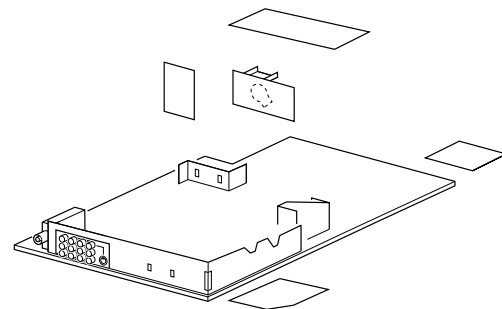


Service
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Service



Service Manual

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1. Technical Specifications, Connections, and Chassis Overview

Index:

1. Technical Specification
2. Connections
3. Chassis Overview

Note:

- Described specifications are valid for the whole product range (see Product Survey for specific models).
- Figures can deviate slightly from the actual situation, due to different set executions.

- : BI-NICAM B/G, D, D/K, I
- A/V connections : NTSC 3.58, 4.43
- Channel selections : 100 or 125 channels
- : UVSH or full cable
- Aerial input : 75 Ohm
- : IEC- or F-type

1.1 Technical Specifications

1.1.1 Reception

- Tuning system : PLL
- Colour systems : NTSC 3.58, 4.43
- : PAL B/G, B/H, D/K, I
- : SECAM B/G, D/K, K1
- Sound systems : FM-Stereo
- : 2CS (B/G, China, Korea)
- : 2CS B/G, DK
- : BTSC DBX
- : NICAM B/G, D, D/K, I

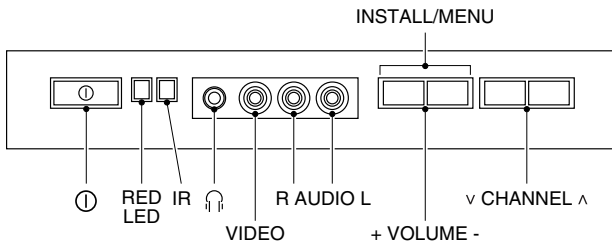
1.1.2 Miscellaneous

- Audio output : Stereo: 2 x 1 W or 2 x 3W or 2 x 5W or 2 x 10W
- : Mono: 1 x 1W or 1 x 3W or 1 x 4W or 2 x 2W
- Mains voltage : 90 - 276 V or 150-276V
- Mains frequency : 50 / 60 Hz
- Ambient temperature : + 5 to + 45 deg. C
- Maximum humidity : 90 %
- Power consumption : 52 W (20") to 120 W (36")
- Standby Power consumption : < 3 W

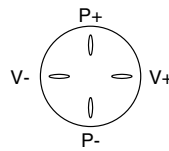
1.2 Connections

1.2.1 Front/Side Connections and Front/Top Control

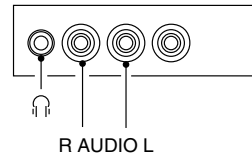
FRONT CONTROL + FRONT I/O



TOP CONTROL



SIDE I/O



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240403

Figure 1-1 Front/Side connections and Front/Top control

Audio / Video In

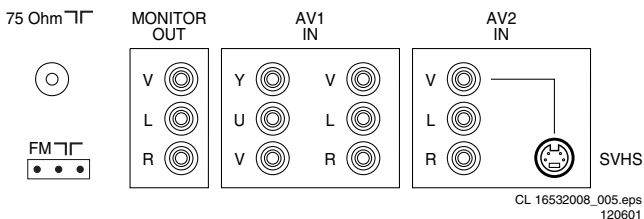
- 1 - Video CVBS 1 Vpp/75 Ohm
- 2 - Audio L 0.2 Vrms/10 kOhm
- 3 - Audio R 0.2 Vrms/10 kOhm
- 4 - Headphone 8 - 600 Ohm, 4 mW

- 3 - Audio R 0.5 Vrms/1 kOhm

AV1 YUV In (if present)

- 1 - Y 0.7 Vpp/75 Ohm
- 2 - U 0.7 Vpp/75 Ohm
- 3 - V 0.7 Vpp/75 Ohm

1.2.2 Rear Connections



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120601

Figure 1-2 Rear connections

Monitor Out

- 1 - Video CVBS 1 Vpp/75 Ohm
- 2 - Audio L 0.5 Vrms/1 kOhm

AV1 In

- 1 - Video CVBS 1 Vpp/75 Ohm
- 2 - Audio L 0.5 Vrms/10 kOhm
- 3 - Audio R 0.5 Vrms/10 kOhm

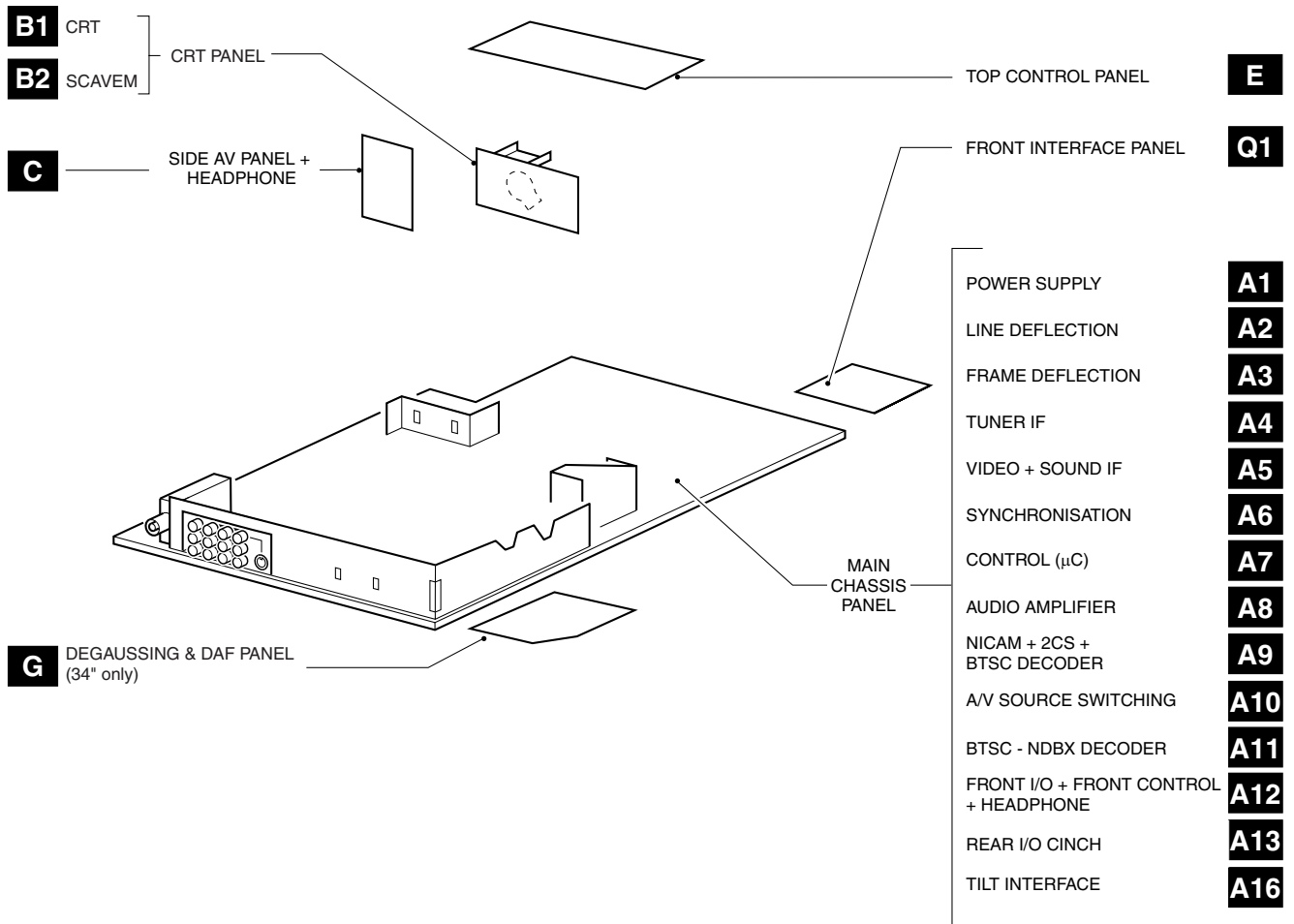
AV2 In

- 1 - Video CVBS 1 Vpp/75 Ohm
- 2 - Audio L 0.5 Vrms/10 kOhm
- 3 - Audio R 0.5 Vrms/10 kOhm

AV2 In (SVHS)

- 1 - gnd
- 2 - gnd
- 3 - Y 1 Vpp/75 Ohm
- 4 - C 0.3 Vpp/75 Ohm

1.3 Chassis Overview



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Figure 1-3 PWB Location

2. Safety & Maintenance Instructions, Warnings, and Notes

Index of this chapter:

1. Safety Instructions for Repairs
2. Maintenance Instructions
3. Warnings
4. Notes

2.1 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 resolder 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 resoldering 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 MOhm and 12 MOhm.
 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.

2.2 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.

2.3 Warnings

- In order to prevent damage to ICs and transistors, avoid all high voltage flashovers. In order to prevent damage to the picture tube, use the method shown in 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).

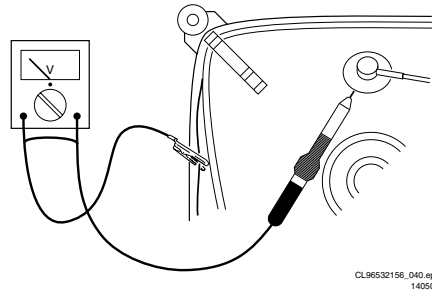


Figure 2-1 Discharge picture tube

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD **▲**). Careless handling during repair can reduce life drastically. 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 tablemat, 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.

2.4 Notes

2.4.1 General

- Measure the voltages and waveforms with regard to the chassis (= tuner) ground (\perp), or hot ground (\downarrow), 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 "Service Modes, Error Codes, and Faultfinding" section) with a color bar signal and stereo sound (L: 3 kHz, R: 1 kHz unless stated otherwise) and picture carrier at 61.25 MHz (NTSC, channel 3).
- Where necessary, measure the waveforms and voltages with \square and without \times 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.

2.4.2 Schematic Notes

- All Resistor values are in ohms and the value multiplier is often used to indicate the decimal point location (e.g. 2K2 indicates 2.2 kOhm).
- Resistor values with no multiplier may be indicated with either an 'E' or an 'R' (e.g. 220E or 220R indicates 220 Ohm).
- All Capacitor values are expressed in Micro-Farads ($\mu = \times 10^{-6}$), Nano-Farads ($n = \times 10^{-9}$), or Pico-Farads ($p = \times 10^{-12}$).
- Capacitor values may also use the value multiplier as the decimal point indication (e.g. 2p2 indicates 2.2 pF).
- An 'asterisk' (*) indicates component usage varies. Refer to the diversity tables for the correct values.
- The correct component values are listed in the Electrical Replacement Parts List. Therefore, always check this list when there is any doubt.

2.4.3 Practical Service Precautions

- **It makes sense to avoid exposure to electrical shock.** While some sources are expected to have a possible dangerous impact, others of quite high potential are of limited current and are sometimes held in less regard.
- **Always respect voltages.** While some may not be dangerous in themselves, they can cause unexpected reactions - reactions that are best avoided. Before reaching into a powered TV set, it is best to test the high voltage insulation. It is easy to do, and is a good service precaution.
- **Before powering up the TV set with the back cover off** (or on a test fixture), attach a clip lead to the CRT DAG ground and to a screwdriver blade that has a well insulated handle. After the TV is powered on and high voltage has developed, probe the anode lead with the blade, starting at the case of the High Voltage Transformer (flyback - IFT). Move the blade to within two inches of the connector of the CRT. **If there is an arc, you found it the easy way, without getting a shock!** If there is an arc to the screwdriver blade, replace the part which is causing the problem; the High Voltage Transformer or the lead (if it is removable).

3. Directions for Use

SAFETY INFORMATION AND USEFUL TIPS

Safety Information

- Disconnect mains plug when :
 - the red light below the TV screen is flashing continuously.
 - a bright white line is displayed across the screen.
- cleaning the TV screen. Never use abrasive cleaning agents. Use a slight damp chamois leather or soft cloth.
- there is a lightning storm.
- the set is left unattended for a prolonged period of time.
- No naked flame sources, such as lighted candles, should be placed on top of the TV or in the vicinity.
- Do not place your TV set under direct sunlight or heat.
- Leave at least 5 cm around each side of TV set to allow for proper ventilation.
- Avoid placing your set (e.g. near the window) where it is likely to be exposed to rain or water.
- No objects filled with liquids should be placed on top of the TV so as to avoid dripping or splashing of liquids on the set.

Useful Tips

- Do not leave your set on standby mode for a prolonged period of time. Switch off set to allow it to be demagnetised. A demagnetised set supports good picture quality.
- Do not shift or move the set around when it is switched on. Unevenness in colour in some parts of the screen may occur.
- Never attempt to repair a defective TV yourself. Always consult a skilled service personnel.

BEFORE CALLING SERVICE

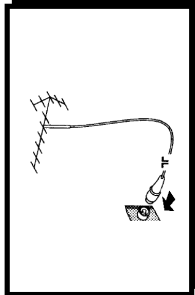
Below is a list of frequently occurred symptoms. Before you call for service, make these simple checks. Some of these symptoms can easily be rectified if you know what to do.

Symptom

What you should do

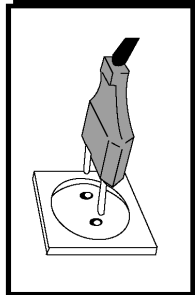
Colour patch (unevenness)	<ul style="list-style-type: none"> • Switch off the TV by the mains power button. Wait for 20 minutes before switching on again. • Check the TV is not placed too near speakers or magnetic objects.
No power	<ul style="list-style-type: none"> • Check the TV's AC power cord is plugged into the mains socket. If there is still no power, disconnect plug. Wait for 60 seconds and re-insert plug. Switch on the TV again.
No picture	<ul style="list-style-type: none"> • Check the antenna connection at the rear of the TV. • Possible TV station problem. Try another channel.
Good picture but no sound	<ul style="list-style-type: none"> • Try increasing the volume. • Check that the sound is not muted. If it is muted, press the Mute button on the remote control to restore sound.
Good sound but poor colour or no picture	<ul style="list-style-type: none"> • Try increasing the contrast and brightness setting.
Snowish picture and noise	<ul style="list-style-type: none"> • Check antenna connection at the rear of the TV.
Horizontal dotted lines	<ul style="list-style-type: none"> • Possible electrical interference e.g. hairdryer, vacuum cleaner, etc. Switch off appliances.
Double images or "Ghost" images	<ul style="list-style-type: none"> • Possible poor positioning of antenna. Using a highly directional antenna may improve reception.
TV not responding to remote control handset	<ul style="list-style-type: none"> • Check life span of batteries of remote control handset. • Aim remote control handset directly at remote control sensor lens on the TV.

HOOKING UP YOUR TV (BASIC CONNECTION)



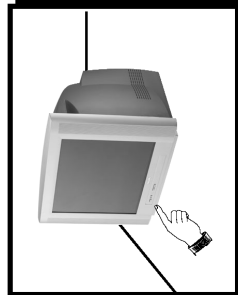
Antenna Connection

- Connect the aerial plug to the antenna socket **T** on the backcover.
- Insert the mains plug into the wall socket.



Mains Connection

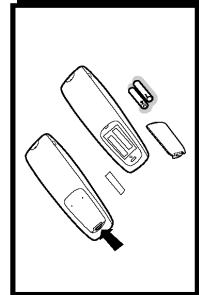
- For correct mains voltage, refer to type sticker at the rear of the TV set
 - Consult your dealer if mains supply is different.
- Note** : This diagram is not representative of the actual plug and socket.



Switching on the Set

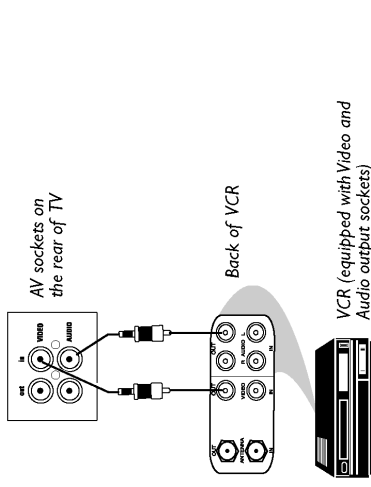
- Press the main power button to switch on/off the TV.
- If the set is on standby (indicator is red), press the **Power** button on the remote control to switch on set.

USE/CARE OF REMOTE CONTROL



- Insert the correct type of batteries into the compartment.
- Ensure the batteries are placed in the right direction.

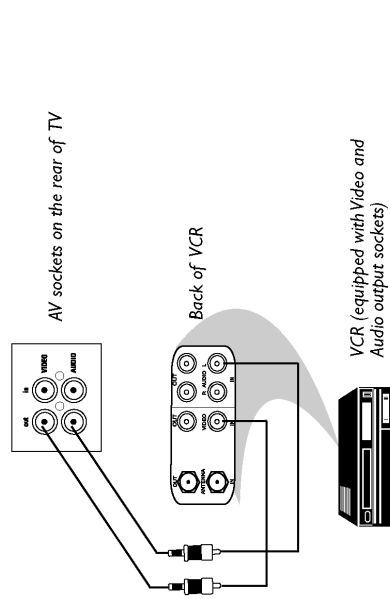
CONNECTING THE AUDIO/VIDEO SOCKETS (PLAYBACK)



You can view the playback of VCR tapes (Video Disc players, camcorders, etc.) by using the **AUDIO** and **VIDEO INPUT** sockets on the rear of the TV.

- Connect the **VIDEO** and **AUDIO IN** sockets on the rear of the TV to the **AUDIO** and **VIDEO OUT** sockets on the VCR.

CONNECTING THE AUDIO/VIDEO SOCKETS (RECORDING)



- Connect the sockets of the VCR which you wish to record from, to the corresponding **AV** sockets.

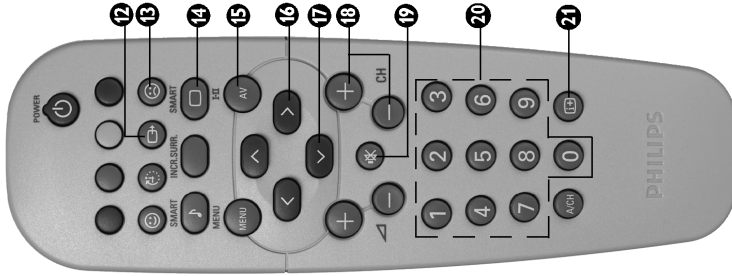
FUNCTIONS OF REMOTE CONTROL

- 1 Power button**
Switch set off temporarily to standby mode. (The red light indicator lights up when the set is on standby mode).
To switch on set from standby mode, press Channel +/-, Digit (0 -9) or Power-button.
- 2 Personal Zapping buttons**
As Personal Zapping buttons, you can surf up to 10 personal channels for each button. For detailed description of functions, refer to section on "Personal Zapping".
- 3 Smiley button**
Allows to add and store your personal preference channels in your Personal Preference list. For detailed description of functions, refer to section on "Using your Personal Zapping feature".
- 4 Sleptimer Button**
Allows you to select a time period after which the set will switch to standby mode automatically.
- 5 Smart Sound Button**
Press the Smart Sound button repeatedly to access 4 different types of sound settings and choose your desired setting.
- 6 Incredible Surround Button**
Allows you to select Incredible Surround sound when transmission is in stereo mode.
Allows you to select Spatial Sound when transmission is in mono mode.
- 7 Menu Button**
Displays the main menu. Also exits menu from screen.
- 8 Cursor Up Button**
Allows you to select the next item on the menu.
- 9 Cursor Left Button**
Allows you to select the sub-menus and adjust the settings.
- 10 Volume + / - Button**
Increases or decreases volume.
- 11 A/CH(Alternate channel) Button**
Allows you to change between the current channel and the previous channel.

7

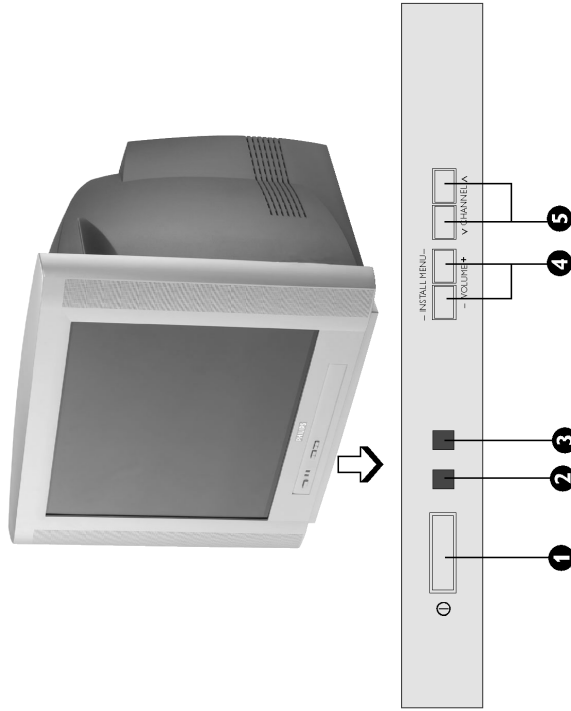
FUNCTIONS OF REMOTE CONTROL

- 12 A/V Button**
Allows you to select the AV channels.
- 13 Frownie button**
Allows to delete stored personal preference channels in your Personal Preference list. For detailed description of functions, refer to section on "Personal Zapping".
- 14 Smart Picture Button**
Press the Smart Picture button repeatedly to access 5 different types of picture settings and choose your desired setting.
- 15 SAP**
Not Applicable.
- 16 Cursor Right Button**
Allows you to access the sub-menus and adjust the settings.
- 17 Cursor Down Button**
Allows you to select the next item on the menu.
- 18 Channel + / - Buttons**
Allows you to select channels in ascending or descending order.
- 19 Mute Button**
Mutes sound. To restore sound, press button again.
- 20 Digit (0 -9) Buttons**
Press to select a channel. For a 2-digit channel number, press the first digit and followed immediately by the second digit.
- 21 OSD button**
Allows you to display the current channel number. It also allows to exit menu from the screen after control adjustments.



8

FUNCTIONS OF TV CONTROLS



1	Mains Power button	Switch mains power on or off.
2	Standby light indicator	Indicate red light when standby mode is activated.
3	Remote Sensor	Acts as a sensor for activating the controls of the TV when remote control handset is aimed at it.
4	Volume + / - buttons	Adjust sound volume softer/louder.
5	Channel V / ^ buttons	Select channel in descending/ascending order.

Note

- You can enter the main menu by pressing both the Volume — and + buttons at the same time.
- Press the Channel V or ^ button to select the next item on the menu.
- Press Volume — or + button to access sub-menu and adjust the settings.

SELECTING THE MENU LANGUAGE

Operating instructions generally explain the operation of the TV set using the buttons on the remote control unless otherwise stated. Please read the following instructions carefully and follow the steps as shown to familiarise yourself with the installations and all features available in your set.

Note: When there is no signal input to the TV, you may encounter instability of the on screen display. In this instance, please use the button on your remote control to select an AV channel.

The Language feature allows you to set the TV's on-screen menu to be shown in your desired language.

Step	Press button	Result on screen
1	Enter main menu.	
2	Select Install.	
3	Enter the Install menu.	
4	Press button repeatedly to cycle through the language list and select the language of your choice.	
5	Exit menu from screen.	

MANUAL TUNING OF CHANNELS

Manual tuning of channels allows you to select your preferred channel number for every available programme.

Step	Press button	Result on screen
1	MENU Enter main menu.	
2	Press button repeatedly until Install is selected.	
3	Enter install menu.	
4	Press button repeatedly until Manual Store is selected.	
5	Enter manual store menu.	
6	Press button repeatedly until Search is selected.	

AUTOMATIC TUNING OF CHANNELS

Automatic tuning of channels allows you to store each programme automatically.

Step	Press button	Result on screen
1	MENU Enter main menu.	
2	Press button repeatedly until Install is selected.	
3	Enter install menu.	
4	Select Auto Store .	
5	Start automatic tuning of channels.	
6	When tuning is completed, exit menu from screen.	

MANUAL TUNING OF CHANNELS

Step	Press button	Result on screen
7	>	
8	>	<p>Select Channel.</p>
9	1 2 3 4 5 6 7 8 9 0	<p>Key in the channel number.</p>
10	>	<p>Press button repeatedly until Store is selected.</p>
11	>	<p>Store tuned channel. Note : If you want to continue searching for another transmitting channel, repeat steps 7 to 11.</p>
12	Ⓜ	<p>Exit menu from screen.</p>


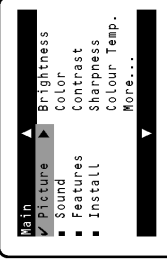

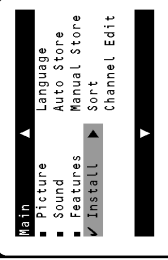

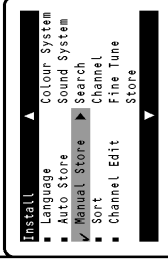

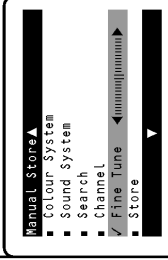


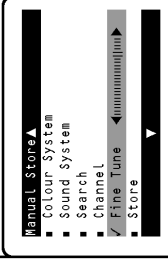


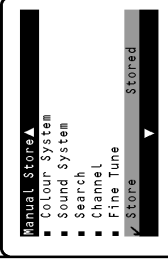

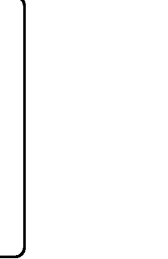



SELECTING THE COLOUR/SOUND SYSTEM

This feature allows you to select your desired **Colour** and **Sound** system. If **Auto** is selected, the respective colour and sound system will be automatically selected according to the transmission system. **Note** : Select your desired colour and sound system manually if reception is poor at **Auto** mode.

Step	Press button	Result on screen
6	< or >	<p>Repeat step 1 to step 5 as in “Manual Tuning of TV Channels”</p> <p>Colour System is selected.</p>
7	>	<p>Select the desired colour system (Auto, PAL, NTSC 3.58, NTSC 4.43 or SECAM).</p>
8	>	<p>Press button repeatedly until STORE is selected.</p> <p>Store selected system.</p>
9	> or <	<p>Proceed to select Sound System.</p>
10	< or >	<p>Select the desired sound system (Auto, BG, I or DK).</p>
11	>	<p>Press button repeatedly until STORE is selected.</p> <p>Store selected system.</p>
12	>	
13	Ⓜ	<p>Exit menu from screen.</p>


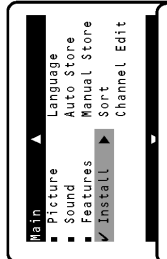

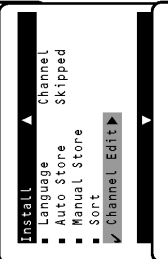

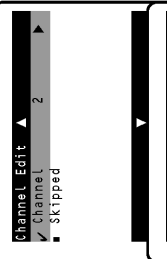

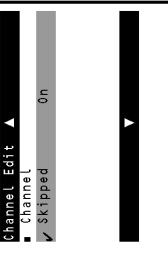

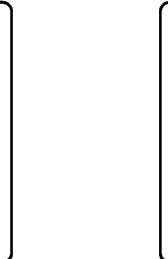
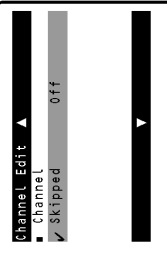

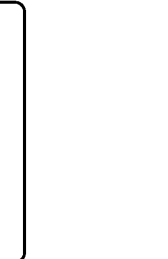



FINE TUNING OF CHANNELS

This feature allows you to adjust picture reception in areas of weak reception.




<p>Step</p> <p>1</p>	<p>Press button</p> <p>MENU</p>  <p>Enter main menu.</p>	<p>Result on screen</p> 
<p>2</p>	<p>Press button repeatedly until Install is selected.</p> 	
<p>3</p>	<p>Enter install menu.</p> 	
<p>4</p>	<p>Press button repeatedly until Manual Store is selected.</p> 	
<p>6</p>	<p>Enter manual store menu.</p>  <p>Press button repeatedly until Fine Tune is selected.</p> 	
<p>7</p>	<p>Fine tune until the best reception is obtained.</p>  <p>or</p> 	
<p>8</p>	<p>Select Store.</p> 	
<p>9</p>	<p>Store last fine-tuned status.</p> 	
<p>10</p>	<p>Exit menu from screen.</p> 	

EDITING OF CHANNELS

This feature allows you to skip or edit channels which have bad or weak TV signal or channels that you do not watch often. **Note** : Once a channel is skipped, you cannot have access to it by the CH (Channel) + or - button. You can only have access to the channel by the Digit (0 -9) buttons.

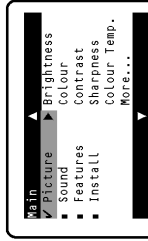
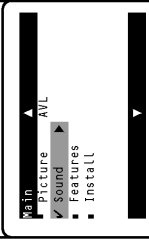
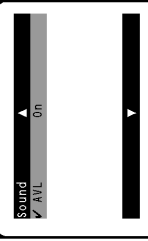
<p>Step</p> <p>1</p>	<p>Press button</p> <p>MENU</p>  <p>Enter main menu.</p>	<p>Result on screen</p> 
<p>2</p>	<p>Press button repeatedly until Install is selected.</p> 	
<p>3</p>	<p>Enter install menu.</p> 	
<p>4</p>	<p>Press button repeatedly until Channel Edit is selected.</p> 	
<p>5</p>	<p>Enter Channel Edit menu.</p> 	
<p>6</p>	<p>Key in the channel number to be skipped.</p> <p>1 2 3 4 5 6 7 8 9 0</p>	
<p>7</p>	<p>Select Skipped.</p> 	
<p>8</p>	<p>Select On to skip channel.</p> 	
<p>9</p>	<p>Exit menu from screen.</p> 	

HOW TO RESTORE SKIPPED CHANNELS

- Repeat **Steps 1 to 5** as "Editing of Channels".
- Key in the channel number to be restored by the **Digit (0 - 9)** button.
- Select **Skipped** by the  button.
- Select **Off** to restore channel by the  button.
- Exit menu from screen by the  button.

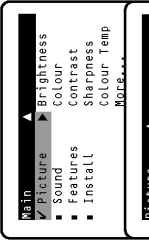
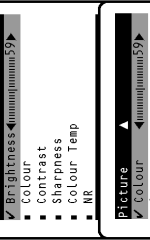
ADJUSTING THE TV SOUND

The sound menu allows you to make adjustments to Auto Volume leveller (AVL). This feature enables volume to remain at a pre-determined level should there be a sudden change in volume during commercial breaks or channel switching.

Step	Press button	Result on screen
1	MENU	
2	Down arrow	
3	Right arrow	
4	Left arrow or Right arrow	Select On to switch on AVL .
5	Exit button	Exit menu from screen.

ADJUSTING THE TV PICTURE



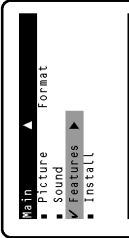


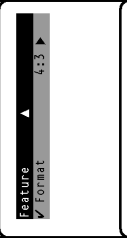


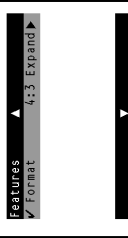


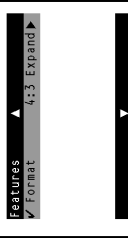


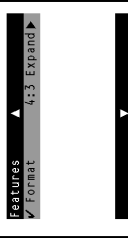



The picture menu allows you to make adjustments to the picture.

Step	Press button	Result on screen
1	MENU	
2	Right arrow	
3	Left arrow or Right arrow	Select item.
4	Left arrow or Right arrow	Adjust level or select desired setting.
5	Exit button	Exit menu from screen.

Picture menu items	Activities
Brightness	Increase or decrease brightness level.
Colour	Increase or decrease color level.
Contrast	Increase or decrease contrast level.
Sharpness	Increase or decrease sharpness level to improve detail in picture.
Colour temperature	Choose from 3 settings (Normal, Warm or Cool).
NR (Noise Reduction)	Select "On" to reduce "noisy" picture (little dots on picture) due to weak signal.
Contrast +	Select "On" to allow you to optimise the total contrast for improved picture quality.





USING THE SCREEN FORMAT

You can have a choice of two formats for your viewing pleasure, namely :- **4:3** mode and the **EXPAND 4:3** mode through the **FORMAT** menu.

<p>Step </p> <p>Press button </p>	<p>Display the main menu on screen.</p>	<p>Result on screen</p> 
<p>Step </p> <p>Press button </p>	<p>Press button repeatedly until Features is selected.</p>	<p>Result on screen</p> 
<p>Step </p> <p>Press button </p>	<p>Enter the Features menu.</p>	<p>Result on screen</p> 
<p>Step </p> <p>Press button </p>	<p>Press button repeatedly until Format is selected.</p>	<p>Result on screen</p> 
<p>Step </p> <p>Press button </p>	<p>Press the button repeatedly to cycle through the different formats (4:3 or Expand 4:3) or and select your desired format.</p>	<p>Result on screen</p> 
<p>Step </p> <p>Press button </p>	<p>Exit menu from screen.</p>	<p>Result on screen</p> 

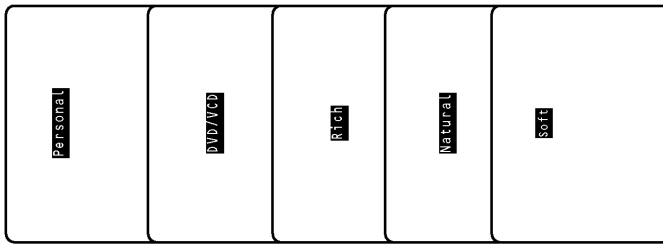
SMART PICTURE CONTROL

Whether you are watching a movie or video game, your TV has automatic video control settings matched to your current program source or content. The Smart Picture feature quickly resets your TV's video controls of program for a number of different types of programs and viewing conditions you may have in your home. Each Smart Picture setting is preset at the factory to automatically adjust the TV's Brightness, Colour, Picture and Sharpness levels.

<p>Step </p> <p>Press button </p>	<p>Press button repeatedly to cycle through the 5 settings namely, Personal, DVD/VCD, Rich, Natural and Soft and select your desired picture setting.</p>
<p>Step </p> <p>Press button </p>	<p>Exit menu from screen.</p>

Definition of Picture Settings

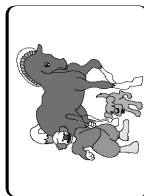
- Personal** : Picture settings are set to your preference.
- DVD/VCD** : For optimal picture setting, whenever the source is connected to DVD/VCD player, select DVD/VCD setting for AV mode.
- Rich** : Emphasize very vibrant colours. This setting is the optimal setting when you are viewing TV programmes in a brightly-lit room.
- Natural** : Emphasize original colours.
- Soft** : Emphasize "warm" colours. (Suitable for dimly-lit room condition and gives cinema-like effect when light is switched off).



When to use the Screen Formats

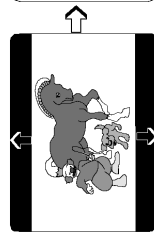
4:3 format

Select the 4:3 format if you want to display the 4:3 picture using the full surface of the screen.



Expand 4:3 format

Select the Expand 4:3 format if you want to expand movie images recorded in the letterbox format. When this format is selected, the black horizontal bars at the top and bottom are expanded thus filling up the entire TV screen.



Personal Notes:

PERSONAL ZAPPING

A list or series of favourite TV programs can be selected and stored in the 4 coloured buttons with the Personal Zapping feature. With this feature you can easily view up to a total of 10 preferred channels for each coloured button.

Adding Channels to the Favourite list

Step	Press button		Result on screen
1		Select a channel by the Digit buttons	
2		Press button to display list.	
3		Choose your favourite colour button to store selected channel. Repeat steps 1 to 3 to add and store your favourite channels to the list.	
4		Exit menu from screen.	

To view through the favourite list

1		Press the colour button that you have selected.
2		Press button repeatedly to cycle through your favourite list and view your favourite channel.

