

42LH20

Direct View LCD



LG

Life's Good

OUTLINE

Section 1

Contact Information, Preliminary Matters, Specifications,
LCD Overview, General Troubleshooting Steps,
Signal Distribution, Disassembly Instructions and Voltages

Section 2

Circuit Board Operation, Troubleshooting of :

- Switch mode Power Supply
- Main Board
 - T-CON Board
 - Ft Control Board
 - Side Keys

42LH20 LCD Direct View Display

Section 1

This Section will cover Contact Information and remind the Technician of Important Safety Precautions for the Customers Safety as well as the Technician and the Equipment.

Basic Troubleshooting Techniques which can save time and money sometimes can be overlooked. These techniques will also be presented.

This Section will get the Technician familiar with the Disassembly, Identification and Layout of the LCD Display Panel.

At the end of this Section the Technician should be able to Identify the Circuit Boards and have the ability and knowledge necessary to safely remove and replace any Circuit Board or Assembly.

Preliminary Matters (The Fine Print)

IMPORTANT SAFETY NOTICE

The information in this training manual is intended for use by persons possessing an adequate background in electrical equipment, electronic devices, and mechanical systems. In any attempt to repair a major Product, personal injury and property damage can result. The manufacturer or seller maintains no liability for the interpretation of this information, nor can it assume any liability in conjunction with its use. When servicing this product, under no circumstances should the original design be modified or altered without permission from LG Electronics. Unauthorized modifications will not only void the warranty, but may lead to property damage or user injury. If wires, screws, clips, straps, nuts, or washers used to complete a ground path are removed for service, they must be returned to their original positions and properly fastened.

CAUTION

To avoid personal injury, disconnect the power before servicing this product. If electrical power is required for diagnosis or test purposes, disconnect the power immediately after performing the necessary checks. Also be aware that many household products present a weight hazard. At least two people should be involved in the installation or servicing of such devices. Failure to consider the weight of an product could result in physical injury.

ESD NOTICE (Electrostatic Static Discharge)

Today's sophisticated electronics are electrostatic discharge (ESD) sensitive. ESD can weaken or damage the electronics in a manner that renders them inoperative or reduces the time until their next failure. Connect an ESD wrist strap to a ground connection point or unpainted metal in the product. Alternatively, you can touch your finger repeatedly to a ground connection point or unpainted metal in the product. Before removing a replacement part from its package, touch the anti-static bag to a ground connection point or unpainted metal in the product. Handle the electronic control assembly by its edges only. When repackaging a failed electronic control assembly in an anti-static bag, observe these same precautions.

REGULATORY INFORMATION

This equipment has been tested and found to comply with the limits for a Class B 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 residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna; Increase the separation between the equipment and the receiver; Connect the equipment to an outlet on a different circuit than that to which the receiver is connected; or consult the dealer or an experienced radio/TV technician for help.

CONTACT INFORMATION

Customer Service (and Part Sales) (800) 243-0000

Technical Support (and Part Sales) (800) 847-7597

USA Website (GCSC) aic.lgservice.com

Customer Service Website us.lgservice.com

LG CS Academy lgcsacademy.com

<http://136.166.4.200>

<http://136.166.44.7>

LCD-DV:	32LG40, 42LG60, 42LG70, 47LG90, 42LH20
PLASMA:	42PG20, 50PG20, 42PQ20, 42PQ30

Plasma Panel Alignment Handbook
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LG Web Training lge.webex.com

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**LG Electronics Alabama, Inc. 201
James Record Road, Huntsville,
AL, 35813.**

SECTION 1: LCD OVERVIEW

Safety and Handling Regulations

1. Approximately 20 minute pre-run time is required before any adjustments are performed.
2. Refer to the Voltage Sticker on the Switch Mode Power Supply silk screening. (+/- ½ volt).
3. Be cautious of electric shock from the Backlight section, it uses high voltage AC. Check that the Power Supply and Drive Circuits are completely discharged because of residual current stored before Circuit Board removal.
4. C-MOS circuits are sensitive to static electricity.
Use caution when dealing with these IC and circuits.
5. Exercise care when making voltage and waveform checks to prevent costly short circuits from damaging the unit.
6. Be cautious of lost screws and other metal objects to prevent a possible short in the circuitry.

Checking Points to be Considered

1. Check the appearance of the Replacement Panel and Circuit Boards for both physical damage and part number accuracy.
2. Check the model label. Verify model names and board model matches.
3. Check details of defective condition and history. Example: Oscillator failure dead set, etc...

Basic Troubleshooting Steps

Define, Localize, Isolate and Correct

•**Define** Look at the symptom carefully and determine what circuits could be causing the failure. Use your senses Sight, Smell, Touch and Hearing. Look for burned parts and check for possible overheated components. Capacitors will sometimes leak dielectric material and give off a distinct odor. Frequency of power supplies will change with the load, or listen for relay closing etc. Observation of the front Power LED may give some clues.

•**Localize** After carefully checking the symptom and determining the circuits to be checked and after giving a thorough examination using your senses the first check should always be the DC Supply Voltages to those circuits under test. Always confirm the supplies are not only the proper level but be sure they are noise free. If the supplies are missing check the resistance for possible short circuits.

•**Isolate** To further isolate the failure, check for the proper waveforms with the Oscilloscope to make a final determination of the failure. Look for correct Amplitude Phasing and Timing of the signals also check for the proper Duty Cycle of the signals. Sometimes “glitches” or “road bumps” will be an indication of an imminent failure.

•**Correct** The final step is to correct the problem. Be careful of ESD and make sure to check the DC Supplies for proper levels. Make all necessary adjustments and lastly always perform a Safety AC Leakage Test before returning the product back to the Customer.

42LH20 Product Information



This section of the manual will discuss the specifications of the 42LH20 LCD Direct View Display Panel.

Basic Specifications

Key Features

- **42" Screen**
- **720p HD Resolution**
- **Two (2) HDMI(TM) (V.1.3 with Deep Color)**
- **ISFccc Ready**
- **Smart Energy Saving**
- **LG SimpLink (TM) (32-inch and above)**
- **LG Core Technologies (32-inch and above)**
- **Dynamic Contrast Ratio 12,000:1**
- **Response Time (G to G) 8ms**
- **Brightness 500 cd/m2**
- **Viewing Angle 178° / 178°**
- **Life Span (Typical) 60,000 hr**
- **Built-in Tuner ATSC/NTSC/Clear QAM**
- **HDMI™/HDCP Input 2 v1.3**
- **Cabinet Color Glossy Piano-Black**
- **Limited Warranty 1 Year Parts/Labor**

PANEL PIXELS (Logo Familiarization Explained)



HD RESOLUTION 720p HD Resolution Pixels: 1366 (H) × 768 (V)

High definition television is the highest performance segment of the DTV system used in the US. It's a wide screen, high-resolution video image, coupled with multi-channel, compact-disc quality sound.

FORMATS			Lines Per Field
SD	480I	Interlaced	240 Lines
ED	480P	Progressive	480 Lines
HD	1080I	Interlaced	540 Lines
HD	720P	Progressive	720 Lines
HD	1080P	Progressive	1080 Lines

Possible Frame Rates: 24FPS 30FPS 60FPS	Interlaced
	2 Fields to make a Frame
	Progressive
	Each Field is a Frame
	Think of sync as the Panels "Refresh Rate"

BASIC PIXEL COUNTS



720P PANEL
1365 (H) × 768 (V)



1080P PANEL
1920 (H) × 1080 (V)



SIMPLINK

Allows for convenient control of other LG SimpLink products using the existing HDMI connection.



Clear Voice Technology

Automatically enhances and amplifies the sound of the human voice frequency range to provide high-quality dialogue when background noise swells.

Remote Control Familiarization

TOP PORTION



BOTTOM PORTION



Accessing the Service Menu

REMOTE TOP PORTION

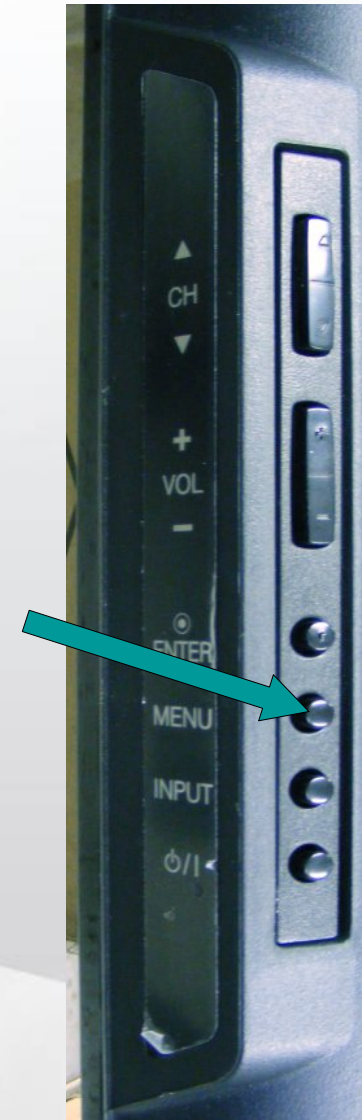


To access the Service Menu.

- 1) Turn the Set On
- 2) Simultaneously, Press and "Hold" the Menu Key on the Side Key pad and Press and "Hold" the Menu Key on the Remote approximately 5 seconds.
- 3) If Customer's Menu appears, continue to hold until it disappears.
- 4) The Service Menu appears

Note: If a Password is required to enter the Service Menu. Enter;
0000

SIDE KEYS

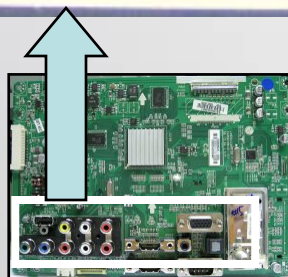


Rear and Side Input Jacks

Rear Input Jacks



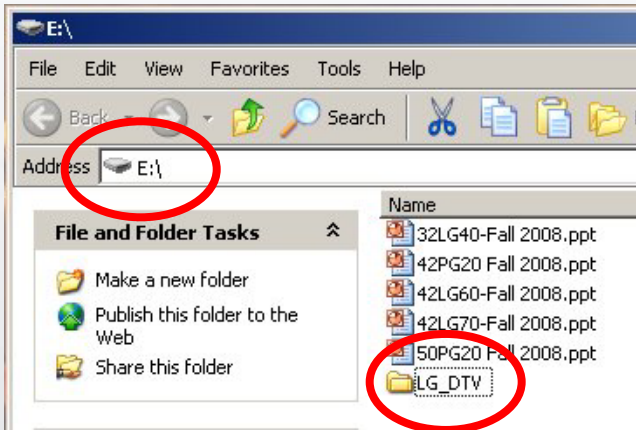
**USB Port
For Software
Upgrades Only**



**Main PWB
Orientation**

USB Download

1) Make 'LG_DTV' folder in USB Flash Drive.



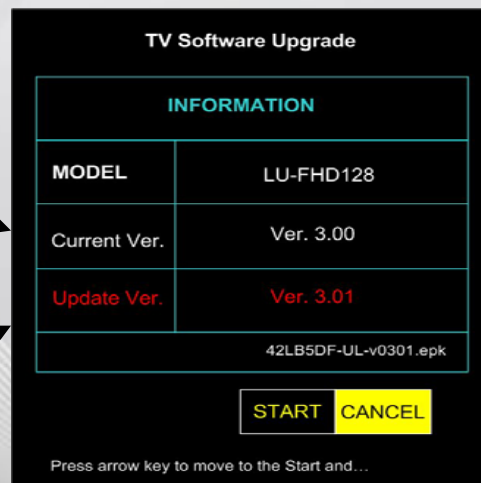
2) Copy new software (xxx.epk) to 'LG_DTV' folder.
Make sure to have correct software file.

3) With TV turned on, insert USB flash drive.

4) You can see the message “TV Software Upgrade”

Shows the
Currently Installed
Version

Shows the
Software Version
found on the USB
Flash Drive



5) Cursor left and highlight 'START' Button and push 'Enter' button using the remote control.

6) You can see the download progress Bar.

7) **Do not unplug until unit has automatically restarted.**

8) When download is completed,
you will see “COMPLETE”.

9) Your TV will be restarted automatically.

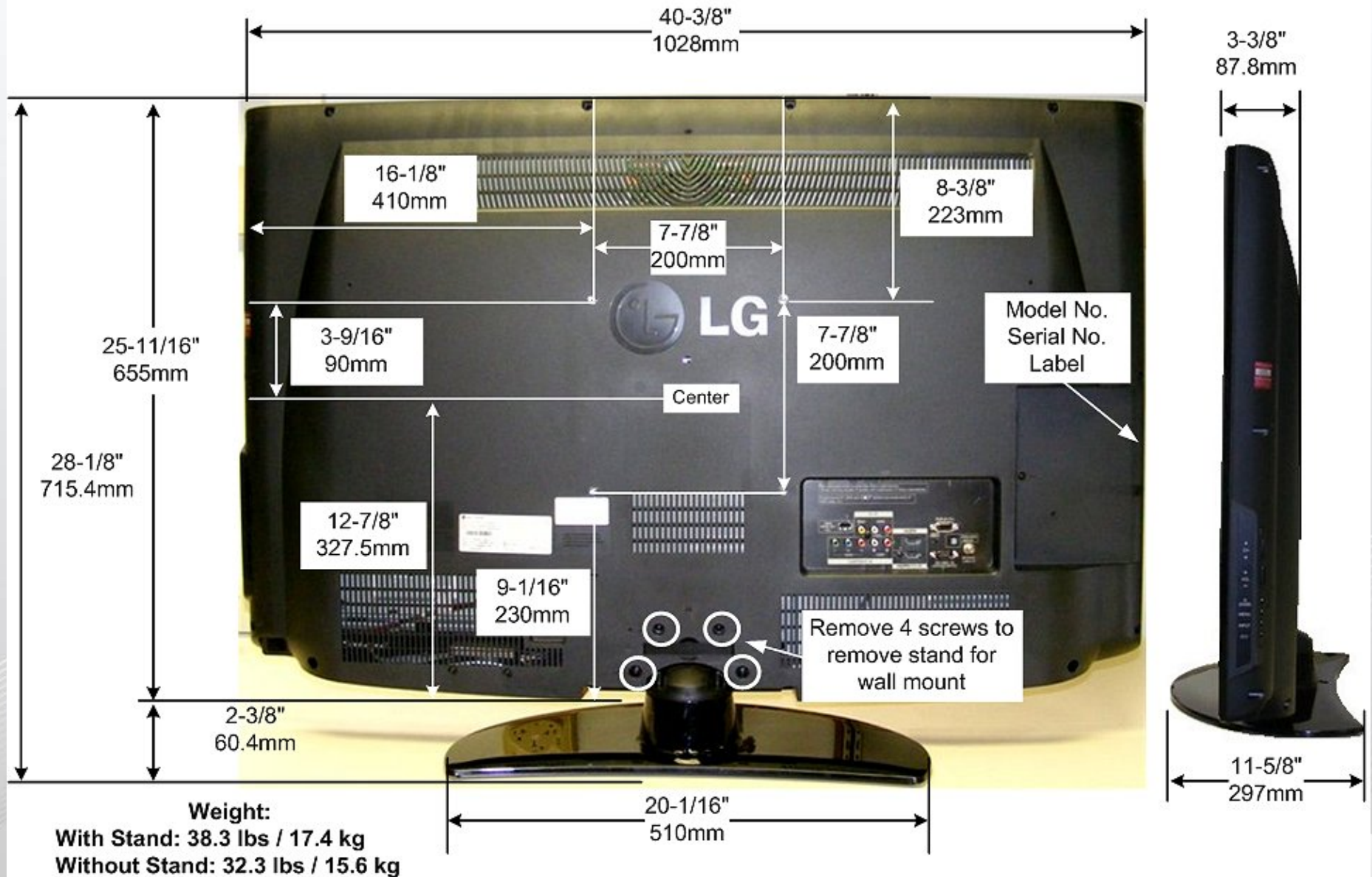
※CAUTION:

**Do not remove AC power or the USB Flash Drive.
Do not turn off Power, during the upgrade process.**

Shows the
Software file
found on the USB
Flash Drive

42LH20 Product Dimensions

42LH20 Dimensions



DISASSEMBLY AND TROUBLESHOOTING SECTION

Disassembly:

This section of the manual will discuss Disassembly, Layout and Circuit Board Identification, of the 42LH20 LCD Direct View Television.

Upon completion of this section the Technician will have a better understanding of the disassembly procedures, the layout of the printed circuit boards and be able to identify each board.

Troubleshooting:

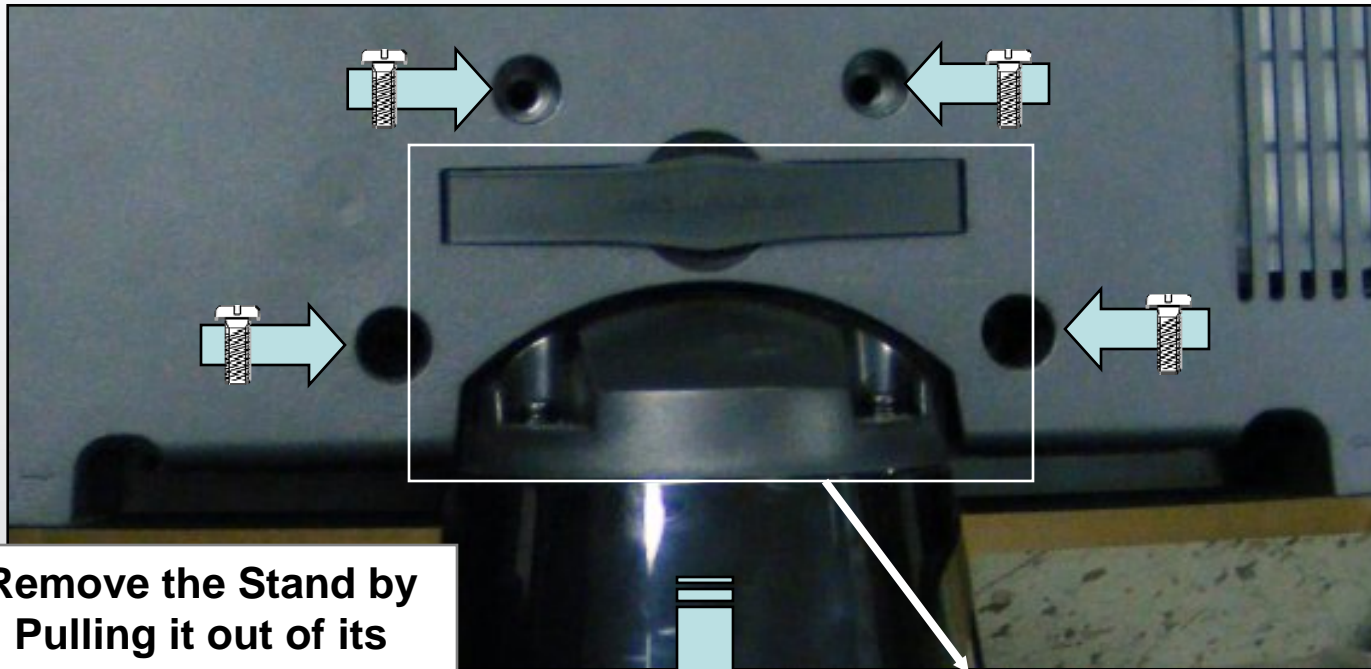
This section of the manual will also discuss troubleshooting.

Upon completion of this section the Technician will have a better understanding of how to diagnosis and resolve problems.

Removing the Back Step (1)

1

Lay the TV down on its face. Remove the 4 screws around stand indicated by the arrows.



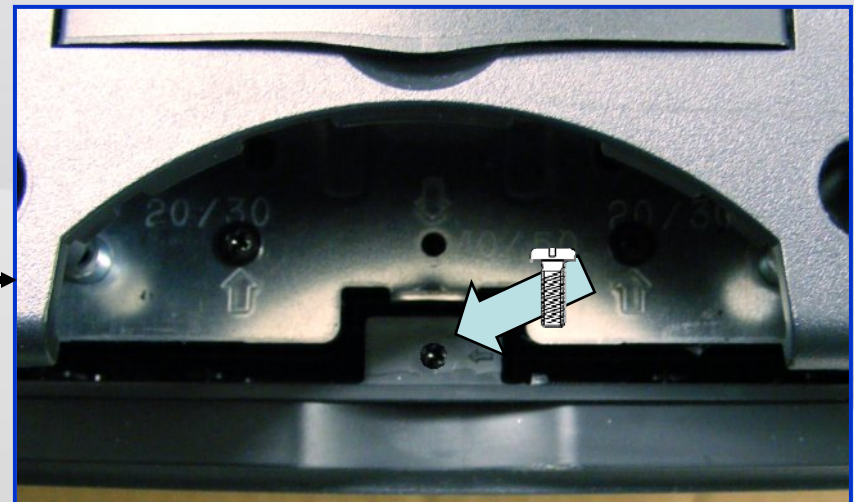
Remove the Stand by Pulling it out of its Retaining bracket.

