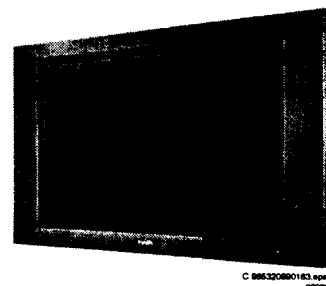


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# Service Manual

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**PHILIPS**

# 1. Technical specifications

## 1.1 Technical data D-box

|                      |                                    |
|----------------------|------------------------------------|
| Mains voltage        | : 110 - 240 Vac; (- 15 % , + 10 %) |
|                      | : 50 Hz - 60 Hz                    |
| Power dissipation    | : 400W                             |
| Stand-by dissipation | : < 1W                             |

## 1.2 Connection facilities

### 1.2.1 Specification of the terminal sockets

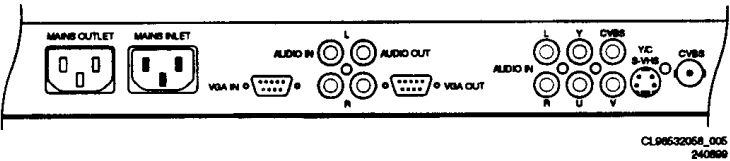


Figure 1-1

#### VGA-in

- 1 - R (0.7 Vpp 75 Ω)
- 2 - G (0.7 Vpp 75 Ω)
- 3 - B (0.7 Vpp 75 Ω)
- 4 - Reserved
- 5 - Bus-gnd
- 6 - R-gnd
- 7 - G-gnd
- 8 - B-gnd
- 9 - RC5
- 10- GND
- 11-

CONFIG\_IDE  
NT

- 12- Bus1 (TxD/ Rxd or SDA)
- 13- Hsync
- 14- Vsync
- 15- Bus2 (TxD/ RxD or SDA)

#### VGA-out

- 1 - R (0.7 Vpp 75 Ω)
- 2 - G (0.7 Vpp 75 Ω)
- 3 - B (0.7 Vpp 75 Ω)
- 4 - Reserved
- 5 - gnd
- 6 - R-gnd
- 7 - G-gnd
- 8 - B-gnd
- 9 - Reserved
- 10- GND
- 11- Reserved
- 12- Reserved
- 13- Hsync
- 14- Vsync
- 15- Reserved

#### Audio VGA-in

- Cinch Audio L(0.5 Vrms >= 10 k)
- Cinch Audio R(0.5 Vrms >= 10 kΩ)

#### Audio VGA-out

- Cinch Audio L(0.5 Vrms >= 1 k)
- Cinch Audio R(0.5 Vrms >= 1 kΩ)

#### SVHS

- 1 - GND
- 2 - GND
- 3 - Y (1 Vpp / 75 )
- 4 - C (0.3 Vpp / 75 )

#### Audio In:

- Cinch Audio L (0.5 Vrms >= 10 k)
- Cinch Audio R (0.5 Vrms >= 10 kΩ)

#### CVBS

- BNC - CVBS (1 Vpp / 75 Ω)

#### YUV

- Y (1 Vpp / 75 )
- 3 - U (1 Vpp / 75 )
- 4 - V (1 Vpp / 75 )