Deleting Channels from the Favourite list

1		Select a colour button and press button repeatedly to select the channel you want to delete.	
2		Press button to display list.	
3		Press button to remove item. Repeat steps 1 to 3 to delete more channels from list.	
4		Exit menu from screen.	

4. Mechanical Instructions

Index of this chapter:

1. Set Disassembly
2. Service Positions
3. Assy/Board Removal
4. Set Re-assembly

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

4.1 Set Disassembly

1. Remove all fixation screws of the rear cover (do not forget the screws that hold the rear connection panel).
2. Now pull the rear cover backwards to remove it.

4.2 Service Positions

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

Main panel without bracket (with integrated 'control' part).

1. Disconnect the strain relief of the AC power cord.
2. Remove the main panel, by pushing the two center clips outwards [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 0212.
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 its rear connections towards the CRT [5].
7. Slide the metal heatsink (near the mains transformer 5520) underneath the right chassis bracket. This secures the panel [6].

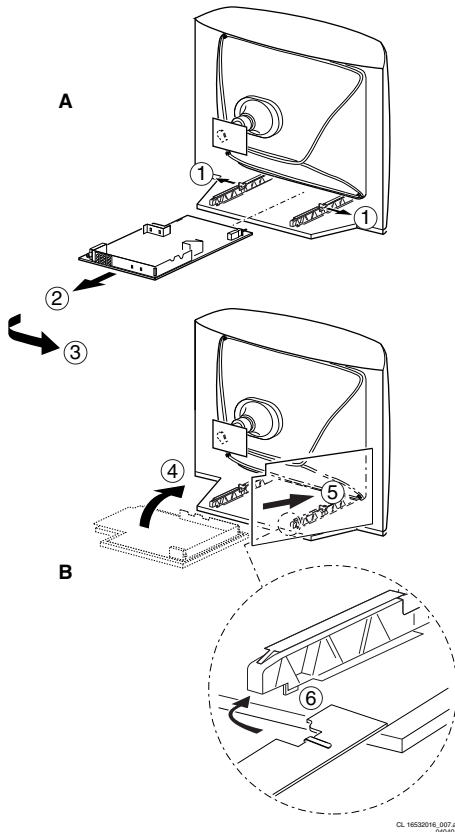


Figure 4-1 Service position (1)

Main panel with bracket (with separate 'control' part).

1. Disconnect the strain relief of the AC power cord.
2. Disconnect the degaussing coil by removing the cable from (red) connector 0212 [1].
3. Remove the panel bracket from the bottom tray, by pulling it backward [2].
4. Turn the chassis tray 90 degrees counter clockwise [2].
5. Move the panel somewhat to the left and flip it 90 degrees [3], with the components towards the CRT.
6. Turn the panel with the rear I/O towards the CRT.
7. Place the hook of the tray in the fixation hole of the cabinet bottom [4] and secure it.

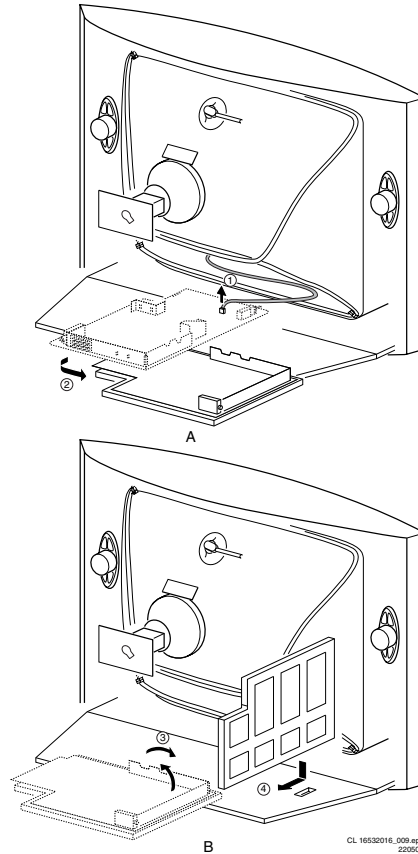


Figure 4-2 Service position (2)

4.3 Assy/Board Removal

4.3.1 Comb Filter Assy/ Board (if present)

You can remove the Comb Filter panel from the Main Carrier board, by disconnecting it from connector 1810 (located nearby the mains transformer 5520).

4.3.2 Top Control Assy/Board (if present)

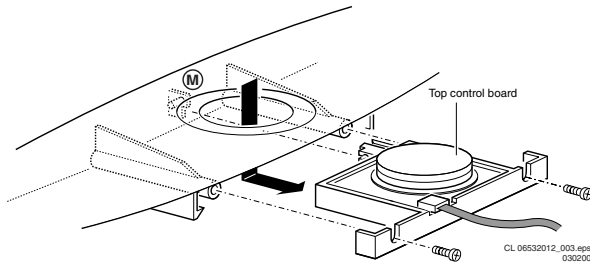


Figure 4-3 Top control removal

1. Remove the two fixation screws (if present).
2. Pull the module down and backwards (w.o.w. release it from the front hinge [M]). You must use some force.
3. Lift the board from its bracket while releasing the two fixation clamps. The board hinges on the other side.

4.3.3 Front Interface Assy/ Board (if present)

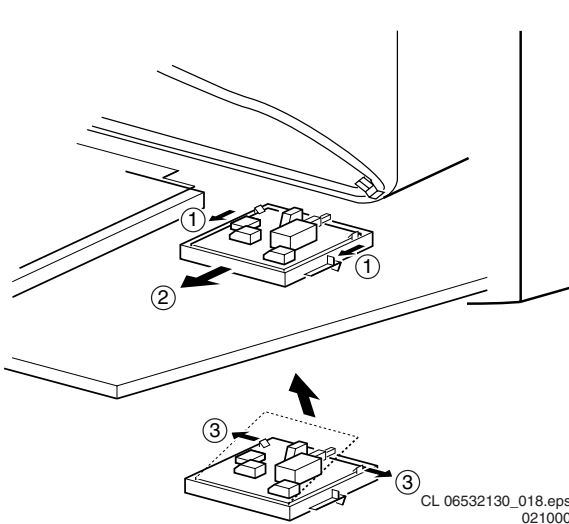


Figure 4-4 Front interface removal

1. You can remove the complete module from the bottom plate, by pulling the two fixation clamps upwards [1] while sliding the module away from the CRT [2].
2. Release the 2 fixation clamps [3] at the side of the bracket, and lift the board out of the bracket (it hinges at one side).

4.3.4 DAF Assy/ Board (if present)

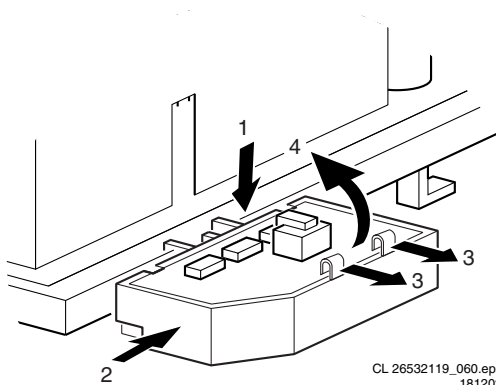


Figure 4-5 DAF panel removal

1. You can remove the complete module from the Main Carrier bracket, by pressing its fixation clamp downwards [1] while sliding the module in the direction of the CRT [2].
2. Release the 2 fixation clamps [3] to lift the board out of the bracket [4].

4.3.5 Side I/O Assy/ Board (if present)

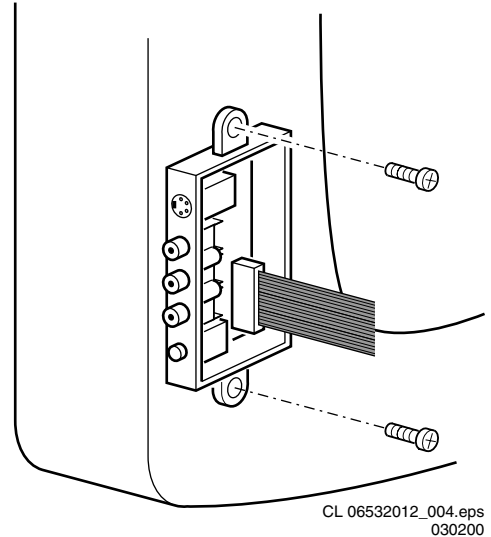


Figure 4-6 Side jack panel removal

1. You can remove the complete Side I/O assembly after removing the 2 fixation screws.
2. Release the 2 fixation clamps to lift the board out of the bracket.

4.4 Set Re-assembly

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. Re-place the strain relief of the AC power cord into the cabinet.
3. Check whether all cables are replaced in their original position.

5. Service Modes, Error Codes and Fault Finding

Index:

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

5.1 Test Points

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

Table 5-1 Test Point Overview

TEST POINT	CIRCUIT	DIAGRAM
A1-A2-A3-..	AUDIO PROCESSING	A8, A9
C1-C2-C3-..	CONTROL	A7
F1-F2-F3-..	FRAME DRIVE & OUTPUT	A3
I1-I2-I3-..	TUNER & IF	A4
L1-L2-L3-..	LINE DRIVE & 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:

- Service Default Alignment Mode.
- Video: colour bar signal.
- Audio: 3 kHz left, 1 kHz right.

5.2 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 dealer and customer.

There is also the option of using ComPair, a hardware interface between a computer (see requirements) and the TV chassis. It offers the ability of structured trouble shooting, error code reading and software version readout for all chassis. Requirements: To run ComPair on a computer (laptop or desktop) requires, as a minimum, a 486 processor, Windows 3.1 and a CD-ROM drive. A Pentium Processor and Windows 95/98 are also acceptable (see also paragraph 5.4).

Table 5-2 SW Cluster

SW Cluster	Software mane	UOC type	UOC Diversity	Special Features
L3LAN1	L01AN4x.y	TDA9582 (LS)	64K ROM Size	China
L3LAN2	L01AN5x.y	TDA9582 (LS)	64K ROM Size	India, M.E.
L3LAN3	L01AN7x.y	TDA9570 (LS)	55K ROM Size	China, AV stereo
L3LAT1	L01AT5x.y	TDA9552 (LS)	64K ROM Size	1pg TXT, AV stereo
L3LAC1	L01AC2x.y	TDA9580 (LS)	64K ROM Size	NTSC, Tai Wan, Korean

Abbreviations in Software name: A = AP, T = TXT, N = NON TXT, C = NTSC, M = MONO, D = DVD

5.2.1 Service Default Alignment Mode (SDAM)

Purpose

- To change option settings.
- To create a predefined setting to get the same measurement results as given in this manual.
- To display / clear the error code buffer.
- To override SW protections.
- To perform alignments.
- To start the blinking LED procedure.

Specifications

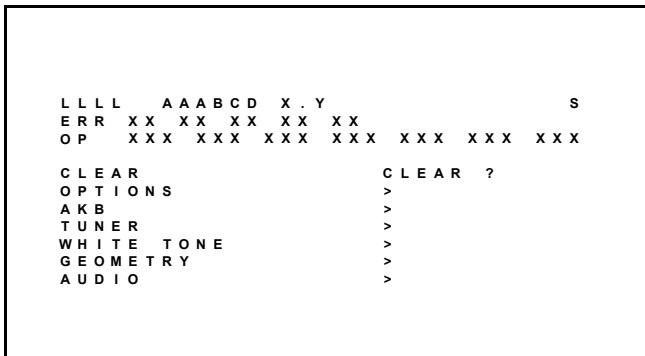
- Tuning frequency:
 - 475.25 MHz for PAL/SECAM (AP-PAL).
 - 61.25 MHz (channel 3) for NTSC-sets (AP-NTSC).
- Colour system:
 - PAL-BG for AP-PAL.
 - NTSC for AP-NTSC.
- All picture settings at 50 % (brightness, colour contrast, hue).
- Bass, treble and balance at 50 %; volume at 25 %.
- All service-unfriendly modes (if present) are disabled, like:
 - (sleep) timer,
 - child/parental lock,
 - blue mute,
 - hotel/hospitality mode
 - auto switch-off (when no "IDENT" video signal is received for 15 minutes),
 - skip / blank of non-favorite presets / channels,
 - auto store of personal presets,
 - auto user menu time-out.
- Operation hours counter.
- Software version.
- Option settings.
- Error buffer reading and erasing.
- Software alignments.

How to enter SDAM

Use one of the following methods:

- Use a standard customer RC-transmitter and key in the code 062596 directly followed by the "M" (menu) button or
- Short jumper wires 9631 and 9641 on the mono carrier (see Fig. 8-1) and apply AC power. Then press the power button (remove the short after start-up).
- Caution: Entering SDAM by shorten 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 lead to damaging the set.
- Or via ComPair.

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



CL 26532046_078.eps
260402

Figure 5-1 SDAM menu

LLLL

This is the operation hours counter. It counts the normal operation hours, not the standby hours.

AAABCD-X.Y

This is the software identification of the main micro controller: A = the project name (L01).

B = the region: E= Europe, A= Asia Pacific, U= NAFTA, L= LATAM.

C = the feature of software diversity: C = NTSC, D = DVD, N = no TXT, T = TXT.

D = the language cluster number:

X = the main software version number.

Y = the sub software version number.

S

Indication of the actual mode. S= SDAM= Service Default Alignment mode.

Error buffers

Five errors possible.

Option bytes

Seven codes possible.

Clear

Erase the contents of the error buffer. Select the CLEAR menu item and press the CURSOR RIGHT key. The content of the error buffer is cleared.

Options

To set the Option Bytes. See chapter 8.3.1 for a detailed description.

AKB

Disable (0) or enable (1) the "black current loop" (AKB = Auto Kine Bias).

Tuner

To align the Tuner. See chapter 8.3.2 for a detailed description.

White Tone

To align the White Tone. See chapter 8.3.3 for a detailed description.

Geometry

To align the set geometry. See chapter 8.3.4 for a detailed description.

Audio

To align the Audio. See chapter 8.3.5 for a detailed description.

How to navigate

- In SDAM, select menu items with the CURSOR UP/DOWN key on the remote control transmitter. The selected item will be highlighted. When not all menu items fit on the screen, move the CURSOR UP/DOWN key to display the next / previous menu items.
- With the CURSOR LEFT/RIGHT keys, it is possible to:
 - Activate the selected menu item.
 - Change the value of the selected menu item.
 - Activate the selected submenu.

- When you press the MENU button twice, 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 OSD / STATUS button.
- When you press the MENU key in a submenu, you will return to the previous menu.

How to store settings

To store settings leave the SDAM (at top level SDAM main menu) with the Standby button on the remote.

How to exit

Switch the set to STANDBY by pressing the power button on the remote control (if you switch the set 'off' by removing the AC power, the set will return in SDAM when AC power is re-applied). The error buffer is not cleared.

5.2.2 Customer Service Mode (CSM)

Purpose

When a customer is having problems with his TV-set, he can call his dealer. The service technician can then ask the customer to activate the CSM, in order to identify the status of the set. Now, the service technician can judge the severeness of the complaint. In many cases, he can advise the customer how to solve the problem, or he can decide if it is necessary to visit the customer.

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

How to enter

To enter the CSM by pressing user remote control and key in the code123654.

After switching ON the Customer Service Mode, the following screen will appear:



CL 26532046_002
040402

Figure 5-2 CSM menu

- Indication of the actual mode CSM = Customer Service Mode
- Reserved.
- Software identification of the main micro controller (see paragraph 5.2.1 for the explanation)
- Reserved item.
- Indicates TV system and or not receiving an "IDENT" signal on the selected source. It will display "NOT TUNED"
- Error code buffer (see paragraph 5.4 for more details). Displays the last five errors of the error code buffer.

How to exit

Use one of the following methods:

- Press one of the buttons "Menu", "OSD" or "Standby" of the remote control keys.
- Switch-off the TV set with the AC power switch.

5.3 Problems and Solving Tips (Related to CSM)

5.3.1 Picture Problems

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

No colours / noise in picture

Check CSM line 5. Wrong colour system installed. To change the setting:

1. Press the MENU button on the remote control.
2. Select the INSTALLATION sub menu.
3. Select and change the SYSTEM setting until picture and sound are correct.
4. Select the STORE menu item.

Colours not correct / unstable picture

Check CSM line 5. Wrong colour system installed. To change the setting:

1. Press the MENU button on the remote control.
2. Select the INSTALLATION sub menu.
3. Select and change the SYSTEM setting until picture and sound are correct.
4. Select the STORE menu item.

Picture too dark or too bright

Increase / decrease the BRIGHTNESS and / or the CONTRAST value when:

- The picture improves after you have pressed the "Smart Picture" button on the remote control.
- The picture improves after you have switched on the Customer Service Mode

The new "Personal" preference value is automatically stored.

White line around picture elements and text

Decrease the SHARPNESS value when:

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

The new "Personal" preference value is automatically stored.

Snowy picture

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

- No or bad antenna signal. Connect a proper antenna signal.
- Antenna not connected. Connect the antenna.
- No channel / pre-set is stored at this program number. Go to the INSTALL menu and store a proper channel at this program number.
- The tuner is faulty (in this case the CODES line will contain error number 10). Check the tuner and replace / repair if necessary.

Snowy picture and/or unstable picture

- A scrambled or decoded signal is received.

Black and white picture

Increase the COLOR value when:

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

The new "Personal" preference value is automatically stored.

Menu text not sharp enough

Decrease the CONTRAST value when:

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

The new "Personal" preference value is automatically stored.

5.3.2 Sound Problems**No sound or sound too loud (after channel change / switching on)**

Increase / decrease the VOLUME level when the volume is OK after you switched on the CSM. The new "Personal" preference value is automatically stored.

5.4 ComPair**5.4.1 Introduction**

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

- ComPair helps you to 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 SearchMan electronic manual of the defective chassis, schematics and PWBs are only a mouse click away.

5.4.2 Specifications

ComPair consists of a Windows based faultfinding program and an interface box between PC and the (defective) product. The ComPair interface box is connected to the PC via a serial or RS232 cable.

In case of the L01 chassis, the ComPair interface box and the TV communicate via a bi-directional service cable via the service connector (located on the Main panel, see also figure 8-1 suffix D).

The ComPair faultfinding program is able to determine the problem of the defective television. ComPair can gather diagnostic information in two ways:

- Automatic (by communication with the television): ComPair can automatically read out 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 micro controller 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 you): Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extend. When this is not the case, ComPair will guide you through the faultfinding tree by asking you questions (e.g. Does the screen give a picture? Click on the correct answer: YES / NO) and showing you examples (e.g. Measure test-point I7 and click on the correct oscillogram you see on the oscilloscope). You can answer by clicking on a link (e.g. 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 / 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:

- Up or downloading of presets.
- Managing of preset lists.
- If both ComPair and SearchMan (Electronic Service Manual) are installed, all the schematics and the PWBs of the 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 PWB with a highlighted capacitor C2568.
- Click on the "Schematic" hyperlink to automatically show the position of the highlighted capacitor.

5.4.3 How To Connect ComPair

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 with "POWER 9V DC") on the ComPair interface.
4. Switch the ComPair interface OFF.
5. Switch the television set OFF (remove the AC power).
6. Connect the ComPair interface cable between the connector on the rear side of the ComPair interface (marked with "I2C") and the ComPair connector on the mono carrier (see figure 8-1 suffix D).
7. Plug the AC power adapter in the AC power outlet and switch on the interface. The green and red LEDs light up together. The red LED extinguishes after approx. 1 second while the green LED remains lit.
8. Start the ComPair program and read the "introduction" chapter.

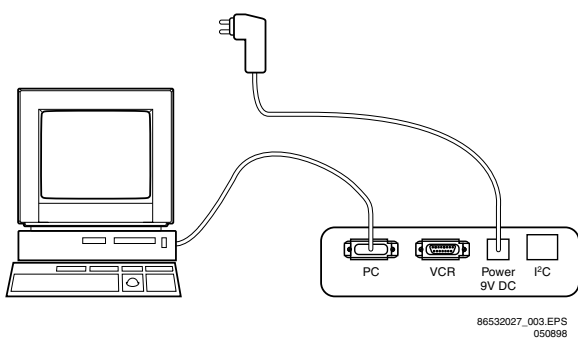


Figure 5-3 Compair connection

5.4.4 How To Order

ComPair order codes:

- Starter kit ComPair32/ SearchMan32 software and ComPair interface (excluding transformer): 3122 785 90450
- ComPair interface (excluding transformer): 4822 727 21631
- Starter kit ComPair32 software (registration version): 3122 785 60040
- Starter kit SearchMan32 software: 3122 785 60050
- ComPair32 CD (update): 3122 785 60070
- SearchMan32 CD (update): 3122 785 60080
- ComPair interface cable: 3122 785 90004

5.4.5 Error Buffer

The error code buffer contains all detected errors 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 written at the left side and all other errors shift one position to the right.

5.4.6 How To Read The Error Buffer

You can read the error buffer in 3 ways:

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

5.4.7 How To Clear The Error Buffer

The error code buffer is cleared in the following cases:

- By activation of the CLEAR command in the SDAM menu:
- If the content of the error buffer has not changed for 50 hours, it resets automatically.

Note:

When leaving SDAM by disconnecting the set from AC power, the error buffer is not reset.

5.4.8 Error Codes

In case of non-intermittent faults, clear the error buffer before you begin the repair. These to ensure 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 code and not the actual cause (e.g., a fault in the protection detection circuitry can also lead to a protection).

ERROR	Device	Error description	Check item	Diagram
0	Not applicable	No Error		
1	Not applicable	X-Ray Protection (USA)	2465, 7460	A2
2	Not applicable	Horizontal Protection	7460, 7461, 7462, 7463, 6467	A2
3	TDA8359/ TDA9302	Vertical Protection	VloAux +13v	A2,A3
4	MSP34X5/ TDA9853	MAP I2C identification error	7831	A9
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 error (USA)	7803	P

5.5 The Blinking LED Procedure

Via 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.

- n short blinks (n = 1 - 14),
- when all the error-codes are displayed, the sequence finishes with a LED blink of 3 s,
- the sequence starts again.

Example of error buffer: 12 9 6 0 0

After entering SDAM:

- 12 short blinks followed by a pause of 3 s,
- 9 short blinks followed by a pause of 3 s,
- 6 short blinks followed by a pause of 3 s,
- 1 long blink of 3 s to finish the sequence,
- the sequence starts again.

problem is expected in the vertical amplifier IC 7471. Measure with a scope the waveform on pin 17 of the UOC. Measure also at pin 1 of IC 7471. If here the signal is missing, a defective resistor R3244 causes the problem

5.6 Protections

If a fault situation is detected an error code will be generated and if necessary the set will be put in the 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 the protection mode. The error codes of the error buffer can be read via the service menu (SDAM), the blinking LED procedure 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). Start-up of the set in a predefined way and adjustment of the set via a menu and with the help of test patterns.

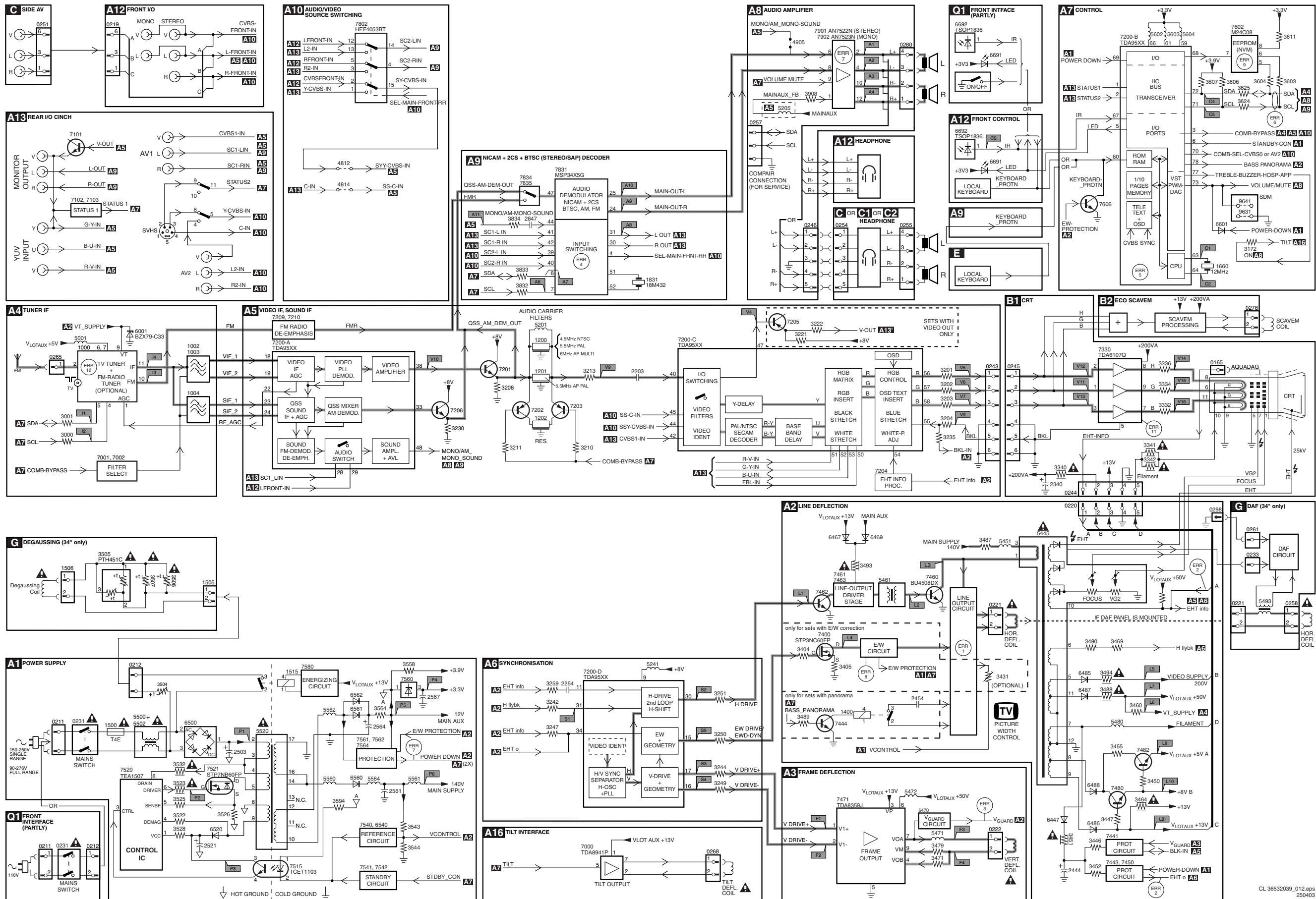
5.7 Repair Tips

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

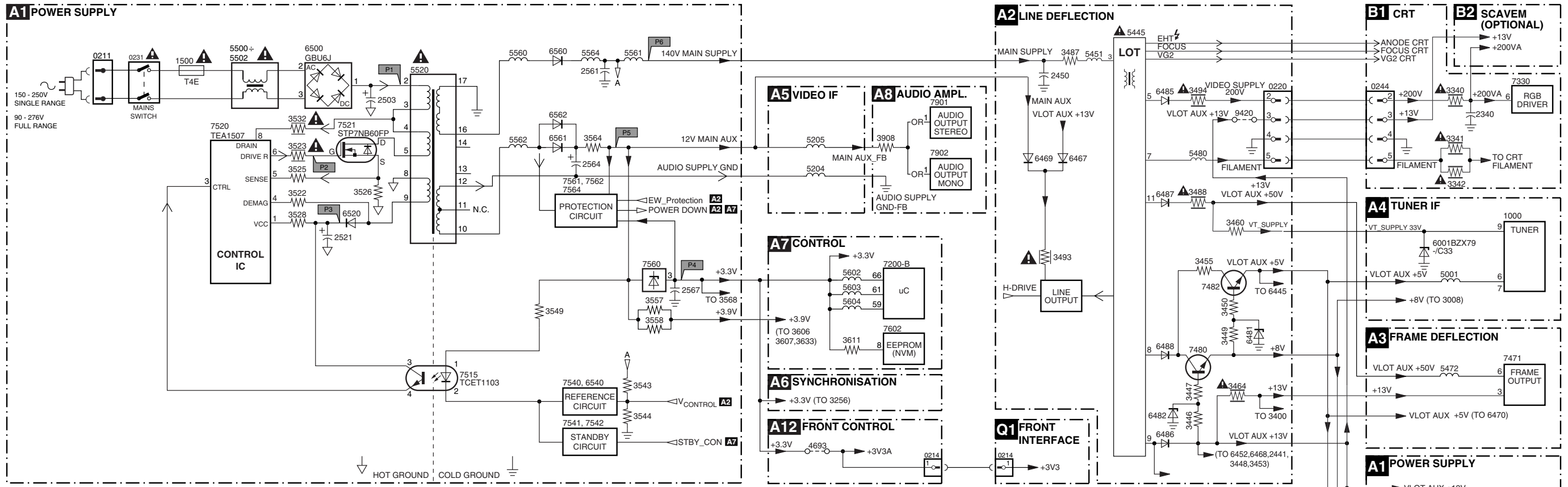
- **Set is dead and makes hiccuping sound** "MainSupply" is available. Hiccupping stops when de-soldering L5561, meaning that problem is in the "MainSupply" line. No output voltages at LOT, no horizontal deflection. Reason: line transistor 7460 is defective.
- **Set is dead, and makes no sound** Check 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 on the gate of 7521; circuitry is very high ohmic and can easily be damaged!
- **Set is in hiccup mode and shuts down after 8 s.** Blinking LED (set in SDAM mode) indicates error 5. As it is unlikely that μ P "POR" and "+8V protection" happen at the same time, measure the "+8V". If this voltage is missing, check transistor 7480.
- **Set is non-stop in hiccup mode** Set is in over current mode; check the secondary sensing (opto coupler 7515) and the "MainSupply" voltage. Signal "Stdbby_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 (pos. 1000). Check presence of supply voltages. As "Vlotaux+5V" 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 in SDAM mode) indicates error 3. Check "Vlotaux+11V" and "+50V". If they are okay,

6. Block Diagram, Supply Voltage, and Testpoint Overview

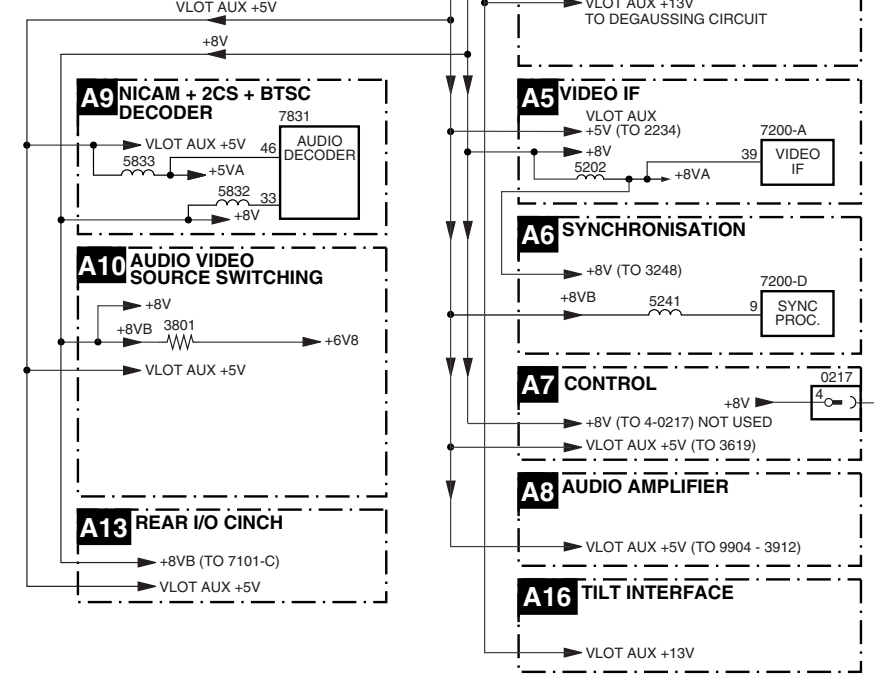
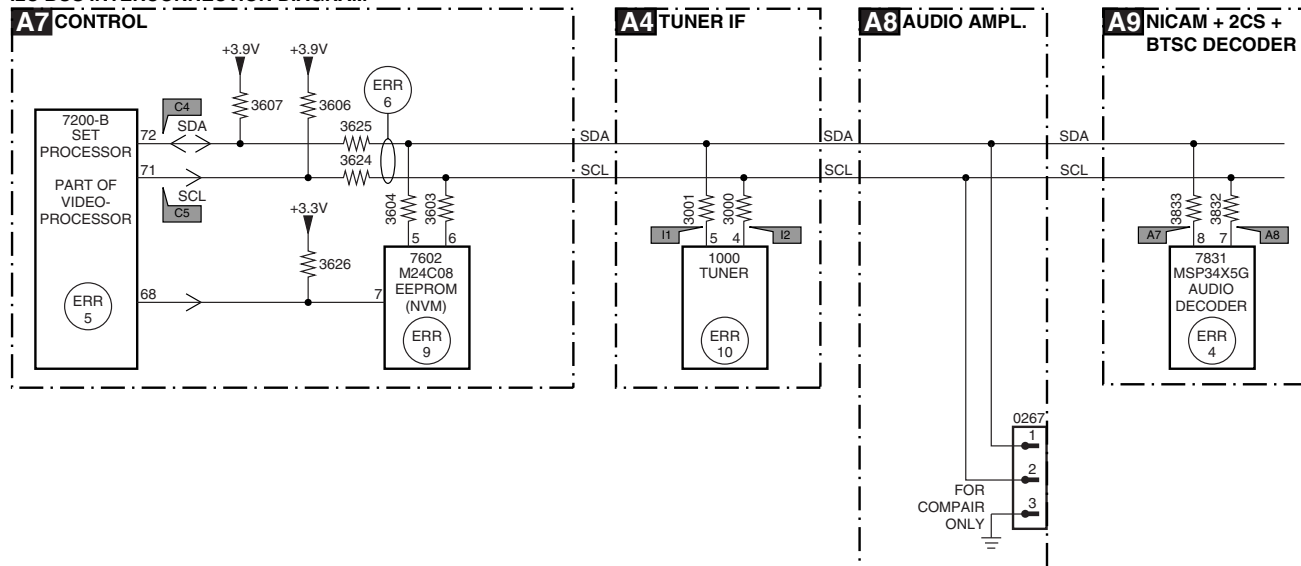
Block Diagram



