

Technical Service Data

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Service and Quality

Service Publications Dept.

One Philips Drive

P.O. Box 14810

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REFER TO SAFETY GUIDELINES

SAFETY NOTICE: ANY PERSON ATTEMPTING TO SERVICE THIS CHASSIS MUST FAMILIARIZE HIMSELF WITH THE CHASSIS AND BE AWARE OF THE NECESSARY SAFETY PRECAUTIONS TO BE USED WHEN SERVICING ELECTRONIC EQUIPMENT CONTAINING HIGH VOLTAGES.

CAUTION: USE A SEPARATE ISOLATION TRANSFORMER FOR THIS UNIT WHEN SERVICING

Philips Consumer Electronics

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Manual 7629

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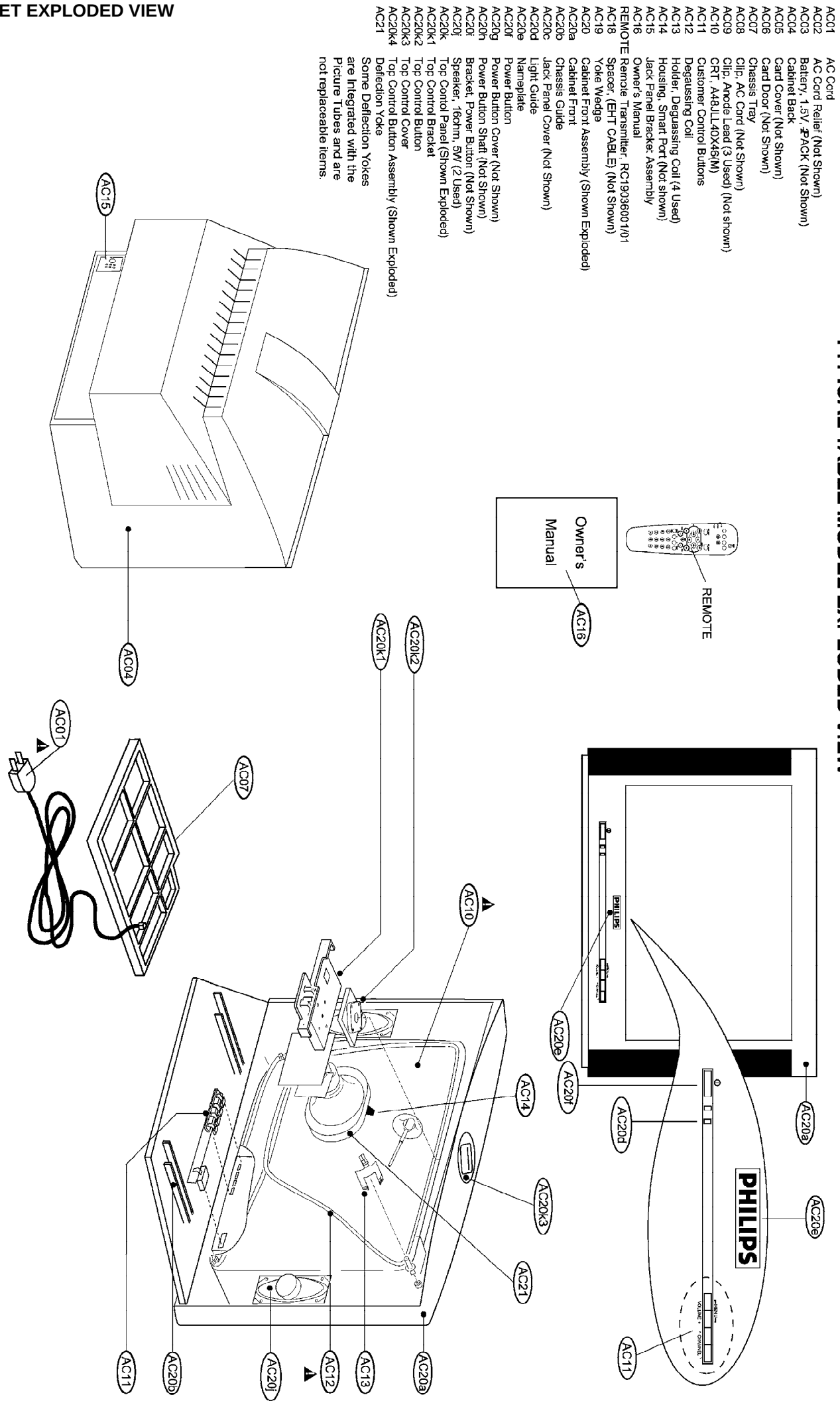
Mechanical Diagrams

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TYPICAL TABLE MODEL EXPLODED VIEW



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Electrical Adjustments

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Alignments

Index of this chapter:

1. General Alignment Conditions
2. Commercial Models SDAM Entry
3. Hardware Alignments
4. Software Alignments and Settings

Note: The Service Default Alignment Mode (SDAM) is described in the "Service Modes, Error Codes and Fault Finding" section. SDAM menu navigation is performed by using the MENU UP, MENU DOWN, MENU LEFT, and MENU RIGHT keys of the remote control transmitter.

General Alignment Conditions

Perform all electrical adjustments under the following conditions:

AC voltage and frequency: 110 V ($\pm 10\%$), 60 Hz ($\pm 5\%$).

Connect the television set to the AC power via an isolation transformer.

Allow the television set to warm up for approximately 20 minutes.

Measure the voltages and waveforms in relation to chassis ground (with the exception of the voltages on the primary side of the power supply). Never use heatsinks as ground.

Test probe: $R_i > 10\text{ MO}$; $C_i < 2.5\text{ pF}$.

Use an isolated trimmer/screwdriver to perform the alignments.

Service Default Alignment Mode (SDAM) Entry for Commercial Models

Note: For commercial models, a master setup remote control is required in order to access the Service Default Alignment Mode (SDAM).

1. Use the master setup remote control to identify the television's operational mode (either "consumer" or "commercial"). Place the master setup remote control in *setup mode* by pressing the TV SETUP key.
2. Press the RECALL key. Information similar to the following will be displayed.

Status Item	Status Data	Meaning
SYSTEM STATUS (L011TV-US4PV)		Information title
MODE	COMMERCIAL/CONSUMER	Operational mode
CHANNEL	CHANNEL, INPUT	Currently tuned channel/input
DCM	OFF/ON	Data Comm. Module online/offline
CODES	209 222 1 33	Internal data for factory/service use
SIGNAL	TUNED/NOT TUNED	Valid signal present/absent
OP HRS	0031h	Number of hours set has operated (hex)
ERRORS	0 0 0 0	Internal data for factory/service use

3. To change the television's mode, ensure the master setup remote control is in *setup mode*, then press the 0-2-4-9-5-MENU keys in order, without permitting the display to time out while entering the key sequence.

Note: *If the operational mode is changed, the television must be turned off and then back on to complete the mode change. When the television is in consumer mode, do not use the master setup remote control to activate commercial mode features.*

4. When the television is in commercial mode, the Institutional Television Menu may be accessed by pressing the MENU button. Though the specific items in the menu will vary, information similar to the following will be displayed.

Menu Item	Settings / Options
(MENU TITLE)	SETUP MENU / MAIN MENU
LANGUAGE	ENGLISH / ESPANOL / FRANCAIS
CHANNEL INSTALL	>
CABLE TUNING	ON / OFF
BRIGHTNESS	--- --- 31
COLOR	--- --- 31
CONTRAST	--- --- 31
SHARPNESS	--- --- 31
TINT	--- --- 0
NOISE REDUCTION	ON / OFF
SOUND MODE	MONO / STEREO
SAP	OFF / NO SAP / ON
AUDIO OUT	FIXED / VARIABLE
BALANCE	--- --- 0
TREBLE	--- --- 31
BASS	--- --- 31
INCRED STEREO	ON / OFF
AVL	ON / OFF
VOLUME BAR	ON / OFF
MIN VOLUME	----- 0
MAX VOLUME	----- 63
SWITCH ON VOLUME	--- --- 31
SWITCH ON CHANNEL	CH. 1-125 / FRONT / AUX / S-VIDEO / CVI / STANDARD
POWER ON	STANDARD / FORCED
CHANNEL DISPLAY	NUMBER / LABEL / ALL / NONE
KEYBOARD LOCK	ON / OFF
ESP	1 – 99 / OFF
AUDIO / VIDEO MUTE	OFF / BLACK / BLUE
EXT AUD / VID OUT	ON / OFF
WELCOME MESSAGE	>
CHANNEL GUIDE	POWER ON / OFF / ON
REMINDER	ON / OFF
3 DIGIT ENTRY	ON / OFF
A/CH A/V SWITCH	ON – OFF
CC	OFF / CC-1 / CC-2 / CC ON MUTE
SAVE CC	ON / OFF
V-CHIP MENU ITEM	ON / OFF

SAVE V-CHIP	ON / OFF
V-CHIP SETUP	>
SLEEPTIMER	OFF / 15 / 30 / 45 / 60 / 90 / 120 / 180 / 240
EXIT	>

5. After making changes to the settings, the EXIT option may be used to leave the Institutional Television Menu.

Hardware Alignments

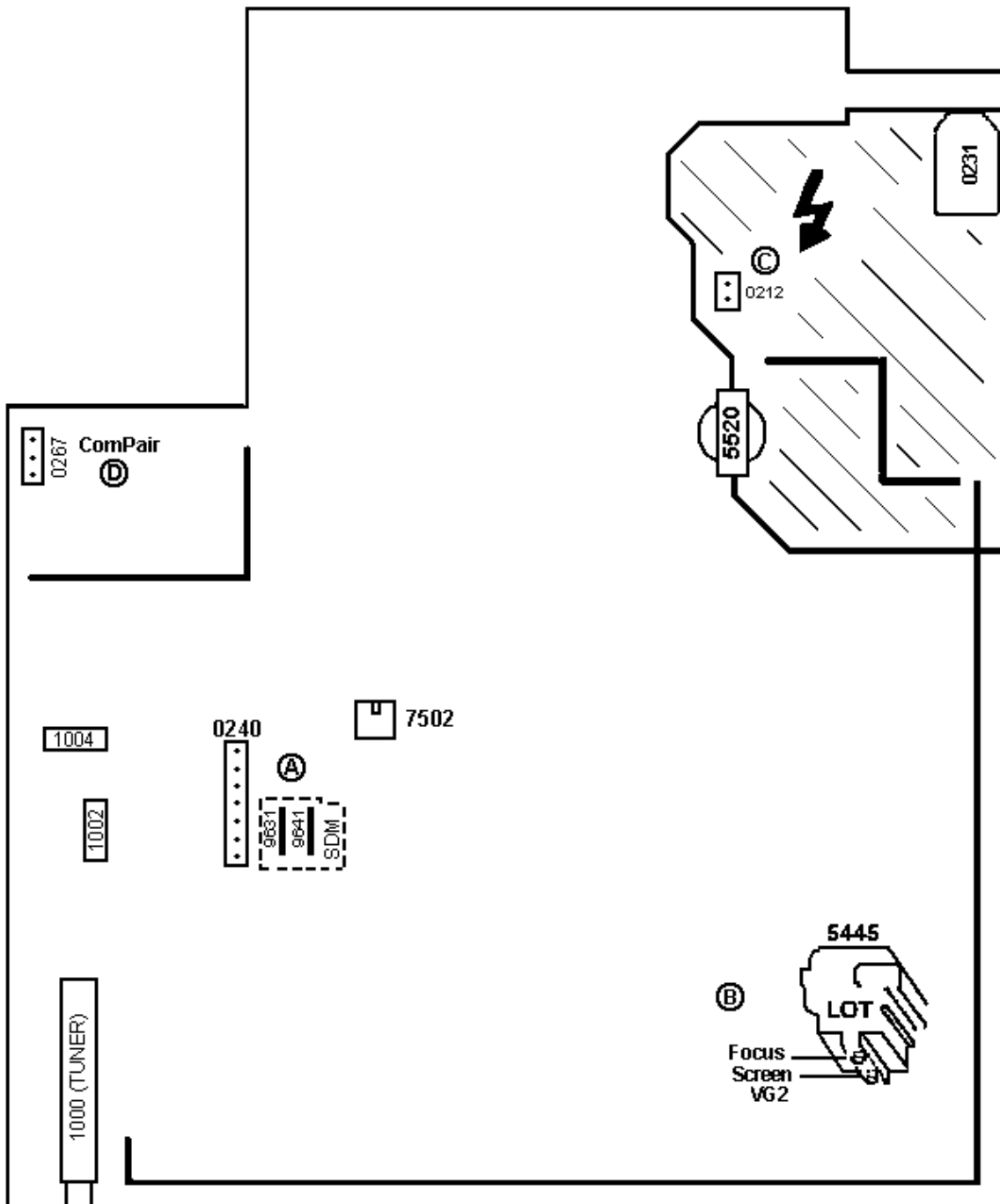


Figure: Mono Carrier (Top View) LS

Vg2 Adjustment

1. Enter SDAM:
2. Press the following key sequence on the remote control transmitter:
0-6-2-5-9-6-MENU
Do not allow the display to time out between entries while keying the sequence.
3. Use the MENU UP/DOWN keys to highlight the WHITE TONE sub menu.

4. Press the MENU LEFT or MENU RIGHT key to enter the WHITE TONE sub menu.
5. In the WHITE TONE sub menu, press the MENU UP/DOWN keys to select NORMAL RED, NORMAL GREEN, or NORMAL BLUE.
6. Use the MENU LEFT/RIGHT keys to set the values of NORMAL RED, NORMAL GREEN and NORMAL BLUE to 40.
7. Press the MENU button twice to enter the normal user menu.
8. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu (if necessary).
9. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
10. Use the MENU UP/DOWN keys to select PICTURE. Be sure to record the current value of PICTURE.
11. Use the MENU LEFT/RIGHT keys to set the value of PICTURE to zero.
12. Use the MENU UP/DOWN keys to select BRIGHTNESS. Be sure to record the current value of BRIGHTNESS.
13. Use the MENU LEFT/RIGHT keys to set the value of BRIGHTNESS to minimum (OSD just visible in a dark room).
14. Press the MENU button twice to return to the top level SDAM menu.
15. Press the STATUS/EXIT button to hide the SDAM onscreen display.
16. Connect the RF output of a video pattern generator to the antenna input.
17. Input a "black picture" test pattern to the television set.
18. Set the oscilloscope to 50 V/div and the time base to 0.2 milliseconds (external triggering on the vertical pulse).
19. Ground the scope at the CRT panel and connect a 10:1 probe to one of the cathodes of the picture tube socket (see schematic diagram B).
20. Measure the cut off pulse during first full line after the frame blanking (see Fig. 8-2). You will see two pulses, one being the cut off pulse and the other being the white drive pulse. Choose the one with the lowest value; this is the cut off pulse.
21. Select the cathode with the highest VDC value for the alignment. Adjust the V Cut-Off of this gun with the SCREEN potentiometer (see Fig. 8-1) on the LOT to the correct value (see table below).
22. Press the STATUS/EXIT button to display the SDAM onscreen display.
23. Press the MENU button to enter the normal user menu.
24. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu (if necessary).
25. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
26. Use the MENU UP/DOWN keys to select PICTURE.
27. Use the MENU LEFT/RIGHT keys to reset the value of PICTURE to the original value.
28. Use the MENU UP/DOWN keys to select BRIGHTNESS.
29. Use the MENU LEFT/RIGHT keys to reset the value of BRIGHTNESS to the original value.
30. Press the MENU button twice to return to the top level SDAM menu.
31. Use the POWER button on the remote control transmitter or the POWER button on the television set to turn off the television set. This will save the changes

made in SDAM.

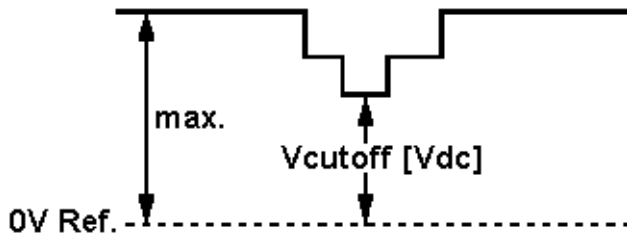


Figure: V Cut-Off

Table: Cut-off Voltage, Large Screen

Screen Size	Cut-off Voltage
25/28Tesla, 25/28BLD	+140V +/- 4V
20RF/21RF/25RF/29RF, 21RF Pin-Free, 25"HF LA, 25V/27V/32V/35V/25"/33"/28BLS, 29", 29SF EU,	+145V +/- 4V
21RF AP/CH, 25" AP/CH, 25RF/29RFAP/CH, 29SF AP	+155V +/- 4V
21RF Ph, 24/28/32WS BLD, 29RF (Eu), 28/32WSRF	+160V +/- 4V

Focusing

1. Connect the RF output of a video pattern generator to the antenna input.
2. Input a circle or crosshatch test pattern to the television set.
3. Press the AUTO PICTURE button on the remote control transmitter repeatedly to choose PERSONAL or MOVIES picture mode.
4. Adjust the FOCUS potentiometer (see Fig. 8-1) until the vertical lines near the left and right sides of the screen, and near the horizontal center of the screen, are at minimum width without visible haze.

Software Alignments and Settings

The following options are performed in the Service Default Alignment Mode (SDAM).

SDAM is described in the "Service Modes, Error Codes and Fault Finding" section.

The following alignments are explained:

1. OPTIONS
2. TUNER
3. WHITE TONE

4. GEOMETRY
5. AUDIO

Options

OP1	XXX
OP2	XXX
OP3	XXX
OP4	XXX
OP5	XXX
OP6	XXX
OP7	XXX

Figure: Options Menu

Options are used to control the presence or absence of certain features and hardware.

How to change an Option Byte

An Option Byte represents a number of different options. Changing these bytes directly makes it possible to set all options very quickly. All options are controlled via seven option bytes.

To change Option Byte(s):

1. Enter SDAM:
Press the following key sequence on the remote control transmitter:
0-6-2-5-9-6-MENU
Do not allow the display to time out between entries while keying the sequence.
2. Use the MENU UP/DOWN keys to highlight the OPTIONS sub menu.
3. Press the MENU LEFT or MENU RIGHT key to enter the OPTIONS sub menu.
4. In the OPTIONS sub menu, press the MENU UP/DOWN keys to select OP 1 through OP 7.
5. Use the number keys on the remote control transmitter to enter a new value for the selected option byte. The value must be entered as a three-digit value (for example, "4" would be entered as "0-0-4").
6. The selected value must be between 0 and 255.
7. When all desired changes to the option bytes are made, press the MENU button to return to the top level SDAM menu. This will save changes to the option byte settings.
8. To ensure the option byte changes take effect: Turn the television set OFF by using the POWER button on the remote control transmitter or the local keyboard. Disconnect the television set from AC power for at least ten seconds. Reconnect the television set to AC power. Turn the television set ON by using the POWER button on the remote control transmitter or the local keyboard.

T8 Option Byte Codes

MODEL	OPTION BYTES						
	OP1	OP2	OP3	OP4	OP5	OP6	OP7
20RF40 S321	* NOT AVAILABLE						
20RF40 S325	* NOT AVAILABLE						
20RF50 S321	0	23	129	162	252	152	0
20RF50 S325	0	23	129	162	252	152	0
21PT63 9A85	* NOT AVAILABLE						
21PT83 9B85	* NOT AVAILABLE						
25PS40 S321	0	23	1	1	144	153	0
25PS40 S325	0	23	1	1	144	153	0
25PS50 S321	0	23	1	162	252	152	0
26LL50 0131	16	23	1	1	144	153	0
26LW50 2231	16	23	1	162	252	152	0
27PS50 B321	0	23	1	162	252	152	0
27PS55 S321	0	23	1	162	252	152	0
27PS60 S321	0	23	1	162	253	152	0
27RF50 S325	0	23	129	162	252	152	0
27RF72 S325	* NOT AVAILABLE						
29LL60 0131	16	23	1	162	252	152	0
29LW60 2231	16	23	1	162	252	152	0
29PV70 2235	16	23	129	162	252	152	0
32PS55 S321	0	23	129	162	252	152	0
32PS60 B321	0	23	129	162	253	152	0
32PS61 S321	0	23	129	162	253	152	0
33LL80 1131	0	23	129	162	253	152	0
CH0119 C322	133	16	2	132	0	-	-
CH0127 C321	213	18	2	64	0	-	-
MS2530 C321	0	5	0	10	192	9	0
HC0113 C321	1	16	148	148	0	-	-
HC0119 C322	1	16	148	148	0	-	-
MS2530 C325	0	5	0	10	192	9	0
MS2730 C321	0	5	0	1	192	9	0
MS3250 C321	0	215	129	162	164	88	0
MS3650 C329	0	215	129	162	164	88	0
PA0113 C321	221	218	35	36	128	-	-
PA0132 C321	223	222	43	40	0	-	-
PC0119 C322	133	16	2	132	0	-	-
PC0125 C321	133	16	2	64	0	-	-
PC0127 C321	213	18	2	64	0	-	-
PCW227 C321	213	222	3	33	0	-	-
PCW227 S321	213	222	3	33	0	-	-
PL0119 C322	1	16	0	132	128	-	-
PL0125 C321	1	16	0	128	128	-	-
PL0127 C321	193	16	0	64	128	-	-
PLW225 S321	213	254	3	35	128	-	-
PPC132 C321	223	222	43	40	0	-	-
PPC132 C331	223	222	43	40	0	-	-
PPC136 C327	223	222	43	40	0	-	-
PRF227 S325	215	254	3	35	128	-	-

SC3127 N321	213	18	2	64	0	-	-
SC3132 N321	223	222	43	40	0	-	-
SC3132 N331	223	222	43	40	0	-	-

* Option Byte Data for these models was not available at manual release.
Refer to future updates to this manual regarding these models.

Tuner

Note: Described alignments are only necessary when the NVM (part reference number 7602) is replaced.

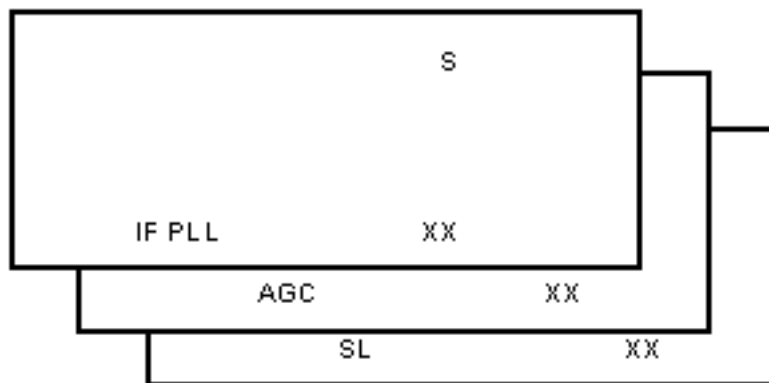


Figure: Tuner Menu

IF PLL

This adjustment is auto-aligned. Therefore, no action is required.

AGC (AGC take over point)

1. Connect the RF output of a video pattern generator to the antenna input.
2. Input a color bar test pattern to the television set.
3. Set the amplitude of the video pattern generator to 10 mV and set the frequency to 61.25 MHz (channel 3).
4. Connect a DC multimeter to pin 1 of the tuner (item 1000 on the main chassis).
5. Enter SDAM:
Press the following key sequence on the remote control transmitter:
0-6-2-5-9-6-MENU Do not allow the display to time out between entries while keying the sequence.
6. Use the MENU UP/DOWN keys to highlight the TUNER sub menu.
7. Press the MENU LEFT/RIGHT keys to enter the TUNER sub menu.
8. Use the MENU UP/DOWN keys to select AGC.
9. Use the MENU LEFT/RIGHT keys to adjust the AGC value (default value is 27) until the voltage at pin 1 of the tuner lies between 3.8V and 2.3V.

10. Press the MENU button to return to the top level SDAM menu.
11. To ensure the AGC change takes effect: Turn the television set OFF by using the POWER button on the remote control transmitter or the local keyboard. Disconnect the television set from AC power for at least ten seconds. Reconnect the television set to AC power. Turn the television set ON by using the POWER button on the remote control transmitter or the local keyboard.

SL (Slicing Level)

This adjustment sets the sync slicing level for non-standard signals.

SL should be turned ON to help correct picture instability in premium decoded cable channels.

OFF: slicing level dependent on noise detector

ON: fixed slicing level of 70%

To adjust SL:

1. Enter SDAM:
Press the following key sequence on the remote control transmitter:
0-6-2-5-9-6-MENU Do not allow the display to time out between entries while keying the sequence.
2. Use the MENU UP/DOWN keys to highlight the TUNER sub menu.
3. Press the MENU LEFT/RIGHT keys to enter the TUNER sub menu.
4. Use the MENU UP/DOWN keys to select SL.
5. Use the MENU LEFT/RIGHT keys to toggle SL "Off" and "On"
6. Press the MENU button to return to the top level SDAM menu.
7. To ensure the SL setting is saved: Turn the television set OFF by using the POWER button on the remote control transmitter or the local keyboard. Disconnect the television set from AC power for at least ten seconds. Reconnect the television set to AC power. Turn the television set ON by using the POWER button on the remote control transmitter or the local keyboard.

White Tone

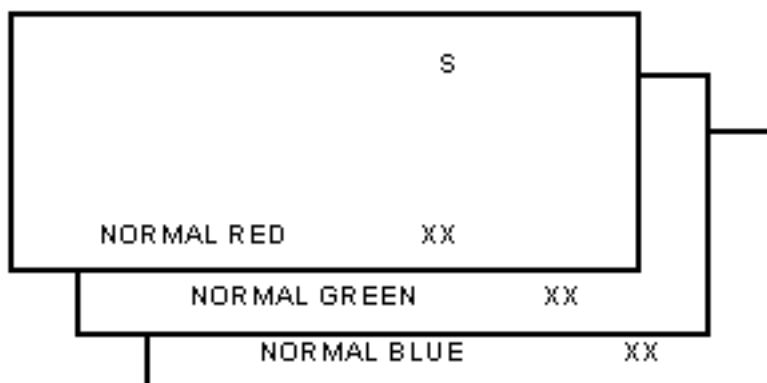


Figure: White Tone Menu

The values of the black cut off level can be adjusted in the WHITE TONE sub menu. Normally, no alignment is needed for WHITETONE, and the given default values are used.

Default settings:

NORMAL (color temperature = 9600 K):

NORMAL RED = 40

NORMAL GREEN = 40

NORMAL BLUE = 40

To adjust NORMAL RED, NORMAL GREEN, and NORMAL BLUE:

1. Enter SDAM:
Press the following key sequence on the remote control transmitter:
0-6-2-5-9-6-MENU Do not allow the display to time out between entries while keying the sequence.
2. Use the MENU UP/DOWN keys to highlight the WHITE TONE sub menu.
3. Press the MENU LEFT/RIGHT keys to enter the WHITE TONE sub menu.
4. Use the MENU UP/DOWN keys to select NORMAL RED, NORMAL GREEN, or NORMAL BLUE.
5. Use the MENU LEFT/RIGHT keys to adjust the value of NORMAL RED, NORMAL GREEN, or NORMAL BLUE.
6. When all desired changes to the WHITE TONE submenu values are made, press the MENU button to return to the top level SDAM menu.
7. To ensure the WHITE TONE settings are saved: Turn the television set OFF by using the POWER button on the remote control transmitter or the local keyboard. Disconnect the television set from AC power for at least ten seconds. Reconnect the television set to AC power. Turn the television set ON by using the POWER button on the remote control transmitter or the local keyboard.

Geometry

The geometry alignments menu contains several Items for correct picture geometry alignment.

1. Connect the RF output of a video pattern generator to the antenna input.
2. Input a crosshatch test pattern to the television set.
3. Set the amplitude of the video pattern generator to at least 1 mV and set the frequency to 61.25 MHz (channel 3).
4. Press the AUTO PICTURE button on the remote control transmitter repeatedly to choose PERSONAL or MOVIES picture mode.
5. Enter SDAM:
Press the following key sequence on the remote control transmitter:

0-6-2-5-9-6-MENU Do not allow the display to time out between entries while keying the sequence.

6. Use the MENU UP/DOWN keys to highlight the GEOMETRY sub menu.
7. Press the MENU LEFT/RIGHT keys to enter the GEOMETRY sub menu.
8. Use the MENU UP/DOWN keys to highlight either the HORIZONTAL sub menu or the VERTICAL sub menu.
9. Press the MENU LEFT/RIGHT keys to enter either the HORIZONTAL sub menu or the VERTICAL sub menu.
10. Use the MENU UP/DOWN keys to select items in the HORIZONTAL sub menu or the VERTICAL sub menu.
11. Use the MENU LEFT/RIGHT keys to adjust the values of items in the HORIZONTAL and VERTICAL sub menus.
12. When all desired changes to the HORIZONTAL and VERTICAL sub menu values are made, press the MENU button twice to return to the top level SDAM menu.
13. To ensure the GEOMETRY settings are saved: Turn the television set OFF by using the POWER button on the remote control transmitter or the local keyboard. Disconnect the television set from AC power for at least ten seconds. Reconnect the television set to AC power. Turn the television set ON by using the POWER button on the remote control transmitter or the local keyboard.

The following alignments can be performed in the GEOMETRY submenu:

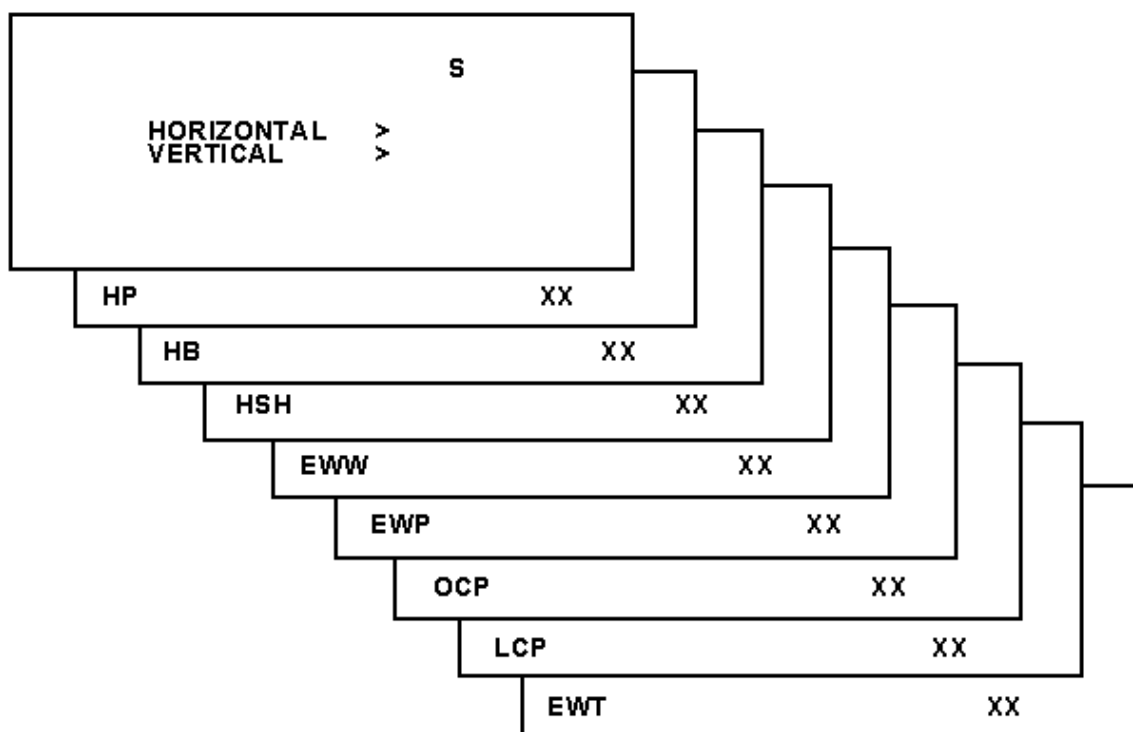


Figure: Horizontal Menu

Horizontal:

Horizontal Parallelogram (HP) Aligns straight vertical lines at the top and the bottom of the screen; vertical rotation round the center.

Horizontal Bow(HB) Aligns straight horizontal lines at the top and the bottom of the screen; horizontal rotation around the center.

Horizontal Shift(HSH) Aligns the horizontal center of the picture to the horizontal center of the CRT.

East West Width(EWW) Aligns the width of the picture.

East West Parabola(EWP) Aligns straight vertical lines at the sides of the screen.

Upper Corner Parabola (UCP) Aligns straight vertical lines in the upper corners of the screen.

Lower Corner Parabola (LCP) Aligns straight vertical lines in the lower corners of the screen.

East West Trapezium(EWT) Align straight vertical lines at the middle of the screen.

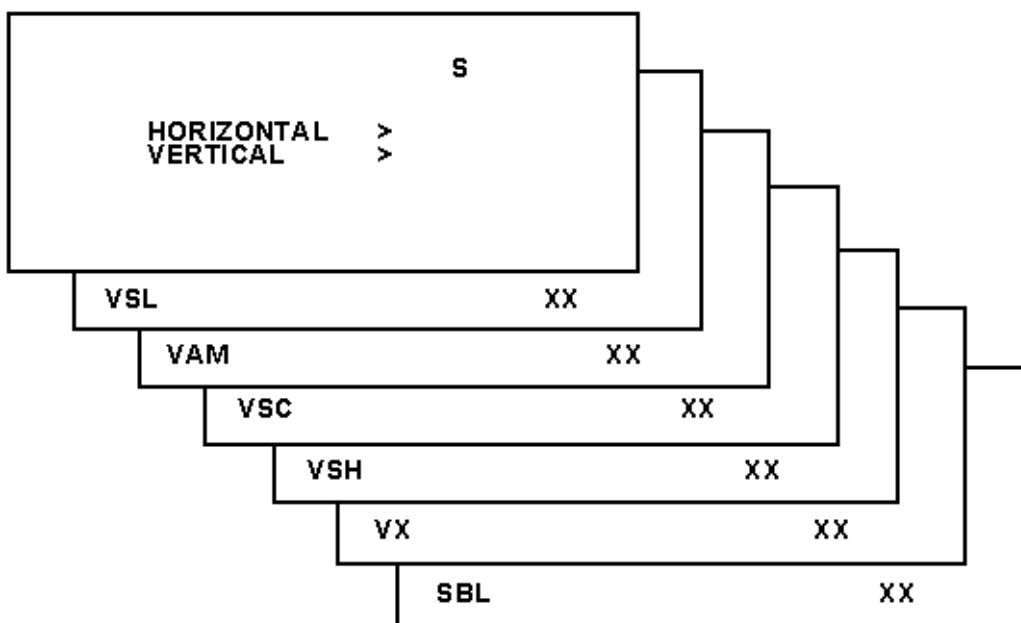


Figure: Vertical Menu

Vertical:

Vertical slope (VSL) Aligns the picture so the proportions are the same at the top and bottom of the screen. This alignment must be performed first, before all other vertical alignments. Turning SBL ON will assist in performing this alignment.

Vertical Amplitude(VAM) Aligns the height of the picture (other vertical alignments are NOT compensated).

Vertical S-Correction (VSC) Aligns the vertical linearity, so that the vertical intervals of the grid-patterns are the same over the entire height of the screen.

Vertical Shift(VSH) Aligns the vertical center of the picture to the vertical center of the CRT. After performing this alignment, it may be necessary to perform the VAM alignment again.

Vertical Zoom(VX) Adjusts picture height.

Service blanking(SBL) Turns the blanking of the lower half of the screen ON or OFF (to be used in combination with the vertical slope alignment).

The table below lists the default GEOMETRY values for the different television sets.

Table: Default Geometry Values

Alignment	Description	20RFL260/37R BTSC NON-DBX	21PT839B/85R BTSC DBX	27RFL260/37R BTSC DBX	20RFL250/37R BISONIC	21PT639A/85R BISONIC
HP	Hor. Parallelogram	31	33	33	31	33
HB	Hor. Bow	30	30	30	30	30
HSB	Hor. S hift	35	39	39	35	39
EWB	East West Width	34	35	35	34	35
EBP	East West Parabola	33	22	22	33	22
UCP	Upper Corner Parabola	35	41	41	35	41
LCP	Lower Corner Parabola	35	41	41	35	41
EBT	East West Trapezium	43	31	31	43	31
VSL	Vert. Slope	33	31	31	33	31
VAM	Vert. Amplitude	33	25	25	33	25
VSC	Vert. S -correction	32	35	35	32	35
VSH	Vert. S hift	35	21	21	35	21
VX	Vert. Zoom	33	25	25	33	25

Audio

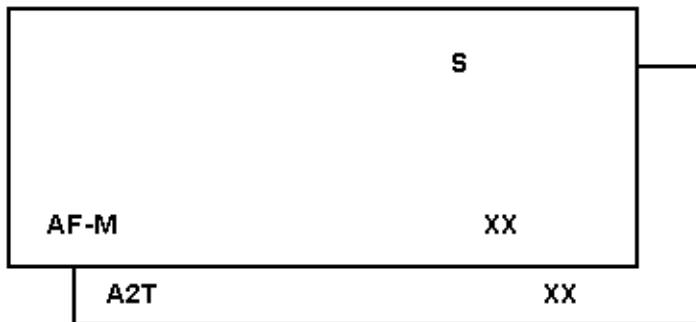


Figure: Audio Menu

No alignments are necessary for the AUDIO sub menu. Use the default values.

AF-M

Default value is 300.

A2T

TV A2 Threshold

Default value is 250.

To adjust AF-M:

1. Enter SDAM:
Press the following key sequence on the remote control transmitter:
0-6-2-5-9-6-MENU Do not allow the display to time out between entries while keying the sequence.
2. Use the MENU UP/DOWN keys to highlight the AUDIO sub menu.
3. Press the MENU LEFT/RIGHT keys to enter the AUDIO sub menu.
4. Use the MENU UP/DOWN keys to select AF-M.
5. Use the MENU LEFT/RIGHT keys to adjust the value of AF-M to 300.
6. Press the MENU button to return to the top level SDAM menu.
7. To ensure the AF-M setting is saved: Turn the television set OFF by using the POWER button on the remote control transmitter or the local keyboard.
Disconnect the television set from AC power for at least ten seconds. Reconnect the television set to AC power. Turn the television set ON by using the POWER button on the remote control transmitter or the local keyboard.

To adjust A2T:

1. Enter SDAM:
Press the following key sequence on the remote control transmitter:
0-6-2-5-9-6-MENU Do not allow the display to time out between entries while keying the sequence.
2. Use the MENU UP/DOWN keys to highlight the AUDIO sub menu.
3. Press the MENU LEFT/RIGHT keys to enter the AUDIO sub menu.

4. Use the MENU UP/DOWN keys to select A2T.
5. Use the MENU LEFT/RIGHT keys to adjust the value of A2T to 250.
6. Press the MENU button to return to the top level SDAM menu.
7. To ensure the A2T setting is saved: Turn the television set OFF by using the POWER button on the remote control transmitter or the local keyboard.
Disconnect the television set from AC power for at least ten seconds. Reconnect the television set to AC power. Turn the television set ON by using the POWER button on the remote control transmitter or the local keyboard.

Philips Consumer Electronics

Technical Service Data

Service and Quality
Service Publications Dept.
One Philips Drive
P.O. Box 14810
Knoxville, TN 37914

Manual 7629

Model no.: 27PS60S321
First Publish: 12740 T8
Rev. Date: 2002-06-06
Print Date: 7/8/2004

Parts List

REFER TO SAFETY GUIDELINES

SAFETY NOTICE: ANY PERSON ATTEMPTING TO SERVICE THIS CHASSIS MUST FAMILIARIZE HIMSELF WITH THE CHASSIS AND BE AWARE OF THE NECESSARY SAFETY PRECAUTIONS TO BE USED WHEN SERVICING ELECTRONIC EQUIPMENT CONTAINING HIGH VOLTAGES.

