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Service Manual

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PHILIPS

1. Technical Specifications, Connections, and Chassis Overview

Index of this chapter:

Notes:

- Figures can deviate due to the different set executions.
- Specifications are indicative (subject to change).

1.1 Technical Specifications

1.1.1 Vision

Display type	:	CRT, Real Flat
Screen size	:	21” (55 cm), 4:3
Tuning system	:	PLL
Presets/channels	:	100
Tuner bands	:	Full-Cable
TV colour systems	:	PAL B/G, D/K, I (all models)
	:	SECAM B/G, D/K (only /56, /63, and /69)
Video playback	:	NTSC, PAL (all models)
	:	SECAM (only /56, /63, and /69)
Aerial input	:	75 ohm, F-type

1.1.2 Sound

Sound systems	:	Stereo BTSC
Maximum power (W_{RMS})	:	1 x 5 or 2 x 5 (depending on model)

1.1.3 Miscellaneous

Power supply:		
- Mains voltage (V_{AC})	:	100 - 240 (/56 and /94)
	:	180 - 240 (/63, /69, and /79)
- Mains frequency (Hz)	:	50 / 60
Ambient conditions:		
- Temperature range (°C)	:	+5 to +40
- Maximum humidity	:	90% R.H.
Power consumption (values are indicative)		
- Normal operation (W)	:	≈ 70
- Stand-by (W)	:	< 7

1.2 Side and Rear Connections

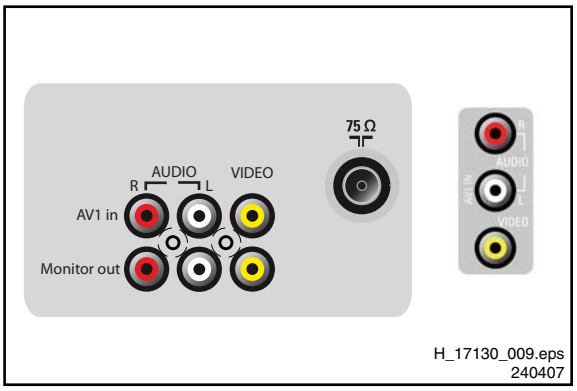

Figure 1-1 Rear and Side I/O connections

Note: The following connector colour abbreviations are used (acc. to DIN/IEC 757): Bk= Black, Bu= Blue, Gn= Green, Gy= Grey, Rd= Red, Wh= White, and Ye= Yellow.

1.2.1 Rear I/O Connections

AV In

Ye - Video (CVBS)	1 V_pp / 75 ohm	
Wh - Audio - L	0.5 V_rms / 10 kohm	
Rd - Audio - R	0.5 V_rms / 10 kohm	

AV Out

Ye - Video (CVBS)	1 V_pp / 75 ohm	
Wh - Audio - L	0.5 V_rms / 10 kohm	
Rd - Audio - R	0.5 V_rms / 10 kohm	

Aerial In

- F-type	Coax, 75 ohm	

1.2.2 Side I/O Connections

AV In

Ye - Video (CVBS)	1 V_pp / 75 ohm	
Wh - Audio - L	0.5 V_rms / 10 kohm	
Rd - Audio - R	0.5 V_rms / 10 kohm	

1.3 Chassis Overview

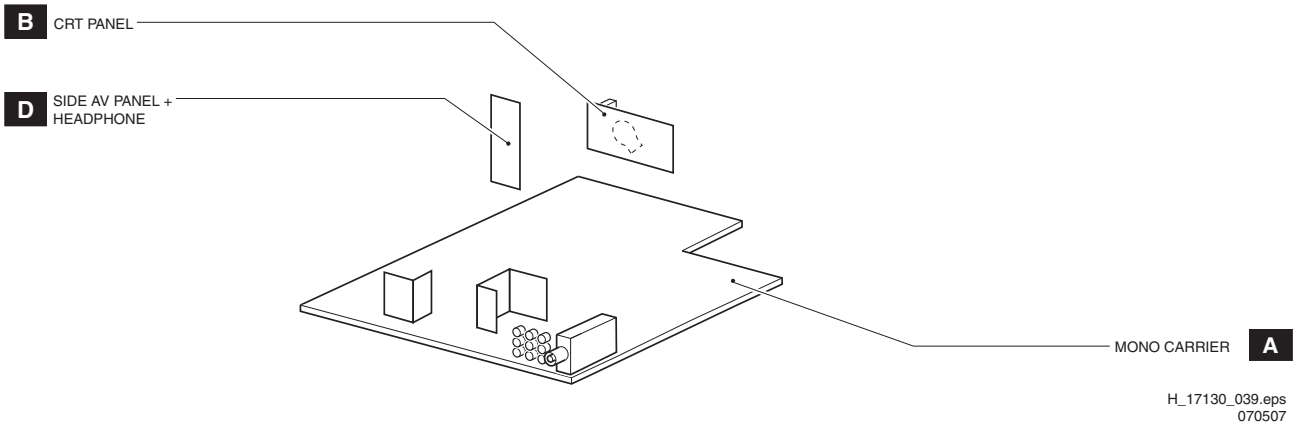

Figure 1-2 PWB/CBA locations (depending on model)

2. Safety Instructions, Warnings, and Notes

Index of this chapter:

2.1 Safety Instructions

Safety regulations require the following **during** a repair:

- Connect the set to the Mains/AC Power via an isolation transformer (> 800 VA).
- Replace safety components, indicated by the symbol ⚠, only by components identical to the original ones. Any other component substitution (other than original type) may increase risk of fire or electrical shock hazard.
- Wear safety goggles when you replace the CRT.

Safety regulations require that **after** a repair, the set must be returned in its original condition. Pay in particular attention to the following points:

- General repair instruction: as a strict precaution, we advise you to re-solder the solder connections through which the horizontal deflection current flows. In particular this is valid for the:
  1. Pins of the line output transformer (LOT).
  2. Fly-back capacitor(s).
  3. S-correction capacitor(s).
  4. Line output transistor.
  5. Pins of the connector with wires to the deflection coil.
  6. Other components through which the deflection current flows.

Note: This re-soldering is advised to prevent bad connections due to metal fatigue in solder connections, and is therefore only necessary for television sets more than two years old.

- Route the wire trees and EHT cable correctly and secure them with the mounted cable clamps.
- Check the insulation of the Mains/AC Power lead for external damage.
- Check the strain relief of the Mains/AC Power cord for proper function, to prevent the cord from touching the CRT, hot components, or heat sinks.
- Check the electrical DC resistance between the Mains/AC Power plug and the secondary side (only for sets that have a Mains/AC Power isolated power supply):
  1. Unplug the Mains/AC Power cord and connect a wire between the two pins of the Mains/AC Power plug.
  2. Set the Mains/AC Power switch to the "on" position (keep the Mains/AC Power cord unplugged!).
  3. Measure the resistance value between the pins of the Mains/AC Power plug and the metal shielding of the tuner or the aerial connection on the set. The reading should be between 4.5 Mohm and 12 Mohm.
  4. Switch "off" the set, and remove the wire between the two pins of the Mains/AC Power plug.
- Check the cabinet for defects, to prevent touching of any inner parts by the customer.

2.2 Maintenance Instructions

We recommend a maintenance inspection carried out by qualified service personnel. The interval depends on the usage conditions:

- When a customer uses the set under normal circumstances, for example in a living room, the recommended interval is three to five years.
- When a customer uses the set in an environment with higher dust, grease, or moisture levels, for example in a kitchen, the recommended interval is one year.
- The maintenance inspection includes the following actions:
  1. Perform the “general repair instruction” noted above.
  2. Clean the power supply and deflection circuitry on the chassis.
  3. Clean the picture tube panel and the neck of the picture tube.

2.3 Warnings

- In order to prevent damage to ICs and transistors, avoid all high voltage flashovers. In order to prevent damage to the picture tube, use the method shown in figure “Discharge picture tube”, to discharge the picture tube. Use a high voltage probe and a multi-meter (position V_{DC}). Discharge until the meter reading is 0 V (after approx. 30 s).

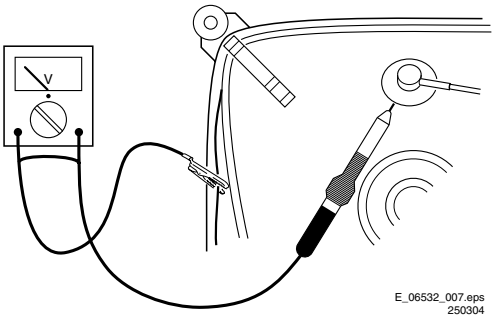

Figure 2-1 Discharge picture tube

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD ⚠). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this same potential.
- Be careful during measurements in the high voltage section.
- Never replace modules or other components while the unit is switched "on".
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and prevents circuits from becoming unstable.

2.4 Notes

2.4.1 General

- Measure the voltages and waveforms with regard to the chassis (= tuner) ground (⏚), or hot ground (⏚), depending on the tested area of circuitry. The voltages and waveforms shown in the diagrams are indicative. Measure them in the Service Default Mode (see chapter 5) with a colour bar signal and stereo sound (L: 3 kHz, R: 1 kHz unless stated otherwise) and picture carrier at 475.25 MHz for PAL, or 61.25 MHz for NTSC (channel 3).
- Where necessary, measure the waveforms and voltages with (⊓) and without (⊼) aerial signal. Measure the voltages in the power supply section both in normal operation (⏻) and in stand-by (⏻). These values are indicated by means of the appropriate symbols.
- The semiconductors indicated in the circuit diagram and in the parts lists, are interchangeable per position with the semiconductors in the unit, irrespective of the type indication on these semiconductors.

2.4.2 Schematic Notes

- All resistor values are in ohms, and the value multiplier is often used to indicate the decimal point location (e.g. 2K2 indicates 2.2 kohm).
- Resistor values with no multiplier may be indicated with either an "E" or an "R" (e.g. 220E or 220R indicates 220 ohm).
- All capacitor values are given in micro-farads (μ= x10^{-6}), nano-farads (n= x10^{-9}), or pico-farads (p= x10^{-12}).
- Capacitor values may also use the value multiplier as the decimal point indication (e.g. 2p2 indicates 2.2 pF).
- An "asterisk" (*) indicates component usage varies. Refer to the diversity tables for the correct values.
- The correct component values are listed in the Spare Parts List. Therefore, always check this list when there is any doubt.

2.4.3 Lead-free Soldering

Due to lead-free technology some rules have to be respected by the workshop during a repair:

- Use only lead-free soldering tin Philips SAC305 with order code 0622 149 00106. If lead-free solder paste is required, please contact the manufacturer of your soldering equipment. In general, use of solder paste within workshops should be avoided because paste is not easy to store and to handle.
- Use only adequate solder tools applicable for lead-free soldering tin. The solder tool must be able:
  - To reach a solder-tip temperature of at least 400°C.
  - To stabilize the adjusted temperature at the solder-tip.
  - To exchange solder-tips for different applications.
- Adjust your solder tool so that a temperature of around 360°C - 380°C is reached and stabilized at the solder joint. Heating time of the solder-joint should not exceed ~ 4 sec. Avoid temperatures above 400°C, otherwise wear-out of tips will increase drastically and flux-fluid will be destroyed. To avoid wear-out of tips, switch “off” unused equipment or reduce heat.
- Mix of lead-free soldering tin/parts with leaded soldering tin/parts is possible but PHILIPS recommends strongly **to avoid** mixed regimes. If this cannot be avoided, carefully clear the solder-joint from old tin and re-solder with new tin.

2.4.4 Alternative BOM identification

The **third digit** in the serial number (example: BF**2**A0635000001) indicates the number of the alternative B.O.M. (Bill Of Materials) that has been used for producing the specific TV set. In general, it is possible that the same TV model on the market is produced with e.g. two different types of displays, coming from two different suppliers. This will then result in sets which have the same CTN (Commercial Type Number; e.g. 28PW9515/12) but which have a different B.O.M. number.
By looking at the third digit of the serial number, one can identify which B.O.M. is used for the TV set he is working with. If the third digit of the serial number contains the number “1” (example: BF**1**A063500001), then the TV set has been manufactured according to B.O.M. number 1. If the third digit is a “2” (example: BF**2**A0635000001), then the set has been produced according to B.O.M. no. 2. This is important for ordering the correct spare parts!
For the third digit, the numbers 1...9 and the characters A...Z can be used, so in total: 9 plus 26= 35 different B.O.M.s can be indicated by the third digit of the serial number.

Identification: The bottom line of a type plate gives a 14-digit serial number. Digits 1 and 2 refer to the production center (e.g. AG is Bruges), digit 3 refers to the B.O.M. code, digit 4 refers to the Service version change code, digits 5 and 6 refer to the production year, and digits 7 and 8 refer to production week (in example below it is 2006 week 17). The 6 last digits contain the serial number.

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Figure 2-2 Serial number (example)

2.4.5 Practical Service Precautions

- **It makes sense to avoid exposure to electrical shock.** While some sources are expected to have a possible dangerous impact, others of quite high potential are of limited current and are sometimes held in less regard.
- **Always respect voltages**. While some may not be dangerous in themselves, they can cause unexpected reactions that are best avoided. Before reaching into a powered TV set, it is best to test the high voltage insulation. It is easy to do, and is a good service precaution.

3. Directions for Use

You can download this information from the following websites:
http://www.philips.com/support
http://www.p4c.philips.com

4. Mechanical Instructions

Index of this chapter:

Note: Figures below can deviate slightly from the actual situation, due to the different set executions.

4.1 Set Disassembly

Follow the disassemble instructions in described order.

4.1.1 Rear Cover Removal

Warning: disconnect the mains power cord before you remove the rear cover.

1. Remove all the fixation screws of the rear cover [1] and [2].
2. Now, pull the rear cover backwards and remove it.

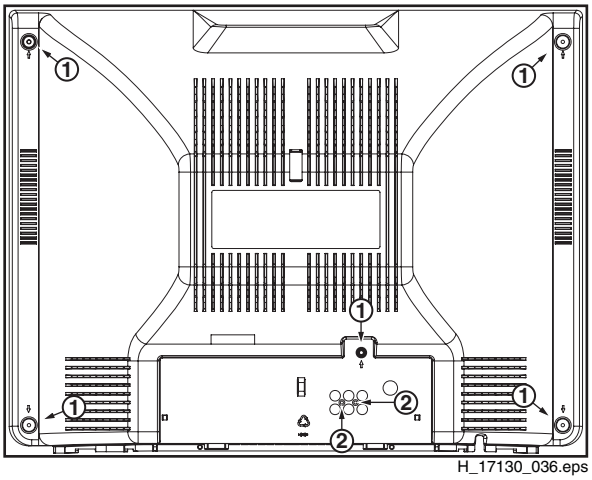

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Figure 4-1 Rear Cover removal (SL5 styling)

4.2 Assy / Board Removal

Sometimes, it can be necessary to swap a complete assy or Printed Wiring Board (PWB). How that can be done is explained below.

4.2.1 Side IO/Keyboard Panel Removal

1. Remove the fixation screws [3].
2. Remove the module from the TV.

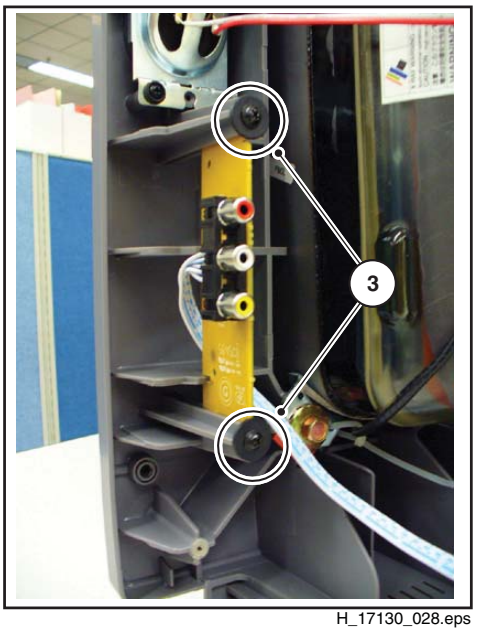

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Figure 4-2 Side-IO/Keyboard panel removal (SYRF styling)

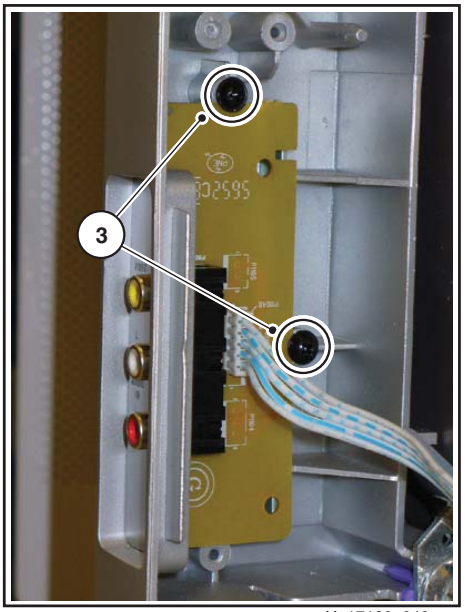

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Figure 4-3 Side-IO/Keyboard panel removal (SL5 styling)

4.2.2 Mono Carrier Removal

1. First, disconnect the strain relief of the AC power cord [4].
2. Disconnect all the necessary cables [5].
3. To remove the Mono Carrier; release the clamps [6] and slide the whole panel backwards [7] (= away from the front).
4. Slide the panel away from the cabinet.

