



AKAI

COLOUR TV SET

Models:

14CT12

15CT22FS

21CT12SR

21CT06FS

29CT06FS

29CT42FSN

29CT42FSQ

SERVICE MANUAL

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1 Technology Specification and Feature

I²C Bus Control

Auto Search

Off/On Timer, Sleep timer

AV Stereo

High Contrast CRT

System:	RF	PAL B/G	SECAM D/K
	AV	PAL	NTSC 3.58/4.43

Channel coverage:	VHF Low channel (VL)	= 48.25 to 147.25 MHz
	VHF high channel (VH)	= 154.25 to 463.25 MHz
	UHF channel (U)	= 471.25 to 863.25 MHz
	IF	38.9MHz

External input/output Video/Audio(L/R) 1set input at side

2. The survey

Table 1, the main IC and functions

Number	Function	IC	Remark
1	Power supply	KA5Q0765RT	N501
2	CPU + SIGNAL PROCESSER	TDA93x1	N301
3	Field driver	LA78040/STV9302A	N401
4	Sound processor	TDA9859	N122
5	Sound driver	AN17821A	N161
6	AV SWITCH	TC4052BP	N801 (Video)
7	Memory	AT24C08	N702
8	Photo-coupler	HS817B	N504
9	IR-receiver	HS0038A	U701
10	8V Regulator	L7808CV	N503
11	5V Regulator	L7805CV	N505

3. The main chips instruction

1. TDA93X1

The UOC (“Ultimate One Chip”) TDA93X1

is adopted in this chassis. This IC is the first available component that contains the complete control and small signal functionality needed for a TV application in one device.

The UOC TDA93X1 pins function description : (total 64 pins)

Pin1: Standby control, “ 1 ” is on, “ 0 ” is off.

Pin2: SCL.

Pin3: SDA.

Pin4: Tuning PWM output.

Pin5: Auto AV control SW/NTSC SW,

Pin6: Key board input.

Pin7: Volume

Pin8: Mute control, “ 1 ” is mute, “ 0 ” is off.

Pin9: Pin12、 Pin18、 Pin30、 Pin35、 Pin41、 Pin55: GND.

Pin10: BAND1 control output.

Pin11: BAND2

Pin12: GND

Pin13: SECAM PLL, connected with a capacitance.

Pin14: +8V power source supply.

Pin15: Using a capacitor of 220n in series to GND, This pin decouples the internal digital supply voltage of the video processor and minimizes the disturbance to the sensitive analogue parts.

Pin16: PHI-2 control loop, this pin requires a capacitor at 2.2nF (C) in series to GND.

Pin17: PHI-1 control loop, the loop filter connected to pin 17 is suitable for various signal conditions like strong/weak and VCR signal. This is achieved by switching of the loop filter time constant by changing the PHI-1 output current.

Pin18: GND.

Pin19: Bandgap decoupling, the bandgap circuit provides a very stable and temperature independent reference voltage. This reference voltage (4.0 V) ensures optimal performance of the analogue video processor part of the N301 and is used in almost all functional circuit blocks.

Pin20: East-west pillow signal output.

Pin21: Pin22 : Vertical drive output.

Pin23: Pin24 : IF input.

Pin25: Reference current, This pin requires a resistor to ground. The optimal reference current is 100mA which is determined by this resistor. The 100mA reference current should not be changed because the geometry processor is optimised for this current. Furthermore the output current of vertical drive and EW are proportional to this current.

Pin26: Vertical sawtooth, This pin requires a capacitor to ground of 100nF

Pin27: AGC output. This output is used to control (reduce) the tuner gain for strong RF signals.

Pin28: Audio de-emphasis.

Pin29: Sound decoupling. This pin requires a capacitor connected to ground. The pin acts as a low pass filter needed for the DC feedback loop.

Pin30: GND.

Pin31: Sound loop filter.

Pin32: AVL filter.

Pin33: Horizontal drive signal output, needs a resistor in series to +8V.

Pin34: Sandcastle output/flyback input,

Pin35: External audio input, this pin should be grounded in this chassis.

Pin36: EHT tracking/ overvoltage protection. If something is wrong, the anode high voltage rises, the heater voltage will rise too. When the rising voltage arrive some limit, the VD461 works, the voltage of pin 36 will exceed 3.9V, the N301 will stop working.

Pin37: PLL loop filter.

Pin38: CVBS output. Monitor or RF videos can be selected.

Pin39: +8V supply source.

Pin40: CVBS input

Pin42: Y signal input.

Pin43: C signal input.