Remove

2

3

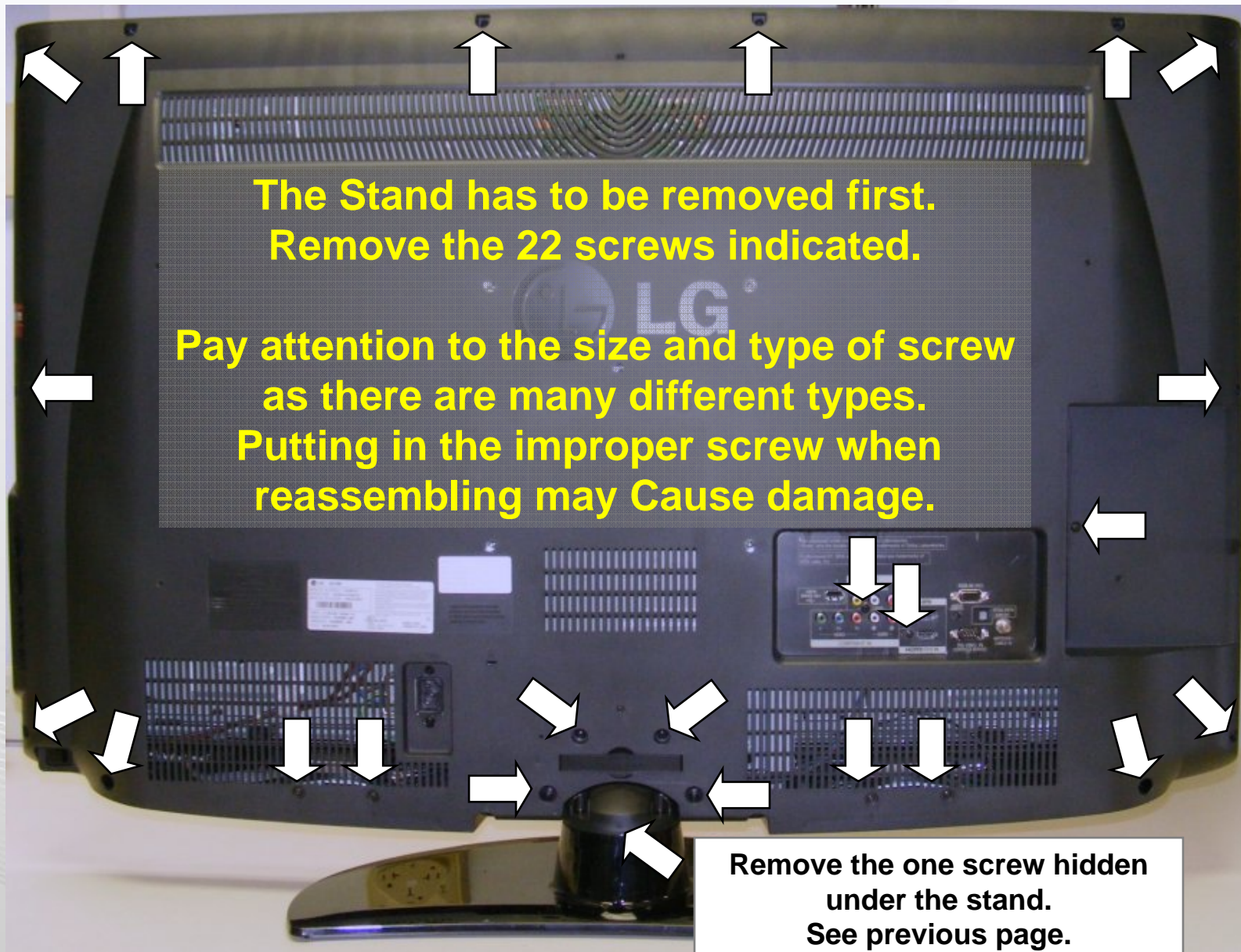
Remove the one screw hidden by the stand.



4

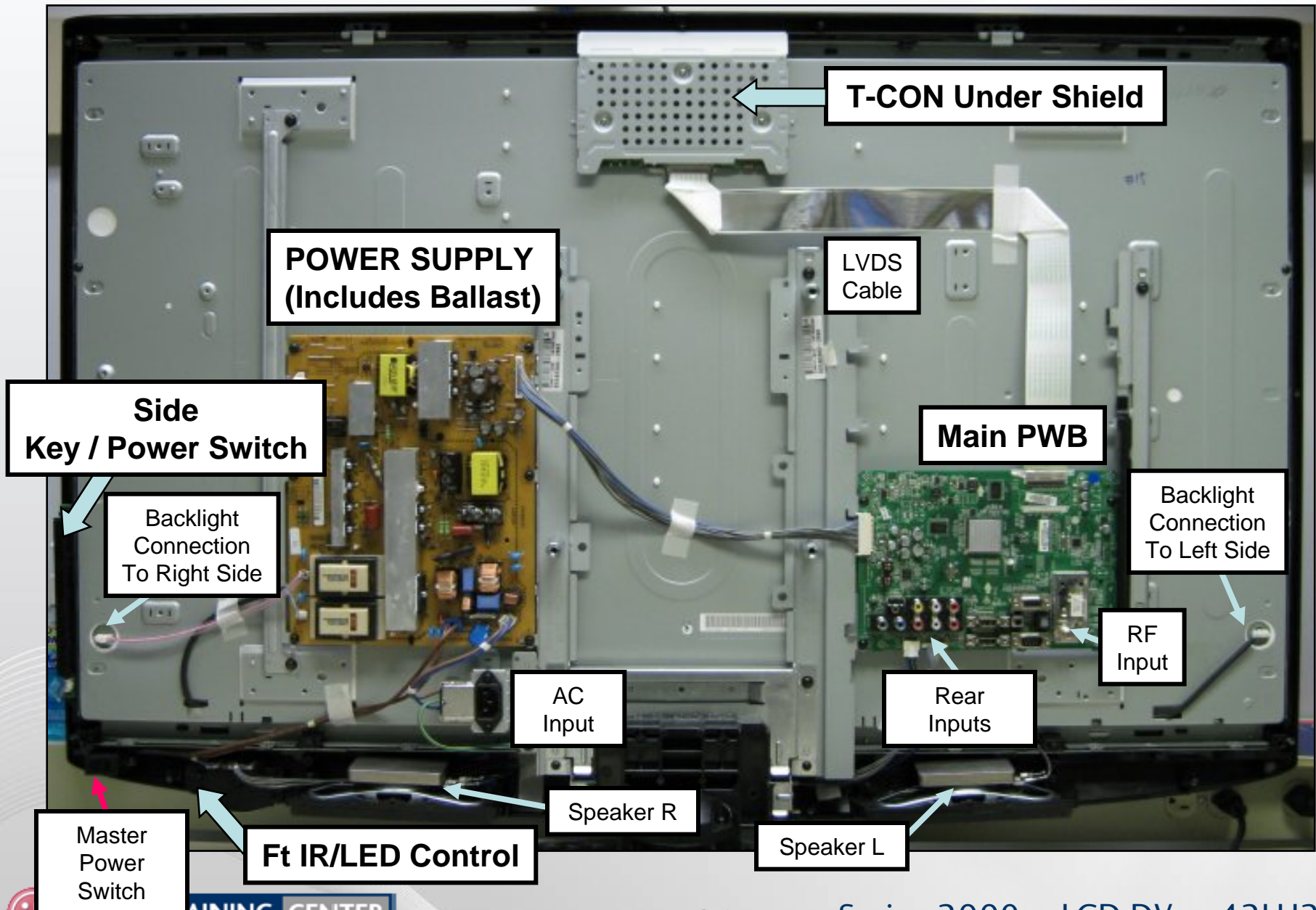
Reinsert the stand and stand the unit upright for service position to continue removing the back cover.

Removing the Back Cover Step 2 (Stand has to be removed)



Circuit Board Layout

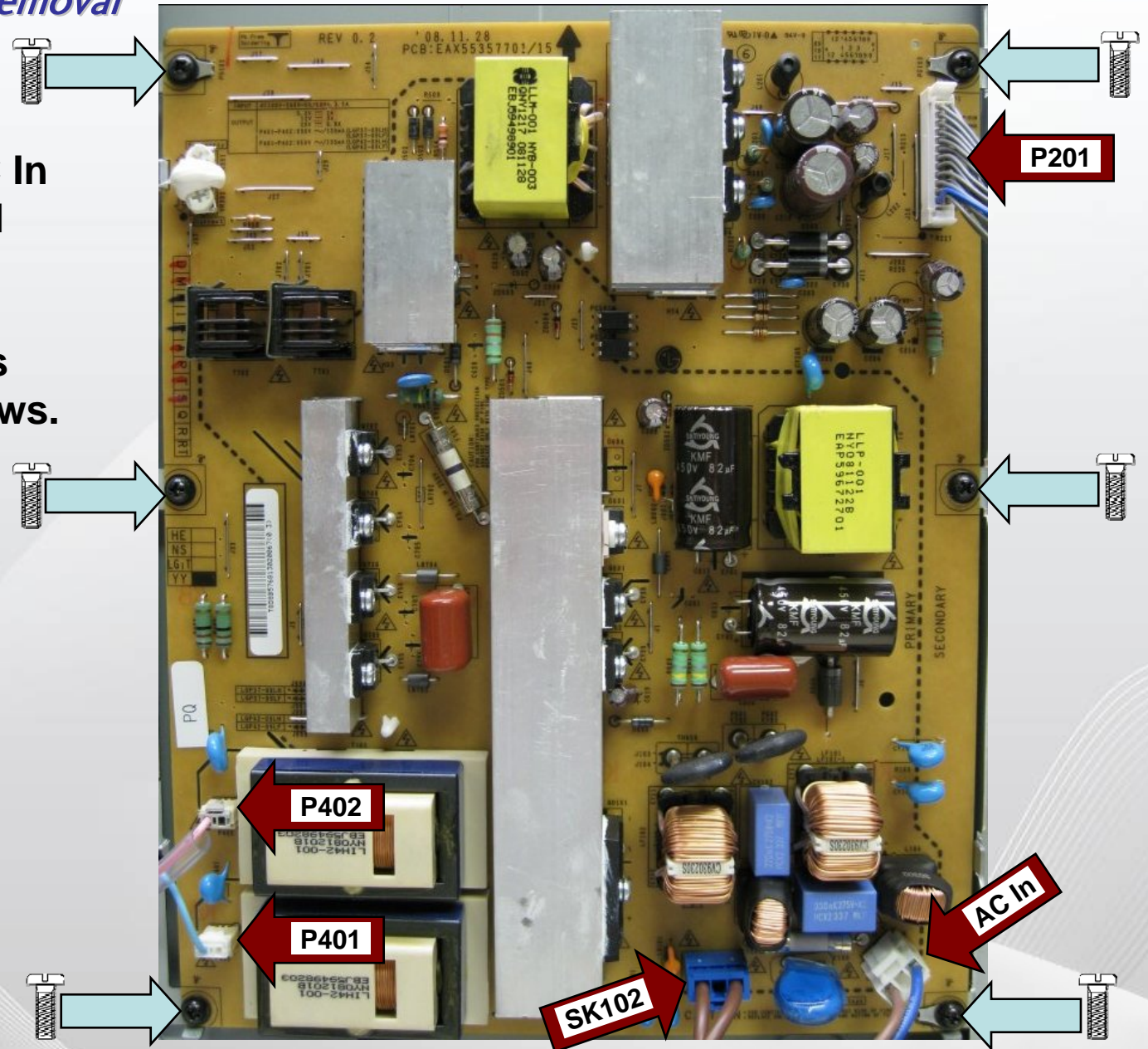
T-CON p/n: EAT60663801



Power Supply PWB Removal

Disconnect P201, AC In and SK102, P401 and P402.

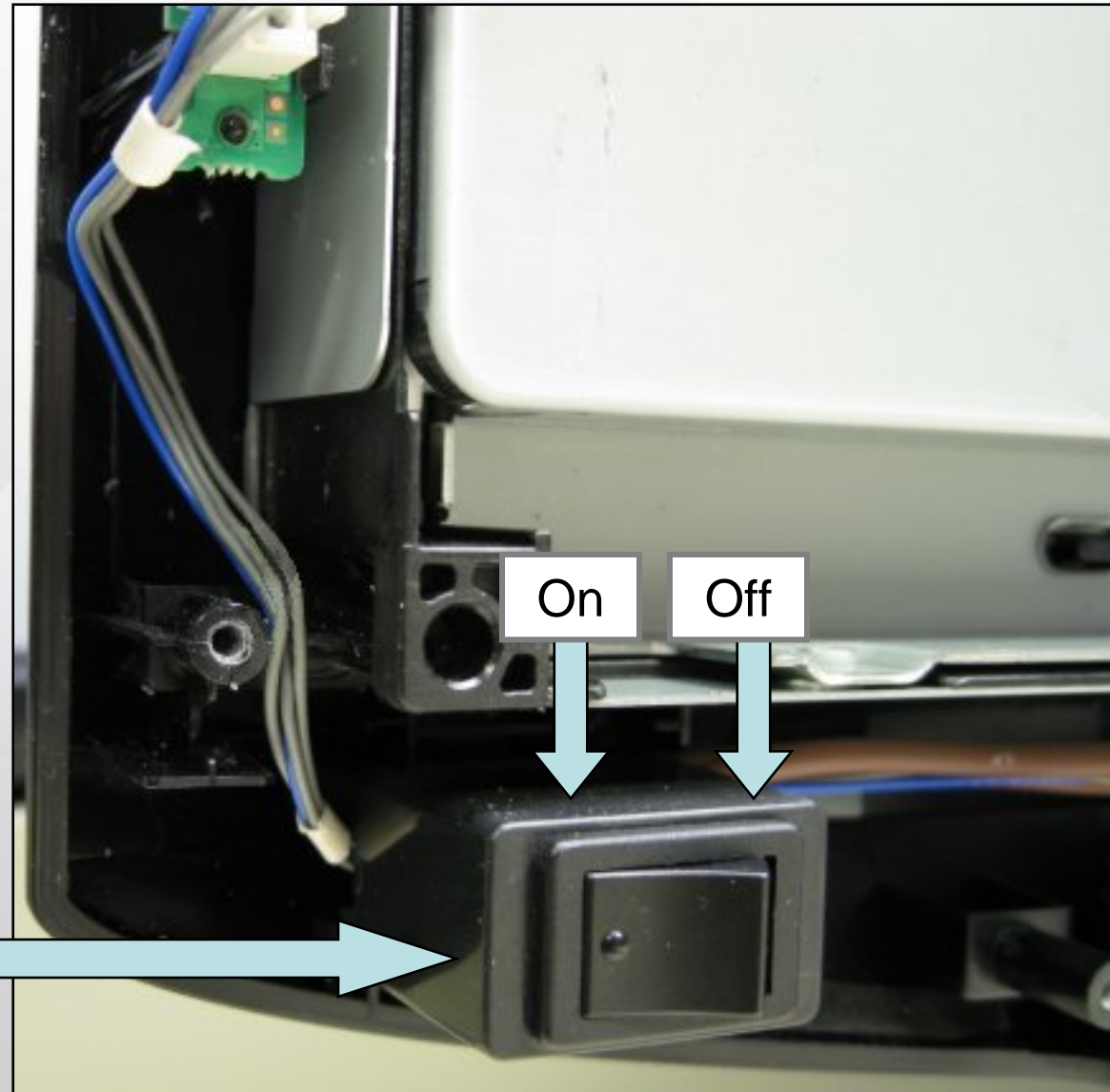
Remove the 6 screws indicated by the arrows.



Power Supply (Master Power Switch) Location

If the TV won't come on, be sure to check the Master Power Switch before assuming a failure has occurred.

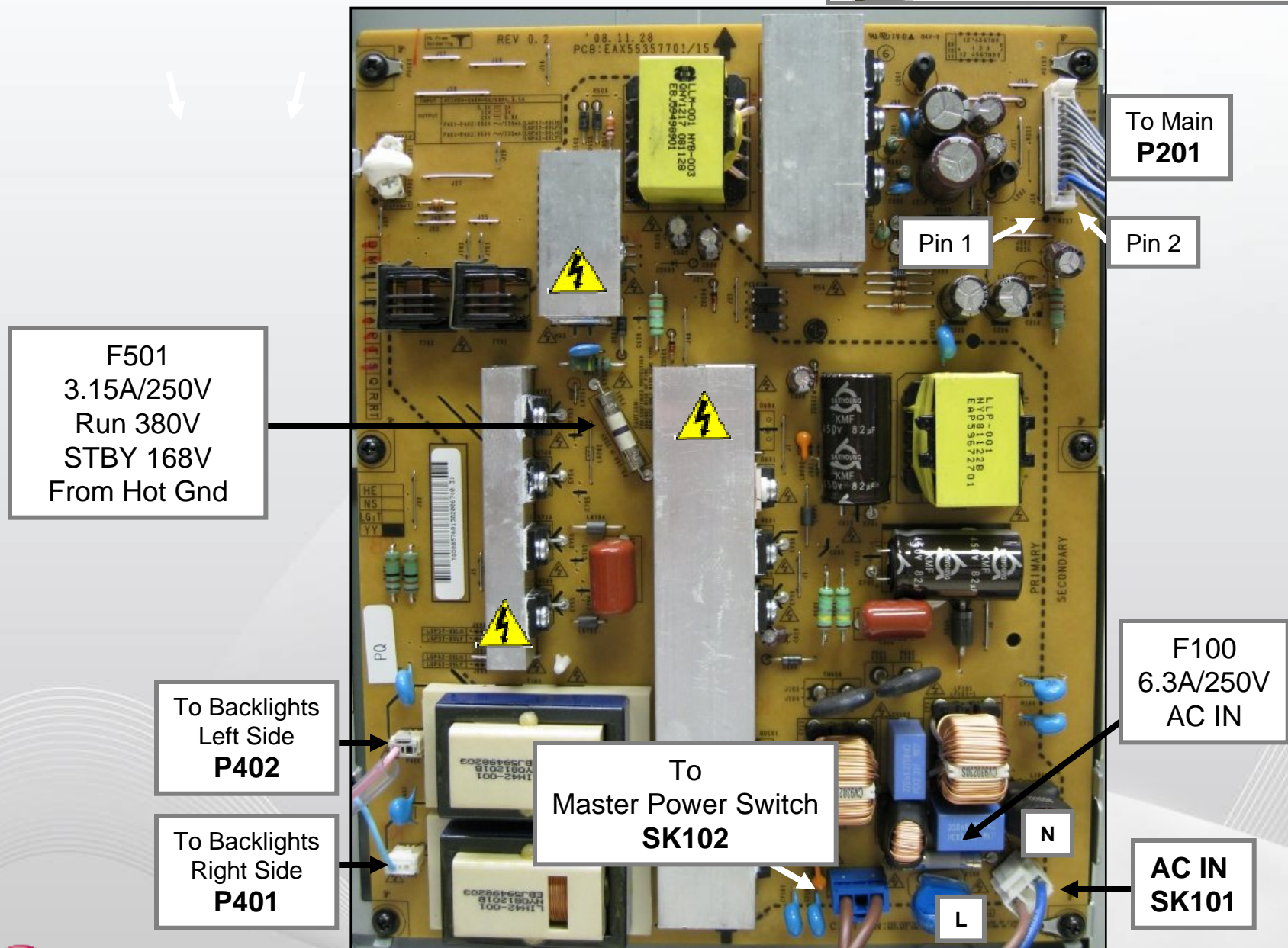
MASTER AC SWITCH
LOCATION
(Bottom Left Side
viewed from rear)



