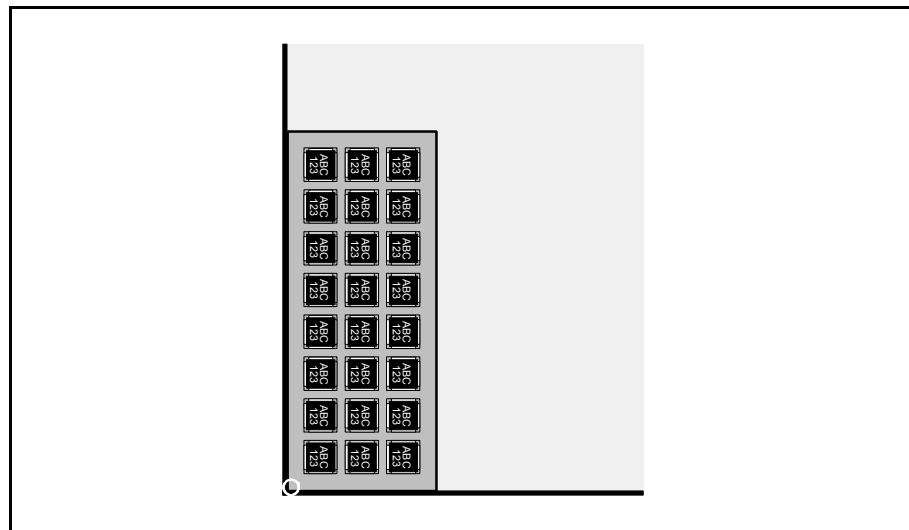
To be able to define a point on the tray wagon table and select a tray corner, open the Tray Wagon Position List by selecting the **Tray Wagon Magazine** option in the **Magazine** menu and then **Tray Positions**.

The Tray Wagon Position List has the same entries and functionality as the Y-Wagon Position List. So, the description on page 5-33 is applicable also to this list.

TEX List

The TEX List is opened by selecting the **TEX** option in the **Magazine** menu.

The TEX List Editor is shown in Figure 5-16 and the function keys are detailed below.
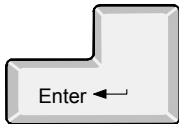
Edit TEX

By pressing <Enter>, you can set the name and type a comment text for the highlighted TEX unit.

Delete

By pressing <Del>, you can remove the highlighted TEX unit from the list, provided the unit is disconnected from the machine.

Locate pallet position

Press <F1> to locate the pallet positions. At least one pallet has to be inserted in each cassette to be located (not available in off-line mode).

Refill all trays

Press <F2> to reset the component quantity for all present pallets. The reset quantity is set in the Pallet Magazine List. To refill a specific tray, use the Pallet Magazine Editor.
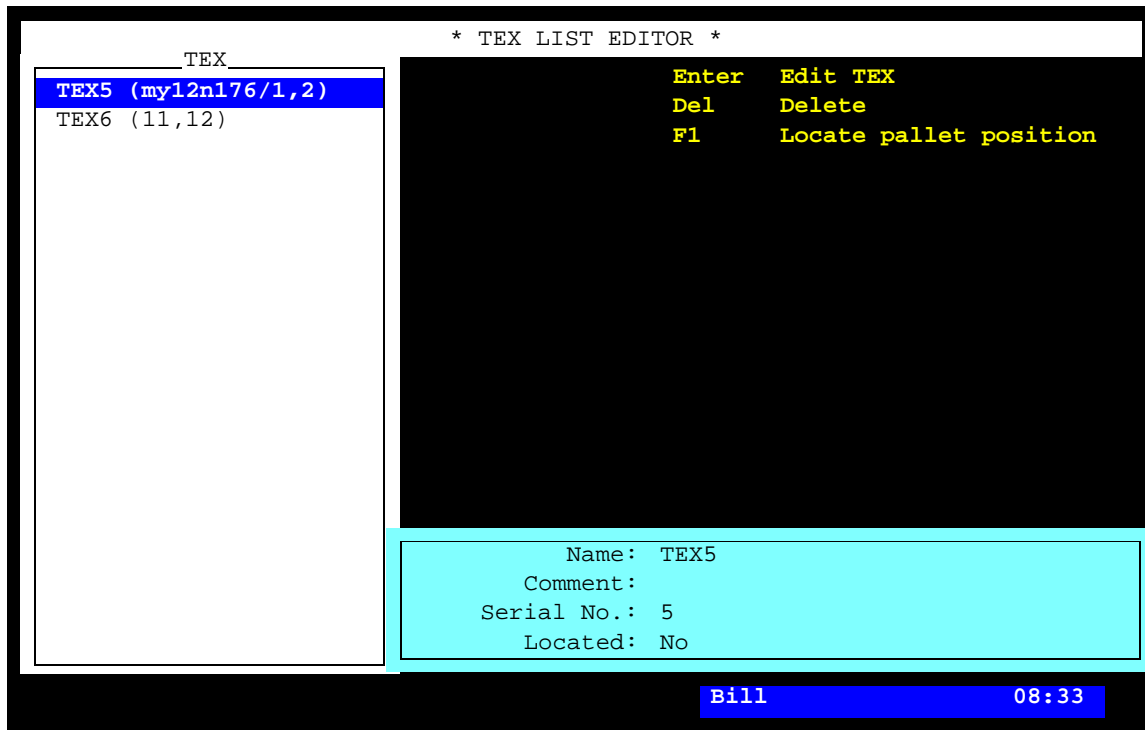
```
┌──────────────────────────────────────────────────────────────────┐
│                      * TEX LIST EDITOR *                           │
│        ┌─TEX─────────────┐                                         │
│        │TEX5 (my12n176/1,2)│      Enter   Edit TEX                 │
│        │TEX6 (11,12)      │       Del     Delete                   │
│        │                  │       F1      Locate pallet position   │
│        │                  │                                        │
│        │                  │                                        │
│        │                  │                                        │
│        │                  │                                        │
│        │                  │                                        │
│        │                  │                                        │
│        │                  │                                        │
│        │                  │    Name:    TEX5                       │
│        │                  │    Comment:                            │
│        │                  │    Serial No.: 5                       │
│        │                  │    Located:  No                        │
│        └──────────────────┘                                        │
│                                Bill                    08:33        │
└──────────────────────────────────────────────────────────────────┘
```

Figure 5-16. TEX List Editor

TEX

This list shows TEX units that are connected or have been connected to the system. A TEX unit that is initiated and connected to the current machine has the occupied magazine positions shown in brackets.
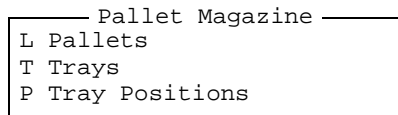
If several machines are connected to a network with shared databases, TEX units that are initiated and connected to other machines are listed with machine identification and magazine positions in brackets.

The highlighted TEX5 in the above figure is thus connected to machine MY12 number 176 and it occupies the magazine positions 1 and 2. Another TEX unit, TEX6 is connected to magazine positions 11 and 12 of the current machine.

Pallet Management

The pallets for the TEX unit are managed by selecting **Pallet Magazine** in the **Magazine** menu.

... and then selecting one of the following options:

```
┌─────── Pallet Magazine ───────┐
│ L Pallets                     │
│ T Trays                       │
│ P Tray Positions              │
└───────────────────────────────┘
```

Pallets

Opens the Pallet List for defining pallets. This list is described in Chapter 6 of the *Programming Manual*.
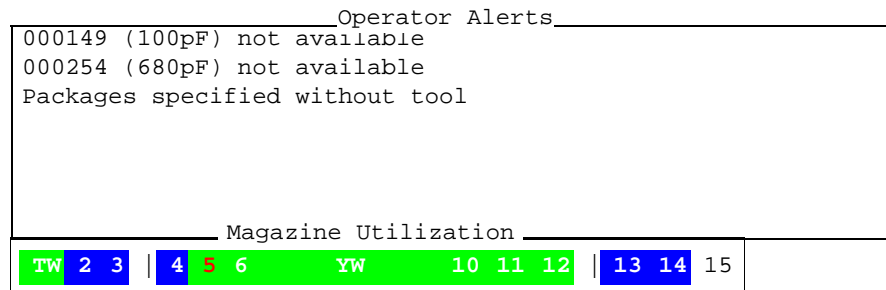
Trays

Opens the Pallet Magazine List editor. This editor is described in Chapter 6 of the *Programming Manual*.

Tray Positions

Opens the Pallet Position List for pre-defining and storing defined tray positions. This list is described in Chapter 6 of the *Programming Manual*.

Magazine Utilization

In assembling mode, there is a *Magazine Utilization* box below the *Operator Alerts* box:

```
                        Operator Alerts
 000149 (100pF) not available
 000254 (680pF) not available
 Packages specified without tool




                   Magazine Utilization
  TW  2  3  |  4  5  6        YW       10 11 12  | 13 14  15
```

The main purpose of the *Magazine Utilization* box is to point out those magazines which contain components for the current layout. This feature makes it easy to check if any of the magazines are not needed for the current layout and thus can be removed. In addition, the *Magazine Utilization* box gives information about inserted magazines and magazine status.

The magazine utilization information is continuously updated, even when the machine is not assembling.

Character key

1 – 19   Magazine positions, which can be from 1 – 9 to 1 – 19 depending on the machine type.

| This line indicates a machine frame (not shown for MY9 and MY12 machines).

YW   Y wagon, Y-wagon magazine.

TW   Tray wagon magazine.

TEX   TEX, Tray Exchanger.

Color key

White background indicates that the magazine position is empty, or has a buttoned out tape magazine.

Green background indicates that the magazine contains components for the current layout.

Blue background indicates that the magazine position is occupied but it contains no components for the current layout.

5 Red position number indicates pick error.

Magazine Errors

Magazine errors can be caused by for instance empty magazines, rejected components and loss of vacuum.

If an error occurs, a number of attempts to pick and place the component are done. If these fail the magazine must be withdrawn for the machine for refilling or solving of the problem.

Recorded errors for a particular magazine are cleared by withdrawing and re-inserting that particular feeder or magazine. It can also be cleared by pressing the magazine release button.

All recorded magazine errors can be cleared by selecting the **Reset Magazine Errors** option in the **Magazine** menu.

After a reset procedure, the system makes new attempts to pick and place all components.

Magazine Optimization

This feature creates a list containing a number of alternative magazine combinations for a desired layout.

The optimization list is created as follows:

- Select the **Magazine Optimization** option in the **Print** menu.

- Select the desired layout for the magazine optimization.

The magazine optimization is then carried out and a list is printed. This information can also be viewed in the web-interface.

An example of a print-out is shown on page 5-43.

```
Magazine optimization

Layout name: TV-ALL

Components not found in any magazine
Component          Comment         Qty./layout      Feeder type
000149             100pF           3                Tape/8mm
000501             1k Ohm 5%       2                Tape/8mm
000255             100 Ohm         4                Tape/12mm
7HC365                             1                Vibratory
Summary by feeder type of comp. not found in any mag
Feeder type    No. of feeders
Tape/8mm                         2
Tape/12mm                        1
Vibratory                         1
Magazine combinations
Magazine            Used feeders             Max no. of picks

Combination 1:
Mag-1               2/30                     1
Mag-2               3/16                     5

Combination 2:
Mag-1               2/30                     1
Mag-3               6/30                     8

Combination 3:
Mag-2               3/16                     5
Mag-3               6/30                     8
```

Entries in the Magazine Optimization list:

Components not found in any magazine

Components which are included in the selected layout but not loaded in any magazine. The quantity, magazines and feeder to use are shown. There is also a summary of the number of feeder types that are needed. This information can be used for a rough decision about where to load components. Typically you put the most frequent component close to the y-wagon. For an accurate magazine optimization use *MySpeed*.

Magazine

Magazines which contain components for the selected layout.

Used feeders

In front of the slash (/) character:
Number of magazine feeders that contain components for the desired layout.

After the slash (/) character:
The total number of feeders in the magazine.

Max no. of picks

Maximum number of picks for the desired layout.

Combination

Magazine combination number. Maximum number of combinations is set by a parameter.

Magazine Kit

The purpose of the Magazine Kit feature is to store information about the contents of the magazines used for the various layouts.

Component trays used by the Y-Wagon Magazine, Tray Wagon Magazine and TEX are also included in the kit information.

Next time you intend to assemble a layout, you can examine, modify if you wish, and print out the Magazine Kit information.

Prior to the next assembling, load the magazines as detailed on the printout and apply the Magazine Kit.

☞ *If you have MYLabel 2.0 installed all loading and unloading of components from magazines shall use MYLabel 2.0 barcode reader. Please see MYLabel 2.0 on page 5-51.*

You can open and modify a Magazine Kit off-line but you cannot apply it off-line.

The following example shows a Magazine Kit printout.

```
Magazine kit

Magazine kit name: TV1

Type Mag/Slot/Feeder   Component/Qty    Component comment
TM8  Audio/6/1          000149/4         100pF
TM8  Audio/6/2          000254/4         680pF
TM8  Audio/6/3          000255/3         820pF
TM8  TM8C-1234/7/3      000312/3
TM1216 Video/8/1        052567/2
TM1216 Video/8/2        0529/1
VM RGB/9/10             757533/1
YW -/QFP208-3*8         ABC123/2
```

The printout is further detailed on page 5-50.

Creating a Magazine Kit

- Load the layout for which the Magazine Kit is to be created.

- Select the **Create Magazine Kit** option in the **Magazine** menu.

- Enter a name for the new Magazine Kit. The name is, by default, suggested to be the same as the layout name:

```
Create New Magazine Kit
Enter name:
TV1
```

Now, the system starts scanning all the magazines for components used in the currently loaded layout. If a component is found in a magazine not inserted in the machine, you can choose to include the magazine in the Magazine Kit or skip it:

```
Magazine "TM8C-1234" not inserted in machine
Should it be included in the magazine kit?
                    Yes   No
```
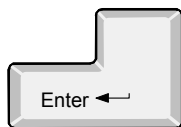
Magazine Kit List Editor

The Magazine Kit List Editor is opened by selecting the **Magazine Kits** option in the **Magazine** menu.

The Magazine Kit List Editor is shown in Figure 5-17.

Function keys in the Magazine Kit List Editor:

Edit magazine kit

Components included in the highlighted Magazine Kit is shown and can be edited by pressing <Enter>.

Insert new

A new Magazine Kit is added by pressing <Ins> and entering a new name and desired comment text.

Delete

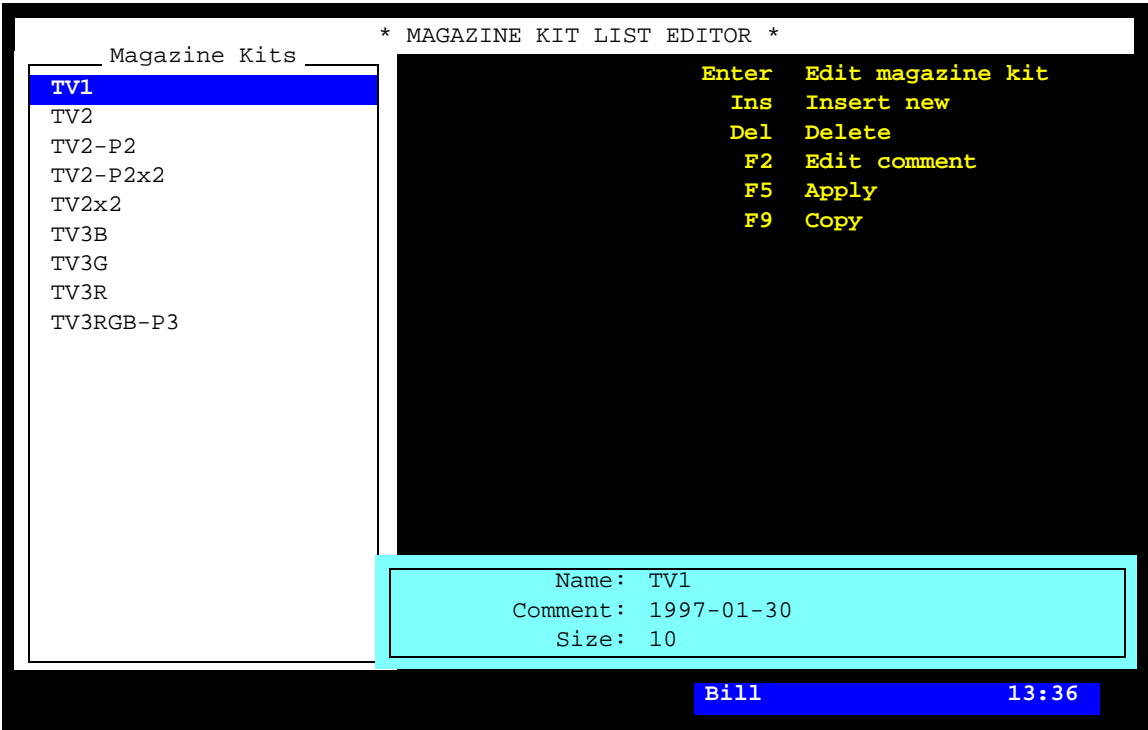The highlighted Magazine Kit is deleted by pressing <Del> and confirming the deletion in a popup box.

Figure 5-17. Magazine Kit List Editor

Edit comment

The Magazine Kit comment text can be modified by pressing <F2>.

F2

Apply

The highlighted Magazine Kit is applied, that is loaded into the Magazine List by pressing <F5> and confirming the application in the following dialog box:

F5

```
Concerned data in the magazine list will be replaced.
Do you want to apply kit "TV1"
                         Yes  No
```

☞ To apply a Magazine Kit means that the magazine information in the Magazine Kit is written to the Magazine List. *Existing information in the Magazine List is thus overwritten.* This is applicable only to components used in the magazines. Magazine data for components not included in the layout are not changed.

If a magazine included in the Magazine Kit is not inserted in the machine, you can choose to apply the Magazine Kit information or skip it. The following dialog box is shown when this is the case:

```
Magazine "TM8C-1234" is not inserted in this machine.
Apply its magazine kit data anyway?
            Yes Select another magazine No
```

If the *Select another magazine* option is chosen a new pop-up window appears. Either type in the new magazine name, or select from a list, reached by pressing <Tab>.

Copy

F9

The highlighted Magazine Kit can be copied by pressing <F9> and entering a new name and desired comment text in a popup box shown.

Assembly preparation

The following preparation is to be carried out before assembling a layout using the Magazine Kit feature:

- Print out the Magazine Kit information.

- Load the magazines strictly as detailed in the printout.

- Apply the Magazine Kit.

Hint ! If an assembled layout is to be assembled again in the future, then create a Magazine Kit for it before applying a new Magazine Kit.

Printing a Magazine Kit

You can print out a Magazine Kit as follows:

- Select the **Magazine Kit** option in the **Print** menu.

- Choose whether you want to print a selected Magazine Kit or all the Magazine Kits. If you choose *Print All Magazine Kits*, confirm the printing of all stored Magazine Kits in a popup box.

This is an example of a Magazine Kit printout:

```
Magazine kit

Magazine kit name: TV1

Type Mag/Slot/Feeder    Component/Qty    Component comment
TM8  Audio/6/1          000149/4         100pF
TM8  Audio/6/2          000254/4         680pF
TM8  Audio/6/3          000255/3         820pF
TM8  TM8C-1234/7/3      000312/3
TM1216 Video/8/1        052567/2
TM1216 Video/8/2        052579/1
VM RGB/9/10             757533/1
YW -/QFP208-3*8         ABC123/2
```

Type Mag/Slot/Feeder

Heading key (in the same order):
- The magazine type.
- User name of the magazine.
- The position in which the magazine is inserted. A hyphen '–' is displayed when a magazine is not inserted in the machine.
- The magazine feeder for the component.

Component/Qty

Component name referred to in the Component List, and number of components in the layout.
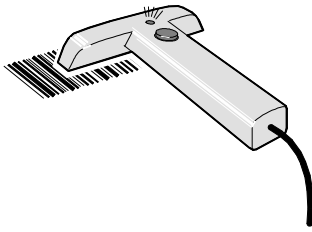
Component comment

The user comment text for the components.

Example

The first component in the example above is component 000149 (100pF) which is used on 4 places in the layout and it is found in feeder number 1 of the TM8 type magazine named *Audio* in magazine position 6.

Barcode Readers

A TPSys barcode reader (optional) can be used to scan component data when loading magazines or removable Agilis feeders (see page 5-2).

In addition to the barcode reader, two barcode labels are provided by MYDATA, one of which is necessary for using this feature with older types of magazines, see page 5-52 and page 5-53.

The magazine barcodes must be linked to the magazine names, and the component barcodes must be linked to the component names, see page 5-54 and 5-56.

Part numbers for the Magazine Barcode Labels and the Auxiliary Barcode Label are found in the *Spare Parts Catalog*.

This description is valid for the UBI ScanPlus ER barcode reader.

Stand alone server

The functionality described herein is also available on stand-alone data servers so that more operations can be carried out simultaneously. It is for instance possible to scan data for one layout while another is being assembled in the machine.

The barcode option must have been purchased for at least one of the machines on the network.

MYLabel

There is also a MYLabel facility available from MYDATA. MYLabel is an efficient tool for reading component names and keeping order of remaining component quantities. The MYLabel facility is run on a separate Windows 95/98/NT system.

MYLabel 2.0

MYLabel 2.0 keeps track of all individual reels and sticks, called Component Carriers. As TPSys currently do not support the Carrier function this information is stored in a PC database.

☞ *To ensure that the MYLabel database is valid, component loading and unloading, must be done by using the MYLabel 2.0 barcode reader. Loading magazines with the Kit list or by importing data will break the link between the Carrier database and the Component list in TPSys.*

For further information about MYLabel, contact MYDATA.

The following description does not include the MYLabel facility.

Configuration

The TPSys barcode reader is configured by scanning the following three barcodes:

Code 128

9600, 7, E, 2

Aiming and reading beam setting.

☞ *Scan these barcodes from top to bottom (the down most code must be read as the last code).*

Magazine Barcode Label

Each magazine, except for Agilis, must be equipped with a magazine barcode label, attached to the magazine front, see Figure 5-18. This label is necessary for the barcode feature and it is unique for each magazine.
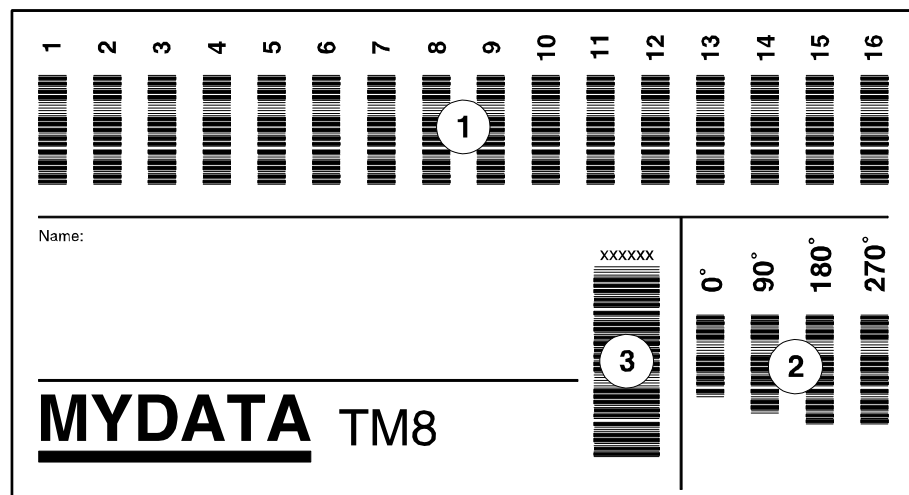
Figure 5-18. Magazine barcode label

Section 1

This section contains feeder number codes. The number of codes should correspond to the number of feeders in the magazine, except for vibratory magazines which has a usable number of feeders on the label.

Section 2

Component angle which applies to the Magazine List.

Section 3

A unique number which should be linked to the magazine name. In addition, this code is the enter command which must always be read as the last code.

There are three small labels provided with the Magazine Barcode Label on which the magazine barcode is printed. These labels are intended to be used in magazine binders for programming components without needing the magazines.

Auxiliary Barcode Label

Figure 5-19. Auxiliary barcode label
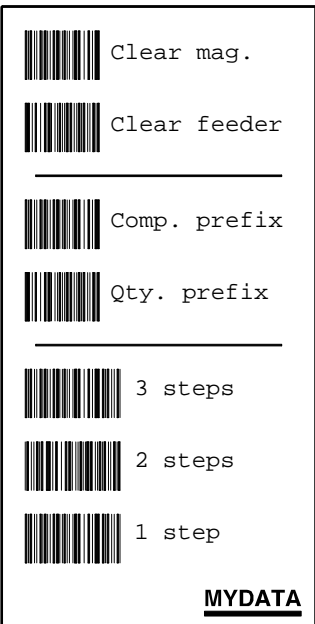
Clear mag.

Clears all the feeders in the selected magazine.

Clear feeder

Clears selected feeder.

Comp. prefix

Sets aside the component prefix requirement for scanning unprefixed manufacturer component barcode labels on for instance tape reels, plastic tubes, storage boxes and delivery notes.

Qty. prefix

Sets aside the quantity prefix requirement for scanning unprefixed manufacturer quantity barcode labels on for instance tape reels, plastic tubes and delivery notes.

3 steps, 2 steps, 1 step

Number of tape advancement steps per component. For tape magazines only.

Linking Magazine Barcodes to Magazines

1. Open the Magazine List by selecting the **Magazines** option in the **Magazine** menu.

2. In the Magazine List Editor, select the desired magazine and press <F2> for editing the magazine name and barcode, see Figure 5-20.

3. Using the barcode reader, scan the magazine barcode on the Magazine Barcode Label, section 3 in Figure 5-18 on page 5-52.

The unique magazine barcode is now shown in the *Barcode* field.
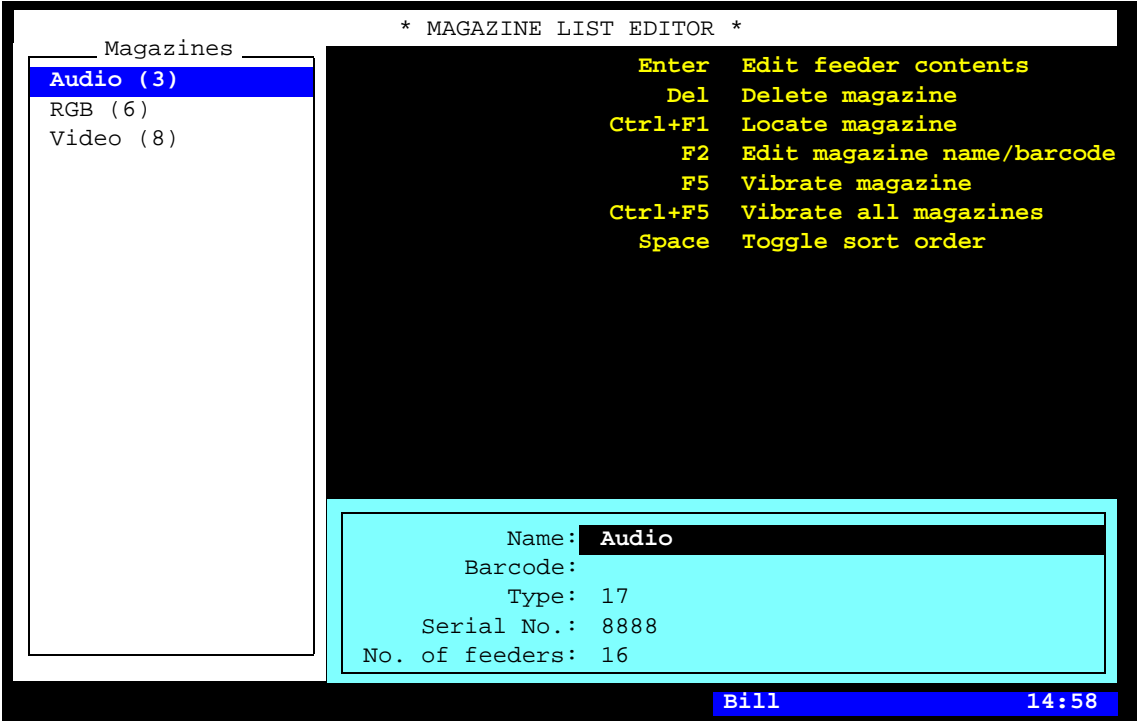
```
 _____     * MAGAZINE LIST EDITOR *
|      Magazines        |                    Enter  Edit feeder contents
| Audio (3)             |                      Del  Delete magazine
| RGB (6)               |                  Ctrl+F1  Locate magazine
| Video (8)             |                       F2  Edit magazine name/barcode
|                       |                       F5  Vibrate magazine
|                       |                  Ctrl+F5  Vibrate all magazines
|                       |                    Space  Toggle sort order
|                       |
|                       |
|                       |
|                       |
|                       |
|                       |
|                       |        _____
|                       |       |         Name: Audio            |
|                       |       |      Barcode:                  |
|                       |       |         Type: 17               |
|                       |       |    Serial No.: 8888            |
|_____|       | No. of feeders: 16             |
                                |_____|
                                          Bill                14:58
```

Figure 5-20. Tape and Vibratory Magazine List Editor

4. Press <Esc> and confirm the modification. You are returned to the Magazine List Editor main window.

Repeat this procedure for all tape and vibratory magazines.

Linking Component Barcodes to Components

1. Open the Component List by selecting the **Components** option in the **Editor** menu.

2. In the Component List Editor, select the desired component and press <Enter> for editing the component.

3. Using the barcode reader, scan the component barcode on for instance the tape reel, plastic tube, storage box or delivery note.

The code does not have to be the same as in the *Name* field. Any unique code can be linked to the highlighted component.

The component string is now shown in the *Barcode* field.

If the manufacturer component code prefix is missing, then you can scan the *Comp. prefix* code on the Auxiliary Barcode Label, and then scan the component code again. All characters including the first one will be included in the component string.

4. Press <Esc> and confirm the modification. You are returned to the Component List Editor main window.

Repeat this procedure for the components which are to be used with barcode scanning.

Loading Magazine Using Barcode Scanning

The following scanning sequence is a complete barcode scanning. You can choose to omit scanning some of the objects, and you can change the scanning order.

But, you must always start with the component code, and you must always finish with the magazine code.

> *Component code first – Magazine code last!*

You can have any window opened on the screen when scanning.

However, if you have the Magazine List Editor opened, you can see the information read with the barcode reader.

Component code

MANDATORY! Scan the barcode for the loaded component on for instance the tape reel, plastic tube, storage box or delivery note.

If the manufacturer component code prefix is missing, then you can scan the *Comp. prefix* code on the Auxiliary Barcode Label, and then scan the component code again. All characters, including the first one, will be included in the component string.

If the component code prefix is incorrect, then you can change it in a component prefix parameter, see the previous *Linking Component Barcodes to Components* section.

Component batch number

Scan the manufacturer component batch id on for instance the tape reel, plastic tube, storage box or delivery note.

The batch id will be inserted in the *Batch ID* field in the magazine feeder contents window, shown by pressing <Enter> in the Magazine List Editor.

Quantity

Scan the component quantity for the loaded component on for instance the tape reel, plastic tube, storage box or delivery note.

If the quantity code prefix is missing, then you can scan the *Qty. prefix* code on the Auxiliary Barcode Label, and then scan the quantity code again. All characters, including the first one, will be included in the quantity code.

Tape advancement steps per component

Select required number of advancement steps per component: 1 step, 2 steps or 3 steps by scanning appropriate code on the Auxiliary Barcode Label.

Component angle

On the Magazine Barcode Label, scan applicable angle in which the component is oriented in the magazine.

The default angle is 90° for tape magazines and 0° for vibratory magazines. You do not need to scan the angle if the default angle is correct.

Feeder number

On the Magazine Barcode Label, scan the applicable feeder number for the component.

If you do not scan the feeder number, the system selects the first unloaded feeder number.

Auxiliary codes

There are auxiliary barcodes for:

Single component
Single quantity
Single batch ID

TPSys can handle these auxiliary barcodes even if the barcode label does not have prefixes for these codes. The default barcodes are +C, +Q and +B .

Magazine code

MANDATORY! On the Magazine Barcode Label, scan the magazine code.

This scanning enters the command.

Checking the Magazine Load

To check a magazine load, scan:

- Component code
- Feeder number
- Magazine code

If the information read corresponds to the load information, no message is displayed.

If the information read does not correspond to the load information, a message is displayed in the message box telling that the magazine feeder is occupied.

Clearing Magazine Feeder

Clear a magazine feeder by scanning the following items on the Auxiliary Barcode Label:

- Scan the *Clear feeder* code.
- Scan the desired feeder number to be cleared.
- Scan the magazine code.

Clearing Magazine

Clear an entire magazine by scanning the following items on the Auxiliary Barcode Label:

- Scan the *Clear mag.* code.
- Scan the magazine code.

Trays position

In tray editors and tray position editors it is possible to edit barcode fields by using a hand held barcode scanner.

Inserting a tray by:

1. Scan the tray name barcode. For pallet trays the load sequence ends with the scanning of a pallet.
2. Scan the tray position barcode belonging to the machine.

It is possible to scan the angle of the tray between the scanning of the tray and the tray position. This defines the orientation of the tray in the tray position, see page 5-34. If no angle is scanned 0 will be used.

Glue Station

The Glue Station is an optional device that all the MYDATA placement machines can be equipped with.

The Glue Station is used as a reservoir for glue to be applied onto the boards.

Replenish glue as follows:

1. Move the glue leveling arm upwards.

2. Fill glue.

3. Adjust the glue leveling arm to the new glue level.

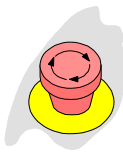# 6. Board Handling

Different board handling systems are available for the MYDATA pick an place machines. The board handling systems operate on the so called Y-axis. The machine can have a manual board handling system or an automated in-line conveyer system.

This chapter details:

• Manual Load systems

• In-line systems

Safety

Both the Manual Load system and In-line system is controlled by the machines safety system. Press any of the Emergency stop buttons and the Y wagon will stop.

Hoods cover the Y wagon and internal conveyors to ensure that no foreign objects, hands or fingers are within the risk area. Safety switches are mounted on these hoods. The switches will stop any machine movements whenever the hood is opened.
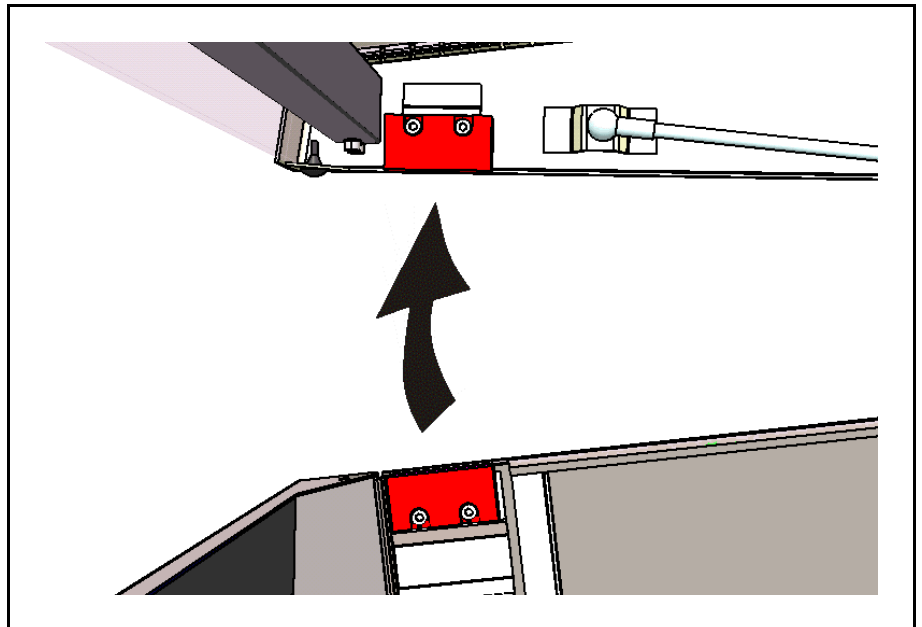
Figure 6-1. Hood safety switch

Always press down an emergency stop button before opening a hood to ensure maximum safety.

Manual Load System

A Manual Load system holds the PCB in the machine. It can hold PCBs of different sizes and/or shapes simultaneously. Unused areas on the load table can be used for component trays.

Figure 6-2. Manual Load system

Handling Boards

The PCBs are secured in position using magnetic supports.
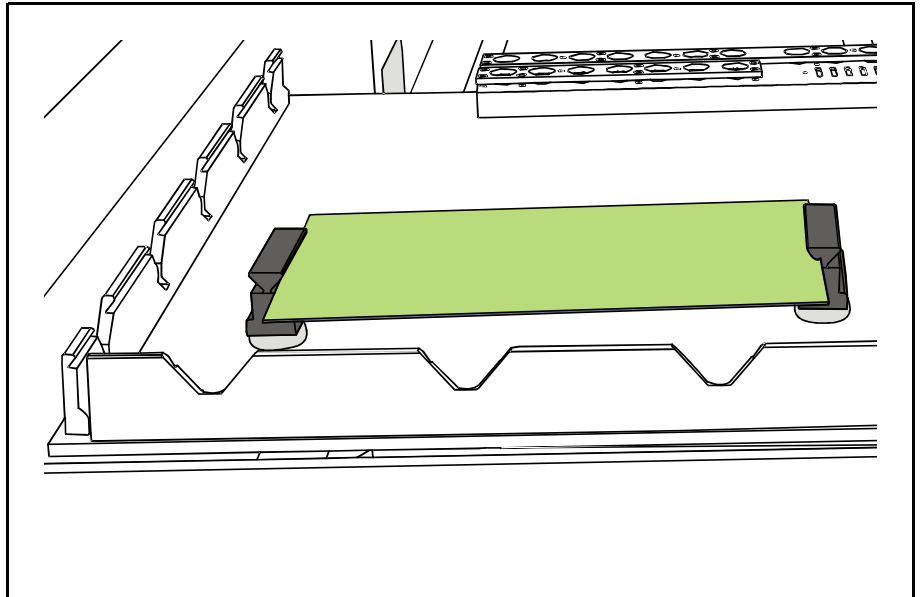
Figure 6-3. Positioning PCB with magnetic supports

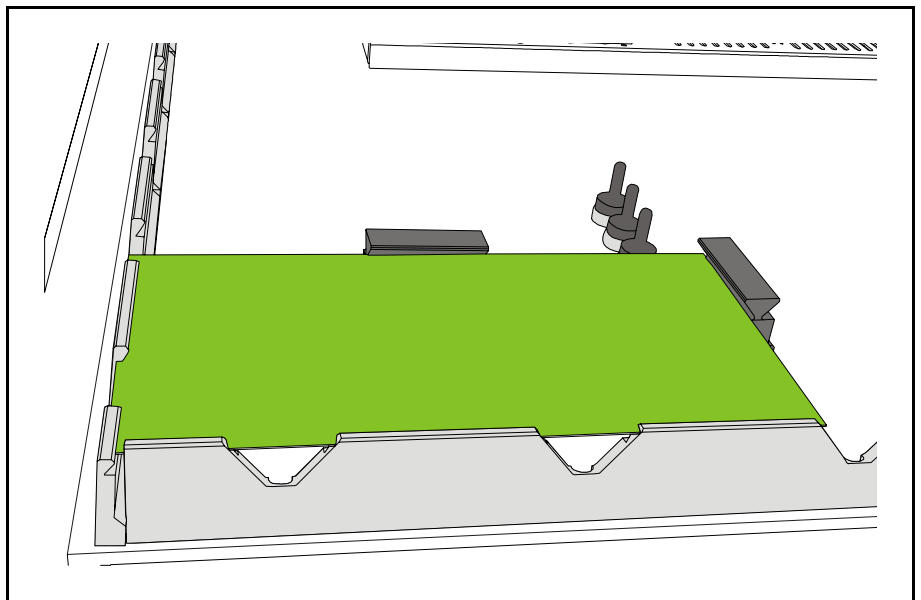There are also card supports available on the tables side.
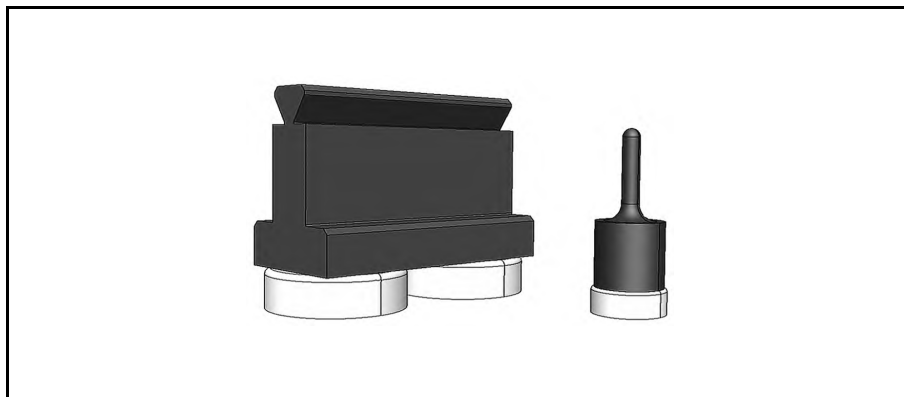

Figure 6-4. Positioning of PCB in corner

Figure 6-5. Magnetic supports

Magnetic supports come in varying sizes and models as can be seen in Figure 6-5. Each support handles one PCB on either side.

Card support pins ensure that you avoid card flexing during mounting. Flexing cards means a lower mounting accuracy and decrease the mounting speed considerably. It is therefore better to use a number of supports, especially if the PCB is large and/or thin.
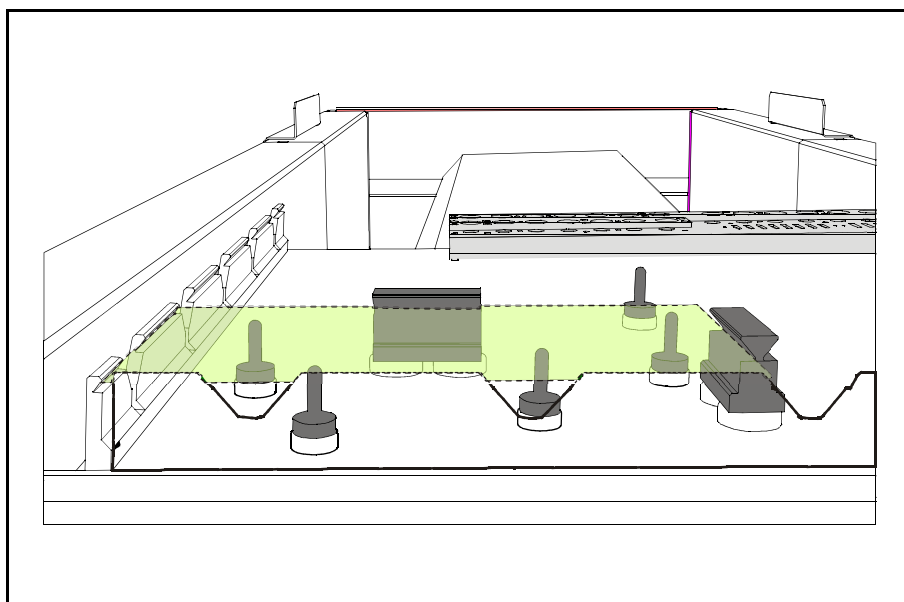
Figure 6-6. Support the board to avoid flexing

Assembling

Loading boards for assembly is done as follows after having chosen the Layout:

1. Move the Y wagon to the front position in one of the following ways:

   – Press the *Front/Back* key on the machine keypad.

   – Press the <Ctrl> and Y keys on the keyboard simultaneously.

   – Select the **Move Y Wagon** in the **Production** menu, and then the **Front** option.

2. Press down an emergency stop button. This will stop all machine movements.

3. Open the hood.

4. Using magnetic supports, place the boards included in the layout on the assembly table. If you want to save time locating the boards, then place the boards in the same way as last time the layout was used.

5. Close the hood.

6. Release the emergency stop button. The machine is now active again.

7. Select **Assemble** in the **Production** menu.

Please see Chapter 3 for illustrations of the above mentioned menus.

In-Line Systems

In-line systems are conveyor systems available as Tee style or Pass through.

Empty PCBs are loaded, transferred to the machine, aligned, populated with components, and then transferred to an oven for soldering.

In both systems the PCB is carried on an internal conveyor on the Y wagon. External conveyors carry the boards to and from the machine. There are also board loaders and unloaders that can be integrated into the system.

It is also possible to use a ML adapter (Manual load table). This allows the in-line machine to be used for stand alone assembly. It sits between the two conveyor rails on the internal Y wagon conveyor.

Tee Style

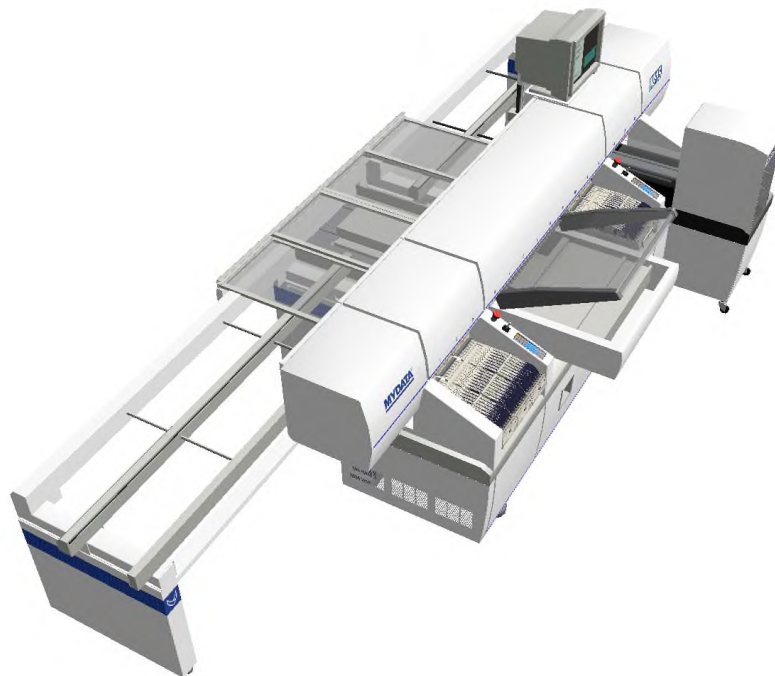The Tee style system has all external conveyors passing along the rear of the machine.

Figure 6-7. Tee style

The internal conveyor fetches a PCB from the external conveyor and brings it into position. When the machine has placed the components, then the internal conveyor takes the PCB back out to the external conveyor, picks a new PCB, and so on.

Pass Through

As the name implies, this system has conveyors passing through the machine. There is the choice of having the line going through the center, or either end of the machine.
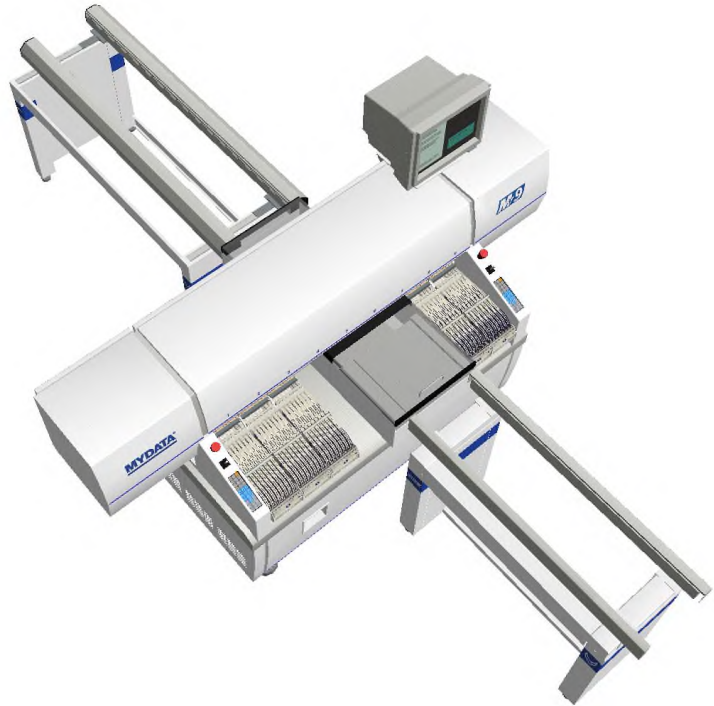

Figure 6-8. Pass through

Pass through use shorter conveyors, and therefore overall line length can be kept down.

In this system the external conveyor delivers the PCB up to the Y wagons internal conveyor. The internal conveyor grabs the PCB, aligns it in the machine and then releases the PCB onto the next external conveyor after component placement.

Handling Boards in In-Line Systems

The handling of boards in the in-line systems is similar whether it is Tee style or Pass through.

The internal conveyor shall normally grab and load boards automatically. This is set in the *1004 Conveyor switches*, see *Switches* in Appendix A.

Handling boards manually

Sometimes you must run the internal conveyor manually.

Select the **Production** menu and then **Conveyor Control**.

Select action from the menu:

```
┌──── Conveyor Control ────┐
│ L Conveyor Load/Grab     │
│ R Conveyor Release & Unload
│ W Set Conveyor Width     │
└──────────────────────────┘
```

- **Conveyor Load/Grab**

  Loads a new board, adjusts the position (for automatic fiducial mark search), and grabs the board.

- **Conveyor Release & Unload**

  Releases the board and moves it out of the machine.

- **Set Conveyor Width**

  This feature only affects the Y-wagon conveyor on the machine. Surrounding conveyor system is not affected. The feature is used to:

  – Read off the current conveyor width, which is shown after selecting this menu option. If a layout is loaded, the board width is shown (zero is shown for a board which has no board size set).

  – Set the conveyor width by typing the conveyor width in the dialog box and confirming it. The conveyor will change to the new width after emptying present boards, if not empty.

7. Tools

This chapter briefly describes the various mount tools that are used on MYDATA machines.

The HYDRA Speedmount ATE system described in more detail is also included in this chapter, which is divided into the following main parts:

- Standard Mount and Glue Tools, page 7-2.

- HYDRA Mount Tools, page 7-4.

- The HYDRA Speedmount ATE System, page 7-5.

Standard Mount and Glue Tools

A standard mount tool consists of a tube mounted in a cylinder. The tool is held in the tool head by two O-rings on the cylindrical section of the tool. The O-rings should be lubricated to avoid drying out.

The mount tool is connected to an air pump and to a vacuum pump via valves. A negative pressure for holding components as well as an over pressure to quickly release components can thus be provided through the tool.

Mount tools must be kept free from dirt and foreign particles to prevent the tube from being blocked.

Standard mount tools are available with spring loaded or stiff tubes. Tools are available in black or bare metal color. Black tools are used to achieve a better contrast at optical centering of components.
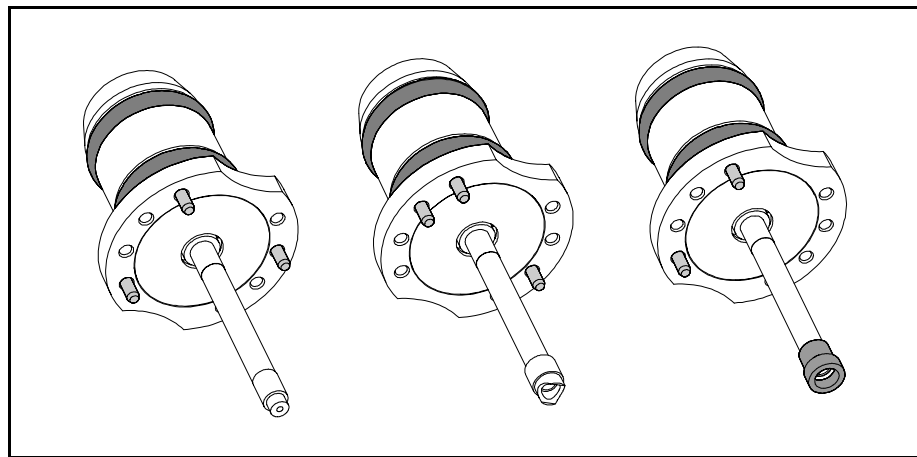

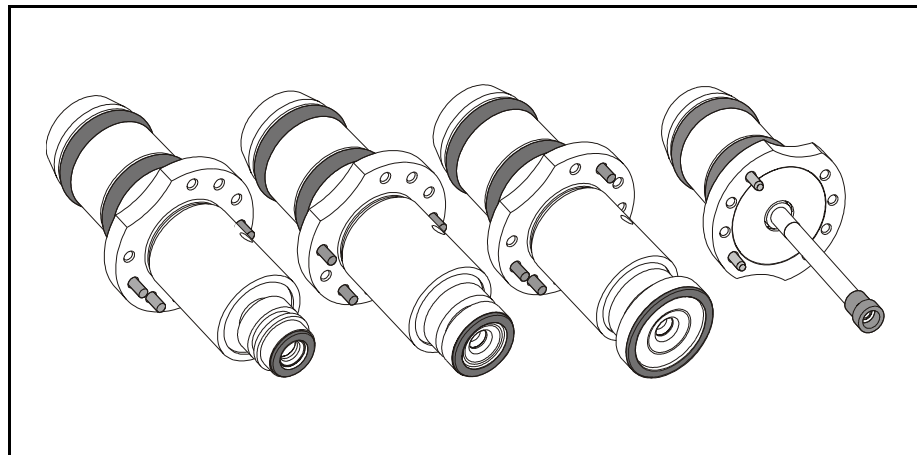*Figure 7-1. Stiff tools*

Figure 7-2. Spring tools

Tools for applying glue have the same cylindrical upper section, but a solid shaft instead of a hollow tube. There are also custom designed tools available like tools with flat pipe nozzles for connectors.

Tool installation is detailed in the *Machine Manual*.

Tool codes

Standard mount and glue tools are coded with a letter and two digits, see Figure 7-3.
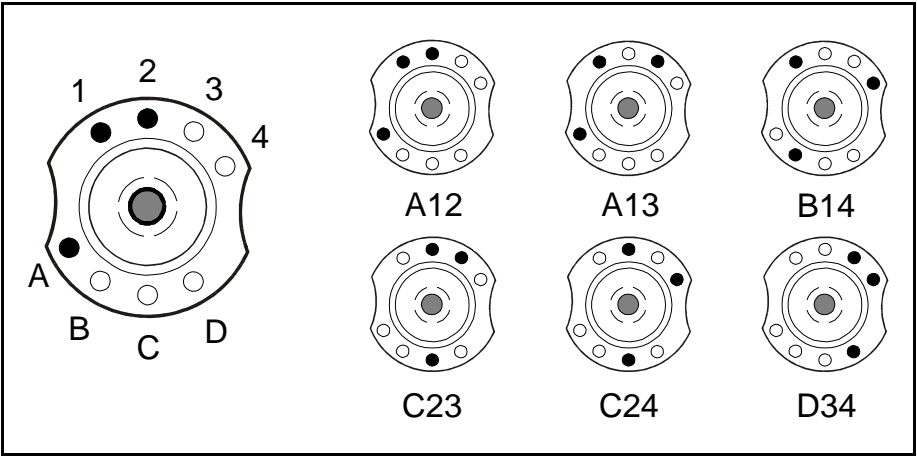

Figure 7-3. Tool coding

- The letters can be: A, B, C and D.
- The digits can be: 1, 2, 3 and 4.

Each tool has three pins indicating its code.

The tools are stored in a tool bank on the machine when not in use. From this bank the machine picks the required tool.
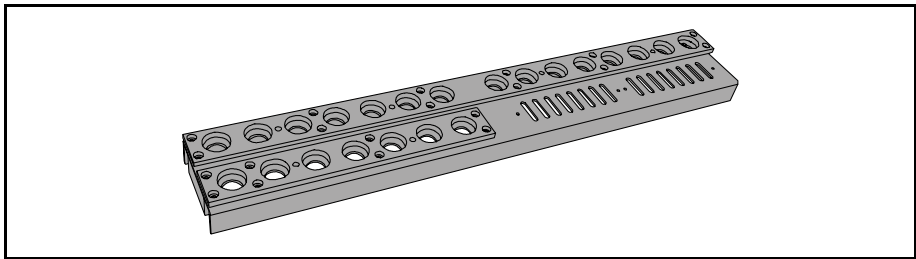

Figure 7-4. Tool bank

The tools position in the machine tool bank is defined by the tool code. The standard tool bank has the layout in Figure 7-5.
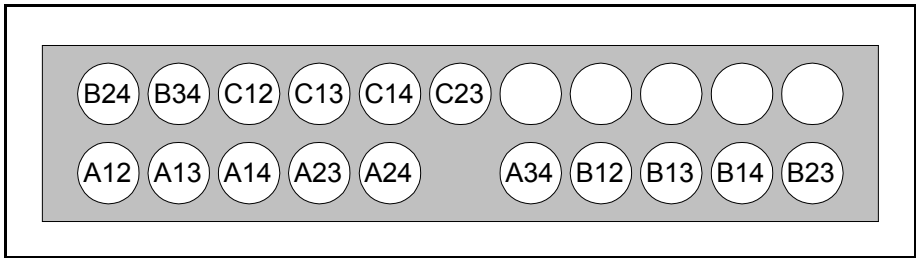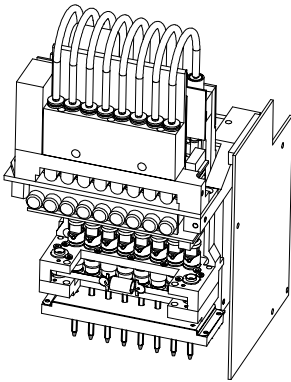

Figure 7-5. Standard tool bank
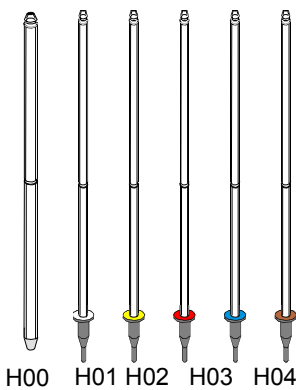
HYDRA Mount Tools

The HYDRA unit is a speed placement unit with eight mount tools.

The mount tools are connected to an air pump and to a vacuum pump via individual valves. A negative pressure for holding components and an over-pressure to quickly release components can thus be provided individually through the eight mount tools.

The eight HYDRA mount tools can be moved downwards and upwards in common or individually. Eight components can thus be picked from a magazine either simultaneously or individually and then be placed individually.

The HYDRA unit can pick components from the Agilis, TM8, TM8F, TM12, TM16 and TM1216, TM-flex, and vibratory magazines.

The HYDRA mount tools consist either of a plain tube (H00) or a tube with a changeable nozzle (H01 – H06), see the figure.

These tools can be used for the following packages (further packages may have been added after issuing this manual):

- H00 (plain tube) for the 0603 – 1210 package range and smaller SOIC packages.

- H01 (white) for the 0402 – 1206-06 package range.

- H02 (yellow) for the same packages as H00.

- H03 (red) for 1206 – 2512 chip packages and for SC-59, SO8, SO14, SOT89, SOT223, SSOP20, SSOP24, SSOP28, and M3216 – M7343 packages.

- H04 (blue) for 0603 – 1206 chip packages, MELF3514, SOD-80 and SOT-23 packages. This tool has a rubber tip designed to handle round components as well as tall capacitors.

- H06 (brown) for 0201 – 0402 package range.

Mount tools must be kept free from dirt and foreign particles to prevent the tubes from being clogged up.

Tool replacement is detailed in the *Machine Manual* and has to be carried out by service personnel.

H00 H01 H02 H03 H04

The HYDRA Speedmount ATE System

HYDRA Speedmount ATE, Automatic Tool Exchanger, is a system for changing HYDRA tools automatically.

Each tool is held in place on the tool tube by two O-rings. This ensures that the tool is always properly aligned and can be replaced without re-calibrating the HYDRA unit.
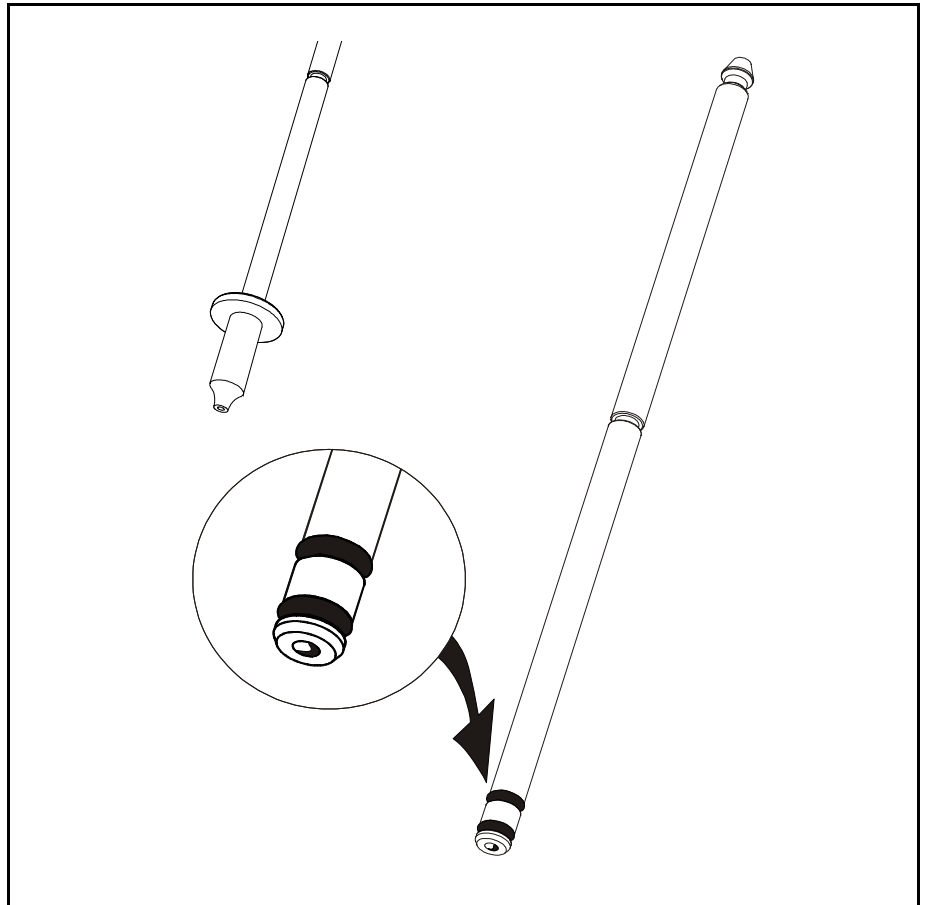

Figure 7-6. HYDRA tool tube

The HYDRA tools are stored in a HYDRA tool bank when not in use. When the tools are to be exchanged, the HYDRA unit moves to the bank and the tools are exchanged.

Each tool resides in an own position in the tool bank.

The first tool tube (position 1 in the HYDRA unit) fetches a tool from one of the two tool slots with index number 1 in the tool bank, see Figure 7-7. The second tool tube (position 2 in the HYDRA unit) fetches from one of the slots marked 2 and so on.

HYDRA tool bank

There are two types of HYDRA tool banks:

- Standard type for 500 T2 conveyor and 288, 468 and ML 3 – 6, T5, and T6 tables, see Figure 7-7.
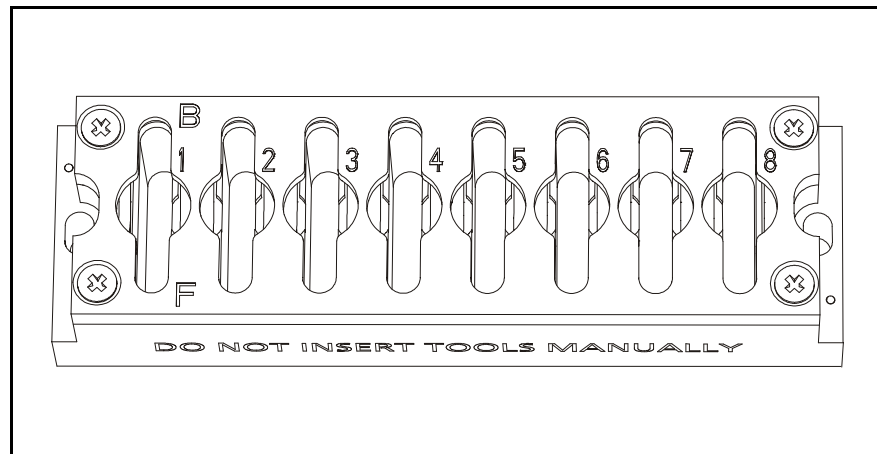
Figure 7-7. Standard tool bank

- PT type for 400 PT and 420 PT conveyors, see Figure 7-8.

Figure 7-8. PT tool bank

A HYDRA tool bank can hold up to 16 tools in two rows by eight tool positions, see Figure 7-9.

Figure 7-9. Tool bank positions, slots and rows

The rows are called Front (marked 'F') and Back (marked 'B') corresponding to their Y positions in the tool bank. Front is the row facing the operator. A slot has two tool positions for one tool each, front and back.

Operations

We will describe the following operational actions for the ATE system:

- Inserting HYDRA tools automatically, page .
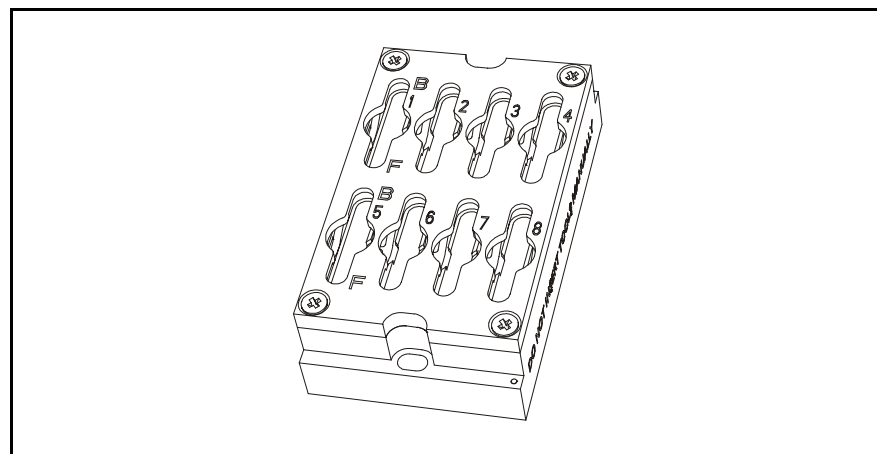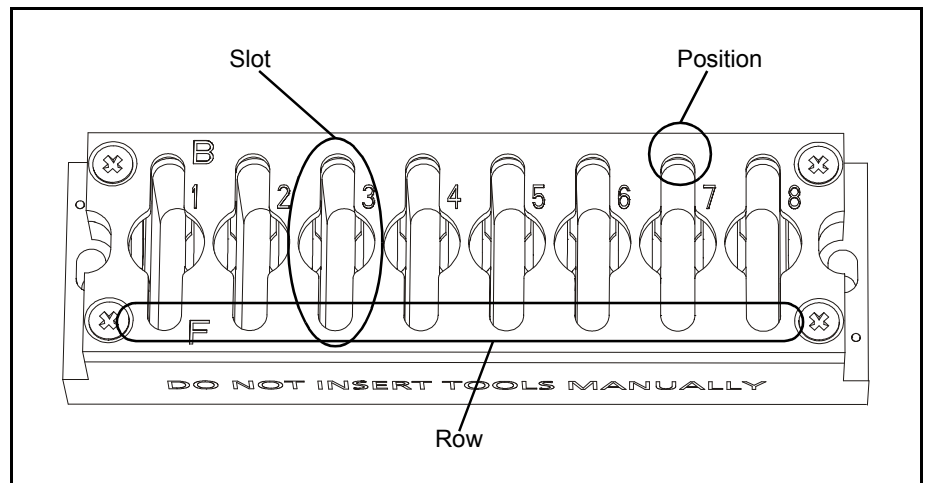- Removing HYDRA tools automatically, page .
- Inserting HYDRA tools manually, page .
- Removing HYDRA tools manually, page .
- Disabling tool bank slots, page .
- Enabling tool bank slots, page .
- Displaying HYDRA tools in the HYDRA unit, page .
- Displaying HYDRA tools in HYDRA tool banks, page .

Inserting HYDRA tools automatically

When inserting HYDRA tools automatically, you manually apply the tools to the tool tubes on the HYDRA unit and let the HYDRA unit place them into the tool bank.

☞ *Do not manually insert a tool into an installed HYDRA tool bank because the HYDRA unit will, most certainly, bend the tool tube.*

For optimal speed and efficiency we recommend you to have only one type of HYDRA tools (H01, H02, H03, H04, or H06) in each bank row.

1. Select the **Installation** option in the **Utility** menu:

```
Utility
I Import
X Export
T Installation
D Diagnostics
M Re-Initiate Motor Controllers
O Re-Initiate Conveyor
C Conveyor Pass-Through Mode
G Login / Logout
A User Access System
W Web Interface Setup
E Clear Event Log
N Delete Management Data
-----------------------------
B Backup
R Restore
H Schedule Backup
S Save System Status
F Format DOS Diskette
U Units
L Language
```

2. Select **HYDRA**:

```
┌──────── Installation ────────┐
X X-Wagon Camera Calibration
C Centering Base Level Measurement
P Place Area Calibration
W Tray Wagon Installation/Removal
O Z-Unit Offset Measurement
S Adjust Slot Position
T Tool Installation
V Optical Centering Calibration
U Optical Centering Camera Offsets
F Centering Camera Fine Tune
H HYDRA
R Cable Resistance Measurement
B Adjust Y-wagon reject bins
L Test Place Area Calibration
```

3. Select **HYDRA Tool Utility**:

```
┌──── HYDRA ────┐
M Measure HYDRA Camera Z Height
A Align HYDRA Camera X/Y
S Coarse Adjust HYDRA Tool Offsets
T Measure HYDRA Tool Tube Lengths
B Align Ref. Background
C Calibrate HYDRA Camera Optics
R Measure Ref. Background Height
L Measure HYDRA Ref. Line
Y Measure Centering Offset For HYDRA Camera
E Measure Centering Offset For Linescan Camera
O Measure HYDRA Tool Offsets
H HYDRA Tool Utility
```

4. Select **Insert automatic HYDRA tools**:

```
┌──── HYDRA tool utility ────┐
Install HYDRA tool bank
Uninstall HYDRA tool bank
Insert automatic HYDRA tools
Remove automatic HYDRA tools
Insert Manual HYDRA Tools
Remove Manual HYDRA Tools
Enable tool slots in HYDRA bank
Disable Tool Slots in HYDRA Bank
Show HYDRA tools on HYDRA
Show HYDRA tools in bank
```

F10

You can also press <F10> and open the **HYDRA Tool Utility** menu from the hot menu.

```
┌──── Hot Menu ────┐
Reset Magazine Errors
Package List Editor
Component List Editor
Magazine List Editor
Parameter Editor
Switches
Mount/Glue Switches
Fiducial Mark List Editor
Y Wagon Magazine
Tray Wagon Magazine
Pallet Magazine
Select Unit
View Messages
Set Message Time Mark
HYDRA Tool Utility
```

The HYDRA unit leaves any automatically inserted tools in the tool bank. If manually inserted tools remain on the tool tubes, then you have to remove them manually. The HYDRA unit moves to the intervention X position.

5. Select tool bank and front or back row from the list of available rows:

```
┌ Select HYDRA tool Bank and Row To Insert To ┐
HYDRA Tool Bank A, Front Row (
HYDRA Tool Bank A, Back Row (
HYDRA Tool Bank B, Front Row (
HYDRA Tool Bank B, Back Row (
```

Front row is the row facing the operator.

6. Select the tool bank positions you want to insert tools into:

```
┌ Insert To HYDRA Tool Bank A, Front Row ┐
Position 1..... Free
Position 2..... Free
Position 3..... Free
Position 4..... Free
Position 5..... Free
Position 6..... Free
Position 7..... Free
Position 8..... Free
   <Space> select <Ctrl>+A select all
```

The positions have to be empty and the HYDRA unit has to be turned on and not equipped with blocking manual HYDRA tools. Otherwise the positions are not selectable.

7. Select tool type to insert:

```
┌ Select Tool Type To Insert ┐
H01 (White)
H02 (Yellow)
H03 (Red)
H04 (Blue)
```

The system checks if the HYDRA unit is ready to install new tools. If it is, the HYDRA unit moves to the intervention X position.

☞ *If this position is located over a present magazine, then remove the magazine before confirming.*

8. Confirm movements down with the selected empty tool tubes:

```
Inserting HYDRA tools
Is it OK to move the HYDRA tool tubes down?
                Yes  No
```

9. Press the emergency stop buttons down.

The selected tool tubes are now moved down to the intervention HZ level, see Figure 7-10.

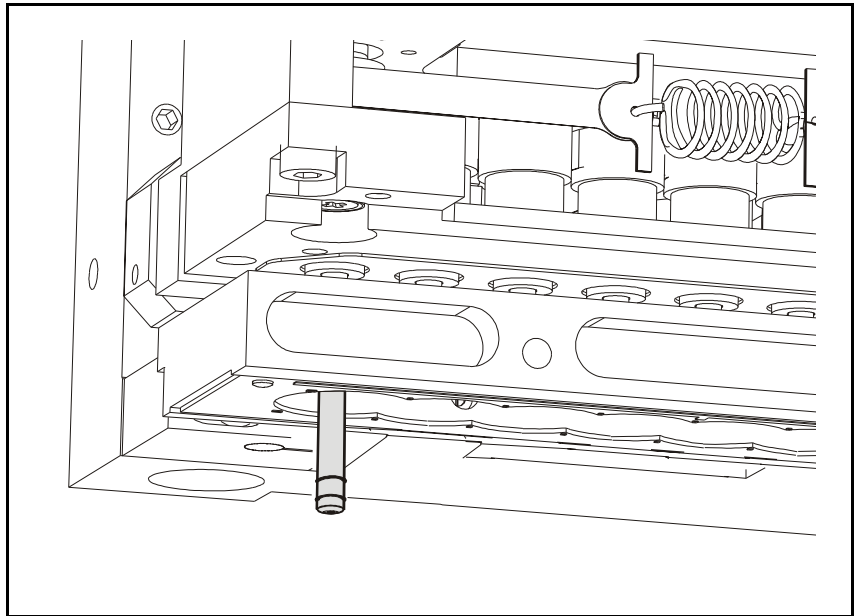*Figure 7-10. Intervention position for automatic tool insertion*

The system also requests that a specific tool type is inserted (H01 is shown as an example):

```
Please insert a HYDRA tool of type H01
(White)
Is the tool inserted?
                    Yes  No
```
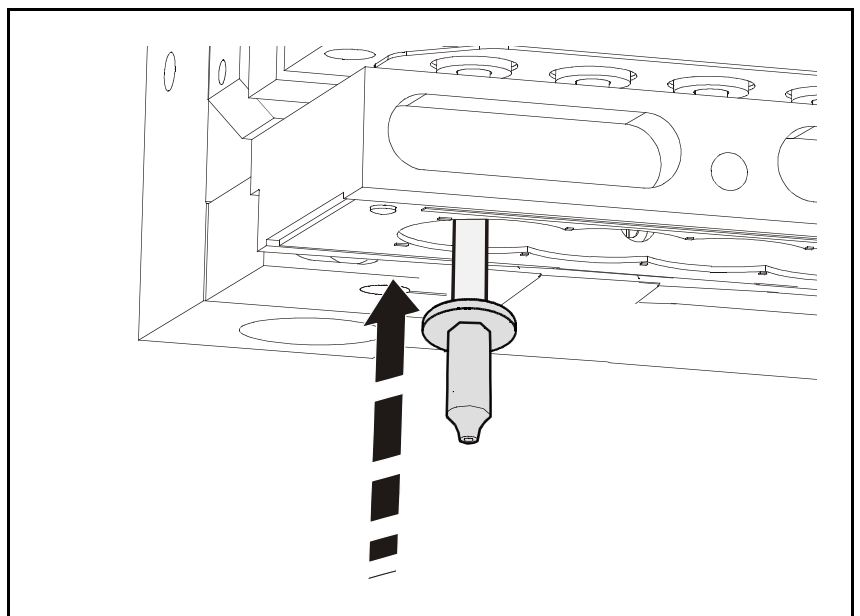
10. Apply the requested tool. The tool tube stays down for 50 seconds, see Figure 7-11.

Figure 7-11. Applying automatic tool

Keep your hands clear of the machine.

11. Confirm the tool insertion. The tool tubes are moved up and down.

12. Repeat the last two steps for the remaining tools.

13. Release the emergency stop buttons.

14. Confirm the tool insertion.

The system will now check if the tools are inserted. The HYDRA unit will then place the inserted tools into the selected tool bank.

Removing HYDRA tools automatically

Remove tools as follows:

1. Select the **Installation** option in the **Utility** menu.

2. Then select **HYDRA** > **HYDRA Tool Utility** > **Remove automatic HYDRA tools**.
The HYDRA unit leaves any automatically inserted tools in the tool bank. If manually inserted tools remain on the tool tubes, then you have to remove them manually. The HYDRA unit moves to the intervention X position.

3. Select tool bank and front or back row from the list of available rows. Front row is the row facing the operator.

4. Select the tool bank positions you want to remove tools from. The positions have to hold a tool and the HYDRA unit has to be turned on and not equipped with blocking manual HYDRA tools. Otherwise the positions are not selectable.
The HYDRA unit fetches the selected tools and moves to the intervention X position.

F10

You can also press <F10> and open the *HYDRA Tool Utility* menu from the hot menu.

If this position is located over a present magazine, then remove the magazine before confirming.

5. Confirm movements down with the selected tool tubes:

```
Removing HYDRA tools
Is it OK to move the HYDRA tool tubes down?
                    Yes  No
```

6. Press the emergency stop buttons down.

The selected tool tubes are now moved down to the intervention HZ level, see Figure 7-10.

The system also requests that the tools are removed:

```
Please remove this HYDRA tool. H01 (White)
Tool removed?
                    Yes  No
```

7. Remove the requested tools. The tool tube stays down for 50 seconds, see Figure 7-11.

8. Confirm the tool removal.

9. Release the emergency stop buttons.

The system will now check if the tools are removed.

Inserting HYDRA tools manually

Normally, HYDRA tools are inserted automatically. However, sometimes you might prefer to insert HYDRA tools manually. If you, for example, are running a short series of components with a special type of tool and do not want to use the tools in the tool banks, then you can choose to insert tools manually.

1. Select the **Installation** option in the **Utility** menu.

2. Then select **HYDRA** > **HYDRA Tool Utility** > **Insert Manual HYDRA Tools**.
The HYDRA unit leaves any automatically inserted tools in the tool bank.

F10

You can also press <F10> and open the *HYDRA Tool Utility* menu from the hot menu.

3. Select tool tubes to apply tools to:

```
┌──────── Insert Manual HYDRA Tools ────────┐
│ Tool tube 1..... Free                      │
│ Tool tube 2..... Free                      │
│ Tool tube 3..... Free                      │
│ Tool tube 4..... Free                      │
│ Tool tube 5..... Free                      │
│ Tool tube 6..... Free                      │
│ Tool tube 7..... Free                      │
│ Tool tube 8..... Free                      │
│  <Space> select <Ctrl>+A select all        │
└────────────────────────────────────────────┘
```

The HYDRA unit has to be turned on and not equipped with blocking manual HYDRA tools. Otherwise the tool tubes are not selectable.

4. Select tool type to apply. The HYDRA unit moves to the intervention X position.
If this position is located over a present magazine, then remove the magazine before confirming.

5. Confirm movements down with the selected empty tool tubes:

```
Inserting HYDRA tools
Is it OK to move the HYDRA tool tubes down?
              Yes  No
```

6. Press the emergency stop buttons down.

The selected tool tubes are now moved down to the intervention HZ level, see Figure 7-10.

The system also requests that a specific tool type is inserted (H01 is shown as an example):

```
Please insert a HYDRA tool of type H01
(White)
Is the tool inserted?
                    Yes  No
```

7. Apply the requested tool, see Figure 7-11. The tool tube stays down for 50 seconds, see Figure 7-11.

☞ *Keep your hands off the machine.*

8. Confirm the tool insertion. The tool tubes are moved up and down.

9. Repeat the last two steps for the remaining tools.

10. Release the emergency stop buttons.

11. Confirm the tool insertion.

If a HYDRA tool bank is installed, then the system will check if the tools are applied.

☞ *HYDRA tools that have been inserted manually must be removed manually.*

Removing HYDRA tools manually

Normally, HYDRA tools are removed automatically. You might, however, sometimes need to remove HYDRA tools manually. If, for example, an error preventing you from removing tools automatically has occurred, then you can remove the tools manually.

☞ *HYDRA tools that have been inserted manually must be removed manually.*

Remove tools as follows:

1. Select the **Installation** option in the **Utility** menu.

2. Then select **HYDRA** > **HYDRA Tool Utility** > **Remove Manual HYDRA Tools**.
The HYDRA unit leaves any automatically inserted tools in the tool bank.

F10

You can also press <F10> and open the *HYDRA Tool Utility* menu from the hot menu.

3. Select the tools you want to remove:

```
──────── Remove Manual HYDRA Tools ────────
Tool tube 1.....H01 (White)
Tool tube 2..... Free
Tool tube 3..... H01 (White)
Tool tube 4..... Free
Tool tube 5..... H01 (White)
Tool tube 6..... Free
Tool tube 7..... H01 (White)
Tool tube 8..... Free
  <Space> select <Ctrl>+A select all
```

The HYDRA must be turned on and equipped with at least one manual HYDRA tool. Only tool tubes with manual tools are selectable.

The HYDRA unit moves to the intervention X position.

☞ *If this position is located over a present magazine, then remove the magazine before confirming.*

4. Confirm movements down with the selected tool tubes.

5. Press the emergency stop buttons down.

The selected tool tubes are now moved down to the intervention HZ level, see Figure 7-10.

The system also requests that the tools are removed:

```
Please remove this HYDRA tool. H01 (White)
Tool removed?
                         Yes   No
```
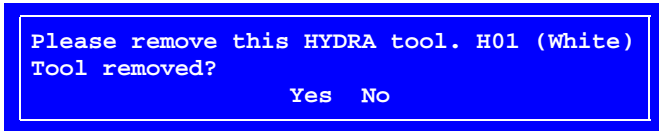
6. Remove the requested tools. The tool tube stays down for 50 seconds, see Figure 7-11.

7. Confirm the tool removal.

8. Release the emergency stop buttons.

If a HYDRA tool bank is installed, then the system will check if the tools are removed.
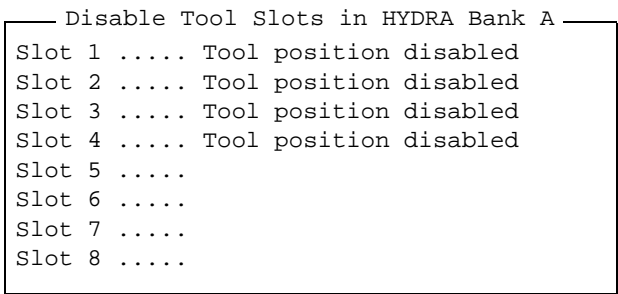
Disabling tool bank slots

Sometimes, it might be useful to have the ability to disable a tool bank slot. For example, if the HYDRA unit for some reason cannot pick tools from a tool bank slot.

1. Select the **Installation** option in the **Utility** menu:

2. Then select **HYDRA** > **HYDRA Tool Utility** > **Disable Tool Slots in HYDRA Bank**.

3. Select tool bank from the list of available tool banks.

4. Select the desired slots to be disabled:

F10

You can also press <F10> and open the *HYDRA Tool Utility* menu from the hot menu.

```
      ── Disable Tool Slots in HYDRA Bank A ──
Slot 1 .....  Tool position disabled
Slot 2 .....  Tool position disabled
Slot 3 .....  Tool position disabled
Slot 4 .....  Tool position disabled
Slot 5 .....
Slot 6 .....
Slot 7 .....
Slot 8 .....
```

Now, the disabled slots will not be used until they are enabled again. To enable slots, see the *Enabling tool bank slots* section.

Enabling tool bank slots

HYDRA tool bank slots that have been disabled can be enabled again.

1. Select the **Installation** option in the **Utility** menu.

2. Then select **HYDRA** > **HYDRA Tool Utility** > **Enable tool slots in HYDRA bank**

3. If a tool that resides in a disabled slot is currently attached to a tool tube in the HYDRA unit, then you will be asked to manually remove it and then confirm the removal.

4. If there are tools in the tool bank, you will be asked to remove them:

F10

You can also press <F10> and open the *HYDRA Tool Utility* menu from the hot menu.

```
Remove manually both tools, front and back, from slot 1
in HYDRA tool bank A

Are all tools removed?
                        Yes  No
```

Now, all the HYDRA tool bank slots are enabled.

☞ *This is the only time you are allowed to manually remove tools from a HYDRA tool bank. And, you are NEVER allowed to manually insert tools into a HYDRA tool bank.*

Displaying HYDRA tools in the HYDRA unit

You can get information about tools currently attached to the tool tubes in the HYDRA unit.

1. Select the **Installation** option in the **Utility** menu.

2. Then select **HYDRA** > **HYDRA Tool Utility** > **Show HYDRA tools on HYDRA**. A list, in which you can see information about tools currently attached to the tool tubes in the HYDRA unit, is shown:

```
TOOL TYPE           FROM      POSITION STATUS
1...H01 (White)     B Front
2...Free
3...H01 (White)     B Front
4...Free
5...H01 (White)     B Front
6...Free
7...H01 (White)     B Front
8...Free
```

Displaying HYDRA tools in HYDRA tool banks

Information about tools currently installed in a HYDRA tool bank is available.

1. Select the **Installation** option in the **Utility** menu:

2. Then select **HYDRA** > **HYDRA Tool Utility** > **Show HYDRA tools in bank**.

3. Select tool bank and front or back row from the list of available rows. Front row is the row facing the operator.
   A list, in which you can see information about tools currently installed in HYDRA tool banks, is shown:

```
TOOL TYPE           FROM      POSITION STATUS
1...H01 (White)    B Front
2...Free
3...H01 (White)    B Front
4...Free
5...H01 (White)    B Front
6...Free
7...H01 (White)    B Front
8...Free
```

8. Operational Features

This chapter details the following operational features:

- **Board location**, page 8-2.
  Board location using manual and automatic fiducial mark search and non-present board marking.

- **Mount and glue switches**, page 8-16.
  Global assembly and glue application switches.

- **Layout preparation**, page 8-18.
  Lists components which cannot be mounted.

- **Alert messages**, page 8-19.
  Messages shown if components cannot be mounted.

- **Layout status**, page 8-19.
  Status for incomplete layout assemblies which can later be used to resume and complete the layouts.

- **Management data**, page 8-24.
  Assembly information specific to the layouts.

- **X wagon to outermost positions**, page 8-29.

Board Location

The purpose of this feature is to locate boards on the assembly table. Positions and angles are determined by centering board fiducial marks.

There are two ways of locating boards:

1. Manual fiducial mark search.

Manual fiducial mark search is used when the board positions on the assembly table differ more than a couple of mm from the previous boards, for instance after changing layout.

Boards can be marked as non-present during the manual fiducial mark search.

A graphic overlay of the fiducial mark is shown on the screen when locating boards manually, provided the system has learned the mark.

2. Automatic fiducial mark search.

Automatic fiducial mark search is used when the board on the assembly table are positioned within a couple of mm from the previous positions, for instance after changing boards in the same layout.

Manual and automatic fiducial mark search are detailed on the following pages as well as deviations of the fiducial mark positions, and switches for the board location feature.

Fiducial mark search commands cause machine movements. Before entering these commands check the following:

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

Manual Fiducial Mark Search

Manual fiducial mark search is used when the board positions differ more than a couple of mm from the previous positions.

Boards can be marked as non-present during this procedure (detailed on page 8-10).

A graphic overlay of the fiducial mark is shown on the screen when locating boards manually. When locating small fiducials manually, the graphics drawn can conceal too much of the fiducial and make the adjustment difficult. It is therefore possible to toggle the graphics marking on and off using <CTRL-F3>.

Manual fiducial mark search can be carried out either directly from the main menu or via the assembling menu. Both ways are described below.

From the main menu

- Select the **Locate Boards (Manual)** option in the **Production** menu:

```
Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

- Using the joystick or trackball, center the cross hairs on the board fiducial marks as shown in Figure 8-1.
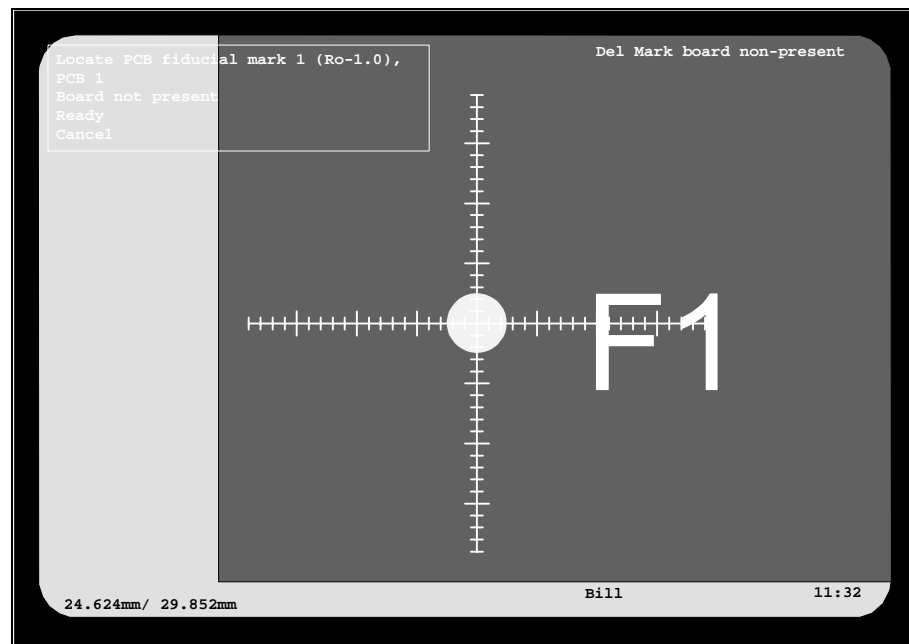
Figure 8-1. Centering fiducial mark F1

👉 *The centering must be performed in correct board order and fiducial mark order.*

Fiducial mark numbers and board numbers are shown in a dialog box:

```
Locate PCB fiducial mark 1 (Ro-1.0),
PCB 1
Board not present
Ready
```

In this example, the board type is *PCB* (the alternative is *panel*, the fiducial mark number is 1, the fiducial mark name is *Ro-1.0* and the board number in the layout is 1.

Select **Ready** and press <Enter> to confirm each fiducial mark.

From the assembling menu

Manual fiducial mark search can also be carried out from the
assembling menu. It is performed as follows:

- Select the **Assemble** option in the **Production** menu:

```
 Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

- Select the desired layout and press <Enter> until the following
  menu is shown:

```
Start Assembling
Locate Boards (Manual)
Clear Non-Present Flags
Glue Boards
Mount Boards
Print Management Data
View Alert Data
Locate Boards (Auto)
Clear Layout Status
```

- Select the **Locate Boards (Manual)** option and press <Enter>.

- Center the cross hairs on the board fiducial marks as described in
  the previous section.

Automatic Fiducial Mark Search

Automatic fiducial mark search can be used when the board positions are within a couple of mm from the previous positions.

The procedure is similar to the manual fiducial mark search, but there are two major differences:

– Automatic fiducial mark search is performed without confirming each fiducial mark manually.

– The camera is moved the shortest way between the fiducial marks, not in board or fiducial mark order.

Automatic fiducial mark search can be carried out either directly from the main menu or via the assembling menu. Both ways are described below.

From the main menu

Automatic fiducial mark search is launched by pressing the **Trim** key on the machine keypad or selecting the **Locate Boards (Auto)** option in the **Production** menu:

```
Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

An automatic fiducial mark search and position calibration is performed, provided that:

– The *Automatic fiducial mark search* switch is set to *Yes*, see page 8-14.

– The board positions are within a couple of mm from the previous boards.

– The fiducial marks are learned by the system (see Chapter 8 in the *Programming Manual*).
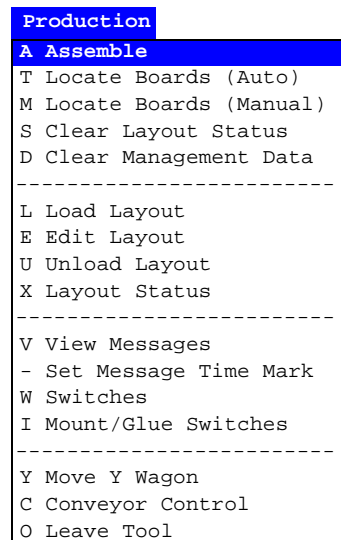
If the automatic fiducial mark search fails, the system switches temporarily to manual fiducial mark search. Use joystick or trackball to center the failing fiducial mark. The system will then continue the automatic search for the remaining fiducial marks.

The board position variation is limited by the size of the scan area defined in the *Verify area X size* and *Y size* variables in the Fiducial Mark List (described in Chapter 8 of the *Programming Manual*).
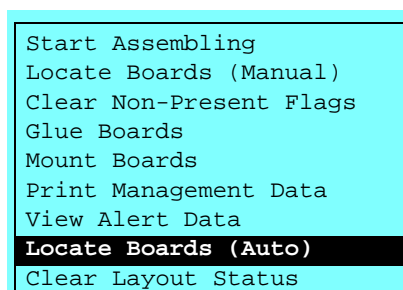
From the assembling menu

Automatic fiducial mark search can also be carried out from the assembling menu. It is performed as follows:

• Select the **Assemble** option in the **Production** menu:

```
Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

• Select the desired layout and press <Enter> until the following popup menu is shown:

```
Start Assembling
Locate Boards (Manual)
Clear Non-Present Flags
Glue Boards
Mount Boards
Print Management Data
View Alert Data
Locate Boards (Auto)
Clear Layout Status
```

• Select the **Locate Boards (Auto)** option and press <Enter>.

Fiducial Mark Deviation

If the result of the fiducial mark search deviates from the defined values for the board, the system asks whether the board is to be accepted or not:

```
Board:
Fiducial mark distance not OK:
 X scale error: -0.405%
 Y scale error: -0.821%
    Angle error: 1.006°

Accept the board?
               Yes     No
```

Accepted deviation is specified in the following switches accessed by first selecting the **Switches** option in the **Production** menu:

```
Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

... and then the **1002 Assembly switches**:

```
_____ 1002 Assembly switches _____
0008 Accepted fiducial mark distance error (%). 0.5
0009 Max accepted board angle deformation...... 0.50°
                 Save and exit
```

Only the switches involved in fiducial mark

deviation are shown in the above box.

– Select the desired switch using the arrow keys.

– Change by typing new values.

– Confirm by highlighting *Save and exit* and pressing <Enter>.

Password may be required to save changes.

0008 Accepted fiducial mark distance error (%)

This parameter defines, in percent, the accepted fiducial mark coordinate deviation, compared to the programmed coordinates for the board.

If the defined deviation is exceeded, then the error box above is shown. The board can be either accepted (*Yes*) or rejected (*No*).
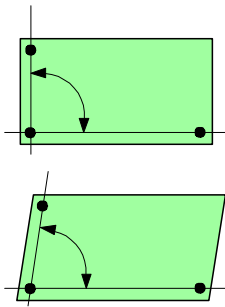
0009 Max accepted board angle deformation

This parameter is only applicable to boards with three fiducial marks. It defines, in degrees, accepted angle deviation between the measured angle and the programmed angle for two axes which cross the three fiducial marks as shown in the figures.

If the defined deviation is exceeded, then the error box above is shown. The board can be either accepted (*Yes*) or rejected (*No*).

Marking Board As Non-Present

The purpose of this feature is to be able to temporarily skip a board, or a couple of boards, included in a multi-board layout, and to do it easy and quickly without changing switches, board programming, or layout settings.

If you, for instance, intend to mount 100 boards in a tree-board layout, you get one single board left after 33 mounted layouts. Now, you can use the same three-board layout for the last board by marking two boards as non-present.

At manual fiducial mark search, non-present marking is performed prior to assembling. Until a non-present marking is cleared, the marked board will not be subjected to automatic fiducial mark search, glue application, or component mounting.

An alternative to the description below is altering the PCB status in a loaded layout by using the Panel Editor (described in the *Panel Editor* section in Chapter 7 of the *Programming Manual*).

Marking boards

Select the **Locate Boards (Manual)** option in the **Production** menu:

```
 Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

... or the **Locate Boards (Manual)** option in the assembling menu:

```
Start Assembling
Locate Boards (Manual)
Clear Non-Present Flags
Glue Boards
Mount Boards
Print Management Data
View Alert Data
Locate Boards (Auto)
Clear Layout Status
```

When the first fiducial mark (only the first one) on each board is centered, two additional menu options appear (shown in Figure 8-1 on page 8-4):

– *Board not present* is shown in the menu box.

– *Del Mark board non-present* is shown in the upper right corner of the screen.

If you want to mark a board as non-present, then highlight the *Board not present* option and press <Enter>, or simply press <Del>.

Automatic Non-Present Board Detection

There is a non-present board detection feature in TPSys that automatically sets non-present status for boards which really are missing in layouts.

If this feature is on and the camera cannot measure any contrast on the position where the first fiducial mark should have been positioned, then the board is automatically marked as non-present.

The automatic non-present board detection feature is set to on/off by the *Automatic* switch (description on page 8-14).

Clearing Non-Present Board Markings

Non-present board markings are active until cleared by one of the following actions.
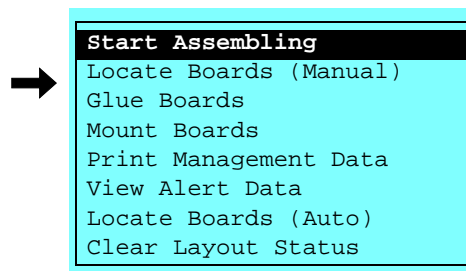
1. Unloading the layout
  – By selecting the *Unload Layout* option in the *Production* menu.

  – By loading another layout.
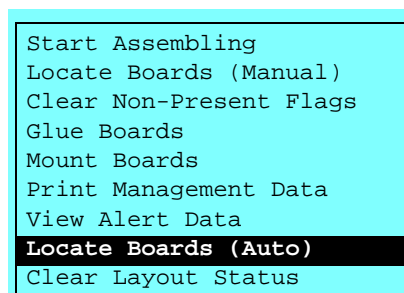
2. Assembling

Assemble in the *Production* menu.

Assembling the boards marked as non-present. This is provided that the *Clear Non-Present Flags* option is not showing in the menu (at the arrow).

➡
```
Start Assembling
Locate Boards (Manual)
Glue Boards
Mount Boards
Print Management Data
View Alert Data
Locate Boards (Auto)
Clear Layout Status
```

The *Clear Non-Present Flags* option is related to the *Remember non-present board flags* switch (detailed on page 8-14).
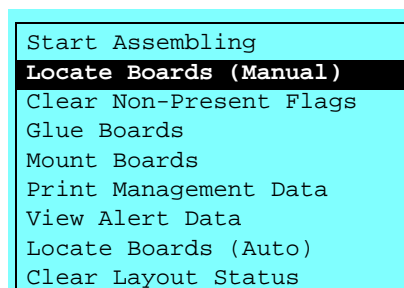
3. Automatic fiducial mark search
  – By selecting the *Locate Boards (Auto)* option in the *Production* menu.

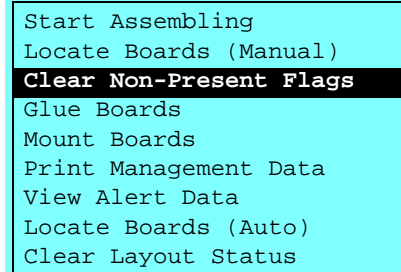 – By selecting the Assemble option in the *Production* menu and then *Locate Boards (Auto)*:

```
Start Assembling
Locate Boards (Manual)
Clear Non-Present Flags
Glue Boards
Mount Boards
Print Management Data
View Alert Data
Locate Boards (Auto)
Clear Layout Status
```

4. Manual fiducial mark search
  – By selecting the *Locate Boards (Manual)* option in the *Production* menu.

  – By selecting the *Assemble* option in the *Production* menu and then *Locate Boards (Manual)*:

```
Start Assembling
Locate Boards (Manual)
Clear Non-Present Flags
Glue Boards
Mount Boards
Print Management Data
View Alert Data
Locate Boards (Auto)
Clear Layout Status
```

5. Manual clearance

Manual clearance of the non-present board markings by selecting the *Assemble* option in the *Production* menu and then *Clear Non-Present Flags*:

```
Start Assembling
Locate Boards (Manual)
Clear Non-Present Flags
Glue Boards
Mount Boards
Print Management Data
View Alert Data
Locate Boards (Auto)
Clear Layout Status
```

... provided that this option is included in the menu (detailed in the *Board Location Switches* section on page 8-14).

Board Location Switches

The following switches, involved in fiducial mark search, are accessed by selecting the **Switches** option in the **Production** menu:

```
┌─────────────────────────┐
│ Production              │
│ A Assemble              │
│ T Locate Boards (Auto)  │
│ M Locate Boards (Manual)│
│ S Clear Layout Status   │
│ D Clear Management Data  │
│ ------------------------ │
│ L Load Layout           │
│ E Edit Layout           │
│ U Unload Layout         │
│ X Layout Status         │
│ ------------------------ │
│ V View Messages         │
│ - Set Message Time Mark │
│ W Switches              │
│ I Mount/Glue Switches   │
│ ------------------------ │
│ Y Move Y Wagon          │
│ C Conveyor Control      │
│ O Leave Tool            │
└─────────────────────────┘
```

... and then **1002 Assembly switches**:

```
┌──────── 1002 Assembly switches ────────┐
│ 0014 Automatic ............................. Yes │
│ 0013 Remember non-present board flags ......... Yes │
│    Locate boards                          │
│ 0003 Automatic fiducial mark search .......... Yes │
│ 0007 Locate all boards on a panel ............ No  │
│ 0008 Accepted fiducial mark distance error (%). 0.5 │
│ 0009 Max accepted board angle deformation...... 0.50° │
│                Save and exit              │
└───────────────────────────────────────────┘
```

Only the switches involved in board location are shown in the above box.

– Select the desired switch using the arrow keys.

– Select *Yes* or *No* by pressing <Space> or modify the values by typing new values.

– Confirm by highlighting *Save and exit* and pressing <Enter>.

Password may be required to save changes.

0003 Automatic fiducial mark search

Yes – Automatic fiducial mark search is performed when Locate Boards (Auto) in the *Production* menu or *Locate Boards (Auto)* in the assembling menu are selected (page 8-6).

No – Automatic fiducial mark search is off.

0007 Locate all boards on a panel

Yes – Besides the panel itself, all PCBs included in the panel are subjected to automatic fiducial mark search (page 8-4) and manual fiducial mark search (page 8-3).

No – The panel itself only is subjected to fiducial mark search.

0008 Accepted fiducial mark distance error (%)

Fiducial mark deviation parameter (described in the *Fiducial Mark Deviation* section on page 8-8).

0009 Max accepted board angle deformation

Fiducial mark deviation parameter (described in the *Fiducial Mark Deviation* section on page 8-8).

0013 Remember non-present board flags

Yes – Non-present board markings remain after assembling the current board.

The *Clear Non-Present Flags* option is included in the *Assemble* menu (page 8-12).

No – Non-present board markings are cleared after assembling the current board.

The *Clear Non-Present Flags* option is omitted in the *Assemble* menu.

0014 Automatic

Yes – Non-present board markings are set automatically if no contrast is found when centering fiducial mark 1.

No – Automatic non-present board detection is off.

☞ *Switch 0013 Remember non-present board flags should be set to No if this switch is set to Yes.*
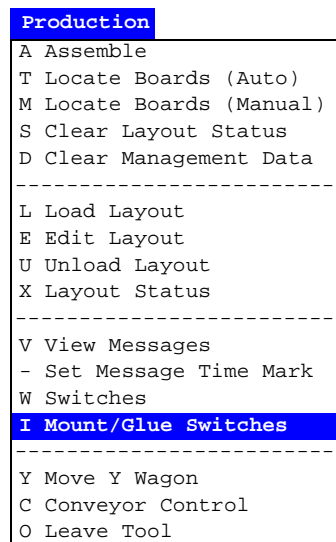
Mount and Glue Switches

This feature allows you to globally enable or disable component mounting and glue application.
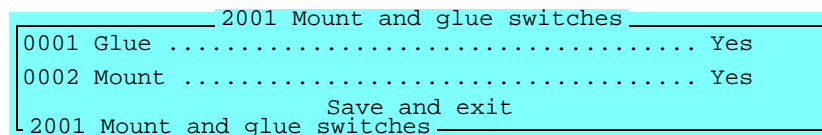
A layout that contains instructions for glue application and component mounting can, by manipulating these switches, be used to:

– Apply glue only.
– Mount components only.
– Apply glue and mount components.

The mount and glue switches are accessed by selecting the **Mount/Glue Switches** option in the **Production** menu:

```
 Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

The following switch menu is shown:

```
_____ 2001 Mount and glue switches _____
0001 Glue ................................... Yes

0002 Mount .................................. Yes
                   Save and exit
2001 Mount and glue switches _____
```

– Select the desired option using the arrow keys.
– Select *Yes* or *No* by pressing <Space>.
– Confirm by highlighting *Save and exit* and pressing <Enter>.

No password is required to save changes.

0001 Glue

Problems? See below! *Yes* – Glue is applied for components which are defined with glue dots in the Mount List.

No – Glue is not applied for any component.

0002 Mount

Problems? See below! *Yes* – Components defined to be mounted in the Mount List are mounted.

No – No component is mounted.

Problems

- Glue is not applied even though *Glue* is set to *Yes*.

    To get glue to be applied, the following points must all be fulfilled:

    – The *Glue* entry in the Component List must be set to *Yes* for the component.

    – The *Glue* entry in the PCB List must be set to *Yes* for the component.

    – The glue dot type indicated in the *Glue dot type* entry in the Package List must be included in the Glue Dot List.

- Components are not mounted even though *Mount* is set to *Yes*.

    To get components to be mounted, the following points must all be fulfilled:

    – The *Mount* entry in the Component List must be set to *Yes* for the component.

    – The *Mount* entry in the PCB List must be set to *Yes* for the component.

    – The *0005 Invert meaning of comp. mount/glue flags* switch must be set to *No*.

    This switch is accessed by selecting the *Switches* option in the *Production* menu and then the *1002 Assembly switches*.

Layout Preparation

This feature generates a list, which can be used to check if there are any components that cannot be mounted. The reason for this is declared in the report, for instance an included component is not found in the Magazine List, no available mount tool for a component, or the glue feature is off when the components are to be glued.

Layout preparation can be carried out off-line.

The Layout Preparation report is created as follows:

- Select the **Layout Preparation** option in the **Print** menu.

- Select the desired layout for which the preparation is to be created.

  The Layout Preparation report is then printed out. An example of a report is shown below.

```
Layout preparation

Layout name: TV-ALL

Components in not inserted magazines
Component name          Magazine    Feeder    Component comment
000254                  Audio         1         680pF
000255                  Audio         4         820pF

Components to be mounted, not declared in the magazine list
Component name          Component comment
000287                  27ohm
000288                  33ohm
```

The report is divided into parts with information about why the components cannot be mounted.

Layout Status

The purpose of the Layout Status is to log the layout assemblies and, if an assembly is not completed, store the mount status. When the remaining components are to be mounted, the stored layout status is loaded whereupon the layout assembly can be completed. When the layout status is loaded, the remaining components only are mounted.

Layout Status is saved if a layout assembling is stopped manually or finished incomplete and:

- the *Skip board?* question shown after the assembling is answered with *No*.

- the *Save layout status?* question shown when the layout is unloaded or another layout is loaded is answered with *Yes*.

Layout status is also saved if a power failure or minor system error occurs.

The system reminds about existing status when loading layouts. If you accept to list it, the layout status can be shown and loaded.

The Layout Status Editor (Figure 8-2) is opened by selecting the **Layout Status** option in the **Production** menu:

```
┌─────────────────────────┐
│ Production              │
├─────────────────────────┤
│ A Assemble              │
│ T Locate Boards (Auto)  │
│ M Locate Boards (Manual)│
│ S Clear Layout Status   │
│ D Clear Management Data  │
│ ------------------------ │
│ L Load Layout           │
│ E Edit Layout           │
│ U Unload Layout         │
│ X Layout Status         │
│ ------------------------ │
│ V View Messages         │
│ - Set Message Time Mark │
│ W Switches              │
│ I Mount/Glue Switches   │
│ ------------------------ │
│ Y Move Y Wagon          │
│ C Conveyor Control      │
│ O Leave Tool            │
└─────────────────────────┘
```
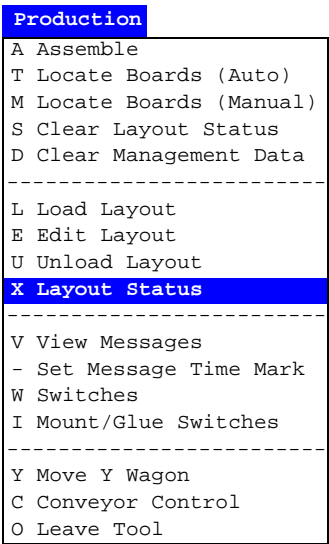
Function keys in the Layout Status Editor:

Select layout

The highlighted layout is selected by pressing <Enter>. After selecting the layout, applicable status can be chosen for resuming and completing, see page 8-21.

```
                        * LAYOUT STATUS EDITOR *
        Layouts
   TV1                                    Enter   Select layout
   TV2
   TV2-P2
   TV2-P2x2
   TV2x2
   TV3B
   TV3G
   TV3RGB-P3
                                        Layout
                                 Name:  Information

                              Comment: Bare boards BB1, BB2x2, BB3x3
                                    :
                                    :
                                    :
                                    :
                                    :
                                    :
                                    :
                                    :
                                    :
                                    :

                                      Bill                 13:32
```
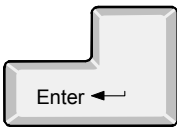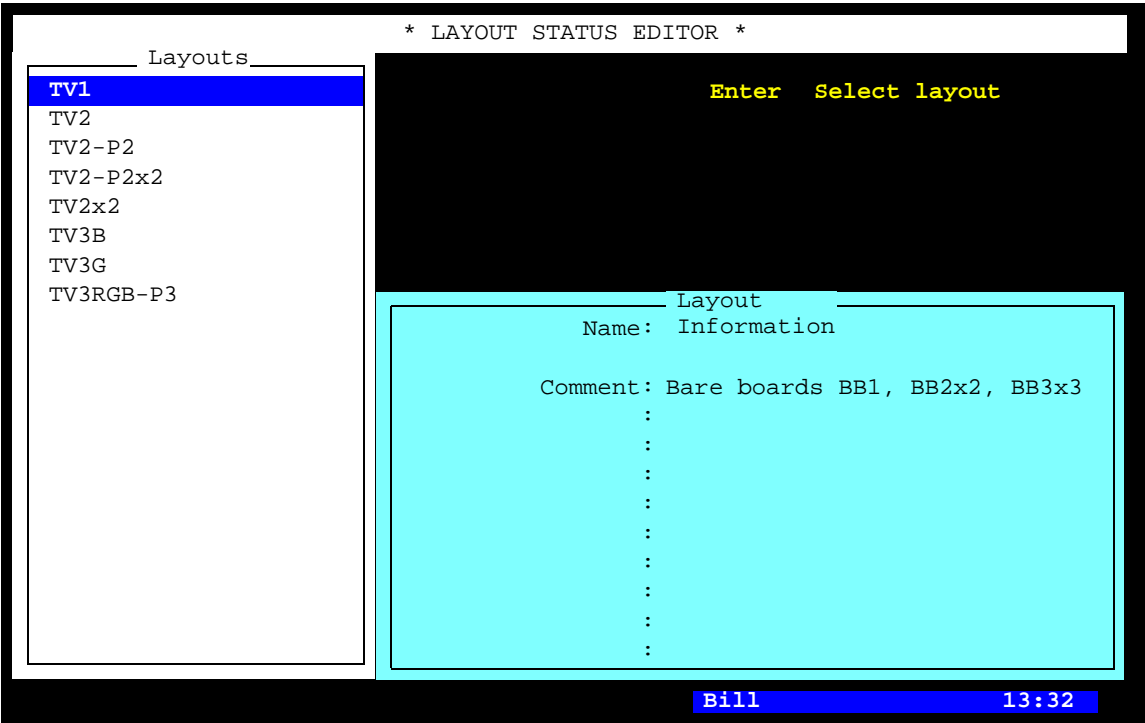
Figure 8-2. Layout Status Editor

Entries in the Layout Status Editor:

Layouts

If you want to exit the Layout Status Editor and return to the main window, then press <Esc>.

This box contains all layouts in the system, with or without saved Layout Status. Use the arrow keys or <PgUp>, <PgDn>, <Home>, or <End> to select the desired layout.

You can search for a layout in the list by simply entering the first characters of the layout name.

Layout Information

This box contains name and comments of the highlighted layout.

Saved Status

Saved layout status can be displayed (Figure 8-3) if *Yes* is selected in the following dialog box shown when loading a layout for which saved status exists:

```
Saved status exist for layout.
View list?
              Yes   No
```
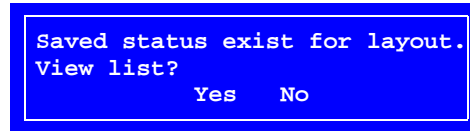
The Layout Status window can also be opened from the Layout Status Editor (page 8-20).

After loading the layout status, the incomplete layout assembly can be resumed and completed. Put the board (or boards) included in the layout on the assembly table and start the assembly with the *Start Assembling* command as usual.

Saved status information is network shared, that is the layout assembly can be resumed in another machine than the one it was originally assembled in, provided two or more MYDATA machines are networked together.

Function keys in the Saved Layout Status window:
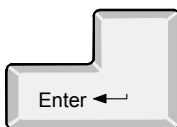
Load status

Highlighted layout status is loaded by pressing <Enter>. After loading, the layout assembly can be resumed and completed.

Delete status

Highlighted layout status is deleted by pressing <Del> and confirming a dialog box.

```
                      * LAYOUT STATUS EDITOR *
         Saved Status
  Missing R3:my12n123                    Enter  Load status
  Missing C2:my12n123                      Del  Delete status
  Stopped:my12n123





                          Layout: TV1
                          Machine: my12n123
                          Comment: Missing R3
                            Saved: 2001 17/10 13:21.19

                                        Bill              13:35
```
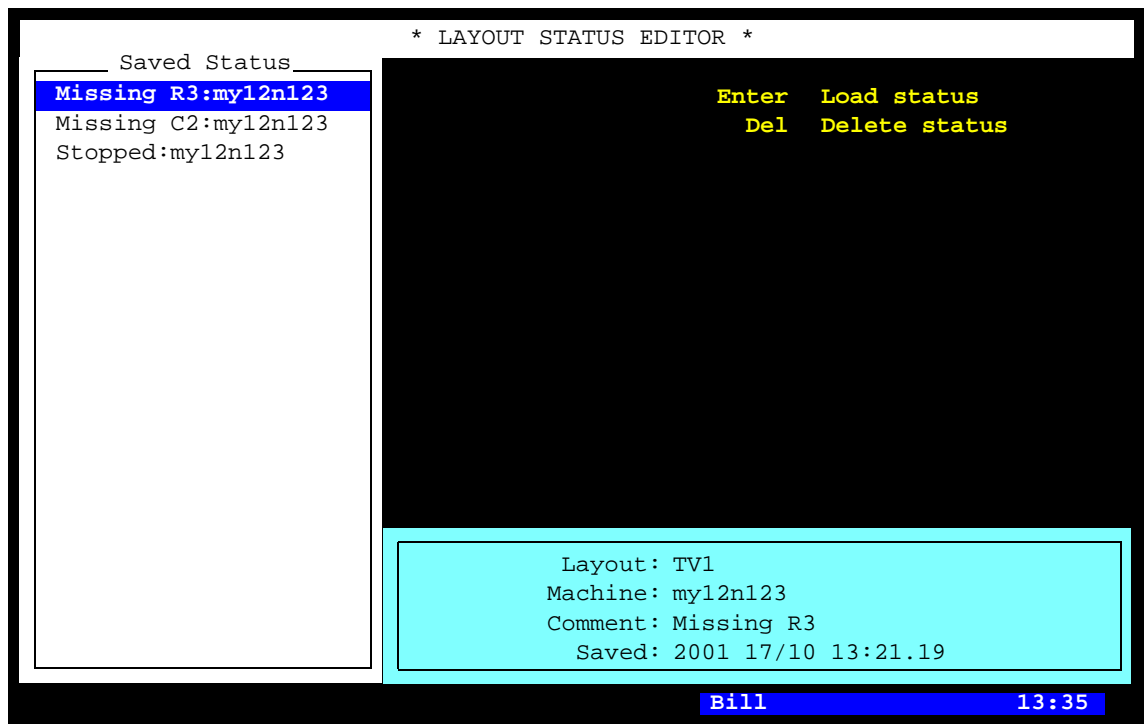
Figure 8-3. Saved Layout Status

Entries in the Layout Status Editor:

Saved Status

In this box existing layout status entries are shown. Each status
entry is represented by a line that displays status comment and
machine identity.

The comment text was typed into the *Save comment* field when the
incomplete layout was unloaded.

Layout, Machine, Comment, Saved

Layout name, machine identity, comment (same as above), and time
when the status was saved.

The date format is: YYYY DD/MM.

Clearing Status

Current layout status can be cleared by selecting the **Clear Layout Status** option in the **Production** menu:

```
 Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```
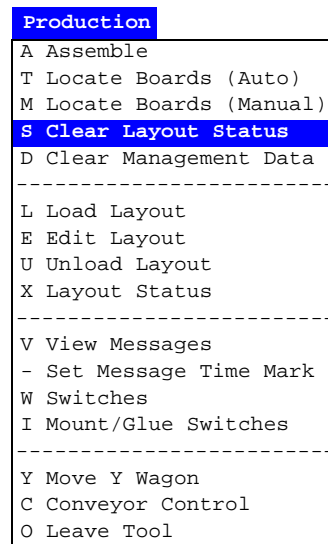
.. or by selecting the **Clear Layout Status** in the assembling menu, available while assembling:

```
Start Assembling
Locate Boards (Manual)
Clear Non-Present Flags
Glue Boards
Mount Boards
Print Management Data
View Alert Data
Locate Boards (Auto)
Clear Layout Status
```
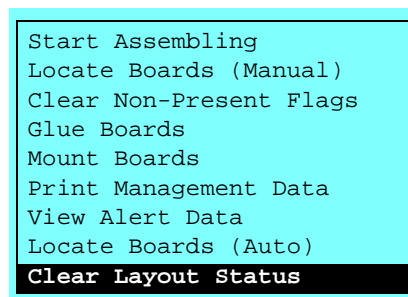
Note that only the currently loaded layout status is cleared. If no layout is loaded, this command has no effect.

You can see the result of this command by selecting the *Edit Layout* option in the *Production* menu and selecting the desired layout and PCB before and after the clearance. Mounted components are indicated with 'M' before clearing. After clearing, none of the components are indicated.

Management Data

Management data, that is production information specific to a layout, is recorded by the system and can be printed out. An example of this may look like this:

```
Management data


Layout name         :  TV-ALL


Station             :  my19n999
Layouts assembled   :  5
PCBs assembled      :  10
Layout loaded time  :  18m 10s
Assembly time/PCB   :  9s
Glue time/PCB       :  0s


Assembly information
```

Component	Number placed	Time/ comp[s]	Mechanical failures	Electrical failures	Other failures	Consumption
000149	27	4.86	2	0	1	30
000254	50	5.12	0	0	0	50
000255	50	5.01	0	0	0	50
----------	------	------	------	------	------	------
Total	127	–	2	0	1	130

Number placed

Successfully placed components.

Time/ comp[s]

Time in seconds for each placed component.

Mechanical/Electrical/ Other failures

Picked components which have not been successfully placed.

Consumption

Number of components which have been picked from the magazines.

Printing Management Data

Management data can be printed out either directly from the main menu or via the assembling menu. Both ways are described below.

From the main menu

- Select the **Management Data** option in the **Print** menu:

```
 Print
C Component
P Package
M Magazine
B PCB
Y Components In Layout
E Messages
R Parameters
-----------------------
N Management Data
O Magazine Optimization
K Magazine Kit
L Layout Preparation
T Removable Feeder
-----------------------
A Cancel All Printouts
```
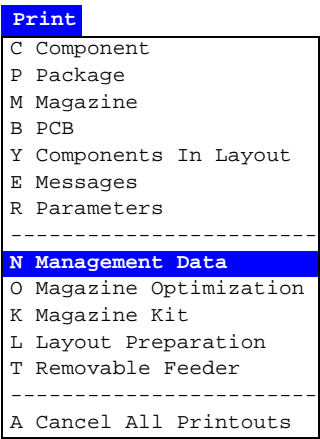
- Choose the desired management data to be printed out.

From the assembling menu

- Select the **Assemble** option in the **Production** menu:

```
Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

- Select the desired layout and press <Enter> until the following menu is shown:

```
Start Assembling
Locate Boards (Manual)
Clear Non-Present Flags
Glue Boards
Mount Boards
Print Management Data
View Alert Data
Locate Boards (Auto)
Clear Layout Status
```

- Select the **Print Management Data** option and press <Enter>.

- Select the desired management data.

Clearing Management Data

Current management data can be cleared by selecting the **Clear Management Data** option in the **Production** menu:

```
Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
-----------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
-----------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
-----------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

Note that only management data for the currently loaded layout is cleared. If no layout is loaded, this command has no effect.

After clearing management data, new management data is logged and saved as soon as new assembling is launched for the layout.

Deleting Management Data

The management data for a layout can be deleted as follows:

- Select the **Delete Management Data** option in the **Utility** menu:

```
Utility
I Import
X Export
T Installation
D Diagnostics
M Re-Initiate Motor Controllers
O Re-Initiate Conveyor
C Conveyor Pass-Through Mode
G Login / Logout
A User Access System
W Web Interface Setup
E Clear Event Log
N Delete Management Data
------------------------------
B Backup
R Restore
H Schedule Backup
S Save System Status
F Format DOS Diskette
U Units
L Language
```
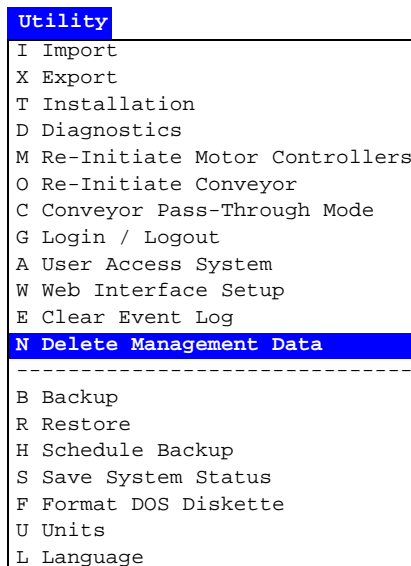
- Select the layout for which the management data is to be deleted.

  Note that you cannot delete the management data for the currently loaded layout.

- Confirm the deletion.

After deleting the management data file, a new file is automatically created as soon as assembling is launched for the layout and new management data is then logged and saved.

This command is intended to be used when cleaning up the system. If you want to clear the management data only for the currently loaded layout, then use the previous described *Clear Management Data* option in the *Production* menu instead.

Moving X Wagon To Outermost Positions

The X wagon can be moved to the leftmost and rightmost positions, for instance when performing maintenance.
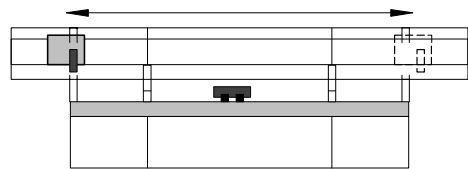
Move the X wagon to the leftmost and rightmost positions as follows:

- Select the **Diagnostics** option in the **Utility** menu:

```
Utility
I Import
X Export
T Installation
D Diagnostics
M Re-Initiate Motor Controllers
O Re-Initiate Conveyor
C Conveyor Pass-Through Mode
G Login / Logout
A User Access System
W Web Interface Setup
E Clear Event Log
N Delete Management Data
------------------------------
B Backup
R Restore
H Schedule Backup
S Save System Status
F Format DOS Diskette
U Units
L Language
```
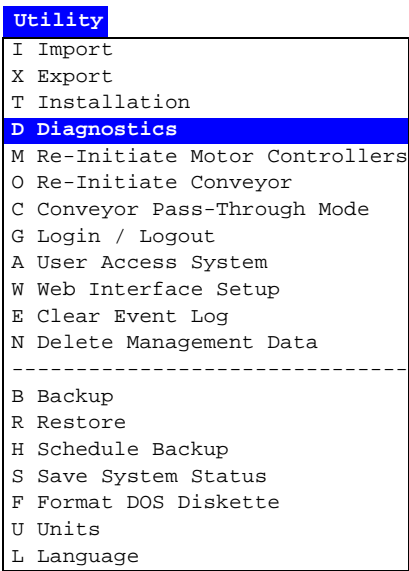
- Select the **Toggle X Wagon Position** option:

```
           Diagnostics
T Toggle X Wagon Position
F Fetch Standard Tool
E Fetch HYDRA Tools
C Cycle Standard Tool
Y Cycle HYDRA Tools
H Hysteresis Test
V Vacuum Test
P Prepare To Grab Images
I Copy Last Images
```
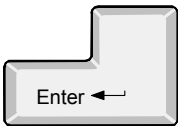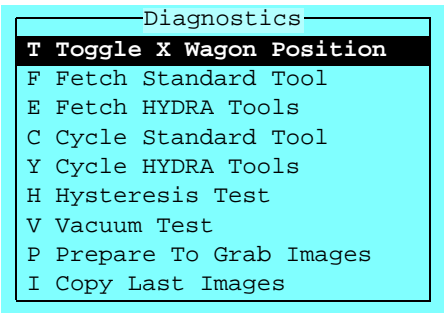
- Press <Enter> to move the X wagon alternately to the leftmost and rightmost positions.

9. Maintenance

The warranty on the machine and parts applies only if the following maintenance instructions are followed.
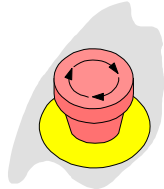
MY series emergency stop button.
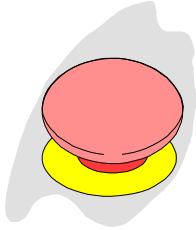
> **WARNING**
> Before commencing any maintenance, press an emergency stop button down or turn the power off.

The maintenance instructions in this chapter comprise the daily maintenance for the MY series of machines and the TP9-2U machine type

P9-2U emergency stop button.

TEX Tray Exchanger

Maintenance of the TEX Tray Exchanger is not included in this chapter. Maintenance instructions for this unit are found in the *TEX Tray Exchanger, Service Manual*, MYDATA part # P-024-0162-EN.

Other optional units

Other optional units (except for external conveyor units) are included in this chapter. For maintenance of these optional units, instructions under the corresponding headlines are to be followed.

Spare parts

Spare part #'s are found in the *Spare Parts Catalog*.

Daily

Base Machine

1. Inspect the mount tools.
– Clean off any solder paste and glue from the mount tools. Be careful not to damage the springs in spring-loaded tools.
– Inspect the tool tips.
– Replace damaged tools and tool tips (plastic and rubber tool tips can be renewed).

2. Clean the centering jaws.
– Clean the centering jaws using Q-tips slightly wet in alcohol.

3. Clean the machine and the magazines.
– Clean the machine and the magazines from components and pieces of component tape.

4. Inspect the magazine connectors.
– Remove components and pieces of component tape from the magazine connectors.
– Make sure the connectors are not damaged.

5. Empty the reject bins.

6. Inspect the warning signs.
– Make sure the warning signs on the machine are clean and readable. If not, replace the signs (refer to the *Safety* chapter).

Glue Device

7. Clean the glue tools.
– Wipe off carefully with a cloth slightly wet in alcohol.

8. Clean glue tool verification points (at tool bank and glue station).
– Clean the glue verification point on the tool bank and the glue verification point on the glue station.

9. Clean under the tool bank.
– Clean under the tool bank where the glue tools are kept.

HYDRA Unit

10. Inspect the HYDRA mount tools.
– Clean off any solder paste and glue from the mount tools.
– Inspect the tools. If damaged, replace the tools or the plastic nozzles (see the *Machine Manual*).

11. Remove components from the HYDRA camera glass.
– Remove dropped components from the HYDRA camera glass by pulling the knob at the front of the HYDRA camera box.

Linescan System
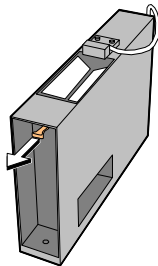
12. Remove components from the Linescan camera glass.
Remove dropped components from the Linescan camera glass by withdrawing it at the front of the camera box, see the figure.

Appendix A – Menu Reference Guide

Appendix A contains:

– Shortcuts

– Hot menu

– Main menu

– Switches

Shortcuts

⇧	F1	Shows the last camera image.
⇧	F10	Opens a hot menu, see the next section. You can press <F10> only as well.
Ctrl	S	Starts stepper mode. If the access system is on, then the user must have the *Service* access right set to *High* to be able to invoke the stepper mode.
Ctrl	T	Removes text from the screen. Useful when inspecting camera images. Reset by pressing <Esc>.
Ctrl	Y	Moves the Y wagon to the front or back position. Press twice if not used for the last five seconds.
Alt	F1	Switches to the TPSys on-line terminal, tty1.
Alt	F*n*	Switches to virtual terminals, for logging on to TPSys off-line or for Linux usage. F*n* being <F2> to <F6> for terminal tty2 – tty6, and <F8> for terminal tty8 used as console.

For machines with CP5/VVG hardware or later

Keys	Description
Ctrl + ↑	Pans the camera image. Select pan direction by using the corresponding arrow key.
Ctrl + ⇧ + ↑	Pans the camera image quickly. Select pan direction by using the corresponding arrow key.
Ctrl + PgDn	Zooms in (requires VVG2 board).
Ctrl + PgUp	Zooms out (requires VVG2 board).
Ctrl + Home	Resets to default zoom and panning.

Appendix A – Menu Reference Guide   **MYDATA automation AB**

Hot Menu

A hot menu containing a number of the most used options is opened by pressing <Shift>+<F10>, or just <F10> in TPSys.

```
┌──────── Hot Menu ────────┐
│ Reset Magazine Errors     │
│ Package List Editor       │
│ Component List Editor      │
│ Magazine List Editor       │
│ Parameter Editor          │
│ Switches                  │
│ Mount/Glue Switches       │
│ Fiducial Mark List Editor │
│ Y Wagon Magazine          │
│ Pallet Magazine           │
│ TEX List Editor           │
│ Tray Wagon Magazine       │
│ View Messages             │
│ Set Message Time Mark     │
│ HYDRA tool utility        │
└───────────────────────────┘
```

All the options in the popup menu may not be shown due to that the feature is not installed or cannot be selected.

The options in the hot menu refer to main menu options or sub options. The following table shows where in the main menu the hot menu options are found.

Hot menu option	Main menu	Page
Reset Magazine Errors	Magazine	A-9
Package List Editor	Editor	A-12
Component List Editor	Editor	A-12
Magazine List Editor	Magazine	A-8
Parameter Editor	Editor	A-12
Switches	Production	A-6
Mount/Glue Switches	Production	A-6
Fiducial Mark List Editor	Editor	A-13
Y Wagon Magazine	Magazine	A-9
Pallet Magazine	Magazine	A-10
TEX List Editor	Magazine	A-11
Tray Wagon Magazine	Magazine	A-10
View Messages	Production	A-6
Set Message Time Mark	Production	A-6
HYDRA tool utility	Utility/Installation	A-17

A - 4   Rev. 0000 2004-01   P-020-0023-EN Operator's Manual

Main Menu

Production

```
┌─────────────────────────┐
│ Production               │
│ A Assemble               │
│ T Locate Boards (Auto)   │
│ M Locate Boards (Manual) │
│ S Clear Layout Status    │
│ D Clear Management Data  │
│ ------------------------ │
│ L Load Layout            │
│ E Edit Layout            │
│ U Unload Layout          │
│ X Layout Status          │
│ ------------------------ │
│ V View Messages          │
│ - Set Message Time Mark  │
│ W Switches               │
│ I Mount/Glue Switches    │
│ ------------------------ │
│ Y Move Y Wagon           │
│ C Conveyor Control       │
│ O Leave Tool             │
└─────────────────────────┘
```

Some of these options cause machine movements. Before entering such commands, check the following:

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

Assemble

Assembly start command, which is followed by a dialog box for layout name, batch name and quantity.

See the *Assembling the Layout* section in Chapter 3 of the *Operator's Manual*.

Locate Boards (Auto)

Causes machine movement.   Locates boards using automatic fiducial mark search.

See the *Board Location* section in Chapter 8 of the *Operator's Manual*.

Locate Boards (Manual)

Causes machine movement.   Locates boards using manual fiducial mark search.

See the *Board Location* section in Chapter 8 of the *Operator's Manual*.

Clear Layout Status

Clears layout status for the currently loaded layout.

See the *Clearing Status* section in Chapter 8 of the *Operator's Manual*.

Clear Management Data

Clears management data for the currently loaded layout.

See also *Delete Management Data* on page A-19.

See the *Clearing Management Data* section in Chapter 8 of the *Operator's Manual*.

Load Layout

Shows a list of available layouts to be selected and loaded.

See the *Loading Layout* section in Chapter 3 of the *Operator's Manual*.

Edit Layout

If a layout is loaded, it is opened in the Layout Editor.

If no layout is loaded, then you can select a layout to edit.

See the *Mount List Structure Diagram* section in Chapter 7 of the *Programming Manual*.

Unload Layout

Unloads the currently loaded layout.

Layout Status

Opens the Layout Status Editor.

See the *Layout Status* section in Chapter 8 of the *Operator's Manual*.

View Messages

Enlarges the message box to a full screen size message window.

See the *Messages* section in Chapter 2 of the *Operator's Manual*.

Set Message Time Mark

Sets a time stamp as a message line in the message log. This feature is intended for troubleshooting (to mark the time for a certain activity to be able to see if the problem remains after the time stamp).

Switches

Makes a number of production switches accessible.

See the *Switches* section in this appendix.

Mount/Glue Switches

Makes global switches for component mounting and glue application accessible.

See the *Mount and Glue Switches* section in Chapter 8 of the *Operator's Manual*.

Move Y Wagon

Moves the Y wagon (and the Tray Wagon Magazine, if used) to the front or back position. Select position from the menu:

Causes machine movement.

```
┌ Y Wagon Move ┐
F Front
B Back
```

Conveyor Control

Manual loading and unloading of boards from a conveyor. Select action from the menu:

```
┌──── Conveyor Control ────┐
L Conveyor Load/Grab
R Conveyor Release & Unload
W Set Conveyor Width
```

- **Conveyor Load/Grab**

  Loads a new board, adjusts the position (for automatic fiducial mark search), and grabs the board.

- **Conveyor Release & Unload**

  Releases the board and moves it out of the machine.

- **Set Conveyor Width**

  This feature affects only the Y-wagon conveyor on the machine. Surrounding conveyor system is not affected. The feature is used to:

  – Read off the current conveyor width, which is shown after selecting this menu option. If a layout is loaded, the board width is shown (zero is shown for a board which has no board size set).

  – Set the conveyor width by typing the conveyor width in the dialog box and confirming it. The conveyor will change to the new width after emptying present boards, if not empty.

The *0092.0031 Automatic width* parameter must be set to *Yes* to get this feature available.

Leave Tool

Current tool is placed in the tool bank after confirming the tool leave in the following popup box:

Causes machine movement.

```
┌─────────────────┐
│ OK to leave tool?│
│       OK         │
└─────────────────┘
```

Magazine

```
┌─────────────────────────┐
│ Magazine                │
│ F Adjust Feeder Positions│
│ M Magazines             │
│ A Locate All Magazines  │
│ G Removable Feeders     │
│ ------------------------│
│ R Reset Magazine Errors │
│ T Tray Type             │
│ Y Y Wagon Magazine      │
│ W Tray Wagon Magazine   │
│ P Pallet Magazine       │
│ X TEX                   │
│ ------------------------│
│ K Magazine Kits         │
│ C Create Magazine Kit   │
│ H HYDRA Preparation     │
└─────────────────────────┘
```

Some of these options cause machine movements. Before entering such commands, check the following:

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

Adjust Feeder Positions

Causes machine movement.   In order to calibrate tape and vibratory magazine feeder pick positions, this option makes it possible to center the cross hairs on the component pick positions by using the trackball or joystick.

See the *Calibrating Pick Positions* section in Chapter 4 of the *Operator's Manual*.

Magazines

Opens the Magazine List Editor for tape and vibratory magazines.

See the *Tape and Vibratory Magazine List* section in Chapter 6 of the *Programming Manual*.

Removable Feeders

Opens the Removable Feeder List Editor.

See the *Removable Feeder List Editor* section in Chapter 6 of the *Programming Manual*.

Locate All Magazines

Causes machine movement.

In order to calibrate the magazine X positions, this option centers magazine fiducial marks automatically, provided the *0084.0302 Use magazine fiducial mark* parameter is set to *Yes*. If the automatic magazine fiducial mark search fails, then you can center the magazine fiducial mark using the trackball or joystick.

TM and TMFlex magazines are provided with fiducial mark stickers. This consists of a black sticker with a white line and it is attached on the left side of the magazine frame, in the pick line. The Agilis magazines have a round, drill-mark.

If you use vibratory magazines, you can attach fiducial mark stickers (see the figure) to get full advantage of the automatic location feature.

Press the sticker down properly when attaching it.

The fiducial mark sticker part # is D-014-0819.

Reset Magazine Errors

Clears magazine errors for all magazines.

See the *Magazine Errors* section in Chapter 4 of the *Operator's Manual*.

Tray Type

Opens the Tray Type List Editor.

See the *Tray Type List* section in Chapter 6 of the *Programming Manual*.

Y Wagon Magazine

The following sub menu is shown:

```
       ┌─── Y Wagon Magazine ───┐
       T Y Wagon Magazine
       P Y Wagon Positions
       └────────────────────────┘
```

- **Y Wagon Magazine**

  Opens the Y-Wagon Magazine List, used for trays placed on the assembly table.

  See the *Y-Wagon Magazine List* section in Chapter 6 of the *Programming Manual*.

- **Y Wagon Positions**

  Opens the Y-Wagon Position List, used for trays placed on the assembly table.

  See the *Y-Wagon Position List* section in Chapter 6 of the *Programming Manual*.

Tray Wagon Magazine

The following sub menu is shown:

```
┌──── Tray Wagon Magazine ────┐
│ T Tray Wagon Magazine       │
│ P Tray Wagon Positions      │
└─────────────────────────────┘
```

- **Tray Wagon Magazine**

  Opens the Tray Wagon Magazine List, used for trays placed on the Tray Wagon Magazine.

  See the *Tray Wagon Magazine List* section in Chapter 6 of the *Programming Manual*.

- **Tray Wagon Positions**

  Opens the Tray Wagon Position List, used for trays placed on the Tray Wagon Magazine.

  See the *Tray Wagon Position List* section in Chapter 6 of the *Programming Manual*.

Pallet Magazine

The following sub menu is shown:

```
┌──── Pallet Magazine ────┐
│ L Pallets               │
│ T Pallet Magazine       │
│ P Pallet Positions      │
└─────────────────────────┘
```

- **Pallets**

  Opens the Pallet List, used for pallets in the TEX.

  See the *Pallet List* section in Chapter 6 of the *Programming Manual*.

- **Pallet Magazine**

  Opens the Pallet Magazine List editor, used for trays placed on pallets in the Tray Elevator Magazine and in the TEX.

  See the *Pallet Magazine List* section in Chapter 6 of the *Programming Manual*.

- **Pallet Positions**

  Opens the Pallet Position List, used for pallets in the Tray Elevator Magazine and in the TEX.

  See the *Pallet Position List* section in Chapter 6 of the *Programming Manual*.

TEX

Opens the TEX List Editor, used for selecting TEX unit, locating pallet position and refilling trays.

See the *TEX List* section in Chapter 4 of the *Operator's Manual*.

Magazine Kits

Opens the Magazine Kit List Editor which contains all the Magazine Kits stored in the system.

See the *Magazine Kit List Editor* section in Chapter 4 of the *Operator's Manual*.

Create Magazine Kit

Creates a Magazine Kit for the currently loaded layout.

See the *Creating a Magazine Kit* section in Chapter 4 of the *Operator's Manual*.

HYDRA Preparation

Composes a magazine load list that is optimized for mounting a layout using the HYDRA unit.

See the *HYDRA Preparation* section in Chapter 6 of the *Programming Manual*.

Editor

```
Editor
C Components
P Packages
---------------
L Layouts
A Panels
B PCBs
---------------
R Parameters
---------------
F Fiducial Marks
G Glue Dots
U Users
```

Components

Opens the Component List Editor.

See the *Component List Editor* section in Chapter 4 of the *Programming Manual*.

Packages

Opens the Package List Editor.

See the *Package List Editor* section in Chapter 5 of the *Programming Manual*.

Layouts

Opens the Layout List Editor.

See the *Layout List Editor* section in Chapter 7 of the *Programming Manual*.

Panels

Opens the Panel List Editor.

See the *Panel List* section in Chapter 7 of the *Programming Manual*.

PCBs

Opens the PCB List Editor.

See the *PCB List* section in Chapter 7 of the *Programming Manual*.

Parameters

Opens the Parameter Editor.

See the *Parameter Editor* section in Chapter 4 of the *Software Manual*.

Fiducial Marks

Opens the Fiducial Mark List Editor.

See the *Fiducial Mark List* section in Chapter 8 of the *Programming Manual*.

Glue Dots

Opens the Glue Dot List Editor.

See the *Glue Dot List* section in Chapter 8 of the *Programming Manual*.

Users

Opens the User List Editor.

See the *User List* section in Chapter 8 of the *Programming Manual*.

Print

```
 Print
C Component
P Package
M Magazine
B PCB
Y Components In Layout
E Messages
R Parameters
-----------------------
N Management Data
O Magazine Optimization
K Magazine Kit
L Layout Preparation
T Removable Feeder
-----------------------
A Cancel All Printouts
```

Component

Selected component data or the complete Component List can be printed out.

Package

Selected package data or the complete Package List can be printed out.

Magazine

Selected magazine contents or the complete Magazine List can be printed out.

PCB

Data for a selected PCB or all PCBs can be printed out.

Components In Layout

A component list for the selected layout is printed out.

Messages

All messages or those with a maximum age of what is stated as *Give time in minutes* can be printed out or saved as a file on a floppy disk or on the local or host hard disk.

See the *Messages* section in Chapter 2 of the *Operator's Manual*.

Parameters

Selected parameter or all parameters can be printed out.

Management Data

Management data for the selected layout is printed out.

See the *Management Data* section in Chapter 8 of the *Operator's Manual*.

Magazine Optimization

Creates and prints a list of possible magazine combinations for the selected layout.

See the *Magazine Optimization* section in Chapter 4 of the *Operator's Manual*.

Magazine Kit

Selected Magazine Kit or all the Magazine Kits can be printed out.

See the *Printing a Magazine Kit* section in Chapter 4 of the *Operator's Manual*.

Layout Preparation

Creates and prints out a list of components which cannot be mounted in the selected layout.

See the *Layout Preparation* section in Chapter 8 of the *Operator's Manual*.

Cancel All Printouts

This command cancels all current print processes.

Utility

```
Utility
I Import
X Export
T Installation
D Diagnostics
M Re-Initiate Motor Controllers
O Re-Initiate Conveyor
C Conveyor Pass-Through Mode
G Login / Logout
A User Access System
W Web Interface Setup
E Clear Event Log
N Delete Management Data
-----------------------------
B Backup
R Restore
H Schedule Backup
S Save System Status
F Format DOS Diskette
U Units
L Language
K Desktop Resolution
```

Some of these options cause machine movements. Before entering such commands, check the following:

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

Import

Import command for TPSys and Directline format data, such as layout, panel, PCB, component, fiducials, and package.

See the *Importing Data* section in Chapter 6 of the *Software Manual*.

Export

Export command for TPSys and Directline format data, such as layout, panel, PCB, component, fiducials, and package.

See the *Exporting Data* section in Chapter 6 of the *Software Manual*.

Installation

Software installation tools for adjusting and calibrating various functions.

The following sub menu is shown:

Causes machine movement.

```
                  ┌──────── Installation ────────┐
                  │ X X-Wagon Camera Calibration      │
                  │ C Centering Base Level Measurement │
                  │ P Place Area Calibration          │
                  │ N Extended X Calibration          │
                  │ W Tray Wagon Installation/Removal │
                  │ O Z-Unit Offset Measurement       │
                  │ S Adjust Slot Position            │
                  │ T Tool Installation               │
                  │ V Optical Centering Calibration   │
                  │ F Centering Camera Fine Tune      │
                  │ H HYDRA                            │
                  │ R Cable Resistance Measurement    │
                  │ L Test Place Area Calibration     │
                  └────────────────────────────────────┘
```

- **Tray Wagon Installation/Removal**
  Installs and uninstalls the Tray Wagon Magazine.

  See the *Tray Wagon Magazine* section in Chapter 4 of the *Operator's Manual*.

- **All other options**
  All the other options in this menu are detailed in the *Machine Manual*.

Diagnostics

Software diagnostic tools for various functions.

The following sub menu is shown:

Causes machine movement.

```
                  ┌──────── Diagnostics ────────┐
                  │ T Toggle X Wagon Position   │
                  │ F Fetch Standard Tool       │
                  │ E Fetch HYDRA Tools         │
                  │ C Cycle Standard Tool       │
                  │ Y Cycle HYDRA Tools         │
                  │ H Hysteresis Test           │
                  │ V Vacuum Test               │
                  │ P Prepare To Grab Images    │
                  │ I Copy Last Images          │
                  └──────────────────────────────┘
```

- **Toggle X Wagon Position**
  Moves the X wagon to the outermost positions.

  See the *Moving X Wagon To Outermost Positions* section in Chapter 8 of the *Operator's Manual*.

- **All other options**
  All the other options in this menu are detailed in the *Machine Manual*.

Re-Initiate Motor Controllers

Causes machine movement.   Initiates the motor controllers and hardware without exiting TPSys.

The procedure should be performed if you suspect any trend of measuring error or abnormal movements.

Re-Initiate Conveyor

Causes conveyor movement.   Initiates the Y-wagon conveyor, that is to measure the mechanical end position and update the software.

☞ *Do not re-initiate the conveyor width if any board is left in the placement area.*

Conveyor Pass-Through Mode

Sets the machine in a pass-through mode so that boards can pass through the machine without being assembled. This option is intended for in-line machines temporarily not used.

Login / Logout

Allows an operator to log on to the system with a personal password and individual privileges.

To avoid leaving the system open for non-authorized persons, the operator can also log off by selecting this menu option.

User Access System

Switches the security feature on or off. This feature can only be switched on or off by a user for witch the *User* privilege level is set to *High*.

See the *User List* section in Chapter 8 of the *Programming Manual*.

Web Interface Setup

Used to select security levels in the WWW-set up.

Clear Event Log

Clears all data in the event log for the machine selected in a dialog box shown.

The event log is a database where system events (for instance start/stop, logon/logoff, magazine insert/extract, components mounted, tool information and errors) are stored. By using the TPSys *Export* feature this database can be used for evaluation of management and quality data outside TPSys.

Delete Management Data

Deletes the management data for a selected layout. The management data for the currently loaded layout cannot be deleted.

This command is intended to be used when cleaning up the system. If you want to clear the management data only for the currently loaded layout, then use the *Clear Management Data* option in the *Production* menu instead, see page A-6.

See the *Deleting Management Data* section in Chapter 8 of the *Operator's Manual*.

Backup

Backup is a feature for backing up most of the data stored in the various databases in TPSys.

See the *Backing Up* section in Chapter 5 of the *Software Manual*.

Restore

Restore is used for restoring data backed up with the previous feature.

See the *Restoring* section in Chapter 5 of the *Software Manual*.

Schedule Backup

Opens a dialog box in which scheduled automatic backup can be configured.

See the *Scheduled Backup* section in Chapter 5 of the *Software Manual*.

Save System Status

Saves numerous status parameters and settings, which can be interpreted by MYDATA technicians only. The function is intended for fault tracing and the command should be given immediately after a fault has occurred. The result can then be sent to MYDATA for evaluation.

Format DOS Diskette

Disks can be DOS formatted by TPSys in the machine disk drive by using this command.

See the *Disk Formatting* section in Chapter 3 of the *Programming Manual*.

Units

The measuring units can be selected to *Metric* or *Inch*.

Language

You can select language from a menu. After changing to another language, TPSys is exited and restarted.

Desktop Resolution

Select the desktop resolution to use from a pop-up window. The choices are *Standard resolution* or *High resolution*. The resolution must be set to high if the web interface is to be used.

Exit

```
 Exit
S Shutdown
R Restart TPSys
X Exit TPSys
M Exit To Service
```

Shutdown

System shutdown is selected prior to switching off the power. When this option is selected, you exit both the MYDATA TPSys and Linux. After receiving the following message you can safely switch the power off:

```
System halted
```

The system can now be re-booted by pressing the key combination <Ctrl>+<Alt>+<Del>.

Restart TPSys

TPSys and Linux are exited and then restarted again.

Exit TPSys

Exits TPSys and returns you to the Linux operating system.
To restart TPSys, type 'go' and press <Enter> at the Linux prompt.

Exit To Service

Exits TPSys and starts the *Service Program*.

The *Service Program* is described in the *Machine Manual*.

About...

```
About...
M This Machine
T TPSys
D Databases
S System Statistics
E Temp. Statistics
C Motor Controllers
```

This Machine

Shows the machine name and number, and available options, which can look like this:

```
Machine name: my15n123
 Machine No.: 15123

Options active:
  * Digitizer
  * Electrical two-pole test
  * Electrical transistor test
  * Optical centering
  * Bar code reader
  * Conveyor
  * Shared databases
  * HYDRA
  * Electrical measurement
  * Z High Speed
  * HYDRA High Speed
  * Autoteach
  * MYSpeed

User access system is on
                OK
```

TPSys

Shows TPSys version and revision trace information, which can look like this:

```
TPSys by MYDATA automation

Version 2.4.x for Linux

OK
```

Databases

Opens a popup menu for selecting status or size.

```
A Status
I Size
```

The *Status* option shows database status, that is local or shared databases:

```
Database status:

 Component data: Shared with tp94n124
  Magazine data: Shared with tp94n124
   Package data: Shared with tp94n124
      Mount data: Local
       User data: Local

                    OK
```

```
A Status
I Size
```

The *Size* option shows the database size for all databases, that is the number of entries in the databases:

```
Number of items:

 439 Magazines         2 Y-Wagon Trays
1156 Packages          1 Y-Wagon Tray Positions
 848 Components        0 Tray Wagon Trays
 115 Layouts           0 Tray Wagon Tray Positions
  39 Panels           10 Pallet Trays
  50 PCBs              5 Pallet Tray Positions
   6 Users            54 Tray Types
 213 Pallets          16 Fiducial Mark Types
   4 TEXs              8 Glue Dots
  33 Kit Lists

                    OK
```

System Statistics

Shows system statistics, which can look like this for machines which are not equipped with the HYDRA system ...

```
┌─────────────────── System statistics ───────────────────┐
│         Total up time: 29 days 10 hours 37 min 39 sec    │
│   Total assembly time: 12 min 23 sec                     │
│       Total glue time: ---                               │
│                                                          │
│  Total mounted with Z: 24                                │
│          Total glued: 0                                  │
│                           OK                             │
└──────────────────────────────────────────────────────────┘
```

... and like this for machines equipped with the HYDRA system:

```
┌──────────────────────────System statistics──────────────────────────┐
│         Total up time:   15 days  4 hours 34 min 45 sec              │
│   Total assembly time:   45 min 17 sec                              │
│       Total glue time:   ---                                        │
│                                                                     │
│  Total mounted with Z:   215                                        │
│          Total glued:   0                                           │
│   Total HYDRA cycles:   640                                         │
│     Tool:   1       2       3       4       5       6       7       8│
│  Mounted:   625     618     614     620     623     525     417     607│
│     Fail:   23      24      30      25      24      27      23      37│
│                                                                     │
│    Total mounted:   4964                                            │
│    Total X cycles:   955                                            │
│                           OK                                        │
└─────────────────────────────────────────────────────────────────────┘
```

Temp. Statistics

This option shows also system statistics, but this statistics can be reset by using the *Reset* command in online mode. The feature is intended for temporary statistics. It can look like this for machines which are not equipped with the HYDRA system ...

```
┌──────────Temporary system statistics──────────┐
│          Up time: 26 days  1 hours 46 min 9 sec │
│    Assembly time: 12 min 23 sec                 │
│        Glue time:  2 sec                        │
│                                                 │
│    Mounted with Z: 659                          │
│            Glued: 0                             │
│                                                 │
│                   OK    Reset                   │
└─────────────────────────────────────────────────┘
```

... and like this for machines equipped with the HYDRA system:

```
┌─────────────────────Temporary system statistics─────────────────────┐
│        Total up time:   15 days  4 hours 34 min 45 sec                │
│   Total assembly time:  45 min 17 sec                                 │
│      Total glue time:   ---                                           │
│                                                                       │
│  Total mounted with Z:  215                                           │
│          Total glued:   0                                             │
│         HYDRA cycles:   640                                           │
│     Tool:   1      2      3      4      5      6      7      8         │
│  Mounted:  625    618    614    620    623    525    417    607       │
│     Fail:  23     24     30     25     24     27     23     37        │
│                                                                       │
│          Mounted:   4964                                              │
│          X cycles:  955                                               │
│                     OK    Reset                                       │
└───────────────────────────────────────────────────────────────────────┘
```

Motor Controllers

Shows the motor controller software versions like this:

```
   Servo release:  7.4c

   Controller   C: C2d9ab 980120
   Controller   M: m31r   990922
   Controller   X: xD32DJ 960524
   Controller   Y: ym20hg 970423
   Controller   Z: zs25CA 971202
   Controller TEX: zs25CA 990309

                  OK
```

Switches

Four groups of production switches can be accessed by selecting the **Switches** option in the **Production** menu:

```
 Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
------------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
------------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
------------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

The four switch groups are:

```
     Parameter groups
1001 Test switches
1002 Assembly switches
1003 Bad board search
1004 Conveyor switches
```

By pressing <F7> you can print the highlighted switch group.

By pressing <F8> you can print out all the switch groups.
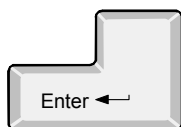
Press <Enter> to modify the highlighted switch group, see the next page.

Information about maximum and minimum values for those entries that are asked for values are shown in the information field.

```
                    ──────── 1001 Test switches ────────
0003 Mechanical test......................... Yes
0004 Test of Z level when place.............. No
0005 Test of Z level when pick............... Yes
0006 Test of Z vacuum........................ Yes
     Electrical test
0001    Test................................ Yes
0008    Perform test after magazine inserted... No
0002    No. of successful test before HYDRA.... 5
0020    Measure component after test........... No
0021    Use enhanced electric measure.......... No
0007 Lamp timeout............................ 90s
Save and exit.
```

– Select the desired switch by using the arrow keys.
– Select *Yes* or *No* by pressing <Space>.
– Confirm by highlighting *Save and exit.* and pressing <Enter>.

Password may be required to save modifications made.

The following switches are included in the switch groups:

```
1001 Test switches
0003 Mechanical test........................... Yes
0004 Test of Z level when place................ No
0005 Test of Z level when pick................. Yes
0006 Test of Z vacuum.......................... Yes
     Electrical test:
0001   Test.................................... Yes
0008   Perform test after magazine inserted..... No
0002   No. of successful test before HYDRA...... 5
0020   Measure component after test............. No
0021   Use enhanced electric measure........... No
0007 Lamp timeout.............................. 90s

1002 Assembly switches
     Bad board test:
0002 Automatic................................. No
0001 Check panels for bad boards............... No
0010 Use bad board mark on panel............... No
     Present board detection:
0014 Automatic................................. No
0013 Remember non-present board flags.......... Yes
     Locate boards:
0003 Automatic fiducial mark search............ Yes
0007 Locate all boards on a panel.............. No
0008 Accepted fiducial mark distance error (%).. 0.125
0009 Max accepted board angle deformation....... 0.50°
     Serial start:
0006 Mode...................................... Off
0023 Wait for layout name before load.......... Yes
     PCB id:
0024 Auto mode................................. Off
0025 Accept manual............................. No
0027 Auto generate on panels................... No
     Warning switches:
0019 Min component distance in PCB editor....... 1mm
0021 Overlapping board warning................. Yes
     Measure board level:
0011 Always.................................... Yes
0012 When new layout is loaded................. Yes
     Assemble:
0004 Use local fiducial marks.................. Yes
0005 Invert meaning of comp. mount/glue flags... No
0020 Max component height on PCB............... 15mm

1003 Bad board search
0001 Contrast level............................ 50
0010 Bad board area
0011   X size.................................. 2mm
0012   Y size.................................. 2mm
0021 Contrast means board OK................... Yes

1004 Conveyor switches
0001 Conveyor fetch............................ No
0002 Conveyor leave............................ No
```

The switches included in the four switch groups are described below in the same order as in the previous table.

1001 Test switches

0003 Mechanical test

Yes   –   Components with the *Verify mechanical* entry set to *Yes* in the Package List are verified mechanically.

No   –   No components are verified mechanically.

0004 Test of Z level when place

Yes   –   A plausibility check of the height level is performed and the actual placement height is compared to the package *Height overall* level in the Package List. This comparison also considers the *0021.0305 Place level tolerance* parameter to compensate the height of solder paste under the component.

      This feature detects if a component was never picked up from the magazine, has dropped from the mount tool or was placed on top of another component.

No   –   The height level is not measured when placing components.

0005 Test of Z level when pick

Yes   –   The same function as the previous switch, but in this case it is checked if the component pick from magazine feeder or tray is done within the height limits. The limits are set by the package *Height overall* entry in the Package List and the *0021.0105 Pick level tolerance* parameter.

      This feature detects if a component for instance is missed in the magazine.

No   –   The height level is not measured when picking components.

0006 Test of Z vacuum

Yes   –   The vacuum in the mount tool is checked to confirm that a component is held by the tool. This applies to all components except those for which the *Vacuum test* is set to *No* in the Package List.

No   –   No vacuum test is performed.

Electrical test

0001 Test

Yes   –   Electrical verification is performed on components for which electrical verification is defined in the Component List. It is also required that:

  1. There is a centering phase defined in the package list which has the same angle as the test specified in the Component List.

  2. The package is set to *Verify electrical Yes* for this centering phase in the package list.

No   –   No components are verified electrically.

0008 Perform test after magazine inserted

Yes   –   If a magazine is removed and then inserted again, then it resets the counter used by the *0002 No. of successful test before HYDRA* test switch. This counter sets how many components to be tested with the standard mount tool, before HYDRA mounting is started.

No   –   If a magazine is removed and then inserted again, then the counter used by the *0002 No. of successful test before HYDRA* test switch continues from the current value. If a sufficient number of components already had been tested by the standard mount tool before the magazine was removed, then the HYDRA mounting will continue immediately as the magazine is inserted again.

0002 No. of successful test before HYDRA

Defines a number of HYDRA mountable components which will be picked with the standard mount tool, tested with the centering jaws, and mounted on the board before the HYDRA unit continuous mounting the components.

The number applies to each magazine feeder that holds HYDRA mountable components. If, for example, there are 16 feeders that hold HYDRA mountable components and this parameter is set to 2, then 32 components will be tested and mounted with the standard mount tool before the HYDRA starts mounting the components.

This parameter affects HYDRA mountable components only, that is components for which a tool is specified in the *HYDRA tools* field in the Package List.

0020 Measure component after test

Yes – After passing the electrical verification, a new electrical measurement is performed on the component and the measured value from this measurement is stored in the event log.

This feature requires also that:

1. The *Save electric value* entry in the PCB editor is set to *Yes*.

2. The *0024 Electrical measurement* parameter in the *0191 Options* parameter group is set to *Yes*.

3. The magic word includes this optional feature.

No – No electrical measurement of the component is performed.

0021 Use enhanced electric measure

Yes – If the previous *0020 Measure component after test* switch is set to *Yes*, then the component value is measured as many times as set in the *0051 Number of measurements* parameter in the *0111 Verifier* parameter group. Then, a mean value and standard deviation is calculated and stored in the event log.

No – The measured value described in the previous switch, *0020 Measure component after test*, is stored in the event log.

0007 Lamp timeout

Sets the camera light idle time when, for instance, centering fiducial marks and positioning components. If the machine is left during such a procedure, the light is switched off after the time set. Pressing a key on the keyboard or moving the trackball or joystick turns it on again.

The time unit is seconds.

1002 Assembly switches

Bad board test

0002 Automatic

This switch has effect only if the switch named *Check panels for bad boards* is set to *Yes*.

Yes – An automatic bad board search is performed, that is the camera is moved to the position specified for bad board marks and searches for a mark.

No – The system does not perform automatic bad board search.

0001 Check panels for bad boards

Yes – The system searches for bad board marks on the PCBs included in the panel.

No – The system does not search for bad board marks.

0010 Use bad board mark on panel

In order to save time, this feature makes it possible to mark a panel to indicate that there are at least one bad PCB in the panel. Panels and bad boards are marked using bad board marks.

Yes – The system checks if there are bad board marks on panels.

If a bad board mark is found on a panel, all the PCBs included in the panel are checked.

If no bad board is found on a panel, the next board in the layout is checked. If there are no more boards, then the bad board search procedure is finished.

No – The system does not check if there are bad board marks on panels, but on all included PCBs.

This feature saves most time when there are many PCBs included in the panels and bad boards are of rare occurrence.

Present board detection

0014 Automatic

Automatic non-present board marking.

☞ The *0013 Remember non-present board flags* switch should be set to *No* if this switch is set to *Yes*.

See the *Automatic Non-Present Board Detection* and *Board Location Switches* sections in Chapter 8 of the *Operator's Manual*.

0013 Remember non-present board flags

Sets whether non-present board marks remain or are cleared after mounting.

See the *Marking Board As Non-Present* and *Board Location Switches* sections in Chapter 8 of the *Operator's Manual*.

Locate boards

0003 Automatic fiducial mark search

Yes – Automatic fiducial mark search is on.

No – Automatic fiducial mark search is off.

See the *Board Location Switches* section in Chapter 8 of the *Operator's Manual*.

0007 Locate all boards on a panel

Yes – When locating panels, all PCBs in the panel are subjected to individual fiducial mark search in addition to the panel itself.

No – Only the panel itself is subjected to fiducial mark search.

0008 Accepted fiducial mark distance error (%)

See the *Fiducial Mark Deviation* section in Chapter 8 of the *Operator's Manual*.

0009 Max accepted board angle deformation

See the *Fiducial Mark Deviation* section in Chapter 8 of the *Operator's Manual*.

Serial start

0006 Mode

Automatic start mode is intended for systems equipped with in-line conveyor and barcode reader or other detection device.

Off
> Automatic start mode is off.

Latest read
> The latest layout name read from the defined serial port is loaded and assembled (no queuing).

FIFO
> Queues up layout names in the order they are read from the defined serial port. As the boards are transported into the machine, the layouts are loaded and assembled in the queue order.

0023 Wait for layout name before load

Yes – If serial start is used, that is the previous switch is set to *Latest read* or *FIFO*, then TPSys will not load the next board until it has got the next layout name from the serial link.

No – The next layout is loaded without waiting for the next layout name from the serial link.

PCB id

For tracing components from a feeder to a PCB. The 'PCB id' is written into the event log in a PCB identity entry.

0024 Auto mode

Sets whether the 'PCB id' is taken from the serial line or not.

Off
> The 'PCB id' is not taken from the serial line.

Latest read, serial line
> The most recent 'PCB id' is taken from the serial line.

FIFO, serial line
> 'PCB id' is taken from the serial line in the order they appear, that is the oldest first.

0025 Accept manual

If switch *0024 Auto mode* is set to *Off*, then a pop-up box is shown asking for the 'PCB id' for each PCB.

Yes – The 'PCB id' can be entered manually by typing it, or by using the hand-held barcode reader.

No – The 'PCB id' cannot be entered manually.

0027 Auto generate on panels

Yes – The system accepts only one identity code per panel. From this identity code it generates identities for all the PCBs in the panel. The syntax of the generated identity codes is 'panelId_boardNo' where 'boardNo' is the board number in the panel.

No – The system does not generate identities for the PCBs in the panel.

Warning switches

0019 Min component distance in PCB editor

If the center-to-center distance between two components that are to be placed on a PCB is below what is specified by this switch, then a warning is shown.

0021 Overlapping board warning

Yes – Warns when the location of two boards on the assembly table are calculated to overlap each other (if you, for instance, have located two boards on the same fiducial marks).

No – No warning is shown for overlapping boards on the assembly table.

Measure board level

0011 Always

Switch for board level measurement.

☞ *Do not mix boards of different thickness in the same layout.*

Yes – The board level is measured once for each time the layout is assembled.

No – The board level can be measured according to the next switch *0012 When new layout is loaded*.

0012 When new layout is loaded

Switch for board level measurement.

This switch has effect only if the previous switch *0011 Always* is set to *No*.

Yes – The board level is measured only once after changing to a new layout.

No – The board level is measured only once.

☞ If the board thickness differ from layout to layout, this switch should be set to *Yes*.

Assemble

0004 Use local fiducial marks

Yes – Local fiducial mark search is performed automatically for components prior to placing, provided the *Local fiducial marks* in the PCB Editor is set to 1, 2, or 3.

No – Local fiducial mark search is off.

See the *PCB Editor* section in Chapter 7 of the *Programming Manual*.

0005 Invert meaning of comp. mount/glue flags

Yes – Only components for which *Mount* is set to *No* in the Component List are mounted. This switch inverts thus the function of the *Mount* field in the Component List.

No – Components for which *Mount is set to No* in the Component List are not mounted.

See the *Mount and Glue Switches* section in Chapter 8 of the *Operator's Manual*.

0020 Max component height on PCB

Using this switch, the operator can inform the system about the maximum height of components on the PCB that are not included in the current mount lists and thus not known by the system.

Normally the system knows the height and position of every component on the PCB from the package database and from the mount lists. This is important for optimizing the speed and allowing simultaneous X and Z movement, without hitting components on the PCB.

1003 Bad board search

0001 Contrast level

Sets a limit, above which the detected contrast is regarded as high. The value must be set so that the program can differentiate between the label and the background (one is detected as 'low', the other as 'high').

The contrast level must not be confused with light intensity level. High contrast means big difference in light intensity between the lightest and the darkest parts of an area.

For safe detection of bad board labels, there must be significant contrast difference between the labels and the backgrounds.

This figure shows a contrast level diagram for a scanned line. The diagram shows that the label has low contrast and is placed on a high contrast area. The *0001 Contrast level* parameter can be set rather low. The *0021 Contrast means board OK* parameter should be set to *Yes* to detect a bad board label.
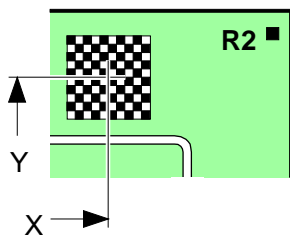
This figure shows a label with high contrast, placed on a board with low contrast. The *0001 Contrast level* parameter can be set rather high. The *0021 Contrast means board OK* parameter should be set to *No* to detect a bad board label.

Bad board area

0011 X size

The distance between the two X coordinates of the area in which a bad board mark is searched for.

Should be smaller than the label size.

0012 Y size

The distance between the two Y coordinates of the area in which a bad board mark is searched for.

Should be smaller than the label size.

0021 Contrast means board OK

Yes – If the contrast for the bad board mark search area is high (higher than the level set in the *0001 Contrast level* parameter), then the board is good and will be mounted.

This is the normal setting and means that the bad board label has less contrast than the board, for instance a white label.

No – Inverted contrast, a high-contrast search area means a bad board.

This setting can be used if you mount boards with no contrast. You can attach high-contrast labels to mark bad boards, or simply mark bad boards with black ink directly on the board.

1004 Conveyor switches

0001 Conveyor fetch

Yes – New boards are fetched automatically by the conveyor.

No – Boards are not fetched by the conveyor.

0002 Conveyor leave

Yes – Assemblies are transported away automatically by the conveyor.

No – Assemblies are not removed by the conveyor.

Appendix B – About the Documentation

The documentation of the MYDATA Component Placement Machines comprises the following parts:

- *Operator's Manual*

- *Programming Manual*

- *Machine Manual*

- *Maintenance Guide*

- *Software Manual*

- *Spare Parts Catalog*

The manual structure in Figure B-1 show the intended user for each manual.
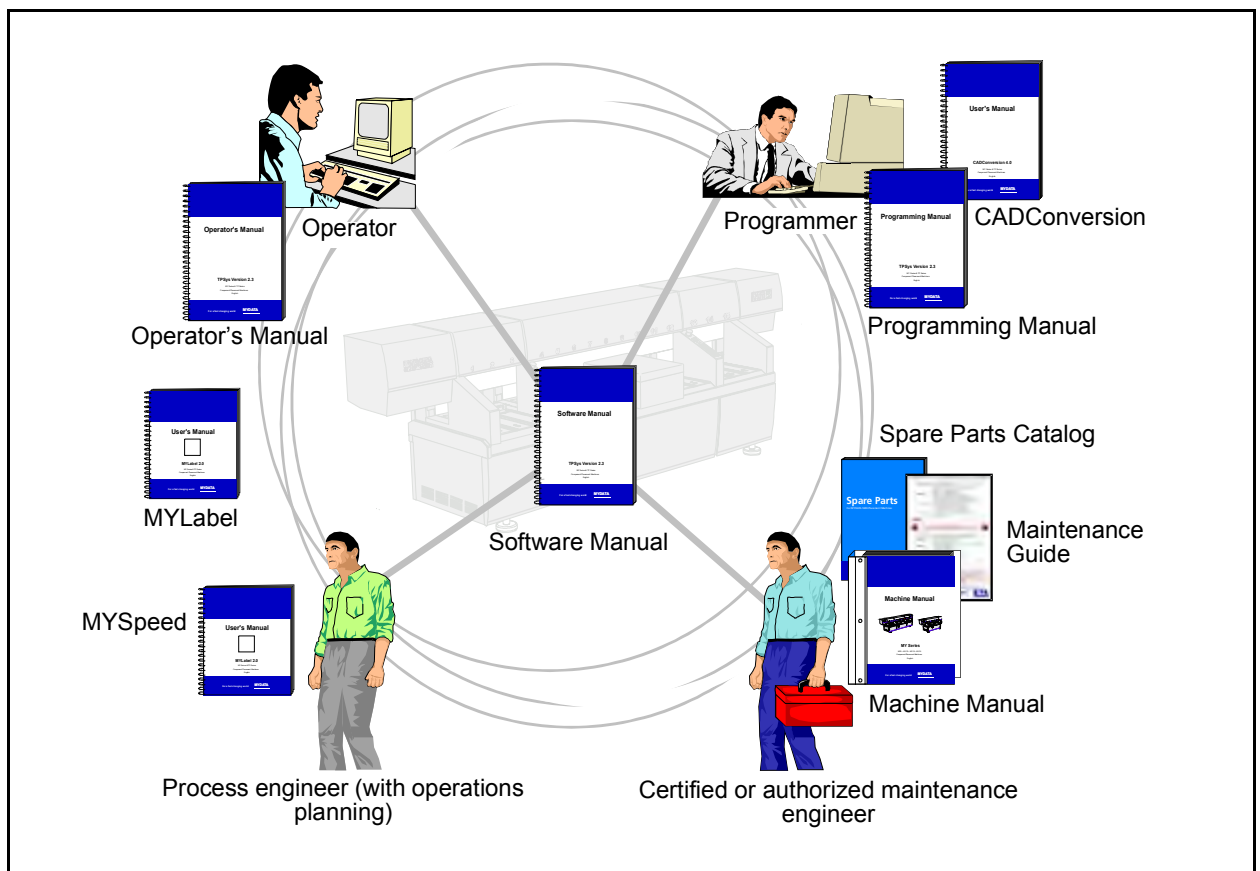
Figure B-1. Manual structure

Operator's Manual

An *Operator's Manual* for TPSys version 2.4 covers all the MYDATA machine types.

This manual is provided with each machine.

The *Operator's Manual* is available in a number of languages.

The *Operator's Manual* contains information to assist the operator to start and operate the system, load components and handle magazines and trays.

Information about safety, daily maintenance, HYDRA, TEX and Tray Wagon operation is also included in the *Operator's Manual*.

Programming Manual

A *Programming Manual* for TPSys version 2.4 covers all the MYDATA machine types.

This manual is provided with each machine.

The *Programming Manual* is available in the most common languages.

The *Programming Manual* contains basic information about the machine movements, coordinates, fiducial marks, angles, centering, verification, and how to program boards, create mount lists, maintain and complete component and package lists, etc.

Information about safety, pre programmed packages, HYDRA, TEX and Tray Wagon programming is also included in the *Programming Manual*.

Machine Manual

A *Machine Manual* is available for each of the machine series. There are thus two different *Machine Manuals* for the two current machine series:

- MY9, MY12, MY15 and MY19

- TP9-2U

Applicable manual is provided with each machine.

The *Machine Manual* is available in English only.

The *Machine Manual* contains descriptions, service instructions and calibration guidelines for the machine.

Information about safety, maintenance and common optional devices and systems are also included in the *Machine Manual*.

The *Machine Manual* has an index tag for the machine test protocol.

Maintenance Guide

A *Maintenance Guide* is available for each of the machine series. There are thus two different *Maintenance Guides* for the two current machine series:

- MY9, MY12, MY15 and MY19.

- TP9-2U.

Applicable guide is provided with each machine.

The *Maintenance Guide* is available in the most common languages.

The *Maintenance Guide* contains service instructions and guidelines for the machine.

Software Manual

A *Software Manual* for TPSys version 2.4 covers all the MYDATA machines running TPSys version 2.4.

The *Software Manual* is available in English only.

The *Software Manual* contains a system overview, Linux description, import/export information, back up/restore instructions and communications.

In an appendix there is also a message reference guide, containing those TPSys messages that can be displayed by TPSys, and descriptions of the messages.

Spare Parts Catalog

A *Spare Parts Catalog*, containing information, figures and part numbers on the most common spare and consumable parts, is available from MYDATA.

The *Spare Parts Catalog* is available in English only.

Supplementary software

MYDATA provide supplementary software which facilliate the programming work in TPSys.

This software may be mentioned in this manual but will not be described here. We refer you to their respective manuals.

CAD Conversion

CAD Conversion is a software package used to convert CAD files containing placement data to TPSys in order to use the data for component placing.

The CAD Conversion software package includes a comprehensive *CADConversion User's Manual*.

MYSpeed

MYSpeed is a software package used to calculate assembly time for boards that have not yet been assembled in order to get information for quotations and production planning. This software can also balance jobs between different machines or machine lines.

The MYSpeed software package includes a comprehensive *MYSpeed User's Manual*.

MYLabel

MYLabel keeps track of component carriers (tapes, sticks) used in production with MYDATA machines, by use of bar codes. MYLabel use an identification bar code linked to a database with component names, quantities and batch information on tape reels to be used by TPSys. The database also contains information related to the component, such as stock location and owner.

The MYLabel software package includes a comprehensive *MYLabel User's Manual*.

Index

Questionnaire

The intention with this manual is to guide you in the MYDATA pick and place system and to answer questions that may turn up.

To ensure that we provide appropriate information for these purposes, we would appreciate your views and suggestions on how to improve the manual in this direction.

Please, fill out the following questionnaire and send it by mail, or fax it to +46 8 475 55 01. You can also e-mail it to: support@mydata.se

Thanks for your kind help.

It's very valuable to us.

☺

Title (Mr./Ms/Other): _____ Initial: _____

Surname: _____ Job title: _____

Company: _____ Address: _____

City: _____ Country: _____ Phone: _____

1 Have you read entire sections or do you use the manual to look up specific information when needed?

❏ Read entire sections.   ❏ Look up specific information.

Comments: _____

_____

_____

2 Do you think the information is easy to find and understand?

❏ Yes   ❏ No

Comments: _____

_____

_____

3 Do you find any feature in MYDATA's system hard to understand, a feature that should be subjected to more detailed description?

❏ Yes   ❏ No

If yes, which one: _____

_____

_____

4 Do you have any suggestions on how we can improve this manual?

_____

_____

_____

MYDATA automation AB

Dokumentationsavdelningen

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Sweden

If you prefer to send by mail, fold here and tape. No envelope required.

If you prefer to send by fax, use this number: +46 8 475 55 01

Programming Manual

TPSys® Version 2.4

MY Series and TP Series

MYDATA Component Placement Machines

English

For a fast changing world   **MYDATA®**

Programming Manual

TPSys Version 2.4

MY Series and TP Series

of

MYDATA Component Placement Machines

–

English

This document is intended for MYDATA component placement machines. These machines can be run with MYDATA SYS program version 2.9 or MYDATA TPSys program version 1.x and 2.x. This document applies to the MYDATA TPSys version 2.4.

This document describes a standard machine and optional equipment available for the machine and magazines. Depending on your system you may lack some of the features described.

This system uses the ms unit for time. Length is measured in mm, but inch can be selected.

National special characters and some non-letter/non-figure characters cannot be entered into the system, for instance in board names and layout names. However, this version of TPSys allows the following characters to be used: " ' ' \ $; ^ @

In this document angle brackets < > are used to indicate certain key names contrary to a sequence of key strokes. Example: <Del> = the Del(ete) key, Del = the D, e, l key sequence.

Hardware and software mentioned in this document are subjected to continuous development and improvement. Consequently, there may be minor discrepancies between the information in the document and the performance or design of the product. Specifications, dimensions and other statements mentioned in this document are subject to changes without prior notice.

Federal Communications Commission (FCC)
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

IMPORTANT

Read the *Safety* chapter before starting the machine.

Contents

New Features in TPSys 2.4

Main features added to TPSys version 2.4 are:

Hardware Support for the Agilis Linear Magazines

Automatic location of fiducial marks on inserted magazines

Autoteach Illumination and vision data for packages

Chip and outline packages

Interactive add and remove

Miscellaneous Bar code handling of trays and tray positions

Look before pick for components in trays

Different pitch in X and Y direction for generic BGAs

Change package for all components with specified package

WWW access from TPSys machine

HYDRA Pick from TM-flex and vibratory magazines

About This Manual

MYDATA strives to provide documentation that is complete, accurate, informative and friendly. Your feedback is welcome! Please mail, or fax, the questionnaire that you find at the end of the manual to us. You can also e-mail your comments to: docs@mydata.se

For clarity, the manual uses several conventions to present information of special importance.

Lists of items, points to consider, or procedures that do not need to be performed in a specific order appear in bullet or hyphenated format:

- Item 1
- Item 2

or

  – Item 1
  – Item2

Procedures that must be performed in a specific order appear in numbered steps:

1. Perform this step first

2. Perform this step second

Specific keyboard keys are depicted in <- brackets, for example <Esc>. If more than one key should be pressed simultaneously, the notation appears as <Key1> + <Key2>, for example <Ctrl> + <F1>.

Screen prompts, menu and window names and appear in **bold** type. Where you need to access a menu, command or submenu, the syntax is **Menu**>**Submenu**.

For example **Editor**>**Component** mean: You open the Editor pull-down menu and select Component.

Fields within editors or boxes appear in *italics*. For example: *Name*

Program code appears in standard Courier font, for example:

```
Login: tpsys
$ go
```

A pointing finger denotes important information.

This is a warning to alert you to potentially harmful consequences.

This icon means that an emergency stop button shall be pressed down or the power turned off.

1. Safety

Before starting the machine, it is necessary that the operator, foreman and any other personnel involved in the machine operation, maintenance or service understand and follow these points:

- This machine is designed to pick components from their packaging and place them onto printed circuit boards, and to apply adhesive. The machine must be used exclusively for these two purposes and nothing else.

- The machine must be operated by trained personnel only.

- All personnel involved in machine operation must understand the use of the emergency stop buttons and how to manually move machine elements in case of emergency. See the sections entitled *Emergency Stop Buttons* and *Emergency Movement of Machine Elements* in this chapter.

- Anyone operating this machine must obey all warning signs. See the *Warning Signs* section in this chapter.

- At least one manual that describes the warning signs of the particular machine type must always be kept, for instance if the machine is upgraded with a later TPSys version.

- Apart from the daily maintenance described in the *Operator's Manual*, the machine is to be serviced by authorized maintenance engineers only.

- Excess component tape from the tape magazines shall be cut from the front of the machine when it is not in operation.

- Tools shall be inserted or removed from the rear of the machine when the tool bank is located on the rear of the Y wagon. For machines where the tool bank is located somewhere else, tools can be changed from the front of the machine. When inserting or removing tools to or from the tool bank, the emergency stop button shall be pressed down.

- An emergency stop button shall be pressed down when a tool or component is manually inserted or removed from the X wagon of the machine.

- If there is a risk that any unauthorized personnel might alter the system settings and thus the behaviour of the machine, then the logon facility for individual access rights has to be used.

- Ensure that all covers and shields are intact, mounted and closed while the machine is in operation.

- Do not disable or disengage any safety switch or sensor.

- Do not configure or modify MYDATA machines or devices without consulting MYDATA. The machines, devices or the interfaces between them might be unsafe.

- Do not use chemicals or other substances which may have any influence on the operator or other personnel involved in the machine operation.

- Handle the monitors carefully. They contain glass electron tubes evacuated from air which may implode if damaged.

Emergency Stop Buttons

All MYDATA placement machines have emergency stop buttons that are red and stop all machine movements immediately when pressed down.

All MY machines have two emergency stop buttons located at the front of the machine frame. These emergency stop buttons are released by being turned clockwise.

The TP9-2U machine has one emergency stop button located at the front of the machine frame. This emergency stop button is released by being pulled up.

Important

An emergency stop button must always be pressed down when hands, fingers, tools or other objects are within a shielded area or in the risk area of movable machine elements such as Y wagon or Tray Wagon Magazine.

Emergency stop buttons on all MYDATA optional devices, such as tray elevators and conveyor systems, have the same function, that is to switch all motors off and release movable machine elements.

Activating a stop system in an optional device, for instance opening a TEX Tray Exchanger door, stops only the optional device. The placement machine is not stopped by such an action.

Restart

To restart a machine after an emergency stop button has been released, enter a command on the keyboard.

Emergency Movement of Machine Elements

1 - 4

MY9, MY12, MY15 and MY19

On the MY machines, the X wagon, Y wagon, and Tray Wagon can be moved manually after pressing **both** the emergency stop buttons down, provided that the power is on.

If an accident has occurred and an emergency movement of a machine element is required, use the following procedure:

Learn this by heart!

1. Press both the emergency stop buttons down.

2. Leave the power on.

3. Move the machine element away by hand.

TP9-2U

On the TP9-2U machine, the X wagon, Y wagon, and Tray Wagon can be moved manually after pressing the emergency stop button down, provided that the power is on.

If an accident has occurred and an emergency movement of a machine element is required, use the following procedure:

Learn this by heart!

1. Press the emergency stop button down.

2. Leave the power on.

3. Move the machine element away by hand.

Warning Signs

The warning signs on the machine must be observed as this machine contains fast moving parts and high voltage.

The machine has warning signs placed as shown on the following pages. The figure numerals refer to the following descriptions.

Note that at least one manual that describes the warning signs of the particular machine type must always be kept, for instance if the machine is upgraded with a later TPSys version.

Optional devices have the warning signs shown in their manuals except for the TEX unit which has the warning signs detailed in the *TEX Tray Exchanger* section in Chapter 5 of the *Operator's Manual*.

All signs must be kept clean and readable.

MY9 and MY12 Warning Signs

Figure 1-1. MY9 and MY12 warning signs

MY9 and MY12 have the same set of warning signs. Figure 1-1 shows the MY12 machine.

Number and position of each sign type is described in the following text. If a sign is missing, it must be replaced immediately. Part numbers are printed on the signs, but can also be read from this description.

MY15 and MY19 Warning Signs

Figure 1-2. MY15 and MY19 warning signs

MY15 and MY19 have the same set of warning signs. Figure 1-2 shows the MY15 machine.

Number and position of each sign type is described in the following text. If a sign is missing, it must be replaced immediately. Part numbers are printed on the signs, but can also be read from the following description.

①

Sign 1 (D-010-0051-ENA/ENE America/Europe) warns of the fast X-wagon movement. No hands, fingers, or other objects are allowed beyond the glass shield.

This sign is applied as follows:

MY9, MY12

– 2 signs on the glass shield.

MY15, MY19

– 4 signs on the glass shield.

②

Sign 2 (D-010-0052-ENA/ENE America/Europe) warns of the optional Tray Wagon Magazine movements.

This sign is applied as follows:
– 2 signs on the Tray Wagon Magazine (optional).

3

Sign 3 (K-049-0073) warns of electric shock. Units on which this sign is placed contain dangerous voltage levels. Power must be switched off before opening the unit. Only authorized service personnel are allowed to operate the machine when such a unit is open.

This sign is applied as follows:

– 1 sign at the mains switch.
– 1 sign on the power supply unit at the rear of the machine.

4

ONLY MYDATA APPROVED
EQUIPMENT MAY BE
CONNECTED HERE.

Sign 4 (D-049-0047-EN) alerts that only MYDATA approved equipment is allowed to be connected to the power supply unit outlet.

This sign is applied as follows:

– 1 sign on the power supply unit at the rear of the machine.

TP9-2U Warning Signs

Figure 1-3. TP9-2U warning signs

Number and position of each sign type is described in the following text. If a sign is missing, it must be replaced immediately. Part numbers are printed on the signs, but can also be read from the following description.

Sign 1 (D-010-0051-ENA/ENE America/Europe) warns of the fast X-wagon movement. No hands, fingers, or other objects are allowed beyond the glass shield.
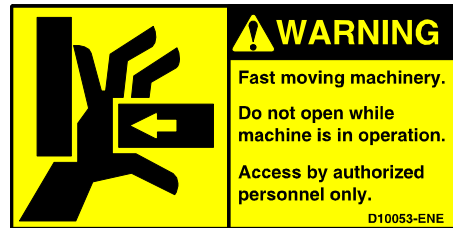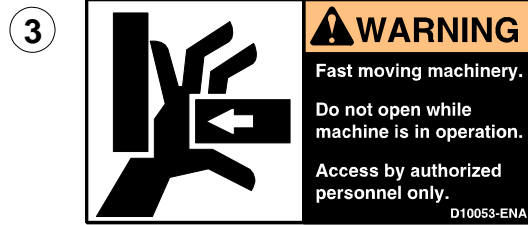
This sign is applied as follows:
 – 3 signs on the glass shield.

Sign 2 (D-010-0052-ENA/ENE America/Europe) warns of the Y wagon and the optional Tray Wagon Magazine movements.

This sign is applied as follows:
 – 2 signs on the Y-wagon base plate (front and rear).
 – 2 signs on the Tray Wagon Magazine (optional).

3

Sign 3 (D-010-0053-ENA/ENE America/Europe) warns of the fast X-wagon movement. Do not open any part of the cover while the machine is in operation, or start the machine if any part of the cover has been removed. Only authorized service personnel are allowed to open covers and expose moving parts.

This sign is applied as follows:
  – 5 signs on the rear of the X-wagon covers.

4

Sign 4 (K-049-0073) warns of electric shock. Units on which this sign is placed contain dangerous voltage levels. Power must be switched off before opening the unit. Only authorized service personnel are allowed to operate the machine when such a unit is open.

This sign is applied as follows:
  – 1 sign at the mains switch.
  – 1 sign on the power supply unit at the rear of the machine.

5

ONLY MYDATA APPROVED EQUIPMENT MAY BE CONNECTED HERE.

Sign 5 (D-049-0047-EN) alerts that only MYDATA approved equipment is allowed to be connected to the power supply unit outlet.

This sign is applied as follows:
  – 1 sign on the power supply unit at the rear of the machine.

Type Plate

The type plate shows the name and address of the manufacturer, the machine type and serial number, and manufacturing year and country. An example of a type plate is shown below.

Figure 1-4. Machine type plate

On the MY machines, the type plate is found on the rightmost machine stand (see '5' in Figure 1-1 and Figure 1-2).

On the TP9-2U machine, the type plate is found at the rear of the machine (see '6' in Figure 1-3).

Warnings in the Manual

Throughout the manual this symbol is used to call your attention to commands that starts machine movements. The symbol refers to the warning signs, which must be obeyed to eliminate the risk of injury.

If there are instructions accompanying this symbol, they must be followed.

Also, to avoid damage, this symbol means that the operator must be observant of the following:

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

Noise

For all the MY machines, the equivalent continuous sound pressure level is measured in accordance with EU directive 89/392/EEC to be 62dB(A).

For the TP9-2U machine, the machine noise is less than 70dB(A).

2. Getting Started

This chapter is intended to be a training guide for programming layouts, PCBs and panels.

A number of training boards, described on page 2-3, are used to show the programming procedure.

You can perform the programming described in this chapter with an operator's knowledge of the MYDATA placement machines. To proceed programming after accomplishing this chapter, you will need further information about the system and the features included in TPSys. The following chapters in this manual contain that information, which is divided into the following main parts:

- Basic information about the system in Chapter 3 including:
  – Fiducial marks
  – Coordinate systems
  – Board location
  – Angles
  – Centering and verification
  – Mount tools
  – Digitizer
  – Barcode reader

- Component information in Chapter 4.

- Package information in Chapter 5 and in *Appendix* A.

- Magazine information in Chapter 6.

- Assembly information in Chapter 7 which also includes:
  – Terminology for boards, panels and layouts.
  – Mount list structure diagram for the main editors in TPSys.

- Fiducial marks, glue application and user privileges are described in Chapter 8.

- A TPSys menu reference guide in *Appendix* B.

You can look up this information whenever needed during programming work.

A good advice is to copy the mount list structure diagram in Chapter 7 and have it available when programming, until you have learned the structure of the mount editors.

Allowed Characters

When entering for instance layout, panel, and PCB names or comment text into editors, all alphabetical and numeral characters are allowed to be used.

National special characters are, however, not included in the provided keyboard. These characters can, of that reason, not be used.

This version of TPSys allows a number of non-letter/non-figure characters. These are specified in the preface text on page ii.

Programming Methods

There are three different methods of programming boards:

- Importing mount data from a CAD system. This feature is not described in this manual. A description is found in the *CADConversion, User's Manual* provided with the MYDATA CADConversion software package.

- Using the position camera in the machine to position the components on the board. This method is described in this chapter.

- Entering position values from the key board. This is carried out in the same way as above, but the position values are keyed in rather than being measured by the camera system.

Manual Insertion/Removal of Tools/Components
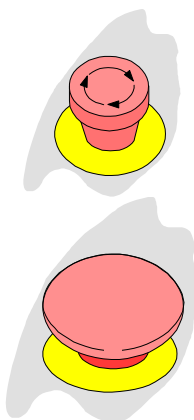
An emergency stop button shall be pressed down when a tool or component is manually inserted or removed from the X wagon of the machine.

In addition to the safety instructions found in the *Safety* chapter, follow any safety information displayed on the screen.

You have to read the *Safety* chapter before operating this machine.

Training Boards and Layouts

A number of PCBs to be programmed and a number of layouts for assembling the PCBs are used as training examples in this chapter. These examples are described below and the boards are available for copying on page 2-54.

Boards To Be Programmed

The following PCBs, included in a TV set, are to be programmed:

PCB	Board type	Qty.	Bare board
TV1	Video board	1	BB1
TV2	Audio board	2	BB2 or panel BB2x2
TV3R	RGB-Red	1	BB3 or panel BB3x3
TV3G	RGB-Green	1	BB3 or panel BB3x3
TV3B	RGB-Blue	1	BB3 or panel BB3x3

TV1

TV1 is the video board which is mounted on a bare board named BB1 see Figure 2-1.
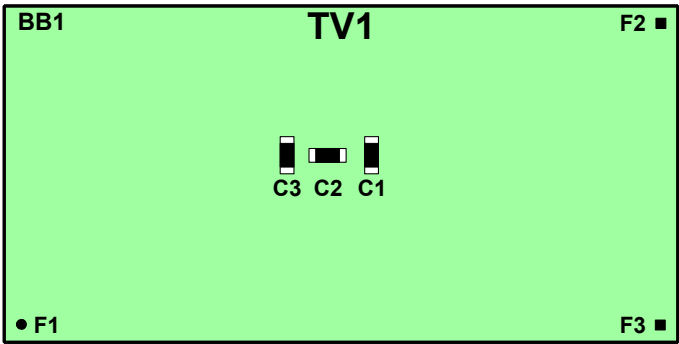
Figure 2-1. Printed circuit board TV1

TV2

TV2 is the audio board. Two identical audio boards are required as the television set has stereo sound. These PCBs are mounted on two BB2 boards, or on one panel named BB2x2 that includes two BB2 boards (see Figure 2-2).
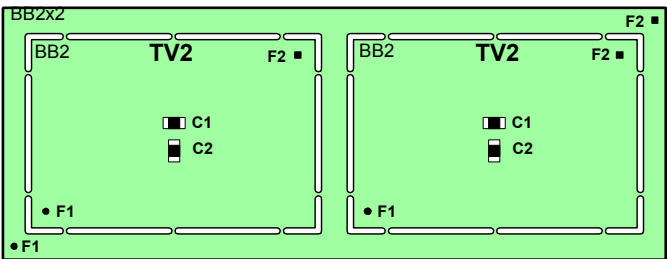
Figure 2-2. Two TV2 boards as a panel

TV3R, TV3G and TV3B

TV3R, TV3G and TV3B are the television color boards for red, green and blue. One of each board is required. These PCBs are mounted on three BB3 boards, or on one panel, BB3x3 which includes three BB3 boards, see Figure 2-3.
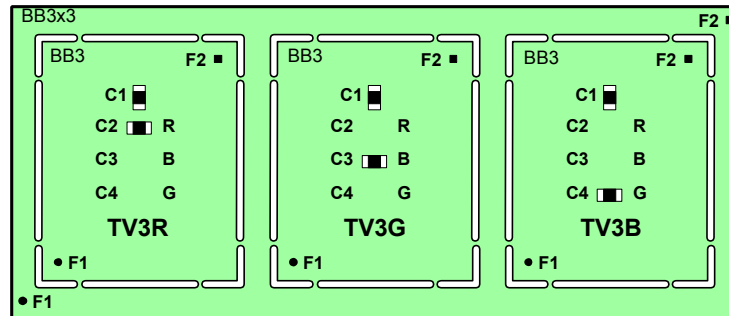
Figure 2-3. TV3R, TV3G and TV3B as a panel

These PCBs are equipped differently. A capacitor in position C2 makes a TV3R board, in position C3 a TV3G board and in position C4 a TV3B board.

Layouts To Be Programmed

The following layouts are to be programmed in this chapter. The layouts contain the following boards:
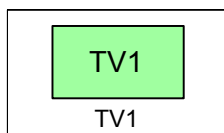
TV1
Assembling video board TV1
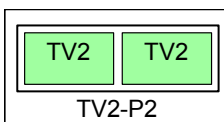
TV2-P2
Assembling two audio boards on panel TV2-P2
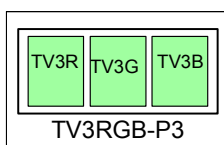
TV3RGB-P3
Assembling three color boards TV3R, TV3G and TV3B on panel TV3RGB-P3.
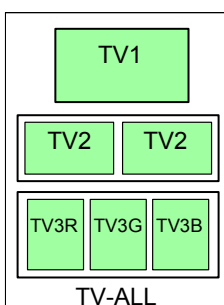
TV-ALL
Assembling a complete set of boards:

– one video board TV1
– two audio boards on panel TV2-P2
– three color boards on panel TV3RGB-P3

☞ The TV-ALL layout can be assembled on a machine with a Manual load sysem, or an in-line system equiped with a Manual load adapter.

Programming PCB

The following assumes that the system does not contain any previously programmed boards. The screen will therefore only show what you have programmed.

First you are going to program the TV1 video board that looks like this:
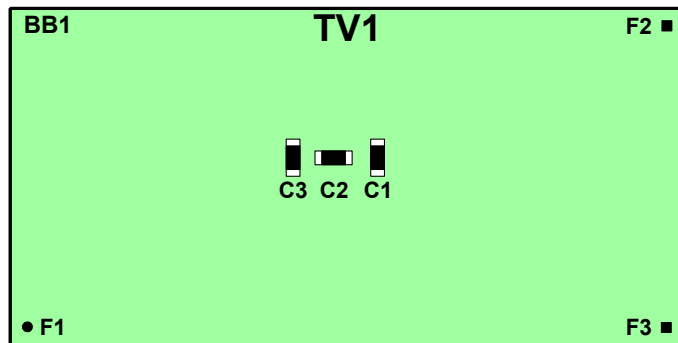
Figure 2-4. Video board TV1

This board is programmed in the following steps:

- Creating a new layout (page 2-6).
- Adding a new PCB to the layout (page 2-8).
- Programming the PCB header information (page 2-11).
- Adding components to the PCB (page 2-20).

Having at Hand when Programming

Have the following at hand when programming:

– A bare board (see page 2-54) to put into the machine.

– An extra board to measure and refer to.

– A table of the board coordinates or a ruler.

– Component location drawing.

– Parts list and any board documentation.

If your system is equipped with a digitizer, then you will notice that it speeds up the component programming considerably.

Creating a New Layout

Start the system and log on as described in Chapter 2 of the *Operator's Manual*.
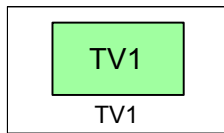
1. Open the Layout List Editor by selecting **Layouts** in the **Editor** menu.

2. Create a new layout by pressing <Ins>.

3. Enter the layout name, "TV1" as shown in Figure 2-5.