Pin44: Main audio output

Pin45: RGB signal input blanking.

Pin46, Pin47, Pin48: RGB signal input.

Pin49: ABL. It means been current limiter input. The R464 is the control resister.

Pin50: Black current input from the CRT board.

Pin51, Pin52, Pin53: RGB drive signal output to the CRT board.

Pin54: +3.3V.

Pin55: GND.

Pin56: +3.3V.

Pin57, Pin58, Pin59: 12MHz crystal.

Pin60: Reset, NC in this chassis.

Pin61: +3.3V

Pin62: This pin is connected to the HEF4052, Functions expanding.

Pin63: This pin is connected to the HEF4052, Functions expanding.

Pin64: IR signal input.

2 Memory AT24C08 is an E²PROM of 8k, pins describe as follows:

Pin1, Pin2, Pin3, Pin4, Pin7: GND.

Pin8: +5V supply.

Pin5: SDA.

Pin6: SCL.

3 HEF4052 is described as follows: total 16 pins

HEF4052	Pin9	HEF4052	Pin10	STATE
0		0		TV
0		1		AV

Pin8: GND.

Pin16: +5V supply.

4. Signal process

The main chip is N301 TDA93X1 AV control switch HEF4052, sound driver is N101 AN17821A.

The TV signal inputs into the tuner (A101) from CABLE or antenna. The pin 10 and pin 11 of the N301 are combined to select the band. The pin 4 of the N301 outputs the PWM tuning signal. The IF video signal comes from the IF pin of the tuner. The 38.9MHz IF signal is coupled to the V308 (pre-amplify) and then to SAWF (Z301). After processed in the SAWF, the 38.9MHz signal gets to the pin 23 and pin 24 of TDA93X1. The IF circuit in TDA93X1 includes such unit as the AGC amplifying circuit, 38.9MHz oscillator, PLL video demodulator, video amplifier, IF identify circuit and AFT circuit. The demodulated signal (CVBS) comes from the pin 38 of TDA93X1, the sound signal comes from the pin 44. The internal CVBS signal needs norm identification then outputs from the pin 38 of TDA93X1, via the trap-wave circuit (composed of the V351, Z354, Z352) feeds back to the pin 40 of TDA93X1. The RGB signal comes from the pin51, Pin52, Pin53 of TDA93X1, and outputs to the CRT board.

The internal sound signal comes from the pin 44 of TDA93X1, via the coupling capacitor C367 connects to the pin 3 and 5 of TDA9859. The TDA9859 is the audio effect processor, the AN7522N is the driver. The TDA9859 includes bass, treble, balance, surround, effect shortcut options.

Through Synchronous separating circuit, the video signal is divided into horizontal-Synchronizing signal and Vertical-Synchronizing signal. The horizontal-Sync pulse coming from the pin 33 is transferred to the horizontal-drive transistor, and will be used to drive the horizontal-transformer. The horizontal-switch transistor is V451, it and the +B supply drives the flyback transformer to generate the anode high voltage, the focus voltage, the screen voltage, the CRT board drive voltage 180V, the vertical drive voltage 15V and -15V.

The vertical sawtooth wave is generated on the pin 21 and 22, and then enters the vertical output amplifier circuit. The vertical output amplifier circuit is realized with the power amplifier IC –LA78040.

The TDA8177 is a 7 pins vertical deflection circuit (2 Amperes) for DC-coupled 90° or 110° deflection systems with frame frequencies from 50 up to 120 Hz. Only a single supply voltage for the scan and a second supply for the flyback are needed.

The vertical drive currents of N301 pins 21 and 22 are connected to input pins 1 and 7 of the TDA8177. The currents are converted into a voltage by resistor R405. Pin 2 is on a fixed DC level (internal bias voltage, about 2.3V) and on pin 1 the drive voltage can be measured (typical 1.4 Vpp).

The outputs (pins 4 and 7) are connected to the series connection of the vertical deflection coil and feedback resistor R404 and R406. The voltage across R404 and R406. is fed via pin 1 to obtain a deflection current which is proportional to the drive voltage. The supply voltage for the TDA8177 is 17V at pin 3. The flyback generator has a separate supply voltage of V on pin 6. On pin 4 a vertical guard signal is available. For HF loop stability a damping resistor R407 is connected across the deflection coil.

6. Power supply

The IC of KA5Q0765RT is adapted in this chassis; it is the product of Fairchild. It supplies four DC voltages, one is the +B = 110V, another is Hcc = 26V, the third is 13V (the sound drive voltage), the fourth is +16V. The +16V can generate the +8V, +5V and +3.3V by the special generators.