I²C and Supply Voltage Overview



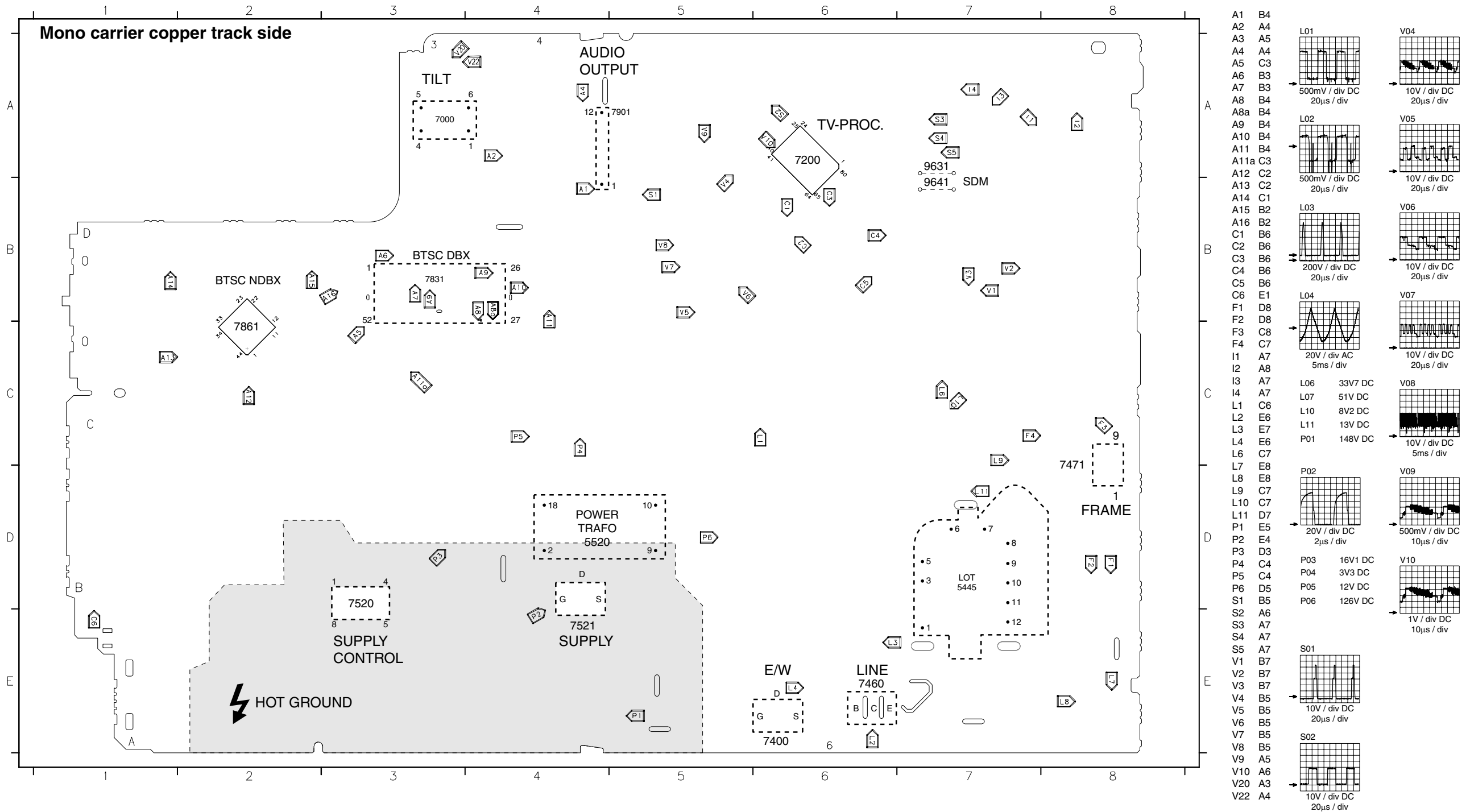
I²C BUS INTERCONNECTION DIAGRAM



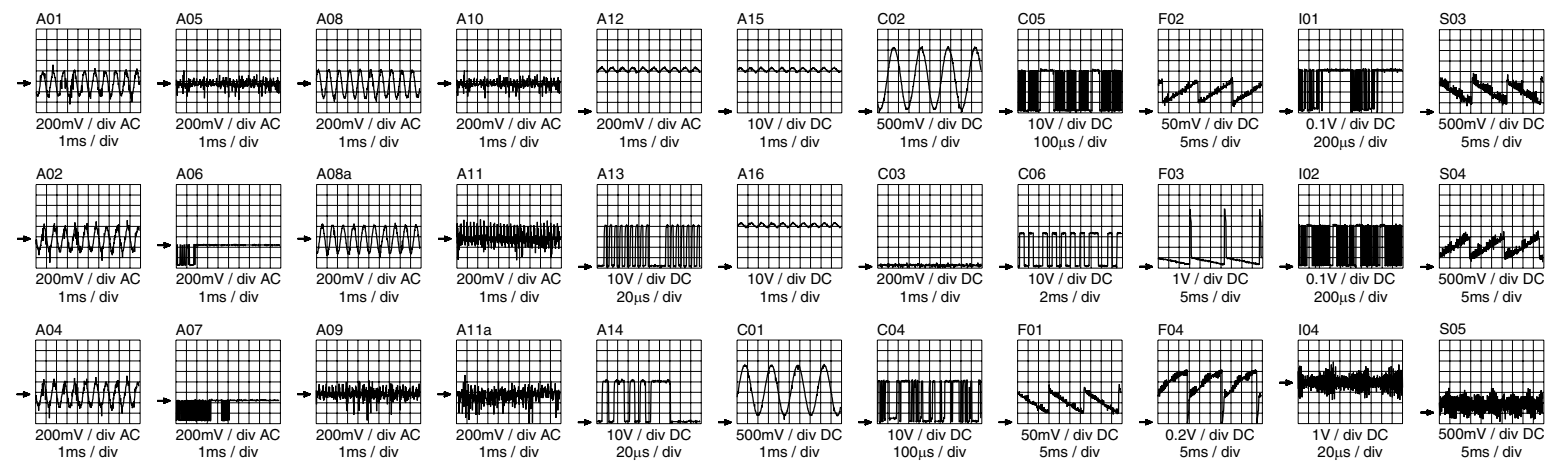
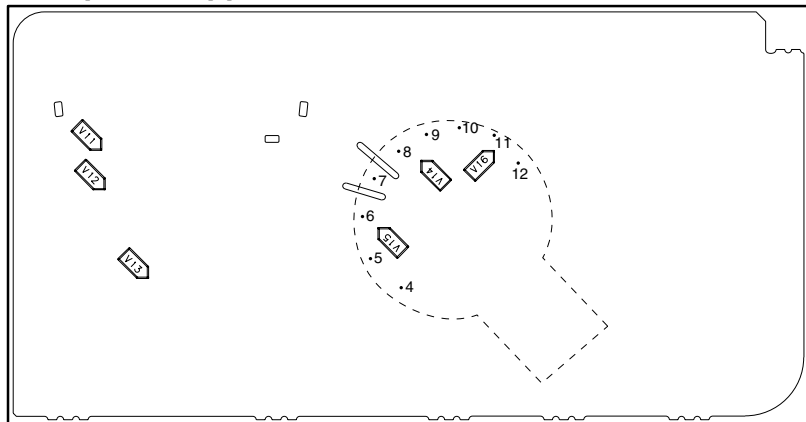
ERROR CODE LIST

Error	Description
0	No error
1	X-Ray / over voltage protection
2	High beam (BCI) protection
3	Vertical guard protection
4	I ² C error while communicating with the sound processor
5	Power ON reset (POR bit) 3.3V protection / +8V protection
6	General I ² C error
7	Power down (over current) protection
8	EW protection (Large Screen only)
9	I ² C error EEPROM error
10	I ² C error PLL tuner
11	Black current loop instability protection

Testpoint Overview

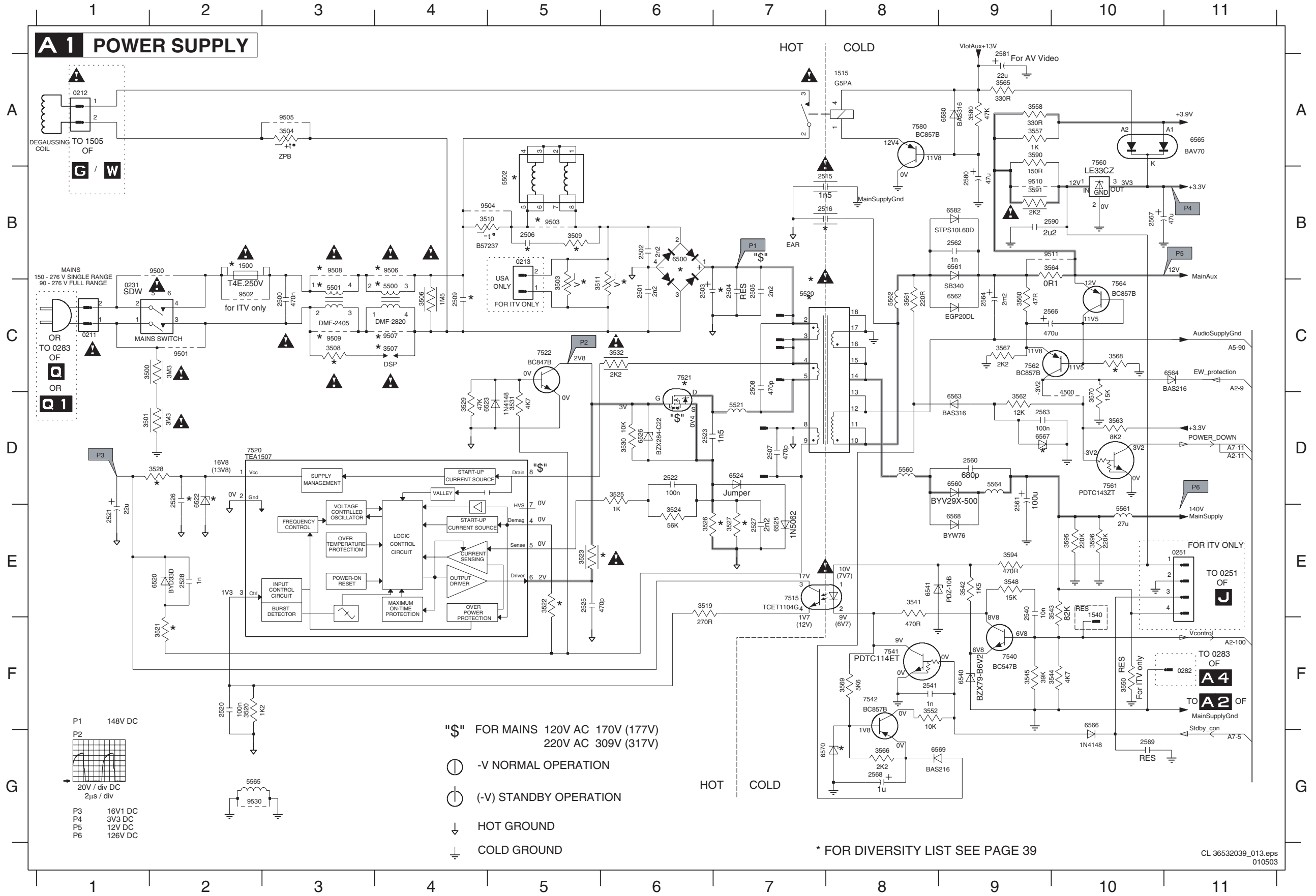


CRT panel copper track side



7. Circuit Diagrams and PWB Layouts

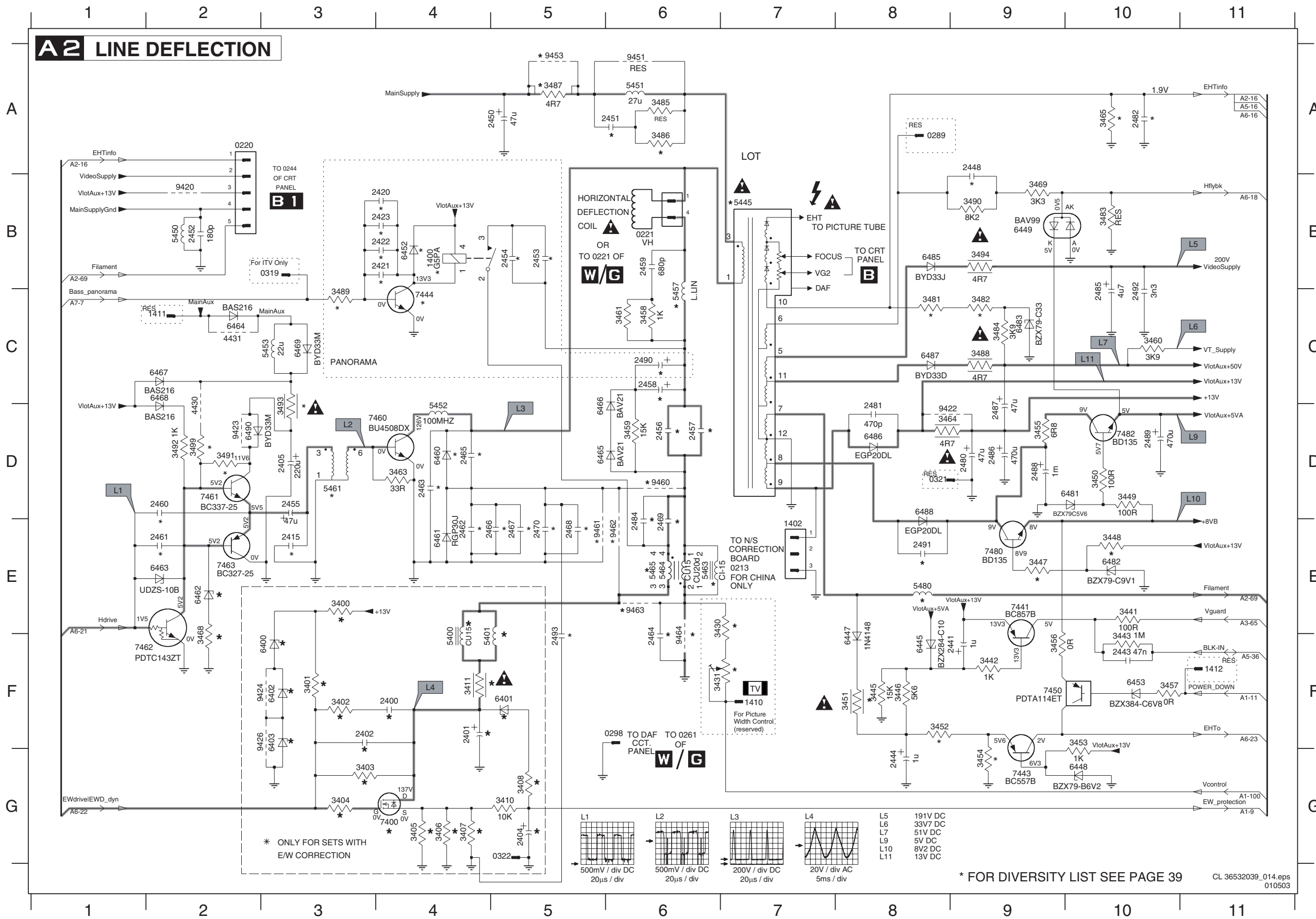
Mono Carrier: Power Supply



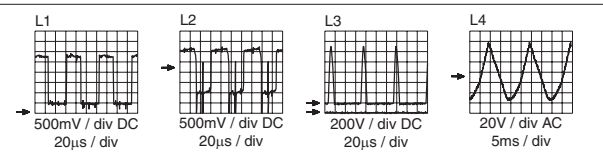
0211 C1	3591 B9
0212 A1	3594 E9
0213 B5	3595 E10
0231 C1	3596 E10
0251 E11	4500 D10
0282 F11	5500 C4
1500 B2	5501 C3
1515 A8	5502 B5
1540 F10	5520 C7
2500 C3	5521 D7
2501 C6	5560 D8
2502 B6	5561 E10
2503 C6	5562 C8
2504 C7	5564 D9
2505 C7	5565 G2
2506 B5	6500 B6
2507 D7	6520 E2
2508 C7	6522 D2
2509 C4	6523 D5
2515 B7	6524 D7
2516 B7	6525 E7
2520 F2	6526 D6
2521 E1	6540 F9
2522 D6	6541 E8
2523 D6	6560 D9
2525 E5	6561 B9
2526 D2	6562 C9
2527 E7	6563 D9
2528 E2	6564 C11
2540 E9	6565 A11
2541 F8	6566 F10
2560 D9	6567 D9
2561 D9	6568 E9
2562 B9	6569 G9
2563 D9	6570 G7
2564 C9	6580 A9
2566 C9	6582 B9
2567 B10	7515 E7
2568 G8	7520 D2
2569 G10	7521 C6
2580 B9	7522 C5
2581 A9	7540 F9
2590 B10	7541 F8
3500 C1	7542 F8
3501 D1	7560 A10
3503 C5	7561 D10
3504 A3	7562 C9
3506 C4	7564 C10
3507 C4	7580 A8
3508 C3	9500 B2
3509 B5	9501 C2
3510 B4	9502 C2
3511 C5	9503 B5
3519 E6	9504 B5
3520 F2	9505 A3
3521 F2	9506 B4
3522 E5	9507 C4
3523 E5	9508 B3
3524 E6	9509 C3
3525 D6	9510 B9
3526 E6	9511 B10
3527 E7	9530 G2
3528 D2	
3529 D4	
3530 D6	
3531 D5	
3532 C6	
3541 E8	
3542 E9	
3543 F10	
3544 F10	
3545 F9	
3548 E9	
3550 F10	
3552 F8	
3557 A9	
3558 A9	
3560 C9	
3561 C8	
3562 D9	
3563 D10	
3564 B10	
3565 A9	
3566 G8	
3567 C9	
3568 C10	
3569 F8	
3570 D10	
3580 A9	
3590 A9	

* FOR DIVERSITY LIST SEE PAGE 39

Mono Carrier: Line Deflection



0220 A2	3459 D6
0221 B6	3460 C10
0289 A8	3461 C6
0298 F6	3463 D4
0319 B2	3464 D8
0321 D8	3465 A10
0322 G5	3468 F2
1400 B4	3469 B9
1402 E7	3481 C8
1410 F7	3482 C9
1411 C2	3483 B10
1412 F11	3484 C9
2400 F4	3485 A6
2401 F4	3486 A6
2402 F3	3487 A5
2404 G5	3488 C9
2405 D3	3489 C3
2415 E3	3490 B9
2420 B4	3491 D2
2421 B4	3492 D2
2422 B4	3493 D3
2423 B4	3494 B9
2441 F9	3499 D2
2443 F10	4430 D2
2444 G8	4431 C2
2448 A9	5400 F4
2450 A5	5401 F4
2451 A6	5445 B7
2452 B2	5450 B2
2453 B5	5451 A6
2454 B5	5452 D4
2455 D3	5453 C3
2456 D6	5457 C6
2457 D6	5461 D3
2458 C6	5463 E6
2459 B6	5464 E6
2460 D2	5465 E6
2461 E2	5480 E8
2462 E4	6400 F3
2463 D4	6401 F5
2464 F6	6402 F3
2465 D4	6403 F3
2466 E5	6445 F8
2467 E5	6447 F8
2468 E5	6448 G10
2469 E6	6449 B9
2470 E5	6452 B4
2480 D9	6453 F10
2481 D8	6460 D4
2482 A10	6461 E4
2484 E6	6462 E2
2485 C10	6463 E2
2486 D9	6464 C2
2487 D9	6465 D5
2488 D9	6466 D5
2489 D10	6467 C2
2490 C6	6468 C2
2491 E8	6469 C3
2492 C10	6481 D10
2493 F5	6482 E10
3400 E3	6483 C9
3401 F3	6485 B8
3402 F3	6486 D8
3403 G3	6487 C8
3404 G3	6488 D8
3405 G4	6490 D2
3406 G4	7400 G4
3407 G4	7441 E9
3408 G5	7443 G9
3410 G5	7444 C4
3411 F4	7450 F9
3430 E6	7460 D3
3431 F6	7461 D2
3441 E10	7462 F1
3442 F9	7463 E2
3443 F10	7480 E9
3445 F8	7482 D10
3446 F8	9420 B2
3447 E9	9422 D8
3448 E10	9423 D2
3449 D10	9424 F3
3450 D10	9426 F3
3451 F8	9451 A6
3452 F8	9453 A5
3453 F10	9460 D6
3454 G9	9461 E5
3455 D9	9462 E6
3456 F9	9463 E6
3457 F10	9464 F6
3458 C6	



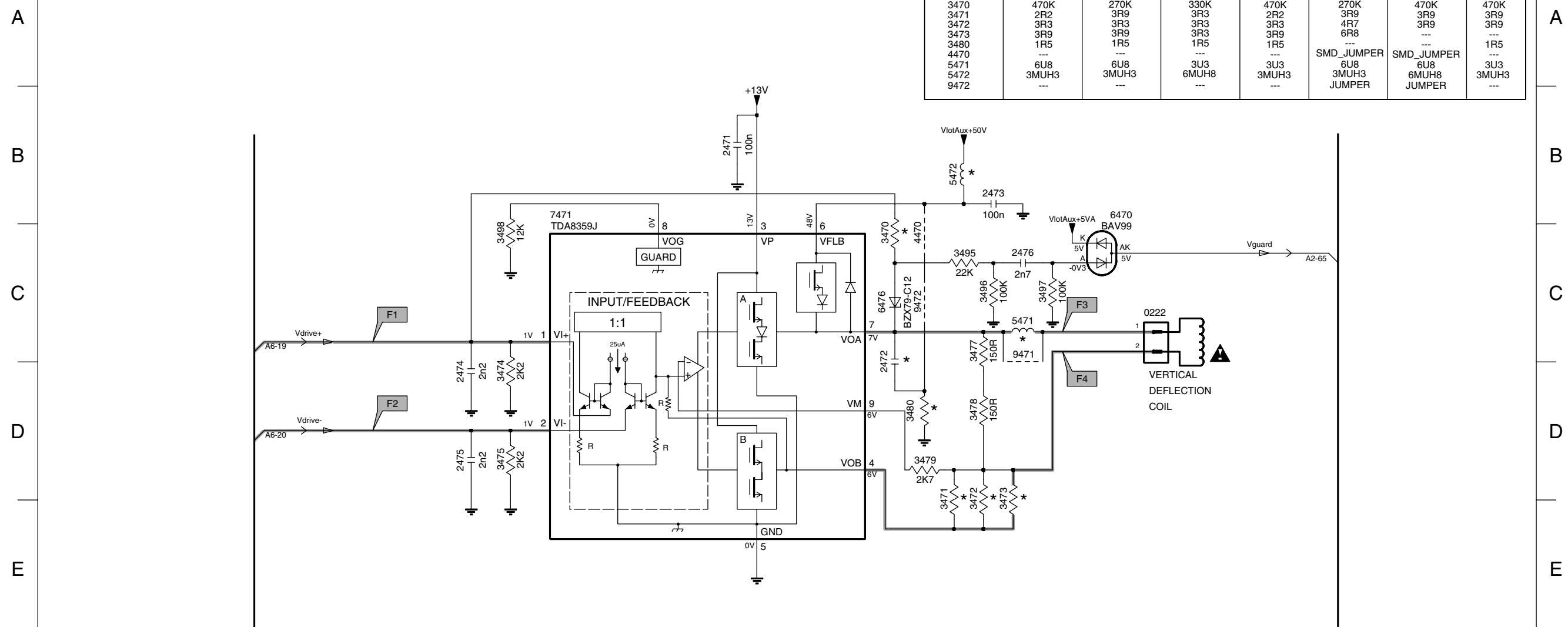
* FOR DIVERSITY LIST SEE PAGE 39
CL 36532039_014.eps
010503

Mono Carrier: Frame Deflection

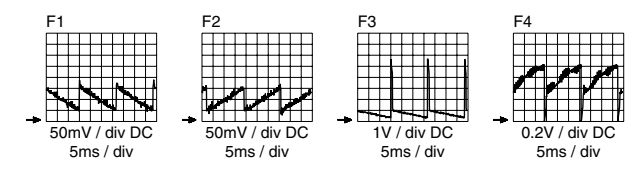
A3 FRAME DEFLECTION

MODEL	L2K3						
REGION	EU				AP	GL	CH/IN
TUBE	PHCO		LG.PH		LG.PH	SMGK(SF)	LG.PH
SET	28WR	32WR	29RF	24WR	21RF	21RF	29RF
2472	63V 150N	63V 150N	63V 150N	63V 150N	100V 10N	100V 10N	63V 150N
3470	470K	270K	330K	470K	270K	470K	470K
3471	2R2	3R9	3R3	2R2	3R9	3R9	3R9
3472	3R3	3R3	3R3	3R3	4R7	3R9	3R9
3473	3R9	3R9	3R3	3R9	6R8	---	---
3480	1R5	1R5	1R5	1R5	---	---	1R5
4470	---	---	---	---	SMD_JUMPER	SMD_JUMPER	---
5471	6U8	6U8	3U3	3U3	6U8	6U8	3U3
5472	3MUH3	3MUH3	6MUH8	3MUH3	3MUH3	6MUH8	3MUH3
9472	---	---	---	---	JUMPER	JUMPER	---

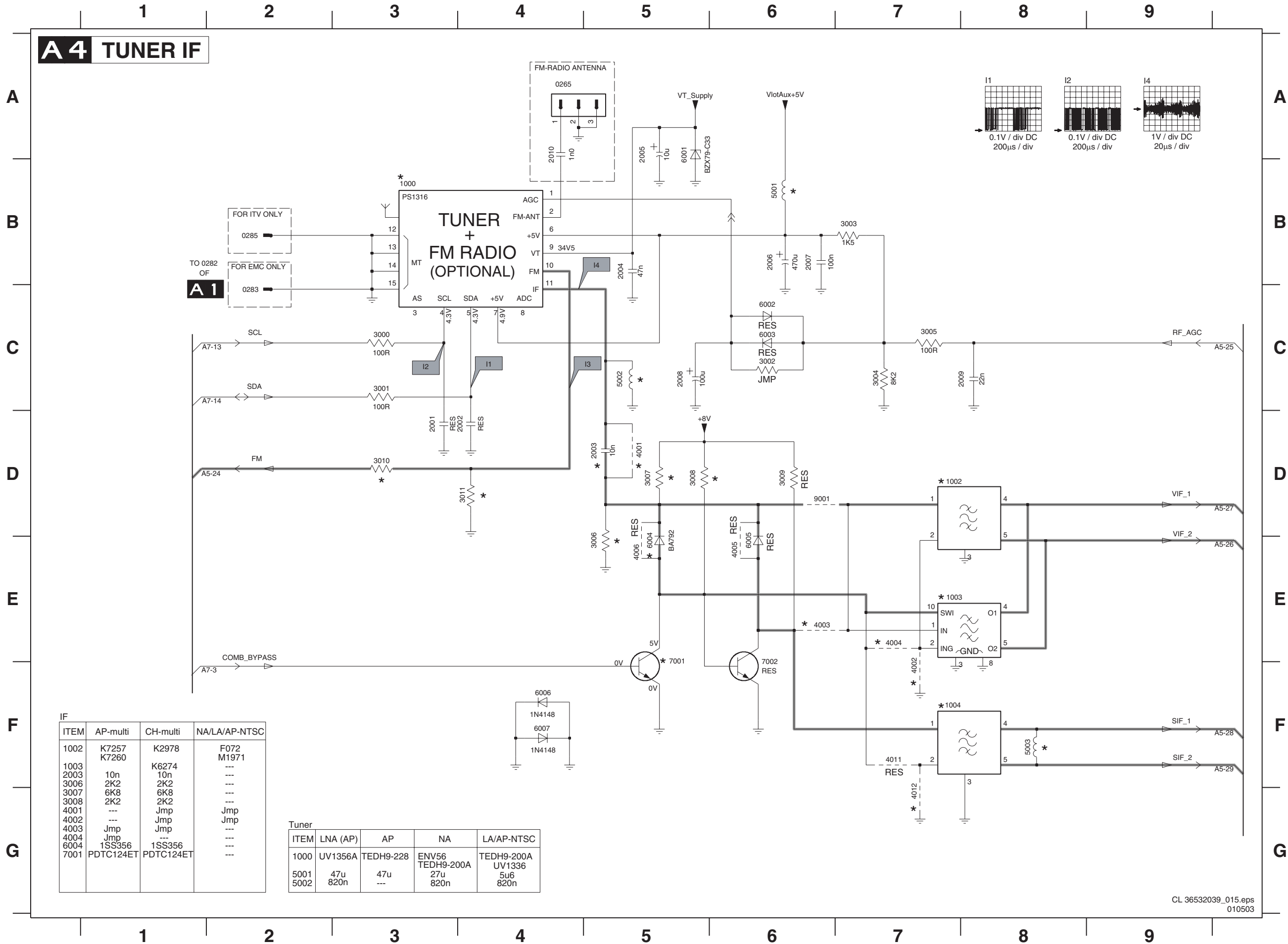
- 0222 C8
- 2471 B5
- 2472 C6
- 2473 B7
- 2474 D3
- 2475 D3
- 2476 C7
- 3470 C6
- 3471 D7
- 3472 D7
- 3473 D7
- 3474 D3
- 3475 D3
- 3477 C7
- 3478 D7
- 3479 D7
- 3480 D6
- 3495 C7
- 3496 C7
- 3497 C7
- 3498 C3
- 4470 C6
- 5471 C7
- 5472 B7
- 6470 B8
- 6476 C6
- 7471 B4
- 9471 C7
- 9472 C6



REGION	NAFTA		LATAM			AP						
TUBE	SMGK	TOS	LG.PH	LG.PH	LG.PH	SMGK	LG.PH	LG.PH	ORION	LG.PH	LG.PH	MMEC
ITEM	21RF	34RF	32V	32WSRF	28WSRF	34RF	34RF	29RF	29RF	25RF	21RF	21RF
2472	63V 150N	63V 150N	63V 150N	63V 150N	63V 150N	100V 150N	63V 150N	63V 150N	63V 150N	63V 150N	100V 10N	100V 10N
3470	SM0805 390K	SM0805 470K	SM0805 390K	SM0805 270K	SM0805 470K	SM0805 220K	SM0805 220K	SM0805 470K	SM0805 470K	SM0805 470K	270K	270K
3471	4R7	3R3	4R7	3R9	3R3	3R9	3R9	3R9	3R9	3R9	5R6	5R6
3472	2R2	2R2	2R2	3R3	3R3	3R9	3R9	3R9	3R9	3R9	3R3	3R3
3473	3R3	2R2	3R3	3R9	3R9	2R2	2R2	3R3	2R2	3R9	6R8	6R8
3480	1R5	1R5	1R5	1R5	1R5	---	1R5	1R5	1R5	1R5	---	---
4470	---	---	---	---	---	---	---	---	---	---	---	---
5471	3U3	6U8	3U3	6U8	6U8	6U8	3U3	6U8	6U8	6U8	6U8	6U8
9472	---	---	---	---	---	---	---	---	---	---	---	---



Mono Carrier: Tuner IF

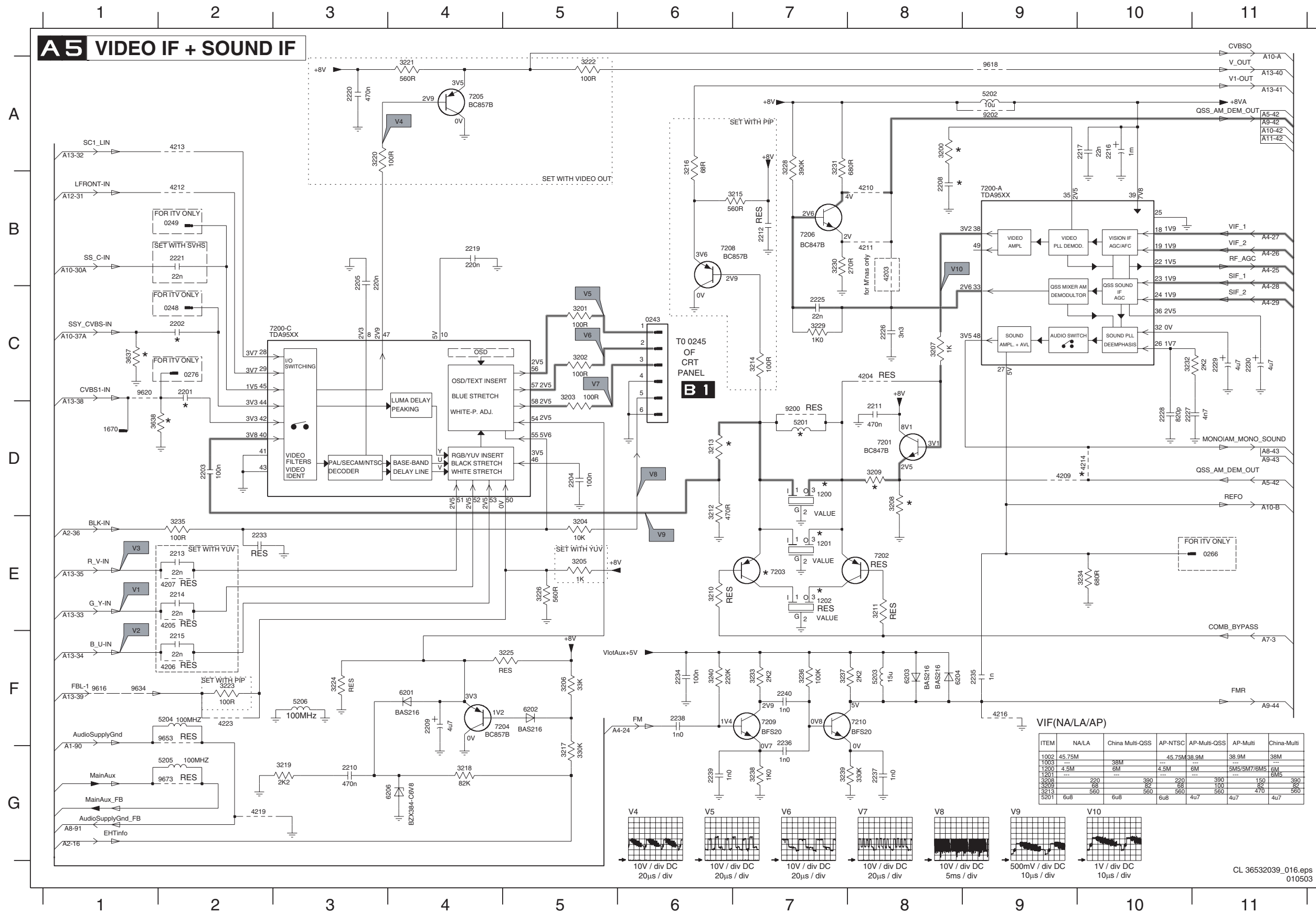


- 0265 A4
- 0283 C2
- 0285 B2
- 1000 B3
- 1002 D7
- 1003 E7
- 1004 F7
- 2001 D3
- 2002 D3
- 2003 D5
- 2004 B5
- 2005 A5
- 2006 B6
- 2007 B6
- 2008 C5
- 2009 C7
- 3001 C3
- 3002 C6
- 3003 B7
- 3004 C7
- 3005 C7
- 3006 E5
- 3007 D5
- 3008 D5
- 3009 D6
- 3010 D3
- 3011 D4
- 4001 D5
- 4002 F7
- 4003 E6
- 4004 E7
- 4005 E6
- 4006 E5
- 4011 F7
- 4012 G7
- 5001 B6
- 5002 C5
- 5003 F8
- 6001 A5
- 6002 C6
- 6003 C6
- 6004 E5
- 6005 E6
- 6006 F4
- 6007 F4
- 7001 F5
- 7002 F6
- 9001 D6

IF	AP-multi	CH-multi	NA/LA/AP-NTSC
1002	K7257 K7260	K2978	F072 M1971
1003		K6274	---
2003	10n	10n	---
3006	2K2	2K2	---
3007	6K8	6K8	---
3008	2K2	2K2	---
4001	---	Jmp	Jmp
4002	---	Jmp	Jmp
4003	Jmp	Jmp	---
4004	Jmp	---	---
6004	1SS356	1SS356	---
7001	PDTC124ET	PDTC124ET	---

Tuner				
ITEM	LNA (AP)	AP	NA	LA/AP-NTSC
1000	UV1356A	TEDH9-228	ENV56 TEDH9-200A	TEDH9-200A UV1336
5001	47u	47u	27u	5u6
5002	820n	---	820n	820n