## 1.3 Chassis overview

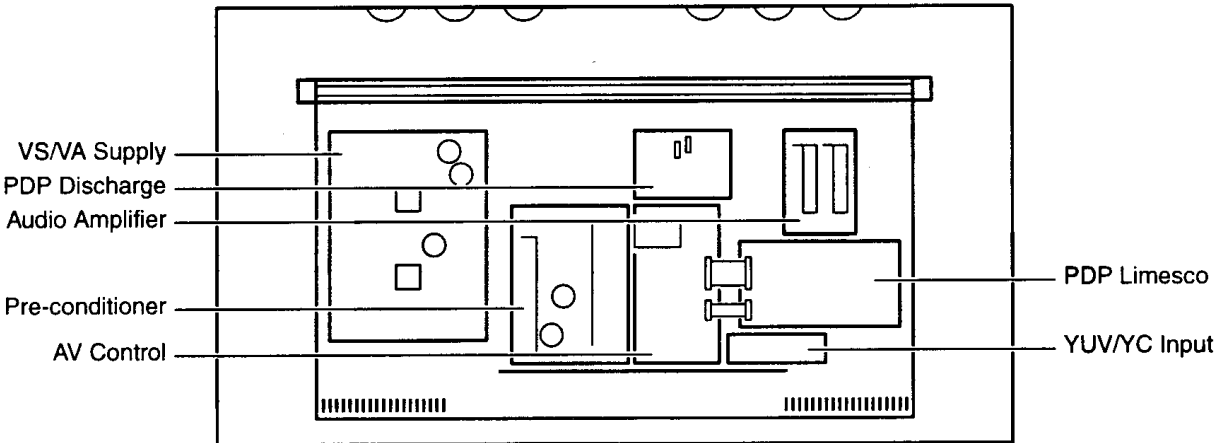


Figure 1-2

## 2. Safety instructions, warnings and notes

### 2.1 Safety instructions ▲

It is not allowed to operate the FTV-set without glass plate. One function of this glass plate is to absorb Infrared Radiation. Without this glass plate the level of Infrared Radiation produced by the plasma display could damage your eyes.

1. Safety regulations require that during a repair:
  - the set should be connected to the mains via an isolating transformer ( in this particular case a transformer of  $\geq 800$  VA);
  - safety components, indicated by the symbol ▲ , should be replaced by components identical to the original ones;
2. Safety regulations require that after a repair the set must be returned in its original condition. In particular attention should be paid to the following points.
  - Note: The wire trees should be routed correctly and fixed with the mounted cable clamps.
  - The insulation of the mains lead should be checked for external damage.
  - The electrical DC resistance between the mains plug and the secondary side should be checked (only for sets that have a mains isolated power supply). This check can be done as follows:
    - unplug the mains cord and connect a wire between the two pins of the mains plug;
    - set the mains switch to the on position (keep the mains cord unplugged!);
    - measure the resistance value between the pins of the mains plug and the metal shielding of the tuner or the aerial connection on the set. The reading should be between  $4.5\text{ M}\Omega$  and  $12\text{ M}\Omega$ ;
    - switch off the TV and remove the wire between the two pins of the mains plug.
  - The cabinet should be checked for defects to avoid touching of any inner parts by the customer.

4. If DST reacts with 'error 2', there is no communication between set and DST. Note that IR-transmitter LED is positioned at right side of IR-receiver eye of the E-box. Take into account that receiver-LED on DST is positioned not in the middle but at the left side. Point corresponding LED's to each other. In case the amount of Infrared produced by the screen pollutes the communication, the set can be set in Standby-mode. Then still the error-messages can be retrieved.

### 2.2 Warnings

#### 1. ESD ▲

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 same potential.

1. Available ESD protection equipment:
  - complete kit ESD3 (combining all 6 prior products - small table mat) 4822 310 10671
  - wristband tester 4822 344 13999
2. Never replace modules or other components while the unit is switched on.
3. When making settings, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

### 2.3 Notes

1. A glass plate is positioned before the plasma display. This glass plate can be cleaned with a slightly humid cloth. If due to circumstances there is some dirt between the glass plate and the plasma display panel it is recommended to do some maintenance by a qualified service employee only.
2. Never disconnect the power display cable when the set is operating
3. With DST no failures (error-codes) can be read, when the set is in Service-mode.

## 4. Mechanical instructions

### 4.1 Introduction:

There are pre-defined service positions for the following panels:

1. VS/VA SUPPLY panel.
2. PDP DISCHARGE panel.
3. AUDIO AMPLIFIER panel.
4. PRE-CONDITIONER panel.
5. AV CONTROL panel.
6. PDP LIMESCO panel.
7. YUV/YC INPUT panel.
8. LED DISPLAY panel.
9. SWITCH DISPLAY panel.

Before these panels can be accessed, the rear cover has to be removed:

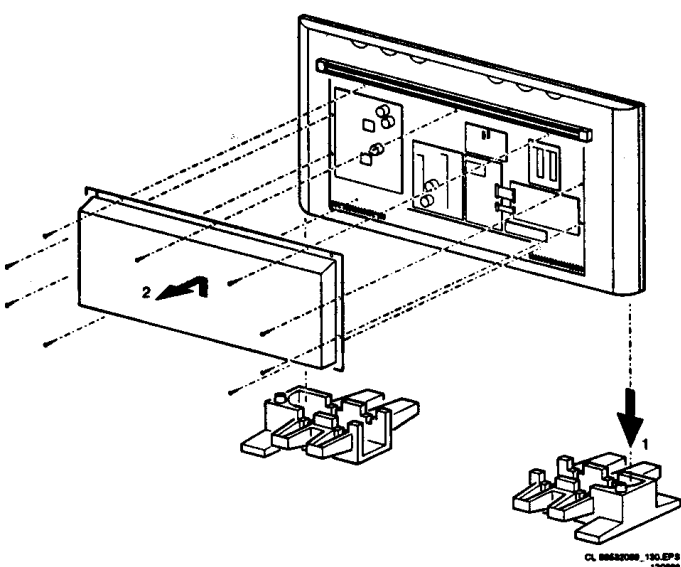


Figure 4-1

1. Place the Display Box in the service stand via 2 reinforced cushions (order code: 3122 126 ?????).
2. Remove the 9 fixation screws of the rear cover.
3. Remove the rear cover (during removal push it slightly upwards).