Power Supply (SMPS) PWB Layout



Hot Ground Shock Hazard



LG

TRAINING CENTER

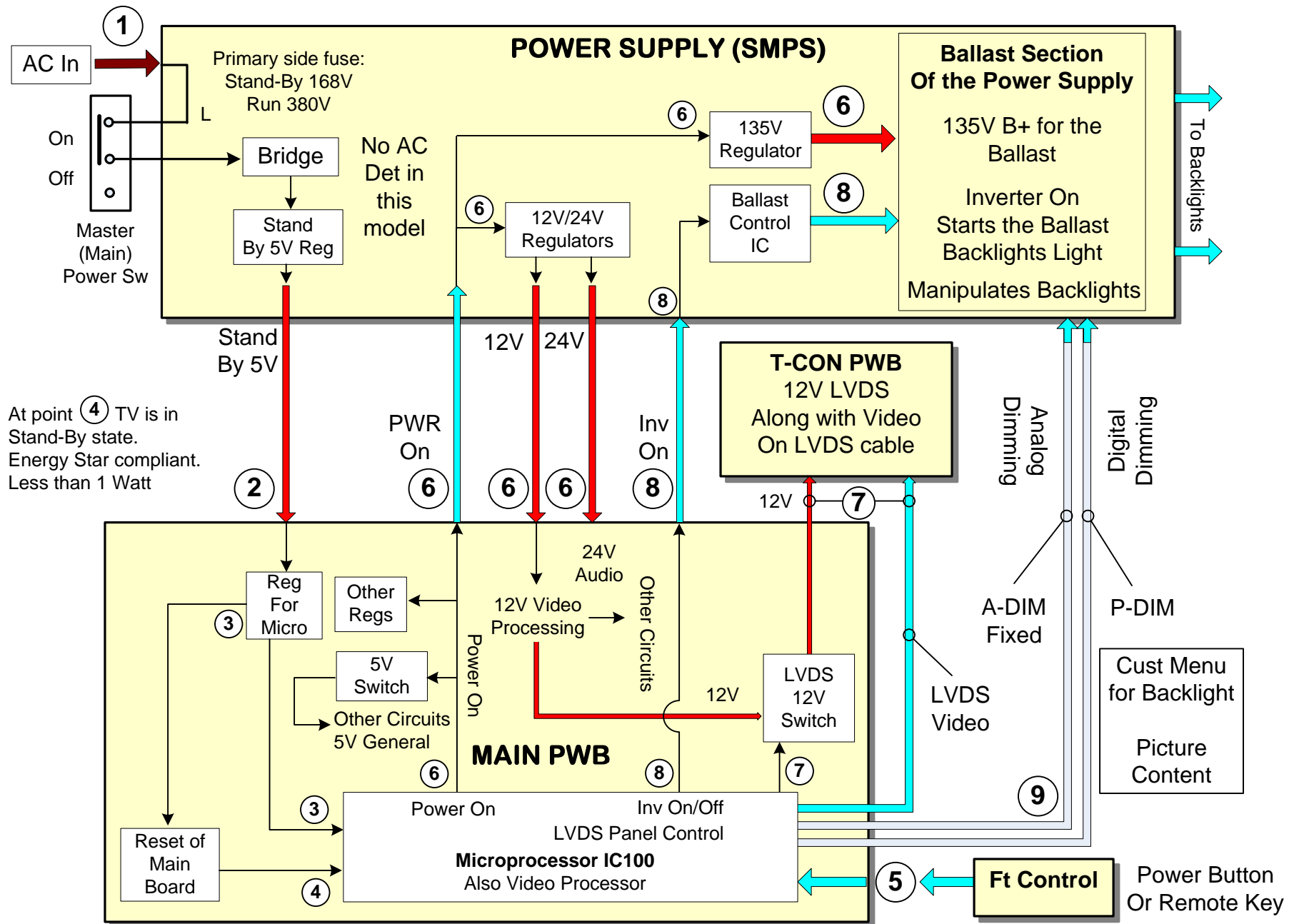
24

Spring 2009

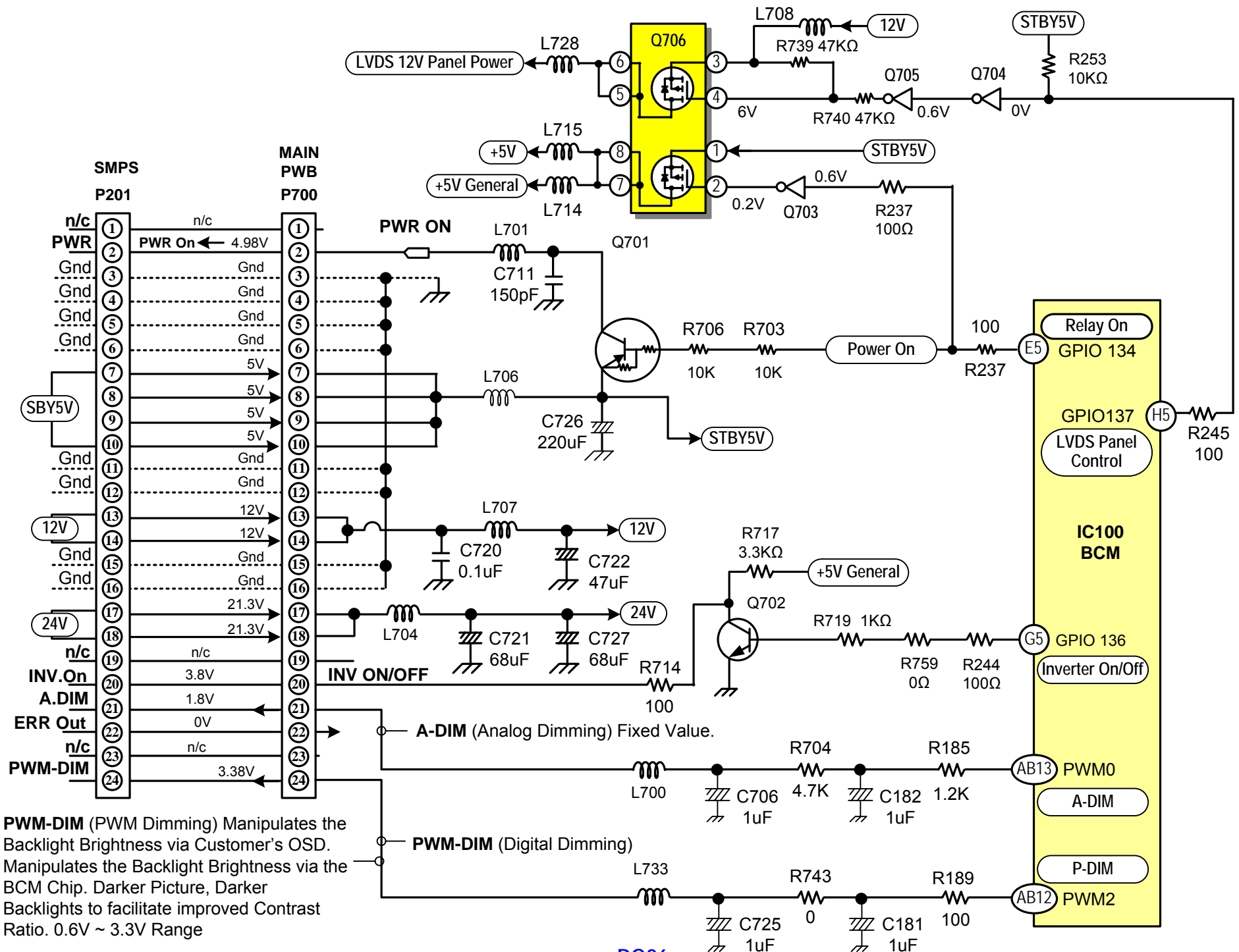
LCD DV

42LH20

42LH20 POWER SUPPLY TURN ON COMMANDS FROM MAIN PWB



42LH20 P700 ON MAIN PWB TO SMPS P201 TURN ON CIRCUIT



Power Supply (SMPS) PWB Operational Troubleshooting

Power Supply Troubleshooting

Ac voltage is supplied to the Power Supply at Connector SC100. This set does not use AC Detect. The AC input generates a Hot Ground primary power supply that runs in two states, Stand-By (168) and Run (380V) measured at Fuse F501. This primary voltage develops all other voltages that are output from the power supply. During Stand-By, the 5 Volt Standby should be present at connector P201, Pins 7,8,9 or 10. If Missing remove AC Power and unplug Connector P201, apply AC Power and recheck for presence of 5 Volt Standby. Loss of 5 Volt Standby would be a Power Supply Failure. Presence of 5 Volt Standby would be an indication of a failure on the Main Board or possibly the Front PWB (IR) assembly. Suspect a possible short circuit loading the supply. **Remember to observe the Front Power Indicating LED this may save some time. A lit LED indicates the Stand-By 5V voltage is present!**

The Main Board sends two commands to the Power Supply Board one being PWR the other is INV ON. These two voltages are used to control the power on turn on sequence. First via PWR (Pin 2) also known as POWER ON, activates the internal Ballast voltage and the 24 Volt and 12 Volt lines to the Main board. The 2nd command is INV ON (P201 pin 20). It is the Lamp Lighting Command Signal. If either command (PWR-ON or INV-ON) is missing it will result in a no picture symptom.

These voltages can easily be checked with the volt meter! Remove AC Power, unplug the two Connectors to the backlights P401/P402. Reapply AC Power and press the ON-OFF Button on either the Remote Control or Power Button on the Unit. Watch for the Power ON LED to change color from red to blue. This is an indication the PWR Signal was created on the Main board. Check P700 or P201 pin 2 for the PWR-ON command (2.8V) to the Power Supply. Check P201 for 24V (Pins 17 or 18) and 12V (Pins 13 or 14). Confirm Pin 20 of P201 went to 3.3V. This is the INV ON signal needed to light the Lamps. Problems with either voltage can be easily solved by following the simple steps on the next page.

TEST 1 Power Supply PWB Low Voltage Test

AC Should not be applied at any time while adding resistors or while unplugging connectors as damage to the circuit PWB may occur.

- a) The SMPS PWB “MUST” be producing STBY 5V on any of the pins 7, 8, 9 or 10 (5V).

If 5V Standby is not being generated, the SMPS PWB is defective and must be replaced. There is no need to continue with the next test.

- (b) Unplug P700 on the Main PWB.

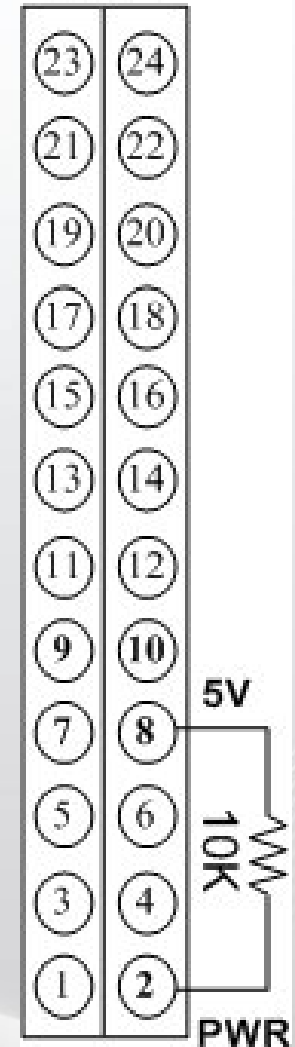
TEST 1:

- (1) Add a 10K resistor between (5V STBY) pin 7, 8, 9 or 10 and Pin 2 (PWR). Apply AC. This will turn on the power supply.

- **Check that the 24V and 12V power supplies are turned on, P201 (24V pins 17 and 18) (12V pins 13 and 14)**

- (2) Remove AC power.

P201



Use P700
Side to insert
resistors

TEST 2 Power Supply PWB Backlights Test

**P700 Connector disconnected from the Main PWB.
Apply AC after adding jumpers.**

Continue if the 1st test was successful. Leave original 10K resistor in place.

(3) Add another 10K resistor between (5V) pin 7, 8, 9 or 10 and Pin 20 (INV On).

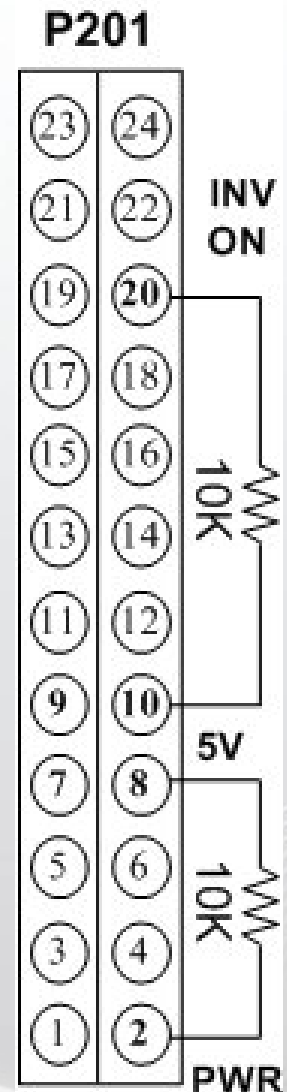
(4) Apply AC Power. This simulates a Power On and Backlight On command.

Observe the Backlights.

- a) If normal, the backlights should turn on.
- b) If they do not, recheck connectors P401 and P401.

(Warning: Disconnect the AC Power first).
These pins carry 1.2Kv when active.

- c) Confirm the INV On/Off line Pin 12 is going to at least 3V.
- d) If no backlight activity, SMPS is defective.



Use P700
Side to insert
resistors

Power Supply Connector P201 Voltage and Resistance

P201 Odd "SMPS" to P700 "Main PWB"

P201	Pin	Label	STBY	Run	Diode Check
(23) (24)	23	nc	nc	nc	nc
(21) (22)	21	¹ A.DIM	0V	1.66V	Open
(19) (20)	19	nc	nc	nc	nc
(17) (18)	17	24V	0V	21.4V	0.71V
(15) (16)	15	Gnd	Gnd	Gnd	Gnd
(13) (14)	13	12V	0V	12.3V	0.96V
(11) (12)	11	Gnd	Gnd	Gnd	Gnd
(9) (10)	9	5V	5.14V	5.14V	1.67V
(7) (8)	7	5V	5.14V	5.14V	1.67V
(5) (6)	5	Gnd	Gnd	Gnd	Gnd
(3) (4)	3	Gnd	Gnd	Gnd	Gnd
(1) (2)	1	nc	nc	nc	nc

¹ADIM Pin 21 Fixed and not used

P201 Even "SMPS" to P700 "Main PWB"

P201	Pin	Label	STBY	Run	Diode Check
(23) (24)	24	² PDIM	0V	3.2V	1.68V
(21) (22)	22	Err Out	0V	0V	Open
(19) (20)	20	INV.ON	0V	3.8V	1.6V
(17) (18)	18	24V	0V	21.4V	0.71V
(15) (16)	16	Gnd	Gnd	Gnd	Gnd
(13) (14)	14	12V	0V	12.3V	0.96V
(11) (12)	12	Gnd	Gnd	Gnd	Gnd
(9) (10)	10	5V	5.14V	5.14V	1.67V
(7) (8)	8	5V	5.14V	5.14V	1.67V
(5) (6)	6	Gnd	Gnd	Gnd	Gnd
(3) (4)	4	Gnd	Gnd	Gnd	Gnd
(1) (2)	2	PWR-ON	0V	4.98V	0.886V

²PDIM Pin 24 can vary according to type of signal being processed and the OSD Backlight setting. 0.6V 0% to 3.3V 100%. Output from the BCM chip.

Diode Mode values taken with all Connectors Removed

Power Supply Connector SK101 and SK102 Voltage and Resistance

Diode Mode values taken with all Connectors Removed

SK101 "SMPS" to AC IN

Pin	Label	STBY	Run	Diode Check
1	L	120Vac		OL
2	N			OL

AC Voltage Readings Across Pins 1 and 2 for STBY and RUN.

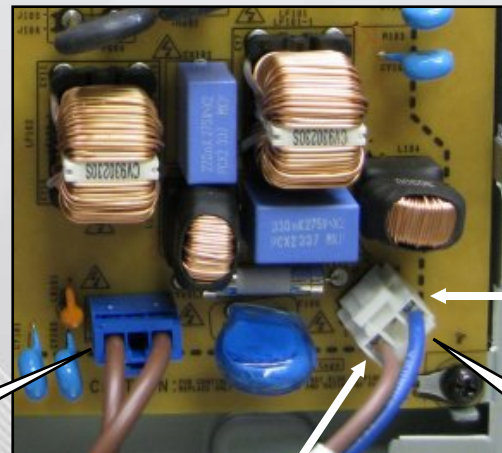
SK102 "SMPS" to MASTER POWER SWITCH

Pin	Label	STBY	Run	Diode Check
1	n/a	120Vac		OL
2	n/a			OL

AC Voltage Readings for either pin 1 or pin 2 in STBY and RUN with one lead on Neutral of SK101.

With the Master Power Switch Closed (On) AC flows. When Open (Off) AC open and does not flow.

Bottom Right of SMPS



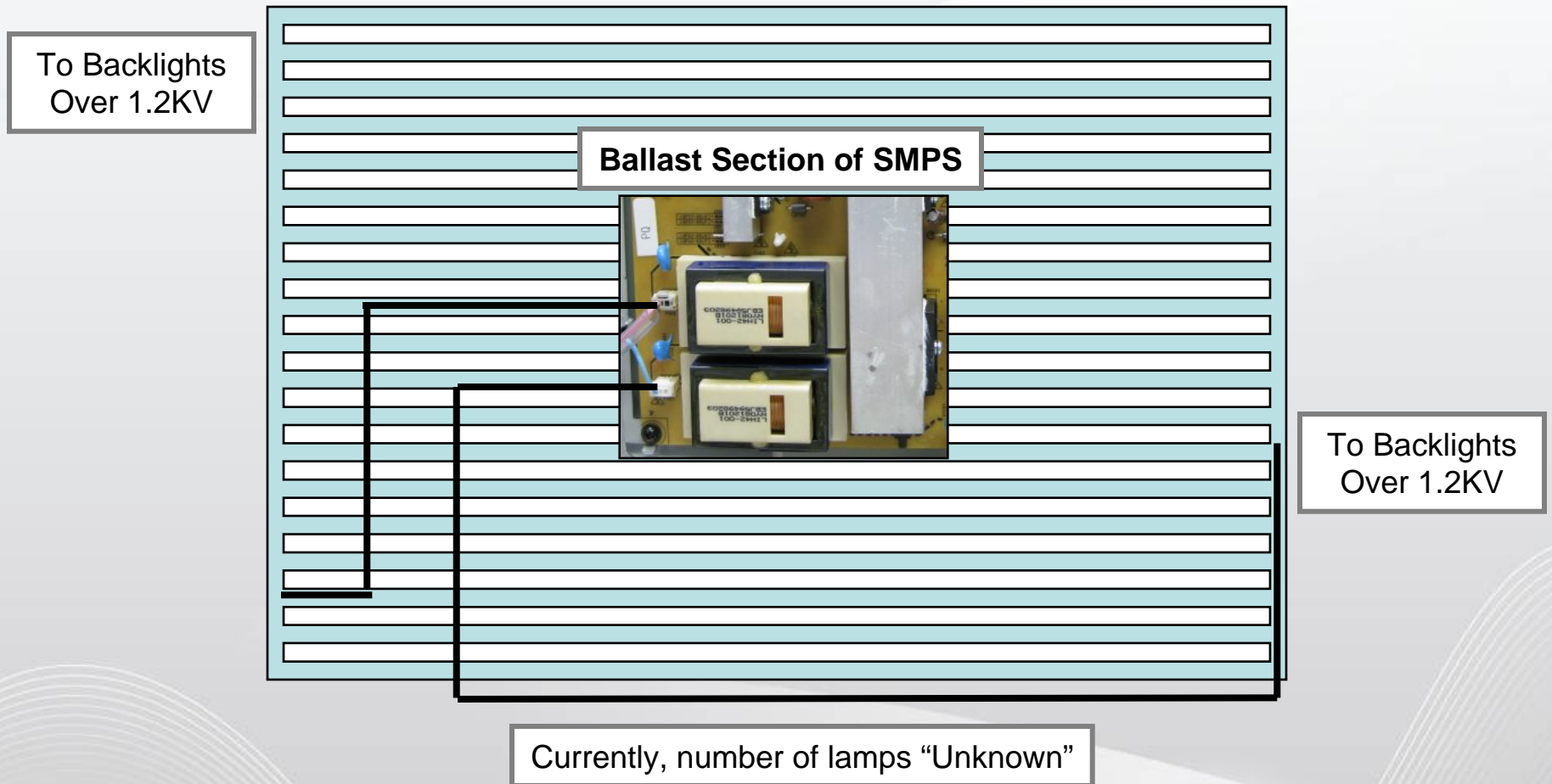
SK102

Live

Neutral

SK101

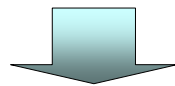
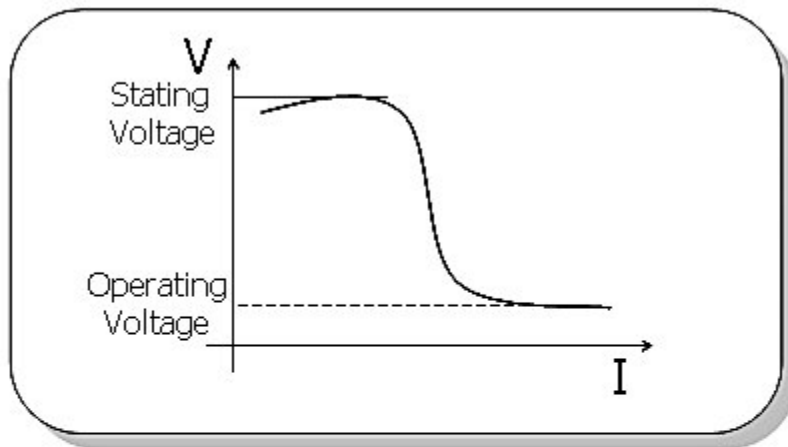
General Backlight Information



EEFL (External Electrode Fluorescent Lamp)
LOW COST Large number of lamps driven by a single inverter

Introducing EEFL

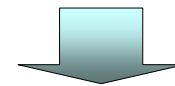
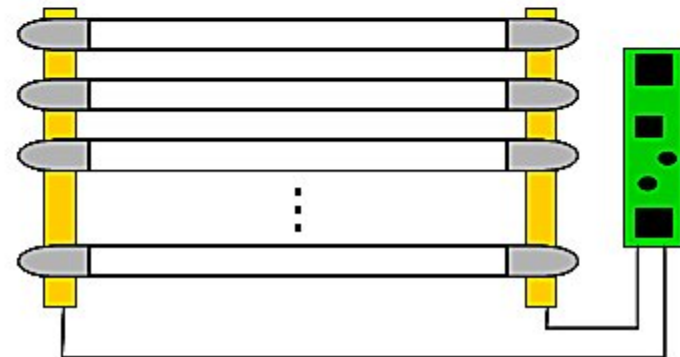
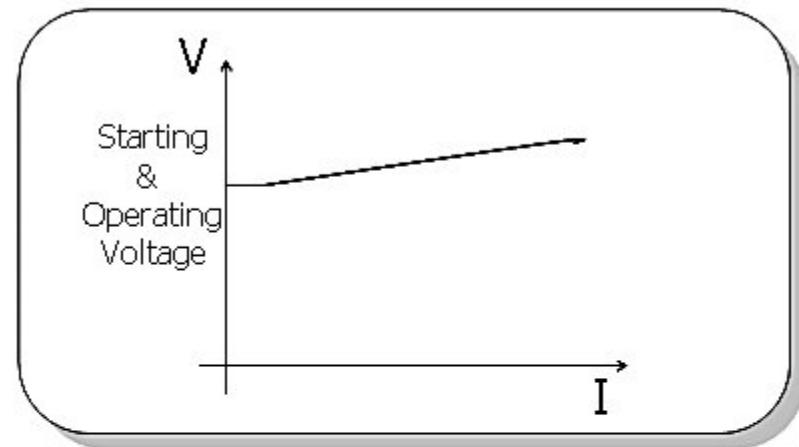
CCFL (Cold Cathode Fluorescent Lamp)



Complicated structure

Simple structure, Low price

EEFL (External Electrode Fluorescent Lamp)



Simple structure

Lamp manufacturing process
Lamp assembly structure

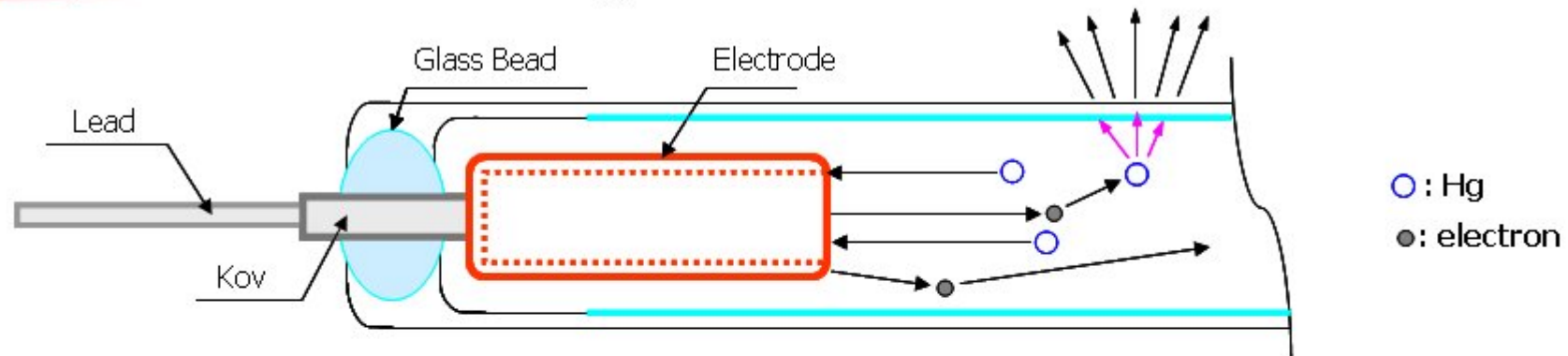
Low Cost

Large number of Lamp
Drive by single inverter

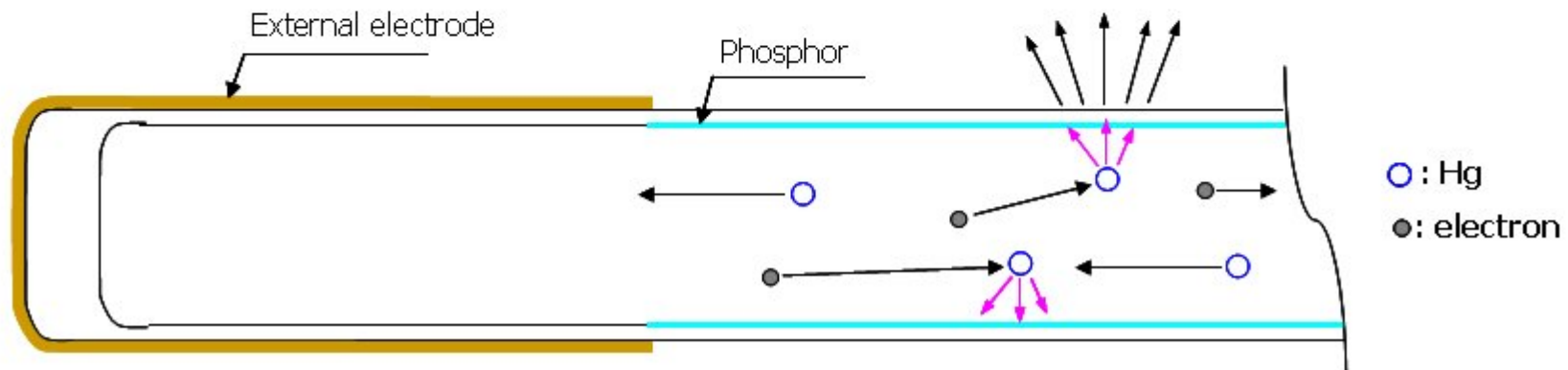
Introducing EEFL Contacts (Bulb Design)