Mono Carrier: Video IF + Sound IF



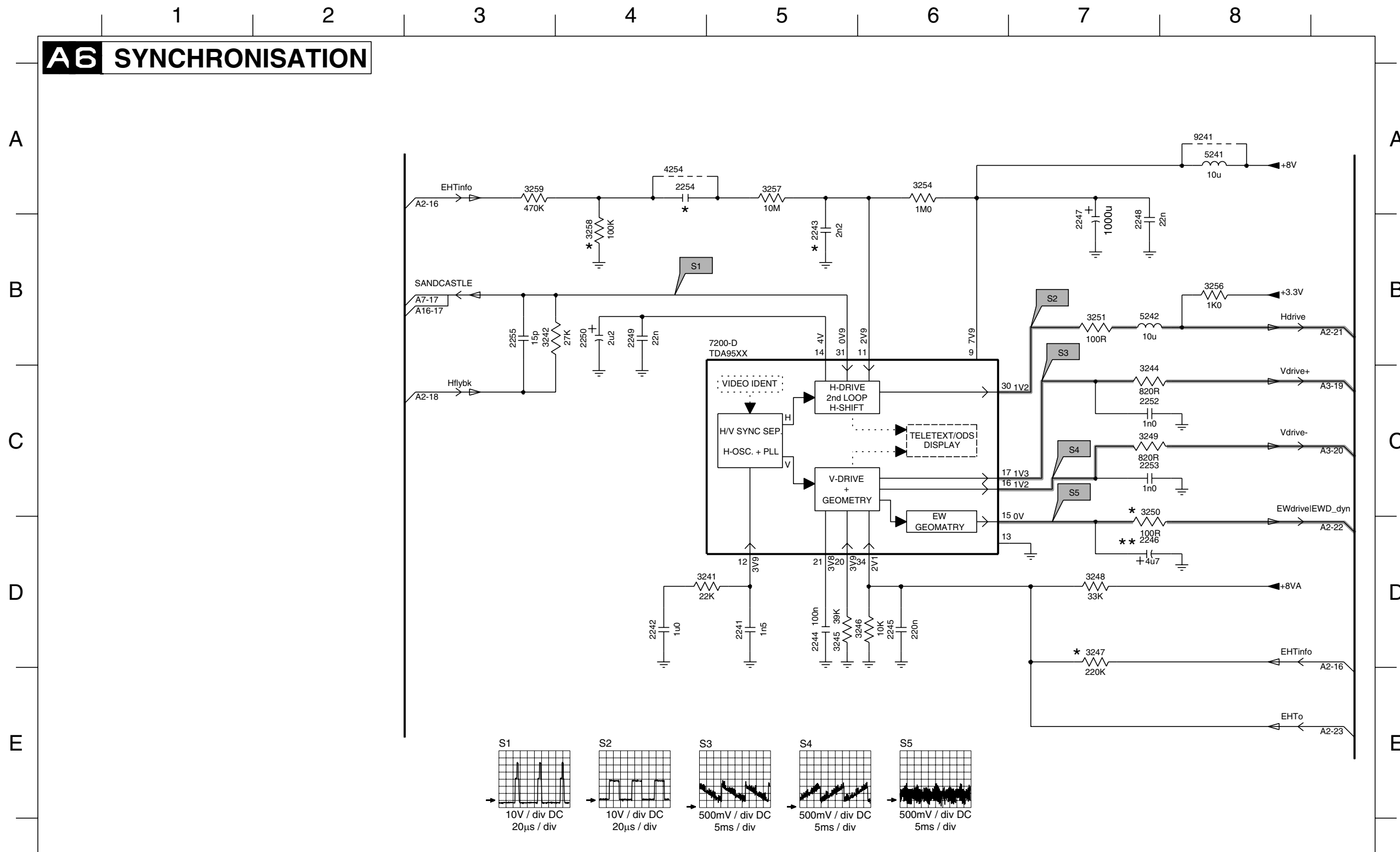
VIF(NA/LA/AP)

ITEM	NA/LA	China Multi-QSS	AP-NTSC	AP-Multi-QSS	AP-Multi	China-Multi
1002	45.75M	38M	45.75M	38.9M	38.9M	38M
1003	---	6M	---	6M	---	6M
1200	4.5M	6M	4.5M	6M	5M5/5M7/6M5	6M
1201	---	---	---	---	---	6M5
3208	220	390	220	390	150	390
3209	68	82	68	100	82	82
3213	560	560	560	560	470	560
3214	6u8	6u8	6u8	560	4u7	4u7
5201	---	---	---	---	---	---

- 0243 C6
- 0248 C2
- 0249 B2
- 0266 E11
- 0276 C2
- 1200 D7
- 1201 E7
- 1202 E7
- 1670 D1
- 2201 C2
- 2202 C2
- 2203 D2
- 2204 D5
- 2205 B3
- 2208 B8
- 2209 F4
- 2210 G3
- 2211 D8
- 2212 B7
- 2213 E2
- 2214 E2
- 2215 F2
- 2216 A10
- 2217 A10
- 2219 B4
- 2220 A3
- 2221 B2
- 2225 C7
- 2226 C8
- 2227 D10
- 2228 D10
- 2229 C11
- 2230 C11
- 2233 E2
- 2234 F6
- 2235 F9
- 2236 F7
- 2237 G8
- 2238 F6
- 3200 A8
- 3201 C5
- 3202 C5
- 3203 C5
- 3204 E5
- 3205 E5
- 3206 F5
- 3207 C8
- 3208 D8
- 3209 D8
- 3210 E6
- 3211 E8
- 3212 D6
- 3213 D7
- 3214 C6
- 3215 B7
- 3216 A6
- 3217 G5
- 3218 G4
- 3219 G3
- 3220 A3
- 3221 A4
- 3222 A5
- 3223 F5
- 3224 F3
- 3225 F5
- 3226 E5
- 3228 A7
- 3229 C7
- 3230 B7
- 3231 A7
- 3232 C10
- 3233 F7
- 3234 E10
- 3235 E2
- 3236 F7
- 3237 F7
- 3238 G7
- 3239 G7
- 3240 F6
- 3637 C1
- 3638 D1
- 4203 B8
- 4204 C8
- 4205 E2
- 4206 F2
- 4207 E2
- 4209 D9
- 4210 B8
- 4211 B8
- 4212 B2
- 4213 A2
- 4214 D10
- 4216 F9
- 4219 G2
- 4223 F2
- 5201 D7
- 5202 A9
- 5203 F8
- 5204 F2
- 5205 G2
- 5206 F3
- 6201 F4
- 6202 F5
- 6203 F8
- 6204 F8
- 6206 G4
- 7200-A B9
- 7200-C C3
- 7201 D8
- 7202 E8
- 7203 E7
- 7204 F5
- 7205 A4
- 7206 B7
- 7208 B7
- 7209 F7
- 7210 F8
- 9200 D7
- 9618 A9
- 9653 F2
- 9673 G2

Mono Carrier: Synchronisation

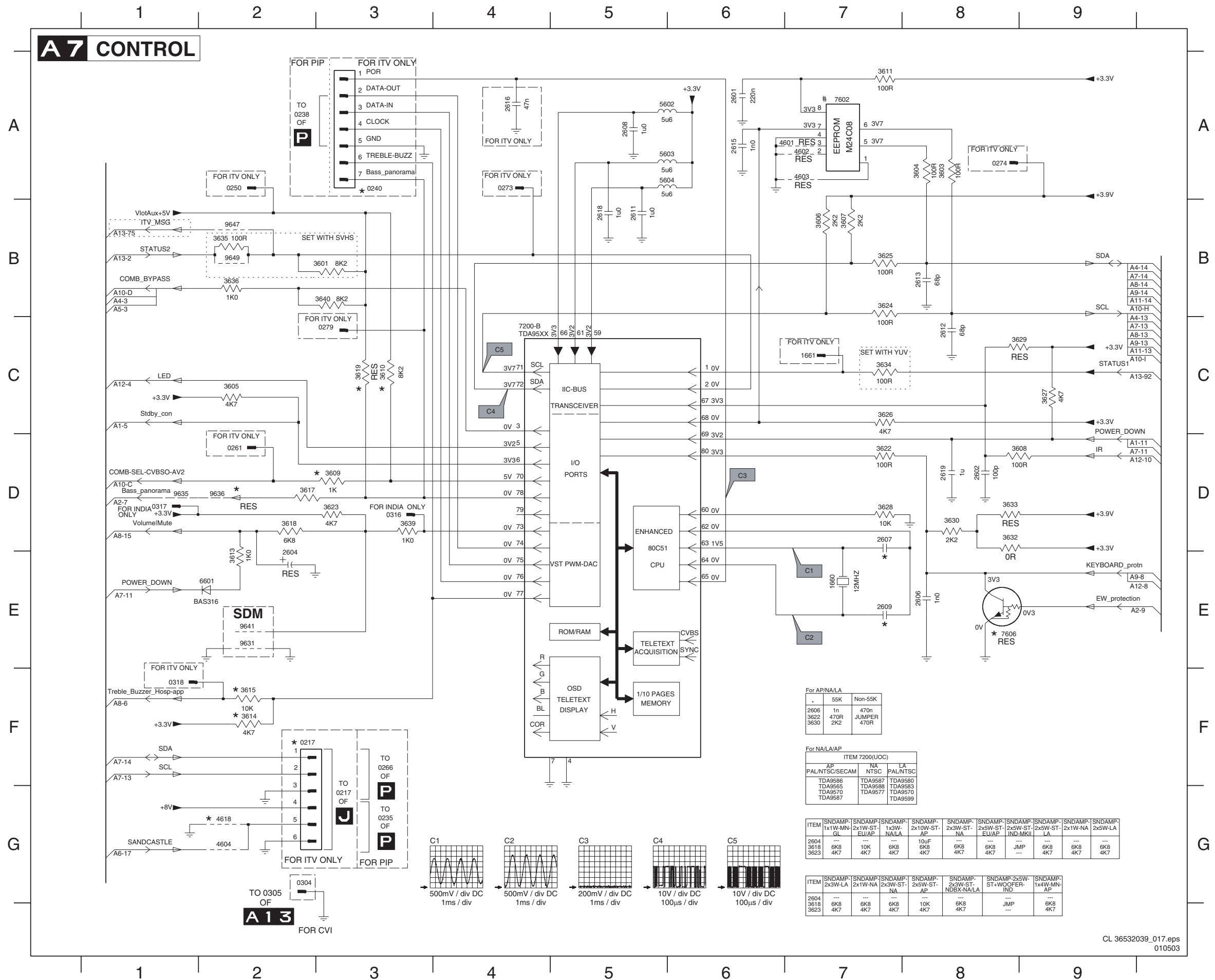
A6 SYNCHRONISATION



- 2241 D5
- 2242 D4
- 2243 B5
- 2244 D5
- 2245 D6
- 2246 D7
- 2247 B7
- 2248 B7
- 2249 B4
- 2250 B4
- 2252 C7
- 2253 C7
- 2254 A4
- 2255 B3
- 3241 D5
- 3242 B3
- 3244 B7
- 3245 D5
- 3246 D6
- 3247 D7
- 3248 D7
- 3249 C7
- 3250 C7
- 3251 B7
- 3254 A6
- 3256 B8
- 3257 A5
- 3258 B4
- 3259 A3
- 4254 A4
- 5241 A8
- 5242 B7
- 7200-D B5
- 9241 A8

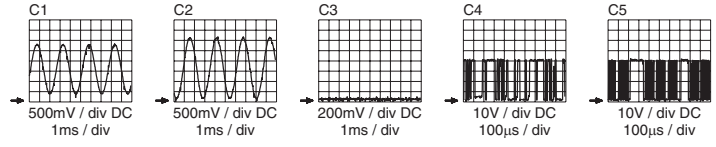
REGION	NAFTA			LATAM		AP						
TUBE	SMGK	TOS	LG.PH	LG.PH	LG.PH	SMGK	LG.PH	LG.PH	ORION	LG.PH	LG.PH	MMEC
ITEM	29RF	34RF	32V	32WSRF	28WSRF	34RF	34RF	29RF	29RF	25RF	21RF	21RF
2243	50V 2N2	50V 2N2	50V 2N2	50V 10N	50V 10N	50V 2N2	50V 2N2	50V 2N2	50V 2N2	50V 2N2	50V 2N2	50V 6N8
3247	680K (SMD)	680K (SMD)	680K (SMD)	470K (SMD)	470K (SMD)	SM0603 470K	SM0603 470K	SM0603 680K	SM0603 680K	SM0603 4K7	SM0603 270K	SM0603 270K
3250	8K2	8K2	8K2	1K	1K	33R	4K7	8K2	4K7	4K7	---	---
3258	100K (SMD)	100K (SMD)	100K (SMD)	100K (SMD)	100K (SMD)	180K	180K	SM0603 100K	SM0603 220K	SM0603 100K	SM0603 100K	SM0603 100K

Mono Carrier: Control



A 7 CONTROL

A 13
FOR CVI



For AP/NA/LA

	55K	Non-55K
2606	1n	470n
3622	470R	JUMPER
3630	2K2	470R

For NA/LA/AP

ITEM 7200(UOC)		
AP	NA	LA
PAL/NTSC/SECAM	NTSC	PAL/NTSC
TDA9586	TDA9587	TDA9580
TDA9565	TDA9588	TDA9583
TDA9570	TDA9577	TDA9570
TDA9587		TDA9599

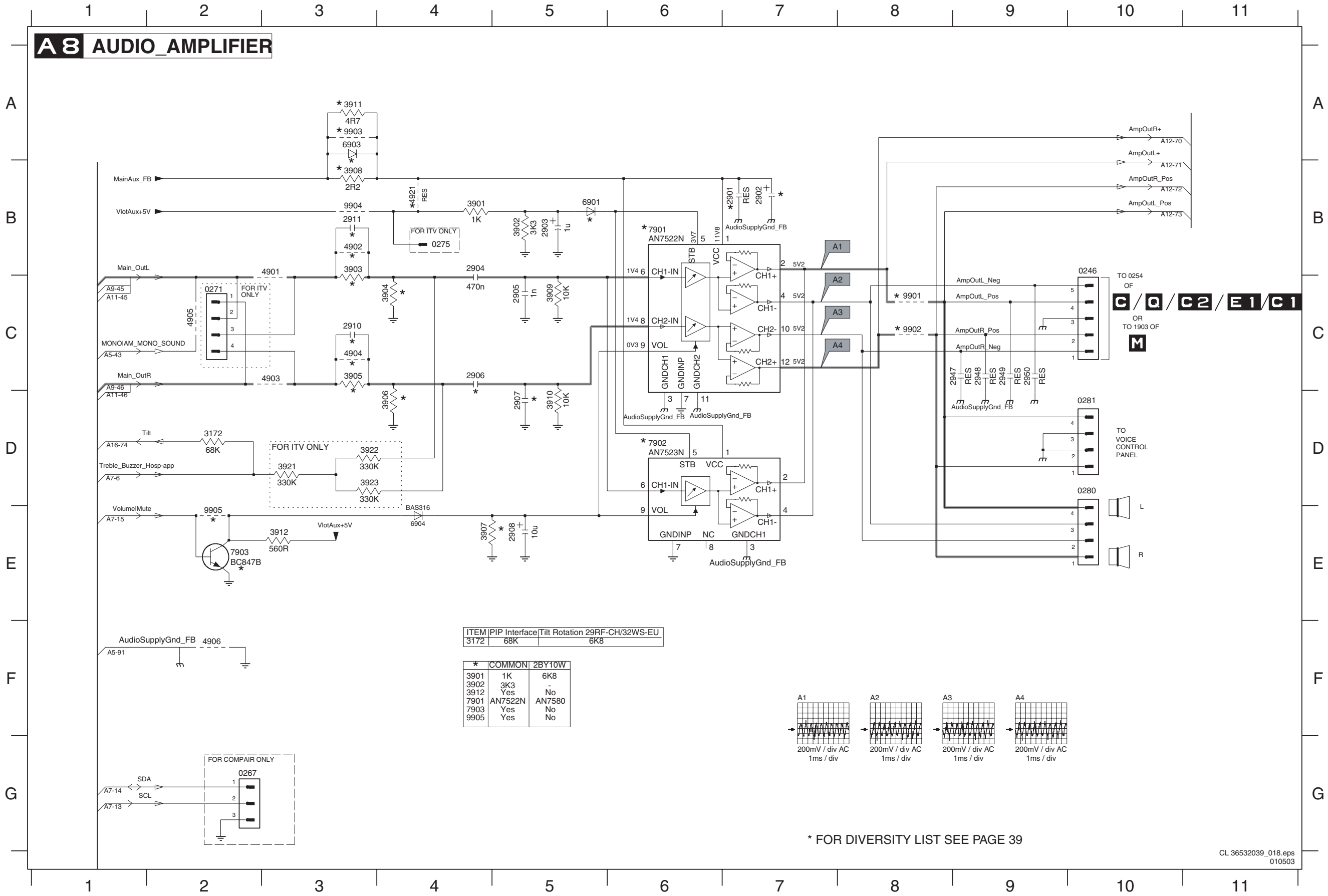
ITEM	SNDAMP-1x1W-MN-GL	SNDAMP-2x1W-ST-EU/AP	SNDAMP-1x2W-NA/LA	SNDAMP-2x10W-ST-AP	SNDAMP-2x3W-ST-NA	SNDAMP-2x3W-ST-EU/AP	SNDAMP-2x3W-ST-IND-MKII-LA	SNDAMP-2x3W-ST-2x3W-ST-2x1W-NA	SNDAMP-2x5W-LA
2604	---	---	---	10µF	---	---	---	---	---
3618	6K8	10K	6K8	6K8	6K8	6K8	JMP	6K8	6K8
3623	4K7	4K7	4K7	4K7	4K7	4K7	---	4K7	4K7

ITEM	SNDAMP-2x3W-LA	SNDAMP-2x1W-NA	SNDAMP-2x3W-ST-NA	SNDAMP-2x5W-ST-AP	SNDAMP-2x3W-ST-NDBX-NA/LA	SNDAMP-2x5W-ST-ST-WOOFER-IND	SNDAMP-1x4W-MN-AP
2604	---	---	---	---	---	---	---
3618	6K8	6K8	6K8	10K	6K8	JMP	6K8
3623	4K7	4K7	4K7	4K7	4K7	---	4K7

- 0217 F2
- 0240 A3
- 0250 A2
- 0261 D2
- 0273 A4
- 0274 A8
- 0279 C3
- 0304 G2
- 0316 D3
- 0317 D1
- 0318 F1
- 1660 E7
- 1661 C7
- 2601 A6
- 2602 D8
- 2604 E2
- 2606 E8
- 2607 D7
- 2608 A5
- 2609 E7
- 2611 B5
- 2612 C8
- 2613 B8
- 2615 A6
- 2616 A4
- 2618 B5
- 2619 D8
- 3601 B3
- 3603 A8
- 3604 A8
- 3605 C2
- 3606 B7
- 3607 B7
- 3608 D9
- 3609 D3
- 3610 C3
- 3611 A7
- 3613 E2
- 3614 F2
- 3615 F2
- 3617 D2
- 3618 D2
- 3619 C3
- 3622 D7
- 3623 D3
- 3624 B7
- 3625 B7
- 3626 C7
- 3627 C9
- 3628 D7
- 3629 C9
- 3630 D8
- 3632 D8
- 3633 D8
- 3634 C7
- 3635 B2
- 3636 B2
- 3639 D3
- 3640 B3
- 4601 A7
- 4602 A7
- 4603 A7
- 4604 G2
- 4618 G2
- 5602 A5
- 5603 A5
- 5604 A5
- 6601 E2
- 7200-B C4
- 7602 A7
- 7606 E8
- 9631 E2
- 9641 E2
- 9647 B2
- 9649 B2

Mono Carrier: Audio Amplifier

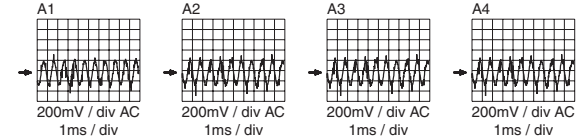
A8 AUDIO_AMPLIFIER



- 0246 B10
- 0267 G2
- 0271 C2
- 0275 B4
- 0280 D10
- 0281 D10
- 2901 B7
- 2902 B7
- 2903 B5
- 2904 B4
- 2905 C5
- 2906 C4
- 2907 D5
- 2908 E5
- 2910 C3
- 2911 B3
- 2947 C9
- 2948 C9
- 2949 C9
- 2950 C9
- 3172 D2
- 3901 B4
- 3902 B5
- 3903 B3
- 3904 C4
- 3905 C3
- 3906 D4
- 3907 E4
- 3908 B3
- 3909 C5
- 3910 D5
- 3911 A3
- 3912 E3
- 3921 D3
- 3922 D3
- 3923 D3
- 4901 B3
- 4902 B3
- 4903 C3
- 4904 C3
- 4905 C2
- 4906 F2
- 4921 B4
- 6901 B5
- 6903 A3
- 6904 E4
- 7901 B6
- 7902 D6
- 7903 E2
- 9901 C8
- 9902 C8
- 9903 A3
- 9904 B3
- 9905 E2

ITEM	PIP Interface	Tilt Rotation	29RF-CH/32WS-EU
3172	68K	6K8	

*	COMMON	2BY10W
3901	1K	6K8
3902	3K3	-
3912	Yes	No
7901	AN7522N	AN7580
7903	Yes	No
9905	Yes	No



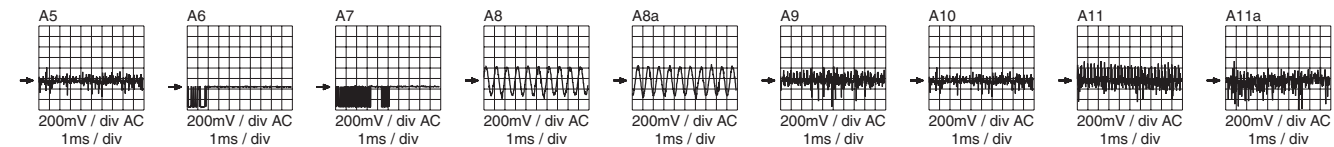
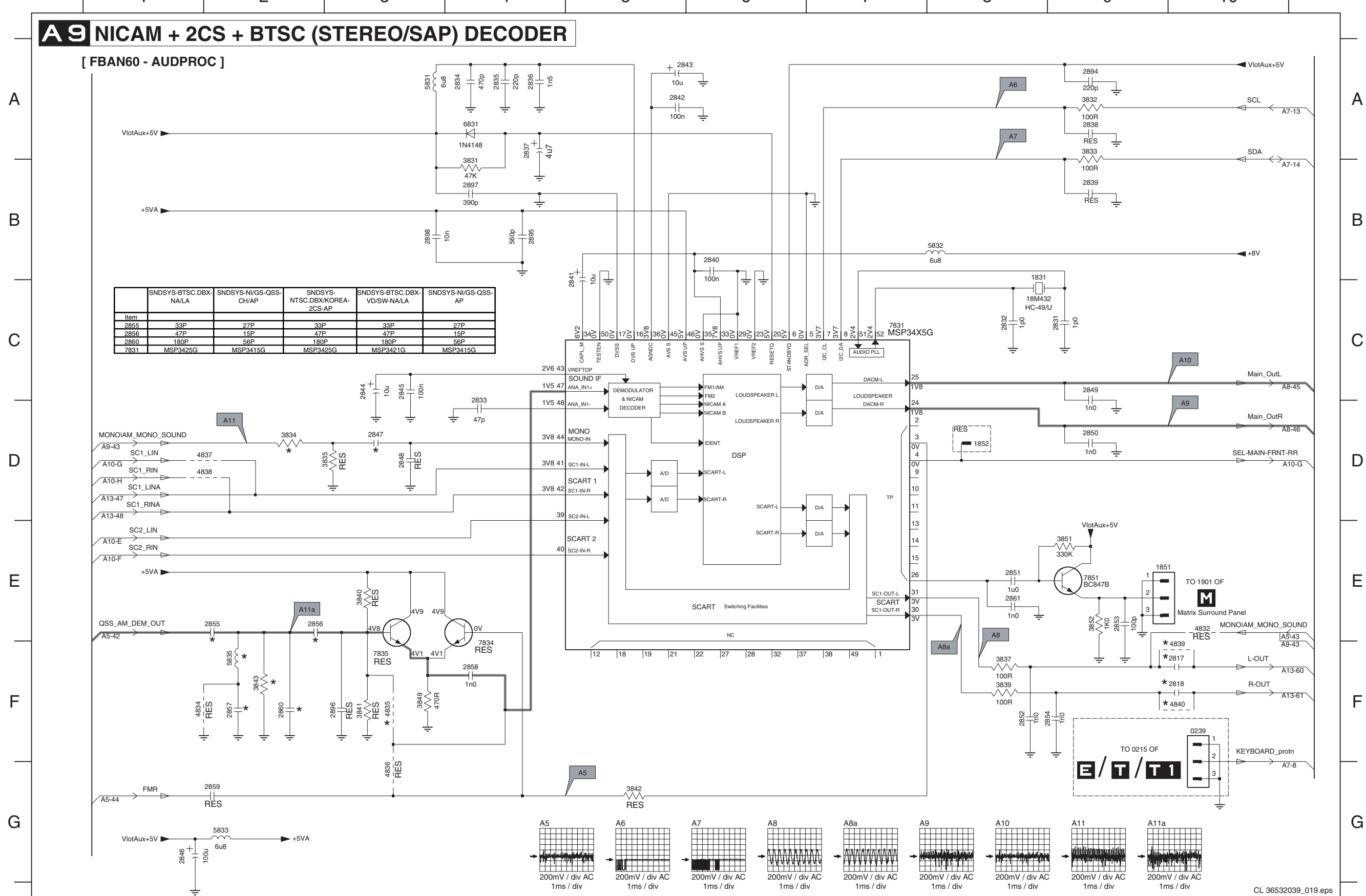
* FOR DIVERSITY LIST SEE PAGE 39

Mono Carrier: NICAM + 2CS + BTSC (Stereo/SAP) Decoder

A9 NICAM + 2CS + BTSC (STEREO/SAP) DECODER

[FBAN60 - AUDPROC]

Item	SND SYS-BTSC-DBX-NA/LA	SND SYS-NI/GS-OSS-CH/AP	SND SYS-NTSC-DBX/KOREA-2CS-AP	SND SYS-BTSC-DBX-VD/SW-NA/LA	SND SYS-NI/GS-OSS-AP
2855	33P	27P	33P	33P	27P
2856	47P	15P	47P	47P	15P
2860	180P	56P	180P	180P	56P
7831	MSP3425G	MSP3415G	MSP3425G	MSP3421G	MSP3415G



- 0239 F10
- 1831 B8
- 1851 E9
- 1852 D8
- 2817 F10
- 2818 F10
- 2831 C9
- 2832 C8
- 2833 D4
- 2834 A4
- 2835 A4
- 2836 A4
- 2837 A4
- 2838 A9
- 2839 B9
- 2840 B6
- 2841 B5
- 2842 A5
- 2843 A5
- 2844 C3
- 2845 C3
- 2846 G1
- 2847 D3
- 2848 D3
- 2849 C9
- 2850 D9
- 2851 E8
- 2852 F8
- 2853 E9
- 2854 F9
- 2855 E2
- 2856 E2
- 2857 F2
- 2858 F4
- 2859 G2
- 2860 F2
- 2861 E8
- 2862 A9
- 2863 B4
- 2864 F3
- 2865 B4
- 2866 B3
- 2867 B4
- 2868 A9
- 2869 D2
- 2870 D3
- 2871 F8
- 2872 E3
- 2873 F3
- 2874 G5
- 2875 F2
- 2876 F3
- 2877 E9
- 2878 E9
- 2879 E10
- 2880 F1
- 2881 F3
- 2882 G3
- 2883 D2
- 2884 F10
- 2885 F10
- 2886 A3
- 2887 B8
- 2888 G2
- 2889 F2
- 2890 A4
- 2891 C7
- 2892 F4
- 2893 F3
- 2894 E9

Mono Carrier: Audio/Video Source Switching

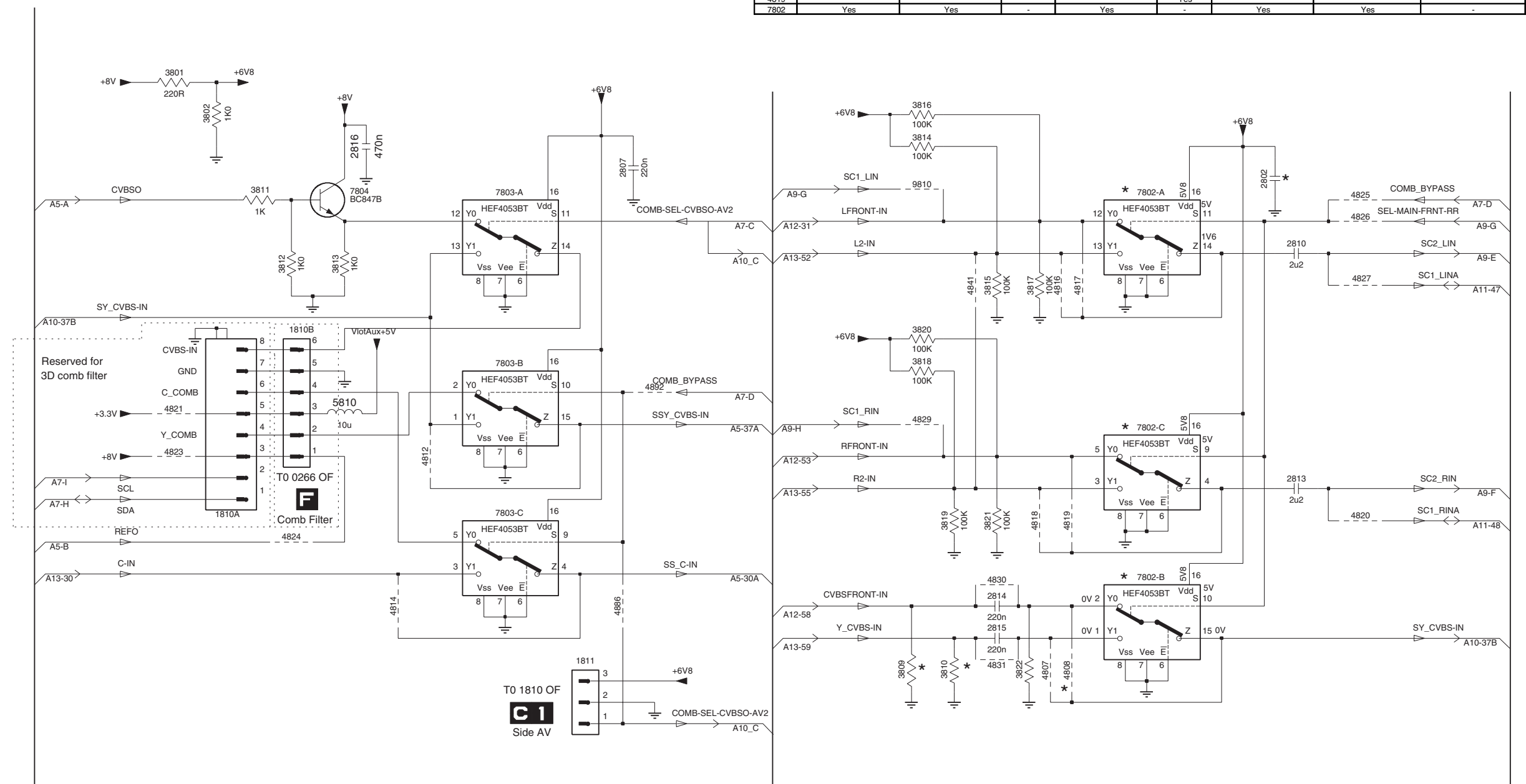
A 1 AUDIO/VIDEO SOURCE SWITCHING

Item	2 x Rear AV in & 1 x AV out with SVHS & YUV, 1 x side AV in	2 x Rear AV in & 1 x AV out with SVHS & YUV	2 x Rear AV in with SVHS	2 x Rear AV in & 1 x AV out with SVHS	1 x Rear AV in	1 x Rear AV in & 1 x AV out with SVHS & YUV, 1 x front AV in	1 x Rear AV in & 1 x AV out with SVHS & YUV, 1 x Side AV in	1 x Rear AV in & 1 x AV out
2802	Yes	Yes	-	Yes	-	Yes	Yes	-
3810	Yes	-	-	-	-	Yes	Yes	-
4807	-	Yes	Yes	Yes	-	-	-	-
4808	-	-	-	-	Yes	-	-	-
4812	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-
4814	Yes	Yes	Yes	Yes	-	Yes	Yes	-
4816	-	Yes	Yes	Yes	-	-	-	-
4817	-	-	-	-	Yes	-	-	Yes
4818	-	Yes	Yes	Yes	-	-	-	-
4819	-	-	-	-	Yes	-	-	-
7802	Yes	Yes	-	Yes	-	Yes	Yes	-

A
B
C
D
E
F

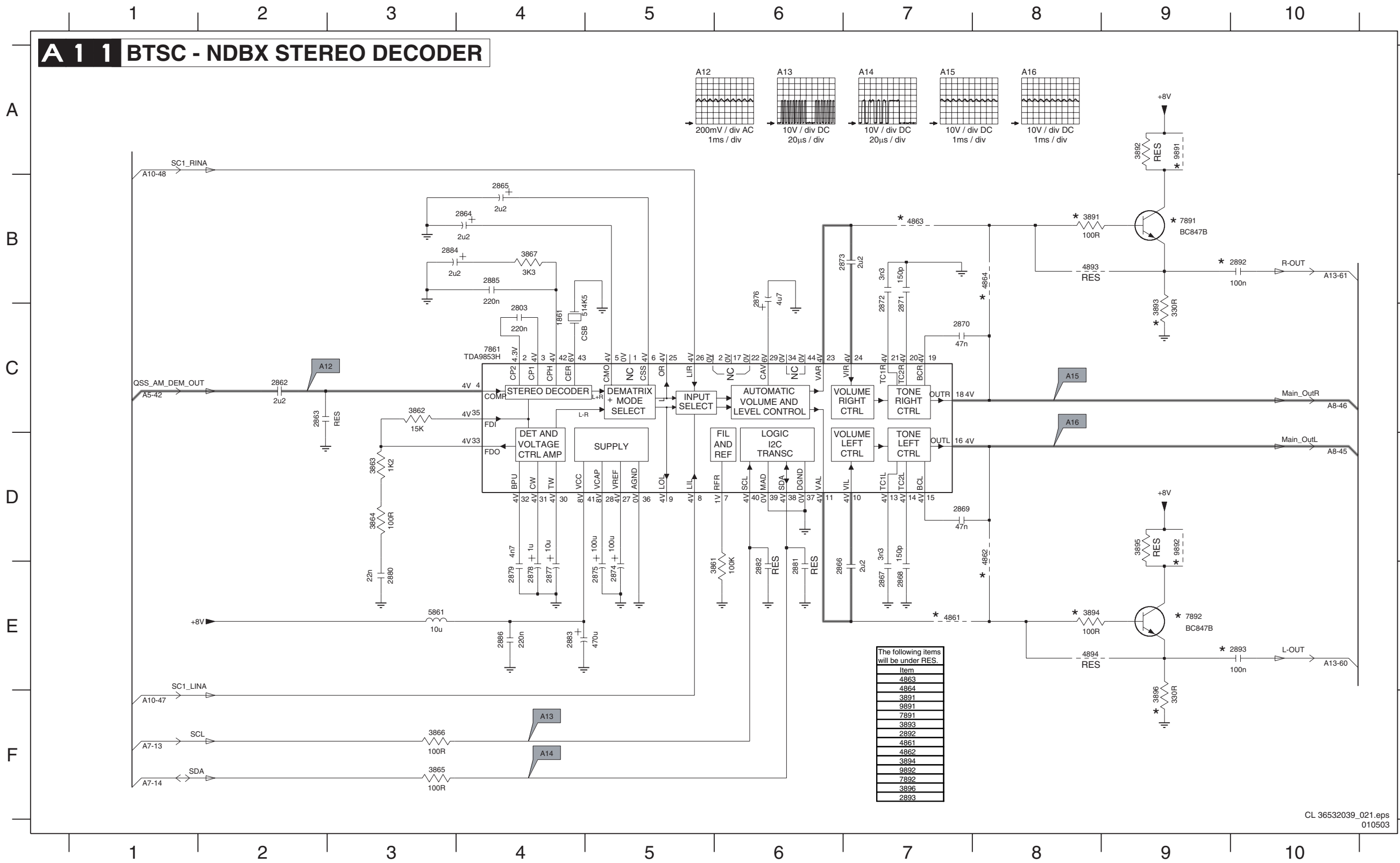
A
B
C
D
E
F

- 1810A E2
- 1810B C3
- 1811 F4
- 2802 B9
- 2807 B5
- 2810 C9
- 2813 D9
- 2814 E7
- 2815 E7
- 2816 B3
- 3801 B2
- 3802 B2
- 3809 F7
- 3810 F7
- 3811 C2
- 3812 C2
- 3813 C3
- 3814 B7
- 3815 C7
- 3816 B7
- 3817 C7
- 3818 D7
- 3819 E7
- 3820 C7
- 3821 E7
- 3822 F7
- 4807 F7
- 4808 F8
- 4812 D3
- 4814 E3
- 4816 C8
- 4817 C8
- 4818 E7
- 4819 E8
- 4820 E10
- 4821 D2
- 4823 D2
- 4824 E2
- 4825 C10
- 4826 C10
- 4827 C10
- 4829 D7
- 4830 E7
- 4841 C7
- 4886 E5
- 4892 D5
- 5810 D3
- 7802-A C8
- 7802-B E8
- 7802-C D8
- 7803-A C4
- 7803-B D4
- 7803-C E4
- 7804 C3
- 9810 C7



Mono Carrier: BTSC NDBX Stereo Decoder

A 1 1 BTSC - NDBX STEREO DECODER



The following items will be under RES.