CAUTION: USE A SEPARATE ISOLATION TRANSFORMER FOR THIS UNIT WHEN SERVICING

Cabinet & Accessory Parts

Cabinet & Accessory Parts			
S AC01	AC Cord.	3135 010 03831	
AC03	Battery, 1.5V, 2-PACK.	9299 000 65263	
AC04	Cabinet Back Assembly.	3121 237 52451	
AC09	Clip, Anode Lead.	3135 014 04471	
S AC10	CRT, A68AJB82X11.	9301 891 90631	
AC11	Customer Control Buttons.	3139 137 83131	
S AC12	Degaussing Coil.	2422 549 43967	
AC13	Holder, Degaussing Coil (4 Used)	3135 013 01641	
AC16	Owner's Manual.	3121 235 20111	
AC16b	Quick Use Guide.	3121 233 40911	
REMOTE	Remote Transmitter, RC19041001/01.	3139 228 86501	
AC20	Cabinet Front Assembly f/27PS60S321.	3121 237 51791	
AC20a	Cabinet Front.	3139 137 83171	
AC20b	Chassis Guide.	3139 124 31381	
AC20d	Light Guide.	3139 124 35111	
AC20f	Power Button.	3139 137 83141	
AC20j	Speaker, Full Range, 16ohm, 5W (2 Use d).	2422 264 00411	
S AC21	Deflection Yoke.	3313 203 01242	

Main Chassis Assembly Parts

Main Chassis Assembly Parts			
0127	Socket Fuse.	2422 088 00271	
S 0211	Connector, 2 Pin.	2422 025 16269	
S 0212	Connector, 2 Pin.	2422 025 16375	
0217	Connector, 5 Pin.	2422 025 12481	
0219	Connector, 6 Pin.	2422 025 12482	
0220	Connector, 5 Pin.	2422 025 04853	
S 0221	Connector, 4 Pin.	2422 025 15503	
S 0222	Connector, 2 Pin.	2422 025 10646	
0223	Socket, Cinch, 9 Pin.	2422 026 05236	
0225	Socket, MDIN, 10 Pin.	2422 026 04926	
0226	Connector, 4 Pin.	2422 025 12479	
0229	Connector, 7 Pin.	2422 025 11244	
0240	Connector, 4 Pin.	2422 025 12479	
0242	Connector, 5 Pin.	2422 025 12481	
0243	Connector, 6 Pin.	2422 025 04854	
0246	Connector, 5 Pin.	2422 025 12481	
0267	Connector, 3 Pin.	2412 020 00725	
0269	Socket, Cinch, 3 Pin.	2422 026 05182	
0284	Connector, 4 Pin.	2422 025 12479	
1000	Tuner, V-U PLL.	2422 542 90108	
1002	SAW Filter, 45MHZ75, 0FWM1971M L.	2422 549 44518	
1200	Filter, Ceramic, 4MHz5.	2422 549 40807	
S 1500	Fuse, 4A, 250V, IEC.	2422 086 10914	
S 1515	Relay, 1P, 12V.	2422 132 07444	
1600	Tact Switch.	2422 128 02742	
1601	Tact Switch.	2422 128 02742	
1602	Tact Switch.	2422 128 02742	
1603	Tact Switch.	2422 128 02742	
1606	Tact Switch.	2422 128 02742	
1660	Crystal Resonator, 12 MHz, 20P, HC49/ U A.	2422 543 01203	
1831	Crystal Resonator, 18MHZ432 12P HC49 /U A.	2422 543 00842	
2004	Cap, 47n, 10%, 16v, Ceramic.	3198 017 34730	
2005	Cap, 10u, 20%, 50v, Electrolytic.	3198 025 51090	
2006	Cap, 470u, 20%, 16v, Electrolytic.	3198 025 24710	
2007	Cap, 100n, +80/-20%, 25v, Ceramic.	3198 023 41040	
2008	Cap, 100u, 20%, 25v, Electrolytic.	3198 025 31010	
2009	Cap, 22n, 10%, 25v, Ceramic.	3198 017 32230	
2101	Cap, 470n, +80/-20%, 16v, Ceramic.	3198 017 24740	
2102	Cap, 22p, 5%, 50v, Ceramic.	3198 016 02290	
2103	Cap, 330p, 10%, 50v, Ceramic.	3198 017 33310	
2104	Cap, 330p, 5%, 50v, Ceramic.	3198 016 33310	
2105	Cap, 10u, 20%, 50v, Electrolytic.	3198 025 51090	
2106	Cap, 10u, 20%, 50v, Electrolytic.	3198 025 51090	
2111	Cap, 22p, 5%, 50v, Ceramic.	3198 016 02290	
2112	Cap, 22p, 5%, 50v, Ceramic.	3198 016 02290	
2113	Cap, 22p, 5%, 50v, Ceramic.	3198 016 02290	
2121	Cap, 22p, 5%, 50v, Ceramic.	3198 016 02290	
2122	Cap, 330p, 5%, 50v, Ceramic.	3198 016 33310	
2123	Cap, 2u2, +80/-20%, 10v, Ceramic.	3198 017 22250	
2124	Cap, 330p, 5%, 50v, Ceramic.	3198 016 33310	
2125	Cap, 2u2, +80/-20%, 10v, Ceramic.	3198 017 22250	
2131	Cap, 330p, 5%, 50v, Ceramic.	3198 016 33310	
2132	Cap, 2u2, +80/-20%, 10v, Ceramic.	3198 017 22250	
2133	Cap, 330p, 5%, 50v, Ceramic.	3198 016 33310	
2134	Cap, 2u2, +80/-20%, 10v, Ceramic.	3198 017 22250	
2135	Cap, 22p, 5%, 50v, Ceramic.	3198 016 02290	
2136	Cap, 22p, 5%, 50v, Ceramic.	3198 016 02290	
2141	Cap, 330p, 5%, 50v, Ceramic.	3198 016 33310	
2143	Cap, 100n, +80/-20%, 25v, Ceramic.	3198 023 41040	
2150	Cap, 150n, 10%, 16v, Ceramic.	2238 780 15652	
2171	Cap, 2n2, 10%, 50v, Ceramic.	3198 019 12220	
2181	Cap, 22p, 5%, 50v, Ceramic.	3198 016 02290	
2184	Cap, 2u2, +80/-20%, 10v, Ceramic.	3198 017 22250	
2201	Cap, 100n, +80/-20%, 25v, Ceramic.	3198 023 21040	
2202	Cap, 100n, +80/-20%, 25v, Ceramic.	3198 023 21040	
2203	Cap, 100n, +80/-20%, 25v, Ceramic.	3198 023 41040	

S = Safety Part Be sure to use exact replacement part.

2204	Cap, 100n, +80/-20%, 25v, Ceramic.	3198 023 41040	
2205	Cap, 220n, +80/-20%, 25v, Ceramic.	3198 023 22240	
2208	Cap, 100n, +80/-20%, 25v, Ceramic.	3198 023 41040	
2209	Cap, 4u7, 20%, 50v, Electrolytic.	3198 025 54780	
2210	Cap, 1u, +80/-20%, 16v, Ceramic.	3198 017 21050	
2211	Cap, 470n, +80/-20%, 10v, Ceramic.	3198 017 44740	
2213	Cap, 22n, 10%, 50v, Ceramic.	3198 017 02230	
2214	Cap, 22n, 10%, 50v, Ceramic.	3198 017 02230	
2215	Cap, 22n, 10%, 50v, Ceramic.	3198 017 02230	
2216	Cap, 1000u, 20%, 16v, Electrolytic.	3198 026 21020	
2217	Cap, 22n, 10%, 25v, Ceramic.	3198 017 32230	
2219	Cap, 220n, +80/-20%, 25v, Ceramic.	3198 023 22240	
2220	Cap, 470n, 10%, 50v, Polyester.	3198 014 04740	
2221	Cap, 22n, 10%, 50v, Ceramic.	3198 017 02230	
2241	Cap, 1n5, 10%, 50v, Ceramic.	3198 017 31520	
2242	Cap, 1u, +80/-20%, 10v, Ceramic.	3198 017 41050	
2243	Cap, 2n2, 10%, 50v, Ceramic.	3198 017 02220	
2244	Cap, 100n, 5%, 63v, Metallized Polyester.	2222 370 76104	
2245	Cap, 220n, +80/-20%, 16v, Ceramic.	3198 023 22240	
2247	Cap, 1000u, 20%, 16v, Electrolytic.	3198 026 21020	
2248	Cap, 22n, 10%, 50v, Ceramic.	3198 017 02230	
2249	Cap, 22n, 10%, 25v, Ceramic.	3198 017 32230	
2250	Cap, 2u2, 20%, 50v, Electrolytic.	3198 025 52280	
2252	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020	
2253	Cap, 1n, 5%, 25v, Ceramic.	3198 016 31020	
2254	Res, Zero ohm, Chip Jumper.	3198 021 90020	
2405	Cap, 220u, 20%, 25v, Electrolytic.	3198 025 32210	
2441	Cap, 1u, 20%, 50v, Electrolytic.	3198 025 51080	
2443	Cap, 47n, +80/-20%, 50v, Ceramic.	3198 017 24730	
2444	Cap, 1u, 20%, 50v, Electrolytic.	3198 025 51080	
2450	Cap, 47u, 20%, 160v, Electrolytic.	2020 021 91139	
2451	Cap, 15n, 10%, 50v, Polyester.	3198 014 01530	
2452	Cap, 180p, 5%, 50v, Ceramic.	3198 016 01810	
2455	Cap, 47u, 20%, 25v, Electrolytic.	3198 025 34790	
2457	Cap, 470n, 5%, 250v, Polypropylene.	2222 479 90023	
2458	Cap, 2u2, 20%, 100v, Electrolytic.	2020 021 91331	
2459	Cap, 680p, 10%, 500v, Ceramic.	3198 019 46810	
2460	Cap, 100p, 5%, 50v, Ceramic.	3198 016 01010	
2462	Cap, 330n, 10%, 250v, Polypropylene.	2022 333 00084	
2463	Cap, 680p, 10%, 2kv, Ceramic.	2020 558 90485	
2463	Cap, 1.2nF, 10%, 2kv, Ceramic.	2020 558 90485	
2465	Cap, 11n, 5%, 1600v, Polypropylene.	2222 375 90155	
2471	Cap, 100n, 10%, 50v, Polyester.	3198 014 01040	
2472	Cap, 150n, 10%, 63v, Metallized Polyester.	2222 365 75154	
2473	Cap, 100n, 10%, 63v, Metallized Polyester.	2222 365 75104	
2474	Cap, 2n2, 10%, 50v, Ceramic.	3198 017 02220	
2475	Cap, 2n2, 10%, 50v, Ceramic.	3198 017 02220	
2476	Cap, 4n7, 10%, 50v, Ceramic.	3198 017 04720	
2480	Cap, 47u, 20%, 25v, Electrolytic.	2020 021 90586	
2481	Cap, 470p, 10%, 500v, Ceramic.	3198 019 44710	
2482	Cap, 68n, 10%, 250v, Polyester.	2222 347 90234	
2485	Cap, 4u7, 20%, 250v, Electrolytic.	2020 021 90856	
2486	Cap, 470u, 20%, 16v, Electrolytic.	2020 021 91577	
2487	Cap, 47u, 20%, 50v, Electrolytic.	2020 021 90854	
2488	Cap, 1000u, 20%, 16v, Electrolytic.	2020 021 91049	
2489	Cap, 470u, 20%, 16v, Electrolytic.	2020 021 91577	
2491	Cap, 1n, 10%, 500v, Ceramic.	3198 019 41020	
S 2500	Cap, 470n, 20%, 275v, Metallized Polypropylene.	2222 336 29148	
2501	Cap, 2n2, 10%, 1000v, Ceramic.	3198 019 52220	
2502	Cap, 2n2, 10%, 1000v, Ceramic.	3198 019 52220	
2503	Cap, 470u, 20%, 200v, Electrolytic.	2020 024 90626	
2505	Cap, 2n2, 10%, 1000v, Ceramic.	3198 019 52220	
2507	Cap, 470p, 10%, 50v, Ceramic.	3198 017 04710	
2508	Cap, 470p, 10%, 1000v, Ceramic.	3198 019 64710	
S 2515	Cap, 1n5, 20%, v, Ceramic.	2020 554 90128	
2520	Cap, 100n, 10%, 16v, Ceramic.	3198 017 01040	
2521	Cap, 22u, 20%, 50v, Electrolytic.	3198 025 52290	
2522	Cap, 100n, 10%, 16v, Ceramic.	3198 017 01040	
2523	Cap, 1n5, 10%, 2000v, Ceramic.	2020 558 90489	
2525	Cap, 470p, 10%, 50v, Ceramic.	3198 017 04710	
2527	Cap, 2n2, 10%, 50v, Ceramic.	3198 017 02220	
2528	Cap, 1n, 10%, 50v, Ceramic.	3198 017 01020	
2540	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030	
2541	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030	
2560	Cap, 680p, 10%, 1000v, Ceramic.	2020 558 90472	
2561	Cap, 100u, 20%, 160v, Electrolytic.	2020 021 91654	
2562	Cap, 1n, 10%, 50v, Ceramic.	3198 019 11020	
2563	Cap, 100n, 10%, 50v, Polyester.	3198 014 01040	
2564	Cap, 2u2, 20%, 25v, Electrolytic.	2020 021 91353	
2566	Cap, 470u, 20%, 6.3v, Electrolytic.	3198 025 04710	
2567	Cap, 47u, 20%, 25v, Electrolytic.	3198 025 34790	
2568	Cap, 1u, 20%, 50v, Electrolytic.	3198 025 51080	
2580	Cap, 47u, 20%, 16v, Electrolytic.	3198 028 24790	
2581	Cap, 22u, 20%, 50v, Electrolytic.	3198 025 52290	
2601	Cap, 220n, +80/-20%, 25v, Ceramic.	3198 023 22240	
2602	Cap, 100p, 5%, 50v, Ceramic.	3198 016 01010	
2606	Cap, 1n, 10%, 50v, Ceramic.	3198 017 01020	
2607	Cap, 33p, 5%, 50v, Ceramic.	3198 016 33390	

2608	Cap, 1u, +80/-20%, 10v, Ceramic. . .	3198 017	41050	3173	Res, 10K, 5%, 1/6W, Carbon Film. . .	3198 011	01030
2609	Cap, 33p, 5%, 50v, Ceramic.	3198 016	33390	3174	Res, 8K2, 5%, 1/6W, Carbon Film. . .	3198 011	08220
2611	Cap, 1u, +80/-20%, 10v, Ceramic. . .	3198 017	41050	3175	Res, 8K2, 5%, 1/6W, Carbon Film. . .	3198 011	08220
2612	Cap, 68p, 5%, 50v, Ceramic.	3198 016	06890	3176	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010
2613	Cap, 68p, 5%, 50v, Ceramic.	3198 016	06890	3177	Res, 8K2, 5%, 1/6W, Carbon Film. . .	3198 011	08220
2615	Cap, 1n, 10%, 50v, Ceramic.	3198 017	01020	3178	Res, 3K9, 5%, 1/6W, Carbon Film. . .	3198 011	03920
2618	Cap, 1u, +80/-20%, 10v, Ceramic. . .	3198 017	41050	3179	Res, 2K2, 5%, 1/6W, Carbon Film. . .	3198 011	02220
2619	Cap, 1u, +80/-20%, 16v, Ceramic. . .	3198 017	21050	3200	Res, 390 ohm, 5%, 1/6W, Carbon Film.	3198 011	03910
2691	Cap, 10u, 20%, 50v, Electrolytic. . .	3198 025	51090	3201	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010
2801	Cap, 22u, 20%, 50v, Electrolytic. . .	3198 025	52290	3202	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010
2802	Cap, 220n, +80/-20%, 25v, Ceramic. .	3198 023	22240	3203	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010
2804	Cap, 2u2, +80/-20%, 10v, Ceramic. . .	3198 017	22250	3204	Res, 22K, 5%, 1/6W, Carbon Film. . .	3198 011	02230
2805	Res, Zero ohm, Chip Jumper.	3198 021	90020	3206	Res, 33K, 5%, 1/16W, Metallized Glass	3198 021	33330
2806	Res, Zero ohm, Chip Jumper.	3198 021	90020	3207	Res, 1K, 5%, 1/6W, Carbon Film. . . .	3198 011	01020
2831	Cap, 1p, 25%, 50v, Ceramic.	3198 016	31080	3208	Res, 220 ohm, 5%, 1/16W, Metallized G	3198 021	32210
2832	Cap, 1p, 25%, 50v, Ceramic.	3198 016	31080		lass.		
2833	Cap, 47p, 5%, 50v, Ceramic.	3198 016	34790	3209	Res, 68 ohm, 5%, 1/16W, Metallized Gl	3198 021	36890
2834	Cap, 470p, 5%, 50v, Ceramic.	3198 016	34710		ass.		
2835	Cap, 220p, 5%, 50v, Ceramic.	3198 016	32210	3212	Res, 470 ohm, 5%, 1/16W, Metallized G	3198 021	34710
2836	Cap, 1n5, 10%, 50v, Ceramic.	3198 017	31520		lass.		
2837	Cap, 4u7, 20%, 50v, Electrolytic. . .	3198 025	54780	3213	Res, 560 ohm, 5%, 1/6W, Carbon Film.	3198 011	05610
2840	Cap, 100n, +80/-20%, 25v, Ceramic. .	3198 023	41040	3214	Res, 100 ohm, 5%, 1/10W, Metallized G	3198 021	51010
2841	Cap, 10u, 20%, 50v, Electrolytic. . .	3198 025	51090		lass.		
2842	Cap, 100n, +80/-20%, 25v, Ceramic. .	3198 023	41040	3215	Res, 560 ohm, 5%, 1/16W, Metallized G	3198 021	35610
2843	Cap, 10u, 20%, 50v, Electrolytic. . .	3198 025	51090		lass.		
2844	Cap, 10u, 20%, 50v, Electrolytic. . .	3198 025	51090	3216	Res, 68 ohm, 5%, 1/6W, Carbon Film. .	3198 011	06890
2845	Cap, 100n, +80/-20%, 25v, Ceramic. .	3198 023	41040	3217	Res, 330K, 5%, 1/16W, Metallized Glas	3198 021	33340
2846	Cap, 100u, 20%, 25v, Electrolytic. . .	3198 025	31010	3218	Res, 82K, 5%, 1/16W, Metallized Glass	3198 021	38230
2849	Cap, 1n, 5%, 25v, Ceramic.	3198 016	31020	3219	Res, 2K2, 5%, 1/16W, Metallized Glass	3198 021	32220
2850	Cap, 1n, 5%, 25v, Ceramic.	3198 016	31020	3220	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010
2851	Res, Zero ohm, Chip Jumper.	3198 021	90020	3221	Res, 560 ohm, 5%, 1/6W, Carbon Film.	3198 011	05610
2852	Cap, 1n, 5%, 25v, Ceramic.	3198 016	31020	3222	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010
2853	Res, Zero ohm, Chip Jumper.	3198 021	90020	3223	Res, 100 ohm, 5%, 1/10W, Metallized G	3198 021	51010
2854	Cap, 1n, 5%, 25v, Ceramic.	3198 016	31020		lass.		
2855	Cap, 33p, 5%, 50v, Ceramic.	3198 016	33390	3226	Res, 560 ohm, 5%, 1/16W, Metallized G	3198 021	35610
2856	Cap, 47p, 5%, 50v, Ceramic.	3198 016	34790		lass.		
2857	Cap, 150p, 5%, 50v, Ceramic.	3198 016	31510	3235	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010
2860	Cap, 180p, 5%, 50v, Ceramic.	3198 016	31810	3241	Res, 22K, 5%, 1/16W, Metallized Glass	3198 021	32230
2894	Cap, 220p, 5%, 50v, Ceramic.	3198 016	32210	3242	Res, 12K, 5%, 1/10W, Metallized Glass	3198 021	51230
2895	Cap, 560p, 5%, 25v, Ceramic.	3198 016	35610	3244	Res, 820 ohm, 5%, 1/6W, Carbon Film.	3198 011	08210
2897	Cap, 390p, 5%, 50v, Ceramic.	3198 016	33910	3245	Res, 39K, 1%, 1/10W, Metallized Glass	2120 108	92630
2898	Cap, 10n, 10%, 50v, Ceramic.	3198 017	31030	3246	Res, 10k, 5%, Carbon.	3198 021	51030
2902	Cap, 1000u, 20%, 16v, Electrolytic. .	3198 026	21020	3247	Res, 680K, 5%, 1/10W, Metallized Glas	3198 021	56840
2903	Cap, 1u, 20%, 50v, Electrolytic. . .	3198 025	51080	3248	Res, 33K, 5%, 1/10W, Metallized Glass	3198 021	53330
2904	Cap, 470n, +80/-20%, 16v, Ceramic. .	3198 017	24740	3249	Res, 820 ohm, 5%, 1/6W, Carbon Film.	3198 011	08210
2905	Cap, 1n, 10%, 50v, Ceramic.	3198 017	01020	3250	Res, 8K2, 5%, 1/6W, Carbon Film. . .	3198 011	08220
2906	Cap, 470n, +80/-20%, 16v, Ceramic. .	3198 017	24740	3251	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010
2907	Cap, 1n, 10%, 50v, Ceramic.	3198 017	01020	3256	Res, 1k, 5%, Carbon.	3198 021	51020
2908	Cap, 10u, 20%, 50v, Electrolytic. . .	3198 025	51090	3257	Res, 10M, 5%, 1/10W, Metallized Glass	3198 021	51060
2910	Cap, 3n3, 10%, 50v, Ceramic.	3198 017	03320	3258	Res, 100K, 5%, 1/10W, Metallized Glas	3198 021	51040
2911	Cap, 3n3, 10%, 50v, Ceramic.	3198 017	03320	3259	Res, 470K, 5%, 1/10W, Metallized Glas	3198 021	54740
2950	Cap, 330p, 5%, 50v, Ceramic.	3198 016	33310	3441	Res, 100 ohm, 5%, 1/10W, Metallized G	3198 021	51010
3000	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010		lass.		
3001	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010	3442	Res, Zero ohm, Chip Jumper.	3198 021	90020
3002	Res, Zero ohm, 'Chip' Jumper.	3198 021	90030	3443	Res, 1M, 5%, 1/10W, Metallized Glass	3198 021	51050
3003	Res, 1K5, 5%, 1/16W, Metallized Glass	3198 021	31520	3445	Res, 15K, 5%, 1/6W, Carbon Film. . .	3198 011	01530
3004	Res, 8K2, 5%, 1/16W, Metallized Glass	3198 021	38220	3446	Res, 5K6, 5%, 1/6W, Carbon Film. . .	3198 011	05620
3005	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010	3447	Res, 56 ohm, 5%, 1/4W, Carbon Film. .	2120 101	74569
3101	Res, 68 ohm, 5%, 1/6W, Carbon Film. .	3198 011	06890	3448	Res, 470 ohm, 5%, 1/6W, Carbon Film.	3198 011	04710
3102	Res, 1K, 5%, 1/16W, Metallized Glass	3198 021	31020	3449	Res, 68 ohm, 5%, 1/6W, Carbon Film. .	3198 011	06890
3103	Res, 150 ohm, 5%, 1/6W, Carbon Film.	3198 011	01510	3450	Res, 33 ohm, 5%, 1/6W, Carbon Film. .	3198 011	03390
3104	Res, 220K, 5%, 1/16W, Metallized Glas	3198 021	32240	S 3451	Res, 10 ohm, 5%, 1/3W, Metal Film. . .	2306 204	03109
3105	Res, 150 ohm, 5%, 1/6W, Carbon Film.	3198 011	01510	3452	Res, 10K, 1%, 3/5W, Metal Film. . . .	2312 915	11003
3106	Res, 220K, 5%, 1/16W, Metallized Glas	3198 021	32240	3453	Res, 1K, 5%, 1/6W, Carbon Film. . . .	3198 011	01020
3111	Res, 75 ohm, 5%, 1/6W, Carbon Film. .	3198 011	07590	3454	Res, 3K9, 1%, 3/5W, Metal Film. . . .	2312 915	13902
3112	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010	3455	Res, 6R8, 5%, 1 1/3W, Metal Film. . .	3198 012	26880
3113	Res, 75 ohm, 5%, 1/6W, Carbon Film. .	3198 011	07590	3456	Res, Zero ohm, Chip Jumper.	3198 021	90020
3114	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010	3457	Res, Zero ohm, Chip Jumper.	3198 021	90020
3115	Res, 75 ohm, 5%, 1/6W, Carbon Film. .	3198 011	07590	3458	Res, 1K, 5%, 1/6W, Carbon Film. . . .	3198 011	01020
3116	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010	3459	Res, 15K, 5%, 1 1/3W, Metal Film. . .	3198 012	21530
3122	Wire Jumper, 0.58MM.	3198 036	90010	3460	Res, 3K9, 5%, 1/6W, Carbon Film. . .	3198 011	03920
3123	Res, 150 ohm, 5%, 1/6W, Carbon Film.	3198 011	01510	3463	Res, 33 ohm, 5%, 1/6W, Carbon Film. .	3198 011	03390
3124	Res, 47K, 5%, 1/16W, Metallized Glass	3198 021	34730	3465	Res, 27K, 1%, 3/5W, Metal Film. . . .	2312 915	12703
3125	Res, 150 ohm, 5%, 1/6W, Carbon Film.	3198 011	01510	3468	Res, 220 ohm, 5%, 1/6W, Carbon Film.	3198 011	02210
3126	Res, 47K, 5%, 1/16W, Metallized Glass	3198 021	34730	3469	Res, 3K3, 5%, 1/6W, Carbon Film. . . .	3198 011	03320
3131	Res, 150 ohm, 5%, 1/6W, Carbon Film.	3198 011	01510	3470	Res, 330K, 5%, 1/10W, Metallized Glas	3198 021	53340
3132	Res, 47K, 5%, 1/16W, Metallized Glass	3198 021	34730	3471	Res, 3R3, 1%, 3/5W, Metal Film. . . .	2312 915	13308
3133	Res, 150 ohm, 5%, 1/6W, Carbon Film.	3198 011	01510	3472	Res, 3R3, 1%, 3/5W, Metal Film. . . .	2312 915	13308
3134	Res, 47K, 5%, 1/16W, Metallized Glass	3198 021	34730	3473	Res, 3R3, 1%, 3/5W, Metal Film. . . .	2312 915	13308
3135	Res, 75 ohm, 5%, 1/6W, Carbon Film. .	3198 011	07590	3474	Res, 2K2, 1%, 3/5W, Metal Film. . . .	2312 915	12202
3136	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011	01010	3475	Res, 2K2, 1%, 3/5W, Metal Film. . . .	2312 915	12202
3138	Wire Jumper, 0.58MM.	3198 036	90010	3477	Res, 150 ohm, 5%, 1/6W, Carbon Film.	3198 011	01510
3141	Res, 1K, 5%, 1/6W, Carbon Film. . . .	3198 011	01020	3478	Res, 150 ohm, 5%, 1/6W, Carbon Film.	3198 011	01510
3149	Res, 100K, 5%, 1/16W, Metallized Glas	3198 021	31040	3479	Res, 2K7, 5%, 1/10W, Metallized Glass	3198 021	52720
3150	Res, 150K, 5%, 1/16W, Metallized Glas	3198 021	31540	3480	Res, 1R5, 5%, 1/4W, Carbon Film. . . .	2120 101	74158
3154	Res, 5K6, 5%, 1/6W, Carbon Film. . . .	3198 011	05620	3481	Res, 12k, 1%, Metal Film.	2312 915	11203
3156	Res, 10K, 5%, 1/6W, Carbon Film. . . .	3198 011	01030	3482	Res, 12k, 1%, Metal Film.	2312 915	11203
3157	Res, 1K5, 5%, 1/16W, Metallized Glass	3198 021	31520	3484	Res, 3K9, 5%, 1/6W, Carbon Film. . . .	3198 011	03920
3158	Res, 10K, 5%, 1/16W, Metallized Glass	3198 021	31030	3486	Res, 33 ohm, 5%, 2 1/2W, Metal Film.	3198 012	33390
3159	Res, 1K2, 1%, 1/10W, Metallized Glass	2120 108	92616	3488	Res, 4R7, 5%, 1/2W, Metal Film. . . .	2306 207	03478
3170	Res, 4K7, 5%, 1/6W, Carbon Film. . . .	3198 011	04720	3490	Res, 8K2, 5%, 1/6W, Carbon Film. . . .	3198 011	08220
3172	Res, 68K, 5%, 1/6W, Carbon Film. . . .	3198 011	06830	3492	Res, 1k, 5%, Carbon.	3198 021	51020

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3493	Res, 6R8, 5%, 1/3W, Metal Film . . .	2306 204 03688	3686	Res, 1K5, 5%, 1/16W, Metallized Glass	3198 021 31520
3494	Res, 4R7, 5%, 1/2W, Metal Film . . .	2306 207 03478	3691	Res, 330 ohm, 5%, 1/16W, Metallized G	3198 021 33310
3495	Res, 22K, 5%, Carbon	3198 021 52230		lass	
3496	Res, 100K, 5%, 1/10W, Metallized Glas	3198 021 51040	3693	Res, 220 ohm, 5%, 1/16W, Metallized G	3198 021 32210
3497	Res, 100K, 5%, 1/10W, Metallized Glas	3198 021 51040		lass	
3498	Res, 12K, 5%, 1/10W, Metallized Glass	3198 021 51230	3694	Res, 4K7, 5%, 1/16W, Metallized Glass	3198 021 34720
3499	Res, 10K, 5%, Carbon	3198 021 51030	3801	Res, 220 ohm, 5%, 1/6W, Carbon Film.	3198 011 02210
S 3500	Res, 3M3, 5%, 1/2W, Metallized Glass	2322 242 13335	3802	Res, 1K, 5%, 1/6W, Carbon Film . . .	3198 011 01020
S 3501	Res, 3M3, 5%, 1/2W, Metallized Glass	2322 242 13335	3809	Res, 75 ohm, 5%, 1/16W, Metallized Gl	3198 021 37590
3504	Res, 3 ohm, +30%/-20%, 144v, PTC, Car			ass.	
	bon Film	2122 663 00019	3810	Res, 75 ohm, 5%, 1/16W, Metallized Gl	3198 021 37590
S 3506	Res, 1M5, 5%, 1/2W, Metallized Glass	2322 242 13155		ass.	
S 3507	Surge Protector, DSP-301N-A21F A . .	2422 549 43073	3831	Res, 47K, 5%, 1/16W, Metallized Glass	3198 021 34730
S 3508	Res, 220 ohm, 20%, 1/2W, Carbon Film	3198 013 02210	3832	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010
3510	Res, 4.7 ohm, 20%, 3W1, NTC, Carbon F		3833	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010
	ilm.	2122 612 00056	3836	Res, 1K, 5%, 1/16W, Metallized Glass	3198 021 31020
3519	Res, 270 ohm, 5%, 1/6W, Carbon Film.	3198 011 02710	3837	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010
3520	Res, 1K2, 5%, 1/10W, Metallized Glass	3198 021 51220	3838	Res, 1K, 5%, 1/16W, Metallized Glass	3198 021 31020
3521	Res, 4R7, 5%, 1/6W, Carbon Film. . .	3198 011 04780	3839	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010
3522	Res, 330K, 5%, 1/10W, Metallized Glas	3198 021 53340	3843	Res, 2K2, 5%, 1/16W, Metallized Glass	3198 021 32220
S 3523	Res, 100 ohm, 5%, 1/3W, Metal Film . .	2306 204 03101	3901	Res, 1K, 5%, 1/16W, Metallized Glass	3198 021 31020
3524	Res, 56K, 5%, 1/10W, Metallized Glass	3198 021 55630	3902	Res, 3K3, 5%, 1/16W, Metallized Glass	3198 021 33320
3525	Res, 1k, 5%, Carbon.	3198 021 51020	3903	Res, 3K3, 5%, 1/16W, Metallized Glass	3198 021 33320
3526	Res, 0R1, 5%, 3/5W, Metal Film . . .	3198 012 11070	3904	Res, 10K, 5%, 1/16W, Metallized Glass	3198 021 31030
3527	Res, 0R33, 5%, 3/5W, Metal Film. . .	3198 012 13370	3905	Res, 3K3, 5%, 1/16W, Metallized Glass	3198 021 33320
3528	Res, Zero ohm, Chip Jumper	3198 021 90020	3906	Res, 10K, 5%, 1/16W, Metallized Glass	3198 021 31030
3529	Res, 47K, 5%, 1/10W, Metallized Glass	3198 021 54730	3907	Res, 8K2, 5%, 1/16W, Metallized Glass	3198 021 38220
3530	Res, 10k, 5%, Carbon	3198 021 51030	4001	Res, Zero ohm, 'Chip' Jumper	3198 021 90030
3531	Res, 4K7, 5%, 1/10W, Metallized Glass	3198 021 54720	4002	Res, Zero ohm, 'Chip' Jumper	3198 021 90030
S 3532	Res, 2K2, 5%, 1/3W, Metal Film	2306 204 03222	4170	Res, Zero ohm, Chip Jumper	3198 021 90020
3541	Res, 470 ohm, 5%, 1/10W, Metallized G		4181	Res, Zero ohm, 'Chip' Jumper	3198 021 90030
	lass	3198 021 54710	4209	Res, Zero ohm, 'Chip' Jumper	3198 021 90030
3542	Res, 1K5, 5%, 1/10W, Metallized Glass	3198 021 51520	4216	Res, Zero ohm, 'Chip' Jumper	3198 021 90030
3543	Res, 82K, 1%, 3/5W, Metal Film	2312 915 18203	4217	Res, Zero ohm, 'Chip' Jumper	3198 021 90030
3544	Res, 4K7, 1%, 1/8W, Metallized Glass	2322 734 64702	4401	Res, Zero ohm, Chip Jumper	3198 021 90020
3545	Res, 270K, 5%, 1/8W, Metallized Glass	2322 730 61274	4402	Res, Zero ohm, Chip Jumper	3198 021 90020
3548	Res, 15K, 5%, 1/10W, Metallized Glass	3198 021 51530	4430	Res, Zero ohm, Chip Jumper	3198 021 90020
3552	Res, 4K7, 5%, 1/10W, Metallized Glass	3198 021 54720	4500	Res, Zero ohm, Chip Jumper	3198 021 90020
3557	Res, 1k, 5%, Carbon.	3198 021 51020	4601	Res, Zero ohm, Chip Jumper	3198 021 90020
3560	Res, 47 ohm, 5%, 1/6W, Carbon Film . .	3198 011 04790	4613	Res, Zero ohm, Chip Jumper	3198 021 90020
3561	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010	4614	Res, Zero ohm, Chip Jumper	3198 021 90020
3562	Res, 12K, 5%, 1/10W, Metallized Glass	3198 021 51230	4615	Res, Zero ohm, 'Chip' Jumper	3198 021 90030
3563	Res, 5K6, 5%, 1/10W, Metallized Glass	3198 021 55620	4617	Res, Zero ohm, Chip Jumper	3198 021 90020
3564	Res, 0R1, 5%, 1 1/3W, Metal Film . . .	3198 012 21070	4618	Res, Zero ohm, Chip Jumper	3198 021 90020
3565	Res, 330 ohm, 5%, 1W, Metal Film . . .	3198 012 13310	4619	Res, Zero ohm, Chip Jumper	3198 021 90020
3566	Res, 2K2, 5%, 1/10W, Metallized Glass	3198 021 52220	4622	Res, Zero ohm, Chip Jumper	3198 021 90020
3567	Res, 1K8, 5%, 1/16W, Metallized Glass	3198 021 31820	4623	Res, Zero ohm, Chip Jumper	3198 021 90020
3568	Res, 8K2, 5%, 1/10W, Metallized Glass	3198 021 58220	4691	Res, Zero ohm, Chip Jumper	3198 021 90020
3569	Res, 5K6, 5%, 1/10W, Metallized Glass	3198 021 55620	4692	Res, Zero ohm, Chip Jumper	3198 021 90020
3580	Res, 47K, 5%, 1/10W, Metallized Glass	3198 021 54730	4693	Res, Zero ohm, Chip Jumper	3198 021 90020
3594	Res, 330 ohm, 5%, 1/10W, Metallized G		4696	Res, Zero ohm, Chip Jumper	3198 021 90020
	lass	3198 021 53310	4801	Res, Zero ohm, Chip Jumper	3198 021 90020
3595	Res, 220K, 5%, 1/10W, Metallized Glas	3198 021 52240	4831	Res, Zero ohm, Chip Jumper	3198 021 90020
3596	Res, 220K, 5%, 1/10W, Metallized Glas	3198 021 52240	4833	Res, Zero ohm, Chip Jumper	3198 021 90020
3601	Res, 8K2, 5%, 1/6W, Carbon Film. . . .	3198 011 08220	4835	Res, Zero ohm, Chip Jumper	3198 021 90020
3603	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010	4901	Res, Zero ohm, Chip Jumper	3198 021 90020
3604	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010	4903	Res, Zero ohm, Chip Jumper	3198 021 90020
3605	Res, 4K7, 5%, 1/16W, Metallized Glass	3198 021 34720	4982	Res, Zero ohm, Chip Jumper	3198 021 90020
3606	Res, 2K2, 5%, 1/6W, Carbon Film. . . .	3198 011 02220	5001	Coil, 27u.	3198 018 22790
3607	Res, 2K2, 5%, 1/6W, Carbon Film. . . .	3198 011 02220	5002	Coil, 820n	3198 018 18270
3608	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010	5201	Coil, 6u8.	3198 018 16880
3609	Res, 1K, 5%, 1/6W, Carbon Film	3198 011 01020	5202	Coil, 10u.	3198 018 21090
3610	Res, 8K2, 5%, 1/6W, Carbon Film. . . .	3198 011 08220	5204	Fixed, Inductor, 100MHZ, 80 ohm. . .	3198 018 90020
3611	Res, 100 ohm, 5%, 1/16W, Metallized G		5205	Fixed, Inductor, 100MHZ, 80 ohm. . .	3198 018 90020
	lass	3198 021 31010	5206	Wire Jumper, 0.58MM.	3198 036 90010
3618	Res, 6K8, 5%, 1/6W, Carbon Film. . . .	3198 011 06820	5241	Coil, 10u.	3198 018 21090
3622	Res, 100 ohm, 5%, 1/10W, Metallized G		5242	Coil, 10u.	3198 018 11090
	lass	3198 021 51010	S 5445	Transformer, LOT, USLOT+U AT2078 . .	3128 138 21401
3623	Res, 4K7, 5%, 1/16W, Metallized Glass	3198 021 34720	5451	Coil, 33u.	3198 018 73390
3624	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010	5452	Fixed, Inductor, 100MHZ, 80 ohm. . .	3198 018 90020
3625	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010	5457	Coil, Linear Correction, 42u	2422 535 94865
3626	Res, 4K7, 5%, 1/16W, Metallized Glass	3198 021 34720	5461	Transformer, Signal Driver, SC10015-0	
3627	Res, 4K7, 5%, 1/16W, Metallized Glass	3198 021 34720		0 B.	2422 531 02465
3628	Res, 10K, 5%, 1/16W, Metallized Glass	3198 021 31030	5471	Coil, 3u3.	3198 018 73380
3630	Res, 2K2, 5%, 1/16W, Metallized Glass	3198 021 32220	5472	Coil, 3u3.	3198 018 23380
3632	Res, Zero ohm, Chip Jumper	3198 021 90020	5480	Fixed Inductor, 39u, 10%, LAL04. . . .	2422 535 97336
3634	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010	S 5501	Filter, Mains, 5mH, 2A	2422 549 43432
3635	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010	S 5520	Transformer, SMT Layer, SS39009-04 B	2422 531 02459
3636	Res, 100 ohm, 5%, 1/10W, Metallized G		5521	Fixed, Inductor, 100MHZ, 50R.	3198 018 90010
	lass	3198 021 51010	5560	Fixed, Inductor, 100MHZ, 50R.	3198 018 90010
3638	Res, 75 ohm, 5%, 1/16W, Metallized Gl		5561	Coil, 27u.	3198 018 22790
	ass.	3198 021 37590	5562	Fixed, Inductor, 100MHZ, 50R.	3198 018 90010
3639	Res, Zero ohm, Chip Jumper	3198 021 90020	5564	Fixed, Inductor, 100MHZ, 50R.	3198 018 90010
3681	Res, 390 ohm, 5%, 1/16W, Metallized G		5602	Coil, 5u6.	3198 018 15680
	lass	3198 021 33910	5603	Coil, 5u6.	3198 018 15680
3682	Res, 3K3, 5%, 1/16W, Metallized Glass	3198 021 33320	5604	Coil, 5u6.	3198 018 15680
3683	Res, 390 ohm, 5%, 1/16W, Metallized G		5831	Coil, 6u8.	3198 018 16880
	lass	3198 021 33910	5832	Coil, 6u8.	3198 018 16880
3684	Res, 560 ohm, 5%, 1/16W, Metallized G		5833	Coil, 6u8.	3198 018 16880
	lass	3198 021 35610	5835	Coil, 12u.	3198 018 31290
3685	Res, 560 ohm, 5%, 1/16W, Metallized G		6001	Zener Diode, 33 volt	3198 010 23390
	lass	3198 021 35610	6006	Diode, Signal, 1N4148.	3198 010 10010