```
              * LAYOUT LIST EDITOR *
___Layouts___
                              Enter   Edit layout
                                Ins   Insert new
                                Del   Delete
                                 F6   HYDRA preparation
                                 F9   Copy

                        __Layout Information__
                          Name:
                        __Insert New Layout__
                          Name: TV1




                                        Bill           13:00
```
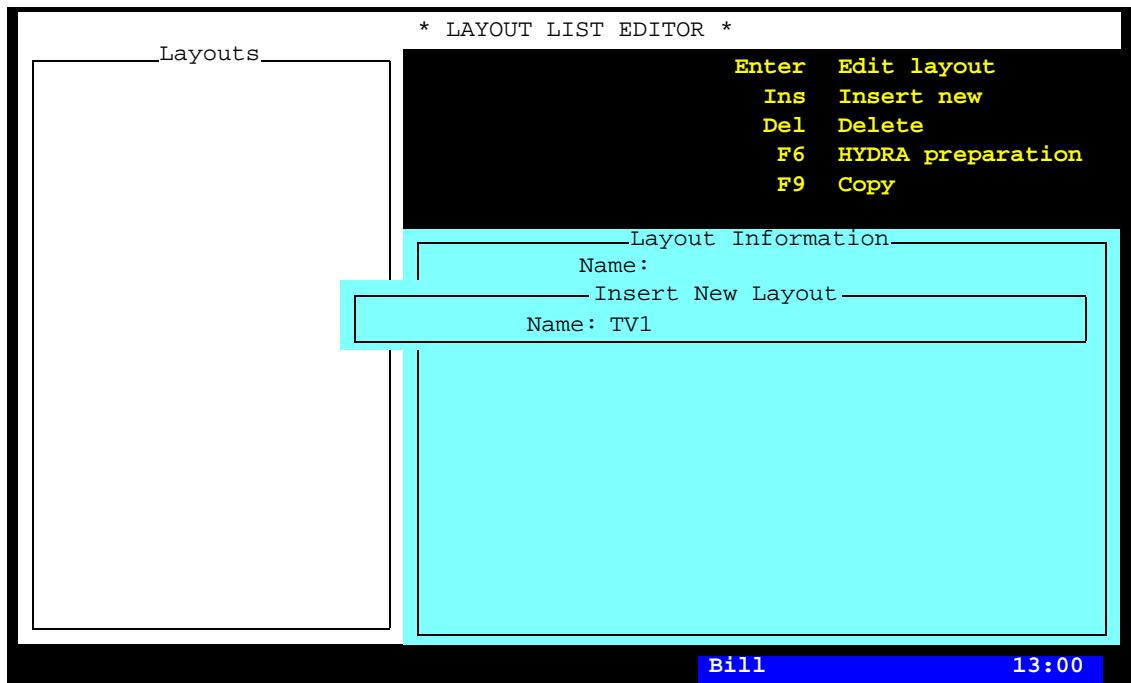
Figure 2-5. Entering a new layout

4. Save the new layout by pressing <Enter>.

5. Open the Layout Editor for editing the new layout by pressing <Enter>. You are asked whether you want to load the layout or not.

6. Load the new layout by selecting **Yes**.

7. Enter the comment text by pressing <F2> and typing the following text, that reflects the object and the name of the bare board:

Layout, bare board BB1

You can type comment text on a number of lines, but only the first line is visible in the various editors.

8. Save the layout header modification, either by pressing <Enter> repeatedly or by pressing <Esc> and accepting to save the modification in the following box:

```
Save modifications?
     Yes     No
```

The Layout Editor, which now contains the layout with the comment text, looks like this:

```
                        * LAYOUT EDITOR *
         ┌──Boards──┐
         │          │              Enter   Edit board
         │          │                Ins   Insert new
         │          │                Del   Delete
         │          │                 F1   Board position
         │          │                 F2   Layout header
         │          │                      information
         │          │
         │          │
         │          │         ┌─Layout Header──────────────┐
         │          │         │  Name:    TV1              │
         │          │         │  Comment:   Layout, bare board BB1 │
         │          │         └────────────────────────────┘
         │          │
         │          │
         │          │
         │          │
         │          │
         │          │                              Bill          13:06
         └──────────┘
```
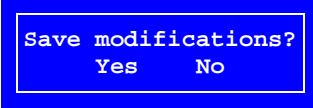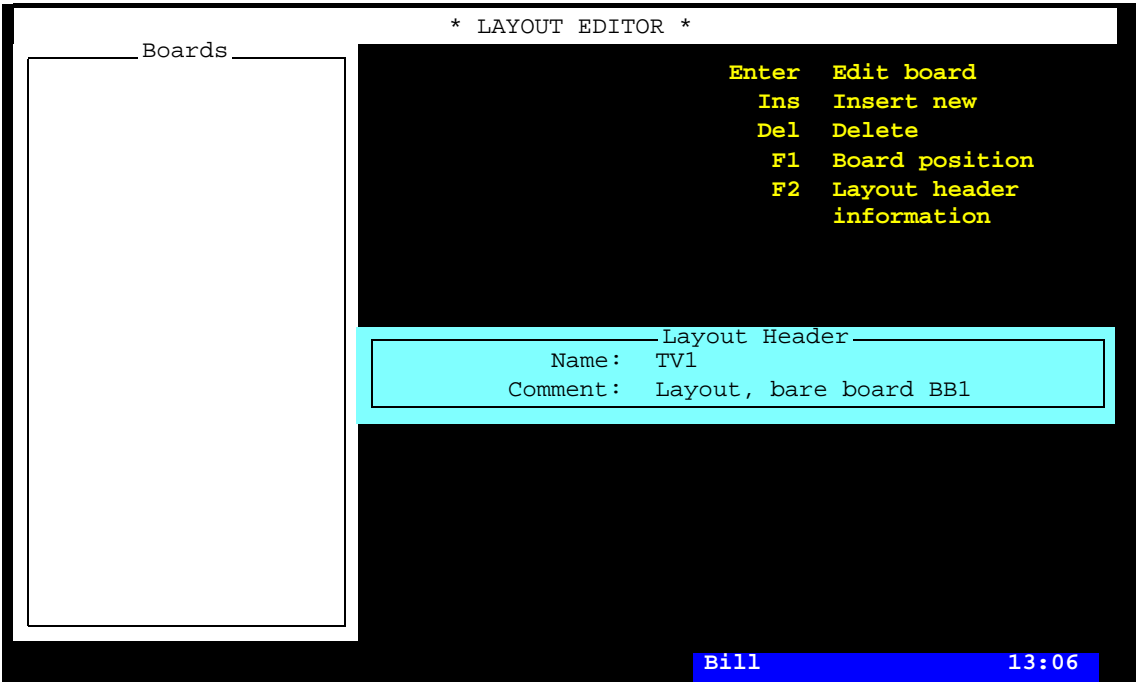
Figure 2-6. The new layout

Adding a New PCB to the Layout
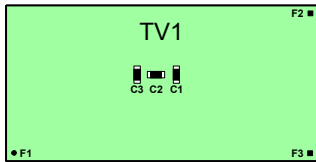
The layout that has been created is still empty. In this section you are going to create and add a PCB (TV1) to the layout.

9. Add a new board by pressing <Ins> and selecting **PCB** since the TV1 board is a PCB.

10. Enter the PCB name on the first line in the **Insert PCB** box:

```
                    ─Insert PCB─────────────
            Name: TV1
         Comment: * UNKNOWN PCB *
Fiducial mark 1:   0.000mm/ 0.000mm
              2:   0.000mm/ 0.000mm
              3:
```

... and press <Enter>.

You are asked if you want to select a PCB from the PCB List since the entered name was not found in the system:

```
PCB 'TV1' unknown
Select from list?
     Yes    No
```

11. Select **No** because the PCB entered does not exist yet.

```
                    ─Insert PCB─────────────
            Name: TV1
         Comment:
Fiducial mark 1:   0.000mm/ 0.000mm
              2:   0.000mm/ 0.000mm
              3:
Press <F1> for camera
```

12. Put the PCB into the machine, if not already done.

The PCB position in the machine is now to be located by means of the positioning camera.

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

13. Press <F1> and center the cross hairs on fiducial mark 1:
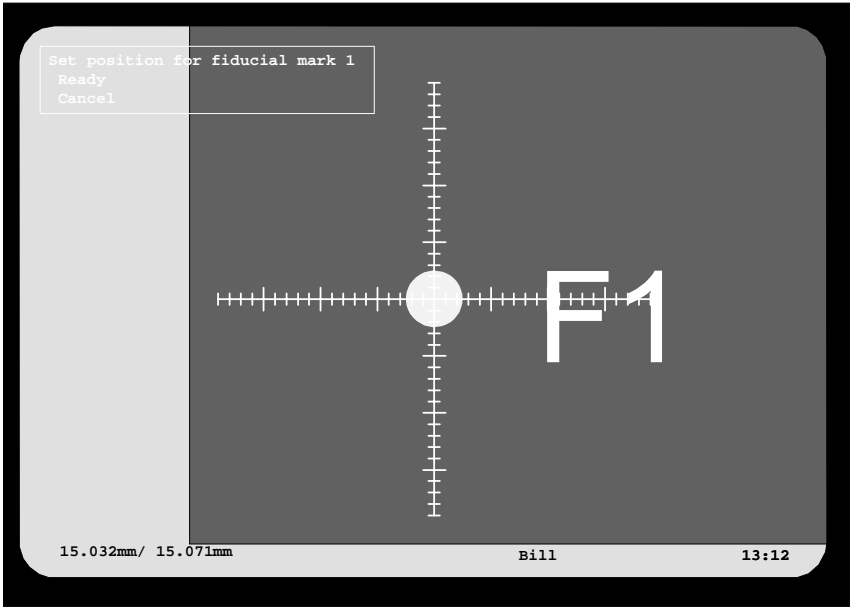
Figure 2-7. Centering fiducial mark F1

14. Confirm the position by selecting **Ready**. You are asked to
position fiducial mark 2:

```
                      ─Insert PCB─
          Name: TV1
       Comment:
Fiducial mark 1: 15.032mm/ 15.071mm
              2:  15.032mm/ 15.071mm
              3:
 Press <F1> for camera
```
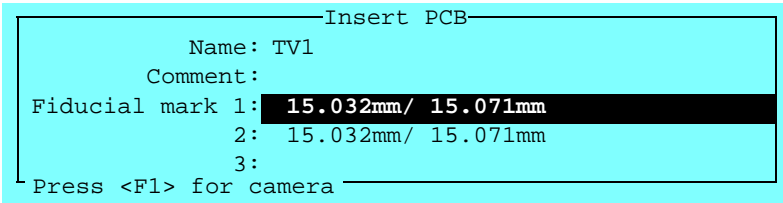
15. Press <F1> again and repeat the centering procedure for
fiducial mark 2:
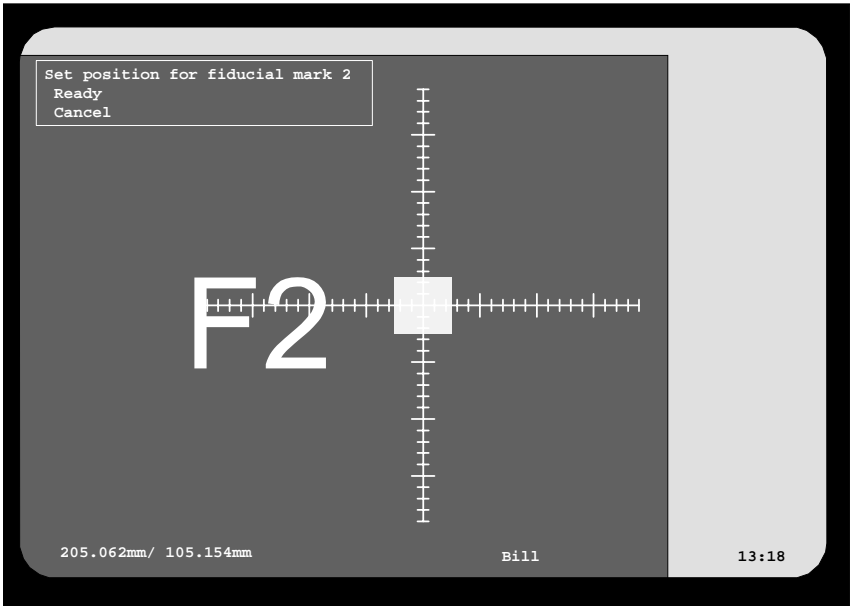
Figure 2-8. Centering fiducial mark F2

After the board is located, you are returned to the Layout Editor, in which the new board is shown:

```
                        * LAYOUT EDITOR *
        Boards
 1: TV1 (PCB)                              Enter   Edit board
                                             Ins   Insert new
                                             Del   Delete
                                              F1   Board position
                                              F2   Layout header
                                                   information




                             Layout Header
        Name:    TV1
        Comment:  Layout, bare board BB1
                             Board Position
        Type:  PCB
        Name:  TV1
       Comment:
              Fiducial mark 1:  15.032mm/ 15.071mm
                            2:  205.062mm/ 105.154mm
                            3:
                                                  Bill              13:12
```
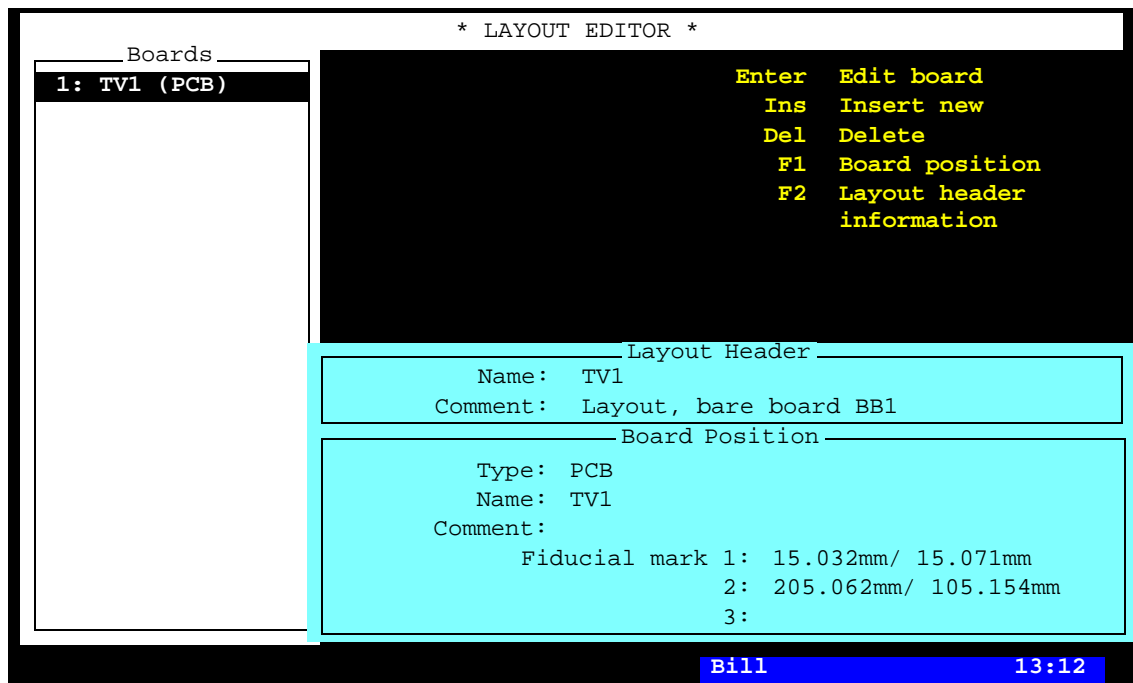
Figure 2-9. The new PCB in the layout

In this stage the new PCB contains only a name. There is no header information and no mount information programmed for it.

Next step is to program the PCB header information.

Programming the PCB Header Information

The PCB header information for the TV1 board is shown in Figure 2-10.
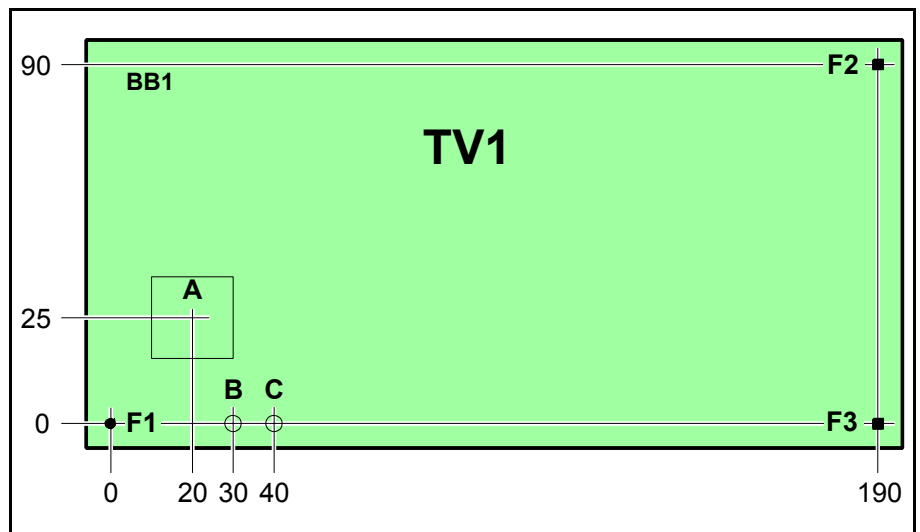
Figure 2-10. TV1 header information

Character key for the figure:

A   Bad board mark label position.

B   Board level measuring point for mount tools.

C   Board level measuring point for glue tools.

F1   Fiducial mark 1, round.

F2   Fiducial mark 2, square.

F3   Fiducial mark 3, square.

A description of creating fiducial marks and setting coordinate values is found in the *Fiducial Marks* section in Chapter 3. The same board, that is TV1, is also used as an example in Chapter 3.

This description starts from the Layout Editor (page 2-10).

16. Open the PCB Editor by pressing <Enter>:

```
              * PCB EDITOR *
   ___Items___
              Enter Edit item        F4 PCB size
               Ins Insert new        F6 Find position
               Del Delete       Shift+F6 Reset digitizer
                F2 PCB header         F7 Change groups
                                      F8 Replace component

                    ─PCB Header Information─
                        Name: TV1




                                      Bill            13:30
```
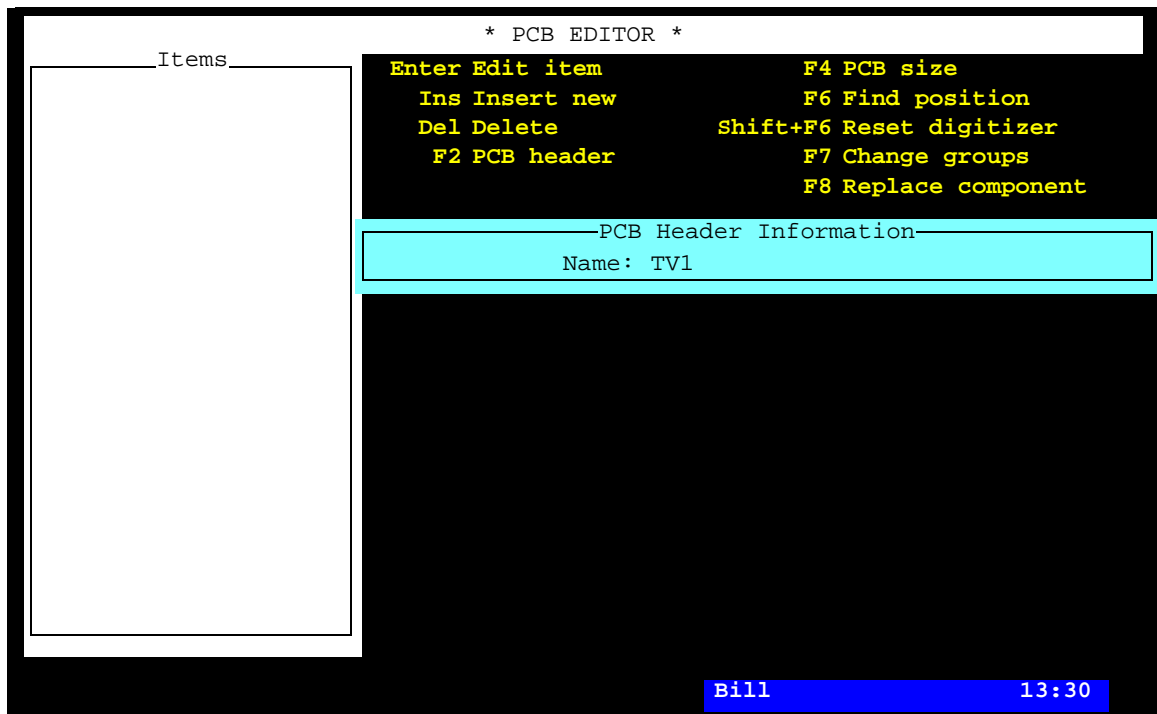
Figure 2-11. PCB Editor

17. Open the header information box by pressing <F2>:

```
              * PCB EDITOR *
   ___Items___
                              Enter Save and exit
                                 Esc Exit




                        ─PCB Header Information─
                        Name: TV1
                     Comment: PCB, bare board BB1
             Level measurement tools:
             No. of fiducial marks: 2
       Mark 1 ID:           pos.:  0.000mm/ 0.000mm
            2 ID:           pos.:  0.000mm/ 0.000mm
            3 ID:           pos.:
              Bad board mark pos.:  0.000mm/ 0.000mm
             Mount tool test pos.:  0.000mm/ 0.000mm
              Glue tool test pos.:  0.000mm/ 0.000mm



                                      Bill            13:36
```
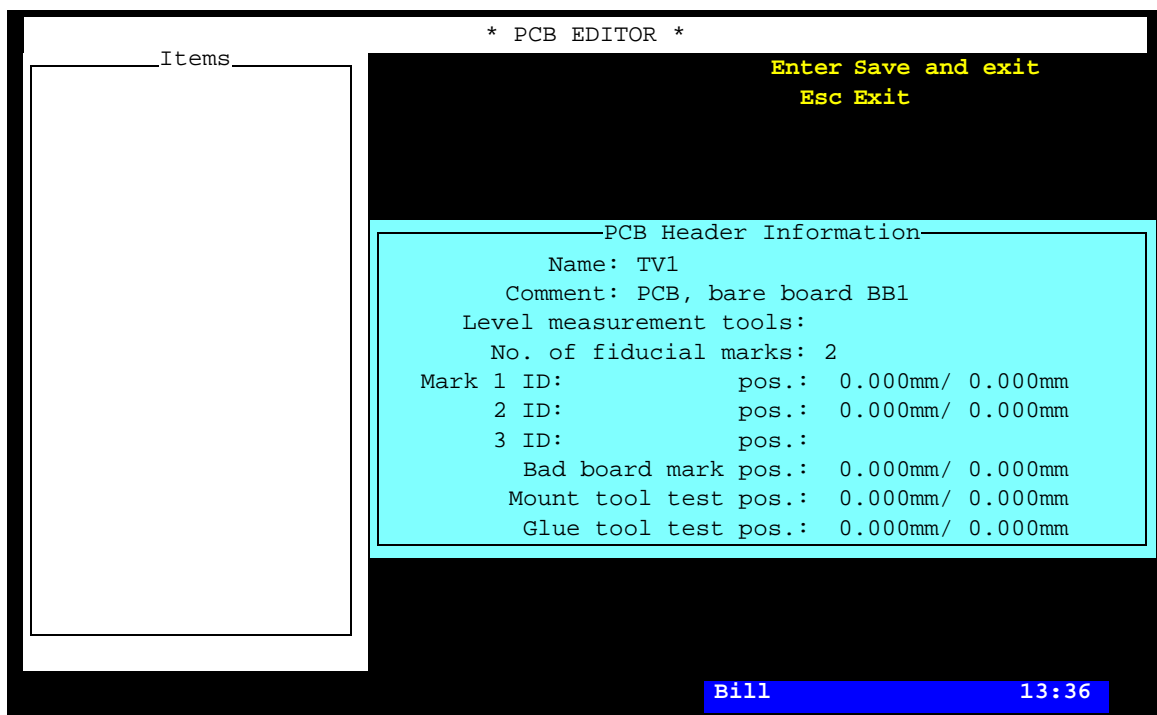
Figure 2-12. PCB header information

18. Type the following PCB comment text and press <Enter>:

> Comment: PCB, bare board BB1

19. Enter the number of fiducial marks, which is 3 for the TV1 board:

> No. of fiducial marks: 3

20. Type any letter in the first fiducial mark name field:

> Mark 1 ID: x   pos.: 0.000mm/ 0.000mm

21. Press <Enter> to open the fiducial mark window for selecting or creating a fiducial mark. The following box is shown:

> **Fiducial mark type 'x' unknown**
> **Select from list?**
> **Yes   No**

22. Accept to select from the list.

23. Create a new fiducial mark by pressing <Ins> in the fiducial mark window and entering the name *Ro-1.0* since the fiducial mark is round with a diameter of 1.0mm. Then teach the new fiducial mark.

This procedure is described in the *Fiducial Marks* section in Chapter 3.

24. Press <Enter> to return to the PCB Editor when the *Ro-1.0* fiducial mark is highlighted.

25. Let the origin of the board coordinate system coincide with fiducial mark 1, that is the default X/Y coordinate values are not changed:

> Mark 1 ID: Ro-1.0   pos.: 0.000mm/ 0.000mm

The system must be told where you have positioned the origin of the board coordinate system in the machine. Otherwise, it cannot calculate the coordinate values to the other fiducial marks and to the components.

To enter the position of fiducial mark 1 in the machine, use the camera as described in the following step (see also Chapter 3).

The system may ask you to insert a board into the machine.

26. Center fiducial mark 1 when the coordinate values of fiducial mark 1 is highlighted by pressing <F1> and using the trackball or joystick to center the cross hairs on fiducial mark 1 like this ...
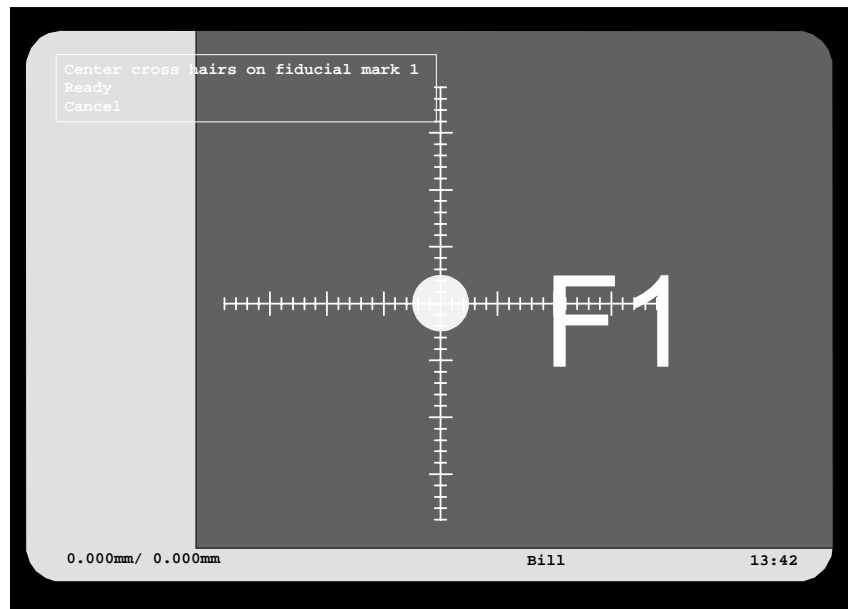
Figure 2-13. Centering fiducial mark F1

... then press <Enter> when **Ready** is highlighted.

27. Verify fiducial mark 1 by selecting **Yes** in the following box:

```
Autosearch fiducial mark?
     Yes    No
```
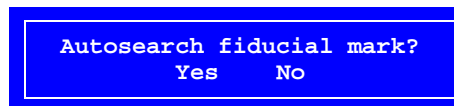
If an existing fiducial mark, perhaps from an earlier processed board type, has been selected, then it is necessary to verify the fiducial mark in this step.

This fiducial mark has previously been learned by the system but you can verify that the system recognizes it anyway.

28. Measure the board angle by selecting **Yes** in the following box:

```
Measure board angle?
     Yes     No
```

It is necessary for the system to know the angle of the board in the machine before centering the remaining fiducial marks.

Two marks on the board are required for this measurement. Use F1 and F3 since these are located along the X axis on the board, see Figure 2-10 on page 2-11.

If there are not two fiducial marks on the X or Y axis of the board, two other marks can be selected.

This procedure is described in the *Defining Fiducial Marks* section in Chapter 3.

29. Center fiducial mark 1 again, since it also is used as the first alignment mark when measuring the angle of the board ...
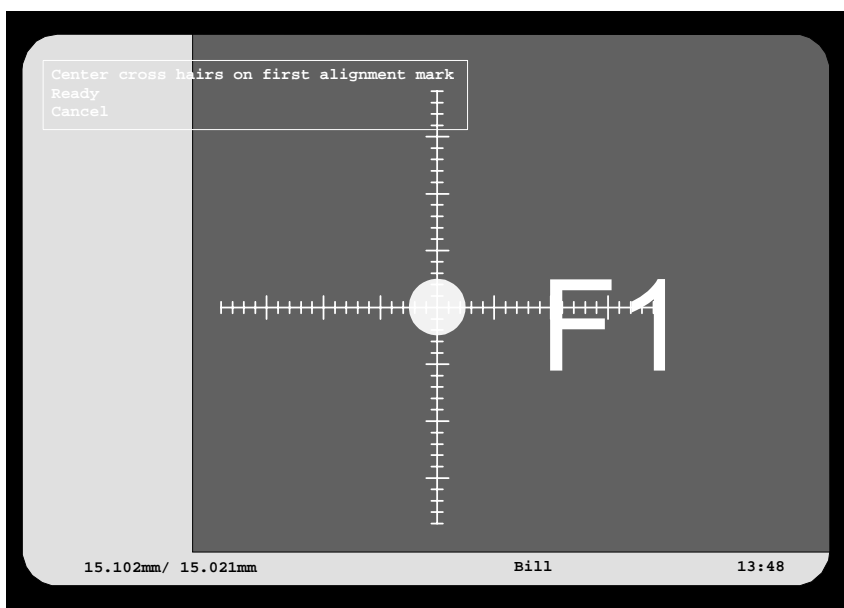
Figure 2-14. Centering the first alignment mark

... then confirm the position by selecting **Ready**.

30. Move to the second alignment mark, F3, and center this alignment mark as well:
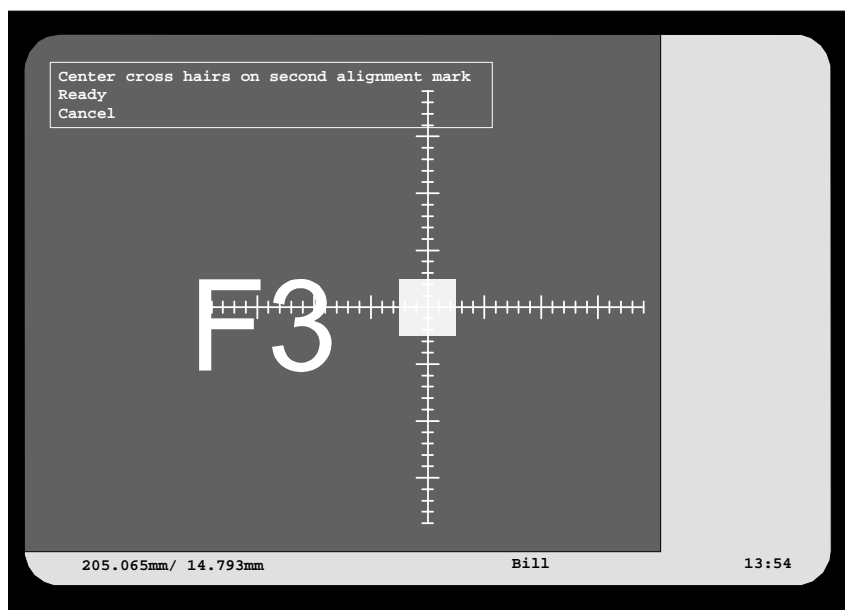
Figure 2-15. Centering the second alignment mark

31. Confirm the measured board angle by selecting **Yes** in the following box:
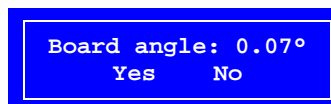
You will return to the PCB Editor.

32. Open the fiducial mark window again by typing a letter in the second fiducial mark name field, pressing <Enter>, and accept selecting from the list.

33. Create a new fiducial mark by pressing <Ins> in the fiducial mark window and entering the name *Sq-1.0* since the fiducial mark is square with 1.0mm sides. Then teach the new fiducial mark.

34. Press <Enter> to return to the PCB Editor when the *Sq-1.0* fiducial mark is highlighted. The fiducial mark is now inserted:

```
      2 ID: Sq-1.0     pos.:  0.000mm/ 0.000mm
```

35. Center the second fiducial mark in the same way as the first fiducial mark:

You can type approximate values before pressing <F1> to save machine movement time.

The trackball speed can be increased by five times if you press the left and the right trackball buttons simultaneously.
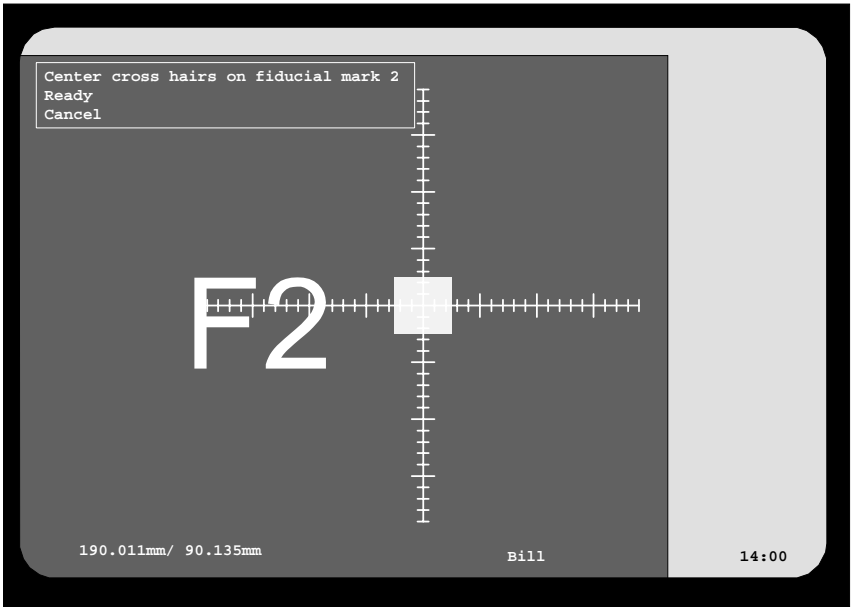
Figure 2-16. Centering fiducial mark F2

You may be asked if you want to make an automatic fiducial mark search.

Fiducial mark 2 is now complete:

```
        2 ID: Sq-1.0      pos.:  190.011mm/ 90.135mm
```

36. The third fiducial mark, F3, has the same shape as the second one. In the fiducial mark name field, type the fiducial mark name *Sq-1.0* and press <Enter>. Or, type the first letter (or letters) of the name, press <Enter>, and select *Sq-1.0* from the list in the fiducial mark window.

```
        3 ID: Sq-1.0      pos.: 0.000mm/ 0.000mm
```

37. Center the third fiducial mark in the same way as the previous fiducial marks:

Use approximate values.
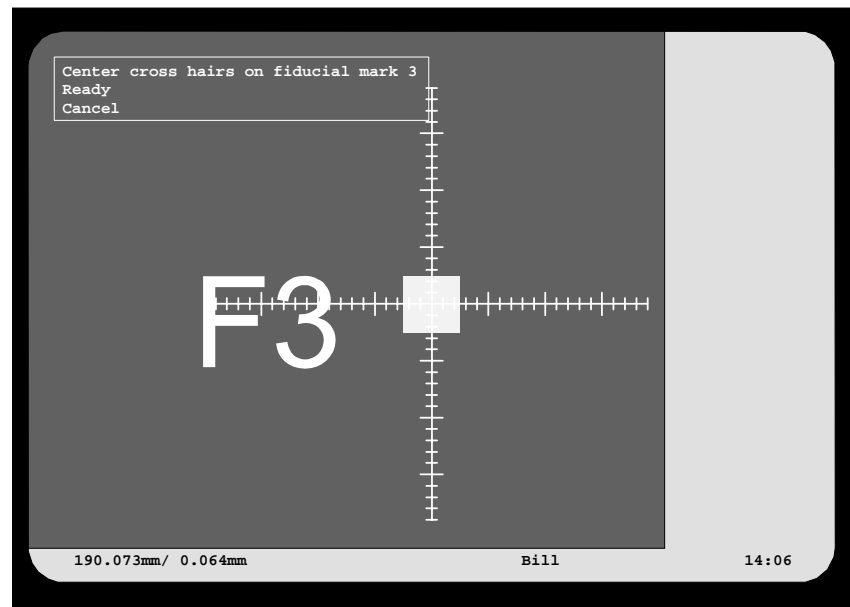
Figure 2-17. Centering fiducial mark F3

You may be asked if you want to make an automatic fiducial mark search.

Fiducial mark 3 is now complete:

```
          3 ID: Sq-1.0       pos.:   190.000mm/ 0.064mm
```

38. Enter the position of bad board mark labels, if used.

Low contrast labels are positioned where the board contrast is high (many visible leads), and vice versa. This feature is further described in the *1003 Bad board search* switches in *Appendix B*.

The coordinate values for the TV1 board (Figure 2-10 on page 2-11) are 20 and 25, which are typed with a space in between like this:

```
            Bad board mark pos.:   20 25
```

Press <Enter> to complete the position:

```
            Bad board mark pos.:   20.000mm/ 25.000mm
```

You can also press <F1> and use the camera to enter the position of bad board marks.

Bad board marks are not used on PCBs, but if the position is specified it can be used if the PCB is included in panels.
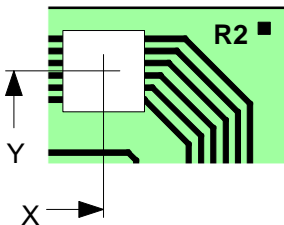
☞ *Study the 'Board Level Measurement' section in Chapter 7 before entering the following test positions.*

39. Enter the coordinate values for the board level test position for mount tools.

These values are 30 and 0 for this board, which are entered in the same way as the previous fields:

```
        Mount tool test pos.:  30.000mm/ 0.000mm
```

40. Enter the coordinate values for the board level test position for glue tools

These values are 40 and 0 for this board:

```
        Glue tool test pos.:  40.000mm/ 0.000mm
```

The PCB header information is now complete. The PCB board looks like this:

A = Bad board marks.

B = Board level measuring point for mount tools.

C = Board level measuring point for glue tools.
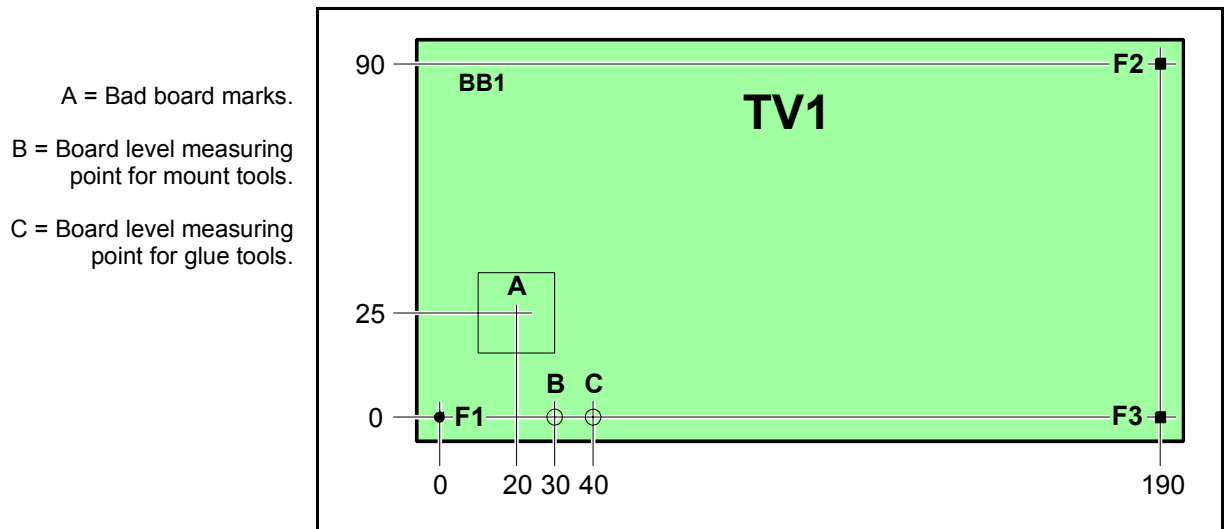
Figure 2-18. TV1 header information

... and the header information looks like this (press <F2> to view it):

```
              ─PCB Header Information─
              Name: TV1
           Comment: PCB, bare board BB1
        No. of fiducial marks: 3
Mark 1 ID: Ro-1.0     pos.:  0.000mm/ 0.000mm
     2 ID: Sq-1.0     pos.:  190.011mm/ 90.135mm
     3 ID: Ro-1.0     pos.:  190.073mm/ 0.064mm
       Bad board mark pos.:  20.000mm/ 25.000mm
     Mount tool test pos.:  30.000mm/ 0.000mm
      Glue tool test pos.:  40.000mm/ 0.000mm
```

Press <Esc> to hide the header information again.

Adding Components to the PCB

The PCB component information for the TV1 board comprises three items shown in Figure 2-19.
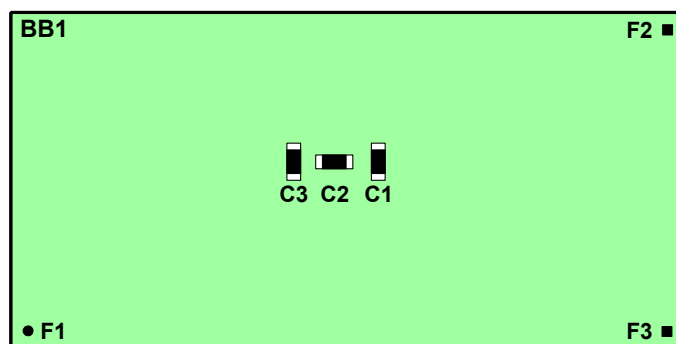
Figure 2-19. TV1 assembly

A detailed description of positioning components is found in the *Component Positioning* section in Chapter 7. The same board, that is TV1 is used as an example also in Chapter 7.

This description starts from the PCB Editor (after the previous action):

```
                          * PCB EDITOR *

           Items
                   Enter Edit item          F4 PCB size
                    Ins Insert new          F6 Find position
                    Del Delete       Shift+F6 Reset digitizer
                    F2 PCB header           F7 Change groups
                                            F8 Replace component
                              PCB Header Information
                            Name: TV1




                                          Bill            13:42
```
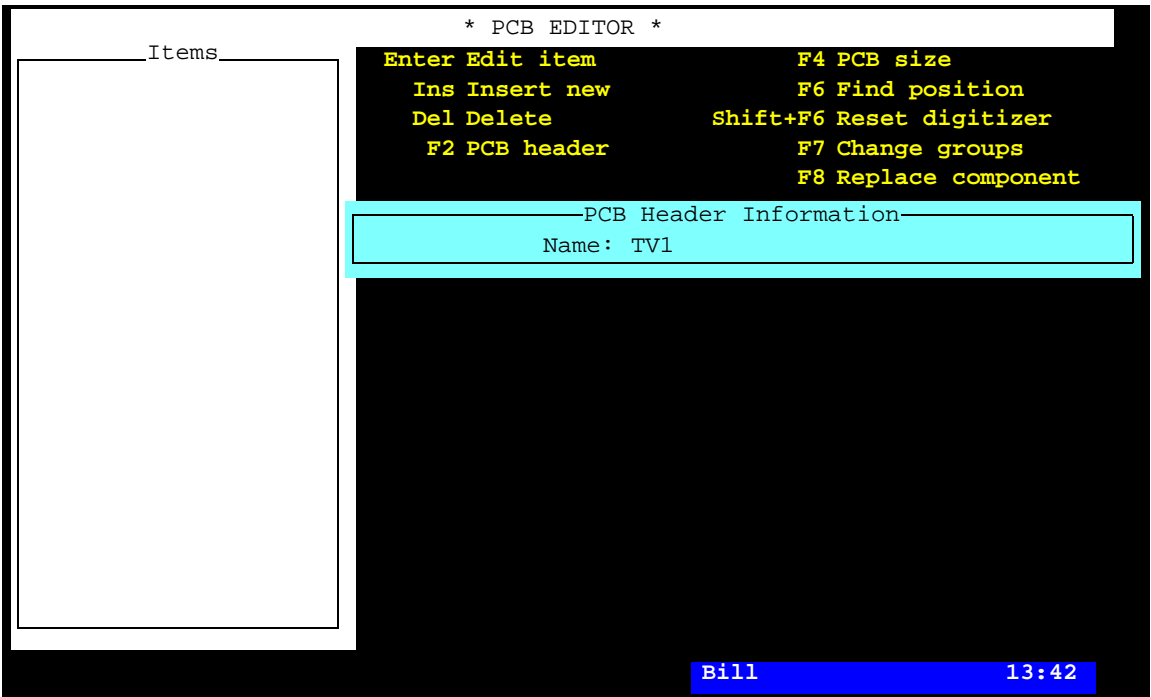
Figure 2-20. PCB Editor with the TV1 board

41. Enter the first item in the PCB parts list, which is capacitor C1, component name 000149.

Press <Ins>, type 'C1' and press <Enter>:

```
                      Insert New
             Location:  C1
             Component:

              Package:
                Angle:  0.00°
             Position:  0.000mm/ 0.000mm
```
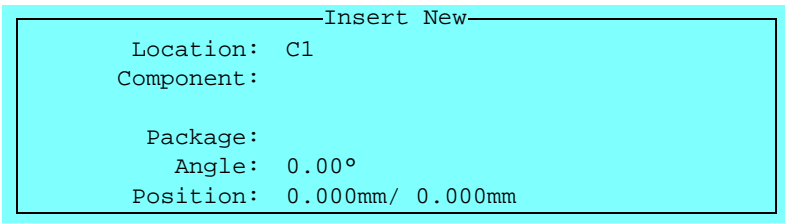
42. Enter the component name '000149' on the *Component* line.

Or, you can type '00' (the first characters of the component name) and press <Enter>. The component name '00' does not exist in the system:

```
Component '00' unknown
   Select from list?
      Yes    No
```
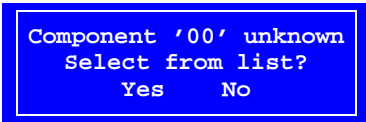
Accept to select from the component list, which is opened by selecting **Yes**.

The component list is opened and the component that closest matches the characters entered is highlighted:

```
                              * SELECT COMPONENT *
      Components
  000149                                        Enter   Select component
  000254                                          Ins   Insert new
  000255
  000501
  000502                       Name: 000149
  000503                    Comment: 100pF
  000511                    Barcode: 123456
  000513                    Package: 1206-06
  000514                      Mount: Yes
  000517              Magazine type: Tape
  000518                Feeder type: 8mm
  000519                       Glue: Yes
  000520            Reject position: Closest reject bin
  000521                  Polarized: No
  000522                             Test 1         Test 2
  000523                       Type: Capacitance low V      ---
  000524                      Angle: 90.00°              ---
  74HC161                     Value: 100pF ±20%          ---
  74HC365            Default load data
  MAX452CSA             Tape angle: 90.00°         Vib. angle: 0.00°
  MB150PF             Step length: 4mm
                                                  Bill              13:48
```

Figure 2-21. Selecting component from list

The component list is described in Chapter 4.

43. Select component 000149 in the list and press <Enter>. The selected component is added to the PCB:

```
                    ─────Insert New─────
        Location: C1
       Component: 000149
                  100pF
         Package: 1206-07
           Angle:  0.00°
        Position:  0.000mm/ 0.000mm
```
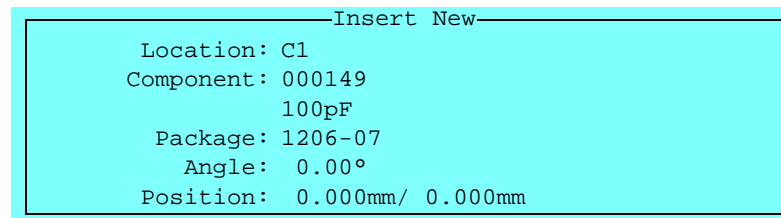
The comment text (100pF) and package type is read from the component list.

44. Enter the component angle and center position, which can be done either by typing the values or by using the camera.

To use the camera, press <F1> when *Position* is highlighted and position the cross hairs on the center of the component place when *Current lead*: *Center* is indicated in the upper left corner of the screen:

Use digitizer, if available.

You can also type approximate values before pressing <F1> to save machine movement time.

The trackball speed can be increased by five times if you press the left and right trackball buttons simultaneously.

Only relevant options in the screen menu is shown (Figure 2-22 and the following figures show all options).


```
Angle resolution: 5.00°                    F2/F3   Toggle lead
Current lead: Center              Ctrl+F3   Toggle component
Ready                                         outline
Cancel                         PgUp/PgDn   Previous/next
                                     F4/F5   Mount/glue
                                   + and -   Rotate component
                                    Ctrl+T   Hide text
                                        F6   Toggle mounted/glued




C1

D 1: C1 (000149)                       Delta pos.:  3.732mm/ 49.163mm
   0.00°                                     Angle:  4.34°
   85.143mm/ 45.211mm               Bill                      14:24
```
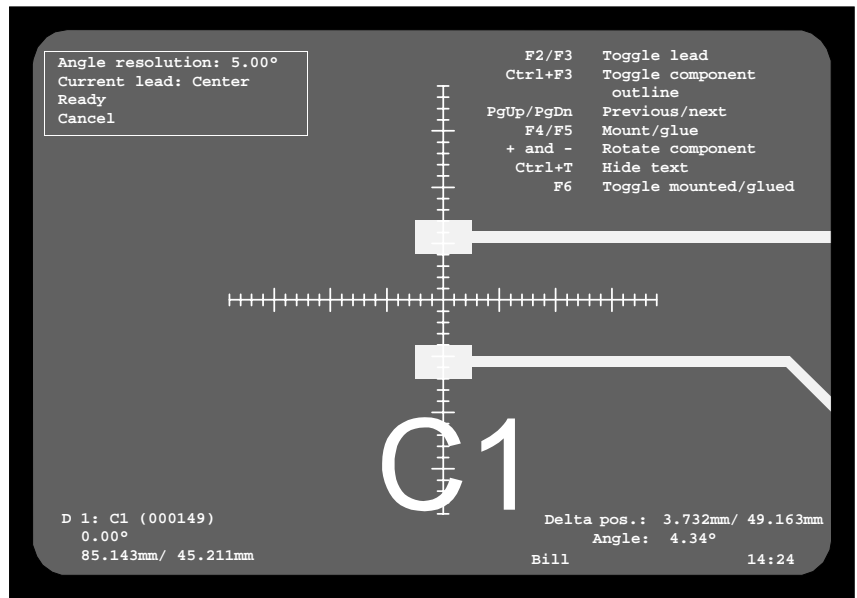
Figure 2-22. Positioning the component center

Press <F2> or <F3> if anything else than *Center* is indicated as *Current lead*.

The component placement angle resolution can be changed by typing a new value as *Angle resolution*.

Check if the component X/Y coordinates, displayed in the bottom left corner of the screen, are likely.

You can use a graphic component outline when positioning components, see the *Component Positioning* section in Chapter 7.

All entries in the positioning window (Figure 2-22 are described in the *Component Positioning* section in Chapter 7).

45. Enter the position of lead 1 by pressing <F2> or <F3> and centering the cross hairs on the position of lead 1 when *Current lead: Lead 1* is indicated:

If the component angle is correct, then the camera automatically moves to the correct position.

The leads for the toggling feature are specified in the *Toggle leads* field in the Package List, described in Chapter 5.
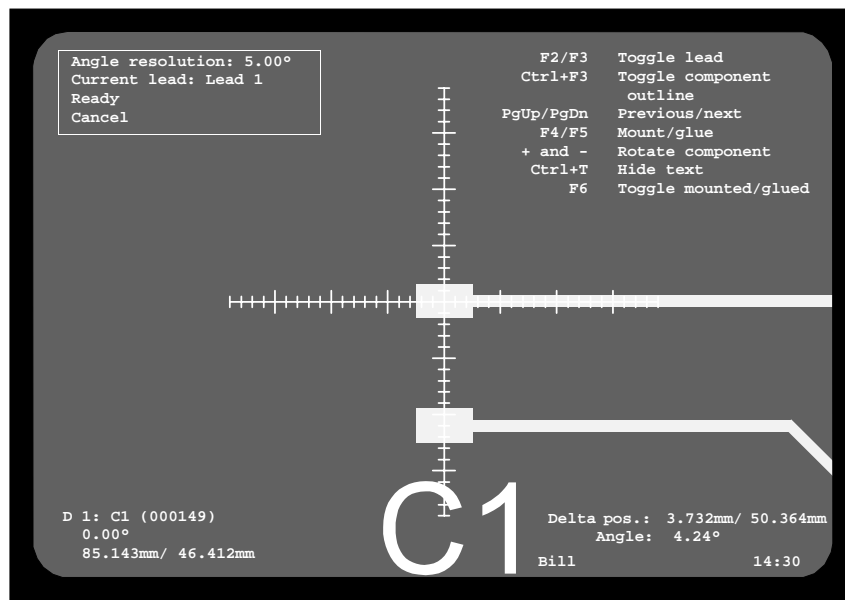
Figure 2-23. Positioning component lead 1

46. Enter the position of lead 2.

Press <F2> or <F3> again and center the cross hairs on the position of lead 2 when *Current lead: Lead 2* is indicated:
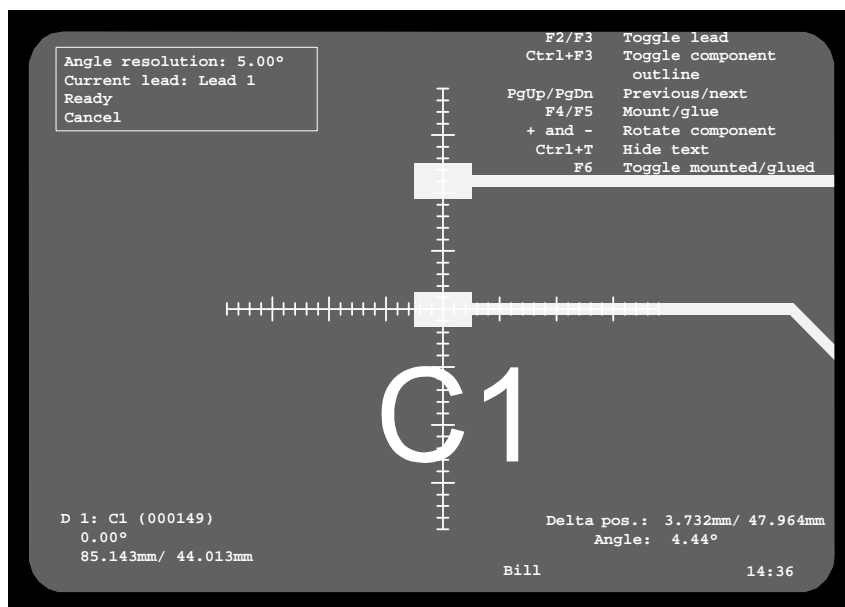
Figure 2-24. Positioning component lead 2

When ready, confirm the positions and angle by pressing <Enter> when **Ready** is highlighted.

The PCB Editor with the new component is shown:

```
                        * PCB EDITOR *
     ┌──Items──────────────┐
     │   1: C1, 000149      │  Enter Edit item          F4 PCB size
     │                      │    Ins Insert new         F6 Find position
     │                      │    Del Delete        Shift+F6 Reset digitizer
     │                      │    F2 PCB header          F7 Change groups
     │                      │                           F8 Replace component
     │                      │
     │                      │    ┌────PCB Header Information────┐
     │                      │    │      Name: TV1               │
     │                      │    └──────────────────────────────┘
     │                      │    ┌──────────────────────────────┐
     │                      │    │   Location: C1               │
     │                      │    │  Component: 000149           │
     │                      │    │    Comment: 100pF            │
     │                      │    │    Package: 1206-07          │
     │                      │    │      Group: 0         Turn before Z down: No
     │                      │    │                      Save electric value: No
     │                      │    │  Mount: Yes      Glue: Yes       Only Z: No
     │                      │    │  Angle:  0.00°     pos.:   40.052mm/  25.363mm
     │                      │    │     Local fiducial marks: 0
     │                      │    │ Mark 1 ID:          pos.:
     │                      │    │      2 ID:          pos.:
     │                      │    │      3 ID:          pos.:
     └──────────────────────┘    └──────────────────────────────┘
                                          Bill                    13:52
```

Figure 2-25. The PCB with the first component

If you press <F1> in the above window, you will return to the previous positioning window, in which you can:

Adds status D. – apply glue for the component by pressing <F5>.

Adds status M. – mount the component by pressing <F4>.

– toggle the mount/glue status by pressing <Space>.

Also, you can press <F1> again to activate the trackball and joystick and adjust the component position.

D 1: C1, 000149. If letter D is shown leftmost on the component line in the PCB Editor *Items* box, then glue has either been applied or the glue status has been changed with the <Space> bar in the positioning window, or in the PCB Editor window.

M 1: C1, 000149. Letter M in the same position indicates that the component either has been mounted or the mount status has been changed with the <Space> bar in the positioning window, or in the PCB Editor window.

47. Program the remaining two items, that is capacitor C2 mounted in 90° and capacitor C3 mounted in 0° by repeating the procedure described in this section.

The PCB Editor will look like this when all the components for the board are programmed:

```
                              * PCB EDITOR *
   ╔═══════Items════════╗   Enter Edit item              F4 PCB size
   ║ 1: C1, 000149       ║    Ins Insert new              F6 Find position
   ║ 2: C2, 000254       ║    Del Delete          Shift+F6 Reset digitizer
   ║ 3: C3, 000255       ║    F2 PCB header               F7 Change groups
   ║                     ║                                F8 Replace component
   ║                     ║
   ║                     ║      ┌──────────PCB Header Information──────────┐
   ║                     ║      │       Name: TV1                          │
   ║                     ║      ├──────────────────────────────────────────┤
   ║                     ║      │   Location: C1                           │
   ║                     ║      │  Component: 000149                       │
   ║                     ║      │    Comment: 100pF                        │
   ║                     ║      │    Package: 1206-07                      │
   ║                     ║      │      Group: 0          Turn before Z down: No │
   ║                     ║      │                       Save electric value: No │
   ║                     ║      │   Mount: Yes        Glue: Yes      Only Z: No │
   ║                     ║      │   Angle:  0.00°     pos.:   40.052mm/  25.363mm │
   ║                     ║      │      Local fiducial marks: 0             │
   ║                     ║      │  Mark 1 ID:          pos.:               │
   ║                     ║      │       2 ID:          pos.:               │
   ║                     ║      │       3 ID:          pos.:               │
   ╚═════════════════════╝      └──────────────────────────────────────────┘
                                            Bill                     13:58
```

Figure 2-26. The PCB with all the components

48. Return to the TPSys main window by pressing <Esc> repeatedly.

An information box in the main window indicates the name of the loaded layout:

```
        ┌─────────Current layout─────────┐
        │  TV1                            │
        │ Layout, bare board BB1          │
        └─────────────────────────────────┘
```
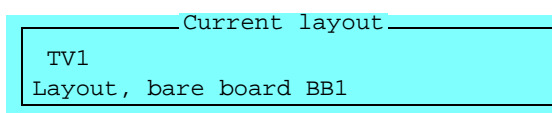
The board programming is now completed.

Programming Panel – Method 1

There are two methods of programming panels:

Method 1 – for similar PCBs

This method means that a panel is created and PCBs, programmed as described in the previous section, are inserted and positioned.

This method is easy to use and the best way of keeping the PCB and panel information separated. Also, there is a feature which makes it very easy to create a matrix of PCBs on the panel by simply entering the number of rows, columns and spacing.

Method 1 is described in this section.

Method 2 – for different PCB types

This method means that PCBs are programmed in the same procedure as the panel. This method is intended for panels that include not yet programmed PCBs of different types.

Method 2 is described on page 2-38.

Panel TV2-P2

Panel TV2-P2 which will be programmed in this section, contains two TV2 type PCBs. It looks like this:
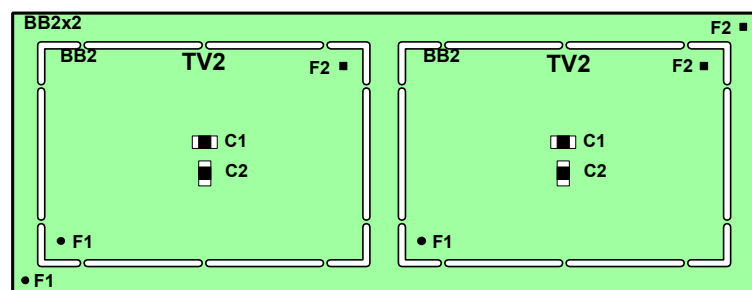
Figure 2-27. Two TV2 audio boards as panel

This board is programmed in the following steps:

- Programming the PCB (page 2-28).

- Creating a layout for the panel (page 2-29).

- Adding a new panel to the layout (page 2-40).

- Programming the panel header information (page 2-41).

- Inserting the PCBs into the panel (page 2-35).

See page 2-5 for things to have at hand when programming.

Programming the PCB

1. Program the PCB in the same way as the TV1 board was programmed, see page 2-6 through page 2-19.

Enter the layout name TV2 and the following comment text:

```
              ─Layout Header─
       Name:   TV2
    Comment:   Layout, bare board BB2
```

Enter the PCB header information shown in the box below.

2. This time, and in the following examples, you can just select the previously created fiducial marks *Ro-1.0* and *Sq-1.0*.

```
                 ─PCB Header Information─
          Name: TV2
        Comment: PCB, bare board BB2
      No. of fiducial marks: 2
Mark 1 ID: Ro-1.0      pos.:  0.000mm/  0.000mm
     2 ID: Sq-1.0      pos.:  80.012mm/ 50.031mm
     3 ID:             pos.:
      Bad board mark pos.:   20.000mm/ 25.000mm
    Mount tool test pos.:   30.000mm/  0.000mm
     Glue tool test pos.:   40.000mm/  0.000mm
```

The board looks like this:

A = Bad board marks.

B = Board level measuring
     point for mount tools.

C = Board level measuring
     point for glue tools.
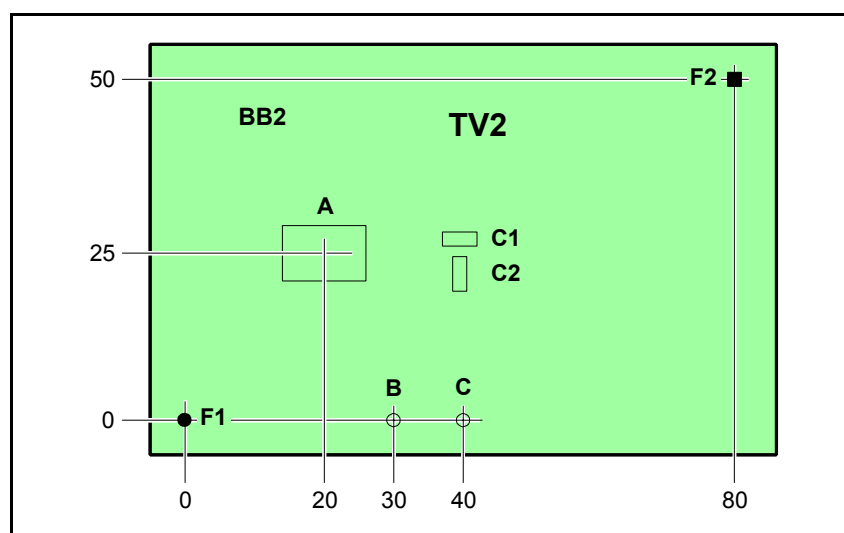
Figure 2-28. TV2 header information

Creating a Layout for the Panel

TV2   TV2
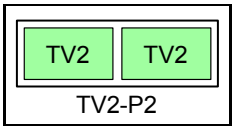
TV2-P2

3. Open the Mount List by selecting the **Layouts** option in the **Editor** menu.

4. Create a new layout by pressing <Ins>.

5. Enter the name TV2-P2 as shown in Figure 2-29.
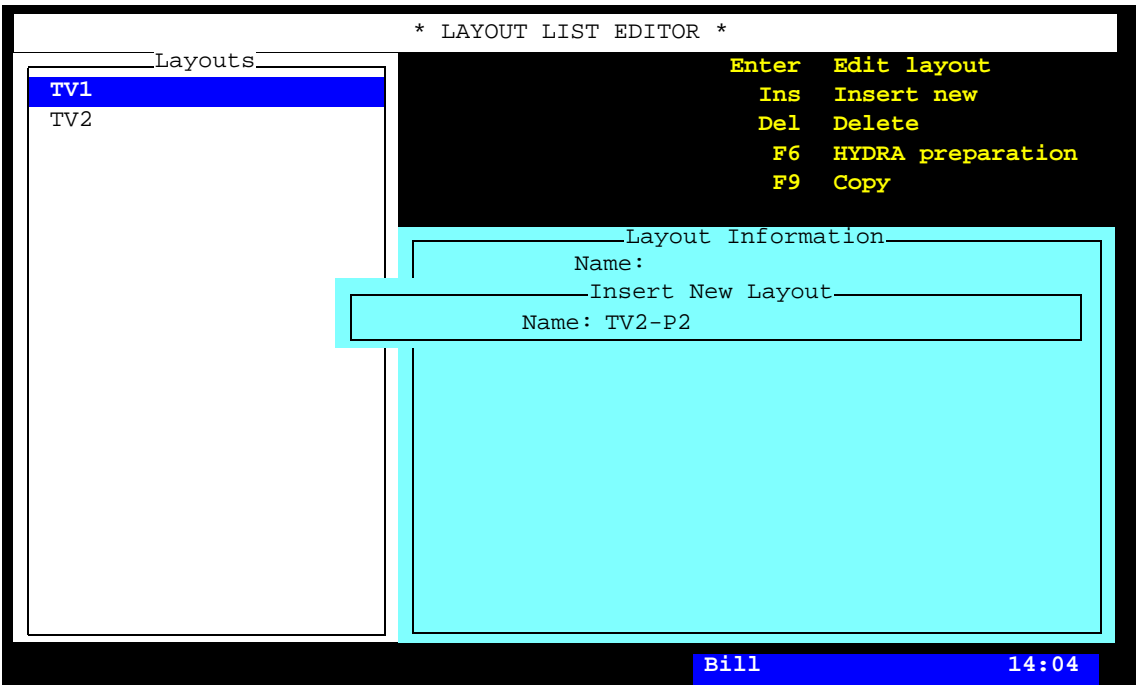
Figure 2-29. Creating a new layout

6. Save the new layout by pressing <Enter>.

7. Open the Layout Editor for editing the new layout by pressing <Enter>. You are asked whether you want to load the layout or not.

8. Load the new layout by selecting **Yes**.

9. Enter the comment text by pressing <F2> and typing the following text, that reflects the object and the name of the bare board:

Layout, bare board BB2x2

You can type comment text on a number of lines, but only the first line is visible in the various editors.

10. Save the layout header modification, either by pressing <Enter> repeatedly or by pressing <Esc> and accepting to save the modification in the following box:

```
Save modifications?
      Yes    No
```

The layout with the comment text looks now like this in the Layout Editor:

```
                      * LAYOUT EDITOR *
          ┌─ Boards ─┐
          │          │         Enter   Edit board
          │          │           Ins   Insert new
          │          │           Del   Delete
          │          │            F1   Board position
          │          │            F2   Layout header
          │          │                 information
          │          │
          │          │         ┌─ Layout Header ─┐
          │          │         │ Name:   TV2-P2   │
          │          │         │ Comment:  Layout, bare board BB2x2 │
          │          │         └─────────────────┘
          │          │
          │          │
          │          │                Bill            14:10
          └──────────┘
```
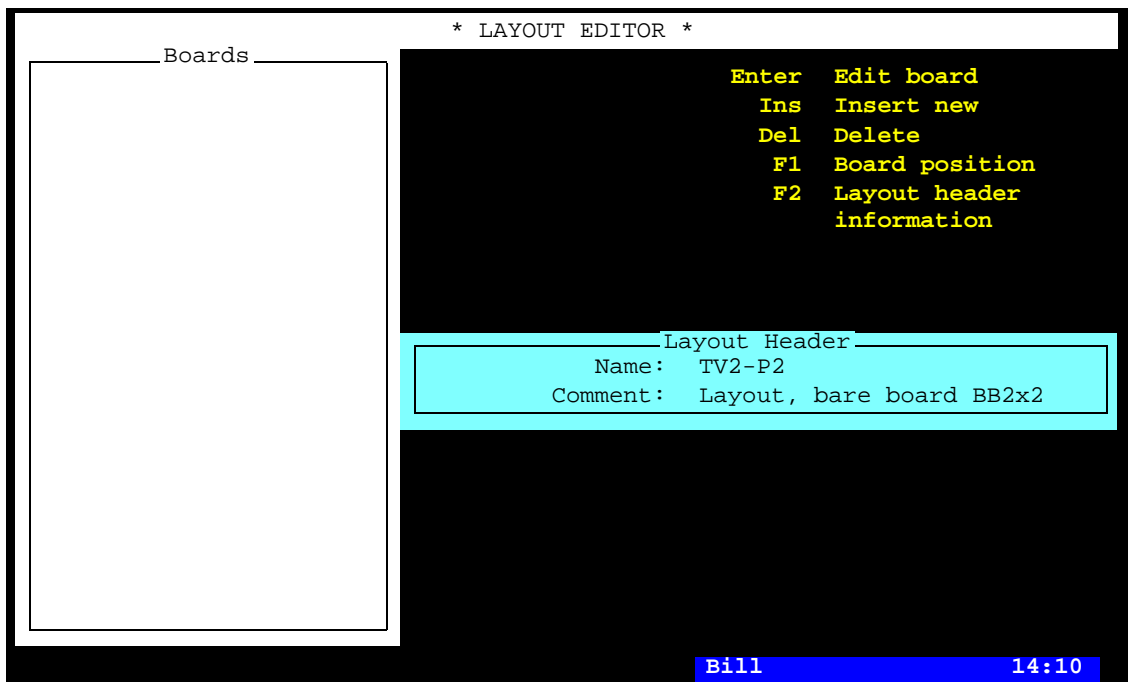
Figure 2-30. The new layout

Adding a New Panel to the Layout
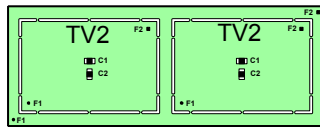
The layout that has been created is still empty. In this section you are going to create and add the TV2-P2 panel to the layout.

TV2-P2

11. Add a new board by pressing <Ins> and selecting **Panel** since the TV2-P2 is a panel:
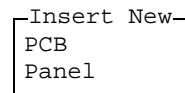
```
┌─Insert New─┐
 PCB
 Panel
└            ┘
```

12. Enter the panel name on the first line in the *Insert panel* box:

```
┌────────────────Insert panel────────────────┐
           Name: TV2-P2
        Comment: * UNKNOWN PANEL *
 Fiducial mark 1:   0.000mm/ 0.000mm
              2:   0.000mm/ 0.000mm
              3:
└─────────────────────────────────────────────┘
```
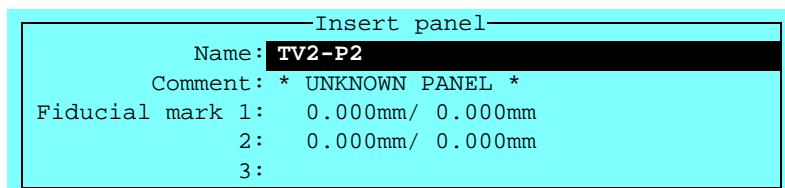
... and press <Enter>.

You are asked if you want to select a panel from the Panel List since the entered name was not found in the system:

```
┌──────────────────────────┐
 Panel 'TV2-P2' unknown
 Select from list?
        Yes    No
└──────────────────────────┘
```
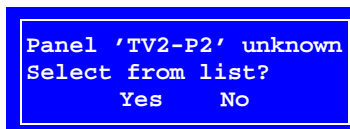
Reply **No** as the new panel does not exist, but is to be created.

```
┌────────────────Insert panel────────────────┐
           Name: TV2-P2
        Comment:
 Fiducial mark 1:   0.000mm/ 0.000mm
              2:   0.000mm/ 0.000mm
              3:
 Press <F1> for camera
└─────────────────────────────────────────────┘
```
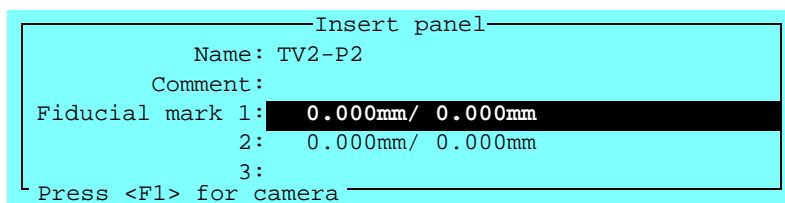
13. Put the panel into the machine, if not already done.

The panel position in the machine is now to be located by means of the positioning camera.

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

14. Press <F1> and center the cross hairs on the panel fiducial mark 1:
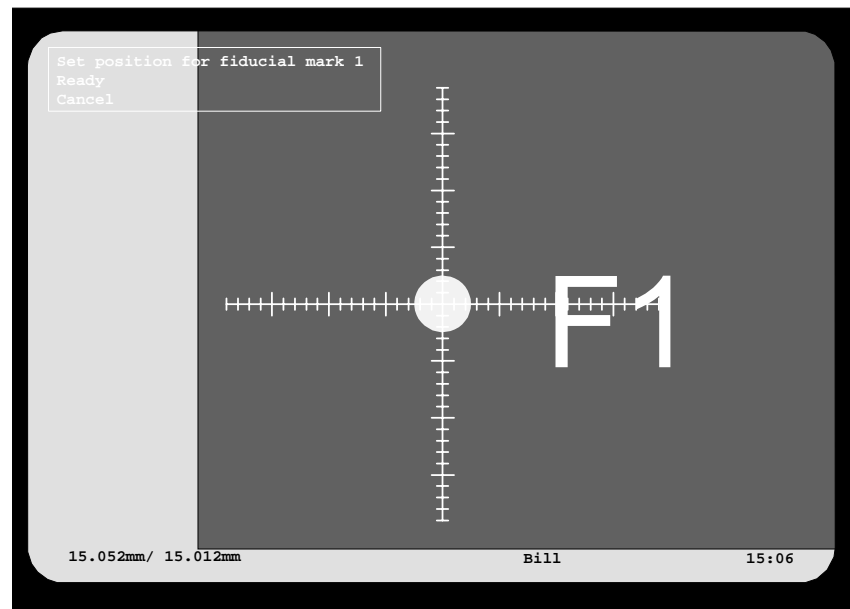
Figure 2-31. Centering fiducial mark F1

15. Confirm the position by selecting **Ready**. You are asked to position fiducial mark 2:
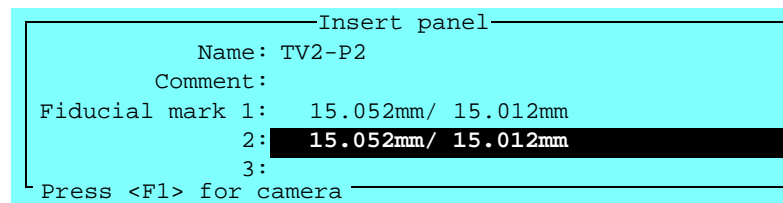
16. Press <F1> again and repeat the centering procedure for the panel fiducial mark 2:
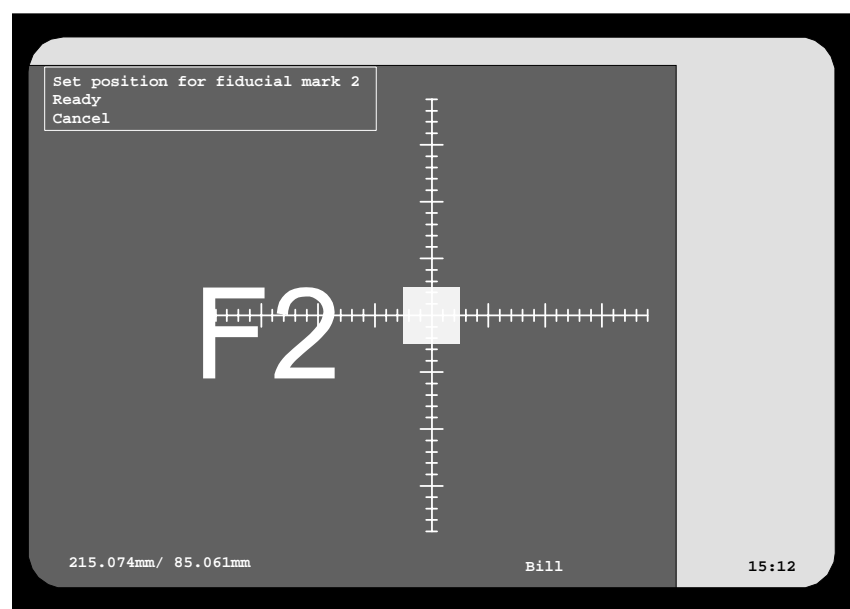
Figure 2-32. Centering fiducial mark F2

After the board is located, you are returned to the Layout Editor, in which the new board is shown:

```
                        * LAYOUT EDITOR *

       ┌─ Boards ─────────┐
       │ 1: TV3RGB-P3 (Panel) │            Enter   Edit board
       │                      │              Ins   Insert new
       │                      │              Del   Delete
       │                      │               F1   Board position
       │                      │               F2   Layout header
       │                      │                    information
       │                      │
       │                      │
       │                      │       ┌─ Layout Header ──────────────┐
       │                      │       │      Name: TV2-P2            │
       │                      │       │   Comment: Layout, bare board BB2x2 │
       │                      │       ├─ Board Position ─────────────┤
       │                      │       │      Type: Panel             │
       │                      │       │      Name: TV2-P2            │
       │                      │       │   Comment:                   │
       │                      │       │        Fiducial mark 1: 15.052mm/ 15.012mm │
       │                      │       │                      2: 215.074mm/ 85.061mm │
       │                      │       │                      3:     │
       └──────────────────────┘       └──────────────────────────────┘
                                            Bill                14:16
```
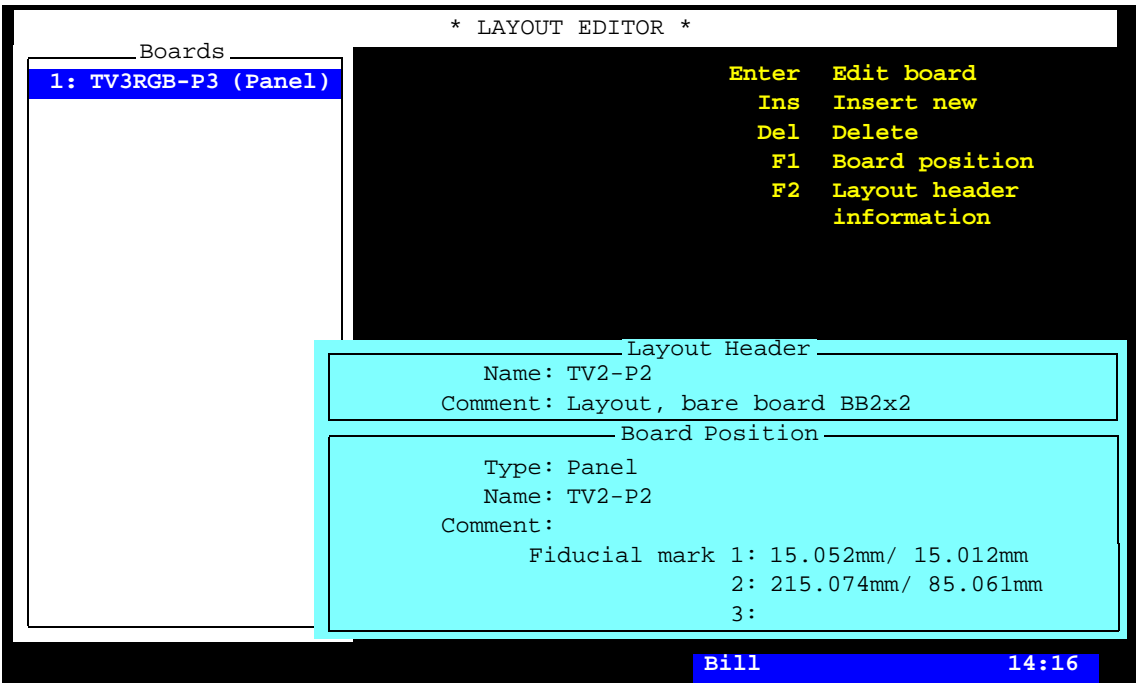
Figure 2-33. The new PCB in the layout

In this stage the new panel contains only a name. There is no header information and no PCBs included in it.

Next step is to program the panel header information.

Programming the Panel Header Information

17. Program the panel header information in the same way as the previous PCB header information was programmed, see page 2-11 through page 2-19. The PCB Editor is in this case the Panel Editor.

Use the two F1 fiducial marks (see Figure 2-34) on the PCBs as alignment marks when measuring the board angle.

The board and the panel header information looks like this:

A = Bad board marks.

B = Board level measuring point for mount tools.

C = Board level measuring point for glue tools.
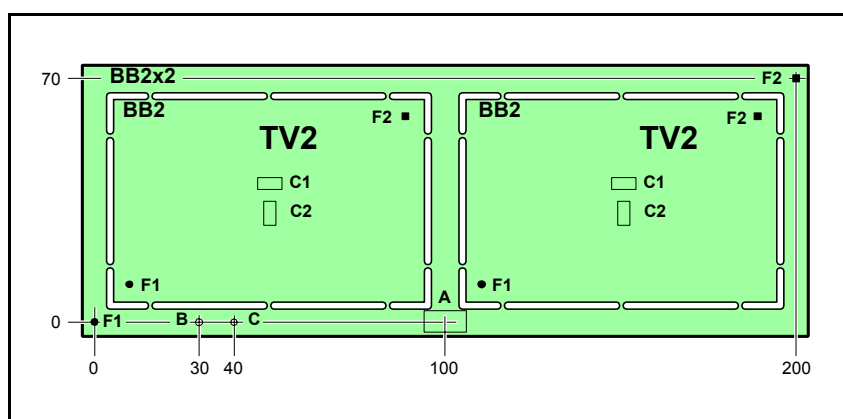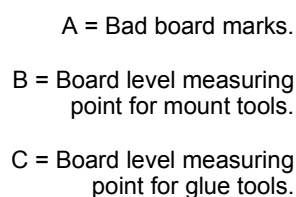
Figure 2-34. TV2-P2 panel header information

```
                        Panel Header
              Name:    Information
            Comment: Panel, bare board BB2x2
       Level measurement tools:
        No. of fiducial marks: 2
  Mark 1 ID: Ro-1.0     pos.:  0.000mm/ 0.000mm
       2 ID: Sq-1.0     pos.:  200.026mm/ 70.057mm
       3 ID:            pos.:
          Bad board mark pos.:  100.000mm/ 25.000mm
        Mount tool test pos.:  30.000mm/ 0.000mm
         Glue tool test pos.:  40.000mm/ 0.000mm
```

Inserting the PCBs into the Panel

This description starts from the Panel Editor, which looks like this after entering the panel header information:

```
                        * PANEL EDITOR *
         _PCBs_
        |                          Enter  Edit PCB
        |                            Ins  Insert new
        |                            Del  Delete
        |                             F1  PCB position
        |                             F2  Panel header
        |                                 information
        |                             F4  Panel size
        |
        |              _Panel Header Information_
        |                   Name:   TV2-P2
        |                Comment:   Layout, bare board BB2x2
        |
        |
        |
        |
        |
        |
        |
        |                                 Bill            14:22
        |_____|
```
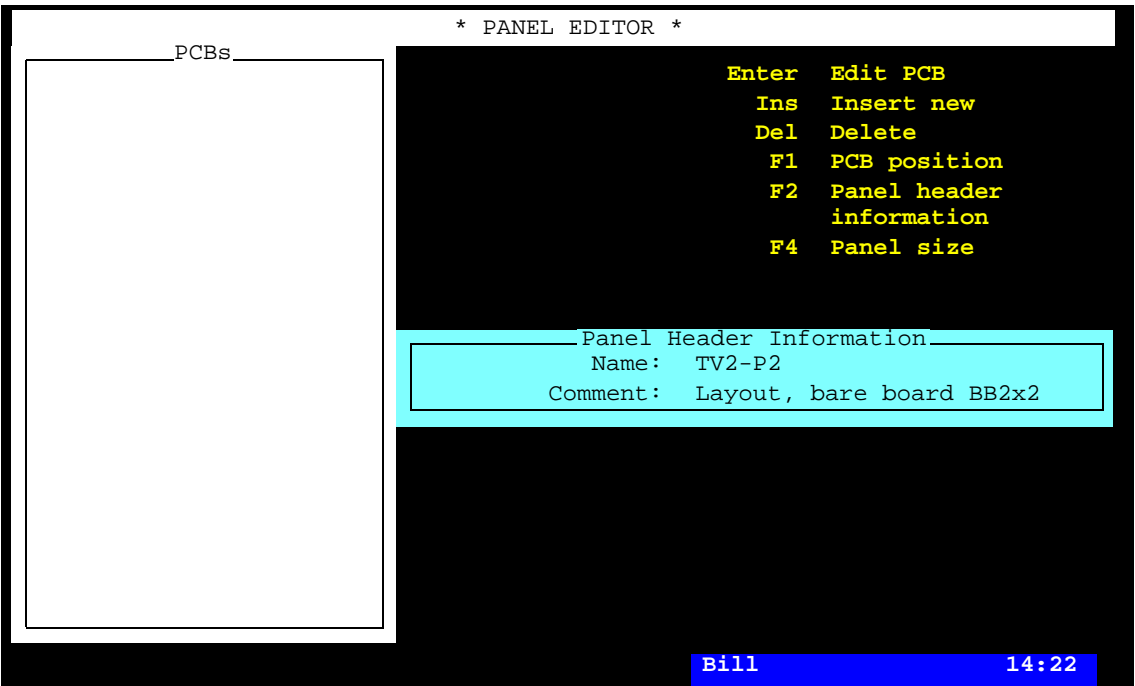
Figure 2-35. Panel Editor with the TV2-P2

18. Insert a PCB into the panel by pressing <Ins>. The following dialog box is shown:

```
                     _Insert PCB(s)_
            PCB name:
            Comment:  * UNKNOWN PCB *
               Rows:  1
            Columns:  1
              Total:  1
                      First new board
                      Fiducial mark 1:  0.000mm/ 0.000mm
                                    2:  0.000mm/ 0.000mm
                                    3:

                      Column/row step:
```
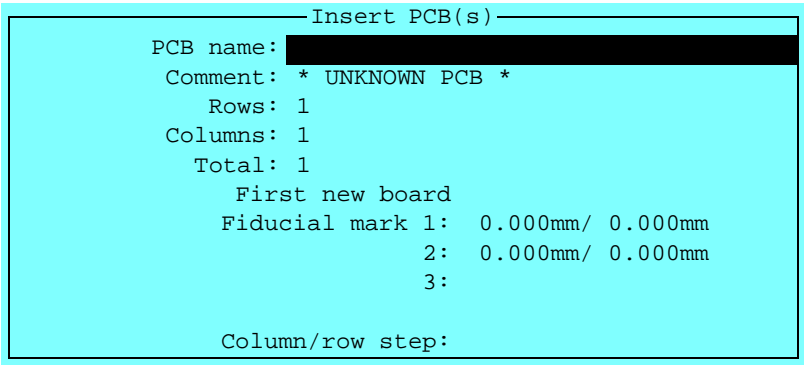
19. Type the PCB name, TV2 on the *PCB name* line and press
<Enter>. Or, type a few characters of the name, press
<Enter>, and select from the PCB List. The text in the
Comment line is read from the PCB List:

```
┌──────────────── Insert PCB(s) ────────────────┐
│          PCB name: TV2                         │
│           Comment: PCB, bare board BB2         │
│              Rows: 1                           │
│           Columns: 1                           │
│             Total: 1                           │
│                First new board                 │
│           Fiducial mark 1:  0.000mm/ 0.000mm   │
│                         2:  0.000mm/ 0.000mm   │
│                         3:                     │
│                                                │
│           Column/row step:                     │
└────────────────────────────────────────────────┘
```

20. Set *Rows* to 1 and *Columns* to 2, since the panel has one row and
two columns, see Figure 2-34 on page 2-34:

```
┌──────────────── Insert PCB(s) ────────────────┐
│          PCB name: TV2                         │
│           Comment: PCB, bare board BB2         │
│              Rows: 1                           │
│           Columns: 2                           │
│             Total: 2                           │
│                First new board                 │
│           Fiducial mark 1:  0.000mm/ 0.000mm   │
│                         2:  0.000mm/ 0.000mm   │
│                         3:                     │
│                                                │
│           Column/row step:                     │
└────────────────────────────────────────────────┘
```

The total number of boards is indicated by the system when
<Enter> is pressed for the *Columns* entry.

Further information about how to create a matrix of PCBs on a
panel is found in the *Panel Editor* section in Chapter 7.

21. Put the panel into the machine, if not already done.

22. Locate fiducial mark 1 of the first PCB as follows:

F1 on board 1.

Further information is found in
Chapter 7.

When the *Fiducial mark 1* entry is highlighted, press <F1> and
center the cross hairs on fiducial mark 1 of the first of the TV2
boards included in the panel. Then press <Enter> when **Ready**
is highlighted.

23. Locate fiducial mark 2 of the same PCB as follows:

F2 on board 1.

When the second fiducial mark entry is highlighted, press <F1>
and center fiducial mark 2 of the same TV2 board.

24. Locate fiducial mark 1 of the other PCB as follows:

F1 on board 2.

When the *Column/row step* entry is highlighted, press <F1>
and center fiducial mark 1 of the second TV2 board.

The panel programming is now completed and the Panel Editor shows both the PCBs:

```
                        * PANEL EDITOR *

        PCBs
   1: TV2                              Enter   Edit PCB
   2: TV2                                Ins   Insert new
                                         Del   Delete
                                          F1   PCB position
                                          F2   Panel header
                                               information
                                          F4   Panel size




                        Panel Header Information
                Name: TV2-P2
             Comment: Panel, bare board BB2x2
                         PCB Position Information
          PCB name: TV2
           Comment: PCB, bare board BB2

              Fiducial mark 1: 10.044mm/ 10.091mm
                           2: 90.028mm/ 60.055mm
                           3:

                                          Bill              14:28
```
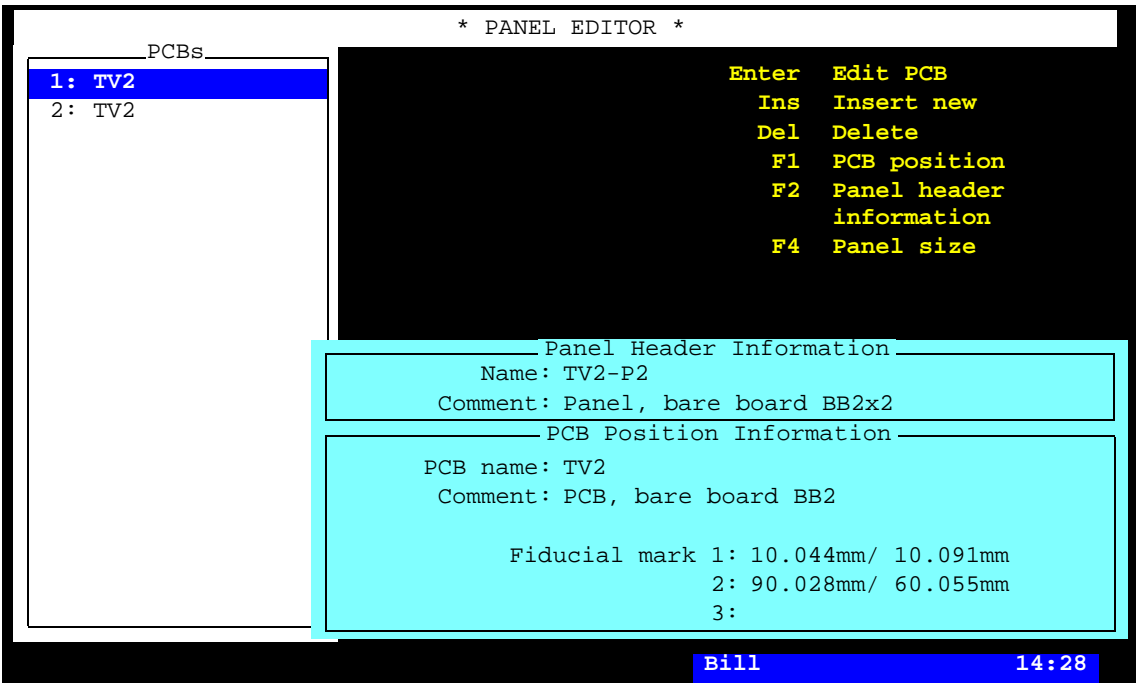
Figure 2-36. Two TV2 boards on the panel

☞ Ensure you teach the fiducials on the first board. On a panel with many identical PCBs it is easy to select fiducial mark from a neighboring PCB.

25. Return to the TPSys main window by pressing <Esc> repeatedly.

Programming Panel – Method 2

In this section you will program the PCBs and the panel in the same procedure (method 2).

Method 1 and method 2 are both described on page 2-27.

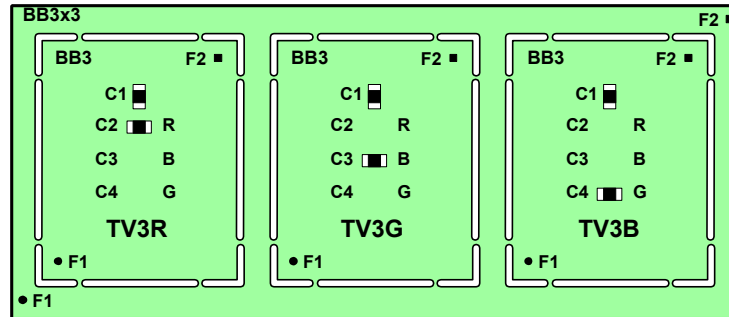Panel TV3RGB-P3, containing the three color boards TV3R, TV3G and TV3B, is used in this exercise. It looks like this:

Figure 2-37. TV3R, TV3G and TV3B as a panel

This panel is programmed in the following steps:

- Creating a layout for the panel (page 2-39).
- Adding a new panel to the layout (page 2-40).
- Programming the panel header information (page 2-41).
- Inserting new PCB into the panel (page 2-42).
- Programming the PCB (page 2-44).
- Programming the additional PCBs (page 2-45).

See page 2-5 for things to have at hand when programming.

Creating a Layout for the Panel
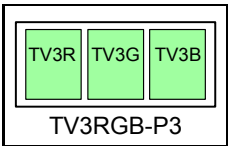
TV3RGB-P3

1. Create and load a new layout in the same way as the previous layout was created and loaded, see page 2-29 through page 2-30.

Enter the following layout information:

Name: *TV3RGB-P3*

Comment: *Layout, bare board BB3x3*

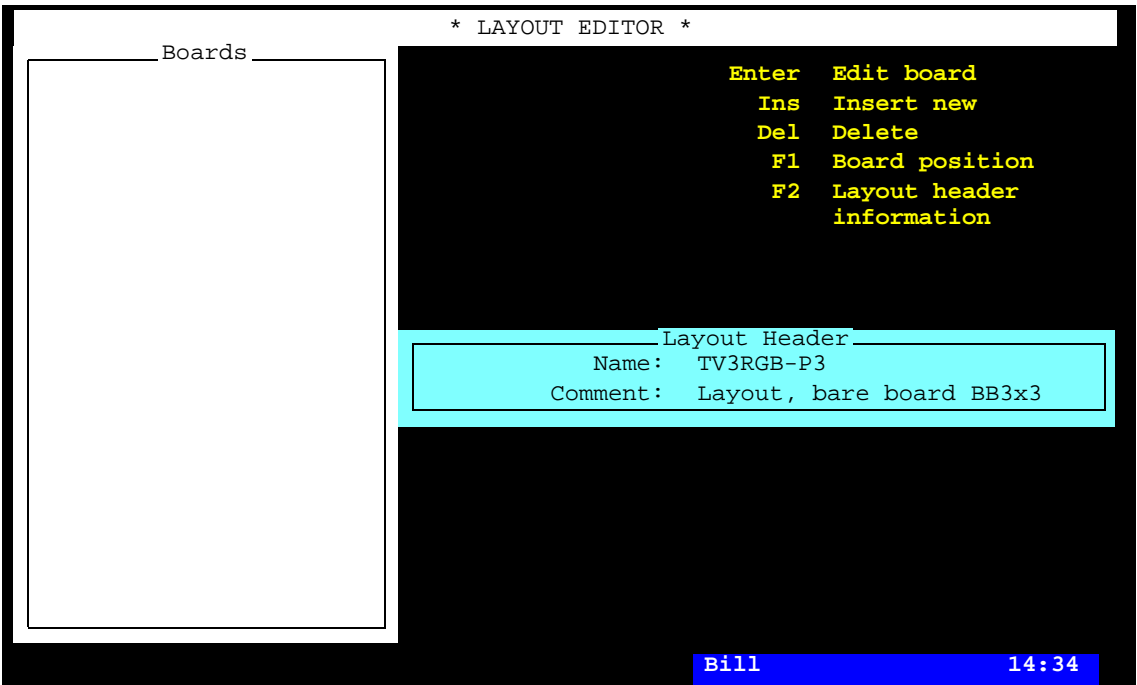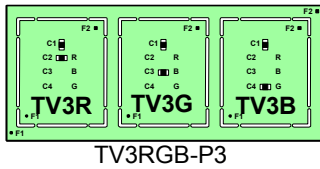The new layout will look like this in the Layout Editor:

Figure 2-38. The new TV3RGB-P3 layout

Adding a New Panel to the Layout

TV3RGB-P3

2. Add a new panel to the layout in the same way as the previous layout was added, see page 2-31 through page 2-33.

Enter the following panel information:

Name: *TV3RGB-P3*
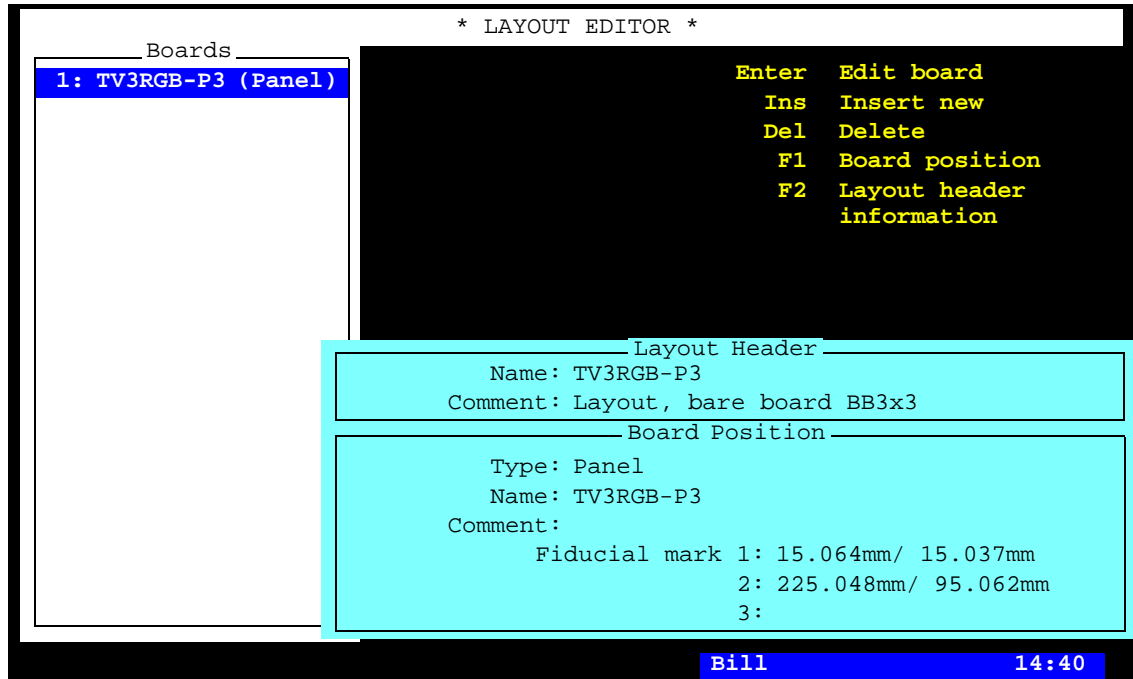
The new panel will look now like this in the Layout Editor:

```
                         * LAYOUT EDITOR *

        ┌─Boards──────────┐
        │1: TV3RGB-P3 (Panel)│              Enter   Edit board
                                              Ins   Insert new
                                              Del   Delete
                                               F1   Board position
                                               F2   Layout header
                                                    information




                       ┌─Layout Header────────────────────┐
                       │     Name: TV3RGB-P3               │
                       │  Comment: Layout, bare board BB3x3│
                       ├─Board Position───────────────────┤
                       │     Type: Panel                   │
                       │     Name: TV3RGB-P3               │
                       │  Comment:                         │
                       │      Fiducial mark 1: 15.064mm/ 15.037mm │
                       │                    2: 225.048mm/ 95.062mm│
                       │                    3:             │
                       └───────────────────────────────────┘
                                          Bill              14:40
```

Figure 2-39. The new TV3RGB-P3 panel

Programming the Panel Header Information

3. Open the Panel Editor by pressing <Enter>.

4. Program the panel header information in the same way as the previous PCB header information was programmed, see page 2-11 through page 2-19. The PCB Editor is in this case the Panel Editor.

Use the fiducial marks F1 on the outermost PCBs as alignment marks.

The board and the panel header information looks like this:

A = Bad board marks.

B = Board level measuring point for mount tools.

C = Board level measuring point for glue tools.
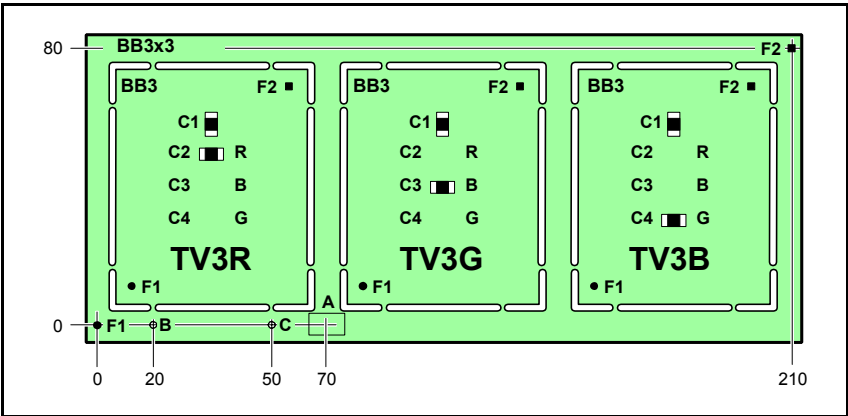
Figure 2-40. TV3RGB-P3 panel header information

```
┌─────────────Panel Header Information─────────────┐
│          Name: TV3RGB-P3                         │
│       Comment: Panel, bare board BB3x3           │
│   Level measurement tools:                       │
│    No. of fiducial marks: 2                      │
│ Mark 1 ID: Ro-1.0     pos.:  0.000mm/ 0.000mm    │
│      2 ID: Sq-1.0     pos.:  210.032mm/ 80.017mm │
│      3 ID:            pos.:                       │
│      Bad board mark pos.:  70.000mm/ 0.000mm     │
│     Mount tool test pos.:  20.000mm/ 0.000mm     │
│      Glue tool test pos.:  50.000mm/ 0.000mm     │
└──────────────────────────────────────────────────┘
```

Inserting New PCB into the Panel

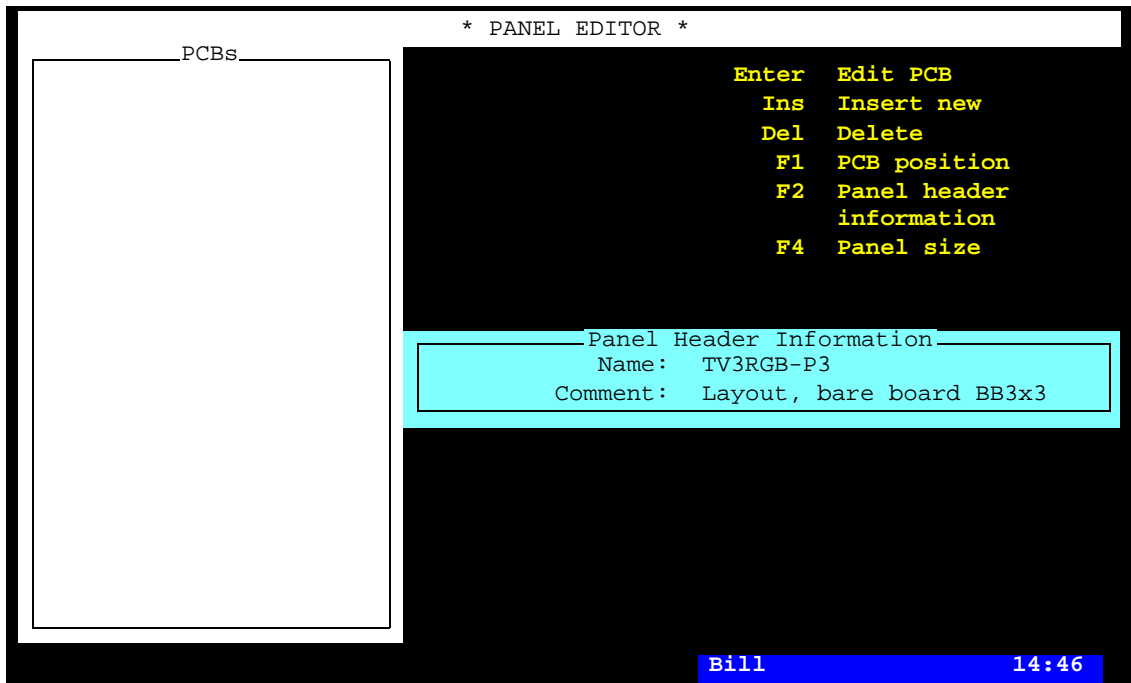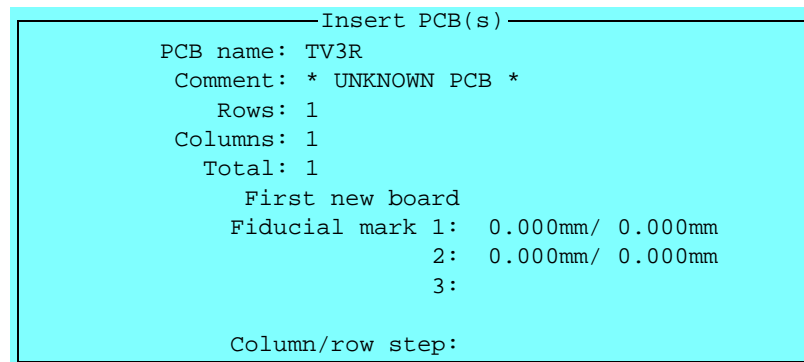This description starts from the Panel Editor, which looks like this after entering the panel header information:

```
                    * PANEL EDITOR *
         ┌─PCBs─────────┐
         │              │         Enter   Edit PCB
         │              │           Ins   Insert new
         │              │           Del   Delete
         │              │            F1   PCB position
         │              │            F2   Panel header
         │              │                 information
         │              │            F4   Panel size
         │              │
         │              │      ┌─Panel Header Information─┐
         │              │      │   Name:   TV3RGB-P3      │
         │              │      │Comment:   Layout, bare board BB3x3│
         │              │      └─────────────────────────┘
         │              │
         │              │
         │              │
         │              │
         │              │
         │              │
         └──────────────┘
                                 Bill              14:46
```

Figure 2-41. The TV3RGB-P3 panel

5. Insert a new PCB into the panel by pressing <Ins>. The following dialog box is shown:

```
              ┌─Insert PCB(s)─┐
         PCB name: TV3R
          Comment: * UNKNOWN PCB *
             Rows: 1
          Columns: 1
            Total: 1
              First new board
              Fiducial mark 1:  0.000mm/ 0.000mm
                            2:  0.000mm/ 0.000mm
                            3:

          Column/row step:
```

6. Type the PCB name, TV3R on the *PCB name* line and press <Enter>. The text in the *Comment* line indicates that the PCB is not found in the system, so it is no idea to select from the list.

7. Set *Rows* to 1 and *Columns* to 1, sinceyou are inserting on PCB at this time.

8. Put the panel into the machine, if not already done.

9. Press <F1> and center the cross hairs on fiducial mark 1 (F1) and fiducial mark 2 (F2) of the TV3R board (see Figure 2-40 on page 2-41).

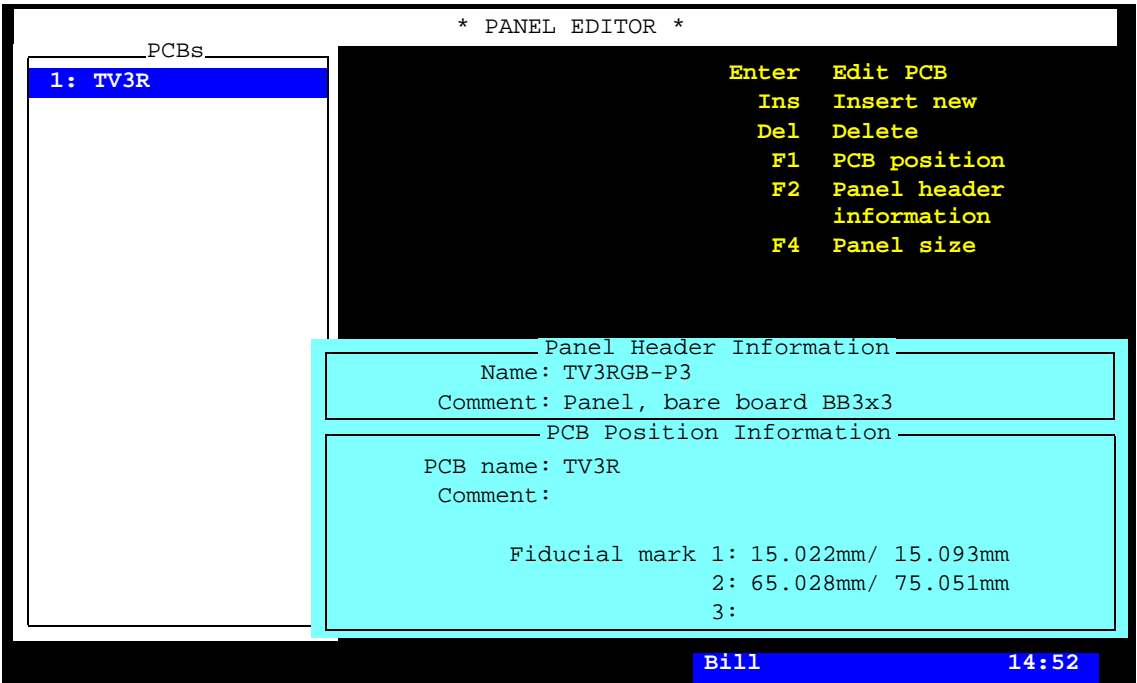The TV3R board is now inserted in the panel:

```
                        * PANEL EDITOR *
    ___PCBs___
   1: TV3R                              Enter  Edit PCB
                                          Ins  Insert new
                                          Del  Delete
                                           F1  PCB position
                                           F2  Panel header
                                               information
                                           F4  Panel size


                    ___ Panel Header Information ___
                        Name: TV3RGB-P3
                     Comment: Panel, bare board BB3x3
                    ___ PCB Position Information ___
                 PCB name: TV3R
                  Comment:

                   Fiducial mark 1: 15.022mm/ 15.093mm
                                 2: 65.028mm/ 75.051mm
                                 3:

                                       Bill            14:52
```

Figure 2-42. TV3R inserted into the panel

Programming the PCB

10. Open the PCB Editor by pressing <Enter> in the Panel Editor:

```
                    * PCB EDITOR *
       Items           Enter Edit item          F4 PCB size
                        Ins Insert new           F6 Find position
                        Del Delete        Shift+F6 Reset digitizer
                        F2 PCB header            F7 Change groups
                                                 F8 Replace component

                        ┌────────PCB Header Information────────┐
                        │      Name: TV3R                      │
                        │   Comment:                           │
                        └──────────────────────────────────────┘




                                           Bill              14:58
```
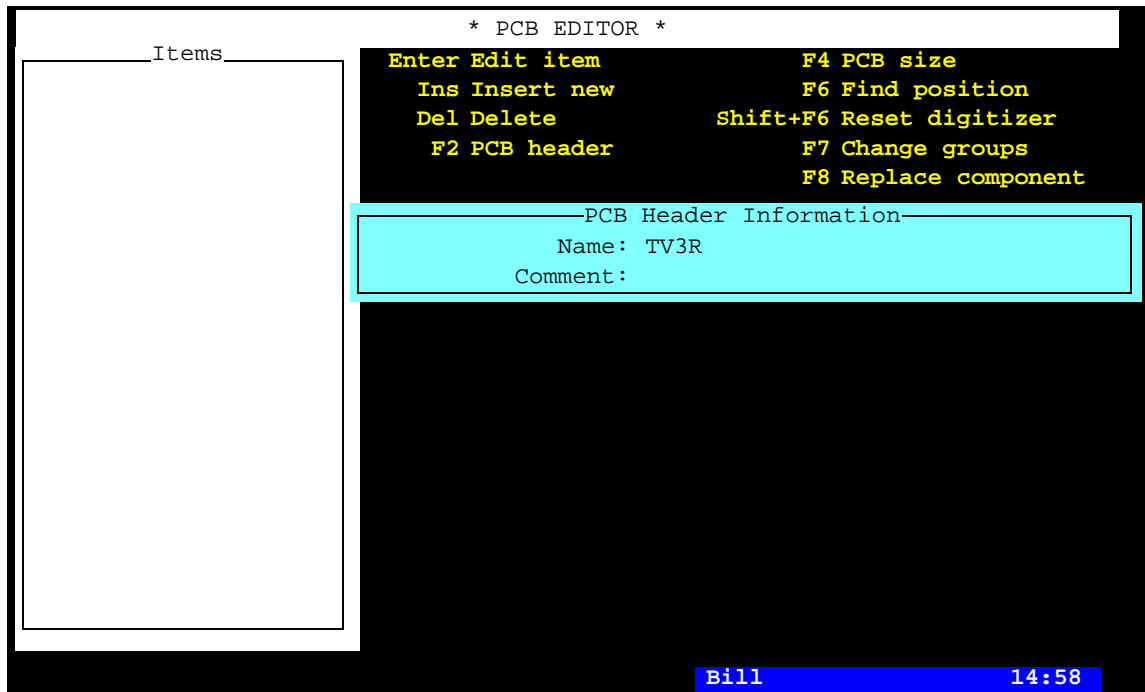
Figure 2-43. Editing the TV3R board

11. Program the header information in the same way as the TV1 board was programmed, see page 2-11 through page 2-19.

12. Add components to the PCB in the same way as the components was added to the TV1 board, see page 2-20 through page 2-26.

The TV3R board is now completed and the two remaining TV3G and TV3B boards are to be inserted and programmed, see the next section.

Programming the Additional PCBs

13. Insert and program the TV3G and TV3B boards in the same way as the TV3R board (only a capacitor differs between the boards).

Or, you can use any of the methods described in the section on page .

If the TV3R, TV3G and TV3B boards had been identical, the same board could have been inserted three times. But they are not, so you have to create three different boards and insert them into the panel.

When the three boards are programmed the Panel Editor will look like this:

```
                           * PANEL EDITOR *
        ___PCBs___
      1: TV3R                                Enter   Edit PCB
      2: TV3G                                  Ins   Insert new
      3: TV3B                                  Del   Delete
                                               F1    PCB position
                                               F2    Panel header
                                                     information
                                               F4    Panel size




                         ___ Panel Header Information ___
                 Name: TV3RGB-P3
              Comment: Panel, bare board BB3x3
                         ___ PCB Position Information ___
             PCB name: TV3B
              Comment: PCB, bare board BB3

                   Fiducial mark 1: 155.033mm/ 15.082mm
                                 2: 205.019mm/ 75.034mm
                                 3:
                                                Bill            15:04
```
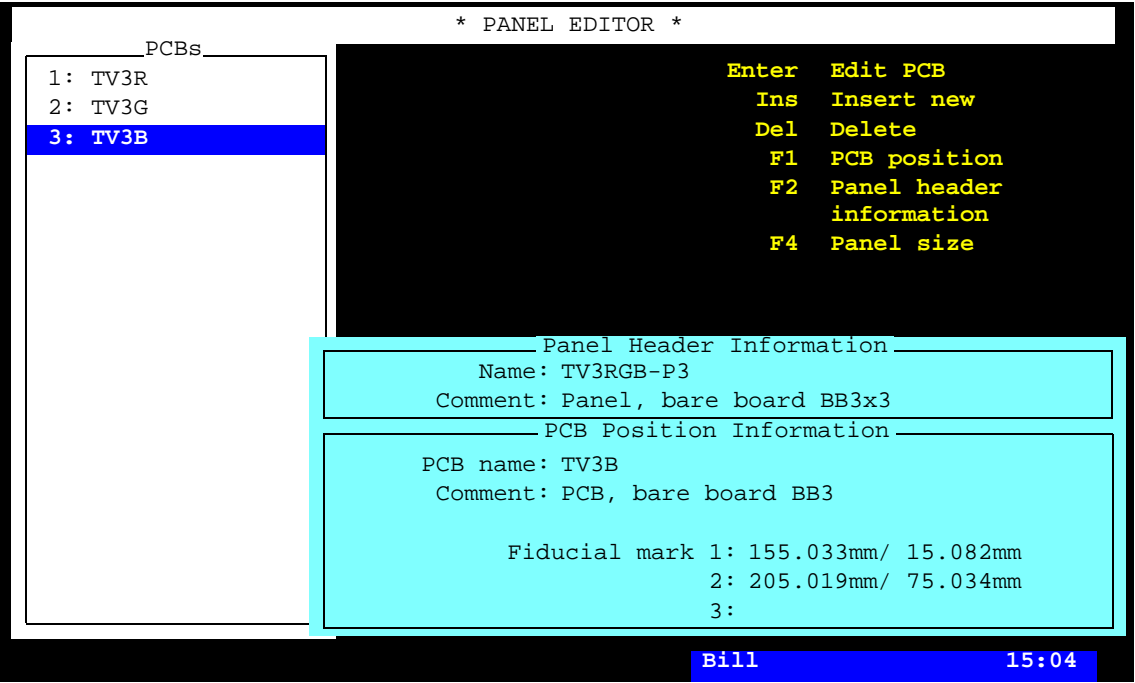
Figure 2-44. All PCBs inserted into the panel

Creating Layout

The purpose of this section is to show how to create a layout containing previously programmed PCBs and panels.

The layout to be programmed contains a complete set of boards for the TV set described on page 2-3 that is a mixture of the PCBs and panels created in the previous examples in this chapter.

These are:

The TV-ALL layout containing:

– TV1 a video board

– TV2-P2 two audio boards as a panel

– TV3RGB-P3 three color boards as a panel
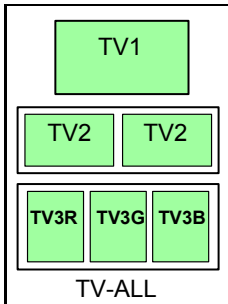
☞ The TV-ALL layout can be assembled on a machine with a Manual load sysem, or an in-line system equiped with a Manual load adapter.

Creating a New Layout

1. Open the Layout List Editor by selecting *Layouts* in the *Editor* menu.

2. Create a new layout by pressing <Ins>.

3. Enter the layout name, TV-ALL as shown in Figure 2-45.
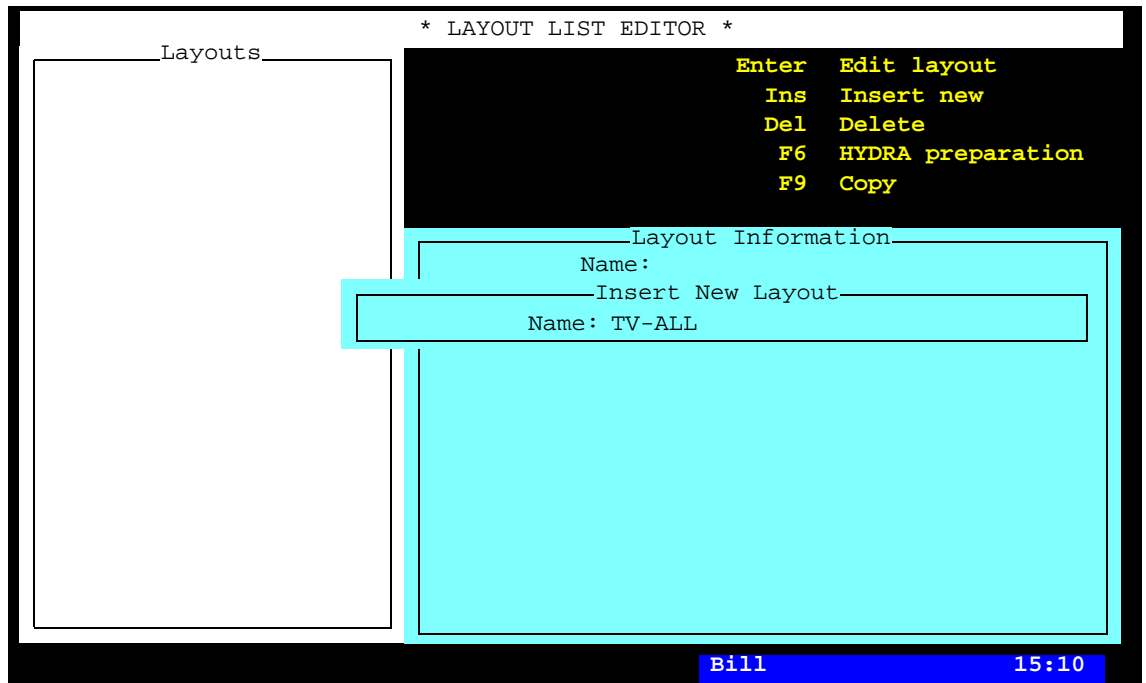
Figure 2-45. Entering a new layout

4. Save the new layout by pressing <Enter>.

5. Open the Layout Editor for editing the new layout by pressing <Enter>. You are asked whether you want to load the layout or not.

6. Load the new layout by selecting **Yes**.

7. Enter the comment text by pressing <F2> and typing the following text, that reflects the object and the name of the bare board:

Bare boards BB1, BB2x2, BB3x3

You can type comment text on a number of lines, but only the first line is visible in the various editors.

8. Save the layout header modification, either by pressing <Enter> repeatedly or by pressing <Esc> and accepting to save the modification in the following box:

```
Save modifications?
     Yes    No
```

The Layout Editor, which now contains the layout with the comment text, looks like this:

```
                        * LAYOUT EDITOR *
        ___Boards___
                                      Enter   Edit board
                                        Ins   Insert new
                                        Del   Delete
                                         F1   Board position
                                         F2   Layout header
                                              information



                              __Layout Header__
                          Name:    TV-ALL
                       Comment:    Bare boards BB1, BB2x2, BB3x3




                                        Bill              15:16
```
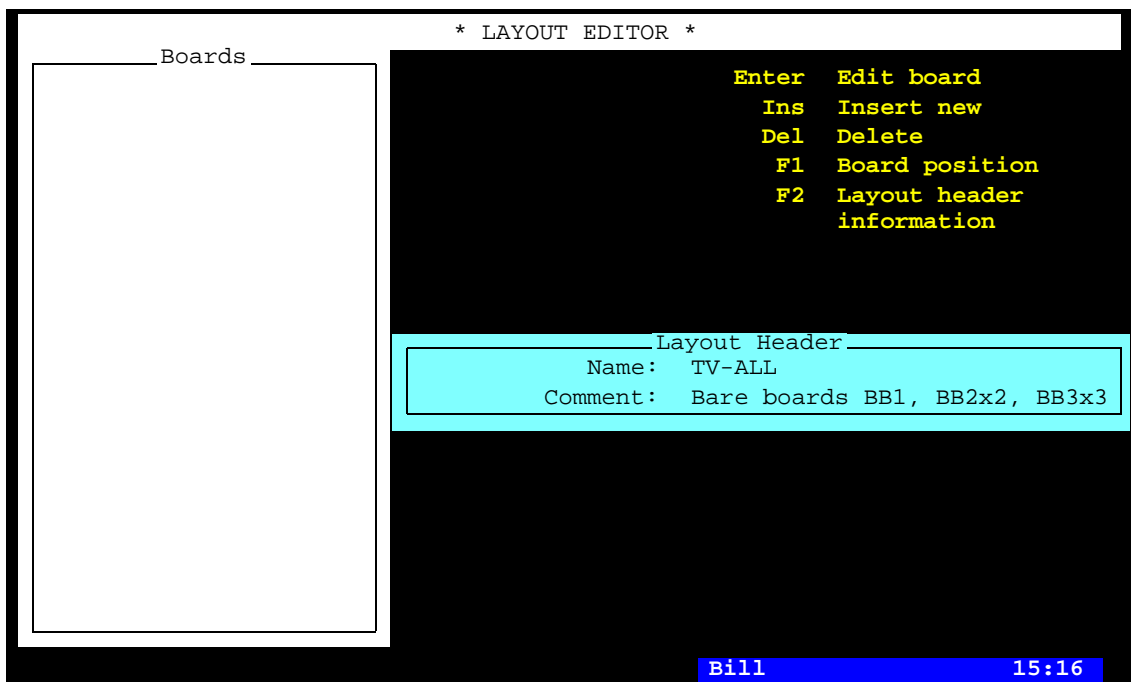
Figure 2-46. The new layout

Adding Boards to the Layout

The layout that has been created is still empty. In this section you are going to add a PCB (TV1 and two panels (TV2-P2 and TV3RGB-P3) to the layout.

Adding the TV1 board (PCB)

9. Add the first board by pressing <Ins> and selecting **PCB** since the TV1 board is a PCB.

10. Enter the PCB name on the first line in the *Insert PCB* box:

```
┌──────────────Insert PCB──────────────┐
│         Name: TV1                     │
│      Comment: * UNKNOWN PCB *          │
│ Fiducial mark 1:   0.000mm/ 0.000mm   │
│              2:   0.000mm/ 0.000mm    │
│              3:                       │
└───────────────────────────────────────┘
```

... and press <Enter>. Or, just enter 'T' and press <Enter>:

```
┌─────────────────────┐
│ PCB 'TV1' unknown   │
│ Select from list?   │
│     Yes     No      │
└─────────────────────┘
```

Select **Yes** choose the TV1 board from the list and press <Enter>.

The comment text, *PCB, bare board BB1*, is read from the PCB List:

```
┌──────────────Insert PCB──────────────┐
│          Name: TV1                    │
│       Comment: PCB, bare board BB1     │
│ Fiducial mark 1:   0.000mm/ 0.000mm   │
│              2:    190.039mm/ 90.013mm│
│              3:    190.061mm/ 0.023mm │
│ Press <F1> for camera                 │
└───────────────────────────────────────┘
```

11. Put the boards included in the layout into the machine, that is the TV1 board (PCB), the TV2-P2 board (panel) and the TV3RGB-P3 board (panel).

The PCB position in the machine is now to be located by means of the positioning camera.

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

12. Press <F1> and center the cross hairs on fiducial mark 1:
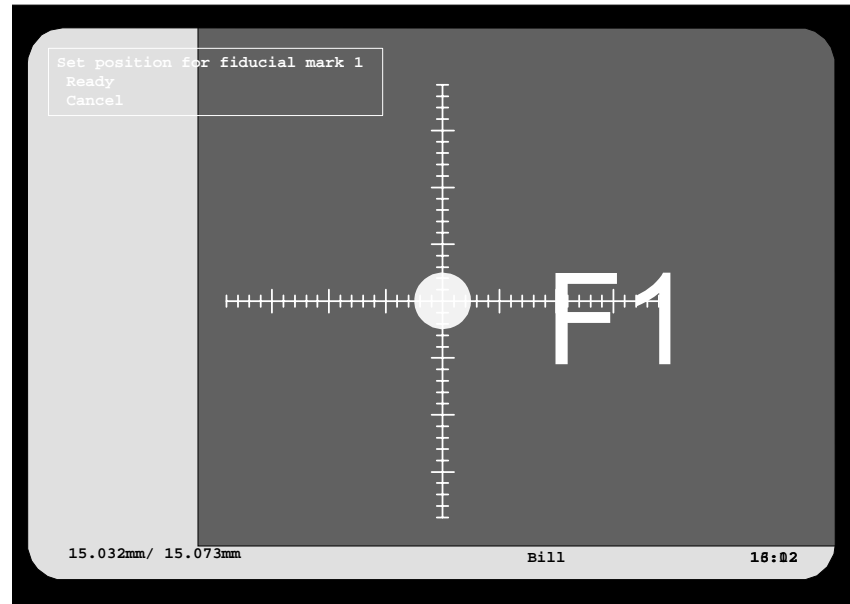
Figure 2-47. Centering fiducial mark F1

13. Confirm the position by selecting **Ready**. You are asked to position fiducial mark 2:

```
                      ─────Insert PCB─────
              Name: TV1
           Comment: PCB, bare board BB1
  Fiducial mark 1:  0.000mm/ 0.000mm
                2:  190.039mm/ 90.013mm
                3:  190.061mm/ 0.023mm
  Press <F1> for camera ─────
```
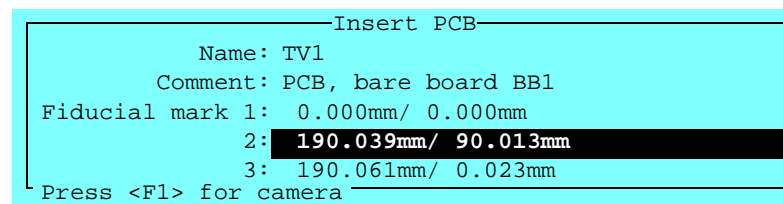
14. Press <F1> again and repeat the centering procedure for fiducial mark 2 (and fiducial mark 3):
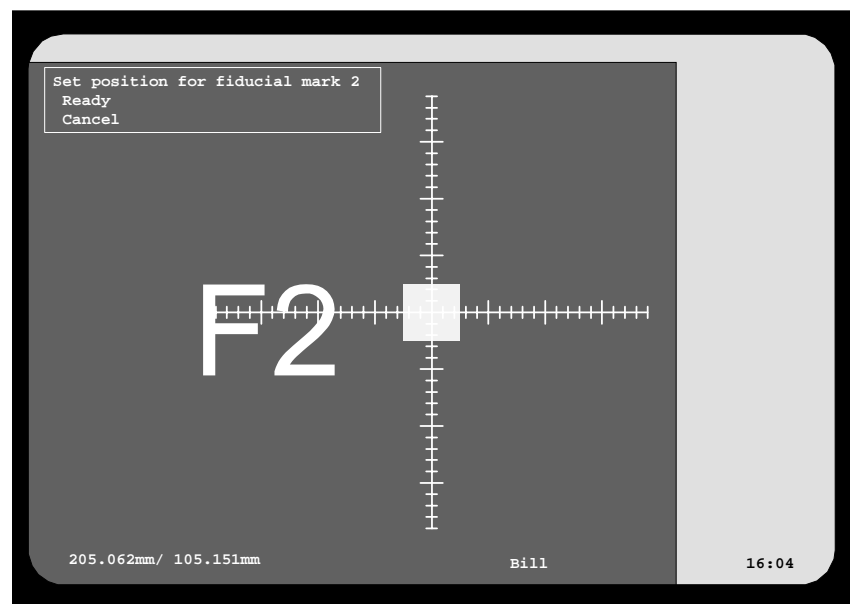
Figure 2-48. Centering fiducial mark F2

After the board is located, you are returned to the Layout Editor, in which the new board is shown:

```
                          * LAYOUT EDITOR *

 ┌─── Boards ───┐
 │ 1: TV1 (PCB) │              Enter  Edit board
 │              │                Ins  Insert new
 │              │                Del  Delete
 │              │                 F1  Board position
 │              │                 F2  Layout header
 │              │                     information
 │              │
 │              │
 │              │    ┌─── Layout Header ───┐
 │              │    │  Name: TV-ALL
 │              │    │  Comment: Bare boards BB1, BB2x2, BB3x3
 │              │    ┌─── Board Position ───┐
 │              │    │  Type: PCB
 │              │    │  Name: TV1
 │              │    │  Comment: PCB, bare board BB1
 │              │    │     Fiducial mark 1: 15.032mm/ 15.073mm
 │              │    │                   2: 205.062mm/ 105.151mm
 │              │    │                   3: 205.093mm/ 15.027mm
 │              │
                                           Bill              15:22
```
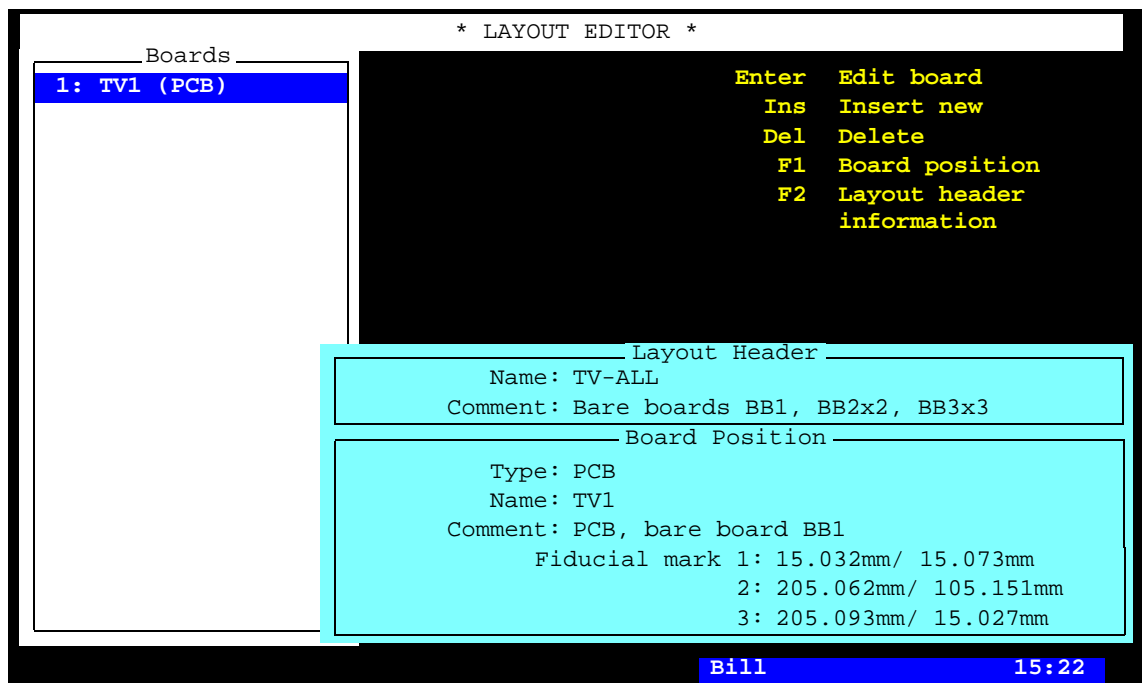
Figure 2-49. The first PCB in the layout

Adding the TV2-P2 board (panel)

15. Add the second board by pressing <Ins> and selecting **Panel** since the TV2-P2 board is a panel.

16. Enter the panel name on the first line in the *Insert panel* box and press <Enter> (or select from the list):

```
        ┌─────────── Insert panel ───────────┐
        │        Name: TV2-P2                 │
        │     Comment: Panel, bare board BB2x2│
        │ Fiducial mark 1:  0.000mm/ 0.000mm  │
        │               2:  200.057mm/ 70.042mm│
        │               3:                     │
        └─────────────────────────────────────┘
```

If two similar boards are inserted in the same layout, then you do not need to select the second board name since the system suggest the same board again. The second fiducial mark for this board is estimated as well.

If more than two similar boards are inserted, then the system assumes that the following boards are lined up and moves automatically to the positions of the following fiducial marks.

17. Center the panel fiducial marks in the same way as the PCB fiducial marks was centered for the TV1 board.

If positions that means overlapping boards are detected, then the system informs about that.

Adding the TV3RGB-P3 board (panel)

18. Add the second board by pressing <Ins> and selecting **Panel** since the TV3RGB-P3 board is a panel as well.

19. Enter the panel name on the first line in the *Insert panel* box and press <Enter> (or select from the list).

20. Center the panel fiducial marks in the same way as the previous fiducial marks.

If positions that means overlapping boards are detected, then the system shows a warning.

The complete layout

The layout containing all the boards for the TV set is now completed and it looks like this:

```
                              * LAYOUT EDITOR *
        ___ Boards _____
      1: TV1 (PCB)                            Enter   Edit board
      2: TV2-P2 (Panel)                         Ins   Insert new
      3: TV3RGB-P3 (Panel)                      Del   Delete
                                                 F1   Board position
                                                 F2   Layout header
                                                      information




                              ___ Layout Header ___
                            Name: TV-ALL
                         Comment: Bare boards BB1, BB2x2, BB3x3
                              ___ Board Position ___
                            Type: PCB
                            Name: TV1
                         Comment: PCB, bare board BB1
                                 Fiducial mark 1: 15.032mm/ 15.073mm
                                               2: 205.062mm/ 105.151mm
                                               3: 205.093mm/ 15.027mm
                                                    Bill              15:28
```
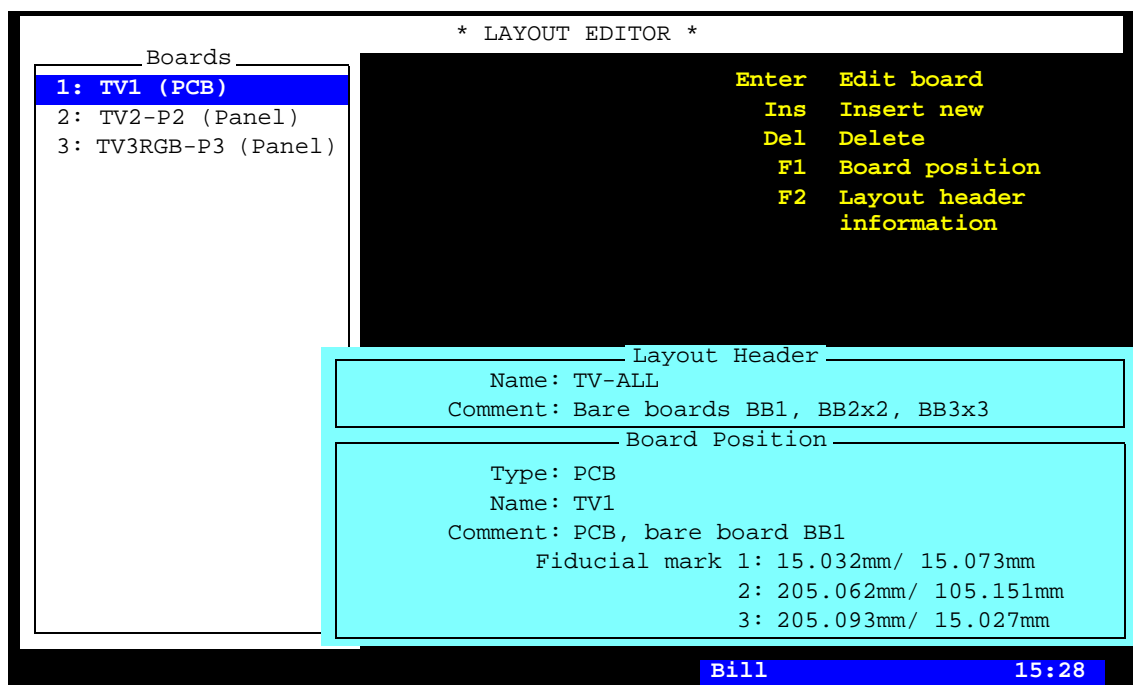
Figure 2-50. The complete TV-ALL layout

Return to the TPSys main window by pressing <Esc> repeatedly.

The created layout can now be assembled, see Chapter 3 in the *Operator's Manual*.

Identical and Almost Identical Boards

If a panel contains identical PCBs, then you can add a matrix of PCBs by simply entering the number of rows, columns and spacing. This feature is very convenient for panels that contain a large number of identical PCBs.

If there are almost identical PCBs, then you as follow:

Make copies of the PCB and modify what differs.

To copy a PCB, select the *PCBs* option in the *Editor* menu, select PCB to copy from, and press <F9>.

Panels can be also be copied and modified in the same way by selecting the *Panels* option in the *Editor* menu.

Entire layouts can also be copied and modified in the same way by selecting the *Layouts* option in the *Editor* menu.

Example: The TV3RGB-P3 panel is created by copying the TV3R board to TV3G and to TV3B, modifying the boards, and inserting the three board types into the panel.

Training Boards

The following pages contain the training boards used in this chapter. You can copy these boards (scale 1:1), cut them out and put them on top of a board in the machine and thus be able to follow the programming procedure described in this chapter.

TV1

TV2

TV2

C1 C2

F2

F2

F1

TV2

C1 C2

F2

F1

F1
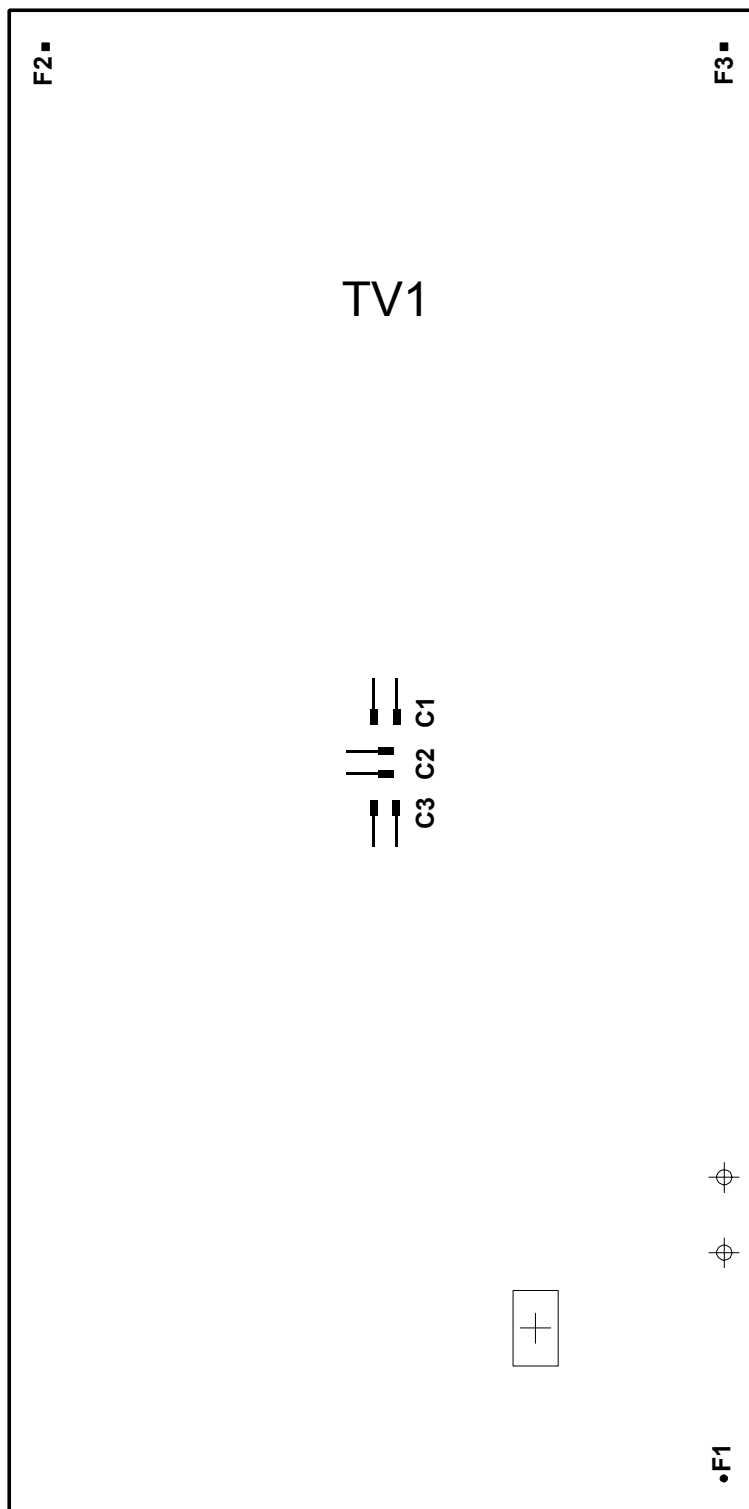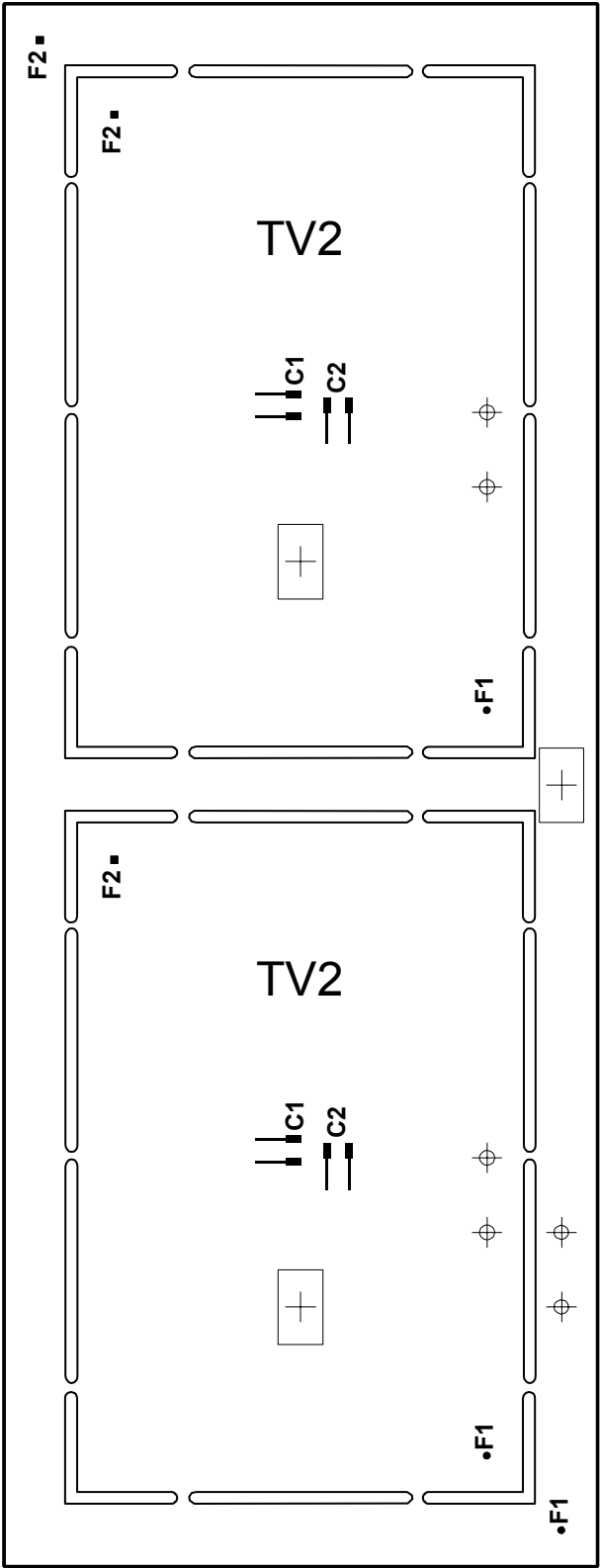
TV3R, TV3G and TV3B
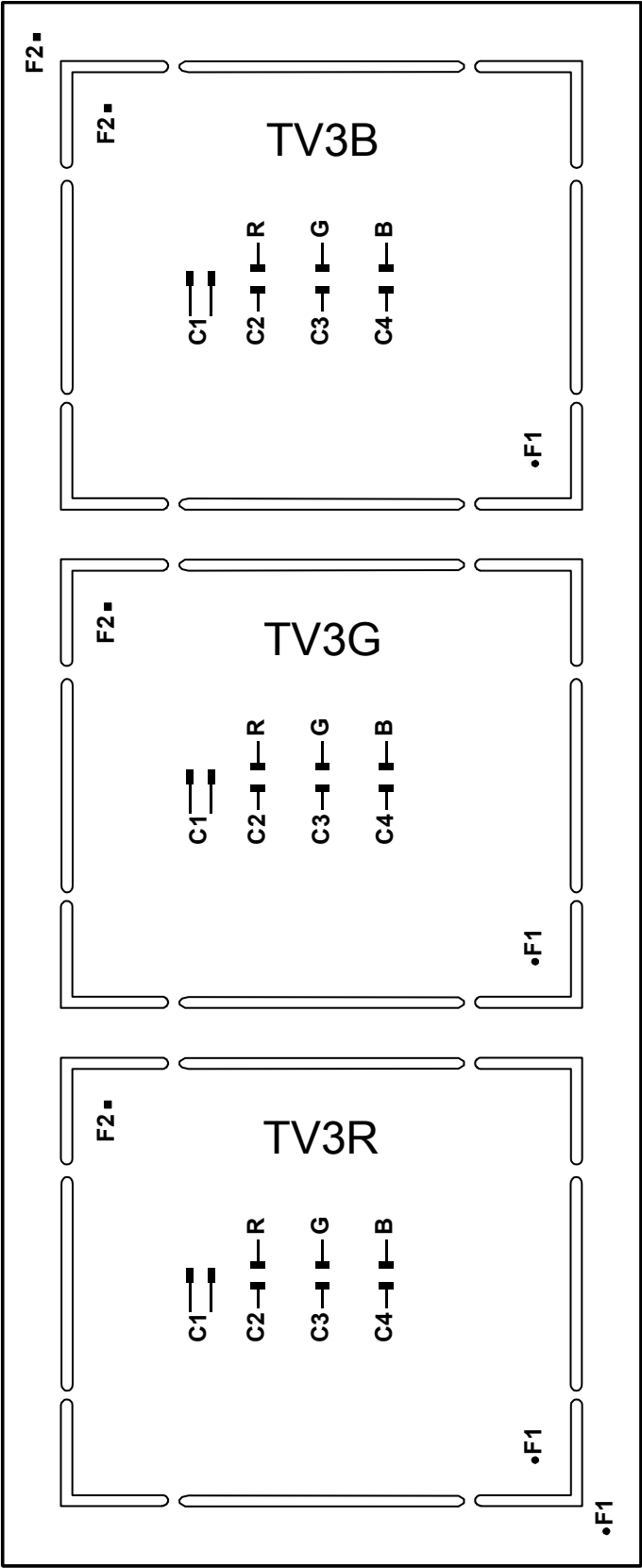
3. Basic Systems and Features

MYDATA component placement machines are able to apply adhesive for components that are to be wave soldered, pick components from magazines, perform optical centering, mechanical and electrical verification, and place the components onto printed circuit boards.

If the machine is equipped with conveyor, mounted printed circuit assemblies are replaced by new bare boards automatically.

The assembly process is controlled by software that takes information from numerous lists within the system. These lists contain information about the components, their packages, the magazine in which the components can be found, and where the components are to be placed.

When programming, all component positions refer to two or three fiducial marks on the board. Prior to assembly each board is located using an optical fiducial mark search feature. Thus, the exact location and alignment of the board on the assembly table is not important.

Components are centered optically, or mechanically, and verified in accordance with the options set during programming. These operations are performed during component transportation from the magazine to the board.

The machine is entirely processor controlled. The operator controls all functions with keyboard, machine keypad, trackball and joystick. Two or three monitors display menus, current processes and messages.

Data, such as the Linux operating system, the TPSys mount software, package, component and magazine lists, operating data, and system parameters is stored on an internal hard disk.

Printouts of most of the TPSys information can be obtained.

Some of the TPSys features can be run off-line.

Assembly and magazine information can be shared by many MYDATA machines provided that the TPSys network option is available for the machines (there is a unique magic word for each machine that can include this feature). The network is also used for backups, CAD imports, exchange of various files, and for communication with other software such as MYPlan.

For information about basic system operation, for instance keyboard, machine keypad, joystick, monitor, menus, messages, and disk drives, see Chapter 2 of the *Operator's Manual*.

Machine Functions and Coordinates
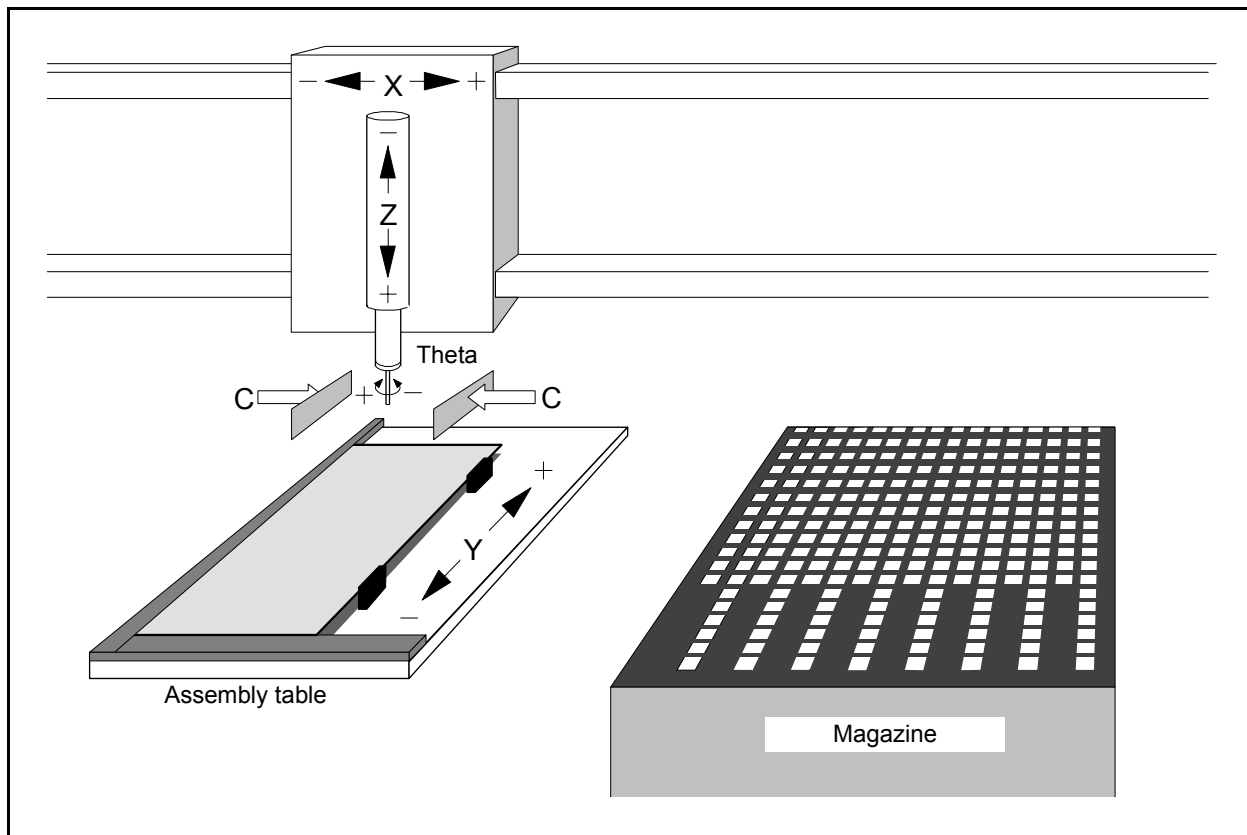
Figure 3-1. The five main movement functions

Components are mounted using five movement functions:

X movement is the longitudinal movement of the machine.

- The mount tool is moved to the magazine pick-up position with the **X movement** (the X coordinate of the machine).

  The mount tool is located on a wagon which moves in the longitudinal X direction of the machine. This means that the pick-up positions, that is the positions at which components are taken from the magazines, must be located along this line.

Z movement is the vertical movement of the tool.

- The mount tool is lowered towards a component with a vertical **Z movement**. When the tool nozzle reaches the component, the air is evacuated (by means of a vacuum pump) in the mount tool nozzle, making it hold the component.

- The mount tool is raised with the Z movement, see Figure 3-2.

- The component is moved along the X line to a position corresponding to the component location on the printed circuit board. The following procedures are performed during that movement:
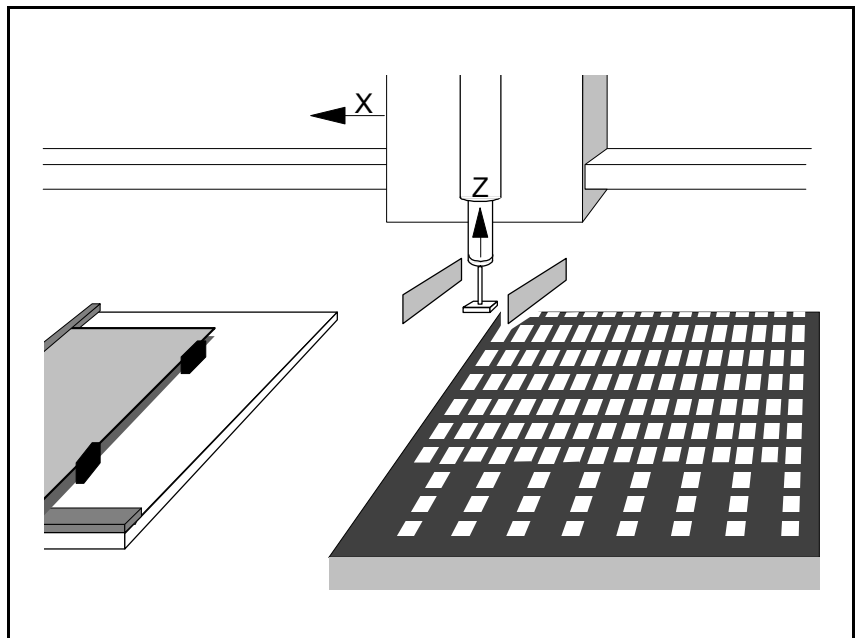
Figure 3-2. Picking a component

– If optical centering is used, the vision system will use a camera to locate the alignment, rotation and outline of the component on the mount tool.

C movement is the symmetrical movement of the centering jaws.

– If mechanical centering is used, two centering jaws (one on each side of the component, see Figure 3-3) move symmetrically in a **C movement** towards each other, until they are both in contact with the component, which is moved to the middle of the tool (centering and aligning). In this position the external dimension and, for certain components, electrical data are measured. The centering jaws then retract.

The assembly process continues if the component was not rejected at the verification. A rejected component is manually removed, put back, or ejected into a bin for rejected components.

Theta movement is the rotation of the tool.

– The tool with the component is rotated 90 degrees by the **Theta movement** to be centered a second time.

Depending on package criteria, there may be additional centering phases.
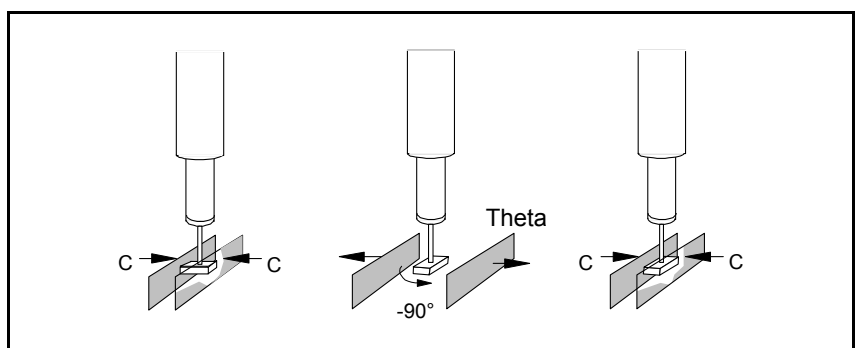
Figure 3-3. Mechanical centering and verifying
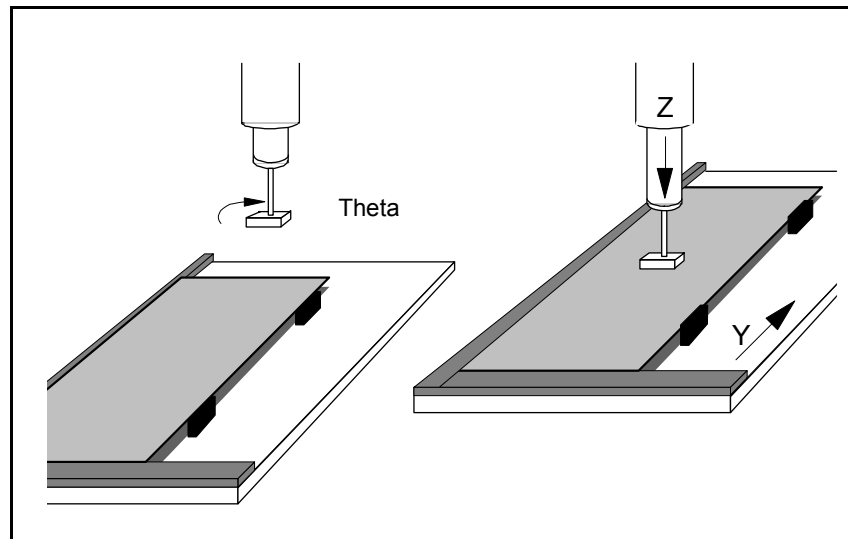
Figure 3-4. Rotating and mounting

- The component is rotated by the **Theta movement** to the angle at which it is to be mounted (see Figure 3-4).

Y movement is the movement of the assembly table.

- The assembly table moves in a **Y movement** (the Y coordinate of the machine) to a position corresponding to the component location on the printed circuit board.

- The Z movement lowers the mount tool with the component. The component is pressed against the board with the force set. The air pressure in the mount tool nozzle is increased to quickly release the component. The tool is then raised.

Vision Systems

There are two main purposes for the machine vision in TPSys:
Locating fiducial marks and inspecting components.

Locating fiducials and other objects

- PCB fiducials – The location of the PCB must be determined with very high accuracy to be able to place the components at the right positions. If the PCB is not located then all components will be mounted with an offset from there nominal position. The X-wagon camera is used for locating the fiducials of the PCB.

- Magazine fiducials – The X-wagon camera locates magazines and trays to ensure successful picking of components.

- Tray and Pallet Corners – The X-wagon camera locates the pallet corners to ensure successful picking of components in a tray.

- Bad board mark – The X-wagon camera is used when locating the bad board fiducials. The fiducial tells if a PCB in a panel is to be mounted or not.

- Feeder positions – The X-wagon camera locates feeder positions in tape and vibrtory magazines. This to ensure successful picking of components.

- Pre pick-inspctin – The X-wagon camera is optionally used to locate components exact position in a traybefore picking.

Inspecting components

When a tool has picked a component the vision system inspects the rotation and alignment of the component on the mount tool. This is done by locating all the solder balls, or the leads, of the component. The system also checks that all solder balls or leads are present and undamaged. If a lead is not detected it might be missing, damaged or it might be the wrong component. In these cases the component will not be mounted. Polarity can also be inspected if the component is non-symmetric or if it has an index mark.

Calibrating the machine:

The different cameras in the system are also used to calibrate the machine, such as calibrating the X- and Y-wagon.

Cameras in the Vision System

The MYDATA Vision System have different subsystems with specific features and applications. These systems are:

– Positioning Vision System (PVS)

– Standard Vision System (SVS)

– Dual Vision System (DVS)

– Linescan Vision System (LVS)

– HYDRA Vision System (HVS)

Positioning Vision System

This system uses a downward looking camera mounted on the X wagon, the X-wagon camera, to inspect and locate PCBs and feeders. It is also used for PCB programming.

Standard Vision System

The Standard Vision System (SVS) uses an upward looking camera for centering and inspection of components. The system is primarily used for centering and inspection of fine-pitch components.

Dual Vision System

The Dual Vision System (DVS) combines the Standard Vision System with a high resolution camera, which enables it to align components ranging from large QFPs to Flip-chips. The system is also equipped with an advanced programmable lightning to further improve the alignment of difficult components.

Linescan Vision System

The Linescan Vision System uses a camera that scans the components on the move. This camera is the fastest and is primarily used for high speed mounting of large components. The Linescan camera is also used by the HYDRA mount head.

HYDRA Vision System

The HYDRA Vision System uses an upward looking camera that examines each component on the HYDRA while it is moved from the magazine to the board.

Fiducial Marks
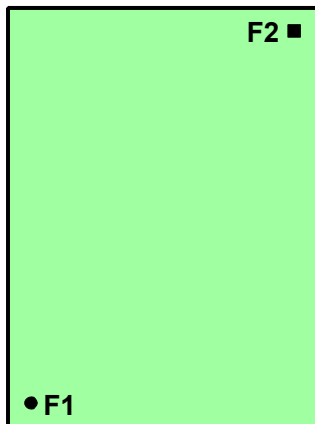
Fiducial marks are two or three arbitrarily shaped marks used to ascertain the position of the PCB with respect to the machine X/Y coordinates.

Fiducial marks should be positioned as far from each other as possible (diagonally near the corners of the board), as this facilitates higher assembly accuracy.

Avoid positioning three fiducial marks in line. Only two of these marks will be used by the system.

Fiducial marks with text, for instance F1 and F2 in the figure, are easy to identify when displayed on the screen.

Fiducial marks should be included in the etched artwork that also contains the land patterns for the components. Corners of the board, drilled via holes, or other marks not included in the etched artwork, should not be used as fiducial marks, as any deviations will affect the assembly accuracy.

Drilled via holes should not be used as fiducial marks, even if they have been drilled very precisely, because the machine measures the board level at the same position as a fiducial mark if the board origin is positioned on a fiducial mark and no other location has been defined for the board level measurement.

Printed circuit boards without fiducial marks can also be assembled if other marks are selected as fiducial marks. However, in this case, it may be difficult to use automatic fiducial mark search for board location.

Before the fiducial marks can be described, it is necessary to know about the three coordinate systems to which the fiducial marks are related. These coordinate systems are described on page 3-8.

Entering coordinate values from keyboard

TPSys usually shows X/Y coordinates like this:

0.000mm/ 0.000mm

When entering new values, simply enter the X and Y values separated by a space. If you, for example, want the X coordinate to be 25mm and the Y coordinate 35mm, type:

25   35

If you fail to type the values from the numerical section of the keyboard, the Num Lock is probably off.

Coordinate Systems

Three coordinate systems on different levels are used to assemble PCBs and panels (a panel is a board containing more than one PCB):

- **PCB coordinates** – for positioning components.

- **Panel coordinates** – for locating included PCBs.

- **Machine coordinates** – for locating boards (and for many other purposes).

Further descriptions of PCBs, panels and layouts are found in the *PCB, Panel and Layout* section in Chapter 7.

PCB coordinates

The PCB coordinate system is used to position components on printed circuit boards.

The origin of the PCB coordinate system can be selected either inside or outside the board outline by defining the position of fiducial mark 1. Thus, you can use the same origin as used in the design data of the board, if any. Figure 3-5 shows an example of a board on which the origin corresponds to fiducial mark 1.
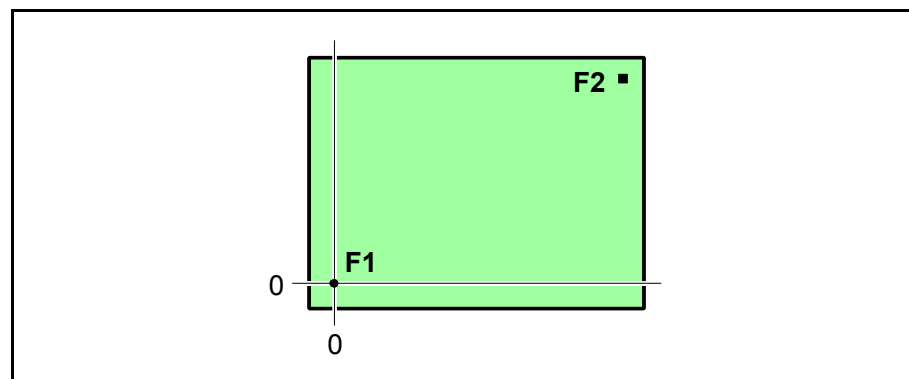
Figure 3-5. Coordinate origin at fiducial mark 1

To get the origin at fiducial mark 1, set the X/Y values to 0/0 in the PCB header information box (shown on page 3-10):

```
    Mark 1 ID:            pos.:  0.000mm/ 0.000mm
```

If the X/Y values are changed to:

```
   Mark 1 ID:            pos.:  15.000mm/ 20.000mm
```

the origin of the PCB coordinate system is positioned outside the board as shown in Figure 3-6.
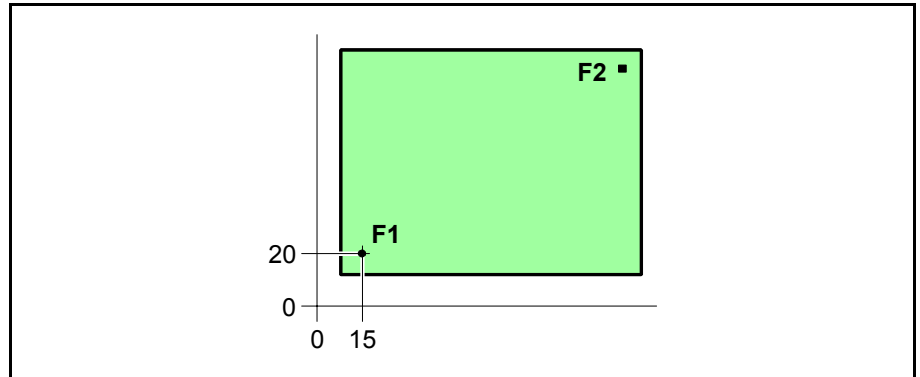
Figure 3-6. Coordinate origin outside the board

All components are positioned with reference to the PCB coordinate system. If a component is positioned near the edge of the board, the coordinates of the component will be as shown in Figure 3-7. Note that the coordinates are calculated to the middle of the component.
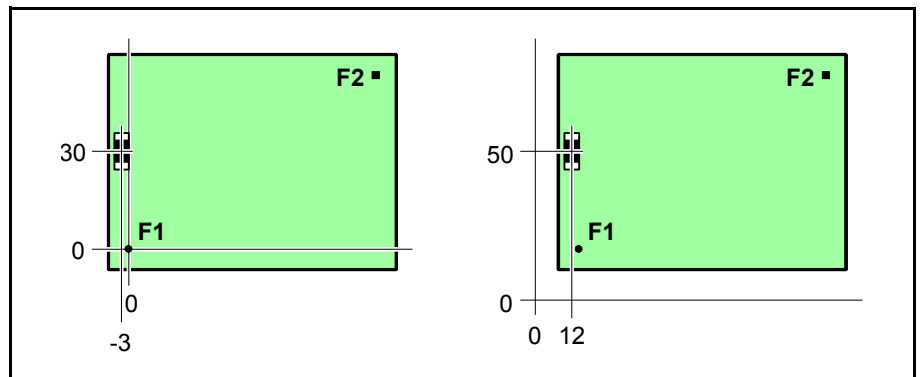
Figure 3-7. Component coordinates

Fiducial mark 2 and, if applicable, mark 3 are assigned their coordinates in the same way as components, by keyboard entry or by using the position vision system.

Figure 3-8 shows a PCB named *TV2* mounted on a bare board named *BB2*. The coordinates in the figure correspond to the following PCB header information for the board:

```
                       ─PCB Header Information─
               Name: TV2
            Comment: PCB, bare board BB2
          No. of fiducial marks: 2
  Mark 1 ID: Ro-1.0      pos.:   0.000mm/ 0.000mm
       2 ID: Sq-1.0      pos.:  80.000mm/ 50.000mm
       3 ID:             pos.:
         Bad board mark pos.:   20.000mm/ 25.000mm
       Mount tool test pos.:    30.000mm/ 0.000mm
        Glue tool test pos.:    40.000mm/ 0.000mm
```

A = Position of bad board marks.

B = Board level measuring point for mount tools.

C = Board level measuring point for glue tools.

Figure 3-8. Coordinates on the TV2 board

Panel coordinates

The panel coordinate system is used to define the positions of the PCBs included in the panel.

The fiducial marks on the PCBs are used for this positioning.

Figure 3-9 shows an example of the previous board, shown here as a panel containing two *TV2* boards.

A = Position of bad board marks.

B = Board level measuring point for mount tools.

C = Board level measuring point for glue tools.
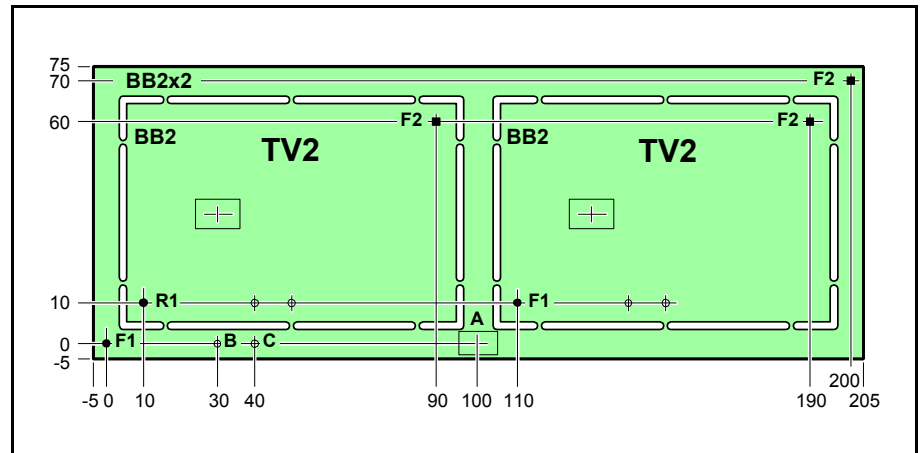
Figure 3-9. Panel coordinate system

The coordinates in the figure correspond to the following panel header information for the *TV2-P2* board:

```
                 ┌─────Panel Header Information─────┐
              Name: TV2-P2
           Comment: Panel, bare board BB2x2
        Level measurement tools:
         No. of fiducial marks: 2
    Mark 1 ID: Ro-1.0      pos.:   0.000mm/  0.000mm
         2 ID: Sq-1.0      pos.:   200.000mm/ 70.000mm
         3 ID:             pos.:
          Bad board mark pos.:    100.000mm/ 25.000mm
          Mount tool test pos.:   30.000mm/  0.000mm
           Glue tool test pos.:   40.000mm/  0.000mm
```

The coordinates of the first included PCB look like this in the Panel List:

```
                 ┌───── PCB Position Information ─────┐
         PCB name:   TV2
          Comment:   PCB, bare board BB2

              Fiducial mark 1:   10.000mm/ 10.000mm
                            2:   90.000mm/ 60.000mm
                            3:
```

... and for the second included PCB like this:

```
                 ┌───── PCB Position Information ─────┐
         PCB name:   TV2
          Comment:   PCB, bare board BB2

              Fiducial mark 1:   110.000mm/ 10.000mm
                            2:   190.000mm/ 60.000mm
                            3:
```

Machine coordinates

The machine coordinate system is used to locate the boards on the assembly table. The machine coordinate system is illustrated in Figure 3-1 on page 3-2.

A board location is performed by storing the coordinate values of the fiducial marks. These values are stored after the fiducial marks are found and centered by means of the camera. The board location procedure is performed prior to each assembly start. The coordinate values of the last board assembled are stored by the system. If more than one board was assembled in the same layout, the coordinate values for all the boards are stored. When the assemblies are completed and replaced with new bare boards to be assembled, the machine starts searching for the fiducial marks at the same positions where they where found last time.

The machine coordinate values are shown at the bottom left of the screen when the machine is in board location mode, that is after selecting the **Locate Boards (Manual)** option in the **Production** menu. The board shown in Figure 3-11 looks like this on the screen:
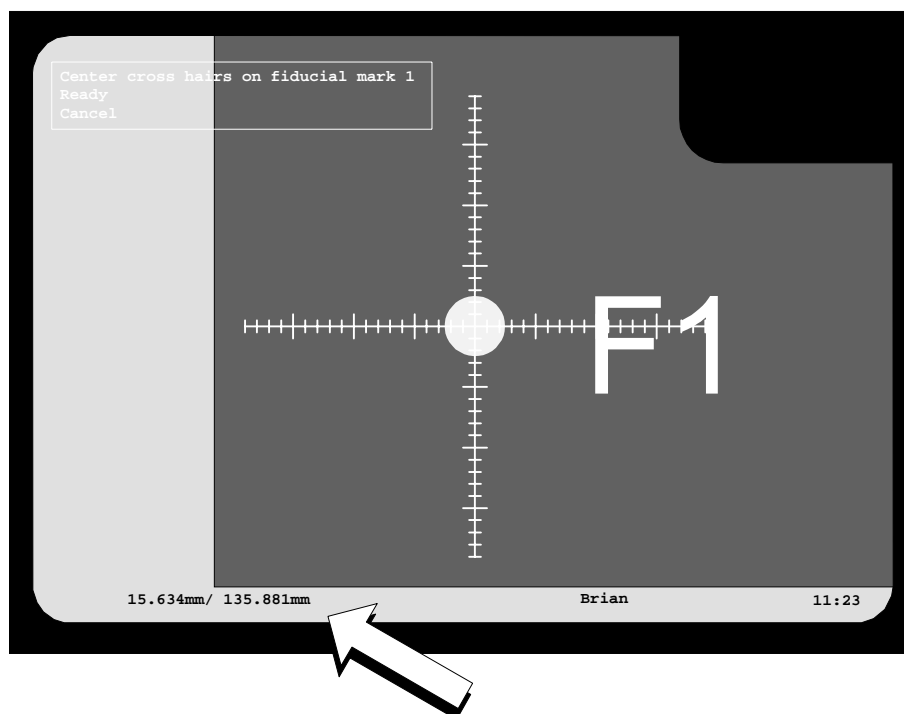
Figure 3-10. Machine coordinates

Defining Fiducial Marks

Before any component can be positioned on a printed circuit board, fiducial marks must be defined to create the PCB coordinate system.

To define the board fiducial marks means:

– Entering the type of fiducial marks and teaching the machine to recognize the marks on the board (a necessity for automatic fiducial mark search).

– Entering the values of the fiducial mark coordinates.

A board named *TV1* is referred to in the following description. It has three fiducial marks and looks like this:
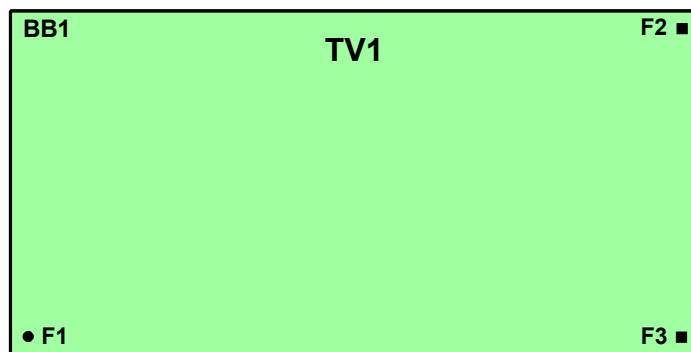
Figure 3-11. Printed circuit board TV1

Create layout, board and fiducial mark

- Open the Layout List Editor (described in Chapter 7).

- Insert a new layout. Select the new layout, press <Enter> and accept to load the new layout.

- In the Layout Editor, insert a new PCB, enter the name *TV1* and skip the rest of header information in the popup box shown.

- Open the PCB Editor by selecting the new PCB in the Layout Editor and pressing <Enter>.

- In the PCB Editor, press <F2> and enter comment text and number of fiducial marks (3) into the *PCB Header Information* box:

```
                 ┌──────PCB Header Information──────┐
                        Name: TV1
                     Comment: PCB, bare board BB1
               Level measurement tools:
                No. of fiducial marks: 3
          Mark 1 ID: R            pos.:  0.000mm/ 0.000mm
               2 ID:              pos.:  0.000mm/ 0.000mm
               3 ID:              pos.:
                Bad board mark pos.:  0.000mm/ 0.000mm
              Mount tool test pos.:  0.000mm/ 0.000mm
               Glue tool test pos.:  0.000mm/ 0.000mm
```

- To add the first fiducial mark F1, named *Ro-1.0* because it is a round mark with a diameter of 1.0mm, enter a character of the fiducial mark name, for instance 'R' and press <Enter> (see the figure above).

- Accept to select from the Fiducial Mark List, which contains available fiducial marks. The name that most closely matches the characters entered is highlighted. This feature is intended for searching and selecting taught fiducial marks directly from the Mount List. The Fiducial Mark List is further described in Chapter 8.

- Press <Ins> and type the name and user comment text:

Select the fiducial mark that has most data in common with the new mark before pressing <Ins>. Current data will be applied to the new mark.