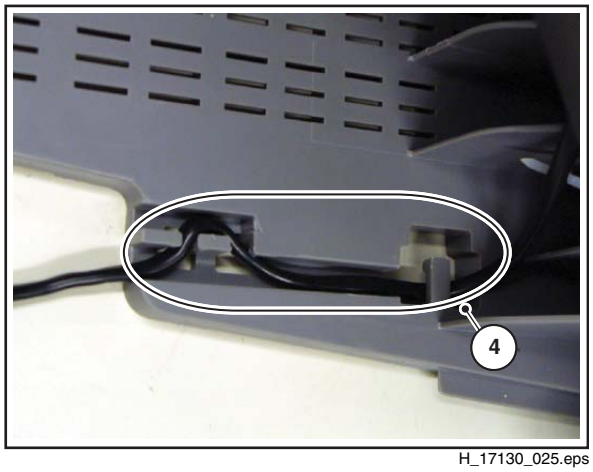

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Figure 4-4 Mono carrier removal [1/4]

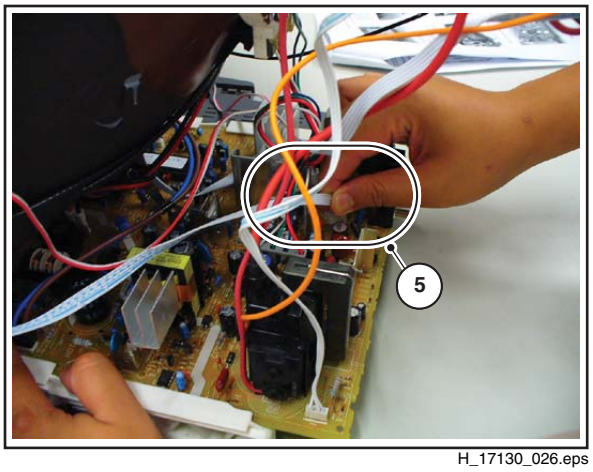

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Figure 4-5 Mono carrier removal [2/4]

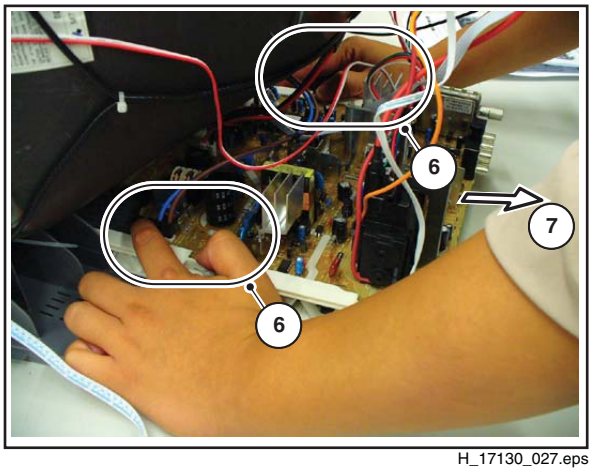

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Figure 4-6 Mono carrier removal [3/4]

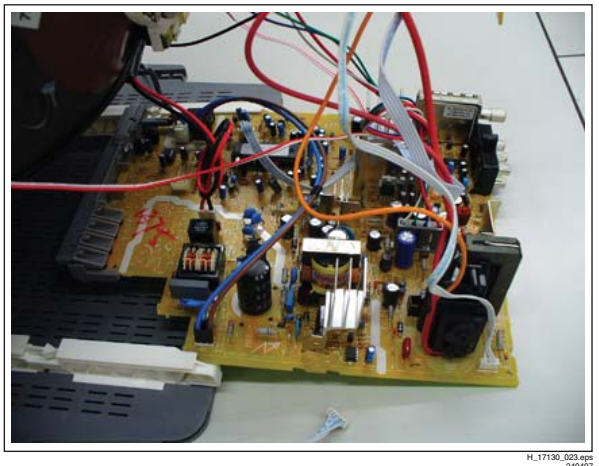

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Figure 4-7 Mono carrier removal [4/4]

4.3 Service Positions

For easy measurements, you can use the following service position.

4.3.1 Service Position Mono Carrier

Removing cables and repositioning the panel

For better accessibility of the Mono Carrier, do the following (see next figure):

1. If necessary, disconnect some cables, and move the panel somewhat to the left. Then flip it 90 degrees with its components towards the CRT.

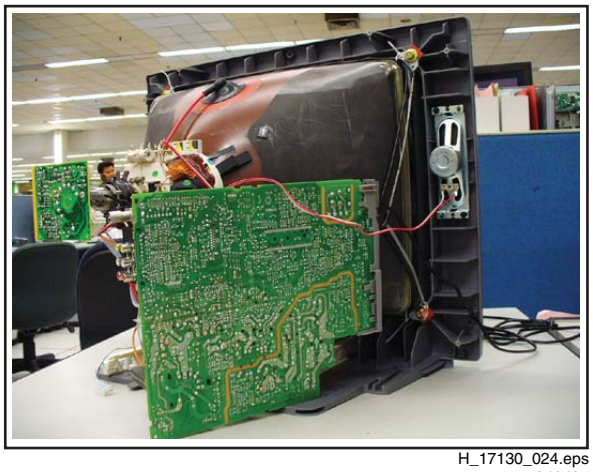

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Figure 4-8 Service position Mono Carrier

4.4 Set Re-assembly

To re-assemble the whole set, do all processes in reverse order.

Be sure that, before the rear cover is mounted:

- The mains cord is positioned correctly in its guiding brackets (make sure that the strain relief is replaced in its correct position and that it will function correctly!).
- All wires/cables are returned in their original positions.

5. Service Modes, Error Codes, and Fault Finding

Index of this chapter:

5.1 Service Modes

For an explanation of the Factory Mode, see chapter 8 “Alignments”.

5.2 Error Codes

Not applicable for this chassis.

5.3 Fault Finding

5.3.1 No Picture, No Sound, No Raster, Fuse Broken

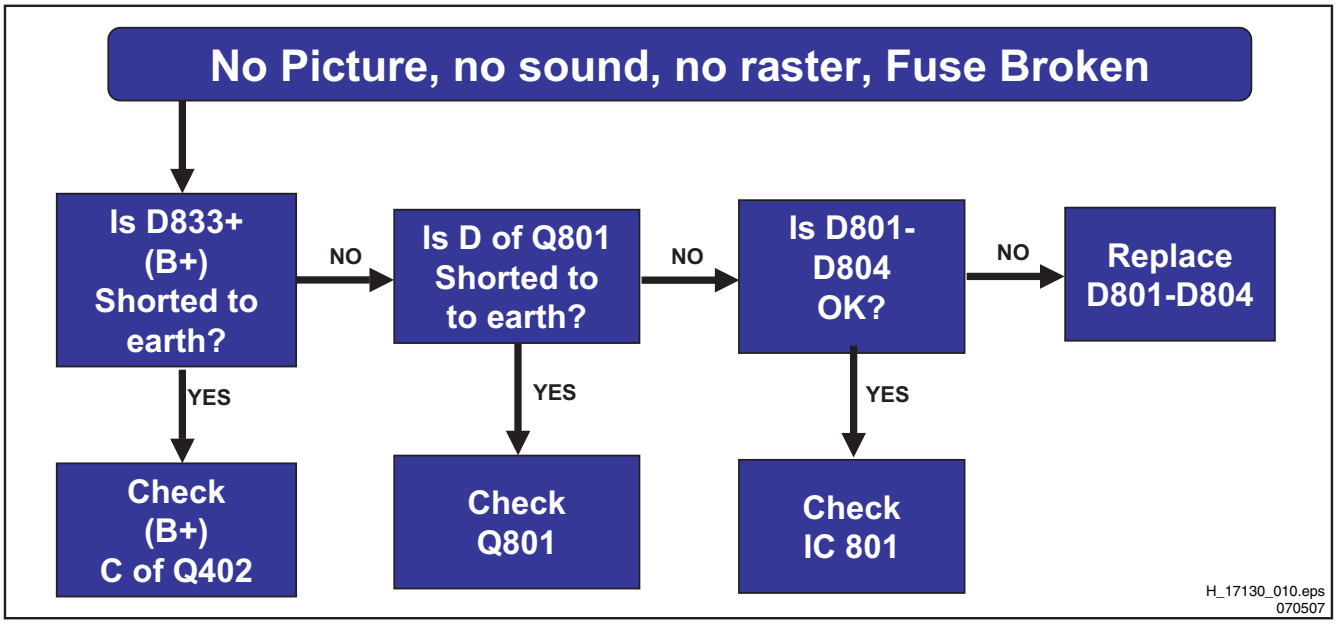

Figure 5-1 Flow chart “No Picture, No Sound, No Raster, Fuse Broken”.

5.3.2 No Picture, No Sound, No Raster, B+ OK

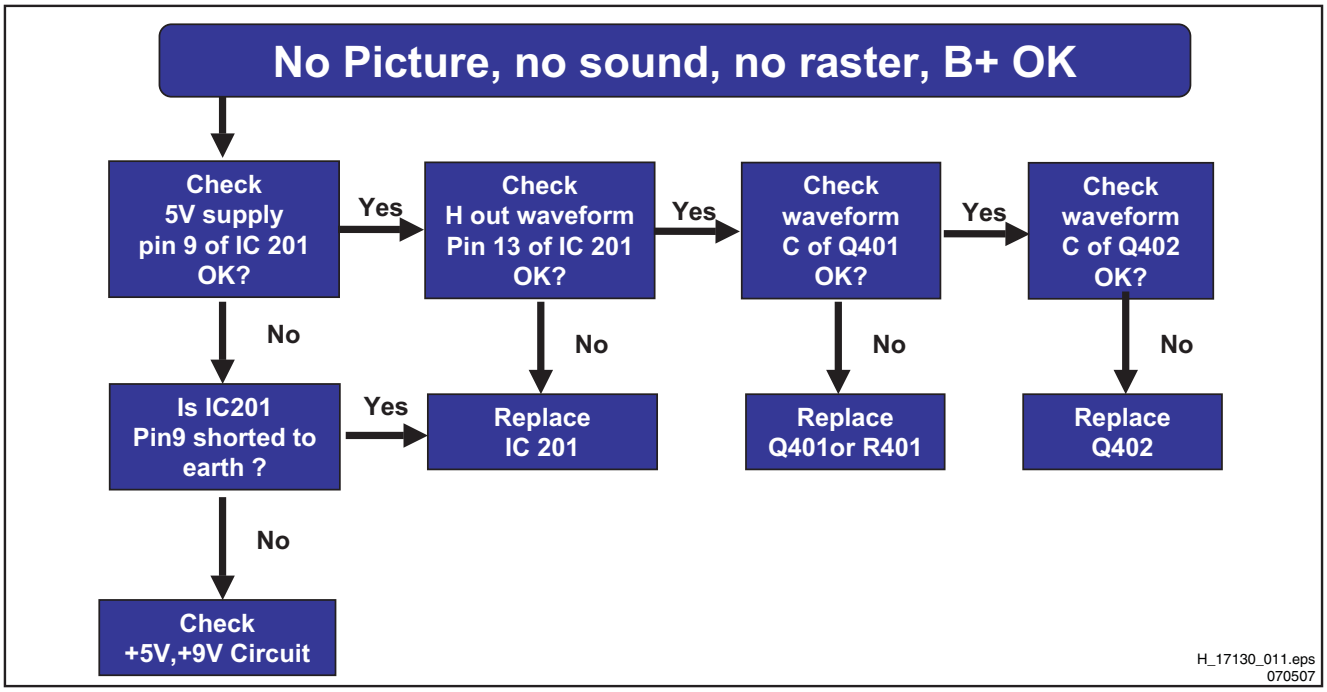

Figure 5-2 Flow chart "No Picture, No Sound, No Raster, B+ OK".

5.3.3 No Picture, Raster and Sound OK

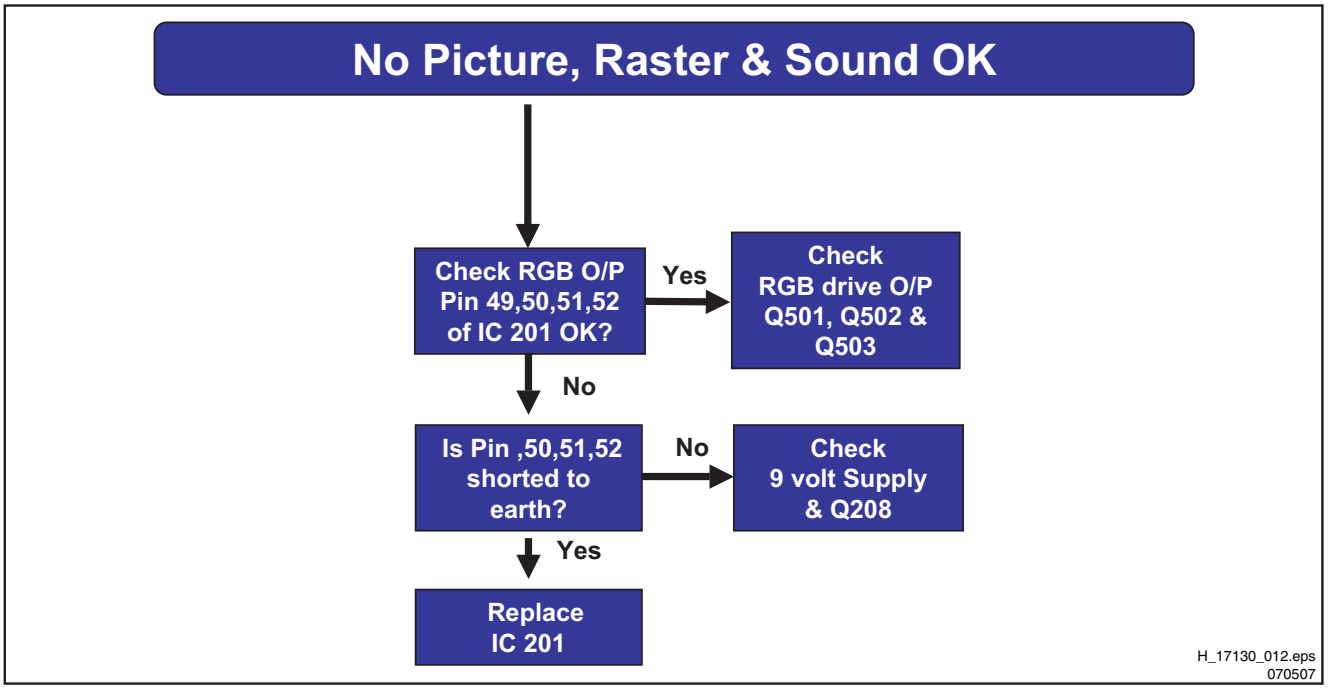

Figure 5-3 Flow chart "No Picture, Raster and Sound OK".

5.3.4 Picture OK, No Sound

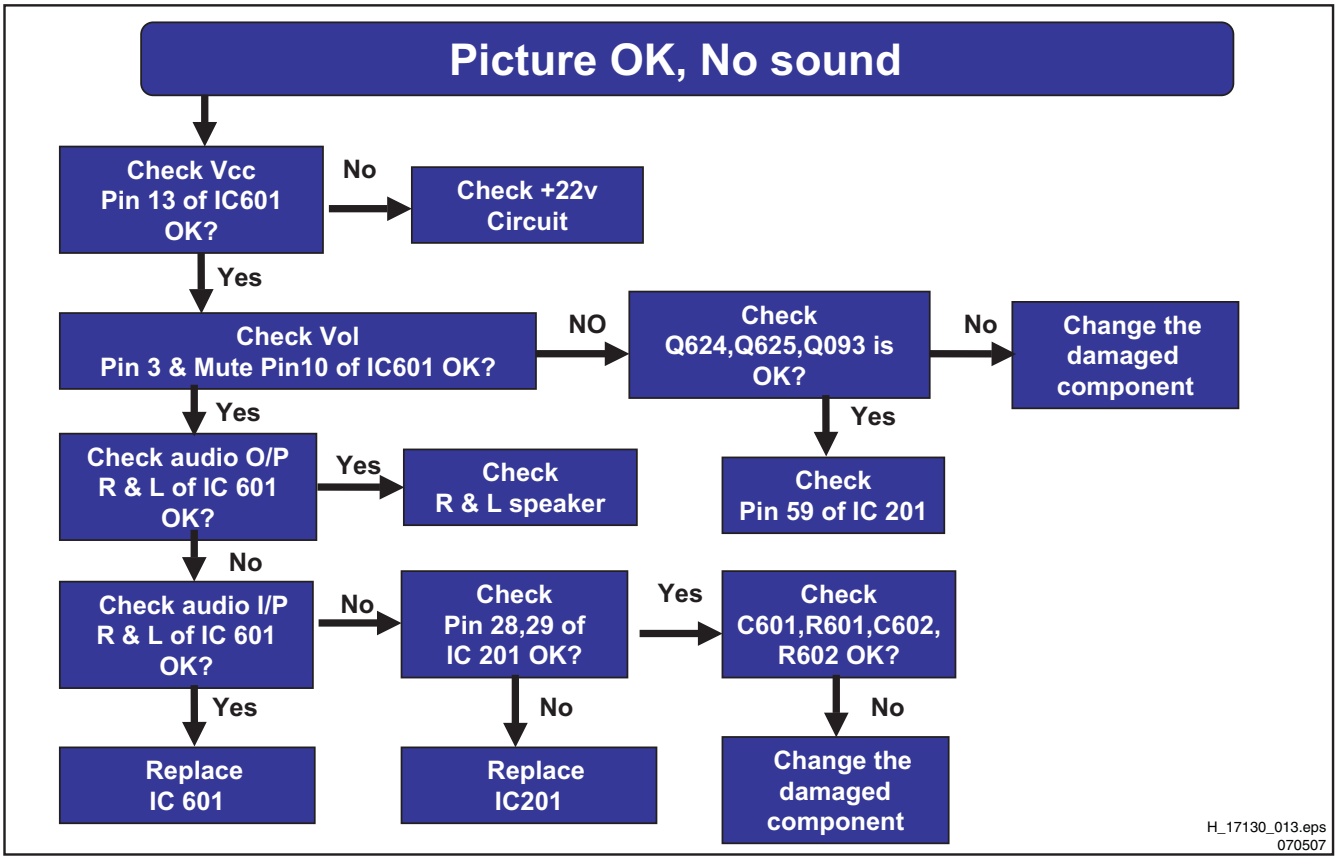

Figure 5-4 Flow chart "Picture OK, No Sound".

5.3.5 No Colour

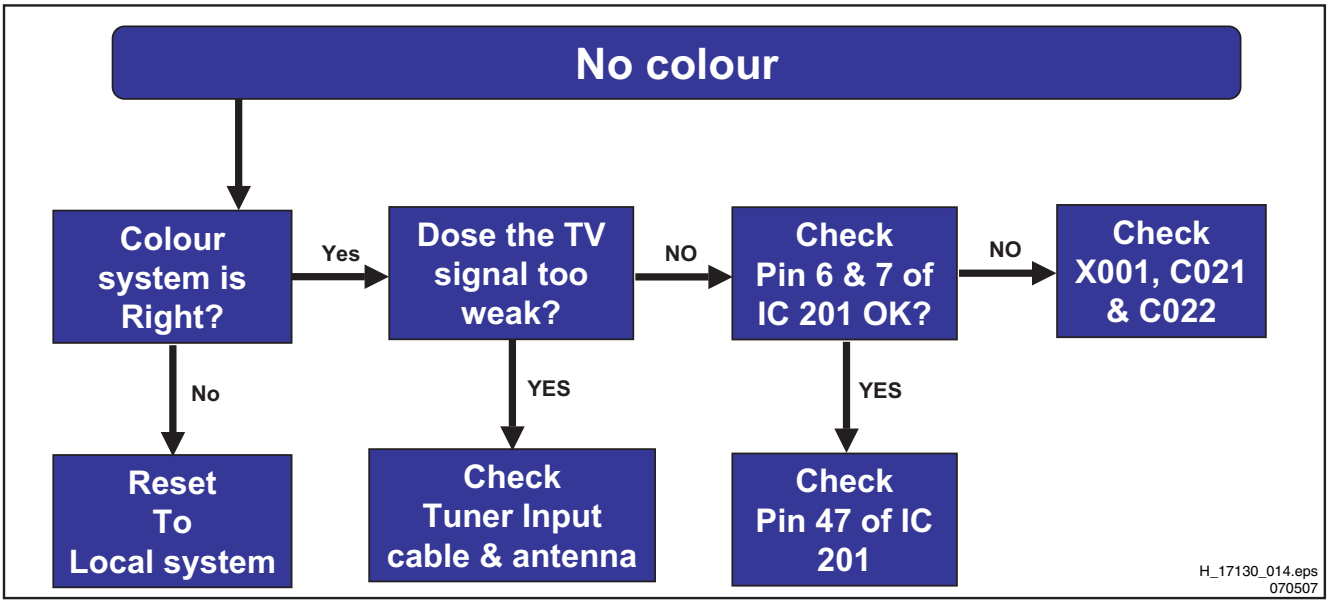

Figure 5-5 Flow chart "No Colour".