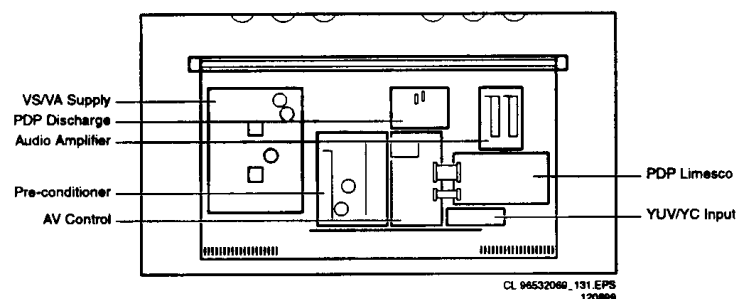


Figure 4-2

1. All panels are now accessible.

#### 4.1.1 VS/VA SUPPLY panel.

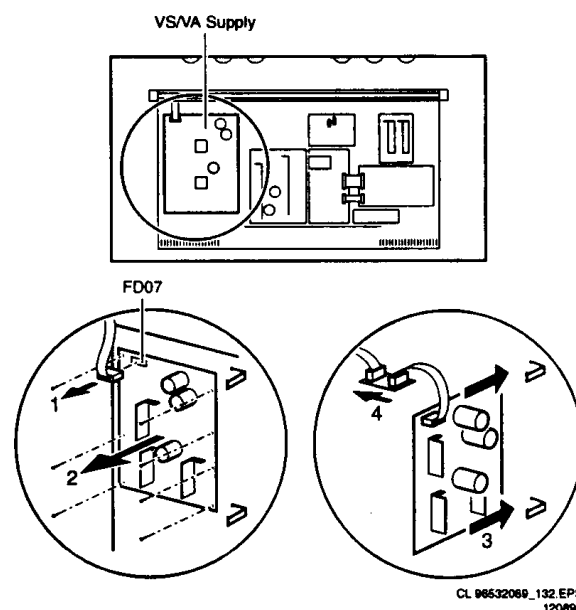


Figure 4-3

1. Disconnect Fan Supply cable from connector FD07 in the upper left corner [1].
2. Remove the 7 fixation screws of the panel [2].
3. Place panel on the 2 hinges, which are located near the right corners of the panel [3].
4. Use the mechanical service part (extension cable assembly, 12NC: 3122 785 90006) to extend the Fan Supply cable [4].
5. The copper side is now accessible from the left.

#### 4.1.2 PDP DISCHARGE panel.

As in the FTV 1.5, this panel must be exchanged completely i defective.

#### 4.1.3 AUDIO AMPLIFIER panel.

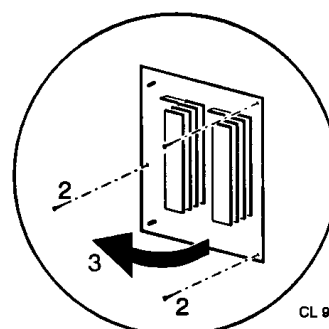
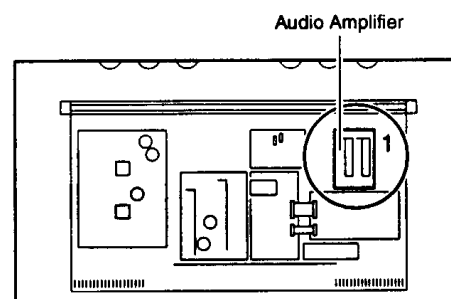


Figure 4-4

1. Some testpoints are accessible at the B-side [1].
2. If this is not sufficient, remove the 3 fixation screws of the panel [2].
3. Panel now can be hinged on the left side to access the A-side (soldering side) [3].