Key: Long Life Time

CCFL (Cold Cathode Fluorescent Lamp)



EEFL (External Electrode Fluorescent Lamp)



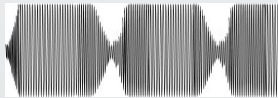
- For CCFL, Hg gas is consumed mainly near the internal electrode
- For EEFL, longer life time is expected because there is no internal electrode consuming Hg gas

Ballast PWB Layout

Viewed from rear

SMPS PWB

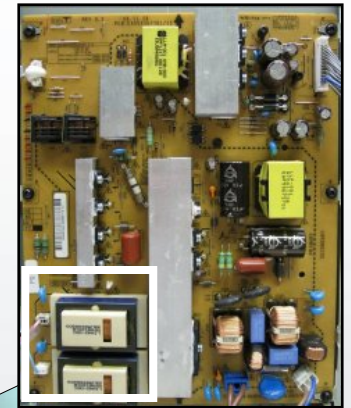
Backlights
Test Point
Bottom of
R406 or R403
38V P/P



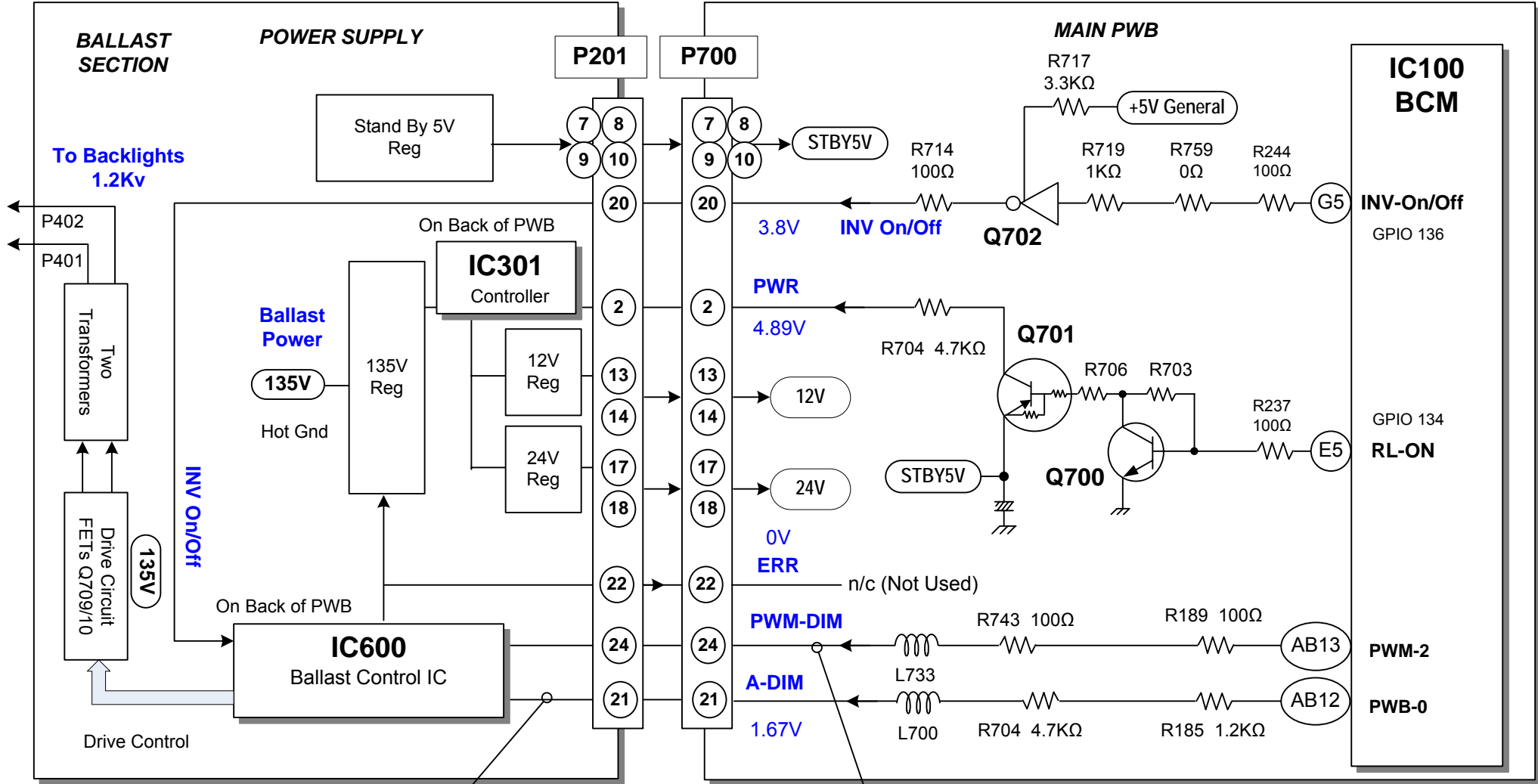
To Backlights
Left Side

1.2Kv

To Backlights
Right Side



42LH20 P700 on Main PWB To Power Supply P201 Ballast Turn On Circuit



VBR-A (Analog Dimming)
This line is not used.

VBR-B (PWM Dimming) Manipulates the Backlight Brightness via Customer's OSD. Manipulates the Backlight Brightness via the BCM Chip. Darker Picture, Darker Backlights to facilitate improved Contrast Ratio. 0.6V ~ 3.3V Range

Power Supply Backlight Drive Signal Effects

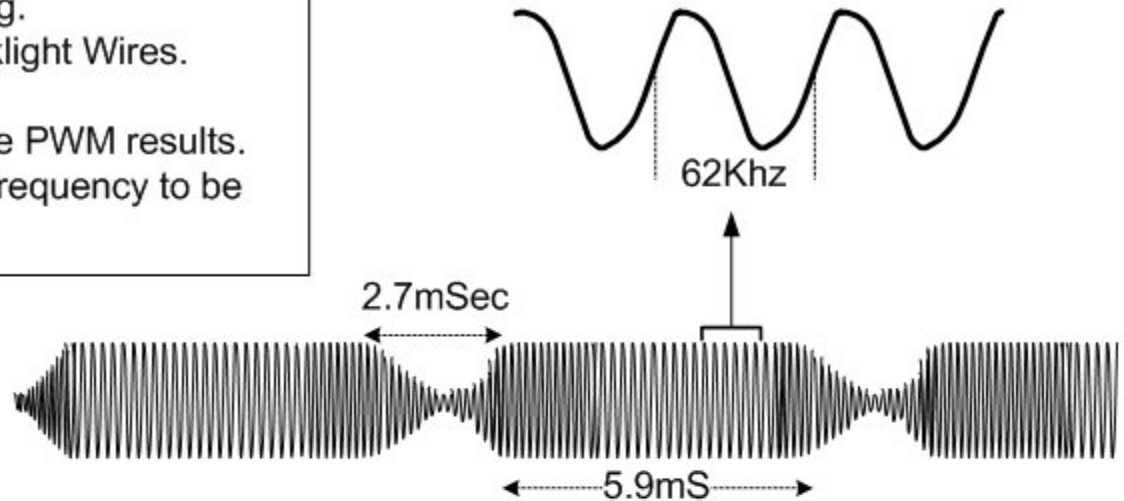
Waveform taken from loose coupling.
Probe clamped on one of the Backlight Wires.
Use caution, 1.2Kv
Slow scope setting to 2.5mS to see PWM results.
The PWM amount can cause the frequency to be measured differently.

VBR-B

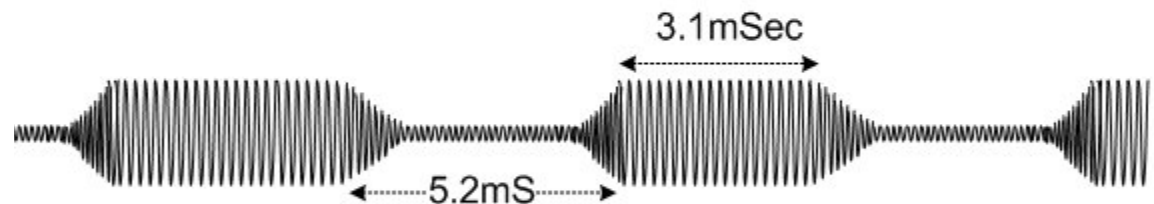
PWMDIM manipulates
the ballast drive IC.

VBR-A

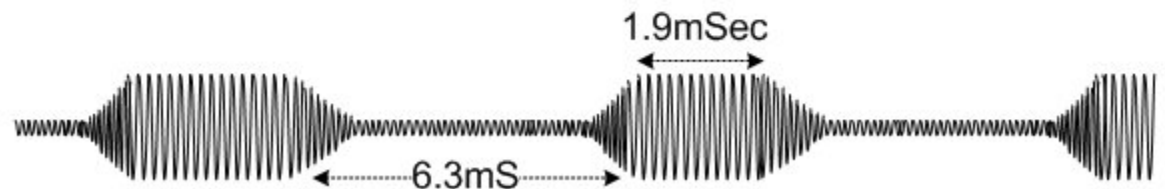
BR1 (ADIM) is not used.



80% on Backlight Bar In Customer's OSD (3.0V PDIM Pin 13 MCN1)



50% on Backlight Bar In Customer's OSD (2.0V PDIM Pin 13 MCN1)



20% on Backlight Bar In Customer's OSD (1.22V PDIM Pin 13 MCN1)

LCD Controller Board

The T-Con IC UC1 receives from the Main Board at CN5 12 Bit LVDS Signals (Video) which it processes into TFT Drive Signals which through connectors CN3 and CN4 controls the LCD Panel.

12V is supplied to the T-Con Board on connector CN5 from the Main Board (easily measured at fuse F1).

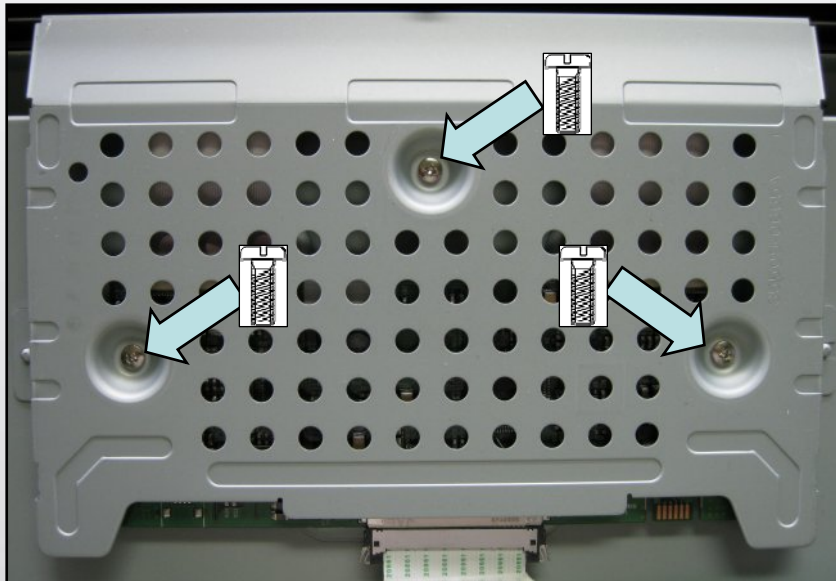
Diode LED1 is a boot up indicator and is helpful in troubleshooting as a quick indication of a loss of supply and or a Boot Up problem.

There are two DC to DC converters that create (17V developed at the cathode of D14) and (3.3V developed at the cathode of D13).

The 3.3V can also be measured at the ribbon connectors delivering signals to the TFT panel (CN3 pins 57, 58 or 59) and (CN4 pins 2, 3 or 4).

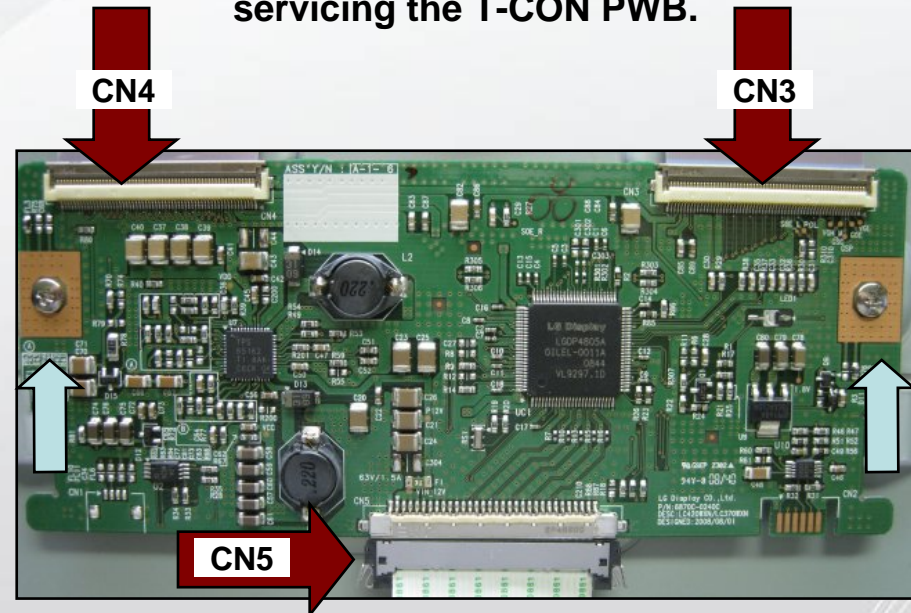
T-CON (TFT Drive) PWB Removal

Remove the 3 Screws in the T-CON shield and remove the shield



The two screws shown in the picture below are for the Service Position.

They would have been removed when removing the shield. Be sure to reinstall them if servicing the T-CON PWB.



Disconnect CN3, CN4 and CN5. See next slide for details.

T-CON (TFT DRIVE) PWB REMOVAL CONTINUED:

UNLOCKING CN3, CN4 and CN5

To remove the flex cables to the TFT Panel, CN3 or CN4: Place a soft thin object like a fingernail underneath the black locking tab and gently pull forward.

(Shown by the arrows in Fig 1)

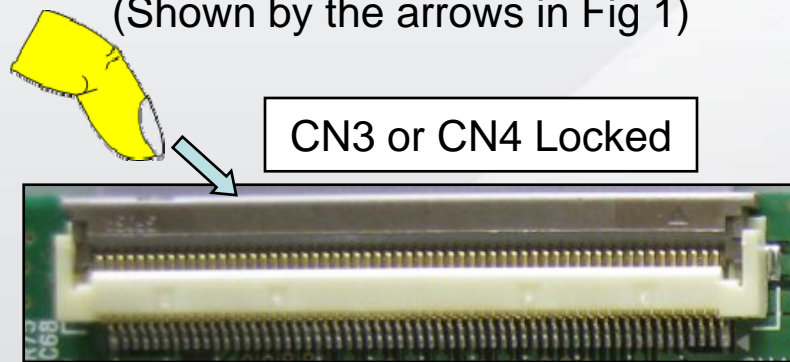


Fig 1

Flip the lock up and back from the flex cable. Then the flex cable can be easily removed.

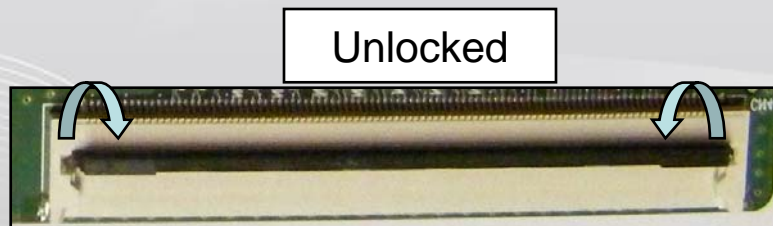
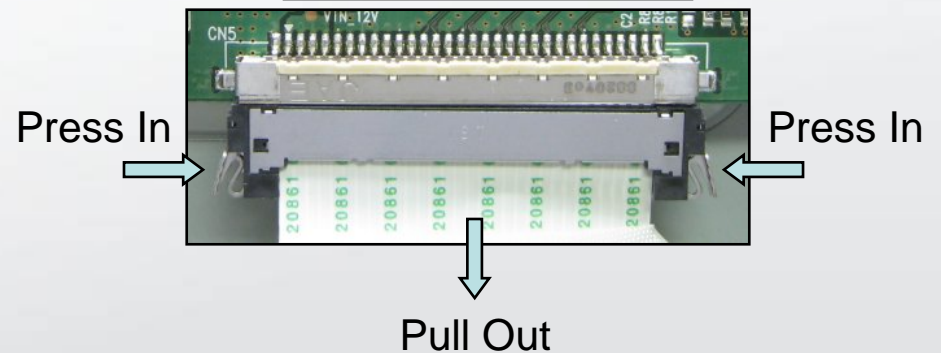


Fig 2

The locking tab is flipped upward

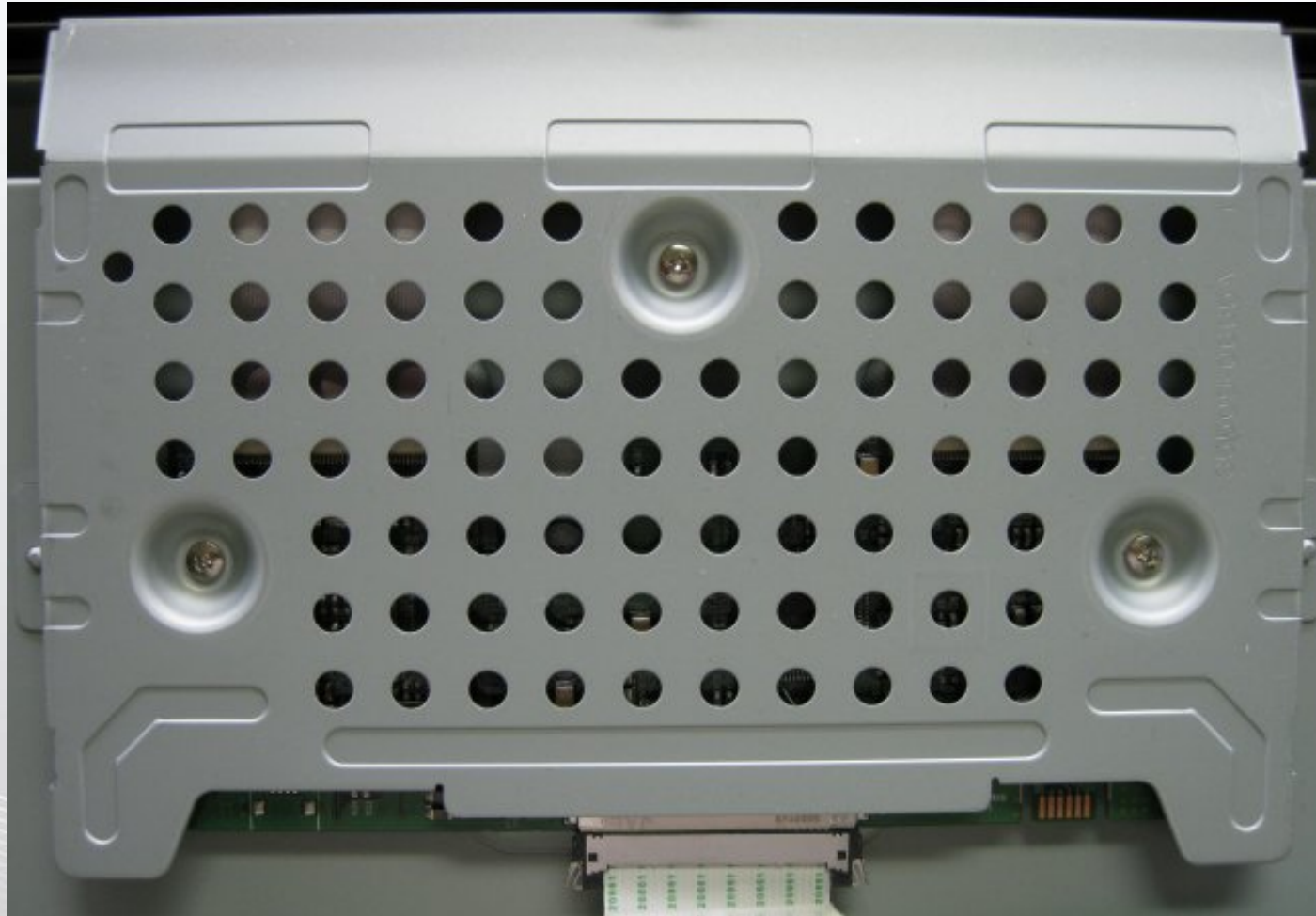
Fig 3 (CN5) LVDS



To remove the LVDS cable CN5; Press in on the two tabs and slowly rock the cable out of the connector.