5.3.6 One Horizontal Line

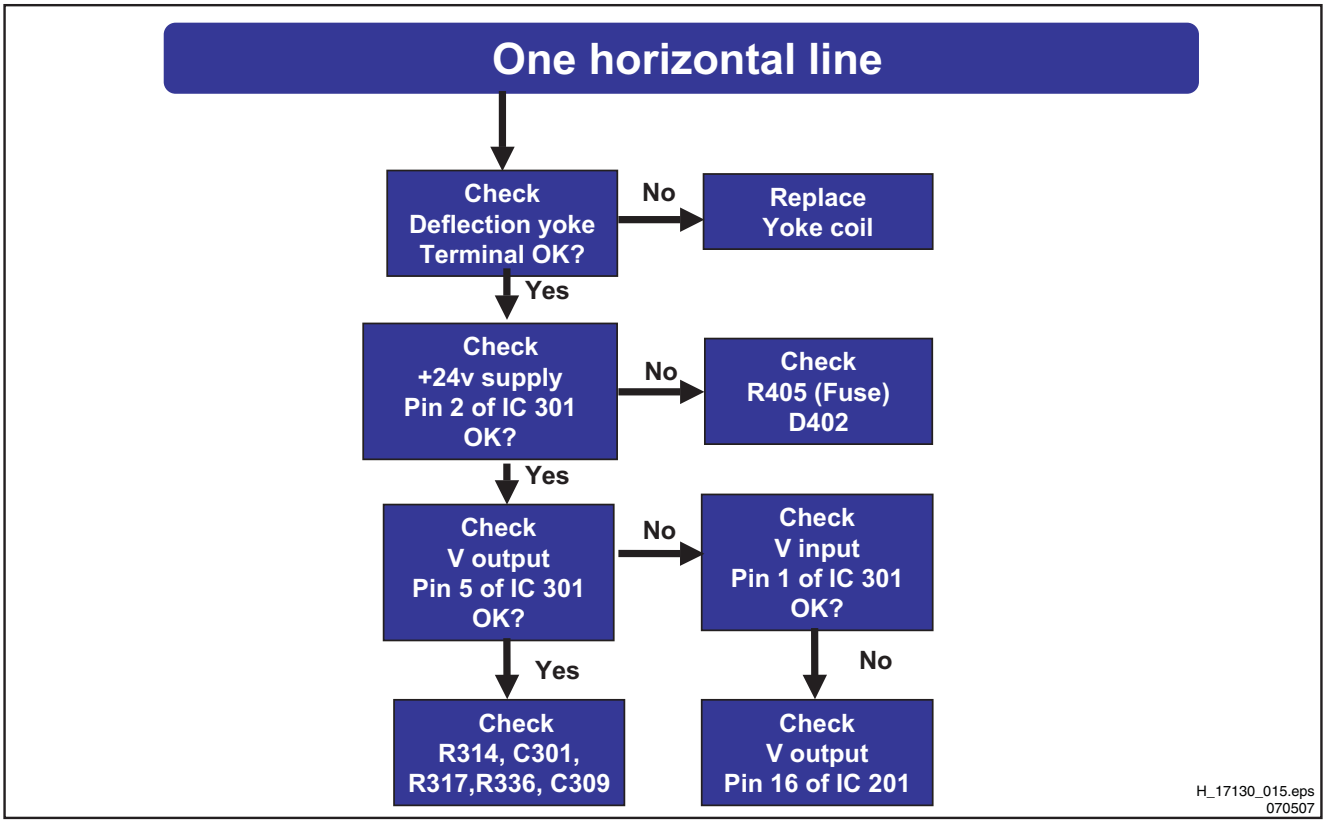

Figure 5-6 Flow chart "One Horizontal Line".

5.3.7 Some Waveforms:

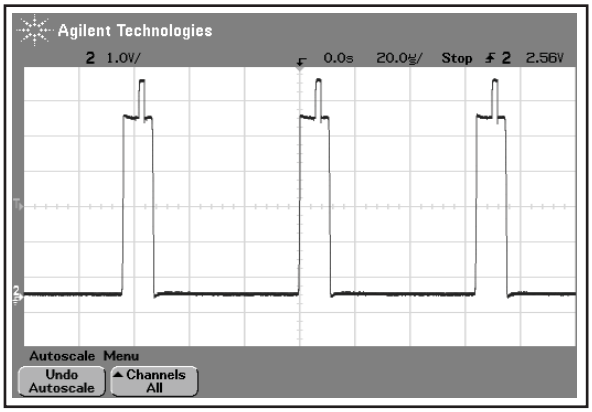

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Figure 5-7 FBP pin 12 of IC201

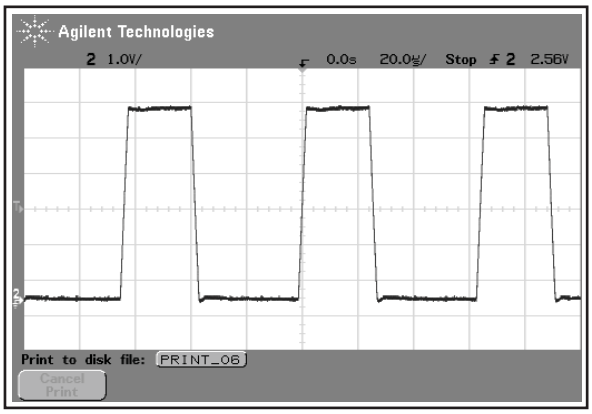

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Figure 5-8 H_out pin 13 of IC201

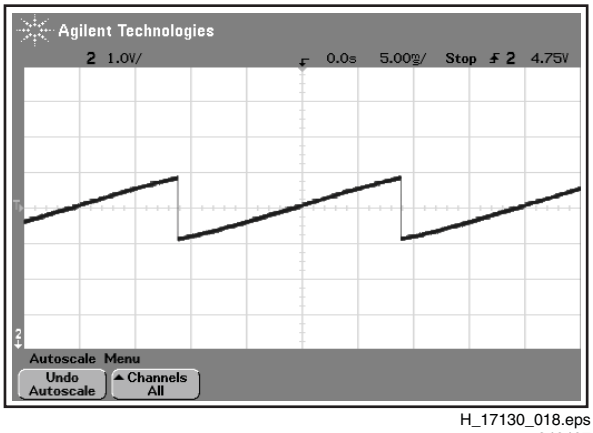

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Figure 5-9 V-out pin 16 of IC201

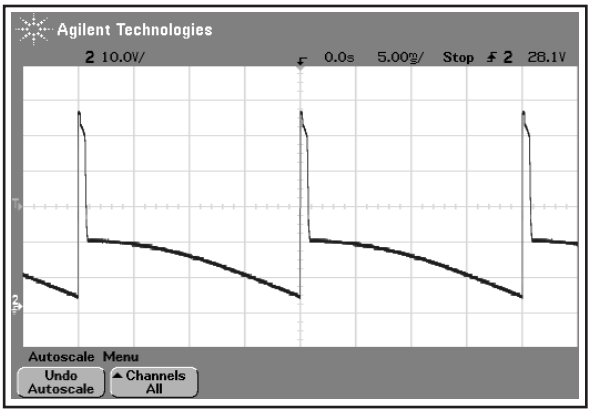

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Figure 5-10 V-out pin 5 of IC301

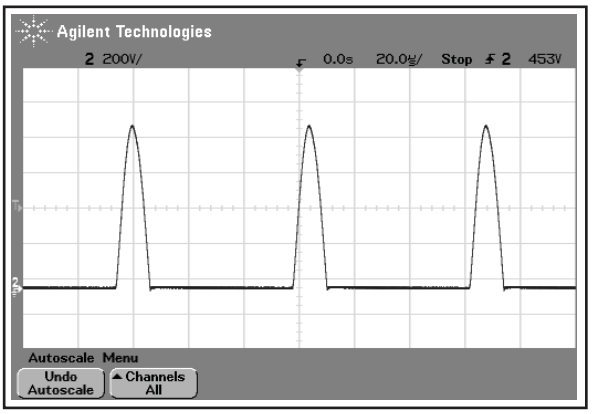

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Figure 5-11 Q402 C

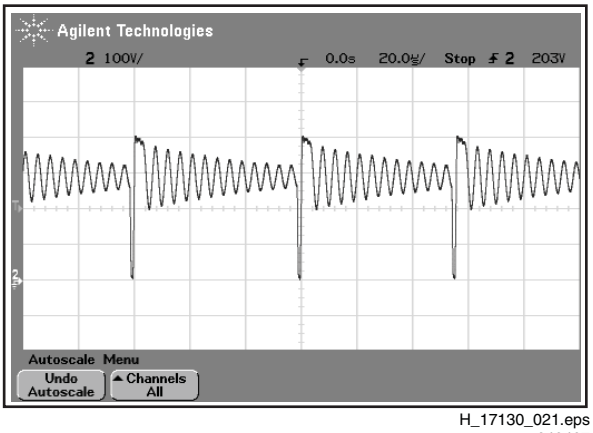

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Figure 5-12 Q815 drain when stand-by

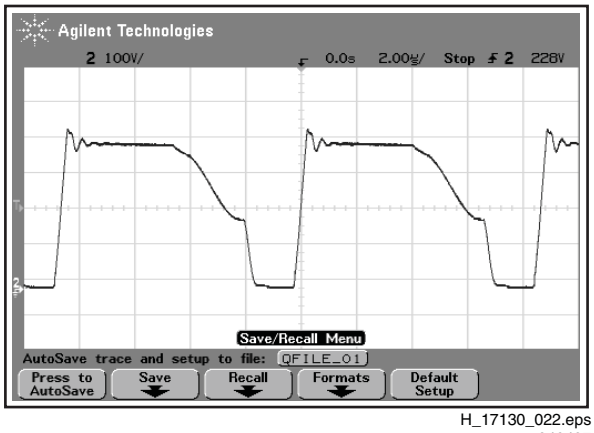

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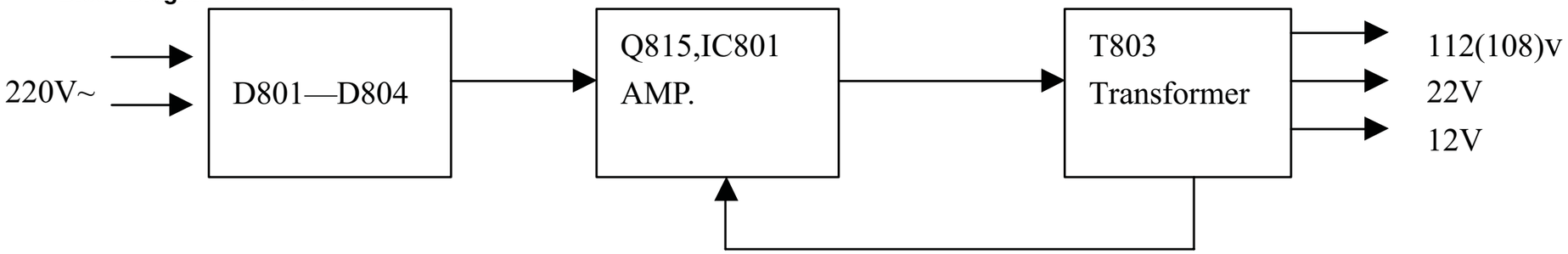
Figure 5-13 Q815 drain

5.3.8 Important Voltages Overview

Line	Position	Normal (V)	Standby (V)
1	B+ Joint of L801 and R826A	+110.8	+96.9
2	Joint of C834 and D831	+13.0	+10.9
3	Joint of L212 and C090	+5.0	+0.0
4	Pin99 of IC200	+4.8	+0.0

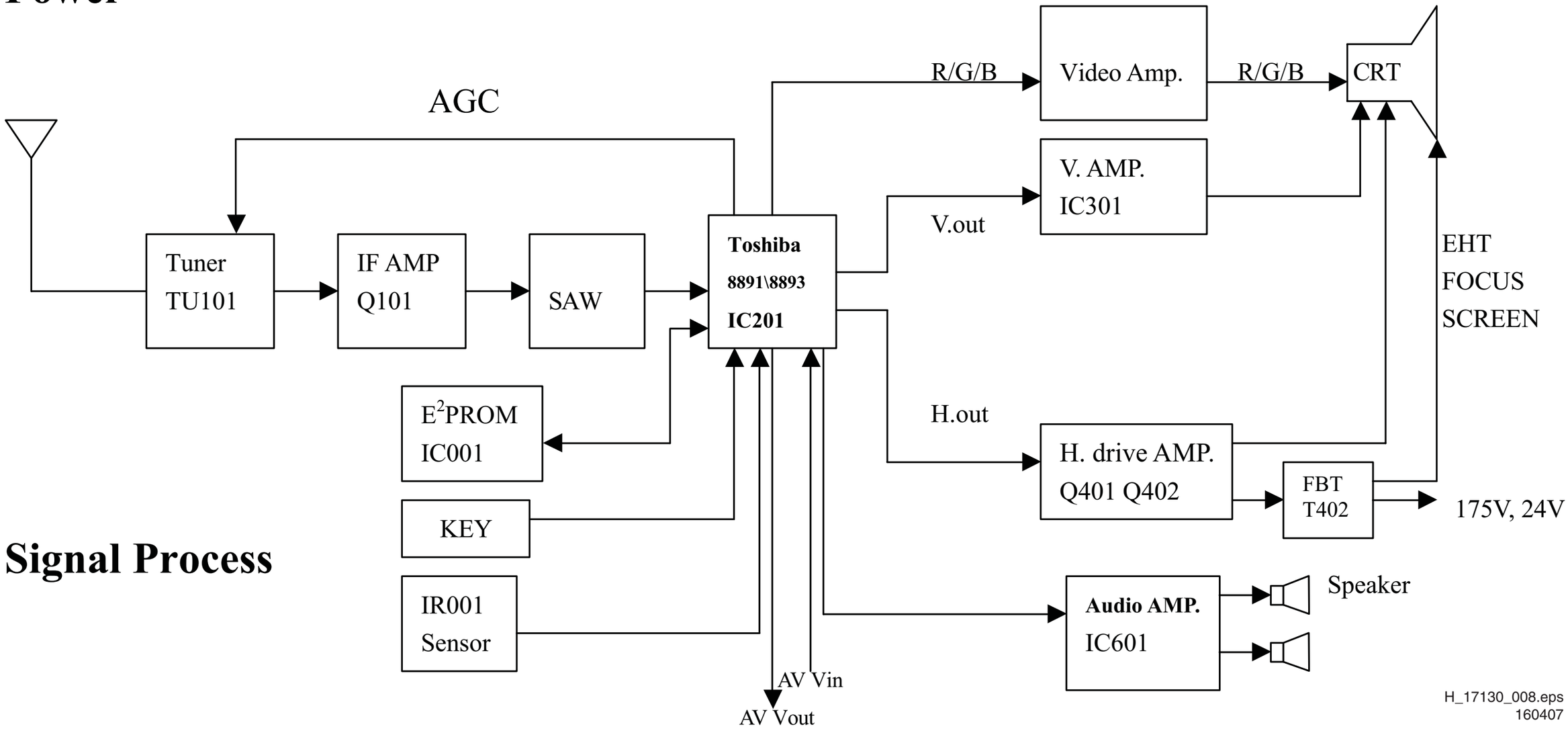
6. Block Diagrams, Test Point Overview, and Waveforms