#### 4.1.4 PRECONDITIONER panel.

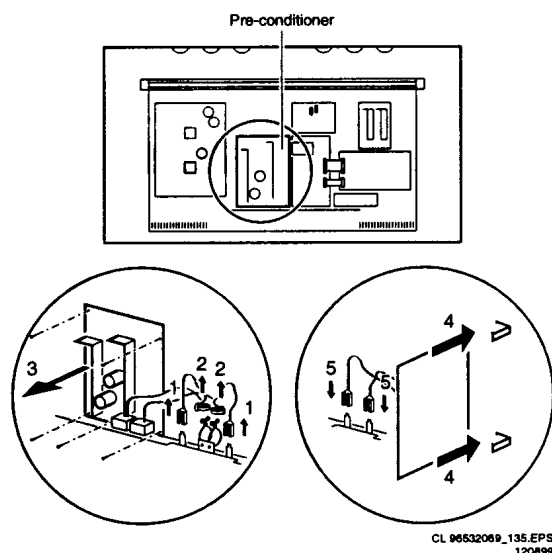


Figure 4-5

1. Disconnect the 2 grounding wires from the shielding plate by pressing the small lever on the connector while pulling [1].
2. Remove the 2 ferrite ring cores from their fixations [2].
3. Remove the 5 fixation screws of the panel [3].
4. Place panel on the 2 hinges, which are located, near the left corners of the panel [4].
5. Reconnect grounding wires to the extra connectors on the shielding plate at the left side [5].
6. The copperside becomes accessible now from the right side.

#### 4.1.5 AUDIO VIDEO CONTROL panel.

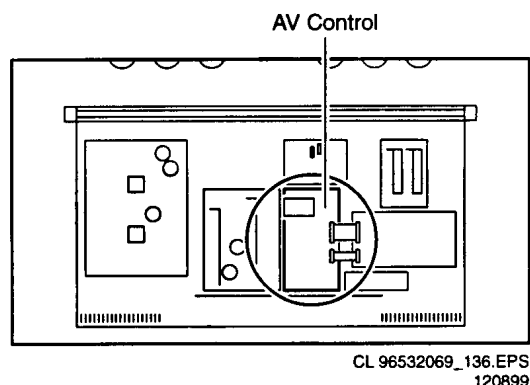


Figure 4-6

This panel has no service position for accessing the A-side, however all service test points are accessible at the B-side (see Service Manual).

In case some components must be (de)soldered, all fixation screws (6 for the panel, 5 at the metal connector plate) and all cables must be removed to access the A-side.

#### 4.1.6 PDP LIMESCO panel.

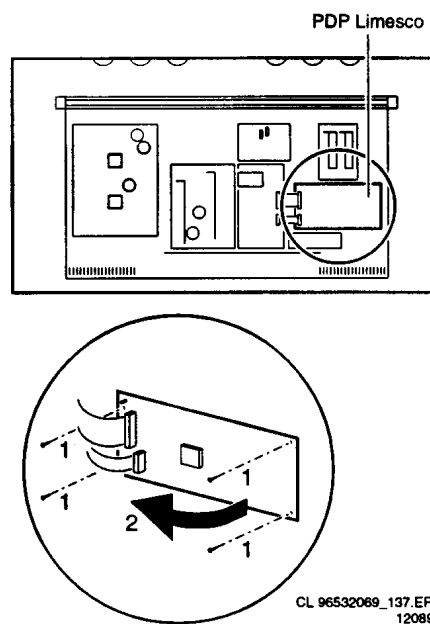


Figure 4-7

All SMC's are located on the B-side, so all testpoints are accessible. In case some components must be (de)soldered, the hinge construction can be used to access the A-side.

1. Remove the 4 fixation screws of the panel [1].
2. Panel can now be hinged to access soldering side [2].

#### 4.1.7 YUV/YC INPUT panel.

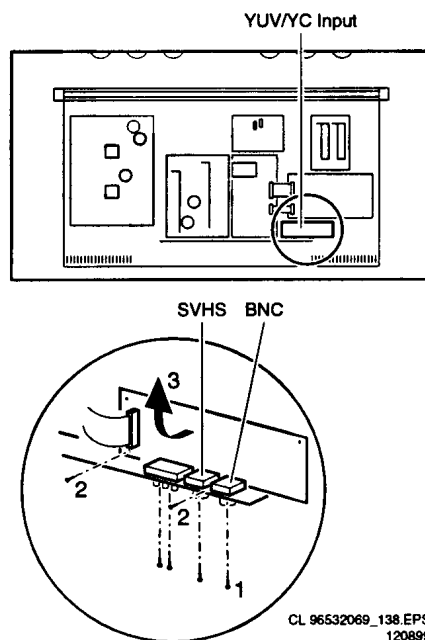


Figure 4-8

This panel has no pre-defined service position. For access of the A-side, the panel has to be removed:

1. Remove the 4 screws at the metal connector plate [1].
2. Remove the 2 fixation screws of the panel [2].
3. Panel can be removed now to access the A-side [3].