5. IC illustration

Fig.1 TDA93X1 illustration

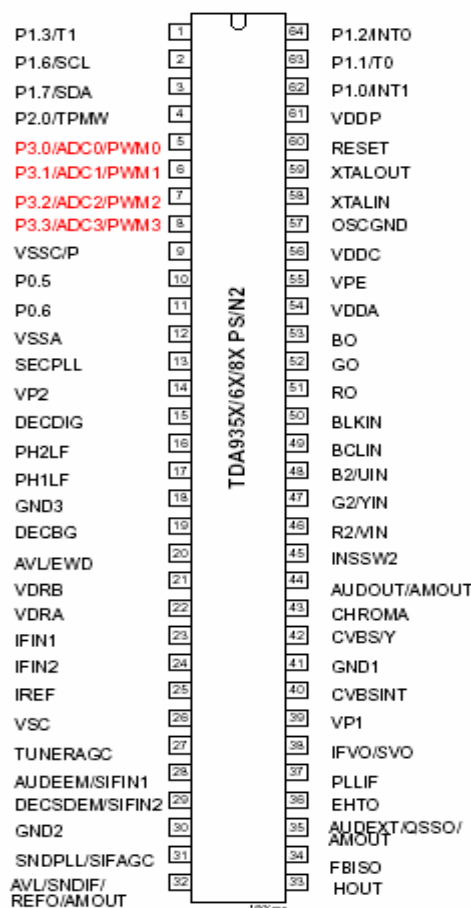
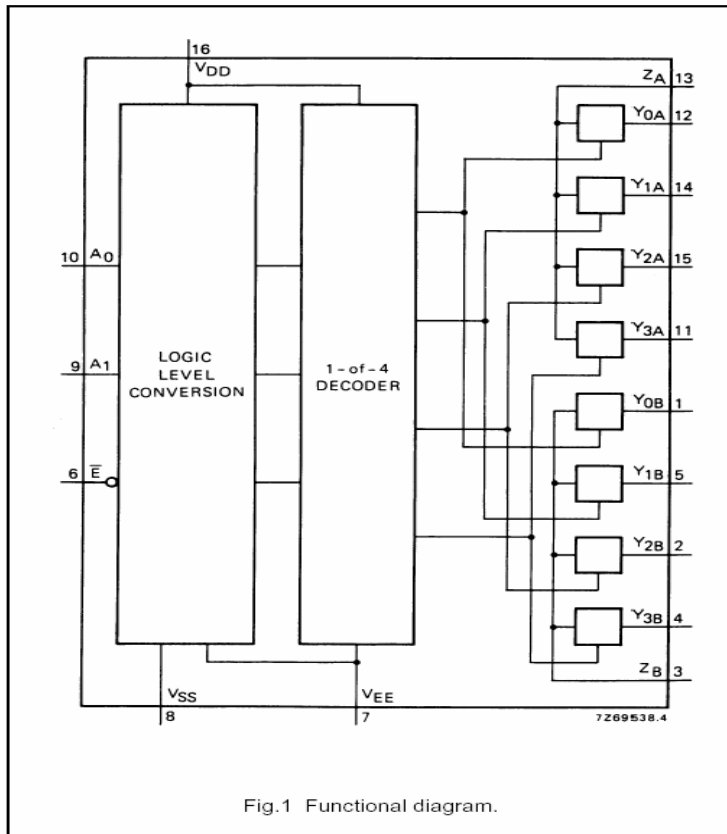


Fig.2 HEF4052BP illustration



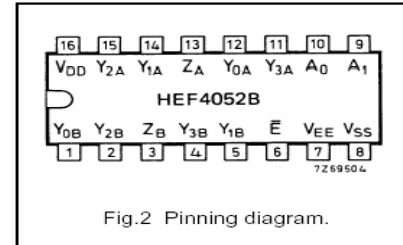
PINNING

Y_{0A} to Y_{3A} independent inputs/outputs
Y_{0B} to Y_{3B} independent inputs/outputs
A₀, A₁ address inputs
 $\bar{E}$ enable input (active LOW)
Z_A, Z_B common inputs/outputs