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6007	Diode, Signal, 1N4148.	3198 010 10010	9178	Wire Jumper, 0.58MM.	3198 036 90010
6150	Diode, Signal, BAS316.	3198 010 10630	9179	Wire Jumper, 0.58MM.	3198 036 90010
6201	Diode, Signal, BAS316.	3198 010 10630	9181	Wire Jumper, 0.58MM.	3198 036 90010
6202	Diode, Signal, BAS316.	3198 010 10630	9182	Wire Jumper, 0.58MM.	3198 036 90010
6206	Zener Diode, 6.8 volt.	3198 020 56880	9183	Wire Jumper, 0.58MM.	3198 036 90010
6445	Zener Diode, 10 volt.	3198 020 51090	9192	Wire Jumper, 0.58MM.	3198 036 90010
6447	Diode, Signal, 1N4148.	3198 010 10010	9193	Wire Jumper, 0.58MM.	3198 036 90010
6448	Zener Diode, 6.2 volt.	9331 668 30133	9406	Wire Jumper, 0.58MM.	3198 036 90010
6449	Diode, Signal, BAV99	3198 010 10620	9407	Wire Jumper, 0.58MM.	3198 036 90010
6453	Zener Diode, 6.8 volt.	3198 020 56880	9408	Wire Jumper, 0.58MM.	3198 036 90010
6460	Diode, Rect, BY228/24.	9340 559 50112	9409	Wire Jumper, 0.58MM.	3198 036 90010
6461	Diode, Rect, RGP30J-L7004.	9338 617 60682	9410	Wire Jumper, 0.58MM.	3198 036 90010
6462	Zener Diode, 9.1 volt.	9331 177 80133	9411	Wire Jumper, 0.58MM.	3198 036 90010
6465	Diode, Signal, BAV21	3198 010 10070	9412	Wire Jumper, 0.58MM.	3198 036 90010
6466	Diode, Signal, BAV21	3198 010 10070	9413	Wire Jumper, 0.58MM.	3198 036 90010
6467	Diode, Signal, BAS316.	3198 010 10630	9415	Wire Jumper, 0.58MM.	3198 036 90010
6468	Diode, Signal, BAS316.	3198 010 10630	9416	Wire Jumper, 0.58MM.	3198 036 90010
6469	Diode, Rect, BYD33J	9337 234 20133	9417	Wire Jumper, 0.58MM.	3198 036 90010
6470	Diode, Signal, BAV99	3198 010 10620	9418	Wire Jumper, 0.58MM.	3198 036 90010
6476	Zener Diode, 15 volt.	3198 010 21590	9419	Wire Jumper, 0.58MM.	3198 036 90010
6481	Zener Diode, 5.6 volt.	3198 010 25680	9421	Wire Jumper, 0.58MM.	3198 036 90010
6482	Zener Diode, 9.1 volt.	9331 177 80133	9422	Wire Jumper, 0.58MM.	3198 036 90010
6483	Zener Diode, 33 volt.	3198 010 23390	9423	Wire Jumper, 0.58MM.	3198 036 90010
6485	Diode, Rect, BYD33J	9337 234 20133	9425	Wire Jumper, 0.58MM.	3198 036 90010
6486	Diode, Rect, EGP20DL-5100.	9322 164 42682	9427	Wire Jumper, 0.58MM.	3198 036 90010
6487	Diode, Rect, BYD33D	9337 234 00133	9453	Wire Jumper, 0.58MM.	3198 036 90010
6488	Diode, Rect, EGP20DL-5100.	9322 164 42682	9460	Wire Jumper, 0.58MM.	3198 036 90010
6500	Diode, Bridge Rect, GBU4JL-7002.	9322 132 55667	9500	Wire Jumper, 0.58MM.	3198 036 90010
6520	Diode, Rect, BYD33D	9337 234 00133	9501	Wire Jumper, 0.58MM.	3198 036 90010
6523	Diode, Signal, 1N4148.	3198 010 10010	9503	Wire Jumper, 0.58MM.	3198 036 90010
6524	Diode, Rect, 1N5062	3198 010 10120	S 9506	Wire Jumper, 0.58MM.	3198 036 90010
6525	Diode, Rect, 1N5062	3198 010 10120	S 9507	Wire Jumper, 0.58MM.	3198 036 90010
6526	Zener Diode, 22 volt.	3198 020 52290	9510	Wire Jumper, 0.58MM.	3198 036 90010
6540	Zener Diode, 6.2 volt.	9331 668 30133	9512	Wire Jumper, 0.58MM.	3198 036 90010
6541	Zener Diode, 9.1 volt.	9322 150 08685	9513	Wire Jumper, 0.58MM.	3198 036 90010
6560	Diode, Rect, BYV29X-500.	9340 555 59127	9514	Wire Jumper, 0.58MM.	3198 036 90010
6562	Diode, Rect, EGP20DL-5100.	9322 164 42682	9515	Wire Jumper, 0.58MM.	3198 036 90010
6563	Diode, Signal, BAS316.	3198 010 10630	9516	Wire Jumper, 0.58MM.	3198 036 90010
6565	Diode, Signal, BAV70	9331 849 10215	9518	Wire Jumper, 0.58MM.	3198 036 90010
6566	Diode, Signal, 1N4148.	3198 010 10010	9520	Wire Jumper, 0.58MM.	3198 036 90010
6569	Diode, Signal, BAS316.	3198 010 10630	9521	Wire Jumper, 0.58MM.	3198 036 90010
6570	Zener Diode, 6.8 volt.	3198 020 56880	9522	Wire Jumper, 0.58MM.	3198 036 90010
6580	Diode, Signal, BAS316.	3198 010 10630	9524	Wire Jumper, 0.58MM.	3198 036 90010
6681	Diode Signal, IG BAT85	9336 247 60133	9525	Wire Jumper, 0.58MM.	3198 036 90010
6691	LED, VS LTL-10224WHCR.	9322 050 99682	9528	Wire Jumper, 0.58MM.	3198 036 90010
6692	IR, Receiver, TSOP1836UH3V	9322 127 54667	9610	Wire Jumper, 0.58MM.	3198 036 90010
6831	Diode, Signal, 1N4148.	3198 010 10010	9611	Coil, 27u.	3198 018 22790
6901	Res, Zero ohm, Chip Jumper	3198 021 90020	9612	Wire Jumper, 0.58MM.	3198 036 90010
7101	Transistor, NPN, BC847B.	3198 010 42030	9613	Wire Jumper, 0.58MM.	3198 036 90010
7102	Transistor, PNP, BC857B.	3198 010 42150	9614	Wire Jumper, 0.58MM.	3198 036 90010
7103	Transistor, NPN, BC847B.	3198 010 42030	9615	Wire Jumper, 0.58MM.	3198 036 90010
7172	Transistor, PNP, BC857B.	3198 010 42150	9616	Wire Jumper, 0.58MM.	3198 036 90010
7173	Transistor, NPN, BC847B.	3198 010 42030	9617	Wire Jumper, 0.58MM.	3198 036 90010
7174	Transistor, PNP, BC857B.	3198 010 42150	9618	Wire Jumper, 0.58MM.	3198 036 90010
7200	IC, SM TDA9587H/N1/3	9352 716 32557	9619	Wire Jumper, 0.58MM.	3198 036 90010
7201	Transistor, NPN, BC847B.	3198 010 42030	9620	Wire Jumper, 0.58MM.	3198 036 90010
7204	Transistor, PNP, BC857B.	3198 010 42150	9621	Wire Jumper, 0.58MM.	3198 036 90010
7205	Transistor, PNP, BC857B.	3198 010 42150	9622	Wire Jumper, 0.58MM.	3198 036 90010
7208	Transistor, PNP, BC857B.	3198 010 42150	9623	Wire Jumper, 0.58MM.	3198 036 90010
7441	Transistor, PNP, BC857B.	3198 010 42150	9624	Wire Jumper, 0.58MM.	3198 036 90010
7443	Transistor, PNP, BC557B.	3198 020 40110	9625	Wire Jumper, 0.58MM.	3198 036 90010
7450	Transistor, PNP, PDTA114ET	3198 010 44010	9626	Wire Jumper, 0.58MM.	3198 036 90010
7460	Transistor, NPN, BU4508DX.	9340 550 92127	9627	Wire Jumper, 0.58MM.	3198 036 90010
7461	Transistor, NPN, BC337-25.	3198 020 43530	9628	Wire Jumper, 0.58MM.	3198 036 90010
7462	Transistor, NPN, PDTC143ZT	9340 547 00215	9629	Wire Jumper, 0.58MM.	3198 036 90010
7463	Transistor, PNP, BC327-25.	3198 020 43430	9630	Wire Jumper, 0.58MM.	3198 036 90010
7471	IC, TDA8359J/N2.	9352 701 64112	9631	Wire Jumper, 0.58MM.	3198 036 90010
7480	Transistor, NPN, BD135	3198 020 41010	9632	Wire Jumper, 0.58MM.	3198 036 90010
7482	Transistor, NPN, BD135	3198 020 41010	9633	Wire Jumper, 0.58MM.	3198 036 90010
S 7515	Optical Coupler, TCET1104(G)	9322 175 72667	9634	Wire Jumper, 0.58MM.	3198 036 90010
7520	IC, TEA1507P/N1.	9352 673 56112	9637	Wire Jumper, 0.58MM.	3198 036 90010
7521	FET Power STP8NC50FP	9322 160 72687	9638	Wire Jumper, 0.58MM.	3198 036 90010
7522	Transistor, NPN, BC847B(COL)	3198 010 42030	9639	Wire Jumper, 0.58MM.	3198 036 90010
7540	Transistor, NPN, BC547B(COL)	3198 020 40030	9640	Wire Jumper, 0.58MM.	3198 036 90010
7541	Transistor, NPN, PDTC114ET	9340 310 10215	9641	Wire Jumper, 0.58MM.	3198 036 90010
7542	Transistor, PNP, BC857B(COL)	3198 010 42150	9642	Wire Jumper, 0.58MM.	3198 036 90010
7560	IC, L78L33ACZ.	9322 134 92676	9643	Wire Jumper, 0.58MM.	3198 036 90010
7561	Transistor, NPN, PDTC143ZT	9340 547 00215	9644	Wire Jumper, 0.58MM.	3198 036 90010
7562	Transistor, PNP, BC857B(COL)	3198 010 42150	9645	Wire Jumper, 0.58MM.	3198 036 90010
7564	Transistor, PNP, BC857B(COL)	3198 010 42150	9646	Wire Jumper, 0.58MM.	3198 036 90010
7580	Transistor, PNP, BC857B(COL)	3198 010 42150	9648	Wire Jumper, 0.58MM.	3198 036 90010
7602	IC, M24C08-WBN6.	9322 154 38682	9650	Wire Jumper, 0.58MM.	3198 036 90010
7801	IC, SM HEF4052BT	9333 729 50653	9654	Wire Jumper, 0.58MM.	3198 036 90010
7802	IC, SM HEF4052BT	9333 729 60653	9655	Wire Jumper, 0.58MM.	3198 036 90010
7831	IC, MSP3445G-PO-B8	9322 160 81682	9656	Wire Jumper, 0.58MM.	3198 036 90010
7901	IC, AN7522N.	9322 158 65667	9657	Wire Jumper, 0.58MM.	3198 036 90010
9001	Wire Jumper, 0.58MM.	3198 036 90010	9658	Wire Jumper, 0.58MM.	3198 036 90010
9171	Wire Jumper, 0.58MM.	3198 036 90010	9659	Wire Jumper, 0.58MM.	3198 036 90010
9172	Wire Jumper, 0.58MM.	3198 036 90010	9660	Wire Jumper, 0.58MM.	3198 036 90010
9173	Wire Jumper, 0.58MM.	3198 036 90010	9661	Wire Jumper, 0.58MM.	3198 036 90010
9175	Wire Jumper, 0.58MM.	3198 036 90010	9662	Wire Jumper, 0.58MM.	3198 036 90010
9176	Wire Jumper, 0.58MM.	3198 036 90010	9663	Wire Jumper, 0.58MM.	3198 036 90010

S = Safety Part Be sure to use exact replacement part.

9664	Wire Jumper, 0.58MM.	3198 036 90010	3335	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010
9665	Wire Jumper, 0.58MM.	3198 036 90010	3336	Res, 1K, 20%, 1/2W, Carbon Film. . .	3198 013 01020
9666	Wire Jumper, 0.58MM.	3198 036 90010	S 3340	Res, 10 ohm, 5%, 1/2W, Metal Film. .	2306 207 03109
9668	Wire Jumper, 0.58MM.	3198 036 90010	S 3341	Res, 1 ohm, 5%, 1/3W, Metal Film . .	2306 204 03108
9669	Wire Jumper, 0.58MM.	3198 036 90010	S 3342	Res, 1 ohm, 5%, 1/3W, Metal Film . .	2306 204 03108
9670	Wire Jumper, 0.58MM.	3198 036 90010	3343	Res, 1K5, 20%, 1/2W, Carbon Film . .	3198 013 01520
9672	Wire Jumper, 0.58MM.	3198 036 90010	3344	Res, 22 ohm, 5%, 1/6W, Carbon Film . .	3198 011 02290
9674	Wire Jumper, 0.58MM.	3198 036 90010	3345	VDR DC 1MA/ 50V S MAX 115V A . . .	2322 593 13507
9675	Wire Jumper, 0.58MM.	3198 036 90010	3346	Res, 22 ohm, 5%, 1/6W, Carbon Film . .	3198 011 02290
9676	Wire Jumper, 0.58MM.	3198 036 90010	3347	Res, Zero ohm, Chip Jumper	3198 021 90020
9678	Wire Jumper, 0.58MM.	3198 036 90010	3350	Res, Zero ohm, Chip Jumper	3198 021 90020
9679	Wire Jumper, 0.58MM.	3198 036 90010	3353	Res, Zero ohm, Chip Jumper	3198 021 90020
9680	Wire Jumper, 0.58MM.	3198 036 90010	5342	Coil, 22u.	2422 535 97333
9683	Wire Jumper, 0.58MM.	3198 036 90010	6331	Diode, Signal, BAV21	3198 010 10070
9685	Wire Jumper, 0.58MM.	3198 036 90010	6332	Diode, Signal, BAS316.	3198 010 10630
9686	Wire Jumper, 0.58MM.	3198 036 90010	6333	Diode, Signal, BAV21	3198 010 10070
9687	Wire Jumper, 0.58MM.	3198 036 90010	6335	Diode, Signal, BAV21	3198 010 10070
9688	Wire Jumper, 0.58MM.	3198 036 90010	7330	IC, TDA6107Q/N2.	9352 576 50112
9689	Wire Jumper, 0.58MM.	3198 036 90010	9311	Wire Jumper, 0.58MM.	3198 036 90010
9690	Wire Jumper, 0.58MM.	3198 036 90010	9341	Wire Jumper, 0.58MM.	3198 036 90010
9691	Wire Jumper, 0.58MM.	3198 036 90010	9342	Wire Jumper, 0.58MM.	3198 036 90010
9694	Wire Jumper, 0.58MM.	3198 036 90010	9343	Wire Jumper, 0.58MM.	3198 036 90010
9695	Wire Jumper, 0.58MM.	3198 036 90010			
9697	Wire Jumper, 0.58MM.	3198 036 90010			
9698	Wire Jumper, 0.58MM.	3198 036 90010			
9699	Wire Jumper, 0.58MM.	3198 036 90010			
9821	Wire Jumper, 0.58MM.	3198 036 90010			
9822	Wire Jumper, 0.58MM.	3198 036 90010			
9824	Wire Jumper, 0.58MM.	3198 036 90010			
9825	Wire Jumper, 0.58MM.	3198 036 90010			
9827	Wire Jumper, 0.58MM.	3198 036 90010			
9828	Wire Jumper, 0.58MM.	3198 036 90010			
9829	Wire Jumper, 0.58MM.	3198 036 90010			
9830	Wire Jumper, 0.58MM.	3198 036 90010			
9831	Wire Jumper, 0.58MM.	3198 036 90010			
9832	Wire Jumper, 0.58MM.	3198 036 90010			
9834	Wire Jumper, 0.58MM.	3198 036 90010			
9835	Wire Jumper, 0.58MM.	3198 036 90010			
9836	Wire Jumper, 0.58MM.	3198 036 90010			
9837	Wire Jumper, 0.58MM.	3198 036 90010			
9838	Wire Jumper, 0.58MM.	3198 036 90010			
9839	Wire Jumper, 0.58MM.	3198 036 90010			
9840	Wire Jumper, 0.58MM.	3198 036 90010			
9841	Wire Jumper, 0.58MM.	3198 036 90010			
9842	Wire Jumper, 0.58MM.	3198 036 90010			
9843	Wire Jumper, 0.58MM.	3198 036 90010			
9844	Wire Jumper, 0.58MM.	3198 036 90010			
9845	Wire Jumper, 0.58MM.	3198 036 90010			
9846	Wire Jumper, 0.58MM.	3198 036 90010			
9847	Wire Jumper, 0.58MM.	3198 036 90010			
9848	Wire Jumper, 0.58MM.	3198 036 90010			
9849	Wire Jumper, 0.58MM.	3198 036 90010			
9851	Wire Jumper, 0.58MM.	3198 036 90010			
9901	Wire Jumper, 0.58MM.	3198 036 90010			
9902	Wire Jumper, 0.58MM.	3198 036 90010			
9903	Wire Jumper, 0.58MM.	3198 036 90010			
9904	Wire Jumper, 0.58MM.	3198 036 90010			
9905	Wire Jumper, 0.58MM.	3198 036 90010			
9911	Wire Jumper, 0.58MM.	3198 036 90010			
9912	Wire Jumper, 0.58MM.	3198 036 90010			
9913	Wire Jumper, 0.58MM.	3198 036 90010			
9914	Wire Jumper, 0.58MM.	3198 036 90010			
9915	Wire Jumper, 0.58MM.	3198 036 90010			
9916	Wire Jumper, 0.58MM.	3198 036 90010			
9918	Wire Jumper, 0.58MM.	3198 036 90010			
9919	Wire Jumper, 0.58MM.	3198 036 90010			
9920	Wire Jumper, 0.58MM.	3198 036 90010			
9921	Wire Jumper, 0.58MM.	3198 036 90010			
9922	Wire Jumper, 0.58MM.	3198 036 90010			
9991	Wire Jumper, 0.58MM.	3198 036 90010			
9994	Wire Jumper, 0.58MM.	3198 036 90010			
9996	Wire Jumper, 0.58MM.	3198 036 90010			
9998	Wire Jumper, 0.58MM.	3198 036 90010			
CBA	Main Chassis Assembly.	3139 177 27041			

CRT Panel Parts (Part of Main Chassis)

CRT Panel Parts (Part of Main Chassis)				
0244	Connector, 5 Pin	2422 025 04853		
0245	Connector, 6 Pin	2422 025 04854		
S 0254	CRT Socket, 9 Pin.	2422 500 80076		
2330	Cap, 100n, 10%, 250v, Metallized Polyester.	2222 368 90177		
2340	Cap, 10u, 20%, 250v, Electrolytic.	2020 012 93495		
2341	Cap, 3n3, 10%, 500v, Ceramic	3198 019 43320		
2342	Cap, 560p, 5%, 50v, Ceramic.	3198 016 05610		
2343	Cap, 3n3, 10%, 2000v, Ceramic.	2020 558 90529		
2344	Cap, 100n, +80/-20%, 25v, Ceramic.	3198 023 21040		
2345	Cap, 1n, 10%, 500v, Ceramic.	3198 019 41020		
3331	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010		
3332	Res, 1K, 20%, 1/2W, Carbon Film.	3198 013 01020		
3333	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198 011 01010		
3334	Res, 1K, 20%, 1/2W, Carbon Film.	3198 013 01020		

S = Safety Part Be sure to use exact replacement part.

Side AV+HP Panel Parts - 313912723881

Side AV+HP Panel Parts - 313912723881				
CBA	Side AV+HP Panel Assembly.	3139 127 23881		
0232	1 Pin Headphone Socket	2422 026 04747		
0250	3 Pin Cinch Socket	2422 026 04815		
0251	6 Pin Connector.	2422 025 12482		
0254	5 Pin Connector.	2422 025 12481		
0255	4 Pin Connector.	2422 025 12479		
2171	Cap, 470p, 10%, 50v, Ceramic	3198 019 14710		
2172	Cap, 470p, 10%, 50v, Ceramic	3198 019 14710		
2173	Cap, 470p, 10%, 50v, Ceramic	3198 019 14710		
2174	Cap, 470p, 10%, 50v, Ceramic	3198 019 14710		
2176	Cap, 470p, 10%, 50v, Ceramic	3198 019 14710		
2177	Cap, 10u, 20%, 50v, Electrolytic	3198 025 51090		
2178	Cap, 470p, 10%, 50v, Ceramic	3198 019 14710		
2179	Cap, 10u, 20%, 50v, Electrolytic	3198 025 51090		
3150	Res, 47K, 5%, 1/6W, Carbon Film.	3198 011 04730		
3151	Res, 150 ohm, 5%, 1/6W, Carbon Film.	3198 011 01510		
3152	Res, 47K, 5%, 1/6W, Carbon Film.	3198 011 04730		
3153	Res, 150 ohm, 5%, 1/6W, Carbon Film.	3198 011 01510		
3156	Res, 120 ohm, 5%, 1/6W, Carbon Film.	3198 011 01210		
3157	Res, 120 ohm, 5%, 1/6W, Carbon Film.	3198 011 01210		
6161	Zener Diode, 6.8 volt.	3198 010 26880		
9153	Jumper	3198 036 90010		
9170	Jumper	3198 036 90010		
9171	Jumper	3198 036 90010		

PIP Panel Parts - 313917721831

PIP Panel Parts - 313917721831				
CBA	PIP Panel Assembly	3139 177 21831		
0134	Bracket, PIP	3139 124 33161		
0192	Cable, 4 Pin, 280mm.	3139 110 38681		
0193	Cable, 7 Pin, 280mm.	3139 131 01731		
0194	Cable, 5 Pin, 280mm.	3139 110 38811		
0195	Cable, 5 Pin, 280mm.	3139 131 01741		
0197	Cable, 4 Pin, 280mm.	3139 110 38681		
0198	Cable, 4 Pin, 280mm.	3139 110 38681		
0216	Connector, 3 Pin	2412 020 00725		
0226	Connector, 4 Pin	2422 025 12479		
0229	Connector, 2 Pin.	2422 025 16343		
0235	Connector, 2 Pin	2412 020 00724		
0240	Connector, 4 Pin	2422 025 12479		
0242	Connector, 5 Pin	2422 025 12481		
0243	Connector, 2 Pin	2412 020 00724		
0266	Connector, 3 Pin	2412 020 00725		
0284	Connector, 4 Pin	2422 025 12479		
1802	Resinator Crystal, 14M31818, 20P	2422 543 00904		
2800	Cap, 470n, +80/-20%, 16v, Ceramic.	3198 017 24740		
2801	Cap, 100n, +80/-20%, 25v, Ceramic.	3198 023 21040		
2802	Cap, 100n, +80/-20%, 25v, Ceramic.	3198 023 21040		
2803	Cap, 47u, 20%, 25v, Electrolytic	3198 025 34790		
2804	Cap, 10u, 20%, 50v, Electrolytic	3198 025 51090		
2805	Cap, 100n, +80/-20%, 25v, Ceramic.	3198 023 21040		
2806	Cap, 100u, 20%, 25v, Electrolytic.	3198 025 31010		
2807	Cap, 47p, 5%, 50v, Ceramic	3198 016 04790		
2808	Cap, 10u, 20%, 50v, Electrolytic	3198 025 51090		
2809	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030		
2810	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030		
2811	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030		
2812	Cap, 47u, 20%, 25v, Electrolytic	3198 025 34790		
2813	Cap, 10u, 20%, 50v, Electrolytic	3198 025 51090		
2814	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030		
2815	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030		
2816	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030		
2819	Cap, 12p, 5%, 50v, Ceramic	3198 016 01290		
2820	Cap, 220n, +80/-20%, 25v, Ceramic.	3198 023 22240		
2821	Cap, 220n, +80/-20%, 25v, Ceramic.	3198 023 22240		
2822	Cap, 33n, 10%, 50v, Ceramic.	3198 017 03330		
2823	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030		

2824	Cap, 47u, 20%, 25v, Electrolytic . .	3198 025 34790	4871	Res, Zero ohm, "Chip" Jumper	3198 021 90020
2825	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030	4872	Res, Zero ohm, "Chip" Jumper	3198 021 90020
2826	Cap, 560p, 5%, 50v, Ceramic.	3198 016 05610	4909	Res, Zero ohm, "Chip" Jumper	3198 021 90020
2827	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030	5890	Coil, 10u.	3198 018 21090
2828	Cap, 100n, +80/-20%, 25v, Ceramic. .	3198 023 21040	5891	Coil, 10u.	3198 018 21090
2829	Cap, 47u, 20%, 25v, Electrolytic . .	3198 025 34790	5892	Coil, 10u.	3198 018 21090
2830	Cap, 100n, +80/-20%, 25v, Ceramic. .	3198 023 21040	6800	Diode, Signal, BAT85	9336 247 60133
2831	Cap, 47u, 20%, 25v, Electrolytic . .	3198 025 34790	6801	Diode, Signal, BAT85	9336 247 60133
2832	Cap, 100n, +80/-20%, 25v, Ceramic. .	3198 023 21040	6802	Diode, Signal, BAT85	9336 247 60133
2833	Cap, 47u, 20%, 25v, Electrolytic . .	3198 025 34790	6890	Zener Diode, 3.9 volt.	3198 020 53980
2834	Cap, 100n, 10%, 16v, Ceramic	3198 017 01040	7801	IC, HEF4053BT.	9333 729 60653
2837	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030	7802	IC, N74F06N.	9339 990 90602
2858	Cap, 47u, 20%, 25v, Electrolytic . .	3198 025 34790	7803	IC, M65669SP	9322 146 60682
2859	Cap, 470n, +80/-20%, 16v, Ceramic. .	3198 017 24740	7804	Transistor, NPN, BC847B.	3198 010 42030
2862	Cap, 390p, 5%, 50v, Ceramic.	3198 016 03910	7805	Transistor, NPN, BC847B.	3198 010 42030
2890	Cap, 100u, 20%, 25v, Electrolytic. .	3198 025 31010	7806	Transistor, NPN, BC847B.	3198 010 42030
2891	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030	7807	Transistor, NPN, BC847B.	3198 010 42030
2892	Cap, 47u, 20%, 25v, Electrolytic . .	3198 025 34790	7810	Transistor, NPN, BC847B.	3198 010 42030
2893	Cap, 47u, 20%, 25v, Electrolytic . .	3198 025 34790	7813	Transistor, NPN, BC847B.	3198 010 42030
2894	Cap, 10n, 10%, 50v, Ceramic.	3198 017 01030	7816	Transistor, NPN, BC847B.	3198 010 42030
3801	Res, 100 ohm, 5%, 1/10W, Metalized Gl	3198 021 51010	7818	IC, HEF4053BT.	9333 729 60653
3802	Res, 100 ohm, 5%, 1/10W, Metalized Gl	3198 021 51010	7820	Transistor, NPN, BC847B.	3198 010 42030
3803	Res, 1K, 5%, 1/6W, Carbon Film . . .	3198 011 01020	7890	IC, MC78M05CT.	9334 703 90687
3804	Res, 1K5, 5%, 1/6W, Carbon Film. . .	3198 011 01520	7891	Transistor, NPN, BC337	9331 796 00126
3805	Res, 100 ohm, 5%, 1/10W, Metalized Gl	3198 021 51010	9800	Wire Jumper, 0.58MM.	3198 036 90010
3806	Res, 2K7, 5%, 1/10W, Metalized Glass	3198 021 52720	9810	Wire Jumper, 0.58MM.	3198 036 90010
3807	Res, 8K2, 5%, 1/10W, Metalized Glass	3198 021 58220	9912	Wire Jumper, 0.58MM.	3198 036 90010
3808	Res, 8K2, 5%, 1/10W, Metalized Glass	3198 021 58220	9913	Wire Jumper, 0.58MM.	3198 036 90010
3809	Res, 8K2, 5%, 1/10W, Metalized Glass	3198 021 58220	9914	Wire Jumper, 0.58MM.	3198 036 90010
3810	Res, 10K, 5%, 1/10W, Metalized Glass	3198 021 51030	9915	Wire Jumper, 0.58MM.	3198 036 90010
3812	Res, 10K, 5%, 1/10W, Metalized Glass	3198 021 51030	9917	Wire Jumper, 0.58MM.	3198 036 90010
3813	Res, 15K, 5%, 1/6W, Carbon Film. . .	3198 011 01530	9919	Wire Jumper, 0.58MM.	3198 036 90010
3814	Res, 1K, 5%, 1/10W, Metalized Glass. .	3198 021 51020	9920	Wire Jumper, 0.58MM.	3198 036 90010
3815	Res, 1K, 5%, 1/10W, Metalized Glass. .	3198 021 51020	9921	Wire Jumper, 0.58MM.	3198 036 90010
3816	Res, 820 ohm, 5%, 1/10W, Metalized Gl	3198 021 58210	9922	Wire Jumper, 0.58MM.	3198 036 90010
3817	Res, 1K, 5%, 1/10W, Metalized Glass. .	3198 021 51020	9924	Wire Jumper, 0.58MM.	3198 036 90010
3818	Res, 15K, 5%, 1/10W, Metalized Glass	3198 021 51530	9925	Wire Jumper, 0.58MM.	3198 036 90010
3819	Res, 10K, 5%, 1/10W, Metalized Glass	3198 021 51030	9927	Wire Jumper, 0.58MM.	3198 036 90010
3820	Res, 1K, 5%, 1/6W, Carbon Film . . .	3198 011 01020	9928	Wire Jumper, 0.58MM.	3198 036 90010
3821	Res, 390 ohm, 5%, 1/10W, Metalized Gl	3198 021 53910	9929	Wire Jumper, 0.58MM.	3198 036 90010
3822	Res, 390 ohm, 5%, 1/10W, Metalized Gl	3198 021 53910			
3823	Res, 390 ohm, 5%, 1/10W, Metalized Gl	3198 021 53910			
3824	Res, 15K, 5%, 1/10W, Metalized Glass	3198 021 51530			
3827	Res, 330 ohm, 5%, 1/10W, Metalized Gl	3198 021 53310			
3828	Res, 4M7, 5%, 1/10W, Metalized Glass	3198 021 54750			
3829	Res, 15K, 5%, 1/10W, Metalized Glass	3198 021 51530			
3830	Res, 2K2, 5%, 1/10W, Metalized Glass	3198 021 52220			
3831	Res, 1M, 5%, 1/10W, Metalized Glass. .	3198 021 51050			
3832	Res, 100 ohm, 5%, 1/6W, Carbon Film. .	3198 011 01010			
3833	Res, 100 ohm, 5%, 1/10W, Metalized Gl	3198 021 51010			
3834	Res, 100 ohm, 5%, 1/10W, Metalized Gl	3198 021 51010			
3836	Res, 1K, 5%, 1/10W, Metalized Glass. .	3198 021 51020			
3838	Res, 220 ohm, 5%, 1/10W, Metalized Gl	3198 021 52210			
3839	Res, 390 ohm, 5%, 1/10W, Metalized Gl	3198 021 53910			
3840	Res, Zero ohm, "Chip" Jumper	3198 021 90020			
3843	Res, 220 ohm, 5%, 1/10W, Metalized Gl	3198 021 52210			
3844	Res, 390 ohm, 5%, 1/10W, Metalized Gl	3198 021 53910			
3845	Res, Zero ohm, "Chip" Jumper	3198 021 90020			
3848	Res, 220 ohm, 5%, 1/10W, Metalized Gl	3198 021 52210			
3849	Res, 390 ohm, 5%, 1/10W, Metalized Gl	3198 021 53910			
3850	Res, Zero ohm, "Chip" Jumper	3198 021 90020			
3852	Res, 12K, 5%, 1/10W, Metalized Glass	3198 021 51230			
3853	Res, 12K, 5%, 1/10W, Metalized Glass	3198 021 51230			
3854	Res, 15K, 5%, 1/10W, Metalized Glass	3198 021 51530			
3856	Res, 820 ohm, 5%, 1/10W, Metalized Gl	3198 021 58210			
3857	Res, Zero ohm, "Chip" Jumper	3198 021 90020			
3858	Res, 1K2, 5%, 1/10W, Metalized Glass	3198 021 51220			
3859	Res, 47K, 5%, 1/10W, Metalized Glass	3198 021 54730			
3860	Res, 1K8, 5%, 1/10W, Metalized Glass	3198 021 51820			
3862	Res, 33 ohm, 5%, 1/10W, Metalized Gla	3198 021 53390			
3865	Res, 150 ohm, 5%, 1/6W, Carbon Film. .	3198 011 01510			
3890	Res, 68 ohm, 5%, 1/6W, Carbon Film . .	3198 011 06890			
4800	Res, Zero ohm, "Chip" Jumper	3198 021 90020			
4870	Res, Zero ohm, "Chip" Jumper	3198 021 90020			

CircuitDescription

Index of this chapter:

1. Introduction
2. Audio signal processing
3. Video signal processing
4. Synchronization
5. Deflection
6. Power supply
7. Control
8. Abbreviations

Note : For complete block diagrams a reference is made to [Block diagram](#).

Introduction

The S8/T8 chassis is a global TV chassis for the model year 2001 and is used for TV sets with screen sizes from 25" - 36" (large screen), in Super Flat, Real Flat and Wide Screen executions.

The standard architecture consists of a Main panel, a Picture Tube panel, a Side I/O panel and a Top Control panel. In some executions, a Picture In Picture (PIP) panel is used.

The Main panel consists primarily of conventional components with hardly any surface mounted devices.

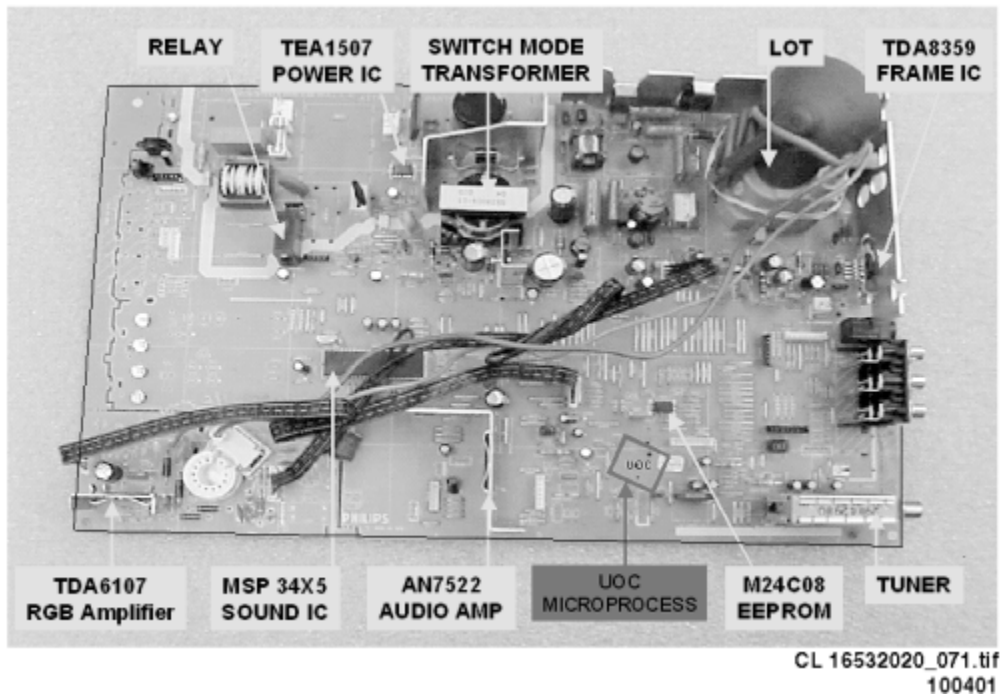


Figure:

The functions for video processing, microprocessor (μP) and teletext (TXT) decoder are combined in one IC (TDA958xH), theso-called Ultimate One Chip (UOC). This chip is (surface) mounted on the copper side of the LSP.

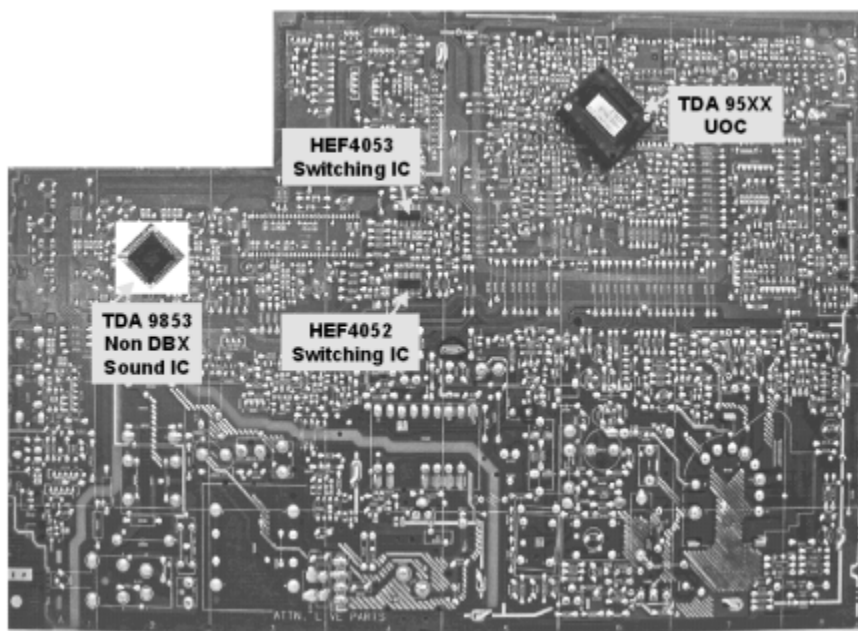


Figure:

The S8/T8 is divided into 2 basic systems, i.e. mono and stereo sound. While the audio processing for the mono sound is done in the audio block of the UOC, an external audio processing IC is used for stereo sets.

The tuning system features 181 channels with on-screen display. The main tuning system uses a tuner, a microcomputer, and a memory IC mounted on the main panel.

The microcomputer communicates with the memory IC, the customer keyboard, remote receiver, tuner, signal processor IC and the audio output IC via the I²C bus. The memory IC retains the settings for favorite stations, customer-preferred settings, and service / factory data. The on-screen graphics and closed caption decoding are done within the microprocessor, and then sent to the signal processor IC to be added to the main signal.

The chassis utilizes a Switching Mode Power Supply (SMPS) for the main voltage source. The chassis has a 'hot' ground reference on the primary side and a cold ground reference on the secondary side of the power supply and the rest of the chassis.

Audio Signal Processing

[Block diagram Audio](#)

Stereo

In stereo sets, the signal goes via the SAW filter (position 1002), to the audio demodulator part of the UOC IC 7200. The audio output on pin 48 goes to the stereo decoder 7831 or 7861. The switch inside this IC selects either the internal decoder or an external source.

There are two stereo decoders used:

1. a BTSC DBX stereo/SAP decoder (MSP34X5 at position 7831) for the highest specified sets and
2. a BTSC non-DBX stereo decoder (TDA 9853 at position 7861) for BTSC Economic.

The output is fed to the audio amplifier (AN7522 at position 7901). The volume level is controlled at this IC (pin 9) by a control line (Volume Mute) from the microprocessor. The audio signal from 7901 is then sent to the speaker / headphone output panel.

Mono

In mono sets, the signal goes via the SAW filter(position 1002), to the audio demodulator part of the UOC IC 7200. The audio output on pin 48 goes, via the smart sound circuit (7941 for Bass and 7942 for Treble) and buffer 7943, to the audio amplifier (AN7523 at position 7902). The volume level is controlled at this IC (pin 9) by a 'VolumeMute' controlline from the microprocessor.

The audio signal from IC 7902 is then sent to the speaker / headphone output panel.

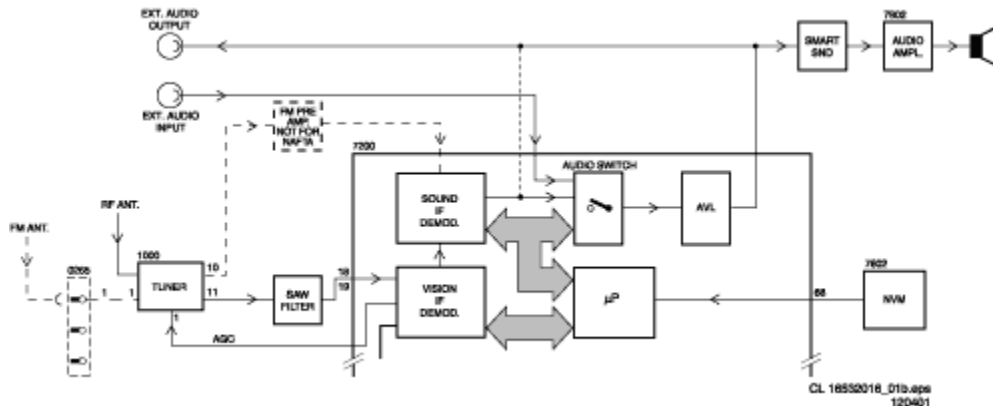


Figure:

Video Signal Processing

Introduction

The video signal-processing path consists of the following parts:

- RF signal processing.
- Video source selection.
- Video demodulation.
- Luminance / Chrominance signal processing.
- RGB control.
- RGB amplifier

The processing circuits listed above are all integrated in the UOC TV processor. The surrounding components are for the adaptation of the selected application. The I²C bus is for defining and controlling the signals.

RF signal processing

The incoming RF signal goes to the tuner (pos.1000), where the 45.75 MHz IF signal is developed and amplified. The IF signals then exits the tuner from pin 11 to pass through the SAW filters (pos. 1002). The shaped signal is then applied to the IF processor part of the UOC (pos. 7200).

Tuner AGC (Automatic Gain Control) will reduce the tuner gain and thus the tuner output voltage when receiving strong RF signals. Adjust the AGC takeover point via the Service Alignment Mode (SAM). The tuner AGC starts working when the video-IF input reaches a certain input level. Adjust this level via the I²C bus. The tuner AGC signal goes to the tuner (pin 1) via the open collector output (pin 22) of the UOC.

The IC also generates an Automatic Frequency Control (AFC) signal that goes to the tuning system via the I²C bus, to provide frequency correction when needed.

The demodulated composite video signal is available at pin 38 and then buffered by transistor 7201.

Video source selection

The Composite Video Blanking Signal (CVBS) from buffer 7201 goes to the audio carrier trap filters (1200, 1201, or 1202 depending on the system used) to remove the audio signal.