## 4.1.8 LED DISPLAY panel.

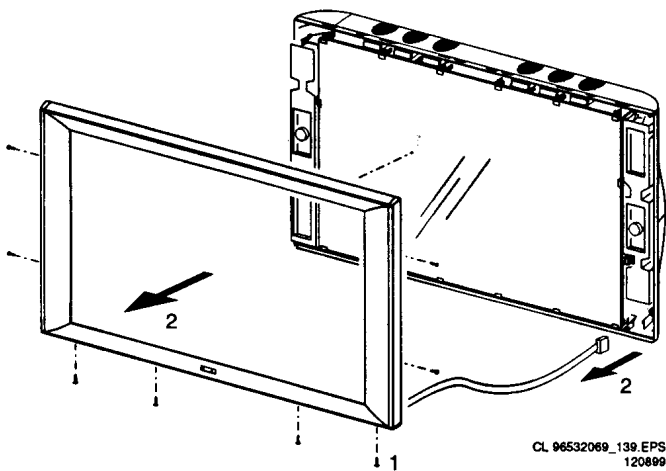


Figure 4-9

1. Remove 2 x 2 screws at the sides and 4 screws at the bottom of the front cover [1].
2. Remove the front cover (it hinges at the top). During removal unplug the cable of the LED DISPLAY panel at the SWITCH DISPLAY panel (connector SD11) [2].

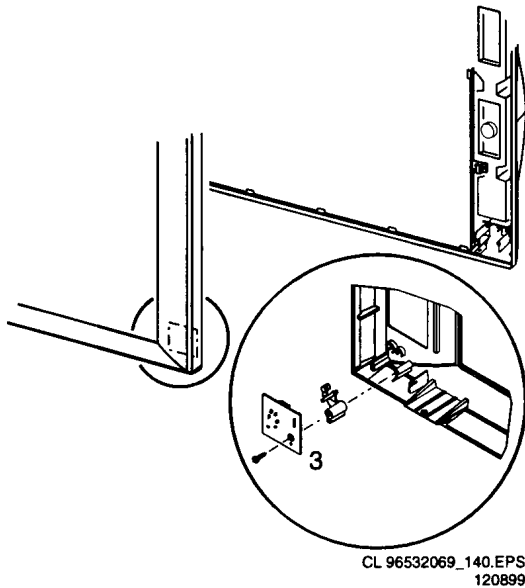


Figure 4-10

1. The LED DISPLAY panel can be removed now by unscrewing 1 fixation screw [3].

## 4.1.9 SWITCH DISPLAY panel.

1. Remove front cover (for a description see Chapter 1.1.8 'LED DISPLAY panel').

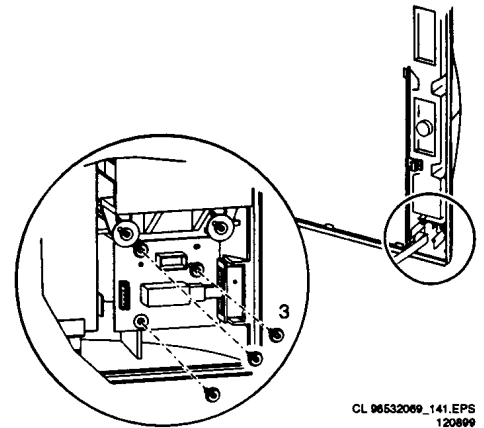


Figure 4-11

1. The SWITCH DISPLAY panel can be removed now by unscrewing 3 fixation screws [3].

## 4.2 Exchanging parts

Some parts of the FTV1.9 Display Box must be exchanged if defective:

1. GLASS PLATE.
2. LOUDSPEAKER.
3. PLASMA DISPLAY PANEL [PDP].

## 4.2.1 Exchanging of the GLASS PLATE.

1. First unplug (remove Mains and VGA cable) the Display Box .
2. Remove front cover (for a description see Chapter 1.1.8 'LED DISPLAY panel').