FAMILY DATA,

I_{DD} LIMITS category MSI

See Family Specifications



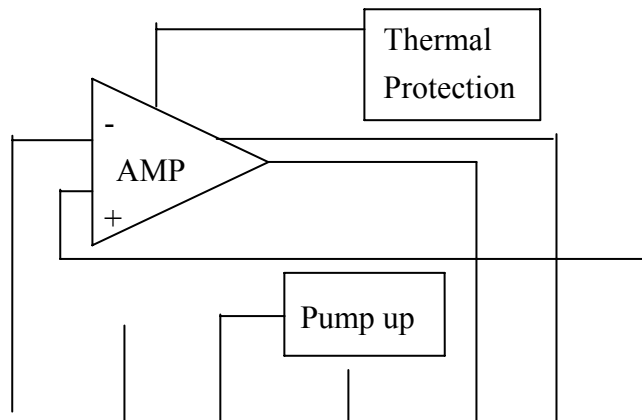
HEF4052BP(N): 16-lead DIL; plastic (SOT38-1)

HEF4052BD(F): 16-lead DIL; ceramic (cerdip) (SOT74)

HEF4052BT(D): 16-lead SO; plastic (SOT109-1)

(): Package Designator North America

Fig. 3 TDA8177 illustration



1 INVERTING INPUT

2 Vcc

3 PUMP UP OUT

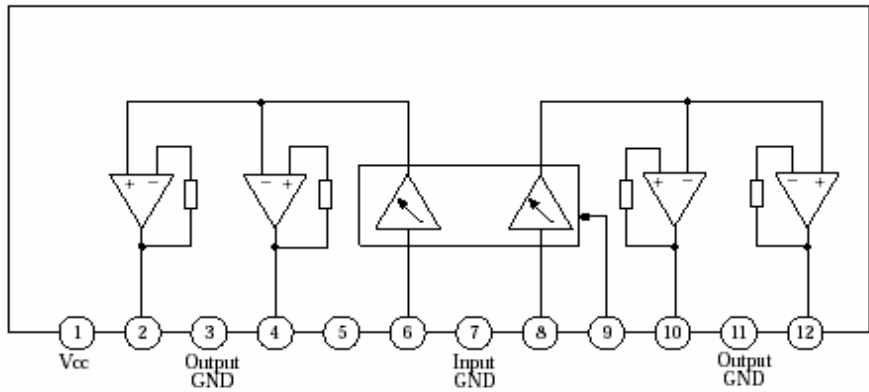
4 GND

5 VER OUTPUT

6 OUTPUT STAGE VCC

7 NON INV.PUT

Fig. 4 AN17821A illustration



Pin Descriptions

Pin No.	Description	Pin No.	Description
1	Vcc	7	GND (Input)
2	Ch.1 Output (+)	8	Ch.2 Input
3	GND (Ch.1 Output)	9	Volume
4	Ch.1 Output (-)	10	Ch.2 Output (-)
5	Standby	11	GND (Ch.2 Output)
6	Ch.1 Input	12	Ch.2 Output (+)