The signal then goes to pin 40 of IC 7200. The internal input switch selects the following input signals:

- Pin 40: terrestrial CVBS input
- Pin 42: external AV1 CVBS input
- Pin 44: external Side I/O CVBS or AV2 Luminance (Y) input
- Pin 45: external AV2 Chrominance (C) input

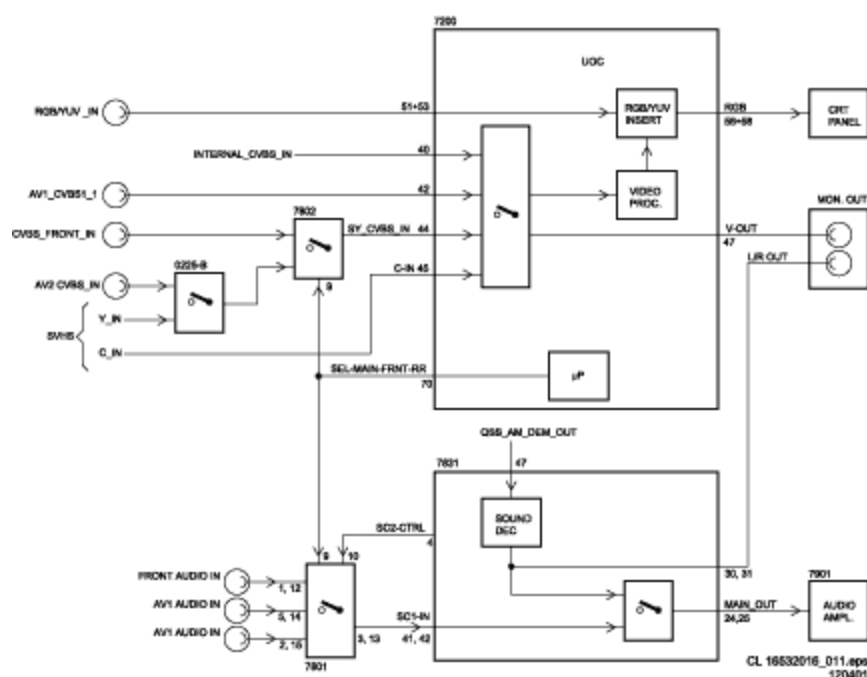


Figure:

Once the signal source is selected, a chroma filter calibration is performed. The received color burst sub-carrier frequency is used for this. Correspondingly, the chroma band pass filter for PAL/NTSC processing or the cloche filter for SECAM processing is switched on. The selected luminance (Y) signal is supplied to the horizontal and vertical synchronization processing circuit and to the luminance processing circuit. In the luminance-processing block, the luminance signal goes to the chroma trap filter. This trap is switched "on" or "off" depending on the color burst detection of the chroma calibration circuit.

The group delay correction part can be switched between the BG and a flat group delay characteristic. This has the advantage that in multi-standard receivers no compromise has to be made for the choice of the SAW filter.

Video demodulation

The color decoder circuit detects whether the signal is a PAL, NTSC or SECAM signal. The result is made known to the auto system manager. The PAL/NTSC decoder has an internal clock generator, which is stabilized to the required frequency by using the 12 MHz clock signal from the reference oscillator of the microcontroller / teletext decoder.

The base-band delay line is used to obtain a good suppression of cross color effects.

The Y signal and the delay line outputs U and V are applied to the luminance / chroma signal processing part of the TV processor.

Luminance / Chrominance signal processing

The output of the YUV separator is fed to the internal YUV switch, which switches between the output of the YUV separator or the external YUV (for DVD or PIP) on pins 51-53. Pin 50 is the input for the insertion control signal called 'FBL-1'. When this signal level becomes higher than 0.9 V (but less than 3 V), the RGB signals at pins 51, 52 and 53 are inserted into the picture by using the internal switches.

Also some picture improvement features are implemented in this part:

- **Black stretch** This function corrects the black level of incoming signals, which have a difference between the black level and the blanking level. The amount of extension depends upon the difference between actual black level and the darkest part of the incoming video signal level. It is detected by means of an internal capacitor.
- **White stretch** This function adapts the transfer characteristic of the luminance amplifier in a non-linear way depending on the average picture content of the luminance signal. It operates in such a way that maximum stretching is obtained when signals with a low video level are received. For bright pictures, stretching is not active.
- **Dynamic skintone correction** This circuit corrects (instantaneously and locally) the hue of those colors which are located in the area in the UV plane that matches the skin tone. The correction is dependent on the luminance, saturation and distance to the preferred axis.

The YUV signal is then fed to the color matrix circuit, which converts it to R, G and B signals. The OSD/TXT signal from the microprocessor is mixed with the main signal at this point, before being output to the CRT board (pins 56, 57 and 58).

Picture in picture (if present)

The PIP controller M65669FP is an NTSC video processor for TV applications. It contains all of the analog signal processing, control logic and memory, necessary to provide sub-picture insertion from a second, non-synchronized, video source into the main picture of the TV. This can be an external source (via the rear I/O inputs) or the video signal of the tuner.

Sync signals are derived from the sandcastle signal and separated by circuit 7171-7174 on the PIP-interface, and then fed to pins 32 and 33 of the PIP processor 7803.

RGB control

The RGB control circuit enables the picture parameters contrast, brightness and saturation to be adjusted, by using a combination of the user menus and the remote control.

Additionally automatic gain control for the RGB signals via cut-off stabilization is achieved in this functional block to obtain an accurate biasing of the picture tube. Therefore this block inserts the cut-off point measuring pulses into the RGB signals during the vertical retrace period.

The following additional controls are used:

- **Black current calibration loop** Because of the 2-point black current stabilization circuit, both the black level and the amplitude of the RGB output signals depend on the drive characteristics of the picture tube. The system checks whether the returning measuring currents meet the requirements, and adapts the output level and gain of the circuit when necessary. After stabilization of the loop, the RGB drive signals are switched on. The 2-point black level system adapts the drive voltage for each cathode in such a way that the two measuring currents have the right value. This is done with the measurement pulses during the frame flyback. During the first frame, three pulses with a current of 8 μA are generated to adjust the cut off voltage. During the second frame, three pulses with a current of 20 μA are generated to adjust the 'white drive'. This has as a consequence, that a change in the gain of the output stage will be compensated by a gain change of the RGB control circuit. Pin 55 (BLKIN) of the UOC is used as the feedback input from the CRT base panel.
- **Blue stretch** This function increases the color temperature of the bright scenes (amplitudes which exceed a value of 80% of the nominal amplitude). This effect is obtained by decreasing the small signal gain of the red and green channel signals, which exceed this 80% level.
- **Beam current limiting** A beam current limiting circuit inside the UOC handles the contrast and brightness control for the RGB signals. This prevents the CRT from being overdriven, which could otherwise cause serious damage in the line output stage. The reference used for this purpose is the DC voltage on pin 54 (BLCIN) of the TV processor. Contrast and brightness reduction of the RGB output signals is therefore proportional to the voltage present on this pin. Contrast reduction starts when the voltage on pin 54 is lower than 2.8 V. Brightness reduction starts when the voltage on pin 54 is less than 1.7 V. The voltage on pin 54 is normally 3.3 V (limiter not active). During set switch-off, the black current control circuit generates a fixed beam current of 1 mA. This current ensures that the picture tube capacitance is discharged. During the switch-off period, the vertical deflection is placed in an over-scan position, so that the discharge is not visible on the screen.

RGB amplifier

From outputs 56, 57 and 58 of IC 7200 the RGB signals are applied to the integrated output amplifier (7330) on the CRT panel. Via the outputs 7, 8 and 9 the picture tube cathodes are driven.

The supply voltage for the amplifier is +200V and is derived from the line output stage.

Synchronization

Inside IC 7200 part D the vertical and horizontal sync pulses are separated. These 'H' and 'V' signals are synchronised with the incoming CVBS signal. They are then fed to the H- and V-drive circuits and to the OSD/TXT circuit for synchronization of the On Screen Display and Teletext (CC) information.

Deflection

Horizontal drive

The horizontal drive signal is obtained from an internal VCO, which is running at twice the line frequency. This frequency is divided by two, to lock the first control loop to the incoming signal. When the IC is switched 'on', the 'Hdrive' signal is suppressed until the frequency is correct. The 'Hdrive' signal is available at pin 30. The 'Hflybk' signal is fed to pin 31 to phase lock the horizontal oscillator, so that Q7462 cannot switch 'on' during the flyback time. The 'EWdrive' signal for the E/W circuit (if present) is available on pin 15, where it drives transistor 7400 to make linearity corrections in the horizontal drive.

When the set is switched on, the '+8V' voltage goes to pin 9 of IC 7200. The horizontal drive starts up in a softstart mode. It starts with a very short T_{ON} time of the horizontal output transistor. The T_{OFF} of the transistor is identical to the time in normal operation. The starting frequency during switch on is therefore about 2 times higher than the normal value. The 'on' time is slowly increased to the nominal value in 1175 ms. When the nominal value is reached, the PLL is closed in such a way that only very small phase corrections are necessary.

The 'EHT information' line on pin 11 is intended to be used as a 'X-ray' protection. When this protection is activated (when the voltage exceeds 6 V), the horizontal drive (pin 30) is switched "off" immediately. If the 'H-drive' is stopped, pin 11 will become low again. Now the horizontal drive is again switched on via the slowstart procedure.

The 'EHT information' line (Aquadag) is also fed back to the UOC IC 7200 pin 54, to adjust the picture level in order to compensate for changes in the beam current.

The 'filament' voltage is monitored for 'no voltage' or 'excessive voltage'. This voltage is rectified by diode 6447 and fed to the emitter of transistor 7443. If this voltage goes above 6.8 V, transistor 7443 will conduct, making the 'EHT0' line 'high'. This will immediately switch off the horizontal drive (pin 30) via the slow stop procedure.

The horizontal drive signal exits IC 7200 at pin 30 and goes to 7462, the horizontal driver transistor. The signal is amplified and coupled to the base circuit of 7460, the horizontal output transistor. This will drive the line output transformer (LOT) and associated circuit. The LOT provides the extra high voltage (EHT), the VG2 voltage and the focus and filament voltages for

the CRT, while the line output circuit drives the horizontal deflection coil.

Vertical drive

A divider circuit performs the vertical synchronization. The vertical ramp generator needs an external resistor (R3245, pin 20) and capacitor (C2244, pin 21). A differential output is available at pins 16 and 17, which are DC-coupled with the vertical output stage.

During the insertion of RGB signals, the maximum vertical frequency is increased to 72 Hz so that the circuit can also synchronize on signals with a higher vertical frequency like VGA.

To avoid damage of the picture tube when the vertical deflection fails, the guard output is fed to the beam current limiting input. When a failure is detected the RGB-outputs are blanked. When no vertical deflection output stage is connected this guard circuit will also blank the output signals.

These 'V_DRIVE+' and 'V_DRIVE-' signals are applied to the input pins 1 and 2 of IC 7471 (full bridge vertical deflection amplifier). These are voltage driven differential inputs. As the driver device (IC 7200) delivers output currents, R3474 and R3475 convert them to voltage. The differential input voltage is compared with the voltage across measuring resistor R3471 that provides internal feedback information. The voltage across this measuring resistor is proportional to the output current, which is available at pins 4 and 7 where they drive the vertical deflection coil (connector 0222) in phase opposition.

IC 7471 is supplied by +13 V. The vertical flyback voltage is determined by an external supply voltage at pin 6 (VlotAux+50V). This voltage is almost totally available as flyback voltage across the coil, this being possible due to the absence of a coupling capacitor (which is not necessary, due to the 'bridge' configuration).

Deflection corrections

The linearity correction

A constant voltage on the horizontal deflection coil should result in a sawtooth current. This however is not the case as the resistance of the coil is not negligible. In order to compensate for this resistance, a pre-magnetised coil L5457 is used. R3485 and C2459 ensure that L5457 does not excite, because of its own parasitic capacitance. This L5457 is called the "linearity coil".

The Mannheim effect

When clear white lines are displayed, the high-voltage circuit is heavily loaded. During the first half of the flyback, the high voltage capacitors are considerably charged. At that point in time, the deflection coil excites through C2465. This current peak, through the high-voltage capacitor, distorts the flyback pulse. This causes synchronisation errors, causing an oscillation under the

white line.

During $t_3 - t_5$, C2490//2458 is charged via R3459. At the moment of the flyback, C2490//2458 is subjected to the negative voltage pulses of the parabola as a result of which D6465 and D6466 are conducting and C2490//2458 is switched in parallel with C2456//2457. This is the moment the high-voltage diodes are conducting. Now extra energy is available for excitation through C2465 and the line deflection. As a consequence the flyback pulse is less distorted.

The S-Correction

Since the sides of the picture are further away from the point of deflection than from the centre, a linear sawtooth current would result in a non-linear image being scanned (the center would be scanned slower than the sides). For the center-horizontal line, the difference in relation of the distances is larger than those for the top and bottom lines. An S-shaped current will have to be superimposed onto the sawtooth current. This correction is called finger-length correction or S-correction.

C2456//2457 is relatively small, as a result of which the sawtooth current will generate a parabolic voltage with negative voltage peaks. Left and right, the voltage across the deflection coil decreases, and the deflection will slow down; in the center, the voltage increases and deflection is faster. The larger the picture width, the higher the deflection current through C2456//2457. The current also results in a parabolic voltage across C2484//2469, resulting in the finger length correction proportionally increasing with the picture width. The east/west drive signal will ensure the largest picture width in the center of the frame. Here the largest correction is applied.

East/West correction

In the T8, there are three types of CRTs, namely the 100°, 110° and wide screen CRTs. The 100° CRT is raster-correction-free and does not need East/West correction.

The 110° 4:3 CRT comes with East/West correction and East/West protection.

The wide screen TV sets have all the correction of the 110 4:3 CRT and also have additional picture format like the 4:3 format, 16:9, 14:9, 16:9 zoom, subtitle zoom and the Super-Wide picture format.

A line, written at the upper- or lower side of the screen, will be larger at the screen center when a fixed deflection current is used. Therefore the amplitude of the deflection current must be increased when the spot approaches the center of the screen. This is called the East/West or pincushion correction.

The 'Ewdrive' signal from pin 15 of IC 7200 takes care for the correct correction. It drives FET 7400. It also corrects breathing of the picture, due to beam current variations (the EHT varies dependent of the beam current). This correction is derived from the 'EHT information' line.

Panorama

Power Supply

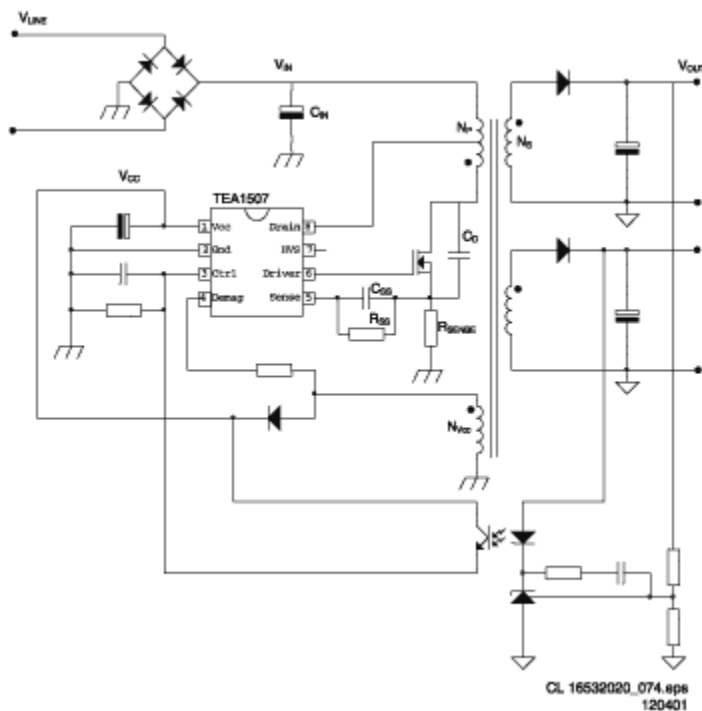


Figure:

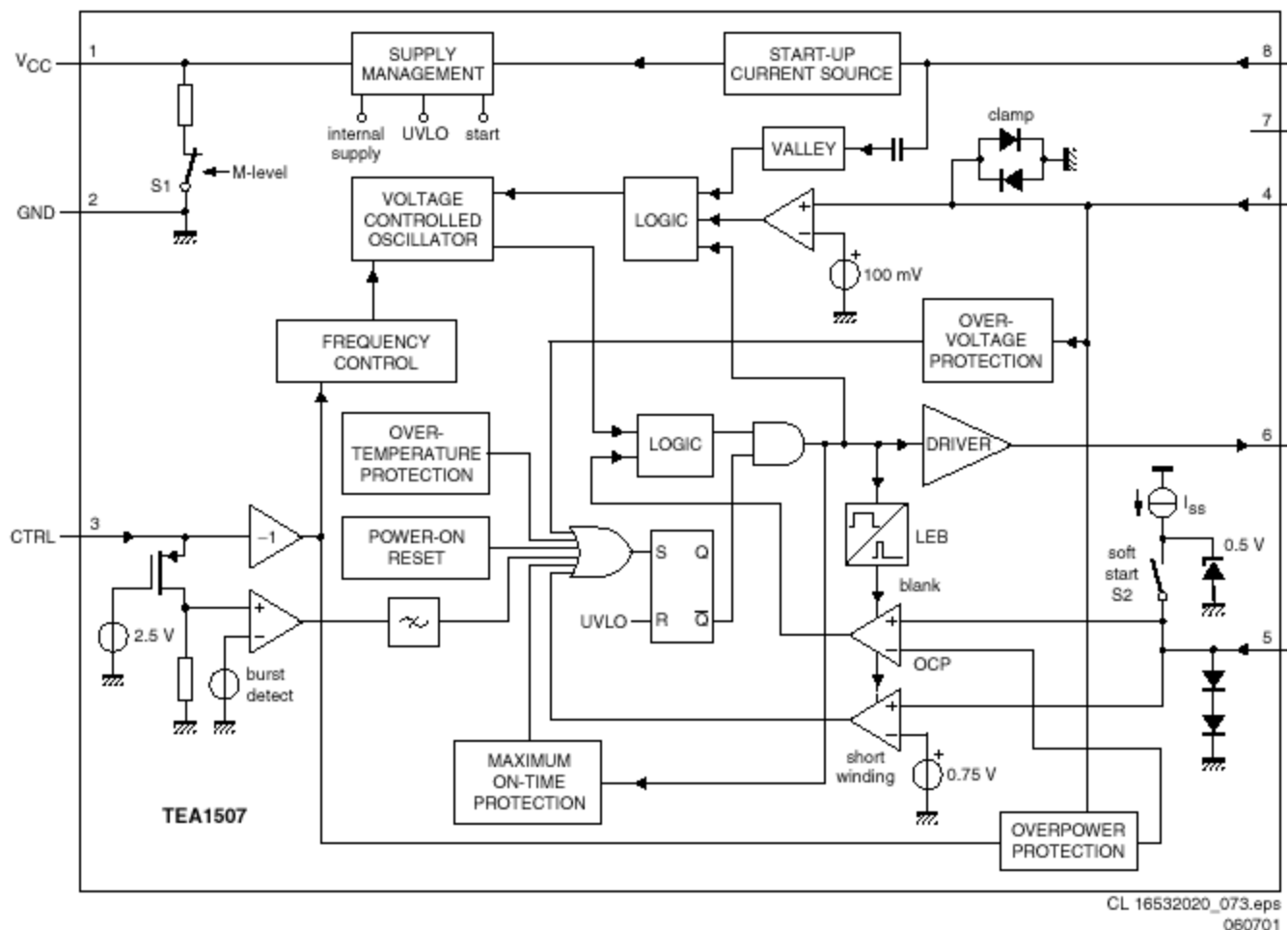


Figure:

Introduction

The supply is a Switching Mode Power Supply (SMPS). The frequency of operation varies with the circuit load. This 'Quasi-Resonant Flyback' behavior has some important benefits compared to a 'hard switching' fixed frequency Flyback converter. The efficiency can be improved up to 90%, which results in lower power consumption. Moreover, the supply runs cooler and safety is enhanced.

The power supply starts operating when a DC voltage goes from the rectifier bridge via T5520, R3532 to pin 8. The operating voltage for the driver circuit is also taken from the 'hot' side of this transformer.

The switching regulator IC 7520 starts switching the FET 'on' and 'off' to control the current flow through the primary winding of transformer 5520. The energy stored in the primary winding during the 'on' time is delivered to the secondary windings during the 'off' time.

The 'MainSupply' line is the reference voltage for the power supply. It is sampled by resistors 3543 and 3544 and fed to the input of the regulator 7540 / 6540. This regulator drives the feedback optocoupler 7515 to set the feedback control voltage on pin 3 of 7520. The power supply in the set is 'on' anytime AC power goes to the set.

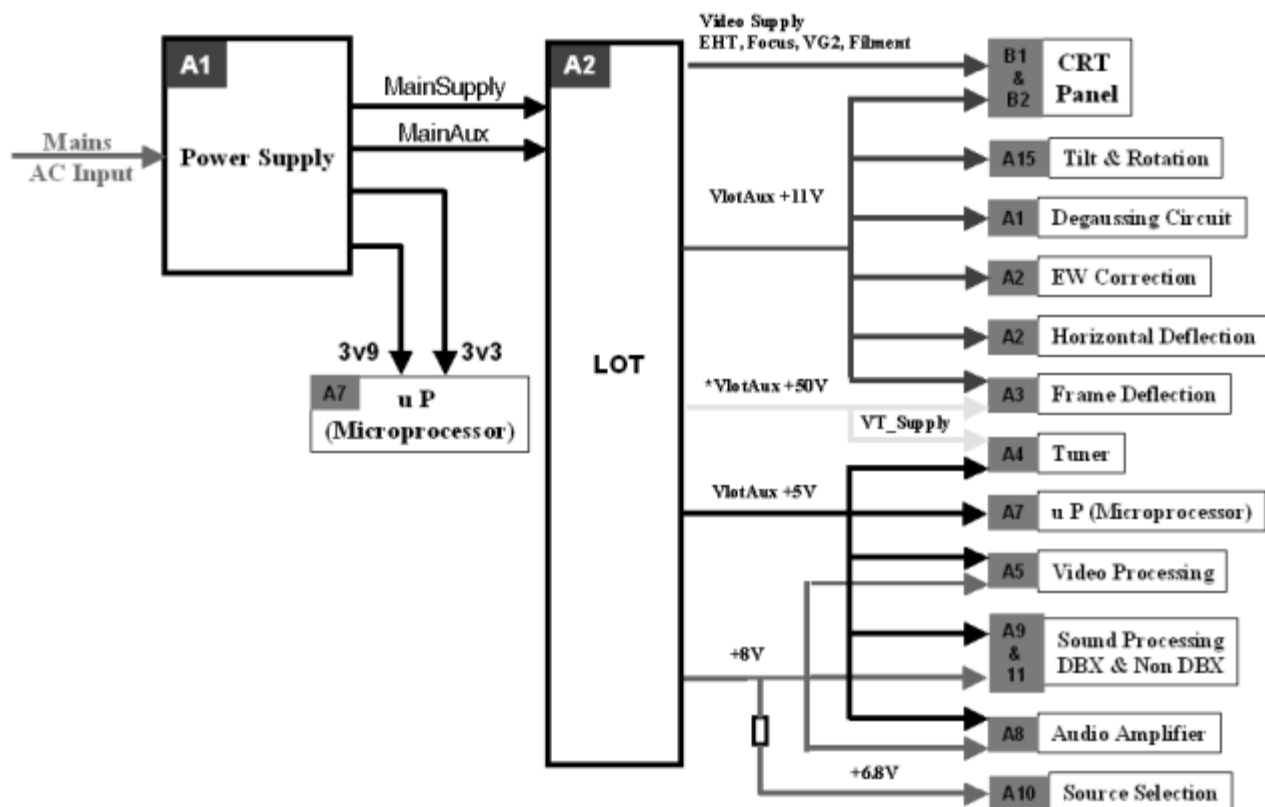
Derived Voltages

The voltages supplied by the secondary windings of T5520 are:

- 'MainAux' for the audio circuit (voltage depends on set execution, see table below),
- 3.3 V and 3.9 V for the microprocessor and
- 'MainSupply' for the horizontal output (voltage depends on set execution, see table below).

Other supply voltages are provided by the LOT. It supplies +50 V (only for large screen sets), +13 V, +8 V, +5 V and a +200 V source for the video drive. The secondary voltages of the LOT are monitored by the 'EHT information' lines. These lines are fed to the video processor part of the UOC IC 7200 on pins 11 and 34.

This circuit will shut 'off' the horizontal drive in case of over-voltage or excessive beam current.



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100401

Figure:

Power supply voltages				
Screen Size	Voltage name	Measuring point	Value	Remark
14", 16RF, 17", 20", 21"	MainSupply	P6 (C2561)	95 V	
	MainAux	P5 (C2564)	11 V	Stereo 2x3 W and Mono 1x2 W, 3
			10 V	Stereo 2x1 W and Mono 1x1 W
All others	MainSupply	P6 (C2561)	130 V	21/25/29RF and 25/27/32/35V
			143 V	25/28/29SF, 25/28BLD, 25/28BLS 29/32WS, 24/28BLDWS & BLSW!
	MainAux	P5 (C2564)	12 V	Stereo 2x1 W, 3 W, 5 W
			10 V	Mono 1x1 W

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Figure:

Degaussing

When the set is switched on, the degaussing relay 1515 is immediately activated as transistor 7580 is conducting. Due to the RC-time of R3580 and C2580, it will last about 3 to 4 seconds before transistor 7580 is switched off.

Basic IC Functionality

For a clear understanding of the Quasi-Resonant behavior, it is possible to explain it by a simplified circuit diagram (see Figure below). In this circuit diagram, the secondary side is transferred to the primary side and the transformer is replaced by an inductance L_P . C_D is the total drain capacitance including the resonance capacitor C_R , parasitic output capacitor C_{OSS} of the MOSFET and the winding capacitance C_W of the transformer. The turns ratio of the transformer is represented by $n (N_P / N_S)$.

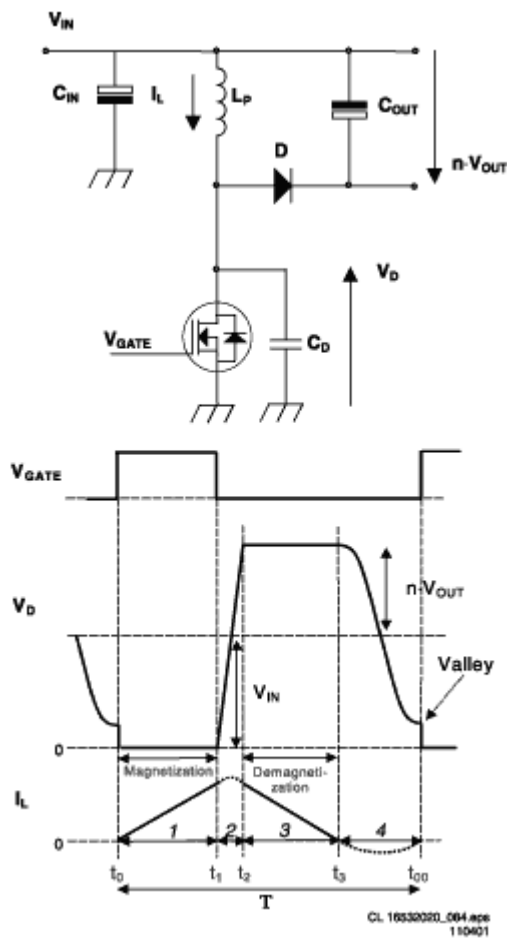


Figure:

In the Quasi-Resonant mode each period can be divided into four different time intervals, in chronological order:

- **Interval 1: $t_0 < t < t_1$ primary stroke** At the beginning of the first interval, the MOSFET is switched 'on' and energy is stored in the primary inductance (magnetization). At the end, the MOSFET is switched 'off' and the second interval starts.
- **Interval 2: $t_1 < t < t_2$ commutation time** In the second interval, the drain voltage will rise from almost zero to $V_{IN} + n \cdot (V_{OUT} + V_F)$. V_F is the forward voltage drop of the diode that will be omitted from the equations from now on. The current will change its positive derivative, corresponding to V_{IN} / L_P , to a negative derivative, corresponding to $-n \cdot V_{OUT} / L_P$.
- **Interval 3: $t_2 < t < t_3$ secondary stroke** In the third interval, the stored energy is transferred to the output, so the diode starts to conduct and the inductive current I_L will decrease. In other words, the transformer will be demagnetized. When the inductive current has become zero the next interval begins.

- **Interval 4: $t_3 < t < t_0$ resonance time** In the fourth interval, the energy stored in the drain capacitor C_D will start to resonate with the inductance L_P . The voltage and current waveforms are sinusoidal waveforms. The drain voltage will drop from $V_{IN} + n \cdot V_{OUT}$ to $V_{IN} - n \cdot V_{OUT}$.

Frequency Behavior

The frequency in the QR-mode is determined by the power stage and is not influenced by the controller (important parameters are L_P and C_D). The frequency varies with the input voltage V_{IN} and the output power P_{OUT} . If the required output power increases, more energy has to be stored in the transformer. This leads to longer magnetizing t_{PRIM} and demagnetizing t_{SEC} times, which will decrease the frequency. See the frequency versus output power characteristics below. The frequency characteristic is not only output power-, but also input voltage dependent. The higher the input voltage, the smaller t_{PRIM} , so the higher the frequency will be.

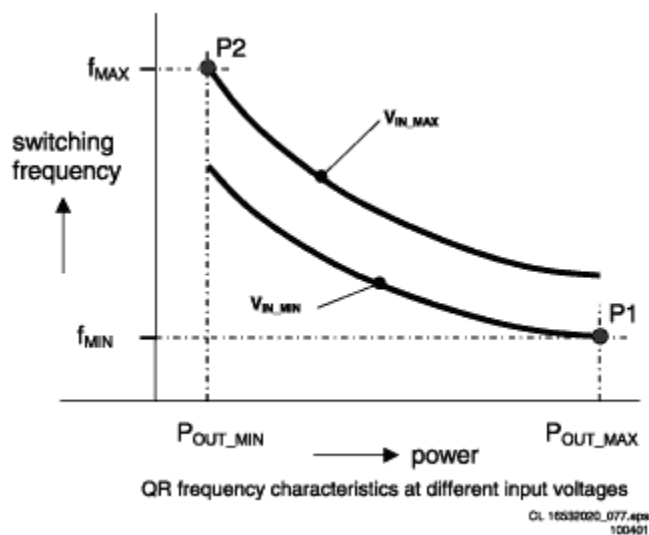


Figure:

Point P1 is the minimum frequency f_{MIN} that occurs at the specified minimum input voltage and maximum output power required by the application. Of course the minimum frequency has to be chosen above the audible limit (>20 kHz).

Start-Up Sequence

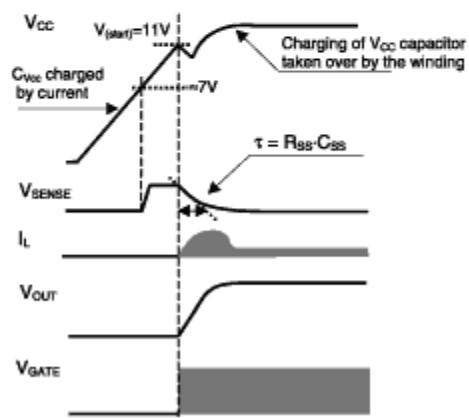
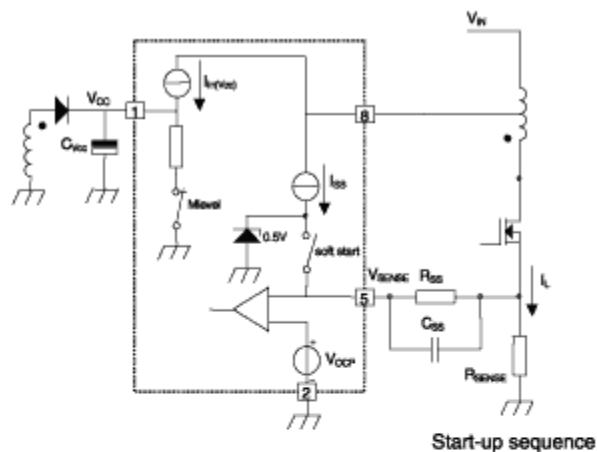
When the rectified AC voltage V_{IN} (via the center tap connected to pin 8) reaches the Mains

dependent operation level (M_{level} : between 60 and 100 V), the internal 'Mlevel switch' will be opened and the start-up current source is enabled to charge capacitor C_{VCC} at the V_{CC} pin as shown below.

The 'soft start' switch is closed when the V_{CC} reaches a level of 7 V and the 'soft start' capacitor C_{SS} (C2522, between pin 5 and the sense resistor R3526), is charged to 0.5 V.

Once the V_{CC} capacitor is charged to the start-up voltage $V_{CC-start}$ (11V), the IC starts driving the MOSFET. Both internal current sources are switched 'off' after reaching this start-up voltage. Resistor R_{SS} (3524) will discharge the 'soft start' capacitor, such that the peak current will slowly increase. This to prevent 'transformer rattle'.

During start-up, the V_{CC} capacitor will be discharged until the moment that the primary auxiliary winding takes over this voltage.



CL 16532020_078.eps
110401

Figure:

The moment that the voltage on pin 1 drops below the 'under voltage lock out' level ($UVLO = \pm 9$ V), the IC will stop switching and will enter a safe restart from the rectified mains voltage.

Operation

The supply can run in three different modes depending on the output power:

- **Quasi-Resonant mode (QR)** The QR mode, described above, is used during normal operation. This will give a high efficiency.
- **Frequency Reduction mode (FR)** The FR mode (also called VCO mode) is implemented to decrease the switching losses at low output loads. In this way the efficiency at low output powers is increased, which enables power consumption smaller than 3 W during stand-by. The voltage at the pin 3 (Ctrl) determines where the frequency reduction starts. An external Ctrl voltage of 1.425 V corresponds with an internal VCO level of 75 mV. This fixed VCO level is called $V_{VCO,start}$. The frequency will be reduced in relation to the VCO voltage between 75 mV and 50 mV (at levels larger than 75 mV, Ctrl voltage < 1.425 V, the oscillator will run on maximum frequency $f_{oscH} = 175$ kHz typically). At 50 mV ($V_{VCO,max}$) the frequency is reduced to the minimum level of 6 kHz. Valley switching is still active in this mode.
- **Minimum Frequency mode (MinF)** At VCO levels below 50 mV, the minimum frequency will remain on 6 kHz, which is called the MinF mode. Because of this low frequency, it is possible to run at very low loads without having any output regulation problems.

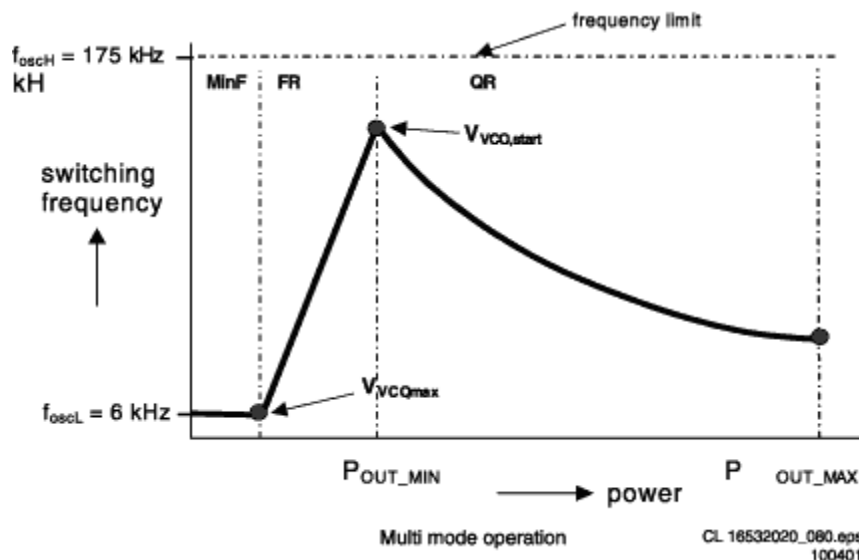


Figure:

Safe-Restart Mode

This mode is introduced to prevent the components from being destroyed during eventual system fault conditions. It is also used for the Burst mode. The Safe-Restart mode will be entered if it is triggered by one of the following functions:

- Over voltage protection,
- Short winding protection,
- Maximum 'on time' protection,
- V_{CC} reaching UVLO level (fold back during overload),
- Detecting a pulse for Burst mode,
- Over temperature protection.

When entering the Safe-Restart mode, the output driver is immediately disabled and latched. The V_{CC} winding will not charge the V_{CC} capacitor anymore and the V_{CC} voltage will drop until UVLO is reached. To recharge the V_{CC} capacitor, the internal current source ($I_{(restart)(VCC)}$) will be switched 'on' to initiate a new start-up sequence as described before. This Safe-Restart mode will persist until the controller detects no faults or burst triggers.

Standby

The set goes to Standby in the following cases:

- After pressing the 'standby' key on the remote control.
- When the set is in protection mode.

In Standby, the power supply works in 'burst mode'.

Burst mode can be used to reduce the power consumption below 1 W at stand-by. During this mode, the controller is active (generating gate pulses) for only a short time and for a longer time inactive waiting for the next burst cycle.

In the active period the energy is transferred to the secondary and stored in the buffer capacitor C_{STAB} in front of the linear stabilizer (see Figure below). During the inactive period, the load (e.g. microprocessor) discharges this capacitor. In this mode, the controller makes use of the Safe-Restart mode.

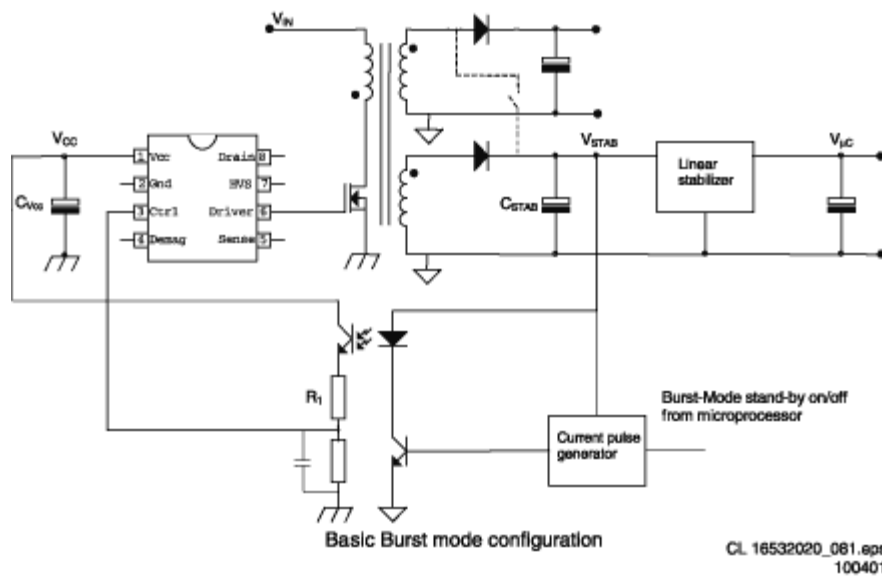


Figure:

The system enters burst mode standby when the microprocessor activates the 'Stdbby_con' line. When this line is pulled high, the base of Q7541 is allowed to go high. This is triggered by the current from collector Q7542. When Q7541 turns 'on', the opto-coupler (7515) is activated, sending a large current signal to pin 3 (Ctrl). In response to this signal, the IC stops switching and enters a 'hiccup' mode. This burst activation signal should be present for longer than the 'burst blank' period (typically 30 μ s): the blanking time prevents false burst triggering due to spikes.

Burst mode standby operation continues until the microcontroller pulls the 'Stdbby_con' signal low again. The base of Q7541 is unable to go high, thus cannot turn 'on'. This will disable the burst mode. The system then enters the start-up sequence and begins normal switching behavior.

For a more detailed description of one burst cycle, three time intervals are defined:

- t1: Discharge of V_{CC} when gate drive is active** During the first interval, energy is transferred, which results in a ramp-up of the output voltage (V_{STAB}) in front of the stabilizer. When enough energy is stored in the capacitor, the IC will be switched 'off' by a current pulse generated at the secondary side. This pulse is transferred to the primary side via the opto coupler. The controller will disable the output driver (safe restart mode) when the current pulse reaches a threshold level of 16 mA into the Ctrl pin. A resistor R_1 (R3519) is placed in series with the opto coupler, to limit the current going into the Ctrl pin. Meanwhile the V_{CC} capacitor is discharged but has to stay above V_{UVLO} .
- t2: Discharge of V_{CC} when gate drive is inactive** During the second interval, the V_{CC}

is discharged to V_{UVLO} . The output voltage will decrease depending on the load.

- **t3: Charge of V_{CC} when gate drive is inactive** The third interval starts when the UVLO is reached. The internal current source charges the V_{CC} capacitor (also the soft start capacitor is recharged). Once the V_{CC} capacitor is charged to the start-up voltage, the driver is activated and a new burst cycle is started.