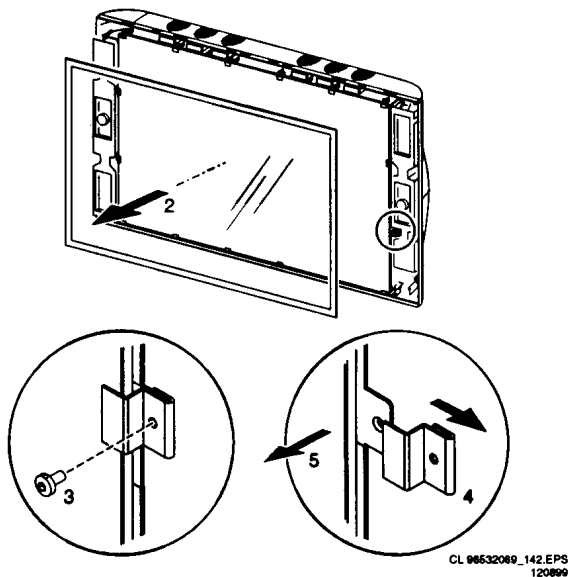


Figure 4-12

1. Now the GLASS PLATE can be removed by unscrewing a screws [3] and removing all glass clips [4].

#### 4.2.2 Exchanging of a LOUDSPEAKER.

1. First unplug (remove Mains and VGA cable) the Display Box.
2. Remove front cover (for a description see Chapter 1.1.8 'LED DISPLAY panel').

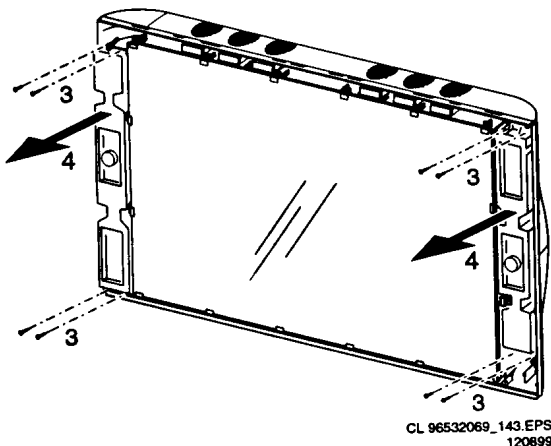


Figure 4-13

1. The LOUDSPEAKER can now be removed by disconnecting its cable and removing the 4 fixation screws at the top and bottom of the speakerbox. Be sure to remove the correct screws, otherwise the speaker system will be damaged (it is an airtight system).

#### 4.2.3 Exchanging of the PDP.

1. First unplug (remove Mains and VGA cable) the Display Box.
2. Place the rear side of the Display Box on a foam cushion (be sure the metal rear cover is mounted in order to prevent damaging of the electronic panels).
3. Remove front cover (for a description see Chapter 1.1.8 LED DISPLAY panel).
4. Now the GLASS PLATE can be removed by unscrewing all screws and removing all glass clips (for a description see Chapter 1.2.1. 'Exchanging of the GLASS PLATE').

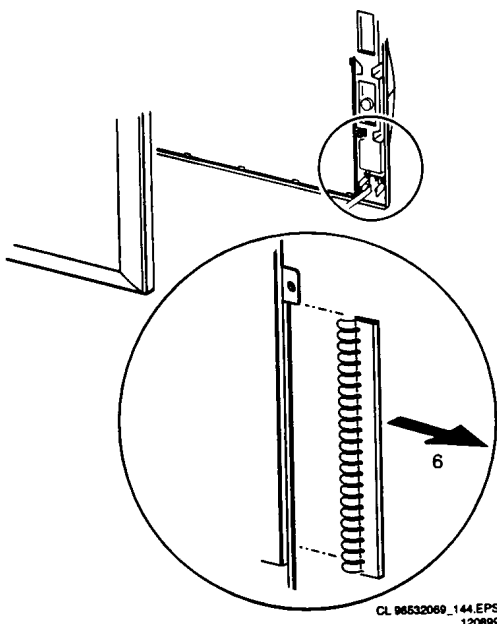


Figure 4-14

1. Remove all copper EMC SHIELDING springs mounted around the display [6].
2. Now flip the complete Display Box and place it with the Plasma Display down on a foam cushion. Be 100 % sure a large foam cushion is placed underneath the PDP, as it will drop about 10 mm after removing its fixation screws !!
3. Disassemble metal rear cover (for a description see Chapter 1.1 'Introduction').