Fig. 5 KA5Q0765RT illustration

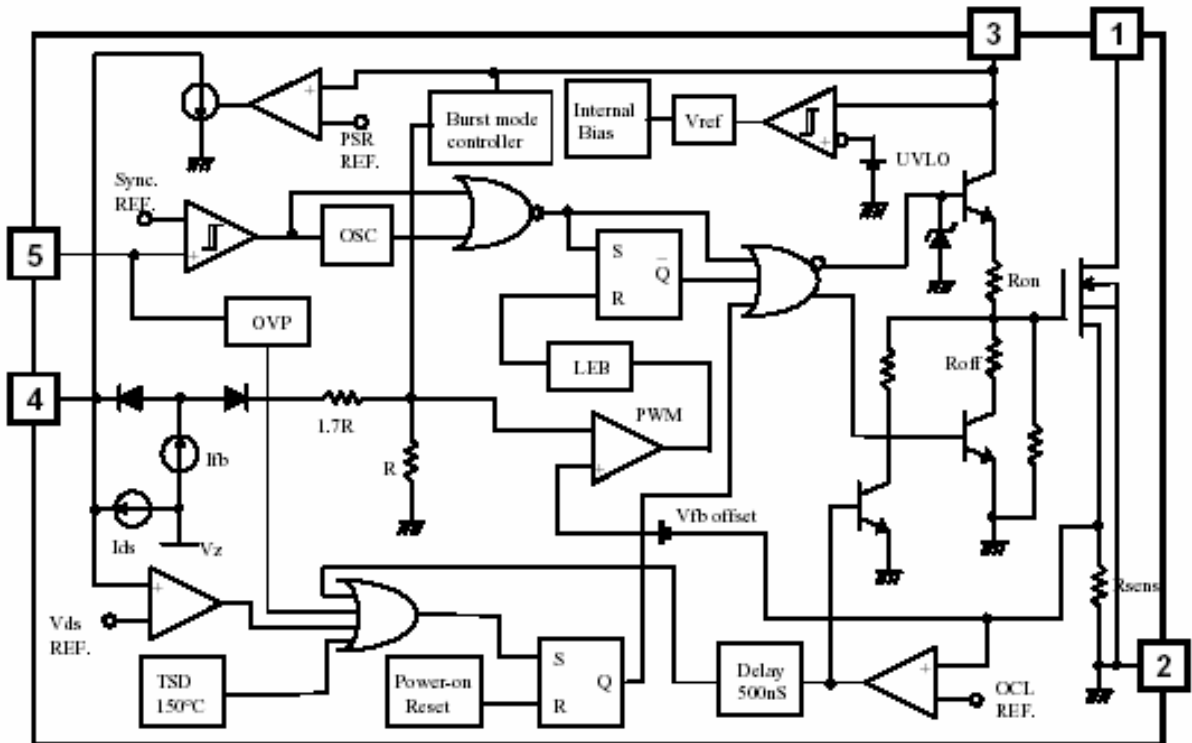
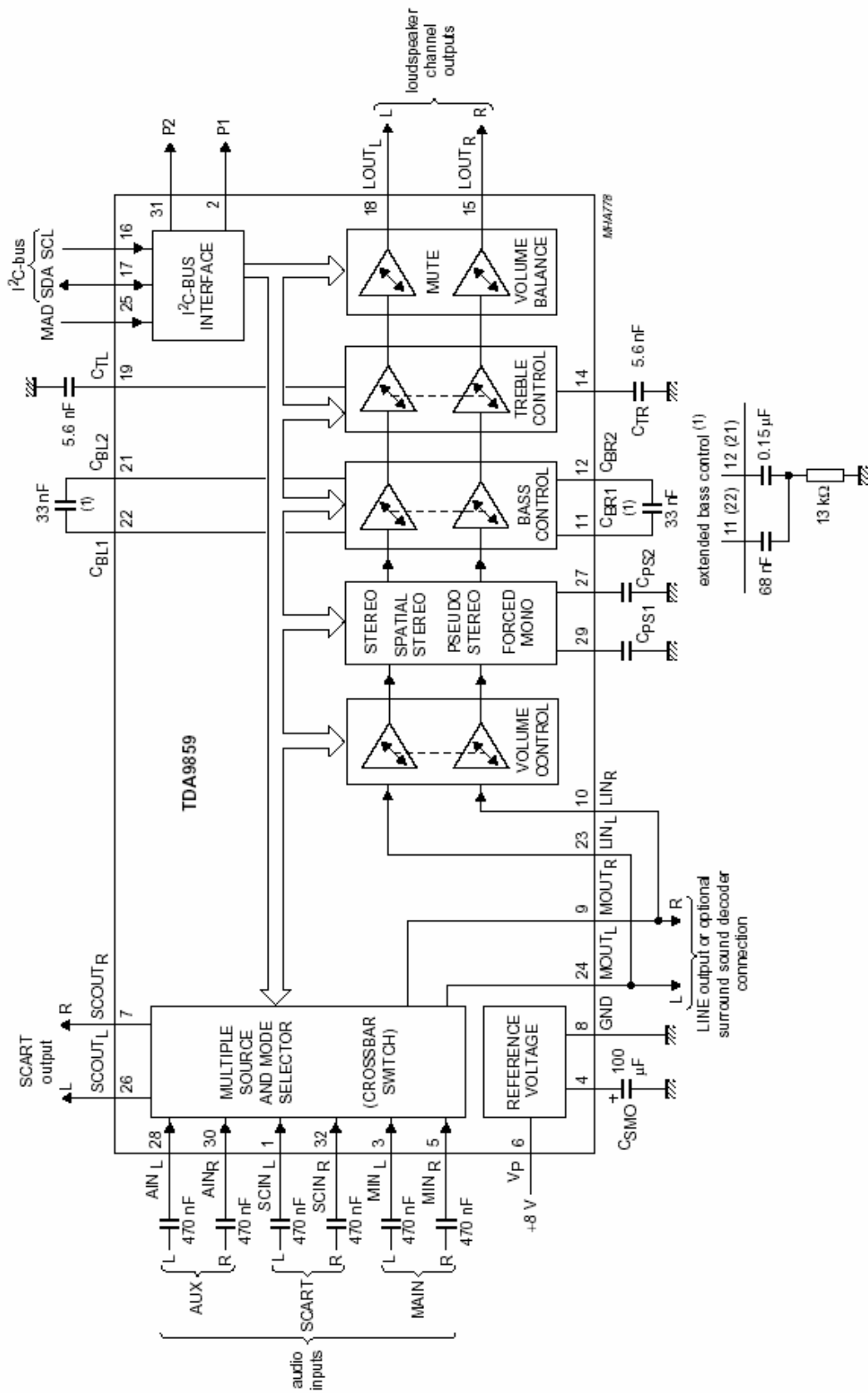


Fig. 6 TDA9859 illustration



(1) For extended bass control, the capacitor between C_{BR1} and C_{BR2} should be replaced by the extended bass control network.