Block Diagram Mono Carrier



Power

Signal Process



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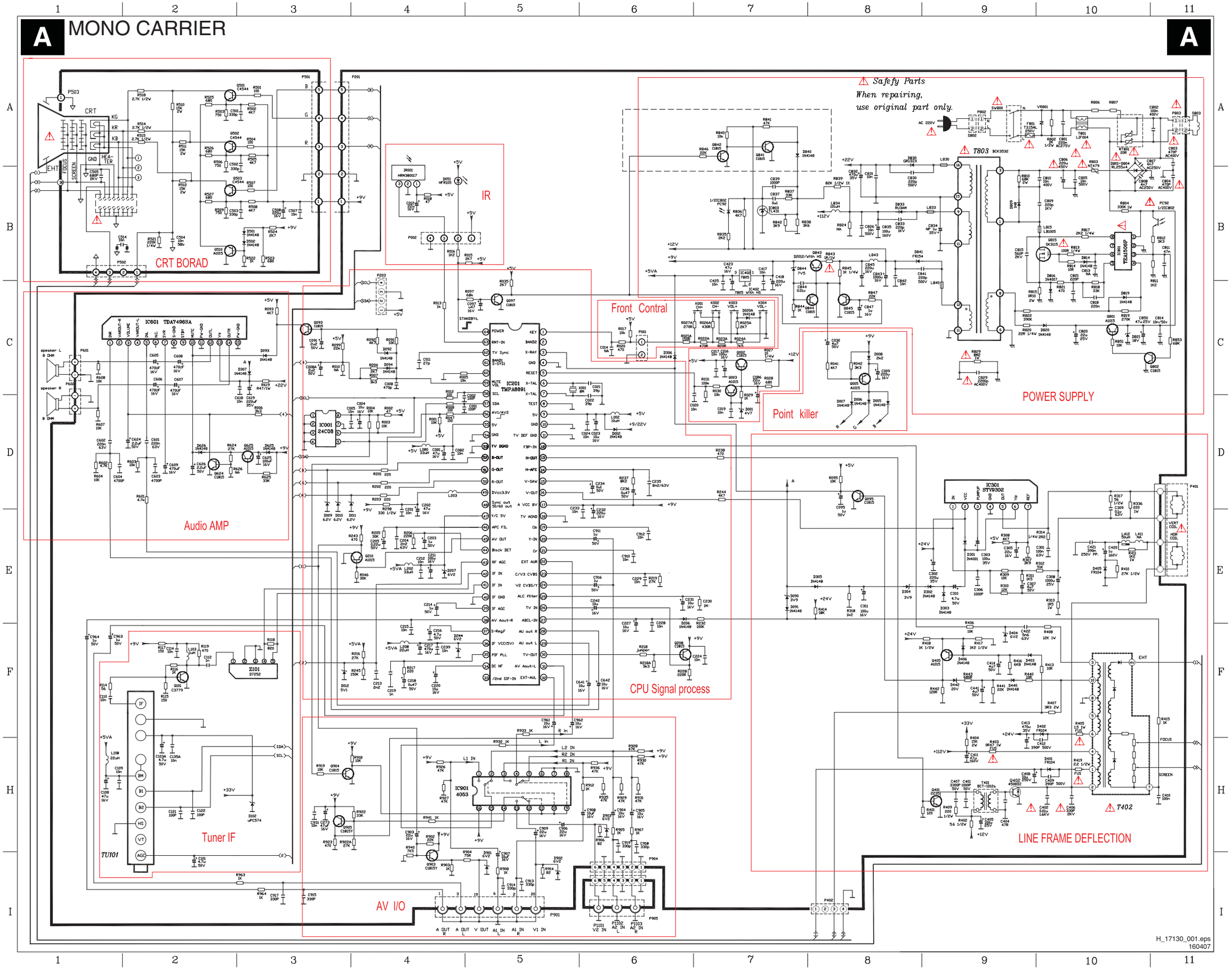
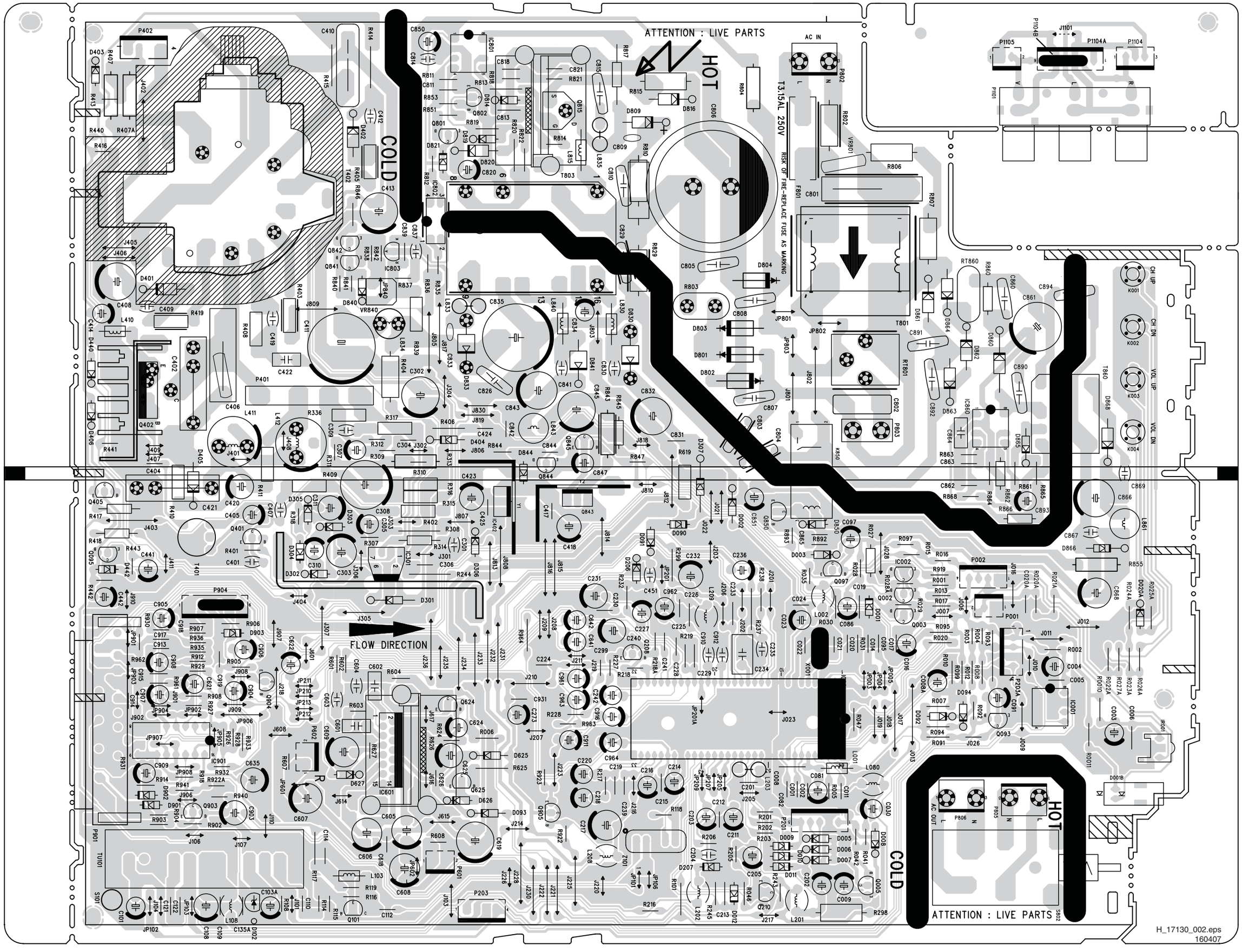
7. Circuit Diagrams and PWB Layouts

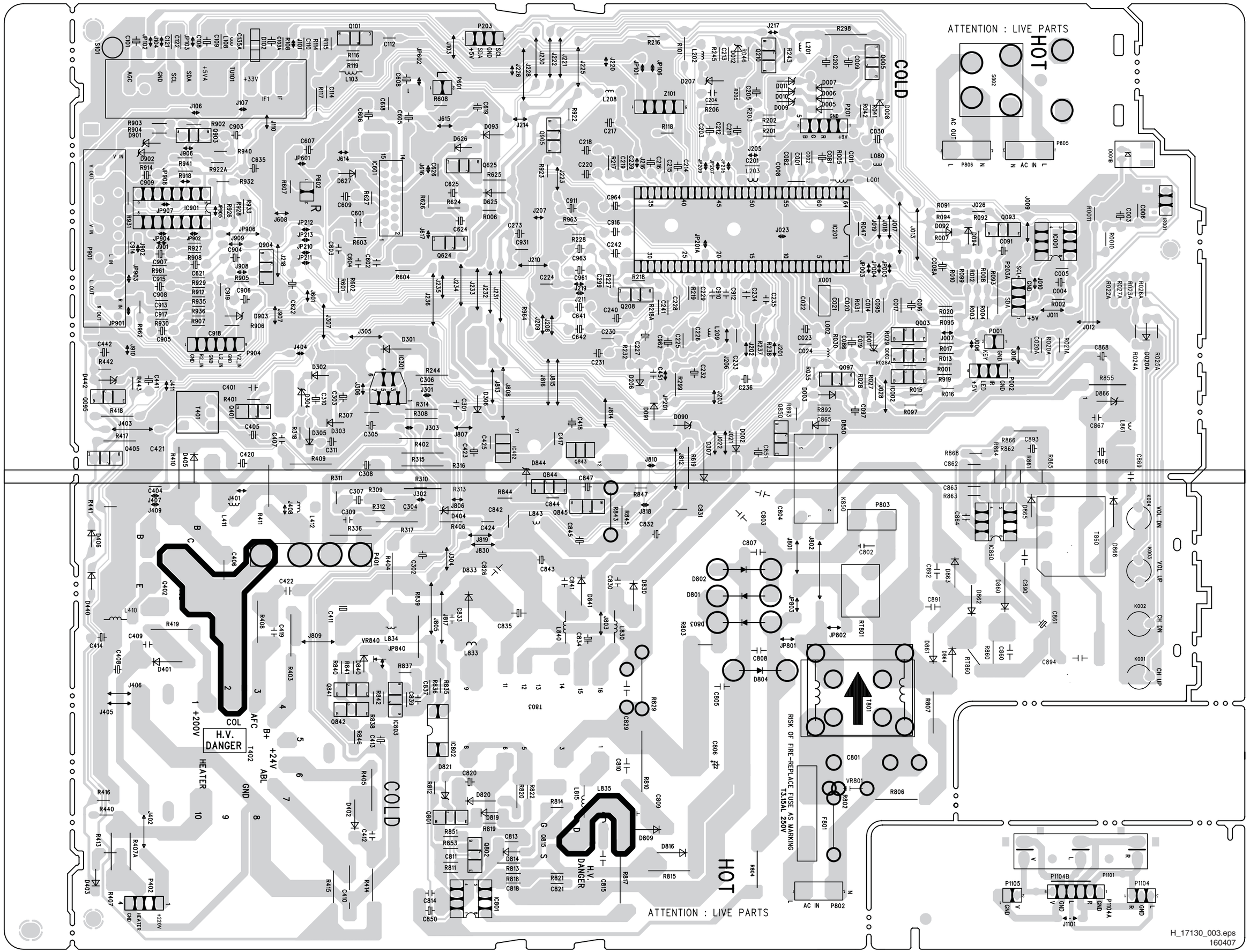
Mono Carrier



Layout Mono Carrier (Top Side)



Layout Mono Carrier (Bottom Side)



CRT Panel

B CRT PANEL

P503
CRT
KG
KR
KB
GND
HEA-
TER
EHT
FOCUS
SCREEN
C505
680P
2KV
R518
2.7K 1/2W
R514
2.7K 1/2W
R515
2.7K 1/2W
R510
15K
2W
R511
15K
2W
R512
15K
2W
C514
10n
R521
220K
1/4W
C504
10n
500v
P502
P501
Q501
C4544
R501
100
R525
680
R503
750
C501
330p
R502
4K7
Q502
C4544
R504
100
R526
680
R506
750
C502
330p
R505
4K7
Q503
C4544
R507
100
R527
680
R509
750
C503
330p
R508
4K7
C508
220u
16V
C507
10n
+9V
R524
2K7
D501
1N4148
D502
1N4148
Q510
A1015
R522
1K
R523
680
B
G
R

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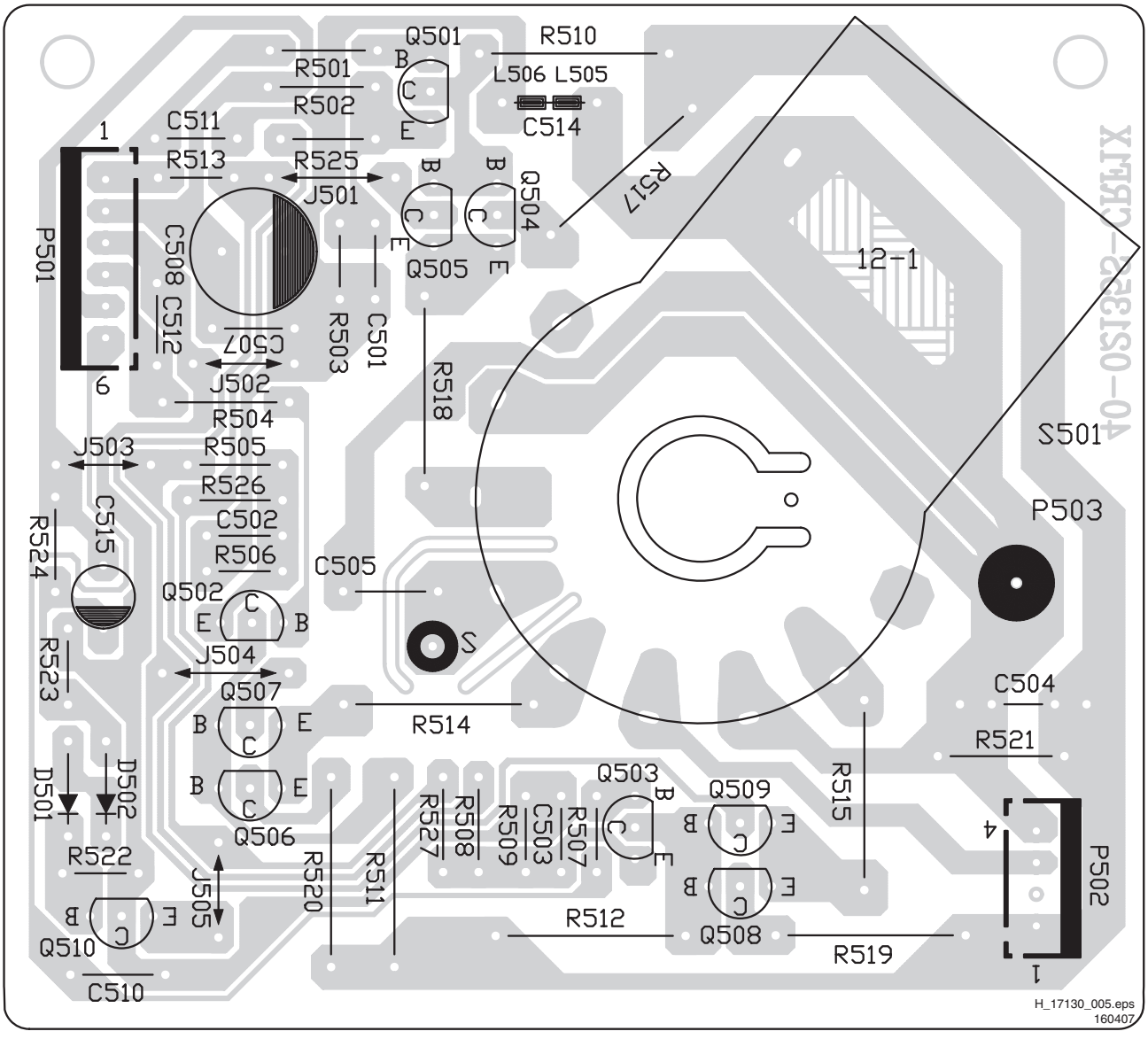
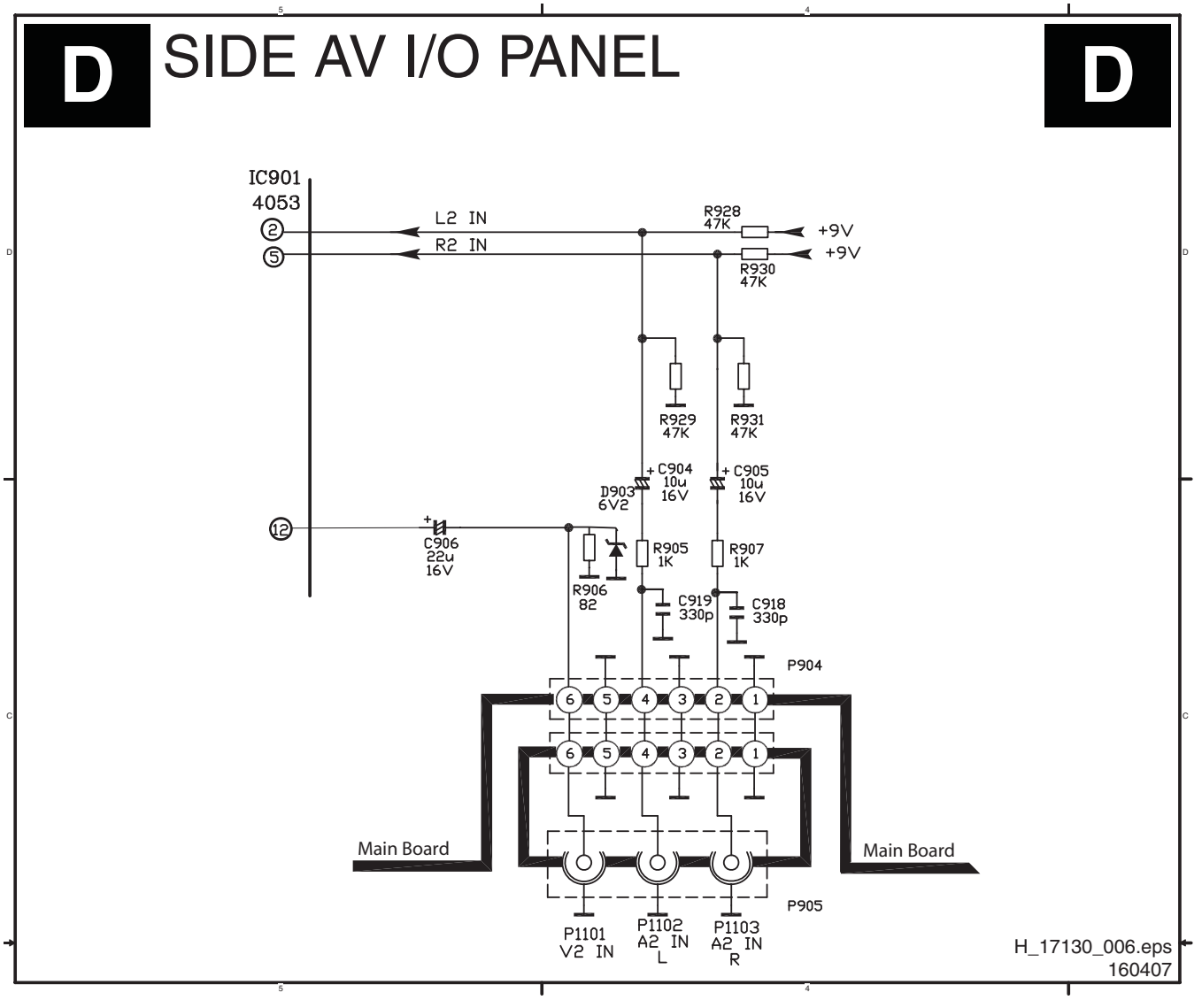
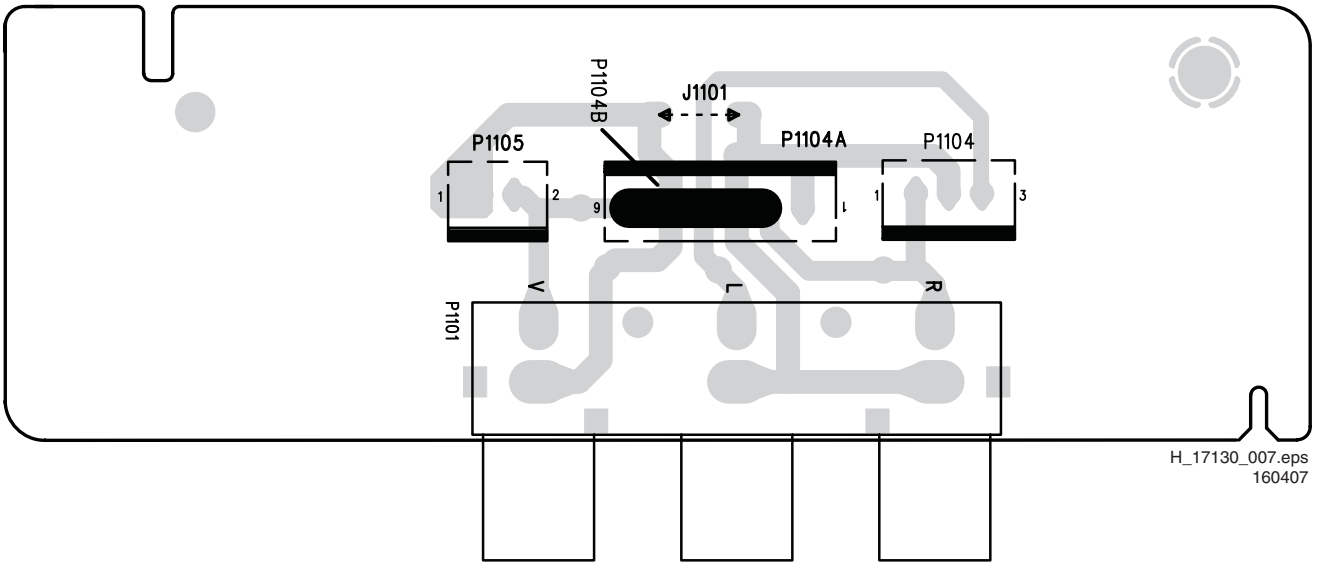
Layout CRT Panel (Top Side)



Side AV & I/O Panel



Layout Side AV & I/O Panel (Top Side)



8. Alignments

Index of this chapter:

Note: Figures below can deviate slightly from the actual situation, due to the different set executions.