```
              ┌──────Create New Fiducial Mark Type──────┐
                     Name: Ro-1.0
                  Comment: Round 1.0mm
```

- Press <Enter> to save the new fiducial mark.

Teaching the fiducial mark

- The system can learn to recognize fiducial marks after recording the shapes using the vision system. To record the new fiducial mark, place the board on the assembly table, make sure the *Ro-1.0* is highlighted and press <F7>.

- Center the fiducial mark using the trackball or joystick as shown in Figure 3-12 Fiducial mark *Ro-1.0* is marked F1 on the board.

- Confirm the centering by pressing <Enter> when *Ready* is highlighted.

A yellow rectangle, the search area, appears in the image and you are asked to adjust its size, see Figure 3-13. If text, conductors or any other surrounding parts of the board artwork is included in the search area, the size can be controlled with the joystick or trackball to cover only the fiducial mark. Confirm the size by pressing <Enter>. The result is shown on the screen.

The verify area is taught in the same way as the teach area.

If the teaching fails, then the fiducial mark data may need to be modified, see the *Fiducial Mark List* section in Chapter 8.
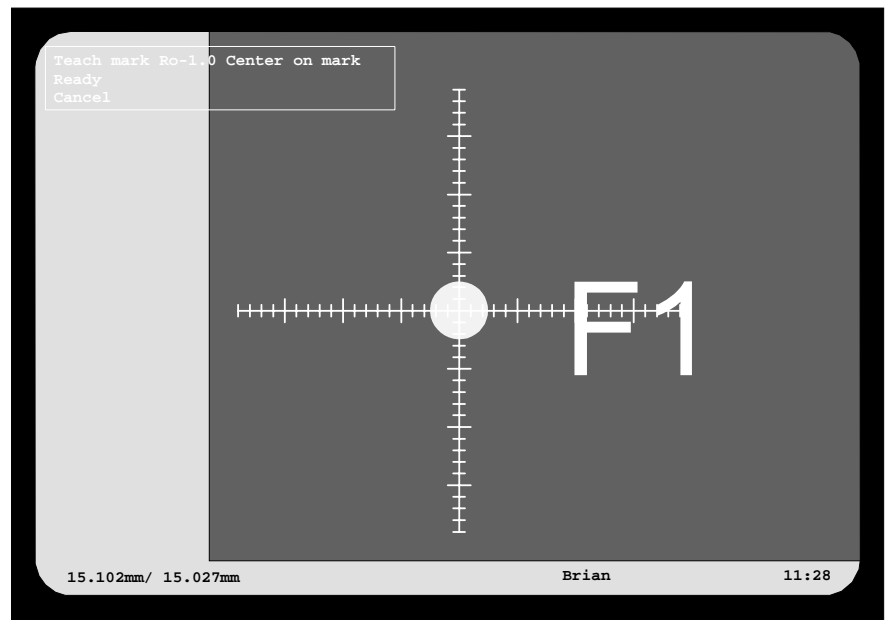
Figure 3-12. Teaching fiducial mark F1
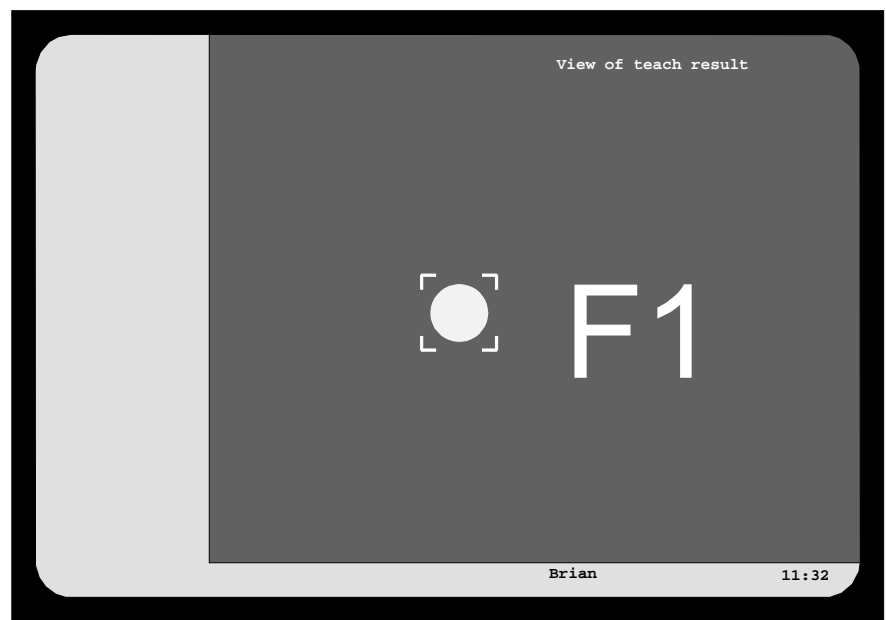
Figure 3-13. Fiducial mark and teach area

- Press any key to return to the Fiducial Mark List window.

- Press <F8> if you want to test the mark by using the fiducial mark search or <Esc> to exit the test mode.

- Press <Enter> when *Ro-1.0* is highlighted to select this fiducial mark and to return to the PCB Editor.

Defining the first fiducial mark

If the design data for the circuit board is available, the first fiducial mark coordinates can be typed into the PCB header information box. If there is no design data available for the board, define the fiducial mark as described below.

The origin of the board coordinate system is intended to coincide with fiducial mark 1 as shown in Figure 3-5 on page 3-8. So, the X/Y coordinates of the first fiducial mark is left unchanged, but you must position them on the assembly table. The system needs this position to be able to calculate the coordinate values of the remaining fiducial marks:

```
┌─────────────────PCB Header Information──────────────────┐
│              Name: TV1                                   │
│           Comment: PCB, bare board BB1                   │
│       Level measurement tools:                          │
│        No. of fiducial marks: 3                         │
│     Mark 1 ID: Ro-1.0      pos.:│ 0.000mm/ 0.000mm │    │
│          2 ID:             pos.:  0.000mm/ 0.000mm      │
│          3 ID:             pos.:                        │
│          Bad board mark pos.:  0.000mm/ 0.000mm         │
│         Mount tool test pos.:  0.000mm/ 0.000mm         │
│          Glue tool test pos.:  0.000mm/ 0.000mm         │
└─ Press <F1> for camera ─────────────────────────────────┘
```

If you enter approximate values before pressing <F1>, the camera will be moved to the indicated position, and you will need to carry out only fine adjustments using the trackball or joystick.

1. Press <F1> to enter the position using the camera. Center the cross hairs on the fiducial mark as shown in Figure 3-14.
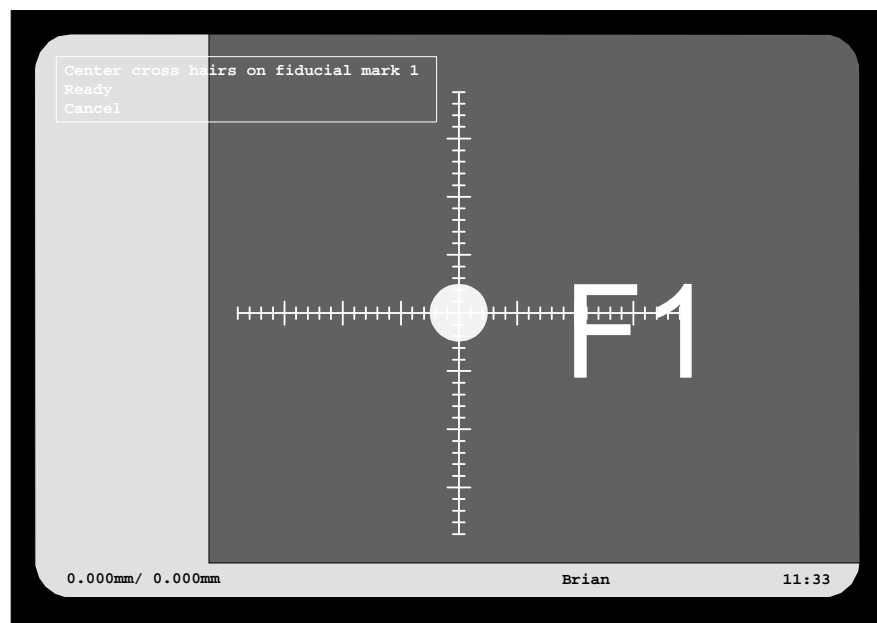
Figure 3-14. Centering fiducial mark F1

2. Press <Enter> when *Ready* is highlighted.

3. Select **Yes** if you want this fiducial mark to be verified by the vision system, otherwise **No**.

```
┌─────────────────────────────────┐
│    Autosearch fiducial mark?    │
│            Yes    No             │
└─────────────────────────────────┘
```

Measuring the board angle on the assembly table
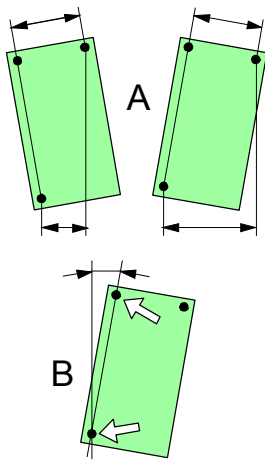
To be able to calculate correct coordinate values for the fiducial marks the system must first calculate the angle in which the board is oriented on the assembly table while the fiducial marks are defined. This angle affects the coordinate values, see 'A' in the figure.

Two marks along the length line (or width line) of the board are used to calculate the board angle. If there are no fiducial marks along the X or Y axes, then use traces, mounting pads or other parts of the board artwork. The only requirement is that the selected marks must be located along the length or width line of the board artwork, and the distance between them should be as big as possible to achieve the highest accuracy, see 'B' in the figure.

The following dialog box, displayed directly after centering fiducial mark 1, asks whether the board angle is to be measured or not:

```
┌─────────────────────────────────┐
│      Measure board angle?       │
│            Yes    No             │
└─────────────────────────────────┘
```

- Select **Yes** to calculate the board angle.

  Use the F1 and F3 fiducial marks as they are located along the length line of the *TV1* board. It is also possible to use fiducial marks F2 and F3 to measure the angle. However, the distance between them is less than that between F1 and F3, which would decrease the accuracy.

  It is not necessary to indicate whether a length or breadth line has been selected, the system is able to decide it due to the positions of the marks.
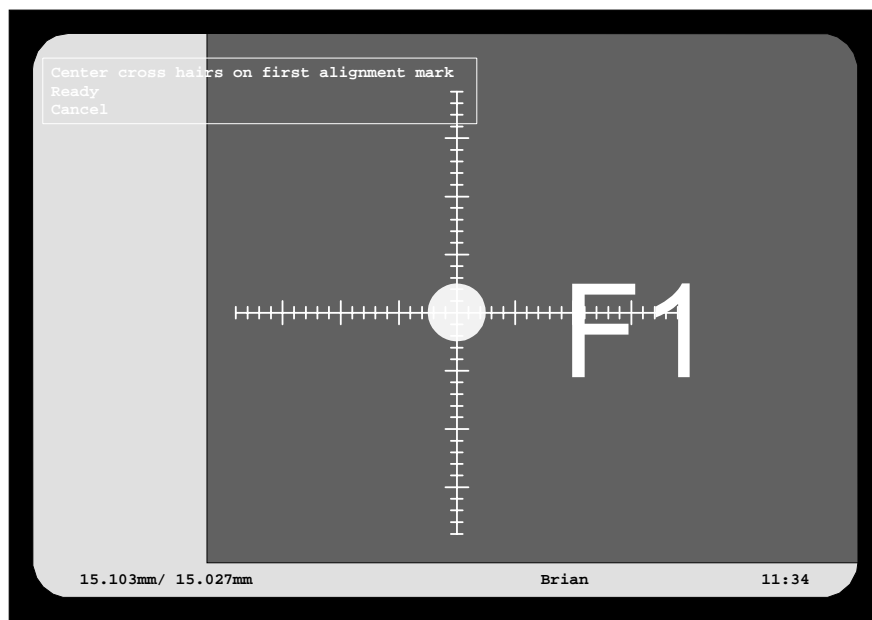
Figure 3-15. Centering the first alignment

- Center the cross hairs on fiducial mark F1, see Figure 3-15 and confirm the first alignment mark by pressing <Enter> when *Ready* is highlighted.

- Move to fiducial mark F3 and repeat the procedure for the second alignment mark, see Figure 3-16.
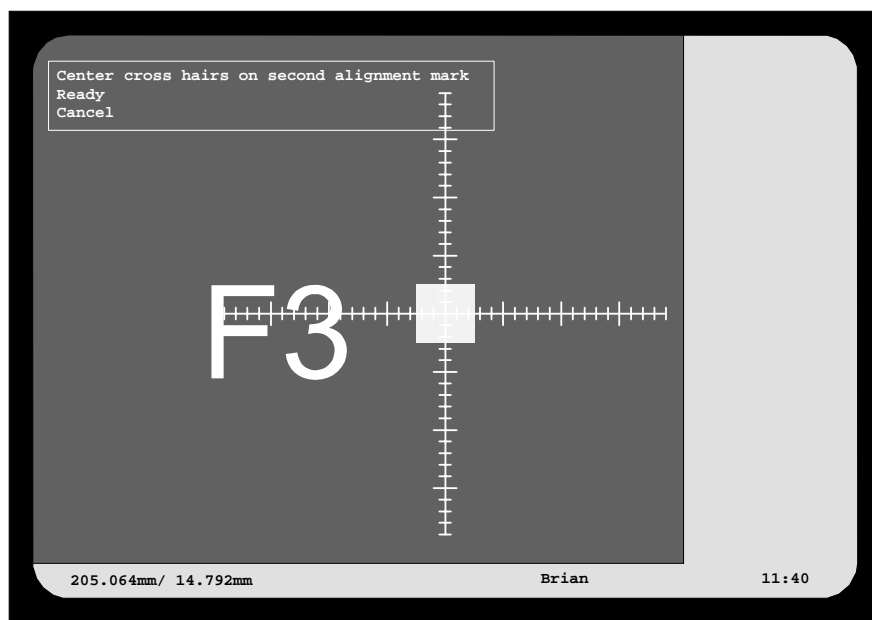
Figure 3-16. Centering the second alignment mark

The alignment of the board is displayed as follows:

```
Board angle: 0.07°
     Yes    No
```
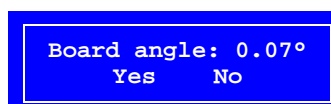
Defining the second fiducial mark.

Fiducial mark F2 is defined in the same way as F1, except for the alignment measurement, which has already been done:

- Enter the name of the second fiducial mark, see page 3-13. Use the name *Sq-1.0* as the mark is a square with a side of 1.0mm.

- Teach the second fiducial mark, see page 3-14.

- Enter the coordinates of fiducial mark 2, see page 3-16. Center fiducial mark F2 as shown in Figure 3-17.
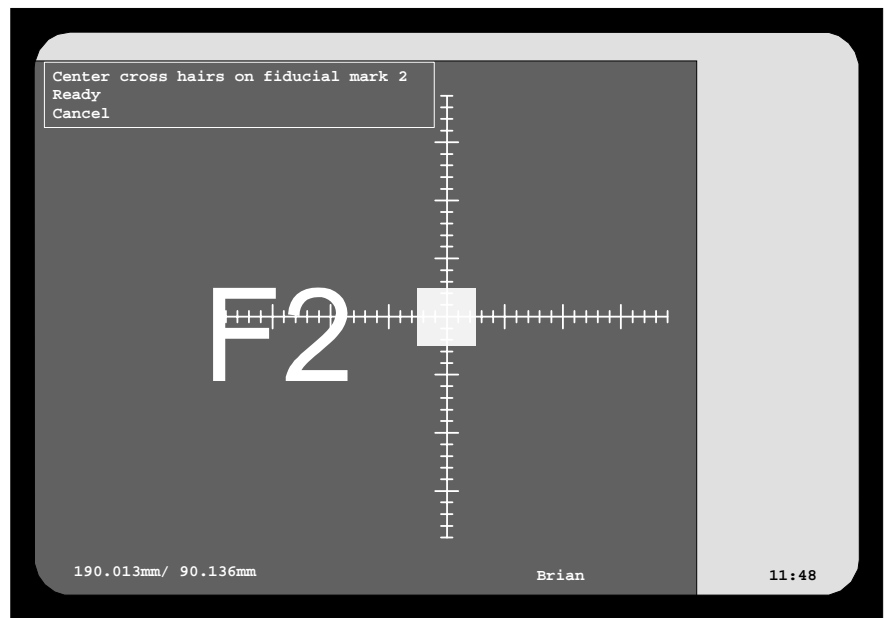
Figure 3-17. Centering fiducial mark F2

Defining the third fiducial mark.

Fiducial mark F3 is defined in the same way as the others. The F3 fiducial mark has the same shape as F2 already taught.

- Enter the name *Sq-1.0* for the third fiducial mark.

- Press <F1> and center fiducial mark F3, see Figure 3-18.


```
Center cross hairs on fiducial mark 3
Ready
Cancel
```

```
F3
```

```
190.073mm/ 0.065mm                    Brian                11:52
```
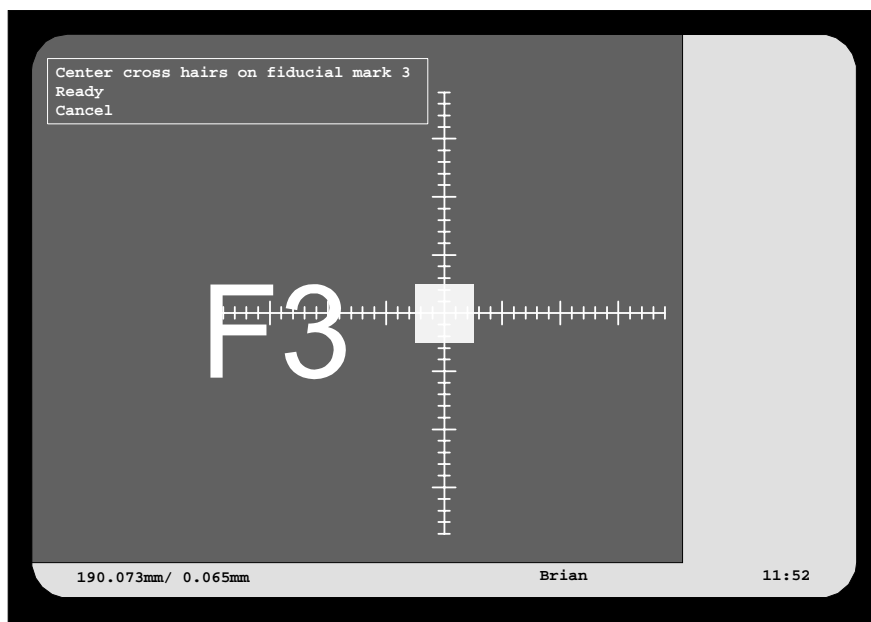
Figure 3-18. Centering fiducial mark F3

When the three fiducial marks are defined, the PCB header information box shows the following:

```
               ┌──────PCB Header Information──────┐
                       Name: TV1
                    Comment: PCB, bare board BB1
             Level measurement tools:
              No. of fiducial marks: 3
        Mark 1 ID: Ro-1.0     pos.:  0.000mm/ 0.000mm
             2 ID: Sq-1.0     pos.:  190.013mm/ 90.136mm
             3 ID: Sq-1.0     pos.:  190.073mm/ 0.065mm
             Bad board mark pos.:  0.000mm/ 0.000mm
            Mount tool test pos.:  0.000mm/ 0.000mm
             Glue tool test pos.:  0.000mm/ 0.000mm
```

Now, you can test automatic fiducial mark search on the board by selecting the *Locate Boards (Auto)* option in the *Production* menu.

Locating Boards

When the fiducial marks have been defined, it does not matter how the boards are placed on the assembly table. The system calculates the component positions and angles in relation to the fiducial marks. However, the system must be told where the board is positioned on the assembly table. So, each board must be located prior to assembly.

IMPORTANT

Fiducial marks must be centered in the correct order. If the marks are swapped on a board with fiducial marks diagonally, all components will be mounted back to front.

See the *PCB* number displayed at the top left of the screen (see Figure 3-19).

Manual board location

Rotate the *TV1* board by 90 degrees on the assembly table. Then select the **Locate Boards (Manual)** option in the **Production** menu. Center fiducial mark F1 as shown in Figure 3-19 and the fiducial marks F2 and F3 in the same way.
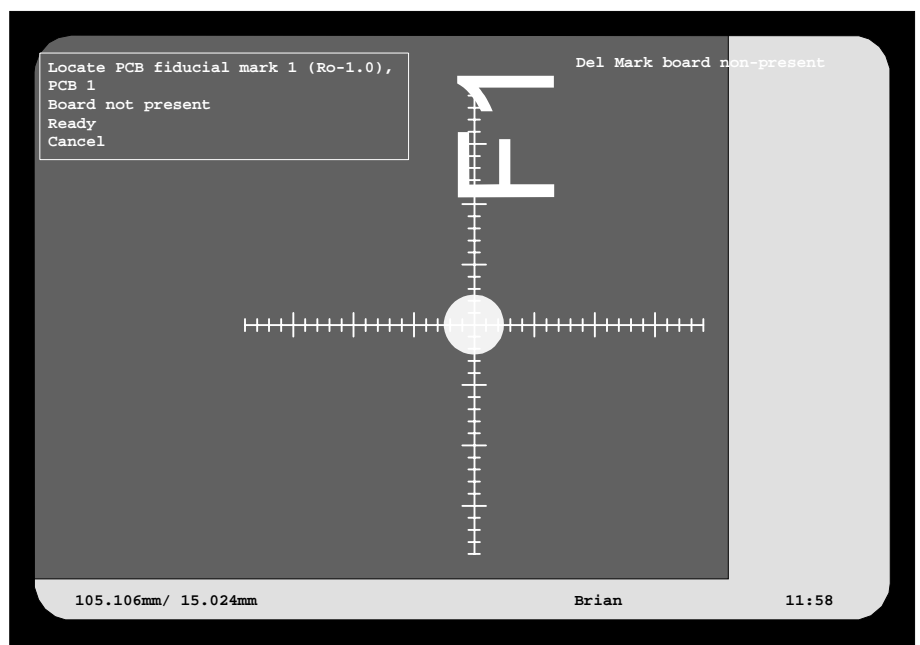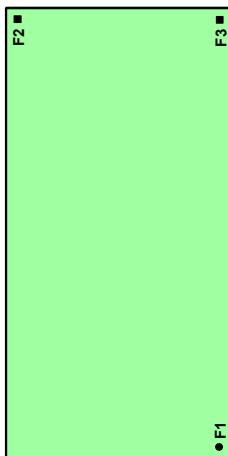
Figure 3-19. Manual board location

A graphic overlay of the fiducial mark is shown on the screen when locating boards manually.

Now the system has located the board position and angle and will mount all the components correctly.

For further information about manual location of boards, see *Board Location* and *Manual Fiducial Mark Search* in Chapter 8 of the *Operator's Manual*.

Automatic location

When the machine has learned the fiducial marks, location can be carried out automatically, that is the system searches for the fiducial marks and centers the cross hairs on them. Each board is then assumed to be positioned within a couple of mm from the previous position.

You can test this feature as follows:

- Perform an automatic fiducial mark search by selecting the **Locate Boards (Auto)** option in the **Production** menu.

- Move the *TV1* board 1mm approximately on the assembly table.

- Select the **Locate Boards (Auto)** option in the **Production** menu.

  The automatic fiducial mark search will now search for the three fiducial marks and center them.

This procedure is performed on each board prior to assembly.

For further information about automatic location of boards, see *Board Location* and *Automatic Fiducial Mark Search* in Chapter 8 of the *Operator's Manual*.
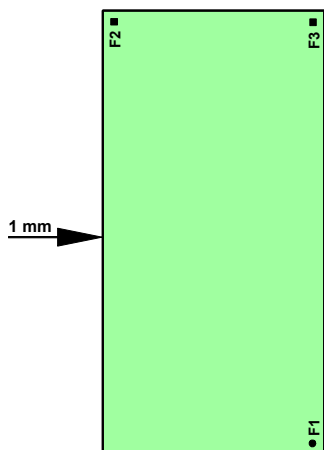
Fiducial mark deviations

If a fiducial mark coordinate deviation exceeds permitted values, the system asks whether the board is to be accepted or not.

For further information about fiducial mark deviations, see *Board Location* and *Fiducial Mark Deviation* in Chapter 8 of the *Operator's Manual*.

Angles

This system relates all angles to the machine. This applies to all angles for components, PCBs, magazines, centering and verification. The relationship between the machine and the angles is shown in Figure 3-20 (top view).
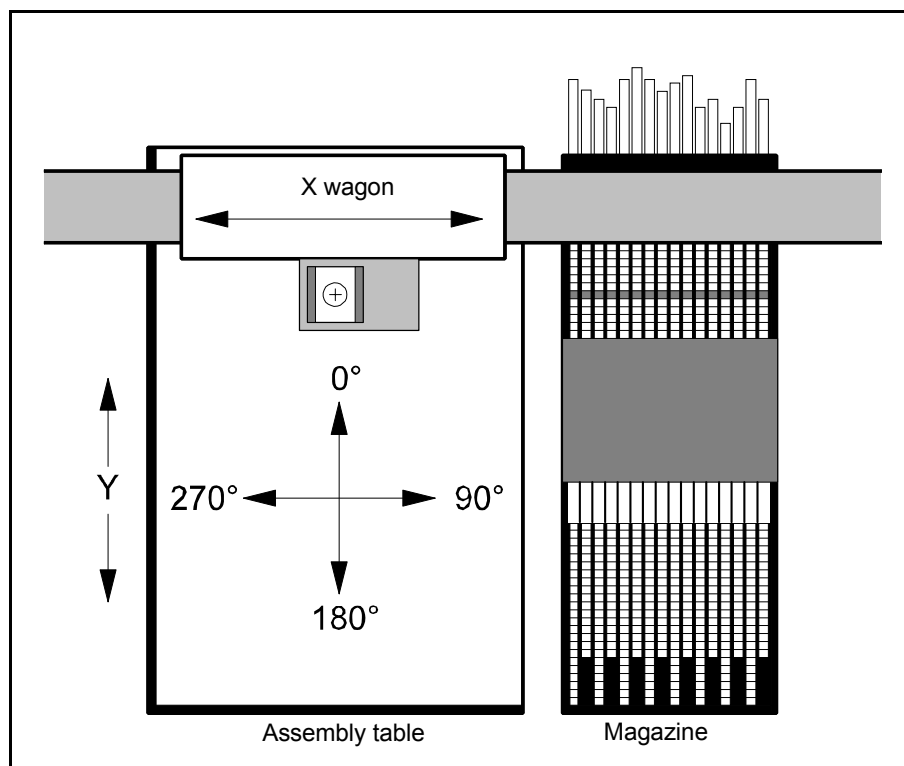
Figure 3-20. Machine angles

A component is oriented in 0° when lead 1 (and the mark, if any) is pointing towards 0° in the alignment system of the machine and/or lead 1 is in the top left quadrant. The angles shown in Figure 3-21 apply to bipolar components.
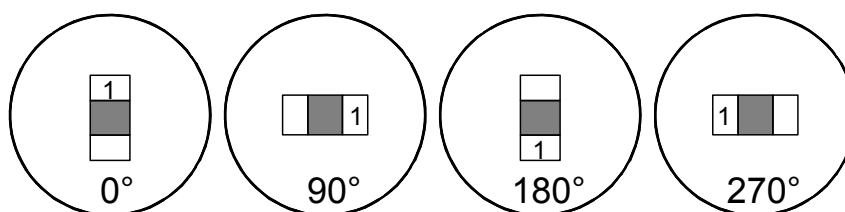
Figure 3-21. Bipolar component angles

Symmetrical components that are not polarized, for instance resistors, can be verified and mounted in 180° to their programmed angles.

Angles for other unmarked components are given in the same way as for bipolar components. Figure 3-22 shows examples of a tripolar diode and transistor package.
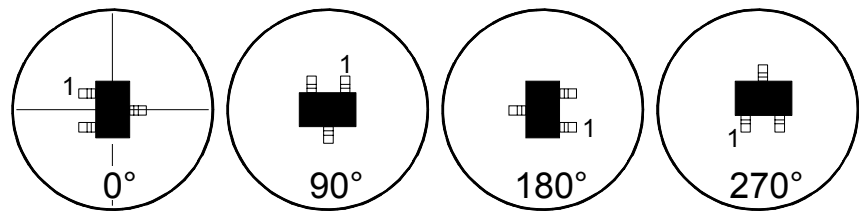
Figure 3-22. Unmarked tripolar component angles
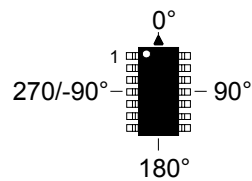
Marked components are aligned as indicated by the marking. The figure shows a simple IC ...
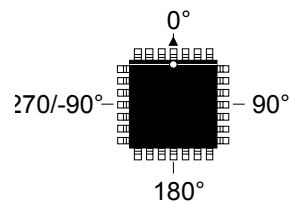
... and a multipolar IC.

Centering

The purpose of the centering feature is to adjust the component position and angle on the mount tool nozzle (mechanical centering), or to detect the component position and angle on the mount tool nozzle (optical centering). The centering procedure is performed while components are moved from the magazine to the board.

Mechanical Centering – Single Mount Head

Mechanical centering means that the centering jaws move towards each other until the component is centered on the mount tool nozzle.

A basic description of mechanical centering is found in the *Machine Functions and Coordinates* section on page 3-2.
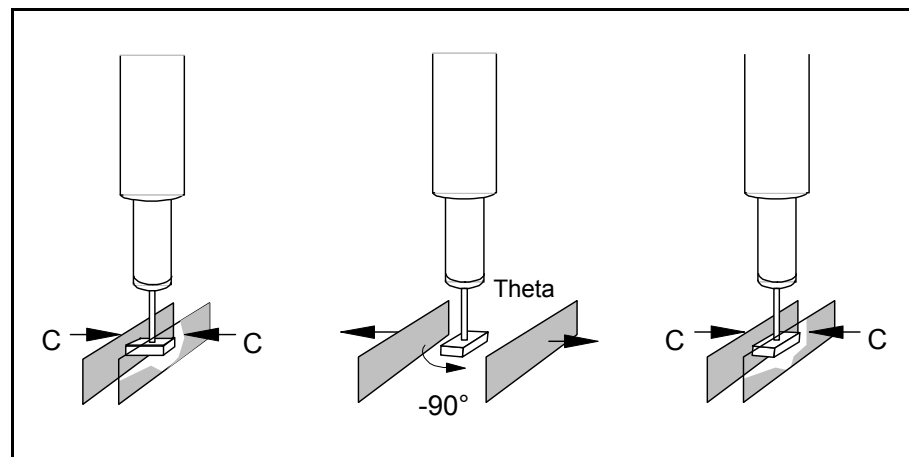
Figure 3-23. Mechanical centering

Optical Centering – Single Mount Head

The optical vision system examine the component and calculates the components position and alignment while it is held by the mount tool nozzle. Then the system calculates the mount tool position and alignment for making a correct component placement. Bent leads, if any, are taken into consideration.

Components with leads bent more than specified are rejected.

Depending on the type of lead group, a package larger than the camera field of view can be examined from two images (dual shot). This is automatically handled by the system.

The following optical cameras are used:

- The Standard Vision Camera (SVC) is used for large components like QFPs and BGAs.

- The High Resolution Camera (HRC) for small components like Flip Chip.

- The Linescan Camera (LSC) for scanning components on the move, passing the camera. This camera is the fastest one (up to three times faster than the Standard Vision Camera), and is used for high speed mounting and of large components. The Linescan camera is also used by the HYDRA. for scanning components on the move.

The cameras all have a programmable light units that can control the light intensity and pattern for different packages. Which camera is to be used for a certain package is specified in the Package List. If more than one camera is used, the system selects the camera with the highest mounting speed.

The camera design includes a programmable illumination unit that can control the light intensity and pattern for different packages.

Details on how to program the lightning of the different cameras is detailed in Chapter 5.

Optical Centering – HYDRA Unit

After the components are picked from the magazine, a HYDRA Vision System (HVS) with a separate HYDRA Camera (HC) or the Linescan camera (LSC), examines each component while the components are moved from the magazine to the board.

Then, the system calculates the mount tool positions and alignments for making correct component placements.

Verification

Verification is performed during the centering phase, see Figure 3-23 on page 3-26. Mechanical and electrical verification can be used by the system.

Package Verification

Package verification means that a picked components package data is measured andverified. The result is compared to the dimensions, lead types, permissible variations and such as specified in the Package List.

Optical centering is used to examine the component outline and external dimensions. This outline is then compared to the component body dimensions and the lead shapes as specified in the Package List.

During mechanical centering the centering jaws measure the external dimensions of the component package. The component dimensions are then compared to the dimensions specified in the Package List.

Components that do not meet the specifications above are rejected, see below.

Electrical Verification

Electrical verification is performed using the single mount head. Electrical verification means that electrodes on the centering jaws measure electrical data on the component during the mechanical centering. The result is then compared to the values and tolerances specified in the Component List. The electrical verifier is described on page 3-30.

Components that do not meet the specifications are rejected, see below.

To avoid placing diodes and transistors back to front, these components can also be verified prior to placing and diodes can also be rotated to correct polarity if picked back to front. This is further described on page 3-29.

Electrical verification when using the HYDRA

When a HYDRA is used no electrical verification is performed. The single mount head can be used to perform electrical verification before the HYDRA is used. A preset number of components are picked by the single mount head, verified with the centering jaws, and placed on the board before the HYDRA unit starts mounting components. The number of components to be tested is preset with the *0002 No. of successful test before HYDRA* parameter in the *1001 Test switches* parameter group found by selecting the **Mount**/**Glue Switches** in the **Production** menu.

Logging measured values

Values measured during electrical verification can be logged and stored in the event log. This optional feature makes it possible to trace component values, but also to provide measured component values to assembled PCBs.

This feature is further described under *Save electric value* in the *PCB Editor* section in Chapter 7.

Rejected Components

If a component does not meet the values specified when verified it is rejected. It can be put, for instance, into a bin for rejected components. If a specified number of components are rejected (3 by default), no further components are picked from that particular feeder until the magazine has been removed from the machine for component replacement, or after selecting the **Reset Magazine Errors** option in the **Magazine** menu.

Rotating Diodes Picked Back to Front

Diodes picked back to front from magazines are treated as defect components at the electrical verification due to wrong polarity. If such a diode is picked with a mount tool, for which the *Z hold compensation* parameter in the *0023 Tool manager* parameter group is set to anything else than 0mm, then the diode can be turned to the correct polarity. This feature is controlled by the following two parameters:

0021.0241 Turn if el. test failed

Yes   – The diode is turned to the correct polarity.

No   – The diode is rejected.

0021.0242 Warn when turning

Yes   – A warning is shown prior to turning the diode to correct polarity, provided the *0021.0241 Turn if el. test failed* parameter is set to *Yes*.

No   – No warning message is shown.

☞   *Turning diodes will reduce the performance if the diodes are picked from magazines located close to the assembly table.*

Electrical Verifier

During electrical verification it is essential that polarized components are correctly positioned between the jaw electrodes. It is also important that components are positioned at the correct level as the electrodes are designed to provide various touch points for different component lead configurations and measurements on various levels.

The level can be set to a *Level* value between 1 and 12 in the Package List.

Note that *Level* only indicates a level. The component position referred to this level is indicated as *Position* in the Package List.

The *Level* is described in the following section. Further information about the *Position* is found in Chapter 5.

Centering Level

The twelve centering levels are shown in Figure 3-24. The base level is set by the *0021.0221 Base level* parameter.
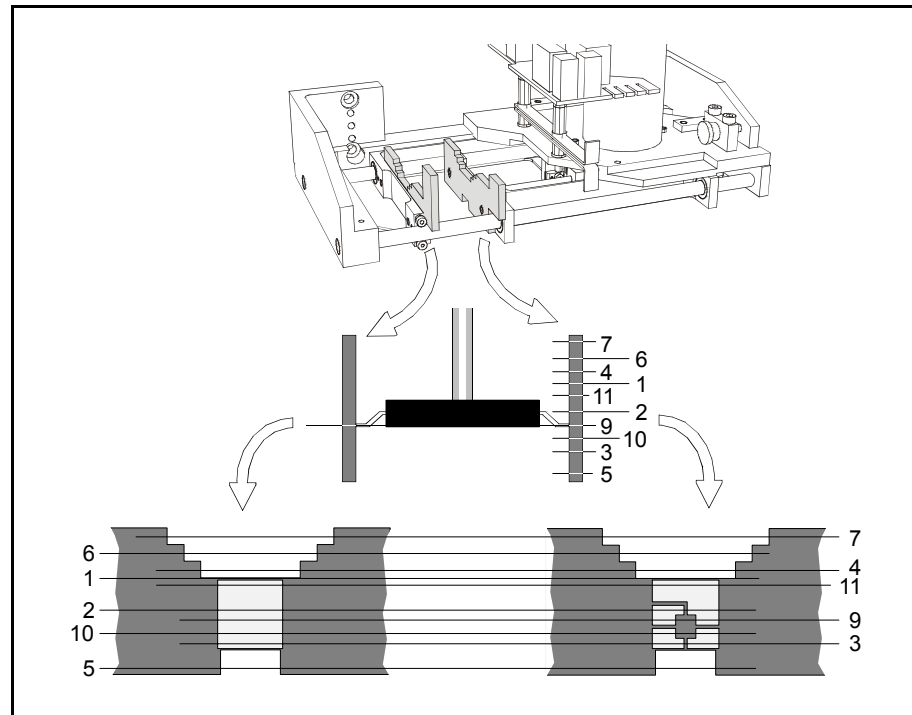
Figure 3-24. Centering levels

The M and E letters in the following list indicate verifications that can be performed during the mechanical centering:

M = Mechanical verification.
E = Electrical verification.

The component orientation during centering and verification is described in the next section.

Number 1 – Offset 0

ME; Standard 2-pole packages, such as 0805, 1206, 1812 and diodes housed in the SOT-23JEDEC package.

Number 2 – Offset 5.35mm below base level

ME; Transistors housed in the SOT-23JEDEC package.

Number 3 – Offset 9.65mm below base level

ME; Transistors housed in the SOT-23JEDEC package. Reverse polarity to level number 2.

Number 4 – Offset 1.00mm above base level

M; QFP64, QFP80, and QFP100 packages.

Number 5 – Offset 13.5mm below base level

M; SO20 – SO28 packages.

Number 6 – Offset 3.00mm above base level

M; QFP64, QFP80, QFP100, and QFP120 packages.

Number 7 – Offset 5.00mm above base level

M; QFP120 package.

Number 8 – Offset 0

Not used.

Number 9 – Offset 6.60mm below base level

ME; Transistors housed in the SOT89 package.

Number 10 – Offset 8.40mm below base level

ME; Transistors housed in the SOT-89JEDEC package. Reverse polarity to level number 9.

Number 11 – Offset 0.60mm below base level

ME; Same as level number 1, that is standard 2-pole packages such as 0805, 1206 and 1812.

Number 12 – Offset 0

Not used.

Orientation – Polarized Capacitors
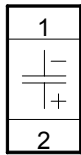
Polarized capacitors in standard 2-pole packages, such as 0805, 1206 and 1812 should be set to:

Centering level: Number 1 or 11.
Cathode: Lead 1.
Anode: Lead 2.

Centering phases:
1. Centering and mechanical/electrical verification in 90°.
2. Mechanical verification in 0°.

Capacitance test indicated in the Component List:

```
                Name: 123456
             Comment:
             Barcode:
             Package: 1206-06
               Mount: Yes
       Magazine type: Tape
         Feeder type: 8mm
                Glue: Yes
      Reject position: Reject bin 1
            Polarized: Yes
                       Test 1              Test 2
                Type: Capacitance pol.        ---
               Angle: 90.00°              ---
               Value: 1µF +-20%           ---
Default load data
          Tape angle: 90.00°         Vib. angle: 0.00°
         Step length: 4mm
```
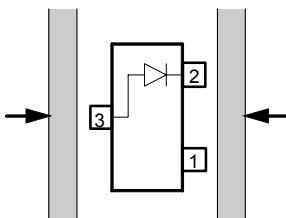
Centering phase 1 – Component orientation (viewed from above) and information indicated in the Package List:

```
       Method: Mechanical
        Angle: 90.00°                      Level:  11
     Position: Upper
        Force: Middle
    Dimension: 3.2mm      Min.: 3mm            Max.: 3.4mm
 Verify mechanical: Yes        Verify electrical: Yes
    OVC light level: ---%

---- DVC Illumination ---------- LSC Illumination ----
```

Centering phase 2:

```
       Method: Mechanical
        Angle: 0.00°                       Level:   1
     Position: Upper
        Force: Middle
    Dimension: 1.6mm      Min.: 1.4mm         Max.: 1.8mm
 Verify mechanical: Yes        Verify electrical: No
    OVC light level: ---%

---- DVC Illumination ---------- LSC Illumination ----
```

Orientation – Diodes in 2-pole Packages

Diodes in standard 2-pole packages, such as 0805, 1206 and 1812 should be set to:

Centering level: Number 1 or 11.
Cathode: Lead 1.
Anode: Lead 2.
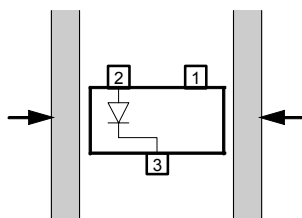
Centering phases:
1. Centering and mechanical/electrical verification in 90°.
2. Centering and mechanical verification in 0°.

Forward voltage drop test and reverse leakage current test indicated in the Component List:

```
          Name: 123456
       Comment:
       Barcode:
       Package: 1206-06
         Mount: Yes
 Magazine type: Tape
   Feeder type: 8mm
          Glue: Yes
Reject position: Reject bin 1
     Polarized: Yes
                  Test 1              Test 2
          Type: Diode voltage    Diode rev. current
         Angle: 90.00°           90.00°
         Value: 0.75V +-5%        5µA
Default load data
     Tape angle: 90.00°              Vib. angle: 0.00°
   Step length: 4mm
```

Centering phase 1 – Component orientation (viewed from above) and information indicated in the Package List:

```
     Method: Mechanical
      Angle: 90.00°                      Level:  11
   Position: Upper
      Force: Middle
  Dimension: 3.2mm      Min.: 3mm         Max.: 3.4mm
 Verify mechanical: Yes      Verify electrical: Yes
   OVC light level: ---%


---- DVC Illumination ---------- LSC Illumination ----
```

Centering phase 2:

```
     Method: Mechanical
      Angle: 0.00°                       Level:  1
   Position: Upper
      Force: Middle
  Dimension: 1.6mm      Min.: 1.4mm       Max.: 1.8mm
 Verify mechanical: Yes      Verify electrical: No
   OVC light level: ---%


---- DVC Illumination ---------- LSC Illumination ----
```

Orientation – Diodes in SOT23 Package
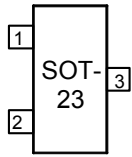
Diodes housed in the SOT23 package should be set to:

Centering level:Number 1.
Lead numbers:See the figure.
Centering phases:See below.

Single diode, anode to lead 3

Centering phases:
1. Centering and mechanical verification in 90°.
2. Centering and mechanical/electrical verification in 180°.

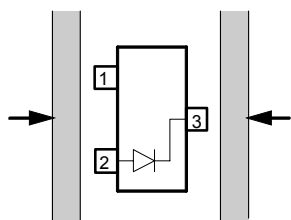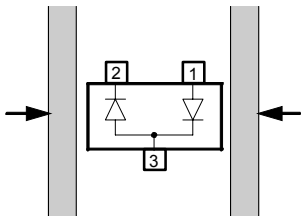Forward and reverse diode test indicated in the Component List:
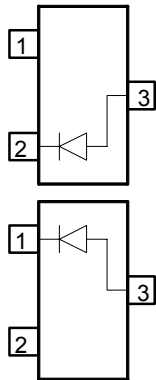
```
              Name: 123456
           Comment:
           Barcode:
           Package: SOT-23JEDEC
             Mount: Yes
     Magazine type: Tape
       Feeder type: 8mm
              Glue: Yes
   Reject position: Reject bin 1
         Polarized: Yes
                    Test 1            Test 2
              Type: Diode voltage     Diode rev. current
             Angle: 90.00°            180.00°
             Value: 0.75V +-5%        5µA
   Default load data
        Tape angle: 90.00°       Vib. angle: 0.00°
       Step length: 4mm
```
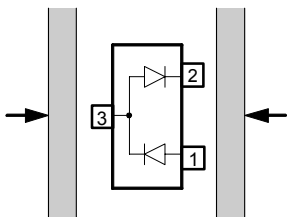
Centering phase 1 – Component orientation (viewed from above) and information indicated in the Package List:

```
        Method: Mechanical
         Angle: 90.00°                      Level:  1
      Position: Upper
         Force: Middle
     Dimension: 2.9mm        Min.: 2.8mm        Max.: 3.04mm
   Verify mechanical: Yes        Verify electrical: No
     OVC light level: ---%


   ---- DVC Illumination ---------- LSC Illumination ----
```
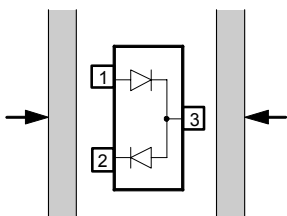
Centering phase 2:

```
        Method: Mechanical
         Angle: 180.00°                     Level:  1
      Position: Upper
         Force: Middle
     Dimension: 2.35mm       Min.: 2.1mm        Max.: 2.64mm
   Verify mechanical: Yes        Verify electrical: Yes
     OVC light level: ---%


   ---- DVC Illumination ---------- LSC Illumination ----
```
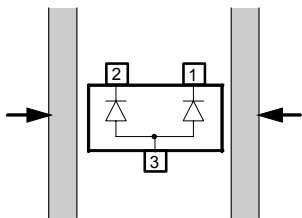
Single diode, cathode to lead 3

Centering phases:
1. Centering and mechanical verification in 90°.
2. Centering and mechanical/electrical verification in 0°.

Forward and reverse diode test indicated in the Component List:
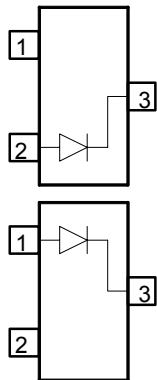

```
                Name: 123456
             Comment:
             Barcode:
             Package: SOT-23JEDEC
               Mount: Yes
       Magazine type: Tape
         Feeder type: 8mm
                Glue: Yes
     Reject position: Reject bin 1
           Polarized: Yes
                      Test 1              Test 2
                Type: Diode voltage      Diode rev. current
               Angle: 0.00°              0.00°
               Value: 0.75V +-5%         5µA
     Default load data
          Tape angle: 90.00°             Vib. angle: 0.00°
         Step length: 4mm
```
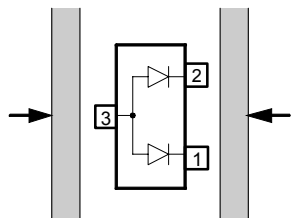

Centering phase 1 – Component orientation (viewed from above).

The same package as the previous one with the anode to lead 3.

Centering phase 2:

The same package as the previous one can be used also in the second centering phase, because the angle indicated in the Component List overrides the angle indicated in the Package List.

Dual serial diodes

Centering phases:
1. Centering and mechanical verification in 90°.
2. Centering and mechanical/electrical verification in 180°.
3. Centering and mechanical/electrical verification in 0°.

Forward test on each diode indicated in the Component List:
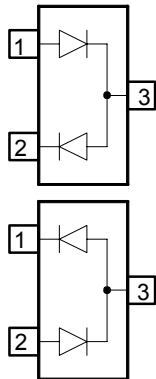

```
                Name: 123456
             Comment:
             Barcode:
             Package: SOT-23JEDEC
               Mount: Yes
       Magazine type: Tape
         Feeder type: 8mm
                Glue: Yes
     Reject position: Reject bin 1
           Polarized: Yes
                        Test 1            Test 2
                Type: Diode voltage    Diode voltage
               Angle: 180.00°          0.00°
               Value: 0.75V +-5%        0.75V +-5%
      Default load data
           Tape angle: 90.00°          Vib. angle: 0.00°
          Step length: 4mm
```
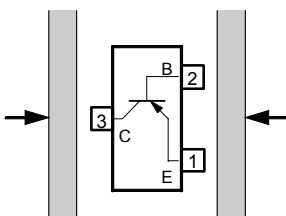
Centering phase 1 – Component orientation (viewed from above) and information indicated in the Package List:


```
          Method: Mechanical
           Angle: 90.00°                     Level:  1
        Position: Upper
           Force: Middle
       Dimension: 2.9mm        Min.: 2.8mm        Max.: 3.04mm
   Verify mechanical: Yes      Verify electrical: No
     OVC light level: ---%

   ---- DVC Illumination ---------- LSC Illumination ----
```

Centering phase 2:


```
          Method: Mechanical
           Angle: 180.00°                    Level:  1
        Position: Upper
           Force: Middle
       Dimension: 2.35mm       Min.: 2.1mm        Max.: 2.64mm
   Verify mechanical: Yes      Verify electrical: Yes
     OVC light level: ---%

   ---- DVC Illumination ---------- LSC Illumination ----
```

Centering phase 3:


```
          Method: Mechanical
           Angle: 0.00°                      Level:  1
        Position: Upper
           Force: Middle
       Dimension: 2.35mm       Min.: 2.1mm        Max.: 2.64mm
   Verify mechanical: Yes      Verify electrical: No
     OVC light level: ---%

   ---- DV  Illumination ---------- LS  Illumination ----
```
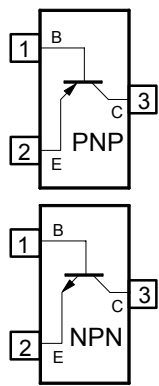
Dual parallel diodes

Centering phases:

1. Centering and mechanical verification in 90°.
2. Centering and mechanical verification in 180°.

Dual diodes, connected in parallel, cannot be verified electrically. Mechanical verification only can be performed:
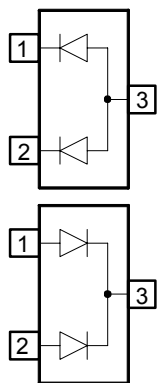
```
              Name: 123456
           Comment:
           Barcode:
           Package: SOT-23JEDEC
             Mount: Yes
     Magazine type: Tape
       Feeder type: 8mm
              Glue: Yes
   Reject position: Reject bin 1
         Polarized: Yes
                    Test 1          Test 2
              Type: ---             ---
             Angle: ---             ---
             Value: ---             ---
Default load data
        Tape angle: 90.00°          Vib. angle: 0.00°
       Step length: 4mm
```
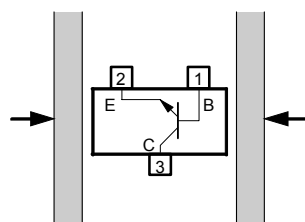
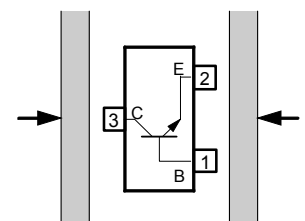Centering phase 1 – Component orientation (viewed from above) and information indicated in the Package List:

```
     Method: Mechanical
      Angle: 90.00°                        Level:  1
   Position: Upper
      Force: Middle
  Dimension: 2.9mm        Min.: 2.8mm        Max.: 3.04mm
  Verify mechanical: Yes       Verify electrical: No
   OVC light level: ---%

 ---- DVC Illumination ---------- LSC Illumination ----
```

Centering phase 2:

```
     Method: Mechanical
      Angle: 180.00°                       Level:  1
   Position: Upper
      Force: Middle
  Dimension: 2.35mm       Min.: 2.1mm        Max.: 2.64mm
  Verify mechanical: Yes       Verify electrical: No
   OVC light level: ---%

 ---- DVC Illumination ---------- LSC Illumination ----
```

Orientation – Transistors in SOT23 Package
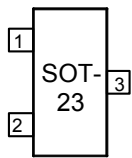
Transistors housed in the SOT23 package should be set to:

Centering level: Number 1 and 2, or number 1 and 3, see below
Lead numbers: See the figure

Centering phases:
1. Centering and mechanical verification in 90°.
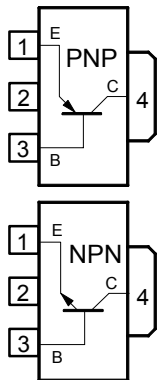2. Centering and mechanical/electrical verification in 180°.

Emitter to lead 1 - PNP or NPN

Centering levels:
Number 1. Centering and mechanical verification in 90°
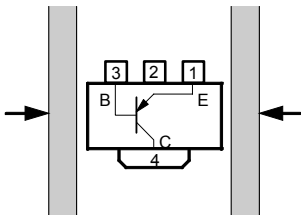Number 2. Centering and mechanical/electrical verification in 180°

Select transistor type PNP or NPN in the Component List:
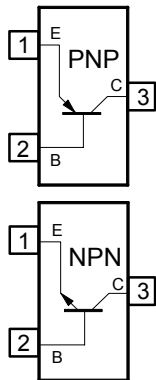
```
              Name: 123456
           Comment:
           Barcode:
           Package: SOT-23-E1JEDEC
             Mount: Yes
     Magazine type: Tape
       Feeder type: 8mm
              Glue: Yes
   Reject position: Reject bin 1
         Polarized: Yes
                    Test 1          Test 2
              Type: PNP transistor     ---
             Angle: 90.00°             ---
             Value: 200hfe +-20%       ---
 Default load data
        Tape angle: 90.00°        Vib. angle: 0.00°
       Step length: 4mm
```

Centering phase 1 – Component orientation (viewed from above) and information indicated in the Package List:

```
           Method: Mechanical
            Angle: 90.00°                    Level:  1
         Position: Upper
            Force: Middle
        Dimension: 2.9mm        Min.: 2.8mm       Max.: 3.04mm
   Verify mechanical: Yes      Verify electrical: No
     OVC light level: ---%

   ---- DVC Illumination ---------- LSC Illumination ----
```

Centering phase 2:

```
           Method: Mechanical
            Angle: 180.00°                   Level:  1
         Position: Upper
            Force: Middle
        Dimension: 2.35mm       Min.: 2.1mm       Max.: 2.64mm
   Verify mechanical: Yes      Verify electrical: Yes
     OVC light level: ---%

   ---- DVC Illumination ---------- LSC Illumination ----
```

Base to lead 1 – PNP or NPN

Centering levels:
Number 1. Centering and mechanical verification in 90°.
Number 3. Centering and mechanical/electrical verification in 180°.
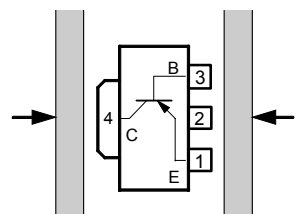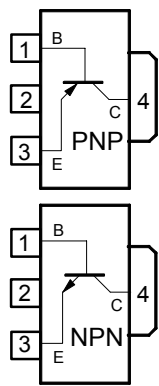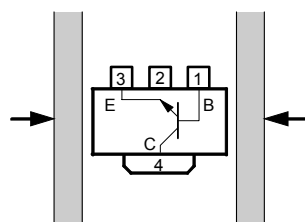
Select transistor type PNP or NPN in the Component List:

```
              Name: 123456
           Comment:
           Barcode:
           Package: SOT-23-B1JEDEC
             Mount: Yes
     Magazine type: Tape
       Feeder type: 8mm
              Glue: Yes
   Reject position: Reject bin 1
         Polarized: Yes
                       Test 1           Test 2
              Type: NPN transistor      ---
             Angle: 180.00°             ---
             Value: 300hfe +-20%        ---
  Default load data
        Tape angle: 90.00°         Vib. angle: 0.00°
       Step length: 4mm
```
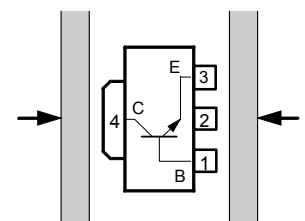
Centering phase 1 – Component orientation (viewed from above) and information indicated in the Package List:

```
           Method: Mechanical
            Angle: 90.00°                      Level:  1
         Position: Upper
            Force: Middle
        Dimension: 2.9mm       Min.: 2.8mm        Max.: 3.04mm
  Verify mechanical: Yes       Verify electrical: No
    OVC light level: ---%

   ---- DVC Illumination ---------- LSC Illumination ----
```

Centering phase 2:

```
           Method: Mechanical
            Angle: 180.00°                     Level:  3
         Position: Upper
            Force: Middle
        Dimension: 2.35mm      Min.: 2.1mm        Max.: 2.64mm
  Verify mechanical: Yes       Verify electrical: Yes
    OVC light level: ---%

   ---- DVC Illumination ---------- LSC Illumination ----
```

Orientation – Transistors in SOT89 Package
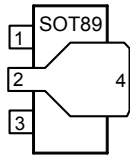
Transistors housed in the SOT89 package should be set to:

Centering level: Number 1 and 9, or number 1 and 10, see below.
Lead numbers: See the figure.

Centering phases:
1. Centering and mechanical verification in 0°.
2. Centering and mechanical/electrical verification in 90°.

Emitter to lead 1 - PNP or NPN

Centering levels:
Number 1. Centering and mechanical verification in 90°.
Number 9. Centering and mechanical/electrical verification in 180°.

Select transistor type PNP or NPN in the Component List:

```
                Name: 123456
             Comment:
             Barcode:
             Package: SOT-89-B1JEDEC
               Mount: Yes
       Magazine type: Tape
         Feeder type: 12mm
                Glue: Yes
     Reject position: Reject bin 1
           Polarized: Yes
                      Test 1            Test 2
                Type: PNP transistor      ---
               Angle: 90.00°             ---
               Value: 200hfe +-20%        ---
    Default load data
          Tape angle: 90.00°        Vib. angle: 0.00°
         Step length: 4mm
```

Centering phase 1 – Component orientation (viewed from above) and information indicated in the Package List:

```
        Method: Mechanical
         Angle: 90.00°                     Level:  1
      Position: Upper
         Force: Middle
     Dimension: 4.5mm       Min.: 4.4mm        Max.: 4.6mm
  Verify mechanical: Yes       Verify electrical: No
    OVC light level: ---%

  ---- DVC Illumination ---------- LSC Illumination ----
```

Centering phase 2:

```
        Method: Mechanical
         Angle: 180.00°                    Level:  9
      Position: Upper
         Force: Middle
     Dimension: 4mm         Min.: 3.94mm       Max.: 4.25mm
  Verify mechanical: Yes       Verify electrical: Yes
    OVC light level: ---%

  ---- DVC Illumination ---------- LSC Illumination ----
```

Base to lead 1 – PNP or NPN

Centering levels:
Number   1. Centering and mechanical verification in 90°.
Number 10. Centering and mechanical/electrical verification in 180°.

Select transistor type PNP or NPN in the Component List:


```
              Name: 123456
           Comment:
           Barcode:
           Package: SOT-89-B1JEDEC
             Mount: Yes
     Magazine type: Tape
       Feeder type: 12mm
              Glue: Yes
   Reject position: Reject bin 1
         Polarized: Yes
                    Test 1            Test 2
              Type: NPN transistor      ---
             Angle: 90.00°              ---
             Value: 300hfe +-20%        ---
Default load data
        Tape angle: 90.00°         Vib. angle: 0.00°
       Step length: 4mm
```

Centering phase 1 – Component orientation (viewed from above) and information indicated in the Package List:


```
        Method: Mechanical
         Angle: 90.00°                      Level:  1
      Position: Upper
         Force: Middle
     Dimension: 4.5mm       Min.: 4.4mm        Max.: 4.6mm
  Verify mechanical: Yes       Verify electrical: No
    OVC light level: ---%

 ---- DVC Illumination ---------- LSC Illumination ----
```

Centering phase 2:


```
        Method: Mechanical
         Angle: 90.00°                      Level:  1
      Position: Upper
         Force: Middle
     Dimension: 4mm         Min.: 3.94mm       Max.: 4.25mm
  Verify mechanical: Yes       Verify electrical: Yes
    OVC light level: ---%

 ---- DVC Illumination ---------- LSC Illumination ----
```

Verification Data

Test data for electrical verification, set in the Component List:

```
None
Resistance
Capacitance
Capacitance low
VCapacitance pol.
Diode voltage
Diode rev. current
Zener diode
NPN transistor
PNP transistor
```

Maximum test voltage is 20VDC for any test option.

Resistance

Resistance range and accuracy at ±4mA test current:

$0\Omega – 30\Omega \pm 0.3\Omega$
$30\Omega – 4k\Omega \pm 1\%$

Resistance range and accuracy at ±16mA test current:

$4k\Omega – 1M\Omega \pm 1\%$
$1M\Omega – 40M\Omega \pm 5\%$

Capacitance

Capacity range and accuracy at ±16V test voltage:

$50pF – 500pF \pm 5\%$
$500pF – 250nF \pm 3\%$

Note that ceramic capacitors often have a voltage dependent capacitance that sometimes is specified at 1V.

Capacitance low V

Capacity range and accuracy at ±2V test voltage:

$50pF – 500pF \pm 5\%$
$500pF – 800nF \pm 3\%$

Note that ceramic capacitors often have a voltage dependent capacitance that sometimes is specified at 1V.

Capacitance pol.

Capacity range and accuracy with unipolar test current of 4mA (for C > 1μF) or 500μA (for C < 1μF):

50nF – 1μF ±3%

1μF – 4.7μF ±3%

4.7μF – 1000μF ±10%

The maximum voltage across the capacitor is:

$$C < 1\mu F: U = \frac{3500}{C} \quad C \ (nF)$$

$$C > 1\mu F: U = \frac{28}{C} \quad C \ (\mu F)$$

The verification voltage does never exceed 25V.

The lower tolerance set in the *Value* field in the Component List determines if the capacitance is more or less than 1μF.

☞ *Results may differ from the manufacturers data sheet for capacitors with a high voltage dependency in their capacitance. Capacitors with a very high voltage dependency in their capacitance can cause unreliable results, and can therefore not be handled by the verifier.This situation can be dealt with partly by using the "Cap. low V" measuring method or by adjusting the programmed nominal capacitance value according to the measured results.*

Diode voltage

Forward voltage drop range and accuracy at 4mA current:

0.1V – 19V ±3%

Diode rev. current

Reverse leakage current range and accuracy at 16VDC:

100nA – 50μA ±3%

This test ignores the tolerance indicated, for instance 200nA ±30% means 200nA.

Zener diode

Forward voltage drop range and accuracy at 4mA current:

0.1V – 19V ±3%

NPN transistor

Current gain range and accuracy at Ic = 5mA and Uce = 10V:

50hfe – 1000hfe ±5%

PNP transistor

Current gain range and accuracy at Ic = 5mA and Uce = 10V:

50hfe – 1000hfe ±5%

Units

Capacitance pF, nF, μF, F
Current   nA, μA, mA, A
Current gain hfe
Resistance   Ω, kΩ, MΩ
Voltage   μV, mV, V

Tolerances

Default tolerance is ±5%.

You can enter any other tolerance by typing it, for instance '5+–3%' gives 5 ±3%, and '5+5%–10%' gives 5 +5% –10%. The latter can also be entered as '5–10%" as ±5% is the default tolerance.

Omitted '+' or '–' sign is interpreted as a positive tolerance. So, '5 5%–10%' is equal to '5+5%–10%.'

Also, by omitting the percent sign (%), you can enter plus and minus values, for instance '5 3–2' gives 5 +60% –40% because 3 is 60% of 5, and 2 is 40% of 5.

Standard Mount and Glue Tools

Standard mount tools consist of a tube mounted in a cylindrical upper section, and are available with spring loaded or stiff tubes.
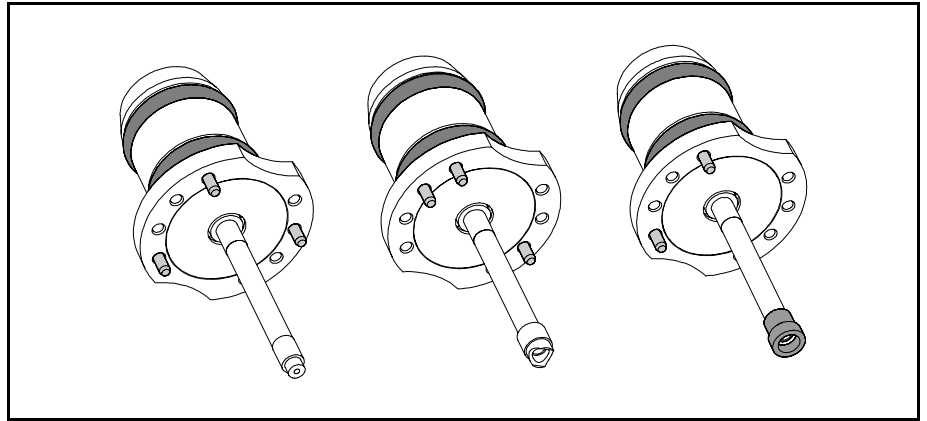
Figure 3-25. Examples of stiff tools
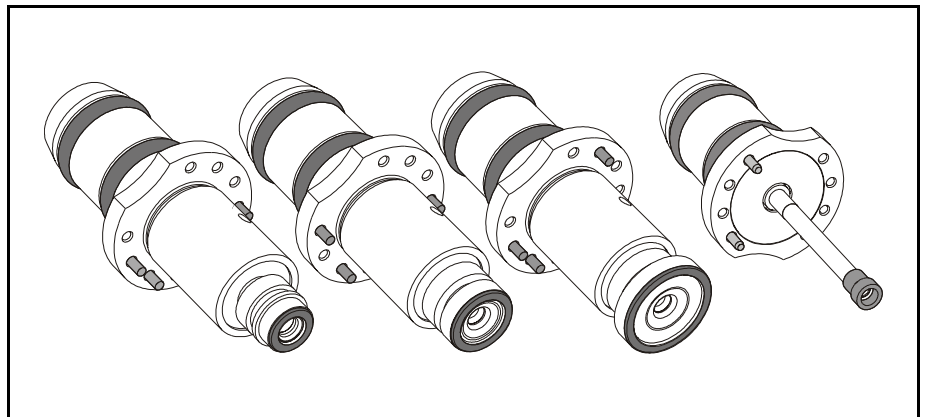
Figure 3-26. Examples of spring tools

Tools for adhesive application have the same cylindrical upper section, but a solid shaft instead of a hollow tube.

Which mount tool to use is determined by the components size, form, weight and the centering method.

Please see the table on page 3-46 and in *Appendix A*.

Placement and application tools are numbered by a code consisting of a letter and two figures. The letters are A, B, C and D, and the numbers are 1, 2, 3 and 4. There are three pins indicating the code and the position of each tool in the machine. Coding can be seen in Figure 3-27.
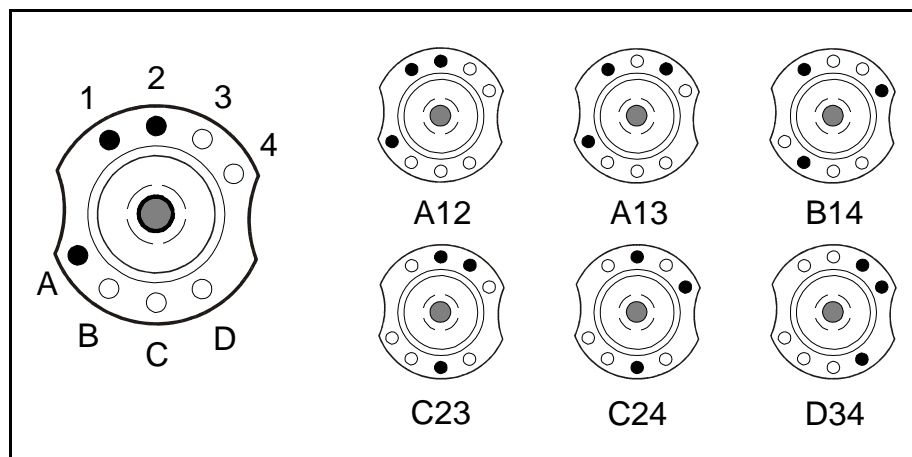
Figure 3-27. Standard mount and glue tool

Tool usage is indicated in the following table:

Pos.*	Tool	Type	Description	Usage examples
1	A12	D/d = 1.4/0.8	Insulating plastic adapter.	0603, 0805, SOT23.
2	A13	D/d = 1.5/1.2	Pure steel tube.	1206, 1812, SOT89.
3	A14S	D/d = 2.6/2.0	Spring tool with insulating plastic adapter.	SO-8, SO-16, SOMC.
4	A23	D/d = 5.0/3.0	Stiff tube with rubber ring.	SO-18, SO-28, FP80.
4	A23S	D/d = 9.5/6.0	Spring tube with rubber ring.	SO-18, SO-28, FP80.
5	A24	D/d = 7.0/5.0	Stiff tube with rubber ring.	LCC, PLCC.
5	A24S	D/d = 9.5/6.0	Spring tube with rubber ring.	LCC, PLCC.
6	A34	Radius 0.75	Insulating plastic adapter.	MINIMELF diam. 1.5mm
7	B12	Shaft diam. 0.8	Small glue shaft.	0805, 1206.
8	B13	Shaft diam. 1.5	Medium glue shaft.	1812, MINIMELF.
9	B14	Shaft diam. 3.0	Large glue shaft.	SO-14, SO-28.
10	B23	Radius 1.25	Insulating plastic adapter.	MELF diam. 2.5mm
11	B24	Radius 1.15	Insulating plastic adapter.	MELF diam. 2.3mm
12	B34	Radius 1.0	Insulating plastic adapter.	MELF diam. 2.0mm
13	C12	Shaft diam. 0.5	Mini glue shaft.	0603, 0805.
14	C13	Shaft diam. 2.2	Large glue shaft.	SO-8, SO-14, SO-16.
15	C14	D/d = 0.6/0.25	Insulating plastic adapter.	0201, 0402 .
16	C23	D/d = 10.0/7.0	Rubber nozzle.	Big and heavy components, optical centering only.
16	C23S	D/d = 9.5/7.0	Spring tube with rubber nozzle.	Big and heavy components, optical centering only.

* The tool position in the tool bank.

Spring Tools

Spring tools, see Figure 3-26, provide a higher mounting speed, and are needed to get full Linescan Vision System performance.

Limitations

The toolbody on some spring tools (A23S, A24S and C23S) is wide, therefore it will not fit in toolbanks that have holes for the stiff tool.

☞ *The code pin configuration for these spring tools are the same as the corresponding stiff tools (for instance code pin configuration for A23S is the same as for A23).*

Therefore it is only possible to use either a spring loaded tool or a stiff tool in a certain machine, not both.

Risk for collision

☞ *Due to the wide toolbody on A23S, A24S and C23S they can collide with higher previously mounted components. If mounting is made close to the edge of a board, the toolbody may collide with conveyor rails.*

To avoid collision with a higher component:

  – Increase the group number for the mount position with the low component. The low component will thereby be mounted before the higher ones.

To avoid collision with the conveyor rails:

Conveyor rails are higher than 5mm above board level. It is therefore not possible to mount components too close to the edge of the board. Components with a dimension less than 10mm need to increase the standard board edge clearance of 3mm.

  – Board edge clearance = 3 + (10–Component dimension)/2. Example: Component dimension 6mm gives a Board edge clearance of 5mm (that is 3+(10–6)/2).
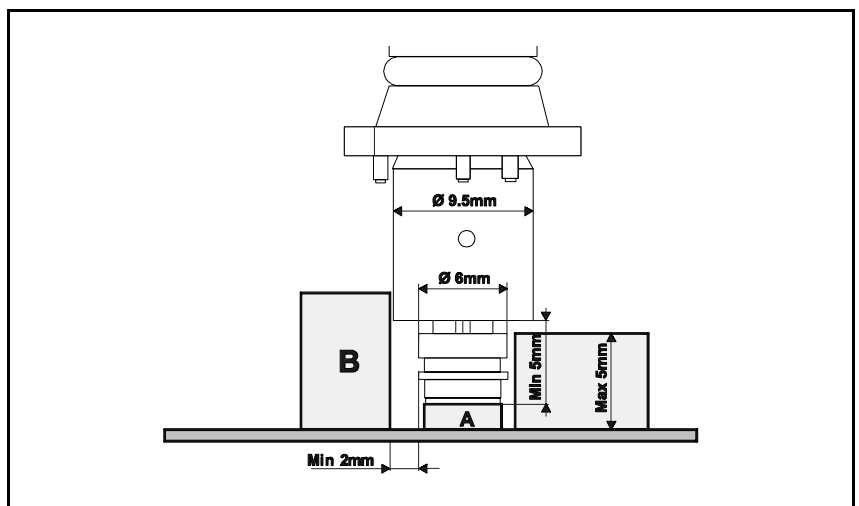
Figure 3-28. Spring tool limitations

HYDRA Mount Tools
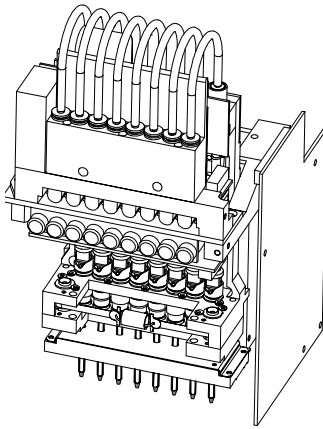
The HYDRA unit is a speed placement unit with eight mount tools.

The mount tools are connected to an air pump and to a vacuum pump via individual valves. A negative pressure for holding components and an over-pressure to quickly release components can thus be provided individually through the eight mount tools.

The eight HYDRA mount tools can be moved downwards and upwards in common or individually. Eight components can thus be picked from a magazine either simultaneously or individually and then be placed individually.

The HYDRA unit can pick components from the Agilis, TM8, TM8F, TM12, TM16 and TM1216 magazine types.
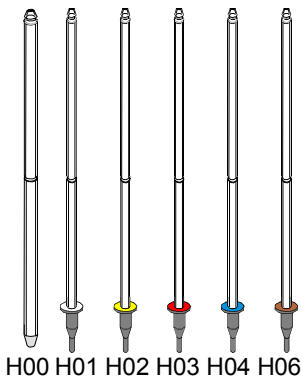
The HYDRA mount tools consist either of a plain tube (H00) or a tube with a changeable nozzle (H01 – H04), see the figure.

These tools can be used for the following components (further components may have been added after issuing this manual):

H00 H01 H02 H03 H04 H06

- H00 (plain tube) for the 0603 – 1210 components range and smaller SOIC components.

- H01 (white) for the 0402 – 1206-06 component range.

- H02 (yellow) for the same components as H00.

- H03 (red) for the 1206 – 2512 chip components and for SC-59, SO8, SO14, SOT89, SOT223, SSOP20, SSOP24, SSOP28, and M3216 – M7343 components.

- H04 (blue) for the 0603 – 1206 chip components, MELF3514, SOD-80 and SOT-23 components. This tool has a rubber tip designed to handle round as well as high capacitors.

- H06 (brown) for 0201 – 0402 package range.

Mount tools must be kept free from dirt and foreign particles to prevent the tubes from being clogged up.

Tool replacement is detailed in the *Machine Manual* and has to be carried out by service personnel.

HYDRA Speedmount ATE

HYDRA Speedmount ATE, Automatic Tool Exchanger, is a system for changing HYDRA tools automatically. The optimal tool for each type of component extends the component range that can be picked with the HYDRA unit and increases the flexibility of the machine.

ATE Software

The ATE software in TPSys, enables the ATE feature and contains functions, such as:

- Detection of missing tools in the HYDRA tool bank.

- Detection of tools that are not properly pushed onto the tool tubes.

- Location of HYDRA tool banks with fiducial marks, which makes a tool bank installation fast and accurate.

- Disabling of a slot in the tool bank in case of pick error.

- Preparation of assemblies by optimizing the feeder locations and contents, either for maximum assembling speed or for minimum changeover time.

- Optimization of the tool usage to get maximum assembling speed, taking both feeder locations and PCB data into account.

HYDRA Tools

HYDRA tools are nozzles attached to tool tubes and used to pick components from the magazine feeders and place them onto a PCB. Tools that are not in use are stored in the HYDRA tool bank. There are, at present, four types of HYDRA tools available (see page 3-48).

HYDRA Tool Tubes

The HYDRA tool tubes are attached to the HYDRA unit. The HYDRA unit moves to the HYDRA tool bank where the tool tubes leave the current tools before picking up new ones.

Each tool is held in place on the tool tube by two O-rings. This ensures that the tool is always properly aligned and can be replaced without re-calibrating the HYDRA unit.
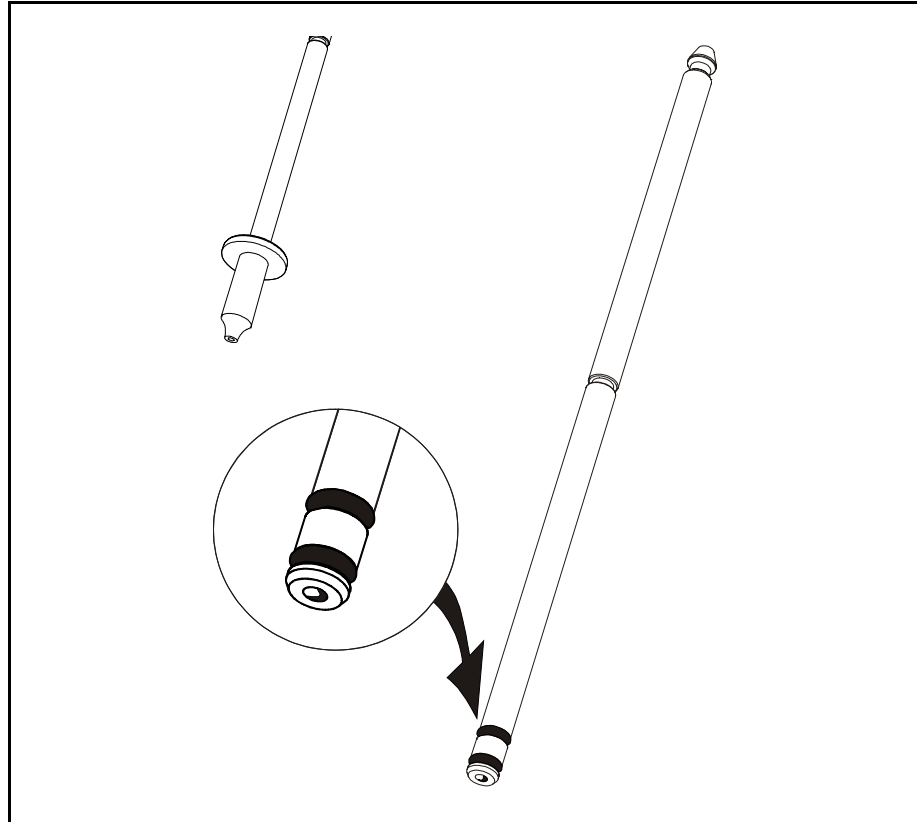
Figure 3-29. HYDRA tool tube

HYDRA Tool Bank

The HYDRA tools are stored in the HYDRA tool bank when not in use. When tools are to be exchanged, the HYDRA unit moves to the bank and the tools are exchanged. Each tool resides in an own position in the tool bank and are temporarily attached to the tool tubes on the HYDRA unit.

The first tool tube (position 1 in the HYDRA unit) fetches a tool from one of the two tool slots with index number 1 in the tool bank, see Figure 3-30. The second tool tube (position 2 in the HYDRA unit) fetches from one of the slots marked 2 and so on.

There are two types of HYDRA tool banks:

- Standard type for 500 T2 conveyor and 288, 468 and ML 3 – 6 tables, see Figure 3-30.
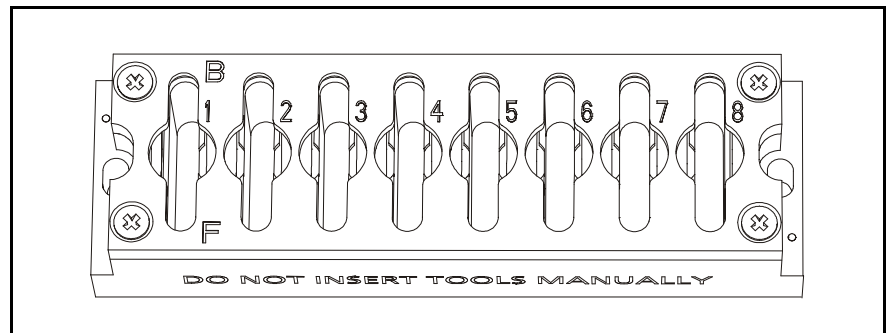
Figure 3-30. Standard tool bank

A HYDRA tool bank can hold up to 16 tools in two rows by eight tool positions, see Figure 3-31.
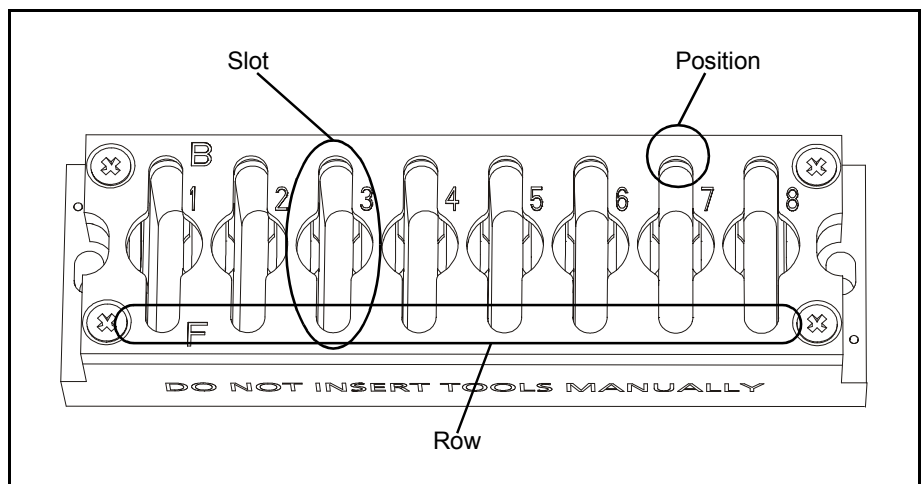
Figure 3-31. Tool bank positions, slots and rows

The rows are called Front (marked 'F') and Back (marked 'B') corresponding to their Y positions in the tool bank. Front is the row facing the operator. A slot has two tool positions for one tool each, front and back.

HYDRA tool bank installation and replacement is detailed in the *Machine Manual* and has to be carried out by service personnel. Operations is detailed in Chapter 7 of the *Operators Manual*.

Disk Formatting
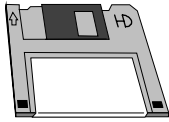
Disks can be DOS formatted by TPSys in the machine disk drive by selecting the **Format DOS Diskette** option in the **Utility** menu.

The following dialog box lets you select which disk drive you want to use:

```
┌─────────────────────────────────────────┐
│ Which diskette drive do you want to use? │
│         A:      B:      Cancel           │
└─────────────────────────────────────────┘
```

A: Select this drive letter for 3.5" 1.44MB floppy disks, which is the standard disk type in the machine.

B: This drive letter may be used if the machine has an old 5.25" 1.2MB disk drive.

Select the desired disk drive and press <Enter>.

The following information box reminds you to insert a 3.5" HD disk in the selected disk drive:

```
┌─────────────────────────────────────────┐
│ Please make sure that a diskette is inserted │
│                  OK                      │
└─────────────────────────────────────────┘
```

When the disk is inserted, press <Enter>.

The disk is now DOS formatted.

After the formatting is completed, you can format another disk by selecting **Yes** in the following dialog box:

```
┌─────────────────────────────────────────┐
│ Do you want to format another diskette?  │
│              Yes      No                 │
└─────────────────────────────────────────┘
```

Otherwise select **No** to exit the formatting mode.

Digitizer

A digitizer is a very useful device when programming boards because it moves the camera quickly to positions very close to the final positions. Only fine corrections need be carried out after positioning with the digitizer.

The digitizer can be used for making all positions, except for defining fiducial marks. You can, for instance, use it to position components, bad board marks, glue tool test points, and mount tool test points.

Figure 3-32 shows the PCB Editor, in which you can position a component by simply pointing out the component position on the board drawing.

```
                          * PCB EDITOR *
        ┌─────Items─────┐
        │  1: C1, 000149 │   Enter Edit item            F2 PCB header
        │  2: C2, 000254 │    Ins Insert new            F4 PCB size
        │  3: C3, 000501 │    Del Delete         Shift+F6 Reset digitizer
        │                │     F1 View position         F7 Change groups
        │                │                              F8 Replace component
        │                │    ┌────────PCB Header Information────────┐
        │                │    │      Name: TV2                       │
        │                │    │   Comment: PCB, bare board BB2       │
        │                │    ├──────────────────────────────────────┤
        │                │    │   Location: C1                       │
        │                │    │  Component: 000149                   │
        │                │    │    Comment: 100pF                    │
        │                │    │    Package: 1206-07                  │
        │                │    │      Group: 0          Turn before Z down: No │
        │                │    │                        Save electric value: No │
        │                │    │   Mount: Yes      Glue: Yes      Only Z: No │
        │                │    │   Angle:  0.00°    pos.:  40.052mm/  25.363mm │
        │                │    │       Local fiducial marks: 0        │
        │                │    │  Mark 1 ID:        pos.:             │
        │                │    │       2 ID:        pos.:             │
        │                │    │       3 ID:        pos.:             │
        └────────────────┘ Press <F1> for camera
                                          Bill              12:04
```

Figure 3-32. Component positioning using digitizer

The digitizer is used as follows:

- Put a PCB or panel board drawing on the digitizer surface and fix it with tape or the like.

- In TPSys, go to a situation where a positioning is to be done on the board, like in Figure 3-32.

- Press the stylus tip anywhere on the digitizer surface.

  To be able to convert digitizer coordinates to board coordinates, the system asks you to point out the board fiducial mark 1 on the PCB drawing:

```
┌──────────────────────────────────────┐
│ Digitize fiducial mark No. 1 ((of 2)  │
│                  OK                    │
└──────────────────────────────────────┘
```
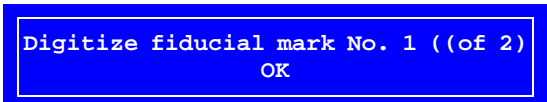
- Point out fiducial mark 1 by pressing the stylus tip on the first fiducial mark.

☞ *Make sure it really is fiducial mark 1 you are pointing out.*

You are now asked to point out fiducial mark 2:

> **Digitize fiducial mark No. 2 ((of 2)**
> **OK**

- Point out fiducial mark 2 by pressing the stylus tip on the second fiducial mark.

  After digitizing the fiducial marks, you can use the digitizer to move the camera to any position on the PCB.

- Position the component by pressing the stylus tip on the component outline.

  The system will move to the selected position. You can then use the camera to finally position the component in the usual way.

You can, at any time, adjust the fiducial marks by pressing <Shift>+<F6> and again point out the fiducial marks in the same way as described above.

TPSys Barcode Reader
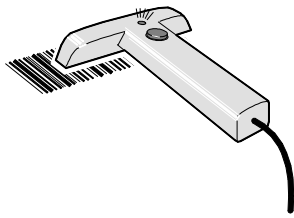
A TPSys barcode reader (optional) can be used to read component names, removable feeder and magazine data when programming boards and components.

Barcode scanning is a convenient and fast way of entering information such as component names, magazines, quantities, and component orientations into the system without typing or selecting from different lists.

For further information about the TPSys barcode reader, such as how to use it and labels required, see the *Barcode Readers* section in Chapter 5 of the *Operator's Manual*.

Configuration

The barcode reader is configured for TPSys by scanning the following three barcodes:

Code 128.

9600, 7, E, 2.

Aiming and reading beam setting.

☞ *Scan these barcodes from top to bottom (the downmost code must be read as the last code).*

Off-Line Usage

It is possible to use stand-alone data servers so that more operations can be carried out simultaneously. It is for instance possible to scan data for one layout while another is being assembled in the machine.

The barcode option must have been purchased for at least one of the machines on the network.

MYLabel

There is also a MYLabel facility available from MYDATA. MYLabel is an efficient tool for reading component names and keeping order of remaining component quantities. The MYLabel facility is run on a separate Windows 95/98/NT system.

For further information about MYLabel, contact MYDATA.

4. Component List

To be able to mount a PCB, four mandatory main lists (or list groups) are required:

- **Component List**

  Contains part numbers and component name and data. Assigns a package to the component.

- **Package List**

  Contains data specific to the component package, such as length, width, height, number of leads, mount tool, placement precision, centering forces and optical centering data.

- **Magazine Lists (group)**

  Lists that inform the system about in which magazine and type of magazine (tape, vibrator, or tray) the components can be found and where the magazines are located. The lists include also such information as component angles and quantities.

- **Mount Lists (group)**

  Mount lists on different levels for PCBs, panels, and layouts, indicating which components are to be mounted and where they are to be placed

```
PACKAGE LIST          COMPONENT LIST        MOUNT LISTS           MAGAZINE LISTS
Package data          Component data     Where components are to  Where components are to
                                              be placed               be found

                                    MOUNTING
```

This chapter describes the Component List, one of the main lists necessary for mounting a board.

The other mandatory lists or list groups are described in Chapter 5, Chapter 6 and Chapter 7.

Additional lists for such features as fiducial marks, adhesive application and user access are found in Chapter 8.

Special characters

National special characters and some non-letter/non-figure characters cannot be entered into the system, for instance in board names and layout names.

The following special characters are, however, allowed to be used:
" ' ` \ $; ^ @

Component List Editor

The Component List contains component names and data. The component names may correspond to market names, for instance BCX56, but company defined names or numbers can be used as well.

The Component List is opened by selecting the **Components** option in the **Editor** menu.

The Component List Editor is shown in Figure 4-1.

Function keys in the Component List Editor:

Edit component

By pressing <Enter> the highlighted component can be modified.
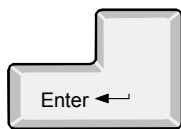
Insert new

A new component is added to the Component List by pressing <Ins> and entering a new name. The new component gets the same data as the component that is highlighted when the <Ins> key is pressed.

Delete

The highlighted component can be deleted by pressing <Del> and confirming the deletion in a popup box.

Search magazines

By pressing <F6>, the system searches through the magazines for the highlighted component. This feature is described on page 4-8.

Replace package

By pressing <F9> the following pop-up window appears:

```
┌─ Change Package For All Components ─┐
│            From 1206-12             │
│             To 1206-16              │
└─────────────────────────────────────┘
```
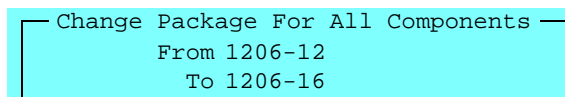
Enter a package that shall be replaced in the first field. Then enter the package that replaces it in the second field. Press <Enter> to see all components that have the "old" package. Confirm the change of package on all these components by pressing <Enter>.

Exit

Press <Esc> if you want to exit the Component List Editor and return to the main window.

```
                         * COMPONENT LIST EDITOR *
  ___Components___        Enter   Edit component      F6   Search magazines
  000149                  Ins   Insert new            F9   Replace package
  000254                  Del   Delete
  000255
  000501                       Name:  000149
  000502                    Comment:  100pF
  000503                    Barcode:  123456
  000511                    Package:  1206-06
  000513                      Mount:  Yes
  000514              Magazine type:  Tape
  000517                Feeder type:  8mm
  000518                       Glue:  Yes
  000519            Reject position:  Closest reject bin
  000520                  Polarized:  No
  000521                                 Test 1           Test 2
  000522                       Type:  Capacitance low V      ---
  000523                      Angle:  90.00°                 ---
  74HC161                     Value:  100pF ±20%              ---
  74HC365           Default load data
  MAX452CSA            Tape angle:  90.00°        Vib. angle: 0.00°
  MB150PF             Step length:  4mm

                                        Brian                    12:32
```

Figure 4-1. Component List Editor

Entries in the Component List Editor:

Components

This box contains the component part numbers. Use the arrow keys or <PgUp>, <PgDn>, <Home>, or <End> to select component.

You can search for a component in the list by simply entering the first characters of the component name.

Name

Component designation, which must be a unique name or number for each component.

Comment

Optional text, for instance component type or component value.

Barcode
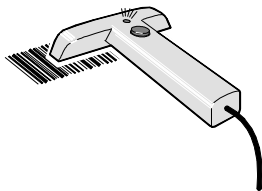
A barcode reader can be used to select components from the Component List when, for instance, loading magazines. The barcodes can be different from the component names. Figure 4-1 shows barcode 123456 which is linked to the component name 00149.

The barcode feature is further detailed in the *Barcode Readers* section in Chapter 5 of the *Operator's Manual*.

Package

This name must be included in the Package List.

Package name, referring to the Package List.

You can search for a package from the Package List by simply entering the first characters of the package name and pressing <Enter>, or by pressing <Enter> at an empty field.

Mount

Yes   –   The component is mounted.

No   –   The component is not mounted.

To toggle between *Yes* and *No* press <Space>.

The *2001.0002 Mount* switch, found under **Mount**/**Glue Switches** in the **Production** menu overrides this field. If it is set to *No* no components are mounted even if *Mount* is set to *Yes*.

The function of the *Mount* field can be inverted by setting the *0005 Invert meaning of comp. mount/glue flags* switch, found under **Switches** in the **Production** menu, to *Yes*.

The *2001.0002 Mount* and *0005 Invert meaning of comp. mount/glue flags* switches are detailed in the *Mount and Glue Switches* section in Chapter 8 of the *Operator's Manual*.

Magazine type

Select the appropriate magazine type for the component from the popup menu shown by pressing <Space>:

```
Unknown
Tape
Vibratory
Tray
```

Unknown   Undefined magazine type

Tape   Tape magazine, see the next field.

Vibratory   Vibratory magazine

Tray   Any type of tray magazine

This information is used for HYDRA preparation. It is also used for optional software packages, for instance MYDATA MYSpeed.

Feeder type

If the magazine type in the previous field is *Tape* then the feeder type for the component can be selected from the popup menu shown by pressing <Space>:

```
8mm
FP8mm
12mm
16mm
24mm
32mm
44mm
56mm
ST32mm
Custom
```
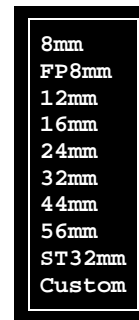
FP8mm   Fine Pitch magazine

ST32mm   Surf Tape magazine (no hardware available)

Custom   Other feeder than the listed ones.

This feeder information is used for HYDRA preparation and for optional software packages, for instance MYDATA MYPlan.

Glue

Yes – Adhesive is dispensed for the component.

No   – Adhesive is not dispensed.

To toggle between *Yes* and *No* press <Space>.

The *2001.0001 Glue* switch, found under **Mount**/**Glue Switches** in the **Production** menu overrides this field. If *2001.0001 Glue* is set to *No* no adhesive is dispensed even if this field is set to *Yes*.

The *2001.0001 Glue* switch is detailed in the *Mount and Glue Switches* section in Chapter 8 of the *Operator's Manual*.

Reject position

Specifies where rejected components are to be put if they do not meet the specifications at mechanical or electrical verification.

Press <Space> and choose an option from the popup menu shown:

```
Manual
Reject bin 1
Reject bin 2
Reject bin 3
Reject bin 4
Put back
Closest reject bin
```
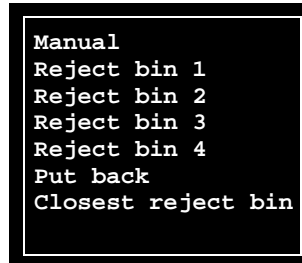
Manual
> Manual removal.

Reject bin 1
> Put into bin 1.

Put back
> Put back, for instance into a component tray.

Closest reject bin
> Put into the bin closest to the current X position.

Polarized

Yes – The component is polarized, for instance diodes.

No – The component is not polarized, for instance resistors.

To toggle between *Yes* and *No* press <Space>.

This field is used to let the machine gain some speed during electrical verification. If this field is set to *Yes* the indicated test angle is used. If it is set to *No* the machine is allowed to mount the component 180° off the indicated test angle.

Test 1, Test 2 Type

Type of electrical verification. Press <Space> and choose type from the popup menu shown:

```
None
Resistance
Capacitance
Capacitance low V
Capacitance pol.
Diode voltage
Diode rev. current
Zener diode
NPN transistor
PNP transistor
```
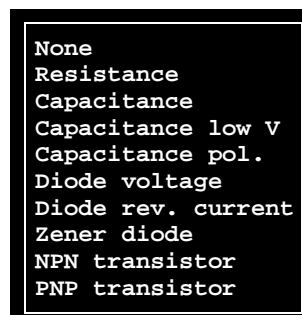
None
> No verification

Resistance
> Resistors, resistance (Ohm)

Capacitance
> Capacitors, capacitance (F)

Capacitance low V
> Low voltage capacitors, capacitance (F)

Capacitance pol.
> Polarized capacitors, capacitance (F)

Diode voltage
> Diodes, forward voltage drop (V)

Diode rev. current
> Diodes, reverse leakage current (A)

Zener diode
> Zener diodes, forward voltage drop (V)

NPN transistor
> NPN-transistors, current gain (hfe)

PNP transistor
> PNP-transistors, current gain (hfe)

Electrical verification is further described in Chapter 3.

Angle

Component orientation during centering and verification.
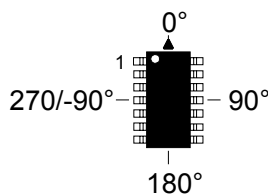
Any test angle is allowed, but there must be a matching centering angle in the Package List for the component. If not, the system will complain when mounting.

Electrical verification is further detailed in Chapter 3.

Value

Nominal component value and tolerance.

Component units and tolerances are further detailed in the *Verification Data* section in Chapter 3.

Magazine Search

By pressing <F6> in the Component List Editor (page 4-3), the system searches through the magazines for the highlighted component.

If the component is found in one or several magazines included in the magazine list, then the locations are listed like this:

```
              Location
  * TM8B-15879/3
  E TM8B-15879/4
    TM8B-14606/1
```

The list shows magazine names and feeder numbers (magazine/feeder).

  * An asterisk (*) in front of the magazine name indicates that the magazine is inserted in the machine.

  E Letter E indicates that the magazine is inserted but the component is not available, which can be caused by an empty feeder.

If you select a magazine from the list, the machine picks a component from the selected magazine and moves it to the manual leave position where you can take the component. For components found on a pallet, the pallet is made available but the component is not picked.

5. Package List

To be able to mount a PCB, four mandatory main lists (or list groups) are required:

- **Component List**

  Contains part numbers and component name and data. Assigns a package to the component.

- **Package List**

  Contains data specific to the component package, such as length, width, height, number of leads, mount tool, placement precision, centering forces and optical centering data.

- **Magazine Lists (group)**

  Lists that inform the system about in which magazine and type of magazine (tape, vibrator, or tray) the components can be found and where the magazines are located. The lists include also such information as component angles and quantities.

- **Mount Lists (group)**

  Mount lists on different levels for PCBs, panels, and layouts, indicating which components are to be mounted and where they are to be placed.

This chapter describes the Package List, one of the main lists necessary for mounting a board.

The other mandatory lists or list groups are described in Chapter 4, Chapter 6 and Chapter 7.

Additional lists for such features as fiducial marks, adhesive application and user access are found in Chapter 8.

Special characters

National special characters and some non-letter/non-figure characters cannot be entered into the system, for instance in board names and layout names.

The following special characters are, however, allowed to be used:
" ' ` \ $; ^ @

Package List Editor

The Package List is opened by selecting the **Packages** option in the **Editor** menu.

The Package List Editor is shown in Figure 5-1.

Examples of packages preprogrammed and included in TPSys are specified in *Appendix A – Packages*. This appendix contains also a description on how to program new packages.

Function keys in the Package List Editor:

Edit package

By pressing <Enter> the highlighted package can be modified.
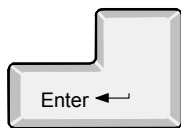
Insert new

A new package can be added to the Package List by pressing <Ins> and entering a new name. The new package gets the same data as the package that is highlighted when the <Ins> key is pressed.

Delete

The highlighted package can be deleted by pressing <Del> and confirming the deletion in a popup box.

Edit accelerations

Accelerations data for the highlighted package is displayed and can be modified, see page 5-10.

Test centering

Test if TPSys is able to center the package with current centering parameters, see page 5-24.

```
                          * PACKAGE LIST EDITOR *
    Packages
 1206-06          Enter   Edit package            F5   Autoteach
 1206-12            Ins   Insert new              F6   Edit optical cent.
 1206-16                                               data
 1210-07            Del   Delete                  F7   Edit lead groups
 1210-12             F3   Edit accelerations      F8   Edit centering phases
 1505-10             F4   Test centering          F9   Edit glue data
 1805-07
 1812-07
 1812-12                  Package: 1206-06
 1812-20              Body length: 3.2mm              Body width: 1.6mm
 1825-10           Length overall: 3.2mm           Width overall: 1.6mm
 218-18            Height overall: 0.698mm
 AL-CAP                      min.: 0.5mm                    max.: 0.9mm
 BGA-13*13-P          Mount tool: A13               Alternate tool: NOTOOL
 BGA-14*14-C       Pick wait time: 0ms            Place wait time: 0ms
 BGA-15*15-P     Place force offset: 0mN        Tool to top offset: 0mm
 BGA-19*19-PE         Vacuum test: Yes             Hold until ready: No
 M3216-16            Toggle leads: 1,2
 M3528-19            HYDRA tools: H00
 M3819-16            HYDRA angle: 90                Pick in center: Yes

                                                 Brian              12:36
```

Figure 5-1. Package List Editor

Autoteach

F5

Create new package data by automatic analysis of a components image, see *Appendix A – Packages*.

Edit optical cent. data

F6

Optical centering data of the highlighted package is displayed and can be modified by pressing <F6>, see page 5-14.

Edit lead groups

F7

Lead group data of the highlighted package is displayed and can be modified by pressing <F7>, see page 5-26.

Edit centering phases

F8

Mechanical centering data and mechanical/electrical verification data is displayed and can be modified by pressing <F8>. Illumination for optical centering can also be set by pressing <F8>. The centering phases window is described on page 5-70.

Edit glue data

F9

Glue data, such as number of glue dots and sizes, is displayed and can be modified by pressing <F9>, see page 5-78.

Exit

Esc

Press <Esc> if you want to exit the Package List and return to the main window.

Entries in the Package List Editor:

Packages

This box contains available programmed packages. You can use the arrow keys or <PgUp>, <PgDn>, <Home>, or <End> to select package.

You can also search for a package in the list by simply entering the first characters of the package name.

Package

The package name, which must be a unique name or number for each package.

Body length

Nominal package body length measured in the Y coordinate of the machine with the component oriented in 0°.
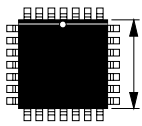
Body width

Nominal package body width measured in the X coordinate of the machine with the component oriented in 0°.
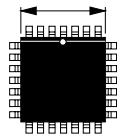
Length overall

Nominal component overall length, leads included, measured in the Y coordinate of the machine with the component oriented in 0°.
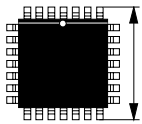
Width overall

Nominal component overall width, leads included, measured in the X coordinate of the machine with the component oriented in 0°.
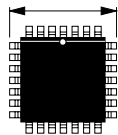
Height overall

The total height of the package above the board surface. Nominal, maximum, and minimum height is stated.
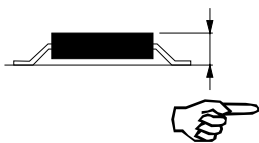
A small difference between the nominal height and the maximum height will make the machine mount faster, especially if the HYDRA unit is used.
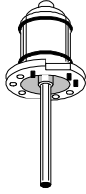
Mount tool

Choose an appropriate standard mount tool with regard to the shape, size, and weight of the component. If you press <Space>, a list of installed tools are shown in a popup menu.

Standard mount tools are described in the *Standard Mount and Glue Tools* section in Chapter 3.

Alternate tool

You can select an alternate standard tool, if any, for the package in this field. If you press <Space>, a list of installed standard tools are shown in a popup menu. The *NOTOOL* option means that no alternate tool is allowed to be used by the machine.

The purpose of this feature is to save time by reducing tool changes. For example, if current package is mounted using the A12 tool and the next package to be mount has the A12 tool as an alternate tool, no tool change will be done.

Pick wait time

Wait time before a component is picked from the magazine. Heavy components require more time to obtain sufficient vacuum in the mount tool. This time is added to the time defined in the *0022.0012 Vacuum wait times Vacuum on at pick* parameter found under the **Parameters** option in the **Editor** menu.

The pick wait time can be set from 0 to ±32 seconds in ms increments ('+' increases the time, '–' decreases the time).

Place wait time

Wait time before the mount tool is lifted from the component after it has been placed. This time is added to the time defined in the *22.0013 Vacuum wait times; Vacuum off at place* parameter.

The place wait time can be set from 0 to ±32 seconds in ms increments ('+' increases the time, '–' decreases the time).

Place force offset

The vertical placement force used on the component when placing it. This force is added to the force defined in the *0021.0311 Place force with indicator* or *0021.0312 Place force without indicator* parameters depending on what type of tool is used. The default force is dependent on the Z-unit type.

The place force can be set from 0 to ±32 Newton in mN increments ('+' increases the force, '–' decreases the force).

Tool to top offset

Defines the difference between the package body center height level and the surrounding highest level.

The offset value shall be set to zero if the component top is plane, or if the body center is the highest part of the package.

Vacuum test

Yes   –   The mount tool vacuum test is on.

No   –   The mount tool vacuum test is off.

To toggle between *Yes* and *No* press <Space>.

The *1001.0006 Test of Z vacuum* switch, found in the **Switches** option in the **Production** menu overrides this field. If the *1001.0006 Test of Z vacuum* switch is set to *No*, then the vacuum in the mount tool is not sensed even if this field is set to *Yes*.

Hold until ready

This funtionis only used primarily with mechanical centering. It i used for large, sensitive, components needing exta careful handling. It is a function tha willslow the machine down.

Yes – If optical centering is used, this setting will mean that there is no theta movement while the X wagon moves. With mechanical centering, the centering jaws assist in holding the component from a magazine or a tray to the mounting position.

No – The centering jaws do not hold the component during the X movement. This is the default setting.

To toggle between *Yes* and *No* press <Space>.

Toggle leads

Natural leads for this package are 1, 8, 9, and 16.
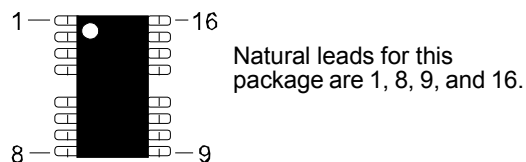
At programming, the indicated leads can be optically positioned on the land pattern. By toggling a key, the cross hairs are moved from lead to lead in the indicated sequence.

Leads with the greatest distance between each other (diagonal leads) should be indicated.

A maximum of eight leads can be indicated.

When entering lead numbers, separate the numbers with commas.

☞ *This entry is not valid for BGA packages. For BGA packages, the toggle leads are automatically generated by TPSys and cannot be changed.*

HYDRA tools

If a HYDRA tool is specified, components in this package will be included in the HYDRA preparation and are thus suggested to be mounted using the HYDRA unit. The HYDRA preparation is detailed in Chapter 6. Examples of preprogrammed HYDRA mountable packages are found in *Appendix A – Packages* in this manual.

The HYDRA unit can pick components from the Agilis, TM8, TM8F, TM12, TM16, TM1216, TMFlex, and vibratory magazine types.

The HYDRA mount tools consist either of a plain tube (H00) or a tube with a changeable nozzle (H01 – H06), see the figure.

H00   H01   H02   H03   H04   H06

Ins
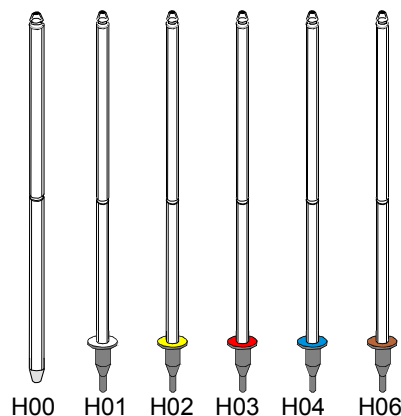
By pressing <Ins> in this field, the mount tools shown in the popup menu (see the figure) can be selected for the package. Only non selected tools are shown in the menu.

```
H00
H01
H02
H03
H04
H06
```

If more than one tool is chosen for a package, and the HYDRA is configured with these tools, then the system will select the most adequate tool with respect to the assembly speed.

Del

By pressing <Del> selected tools can be unselected. Only selected tools are shown in the menu.

Pressing <Space> clears all tools from the field and sets *None* meaning that this package will not be mounted by using the HYDRA unit.

HYDRA angle

```
0
90
180
270
```
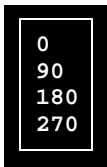
Defines the component angle at the optical HYDRA centering performed while the component is moved from the magazine to the board. Examples of angles for the HYDRA mountable preprogrammed packages are found in *Appendix A – Packages*. Use 90° for components with lead type *CHIP*.

Accelerations

By pressing <F3> in the main Package List Editor (page 5-3), a box containing accelerations data is shown, see Figure 5-2.

Esc

Press <Esc> if you want to return to the main Package List Editor (page 5-3).

Entries in the Accelerations editor:

Package

The package name.

Mount precision

The mount precision, which can be lowered for packages mounted on large land patterns. Lower precision means faster mounting.

Press <Space> and choose mount precision:

```
NORMAL
HIGH
LOW
```
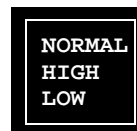
NORMAL   Standard precision.
HIGH   Higher precision, slower mounting.
LOW   Lower precision, faster mounting.

```
                        * PACKAGE LIST EDITOR *
        Packages
  1206-06
  1206-12
  1206-16
  1210                    ┌──────────Accelerations──────────┐
  1210                    │        Package: 1206-06          │
  1505                    │  Mount precision:                │
  1805                    │                                  │
  1812                    │  Acceleration codes              │
  1812                    │               X:                 │
  1812                    │               Y:                 │
  1825                    │            Tape:                 │
  218-                    │           Theta:                 │
  AL-C                    │               Z:                 │
  BGA-                    │     HYDRA theta:                 │
  BGA-                    │        HYDRA Z:                  │
  BGA-                    │                                  │
  BGA-                    │        Z slow up                 │
  M321                    │        Distance: 0mm             │
  M352                    │           Speed: 1ms             │
  M381                    └──────────────────────────────────┘
                                         Brian              12:38
```
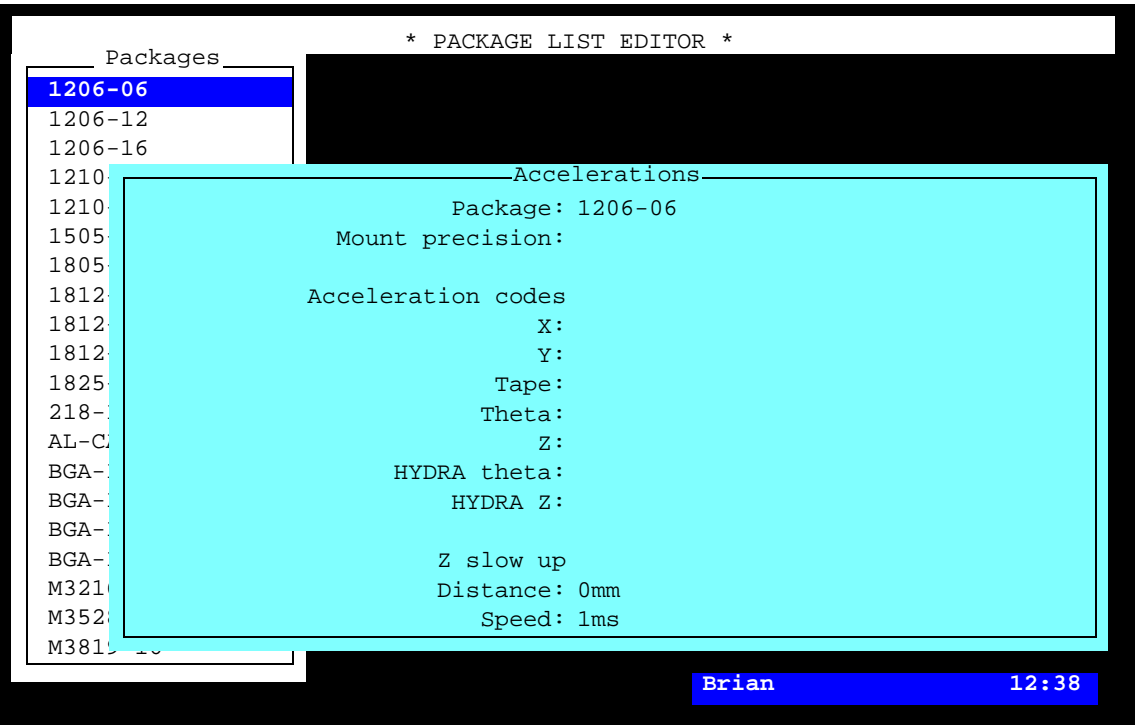
Figure 5-2. Accelerations editor

Acceleration codes Theta

Acceleration of the Theta movement (standard mount tool rotation).
Large and heavy components may need slow Theta acceleration to
avoid slipping on the tool.

Press <Space> and choose acceleration:

```
HIGHEST
HIGH
LOW
LOWEST
```

HIGHEST Highest acceleration.

HIGH   High acceleration.

LOW   Low acceleration.

LOWEST   Lowest acceleration.

Acceleration codes Y

Acceleration of the Y movement (Y wagon). Works in the same way as *Acceleration Codes Theta*.

This feature makes it possible to reduce the Y-wagon acceleration after the component has been placed.

Acceleration codes X

Acceleration of the X movement (longitudinal). Works in the same way as *Acceleration Codes Theta*.

Acceleration codes Z

Acceleration of the Z movement (vertical). Works in the same way as *Acceleration Codes Theta*.

Acceleration codes Tape

Acceleration of the component tape. Works in the same way as *Acceleration Codes Theta*.

HYDRA theta

Acceleration of the HYDRA theta movement (HYDRA mount tool rotation). Works in the same way as *Acceleration Codes Theta*.

HYDRA Z

Acceleration of the HYDRA Z movement (vertical). Works in the same way as *Acceleration Codes Theta*.

Distance

The distance for slowly moving the Z tool up after placing a component. If the tool moved at maximum acceleration there is a small risk that the board may spring back and flip the component away. The speed of the movement is set by *Speed* below.

Minimum value:0mm
Maximum value:3mm

Speed

Sets the maximum speed for the Z tool movement after placing component. The tool will move at this speed within the distance from the board as set by *Distance* above. After this the Z tool will move up at maximum acceleration.

Minimum value:15nm/s
Maximum value:1m/s.

Optical Centering

By pressing <F6> in the main Package List Editor (page 5-3), a box containing optical centering data is shown, see Figure 5-3.

Vision centering of components is done in two steps:

– *Coarse search*. The coarse location and rotation of the component in the acquired image is detected.

– *Fine search*. The vision system calculate the position and rotation of the component relative to the picking tool. This is done by detecting the position of each lead or the whole component outline. The information is also compared to the package data base. This to verify that it is the correct component, there are no bent leads, or if the component has the correct orientation.

Optical centering data for BGA packages is found on page 5-22.

Function keys in the optical centering window:

Press <Esc> if you want to return to the main Package List Editor (page 5-3).

Entries in the optical centering box:

Use best fit

Yes – If one or more leads are bent, the system calculates an alignment to the best fit on the land pattern. The component is mounted provided the leads, after the adjustment, can be positioned within specified areas, otherwise it is rejected. The areas are specified by the *Max cross-wise deviation* and *Max length-wise deviation* entries, see page 5-68.

No – The leads must be within specified areas without best fit alignment, otherwise the part is rejected. This is the default setting.

To toggle between *Yes* and *No* press <Space>.

Use sub pixel

Yes – The vision system works in a high-resolution mode, which means a higher centering accuracy and, consequently, a slightly longer centering time. It requires a sharp contrast between the lead edges and the background. Gullwing leads normally show sharp edges. This option is used for all SO, SOT and QFP packages.

No – The vision system works in standard mode. This option is used for all BGA, CHIP, MELF packages and packages with J-Bend leads.

To toggle between *Yes* and *No* press <Space>.

```
                        * PACKAGE LIST EDITOR *
    Packages
 PLCC100opt
 PLCC1                    Use best fit: No
 PLCC2                    Use sub pixel: Yes
 PLCC2              Coarse search method: Standard
 PLCC4               Coarse search noise: 1000
 PLCC5             Coarse search contrast: 30
 PLCC6                 Fine search noise: 1000
 PLCC8               Fine search contrast: 30
 PLCC8                       Index type: None
 QFP13                Index area offset:  0.000mm/ 0.000mm
 QFP16                  Index area size: 5mm
 QFP19                  Corner contrast: 15%
 QFP20                  Corner variance: 10%
 QFP24                    Mark contrast: 15%
 QFP25                  Usable cameras: Standard, Linescan
 QFP30                 Unusable cameras: None
 QFP80              Usable HYDRA cameras: Linescan
 SO-14       Linescan illum. for HYDRA: Full
 SO-14       HYDRA camera light levels: Max
 SO-16
                                              Brian                    12:40
```

Figure 5-3. Optical centering

Coarse search method

This field controls which method that shall be used to locate the
component in the coarse search step.

Press <Space> for a list of options.

```
Standard
Centered
Outline
Multiple Leads
```
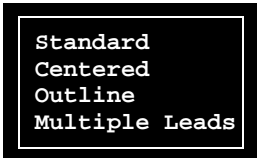
A preliminary component position is calculated by searching for a
limited amount of component features, such as individual leads, the
start or end of a group of leads, the component body outline or body
corners.

Standard

Locates the component by searching for the outermost leads
in three corners of the component. If the component lacks
leads the corners of the component will be located instead.
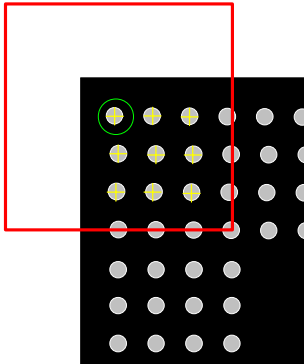
Centered

>   The component is assumed to be centered in relation to the picking tools rotational center. No image processing is done to calculate the coarse position. Centering the component on the picking toll can be done using mechanical centering phases before the optical inspection.

Outline

>   Coarse search is done by detecting only the components outline. This method can be used for BGAs and flip-chips that are rectangular and have enough contrast between the background and the component body.

Multiple Leads

>   This method works as the standard method but instead of locating individual leads at the corners of the component this method searches for a group of leads, forming a pattern, at each corner. Leaded components (for instance QFPs) where the tool can be seen in the background can be centered more robustly using this method.
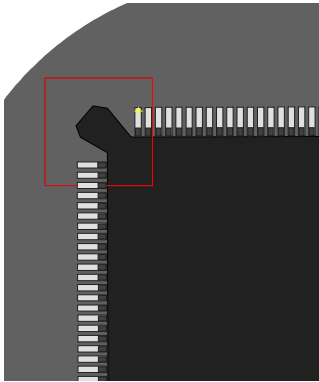
Whatever the coarse search algorithms selected, the final component position is calculated by using the whole of the features defined in the mathematical model, that is all the leads/bumps or the whole package outline.

Coarse search noise

Specifies how much the image intensity can vary around an object, for it to be considered as a lead/corner by the vision system.
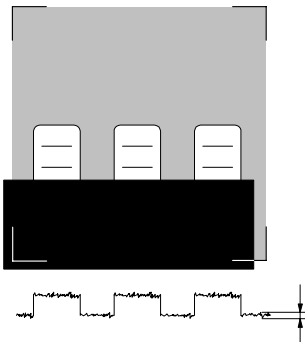
If the variation around an object is larger than the coarse search noise, the object will not be considered as a lead/corner. A lower value puts higher demands on an even background. By lowering the value, false hits on for example the tool, index marks or wirering can be avoided. If the value is set too low though, the vision system may reject real leads/corners.

If the coarse search noise is exceeded for all image points, the component search fails and an error message is shown.

See *Appendix A* for recommendations on how to set this value for different package types.

Coarse search contrast
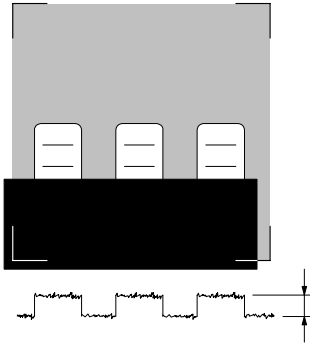
Specifies how much the image intensity may differ between a lead/corner, and the surrounding background.

If the difference is lower than the coarse search contrast, the object will not be considered as a lead/corner. A higher value therefore puts a higher demand on contrast. By increasing this value, false hits on for example the tool, index marks, or wirering can be avoided. A too high value may lead to the vision system rejecting real leads/corners.

If the coarse search contrast is not achieved for any image point in the coarse search step the component search fails and an error message is shown.

See *Appendix A* for recommendations on how to set this value for different package types.

Fine search noise

This field specify how much the image intensity is allowed to vary around an image object for it to be considered as a correct lead.

If the image intensity variation is larger than the fine search noise the object will not be considered as a correct lead/corner. A lower value puts a higher demand on how even the background around a lead must be.

If the fine search noise is exceeded for a lead in the fine search step the component search fails and an error message is shown.

See *Appendix A* for recommendations on how to set this value for different package types.

Fine search contrast

Here it is specified how much the image intensity may differ between a lead/corner and the background surrounding it.

If the contrast between the lead and the background around it is lower than specified, the object will not be considered as a correct lead/corner. Therefore a higher value puts a higher demand on the contrast.

If a lead in the fine search step has a contrast lower than specified, the component search fails and an error message is shown.

See *Appendix A* for recommendations on how to set this value for different package types.
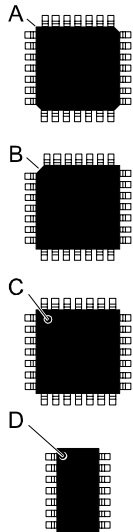
Index type

Indicates the shape of an orientation index located underneath the package. This index can be used by the optical centering system to verify the orientation of the component.

Press <Space> and choose appropriate index type from the popup menu shown:

```
None
Corner
No corner
Mark
```
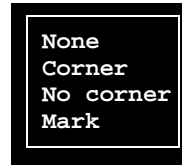
None   No index search.

Corner   Corner ('A' in the figure).

No corner   Cut corner (B).

Mark   Hollow, recess or other mark (C and D).
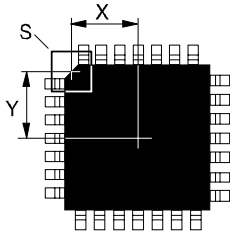
Index area offset

The distance between the center of the component and the center of the index ('X' and 'Y' in the figure).

The component oriented in 0° and the measurements in X and Y coordinates of the machine.

Index area size

The side length of a square search area. The search area is marked 'S' in the figure.

Example: 5mm (5mm x 5mm search area).

Corner contrast

The ratio between the component body contrast and the background contrast when searching for corner or cut corner. The default value is 15%.

A lower value means easier to find the index, but also easier to confuse the component with the background.

Corner variance

Accepted contrast variance when searching for corner or cut corner. Default value is 10%.

A higher value means easier to find the index, but also easier to confuse the component with the background.

Mark contrast

The ratio between the component body contrast and the index mark contrast when searching for a dot or a recess. Default value is 15%.

A lower value means easier to find the index mark, but also easier to confuse the mark with the component body.

Usable cameras

Different camera types are available for the MYDATA placement machines (see the *Centering* section in Chapter 3).

You can select different camera options from a menu containing both camera groups and specific camera types of two reasons:

– The first reason is that some packages require certain camera types for optical centering.

– The second reason is that several camera types can be selected for a package because the same Package List is intended to be shared in networks by many machines with different camera types.

Press <Ins> in this field to get the popup menu with the camera options.

```
Standard
High res.
Linescan
SVC
HRC
LSC
OVC1
OVC2
OVC3
OVC4
OVC5
EVC1
EVC2
EVC3
```
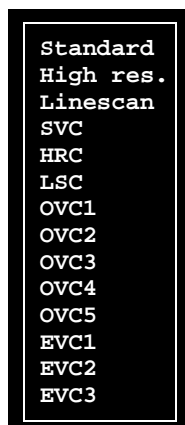
From the menu, you can select one or several camera options. All the options are described below.

Standard

All standard cameras, that is SVC, OVC1 – 5 and EVC1 – 3 (see below).

High res.

The HRC camera (see below). For the time being, this option is the same as the HRC option, but this option is prepared for additional high resolution cameras in the future.

Linescan

The LSC camera (see below). For the time being, this option is the same as the LSC option, but this option is prepared for additional Linescan cameras in the future.

SVC

Standard Vision Camera for big packages, for instance QFP and BGA. Maximum package size is:
39.0x39.0mm (1.53"x1.53") at any mount angle,
51.9x51.9mm (2.04"x2.04") at dual shot mode.

HRC

High Resolution Camera for small packages, for instance flip-chip and chip-scale BGA. Maximum package size is:
11.0x11.0mm (0.43"x0.43") at any mount angle,
15.0x15.0mm (0.59"x0.59") at dual shot mode.

LSC

> Linescan Camera for scanning components on the move, passing the camera. This camera is the fastest one (up to three times faster than SVC), used for high speed mounting and for big packages. Maximum package size is 56.0mm x 56.0mm (2.2" x 2.2"). Finest pith is 0.3mm for BGA and 0.2mm for QFP.

OVC1 – 5

> Original Vision Camera 1 – 5.

> Older camera types for the same package size as SVC. These cameras are replaced by SVC.

EVC1 – 3

> Extended Vision Camera 1 – 3.

> Camera types for even bigger package size than what the SVC type can handle.

To delete camera types, press <Del> and remove camera types by selecting from the list shown.

Pressing <Space> clears all cameras from the field and sets *None* meaning that no optical centering will be performed for this package.

If more than one camera type is selected for a package and also installed in the currently used machine, then the system will use the camera with the highest mounting speed.

If none of the camera types selected for the package is installed in the currently used machine, then the following message will pop up:

No usable optical centering cameras defined for XXX.

Unusable cameras

Cameras selected in this field will not be used for the current package.

The purpose of this field is to be able to unselect certain cameras from a group of cameras, for instance a camera that has too small field of view for the current package.

The following example allows the SVC, OVC5 and EVC1 – 3 camera types to be used:

```
    Usable cameras:  Standard
  Unusable cameras:  OVC1, OVC2, OVC3, OVC4
```

You can add camera types to the list and remove types from the list in the same way as described for the previous field.

Usable HYDRA cameras

All packages that can be centered with the HYDRA Camera previously can be centered using a Line Scan Camera.

| Ins |

Press <Ins> in this field to get a popup menu with the camera options.

Linescan illum. for HYDRA

Defines the types of illuminations that can be used to center a package type using the Line Scan Camera and the HYDRA unit.

| Ins |

Press <Ins> in this field to get a popup menu with the camera options.

From the menu, you can select one or several options.

```
Full
Front
Ambient
```

Full   Use all the LED groups of the LSC illumination unit.

Front   Use the front LED group of the LSC illumination unit.

*Ambient*Use the ambient LED group of the LSC illumination unit.

Only packages sharing at least one common illumination type will be centered in a single mount cycle.

HYDRA camera light levels

Defines the illumination levels that can be used to center a package type using the HYDRA Camera.

| Ins |

Press <Ins> in this field to get a popup menu with the camera options.

It can be *Min*, *Max* or both of them.

BGA Packages

In the optical centering window (page) make the settings described below for BGAs with CBGA, PBGA and CGA lead types. See page for more information on this lead type.

CBGA lead types

For CBGA packages, which have a ceramic body lighter than the leads, make the following initial settings:

```
              Use best fit: No
             Use sub pixel: No
      Coarse search method: Outline
       Coarse search noise: 500
    Coarse search contrast: 10
          Fine search noise: 500
      Fine search contrast: 10
                Index type: None
          Index area offset:  0.000mm/ 0.000mm
            Index area size: 5mm
            Corner contrast: 15%
            Corner variance: 10%
              Mark contrast: 15%
            Usable cameras: Standard, Linescan
          Unusable cameras: None
       Usable HYDRA cameras: Linescan
  Linescan illum. for HYDRA: Full
  HYDRA camera light levels: Max
```

PBGA lead types

For PBGA packages, which have a plastic body darker than the leads, make the following initial settings:

```
              Use best fit: No
             Use sub pixel: No
      Coarse search method: Standard
       Coarse search noise: 500
    Coarse search contrast: 25
          Fine search noise: 500
      Fine search contrast: 25
                Index type: None
          Index area offset:  0.000mm/ 0.000mm
            Index area size: 5mm
            Corner contrast: 15%
            Corner variance: 10%
              Mark contrast: 15%
            Usable cameras: Standard, Linescan
          Unusable cameras: None
       Usable HYDRA cameras: Linescan
  Linescan illum. for HYDRA: Full
  HYDRA camera light levels: Max
```

For CCGAs choose PBGA lead type and by using only front light illumination create contrast between the columns and the ceramic body. Use *Outline* coarse search to locate the component.

```
              Use best fit: No
              Use sub pixel: No
       Coarse search method: Outline
        Coarse search noise: 500
     Coarse search contrast: 40
          Fine search noise: 1500
       Fine search contrast: 10
                 Index type: None
          Index area offset:  0.000mm/ 0.000mm
            Index area size: 5mm
             Corner contrast: 15%
             Corner variance: 10%
               Mark contrast: 15%
              Usable cameras: Standard, Linescan
            Unusable cameras: None
         Usable HYDRA cameras: Linescan
    Linescan illum. for HYDRA: Full
    HYDRA camera light levels: Max
```

CGA lead types

For BGA packages with CGA lead types, that is with leads that appear darker than the body, make the following initial settings:

```
              Use best fit: No
              Use sub pixel: No
       Coarse search method: Standard
        Coarse search noise: 500
     Coarse search contrast: 25
          Fine search noise: 500
       Fine search contrast: 25
                 Index type: None
          Index area offset:  0.000mm/ 0.000mm
            Index area size: 5mm
             Corner contrast: 15%
             Corner variance: 10%
               Mark contrast: 15%
              Usable cameras: Standard, Linescan
            Unusable cameras: None
         Usable HYDRA cameras: Linescan
    Linescan illum. for HYDRA: Full
    HYDRA camera light levels: Max
```

Corner contrast, Corner variance and Mark contrast

Start with the default values shown above. Then, if necessary, adjust these values. See the description in the previous section.

Test Centering

There are a lot of parameters that can be set and adjusted in connection with centering of packages. *Test centering* does a test of the actual centering data, making it easier to find the best parameters for the chosen package.

Press <F4> in the main Package List Editor (page 5-3), and a box containing test data is shown, see Figure 5-4.

Function keys in the test centering window:

Esc

Press <Esc> if you want to return to the main Package List Editor (page 5-3).

```
                       * TEST CENTERING PACKAGE 1206-06 *
    ___Packages___
   1206-06
    1206-12
    1206-16
    1210-07
    1210-12
    1505-10
    1805-07
    1812              ┌─────────Pick Up Component─────────────────────┐
    1812              │      Package height: 0.698mm                   │
    1812              │              Tool: A13                         │
    1825              │                                                │
    218-              │        Pick from: Y wagon (90°)                │
    AL-C              │        Feeder/Tray: ---                        │
    BGA-13^13-P       └────────────────────────────────────────────────┘
    BGA-14*14-C
    BGA-15*15-P
    BGA-19*19-PE
    M3216-16
    M3528-19
    M3819-16                                    Brian              12:42
```
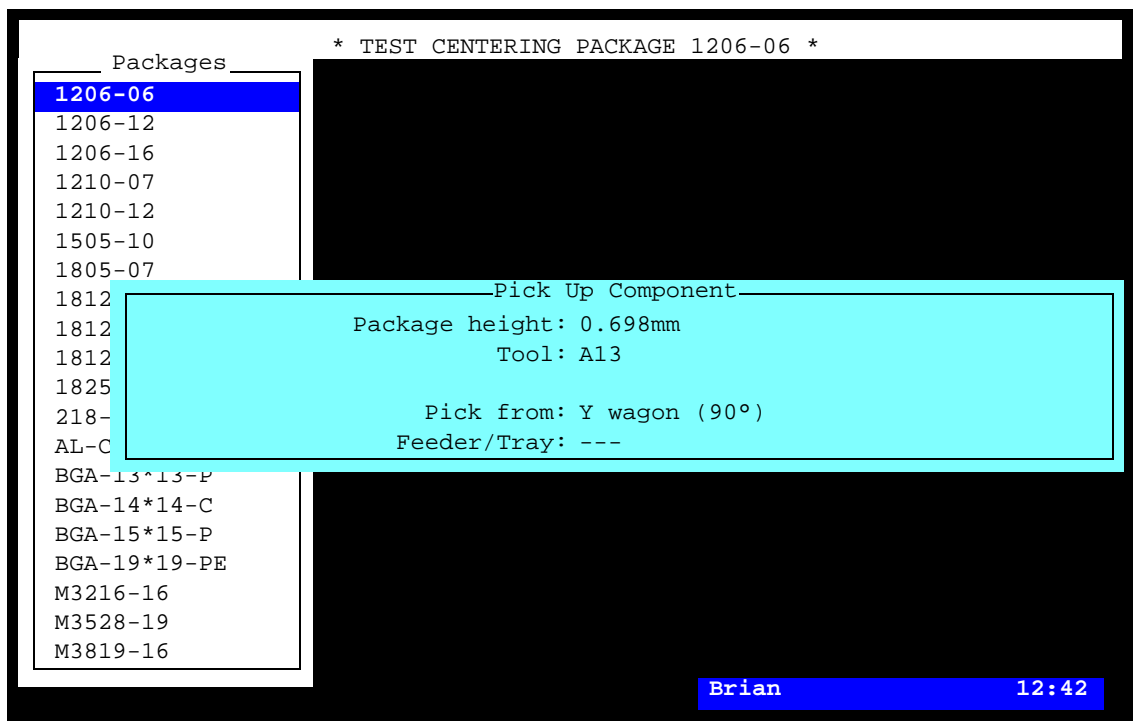
Figure 5-4. Test centering

Entries in the test centering box:

Package height

Height specified in package list editor. Cannot be changed in this view.

Tool

Tool specified in package list editor. Cannot be changed in this view.

Pick from

Specify where the package can be picked. Press <Space> to toggle between *Y wagon (0°)*, *Y wagon (90°)*, *Tray wagon (0°)*, *Tray wagon (90°)., Feeder/Tray*

Feeder/Tray

This field is only available if *Feeder/Tray* was chosen above. Feeders or trays where the package is presently loaded. Press <Space> for list of all available feeders to choose from.

--- in the field indicates that the package is not loaded.

Press <Enter> and the component is picked, centered and either put back or discarded.

If *Y wagon (0°), Y wagon (90°)*, *Tray wagon (0°)*, or *Tray wagon (90°)* is chosen in *Pick from* you must locate the package by using the camera. Three corners of the package must be indicated.

This window appears if the centering is successful:

```
Package successfully centered
             OK
```

Packag types

By pressing <F7>in the main Package List Editor (page 5-3), a window containing lead type data, is opened.

The following packag types are defined:
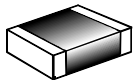
Two pole package

Example: 1206-06.
See page 5-28.

Three pole package

Example: SOT-23.
See page 5-30.
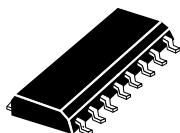
Two symmetric lead groups

Example: SO14.
See page 5-32.
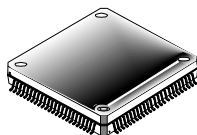
Four symmetric lead groups

Example: LQFP208-0.50.
See page 5-34.
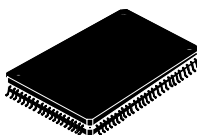
Two plus two symmetric lead groups

Example: MQFP80-16x24-0.80-2.7.
See page 5-36.
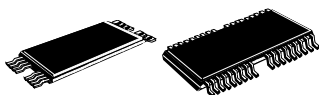
Four lead groups on two sides

Example: SOJ26-FOUR-LEAD-GROUPS.
See page 5-40.
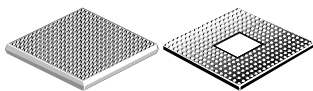
BGA package, Generic BGA

Example: BGA169-13x13-1.0.
Staggered or filled lead patterns, see page 5-44.
Any regular pitch lead patterns see page 5-48.
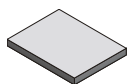
Outline package

See page 5-58.

Generic

Any other package.
Example: SOT-223.
See page 5-60.

The following descriptions will only deal with the programming of lead types. For any other information, such as nomenclature, tools and other programming hints, please refer to *Appendix A – Packages*.

Package
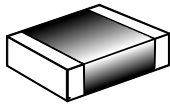
This package type is used for standard 2-pole packages where the leads are located symmetrical with respect to the package center.

Example: 0805, 1206, 1812.

The package type box is shown in Figure 5-5.

Function keys in the package type window:

Change package type

F7

To change to another package type, press <F7>. Package type selection is detailed on page 5-66 and the lead types are described on page 5-67.

Exit

Esc

Press <Esc> if you want to exit this window and return to the main Package List Editor (page 5-3).

Entries in the package type box:

Lead type

The lead type of the package. Press <Space> in this field to get a popup menu with the available options further detailed on page 5-67.

```
CHIP
SMALL-CHIP
```

Width over leads

The distance between the leads (a). Lead 1 in 0 degrees.

Lead width

The width of the leads (b).

Lead length

The length of the leads (c).

```
                                    Esc   Exit
                                    F7    Change package type




        Package 1206-06
        Two symmetric leads with lead 1 in zero degrees

                            Lead type: CHIP
                      Width over leads: 3.2mm
                            Lead width: 1.6mm
                           Lead length: 0.5mm

                     No. of image points: 40
              Image points distribution: Standard

              Max cross-wise deviation:
             Max length-wise deviation:




                                           Brian              12:44
```
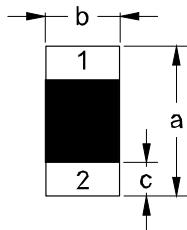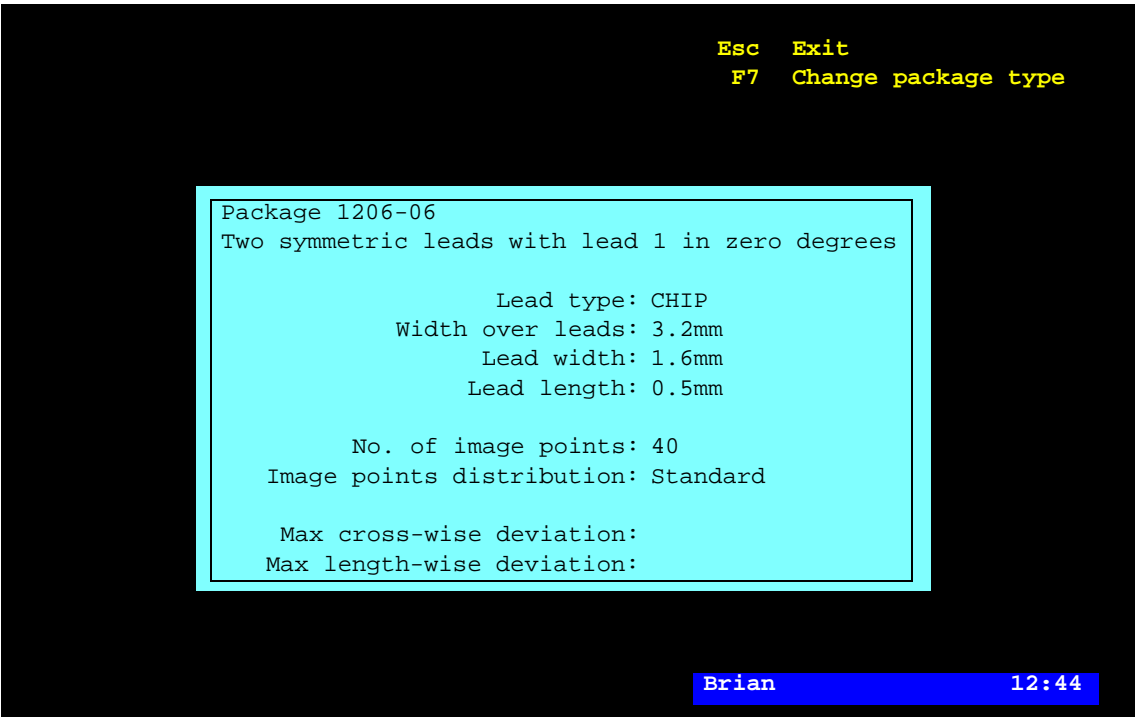
Figure 5-5. Two pole package

No. of image points

Standard distribution.

Number of image points around the component outline. The defined number of points is used by the optical centering system to identify the component size, position and alignment.

You can set a number between 10 and 120 points. The more points the more accuracy but slower centering, and vice versa. A minimum value of 40 is recommended to be able to calculate each chip side angle accurately.
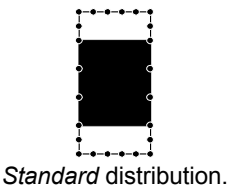
Image points distribution

Leads only distribution.

This field determines how the image points are distributed around the outline of a chip component. The input can be toggled between *Standard* and *Leads only*.

Leads only is used for components with an irregular shaped or colored body, that is difficult for the vision system to detect.
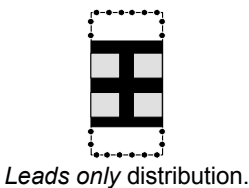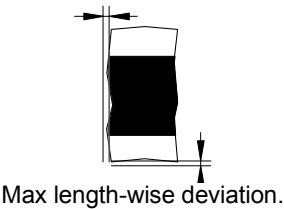
Max cross-wise deviation, Max length-wise deviation

Max cross-wise deviation.

Max length-wise deviation.

The distance between the correct component outline and the current component geometric mean outline. Note that the component size tolerance must be included in this value. The value is not allowed to be 0.

Three pole package

This package type is used for 3-pole packages with two leads in a first group and one lead in a second group. These groups are located symmetrical with respect to the package center.

Example: SOT-23.

The package type box is shown in Figure 5-6.

Function keys in this package window:

Change package type

F7

To change to another package type, press <F7>. Package type selection is detailed on page 5-66 and the lead types are described on page 5-67.
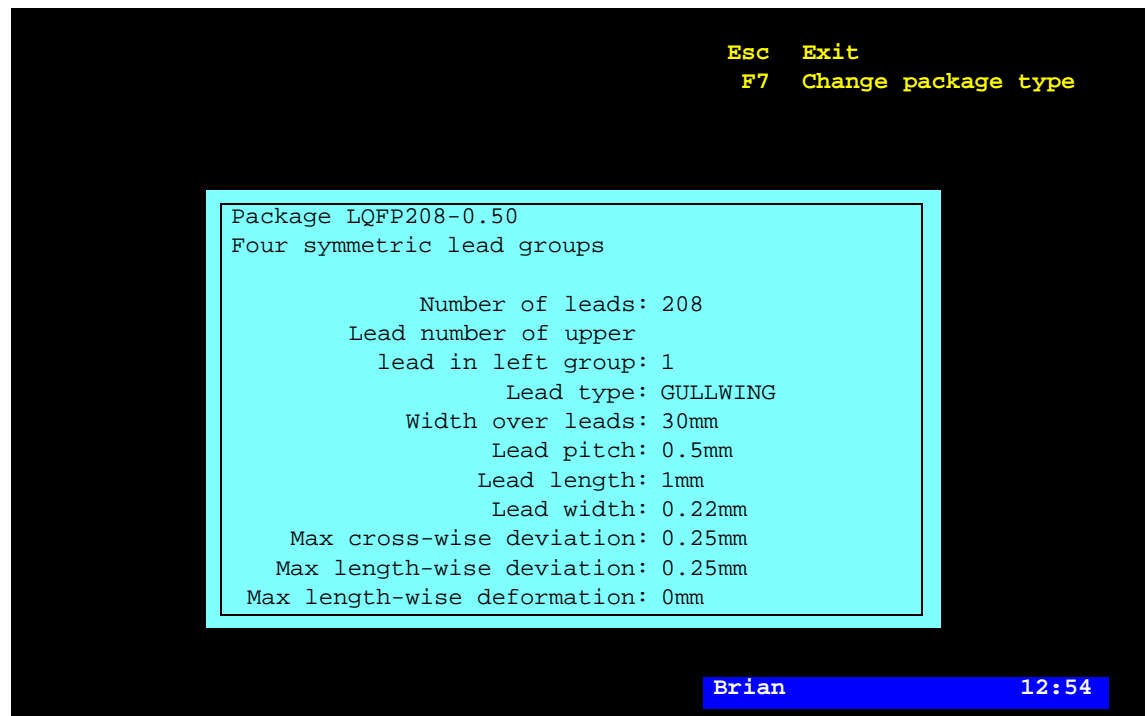
Exit

Esc

Press <Esc> if you want to exit this window and return to the main Package List Editor (page 5-3).

Entries in the package type box:

Lead type

The lead type of the current package. Press <Space> in this field to get a popup menu with the available options further detailed on page 5-67.

```
J-BEND
FLAT
GULLWING
LEADLESS
I-LEAD
```

Width over leads

The total width over the leads. The component oriented in 0° and the measurement in the X coordinate of the machine.
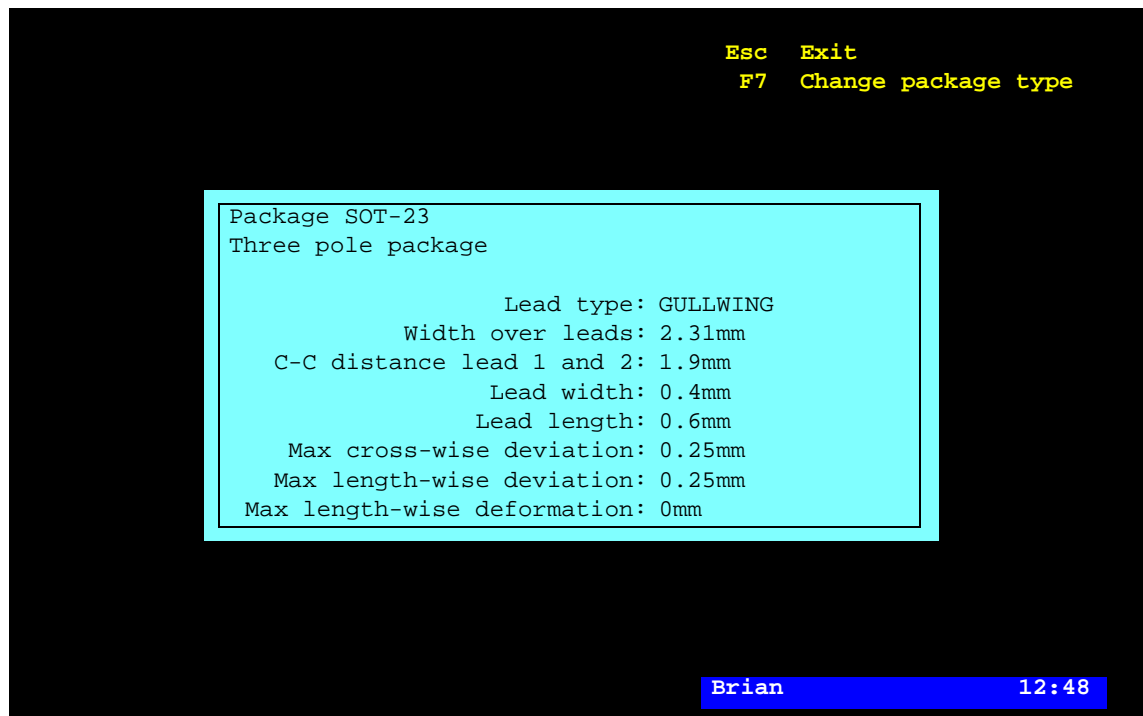
Figure 5-6. Three pole package

C-C distance lead 1 and 2

The distance between the center of lead 1 and the center of lead 2.
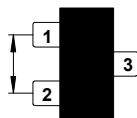
Lead width

The width of the leads.
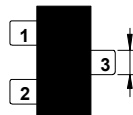
Lead length

The length of the leads measured from the package body to the lead tip.
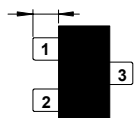
### Max cross-wise deviation

See the description on page 5-68.

Max length-wise deviation

See the description on page 5-68.

Max length-wise deformation

See the description on page 5-69.

Two symmetric lead groups
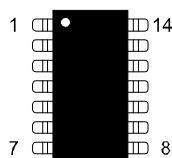
This package type is used for packages with two symmetric lead goups numbered counter-clockwise.

Example: SO14.

The package type box is shown in Figure 5-7.

Function keys in this package window:

Change package type

To change to another package type, press <F7>. Package type selection is detailed on page 5-66 and the lead types are described on page 5-67.

Exit

Press <Esc> if you want to exit this window and return to the main Package List Editor (page 5-3).
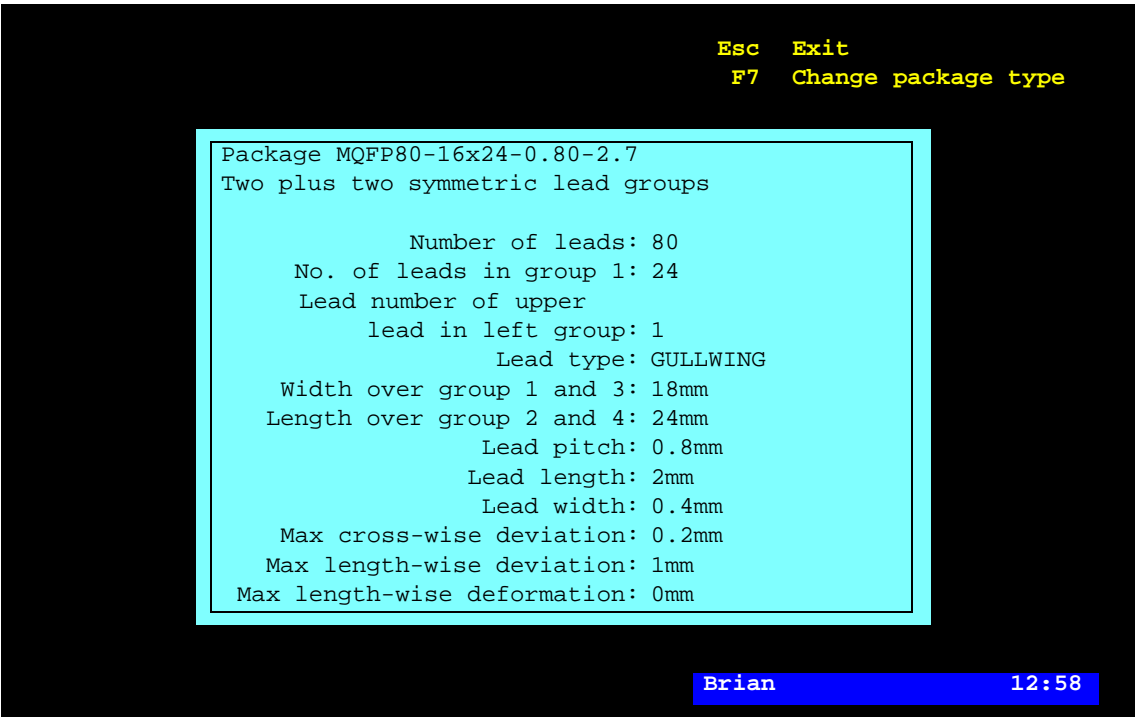
Entries in the package type box:

Number of leads

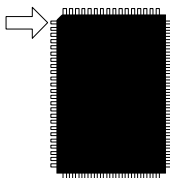The total number of leads in both groups, which must be an even number, for instance 14 for the SOT14 package.

Lead type

The lead type of the current package. Press <Space> in this field to get a popup menu with the available options further detailed on page 5-67.



```
J-BEND
FLAT
GULLWING
LEADLESS
I-LEAD
```

Width over leads

Total package width including the leads. The component oriented in 0° and the measurement in the X coordinate of the machine.

```
                                    Esc   Exit
                                    F7    Change package type




        Package SO-14
        Two symmetric lead groups

                        Number of leads: 14
                              Lead type: GULLWING
                        Width over leads: 6.198mm
                              Lead pitch: 1.27mm
                             Lead length: 1mm
                              Lead width: 0.42mm
            Max cross-wise deviation: 0.2mm
           Max length-wise deviation: 1mm
         Max length-wise deformation: 0.1mm




                                          Brian              12:50
```
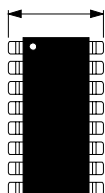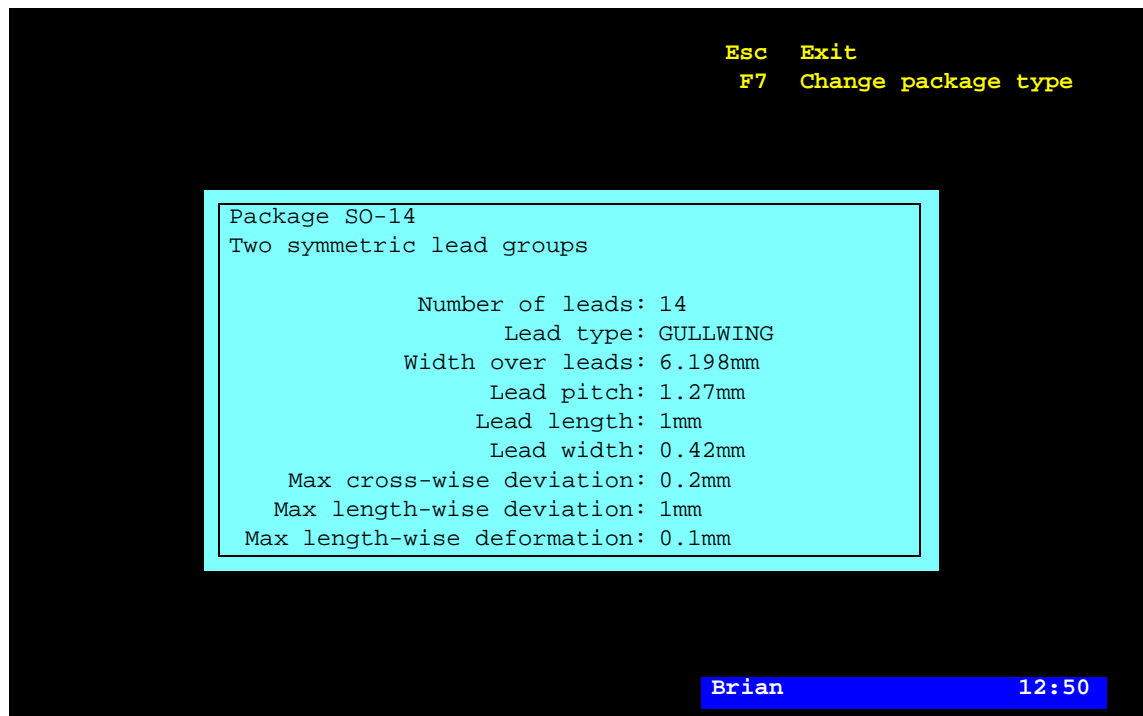
Figure 5-7. Two symmetric lead groups

Lead pitch

The distance between the centers of the leads.
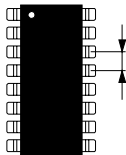
Lead length

The length of the leads measured from the package body to the lead tip.

Lead width

The width of the leads.
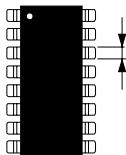
### Max cross-wise deviation

See the description on page 5-68.

Max length-wise deviation

See the description on page 5-68.

Max length-wise deformation

See the description on page 5-69.

Four symmetric lead groups
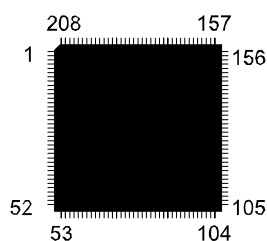
This package type is used for packages with four symmetric lead groups of the same type and numbered counter-clockwise.

Example: LQFP208-0.50.

The package type box is shown in Figure 5-8.

Function keys in this package window:

Change package type

To change to another package type, press <F7>. Package type selection is detailed on page 5-66 and the lead types are described on page 5-67.

Exit

Press <Esc> if you want to exit this window and return to the main Package List Editor (page 5-3).

Entries in the package type box:

Number of leads

The total number of leads in the four groups, which must be a multiple of 4, for instance 208 for the LQFP208-0.50 package.

Lead number of upper lead in left group
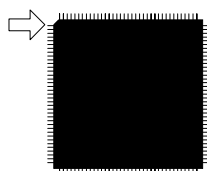
Defines the lead number of the uppermost lead in the left lead group, indicated with an arrow in the figure.

Lead type

The lead type of the current package. Press <Space> in this field to get a popup menu with the available options further detailed on page 5-67.

```
J-BEND
FLAT
GULLWING
LEADLESS
I-LEAD
```

```
                                          Esc   Exit
                                          F7    Change package type




            Package LQFP208-0.50
            Four symmetric lead groups

                      Number of leads: 208
                  Lead number of upper
                    lead in left group: 1
                            Lead type: GULLWING
                      Width over leads: 30mm
                            Lead pitch: 0.5mm
                           Lead length: 1mm
                            Lead width: 0.22mm
                Max cross-wise deviation: 0.25mm
               Max length-wise deviation: 0.25mm
             Max length-wise deformation: 0mm




                                          Brian              12:54
```

Figure 5-8. Four symmetric lead groups

Width over leads

Total package width including the leads. The component oriented in 0° and the measurement in the X coordinate of the machine.
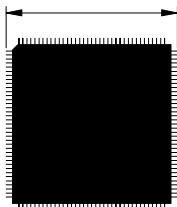
Lead pitch

The distance between the centers of the leads in the group.
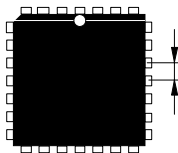
Lead length

The length of the leads measured from the package body to the lead tip.

Lead width

The width of the leads.
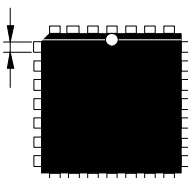
Max cross-wise deviation

See the description on page 5-68.

Max length-wise deviation

See the description on page 5-68.

Max length-wise deformation

See the description on page 5-69.

Two plus two symmetric lead groups
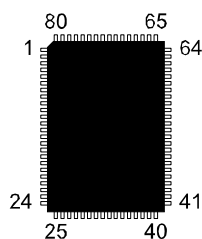
This package type is used for rectangular packages with one lead group on each side and symmetrical lead groups on opposite sides. All leads are of the same type and numbered counter-clockwise.

Example: MQFP80-16x24-0.80-2.7.

The package type box is shown in Figure 5-9.

Function keys in this package window:

Change package type

To change to another package type, press <F7>. Package type selection is detailed on page 5-66 and the lead types are described on page 5-67.

Exit

Press <Esc> if you want to exit this window and return to the main Package List Editor (page 5-3).

Figure 5-9. Two plus two symmetric lead group

Entries in the package type box:

Number of leads

The total number of leads in the four groups, which must be an even number, for instance 80 for the MQFP80 package.

No. of leads in group 1

Number of leads in lead group 1. The arrow in the figure points out lead group 1.
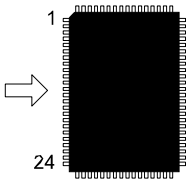
Lead number of upper lead in left group

Defines the lead number of the uppermost lead in the left lead group, indicated with an arrow in the figure.

Lead number 1 should be pointed out, as the component must be oriented in 0°.

Lead type

The lead type of the current package.

Press <Space> in this field to get a popup menu with the available options further detailed on page .

```
J-BEND
FLAT
GULLWING
LEADLESS
I-LEAD
```

Width over group 1 and 3

Total package width across lead group 1 and 3, including the leads. The component oriented in 0° and the measurement in the X coordinate of the machine.
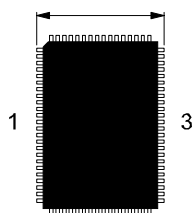
Length over group 2 and 4

Total package length across lead groups 2 and 4, including the leads. The component oriented in 0° and the measurement in the Y coordinate of the machine.
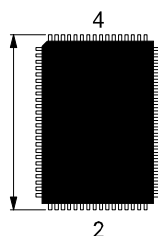
Lead pitch

The distance between the centers of the leads.
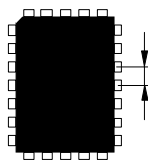
Lead length

The length of the leads measured from the package body to the lead tip.
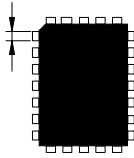
Lead width

The width of the leads.

### Max cross-wise deviation

See the description on page 5-68.

Max length-wise deviation

See the description on page 5-68.

Max length-wise deformation

See the description on page 5-69.

Four lead groups on two sides
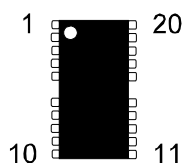
This package type is used for rectangular packages with four lead groups, two groups on two sides each. All leads are of the same type and numbered counter-clockwise.

Example: SOJ26-FOUR-LEAD-GROUPS.

The package type box is shown in Figure 5-10.

Function keys in this package window:

Change package type

To change to another package type, press <F7>. Package type selection is detailed on page 5-66 and the lead types are described on page 5-67.

Exit

Press <Esc> if you want to exit this window and return to the main Package List Editor (page 5-3).