PINNING

SYMBOL	PIN	DESCRIPTION
SCIN _L	1	SCART input; left channel
P1	2	port 1 output
MIN _L	3	MAIN input; left channel
C _{SMO}	4	smoothing capacitor of reference voltage
MIN _R	5	MAIN input; right channel
V _p	6	supply voltage
SCOUT _R	7	SCART output; right channel
GND	8	ground
MOUT _R	9	MAIN output; right channel
LIN _R	10	input to right loudspeaker channel
C _{BR1}	11	bass capacitor connection 1; right channel
C _{BR2}	12	bass capacitor connection 2; right channel
n.c.	13	not connected
C _{TR}	14	treble capacitor connection; right channel
LOUT _R	15	loudspeaker output; right channel
SCL	16	serial clock input; I ² C-bus
SDA	17	serial data input/output; I ² C-bus
LOUT _L	18	loudspeaker output; left channel
C _{TL}	19	treble capacitor connection; left channel
n.c.	20	not connected
C _{BL2}	21	bass capacitor connection 2; left channel
C _{BL1}	22	bass capacitor connection 1; left channel
LIN _L	23	input to left loudspeaker channel
MOUT _L	24	MAIN output; left channel
MAD	25	module address select input
SCOUT _L	26	SCART output; left channel
C _{PS2}	27	pseudo stereo capacitor 2
AIN _L	28	AUX input; left channel
C _{PS1}	29	pseudo stereo capacitor 1
AIN _R	30	AUX input; right channel
P2	31	port 2 output
SCIN _R	32	SCART input signal RIGHT

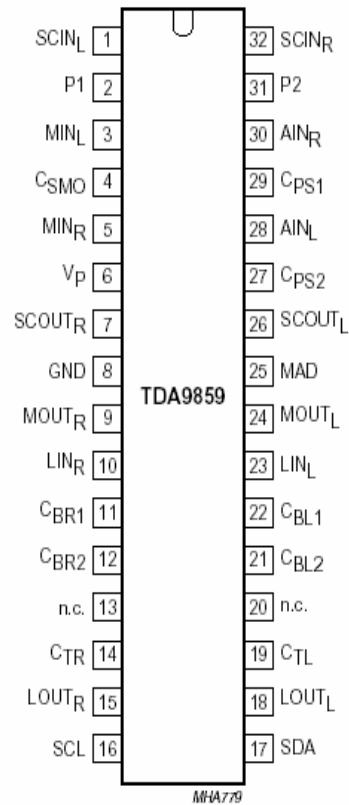


Fig.2 Pin configuration.

6 . adjustment method

Main power +B setting

Receive standard color pattern RF signal, set picture to “ Standard Mode” . Adjust VR501, to get +B (VD631 -) voltage =110 V

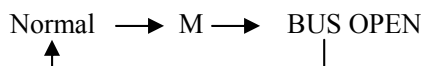
7 . I²C bus control adjustment method: enter and exit factory mode

7.1

1) For remote controller of factory

continuous push [test] key on remote controller, the TV mode will change as follow:

Normal → M → BUS OPEN you can select “M” (factory mode) or “normal” mode.



2) For remote controller of user

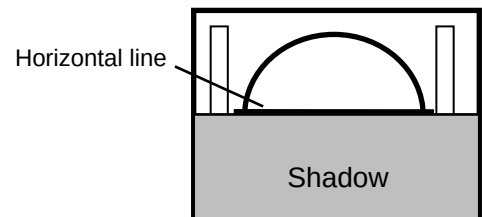
Push [menu] key, → display picture manual → push digital key 8500 → display M.

Push [standby] key , exit factory mode and TV will be standby.

7.2 MENU8 Geometrical adjustment .

Receive standard Crosshatch pattern signal for PAL system .

- 1) Adjust VSLOPE value, to the horizontal line just appear from half bottom shadow.
- 2) Adjust VSHIFT value, the center horizontal line correspond to CRT vertical center.
- 3) Adjust Vamp value, to get 90% of vertical picture contents would be displayed on CRT.
- 4) Adjust HSHIFT value, to get the picture horizontal center correspond to CRT horizontal center.
- 5) Receive standard Crosshatch pattern signal for NTSC system, and again adjust.