8.1 General Information

Perform all electrical adjustments under the following conditions:
- Power supply voltage: 100 - 240 V_{AC}, 50/60 Hz (± 10%)
- Connect the set to the mains via an isolation transformer with low internal resistance.
- Allow the set to warm up for approximately 15 minutes.
- Measure voltages and waveforms in relation to correct ground (e.g. measure audio signals in relation to AUDIO_GND).
  Caution: It is not allowed to use heatsinks as ground.
- Test probe: Ri > 10 Mohm, Ci < 20 pF.
- Use an isolated trimmer/screwdriver to perform alignments.

8.2 Factory Mode (Service Menu, Service Mode)

For certain alignment procedures, you will need to enter Factory Mode (Service Menu). **See also figure "" on next page.**

8.2.1 How To Enter

1. Press and hold the VOLUME DOWN key on the TV tightly until minimum level.
2. Then, while holding the VOLUME DOWN key, press the "DEL / [i+]" key on the remote control (RC).

8.2.2 How To Navigate

- Press "CH+ (^) / CH- (v)" cursor key on the RC to select option.
- Press "VOL- (<) / VOL+ (>)" cursor key on the RC to adjust or select option.
- Press "0-9" or "SOUND SYS" key on the RC as the shortcut key to directly access certain factory menu's (see figure "Group list overview").
- All changes in factory data will be saved in EEPROM automatically.

8.2.3 How To Exit

Press the RC "POWER / ⏻" button, or power down the set with the main switch, to exit the Factory Mode.

8.2.4 Factory Mode Overview

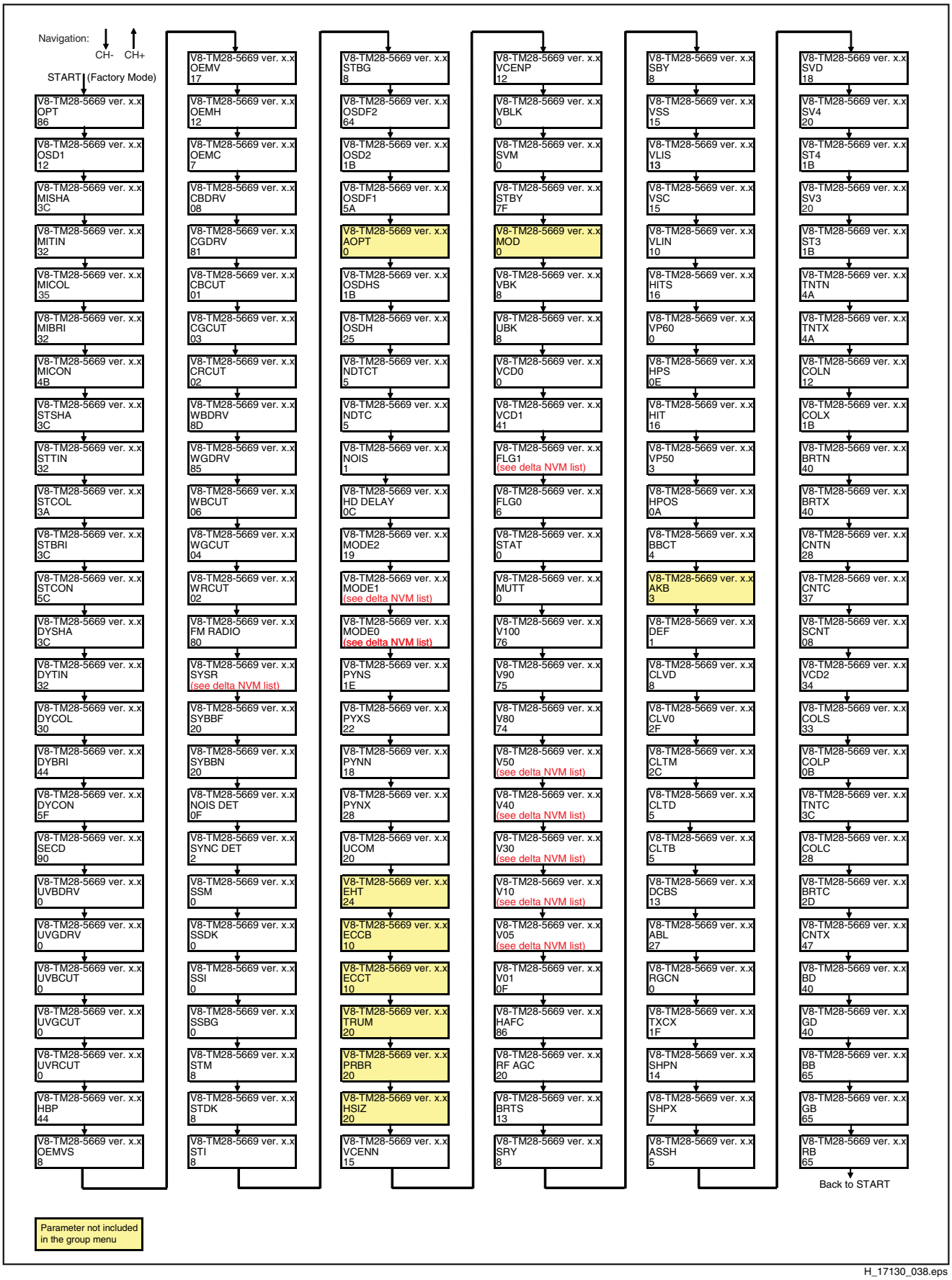


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Figure 8-1 Factory mode overview (incl. default values)

8.2.5 Group List Overview

GROUP1	KEY 0
RB	R CUT OFF
GB	G CUT OFF
BB	B CUT OFF
GD	G DRIVE
BD	B DRIVE
UBK	DVD U level adjustment 0: (-22mV, Input DC) 8: 0mV F: (19mV, 2.75mV/dev)
VBK	DVD V level adjustment Bits 4-7 Don't use
GROUP2	KEY 1
HPOS	Horizontal Position 50Hz
HPS	Horizontal Position 60Hz
HIT	Height 50Hz
HITS	Height 60 Hz
VP50	Vertical Position 50Hz
VP60	Vertical Position 60Hz
VLIN	V Linearity 50Hz
VLIS	V Linearity 60hz
VSC	VS Correction 50Hz
VSS	VS Correction 60Hz
VBLK	V BLK Start / Stop
VCENP	V CENTERING 50Hz
VCENN	V CENTERING 60Hz
OSDH	OSD vertical position 50Hz
OSDHS	OSD vertical position 60Hz
GROUP 3	KEY 3
CNTX	CONTRAST MAX.
CNTN	CONTRAST MIN.
BRTX	BRIGHT MAX. (difference from center)
BRTN	BRIGHT MIN. (difference from center)
COLX	COLOR MAX. (difference from center)
COLN	COLOR MIN.
TNTX	TINT MAX. (difference from center)
TNTN	TINT MIN. (difference from center)
GROUP 4	KEY 4
BRTC	BRIGHT CENTER
COLC	COLOR CENTER NTSC
COLS	COLOR CENTER SECAM
COLP	COLOR CENTER PAL (shift data from COLC)
SCNT	SUB CONTRAST
CNTC	CONTRAST CENTER
TNTC	TINT CENTER
GROUP 5	KEY 5
ST3	SHARP CENTER 3.58NTSC TV
SV3	SHARP CENTER 3.58NTSC VIDEO
ST4	SHARP CENTER OTHER TV
SV4	SHARP CENTER OTHER VIDEO
SVD	SHARP CENTER DVD
ASSH	ASYMMETRY-SHARPNESS
SHPX	SHARP MAX. (difference from center)
SHPN	SHARP MIN. (difference from center)
GROUP 6	KEY 6
OPT	OPTION DATA 0 D mode key 0: No use 1 :use 1 0:normal 1: mute sound when no sync in TV 2 0:NORMAL 1: mute video during change channel 3 AU gain (0: 50kHz 1: 25kHz) 4 when no sync (1: AFT 0: no AFT) 5 AV change (1:mute 0:no mute) 6 Korea PAL50 blink function (1:enable 0:disable) 7 Standby state (0:High standby 1:Low standby)
FLG0	0 Over MOD 1 N Buzz Cancel 2 Pin 56 function (1: AV1/AV2 0:Mute pin) 3 SLO f0 shift 4 Hotel mode TV mode enter 5 Hotel mode AV mode enter 6 Hotel mode 7 VCO readjust when position select (0:enable 1:disable)
FLG1	0 (0: 6 key 1: 7 key) 1 OEM Logo (0: Use TCL Logo 1: Use OEM Logo) 2 Logo (0: disable 1: enable) 3 TINT por 4 PIF SELECT 00: 38MHz 01: 38.9MHz 5 10:45.75MHz 11:Don't Use 6 SECAM (0:disable 1:enable) 7 APC (0:Preset 1:Auto)
STBY	0 Not Used 1 Not Used 2 HD kill timer set *40us 3 Not Used 4 When STBY.5=0 ,after AC on 0: standby 1: power on 5 After AC power on, 0: ref STBY4 1: last state 6 Biological Clock (0:disable 1:enable) 7 Child Lock (1:diable 0:enable)
HD DELAY	
MODE0	0 FS/VS Select 0:VS TUNER 1:FS Tuner 1 English language select 2 Arabic language select /Thailand 3 Vietnam language select 4 Mute type 0: y mute 1: RGB mute 5 When mode0. (7 = 1 ; preset sound system after ASM) 6 00:BG 01:I 10:DK 11:M 7 Preset sound system after ASM (0:disable 1:enable)
MODE1	0 BG system enable 1 I system enable 2 DK system enable 3 M system enable 4 Video2 enable 5 Video3 enable 6 YUV enable 7 Thailand Dual language 0:Disable 1:Enable
MUTT	Standby -->wake time
STAT	Contrast up timer after standby off

GROUP 7	KEY 7
RFAGC	RF AGC
SBY	SECAM B-Y BLACK ADJUST
SRY	SECAM R-Y BLACK ADJUST
BRTS	SUB BRIGHT shift data of BRTC
TXCX	TEXT RGB CONTRAST MAX.
RGCN	TEXT RGB CONTRAST MIN.
BBCT	SECAM MODE
GROUP 9	KEY 8
V01	VOLUME 01
V05	VOLUME 05
V10	VOLUME 10
V30	VOLUME 30
V40	VOLUME 40
V50	VOLUME 50
V70	VOLUME 70
V90	VOLUME 90
V100	VOLUME 100
GROUP 10	KEY 9
SVM	SVM
PYNX	Normal H.SYNC max
PYNN	Normal H.SYNC min
PYXS	Search H.SYNC max
PYNS	Search H.SYNC min
GROUP 16	KEY 2
STBG	0~3 (S-Trap f0 for BG) [0: Sound Trap Off 1: f0 tuning min F: f0 tuning max] 4~7 (Don't use)
STI	0~3 (S-Trap f0 for I) [0: Sound Trap Off 1: f0 tuning min F: f0 tuning max] 4~7 (Don't use)
STDK	0~3 (S-Trap f0 for DK) [0: Sound Trap Off 1: f0 tuning min F: f0 tuning max] 4~7 (Don't use)
STM	0~3 (S-Trap f0 for I) [0: Sound Trap Off 1: f0 tuning min F: f0 tuning max] 4~7 (Don't use)
SSBG	0~1 - Sound Trap GD for BG [00: Off 01: 60nS 10: 90nS 11: 120nS] 2~3 - Sound Trap Q for BG [00: Q = 3 01: Q = 5 10: Q = 7 11: Q = 9] 4~5 - Sound Trap HP/LP for BG [00: Off 01: 1 dB HPF 10: -3 dB LPF 11: -2 dB LPF] 6~7 (Don't use)
SSI	0~1 - Sound Trap GD for I [00: Off 01: 60nS 10: 90nS 11: 120nS] 2~3 - Sound Trap Q for I [00: Q = 3 01: Q = 5 10: Q = 7 11: Q = 9] 4~5 - Sound Trap HP/LP for I [00: Off 01: 1 dB HPF 10: -3 dB LPF 11: -2 dB LPF] 6~7 (Don't use)
SSDK	0~1 (Sound Trap GD for DK) [00: Off 01: 60nS 10: 90nS 11: 120nS] 2~3 (Sound Trap Q for DK) [00: Q = 3 01: Q = 5 10: Q = 7 11: Q = 9] 4~5 (Sound Trap HP/LP for DK) [00: Off 01: 1 dB HPF 10: -3 dB LPF 11: -2 dB LPF] 6~7 (Don't use)
SSM	0~1 (Sound Trap GD for M) [00: Off 01: 60nS 10: 90nS 11: 120nS] 2~3 (Sound Trap Q for M) [00: Q = 3 01: Q = 5 10: Q = 7 11: Q = 9] 4~5 (Sound Trap HP/LP for M) [00: Off 01: 1 dB HPF 10: -3 dB LPF 11: -2 dB LPF] 6~7 (Don't use)
GROUP 17	Key SNDSYS
NDTC	0~7 (Counter for non-weak signal detection) [0 - FF]
NDTCT	0~7 (Counter for weak signal detection) [0 - FF]
OEMC	0~2 (OEM Logo string color setting) [000: Black 001: use Red instead of Blue 010: Green 011: Cyan 100: Red 101: Magenda 110: Yellow 111: White] 3~7 (Don't use)
OEMH	0~7 (H - offset value for OEM logo) [0 - FF]
OEMV	0 - 7 (V – offset value for OEM logo in 50Hz system) [0 - FF]
OEMVS	0 - 7 (V – offset value for OEM logo in 60Hz system) [0 - FF]
HBP	0 - 3 (H BOW) [0: -1uS 4: 0uS 7: 1uS] [0: -/+2 Us 4: 0 uS 7: +/-2 uS] 4~7 (H PARA)

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Figure 8-2 Group list overview

8.2.6 Delta NVM Overview

Some option values depend on the model number. Please refer to table below for the deviations.

Table 8-1 Delta NVM overview

Key	Group	Option	21PT2327/79	21PT5027/79	21PT2327/56	21PT5027/56	21PT5007/56	21PT2327/69	21PT5027/69	21PT5007/69	21PT5027/94	21PT5017/94	21PT2217/94	21PT5007/94
6	6	OPT	0x86	0x86	0x86	0x86	0x86	0x86	0x86	0x86	0x86	0x86	0x86	0x86
		FLG0	0x06	0x06	0x06	0x06	0x06	0x06	0x06	0x06	0x06	0x06	0x06	0x06
		FLG1	0x9C	0x9C	0x9C	0x9C	**0xDC**	**0xDC**	**0xDC**	**0xDC**	**0xDC**	**0xDC**	0x9C	0x9C
		STBY	0x7F	0x7F	0x7F	0x7F	0x7F	0x7F	0x7F	0x7F	0x7F	0x7F	0x7F	0x7F
		HD DELAY	0x0C	0x0C	0x0C	0x0C	0x0C	0x0C	0x0C	0x0C	0x0C	0x0C	0x0C	0x0C
		MODE0	0x93	0x93	0x93	0x93	**0x9B**	**0x9B**	**0x9B**	**0x97**	**0x97**	**0x97**	0x93	0x93
		MODE1	0x17	**0x07**	0x17	0x17	0x17	0x17	**0x07**	0x17	0x17	**0x07**	0x17	**0x07**
		MUTT	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
		STAT	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
8	9	V01	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F
		V05	0x0F	0x0F	0x0F	0x0F	**0x12**	**0x12**	**0x12**	**0x12**	**0x12**	**0x12**	**0x12**	**0x12**
		V10	0x15	0x15	0x15	0x15	**0x17**	**0x17**	**0x17**	**0x17**	**0x17**	**0x17**	**0x17**	**0x17**
		V30	0x49	0x49	0x49	0x49	**0x28**	**0x28**	**0x28**	**0x28**	**0x28**	**0x28**	**0x28**	**0x28**
		V40	0x58	0x58	0x58	0x58	**0x3C**	**0x3C**	**0x3C**	**0x3C**	**0x3C**	**0x3C**	**0x3C**	**0x3C**
		V50	0x63	0x63	0x63	0x63	**0x53**	**0x53**	**0x53**	**0x53**	**0x53**	**0x53**	**0x53**	**0x53**
		V80	0x74	0x74	0x74	0x74	0x74	0x74	0x74	0x74	0x74	0x74	0x74	0x74
		V90	0x75	0x75	0x75	0x75	0x75	0x75	0x75	0x75	0x75	0x75	0x75	0x75
		V100	0x76	0x76	0x76	0x76	0x76	0x76	0x76	0x76	0x76	0x76	0x76	0x76
13	15	VCD0	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
		VCD1	0x41	0x41	0x41	0x41	0x41	0x41	0x41	0x41	0x41	0x41	0x41	0x41
		VCD2	0x34	0x34	0x34	0x34	0x34	0x34	0x34	0x34	0x34	0x34	0x34	0x34
		MODE2	0x15	0x15	0x15	0x15	0x15	0x15	0x15	0x15	0x15	0x15	0x15	0x15
		SYNC DET	0x02	0x02	0x02	0x02	0x02	0x02	0x02	0x02	0x02	0x02	0x02	0x02
		SYBBN	0x20	0x20	0x20	0x20	0x20	0x20	0x20	0x20	0x20	0x20	0x20	0x20
		SYBBF	0x20	0x20	0x20	0x20	0x20	0x20	0x20	0x20	0x20	0x20	0x20	0x20
		SYSR	0x20	0x20	0x20	0x20	**0x10**	**0x10**	**0x10**	**0x10**	**0x10**	**0x10**	**0x10**	**0x10**
		NOIS DET	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F	0x0F

8.3 Alignment procedure

Perform the alignments in the following sequence:
1. B+ voltage adjustment.
2. RF AGC adjustment.
3. Screen voltage and focus adjustment.
4. White balance adjustment.
5. Pin cushion and screen width adjustment.
6. Screen centre and size adjustment (PAL).
7. Screen centre and size adjustment (NTSC).