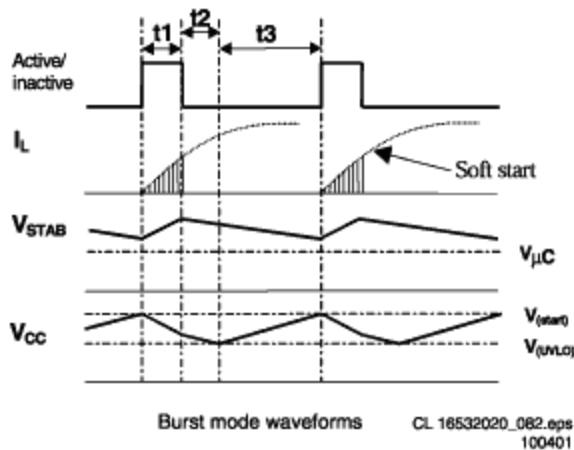


Figure:

Protection Events

The SMPS IC 7520 has the following protection features:

Demagnetization sense

This feature guarantees discontinuous conduction mode operation in every situation. The oscillator will not start a new primary stroke until the secondary stroke has ended. This is to ensure that FET 7521 will not turn on until the demagnetization of transformer 5520 is complete. The function is an additional protection feature against:

- saturation of the transformer,
- damage of the components during initial start-up,
- an overload of the output.

The demagnetization sense is realized by an internal circuit that guards the voltage (V_{demag}) at pin 4 that is connected to V_{CC} winding by resistor R_1 (R3522). The Figure below shows the circuit and the idealized waveforms across this winding.

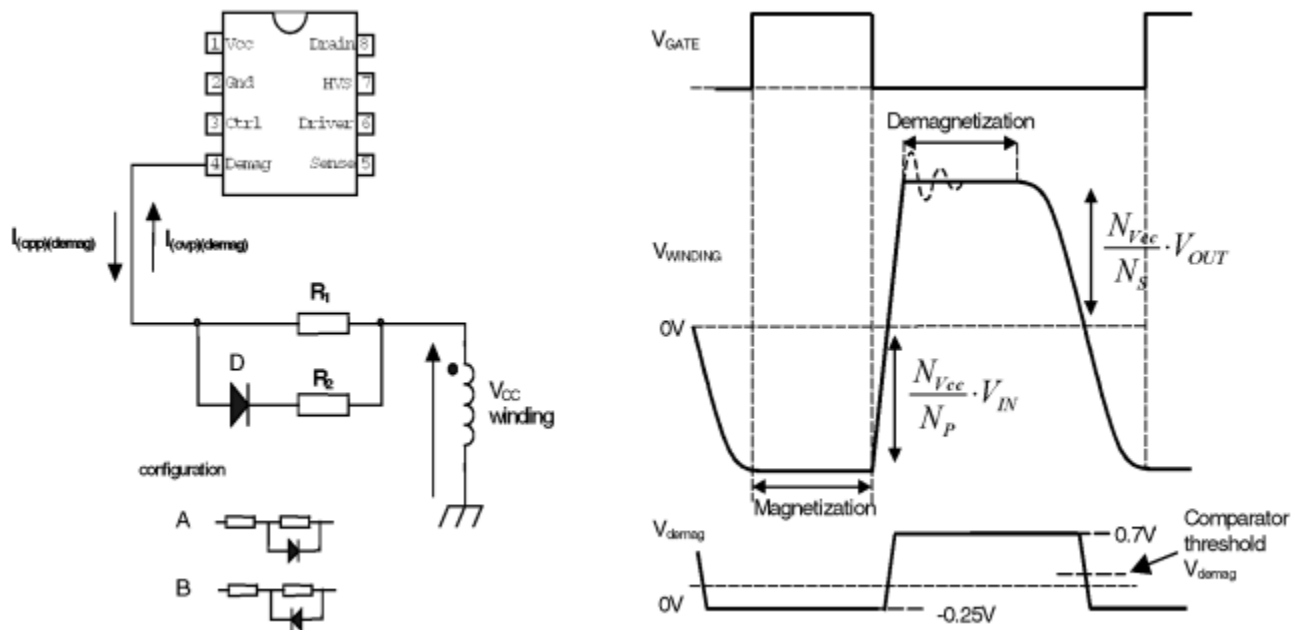


Figure:

Over Voltage Protection

The Over Voltage Protection ensures that the output voltage will remain below an adjustable level. This works by sensing the auxiliary voltage via the current flowing into pin 4 (DEM) during the secondary stroke. This voltage is a well-defined replica of the output voltage. Any voltage spikes are averaged by an internal filter.

If the output voltage exceeds the OVP trip level, the OVP circuit switches the power MOSFET 'off'.

Next, the controller waits until the 'under voltage lock out' level ($UVLO = \pm 9\text{ V}$) is reached on pin 1 (V_{CC}). This is followed by a safe restart cycle, after which switching starts again. This process is repeated as long as the OVP condition exists. The output voltage at which the OVP function trips, is set by the demagnetization resistor R3522.

Over Current Protection

The internal OCP protection circuit limits the 'sense' voltage on pin 5 to an internal level.

Over Power Protection

During the primary stroke, the rectified AC input voltage is measured by sensing the current drawn from pin4 (DEM). This current is dependent on the voltage on pin 9 of transformer 5520 and the value of R3522. The current information is used to adjust the peak drain current, which is measured via pin I_{SENSE} .

Short Winding Protection

If the 'sense' voltage on pin 5 exceeds the short winding protection voltage (0.75 V), the converter will stop switching. Once V_{CC} drops below the UVLO level, capacitor C2521 will be recharged and the supply will start again. This cycle will be repeated until the short circuit is removed (safe restart mode). The short winding protection will also protect in case of a secondary diode short circuit.

This protection circuit is activated after the leading edge blanking time (LEB).

LEB time

The LEB (Leading Edge Blanking) time is an internally fixed delay, preventing false triggering of the comparator due to current spikes. This delay determines the minimum 'on' time of the controller.

Over Temperature protection

When the junction temperature exceeds the thermal shutdown temperature (typ. 140° C), the IC will disable the driver. When the V_{CC} voltage drops to UVLO, the V_{CC} capacitor will be recharged to the $V_{(start)}$ level. If the temperature is still too high, the V_{CC} voltage will drop again to the UVLO level (Safe-Restart mode). This mode will persist until the junction temperature drops 8 degrees typically below the shutdown temperature.

Mains dependent operation enabling level

To prevent the supply from starting at a low input voltage, which could cause audible noise, a mains detection is implemented (Mlevel). This detection is provided via pin 8, that detects the minimum start-up voltage between 60 and 100 V. As previously mentioned, the controller is enabled between 60 and 100 V.

An additional advantage of this function is the protection against a disconnected buffer capacitor (C_{IN}). In this case, the supply will not be able to start-up because the V_{CC} capacitor will not be charged to the start-up voltage.

Control

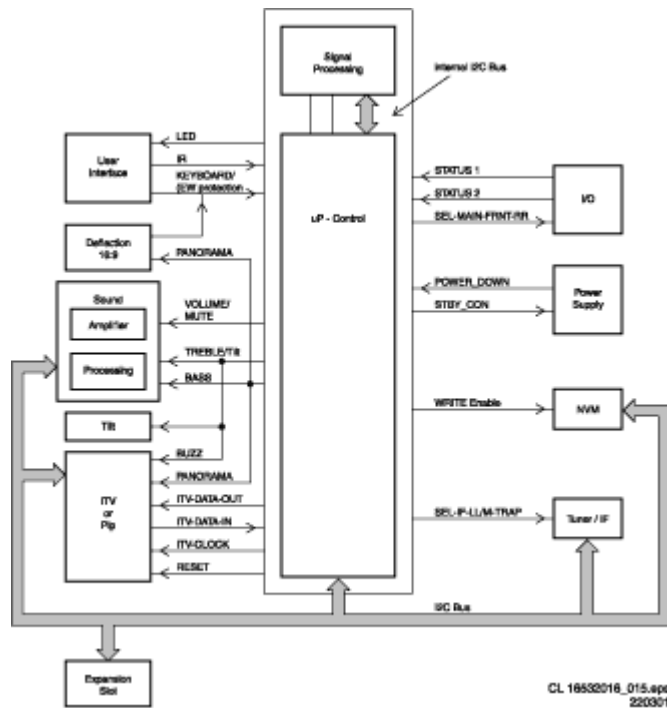


Figure:

Introduction

The microprocessor part of the UOC, has the complete control and teletext on board. User menu, Service Default Mode, Service Alignment Mode and Customer Service Mode are generated by the μP . Communication to other ICs is done via the I² C-bus.

I² C-Bus

The main control system, which consists of the microprocessor part of the UOC (7200), is linked to the external devices (tuner, NVM, MSP, etc) by means of the I² C-bus. An internal I² C-bus is used to control other signal processing functions, like video processing, sound IF, vision IF, synchronization, etc.

User Interface

The S8/T8 uses a remote control with RC5 protocol. The incoming signal is connected to pin 67 of the UOC.

The "Top Control" keyboard, connected to UOC pin 80, can also control the set. Button

recognition is done via a voltage divider.

The front LED (6691) is connected to an output control line of the microprocessor (pin 5). It is activated to provide the user information about whether or not the set is working correctly (e.g., responding to the remote control, normal operation (USA only) or fault condition)

In- And Output Selection

For the control of the input and output selections, there are three lines:

- **STATUS1** This signal provides information to the microprocessor on whether a video signal is available on the SCART1 AV input and output port (only for Europe). This signal is not connected in NAFTA sets.
- **STATUS2** This signal provides information to the microprocessor on whether a video signal is available on the SCART2 AV input and output port (only for Europe). For sets with an SVHS input it provides the additional information if a Y/C or CVBS source is present. The presence of an external Y/C source makes this line 'high' while a CVBS source makes the line 'low'.
- **SEL-MAIN-FRNT-RR** This is the source select control signal from the microprocessor. This control line is under user control or can be activated by the other two control lines.

Power Supply Control

The microprocessor part is supplied with 3.3V and 3.9 V both derived from the 'MainAux' voltage via a 3V3 stabilizer (7560) and a diode.

Two signals are used to control the power supply:

- **Stdbby_con** This signal is generated by the microprocessor when over-current takes place at the 'MainAux' line. This is done to enable the power supply into standby burst mode, and to enable this mode during a protection. This signal is 'low' under normal operation conditions and goes to 'high' (3.3V) under 'standby' and 'fault' conditions.
- **POWER_DOWN** This signal is generated by the power supply. Under normal operating conditions this signal is 'high' (3.3 V). During 'standby' mode, this signal is a pulse train of approx. 10 Hz and a 'high' duration of 5 ms. It is used to give information to the UOC about the fault condition in the Audio amplifier supply circuit. This information is generated by sensing the current on the 'MainAux' line (using voltage drop across R3564 to trigger Q7562). This signal goes 'low' when the DC-current on the 'MainAux' line exceeds 1.6- 2.0 A. It is also used to give an early warning to the UOC about a power failure. Then the information is used to mute the sound amplifier to prevent a switch off noise and to solve the switch-off spot.

Protection Events

Several protection events are controlled by the UOC:

- **BC protection** , to protect the picture tube from a too high beam current. The UOC has the capability of measuring the normal back level current during the vertical flyback. So if for some reason the CRT circuit is malfunctioning (i.e. high beam current), the normal black current will be out of the 75 μ A range, and the UOC will trigger the power supply to shut down. However, this is a high beam-current situation, the TV screen will be bright white before the set is shut down.
- **E/W protection** , two protection mechanisms are built in, over-current and over-voltage.
 - In case of over-current due to defective parts in the line deflection output stage, a high current will flow through resistors 3405//3406. If this current is large enough to create a voltage drop of 0.7V across 3405//3406, transistor Q7606 (in A7 diagram) will conduct and pin 80 of the UOC will be pulled down. Thereafter, the UOC will shut down the power supply. In case of further current increase, the fused resistor 3411 is built-in for double protection.
 - In case of a high voltage appearing across capacitor 2401 (dependent of the tube size), which is high enough to trigger zener diode 6401 into conduction, transistor Q7606 (in A7 diagram) will conduct and UOC is triggered to shut down the power supply.
- **I² C protection** , to check whether all I² C IC's are functioning.

In case one of these protections is activated, the set will go into 'standby'.

The 'on' and 'standby' LEDs are controlled via the UOC.

Abbreviation list

Abbreviation	Description
2CS	2 Carrier (or Channel) Stereo
ACI	Automatic Channel Installation: algorithm that installs TV sets directly from cable network by means of a predefined TXT page
ADC	Analogue to Digital Converter
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency
AFT	Automatic Fine Tuning
AGC	Automatic Gain Control: algorithm that controls the video

	input of the featurebox
AM	Amplitude Modulation
AP	Asia Pacific
AR	Aspect Ratio: 4 by 3 or 16 by 9
ATS	Automatic Tuning System
AV	External Audio Video
AVL	Automatic Volume Level
BC-PROT	Beam Current Protection
BCL	Beam Current Limitation
B/G	Monochrome TV system. Sound carrier distance is 5.5MHz
BLC-INFORMATION	Black current informationrmation
BTSC	Broadcast Television Standard Committee. MultiplexFM stereo sound system, originating from the USA and used e.g. inLATAM and AP-NTSC countries
B-TXT	Blue teletext
CC	Closed Caption
ComPair	Computer aided rePair
CRT	Cathode Ray Tube or picture tube
CSM	Customer Service Mode
CTI	Colour Transient Improvement: manipulates steepnessof chroma transients
CVBS	Composite Video Blanking and Synchronisation
DAC	Digital to Analogue Converter
DBE	Dynamic Bass Enhancement: extra low frequency amplification
DBX	Dynamic Bass Expander
D/K	Monochrome TV system. Sound carrier distance is 6.5MHz
DFU	Direction For Use: description for the end user
DNR	Dynamic Noise Reduction
DSP	Digital Signal Processing

DST	Dealer Service Tool: special remote control designed for dealers to enter e.g. service mode
DVD	Digital Versatile Disc
EEPROM	Electrically Erasable and Programmable Read Only Memory
EHT	Extra High Tension
EHT-INFORMATION	Extra High Tension information
EU	Europe
EW	East West, related to horizontal deflection of the set
EXT	External (source), entering the set via SCART or Cinch
FBL	Fast Blanking: DC signal accompanying RGB signals
FILAMENT	Filament of CRT
FLASH	Flash memory
FM	Field Memory
FM	Frequency Modulation
HA	Horizontal Acquisition: horizontal sync pulse coming out of the HIP
HFB	Horizontal Flyback Pulse: horizontal sync pulse from large signal deflection
HP	Headphone
Hue	Colour phase control for NTSC (not the same as 'Tint')
I	Monochrome TV system. Sound carrier distance is 6.0MHz
I2C	Integrated IC bus
IF	Intermediate Frequency
IIC	Integrated IC bus
Interlaced	Scan mode where two fields are used to form one frame. Each field contains half the number of the total amount of lines. The fields are written in "pairs", causing line flicker.
ITV	Institutional TV
LATAM	Latin America

LED	Light Emitting Diode
L/L'	Monochrome TV system. Sound carrier distance is 6.5MHz. L' is Band I, L is all bands except for Band I
LNA	Low Noise Amplifier
LS	Large Screen
LS	Loudspeaker
LSP	Large signal panel
M/N	Monochrome TV system. Sound carrier distance is 4.5MHz
MSP	Multistandard Sound Processor: ITT sound decoder
MUTE	Mute-Line
NC	Not Connected
NICAM	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, mainly used in Europe.
NTSC	National Television Standard Committee. Colour system mainly used in North America and Japan. Colour 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 e.g. alignments
OB	Option Byte
OC	Open Circuit
OSD	On Screen Display
PAL	Phase Alternating Line. Colour system mainly used in West Europe (colour carrier = 4.433619 MHz) and South America (colour carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)
PCB	Printed Circuit board
PIP	Picture In Picture
PLL	Phase Locked Loop. Used for e.g. FST tuning systems. The customer can give directly the desired frequency
POR	Power-On Reset
Progressive Scan	Scan mode where all scan lines are displayed in one frame

at the same time, creating a double vertical resolution.

PTP	Picture Tube Panel (or CRT-panel)
RAM	Random Access Memory
RC	Remote Control handset
RC5	Remote Control system 5, signal from the remote controlreceiver
RGB	Red Green Blue
ROM	Read Only Memory
SAM	Service Alignment Mode
SAP	Second Audio Program
SC	Sandcastle: pulse derived from sync signals
S/C	Short Circuit
SCAVEM	Scan Velocity Modulation
SCL	Serial Clock
SDA	Serial Data
SDM	Service Default Mode
SECAM	SEquence Couleur Avec Memoire. Colour system mainlyused in France and East Europe. Colour carriers = 4.406250MHz and 4.250000 MHz
SIF	Sound Intermediate Frequency
SS	Small Screen
STBY	Standby
SVHS	Super Video Home System
SW	Software
THD	Total Harmonic Distortion
TXT	Teletext
µP	Microprocessor
UOC	Ultimate One Chip
VA	Vertical Acquisition
VBAT	

	Main supply voltage for the deflection stage (mostly 141 V)
V-chip	Violence Chip
VCR	Video Cassette Recorder
WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
XTAL	Quartz crystal
YC	Luminance (Y) and Chrominance (C) signal

Service Modes, Error Codes and Fault Finding

Index:

1. Test points.
2. Service Modes.
3. Problems and Solving Tips (related to CSM).
4. Compar.
5. Error Codes.
6. The Blinking LED Procedure.
7. Protections.
8. Repair Tips.

Supporting Overviews

- [I2C-IC overview](#)
- [Test points overview Main Panel](#)
- [Test points overview CRT Panel](#)

Test Points

The chassis is equipped with test points printed on the circuit board assemblies. These test points refer to the functional blocks:

Table: Testpoint Overview

Test point	Circuit	Diagram
A1-A2-A3-..	Audio processing	A8, A9 / A11
C1-C2-C3-..	Control	A7
F1-F2-F3-..	Frame drive and output	A3
I1-I2-I3-..	Tuner & IF	A4
L1-L2-L3-..	Line drive and output	A2
P1-P2-P3-..	Power supply	A1
S1-S2-S3-..	Synchronisation	A6
V1-V2-V3-..	Video processing	A5, B1

The numbering is in a logical sequence for diagnostics. Always start diagnosing within a functional block in the sequence of the relevant test points for that block.

Perform measurements under the following conditions:

- Television set in Service Default Alignment Mode.
- Video input: Color bar signal.
- Audio input: 3 kHz left channel, 1 kHz right channel.

Service Modes

Service Default Alignment Mode (SDAM) offers several features for the service technician, while the Customer Service Mode (CSM) is used for communication between the service technician and the customer.

The T8 chassis also offers the option of using ComPair, a hardware interface between a computer and the TV chassis. It offers the abilities of structured troubleshooting, error code reading, and software version readout for all T8 chassis. Minimum requirements for ComPair: a 486 processor, Windows 3.1 and a CD-ROM drive.

Note : ComPair products will become available as they are developed.

Table: Service Modes

SW Cluster	Software name	UOC type	UOC Diversity	Special Features

2US9	L01UM9x.y	TDA9577 (SS)	55K ROM Size	Mono (Magnavox)
3US2	L01UN2x.y	TDA9577 (SS) (LS)	55K ROM Size	Stereo non-dBx (Magnavox)
1US5	L01US5x.y	TDA9588 (LS)	64K ROM Size	Stereo non-dBx (Magnavox), Non PIP
2US2	L01UM2x.y	TDA9577 (LS)	55K ROM Size	Mono(Philips)
3US3	L01UN3x.y	TDA9577 (SS) (LS)	55K ROM Size	Stereo non-dBx (Philips), CVI
1US4	L01US4x.y	TDA9587 (SS), TDA9588 (LS)	64K ROM Size	Stereo non-dBx (Philips), PIP
Abbreviations in Software name: U = USA (NAFTA), M = Mono, N = Stereo non-dBx and S = Stereo dBx.				

Service Default Alignment Mode (SDAM)

Purpose

- To create a predefined setting for measurements to be made.
- To override software protections.
- To start the blinking LED procedure.
- To change option settings.
- To display / clear the error code buffer.
- To perform alignments.

Specifications

- Tuning frequency: 61.25 MHz (channel 3)
- Color system: NTSC M
- All picture settings at 50% (brightness, color contrast, hue)
- Bass, treble and balance at 50%; volume at 25%.
- All service-unfriendly modes (if present) are disabled. The service unfriendly modes are:
 - (sleep) timer
 - child/parental lock
 - blue mute
 - hotel/hospitality mode
 - auto shutoff (when no "IDENT" video signal is received for 15 minutes)
 - skipping of non-favorite presets / channels
 - auto-storage of personal presets
 - auto user menu timeout
- Run timer (maximum four digits displayed)
- Software version
- Option settings
- Error buffer reading and erasing
- Software alignments

How to enter SDAM

To enter SDAM, use one of the following methods:

- Press the following key sequence on the remote control transmitter:
- **0-6-2-5-9-6-MENU**
- Do not allow the display to time out between entries while keying the sequence.
- Short jumper wires 9631 and 9641 on the monocarrier (see Fig. 8-1) and apply AC power. Then press the power button (remove the short after start-up). **Caution** : Entering SDAM by shorting wires 9631 and 9641 will override the +8V-protection. Do this only for a short period. When doing this, the service-technician must know exactly what he is doing, as it could damage the television set.
- Or via ComPair (with the ComPair "Tools" RC7150 Service Remote, it should be possible to enter SDAM via the ComPair interface IR).

After entering SDAM, the following screen is visible, with S at the upper right side for recognition.

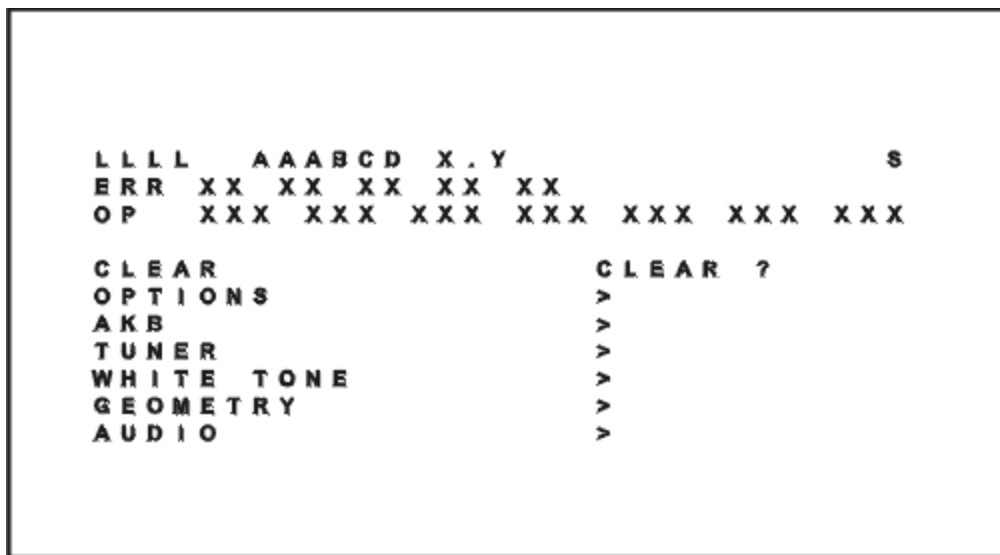


Figure: SDAM Menu

Explanation of SDAM Menu

1. **LLLL** This represents the run timer. The run timer counts normal operation hours, but does not count standby hours. (maximum four digits displayed).
2. **AAABCD-X.Y** This is the software identification of the main microprocessor:
 - A = the project name (L01).
 - B = the region: E= Europe, A= Asia Pacific, U= NAFTA, L= LATAM.
 - C = the feature of software diversity: N = stereo non-dBx, S = stereo dBx, M = mono, D = DVD
 - D = the language cluster number:
 - X = the main software version number
 - Y = the sub software version number
3. **S** Indication of the service mode. S= SDAM= Service Default Alignment Mode.
4. **Error Buffer** Shows all errors detected since the last time the buffer was erased. Five errors possible.
5. **Option Bytes** Used to set the option bytes. See "Options" in the Alignments section for a detailed description. Seven codes possible.
6. **Clear** Erases the contents of the error buffer. Select the CLEAR menu item and press the MENU RIGHT key. The contents of the error buffer are cleared.
7. **Options** Used to set the option bits. See "Options" in the Alignments section for a detailed description.
8. **AKB** Used to disable (0) or enable (1) the "black current loop" (AKB = Auto Kine Bias).
9. **Tuner** Used to align the tuner. See "Tuner" in the Alignments section for a detailed description.
10. **White Tone** Used to align the white tone. See "White Tone" in the Alignments section for a

detailed description.

11. **Geometry** Used to align the geometry settings of the television. See "Geometry" in the Alignments section for a detailed description.
12. **Audio** No audio alignment is necessary for this television set.

How to navigate in SDAM

- In SDAM, select menu items with the MENU UP/DOWN keys on the remote control transmitter. The selected item will be highlighted. When not all menu items fit on the screen, use the MENU UP/DOWN keys to display the next / previous menu items.
- With the MENU LEFT/RIGHT keys, it is possible to:
 - Activate the selected menu item.
 - Change the value of the selected menu item.
 - Activate the selected submenu.
- In SDAM, When you press the MENU button, the set will switch to the normal user menus (with the SDAM mode still active in the background). To return to the SDAM menu press the STATUS/EXIT button.
- When you press the MENU key while in an SDAM submenu, you will return to the previous menu.

How to store SDAM settings

To store settings changed in SDAM leave the top level SDAM menu by using the POWER button on the remote control transmitter or the television set.

How to exit SDAM

Switch the set to STANDBY by pressing the POWER button on the remote control transmitter or the television set.

If you turn the television set off by removing the AC power (i.e., unplugging the television) without using the POWER button, the television set will remain in SDAM when AC power is re-applied, and the error buffer is not cleared.

Customer Service Mode (CSM)

Purpose

The Customer Service Mode shows error codes and information on the TV operation settings. The service technician can instruct the customer to enter CSM by telephone and read off the information displayed. This helps the service technician to diagnose problems and failures in the TV set.

before making a service call.

The CSM is a read-only mode; therefore, modifications are not possible in this mode.

How to enter CSM

To enter CSM, press the following key sequence on the remote control transmitter:

1-2-3-6-5-4

Do not allow the display to time out between entries while keying the sequence.

Upon entering the Customer Service Mode, the following screen will appear:



Figure: CSM Menu

Explanation of CSM Menu

1. Indication of the service mode CSM = Customer Service Mode
2. Reserved.
3. Software identification of the main microprocessor (see "Service Default Alignment Mode" for an explanation)
4. Reserved item.
5. Indicates the type of TV system or whether or not the television is receiving an "IDENT" signal on the selected source. If no "IDENT" signal is detected, the display will read "NOT TUNED"
6. Error code buffer. Displays the last five errors detected in the error code buffer.

How to exit CSM

To exit CSM, use one of the following methods:

- Press the MENU, STATUS/EXIT, or POWER button on the remote control transmitter.
- Press the POWER button on the television set.

Problems and Solving Tips Related to CSM

Picture Problems

Note : The problems described below are all related to the TV settings. The procedures used to change the value (or status) of the different settings are described.

Picture too dark or too bright

If:

- The picture improves when you have pressed the AUTO PICTURE button on the remote control transmitter, or
- The picture improves when you enter the Customer Service Mode

Then:

1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu (if necessary).
4. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the MENU UP/DOWN keys (if necessary) to select BRIGHTNESS.
6. Press the MENU LEFT/RIGHT keys to increase or decrease the BRIGHTNESS value.
7. Use the MENU UP/DOWN keys to select PICTURE.
8. Press the MENU LEFT/RIGHT keys to increase or decrease the PICTURE value.
9. Press the MENU button on the remote control transmitter twice to exit the user menu.
10. The new PERSONAL preference values are automatically stored.

White line around picture elements and text

If:

The picture improves after you have pressed the "Smart Picture" button on the remote control transmitter

Then:

1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu (if necessary).

4. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the MENU UP/DOWN keys to select SHARPNESS.
6. Press the MENU LEFT key to decrease the SHARPNESS value.
7. Press the MENU button on the remote control transmitter twice to exit the user menu.
8. The new PERSONAL preference value is automatically stored.

Snowy picture

Enter CSM, by pressing the following key sequence on the remote control transmitter:

1-2-3-6-5-4

Do not allow the display to time out between entries while keying the sequence.

Check CSM line 5. If this line reads "Not Tuned," check the following:

- Antenna not connected. Connect the antenna.
- No antenna signal or bad antenna signal. Connect a proper antenna signal.
- The tuner is faulty (in this case line 6, the Error Buffer line, will contain error number 10). Check the tuner and replace/repair the tuner if necessary.

Black and white picture

If:

- The picture improves after you have pressed the "Smart Picture" button on the remote control transmitter

Then:

1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu (if necessary).
4. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the MENU UP/DOWN keys to select COLOR.
6. Press the MENU RIGHT key to increase the COLOR value.
7. Press the MENU button on the remote control transmitter twice to exit the user menu.
8. The new PERSONAL preference value is automatically stored.

Menu text not sharp enough

If:

- The picture improves after you have pressed the "Smart Picture" button on the remote control transmitter.

Then:

1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu (if necessary).
4. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the MENU UP/DOWN keys to select PICTURE.
6. Press the MENU LEFT key to decrease the PICTURE value.
7. Press the MENU button on the remote control transmitter twice to exit the user menu.
8. The new PERSONAL preference value is automatically stored.

ComPair

Introduction

ComPair (Computer Aided Repair) is a service tool for Philips Consumer Electronics products. ComPair is a further development of the DST (special remote control transmitter for Service), which allows faster and more accurate diagnostics. ComPair has three big advantages:

- ComPair helps you quickly get an understanding on how to repair the chassis in a short time by guiding you systematically through the repair procedures.
- ComPair allows very detailed diagnostics (on I2C level) and is therefore capable of accurately indicating problem areas. You do not have to know anything about I2C commands yourself because ComPair takes care of this.
- ComPair speeds up the repair time since it can automatically communicate with the chassis (when the microprocessor is working) and all repair information is directly available. When ComPair is installed together with the Force electronic manual of the T8 chassis, schematics and CBAs are only a mouse-click away.

Specifications

ComPair consists of a Windows based fault finding program and an interface box between PC

and the product. The ComPair interface box is connected to the PC via a serial or RS232 cable.

In the case of the L01 chassis, the ComPair interface box and the TV communicate via a bi-directional service cable via the service connector (Connector 0267).

The ComPair faultfinding program is able to determine the problem of the television set.

ComPair can gather diagnostic information in two ways:

- Automatic (by communication with the television): ComPair can automatically read the contents of the entire error buffer. Diagnosis is done on I2C level. ComPair can access the I2C bus of the television. ComPair can send and receive I2C commands to the microprocessor of the television. In this way, it is possible for ComPair to communicate (read and write) to devices on the I2C busses of the TV-set.
- Manually (by asking questions to the service technician): Automatic diagnosis is only possible if the microprocessor of the television is working correctly, and only to a certain extent. When this is not the case, ComPair will guide you through the faultfinding tree by asking you questions (for example; Does the screen give a picture? Click on the correct answer: YES / NO) and showing you examples (for example; Measure test-point I7 and click on the correct oscillogram you see on the oscilloscope). You can answer by clicking on a link (for example, text or a waveform picture) that will bring you to the next step in the faultfinding process.

By a combination of automatic diagnostics and an interactive question and answer procedure, ComPair will enable you to find most problems in a fast and effective way.

Beside fault finding, ComPair provides some **additional features** like:

- Uploading or downloading of presets.
- Management of preset lists.
- If both ComPair and the Force electronic service manual are installed, all the schematics and CBAs of the television set are available by clicking on the appropriate hyperlink.
Example: Measure the DC-voltage on capacitor C2568 (Schematic/Panel) at the Monocarrier. Click on the "Panel" hyperlink to automatically show the CBA with a highlighted capacitor C2568. Click on the "Schematic" hyperlink to automatically show the electronic position of the highlighted capacitor.

How To Connect

1. First install the ComPair Browser software (see the Quick Reference Card for installation instructions).
2. Connect the RS232 interface cable between a free serial (COM) port of your PC and the PC connector (marked with "PC") of the ComPair interface.
3. Connect the AC power adapter to the supply connector (marked "POWER 9V DC") on the ComPair interface.

4. Switch the ComPair interface OFF.
5. Switch the television set OFF (and remove the AC power).
6. Connect the ComPair interface cable between the connector on the rear side of the ComPair interface (marked "I2C") and the ComPair connector on the mono carrier (Connector 0267).
7. Plug the AC power adapter in the AC power outlet and switch on the ComPair interface. The green and red LEDs light up together. The red LED turns off after approximately 1 second, while the green LED remains lit.
8. Start the ComPair program and read the "introduction" chapter.

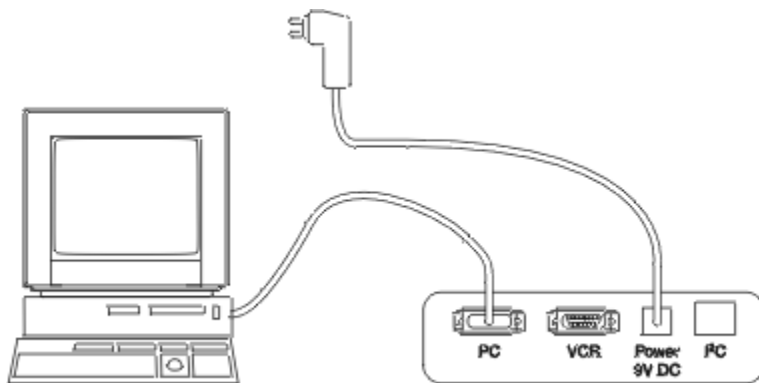


Figure: ComPair Connection

How To Order

ComPair order codes:

- ComPair InterfaceBox 4822 727 21631
- CDR Interface board 3122 785 90200
- TV cable 3122 785 90004
- DVD cable 3122 785 90017
- BETA CALIBRATION DISK 7104 099 93132
- Extra Com Cable S83-940
- AC Adapter T405-ND

Error Buffer

The error code buffer contains all errors detected since the last time the buffer was erased. The

buffer is written from left to right. When an error occurs that is not yet in the error code buffer, it is displayed at the left side and all other errors shift one position to the right.

How To Read The Error Buffer

You can read the error buffer in 3 ways:

- On screen via the SDAM (if you have a picture). Examples:
 - ERROR: 0 0 0 0 : No errors detected
 - ERROR: 6 0 0 0 : Error code 6 is the last and only detected error
 - ERROR: 9 6 0 0 : Error code 6 was detected first and error code 9 is the last detected (newest) error
- Via (when you have no picture). See "The Blinking LED Procedure"
- Via ComPair.

How To Clear The Error Buffer

- The error code buffer is cleared in the following cases:
- By using the CLEAR command in the SDAM menu:
 - To enter SDAM, Press the following key sequence on the remote control transmitter:
 - **0-6-2-5-9-6-MENU**
 - Do not allow the display to time out between entries while keying the sequence.
 - Make sure the menu item CLEAR is highlighted. Use the MENU UP/DOWN buttons, if necessary.
 - Press the MENU RIGHT button to clear the error buffer. The text on the right side of the "CLEAR" line will change from "CLEAR?" to "CLEARED"
- If the contents of the error buffer have not changed for 50 hours, the error buffer resets automatically.

Note:

If SDAM is exited by disconnecting the AC power from the television set, the error buffer is not reset.

Error Codes

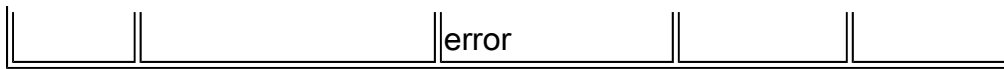
In case of non-intermittent faults, write down the errors present in the error buffer and clear the error buffer before you begin the repair.

This ensures that old error codes are no longer present.

If possible, check the entire contents of the error buffer. In some situations an error code is only the result of another error and not the actual cause of the problem (for example, a fault in the protection detection circuitry can also lead to a protection).

Table: Error Code Table

ERROR	Device	Error description	Check item	Diagram
0	Not applicable	No Error		
1	Not applicable	X-Ray Protection	2465, 7460	A2
2	Not applicable	Horizontal Protection	7460, 7461, 7462, 7463, 6467	A2
3	TDA8359/TDA9302	Vertical Protection	7861, VloAux +13v	A2, A3
4	MSP34X5/TDA9853	MAP I2C identification error	7831, 7861	A9 or A11
5	TDA95XX	POR 3.3V / 8V Protection	7200, 7560, 7480	A1, A2, A5, A6, A7
6	I2C bus	General I2C bus error	7200, 3624, 3625	A7
7	Not applicable	-	-	-
8	Not applicable	E/W Protection (Large Screen)	7400, 3405, 3406, 3400	A2
9	M24C08	NVM I2C identification error	7602, 3611, 3603, 3604	A7
10	Tuner	Tuner I2C identification error	1000, 7482	A2, A4
11	TDA6107/8	Black current loop protection	7330, RGB amps, CRT	B1, B2
12	M65669	MAP I2C identification	7803	P



Note: Error 7 is not applicable.

TheBlinking LED Procedure

Using this procedure, you can make the contents of the error buffer visible via the front LED. This is especially useful when there is no picture.

When the SDAM is entered, the LED will blink the contents of the error-buffer:

- 1-12 shortblinks (indicates error number 1-12)
- when all the error-codes are displayed, the sequence finishes with an "ON" LED blink of 3 seconds
- the sequence starts again

Example of error buffer: 12 9 6 0 0

After entering SDAM, the following occurs:

- 12 shortblinks followed by a pause of 3 seconds
- 9 short blinks followed by a pause of 3 seconds
- 6 short blinks followed by a pause of 3 seconds
- 1 long "ON" blink of 3 seconds to finish the sequence
- the sequence starts again.

Protections

If a fault situation is detected, an error code will be generated; and, if necessary, the television set will go into protection mode. Blinking of the red LED at a frequency of 3 Hz indicates the protection mode. In some error cases, the microprocessor does not put the set in protection mode. The error codes of the error buffer and the blinking LED procedure can be read via the Service Default Alignment Menu (SDAM), or via ComPair.

To get a quick diagnosis the chassis has two service modes implemented:

- The Customer Service Mode (CSM).
- The Service Default Alignment Mode (SDAM).

For a detailed description see Chapter 9 paragraphs 3.4 and 4.5.

Repair Tips

Below some failure symptoms are given, followed by a repair tip.

- **Set is dead and makes hiccuping sound**
 "Main Power Supply" is available. Hiccupping stops when L5561 is de-soldered, meaning that problem is in the "Main Power Supply" line. No output voltages at LOT, no horizontal deflection. Reason: line transistor 7460 is defective.
- **Set is dead, and makes no sound**
 Check power supply IC 7520. Result: voltage at pins 1, 3, 4, 5 and 6 are about 180 V and pin 8 is 0 V. The reason why the voltage on these pins is so high is because the output driver (pin 6) has an open load. That is why MOSFET 7521 is not able to switch. Reason: feedback resistor 3523 is defective. **Caution** : Be careful measuring the gate of 7521; circuitry is very high ohmic and can easily be damaged!
- **Set is in hiccup mode and shuts down after 8 seconds** Blinking LED (set is in SDAM mode) indicates error 5. As it is unlikely that P "POR" and "+8V protection" happen at the same time, measure the "+8V" supply. If this voltage is missing, check transistor 7480.
- **Set is in non-stop hiccup mode**
 Set is in over-current mode; check the secondary sensing (optocoupler 7515) and the "Main Power Supply" voltage. Signal "Stdby_con" must be logic low under normal operation conditions and goes to high (3.3 V) under standby and fault conditions.
- **Set turns on, but without picture and sound**
 The screen shows snow, but OSD and other menus are okay. Blinking LED procedure indicates error 11, so problem is expected in the tuner (part reference number 1000). Check presence of supply voltages. "Vlotaux+5V" voltages at pin 5 and 7 are okay; "VT_supply" at pin 9 is missing. Conclusion: resistor 3460 is defective.
- **Set turns on, but with a half screen at the bottom. Sound is okay**
 Blinking LED (set is in SDAM mode) indicates error 3. Check "Vlotaux+11V" and "+50V". If they are okay, problem is expected in the vertical amplifier IC 7471. Use an oscilloscope to measure the waveform on pin 17 of the UOC. Also measure the waveform at pin 1 of IC 7471. If the signal there is missing, a defective resistor R3244 caused the problem.

Mechanical Instructions

Rear Cover Removal

1. Remove all fixation screws of the rear cover.
2. Now pull the rear cover backward to remove it.

Service Position Main Panel

There are 2 configurations. With and without panel bracket. Both have a different service position:

Main panel **without** bracket.