```
                                    Esc   Exit
                                    F7    Change package type

        Package SOJ26-FOUR-LEAD-GROUPS
        Four lead groups on two sides

                    Number of leads: 20
              Lead number of upper
                lead in left group: 1
                          Lead type: J-BEND
                    Width over leads: 8.51mm
                         Lead pitch: 1.27mm
              C-C distance last lead
                in group 1 and first
                    lead in group 2: 5.08mm
                        Lead length: 0.5mm
                         Lead width: 0.5mm
           Max cross-wise deviation: 0.65mm
          Max length-wise deviation: 0.65mm
        Max length-wise deformation: 0mm


                                    Brian              13:04
```
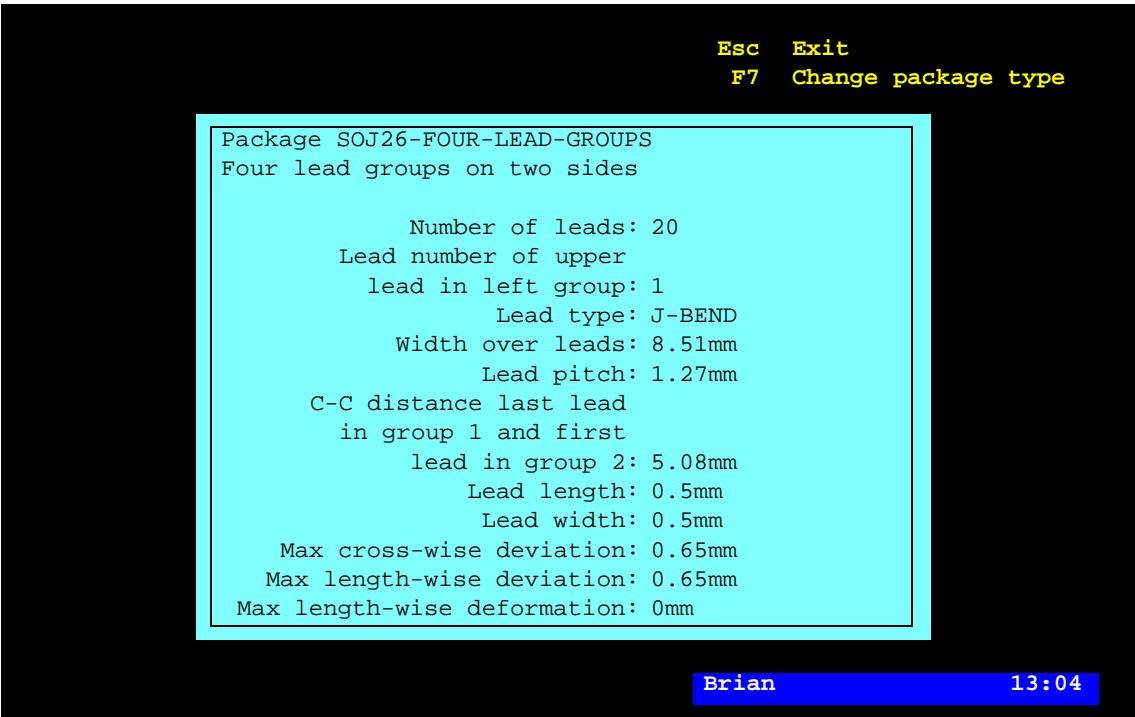
Figure 5-10. Four lead groups on two sides

Entries in the package type box:

Number of leads

The total number of leads in the four groups, which must be a multiple of 4.

Lead number of upper lead in left group

Defines the lead number of the uppermost lead in the left lead group, indicated with an arrow in the figure.

Lead number 1 should be pointed out, as the component must be oriented in 0°.

Lead type

The lead type of the current package.

Press <Space> in this field to get a popup menu with the available options further detailed on page 5-67.

```
J-BEND
FLAT
GULLWING
LEADLESS
I-LEAD
```

Width over leads

The total width over the leads. The component oriented in 0° and the measurement in the X coordinate of the machine.
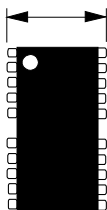
Lead pitch

The distance between the lead centers.
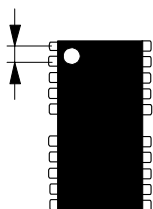
C-C distance last lead in group 1 and first lead in group 2

The distance between the centers of the adjacent leads in group 1 and group 2.
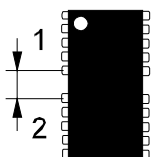
Lead length

The length of the leads measured from the package body to the lead tip.
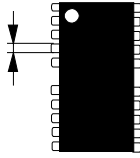
Lead width

The width of the leads.

Max cross-wise deviation

See the description on page 5-68.

Max length-wise deviation

See the description on page 5-68.

Max length-wise deformation

See the description on page 5-69.

BGA package
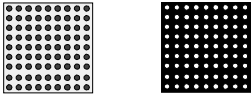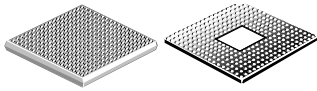
This package type is used for square shaped packages with ball grid array connection, which can be called for instance BGA (Ball Grid Array), SGA (Solder Grid Array) and LGA (Land Grid Array).

Any package with circular shaped leads (bumps), such as CSP, CS-BGA or FC, may be set up as a BGA package.

This package type handles predefined lead patterns according to what is described below. For other BGA lead patterns a package may be converted to, and further edited as, *Generic BGA package* (page 5-48) or *Generic* package type (page 5-60).

The package type box is shown in Figure 5-11.

Function keys in this package window:

Change package type

To change to another package type, press <F7>. Package type selection is detailed on page 5-66 and the lead types are described on page 5-67.

Exit

Press <Esc> if you want to exit this window and return to the main Package List Editor (page 5-3).

Entries in the package type box:

Leads per row, Leads per column
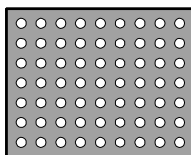
The number of leads, in filled rows and in filled columns respectively.

The package in this figure has 9 leads per row and 7 leads per column.

```
                                    Esc   Exit
                                    F7    Change package type



                     Package: BGA169-13x13-1.0


               Leads per row: 13
            Leads per column: 13
                   Staggered: No
         Extra corner leads: 0

        Leads per row in hole: 0
     Leads per column in hole: 0


                    Lead type: PBGA
                   Lead pitch: 1.5mm
                Lead diameter: 0.7mm
         Max lead displacement: 0.2mm




                                    Brian              13:06
```
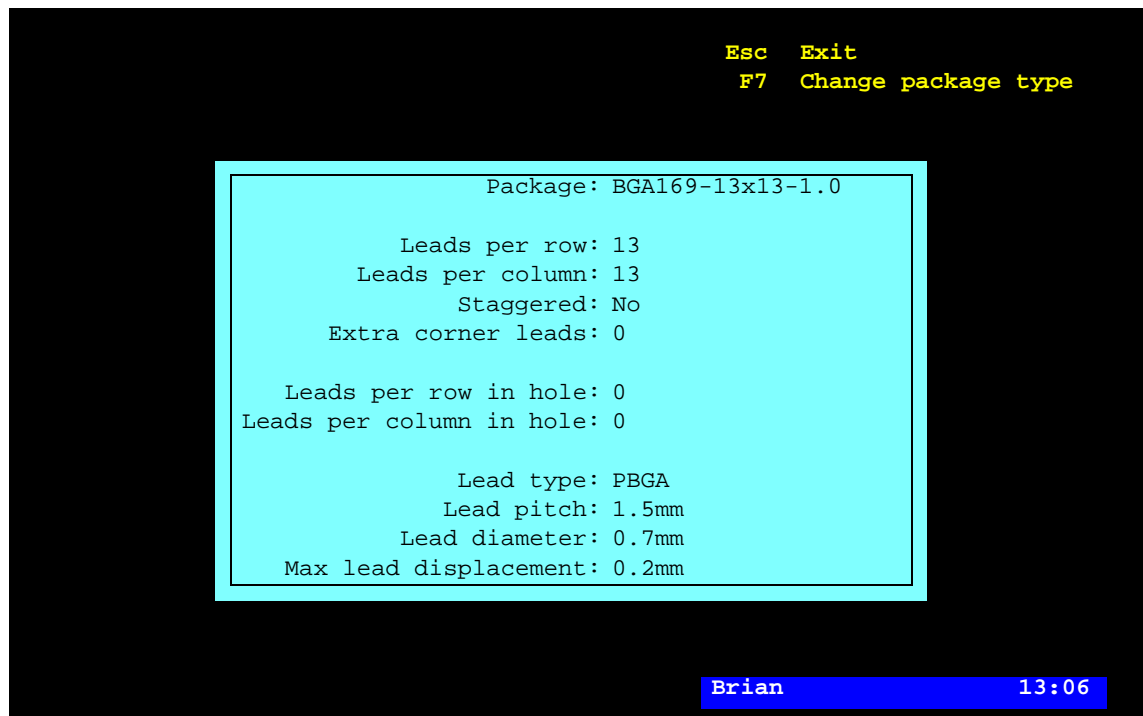
Figure 5-11. BGA package

Staggered

Staggered means that every other position of a lead matrix is filled.

Staggered can be set to *No*, *Short* or *Long* by pressing <Space> and selecting an option from the list. The three options are described below.
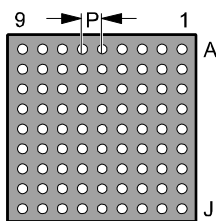
No is used when all positions of a lead matrix are filled, which looks like this for a 9 x 9 lead matrix.

P indicates how to measure the *Lead pitch* value.
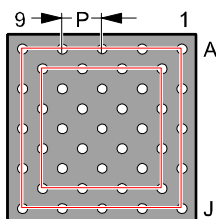
Short is used when every other row and column are one lead short, forming a second matrix inside the first one. The figure shows a 5 x 5 lead matrix for which *Staggered* is *Short*. The two rectangles in the figure indicate the matrixes mentioned.

P indicates how to measure the *Lead pitch* value.
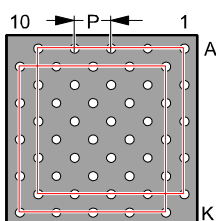
Long is used when every other row and column are as long as the previous one, forming a second matrix shifted by one position. The figure shows a 5 x 5 lead matrix for which *Staggered* is *Long*. The two rectangles in the figure indicate the matrixes mentioned.

P indicates how to measure the *Lead pitch* value.

By combining *Staggered* with the settings for rows, columns and holes, various grid patterns can be programmed. The following figures illustrate some examples of this (grid nodes without leads are marked with '+'):
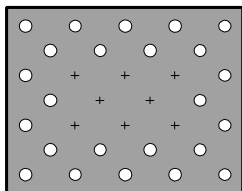
```
            Leads per row: 5
         Leads per column: 4
                Staggered: Short

     Leads per row in hole: 3
  Leads per column in hole: 2
```
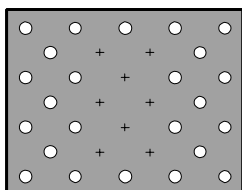
```
            Leads per row: 5
         Leads per column: 4
                Staggered: Short

     Leads per row in hole: 2
  Leads per column in hole: 3
```
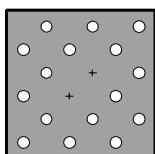
```
            Leads per row: 3
         Leads per column: 3
                Staggered: Long

     Leads per row in hole: 1
  Leads per column in hole: 1
```
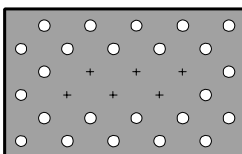
```
            Leads per row: 5
         Leads per column: 3
                Staggered: Long

     Leads per row in hole: 3
  Leads per column in hole: 1
```

Extra corner leads

This feature is used if a package has extra corner leads outside the filled matrix, or no leads in the matrix corner nodes.

Extra corner leads can be set to –1, 0 or +1, by pressing <Space> and selecting an option from the list. The three options are used as follows:

```
-1
 0
+1
```
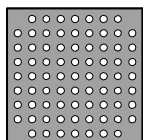
–1 is used if there are no leads in the matrix corner nodes as shown in the figure.
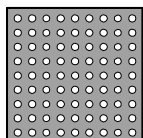
0 is used if there are no extra corner leads outside the filled matrix, or omitted leads in the matrix corner.
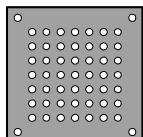
+1 is used if there are extra corner leads outside the filled matrix as shown in the figure.

Leads per row in hole, Leads per column in hole

Number of leads in a row/column that is not filled. These fields are set to 0 for a filled matrix.
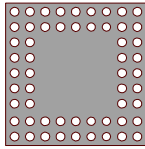
The package in this figure is set to:

```
            Leads per row: 5
         Leads per column: 5
```

Lead type

Press <Space> in this field to get a popup menu with the available options:

```
CBGA
PBGA
CGA
```

Select an option depending on the BGA type:

CBGA if a bright bump is surrounded by a darker ring on a bright body (white ceramic BGAs only).

PBGA if the bump is brighter than the surrounding body (mostly BGAs with dark body).

CGA if the bump is darker than the surrounding body.

Lead types are further detailed on page 5-67.

Lead pitch

Center-to-center distance between the leads in the rows and the columns ('P' in the figure).
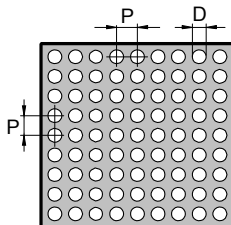
For staggered lead patterns the lead pitch is measured between two leads in the same row or column, see page 5-45.

Note that this staggered lead pitch is twice as big as the staggered lead pitch in the *Generic BGA package* (page 5-50) for the same pattern. To be considered if converting between these package types.

Lead diameter

The diameter of the leads as seen by the vision system. The visible part of the bump depends upon the chosen illumination setting.
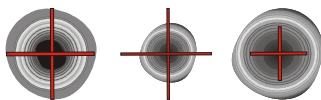
The Linescan camera lacks Dark Field illumination. As a rule of thumb, the diameter should be set to approximately 2/3 of the physical bump diameter (D).

Max lead displacement

Maximum accepted distance deviation between the centers of the leads. Entering zero turns the check off.

Generic BGA package
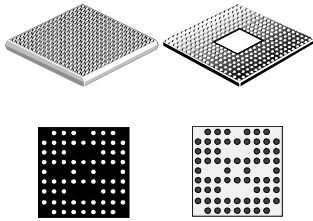
This package type is used for any package type with ball grid array connection, which can be called for instance BGA (Ball Grid Array), SGA (Solder Grid Array) and LGA (Land Grid Array).

Any package with circular shaped leads (bumps), such as CSP, CS-BGA or FC, may be set up as a BGA package. It is required that the leads can be recognized as PBGA, CBGA or CGA (bright bump on dark body, or vice versa), which is further described on page 5-47.

This package type is programmed graphically and any lead patterns with a regular pitch can be programmed.

Packages with staggered lead patterns can be created in, or converted to, *BGA package* (page 5-44) and then be further edited in this package type editor.

For lead patterns with an irregular lead pitch the package can be converted to, and further edited as, a *Generic* package type (page 5-60).

The package type box is shown in Figure 5-12.

Function keys in this package window:

Edit pattern

By pressing <F1> the generic BGA editor is set in editing mode (page 5-50).

Change package type

To change to another package type, press <F7>. Package type selection is detailed on page 5-66 and the lead types are described on page 5-67.

Exit

Press <Esc> if you want to exit this window and return to the main Package List Editor (page 5-3).

```
                                   F1   Edit pattern
                                   F7   Change package type


     10    6    2                        Editing symmetry:
   12    8    4                                None

  oooooooooooooo  A                      View: Bottom
  oooooooooooooo  B                      Size: 14  x 14
  oooooooooooooo  C                      No. of leads: 196
  oooooooooooooo  D
  oooooooooooooo  E                      Position:   - -
  oooooooooooooo  F                      Offset:
  oooooooooooooo  G                      -6.500mm/ 6.500mm
  oooooooooooooo  H
  oooooooooooooo  I              Package: BGA169-14x14-1.0
  oooooooooooooo  J              Generic BGA package
  oooooooooooooo  K                     Lead type: PBGA
  oooooooooooooo  L                 X-wise pitch: 1mm
  oooooooooooooo  M                 Y-wise pitch: 1mm
  oooooooooooooo  N               Lead diameter: 0.54mm
                               Max lead displacement: 0.2mm

                                    Brian                13:12
```
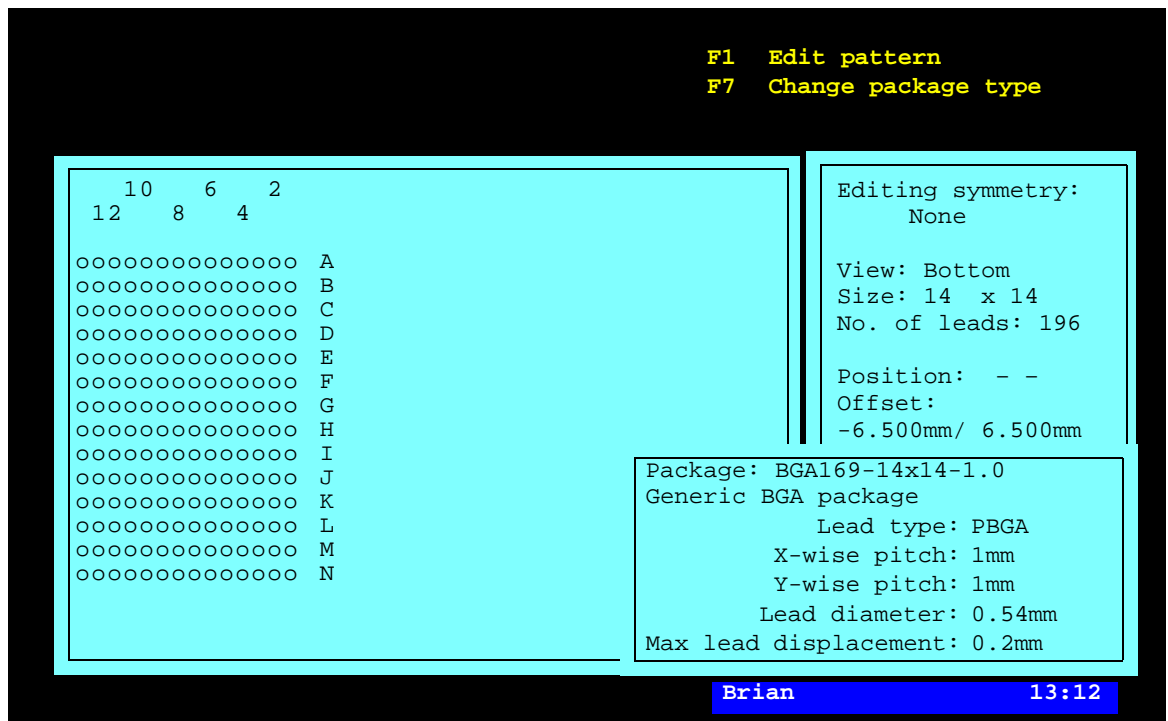
Figure 5-12. Generic BGA package

Entries in the package type window:

Lead type

Press <Space> in this field to get a popup menu with the available options:

```
CBGA
PBGA
CGA
```

Select an option depending on the BGA type:

○   *CBGA* if a bright bump is surrounded by a darker ring on a bright body (white ceramic BGAs only).

●   *PBGA* if the bump is brighter than the surrounding body (mostly BGAs with dark body).

●   *CGA* if the bump is darker than the surrounding body.

Lead types are further detailed on page 5-67.
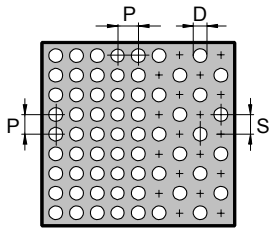
X-wise pitch, Y-wise pitch

Center-to-center distance between the leads in the rows and in the columns.

For staggered lead patterns the *X-wise pitch* and/or *Y-wise pitch* is measured between two nodes in the pattern grid (S), no matter if there are leads in the nodes or not.

Note that this staggered lead pitch is half of the staggered lead pitch in the *BGA package* (page 5-47) for the same pattern. To be considered if converting between these package types.

Lead diameter

The diameter of the leads as seen by the vision system. The visible part of the bump depends upon the chosen illumination setting. As a rule of thumb, the diameter should be set to approximately 66% of the physical bump diameter (D).

Max lead displacement

Maximum accepted distance deviation between the centers of the leads.

Entering zero turns the check off.

Editing mode

By pressing <F1> in the opening window, the generic BGA editor is set in editing mode, see Figure 5-13.

Desired row letters can be omitted in the lead pattern, see page 5-57.

Function keys in the editing mode:

Help

By pressing <F8> the editing commands are shown, see page 5-54.

Exit

Press <Esc> if you want to exit the editing mode and return to the opening window (page 5-49).
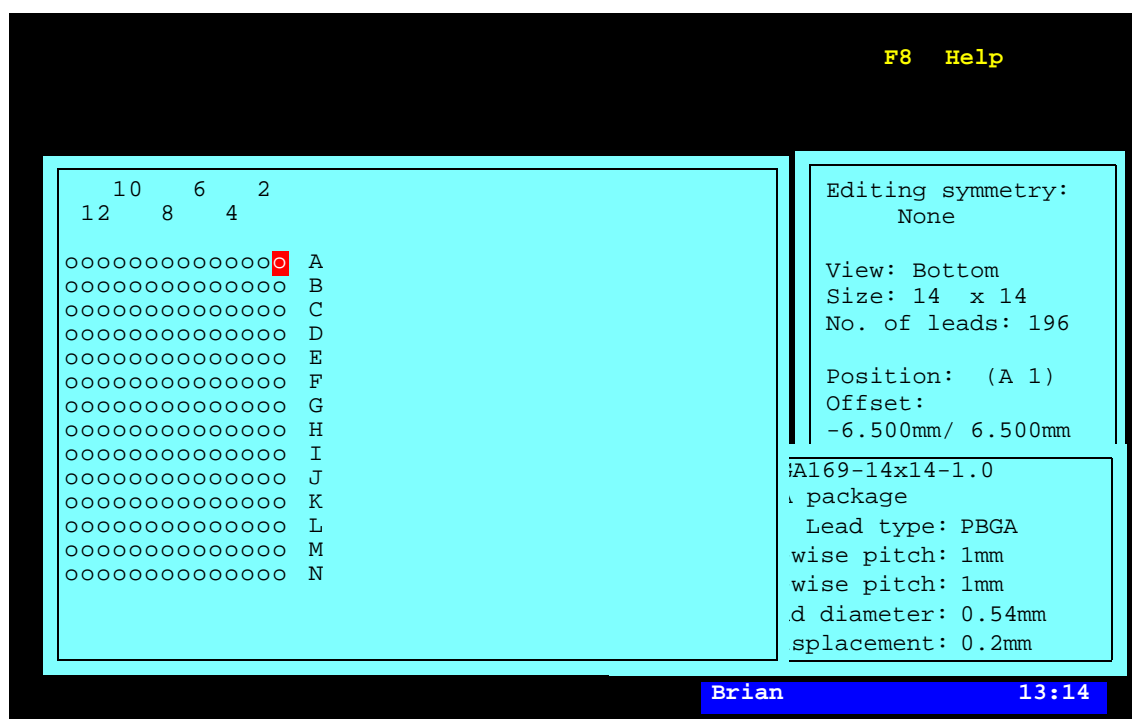
Figure 5-13. Generic BGA package

Entries in the editing mode:

Editing symmetry

Shows the currently selected editing symmetry, that is *None*, *Horizontal*, *Vertical*, *Fourfold* or *Eightfold*.

You can change the editing symmetry by pressing <F1>.

Editing symmetry is further described in the editing command section, see page 5-54.

View

Shows the currently selected view, which can be either *Bottom* or *Top*, that is bottom or top view of the component and PCB pattern.

You can mirror the view horizontally by pressing 'h' or vertically by pressing 'v.' You can also rotate the pattern by pressing <F3> or <F4>.

The view control is further described in the editing command section, see page 5-54.

Size

Number of rows and columns for the lead pattern. Note that even rows and columns without leads are included.

You can add rows by pressing 'I' and columns by pressing 'i.'

The size is further described in the editing command section, see page 5-54.

No. of leads

Number of leads in the lead pattern.

This value is changed if you toggle the cursor position, or a selected number of positions, between leads and empty nodes by pressing <Space>.

Setting and clearing leads is further described in the editing command section, see page 5-54.

Position

Indicates the cursor position in the pattern with a letter and a number.

From column number 10, the column number is always read at the last digit, for instance column 14 is the column under '4' in 14.

```
                                    F8   Help


      10    6    2
   12     8    4

  .....oooo.....  A          Editing symmetry:
  .....oooo.....  B              None
  .....oooo.....  C
  ....oooooo....  D          View: Bottom
  ...oooooooo...  E          Size: 14  x 14
  oooooooooooooo  F          No. of leads: 122
  ooooo....ooooo  G
  ooooo...oooooo  H          Position:  (E 11)
  oooooooooooooo  I          Offset:
  .....ooooooooo  J            3.500mm/ 2.500mm
  ....oooooooooo  K
  ..oooooooooooo  L         A169-14x14-1.0
  ....oooooooo..  M          package
  ....oooooooo..  N           Lead type: PBGA
                            wise pitch: 1mm
                            wise pitch: 1mm
                            d diameter: 0.54mm
                            splacement: 0.2mm

                            Brian            13:16
```

Figure 5-14. Generic BGA package, editing mode

Offset

The current X and Y distances between the lead pattern origin and the cursor. Figure 5-15 shows the offset values for the cursor position illustrated in Figure 5-14 that has a lead pitch of 1mm.
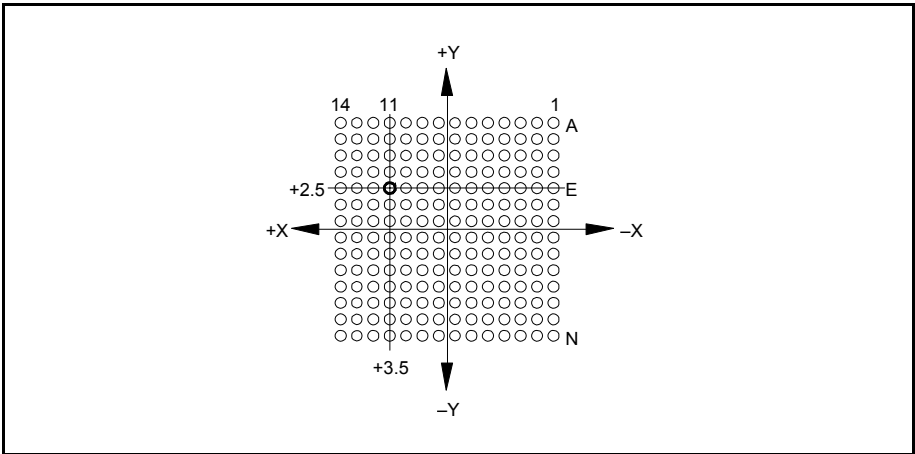
Figure 5-15. Generic BGA offset

In Figure 5-15, the pattern origin is located in the center of the lead pattern, but it can be set at any position by pressing <F2>.

Lead pattern origin setting is further described in the editing command section, see page 5-54.

Editing commands

By pressing <F8> in the editing mode the following editing command box is shown:

```
F1              Change editing symmetry
F2              Set offset
F3, F4          Rotate view
Space           Toggle lead
Ins             Set lead
Del             Clear lead
Shift+Arrow keys Select
I               Insert row
i               Insert column
D               Delete row
d               Delete column
h               Mirror view horizontally
v               Mirror view vertically
                    OK
```

Command description:

Change editing symmetry

F1

By pressing <F1> you can select the following editing symmetries:

```
None
Horizontal
Vertical
Fourfold
Eightfold
```

- **None**

  No editing symmetry.
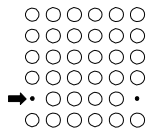
- **Horizontal**

  If you change a position in the lead pattern (at the arrow in the figure), then the corresponding position in the other horizontal half of the pattern will be changed automatically.
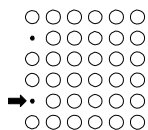
- **Vertical**

  If you change a position in the lead pattern (at the arrow in the figure), then the corresponding position in the other vertical half of the pattern will be changed automatically.
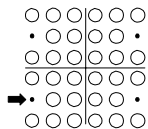
- **Fourfold**

  If you change a position in the lead pattern (at the arrow in the figure), then the corresponding positions in the rest of the four quadrants of the pattern will be changed automatically.
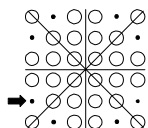
- **Eightfold**

  If you change a position in the lead pattern (at the arrow in the figure), then the corresponding positions in the rest of the eight octants of the pattern will be changed automatically.

  This option is only available if there are equal number of rows and columns in the pattern.

Set offset

By pressing <F2> you can either set the pattern origin offset from the current lead, or set the pattern origin to the center of the pattern. The following dialog box is shown:

```
Set offset for lead ( (E    3.500mm/ 2.500mm
11)
 <F2> Set origin to center
```
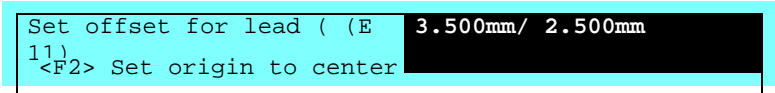
– If you want to set the pattern origin by entering the offset from the current cursor position, then type the X/Y values in this box.

– If you want to set the pattern origin to the center of the pattern, then press <F2> again.

Note that all rows and columns are included when the pattern origin is calculated, leads as well as nodes without leads.

Figure 5-16 illustrates what happens if empty rows or columns are included when setting the pattern origin to center by pressing <F2>.
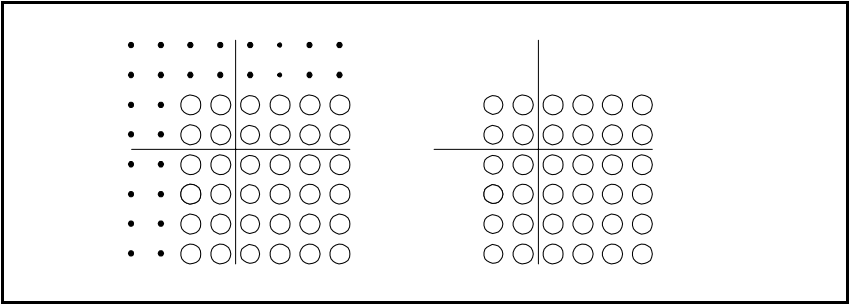
Figure 5-16. Set origin to center

In the left figure, origin is set to center. In the right figure all empty rows and columns are removed and the origin, which will be positioned in the middle of the component footprint on the PCB, is incorrect positioned.

Rotate view

By pressing <F3> or <F4> the pattern is turned by 90° clockwise or counter-clockwise.

Toggle lead

Toggles the cursor position, or a selected number of positions, between leads and empty nodes.

Set lead

Sets the cursor position, or a selected number of positions, to leads.

Clear lead

Clears the cursor position, or a selected number of positions, from leads.

Select

By pressing <Shift> + any of the arrow keys, a number of positions are selected in the arrow direction. The selected positions can then be:

– toggled between leads and empty nodes.

– set to leads.

– cleared from leads.

If *Editing symmetry* is selected to *Horizontal*, *Vertical*, *Fourfold* or *Eightfold*, then positions cannot be selected across the symmetry borders.

Insert row

The 'I' key inserts new rows at the cursor, which can be moved below the last row to be able to add new rows in the end of the pattern.

Insert column

The 'i' key inserts new columns at the cursor, which can be moved to the left of the first column to be able to add columns in the left end of the pattern.

Delete row

The 'D' key deletes the row on which the cursor is placed.

Delete column

The 'd' key deletes the column in which the cursor is placed.

Mirror view horizontally

The 'h' key flips the pattern horizontally, that is the left end becomes the right end, and vice versa. The View field is changed between *Bottom* and *Top* every time this action is performed.

This feature makes it possible to get a top view or bottom view of the component and PCB pattern.

Mirror view vertically

The 'v' key makes the same as the previous option, but it flips the pattern vertically, that is the upper end becomes the lower end, and vice versa.

Parameters involved

Letters to be omitted as row letters can be entered in the following parameter, found in the *0234 Desktop* parameter group:

0234.0202 Not used characters in coordinates

If you enter 'ace' in this parameter, then the pattern rows will be: B D F G ...

Outline package
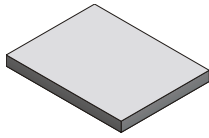
This package type is used only for centering using the outline of the package. This package type may also be used for rectangular packages other than flip-chips.

The package type box is shown in Figure 5-17.

Function keys in this package window:

Change package type

To change to another package type, press <F7>. Package type selection is detailed on page 5-66 and the lead types are described on page 5-67.

Exit

Press <Esc> if you want to exit this window and return to the main Package List Editor (page 5-3).

Entries in the package type box:

Length of substrate
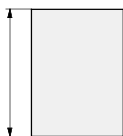
The substrate total length measured in the Y coordinate of the machine with the component oriented in 0°.

Width of substrate

The substrate total width measured in the X coordinate of the machine with the component oriented in 0°.

Figure 5-17. Outline package

Edge point pitch
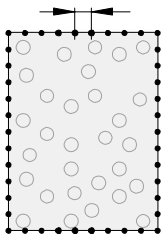
The center-to-center spacing of imaginary measuring points along the substrate sides, which are used to determine the position and orientation of the component.

You can try with an average number of ten points along each substrate side, that is two side lengths divided by twenty (in the above example: 13.8mm plus 8mm divided by 20 equals 1.1mm).

Max edge unlinearity
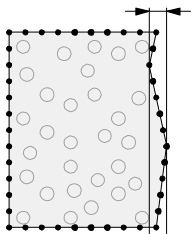
Maximum accepted non-linearity for the measuring points along a side. The measuring resolution is 70μm or better.

Generic
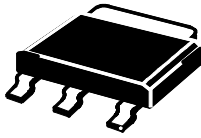
This package type is used for packages for which the previous lead configurations are not applicable.

Example: SOT-223.

A description of how to program a BGA package is found on page 5-64.

The package type window is shown in Figure 5-18.

Function keys in the package type window:

Edit lead group

By pressing <Enter> the highlighted package type can be modified.
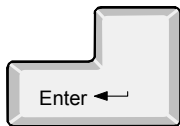
Insert new

A new package type is added to the package type list by pressing <Ins>.

Delete

The highlighted package type is deleted by pressing <Del> and confirming the deletion in a popup box.

Change package type

To change to another package type, press <F7>. Package type selection is detailed on page 5-66 and the lead types are described on page 5-67.

Exit

Press <Esc> if you want to exit this window and return to the main Package List Editor (page 5-3).
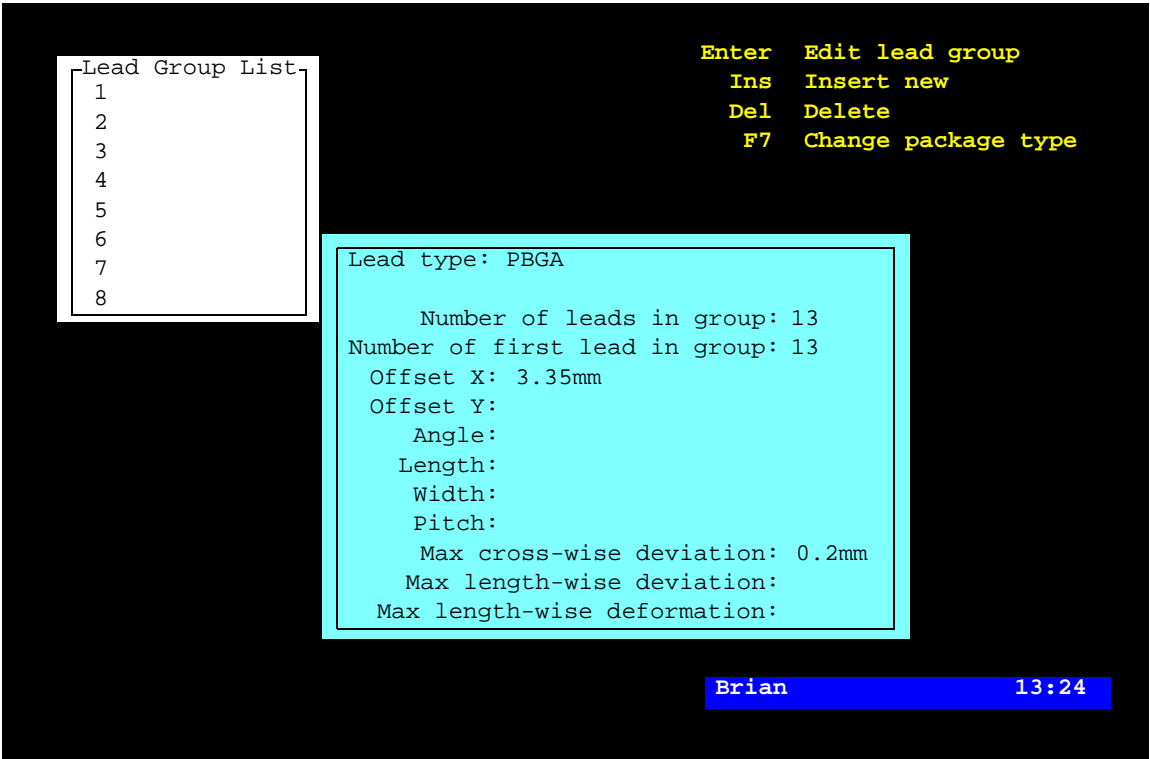
Figure 5-18. BGA package

Entries in the package type window:

Lead Group List

A four lead group component.

Number of lead groups on the package. A lead group is a row of evenly spaced and shaped leads. The numbering sequence is shown in the figure.
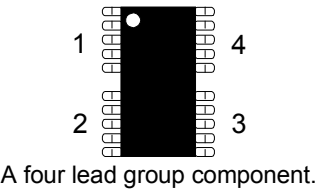
Each lead group is represented by a line in this box. Use the arrow keys to select lead group.
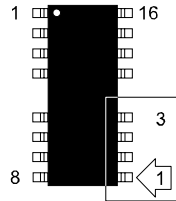
Lead type

The lead type of the current package.

Press <Space> in this field to get a popup menu with the available options further detailed on page .
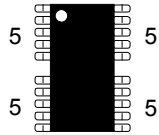
Number of leads in group

Number of leads in the lead groups.

Number of first lead in group

The lead number which is selected as the first lead in the lead group.

The figure illustrates a package for which lead 9 is defined as the first lead in lead group 3.
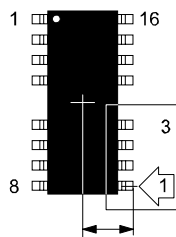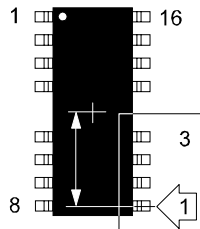
Offset X

The distance between the center of the component and the tip of the lead previously defined as the first lead in the group.

The component oriented in 0° and the measurement in the X coordinate of the machine.

Leads are by default defined as pointing outwards from the center of the package body. Therefore even for J-Bend leads the tip of the lead is considered to be the outer edge.
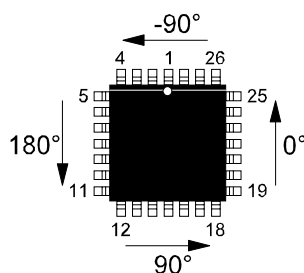
Image of Offset X for a PLCC

Offset Y

The distance between the center of the component and the center line of the lead defined as the first lead in the group.

The component oriented in 0° and the measurement in the Y coordinate of the machine.
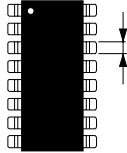
Angle

The angle of the selected lead group.

Allowed angles are 0°, 90°, 180°, and –90° (270°).

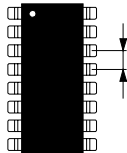The lead group angle is determined by the direction of ascending lead numbers in the group.

The upper lead group in the figure has the group angle –90° as the increasing lead numbers 26 – 28 and 1 – 4 point towards –90°.

Length

The length of the leads measured from the package body to the lead tip.

Width

The width of the leads.

Pitch

The c/c distance between the leads in the group.

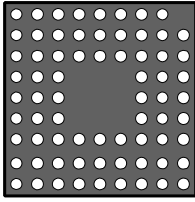### Max cross-wise deviation

See the description on page 5-68.

Max length-wise deviation

See the description on page 5-68.

Max length-wise deformation

See the description on page 5-69.

Programming Example, Generic


BGA71-9x9 (bottom view).

This section contains a description of how to program a BGA by using generic programming. The example is a BGA71-9x9 that has a lead pattern like in the figure.

The package is programmed in the following steps, further detailed below:

- Collecting package data.
- Choosing the most similar preprogrammed package.
- Editing the basic package data.
- Removing the single corner lead.

Collecting package data

Collect available basic package data from the data sheet regarding the BGA to be programmed, for instance number of leads, rows, columns, and lead pitch. Or, calculate the package data as follows:
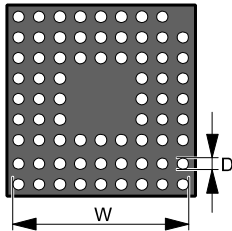
1. Measure the lead bump diameter ('D' in the figure).

2. Measure the total width over as many leads as possible (W). Measure from outside edge to outside edge of the leads.

3. Count the number of leads (N_L) within the measured length (W).

**4.** Calculate the lead pitch from the following equation:

$$\frac{W - D}{N_L - 1}$$

5. Round off the calculated value as pitch normally is an even multiple of 1/10mm or mil, for instance 1.00mm or 1.27mm.

Choosing the most similar preprogrammed package

6. In the Package List (see page), choose that package which is most similar to the package to be programmed.

   This figure shows the BGA81-9x9 package, which is the most similar type to the new package in this example.
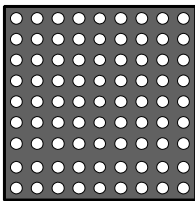
Preprogrammed BGA81-9x9.

7. Press <Ins> and enter a name for the new package, which now has inherited all data from the selected package.

Editing the basic package data

8. Edit, if necessary, the main package data, such as centering data (<F6>), centering phases (<F8>) and glue data (<F9>).

9. Open the *Edit lead groups* window by pressing <F7>.

**10.** Edit, if necessary, the data according to the measurements above.
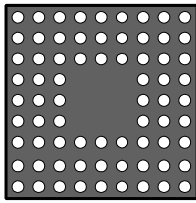
3x3 leads omitted.

11. Set the *Leads per row in hole* and Leads per column in hole to 3 as three times three leads are omitted in the lead matrix.

Only the omitted lead in the corner is now left to program.

12. If *Max lead displacement* is to be used, then enter the value now. Otherwise, it will need to be edited several times later.

Removing the single corner lead
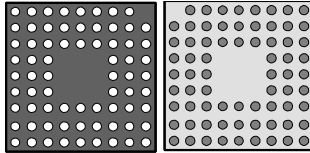
Bottom view.Top view.

To be able to remove the corner lead, the current BGA lead group has to be converted to *Generic*. TPSys will scan the lead matrix and transform the result to a number of lead groups. To be able to identify these lead groups the package has to be viewed from the top, see the figure.

13. In the lead group editor, press <F7> and select the Generic group (see page 5-66).

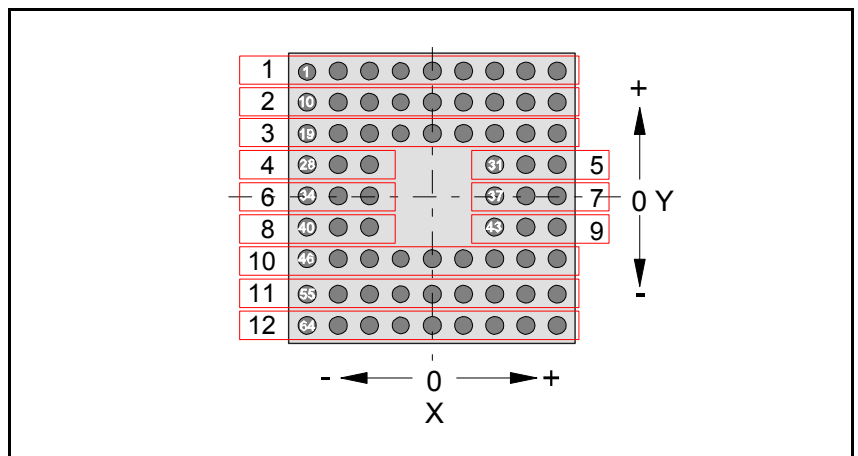Now, 12 lead groups will be identified, see Figure 5-19.

Figure 5-19. Identified lead groups (top view)

14. Adjust *Number of leads in group* and *Offset X* for the first lead in lead group 1 as follows:

Number of leads in group: 8

Offset X: +1 lead distance

Number of leads in group has to be changed from 9 to 8 for lead group 1 as the first lead is omitted.

Offset X for lead 1 in lead group 1 has to be changed by one lead distance in positive X direction, see Figure 5-19, as the previous lead 2 now is lead 1.
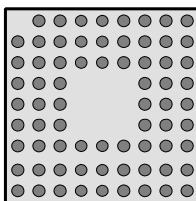
The new package is now completed. During the transformation from BGA to *Generic* the *Lead diameter* was transformed to *Length* and *Width*. And, so was the *Max lead displacement* transformed to *Max cross-wise deviation* and *Max length-wise deviation*.

Any lead pattern can be programmed in this way.

Selecting Package Type

F7

To select another package type for a package, press <F7> in any of the package type windows (see the previous sections) and select another package type in the following menu:

```
               ─── Package Types ───
      Two pole package
      Three pole package
      Two symmetric lead groups
      Four symmetric lead groups
      Two plus two symmetric lead groups
      Four lead groups on two sides
      BGA package
      Generic BGA
      Outline package
      Generic
```

☞ *Current package type information that does not match the new package type is deleted when saving as a new package type.*

Current package type information that matches the new package type is converted when saving as a new package type.
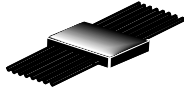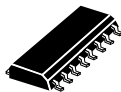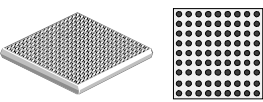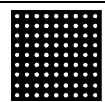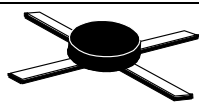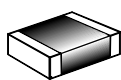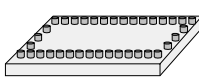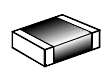
When selecting *Generic*, all current package type information is converted when saving as a new package type.

Lead Types

An appropriate lead type is selected by pressing <Space> in the *Lead type* field of a package type window (see the previous sections) and selecting a lead type in the menu shown:

```
J-BEND
FLAT
GULLWING
LEADLESS
CBGA
PBGA
I-LEAD
CHIP
CGA
SMALL-CHIP
```

The lead types are described below.

Lead type	Package	Description
J-BEND		For rectangular leads that reflect light unevenly, for instance curved lead tips.
FLAT		For rectangular leads that reflect light evenly. Gullwing lead type works also for these types of leads.
GULLWING		At least 2 leads are required in each lead group. For optical centering.
LEADLESS		The leads are at the same level as the body and they do not extend outside the package body.
CBGA		Ball grid array on white ceramic body (Ceramic Ball Grid Array). Also called SGA (Solder Grid Array) and LGA (Land Grid Array). The body is brighter than the leads.
PBGA		The same package as CBGA but PBGA has a (plastic) body darker than the leads.
I-LEAD		Leads with non-circular or rectangular shape.
CHIP		Chip components such as 0201 – 1210.
CGA		Column Grid Array. Can also be used for BGA packages. Used if the leads are darker than the surrounding body.
SMALL-CHIP		For use with the Hydra camera. If using an LSC or DVC select CHIP lead type instead

Max cross-wise deviation

The cross-wise deviation is defined in most of the package type windows (see the previous sections).

This value indicates the maximum accepted cross-wise placing deviation of the leads. 'Cross-wise' is related to the lead center lines. The cross-wise deviation is marked 'x' in Figure 5-20. The lead edge center must be placed within this distance.

Cross the lead center lines.

The shaded area in Figure 5-20 show the land pattern on the PCB, with the lead contact area placed ideally centered on it.
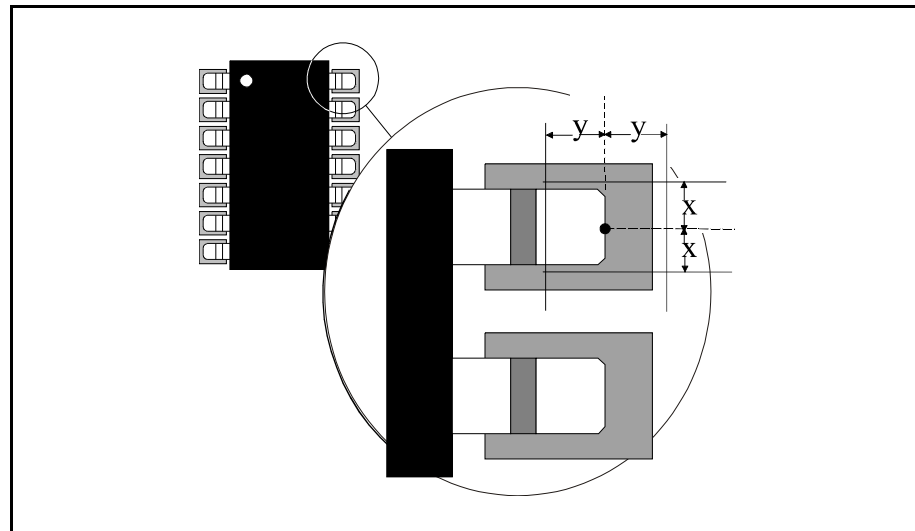
Figure 5-20. Cross-wise and length-wise deviation

Max length-wise deviation

This value indicates the maximum accepted length-wise placing deviation of the leads. 'Length-wise' is related to the lead center lines. The length-wise deviation is marked 'y' in Figure 5-20. The lead tip edge center, indicated black in the figure, must be placed within this distance.

Along the lead center lines.

The cross-wise and length-wise deviations demarcate the area in which the lead tip center must be encircled.

Max length-wise deformation

The length-wise deformation is defined in most of the package type windows (in the previous sections).

Length-wise the lead group axis.

This value indicates the maximum accepted length-wise deformation of the leads, caused by cut or bent leads, see the upper part of Figure 5-21. 'Length-wise' is related to the lead group axis.
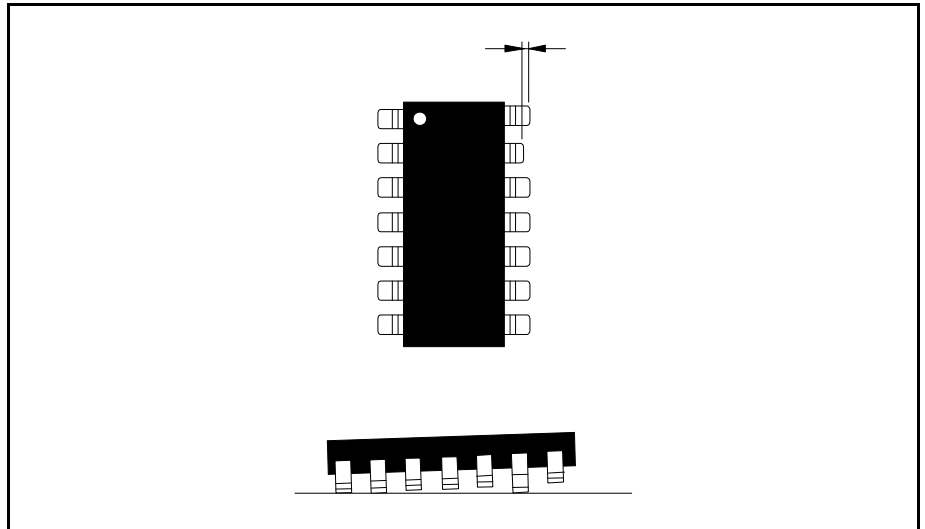
Figure 5-21. Max length-wise deformation

Note that a deformation caused by a bent lead also affects the height of the lead, which is shown in the lower part of the figure.

If length-wise deformation is set to '0' then the feature is off, that is no consideration will be taken to the deformation.

Centering Phases

By pressing <F8> in the main Package List Editor (page 5-3), a centering phase window, containing information about mechanical centering and mechanical/electrical verification, is opened.

The centering phases window is shown in Figure 5-22.

Function keys in the centering phases window:

Enter

By pressing <Enter> the highlighted centering phase can be modified.
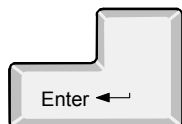
Ins

A new centering phase is added to the centering phase list by pressing <Ins>. Maximum eight centering phases can be used.

Del

The highlighted centering phase is deleted by pressing <Del> and confirming the deletion in a popup box.

Exit

Press <Esc> if you want to exit this window and return to the main Package List Editor (page 5-3).

```
Centering phases            * PACKAGE LIST EDITOR *

 1                              Enter   Edit centering phase
 2                              Ins     Insert new
                                Del     Delete

                Package: 1206-06
                 Method: Mechanical
                  Angle: 90.00°                      Level:
               Position: Upper
                  Force: Middle
 0805-10      Dimension: 3.2mm        Min.: 3mm         Max.: 3.4mm
 1005-07             Verify mechanical: Yes
 1206-06             Verify electrical: Yes
 1206-12               OVC light level: ---%
 1206-16
 1210-07      ---- DVC Illumination ---------- LSC Illumination ----
 1210-12        Light level: ---            Light level: ---%
 1505-10            Pattern: ---                Pattern: ---
 1805-07                  Rel.  Abs.                    Rel.  Abs.
 1812-07        Dark field: ---% ---%  Ambient light: ---%   ---%
 1812-12     Ambient light: ---% ---%   Front light: ---%   ---%
 1812-15      Front light: ---% ---%
                                          Brian                 13:36
```

Figure 5-22. Centering phases

Entries in the centering phase window:

Centering phases

Number of centering phases for the package.

Up to eight centering phases can be used. Use the arrow keys to select centering phase.

Package

The selecte package.

Method

Choose centering method by pressing <Space>. The following options are available:

Optical
> Optical centering using the vision system.

Mechanical
> Mechanical centering using the jaws.

Angle

The component angle during the centering phase.

The centering angle and electrical verification is further described in Chapter 3.
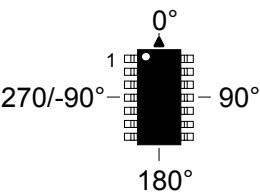
Level

Centering level is a value between 1 and 12 indicating a height level on the centering jaws where components are mechanically centered and electrically verified. Different height levels provide different touch points between the component and the jaws for different lead configurations and measurements.

Figure 5-23 shows ten of the twelve levels.
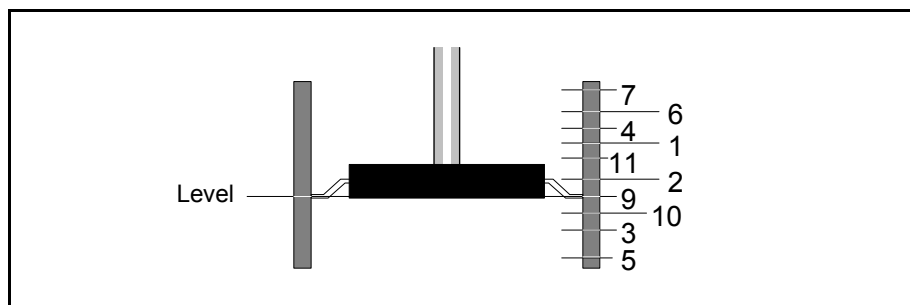
Figure 5-23. Centering jaw levels

The centering level is further detailed in Chapter 3.

Position

The component position code indicates which part of the component will be at the centering level.

Press <Space> and choose position code from the popup menu shown:
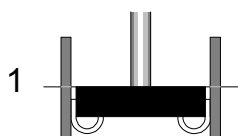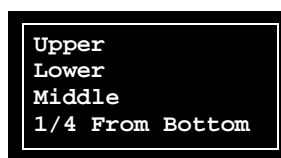
Upper
> The upper edge of the component ('1' in the figure).
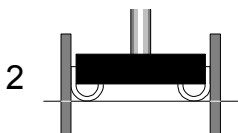
Lower
> The lower edge of the component (2).
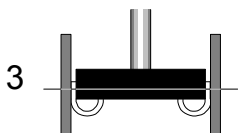
Middle
> The middle of the component (3).
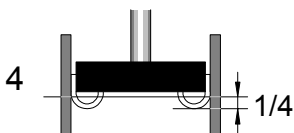
1/4 From Bottom
> A quarter way from the bottom of the package to prevent burring/flashing interfering with the centering/measurement of certain packages (4).

Force

The force applied to the jaws when centering.

Press <Space> and choose centering force from the popup menu shown:

```
High
Middle
Low
No
```

High

> High centering force.

Middle

> Medium centering force.

Low

> Low centering force.

No

> No centering force.

Dimension

The mechanical centering dimension with respect to the information indicated in the *Level* and *Position* fields.
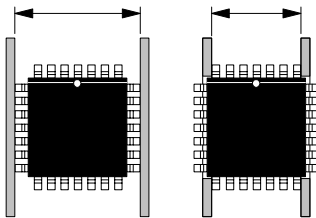
The component can be either centered overall, as shown in the left part of the figure, or fitted into the jaw recesses so that centering can be carried out unaffected by the body or other leads as shown in the right part of the figure.

Nominal, minimum (*Min.*) and maximum (*Max.*) values can be defined.

For optical centering the maximum value is compared to the *0053/0054/0055/0056.0461 Component dimension limit* parameter. If Max. is larger than the parameter value, then the system examines the component from two dual shot images. This is, however, not applicable to centering camera OVC1.

Verify mechanical

Yes – Components are verified mechanically and rejected if they do not meet the tolerance requirements.

No – Components are not verified mechanically in this centering phase.

To toggle between *Yes* and *No*, press <Space>.

Verify electrical

Yes – Electrical verification is performed in this centering phase provided that the verification is specified with a matching angle, and that the verification has not been already performed in a previous centering phase. Components are rejected if they do not meet the tolerance requirements.

No – No electrical verification is performed in this centering phase.

To toggle between *Yes* and *No*, press <Space>.

OVC light level

The luminance level in optical centering camera systems with only one illumination group (OVC and EVC1 – 2).

Select illumination intensity by entering a number between 0% and 100%, where 0% stands for no illumination. The light is not changed continuously but in 8 steps (including 0), each step corresponding to approximately 14%.

The *OVC light level* field can only be changed when the *Method* field is set to *Optical*.

The Package List can be shared by several machines in networks. And, these machines can be equipped with different centering cameras. Because of that, this field as well as the below fields for programmable illumination should be set.

DVC Illumination, LSC Illumination

Current optical centering systems use cameras with several illumination groups. This gives the possibility to optimize the illumination of each package depending on the package shape, color and other optical characteristics.

Illumination is set in the same way for both DVC and Linescan cameras. First the overall light intensity is set using the fields called *Light level*. The illumination of each group is then set by choosing an illumination pattern or by defining the illumination manually for each illumination group. *DVC* have three illumination groups: *Dark field*, *Ambient light*, and *Front light*.

Linescan have two illumination groups: *Ambient light* and *Front light*.

Pattern

A number of predefined illumination patterns for different packages can be selected from a popup menu shown by pressing <Space> when this field is highlighted:

```
Generic
Standard
QFP
BGA
CBGA
MBGA
Flip Chip
Outline
```

Generic

> The three relative light fields are accessed and a customized pattern can be programmed.

Standard

> Equivalent to the previous optical centering cameras with only one illumination group.

QFP

> For QFP and similar packages with typical lead types *GULLWING* or *J-BEND*.

BGA

> For BGA and similar packages. A typical package type is *PBGA*.

CBGA

> Ceramic BGA. A typical package type is *CBGA*.

MBGA

> Metallic BGA. A typical package type is *CGA*.

Flip Chip

> For flip-chip packages with mirror-like surface. A typical package type is *PBGA*.

Outline

> For locating the outline of a component with package type *Outline package*.

Guidelines for setting the best illumination pattern is found on page .

Dark field – Rel.

The relative dark field level, that is the light level from the LED group generating light with an oblique incidence to the package, see Figure 5-24.

This field can only be edited when the *Generic* pattern is selected.
.
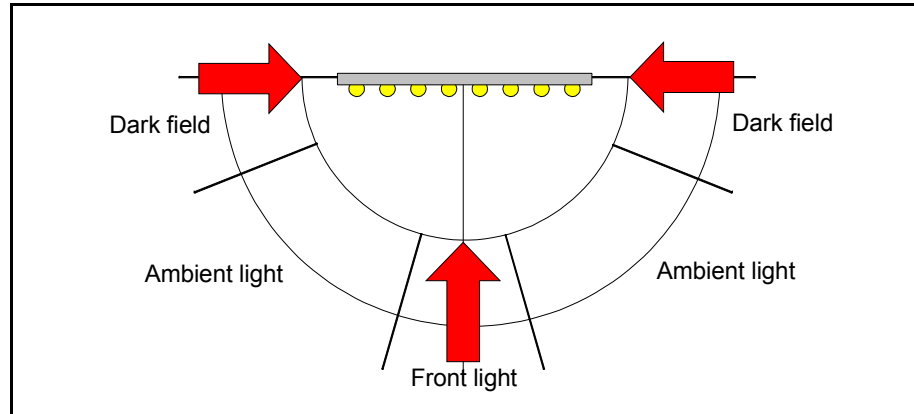
Figure 5-24. Programmable illumination

Ambient light – Rel.

The relative ambient light level, that is the luminance level from the LED group generating the general background light, see Figure 5-24.

This field can only be edited when the *Generic* pattern is selected.

Front light – Rel.

The relative front ligt level, that is the light level from the LED group generating light from the front with a normal incidence to the package, see Figure 5-24.

This field can only be edited when the *Generic* pattern is selected.

Dark field, Ambient light, Front light – Abs.

The absolute light level, that is the actual light level generated by each LED group calculated from the relative values multiplied with the overall light level.

Example: If the *OVC light level* is set to 50% and the *Front light – Rel.* is set to 10%, then the *Front light – Abs.* will be 5% (50% multiplied by 10%).

Guidelines for Programmable Illumination

The purpose of the programmable illumination is to bring out the image of the leads and supress of the features such as wiring.

- The best lead information is often achieved by keeping the image somewhat dark.

- Use a low front light level for packages with a glossy body.

- Try to get a homogeneous image of the leads. If the image of a lead is bright except for a dark 'hole' in the center, then the front light level is set too low.

- If the leads in the image seems too small, then increase the dark field level.

- If BGA packages are to be centered by both LSCs and DVCs, try to achieve an illumination with the DVC that is equivalent to the LSC illumination. You can achieve this by using only ambient light.

  The bump diameter should be the bump diameter shown with this illumination, or about 2/3 of the real one.

Glue Dots

By pressing <F9> in the main Package List Editor (page 5-3), a glue dot window, containing information about the glue dots for the selected package, is opened.

The Glue Dot Editor is shown in Figure 5-25.

Function keys in the Glue Dot Editor:

Edit glue data

By pressing <Enter> the highlighted glue dot can be modified.
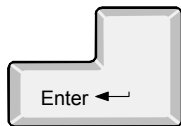
Insert new

A new glue dot can be added to the glue dot list by pressing <Ins> and selecting a glue dot from the Glue Dot List, which is opened by entering the first characters of the glue dot name and pressing <Enter>, or by simply pressing <Enter>.

Delete

Highlighted glue dot is deleted by pressing <Del> and confirming the deletion in a popup box.

Exit

Press <Esc> if you want to exit this window and return to the main Package List Editor (page 5-3).

Entries in the Glue Dot Editor:

Glue Dot Data

This box contains dot numbers, dot names, and positions for the glue dots of the selected package.

Use the arrow keys to select glue dot.

The *Dot-0.8mm* and *Dot-1.5mm* glue dots in Figure 5-25, are defined in the *Glue Dots* section in Chapter 5.

```
                        * PACKAGE LIST EDITOR *
             ┌────────Glue Dot Data─────────────┐         ┌──────────────────
             │ 1:       Dot-0.8mm @  -4.5mm/ 9mm │         Enter   Edit glue data
             │ 2:       Dot-1.5mm @   4.5mm/ 9mm │         Ins     Insert new
             │ 3:       Dot-1.5mm @  -4.5mm/-9mm │         Del     Delete
             │ 4:       Dot-0.8mm @   4.5mm/-9mm │
             │                                   │
             │                                   │
             └───────────────────────────────────┘

                                             ┌──────────────────────────────┐
                                             │ Glue dot position: -4.5mm/ 9mm │
                                             │      Glue dot type: Dot-0.8mm  │
                                             └──────────────────────────────┘
                                             Brian                      13:38
```

Figure 5-25. Glue dots

Glue dot position

Shows the selected glue dot position in X/Y coordinates from the center of the component to the center of the glue dots. The component in 0 degrees.

Glue dot type

The selected glue dot name.

Example

Figure 5-26 shows the glue dots displayed in Figure 5-25, and the component outline.
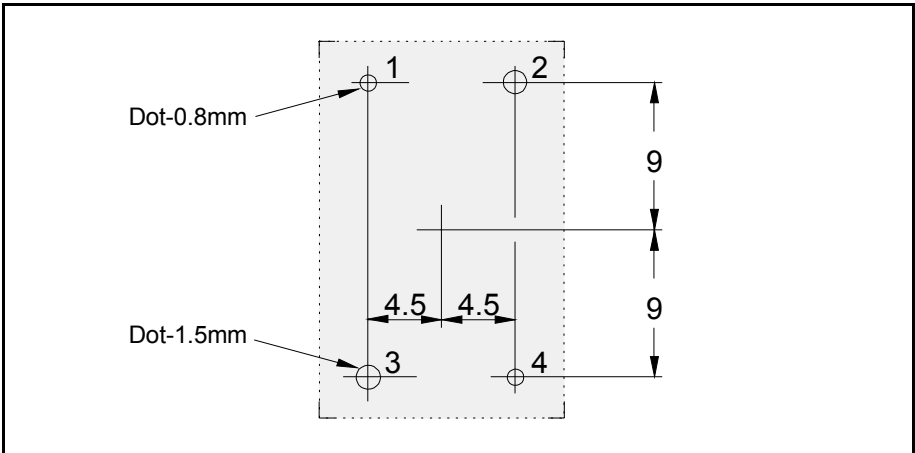
Figure 5-26. Glue dots in a component outline

6. Magazine Lists

To be able to mount a PCB, four mandatory main lists (or list groups) are required:

- **Component List**

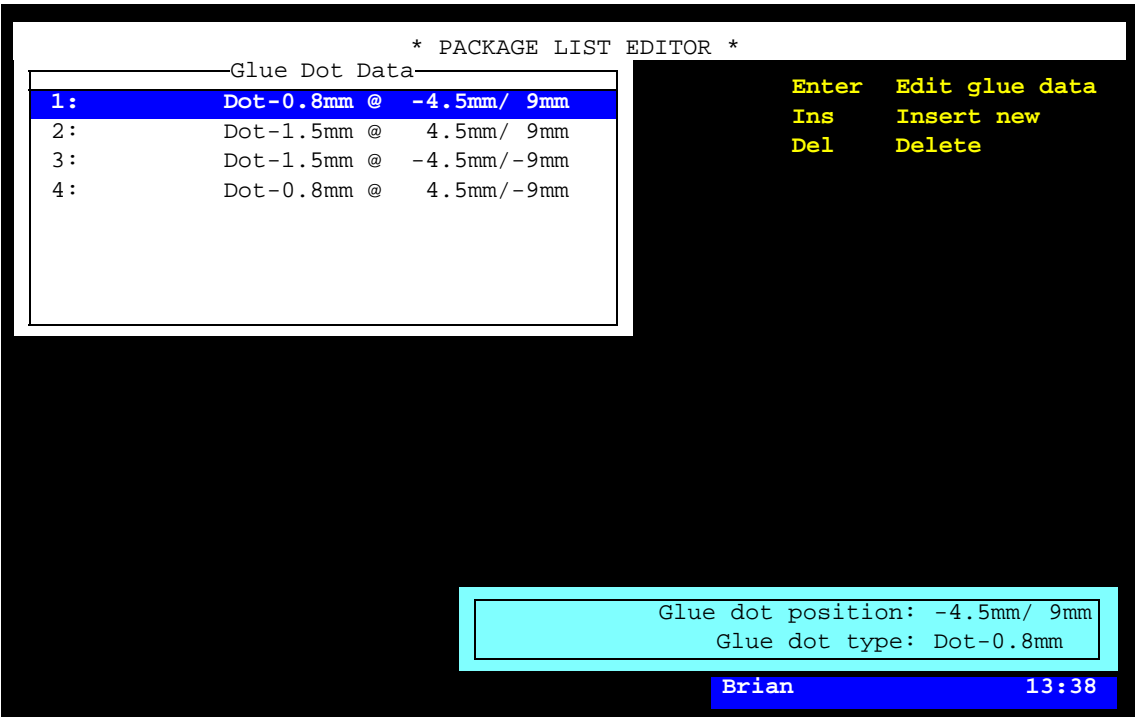 Contains part numbers and component name and data. Assigns a package to the component.

- **Package List**

  Contains data specific to the component package, such as length, width, height, number of leads, mount tool, placement precision, centering forces and optical centering data.

- **Magazine Lists (group)**

  Lists that inform the system about in which magazine and type of magazine (tape, vibrator, or tray) the components can be found and where the magazines are located. The lists include also such information as component angles and quantities.

- **Mount Lists (group)**

  Mount lists on different levels for PCBs, panels, and layouts, indicating which components are to be mounted and where they are to be placed

This chapter describes the Magazine Lists, one of the main list groups necessary for mounting a board.

The other mandatory lists or list groups are described in Chapter 4, Chapter 5 and Chapter 7.

Additional lists for such features as fiducial marks, adhesive application and user access are found in Chapter 8.

Special characters

National special characters and some non-letter/non-figure characters cannot be entered into the system, for instance in board names and layout names.

The following special characters are, however, allowed to be used: " ' ` \ $; ^ @

Magazine types

There are several magazine types that can be used in the MYDATA placement machines. Each of which has a magazine list in TPSys. These magazine lists are involved in the programming work and are thus described in this chapter.

We describe the following in this chapter:

- **Removable feeders**
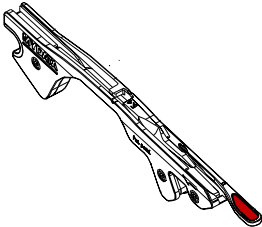
  The Agilis feeder is an intelligent, removable unit in which you can load the component tape before inserting it into the magazine. The feeders can easily be moved from one feeder position to another.

  The Removable Feeder List Editor is described on page 6-4.

- **Tape and Vibratory Magazines**

  Tape and vibratory magazines which are inserted into the magazine positions of the machine. Tape magazines are either Agilis magazines or TM magazines. The TM magazine is marked 'A' in Figure 6-1. Figure 6-2 shows Agilis linear (ALM) and non-linear (AM) magazines.

  The Tape and Vibratory Magazine List is described on page 6-7.

- **Y-Wagon Magazine**

  Component trays placed onto the standard assembly table of the Y wagon. The Y-Wagon Magazine is marked 'B' in Figure 6-1.

  The Y-Wagon Magazine List is described on page 6-17.

- **Tray Wagon Magazine**

  Component trays placed on a Tray Wagon Magazine, which has a Y movement of its own. The Tray Wagon Magazine is marked 'C' in Figure 6-1.

  The Tray Wagon Magazine List is described on page 6-30.

- **TEX Tray Exchanger**
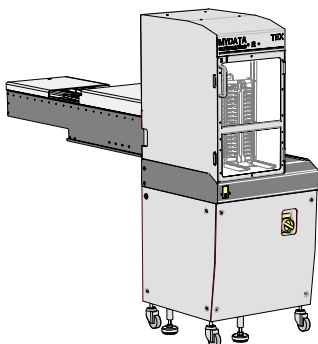
  A separate tray magazine (see the figure) that is placed in front of the machine is able to store 32 JEDEC trays, which are moved to the machine pick line by means of two parallel and separately controlled tray tracks.

  The TEX occupies two ordinary magazine positions. Several TEX units can be used in the same placement machine.
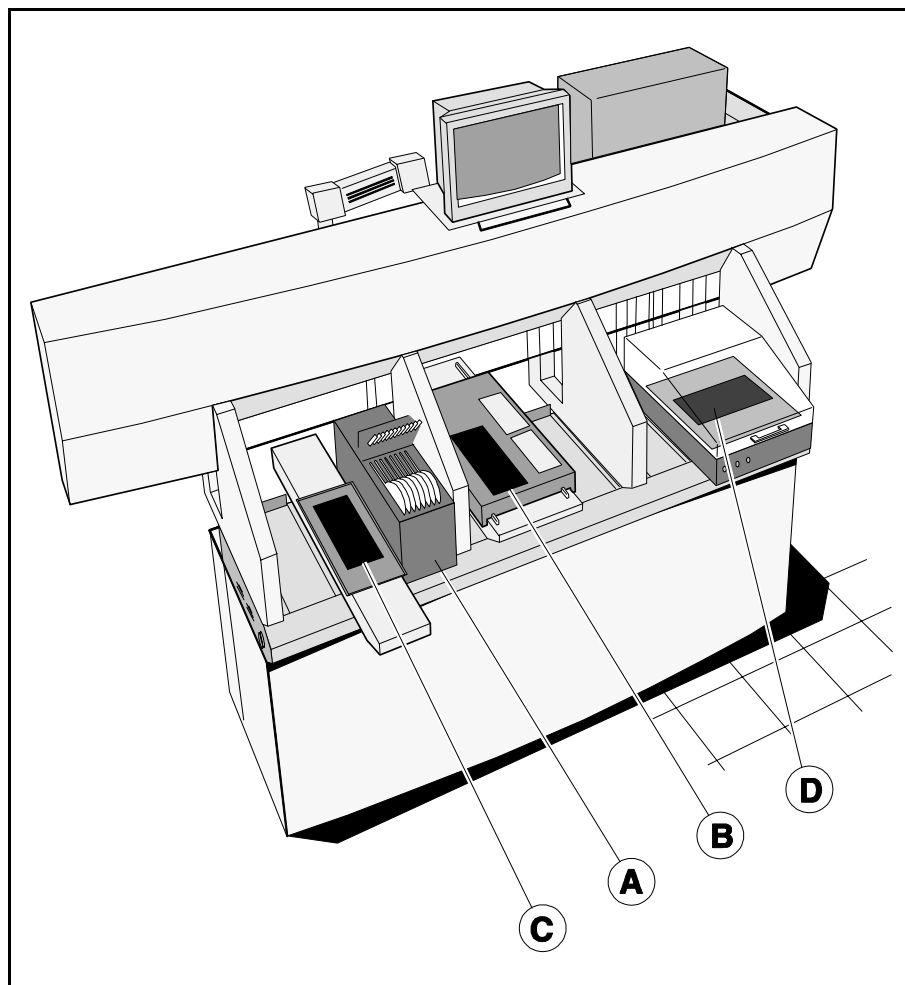
Figure 6-1. Magazine types

The magazines shown in Figure 6-1 are applied to a type TP9-UFP
machine, but they can be used on all the MYDATA machine types.
The same applies to Aglis magazines.
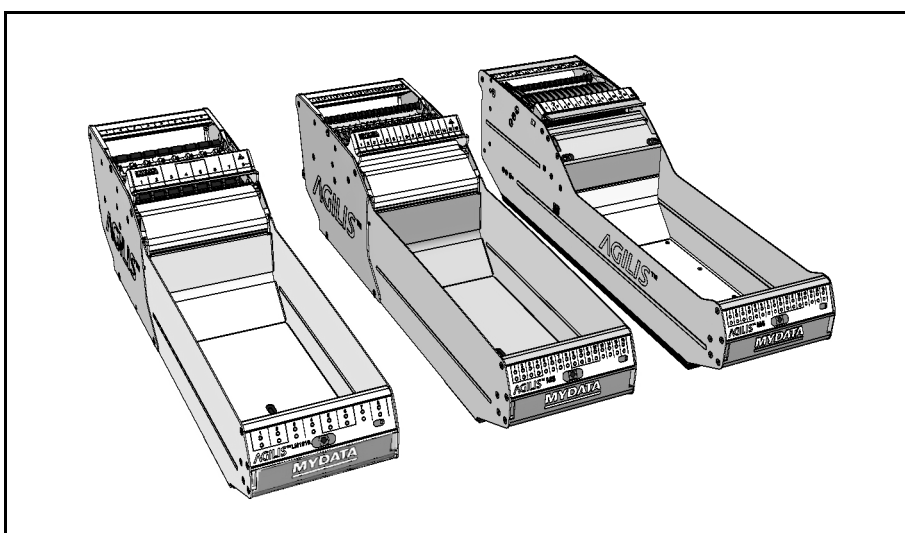
Figure 6-2. Agilis magazines

Removable Feeder List Editor

Selecting the **Removable Feeders** option in the **Magazine** menu opens the Removable Feeder List Editor.

The Removable Feeder List Editor is shown in Figure 6-3.

Function Keys in the Removable Feeder List Editor:

Edit removable feeder

By pressing <Enter> the contents of the highlighted removable feeder can be updated.

Delete

The highlighted feeder can be deleted by pressing <Del> and confirming the deletion in a popup box, provided the feeder is not inserted in a magazine that is inserted in a machine.

Clear component data

Pressing <F7> clears the contents of the highlighted feeder.

Edit feeder header

By pressing <F2> the highlighted feeder header information in the Removable feeder header box can be edited.

Toggle sort order

By pressing <Space> the sort order in the Removable feeders list is changed.

The default sort order is alphabetical, sorted by feeder name (see Figure 6-3). By pressing <Space> once, the sort order is changed to show all feeders inserted in magazines or machines first, also sorted by name. Removable feeders not inserted in magazines or machines come last.

```
                                      * REMOVABLE FEEDER LIST EDITOR *
    ___Removable Feeders___
  *1: 1206 (537)                                  Enter   Edit removable feeder
   2:      (526)                                    Del   Delete
   3:      (539)                                     F7   Clear component data
   4:      (538)                                     F2   Edit feeder header
   5:      (505)                                  Space   Toggle sort order
   6:      (507)


                                Component: 1206
                                  Package: 1206-05
                                  Comment:
                                 Batch ID:
                                    Angle: 90.00°
                                 Quantity: 0                         Alarm: 0


                                     Type:
                                     Name:
                                  Comment:
                              Step length:


                                                    Brian                13:52
```
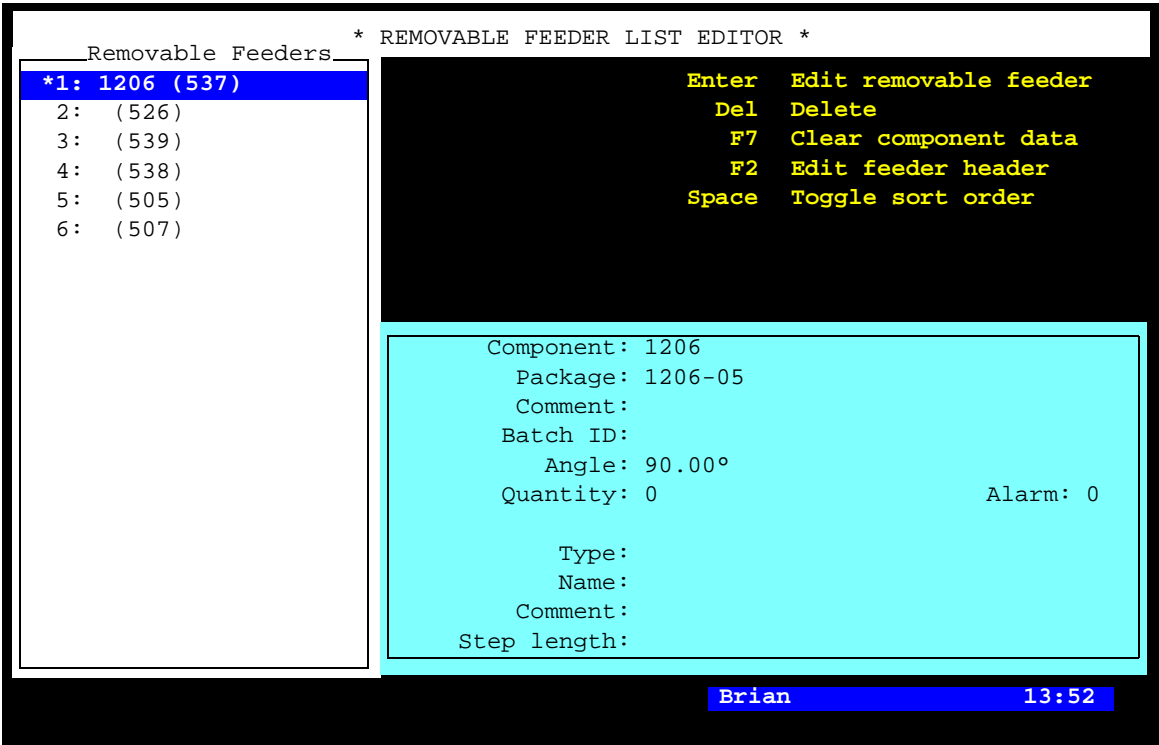
Figure 6-3. Removable Feeder List Editor

Entries in the Removable Feeder List Editor:

Removable Feeders

This list shows the removable feeders in the machine system, and in
the machine network if shared databases are used. The magazines
they are inserted in are shown in brackets, if inserted in a machine.
No position number is shown for feeders registered but not inserted.

Feeder information box

The feeder information box in the lower right part of the Removable
Feeder Editor window contains data for the highlighted feeder.

Component

The name of the component in the highlighted feeder. The name is
referred to in the Component List.

You can change a component by selecting from the Component List,
which is opened by entering the first characters of the component
name and pressing <Enter>.

Package

The package type of the highlighted component.

Comment

User comment text read from the Component List.

Batch ID

This field is intended for component batch number found on, for instance, the tape reel, plastic tube, storage box or delivery note.

The batch number can either be typed into this field or read, using a TPSys bar code reader.

Angle

The component angle in the feeder, see the figure.

Quantity

The component quantity in the highlighted feeder.

The quantity is to be updated when loading the removable feeder. The value is then counted down each time a component is taken. The remaining number of components is indicated in this field. The quantity can either be typed into this field or read by using a TPSys bar code reader.

Alarm

The component quantity level at which the operator is notified in the Operator alerts box that the magazine feeder is low on components. The quantity can be set in this window.

This feature can be enabled or disabled by setting the *84.0500 Alarm on reels* parameter to *Yes* or *No*. When disabled, this entry is not shown in the magazine feeder window.

Type

The type of the highlighted removable feeder.

Name

The feeders name,for instance AF00167823.

Comment

User comment for the highlighted feeder.

Step length

The length of tape advanced per step is defined by this setting. The step length is expressed in mm.

Tape and Vibratory Magazine List

The Tape and Vibratory Magazine List is opened by selecting the **Magazines** option in the **Magazine** menu.

The Tape and Vibratory Magazine List Editor is shown in Figure 6-4.

Function keys in the Tape and Vibratory Magazine List Editor:

Edit feeder contents

By pressing <Enter> the contents of the highlighted magazine can be updated, see page 6-11.

Delete magazine

The highlighted magazine can be deleted by pressing <Del> and confirming the deletion in a popup box, provided the magazine is not inserted in the machine. All magazine information is erased if the magazine is deleted.

Locate magazine

By pressing <Ctrl>+<F1>, the X position of the highlighted magazine is calibrated using automatic fiducial mark search. If the automatic fiducial mark search fails, you can center the fiducial mark manually. Further information is found in the *Locate All Magazines* section under *Magazine* in *Appendix B – Menu Reference Guide*.

Edit magazine name/barcode

The highlighted magazine can be renamed and the bar code can be changed by pressing <F2> and typing a new name or reading a new bar code (see below).

Vibrate magazine

To vibrate an inserted vibratory magazine, select magazine and press <F5>.

Figure 6-4. Tape and vibrator Magazine List Editor

Vibrate all magazines

To vibrate all inserted vibratory magazines, press <Ctrl>+<F5>.

Toggle sort order

By pressing <Space> the sort order in the *Magazines* list is changed.

The default sort order is alphabetical (see Figure 6-4).

By pressing <Space> once, the sort order is changed to show all magazines inserted in the machine, sorted by magazine positions. These magazines are followed by magazines inserted in other machines, sorted by machine and magazine positions.

By pressing <Space> again, the sort order is changed to show those magazines which contain components included in the loaded layout.

Exit

Press <Esc> if you want to exit this window and return to the main window.

Entries in the Magazine List Editor:

Magazines

This box shows the magazines in the machine system, and in the machine network, if shared databases are used. The magazine position numbers are shown in brackets, if inserted in the machine. No position number is shown for magazines registered but not inserted, see TM8C-1234 in Figure 6-4.

Figure 6-4 shows a machine with four registered magazines, three of which are inserted.

( )   If shared databases are used, then the machine number is also shown in brackets for magazines inserted in other machines, for instance (tp9n491/8) if the magazine is inserted in magazine position 8 in a TP9 machine with serial number 491.

*   An asterisk (*) indicates that the magazine contains components included in the currently loaded layout.

Magazine information box

The magazine information box in the lower part of the Magazine List Editor window contains data for the highlighted magazine, which is is read from the magazine and thus not editable, except for the magazine name and the bar code which can be changed after pressing <F2>.

Name

User name of the magazine. If no user name is assigned, this field shows the magazine type followed by the serial number, for instance TM8C-1234.

You can rename the highlighted magazine after pressing the <F2> key.

Barcode

A bar code reader can be used, for example, to select magazine when loading or refilling components. The bar codes, which are unique to each TM8 magazine, are printed on the magazine bar code labels. These unique codes can be linked to the user magazine names. In Figure 6-4 the bar code 5001 is linked to the *Video* magazine.

Bar code reading is described in the *Barcode Readers* section in Chapter 5 of the *Operator's Manual*.

Fiducial mark

Indicates if automatic magazine fiducial mark search is active or not.

Type

The magazine type, for instance VM for vibratory magazines, TM for 8mm tape magazines or ALM8 for Agilis Linear M8. The magazine type is read from the magazine and cannot be changed in this box.

Serial No.

Shows the magazine serial number. The serial number is read from the magazine and cannot be changed in this box.

No. of feeders

Shows the number of feeders in the magazine, for instance 16 for an 8mm tape magazine and 30 for a vibratory magazine. The feeder number is read from the magazine and cannot be changed in this box.

Tape Magazine Contents

By pressing <Enter> in the Tape and Vibratory Magazine List Editor (page 6-8), a tape magazine contents window is opened.

The tape magazine contents window is shown in Figure 6-5.

Function keys in the tape magazine contents window:

Edit/insert component

By pressing <Enter> the highlighted feeder load information can be changed or updated.

Clear component data

The highlighted component can be removed from the list by pressing <F7> and confirming the deletion in a popup box.

Adjust pick position

The feeder pick position can be calibrated by pressing <F1>. The procedure is described in the *Manually Calibrating Pick Positions* section in Chapter 5 of the *Operator's Manual*.

For Agilis magazines, the feeder list will show only removable feeders that are inserted in the magazine. The component name is shown in brackets.

However, in this case the system will go directly to the feeder that contains the highlighted component.

Locate magazine

By pressing <Ctrl>+<F1>, the X position of the current magazine is calibrated using automatic fiducial mark search. The Y position is adjusted mechanically, see *Pick Line Adjustment – Agilis AM8* in Chapter 5 of the *Operators Manual* for Agilis magazines and the *Machine Manual* for TM magazines. If the automatic fiducial mark search fails, you can center the fiducial mark manually. Further information is found in the Locate All Magazines section under Magazine in *Appendix B – Menu Reference Guide*.

Clear component data for all feeders

A magazine can be cleared from all components by pressing <F9> and confirming the deletion in a popup box.

Copy feeder contents

The magazine feeder contents can be copied from another magazine by pressing <Shift>+<F9> and typing the magazine name to copy from in a popup box (or pressing <Tab> or <Enter> and selecting magazine from a popup magazine list).

```
                        * FEEDER CONTENTS FOR MAGAZINE Video *
     Pos.: component
 *  1: 000149                 Enter   Edit/insert component
    2: 000254                    F7   Clear component data
    3: 000255                    F9   Clear component data for all feeders
    4: 000501              Shift+F9   Copy feeder contents
    5: 000502               Ctrl+F1   Locate magazine
    6: 000503                    F1   Adjust pick position
    7:                        Space   Toggle component/comment/package
    8:
    9:
   10:
   11:
   12:
   13:                      Component: 000149
   14:                        Package: 1206-06
   15:                        Comment: 100pF
   16:                       Batch ID: 123456789
                               Angle: 0.00°
                            Quantity:1338              Alarm: 100

                           Step length: 1mm

                                             Brian                13:56
```
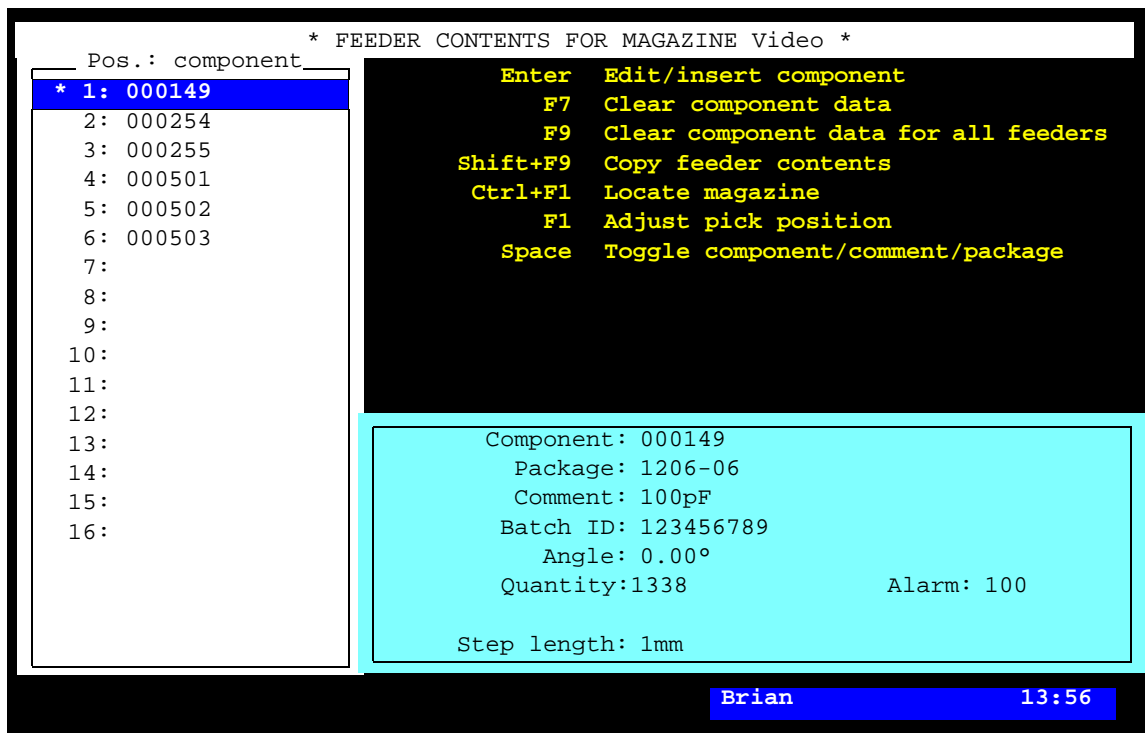
Figure 6-5. Tape magazine contents

Toggle component/comment/package

By pressing <Space> the *Pos.: component* box, indicating component names, is changed to *Pos.: comment* indicating component comments. A second press on the <Space> bar changes to *Pos.: package* indicating packages. A third press shows the component names again.

Exit

Press <Esc> if you want to exit this window and return to the Magazine List Editor (page 6-8).

Entries in the magazine contents window:

Pos.: component, Pos.: comment, Pos.: package

This box shows the components loaded in each magazine feeder. The component names, component comments, or component packages can be displayed by pressing <Space>.

* An asterisk (*) in the first position of a line indicates that the feeder is loaded with a component included in the currently loaded layout.

Component

The name of the highlighted component in the feeder list. The component name is referred to in the Component List.

You can search for a component from the Component List, which is opened by entering the first characters of the component name and pressing <Enter>, or by simply pressing <Enter>.

Package

Package name set in the Component List.

Comment

User comment text read from the Component List.

Batch ID

This field is intended for component batch number found on, for instance, the tape reel, plastic tube, storage box or delivery note.

The batch number can be either typed into this field or read using a TPSys bar code reader.

The TPSys bar code reader is described in the *Barcode Readers* section in Chapter 5 of the *Operator's Manual*.

Angle

The component angle in the feeder, see the figure.
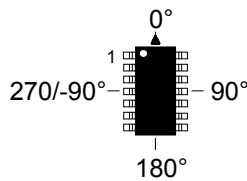
Quantity

The component quantity for the feeder.

The quantity is to be updated when loading the magazine feeder. The value is then counted down each time a component is taken from the feeder. Remaining parts are thus indicated in this field.

The quantity can be either typed into this field or read using a TPSys bar code reader.

The TPSys bar code reader is described in the *Barcode Readers* section in Chapter 5 of the *Operator's Manual*.

Alarm

The component quantity level at which the operator is notified in the *Operator Alerts* box that the magazine feeder is low on components.

This feature can be enabled or disabled by setting the *84.0500 Alarm on reels* parameter to *Yes* or *No*. When disabled, this entry is not shown in the magazine feeder window.

Step length

The length of tape advanced per step is defined by this setting. The step length is expressed in mm.

The Agilis Magazine

The Agilis magazine contents window has the same entries as the tape magazine window, except for some entries related to removable feeders detailed below

```
            * FEEDER CONTENTS FOR MAGAZINE AM8-3013 *
Pos.: component (feeder)
9: (AF 0016777239)        Enter   Edit removable feeder
8: (AF 0016777241)          Del   Remove feeder
                             F8   Remove all feeders
                             F7   Clear component data
                             F9   Clear component data for all feeders
                         Ctrl+F1  Locate magazine
                             F1   Adjust pick position
                             F2   Edit feeder header
                          Space   Toggle component/comment/package

                        Component: 0016777239
                          Package:
                          Comment:
                         Batch ID:
                            Angle: 90.00°
                         Quantity: 0                   Alarm: --

                             Type: Agilis F8 4.7
                             Name:
                          Comment:
                      Step length: 1mm

                                           Brian              13:58
```

Figure 6-6. Tape magazine contents

Remove all feeders

F8

Removes all feeders from a magazine provided the magazine is not inserted in the machine.

Clear component data

F7

Deletes component from feeder.

Edit feeder header

F2

By pressing <F2> the highlighted feeder header information in the Removable feeder header box can be edited.

Entries in the magazine contents window:

Type

The type of highlighted removable feeder.

Name

The name of the highlighted removable feeder. The default name is the serial number, but this can be changed.

Comment

User comment for the highlighted feeder.

Step length

Number of tape advancement per component feed expresse in mm.

Vibratory Magazine Contents

The vibratory magazine contents window has the same entries as the tape magazine window, except for some vibratory related entries detailed below.
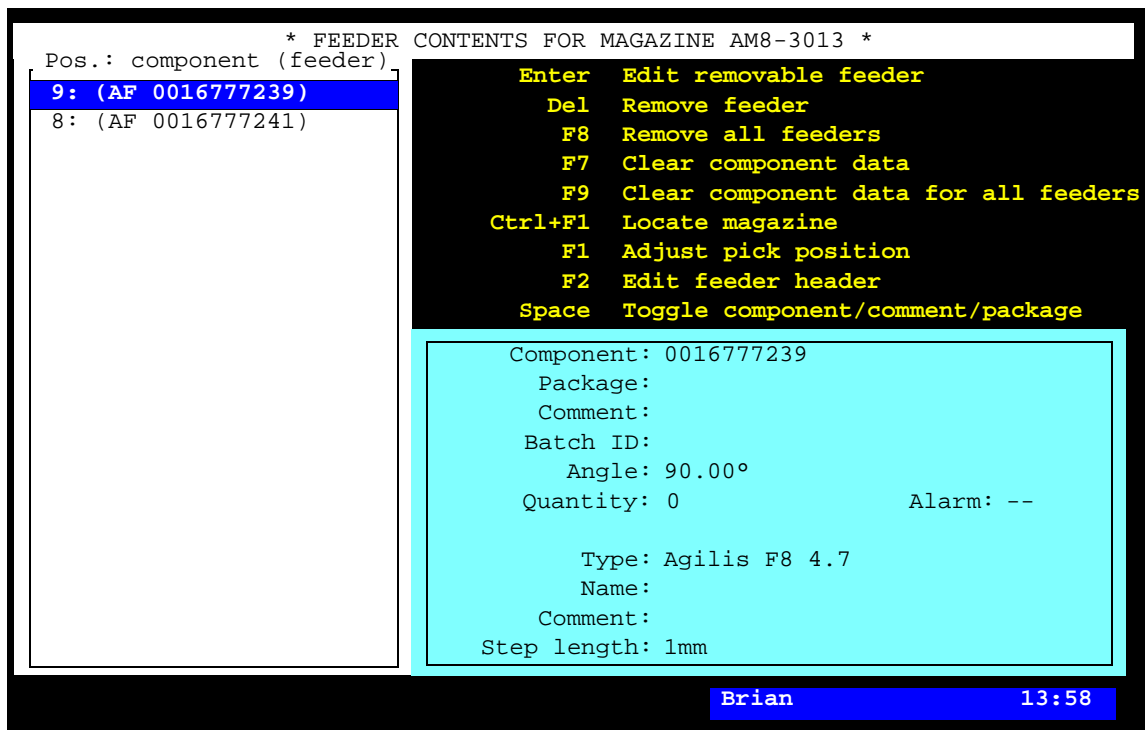
```
      Component: MB1501PF
        Package:
        Comment: PLL
       Batch ID: 123456789
          Angle: 0.00°
       Quantity:13                Alarm: 5


      Amplitude: 10
       Duration: 1000
      Frequency: 57
```

Amplitude

Vibrator amplitude value. The setting range is 0 – 127. This setting affect all feeders in a group.

Duration

Vibration time in ms. The setting range is 0 – 6000ms (0 – 6 seconds). This is set for each individual feeders

Frequency

Vibrator frequency in Hz. The setting range is 10 – 99Hz. This setting affect all feeders in a group.

Y-Wagon Magazine List

The Y-Wagon Magazine List is used for component trays placed on the manual assembly table, see 'B' in Figure 6-1 on page 6-3.

A structure diagram of the Y-Wagon Magazine List is found on page 6-29.

The list is opened by selecting **Magazine** > **Y Wagon Magazine** > **Trays**.

The second option, *Tray Positions* is used to define and store fixed tray positions on the assembly table, see page 6-25.

The Y-Wagon Magazine List Editor is shown in Figure 6-7.

Function keys in the Y-Wagon Magazine List Editor:

Edit tray

By pressing <Enter> the highlighted tray can be modified.
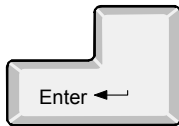
Insert new

A new tray can be added to the tray list by pressing <Ins>, and then select component and tray type. The new tray gets the same name as the selected component plus an order number.

Delete

The highlighted tray can be deleted from the trays list by pressing <Del> and confirming the deletion in a popup box.

Locate position

The tray position on the assembly table can be located by positioning two tray corners, two components on the tray, or two fiducial marks. To locate the tray, press <F7> when the *Position* field is highlighted, see page 6-23.

```
                      * Y-WAGON MAGAZINE EDITOR *
   Trays By Name    Enter   Edit tray        Space   Toggle sort order
  4 ABC111(my9n476)  Ins   Insert new         F6   Reload
- 1 ABC123           Del   Delete             F7   Remove from magazine
* 2 ABC123           F1   Locate position     F8   Remove all from magazine
* 3ABC123(my12n123)
                              Tray Information
                     Name/barcode:  ABC111
                        Component:  QFP120
                          Package:  ASIC-32
                          Comment:
                         Batch ID:
                  Component angle:  0.00°
                        Tray type:  QFP120-3*8
                         Quantity:  14            Alarm:  5
                      Auto refill:  Yes

                                  Machine:  my9n476
                                 Position:  * UNKNOWN *
                  First component location:  ---
                          Lower left corner:  92.642mm/ 221.673mm
                         Upper right corner:  117.331mm/ 245.746mm

                                          Brian                    14:13
```
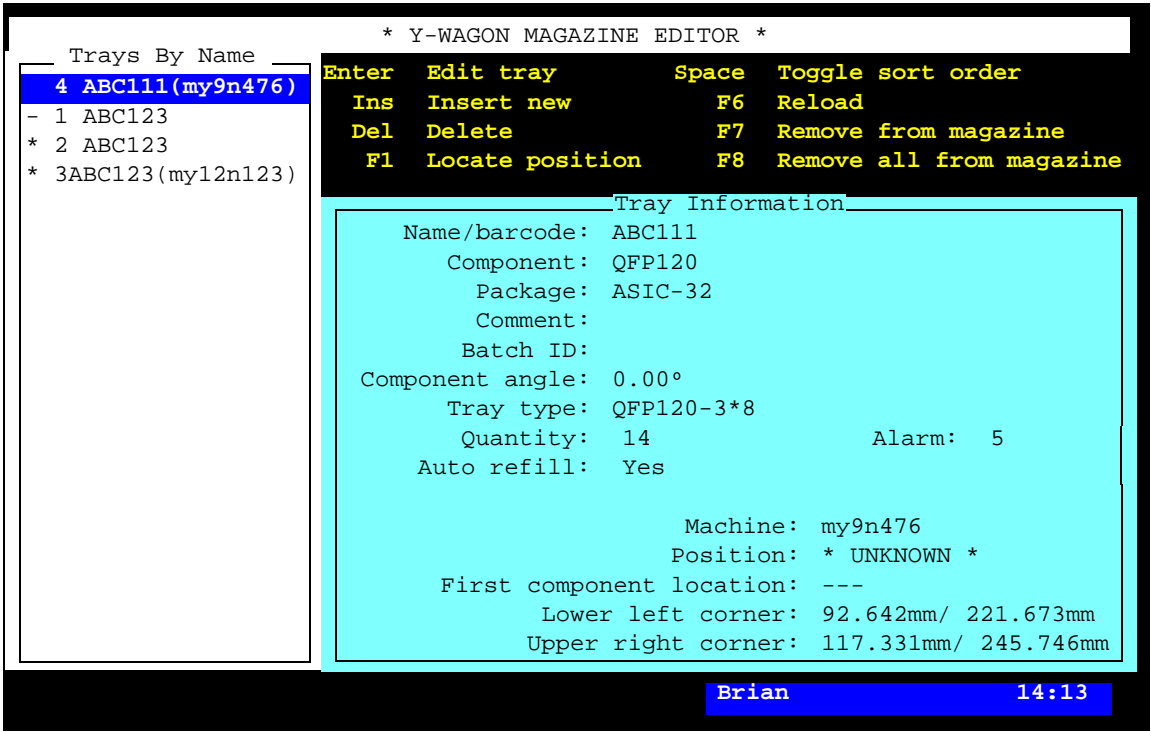
Figure 6-7. Y-Wagon Magazine List Editor

Toggle sort order

Toggle the sort order in the list.

Reload

F6

The component quantity for the highlighted tray can be updated by pressing <F6> and confirming or changing in a dialog box, see *Quantity* below.

Remove from magazine

F7

Remove a tray (make not present) by highlighting it and press <F7>.

Remove all from magazine

F8

Removes all trays from a magazine.

Exit

Esc

Press <Esc> if you want to exit this window and return to the *Y Wagon Magazine* sub menu.

Press <Esc> twice to return to the main window.

Entries in the Y-Wagon Magazine List Editor:

Trays By Name

This box contains defined trays. A tray is defined by pressing <Ins>, selecting a component from the Component List and selecting a tray from the Tray Type List. In the first position of the list, one of the following characters can be shown:

* The tray is marked as present on the assembly table.
– The tray is marked as present but empty.
! A pick error has occurred.

No character in the first position indicates that the tray is non-present on the assembly table. The system does not pick from such a tray.

Figure 6-7 shows one non-present tray and three present trays, one of which is empty. As a tray can be shared with other machines, the serial number of the machine where it is loaded is displayed.

Tray Information

This box contains information about the highlighted tray.

Name/barcode

You can search for a component from the Component List, which is opened by entering the first characters of the component name and pressing <Enter>, or by simply pressing <Enter>.

New components can be defined and added to the Component List if you choose to select from list.

Component

Component that is loaded in the tray.

Package
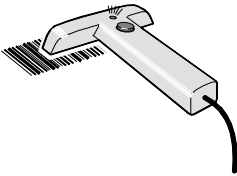
The components package type.

Comment

User comment text read from the Component List.

Batch ID

This field is intended for component batch number found on, for instance, the tray, storage box or delivery note.
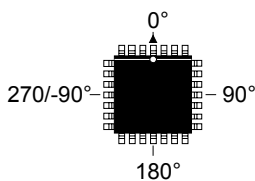
The batch number can be either typed into this field or read using a TPSys bar code reader.

The TPSys bar code reader is described in the *Barcode Readers* section in Chapter 5 of the *Operator's Manual*.

Component angle

The component angle referred to the tray, see the figure.

0°

270/-90°   90°

180°

Tray type

Tray type referred to in the Tray Type List (page 6-42).

You can search for a tray from the Tray Type List, which is opened by entering the first characters of the tray type name and pressing <Enter>, or by simply pressing <Enter>. You have to open the Tray Type List to define tray types, see page 6-42.

Quantity

F6

The component quantity for the tray.

To update the quantity, press <F6> and confirm or change the quantity value in the dialog box:

```
──────────── Reload tray────
       Component: ABC123
       Tray type: QFP208-3*8
        Quantity: 24
        Batch ID: 123456789
```

The quantity is counted down each time a component is picked from the tray. So, the quantity field indicates always the remaining number of components on the tray.

Maximum quantity is defined by the row and column numbers in the Tray Type List.

☞ If you set a less quantity than full tray, for instance 10 for a 3 x 8 tray, then the system starts picking after the missing components, in this case from component number 15. The component numbers on the tray are shown in Figure 6-28 on page 6-48.

You can also set negative numbers, which means the number of missing components on the tray. If you set –3 for a 3 x 8 tray, then the system will pick 21 components, starting from number 4.

Alarm

The component quantity level at which the operator is notified in the *Operator Alerts* box that the magazine is low on components.

Auto refill

Enables or disables messages when trays are out of components.

Yes – If the tray is marked as present (*), then a dialog box is shown that calls the operator's attention to refill the tray.

No – No dialog box is shown.

To toggle between *Yes* and *No* press <Space>.

Position

A newly inserted tray has an unknown position indicated with the text: * *UNKNOWN* *.

To locate the tray, you can either use the camera, or select a pre-defined position from the Y-Wagon Position List.

Locate the tray using the camera ...
To locate the tray using the camera, press <F1> and select two corners, first and last component, or two fiducial marks for positioning, see page 6-23.

The following text is displayed after the tray has been located on the assembly table using the camera:

```
                     Position:  * LOCATED *
```

... or select a pre-defined position.
To make the use of trays more convenient and fast, defined tray positions on the assembly table can be saved and stored in the Y-Wagon Position List (page 6-25).

To use a pre-defined position from the Y-Wagon Position List, enter a few characters of the position name and press <Enter>, or simply press <Enter>:

```
 ┌─── Positions By Name ───┐
 │ * UNKNOWN *             │
 │ Point 1                 │
 │ Table corner            │
 │                         │
 └─────────────────────────┘
```

Choose position and press <Enter>.

... or using a bar code reader
Scan the tray name barcode and then scan a tray position barcode belonging to the machine in question.

Enter the tray angle on the assembly table by selecting the appropriate option for the first component on the tray.

If the *Table corner* position was selected, then the position is shown like this:

```
                              Position:  Table corner
```

Lower left corner

The current X/Y coordinates of the lower left tray corner.

Upper right corner

The current X/Y coordinates of the upper right tray corner.

Locating Trays on the Assembly Table

A tray on the assembly table is located manually by positioning two tray corners, two components on the tray (if defined, see below), or two fiducial marks (if defined, see below). This is carried out when *Position* in the Y-Wagon Magazine Editor (page 6-18) is highlighted.

F1

Press <F1> and choose whether you want to locate the tray by positioning corners, fiducial marks, or components:

```
 _____ Select Points To Use _____
Tray corners
First and last component position
Fiducial marks
```

The *First and last component position* option is shown only if the tray is defined in the Tray Type List, see page 6-42.

The *Fiducial marks* option is shown only if *Fiducial marks exist* is set to *Yes* in the Tray Type List, see page 6-43.

☞ If a tray contains big components, then use the corners or fiducial marks, if defined. But, if the components are small or the tray has bad corners, then use first and last component.

The tray shown in the following figures is defined in the Tray Type List on page 6-48.

Tray corners

Figure 6-8 shows the cross hairs on the lower left corner at the first component (1), and on the upper right corner at the last component (2).
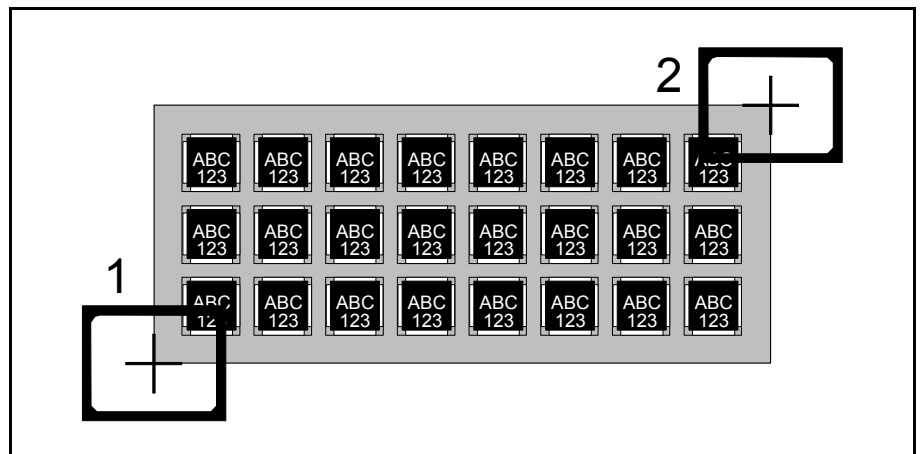

Figure 6-8. Positioning two tray corners

First and last component position

Figure shows the cross hairs on the first component (1) and on the last component (2).

The tray is located by centering the cross hairs on the center of the components and on those leads which are defined in the *Toggle leads* field in the Package List. Change leads by pressing the <F3> key.

☞ When positioning the first component, the system does not know at what angle the tray, and thus the component, is. This means that the toggle-lead function may behave a bit strangely.
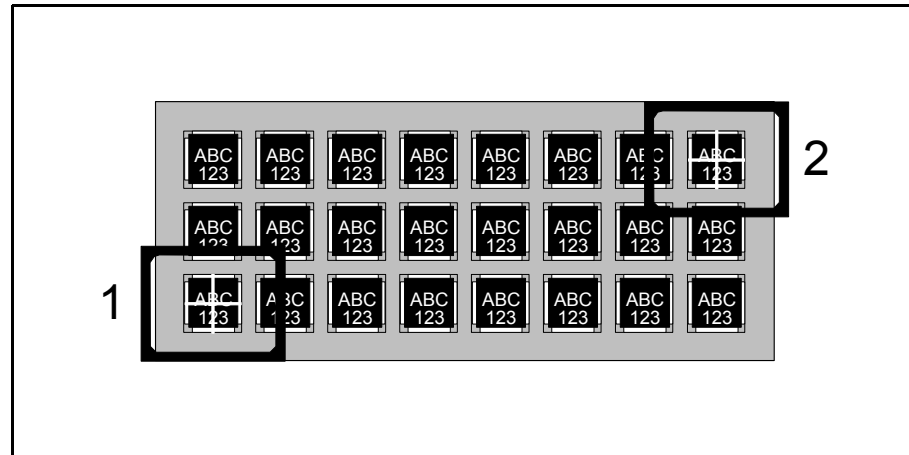

Figure 6-9. Positioning first and last component

Fiducial marks

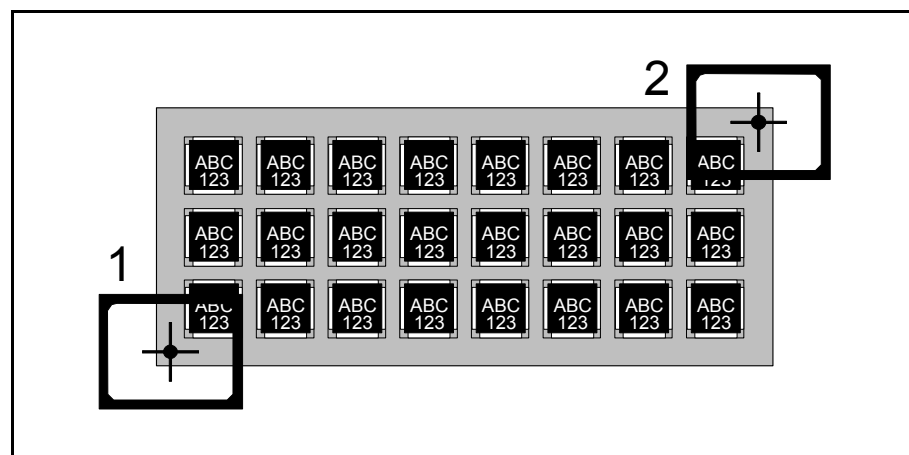Figure shows the cross hairs on the first fiducial mark (1) and on the second fiducial mark (2).

Figure 6-10. Positioning fiducial marks

Y-Wagon Position List

To reduce the locating time for tray positions, a Y-Wagon Position List feature lets you pre-define and store several tray positions, which can be used directly with no camera location.

Define a point ...   By defining a point somewhere on the Y-wagon assembly table and place one of the tray corners at this point, the tray position is settled.

... put a tray corner at the point ...

... and tell the system which corner. That's all.   The system must, however, get information about which corner you have placed at the defined point.

Figure 6-11 shows the lower left tray corner placed at the lower left assembly table corner.
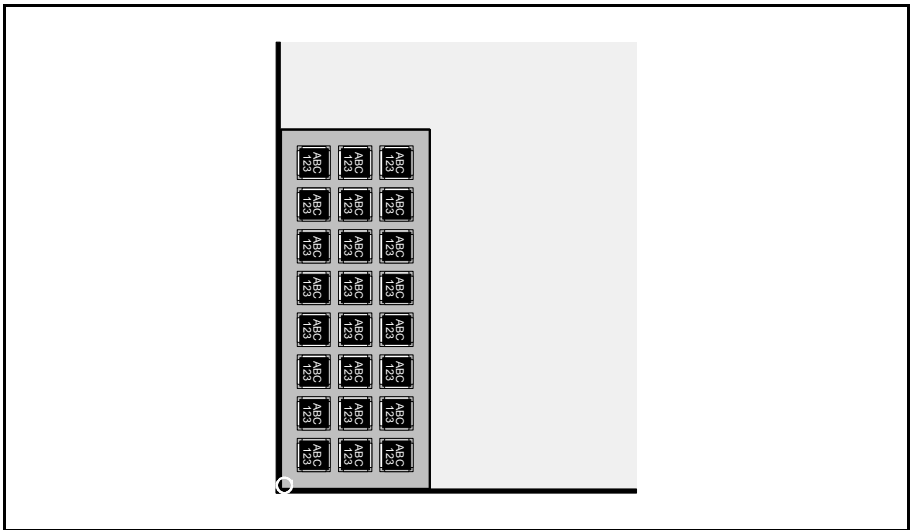

Figure 6-11. Tray at the lower left table corner

To be able to define a point on the assembly table and select a tray corner, open the Y-Wagon Position List by selecting the **Trays** option in the **Magazine** menu and then **Tray Positions**.
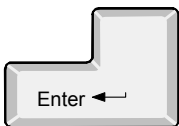
Bar code scanning ...   Inserting pallet trays via the hand held barcode scanner is possible by scanning the tray name followed by a scanning of a tray position barcode.

The Y-Wagon Position List window is shown in Figure 6-12.

Function keys in the Y-Wagon Position List window:

Edit tray position

By pressing <Enter> the highlighted position can be modified.

Insert new

A new position is created and added to the *Positions By Name* list after pressing <Ins> and entering a new name.
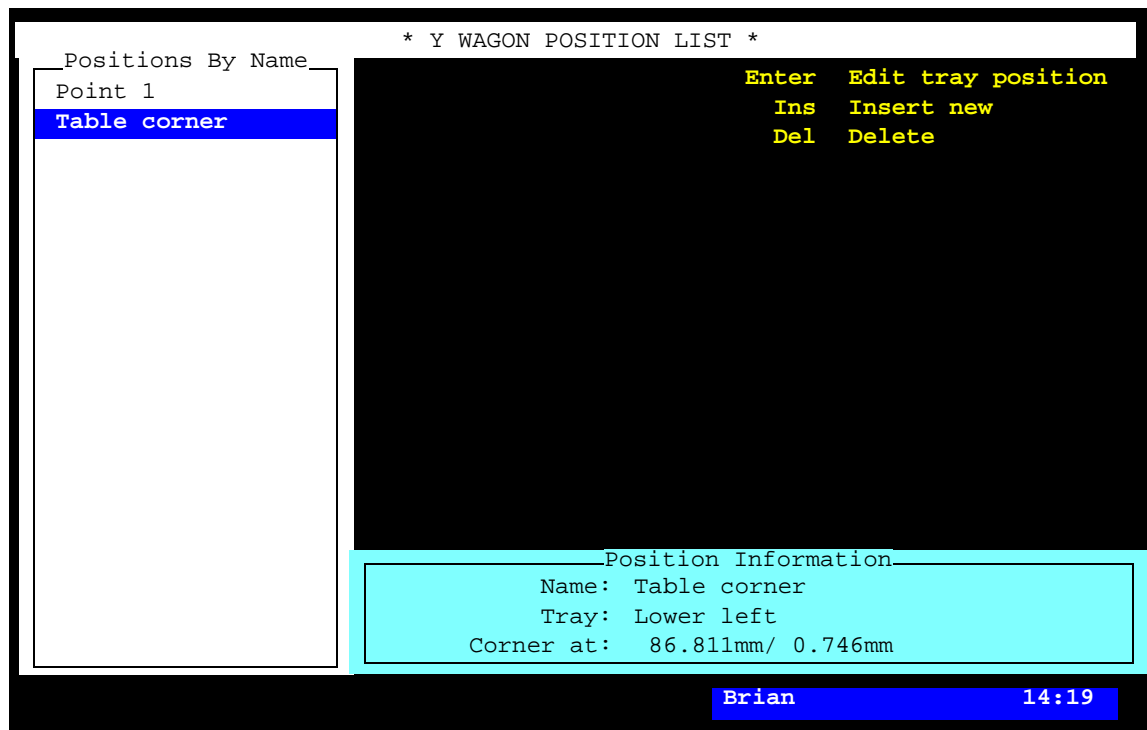
```
                    * Y WAGON POSITION LIST *
  _Positions By Name_
  Point 1                              Enter   Edit tray position
  Table corner                           Ins   Insert new
                                         Del   Delete




                              _Position Information_
                              Name:  Table corner
                              Tray:  Lower left
                           Corner at:   86.811mm/ 0.746mm

                                         Brian              14:19
```

Figure 6-12. Y-Wagon Position List

Delete

[Del]

The highlighted position is deleted by pressing <Del> and confirming the deletion in a popup box.

Exit

[Esc]

Press <Esc> if you want to exit this window and return to the **Y Wagon Magazine** sub menu.

Press <Esc> twice to return to the main window.

Entries in the Y-Wagon Position List window:

Positions By Name

This box contains the user's names of pre-defined positions.

Position Information

This box contains information about the highlighted position.

Name

Position name, which must be a unique name or number for each position.

Tray

Indicates which tray corner to be placed on the defined position point.

Press <Space> and choose the appropriate corner from the popup menu shown:

```
Lower left
Upper left
Upper right
Lower right
```
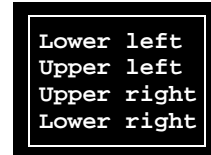
Figure 6-13 shows the four corner options: *Lower left* (1), *Upper left* (2), *Upper right* (3), and *Lower right* (4).
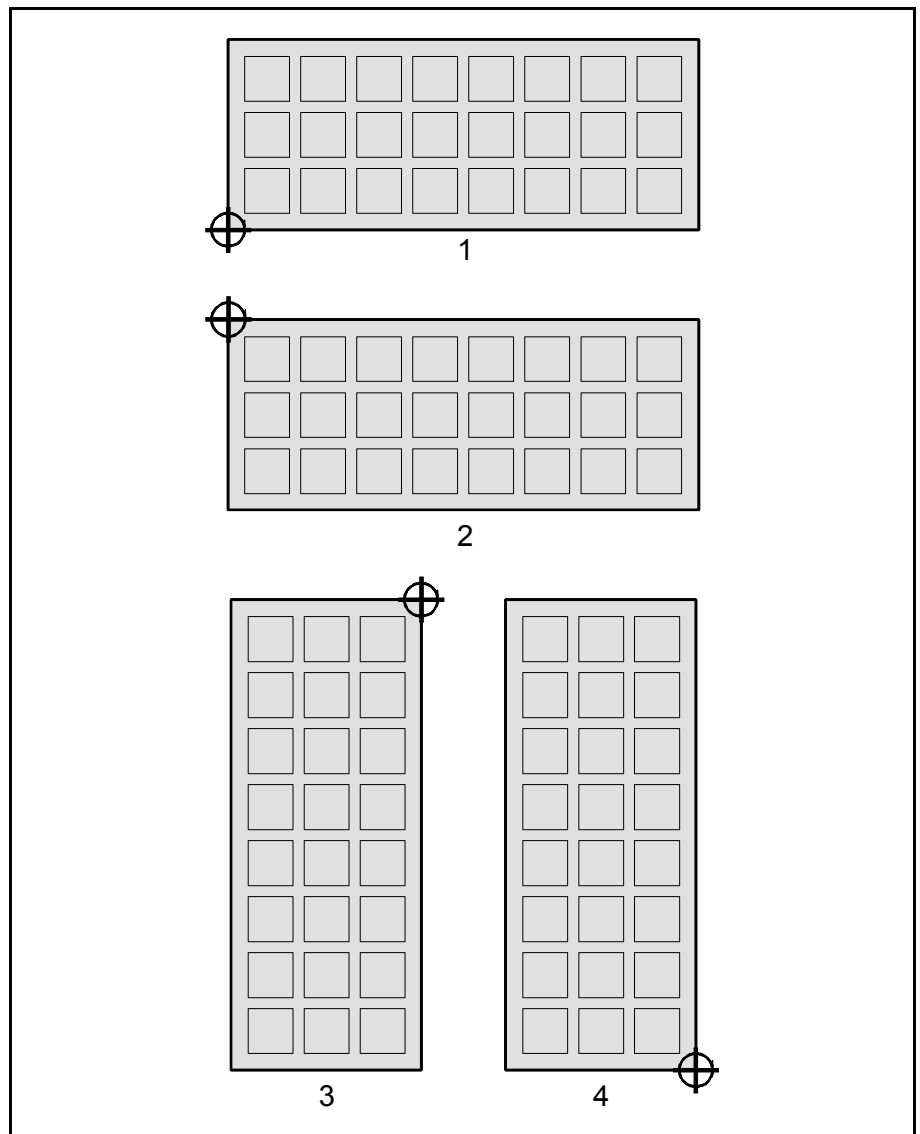

Figure 6-13. Tray corner at position point

As shown in Figure 6-13 the lower left corner is always the lower left corner, no matter how the tray is turned, and the upper left corner is always the upper left corner, no matter how the tray is turned.

Tray angles are restricted to 0° (or 180°) and 90° (or –90°/270°).

Corner at

The coordinates of the position point on the assembly table.

F1

Press <F1> and center the cross hairs on the selected position point. If you have a tray in the selected position, you can center the cross hairs on the tray corner.

The Structure of the Y-Wagon Magazine List

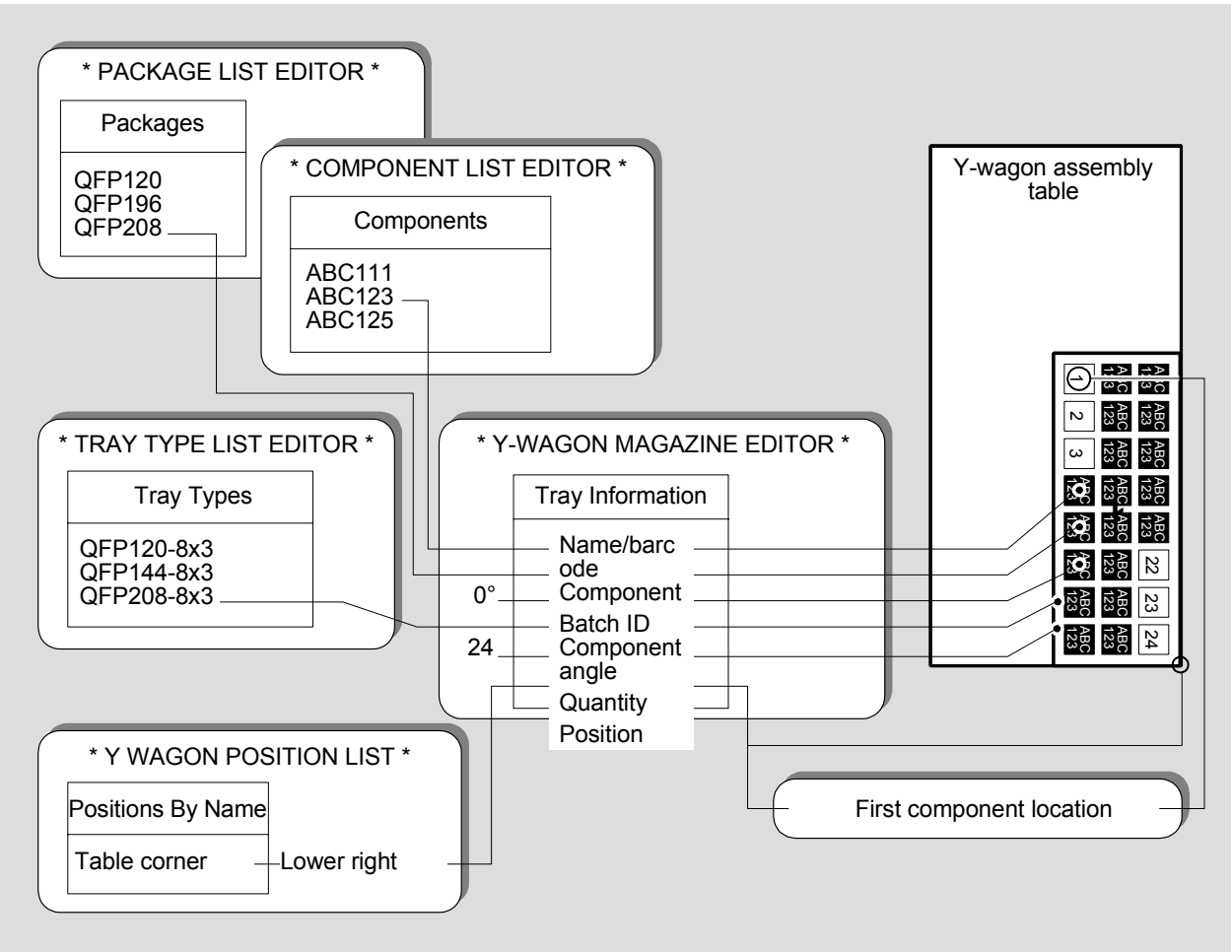The structure of the Y-Wagon Magazine List is shown in Figure 6-14.

Figure 6-14. Y-Wagon Magazine List structure

Figure 6-14 shows the following example:

Component – Component – Batch ID – Quantity. A tray that contains ABC123 type components in QFP208 packages. The component angle is 0° referred to the tray, and there are 24 components in a full tray.

Tray type – Position. The tray used is a QFP208-8x3 type tray and it is placed at the lower right corner of the Y-wagon assembly table.

The first component is located at the upper left corner of the tray. The tray angle is thus 90°.

Tray Wagon Magazine List

The Tray Wagon Magazine List is used for trays placed on a Tray Wagon Magazine, which has a Y movement of its own, see Figure 6-15.
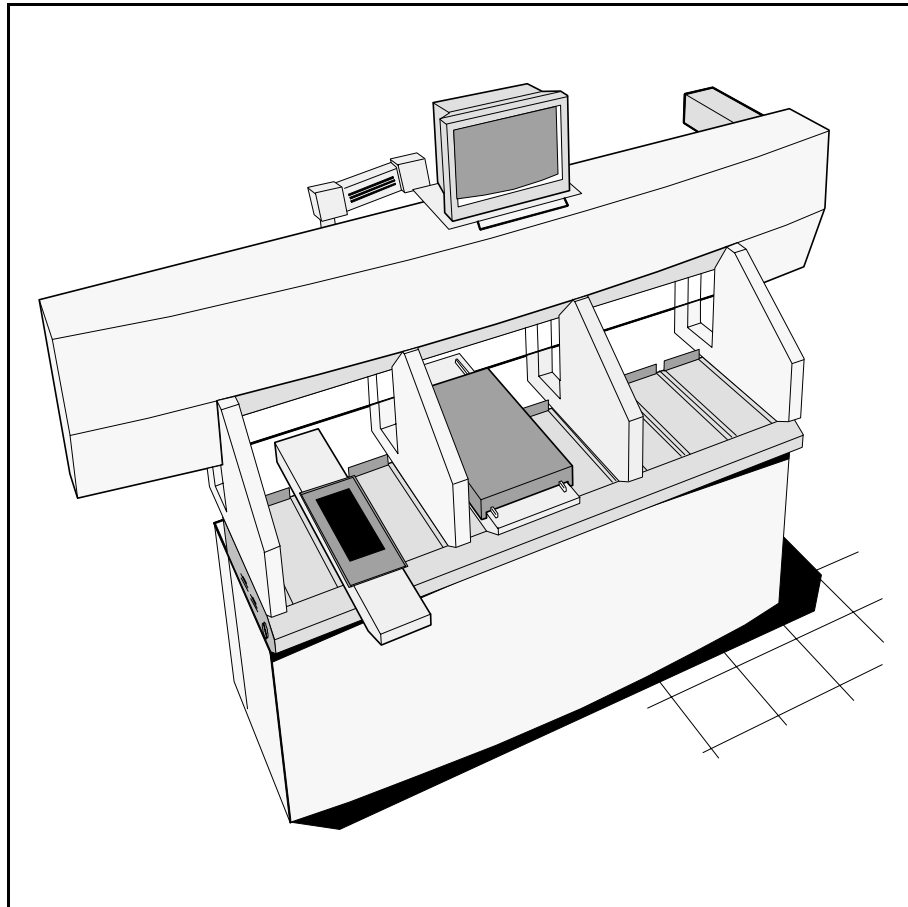

Figure 6-15. Tray Wagon Magazine

Installation and loading instructions for the Tray Wagon Magazine is found in the *Operator's Manual*, Chapter 5.

A structure diagram of the Tray Wagon Magazine List is found on page 6-33.

The Tray Wagon Magazine List is opened by selecting **Magazine** > **Tray Wagon Magazine** > **Trays**.

The second option, *Tray Positions* is used to define and store fixed tray positions on the Tray Wagon Magazine table, see page 6-32.

The Tray Wagon Magazine List has the same entries and functionality as the Y-Wagon Magazine List. So, the description on page 6-17 (to page 6-22) is applicable also to this list. However, the trays are placed on the tray wagon table in this case, not on the Y-Wagon assembly table.

Locating Trays on the Tray Wagon

A tray on the tray wagon is located manually by positioning two tray corners, two components on the tray (if defined), or two fiducial marks (if defined). This is carried out when *Position* in the Tray Wagon Magazine Editor (see above) is highlighted.

F1

Press <F1> and choose if you want to locate the tray by positioning corners, components, or fiducial marks in the same way as described for the Y-Wagon Magazine on page 6-23.

Tray Wagon Position List

To reduce the locating time for trays, a Tray Wagon Position List feature lets you pre-define and store several tray positions. Hereby there is no need to locate them with the aid of a camera.

Define a point ...

By defining a point somewhere on the tray wagon table and place one of the tray corners at this point, the tray position is settled.

... put a tray corner at the point ...

... and tell the system which corner. That's all.

The system must, however, get information about which corner you have placed at the defined point.

Figure 6-16 shows the lower left tray corner placed at the lower left tray wagon table corner.
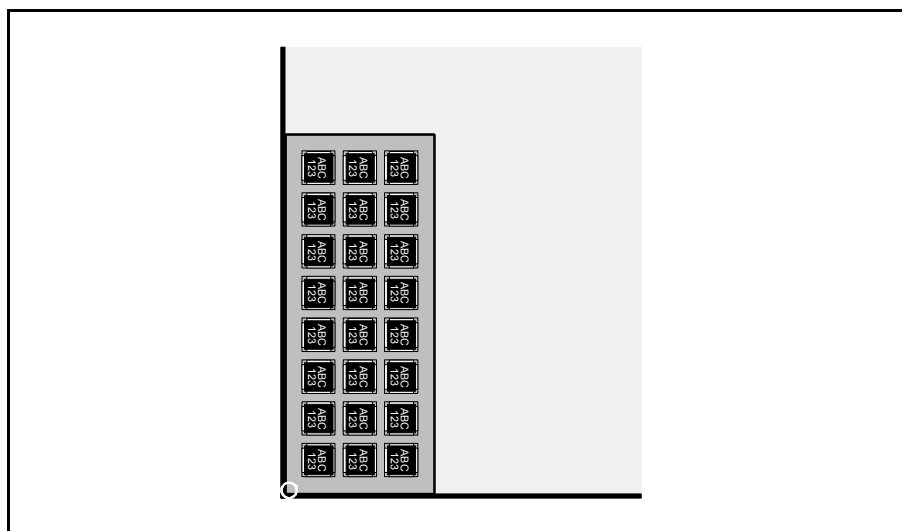

Figure 6-16. Tray at the lower left table corner

To be able to define a point on the tray wagon table and select a tray corner, open the Tray Wagon Position List by selecting the **Tray Wagon Magazine** option in the **Magazine** menu and then **Tray Positions**.

Bar code scanning ...

Inserting pallet trays via the hand held barcode scanner is possible by scanning the tray name followed by a scanning of a tray position barcode.

The Tray Wagon Position List has the same entries and functionality as the Y-Wagon Position List. So, the description on page 6-25 (to page 6-28) is applicable also to this list.

The Structure of the Tray Wagon Magazine List

The structure of the Tray Wagon Magazine List is shown in Figure 6-17.
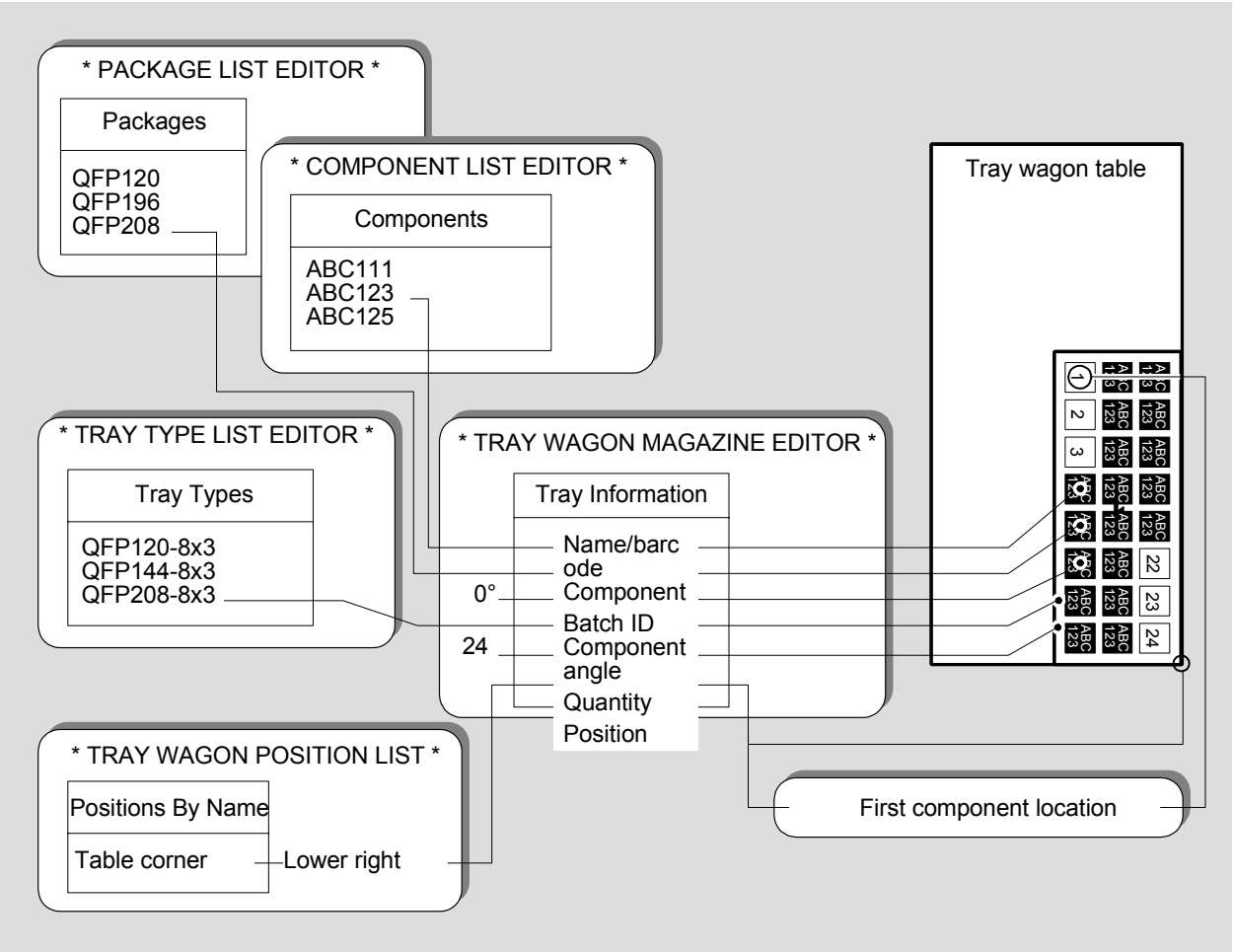
Figure 6-17. Tray Wagon Magazine List structure

Figure 6-17 shows the following example:

Component – Component – Batch ID – Quantity.	A tray that contains ABC123 type components in QFP208 packages. The component angle is 0° referred to the tray, and there are 24 components in a full tray.
Tray type – Position.	The tray used is a QFP208-8x3 type tray and it is placed at the lower right corner of the tray wagon table.
	The first component is located at the upper left corner of the tray. The tray angle is thus 90°.

Pallet Magazine List

The Pallet Magazine List is used by the TEX Tray Exchanger
(Figure 6-18). This unit handles and stores component trays placed
on pallets.

Figure 6-18. TEX Tray Exchanger

Further information about the unit and how to handle it is found in
the *Operator's Manual*.

The Pallet Magazine List is opened by selecting **Pallet Magazine >
Magazine > Trays**.

The other options in the submenu is used as follows:

- *Pallets* is used to define pallets, see page 6-36.

- *Trays* opens the Pallet Magazine List Editor, see below.

- *Tray Positions* is used for defining and storing defined tray
  positions, see page 6-39.

The Pallet Magazine List has, with some exception, the same entries
and functionality as the Y-Wagon Magazine List. So, the description
on page 6-17 (to page 6-22) is applicable also to this list. However, the
trays are placed on pallets in this case, not on the Y-wagon assembly
table.

Entries specific for the Pallet Magazine List are:

Pallet

Pallet referred to in the Pallet List (page 6-36). This pallet is used for the highlighted tray and it is shown in brackets after the component name in the trays list.

In the *Pallet* field, the highlighted tray can be assigned to a new pallet (for instance a TEX pallet with a different bar code). You can search for this pallet from the Pallet List, which is opened by entering the first characters of the pallet name and pressing <Enter>, or by simply pressing <Enter>.

Locating Trays on the Pallets

A tray on a pallet is located by positioning two tray corners, two components on the tray (if defined), or two fiducial marks (if defined). This is carried out when *Position* in the Pallet Magazine List Editor (see above) is highlighted.

F1

Press <F1> and choose if you want to locate the tray by positioning corners, components, fiducial marks, or scan barcodes in the same way as described for the Y-Wagon Magazine on page 6-23.

Pallet List

The purpose of the Pallet List is to assign individual names to pallets and store these names and position data. The system can then use these pallet data for instance after removing the pallets for refilling or changing over to other boards to assemble.

Pallets must be defined in the Pallet List to be used, see the *Pallet* entry on page 6-35. The TEX unit automatically scans and enters available pallets to the list. The pallets can then be renamed in the Pallet List window.

The Pallet List is opened by selecting **Pallet Magazine** and **Pallets** in the **Magazine** menu.

The Pallet List Editor is shown in Figure 6-19.

Function keys in the Pallet List Editor window:

Edit pallet

By pressing <Enter> the highlighted pallet can be modified.
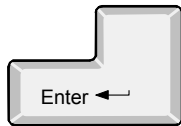
Delete

The highlighted pallet is deleted from the pallets list by pressing <Del> and confirming the deletion in a popup box.

Toggle sort order

The pallet list can be sorted in alphabetic order or according to the TEX unit and the slot position. Press <Space> to toggle the sort order.

Exit

Press <Esc> if you want to exit this window and return to the *Pallet Magazine* sub menu.

Press <Esc> twice to return to the main window.

```
                        * PALLET LIST EDITOR *
        ___Pallets___
       TE-1  (7)                        Enter   Edit pallet
       TE-2                               Del   Delete
       TE-3  (1)                        Space   Toggle sort order
       TE-4  (2)
       TE-5
       TE-6  (6)
       TE-7
       TE-8
       XS-S1242   (TEX1/7/8)
       XS-S1253   (TEX1/7/11)
       XS-S1662   (TEX1/8/14)
       XS-S1664
       XS-S1666


                                        Name: XS-S1242
                                        Type: XS
                                     Barcode: S1242

                                     Brian            14:44
```
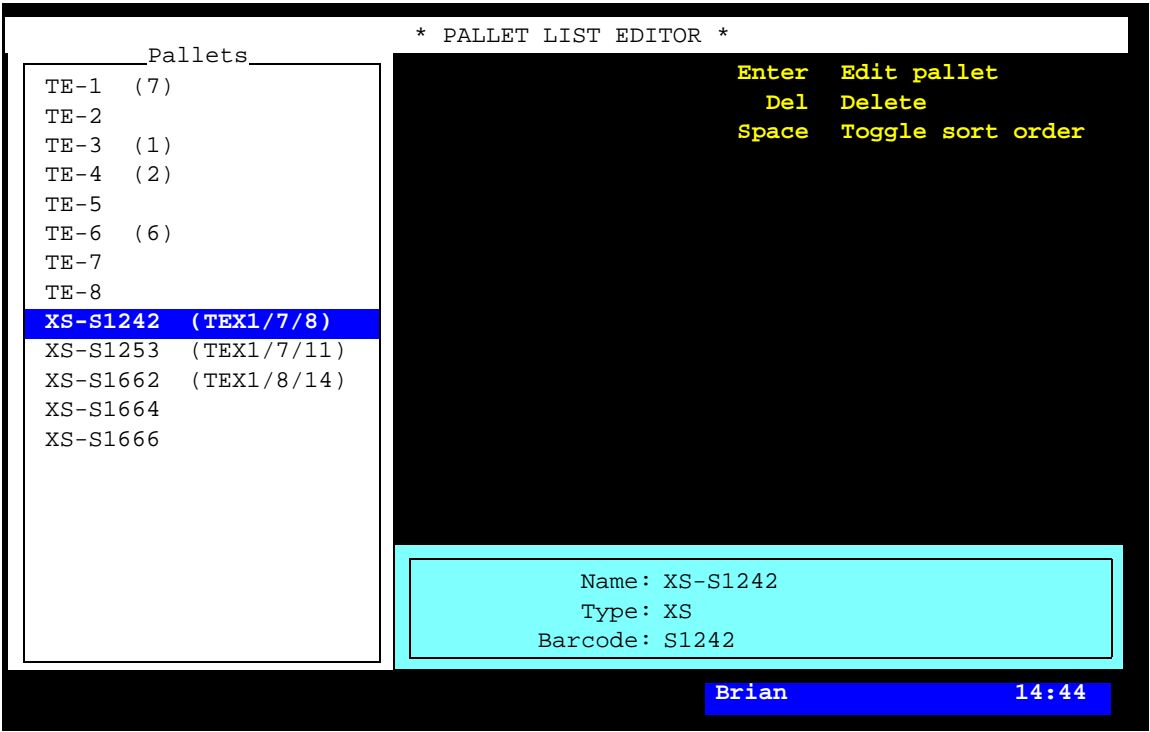
Figure 6-19. Pallet List

Entry in the Pallet List Editor:

Pallets

This box lists defined pallets in the system, and in the TPSys network, if shared databases are used. The magazine position numbers are shown in brackets. No position number is shown for pallets defined but not inserted or scanned by the TEX unit.

New TE pallets are inserted by pressing <Ins>. New XS and XD pallets are automatically inserted as they are scanned by the TEX unit.

Figure 6-19 shows a machine with 13 defined pallets:

– Eight TE pallets, four of which are inserted.

– Five XS pallets, three of which are inserted and recognized by TEX unit number 1.

The selected XS-S1242 (TEX1/7/8) pallet, is inserted in TEX unit number 1, magazine position number 7, and TEX cassette slot number 8.

If shared databases are used, then the machine number is also shown in brackets for pallets inserted in other machines, for instance (tp9n491/8) if the pallet is inserted in magazine position 8 in a TP9 machine with serial number 491.

Name

The selected pallet can be given a name after pressing <Enter>.

Type

Pallets are classified in three different types:

XS   – Standard pallet for the TEX unit with two cassettes. This type can only be inserted by the TEX unit.

XD   – Double width pallet for the TEX unit with one cassette. This type can only be inserted by the TEX unit.

TE   – Pallet used in the Tray Elevator Magazine. This type can be inserted in the Pallet List Editor.

The information in this field cannot be edited.

Barcode

Bar codes are generated automatically for XS and XD pallets as the TEX unit scans the bar codes on the pallets.

Bar codes are not used for TE pallets.

The bar codes cannot be edited.

Pallet Position List

To reduce the locating time for tray positions, a Pallet Position List feature lets you pre-define and store several tray positions, which can be used directly with no camera location.

Define a point ... By defining a point somewhere on the pallet and place one of the tray corners at this point, the tray position is settled.

... put a tray corner at the point ...

... and tell the system which corner. That's all. The system must, however, get information about which corner you have placed at the defined point.

Figure 6-20 shows the lower left tray corner placed at the lower left pallet corner.
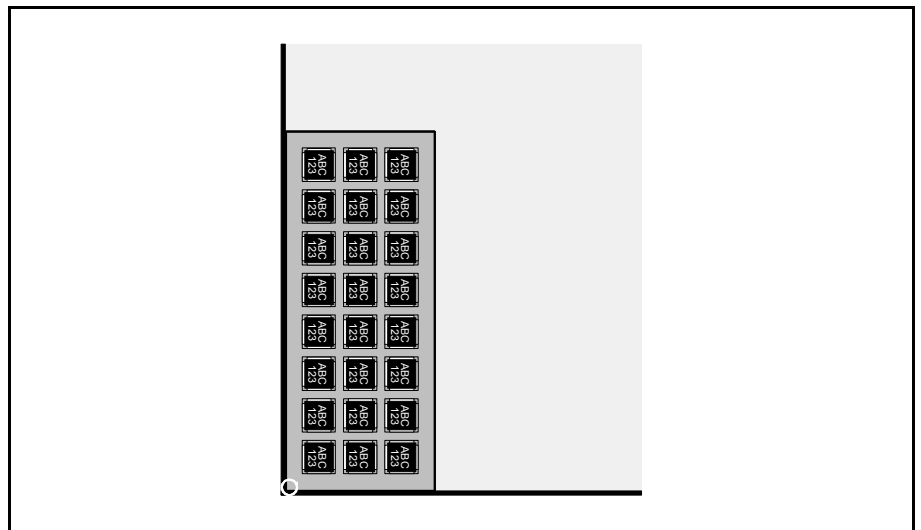

Figure 6-20. Tray at the lower left pallet

To be able to define a point on the pallet and select a tray corner, open the Pallet Position List by selecting the **Pallet Magazine** option in the **Magazine** menu and then **Tray Positions**.

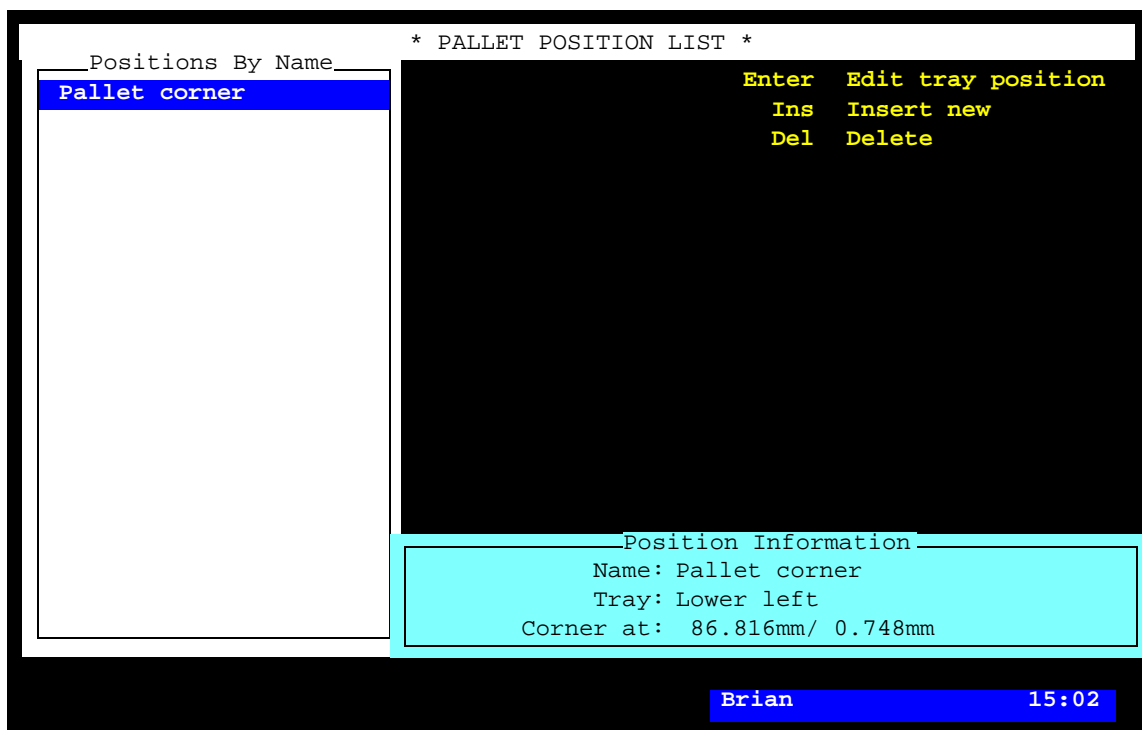The Pallet Position List window is shown in Figure 6-21.

```
                        * PALLET POSITION LIST *
  __Positions By Name__
  Pallet corner                            Enter   Edit tray position
                                             Ins   Insert new
                                             Del   Delete








                            Position Information
                           Name: Pallet corner
                           Tray: Lower left
                      Corner at:  86.816mm/ 0.748mm


                                         Brian              15:02
```

Figure 6-21. Pallet Position List

The Pallet Position List has the same entries and functionality as the Y-Wagon Position List. So, the description on page 6-25 (to page 6-28) is applicable also to this list.

The Structure of the Tray Pallet Magazine List

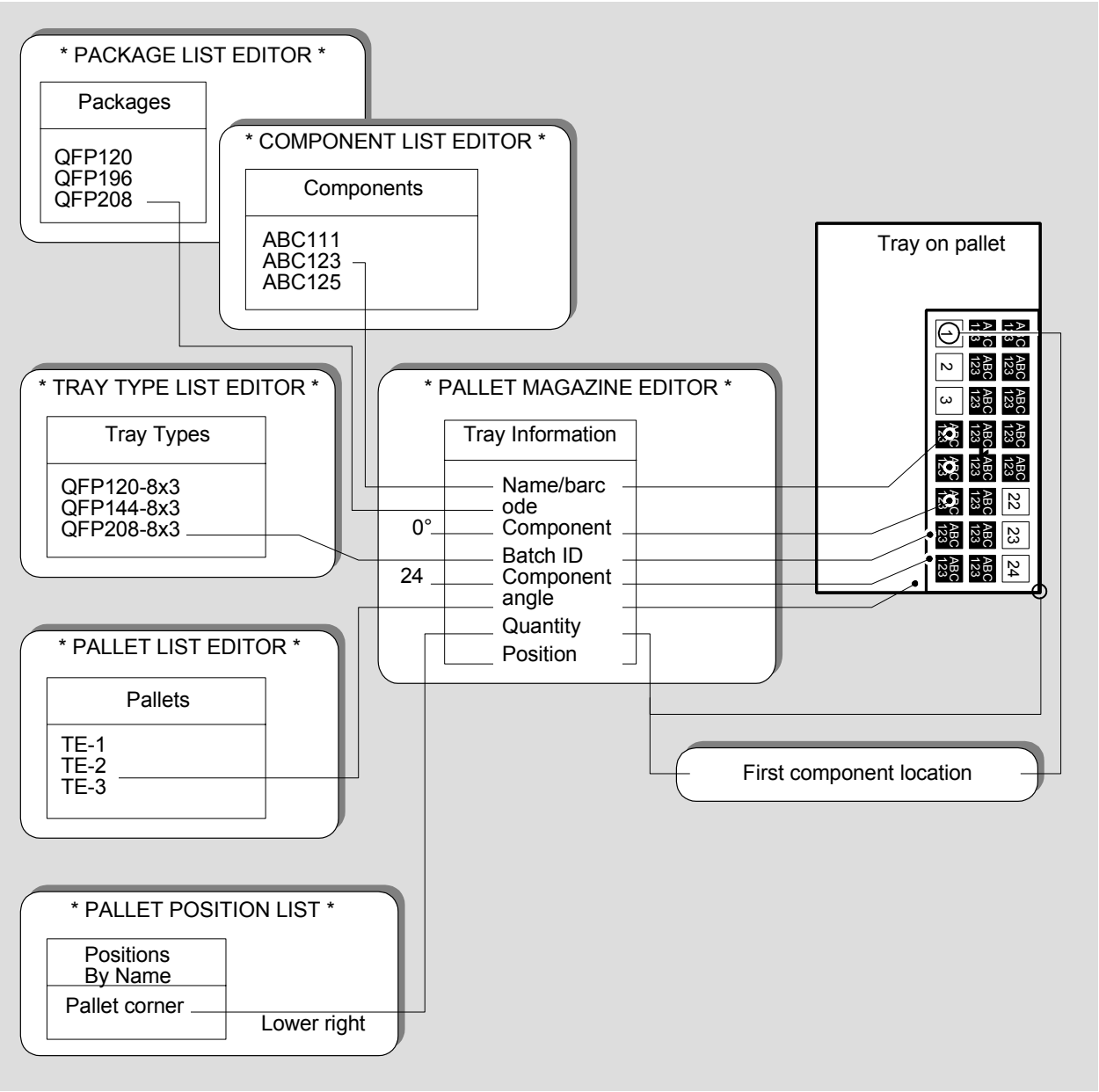The structure of the Tray Pallet Magazine List is shown in Figure 6-22.

Figure 6-22. Tray Pallet Magazine List structure

Figure 6-22 shows the following example:

Component – Component – Batch ID – Quantity.   A tray that contains ABC123 type components in QFP208 packages. The component angle is 0° referred to the tray, and there are 24 components in a full tray.

Tray type – Pallet – Position.   The tray used is a QFP208-8x3 type tray which is placed on a pallet named TE-2, at the lower right corner.

The first component is located at the upper left corner of the tray. The tray angle is thus 90°.

Tray Type List

The purpose of the Tray Type List is to define various types of trays that are used for the Y-Wagon Magazine, Tray Wagon Magazine, and TEX Tray Exchanger.
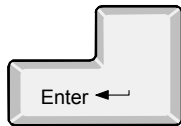
The Tray Type List is opened by selecting the **Tray Type** option in the **Magazine** menu

The Tray Type List Editor is shown in Figure 6-23.

Function keys in the Tray Type List Editor:

Edit tray type

By pressing <Enter> the highlighted tray type can be modified.

Insert new

A new tray type can be added to the tray types list by pressing <Ins> and enter a new name.

Delete

The highlighted tray type can be deleted by pressing <Del> and confirming the deletion in a popup box.

Select magazine

The default viewing area of the camera is the Y wagon, used for the Y-Wagon Magazine. Changing the viewing area to the Tray Wagon Magazine, the TEX or to the Tray Elevator Magazine is carried out by pressing <F6> and selecting a magazine.
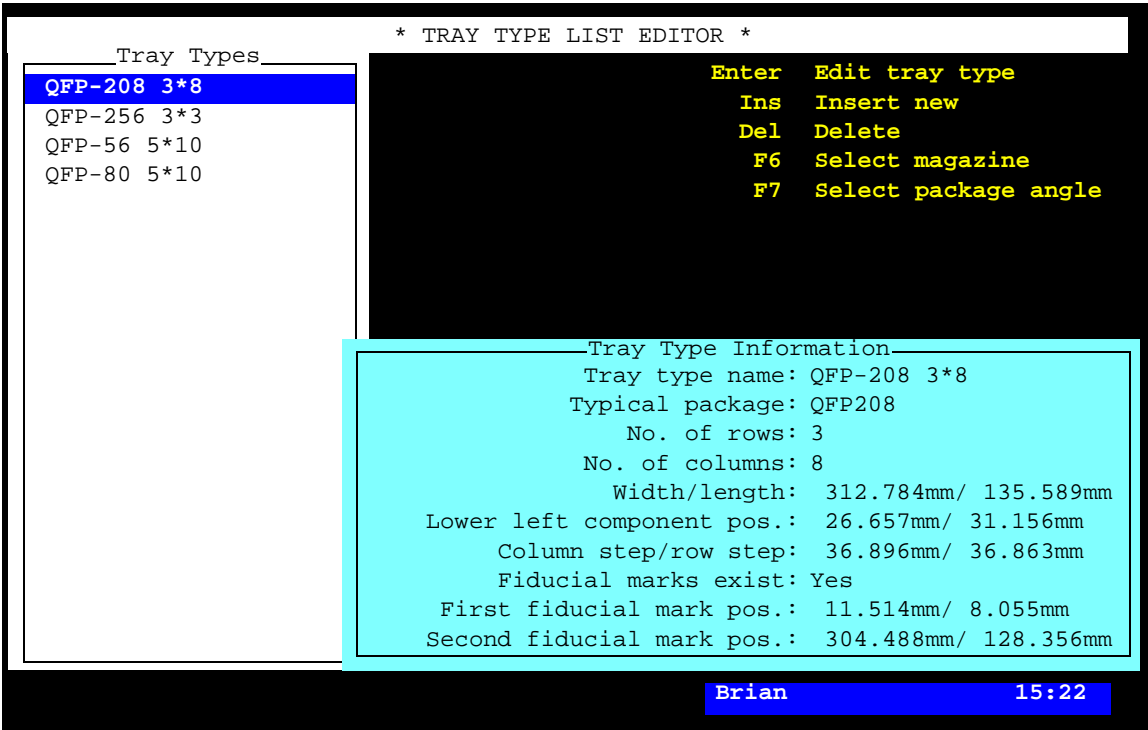
```
                              * TRAY TYPE LIST EDITOR *
        ___Tray Types___
       QFP-208 3*8                       Enter   Edit tray type
       QFP-256 3*3                         Ins   Insert new
       QFP-56 5*10                         Del   Delete
       QFP-80 5*10                          F6   Select magazine
                                            F7   Select package angle




                             ___Tray Type Information___
                              Tray type name: QFP-208 3*8
                              Typical package: QFP208
                                  No. of rows: 3
                               No. of columns: 8
                                 Width/length:  312.784mm/ 135.589mm
                      Lower left component pos.:  26.657mm/ 31.156mm
                          Column step/row step:  36.896mm/ 36.863mm
                          Fiducial marks exist: Yes
                       First fiducial mark pos.:  11.514mm/ 8.055mm
                      Second fiducial mark pos.:  304.488mm/ 128.356mm

                                      Brian                    15:22
```

Figure 6-23. Tray Type List Editor

Select package angle

F7

If trays are to be located using *First and last component position* and the component angle on the tray is not 0°, then the current component angle must be entered by pressing <F7> and using the *Toggle lead* feature.

Exit

Esc

Press <Esc> if you want to exit this window and return to the *Pallet Magazine* sub menu.

Press <Esc> twice to return to the main window.

Entries in the Tray Type List Editor:

Tray Types

This box contains the names of the defined tray types. Use the arrow keys to select a tray type.

Tray Type Information

This box contains information about the highlighted tray type.

Tray type name

Tray type name, which has to be a unique name or number.

You can search for a tray type in the list by simply entering the first characters of the tray type name.

Typical package

Component package referred to in the Package List.

This field must contain a package if trays are to be located by using the *First and last component position* method because the *Toggle leads* field in the Package List must contain information about the package leads to be centered.

You can search for a package from the Package List by entering the first characters of the package name and pressing <Enter>, or by simply pressing <Enter>.

No. of rows

Number of component rows on the tray. Rows are defined in the Y coordinate of the machine when the components are oriented in 0°. The tray in Figure 6-28 has 3 rows. Maximum 100 rows can be defined.

No. of columns

Number of component columns on the tray. Columns are defined in the X coordinate of the machine. The tray in Figure 6-28 has 8 columns. Maximum 100 columns can be defined.

Width/length

Width in the X coordinate of the machine and length in the Y coordinate. Figure 6-28 shows a 316mm x 136mm tray.

You can enter these values either by typing them from the keyboard or by measuring with the camera. If you prefer to use the camera, then press <F1> and center the tray corners in the order indicated on the screen. Figure 6-24 shows the lower left corner (1), the lower right corner (2), and the upper left corner (3).
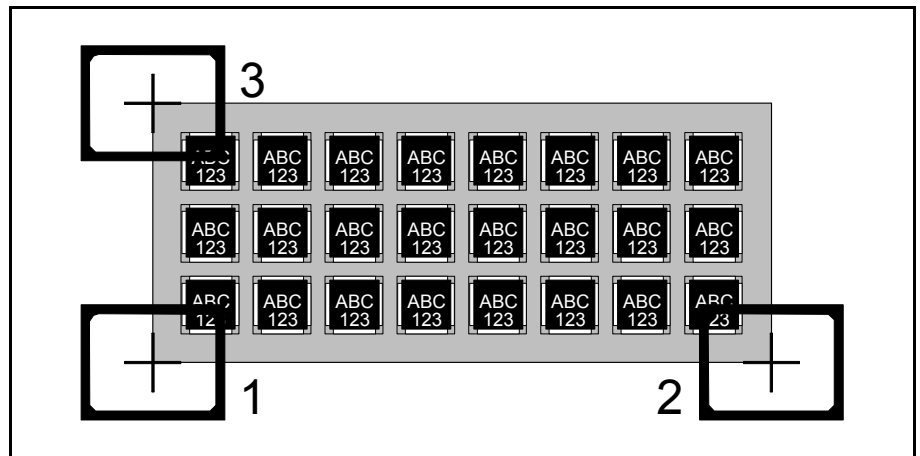
Figure 6-24. Tray width and length measuring

Lower left component pos.

The position of the lower left component on the tray. This applies to component 1 in Figure 6-28.

The coordinate values are measured from the tray corner to the center of the component, that is 28.5mm/31mm in Figure 6-28.

You can enter the first component coordinate values by typing or by measuring with the camera. If you prefer to use the camera, then press <F1> and center the first component, see Figure 6-25. If the *Typical package* coincides with the current package, you can center the cross hairs on defined leads by pressing <F3>.
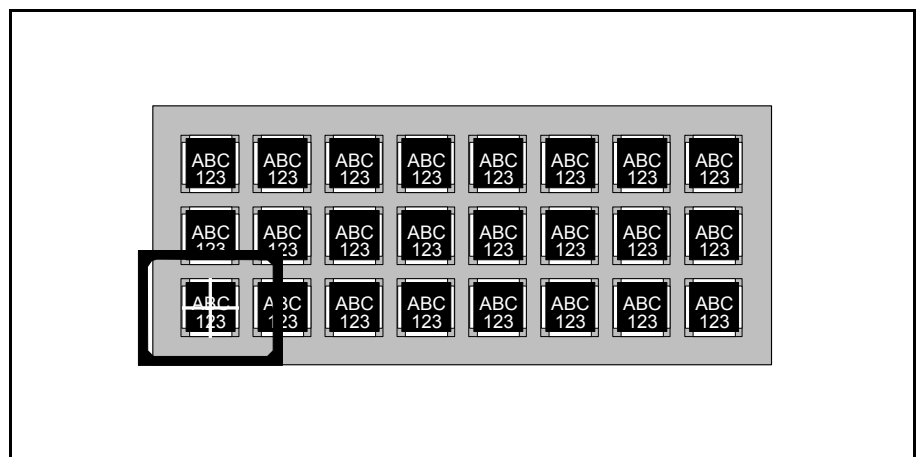

Figure 6-25. Positioning the lower left component

Column step/row step

The center distance between columns and rows, that is 37mm and 37mm in Figure 6-28.

These values can be entered in the same way as the lower left component, but on the upper right component if camera is used, see Figure 6-26. The system calculates the spacing values.
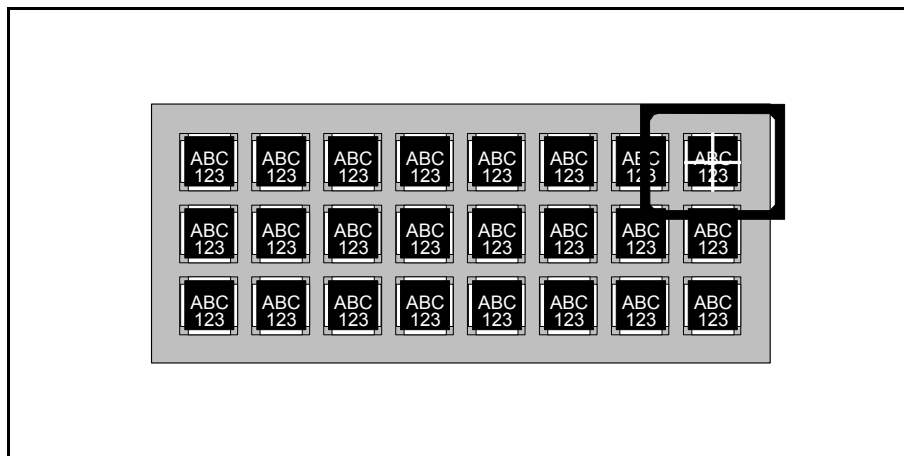

Figure 6-26. Positioning the upper right corner

Fiducial marks exist

Yes – The tray has two marks that can be used as fiducial marks. The example in Figure 6-28 has two fiducial marks named 'F1' and 'F2.'

No – No fiducial marks are to be used on the tray. The two following lines are not used if *No* is set in this field.

First fiducial mark pos.

The X/Y coordinates of the first fiducial mark on the tray, if exist.

If the previous *Fiducial marks exist* field is set to *Yes*, then you can enter the X/Y coordinates of the first fiducial mark by typing or by measuring with the camera. If you prefer to use the camera, then press <F1> and center the cross hairs on the first fiducial mark, see '1' in Figure 6-27.

Second fiducial mark pos.

The X/Y coordinates of the second fiducial mark on the tray, if exist.

Repeat the previous entering by typing or with the camera, but center the second fiducial mark, see '2' in Figure 6-27.
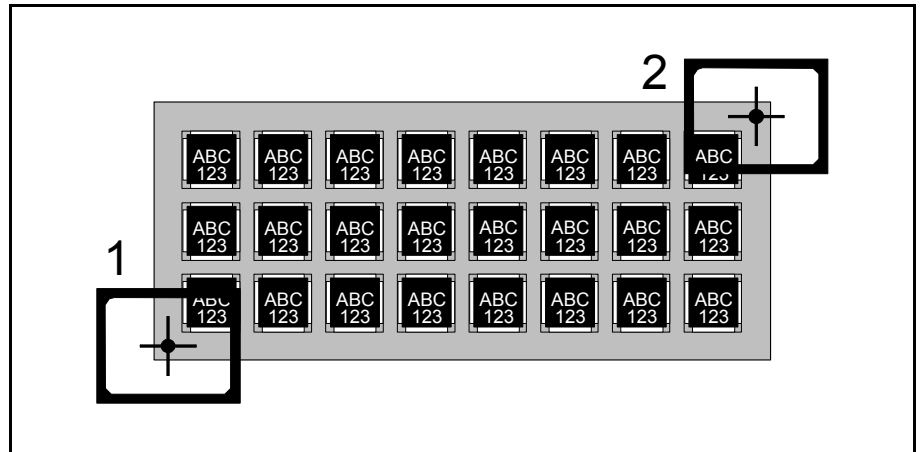

Figure 6-27. Positioning two fiducial mark

In Figure 6-28 you will find an example of a tray definition, and below, the corresponding tray type information box.
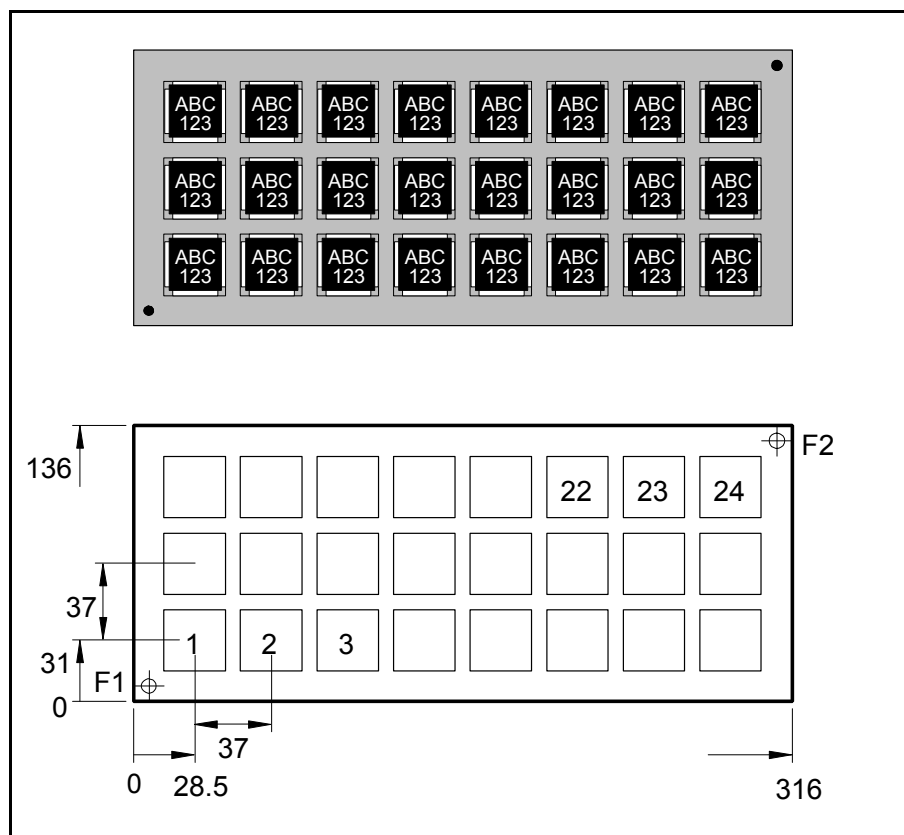
Figure 6-28. QFP-3*8 tray definition example

The following tray type information box applies to the QFP-3*8 tray
shown in Figure 6-28:

```
                  ─Tray Type Information─
                 Tray type name: QFP-208 3*8
                Typical package: QFP208
                    No. of rows: 3
                 No. of columns: 8
                   Width/length:   316.054mm/ 136.091mm
        Lower left component pos.:   28.503mm/ 31.014mm
            Column step/row step:   37.083mm/ 37.026mm
            Fiducial marks exist: Yes
        First fiducial mark pos.:   11.514mm/ 8.055mm
       Second fiducial mark pos.:   304.488mm/ 128.356mm
```

Note that these values are examples. You cannot use them for
programming a QFP-3*8 tray.

HYDRA Preparation
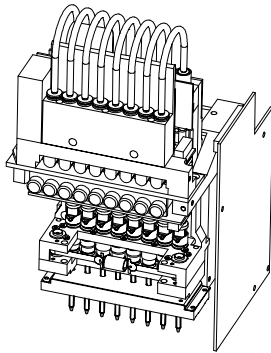
The purpose of the HYDRA preparation is to compose the contents of a Magazine Kit which is optimized for assembling a layout using the HYDRA unit.

The magazine preparation is carried out by simply selecting an option in the TPSys main menu and then selecting the desired layout.

An optimized magazine load list for the desired layout is presented in a HYDRA Preparation Editor window. This information can also be printed out.

After preparation, a Magazine Kit can be created, modified and printed out. This Magazine Kit is then applied into the Magazine List prior to assembling the layout.

A HYDRA preparation does not consider current magazine contents. A suggestion presented is based completely on an optimized use of the HYDRA unit. You can, however, edit the Magazine Kit information to meet the current magazine contents if you wish.

HYDRA preparation and Magazine Kit modification can be carried out off-line.

The HYDRA preparation can include all magazines from which the HYDRA unit can pick components, except VMF30, Agilis LM, and TMFlex magazines.

We recommend that MYPlan software is used for optimization. This software handle all combinations of magazines and pick heads. Using MYPlan will generate an optimal kit-list for all components – not only the HYDRA components.

Preparing a Layout for HYDRA

- To prepare a layout for assembling using the HYDRA unit, select the **HYDRA Preparation** option in the **Magazine** menu.

- Select the desired layout for which the magazine list is to be prepared.

  The magazine optimization is then carried out.

A HYDRA preparation dialog box that displays the result of the preparation is shown after the preparation is completed. In this box (shown on page 6-52) you can make modifications, print the optimized magazine load list, and create a Magazine Kit.

HYDRA Preparation Editor

The HYDRA Preparation Editor shows the result of a HYDRA preparation. It is opened automatically after a completed HYDRA preparation.

The HYDRA Preparation Editor is shown in Figure 6-29.

Function keys in the HYDRA Preparation Editor:
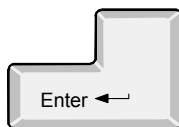
Feeders to use

Number of available feeders for a component can be set by pressing <Enter> and changing the *Available feeders* entry in the *Component* box (Figure 6-29). As the number of available feeders is changed, a new preparation is calculated automatically.

Available feeders is described on page 6-55.

Print preparation

You can print the suggested preparation by pressing <F1>. An example of a printout is found on page 6-59.

Optimum preparation

By pressing <F2> an optimum preparation is created in which no consideration is taken to manual feeder number modification, this preparation will thus override any previous manual input.
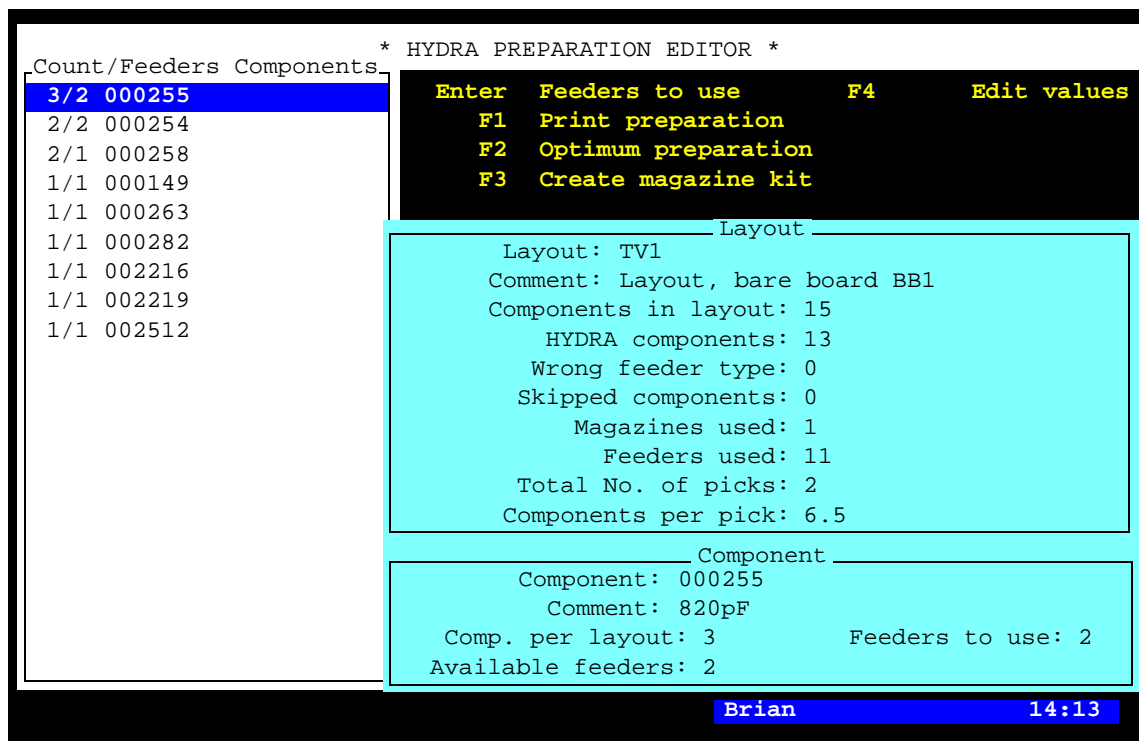
```
                        * HYDRA PREPARATION EDITOR *
 Count/Feeders Components
 3/2 000255            Enter   Feeders to use      F4      Edit values
 2/2 000254             F1  Print preparation
 2/1 000258             F2  Optimum preparation
 1/1 000149             F3  Create magazine kit
 1/1 000263
 1/1 000282                            Layout
 1/1 002216               Layout: TV1
 1/1 002219               Comment: Layout, bare board BB1
 1/1 002512      Components in layout: 15
                      HYDRA components: 13
                     Wrong feeder type: 0
                    Skipped components: 0
                        Magazines used: 1
                          Feeders used: 11
                  Total No. of picks: 2
                  Components per pick: 6.5
                                    Component
                      Component: 000255
                        Comment: 820pF
                  Comp. per layout: 3          Feeders to use: 2
                  Available feeders: 2
                                                Brian              14:13
```

Figure 6-29. HYDRA Preparation Editor

Create magazine kit

F3

By pressing <F3> and entering a new name, a Magazine Kit is created and opened in the Magazine Kit List editor, see the *Magazine Kit* section in the *Operators Manual*, in which you can edit and print and then apply it for assembling.

Edit values

F4

In order to find the best kit, you can manipulate the preparation by pressing <F4> and changing preparation values, see page 6-57.

As the values are changed, a new preparation is calculated automatically.

Entries in the HYDRA Preparation Editor:

Count/Feeders Components

A list of components that can be mounted in the layout using the HYDRA unit, that is components for which one or more HYDRA tools have been defined in the Package List and also are set as available in the preparation tool parameters (page).

Each component entry is divided into three parts:

First number.   – The total number of this component in the layout (the same as *Comp. per layout* in the *Component* box).

This number is the second sort criterion of this list (descending sort order).

Second number.   – The suggested number of feeders for this component (the same as *Feeders to use* in the *Component* box).

This number is the first sort criterion of this list (descending sort order).

Component name.   – Component name, referred to in the Component List.

The component name is the third sort criterion of this list (ascending alphanumeric sort order).

In the *Layout* box.   ## Layout, Comment

Name and comment text for the selected layout.

Components in layout

The total number of components in the layout, HYDRA mountable as well as not HYDRA mountable components.

HYDRA components

The total number of HYDRA mountable components in the layout. Equals the total number of components indicated in the *Count/Feeders Components* list.
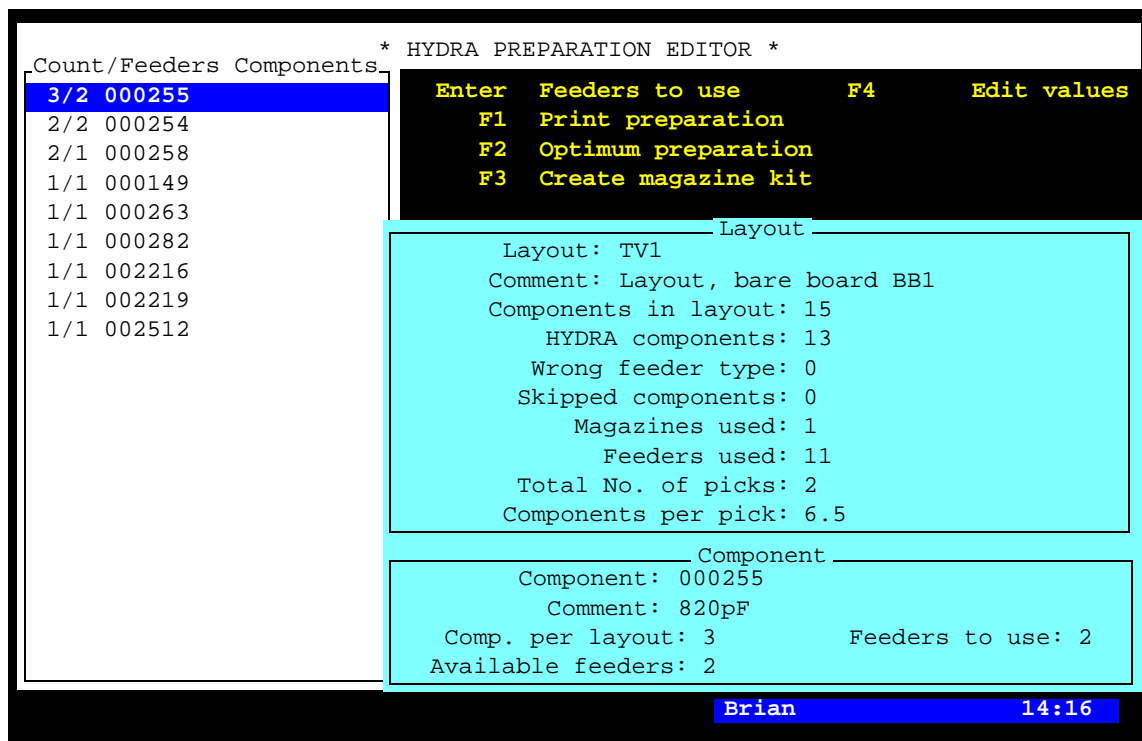
```
                        * HYDRA PREPARATION EDITOR *
 Count/Feeders Components
  3/2 000255              Enter   Feeders to use       F4      Edit values
  2/2 000254                F1   Print preparation
  2/1 000258                F2   Optimum preparation
  1/1 000149                F3   Create magazine kit
  1/1 000263
  1/1 000282                            Layout
  1/1 002216                 Layout: TV1
  1/1 002219                Comment: Layout, bare board BB1
  1/1 002512       Components in layout: 15
                       HYDRA components: 13
                      Wrong feeder type: 0
                    Skipped components: 0
                         Magazines used: 1
                           Feeders used: 11
                    Total No. of picks: 2
                    Components per pick: 6.5

                                        Component
                          Component: 000255
                            Comment: 820pF
                     Comp. per layout: 3          Feeders to use: 2
                     Available feeders: 2

                                        Brian                    14:16
```

Figure 6-30. HYDRA Preparation Editor

Wrong feeder type

Number of feeders containing HYDRA mountable components
loaded in not HYDRA pickable feeders. HYDRA pickable feeders
have the following settings in the Component List:

Magazine type: *Tape*
Feeder type: *8mm*, *FP8mm*, *12mm* or *16mm*.

Skipped components

Number of components which will not be mounted because they are
set to no mounting (described in the *Mount and Glue Switches*
section in Chapter 7).

Magazines used, Feeders used

Suggested number of magazines and feeders to be used for the
HYDRA mountable components in the layout.

Total No. of picks

The total number of picks required for assembling the layout.

Components per pick

The average number of components per pick, that is the indicated number of *HYDRA components* divided by the *Total No. of picks*.

In the *Component* box.   ### Component, Comment

Component name and comment text referred to in the Component List.

Comp. per layout

The number of the highlighted component in the layout, also indicated in the *Count/Feeders Components* list.

Feeders to use

Number of feeders suggested for the component, also indicated in the *Count/Feeders Components* list.

Available feeders

Number of feeders that can be used for the highlighted component.

This number can be changed by pressing <Enter> and typing a new number.

If you have a board that contains eight components of the same type, then TPSys may suggest eight feeders for this component type. If you only have three reels of this component type, then change to 3 in this field.

As the number of feeders is changed, a new preparation is calculated automatically.

☞ A modification in this field does not affect an optimum preparation launched by pressing <F2>.