8.3.1 B+ Voltage Test

1. Apply the specified mains voltage to the mains power input, and a standard test pattern to the RF input.
2. Not need to adjust, just for verification: with the TV settings in “Personal” mode (BRI/CONT/COL in middle position), test if the voltage at D833 (B+) is 112 V ± 2.0 V.

8.3.2 RF AGC Adjustment

1. Input RF signal: 80 dBµV Color Bar signal, 100% modulation (e.g. PM5418, RF Ampl.: 10 mV).
2. Press key “7” on the RC (in Factory Mode) to enter the RF AGC adjustment mode.
3. Adjust the “RFAGC” item until the output of the detector becomes 0.6 Vp-p ± 0.05 V.

8.3.3 Focus and Screen Voltage Adjustment

1. Before adjusting, please confirm that the settings are:
   – Input signal: Cross Hatch test pattern
   – SMART PICTURE = NATURAL.
2. Adjust the “FOCUS” potentiometer on the LOT such that the horizontal/vertical line of 2/3 on the screen looks thinnest. The FOCUS voltage must be within 6.6 - 7.8 kV.
3. Then adjust the “SCREEN” potentiometer on the LOT until the horizontal line is just visible.
4. At this moment (vertical “off”), measure the VG2 voltage with a high voltage meter and high voltage test probe (1000:1). The VG2 voltage spec is 570 V ± 50 V.

8.3.4 White Balance Adjustment

1. Before adjusting, please confirm that the settings are:
   – Input signal: Black and White test pattern
   – SMART PICTURE = NATURAL.
   – COLOR TEMP= NORMAL.
2. Press key “0” on the RC (in Factory Mode) to enter the White Balance adjustment mode.
3. Use a color analyser to measure the **Black** part of the screen. By changing the value of “BB” and “GB”, set the reading of the color analyser to the x,y values as given in the next table.
4. Use a color analyser to measure the **White** part of the screen. By changing the value of “BD” and “GD”, set the reading of the color analyser to the x,y values as given in the next table.
5. Repeat these steps until you get the right color on both dark and bright pictures (see next table).

Table 8-2 White balance adjustment values

Picture Mode	Color Temp.	x	y	Y (Nit)
Normal	11500K	274	280	90 (white), 5 (black)
Cool	15000K	265 *	266 *	
Warm	8500K	291 *	300 *	

Remarks:
- (*) Only adjust the NORMAL status; the COOL and WARM offset adjustments are preset in the NVM.
  If necessary, the COOL adjustments can be performed with “WRCUT“, “WGCUT“, “WBCUT“, “WGDRV“, and “WBDRV“, while the WARM adjustments can be performed via “CRCUT“, “CGCUT“, “CBCUT“, “CGDRV“, and “CBDRV“
- When adjusting, “BB” and “GB” are used to adjust black balance, and “BD” and “GD” are used to adjust white balance.

8.3.5 Picture geometric adjustment

For PAL
1. Input a PAL cross hatch pattern (in NATURAL status).
2. Press key “1” on the RC (in Factory Mode) to enter the Geometric adjustment.
3. Select “HPOS” to adjust the horizontal centre.
4. Select “VP50” to adjust the vertical centre.
5. Select “HIT” to adjust the vertical amplitude.
6. Select “VLIN” to adjust the vertical linearity.
7. Select “VSC” to adjust the vertical S-correction.

For NTSC
1. Input a NTSC cross hatch pattern (in NATURAL status).
2. Press key “1” on the RC (in Factory Mode) to enter the Geometric adjustment.
3. Select “HPS” to adjust the horizontal center.
4. Select “VP60” to adjust the vertical center.
5. Select “HITS” to adjust the vertical amplitude.
6. Select “VLIS” to adjust the vertical linearity.
7. Select “VSS” to adjust the vertical S-correction.

Adjustment of OSD Position
1. Navigate through the “Factory Mode” options with the “CH+ (^) / CH- (v)” cursor keys on the RC (see also figure “Factory Mode Overview”).
2. Select the “OSD2” option and adjust the OSD horizontal position, until OSD “MUTE” is at the middle of the screen.

9. Circuit Descriptions, Abbreviation List, and IC Data Sheets

Index of this chapter:

Notes:

- Figures can deviate slightly from the actual situation, due to different set executions.
- For a good understanding of the following circuit descriptions, please use the Wiring, Block (chapter 6) and Circuit Diagrams (chapter 7). Where necessary, you will find a separate drawing for clarification.

9.1 General

This chassis uses the Toshiba TPMA8891 processor/decoder, and has the following key components:

Item	Part No.	Name of IC	Function
IC201	13-PA8891-PSP	TMPA8891CXBNG	MCU & Decoder
TU101	07-389FI5-NA3G	FSBP05P-3-E	Tuner
Z101	45-SAW296-6M00G	K2966M	SAW Filter
IC001	13-24C08A-PUP27	AT24C08A	EEPROM
IC601	13-TDA749-6AS	TDA7496SA	Audio output amplifier
IC901	13-000040-53P	HCF4053B	Analog Switch
IC301	13-LA7804-0NS	LA78040N-E	Vertical Deflection Output IC
Q402	11-4508DZ-0CX	BU4508DZS	Horizontal Output IC
IC801	13-TEA150-6PP	TEA1506P	Power Controller IC

9.2 Chassis Block Diagram

Below find the chassis block diagram:

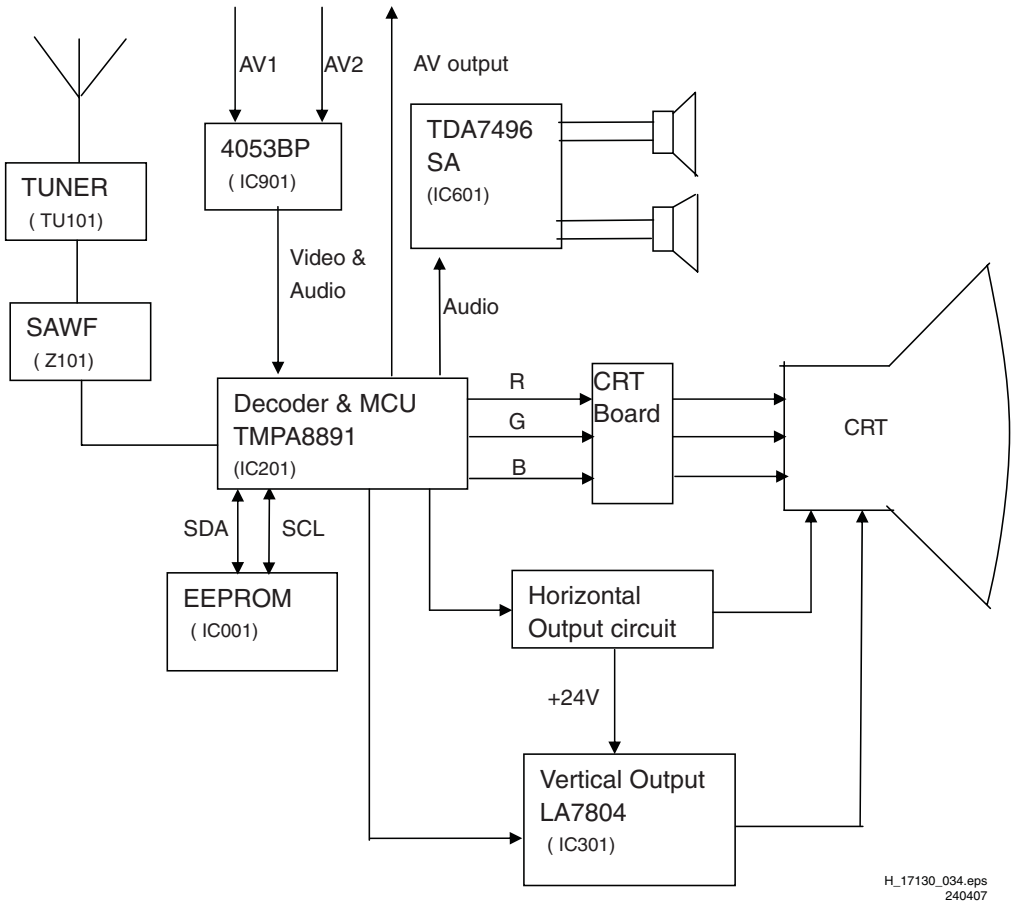

Figure 9-1 Chassis block diagram

9.3 Brief IC Descriptions

9.3.1 IC201 (TMPA8891CXBNG)

The TMPA8891 is an integrated circuit for a PAL/ NTSC/ SECAM TV. A microcontroller (MCU) and a TV signal processor are integrated in a 64-pin shrink DIP package.

The MCU part contains:
- 8-bit CPU.
- ROM.
- RAM.
- I/O ports.
- Timers/ counters.
- A/D converters.
- On-Screen Display controller.
- remote control interfaces.
- IIC bus interfaces.
- Closed Caption decoder.

The TV signal processor part contains:
- PIF.
- SIF.
- Video.
- Multi-standard chroma.
- Sync.
- RGB processors.

Block diagram is as follows:

Block Diagram & Pin Configuration

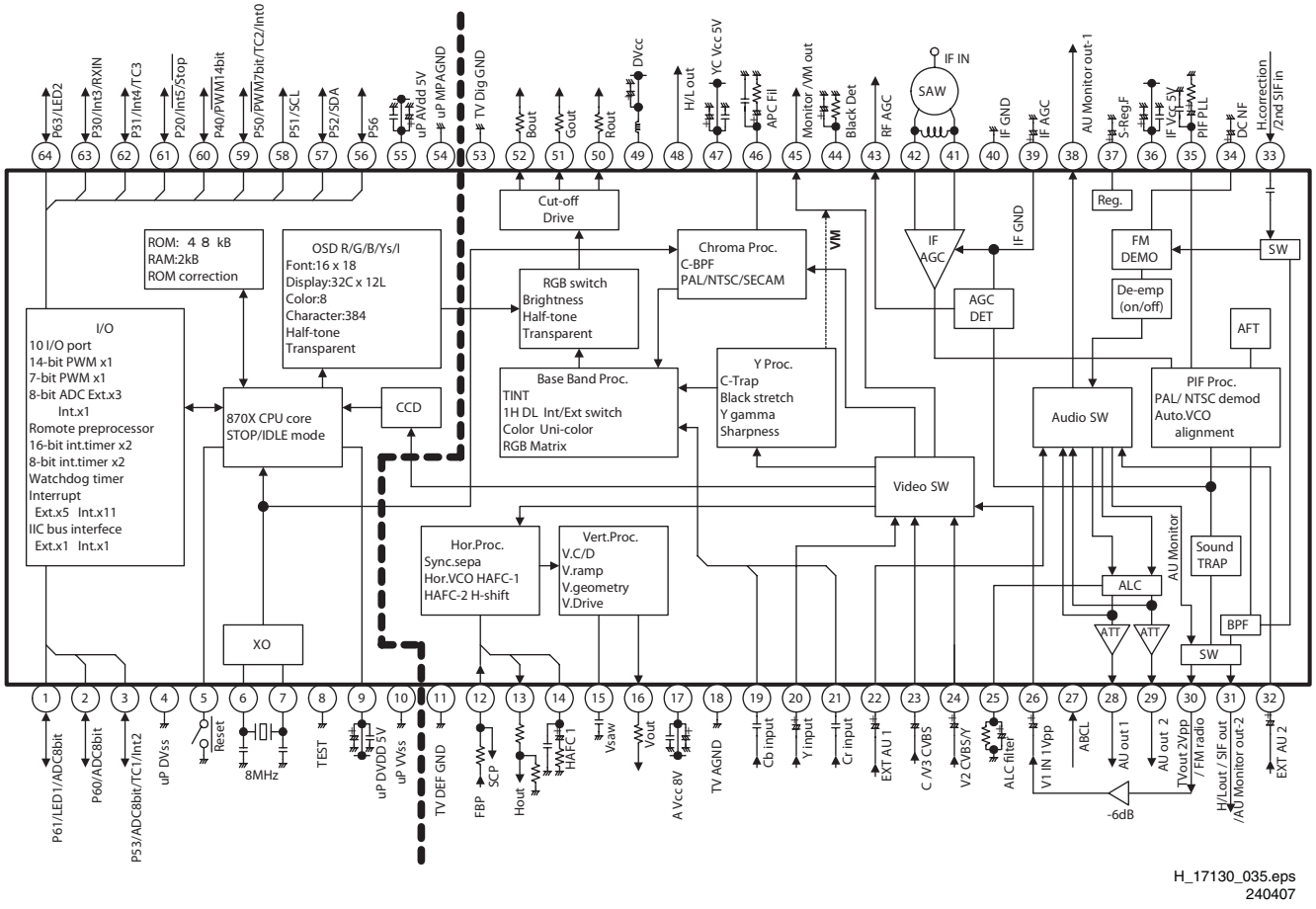

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Figure 9-2 Block diagram IC201 (TMPA8891CXBNG)

9.3.2 TU101 (FSBP05P-3-E)

Intermediate frequency:
- Picture carrier: 38.90 MHz
- Color carrier: 34.47 MHz
- Sound carrier: 33.40 MHz

Pin connection is as follows:

Pin	Symbol	Description
1	AGC	Automatic Gain Control
2		
3	AS	I2C Bus Address Select
4	SCL	I2C Bus Serial Clock
5	SDA	I2C Bus Serial Data
6		
7	BP	Supply Voltage Tuner Section +5V
8	AFC	Automatic Frequency Control
9	BT	Supply Voltage Tuner Section +31V
10	n.c. / IF1	
11	IF2	Intermediate Frequency Out

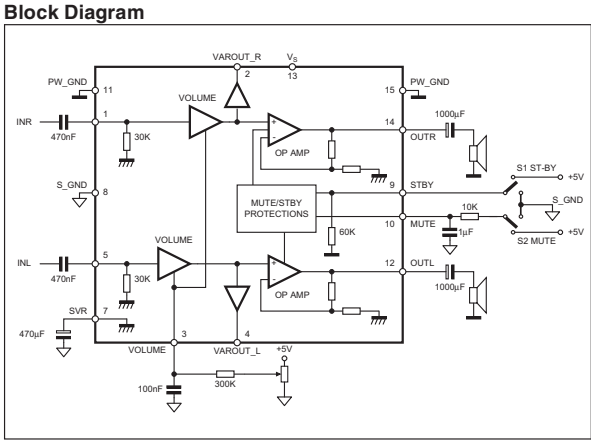
9.3.3 IC001 (AT24C08A)

It provides 8192 bits of serial electrically erasable and programmable read-only memory (EEPROM) organized as 1024 words of 8 bits each. It needs to be pre-copied before produced.

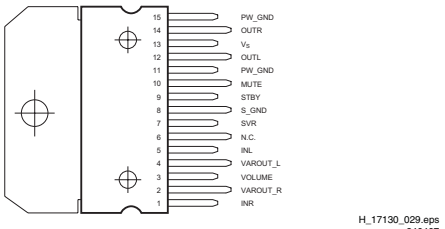
9.3.4 IC601 (TDA7496SA)

The TDA7496SA is a 2 x 5 W class AB power audio amplifier. The pinning is as follows:

Block Diagram



Pin Configuration (Top View)



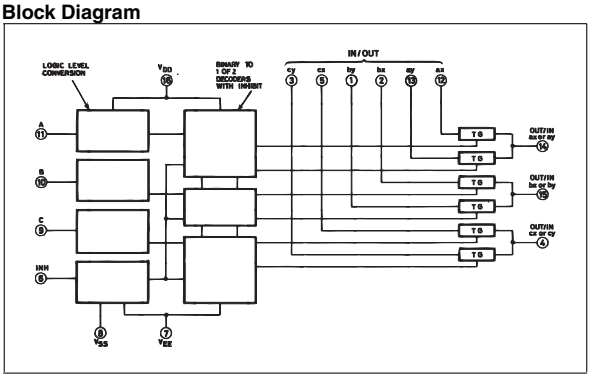
H_17130_029.eps
240407

Figure 9-3 Block diagram and pinning of IC601 (TDA7496SA)

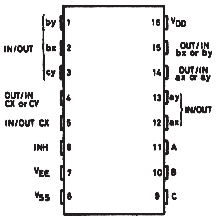
9.3.5 IC901 (HCF4053B)

This is an analogue switch. Its pinning diagram, pin description and truth table are as follows:

Block Diagram



Pin Configuration



E_06532_040.eps
040507

Figure 9-4 Block diagram and pinning of IC901 (HCF4053)

Table 9-1 Pin Configuration

PIN No	SYMBOL	NAME AND FUNCTION
11, 10, 9	A, B, C	Binary Control Inputs
6	INH	Inhibit Inputs
12, 13, 2, 1, 5, 3	IN/OUT	ax,ay,bx,by,cx,cy Input/Output
14	OUT/IN	ax or ay
15	OUT/IN	bx or by
4	OUT/IN	cx or cy
7	VEE	Supply Voltage
8	VSS	Negative Supply Voltage
16	VDD	Positive Supply Voltage

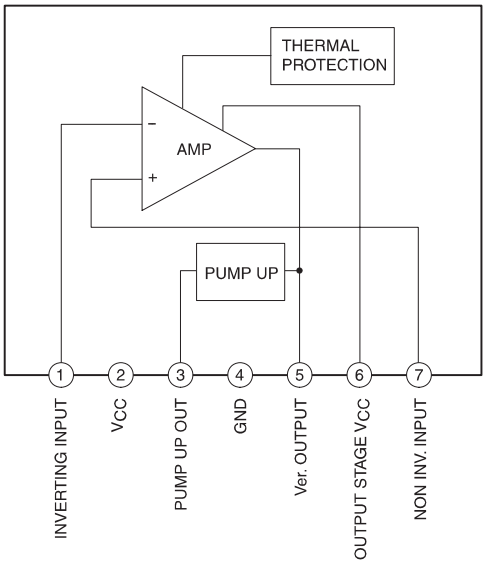
Table 9-2 Truth Table

INHIBIT	C or B or A	
0	0	ax or bx or cx
0	1	ay or by or cy
1	X	NONE
X : Don't Care		

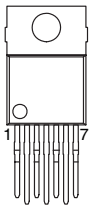
9.3.6 IC301 (LA78040N-E)

IC301 is a vertical deflection output IC.
Its block diagram and pin connection are as follows:

Block Diagram



Pin Configuration



H_17130_031.eps
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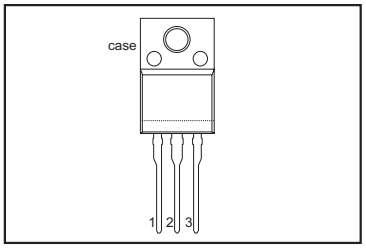
Figure 9-5 Block diagram and pinning of IC301 (LA78040N-E)

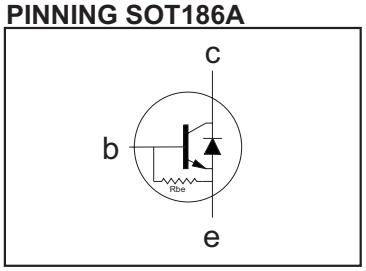
9.3.7 Q402 (BU4508DZS)