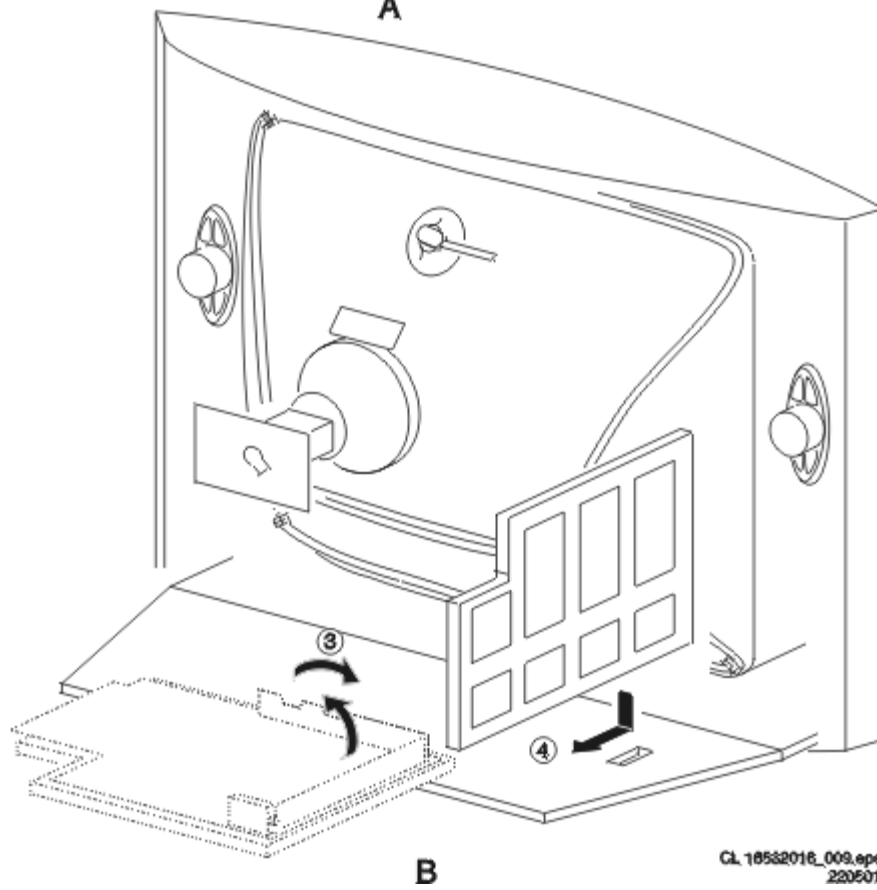
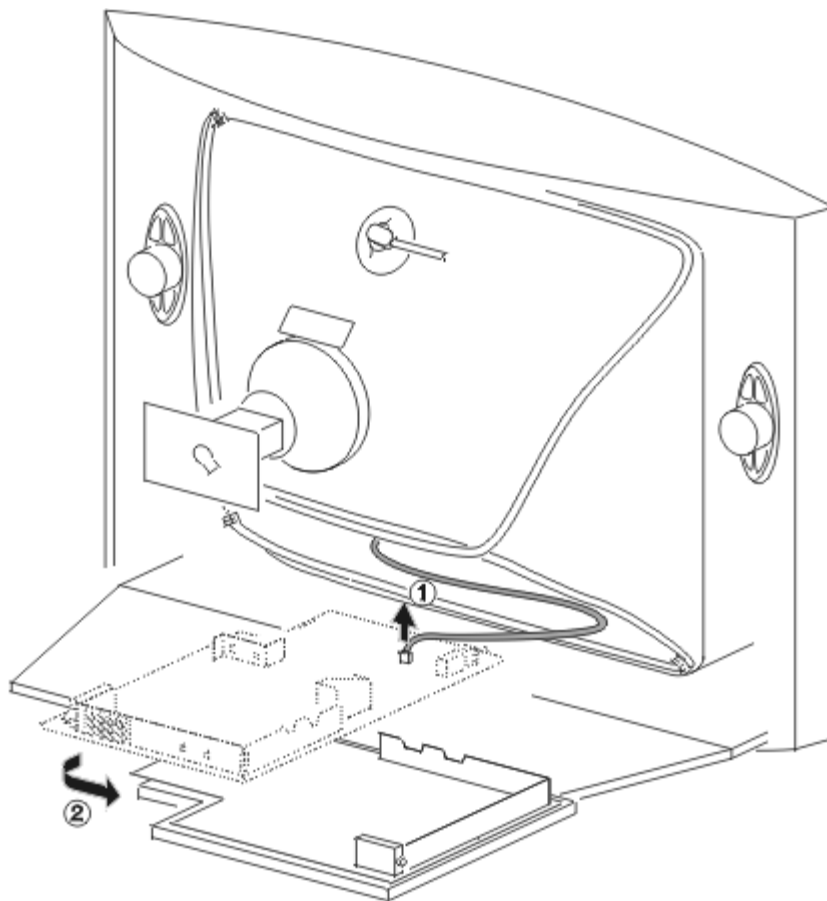
1. Disconnect the strain relief of the AC power cord.
2. Remove the main panel, by pushing the two center clips outward [1]. At the same time pull the panel away from the CRT [2].
3. Disconnect the degaussing coil by removing the cable from (red) connector 0201.
4. Turn the panel 90 degrees counter clockwise [3].
5. Flip the panel 90 degrees [4], with the components towards the CRT.
6. Turn the panel with the rear I/O towards the CRT [5].
7. Slide the metal heatsink (near the mains transformer 5520) underneath the right chassis bracket, so the panel is secured [6].



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Main panel **with** bracket.

1. Disconnect the strain relief of the AC power cord.
2. Disconnect the degaussing coil by removing the cable from (red) connector 0201 [1].
3. Remove the panel bracket from the bottom tray, by pulling it backward [2] and turn the chassis tray 90 degrees counter clockwise.
4. Move the panel somewhat to the left and flip it 90 degrees [3], with the components towards the CRT.
5. Turn the panel with the rear I/O towards the CRT.
6. Place the hook of the tray in the fixation hole of the cabinet bottom [4] and secure it.



CL 10532016_009.eps
220501

Figure:

Side I/O Panel Removal

1. Remove the complete Side I/O assembly after unscrewing the 2 fixation screws.
2. Release the 2 fixation clamps and lift the board out of the bracket.

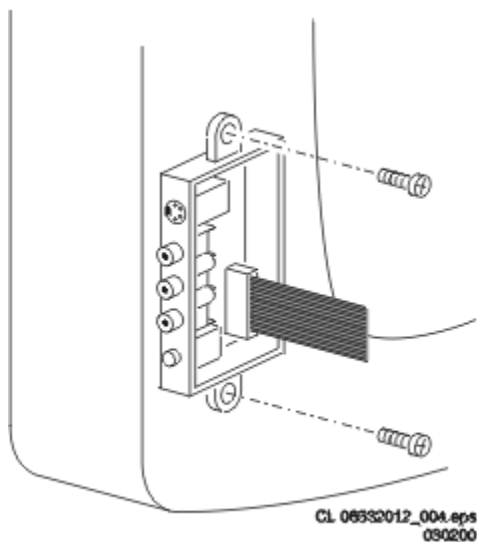


Figure:

Pip Module (If Present)

Service Position

1. Remove the module bracket from the bottom tray by pulling it backward.
2. Hook the bracket in the first row of the cabinet bottom. In other words: reposition the bracket from [1] to [2].

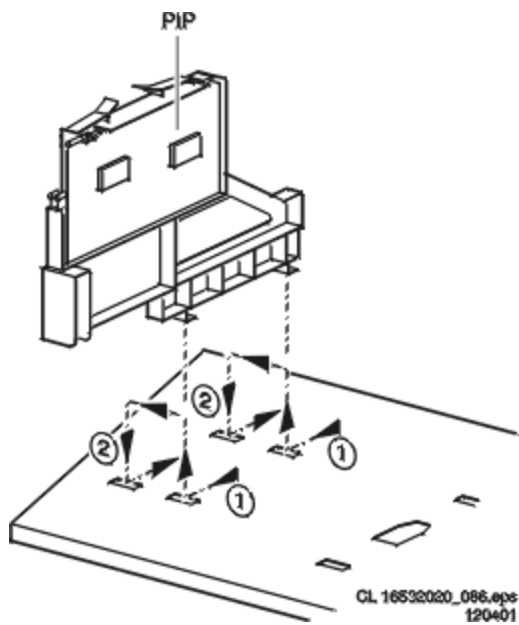


Figure:

Panel Removal

1. Lift the board out of its bracket after releasing the 2 fixation clamps.

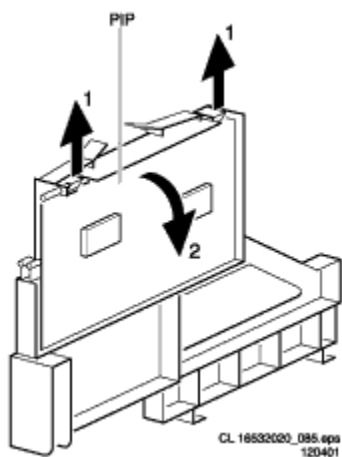


Figure:

Rear Cover Mounting

Before you mount the rear cover, perform the following checks:

1. Check whether the AC power cord is mounted correctly in its guiding brackets.
2. Replace the strain relief of the AC power cord into the cabinet.
3. Check whether all cables are replaced in their original position.

Technical Service Data

Model no.: 27PS60S321

First Publish: 12740 T8

Rev. Date: 2002-06-06

Print Date: 7/8/2004

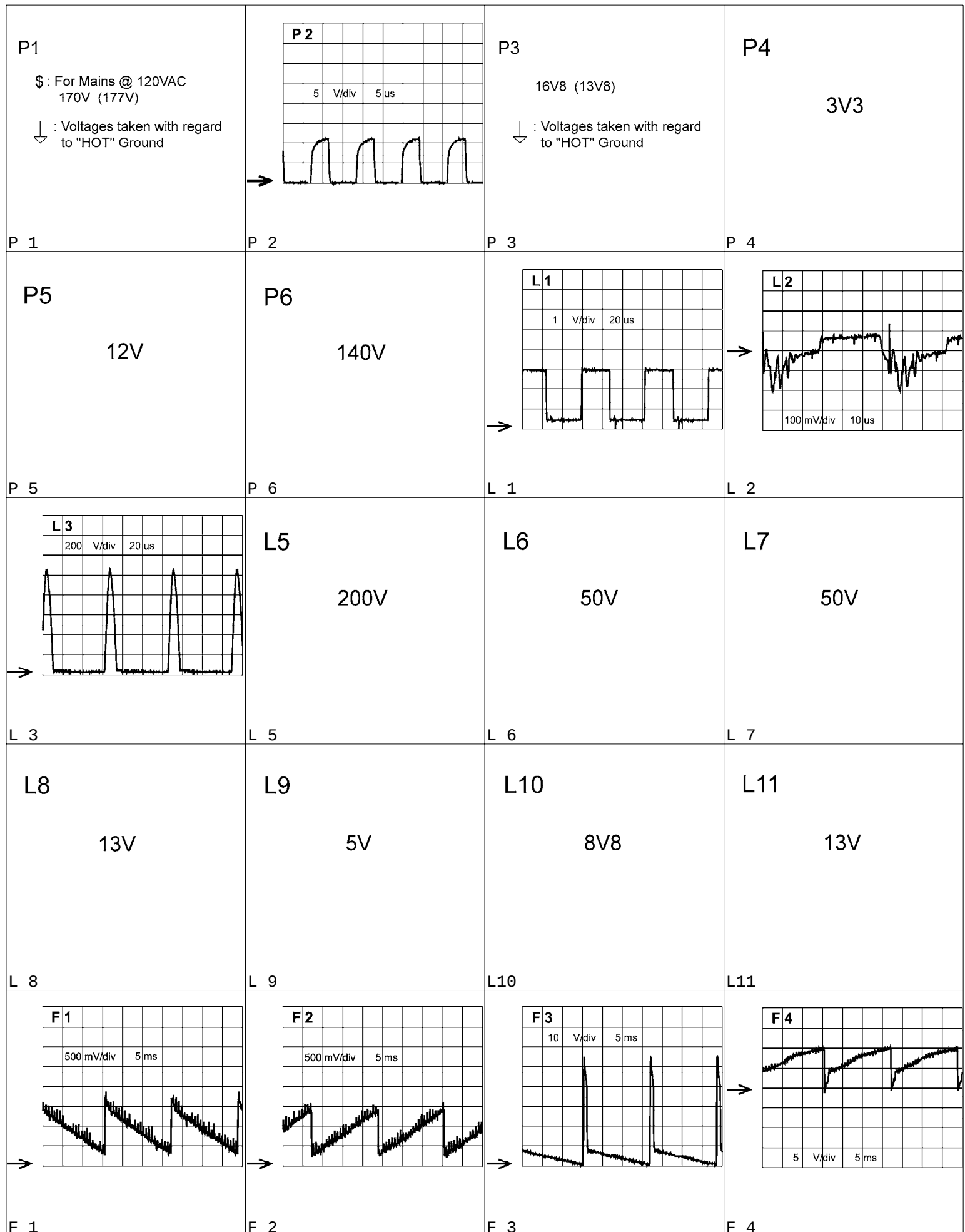
Service and Quality
Service Publications Dept.
One Philips Drive
P.O. Box 14810
Knoxville, TN 37914

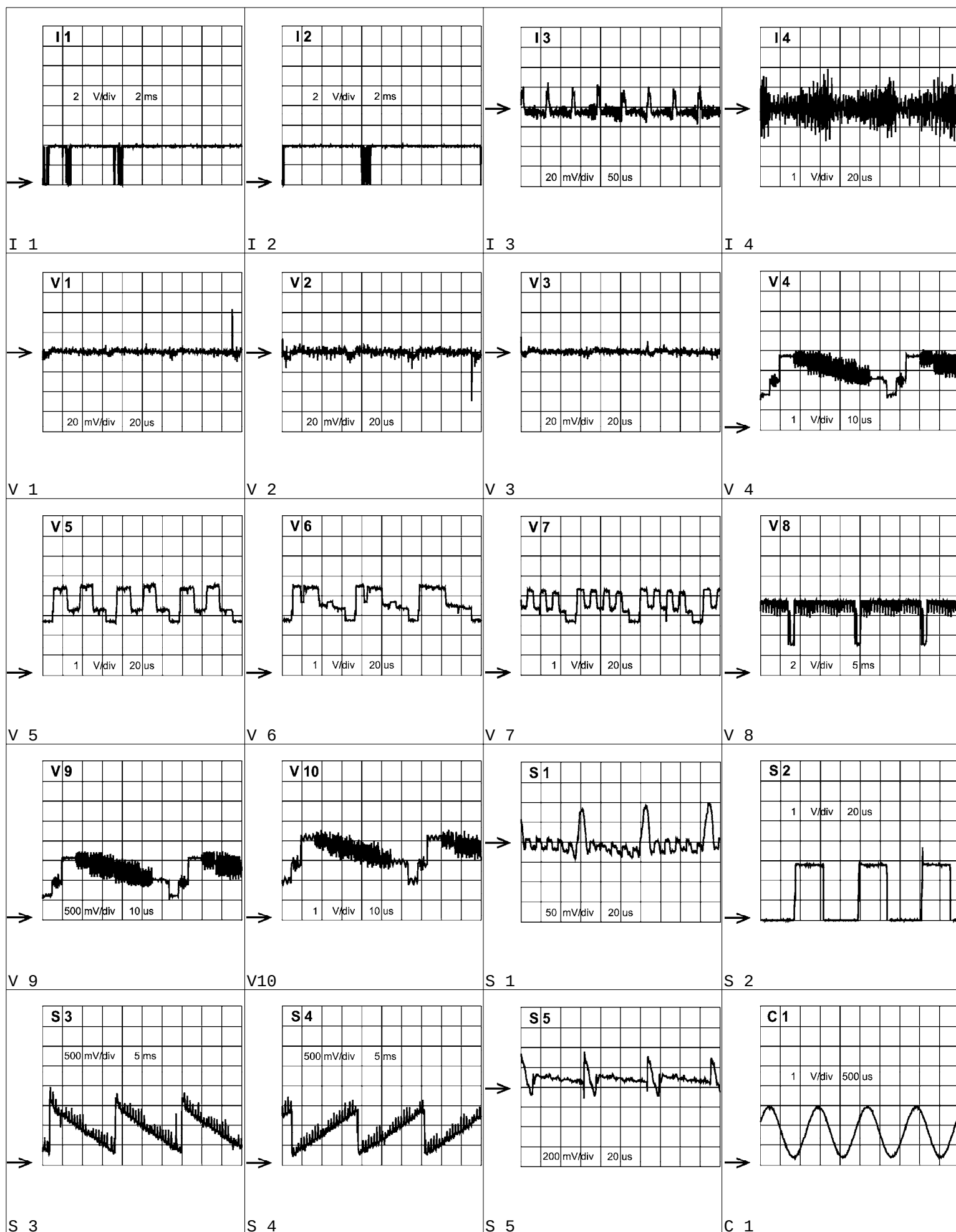
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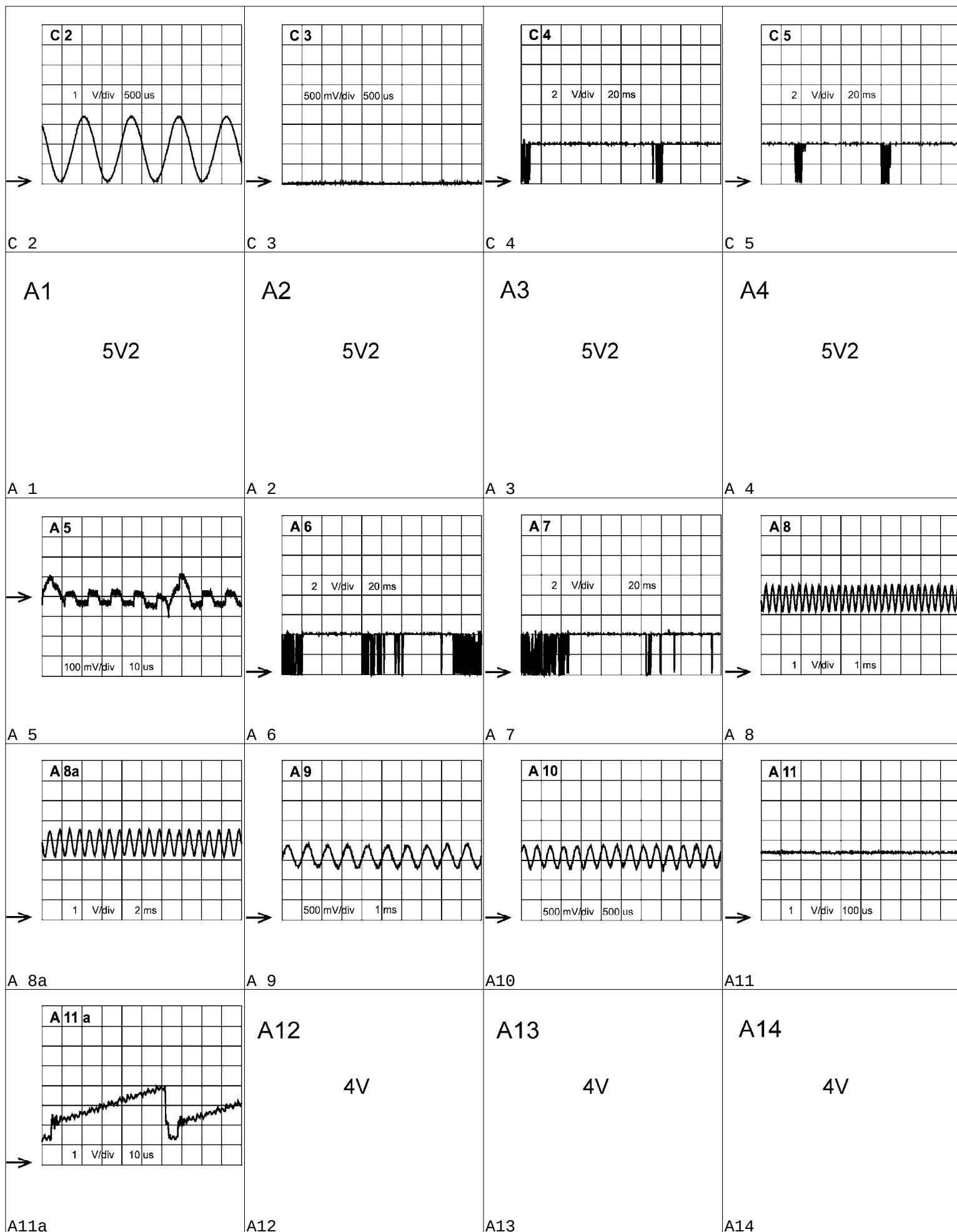
REFER TO SAFETY GUIDELINES

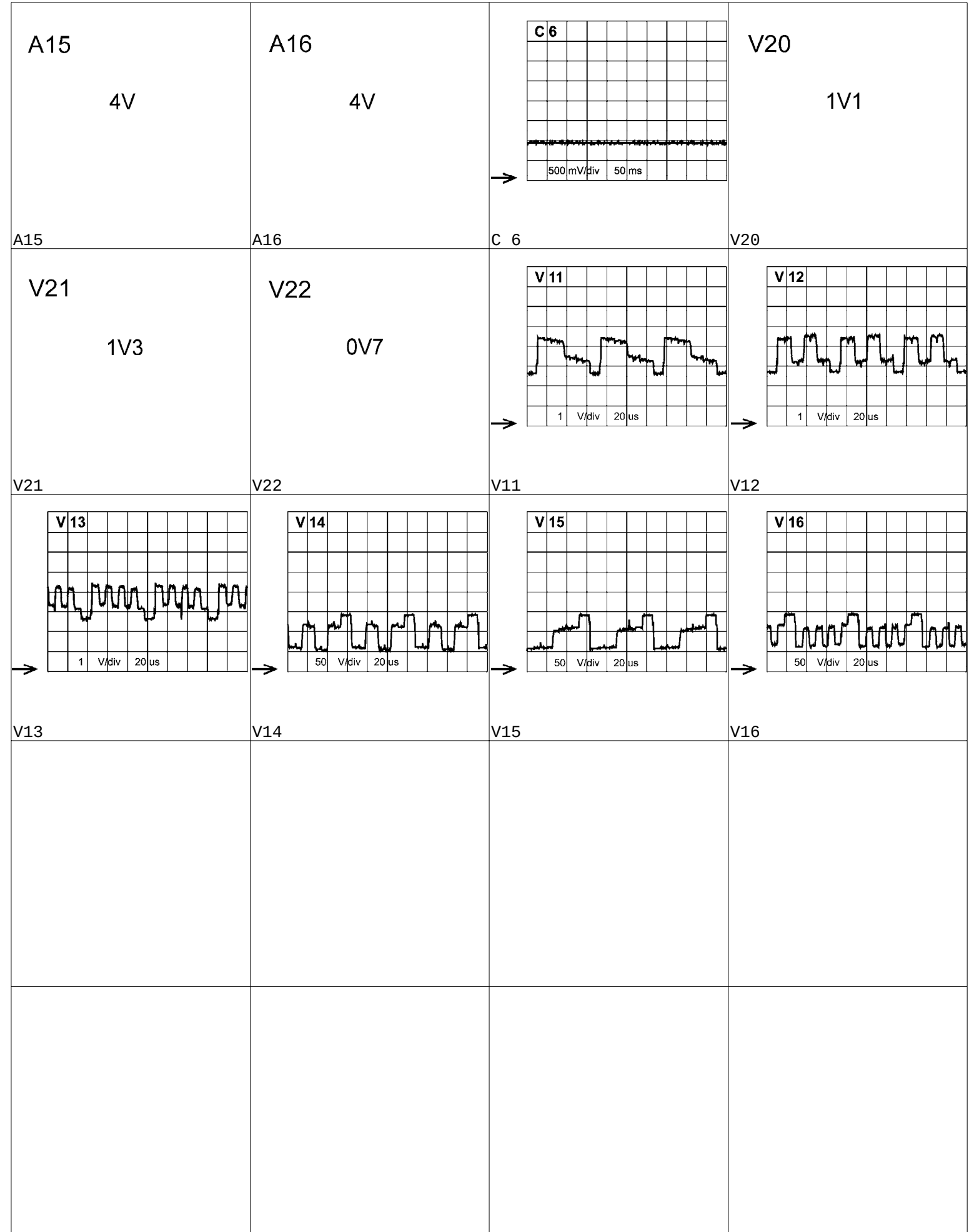
SAFETY NOTICE: ANY PERSON ATTEMPTING TO SERVICE THIS CHASSIS MUST FAMILIARIZE HIMSELF WITH THE CHASSIS AND BE AWARE OF THE NECESSARY SAFETY PRECAUTIONS TO BE USED WHEN SERVICING ELECTRONIC EQUIPMENT CONTAINING HIGH VOLTAGES.

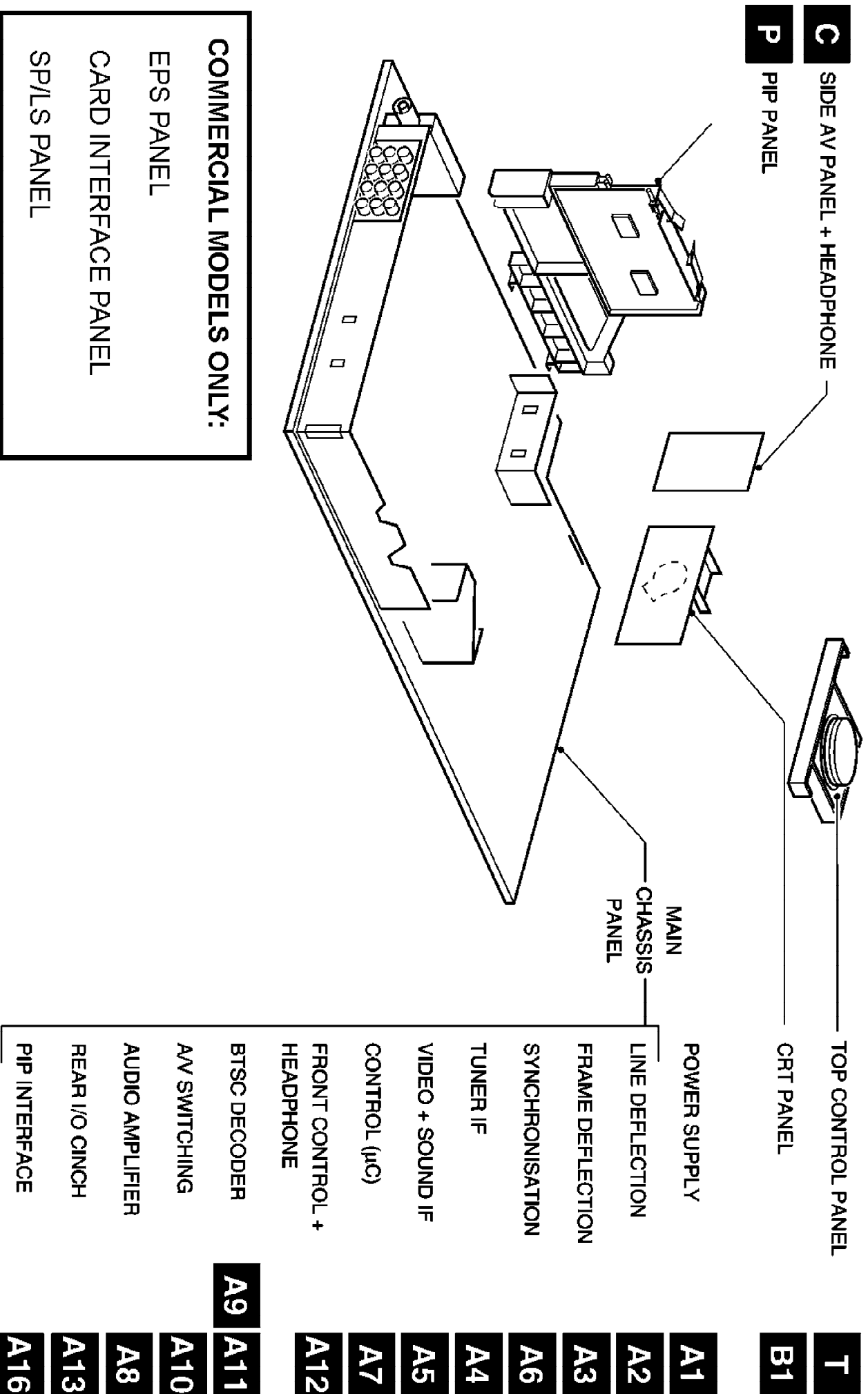
CAUTION: USE A SEPARATE ISOLATION TRANSFORMER FOR THIS UNIT WHEN SERVICING





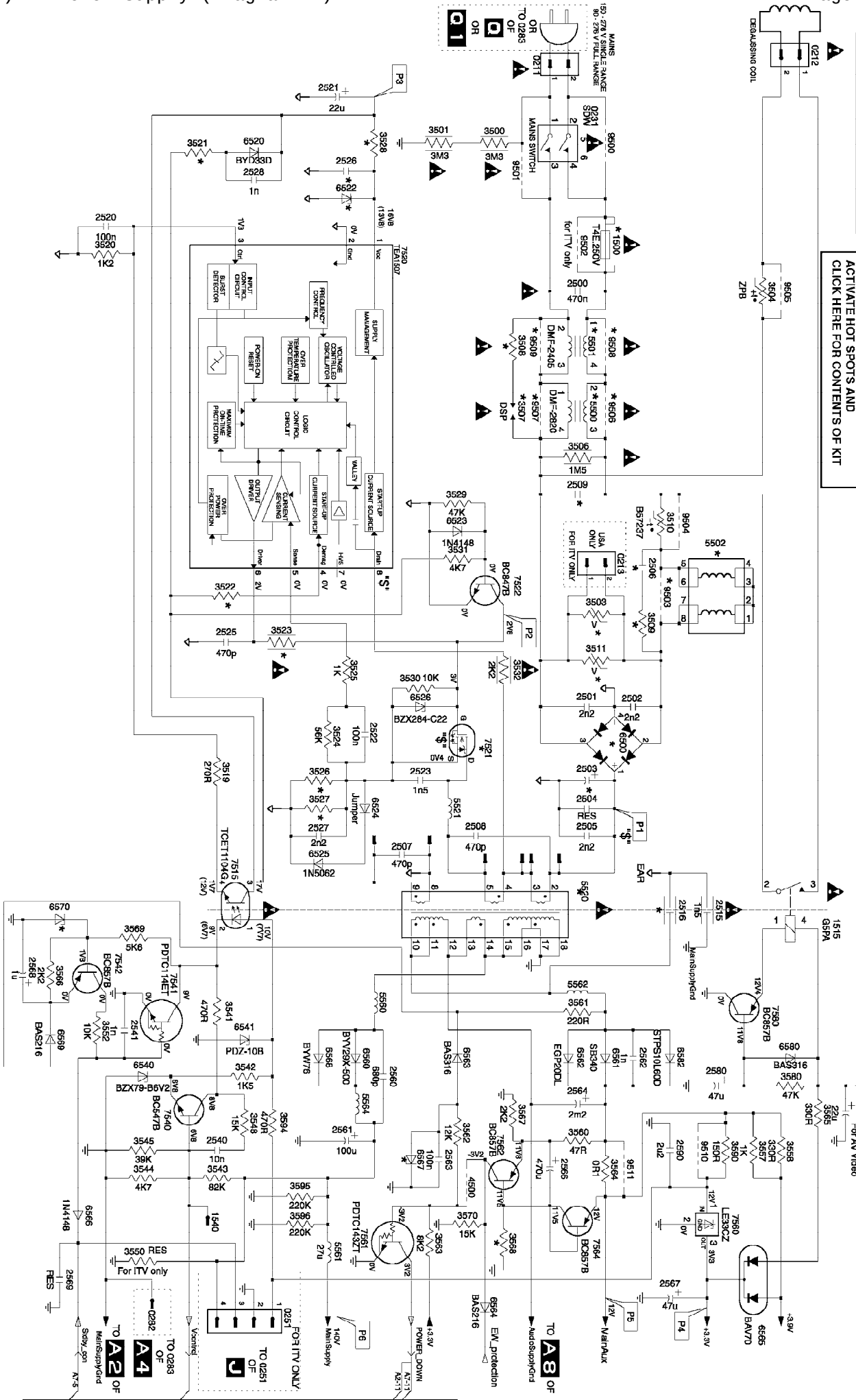


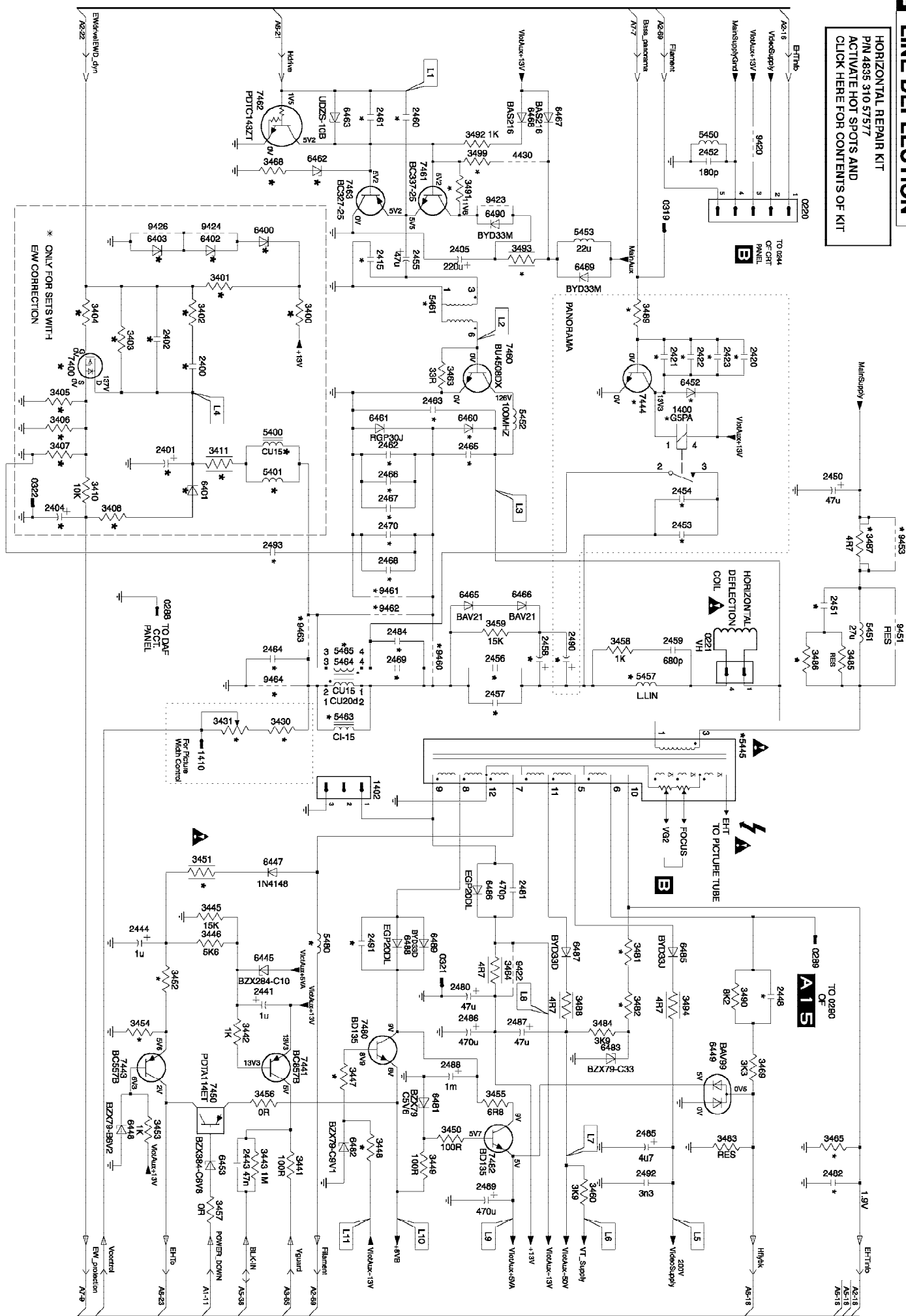




A1 POWER SUPPLY

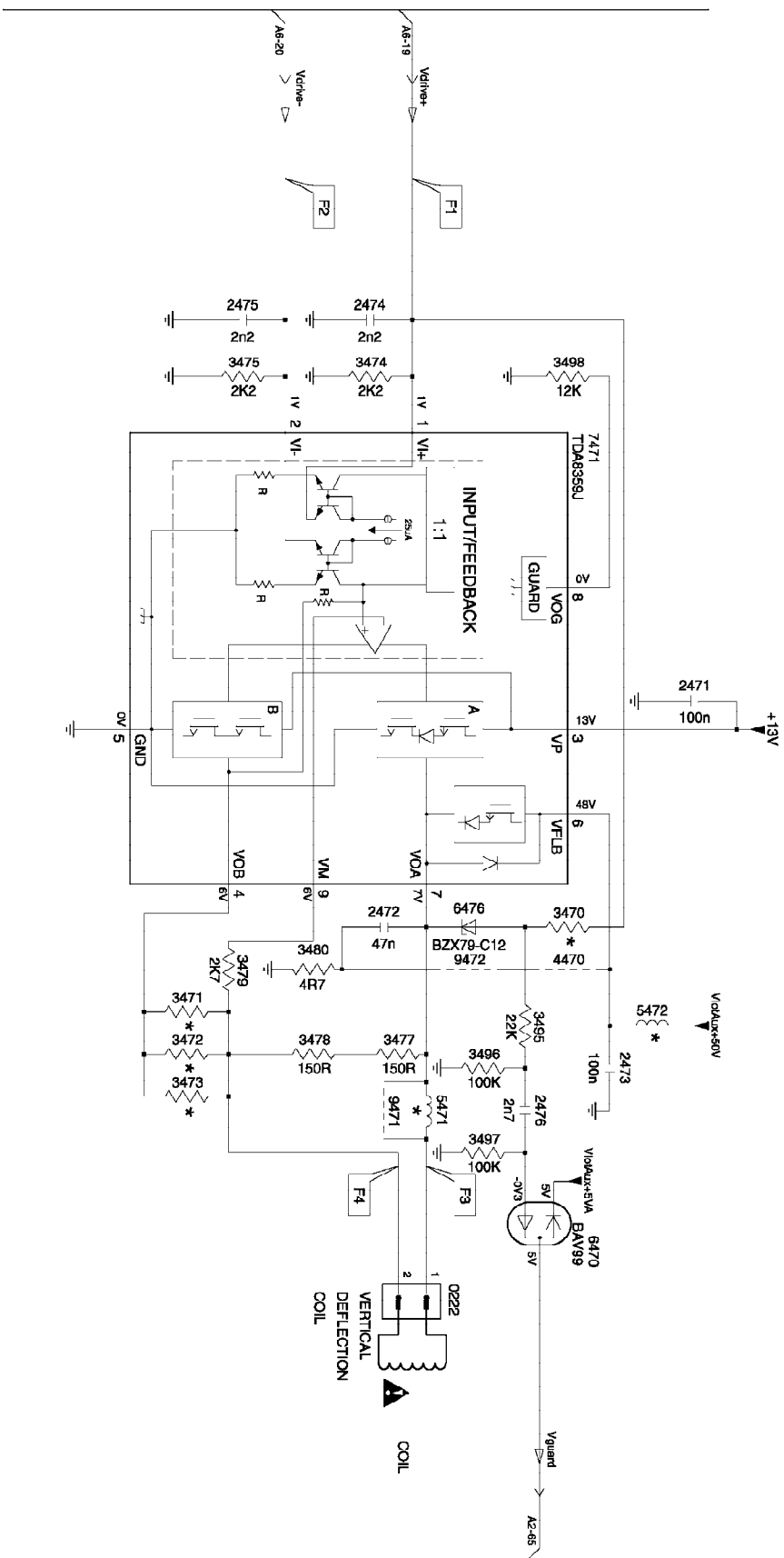
POWER SUPPLY REPAIR KIT
P/N 4835 310 57581
ACTIVATE HOT SPOTS AND
CLICK HERE FOR CONTENTS OF KIT