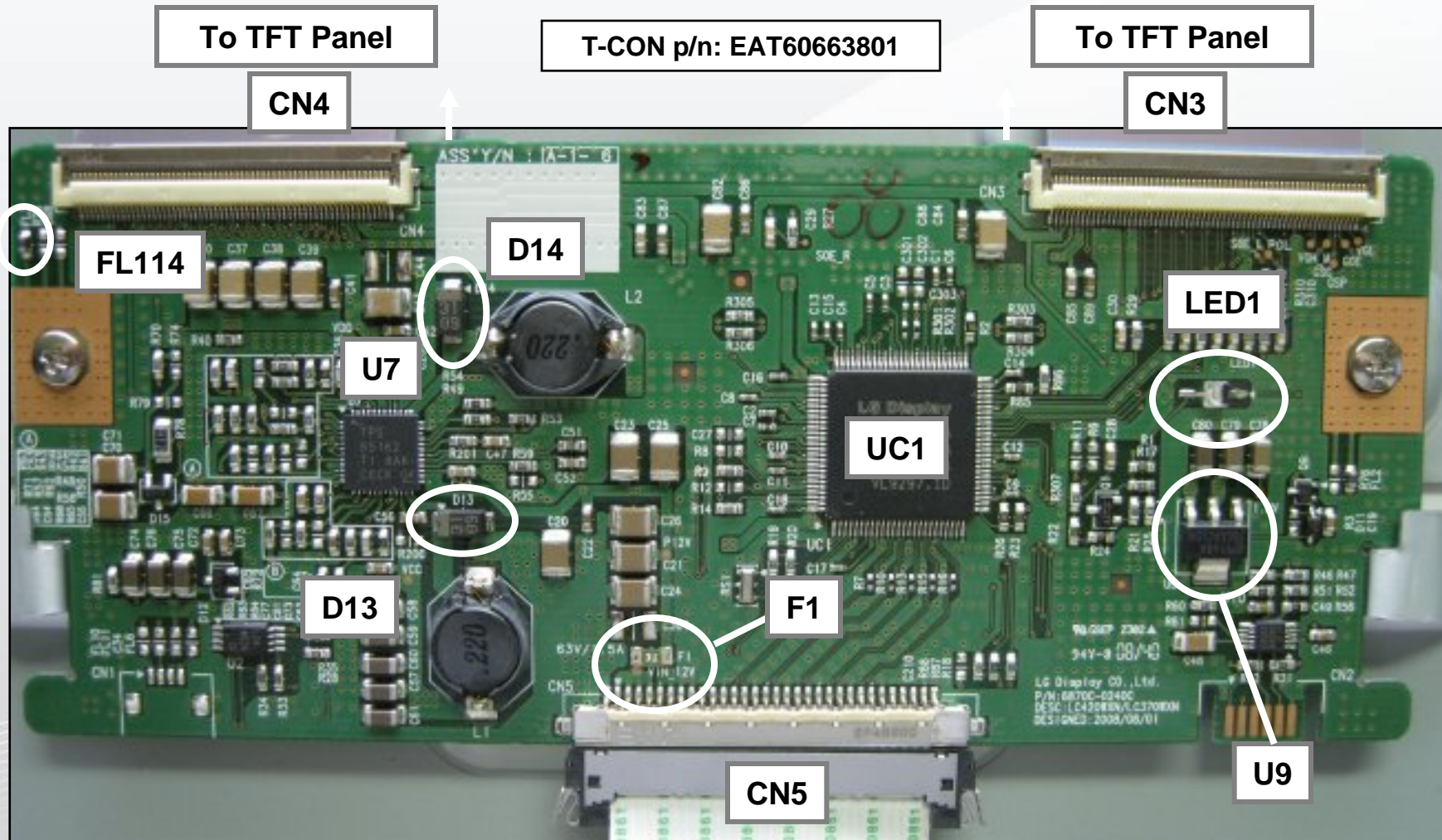
(Shown by the arrows in Fig 3)

T-CON (TFT DRIVE) PWB WITH SHIELD



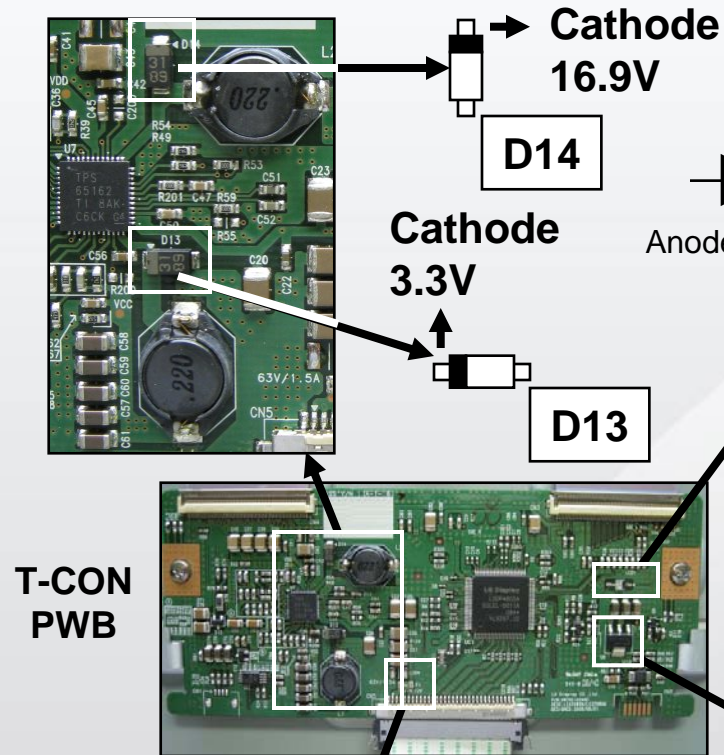
LVDS (Video and 12V) from Main PWB

T-CON (TFT Drive) PWB (Shield Removed)



Remember to replace screws for ground purposes if testing the PWB.

T-CON (TFT Drive) PWB Checks

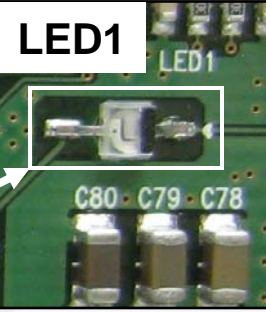
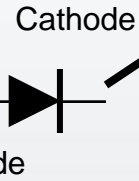


**Cathode
16.9V**

D14

**Cathode
3.3V**

D13

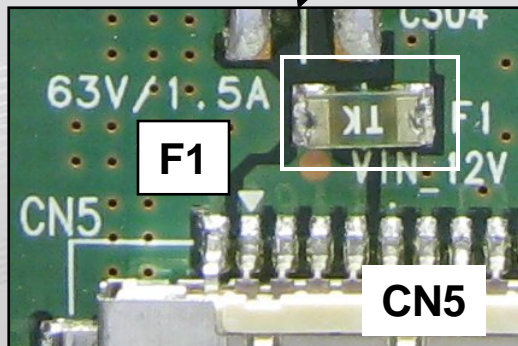


Use LED1 to determine if The boot up sequence of The T-CON is OK.
This LED will turn bright Blue Shortly after power is applied then go out shortly after backlights illuminate if all is OK.

Power Off
Anode 0V
Cathode 0V
LED OFF

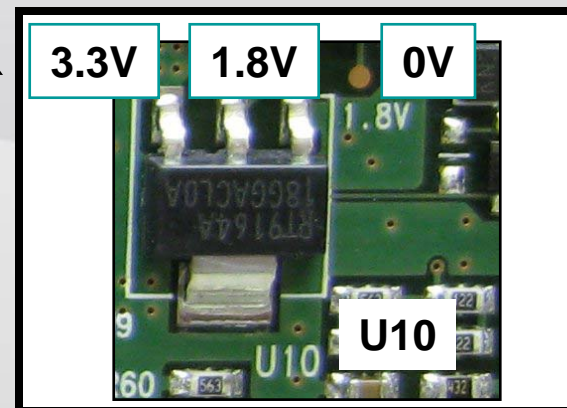
Power 1st On
Anode 3.3V
Cathode 0V
LED ON

Power On
Anode 3.3V
Cathode 1.3V
LED OFF



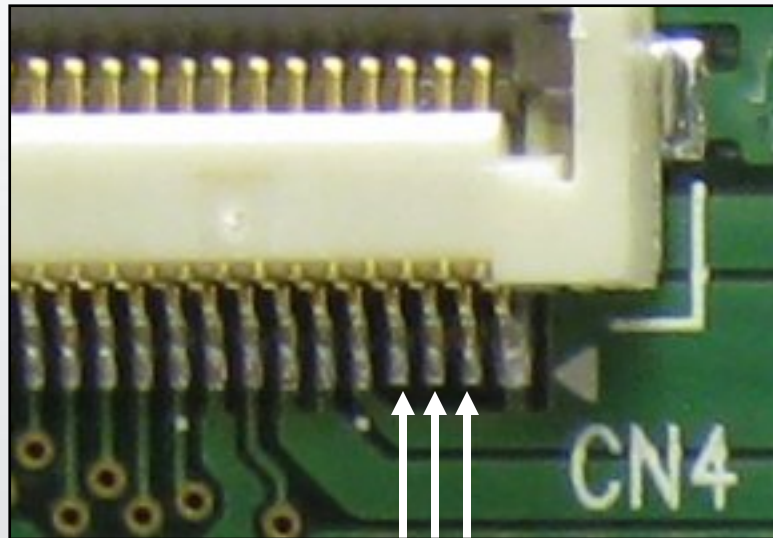
**Check Fuse
F1 for 12V**

**From Pins 2,
3, 4 and 5.**



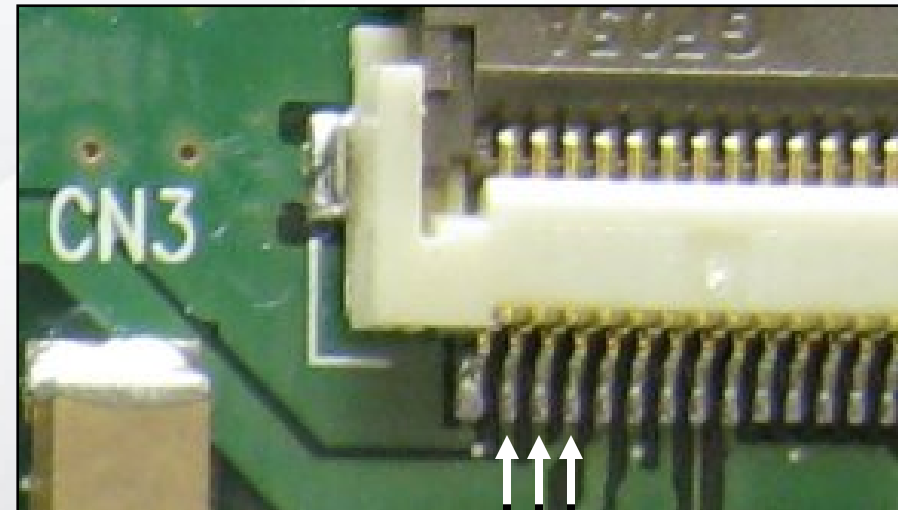
**Check the Regulator
U10 for Correct Voltage**

T-CON (TFT Driver) Board CN3 and CN4 (3.3V Voltage Check)



3.3V Check

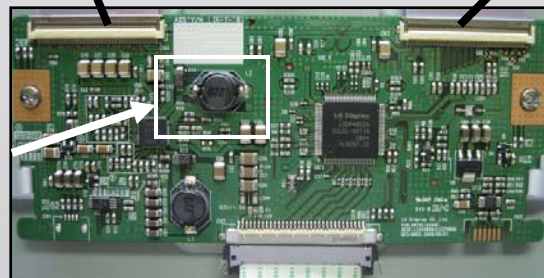
CN4



3.3V Check

CN3

If the 3.3Volts is missing,
check the 3.3V DC to DC
converter. Check at D13
cathode.
See previous page for
location.



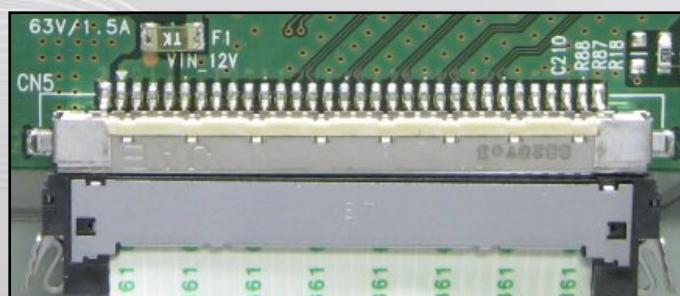
T-CON PWB

T-CON PWB Connector CN5 to Main PWB Voltage and Resistance

Diode Mode values taken with all Connectors Removed

CN5 CONNECTOR "T-CON PWB" to P801 "Main"

1	Gnd	Gnd	Gnd	Gnd	17	TXA1+	Gnd	1.1V	1.1V
2	LVDS 12V	0V	12.1V	1.6V	18	Gnd	Gnd	Gnd	Gnd
3	LVDS 12V	0V	12.1V	1.6V	19	TXA2-	0V	1.2V	1.1V
4	LVDS 12V	0V	12.1V	1.6V	20	TXA2+	0V	1.1V	1.1V
5	LVDS 12V	0V	12.1V	1.6V	21	Gnd	Gnd	Gnd	Gnd
6	Gnd	Gnd	Gnd	Gnd	22	TXAC-	0V	1.1V	1.1V
7	Gnd	Gnd	Gnd	Gnd	23	TXAC+	0V	1.2V	1.1V
8	Gnd	Gnd	Gnd	Gnd	24	Gnd	Gnd	Gnd	Gnd
9	Gnd	Gnd	Gnd	Gnd	25	TXA3-	0V	1.2V	1.1V
10	LVDS-SEL	0V	0V	Open	26	TXA3+	0V	1.2V	1.1V
11	OPC-EN	0V	0V	1.1V	27	Gnd	Gnd	Gnd	Gnd
12	Gnd	Gnd	Gnd	Gnd	28	OPC-OUT	0V	3.3V	Open
13	TXA0-	0V	1.2V	1.1V	29	*PWM-DIM	0V	3.1V	1.1V
14	TXA0+	0V	1.1V	0.8V	30	Gnd	Gnd	Gnd	Gnd
15	Gnd	Gnd	Gnd	Gnd	31	Gnd	Gnd	Gnd	Gnd
16	TXA1-	0V	1.2V	1.1V	32	Gnd	Gnd	Gnd	Gnd



*Pin 29 PWM-DIM 3.15V (Max 100%) to 0.6V (Min 0%) Customer's Menu Backlight setting. But is Not Used by T-CON.

NOTE: The outside pins on each side are actually not counted, they are both ground. But they are counted in the table. (See arrow on the T-CON PWB CN5)

Main PWB IC100 Video Processor Overview

Input Signal Processing

IC100 is the main Microprocessor and the main Signal Processor and is responsible for :

- ATSC, NTSC, and QAM reception and processing
- RS 232 service only Port (software upgrades and home theater environment).
- Wired Remote Port
- (1) Component Input Y, Pr, Pb and Audio L R
- (2) HDMI Inputs (back) (1) HDMI (Side Input)
- RGB PC and (PC Audio)
- USB (software upgrades using flash drive). USB located on the Rear, no Side Inputs.
- AV Composite
- SIF and SAP

Output Signals

- 10 Bit LVDS (10 Pin) to the T-CON Board
- Audio output signals to the Speakers
- Digital Audio Output Coaxial and Optical
- ON OFF Controls to the SMPS turning on low voltage generation and Backlights
- Backlight intensity control signal (Digital Dimming) P-DIM

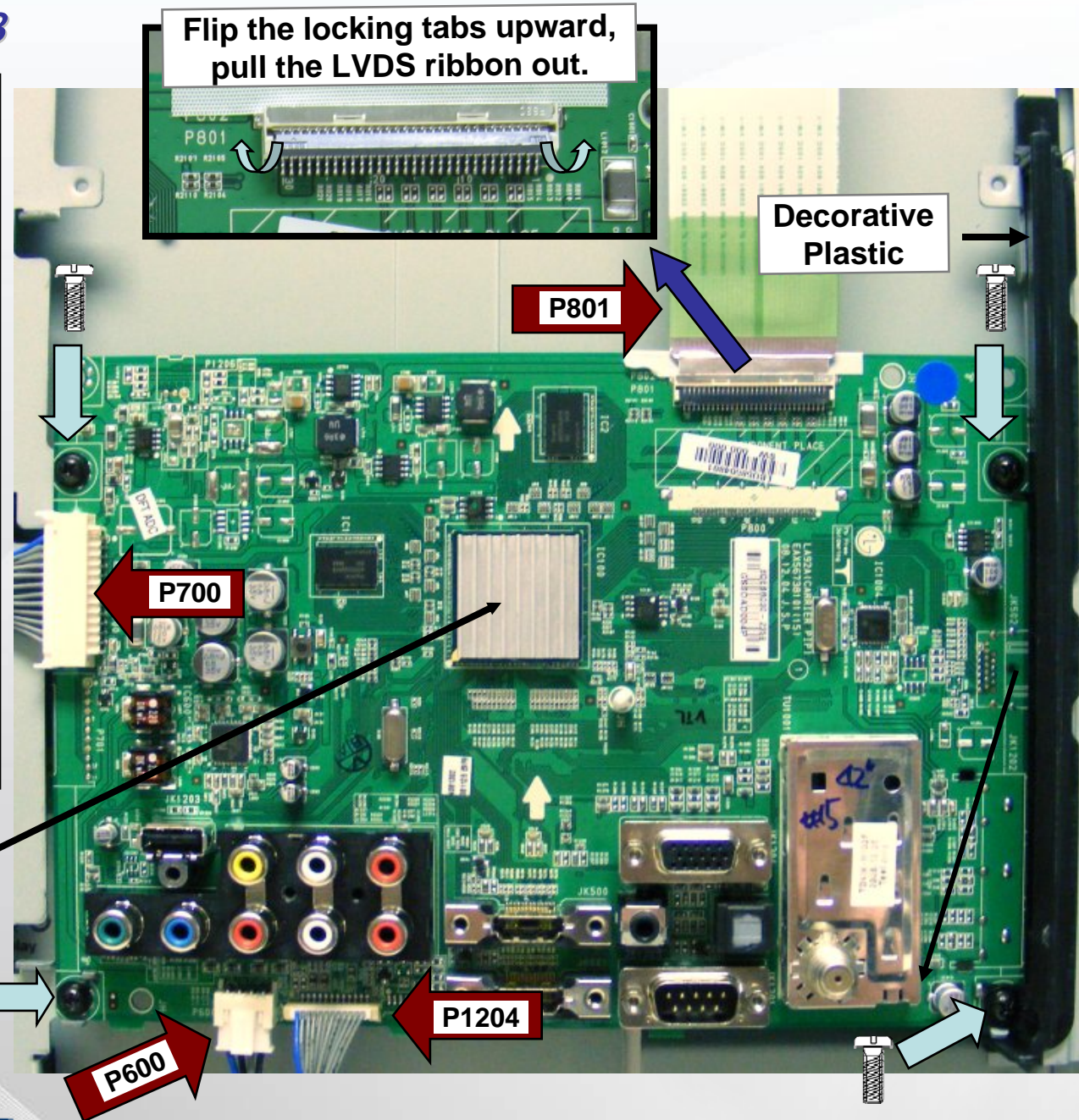
Removing the Main PWB

Remove the one screws at the bottom of the Decorative plastic piece on the right side. Remove the plastic piece.

Remove the two pieces of tape on the left side holding down the cables and the one at the top.

Remove the remaining 11 screws indicated by the arrows.

NOTE: Be sure to check on top and behind the Video Processor IC. Look for a piece of Chocolate (Heat Transfer Material). Be sure to transfer to new PWB if present.



Main PWB Layout

Look carefully on top and behind the Video Processor IC for Chocolate (Heat Transfer) material. Be sure to transfer to new PWB if replaced.

P801 to T-CON PWB

VIDEO PROCESSOR
IC100 RUNS HOT,
THIS IS NORMAL.