Q402 is a high speed switching, high voltage PNP power transistor with a built-in damper diode, designed for use in horizontal deflection circuits.
The pinning is as follows:

PIN CONFIGURATION



PINNING SOT186A



SYMBOL

PIN	DESCRIPTION
1	base
2	collector
3	emitter
case	isolated

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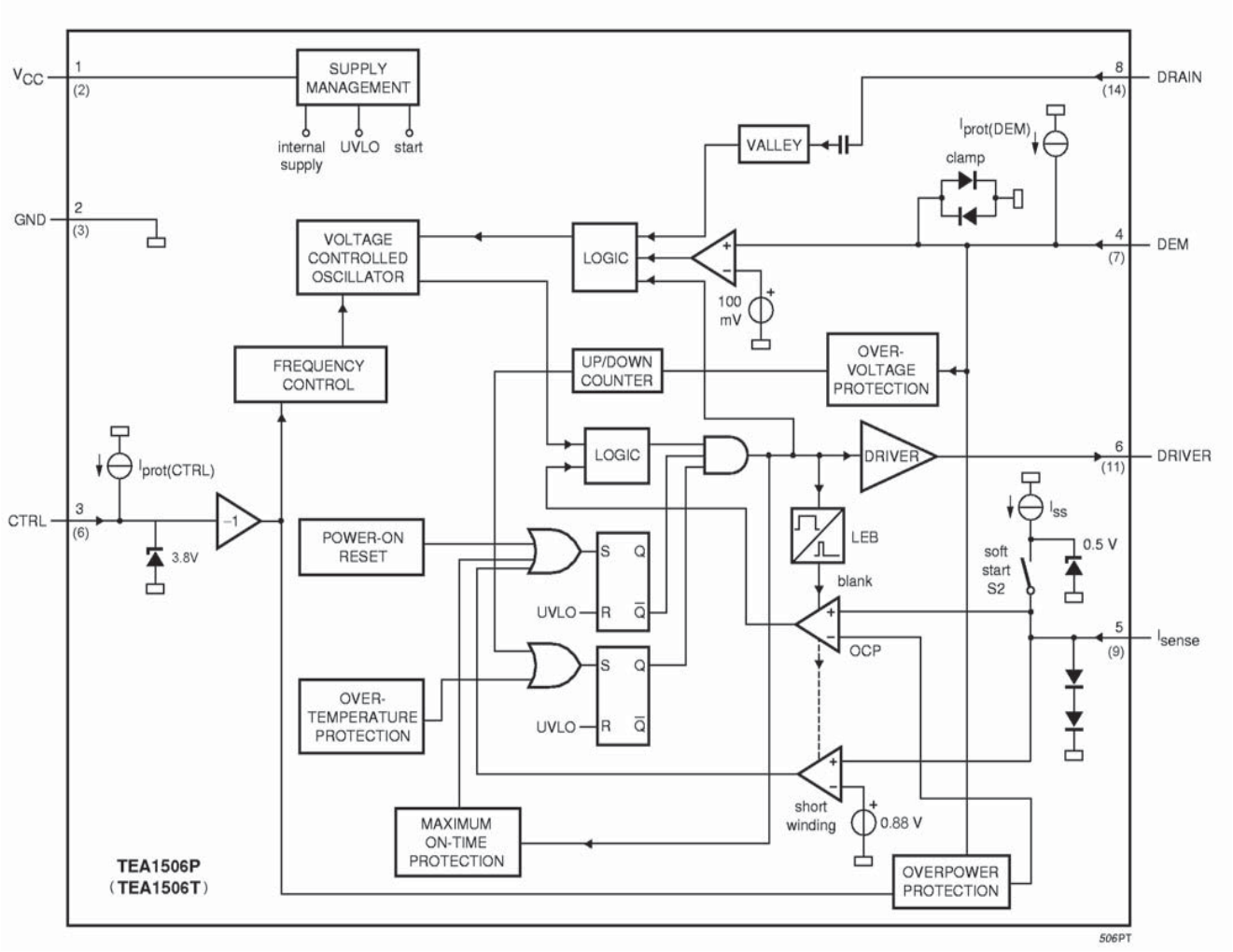
240407

Figure 9-6 Pinning of Q402 (BU4508DZS)

9.3.8 IC801 (TEA1506P)

IC801 is a switched mode power supply control IC.
Its block diagram and pinning are as follows:

Block Diagram



Pin Configuration

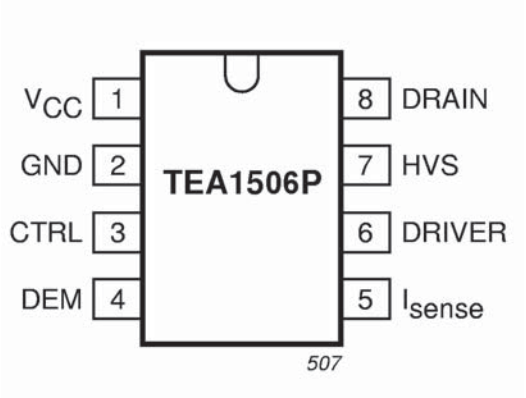


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Figure 9-7 Block diagram of IC801 (TEA1506P)

9.4 Abbreviation List

1080i	1080 visible lines, interlaced
1080p	1080 visible lines, progressive scan
ADC	Analogue to Digital Converter
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency
AGC	Automatic Gain Control: algorithm that controls the video input of the feature box
AM	Amplitude Modulation
AR	Aspect Ratio: 4 by 3 or 16 by 9
AV	Audio Video
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz
BTSC	Broadcast Television System Committee
CBA	Circuit Board Assembly (or PWB)
CVBS	Composite Video Blanking and Synchronization
CVI	Component Video Input
DAC	Digital to analogue Converter
DFU	Directions For Use: owner's manual
DNR	Dynamic Noise Reduction
DRAM	Dynamic RAM
DSP	Digital Signal Processing
DVD	Digital Versatile Disc
EEPROM	Electrically Erasable and Programmable Read Only Memory
EXT	EXTernal (source), entering the set by SCART or by cinches (jacks)
FBL	Fast Blanking: DC signal accompanying RGB signals
FM	Field Memory / Frequency Modulation
H	H_sync
HD	High Definition: 720p, 1080i, 1080p
HP	Head Phone
I	Monochrome TV system. Sound carrier distance is 6.0 MHz
I2C	Integrated IC bus
IC	Integrated Circuit
IF	Intermediate Frequency
IR	Infra Red
IRQ	Interrupt ReQuest
Last Status	The settings last chosen by the customer and read and stored in RAM or in the NVM. They are called at start-up of the set to configure it according the customers wishes
LATAM	LATin AMerica
LED	Light Emitting Diode
LS	Loud Speaker
M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz
MOSFET	Metal Oxide Semiconductor Field Effect Transistor
MUTE	MUTE Line
NAFTA	North American Free Trade Association: Trade agreement between Canada, USA and Mexico
NC	Not Connected
NTSC	National Television Standard Committee. Color system used mainly in North America and Japan. Color carrier NTSC M/N = 3.579545 MHz, NTSC 4.43 = 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)
NVM	Non Volatile Memory: IC containing TV related data (for example, options)
O/C	Open Circuit
OSD	On Screen Display
PAL	Phase Alternating Line. Color system used mainly in Western Europe (color carrier = 4.433619 MHz) and South America (color carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)
PCB	Printed Circuit Board (or PWB)
PIP	Picture In Picture
PLL	Phase Locked Loop. Used, for example, in FST tuning systems. The customer can directly provide the desired frequency
PSU	Power Supply Unit
PWB	Printed Wiring Board (or PCB)
RAM	Random Access Memory
RC	Remote Control transmitter
RC5 (6)	Remote Control system 5 (6), the signal from the remote control receiver
RF	Radio Frequency
RGB	Red, Green, and Blue. The primary color signals for TV. By mixing levels of R, G, and B, all colors (Y/C) are reproduced.
RGBHV	Red, Green, Blue, Horizontal sync, and Vertical sync
ROM	Read Only Memory
SC	SandCastle: two-level pulse derived from sync signals
S/C	Short Circuit
SCL	Clock signal on I2C bus
SD	Standard Definition: 480i, 576i
SDA	Data signal on I2C bus
SDRAM	Synchronous DRAM
SECAM	SEequence Couleur Avec Memoire. Color system used mainly in France and Eastern Europe. Color carriers = 4.406250 MHz and 4.250000 MHz
SIF	Sound Intermediate Frequency
SMPS	Switch Mode Power Supply
SND	SouND
SOPS	Self Oscillating Power Supply
SRAM	Static RAM
SSB	Small Signal Board
STBY	Stand-by
SVHS	Super Video Home System
SW	Sub Woofer / SoftWare / Switch
THD	Total Harmonic Distortion
TXT	TeleteXT
uP	Microprocessor
VL	Variable Level out: processed audio output toward external amplifier
VCR	Video Cassette Recorder
VGA	Video Graphics Array
WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
XTAL	Quartz crystal
YPbPr	Component video (Y= Luminance, Pb/Pr= Color difference signals B-Y and R-Y, other amplitudes w.r.t. to YUV)
Y/C	Video related signals: Y consists of luminance signal, blanking level and sync; C consists of color signal.
Y-OUT	Luminance-signal
YUV	Baseband component video (Y= Luminance, U/V= Color difference signals)

10. Spare Parts List

Set Level

21PT5007/94

P401H	9965 100 04136	HS 4P 400/13 TJC1/4Y
P601H	9965 100 04134	HS 2P 2468 S11/2Y
P602H	9965 100 04133	HS 2P22 570/7 TJC3-2Y
OTH003	9965 100 02991	Degaussing Coil
OTH009	9965 000 41238	Chassis Guide
OTH013	9965 100 04135	LOGO
OTH036	9965 100 01107	Audio Cable 1500mm
OTH056	9965 000 26496	CRT Bracket
OTH091	9965 000 35209	Conn .310431103011
W601	9965 000 36789	Loudsp. 8Ω 5W
W602	9965 000 36789	Loudsp. 8Ω 5W

Main Carrier [A]

	9965 000 15099	0.01µF +80%~20% 50V

Various

F801	9965 000 35264	Fuse 3.15AT 250VAC
IR001A	9965 000 27288	IR Receiver Module
P1101	9965 100 04139	RCA Socket AV
P1104B	9965 000 34463	HS 5p TJC3-5Y
P901	9965 100 03169	AV Socket AV
S802	9965 000 33555	Power Switch
TU101	9965 100 03089	Tuner FSBP05P-3-e
X001	9965 000 15136	Xtal 8.0MHz
Z101	9965 000 15137	SAW 38.9MHz K2966M
K001	9965 000 17540	Switch
K002	9965 000 17540	Switch
K003	9965 000 17540	Switch
K004	9965 000 17540	Switch

⊣⊢

C001	9965 000 34503	100pF 5% 50V
C002	9965 000 34503	100pF 5% 50V
C003	9965 000 27860	10µF /-20% 16V
C004	9965 000 27860	10µF /-20% 16V
C005	9965 000 15099	0.01µF +80%~20% 50V
C006	9965 000 15099	0.01µF +80%~20% 50V
C008	9965 000 31199	470pF 5% 50V
C008A	9965 000 28015	22µF 20% 50V
C009	9965 000 14069	100µF 20% 16V
C011	9965 000 35328	27pF 5% 50V
C016	9965 000 14069	100µF 20% 16V
C017	9965 000 15099	0.01µF +80%~20% 50V
C019	9965 000 15099	0.01µF +80%~20% 50V
C020	9965 000 15099	0.01µF +80%~20% 50V
C020A	9965 000 33957	10nF 5% 50V
C021	9965 000 34506	39pF 5% 50V
C022	9965 000 34506	39pF 5% 50V
C023	9965 000 27860	10µF /-20% 16V
C024	9965 000 15099	0.01µF +80%~20% 50V
C030	9965 000 14039	4.7µF 20% 50V
C081	9965 000 13961	47µF 20% 16V
C082	9965 000 15099	0.01µF +80%~20% 50V
C086	9965 000 15084	22µF 20% 16V
C091	9965 000 28015	22µF 20% 50V
C095	9965 000 34518	1500pF 10% 50V
C097	9965 000 14075	10µF 20% 50V
C101	9965 000 14039	4.7µF 20% 50V
C103A	9965 000 14039	4.7µF 20% 50V
C108	9965 000 13961	47µF 20% 16V
C109	9965 000 15099	0.01µF +80%~20% 50V
C110	9965 000 15099	0.01µF +80%~20% 50V
C112	9965 000 30711	1000pF 20% 50V
C114	9965 000 15099	0.01µF +80%~20% 50V
C121	9965 000 34503	100pF 5% 50V
C122	9965 000 34503	100pF 5% 50V
C135A	9965 000 15099	0.01µF +80%~20% 50V
C201	9965 000 15099	0.01µF +80%~20% 50V
C202	9965 000 13961	47µF 20% 16V
C203	9965 000 14037	1µF 20% 50V
C204	9965 000 15115	2200pF 5% 50V
C205	9965 000 34500	0.22µF 10% 50V
C206	9965 000 34518	1500pF 10% 50V
C207	9965 000 34505	3300pF 50V 10%
C211	9965 000 14069	100µF 20% 16V
C212	9965 000 15099	0.01µF +80%~20% 50V
C213	9965 000 30713	2.2nF 10% 50V
C214	9965 000 28015	22µF 20% 50V
C215	9965 000 15099	0.01µF +80%~20% 50V
C216	9965 000 14039	4.7µF 20% 50V
C217	9965 000 14599	470µF 20% 16V
C218	9965 000 15088	0.47µF 20% 50V
C219	9965 000 30711	1000pF 20% 50V
C220	9965 000 27860	10µF /-20% 16V
C224	9965 000 15099	0.01µF +80%~20% 50V
C227	9965 000 27860	10µF /-20% 16V
C228	9965 000 15099	0.01µF +80%~20% 50V
C230	9965 100 03106	RES. C.F. 1M OHM 1/6W
C231	9965 000 27860	10µF /-20% 16V
C232	9965 000 14070	220µF 20% 16V
C233	9965 000 15099	0.01µF +80%~20% 50V
C234	9965 000 27872	0.1µF 5% 100V
C235	9965 000 17886	0.0082µF 5% 63V
C236	9965 000 34501	0.47µF 10%
C239	9965 000 15099	0.01µF +80%~20% 50V
C242	9965 000 15088	0.47µF 20% 50V
C273	9965 000 13961	47µF 20% 16V
C301	9965 000 15112	0.1µF 5% 50V
C302	9965 100 03161	220µF 20% 35V
C303	9965 000 14598	100µF 20% 35V
C304	9965 000 35325	10pPF 5% 50V
C305	9965 000 15084	22µF 20% 16V
C306	9965 000 30711	1000pF 20% 50V
C307	9965 000 14039	4.7µF 20% 50V
C308	9965 000 22932	1000pµF 20% 25V
C309	9965 000 15112	0.1µF 5% 50V
C310	9965 000 14039	4.7µF 20% 50V
C311	9965 000 14069	100µF 20% 16V
C337	9965 000 15088	0.47µF 20% 50V
C401	9965 000 15094	1000pF 10% 500V
C402	9965 000 17517	0.011µF 5% 1.6kV
C404	9965 100 03127	47Ω 5% 1/6W
C405	9965 000 14036	100µF 20% 25V
C407	9965 000 15095	3300pF 10% 500V
C408	9965 000 14921	10µF 20% 250V
C409	9965 000 15096	390pF 10% 500V
C410	9965 100 03162	CAP. M.PP 0.1 UF 250V
C411	9965 000 17512	47µF 20% 160V
C412	9965 000 15096	390pF 10% 500V
C413	9965 000 14073	470µF 20% 35V
C414	9965 000 14039	4.7µF 20% 50V
C418	9965 000 14070	220µF 20% 16V
C420	9965 000 24353	1µF 20% 160V
C421	9965 100 03163	0.3µF 5% 250V
C422	9965 000 14081	5600pF 5% 50V
C423	9965 000 13961	47µF 20% 16V
C425	9965 000 15099	0.01µF +80%~20% 50V
C441	9965 000 14039	4.7µF 20% 50V
C601	9965 000 15113	220nF 5% 50V
C602	9965 000 15113	220nF 5% 50V
C603	9965 000 15117	4700pF 5% 50V
C604	9965 000 15117	4700pF 5% 50V
C605	9965 000 14599	470µF 20% 16V
C606	9965 000 14599	470µF 20% 16V
C607	9965 000 14599	470µF 20% 16V
C608	9965 000 14599	470µF 20% 16V
C609	9965 000 14599	470µF 20% 16V
C618	9965 100 03088	22µF 20% 50V
C619	9965 000 14073	470µF 20% 35V
C624	9965 000 28015	22µF 20% 50V
C625	9965 000 14069	100µF 20% 16V
C626	9965 000 35326	0.1µF 80%/20% 50V
C635	9965 000 13961	47µF 20% 16V
C641	9965 000 27860	10µF /-20% 16V
C642	9965 000 27860	10µF /-20% 16V
C801	9965 000 35331	0.22µF 20% 250V
C802	9965 100 03199	0.1µF 10% 400V
C803	9965 000 17914	470pF 10% 400V
C804	9965 000 17914	470pF 10% 400V
C805	9965 000 44381	10nF 10% 500V
C806	9965 000 40946	220µF 20% 450V
C807	9965 000 15188	4700pF 250Vac +80-20%
C808	9965 000 15188	4700pF 250Vac +80-20%
C809	9965 000 23786	220pF 10% 1KV
C810	9965 100 03198	CAP.M.PP.10NF/400V
C811	9965 100 03197	47nF 80% 50V
C813	9965 000 31199	470pF 5% 50V
C814	9965 000 15806	0.1µF +80-20% 50V
C815	9965 000 37248	560pF 10% 2kV
C818	9965 100 03088	22µF 20% 50V
C820	9965 100 03193	22µF 20% 25V
C821	9965 000 31455	220pF 5% 50V
C826	9965 000 44381	10nF 10% 500V
C829	9965 100 03195	2200pF 20% 400VAC
C830	9965 000 15183	220pF 500V 10%
C831	9965 000 15099	0.01µF +80%~20% 50V
C832	9965 000 14073	470µF 20% 35V
C833	9965 000 23786	220pF 10% 1KV
C834	9965 100 03194	1µ 50V
C835	9965 000 31230	100µF 20% 160V
C837	9965 000 15806	0.1µF +80-20% 50V
C839	9965 000 30711	1000pF 20% 50V
C841	9965 000 15183	220pF 500V 10%
C842	9965 000 15099	0.01µF +80%~20% 50V
C843	9965 000 17510	1000µF 16V 20%
C844	9965 000 33957	10nF 5% 50V
C845	9965 000 14067	1000µF 20% 16V
C850	9965 000 15182	47µF 20% 25V
C903	9965 000 15084	22µF 20% 16V
C904	9965 000 27860	10µF /-20% 16V
C905	9965 000 27860	10µF /-20% 16V
C906	9965 000 15084	22µF 20% 16V
C907	9965 000 27860	10µF /-20% 16V
C908	9965 000 27860	10µF /-20% 16V
C909	9965 000 15084	22µF 20% 16V
C910	9965 000 15099	0.01µF +80%~20% 50V
C912	9965 000 15099	0.01µF +80%~20% 50V
C913	9965 000 15690	330pF 5% 50V
C914	9965 000 15690	330pF 5% 50V
C916	9965 000 14037	1µF 20% 50V
C918	9965 000 15690	330pF 5% 50V
C919	9965 000 15690	330pF 5% 50V
C931	9965 000 15099	0.01µF +80%~20% 50V
C961	9965 000 27860	10µF /-20% 16V
C962	9965 000 27860	10µF /-20% 16V
C963	9965 000 14037	1µF 20% 50V
C964	9965 000 14037	1µF 20% 50V