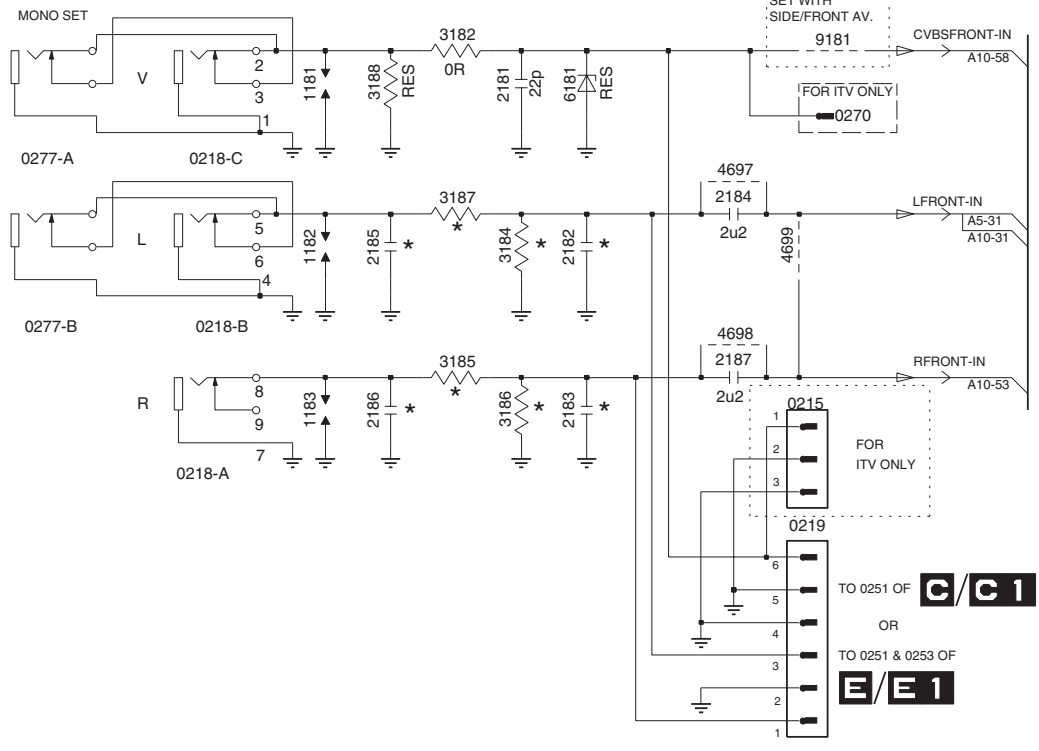
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4863
4864
3891
9891
7891
3893
2892
4861
4862
3894
9892
7892
3896
2893

- 1861 C4
- 2803 C4
- 2862 C2
- 2863 C2
- 2864 B4
- 2865 B4
- 2866 E6
- 2867 E7
- 2868 E7
- 2869 D7
- 2870 C7
- 2871 C7
- 2872 C7
- 2873 B7
- 2874 E5
- 2875 E5
- 2876 B6
- 2877 E4
- 2878 E4
- 2879 E4
- 2880 E3
- 2881 E6
- 2882 E6
- 2883 E4
- 2884 B3
- 2885 B4
- 2886 E4
- 2892 B10
- 2893 E10
- 3861 E6
- 3862 C3
- 3863 D3
- 3864 D3
- 3865 F3
- 3866 F3
- 3867 B4
- 3891 B8
- 3892 A9
- 3893 C9
- 3894 E8
- 3895 D9
- 3896 F9
- 4861 E7
- 4862 D8
- 4863 B7
- 4864 B8
- 4893 B8
- 4894 E8
- 5861 E3
- 7861 C4
- 7891 B9
- 7892 E9
- 9891 A9
- 9892 D9

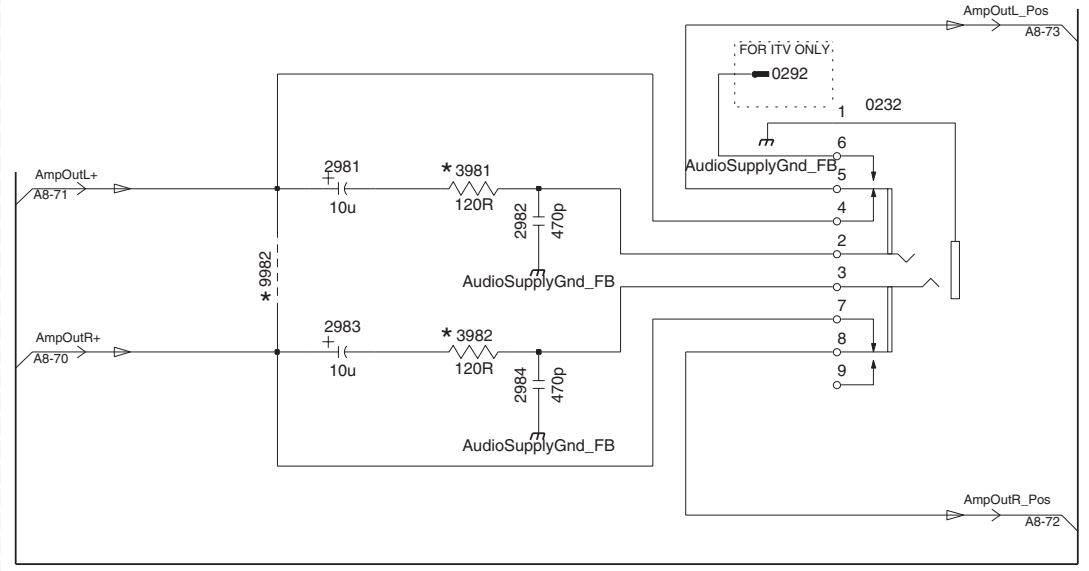
Mono Carrier: Front I/O + Front Control + Headphone

A 1 2 FRONT IO + FRONT CONTROL + HEADPHONE

FRONT CINCH

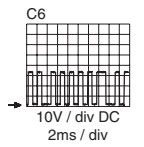
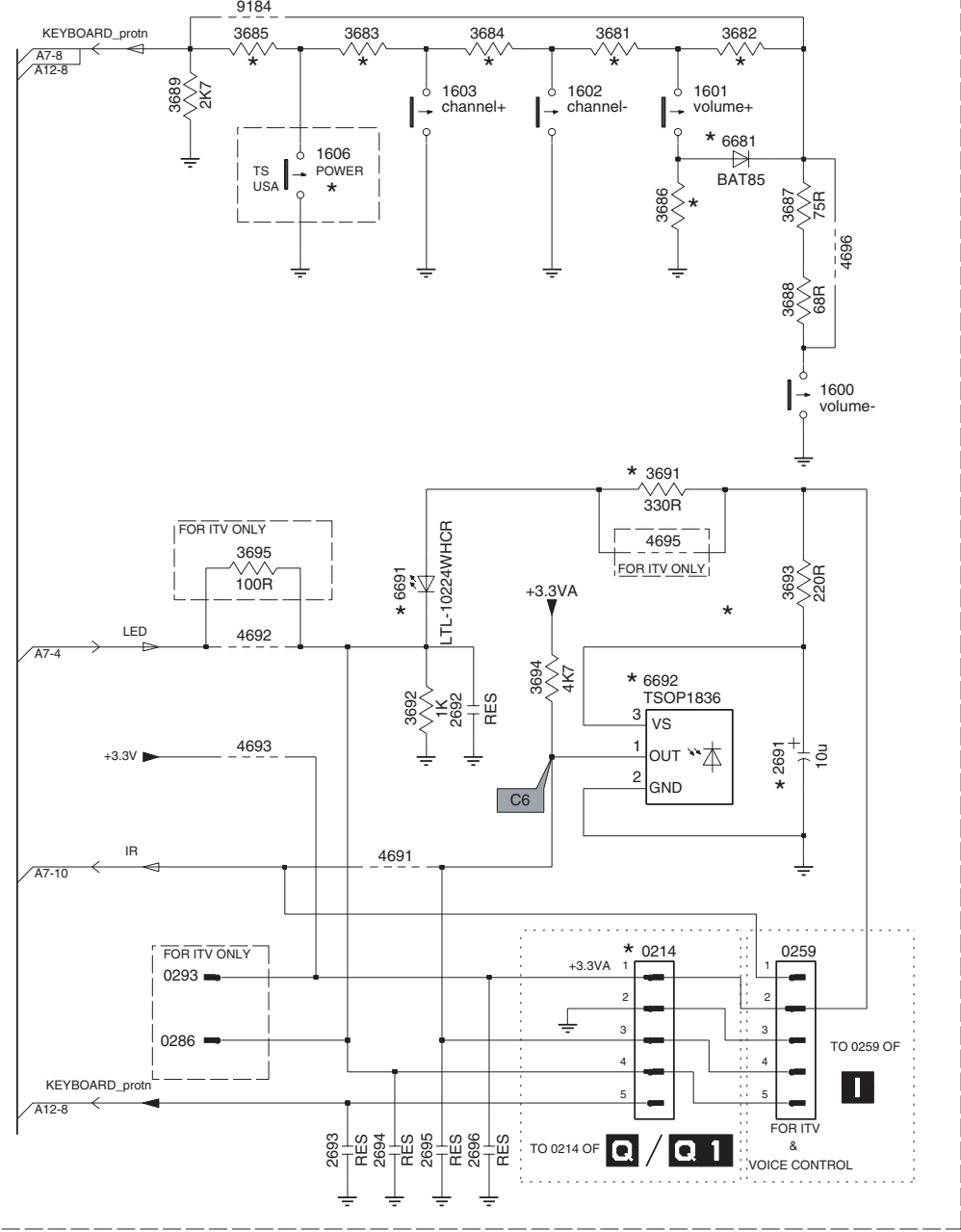


HEADPHONE



For Engg Purpose Only
4694

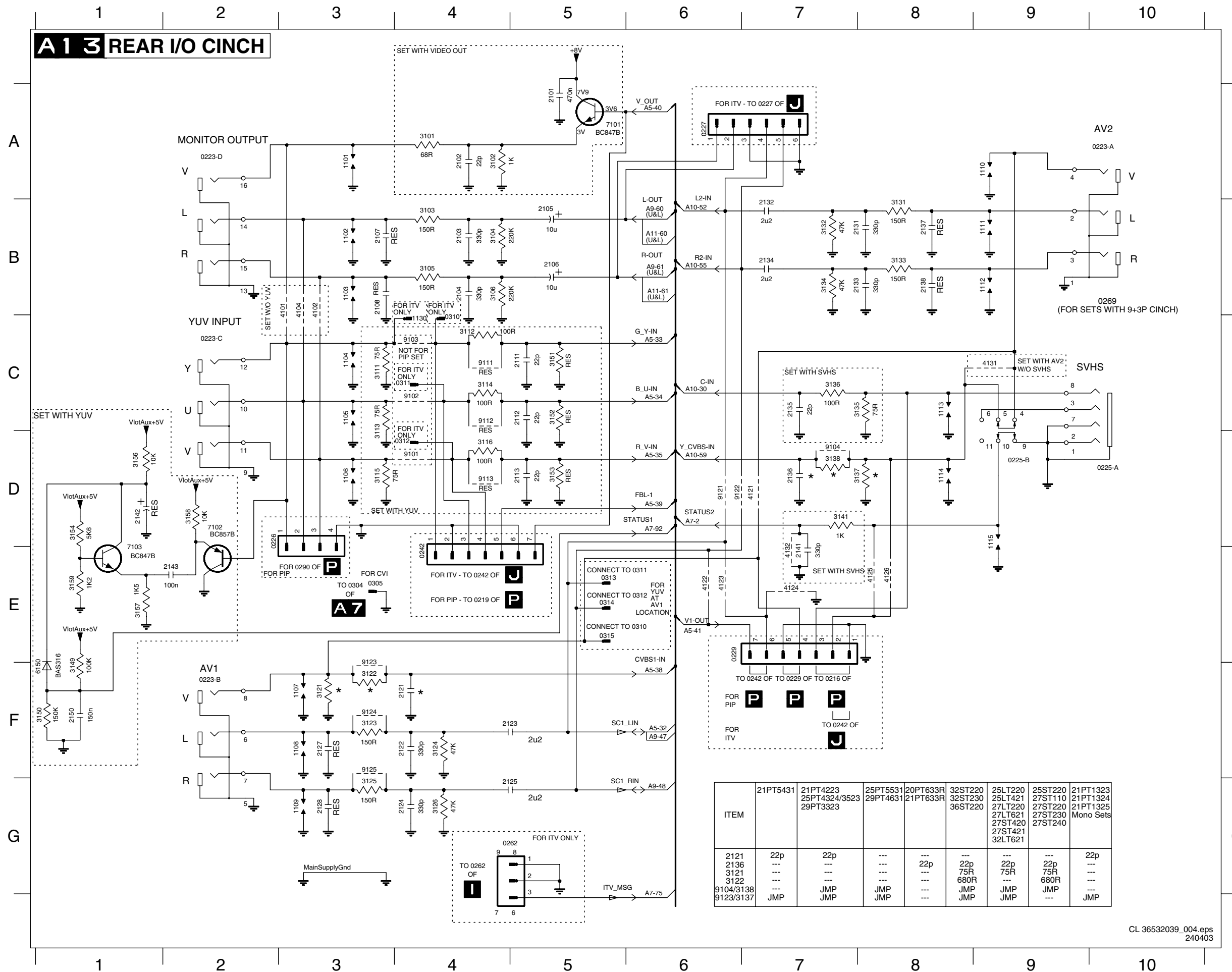
FRONT CONTROL



* FOR DIVERSITY LIST SEE PAGE 39

- 0214 E9
- 0215 C4
- 0218-A C2
- 0218-B B2
- 0218-C B2
- 0219 C4
- 0232 E5
- 0259 E10
- 0270 A5
- 0277-A B1
- 0277-B B1
- 0286 F7
- 0292 E4
- 0293 E7
- 1181 A2
- 1182 B2
- 1183 C2
- 1600 C10
- 1601 A9
- 1602 A9
- 1603 A8
- 1606 B8
- 2181 A3
- 2182 B3
- 2183 C3
- 2184 B4
- 2185 B3
- 2186 C3
- 2187 B4
- 2691 D10
- 2692 D8
- 2693 F8
- 2694 F8
- 2695 F8
- 2696 F8
- 2981 E2
- 2982 F3
- 2983 F2
- 2984 F3
- 3182 A3
- 3184 B3
- 3185 B3
- 3186 C3
- 3187 B3
- 3188 A3
- 3681 A9
- 3682 A10
- 3683 A8
- 3684 A8
- 3685 A7
- 3686 B9
- 3687 B10
- 3688 B10
- 3689 A7
- 3691 C9
- 3692 D8
- 3693 D10
- 3694 D9
- 3695 C7
- 3981 E3
- 3982 F3
- 4691 E8
- 4692 D7
- 4693 D7
- 4694 G5
- 4695 C9
- 4696 B10
- 4697 B4
- 4698 B4
- 4699 B4
- 6181 A3
- 6681 B10
- 6691 D8
- 6692 D9
- 9181 A5
- 9184 A7
- 9982 F2

Mono Carrier: Rear I/O Cinch



- 0223-A A10
- 0223-B F2
- 0223-C C2
- 0223-D A2
- 0225-A D10
- 0225-B D9
- 0226 D2
- 0227 A6
- 0229 E6
- 0242 D4
- 0262 G5
- 0305 E3
- 0310 B4
- 0311 C4
- 0312 D4
- 0313 E5
- 0314 E5
- 0315 E5
- 1101 A3
- 1102 B3
- 1103 B3
- 1104 C3
- 1105 C3
- 1106 D3
- 1107 F3
- 1108 F3
- 1109 G3
- 1110 A9
- 1111 B9
- 1112 B9
- 1113 C8
- 1114 D8
- 1115 D9
- 1130 C4
- 2101 A5
- 2102 A4
- 2103 B4
- 2104 B4
- 2105 B5
- 2106 B5
- 2107 B3
- 2108 B3
- 2111 C5
- 2112 C5
- 2113 D5
- 2121 F4
- 2122 F4
- 2123 F4
- 2124 G4
- 2125 G4
- 2127 F3
- 2128 G3
- 2131 B8
- 2132 B7
- 2133 B8
- 2134 B7
- 2135 C7
- 2136 D7
- 2137 B8
- 2138 B8
- 2141 E7
- 2142 D1
- 2143 E2
- 2150 F1
- 3101 A4
- 3102 A4
- 3103 B4
- 3104 B4
- 3105 B4
- 3106 B4
- 3111 C3
- 3112 C4
- 3113 D3
- 3114 C4
- 3115 D3
- 3116 D4
- 3121 F3
- 3122 F3
- 3123 F3
- 3124 F4
- 3125 G3
- 3126 G4
- 3131 B8
- 3132 B7
- 3133 B8
- 3134 B7
- 3135 C8
- 3136 C7
- 3137 D8
- 3138 D7
- 3141 D7
- 3149 F1
- 3150 F1
- 3151 C5
- 3152 C5
- 0223-A A10
- 0223-B F2
- 0223-C C2
- 0223-D A2
- 0225-A D10
- 0225-B D9
- 0226 D2
- 0227 A6
- 0229 E6
- 0242 D4
- 0262 G5
- 0305 E3
- 0310 B4
- 0311 C4
- 0312 D4
- 0313 E5
- 0314 E5
- 0315 E5
- 1101 A3
- 1102 B3
- 1103 B3
- 1104 C3
- 1105 C3
- 1106 D3
- 1107 F3
- 1108 F3
- 1109 G3
- 1110 A9
- 1111 B9
- 1112 B9
- 1113 C8
- 1114 D8
- 1115 D9
- 1130 C4
- 2101 A5
- 2102 A4
- 2103 B4
- 2104 B4
- 2105 B5
- 2106 B5
- 2107 B3
- 2108 B3
- 2111 C5
- 2112 C5
- 2113 D5
- 2121 F4
- 2122 F4
- 2123 F4
- 2124 G4
- 2125 G4
- 2127 F3
- 2128 G3
- 2131 B8
- 2132 B7
- 2133 B8
- 2134 B7
- 2135 C7
- 2136 D7
- 2137 B8
- 2138 B8
- 2141 E7
- 2142 D1
- 2143 E2
- 2150 F1
- 3101 A4
- 3102 A4
- 3103 B4
- 3104 B4
- 3105 B4
- 3106 B4
- 3111 C3
- 3112 C4
- 3113 D3
- 3114 C4
- 3115 D3
- 3116 D4
- 3121 F3
- 3122 F3
- 3123 F3
- 3124 F4
- 3125 G3
- 3126 G4
- 3131 B8
- 3132 B7
- 3133 B8
- 3134 B7
- 3135 C8
- 3136 C7
- 3137 D8
- 3138 D7
- 3141 D7
- 3149 F1
- 3150 F1
- 3151 C5
- 3152 C5

Mono Carrier: Diversity Tables

DIVERSITY TABLE FOR A1 POWER SUPPLY

Table with columns: REGION, NA, LA/AP, CH. Rows include audio output, various component values (e.g., 200V 470U, 1K1V 2N2), and part numbers.

DIVERSITY TABLE FOR A2 LINE DEFLECTION

Large table with columns: REGION, LG.PH, SAMSUNG, LG.PH, AP, LG.PH, LG.PH(HF), MMEC. Rows include various component values and part numbers for line deflection.

DIVERSITY TABLE FOR A12 FRONT IO + FRONT CNTL + HP

Table with columns: ITEM, 55K NA, 55K LA, NON 55K NA, NON 55K LA, IR + LED NA, IR + LED LA, KEYBOARD+ IR + LED LA, and two columns for SCART IN (1K, 10K).

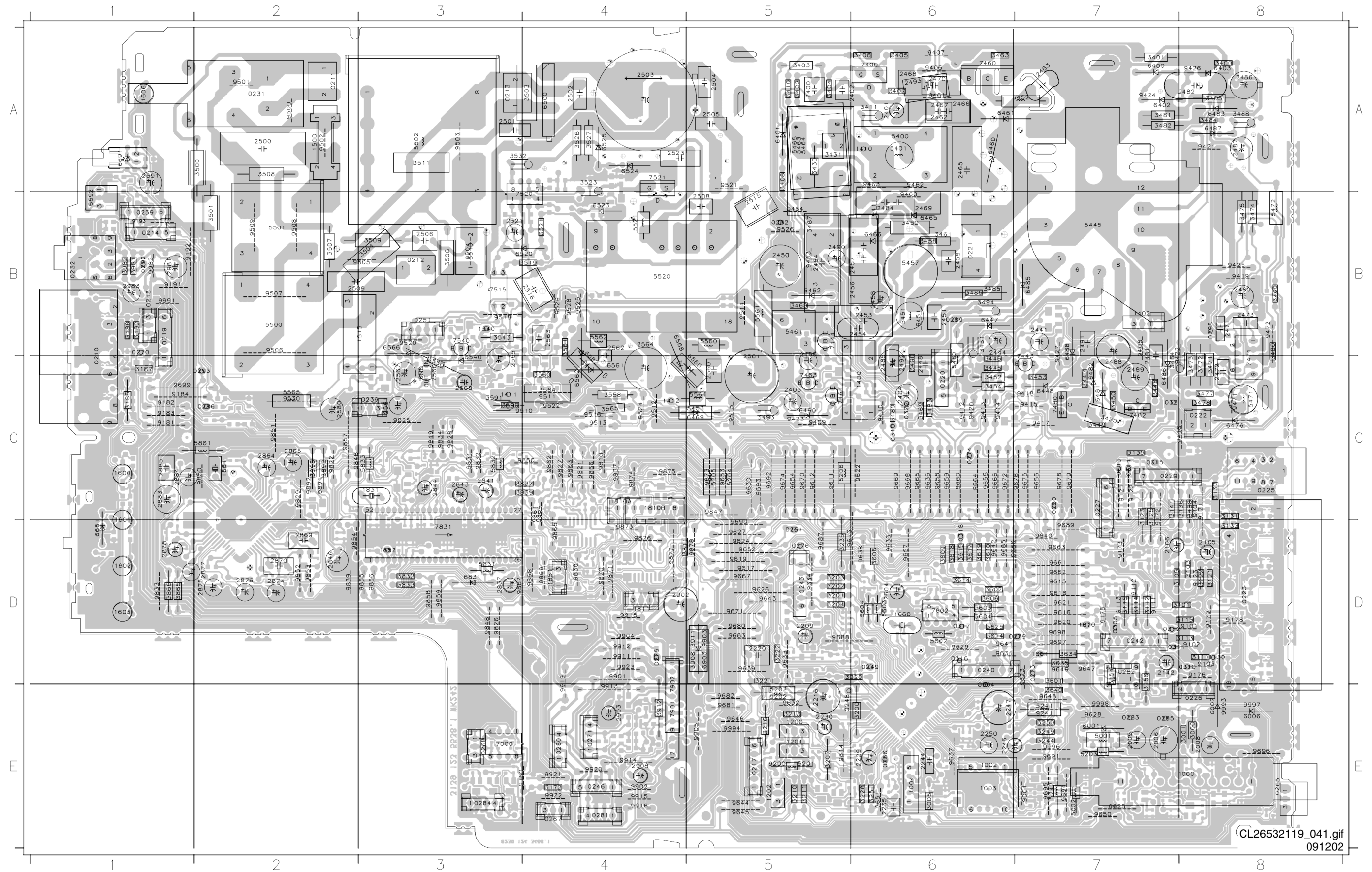
DIVERSITY TABLE FOR A3 AUDIO AMPIFIER

Table with columns: ITEM, SNDAMP-2x3w-NA, SNDAMP-2x5w-LA, SNDAMP-2x10w-ST-AP, etc. Rows include various component values and part numbers for audio amplifier.

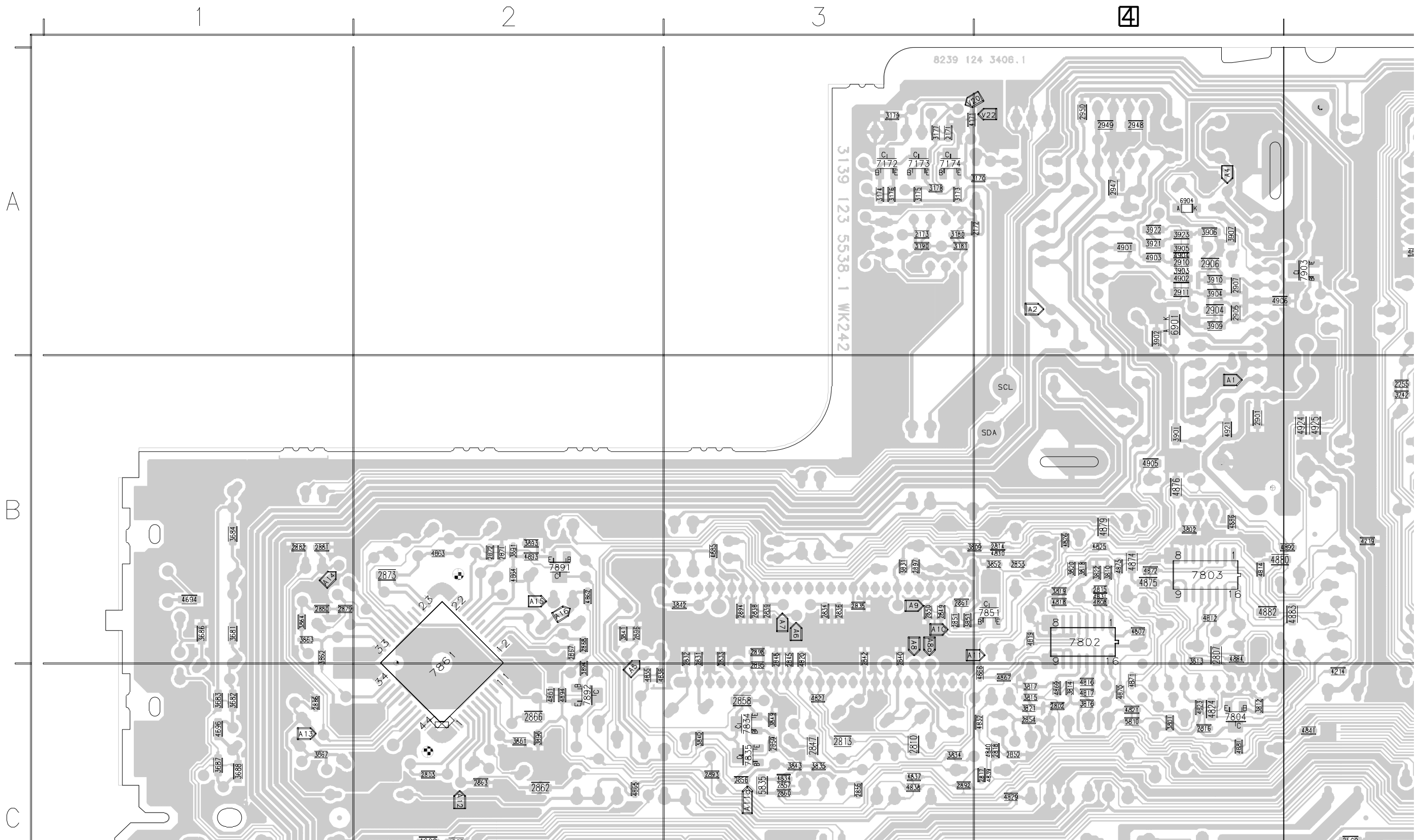
Table with columns: ITEM, KEYBOARD IR+LED-GL, IR+LED-EU/LA/AP, TC.PNL+FI.PNL-INTERF.EU/NA/AP, L2K2 FRNT 55K-NA, L2K2 FRNT 55K-LA, L2K2 FRNT NON-55K-NA, L2K2 FRNT NON-55K-LA, IR+LED. 55K NA. Includes a note: * 1% TOLERANCE RESISTOR

Small table with columns: ITEM, SNDAMP-2x10w-ST-EU, SNDAMP-2x5w-ST-EU/AP, SNDAMP-2x5w-VD-ST-EU, SNDAMP-2x10w-VD-ST-EU. Row 2604.

Layout Mono Carrier: Top Side



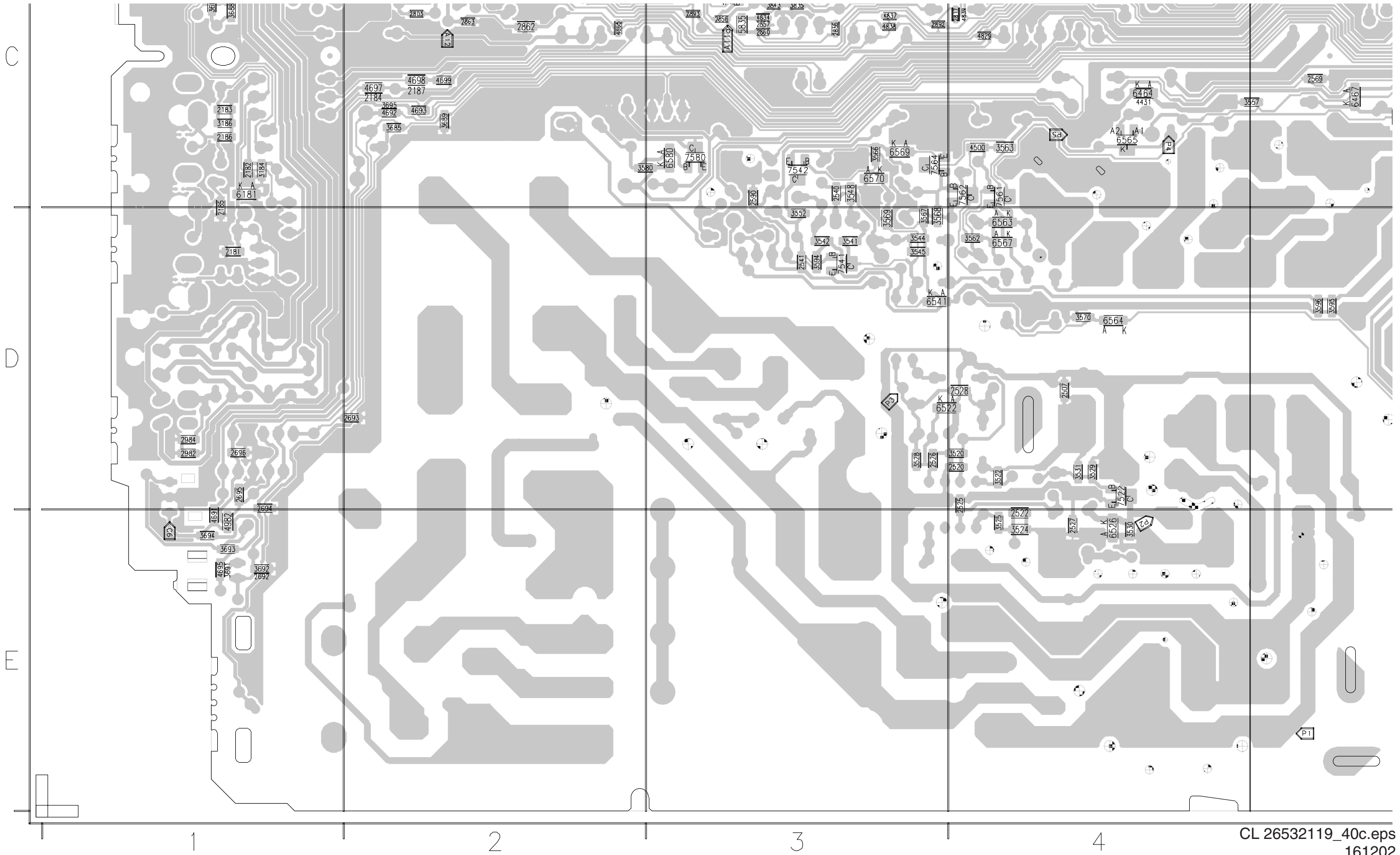
Layout Mono Carrier (Part 1 Bottom Side)



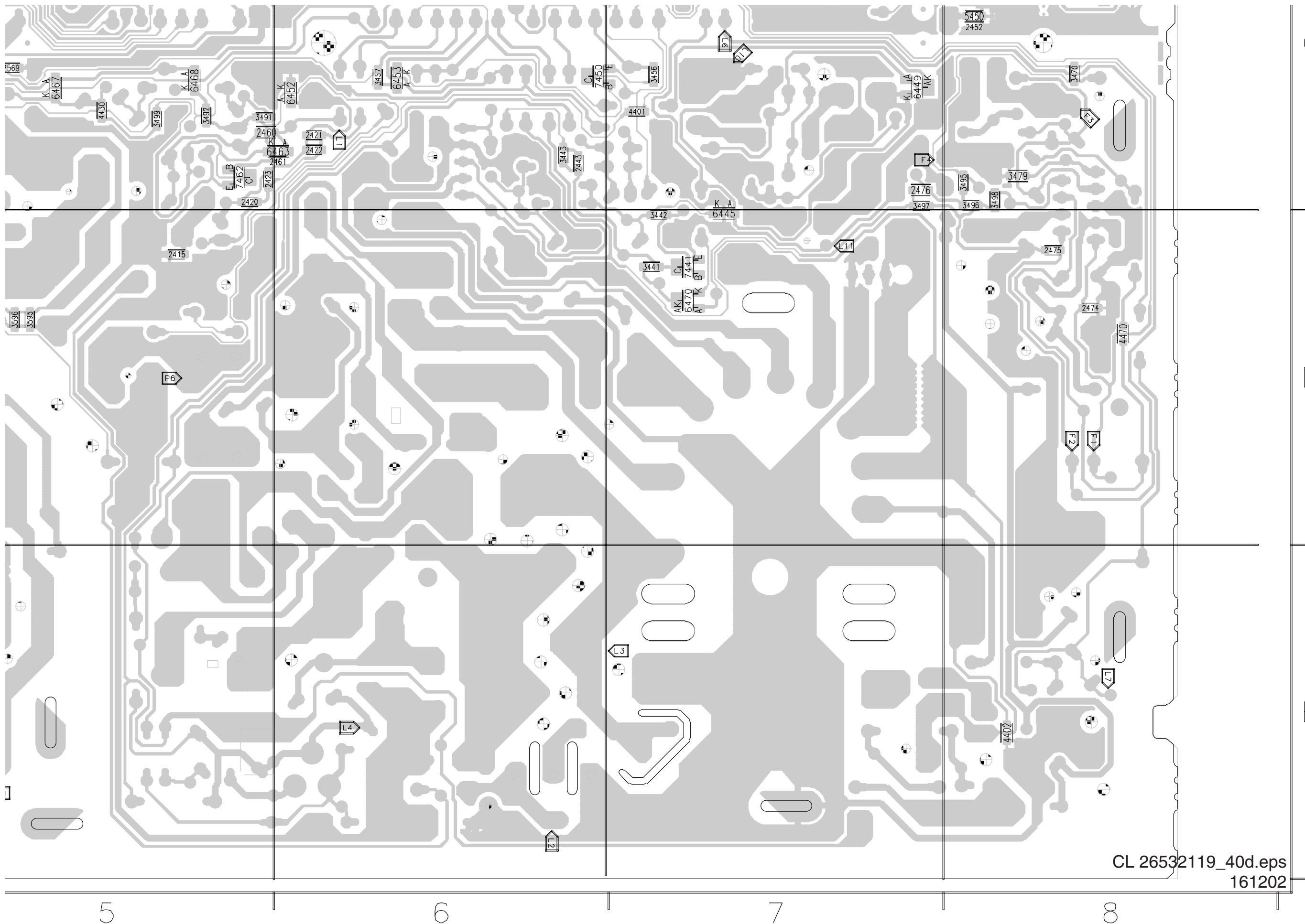
Layout Mono Carrier (Part 2 Bottom Side)



Layout Mono Carrier (Part 3 Bottom Side)