P801

To SMPS

P700

SW100
Reset

IC100
Microprocessor
and
Video Processor

X105

LD1000

LD1000
Tuner OK
when
Green

X100

For
Software
Upgrade
via Jig

USB

Tuner
TU1001

To Speakers

P600

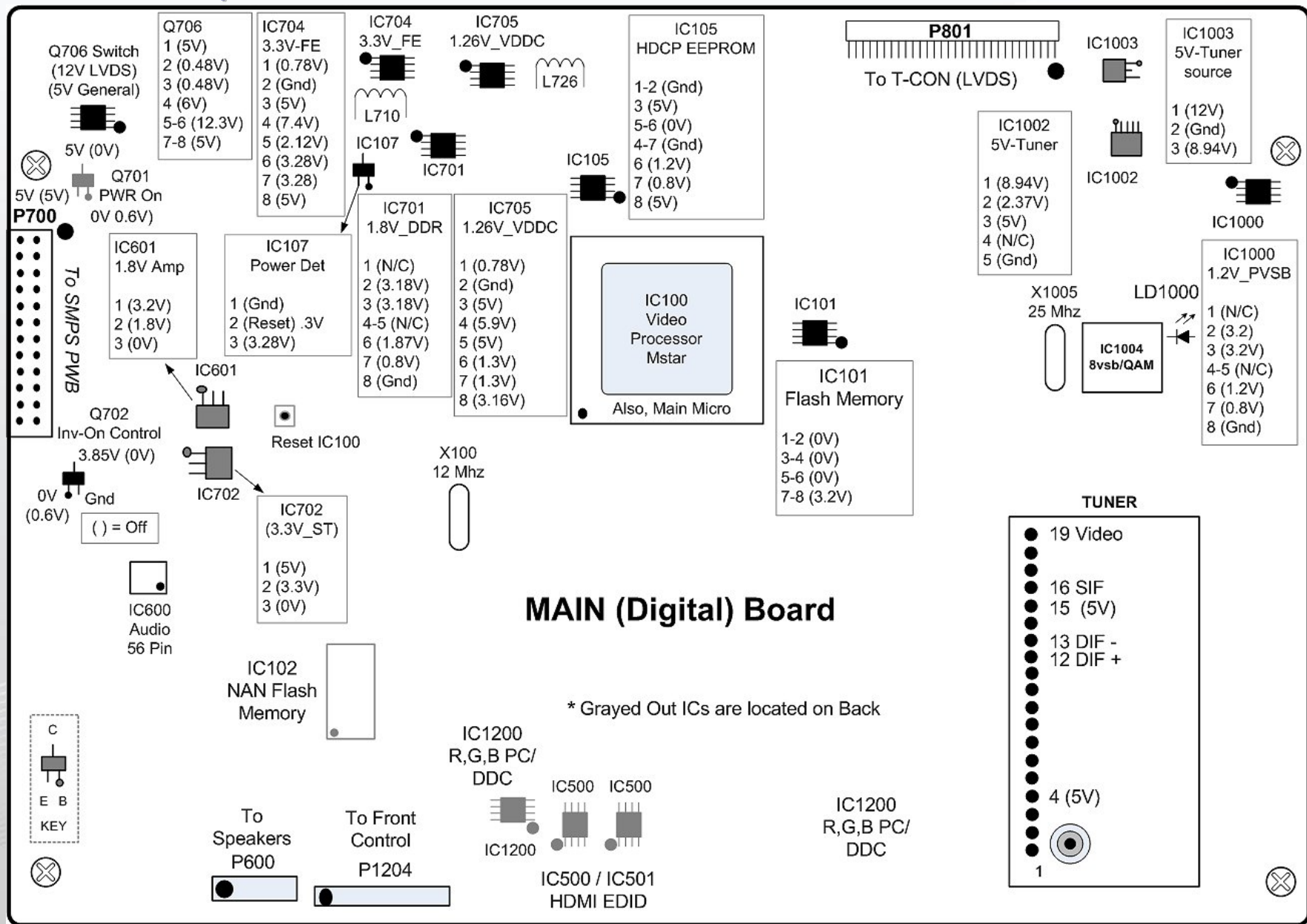
P1204

To Front PWB
Assembly

Voltages given on the 11X17 foldout “Interconnect Diagram”

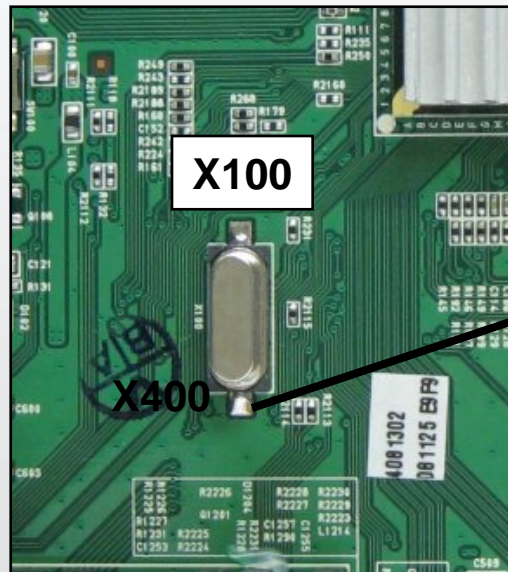


Main PWB Component Identification

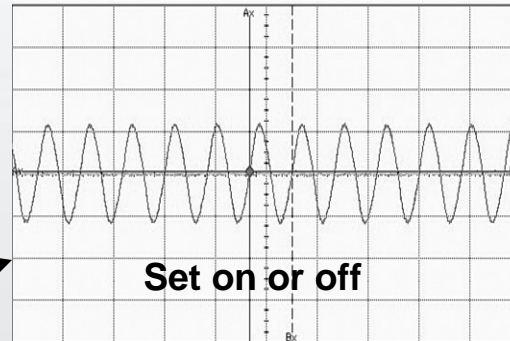


Main PWB X100 and X1005 Check

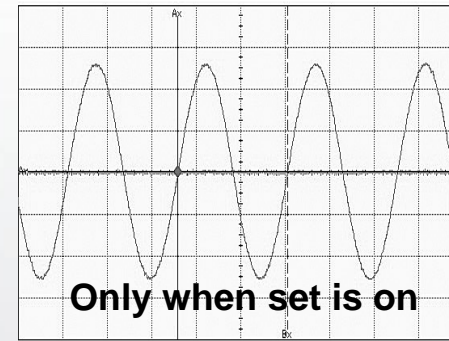
IC100 Microprocessor Crystal



2.28Vp/p
12Mhz

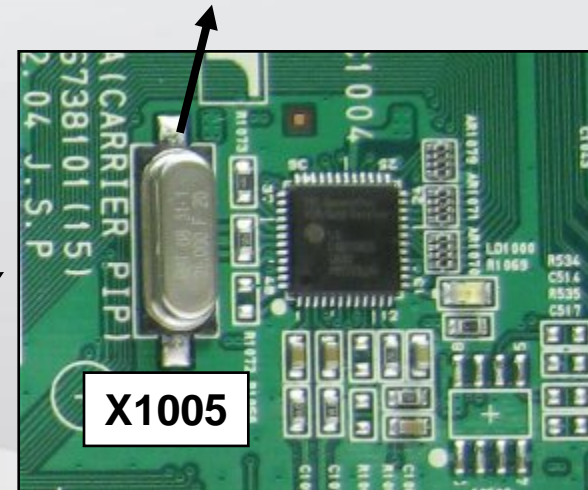
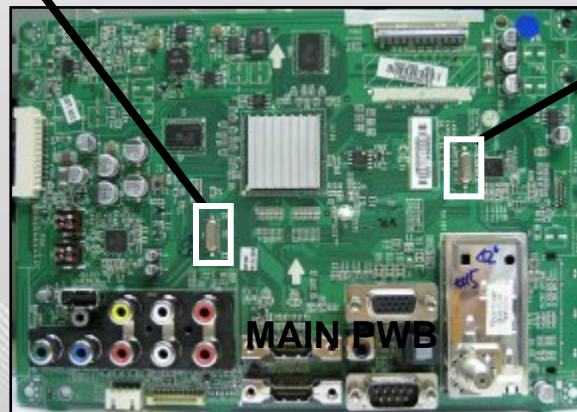


4.95Vp/p
25Mhz



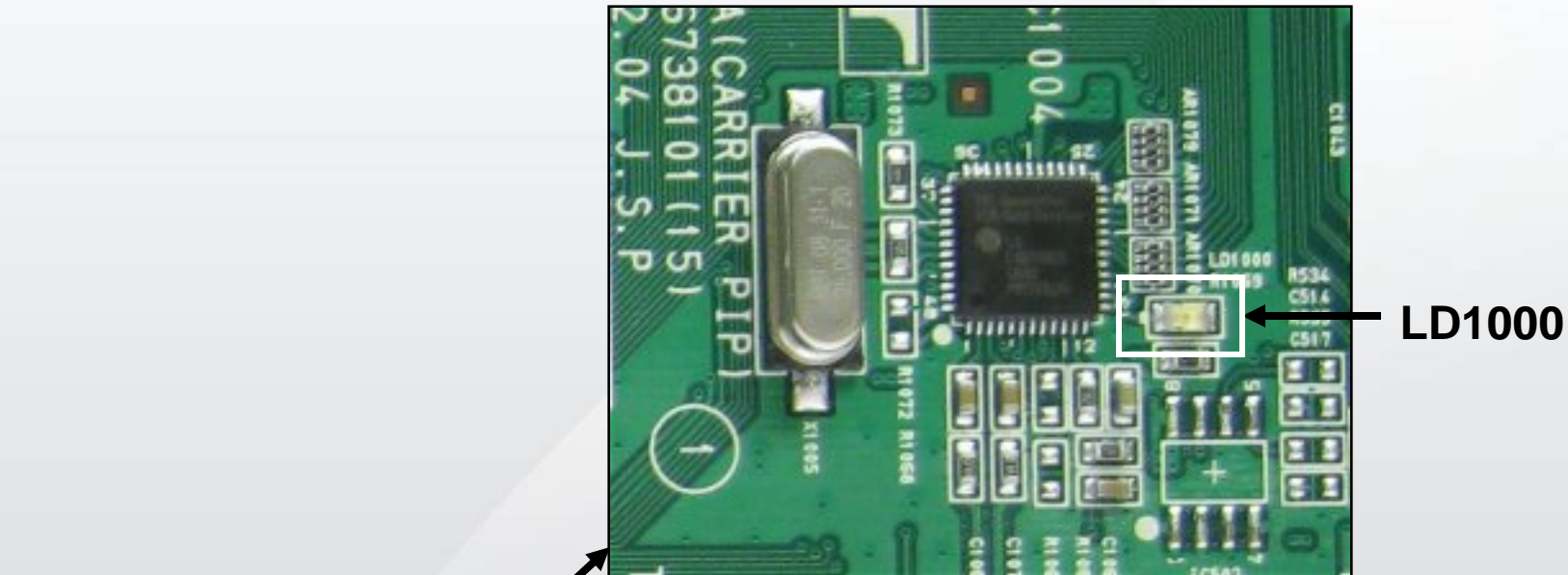
X100
Location

X1005
Location



Tuner Control IC1004 Crystal

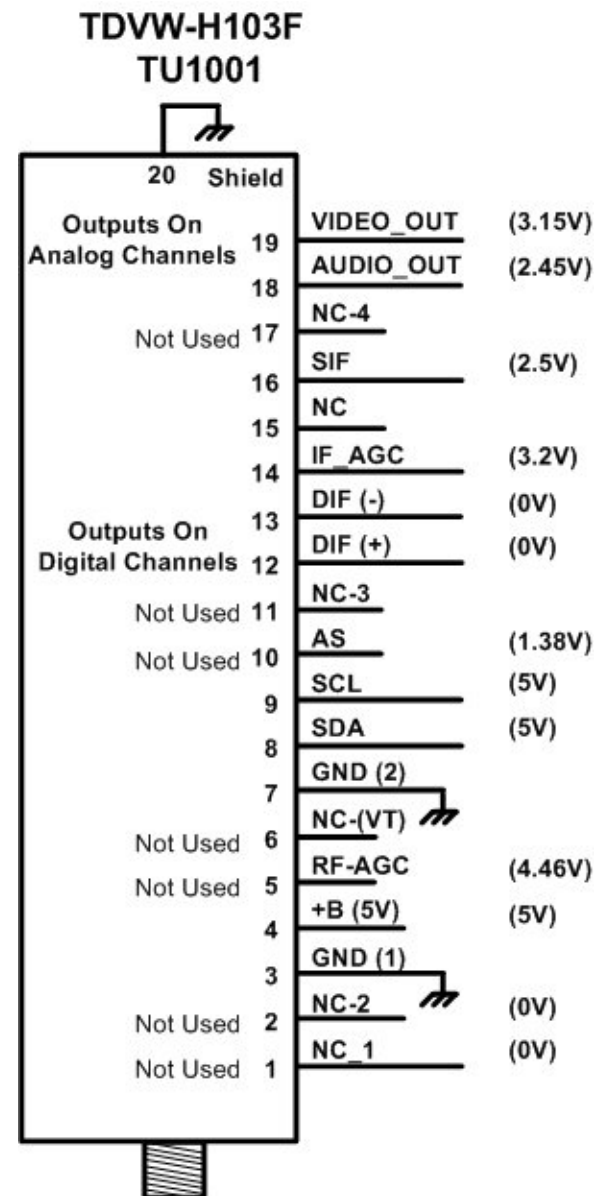
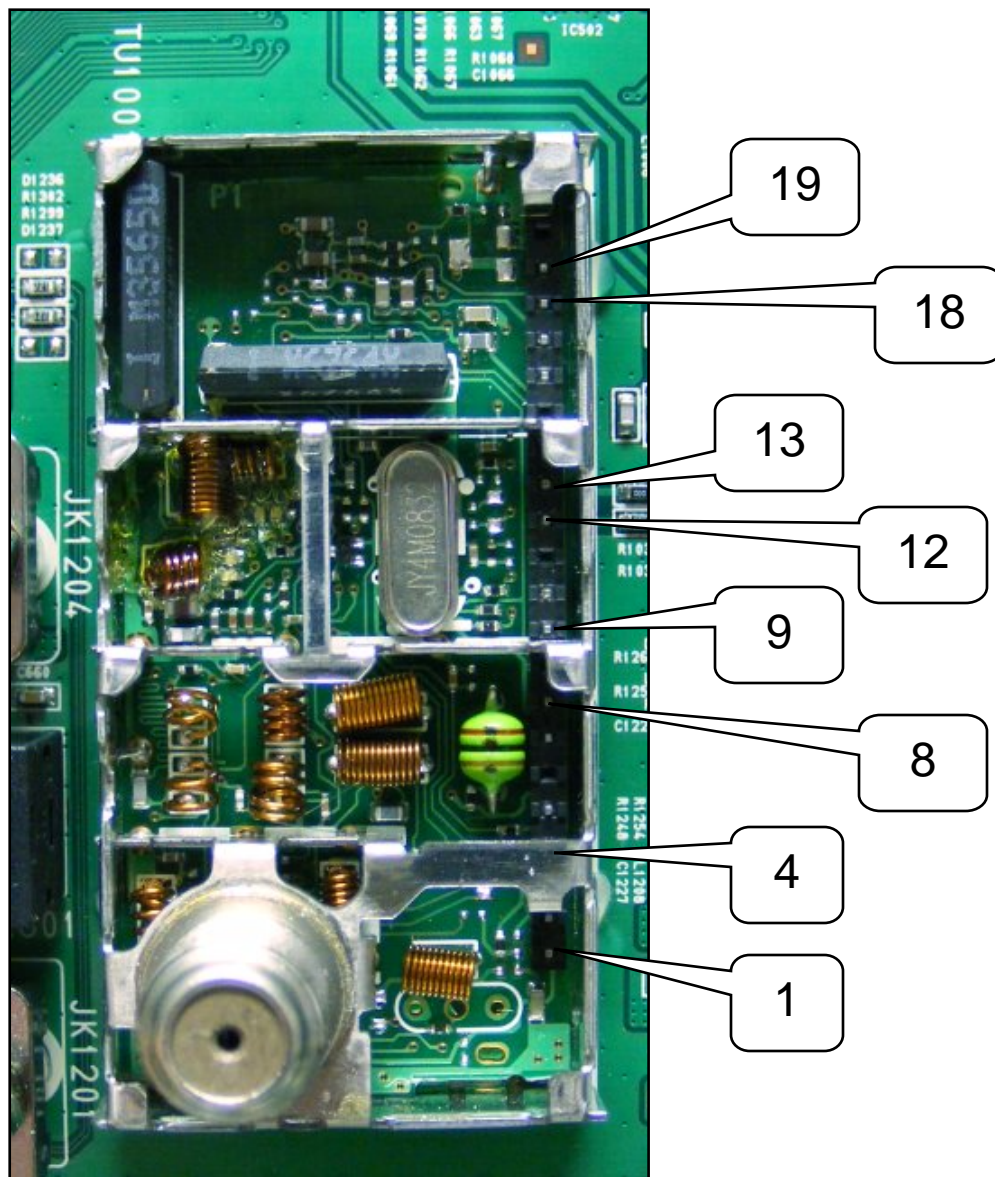
Main PWB LD1000 Function



Main PWB
LD1000 Location
MAIN PWB

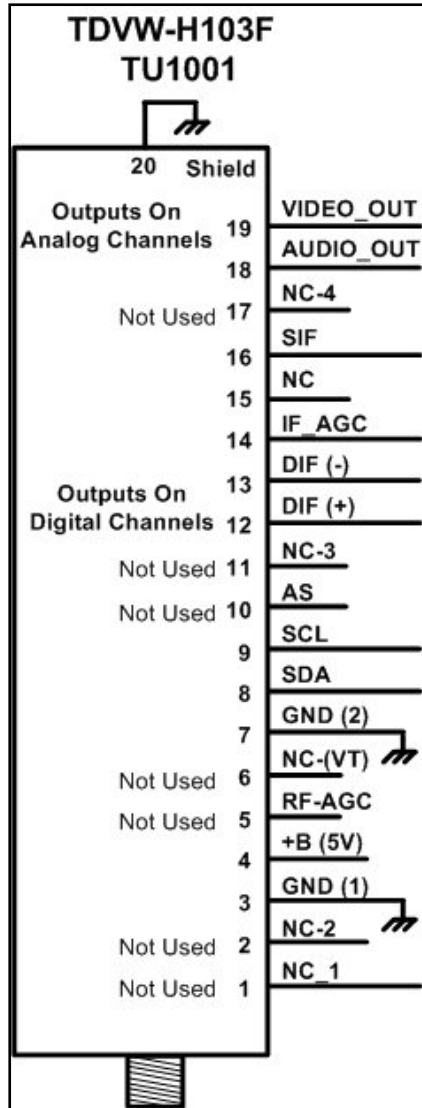
Use LD1000 as a visual aid.
This lets you know if the tuner internal PLL
(Phase Locked Loop) system is locked.
Illuminated PLL is normal.
Off is abnormal tuner lock.

Main PWB Tuner with Shield Off (Pin ID)

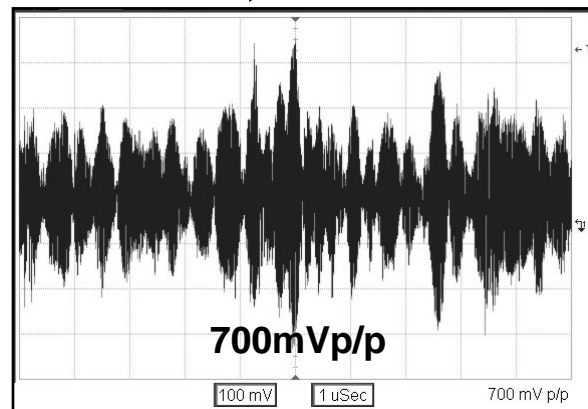
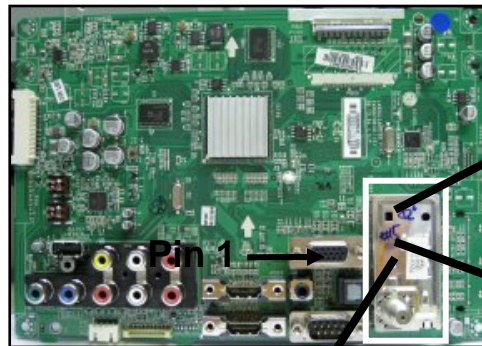


Main PWB Tuner Video and SIF Output Check

USING COLOR BAR SIGNAL INPUT

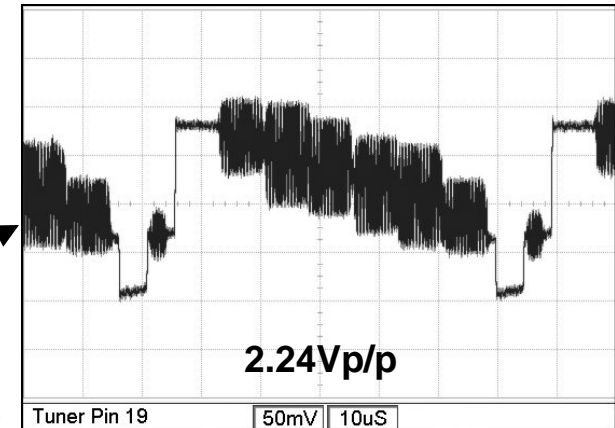


MAIN PWB Tuner Location

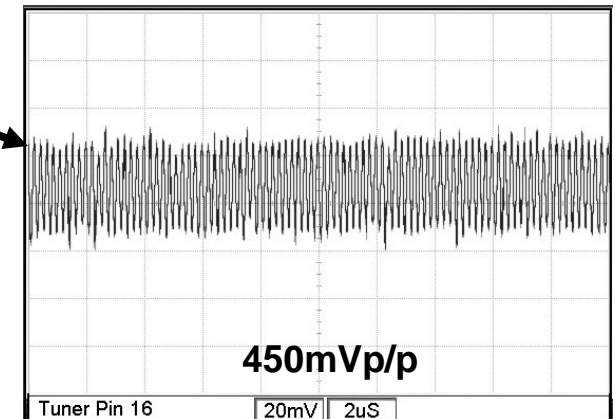


Pin 19 "Video" Signal

Note: "Video Out" Signal only when receiving an analog Channel.



Pin 16 "SIF" Signal



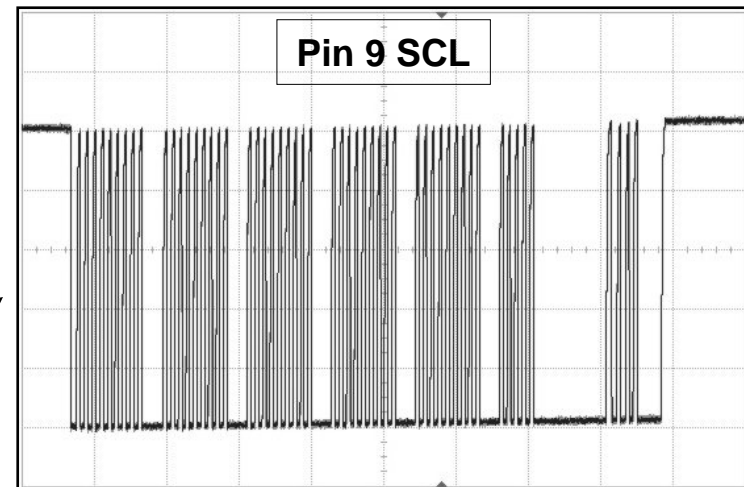
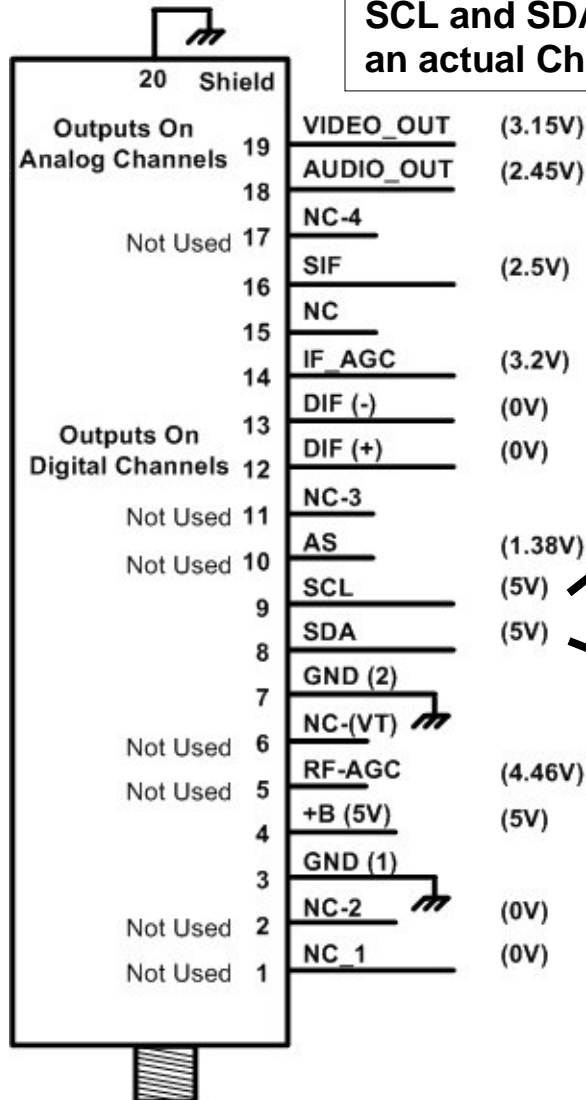
Note:
"Dig IF" Signal only when receiving a Digital Channel.