```
                          * HYDRA PREPARATION EDITOR *
Count/Feeders Components
 3/2 000255            Enter  Feeders to use           F4   Edit values
 2/2 000254             F1  Print preparation
 2/1 000258             F2  Optimum preparation
 1/1 000149             F3  Create magazine kit
 1/1 000263
 1/1 000282                              ┌─ Layout ─┐
 1/1 002216              Layout: TV1
 1/1 002219             Comment: Layout, bare board BB1
 1/1 002512      Components in layout: 15
                     HYDRA components: 13
                    Wrong feeder type: 0
                   Skipped components: 0
                       Magazines used: 1
                         Feeders used: 11
                 Total No. of picks: 2
                 Components per pick: 6.5

                                       ┌─ Component ─┐
                     Component: 000255
                       Comment: 820pF
                 Comp. per layout: 3        Feeders to use: 2
                                          Available feeders: 2

                                        Brian                14:19
```

Figure 6-31. HYDRA Preparation Editor

Example

Figure 6-31 shows an example in which 11 feeders in 1 magazine will
be used to mount 13 components (three 000255, two 000254, and one
of each of the other components in the layout).

To pick and place these 13 components the HYDRA unit has to make
two pick and place procedures, for instance one with 6 components
and one with 7 components (two picks from component 000255 and
000258).

Thirteen components in two pick procedures equals 6.5 components
per pick on average.

This example is also shown as a print-out on page 6-59.

Edit HYDRA Preparation Values

By pressing <F4> in the HYDRA Preparation Editor, you can change preparation values in order to find the best magazine kit.

The following preparation parameter box is shown:

```
                  Edit preparation values
Trade-off: Number of saved picks
                for each extra feeder 15
           Maximum computation time: 13
   No. of available TM12 magazines: 0
   No. of available TM16 magazines: 0
 No. of available TM1216 magazines: 1
```

Entries in the preparation parameter box:

Trade-off: Number of saved picks for each extra feeder

This parameter determines whether extra feeders can be used or not. The criteria for using additional feeders is how many picks each extra feeder can save.

If an extra feeder saves at least as many picks for the layout as set in this entry, then an extra feeder will be suggested. If not, no extra feeder will be suggested.

A big value (over 25) is recommended for small batches where the change-over time is most important.

A small value (0.1 – 5.0) is recommended for big batches where the assembly speed is most important.

Maximum computation time

This parameter sets the time limit for calculating the HYDRA preparation. If the best solution is not found when this time has elapsed, then the best solution found is displayed.

No. of available TM12 magazines

No. of available TM16 magazines

No. of available TM1216 magazines

These parameters set the number of available TM12, TM16 and TM1216 magazines.

The HYDRA preparation does not suggest more TM12 and TM16 magazines than available, unless necessary.

Modified Preparation Values

The following popup box is shown when leaving the HYDRA
Preparation Editor, if at least one of the preparation values has been
modified:

```
Save changed preparation values?
            Yes  No
```
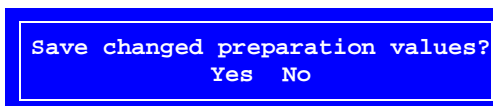
Yes – The modified values are saved and will be the current
preparation values the next time the HYDRA preparation is
launched (for any layout).

No – The modified values are not saved. The previous preparation
values will remain the next time the HYDRA preparation is
launched.

HYDRA Preparation Printout

The following printout is an example of the preparation shown in Figure 6-31 on page 6-56.

```
                    HYDRA magazine preparation

                          Layout: TV1
              Components in layout:   15
                   HYDRA components:   13
                 Skipped components:    0
                      Feeders used:    1
              Total number of picks:    2
                 Components per pick: 6.50

 Magazine: TM8B-1
     Slot: 3
     Feeder:                          Component:        Number of picks:
        1                             ----------                       0
        2                             ----------                       0
        3                             ----------                       0
        4                             ----------                       0
        5                             ----------                       0
        6                                000149                        1
        7                                000254                        1
        8                                000254                        1
        9                                000255                        1
       10                                000255                        2
       11                                000258                        2
       12                                000263                        1
       13                                000282                        1
       14                                002216                        1
       15                                002219                        1
       16                                002512                        1
 Speed: 5 components per pick

 Component:                       Magazine:                    Feeders:
 000149                           TM8B-1                       6
 000254                           TM8B-1                       7,8
 000255                           TM8B-1                       9,10
 000258                           TM8B-1                       11
 000263                           TM8B-1                       12
 000282                           TM8B-1                       13
 002216                           TM8B-1                       14
 002219                           TM8B-1                       15
 002512                           TM8B-1                       16
```

The first part of the printout applies to the layout. The second part applies to the magazines and is first sorted by feeders and then by components.

The magazine position number (*Slot* above) is determined by the *85.0104 Magazine position priority* parameter.

The magazine name and position number can be changed in the Magazine Kit Editor (see the *Magazine Kit* section in the *Operators Manual*) prior to applying the Magazine Kit into the Magazine List.

The printout above is an example of the preparation described on page 6-56 in which a first pick from feeder 6 – 11 and a second pick from feeder 10 – 16 make the 13 components in two picks.

HYDRA Preparation Parameters

The following parameters, involved in the HYDRA preparation, are found in the *0172 HYDRA preparation* parameter group:

– *0172.0101 Treat unknown feeder types as*
  In this parameter components with no specified feeder type can be set to *Unknown* (default), *8mm*, *FP8mm*, *12mm* and *16mm*.

– *0172.0103 Include skipped components*
  Sets whether components marked as skipped in the Component List or PCB List are to be included in the preparation or not.

Available HYDRA tool types

– *0172.0301 H00*
– *0172.0302 H01*
– *0172.0303 H02*
– *0172.0304 H03*
– *0172.0305 H04*
– *0172.0306 H05*
– *0172.0307 H06*
– *0172.0308 H07*

These eight parameters set the HYDRA tools to be available or not available for HYDRA preparation.

These parameters have no affect on the assembly process, they only control the preparation result.

7. Mount Lists

To be able to mount a PCB, four mandatory main lists (or list groups) are required:

- **Component List**

  Contains part numbers and component name and data. Assigns a package to the component.

- **Package List**

  Contains data specific to the component package, such as length, width, height, number of leads, mount tool, placement precision, centering forces and optical centering data.

- **Magazine Lists (group)**

  Lists that inform the system about in which magazine and type of magazine (tape, vibrator, or tray) the components can be found and where the magazines are located. The lists include also such information as component angles and quantities.

- **Mount Lists (group)**

  Mount lists on different levels for PCBs, panels, and layouts, indicating which components are to be mounted and where they are to be placed.

PACKAGE LIST
Package data
⇒
COMPONENT LIST
Component data
⇒
MOUNT LISTS
Where components are to be placed
⇐
MAGAZINE LISTS
Where components are to be found

⇓

MOUNTING

This chapter describes the Mount Lists, one of the main list groups necessary for mounting a board.

The other mandatory lists or list groups are described in Chapter 4, Chapter 5 and Chapter 6.

Additional lists for such features as fiducial marks, adhesive application and user access are found in Chapter 8.

Special characters

National special characters and some non-letter/non-figure characters cannot be entered into the system, for instance in board names and layout names.

The following special characters are, however, allowed to be used:
" ' ` \ $; ^ @

Terminology

Industry terminology can sometimes be confusing and ambiguous. In order to ensure good understanding, the following terms are consistently used throughout this manual.

Bad board mark

Label for marking defective PCBs included in panels.

Board

PCB or panel, mounted or bare board.

Header information

Information about the board, such as size and fiducial marks.

Mount information

Information about components and their positions on the board.

Printed Circuit Board, PCB

A generic term for a mounted or bare board.

Panel

A board containing multiple PCBs, identical or different, which are separated into individual boards after completing the assembly process.

Layout

One or several boards that are assembled simultaneously on the assembly table. PCBs and panels can be mixed.

Fiducial mark

Fiducial mark used to locate boards by means of the vision system. At least two fiducial marks are required on each board. The system can handle maximum three fiducial marks on boards.

The Purpose of the Mount Lists

The Mount Lists indicate which components are to be mounted and where they are to be positioned.

The lists are used for PCBs, panels, and layouts.

PCB, Panel and Layout

PCB

Individual printed circuit board.
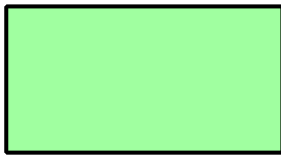
Panel

Board containing more than one PCB, identical or different, which are separated after mounting and soldering.
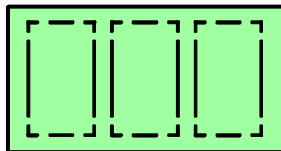
Layout

All assembling is performed in layouts containing one or many boards that are assembled simultaneously. PCBs and panels can be mixed in a layout.
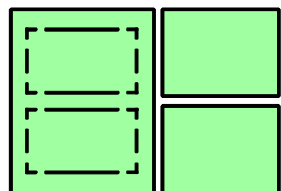
This chapter details the various lists that are required for mounting PCBs and panels in layouts.

PCB

A PCB must be assigned a unique name, either alphabetical or numerical. The name is the keyword for all information about the PCB.

The PCB in the following figure is named PCB1.
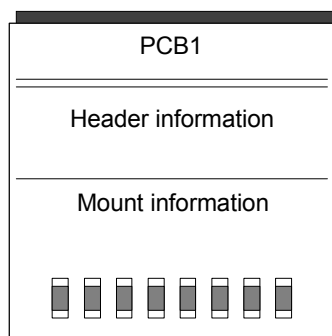
Figure 7-1. PCB1 information

The information about a PCB can be divided into two parts:

Header information

General information for the entire board, such as board dimensions, number of fiducial marks, type and position of fiducial marks, and location of bad board marks and mount tool test points.

Mount information

Information about which components are to be mounted and where they are to be located, including for instance component names, locations, alignments and mount order.

Panel

The panel must be assigned a name, which becomes the keyword for all information about the panel. The name does not need to be unique and can be the same as the name of the included PCB. However, there cannot be two panels with the same name.

The panel in the following figure is named PANEL1, and two PCBs are included in it.
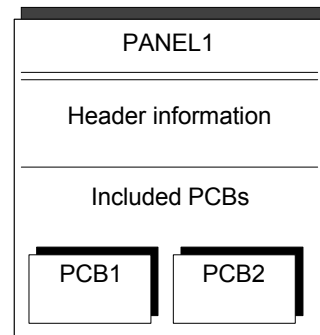
Figure 7-2. PANEL1 with two PCBs

The information about a panel can be divided into two parts:

Header information

General information for the entire board, which is the same information described for the PCB, that is for instance dimensions, number of fiducial marks, type and position of fiducial marks, and location of bad board marks and tool test points.

Included PCBs

The names of the included PCBs in the panel. These names link the PCB information to the panel. A modification made on an individual PCB will thus affect the PCB also when included in panels.

There is also information about the position of the PCBs in the panel. This information is related to the panel fiducial marks.

Layout

A layout must also be assigned a name, which becomes the keyword for the boards included in the layout. The layout name need not be unique and can be the same as the name of the included PCB or panel. The same name is preferable when a layout contains a single board. However, there cannot be two layouts with the same name.

All assembling is performed using layouts. A PCB or panel cannot be assembled without being included in a layout.

The layout in the following figure is named LAYOUT1 and it contains PANEL1 with the two PCBs.

```
          LAYOUT1
      _____

      Layout information
      _____

      Included boards

      ┌──────────────────┐
      │      PANEL1       │
      │  ┌─────┐  ┌─────┐ │
      │  │PCB1 │  │PCB2 │ │
      │  └─────┘  └─────┘ │
      └──────────────────┘
```
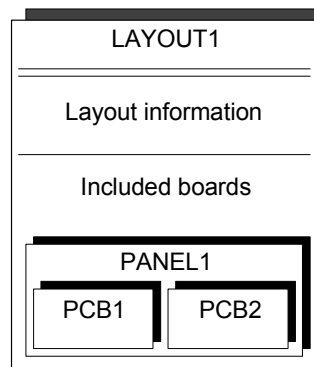
Figure 7-3. Layout for a panel with two PCBs

The information about a layout can be divided into two parts:

Layout information

Name and general information about the layout.

The layout level is the highest level in the hierarchy of the Mount Lists. See the structure diagram of the Mount Lists in Figure 7-4.

Included boards

The names of the included boards and panels in the layout. These names link the board information to the layout. A modification made to an individual PCB or panel will thus affect this board in all layouts where included.

This part contains also information about the board positions on the assembly table. This information is recorded by the system, and is updated for each assembling.

Mount List Structure Diagram

Figure 7-4 shows a Mount List structure diagram with the names of the various editors.
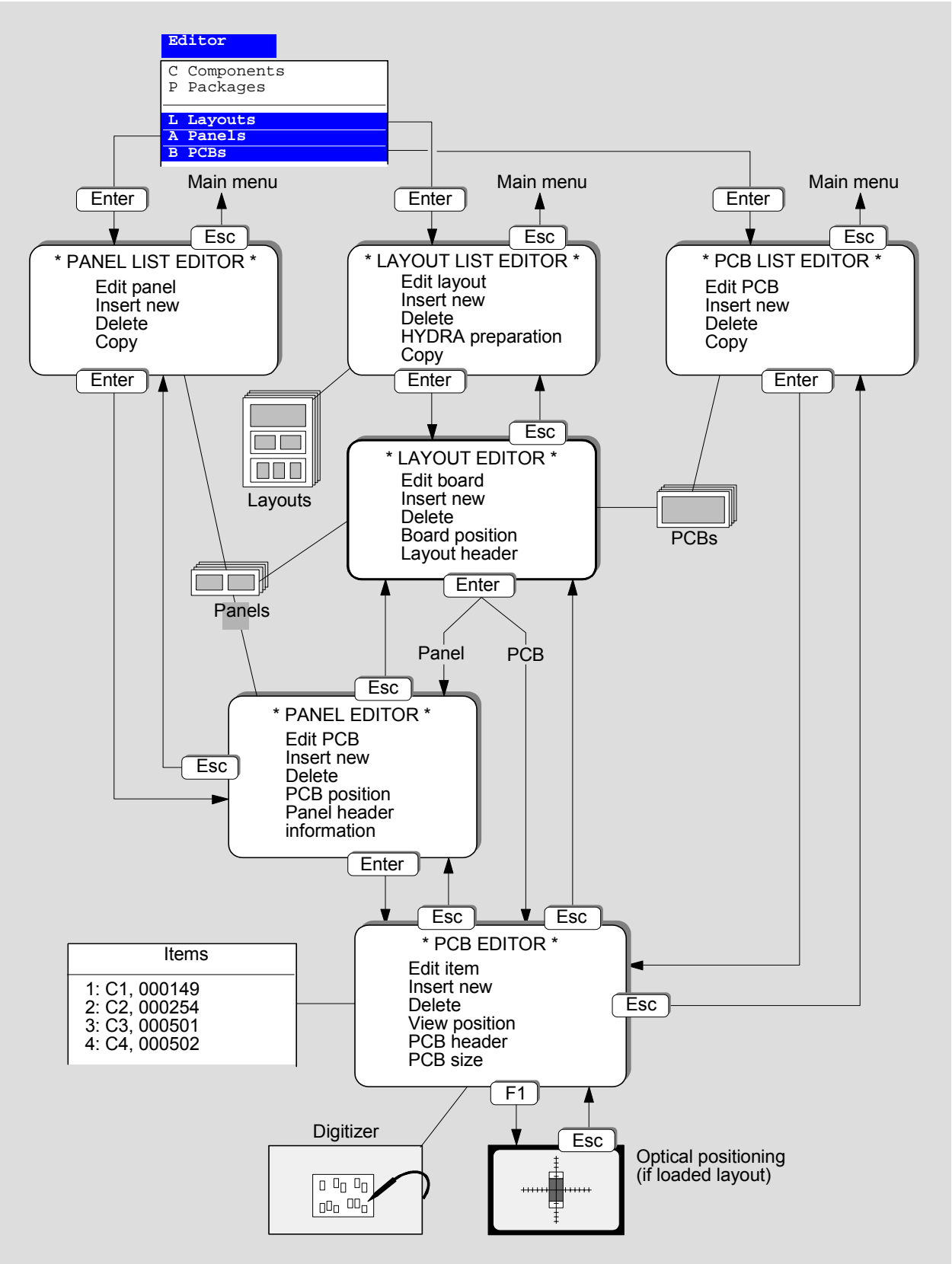
Figure 7-4. Structure diagram of the Mount Lists

Layout List Editor

The Mount Lists have four editorial levels (see Figure 7-4):

Layout List Editor–Handling layouts

Layout Editor–Handling boards in layouts

Panel Editor–Handling PCBs in panels

PCB Editor–Placing components

This section describes the Layout List, which is the entry level of the Mount Lists, opened by selecting the **Layouts** option in the **Editor** menu:

```
Editor
C Components
P Packages
----------------
L Layouts
A Panels
B PCBs
----------------
R Parameters
----------------
F Fiducial Marks
G Glue Dots
U Users
```
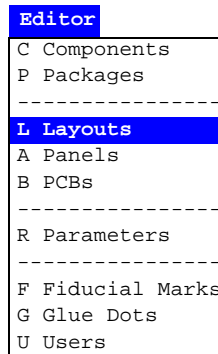
The Layout List Editor is shown in Figure 7-6.

Function keys in the Layout List Editor:
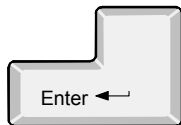
Edit layout

By pressing <Enter> the highlighted layout can be modified in the Layout Editor, see page 7-10. You will be asked whether you want to load the layout or not, if not already loaded. You do not have to load the layout unless you intend to mount components or use the camera for instance to locate boards or position components.

Layout status.   If you load a layout, you are reminded about stored layout status, if exists for the loaded layout. Layout status is described in Chapter 8 of the *Operator's Manual*.

Management data.   If you load a layout, you can also clear management data, if exists for the loaded layout. Management data is described in Chapter 8 of the *Operator's Manual*.

Insert new

A new layout can be created by pressing <Ins> and entering a new name.

Delete

The highlighted layout can be deleted by pressing <Del> and confirming the deletion in a popup box, which asks whether you want to delete all panels and PCBs included in the layout. A loaded layout cannot be deleted. Unload first by selecting the *Unload Layout* option in the *Production* menu.

☞ *If you accept to delete the boards, no further check is performed to find out whether the boards are included in other layouts or not.*

```
                          * LAYOUT LIST EDITOR *

     ┌─Layouts────────────┐              Enter   Edit layout
     │ TV-ALL             │                Ins   Insert new
     │ TV1                │                Del   Delete
     │ TV2                │                 F6   HYDRA preparation
     │ TV2-P2             │                 F9   Copy
     │ TV2-P2x2           │
     │ TV2x2              │
     │ TV3B               │        ┌─ Layout Information ──────┐
     │ TV3G               │        │    Name: TV-ALL           │
     │ TV3RGB-P3          │        │                           │
     │                    │        │ Comment: Bare boards BB1, BB2x2, BB3x3
     │                    │        │        :                  │
     │                    │        │        :                  │
     │                    │        │        :                  │
     │                    │        │        :                  │
     │                    │        │        :                  │
     │                    │        │        :                  │
     │                    │        │        :                  │
     │                    │        │        :                  │
     │                    │        │        :                  │
     └────────────────────┘        └───────────────────────────┘
                                       Brian            14:16
```
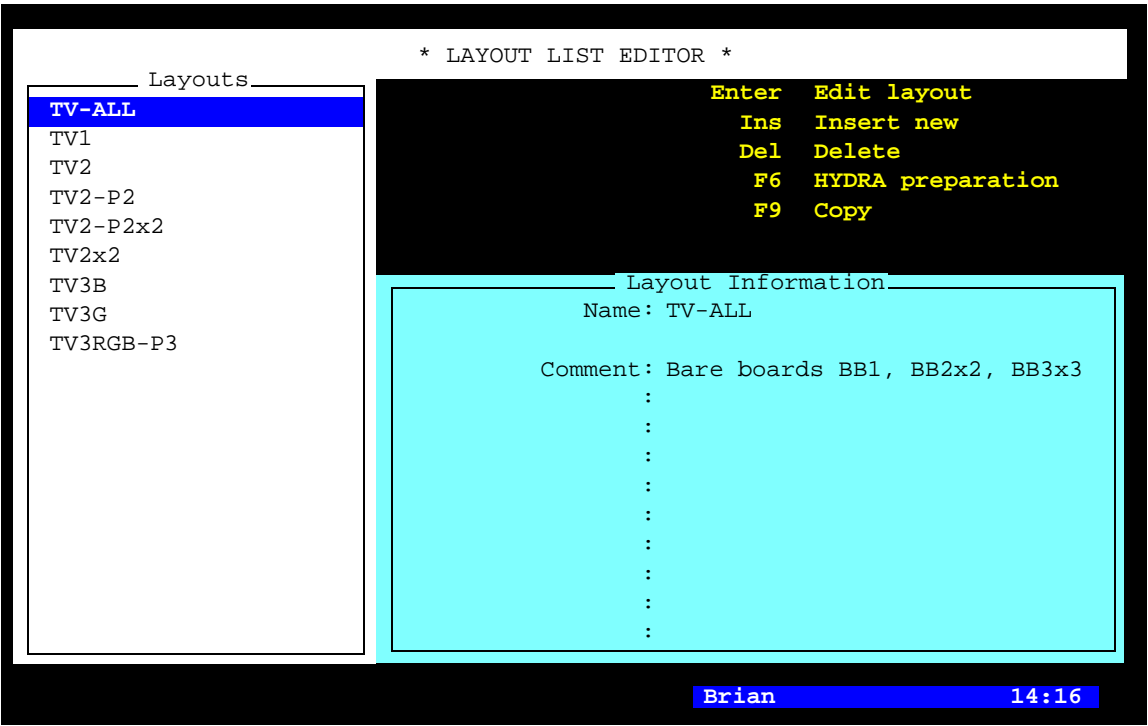
Figure 7-5. Layout List Editor

HYDRA preparation

F6

Composes a magazine load list which is optimized for assembling the highlighted layout using the HYDRA unit. This feature is further detailed in Chapter 6.

Copy

F9

The highlighted layout can be copied by pressing <F9> and entering a new layout name. It is possible to copy panels and PCBs in the layout so that they are no longer affected by subsequent changes to the originals.

Exit

Esc

Press <Esc> if you want to exit the Layout List and return to the main window.

Entries in the Layout List Editor:

Layouts

This box contains the layouts stored in the system and in the TPSys network, if shared databases are used. Use the arrow keys, <PgUp>, <PgDn>, <Home>, or <End> to select layout.

You can search for a layout in the list by simply entering the first characters of the layout name.

Layout Information

Layout names and comment text of the highlighted layout.

Layout Editor

The Layout Editor, which handles the boards included in layouts, is opened by pressing <Enter> in the Layout List Editor (page 7-8), or by selecting the **Edit Layout** option in the **Production** menu.

The Layout Editor is shown in Figure 7-6.

Function keys in the Layout Editor:

Edit board

By pressing <Enter> the highlighted board can be modified in:
- the Panel Editor if the board is a panel, see page 7-14.
- the PCB Editor if the board is a PCB, see page 7-24.
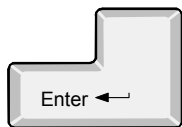
Insert new

A new board can be inserted into the layout by pressing <Ins>, selecting PCB or panel, and entering the name of a new board or selecting an existing board from the list. If the board is present on the assembly table, it can be located as well by centering the fiducial marks using the camera.

Delete

The highlighted board can be deleted by pressing <Del> and confirming the deletion in a popup box.

Board position

A board on the assembly table can be located by pressing <F1> and centering the fiducial marks using the camera.

Layout header information

Comment text, barcode, conveyor width and conveyor board type is accessible after pressing <F2>, see page 7-12.

Exit

Press <Esc> if you want to exit the Layout Editor and return to the Layout List Editor (page 7-8).

```
                        * LAYOUT EDITOR *
      ┌─── Boards ───────┐              Enter   Edit board
      │ 1: TV1 (PCB)     │                Ins   Insert new
      │ 2: TV2-P2 (Panel)│                Del   Delete
      │ 3: TV3RGB-P3 (Panel)│              F1   Board position
      │                  │                 F2   Layout header
      │                  │                      information
      │                  │
      │                  │
      │                  │    ┌─── Layout Header ──────────┐
      │                  │    │    Name:  TV-ALL           │
      │                  │    │ Comment:  Bare boards BB1, BB2x2, BB3x3 │
      │                  │    ├─── Board Position ─────────┤
      │                  │    │    Type:  Panel            │
      │                  │    │    Name:  TV2-P2           │
      │                  │    │ Comment:  Panel, bare board BB2x2 │
      │                  │    │ Fiducial mark 1:  15.044mm/ 135.116mm │
      │                  │    │               2:  215.091mm/ 205.137mm │
      │                  │    │               3:                      │
      └──────────────────┘    └────────────────────────────┘

                                Brian                14:22
```
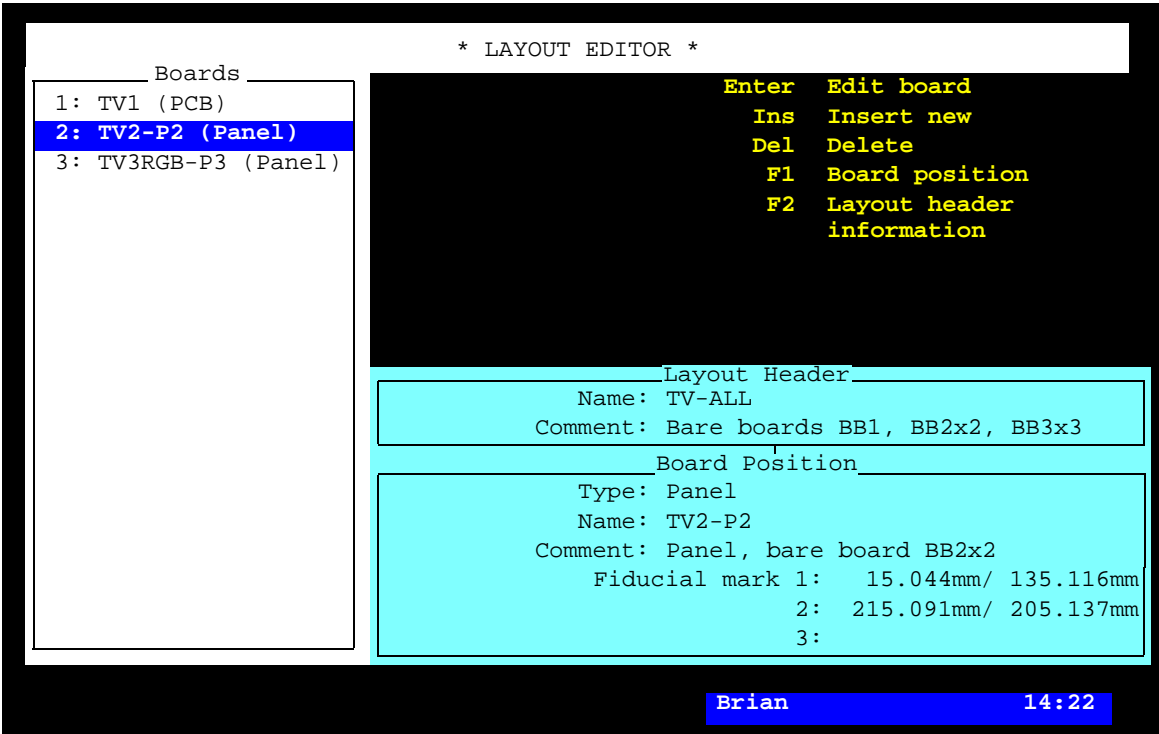
Figure 7-6. Layout Editor

Entries in the Layout Editor:

Boards

This box contains the names of the PCBs and panels included in the selected layout.

Layout Header

This box contains name and the first comment text line of the selected layout. The comment text is accessible after pressing <F2>.

Board Position

This box contains information about the highlighted board. The information can be modified after pressing <F1>.

Type

Type of board, which can be *PCB* or *Panel*.

Name Comment

Name and the first line of the comment text of the board.

Fiducial mark 1, 2, 3

The latest location of the board on the assembly table, measured in the machine coordinate system.

Layout Header Information

F2

Layout header information is accessible for editing after pressing
<F2> in Layout editor.

```
                        * LAYOUT EDITOR *
        ┌Boards──────────────┐
        │ 1: TV1 (PCB)       │              Enter  Save and exit
        │ 2: TV2-P2 (Panel)  │                Esc  Exit
        │ 3: TV3RGB-P3 (Panel)│
        │                    │
        │                    │        ┌Layout Header──────────────────┐
        │                    │        │       Name: TV-ALL            │
        │                    │        │    Comment: Bare boards BB1, BB2x2, BB3x3 │
        │                    │        │          :                    │
        │                    │        │          :                    │
        │                    │        │          :                    │
        │                    │        │          :                    │
        │                    │        │          :                    │
        │                    │        │          :                    │
        │                    │        │          :                    │
        │                    │        │          :                    │
        │                    │        │          :                    │
        │                    │        │    Barcode:                   │
        │                    │        │Conveyor width: 0mm            │
        │                    │ Conveyor board type: Normal           │
        └────────────────────┘        └───────────────────────────────┘
                                          Brian                14:28
```
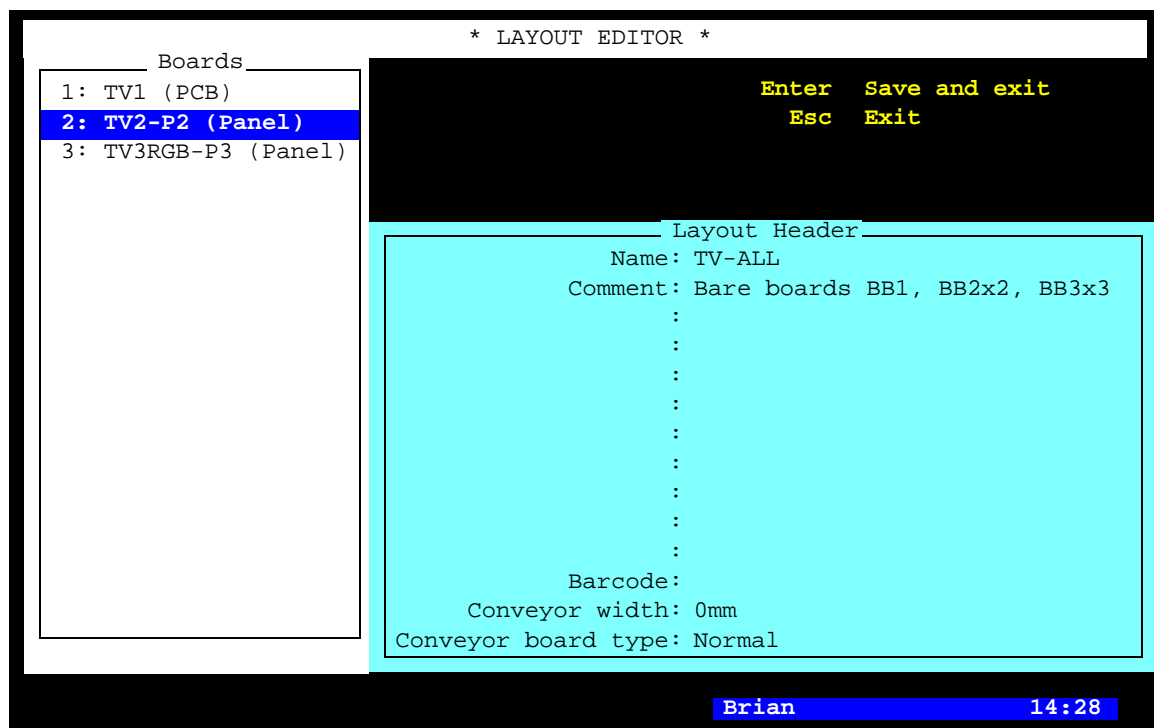
Figure 7-7. Layout Header

Information regarding conveyor systems used may be entered in the
Layout Header fields. Board sizes, barcodes and conveyor width can
also be specified here.

Barcode

If you use the serial start function TPSys require a name of the
layout to load. Type, or scan the barcode, into this field.

The barcode name can differ from the name you have assigned to the
layout.

Conveyor width

If the machine is equipped with a conveyor, you can specify the
conveyor width here.

Conveyor board type

This setting is only applicable for the T5 and T6 conveyors and will control how the board is clamped. Specify the type of board or panel that will be used on the conveyor. For instance if board is large and heavy or small and thin. Choose from list. List is accessed by pressing <Space>.

```
Normal
Small
Large
Special
```

A *Large* board is larger than 460 mm (18") or thicker than 5mm (0.2"). *Normal* boards are approximately half the length of the large board and not more than 5 mm (0.2" or 200mil) thick. *Small* boards are smaller than 100x 100 mm (4"x4") maximum 2mm (0.08" or 80mil) thick. The *Special* option can be used for special boards like ceramical boards.

The paramets for these types of boards are set in parametergrop 0092.

Panel Editor

The Panel Editor, which handles PCBs included in the panels, is opened by pressing <Enter> in:

– Layout Editor, when panel (page 7-10), or
– Panel List Editor (page 7-40).

The Panel Editor is shown in Figure 7-8.

Function keys in the Panel Editor:

Edit PCB

By pressing <Enter> the highlighted PCB can be modified in the PCB Editor, see page 7-24.
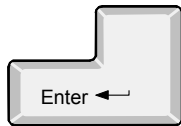
Insert new

New PCBs can be inserted into the panel after pressing <Ins>. Also, a matrix of PCBs can be inserted by specifying the row/column spacing, see page 7-18 and page 7-19.

Delete

The highlighted PCB can be deleted by pressing <Del> and confirming the deletion in a popup box.

PCB position

After pressing <F1>, the highlighted PCB can be positioned on the panel by typing the coordinate values or, if the layout is loaded, by using the camera (and digitizer, if used).

Camera usage requires loaded layout.

Panel header information

The panel header information can be modified by pressing <F2>, see page 7-21.

Panel size

By pressing <F4> *Lower left corner* and *Upper right corner* positions can be entered to define the panel size (see Figure 7-9 on page 7-17). Entered information is not used for placing components but might be used by optional software packages.

```
                        * PANEL EDITOR *
          __PCBs__
        *1: TV2                            Enter   Edit PCB
        *2: TV2                              Ins   Insert new
                                             Del   Delete
                                              F1   PCB position
                                              F2   Panel header
                                                   information
                                              F4   Panel size
                                              F6   Fine tune PCB
                                                   position

                            __Panel Header Information__
                                  Name: TV2-P2
                               Comment: Panel, bare board BB2x2
                            __PCB Position Information__
                              PCB name: TV2
                               Comment: PCB, bare board BB2

                            Fiducial mark 1:   10.000mm/ 10.000mm
                                          2:   90.000mm/ 60.000mm
                                          3:

                                    Brian                    14:34
```
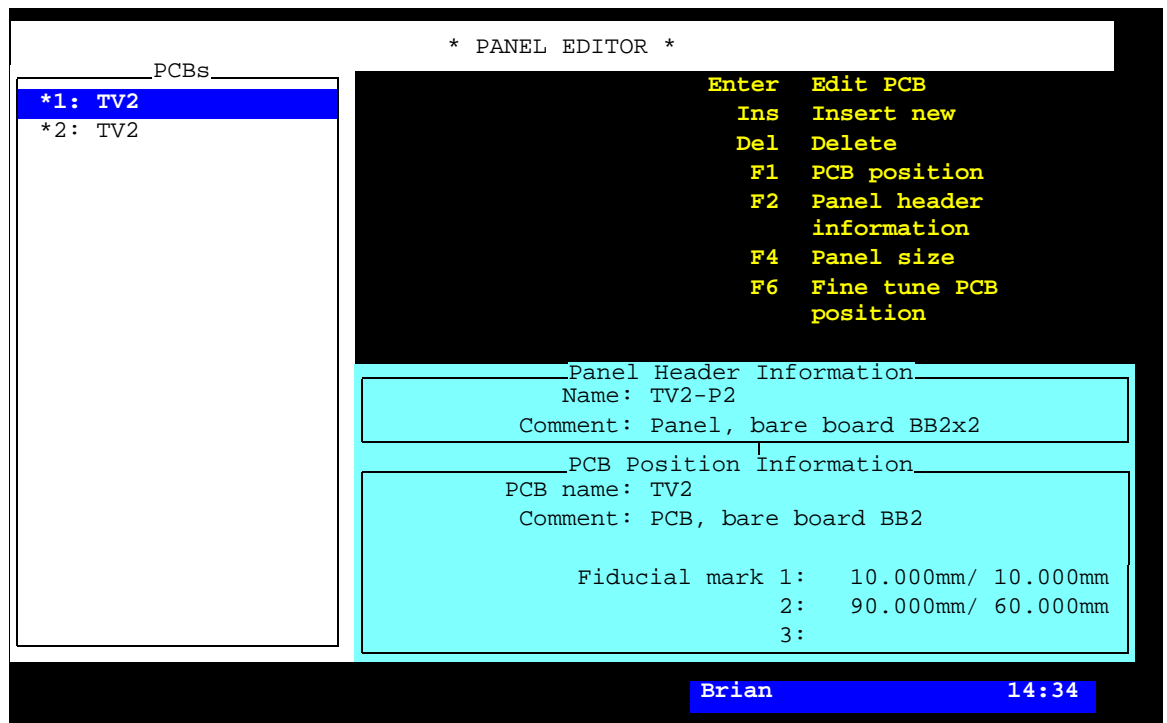
Figure 7-8. Panel Editor

Fine tune PCB position

[F6]

This option is available only if the layout is loaded.

All PCB positions can be fine tuned by pressing <F6>, provided the layout is loaded. You can choose automatic fiducial mark search or manual fiducial mark centering from the menu shown:

```
Locate all PCBs (auto)
Locate all PCBs (manual)
```

The *Locate all PCBs (auto)* option means automatic fiducial mark search, which requires that the fiducial marks are defined, learned, and stored in the Fiducial Mark List.

Set present status

[F8]

Press <F8> if you want to set the present status of all boards in a panel or lay-out.

```
_Set Present Status of All Boards_
Present
Not present
```

The *Present* option means that the *Not present* tag is cleared. Fiducal mark will be searched in the following assembly. Bad board tags are also cleared and no *Bad board search* will be performed. *Not present* means that the boards will be skipped in the following assembly. You can toggle with the <Space> bar.

Exit

[Esc]

Press <Esc> if you want to exit the Panel Editor and return to the Layout Editor (page 7-10).

Entries in the Panel Editor:

PCBs

This box contains the names of the PCBs included in the selected panel.

The status for each PCB in a loaded layout is indicated to the left of the name. When loaded, a PCB can have the status of *Present*, *Not present* or *Bad*.

* *Present* – A board which is successfully fiducial mark searched is automatically tagged *Present*. If the fiducial mark search fail and manual present search is on, the operator can set the board to *Present* or *Not present*.

- *Not present* – If automatic fiducial mark search fails for the first point searched on the board, it can be marked *Not present* if automatic present search is on, or if the operator marks the board as *Not present* during manual fiducial mark search.

! *Bad* – A board, which is found bad during *Bad board search* is, tagged bad. Only possible for PCBs in panels.

The status can be toggled by pressing <Space>.

☞ *The status for PCBs is only showed and editable in the online TPSys, that is when a layout has been loaded.*

You can insert single PCBs or a matrix of PCBs into the selected panel by performing the applicable procedure, see page 7-18 (single PCB) and page 7-19 (matrix of PCBs).

Panel Header Information

This box shows the name and the comment text of the selected panel. You can open the complete header information box by pressing <F2>, see page 7-21.

PCB Position Information

This box contains information about the highlighted PCB. Only the fiducial mark coordinates can be modified here.

PCB name Comment

Name and user comment text for the board.

Fiducial mark 1, 2, 3

The X/Y coordinates of the PCB fiducial marks related to the panel coordinate system.

The coordinate values can be modified after pressing <F1>, either by typing the values or, if you have a panel on the assembly table, by pressing <F1> and centering the PCB fiducial marks using the camera.

Use digitizer, if available.

Or, you can type approximate values before pressing <F1> to save machine movement time.

If you intend to use the camera, note that the panel fiducial marks and the PCB fiducial marks must be defined. You will also be asked to locate the panel on the assembly table, if not already done.

The information shown in Figure 7-8 applies to the left PCB in Figure 7-9.
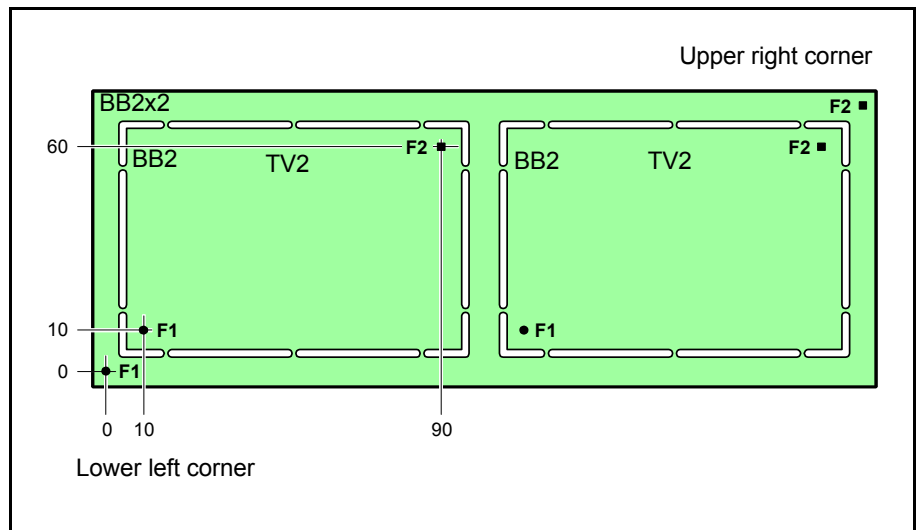
Figure 7-9. Panel header information

The text *Lower left corner* and *Upper right corner* in the figure is explained under Panel size on page 7-14.

Inserting a Single PCB into a Panel

This section describes how to insert a single new or existing PCB into a panel.

1. In the Panel Editor, press <Ins>.

2. In the *PCB name* field, enter the name of a new PCB or an existing PCB, or press <Enter> and select an existing PCB from the list. The text ** UNKNOWN PCB ** is shown if you choose to insert a new PCB.

3. Press <Enter> twice to accept 1 row and 1 column.

4. In the *Fiducial mark 1* field, enter the X/Y coordinate values to fiducial mark 1 on the PCB. These values are related to the panel coordinate system.

   You can either type the values or, if you have a panel on the assembly table, press <F1> and center fiducial mark 1 on the PCB using the camera.

   Use digitizer, if available.

   Or, you can type approximate values before pressing <F1> to save machine movement time.

   If you intend to use the camera, note that the panel fiducial marks and the PCB fiducial marks must be defined. You will also be asked to locate the panel on the assembly table, if not already done.

5. Repeat the coordinate setting for fiducial mark 2, and 3 if three fiducial marks are used on the PCB.

6. Press <Enter> to skip over the *Column/row step* field.

You have now inserted a PCB into the panel and the complete settings for the PCB looks like this:

```
                    ┌──Insert PCB(s)────────────────┐
                    │       PCB name: TV3R           │
                    │        Comment: * UNKNOWN PCB *│
                    │           Rows: 1              │
                    │        Columns: 1              │
                    │          Total: 1              │
                    │   First new board             │
                    │ Fiducial mark 1:  10.000mm/ 10.000mm │
                    │               2:  90.000mm/ 60.000mm │
                    │               3:              │
                    │                               │
                    │ Column/row step:  0.000mm/ 0.000mm │
                    └───────────────────────────────┘
```

Inserting a Matrix of PCBs into a Panel

This section describes how to insert a matrix, that is a number of new or existing PCBs into a panel by using a feature for quick insertion of boards arranged in a matrix pattern.

1. In the Panel Editor, press <Ins>.

2. Enter the PCB name in the same way as described for single PCBs in the previous section.

3. Enter the number of rows, that is the number of PCB rows in the panel, counted in the X axis of the machine. Figure 7-10 shows an example of a two row panel.

4. Enter the number of columns, that is the number of PCB columns in the panel, counted in the Y axis of the machine. The example in Figure 7-10 has three columns.

   The *Total* field shows automatically the number of PCBs on the panel.

5. Set the coordinate values for fiducial mark 1 in the *Fiducial mark 1* field in the same way as described for a single PCB in the previous section.

   This fiducial mark is marked '1' in Figure 7-10.

6. Repeat the coordinate setting for fiducial mark 2, and 3 if three fiducial marks are defined on the PCB.

   Fiducial mark 2 is marked '2' in Figure 7-10.

7. Set the column spacing and the row spacing in the *Column/row step* field either by typing the distances or by pressing <F1> and using the camera.

   If you use the camera, center fiducial mark 1 on the last board when the following message is shown:

   ```
   Center first fiducial mark on last board
    Ready
    Cancel
   ```

   Fiducial mark 1 on the last board is marked '3' in Figure 7-10.

Fine tuning.   You have now inserted six PCBs in the panel. You can check and adjust the PCB positions by pressing <F6>, see page 7-15.
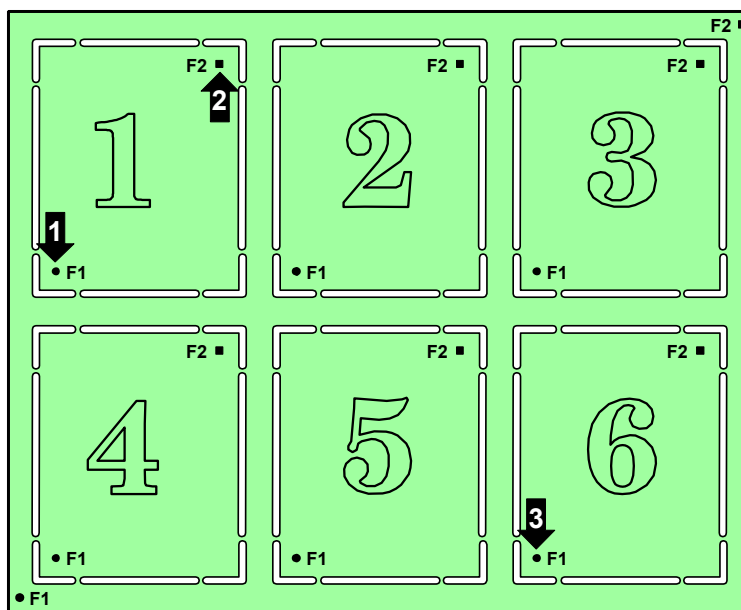
Figure 7-10. PCB matrix in a panel

You can define PCB 1 in any corner of the panel, that is as board
number 1, 3, 4, or 6 in Figure 7-10 but you must always define the
last board in the opposite corner of the first board.

The complete settings for the matrix of PCBs looks like this:

```
                     Insert PCB(s)
                  PCB name: TV3R
                   Comment: * UNKNOWN PCB *
                      Rows: 2
                   Columns: 3
                     Total: 6
             First new board
           Fiducial mark 1:  10.000mm/ 100.000mm
                         2:  60.000mm/ 160.000mm
                         3:

           Column/row step:  150.000mm/ 10.000mm
```

Panel Header Information

By pressing <F2> in the Panel Editor (page 7-14) the panel header
information can be modified.

The panel header information box looks like this:

```
                        ─Panel Header Information─
              Name: TV2-P2
           Comment: Panel, bare board BB2x2
           Level measurement tools:
            No. of fiducial marks: 2
  Mark 1 ID: Ro-1.0      pos.:  0.000mm/  0.000mm
       2 ID: Sq-1.0      pos.:  200.000mm/  70.000mm
       3 ID:             pos.:
           Bad board mark pos.:  100.000mm/  0.000mm
          Mount tool test pos.:  30.000mm/ 0.000mm
           Glue tool test pos.:  40.000mm/ 0.000mm
```

The information in this box applies to the panel in Figure 7-11.

A = Bad board mark label.

B = Board level measuring
     point for mount tools.

C = Board level measuring
     point for glue tools.
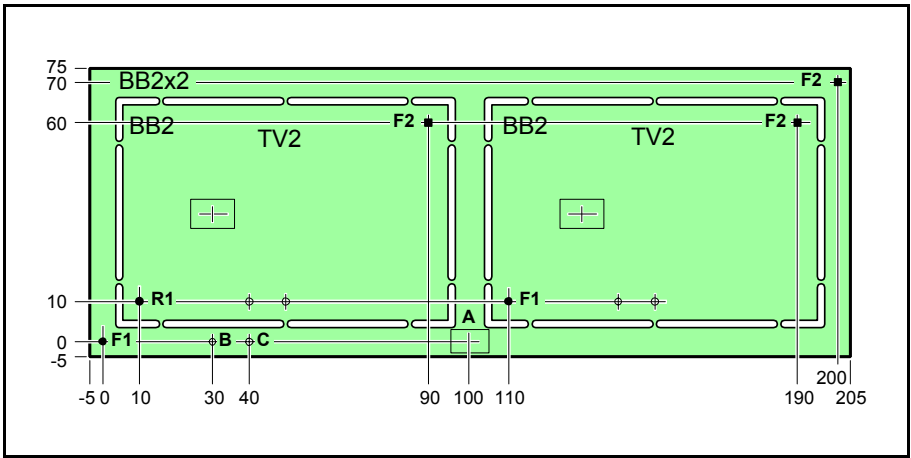
Figure 7-11. Panel header information

Entries in the panel header information box:

Name

The panel name.

Comment

User comment text.

No. of fiducial marks

Number of fiducial marks on the panel. Minimum 2 and maximum 3 fiducial marks.

Mark 1 ID, 2 ID, 3 ID

The names of the fiducial marks. Automatic fiducial mark search requires the fiducial marks to be defined, learned, and stored in the Fiducial Mark List.

pos.

The X/Y coordinates of the panel fiducial marks. These values are related to the panel coordinate system.

You can set these coordinate values either by typing the values or, if you have a panel on the assembly table, by pressing <F1> and centering the panel fiducial marks using the camera.

If you type an approximate value before pressing <F1>, then you will save machine movement time.

Bad board mark pos.

Bad board label for marking that there are at least one defective PCB on the panel.

These X/Y coordinates indicate the center of the bad board label, in the panel coordinate system.

Use a label with high contrast if you put it on an area with low contrast, and vice versa.

More information about bad board marks is found in the Switches section, in *Appendix B*.

Mount tool test pos.

The position where the board level is measured with mount tools. These X/Y values are related to the panel coordinate system.

Board level measuring is further detailed on page .

Glue tool test pos.

The position where the board level is measured with glue tools. These X/Y values are related to the panel coordinate system.

☞ Note that adhesive will be applied on the defined position if the adhesive dispensing is on. So, avoid using the same measuring position for mount tools and glue tools, otherwise the mount tool tip will be sticky.

Board level measuring is further detailed on page .

PCB Editor

The PCB Editor, which handles the components and their positions, is opened by pressing <Enter> in:

– Layout Editor, when PCB (page 7-10), or

– Panel Editor (page 7-14), or

– PCB List Editor (page 7-42).

The PCB Editor, with the actual layout loaded as current, is shown in Figure 7-12.

Function keys in the PCB Editor:

Edit item

By pressing <Enter> the mount information of the highlighted item can be modified.
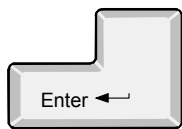
Insert new

New items can be inserted by pressing <Ins> and typing the component name, or selecting from the Component List.

Delete

The highlighted item can be deleted by pressing <Del> and confirming the deletion in a popup box.

View position

By pressing <F1>, the highlighted item can be positioned on the board using the camera, see page 7-32.

This option is available only if the layout is loaded.

PCB header

The PCB header information can be modified after pressing <F2>, see page 7-37.

PCB size

By pressing <F4> *Lower left corner* and *Upper right corner* positions can be entered to define the PCB size (see Figure 7-18 on page 7-37). Entered information is not used for placing components but might be used by optional software packages.

```
                                    * PCB EDITOR *
        _____Items_____
    ┌──────────────────────┐    Enter Edit item              F4 PCB size
    │ D  1: C1, 000149     │      Ins Insert new             F6 Find position
    │ M  2: C2, 000254     │      Del Delete          Shift+F6 Reset digitizer
    │ S  3: C3, 000501     │      F2 PCB header              F7 Change groups
    │    4: C4, 000502     │                                F8 Replace component
    │                      │
    │                      │       ─────PCB Header Information─────
    │                      │           Name: TV2
    │                      │
    │                      │        Location: C1
    │                      │       Component: 000149
    │                      │         Comment: 100pF
    │                      │         Package: 1206-07
    │                      │           Group: 0           Turn before Z down: No
    │                      │                              Save electric value: No
    │                      │       Mount: Yes        Glue: Yes         Only Z: No
    │                      │       Angle:  0.00°     pos.:   40.051mm/  25.362mm
    │                      │          Local fiducial marks: 0
    │                      │     Mark 1 ID:           pos.:
    │                      │          2 ID:           pos.:
    │                      │          3 ID:           pos.:
    └──────────────────────┘                         Brian              14:40
```

Figure 7-12. PCB Editor

Find position

F6

Press <F6> to search for mount position. Choose information type: *Package*, *Component* or *Location*. Enter the search value for one of the types, press <Enter> and the PCB is searched for a position that match the search criteria. The search starts from the position *after* the one currently highlighted. If a position is found, the cursor is moved to that position, but the search window is not closed. Pressing Enter again will repeat the search. This can be repeated until no more matching position is found. The search window is exited by pressing <Esc>.

Reset digitizer

⇧ **F6**

If you use a digitizer, the position of the PCB fiducial marks can be calibrated after pressing <Shift>+<F6>. The procedure is further detailed in Chapter 3.

Change groups

F7

By pressing <F7> all the placement group numbers can be changed by a value entered, see the description under *Group* below.

Replace component

F8

By pressing <F8> a component type can be replaced by another component type in the current PCB, in all PCBs in the panel, in all PCBs in the layout, or in all PCBs. A detailed description is found under *Component* below.

Exit

Esc

Press <Esc> if you want to exit the PCB Editor and return to the Layout Editor (page 7-10) or the Panel Editor (page 7-14).

Entries in the PCB Editor:

Items

This box contains the items of the PCB.

The first position in the list can indicate the following status:

Column 1. D – Dispensed adhesive, see *Glue* below and the *Component Positioning* section on page 7-32.

M – Mounted item, see *Mount* below and the *Component Positioning* section on page 7-32.

S – Skipped item, that is an item which is not to be placed, see *Mount* below.

D and M can be inserted or removed by pressing <Space> in the positioning mode, see the *Component Positioning* section on page 7-32.

Column 2. The second column contains the line number.

Column 3. The third column is intended for the item number, see *Location* below.

Column 4. The fourth column contains the component name referred to in the Component List, see *Component* below.

PCB Header Information

This box contains name and user comments of the selected PCB. You can open the complete header information box by pressing <F2>, see page 7-37.

Location

User text intended for the item numbers in the PCB parts list. This text is shown in the *Items* box, for instance C1 and C2 in Figure 7-12.

Component

Component name referred to in the Component List.

You can search for a component from the Component List, which is opened by entering the first characters of the component name and pressing <Enter>, or by simply pressing <Enter>.

Component replacement. By pressing <F8> a component type can be replaced by another component type. The names of the component to be replaced and the replacement component are entered in the popup box shown:

```
┌──────────── Component Replacement ────────────┐
│          Component to replace: 000149          │
│          Replacement component: 050387         │
└────────────────────────────────────────────────┘
```

To set the extent of the component type replacement, choose one of the options in the next box shown (*TV2*, *TV2-P2* and *TV-ALL* in the box are examples):

```
┌──── Choose PCBs to change────┐
│Current PCB (  (TV2)          │
│All PCBs in panel  TV2-P2     │
│All PCBs in layout  TV-ALL    │
│All PCBs                      │
└──────────────────────────────┘
```

After selecting the desired option and pressing <Enter> the replacement is accomplished.

Comment

Optional user text, for instance component type or component value, read from the Component List.

Package

The component package, read from the Component List.

Group

All items can be assigned a group number between 0 and 255. This group number sets the placement order for the items, that is items with low group numbers are mounted prior to items with high group numbers.

Pressing <F7> makes it possible to change all used group numbers for all items by a value between –255 and 255. The value to be added is entered in the popup box shown:

```
┌──────────────────────────────────────────────┐
│Select value to add to all group numbers: 1    │
│(-255..255)                                     │
└──────────────────────────────────────────────┘
```

If you, for instance, enter '10,' then group number 0 becomes 10, group number 1 becomes 11, and so on. If you enter a negative value, all group numbers are decreased. You can change the group numbers within the range used, that is between 0 and 255.

This feature makes it possible to place an item prior to all other items. If, for instance, all items have group number 0 and you want to place a particular item prior to all other items, then you can increase all group numbers and then set the particular item to a lower group number manually.

Turn before Z down

This feature prevents a component from being lowered towards the board until the final turning and positioning is completed. This field should be set to *Yes* if there are high components close to the place where the component is to be mounted.

Yes   – The component is turned and positioned completely before lowered towards the board.

No   – The final turning and positioning is carried out while the component is lowered towards the board.

To toggle between *Yes* and *No* press <Space>.

Save electric value

Values measured during electrical verification can be logged and stored in the event log. This optional feature makes it possible to trace component values, but also to provide measured component values for assembled PCBs.

The measuring can be performed either once per component. or a preset number of times. The latter, enhanced measuring, gives a number of results that are calculated to mean value and standard deviation. These calculated values are stored in the event log.

Yes   – Electrical measurement is performed under the conditions described in the *Switches* section in *Appendix B* for the following switches:

       0020 Measure component after test

       0021 Use enhanced electric measure

No   – No electrical measurement is performed.

To toggle between *Yes* and *No* press <Space>.

The event log, with the measured values, can be exported by selecting the *Export* option in the TPSys *Utility* menu.

Mount

Yes   – The component is mounted.

No   – The component is not mounted.

To toggle between *Yes* and *No* press <Space>.

Glue

Yes   – Adhesive is dispensed for the component.

No   – Adhesive is not dispensed.

To toggle between *Yes* and *No* press <Space>.

Only Z

Yes   – This item will not be mounted by the HYDRA unit. Select this option if it, for instance, is a big (high) pre-mounted component close to this item.

No   – The component can be mounted by the HYDRA unit.

To toggle between *Yes* and *No* press <Space>.

Angle

The angle in which the component is to be placed.
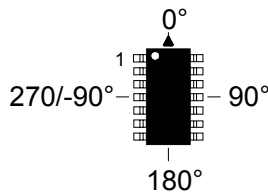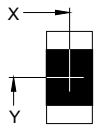
pos.

The PCB coordinates (X/Y) to the center of the component. The values can be either typed into the field or inserted using camera after pressing <F1> (see the *Component Positioning* section on page 7-32).

You can use a digitizer to position the components. Or, you can type approximate values before pressing <F1> to save machine movement time.

Local fiducial marks

To be able to make extra position and angle calibrations for big fine pitch components prior to placing, up to three local fiducial marks can be used per package. The *Local fiducial marks* field can thus indicate a number between 0 and 3.

The fiducial marks can be positioned anywhere in the component outline, but the optimal accuracy for a single fiducial mark is at the center of the component, see '1' in Figure 7-13.

The optimal accuracy for two fiducial marks is achieved with the fiducial marks placed symmetrically with respect to the component center, see '2' in the figure.

Three fiducial marks are also positioned symmetrically with respect to the component center, see '3' in the figure.

The system learns and stores the local fiducial marks in the Fiducial Mark List in the same way as board fiducial marks. The Fiducial Mark List is described in Chapter 8.
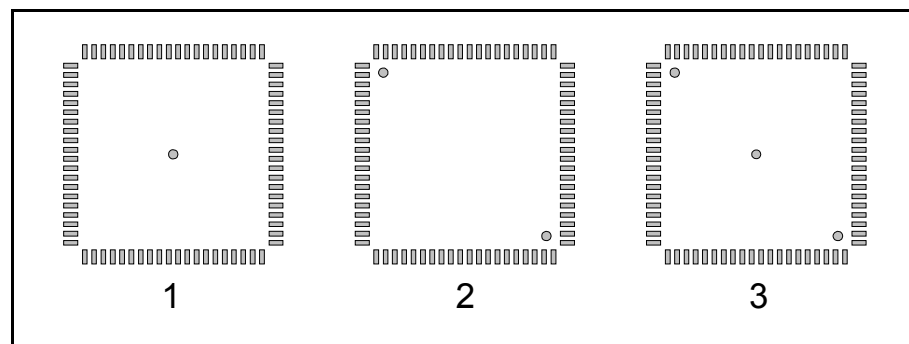
Figure 7-13. Local fiducial marks

The *0004 Use local fiducial marks* parameter found under the *Switches* option in the *Production* menu must be set to *Yes* to be able to use local automatic fiducial mark search.

Mark 1 ID, 2 ID, 3 ID

The names of the local fiducial marks. Automatic fiducial mark search requires the fiducial marks to be defined, learned, and stored in the Fiducial Mark List.

pos.

The X/Y distance from the center of the component to the center of the fiducial marks.

You can set the X/Y values either by typing the values from the keyboard or, if you have a PCB on the assembly table, by pressing <F1> and centering the fiducial marks using the camera.

Component Positioning

By pressing <F1> in the PCB Editor (page 7-24) the highlighted component can be positioned on the board using the camera as shown in Figure 7-14.

Use digitizer, if available.

You can type approximate values before pressing <F1> to save machine movement time.

The trackball speed can be increased by five times if you press the left and right trackball buttons simultaneously.
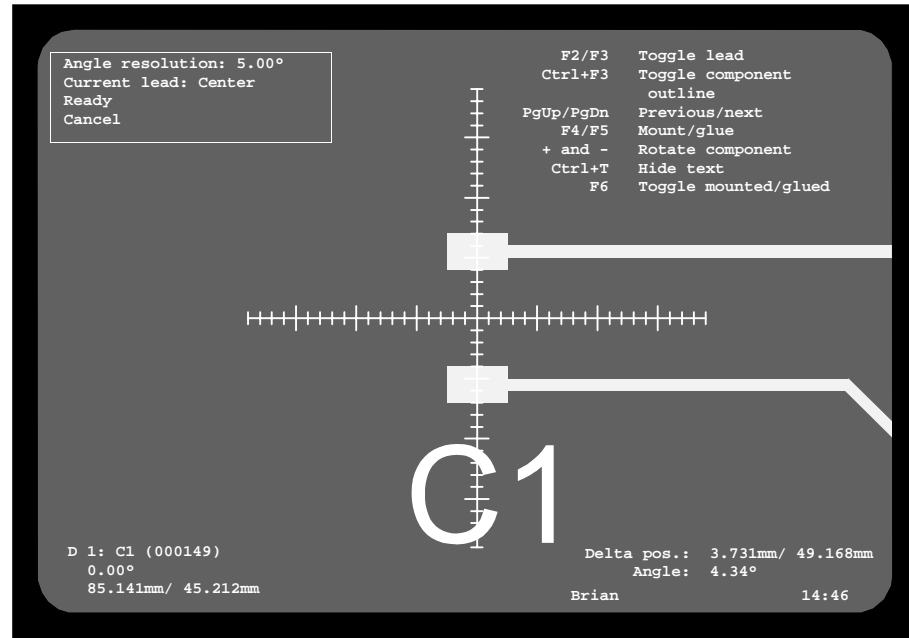
Figure 7-14. Positioning the component center

Position the cross hairs on the component center when *Current lead Center* is indicated in the upper left corner of the screen. Figure 7-14 shows the position of a 1206-07 package.

Position the leads by pressing <F2> or <F3> and centering the cross hairs on the land patterns. Each time the <F2> or <F3> key is pressed the camera is moved to the previous or next of the leads specified in the Package List. Current lead is indicated in the *Current lead* line in the upper left corner of the screen.

Figure 7-15 shows the position of lead 1 for the 1206-07 package.

Changing an existing component position.

If you want to change the position of an existing component, the <F1> key on the keyboard or the *Camera* button on the machine keypad must be pressed to activate the trackball and the joystick. This is indicated by the following information box:

```
Press <F1>
or Camera
to adjust
position
```

```
Angle resolution: 5.00°                              F2/F3   Toggle lead
Current lead: Lead 1                               Ctrl+F3   Toggle component
Ready                                                          outline
Cancel                                             PgUp/PgDn  Previous/next
                                                      F4/F5   Mount/glue
                                                    + and -   Rotate component
                                                     Ctrl+T   Hide text
                                                         F6   Toggle mounted/glued
```

```
D 1: C1 (000149)                    Delta pos.:  3.732mm/ 50.364mm
   0.00°                                 Angle:  4.24°
   85.141mm/ 46.413mm               Brian                      14:48
```
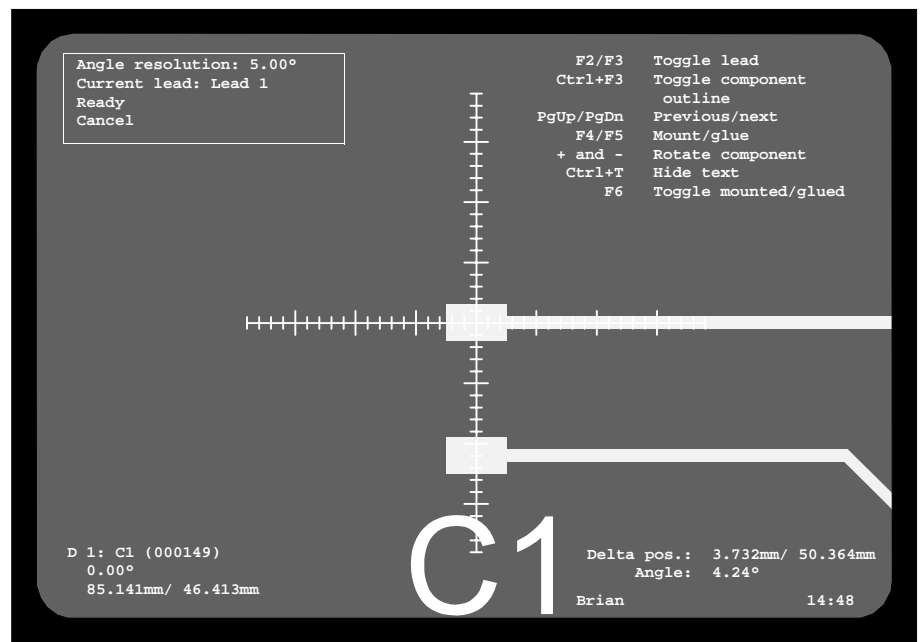
Figure 7-15. Positioning lead 1

Angle resolution

The component angle resolution, which can be changed by entering a new value. Use the <up arrow> or <down arrow> to select the *Angle resolution* field.

Current lead

Shows the current position when moving between the component center and the specified leads (by pressing the <F2> or <F3> key). The leads are indicated as *Lead 1*, *Lead 2*, and so on, and they are specified in the *Toggle leads* field in the Package List.

D 1: C1 (000149)

This line indicates the current component, see the *Items* box on page 7-25.

0.00°

The component angle.

85.14mm/ 46.41mm

Current camera position in the PCB coordinate system.

Delta pos., Angle

This information is shown if you move the camera in the positioning mode.

The *Delta pos.* field displays the distance from the viewing start position to the current position in X/Y coordinates.

The *Angle* field displays the angle for the same movement.

Figure 7-16 illustrates the Delta information.
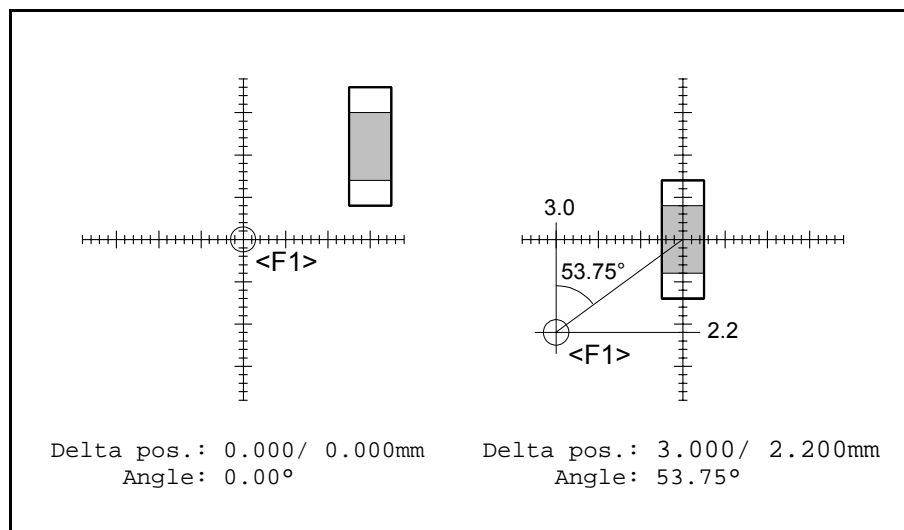
Figure 7-16. Delta information

The viewing start position, where the <F1> key was pressed, is marked <F1> in the figure. The left part of the figure shows the viewing start position and the right part shows the angle and coordinates after moving the cross hairs to the center of the component.

The following function keys are active in the positioning mode:

Toggle lead

F2   F3

The <F2> and <F3> keys move the camera either clockwise or counter-clockwise between the leads specified in the *Toggle leads* field, see *Current lead* above.

Toggle component outline

Ctrl   F3

A graphic outline of the component can be displayed by pressing <Ctrl>+<F3>. The graphic symbol is a rectangle with a dot for each lead. Lead 1 is marked with a rectangle.

Note that the graphic symbol may differ somewhat from the actual component size. So, use the cross hairs for positioning, not the graphic symbol.

This figure illustrates an example of a graphic symbol with the cross hairs in the center of the component.
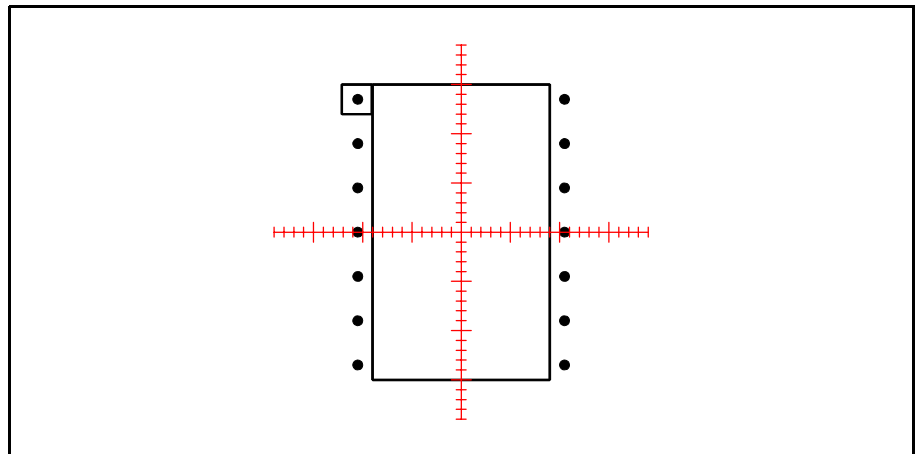
Figure 7-17. Graphic component outline

Previous/next

PgUp   PgDn

You can change to the previous item by pressing the <PgUp>key, or to the next item by pressing the <PgDn>key.

Mount/glue

F4

Current component can be mounted, if available, by pressing <F4>. Letter M will be shown in the first position of the *Items* box, see page 7-25 and page 7-33.

F5

Adhesive can be applied, if available, for the current component by pressing <F5>. Letter D will be shown in the first position of the *Items* box, see page 7-25 and page 7-33.

Rotate component

When the cross hairs are in the center of the component, the component angle can be changed by pressing the '+' and '–' keys as follows:

Each press on the '+' key changes the component angle clockwise by 90°, that is from 0° to 90°, from 90° to 180°, and so on.

Each press on the '–' key changes the component angle counter-clockwise by the angle shown in the *Angle resolution* field in the upper left corner of the screen. Figure 7-15 on page 7-33 shows 5.00° which causes the angle to change 5°at each key press, that is from 90° to 85°, from 85° to 80°, and so on.

Hide text

The screen text can be hidden to give a better view of the positioning. Hide/show the text by pressing <Ctrl>+<T>.

Toggle mounted/glued

The mount and dispense status for the current component can be changed without dispensing or mounting as follows:

Press <Space> to switch from blank to 'D' to 'M' and back to blank, see the *Items* box on Figure 7-25.

Exit

Press <Esc> if you want to exit the positioning mode and return to the main PCB Editor (page 7-25) without leaving the position field. Otherwise, select *Ready* in the upper left menu.

PCB Header Information

By pressing <F2> in the PCB Editor (page 7-25) the PCB header
information can be modified.

The PCB header information box looks like this:

```
                  ┌────PCB  Header  Information────┐
                  │     Name: TV2                  │
                  │  Comment: PCB, bare board BB2   │
                  │  Level measurement tools: All tools │
                  │   No. of fiducial marks: 2      │
                  │Mark 1 ID: Ro-1.0    pos.:  0.000mm/  0.000mm │
                  │     2 ID: Sq-1.0    pos.:  80.000mm/  50.000mm │
                  │     3 ID:           pos.:       │
                  │      Bad board mark pos.:  20.000mm/  25.000mm │
                  │     Mount tool test pos.:  30.000mm/ 0.000mm │
                  │      Glue tool test pos.:  40.000mm/ 0.000mm │
                  └────────────────────────────────┘
```

The PCB header information in this box applies to the PCB in
Figure 7-18.

A = Bad board mark label.

B = Board level measuring
point for mount tools.

C = Board level measuring
point for glue tools.
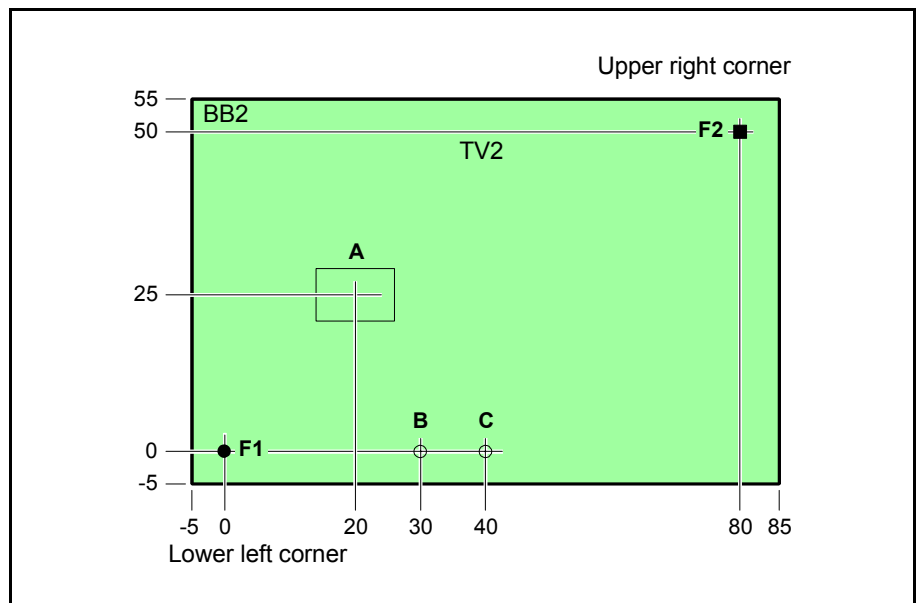
Figure 7-18. PCB header information

The text *Lower left corner* and *Upper right corner* in the figure is
explained under PCB size on page 7-24.

Entries in the PCB header information box:

Name

The PCB name.

Comment

User comment text.

Level measurement tools

TPSys measures the board height before assembling. A list of allowed tools to use when measuring the board level can be defined. See further page 7-39.

No. of fiducial marks

Number of fiducial marks on the PCB. Minimum 2 and maximum 3 fiducial marks are allowed.

Mark 1 ID, 2 ID, 3 ID

The names of the fiducial marks. Automatic fiducial mark search requires the fiducial marks to be defined, learned, and stored in the Fiducial Mark List.

pos.

The X/Y coordinates of the PCB fiducial marks. These values are related to the PCB coordinate system. You can set these coordinate values either by typing the values or, if you have a PCB on the assembly table, by pressing <F1> and centering the PCB fiducial marks using the camera.

If you type an approximate value before pressing <F1>, then you will save machine movement time.
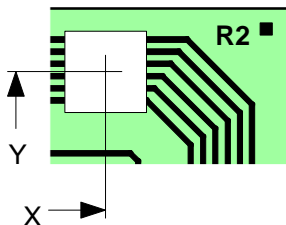
Bad board mark pos.

Bad board label for marking defective PCBs included in panels. Marked PCBs will be skipped at assembling.

These X/Y coordinates indicate the center of the bad board label, in the PCB coordinate system.

Use a low contrast label if you put it on a high contrast area, for instance where there are many visible leaders, and vice versa. More information about bad board marks is found in the *Switches* section, in *Appendix B*.

Mount tool test pos.

The position where the board level is measured with mount tools. These X/Y values are related to the PCB coordinate system. Board level measuring is further detailed on page 7-39.

Glue tool test pos.

The position where the board level is measured with glue tools. These X/Y values are related to the PCB coordinate system.

☞ Note that adhesive will be applied on the defined position if the adhesive dispensing is on. So, avoid using the same measuring position for mount tools and glue tools, otherwise the mount tool tip will be sticky.

Board level measuring is further detailed on page 7-39.

Board Level Measurement
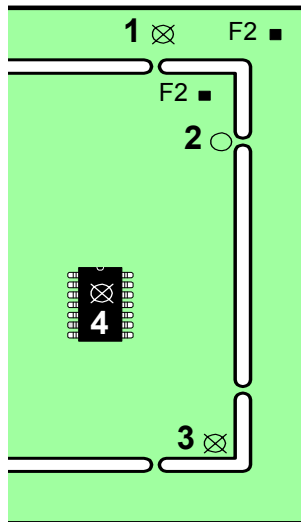
Place the board level measuring points on PCBs even though the PCBs are included in panels, because if you have placed the measuring points on the panels (1) the PCBs cannot be assembled as individual PCBs, if removed from the panels.

If a panel is being programmed, then it is preferable to select a measuring point at which the PCB is fixed to the panel (2), as the board level is probably most representative in such a position. Avoid free milled corners (3).

Do not select a measuring point at which a component will be mounted (4). If you intend to after-mount components which was not available at the first assembly, the component at the measuring point may already be mounted.

Ensure that the position does not coincide with holes or recesses in the board.

At assembly, an allowed tool will be used to do the measuring of the board level. If none of the accepted tools is available, the assembly stops with a message on the message log.

If the board height is measured using any tool the optimizer thinks is good, for instance the last tool used or the next tool to be used, then there may be problems. Maybe there is not space enough for a large tool. Some PCBs may require the low force that you can get only by using indicator tools or HYDRA tools.

In *Level measurement tools* (see *PCB Header Information* box on page 7-37) the allowed tools are specified and can be chosen from a list.

The default value for this parameter is *All tools*. To get the list, press <Insert>.

The new parameter can be exported, imported and printed in the same way as parameters.

```
All tools
All indicator tools
A12
A13
A14
A23
A24
A34
B12
B13
B14
B23
B24
B34
C12
C13
C14
C23
C24
C34
D12
D13
D14
D23
D24
D34
H00
H01
H02
H03
H04
H06
```

Panel List

The Panel List contains all panels stored in the machine system, and in the TPSys netwrk, if shared databases. No PCBs are included in this list. All the panels are accessible and can be modified, deleted and copied. New panels can be created as well.

You can open the Panel Editor from this window and position PCBs. Furthermore, from the Panel Editor you can open the PCB Editor. You have thus access to all the editors needed to create and modify panels and included PCBs. See the structure diagram of the Mount Lists on page 7-7.

If the layout is loaded, you can also use the camera to define panel and PCB fiducial marks, define PCBs in panels, and to position components on PCBs.

The Panel List is opened by selecting the **Panels** option in the **Editor** menu

The Panel List Editor is shown in Figure 7-19.

Function keys in the Panel List Editor:

Edit panel
By pressing <Enter> the highlighted panel can be modified in the Panel Editor, see page 7-14.

Insert new
A new panel can be created by pressing <Ins> and entering a new name.

Delete
The highlighted panel can be deleted by pressing <Del> and confirming the deletion in a popup box.

Copy
The highlighted PCB can be copied by pressing <F9> and entering a new name. It is possible to copy the PCBs in the panel so that they are no longer affected by subsequent changes to the originals.

```
                          * PANEL LIST EDITOR *
            Panels
    TV2-P2                                  Enter   Edit panel
    TV3RGB-P3                                 Ins   Insert new
                                             Del   Delete
                                              F9   Copy




                     Name: TV2-P2
                  Comment: Panel, bare board BB2x2
                  Level measurement tools: All tools
                    No. of fiducial marks: 2
         Mark 1 ID: Ro-1.0      pos.: 0.000mm/   0.000mm
              2 ID: Sq-1.0      pos.: 200.000mm/   70.000mm
              3 ID:             pos.:
                   Bad board mark pos.: 0.000mm/   0.000mm
                  Mount tool test pos.: 30.000mm/  0.000mm
                   Glue tool test pos.: 40.000mm/  0.000mm
                     Lower left corner: 0.000mm/   0.000mm
                    Upper right corner: 0.000mm/   0.000mm


                                         Brian            14:52
```

Figure 7-19. Panel List Editor

Exit

Esc

Press <Esc> if you want to exit the Panel List Editor and return to the main window.

Entries in the Panel List Editor:

Panels

This box contains all panels stored in the system, and in the TPSys network, if shared databases are used. Use the arrow keys or <PgUp>, <PgDn>, <Home>, or <End> to select panel. You can search for a panel in the list by simply entering the first characters of the panel name.

Panel information box

This box contains the panel header information of the highlighted panel, that is name, comment text, and positions of fiducial marks, bad board labels, and board level test points.

Except for the two last lines in the box, *Lower left corner* and *Upper right corner* the information in this box is detailed in the *Panel Header Information* section on page 7-21.

Lower left corner, Upper right corner

These lines indicate the panel size not used for component placement, see the explanation under *Panel size* on page 7-14.

PCB List

The PCB List contains all PCBs stored in the system, and in the TPSys network, if shared databases are used. No panels are included in this list.

All the PCBs are accessible and can be modified, deleted and copied. New PCBs can be created as well.

You can open the PCB Editor from this window and make any modifications on the PCBs. See the structure diagram of the Mount Lists on page 7-7.

If the layout is loaded, you can also use the camera to, for instance, define fiducial marks or position components.

The PCB List is opened by selecting the **PCBs** option in the **Editor** menu.

The PCB List Editor is shown in Figure 7-20.

Function keys in the PCB List Editor:

Edit PCB

By pressing <Enter> the highlighted PCB can be modified in the PCB Editor, see page 7-24.

Insert new

A new PCB can be created by pressing <Ins> and entering a new name.

Delete

The highlighted PCB can be deleted by pressing <Del> and confirming the deletion in a popup box.

Copy

The highlighted PCB can be copied by pressing <F9> and entering a new name.

```
                              * PCB LIST EDITOR *
            PCBs
    TV1
    TV2                                              Enter   Edit PCB
    TV3B                                               Ins   Insert new
    TV3G                                               Del   Delete
    TV3R                                                F9   Copy




                      Name: TV1
                   Comment: PCB, bare board BB1
                   Level measurement tools: All tools
                     No. of fiducial marks: 2
             Mark 1 ID: Ro-1.0     pos.: 0.000mm/   0.000mm
                  2 ID: Sq-1.0     pos.: 200.000mm/  70.000mm
                  3 ID:            pos.:
                     Bad board mark pos.: 0.000mm/   0.000mm
                    Mount tool test pos.: 30.000mm/  0.000mm
                     Glue tool test pos.: 40.000mm/  0.000mm
                       Lower left corner: 0.000mm/   0.000mm
                      Upper right corner: 0.000mm/   0.000mm

                                          Brian              14:58
```
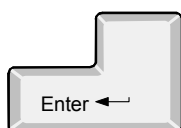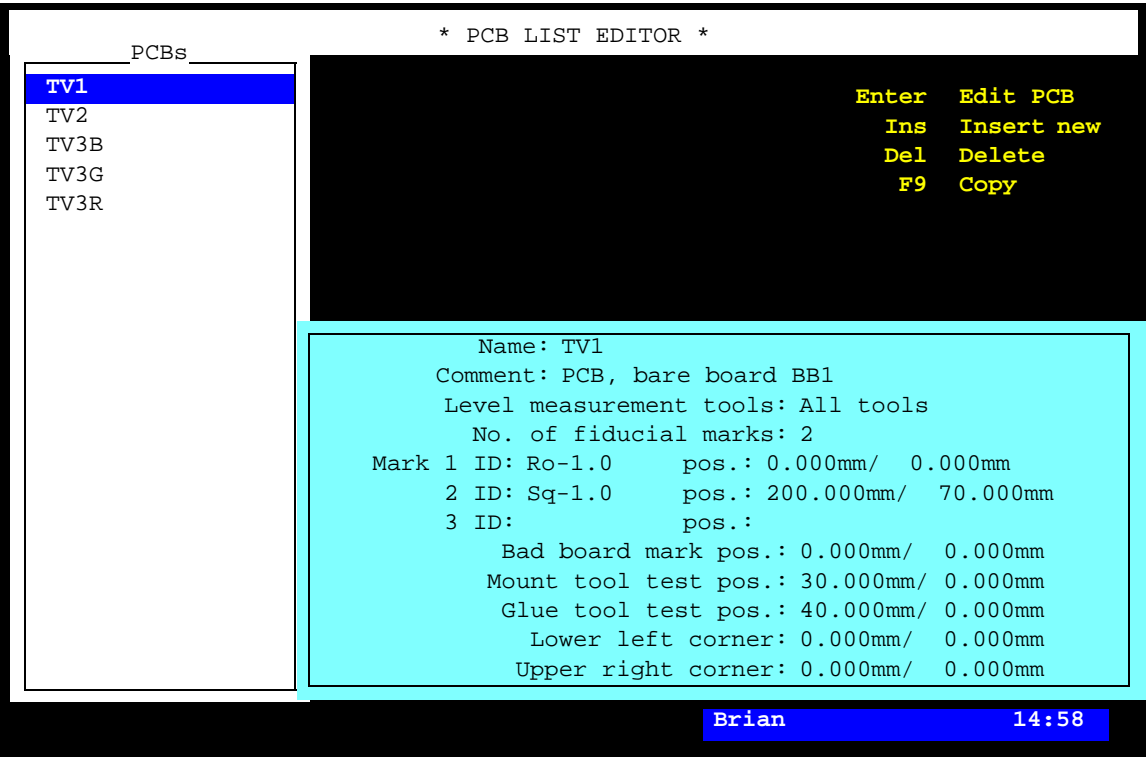
Figure 7-20. PCB List Editor

Exit

Press <Esc> if you want to exit the PCB List Editor and return to
the main window.

Entries in the PCB List Editor:

PCBs

This box contains all PCBs stored in the system, and in the TPSys
network, if shared databases are used. Use the arrow keys or
<PgUp>, <PgDn>, <Home>, or <End> to select PCB.

You can search for a PCB in the list by simply entering the first
characters of the PCB name.

PCB information box

This box contains the PCB header information of the highlighted
PCB, that is name, comment text, and positions of fiducial marks,
bad board labels, and board level test points.

Except for the two last lines in the box, *Lower left corner* and *Upper
right corner* the information in this box is detailed in the *PCB Header
Information* section on page 7-37.

Lower left corner, Upper right corner

These lines indicate the PCB size not used for component placement,
see the explanation under *PCB size* on page 7-24.

8. Miscellaneous Lists

This chapter describes lists other than the four main lists. These are:

- **Fiducial Mark List**, page 8-2.

  Name and data of defined fiducial marks are stored in this list used for automatic fiducial mark search.

- **Glue Dot List**, page 8-8.

  Names and data of defined glue dots are stored in this list used for glue application.

- **User List,** page 8-13.

  User names, privileges and passwords are stored in this list used for logging on the system.

Special characters

National special characters and some non-letter/non-figure characters cannot be entered into the system, for instance in board names and layout names.

The following special characters are, however, allowed to be used:
" ' ` \ $; ^ @

Fiducial Mark List

The purpose of the Fiducial Mark List is to store data for fiducial marks. This information is then used by the system to locate boards automatically by recognizing and positioning fiducial marks. Also, the list is a bank of recognizable fiducial marks that can be used to locate other boards, provided the marks have exactly the same shapes.

The Fiducial Mark List is opened by selecting the **Fiducial Marks** option in the **Editor** menu.

The Fiducial Mark Editor is shown in Figure 8-1.

Function keys in the Fiducial Mark Editor:

Edit fiducial mark

By pressing <Enter> the highlighted fiducial mark can be modified.
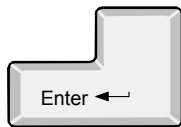
Insert new

A new fiducial mark can be added to the list by pressing <Ins> and typing a new name.

Delete

The highlighted fiducial mark can be deleted by pressing <Del> and confirming the deletion in a popup box.

View

A graphic overlay of the highlighted fiducial mark is shown on the screen by pressing <F1>. This consists of edge points or a circle.

```
                      * FIDUCIAL MARK EDITOR *
 Fiducial Marks
  Ro-1.0          Enter   Edit fiducial mark      F1   View
  Sq-1.0            Ins   Insert new              F7   Teach
                    Del   Delete                  F8   Verify
                            ┌─────Fiducial Mark Information─┐
                                            Name:  Ro-1.0
                                       Camera ID:
                                         Comment:  Round 1.0mm
                              Generic mark taught:  Yes
                                  White on black:  Yes
                                  Symmetric mark:  Yes
                               Teach area X size:  2.5mm
                                          Y size:  2.5mm
                               Object filter size:  0.3mm
                               Verify area X size:  5mm
                                          Y size:  5mm
                                      Correlation:  80
                                Fiducial mark type:  Circle
                                         Diameter:  0.971
                                Diameter tolerance:  25
                                   Circle contrast:  20

                                              Brian              17:04
```

Figure 8-1. Fiducial Mark Editor

Teach

[F7]

The system can learn to recognize the highlighted fiducial mark by pressing <F7>. Center the cross hairs on a fiducial mark using the joystick or trackball and press <Enter>, see Figure 8-2 on page 8-5.

When the fiducial has been located a graphic box appears. This defines the area in which the system will learn the fiducial. The box shall be slightly bigger than the fiducial. The size of the box is adjusted by using the joystick or the trackball. Confirm the size by pressing <Enter>. Finally set the size of the area where the fiducial is searched during board location. This is also done by adjusting the size of a graphical box using the joystick or the trackball and confirming with <Enter>.

Verify

[F8]

The highlighted fiducial mark can be verified by pressing <F8>.

Exit

[Esc]

Press <Esc> if you want to exit the Fiducial Mark Editor and return to the main window.

Entries in the Fiducial Mark Editor:

Fiducial Marks

This box contains all the fiducial marks stored in the system. Use the arrow keys or <PgUp>, <PgDn>, <Home>, or <End> to select a fiducial mark.

You can search for a fiducial mark in the list by simply entering the first characters of the fiducial mark name.

Fiducial Mark Information

This box contains information about the highlighted fiducial mark.

Name

The fiducial mark name, which must be a unique name or number.

Comment

User comment text.

Fiducial mark type

Press <Space> to select either *Generic* or *Circle*.

Generic

Select this option if the fiducial mark shape is not circular. The system will search for a fiducial mark with the same shape as the mark learned.

Circle

Select this option if the fiducial mark is circular. The system will always search for a circular fiducial mark, and the *Diameter* will be updated with the detected fiducial mark diameter each time it is found. The *Diameter* value is updated also in the fiducial mark database.

Generic mark taught

This otionis only available for the *Generic* alternative above.

Yes   –   The system has learned the fiducial mark and is able to recognize it.

No   –   The system has not learned the fiducial mark and is not able to recognize it.

Yes or *No* is indicated by the system and cannot be changed from the keyboard. *No* is changed to *Yes* after the system has learned the fiducial mark.

Figure 8-2 shows how to center a fiducial mark in order to teach the system to recognize and center the point automatically.
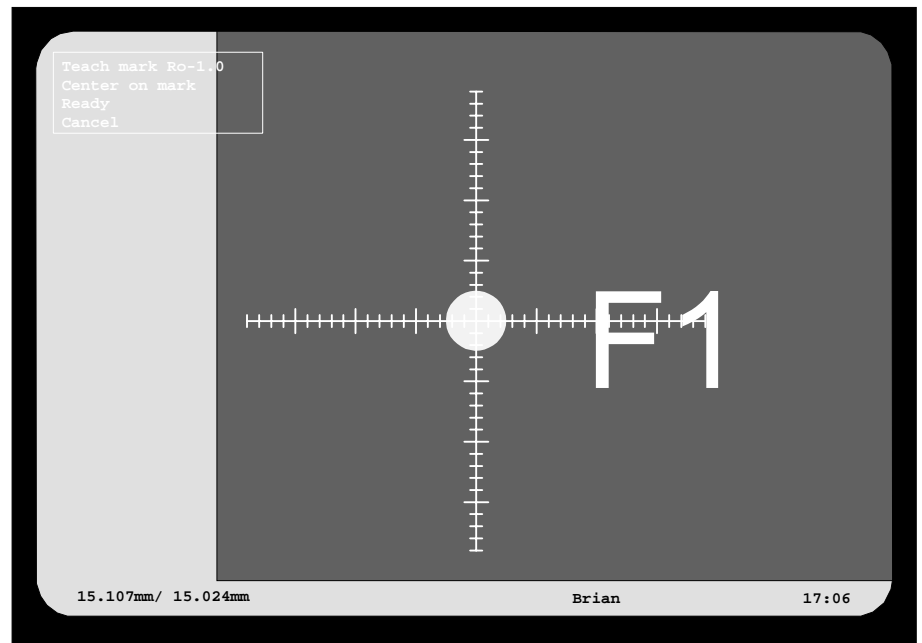
Figure 8-2. Teaching a fiducial mark

White on black

Yes   – The fiducial mark is brighter than the background.

No   – The fiducial mark is darker than the background.

To toggle between *Yes* and *No* press <Space>.

An example of the *Yes* option is shown in Figure 8-2 where the fiducial mark is brighter than the background.

Symmetric mark

Yes   – The geometric shape of the fiducial mark is symmetrical, for instance rectangular. The mark center is calculated to be in the geometrical center, not the position set during the centering procedure (see Figure 8-2).

No   – The geometric shape of the fiducial mark is asymmetrical, for instance a leader corner. The mark center is the position set during the centering procedure.

To toggle between *Yes* and *No* press <Space>.

Always try to use a symmetrical fiducial mark, and this option set to *Yes*.

☞ *To avoid incorrect board and component positioning, do not set this option to 'No' for symmetrical fiducial marks.*

Teach area X size/Y size

The size, in X/Y coordinates, of the area scanned when the system learns a fiducial mark. This area is normally set using the joy-stick or trackball. The values may also be entered directly into this field.

Object filter size

This is a pixel grid size used as a filter when the system learns the fiducial marks.
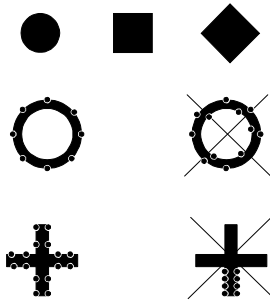
Set 0.3mm for filled usual fiducial mark shapes. You can use this value for the smallest points (0.8mm) as well as for the largest ones.

If the fiducial mark is not filled, then you may have to increase the value to avoid detecting spots on the inner contour line, see the figure.

If the fiducial mark has a symmetrical but unusual shape, then you may have to increase the value to get the detected spots to be spread on all the geometrical parts of the object. If the 'plus' fiducial mark in the figure is for instance 1.5mm, try to set 1.0mm.

If you cannot see the definition spots on the screen, make sure the *0041.0022 Mark true edges* parameter is set to *Yes* and the *0041.0023 Mark possible edges* parameter is set to *No*.

Verify area X size/Y size

The size, in X/Y coordinates, of the area which will be scanned by the vision system at automatic fiducial mark search.

A small value means that the automatic fiducial mark search is carried out fast because only a small area is scanned, but, the machine can only handle a small deviation from the previous location. A big value gives the opposite effect. Maximum value is 7.5mm for both X and Y.

This area is normally set using the joy-stick or trackball. The values may be entered directly into this field.

Correlation

The percentage correlation between the learned and a searched fiducial mark.

A lower value means that the system accepts greater deviations between learned and searched fiducial marks (less critical).

A higher value means higher acceptance requirements (more critical).

Default value: 80%.

Diameter

An approximate diameter can be entered when a *Circle* type fiducial mark is created. When the system is learned to recognize the fiducial mark, this value is updated to the detected diameter.

Used for *Circle* type fiducial marks only.

Diameter tolerance

Accepted tolerance for *Diameter* in percent.

Default value: 25%.

Used for *Circle* type fiducial marks only.

Circle contrast

The minimum contrast required between the fiducial mark surface and the surrounding background.

Default value: 25.

Used for *Circle* type fiducial marks only.

Glue Dot List

The purpose of the Glue Dot List is to store names and data for defined glue dots used by the *Package List Editor* (there is a section on glue dots in the *Glue Dots* description) in Chapter 5.

The Glue Dot List is also is a bank of defined glue dots that can be used for new packages by simply entering the glue dot names.

The Glue Dot List is opened by selecting the **Glue Dots** option in the **Editor** menu.

The Glue Dot Editor, containing five default glue dots provided with TPSys, is shown in Figure 8-3.

Function keys in the Glue Dot Editor:

Edit glue dot

By pressing <Enter> the highlighted glue dot can be modified.
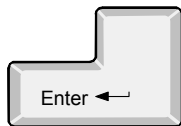
Insert new

A new glue dot can be added to the list by pressing <Ins> and typing a new name.

Delete

The highlighted glue dot can be deleted by pressing <Del> and confirming the deletion in a popup box.

Apply and view

The highlighted glue dot can be applied, viewed and measured by pressing <F7>, see page 8-12.

Exit

Press <Esc> if you want to exit the Glue Dot List Editor and return to the main window.

```
                          * GLUE DOT EDITOR *
        ___Glue Dots___
       |Dot-0.5mm      |                        Enter   Edit glue dot
       |Dot-0.8mm      |                          Ins   Insert new
       |Dot-1.5mm      |                          Del   Delete
       |Dot-2.2mm      |                           F7   Apply and view
       |Dot-3.0mm      |
       |               |
       |               |        ___Glue Dot Information___
       |               |         Name:  Dot-0.5mm
       |               |        Comment:
       |               |                         Tool:  C12
       |               |          Dip depth in glue:  0mm
       |               |          Wait time in glue:  64ms
       |               |      Slow up dist. from glue:  1.2mm
       |               |      Slow up force from glue:  5N
       |               |      Slow up speed from glue:  80mm/s
       |               |        Wait time b/a X run:  0ms
       |               |           Wait time on PCB:  0ms
       |               |      Slow up dist. from PCB:  1.2mm
       |_____|      Slow up force from PCB:  5N
                             Slow up speed from PCB:  80mm/s

                                          Brian              17:10
```

Figure 8-3. Glue Dot Editor

Entries in the Glue Dot Editor:

Glue Dots

This box contains the names of the defined glue dots. Use the arrow keys or <PgUp>, <PgDn>, <Home>, or <End> to select a glue dot.

You can search for a glue dot in the list by simply entering the first characters of the glue dot name.

This list contains the five default glue dots provided with TPSys.

Glue Dot Information

This box contains information about the highlighted glue dot.

Name

The glue dot name, which must be a unique name or number.

Comment

User comment text.
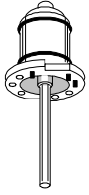
Tool

Glue tool for application of adhesive.

The tool coding is detailed in Chapter 3.

If you press <Space> in this field, installed tools are shown in a popup menu.
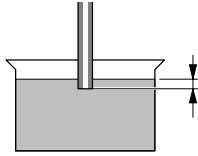
Dip depth in glue

The depth to which the tool is dipped into the glue. The figure shows the depth schematically, in the reality the depth is measured after the glue levelling arm.

This field is set to 0mm for the five default glue dots provided with TPSys. The reason is that the depth is entirely dependent on the glue characteristics.

If you have no experience of a particular glue, try first 0mm, test the glue dot using the test feature described on page 8-12 and increase the depth gradually until you find an appropriate depth.

Avoid using different glue dot types with different depths for the same glue tool. Larger glue dots than expected for the smallest of these dots will be the result.

If you want to be sure of the glue dot size after changing from a higher to a lower depth value, clean the tool.

Wait time in glue

Wait time in the glue reservoir required for the glue to adhere to the tool tip.
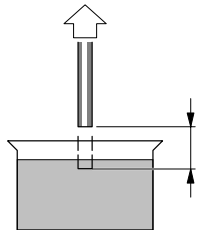
Slow up dist. from glue

A distance, from the start position in the glue, at which the force and speed (see below) can be decreased to ensure that the glue remains on the tool.

Slow up force from glue

The vertical maximum force used when the glue tool moves up the first distance from the glue surface. The first distance is defined in the previous *Slow up dist. from glue* field.

Slow up speed from glue

The vertical maximum speed used when the glue tool moves up the first distance from the glue surface. The first distance is defined in the *Slow up dist. from glue* field above.
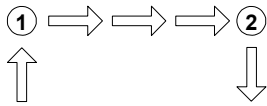
Wait time b/a X run

The wait time before and after the X-wagon movement, that is before the X wagon starts moving (1), and after the X wagon has reached its position (2).

Wait time on PCB

Wait time before the glue tool is lifted from the board surface when applying glue.
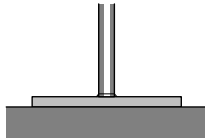
Slow up dist. from PCB

A distance, from the start position at the PCB board surface, at which the force and speed (see below) can be decreased to ensure that the glue remains on the PCB surface.
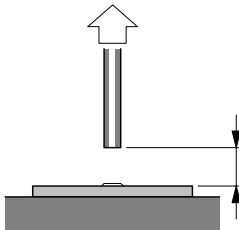
Slow up force from PCB

The vertical maximum force used when the glue tool moves up the first distance from the PCB surface. The first distance is defined in the previous *Slow up dist. from PCB* field.

Slow up speed from PCB

The vertical maximum speed used when the glue tool moves up the first distance from the PCB surface. The first distance is defined in the *Slow up dist. from PCB* field above.

Verifying a Glue Dot

F7

By pressing <F7> in the Glue Dot Editor (page 8-9) a glue dot can be applied, viewed and measured.

Before applying the glue, you are asked to find a place to measure the board level on:

```
 ┌ Find a place to measure board level on ┐
 Ready
 Cancel
```

Move the cross hairs to a place to measure the board level on and press <Enter>.
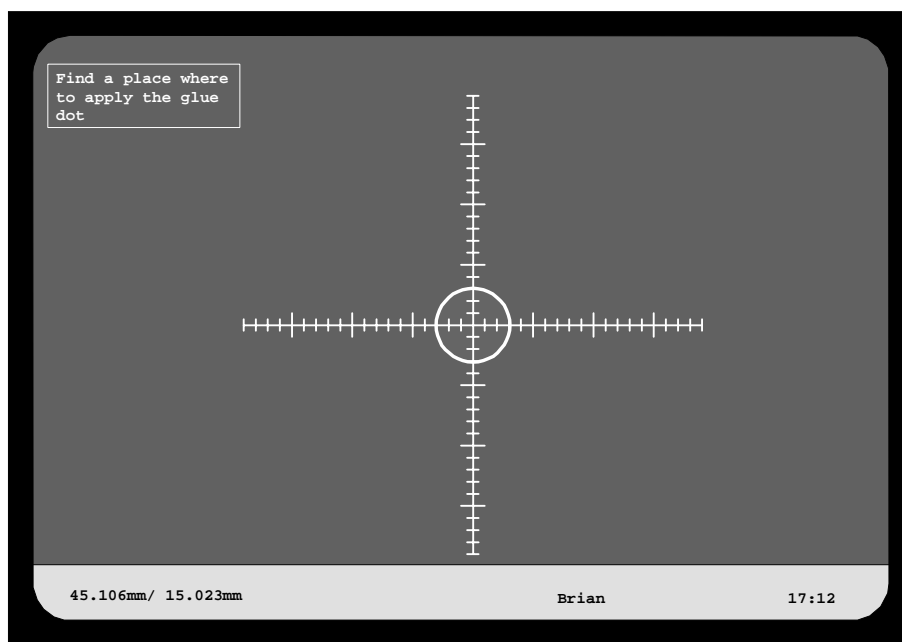
Figure 8-4. Verifying a glue dot

Move the cross hairs to an appropriate place to apply a glue dot, and press <Enter> when the *Ready* option is highlighted.

A glue dot is applied, provided the machine has a glue station inserted and indicated glue tool installed.

The glue dot can be measured by means of the cross hairs scales, see Figure 8-4.

Esc

The glue dot testing mode is exited by selecting the *Cancel* option or by pressing <Esc>.

User List

In TPSys there is a user security feature in which passwords are used to prevent from unauthorized data modification. User names, passwords and individual data modification privileges are used for this feature.

The user security is configured in a User List Editor, described overleaf.

The user security feature can be enabled or disabled from the TPSys main menu (description on page).

System locking

It is not possible to lock the system for all users by manipulating the security feature. However, in a network system with shared *User* database, the client system might be locked if manipulating the user privilege levels and the log on/off feature in the client and server systems. But, a locked client system can always be accessed again by changing the *User* privilege level in the server system.

User List Editor

User information in the User List can be modified when the security is either disabled or enabled.

- If disabled, any user can modify the security information without logging on.

- If enabled, the user must be logged on with the *User* privilege level set to *High*.

The currently logged on user name is shown at the bottom of the screen, see *Brian* in Figure 8-5.

The User List Editor is opened by selecting the **Users** option in the **Editor** menu.

The User List Editor is shown in Figure 8-5.

Function keys in the User List Editor:

Edit user

By pressing <Enter> the highlighted user privilege levels can be modified.

Insert new

A new user can be added by pressing <Ins> and typing a new name and password.

Delete

The highlighted user can be deleted by pressing <Del> and confirming the deletion in a popup box, provided the user is not currently logged on, which is indicated with an asterisk (*) in the user list.

```
                              * USER LIST EDITOR *
        ┌─User─────────┐
        │ Bill         │                        Enter  Edit user
        │ *Brian       │                          Ins  Insert new
        │ David        │                          Del  Delete
        │ Eric         │                           F2  Change password
        │ John         │
        │              │
        │              │
        │              │   ┌──────────────────────────────────────────┐
        │              │   │          Name: Brian                     │
        │              │   │   Access rights                          │
        │              │   │        Layout: High       Board: Standard│
        │              │   │     Component: High      Package: High   │
        │              │   │      Glue dot: High Fiducial marks: High │
        │              │   │      Magazine: Standard Tray type: High  │
        │              │   │  Magazine kit: Low          User: High   │
        │              │   │      Switches: Low Mount/glue switch: High│
        │              │   │     Parameter: High      Service: High   │
        │              │   │    Management: High                      │
        └──────────────┘   └──────────────────────────────────────────┘
                                            Brian              12:16
```
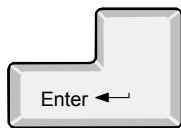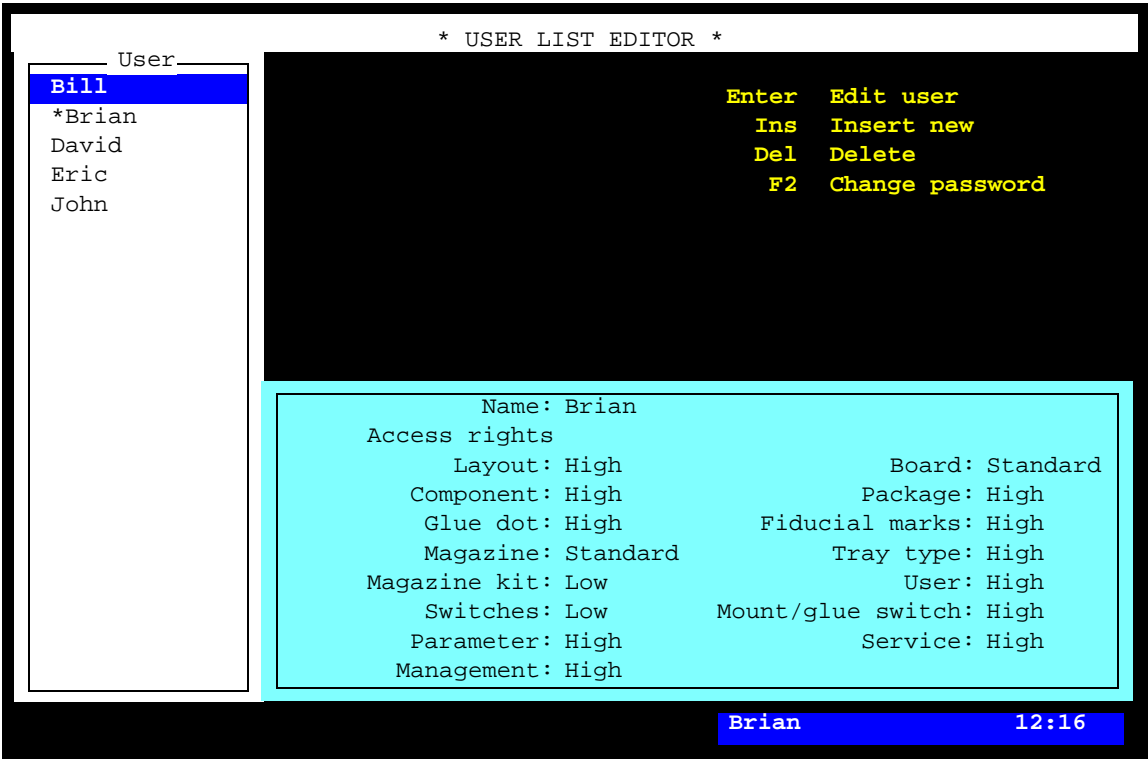
Figure 8-5. User List Editor

Change password

F2

The password for the highlighted user can be changed after pressing
<F2>. Passwords are sensitive to upper/lower case.

Exit

Esc

Press <Esc> if you want to exit the User List Editor and return to
the main window.

Entries in the User List Editor:

User

The users defined in the system.

Use the arrow keys or <PgUp>, <PgDn>, <Home>, or <End> to
select user.

* A user currently logged on is marked with an asterisk (*). Only one
user can be logged on the system in on-line mode. Several users can,
however, be logged on the system in off-line mode.

Name

User name, which must be a unique name for each user.

Access rights

Privilege levels for the highlighted user can be set individually for a number of system actions, further described below.

The privilege levels are selected by pressing <Space>.

High and *Low* privilege levels can be chosen for most of the actions. For some of the actions, an additional *Standard* privilege level can be selected.

The three privilege levels are intended for the following purposes:

Low

> Intended for minimal trained operators. It allows to run the system, locate boards and re-load components, but it does not allow to change any settings.

Standard

> Intended for trained operators and it allows also to modify the contents of the magazines, and to modify board positions in panels.

High

> Intended for programmers and service personnel. It has no limitations, that is any placement and system settings can be changed.

Actions allowed for the three privilege levels are described below. *Standard* points out only what is allowed in addition to the *Low* level. *High* is not included since it has no limitations.

Layout: Low

Layout Editor.
- Move the board position fiducial marks.

Board: Low

PCB Editor.
- Toggle the 'D' and 'M' status in the *Items* list.

- All actions in the *View position* mode except for changing the component position.

Board: Standard

PCB Editor.
- Modify the component angle, position and local fiducial mark positions.

- Modify the following PCB header information:
  – *Bad board mark pos.*
  – *Mount tool test pos.*
  – *Glue tool test pos.*

Panel Editor.
- Move the PCB position fiducial marks.

- Modify the following panel header information:
  – *Bad board mark pos.*
  – *Mount tool test pos.*
  – *Glue tool test pos.*

Component: Low

Component List Editor.
- No modification is allowed, but the *F6* feature can be used.

Package: Low

Package List Editor.
- No modification is allowed.

Glue dot: Low

Glue Dot List Editor.
- No modification is allowed, but you can apply and view a glue dot using the *Apply and view* option in the menu.

Fiducial marks: Low

Fiducial Mark List Editor.
- No modification is allowed but you can verify a fiducial mark using the *Verify* option in the menu.

Magazine: Low

Magazine List Editor.
- Perform the following magazine actions:
  - *Locate magazine*
  - *Vibrate magazine*
  - *Vibrate all magazines*

Y-Wagon Magazine Editor.
Tray Wagon Magazine Editor.
Pallet Magazine Editor.
- Perform the following actions:
  - *Reload*
  - *Remove from magazine*

- Modify the following tray information:
  - *Quantity*
  - *Position*

TEX List.
- Perform the following actions:
  - *Locate pallet position*
  - *Refill all trays*

Tray Elevator.
- No restrictions (the Tray Elevator is not controlled by the user security feature). However, the pallet trays are restricted.

Magazine: Standard

Magazine List Editor.
- Modify all feeder contents information accessed by selecting the *Edit feeder contents* option in the menu.

Y-Wagon Magazine Editor.
Tray Wagon Magazine Editor.
Pallet Magazine Editor.
- Perform the following actions:
  - *Insert new*
  - *Delete*
  - *Toggle sort order*

- Modify the tray information, for instance *Name/barcode*, *Comment* and *Batch ID*.

Magazine Kit List Editor.
- Load a Magazine Kit into a Magazine List by selecting the *Apply* option in the menu.

Tray type: Low

Tray Type List Editor. No modification is allowed.

Magazine kit: Low

Magazine Kit Editor.
- No modification is allowed, but you can change the sort order by selecting the *Toggle sort order* option in the menu.

User: Low

User List Editor.
- No modification is allowed, neither of any user privileges nor passwords.

☞ To avoid the risk of locking everyone out from the system, the currently logged on user cannot set his own *User* level to Low.

Switches: Low

No modification is allowed of the switches accessed by selecting the *Switches* option in the *Production* menu.

Mount/glue switch: Low

No modification is allowed of the mount and glue switches accessed by selecting the *Mount/Glue Switches* in the *Production* menu.

Parameter: Low

Parameter List Editor. No modification is allowed of the parameters accessed by selecting the *Parameters* option in the *Editor* menu.

Schedule Backup. No access is given to the *Schedule Backup* feature in the *Utility* menu.

Service: Low

Service tools. No access is given to the *Installation* and *Diagnostics* service tools in the *Utility* menu.

Management: Low

If this field is set to *Low* then the following actions are, contrary to the above descriptions, **not** allowed to be performed:

- Clear the event log (the *Clear Event Log* option in the *Utility* menu).

- Clear management data (the *Clear Management Data* option in the *Production* menu).

- Delete management data (the *Delete Management Data* option in the *Utility* menu).

Security On/Off

The security can be switched on/off from the TPSys main menu in on-line mode, provided the *User* privilege level is set to *High* for the currently logged on user.

To enable or disable the feature, select the **User Access System** option in the **Utility** menu ...
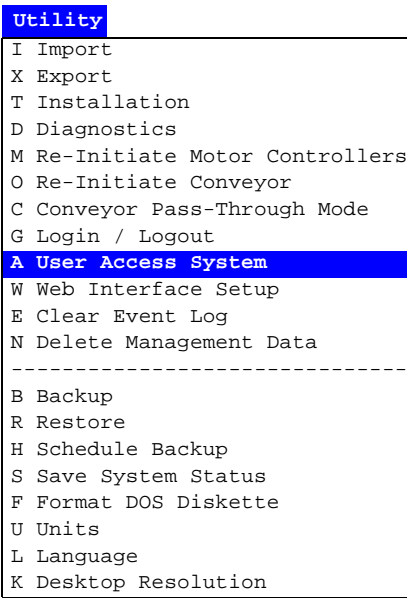
```
Utility
I Import
X Export
T Installation
D Diagnostics
M Re-Initiate Motor Controllers
O Re-Initiate Conveyor
C Conveyor Pass-Through Mode
G Login / Logout
A User Access System
W Web Interface Setup
E Clear Event Log
N Delete Management Data
-----------------------------
B Backup
R Restore
H Schedule Backup
S Save System Status
F Format DOS Diskette
U Units
L Language
K Desktop Resolution
```

... and the desired option for enabling or disabling the user security feature ...

```
        User Access System
N On
F Off
```

... then, enter your name in the popup box shown:

This dialog box is not shown if a user with *User* privileges set to *High* disables the feature.

```
        User with HIGH access right
          Name: Brian
        Password: ******
```

Or, you can simply press <Enter> and select user from the list. Enter the password and press <Enter>.

An information box will indicate that the user security feature is switched on or off.

Note that only users for which the *User* privilege level is set to *High* are allowed to switch the user security feature on or off.

Log On/Off
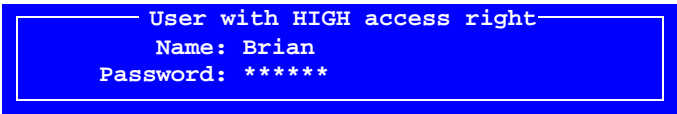
How to log on and log off is described in the *User Access* section in Chapter 2 of the *Operator's Manual*.

Appendix A – Packages

The purpose of this appendix is to show the most common packages and to be a guide for programming new packages.

The appendix contains a package survey over the most common packages that are pre programmed as default in TPSys. It also contains a description of how to program a new package.

How To Program a New Package

The fastest way to program a new package is to follow the below description and use the information on the following pages.

New package data can also be created automatically by using Autoteach, described on page .

1. Find the package type in the survey on page .

2. Look up the page indicated for the found package type.

3. Insert the data of the new package, for instance the package size and number of leads, in the 'TPSys package name' string.

4. In the Package List, select that package which is closest to the new one, press <Ins> to create a new package with the same data as the selected package, and enter a new name for the package.

5. Finally, modify that package data which differ between the selected package and the new package.

See also the programming hints on the following pages.

The TPSys Package List, opened by selecting the **Packages** option in the **Editor** menu:

```
Editor
C Components
P Packages
----------------
L Layouts
A Panels
B PCBs
----------------
R Parameters
----------------
F Fiducial Marks
G Glue Dots
U Users
```
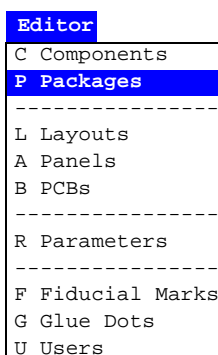
The TPSys Package List is described in the *Programming Manual* Chapter .

Autoteach

Autoteach is a system tool which automatically creates package definitions. It measure mechanical package data by taking an image and analyzing it by means of automatic image analysis. On components where the leads lie on a grid, Autoteach is able to analyze the measured coordinates to find the pitch of the grid. The leads can be adjusted to lie on the detected grid and the effect of measurement errors eliminated.

Autoteach also makes it possible to automatically find good vision settings for packages.

[F5]

The user activates Autoteach by highlighting a package in the Package List Editor and then pressing <F5>. The Package List Editor is described in Chapter 5.

A window with the Autoteach data is shown, see Figure A-1.

```
                    * AUTOTEACH PACKAGE 00-ABC *
  ___Packages___
  00-ABC          Enter  Edit package         F5   Autoteach
  1206-12           Ins  Insert new           F6   Edit optical cent.
  1206-16                                           data
  1210-07           Del  Delete               F7   Edit lead groups
  1210-12           F3   Edit accelerations   F8   Edit centering phases
  1505-10           F4   Test centering       F9   Edit glue data
  1805-07
  1812-07
  1812-12                        ──Pick Up Component──
  1812-20               Package height: 2.35mm
  1825-10                         Tool: C23
  218-18
  AL-CAP                  Package type: Leaded device
  BGA-13*13-P                     Teach: Geometrical data
  BGA-14*14-C               Pick from: Y wagon (0°)
  BGA-15*15-P             Feeder/Tray:
  BGA-19*19-PE
  M3216-16
  M3528-19
  M3819-16

                                          Brian                14:16
```

Figure A-1. Autoteach window

Entries in the Autoteach window:

Package height

The height of the package cannot be measured by Autoteach. It must be entered manually before activating Autoteach.

Tool

The tool to be used when picking the package must be selected in the Package List Editor before activating Autoteach. This information cannot be changed in the Autoteach window.

Package type

Select from a list the type of package to be taught. Toggle between *Ball device*, *Leaded device*, *Outline* or *Chip* by pressing <Space>.

Teach

Specifies which kind of data that shall be taught. Select if Autoteach should learn:

- *Geometrical and vision data*. This alternative teach both geometrical and vision data.
- *Geometrical data*. Autoteach will only measure the positions of the leads, the dimension of the leads and so on.
- *Vision data*. Autoteach will only determine good vision settings for the package.

Pick from

Choose if the component should be picked from the Y wagon or a magazine. Toggle between *Y wagon (0°)*, *Y wagon (90°)*, *Tray wagon (0°)*, *Tray wagon (90°)*, or *Feeder/Tray*,by pressing <Space>.

If Y wagon or Tray wagon is chosen, TPSys asks for three corners of the component to be located. Center the cross hairs on them by using the joystick. Autoteach assumes that the component lies in zero degrees when picking a component from these magazines.

Picking the component from the Y wagon or Tray wagon is slightly more robust than picking from a feeder. If the component is picked from these magazines, Autoteach knows the extent of the component in the image and does not have to detect this automatically.

Feeder/Tray

If the package is loaded into a magazine, specify which feeder or tray to pick from if *Feeder/Tray* was chosen above.

Press <Enter> and a new pop-up window appears.

Teach Types

It is possible to select if Autoteach should teach both geometrical and vision data, only geometrical data or only vision data. If geometrical data is chosen Autoteach will measure the positions of the leads, the dimension of the leads etc. If vision data is chosen Autoteach will determine good vision settings for the package.

Geometrical data

If only geometrical data is chosen, Autoteach will only measure the mechanical data of the package. Illumination and vision settings for the package will not be affected by this operation.

This is a good alternative when a similar package to the new one exist in the package editor. A package for which vision centering works well and that is similar in appearance to the new package. Make a copy of the existing package and run Autoteach for only geometrical data. Creating a package in this way saves the time spent trying to find a good illumination. If the vision settings does not work well enough for the new package, teach the vision data later.

Vision data

This alternative is used when the geometrical data for a package is correct, but poor vision settings makes optical centering work poorly. Running this alternative will leave all geometrical data unchanged, except the lead dimension. The lead dimensions of the package may have to be adjusted because the size of a lead in the image varies with illumination.

Teaching both geometrical and vision data

It is possible to teach both geometrical and vision data in the same run. Autoteach will first measure the geometrical data and show the result. If the measured geometrical data is approved, Autoteach will proceed to the teaching of vision data.

Vision data and the DVC

If the DVC is used to teach vision data, TPSys must know the position of the component in the image. Autoteach will show an image of the component and asks for the location of the corners. Use the trackball or the joystick to mark the corners.

On some machines part of the DVC image will be outside the screen. This means that it is possible for a corner of the component to be outside the visible part of the image. Move the image by using <Ctrl> + arrow keys. Zoom in and out using <Ctrl> + <Page Up> or <Ctrl> + <Page Down>.

Components picked from the Y-wagon are no problem. This because three corners of the component must be located for the machine to be able to pick it. Teaching both geometrical and vision data is also no problem, since the position of the leads have already been detected.

Vision data for chip packages

For Chip component, optical centering can be performed either by looking at the whole chip outline or looking at the leads only.

You will b asked to select the method to use before vision data teaching is performed. You can select the following :
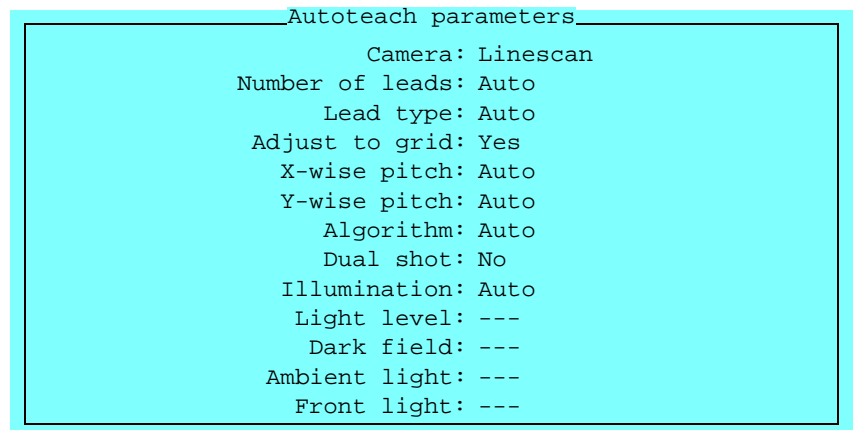
– STANDARD This will use the whole component outline.
– LEADS ONLY This means the vision system will only look at the leads on the chip. This is useful when the whole component outline is hard to see in the image.

☞ Always select the camera that will be used for optical centering of the package during production. Autoteach only sets up the vision data for the selected camera. Illumination settings for other cameras are left unchanged. Teaching a package in a Linescan camera for example, will not automatically work for SVC or OVC.

Autoteach of BGA Packages

If *Ball device* was chosen in Figure A-1 and teach *Geometrical data*, the following window appears:

```
_____Autoteach parameters_____
                   Camera: Linescan
          Number of leads: Auto
                Lead type: Auto
            Adjust to grid: Yes
             X-wise pitch: Auto
             Y-wise pitch: Auto
                Algorithm: Auto
                Dual shot: No
             Illumination: Auto
              Light level: ---
               Dark field: ---
            Ambient light: ---
              Front light: ---
```

This window allows the following parameters to be set:

Camera

The camera that shall be used for the Autoteach procedure can be set. The list contains all the available cameras in the machine except the Hydra camera, which cannot be used to teach packages.

☞ Always select the camera that will be used for optical centering of the package during production.

Number of leads

If this field is set to *Auto* the function automatically tries to detect the number of solder balls on the package. If one knows the number of solder balls it can be entered directly into this field to help the function.

Lead type

If this field is set to *Auto* the function automatically tries to detect which type of lead the package has. The lead type can also be entered directly into the field.

Adjust to grid

On most BGA components the solder balls lie on standardized grids. This means that the measured coordinates of the solder balls can be adjusted to lie on such a grid, thus eliminating the effect of measurement errors. This is done if the field is set to *Yes*. If set to *No* Autoteach treats every detected lead as a lead group and saves the coordinates without adjustment.

X-wise pitch

This field can only be edited if the *Adjust to grid* field above is set to *Yes*. If the pitch field is set to *Auto* the function measures the x-wise pitch of the package and compares it with known standardized pitches. If one knows the pitch it can also be entered into the field.

Y-wise pitch

This field can only be edited if the *Adjust to grid* field above is set to *Yes*. If the pitch field is set to *Auto* the function measures the y-wise pitch of the package and compares it with known standardized pitches. If one knows the pitch it can also be entered into the field.

Algorithm

This field specifies which algorithm should be used when locating the solder balls:

Auto
> Autoteach automatically chooses the algorithm that it thinks will work best.

Bright on dark
> Autoteach searches for bright solder balls on a dark component body.

Bright on bright
> Autoteach searches for bright solder balls on a bright component body.

Dark on bright
> Autoteach searches for dark solder balls on a bright component body.

Flip chip
> Works as *Bright on dark* but with some added robustness. If *Illumination* (see below) is set to *Auto* illumination will be set to a value appropriate for flip-chip components.

Dual shot

If this field is set to *Yes* two images will be taken of the component and merged into one image that will be analyzed by Autoteach. This enables the user to teach packages that are larger then the camera Field of View.

Illumination

These fields only affects the illumination used for Autoteach and are not stored in the Package list.

This field has the following two options:

> – *Auto*
> Autoteach will use the default illumination for the package type that is defined in the Autoteach parameters.
>
> – *Manual*
> The illumination fields can be edited and one can specify the illumination that Autoteach uses.
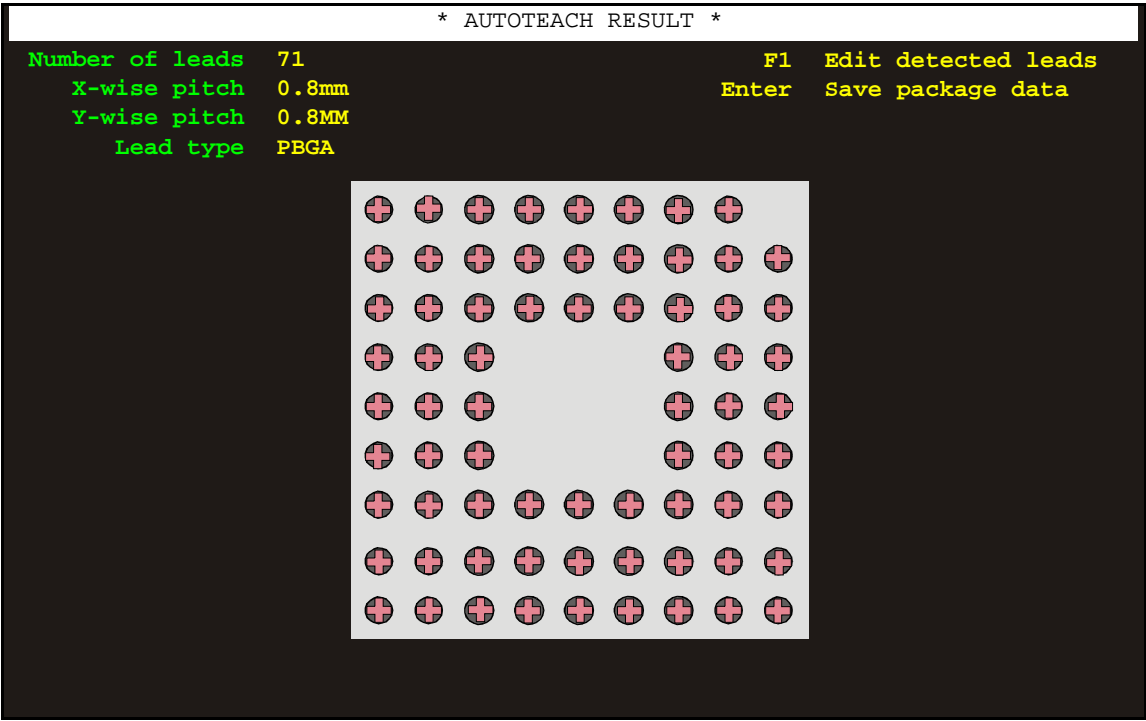
Figure A-2. Autoteach result

Leave the pop-up window by pressing <Enter> and the machine picks the component and shows it to the specified camera. The image is analyzed to locate the solder balls and the method measures pitch and ball diameter. The result is shown in a window, see Figure A-2.

The detected solder balls are marked with red crosses. In the upper left corner the system outputs the number of detected solder balls, the measured pitch and the detected lead type.

Edit detected leads

Press <F1> and a yellow cursor appears on the screen. The position of the cursor is controlled by the joystick or the trackball. If Autoteach has marked a feature that isn't a lead, point at the mark and pressing <Del> to delete the mark. If one or more leads are missed they can be added by pointing with the cursor at the position of the lead and pressing <Ins>. After leads have been edited, confirm by selecting **Ready** in the upper left corner menu.
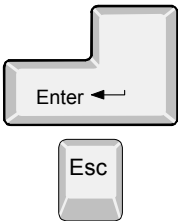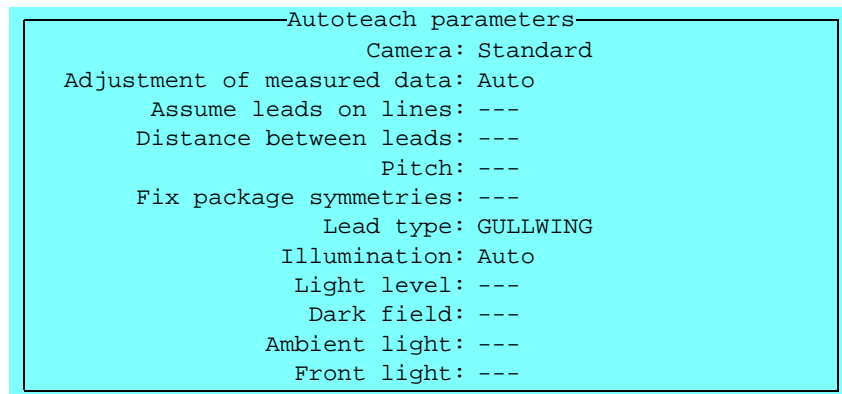
Save package data

The machine puts the component back and the result is exported to the Package List.

If the method failed to measure the package correctly, hit <Esc> and the parameter window will reappear. Try changing one or several parameters and teach the package again. For odd packages one may have to set algorithm and illumination manually.

Autoteach of Leaded Devices

If *Leaded device* was chosen as the package type in the Autoteach window (Figure A-1) the following window appears:

```
                    ┌───────Autoteach parameters───────┐
                                Camera: Standard
            Adjustment of measured data: Auto
                   Assume leads on lines: ---
                   Distance between leads: ---
                                  Pitch: ---
                 Fix package symmetries: ---
                             Lead type: GULLWING
                          Illumination: Auto
                           Light level: ---
                            Dark field: ---
                         Ambient light: ---
                           Front light: ---
```

This window allows the following parameters to be set:

Camera

Specify camera to be used. The list contains all the available cameras in the machine except the Hydra camera, which cannot be used to teach packages.

☞ Always select the camera that will be used for optical centering of the package during production.

Adjustment of measured data

Autoteach may not be able to measure the ideal position of each lead due to measurement errors, slightly bent leads and such. Normally leads of every lead group should lie on a straight line and the distance between adjacent leads should be a multiple of the pitch. By using this knowledge Autoteach can adjust the measured data to better resemble an ideal package.

Auto
> The default value of the field. Autoteach automatically decides which assumptions seem to match the package currently being taught. This setting works for a large majority of packages.

Custom
> Manually controlling the assumptions made. If the field is set to *Custom* the user will be able to edit the next four fields.

Assume leads on lines

If set to *Yes* the detected leads will be adjusted to lie on straight lines in 0°, 90°, 180° and –90°. This is the default value.

Distance between leads

Multiple of pitch
> Distance between two neighboring leads will be adjusted to be equal to a multiple of the pitch, this is the default value of the field.

Arbitrary
> Distance between the leads will not be adjusted.

Pitch

This field may be edited if *Distance between leads* above is set to *Multiple of pitch*.

Enter the pitch of the package if it is known. *Auto* will measure the pitch of the package and adjust it to the closest standardized pitch. This is the default setting.

Fix package symmetries

Yes – Lead groups on opposite sides of the package will be adjusted so that they have the same distance to the axis ('1' in Figure A-3). Every lead group will also be adjusted so that the distance from the two outer leads of the group to the axis vertical to the group (2) is the same.

No – Symmetries will not be adjusted.
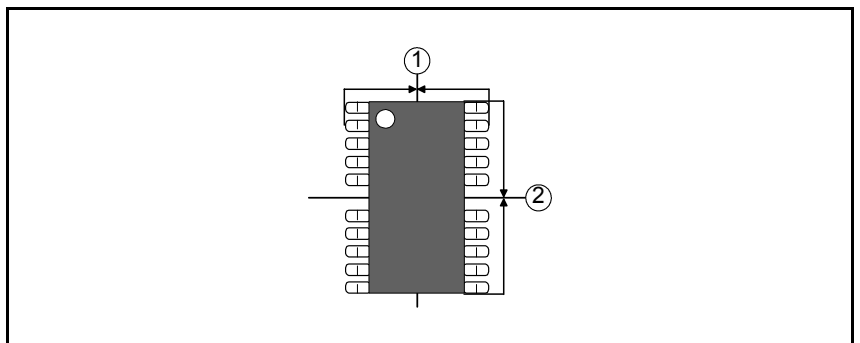
Figure A-3. Package symmetries

Lead type

This field specifies the lead type of the package being taught. The available lead types are *GULLWING* and *J-BEND*. You can toggle by pressing <Space>.

Illumination

The last few fields control the illumination that is used when teaching the package.

Auto

> Autoteach will use the default illumination for leaded devices that is defined in the parameters for Autoteach.

Manual

> Illumination may be set manually for this field, and the subsequent fields.

Press <Enter> and the result of Autoteach is shown on the screen (see Figure below).
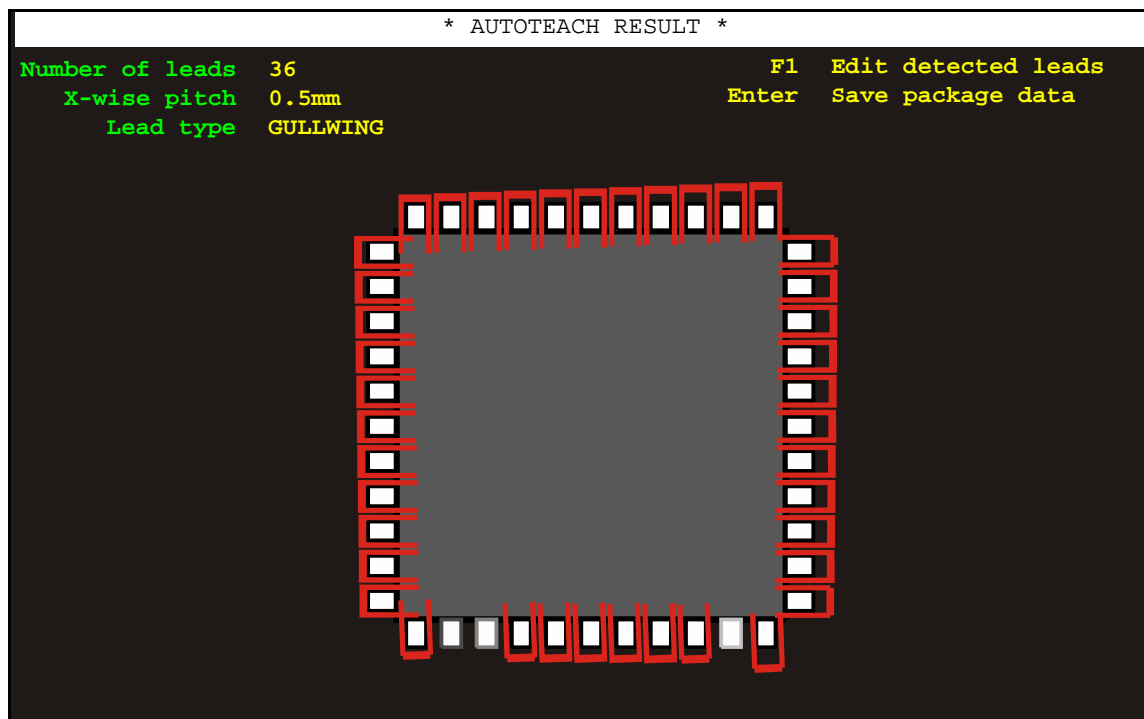
Figure A-4. Autoteach result

If the parameters have to be edited, start by adjusting the parameter that control the light level. This as the proportion of light from each LED-group has been designed to fit the package type in question.

The detected solder balls are marked with red crosses. In the upper left corner the system outputs the number of detected solder balls, the measured pitch and the detected lead type.

Edit detected leads

Press <F1> and a yellow cursor appears on the screen. The position of the cursor is controlled by the joystick or the trackball.

For leaded components the angle of the cursor is changed by pressing the <+> or <−> key.

When adding to a leaded package, first align the direction of the cursor to the angle of the lead that shall be added and then press <Ins>. When deleting leads the angle doesn't matter, just point the tip of the cursor at the tip of the lead that shall be removed and press <Del>.

After leads have been edited, confirm by selecting **Ready** in the upper left corner menu.

It is also possible to abort the changes at any time during the interactive add / remove by choosing cancel in the menu or by hitting the Esc key.

Autoteach of Chip and Outline Packages

Chip or *Outline* can be selected as the package type in the Autoteach window (Figure A-1). Autoteach then only needs to know the length and width of the package in order to create a package description.

– **Picking from the Y wagon** Three corners of the package must be located if picked from the Y wagon. The component will not be picked and shown to a camera if only *Geometrical data* is taught. Only package length and width are reqired by the system, and these are calculated from the corners already located. Mark the corners by using the joystick.

– **Picking from a feeder** A camera is neded to extract package data if the component i picked from a feeder. The camera is specified in a pop-up window. There is a list containing all the available cameras in the machine. Press <Space> to see the list. The machine picks the package and takes an image of it with the specified camera. Autoteach will ask for the corners to be located, which is done by using the joystick. The length and width are then calculated from these marked corners.

Error Messages for Autoteach

No leads found

You will get this message if Autoteach failed to find any solder balls or leads. This may occur if the contrast between solder balls and the component body is too small. Adjust the illumination and run Autoteach again.

Leaded device
> Need a high contrast between the lead and the background around the lead.

Ball device
> Try adjusting the *Algorithm* field (see page A-8) and run Autoteach again. You can also specify the number of balls on the package manually.

Failed to measure pitch

Autoteach failed to measure the pitch of the package.

The package may lack a grid or the method has not detected enough balls or leads to measure the pitch.

If the pitch is known it can be entered manually in the *Pitch* field of the Autoteach parameter window.

Unable to find more leads

Autoteach failed to add a lead when the <Ins> was pressed.

No more leads to remove

The <Del> was pressed in the result window but there were no more leads to remove.

Unable to adjust the leads to a grid with the pitch x mm

The measured or manually entered pitch is out of range. If *Pitch* in the parameter window was set to *Auto* try entering the pitch manually.

Could not find all leads

This error occurs if the number of leads was set manually, but Autoteach cannot find the number of specified leads.

Check that the number of entered leads is correct. Alternatively try teaching the component using a better illumination, or using a different algorithm.

Package Survey

Those packages which are pre programmed and included in the TPSys are shown below and are detailed on the following pages.

0201 to 2412

Size coded packages

Two-pole flat chip packages used for passive and discrete components.

Lead numbers and package angles in TPSys:
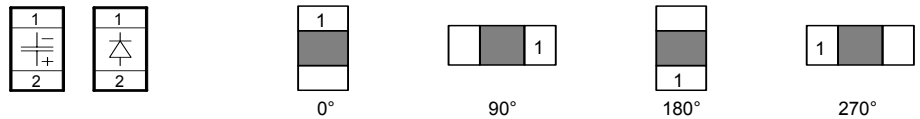
This package type can be placed by the HYDRA unit.

TPSys package name

YYXX-ZZ
YY   Package length in 1/100 inch (Y-wise in 0°).
XX   Package width in 1/100 inch (X-wise in 0°).
ZZ   Package height in 1/10 mm, which should be measured carefully.

Example: 1206-06

Programming hints:

Main window.	*Mount tool*: See table on page A-18.
Lead group window.	*Package Types*: *Two pole package* *Lead type*: CHIP *No. of image points*: 40 *Max cross-wise deviation*: 0.2mm *Max length-wise deviation*: 0.2mm
Centering phase window.	*Level*: 1 or 11 *Position*: *Upper* *Force*: *Middle* or *High* (*High* for 1812 or bigger).

HYDRA

Main window.	*HYDRA tools*: See table on page A-18. *HYDRA angle*: 90.00°
Accelerations.	*HYDRA theta* If the new package is higher than the selected package and the component placement angle is incorrect, then you can try setting a lower acceleration.
Lead group window.	*Lead type*: CHIP *No. of image points*: 40 *Image points distribution*: *Standard* If the new package body is darker than the selected body and the system rejects the component, then you can try setting this entry to *Leads only*.

Tool guide

Single Mount Hed

Mount tools to use are determined by the package size, form, weight and centering method used.

Package	Tool								
	A12	A13	A14S	B12	B13	B14	C12	C13	C14
0201									🟩
0402									🟩
0603	🟩								
0805	🟩								
1206		🟩							
1210		🟩							
1812			🟩						
1825			🟩						
2010			🟩						
2318		🟩							
2412			🟩						

HYDRA

Package	Tool					
	H00	H01 (white)	H02 (yellow)	H03 (red)	H04 (blue)	H06 (brown)
0201						🟩
0402		🟩				🟩
0603	🟩	🟩	🟩		🟩	
0805	🟩	🟩	🟩		🟩	
1206	🟩	🟩	🟩	🟩	🟩	
1210	🟩		🟩	🟩	🟩	
1812				🟩		
1825				🟩		
2010				🟩		
2318				🟩		
2412				🟩		

Resistor network

Resistor Network components comprise a number of separate film resistors contained within a single integrated package.

This package type can be placed by the HYDRA unit

TPSys package name

RNXX-YYYY

XX Total number of contact leads

YYYY Case size, e.g. 1206, 0804

Programming hints

Main window   *Mount tool*: Same as for chips of same size, see page .

Lead group window   *Package Types*: Generic

The resistor network in the picture below has leads with two different thicknesses and can be defined as a "Generic" package with 4 lead groups represented by the numbers and arrows in the picture.
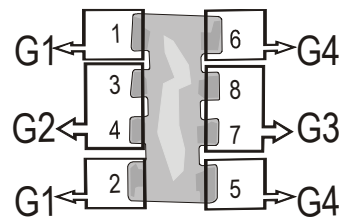
Lead Group 1 (G1)
Lead type: GULLWING
Number of leads in group: 2
Number of first lead in group: 1
Offset X: Distance in X from the center of the package to the tip of lead 1
Offset Y: Distance in Y from the center of the package to the tip of lead 1
Angle: 180 degrees
Length: Length of the leads
Width: Width of leads 1-2
Pitch: Distance between leads 1 and 2

Lead Group 2 (G2)
Lead type: GULLWING
Number of leads in group: 2
Number of first lead in group: 3
Offset X: Distance in X from the center of the package to the tip of lead 3
Offset Y: Distance in Y from the center of the package to the tip of lead 3
Angle: 180 degrees
Length: Length of the leads
Width: Width of leads 3-4
Pitch: Distance between leads 3 and 4

Lead Group 3 (G3)
Lead type: GULLWING
Number of leads in group: 2

Number of first lead in group: 5
Offset X: Distance in X from the center of the package to the tip of lead 5
Offset Y: Distance in Y from the center of the package to the tip of lead 5
Angle: 0 degrees
Length: Length of the leads
Width: Width of leads 5-6
Pitch: Distance between leads 5 and 6

Lead Group 4 (G4)
Lead type: GULLWING
Number of leads in group: 2
Number of first lead in group: 7
Offset X: Distance in X from the center of the package to the tip of lead 7
Offset Y: Distance in Y from the center of the package to the tip of lead 7
Angle: 0 degrees
Length: Length of the leads
Width: Width of leads 7-8
Pitch: Distance between leads 7 and 8

Optical centering window   *Use sub pixel*: Yes
Coarse search method: Standard
Coarse search noise: 1000
Coarse search contrast: 30
Fine search noise: 1000
Fine search contrast: 30

Centering phase window   *Method*: Optical
OVC light level: 50%
DVC Illumination
  Light level: 50%
  Pattern: Standard
  Rel.
    Dark field: 100 %
    Ambient light: 100%
    Front light: 100%l

LSC Illumination
  Light level: 50%
  Pattern: Standard
  Rel.
    Ambient light: 100%
    Front light: 100%

BGA, CBGA, LBGA, MBGA, PBGA
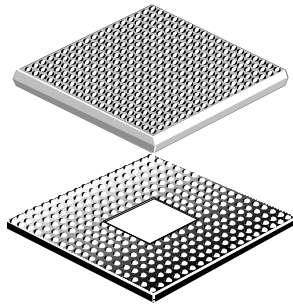
Ball grid array packages

Packages with solder ball leads arranged in any pattern.

For optical centering the lead pattern must fit within the camera field of view (FOV).

BGA   Ball Grid Array.
LBGA   Low profile Ball Grid Array.
MBGA   Micro Ball Grid Array.
PBGA   Plastic Ball Grid Array.

Package angles in TPSys (top view):
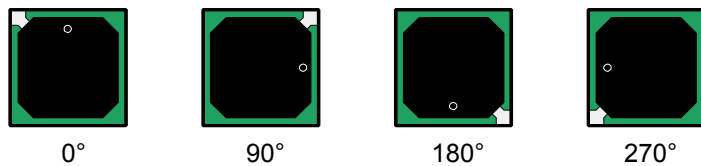
| 0° | 90° | 180° | 270° |

This package type cannot be placed by the HYDRA unit.

TPSys package name

[Type]ZZ–YYxXX–QQQ
Type   According to the list above (BGA refers to PBGA).
ZZ   Number of leads.
YY   Lead rows (Y-wise in 0°).
XX   Lead columns (X-wise in 0°).
QQQ   Lead pitch.

Example: BGA169–13x13–1.0

A PBGA package with 169 leads, 13 rows (Y-wise in 0°), 13 columns (X-wise in 0°), and 1.0mm lead pitch.

Programming hints:

Main window.   *Mount tool*: See table on page A-22.
Pick wait time / *Place wait time*: 100ms for big package, 50ms for small.
Hold until ready: *Yes*

Accelerations. *Mount precision*: *High*
Theta: Depends on the package size.
Y: *Highest*
X: *Highest*
Z: *High*

Optical centering window.   *Use sub pixel*: *No*
Coarse search method: *Standard*
Coarse search noise: 500
Coarse search contrast: 25 for LBGA and PBGA.
Fine search noise: 500
Fine search contrast: 25 for LBGA and PBGA.

Lead group window.   *Package Types*: *BGA package*
Lead type: *PBGA* for LBGA and PBGA packages.
Staggered: *No*
Extra corner leads: 0
Leads per row in hole: 0
Leads per column in hole: 0
Lead diameter: 90% of the real diameter for DVC. Use 65% for LSC.
Max lead displacement: 0,2mm

Centering phases.   *Method*: *Optical*

OVC light level: 57%
Rel.
   Dark field: 100%
   Ambient light: 100%
   Front light: 100%

DVC Illumination
Light level: 57%
Pattern: BGA

LSC Illumination
Light level: 65%
Pattern: BGA
Rel.
     Ambient light: 100%
     Front light: 100%

Tool guide

Mount tools to use are determined by the package size, form, weight
and centering method used.

Package	Tool	
	C23	C23S
LBGA		
BGA		
CBGA		
MBGA		
PBGA		

CBGA, CCGA
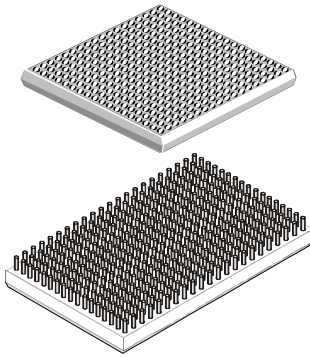
Ceramic ball/column grid array packages

Packages with solder ball or column leads arranged in any pattern.

For optical centering the whole body and lead pattern must fit within the camera field of view (FOV).

CBGA   Ceramic Ball Grid Array.
CCGA   Ceramic Column Grid Array.
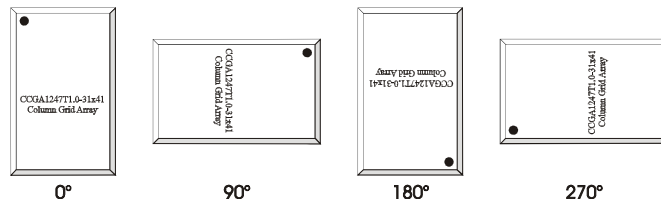
Package angles in TPSys (top view):

| 0° | 90° | 180° | 270° |

This package type cannot be placed by the HYDRA unit.

TPSys package name

[Type]ZZ–YYxXX–QQQ
Type   According to the list above.
ZZ   Number of leads.
YY   Lead rows (Y-wise in 0°).
XX   Lead columns (X-wise in 0°).
QQQ   Lead pitch.

Example: CBGA169–13x13–1.0

A CBGA package with 169 leads, 13 rows (Y-wise in 0°), 13 columns (X-wise in 0°), and 1.0mm lead pitch.

Programming hints:

Main window. *Mount tool*: See table on page A-24.
Pick wait time / Place wait time: 100ms for big package, 50ms for small.
Hold until ready: *Yes*

Accelerations. *Mount precision*: *High*
Theta: Depends on the package size.
Y: *Highest*
X: *Highest*
Z: *High*

Optical centering window. *Use sub pixel*: *No*
Coarse search method: *Outline*
Coarse search noise: 500
Coarse search contrast: 20
Fine search noise: 500
Fine search contrast: 10

Lead group window.   *Package Types*: *BGA package*
Lead type:
   CBGA for CBGA packages.
   PBGA for CCGA packages.
Staggered: *No*
Extra corner leads: 0
Leads per row in hole: 0
Leads per column in hole: 0

Lead diameter:
   CBGA 90% of the real diameter forg DVC. Use 65% for LSC.
   CCGA always 100%.
Max lead displacement: 0,2mm

Centering phases.   *Method*: *Optical*

CBGA

OVC light level: 57%
Rel.
   Dark field: 100%
   Ambient light: 100%
   Front light: 100%

DVC Illumination
Light level: 57%
Pattern: Generic

LSC Illumination
Light level: 75%
Pattern: Generic
Rel.
      Ambient light: 0%
      Front light: 100%

CCGA

OVC light level: 100%
Rel.
   Dark field: 0%
   Ambient light: 0%
   Front light: 100%

DVC Illumination
Light level: 100%
Pattern: Generic

LSC Illumination
Light level: 65%
Pattern: Generic
Rel.
      Ambient light: 0%
      Front light: 100%

Tool guide

Mount tools to use are determined by the package size, form, weight and centering method used.

Package	Tool	
	C23	C23S
CBGA	🟩	🟩
CCGA	🟩	🟩

M3216 to M8345
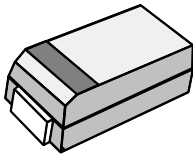
Metric size coded packages

Two-pole packages used for passive and discrete components, such as tantalum capacitors.

Also called SD packages when used for tantalum capacitors. Meets E.I.A./IECQ footprints.

Lead numbers and package angles in TPSys (top view):
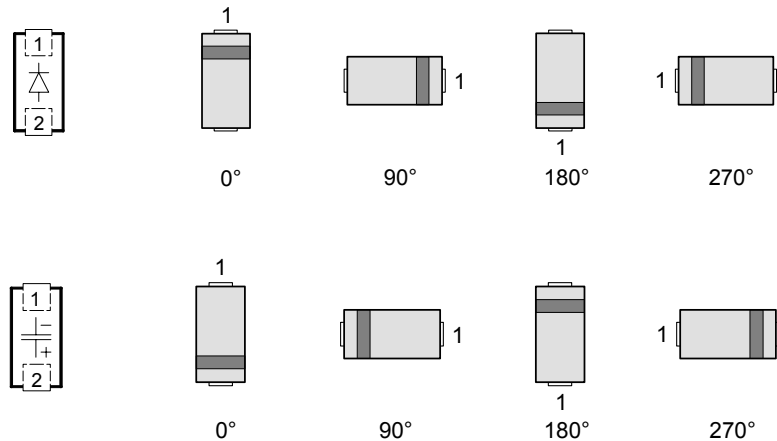
Most of these packages can be placed by the HYDRA unit.

TPSys package name

MYYXX-ZZ
YY   Package length in 1/10 mm (Y-wise in 0°).
XX   Package width in 1/10 mm (X-wise in 0°).
ZZ   Package height in 1/10 mm, which should be measured carefully.

Example: M3224-22

The following packages match the below EIA case types and have no package height extension in TPSys:

M3216-A (height 1.6mm) matches A Case
M3528-B (height 1.9mm) matches B Case
M6032-C (height 2.5mm) matches C Case
M7343-D (height 2.8mm) matches D Case

Programming hints:

Main window.   *Mount tool*: See table on page A-27.
Pick wait time / *Place wait time*: From 0 to 50ms.

Accelerations.   *Mount precision*: *Normal*
Theta: From *Highest* to *Low*.
X: *Highest*
Y: *Highest*
Z: *Highest*

Lead group window. *Package Types*: *Package*
Lead type: *CHIP*
Image points distribution: *Standard*
Max cross-wise deviation: 0,2mm
Max length-wise deviation: 0,2mm

Optical centering window. *Use sub pixel*: *No*
Coarse search method: *Standard*
Coarse search noise: 1000
Coarse search contrast: 30
Fine search noise: 1000
Fine search contrast: 30

Centering phase window. *Method*: *Mechanical* (two centering phases).
Angle: 90° in centering phase one and then 0° in phase two.
Level: 1 or 11
Position: *Upper*
Force: *Middle* or *High*
Verify mechanical: *Yes*
Verify electrical: *No*

HYDRA

Accelerations. *HYDRA theta*

If the new package is higher than the selected package and
the component placement angle is incorrect, then you can
try setting a lower acceleration.

HYDRA tools: See table on page A-27.
HYDRA angle: 90.00°

Lead group window. *Lead type*: *CHIP*
No. of image points: 40
Image points distribution: *Standard*

If the new package body is darker than the selected body and
the system rejects the component, then you can try setting
this entry to *Leads only*.

Tool guide

Single Mount Head

Mount tools to use are determined by the package size, form, weight and centering method used.

Package	Tool						
	A12	A13	A14S	A23	A23S	A24	A24S
M10857				✓	✓		
M20869				✓	✓		
M3216		✓					
M3224		✓					
M3518		✓					
M3527			✓				
M3528			✓				
M4532			✓				
M4945			✓				
M4955			✓				
M5134			✓				
M6032			✓				
M6235			✓				
M7227			✓				
M7243			✓				
M7257				✓	✓		
M7343			✓				
M7350				✓	✓		
M7355				✓	✓		
M7365				✓	✓		
M7370						✓	✓
M9675			✓				
M9940						✓	✓

HYDRA

Package	Tool				
	H00	H01 (white)	H02 (yellow)	H03 (red)	H04 (blue)
M10857					
M20869					
M3216				✓	
M3224				✓	
M3518				✓	
M3527				✓	
M3528				✓	
M4532				✓	
M4945				✓	
M4955				✓	
M5134				✓	
M6032				✓	
M6235				✓	
M7227				✓	
M7243				✓	
M7257				✓	
M7343				✓	
M7350					
M7355					
M7365					

MELF, Micro-MELF, Mini-MELF, Maxi-MELF
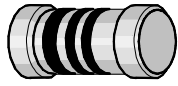
Metal electrode face, or metal end long form

Two-pole, leadless cylindrical packages used for resistors, capacitors and diodes.

Lead numbers and package angles in TPSys:

0°   90°   180°   270°
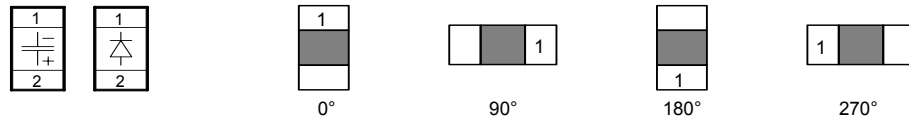
This package type can be placed by the HYDRA unit.

TPSys package name

MELFYYXX-ZZ
YY   Package length in 1/10 mm (Y-wise in 0°).
XX   Package diameter in 1/10 mm (X-wise in 0°).
ZZ   Package height in 1/10 mm.

Example: MELF2012-12

MELF2012 in TPSys is equal to Micro-MELF or 0805-MELF.
MELF3514 in TPSys is equal to Mini-MELF or 1206-MELF.
MELF5922 in TPSys is equal to Maxi-MELF.

Programming hints:

Main window.
Mount tool: See table on page A-29.
Pick wait time / Place wait time: 0
Vacuum test: *No*

Accelerations.
Mount precision: *Normal*
Theta: *High*
X: *Highest*
Y: *Highest*
Z: *Highest*

Lead group window.
Package Types: *Two pole package*
Lead type: *CHIP*
No. of image points: 40
Image points distribution: *Standard*
Max cross-wise deviation: 0.2mm
Max length-wise deviation: 0.2mm

Optical centering window.
Use sub pixel: *No*
Coarse search method: *Standard*
Coarse search noise: 1000
Coarse search contrast: 30
Fine search noise: 1000
Fine search contrast: 30

Centering phase window.
Method: *Mechanical*
Angle: 90.00°
Level: 1 or 11
Position: *Upper*
Force: *Middle*
Verify mechanical: *Yes*
Verify electrical: *Yes*

Tool guide

Mount tools to use are determined by the package size, form, weight and centering method used.

Single Mount Head

Package	Tool					
	A12	**B13**	**A34**	**B23**	**B24**	**B34**
Micro-MELF[1]	🟩					
Mini-MELF[2]		🟩	1.5mm			
MELF				2.5mm	2.3mm	2.0mm

[1] Micro-MELF or 0805-MELF is equal to MELF2012 in TPSys.

[2] Mini-MELF or 1206-MELF is equal to MELF3514 in TPSys.

HYDRA

Package	Tool				
	H00	**H01 (white)**	**H02 (yellow)**	**H03 (red)**	**H04 (blue)**
MELF3514					🟩

PLCC

Plastic leaded chip carrier

Packages with J-leads on four sides.

Package angles in TPSys (top view):

| 0° | 90° | 180° | 270° |
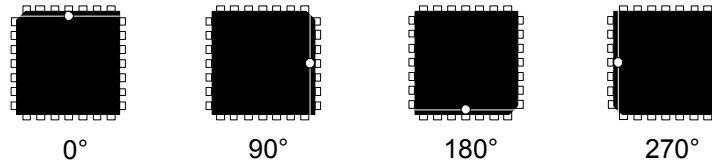
This package type cannot be placed by the HYDRA unit.

TPSys package name

PLCCXX
XX Total number of leads.

Example: PLCC44

Programming hints:

Main window. *Mount tool*: See table on page A-31.
Pick wait time / *Place wait time*: 100ms
Hold until ready: *Yes* for PLCC80 and bigger, all other *No*.

Accelerations. *Theta*: *Highest* for PLCC20 and PLCC28 all other *Low* or *Lowest*.
X: *Highest*
Y: *Highest*
Z: *High*

Lead group window. *Package Types*: *Four symmetric lead groups*
Lead type: *J-BEND*

Optical centering window. *Use sub pixel*: *No*
Coarse search method: *Standard*
Coarse search noise: 200
Coarse search contrast: 20
Fine search noise: 200
Fine search contrast: 20

Centering phase window. *Method*: *Mechanical*, use two phases.
Angle:
    Phase 1: 0.00°
    Phase 2: 90.00°
Level: 1 or 11
Position: *Upper*
Force: *High*
Verify mechanical: *Yes*
Verify electrical: *No*

Tool guide

Mount tools to use are determined by the package size, form, weight and centering method used.

Package	Tool	
	A24	A24S
PLCC		
CLCC		
MLCC		

CQFP, FQFP, LQFP, MQFP, PQFP, TQFP

QFP package types (quad flat pack)

Packages with gull-wing leads on four sides.
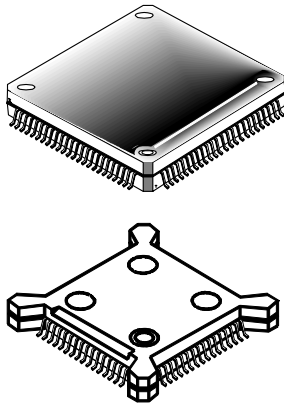
CQFP	Ceramic quad flat pack.
FQFP	Fine pitch quad flat pack.
LQFP	Low profile quad flat pack.
MQFP	Metric plastic quad flat pack.
PQFP	Plastic quad flat pack with bumpered corners.
TQFP	Thin quad flat pack.

Package angles in TPSys (top view):

0°	90°	180°	270°

PQFP

0°	90°	180°	270°
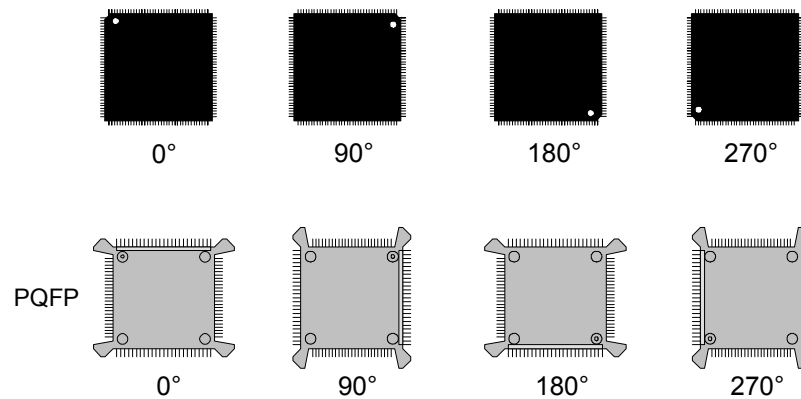
These package types cannot be placed by the HYDRA unit.

TPSys package name

[Type]ZZ-YYxXX-QQQ(-H:WWW)

Type	According to the list above.
ZZ	Number of leads.
YY	Number of leads Y-wise in 0° (rectangular packages only).
XX	Number of leads X-wise in 0° (rectangular packages only).
QQQ	Lead pitch.
WWW	Package height (only stated when needed to distinguish between otherwise identical packages).

Example: MQFP80-24x16-0.80-H:2.8

A MQFP package with 80 leads, 24 leads at the long side (Y-wise in 0°), 16 leads at the short side (X-wise in 0°), 0.80mm lead pitch, and 2.8mm package height.

Programming hints

Main window. *Body length*: Without the Corner bumps for PQFP.
Mount tool: See table on page A-33.
Pick wait time / Place wait time:
        100ms for big packages.
        50ms for small packages.
Toggle leads: According to package geometry.
Hold until ready: No

Accelerations.   *Theta*:   *Highest* for the smaller packages like QFP80.
                              Low or *Lowest* for all other.

                 X: CQFP: *Low*
                             PQFP,TQFP,FQFP,MQFP: *Highest*

                 Y: *Highest*

                 Z: CQFP: *Lowest*
                             PQFP,TQFP,FQFP,MQFP: *High*

Lead group window.   *Package Types*: *Four symmetric lead groups*
                      Lead type:
                              J-BEND for CQFP.
                              GULLWING for all other.
                      Max cross-wise deviation: Half the c-c distance.
                      Max length-wise deviation: Half the c-c distance.

Optical centering window.   *Use sub pixel*: *Yes*
                             Coarse search noise / *Fine search noise*: 1000
                             Coarse search contrast / *Fine search contrast*: 30

Centering phase window.   *Method*: *Optical*
                           Dimension: 0
                           Verify mechanical: *No*
                           Verify electrical: *No*
                           OVC light level: 85%
                           Pattern: *Multiple Leads*
                           Light level: 85%

                           Dark field:
                               100% for *Rel.*
                           Ambient light:
                               100% for *Rel.*
                           Front light:
                               100% for *Rel.*

                           DVC Illumination
                           Pattern: QFP

                           LSC Illumination
                           Light level: 65%
                           Pattern: QFP

Tool guide

Mount tools to use are determined by the package size, form, weight
and centering method used.

Package	Tool						
	A14S	**A23**	**A23S**	**A24**	**A24S**	**C23**	**C23S**
All QFP20	■						
All QFP24	■						
All QFP32		■	■				
All QFP36		■	■				
All QFP40		■	■				
All QFP44 – QFP80				■	■		
All QFP100 – QFP376						■	■

SO, SSOP
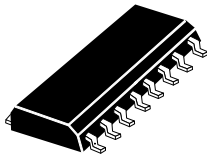
Small outline packages

Packages with gull-wing leads on two sides.

SO   Small outline.
SSOP   Plastic shrink SO.

Package angles in TPSys (top view):

| 0° | 90° | 180° | 270° |
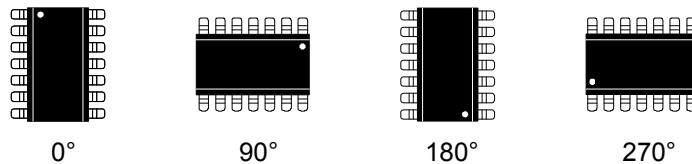
Some of these packages can be placed by the HYDRA unit, see below.

TPSys package name

SO packages:[Type]XX
SSOP packages:[Type]XX-YYY(-BW:ZZ)

Type   According to the list above.
XX   Number of leads.
YYY   Lead pitch.
ZZ   Package width (only stated when needed to distinguish
        between otherwise identical packages).

Example: SO14
Example: SSOP24-0.65-BW:6.1

Programming hints

Main window. *Mount tool*: See table on page .
Mount precision
        Normal for mechanical centering.
        High for optical centering.

Pick wait time / *Place wait time*:
        100ms for big packages.
        50ms for small packages.

Hold until ready: *No*

Accelerations. *Theta*: Depends on package size.
Y: *Highest*
X: *Highest*
Z: *Highest*

Lead group window. *Package Types*: *Two symmetric lead groups*
Lead type: *GULLWING*
Max cross-wise deviation: Half the c-c distance.
Max length-wise deviation: Half the c-c distance.
Max length-wise deformation: 0mm

Optical centering window.   *Use sub pixel*: *Yes*
Coarse search noise / *Fine search noise*: 1000
Coarse search contrast / *Fine search contrast*: 30

Centering phase window.   *Method*: *Mechanical*, use two phases. (Used for SO packages.)
Angle:
    Phase 1: 90.00°
    Phase 2: 90.00°.
Level: 1
Position: *Upper*
Force: *High*
Verify mechanical: *Yes*
Verify electrical: *No*

Method: *Optical* (Used for SSOP packages.)
Dimension: 0
Verify mechanical: *No*
Verify electrical: *No*
OVC light level: 67%
Pattern: *Standard*
Light level: 67%

LSC Illumination
Light level: 65%
Pattern: Standard

Dark field: 100%
Ambient light: 100%
Front light: 100%

HYDRA unit

Main window.   *Acceleration codes HYDRA theta*
        If the new package is higher than the selected package and
        the component placement angle is incorrect, then you can
        try setting a lower acceleration.

HYDRA tools:
        H03 (Red) for SO8, SO14, SSOP24-0.65-BW:6.1,
        SSOP28-0.50-BW:6.1, SSOP28-0.65-BW:6.1 and
        SSOP28-0.65-BW:8.0

HYDRA angle: 0°

Tool guide

Mount tools to use are determined by the package size, form, weight and centering method used.

Single Mount Head

Package	Tool						
	A14S	**A23**	**A23S**	**A24**	**A24S**	**C23**	**C23S**
SO14	■						
SO16		■	■				
SO18				■	■		
SO20				■	■		
SO24				■	■		
SO28				■	■		
SSOP24-0.65-BW:6.1		■	■				
SSOP28-0.50-BW_6.1		■	■				
SSOP28-0.65-BW_8.0				■	■		
SSOP30-0.65-BW_6.1		■	■				
SSOP32-0.65-BW_6.1		■	■				
SSOP32-0.65-BW_8.0				■	■		
SSOP36-0.40-BW_6.1		■	■				
SSOP36-0.50-BW_8.0				■	■		
SSOP40-0.50-BW_6.1		■	■				
SSOP40-0.50-BW_8.0				■	■		
SSOP44-0.50-BW_6.1		■	■				
SSOP48-0.40-BW_6.1		■	■				
SSOP48-0.40-BW_8.0				■	■		
SSOP52-0.40-BW_6.1		■	■				
SSOP52-0.40-BW_8.0				■	■		
SSOP56-0.40-BW_6.1		■	■				
SSOP56-0.40-BW_8.0				■	■		
SSOP56-0.50-BW_6.1		■	■				
SSOP56-0.50-BW_8.0				■	■		
SSOP60-0.40-BW_8.0				■	■		
SSOP64-0.40-BW_6.1		■	■				
SSOP64-0.40-BW_8.0				■	■		
SSOP64-0.50-BW_6.1		■	■				
SSOP68-0.40-BW_8.0				■	■		
SSOP80-0.40-BW_6.1		■	■				

HYDRA

Package	Tool				
	H00	**H01 (white)**	**H02 (yellow)**	**H03 (red)**	**H04 (blue)**
SO8				■	
SO14				■	
SSOP24-0.65-BW:6.1				■	
SSOP28-0.50-BW_6.1				■	
SSOP28-0.65-BW:6.1				■	
SSOP28-0.65-BW_8.0				■	

SOD
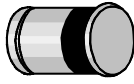
Small outline diode

Two-pole cylindrical packages used for diodes.

SOD-80 is also called SM1 and LL41.

Lead numbers and package angles in TPSys (top view):

0°   90°   180°   270°
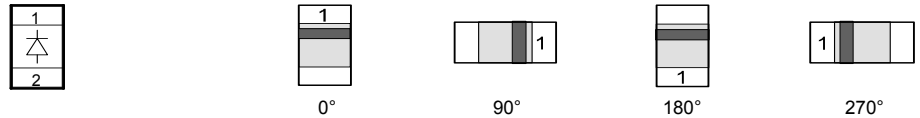
This package type can be placed by the HYDRA unit.

TPSys package name

SOD-80 is the only preprogrammed SOD package in TPSys.

Programming hints, Single Mount Head

Main window. *Mount tool*: See table on page A-38.
Pick wait time / Place wait time: 0
Vacuum test: No

Accelerations. *Mount precision*: Normal
Theta: High
X: Highest
Y: Highest
Z: Highest

Lead group window. *Package Types*: Two pole package
Lead type: CHIP
No. of image points: 40
Image points distribution: Standard
Max cross-wise deviation: 0.2mm
Max length-wise deviation: 0.2mm

Optical centering window. *Use sub pixel*: No
Coarse search method: Standard
Coarse search noise: 1000
Coarse search contrast: 30
Fine search noise: 1000
Fine search contrast: 30

Centering phase window. *Method*: Mechanical
Angle: 90.00°
Level: 1 or 11
Position: Upper
Force: Middle
Verify mechanical: Yes
Verify electrical: Yes

Tool guide

Mount tools to use are determined by the package size, form, weight and centering method used.

Single Mount Head

Package	Tool
	A34
SOD-80	🟩

HYDRA

Package	Tool				
	H00	H01 (white)	H02 (yellow)	H03 (red)	H04 (blue)
SOD-80					🟩

SOJ, LSOJ
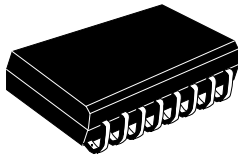
Small outline J-lead packages

Packages with J-leads on two sides.

SOJ   Small outline J-lead.
LSOJ   Low profile SO.

SO packages with gull-wing leads are found on page A-34.

Package angles in TPSys (top view):

0°   90°   180°   270°
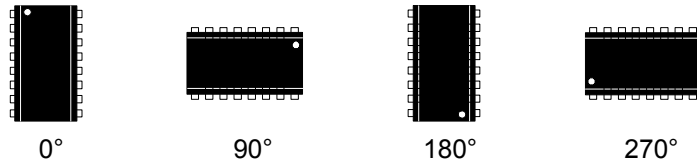
This package type cannot be placed by the HYDRA unit.

TPSys package name

SOJ packages:[Type]XX(-BW:ZZ)
LSOJ packages:[Type]XX-YYY(-BW:ZZ)

Type   According to the list above.
XX   Number of leads.
YYY   Lead pitch.
ZZ   Package width (only stated when needed to distinguish
            between otherwise identical packages).

Example: SOJ28-BW:7.52
Example: LSOJ28-1.27

Programming hints

SOJ, LSOJ packages are to a great extent programmed in the same way as SO, SSOP packages (see page A-34). Here we will only discuss the differences.

Main window.   *Mount tool*: See table on page A-40.

Lead group window.   *Lead type*: *J-BEND*

Centering phase window.   *Method*: *Mechanical*, use two phases.
Angle:
   Phase 1: 90.00°
   Phase 2: 90.00°
Level: 1
Position: *Upper*
Force: *High*
Verify mechanical: *Yes*
Verify electrical: *No*

Tool guide

Mount tools to use are determined by the package size, form, weight and centering method used.

Package	Tool					
	A23	A23S	A24	A24S	C23	C23S
LSOJ28-1.27			🟩	🟩		
SOJ14-BW_7.52	🟩	🟩				
SOJ16-BW_7.52	🟩	🟩				
SOJ18-BW_7.52	🟩	🟩				
SOJ20-BW_7.52	🟩	🟩				
SOJ24-BW_7.52	🟩	🟩				
SOJ26-BW_7.62	🟩	🟩				
SOJ26-FOUR-LEAD-GROUPS			🟩	🟩		
SSOJ28-BW:10.16			🟩	🟩		
SOJ28-BW_7.52	🟩	🟩				
SOJ28-BW_7.62	🟩	🟩				
SOJ28-BW_8.38	🟩	🟩				
SOJ28-BW_8.89			🟩	🟩		
SOJ32-BW_10.16			🟩	🟩		
SOJ32-BW_7.62	🟩	🟩				
SOJ32-BW_8.38	🟩	🟩				
SOJ34-BW_10.16			🟩	🟩		
SOJ36-BW_8.38	🟩	🟩				
SOJ40-BW_10.16			🟩	🟩		
SOJ42-BW_10.16			🟩	🟩		
SOJ44-BW_10.16			🟩	🟩		
SOJ50-BW_10.15			🟩	🟩		
SOJ64-BW_12.0			🟩	🟩		
SOJ70-BW_10.15			🟩	🟩		
SOJ70-BW_12.7			🟩	🟩		

SOT, SC

Small outline transistor

Any of various plastic packages designed for semiconductors, such as transistors and diodes.

Packages with lead numbers and angles in TPSys (top view):

SOT-23JEDEC
SOT-323

| 0° | 90° | 180° | 270° |

SOT-89JEDEC

| 0° | 90° | 180° | 270° |

SOT-143JEDEC

| 0° | 90° | 180° | 270° |

SOT-223JEDEC

| 0° | 90° | 180° | 270° |
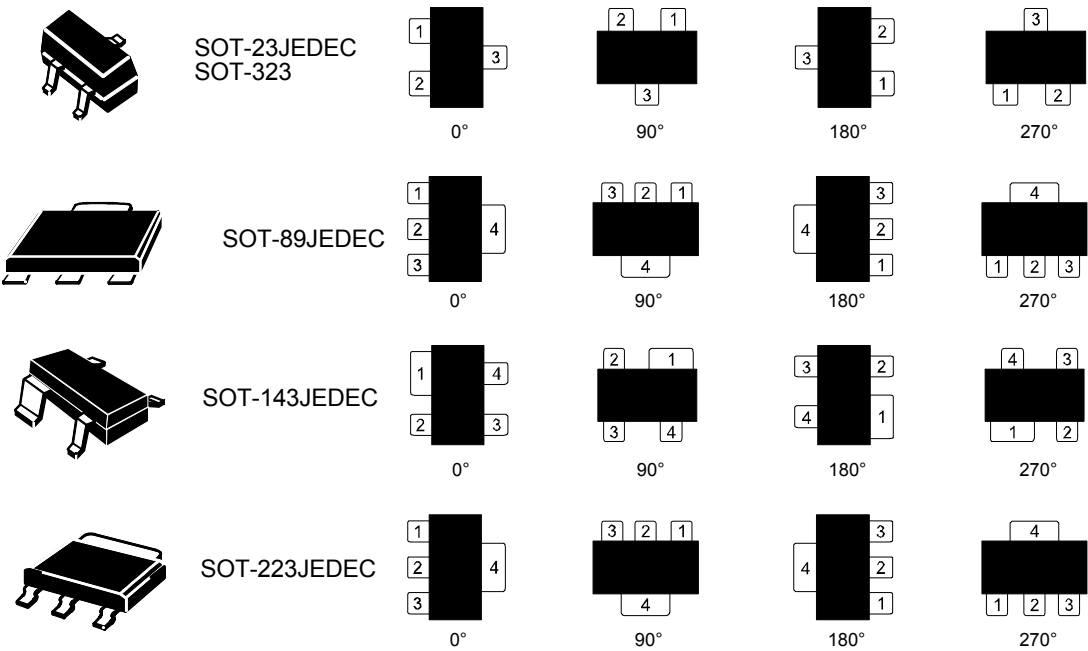
These package types can be placed by the HYDRA unit, see below.

TPSys package name

SOT-23-E1JEDEC and SOT-89-E1JEDEC
        Transistor with emitter to lead 1.

SOT-23-B1JEDEC and SOT-89-B1JEDEC
        Transistor with base to lead 1.

SC-59   Japanese version of SOT-23.

Programming hints

Package	Number of leads	Lead pitch	Length	Width	Height overall
SC-59	3	1.90mm	2.90mm	1.60mm	1.10mm
SOT-143JEDEC	4	1.92mm	2.92mm	1.30mm	1.00mm
SOT-223JEDEC	4	2.30mm	6.50mm	3.50mm	1.70mm
SOT-23-B1JEDEC	3	1.90mm	2.90mm	1.30mm	1.00mm
SOT-23-E1JEDEC	3	1.90mm	2.90mm	1.30mm	1.00mm
SOT-23JEDEC	3	1.90mm	2.90mm	1.30mm	1.00mm
SOT-323_SC-70	3	1.30mm	2.00mm	1.25mm	0.90mm
SOT-89JEDEC	3	1.50mm	4.50mm	2.45mm	1.50mm
SOT-89-B1JEDEC	3	1.50mm	4.50mm	2.45mm	1.50mm
SOT-89-E1JEDEC	3	1.50mm	4.50mm	2.45mm	1.50mm

Main window.
Mount tool: See table on page A-43.
Pick wait time / *Place wait time*: 0

Accelerations.
Theta: *Low*
X: *Highest*
Y: *Highest*
Z: *Highest*

Lead group window.
Package Types: *Three pole package*
Lead type: *GULLWING*
Max cross-wise deviation: 0.25mm
Max length-wise deviation: 0.25mm
Max length-wise deformation: 0.2mm

Lead group window.
Package Types: *Generic*
Lead type: *GULLWING* or *FLAT*

Offset X:
The distance between the package center and the outside of the first lead.

Offset Y:
The distance between the center of the package and the centerline on the first lead.

Angle:
The location of the single lead, 0° if it is on the right side of the package, 180° if it is on the left side.

Max cross-wise deviation: 0.2mm
Max length-wise deviation: 0.2mm
Max length-wise deformation: 0mm

Optical centering window.
Use sub pixel: *Yes*
Coarse search noise / *Fine search noise*: 1000
Coarse search contrast / *Fine search contrast*: 20

Centering phase window. *Method*: *Mechanical*, use two phases.
 Angle:
  Phase 1: 90.00°
  Phase 2: 0.00° or 180°. If electric test is used the angle must be 180°.
 Level: 1 or 11
 Position: *Upper*
 Force: *Middle*
 Verify mechanical: *Yes*
 Verify electrical:
  Phase 1: No
  Phase 2: Yes, if SOT23,SOT89, all other No.

Programming hints, HYDRA unit

Main window. *Acceleration codes HYDRA theta*
 If the new package is higher than the selected package and the component placement angle is incorrect, then you can try setting a lower acceleration.

HYDRA tools: See table below.
HYDRA angle: 0°

Tool guide

Mount tools to use are determined by the package size, form, weight and centering method used.

Single Mount Head

Package	Tool		
	A12	**A13**	**A14S**
SC-59		■	
SOT23	■		
SOT89		■	
SOT143	■		
SOT223			■
SOT323	■		

HYDRA

Package	Tool				
	H00	**H01 (white)**	**H02 (yellow)**	**H03 (red)**	**H04 (blue)**
SC-59	■		■		■
SOT23	■		■		■
SOT89				■	
SOT143	■		■		■
SOT223				■	
SOT323	■		■		■

TO
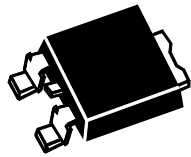
Transistor outline

Four-pole packages, used for transistors.

Package angles in TPSys (top view):

0°   90°   180°   270°
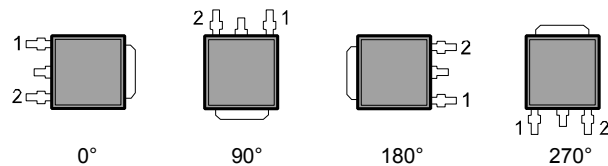
This package type cannot be placed by the HYDRA unit.

TPSys package name

TO packages preprogrammed in TPSys are named in accordance with the E.I.A./JEDEC standard.

Examples: TO-252_DPAK, TO-263, TO-268.

Programming hints

Use the *Generic* lead group for this package and set two leads in the group with 180° between lead 1 and lead 2 (even though this is a package with four leads).
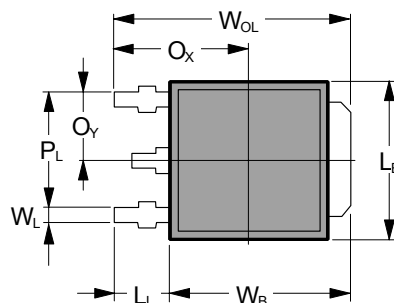
The letters below refer to the figure.

Main window. *Body length*: LB
Body width: WB
Width overall: WOL
Mount tool: See table on page .
Pick wait time / Place wait time: 0
Toggle leads: According to geometry of the package.

Accelerations. *Theta*: *Low*
X: *Highest*
Y: *Highest*
Z: *Highest*

Lead group window.

Package Types: *Generic*
Lead type: *GULLWING*
Number of leads in group: 2
Number of first lead in group: 1
Offset X: Ox
Offset Y: Oy
Angle: 180.00°
Length: LL
Width: WL
Pitch: PL
Max cross-wise deviation: 0.2mm
Max length-wise deviation: 0.2mm
Max length-wise deformation: 0mm

Optical centering window.

Use sub pixel: *Yes*
Coarse search noise / Fine search noise: 1000
Coarse search contrast / Fine search contrast: 20

Centering phase window.

Method: *Mechanical*, use two phases.
Angle:
    Phase 1: 90.00°
    Phase 2: 0.00°
Level: 1 or 11
Position: *Upper*
Force: *Middle*
Verify mechanical: *Yes*
Verify electrical: *No*

Tool guide

Mount tools to use are determined by the package size, form, weight and centering method used.

Package	Tool			
	A23	A23S	A24	A24S
TO-252 DPAK	■	■		
TO-263			■	■
TO-268			■	■

TSOP, TSSOP
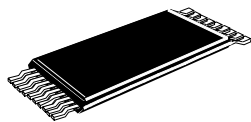
Type I.
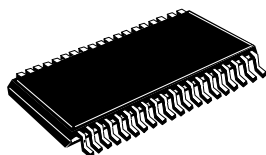
Type II.

Thin small outline package

Thin packages with gull-wing leads on two sides.

TSOP   Thin SO.

TSSOP Plastic thin shrink SO.

Type I packages have leads extending from the narrow sides of the body, see the figure.

Type II packages have leads protruding from the wide sides of the body, see the figure.

Package angles in TPSys for type I (top view):

0°   90°   180°   270°

And type II:

0°   90°   180°   270°
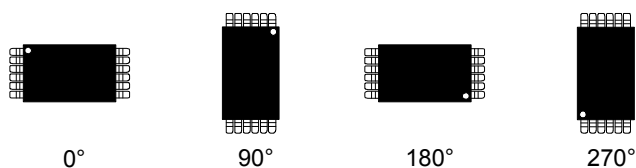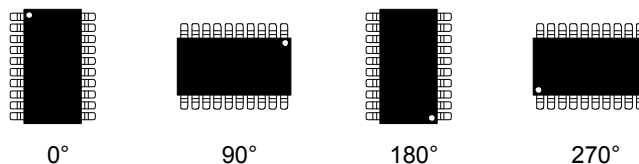
These package types cannot be placed by the HYDRA unit.

TPSys package name

TSOP packages:[Type]XX(-BW:ZZ)
TSSOP packages:[Type]XX-YYY(-BW:ZZ)

Type   According to the list above.
XX   Number of leads.
YYY   Lead pitch.
ZZ   Package width (only stated when needed to distinguish
              between otherwise identical packages).

Example: TSOP24-BW:14.4
Example: TSSOP28-0.50-BW:6.1

Programming hints

PSOP, TSSOP packages are to a great extent programmed in the same way as SO, SSOP packages (see page A-34). Here we will only discuss the differences.

Main window. *Mount tool*: See table below

Optical centering window. *Use sub pixel*: *Yes*
Coarse search noise / *Fine search noise*: 1000
Coarse search contrast / *Fine search contrast*: 30

Centering phase window. *Method*: *Optical*
Dimension: 0
Verify mechanical: *No*
Verify electrical: *No*
OVC light level: 67%
Pattern: *Standard*
Light level: 67%

LSC Illumination
Light level: 65%
Pattern: Standard

Dark field: 100%
Ambient light: 100%
Front light: 100%

Tool guide

Mount tools to use are determined by the package size, form, weight and centering method used.

Package	Tool					
	A23	**A23S**	**A24**	**A24S**	**C23**	**C23S**
TSOP24-BW_12.4	■	■				
TSOP24-BW_18.4			■	■		
TSOP32-BW_12.4			■	■		
TSOP40-BW_12.4			■	■		
TSOP56-BW_14.4					■	■
TSSOP100-0.40-BW_6.1	■	■				
TSSOP28-0.65-BW_8.0			■	■		
TSSOP30-0.65-BW_6.1	■	■				
TSSOP32-0.65-BW_6.1	■	■				
TSSOP32-0.65-BW_8.0			■	■		

PLCC Socket

Packages where the inner tips of the contact leads must be detected instead of outer ones.

TpSys package name

PLCCXX-socket

XX   Total number of contact leads.

Programming hints

Lead group window   *Package Types*: Generic

In the PLCC28 in the picture below we want to locate the inner tips of the leads. To do so we need to define the package as "Generic" and increasing lead numbers advancing in a clockwise direction, as shown by the arrows in the picture.
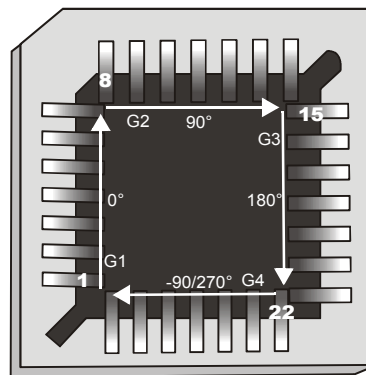
Lead Group 1 (G1)

Lead type: GULLWING
Number of leads in group: 7
Number of first lead in group: 1
Offset X: Distance in X from the center of the package to the tip of lead 1
Offset Y: Distance in Y from the center of the package to the tip of lead 1
Angle: 0 degrees

Lead Group 2 (G2)

Lead type: GULLWING
Number of leads in group: 7
Number of first lead in group: 8
Offset X: Distance in X from the center of the package to the tip of lead 8
Offset Y: Distance in Y from the center of the package to the tip of lead 8
Angle: 90 degrees

Lead Group 3 (G3)

Lead type: GULLWING
Number of leads in group: 7
Number of first lead in group: 15
Offset X: Distance in X from the center of the package to the tip of lead 15

Offset Y: Distance in Y from the center of the package to the tip of lead 15
Angle: 180 degrees

Lead Group 4 (G4)

Lead type: GULLWING
Number of leads in group: 7
Number of first lead in group: 22
Offset X: Distance in X from the center of the package to the tip of lead 22
Offset Y: Distance in Y from the center of the package to the tip of lead 22
Angle: -90 degrees

Main window *Mount tool*: See table on page A-49.
Tool to top offset: The height difference from the socket leads to the top of the package.

Optical centering window *Use sub pixel*: Yes
Coarse search method: Multiple Leads
Coarse search noise: 1000
Coarse search contrast: 30
Fine search noise: 1000
Fine search contrast: 30

Centering phase window *Method*: Optical
OVC light level: 50%
DVC Illumination
    Light level: 50%
    Pattern: Standard
    Rel.
        Dark field: 100 %
        Ambient light: 100%
        Front light: 100%l

LSC Illumination
    Light level: 65%
    Pattern: Standard
    Rel.
        Ambient light: 100%
        Front light: 100%

Tool guide

Mount tools to use are determined by the package size, form, weight and centering method used.

Package	Tool	
	A24	A24S
PLCC		
CLCC		
MLCC		

Appendix B – Menu Reference Guide

Appendix A contains:

– Shortcuts

– Hot menu

– Main menu

– Switches

Appendix B – Menu Reference Guide

Shortcuts

⇧ F1	Shows the last camera image.
⇧ F10	Opens a hot menu, see the next section. You can press <F10> only as well.
Ctrl S	Starts stepper mode. If the access system is on, then the user must have the *Service* access right set to *High* to be able to invoke the stepper mode.
Ctrl T	Removes text from the screen. Useful when inspecting camera images. Reset by pressing <Esc>.
Ctrl Y	Moves the Y wagon to the front or back position. Press twice if not used for the last five seconds.
Alt F1	Switches to the TPSys on-line terminal, tty1.
Alt F*n*	Switch between virtual terminals. F*n* being <F2> to <F6> as <Alt>+<F1> always contains the online TPSys terminal.

If TPSys is running in *high-resolution mode* <Alt>+<F2> contains a graphical terminal. It then gives access to a web interface, PDF-reader and a calculator. In standard resolution mode <Alt>+<F2> to<Alt>+<F6> gives access Linux terminals for Linux usage or for running off-line TPSys terminals.

For machines with CP5/VVG hardware or later

Ctrl　　　↑　　　　Pans the camera image. Select pan direction by using the corresponding arrow key.

Ctrl　⇧　↑　　　　Pans the camera image quickly. Select pan direction by using the corresponding arrow key.
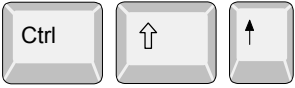
Ctrl　PgDn　　　　Zooms in (requires VVG2 board).

Ctrl　PgUp　　　　Zooms out (requires VVG2 board).
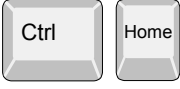
Ctrl　Home　　　　Resets to default zoom and panning.

Hot Menu

⬆   F10

A hot menu containing a number of the most used options is opened by pressing <Shift>+<F10>, or just <F10> in TPSys.