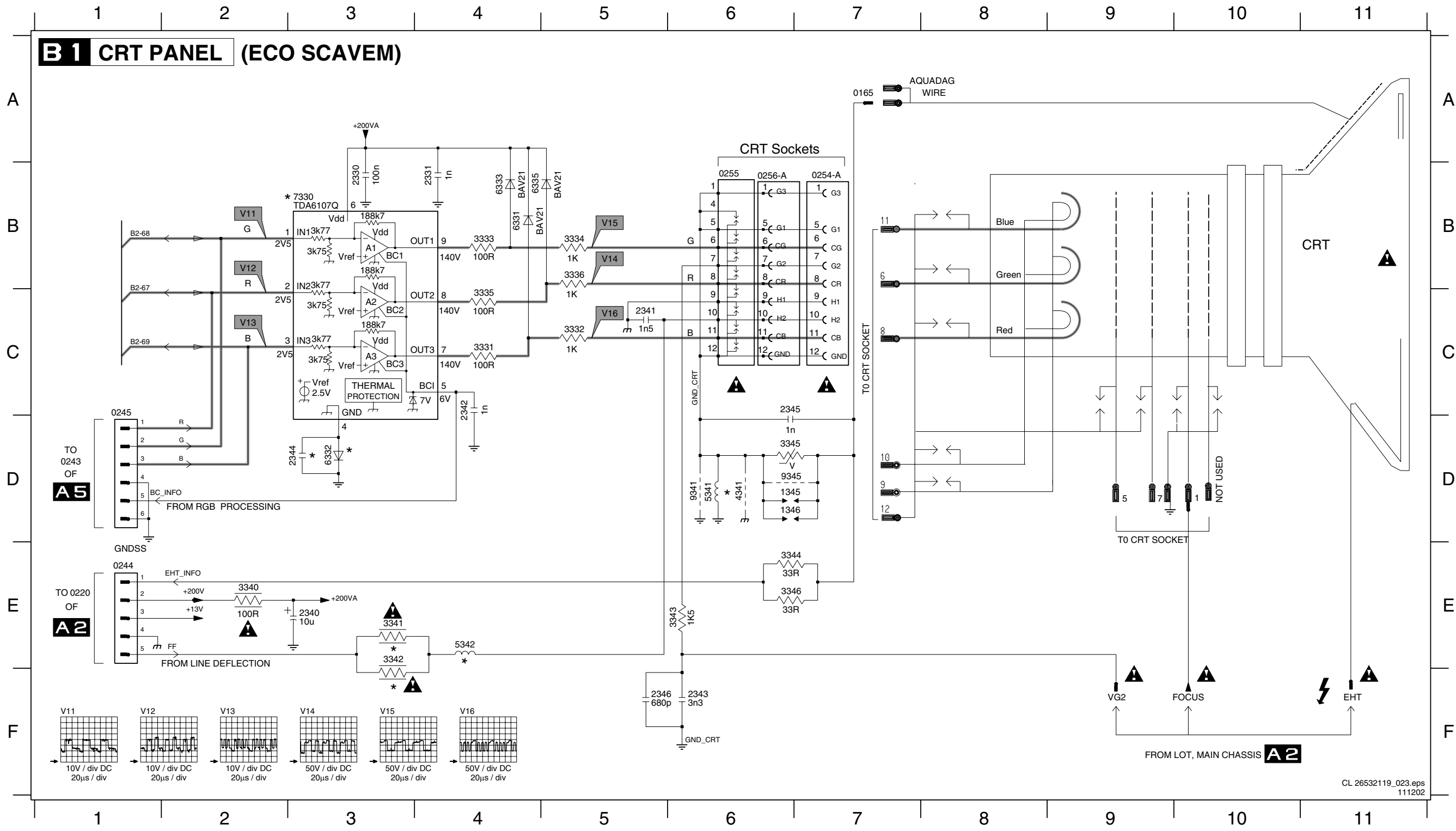


Layout Mono Carrier (Part 4 Bottom Side)



CRT Panel ECO SCAVEM

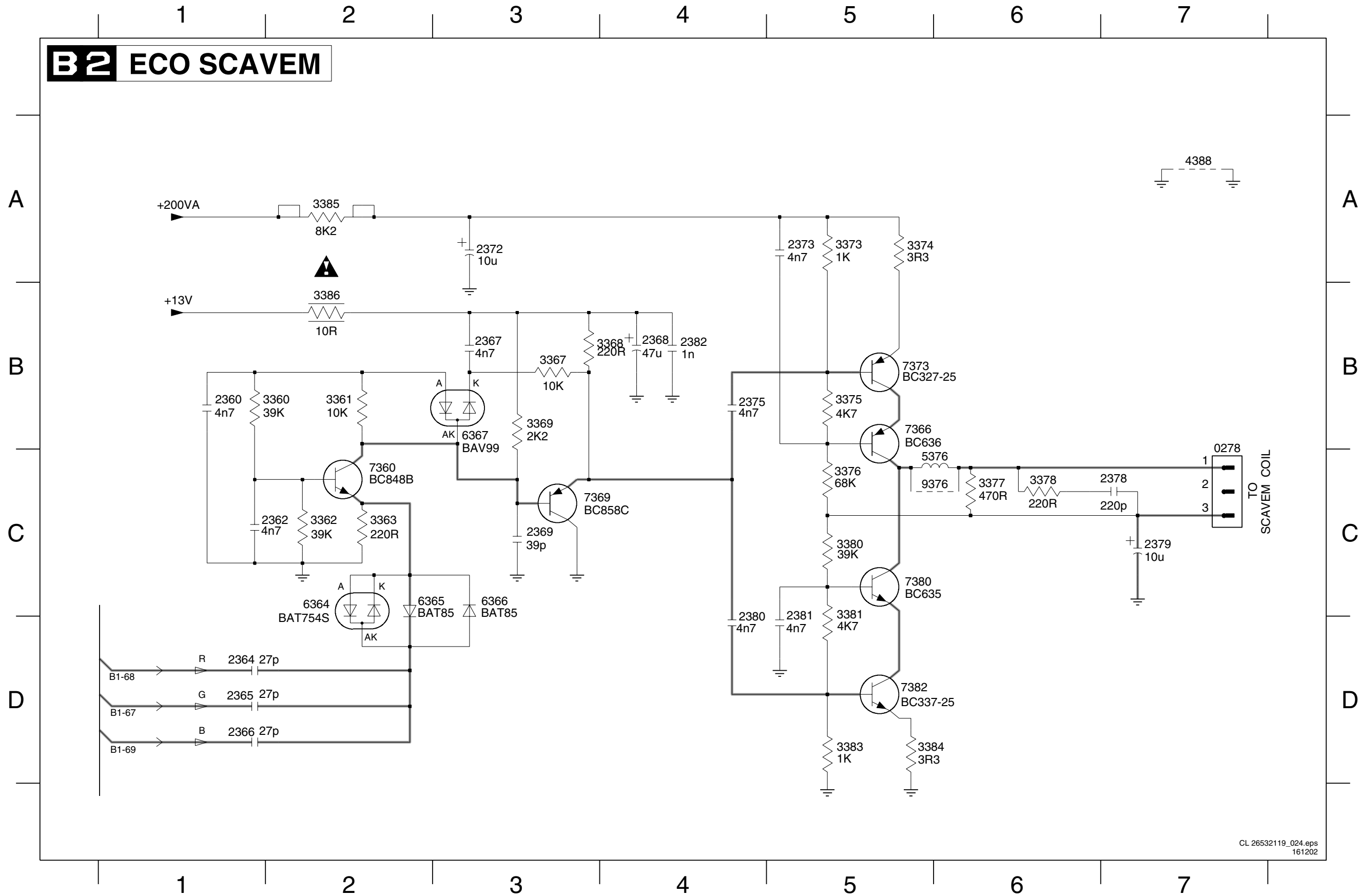
B 1 CRT PANEL (ECO SCAVEM)



- VG2 F9
- 0165 A7
- 0244 E1
- 0245 D1
- 0254-A B7
- 0255 B6
- 0256-A B6
- 1345 D6
- 1346 D6
- 2330 B3
- 2331 B4
- 2340 E3
- 2341 C5
- 2342 C4
- 2343 F6
- 2344 D3
- 2345 C6
- 2346 F5
- 3331 C4
- 3332 C5
- 3333 B4
- 3334 B5
- 3335 C4
- 3336 B5
- 3340 E2
- 3341 E3
- 3342 E3
- 3343 E6
- 3344 E6
- 3345 D6
- 3346 E6
- 4341 D6
- 5341 D6
- 5342 E4
- 6331 B4
- 6332 D3
- 6333 B4
- 6335 B4
- 7330 B3
- 9341 D6
- 9345 D6

CRT Panel ECO SCAVEM

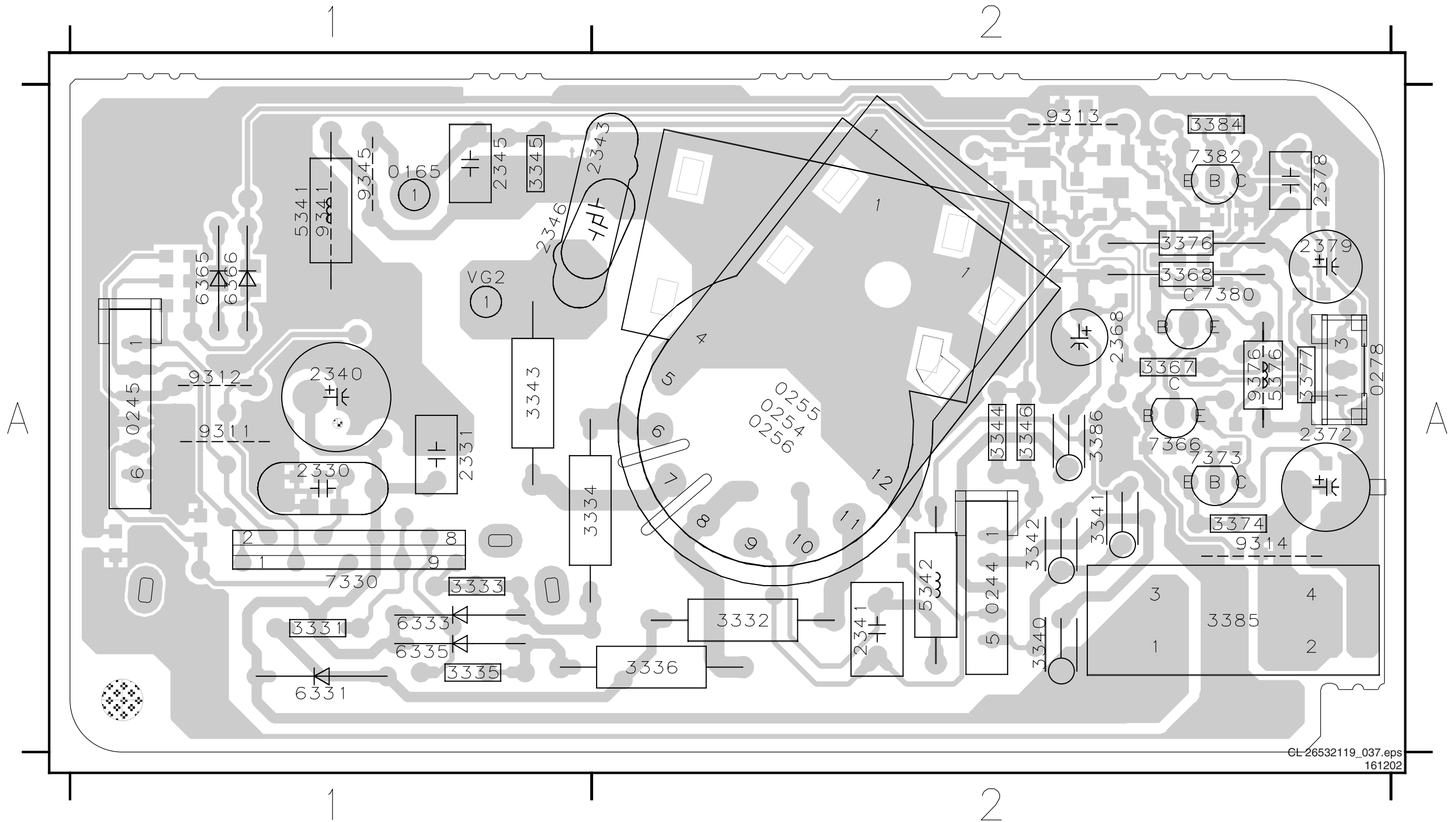
B2 ECO SCAVEM



- 0278 C7
- 2360 B1
- 2362 C2
- 2364 D1
- 2365 D1
- 2366 D1
- 2367 B3
- 2368 B4
- 2369 C3
- 2372 A3
- 2373 A5
- 2375 B4
- 2378 C7
- 2379 C7
- 2380 C4
- 2381 C5
- 2382 B4
- 3360 B2
- 3361 B2
- 3362 C2
- 3363 C2
- 3367 B3
- 3368 B4
- 3369 B3
- 3373 A5
- 3374 A5
- 3375 B5
- 3376 C5
- 3377 C6
- 3378 C6
- 3380 C5
- 3381 C5
- 3383 D5
- 3384 D5
- 3385 A2
- 3386 B2
- 4388 A7
- 5376 C6
- 6364 C2
- 6365 C2
- 6366 C3
- 6367 B3
- 7360 C2
- 7366 B5
- 7369 C3
- 7373 B5
- 7380 C5
- 7382 D5
- 9376 C6

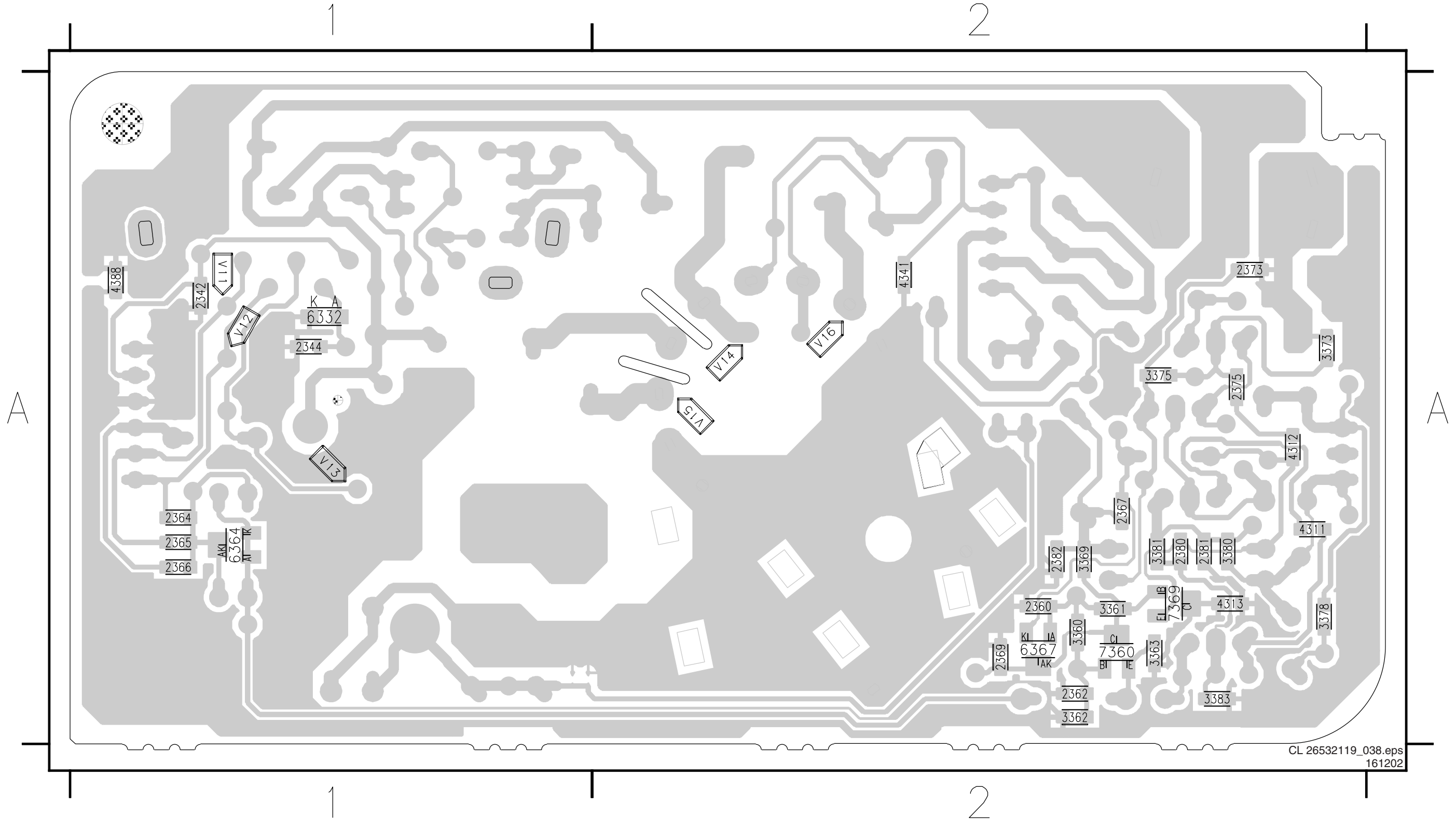
Layout CRT Panel (Top Side)

VG2	A1	0255	A2	2340	A1	2368	A2	3332	A2	3340	A2	3345	A1	3376	A2	5341	A1	6335	A1	7373	A2	9313	A2
0165	A1	0256	A2	2341	A2	2372	A2	3333	A1	3341	A2	3346	A2	3377	A2	5342	A2	6365	A1	7380	A2	9314	A2
0244	A2	0278	A2	2343	A2	2378	A2	3334	A1	3342	A2	3367	A2	3384	A2	5376	A2	6366	A1	7382	A2	9341	A1
0245	A1	2330	A1	2345	A1	2379	A2	3335	A1	3343	A1	3368	A2	3385	A2	6331	A1	7330	A1	9311	A1	9345	A1
0254	A2	2331	A1	2346	A1	3331	A1	3336	A2	3344	A2	3374	A2	3386	A2	6333	A1	7366	A2	9312	A1	9376	A2

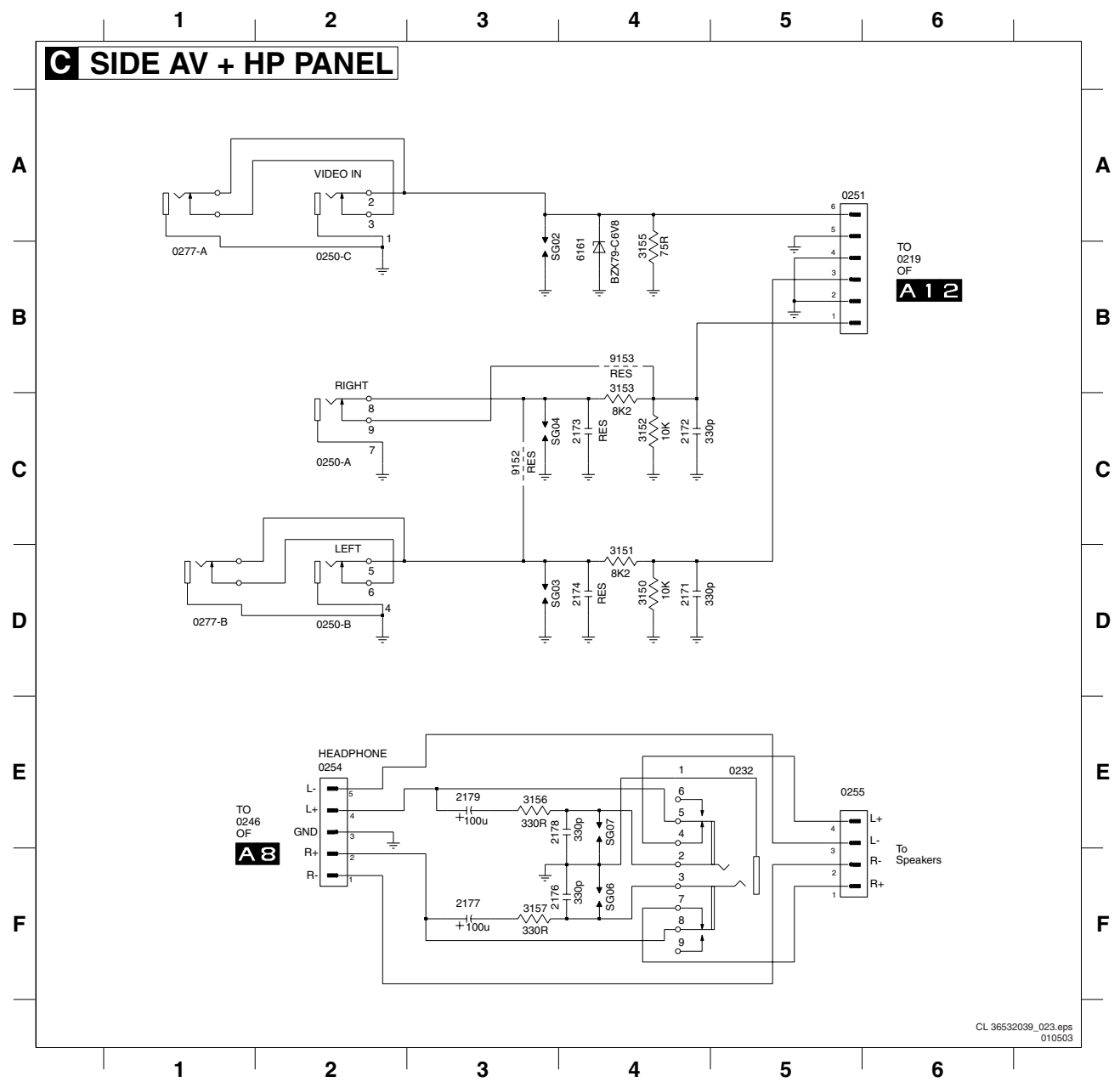


Layout CRT Panel (Bottom Side)

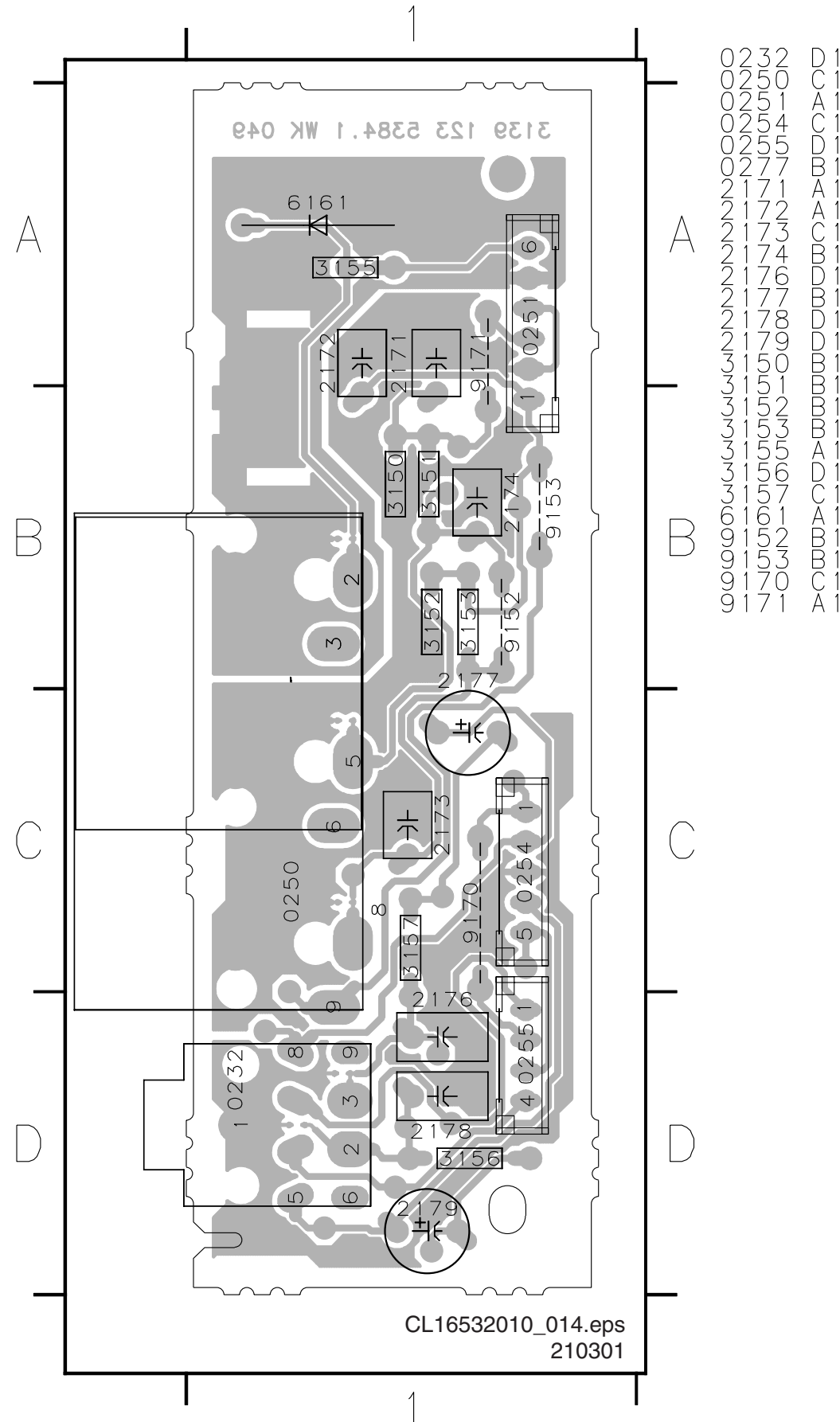
2342 A1	2365 A1	2375 A2	3361 A2	3375 A2	4311 A2	6332 A1
2344 A1	2366 A1	2380 A2	3362 A2	3378 A2	4312 A2	6364 A1
2360 A2	2367 A2	2381 A2	3363 A2	3380 A2	4313 A2	6367 A2
2362 A2	2369 A2	2382 A2	3369 A2	3381 A2	4341 A2	7360 A2
2364 A1	2373 A2	3360 A2	3373 A2	3383 A2	4388 A1	7369 A2



Side AV + HP Panel



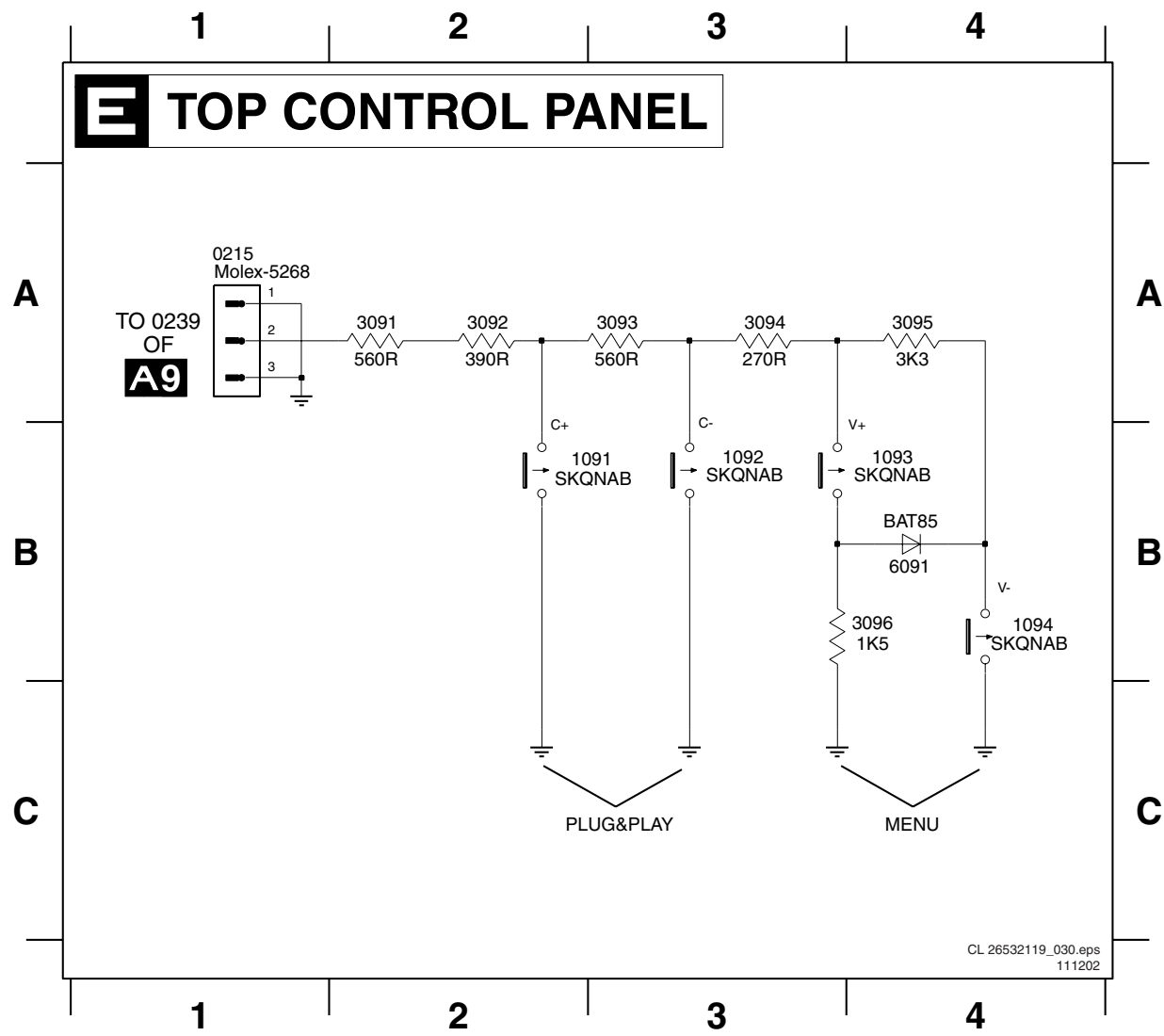
Layout Side AV + HP Panel



- 0232 E5
- 0250-A C2
- 0250-B D2
- 0250-C B2
- 0251 A5
- 0254 E2
- 0255 E5
- 0277-A B1
- 0277-B D1
- 2171 D4
- 2172 C4
- 2173 C4
- 2174 D4
- 2176 F3
- 2177 F3
- 2178 E3
- 2179 E3
- 3150 D4
- 3151 D4
- 3152 C4
- 3153 B4
- 3155 B4
- 3156 E3
- 3157 F3
- 6161 B4
- 9152 C3
- 9153 B4
- SG02 B3
- SG03 D3
- SG04 C3
- SG06 F4
- SG07 E4

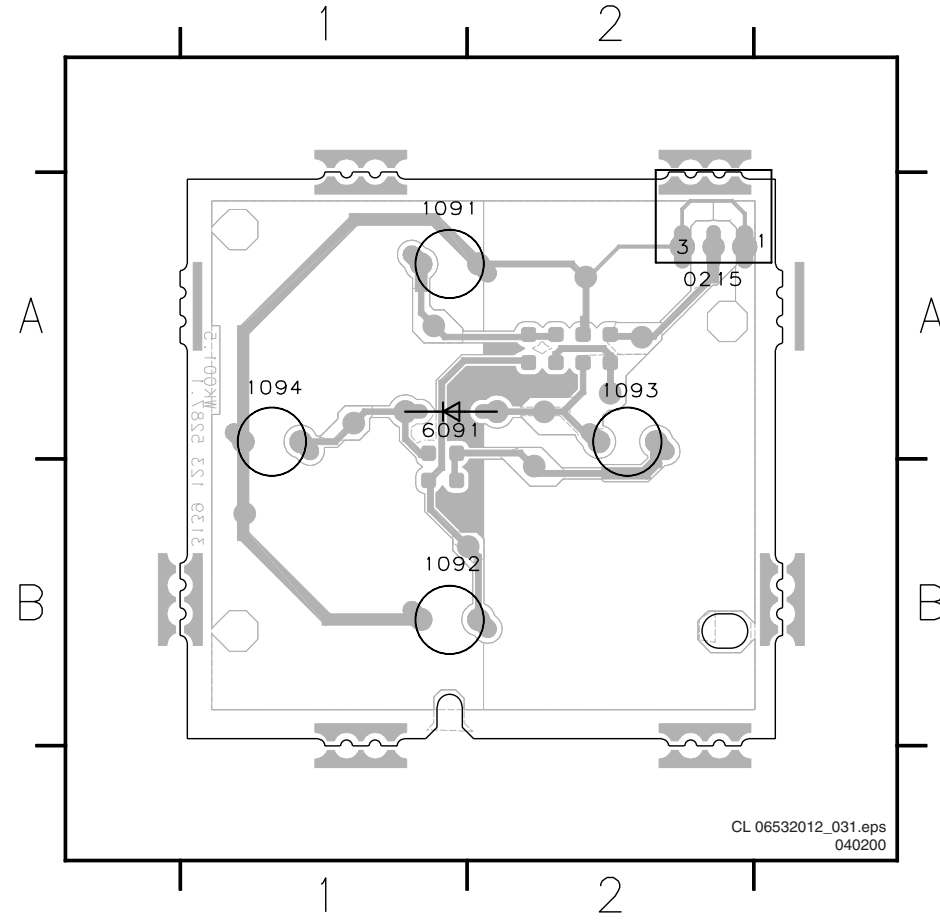
- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- A
- B
- C
- D
- E
- F
- G
- H
- I
- J
- K
- L
- M
- N
- O
- P
- Q
- R
- S
- T
- U
- V
- W
- X
- Y
- Z

Top Control Panel



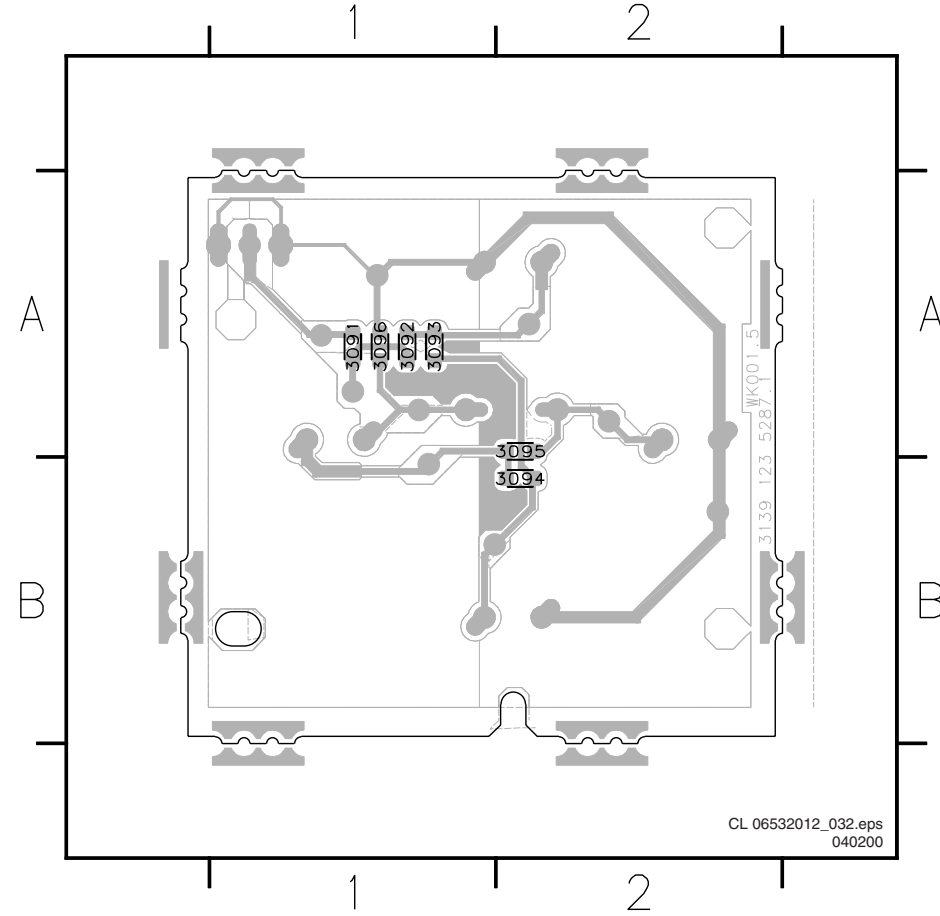
- 0215 A1
- 1091 B3
- 1092 B3
- 1093 B4
- 1094 B4
- 3091 A2
- 3092 A2
- 3093 A3
- 3094 A3
- 3095 A4
- 3096 B4
- 6091 B4

Layout Top Control Panel (Top Side)