Main PWB Tuner Clock and Data Lines

TDVW-H103F

TU1001

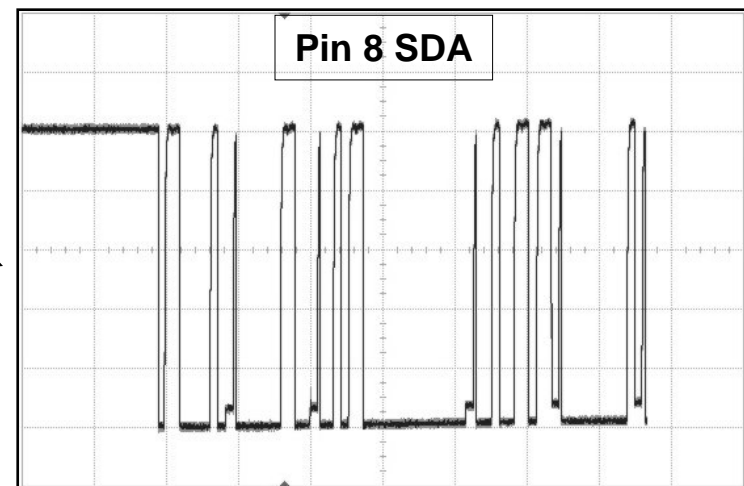
Note:
SCL and SDA only active during
an actual Channel Change.



1V per/div

100uS

5V p/p



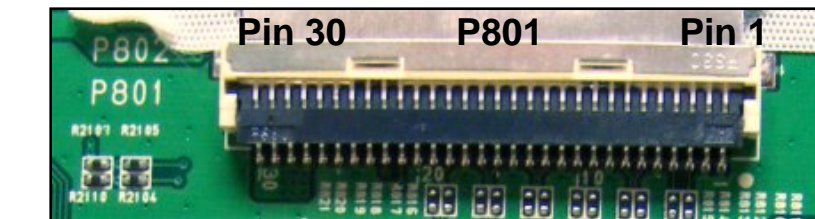
1V per/div

100uS

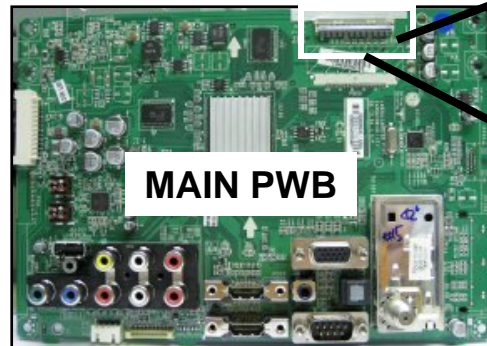
5V p/p

Main PWB LVDS P801 Video Output Check

To confirm that the Main PWB is outputting Picture Content signals, check P801 (LVDS) cable for output. Check pins 6-7, 12-13, 15-16 and 18-19. Pins 9-10 carry the clock. These signals vary from each other, but looking for signals like the ones shown below on any of these pins will confirm the output of video content. This signal is using standard SMTE Color Bar output from a generator as the input source.

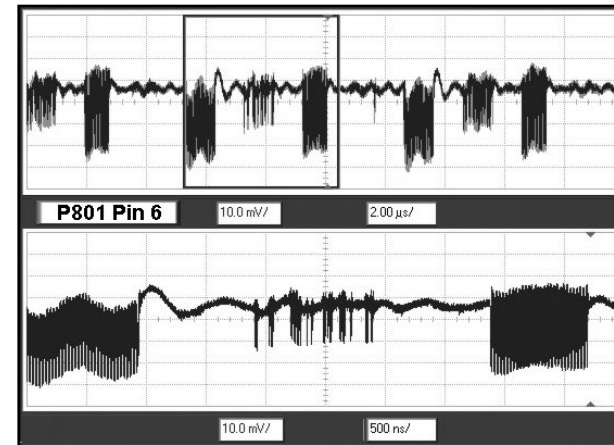


Pin 30, 29, 28, 27 (LVDS 12V)



P801
Location

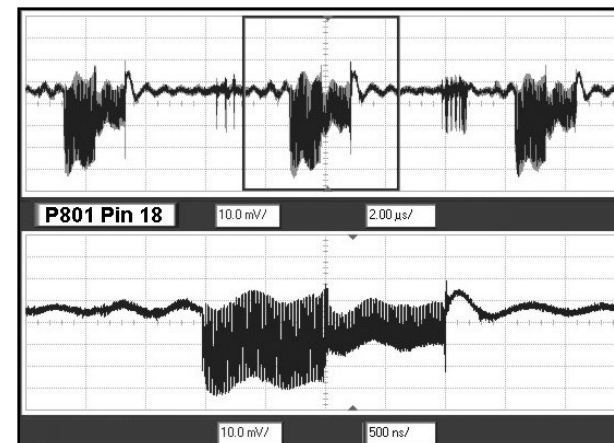
Pin 6



2us

500us

Pin 18

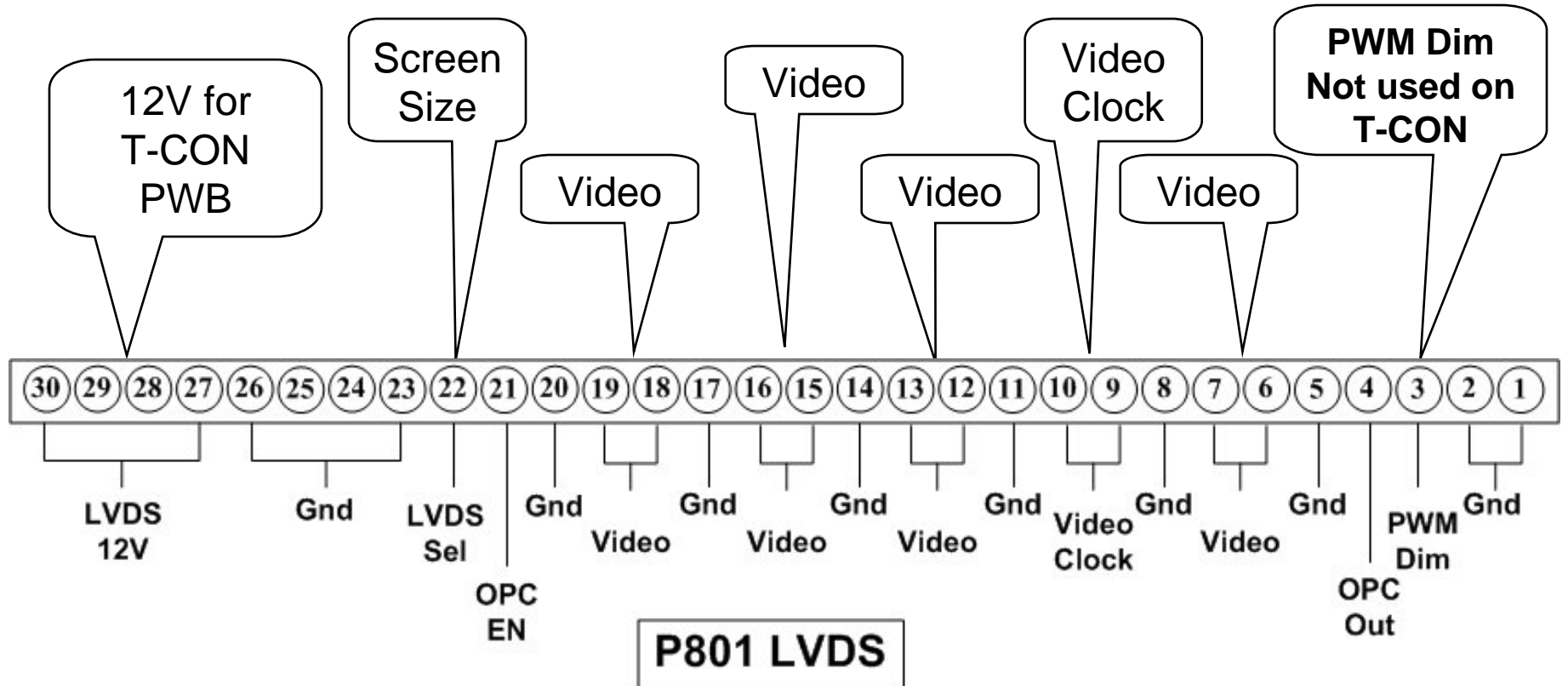
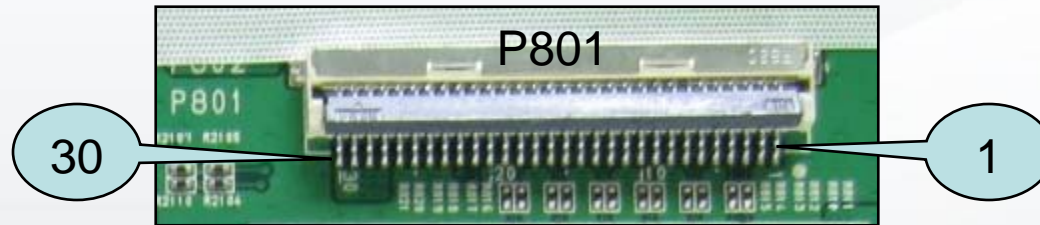


2us

500us

This is just a sample of two pins on the LVDS.
There are 8 pins on P801 carrying video.

Main PWB LVDS Connector P801 Pin Identification



Main PWB Connector P801 to T-CON Voltage and Resistance

Diode Mode values taken with
all Connectors Removed

P801 CONNECTOR "Main" to CN5 "T-CON PWB"

Pin	LABEL	SBY	Run	Diode Check
1	Gnd	Gnd	Gnd	Gnd
2	Gnd	Gnd	Gnd	Gnd
3	*PWM-DIM	0V	3.1V	1.1V
4	OPC-OUT	0V	3.3V	Open
5	Gnd	Gnd	Gnd	Gnd
6	TXA3+	0V	1.2V	1.1V
7	TXA3-	0V	1.2V	1.1V
8	Gnd	Gnd	Gnd	Gnd
9	TXAC+	0V	1.2V	1.1V
10	TXAC-	0V	1.1V	1.1V
11	Gnd	Gnd	Gnd	Gnd
12	TXA2+	0V	1.1V	1.1V
13	TXA2-	0V	1.2V	1.1V
14	Gnd	Gnd	Gnd	Gnd
15	TXA1+	Gnd	1.1V	1.1V

Pin	LABEL	SBY	Run	Diode Check
16	TXA1-	0V	1.2V	1.1V
17	Gnd	Gnd	Gnd	Gnd
18	TXA0+	0V	1.1V	0.8V
19	TXA0-	0V	1.2V	1.1V
20	Gnd	Gnd	Gnd	Gnd
21	OPC-EN	0V	0V	1.1V
22	LVDS-SEL	0V	0V	Open
23	Gnd	Gnd	Gnd	Gnd
24	Gnd	Gnd	Gnd	Gnd
25	Gnd	Gnd	Gnd	Gnd
26	Gnd	Gnd	Gnd	Gnd
27	LVDS 12V	0V	12.1V	1.6V
28	LVDS 12V	0V	12.1V	1.6V
29	LVDS 12V	0V	12.1V	1.6V
30	LVDS 12V	0V	12.1V	1.6V

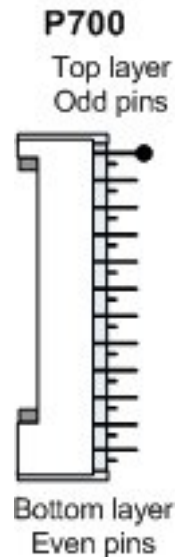
*Pin 3 PWM-DIM 3.15V (Max 100%) to 0.6V (Min 0%)
Customer's Menu Backlight setting. But is Not Used on T-CON.

Main PWB Connector P700 to Power Supply Voltage and Resistance

P700 "Main PWB" to P201 "SMPS PWB"

Odd Pins

Even Pins



Pin	Label	STBY	Run	Diode Check
1	nc	nc	nc	nc
3	Gnd	Gnd	Gnd	Gnd
5	Gnd	Gnd	Gnd	Gnd
7	5V	5.14V	5.14V	1.1V
9	5V	5.14V	5.14V	1.1V
11	Gnd	Gnd	Gnd	Gnd
13	12V	0V	12.3V	2.1V
15	Gnd	Gnd	Gnd	Gnd
17	24V	0V	21.4V	Open
19	nc	nc	nc	nc
21	¹ A.DIM	0V	1.7V	2V
23	nc	nc	nc	nc

Pin	Label	STBY	Run	Diode Check
2	PWR-ON	0V	4.98V	1.87V
4	Gnd	Gnd	Gnd	Gnd
6	Gnd	Gnd	Gnd	Gnd
8	5V	5.14V	5.14V	1.1V
10	5V	5.14V	5.14V	1.1V
12	Gnd	Gnd	Gnd	Gnd
14	12V	0V	12.3V	2.1V
16	Gnd	Gnd	Gnd	Gnd
18	24V	0V	21.4V	Open
20	Inv.Out	0V	3.8V	1.9V
22	Err Out	0V	0V	Open
24	² PDIM	0V	3.2V	Open

¹ADIM Pin 21 Fixed and not used

²PDIM Pin 24 can vary according to type of signal being processed, OSD Backlight setting. 0.6V 0% to 3.3V 100% and the Intelligent Sensor. Output from the BCM chip.

Diode Mode values taken with all Connectors Removed

Main PWB Connector P1204 to (Ft. IR/LED Control) Voltage and Resistance

P1204 CONNECTOR "MAIN PWB" to P1 "Front IR / LED PWB Assy"

Pin	Label	STBY	Run	Diode Check
1	SCL	3.3V	3.3V	1.14V
2	SDA	3.3V	3.3V	1.14V
3	Gnd	Gnd	Gnd	Gnd
4	Key1	3.3V	3.3V	1.08V
5	Key2	3.3V	3.3V	1.08V
6	5V ST	5.1V	5.1V	1.13V
7	Gnd	Gnd	Gnd	Gnd
8	Gnd	Gnd	Gnd	Gnd
9	IR	4.8V	4.8V	Open
10	Gnd	Gnd	Gnd	Gnd
11	3.3V_ST	3.29V	3.29V	0.6V
12	POWER On/Off	0V	3.29V	2.17V

Diode Mode values taken with all Connectors Removed

Main PWB Connector P600 to Speakers Voltage and Resistance

P600 CONNECTOR "Main" to "Speakers"

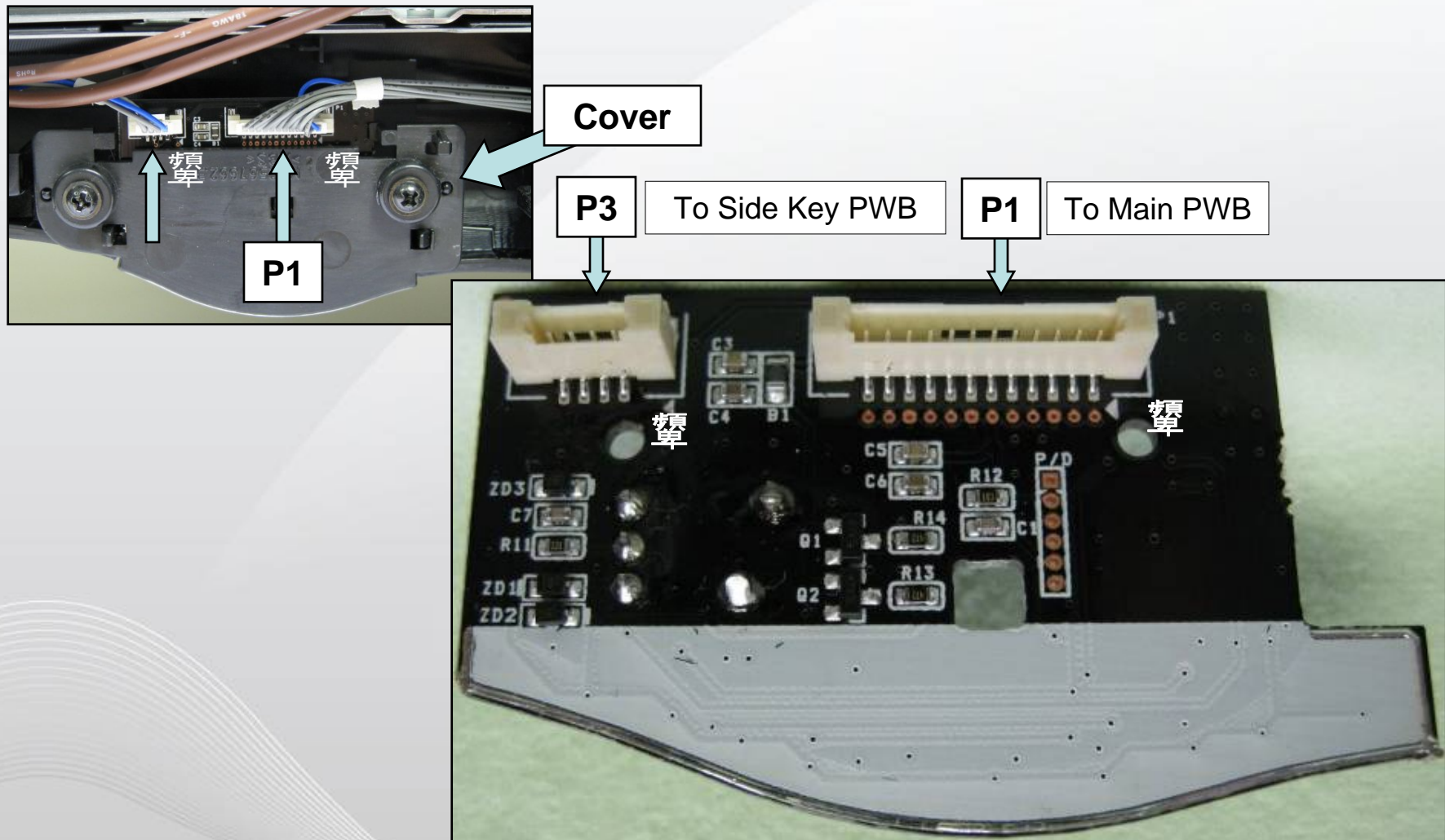
Pin	LABEL	SBY	Run	Diode Check
1	SPK-R(-)	0V	10.7V	1.5V
2	SPK-R(+)	0V	10.7V	1.5V
3	SPK-L(-)	0V	10.7V	1.5V
4	SPK-L(+)	0V	10.7V	1.5V

Use speaker out to test for defective Audio Amp IC600

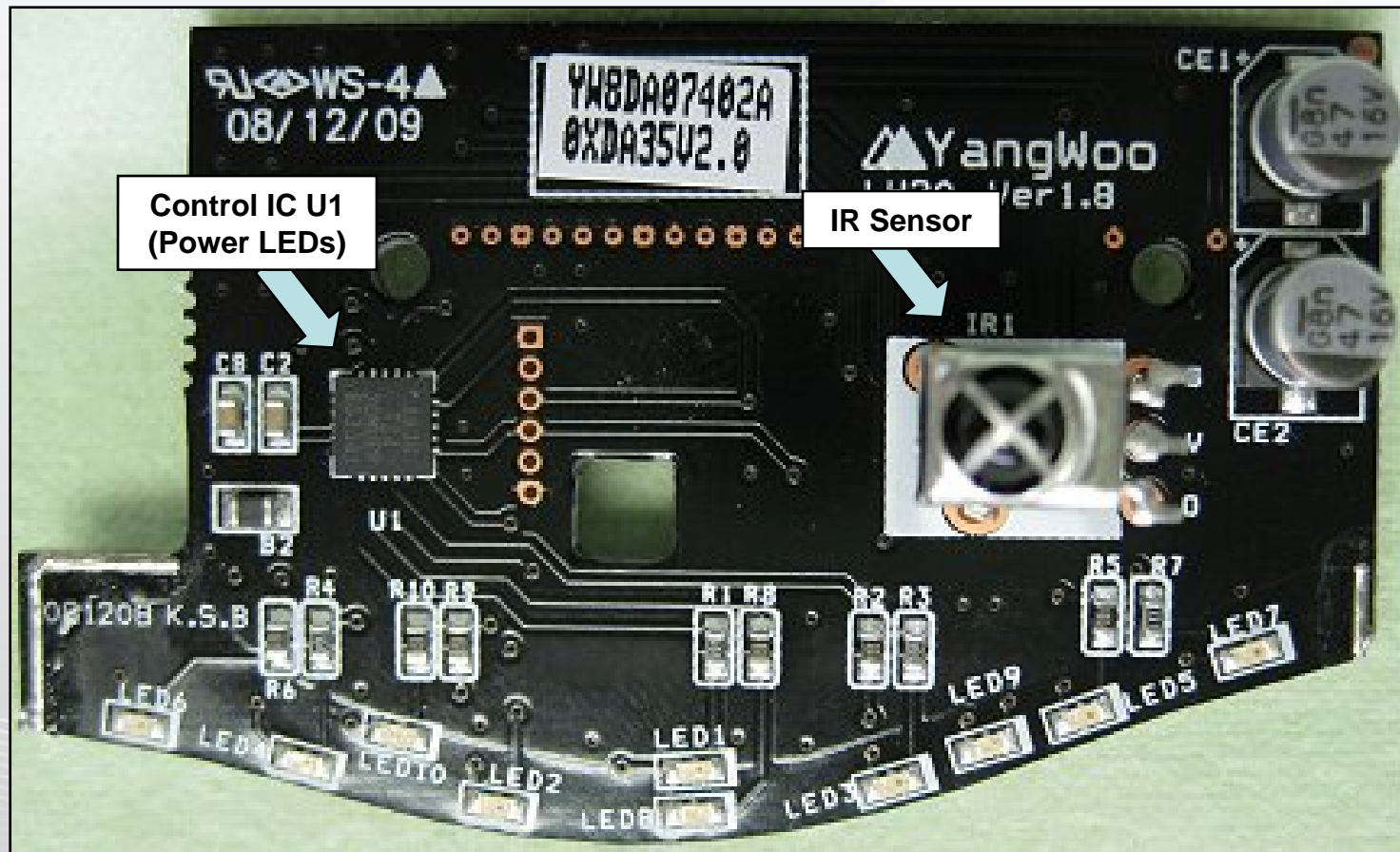
Diode Mode values taken with all Connectors Removed