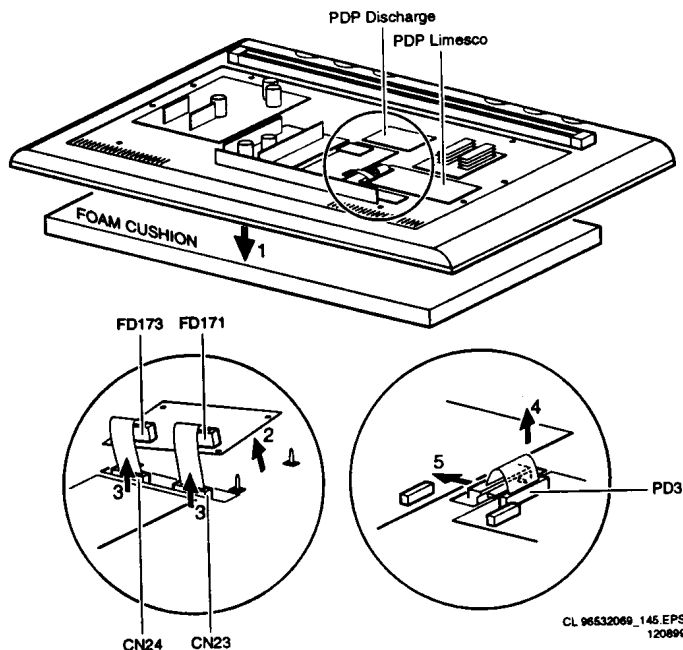


Figure 4-15

1. Disconnect the following cables:
  - Cables coming from connectors CN23 and CN24 of the PDP DISPLAY panel [3] (for easiest access lift the PDP DISCHARGE panel from its fixations [2]).
  - Flat cable on connector PD3 of the PDP LIMESCO panel [4]. Also remove the ferrite 'flat cable shield' completely by unlocking its fixations [5].

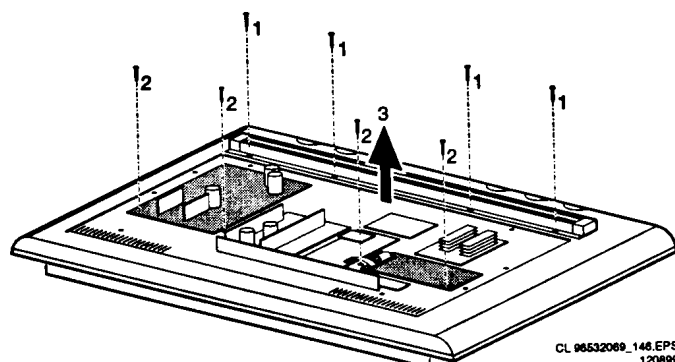


Figure 4-16

1. Now remove the 8 large screws which hold the PDP:
  - 4 screws are located at the top: they also hold the aluminium wall mount [1].
  - The other 4 are located at the bottom: the 2 outer screws are hidden behind panels. Therefore unscrew the VS/VA SUPPLY and the PDP-LIMESCO panel (grey panels) [2].
2. Lift encasing from PDP and replace PDP [3].

## 5. Service modes, fault finding and repair tips

For the FTV1.9, the Monitor can be used in two applications.

- A stand-alone configuration, a separate device which can also be sold and serviced separately.
- TV configuration, where the monitor is combined with the E-box.

The monitor, as a stand-alone unit, can be serviced by using a test pattern coming from the PDP-LIMESCO panel on the rear of the monitor itself or via a PC/laptop by using ComPair via the ComPair connector.

In this chapter the following paragraphs are included:

1. Test points
2. Dealer Service Tool (DST)
3. Service Modes
4. Error code buffer and error codes
5. The "blinking LED" procedure
6. Fault-finding tips
7. ComPair

### 5.1 Test points

The FTV1.9 chassis is equipped with test points in the service printing. These test points are referring to the functional blocks:

- A1-A2-A3, etc.: Test points for the Audio amplifier (A)
- C1-C2-C3, etc.: Test points for the AV control circuit (AVC)
- FD1-FD2-FD3, etc.: Test points for the VsVa supply (FD1-FD2) and the PDP discharge panel
- L1-L2-L3, etc.: Test points for the PDP LIMESCO (PD1-PD9)
- PR1-PR2-PR3, etc.: Test points for the Pre-conditioner (PR1-PR3)
- Y1-Y2-Y3, etc.: Test points for the Y/C YUV monitor panel (UY1-YC4)

Measurements are performed under the following conditions:

Video: colour bar signal; Audio: 3 kHz left, 1 kHz right

### 5.2 Dealer Service Tool (DST)

For easy installation and diagnosis the dealer service tool (DST) RC7150 can be used. When there is no picture (to access the error code buffer via the OSD), DST can enable the functionality of displaying the contents of the entire error code buffer via the blinking LED procedure, see also paragraph 5.5. The ordering number of the DST (RC7150) is 4822 218 21232.

#### 5.2.1 Installation features for the dealer

The dealer can use the RC7150 for programming the TV-set with pre-sets. 10 Different program tables can be programmed into the DST via a GFL TV-set (downloading from the GFL to the DST; see GFL service manuals) or by the DST-I (DST interface; ordering code 4822 218 21277). For explanation of the installation features of the DST, the directions for use of the DST are recommended (For the FTV1.9 chassis, download code X should be used).