- 0215 A2
- 1091 A1
- 1092 B1
- 1093 A2
- 1094 A1
- 6091 A1

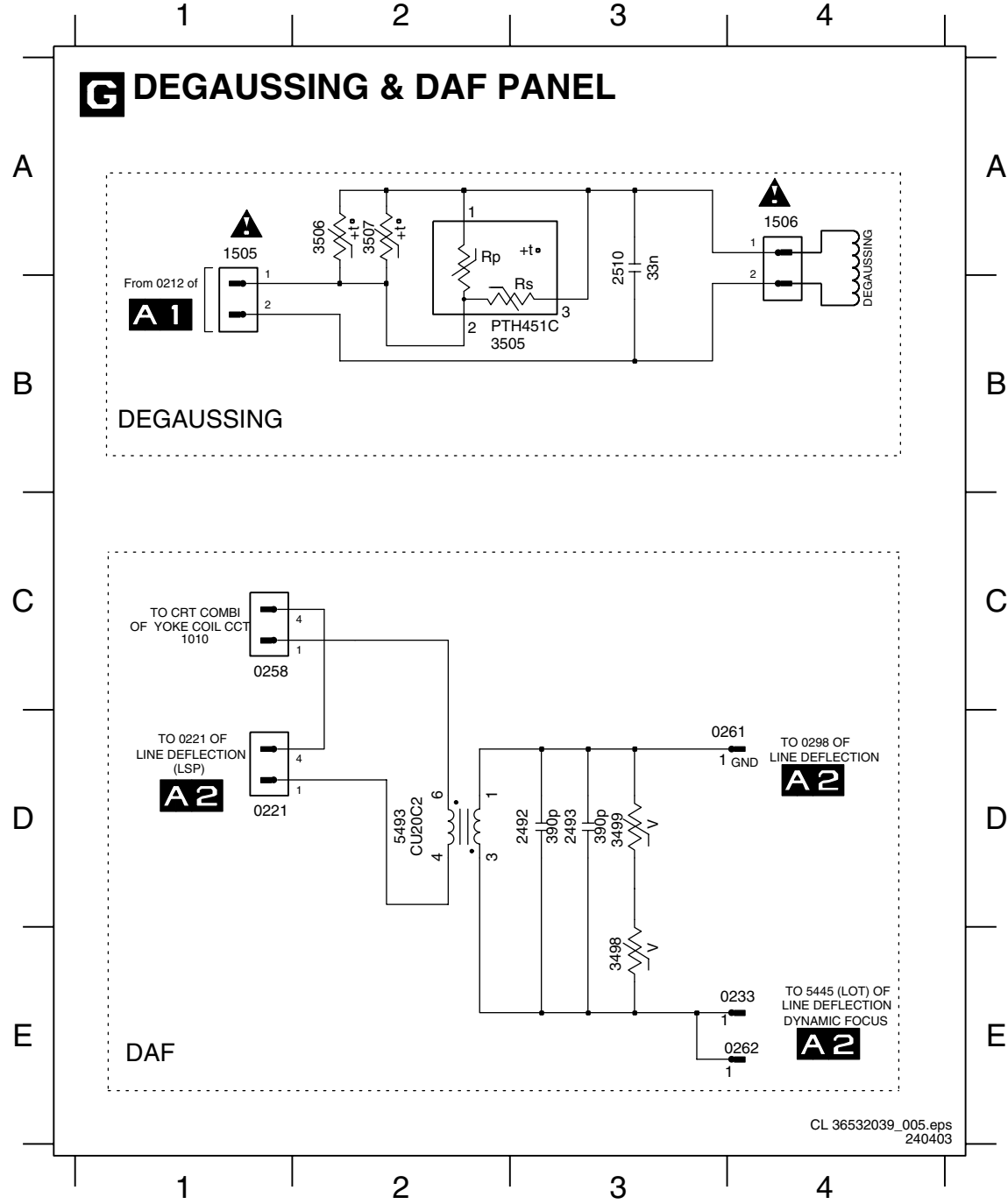
Layout Top Control Panel (Bottom Side)



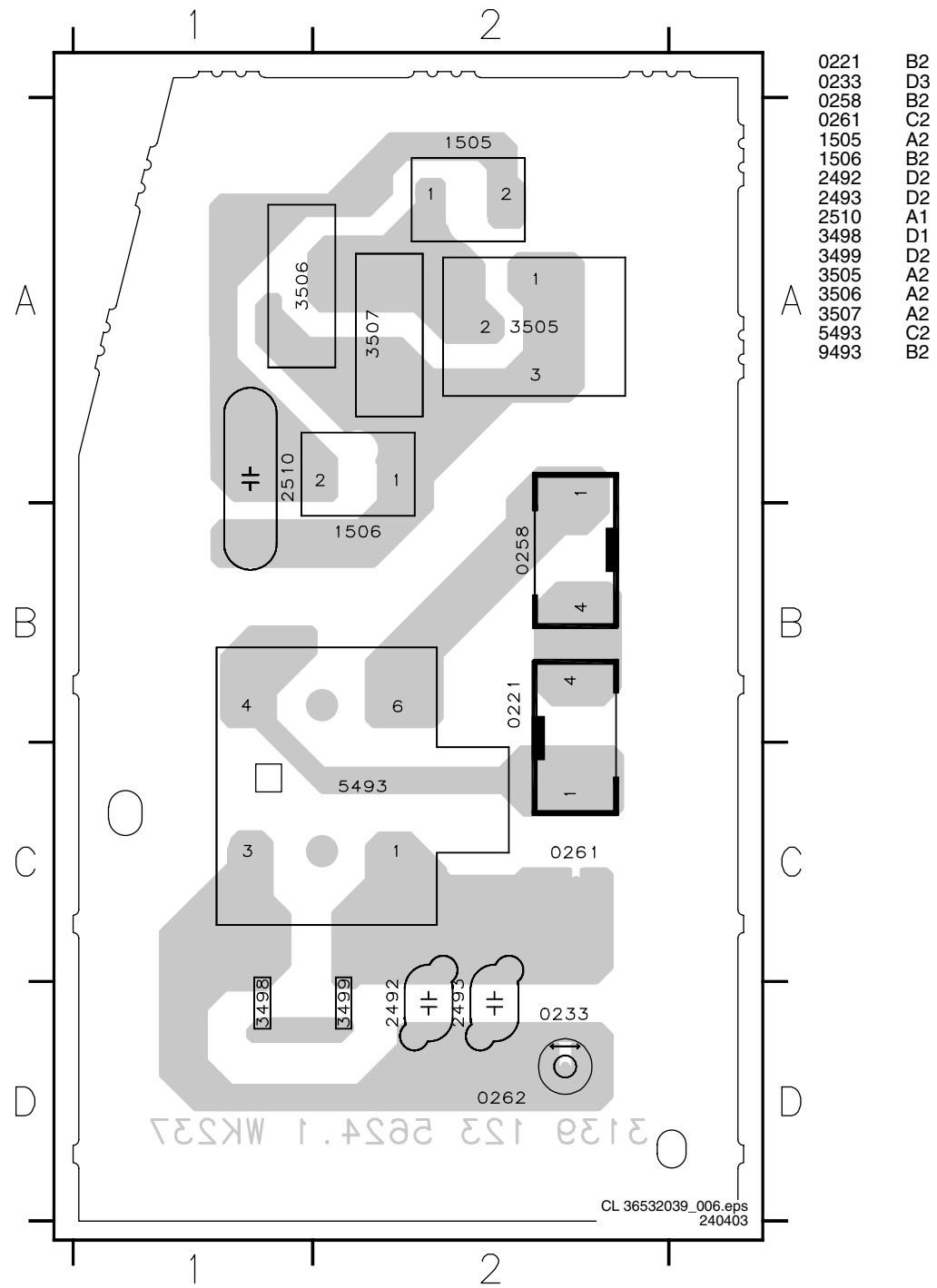
- 3091 A1
- 3092 A1
- 3093 A1
- 3094 B2
- 3095 A2
- 3096 A1

Degaussing & DAF Panel

0221 D1 0258 C1 0262 E4 1506 A4 2493 D3 3498 E3 3505 B2 3507 A2
 0233 E3 0261 D4 1505 A1 2492 D3 2510 A3 3499 D3 3506 A2 5493 D2

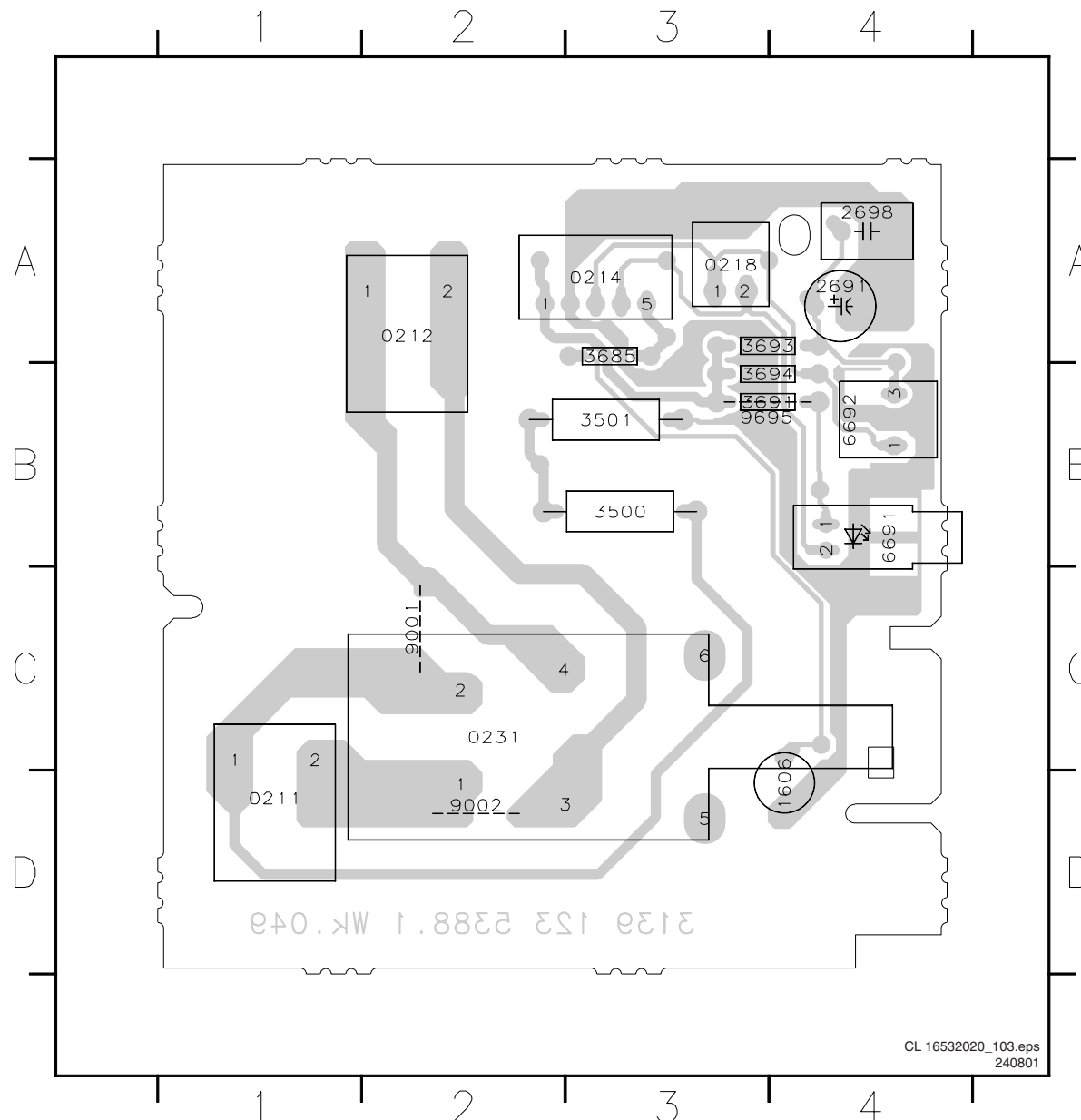
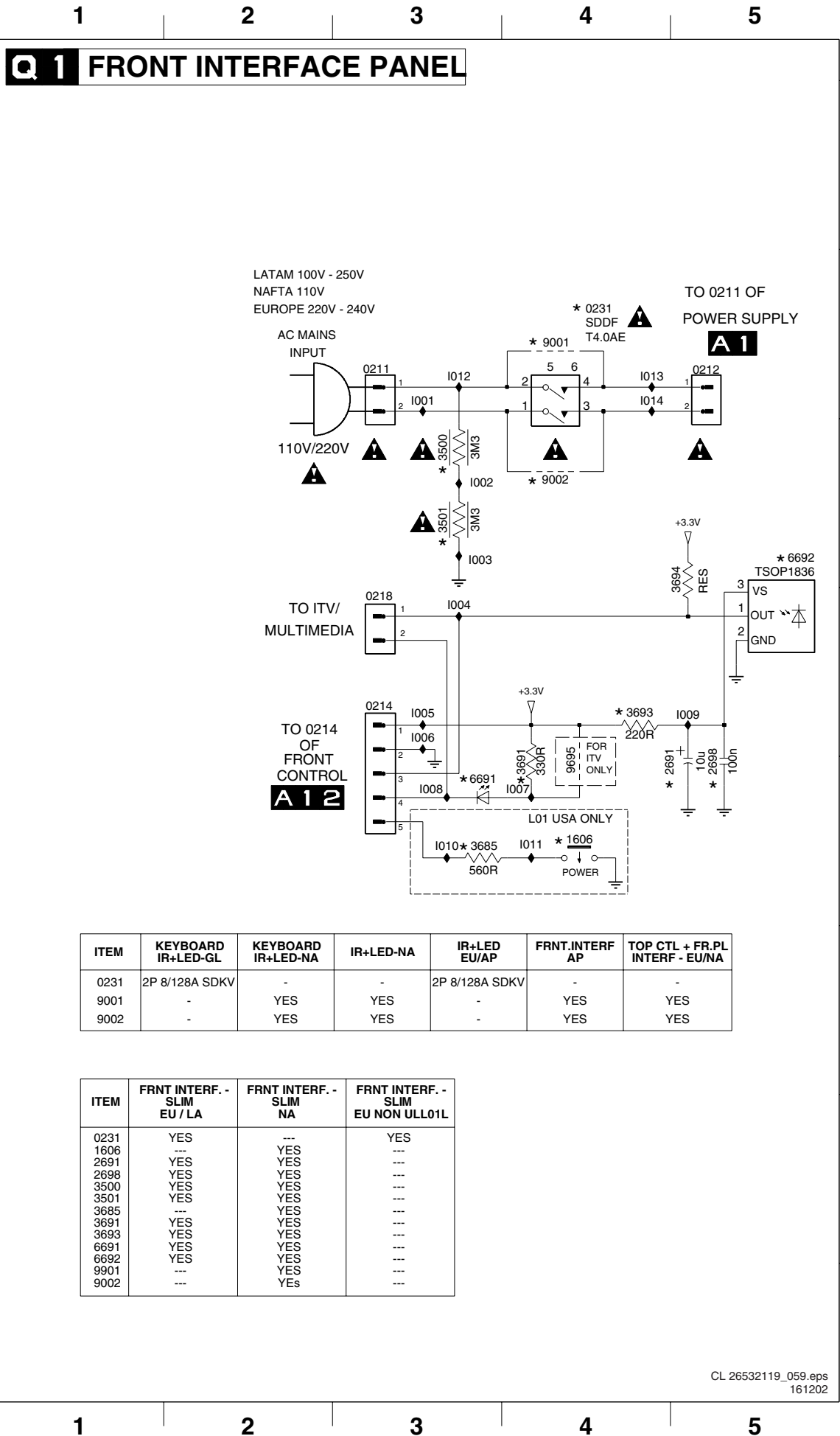


Layout Degaussing & DAF Panel (Top Side)



Front Interface Panel

Layout Front Interface Panel



- 0211 B3
- 0212 B5
- 0214 D3
- 0218 D3
- 0231 B4
- 1606 E4
- 2691 E5
- 2698 E5
- 3500 C3
- 3501 C3
- 3685 E4
- 3691 E4
- 3693 D5
- 3694 C5
- 6691 E4
- 6692 C6
- 9001 B4
- 9002 C4
- 9695 E4
- I001 B3
- I002 C4
- I003 C4
- I004 D4
- I005 D3
- I006 D3
- I007 E4
- I008 E3
- I009 D5
- I010 E3
- I011 E4
- I012 B4
- I013 B5
- I014 B5

- 0211 B1
- 0212 B2
- 0214 B3
- 0218 B3
- 0231 B3
- 1606 D4
- 2691 A4
- 2698 A4
- 3500 B3
- 3501 B3
- 3685 B3
- 3691 B3
- 3693 B3
- 3694 B3
- 6691 B3
- 6692 B3
- 9001 B2
- 9002 B2
- 9695 B3
- C1
- A2
- A3
- C3
- D4
- A4
- B4
- B3
- B3
- B3
- B4
- B4
- C2
- D2
- B3

ITEM	KEYBOARD IR+LED-GL	KEYBOARD IR+LED-NA	IR+LED-NA	IR+LED EU/AP	FRNT.INTERF AP	TOP.CTL + FR.PL INTERF - EU/NA
0231	2P 8/128A SDKV	-	-	2P 8/128A SDKV	-	-
9001	-	YES	YES	-	YES	YES
9002	-	YES	YES	-	YES	YES

ITEM	FRNT INTERF. - SLIM EU / LA	FRNT INTERF. - SLIM NA	FRNT INTERF. - SLIM EU NON ULL01L
0231	YES	---	YES
1606	---	YES	---
2691	YES	YES	---
2698	YES	YES	---
3500	YES	YES	---
3501	YES	YES	---
3685	---	YES	---
3691	YES	YES	---
3693	YES	YES	---
6691	YES	YES	---
6692	YES	YES	---
9901	---	YES	---
9002	---	YES	---

8. Alignments

Index of this chapter:

1. General Alignment Conditions
2. Hardware Alignments
3. 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.

8.1 General Alignment Conditions

Perform all electrical adjustments under the following conditions:

- AC voltage and frequency: according to country's standard.
- 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: $R_i > 10 \text{ MOhm}$; $C_i < 2.5 \text{ pF}$.
- Use an isolated trimmer/screwdriver to perform the alignments.

8.2 Hardware Alignments

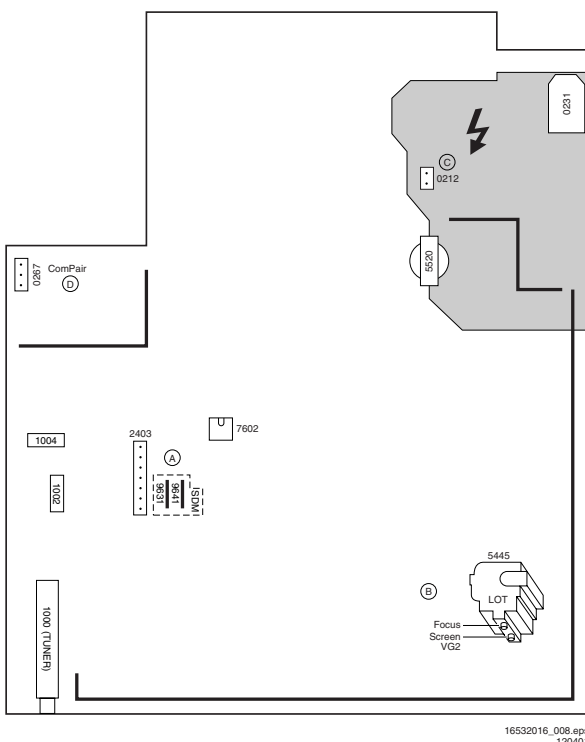


Figure 8-1 Family Board (top view)

8.2.1 Vg2 Adjustment

1. To enter SDAM, press the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed by the MENU button (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 or MENU RIGHT key to enter the WHITE TONE sub menu.
4. In the WHITE TONE sub menu, press the MENU UP/DOWN keys to select NORMAL RED, NORMAL GREEN, or NORMAL BLUE.
5. Use the MENU LEFT/RIGHT keys to set the values of NORMAL RED, NORMAL GREEN and NORMAL BLUE to '40'.
6. Press the MENU button twice to enter the normal user menu.
7. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu (if necessary).
8. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
9. Use the MENU UP/DOWN keys to select PICTURE. Be sure to record the current value of PICTURE.
10. Use the MENU LEFT/RIGHT keys to set the value of PICTURE to '0'.
11. Use the MENU UP/DOWN keys to select BRIGHTNESS. Be sure to record the current value of BRIGHTNESS.
12. Use the MENU LEFT/RIGHT keys to set the value of BRIGHTNESS to minimum (OSD just visible in a dark room).
13. Press the MENU button twice to return to the top level SDAM menu.
14. Press the OSC/STATUS button to hide the SDAM onscreen display.
15. Connect the RF output of a video pattern generator to the antenna input.
16. Input a 'black picture' test pattern to the television set.
17. Set the oscilloscope to 50 V/div and the time base to 0.2 milliseconds (external triggering on the vertical pulse).
18. 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 B1).
19. Measure the 'cut off pulse' during the 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'.
20. Select the cathode with the highest V_{DC} value for the alignment. Adjust the V_{cutoff} of this gun with the SCREEN potentiometer (see Fig. 8-1) on the LOT to the correct value (see table 'Vg2 cut-off point').
21. Press the OSC/STATUS button to display the SDAM onscreen display.
22. Press the MENU button to enter the normal user menu.
23. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu (if necessary).
24. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
25. Use the MENU UP/DOWN keys to select PICTURE.
26. Use the MENU LEFT/RIGHT keys to reset the value of PICTURE to the original value.
27. Use the MENU UP/DOWN keys to select BRIGHTNESS.
28. Use the MENU LEFT/RIGHT keys to reset the value of BRIGHTNESS to the original value.
29. Press the MENU button twice to return to the top level SDAM menu.
30. 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.

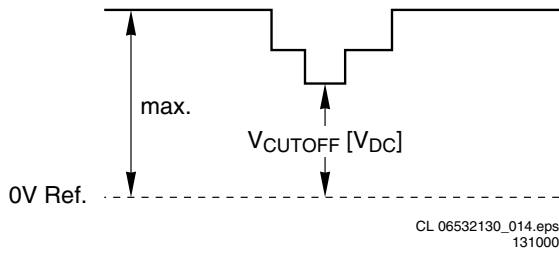


Figure 8-2 Vcutoff

Table 8-1 Vg2 cut-off point (large screen)

Screen Size	Cut-off point (V)
25/28Tesla 25/28BLD	+140 V ± 4 V
21RFMEC/ 21RF SMGK/ 21RF LG/ 25"HF LA 25RF 25/28"BLS 29RF	+145 V ± 4 V
21RF AP/CH 25" AP/CH, 25RF AP/CH 29SF AP 29RF (CH) 34SF(AP)	+155 V ± 4 V
21RF Ph/ 21RF Ph RCF/ 24WS BLD 24WSRF EU 28WS BLD 28WSRF 29RF (Eu) 32WS BLS 32WSRF	+160 V ± 4 V

8.2.2 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 SMART PICTURE button on the remote control transmitter repeatedly to choose NATURAL 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.

8.3 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

8.3.1 Options

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 8 option bytes.

Note: Each option byte controls several features of the television set; therefore, before changing option byte information, it is important to record the current option byte values. This ensures that the television features can be restored to the original settings, if necessary.

1. To enter SDAM, press the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed by the MENU button (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 8'.
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.

	S
OP 1	X X X
OP 2	X X X
OP 3	X X X
OP 4	X X X
OP 5	X X X
OP 6	X X X
OP 7	X X X
OP 8	X X X

CL 36532039_011.eps 250403

Figure 8-3 Options menu

8.3.2 Tuner

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

Table 8-2 Options code setting

Typenumber	OP1	OP2	OP3	OP4	OP5	OP6	OP7	OP8
21PT1323/56R	0	23	65	0	192	144	12	4
21PT1323/67R	0	23	65	0	192	144	11	16
21PT1323/69R	0	23	65	0	192	144	11	1
21PT1323/71R	0	23	65	0	64	144	0	2
21PT1323/79R	0	23	65	0	192	144	11	1
21PT1324/93R	0	23	65	0	192	144	10	1
21PT1325/93R	1	23	65	0	192	144	10	1
21PT3123/93R	1	215	65	1	236	145	92	1
21PT3223/67R	0	215	65	1	228	145	28	16
21PT3323/56R	0	215	65	1	236	145	28	4
21PT3323/67R	0	215	65	1	236	145	28	16
21PT3323/69R	0	215	65	1	236	145	28	1
21PT3323/71R	0	215	65	33	108	145	16	2
21PT3323/79R	0	215	65	1	236	145	28	1
21PT4223/67R	0	215	65	170	236	145	92	16
21PT4223/69R	0	215	65	170	236	145	92	1
21PT4323/56R	0	215	81	170	252	145	92	4
21PT4323/67R	0	215	81	170	252	145	92	16
21PT4323/69R	0	215	81	170	252	145	92	1
21PT4323/71R	0	215	81	162	124	145	80	34
21PT4323/79R	0	215	81	170	252	145	92	1
25PT3123/93R	1	215	193	1	228	145	28	1
25PT3323/56R	0	215	193	1	236	145	28	4
25PT3323/67R	0	215	193	1	236	145	28	16
25PT3323/69R	0	215	193	1	236	145	28	1
25PT3523/93R	1	215	193	170	236	145	92	1
25PT4323/56R	0	215	209	170	236	145	92	4
25PT4323/67R	0	215	193	170	236	145	92	16
25PT4323/69R	0	215	209	170	236	145	92	1
25PT4323/71R	0	215	209	162	108	145	80	34
25PT4323/79R	0	215	209	170	236	145	92	1
29PT3123/93R	1	215	193	1	228	145	28	1
29PT3133/93R	1	215	193	1	228	145	12	1
29PT3223/56R	0	215	193	1	236	145	28	4
29PT3223/67R	0	215	193	1	236	145	28	16
29PT3223/69R	0	215	193	1	236	145	28	1
29PT3223/79R	0	215	193	1	236	145	28	1
29PT3323/56R	0	215	193	170	236	145	28	4
29PT3323/67R	0	215	193	9	236	145	28	16
29PT3323/69R	0	215	193	170	236	145	28	1
29PT3323/71R	0	215	193	162	108	145	16	34
29PT3323/79R	0	215	193	170	236	145	28	1
29PT3523/93R	1	215	193	170	252	145	92	1
29PT3533/93R	1	215	193	170	252	145	92	1
29PT4323/56R	0	215	209	170	252	145	92	4
29PT4323/67R	0	215	209	170	252	145	92	16
29PT4323/69R	0	215	209	170	252	145	92	1
29PT4323/71R	0	215	209	162	124	145	80	34
29PT4323/79R	0	223	209	170	252	145	92	1
29PT4520/93R	1	215	193	1	228	145	12	1
34PT4323/56R	0	223	209	170	252	145	92	4
34PT4323/67R	0	223	209	42	252	145	92	16
34PT4323/69R	0	223	209	170	252	145	92	1
34PT4323/71R	0	223	209	162	124	145	80	2
34PT4323/93R	1	223	209	170	252	145	92	1
34PT4523/93R	1	223	209	170	252	145	92	1

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 475.25 MHz (PAL/SECAM) or 61.25 MHz (NTSC).
4. Connect a DC multimeter to pin 1 of the tuner (item 1000 on the main chassis).
5. To enter SDAM, press the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed by the MENU button (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 DC-voltage at pin 1 of the tuner lies between 3.8 V and 2.3 V.
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. You must turn it 'on' to have no picture instability in premium decoded cable channels.

- OFF: slicing level dependent on noise level.
- ON: fixed slicing level of 70 %.

To adjust SL:

1. To enter SDAM, press the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed by the MENU button (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.

8.3.3 White Tone

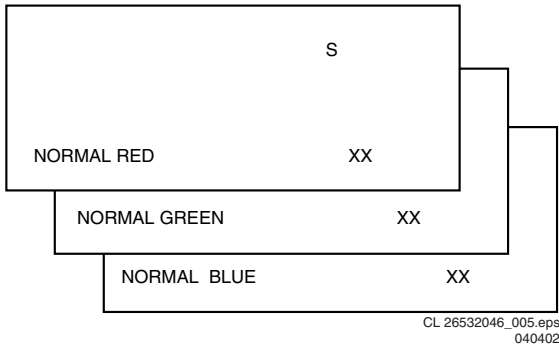


Figure 8-4 White tone alignment menu

The values of the 'black cut off level' can be adjusted in the 'WHITE TONE' sub menu. Normally, no alignment is needed for 'WHITE TONE', 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:

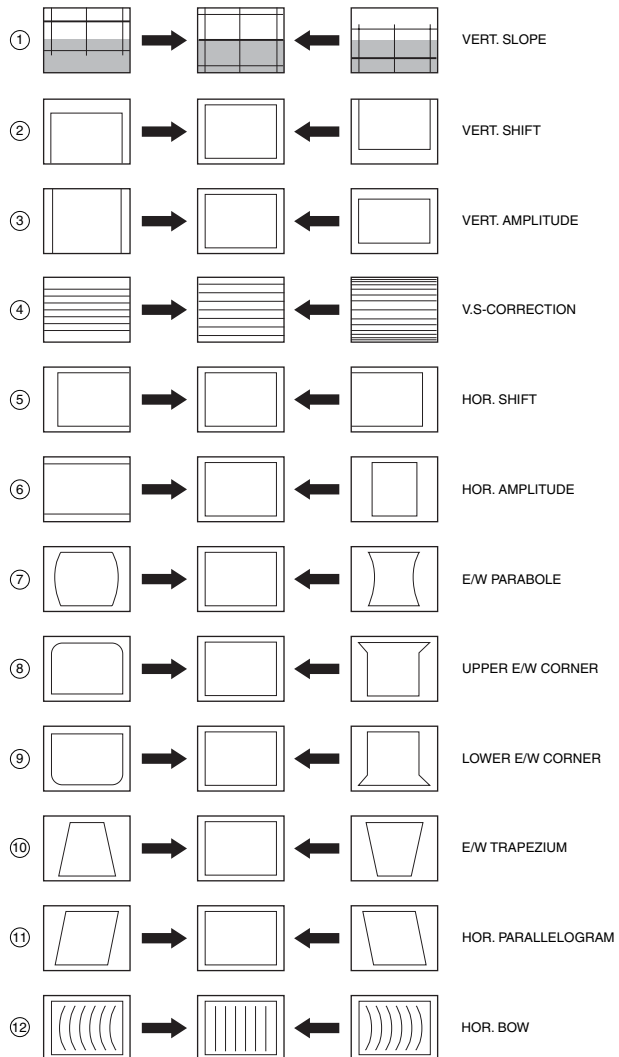
1. To enter SDAM, press the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed by the MENU button (do not allow the display to time out between entries while keying the sequence).
2. Use the MENU UP/DOWN keys to highlight the WHITE TONE sub menu.
3. Press the MENU 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 sub menu 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.
 - ?

5. To enter SDAM, press the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed by the MENU button (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.

8.3.4 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 475.25 MHz (PAL/SECAM) or 61.25 MHz (NTSC).
4. Press the AUTO PICTURE button on the remote control transmitter repeatedly to choose PERSONAL or MOVIES picture mode.



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Figure 8-5 Geometry alignments

The following alignments can be performed in the GEOMETRY sub menu:

Horizontal Amplitude and Phase:

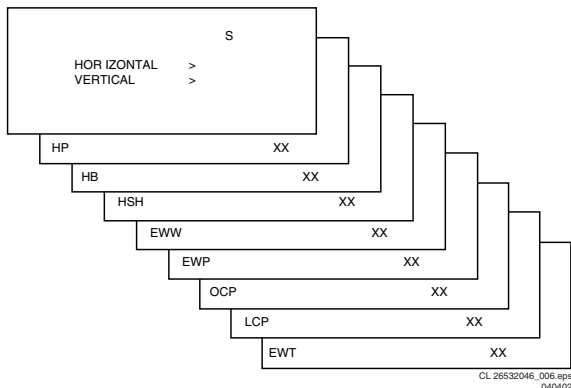


Figure 8-6 Horizontal alignment menu

- **Horizontal Shift (HSH).** Select Horizontal Shift to center the picture on the screen.
- **Horizontal Parallelogram (HP).** Set Horizontal Parallelogram to prevent the picture from slanting to one side.
- **Horizontal Bow (HB).** Set Horizontal Bow to prevent the top and bottom of picture from bending to the sides.
- **East West Width (EWW).** Select East-West Width and align the picture width until the complete test pattern is visible.
- **East West Parabola (EWP).** Select East-West Parabola and align the vertical sides until the sides are straightened.
- **Upper Corner Parabola (UCP).** Select Upper Corner Parabola to straighten the top of the vertical lines at the sides.
- **Lower Corner Parabola (LCP).** Select Lower Corner Parabola to straighten the bottom of the vertical lines at the sides.
- **East West Trapezium (EWT).** Align straight vertical lines in the middle of the screen.

Vertical Amplitude and Position:

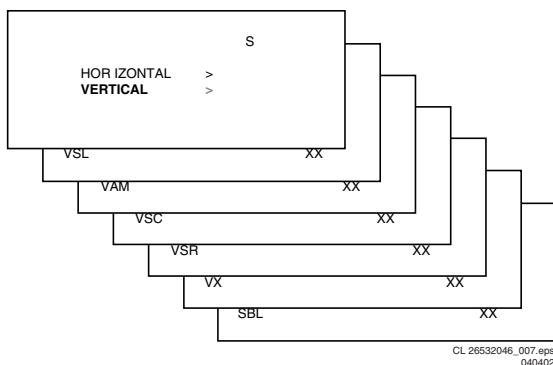


Figure 8-7 Horizontal alignment menu

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

- **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).
- **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 the picture height.
- **Delta Horizontal Shift 60 Hz (H60).**
- **Delta Vertical Amplitude 60 Hz (V60).**

Methods of adjustment

1. Select Service Blanking (SBL) and set it to 1. The lower half of the picture will be blanked.
2. Press the MENU UP/DOWN buttons to select Vertical Slope (VSL).
3. Align VSL to start the blanking exactly at the horizontal white line at the center of the test circle (align the bottom of the screen so that castellations just disappear).
4. Press the MENU UP/DOWN buttons to select SBL and set it back to 0. The full picture reappears.
5. Select Vertical Amplitude (VAM) and align the picture height to approximately 13.0 - 13.1 blocks (align the top of the screen so that castellations just disappear).
6. Select Vertical Shift (VSH) and align for vertical centering of the picture on the screen.

Repeat the last two steps if necessary.

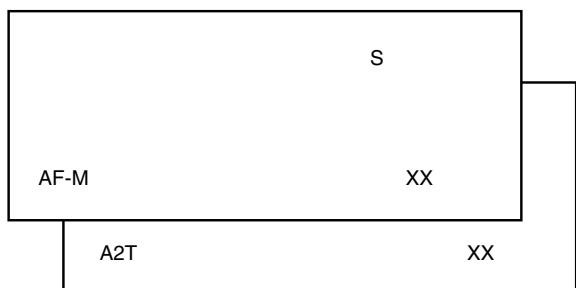
The table below lists the default GEOMETRY values for the different television sets.

Table 8-3 Default geometry values

Parameter	20RF, 21RF, 25RF, 27RF, 29RF, 25", 28", 29"SF, 32V, 33"							
	25V	27V/29"	35V	28WS	32WS	28WSRF	32WSRF	
HP Hor. Parallelogram	31	31	31	45	47	32	36	45
HB Hor. Bow	31	31	31	25	32	32	40	30
HSH Hor. Shift	35	35	35	23	27	24	31	29
EWW East-West Width	34	-	-	45	36	39	40	33
EWP East-West Parabola	33	-	-	23	21	21	37	16
UCP Upper Corner Parabola	35	-	-	25	26	23	14	16
LCP Lower Corner Parabola	35	-	-	31	30	30	25	23
EWT East-West Trapezium	35	-	-	24	28	26	18	27
VSL Vertical Slope	33	25	25	19	42	35	31	25
VAM Vertical Amplitude	26	32	32	31	30	23	23	30
VSC Vertical S-Correction	23	23	23	27	24	24	12	20
VSH Vertical Shift	31	28	28	26	18	23	36	34

Parameter	20RF, 21RF, 25RF, 27RF, 29RF, 25", 28", 29"SF, 32V, 33"	25V	27V/29"	35V	28WS	32WS	28WSRF	32WSRF
VX Vertical Zoom	25	-	-	25	25	25	25	25
H60 Horizontal Shift Offset (NTSC)	9	9	9	9	9	9	9	9
V60 Vertical Shift Offset (NTSC)	-2	-2	-2	-2	-2	-2	-2	-2

8.3.5 Audio



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Figure 8-8 Audio alignment menu

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

AF-M (NICAM threshold)

Default value is 300.