```
┌──────── Hot Menu ────────┐
│ Reset Magazine Errors     │
│ Package List Editor       │
│ Component List Editor      │
│ Magazine List Editor       │
│ Parameter Editor           │
│ Switches                   │
│ Mount/Glue Switches        │
│ Fiducial Mark List Editor  │
│ Y Wagon Magazine           │
│ Pallet Magazine            │
│ TEX List Editor            │
│ Tray Wagon Magazine        │
│ View Messages              │
│ Set Message Time Mark      │
│ HYDRA Tool Utility         │
└────────────────────────────┘
```

All the options in the popup menu may not be shown due to that the feature is not installed or cannot be selected.

The options in the hot menu refer to main menu options or sub options. The following table shows where in the main menu the hot menu options are found.

Hot menu option	Main menu	Page
Reset Magazine Errors	Magazine	B-9
Package List Editor	Editor	B-12
Component List Editor	Editor	B-12
Magazine List Editor	Magazine	B-8
Parameter Editor	Editor	B-12
Switches	Production	B-6
Mount/Glue Switches	Production	B-6
Fiducial Mark List Editor	Editor	B-13
Y Wagon Magazine	Magazine	B-9
Pallet Magazine	Magazine	B-10
TEX List Editor	Magazine	B-11
Tray Wagon Magazine	Magazine	B-10
View Messages	Production	B-6
Set Message Time Mark	Production	B-6
HYDRA Tool Utility	Utility/Installation	B-17

Main Menu

Production

```
┌─────────────────────────┐
│ Production               │
├─────────────────────────┤
│ A Assemble               │
│ T Locate Boards (Auto)   │
│ M Locate Boards (Manual) │
│ S Clear Layout Status    │
│ D Clear Management Data  │
│ ----------------------- │
│ L Load Layout            │
│ E Edit Layout            │
│ U Unload Layout          │
│ X Layout Status          │
│ ----------------------- │
│ V View Messages          │
│ - Set Message Time Mark  │
│ W Switches               │
│ I Mount/Glue Switches    │
│ ----------------------- │
│ Y Move Y Wagon           │
│ C Conveyor Control       │
│ O Leave Tool             │
└─────────────────────────┘
```

Some of these options cause machine movements. Before entering such commands, check the following:

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

Assemble

Assembly start command, which is followed by a dialog box for layout name, batch name and quantity.

See the *Assembling the Layout* section in Chapter 3 of the *Operator's Manual*.

Locate Boards (Auto)

Causes machine movement. Locates boards using automatic fiducial mark search.

See the *Board Location* section in Chapter 8 of the *Operator's Manual*.

Locate Boards (Manual)

Causes machine movement. Locates boards using manual fiducial mark search.

See the *Board Location* section in Chapter 8 of the *Operator's Manual*.

Clear Layout Status

Clears layout status for the currently loaded layout.

See the *Clearing Status* section in Chapter 8 of the *Operator's Manual*.

Clear Management Data

Clears management data for the currently loaded layout.

See also *Delete Management Data* on page B-19.

See the *Clearing Management Data* section in Chapter 8 of the *Operator's Manual*.

Load Layout

Shows a list of available layouts to be selected and loaded.

See the *Loading Layout* section in Chapter 3 of the *Operator's Manual*.

Edit Layout

If a layout is loaded, it is opened in the Layout Editor.

If no layout is loaded, then you can select a layout to edit.

See the *Mount List Structure Diagram* section in Chapter 7 of the *Programming Manual*.

Unload Layout

Unloads the currently loaded layout.

Layout Status

Opens the Layout Status Editor.

See the *Layout Status* section in Chapter 8 of the *Operator's Manual*.

View Messages

Enlarges the message box to a full screen size message window.

See the *Messages* section in Chapter 2 of the *Operator's Manual*.

Set Message Time Mark

Sets a time stamp as a message line in the message log. This feature is intended for troubleshooting (to mark the time for a certain activity to be able to see if the problem remains after the time stamp).

Switches

Makes a number of production switches accessible.

See the *Switches* section in this appendix.

Mount/Glue Switches

Makes global switches for component mounting and glue application accessible.

See the *Mount and Glue Switches* section in Chapter 8 of the *Operator's Manual*.

Move Y Wagon

Moves the Y wagon (and the Tray Wagon Magazine, if used) to the front or back position. Select position from the menu:

Causes machine movement.

```
  ┌ Y Wagon Move ┐
  F Front
  B Back
  └──────────────┘
```

Conveyor Control

Manual loading and unloading of boards from a conveyor. Select action from the menu:

```
  ┌─── Conveyor Control ───┐
  L Conveyor Load/Grab
  R Conveyor Release & Unload
  W Set Conveyor Width
  └────────────────────────┘
```

- **Conveyor Load/Grab**

  Loads a new board, adjusts the position (for automatic fiducial mark search), and grabs the board.

- **Conveyor Release & Unload**

  Releases the board and moves it out of the machine.

- **Set Conveyor Width**

  This feature affects only the Y-wagon conveyor on the machine. Surrounding conveyor system is not affected. The feature is used to:

  – Read off the current conveyor width, which is shown after selecting this menu option. If a layout is loaded, the board width is shown (zero is shown for a board which has no board size set).

  – Set the conveyor width by typing the conveyor width in the dialog box and confirming it. The conveyor will change to the new width after emptying present boards, if not empty.

  The *0092.0031 Automatic width* parameter must be set to *Yes* to get this feature available.

Leave Tool

Current tool is placed in the tool bank after confirming the tool leave in the following popup box:

Causes machine movement.

```
┌──────────────────┐
│ OK to leave tool? │
│       OK          │
└──────────────────┘
```

Magazine

```
┌─────────────────────────────┐
│ Magazine                    │
│ F Adjust Feeder Positions   │
│ M Magazines                 │
│ A Locate All Magazines      │
│ G Removable Feeders         │
│ ─────────────────────────── │
│ R Reset Magazine Errors     │
│ T Tray Type                 │
│ Y Y Wagon Magazine          │
│ W Tray Wagon Magazine       │
│ P Pallet Magazine           │
│ X TEX                       │
│ ─────────────────────────── │
│ K Magazine Kits             │
│ C Create Magazine Kit       │
│ H HYDRA Preparation         │
└─────────────────────────────┘
```

Some of these options cause machine movements. Before entering such commands, check the following:

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

Adjust Feeder Positions

Causes machine movement.

In order to calibrate tape and vibratory magazine feeder pick positions, this option makes it possible to center the cross hairs on the component pick positions by using the trackball or joystick.

See the *Manually Calibrating Pick Positions* section in Chapter 5 of the *Operator's Manual*.

The X-axis position only can be adjusted using this procedure. The Y-axis position is adjusted mechanically, see the *Machine Manual*.

For Agilis see the *Pick Line Adjustment – Agilis AM8* section in Chapter 5 of the *Operator's Manual*.

Magazines

Opens the Magazine List Editor for tape and vibratory magazines.

See the *Tape and Vibratory Magazine List* section in Chapter 6 of the *Programming Manual*.

Removable Feeders

Opens the Removable Feeder List Editor.

See the *Removable Feeder List Editor* section in Chapter 6 of the *Programming Manual*.

Locate All Magazines

Causes machine movement.
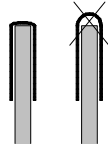
In order to calibrate the magazine X positions, this option centers magazine fiducial marks automatically, provided the *0084.0302 Use magazine fiducial mark* parameter is set to *Yes*. If the automatic fiducial mark search fails, then you can center the fiducial mark using the trackball or joystick.

A magazine fiducial mark consists of a black sticker with a white line and it is attached on the left side of the magazine frame, in the pick line.

Tape magazines are provided with fiducial mark stickers. If you use vibratory magazines, you can attach fiducial mark stickers (see the figure) to get full advantage of the automatic location feature.

Press the sticker down properly when attaching it.

The fiducial mark sticker part # is D-014-0819.

Reset Magazine Errors

Clears magazine errors for all magazines.

See the *Magazine Errors* section in Chapter 5 of the *Operator's Manual*.

Tray Type

Opens the Tray Type List Editor.

See the *Tray Type List* section in Chapter 6 of the *Programming Manual*.

Y Wagon Magazine

The following sub menu is shown:

```
┌──── Y Wagon Magazine ────┐
│ T Trays                  │
│ P Tray Positions         │
└──────────────────────────┘
```

- **Trays**

   Opens the Y-Wagon Magazine List, used for trays placed on the assembly table.

   See the *Y-Wagon Magazine List* section in Chapter 6 of the *Programming Manual*.

- **Tray Positions**

   Opens the Y-Wagon Position List, used for trays placed on the assembly table.

   See the *Y-Wagon Position List* section in Chapter 6 of the *Programming Manual*.

Tray Wagon Magazine

The following sub menu is shown:

```
┌──── Tray Wagon Magazine ────┐
│ T Trays                     │
│ P Tray Positions            │
│                             │
└─────────────────────────────┘
```

- **Trays**

  Opens the Tray Wagon Magazine List, used for trays placed on the Tray Wagon Magazine.

  See the *Tray Wagon Magazine List* section in Chapter 6 of the *Programming Manual*.

- **Tray Positions**

  Opens the Tray Wagon Position List, used for trays placed on the Tray Wagon Magazine.

  See the *Tray Wagon Position List* section in Chapter 6 of the *Programming Manual*.

Pallet Magazine

The following sub menu is shown:

```
┌──── Pallet Magazine ────┐
│ L Pallets               │
│ T Trays                 │
│ P Tray Positions        │
└─────────────────────────┘
```

- **Pallets**

  Opens the Pallet List, used for pallets in the TEX.

  See the *Pallet List* section in Chapter 6 of the *Programming Manual*.

- **Trays**

  Opens the Pallet Magazine List editor, used for trays placed on pallets in the TEX.

  See the *Pallet Magazine List* section in Chapter 6 of the *Programming Manual*.

- **Tray Positions**

  Opens the Pallet Position List, used for pallets in the TEX.

  See the *Pallet Position List* section in Chapter 6 of the *Programming Manual*.

TEX

Opens the TEX List Editor, used for selecting TEX unit, locating pallet position and refilling trays.

See the *TEX List* section in Chapter 5 of the *Operator's Manual*.

Magazine Kits

Opens the Magazine Kit List Editor which contains all the Magazine Kits stored in the system.

See the *Magazine Kit List Editor* section in Chapter 5 of the *Operator's Manual*.

Create Magazine Kit

Creates a Magazine Kit for the currently loaded layout.

See the *Creating a Magazine Kit* section in Chapter 5 of the *Operator's Manual*.

HYDRA Preparation

Composes a magazine load list that is optimized for mounting a layout using the HYDRA unit.

See the *HYDRA Preparation* section in Chapter 6 of the *Programming Manual*.

Editor

```
Editor
C Components
P Packages
---------------
L Layouts
A Panels
B PCBs
---------------
R Parameters
---------------
F Fiducial Marks
G Glue Dots
U Users
```

Components

Opens the Component List Editor.

See the *Component List Editor* section in Chapter 4 of the *Programming Manual*.

Packages

Opens the Package List Editor.

See the *Package List Editor* section in Chapter 5 of the *Programming Manual*.

Layouts

Opens the Layout List Editor.

See the *Layout List Editor* section in Chapter 7 of the *Programming Manual*.

Panels

Opens the Panel List Editor.

See the *Panel List* section in Chapter 7 of the *Programming Manual*.

PCBs

Opens the PCB List Editor.

See the *PCB List* section in Chapter 7 of the *Programming Manual*.

Parameters

Opens the Parameter Editor.

See the *Parameter Editor* section in Chapter 4 of the *Software Manual*.

Fiducial Marks

Opens the Fiducial Mark List Editor.

See the *Fiducial Mark List* section in Chapter 8 of the *Programming Manual*.

Glue Dots

Opens the Glue Dot List Editor.

See the *Glue Dot List* section in Chapter 8 of the *Programming Manual*.

Users

Opens the User List Editor.

See the *User List* section in Chapter 8 of the *Programming Manual*.

Print

```
 Print
C Component
P Package
M Magazine
B PCB
Y Components In Layout
E Messages
R Parameters
----------------------
N Management Data
O Magazine Optimization
K Magazine Kit
L Layout Preparation
T Removable Feeder
----------------------
A Cancel All Printouts
```

Component

Selected component data or the complete Component List can be printed out.

Package

Selected package data or the complete Package List can be printed out.

Magazine

Selected magazine contents or the complete Magazine List can be printed out.

PCB

Data for a selected PCB or all PCBs can be printed out.

Components In Layout

A component list for the selected layout is printed out.

Messages

All messages or those with a maximum age of what is stated as *Enter time in minutes* can be printed out or saved as a file on a floppy disk or on the local or host hard disk.

See the *Messages* section in Chapter 2 of the *Operator's Manual*.

Parameters

Selected parameter or all parameters can be printed out.

Management Data

Management data for the selected layout is printed out.

See the *Management Data* section in Chapter 8 of the *Operator's Manual*.

Magazine Optimization

Creates and prints a list of possible magazine combinations for the selected layout.

See the *Magazine Optimization* section in Chapter 5 of the *Operator's Manual*.

Magazine Kit

Selected Magazine Kit or all the Magazine Kits can be printed out.

See the *Printing a Magazine Kit* section in Chapter 5 of the *Operator's Manual*.

Layout Preparation

Creates and prints out a list of components which cannot be mounted in the selected layout.

See the *Layout Preparation* section in Chapter 8 of the *Operator's Manual*.

Cancel All Printouts

This command cancels all current print processes.

Utility

```
Utility
I Import
X Export
T Installation
D Diagnostics
M Re-Initiate Motor Controllers
O Re-Initiate Conveyor
C Conveyor Pass-Through Mode
G Login / Logout
A User Access System
W Web Interface Setup
E Clear Event Log
N Delete Management Data
------------------------------
B Backup
R Restore
H Schedule Backup
S Save System Status
F Format DOS Diskette
U Units
L Language
K Desktop Resolution
```

Some of these options cause machine movements. Before entering such commands, check the following:

Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

Import

Import command for TPSys and Directline format data, such as layout, panel, PCB, component, and package.

See the *Importing Data* section in Chapter 6 of the *Software Manual*.

Export

Export command for TPSys and Directline format data, such as layout, panel, PCB, component, and package.

See the *Exporting Data* section in Chapter 6 of the *Software Manual*.

Installation

Software installation tools for adjusting and calibrating various functions.

The following sub menu is shown:

Causes machine movement.

```
┌──────── Installation ────────┐
│ X X-Wagon Camera Calibration │
│ C Centering Base Level Measurement
│ P Place Area Calibration     │
│ N Extended X Calibration     │
│ W Tray Wagon Installation/Removal
│ O Z-Unit Offset Measurement  │
│ S Adjust Slot Position       │
│ T Tool Installation          │
│ V Optical Centering Calibration
│ F Centering Camera Fine Tune │
│ H HYDRA                      │
│ R Cable Resistance Measurement
│ L Test Place Area Calibration│
└──────────────────────────────┘
```

- **Tray Wagon Installation/Removal**
  Installs and uninstalls the Tray Wagon Magazine.

  See the *Tray wagon magazines* section in Chapter 5 of the *Operator's Manual*.

- **All other options**
  All the other options in this menu are detailed in the *Machine Manual*.

Diagnostics

Software diagnostic tools for various functions.

The following sub menu is shown:

Causes machine movement.

```
┌──────── Diagnostics ────────┐
│ T Toggle X Wagon Position   │
│ F Fetch Standard Tool       │
│ E Fetch HYDRA Tools         │
│ C Cycle Standard Tool       │
│ Y Cycle HYDRA Tools         │
│ H Hysteresis Test           │
│ V Vacuum Test               │
│ P Prepare To Grab Images    │
│ I Copy Last Images          │
└─────────────────────────────┘
```

- **Toggle X Wagon Position**
  Moves the X wagon to the outermost positions.

  See the *Moving X Wagon To Outermost Positions* section in Chapter 8 of the *Operator's Manual*.

- **All other options**
  All the other options in this menu are detailed in the *Machine Manual*.

Re-Initiate Motor Controllers

Causes machine movement.   Initiates the motor controllers and hardware without exiting TPSys.

The procedure should be performed if you suspect any trend of measuring error or abnormal movements.

Re-Initiate Conveyor

Causes conveyor movement.   Initiates the Y-wagon conveyor, that is to measure the mechanical end position and update the software.

☞ *Do not re-initiate the conveyor width if any board is left in the placement area.*

Conveyor Pass-Through Mode

Sets the machine in a pass-through mode so that boards can pass through the machine without being assembled. This option is intended for in-line machines temporarily not used.

Login / Logout

Allows an operator to log on to the system with a personal password and individual privileges.

To avoid leaving the system open for non-authorized persons, the operator can also log off by selecting this menu option.

User Access System

Switches the security feature on or off. This feature can only be switched on or off by a user for witch the *User* privilege level is set to *High*.

See the *User List* section in Chapter 8 of the *Programming Manual*.

Web Interface Setup

Used to select security levels in the WWW-set up.

Clear Event Log

Clears all data in the event log for the machine selected in a dialog box shown.

The event log is a database where system events (for instance start/stop, logon/logoff, magazine insert/extract, components mounted, tool information and errors) are stored. By using the TPSys *Export* feature this database can be used for evaluation of management and quality data outside TPSys.

Delete Management Data

Deletes the management data for a selected layout. The management data for the currently loaded layout cannot be deleted.

This command is intended to be used when cleaning up the system. If you want to clear the management data only for the currently loaded layout, then use the *Clear Management Data* option in the *Production* menu instead, see page B-6.

See the *Deleting Management Data* section in Chapter 8 of the *Operator's Manual*.

Backup

Backup is a feature for backing up most of the data stored in the various databases in TPSys.

See the *Backing Up* section in Chapter 5 of the *Software Manual*.

Restore

Restore is used for restoring data backed up with the previous feature.

See the *Restoring* section in Chapter 5 of the *Software Manual*.

Schedule Backup

Opens a dialog box in which scheduled automatic backup can be configured.

See the *Scheduled Backup* section in Chapter 5 of the *Software Manual*.

Save System Status

Saves numerous status parameters and settings, which can be interpreted by MYDATA technicians only. The function is intended for fault tracing and the command should be given immediately after a fault has occurred. The result can then be sent to MYDATA for evaluation.

Format DOS Diskette

Disks can be DOS formatted by TPSys in the machine disk drive by using this command.

See the *Disk Formatting* section in Chapter 3 of the *Programming Manual*.

Units

The measuring units can be selected to *Metric* or *Inch*.

Language

You can select language from a menu. After changing to another language, TPSys is exited and restarted.

Desktop Resolution

Select the desktop resolution to use from a pop-up window. The choices are *Standard resolution* or *High resolution*. The resolution must be set to high if the web interface is to be used.

Exit

```
Exit
S Shutdown
R Restart TPSys
X Exit TPSys
M Exit To Service
```

Shutdown

System shutdown is selected prior to switching off the power. When this option is selected, you exit both the MYDATA TPSys and Linux. After receiving the following message you can safely switch the power off:

```
System halted
```

The system can now be re-booted by pressing the key combination <Ctrl>+<Alt>+<Del>.

Restart TPSys

TPSys and Linux are exited and then restarted again.

Exit TPSys

Exits TPSys and returns you to the Linux operating system.
To restart TPSys, type 'go' and press <Enter> at the Linux prompt.

Exit To Service

Exits TPSys and starts the *Service Program*.

The *Service Program* is described in the *Machine Manual*.

About...

```
          About...
M This Machine
T TPSys
D Databases
S System Statistics
E Temp. Statistics
C Motor Controllers
```

This Machine

Shows the machine name and number, and available options, which can look like this:

```
Machine name: my15n123
 Machine No.: 15123

Options active:
   * Digitizer
   * Electrical two-pole test
   * Electrical transistor test
   * Optical centering
   * Bar code reader
   * Conveyor
   * Shared databases
   * HYDRA
   * Electrical measurement
   * Z High Speed
   * HYDRA High Speed
   * Autoteach
   * MYSpeed

User access system is on
                    OK
```

TPSys

Shows TPSys version and revision trace information, which can look like this:

```
      TPSys by MYDATA automation

      Version 2.3.x for Linux

                OK
```

Databases

Opens a popup menu for selecting status or size.

```
A Status
I Size
```

The *Status* option shows database status, that is local or shared databases:

```
Database status:

 Component data: Shared with tp94n124
  Magazine data: Shared with tp94n124
   Package data: Shared with tp94n124
     Mount data: Local
      User data: Local

                    OK
```

```
A Status
I Size
```

The *Size* option shows the database size for all databases, that is the number of entries in the databases:

```
Number of items:

 439 Magazines        2 Y-Wagon Trays
1156 Packages         1 Y-Wagon Tray Positions
 848 Components       0 Tray Wagon Trays
 115 Layouts          0 Tray Wagon Tray Positions
  39 Panels          10 Pallet Trays
  50 PCBs             5 Pallet Tray Positions
   6 Users           54 Tray Types
 213 Pallets         16 Fiducial Mark Types
   4 TEXs             8 Glue Dots
  33 Kit Lists

                    OK
```

System Statistics

Shows system statistics, which can look like this for machines which are not equipped with the HYDRA system ...

```
────────────────System Statistics────────────────
       Total up time: 29 days 10 hours 37 minutes 39
                      seconds
  Total assembly time: 12 minutes 23 seconds
      Total glue time: ---


Total mounted with Z: 24
         Total glued: 0
                            OK
```

... and like this for machines equipped with the HYDRA system:

```
─────────────────System Statistics─────────────────
      Total up time:   15 days  4 hours 34 minutes 45 seconds
  Total assembly time:  45 minutes 17 seconds
     Total glue time:   ---

Total mounted with Z:   215
        Total glued:    0
  Total HYDRA cycles:   640
    Tool:  1         2         3         4         5         6         7         8
Mounted:  625       618       614       620       623       525       417       607
   Fail:  23        24        30        25        24        27        23        37


   Total mounted:   4964
   Total X cycles:  955
                            OK
```

Temp. Statistics

This option shows also system statistics, but this statistics can be reset by using the *Reset* command in online mode. The feature is intended for temporary statistics. It can look like this for machines which are not equipped with the HYDRA system ...

```
          ─Temporary System Statistics─
          Up time: 26 days  1 hours 46 minutes 9
                           seconds
    Assembly time: 12 minutes 23 seconds
        Glue time:  2 seconds


  Mounted with Z: 659
           Glued: 0


                     OK    Reset
```

... and like this for machines equipped with the HYDRA system:

```
                    ─Temporary System Statistics─
        Total up time:  15 days  4 hours 34 minutes 45 seconds
   Total assembly time:  45 minutes 17 seconds
      Total glue time:  ---

 Total mounted with Z:   215
          Total glued:   0
         HYDRA cycles:   640
     Tool:   1        2        3        4        5        6        7        8
  Mounted:  625      618      614      620      623      525      417      607
     Fail:  23       24       30       25       24       27       23       37


           Mounted:   4964
          X cycles:   955
                          OK    Reset
```

Motor Controllers

Shows the motor controller software versions like this:

```
       Servo release:  7.4c

     Controller    C: C2d9ab 980120
     Controller    M: m31r   990922
     Controller    X: xD32DJ 960524
     Controller    Y: ym20hg 970423
     Controller    Z: zs25CA 971202
     Controller  TEX: zs25CA 990309

                   OK
```

Switches

Four groups of production switches can be accessed by selecting the **Switches** option in the **Production** menu:

```
 Production
A Assemble
T Locate Boards (Auto)
M Locate Boards (Manual)
S Clear Layout Status
D Clear Management Data
-----------------------
L Load Layout
E Edit Layout
U Unload Layout
X Layout Status
-----------------------
V View Messages
- Set Message Time Mark
W Switches
I Mount/Glue Switches
-----------------------
Y Move Y Wagon
C Conveyor Control
O Leave Tool
```

The four switch groups are:

```
        Parameter Groups
1001 Test switches
1002 Assembly switches
1003 Bad board search
1004 Conveyor switches
```

F7

By pressing <F7> you can print the highlighted switch group.

F8

By pressing <F8> you can print out all the switch groups.

Enter ◄┘

Press <Enter> to modify the highlighted switch group, see the next page.

Information about maximum and minimum values for those entries that are asked for values are shown in the information field.

```
                    ── 1001 Test switches ──
1001.0003 Mechanical
test......................... Yes
1001.0004 Test of Z level when place..............
No
1001.0005 Test of Z level when pick...............
Yes
1001.0006 Test of Z vacuum........................
Yes
     Electrical test
0001    Test.................................. Yes
0008    Perform test after magazine inserted... No
0002    No. of successful test before HYDRA.... 5
0020    Measure component after test........... No
```

  – Select the desired switch by using the arrow keys.

  – Select *Yes* or *No* by pressing <Space>.

  – Confirm by highlighting *Save and exit* and pressing <Enter>.

Password may be required to save modifications made.

The following switches are included in the switch groups:

```
1001 Test switches
1001.0003 Mechanical test...........................
Yes
1001.0004 Test of Z level when place................
No
1001.0005 Test of Z level when pick.................
Yes
1001.0006 Test of Z vacuum..........................
Yes
     Electrical test:
0001    Test...................................... Yes
0008    Perform test after magazine inserted..... No
0002    No. of successful test before HYDRA...... 5
0020    Measure component after test............. No
1001.0007 Lamp timeout..............................
90s

1002 Assembly switches
     Bad board test:
0002 Automatic.................................. No
0001 Check panels for bad boards............... No
0010 Use bad board mark on panel............... No
     Present board detection:
0014 Automatic.................................. No
0013 Remember non-present board flags........... Yes
     Locate boards:
0003 Automatic fiducial mark search............. Yes
0007 Locate all boards on a panel............... No
0008 Accepted fiducial mark distance error (%).. 0.125
0009 Max accepted board angle deformation....... 0.50°
     Serial start:
0006 Mode....................................... Off
0023 Wait for layout name before load.......... Yes
     PCB id:
0024 Auto mode.................................. Off
0025 Accept manual.............................. No
0027 Auto generate on panels.................... No
     Warning switches:
0019 Min component distance in PCB editor....... 1mm
0021 Overlapping board warning.................. Yes
     Measure board level:
0011 Always..................................... Yes
0012 When new layout is loaded.................. Yes
     Assemble:
0004 Use local fiducial marks................... Yes
0005 Invert meaning of comp. mount/glue flags... No
0020 Max component height on PCB............... 15mm

1003 Bad board search
0001 Contrast level............................. 50
0010 Bad board area
0011   X size................................... 2mm
0012   Y size................................... 2mm
0021 Contrast means board OK.................... Yes
```

The switches included in the four switch groups are described below in the same order as in the previous table.

1001 Test switches

1001.0003 Mechanical test

Yes – Components with the *Verify mechanical* entry set to *Yes* in the Package List are verified mechanically.

No – No components are verified mechanically.

1001.0004 Test of Z level when place

Yes – A plausibility check of the height level is performed and the actual placement height is compared to the package *Height overall* level in the Package List. This comparison also consider the *0021.0305 Place level tolerance* parameter to compensate the height of solder paste under the component.

This feature detects if a component was never picked up from the magazine, has dropped from the mount tool or was placed on top of another component.

No – The height level is not measured when placing components.

1001.0005 Test of Z level when pick

Yes – The same function as the previous switch, but in this case it is checked if the component pick from magazine feeder or tray is done within the height limits. The limits are set by the package *Height overall* entry in the Package List and the *0021.0105 Pick level tolerance* parameter.

This feature detects if a component for instance is missed in the magazine.

No – The height level is not measured when picking components.

1001.0006 Test of Z vacuum

Yes – The vacuum in the mount tool is checked to confirm that a component is held by the tool. This applies to all components except those for which the *Vacuum test* is set to *No* in the Package List.

No – No vacuum test is performed.

Electrical test

0001 Test

Yes – Electrical verification is performed on components for which electrical verification (*Test 1*, *Test 2 Type*) is defined in the Component List. It is also required that:

　1. There is a centering phase defined in the package list which has the same angle as the test specified in the Component List.

　2. The package is set to *Verify electrical Yes* for this centering phase in the package list.

No – No components are verified electrically.

0008 Perform test after magazine inserted

Yes – If a magazine is removed and then inserted again, then it resets the counter used by the *0002 No. of successful test before HYDRA* test switch. This counter sets how many components to be tested with the standard mount tool, before HYDRA mounting is started.

No – If a magazine is removed and then inserted again, then the counter used by the *0002 No. of successful test before HYDRA* test switch continues from the current value. If a sufficient number of components already had been tested by the standard mount tool before the magazine was removed, then the HYDRA mounting will continue immediately as the magazine is inserted again.

0002 No. of successful test before HYDRA

Defines a number of HYDRA mountable components which will be picked with the standard mount tool, tested with the centering jaws, and mounted on the board before the HYDRA unit continuous mounting the components.

The number applies to each magazine feeder that holds HYDRA mountable components. If, for example, there are 16 feeders that hold HYDRA mountable components and this parameter is set to 2, then 32 components will be tested and mounted with the standard mount tool before the HYDRA starts mounting the components.

This parameter affects HYDRA mountable components only, that is components for which a tool is specified in the *HYDRA tools* field in the Package List.

0020 Measure component after test

Yes – After passing the electrical verification, a new electrical measurement is performed on the component and the measured value from this measurement is stored in the event log.

This feature requires also that:

1. The *Save electric value* entry in the PCB editor is set to *Yes*.

2. The *0024 Electrical measurement* parameter in the *0191 Options* parameter group is set to *Yes*.

3. The magic word includes this optional feature.

No – No electrical measurement of the component is performed.

1001.0007 Lamp timeout

Sets the camera light idle time when, for instance, centering fiducial marks and positioning components. If the machine is left during such a procedure, the light is switched off after the time set. Pressing a key on the keyboard or moving the trackball or joystick turns it on again.

The time unit is seconds.

1002 Assembly switches

Bad board test

0002 Automatic

This switch has effect only if the previous switch named *Check panels for bad boards* is set to *Yes*.

Yes – An automatic bad board search is performed, that is the camera is moved to the position specified for bad board marks and searches for a mark.

No – The system does not perform automatic bad board search.

0001 Check panels for bad boards

Yes – The system searches for bad board marks on the PCBs included in the panel.

No – The system does not search for bad board marks.

0010 Use bad board mark on panel

In order to save time, this feature makes it possible to mark a panel to indicate that there are at least one bad PCB in the panel. Panels and bad boards are marked using bad board marks.

Yes – The system checks if there are bad board marks on panels.

If a bad board mark is found on a panel, all the PCBs included in the panel are checked.

If no bad board is found on a panel, the next board in the layout is checked. If there are no more boards, then the bad board search procedure is finished.

No – The system does not check if there are bad board marks on panels, but on all included PCBs.

This feature saves most time when there are many PCBs included in the panels and bad boards are of rare occurrence.

Present board detection

0014 Automatic

Automatic non-present board marking.

☞ The *0013 Remember non-present board flags* switch should be set to *No* if this switch is set to *Yes*.

See the *Automatic Non-Present Board Detection* and *Board Location Switches* sections in Chapter 8 of the *Operator's Manual*.

0013 Remember non-present board flags

Sets whether non-present board marks remain or are cleared after mounting.

See the *Marking Board As Non-Present* and *Board Location Switches* sections in Chapter 8 of the *Operator's Manual*.

Locate boards

0003 Automatic fiducial mark search

Yes – Automatic fiducial mark search is on.

No – Automatic fiducial mark search is off.

See the *Board Location Switches* section in Chapter 8 of the *Operator's Manual*.

0007 Locate all boards on a panel

Yes – When locating panels, all PCBs in the panel are subjected to individual fiducial mark search in addition to the panel itself.

No – Only the panel itself is subjected to fiducial mark search.

0008 Accepted fiducial mark distance error (%)

See the *Fiducial Mark Deviation* section in Chapter 8 of the *Operator's Manual*.

0009 Max accepted board angle deformation

See the *Fiducial Mark Deviation* section in Chapter 8 of the *Operator's Manual*.

Serial start

0006 Mode

Automatic start mode is intended for systems equipped with conveyor and barcode reader or other detection device.

Off
> Automatic start mode is off.

Latest read
> The latest layout name read from the defined serial port is loaded and assembled (no queuing).

FIFO
> Queues up layout names in the order they are read from the defined serial port. As the boards are transported into the machine, the layouts are loaded and assembled in the queue order.

0023 Wait for layout name before load

Yes – If serial start is used, that is the previous switch is set to *Latest read* or *FIFO*, then TPSys will not load the next board until it has got the next layout name from the serial link.

No – The next layout is loaded without waiting for the next layout name from the serial link.

PCB id

For tracing components from a feeder to a PCB. The 'PCB id' is written into the event log in a PCB identity entry.

0024 Auto mode

Sets whether the 'PCB id' is taken from the serial line or not.

Off
> The 'PCB id' is not taken from the serial line.

Latest read, serial line
> The most recent 'PCB id' is taken from the serial line.

FIFO, serial line
> 'PCB id' is taken from the serial line in the order they appear, that is the oldest first.

0025 Accept manual

If switch *0024 Auto mode* is set to *Off*, then a pop-up box is shown asking for the 'PCB id' for each PCB.

Yes – The 'PCB id' can be entered manually by typing it, or by using the hand-held barcode reader.

No – The 'PCB id' cannot be entered manually.

0027 Auto generate on panels

Yes – The system accepts only one identity code per panel. From this identity code it generates identities for all the PCBs in the panel. The syntax of the generated identity codes is 'panelId_boardNo' where 'boardNo' is the board number in the panel.

No – The system does not generate identities for the PCBs in the panel.

Warning switches

0019 Min component distance in PCB editor

If the center-to-center distance between two components that are to be placed on a PCB is below what is specified by this switch, then a warning is shown.

0021 Overlapping board warning

Yes – Warns when the location of two boards on the assembly table are calculated to overlap each other (if you, for instance, have located two boards on the same fiducial marks).

No – No warning is shown for overlapping boards on the assembly table.

Measure board level

0011 Always

Switch for board level measurement.

☞ *Do not mix boards of different thickness in the same layout.*

Yes – The board level is measured once for each time the layout is assembled.

No – The board level can be measured according to the next switch *0012 When new layout is loaded*.

0012 When new layout is loaded

Switch for board level measurement.

This switch has effect only if the previous switch *0011 Always* is set to *No*.

Yes – The board level is measured only once after changing to a new layout.

No – The board level is measured only once.

☞ If the board thickness differ from layout to layout, this switch should be set to *Yes*.

Assemble

0004 Use local fiducial marks

Yes – Local fiducial mark search is performed automatically for components prior to placing, provided the *Local fiducial marks* in the PCB Editor is set to 1, 2, or 3.

No – Local fiducial mark search is off.

See the *PCB Editor* section in Chapter 7 of the *Programming Manual*.

0005 Invert meaning of comp. mount/glue flags

Yes – Only components for which *Mount* is set to *No* in the Component List are mounted. This switch inverts thus the function of the *Mount* field in the Component List.

No – Components for which *Mount is set to No* in the Component List are not mounted.

See the *Mount and Glue Switches* section in Chapter 8 of the *Operator's Manual*.

0020 Max component height on PCB

Using this switch, the operator can inform the system about the maximum height of components on the PCB that are not included in the current mount lists and thus not known by the system.

Normally the system knows the height and position of every component on the PCB from the package database and from the mount lists. This is important for optimizing the speed and allowing simultaneous X and Z movement, without hitting components on the PCB.

1003 Bad board search

1003.0001 Contrast level

Sets a limit, above which the detected contrast is regarded as high. The value must be set so that the program can differentiate between the label and the background (one is detected as 'low', the other as 'high').

The contrast level must not be confused with light intensity level. High contrast means big difference in light intensity between the lightest and the darkest parts of an area.

For safe detection of bad board labels, there must be significant contrast difference between the labels and the backgrounds.

This figure shows a contrast level diagram for a scanned line. The diagram shows that the label has low contrast and is placed on a high contrast area. The *1003.0001 Contrast level* parameter can be set rather low. The *1003.0021 Contrast means board OK* parameter should be set to *Yes* to detect a bad board label.

This figure shows a label with high contrast, placed on a board with low contrast. The *1003.0001 Contrast level* parameter can be set rather high. The *1003.0021 Contrast means board OK* parameter should be set to *No* to detect a bad board label.

Bad board area

0011 X size

The distance between the two X coordinates of the area in which a bad board mark is searched for.

Should be smaller than the label size.

0012 Y size

The distance between the two Y coordinates of the area in which a bad board mark is searched for.

Should be smaller than the label size.

0021 Contrast means board OK

Yes – If the contrast for the bad board mark search area is high (higher than the level set in the *1003.0001 Contrast level* parameter), then the board is good and will be mounted.

This is the normal setting and means that the bad board label has less contrast than the board, for instance a white label.

No – Inverted contrast, a high-contrast search area means a bad board.

This setting can be used if you mount boards with no contrast. You can attach high-contrast labels to mark bad boards, or simply mark bad boards with black ink directly on the board.

1004 Conveyor switches

0001 Conveyor fetch

Yes – New boards are fetched automatically by the conveyor.

No – Boards are not fetched by the conveyor.

0002 Conveyor leave

Yes – Assemblies are transported away automatically by the conveyor.

No – Assemblies are not removed by the conveyor.

Appendix C – About the Documentation

The documentation of the MYDATA Component Placement Machines comprises the following parts:

- *Operator's Manual*

- *Programming Manual*

- *Machine Manual*

- *Maintenance Guide*

- *Software Manual*

- *Spare Parts Catalog*

The manual structure in Figure C-1 show the intended user for each manual.
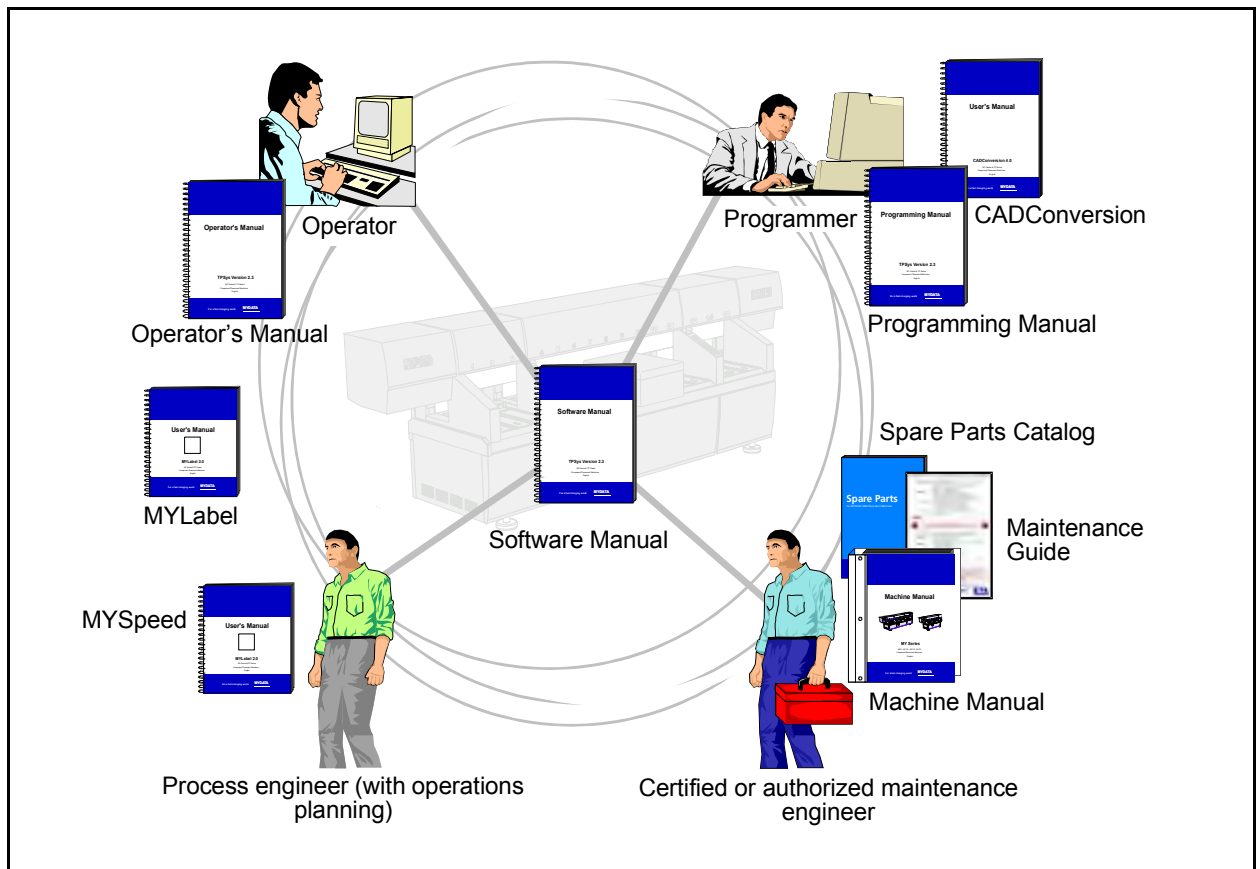
Figure C-1. Manual structure

Operator's Manual

An *Operator's Manual* for TPSys version 2.4 covers all the MYDATA machine types.

This manual is provided with each machine.

The *Operator's Manual* is available in a number of languages.

The *Operator's Manual* contains information to assist the operator to start and operate the system, load components and handle magazines and trays.

Information about safety, daily maintenance, HYDRA, TEX and Tray Wagon operation is also included in the *Operator's Manual*.

Programming Manual

A *Programming Manual* for TPSys version 2.4 covers all the MYDATA machine types.

This manual is provided with each machine.

The *Programming Manual* is available in the most common languages.

The *Programming Manual* contains basic information about the machine movements, coordinates, fiducial marks, angles, centering, verification, and how to program boards, create mount lists, maintain and complete component and package lists, etc.

Information about safety, pre programmed packages, HYDRA, TEX and Tray Wagon programming is also included in the *Programming Manual*.

Machine Manual

A *Machine Manual* is available for each of the machine series. There are thus two different *Machine Manuals* for the two current machine series:

- MY9, MY12, MY15 and MY19

- TP9-2U

Applicable manual is provided with each machine.

The *Machine Manual* is available in English only.

The *Machine Manual* contains descriptions, service instructions and calibration guidelines for the machine.

Information about safety, maintenance and common optional devices and systems are also included in the *Machine Manual*.

The *Machine Manual* has an index tag for the machine test protocol.

Maintenance Guide

A *Maintenance Guide* is available for each of the machine series. There are thus two different *Maintenance Guides* for the two current machine series:

- MY9, MY12, MY15 and MY19.

- TP9-2U.

Applicable guide is provided with each machine.

The *Maintenance Guide* is available in the most common languages.

The *Maintenance Guide* contains service instructions and guidelines for the machine.

Software Manual

A *Software Manual* for TPSys version 2.4 covers all the MYDATA machines running TPSys version 2.4.

The *Software Manual* is available in English only.

The *Software Manual* contains a system overview, Linux description, import/export information, back up/restore instructions and communications.

In an appendix there is also a message reference guide, containing those TPSys messages that can be displayed by TPSys, and descriptions of the messages.

Spare Parts Catalog

A *Spare Parts Catalog*, containing information, figures and part numbers on the most common spare and consumable parts, is available from MYDATA.

The *Spare Parts Catalog* is available in English only.

Supplementary software

MYDATA provide supplementary software which facilitate the programming work in TPSys.

This software may be mentioned in this manual but will not be described here. We refer you to their respective manuals.

CAD Conversion

CAD Conversion is a software package used to convert CAD files containing placement data to TPSys in order to use the data for component placing.

The CAD Conversion software package includes a comprehensive *CADConversion User's Manual*.

MYSpeed

MYSpeed is a software package used to calculate assembly time for boards that have not yet been assembled in order to get information for quotations and production planning. This software can also balance jobs between different machines or machine lines.

The MYSpeed software package includes a comprehensive *MYSpeed User's Manual*.

MYLabel

MYLabel keeps track of component carriers (tapes, sticks) used in production with MYDATA machines, by use of bar codes. MYLabel use an identification bar code linked to a database with component names, quantities and batch information on tape reels to be used by TPSys. The database also contains information related to the component, such as stock location and owner.

The MYLabel software package includes a comprehensive *MYLabel User's Manual*.

Index

Z

Questionnaire

The intention with this manual is to guide you in the MYDATA pick and place system and to answer questions that may turn up.

To ensure that we provide appropriate information for these purposes, we would appreciate your views and suggestions on how to improve the manual in this direction.

Please, fill out the following questionnaire and send it by mail, or fax it to +46 8 475 55 01.

Thanks for your kind help.

It's very valuable to us.

☺

Title (Mr./Ms/Other): _____ Initial: _____

Surname: _____ Job title: _____

Company: _____ Address: _____

City: _____ Country: _____ Phone: _____

1

Have you read entire sections or do you use the manual to look up specific information when needed?

❑ Read entire sections.   ❑ Look up specific information.

Comments: _____

_____

_____

2

Do you think the information is easy to find and understand?

❑ Yes   ❑ No

Comments: _____

_____

_____

3

Do you find any feature in MYDATA's system hard to understand, a feature that should be subjected to more detailed description?

❑ Yes   ❑ No

If yes, which one: _____

_____

_____

4

Do you have any suggestions on how we can improve this manual?

_____

_____

MYDATA automation AB

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If you prefer to send by mail, fold here and tape. No envelope required.

If you prefer to send by fax, use this number: +46 8 475 55 01

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Maintenance Guide for the TP9-2U placement machine.

Emergency stop button

The warranty on the machine and parts applies only if all the maintenance instructions are followed. For further information about the maintenance, refer to the *Maintenance* chapter in the *Machine Manual*.

> **WARNING**
> Before commencing any maintenance, press the emergency stop button down or turn the power off.

Use Shell Tellus oil and OKS 270 grease, unless other lubricant to be used is put in brackets. Oil and grease should be applied in small amounts, just to give a thin film.

Daily

	1. Inspect the mount tools.
	2. Clean the centering jaws.
	3. Clean the machine and the magazines.
	4. Inspect the magazine connectors.
	5. Empty the reject bins.
	6. Inspect the warning signs.
Glue Device	7. Clean the glue tools.
	8. Clean the glue tool verification points (at tool bank and glue station).
	9. Clean under the tool bank.

> Authorized maintenance engineers only are allowed to perform the maintenance described below.

Weekly

	1. Make a backup.
No lubrication of S tools.	2. Inspect and lubricate spring-loaded tools with oil, but do not lubricate A23S, A24S or C23S tools.
Optical Centering Camera	3. Empty the optical centering camera dump bin.
	4. Inspect the centering electrodes.
	5. Clean the Y-wagon rods.
Tray Wagon Magazine	6. Clean and lubricate the Tray-wagon rods with oil.
	7. Clean and lubricate the Z shaft with oil.
	8. Clean and lubricate the centering unit axles with oil.
	9. Clean and lubricate the Z cog wheels and rack with grease.
	10. Clean and lubricate the tool O-rings with grease.
	11. Clean and lubricate the tool head with grease.

Authorized maintenance engineers only are allowed to perform the maintenance described below.

Monthly or 160 Hours

	1.	Inspect the flexible X-wagon XXW1 and XXW2 cables.
Optical Centering Camera	2.	Clean the outer optical centering camera mirror.
	3.	Clean and lubricate the Theta belt with grease.
	4.	Clean and lubricate the X-wagon nylon wheels and X-rail surfaces (Molykote).
	5.	Check the Y, Z, C, and Theta frictions.
	6.	Check the Z sensor.
	7.	Check the vacuum system.
	8.	Clean or renew the fan filters.

1/4 Year or 500 Hours

Every other service.	1.	Replace the vacuum filter.
	2.	Clean and lubricate the X belt with grease.
	3.	Clean and lubricate the X motor belt with grease.
	4.	Lubricate the Y-wagon ball screw and nipple. For type 1 Y wagon, use Retinax grease. For type 3 and 4 Y wagons, use NSK grease.

Yearly or 2,000 Hours

Optical Centering Camera	1.	Clean the inner optical centering camera mirror.
	2.	Replace the flexible X-wagon XXW1 and XXW2 cables. *To be carried out by a certified MYDATA service engineer.*
Tray Wagon Magazine	3.	Clean and lubricate the Tray-wagon belt with grease.

Maintenance Guide

MY9 – MY12 – MY15 – MY19

Component Placement Machines

English

For a fast changing world **MYDATA®**

MY9 – MY12 – MY15 – MY19

Component Placement Machines

Maintenance Guide

English

MYDATA®
automation
W O R L D W I D E

This document is intended for MYDATA component placement machines. These machines can be run with MYDATA SYS version 2.9 or MYDATA TPSys version 1.x and 2.x. This document applies to the MYDATA TPSys version 2.4.

This document describes a standard machine and optional equipment available for the machine and magazines. Depending on your system you may lack some of the features described.

This system uses the ms unit for time. Length is measured in mm, but inch can be selected.

National special characters and some non-letter/non-figure characters cannot be entered into the system, for instance in board names and layout names. However, this version of TPSys allows the following characters to be used: " ' ' \ $; ^ @

Disclaimer
Hardware and software mentioned in this document are subjected to continuous development and improvement. Consequently, there may be minor discrepancies between the information in the document and the performance or design of the product. Specifications, dimensions and other statements mentioned in this document are subject to changes without prior notice.

Federal Communications Commission (FCC)
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

IMPORTANT

Read the safety chapter before starting the machine.

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Contents

About This Document

This document uses several conventions to present information of particular importance. These are explained below.

MYDATA strives to provide documentation that is complete, accurate, informative and friendly. Your feedback on this is welcome. We would apprecate it if you email your comments to *docs@mydata.se*

Lists

Lists of items, points to consider, or procedures that do not need to be performed in a specific order appear in bulleted or hyphenated format:

- Item 1

- Item 2

or

    – Item 1

    – Item 2

Procedures that must be performed in a specific order appear in numbered lists:

1. Perform this step first.

2. Perform this step second.

Screen text

All screen text appear in italic, for example *Name*. Italic face can also be used for names, for example *Spare Parts Catalog*.

Symbols

The following symbols can be used beside the text:

☞ A pointing finger notes particular important information.

⚠ *WARNING! A warning sign alerts you to potentially harmful consequences.*

1. Safety

Operational safety instructions, found in the operator´s manual, must be read carefully before operating, maintaining or servicing the machine.

1 - 2

2. Maintenance

This document informs about preventive maintenance for the MY9, MY12, MY15, and MY19 machine types. This maintenance should be performed at stated intervals. The warranty on the machine and parts applies only if these instructions are followed.

⚠️ *WARNING! Before commencing any maintenance, press an emergency stop button down or turn the power off.*

Maintenance intervals

The intervals for daily and weekly maintenance are fixed. The maintenance intervals specified at 160 hours running time and 2000 hours running time are dependent on the usage of the machine.

△ *CAUTION! The maintenance intervals apply to a clean environment and an indoor temperature of maximum 25°C. If operated in a dusty environment, or higher temperature, it is strongly recommended to perform cleaning and lubrication after half the stated time intervals.*

Cleaning optics

– If the optical surface is very dusty or dirty, remove the dust and dirt using a spray can with clean air *intended for optics*. Other air may contain particles and grease from air pumps and valves which may be harmful to the optics.

– Clean optics by folding a clean lint-free cloth to the width of the optics. Apply a small amount of *isopropyl* alcohol, and gently pass the cloth over the surface. Ensure there is no film left on the surface after the use of alcohol. An alternative is to use pre-moistened cleaning towlettes, especially developed for cleaning of optics.

Lubricants

Unless otherwise stated, use Shell Tellus oil and OKS 270 grease. Oil and grease should be applied just to give just a thin film.

Material Safety Data Sheets are found in the machine manual.

Spare parts

Part numbers for spare parts are found in the *Spare Parts Catalog*.

Daily Maintenance
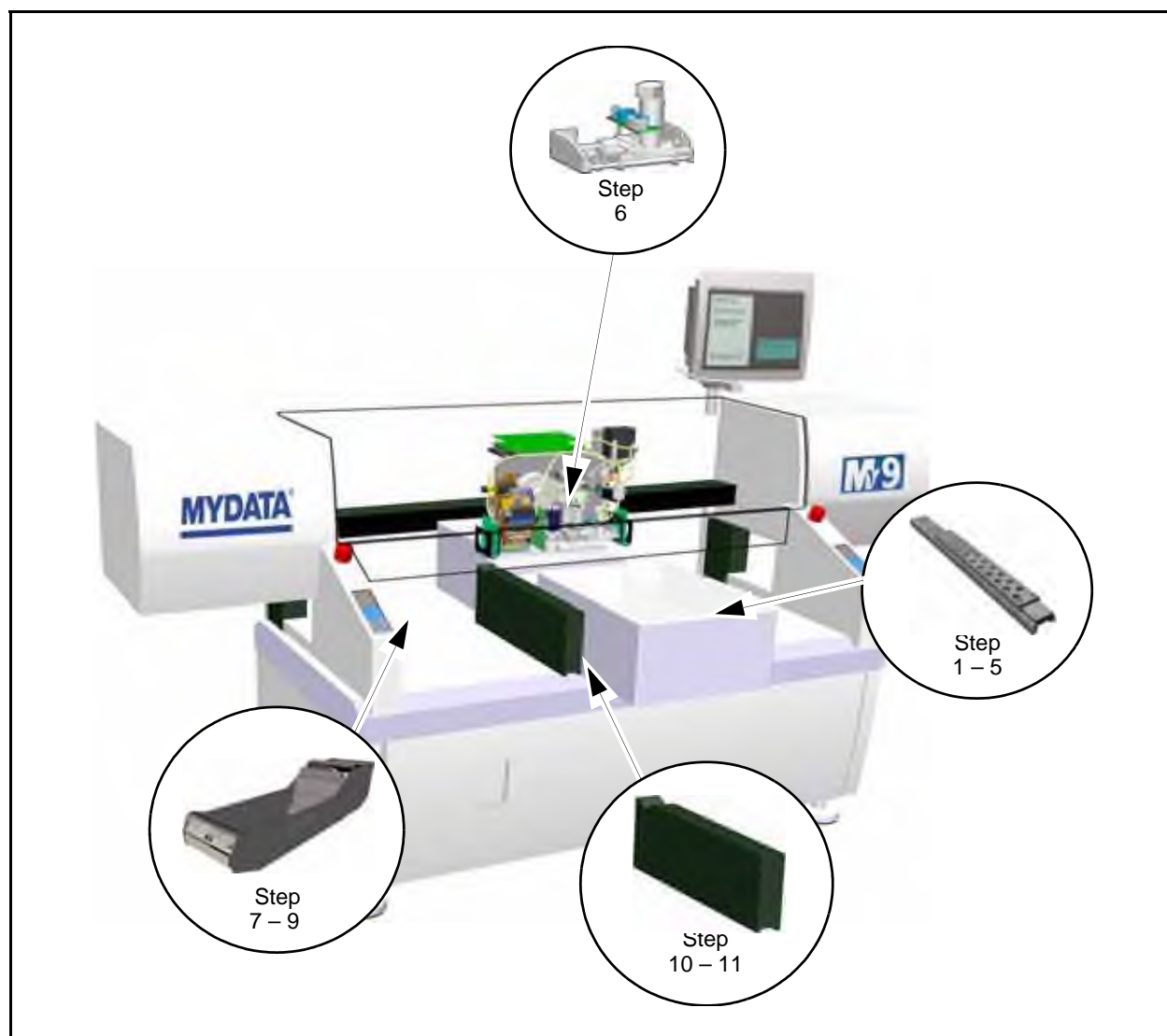
The numbered steps in the figure above corresponds to the descriptive paragraphs below.

Equipment

    – Q-tips (lint-free cottonwool buds).

    – Isopropyl alcohol.

    – Lint-free cloths.

    – Collecting container for rejected components.

    – Vacuum cleaner or short-bristled brush.

Tool Banks

1. Inspect the single mount-head tools.

– Clean off any solder paste and glue from the mount tools. Be careful not to damage the springs in spring-loaded tools.
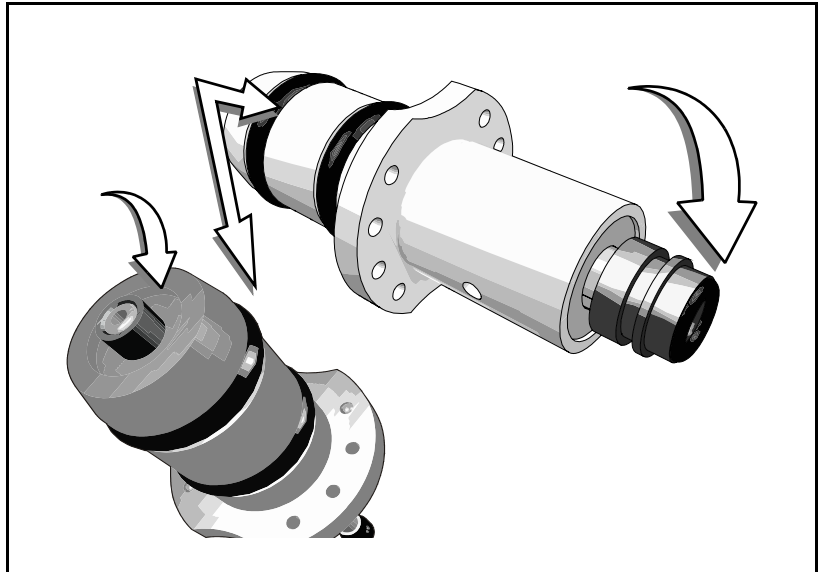
– Inspect the tool tips. Replace damaged tools and tool tips. Part numbers are found in the *Spare Parts Catalog*.

– Inspect O-rings for cracks or abrasions. Replace if necessary. Part numbers are found in the *Spare Parts Catalog*.
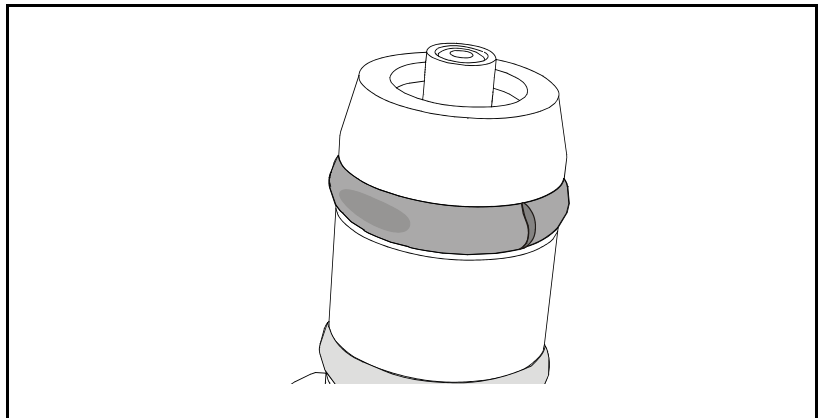
2. Inspect the HYDRA mount tools.

– Clean off any solder paste and glue from the mount tools.

– Inspect the tool. If damaged, replace the tools or the nozzles.

3. Clean the glue tools.

– Wipe off carefully with a cloth slightly wet in alcohol.

4. Clean glue tool verification points (at tool bank and glue station).

– Clean the glue verification point on the tool bank and the glue level verification point on the glue station.

5. Clean under the tool bank.

– Clean under the tool bank where the glue tools are kept.

Centering Unit

6. Clean the centering jaws.

    – Clean the centering jaws using Q-tips slightly wet in alcohol.
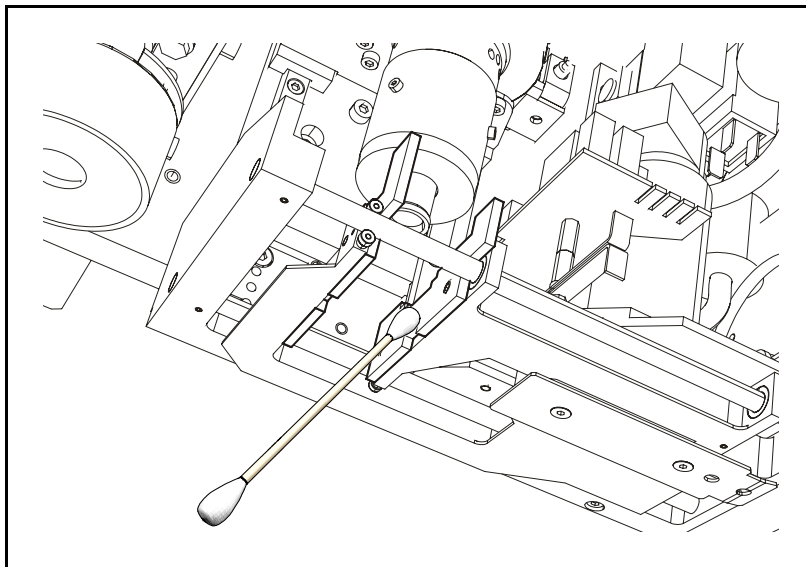
Component Handling

7. Clean the machine, internal conveyors, TEX and the magazines.

    – Clean the machine, internal conveyors, TEX and the magazines from loose components and pieces of component tape.

8. Inspect the magazine connectors.
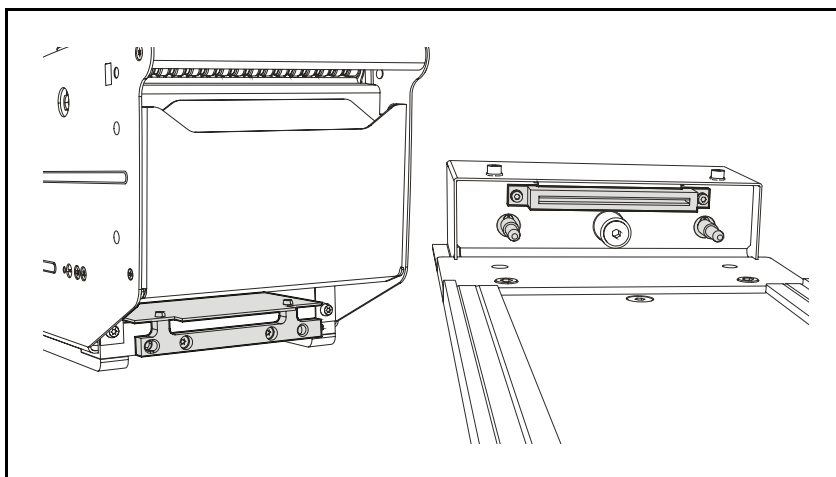
    – Make sure that the connectors are not damaged.

    – Remove components or pieces of component tape in the connectors.

CAUTION! Turn the power off before removing components or tape from the connectors.

9. Empty the reject bins.

Cameras

10. Remove components from the HYDRA Vision camera glass.

– Remove dropped components from the camera glass by pulling the knob at the front of the HYDRA Vision camera box.
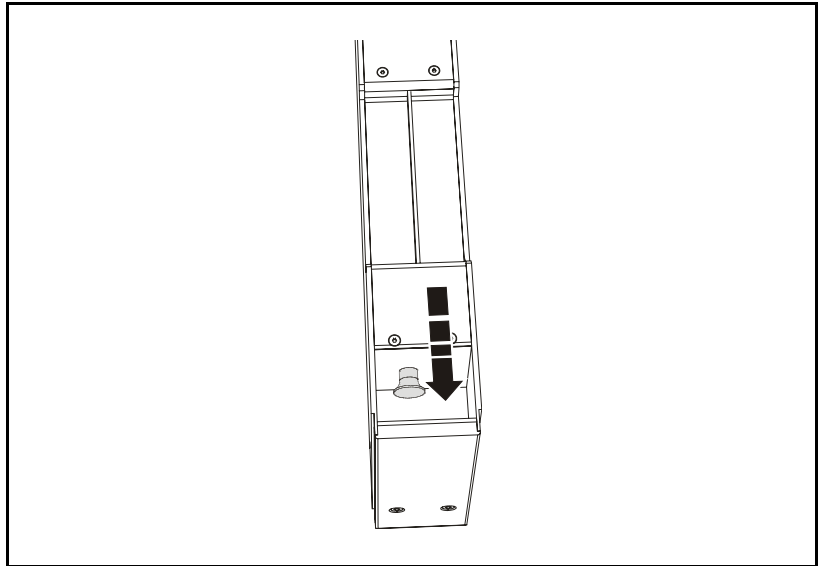
11. Remove components from the Linescan camera glass.

– Remove dropped components from the Linescan camera glass by withdrawing it at the front of the camera box, see the figure.
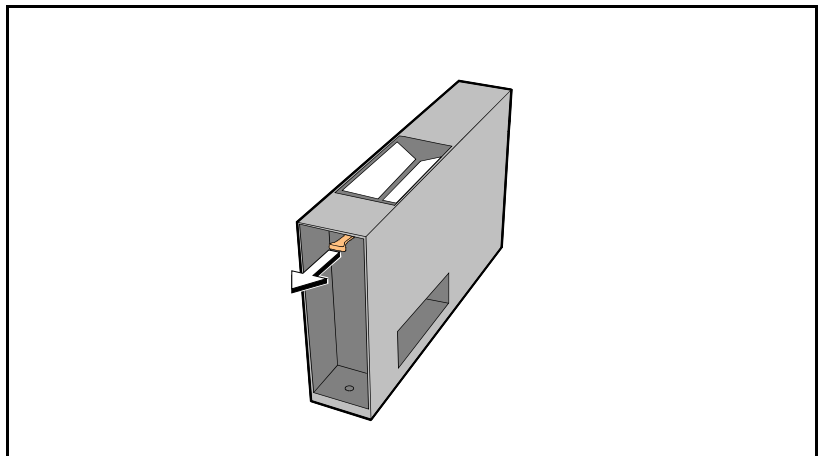
☞ Be careful not push the camera glass too far back when re-inserting it in the Linescan camera.

Weekly Maintenance
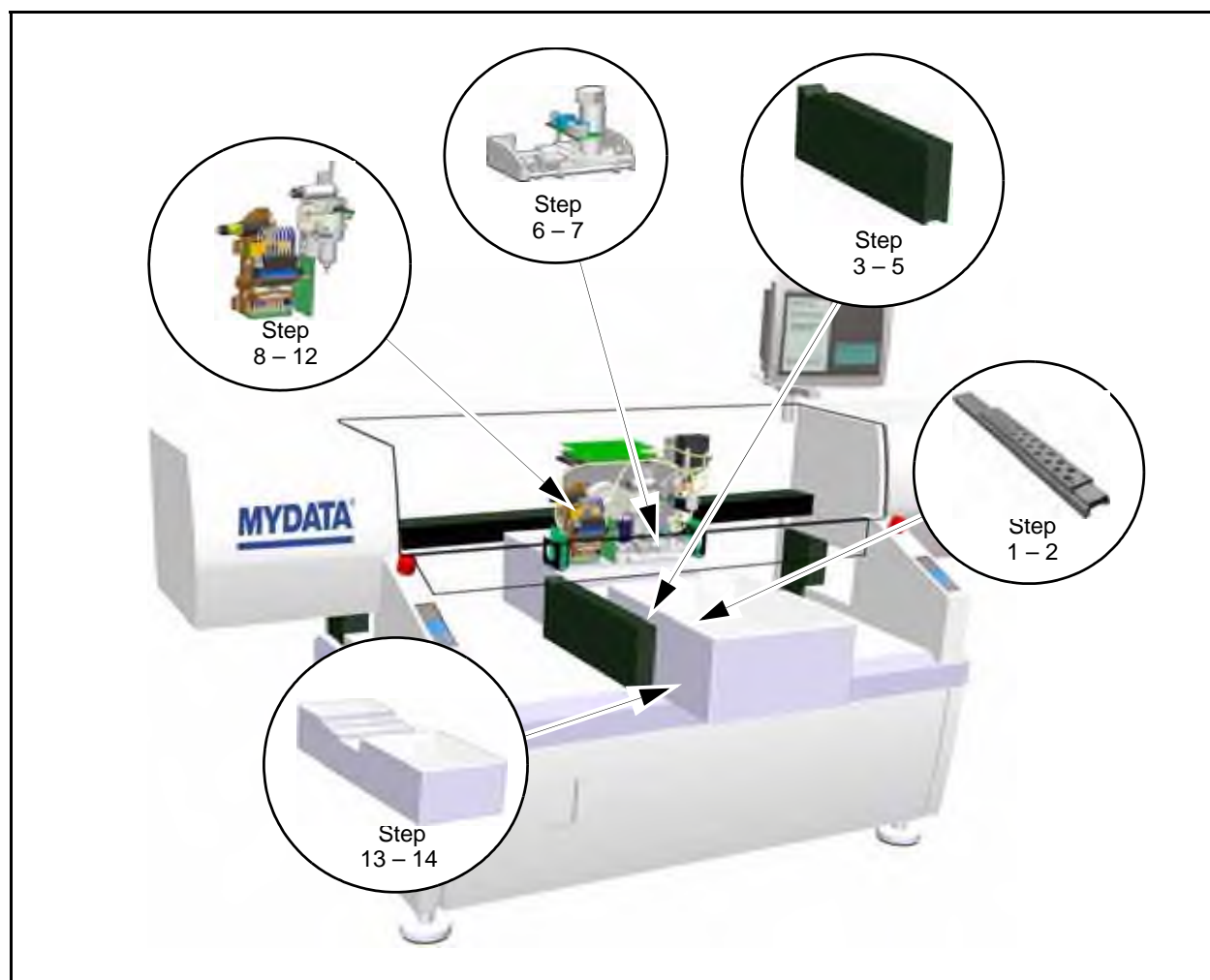
The numbered steps in the figure above corresponds to the descriptive paragraphs below.

Equipment

– Tellus oil for lubrication.

– OKS 270 grease.

– Isopropyl alcohol.

– Lint-free cloths.

– Collecting container for rejected components.

– Vacuum cleaner or short-bristled brush.

Preparation

Make a backup of TPSys.

– Refer to the TPSys software manual about backing up data and parameters.

Tool Banks

1. Inspect single mount-head tools.

    –   Check spring-loaded tools by gently pressing the tubes to the end position. When the tubes are released, make sure they return to the original positions. *Be careful not to overload the springs*.
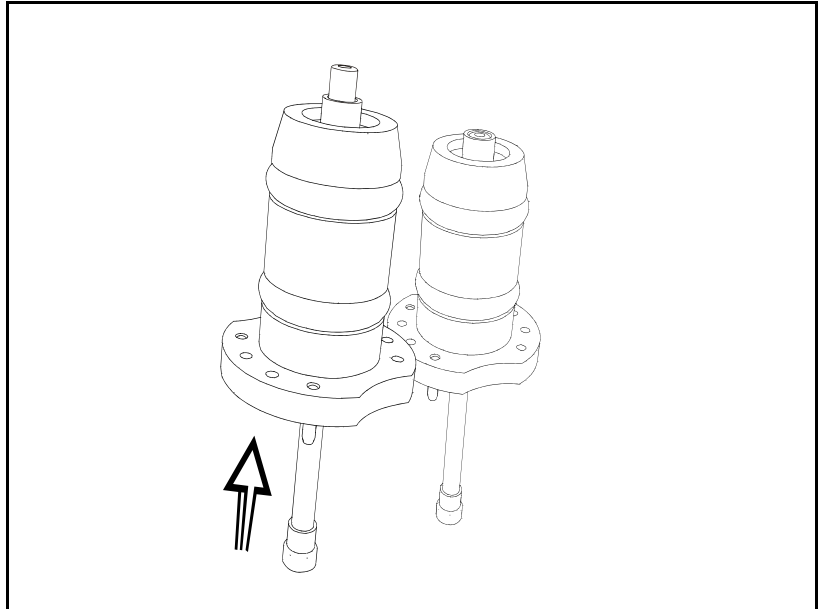
    –   Lubricate metal colored spring-loaded tools with a drop of oil. *Do not lubricate any tools with a black housing*.

2. Clean and lubricate the single mount-head tool O-rings with grease.

Cameras

3. Empty the Single Vision/Double Vision centering camera dump bin.

Dump bin   Camera cover
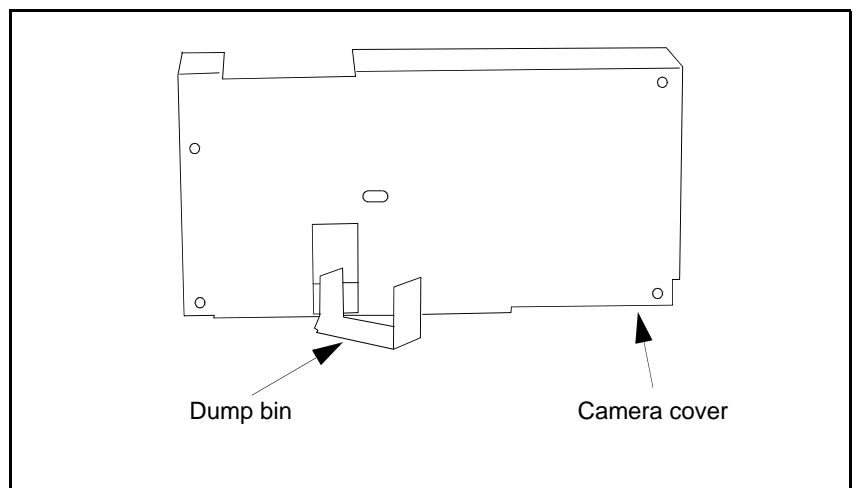
4. Clean the Linescan camera glass.

   – Remove the Linescan camera glass by withdrawing it at the front of the camera box, see the figure.
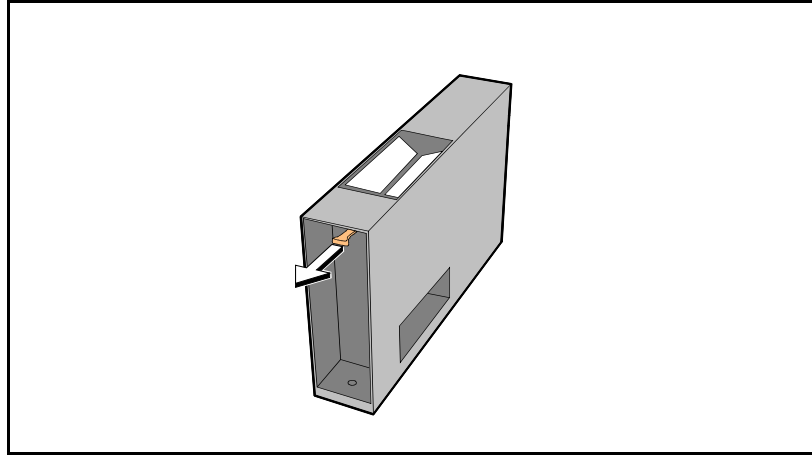
Instructions on how to clean optics are found on page .

5. Empty the HYDRA Vision camera dump bin.

   – Open the bin lid at the rear of the HYDRA Vision camera box and remove dropped components, preferably with a vacuum cleaner.
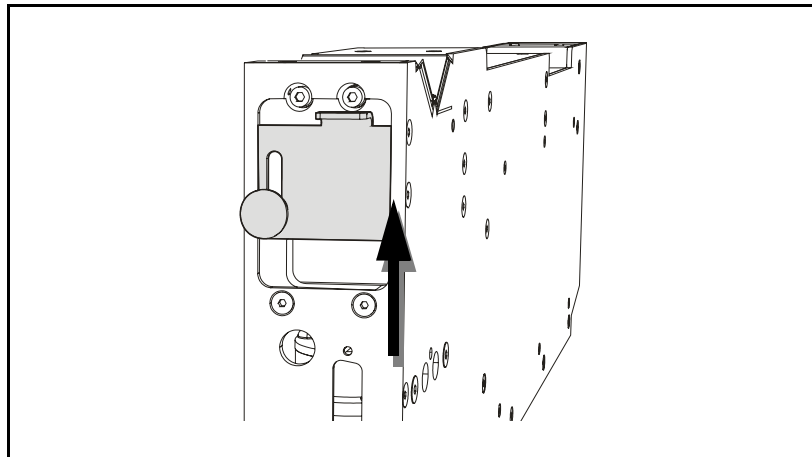
Centering Unit

6. Inspect the mechanical centering unit electrodes.

   – Inspect the electrodes and the termination wires. Are the electrodes pitted (that is full of dents after components), worn, or the wires are damaged, the centering jaws must be replaced and calibrated. Refer to the machine manual for details. Part numbers are found in the *Spare Parts Catalog*.

7. Clean and lubricate the mechanical centering unit axles with oil.

Mount Heads

8. Clean the reference background on the single mount head.

9. Clean the reference background on the HYDRA unit.

10. HYDRA 2B: Lubricate the HYDRA Z shaft with oil (HYDRA 2D is lubricated at the yearly service).
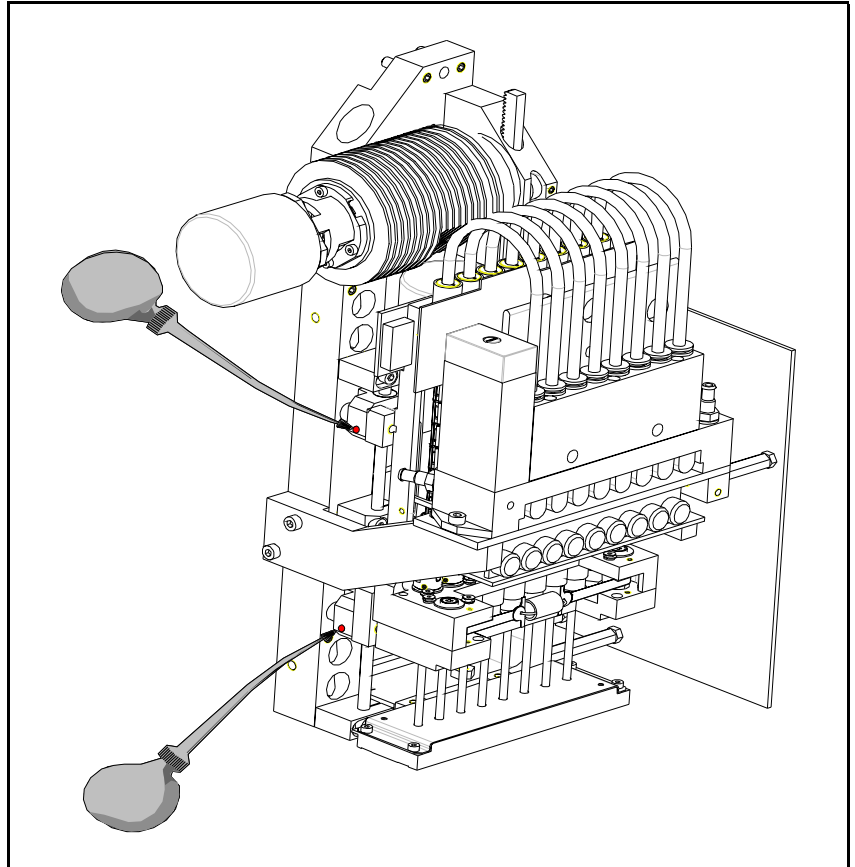
11. Clean and lubricate the single mount-head Z cog wheels and rack with grease.

12. Clean and lubricate the single mount-head tool head with grease.

– Clean dirt and dust out from the inside of the tool head. Be careful not to damage the force sensor inside the tool head. Lubricate the inside of the tool head by inserting and removing a greased tool manually.

Board and Component Handling

13. Clean and lubricate the Y-wagon rods with oil.

– Clean and lubricate the rods for the Y-wagon linear bushings by wiping off the rods using a slightly oiled cloth.

14. Clean and lubricate the Tray Wagon Magazine rod with oil.

– Clean and lubricate the Tray Wagon Magazine rod by wiping off the rod using a slightly oiled cloth.

Other

15. Inspect the warning signs.

– Warning signs on the machine must be clean and readable. If not, replace the signs (refer to the safety instructions in the operator's manual).

160 Hours Maintenance

These maintenance tasks shall only be performed by an authorized maintenance engineer.

1. Inspect the X-wagon flexible XXW1 and XXW2 cables.

   – Check the two X-wagon flat cables located on top of the X bar. Renew damaged or worn cables.

2. Clean the SVS/DVS optical centering camera mirror.

   – If an optical centering camera is used, then clean the outer mirror (at the arrow in the figure) accessible without opening the camera cabinet.
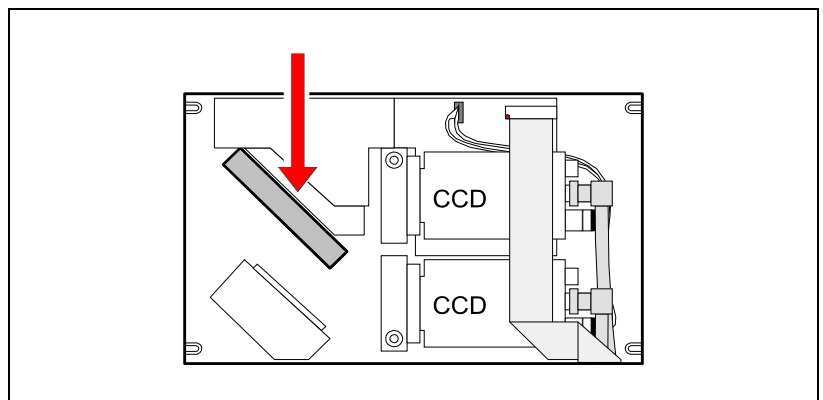
3. Clean the HYDRA Theta belt.

   – Clean the Theta belt at the motor shaft using a Q-tip slightly wet in alcohol, see the figure. Move the belt by gently dragging the belt spring as shown by the arrow in the figure.
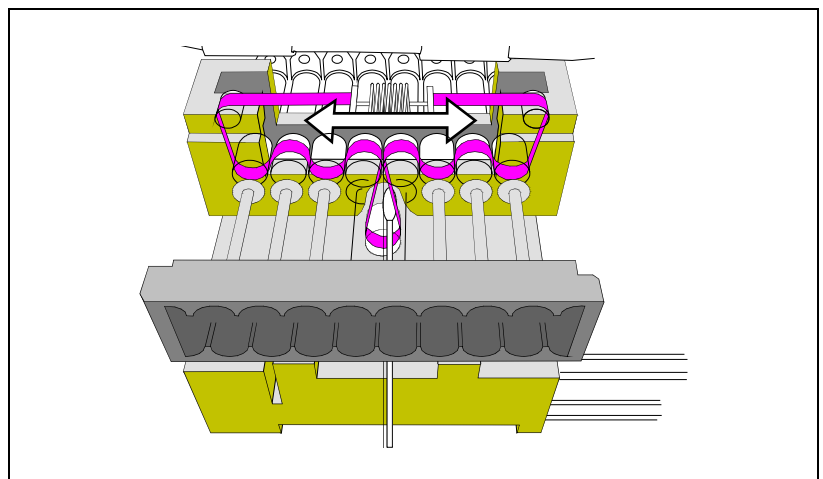
4. Clean the HYDRA camera glass.

5. Check the HYDRA vacuum system.

   – Check the HYDRA vacuum system as described in the machine manual.

6. Lubricate the front and rear of the HYDRA Z rack with grease.

7. Check the vacuum system.

   – Inspect the vacuum hoses and test the vacuum system as described in the machine manual.

8. Clean or renew the fan filters.

   – Clean thoroughly (using a vacuum cleaner) the two fan filters at the rear of the machine. If the filters are clogged they must be renewed. Part numbers are found in the *Spare Parts Catalog*.

9. Check the grease pump.

   – Make sure the indicator lamp on the grease pump is lit by using the *Check X-wagon Grease Pump* procedure as described in the machine manual.

10. Every other service, replace the vacuum filter.

   – Renew the vacuum filter at every other service. Part numbers are found in the *Spare Parts Catalog*.

Yearly or 2000 Hours Maintenance

This preventive maintenance shall only be carried out by authorized MYDATA service engineers. There is a specific instruction for the yearly maintenance that has to be followed.

Please contact your MYDATA Service Department to arrange for a visit by a MYDATA field service engineer.

This service will affect for example:

– The HYDRA ATE.

– The single and HYDRA mount heads.

– The X system.

– The internal conveyor sytem.

Maintenance Tables

This section shows the previous described maintenance as tables that can be copied and used as service protocols.

Daily

Place	Maintenance action	Completed
Tool banks	1. *Inspect the single mount-head tools.*	
	2. *Inspect the HYDRA mount tools.*	
	3. *Clean the glue tools.*	
	4. *Clean glue tool verification points (at tool bank and glue station).*	
	5. *Clean under the tool bank.*	
Centering unit	6. *Clean the centering jaws.*	
Component handling	7. *Clean the machine, internal conveyors, TEX and the magazines.*	
	8. *Inspect the magazine connectors.*	
	9. *Empty the reject bins.*	
Cameras	10. *Remove components from the HYDRA Vision camera glass.*	
	11. *Remove components from the Linescan camera glass.*	

Weekly

Place	Maintenance action	Completed
Preparation	*Make a backup of TPSys.*	
Tool banks	1. *Inspect single mount-head tools.*	
	2. *Clean and lubricate the single mount-head tool O-rings with grease.*	
Cameras	3. *Empty the Single Vision/Double Vision centering camera dump bin.*	
	4. *Clean the Linescan camera glass.*	
	5. *Empty the HYDRA Vision camera dump bin.*	
Centering unit	6. *Inspect the mechanical centering unit electrodes.*	
	7. *Clean and lubricate the mechanical centering unit axles with oil.*	
Mount heads	8. *Clean the reference background on the single mount head.*	
	9. *Clean the reference background on the HYDRA unit.*	
	10. *HYDRA 2B: Lubricate the HYDRA Z shaft with oil (HYDRA 2D is lubricated at the yearly service).*	
	11. *Clean and lubricate the single mount-head Z cog wheels and rack with grease.*	
	12. *Clean and lubricate the single mount-head tool head with grease.*	
Board and component handling	13. *Clean and lubricate the Y-wagon rods with oil.*	
	14. *Clean and lubricate the Tray Wagon Magazine rod with oil.*	
Other	15. *Inspect the warning signs.*	

160 Hours Maintenance

> This preventive maintenance shall only be carried out by authorized MYDATA service engineers. There is a specific instruction for the yearly maintenance that has to be followed.

Interval	Maintenance actions	Completed
Monthly or 160 hours	1. *Inspect the X-wagon flexible XXW1 and XXW2 cables.*	
	2. *Clean the SVS/DVS optical centering camera mirror.*	
	3. *Clean the HYDRA Theta belt.*	
	4. *Clean the HYDRA camera glass.*	
	5. *Check the HYDRA vacuum system.*	
	6. *Lubricate the front and rear of the HYDRA Z rack with grease.*	
	7. *Check the vacuum system.*	
	8. *Clean or renew the fan filters.*	
	9. *Check the grease pump.*	
	10. *Every other service, replace the vacuum filter.*	

Yearly Maintenance or 2000 Hours

> This preventive maintenance shall only be carried out by authorized MYDATA service engineers. There is a specific instruction for the yearly maintenance that has to be followed.

Interval	Maintenance actions	Completed
Yearly or 2000 hours	Please contact your MYDATA Service Department to arrange for a visit by a MYDATA field service engineer.	

MYDATA automation®
WORLDWIDE

Machine Manual

MY Series

TPSys® Version 2.4

Component Placement Machines

English

For a fast changing world　**MYDATA®**

Machine Manual

MY Series

of

MYDATA Component Placement Machines

–

English

This document is intended for MYDATA component placement machines. These machines can be run with MYDATA SYS program version 2.9 or MYDATA TPSys program version 1.x and 2.x. This document applies to the MYDATA TPSys version 2.3.

This document describes a standard machine and optional equipment available for the machine and magazines. Depending on your system you may lack some of the features described.

This system uses the ms unit for time. Length is measured in mm, but inch can be selected.

National special characters and some non-letter/non-figure characters cannot be entered into the system, e.g. in board names, layout names, etc. However, this version of TPSys allows the following characters to be used:
" ' ` \ $; ^ @

In this document angle brackets <> are used to indicate certain key names contrary to a sequence of key strokes. Example: <Del> = the Del(ete) key, Del = the D, e, l key sequence.

Hardware and software mentioned in this document are subjected to continuous development and improvement. Consequently, there may be minor discrepancies between the information in the document and the performance or design of the product. Specifications, dimensions and other statements mentioned in this document are subject to changes without prior notice.

Federal Communications Commission
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

IMPORTANT

Read the Safety chapter before starting the machine.

MYDATA automation AB, Adolfsbergsv. 11, S-168 66 Bromma, Sweden.

Phone: +46 8 475 55 00 - Fax: +46 8 475 55 01 - Internet: www.mydata.com

Contents

1. Safety

2. About the Documentation

3. Installation

4. X Movement System

5. Mount Heads

Appendix A - Service Program Reference Guide

Index

1. Safety

Operational safety instructions, found in the operator´s manual, must be read carefully before operating, maintaining or servicing the machine.

In addition follow the special safety instructions set out in this section.

DANGER! The permanent magnets of the T3 – T6 conveyor have an extremely powerful magnetic field. Personnel wearing heart pace-makers are NOT permitted to stand in the vicinity of permanent magnets.

WARNING! Do not approach permanent magnets when carrying metal objects made of iron, steel or nickel. The powerful force of attraction may cause fingers to be crushed.

CAUTION! Do not wear watches in the vicinity of permanent magnets since they can be damaged. Do not bring magnetic data media, check or credit cards near permanent magnets - the data on the data media may be erased by the magnetic field of the permanent magnets.

2. About the Documentation

The documentation of the MYDATA Component Placement Machines comprises the following parts:

- Operator's Manual

- Programming Manual

- Machine Manual

- Maintenance Guide

- Software Manual

- Spare Parts Catalog

The manual structure in Figure 2-1 show the intended user for each manual.
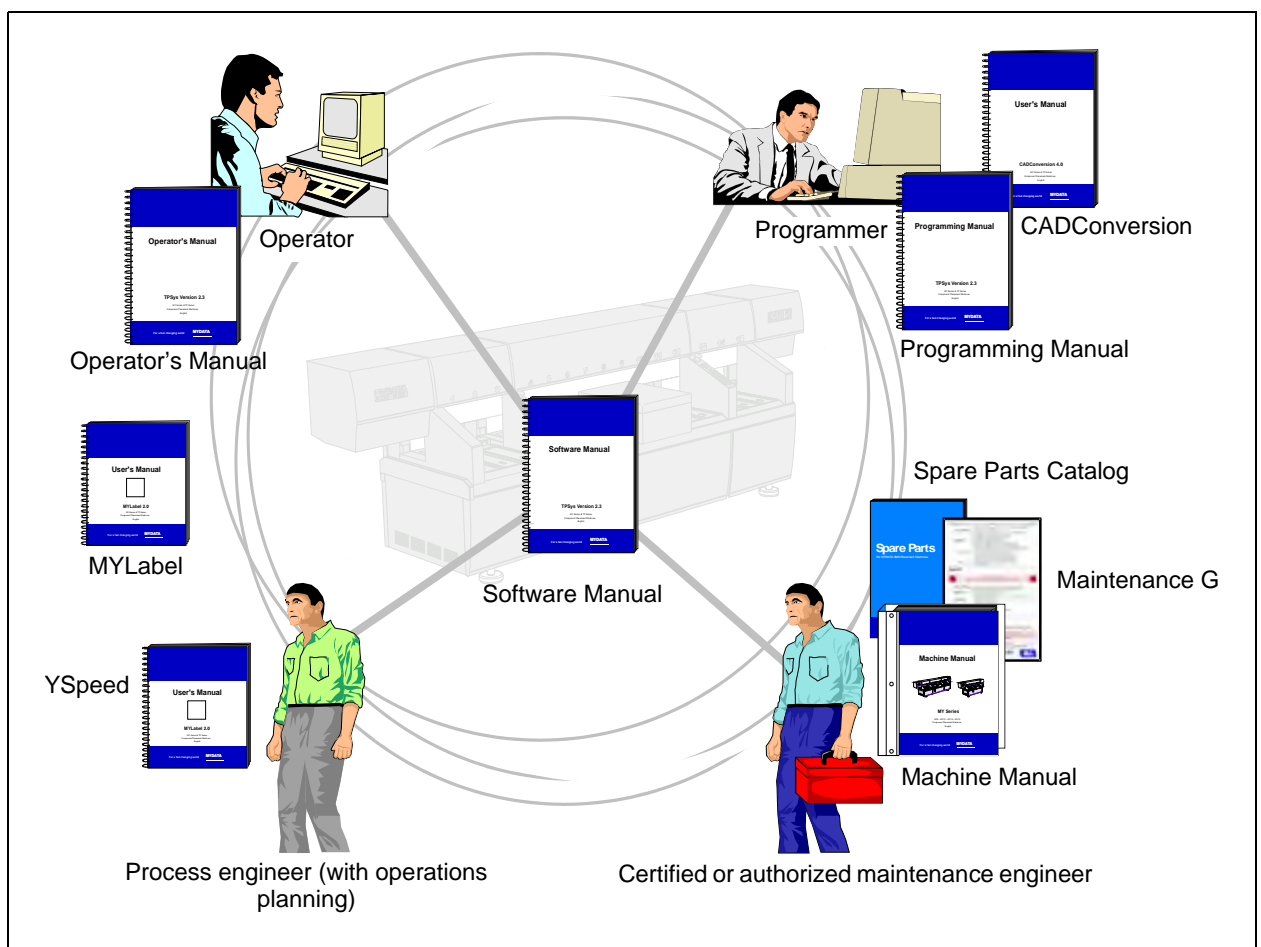
Figure 2-1. Manual structure

Operator's Manual

An Operator's Manual for TPSys version 2.4 covers all the MYDATA machine types.

This manual is provided with each machine.

The Operator's Manual is available in a number of languages.

The Operator's Manual contains information to assist the operator to start and operate the system, load components and handle magazines and trays.

Information about safety, daily maintenance, HYDRA, TEX and Tray Wagon operation is also included in the Operator's Manual.

Programming Manual

A Programming Manual for TPSys version 2.4 covers all the MYDATA machine types.

This manual is provided with each machine.

The Programming Manual is available in the most common languages.

The Programming Manual contains basic information about the machine movements, coordinates, fiducial marks, angles, centering, verification, and how to program boards, create mount lists, maintain and complete component and package lists, etc.

Information about safety, preprogramming packages, HYDRA, TEX and Tray Wagon programming is also included in the Programming Manual.

Machine Manual

A Machine Manual is available for each of the machine series. There are thus two different Machine Manuals for the two current machine series:

MY9, MY12, MY15 and MY19

TP9-2U

Applicable manual is provided with each machine.

The Machine Manual is available in English only.

The Machine Manual contains descriptions, service instructions and calibration guidelines for the machine.

Information about safety, maintenance and common optional devices and systems are also included in the Machine Manual.

The Machine Manual has an index tag for the machine test protocol.

Also it is included in the software package, when upgrading TPSys version. This will ensure that the different calibrations, measurements and installation procedures will be accurate and up-to-date.

Also included in the Machine Manual is a CD-ROM disc that contains circuit diagrams and other schematics concerning the electronic systems in the MY series of machines. The schematics on the CD ROM are saved in PDF format. Use Adobe Reader to open the files. Adobe Reader is available for free download on the Adobe website (www.Adobe.com). Refer to the file named 'ReadMe' on the CD-ROM for more information.

The CD-Rom disc is found on the inside covers of the Machine Manual.

Maintenance Guide

A Maintenance Guide is available for each of the machine series. There are thus two different Maintenance Guides for the two current machine series:
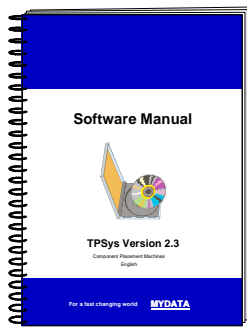
MY9, MY12, MY15 and MY19

TP9-2U

Applicable guide is provided with each machine.

The Maintenance Guide is available in the most common languages.

The Maintenance Guide contains service instructions and guidelines for the machine.

Software Manual

A Software Manual for TPSys version 2.4 covers all the MYDATA machines running TPSys version 2.4.

The Software Manual is available in English only.

The Software Manual contains a system overview, Linux description, import/export information, back up/restore instructions and communications.

In an appendix there is also a Message Reference Guide, containing those TPSys messages that can be displayed by TPSys, and descriptions of the messages.

Spare Parts Catalog

A Spare Parts Catalog, containing information, figures and part numbers on the most common spare and consumable parts, is available from MYDATA.

The Spare Parts Catalog is available in English only.

3. Installation

In this chapter you will find the following information:

– *Site Preparation* on page 3-2.

  Describes what is required of the site for a successful installation.

– *Installation* on page 3-6.

  Describes how to install the machine at the site. There is also site preparation check list on page 3-15.

Site Preparation

In this section you will find prerequisites of what is required of the site for a successful installation of a MYDATA Placement Machine. Details about the working area, environmental and electrical requirements, and regulatory compliance are given. Follow these directions to ensure a safe and proper installation, as well as ongoing operating efficiency.

Site Preparation Check List

1. Identify the desired location for the machine. Verify that enough space is available.

2. Verify that all environmental requirements are met.
   – Temperature
   – Humidity
   – Cleanliness/airborne contaminants

3. Verify that the floor is level and can take the weight.

4. Plan the transportation route to the installation site.

5. Verify that means for transportation and lifting are available (fork lift, crane etc.).

6. Obtain required, stable input power.

7. Arrange for electrostatic avoidance equipment.

8. Table (and chair) for terminal/printer.

9. Network connection.

Required Working Area

Prepare a suitable working area according to the dimensions shown in Figure 3-1 and Figure 3-2. The dimensions shown are the minimum space required for the machine with no extra options. To achieve a more efficient working area, add space for operating personnel and storage area for magazines, components etc.

Note that space around the machine is necessary for maintenance of the machine and optional equipment, if any.

Machine weight

The floor, on which the machine is transported and finally positioned, must support the machine weight, which is:

for MY9   1,800kg (3,970lbs) net weight.

for MY12   2,000kg (4,410lbs) net weight.

for MY15   2,500kg (5,510lbs) net weight.

for MY19   2,800kg (6,170lbs) net weight.

Shipping gross weight

The shipping gross weight depends on the quantity of delivered options.
A usual gross weight is the machine weight plus approximately 1,000kg
(2,200lbs).

The site

The floor at the machine site must be level.

It is recommended that the area at the machine site is ESD (Electrostatic
Discharge) protected.

Cables for mains and computer network are connected to the machine at the
rear (see Figure 3-2).

Maximum cable length from the machine to the terminal or printer is 5m
(197").

The machine noise is maximum 62dB(A).
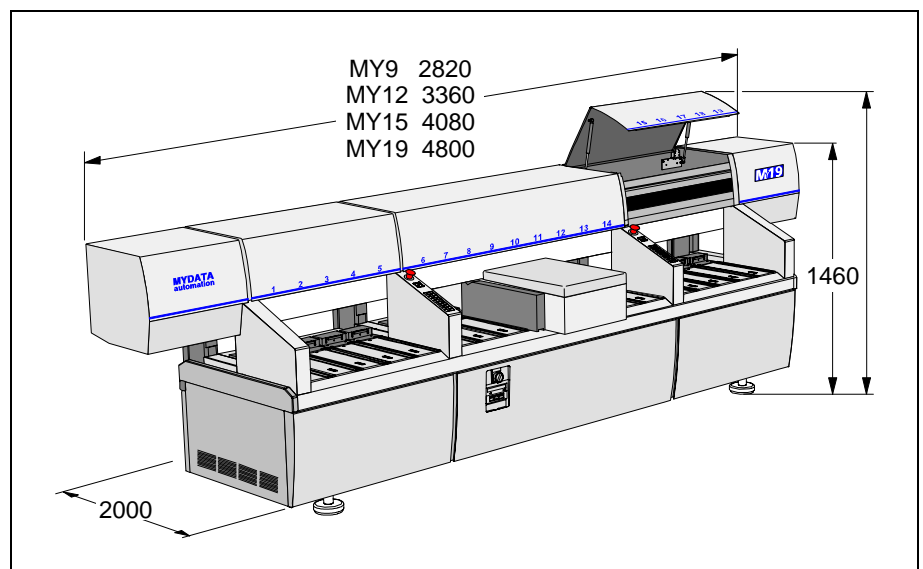
Figure 3-1. Main dimensions

Figure 3-1 shows the main dimensions (in mm). Note that the height,
1460mm, does not include the monitors.
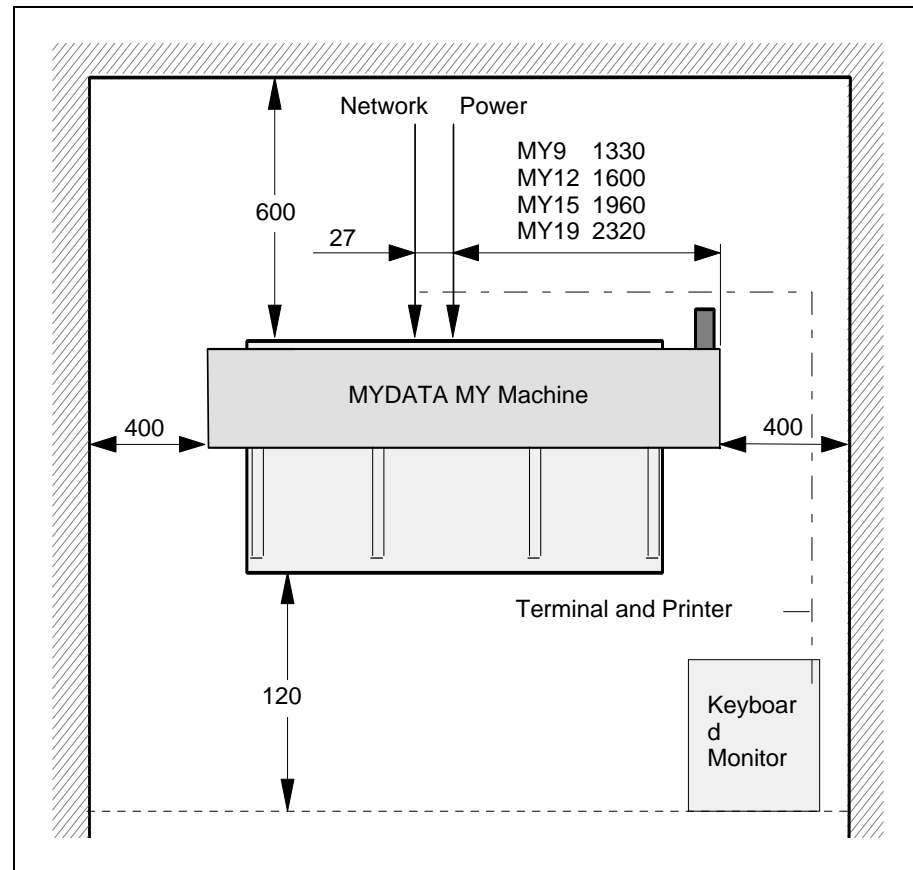
Figure 3-2. Clear space around the machine

Figure 3-2 shows a top view over the required service area around the machine (measurements in mm), the position of the keyboard, monitor and printer and the terminal and printer cables.

Also the position of the network and power inlets are shown in the figure.

Environmental Requirements

Temperature

Operating: +18 to +35°C with full performance.

+10 to +18°C and +35 to +40° with no guarantee of the accuracy.

Storage: –30 to +65°C

Relative humidity

Operating: <95%, non-condensing

Storage: 100%

Dust and dirt

The machine does not require a clean-room environment but dust and dirt must be kept as low as possible. The maintenance intervals are shortened by high temperature and dusty or dirty environment.

Electrical Requirements

Three phase 50/60Hz AC, 6.6kVA (3 x 2.2kVA), 5-wire connection, slow blow fuse (T).

Acceptable voltages (±10%): 435/250, 415/240, 410/235, 400/230, 390/225, 380/220, 370/215, 365/210, 220/127, 210/121, 200/115, 190/110.

Regulatory Compliance

All the MYDATA machines meet the following EU directives:

– 98/37/EC (regarding machinery)

– 89/336/EEC and amendment 92/31EEC (regarding EMC)

– 73/23/EEC (regarding low voltage)

Installation

Upon arrival the machine must be unpacked, lifted, moved to the machine site and leveled.

This section describes how to perform the installation tasks and is divided into the following main parts:

Equipment

– Standard Tools
– Set of Allen Keys(mm)
– Spirit level and 70mm wrench.
– Lifting equipment

Unpacking

The machine is shipped in a wooden crate (outside Europe) and must be handled with care. It is strongly recommended that a MYDATA representative is present when the machine is unpacked.

1. Inspect the "Shock-Watch" and "Tilt-Watch" gages for activation and the crate for damages. These must be annotated on the Bill of Lading and goods received note.

2. Remove the top lid.

3. Remove the rear and front sides of the box.

4. Remove the plastic protection.

5. Remove the additional packages fastened to the machine (monitor, printer, magazines, etc.).

6. Release the machine from the bottom of the box.

7. Inventory all packages to ensure that the correct items are delivered according to the packing list. If not, contact your local MYDATA representative.

Items that are always included:

- Power cable

- Keyboard and trackball

- Printer and printer cable

- Monitor (with cables)

- Spare part kit

- Calibration board

- Operator's Manual

- Programming Manual

- Machine Manual

- Maintenance Guide

Lifting the Machine

To avoid tilting or damaging the machine, always lift the machine as described below. The description includes fork lift as well as crane lift.

WARNING! Lift the machine as described below. Otherwise, the machine may become damaged and the lifting may become dangerous.

Fork Lift

Normally, the machine can be lifted with the forks placed at the center of the machine, se Figure 3-3.
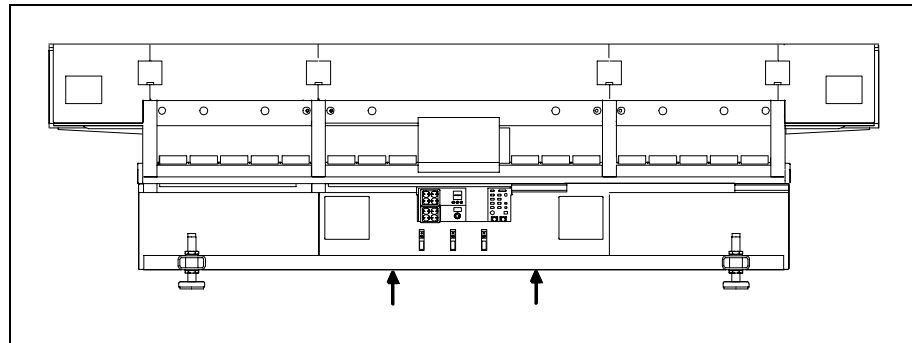

Figure 3-3. Fork lift

Figure 3-3 shows a MY19 machine, but the forks are to be placed in the center for all machines in the MY series.

If the Y wagon is fitted other than in the center of the machine, it may be necessary to compensate for this unbalance by placing the forks slightly more to the side where the Y wagon is positioned.

Crane Lift

A lifting equipment, available from MYDATA Sweden, should be used when lifting the machine with a crane.

☞ The machine´s center of gravity is located near the front of the machine. Therefore the hoisting cable should be slightly shorter at the front.

Figure 3-4 shows a MY19 machine, but the procedure is the same for all the machines in the MY series. The numerals in the Figure 3-4 refer to the description.
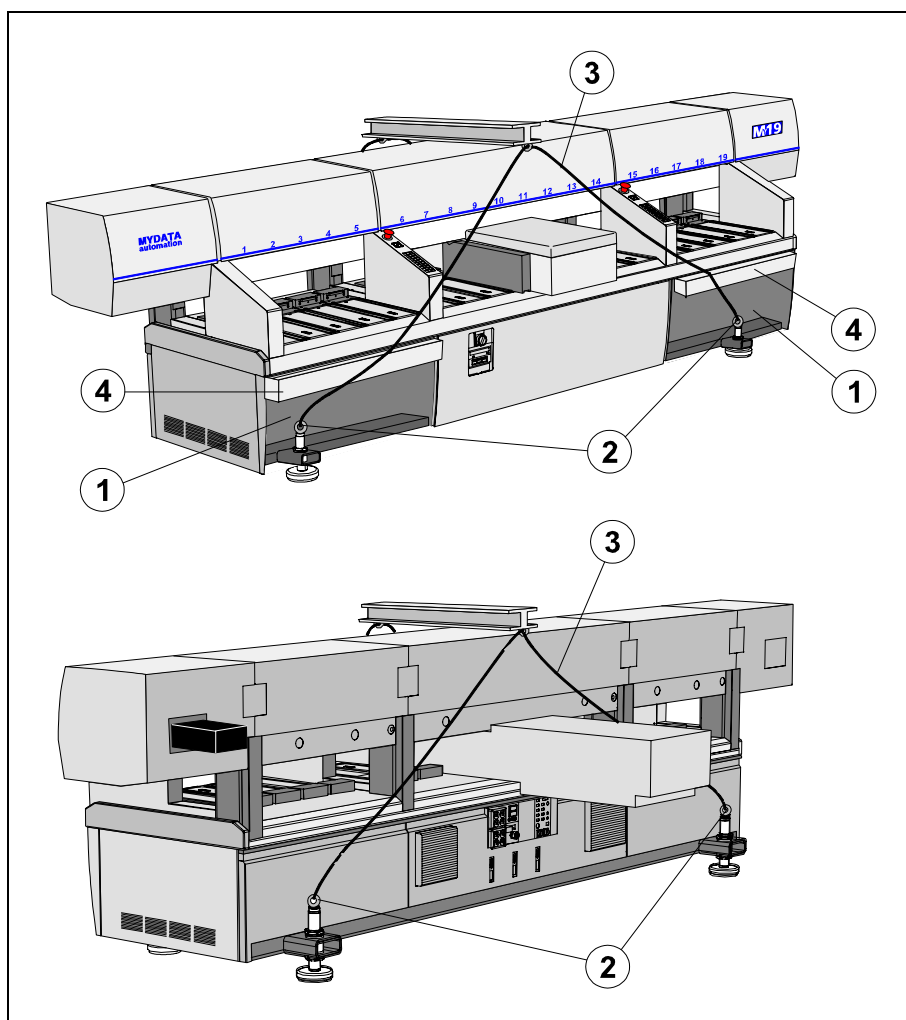

Figure 3-4. Crane lift

1. Remove the front cover(s) at the leveling feet.

2. *For MY9*: Fit lifting eye bolts (M30 thread) in the two leveling feet at the rear of the machine.
   For MY12, MY15, MY19: Fit four lifting eye bolts (M30 thread) in the leveling feet

3. *For MY9*:Fit the hoisting cable as in Figure 3-4 for the two eye bolts on the rear of the machine. Fit the front hoisting cable *around* the two front leveling feet.
For MY12, MY15, MY19: Fit the hoisting cable between the eye bolts and the beam. This beam has a length of 1500 mm (5 ft.)

4. Place a piece of cardboard, or a blanket, between the machine frame and the hoisting cable. This will protect the magazine table when the hoisting cable is stretched.

Moving and Placing the Machine

Move the machine to the final position and put it on the leveling feet. You can use either a fork lift or a crane. An alternative is to do as follows:

1. Place the machine on fixed supports, e.g. 280mm or higher solid wooden blocks. These supports *must* be placed under the *frame* of the machine.

2. Mount a wheel on each leveling foot using four screws (8mm Allen key) for each wheel.

3. Resting the machine on the wheels, move it to its final location.

4. With a jack under the cross bar at a short end of the machine, lift one side of the machine.

⚠ *WARNING! Block up the machine while working under it.*

5. Remove two wheels and place the machine on the leveling feet.

6. Repeat the procedure on the other side of the machine.

Leveling

When the machine has been placed in the final location, check the leveling as described below.

1. Place a spirit level on the Y wagon or on the magazine tracks and adjust the leveling feet until the machine is level in both directions.

2. Make sure that each leveling foot is screwed firmly against the floor so that the weight of the machine is divided equally on the four feet.

3. Check if the machine is steady by manually trying to rock the machine. If not, adjust the leveling feet.

4. Tighten the locking nut on each leveling foot.

Powering

MYDATA machines are set up for adequate mains supply before delivery. It is set according to the customer order i.e. normally only the mains power needs to be connected and nothing needs to be altered inside the machine.

Knowing your mains power supply, you can verify that the machine is properly set up by comparing the configuration plugs numbers in the machine to the table below.

If the mains voltage or the type of mains supply is to be changed, internal power connections in the machine must also be changed accordingly, see the next section.

DANGER! The power configuration plugs should only be installed by an authorized MYDATA service engineer.

Electrical Configuration

WARNING! Disconnect the mains before opening, or doing any work inside the machine.
Always ensure that the voltage labeled on the machine (close to the mains power inlet) corresponds to the mains. If not, check and when necessary replace the configuration plugs.

The machine is equipped with three mains transformers (TR1, TR2 and TR3), which all have to be configured in the same way and according to the supply voltage. Jumpers for configuration are provided as voltage configuration plugs. A fourth type of configuration plug is provided for selecting how the three mains supply phases are connected to the machine.
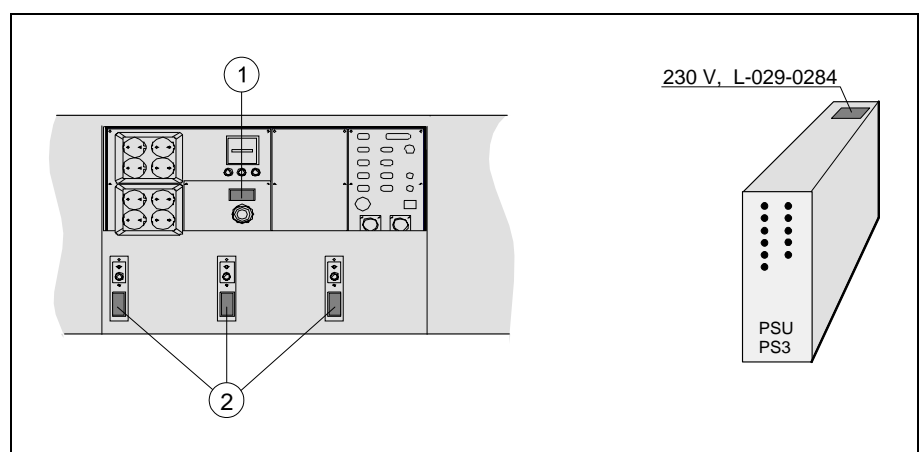

Figure 3-5. Configuration plugs

Figure 3-5 shows the rear panel with the type configuration plug (1) and the voltage configuration plugs (2).

Electrical Configuration Plug Table

Select the configuration plugs for the mains according to the table below.

Mains voltage V	Phases	D/Y	Voltage plug part #	Type plug part #	Remark
190/110	3	D	L-029-0292	L-029-0296	
200/115	3	D	L-029-0289	L-029-0297	Japan
210/121	3	D	L-029-0288	L-029-0296	USA
215/125	3	D	L-029-0428-1	L-029-0296	
220/127	3	D	L-029-0290	L-029-0296	220V w. no neutral Norway
225/130	3	D	L-029-0427-1	L-029-0296	
230/133	3	D	L-029-0426-1	L-029-0296	
235/136	3	D	L-029-0425	L-029-0296	
240/	3	D	L-029-0283	L-029-0296	USA 3-phase w. long leg
240/140	3	D	L-029-0424-1	L-029-0296	
250/175	3	D	L-029-0423-1	L-029-0296	
345/200	3	Y	L-029-0422-1	L-029-0295	
365/210	3	Y	L-029-0362	L-029-0295	USA
370/215	3	Y	L-029-0287	L-029-0295	
380/220	3	Y	L-029-0286	L-029-0295	
390/225	3	Y	L-029-0285	L-029-0295	
400/230	3	Y	L-029-0284	L-029-0295	EU standard
410/235	3	Y	L-029-0291	L-029-0295	
415/240	3	Y	L-029-0283	L-029-0295	The U.K. and Japan
435/250	3	Y	L-029-0282	L-029-0295	

WARNING! Never connect the mains before ensuring that the correct configuration plugs are installed.

Electrical Connection

This placement machine is intended to be stationary and movable to accommodate the changing production needs of the end use factory (this is in compliance with the NEC Article 400-7 and -8).

The machine is delivered with a 5 x 2.5mm^2 power cable and, depending on the destination, a US 5 pole, three-phase power plug (Figure 3-6), or a European standard 5 pole, three-phase power plug (Figure 3-7).

US power plug specification (Figure 3-6): NEMA L21-20P, 20A 3ýY, 120/208V AC, UL/CSA, 2HP, IP20.

Power Plug Connection

Connect the mains power plug according to Figure 3-6 or 3-7 and table shown below.
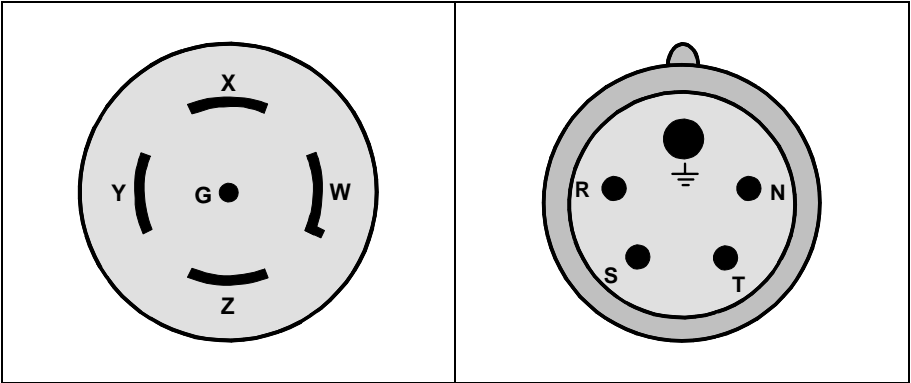
Figure 3-6. Power plug, US   *Figure 3-7. Power plug, Europe*

Part	Power plug markings US	Power Cord Color, US	Power plug markings EU	Power Cord Color, EU
Live 1	X	Orange	T	Black
Live 2	Y	Red	S	Brown
Live 3	Z	Black	R	Black
Neutral	W	White	N	Blue
Protective Earth	PE	Green	W	Yellow/Green

Power Cord Connection

The machine power terminal block is to be connected to the mains power cord as shown in Figure 3-8 and table shown below.
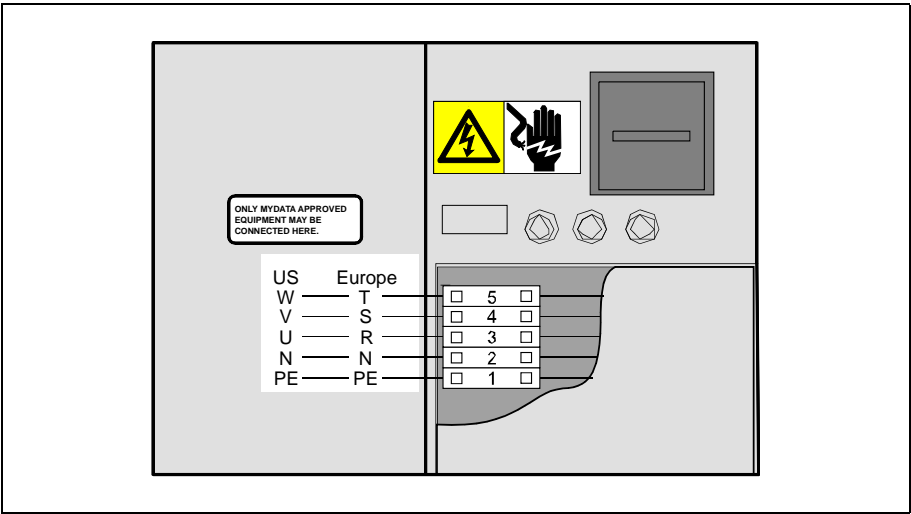

Figure 3-8. Power terminal block

Part	Power terminal block marking US	Power cord marking, US	Power terminal block marking EU	Power cord marking, EU
Live 1	W	Orange	T	Black
Live 2	V	Red	S	Brown
Live 3	U	Black	R	Black
Neutral	N	White	N	Blue
Protective Earth	PE	Yellow/Green	PE	Yellow/Green

WARNING! Never connect the mains power before ensuring that the correct configuration plugs are installed.

Network Connection

The computer network is connected with a RJ45 connector.

Machine Installation

The following listing show the installation tasks, and their recommended order, for a complete machine installation. The tasks are described in their relevant Chapters throughout the *Machine Manual*.

1. *Installing a Tool Bank* on page 6-5.

2. *Measuring the Centering Base Level* on page 7-3.

3. *Z-Unit Offset Measurement* on page 5-5.

4. *Calibrating the X wagon Camera*.on page 8-3.

5. *Place Area Calibration* on page 11-8.

6. *Measuring the Fine tune Z-unit offset* on page 5-7.

7. *Aligning The Mechanical Centering Unit* on page 5-6.

8. If the centering device was moved significantly in the previous step, redo *Measuring the Centering Base Level* on page 7-3.

9. *Calibrating Tool Offset* on page 5-8.

10. *Adjusting Magazine Slots* on page 12-2. Requires a reference magazine.

11. *Single Mounthead Tool Installation* on page 6-3.
    Check that the tool bank is compatible with the tools you are planning to use.

12. If applicable *Tray Wagon Magazine Installation* on page 12-24.

13. *Standard and Dual Vision Systems Calibration* on page 8-10. Calibrate (HRC) before (SVC).

14. *Calibration of Optical Centering (Linescan Vision System)* on page 8-21.

15. *Optical Centering Camera Offsets (Standard and Dual Vision Systems)* on page 8-14.

16. Do the *Fine Tuning the Centering Camera (Standard and Dual Vision Systems)* if the accur board (L-029-0243-2) was used . Use package QFP with 256 leads and a lead pitch of 0.4mm.

17. *Centering Camera Fine Tune (Linescan Vision System)* on page 8-26.
    Use package QFP with 304 leads and a lead pitch of 0.5mm.

18. *Cable Resistance Measurement* on page 7-4.

19. *Adjusting Y wagon Reject Bins* on page 11-11.

20. *Installing the HYDRA System* on page 5-11.

4. X Movement System

This chapter contains adjustment and calibration instructions for the X movement function.

Also, it contains some procedures to measure particular values for evaluating purposes during calibrations.

The machine contains the following four different movement systems:

1. X movement moves the X wagon in the X direction.

2. Y movement moves the Y wagon with the assembly table in the Y direction.

3. Z movement moves the mount tool vertically.

4. Theta movement rotates the mount head.

WARNING! In this chapter, some of the procedures causes the machine to make movements. The below warning must be followed for such procedures. Procedures that causes the machine to make movements are marked with this sign next to the text. Before entering such commands, check the following: Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions

Electrical Parts

The schematics covering the X movement system can be found on the enclosed CD-Rom disc.

Show Transducer Positions

This program shows the C, Theta, X, Y, and Z positions, and the Theta and Z positions for the HYDRA unit, if used. Use this procedure to detect transducer faults or faults in the transducer wiring.

Procedure

1. If you currently run TPSys, select *Restart TPSys* from the *Exit* menu and press the space bar on the keyboard to get to the Startup menu.

2. Select *Show Transducers* in the Startup menu.

3. When prompted OK to initiate hardware? press the <Enter> key. The Transducer Program window is shown, see Figure 4-1.

```
         ┌──────── Show Transducers ────────┐
   C: 45100
  Fi: -14271
   X: 569718
   Y: 540
  YM: 420
   Z: 2979      Released
 HFi: -211775
  HZ: 18

 Press F1 or Camera to change bet-
    when released Z- and hZ-axis
```
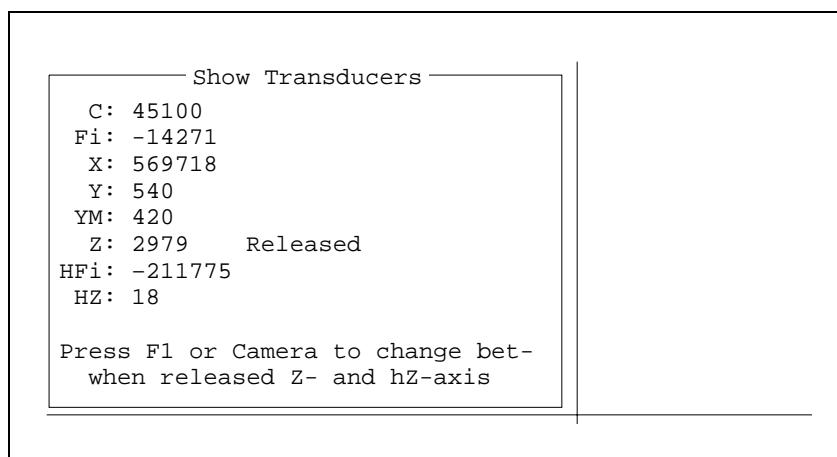
Figure 4-1. Transducer Program window

– Transducers named 'Fi' show the Theta values (in mDeg).

– The YM transducer is shown only if the machine has a tray wagon magazine, and the HFi and HZ transducers are shown only if the machine has a HYDRA unit.

– All axes, except for the X axis, are released. Use the joystick to make X movements.

⚠ *CAUTION! Watch the tool head during movements because the locks can be released, which means that the Z mechanism may go entirely down by its own weight.*

4. When ready with the Transducer Program, exit by pressing any other key than <F1> on the keyboard or Camera on the machine keypad.

5. Confirm by replying *Yes* in the shown *Exit* dialog box.

⚠ *WARNING! Make sure there are no fingers in the machine moving areas and press <Enter> to resume the previous positions:*

6. If you want to return to the Startup menu, press <Space> before TPSys is started.

Check X-wagon Grease Pump

Use the procedure below to test the function of the X-wagon Grease Pump.

Procedure

1. Start the Service Program by selecting *Exit To Service* in the TPSys *Exit* menu.

2. Select *Utility > Test PAIB board*

   The *Load board* dialog box is shown with the servo file that will be loaded to the MOT-X board.

3. When ready, select *Yes* in the *Load board* dialog box to start the measurement. The *PAIB Board Test* information box is shown:

```
┌──────────── PAIB Board Test ────────────┐
│ Emergency button: Yes    Limits exceeded: No │
│       Door open: No    X wagon fan fail: No │
│   ELMO disabled: Yes      Belt motor hot: No │
│                                         │
│  Motor relay on: No             ELMO on: No │
│  Grease pump on: No     Limit check on: No │
│   Set PAIB port: Enter                  │
└ Press <Space> to toggle ────────────────┘
```

4. Control the Grease pump status by moving the cursor to the *Grease pump on* field and press the <Space> key to toggle the Grease pump 'On' or 'Off'.

5. Press <Enter> to save the chosen setting.

Adjustment and Calibration

Adjustments and calibrations included in the X movement section are:

Measuring the X Belt Tension

This section describes how to measure the tension of the X belt, located under the upper covers of the machine.

Tools

– Frequency counter.

– Two prisms.

Procedure

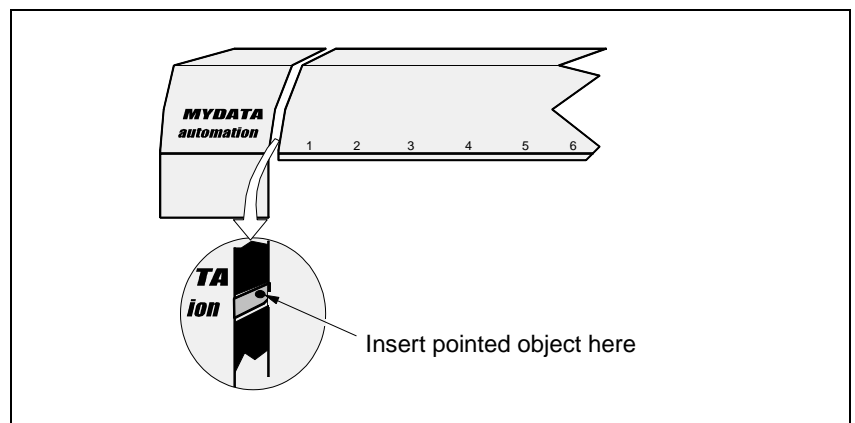**1.** Open the upper left cover using a pointed object, for example a thin screwdriver, see Figure 4-2.

Figure 4-2. Opening the upper machine cover

2. Move the X wagon to its leftmost position, see Figure 4-3.
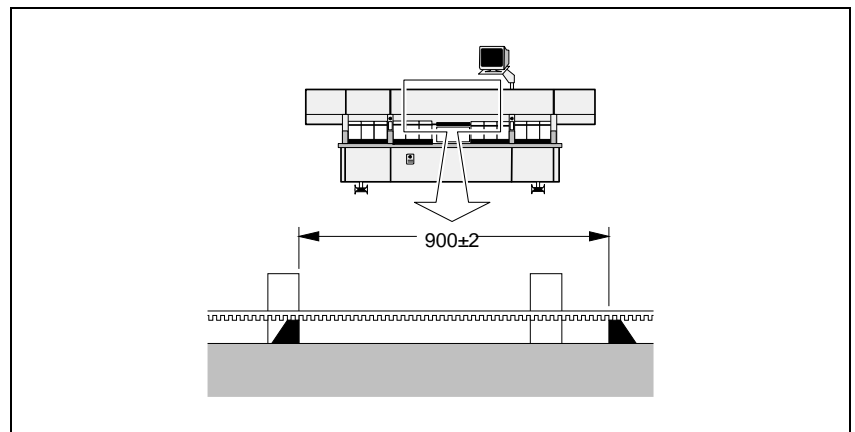
Figure 4-3.   Measuring the X belt tension

3. Put the two prisms on the X rail with the flat edge upwards as shown in Figure 4-3, under the X belt upper part. They should be placed with a spacing of 900mm ±2mm.

4. Measure the resonant frequency on the length between the prisms. The belt tension is correct when the frequency is 57Hz.

5. If the belt tension is not correct, then adjust as described in the next section *Adjusting the X Belt Tension*.

Adjusting the X Belt Tension

This section shows how to adjust the X belt tension if the measured frequency is not measured to be 57 Hz (see above).

A measured value below 57 Hz indicates that the belt is slack and must be tightened. A value above 57 Hz indicates a belt too taut and therefore needs to be untightened.

Procedure

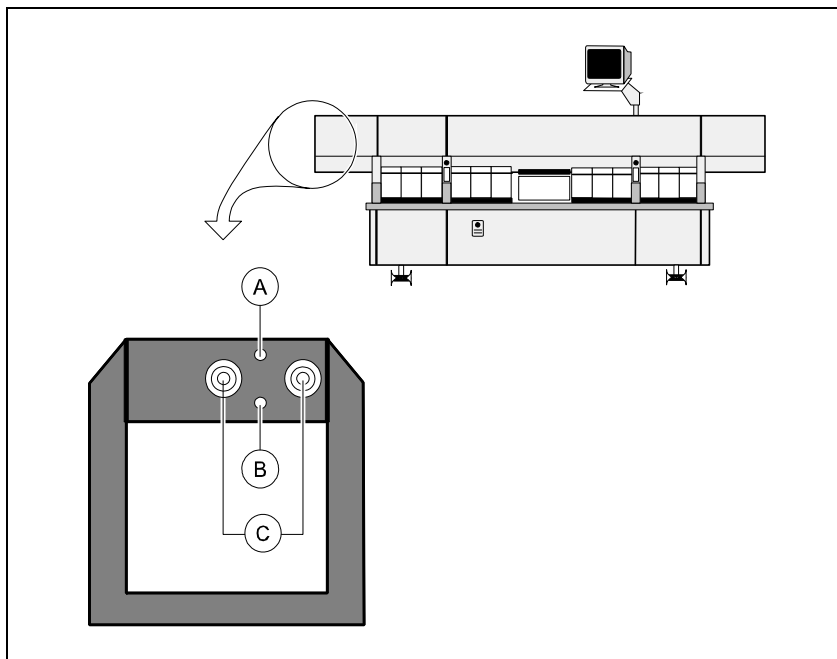1. Loosen the A and B fixing screws, see Figure 4-4.

Figure 4-4.   Adjusting X belt tension

2. Adjust the belt by turning the screws marked C and D in Figure 4-4 as follows:

    –   To stretch the belt – turn the C and D screws clockwise.When stretching the belt, loosen the A and B fixing screws successively.

    –   Loosen the belt – turn the C and D screws counter-clockwise.

3. Make sure that the belt is parallel to the X-rail end by adjusting the C and D screws equally.

4. When satisfied with the adjustment, tighten the A and B fixing screws.

5. Continue by performing the *Adjusting the X-Belt Pulley* procedure as described on page 4-7.

Adjusting the X-Belt Pulley

This procedure is used to adjust the X belt dynamic position on the pulley after adjusting the X belt tension.

The X-belt utility option in TPSys is used to run the X wagon back and forth, while adjusting the X-belt pulley.

Adjust the pulley using the X-belt utility as follows:

Procedure

1. Select *Exit > Exit To Service* in TPSys to start the service program.

2. Start the *X-belt utility program* by selecting *Utility > Adjust X belt*.

⚠ *WARNING! To simplify the adjustment the machine will move the X wagon continuously.*

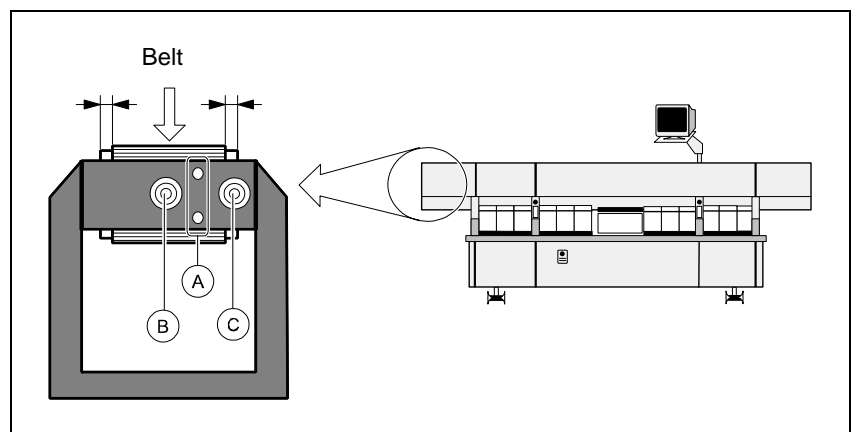3. Loosen the A and B fixing screws somewhat, see Figure 4-5.

Figure 4-5.   Adjusting X belt pulley

4. Adjust the dynamic position of the X belt to the center of the stretching pulley.
   – To move the belt leftwards, loosen the C screw somewhat and tighten the D screw somewhat.
   – To move the belt rightwards, loosen the D screw somewhat and tighten the C screw somewhat.

5. When the X belt is centered on the pulley and does not touch the driving pulley flanges on the opposite side of the machine, tighten the A and B fixing screws.

6. Terminate the X-belt program by pressing any key.

7. Finally, run the *X Axis Calibration* on page 4-8.

X Axis Calibration

This calibration creates correlation data for the X-wagon motor transducer and the X-belt motor transducer. The correlation data is inserted in a new X servo file.

This procedure is performed automatically on machines with MOT3D boards and HYDRA 21K during initialization.

On machines with previous servo software it must be performed manually:

– After the X belt has been stretched (see section *Adjusting the X-Belt Pulley*).

– Prior to initiating the hardware if a new servo is installed.

– If mechanical parts of the X axis mechanism have been replaced or adjusted.

1. If you are currently running TPSys, then select *Exit TPSys* from the *Exit* menu.

2. Start the *xCalibrate program* by entering the command xCalibrate at the Linux prompt.

⚠ *WARNING! This will create machine movements.*

3. Wait until the program is finished.

Measuring the Cog Play

This procedure is used to adjust the X-wagon motor cog play.

It is an adjustment that shall be performed if the X-wagon motor has been removed for repair, or after yearly maintenance.

The procedure should be repeated for each magazine (slot) position along the X rail.

Procedure

1. If you are currently running TPSys, then select *Exit TPSys* from the *Exit* menu.

2. Press both the emergency stop buttons down, move the X wagon by hand to a magazine position, and release the emergency stop buttons.

3. Select *Utility > Measure X cog play*

   The *Load board* dialog box is shown with the servo file that will be loaded to the MOT-X board.

4. When ready, select *Yes* in the Load board dialog box to start the measurement.

⚠ *WARNING! This causes machine movements.*

An alternating forward/reverse force of 127mNm is applied to the X-wagon motor, which increases in 1mNm steps until the X-belt motor transducer indicates a movement.

The system measures the cog play and presents the result like this:

```
Cog play was measured to 62µm
Try again?
          Yes    No
```

The cog play should be between 48µm and 108µm in all the magazine positions along the X rail.

5. Repeat the above procedure, on each magazine position along the X rail.

   – If the received value is outside the accepted range (between 48µm and 108µm) in any of the magazine positions, adjust the cog play as described in the next step.

Adjusting the Cog Play

Adjust the cog play as follows:

1. On machines with a Midas unit, remove the Midas Z motor (the Midas Unit is described in Chapter 5 *Mount Heads*.

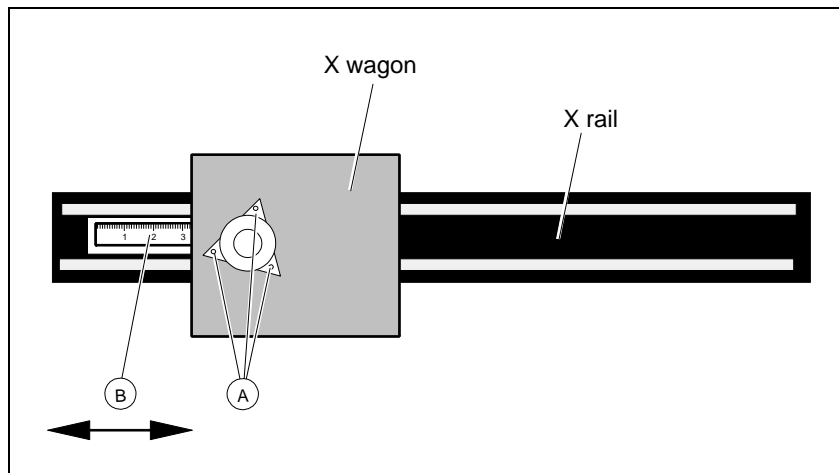**2.** Loosen the three motor fixing screws ('A' in Figure 4-6) somewhat.

X wagon

X rail

Figure 4-6.   Adjusting X cog play

3. Use a metal ruler with a hole in the end. Insert this ruler behind the X wagon and place the hole of the ruler over a pin used to adjust the cog play (B).

– To increase the cog play, push the ruler to the right.

– To decrease the cog play, pull the ruler to the left.

4. Tighten the three motor fixing screws (A).

5. On machines with a Midas unit, reinstall the Midas Z-motor.

6. Run the *X Axis Calibration* as described on page 4-8.
 (Not necessary if MOT3D and HYDRA 21K are installed).

5. Mount Heads

The MY series of machines can have two different types of placement heads:

Midas Unit

This is the fine pitch single mounthead on MY machines (See Figure 5-1).

HYDRA Unit

The HYDRA unit is a multiple mounthead with eight mount tools (See Figure 5-2).

The HYDRA unit can pick components from the Agilis M8, Agilis LM8, Agilis LM1216, TM8, TM8F, TM12, TM1216, TM16, TM Flex and VMF30 magazine types.
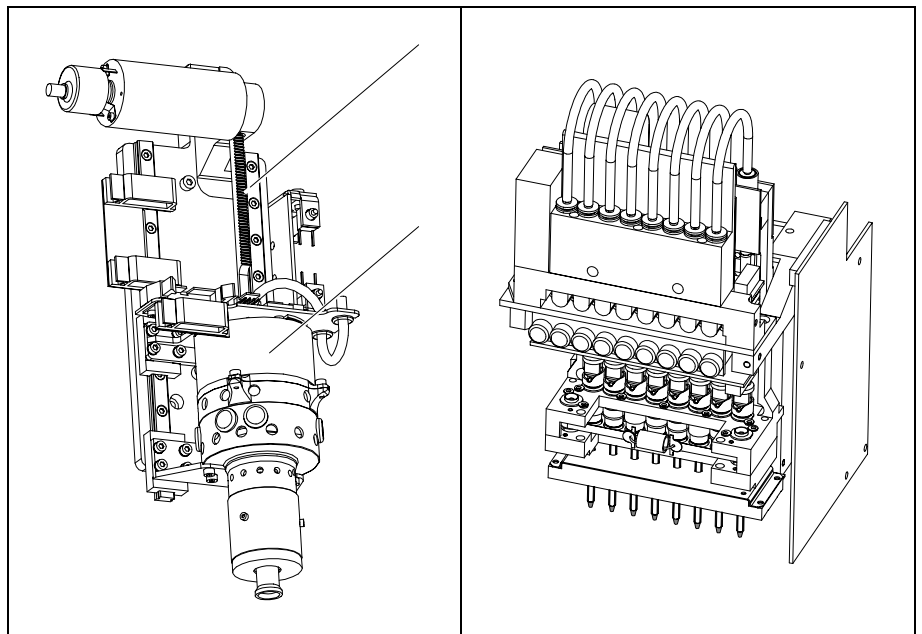
Both units are described in this section.

Figure 5-1. The Midas Unit *Figure 5-2. The HYDRA Unit*

⚠️ *WARNING! In this chapter, some of the procedures causes the machine to make movements. The below warning must be followed for such procedures. Procedures that causes the machine to make movements are marked with this sign next to the text. Before entering such commands, check the following: Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas. Ensure that the single mounthead and the HYDRA tools are in their upper positions.*

Midas Unit

The Midas unit is a highly accurate single mounthead for the MY series of machines.
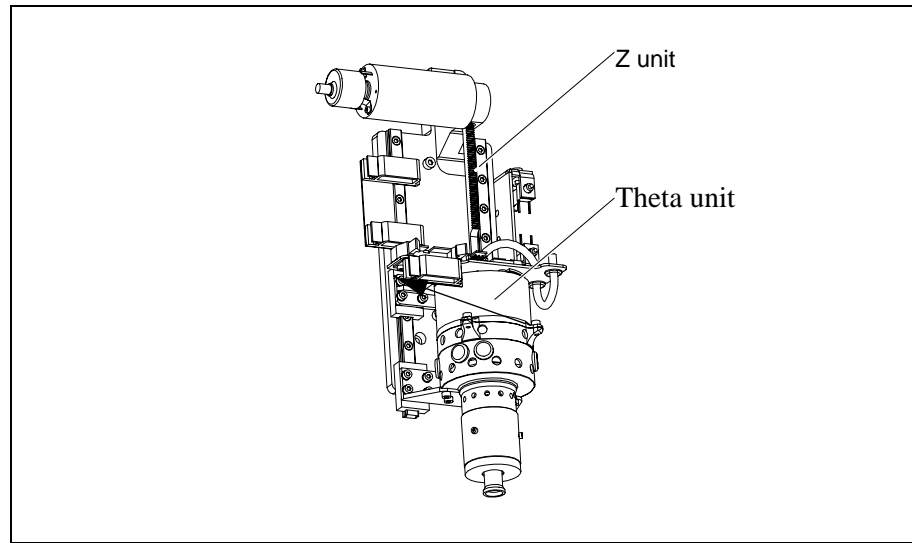

Figure 5-3.   Z and Theta units of the Midas

A Midas consists of two main units, the Z unit and the Theta unit (See Figure 5-3), which are assembled together. These two units include all devices needed for the Z movement and the Theta movement respectively.

In the Midas the motor and encoders are integrated with the Z shaft guided by stiff play-free bearings.

Electrical Parts

There are two PCBs included in the Midas Unit:

ZFIB located on top of the Theta unit. ZFIB is a connector board with a line driver for the Theta encoder.

FFX, which is a flexible board with Z sensors. FFX is located in between the ZFIB board and the tool head to allow the Theta movement.

The schematics covering the Midas Unit can be found on the enclosed CD-Rom disc.

Adjustment and Calibration

This section comprises the following adjustment and calibration procedures:

Measuring Midas Cog Play

This section describes how to measure the cog play for the Midas Z movement.

1. If you are in TPSys you must exit to the Linux prompt. Select *Exit > Exit TPSys*.

2. Enter `service -x` at the Linux prompt to start the extended service program.

3. Select *Utility > Test tools > Test of Midas > Friction test Z axis.* Allow the test to perform.

4. Select *View results on screen*. You may have to press <q> repeatedly to see the results.

5. Exit. If the cog play needs adjustment, please see the following section.

Adjusting the Cog Play

This section describes how to adjust the cog play for the Midas Z movement.

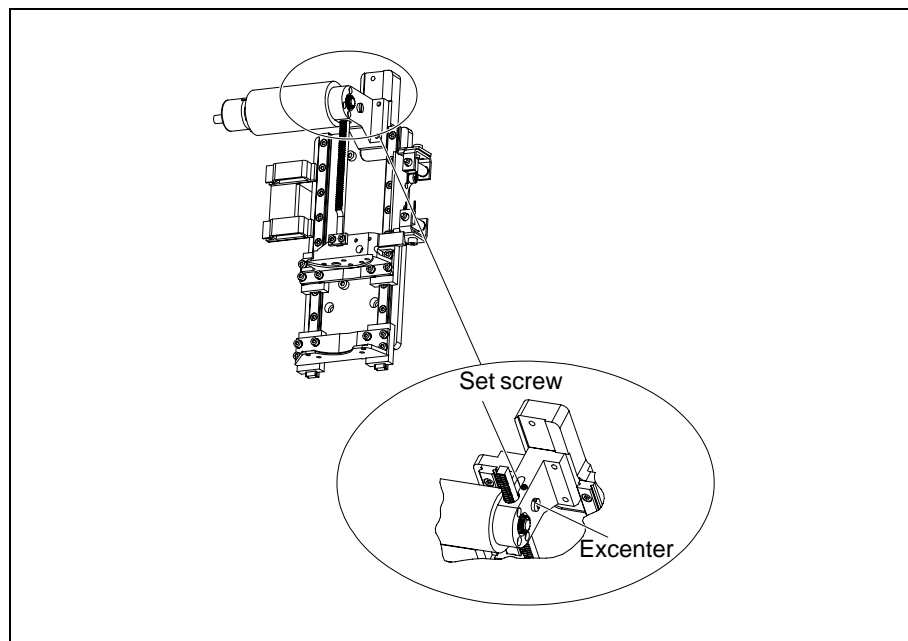☞ The Midas Unit does not require adjustment of the cog play after replacing the Z motor.

Figure 5-4.   Adjusting the cog play

Procedure

1. Carefully loosen the lock screw (see Figure 5-4).

2. Adjust the cog play. To check, press the rack gently towards and from the cog wheel by hand. Cog play must be as small as possible without increasing friction.

3. Adjust the cog play by turning the excenter screw (see Figure 5-4).

4. Tighten the set screw.

5. Run the friction program for Z motor. If the measured friction is too high, readjust the cog play and remeasure the friction again.

Z-Unit Offset Measurement
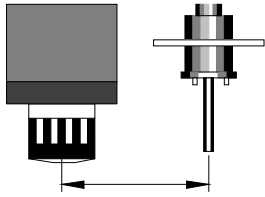
The purpose of this procedure is to set a coarse offset between the optical axis of the X-wagon camera and the mount tool center line.

This procedure should be performed when installing a new machine, or if the X wagon camera, or parts of the Z axis or table have been loosened.

Procedure

1. Start the offset measuring by selecting *Installation* from the TPSys *Utility* menu.

2. Select *Z-Unit Offset Measurement > Coarse measurement of Z-unit offset*.

3. When the dialog box *Select place position* is shown place a board on the assembly table.Use the trackball or joystick to move the cross hairs to a position on the board.

   Confirm the position by selecting *Ready* in the dialog box.

4. When prompted, manually apply the calibration package (L-010-0166-1) to the tool tip in 0 degrees, see the figure.
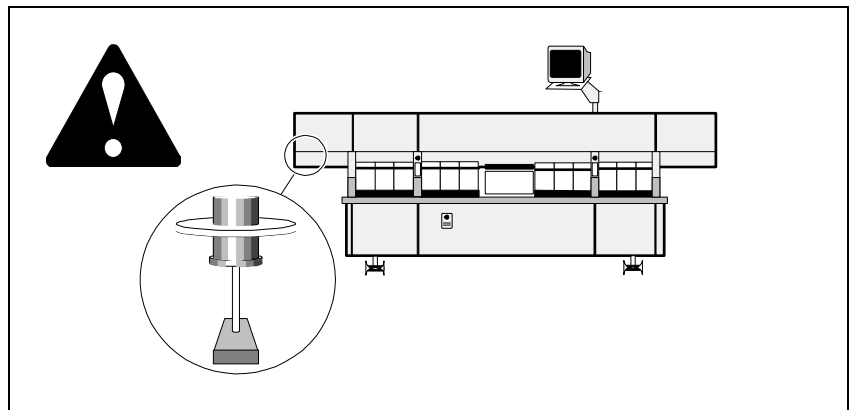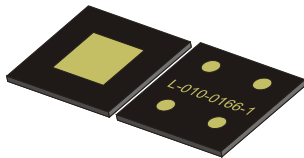
Figure 5-5. Center cross hairs

5. The component is placed on the board in 90 degrees. Center the cross hairs on the placed component, see Figure 5-5. Confirm by selecting *Ready* in the shown *Center cross hairs on component* dialog box.
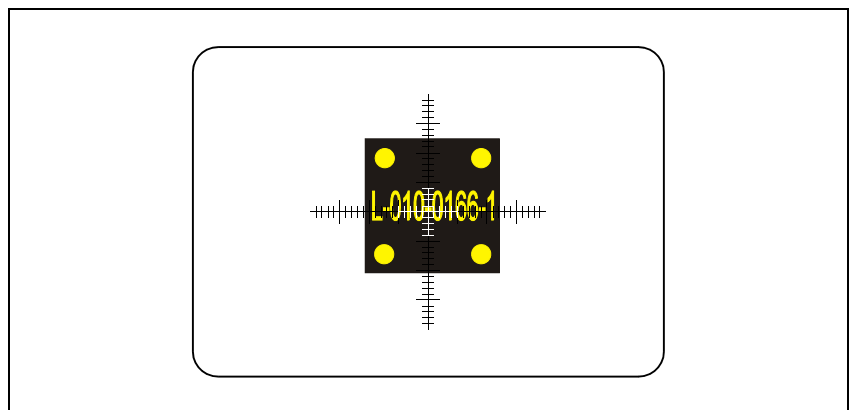
Figure 5-6. Center cross hairs

New and old Z-unit offset values are shown in a dialog box. The new values are saved after confirming the result. Continue with *Mechanical centering unit alignment* below.

```
New Z tool centering offset:
     X: 93843 µm   Y: 1303 µm
Old centering offset:
     X: 93891 µm   Y: 1211 µm
Difference
     X: 48 µm      Y: 92 µm
Save?
                  Yes  No
```

Aligning The Mechanical Centering Unit

This calibration is used to align the mechanical centering unit to the rotational center of the Z-unit mount tool.

1. Select *Utility > Installation > Mechanical centering unit alignment.*

2. Place a board and the calibration component L-010-0166-1 on the assembly table.

☞ Always place the calibration component perpendicular to the Y wagon, that is with the text running from left to right, for best results.

3. Locate the component and select a suitable place position when prompted. Confirm by selecting *Ready* in the shown *Center cross hairs on component* dialog box.

4. The offset value is shown in the dialog box below.

```
C misalignment: -12 µm (Limit is -6 µm)
Move unit to the left.
                  OK
```

5. If the C misalignment exceeds ±6µm, then the centering device should be adjusted as described in the *Adjusting the Centering Device* section in Chapter 7.

Measuring the Fine tune Z-unit offset

This procedure is a continuation of the *Z-Unit Offset Measurement* above. This procedure should also be run after a *Place Area Calibration* (See Chapter 11 *Board Handling Systems*).

Procedure
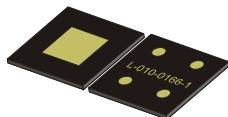
1. Place a board and the calibration component L-010-0166-1 with the four dots facing upwards on the assembly table.

2. Start the offset measuring by selecting *Utility > Installation*.

3. Select *Z-Unit Offset Measurement > Fine tune Z-unit offset*.

4. Move the cross hairs to any position on the board. The system will start the measuring and center the component automatically.

5. If the system can not locate the component – you will be prompted to locate the calibration component L-010-0166-1and confirm with *Ready* in the *Center cross hairs on component* dialog box.

6. The new values are shown in a dialog box.

```
New Z-unit offset:
     X: 93843 µm   Y: 1303 µm
Old Z-unit offset:
     X: 93891 µm   Y: 1211 µm
Difference:
     X: 48 µm       Y: 92 µm
Repeatability:
     X: 48 µm       Y: 92 µm
Save Z-unit offset?
             Yes  No
```

Calibrating Tool Offset

This calibration increases the placement accuracy when placing components close to the left edge of the Y wagon.

1. Select *Utility > Installation > Mount tool offset calibration.*

2. Place a board and the calibration component L-010-0166-1 on the assembly table.

3. The following will be asked by the system: *Select leftmost place position* and *Select rightmost place position*.

☞ TPSys will suggest default left and right positions. For best results do not adjust these positions.

---

4. The system will perform the measurements after the selection of positions. This may take up to ten minutes.

   A progress indicator will be displayed on the screen during this process.

5. The measured values are shown in the dialog box below.

```
Calibration successfully completed
Repeatability:
    X: 10 µm    Y: 10 µm
                       OK
```

Troubleshooting

The following table shows some of the symptoms that may turn up when installing and running the Midas Unit.

Symptom	Possible reason	Suggested action
CMB in the way of Midas.	Wrong CMB.	Change to CMB2, part # L-029-0371-1E.
Scraping sound when rotating Theta.	FFX worn.	Exchange the FFX board.
	Theta stop in contact with housing.	Adjust the Theta stop.
	Theta encoder broken	Exchange Midas unit
	Theta brushes worn out.	Exchange the brushes.
High Z friction.	Rack too tight.	Adjust the rack.
	Rack worn due to poor lubrication.	Exchange the rack and the Z motor.
	Cable holder touches the linear guides.	Bend the cable holder back.
Z sensor does not work.	FFX board worn or sensors broken.	Exchange the FFX board. See separate Repair Guide.
	FFX board connector not inserted properly.	Reinsert FFX board connector.
Midas does not work.	MOT2 motor board instead of MOT3.	Change to MOT3 board in the MOT-Z computer slot.
Z locks do not work.	Solenoids worn out.	Replace the solenoids.
	Z lock bracket bent.	Order new bracket or bend it back.
Theta upper/lower end point not repetitive.	The FFX board is too tight.	Adjust the FFX board. See separate Repair Guide.
Theta encoder not stable.	Theta stop loose.	Tighten the M4 screw at the rear of the Midas unit.

HYDRA Mount Head

The HYDRA system is a multiple mounthead designed to pick and place up to eight components during the same X movement. This considerably increases the placement speed.
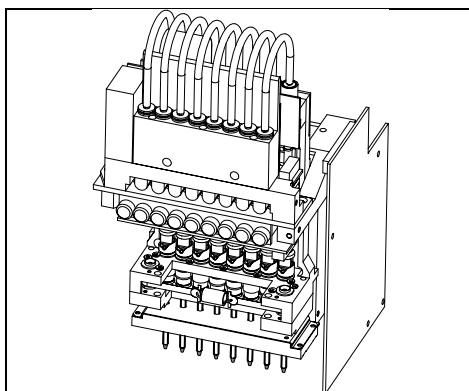

Figure 5-7.   HYDRA Unit

Electrical Parts

Boards involved in the HYDRA electronics are as follows:

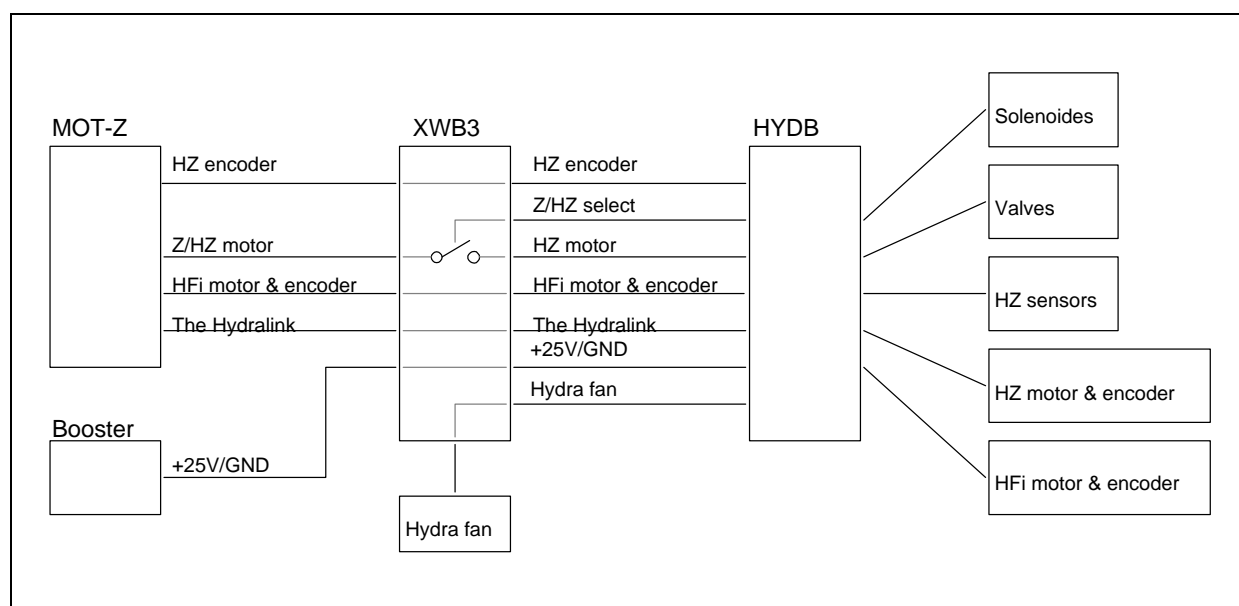*Figure 5-8. HYDRA electronics, block diagram*

HYDB	Main control board (right side of HYDRA unit).
HYDSB	Solenoid board (below the solenoids)
HYDVB	Valve board (behind the front, above the solenoids)
HYDUFB	Upper front board (flex board)
HYDUBB	Upper back board
XWB3	X-wagon board 3
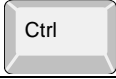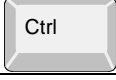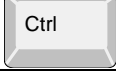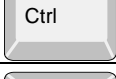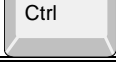
The schematics covering the HYDRA Unit can be found on the enclosed CD-Rom disc.

Installing the HYDRA System

This section describes how to install and calibrate the HYDRA. TPSys allows vision centering of HYDRA picks using either the HYDRA Vision Camera (HVC) or the Line Scan Camera (LSC).

It is also possible to use the LSC during installation and calibration of the HYDRA unit. Many of the steps in the installation procedure can be performed using either the LSC or the HVC.

During the installation procedures the camera view can be moved by using the following key combinations.

Key Combination	Move Camera View
Ctrl + ↑	Up
Ctrl + ↓	Down
Ctrl + ←	Left
Ctrl + →	Right
Ctrl + PgUp	Zoom Out
Ctrl + PgDn	Zoom In
Ctrl + Home	Back to normal view

Open the HYDRA Installation Menu by selecting *Utility > Installation > HYDRA*.