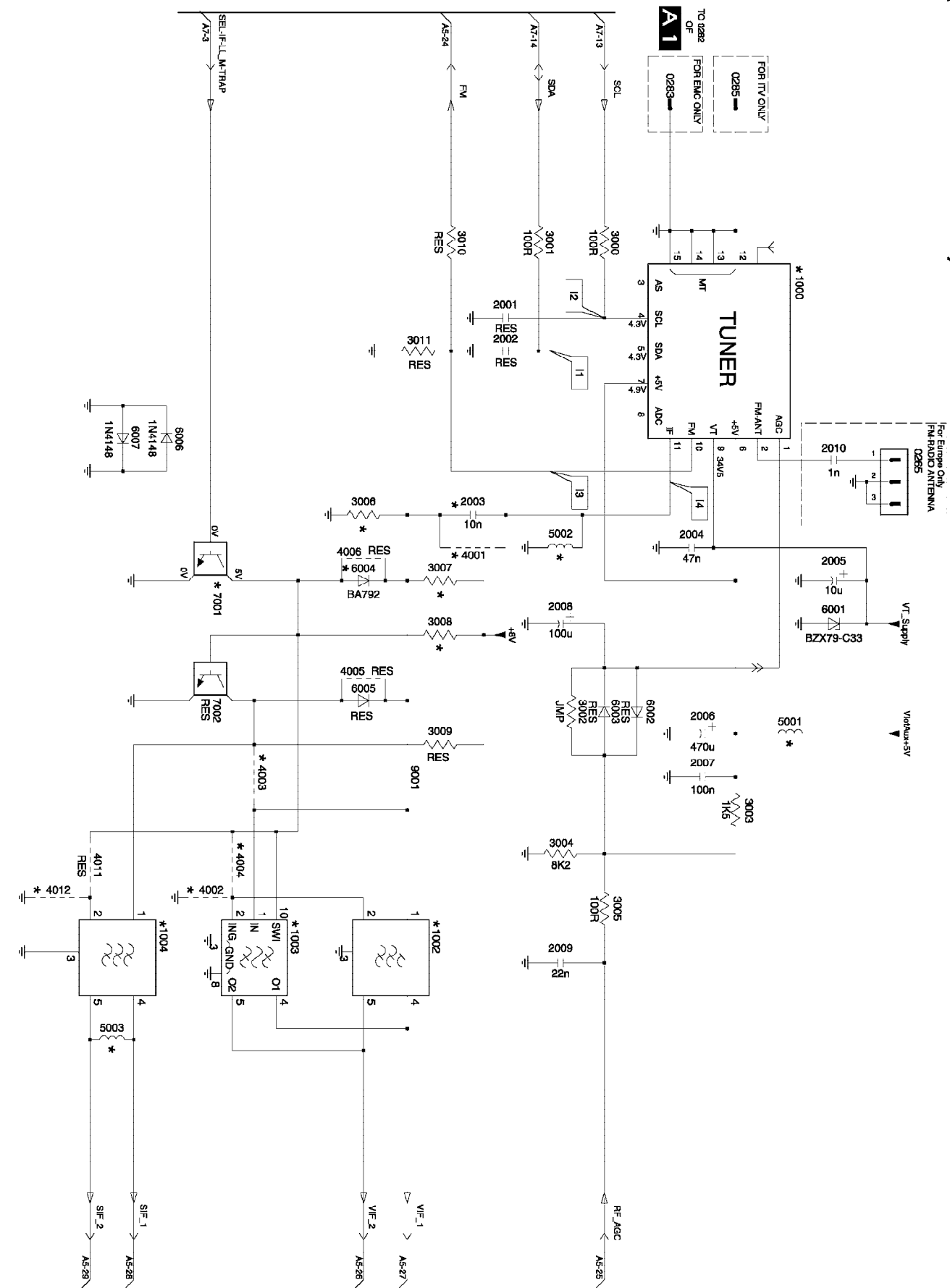




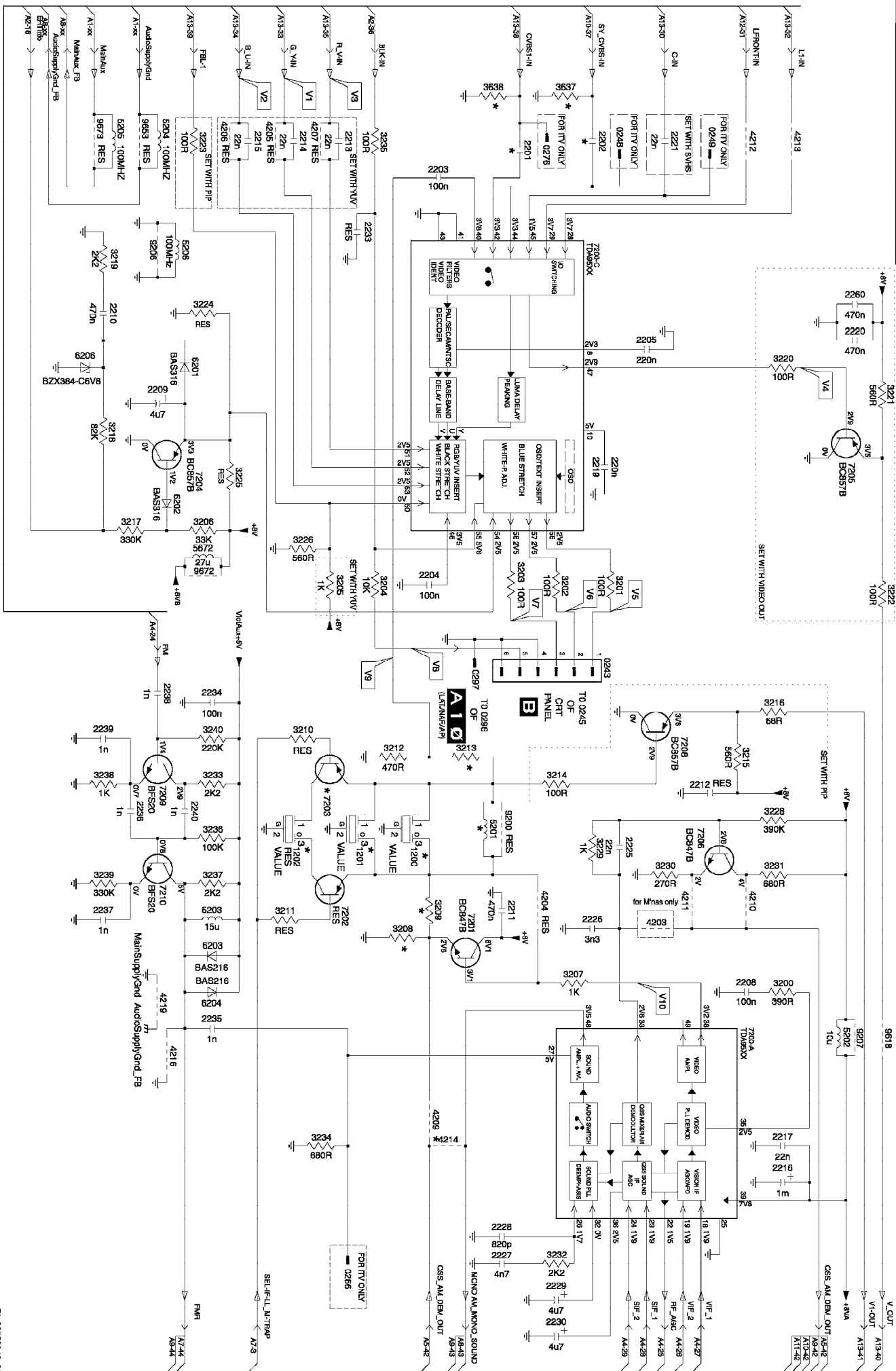
A3 FRAME DEFLECTION

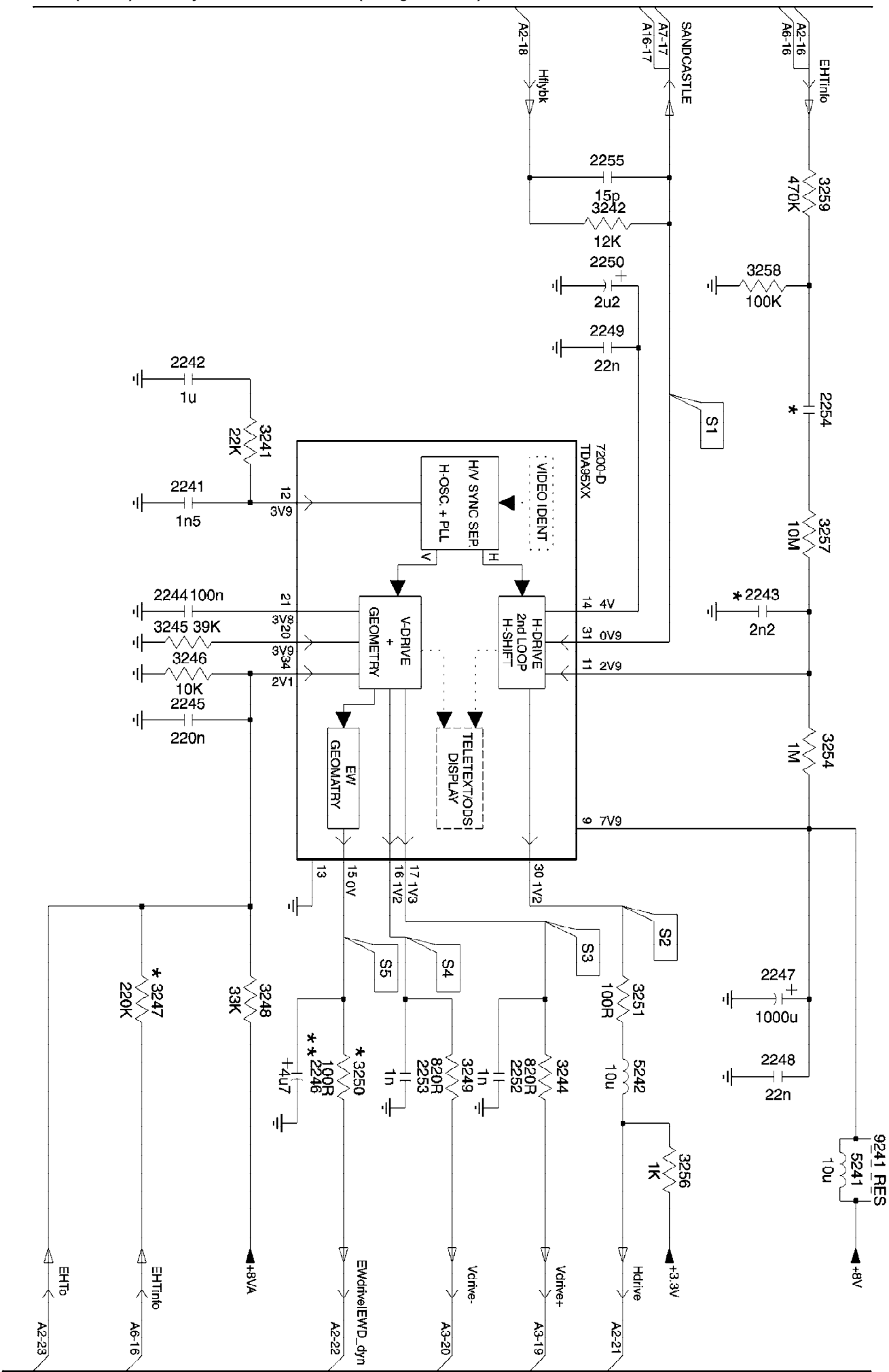
VERTICAL REPAIR KIT
P/N 4835 310 57582
ACTIVATE HOT SPOTS AND
CLICK HERE FOR CONTENTS OF KIT

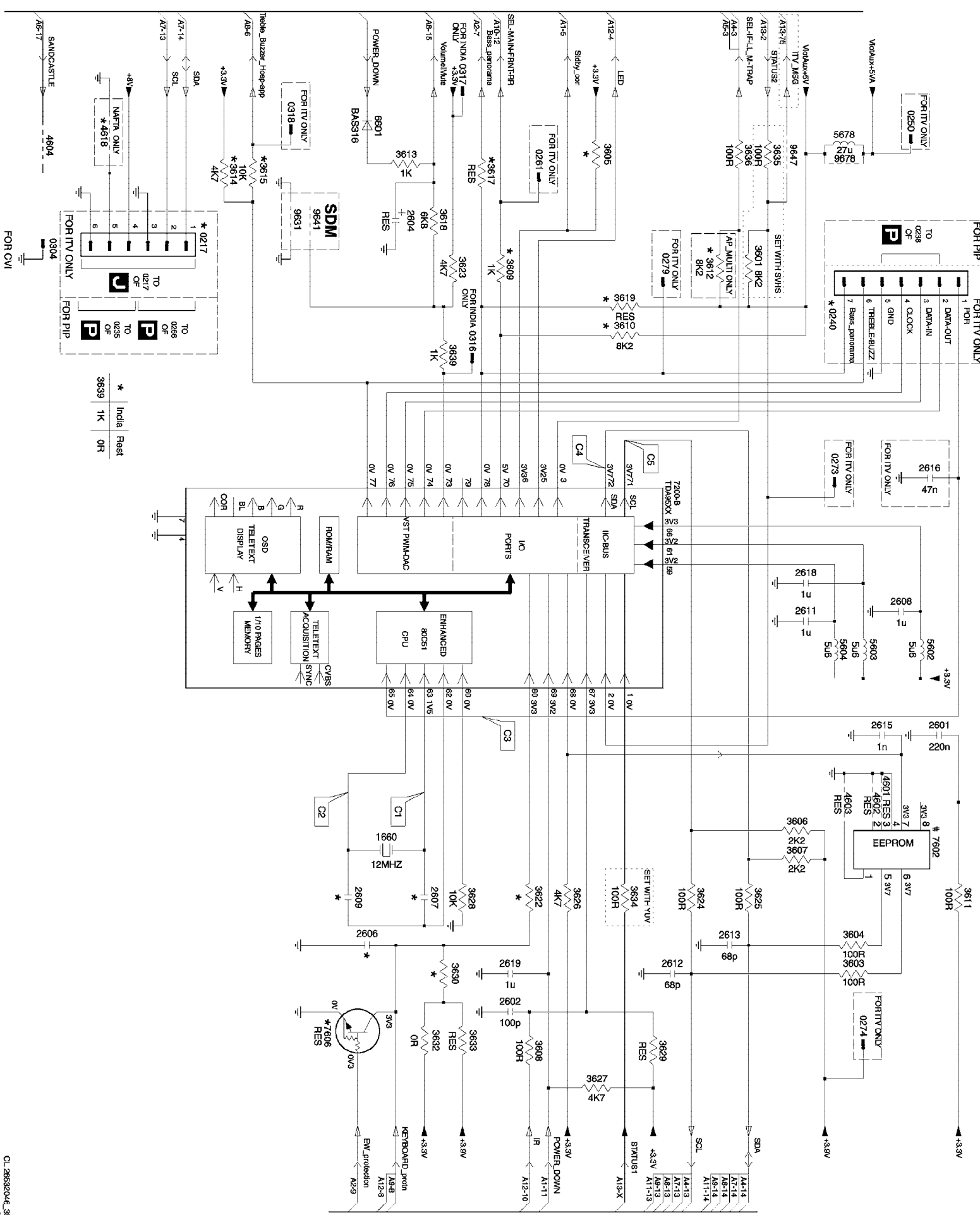


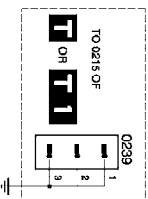


A5 VIDEO IF + SOUND IF (LATAM / NAFTA / AP)

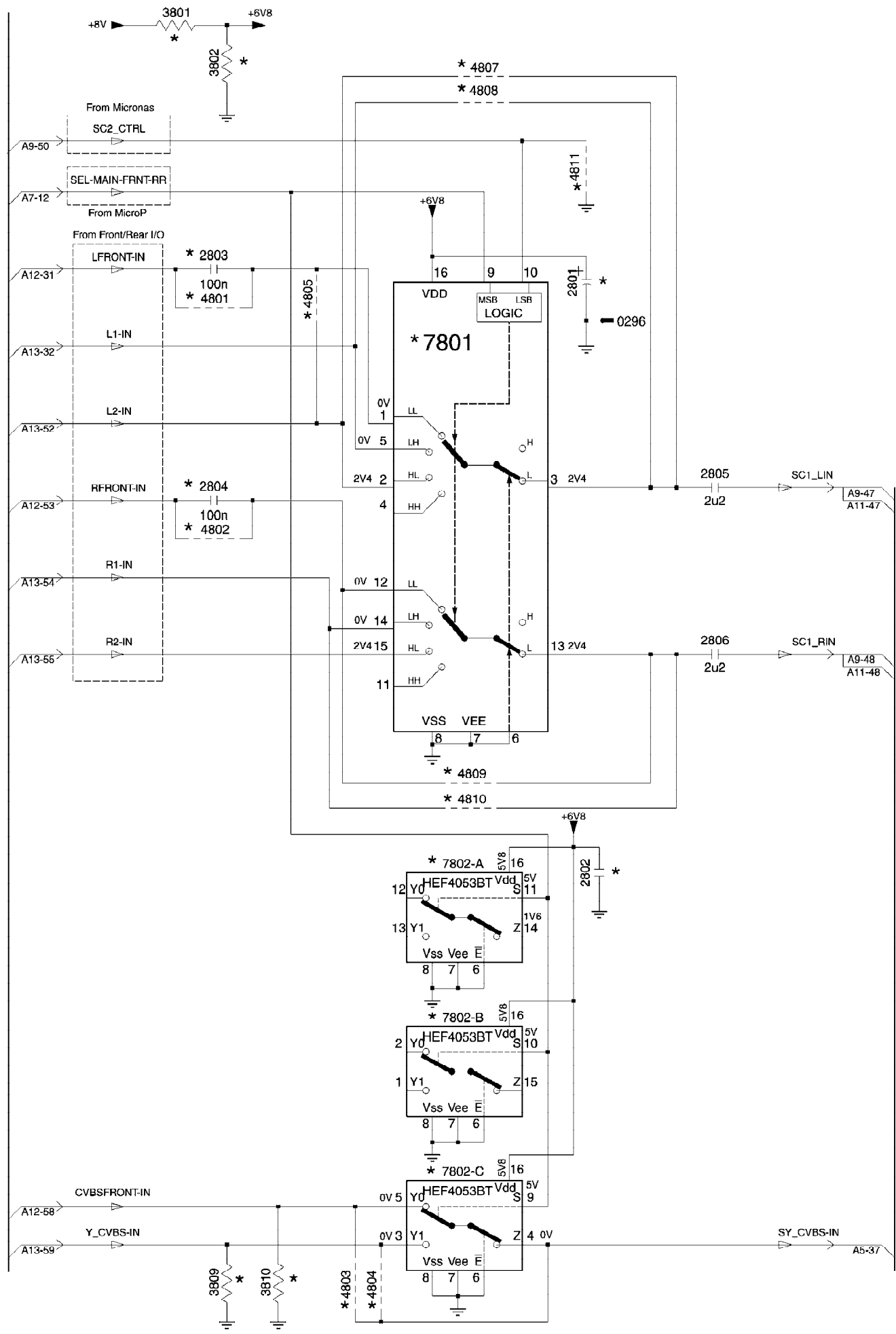


A6 SYNCHRONISATION (LATAM / NAFTA / AP)

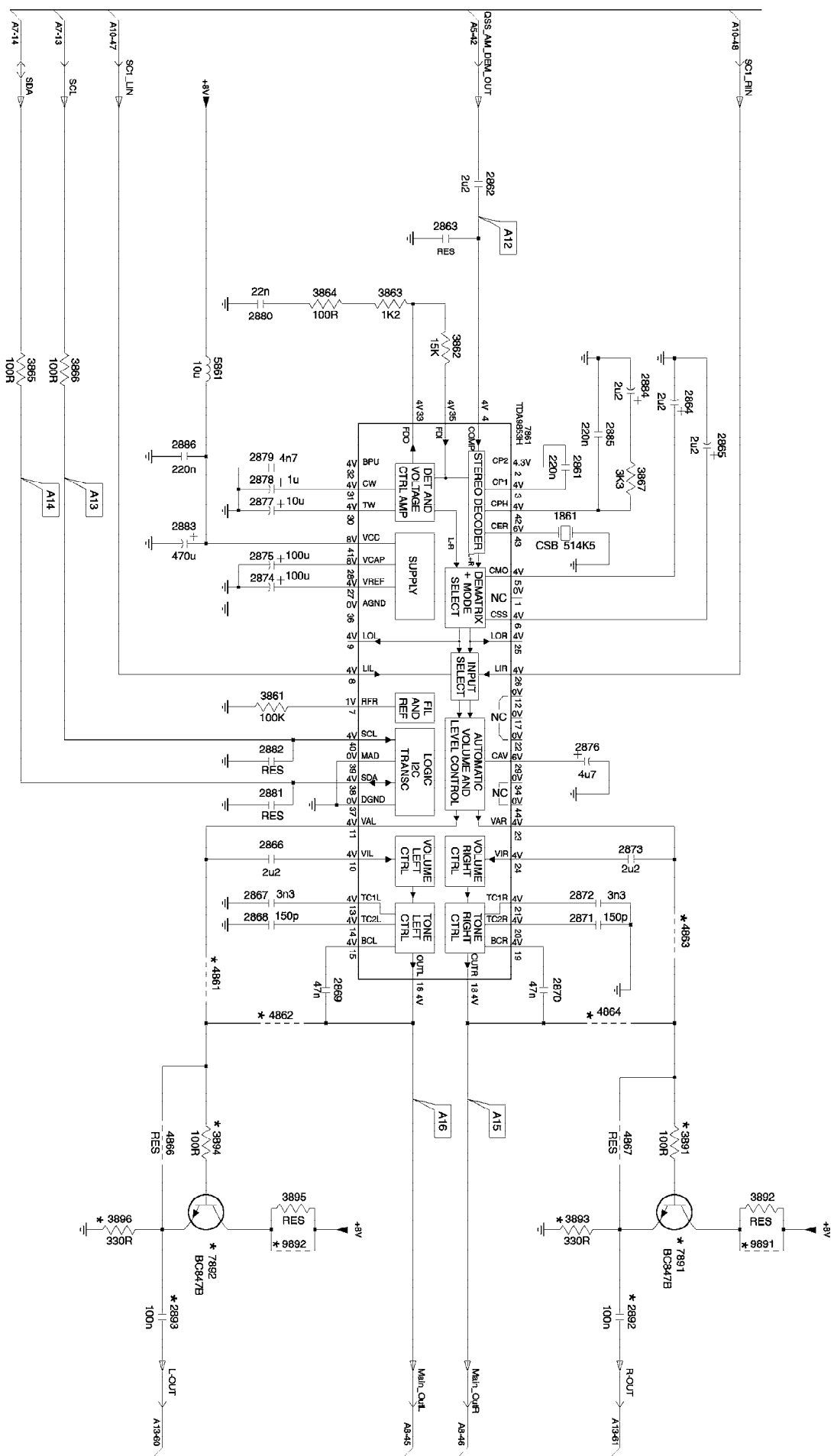




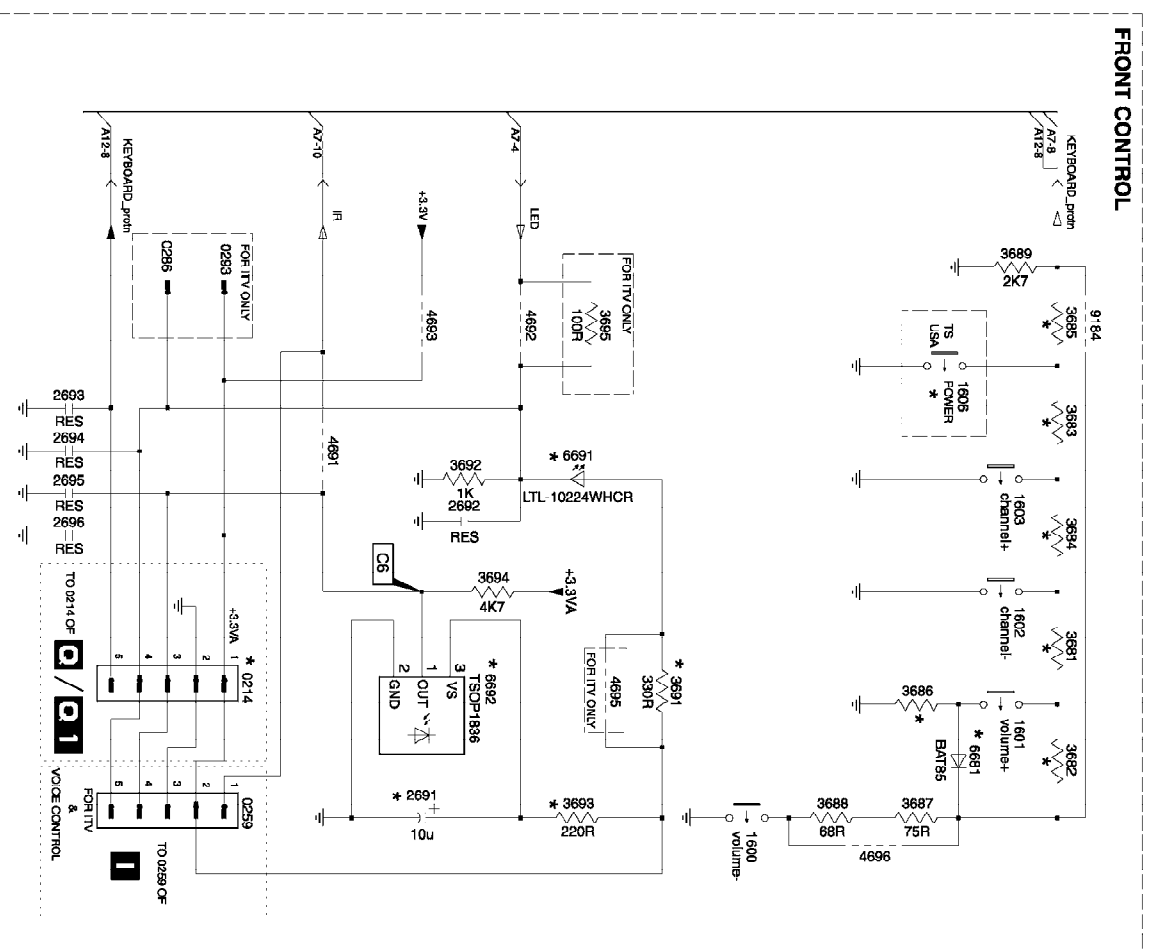
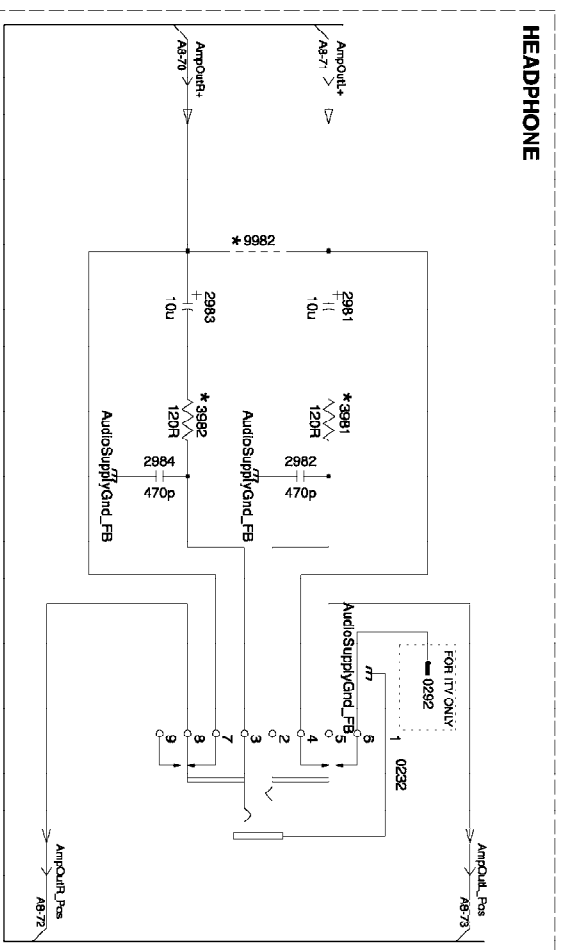
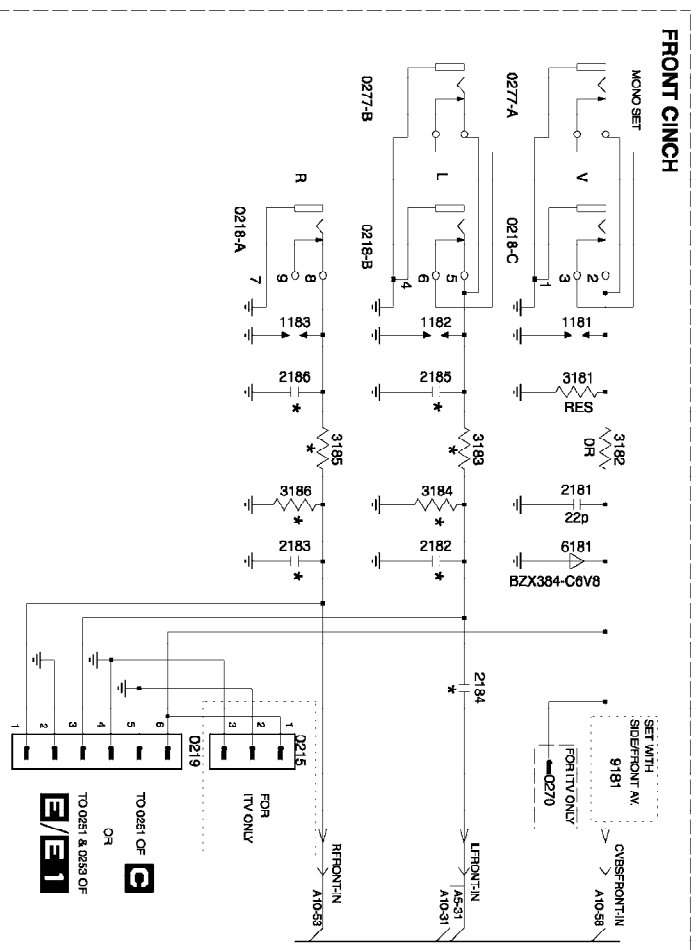
A10 AUDIO/VIDEO SOURCE SWITCHING (LATAM / NAFTA)



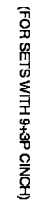
A11 BTSC - NDBX STEREO DECODER (LATAM / NAFTA)



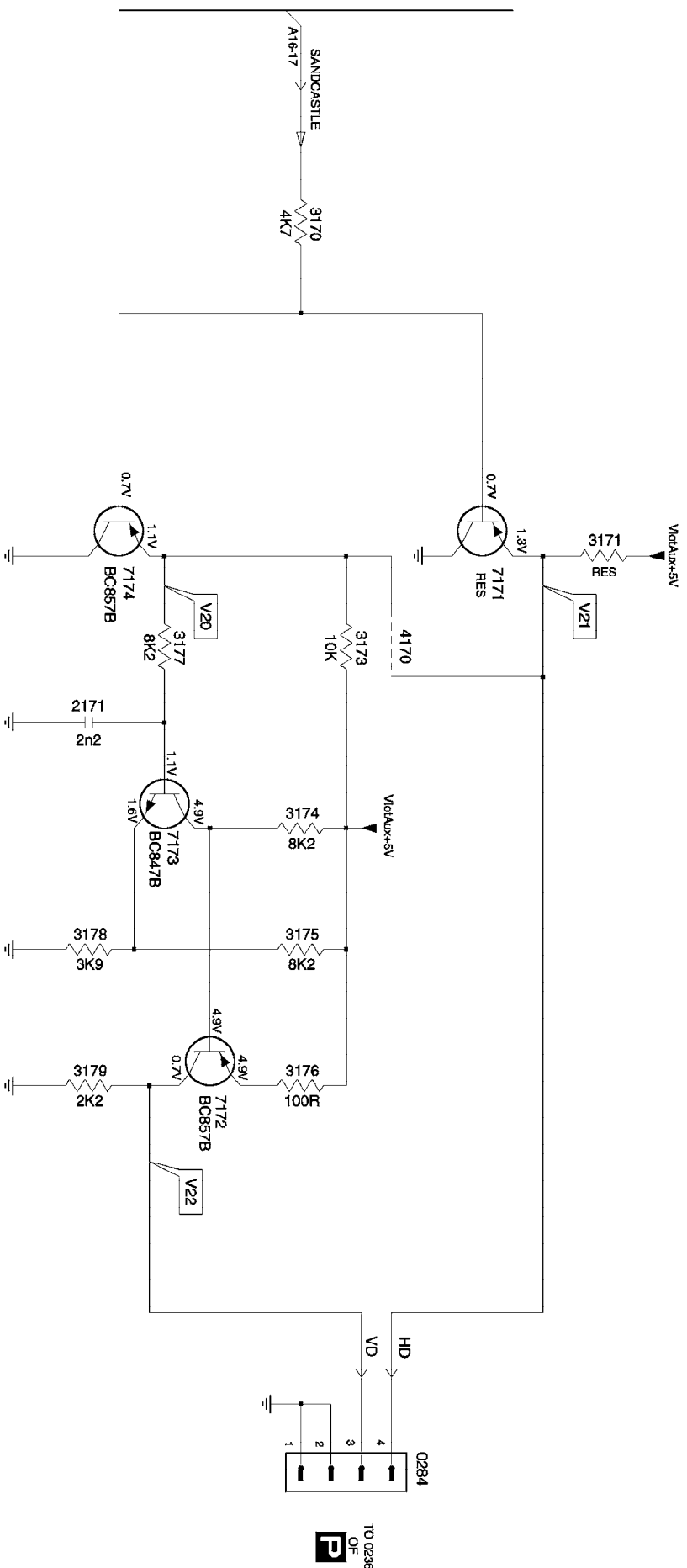
of 30



4694



A16 PIP INTERFACE



A8

0254 HEADPHONE

TO
0246
OF

L-
L+
GND
R+
R-

1
2
3
4
5

2179
+100u
3156
330R
2178
330p
2176
330p
3157
330R
2177
+100u

SG06
SG07

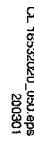
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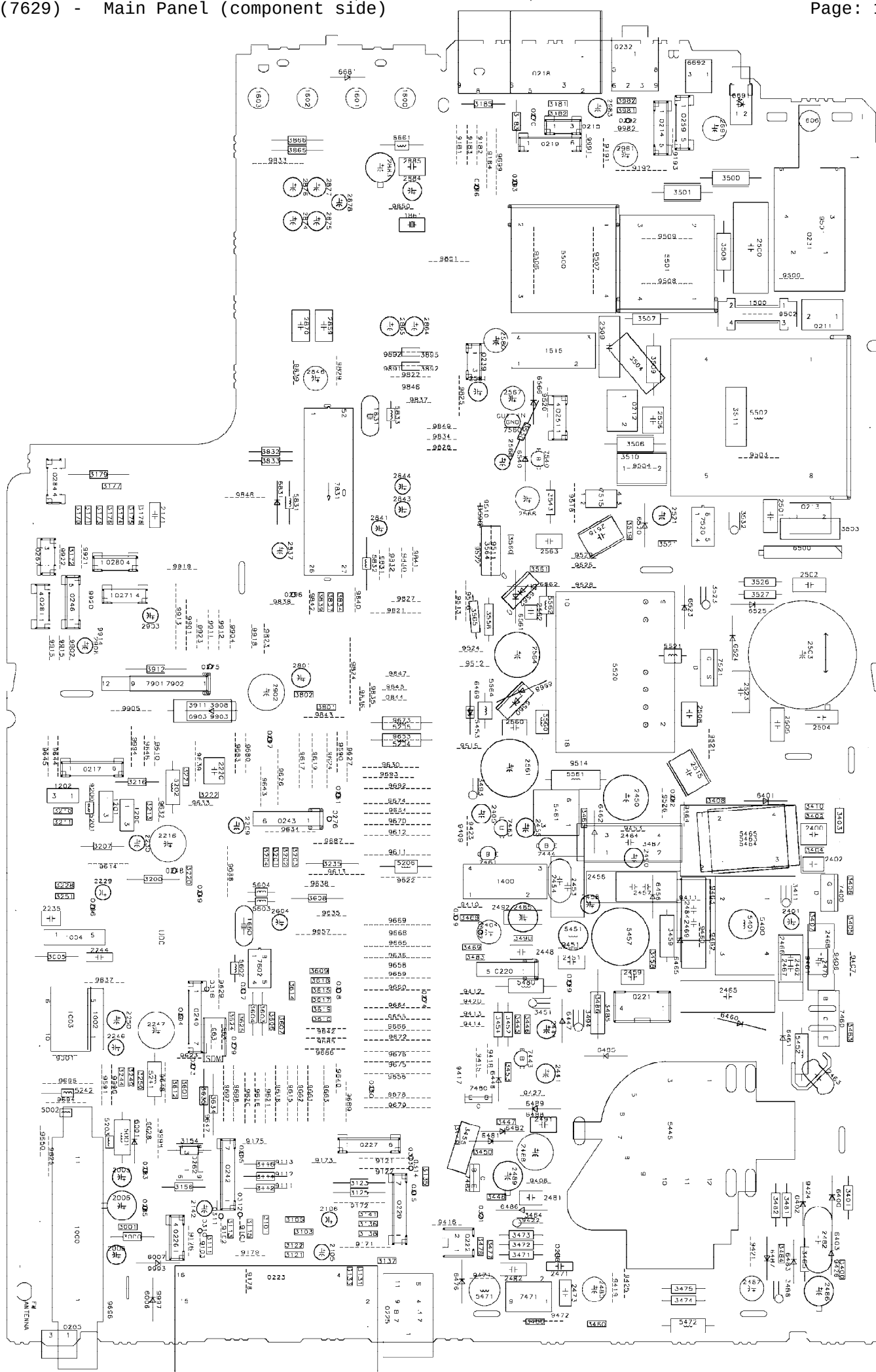
1
2
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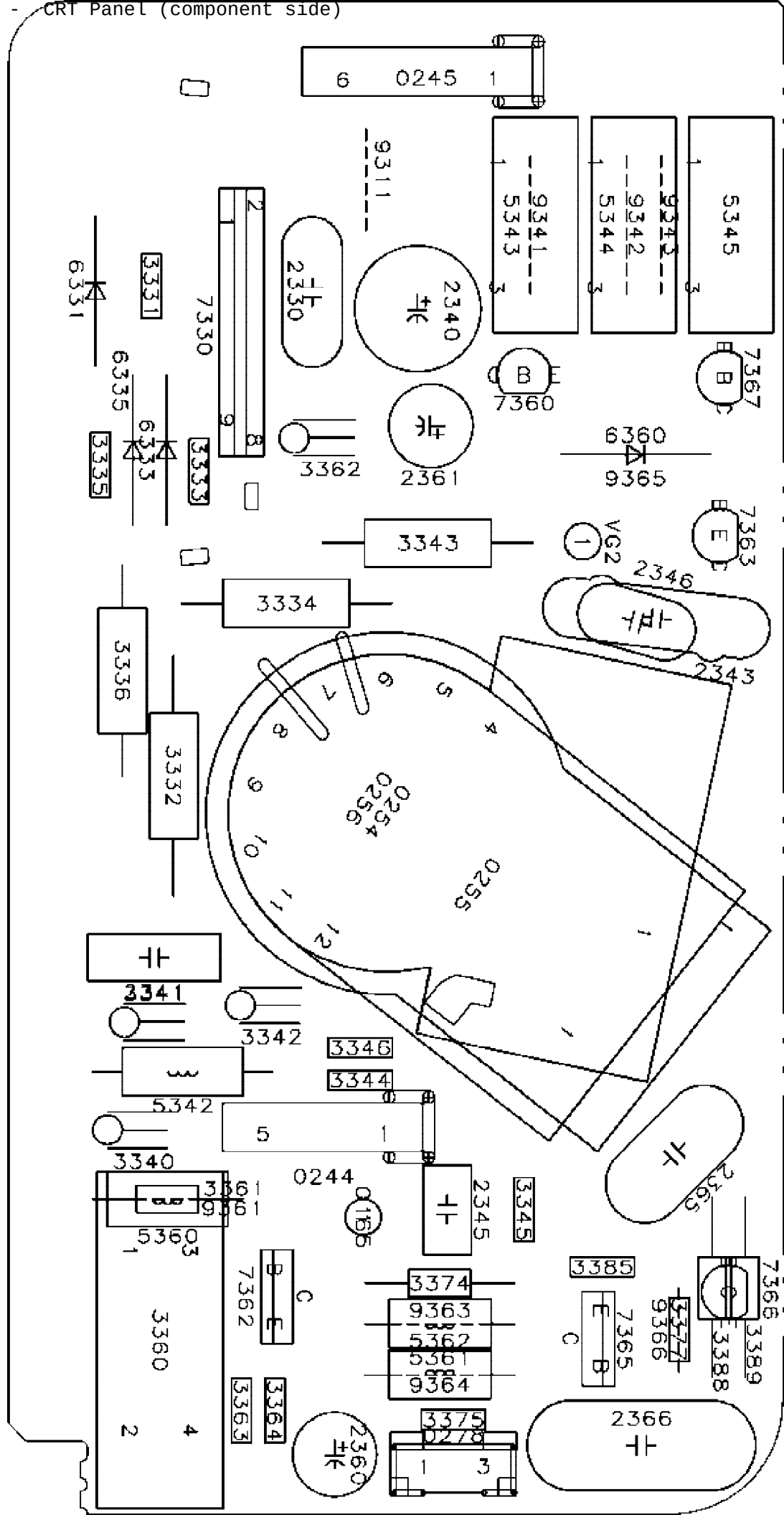
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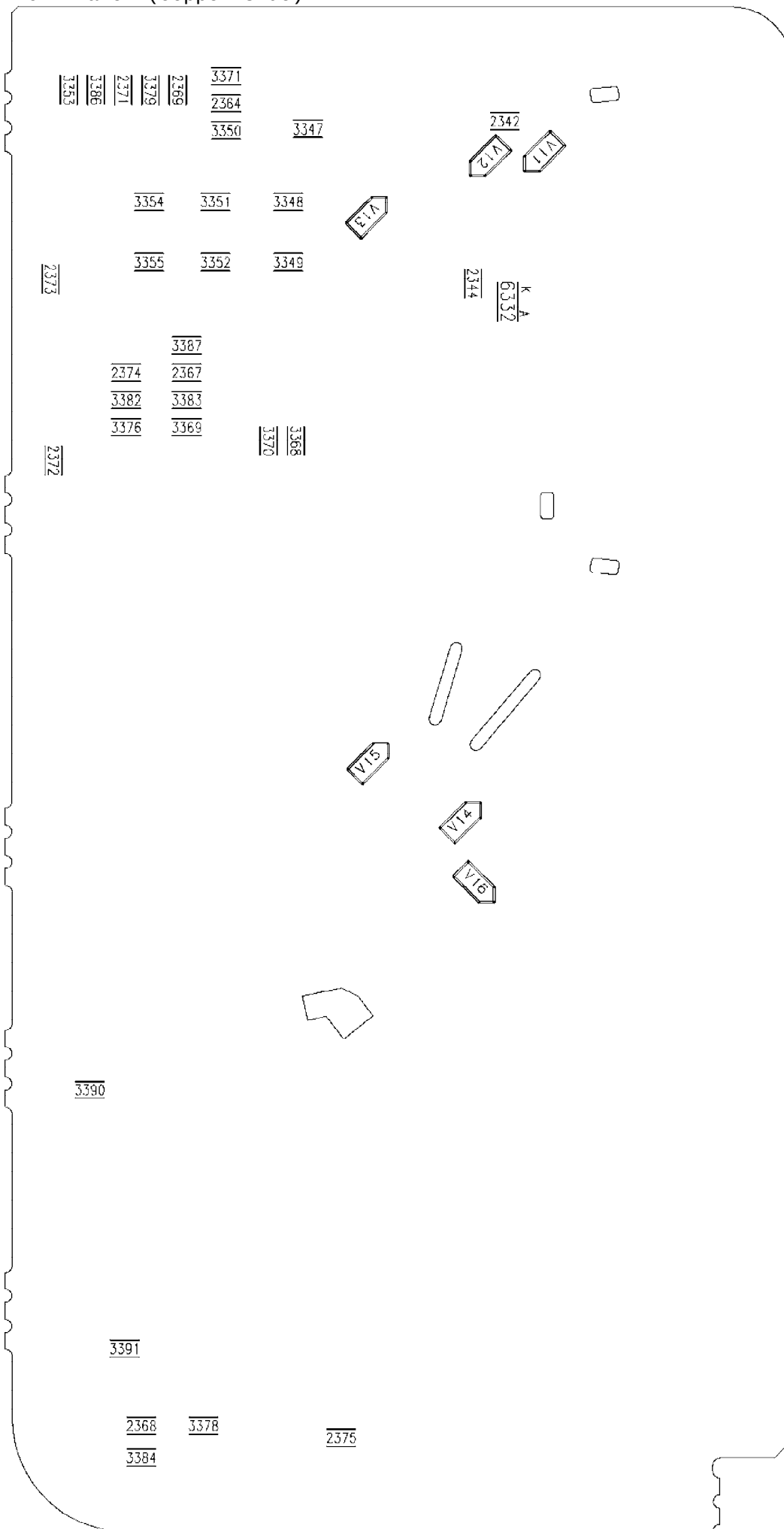
L+
L-
R-
R+
1
2
3
4