–WW–

R001	9965 000 14050	10k 5% 0.16W
R0010	9965 100 03127	47Ω 5% 1/6W
R002	9965 100 03127	47Ω 5% 1/6W
R003	9965 000 15057	4.7k 5% 0.16W
R004	9965 000 15057	4.7k 5% 0.16W
R005	9965 000 14050	10k 5% 0.16W
R008	9965 000 14049	100Ω 5% 0.16W
R012	9965 000 14049	100Ω 5% 0.16W
R013	9965 100 02999	1kΩ 5% 1/6W
R015	9965 100 03121	2.7kΩ 5% 1/6W
R016	9965 100 03107	1.2kΩ 5% 1/6W
R017	9965 000 13957	2.2kΩ 5% 1/6W
R020	9965 000 13960	470Ω 5% 0.16W
R021A	9965 100 03110	150Ω 5% 1/6W
R022A	9965 000 13960	470Ω 5% 0.16W
R023A	9965 000 17864	820Ω 5% 0.16W
R024A	9965 000 15062	7.5kΩ 50% 1/6W
R025A	9965 100 03121	2.7kΩ 5% 1/6W
R026A	9965 100 03126	430Ω 50% 1/6W
R027	9965 000 15066	10Ω 5% 0.25W
R027A	9965 000 15050	270Ω 5% 0.16W
R028	9965 100 03000	680Ω 5% 1/6W
R029	9965 100 02999	1kΩ 5% 1/6W
R030	9965 000 14050	10k 5% 0.16W
R031	9965 000 15041	100k 5% 0.16W
R035	9965 100 02999	1kΩ 5% 1/6W
R041	9965 000 15057	4.7k 5% 0.16W
R042	9965 000 14050	10kΩ5% 0.16W
R046	9965 100 03123	30kΩ 5% 1/6W
R047	9965 000 14049	100Ω 5% 0.16W
R091	9965 000 14050	10kΩ 5% 0.16W
R092	9965 000 15057	4.7k 5% 0.16W
R093	9965 000 15057	4.7k 5% 0.16W
R094	9965 000 15044	1.5k 5% 0.16W
R095	9965 000 14050	10k 5% 0.16W
R114	9965 100 03140	56Ω 5% 1/6W
R115	9965 100 03110	150Ω 5% 1/6W
R116	9965 100 02999	1kΩ 5% 1/6W
R117	9965 100 03110	150Ω 5% 1/6W
R118	9965 000 17864	820Ω 5% 0.16W
R119	9965 000 13960	470Ω 5% 0.16W
R201	9965 100 03114	220Ω 5% 1/6W
R202	9965 100 03114	220Ω 5% 1/6W
R203	9965 100 03114	220Ω 5% 1/6W
R205	9965 100 03123	30kΩ 5% 1/6W
R206	9965 100 03120	220kΩ 5% 1/6W
R207	9965 100 03127	47Ω 5% 1/6W
R216	9965 000 27858	27kΩ 5% 1/6W
R217	9965 100 03114	220Ω 5% 1/6W
R228	9965 000 13960	470Ω 5% 0.16W
R232	9965 000 15041	100k 5% 0.16W
R237	9965 100 03146	8.2kΩ 5% 1/6W
R238	9965 000 13960	470Ω 5% 0.16W
R243	9965 000 13960	470Ω 5% 0.16W
R244	9965 000 15057	4.7k 5% 0.16W
R245	9965 000 23744	150kΩ 5% 0.17W
R298	9965 100 03152	330Ω 1/2W

R307	9965 100 03113	18kΩ 5% 1/6W
R308	9965 000 15057	4.7k 5% 0.16W
R309	9965 000 14050	10k 5% 0.16W
R310	9965 100 03109	12kΩ 5% 1/6W
R311	9965 000 15044	1.5k 5% 0.16W
R312	9965 100 03139	51kΩ 1/6W
R313	9965 100 03159	1.5Ω 1W
R314	9965 100 03147	RES. C.F. 2.2 OHM 1/4W
R317	9965 100 03153	RES. C.F. 56 OHM 1/2W
R318	9965 100 03107	1.2kΩ 5% 1/6W
R336	9965 100 03149	220Ω 1/2W
R337	9965 000 15041	100k 5% 0.16W
R338	9965 000 15041	100k 5% 0.16W
R401	9965 000 17494	120Ω 5% 1/6W
R402	9965 100 03148	5.6Ω 5% 1/2W
R403	9965 000 24352	0.47Ω 5% 1W
R404	9965 000 15409	15kΩ 5% 2W
R405	9965 100 03155	1.5Ω 5% 1W
R406	9965 000 15057	4.7kΩ 5% 0.16W
R407	9965 100 03160	3.3Ω 5% 2W
R408	9965 000 17869	12k 5% 1W
R409	9965 100 03149	220Ω 1/2W
R410	9965 100 03151	22kΩ 1/2W
R411	9965 100 03158	1.8kΩ 5% 1W
R413	9965 000 14048	10Ω 5% 1/6W
R414	9965 000 15049	24kΩ 5% 1/6W
R415	9965 100 02999	1kΩ 5% 1/6W
R416	9965 100 03142	6.8kΩ 5% 1/6W
R417	9965 100 03157	1.2kΩ 5% 1/2W
R418	9965 100 03156	1kΩ 5% 1/2W
R419	9965 100 03154	2.2Ω 5% 1/2W
R440	9965 000 14048	10Ω 5% 1/6W
R442	9965 000 17494	120Ω 5% 1/6W
R443	9965 100 03141	620Ω 5% 1/6W
R601	9965 000 15057	4.7k 5% 0.16W
R602	9965 000 15057	4.7k 5% 0.16W
R603	9965 000 14050	10k 5% 0.16W
R604	9965 000 14050	10k 5% 0.16W
R607	9965 000 14050	10k 5% 0.16W
R608	9965 000 14050	10k 5% 0.16W
R619	9965 000 22921	0.22Ω 1W
R802	9965 000 15177	1MΩ 1/2W
R803	9965 100 03192	NTC.RES 3D2-14
R804	9965 100 03190	Metal Film 1WS 330kΩ
R806	9965 000 17557	DSP-301M-A
R807	9965 000 25987	220Ω 10% 1/2W
R810	9965 000 30822	68kΩ 5% 2W
R811	9965 100 03107	1.2kΩ 5% 1/6W
R813	9965 100 03187	100Ω 5% 1/4W
R814	9965 000 14048	10Ω 5% 1/6W
R815	9965 100 03191	0.08Ω 5% 2W
R817	9965 000 15664	2.2kΩ 5% 1/4W
R818	9965 000 14055	33kΩ 5% 1/6W
R819	9965 100 03184	330kΩ 5% 1/6W
R820	9965 000 14059	22Ω 5% 0.25W
R821	9965 000 13960	470Ω 5% 0.16W
R822	9965 100 03185	390kΩ 1/6W
R829	9965 000 15781	8.2MΩ 1W
R835	9965 100 03000	680Ω 5% 1/6W
R836	9965 000 13957	2.2kΩ 5% 1/6W
R837	9965 000 14055	33kΩ 5% 1/6W
R838	9965 100 03188	RES. M.F. 3.6K OHM 1/6
R839	9965 000 23773	82kΩ 1% 0.5W
R840	9965 000 14050	10k 5% 0.16W
R841	9965 000 14585	47kΩ 5% 1/6W
R842	9965 000 44690	3.9kΩ 1% 1/6W
R843	9965 100 03189	1Ω 5% 1W
R844	9965 100 02999	1kΩ 5% 1/6W
R845	9965 000 15771	1KΩ 1/4W 5% Carb. Film
R851	9965 000 14050	10k 5% 0.16W
R901	9965 000 27858	27kΩ 5% 1/6W
R903	9965 100 02999	1kΩ 5% 1/6W
R904	9965 100 03143	75Ω 5% 1/6W
R905	9965 100 02999	1kΩ 5% 1/6W
R906	9965 100 03144	82Ω 5% 1/6W
R907	9965 100 02999	1kΩ 5% 1/6W
R908	9965 100 02999	1kΩ 5% 1/6W
R912	9965 100 02999	1kΩ 5% 1/6W
R914	9965 100 03144	82Ω 5% 1/6W
R918	9965 000 14050	10k 5% 0.16W
R919	9965 000 14050	10k 5% 0.16W
R922	9965 000 14055	33kΩ 5% 1/6W
R922A	9965 000 27858	27kΩ 5% 1/6W
R923	9965 000 13960	470Ω 5% 0.16W
R926	9965 000 14585	47kΩ 5% 1/6W
R927	9965 000 14585	47kΩ 5% 1/6W
R928	9965 000 14585	47kΩ 5% 1/6W
R929	9965 000 14585	47kΩ 5% 1/6W
R930	9965 000 14585	47kΩ 5% 1/6W
R931	9965 000 14585	47kΩ 5% 1/6W
R932	9965 100 02999	1kΩ 5% 1/6W
R933	9965 100 02999	1kΩ 5% 1/6W
R935	9965 000 14585	47kΩ 5% 1/6W
R936	9965 000 14585	47kΩ 5% 1/6W
R940	9965 000 15062	7.5kΩ 50% 1/6W
R941	9965 100 02999	1kΩ 5% 1/6W
R963	9965 100 02999	1kΩ 5% 1/6W
R964	9965 100 02999	1kΩ 5% 1/6W
RT801	9965 000 25706	PTC 9 OHM
VR801	9965 000 24388	Varistor Res Myg-14k300
J103	9965 000 14049	100Ω 5% 0.16W

L001	9965 100 03164	12µH +/-5%
L002	9965 000 15123	10µH 5%
L080	9965 000 15126	33µH 5%
L103	9965 000 15121	1µH 10%
L108	9965 000 15124	22µH 5%
L202	9965 000 15126	33µH 5%
L203	9965 100 03165	Bead BF-I35050R-730
L208	9965 000 15124	22µH 5%
L411	9965 100 03168	Coil Width 92µH
L412	9965 100 03167	Coil Linearity 45µH
L815	9965 000 24357	Bead H75 (3.5X1X5)
L830	9965 000 24357	Bead H75 (3.5X1X5)
L833	9965 100 03165	Bead BF-I35050R-730
L834	9965 000 15193	100µH 10%
L835	9965 100 03165	Bead BF-I35050R-730
L840	9965 000 24357	24357
L843	9965 000 15193	100µH 10%
T401	9965 100 03166	Transf. Hor. BCT-101
T402	9965 100 03170	FBT BSC25-0220w
T801	9965 100 03202	Line Filter
T803	9965 100 03203	Transf. Conv. BCK4035

D001	9965 100 03096	Zener 5% 4V7 1/2W
D001A	9965 000 32018	LED 932205099682
D002	9965 100 02996	1N4148 (Switching)
D005	9965 100 02996	1N4148 (Switching)
D006	9965 100 02996	1N4148 (Switching)
D007	9965 100 02996	1N4148 (Switching)
D008	9965 000 13957	2.2kΩ 5% 1/6W
D009	9965 000 15818	BZX79-C6V2
D010	9965 000 15818	BZX79-C6V2
D011	9965 000 15818	BZX79-C6V2
D012	9965 100 03097	Zener 5V1 1/2W 5%
D020A	9965 100 03090	BAT85 (Switch.)
D090	9965 000 15817	3V9 1/2W 5%
D091	9965 100 02996	1N4148 (Switching)
D092	9965 100 02996	1N4148 (Switching)
D093	9965 100 02996	1N4148 (Switching)
D094	9965 100 02996	1N4148 (Switching)
D102	9965 100 03098	Diode CW574CD
D206	9965 100 02996	1N4148 (Switching)
D207	9965 000 15818	BZX79-C6V2
D301	9965 100 03094	1N4001 (Rectifier)
D302	9965 100 02996	1N4148 (Switching)
D303	9965 100 02996	1N4148 (Switching)
D304	9965 000 15817	3V9 1/2W 5%
D305	9965 100 02996	1N4148 (Switching)
D306	9965 100 02996	1N4148 (Switching)
D307	9965 100 02996	1N4148 (Switching)
D337	9965 100 02996	1N4148 (Switching)
D338	9965 100 02996	1N4148 (Switching)
D401	9965 100 03091	FR104 (Fast Rectifier)
D402	9965 100 03091	FR104 (Fast Rectifier)
D403	9965 100 02996	1N4148 (Switching)
D404	9965 000 15818	BZX79-C6V2
D405	9965 100 03091	FR104 (Fast Rectifier)
D406	9965 100 02996	1N4148 (Switching)
D440	9965 100 02996	1N4148 (Switching)
D442	9965 100 03095	Diode BZX79BXXX
D625	9965 100 02996	1N4148 (Switching)
D626	9965 100 02996	1N4148 (Switching)
D801	9965 000 15164	RL255
D802	9965 000 15164	RL255
D803	9965 000 15164	RL255
D804	9965 000 15164	RL255
D809	9965 000 20421	1H8
D814	9965 100 02996	1N4148 (Switching)
D819	9965 100 02996	1N4148 (Switching)
D820	9965 100 03091	FR104 (Fast Rectifier)
D821	9965 100 03172	Zener 18V 1/2W 5%
D830	9965 100 03174	Diode GRU3ZX
D833	9965 000 44366	Rectifier RU3A
D840	9965 100 02996	1N4148 (Switching)
D841	9965 000 44714	Diode RU3YX
D844	9965 100 03173	Zener 7V5 1/2W 5%
D902	9965 000 15818	BZX79-C6V2
D903	9965 000 15818	BZX79-C6V2

IC001	9965 100 03103	AT24C08A-10PU-2.7
IC201	9965 100 03105	TMPA8891CXBNG
IC301	9965 100 03104	LA78040N-E
IC402	9965 100 03102	L7805CV
IC601	9965 100 03004	IC TDA7496SA
IC801	9965 100 03179	TEA1506P
IC802	9965 100 03178	HPC922-C
IC803	9965 100 03177	TL431ACLP
IC901	9965 100 03101	4053 (ANALOG SW)
Q002	9965 100 03003	2SC1815-Y
Q003	9965 100 02997	ST2SA1015Y (PNP)
Q005	9965 100 02997	ST2SA1015Y (PNP)
Q093	9965 100 03003	2SC1815-Y
Q095	9965 100 03003	2SC1815-Y
Q097	9965 100 03003	2SC1815-Y
Q101	9965 000 14974	2SC3779D
Q202	9965 100 03003	2SC1815-Y
Q208	9965 100 03003	2SC1815-Y
Q210	9965 100 02997	ST2SA1015Y (PNP)
Q401	9965 100 03100	2SC2235-Y(NPN)
Q402	9965 100 03099	BU450DZ
Q405	9965 100 02997	ST2SA1015Y (PNP)
Q624	9965 100 03003	2SC1815-Y
Q625	9965 100 02997	ST2SA1015Y (PNP)
Q801	9965 100 02997	ST2SA1015Y (PNP)
Q802	9965 100 03003	2SC1815-Y
Q815	9965 100 03176	2SK2645-01MR
Q841	9965 100 03003	2SC1815-Y
Q842	9965 100 03003	2SC1815-Y
Q843	9965 100 03175	2SD2012
Q844	9965 100 03003	2SC1815-Y
Q845	9965 100 03003	2SC1815-Y
Q903	9965 100 03003	2SC1815-Y
Q904	9965 100 03003	2SC1815-Y
Q905	9965 100 03003	2SC1815-Y

CRT Panel

Various

P501	9965 100 04137	HS 5P24 500 TJC3-5Y/ SCN-5Y
P502	9965 100 04138	HS 4P24 460 F/W TJC3-4Y/SCN-4
OTH027	9965 000 34422	CRT Sock. GZS10-2-108

C501	9965 000 31199	470pF 5% 50V
C502	9965 000 31199	470pF 5% 50V
C503	9965 000 31199	470pF 5% 50V
C504	9965 000 44381	10nF 10% 500V
C505	9965 000 44382	1000pF 10% 2kV
C507	9965 000 15099	0.01µF +80%~20% 50V
C508	9965 000 14070	220µF 20% 16V
C514	9965 000 14925	Bead BF60 for C508
C514	9965 000 35317	10nF 20/80%

R501	9965 000 14049	100Ω 5% 0.16W
R502	9965 000 15057	4.7k 5% 0.16W
R503	9965 000 17938	750Ω 5% 0.16W
R504	9965 000 14049	100Ω 5% 0.16W
R505	9965 000 15057	4.7k 5% 0.16W
R506	9965 000 17938	750Ω 5% 0.16W
R507	9965 000 14049	100Ω 5% 0.16W
R508	9965 000 15057	4.7k 5% 0.16W
R509	9965 000 17938	750Ω 5% 0.16W
R510	9965 000 15409	15k 5% 2W
R511	9965 000 15409	15k 5% 2W
R512	9965 000 15409	15k 5% 2W
R514	9965 100 03001	2.7kΩ 5% 1/2W
R515	9965 100 03001	2.7kΩ 5% 1/2W
R518	9965 100 03001	2.7kΩ 5% 1/2W
R521	9965 000 17939	100k 5% 0.25W
R522	9965 100 02999	1kΩ 5% 1/6W
R523	9965 100 03000	680Ω 5% 1/6W
R524	9965 100 03086	RES. C.F. 5.1K OHM 1/6
R525	9965 100 03000	680Ω 5% 1/6W
R526	9965 100 03000	680Ω 5% 1/6W
R527	9965 100 03000	680Ω 5% 1/6W

D501	9965 100 02996	1N4148 (Switching)
D502	9965 100 02996	1N4148 (Switching)

Q501	9965 100 02998	TRANSISTOR 2SC2482
Q502	9965 100 02998	TRANSISTOR 2SC2482
Q503	9965 100 02998	TRANSISTOR 2SC2482
Q510	9965 100 02997	ST2SA1015Y (PNP)

11. Revision List

Manual xxxx xxx xxxx.0

- First release.