7.3 MENU7 AGC-TOP adjustment

Receive 60dBu (1mv)V_H color bar signal, adjust AGC value (voltage from high to low) , to picture noise reduce gradually to be just disappeared.

7.4 MENU9 CRT cut-off and white balance and sub-brightness adjustment.

Receive gray and white 2 steps signal.

a) CRT cut off adjustment.

1. push [▲P+][▼P-] key to select “SC”, push [▶V+][◀V-] key then automatically vertical scan will be stopped.
2. adjust SCREEN control on Flyback transformer to get the darkest single horizontal line (red、 green、 or blue, sometimes shows more yellow、 more purple or more white).
3. push [V+][V-] key again, vertical scan work repeat.

b) white balance adjustment.

1. select RD/BD menu.
2. adjustment RD/BD to get color temperature as x=281, y=311.

c) sub-brightness adjustment (use stair case signal)

1. select SB MENU.
2. adjust SB to get the darkest step being on or off.

7.5 MENU6 Set SHIP MODE

Select "SHIPMODE", push [V+][V-]key may be shipped.

Note::

May increase the screen of FBT current, the darking single ought no flyback line, AV state.

7.6 I²C bus control adjustment item default setting (21 inch)

NTDA93X1 The factory menu constitution

MI	items	variable	preset	remark
M0	AVL	ON/OFF	ON	Automatic volume the electricity is even to limit to choose the switch
	FSL	ON/OFF	OFF	The Forced slicing(the limit) level for vertical syn.
	FMWS	ON/OFF	ON	Window selection of narrow-band sound PLL.
	FFI	ON/OFF	OFF	Fast filter if-PLL.
	OSO	ON/OFF	ON	Switch-off in vertical overscan.
	FCO	ON/OFF	OFF	Compulsory colorful switch of weak signal.
	WOOFER	ON/OFF	OFF	Have the heavy bass function choice switch of hour of TDA9860.
	DUAL OUT	0~1	1	Have the TDA9874 a track companion sound of hour to output.
	Volume mode	0~1	1	One choice of the companion sound curve.
	VOL PIN	OPEN- DRAIN/ PUSH- PULL	PUSH-PULL	The volume control feet output the way choice.
M1	BAND	0~2	1	The tuner wave band control choice.
	AV CFG	0~9	9	The video frequency function install.
	NTSC MX		USA	The NTSC decoding matrix choice.
	VIDEO OUT		CVBS	Have already chosen the video frequency exportation choice. IF: picture in the IF CVBS: output with the screen
	PIN5		RGB	The UOC pin5 function choice.
	PRO	0~3	0	The picture prepares the blunt adjustment.
M2	VISION IF		38.9M	IF chooses in the picture.

	DK	ON/OFF	ON	Companion sound DK make type choice.
	BG	ON/OFF	ON	Companion sound BG make type choice.
	I	ON/OFF	ON	Companion sound I make type choice.
	M	ON/OFF	OFF	Companion sound M make type choice.
	SIF PREFER		BG	Companion sound make type prior choice.
	AUTO SOUND	ON/OFF	ON	The automatic companion sound make type identify
M3	START ON	0~3	1	Switch on the power supply appearance choice, know well to see Note3.
	ENGLISH	ON/OFF	ON	English holds to show the language choice.
	ARABIC	ON/OFF	ON	ARABIC holds to show the language choice.
	PERSIAN	ON/OFF	ON	PERSIAN holds to show the language choice.
	TURKISH	ON/OFF	ON	TURKISH holds to show the language choice.
	FRANCE	ON/OFF	ON	FRANCE holds to show the language choice.
	RUSSIA	ON/OFF	ON	RUSSIA holds to show the language choice.
	Spanish bit	0~1	0	In the diagram text the Spanish character list manifestation switch.
	TXT DEF	0~3	0	The diagram text district constitution switch, know well to see Note1.
	TXT BRI	0~32	8	A constitution of hour of the diagram text appearance.
	TXT LIST	0~1	0	The diagram text fast index function constitution switch. Know well to see the annotation 2 Note2.
M4	SUBCON	0~63	36	Sub contrast.
	SUBCOL	0~63	63	Sub colour.
	SUBSHP	0~63	25	Pay the clear degree regulate.
	SUBTINT	0~63	32	Pay the tone regulate.
	YDLY PAL		14	Regulate when bright degree of PAL postpone.
	YDLY NTSC		5	Regulate when bright degree of NTSC postpone.
	YDLY SEC		14	Regulate when bright degree of SECAM postpone.
	YDLY AV		15	Regulate when bright degree of AV postpone.
	UOC VOL		OFF	The volume switch choice inside the UOC.
	UOC VOL	0~63	50	The volume switch inside the UOC regulate.
	CATHODE	0~15	4	The cathode electricity is even to regulate.
	TDA9874 GAIN	0~32	15	The TDA9874 outputs to increase the benefit to regulate.
	SC BRI	0~63	32	The bright degree of bright line hour of level regulate.
M5	OSD VPOS	0~63	46	OSD high position adjustment.
	OSD HPOS	0~59	17	OSD horizontal position adjustment.