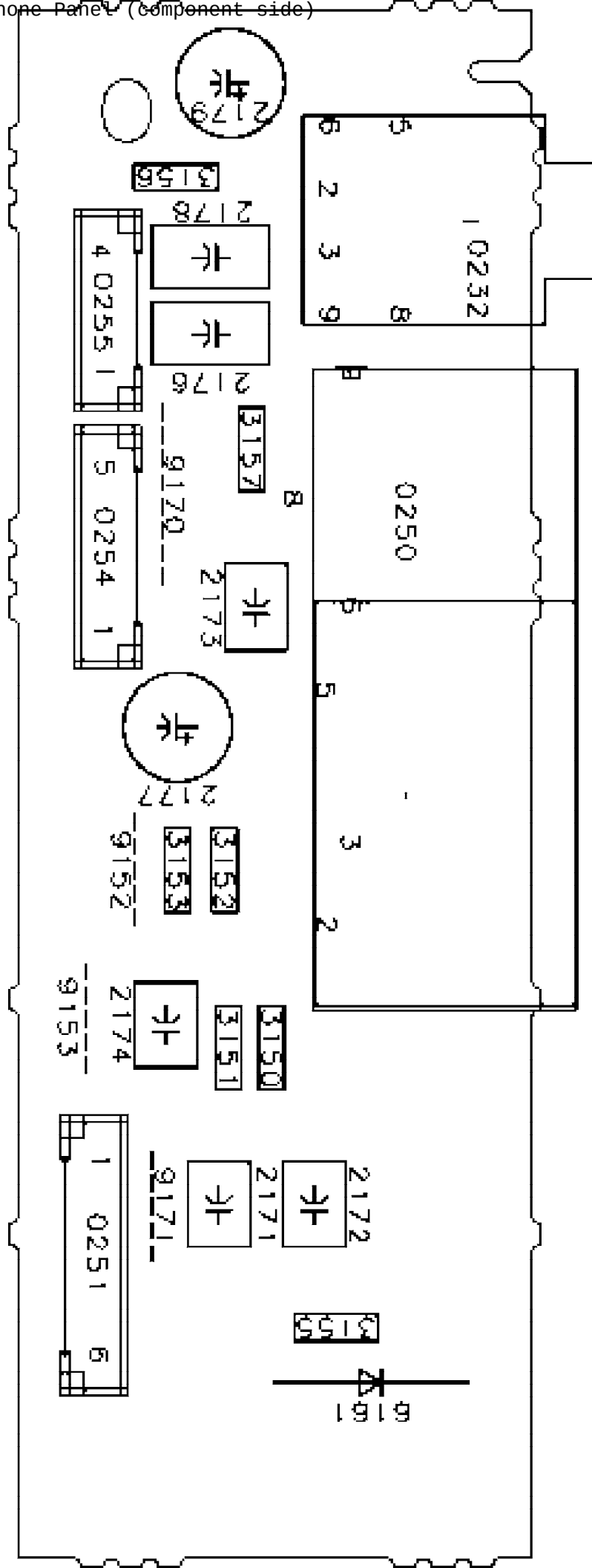
TO
Speakers

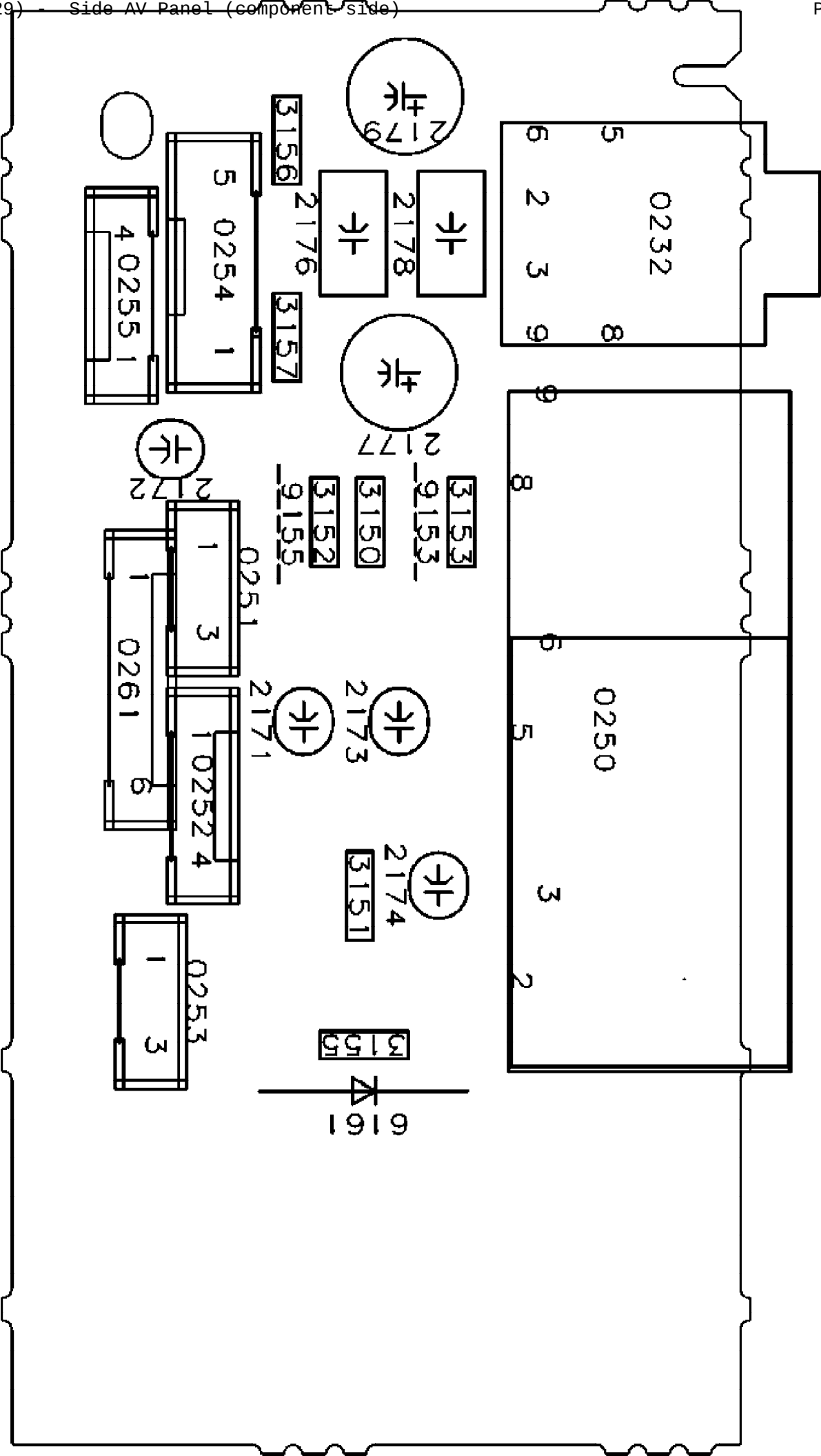


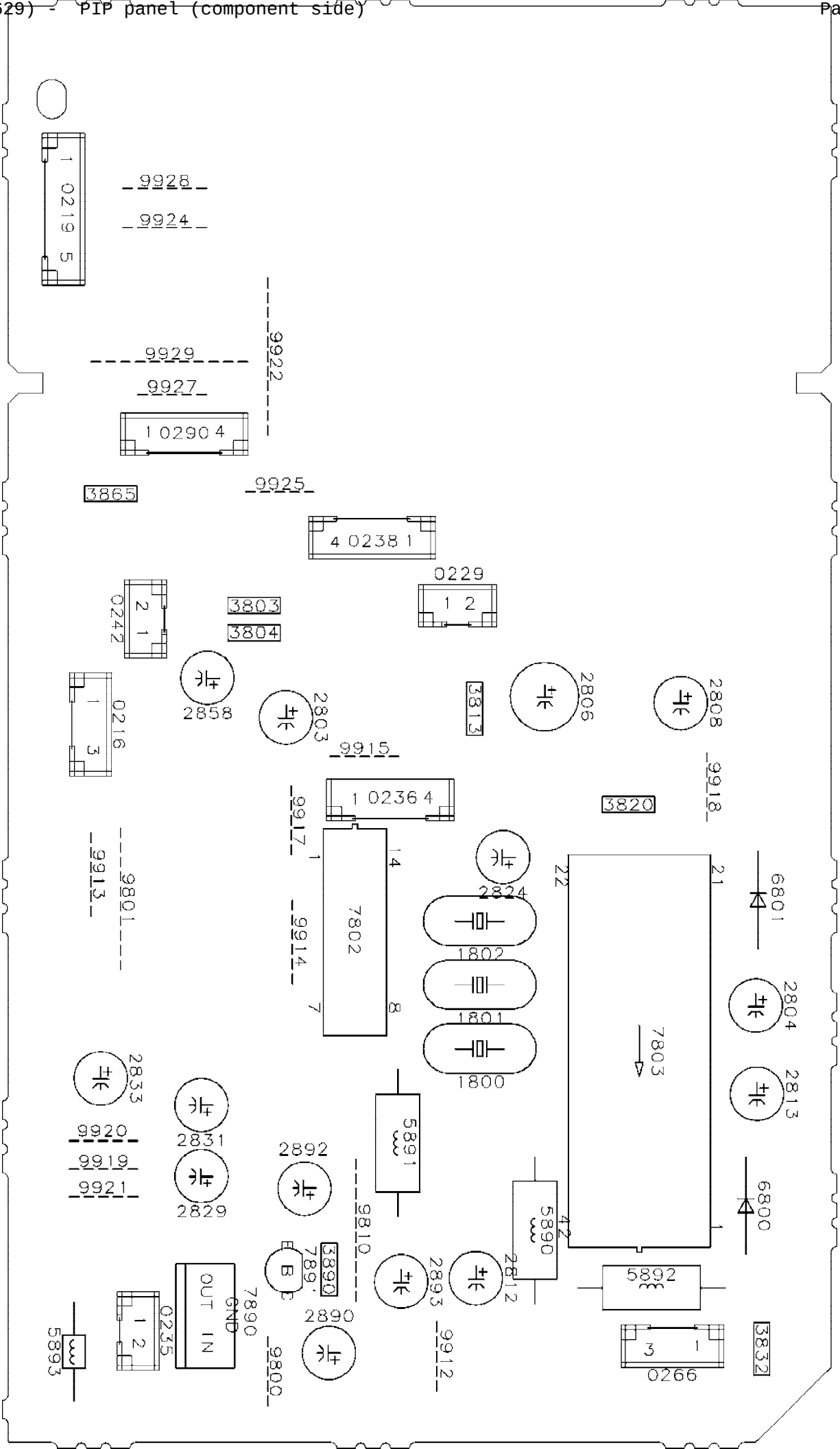


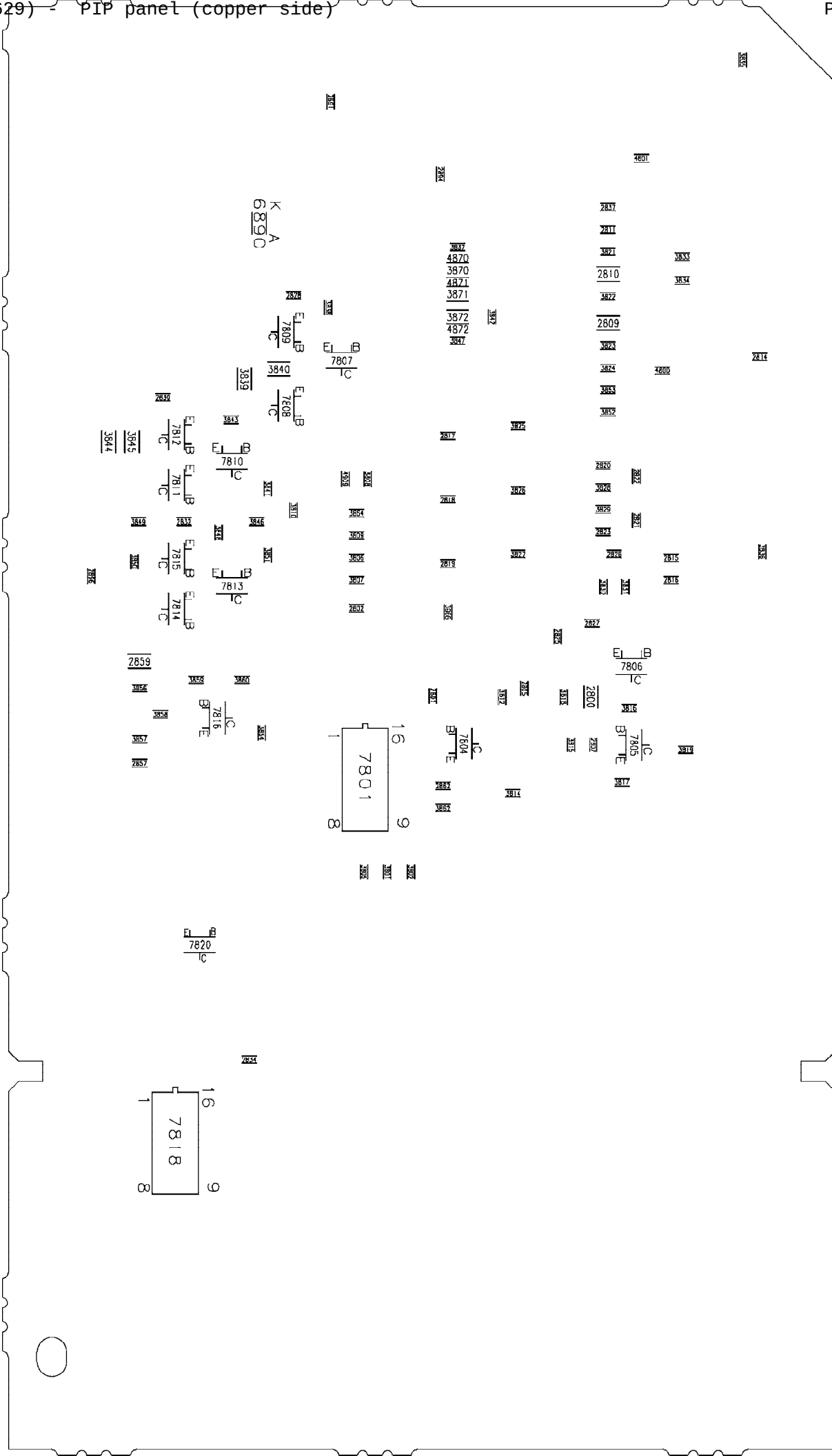


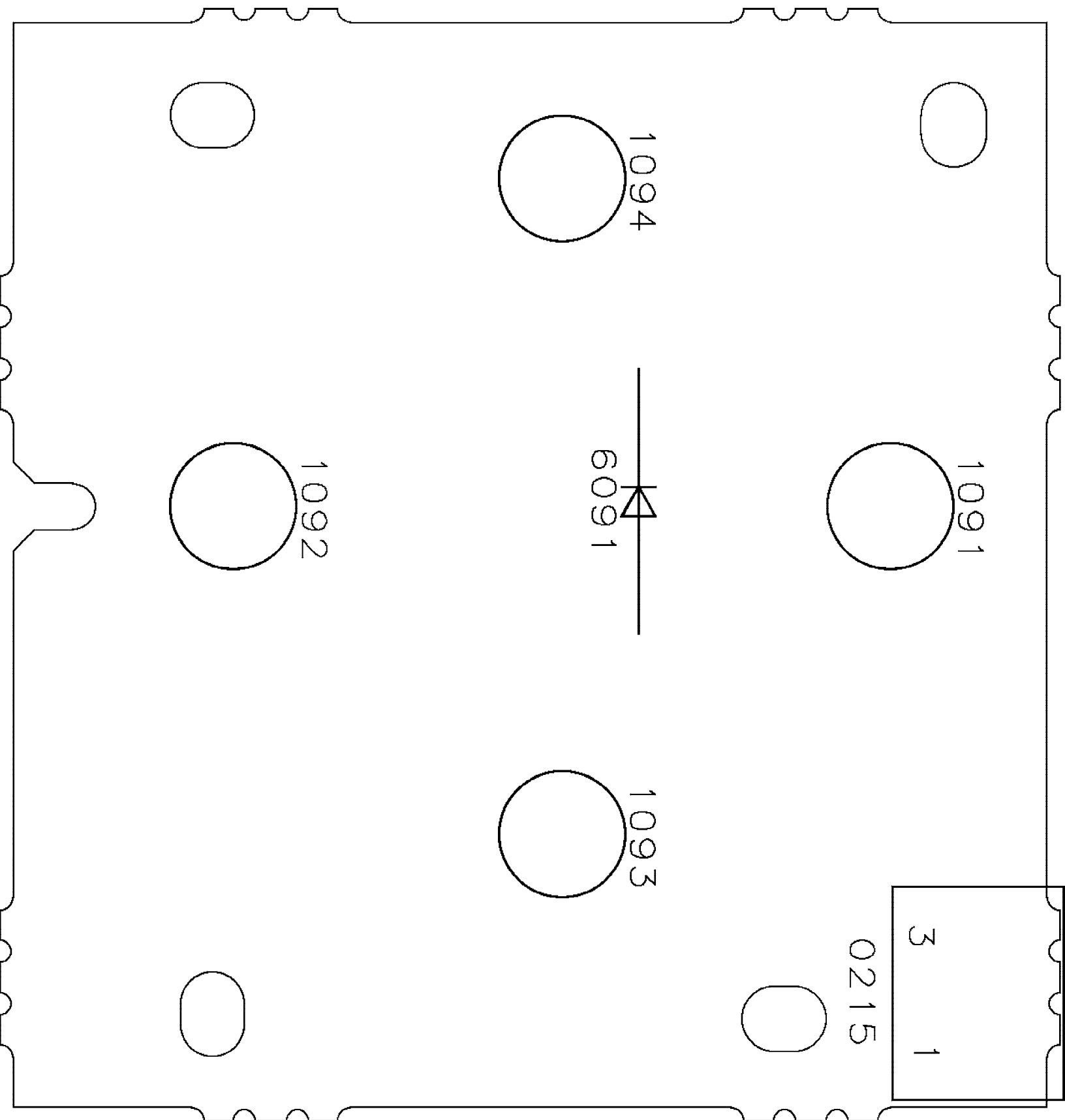


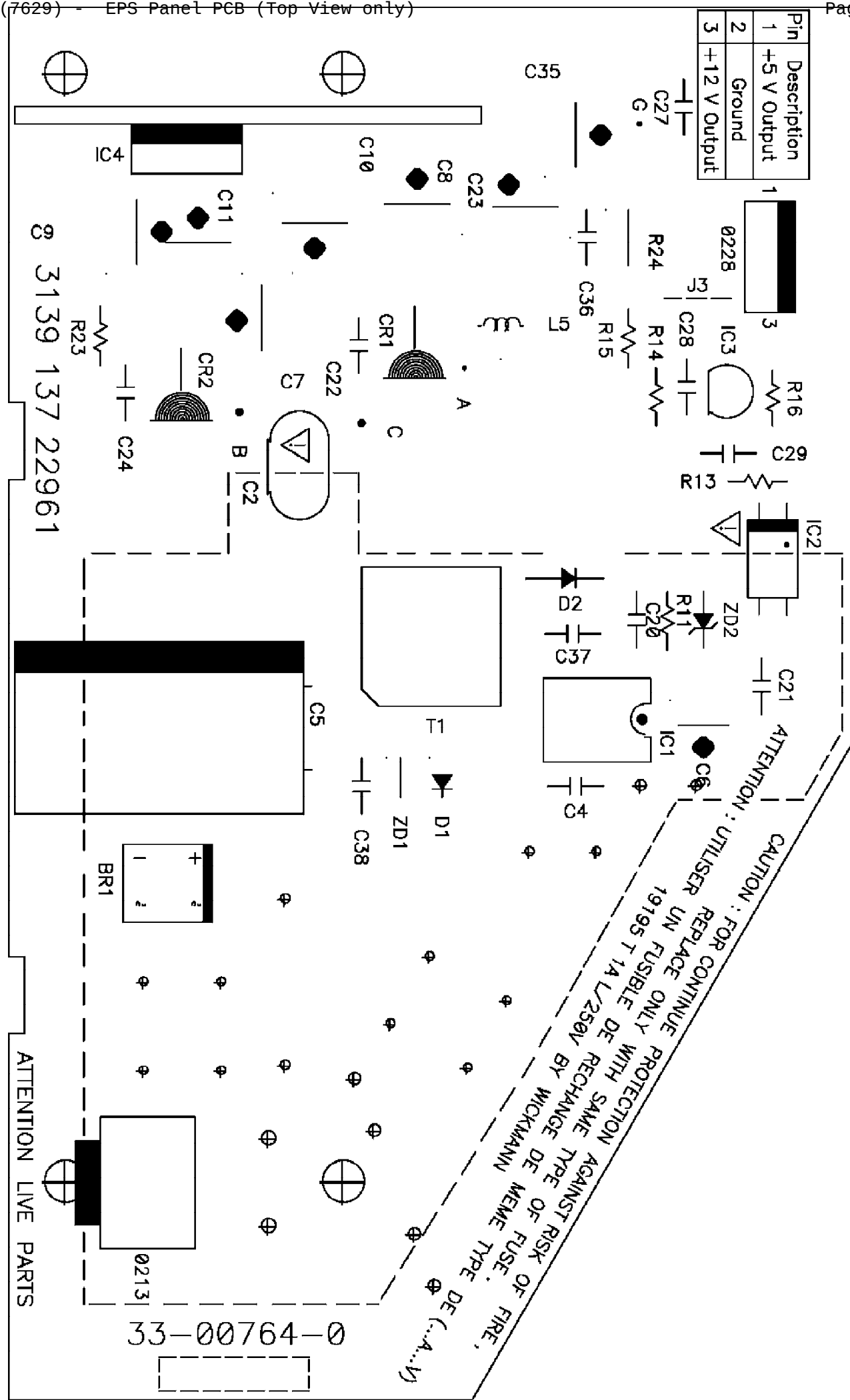


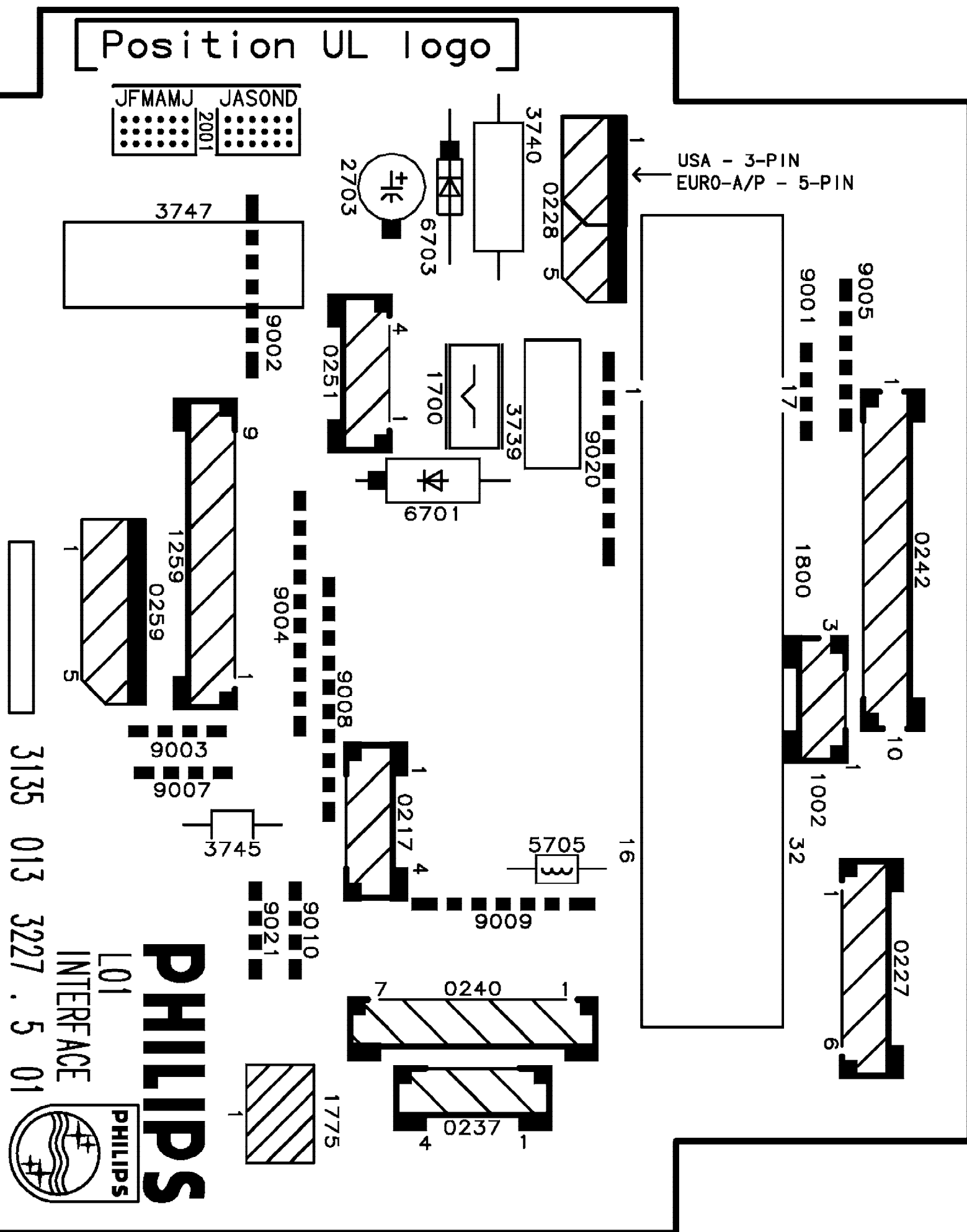


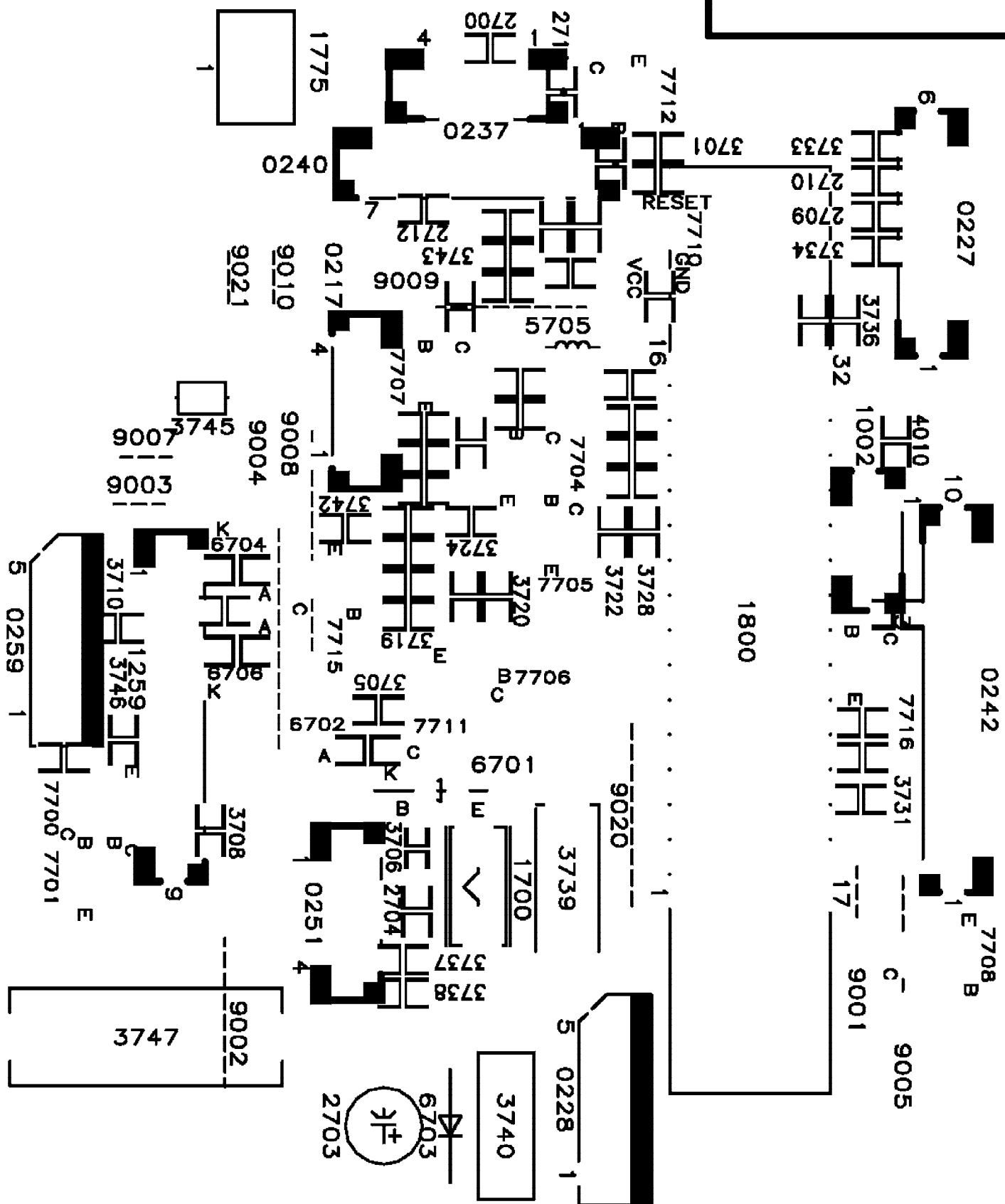












Directions For Use (DFU)

For Customer Operating Instructions, please visit our web site: www.p4c.philips.com.

Safety & Maintenance Instructions, Warnings, And Notes

Safety Instructions For Repairs

Safety regulations require that during a repair:

- Due to the 'hot' parts of this chassis, the set must be connected to the AC power via an isolation transformer.
- Safety components, indicated by the symbol , should be replaced by components identical to the original ones.
- When replacing the CRT, safety goggles must be worn.

Safety regulations require that after a repair, the set must be returned in its original condition. Pay 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 is flowing, in particular:
 - all pins of the line output transformer (LOT)
 - fly-back capacitor(s)
 - S-correction capacitor(s)
 - line output transistor
 - pins of the connector with wires to the deflection coil
 - 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 AC power cord for external damage.
- Check the strain relief of the 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 AC plug and the secondary side (only for sets that have an isolated power supply). Do this as follows:
 1. Unplug the AC power cord and connect a wire between the two pins of the AC plug.
 2. Turn on the main power switch (keep the AC power cord unplugged!).
 3. Measure the resistance value between the pins of the AC plug and the metal shielding of the tuner or the aerial connection of the set. The reading should be

between 4.5 M Ω and 12 M Ω .

4. Switch the TV OFF and remove the wire between the two pins of the AC plug.
- Check the cabinet for defects, to prevent the possibility of the customer touching any internal parts.

Maintenance Instructions

It is recommended to have a maintenance inspection carried out by qualified service personnel. The interval depends on the usage conditions:

- When the set is used under normal circumstances, for example in a living room, the recommended interval is three to five years.
- When the set is used 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.

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 Fig. 2-1, to discharge the picture tube. Use a high voltage probe and a multi-meter (position VDC). Discharge until the meter reading is 0 V (after approx. 30 s).

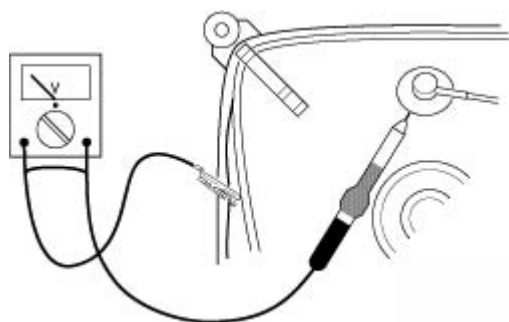


Figure:

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD).

Careless handling during repair can reduce life drastically. When repairing, make sure that 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 potential. Available ESD protection equipment:

- Complete kit ESD3 (small table mat, wristband, connection box, extension cable, and ground cable) 4822 310 10671.
- Wristband tester 4822 344 13999.
- Together with the deflection unit and any multi-pole unit, flat square picture tubes form an integrated unit. The deflection and the multi-pole units are set optimally at the factory. Adjustment of this unit during repair is therefore not recommended.
- Be careful during measurements in the high voltage section and on the picture tube.
- 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 the danger of a circuit becoming unstable.

Notes

- Measure the voltages and waveforms with regard to the chassis (= tuner) ground (), or hot ground (), depending on the area of circuitry being tested.
- The voltages and waveforms shown in the diagrams are indicative. Measure them in the Service Default Mode (see chapter 5) with a color bar signal and stereo sound (L: 3 kHz, R: 1 kHz unless stated otherwise) and picture carrier at 475.25 MHz (PAL) or 61.25 MHz (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 standby (). These values are indicated by means of the appropriate symbols.
- The picture tube panel has printed spark gaps. Each spark gap is connected between an electrode of the picture tube and the Aquadag coating.
- The semiconductors indicated in the circuit diagram and in the parts lists are completely interchangeable per position with the semiconductors in the unit, irrespective of the type indication on these semiconductors.

Technical Specifications, Connections And Chassis Overview

Technical Specifications

Reception

Feature	Data
• Tuning system	: PLL
• Color systems	: NTSC M : (3.58 - 4.5 MHz)
• Sound systems	: FM-mono M : (4.5 MHz) : BTSC DBX : (4.5 MHz)
• A/V connections	: NTSC M : (3.58 - 4.5 MHz)
• Channel selections	: 181 channels, full cable
• IF frequency	: 45.75 MHz
• Aerial input	: 75 Ω , Coax

Miscellaneous

Feature	Data
• AC voltage	: 90 - 140 V (± 10 %)
• AC frequency	: 60 Hz (± 5 %)
• Ambient temperature	: + 5 to + 45 deg. C
• Maximum humidity	: 90 %
• Power consumption	: 36 W (14") : 100 W (32")

- Standby Power consumption : < 3 W

Connections

Front Or Top Control, Front Or Side Connections

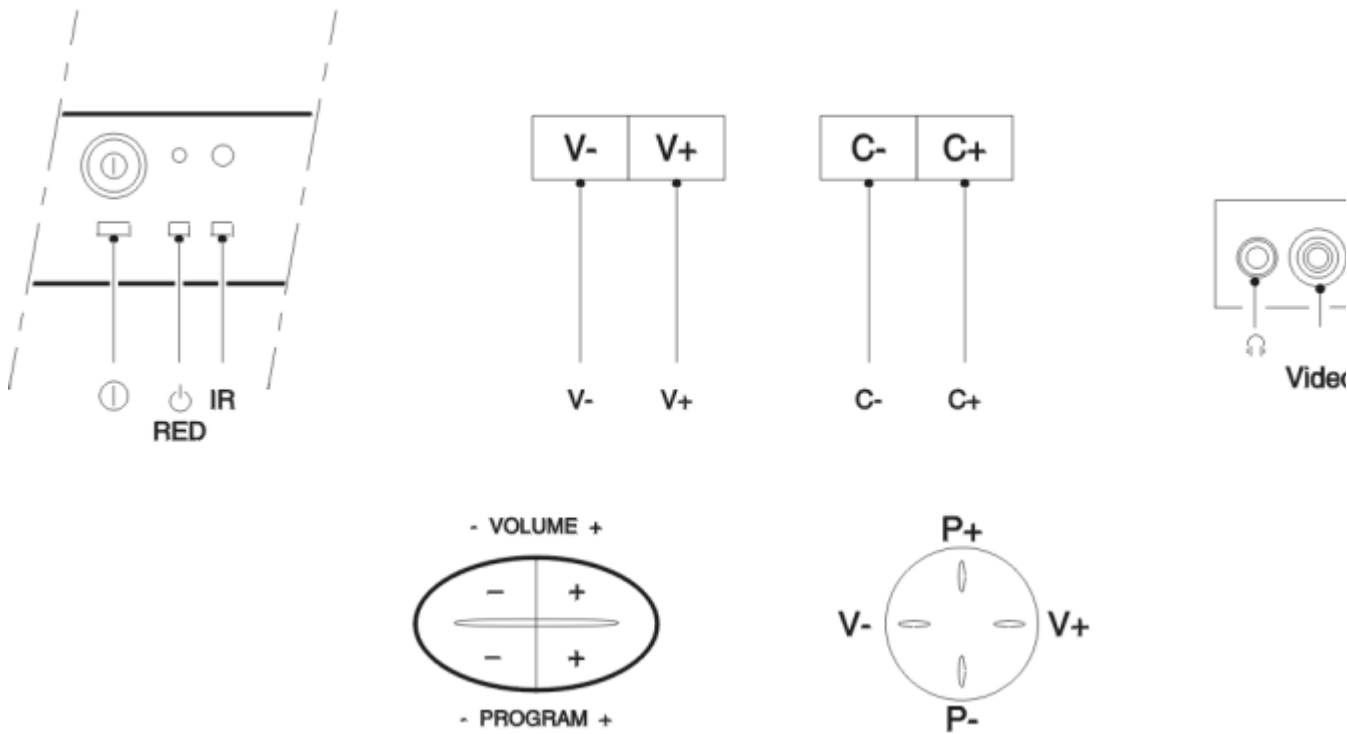


Figure:

Audio / Video In

Connector	Kind	Value	Symbol
1	Video	1 Vpp / 75 Ω	
2	Audio	L (0.2 Vrms / 10 k Ω)	
3	Audio	R (0.2 Vrms / 10 k Ω)	
4	Headphone (3.5 mm)	8 - 600 Ω / 4 mW	

Rear Connections

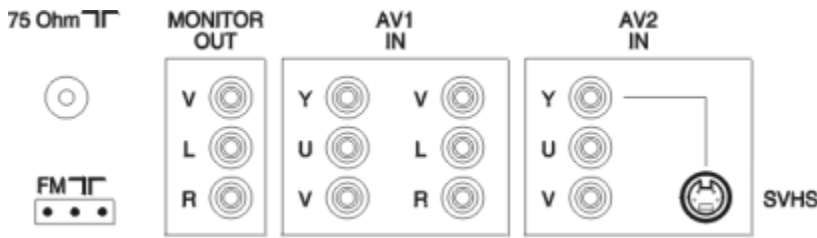


Figure:

Monitor Out

Connector	Kind	Value	Symbol
1	Video	1 Vpp / 75 Ω	
2	Audio	L (0.5 Vrms / 1 kΩ)	
3	Audio	R (0.5 Vrms / 1 kΩ)	

YUV In

Connector	Kind	Value	Symbol
1	Y	0.7 Vpp / 75 Ω	
2	U	0.7 Vpp / 75 Ω	
3	V	0.7 Vpp / 75 Ω	

AV1 In

Connector	Kind	Value	Symbol
4	Video	1 Vpp / 75 Ω	
5	Audio	L (0.5 Vrms / 10 kΩ)	
6	Audio	R (0.5 Vrms / 10 kΩ)	

AV2 In

Connector	Kind	Value	Symbol
1	Video	1 Vpp / 75 Ω	
2	Audio	L (0.5 Vrms / 10 k Ω)	
3	Audio	R (0.5 Vrms / 10 k Ω)	

AV2 In (SVHS)

Connector	Kind	Value	Symbol
1		gnd	
2		gnd	
3	Y	1 Vpp / 75 Ω	
4	C	0.3 Vpp / 75 Ω	