Front PWB Assembly (IR and LED Control) Layout (Back View)

The IR Sensor and Power LED control IC are located on the front of this PWB



Front PWB Assembly (IR and LED Control) Layout (Back View)



POWER LEDS (LED1 through LED10)

Front IR/LED Control Connector P1 and P3 to Main Voltage and Resistance

**P1 Connector "IR/LED Control PWB"
to "MAIN PWB" P404**

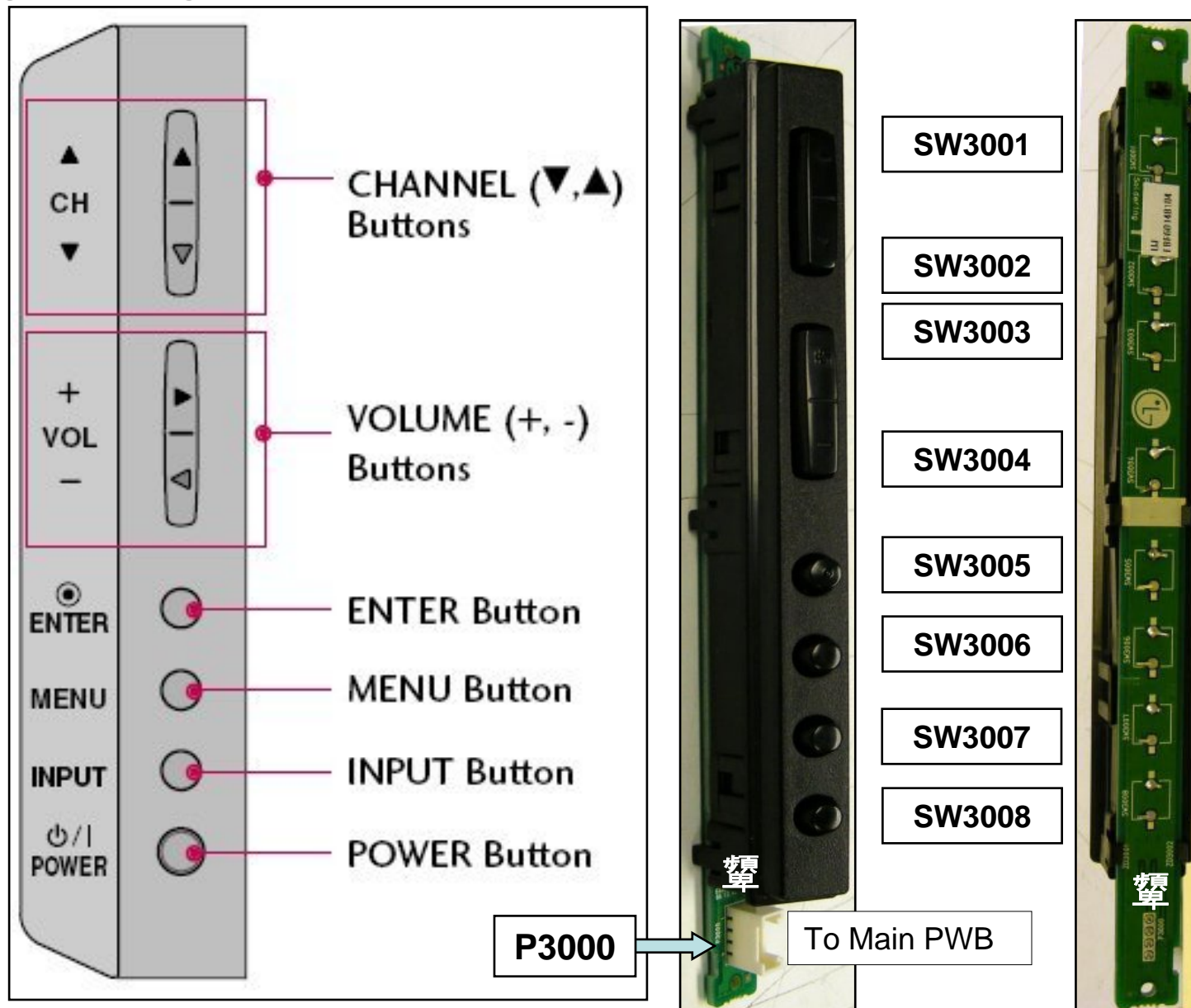
Pin	LABEL	STBY	Run	Diode Check
1	SCL	3.3V	3.3V	2.4V
2	SDA	3.3V	3.3V	2.4V
3	Gnd	Gnd	Gnd	Gnd
4	Key1	3.3V	3.3V	Open
5	Key2	3.3V	3.3V	Open
6	5V ST	5.1V	5.1V	1.5V
7	Gnd	Gnd	Gnd	Gnd
8	Gnd	Gnd	Gnd	Gnd
9	IR	4.8V	4.8V	2V
10	Gnd	Gnd	Gnd	Gnd
11	3.3V_ST	3.29V	3.29V	Open
12	POWER On/Off	0V	3.29V	2V

**P3 Connector "IR/LED Control PWB"
to "Side Key" P3000**

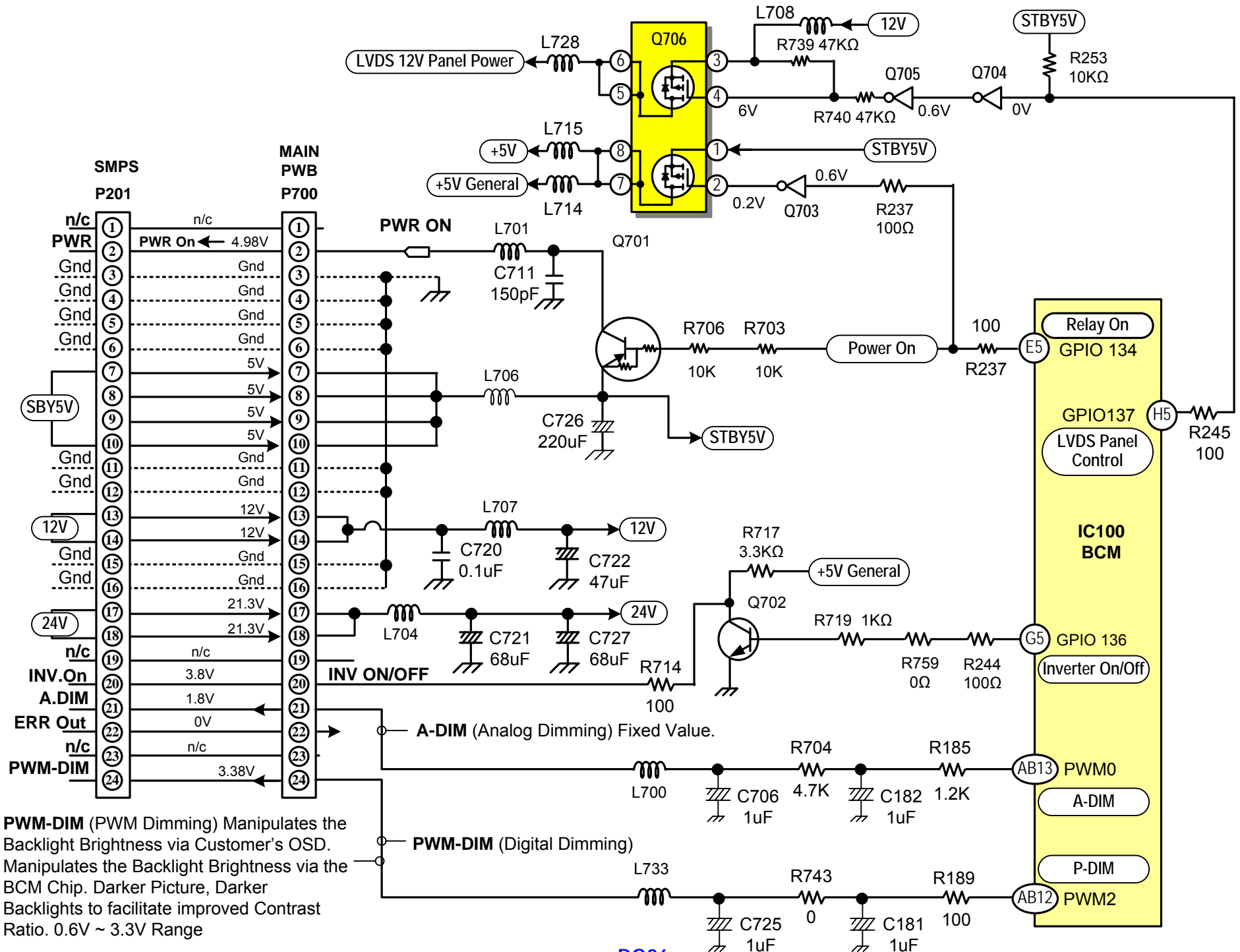
Pin	Label	STBY	Run	Diode Check
1	Key1	3.3V	3.3V	Open
2	Gnd	Gnd	Gnd	Gnd
3	Key2	3.3V	3.3V	Open
4	Gnd	Gnd	Gnd	Gnd

Diode Mode values taken with all Connectors Removed

Side Key Assembly

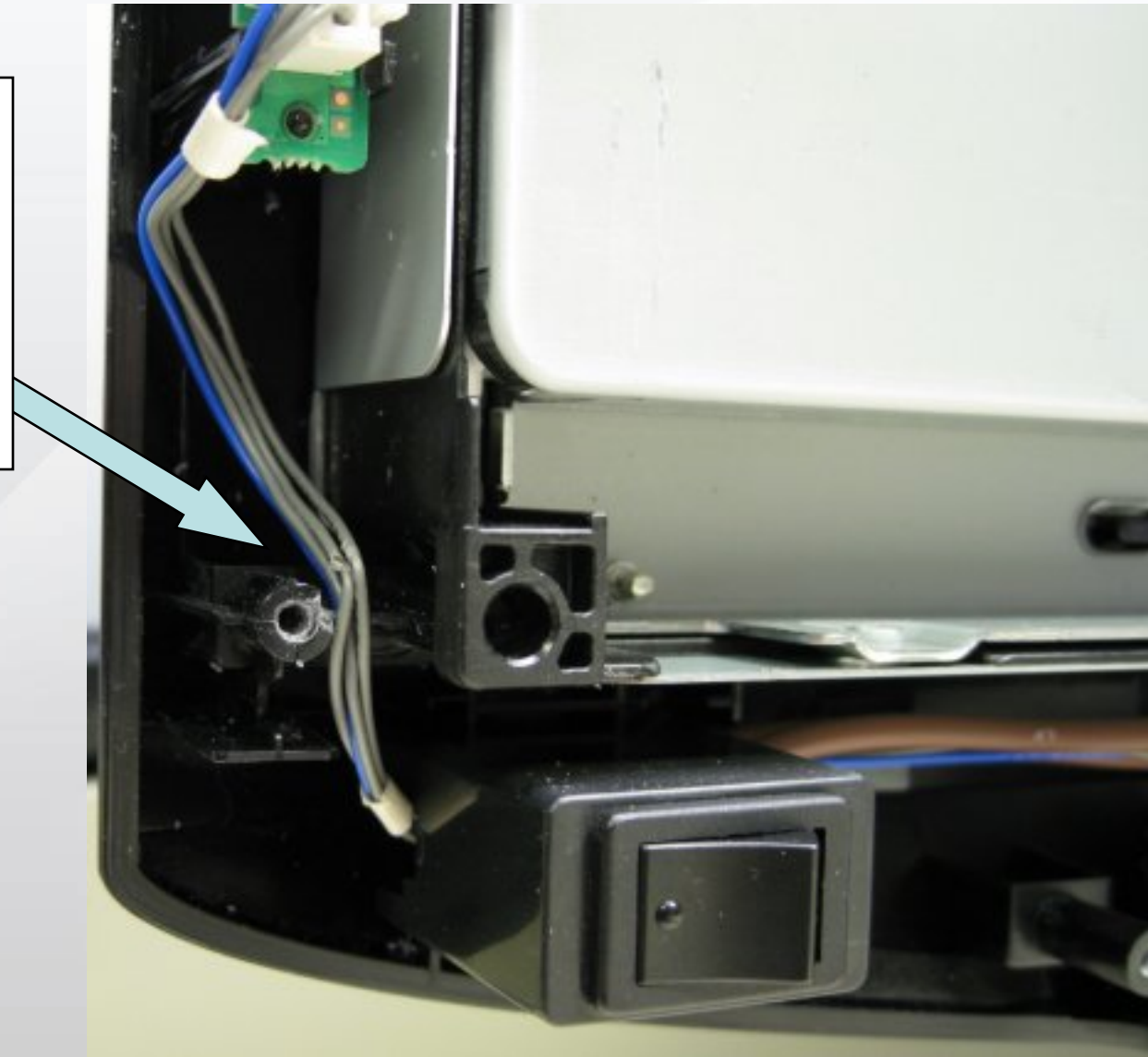


42LH20 P700 ON MAIN PWB TO SMPS P201 TURN ON CIRCUIT



Reassembly Notes:

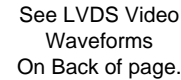
Pay attention to the wire dress for the Side Key PWB. These wires can get pinched between the rear cover and lower left hand screw post. The wires can be dressed to the right of the post in the slot provided.



11 X 17 Foldout Section

This section shows the 11X17 foldout that's available in the Paper and Adobe version of the Training Manual.

Warning:
T-Con PWB under shield. Be sure to reinsert screws
before operating set with shield removed.



Pin	Label	STBY	Run	Diode Check
23	n/c	n/c	n/c	n/c
21	A.DIM	0V	1.7V	Open
19	n/c	n/c	n/c	n/c
17	24V	0V	21.4V	0.71V
15	Gnd	Gnd	Gnd	Gnd
13	12V	0V	12.3V	0.96V
11	Gnd	Gnd	Gnd	Gnd
9	STBY 5V	5.1V	5.14V	1.67 V
7	STBY 5V	5.1V	5.14V	1.67 V
5	Gnd	Gnd	Gnd	Gnd
3	Gnd	Gnd	Gnd	Gnd
1	n/c	n/c	n/c	n/c

Pin	Label	STBY	Run	Diode Check
24	*PWM-DIM	0V	.6V ~ 3.3V	1.68V
22	Err Out	0V	0V	Open
20	INV-On/Off	0V	3.8V	1.6V
18	24V	0V	21.4V	0.71V
16	Gnd	Gnd	Gnd	Gnd
14	12V	0V	12.3V	0.96V
12	Gnd	Gnd	Gnd	Gnd
10	STBY 5V	5.14V	5.14V	1.67 V
8	STBY 5V	5.14V	5.14V	1.67 V
6	Gnd	Gnd	Gnd	Gnd
4	Gnd	Gnd	Gnd	Gnd
2	PWR_ON	0V	4.98V	0.886V

Pin	LABEL	SBY	Run	Diode Check
1	Gnd	Gnd	Gnd	Gnd
2	Gnd	Gnd	Gnd	Gnd
3	*PWM-DIM	0V	3.1V	1.1V
4	OPC-OUT	0V	3.3V	Open
5	Gnd	Gnd	Gnd	Gnd
6	TXA3+	0V	1.2V	1.1V
7	TXA3-	0V	1.2V	1.1V
8	Gnd	Gnd	Gnd	Gnd
9	TXAC+	0V	1.2V	1.1V
10	TXAC-	0V	1.1V	1.1V
11	Gnd	Gnd	Gnd	Gnd
12	TXA2+	0V	1.1V	1.1V
13	TXA2-	0V	1.2V	1.1V
14	Gnd	Gnd	Gnd	Gnd
15	TXA1+	Gnd	1.1V	1.1V

Pin	LABEL	SBY	Run	Diode Check
16	TXA1-	0V	1.2V	1.1V
17	Gnd	Gnd	Gnd	Gnd
18	TXA0+	0V	1.1V	0.8V
19	TXA0-	0V	1.2V	1.1V
20	Gnd	Gnd	Gnd	Gnd
21	OPC-EN	0V	0V	1.1V
22	LVDS-SEL	0V	0V	Open
23	Gnd	Gnd	Gnd	Gnd
24	Gnd	Gnd	Gnd	Gnd
25	Gnd	Gnd	Gnd	Gnd
26	Gnd	Gnd	Gnd	Gnd
27	LVDS 12V	0V	12.1V	1.6V
28	LVDS 12V	0V	12.1V	1.6V
29	LVDS 12V	0V	12.1V	1.6V
30	LVDS 12V	0V	12.1V	1.6V

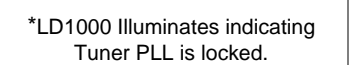
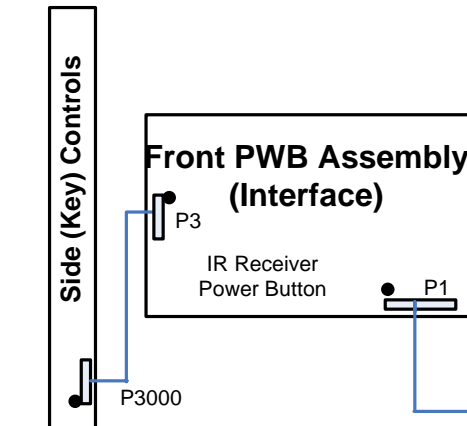
Far left pins 2, 3, 4 AND 5 for CN5 are 12V from Main PWB LVDS 12V Switch.



Pin	Label	STBY	Run	Diode Check	Diode Check
1	KEY 1	3.3V	3.3V	1.1V	Open
2	Gnd	Gnd	Gnd	Gnd	Gnd
3	KEY 2	3.3V	3.3V	1.1V	Open
4	Gnd	Gnd	Gnd	Gnd	Gnd

Pin	Label	Diode Check	Pin	Label	Diode Check
1	n/c	n/c	2	PWR_ON	1.87V
3	Gnd	Gnd	4	Gnd	Gnd
5	Gnd	Gnd	6	Gnd	Gnd
7	STBY 5V	1.1 V	8	STBY 5V	1.1 V
9	STBY 5V	1.1 V	10	STBY 5V	1.1 V
11	Gnd	Gnd	12	Gnd	Gnd
13	12V	2.1V	14	12V	2.1V
15	Gnd	Gnd	16	Gnd	Gnd
17	24V	Open	18	24V	Open
19	n/c	n/c	20	INV-On/Off	1.9V
21	A.DIM	2V	22	Err Out	Open
23	n/c	n/c	24	*PWM-DIM	Open

For Stand-By
and Run
voltages, see
P201 Chart



“Front IR/LED”				P1204 “Main”	P1 “IR/LED”
Pin	Label	STBY	Run	Diode Check	Diode Check
1	SCL	3.3V	3.3V	1.14V	2.4V
2	SDA	3.3V	3.3V	1.14V	2.4V
3	Gnd	Gnd	Gnd	Gnd	Gnd
4	KEY 1	3.3V	3.3V	1.1V	Open
5	KEY 2	3.3V	3.3V	1.1V	Open
6	5V STBY	5.1V	5.1V	1.13V	1.5V
7	Gnd	Gnd	Gnd	Gnd	Gnd
8	Gnd	Gnd	Gnd	Gnd	Gnd
9	IR	4.8V	4.8V	Open	2V
10	Gnd	Gnd	Gnd	Gnd	Gnd
11	3.3V STBY	3.29V	3.29V	1.0V	Open
12	Power On/Off	0V	3.29V	1.0V	2V

<p>IC101 (Flash Memory) 1-2 (0V) 3-4 (0V) 5-6 (0V) 7-8 (3.2V)</p>
<p>IC105 (HDCP EEPROM) 1-2 (Gnd) 3 (5V) 5-6 (0V) 4-7 (Gnd) 6 (1.2V) 7 (0.8V) 8 (5V)</p>
<p>IC107 (Power Det) 1 (Gnd) 2 (Reset) .3V 3 (3.28V)</p>

IC601 (1.8V Amp) 1 (3.2V) 2 (1.8V) 3 (0V)	1 2 3
Q701 (PWR ON) 1 (0V) 2 (5V) 3 (5V)	1 2 3 4
IC701 1.8V_DDR 1 (N/C) 2 (3.18V) 3 (3.18V) 4-5 (N/C) 6 (1.87V) 7 (0.8V) 8 (Gnd)	5 6 7 8 9 10 11 12

IC702	IC705
(3V, ST)	(1.26V, V _{DDC})
(V)	(1 (0.78V))
(3V)	2 (Gnd)
(V)	3 (5V)
	4 (5.9V)
04	5 (5V)
(V-FE)	6 (1.3V)
(.78V)	7 (1.3V)
(Gnd)	8 (3.16V)
(4V)	
(.12V)	Q706 Switch
(.28V)	(12V LVDS)
(.28)	(5V General)
(V)	1 (5V)
	2 (0.48V)
02	3 (0.48V)
(ON)	4 (6V)
(.6V)	5-6 (12.3V)
(.82V)	7-8 (5V)
(Gnd)	

<p>IC1000 (1.2V_PVSB)</p> <p>1 (N/C)</p> <p>2 (3.2)</p> <p>3 (3.2V)</p> <p>4-5 (N/C)</p> <p>6 (1.2V)</p> <p>7 (0.8V)</p> <p>8 (Gnd)</p>	<p>IC1003 (5V-Tuner source)</p> <p>1 (12V)</p> <p>2 (Gnd)</p> <p>3 (8.94V)</p>
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42LH20 LVDS P801 WAVEFORMS