To adjust AF-M:

- To enter SDAM, press the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed by the MENU button (do not allow the display to time out between entries while keying the sequence).
- Use the MENU UP/DOWN keys to highlight the AUDIO sub menu.
- Press the MENU LEFT/RIGHT keys to enter the AUDIO sub menu.
- Use the MENU UP/DOWN keys to select AF-M.
- Use the MENU LEFT/RIGHT keys to adjust the value of AF-M to 300.
- Press the MENU button to return to the top level SDAM menu.
- 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.

A2T (TV A2 Threshold)

Default value is 250.

To adjust A2T:

- To enter SDAM, press the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed by the MENU button (do not allow the display to time out between entries while keying the sequence).
- Use the MENU UP/DOWN keys to highlight the AUDIO sub menu.
- Press the MENU LEFT/RIGHT keys to enter the AUDIO sub menu.
- Use the MENU UP/DOWN keys to select A2T.
- Use the MENU LEFT/RIGHT keys to adjust the value of A2T to 250.
- Press the MENU button to return to the top level SDAM menu.
- 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.

9. Circuit Description

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
9. IC Data Sheets

Notes:

- For a good understanding of the following circuit descriptions, please use the block diagram in section 'Wiring Diagram, Block Diagrams, and Overviews' and/or the electrical diagrams in section 'Circuit Diagrams and PWB Layouts'. Where necessary, you will find a separate drawing for clarification.
- Figures below can deviate slightly from the actual situation, due to different set executions.

9.1 Introduction

The 'L01.1A AC' chassis is a global TV chassis for the model year 2003 and is used for TV sets with screen sizes from 20" to 36", in Super Flat, Real Flat, and Wide Screen executions. In comparison to its predecessor (the 'L01.1A AB'), the chassis has enhanced features like 'Virtual Dolby', and 'Active Control', presented in a new 'Smartline' styling.

The standard architecture consists of a Main panel, a Picture Tube panel, a Side I/O panel, and a Top Control panel.

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

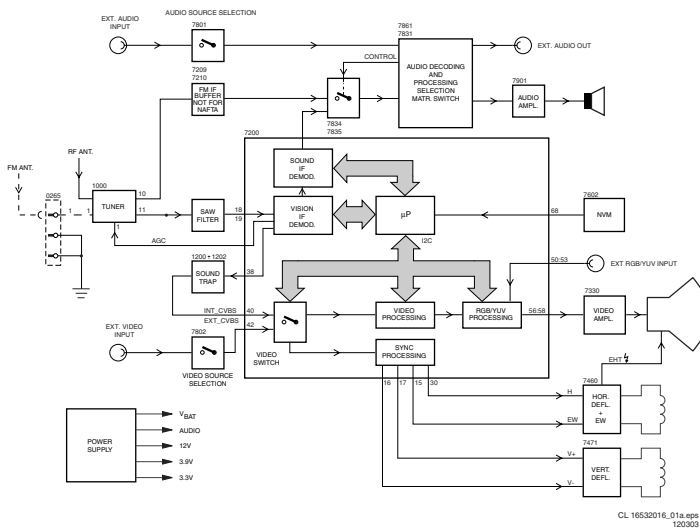


Figure 9-1 Block diagram

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

The 'L01.1L AC' is divided into 2 basic audio 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, teletext 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.

9.2 Audio Signal Processing

9.2.1 Stereo

In stereo sets, the signal goes via the SAW filter (position 1002/1003), to the audio demodulator part of the UOC IC 7200. The audio output on pin 33 goes to the stereo decoder 7831/7861. The switch inside this IC selects either the internal decoder or an external source (see also block diagram above).

The built-in stereo decoder item 7831 (MSP34X5) can receive 2CS, NICAM and BTSC stereo signals.

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

9.2.2 Mono

In mono sets, the signal goes via the SAW filter (position 1002/1003), to the audio demodulator part of the UOC IC 7200. The audio output on pin 48 goes to the audio amplifier (AN7523 at position 7902).

The volume level is controlled at this IC (pin 9) by a 'VolumeMute' control line from the microprocessor. The audio signal from IC 7902 is then sent to the speaker and headphone output panel.

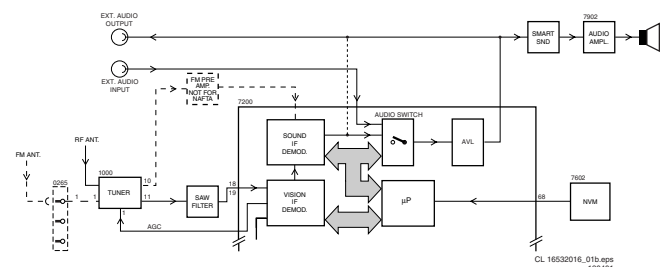


Figure 9-2 Mono audio signal processing

9.3 Video Signal Processing

9.3.1 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.

9.3.2 RF Signal Processing

The incoming RF signal goes to the tuner (pos. 1000), where the IF signal is developed and amplified. The IF signals then exits the tuner from pin 11 to pass through the SAW filter (pos. 1002/1003). 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 Default Alignment Mode (SDAM). The tuner AGC starts working when the video-IF input reaches a certain input level and will 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.

9.3.3 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 Y input
- Pin 45: external AV2 or chrominance C input

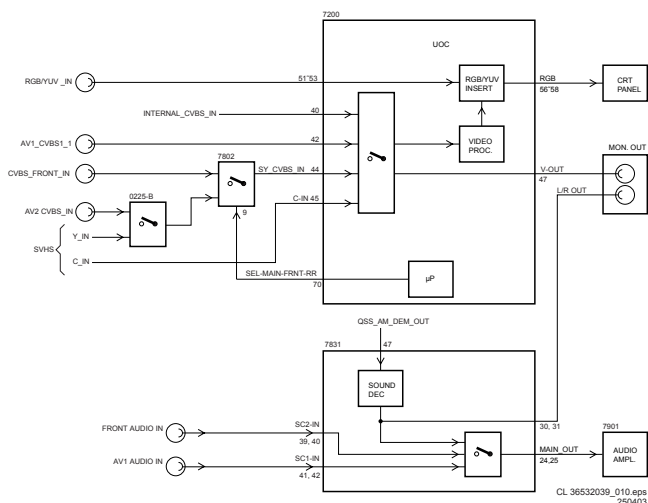


Figure 9-3 Video source selection

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 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.

9.3.4 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.

9.3.5 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 skin tone 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).

9.3.6 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 adapt 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.

9.3.7 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 +200 V and is derived from the line output stage.

9.3.8 Eco Scavem (diagram B2 if present)

The SCAn VELOCITY Modulation (Scavem) circuitry is implemented in the layout of the picture tube panel. It is thus not an extra module. This circuit influences the horizontal deflection as a function of the picture content. In an ideal square wave, the sides are limited in slope due to a limited bandwidth (5 MHz). Scavem will improve the slope as follows:

- **At a positive slope,** a Scavem current is generated which supports the deflection current. At the first half of the slope, the spot is accelerated and the picture is darker. At the second half of the slope, the spot is delayed and the slope becomes steeper.
- **At the end of the slope,** the Scavem-current decays to zero and the spot is at the original position. An overshoot occurs which improves the impression of sharpness.
- **At the negative slope,** the Scavem-current counteracts the deflection. During the first half of the slope, the spot is delayed and the slope becomes steeper. During the

second half the spot accelerates, the Scavem-current is zero at the end of the slope.

The RGB signals are fed into the Scavem circuit and differentiated by C2364/2365/2366 and the input impedance of the TS7360 stage. Diode D6364 (Schottky diode) is the coring component, which blocks all the signals below 0.3 V so that the noise is not amplified and all the signals larger than 0.3 V are differentiated and amplified.

After differentiation, the signal is amplified by TS7360 with R3369 as the collector resistor. The biasing of the TS7360 stage is done by R3369, R3361, R3360, R3362, and R3363.

Items D6367, C2367, R3367, R3361, and C2360 work as the clipping components that limit the Scavem current at a certain level, to prevent Scavem over-correction.

After being buffered by TS7369, the differentiated signals are coupled through C2375 and C2380 to the output stage. The output stage is configured into cascode stage and push-pull operation. The biasing is done by R3373, R3375, R3376, R3380, R3381, R3383, R3374, and R3384. The working voltage of the transistors is settled at half the supply voltage. At the rising portion of the RGB signals, cascode TS7380 and TS7382 will be operating and will pull the current through the Scavem coil. Contrarily, at the falling portion of the RGB signals, cascode TS7373 and TS7366 will be operating and will push the current through the Scavem coil.

The capacitors C2362, C2373, and C2381 ground the high frequencies, to prevent high frequency amplification. The ferrite bead L5376 is for EMC purpose. Resistors R3374 and R3384 determine the output Scavem current.

Items C2378 and R3378 are for the fine-tuning for different Scavem coil impedances. They also help to suppress high frequency oscillation. Capacitor C2369 helps to suppress the high frequency components and controls the Scavem delay.

9.4 Synchronization

Inside IC 7200 part D, the vertical and horizontal sync pulses are separated. These 'H' and 'V' signals are synchronized 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.

9.5 Deflection

Please use the diagrams in chapter 6 and/or 7 for elucidation of the descriptions below.

9.5.1 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 TS7462 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 TS7400 to make linearity corrections in the horizontal drive.

When the set is switched on, the '+8V' voltage goes to pin 9 of IC7200. The horizontal drive starts up in a soft start 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 'EHTinformation' 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 slow start procedure.

The 'EHTinformation' 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' 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 IC7200 at pin 30 and goes to TS7462, the horizontal driver transistor. The signal is amplified and coupled to the base circuit of TS7460, the horizontal output transistor. This will drive the line output transformer (LOT) L5445 and the 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.

9.5.2 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).

9.5.3 Deflection Corrections (see diagram A2)

The Linearity Correction

A constant voltage on the horizontal (or line) 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-magnetized coil L5457 is used. R3485 and C2459 ensure that L5457 does not excite, because of its own parasite 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 synchronization errors, causing an oscillation under the white line.

During the second half of the flyback, C2490//2458 is charged via R3459. At the moment of the flyback, C2490//2458 is subjected to the negative voltage pulses of the parabola because of which D6465 and D6466 are conducting and C2490//2458 is switched in parallel with C2456//2457. The high-voltage diodes are conducting this moment. Now extra energy is available for excitation through C2465 and the line deflection. Consequently, 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 center, 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 this chassis, there are three types of CRTs, namely the 100 deg., 110 deg., and wide screen CRTs. The 100 deg. CRT is raster-correction-free and does not need East/West correction. The 110 deg. 4:3 CRT comes with East/West correction and East/West protection.

The wide screen TV sets have all the corrections of the 110 deg. 4:3 CRT, but also have additional picture formats 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 'EHTinformation' line.

Two protections are built-in for the E/W circuit: over-current and over-voltage protection. See paragraph 'Protection Events'.

Panorama

The panorama function is only used in 16:9 sets. This is a function to enable the 4:3 and Super-Wide feature. It drives the 'Bass_panorama' line, to activate relay 1400. When this relay is switched on, the capacitors 2453 and 2454 are added in parallel to the default S-correction capacitors 2456 and 2457. This results in an increased capacitance, a lower resonance frequency of the line deflection coil and the S-correction capacitors and therefore a less steep S-corrected line deflection current.

9.6 Power Supply

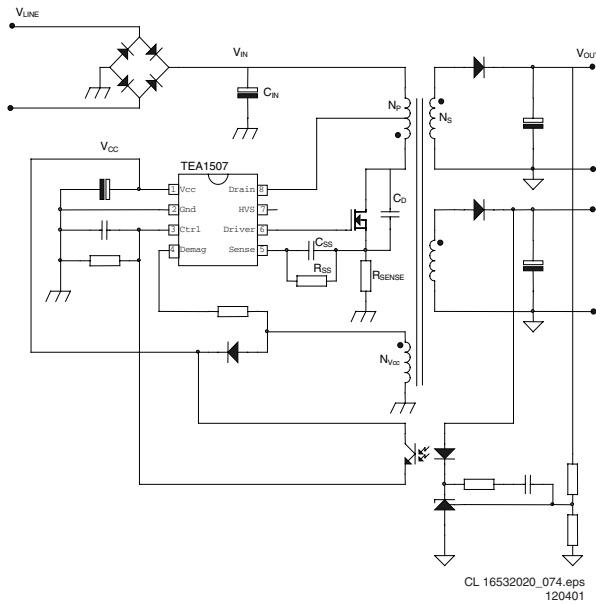


Figure 9-4 Switched Mode Power Supply standard circuit

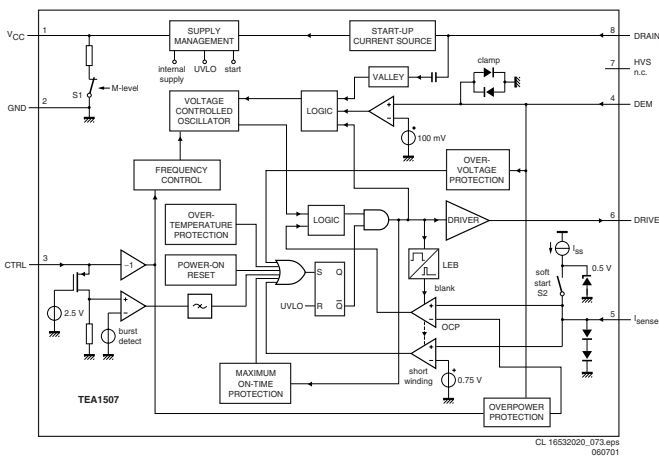


Figure 9-5 Internal block diagram of the driver IC (TEA1507)

9.6.1 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' any time 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 'EHTinformation' 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.

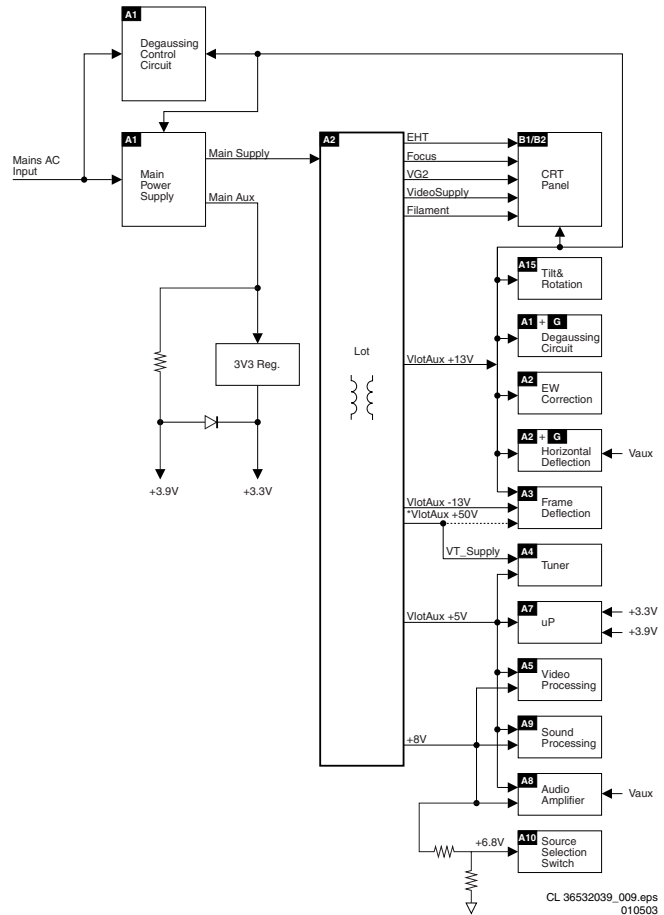


Figure 9-6 Derived voltages

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.

9.6.2 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 . Capacitor 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 turn ratio of the transformer is represented by $n (N_p/N_s)$.

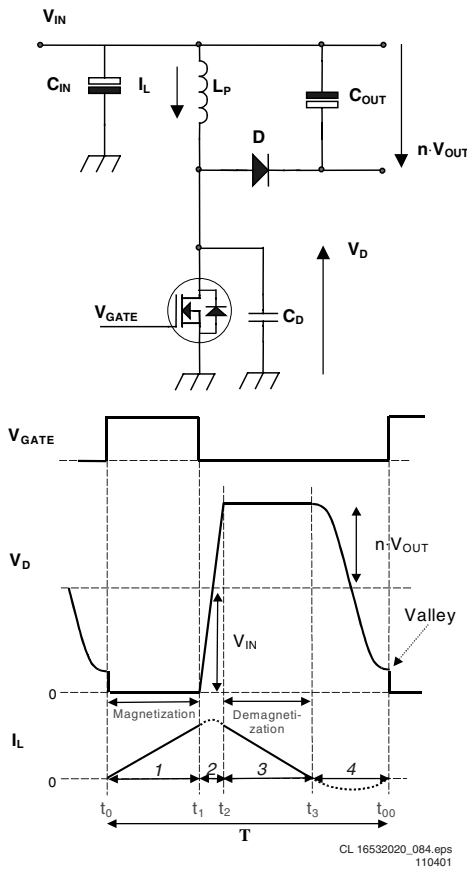


Figure 9-7 QR-mode time intervals

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: $t_3 < t < t_{00}$ 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.

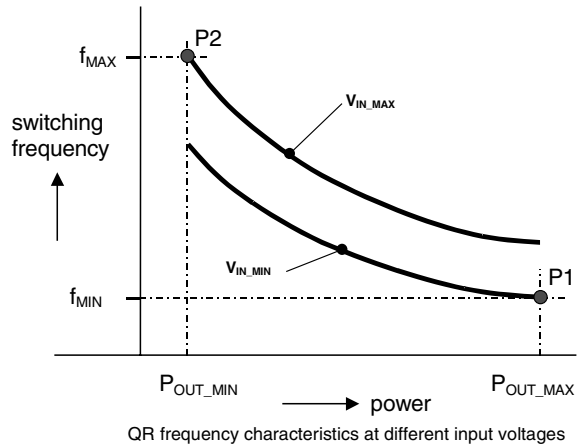


Figure 9-8 QR frequency behavior

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 Mlevel dependent operation level (Mlevel: between 60 and 100 V), the internal 'Mlevel switch' will be opened and the start-up current source is enabled to charge capacitor C2521 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_{start} (11 V), 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.

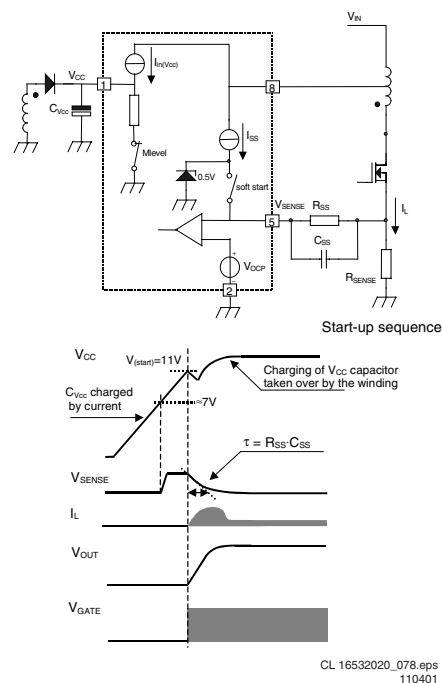


Figure 9-9 Start-up behavior

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 < 1.425V, 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.

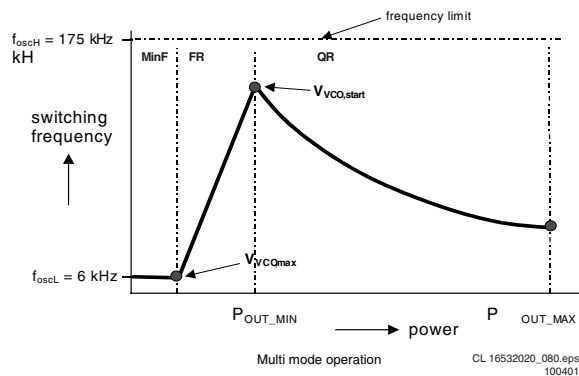


Figure 9-10 Different supply modes

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.

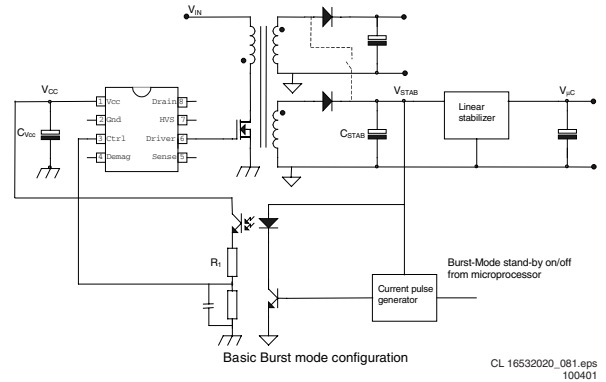


Figure 9-11 Supply standby mode (burst mode)

The system enters burst mode standby when the microprocessor activates the 'Stdbby_con' line. When this line is pulled high, the base of TS7541 is allowed to go high. This is triggered by the current from collector TS7542. When TS7541 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 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 TS7541 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 result 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 R1 (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.

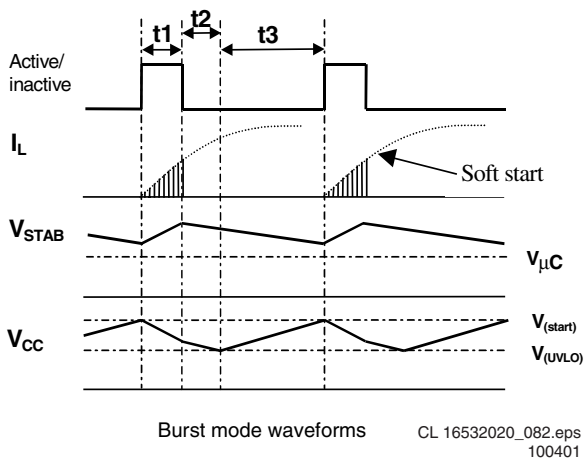


Figure 9-12 Burst mode waveforms

9.6.3 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 demag(netization) 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 R1 (R3522).

The figure below shows the circuit and the idealized waveforms across this winding.

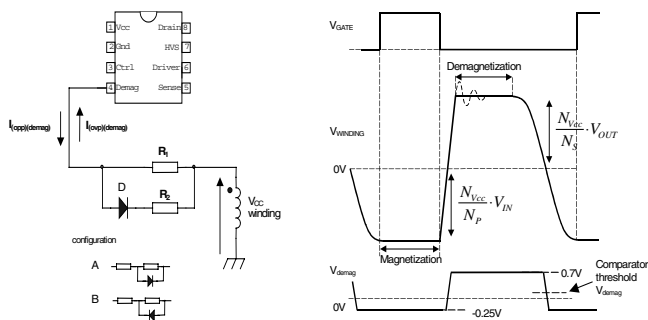


Figure 9-13 Demagnetization protection

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 = ± 9 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 pin 4 (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 deg. 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, which detects the minimum start-up voltage between 60 and 100 V. As previous 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.

9.7 Control

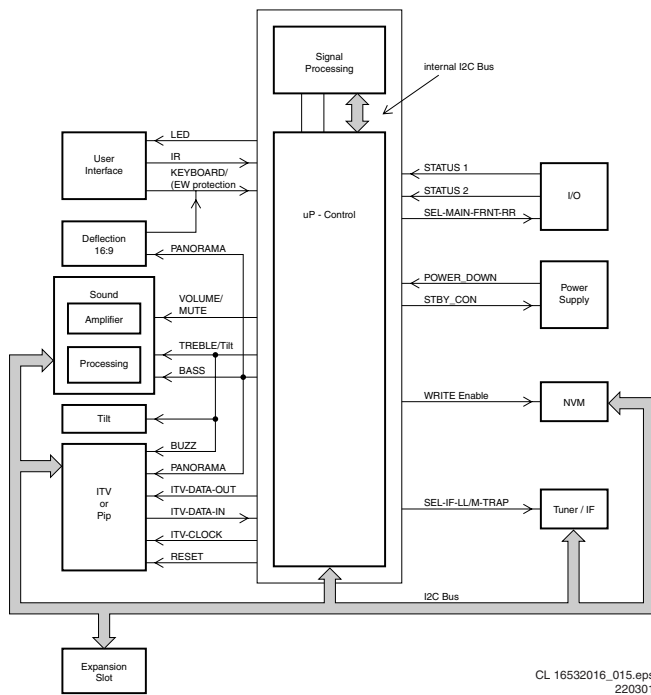


Figure 9-14 Block diagram set control

9.7.1 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 uP. Communication to other ICs is done via the I2C-bus.

9.7.2 I2C-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 I2C-bus. An internal I2C-bus is used to control other signal processing functions, like video processing, sound IF, vision IF, synchronization, etc.

9.7.3 User Interface

The 'L01.1L AC' 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)

9.7.4 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.

9.7.5 Power Supply Control

The microprocessor part is supplied with 3.3 V 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' (3.3 V) 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 TS7562). 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.

9.7.6 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 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 0.7 V across 3405//3406, transistor TS7606 (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 TS7606 (in A7 diagram) will conduct and UOC is triggered to shut down the power supply.
- **I2C protection,** to check whether all I2C ICs 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.

9.8 Abbreviation list

2CS	2 Carrier (or Channel) Stereo	HFB	Horizontal Flyback Pulse: horizontal sync pulse from large signal deflection
ACI	Automatic Channel Installation: algorithm that installs TV sets directly from cable network by means of a predefined TXT page	HP	Headphone
ADC	Analogue to Digital Converter	Hue	Color phase control for NTSC (not the same as 'Tint')
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency	I	Monochrome TV system. Sound carrier distance is 6.0 MHz
AFT	Automatic Fine Tuning	I2C	Integrated IC bus
AGC	Automatic Gain Control: algorithm that controls the video input of the feature box	IF	Intermediate Frequency
AM	Amplitude Modulation	IIC	Integrated IC bus
AP	Asia Pacific	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.
AR	Aspect Ratio: 4 by 3 or 16 by 9	ITV	Institutional TV
ATS	Automatic Tuning System	LATAM	Latin America
AV	External Audio Video	LED	Light Emitting Diode
AVL	Automatic Volume Level	L/L'	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I
BC-PROT	Beam Current Protection	LNA	Low Noise Amplifier
BCL	Beam Current Limitation	LS	Large Screen
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz	LS	Loudspeaker
BLC-INFORMATION	Black current information	LSP	Large signal panel
BTSC	Broadcast Television Standard Committee. Multiplex FM stereo sound system, originating from the USA and used e.g. in LATAM and AP-NTSC countries	M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz
B-TXT	Blue teletext	MSP	Multi standard Sound Processor: ITT sound decoder
CBA	Circuit Board Assembly	MUTE	Mute-Line
CC	Closed Caption	NC	Not Connected
ComPair	Computer aided rePair	NICAM	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, mainly used in Europe.
CRT	Cathode Ray Tube or picture tube	NTSC	National Television Standard Committee. Color system mainly used in North America and Japan. Color carrier NTSC M/N = 3.579545 MHz, NTSC 4.43 = 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)
CSM	Customer Service Mode	NVM	Non Volatile Memory: IC containing TV related data e.g. alignments
CTI	Color Transient Improvement: manipulates steepness of chroma transients	OB	Option Byte
CVBS	Composite Video Blanking and Synchronization	OC	Open Circuit
DAC	Digital to Analogue Converter	OSD	On Screen Display
DBE	Dynamic Bass Enhancement: extra low frequency amplification	PAL	Phase Alternating Line. Color system mainly used in West Europe (color carrier = 4.433619 MHz) and South America (color carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)
DBX	Dynamic Bass Expander	PCB	Printed Circuit board
D/K	Monochrome TV system. Sound carrier distance is 6.5 MHz	PIP	Picture In Picture
DFU	Direction For Use: description for the end user	PLL	Phase Locked Loop. Used for e.g. FST tuning systems. The customer can give directly the desired frequency
DNR	Dynamic Noise Reduction	POR	Power-On Reset
DSP	Digital Signal Processing	Progressive Scan	Scan mode where all scan lines are displayed in one frame at the same time, creating a double vertical resolution.
DST	Dealer Service Tool: special remote control designed for dealers to enter e.g. service mode	PTP	Picture Tube Panel (or CRT-panel)
DVD	Digital Versatile Disc	RAM	Random Access Memory
EEPROM	Electrically Erasable and Programmable Read Only Memory	RC	Remote Control handset
EHT	Extra High Tension	RC5	Remote Control system 5, signal from the remote control receiver
EHT-INFORMATION	Extra High Tension information	RGB	Red Green Blue
EU	Europe	ROM	Read Only Memory
EW	East West, related to horizontal deflection of the set	SAM	Service Alignment Mode
EXT	External (source), entering the set via SCART or Cinch	SAP	Second Audio Program
FBL	Fast Blanking: DC signal accompanying RGB signals	SC	Sandcastle: pulse derived from sync 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		

S/C	Short Circuit
SCAVEM	Scan Velocity Modulation
SCL	Serial Clock
SDA	Serial Data
SDM	Service Default Mode
SECAM	SEquence Couleur Avec Memoire. Color system mainly used in France and East Europe. Color carriers = 4.406250 MHz 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
uP	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

9.9 IC Data Sheets

In this paragraph, the internal block diagrams and pinning are given of ICs that are drawn as a 'black box' in the electrical diagrams (with the exception of 'memory' and 'logic' ICs).

This is not applicable for this manual (all ICs are drawn with internal block diagrams)

6580	4822 130 11397	BAS316
6582	9322 175 70667	STPS10L60D
6681	4822 130 31983	BAT85
6691	9322 050 99682	LTL-10224WHCR
6692	9322 127 54667	TSOP1836UH1
6831	4822 130 30621	1N4148
6901	4822 051 20008	Jumper 0805
6904	4822 051 20008	Jumper 0805



7000	9352 628 51112	TDA8941P/N1
7001	4822 130 63732	MMUN2212
7101	5322 130 60159	BC846B
7102	4822 130 60373	BC856B
7103	5322 130 60159	BC846B
7200	9352 706 10557	TDA9570H/N1/AI
7200	9352 711 31557	TDA9580H/N1/3I
7200	9352 711 32557	TDA9582H/N1/3I
7200	9352 712 27557	TDA9583H/N1/3I
7200	9352 712 42557	TDA9555H/N1/3I
7200	9352 715 39557	TDA9586H/N1/3I
7201	5322 130 60159	BC846B
7202	4822 130 60373	BC856B
7203	4822 130 60373	BC856B
7204	4822 130 60373	BC856B
7205	4822 130 60373	BC856B
7206	5322 130 42755	BC847C
7330	9352 713 37112	TDA6107JF/N3
7360	5322 130 60159	BC846B
7366	9322 167 18676	2SA965
7369	4822 130 60373	BC856B
7373	4822 130 41246	BC327-25
7380	4822 130 43226	2SC2235-O
7382	4822 130 40981	BC337-25
7400	9322 157 37687	STP3NC60FP
7441	4822 130 60373	BC856B
7443	4822 130 44568	BC557B
7450	3198 010 44010	PDTA114ET
7460	9340 550 92127	BU4508DX
7461	4822 130 40981	BC337-25
7462	9340 547 00215	PDTC143ZT
7463	4822 130 41246	BC327-25
7471	0451 900 00151	TDA8357J
7471	9352 701 64112	TDA8359J/N2
7480	4822 130 40823	BD139
7482	4822 130 40823	BD139
7515	8238 274 02070	TCET1103G
7515	9322 175 72667	TCET1104(G)
7520	9352 673 56112	TEA1507P/N1
7521	9322 160 63687	STP7NC80ZFP
7521	9322 163 76687	STU9NC80ZI
7522	5322 130 60159	BC846B
7540	4822 130 40959	BC547B
7541	4822 130 11155	PDTC114ET
7542	4822 130 60373	BC856B
7560	4822 209 16978	LF33CV
7561	9340 547 00215	PDTC143ZT
7580	4822 130 60373	BC856B
7602	9322 147 25682	M24C16-WBN6
7606	9340 547 00215	PDTC143ZT
7802	5322 209 14481	HEF4053BT
7831	9322 187 89682	MSP3425G-PO-B8-V3
7831	9322 191 13682	MSP3415G-PO-C12
7861	9352 671 19557	TDA9853H/V1
7891	5322 130 60159	BC846B
7892	5322 130 60159	BC846B
7901	9322 166 29682	AN7580
7901	9322 181 41682	AN7522N
7903	5322 130 60159	BC846B

Side AV Panel [C]

Various

0163	3139 131 01551	Cable 6p/560/3p-3p
0186	3139 110 38861	Cable 5p/680/5p
0232	4822 267 31014	Socket headphone
0250	4822 265 11606	Connector 3p
0251	4822 267 10735	Connector 3p m
0253	2422 025 16382	Connector 3p m
0254	4822 267 10734	Connector 5p m
0255	4822 267 10565	Connector 4p



2171	5322 122 32311	470pF 10% 100V
2172	5322 122 32311	470pF 10% 100V
2173	5322 122 32311	470pF 10% 100V
2174	5322 122 32311	470pF 10% 100V
2176	5322 122 32311	470pF 10% 100V

2177	4822 124 40248	10µF 20% 63V
2178	5322 122 32311	470pF 10% 100V
2179	4822 124 40248	10µF 20% 63V



3150	4822 116 83884	47kΩ 5% 0.5W
3151	4822 116 83868	150Ω 5% 0.5W
3152	4822 116 83884	47kΩ 5% 0.5W
3153	4822 116 83868	150Ω 5% 0.5W
3156	4822 116 52206	120Ω 5% 0.5W
3157	4822 116 52206	120Ω 5% 0.5W



6161	4822 130 34278	BZX79-B6V8
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Top Control Panel [E]

Various

0215	4822 267 10748	Connector 3p m
1091	4822 276 13775	Switch
1092	4822 276 13775	Switch
1093	4822 276 13775	Switch
1094	4822 276 13775	Switch



3088	4822 051 20008	Jumper 0805
3089	4822 051 20008	Jumper 0805
3091	4822 051 20561	560Ω 5% 0.1W
3092	4822 051 20391	390Ω 5% 0.1W
3093	4822 051 20561	560Ω 5% 0.1W
3094	4822 051 20391	390Ω 5% 0.1W
3095	4822 051 20332	3.3kΩ 5% 0.1W
3096	4822 117 11139	1.5kΩ 1% 0.1W
4092	4822 051 20008	Jumper 0805



6092	4822 130 11528	1PS76SB10
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DAF Panel [G]

Various

0180	3139 131 00761	Cable 2p 560mm
0221	4822 267 10966	Connector 2p
0258	4822 267 10966	Connector 2p
0261	4822 267 10676	Connector 1P
0262	4822 267 10676	Connector 1P



2492	4822 126 13865	390pF 10% 2kV
2493	4822 126 13865	390pF 10% 2kV



3498	2322 592 13017	VDR 1mA/423V
3499	2322 592 13017	VDR 1mA/423V



5493	4822 148 81425	DAF
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Front Interface Panel [Q]

Various

0211	2422 025 16268	Connector 2p m
0212	2422 025 16268	Connector 2p m
0214	2422 025 06353	Connector 5p male
0231	2422 128 02972	Mains switch



2691	4822 124 12379	220µF 25V
2692	4822 126 13751	47nF 10% 63V
2693	4822 126 13751	47nF 10% 63V
2694	4822 126 13751	47nF 10% 63V
2695	4822 126 13751	47nF 10% 63V
2698	5322 121 42386	100nF 5% 63V



3500	4822 053 21335	3.3MΩ 5% 0.5W
3501	4822 053 21335	3.3MΩ 5% 0.5W
3691	4822 116 52219	330Ω 5% 0.5W
3693	4822 116 83872	220Ω 5% 0.5W



6691	9322 050 99682	LTL-10224WHCR
6692	9322 127 54667	TSOP1836UH1

11. Revision List

First release.

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