	WIDE	0~63	8	16:9 breadths hold a range regulate.
	ZOOM	0~63	34	Enlarge a range of appearance regulate.
	NENU TITLE	0~6	3	Hold to show a color of the menu headline to regulate.
M6	LOGO		ON	Switch on the LOGO size choice switch..
	LOGO SIZE		1	Greatly switch on constitution switch of LOGO.
	BIG LOGO START		0	Greatly switch on constitution switch of LOGO.
	LOGO COLOUR		0	Switch on the LOGO color constitution.
	LOGO PSITION		0	Switch on character list position of LOGO.
	LOGO CHAR			Switch on the LOGO character list choice.
	SEARCH SPEED		0	Search the speed choice switch.
	SHIPMODE			A constitution with automatic factory.
M7	AGC-TOP	0~63	36	The AGC rises to control to order to regulate.
	AGC-TIME	0~3	1	The AGC constant choice.
	SP1	0~63	15	2 spots of the companion sound curve 1, the recommendation be worth 20.
	SP16	0~63	52	2 spots of the companion sound curve 16, the recommendation be worth 35.
	SP32	0~63	56	2 spots of the companion sound curve 32, the recommendation be worth 45.
	SP48	0~63	58	2 spots of the companion sound curve 48, the recommendation be worth 60.
	START TIME	0~15	6	Switch on time constitution.
M8	VSLOPE	50HZ 34	60HZ 34	hight line position regulate.
	VSHIFT	34	34	hight position regulate.
	VAMP	25	25	Hight range regulate.
	VSCOR	26	26	VS correction.
	HSHIFT	32	32	Horizontal position.
	RGB HS	32	32	YUV or the RGB appearance hour, go the position to regulate.
M9	BT		40	Adjust bright degree of the white balance.
	CT		34	Adjust the white and equilibrium contrast degree.
	SC		OFF	Adjust the bright line.
	RB		32	Red close to give or get an electric shock the even adjustment.
	GB		32	Green close to give or get an electric shock the even adjustment.
	RD		32	Red encourage to give or get an electric shock the even adjustment.

	GD		32	Green encourage to give or get an electric shock the even adjustment.
	BD		32	Blue encourage to give or get an electric shock the even adjustment.
	SB		40	The vice- bright degree adjust.

Note1:

TEXT DEF : TXT_def = 0: Pan_Euro + Cyrillic

= 1: Farsi English + French + Turkish

= 2: Arabic + English + French + Turkish

= 3: UKRAINIAN

Attention:

When TXT_def=0, will appear" the TXT LANGUAGE" in the customer Setup menu, press V+/ V- key," the TXT LANGUAGE" will appear the following circulation: W- TR-> EAST1-> EAST2-> W- TR

The W- TR diagram text includes the following language:

English German Swedish/Fin/Dan/Hungarian Italian French Spanish/Portuguese Turkish

The EAST1 diagram text includes the following language:

Polish German Estonian Slovenian Czech/Slovak Rumanian

The EAST2 diagram text includes the following language:

Polish German Swedish/Fin/Dan/Hungarian Lettish Russian Slovenian Czech/Slovak Estonian

Note 2:

Make use of 4 color keys of the remote control, browse 4 pages of the enactment quickly, namely index function.

The TV/ AV sets the saving key for the index.

While using this function," the TXT LIST" establishes for" ON" in the customer menu.

Example: if want to use the color key of the red quickly 230 pageses of enter the diagram text

The sequence press" TEXT"," red key","2","3","0" on the remote control," TV/ AV"

Note 3:

Switch on the hour appearance constitution

0: connect the AC power, enter to need the machine appearance automatically

1: connect the AC power, automatically switch on appearance

2: connect the AC power, if shut down the appearance as the diagram text appearance, enter the diagram text appearance automatically