```
                         ┌─ HYDRA ─────────────────────────┐
                         │ M Measure HYDRA Camera Z Height            │
5 - 12                   │ A Align HYDRA Camera X/Y                   │
                         │ S Coarse Adjust HYDRA Tool Offsets         │
                         │ T Measure HYDRA Tool Tube Lengths          │
                         │ B Align Ref. Background                    │
                         │ C Calibrate HYDRA Camera Optics            │
                         │ R Measure Ref. Background Height           │
                         │ L Measure HYDRA Ref. Line                  │
                         │ Y Measure Centering Offset For HYDRA Camera│
                         │ E Measure Centering Offset For Linescan Camera│
                         │ O Measure HYDRA Tool Offsets               │
                         │ H HYDRA Tool Utility                       │
                         └────────────────────────────────┘
```

The installation procedures should be performed in the order the procedures are listed in the menu above.

Prerequisites

The HYDRA unit has to be mounted and aligned carefully according to instructions in the HYDRA Installation Guide.

– Set of Allen keys.

– Vernier caliper.

– HYDRA Calibration plate if the HYDRA Vision Camera is used.

– Specially made calibration component.

Measure HYDRA Camera Height

The purpose of this procedure is to measure the height of the HYDRA Vision Camera in order to calculate the centering level of the camera. Perform this procedure when a new HYDRA system is installed and will use a HYDRA Vision Camera (HVC) for centering.

Procedure
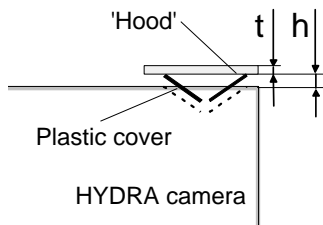
To measure the camera Z level with the single mounthead, a protection hood with known thickness ('t' in the figure) must be placed over the camera opening. Use for instance a metal ruler as hood. If the camera openings plastic cover is sticking up above the camera housing, this height ('h' in the figure) must also be measured and added to the thickness of the hood. Use a vernier calliper to measure the height.

1. Ensure the single mounthead has no tool.

2. Set the parameter *64.0004 Hood height* to'Measured hood thickness (t+h)' in TPSys.

3. Select *HYDRA > Measure HYDRA Camera Z Height*.

4. When prompted, place the hood (metal ruler) over the plastic cover on the HYDRA Vision Camera, so that the single mounthead can measure the camera height.

5. When ready, press <Enter>. The X wagon camera will move to the HYDRA camera.

   The camera view with a cross hair is shown on the screen:
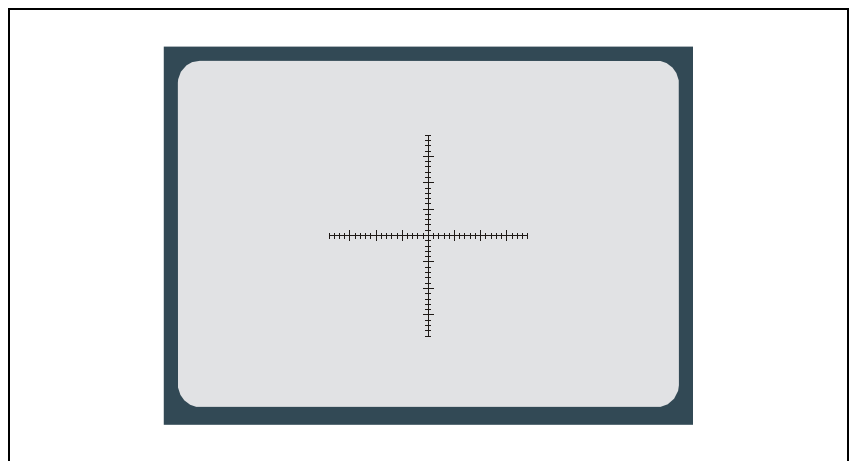
Figure 5-9. Center the cross hairs

6. Center the cross hairs on the approximate center of the covered HYDRA Vision Camera opening. When done, select *Ready* in the dialog box and press <Enter>.

   The single mounthead will now measure the camera level.

7. When prompted, remove the object used as a hood and press <Enter>.

Align HYDRA Camera

The purpose of this procedure is to measure the X-wise coordinate of the HYDRA Vision Camera (HVC). Also to physically adjust the camera Y-wise, so that the center of its CCD coincides with the center of the single mounthead.

Procedure

1. Select *Align HYDRA Camera X/Y* in the *HYDRA* menu.

   The machine fetches the tool to use and moves the single mounthead to the expected X position of the HVC. It moves the tool to the centering level. The camera view with a square graph is shown on the screen:
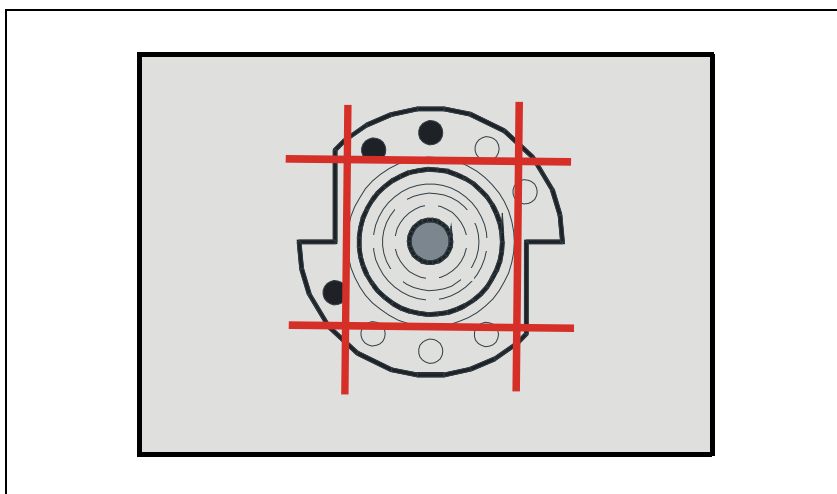
Figure 5-10. Align the tool inside the square

2. Align the tool's X position inside the square using the joystick, see Figure 5-10.

3. If necessary adjust the HVC Y position (points 4 - 9 below).

4. Loosen the lid of the camera box and remove it (e.g. with a magnet). See Figure 5-11.
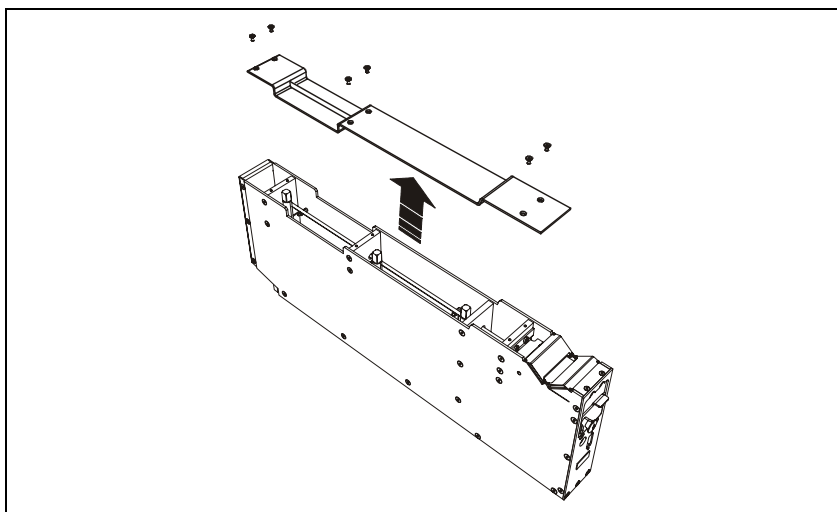
Figure 5-11. Remove camera lid

5. Loosen the three bars in the camera box with a 9mm universal screw spanner. See Figure 5-12.
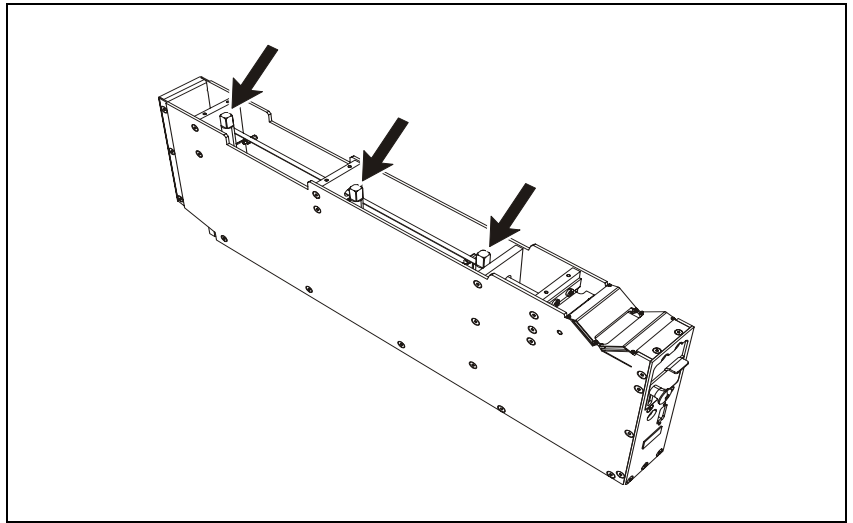
Figure 5-12. Loosen bars

6. Loosen screw located in the front of the camera box ('A' in figure 5-13).

7. Adjust the Y position of the camera with screw (B). By turning the screw clock-wise the camera can be moved towards the front of the machine (on the monitor it looks as if the camera is moving downwards).
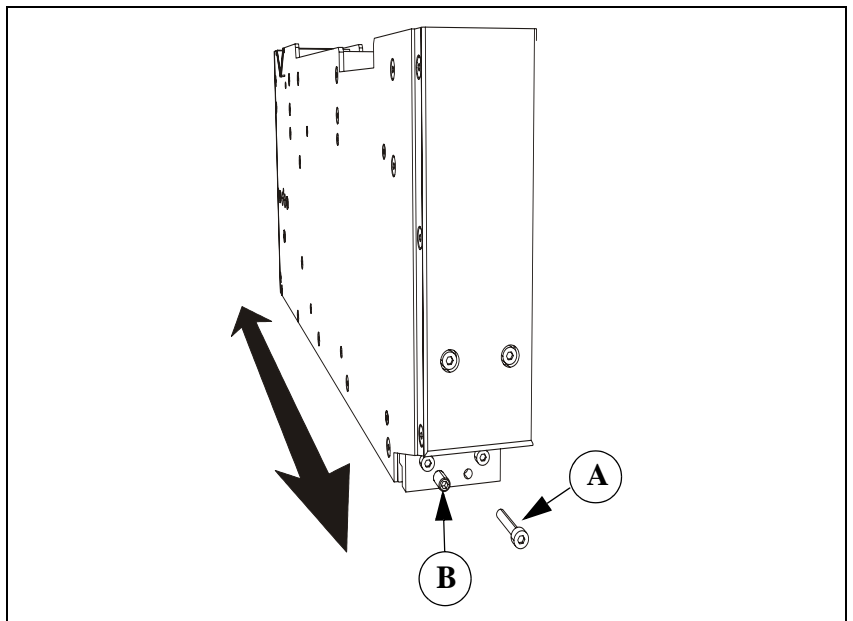
Figure 5-13. Adjust camera Y-position

8. When satisfied with the Y position, fasten screw (A) and the three bars in the camera box.

9. Reattach the lid.

10. If satisfied with both the X position and the Y position, select *Ready* in the dialog box and press <Enter>.

11. When prompted select *Yes* in the dialog box and press <Enter> to save the new position coordinates of the HYDRA Vision Camera.

Adjust HYDRA Tool Offset

The purpose of this procedure is to set good approximate values of the HYDRA Tool Offsets. It is necessary to have good offset values to be able to pick components in later installation procedures. Perform this procedure when a new HYDRA system is installed.

This procedure can be carried out with either the HVC or the LSC, if present.

☞ If you are reinstalling a HYDRA unit and have not moved it mechanically you can skip this step.

Procedure

1. Select *Utility > Installation > HYDRA > Coarse Adjust HYDRA Tool Offsets*.

2. Select which camera to use in the shown dialog box.

☞ The X wagon moves to the selected camera. Depending on the selected camera, the system shows different camera views.

Figure 5-14 shows the camera view when a HYDRA Vision Camera (HVC) is used. Figure 5-15 shows the camera view when the LineScan Camera (LSC) is used.

3. Using the joy-stick or trackball, align tool number 4 between the two parallel lines drawn in the graph. For HVC see Figure 5-14 for and for LSC see Figure 5-15.
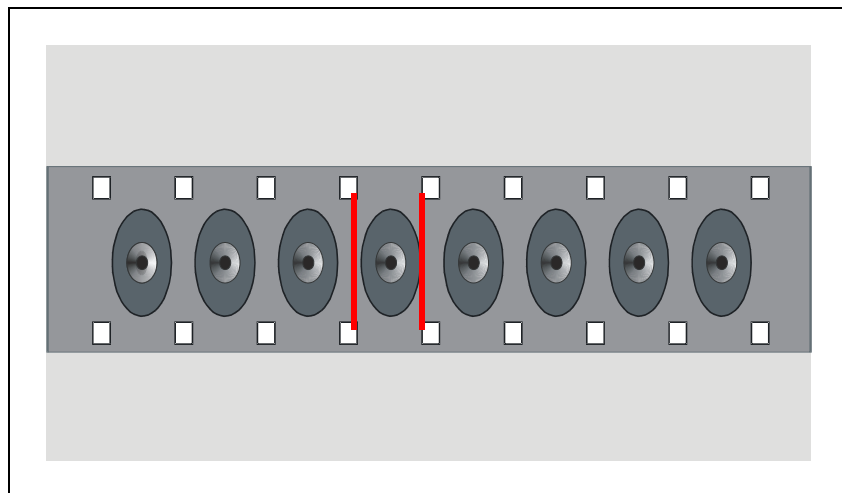
Figure 5-14. HVC view
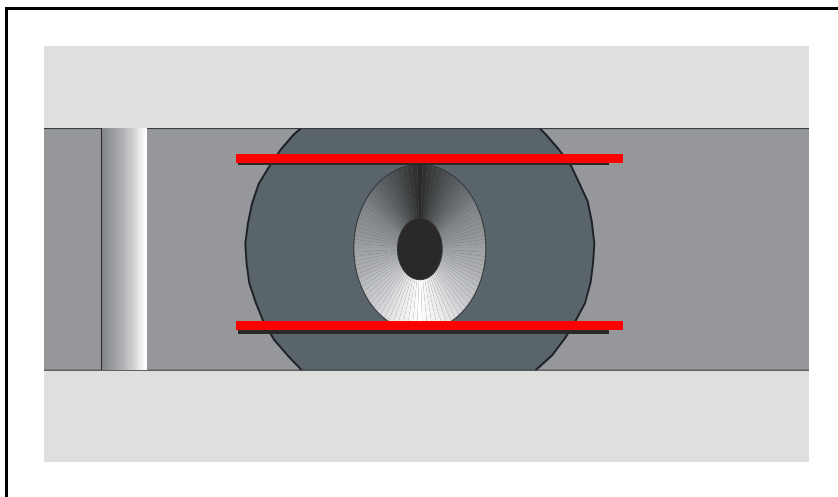
Figure 5-15. LSC view

4. The previous step is repeated for tool number 5.

5. When done, the following message is shown:

```
New HYDRA tool 1 offset (at:
    X: 189007 µm   Y: 0 µm
Old HYDRA tool offset:
    X: 189007 µm   Y: -452 µm
     Save?
             Yes          No
```

Only the offset for tool number 1 is displayed.

6. If you are satisfied with the result, select *Yes* and press <Enter> to accept the *New HYDRA tool* offsets value.

Measure HYDRA Tool Tube Length

This procedure will measure the length (offset Z-Hz) of the HYDRA tool tubes. Perform this procedure when a new HYDRA system is installed.

☞ There shall not be any tool tips on the tool tubes during this measurement.

Procedure

1. Select *Utility > Installation > HYDRA > Measure HYDRA Tool Tube Lengths*.

2. The *Measure Z level* dialog box is shown on the screen.

3. TPSys will select all tools when the Measure Ref. Background Height dialog box is shown. If you do not want to use all tools, select the tool type you want and press <Enter> when ready. The camera view with a cross hair is shown on the screen:
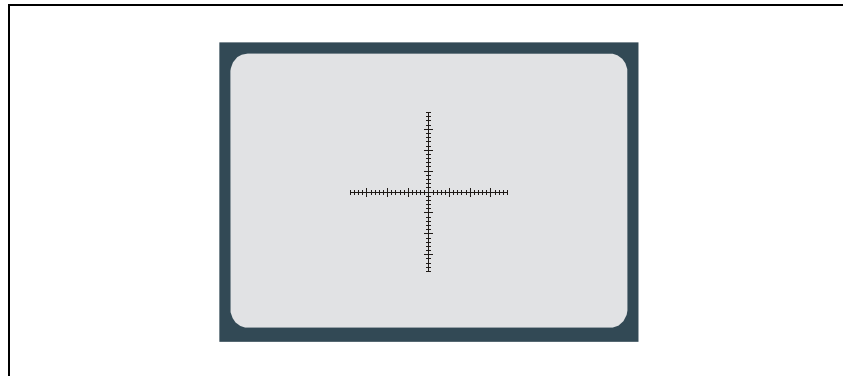
Figure 5-16. Camera view

⚠ 4. Move the X-wagon camera to a hard, even and clean surface suitable for measuring of the Z height. The PCB guide bar on the manual load table, or the light sensor tower of a conveyor are good examples.

☞ It is important to make sure the HYDRA heads can reach the measurement surface. The Midas tool bank on a conveyor is too low for the HYDRA to reach. Make sure the Midas touches the measurement surface properly.

5. When satisfied with the position, select *Ready* in the dialog box and press <Enter>. If there are any tool tips on the HYDRA tool tubes, the X wagon moves to a position suitable for moving the HYDRA tool tubes down.

⚠ 6. Ensure no obstacles are in the way, before confirming down movements with the tool tubes. Select *Yes* in the shown dialog box to confirm.

7. Press down an emergency stop button.

8. When prompted, remove any present tool tips and confirm by selecting *Yes* in the dialog box.

9. Release the emergency stop button and the machine will start the measuring process. First using the single mounthead (without tool) and then all the HYDRA tools one at a time.

10. When the *Measuring finished* information box is shown, Press <Enter> to exit the procedure.

Aligning HYDRA Camera Background Reference
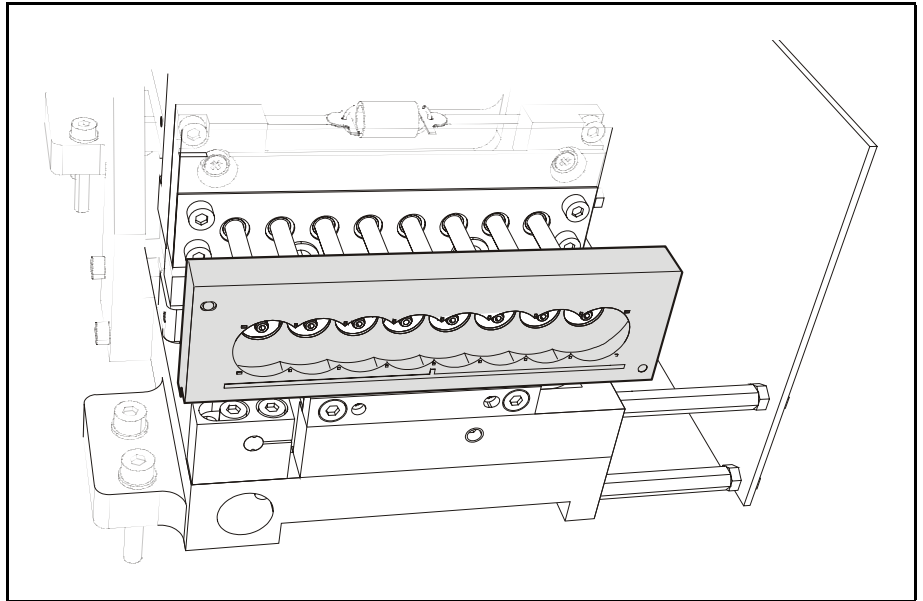
Figure 5-17. HYDRA reference background.

The purpose of this procedure is to align the camera reference until it is parallel with the X-axis. This unit is a black plate, with reference points which the camera uses as a background reference when centering components.

There are three reference backgrounds available:

Type 14

The standard HYDRA camera reference background.

Type 14 LSC

A reference background optimized for the Linescan Vision Camera.

Type 23 LSC

A reference background intended for bigger type of components.

Perform this procedure when a new HYDRA system is installed. In this procedure only a mechanical alignment is made no parameters are modified.

This procedure can be carried out either with the HVC or the LSC.

⚠️ *WARNING! This procedure will cause machine movements. Keep hands, tools and foreign objects clear of moving machinery.*

Procedure

1. Select *Utility > Installation > HYDRA > Align Ref. Background*.

2. Select the camera to use when performing this procedure.

    The X wagon moves to the selected camera. Depending on the selected camera, the system shows different camera views.

    Figure 5-18 shows the camera view when the HYDRA Vision Camera (HVC) is used. Figure 5-19 shows the camera view when the LineScan Camera (LSC) is used.
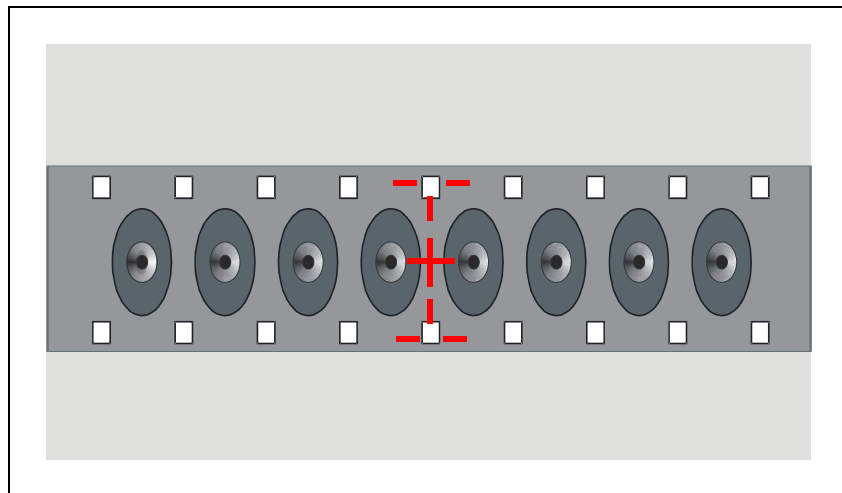
Figure 5-18. HVC view
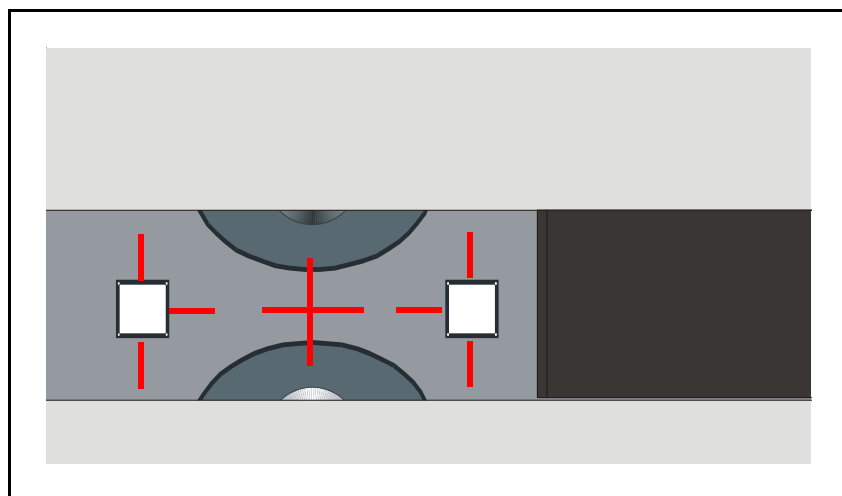
Figure 5-19. LSC view

3. Check the alignment of the reference background by verifying that, the two small red crosses are positioned in the middle of the white reference points on both ends of the reference background. If necessary, the reference point background can be adjusted mechanically in horizontal (Y) and/or theta direction as described in points 4 - 7 below.

4. Loosen the two 2.5mm screws under the reference background with an allen key.

5. Adjust the reference point background in horizontal (Y) and/or theta direction with the two (0.9mm) set screws, situated against the HYDRA chassis, perpendicular against the tools.

6. Adjust the reference background until the two small red crosses are positioned in the middle of the white reference points
(See Figure 5-18 and 5-19) at both ends of the reference background.

7. When satisfied, fasten the (2.5mm) screws.

8. If you are satisfied with the result, select *Ready* in the shown dialog box and press <Enter> to exit the procedure.

Calibrate the HYDRA Optical System

This procedure will calibrate the optical system of the HYDRA Vision camera. Hereby TPSys will be able to compensate for non-linearities and distortions in the optical system. Perform this procedure when a new HYDRA system is installed with a HYDRA Vision Camera intended for centering.

Procedure

1. Select *Utility > Installation > HYDRA > Calibrate HYDRA Camera Optics*.

2. Verify that the calibration plate thickness value is correct using a caliper. When ready, press <Enter>.

```
Verify calibration plate thickness 1.5mm
(0mm..4mm)
```

3. When prompted, insert a clean PCB on the lower left end of the Y wagon. Place your calibration plate upside down on the PCB according to figure 5-20.
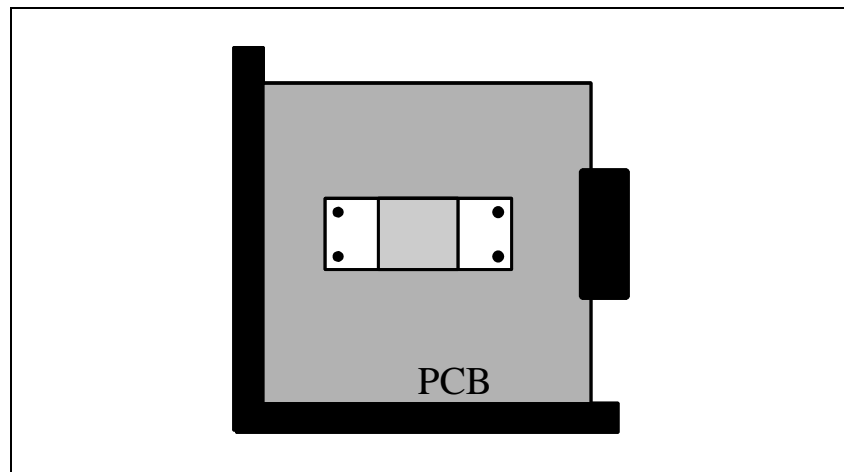
Figure 5-20. Calibration plate on the PCB

4. When ready, select *Yes* in the *Insert optical calibration plate* dialog box and press <Enter>. The camera view with a cross-hair is shown on the screen.
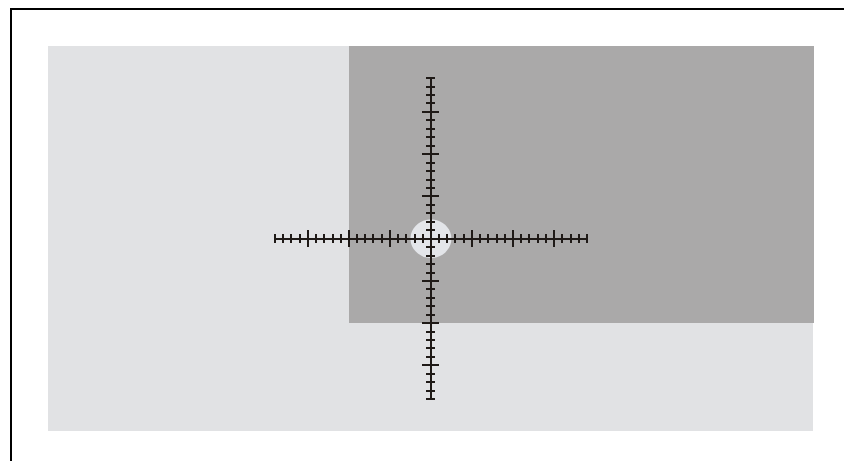
Figure 5-21. Find lower left fiducial mark

5. Use the joystick to center the cross hairs on the lower left fiducial mark as accurately as possible.

6. When done, Select *Ready* in the *Find calibration plate* dialog box and press <Enter>.

The X wagon moves to the lower right fiducial mark.
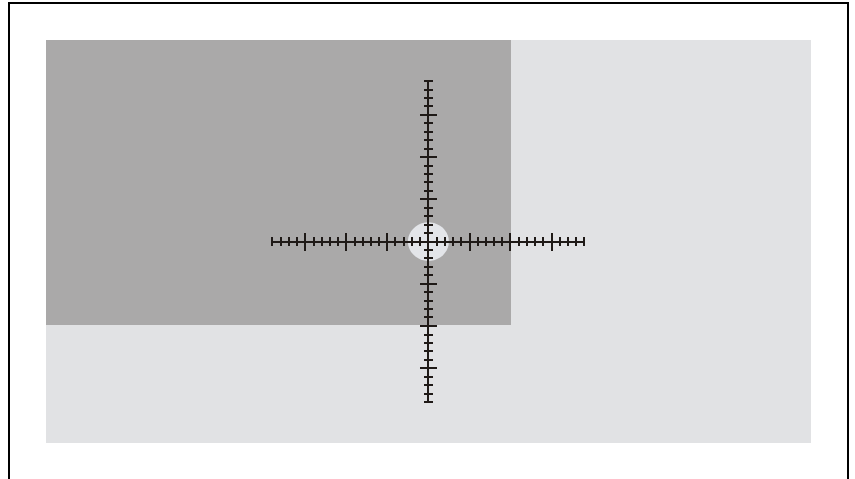
Figure 5-22. Find lower right fiducial mark

7. Use the joystick to center the cross hairs on the lower right fiducial mark as accurately as possible.

8. When done, Select *Ready* in the *Find calibration plate* dialog box and press <Enter>.

9. The next step is to find a place to measure the board level on. Use the joystick to move the X-wagon camera somewhere on the PCB near the calibration plate.
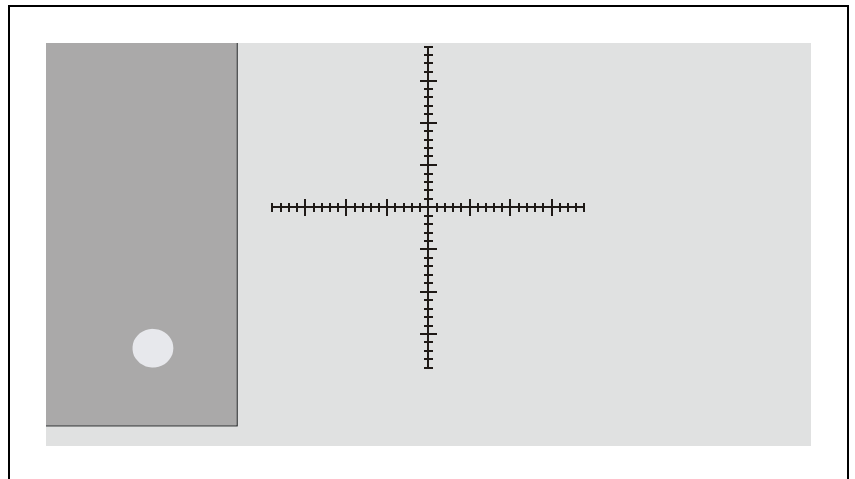
Figure 5-23. Measure board level

10. When done, Select *Ready* in the *Find a place to measure board level on* dialog box and press <Enter>.

The single mounthead will now pick up the calibration plate and move to a position above the HYDRA camera.

The camera view with a graphical support pattern is shown on the screen See Figure 5-24.
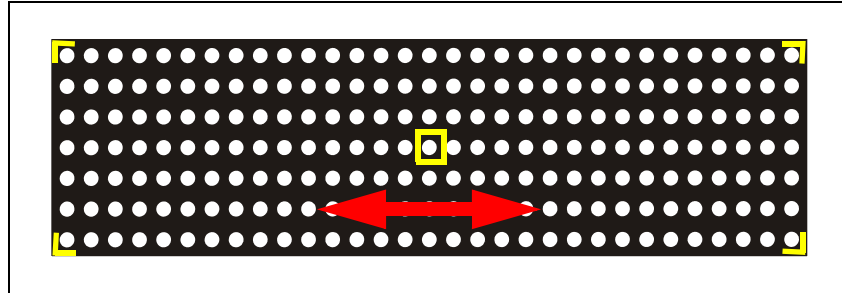
Figure 5-24. Locate X position of calibration plate

11. Use the graphical support pattern to locate the X position of the calibration plate. See Figure 5-24.

If necessary use the shortcut keys to move the camera view, see page 5-11.

12. When you are satisfied with the X position, select *Ready* in the *Locate X position of calibration plate* dialog box and press <Enter>.

13. Now use the graphical support pattern to adjust the Y position of the calibration plate. See Figure 5-25.

If necessary use the shortcut keys to move the camera view, see page 5-11.

The adjustment procedure can be found in section, *Align HYDRA Camera* on page 5-14.
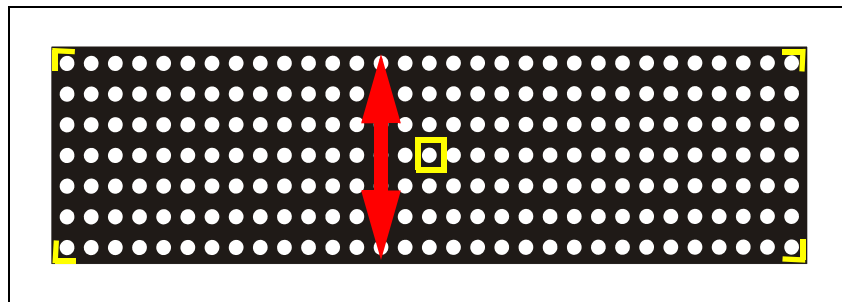
Figure 5-25. Adjust Y position of camera

14. When you are satisfied with the X position, select *Ready* in the *Adjust Y position of camera* dialog box and press <Enter>.

15. When the calibration of the camera optics is done, verify the calibration by pressing <Shift> + <F1> and study the view with the small crosses.

16. Ensure that all crosses are in the center of the dots. Move the image with the shortcut keys, see page 5-11.

Measure the Height Of the Camera Reference Background

The purpose of this procedure is to measure the Z-level of the HYDRA Camera reference background. During optical inspection of components picked up by the HYDRA unit, the bottom surface of the components should be at this level during image acquisition.

There is no controlled way of adjusting the HYDRA head vertically when mounting it on the X wagon. By measuring the height of the reference background, the system will be able to show the components in the same plane as the reference background. This makes the HYDRA system more accurate. Always perform this procedure when a new HYDRA system is installed.

If a LSC is present in the machine TPSys will use this camera for the measurement, even if a HVC is available. With only the HVC present the system will use the HVC for the measurement.

The HVC must be re-calibrated after this procedure if installed! The re-calibration must be done even if the LSC is used to measure the height.

Measuring the height using the LSC

When a LSC is used to measure the level of the reference background, no components are picked and centered. Instead the geometry of the reference background and the properties of the LSC's optical system are used to calculate the level.

Procedure

1. Select *Utility > Installation > HYDRA > Measure Ref. Background Height*.

2. Select which LineScan camera to use (if more than one installed) in the *Select HYDRA centering camera* dialog box, and press <Enter>

   The X wagon moves to the selected camera.

   The system starts to acquire the necessary number of images and calculates the reference background level (height).

   The following parameters are updated and the new level is displayed.

   – *52.0204 Centering level*

   – *28.0200 Ref. background height:*

   ```
   Reference background height result: 57917 µm
                        OK
   ```

3. Re-calibrate the HYDRA camera according to the instructions on page 5-22.

Measuring the height using a HVC

Procedure

1. Select *Measure Ref. Background Height* in the *HYDRA* menu.

2. Select the HYDRA camera in the *Select HYDRA centering camera* dialog box, and press <Enter>.

3. Insert an empty board to place the component on.

4. Put the L-010-0166-1 calibration component on the board, see Figure 5-26.
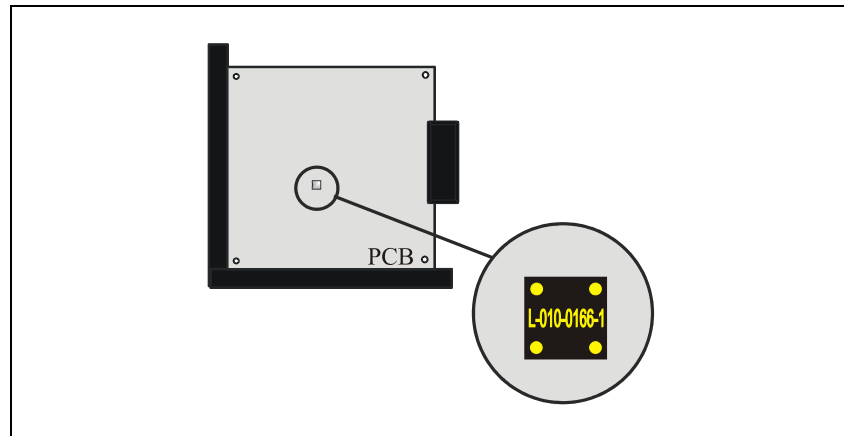
Figure 5-26. Jagged edge to the left

5. When done, confirm by selecting *Yes* in the *Insert optical calibration plate* dialog box.

6. When prompted, use the joystick to center the cross hairs on the following positions on the component.

   – *Locate lower left corner*

   – *Locate lower right corner*

   – *Locate upper left corner*

7. Confirm the positions by selecting *Ready* and pressing <Enter> when respective *Locate component* dialog box is shown.

8. TPSys will select all tools when the *Measure Ref. Background Height* dialog box is shown. If you do not want to use all tools, select the tool type you want and press <Enter> when ready.

9. The next step is to find a place to measure the board level on. Move the cross hairs to the base board for measuring the board level.

10. When satisfied with the position, select *Ready* in the *Find a place on the board to measure board level on* dialog box and press <Enter>.

TPSys picks up the component and acquires the necessary number of images and calculates the reference background height.

When the measurement is done, the result is presented in the following information box.

```
Reference background height results:

                Tool 1 51855 µm
                Tool 2 51903 µm
                Tool 3 51926 µm
                Tool 4 51744 µm
                Tool 5 52067 µm
                Tool 6 51508 µm
                Tool 7 51589 µm
                Tool 8 51763 µm

Reference background is -90 µm out of focus.

                      OK
```

– The parameter *52.0204 Position; Centering level* is updated with the new result.

– The parameter *64.0003 Focal plane offset* has a value of "-14" as default. This value should not be altered.

11. Re-calibrate the HYDRA camera according to the instructions on page 5-22 before continuing with the installation procedures.

Measure the HYDRA Reference Line

To be able to accurately align HYDRA-components with the LSC, it is necessary to measure the Y-direction movements of the X-wagon during the image acquisition. This movement can be measured by using the reference line on the camera background.

The purpose of this procedure is to measure the skew and curvature of the reference line on the reference background. TPSys will then be able to calculate nominal rotation centers for the HYDRA tools. This procedure is performed whenever a new HYDRA system is installed.

This is a procedure that can only be carried out if there is a Linescan camera (LSC) installed in the machine. The procedure is automatically repeated for each installed LSC.

Procedure

1. Select *Utility > Installation > HYDRA > Measure HYDRA Ref. Line*.

    The X wagon moves to the LSC and starts the measurement.

    If more than one LSC is present, the measurement automatically continues on the second LSC.

2. Confirm by pressing <Enter> when the Reference line measured dialog box is shown.

Measure Centering Offset For HYDRA Camera

The purpose of this procedure is to find the offsets between the nominal and the actual rotation centers of the HYDRA tools when the HYDRA Vision Camera is used. Perform this procedure when a new HYDRA Vision Camera is installed.

Procedure

1. Select *Utility > Installation > HYDRA > Measure Centering Offset For HYDRA Camera.*

2. If not done previously, insert an empty board on which to place the calibration componen.

3. If not done previously, put the calibration component (L-010-0166-1) on the board.

.

Figure 5-27. Calibration component

4. When done, confirm by selecting *Yes* in the *Insert optical calibration plate* dialog box.

5. When prompted, use the joystick to center the cross hairs on the following positions on the component.

    – *Locate lower left corner*

    – *Locate lower right corner*

    – *Locate upper left corner*

6. Confirm the positions by selecting *Ready* and pressing <Enter> when respective *Locate component* dialog box is shown.

7. Select which HYDRA tool to measure in the shown *Measure Centering Offset For HYDRA Camera* dialog box.

All HYDRA tools must be measured, but it is not necessary to measure all tools at the same time.

8. Move the cross hairs to the base board for measuring the board level.

9. When satisfied with the position, select *Ready* in the *Find a place on the board to measure board level on* dialog box and press <Enter>.

TPSys picks up the component and acquires the necessary number of images and calculates the centering offsets.

When the measurement is done, the result is presented in the following information box.

```
New centering offset for tool 1:
    X: 100 µm    Y: -16 µm
Old centering offset:
    X:  89 µm    Y: -10 µm
Difference
    X:  11 µm    Y: -6 µm
Save?
                   Yes   No
```

10. Save the new results by selecting *Yes* in the dialog box and pressing <Enter>.

By repeating the measurement a number of times for all HYDRA tools an average value is calculated, providing a more accurate centering offset value. The number of repetitions is stored in parameter *66.0003 Number of centering measurements*. The parameter default value is 6.

Measuring the Centering Offset For Linescan Camera

The purpose of this procedure is to find the offsets between the nominal and the actual rotation centers of the HYDRA tools when the LSC is used. Perform this procedure when a new HYDRA system is installed.

This procedure can only be carried out if there is a Linescan Camera (LSC) installed in the machine. If more than one LSC is present in the machine, this procedure only has to be carried out for one of the LSC's.

Procedure

1. Select *Measure Centering Offset For Linescan Camera* in the *HYDRA* menu.

2. Select which LineScan camera to use (if more than one installed) in the *Select HYDRA centering camera* dialog box, and press <Enter>

3. If not done previously, insert an empty board to place the calibration component on.

4. If not done previously, put the calibration component (L-010-0166-1) on the board.
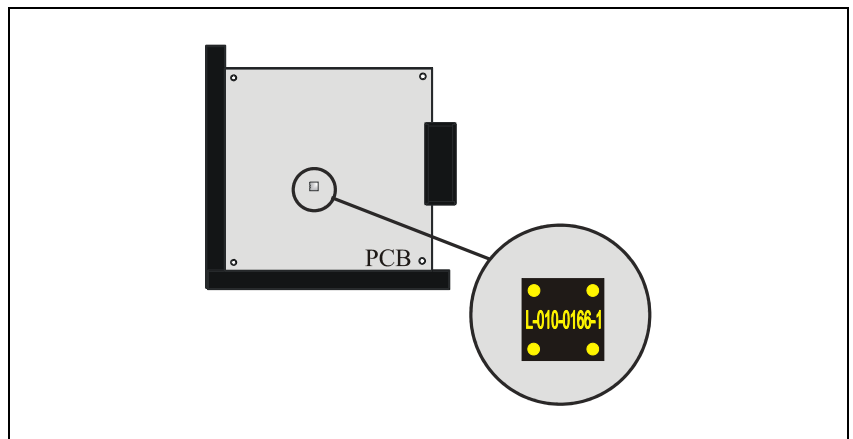
Figure 5-28. Calibration component

5. When done, confirm by selecting *Yes* in the shown *Insert optical calibration plate* dialog box.

6. When prompted, use the joystick to center the cross hairs on the following positions on the component.

    – *Locate lower left corner*

    – *Locate lower right corner*

    – *Locate upper left corner*

7. Confirm the positions by selecting *Ready* and pressing <Enter> when respective *Locate component* dialog box is shown.

8. Select which HYDRA tool to measure in the shown *Measure Centering Offset For Linescan Camera* dialog box.

All HYDRA tools must be measured, but it is not necessary to measure all tools at the same time.

9. Move the cross hairs to the base board for measuring the board level.

10. When satisfied with the position, select *Ready* in the *Find a place on the board to measure board level on* dialog box and press <Enter>.

TPSys picks up the component and acquires the necessary number of images and calculates the centering offsets.

When the measurement is done, the result is presented in the following information box.

```
New centering offset for tool 1:
     X: 100 µm    Y: -16 µm
Old centering offset:
     X:  89 µm    Y: -10 µm
Difference
     X:  11 µm    Y: -6 µm
Save?
                   Yes   No
```

11. Save the new results by selecting *Yes* in the dialog box and pressing <Enter>.

By repeating the measurement a number of times for all HYDRA tools an average value is calculated, providing a more accurate centering offset value. The number of repetitions is stored in parameter *66.0003 Number of centering measurements*. The parameter default value is 6.

Measure HYDRA Tool Offsets

The purpose of this procedure is to measure (fine-tune) the offsets between the individual HYDRA tools and the defined zero point on the X wagon. Perform this procedure when a new HYDRA system is installed.

Procedure.

1. Select *Measure HYDRA Tool Offsets* in the *HYDRA* menu.

2. If not done previously, insert an empty board to place the calibration component on.

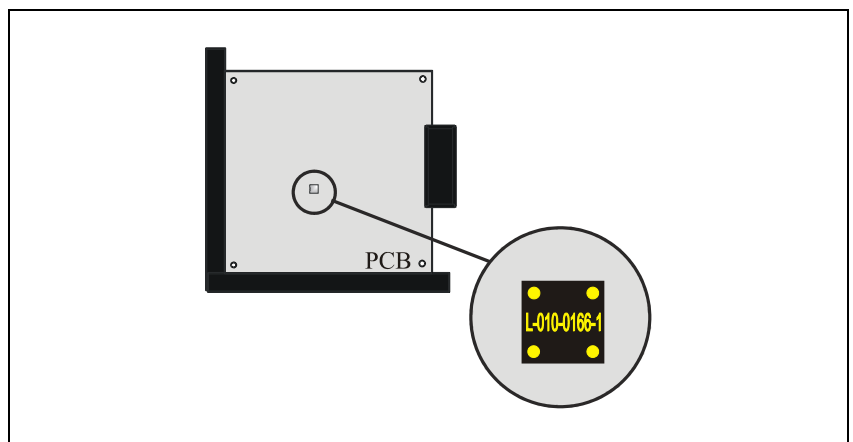3. If not done previously, put the calibration component (L-010-0166-1) on the board.
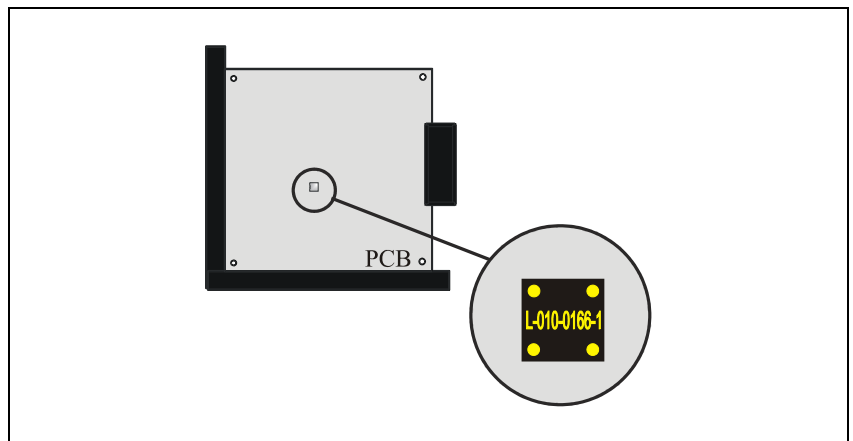
Figure 5-29. Calibration component

4. When done, confirm by selecting *Yes* in the shown *Insert optical calibration plate* dialog box.

5. When prompted, use the joystick to center the cross hairs on the following positions on the component.

   – *Locate lower left corner*

   – *Locate lower right corner*

   – *Locate upper left corner*

6. Confirm the positions by selecting *Ready* and pressing <Enter> when respective *Locate component* dialog box is shown.

7. Select a place on the board to place the component.

8. When satisfied with the position, select *Ready* in the *Select place position.* dialog box and press <Enter>.

9. Select which HYDRA tool to measure in the shown *Measure HYDRA Tool Offsets* dialog box.

All HYDRA tools must be measured, but it is not necessary to measure all tools at the same time.

10. Move the cross hairs to the base board for measuring the board level.

11. When satisfied with the position, select *Ready* in the *Find a place on the board to measure board level on* dialog box and press <Enter>.

A component will be picked up, rotated 180°, and put back. Any displacement of the components position is then meassured. This will be done a number of times. When the measurement is done, the result is presented in the following information box.

```
New centering offset for tool 1:
    X: 100 µm    Y: -16 µm
Old centering offset:
    X:  89 µm    Y: -10 µm
Difference
    X:  11 µm    Y: -6 µm
Save?
                 Yes   No
```

12. Save the new results by selecting *Yes* in the dialog box and pressing <Enter>.

By repeating the measurement a number of times for all HYDRA tools an average value is calculated, providing a more accurate HYDRA tool offset value.

Verifying the HYDRA System Installation

After completing the installation make a final verification of the mounting precision as follows:

Procedure

1. Start mounting a PCB, for example "tight49".

2. Cancel the mounting after a few components have been mounted. Do not reset the layout status.

3. Select *Edit Layout* in the *Production* menu.

4. Select the PCB you have canceled.

5. Select a mounted component and verify that the position is correct (use the <F1> key).

6. Repeat this procedure for a number of components.

The HYDRA system installation is now completed.

Adjustment and Calibration

This section comprises the following adjustment procedures:

Adjusting z-indicator levellers (HYDRA 2D)

Below the swivel there is a cylinder acting as the z-indicator leveller. If the z-levels need adjustment the cylinder can be adjusted up and down.

The cylinder is connected to the vacuum pipe with an M2 screw. Be sure to use thread lock Loctite on the screw after adjustment.

Swivel

Lock screw

Vacuum pipe
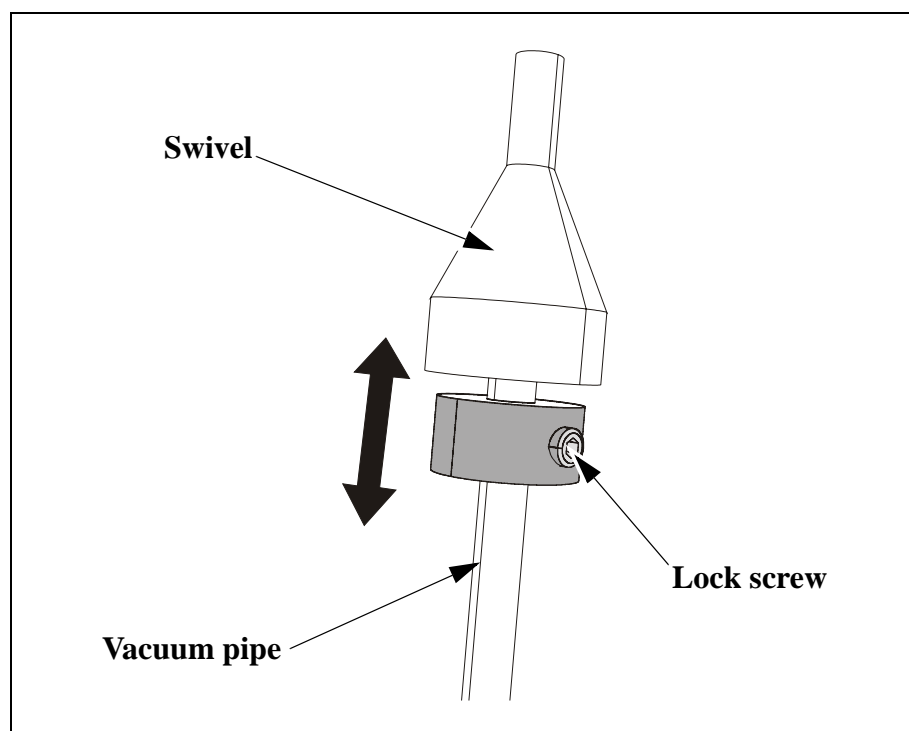
Figure 5-30. Adjusting z-indicator

Cog Play Adjustment

1. Run the *HYDRA Service program*, HZ Cog Play. Follow the instructions given by the program.

   Depending on the result from the extended service program, reduce or increase the cog play as follows:

2. Loosen the locking screw ('1') in Figure 5-31).

3. Turn the eccentric adjustment screw (2) slightly to reduce (too little cog play) or increase (too much cog play) the pressure of the bearing against the gear rack.

   – From the mid position, the pressure is increased in both clockwise and counter-clockwise direction.

   – If it is difficult to reach the correct adjustment in both upper and lower position, chose a loose setting rather than adjusting the cog play too tight.

4. Tighten the locking screw.

5. Run the HZ Cog play test again and repeat the adjustment if necessary.
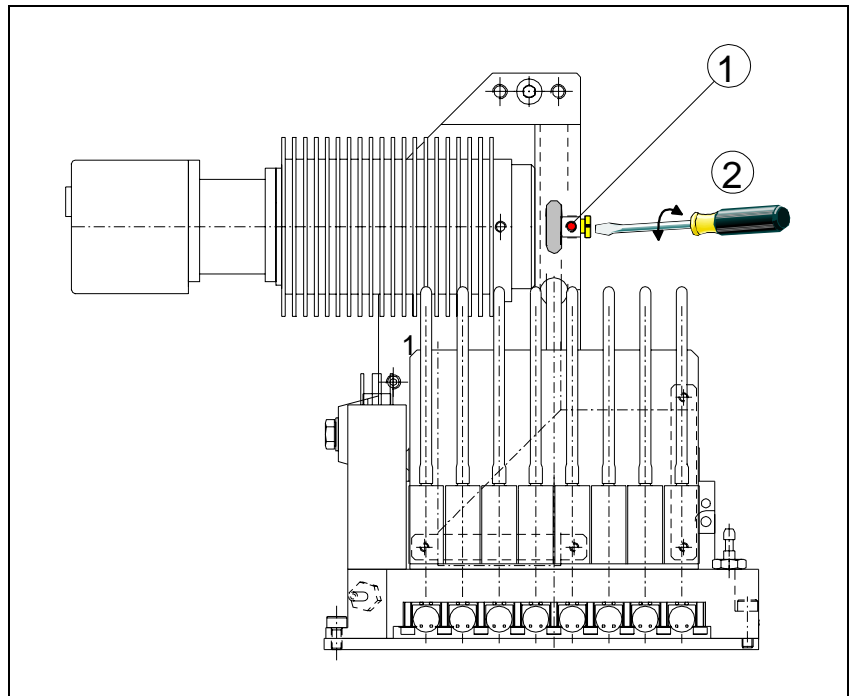
Figure 5-31.   HZ Cog play adjustment

Troubleshooting

The following section covers some of the symptoms that may turn up when installing and running the HYDRA Unit. To perform some of the following tests, run the HYDRA Service program. Follow the instructions given by the program.

Check List

Before commencing any troubleshooting on the HYDRA unit, verify that measured values are in accordance with the values mentioned below.

Mechanics/movement

- Check the HZ and H-Theta operating ranges and the transducer deviations, if any.

    – The HZ operating range shall be 2 056 - 19 500 ±500 units (tics).

    – The H-Theta operating range shall be 2 056 - 19 500 ±500 units.

- The transducer deviation during operation should be less than 10 units for the HZ with no time limitation, and less than 100 units for the H-Theta during 100 cycles.

- Measure the HZ static friction.

    – The minimum force required to move the HZ wagon from a static position, above the tool latches, should be 0 - 6 force units approximately.

- Measure the HZ dynamic friction.

    – The minimum force required to move the HZ wagon across the operating range with some or all latches activated should be 4 - 12 force units approximately.

- Check the HZ cog play.

    – The play between the HZ motor and the rack should be 5 - 12 tics. A low value means high friction. A high value could result in wear and bad servo regulation. The results from three consecutive readings (in the same Z position) must differ less than 3 tics.

- Measure the H-Theta dynamic friction.

    – The minimum force required to move the H-Theta across the operating range should be 18 - 40 force units approximately.

- Each HYDRA tool must have an eccentricity (wobble) less than 0.08mm.

- In lowered position, the difference in height between the lowest and highest tool must be less than 0.3mm.

- Tool tips must not be worn or damaged. Clean with alcohol.

- The spring load on each HYDRA tool should be within 1.10 - 1.25N.

- While turning the HYDRA theta belt, the belt must wander <1mm Z wise across the belt wheels. If not, replace the belt.

- Ensure that all tool clamps are properly seated into the Theta couplings.

Vacuum

- Measure the vacuum levels at open, partly open and closed vacuum system, see Chapter 9.

  – For an open system, the level should be 60 - 80 units (vacuum) approximately.

  – A closed system should show 200 - 230 units approximately.

  – When one valve is open, the vacuum system should show 160 - 200 units approximately

- The vacuum sensor must indicate the atmospheric pressure within 0.01 bar, and a negative pressure of at least 0.4 bar.

Impact sensors

- Use the Check leds, current 0-15 feature in the Motqom menu.

  – Make sure that the light levels for the indicators are at 180 - 190 at current level 7 in the table. If not, adjust the position of the HYDUBB Ed-2 board.

- Check the correlation between indicator level and the angle of the H-Theta.

  – Verify that the variations do not exceed 15 units. Otherwise, the electronics make an incorrect decision as to weather or not an impact on a surface has been made, due to the angle of the H-Theta.

Tool latches

- Check the function of all the tool latches. In case of malfunction, measure the electrical resistance in each solenoid (85 ±5W).

- Measure the individual HZ tool latch positions.

  – The latch height levels shall be 4 200 - 4 900 units (tics).

  – The deviation from the lowest to the highest level must be less than 150 units. The variation between three consecutive measurements should be <50 tics.

- Check the indicator gain.

  – The correct value should be in an interval of 200 - 600 units.

  – A unit is defined as 1/1000 indicator unit per tic i.e. if HZ moves 100 tics downwards and the gain is 600 units, the indicator should change 100x600/1000=60 units.

Electronics

- Check the HYDB board function, the board supply voltage level, and the motor temperature.

    – To indicate a proper function, the green LED on the board shall blink with the light on 75% of the time.

    – A fault in the communication is indicated with a blinking light which is on 25% of the time.

    – The board supply voltage shall be approximately 25 Volt (18 - 26V).

    – The HZ motor temperature should not exceed 75°C.

Vision

- Check and clean the Linescan and HYDRA camera optics, mirrors and protective glass.

- Clean the camera reference background and check for even the smallest scratch or damage. Perform the *Align HYDRA Camera* on page 5-14 if a HVC is installed.

TPSys

- Ensure that the setting of the HYDRA angle in the Package List is 90°.

- Ensure that the Small chip lead type is not used in the package data (unless otherwise is clearly stated).

- Ensure that the TPSys package data corresponds to the real components.

Troubleshooting Actions

To perform some of the following tests, run the HYDRA Service program in the extended service program. Follow the instructions given by the program.

For each test in Test specific system there are defined limits. These limits are stored in a separate text file.

When the control of limits is performed the system generates a number of error messages. Refer to the table below for information about a specific error message.

Symptom (Error Message)	Suggested action
HZ- or HTheta working range assumes unreasonable figures and limits	Reload MOT-Z and re initiate.
	If the error repeats itself it may be caused by problems with the MOT-Z or a bad transducer coupling.
HZ and HTheta within limits, but too big transducer drift	Check that the transducer is properly connected and that no outside currents interfere.
HZ start friction or movement friction very high:	Check that the shaft or guide bearings are not damaged or dirty.
	Make sure the rack is not too tight.
	Check if there is current to the HZ- motor.
HZ cog play too big or too small	Adjust the rack.
HTheta friction very high	Make sure all tool holders are properly in position. Try manually, with zero motor current, to move the belt back and forth.
	If the friction feels uneven the belt is probably deformed. Run burnin on HTheta or change belt.
	Also check each bushing.
Vacuum levels out of bounds	Make sure the vacuum pump is working properly. Apply vacuum for each tool and feel with the finger tip. Check filters and look for possible leakage.
Bad current levels for the indicators, or no indication of hit	Use 'Check leds, current 0-15' in the single command menu. Make sure that the light level for the indicators is at correct values at current level 5 in the table.

If not, then the indicators are not adjusted properly, and may have to be readjusted. |
	Repeated problems may be caused by poorly adjusted sensors, bad LEDs or the light path may be obstructed. Also worn out tool springs may generate disturbances or even indications of a hit.
Indicator variation is too big when turning HTheta	Check if the upper part of the tool mechanism wobbles too much.
	Ckeck if the lower edge of the housing, which obstructs the light beam from the LED, is uneven.
Tool latches don't work	Check if the latches can be activated in a position were the HZ-wagon is out of the way. A burnt solenoid can be detected by its distinct smell.
	Check that there is no mechanical obstacle for the latch itself by moving it by hand.
Uneven levels between the tool latches	If one or more latches operates at a different height or out of bounds, it may be caused by a poorly adjusted solenoid pack. Make sure the latch does not move too much z-wise.
	The problem may also be caused by a bad HZ-indicator.
Tool spring length too small	Adjust the latch fingers upwards. You need to remove the vacuum module (white or translucent) to see the three screws holding the latch fingers in place. Loosen the screws and move the shaft upward.

Symptom (Error Message)	Suggested action
Tool spring length too big	The latch finger misses the rim of the tool mechanism. This causes failure when e.g. measuring board height. Adjust solenoids outwards, by adjusting the position of the brackets attached to the HZ-frame. Make sure that the latch finger does not hit (noticeable as a metallic sound) the tool mechanism when the latch is actuated. A perfectly adjusted latch should make more of a 'thud'-sound.
Problems of malfunctions	Reload MOT-Z and initiate HZ and HTheta.
	Make sure the motor is not too hot.
	Check if the fan works properly.
	Investigate if the motor windings smell burned.
	Check the position of the brackets attached to the HZ-frame.

6. Tools & Tool Banks

This chapter contains a description of the different tools and tool banks used on MYDATA placement machines.

– *Single Mounthead Tools* on page 6-2.
  The single mounthead tools used on the Midas Unit

– *HYDRA Mount Tools* on page 6-10.
  The HYDRA mount tools used on the HYDRA unit.

– *HYDRA Automatic Tool Exchanger* on page 6-12.
  HYDRA Speedmount ATE, Automatic Tool Exchanger, is a system for changing HYDRA tools automatically

WARNING! In this chapter, some of the procedures causes the machine to make movements.The below warning must be followed for such procedures. Procedures that causes the machine to make movements are marked with this sign next to the text. Before entering such commands, check the following: Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

Single Mounthead Tools

This section comprises the following sections:

The following two types of single mount head tools are available for the Midas unit on MYDATA placement machines:
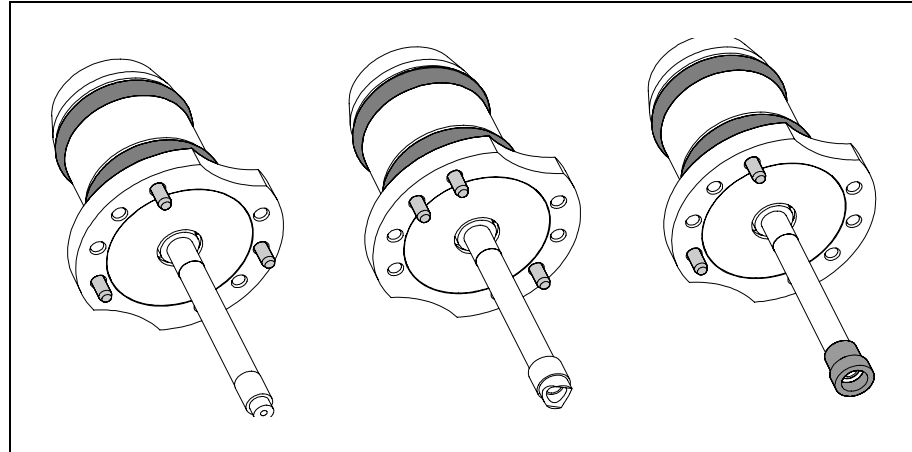
Figure 6-1. Stiff tools
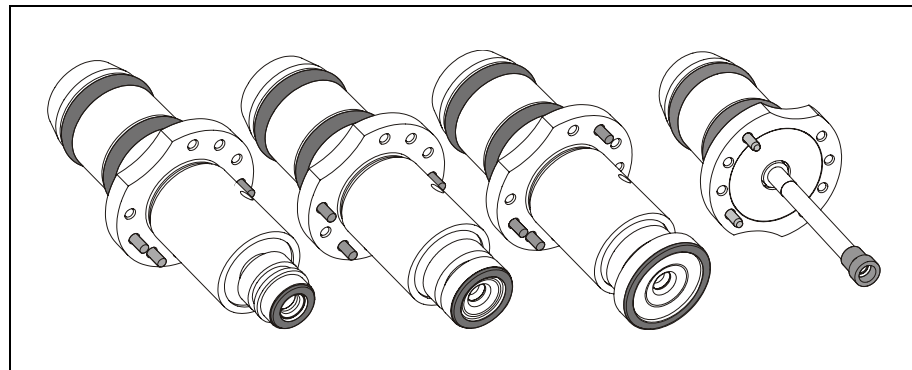
Figure 6-2. Spring-loaded tools

The main difference between these two types of tools is that the spring-loaded tools provide a faster mounting speed by utilizing the Intelligent Surface Impact Control (ISIC) function.

Both types are intended for the same component ranges. The A14S, A23S, A24S and C23S tools are spring-loaded versions of the A14, A23, A24 and C23 stiff tools.

☞ To get full Linescan Vision System performance, it is necessary to use spring-loaded tools.

Single Mounthead Tool Installation

This procedure is used to install the single mounthead tools, spring-loaded or stiff, before they can be used for placement or adhesive application.

⚠️ *WARNING! This procedures causes the machine to make movements.The below warning must be followed for such procedures. Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.*

Procedure

The following example applies to the A13 mount tool:

1. Open the *0023 Tool manager* parameter group and set the following parameters for the A13 stiff tool:

Parameters	Setting
1302 Present	*Yes*
1307 Indicator	*No*

⚠️ *CAUTION! The Indicator parameter must be set to No when a stiff tool is used otherwise there is a risk to get uncontrolled placement forces or impact forces which may damage the component and the board or the mounthead. Always check that the parameters are correctly set when a tool is exchanged.*

Parameter settings for A13 spring-loaded tool:

Parameters	Setting
1302 Present	*Yes*
1307 Indicator	*Yes*

In order to take advantage of the ISIC-function when using spring-loaded tools the Indicator parameter must be set to *Yes*.

⚠️ *CAUTION! Because of the wide tool body compared to the tool tip on A23S and A24S, there is a small but not negligible risk for collision between the tool body and tall components already placed, or between the tool body and the rails of the conveyors. This risk does not apply to the C23S tool. To limit this risk it is advisable to mount low components before mounting high components.*

2. Select *Utility > Installation > Tool Installation > Install tools*

3. The *Select tools to install* dialog box is shown and a submenu with the following three options is opened.

   – *All tools*

     Including tools that have been previously installed.

   – *All uninstalled tools*

     Only the tools that are not installed.

   – *Specific tool*

     Only one specific tool. You have to choose which specific tool you want to install. Press <Space> to show a list of available tools.

4. When prompted, trim the tool positions by centering the cross hairs on the selected tools and confirm the positions with *Ready*.

Installing a Tool Bank

1. Select *Utility > Installation > Tool Installation > Install tool bank* in TPSys. The *Select tool bank type* dialog box is shown.

2. Press <Space> to show a list of available tool banks (See page 6-6 for various tool bank lay-outs).

The standard tool bank has the following layout:

Tool numbering and usage are further detailed in the Programming Manual.
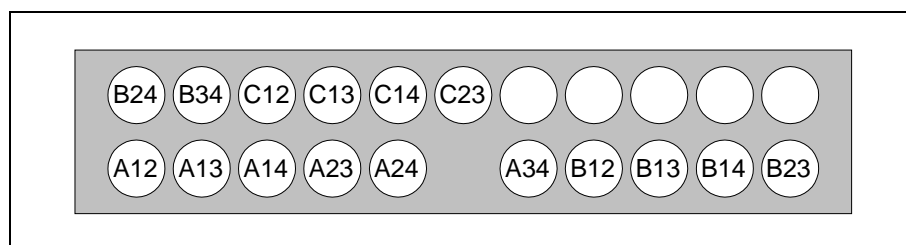
Figure 6-3. Example of tool bank layout

The tool body on the A23S, A24S and C23S tools are wide (Ø9.5mm) therefore the A23 and A24 tools will not fit in some tool banks. Check that the tool bank is compatible with the tools you are planning to use. If the tool bank is not compatible with the tools, you may require an upgrade kit (see the table below).

Tool bank related to mount table	Compatible with tools	Requires upgrade kit
ML tables (ML3, 4, 5, 6)	A23S, A24S, C23S	
500T2 Conveyors (pre. 2001-08-20)	C23S	L-015-1616
500T2 Conveyors (post. 2001-08-20)	A23S, A24S, C23S	
400PT Conveyors	A23S, A24S, C23S	
420PT Conveyors (pre. 2001-08-20)	C23S	L-015-1615

☞ An A23S tool has the same code pin configuration as the corresponding stiff tool A23. The same applies for A24S and C23S. It is therefore not possible to use a spring-loaded tool and the corresponding stiff tool simultaneously.

Removing a Tool Bank

1. Select *Utility > Installation > Tool Installation > Remove tool bank*

    The *Remove tool bank* dialog box is shown.

2. Select which tool bank to remove from the list of installed tool banks.

3. Press <Enter> to remove the selected tool bank.

Tool banks

These tables can be used to identify the bank in the machine when asked to *Select tool bank type* at installation above. "**TP**" in these tables indicates the test position, that is the tool check position.

Y wagon 288
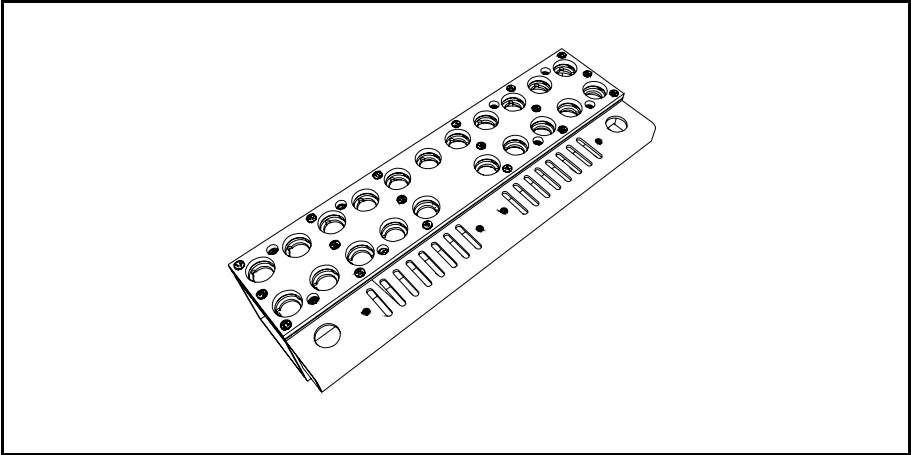
B24	B34	C12	C13	C14	C23	C24	C34	D12	D13	D14
A12	A13	A14	A23	A24	**TP**	A34	B12	B13	B14	B23

ML 3/4/5
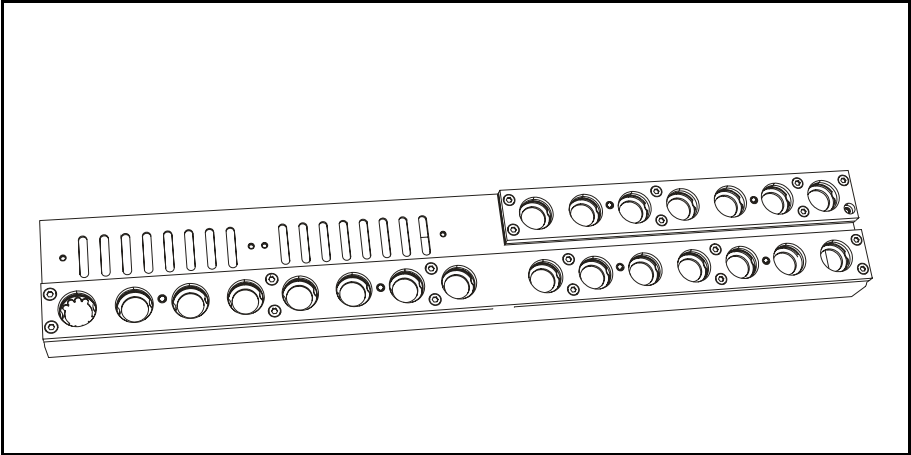
									C23	C24	C34	D12	D13	D14	D23
A12	A13	A14	A23	A24	A34	B12	B13	**TP**	B14	B23	B24	B34	C12	C13	C14

ML 3/4/5 ATE
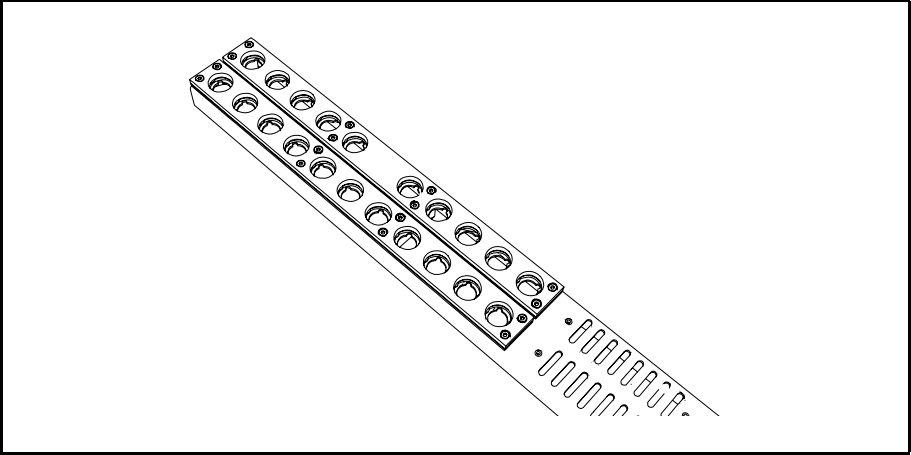
B34	C12	C13	C14	C23	**TP**	C24	C34	D12	D13	D14
A12	A13	A14	A23	A24	A34	B12	B13	B14	B23	B24

ML 6
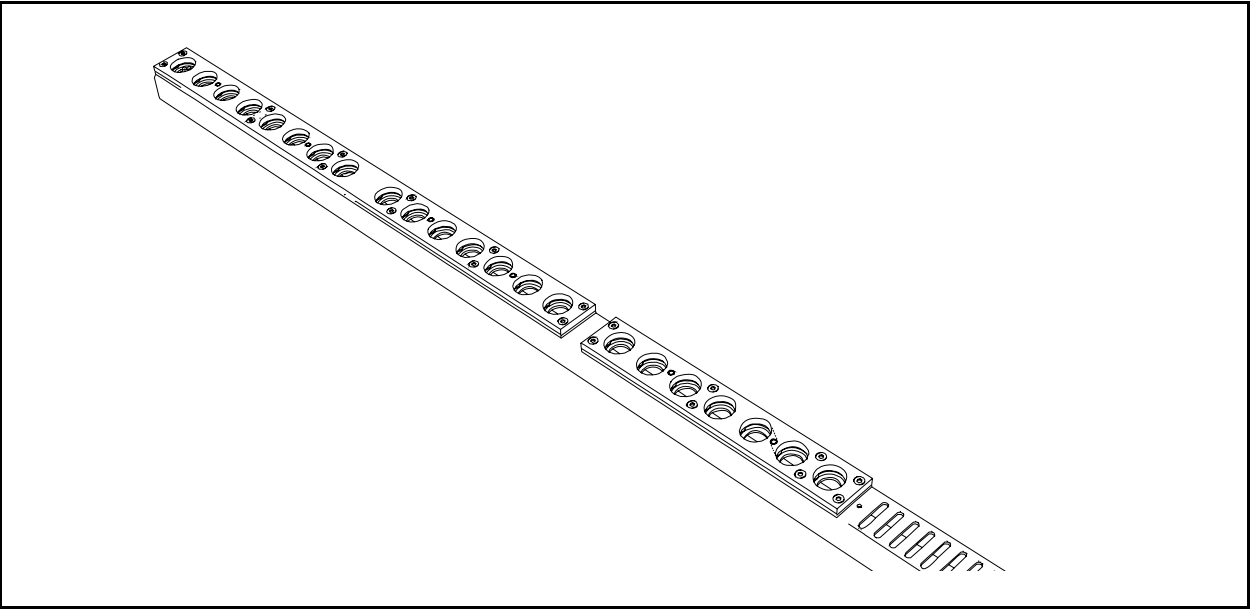
A12	A13	A14	A23	A24	A34	B12	B13	**TP**	B14	B23	B24	B34	C12	C13	C14	C23	C24	C34	D12	D13	D14	D23

ML 6 ATE

A12	A13	A14	A23	A24	A34	B12	B13	B14	B23	B24	B34	C12	C13	C14	C23	**TP**	C24	C34	D12	D13	D14

T conveyor

A12	A13	A14	A23	A24	A34	B12	B13	B14	**TP**	B23	B24	B34	C12	C13	C14	C23	C24

PT conveyors
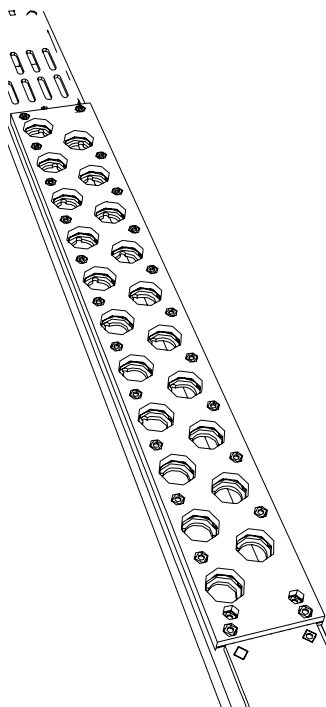
PT Conveyor 400

400PT	420PT	450PT
TP	D23	C24
D14	D14	C23
D13	D13	C14
D12	D12	C13
C34	C34	C12
C24	C24	B34
C23	C23	B24
C14	C14	B23
C13	C13	B14
C12	C12	B13
B34	B34	B12
B24	B24	A34
B23	B23	A24
B14	B14	A23
B13	B13	A14
B12	B12	A13
A34	**TP**	A12
A24	A34	**TP**
A23	A24	
A14	A23	
A13	A14	
A12	A13	

If the tool bank on the machine does not match any of the above layouts, the installation can proceed anyway. These layouts are used by TPSys to provide good initial guesses as to tool positions and tool check positions. The positions can be manually located in case of an unknown tool bank.

If the tool bank is not of a known type, choose the "custom" type. Then locate the tool bank on the Y-wagon. TPSys will guide you through this procedure.

The tool and glue tool check positions must also be located. The machine will offer a default position for these, but the position must be located manually. In this case, the default positions of the mount tools will also be incorrect, and they will need to be located with the joystick when they are installed.

Calibrating Tool Indicator

This procedure is used to calibrate the tool indicator used for spring-loaded tools. The tool indicator is calibrated as described below.

Procedure

1. Make sure there is a spring-loaded tool in the single mounthead. If not perform steps 2 - 5 below, otherwise go to step 6.

2. Press both emergency stop buttons down.

3. Move, by hand, the X wagon to a suitable place.

4. Insert a spring-loaded tool manually. Make sure the tool is properly inserted.

5. Release both emergency stop buttons.

6. Start the *Service Program* by selecting *Exit To Service* in the TPSys *Exit* menu.

7. To be able to see the *Force* value, open the *Show/Hide vacuum/force sensors* information box by selecting *Vacuum* or *Motor > Show/Hide vacuum/force sensors*

   The Force value is displayed in the *Vacuum and force* information box:

   ```
   Vacuum and force
   Vacuum: 16
    Force: 188
   ```

8. Select *Motor > Z motor > Calibrate force sensor*

9. Read off the *Force* value. It should now be calibrated to approximately 180.

10. Gently press the mount tool nozzle upwards with a finger (see figure).

11. Read off the *Force* value whilst the nozzle is pressed up. The value should now be between 0 and 20.
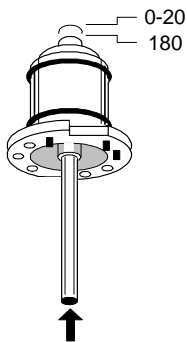
    Force is a value between 0 and 200 and it indicates the vertical position of the movable nozzle part when inserted in the single mounthead (see the figure).

    During the calibration, the system sets the *Force* value for the current tool to be approximately 180 at the down most position. The value for the upper position is normally set between 0 and 20 depending on the move length of the tool nozzle. This function is controlled by the MOT-Z board.

HYDRA Mount Tools

The HYDRA mount tools consist either of a plain tube (H00) or a tube with a changeable nozzle (H01 – H06), see the figure.
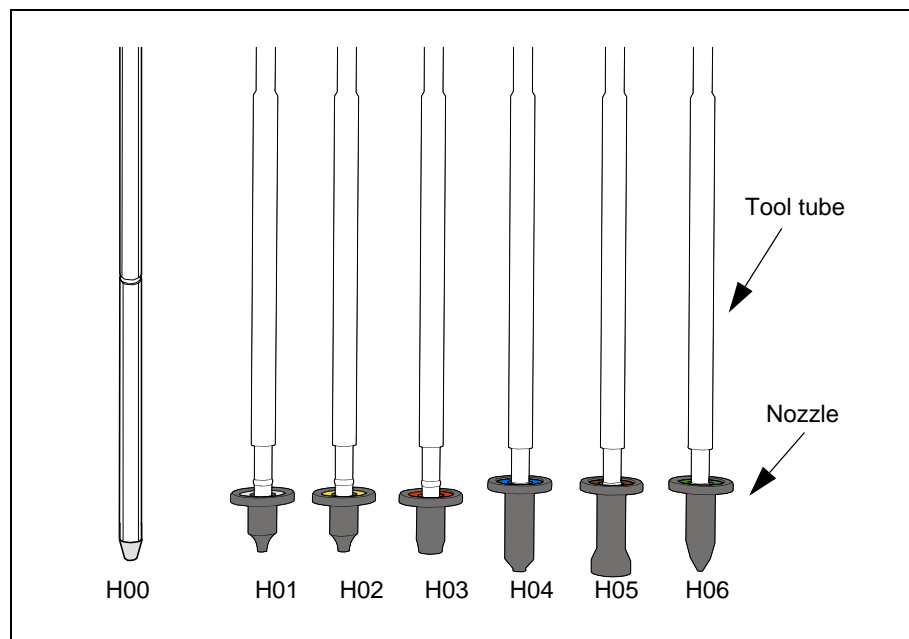
Figure 6-4. HYDRA mount tools

There are, for the time being, seven types of HYDRA tools intended for different sizes of component packages. Each tool type has its own identification color on the top of the nozzle. Mount tools must be kept free from dirt and foreign particles to prevent the tubes from being clogged up.

The HYDRA mount tools can be changed manually or by using the HYDRA Speedmount ATE, Automatic Tool Exchanger system mentioned below.

HYDRA Tool Tubes

The HYDRA tool tubes are attached to the HYDRA unit.

The HYDRA unit moves to the HYDRA tool bank where the tool tubes leave the current tools before picking up new ones.
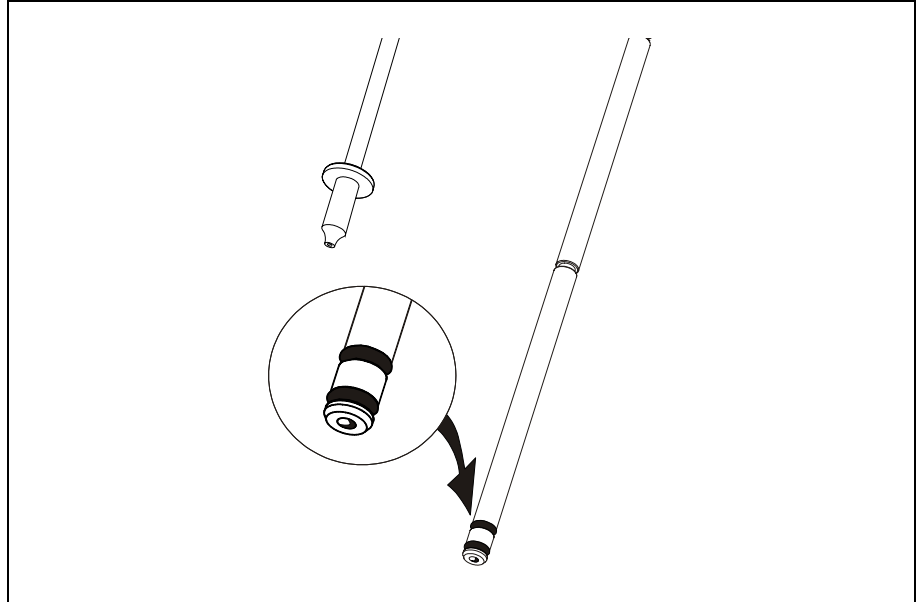
Figure 6-5. HYDRA 2B Tool tube

Figure 6-6. HYDRA 2D Tool tube

Each tool is held in place on the tool tube by two O-rings. This ensures that the tool is always properly aligned and can be replaced without re-calibrating the HYDRA unit.

HYDRA Automatic Tool Exchanger

HYDRA Speedmount ATE, Automatic Tool Exchanger, is a system for changing HYDRA tools automatically.

The optimal tool for each type of component extends the component range that can be picked with the HYDRA unit and increases the flexibility of the machine.

Instructions regarding how to operate the ATE system can be found in the *Operators Manual*.

The ATE system comprises the following parts:

In the following text, the HYDRA ATE tool bank is called HYDRA tool bank or just tool bank.

HYDRA Tool Bank

The HYDRA tools are stored in the HYDRA tool bank when not in use. When the tools are to be exchanged, the HYDRA unit moves to the bank and the tools are exchanged.

Each tool resides in an own position in the tool bank. When a tool is automatically fetched by the HYDRA unit, it is considered that the HYDRA unit has borrowed the tool from the tool bank. So, all the tools reside in their own tool bank positions but are temporarily attached to the tool tubes on the HYDRA unit.

The first tool tube (position 1 in the HYDRA unit) fetches a tool from one of the two tool slots with index No. 1 in the tool bank, see Figure 6-7. The second tool tube (position 2 in the HYDRA unit) fetches from one of the slots marked 2, etc.
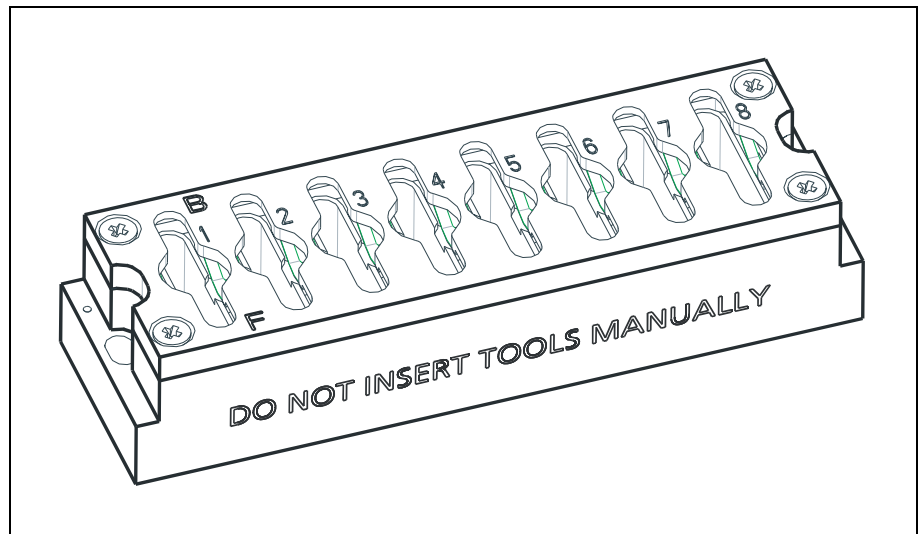
Figure 6-7. HYDRA ATE tool bank

Bank types

There are two types of HYDRA tool banks:

Standard type

For T-type conveyors and 288, 468 and ML 3-6 tables, see Figure 6-8.
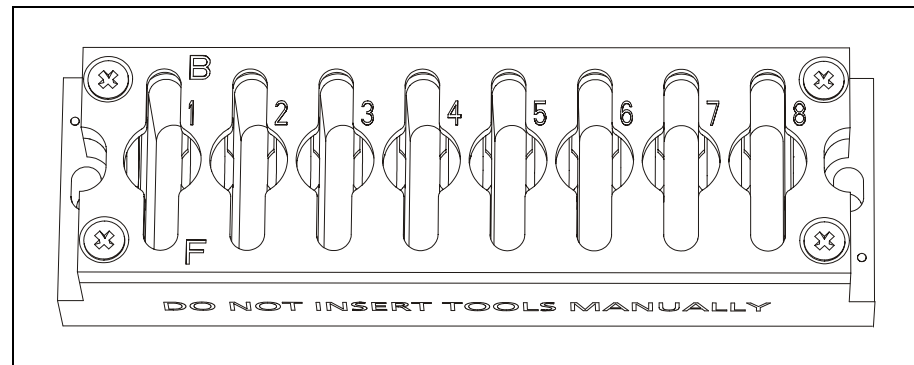
Figure 6-8.   Standard tool bank

PT type (Pass-through)

For 400 PT and 420 PT conveyors, see Figure 6-9.
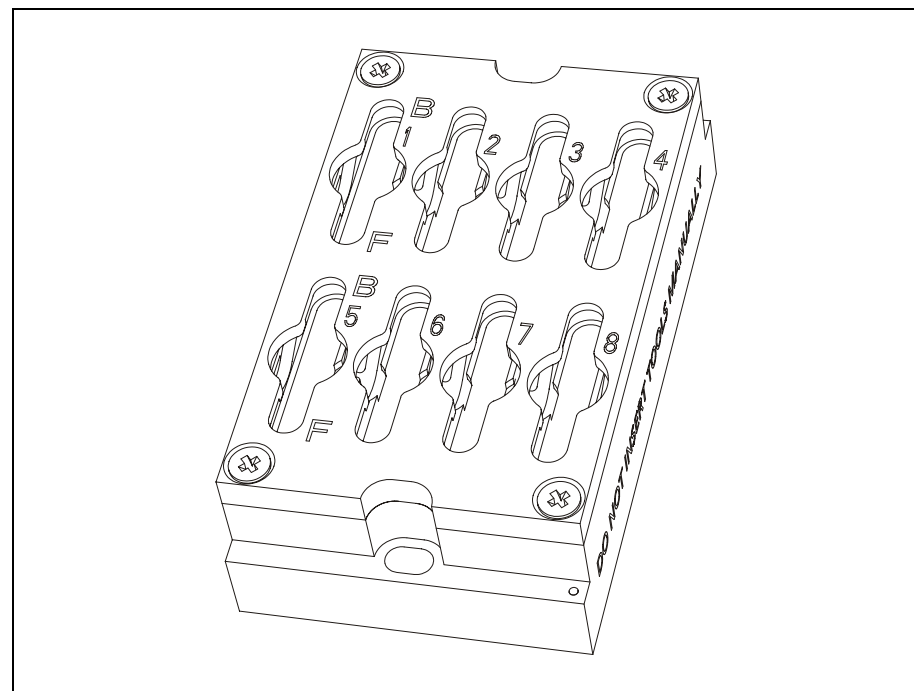
Figure 6-9. PT Tool bank

Bank Parts

A HYDRA tool bank consists of the following parts (see Figure 6-10):

    – A housing.

    – A lid with recessions underneath to ensure the positioning of each tool.

    – A spring that presses the tools against the lid.

    – Four mounting screws for the lid.
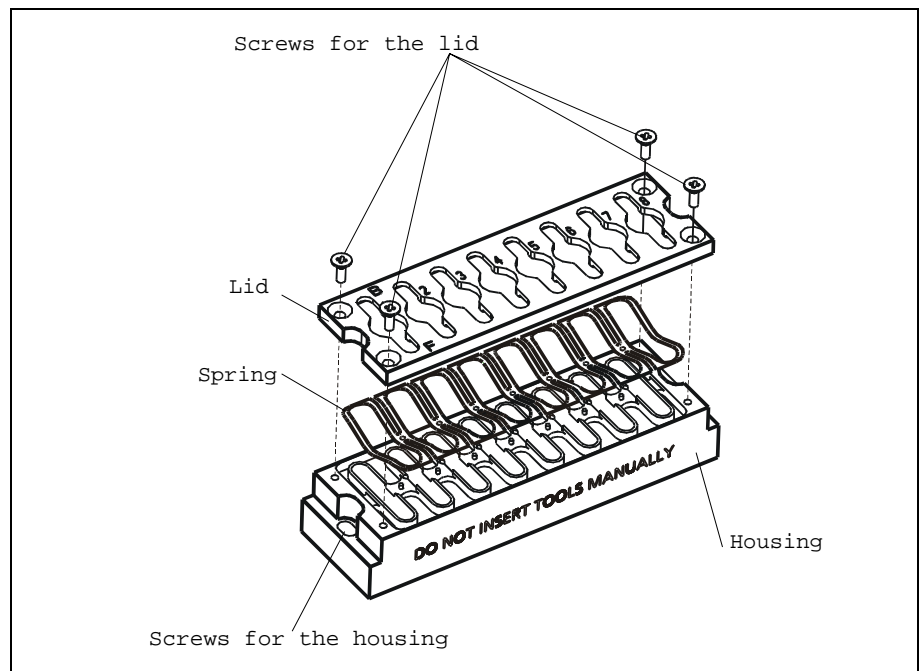
Figure 6-10. HYDRA tool bank parts

Bank Positions, Slots and Rows

A HYDRA tool bank can hold up to 16 tools in two rows by eight tool positions, see Figure 6-11.
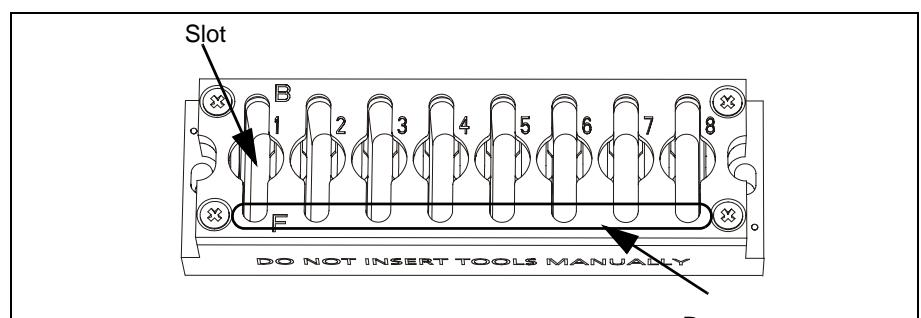
Figure 6-11. Tool bank positions, slots and rows

    – A slot has two positions, a front position and a back position.

    – A tool position can hold one tool.

    – The rows are called Front (marked 'F') and Back (marked 'B') corresponding to their Y positions in the tool bank. Front is the row facing the operator.

Installing HYDRA tool bank

This procedure is used to install the HYDRA Tool bank. Perform this procedure after installing a new HYDRA Tool bank or after replacing or moving the HYDRA Tool bank.

Create New Fiducial Mark

To be able to locate the bank positions on the Automatic Tool Exchanger (ATE) tool bank, you first have to create a new fiducial mark in TPSys and make TPSys recognize this mark type by teaching it.

Each tool bank has two fiducial marks of the same type. This mark type is to be recognized by TPSys.

1. Select *Editor > Fiducial Marks*

   The *Fiducial Mark Information* dialog box is shown.

   ```
   ┌──────────── Fiducial Mark Information ────────────┐
   │                        Name: hydrabank            │
   │                     Comment:                      │
   │           Fiducial mark type: Circle              │
   │          Generic mark taught: No                  │
   │               White on black: Yes                 │
   │               Symmetric mark: ---                 │
   │           Teach area X size: 1mm                  │
   │                      Y size: 1mm                  │
   │           Object filter size: ---                 │
   │           Verify area X size: 1.5mm               │
   │                      Y size: 1.5mm                │
   │                  Correlation: 70                  │
   │                     Diameter: 0.9mm               │
   │            Diameter tolerance: 25                 │
   │               Circle contrast: 20                 │
   └───────────────────────────────────────────────────┘
   ```

2. Create a new fiducial mark called hydrabank (in one word). Note that only this name can be used for this purpose.

3. Set all the values in the dialog box as shown in the figure above.

4. Press <F7> to make TPSys recognize the new fiducial mark.

5. Locate and center one of the fiducial marks on the tool bank by using the joystick or trackball. Press <Enter> when ready.

   The yellow rectangle, shown on the screen represents the teach area.

6. Use the joystick or trackball to adjust the size of the teach area until the yellow rectangle completely covers the fiducial mark. Press <Enter> when ready.

   The fiducial mark is taught and the result is shown on the screen.

7. Proceed with the next section *Install HYDRA tool bank*.

Install HYDRA tool bank

1. If not already done, perform the procedure *Create New Fiducial Mark* as described in the previous section.

2. Open the *HYDRA* menu by selecting *Utility > Installation > HYDRA*.

3. Select *HYDRA Tool Utility > Install HYDRA tool bank*.

4. Select a tool bank to install from the shown list in Select HYDRA tool bank to install dialog box.

5. Select type of tool bank to install from the *Select HYDRA tool bank type to install* dialog box.

   – Choose *PT type* for Pass-Through Conveyors.

   – Choose *Standard* for all other Y wagon solutions.

6. Press <Enter> when ready.

7. Make sure the tool bank is empty.

CAUTION! If a tool is left in a tool position, then the tool tube for that position will most certainly be bent.

When prompted, confirm in the shown dialog box that the tool bank is empty.

8. Center the first fiducial mark, located to the left of the tool bank, by using the trackball or joystick.

9. Press <Enter> when *Ready* is highlighted.

10. Center the second fiducial mark, located to the right of the tool bank, in the same way as the first one.

    TPSys will now measure the scale, angle and level for the tool bank, and if the tool bank seems to overlap an already installed tool bank.

    If the measured values are outside the defined limits, the system will ask if you accept the scale and angle deviations.

```
HYDRA tool bank: A
  was measured OK.
  Scale deviation: -0.03%        ((limit is: ±0.30%)
  Angle deviation: -0.14°         ((limit is: ±0.30°)

                    Accept?
               Yes         No
```

    If the values are outside the limits you must adjust the tool banks as described in section *Adjusting HYDRA Tool Bank Position* on page 6-19.

11. Select *Yes* to accept (or *No* if you do not want to accept).

    If you accept, then the installation is complete.

12. You can now insert tools in the tool bank as described in the *Operator's Manual*.

Uninstalling HYDRA Tool Bank

This procedure is used to uninstall a HYDRA tool bank from the system. Perform this procedure when you want to replace or remove a HYDRA tool bank.

Make sure the HYDRA tool bank is empty from tools, before uninstalling the tool bank. Refer to the *Operator's manual* for instructions regarding the removing of tools.Uninstalling a non-empty tool bank means that the information about the inserted tools is lost and the tools must be removed manually.

Procedure

1. Open the *HYDRA* menu by selecting *Utility > Installation > HYDRA*

2. Select *HYDRA Tool Utility > Uninstall HYDRA tool bank*

3. Select the tool bank to be uninstalled from the shown list in *Select HYDRA tool bank to uninstall* dialog box.

4. If the tool bank is not empty you have to confirm that you want to uninstall a non-empty tool bank.

```
HYDRA tool bank A is not empty.
Uninstall anyway?

                Yes     No
```

The tool bank is now uninstalled from TPSys.

Adjusting HYDRA Tool Bank Position

If the tool bank scale, angle or level measurement values are outside the defined limits in the installation, you must adjust the tool banks as described below.

The adjustment description comprises:

– Adjust Tool Bank Angle.

– Adjust Tool Bank Level (288 and 468 ATE Base Tool Bank only).

– Overlapping Tool Banks.

Adjust Tool Bank Angle

If the angle deviation was outside the defined limit during the tool bank installation.

1. Loosen the two tool bank mounting screws and tap it carefully to a correct position.

2. Tighten the two mounting screws.

3. Center the fiducial marks according to the description in *Create New Fiducial Mark* on page 6-16.

Adjust Tool Bank Level

This description is applicable for 288 and 468 board handling systems only.

CAUTION! If you have altered the tool bank height – you must reinstall the tool bank. The machine can be damaged due to new tool bank height.

If the level was outside the defined limit during the tool bank installation:

– If too low, then you can place shims (see Figure 6-12) under it.

Use a single or a combination of shims that answer the required thickness. An ATE Base Tool Bank Upgrade Kit contains 1mm, 2mm and 3mm shims (2 pieces of each).
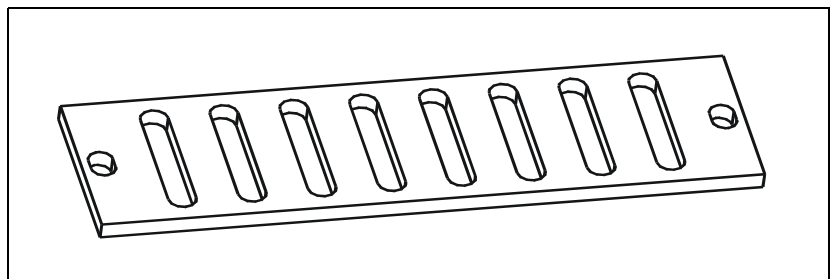
Figure 6-12. Shim

Overlapping Tool Banks

If the system senses that the a tool bank seems to overlap another tool bank during the installation, then the installation will fail. A probable explanation for this is that you have chosen a tool bank already installed.

7. Mechanical Centering and Verification

This chapter describes the mechanical centering system. It contains a description of the system, adjustment and calibration information.

⚠ *WARNING! In this chapter, some of the procedures causes the machine to make movements. The below warning must be followed for such procedures. Procedures that causes the machine to make movements are marked with this sign next to the text. Before entering such commands, check the following: Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas. Ensure that the single mounthead and the HYDRA tools are in their upper positions.*

The mechanical centering system centers and aligns the components mechanically when held by the single mounthead tool.
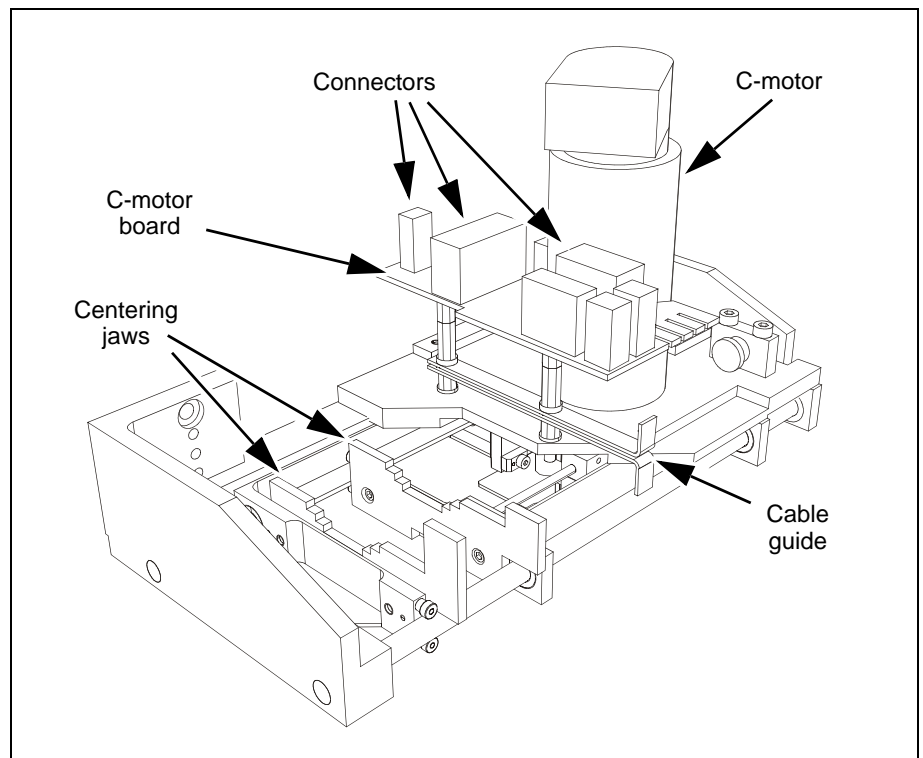
Figure 7-1. C60 Mechanical centering system

The mechanical centering system is also a mechanical and electrical verifier system that verifies the component dimensions and electrical values prior to placing the components.

Mechanical Centering
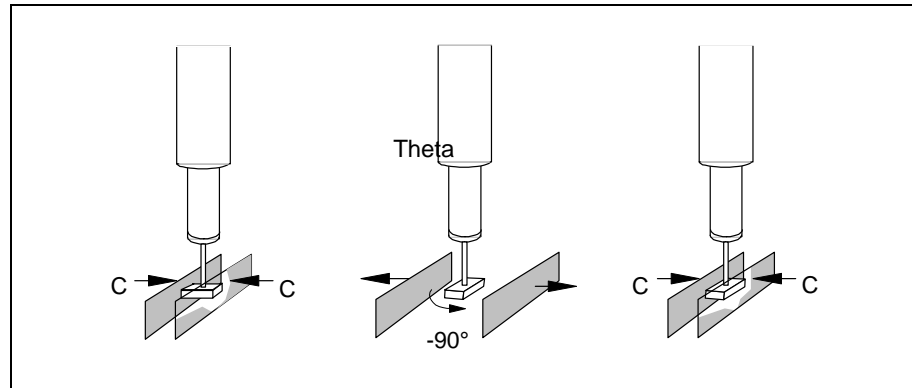
Figure 7-2.   Centering and verifying

Two centering jaws on each side of the component move symmetrically in a C movement towards each other, see Figure 7-2. They move until they both touch the component. The component is moved to the middle of the tool (centering and aligning). In this position the external dimensions and electrical data are verified. The centering jaws then retract.

The assembly process continues if the component was not rejected at the verification above. A rejected component is put into a reject bin, put back, or manually removed.

For most, common, packages, the tool with the component is rotated 90 degrees by the Theta movement to be centered and verified a second time. Packages can be programmed to use up to twelve mechanical centering phases. See the *Programming Manual* for more information.

Mechanical Verification

Mechanical verification means that the centering jaws measure the external dimensions of the component during mechanical centering. The component dimensions specified in the Package List are used at this verification. Components that do not meet the mechanical specifications are rejected, see the next section.

Electrical Verification

Electrical verification means that electrodes on the centering jaws measure electrical parameters of the component during the mechanical centering. Component values and tolerances defined in the Component List are used during this verification.

Components that do not meet the electrical specifications are rejected.

Electrical Parts

The schematics covering the C movement system can be found on the enclosed CD-Rom disc.

Adjustment and Calibration

This section contains adjustment and calibration instructions for the mechanical centering system.

The following procedures are covered by this section:

- *Measuring the Centering Base Level* on page 7-3.
- *Adjusting the Centering Device* on page 7-4.
- *Cable Resistance Measurement* on page 7-4.
- *Measure friction on the Centering Device* on page 7-5.

Measuring the Centering Base Level

This procedure measures the vertical position of the centering jaws, which equals the base centering level (see the figure).
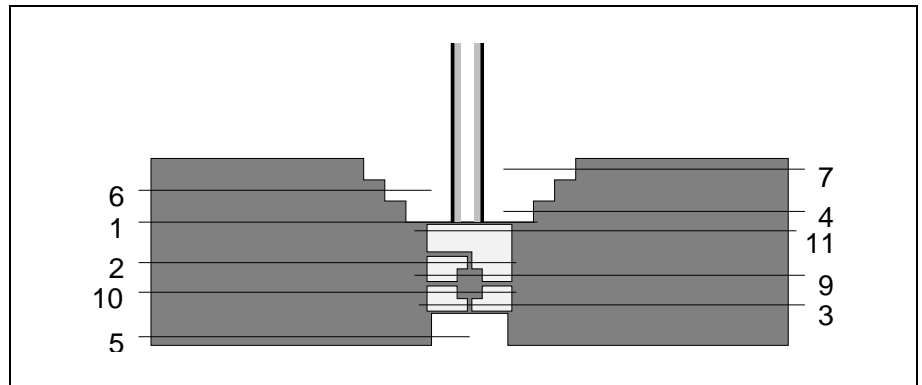
Figure 7-3.   Mechanical centering levels

The mechanical centering level must be measured if the centering jaws have been loosened or replaced.

It should also be performed as the first step if a mechanical centering or electrical verification problem occurs.

1. Select *Utility > Installation > Centering Base Level Measurement*.

2. Press the <Space> bar when the *Measure centering base level* dialog box is shown. The installed tools submenu is shown.

3. Select the tool to be used from the submenu.

   When ready, press <Enter>. The vertical position of the centering jaws is measured.

   If the value in the following dialog box is confirmed, then the new value is stored as parameter *21.0221 Centering; Centering levels; Base level* which normally equals centering level Number 1.

```
New centering base level: 29297 µm
Old centering base level: 29525 µm
          Accept new value?
                Yes   No
```

Adjusting the Centering Device

In this procedure the adjustment will compensate for any C misalignment in the centering device.

1. Prior to this adjustment you will have to perform the *Mechanical centering unit alignment* procedure described in Chapter 5.

2. Read off the field C misalignment when the procedure is completed.

3. If the C misalignment exceeds ±6μm, then the centering device should be adjusted as follows.

4. Loosen the four locking screws.

5. Adjust the micrometer on the centering device to counteract the indicated C misalignment.

6. Tighten the locking screws.

7. Repeat the procedure until the misalignment value is within accepted range.
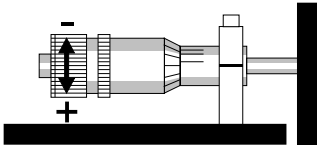
Cable Resistance Measurement

This procedure is used to measure the cable resistance in wires included in the electrical verification circuit, and to update this value in the system.

The cable resistance has effect when verifying low ohm resistors only, see below.

Prerequisites

Zero ohm resistors are required to perform this measurement.

1. Select *Utility > Installation > Cable Resistance Measurement*

2. Select package. By default, package 1206-09 is highlighted.

3. When prompted, select the *Measuring angle*, which is 90° for 2-pole components.

4. Select *Manual* or *Magazine* pick method. The latter requires a magazine loaded with zero ohm resistors.

If you have selected manual pick, apply manually a zero ohm resistor with the selected package to the tool tip in 0 degrees. Press <Enter> when ready.

This procedure updates the *111.0002 Cable resistance* parameter. The default value for this parameter is 0.6 ohm, which, if incorrect, has effect only on resistors with a resistance of less than 50 ohm approximately.

If you have no zero ohm resistor, you can use a low ohm resistor and subtract the real resistor value from the measured value and enter the difference to the *111.0002 Cable resistance* parameter.
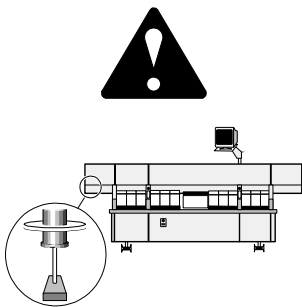
Measure friction on the Centering Device

1. Select the Exit To Service option in the TPSys Exit menu.

2. Select *Motor > C motor > Measure friction*

3. Measure the friction with the default speed value suggested in the shown dialog box.

   The *Measure* command starts the friction measuring.

   After completed measuring, the friction is shown as follows:

   ```
   Friction was measured to 131mN
                 Ok
   ```

   Measured friction values for the C-axis should be, max. 1 112 mN.

Replace Centering Jaws

1. Check the wiring before disconnecting the cables to the XTC board so that you can reconnect properly.

2. Remove the old jaws (see figure) and replace with new ones.
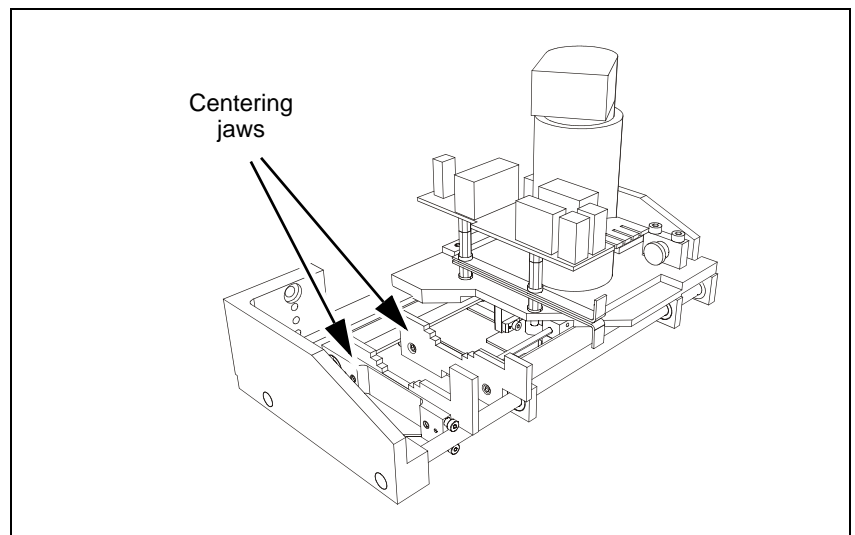
Figure 7-4. Centering Jaws

☞ Make sure the cables can run smoothly by pressing the centering jaws gently together by hand.

3. Perform the procedure *Measuring the Centering Base Level* on page 7-3.

4. Perform the procedure *Measuring the Fine tune Z-unit offset* procedure as described in Chapter 5.

5. If the received C misalignment value is outside the accepted range (see section *Adjusting the Centering Device* on page 7-4). Then perform the *Z-Unit Offset Measurement* as described in Chapter 5.

6. Perform the *Cable Resistance Measurement* on page 7-4.

7. Make a test assembling.

8. Vision Systems

This chapter contains a description of the different cameras and vision systems used on MYDATA placement machines.

This chapter is divided into the following two parts.

X wagon Camera

This section describes the positioning vision system – the X-wagon camera. It contains a description of the system, adjustment and calibration information.

The positioning vision system hardware consists of a camera located on the X wagon with the lens facing downwards, focusing on boards, magazines and trays below the camera. This camera is used to position components on PCBs, locate boards, calibrate magazine and magazine feeders, and locate trays and tray pallets.

The TPSys software controls the positioning vision system including an automatic fiducial mark search feature.

WARNING! In this section, some of the procedures causes the machine to make movements. The below warning must be followed for such procedures. Procedures that causes the machine to make movements are marked with this sign next to the text. Before entering such commands, check the following: Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the Hydra tools are in their upper positions.

CAUTION! Camera units contain components that can be damaged by improper handling. Do not put fingerprints on any optical parts. Avoid exposing the camera to a dusty environment. Mirrors and CCD cameras are factory adjusted and must not be readjusted.

Electrical Parts

The schematics covering the Positioning Vision system can be found on the enclosed CD-Rom disc.

Calibrating the X wagon Camera

The purpose of this calibration procedure is to let the system adjust the camera optics, with the aid of a calibration board, to coincide with the values provided by the vision system. Perform this procedure when installing a new machine or if the X-wagon camera has been replaced. Also if the offset values for the X-wagon camera, are not within $\pm3\mu m$ approximately.

Procedure

1. Start the calibration by selecting *Utility > Installation > X-Wagon Camera Calibration.*

2. TPSys will ask if the calibration plate L-015-0450 (see Figure 8-1) is available. Select *Yes*.
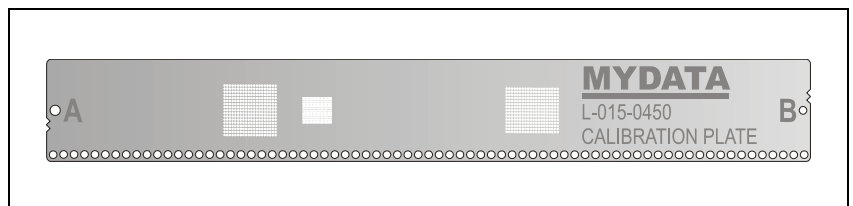
Figure 8-1. Calibration board L-015-0450

   – If this board is not available select *No* and TPSys will revert to the procedure described on page 8-5.

3. TPSys will now ask for the calibration board to be placed on the Y wagon. Place the calibration board on the Y wagon, approximately aligned to the X axis, and verify by selecting *OK*.
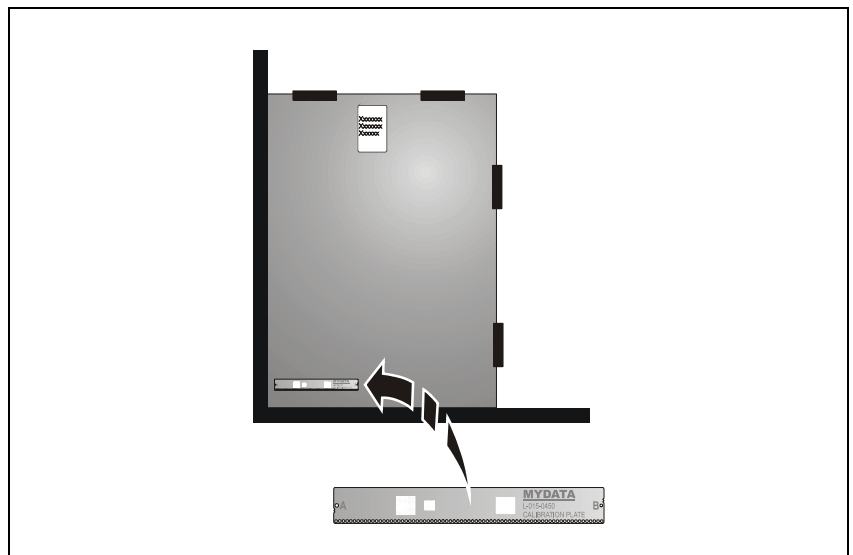
Figure 8-2. Calibration board (L-015-0450)

4. You are now asked to locate the fiducial marks A and B on the calibration board, see Figure 8-1.

   – Center the camera cross hairs on the fiducial mark A and verify by pressing <Enter>.

   – Repeat this procedure for fiducial mark B.

5. .Select a suitable position for *Board Level measurement* when prompted. Center the cross-hairs on a position on the Y wagon and press <Enter>.

– The machine will now pick a C23 tool.

– This tool is used to rotate the calibration board and align it with the X axis.

– When the board is accurately aligned the camera is moved to the calibration pattern and calibrated.

A calibration result box is shown:

```
  Camera calibration results:
       X offset: –102 µm
       Y offset: –54 µm
          Theta: +.01°
 X Scale error: +.03%
 Y Scale error: +.02%

   Redo camera calibration?
           Yes   No
```

6. TPSys will repeat the calibration a number of times and usually reach an acceptable result so you can select *No*. If the values are outside ±3µm redo the calibration by answering *Yes*. The same box is shown again, but with lower offset values.

7. After this procedure the assembly area has to be calibrated as described in *Place Area Calibration* in Chapter 11 *Board Handling Systems*.

Using calibration board L-029-0220F or later

If the calibration plate L-015-0450 is not available TPSys will revert to the following calibration procedure.

Procedure

1. Insert the calibration board (L-029-0220F or later) on the Y wagon.

2. Start the calibration by selecting:
   Utility > Installation > X-Wagon Camera Calibration.

3. Center the camera cross hairs on the calibration pattern marked with letter 'B' as shown in Figure 8-3.
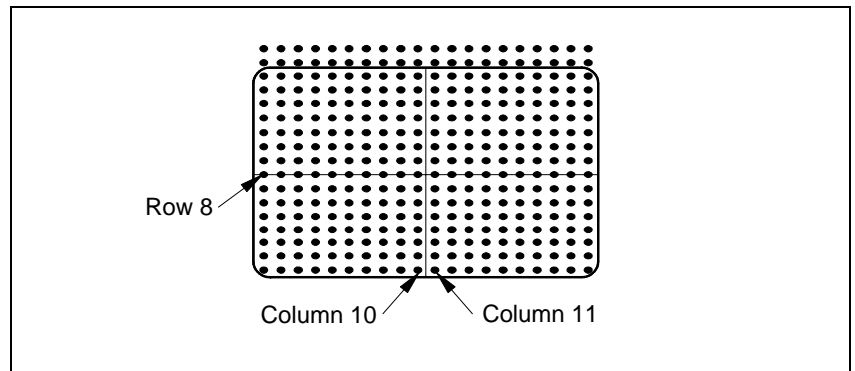
Figure 8-3. Centering the cross hairs

4. Center the cross hairs between column 10 and 11 on row 8 as in Figure 8-3 and press <Enter>.

   A calibration result box is shown:

   ```
    Camera calibration results:
        X offset: -102 µm
        Y offset: -54 µm
           Theta: +.01°
   X Scale error: +.03%
   Y Scale error: +.02%

     Redo camera calibration?
            Yes  No
   ```

5. TPSys will repeat the calibration a number of times and usually reach an acceptable result so you can select *No*. If the values are outside ±3µm redo the calibration by answering *Yes*. The same box is shown again, but with lower offset values.

6. After this procedure the assembly area has to be calibrated as described in *Place Area Calibration* in Chapter 11 *Board Handling Systems*.

Adjusting the X-wagon Camera Focus

At delivery the cameras focus is preset to a nominal 23.7mm. This is the distance between the lowest part of the cameras illumination unit, and the upper surface of the PCB on the Y wagon. If there is problem with the focus, for instance if the machine is used mostly for very thick boards, the camera focus may need to be adjusted.

☞ Note that the camera has to be calibrated after this adjustment, and that the assembly table place area must be calibrated as well.

Procedure

1. Insert the calibration board (L-029-0220F or later) on the Y wagon.

2. Start the calibration by selecting:
   Utility > Installation > X-Wagon Camera Calibration.

3. Center the camera on the calibration board pattern.

4. Make sure the emergency stop button(s) are pressed down.

5. Remove the cover on the machine to gain access to the camera unit.

   On the front of the camera unit, about 15mm below the Sony camera, there are three holes. Two of which are threaded, see Figure 8-4.

   In both the threaded holes there is a lock screw for the lens system. The unthreaded hole is used for focus adjustment.

6. Loosen one of the lock screws that locks the lens system.
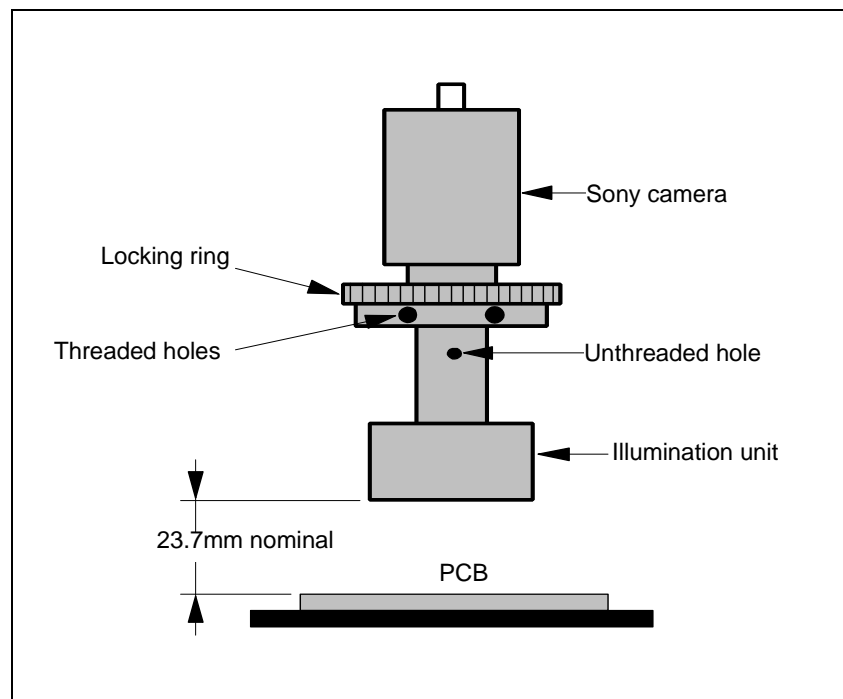
Figure 8-4.   Camera unit, front view

7. Insert a screw driver in the unthreaded hole and apply a gentle force.

8. Unscrew the other lock screw that holds the lens system. The lens system can now be moved up and down with the screw driver.

9. View the image on the monitor and adjust the focus.

10. When ready, tighten the lock screws before removing the screw driver.

11. Put back the cover.

12. Release the emergency stop button(s).

13. Perform the procedure *Calibrating the X wagon Camera* on page 8-3.

14. Perform the procedure *Place Area Calibration* in Chapter 11 *Board Handling Systems*.

Optical Centering Systems

An optical centering system consists of a camera that can focus on a component held by the mount tool, and software which can identify, inspect and calculate the exact position and angle of the component relative the mount tool. The system then calculates the position and angle for the mount tool to place the component correctly on the PCB.

There are several different vision systems available:

– The Standard Vision System (SVS).

This system consists of one Standard Vision Camera (SVC).

– The Dual Vision System (DVS).

This system consists of one Standard Vision Camera (SVC) and one High Resolution Camera (HRC).

– The HYDRA Vision System.

This system consists of one HYDRA Vision Camera (HVC).

– The Linescan Vision System.

This system consists of one Linescan Camera (LSC).

WARNING! In this section, some of the procedures cause the machine to make movements. The below warning must be followed for such procedures. Procedures that causes the machine to make movements are marked with this sign next to the text. Before entering such commands, check the following: Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the Hydra tools are in their upper positions.

CAUTION! Camera units contain components that can be damaged by improper handling. Do not put fingerprints on any optical parts. Avoid exposing the camera to a dusty environment. Mirrors and CCD cameras are factory adjusted and must not be readjusted.

Standard and Dual Vision Systems

SVS, Standard Vision System

The SVS, Standard Vision System, is a single camera system with a field of view (FOV) area of 55.4mm x 41.5mm. This system is intended for optical centering and inspection of a wide range of parts, from SO packages with only a few leads to large fine pitch QFP packages and BGA packages with generic bump patterns.

The camera unit is called SVC, Standard Vision Camera unit. The SVC camera unit is shown in Figure 8-5.
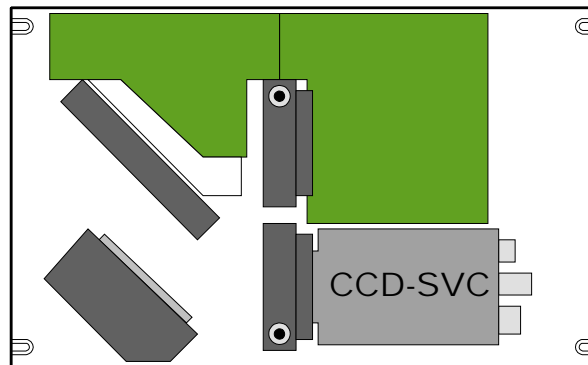
Figure 8-5. SVC camera unit

DVS, Dual Vision System

The DVS, Dual Vision System, is a dual camera system with two different field of view (FOV) areas, 55.4mm x 41.5mm for the standard camera and 17.3mm x 12.9mm for an additional high resolution camera (HRC). This system is intended for optical centering and inspection of the same parts as the SVC camera, but this one can handle small packages with no loss of details.

The camera unit is called DVC, Dual Vision Camera unit and it contains a high resolution camera in addition to the standard camera. The DVC camera unit is shown in Figure 8-6.
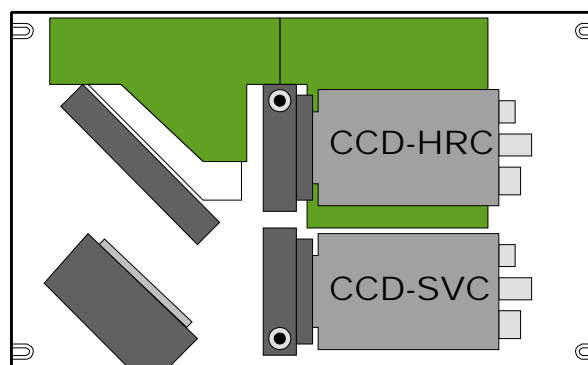
Figure 8-6. DVC camera unit

Standard and Dual Vision Systems Calibration

Prerequisites

Calibration board for the SVC or HRC camera.

☞ Please note that the board variants before *L-029-0506-3* have a gold plated pattern. This gold plated variety will not work properly with the lighting calibration in TPsys 2.4. The -3 type of board have a pattern made of copper.
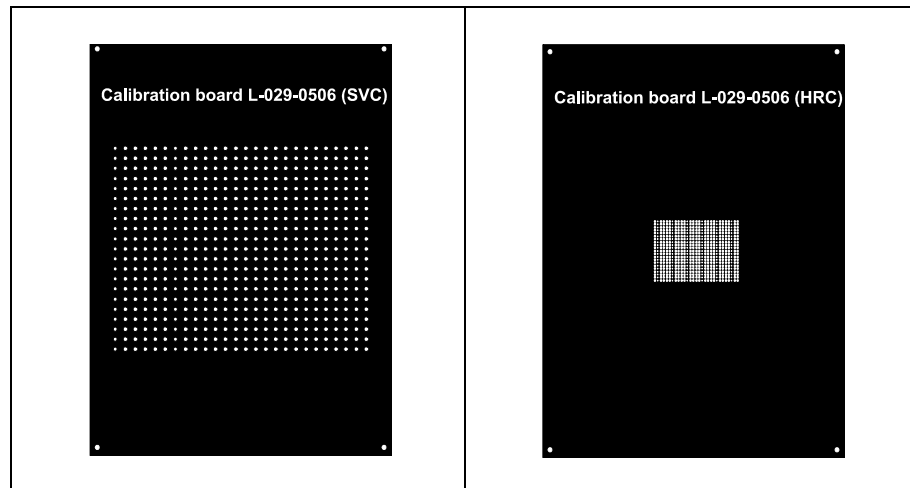
Figure 8-7. SVC - (L-029-0506-3)   *Figure 8-8. HRC - (L-029-0506-3)*

⚠ *CAUTION! The calibration plate is the camera´s absolute reference and shall therefore always be handled with care. When not used the calibration plate shall be stored in its accompanying casing in order to keep it clear from dust and in good shape.*

Procedure

👉 When calibrating a DVC camera unit, first calibrate the HRC camera, then calibrate the SVC camera. Do not calibrate in the opposite order. When calibrating the SVC camera in a DVC unit, exclude step 13 below (mechanical adjustment of the camera unit).

1. Ensure there are no tools in the single mounthead.

2. Remove the cover and component bin from the camera unit.

3. Start the calibration by selecting:
   Utility > Installation > Optical Centering Calibration.

4. Select camera to calibrate when the *Select centering camera* dialog box is shown.

   – Select *Standard* to calibrate a SVC camera.

   – Select *High resolution* to calibrate a HRC camera.

   The figures 1 and 2 after the camera name indicates the camera number.

   It is possible to install up to three camera units in the machine. Two SVC cameras and one HRC camera, or vice versa
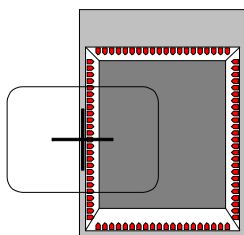
5. Move the cross hairs to the camera´s left side when the *Center cross hairs on the left side of the camera frame* dialog box is shown. Confirm the position when ready.

   The machine will now measure the camera Z position by slowly lowering the single mounthead tool holder until it touches the camera frame. This measurement is needed for calculating the level at which the component is optically inspected. The camera is factory adjusted to focus 2mm above the camera frame.

6. Measure the calibration plate thickness with a vernier caliper when the *Verify calibration plate thickness* dialog box is shown. If necessary, insert the correct value in the dialog box on the screen.

7. When prompted, put a board on the assembly table and then the calibration plate on top of that board with the supports downwards. When ready confirm in the *Insert optical calibration plate* dialog box.

8. When prompted, *Center cross hairs on lower left fiducial mark of calibration plate* and confirm the position by selecting *Ready* and pressing <Enter>.

9. When *Center cross hairs on lower right fiducial mark of calibration plate* is shown, move the cross hairs to this fiducial mark. Confirm the position by selecting *Ready* and pressing <Enter>.

The fiducial mark centering steps above are repeated until the calibration board is adjusted to an acceptable angle.
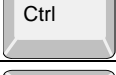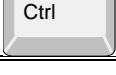
☞ Be as precise as possible when positioning the cross hairs. The more precise the better quality of the mount precission later!

10. When prompted to *Find a place on the board to measure board level on*, move the cross hairs to the base board for measuring the board level and confirm the position by selecting *Ready* and pressing <Enter>.

11. When *Locate X position of calibration plate* is shown, adjust the cross hairs to the center of the calibration pattern in the X direction using the joystick.

The camera is positioned in 90 degrees. Consequently, the dot area should be centered vertically on the monitor.

To pan the image, use the key combinations in the table below.

Key combination	Move image
Ctrl + W	Up
Ctrl + X	Down
Ctrl + A	Left
Ctrl + D	Right
Ctrl + PgUp	Zoom Out
Ctrl + PgDn	Zoom In
Ctrl + S	Back to normal view

12. When done, confirm the position of the calibration pattern center by selecting *Ready* and pressing <Enter>.

13. If the calibration pattern is not aligned in the Y direction, it might be necessary to adjust the Y position of the camera unit mechanically.

☞ Do not adjust a DVC unit mechanically if the SVC is calibrated. Only adjust the DVC unit mechanically when the HRC is calibrated.
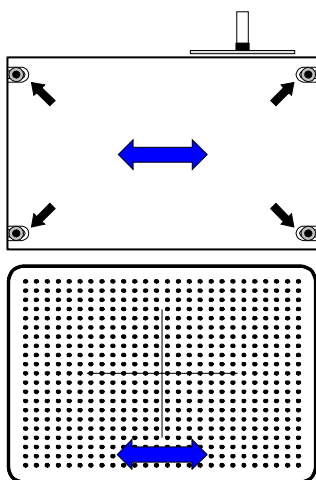
If you touch the calibration board, then select *Cancel* in the dialog box and repeat the calibration procedure from the beginning.

14. To adjust the camera Y position, loosen the four screws as depicted in the figure.

15. Adjust the camera unit, in the Y-wise direction, until the cross hairs are centered to the calibration pattern.

16. Tighten the four screws and check that the calibration pattern is still centered. If not, loosen the screws again and repeat the adjustment described above.

17. Confirm that the Y adjustment is completed by selecting *Ready* in the shown *Adjust Y position of camera* dialog box.

18. When the *Calibration successful* dialog box is shown the calibration procedure if finished.

19. Reassemble the cover and component bin on the camera unit.

Proceed with the procedure *Optical Centering Camera Offsets (Standard and Dual Vision Systems)* on page 8-14.

The most common reason for the camera calibration to fail is as follows:

– Too bright image.

– Too dark image.

– Light reflections interfere with the black reference dots.

Light reflections, originating from the surface of the calibration plate, is reduced by turning off the dark field illumination.

Set the following parameters to 0% (zero):

Standard Vision Camera (SVC):
65.0403 Illumination Levels; Use dark field   % (DVC illumination)

High Resolution Camera (HRC):
68.0403 Illumination Levels; Use dark field   % (DVC illumination)

Optical Centering Camera Offsets (Standard and Dual Vision Systems)

The Optical Centering Camera Offsets procedure is used to increase the accuracy of the computed centering offsets.

This calibration step needs to be performed for all centering cameras in the machine, except for the HYDRA camera, which can not be used together with the single head.

Prerequisites

– Special calibration component L-010-0166-1.

– Package definition file called 'Install-4x4mm' Import the file 'Install-4x4mm' from /home/tpsys/lib/DefData/ directory.

Procedure

1. Start the procedure by selecting:
   Utility > Installation > Optical Centering Camera Offsets.

2. Select which camera to calibrate, when the *Select centering camera* dialog box is shown.

3. Insert an empty board and place the L-010-0166-1 calibration component on it.
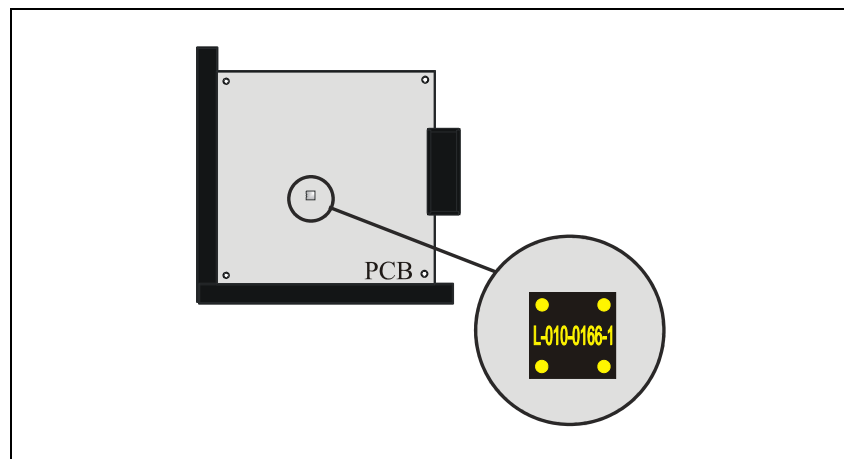
Figure 8-9. Thin calibration component

4. When done, confirm by selecting *Yes* in the *Insert optical calibration plate* dialog box.

5. When prompted, use the joystick to center the cross hairs on the following positions on the component.

– *Locate lower left corner.*

– *Locate lower right corner.*

– *Locate upper left corner.*

Confirm the positions by selecting *Ready* and pressing <Enter> when respective *Locate component* dialog box is shown.

6. When prompted, move the cross hairs to the base board for measuring the board level.

7. When satisfied with the position, select *Ready* in the *Find a place on the board to measure board level on* dialog box and press <Enter>.

TPSys picks up the component and acquires the necessary number of images and calculates the centering offsets.

When the measurement is done, the result is presented in the following information box.

```
New Z tool centering offset:
    X: 100 µm     Y: -16 µm
   Old centering offset:
    X:  89 µm     Y: -10 µm
        Difference:
    X:  11 µm     Y: -6 µm
           Save?
          Yes    No
```

8. Save the new results by selecting *Yes*.

☞ If you did not use the L-015-0450 calibration plate when doing Place Area calibration – proceed with the procedure *Fine Tuning the Centering Camera (Standard and Dual Vision Systems)* on page 8-16.

Fine Tuning the Centering Camera (Standard and Dual Vision Systems)

If you did not use the L-015-0450 calibration plate when doing Place Area calibration it is necessary to perform a fine tuning to achieve the highest possible placement accuracy.

Procedure

1. Start the procedure by selecting:
   Utility > Installation > Centering Camera Fine Tune.

2. Select the camera to fine tune, when the *Select centering camera* dialog box is shown.

3. In the following dialog box, the system suggests a suitable package to use for optical centering. It is possible to use another package if preferred.

```
        Select a large optically centered package.
              A good choice for fine tuning
    the Standard Vision Camera is QFP256 with 0.4mm lead
                          pitch.
                           OK
```

Figure 8-10 illustrates a QFP with 256 leads and a lead pitch of 0.4mm. The arrows in the figure point out the default lead numbers used for the TPSys Toggle lead feature. This package is a good choice for fine tuning the SVC. If the HRC centering camera is being fine tuned, then the system will suggest the QFP48 package.
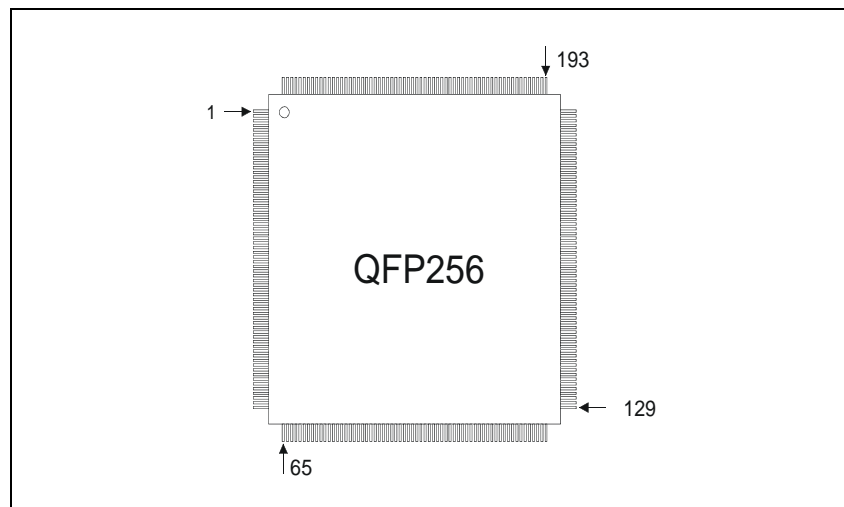
Figure 8-10. QFP256

☞ Be carefull in the choice of fine tune component – a less ideal component will affect the mounting precission!

4. Select a large optically centered package from the
   * SELECT PACKAGE * window.

5. When prompted to *Select place position.* Put a board on the assembly table and select a place on the board to place the previously selected component. When done, confirm the position in the dialog box.

6. Select where to pick up the chosen component from the shown *Pick Up Component* dialog box.

7. If you choose to pickup the component from the Y wagon then the system will prompt you to use the joystick to center the cross hairs on the following positions on the component.

   – *Locate lower left corner.*

   – *Locate lower right corner.*

   – *Locate upper left corner.*

8. Confirm the positions by selecting *Ready* and pressing <Enter> when respective *Locate component* dialog box is shown.

9. Toggle between leads <F2> and adjust the graphic representation of the component to the component until they match, confirm with <Enter> when ready.

   Offset values are presented in the lower left corner of the screen together with the difference between new and old values.

   Centering camera offset values in the parameter file are updated.

   Acceptable values for the offset between the component and the graph are shown in the table below.

HYDRA Camera

The HYDRA camera takes images of components picked by the HYDRA unit. It reads an image of four components in one shot. When picking components, two consecutive images are taken while the HYDRA unit passes over the camera.
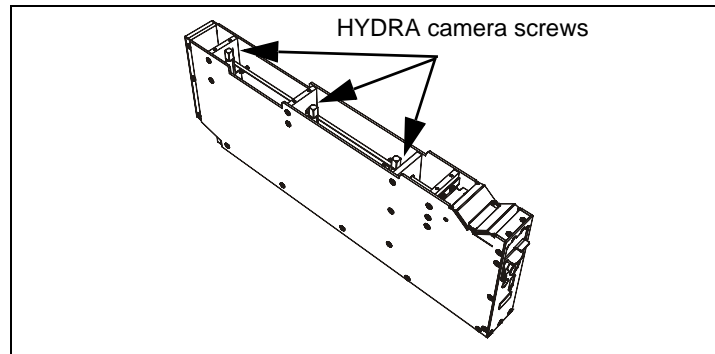
Figure 8-11. HYDRA camera with top lid removed

The camera box is mounted on the machine using three screws at the bottom of the camera box, extending through a steel plate (See figure 8-11).

A Sony camera has been adjusted to fit the box and the optic system is based on a special lens system which increases the performance for offset calculation of very small components.

To protect the lenses from dust and components there is a transparent gate in the camera box that is controlled from the front.

When removing any components from the glass on the gate they fall down to the back of the camera into a dump bin and can easily be reached.

Electrical Parts

The schematics covering the HYDRA Camera System can be found on the enclosed CD-Rom disc.

Adjustment and Calibration

Calibrating the HYDRA Camera

See section *Calibrate the HYDRA Optical System* in Chapter 5 *Mount Heads* for instructions on how to calibrate the HYDRA camera.

Linescan Vision System

The LineScanVision System generates a picture by a series of flashes synchronized with the position of the mount head as it pass over the camera. The final image is made up of thousands of such lines.

The illumination of the component is done with front lighting. The light segments are fully programmable as a function of what package is to be inspected. The illumination can be altered both in intensity and in angle.

The LineScanVision System consists of the following hardware:

– Camera box.

– LSAD board.

– Power unit.

WARNING! In this section, some of the procedures causes the machine to make movements. The below warning must be followed for such procedures. Procedures that causes the machine to make movements are marked with this sign next to the text. Before entering such commands, check the following: Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the Hydra tools are in their upper positions.

Camera box
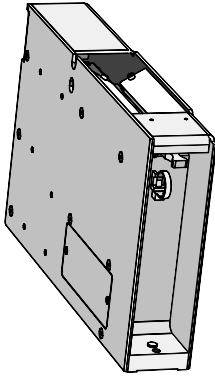
The most important part of the LVS is the Linescan camera (LSC). Inside the camera box there is a 2048 x 96 pixel CCD. There are also electronic boards needed to drive the CCD clocks and send the analog video signal to the LSAD board.

The camera can be used as a 2048 x 96 pixels area camera, which is useful for calibration and troubleshooting. Use this mode in the service program.

The focal plane is factory-set at 14mm above the camera frame. This is not possible to adjust. There are no serviceable parts inside the camera box, except for the glass window and the LED boards. To avoid vibrations or relative movements between the CCD and the lens, all optical elements are glued to a steel frame. This frame is machined from a single solid block of metal.

The illumination unit has two separate segments, front light and ambient light. The LED current is constant (50mA per diode). The light intensity is varied by changing the duty cycle.

LSAD Board

An LSAD board is mounted inside the AT-CPU2 and performs several functions:

– It provides the camera box with line synchronization based on HFLASH and linear encoder signals.

– Switches the LED boards on and off.

– AD converts the 8 channel analog video and feeds the data to the 4MB video memory on VVG2.

– It compensates for gain and offset variations between the 8 channels, using Look Up Tables (LUT).

– Controls the camera electronics via a serial link.

The LSAD board is accessed via the VVG2. Only +5V and GND are connected to the ISA-bus.

Power Unit
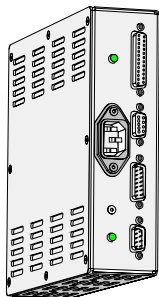
The Power unit is mounted behind the Linescan camera and supplies it with six different voltages: +15V, +13.5V, +12V, +5V, –2V and -5V.

The Power unit also supplies the drive current for the LED boards. If the LED boards are kept on for too long, a watch-dog will automatically switch them off, preventing the diodes from over-heating due to a faulty cable or LSAD board.

Two green LED indicate camera power OK and LED power OK.

Electrical Parts
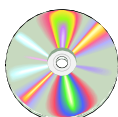
The schematics covering the Linescan Camera System can be found on the enclosed CD-Rom disc.

Calibration of Optical Centering (Linescan Vision System)

This procedure describes how to calibrate the LSC camera. Perform this procedure when a new LSC camera is being installed or if parts of the optical or mechanical system are modified or replaced.

Prerequisites

– C23S mount tool.

– Calibration plate for the LSC camera, part No. L-010-0452B.
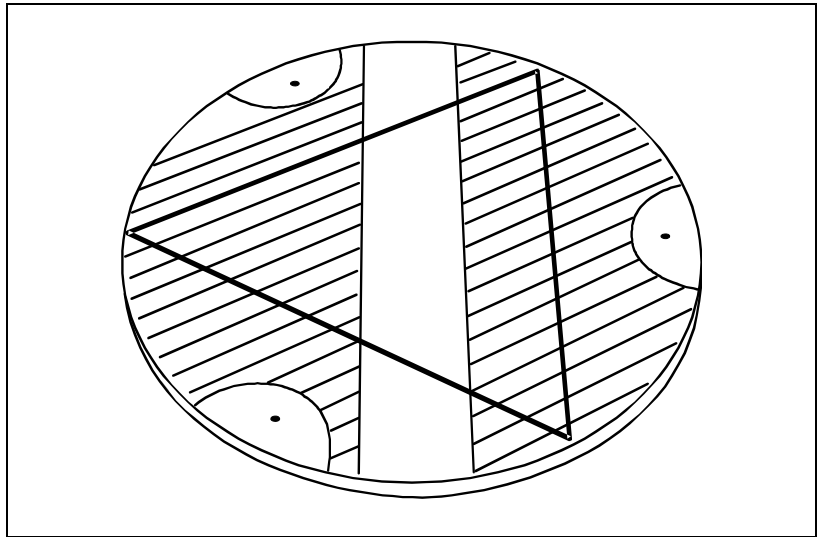
Figure 8-12. Calibration Plate

⚠ *CAUTION! The calibration plate is the cameras absolute reference and shall therefore always be handled with care. When not used the calibration plate must be stored in its accompanying casing in order to keep it clear from dust and in good shape.*

Procedure

1. Ensure there is no tool in the single mounthead.

2. Select *Utility > Installation > Optical Centering Calibration.*

3. Select which camera to calibrate, when the *Select centering camera* dialog box is shown.

4. When prompted, *Center cross hairs on the left side of the camera frame* (see figure). Confirm the position when ready.
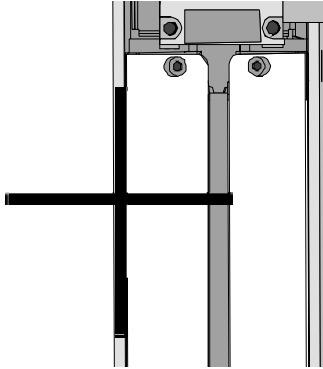
    The machine will now measure the camera Z position by slowly lowering the mounthead tool holder until it touches the camera frame. This measurement is necessary in order to calculate the level for the component to be optically inspected at. The camera is factory adjusted to focus 14mm above the camera frame.
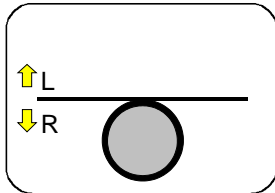
5. The tool center position is measured by first aligning the left side of the single mounthead tool holder top to the horizontal line in the center of the screen. When the *Position on left side of standard tool holder top* dialog box is shown, move the tool position up or down using the joystick.
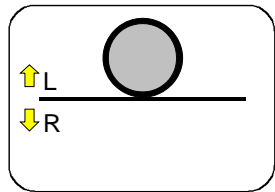
6. Select *Ready* and press <Enter> when satisfied with the position.

7. Align the right side of the Z tool in the same way as above and confirm the position by selecting *Ready* and pressing <Enter>.
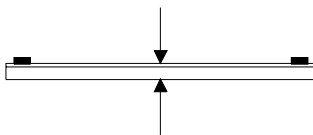
The plate thickness does not include the supports.

8. When the *Verify calibration plate thickness* dialog box is shown. Measure the calibration plate thickness with a vernier caliper and, if necessary, insert the correct value in the shown dialog box.
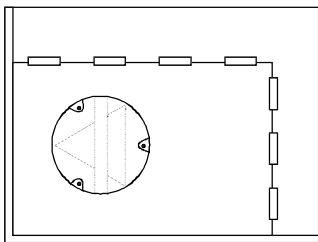
9. Put a board on the assembly table and then the calibration plate on top of that board with the supports downwards when the *Insert optical calibration plate* dialog box is shown. Note the orientation of the plate. Confirm by selecting *Yes* in the dialog box.
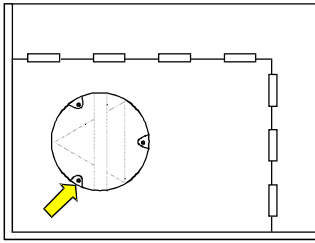
10. When prompted, *Center cross hairs on lower left fiducial mark of calibration plate* and confirm the position by selecting *Ready* and pressing <Enter>.
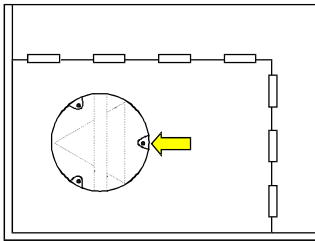
11. When prompted, *Center cross hairs on the center right fiducial mark of calibration plate* and confirm the position by selecting *Ready* and pressing <Enter>.
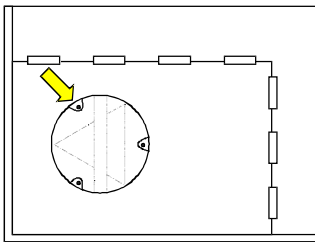
12. When prompted, *Center cross hairs on upper left fiducial mark of calibration plate* and confirm the position by selecting *Ready* and pressing <Enter>.
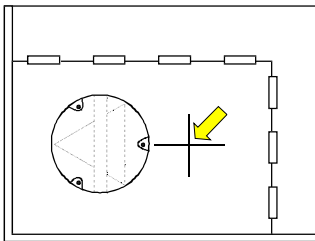
13. When the *Find a place on the board to measure board level on* is shown. Move the cross hairs to the base board for measuring the board level and confirm the position by selecting *Ready* and pressing <Enter>.

14. The calibration starts and the *Running Linescan camera calibration* dialog box is presented on screen. The calibration procedure will last for approximately 2 minutes and if successful the *Calibration successful* dialog box is presented on the screen.

Now proceed with the procedure *Optical Centering Camera Offsets (Linescan Vision System)* on page 8-24.

Optical Centering Camera Offsets (Linescan Vision System)

The Optical Centering Camera Offsets procedure is used to increase the accuracy of the computed centering offsets.

This calibration step needs to be performed for all centering cameras in the machine, except for the HYDRA camera, which can not be used together with the single head.

Prerequisites

– Special calibration component L-010-0166-1.

– Package definition file called 'Install-4x4mm'.Import the file 'Install-4x4mm' from /home/tpsys/lib/DefData/ directory.

Procedure

1. Select *Utility > Installation > Optical Centering Camera Offsets.*

2. Select which Linescan camera to measure, when the *Select centering camera* dialog box is shown.

3. If not done previously, insert an empty board to place the calibration component on.

4. Put the calibration component on the board.
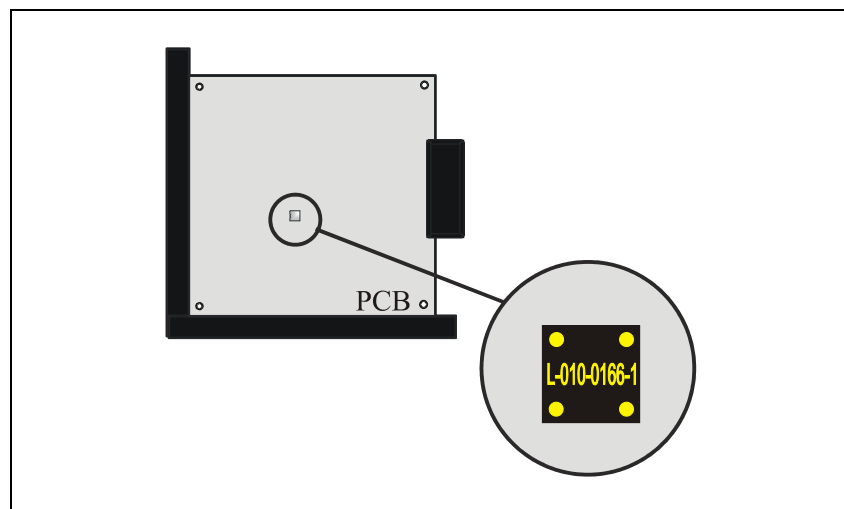
Figure 8-13. Calibration component

5. When done, confirm by selecting *Yes* in the *Insert optical calibration plate* dialog box.

6. When prompted, use the joystick to center the cross hairs on the following positions on the component.

  – *Locate lower left corner.*

  – *Locate lower right corner.*

  – *Locate upper left corner.*

Confirm the positions by selecting *Ready* and pressing <Enter> when respective *Locate component* dialog box is shown.

7. When prompted, move the cross hairs to the base board for measuring the board level.

8. When satisfied with the position, select *Ready* in the *Find a place on the board to measure board level on* dialog box and press <Enter>.

TPSys picks up the component and acquires the necessary number of images and calculates the centering offsets.

When the measurement is done, the result is presented in the following information box.

```
New Z tool centering offset:
    X: 100 µm    Y: -16 µm
   Old centering offset:
    X:  89 µm    Y: -10 µm
       Difference:
    X:  11 µm    Y: -6 µm
          Save?
         Yes   No
```

9. Save the new results by selecting *Yes*.

Proceed with the procedure *Centering Camera Fine Tune (Linescan Vision System)* on page 8-26.

Centering Camera Fine Tune (Linescan Vision System)

It is necessary to perform a fine tuning to achieve the highest possible placement accuracy.

Procedure

1. Select *Utility > Installation > Centering Camera Fine Tune*

2. Select which camera to measure, when the *Select centering camera* dialog box is shown.

3. In the following dialog box, the system suggests a suitable package to use for optical centering.

```
Select a large optically centered package.
A good choice for fine tuning
the Linescan Camera is QFP304 with 0.5mm lead pitch.
                         OK
```

Figure 8-14 illustrates a QFP with 304 leads and a lead pitch of 0.5mm. The arrows in the figure point out the default lead numbers used for the TPSys Toggle lead feature. This package is a good choice for fine-tuning the Linescan Camera.
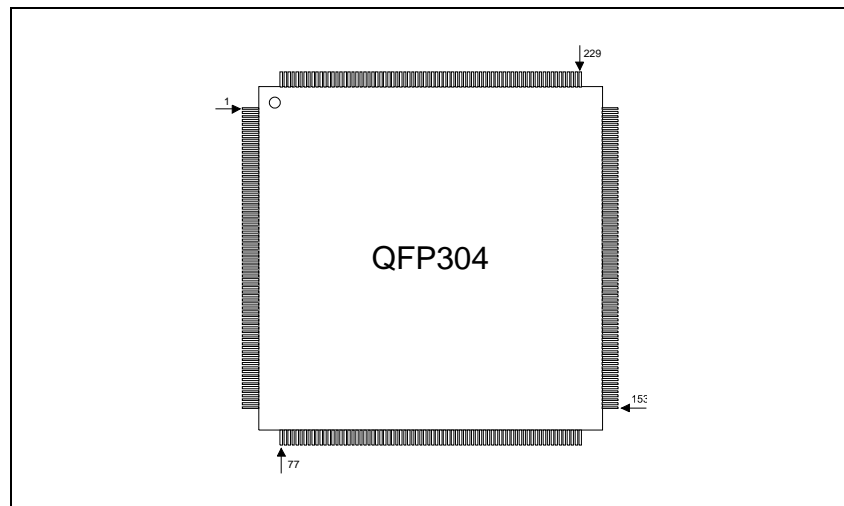
Figure 8-14. QFP304

If the suggested package is not available or some other package is preferred then it is possible to choose another package.

4. Select a large optically centered package from the ** SELECT PACKAGE ** window.

5. When prompted to *Select place position.* Put a board on the assembly table and select a place on the board to place the previously selected component. When done, confirm position in the dialog box.

6. Select where to pick up the chosen component from the shown *Pick Up Component* dialog box.

If you choose to pickup the component from the Y wagon then the system will prompt you to, use the joystick to center the cross hairs on the following positions on the component.

– *Locate lower left corner*

– *Locate lower right corner*

– *Locate upper left corner*

Confirm the positions by selecting *Ready* and pressing <Enter> when respective *Locate component* dialog box is shown.

7. Toggle between leads <F2> and adjust the graphic representation of the component to the component until they match, confirm with <Enter> when ready.

Offset values are presented in the lower left corner of the screen together with the difference between new and old values.

Centering camera offset values in the parameter file are adjusted.

8. Repeat the procedure until no or very small adjustment is required to align the graph to the component.

Acceptable values for the offset between the component and the graph are shown in the table below.

Machine	X offset	Y offset	Theta offset
MY-series	25μm	25μm	0,10°

Troubleshooting

Refer to the table below if you have problems with the Linescan Camera.

Symptom	Possible reason
Calibration fails	Calibration plate touches centering jaws when rotated. Try setting parameter 73.0003 to –13.5 mm.
	Linear encoder incorrectly adjusted.
	Ensure that you have installed the reference background correctly.
Cannot find the reference background	Camera or reference background incorrectly mounted in Y direction. The entire reference background (7x56mm) should be visible in the left most channel (pixels 0-255).
	Reference background dirty, bent, damaged or not installed.
LED boards not illuminating.	Light intensity in package data set to 0%.
	Power unit or LED cable damaged.
Blurred image in both vertical and horizontal direction.	Incorrect component height in package data.
	Camera level incorrectly measured.
	Centering unit mounted in upper position.
	Magnification incorrectly measured during calibration.
Blurred image only in vertical direction.	Linear encoder incorrectly adjusted
	Protective tape not removed from linear encoder head or codes trip.
	X wagon traveling too fast over camera. Try lowering parameter for max X speed 57.0211 (also 58.0211 if you have two LSCs).
Vertical stripes in image.	Look-up-table-calibration failed.
	LED cable shield damaged.
	Power unit or power cable damaged.
	Video cable damaged.
Dark image.	Calibration failed.
	LED boards or power unit damaged.
Dark spots in image.	Dirt on camera window.
Bad placement accuracy.	Dirt on reference background.
Slow mounting.	Max-safe-pos incorrect.
	View mode or debug mode on.
	Incorrect tool parameters.
Level of camera box not repeatable.	Midas touches LED board Plexiglas cover when measuring camera box height. Loosen screws holding Plexiglas over LED boards, push down, and re-tighten screws.

9. Pneumatic System

This chapter briefly describes the pneumatic system. The chapter is divided into the following parts:

– *Standard Pneumatic System* on page 9-2.
For the single mounthead.

– *HYDRA Pneumatic System* on page 9-4.
For the HYDRA unit.
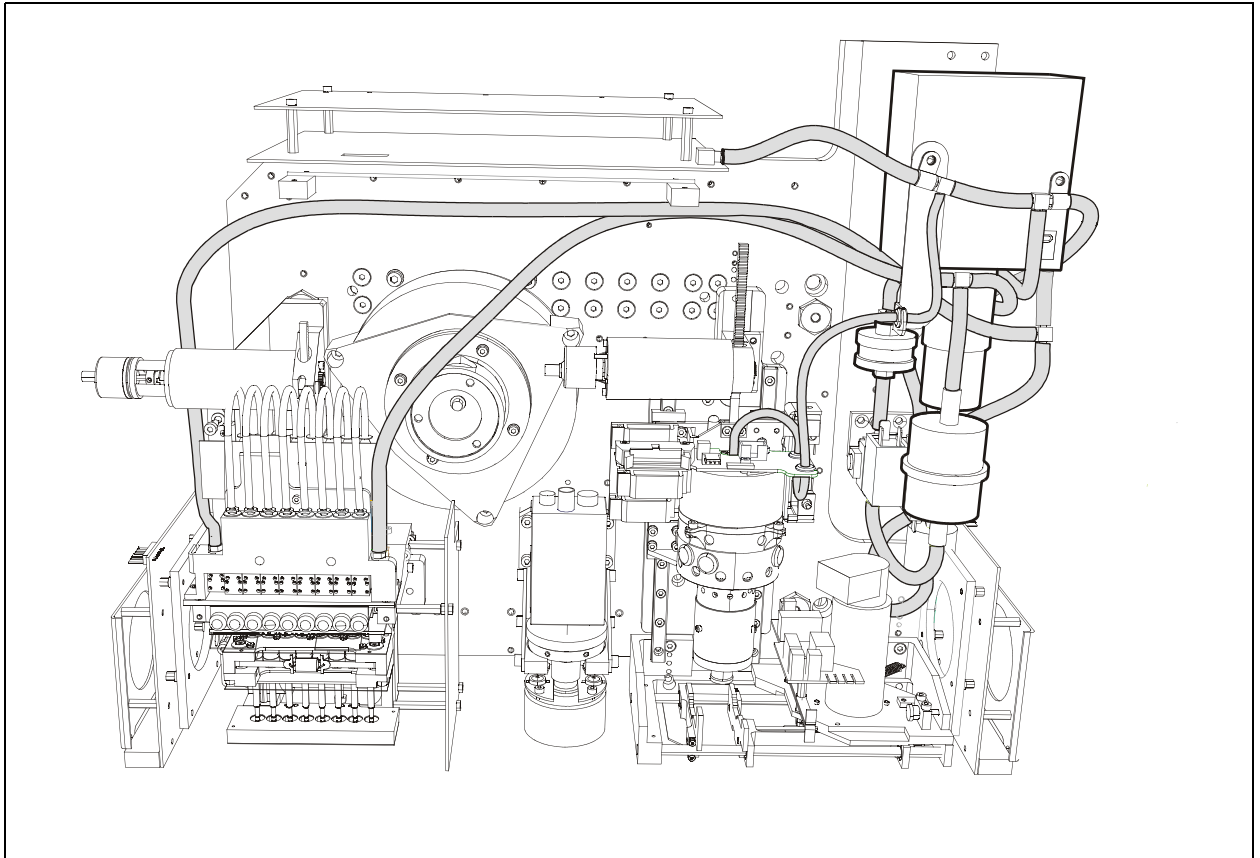
Figure 9-1. Pneumatic system

Standard Pneumatic System

The pneumatic system is located on the X wagon and is used to obtain a negative pressure in the single mounthead tool when picking and moving parts. It also produces an air pressure used to quickly release parts when placing the components.

A schematic of the standard tool pneumatic system is shown in Figure 9-2.
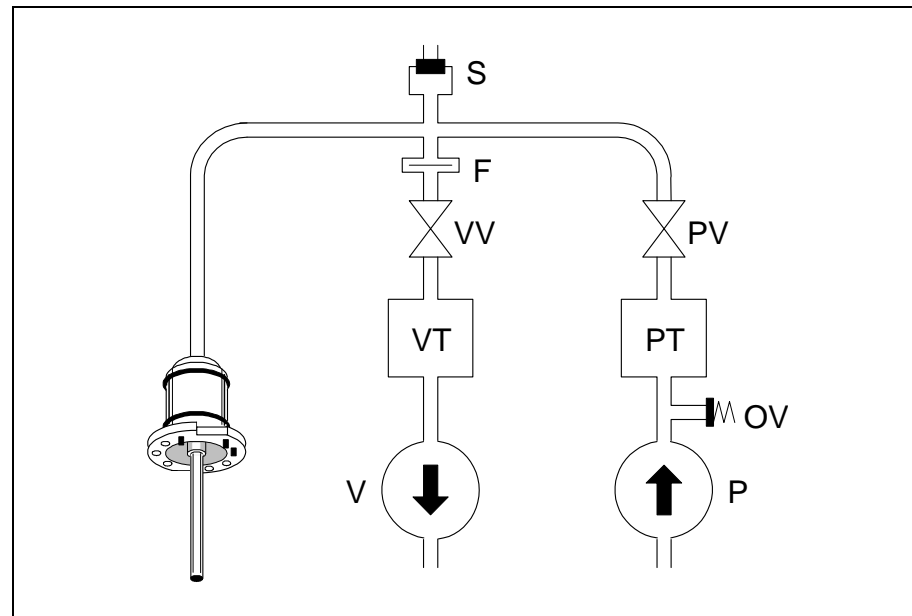
Figure 9-2.   Standard pneumatic system

Vacuum

A vacuum pump (V) maintains a negative air pressure in a vacuum tank (VT). When the vacuum valve (VV) opens, air will be taken from the mount tool via a filter (F). A sensor (S) measures and indicates the negative pressure to the system.

Pressure

An air pump (P) maintains an air pressure in a pressure tank (PT). When a pressure valve (PV) opens, air from the tank will increase the pressure in the mount tool. The sensor (S) indicates the pressure to the system.

An overload valve (OV) secures the air pressure not to exceed a certain maximum level.

Electrical Parts

The schematics covering the Standard pneumatic system can be found on the enclosed CD-Rom disc.

The vacuum system is controlled by the MOT-Z board.

Standard Vacuum control

You can individually control pump, vacuum valve, pressure valve, and also supervise the sensor pressure from the *Z Vacuum* control dialog box.

Procedure

1. Start the *Service Program* by selecting *Exit > Exit To Service* in the TPSys menu.

2. To see the vacuum level in the standard mount tool, select *Vacuum > Show/Hide vacuum/force sensors*

   The *Vacuum and force* information box for the standard mount tool is shown:

   ```
   ┌─ Vacuum and force ─┐
   │      Vacuum: 16    │
   │       Force: 182   │
   └────────────────────┘
   ```

   – The field *Vacuum* in the standard mount tool shows as a value between 0 and 255.

   – A value between 0 and 30 should be shown for no vacuum, that is when the vacuum/pressure pump is off.

   – A value above 170 should be shown for full vacuum, that is when the pump is on, the vacuum valve is open, and the pressure valve is closed.

3. You can individually control pump, vacuum valve, pressure valve by selecting *Vacuum > Z Vacuum*

   The *Z Vacuum* control dialog box for the standard mount tool is shown:

   ```
   ┌────────── Z Vacuum ──────────┐
   │          Pump: On     Off    │
   │  Vacuum valve: Open   Close   │
   │Pressure valve: Open   Close   │
   └──────────────────────────────┘
   ```

4. You can control the vacuum pump, the vacuum valve and the pressure valve by moving the cursor to the desired option and pressing <Enter>.

HYDRA Pneumatic System

The HYDRA pneumatic system uses the same vacuum and pressure pump as the standard tool pneumatic system. For more details see section in the *Standard Pneumatic System* section.

The HYDRA pneumatic system consist of eight vacuum valves and a pressure valve. The vacuum valves switch between vacuum and pressure. Pressure can either be over pressure or atmospheric pressure. The pressure valve is only open (over pressure) for a few milliseconds, enough to clear the vacuum in the tool tip.

A schematic of the HYDRA pneumatic system is shown in Figure 9-3.
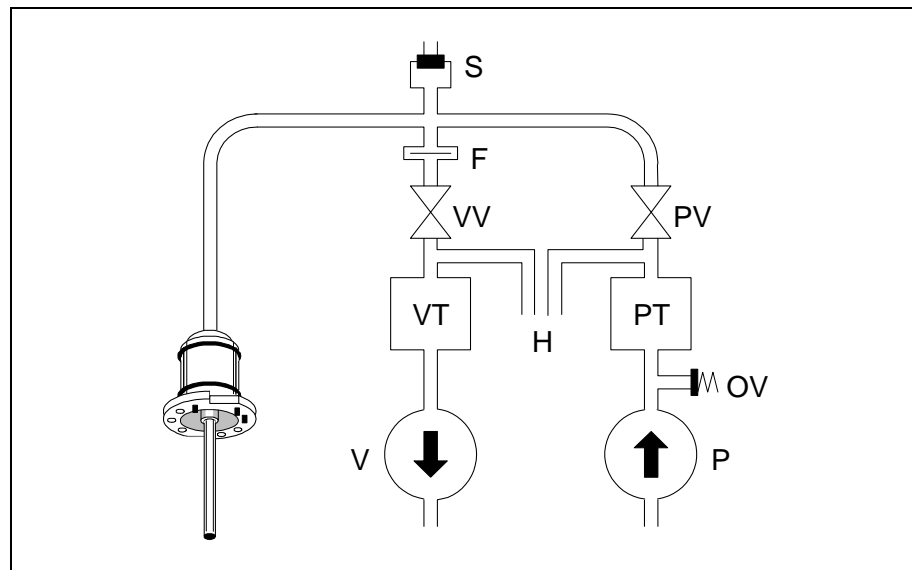
Figure 9-3.   HYDRA pneumatic system

Vacuum

The HYDRA pneumatic system is connected to the common vacuum pump at 'H.'

Pressure

The HYDRA pneumatic system is connected to the common pressure pump at 'H.'

Electrical Parts

The schematics covering the HYDRA pneumatic system can be found on the enclosed CD-Rom disc.

The vacuum system is controlled by the MOT-Z board.

HYDRA Vacuum Control

You can individually control pump, vacuum valve, pressure valve, and also supervise the sensor pressure from the *HYDRA Vacuum* control dialog box.

Procedure

1. Start the *Service Program* by selecting *Exit > Exit To Service* in the TPSys menu.

2. To be able to see the vacuum levels in the HYDRA mount tools, open the vacuum sensor information box by selecting:

   Vacuum > Show/Hide vacuum/force sensors

   The *Vacuum and force* information box for the HYDRA mount tools is shown:

```
┌─── Vacuum and force ───┐
│  Vacuum  Force  Hit    │
│  ======  =====  ===     │
│   Z: 16         182     │
│        H: 33           │
│ Tool 1:    197     No  │
│      2:    197     No  │
│      3:    198     No  │
│      4:    193     No  │
│      5:    190     No  │
│      6:    196     No  │
│      7:    197     No  │
│      8:    197     No  │
└────────────────────────┘
```

   – The vacuum in the HYDRA unit is shown as a value between 0 and 255 (H in the figure above). The field Z in the information box shows the vacuum in the standard mount tool.

   – A value between 30 and 75 should be shown for no vacuum, that is when the vacuum/pressure pump is off. For best repeatability perform this test without HYDRA tools.

   – A value between 190 and 220 should be shown for full vacuum, i.e. when the pump is on, the vacuum valve for the particular nozzle is open, and the pressure valve for the same nozzle is closed.

3. You can individually control pump, vacuum valve, pressure valve by selecting *Vacuum > HYDRA Vacuum*

   The HYDRA Vacuum control dialog box for the HYDRA unit is shown:

```
┌──────────────────── HYDRA Vacuum ────────────────────┐
│           Pump:  On   Off                            │
│                   1     2     3     4     5     6     7     8 │
│ Vacuum valves : Close Close Close Close Close Close Close Close │
│                 Set                                  │
│ Pressure valve: Open  Close                          │
└──────────────────────────────────────────────────────┘
```

You can control the vacuum pump, the vacuum valve and the pressure valve by moving the cursor to the desired option and pressing <Enter>.

The vacuum valves are controlled by moving the cursor to the desired tool number, pressing the <Space bar> for an *Open* or *Close* action, moving the cursor to the Set option, and pressing <Enter>.

10. Power Supply System

This chapter contains information about the power system and fuses that are accessible from the outside of the electrical units in the machine.

The following units are included in the power supply system. All the units are located on the electric shelf ('1' in Figure 10-1):

– *Mains Input Unit* on page 10-2.

– *EPT Units* on page 10-2.

– *PS3* ('2' in Figure 10-1) on page 10-3.

– *BM4CB* ('3') on page 10-4.

– *UPS* ('5') on page 10-5.

– *12V/5V Box* ('4') on page 10-7.
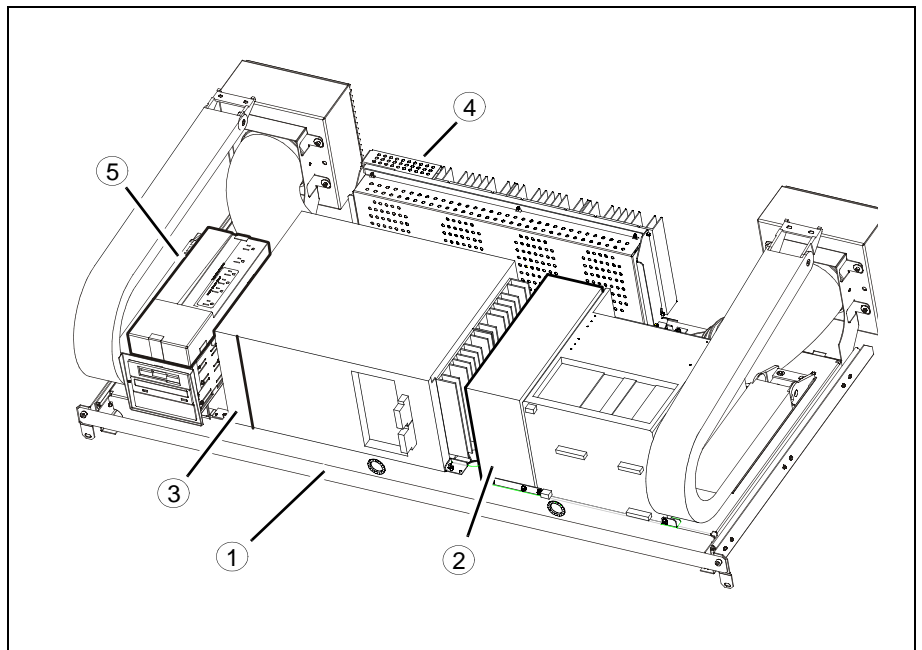
Figure 10-1. Power Supply System

WARNING! These units contain dangerous voltage levels. Follow the safety instructions in the operator´s manual. Power must be switched off before opening a unit.

Fuses

The electrical systems are protected by fuses located in the following units:

– Mains Input Unit

– PS3

– BM4CB

– UPS Unit

Mains Input Unit

The Mains Input Unit is located at the rear of the machine. The unit supplies the various machine systems with power converted to different voltages from the mains voltage.

The machine can be either Y or D connected to the mains.

It is important to know what kind of connection the machine is connected to, because the fuses are different depending on the connection type.

The fuses included in the Mains Input Unit are accessible from the mains input panel (see '1' in Figure 10-2).
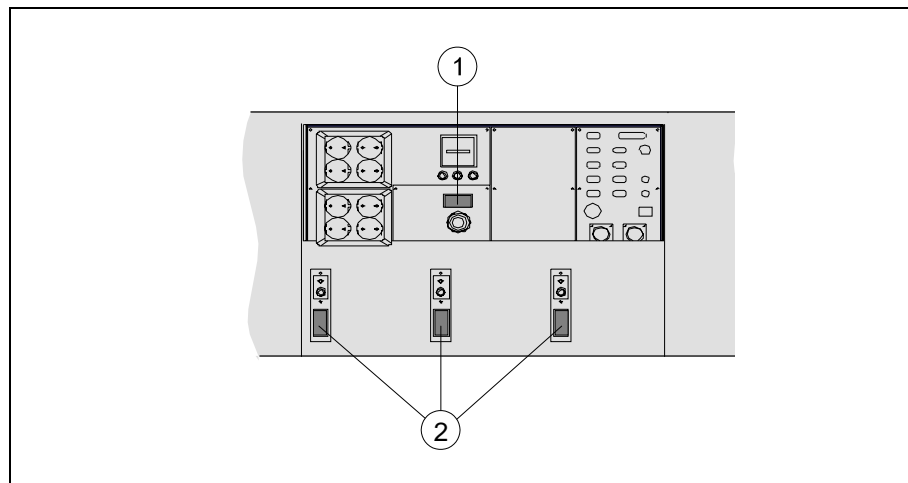
Figure 10-2.   Mains input panel

The F1, F2 and F3 fuse data are indicated in the following table for Y and D connection. The fuses are located at '1' in Figure 10-2.

Fuse	Type	Rate Y Connection	Rate D Connection
F1	6.3 x 32mm	8A Slow	15A Slow
F2	6.3 x 32mm	8A Slow	15A Slow
F3	6.3 x 32mm	8A Slow	15A Slow

EPT Units

Three EPT units are located in the Mains Input Unit accessible from the input panel (see '2' in Figure 10-2).

The EPT units have voltage plugs and fuses and are used for one phase each.

The fuses in the three EPT units are called F1 and have the following data:

Fuse	Voltage	Type	Rate
F1	140V AC	6.3 x 32mm	10A Slow

PS3

The PS3 power supply unit contains the main fuses ('2' in Figure 10-3).
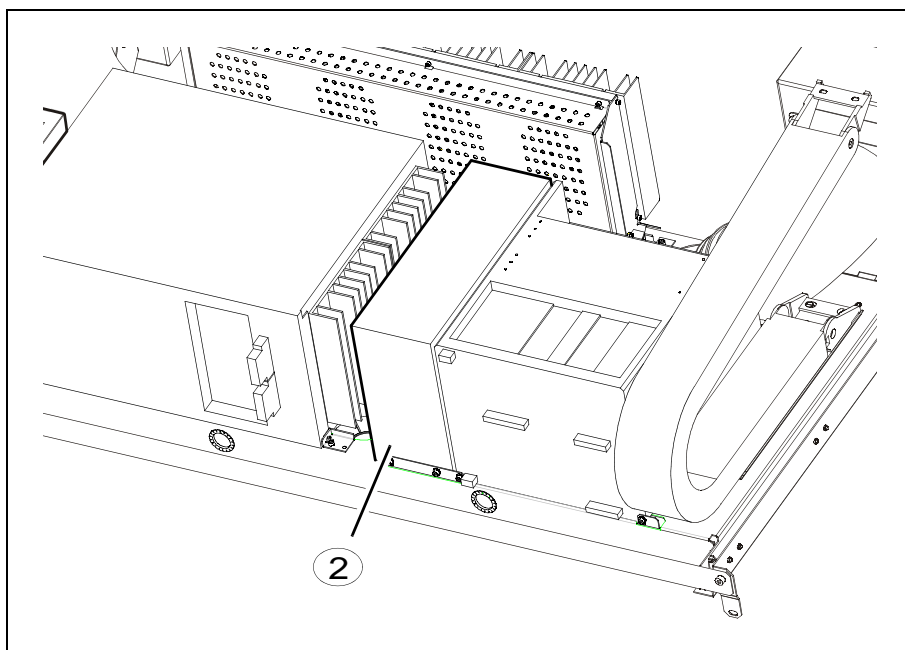
Figure 10-3. PS3

The fuses in PS3 are accessible from the front of the machine, in the middle section, under the magazines.

The following table shows the fuses and circuit breakers included in the PS3 unit.

Fuse	Circuit	Type	Rate
F1	Mains	Circuit breaker	8A
F2	Mains	Circuit breaker	8A
F3	Elmo	6.3 x 32mm	10A Slow
F4	Elmo	6.3 x 32mm	10A Slow
F5	55V AC	6.3 x 32mm	0.1A Quick
F6	55V AC	6.3 x 32mm	0.1A Quick
F7	+75V	6.3 x 32mm	6.3A Slow
F8	+38V	6.3 x 32mm	10A Slow
F9	20V	6.3 x 32mm	15A Slow
F11	–38V DC	6.3 x 32mm	10A Slow
F12	–75V DC	6.3 x 32mm	6.3A Slow

BM4CB

There is a BM4CB unit ('3' in Figure 10-4) located to the left in the computer box. The computer box is located on the electric shelf ('1') inside the machine.
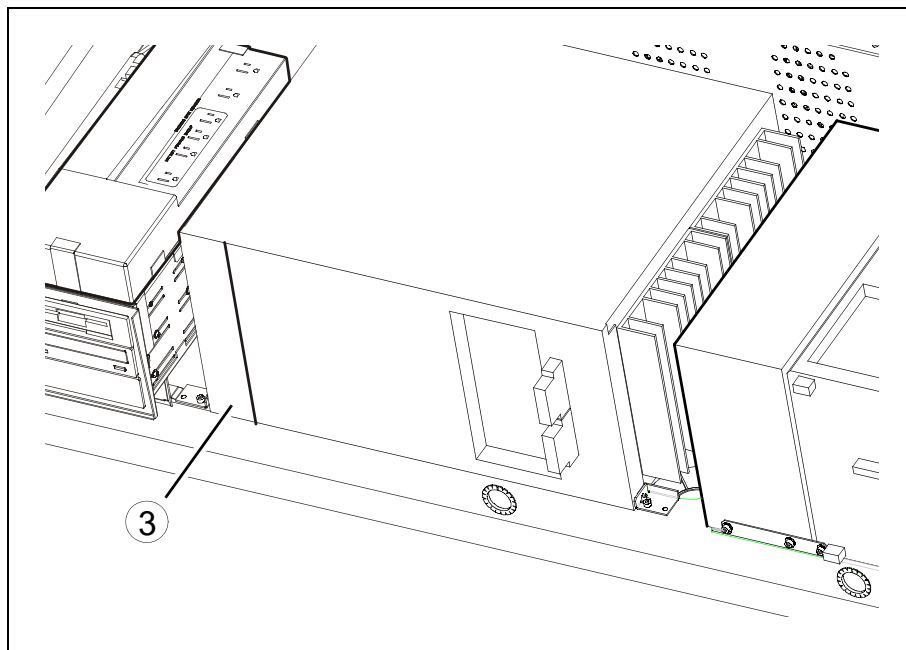
Figure 10-4. BM4CB

The fuses included in the BM4CB are shown in the following table.

Fuse	Type	Rate
M25V-	5 x 20mm Quick	2A
Theta (Fi)	5 x 20mm Quick	1.6A
C	5 x 20mm Quick	1.6A
H Theta (Fi)	5 x 20mm Quick	1.6A
M25V+	5 x 20mm Quick	2A
X	nc	nc
Z	5 x 20mm Quick	2A
Y	5 x 20mm Quick	4A
YM	5 x 20mm Quick	1.6A

UPS

The UPS (Uninterrupted Power Supply) unit provides battery support to the computer box in case of power failure.

The UPS unit is located to the left side of the electrical shelf, on top of the CD-tower ('5' in Figure 10-5).
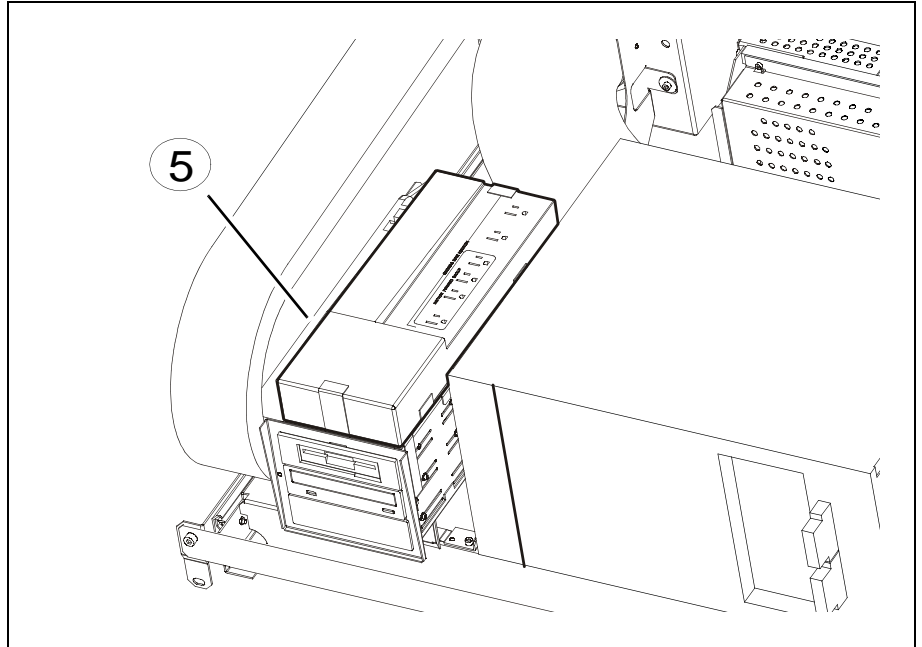
Figure 10-5. UPS Unit

UPS main cabling

– The MAINS ADAPTER UPS CABLE provides the power from the Power supply to the UPS.

– The CORDSET IEC00-US00 2.5M, distributes the output power to the BOX 12V 5V / 120VAC.

– The UPS unit is shut down with a shutdown signal distributed by the UPS COM PORT CABLE from the BM4CB in the computer box.

If the machine of any reason is turned off from power for more than 6 months the batteries in the UPS should be charged for 24 hours to prevent backup failure.

The batteries should be changed after 5 years to new batteries.

UPS fuse

There is one fuse in the UPS unit. The fuse is an automatic circuit breaker located on rear of the unit, rated 10Amp.
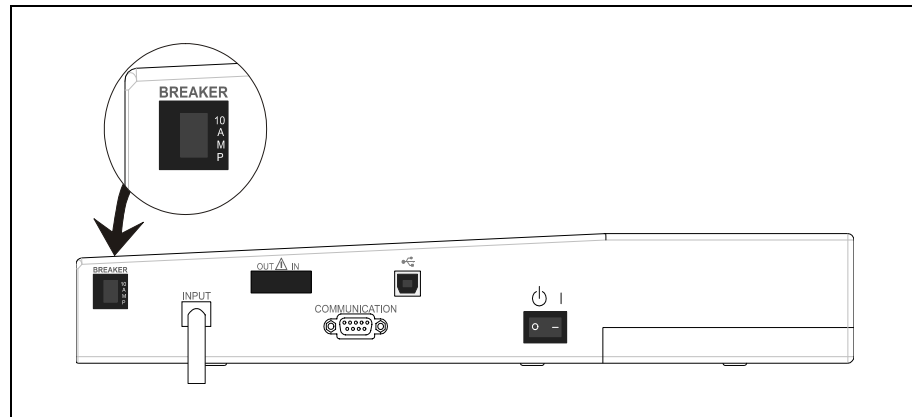
Figure 10-6.   UPS Unit rear view

12V/5V Box

The 12V 5V Box is located on the electric shelf on the left side of the booster ('4' in Figure 10-7).
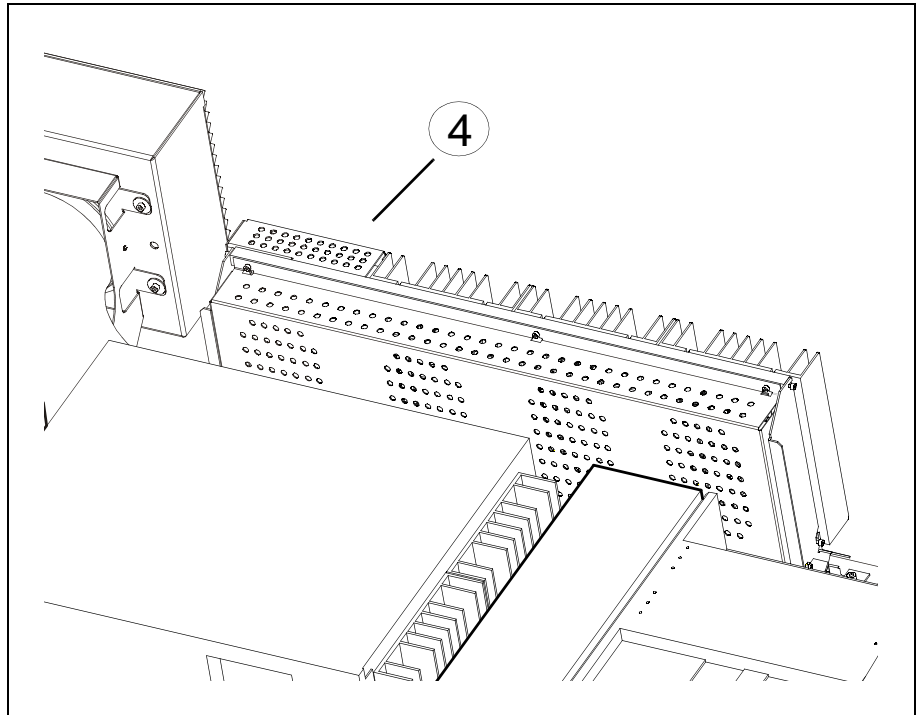
Figure 10-7.   Box 12V / 5V

Inside the box there are two switch mode power supplies, generating the 5V and 12V DISC voltages.

The 5V and 12V are distributed with the XP5/12V cable to the BM4CB in the computer box.

The input power is supplied by the UPS unit.

Electrical Parts

The schematics covering the Power Supply System can be found on the enclosed CD-Rom disc.

Functional Test

The following procedure describes how to display the internal system voltages.

Procedure

1. Start the Service Program by selecting the *Exit To Service* in the TPSys *Exit* menu.

2. Select *Utility > Show line voltages*

   The internal system voltages is displayed in the following box:

```
 ┌──────── Line voltages ────────┐
 │    50 V AC (rms): 53.91        │
 │ 20 V DC/DC input: 18.4         │
 │    18 V battery: 19.9          │
 │        12 V crt: 11.9          │
 │       12 V disk: 11.8          │
 │           5.6 V: 5.68          │
 │             5 V: 4.98          │
 │           -25 V: -24.6         │
 │           -35 V: -35.9         │
 │           -75 V: -74.4         │
 │            75 V: 76.7          │
 │            35 V: 35.4          │
 │            25 V: 25.4          │
 └───────────────────────────────┘
```

The voltage '5.6 V' are no longer used and the '18 V battery' voltage is generated by the UPS system.

Line voltages description

Field	Description
50 V AC (rms).	This voltage is sensed for power failure. When it decreases to a certain level, files are saved and the system is shut down using battery backup power.
20 V DC/DC input.	This voltage is generated by the PSU and is applied the DC/DC converter for 5V DC supply voltage.
18 V battery.	Battery power fed to the booster for generating required backup voltages.
12 V crt.	12 V DC for monitor.
12 V disk.	12 V DC for disk drives.

Remaining lines display internal supply voltages generated by the PSU and the following booster.

This function is controlled by the MOT-M board.

Troubleshooting

A LED indicator is located on the front panel of the UPS Unit. The LED indicator is used to show the current status of the UPS Unit. The following table shows the status levels that the UPS Unit can assume.

LED indicator status	Function
Steady green light.	Normal line.
Slow blinking.	Battery in use.
Fast blinking (pending shutdown).	Low battery.
Black out.	Overload, short.

The following table shows some of the symptoms that may turn up in case of failure in the UPS Unit.

Symptom	Suggested action
LED is not on.	1. Check for power fail.
	2. Check if input cable is loose.
	3. Check if power switch is "off".
	4. Check if the fuse is blown.
Back up failure.	Check if the battery voltage is to low (Recharge the batteries for 24 hours).

11. Board Handling Systems

This chapter describes the Board Handling System. It contains brief descriptions about internal and external conveyors, Y wagons and Y module types and different Conveyor configuration systems.

This chapter also contains instructions concerning functional tests and adjustment and calibration procedures that can be performed on the different Board Handling System configurations.

The Board Handling System comprises the following main parts:

Y Wagon or Y Module Unit

The Y wagon or Y module unit provides the Y–movement of the Manual load table or Internal Conveyor in the machine.

Conveyor System

To transport the mounted PCB, the Y module is equipped with an Internal and/or External Conveyor.

Cover Hoods

The Y wagon and Conveyor system are covered by hoods to protect operators from moving parts of the machine.

Y Wagon or Y Module Unit

The Y Wagon or Y module unit provides the Y–movement of the Manual load table or Internal Conveyor in the machine.

There are two different methods, used by the Y module to hold the PCBs in the MY series of machines. The Y module can be equipped with either a Manual load table or an Internal conveyor system.

Manual load (ML)

The PCBs are fixed into position using magnetic supports. Any number of PCBs, of different sizes or shapes that fits on the table can be mounted simultaneously.
Examples of manual load Y modules are:

288 ML2 – The two module Y wagon using two magazine positions

468 ML3 – The three module Y wagon using three magazine positions

Figure 11-1. MY 12 with manual load

Internal conveyor (IC)

The PCBs are automatically placed and locked in the right position before the components are mounted. After the components are mounted the conveyor transports the board to the next stop, usually an external conveyor.
Examples of Y module Internal conveyors are:

– Conveyor 420PT

– Conveyor 500T2

– Conveyor 500T

Figure 11-2. MY 15 with 500T Internal conveyor

Y Wagon or YM unit types

The table below shows the different Y Wagon or YM unit types.

Y wagon name	Description
Y-cogbelt	Y wagon with cog belt.
Y1/Y2a	Y wagon with short screw.
Y1/Y2b	Y wagon with long screw.
Y1/Y2c	Y1, Y2 with YWB and optional TWM.
Y1/Y2d	Y1, Y2 with YWB2 (with board jam indicators) and optional TWM.
Y1/Y2e	Y1, Y2 with YWB and Y-type TWM.
YWU3a	YWU3 with stand alone 288.
YWU3b	YWU3, 4, 5 with stand alone 468, ML3, 4, 5 or conveyor.
YWU3c	YWU3, 4, 5 with special conveyor.
YWU3d	YWU3, 4, 5 with huge table.
YWU4a	YWU4, 5 with ML6, 7 and low friction.
YWU4b	YWU4, 5 with ML6, 7 and high friction.
YM0	Empty Y-unit for CAN network (Intended for Conveyor).
YM1	Y-unit for ML3 for CAN.

Conveyor Systems

The main function of the Conveyor System is to transport the mounted PCB to the next stop, usually an external conveyor.

There are mainly two types of conveyor systems:

Internal Conveyor System

Uses an internal conveyor on the Y module to transport the PCB.

External Conveyor System

This system consists of external conveyors, board loaders and unloaders that are used to transport the mounted PCB to other stages in the production chain.

Examples of External conveyors are:

- Buffer conveyor BC2 1200
- Buffer conveyor BC2 1500
- Transport conveyor TC2 1200
- Transport conveyor TC2 1500
- Transport conveyor TC2 2000

There are also loaders, unloaders and workstations available.

The External Conveyor System is not covered by this chapter.

Conveyor types

The table below shows some of the different Conveyor types.

Conveyor	Description
Conveyor 400PT	Internal Y module conveyor for the Pass Through configuration.
Conveyor 500T2	Internal Y module conveyor for the Transversal configuration.
Conveyor T3 through T6	Internal Y module conveyor for the Transversal configuration (controlled by CAN network).

Conveyor System Configurations

There are two different configuration styles for Conveyor systems:

(T) Transversal style
In this configuration the entire line passes along the back of the machine. This allows the front side to be fully accessible to the operator.

Figure 11-3. Transversal style configuration

(PT) Pass through
The pass through system has the advantage of using shorter conveyors, which keeps the overall length down. There is a choice of having the line passing through the center or at either end of the machine.

Figure 11-4. MY 15 with 500T conveyor

Hoods

To protect operators from moving parts of the machine, the Y wagon and Conveyor system are covered by hoods.The hoods are equipped with safety switches that stop the machine, when opened during operation.

To prevent failures in the board handling the hood kit is also equipped with Board Jam Sensors in the feeder regions.

Electrical Parts

The schematics covering the Board Handling System can be found on the enclosed CD-Rom disc.

Measure Friction Of Y Wagon

This procedure describes how to measure friction on the CAN-System controlled YM Y wagon. The maximum and minimum position values for the Y wagon will be needed to be able to perform this measurement.

Procedure

1. Start the *Service Program* by selecting *Exit > Exit To Service* in the TPSys menu.

2. Select *Motor > Y motor > Read range.*

3. Make a note of the position values that are shown in the information box.

4. Select *Motor > Y motor > Measure friction.*

5. Enter the speed value 100mm/s in the dialog box.

6. Select the field *Measure friction* and press <Enter> to start the measurement.

7. When the measurement is done, select the field *View result* and press <Enter>.

8. Repeat the procedure above, using the following speed values 200, 400 and 600mm/s.

Measure Friction On T3 – T6 Board Handling Systems

This procedure describes how to measure friction on the new CAN-System controlled conveyor.

Procedure

1. Start the *Service Program* by selecting *Exit > Exit To Service* in the TPSys menu.

2. Select *Conveyor > Width motor > Measure friction*

3. Enter the speed value 10mm/s in the dialog box.

4. Select the field *Measure friction* in the dialog box and press <Enter> to start the measurement.

5. When the measurement is done, select the field *View result* and press <Enter>.

6. Repeat the procedure above, for the *Transport motor* and the *Hold motor* using the following speed values:

   – *Transport motor*: 40mNm

   – *Hold motor*: 1N

Place Area Calibration

This procedure is used to calibrate the assembly table place area. The objective is to obtain a correlation between the sensor coordinates and the actual physical coordinates of the assembly table place area. Perform this procedure when a new machine is installed or if the Y wagon has been moved.

This procedure can be performed on any of MYDATA's Board Handling Systems.

Prerequisites

Calibration plate, part# L-015-0450

Calibration background plate, part# L-012-1122 - L-012-1131 (ten different sizes available)

or

Accuracy Test Board 1, part # L-029-0243

Procedure

1. Select *Utility > Installation > Place Area Calibration.*

2. TPSys will ask if the calibration board L-015-0450 (see Figure 8-1) is available. Select *Yes*.
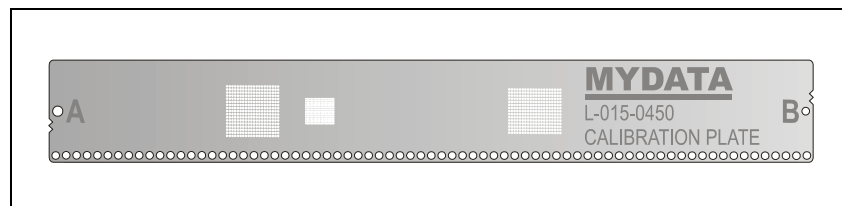
Figure 11-5. Calibration board L-015-0450

   – If this board is not available select *No* and TPSys will revert to the procedure *Calibrating using Accuracy Test Board L-029-0243* as described on page 11-9.

3. There are three different, circular fiducial marks on the calibration board that have to be defined. If these marks are missing in the database, TPSys will ask if the default calibration data shall be imported. Select *Yes* and the CalibData.gen file will be imported automatically.

4. TPSys will now ask for the calibration board to be placed on the Y wagon. Place the calibration background on the Y wagon. Then place the calibration plate on top of the the background. Place the calibration plate so that it is approximately aligned to the X axis. Select *OK* when the plate has been placed on the background.

5. Locate the left, lower, right and upper edges of the area to be calibrated when prompted.

Make the area as large as possible for best results. It must be possible to place the calibration board anywhere inside this area. Too wide an area may lead to the machine trying to place the board on top of board supports or such.

If it is hard to locate the edges on the black background plate. Use the gray calibration board as guide by placing it along the edges manually.

6. You are now asked to locate the fiducial marks A and B on the calibration board, see Figure 11-5.

– Center the camera cross hairs on the fiducial mark A and verify by pressing <Enter>.

– Repeat this procedure for fiducial mark B.

7. A coarse measurement of the Z unit offset is made. You are asked if the Y wagon alignment shall be measured. Normally you can select *No*.

– This step should usually only be performed if the Y wagon has been removed. If you perform a Y wagon alignment measurement, you must re-confirm the edges of the calibration area.

The place area calibration will now run and a progress bar will be displayed showing information as to elapsed time and remaining time.

Calibrating using Accuracy Test Board L-029-0243

When you select *Utility > Installation > Place Area Calibration*, TPSys will ask if the calibration board L-015-0450 is available. If you select *No* TPSys will run a calibration process using Accuracy Test Board L-029-0243.

1. Place the accuracy test board to the left on the Y wagon, (see figure) if there is no conveyor.

If there is a conveyor installed, then let the conveyor position the calibration board.
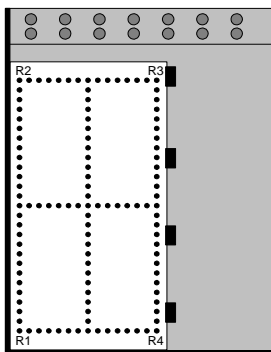
2. Create a fiducial mark named 'refpoint' with the following data:

```
───────── Fiducial Mark Information ─────────
Name:                          refpoint
Camera ID:
Comment:                       Round 1.0mm
Generic mark taught:           Yes
White on black:                Yes
Symmetric mark:                Yes
Teach area X size:             2.5mm
Y size:                        2.5mm
Object filter size:            0.3mm
Verify area X size:            5mm
Y size:                        5mm
Correlation:                   80
Fiducial mark type:            Circle
Diameter:                      0.971
Diameter tolerance:            25
Circle contrast:               20
```

3. Teach one of the accuracy test board points as 'refpoint'.

4. Locate and center the three fiducial marks that the system asks for (R1, R2 and R4). Before the calibration is started, the system will show a popup box, in which the deviation angle for the Y wagon with the calibration board is shown.

5. If the deviation is too big, e.g. bigger than stated in the popup box, then adjust the board angle as denoted in the popup box (or adjust the Y wagon angle) and repeat the preparation.

When the Y wagon with the calibration board is within the accepted angle range, the calibration procedure is started. When the calibration is completed, the result is displayed as standard deviations for the X axis and the Y axis.

Calibration

The calibration is performed in one pass, including both the X axis and the Y axis. It will take about 30 minutes. When the calibration is completed, the result is displayed as standard deviations for the X axis and the Y axis.

The standard deviation is a measurement of how each calibration point was found on the calibration board.

A high standard deviation indicates that the calibration board has moved during calibration or that there are some mechanical problems in the machine.

The reference points on the test board will not always be centered by the positioning camera. They are measured by the system even though they are not in the cross hairs center.

6. When done with the *Place Area Calibration*, perform the *Z-Unit Offset Measurement* as described in Chapter 5.

Adjusting Y wagon Reject Bins

It is possible to have up to eight reject bins. Usually they are placed in the frames of the machine. If the frames host cameras or a glue station there is no room left for reject bins. It is therefore possible to have reject bins on the Y wagon.

Procedure

1. Select *Utility > Installation > Adjust Y-wagon reject bins.*

2. When prompted select the bin you want to adjust.

   – Bins 1-4, which are of frame type, are installed in autoInstall.

   – Bins 5-8 are by default set to 'Not used'. This can be changed in parameter group *0032 Reject positions*.

3. When prompted use the joystick to point the Z-head at the desired bin location.

Adjust Board Jam Sensor

This section describes how to adjust the Board Jam Sensors on systems that are equipped with the Y Module and the T3 – T6 Board Handling System.

Board Jam Sensors are used in the T configurations of the machine. The Board Jam Sensors are placed on the Side Covers below the feeder conveyors. Two of the Board Jam Sensors are positioned at the front end of the support beams and two at rear end.

Perform this adjustment once a month.

Procedure

1. Before adjusting the Board Jam Sensor verify the following Main Unit settings: (The Main Unit is located on the inner left side of the Y module's electronic cabinet).

   – Output Selector switch set to D.ON (dark on).

   – Power Mode set to "SUPER".

   – Output Timer mode set to "OFF".

2. Make sure there is nothing blocking the Board Jam Sensor light beam.

3. On the Main Unit display, check that the value is above 500.

4. Adjust the Board Jam Sensors by loosening the two screws ('A' in Figure 11-6) holding the Board Jam Sensor to the sensor bracket.

5. Slightly turn the Board Jam Sensor (See Figure 11-6) and monitor the display on the Main Unit. The value on the display should be as high as possible.
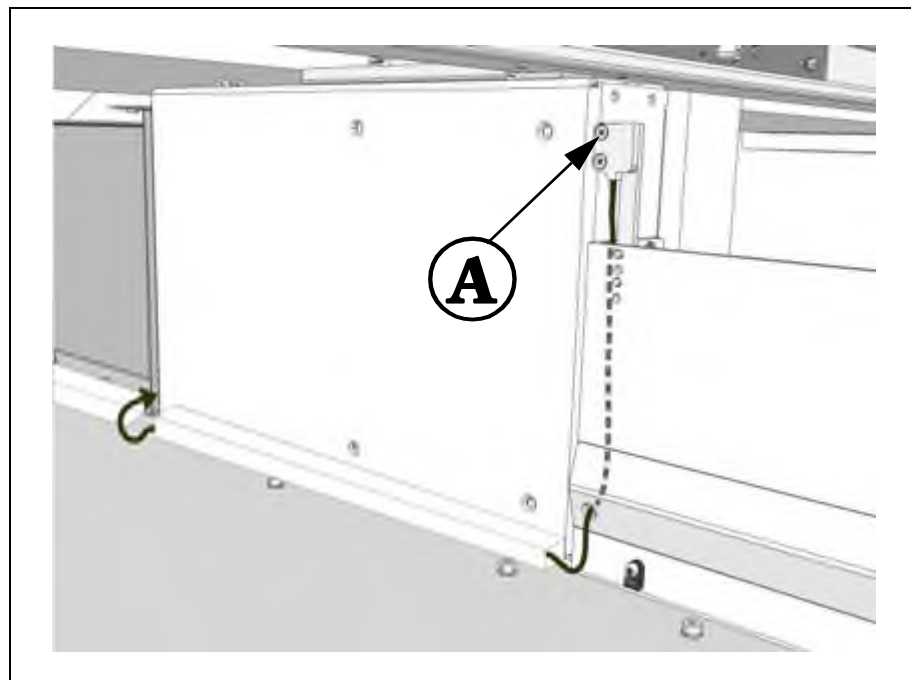
Figure 11-6. Adjust Board Jam Sensor

6. When satisfied with the received value, refasten the Board Jam Sensor screws.

⚠ *CAUTION! Be careful, not to use too much force when tightening the screws or the Board Jam Sensor may be damaged.*

---

7. With no PCB in place, press the button marked "SET" on the Main Unit.

    The orange LED on the Main Unit lights up.

8. Place a 0.6 mm PCB on the Conveyor to cut out the light beam, and press the "SET" button again and release it.

9. Repeat the procedure above, on the other Main Unit.

12. Component Feeding Systems

This chapter contains descriptions, calibration and adjustment information for the various component handling systems. The chapter is divided into the following sections:

TEX the Tray Exchanger is described in a separate manual entitled *TEX Tray Exchanger, Service Manual*. This manual shall be inserted in this chapter, if a TEX is used.

WARNING! In this chapter, some of the procedures causes the machine to make movements. The below warning must be followed for such procedures. Procedures that causes the machine to make movements are marked with this sign next to the text. Before entering such commands, check the following: Ensure that there are no foreign objects on the assembly table, near the tool bank, or within the X wagon, Y wagon, or Tray Wagon Magazine moving areas, and that the standard tool head and the HYDRA tools are in their upper positions.

Tape Magazines

To get the full flexibility of the tape magazine system, the machine must be calibrated accurately using a reference magazine.

When the machine is calibrated, all the tape magazines (except Agilis Linear Magazines LM8 and LM1216) need a pick line adjustment. For more information about a specific tape magazine refer to the following sections and pages.

The above is important particularly if fine pitch magazines are used.

Adjusting Magazine Slots

The magazine slot´s Y direction is adjusted mechanically. This adjustment must be performed if the magazine slot´s adjusting screw has been loosened.

Prerequisites

– Shims in different thicknesses.

– A set of Allen keys (mm).

– A reference magazine is required to adjust and calibrate the magazine slots properly.

Procedure

1. Insert, until stop, the reference magazine in position 1.

2. Select *Utility > Installation > Adjust Slot Position.*

3. Select a magazine position from the shown selection box.

4. Check the slot´s Y direction on the monitor against the reference magazines center mark in both X and Y.

    Use the trackball or joystick to move the camera along the pick position line. The cross hairs should be centered on the line.

5. If the centermark is off in the Y direction adjust the slot position. Start by unscrewing the stop screw, see Figure 12-1.
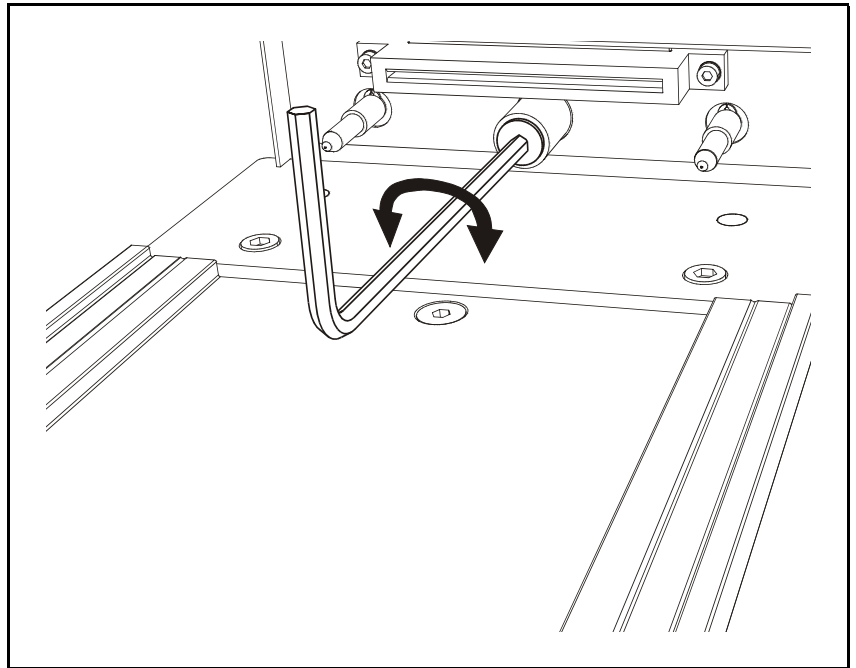
Figure 12-1. Unscrew the Stop Screw

6. Add or remove shims as necessary, see Figure 12-2. Shims are available in different thicknesses. Use the cross hair scaling to determine how much off-center the mark is in the Y direction.
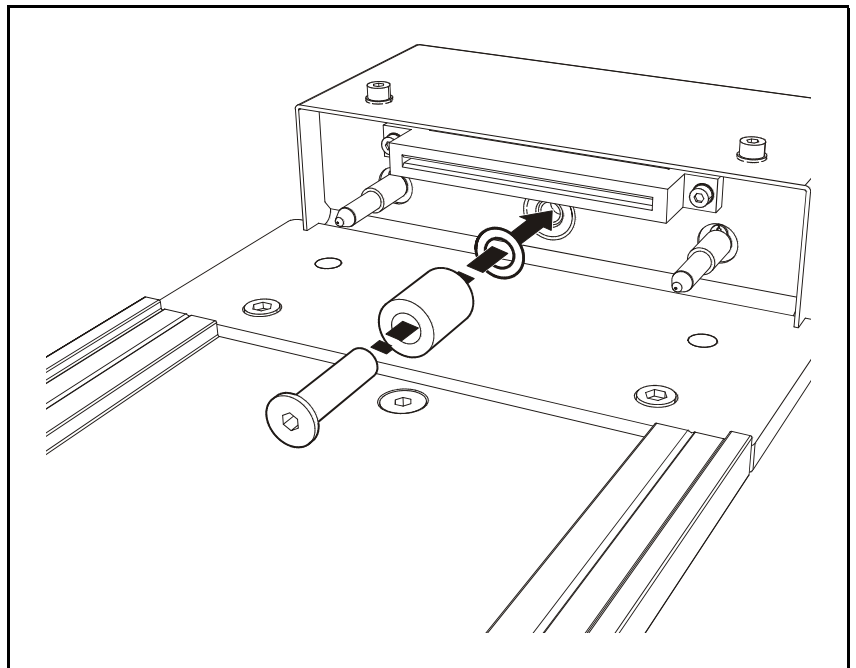
Figure 12-2. Add or remove shims for correct alignment

7. Check that the Y position of the centermark aligns with the cross-hair.

8. Center the cross-hairs on the Magazine center mark in the X direction. Confirm by selecting *Ready* in the *Locate position* dialog box.

9. Repeat the procedure for all the magazine positions.

Test Magazine

This option tests major functions of the selected magazine.

Procedure

1. Start the Service Program by selecting *Exit > Exit To Service*

2. Select *Magazine > Test*

3. Select the desired magazine by entering the magazine position in the *Select slot* dialog box:

   A continuously updated test result for the selected magazine is shown (this example shows a TM8B magazine):

```
 Test TM8B (17), no. 14320 in slot: 1
Test result: Passed
      Button: No
       Lamps: Yellow
```

Function	Setting	Description
Test result	Passed	A communication test completed successfully.
	Off	The test was not successfully completed.
Button	No	The release button on the magazine is released.
	Yes	The release button on the magazine is pressed in.
Lamps	Off	Both of the LEDs are temporarily off, or the LED test was not successfully completed.
	Yellow	The `Yellow` LED only is temporarily lit.
	Green flash	The Green flash LED only is temporarily lit.
	Yellow flash	Yellow flash of the LEDs are temporarily lit.

The Button and Lamps status shall reflect the visible states of these functions on the magazine.

Polling Magazines

Polls those magazines which are inserted in the machine.

Procedure

1. Start the Service Program by selecting *Exit > Exit To Service*

2. Select *Magazine > Poll*

3. The polling result is displayed on the monitor as follows:

```
                    Poll magazines
  Address  Type      Code    Serial no.  Buttoned out
  =======  =========  ======  ==========  ============
    1      TM8B       17      14320       No
    2
    3
    4
    5
    6
    7
    8
    9
   10
   11
   12
   13
   14
   15
   16
 <F1> octal numbers
```

In this example above, a TM8B magazine (code 17) is present in magazine position 1.

If the text in the Buttoned out column is *No* the magazine is in operation (the green LED on the magazine is lit with a steady light). If the text is *Yes* the system does not pick from the magazine (the green LED is either flashing or off). If it is neither of these but '---' the magazine type has no release button.

Agilis Linear Magazine (ALM8 and ALM1216)

From version 2.4 TPSys supports Agilis Linear Magazine 8 (for 8 mm tape) and Agilis Linear Magazine 1216 (for 12 and 16 mm tape).

The main new features of these magazines are feeding speed, feeding accuracy and flexible feeding stroke. The magazine can feed tape in variable length. This makes it possible for the software to adjust the pick position for a feeder not only in the X direction but also in the Y direction.
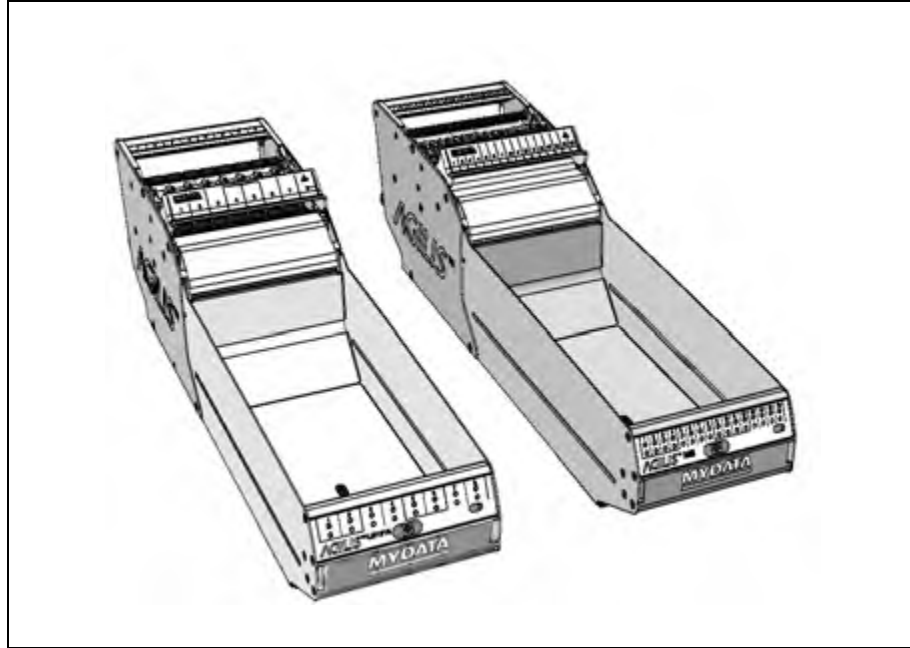
Figure 12-3. Agilis Linear Magazine ALM1216 and ALM8.

The Agilis Linear Magazines 8mm, ALM8, use the same feeders as Agilis Magazine M8, see *Agilis Magazine (AM8)* on page 12-9.

The Agilis Linear Magazines 1216mm, ALM1216, use 12 and 16 mm feeders. They are similar to the 8mm feeders but can handle larger components.

Instead of the cogwheels that feed the tape in the AM8 magazine, the ALM magazines have a linear slide that moves back and forth (see Figure 12-4). The slide is equipped with pins that move up and down. This construction makes it possible to feed tape with steps of arbitrary length.
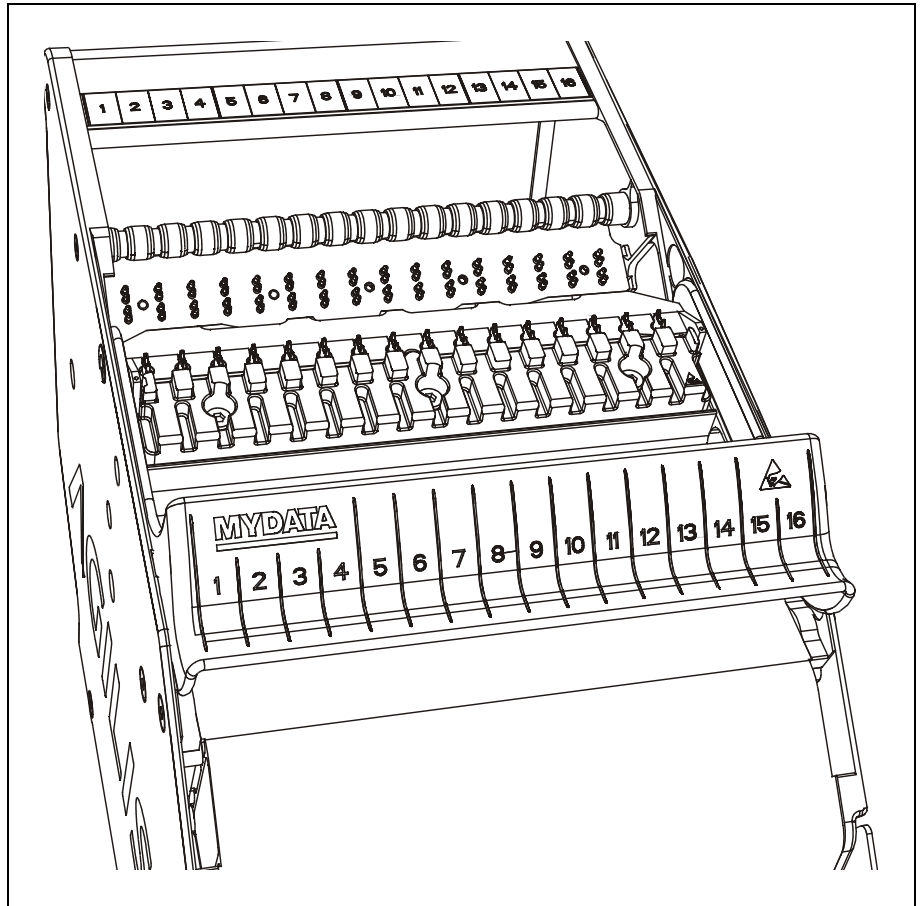
Figure 12-4. Agilis Linear Magazine – ALM8

The ALMs have two Magazine fiducial marks, one on each side of the wagon. They are circular, 1 mm diameter, black on white. Both fiducial marks are searched when the magazine is located. All previous types of magazines only have one fiducial mark (1mm wide, 10mm long) on the left side.

Electrical Parts

The schematics covering the Agilis ALM8 and ALM1216 magazines can be found on the enclosed CD-Rom disc.

Pick Line Adjustment

As mentioned above, Agilis Linear Magazines have the ability to step feeders with an arbitrary step length. This makes it possible for the software to adjust the pick position in both in X and Y direction. Mechanical adjustments to the magazine are no longer required.

See the *Operator´s Manual* for instructions on how to adjust the pick line.

Information Panel

The Agilis Linear Magazine has the same information panel as Agilis M8, please see *Release button and status LEDs* on page 12-10.

Polling Removable Feeders

Agilis Linear Magazines use the same feeders as Agilis M8. Therefore polling of the feeders are done in the same way. Please see *Polling Removable Feeders* on page 12-11

Agilis Magazine (AM8)

The Agilis M8 Magazine is a tape magazine for 8mm tape. Removable feeders are used to bring the components to the placement head. These feeders make reloading of components fast and easy. You can run any combination of normal and fine pitch component tapes in an Agilis M8 Magazine.
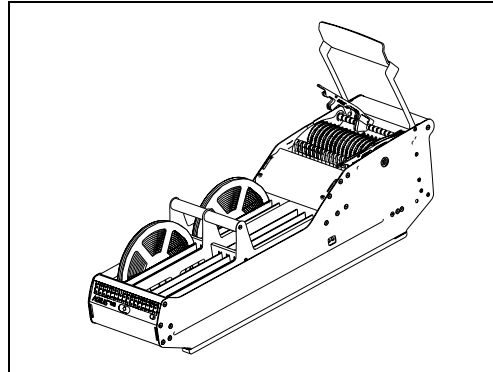
Figure 12-5. Agilis M8 magazine

The removable feeder is an intelligent unit in which you load the component tape before inserting it into the magazine. Feeders can easily be moved from one feeder position to another.
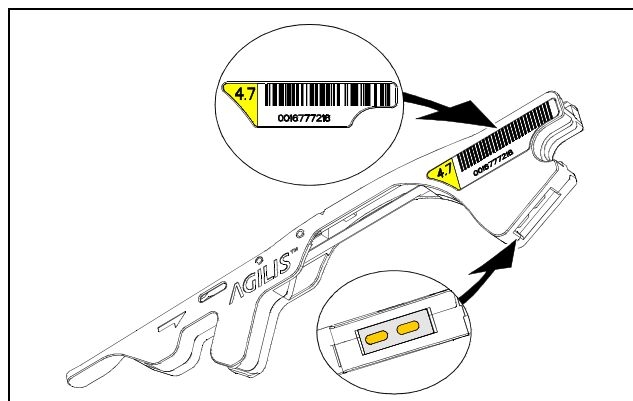
Figure 12-6. Removable Feeder

The feeder has a barcode and a unique ID number, which is also stored in its electronic part.

Electrical Parts

The schematics covering the Agilis AM8 magazine can be found on the enclosed CD-Rom disc.

Release button and status LEDs

The Agilis magazine has an info panel with green ('1' in Figure 12-7) and yellow ('2' in Figure 12-7) LEDs showing the status for each feeder. The panel also has a release button ('3' in Figure 12-7) from which you can order the machine not to pick components from the magazine. Finally there is a LED indicating the magazine status ('4' in Figure 12-7).
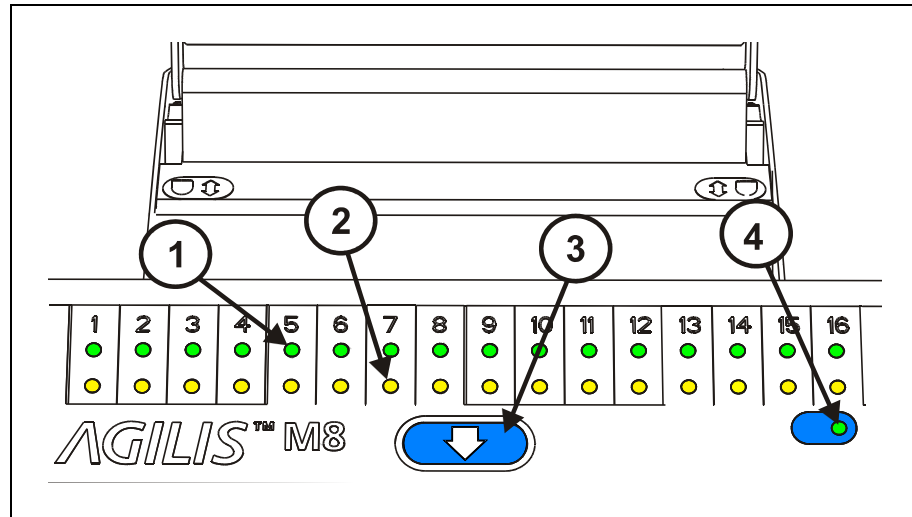
Figure 12-7. Information panel

Green and Yellow LEDs (1, 2)

The LEDs on the information panel indicate that the magazine has contact with the machine. There is one green and one yellow LED for each feeder position. If a feeder is loaded, the green LED is on at this position. If there is no feeder in a feeder position no LED is on.

If the component reel is running out of components, the green LED for that feeder position will blink. If the machine is unable to use the feeder, the yellow LED comes on.

Release button and Indication LED (3, 4)

Press the release button ('3' in Figure 12-7) on the panel. This tells the machine not to pick components from the magazine.

This button resets magazine errors for the magazine, i.e. equivalent to removing or inserting the magazine.

The green indication LED in the bottom right corner ('4' in Figure 12-7) is on when the magazine is inserted in the machine. It starts blinking when you press the release button and is off when the magazine is ready to be pulled out.

Make sure the green LED in the bottom right corner and the green LEDs for loaded feeder positions are on before starting assembly.

☞ Always wait until the green indication LED in the bottom right corner is off. Removing the magazine from the machine while the green LED is on can damage the placement head.

Polling Removable Feeders

Polls magazines that are equipped with removable feeders.

Procedure

1. Start the *Service Program* by selecting *Exit > Exit To Service.*

2. Select *Magazine > Poll removable feeders.*

3. Select the desired magazine by entering the magazine position in the *Select slot* dialog box. The polling result is displayed on the monitor as follows:

```
 _____ Poll removable feeders _____
                    Serial no.
         Feeder     (dec)        (hex)
         =========  =========    ========
            1       16779431     0x10008a
            2       16779833     0x1000a3
            3       3            0x3
            4       16780099     0x1000b4
            5       3            0x3
            6       3            0x3
            7       3            0x3
            8       3            0x3
            9       3            0x3
           10       3            0x3
           11       3            0x3
           12       3            0x3
           13       3            0x3
           14       3            0x3
           15       3            0x3
           16       3            0x3
```

The serial numbers are presented both by decimal and by hexadecimal notation in the information box.

If the decimal serial number is '3', it means that the system has found no Agilis feeders in that position. Apart from the obvious reason of no feeder installed, it can be caused by:

– Poor contact between the Agilis feeder and the Magazine.

– Faulty Agilis feeder ID circuit board.

Agilis M8 Pick Line Adjustment

The pick line in Agilis M8 is adjustable in Y direction mechanically and in X direction through TPSys, see *Operator's Manual.*

To adjust the pick line Y direction, use the two Allen screws positioned on top of the magazine near the feeders, see Figure 12-8. You can do the adjustment with the magazine inserted in the machine and instantly see the result on the screen.

We recommend you to adjust feeder position 1 first and then feeder position 16. Use a 3mm Allen key.

Use the step feeder function, key <F4>, to assure that the component is in pick position before you make the adjustment.
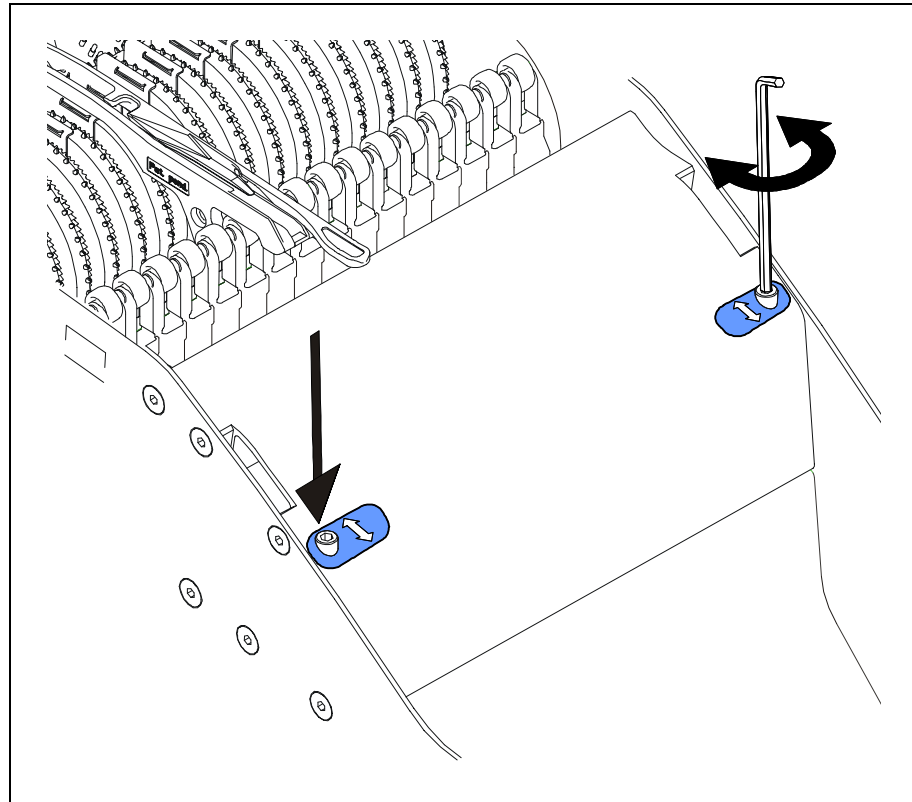
Figure 12-8. Adjusting Pick line Y direction

Troubleshooting

This section describes how to locate errors that may occur and suggestions on how to solve the problems.

The troubleshooting chapter is divided as follows:

Start in the first localization section. You will then be guided to the appropriate part of the other sections.

Locating Errors

The following table helps you to find out if an error is located in the Agilis magazine or in the base machine.

An error has occurred	
Is the Magazine correctly inserted?	**No** – Insert properly. **Yes** – Do the test below.
Does the magazine work in other magazine positions?	**Yes** – Most likely the magazine position does not work properly. Go to the *Machine Errors* section. **No** – Do the test below.
Do other Magazines work in the magazine position?	**No** – Most likely the magazine position does not work properly. Go to the *Machine Errors* section. **Yes** – Most likely the error is located in the Agilis M8 Magazine. Go to the *Magazine Errors* section.

Magazine Errors

This section contains errors located in the Agilis magazine and suggestions on how to solve the problems.

LED Indicated Error

This table contains errors indicated by the LEDs on the rear handle and how to solve these problems.

Symptom	Action
None of the LEDSs are lit.	Check if the control board cables are connected? **If No** – Connect the Magazine board cables through the main opening underneath the Magazine. **If Yes** – Replace the control board. *If control board is replaced but LEDs not lit* – Replace the rear handle. *Note*! If it is a faulty rear handle unit, put the old control board back since it is probably intact and has the original serial number.
The LEDs are not lit according to the loaded feeders position and TPSys do not detect the magazine.	Replace the control board. *If replacing control board does not solve the problem* – Replace the handle unit. *Note*! If it is a faulty rear handle unit, put the old control board back since it is probably intact and has the original serial number.
Yellow LEDs are lit but only for a short while. No green LEDs are lit even though there are feeders in the Magazine.	Try feeders that you know work in other Magazines. *If other feeders does not solve the problem* – Replace the control board. *If replacing control board does not solve the problem* – Replace the interconnection board. *Note*! If it is a faulty interconnection board, put the old control board back since it is probably intact and has the original serial number.
A feeder is not detected in a single feeder position (the green LED for the feeder position is not lit).	Check if the feeder work in other magazines. – If not replace the feeder. *If the feeder work in other magazines* – Check the condition of the interconnection board connectors (there are double connectors for each of the two contact areas). *If no fault with interconnection connectors* – Change the interconnection board.

Pick Error

This section contains component pick errors and how to solve the problems.

Check		Action
Out of components?	Yes	Load a new component reel.
	No	See below.
Is the pick line adjusted?	No	Adjust the pick line according to the *Operator´s Manual*.
	Yes	See below.
Is the tape transport free from interference?	No	Make sure the tape can run smoothly from the reel to the feeder.
	Yes	See below.
Is the feeder properly inserted in the Magazine?	No	Make sure the feeder wheel spikes are positioned in the component tape feeding holes.
	Yes	See below.
Is the feeder properly loaded?	No	Reload the feeder according to the Operator´s Manual.
	Yes	See below.
Are the feeder wheels running?	No	See the *Feed Error* section.
	Yes	See below.
Are the feeder wheels running evenly and smoothly?	No	Assure the free movement of the wheels by adjusting the nut on the feeder wheel unit.
	Yes	See below.
Are the feeder wheels intact?	No	Replace the feeder wheel unit.
	Yes	Make sure there are no components or other things stuck between the feeder wheel cogs.

Feed Error

This section contains feed errors and how to solve the problems.

Check		Action
Do you hear the motor running for about a second?	No	Replace the motor unit. *If this does not solve the problem* – replace the control board.
	Yes	See below.
Do you hear clicking sound from the solenoids?	No	Make sure the connectors to the solenoids are properly connected (20-pole flat cable). Check both the connectors at the control board and at the solenoid unit. If the cable is loose, reconnect it. *If this does not solve the problem* – replace the control board. *If this does not solve the problem* – replace the solenoid unit. *Note*! If it is a faulty interconnection board, put the old control board back since it is probably intact and has the original serial number.
	Yes	See below.
		Make sure there are no components or other things stuck between the feeder wheel cogs.

Machine Errors

This section contains errors indicated by the LEDs on the rear handle, located in the machine and suggestions on how to solve the problems.

Symptoms	Action
The LEDs are not lit the way they are supposed to.	Check if *any* LEDs are lit. Make sure there are no components or other things stuck in the Magazine slot connectors – check all the slots. Check the M25V+ fuse on the BM3CB board in the computer box – replace if blown.
LEDs are lit but TPSys does not detect any Magazine.	Replace the 74HC/LS244 socketed circuit on the MI board in the computer box (Always use HC-circuits when replacing). *If replacing this circuit does not solve the problem* – Check the XMIF cable between the computer box and the Magazines.
LEDs are lit and TPSys does detect the Magazine	Make sure there are no components or other things stuck in the Magazine slot connectors – check all the slots. *If the action above does not solve the problem* – Change the driver circuits on the MI board (ULN2003, L603 or L702). *If the action above does not solve the problem* – Replace the MI board and/or the MOT-M or the MCU.

TM – Tape Magazines

The TM tape Magazines can handle all tape materials – paper, plastic and aluminium. They do not have removable feeders like the Agilis range of Magazines.

TM magazines are available for a range of tape widths – 8mm – 56mm. There is also TMFlex Magazine available which have removable feeders with internal tape feeding.
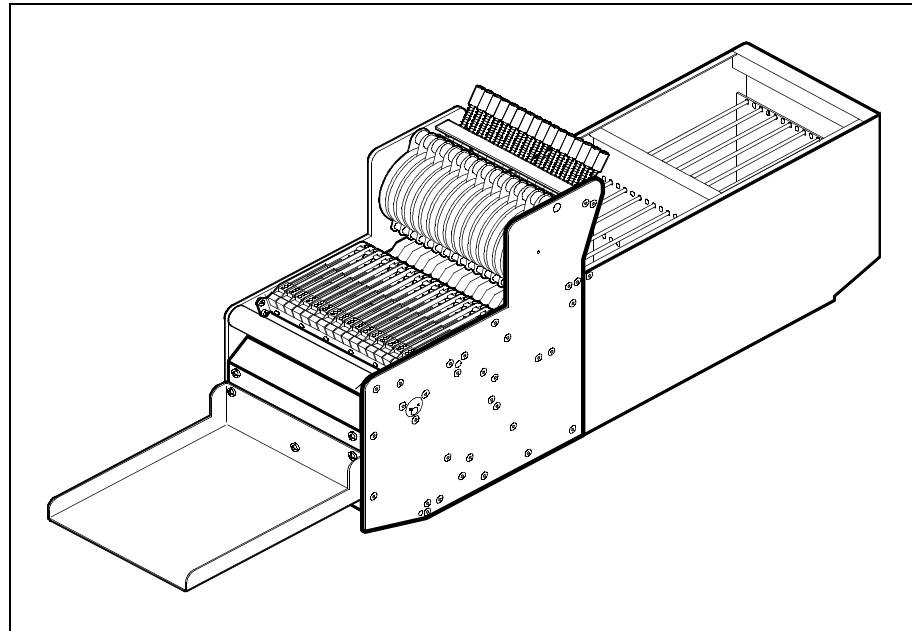
Figure 12-9. TM8 tape magazines

Electrical Parts

The schematics covering the TM Tape magazines can be found on the enclosed CD-Rom disc.

Functional Test

Release Button and Status LEDs
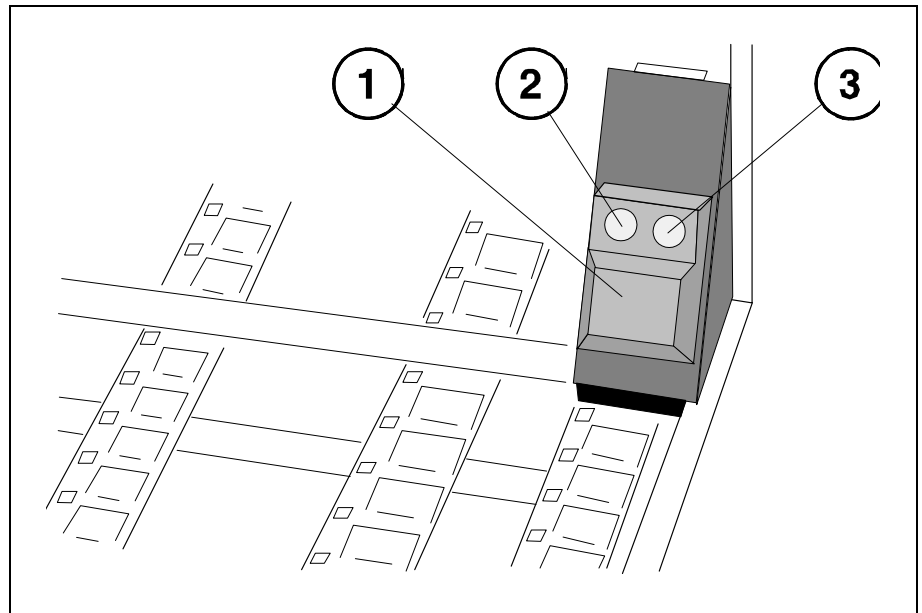
Figure 12-10. Release button and status LEDs

All TM Magazines are equipped with a release button ('1' in Figure 12-10) which has a green LED (2) and a yellow LED (3).

Release button (1)

☞ Press this button and wait until the green LED is off before removing the magazine from the machine.

This button resets magazine errors for the magazine, i.e. equivalent to removing or inserting the magazine.

Green LED (2)

Steady light	The magazine is recognized by the system and will be used.
Flashing	The release button has been pressed.
Off	The system does not use the magazine.

Yellow LED (3)

Steady light	At least one feeder is empty or a pick error has occurred.
Off	In operation.

Adjusting Feeder Arm Gap

Procedure

1. Slightly tighten both the countersunk screws at the solenoid bar (one at each side of the magazine).
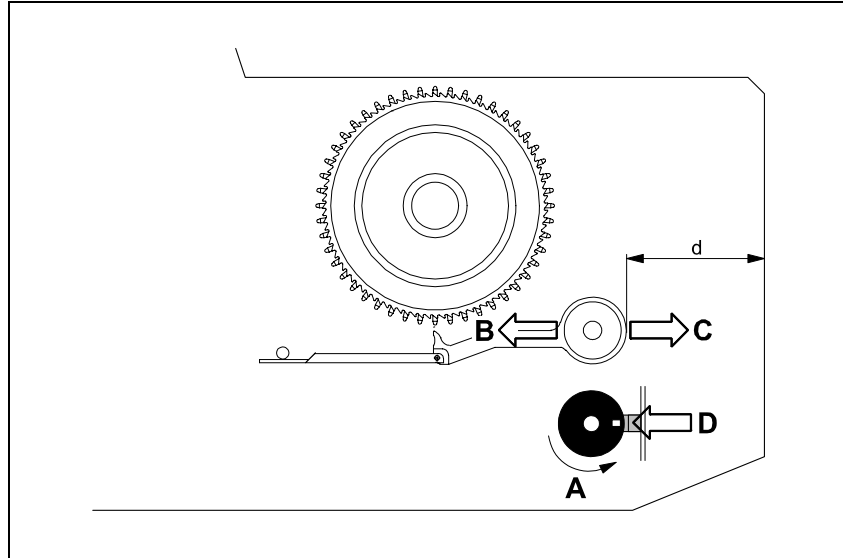
Figure 12-11. Feeder arm gap

2. Adjust the gap between the feeder wheels and the feeder arm tips ('A' in Figure 12-11) by turning the solenoid bar. The gap should be 0.5mm - 1.0mm.
   Set the gap as follows:

   – Lift the outermost feeder arm (B) by hand as much as the tip touches the feeder wheel.

   – Turn the feeder wheel (C) while the feeder arm is lifted.

   – Stop turning the feeder wheel when the top point of a tooth passes (D).

   – Compare the lifted feeder arm position to the released position and estimate the gap.

   – Turn the solenoid bar (E) until the gap is 0.5mm - 1.0mm.

   – Slightly tighten the adjusting screw (protruding head) at the solenoid bar.

   – Repeat the procedure for the outermost feeder arm on the opposite side.

3. Turn all the feeder wheels. The feeder arm tips must not touch the wheels. Readjust if necessary.

4. Tighten the four solenoid bar screws.

5. Check the gap again. Readjust if necessary.

Setting Code Disc Synchronization

The code disc synchronization can be set either by using a pulse counter device or without using this device. The following describe setting the synchronization without a pulse counter device.

Procedure

1. Loosen the stop screw on the single hole code disc.
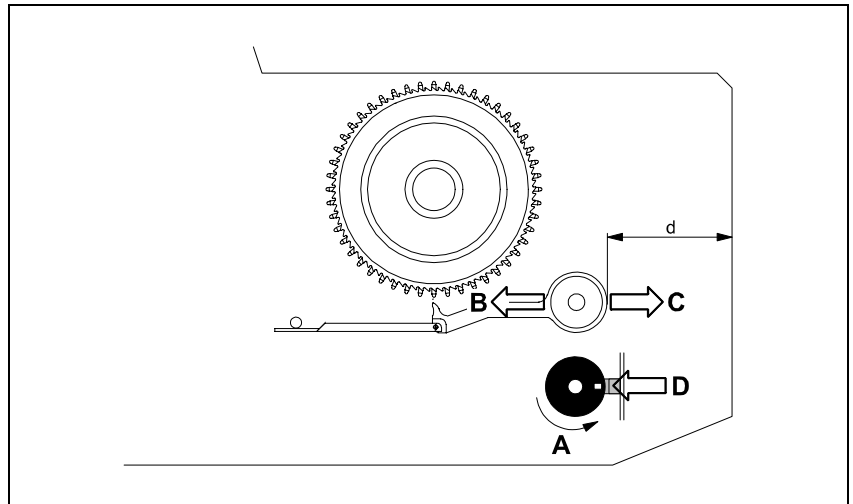
Figure 12-12. Setting the code disc

2. Turn the multi-hole code disc by hand ('A' in Figure 12-12) until the eccentric shaft with the feeder arms are as far from the magazine front as possible (B), i.e. when the 'd' distance is maximum.

3. Measure the 'd' distance and note it down as 'd1.'

4. Continue turning the multi-hole code disc by hand until the eccentric shaft with the feeder arms are as close to the magazine front as possible (C), i.e. when the 'd' distance is minimum. 1.5

5. Measure the 'd' distance and note it down as 'd2.'

6. Calculate 'd3' as follows:

$$d3 \ = \ \frac{d1 + d2}{2} + 1.5$$

7. Again, turn the multi-hole code disc until the 'd' distance equals the calculated 'd3' distance.

8. Without turning the multi-hole code disc, turn the single hole code disc until the hole is in the optical sensor read off position (D).

9. Without turning the code discs, position the single hole code disc in the middle of the optical sensor gap (see the figure) and tighten the stop screw.

10. Check the setting by turning the single hole disc until the hole is in the optical sensor read off position and measure the 'd' distance. It shall correspond to the calculated 'd3' distance. If not, readjust the setting.
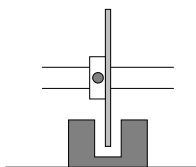
Measuring Feeder Wheel Friction

This procedure is for the TM8 – TM56 Magazines, but not for the TMFlex Magazines.

Prerequisites

– Piece of component tape

– Dynamometer

Procedure
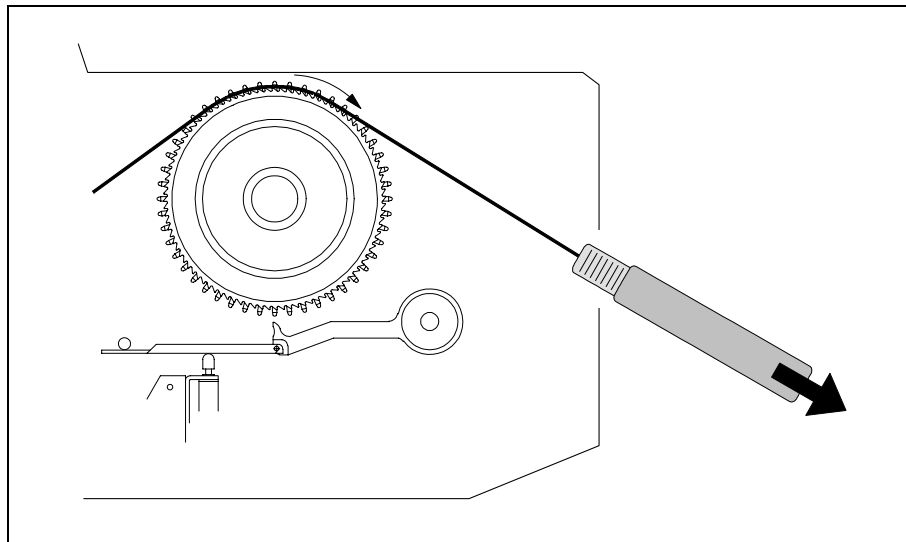
Figure 12-13. Feeder wheel friction measurement

1. Measure the feeder wheel friction by putting a piece of component tape on the feeder wheels and pull the tape using a dynamometer (see Figure 12-13). The force required to rotate each wheel shall be 1 - 5N.

2. If necessary, adjust by turning the nut (A in Figure 12-14) clockwise to increase the friction, counter-clockwise to decrease it.

.
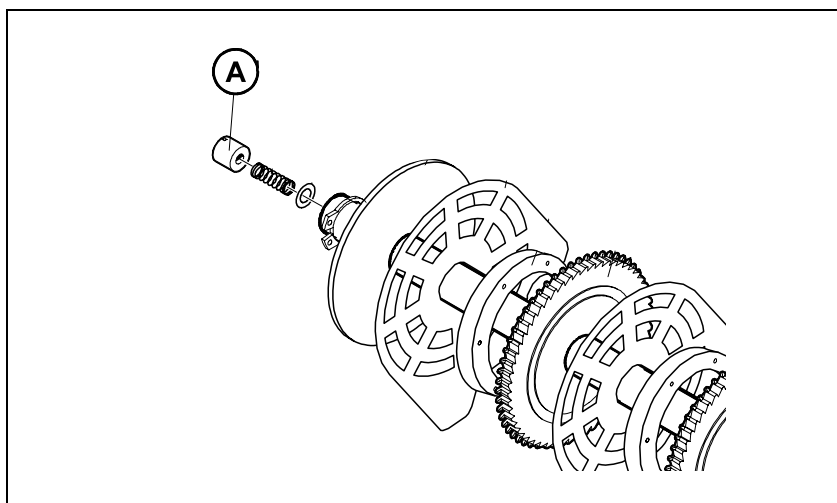
Figure 12-14. Feeder wheel pack end nut

Tray Wagon Magazine

Figure 12-15 below shows the Tray Wagon Magazine inserted in one of the magazine positions of a TP9-UFP machine.

The Tray Wagon Magazine can be used on all the MYDATA placement machines.

The Tray Wagon Magazine has a Y movement of its own.
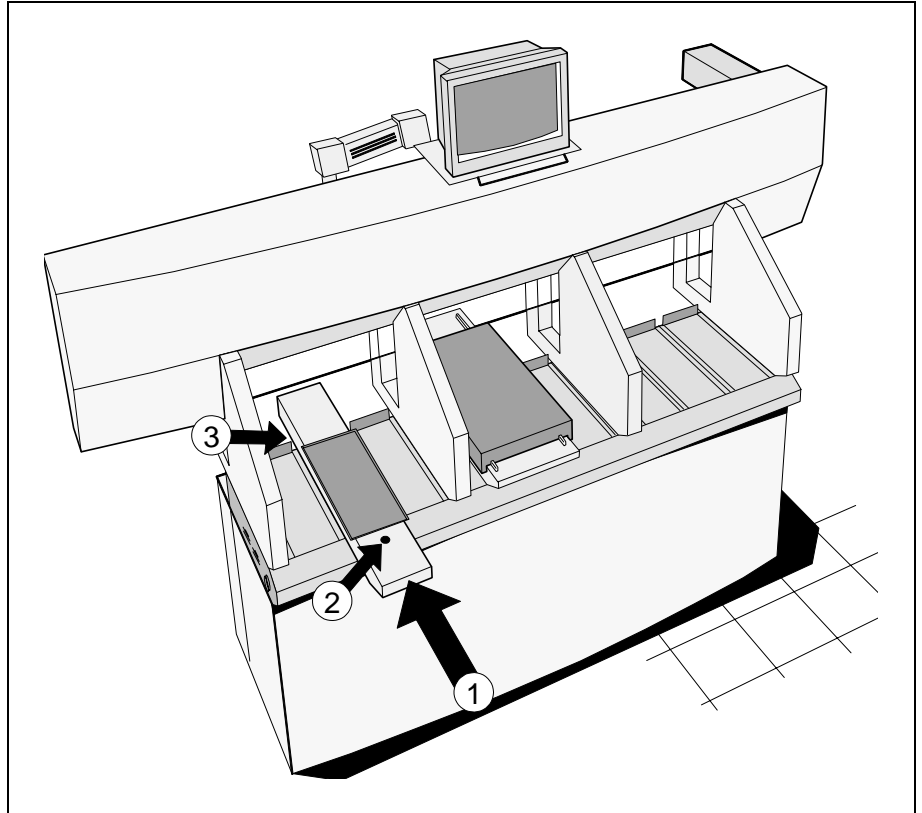
Figure 12-15. Tray Wagon Magazine

Tray Wagon Magazine Installation

1. Insert the Tray Wagon magazine in a magazine position ('1' in Figure 12-15). Any magazine position can be used for a one-module magazine. Two- and three-module magazines can be used in all magazine positions except for the positions required for the magazine top overhang.

2. Fasten the magazine by tightening the screw (2).

3. Select *Utility > Installation > Tray Wagon Installation/Removal.*

   The *Connect the tray wagon magazine* dialog box is shown.

4. Connect the magazine cable at the rear of the machine and press <Enter> when done. The Tray Wagon Magazine cable is connected to the XYM-B connector underneath the Y wagon. If the Tray Wagon Magazine has been used before, then the connection is made to the cable connector.

5. Press <Enter> when prompted OK to initiate hardware?

6. Enter the top table width of the Tray Wagon Magazine from the *Select table width* dialog box (1 – 3 magazine positions):

7. Check and, if incorrect, modify used magazine position number in the shown *Tray wagon position calibration* dialog box.

   For two or three-module magazines, the magazine position furthest to the left should be entered.

8. Calibrate the Tray Wagon Magazine position by centering the following marks on the tray wagon:

   – Lower left mark.

   – Upper right mark.

   – Lower right mark.

9. Restart any off-line terminal

   The installation extends some of the TPSys menu options. Any off-line terminal that has been active during the installation must be restarted to make the installation take effect in the off-line menu system.

Tray Wagon Magazine Removal

1. Select *Utility > Installation > Tray Wagon Installation/Removal*

   The *Remove tray wagon?* dialog box is shown.

2. Reply *Yes* to remove the tray wagon:

3. Press <Enter> when prompted OK to initiate hardware?

4. When the information box below is shown, disconnect the Tray Wagon Magazine cable connector at the rear of the Tray Wagon Magazine, loosen the fixing screw and remove the Tray Wagon Magazine.

```
   Tray wagon magazine uninstalled
Disconnect and remove the magazine
               OK
```

13. Peripheral Systems

This chapter describes the peripheral systems, which includes the following accessories:

Signal Tower
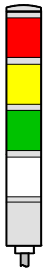
An optional signal tower that has red, yellow, green and white light in addition to a buzzer can be used to indicate the operational status of the machine.

The combination of light and buzzer signals for various machine states can be configured to match individual needs, which is described in the following sections.

The signal tower has a buzzer and four lamps: red, yellow, green and white. The unit is connected as follows:

– CP4 board to an 8 pin Din connector labeled Warning lamp.

– CP5 board to a 15 pin D-sub connector behind the connector panel at the rear of the machine.

The machine can be pre-wired with a 15 pin D-sub connector in one of the cable racks. The connector carries +25V, GND and a number of control signals.

Signal connection:

Bit 0 = Red lamp
Bit 1 = Yellow lamp
Bit 2 = Green lamp
Bit 3 = Not connected
Bit 4 = White lamp (fixed at GND on most CP4 boards).
Bit 5 = Not connected
Bit 6 = Buzzer
Bit 7 = Not connected

Machine States

The machine can be in seven different states, which are defined in the below default settings table. Each state can be indicated with the signal tower with a combination of lit lamps and activated buzzer. The lamps can have steady light or be blinking and the buzzer sound can be intermittent or continuous.

The combination of lit lamps, blinking lamps and buzzer sound for the various machine states is configured in a parameter file.

Default Settings

The settings shown in the following table is the default settings for delivered machines.

The desired combinations of lamp and buzzer signals for each machine state are set in the parameters. See the Software Manual for information on how to change these parameters.

Default signal	Machine state	Description
Green steady light	Running	Normal mounting or gluing operation.
	Waiting	The machine is running but it waits for loading or unloading the board.
Green steady light + yellow blinking + intermittent buzzer	Poor performance	The machine is running but components cannot be picked from at least one magazine feeder which may be out of components. The same component type is however available in another magazine feeder.
	Stops soon	The machine is running but components cannot be picked from at least one magazine feeder which may be out of components. The layout will not be completely mounted.
Yellow steady light	Idle/stopped	The machine - has not been started yet or - has finished mounting/gluing a layout. or - is stopped by the operator.
Red steady light + buzzer	Operator needed	The machine cannot complete the assembly without help from the operator. Normally caused by lack of components.
	Error	The machine is stopped due to a fatal error or by an emergency stop button(s).

Testing the Signal Tower

Use the procedure below to test the function of the lamps in the Signal Tower.

Procedure

1. If not already running, start the Service Program by selecting *Exit > Exit To Service* in the TPSys menu.

2. *Select Utility > Warning lamps.*

   The *Warning lamps* dialog box is shown:

   ```
   ┌─── Warning lamps ───┐
   │        Lamp: 1      │
   │ Action: On Off Blink│
   │ (0..8) ─────────────┘
   ```

3. Select which lamp to be altered in the field named *Lamp*.

4. Each lamp can be set in three different states *On*, *Off* or *Blink* by moving the cursor to the desired field and pressing <Enter>.

Printer

A printer is used with the machine to print out several kinds of data, for example:

  – Component list

  – Package list

  – Magazine and tray lists

  – Layout, panel and PCB data

  – Settings and parameters

  – Production data

This section describes how to prepare the following printer for usage in TPSys:
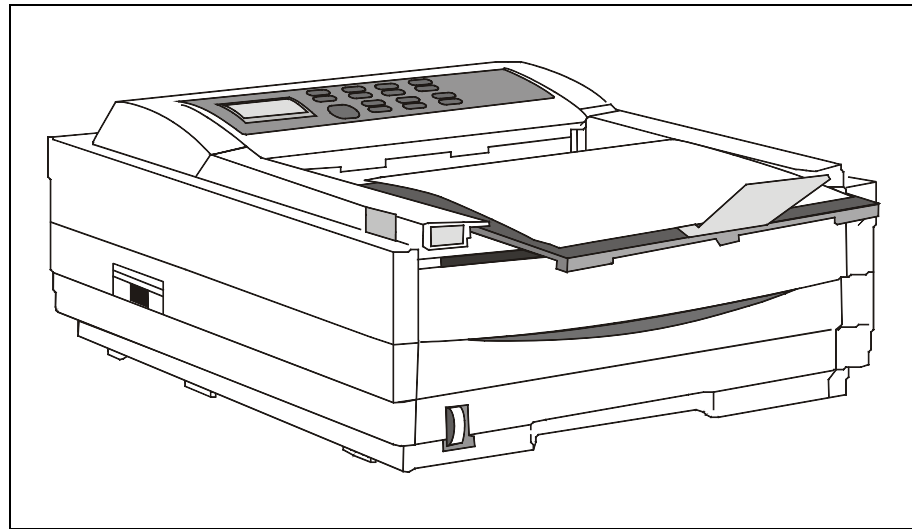
Figure 13-1. Printer

Installation

The printer is delivered in its original box. With the printer there is a manufacturers manual detailing how some of the steps below are to be preformed.

Procedure

1. Unpack the printer and check the contents according to the printer setup guide.

2. Install toner and load paper as per the printer manual.

3. Make sure the power for the MY machine is switched off.

4. Attach the power cord to the printer and the main power. Plug the power cord into the printer first, then into a grounded outlet.

5. Insert the printer end of the cable firmly into the connector on the back of the printer. Fasten the cable to the printer securely.

6. Connect the other end of the cable to the printer connector on the MY machine backside (see Figure 13-2). Fasten the cable securely.
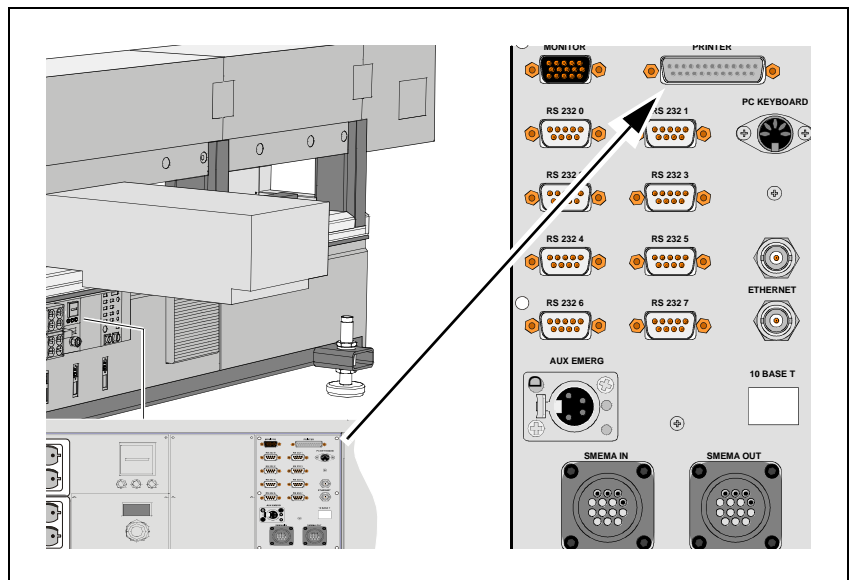
Figure 13-2. Mains input panel

7. Switch on the MY machine and turn on the printer. It takes about 10 seconds for the printer to initialize, warm up, and display the ON-LINE message, indicating the printer is ready to receive data.

8. Do not start TPSys.

9. At the Linux command prompt, write – `setPrinter` and follow the description in the TPSys 2.4 Installation Guide P-010-0812-EN on how to configure the printer. For details on operations of the printer, please refer to the printer manual.

Digitizer

A digitizer can be used to roughly and quickly enter placement data to the TPSys from plain drawings, e.g. if no convertible CAD data is available.

This section contains information for preparing the following digitizer for usage in the TPSys:
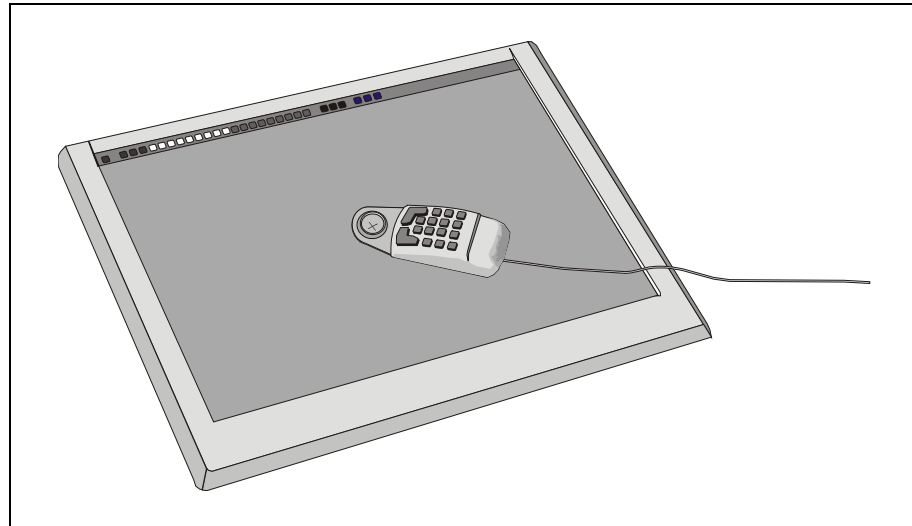
Figure 13-3. Digitizer (CalComp 34180)

Installation

Connecting the Digitizer

1. Unpack the digitizer and its accessories.

2. Connect the AC adapter to the serial cable.

    There are two different AC adapters in the package. Use the universal adapter for 100-250V.

3. Connect the serial cable to the digitizer.

4. Before connecting the AC adapter and interface cable to the MYDATA machine power supply:

    – Make sure the tablet unit and computer power switches are OFF.

    – Also make sure that the AC adapter is suitable for the power supply.

5. After connecting the interface cable, secure all connector screws.

6. Connect the cursor to the digitizer.

7. Switch on the power.

8. Refer to MYDATA document P-040-0009 (included in digitizer box) for instructions on how to setup the digitizer for the first time.
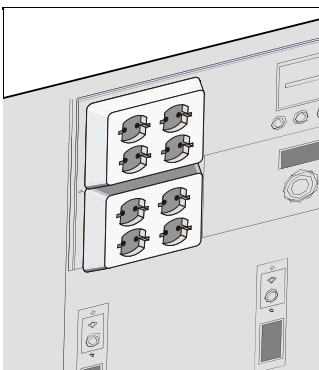
Installation in the MYDATA machine

1. Connect the digitizer to the MYDATA machine by using the extra serial adapters and the modular cable. Notice the port number you use.
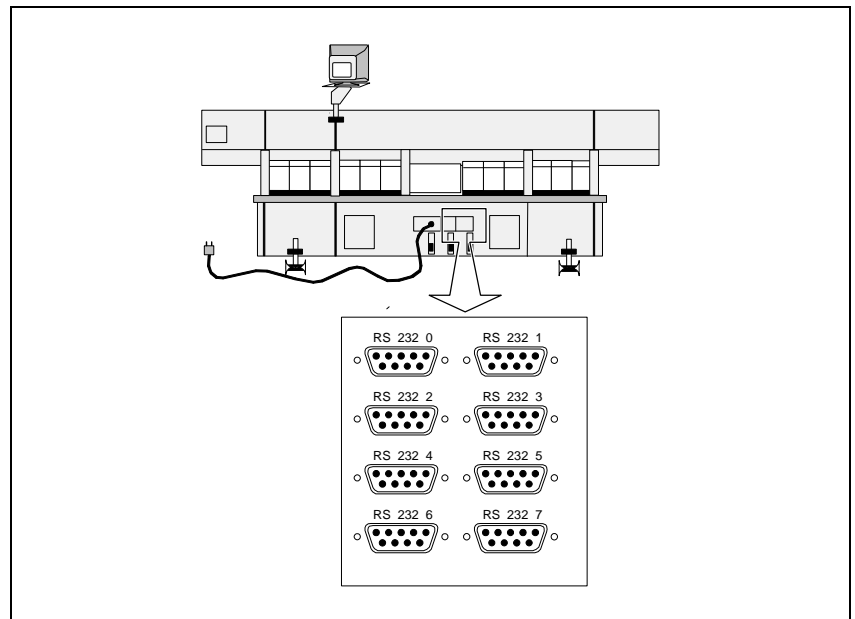
Figure 13-4. Connecting the digitizer

2. Exit TPSys and start the *SetPorts* program.

3. Note the ports for all currently installed serial devices.

4. Select to change the port setup.

5. For each of the previously installed serial devices and for the digitizer, select the port number that you have noted.

6. Save the configuration and quit.

Setting TPSys Digitizer Parameters

1. Start TPSys.

2. Open the *191.0011 Options; Digitizer* parameter in theTPSys parameter editor.

3. If there is a new magic word, set the *191.0001 Magic word* parameter to the new magic word text string.

4. Set the *0011 Digitizer* parameter to *Yes*.

5. Open the *0122 Digitizer* parameter group and set the parameters.

6. Save and exit the Digitizer parameter file.

7. Exit the parameter editor and restart TPSys. The digitizer is now ready to use.

External off-line terminal

The placement machine can be accessed via an external off-line terminal, for instance a standard PC or other terminal.

An off-line terminal can be used for board programming, package and component editing, magazine work, etc.

No machine movements can be started via an off-line terminal.
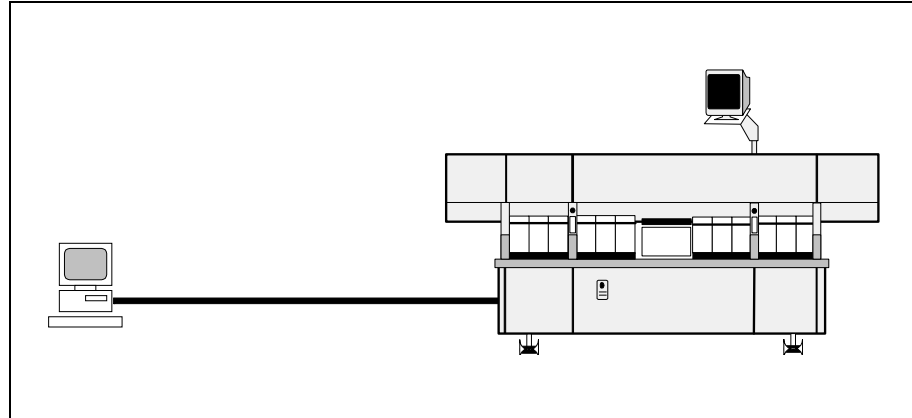
Figure 13-5. Off-line terminal

The following conditions are valid for off-line terminal usage:

– The off-line main menu is reduced in comparison to the on-line menu. Only options that can be activated from an off-line terminal are included.

– A digitizer cannot be used on an off-line terminal.

– Only the disk drive on the machine can be used. Disk drives on the off-line terminal cannot be used.

– When you use an off-line terminal, characters may sometimes be missed on the monitor. This affects the monitor only, the input is intact.

The off-line terminal does not slow down the machine. The machine processes have a higher priority than terminal processes.

14. Safety System

The safety system comprises the following parts:

This chapter contains a description of these parts. It also contains adjustment and calibration information for the WSR2 boards in the optical safety system. There is also a description of a functional test that displays the status of the emergency stop buttons and the light beams

Emergency Stop Buttons
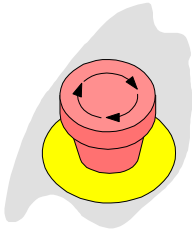
There are two emergency stop buttons located on the machine frame adjacent to the Y wagon.

The emergency stop buttons are red and they stop all machine movements immediately when pressed down.

The buttons are released by turning the knobs clockwise.

Emergency stop buttons on MYDATA accessories such as Tray Exchanger – TEX, conveyor system, etc. have the same function, that is to switch all motors off and release movable machine elements.

WARNING! An emergency stop button must always be pressed down when hands, fingers, tools or other objects are within a shielded area or in the danger area of movable machine elements such as the X wagon or Tray Wagon Magazine.

Restart

To restart the machine after an emergency button has been released, enter a command on the keyboard.

Optical Safety System

There is an optical safety system that transmits and receives non-visible light beams between the X wagon and the machine ends, along the glass shield. If any of these light beams is blocked, a safety relay stops the X movement immediately.

The X wagon safety relay is included in the safety system.

The optical safety system is built-up by two WSR2 boards on the X wagon and two TST2 boards in the machine ends.

The WSR2 boards have switches that must be set as detailed in the adjustment part of this chapter.

Cover and Door Switches

There are electrical switches at the X-wagon covers and at the Y-wagon cabinet.

If any of the switches at the X-wagon covers is activated, i.e. if a cover is opened, then the X-wagon safety relay stops the X movement immediately.

If the front or rear part of the Y-wagon cabinet is opened, then an Y-motor relay stops the Y movement immediately.

Electrical Parts

The schematics covering the Safety System can be found on the enclosed CD-Rom disc.

The Safety sensors are controlled by the MOT-X board.

Functional Test

This procedure displays the status of the emergency stop buttons and the light beams of the X-wagon optical safety system.

Procedure

1. Start the *Service Program* by selecting *Exit > Exit To Service* in the TPSys menu.

2. To be able to see the Safety sensors settings, open the *Show/Hide safety switches* information box by selecting:

    Motor > Show/Hide safety switches

The Safety sensors settings is displayed in the *Safety sensors* dialog box:

```
_____ Safety sensors _____
  Emergency stop: No
   Light curtain: No
```

Emergency stop

No   – The emergency stop buttons are not pressed. The machine is operable.

Yes – At least one of the emergency stop buttons are pressed down.The machine is not operable.

Light curtain

No   – The light beams of the X-wagon optical safety system are not blocked (green LED lit on the optical safety unit). The machine is operable.

Yes – The light beams are blocked (red LED lit). The machine is not operable.

☞ Both the emergency stop buttons have to be pressed down to release the X wagon and make it possible to move it manually.

Adjusting the WSR2 Switches

The optical safety system is built-up of two WSR2 boards on the X wagon and two TST2 boards in the machine ends. The WSR2 boards have switches that must be set as detailed below.

The WSR2 boards have two switches each, S1 and S2. The boards are located left most and right most on the lower part of the X wagon. The boards are shown in Figure 14-1 and Figure 14-2.(In some cases WSR2 switches may be found in a different location as to the ones shown in the figures below. The markings though are always the same).

- The switch setting for the WSR2 board on the left-hand side of the X wagon is shown in Figure 14-1. S1 should be set to ON-OFF-OFF-ON and S2 to OFF-ON-OFF-ON.
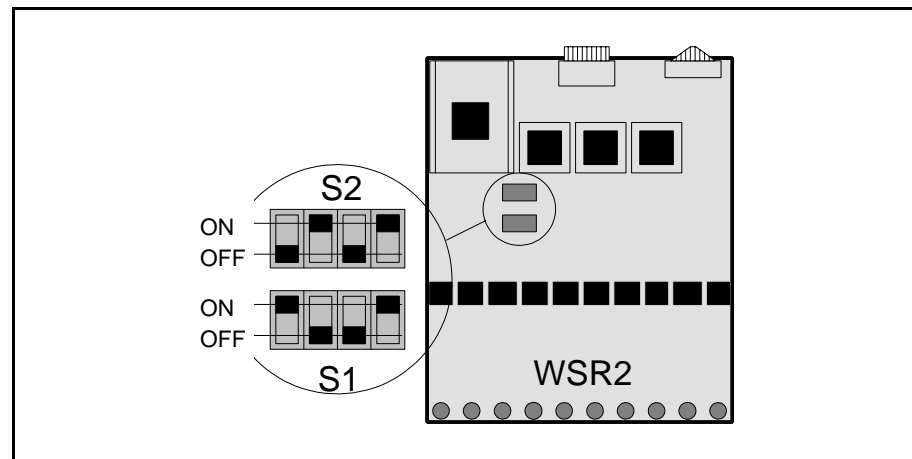
Figure 14-1.   Left WSR2 board

- The switch setting for the WSR2 board on the right-hand side of the X wagon is shown in Figure 14-2. S1 should be set to ON-OFF-OFF-ON and S2 to ON-OFF-ON-OFF.
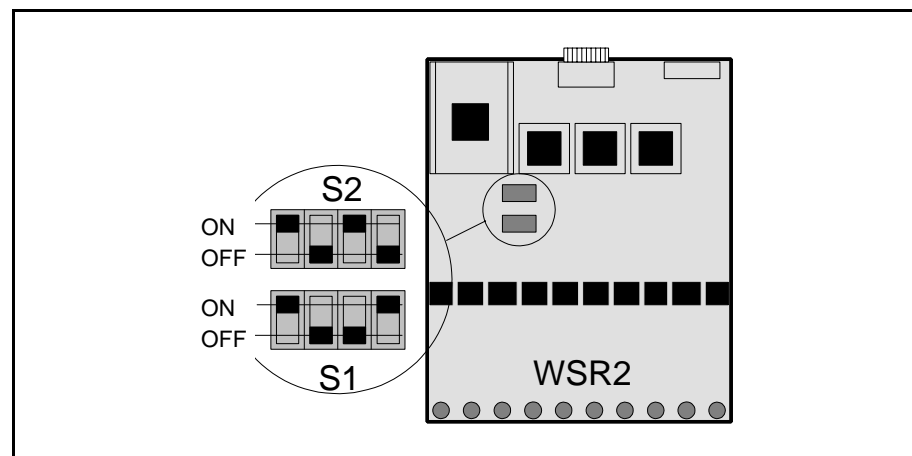
Figure 14-2. Right WSR2 board

15. Material Safety Data Sheets

This chapter contains the complete material safety data sheets for the oil, grease and miscellaneous products used for the MYDATA placement machines.

The following MSDS documents are included:

Oil products

Grease products

Miscellaneous products

Oil Products

This section contains the oil products used, i.e. Shell Tellus Oil.

Tellus Oil

Shell Tellus is the base lubrication oil for the machine.

Data

Full product name:	Shell Tellus Oil 46
Type:	Hydraulic oil
Color:	Light brown
Flash point:	+243°C
Storage temperature:	0°C to +50°C

Supplier

MYDATA (part # L-012-0122 for 100ml) or the nearest supplier, which can be found at http://www.shell.com

Manufacturer

Shell
Internet: http://www.shell.com

MATERIAL SAFETY DATA SHEET
MSDS

Last changed: 2000-09-14   Internal no.:   Replaces date: 2000-04-12

SHELL TELLUS 10, 22, 32, 46, 68

1. PRODUCT AND COMPANY   ⊠

☐	☐
☐	☐
☐	☐

TRADE NAME	SHELL TELLUS 10, 22, 32, 46,
APPLICATION	Hydraulic oil.

ART-NO	742412, 742422, 742432, 742446, 742468

Producer/Importer	AB Svenska Shell
Address	Avd Hälsa & Miljö
Zipcode & City	167 80 BROMMA
Telephone	08-555 480 00
Fax	08-555 481 27
Contactperson	Marita Nilsson, Elna Kristin Renström
Issued by	Marita Nilsson
Emergency number	Giftinformationscentralen
	08-33 12 31
	eller 112 (Giftinformation)

2. COMPOSITION OF PRODUCT   ⊠

No	Ingredients name	CAS-NO	Cons.(weight%)		Classification
1	Highly refined mineral oil, PCA-content < 3% acc IP346	-	80-100		NC
2	Zinc dialkyldithiophosphate	-	< 1		Xi,R36/38
3	Other additives	-			
Legend	T+=Very toxic, T=Toxic, C=Corrosive, Xn=Harmful, Xi=Irritant, IK=No classification required, E=Explosive, O=Oxidising, F+=Extremely flammable, F=Very flammable, Fo=Flammable, N=Dang. to the environment, Mut=Genetoxic, Sens=Sensitizing, Carc=Cancerogen, Repr=Causes birth defects				

INGREDIENT COMMENTS
The highly refined oil is based on, dependence on viscosity grade, oils with one or some of the following CAS no:64742-65-0, 64742-53-6, 64742-56-9. These oils contain <3% (w/w) DMSO-extract,according to IP 346, and shall not be classifed as carcinogenic.

3. HAZARD IDENTIFICATION   ☐

Contains mineral oil for which an exposure limit for oil mist applies. Prolonged or repeated exposure may give rise to dermatitis. Used oil may contain harmful impurities. Not classified as flammable but will burn. Not readily biodegradable. Has the potential to bioaccumulate.

4. FIRST AID   ☐

INHALATION
In the unlikely event of dizziness or nausea, remove casualty to fresh air. If symptoms persist, obtain medical attention.

SKIN CONTACT

MATERIAL SAFETY DATA SHEET
MSDS

Last changed: 2000-09-14   Internal no.:   Replaces date: 2000-04-12

SHELL TELLUS 10, 22, 32, 46, 68

Remove contaminated clothing and wash affected skin with soap and water. If persistent irritation occurs, obtain medical attention. If high pressure injection injuries occur, obtain medical attention immediately.

EYE CONTACT
Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.

INGESTION
Do NOT induce vomiting. Give nothing by mouth. Obtain medical attention.

MEDICAL INFORMATION
Treat symptomatically. Aspiration into the lungs may cause chemical pneumonitis. Dermatitis may result from prolonged or repeated exposure.

5. FIRE FIGHTING MEASURES

PROPER FIREFIGHTING EQUIPMENT
Foam and dry chemical powder. Carbon dioxide, sand or earth may be used for small fires only. Do not use water in a jet.

FIRE AND EXPLOSION HAZARDS
Combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates and gases, including carbon monoxide, oxides of sulphur, and unidentified organic and inorganic compounds.

OTHER INFORMATION
Proper protective equipment including breathing apparatus must be worn when approaching a fire in a confined space.

6. ACCIDENTAL RELEASE MEASURES

SAFETY MEASUREMENTS TO PROTECT PERSONS
Avoid contact with skin eyes. Wear impermeable gloves and boots.

SAFETY MEASUREMENTS TO PROTECT ENVIRONMENT
Prevent from spreading or entering into drains, ditches or rivers by using sand, earth, or other appropriate barriers. Inform local authorities if this cannot be prevented.

PROPER METHODS FOR DAMAGE LIMITATION AND CLEANUP
For small spillage, absorb liquid with sand or earth. Sweep up and remove to a suitable, clearly marked container for disposal in accordance with local regulations. For large spillage, prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim product directly or in an absorbent. Dispose of as for small spills.

7. HANDLING AND STORAGE

HANDLING
When handling product in drums, safety footwear should be worn and proper handling equipment should be used. Prevent spillages. Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.

STORAGE
Keep in a cool, dry, well-ventilated place. Use properly labelled and closable containers. Avoid direct sunlight, heat sources, and strong oxidising agents. Storage temperature 0°C minimum, 50°C maximum. For containers, use: Mild steel or high density polyethylene. For containers or container linings, avoid: PVC.

8. EXPOSURE CONTROL AND PERSONAL PROTECTION

EXPOSURE CONTROL
The Swedish threshold limit value for oil mist is 1 mg/m³. Use local exhaust ventilation if there is a risk of inhalation of vapours, mists or aerosols. Wash hands before eating, drinking, smoking and using the toilet.

RESP. PROTECTION

MATERIAL SAFETY DATA SHEET
MSDS

Last changed: 2000-09-14	Internal no.:	Replaces date: 2000-04-12

SHELL TELLUS 10, 22, 32, 46, 68

Not normally required. If oil mist cannot be controlled, a respirator fitted with an organic vapour cartridge combined with a particulate pre-filter should be used.

EYE PROTECTION
Wear safety glasses or full face shield if splashes are likely to occur or in high pressure applications.

HAND PROTECTION
PVC or nitrile rubber gloves.

SKIN PROTECTION
Minimise all forms of skin contact. Wear overalls to minimise contamination of personal clothing. Launder overalls and undergarments regularly.

9. PHYSICAL AND CHEMICAL PROPERTIES   ☒

Form	Liquid at ambient temperature		
Colour	Tan		
Odour	Characteristic		
Solubility			
Melting point/range	from -57 to - 30°C	Density	from 867 to 882 kg/m³ @ 15°C
Expl. limit LEL-UEL., %-%:	1-10	Solubility in water	Negligible
Vapor pressure		Saturation conc.	
Decomposition temp.		Rel. density sat. air (air=1)	
pH Solution		Boiling point/range	
Flash point	from 150 to 220°C	pH concentrate	
Molecular weight		Viscosity	from 10 to 68 cSt @ 40°C
Ignition temp	> 320°C	Smelling limits lo-hi	
Rel. vapor density (air=1)		Rel. evap. velocity	
Air reactive		Water reactive	
Zink, weight-%	< 0,1		

10. STABILITY AND REACTIVITY   ☐

STABILITY
Stable. Avoid extremes of temperature and direct sunlight.

MATERIALS TO AVOID
Strong oxidising agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous decomposition products are not expected to form during normal storage.

11. TOXICOLOGICAL INFORMATION   ☐

Acute oral tox.	(LD50, expected)	> 2000 mg/kg
Acute derm. tox.	(LD50, ecpected)	> 2000 mg/kg
Inh. toxicity		

OTHER TOX. INFORMATION
Prolonged and/or repeated contact with this product can result in defatting of the skin, particularly at elevated temperatures. This can lead to irritation and possibly dermatitis, especially under conditions of poor personal hygiene. Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment. ALL used oil should be handled with caution and skin contact avoided as far as possible.

GENERAL
Toxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the toxicology of similar products.

MATERIAL SAFETY DATA SHEET
MSDS

Last changed: 2000-09-14	Internal no.:	Replaces date: 2000-04-12

SHELL TELLUS 10, 22, 32, 46, 68

INHALATION
If mists are inhaled, slight irritation of the respiratory tract may occur.

SKIN CONTACT
Expected to be slightly irritant.

EYE CONTACT
Expected to be slightly irritant.

INGESTION
Low acute toxicity. Risk for chemical pneumonitis if the liquid is aspirated into the lungs after ingestion. Especially observe this risk if vomiting occurs.

SESITATION
Not expected to be a skin sensitiser.

CANCER
Product is based on mineral oils of types shown to be non-carcinogenic in animal skin-painting studies. Other components are not known to be associated with carcinogenic effects.

MUTAGENICITY EFFECTS
Not considered to be a mutagenic hazard.

12. ECOLOGICAL INFORMATION

MOBILITY
Product floats on water. Liquid under most environmental conditions. If it enters soil, it will adsorb to soil particles and will not be mobile.

BREAKDOWN
Not readily biodegradable. Major constituents are expected to be inherently biodegradable, but the product contains components that may persist in the environment.

ACCUMULATION
Has the potential to bioaccumulate.

ECOTOXITY
Product is expected to be practically non-toxic to aquatic organisms, LC/EC50>100 mg/l. (LC/EC50 expressed as the nominal amount of product required to prepare aqueous test extract).

OTHER DAMAGES
May cause physical fouling of aquatic organisms.

OTHER INFORMATION
Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products.

13. DISPOSAL

Recycle or dispose of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the contractor to deal satisfactorily with this type of product should be established beforehand. Waste product should not be allowed to contaminate soil or water, or be disposed of into the environment. Empty drums by turning upside down, slightly inclined with the opening in the lowest position. Let the liquid pour out until drum is completely drip free. Emtying of drums should be carried out at room temperature (min 15°C). Do not close drum after emptying.

MATERIAL SAFETY DATA SHEET
MSDS

Last changed: 2000-09-14	Internal no.:	Replaces date: 2000-04-12

SHELL TELLUS 10, 22, 32, 46, 68

14. TRANSPORT INFORMATION

PROPER SHIPPING NAME	
Toll. reg. no.	
HAZCHEM	
ADR (Road)	
UN No.	**Dang. goods**
Class	**Label**
Haz. id. no	**Marginno.**
RID (Railway)	
UN No.	**Dang. goods**
Class	**Label**
Haz..id.no	
IMDG (Sea)	
UN No.	**Dang. goods**
Class	**Label**
Packaging group	**EmS**
MFAG	**Marine Pollutant**
Sub. risk	**Page**
IATA (Airplane)	
UN No.	**Dang. goods**
Class	**Sub. risk**
Label	**Packaging group**

GENERAL
Not dangerous for conveyance under IMO or ADR/RID codes.

15. REGULATORY INFORMATION

Classification

OTHER INFORMATION
Not classified as hazardous to health or the environment according to Swedish Chemicals Legislation.

16. OTHER INFORMATION

ISSUED:

VENDOR NOTES
This document contains important information to ensure the safe storage, handling and use of this product. The information in this document should be brought to the attention of the person in your organisation responsible for advising on safety matters. This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

Grease Products

This section contains the grease products used, i.e. Q8 Rubens 00, OKS 270 and Shell Retinax Grease EP2 & EP3.

NSK

NSK grease is used for the Y-wagon ball screw and nut.

Data

Full product name:	MULTEMP LRL No.3
Type:	Lubricating grease
Color:	peach white paste
Flash point:	>225°C

Supplier

MYDATA (part # K-015-0081) or the nearest supplier, which can be found at http://www.kyodoyushi.co.jp/eng/oversea/index.html.

Manufacturer

KYODO YUSHI CO., LTD.
DENTSU KOSAN DAI-3 BLDG.
2-16-7 GINZA CHUO-KU, TOKYO 104, JAPAN
Tel: 81-3-3543-5813
Fax: 81-3-3545-6259

KYODO YUSHI CO., LTD.

SAFETY DATA SHEET

According to EEC Directives 91/155/EEC, 93/112/EC and 2001/58/EC

SDS No.: 07-230   Page: 1/4
Product name: MULTEMP LRL No.3   Date prepared:2002/10/09

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1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF COMPANY/UNDERTAKING

Preparation name: MULTEMP LRL No.3

Use: Lubricating grease

Company: KYODO YUSHI CO., LTD.
                       DENTSU KOSAN DAI-3 BLDG.
                       2-16-7 GINZA CHUO-KU, TOKYO 104, JAPAN
                       Tel: 81-3-3543-5813
                       Fax: 81-3-3545-6259
Emergency telephone: 81-3-3543-5813

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2. COMPOSITION/INFORMATION ON INGREDIENTS

The preparation contains: ester type synthetic oil, lithium soap and additives.

Chemical name:	EINECS No.:	%	Hazard classification:	Notes:
none				

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3. HAZARDS IDENTIFICATION

The preparation is not classified as dangerous according to Directive 1999/45/EC.

Man: Prolonged or repeated contact with skin may cause redness, Itching,
                Irritation, eczema/chapping and oil acne.

Environment: Grease are generally hazardous to the environment.

---

4. FIRST AID MEASURES

Inhalation: Move into fresh air and keep at rest. In case of persistent throat
                Irritation or coughing: Seek medical attention and bring along these
                Instructions.

Skin contact: Remove contaminated clothing immediately and rinse skin with rinsing
                cream. After this, apply a fatty cream. In case of rashes, wounds or
                other skin disorders: Seek medical attention and bring along these
                instructions.

Eye contact: Immediately flush with plenty of water for up to 15 minutes. Remove
                any contact lenses and open eyelids widely. If irritation persists; Seek
                medical attention and bring along these instructions.

Ingestion: Immediately rinse mouth and drink plenty of water. Keep person under
                observation. If uncomfortable: Seek hospital and bring along these
                instructions. Do not induce vomiting. If vomiting occurs, keep head low.

KYODO YUSHI CO., LTD.

SAFETY DATA SHEET

According to EEC Directives 91/155/EEC, 93/112/EC and 2001/58/EC

SDS No.: 07-230   Page: 2/4
Product name: MULTEMP LRL No.3   Date prepared:2002/10/09

5. FIRE-FIGHTING MEASURES

Extinguishing media: Extinguish with carbon dioxide or dry powder. Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards: By heating and fire, harmful vapors may be formed.

Fire men protection: Dense smoke. Fire fighter wear an approved self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin and eyes. In case of spills, beware of slippery floors and surfaces. For personal protection, see point 8.
Shut off all source of ignition.

Environmental precautions: Avoid discharge into drains, water courses or onto the ground.

Methods for cleaning up: Absorb spillage with oil-absorbing material. Clean contaminated area with oil-removing material. For waste disposal, see point 13.

7. HANDLING AND STORAGE

Safe handling advice: Avoid prolonged and repeated contact. Observe good industrial hygiene practices.
Technical measures: Work practice should minimize contact.

Technical precautions: When working with heated grease, mechanical ventilation may be required.
Technical measures for safe storage: No special precautions.

Storage conditions: Store in a cool and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values:

Chemical name:	Exposure limits:	Type:	Notes:	References:
none				

Exposure controls: Provide adequate ventilation. Observe Occupational Exposure Limits and minimize the risk of inhalation of vapors from heated grease. Provide access to washing facilities incl. soap, skin cleanser and fatty cream

Respiratory protection: In case of inadequate ventilation or when the product is heated, use suitable respiratory equipment with gas filter.

Hand protection: Wear protective gloves. Suitable gloves can be recommended by the glove supplier.

Eye protection: Risk of contact: Wear goggles/face shield.

Skin protection: Wear apron or protective clothing in case of splashes.
Remove contaminated clothing and wash the skin thoroughly with soap and water after work. Wash contaminated clothing before reuse.

KYODO YUSHI CO., LTD.

SAFETY DATA SHEET

According to EEC Directives 91/155/EEC, 93/112/EC and 2001/58/EC

SDS No.: 07-230   Page: 3/4
Product name: MULTEMP LRL No.3   Date prepared:2002/10/09

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: peach white paste
Odor: slight odor
pH: not relevant
Melting(Dropping) point: 205℃
Flash point: 225℃
Autoignition temperature: not available
Relative density: 0.98
Solubility: insoluble in water

10. STABILITY AND REACTIVITY

Stability: Stable under normal temperature conditions.

Conditions/   Avoid exposing to heat and contact with strong oxidizing substances.
materials to avoid:

Hazardous   By heating and fire, harmful vapors may be formed.
decomposition products:

11. TOXICOLOGICAL INFORMATION

Acute toxicity: No data available

Inhalation: Not relevant at normal room temperatures. Inhalation of oil mist or
                        vapors formed during heating of the product will irritate the respiratory
                        system and provoke coughing.

Skin contact: Prolonged or frequent contact may cause redness, itching, irritation,
                        eczema/chaps and oil acne.

Eye contact: Direct contact may irritate.

Ingestion: Not likely, due to the form of the product. However, ingestion may
                        cause irritation and malaise.

12. ECOLOGICAL INFORMATION

Ecotoxicity: The product may be hazardous to the environment.

Mobility: The product is insoluble in water.

Degradability: The product is slowly biodegradable.

13. DISPOSAL CONSIDERATIONS

Dispose of waste and residues according to agreement with local authorities.

Contaminated packaging: Dispose of contaminated packaging as residue.

KYODO YUSHI CO., LTD.

SAFETY DATA SHEET

According to EEC Directives 91/155/EEC, 93/112/EC and 2001/58/EC

SDS No.: 07-230   Page: 4/4
Product name: MULTEMP LRL No.3   Date prepared:2002/10/09

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14. TRANSPORT INFORMATION

The product is not covered by international regulation on the transport of dangerous goods.

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15. REGULATORY INFORMATION

All components are listed on EINECS .

Labeling: The product is not liable to classification and labeling according to EEC
                       Directives 67/548/EEC, 88/379/EEC and 1999/45/EC.

National regulation: EC Directives 67/548/EEC on dangerous substances and 1999/45/EC
                       on dangerous preparations.
                       Regulatory information with regard to this substance in your country or
                       your region should be examined by your own responsibility.

16. OTHER INFORMATION

List of relevant R   none
phrases:

The user must be instructed in the proper work procedure and be familiar with the contents
of these Instructions.

Original Date : 2000/ 06 / 16
Revision Date : 2002/ 10 / 09   based on EC Directive 2001/58/EC.

The information on this data sheet represents our current data and is reliable provided that
the product is used under the prescribed conditions and in accordance with the application
specified on the packaging and/or in the technical guidance literature. Any other use of the
product which involves using the product in combination with any other product or any
other process is the responsibility of the user.

Intentionally left blank

OKS 270

OKS 270 is the base lubrication grease for the machine.

Data

Full product name:	OKS 270
Type:	Grease paste
Color:	Whitish
Flash point:	>210°C

Supplier

MYDATA (part # K-013-0014 for 100g, K-013-0013 for 1000g) or the nearest supplier, which can be found at http://www.oks-germany.com

Manufacturer

OKS Spezialschmierstoffe GmbH
Postfach 500466
80974 Munich
Germany
Phone: Nat. 089-14 98 920 Int. +49 89 14 98 920
Internet: http://www.oks-germany.com

Page 1/4

Material Safety Data Sheet
According to 91/155 EC

Printing date 22.07.2002   Reviewed on 03.07.2000

* **1 Identification of substance:**

· **Product details:**

· **Trade name: OKS 270**

· **Article number:** 002700

· **Manufacturer/Supplier:**
OKS Spezialschmierstoffe GmbH
Triebstrasse 9
D-80993 München
Phone (+49)-89-149892-0
Fax   (+49)-89-1419219

· **Informing department:** Technical departement
· **Emergency information:**
OKS Spezialschmierstoffe GmbH
Triebstraße 9
D-80993 München
Tel. (+49) 089-149892-0
Fax (+49) 089-1419219

* **2 Composition/Data on components:**

· **Chemical characterization**
· **Description:**
Mixture of the substances listed below with harmless additions.
Preparation of solid lubricants and additives in mineral oil.

· **Dangerous components:** Void

3 Hazards identification

· **Hazard designation:** void
· **Information pertaining to particular dangers for man and environment** void
· **Classification system**
The classification is in line with current EC lists. It is expanded, however, by information from technical literature and by information furnished by supplier companies.

* **4 First aid measures**

· **After skin contact** The product is not skin irritating.
· **After eye contact** Rinse opened eye for several minutes under running water.
· **After swallowing** In case of persistent symptoms consult doctor.

* **5 Fire fighting measures**

· **Suitable extinguishing agents** Use fire fighting measures that suit the environment.
· **Protective equipment:** Do not inhale explosion gases or combustion gases.

GB

Page 2/4

Material Safety Data Sheet
According to 91/155 EC

Printing date 22.07.2002   Reviewed on 03.07.2000

Trade name: OKS 270

(Contd. of page 1)

6 Accidental release measures

· **Person-related safety precautions:**
  Particular danger of slipping on leaked/spilled product.
· **Measures for environmental protection:**
  Do not allow product to reach sewage system or water bodies.
· **Measures for cleaning/collecting:** Collect mechanically.
· **Additional information:** No dangerous materials are released.

7 Handling and storage

· **Handling**
· **Information for safe handling:** No special measures required.
· **Information about protection against explosions and fires:**
  No special measures required.

· **Storage**
· **Requirements to be met by storerooms and containers:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** None.
· **Storage class**
· **Class according to regulation on inflammable liquids:** Void

8 Exposure controls and personal protection

· **Additional information about design of technical systems:** No further data; see item 7.

· **Components with critical values that require monitoring at the workplace:**
  The product does not contain any relevant quantities of materials with critical values that
  have to be monitored at the workplace.
· **Additional information:**
  The currently valid safety information database was used to compile this data sheet.

· **Personal protective equipment**
· **General protective and hygienic measures**
  The usual precautionary measures should be adhered to when handling the lubricant.
· **Eye protection:** Safety glasses recommended during refilling.

* 9 Physical and chemical properties:

· **General Information**

Form:	Paste
Colour:	Whitish
Smell:	Mineral-oil-like

· **Change in condition**
  Melting point/Melting range: Not determined
  Boiling point/Boiling range: Not determined

· **Flash point:**   >210°C (ISO 2592)

· **Self-inflammability:**   Product is not self igniting.

(Contd. on page 3)

GB

Page 3/4

Material Safety Data Sheet
According to 91/155 EC

Printing date 22.07.2002   Reviewed on 03.07.2000

Trade name: OKS 270

(Contd. of page 2)

· **Danger of explosion:**   Product is not explosive.

· **Density**   Not determined

· **Solubility in / Miscibility with**
   Water: insoluble

10 Stability and reactivity

· **Thermal decomposition / conditions to be avoided:**
No decomposition if used according to specifications.
· **Dangerous reactions** Reacts with oxygen
· **Dangerous products of decomposition:** Carbon monoxide and carbon dioxide

* 11 Toxicological information

· **Acute toxicity:**
· **Primary irritant effect:**
· **on the skin:** No irritant effect.
· **on the eye:** No irritant effect.
· **Sensitization:** No sensitizing effect known.
· **Additional toxicological information:**
When used and handled according to specifications, the product does not have any harmful effects according to our experience and the information provided to us.

12 Ecological information:

· **Information about elimination (persistence and degradability):**
· **Other information:** The product is slightly biodegradable.
· **General notes:** Water hazard class 1 (Self-assessment): slightly hazardous for water.

* 13 Disposal considerations

· **Product:**
· **Recommendation**
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

· **Uncleaned packagings:**
· **Recommendation:** Disposal must be made according to official regulations.

14 Transport information

· **Land transport ADR/RID and GGVS/GGVE (cross-border/domestic)**
· **ADR/RID-GGVS/E Class:** -

· **Transport/Additional information:** Not dangerous according to the above specifications.

GB

Page 4/4

Material Safety Data Sheet
According to 91/155 EC

Printing date 22.07.2002   Reviewed on 03.07.2000

Trade name: OKS 270

(Contd. of page 3)

* | **15 Regulatory information**

· **National regulations**

· **Classification according to VbF:** Void

· **Water hazard class:**
Water hazard class 1 (Self-assessment): slightly hazardous for water.

* | **16 Other information:**

This data is based on our present knowledge. However, it shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Department issuing data specification sheet:** Technical departement
· **Contact:** Technical departement

GB

Intentionally left blank

Paraliq GA 351

Data

Full product name:	Paraliq GA 351
Type:	Lubricating grease
Color:	beige, almost transparent
Flash point:	>220°C

Supplier

MYDATA or the nearest supplier, that can be found at http://www.kluber.com

Manufacturer

Klüber Lubrication, München KG Geisenhauserstraße 7
D-81379 München
Germany
Phone: Int +49 89 78 76 333

PARALIQ® GA 351
Material Safety Data Sheet

Section I

Manufacturer's name: Klüber Lubrication München KG
Chemical name and synonyms: Lubricating grease
Trade name and synonyms: PARALIQ GA 351
Chemical family: Paraffinic mineral oil, synthetic hydro-
carbon oil, Al complex soap
Formula: Proprietary; authorized by USDA-H1

Section II – Hazardous Ingredients
Paints, preservatives, solvents

	%	TLV (units)
Pigments	–	–
Catalyst	–	–
Vehicle	–	–
Solvents	–	–
Additives	–	–
Others	–	–

Alloys and metallic coatings

	%	TLV (units)
Base metal	–	–
Alloys	–	–
Metallic coatings	–	–
Filler metal plus coating or core flux	–	–
Others	–	–

Hazardous mixtures of other liquids, solids, or gases
—

Section III – Physical Data

Boiling point:	n/a
Vapor pressure (mm Hg):	n/a
Vapor density (air=1):	n/a
Solubility in water:	not soluble
Specific gravity (H_2O=1):	approx. 0.90
Percent, volatile by volume (%):	0
evaporation rate (_____ = 1):	n/a
Appearance and odor:	beige, neutral

Section IV – Fire and Explosion Hazard Data

Flash point (base oil): >220 °C ASTM D-92
Flammable limits: —   Lel: Uel:
Extinguishing media: Water fog, foam, dry chemical, CO_2
Special fire fighting procedures: Use self-contained
breathing apparatus, cool fire exposed areas and
equipment.
Unusual fire and explosion hazards: Do not use direct
stream of water, material may float and reignite.

n/a = not applicable

Section V – Health Hazard Data

Threshold limit value: n/a
Effects of overexposure:
Eyes: Mild irritation
Skin: Mild irritation, may cause dermititis, oil acne or
folliculitis with repeated contact.
Ingestion: No more than slightly toxic if swallowed.
Inhalation: n/a
Emergency and first aid procedures:
Eyes: Flush with large amount of water.
Skin: Remove contaminated clothing, wash skin with soap
and water, launder clothing prior to reuse.
Ingestion: Contact doctor for directions. Never give any-
thing by mouth to an unconscious person.

Section VI – Reactivity Data

Stability: stable
Incompatibility (materials to avoid): Strong oxidizing
materials, such as pure oxygen
Hazardous decomposition products: n/a
Hazardous polymerization: will not occur

Section VII – Spill or Leak Procedures

Steps to be taken in case material is released or spilled:
Eliminate all sources of ignition. Collect lubricating grease.
Keep product out of waterways.
Waste disposal method:
Incinerate material or dispose of it in accordance with your
local, state and federal regulations.

Section VIII – Special Protection Information

Respiratory protection (specify type):	n/a
Ventilation:	n/a
Local exhaust:	recommended
Protective gloves:	n/a
Eye protection:	n/a
Other protective equipment:	no

Section IX – Special Precautions

Precautions to be taken in handling and storing:
Minimize skin contact with all lubricants. Wash with soap
and water prior to eating, drinking, smoking or using
sanitary facilities.
Other precautions:
All chemical products should be handled as to prevent
constant or repeated contact.

The data in this brochure is based on our general experience and knowledge at the time of printing and is intended to give information of possible applications to a reader with technical experience without, however, constituting an assurance of properties for specific cases. We recommend contacting our Technical Consulting Staff for information regarding specific applications. If required and possible we will be pleased to provide a sample for testing.

Freudenberg Klüber Lubrication, a member of the Freudenberg group of companies

Retinax Grease EP2 & EP3

Retinax grease is used for the upper and lower X rails. It is always applied by means of a grease gun (MYDATA part # L-015-0395).

Data

Full product name:	Shell Retinax Grease EP 2 & EP 3
Storage temperature:	0°C to +50°C

Supplier

MYDATA (grease gun refill, part # K-015-0091 for 225g) or the nearest supplier, which can be found at http://www.shell.com

If the grease is not bought from MYDATA, then the tube nozzle has to be cut off prior to connecting the tube to the grease gun.

Manufacturer

Shell
Internet: http://www.shell.com

MSDS

SHELL RETINAX EP 2

1. IDENTIFICATION OF SUBSTANCE AND COMPANY

TRADE NAME	SHELL RETINAX EP 2
APPLICATION	Lubricating grease

ART No.	728050

Producer/importer	AB Svenska Shell
Address	Avd Hälsa & Miljö
Postal code	167 80 BROMMA
Country	S
Telephone	08-555 480 00
Fax	08-555 481 27
Contact pers.	Marita Nilsson, Elna Kristin Renström
ISSUED BY	Marita Nilsson
Emergency Telephones	Giftinformationscentralen
	08-33 12 31
	or 112 (Giftinformation)

2. COMPOSITION/INFORMATION ON INGREDIENTS   ☒

No	Ingredients name	CAS No.	Conc. (wt%)		Classification
1	Highly refined mineral oil, PCA-content < 3% acc IP346	-	60-80		NC
2	Lithium saponified fatty acids	-	10-15		NC
3	Other additives	-			
	Legend: T+=Very toxic, T=Toxic, C=Corrosive, Xn=Harmful, Xi=Irritant, E=Explosive, O=Oxidising, F+=Extremely flammable, F=Highly flammable, N=Dangerous for the environment				

INGREDIENT COMMENTS
The highly refined mineral oil is based on oils with following CAS no:64742-65-0. These oils contain <3% (w/w) DMSO-extract, according to IP 346, and shall not be classified as carcinogenic.

3. HAZARDS IDENTIFICATION

Contains mineral oil for which an exposure limit for oil mist applies. Prolonged or repeated exposure may give rise to dermatitis. Used grease may contain harmful impurities. Not classified as flammable but will burn. Not readily biodegradable. Has the potential to bio accumulate.

4. FIRST AID MEASURES

INHALATION
In the unlikely event of dizziness or nausea, remove casualty to fresh air. If symptoms persist, obtain medical attention.

SKIN CONTACT
Remove contaminated clothing and wash affected skin with soap and water. If persistent irritation occurs, obtain medical attention. If high pressure injection injuries occur, obtain medical attention immediately.

EYE CONTACT
Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.

INGESTION
Do NOT induce vomiting. Give nothing by mouth. Obtain medical attention.

MEDICAL INFORMATION

MSDS

Last changed: Internal No.:   Replaces date:

SHELL RETINAX EP 2

Treat symptomatically. Aspiration into the lungs may cause chemical pneumonitis. Dermatitis may result from prolonged or repeated exposure.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA
Foam and dry chemical powder. Carbon dioxide, sand or earth may be used for small fires only. Do not use water in a jet.

FIRE AND EXPLOSION HAZARDS
Combustion is likely to give rise to a complex mixture of gases and airborne particulates, including carbon monoxide, oxides of sulphur, and unidentified organic and inorganic compounds.

OTHER INFORMATION
Proper protective equipment including breathing apparatus must be worn when approaching a fire in a confined space.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS
Avoid contact with skin Wear impermeable gloves and boots.

ENVIRONMENTAL PRECAUTIONS
Prevent from entering into drains, ditches or rivers. Inform local authorities if this cannot be prevented.

METHODS FOR CLEANING UP
For small spills, shovel into a suitable, clearly marked container for disposal or reclamation in accordance with local regulations. For large spillage, prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim product directly or in an absorbent. Dispose of as for small spills.

7. HANDLING AND STORAGE

HANDLING PRECAUTIONS
When handling product in drums, safety footwear should be worn and proper handling equipment should be used. Prevent spillages. Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.

STORAGE
Keep in a cool, dry, well-ventilated place. Use properly labelled and closable containers. Avoid direct sunlight, heat sources, and strong oxidising agents. Storage temperature 0°C minimum, 50°C maximum. For containers, use: Mild steel For containers or container linings, avoid: PVC.

8. EXPOSURE CONTROL/PERSONAL PROTECTION

EXPOSURE CONTROL
The Swedish threshold limit value for oil mist is 1 mg/m³. Use local exhaust ventilation if there is a risk of inhalation of vapours, mists or aerosols. Wash hands before eating, drinking, smoking and using the toilet.

RESPIRATORY PROTECTION
Not normally required. If oil mist cannot be controlled, a respirator fitted with an organic vapour cartridge combined with a particulate pre-filter should be used.

EYE PROTECTION
Wear safety glasses or full face shield if splashes are likely to occur or in high pressure applications.

HAND PROTECTION
PVC or nitrile rubber gloves. When handling heated product, protect hands and body from splashes.

PROTECTIVE CLOTHING
Minimise all forms of skin contact. Wear overalls to minimise contamination of personal clothing. Launder overalls and undergarments regularly.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Semi-solid at ambient temperature

MSDS

SHELL RETINAX EP 2

Colour:	Light brown		
Odour:	Characteristic mineral oil		
Solubility:			
Melting point/range:		**Density:**	900 kg/m3 @ 15°C
Expl. limit LEL-UEL%:		**Solubility in water:**	Negligible
Vapour pressure:		**Saturation conc.:**	
Decomposition temp.:		**Rel. dens. sat. air (air=1):**	
pH solution:		**Boiling point/range:**	
Flash point:	> 140°C (COC)	**pH concentrate:**	
Molar weight:		**Viscosity:**	
Ignition temp.:		**Odour threshold value:**	
Rel.vap.dens.(air=1):		**Rel. evap. velocity:**	
Air reactive:		**Water reactive:**	

10. STABILITY AND REACTIVITY

STABILITY
Stable. Avoid extremes of temperature and direct sunlight.

MATERIALS TO AVOID
Strong oxidising agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous decomposition products are not expected to form during normal storage.

11. TOXICOLOGICAL INFORMATION

Acute oral tox.	(LD50,expected)	> 2000 mg/kg
Acute derm. tox.	(LD50,expected)	> 2000 mg/kg
Inh. toxicity		

OTHER TOXICOLOGICAL INFORMATION
Prolonged and/or repeated contact with this product can result in defatting of the skin, particularly at elevated temperatures. This can lead to irritation and possibly dermatitis, especially under conditions of poor personal hygiene. Used grease may contain harmful impurities that have accumulated during use. The concentration of such harmful impurities will depend on use and they may present risks to health and the environment. ALL used grease should be handled with caution and skin contact avoided as far as possible.

GENERAL
Toxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the toxicology of similar products.

INHALATION
If mists are inhaled, slight irritation of the respiratory tract may occur.

SKIN CONTACT
Expected to be slightly irritant.

EYE CONTACT
Expected to be slightly irritant.

INGESTION
Low acute toxicity.

SENSITIZATION
Not expected to be a skin sensitiser.

CARCINOGENICITY
Product is based on mineral oils of types shown to be non-carcinogenic in animal skin-painting studies. Other components are not known to be associated with carcinogenic effects.

MUTAGENICITY

MSDS

SHELL RETINAX EP 2

Not considered to be a mutagenic hazard.

12. ECOLOGICAL INFORMATION

MOBILITY
Product floats on water. Semi-solid under most environmental conditions. If it comes into contact with soil, it will strongly adsorb to soil particles.

DEGRADABILITY
Not readily biodegradable. Major constituents are expected to be inherently biodegradable, but the product contains components that may persist in the environment.

ACCUMULATION
Has the potential to bioaccumulate.

ECOTOXICITY
Product is expected to be practically non-toxic to aquatic organisms, LC/EC50>100 mg/l. (LC/EC50 expressed as the nominal amount of product required to prepare aqueous test extract).

OTHER EFFECTS
May cause physical fouling of aquatic organisms.

OTHER INFORMATION
Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products.

13. DISPOSAL CONSIDERATIONS

GENERAL REGULATIONS
Recycle or dispose of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the contractor to deal satisfactorily with this type of product should be established beforehand. Waste product should not be allowed to contaminate soil or water, or be disposed of into the environment.

14. TRANSPORT INFORMATION

PROPER SHIPPING NAME	
Toll. reg. no:	
HAZCHEM **(Y=black,y=white):**	
ADR **(Road)**	
UN No.	Dang. goods
Class	Label
Haz. ID No.	Marge No.
RID (Railway)	
UN No.	Dang. goods
Class	Label
Haz. ID No.	
IMDG(Sea)	
UN No.	Dang. goods
Class	Label
Pkg Gr	EmS
MFAG	Marine Pollutant
Sub Risk	Page
IATA(Air)	
UN No.	Dang. goods
Class	Sub Risk
Label	Pkg Gr

Not dangerous for conveyance under IMO or ADR/RID codes.

15. REGULATORY INFORMATION

MSDS

Last changed: Internal No.:   Replaces date:

SHELL RETINAX EP 2

Classif.:

OTHER INFORMATION
Not classified as hazardous to health or the environment according to Swedish Chemicals Legislation.

16. OTHER INFORMATION	☐

ISSUED:

VENDOR NOTES
This document contains important information to ensure the safe storage, handling and use of this product. The information in this document should be brought to the attention of the person in your organisation responsible for advising on safety matters. This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product. A cross mark in the box to the right of a chapter heading indicates that changes have been made in this chapter compared to the previous version of the Safety Data Sheet.

Rubens 00

Rubens grease is used in the X-wagon grease pump for the X-rail cog wheels and rack.

Data

Full product name:	Q8 Rubens 00
Type:	Lithium based grease
Color:	Amber
Flash point:	>150°C (ASTM D 92, COC)

Supplier

MYDATA (part # K-023-0009 for 50Kg) or the nearest supplier, which can be found at http://www.q8.com

Manufacturer

Kuwait Petroleum Corporation of Safat
Kuwait
Internet: http://www.q8.com

PRODUCT SAFETY DATA SHEET

Q8 Rubens 00   1999-10-12

1.	PRODUCT AND COMPANY IDENTIFICATION

Product name: Q8 Rubens 00
Grades: NLGI No. 00
Use: Lubricating grease

Company: OK-Q8 AB
                   Box 23900, 104 35 Stockholm
                   Tel. 08 - 457 60 00. Fax 08- 28 50 90

2.	COMPOSITION / INFORMATION ON INGREDIENTS

No	Name	CAS-No	%-mass	Symbol(s)	R Phrases
1	Severely refined mineral oil (IP346 DMSO extract < 3 %) with additives			-	-
2	Lithium soaps of fatty acids (appr. $? %).			-	-
3	Zinc naphthenate		1-5	Xi	R36/38
4	Zinc alkyldithiophosphate		< 1	Xi	R36/38
5	Organic sulphur and phosphorus containing compounds		< 1	Xi	R43
6	Alkylated diphenylamines		< 1	N	R51/53

No substances are present in concentrations regarded to present health hazards (article 3 of Directive 88/379/EEC).

3.	HAZARDS IDENTIFICATION

Health: Unlikely to cause eye irritation.
                   Unlikely to cause immediate irritation but prolonged and repeated contact may be harmful to the skin.
                   Not volatile. It is not likely to be an inhalation hazard at normal ambient temperatures.
                   If overheated, fumes and vapours are irritating to the breathing passages and lungs.
                   Ingestion is unlikely to cause adverse systemic health effects.

Environmental: Although no specific ecological hazards are expected and bioaccumulation is unlikely, spillage into the environment should always be avoided.

Physical / Chemical: Not applicable

Additional Information: Injection under the skin of oil or grease under very high pressure is a serious emergency which should immediately be referred to hospital. A copy of this data sheet should accompany the casualty to hospital for the information of the medical staff.

4.	FIRST AID MEASURES

Eyes: Flush the eye with copious amounts of water. No emergency measures are necessary but if adverse eye effects follow, refer for medical attention.
Skin: Wash the contaminated skin thoroughly with soap and water. No emergency measures are necessary but if adverse skin effects follow, refer for medical attention.
Inhalation: Remove the affected person to fresh air. If recovery is not rapid, obtain medical attention.
Ingestion: DO NOT INDUCE VOMITING. No emergency measures are needed but if adverse health effects follow, refer for medical attention.
Additional Information: Injection under the skin of mineral oil or grease under very high pressure is a serious emergency requiring IMMEDIATE medical attention and hospitalization, even if initially there may be very little in the way of symptoms or signs to suggest this seriousness. Surgical exploration of the affected site with wide incision(s), careful debridement and irrigation of the damaged area should be undertaken at the slightest sign of actual presence of the oil under the skin. A conservative approach will inevitably lead to extensive necrosis of the subcutaneous tissues and structures. Especially vulnerable are the myelin sheaths of the nerves as these are rapidly dissolved by the hydrocarbon leading to extensive and irreversible impairment.

5.	FIREFIGHTING MEASURES

Extinguishing media: Recommended   Dry chemical, foam, CO2.
                                         Not to be used   -

Specific exposure hazards:
Slight flammability hazard when exposed to heat or flame.

Special protective equipment for firefighters:
Use self-contained breathing equipment when fighting fire in confined spaces.

6.	ACCIDENTAL RELEASE MEASURES

Personal precautions: Surfaces may become slippery after spillage.
Environmental precautions: Water may be used to flush spills away from sources of ignition.
                               Do not allow the product to enter public drainage system or open water courses.
Methods for cleaning up: Absorb and scrape up.
Absorbent materials: Sand or active clay.

7.	HANDLING AND STORAGE

Handling: Avoid prolonged or repeated skin contact.
            Use adequate ventilation.
Storage: Store in original steel or plastic containers.

8.	EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures No special measures needed.
Control parameters: TWA TLV (ACGIH) : 5 mg/m³ for oil mist. However, in all circumstances exposure should be
                      kept as low as reasonably possible by good ventilation and safe working practices.
Respiratory protection: Inhalation of the vapours, fumes or mists should be avoided by safe working practices and
                      good ventilation.
Eye protection: No special precautions are needed beyond clean working conditions and safe handling
                      practices.
Skin protection: Prolonged and repeated skin contact should be avoided by the use of clean gloves and clean
                      overalls.

9.	PHYSICAL AND CHEMICAL PROPERTIES

Physical state   :   Grease
Colour   :   Amber
Appearance   :   Smooth
Odour   :   Mineral oil
pH   :   Neutral
Boiling range, °C   :   Not known
Melting Point. °C   :   Not applicable
Flash Point, °C   :   > 150 (ASTM D 92, COC)
Autoflammability/ ignition, °C   :   Not known
Upper explosion limit   :   Not known
Lower explosion limit   :   Not known
Vapour pressure, 20 °C, kPa   :   Negligible
Viscosity, kinematic, 40 °C, mm²/s   :   Not applicable
Relative density, 15 °C   :   < 1.00
Water solubility   :   Negligible
Partition coefficient, n-octanol/water :   Not known
Other data   :   -
                                      :

10.	STABILITY AND REACTIVITY

Conditions / materials to avoid:
Stable. May react with strong oxidizing agents.

Hazardous decomposition products:
Thermal decomposition or incomplete combustion may produce oxides of carbon and irritating fumes.

file://H:\Safety\kps\e\1711_Q8Rubens00.htm   Page 2 of 3 - printed 12-10-99

11.	TOXICOLOGICAL INFORMATION

Eyes: Unlikely to cause eye irritation.
Skin: Although incidental contact with the skin does not cause immediate irritation, prolonged and
                 repeated contact may defat the skin and eventually cause dermatitis.
Inhalation: Not volatile. It is not likely to be an inhalation hazard at normal ambient temperatures.
                 If overheated, fumes and vapours are irritating to the breathing passages and lungs.
Ingestion: Ingestion is unlikely to cause adverse systemic health effects.
Other: The refined mineral base oils used in the formulation of this product are of a low order of toxicity in
                 test animals.
                 LD50 (rat) for base oils is above 5 g/kg .

12.	ECOLOGICAL INFORMATION

Mobility: Little mobility in soil. Some components may penetrate the soil causing ground water
                               pollution. Will spread on the water surface. A small portion may be dispersed in water.
Degradability: Not readily biodegradable.
Ecotoxicity/bioaccumulation: The base oil components are not expected to be dangerous to the aquatic environment.

13.	DISPOSAL CONSIDERATIONS

Transport to authorized waste location, or incinerate under controlled conditions.
European Waste Catalogue No. 130202.

14.	TRANSPORT INFORMATION

UN-no: Not classified
RID / ADR: Not classified
IMO: Not classified
IATA / ICAO: Not classified
Other: -

15.	REGULATORY INFORMATION

EC Labeling / Classification
Symbol(s)   None
Contains:
R phrases: None
S phrases:
Other
regulations: No EC exposure limit established.

16.	OTHER INFORMATION

CONCAWE report no. 5/87 "health aspects of lubricants".

Replaces sheet dated: 1995-06-07   Sections revised: 2-11-12-13

The information in this sheet has been compiled by Kuwait Petroleum Research & Technology B.V. of Rotterdam, Netherlands, on the basis of data
available to them at the date stated above.
The information is for the guidance of customers of the Kuwait Petroleum group of companies (being all companies controlled directly or indirectly by
Kuwait Petroleum Corporation of Safat, Kuwait) but is not intended as an exhaustive description of the health and safety aspects of the use of the product
and in particular the information takes no account of possible abnormal reactions of individuals.
Customers are responsible for the proper storage, use and handling of the product and for determining whether the product is fit for the use to which it is
put. The information does not describe health and safety aspects of the product once it has been misused or mishandled or when it is mixed with any
other product.
This document is in accordance with 91/155/EEC, 93/112/EC and ISO 11014-1.

Miscellaneous Products

This section contains chip bonder products, i.e. Chipbonder 368.

Chipbonder 368

Data

Full product name:	Loctite Chipbonder 368 adhesive
Item-No.:	17717
Type:	Epoxy
Color:	Orange-red
Flash point:	More than 200°F

Supplier

MYDATA or the nearest supplier, that can be found at http://www.loctite.com

Manufacturer

Internet: http://www.loctite.com

Product Name: Loctite(R) Chipbonder(R) 368 Adhesive   HENKEL LOCTITE CORPORATION
11/10/02
                              ROCKY HILL, CONNECTICUT 06067
                              EMERGENCY PHONE: (860) 571-5100

                              MATERIAL SAFETY DATA SHEET   Page 01 of 05

     Loctite(R) Chipbonder(R) 368 Adhesive
     17717

      1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

     Product Name: Loctite(R) Chipbonder(R) 368 Adhesive
     Item No.:   17717
     Product Type: Epoxy

      2. COMPOSITION, INFORMATION ON INGREDIENTS

     Ingredients   CAS No.   %

     Epoxy resin   25068-38-6   40-50
     Polyamide hardener   Proprietary   25-35
     Epoxy resin   30499-70-8   10-20
     SILICA, AMORPHOUS, FUMED,
      CRYSTALLINE-FREE   112945-52-5   3-10
     Dyed melamine resin   39277-28-6   1-3
     Pigment red*   7585-41-3   0.1-1
     DIETHYLENETRIAMINE   111-40-0   0.1-1
     TITANIUM DIOXIDE   13463-67-7   0.1-1

     * This component is listed as a SARA Section 313 Toxic Chemical.

        Ingredients which have exposure limits

     Exposure Limits (TWA)   ACGIH   OSHA   OTHER
     Ingredients   (TLV)   (PEL)

     SILICA, AMORPHOUS, FUMED,
      CRYSTALLINE-FREE   10 mg/m3 TWA 6 mg/m3 TWA 3 mg/m3 TWA
                                                           resp. dust
     DIETHYLENETRIAMINE   1 ppm skin   1 ppm TWA   None
                                4.2mg/m3 skin 4mg/m3
     TITANIUM DIOXIDE   10 mg/m3   15 mg/m3   None
                                              Total dust

     Exposure Limits (STEL)   ACGIH   OSHA
     Ingredients   (TLV)   (PEL)

      3. HAZARDS IDENTIFICATION

     Toxicity: Skin and eye irritant.
                                Estimated oral LD50 more than 5000 mg/kg
     Primary Routes of Entry: None known
     Signs and Symptoms
      of Exposure: May cause dermatitis on prolonged contact in
                                sensitive individuals.

```
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                         MATERIAL SAFETY DATA SHEET          Page 02 of 05

Product Name:            Loctite(R) Chipbonder(R) 368 Adhesive
Item No.:                17717

 3.  HAZARDS IDENTIFICATION                                    (continued)

Existing Conditions
 Aggravated by Exposure:   Melamine resin: Respiratory allergies and diseases


                         Literature Referenced               Carcinogen
Ingredients              Target Organ and Other Health Effects  NTP IARC OSHA

Epoxy resin              ALG IRR                              NO  NO   NO
Polyamide hardener       No Data                              NO  NO   NO
Epoxy resin              ALG IRR                              NO  NO   NO
SILICA, AMORPHOUS, FUMED,
 CRYSTALLINE-FREE         NUI                                  NO  N/A  NO
Dyed melamine resin      No Data                              NO  NO   NO
Pigment red              NTO                                  NO  NO   NO
DIETHYLENETRIAMINE       ALG EYE IRR                          NO  NO   NO
TITANIUM DIOXIDE         IRR RES                              NO  NO   NO
------------------------------------------------------------------------


Abbreviations

N/A Not Applicable                  ALG Allergen
EYE Eyes                            IRR Irritant
NTO No Target Organs                NUI Nuisance dust
RES Respiratory

 4.  FIRST AID MEASURES

Ingestion:               Induce vomiting. Obtain medical attention.
Inhalation:              Does not apply
Skin Contact:            Wash with soap and water.
Eye Contact:             Flush at least 15 minutes with water.  Obtain
                         medical attention.

 5.  FIRE FIGHTING MEASURES

Flash Point:             More than 200°F      Method:  Tag Closed Cup
Recommended
 Extinguishing Agents:   Carbon dioxide, foam, dry chemical
Special Firefighting
 Procedures:             Not available
Hazardous Products formed
 by Fire or Thermal Decomp Irritating or toxic organic vapors.
Unusual Fire or
 Explosion  Hazards:     None


 Explosive Limits:
(% by volume in air)Lower  Not available
```

```
(% by volume in air)Upper  Not available

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                        MATERIAL SAFETY DATA SHEET          Page 03 of 05

Product Name:            Loctite(R) Chipbonder(R) 368 Adhesive
Item No.:                17717

 6.  ACCIDENTAL RELEASE MEASURES

Steps to be taken in case
  of spill or leak:      Soak up in an inert absorbent.  Store in a closed
                         container until disposal.

 7.  HANDLING AND STORAGE

Safe Storage:            Store below 80°F.
(Contact Loctite Customer  Service 1-800-243-4874 for shelf life information)
Handling:                Avoid prolonged skin contact. Keep away from eyes.

 8.  EXPOSURE CONTROLS, PERSONAL PROTECTION

Eyes:                    Safety glasses or goggles.
Skin:                    Rubber or plastic gloves.
Ventilation:             Local ventilation for prolonged use in a confined
                         area.
Respiratory              Not available

                         See Section 2 for Exposure Limits.

 9.  PHYSICAL AND CHEMICAL PROPERTIES

Appearance:              Orange-red
Odor:                    Slight amine
Boiling Point:           Not Available
pH:                      Does not apply
Solubility in Water:     Slight
Specific Gravity         1.2
Volatile Organic Compound
  (EPA Method 24)        0%; 0 grams per liter
Vapor Pressure:          Less than 5mm at 80°F
Vapor Density:           Not available
Evaporation Rate
  (Ether = 1)            Not available

10.  STABILITY AND REACTIVITY

Stability:               Stable
Hazardous Polymerization: Will not occur
Incompatibility:         Strong acids, bases, oxidizers, amines, mercaptans
                         moisture.
Conditions to Avoid:     Not available
Hazardous Decomposition
 Products (non-thermal): None
```

```
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                              MATERIAL SAFETY DATA SHEET          Page 04 of 05

Product Name:                 Loctite(R) Chipbonder(R) 368 Adhesive
Item No.:                     17717

11.  TOXICOLOGICAL INFORMATION

                              See Section 3.

12.  ECOLOGICAL INFORMATION

                              No data available

13.  DISPOSAL CONSIDERATIONS

Recommended methods of
 disposal:                    Incinerate following EPA and local regulations.
EPA Hazardous Waste
 Number                       Not a RCRA hazardous waste when disposing of
                              unused product in original container (Up to
                              300 ml cartridges).  For other waste issues
                              please contact Loctite Health & Regulatory
                              Affairs.

14.  TRANSPORTATION INFORMATION

DOT (49 CFR 172)
 Domestic Ground Transport
   Proper Shipping Name:  Not Regulated (Up to 300 ml cartridges)
   Hazard Class or
     Division:            None
   Identification Number: None
   Marine Pollutant:      None
IATA
   Proper Shipping Name:  Not Regulated (Up to 300 ml cartridges)
   Class or Division:     None
   UN or ID Number:       None

15.  REGULATORY INFORMATION

CA Proposition 65:            WARNING: This product contains a chemical known to
                                       the State of California to cause cancer.
                                       Epichlorohydrin

16.  OTHER INFORMATION

Estimated NFPA(R) Code:
   Health Hazard:             2
   Fire Hazard:               1
   Reactivity Hazard:         1
   Specific Hazard:           Does not apply
```

```
   Estimated HMIS(R) Code:
      Health Hazard:          2
      Flammability Hazard:    1

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                         EMERGENCY PHONE: (860) 571-5100


                         MATERIAL SAFETY DATA SHEET          Page 05 of 05

   Product Name:           Loctite(R) Chipbonder(R) 368 Adhesive
   Item No.:               17717

   16.  OTHER INFORMATION                                          (continued)

      Reactivity Hazards:    1
      Personal Protection:   See Section 8.

        NFPA is a registered  trademark of the National Fire Protection Assn.
        HMIS is a registered  trademark of the National Paint and Coatings Assn.

   Prepared By:            Stephen Repetto
   Title:                  Research Chemist - Health & Regulatory Affairs
   Company:                Henkel Loctite Corporation, Rocky Hill CT 06067
   (24hr.) Phone:          (860) 571-5100
   Revision Date:          January 27, 1999             Revision: 0033
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16. Test Protocol

This chapter is intended for the test protocols provided with the machine.

Appendix A - Service Program Reference Guide

The Service Program is a collection of various basic service tools selectable from a main menu (see Figure A-1).

There is also an Extended Service Program that is basically the same program as the Service Program, but some of the sub menus have more options than the Service Program.

The Extended Service Program contains procedures that should only be carried out by an authorized MYDATA service engineer

Starting the Service Program

- If you are currently running TPSys, then you can select *Exit > Exit To Service* in the menu.

- ... or select the *Restart TPSys* option in the *Exit* menu and press the space bar to get the Startup menu. In the Startup menu, select the *Service* option.

The Service Program main window (see Figure A-1) is shown:

| Board | Motor | Magazine | Vacuum | Conveyor | Camera | Utility | Exit |

Messages
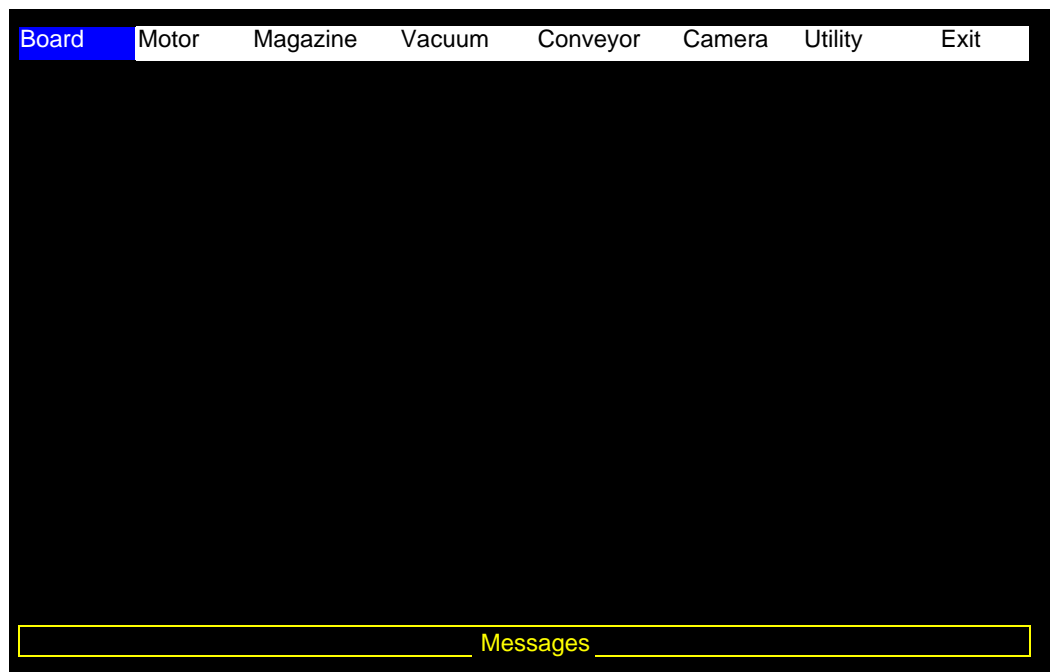
Figure A-1.   Service program main menu

Main Menu Options

Described below are some of the options and commands that are available from the main menu.

Board

To control the Servo computer boards of the various movements of the machine, including:

- Show status.

- Load or Reset motor controller boards.

Motor

To control the various axes of the machine, including:

- Initiate motors and read position or range.

- Control locks and latches for standard and HYDRA tools.

- Toggle the Y wagons position.

- Measure frictions.

- Calibrate the force sensor.

Magazine

To control tape and vibrator magazines, including:

- Step, poll and test magazines or removable feeders.

- Test the MagLink used by the TEX Tray Exchanger.

Vacuum

To control the vacuum pump and the valves for vacuum and air pressure for the single mounthead tool and the HYDRA mount tools. The vacuum and force sensors can also be shown from this option.

Conveyor

To control the Y-wagon conveyor features.

Camera

To control the various illumination units and cameras.

Utility

To control and indicate:

- Voltages.

- PAIB board.

- Measure cog play.

- Warning lamps.

- Perform TEX installation.

- Show about information boxes.

Exit

To exit the Service Program.

Board

This menu contains options regarding the various boards
(CanIC board - MotZ board) that control the movements of the machine.

```
Board
CanIC board
CanY board
MotC board
MotM board
MotX board
MotY board
MotZ board
Show status of all boards
Load all boards
```
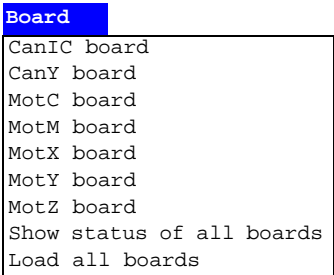
Selecting one of the boards (CanIC board - MotZ board) opens a submenu with
options that may vary, depending on selected board.

The following submenu options are available for the
(CanIC board - MotZ board):

– Show status.

– Reset.

– Load.

Show status

Displays motor controller load status and servo identification. The information
in this box may vary, depending on selected board.

```
Board        C: Loaded         Servo program: Cm22bg 000801
Load?
                         Yes   No
```

Reset

Performs a hardware reset of the selected board.

Load

Loads the displayed Servo program to the selected board.

Show status of all boards

Displays motor controller load status and servo identification for all the boards.

A - 4

```
Status of all boards
    Board      C: Loaded          Servo program: Cm22be 960308
    Board      M: Loaded          Servo program: M40g5 980123
    Board      X: Loaded          Servo program: Xd33c1 980505
    Board      Y: Loaded          Servo program: Ym33g1 970526
    Board      Z: Loaded          Servo program: Zh31dr 980429
    Board   CanY: Not present
Primary function:
  Servo version:
    Board CanIC: Not present
Primary function:
  Servo version:
    Board CanCM: Not present

Load unloaded boards?
Yes   No
```

Unloaded boards, if any, can also be loaded by confirming this option in the dialog box. If you do not want to load unloaded boards, press the <Esc> key.

Load all boards

Loads all servo files.

Motor

This menu contains options regarding the motors
(C motor to HYDRA Z motor) that control the various axes of the machine.

```
Motor
C motor
Theta motor
X motor
Y motor
Tray wagon motor
Z motor
HYDRA Theta motor
HYDRA Z motor
Gluepot motor
Show/Hide motor positions
Show/Hide force/vacuum sensors
Show/Hide safety switches
```

Selecting one of the motors (C motor to HYDRA Z motor) opens a popup submenu with options that may vary, depending on selected motor.

The following submenu options are available for the
(C motor to HYDRA Z motor):

- Initiate or Initiate motor.
- Read range.
- Read position.
- Stand by.
- Locks.
- Latches.
- Measure friction.
- Calibrate force sensor.

Initiate or Initiate motor

This option is applicable to all motor functions. This option makes a hardware initiation, i.e. moves to the mechanical stop and resets the position counter.

☞ If Z-axis and/or Hydra Z is not initiated then the system will ask if you want to initiate Y motor anyway. Before proceeding, check that there is no risk for collision between Z-axis and/or Hydra Z and Y axis.

Read range

This option displays the selected motors range.

```
┌─── Read C motor range ───┐
│Min:        ------        │
│Max:        ------        │
│              Read        │
└──────────────────────────┘
```

Confirm the Read command by pressing <Enter>. The Min. and Max. positions of the selected range are shown in the box.

Read position

This option displays the current position. To get the position value for a desired position, move to the position when this box is shown:

```
┌─ Read C motor position ─┐
│Position: ------         │
│            Read         │
└─────────────────────────┘
```

Then, confirm the Read command by pressing <Enter>. The current position is shown.

```
┌─ Read C motor position ─┐
│Position: 2561           │
│            Read         │
└─────────────────────────┘
```

Stand by

This option is applicable to the X-motor function only. It can be used if the stop position after any X wagon move happens to be at a point where the servo and motor keep regulating continuously, which causes an inconvenient noise from the X-wagon motor.

This command stops such a regulation and thus the noise. The stand-by mode ceases automatically at any next X-wagon move command.

The command is primarily intended for the biggest machines.

Locks

This option is applicable to the Z-motor function only. It controls the magnet locks for the Z axis. The locks can be individually controlled as shown in the dialog box.

```
┌──── Z motor locks ────┐
│Upper lock: Lock  Unlock│
│Lower lock: Lock  Unlock│
└────────────────────────┘
```

The Z-axis locks are controlled by the MOT-C board.

Latches

This option is applicable to the HYDRA Z-motor function only. It controls the magnet lock for the Z movement mechanism and the mount tool latches, one latch for each of the eight mount tools. The magnet locks are shown like this:

```
                 ┌──── HZ motor latches ────┐
                     1   2   3   4   5   6   7   8
  Latches to set: No  No  No  No  No  No  No  No
    Soft setting: No
                     Latch
  └── Press <Space> to toggle ───────────────┘
```

Latches to set

Each HYDRA mount tool that has its latch engaged will follow the vertical movement of the Z mechanism. The latches are engaged by selecting the Yes option for the desired tool numbers. Tools with the No option will not move.

Soft setting

The selected options can be performed softly, that is slowly, by setting this option to Yes.

Latch

Highlight this option and press <Enter> to carry out settings made.

To toggle between *Yes* and *No* press the space bar.

The HYDRA Z-axis lock and latches are controlled by the MOT-Z board.

Measure friction

This option measures the friction, and it is applicable to all the movement axes except the X axis.

Depending on the selected motors control system (MOT-board or CAN-board), the available options differ somewhat.

When measuring friction on MOT- controlled motors, the following dialog box is shown.

```
         ┌─ Measure friction for Y motor ─┐
         Measuring speed: 100mm/s
                         Measure
         └────────────────────────────────┘
```

Measuring speed

Speed value while measuring friction.

Measure

Start the measuring procedure.

The friction result is shown in an information box.

When measuring friction on CAN- controlled motors, the following dialog box is shown.

```
┌──── Measure friction for Y motor ────┐
│ Measuring speed:          200mm/s     │
│ Start position:           102.636mm   │
│ End position:             1428.131mm  │
│                                       │
│ Measure friction:         Enter       │
│ View result:              Enter       │
│ Print result:             Enter       │
│ Save result on floppy:    Enter       │
│ Rename result file:       Enter       │
│ View other measurements:  Enter       │
└───────────────────────────────────────┘
```

Measuring speed

Speed value while measuring friction.

Start position

Value that indicates where on the Y module the friction measurement area starts.

End position

Value that indicates where on the Y module the friction measurement area ends.

Measure friction

Start the measuring procedure.

View result

Opens the information box Y Wagon Friction Measurement Result.

Print result

Print the measurement result on a printer.

Save result on floppy

Save the measurement data on a floppy disk.

Rename result file

Rename the measurement data file.

View other measurements

View results from previous measurements.
The friction result is presented as a histogram, with the position intervals to the left and the actual force required to move the Y wagon is represented by 'X's to the right in the figure. A summary of the friction result is shown above the histogram.

Calibrate force sensor

This option is used to calibrate the tool indicator used for single mounthead spring-loaded tools.

Gluepot motor

This option is used to start and stop the glue pot rotation motor.

Show/Hide motor positions

Selecting this option opens and closes an information box that shows the positions for the motors used in the system.

```
┌ Available motor positions ┐
        C: 2983
    Theta: 4113
        X: 1102714
        Y: 2427
        Z: 2185
Tray Wagon: 1714
  Conveyor: 1048
   HYDRA Z: 2798
HYDRA Theta: 2584
```

Show/Hide force/vacuum sensors

Selecting this option opens and closes an information box that shows the vacuum and the tool indicator values for standard mount tool and HYDRA mount tool.

The force and vacuum indication features are controlled by the MOT-Z board.

Standard mount tool information box

```
┌ Vacuum and force ┐
Vacuum: 16
 Force: 182
```

Vacuum

The vacuum in the mount tool shown as a value between 0 and 255. See the vacuum section on page A-17.

Force

Tool indicator value. Normal value is approximately 180 for released tool and 0 - 20 when the tool nozzle is pressed in.

HYDRA mount tool information box

```
   ┌─── Vacuum and force ───┐
   │  Vacuum  Force  Hit    │
   │  ======  =====  ===     │
   │Z: 16       182          │
   │H: 33                    │
   │Tool 1:     177    No    │
   │     2:     177    No    │
   │     3:     178    No    │
   │     4:     173    No    │
   │     5:     180    No    │
   │     6:     176    No    │
   │     7:     177    No    │
   │     8:     177    No    │
   └────────────────────────┘
```

Vacuum

Z = Standard mount tool vacuum.

The vacuum in the mount tool shown as a value between 0 and 255. See the vacuum section on page A-17.

H = HYDRA unit vacuum.

A value between 30 and 75 is shown for no vacuum. A value between 190 and 220 is shown for full vacuum. See the vacuum section on page A-17.

Force

Z = Standard mount tool indicator value.

Normal value is approximately 180 for released tool and 0 - 20 when the tool nozzle is pressed in.
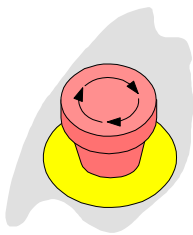
Tool 1-8 = HYDRA tools indicator value.

The Tool 1-8 lines in the figure apply, individually, to the eight HYDRA mount tools.

Hit

Indicates, individually for the eight HYDRA mount tools, if the nozzles have 'hit' components, i.e. are pressed in somewhat (indicated Yes) or not (No). You can test the function by gently pressing the nozzles upwards.

Show/Hide safety switches

Displays the status of the emergency stop buttons and the light beams of the X-wagon optical safety system as follows:

```
┌──── Safety sensors ────┐
│    Emergency stop: No  │
│     Light curtain: No  │
└────────────────────────┘
```

Emergency stop

No   The emergency stop buttons are not pressed. The machine is operable.

Yes   At least one of the emergency stop buttons are pressed down.The machine is not operable.

Light curtain

No   The light beams of the X-wagon optical safety system are not blocked (green LED lit on the optical safety unit). The machine is operable.

Yes   The light beams are blocked (red LED lit). The machine is not operable.

This function is controlled by the MOT-X board.

☞   Both the emergency stop buttons have to be pressed down to release the X wagon and make it possible to move it manually.

Magazine

Step, polling and MagLink commands can be given to a desired magazine by using the options in this menu.

```
Magazine
Step magazines
Poll
Test
Poll removable
feeders
```

All magazine functions are controlled by either the CAN-M board or the MOT-M board.

Step magazines

Sends a component advancement command to the magazine.

This command can be used to obtain component advancements without picking a component after each advancement.

Select the desired magazine by entering the magazine position in the following dialog box:

```
 Select slot
   Slot: 1
```

After selecting the desired magazine, you can choose to make advancement steps on multiple feeders or on a single feeder:

```
Use multiple feeders?
   Yes    No
```

If you select Yes a multiple feeder dialog box is shown (this example shows a TM8B magazine):

```
 Step TM8B (17), no. 14320 in slot: 1
               1   2   3   4   5   6   7   8
      Feeders: No  No  No  No  No  No  No  No
               9  10  11  12  13  14  15  16
               No  No  No  No  No  No  No  No
 Feeds wanted: 1           (0 = continuously)

               1   2   3   4   5   6   7   8
Steps per feed: 1   1   1   1   1   1   1   1
               9  10  11  12  13  14  15  16
               1   1   1   1   1   1   1   1
Feeders to step
 simultaneously:1

               Step
   Steps done: 0
 Press <Space> to toggle
```

If you select No a single feeder dialog box is shown:

```
 ┌──── Step TM8B (17), no. 14320 in slot: 1 ────┐
 │      Feeder: 1          (0 = all feeders)    │
 │ Feeds wanted: 1          (0 = continuously)  │
 │                                              │
 │                1   2   3   4   5   6   7   8  │
 │Steps per feed: 1   1   1   1   1   1   1   1  │
 │                9  10  11  12  13  14  15  16  │
 │                1   1   1   1   1   1   1   1  │
 │                                              │
 │                Step                          │
 │  Steps done: 0                               │
 └─(0..16) ─────────────────────────────────────┘
```

Feeders/Feeder

You can choose feeder by pressing the spacebar (multiple feeders) or enter the desired feeder number (single feeder).

Feeds wanted

Enter the desired number of feeds to be performed.

Steps per feed

Enter the desired number of steps per feed to be performed on each feeder.

Step

Starts the step command.

Steps done

Counts the number of steps done.

Poll

Polls those magazines which are inserted in the machine. The polling result is displayed on the monitor as follows:

```
                        Poll magazines
  Address   Type      Code    Serial no.   Buttoned out
  =======   =========  ======  ==========   ============
   1        TM8B        17      14320        No
   2
   3
   4
   5
   6
   7
   8
   9
  10
  11
  12
  13
  14
  15
  16
  <F1> octal numbers
```

In this example, a TM8B magazine (code 17) is present in magazine position 1.

If the text in the *Buttoned out* column is *No* the magazine is in operation (the green LED on the magazine is lit with a steady light). If the text is *Yes* the system does not pick from the magazine (the green LED is either flashing or off). If it is neither of these but '---' the magazine type has no release button.

If you press the <F1> key, then the type and serial numbers are displayed as octal numbers. Another press on the <F1> key toggles back to decimal presentation.

Test

This option tests continuously major functions of the selected magazine.

Select the desired magazine by entering the magazine position in the following dialog box:

```
 ── Select slot ──
      Slot: 1
```

A continuously updated test result for the selected magazine is shown (this example shows a TM8B magazine):

```
 ── Test TM8B (17), no. 14320 in slot: 1 ──
Test result: Passed
     Button: No
      Lamps: Yellow
```

Test result

Passed	A communication test completed successfully.
Off	The test was not successfully completed.

Button

No	The release button on the magazine is released.
Yes	The release button on the magazine is pressed in.

Lamps

Off	Both of the LEDs are temporarily off.
Yellow	The Yellow LED only is temporarily lit.
Green flash	The Green flash LED only is temporarily lit.
Yellow flash	Yellow flash of the LEDs are temporarily lit.
Off	The LED test was not successfully completed.

The Button and Lamps status shall reflect the visible states of these functions on the magazine.

Poll removable feeders

Polls magazines that are equipped with removable feeders if any.

Select the desired magazine by entering the magazine position in the following dialog box:

```
        ┌─ Select slot ─┐
        │    Slot: 1    │
        └───────────────┘
```

The polling result is displayed on the monitor as follows:

```
        ┌──── Poll removable feeders ────┐
        │                Serial no.      │
        │ Feeder       (dec)       (hex) │
        │ ==========  ==========  ====== │
        │  1          16779431    0x10008a │
        │  2          16779833    0x1000a3 │
        │  3          3           0x3    │
        │  4          16780099    0x1000b4 │
        │  5          3           0x3    │
        │  6          3           0x3    │
        │  7          3           0x3    │
        │  8          3           0x3    │
        │  9          3           0x3    │
        │ 10          3           0x3    │
        │ 11          3           0x3    │
        │ 12          3           0x3    │
        │ 13          3           0x3    │
        │ 14          3           0x3    │
        │ 15          3           0x3    │
        │ 16          3           0x3    │
        └────────────────────────────────┘
```

The serial numbers are presented both by decimal and by hexadecimal notation in the information box.

MagLink
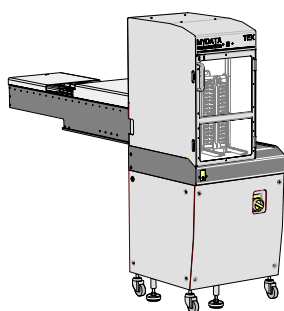
MagLink stands for a magazine communication protocol, which only is used by the TEX Tray Exchanger.

This option opens a status and feature test box for the selected TEX magazine position.

This status and feature test box is intended for MYDATA service personnel only.

Vacuum

The vacuum pump and the valves for pressure and vacuum can be controlled with the options in this menu.

```
Vacuum
Show/Hide vacuum/force sensors
Z vacuum
HYDRA vacuum
```
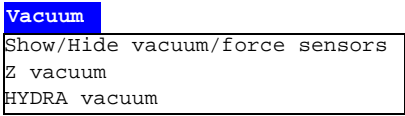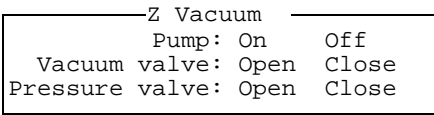
Show/Hide vacuum/force sensors

Opens and closes an information box that shows the vacuum and the tool indicator values.

This menu option is the same as the Show/Hide force/vacuum sensors option in the Motor menu described in *Show/Hide force/vacuum sensors* on page A-9).
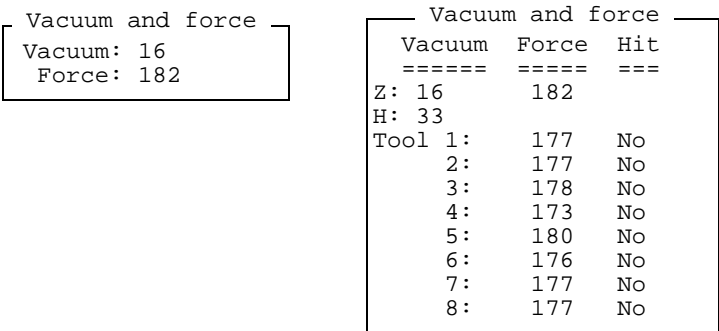
Z vacuum

Opens the following vacuum control dialog box for the standard mount tool:

```
            Z Vacuum
        Pump: On    Off
 Vacuum valve: Open  Close
Pressure valve: Open  Close
```

You can control the vacuum pump, the vacuum valve and the pressure valve by moving the cursor to the desired option and pressing <Enter>.

To be able to see the vacuum level in the standard mount tool, open the vacuum sensor measuring box by selecting the Show/Hide vacuum/force sensors option.

The left figure below refers to a machine without a HYDRA unit, and the right figure to a machine with a HYDRA unit.

```
 Vacuum and force
Vacuum: 16
 Force: 182
```

```
   Vacuum and force
  Vacuum  Force  Hit
  ======  =====  ===
Z: 16     182
H: 33
Tool 1:   177    No
     2:   177    No
     3:   178    No
     4:   173    No
     5:   180    No
     6:   176    No
     7:   177    No
     8:   177    No
```

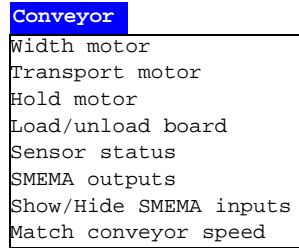The vacuum in the standard mount tool is shown as a value between 0 and 255 (see the left figure and Z in the right figure).

A value between 0 and 30 should be shown for no vacuum, that is when the vacuum/pressure pump is off.

A value above 170 should be shown for full vacuum, that is when the pump is on, the vacuum valve is open, and the pressure valve is closed.

HYDRA vacuum

Opens the following vacuum control dialog box for the HYDRA unit:

```
                  ─── HYDRA Vacuum ───
          Pump:  On   Off
                  1    2    3    4    5    6    7    8
Vacuum valves : Close Close Close Close Close Close Close Close
                Set
Pressure valve: Open  Close
```

You can control the vacuum pump and the pressure valve by moving the cursor to the desired option and pressing <Enter>.

The vacuum valves are controlled by moving the cursor to the desired tool number, pressing the <Space bar> for an Open or Close action, moving the cursor to the Set option, and pressing <Enter>.

To be able to see the vacuum levels in the HYDRA mount tools, open the vacuum sensor measuring box by selecting the Show/Hide vacuum/force sensors option:

```
    ──Vacuum and force ──
   Vacuum  Force  Hit
   ======  =====  ===
Z: 16       182
H: 33
Tool 1:     177    No
     2:     177    No
     3:     178    No
     4:     173    No
     5:     180    No
     6:     176    No
     7:     177    No
     8:     177    No
```

The vacuum in the HYDRA unit is shown as a value between 0 and 255 (H in the figure above).

A value between 30 and 75 should be shown for no vacuum, that is when the vacuum/pressure pump is off.

A value between 190 and 220 should be shown for full vacuum, that is when the pump is on, the vacuum valve for the particular nozzle is open, and the pressure valve for the same nozzle is closed.

The vacuum system is controlled by the MOT-Z board.

Conveyor

From the Conveyor menu, you can control the following conveyor features:

```
Conveyor
Width motor
Transport motor
Hold motor
Load/unload board
Sensor status
SMEMA outputs
Show/Hide SMEMA inputs
Match conveyor speed
```

Selecting one of the motors (Width motor, Hold motor or Transport motor) opens a popup menu with options that may vary, depending on selected motors.

The options Transport motor and Hold motor is only applicable for CAN-controlled conveyors.

The following submenu options are available for the (Width motor, Hold motor or Transport motor):

– Initiate.

– Read range.

– Read position.

– Move, Movego.

– Toggle axis.

– Measure friction.

Initiate

To initiate the different conveyor motors, ensure that the conveyor path is empty (no PCB in the path) and select the Initiate option in the popup menu.

Since the MOT-controlled conveyors only have a Width motor, this option initiates the whole MOT-controlled conveyor.

Select Yes in the dialog box to perform the motor initiation.

Read range

This option displays the selected motor´s range.
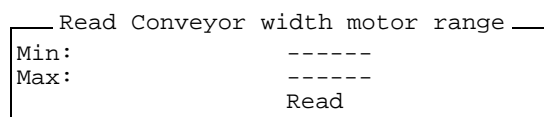
```
Read Conveyor width motor range
Min:              ------
Max:              ------
                  Read
```

Confirm the Read command by pressing <Enter>. The *Min* and *Max* positions of the selected range are shown in the box.

Read position

This option displays the current position. To get the position for a desired position, move to the position when this box is shown:

```
┌─ Read Conveyor width motor position ─┐
│      Position: ------                │
│                    Read              │
│                                      │
└──────────────────────────────────────┘
```

Then, confirm the *Read* command by pressing <Enter>. The current position is shown.

Move, Movego

These options are advanced movement commands that can be used by service engineers to perform various test and service procedures. These commands are not covered in this manual.

CAUTION! Due to the risk of damaging the machine, do not run the Movement commands without a full understanding of their function.

Toggle axis

This option toggles the conveyor axis position, that is moves the conveyor axis between its end positions.

This command will move the selected conveyor axis to the opposite end of its travel. If the axis is not at either end, it will move to the end furthest from its current position.

Measure friction

This option measures the friction, and it is only applicable to the CAN-controlled conveyor.

By selecting this option in the Conveyor submenu, the following popup box is shown:

```
┌  Measure friction for Conveyor Width motor  ┐
│Measuring speed:          10mm/s               │
│Start position:           1.01mm               │
│End position:             572.989mm            │
│                                               │
│Measure friction:         Enter                │
│View result:              Enter                │
│Print result:             Enter                │
│Save result on floppy:    Enter                │
│Rename result file:       Enter                │
│Viewothermeasurements:    Enter                │
│                                               │
└                                               ┘
```

Measuring speed

Speed value while measuring friction.

Start position

Value that indicates where on the Conveyor the friction measurement area starts.

End position

Value that indicates where on the Conveyor the friction measurement area end.

Measure friction

Start the measuring procedure.

View result

Opens the information box Conveyor Width Axis Friction Measurement Result. The friction result is presented as a histogram, with the position intervals to the left and the actual force required to move the Conveyor Width Axis is represented by 'X's to the right in the figure. A summary of the friction result is shown above the histogram in the information box.

Print result

Print the measurement result on a printer.

Save result on floppy

Save the measurement data on a floppy disk.

Rename result file

Rename the measurement data file.

View other measurements

View results from previous measurements.

Load/unload board

By selecting the *Load/unload board* option in the Conveyor menu the following load/unload menu is shown:

```
┌──────── Load/unload board ────────┐
│ Load from: Front/Left    Rear/Right │
│ Unload to: Front/Left    Rear/Right │
│    Holder: Grab          Release    │
└─────────────────────────────────────┘
```

You can load, unload, grab, and release the board by selecting the desired option from the menu and pressing <Enter>.

The CAN-controlled conveyor only has the Grab and Release option in the load/unload menu.

Sensor status

This option is only applicable for MOT-controlled conveyors.

A number of sensors can be used in the conveyor path. The status of these sensors can be shown by selecting the Sensor status option in the Conveyor menu.

Yes   -   A board is currently present at the sensor position. You can test this option by putting a finger in front of the sensor.

No   -   There is no board at the sensor position, or the particular sensor is not used.

```
┌─────── Conveyor sensors ───────┐
│                   End: Yes      │
│           End-of-fast: No       │
│             Support up: No      │
│           Support down: No      │
│             Width home: Yes     │
│           Elevator home: No     │
│ Front/left presence: 1          │
│           Right button: No      │
│            Left button: No      │
│ Rear/right presence: 0          │
└─────────────────────────────────┘
```

End
> Not used.

End-of-fast
> Not used.

Support up
> Indicates that the board is in its upper position.

Support down
> Indicates that the board is in its lower position.

Width home
> Indicates the home position of the internal Y-wagon conveyor width.

Elevator home
> Not used.

Front/left presence

The front or left (depending on the conveyor direction) end position of the internal conveyor path of the Y wagon.

Right button

Indicates that the right and center buttons are pressed simultaneously.

Left button

Indicates that the left and center buttons are pressed simultaneously.

Rear/right presence

The rear or right (depending on the conveyor direction) end position of the internal conveyor path of the Y wagon.

SMEMA outputs

To be able to test the conveyor system, the SMEMA output from the machine can be manipulated by the operator. This is performed by first selecting the SMEMA outputs option in the Conveyor menu.

The following dialog box is shown:

```
┌───── SMEMA outputs ─────┐
│Ch1          Busy: Yes   No│
│Ch2     Available: Yes   No│
└───────────────────────────┘
```

You can set channel 1 and channel 2 to be busy or available by selecting the desired option from the menu and pressing <Enter>.

Show/Hide SMEMA inputs

The SMEMA input signal from the prior conveyor system can be shown or hidden by selecting the Show/Hide SMEMA inputs option in the Conveyor menu.

The following information box is shown:

```
┌──── SMEMA inputs ────┐
│Ch1     Avail: No     │
│Ch2      Busy: Yes    │
└──────────────────────┘
```

Match conveyor speed

With this option you can match the conveyor speeds. The following dialog box is used:

```
┌──────────Match conveyor speed──────────┐
│Start downstream conveyor                │
│                                         │
│Start internal conveyor     Set speed:200mm/s│
│                                         │
│Start upstream conveyor                  │
│                                         │
│                    OK                   │
└Press <Enter> to start/stop──────────────┘
```

If the internal conveyor speed is changed a popup is displayed after pressing OK, asking if the parameters 92:0013 and/or 92:0023 should be set to the entered value.

Camera

The Camera menu controls the positioning camera on the X wagon, the optical centering vision camera, the HYDRA vision camera, and Linescan camera.

When a camera is selected you will get a pop-up window where you can turn on or off the camera. You will also be able to select which lighting to use for the for some of the cameras in this pop-up window.

```
Camera
X wagon camera
Optical centering camera 1
Optical centering camera 2
HYDRA camera
Linescan camera 1
Linescan camera 2
All cameras off
------------------------
Show LSAD status
```
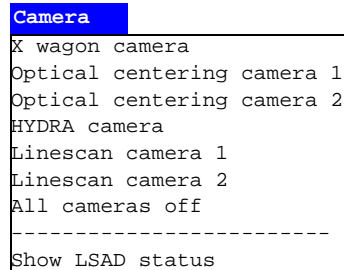
X wagon camera

Turns on the X-wagon camera.

Optical centering camera 1

Turns on the standard optical centering camera, if any.

Optical centering camera 2

Turns on a second optical centering camera, if any.

HYDRA camera

Turns on the HYDRA centering camera, if any.

Linescan camera 1

Turns on the line scan camera, if any.

Linescan camera 2

Turns on a second line scan camera, if any.

All cameras off

Turns off all the cameras.

Utility

From the Utility menu, you can for example control the following features:

```
Utility
Show line voltages
Test PAIB board
Measure X cog play
About machine
About HYDB board
Warning lamps
TEX installation
```
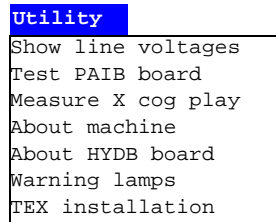
– Show the internal system voltages.

– Show the machine model and serial number.

– Show type, version and temperature of the HYDRA unit.

– Set up the tower lamp signals.

– Install the TEX Tray Exchanger.

Show line voltages
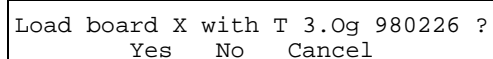
The Show line voltages option in the Utility menu. Displays the internal system voltages in an information box.

This function is controlled by the MOT-M board.

Test PAIB board

This option is used to show status for a number of various features in the machine, see the figure below.

By selecting Yes in the following box, the selected servo file will be loaded to the MOT-X board.

```
Load board X with T 3.Og 980226 ?
        Yes    No   Cancel
```

The following window is opened.

```
┌──────────────── PAIB Board Test ────────────────┐
│ Emergency button: Yes      Limits exceeded: No   │
│        Door open: No      X wagon fan fail: No   │
│    ELMO disabled: Yes       Belt motor hot: No   │
│                                                  │
│   Motor relay on: No                 ELMO on: No │
│   Grease pump on: No          Limit check on: No │
│    Set PAIB port: Enter                          │
└─ Press <Space> to toggle ────────────────────────┘
```

Emergency button

Yes   At least one of the emergency stop buttons are pressed down.

No   None of the emergency stop buttons are pressed down.

Limits exceeded
    Not used.

Door open

Yes   At least one machine door is open.

No   All the machine doors are closed.

X wagon fan fail

Yes   The X wagon fan is not working.

No   The X wagon fan is working.

ELMO disabled

Yes   The ELMO booster unit is off.

No   The ELMO booster unit is on.

Belt motor hot

Yes   The X wagon belt motor is too hot.

No   The X wagon belt motor is not too hot.

Motor relay on
    Select Yes or No and press <Enter> to activate or deactivate the X wagon motor relay.

ELMO on
    Select Yes or No and press <Enter> to switch the ELMO booster on or off.

Grease pump on
    Select Yes or No and press <Enter> to switch the X wagon grease pump on or off.

Limit check on
    Not used.

Set PAIB port
    Select Enter and press <Enter> to set the choice made in the lower part of the box.

Measure X cog play

This procedure is used to measure the cog play for the X-wagon cogwheel.

About machine

This option shows the machine type, the machine serial number, and the machine name:

– Model: my19..

– Serial: 15000.

– Name: MyMachine.

About HYDB board

This option shows the following HYDRA information in an information box.

– Version.

– Type.

– Supply voltage.

– Motor temperature.

Warning lamps

This option is used to test the lamps in the signal tower. The following dialog box is shown:

```
┌──── Warning lamps ────┐
  Lamp: 1
Action: On Off Blink
└─(0..8)────────────────┘
```

Each lamp can be set to On, Off or Blink.
This test does not affect the lamp configuration setting.

TEX installation

This option is used to initially install the TEX Tray Exchanger, which has to be carried out by MYDATA service personnel.
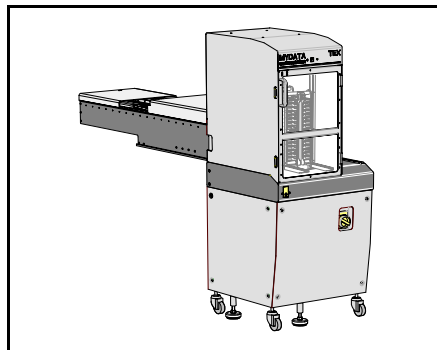
Figure A-2. TEX Tray Exchanger

Index