#### 5.2.2 Diagnose features for service

FTV1.9 sets can be put in two service modes via the RC7150. These are the Service Default Mode (SDM) and the Service Alignment Mode (SAM).

### 5.3 Service Modes

Below described sequence is only valid for the "Monitor Only Configuration". When a Receiver box is connected to the

Display Box (TV Configuration), please check chapter 5 in the Training Manual of the Receiver Box.

#### 5.3.1 Service Default Mode (SDM)

The purpose of the SDM is:

- Provide a situation with predefined settings to get the same measurements as in this manual.
- Access to the error buffer via the blinking LED procedure
- Inspect the error buffer.
- Possibility to overrule software protections via the service pins (caution: override of software protections! ).

Entering the SDM:

- By transmitting the "DEFAULT" command with the RC7150 Dealer Service Tool (this works both while the set is in normal operation mode or in the SAM).
- By pressing on a standard RC the following sequence 0, 6 2, 5, 9, 6 followed by the "MENU" key.
- By short-circuiting the SDM pin on the AVC panel (see TM Display Box chapter 7).

In the SDM the following information is displayed on the screen:

```
-----
F19DBC X.Y_12345 (1) LLLL (2) SDM (3)
ERR 02 01 44 ## ## ## ## ## ## ## ##
-----
```

Explanation notes/references:

(1) Software identification of the main micro controller (F19DBC X.Y\_12345)

- F19D is the chassis name for FTV1.9 display
- B is the region identification
- C is the language cluster
- X = (main version number)
- Y = (subversion number)
- ##### are the last 5 digits of the 12nc number

(2) "LLLL" Normal display operation in hours

(3) "SDM" To indicate that the TV set is in the service default mode

(4) "ERR 02 01 44 ## ## ## ## ## ## ## ##" This line shows the contents of the error buffer (max. 10 errors). The last error that occurred is displayed at the most left position. When less than 10 errors have occurred the rest of the line is empty. When the errorlist is empty "No errors" is displayed. No duplicate errors.

Exit the SDM:

Push the "MENU" button on the Remote Control.

The SDM sets the following pre-defined conditions:

- Volume level is set to 25% (of the maximum volume level)
- Linear Audio and Video settings are set to 50%.
- Colour temperature is set to normal.

The following functions are "overruled" in SDM since they interfere with diagnosing/repairing a set

- Video blanking.
- Slow demute.
- Anti-ageing.
- Automatic switch to "Standby" when H- and/or V-sync signals are lost.

All other controls operate normally.

#### 5.3.2 Service Alignment Mode (SAM)

The purpose of the SAM is to align and or adjust settings.

For recognition of the SAM, "SAM" is displayed at the top of the right side of the screen

Entering the SAM-menu:

- By pressing the "ALIGN" button on the RC7150 Dealer Service Tool followed by code 3140 and the "OK" button
- Standard RC sequence 062596 followed by the "OSD" button.



- By short-circuiting the SAM pin on the AVC panel (Caution: override of software protections !! )
- In the SAM the following information is displayed on the screen:

```
-----
F19DBC X.Y_12345          SAM
ERROR## ## ## ## ##
WHITE POINT
PDP TEST PATTERN    [ON/OFF]
STORE
RESET ERROR BUFFER
-----
```

### The menus and submenus

#### White point

The white point sub menu contains the following items:

- RED
- GREEN
- BLUE
- COLOUR TEMPERATURE

#### PDP Test pattern

By selecting this item, all OSD disappears from the screen. The screen now changes from light grey to dark grey in a slow regular rhythm. One can so easily check if all pixels of the monitor are correct.

#### Store

The change values are stored in the NVM.

#### Reset Error Buffer

This option will reset the error buffer.

Exit the SAM:

Push the "MENU" button on the Remote Control.

SAM menu control:

Menu items can be selected with the "UP" or "DOWN" key.

Entry into the selected items (sub menus) is done by the "LEFT" or "RIGHT" key. The selected item will be highlighted. With the same "LEFT/RIGHT" keys, it is possible to increase/decrease the value of the selected item.

Return to the former screen by pushing the "MENU" button. The item values are stored in NVM if the sub menu is left.

### 5.3.3 Customer Service Mode (CSM) Display

FTV1.9 monitors are equipped with the "Customer Service Mode" (CSM). CSM is a special service mode that can be activated and de-activated by the customer, upon request of the service technician/dealer during a telephone conversation in order to identify the status of the set. This CSM is a 'read only' mode, therefore modifications in this mode are not possible.

Entering the Customer Service Mode.

- By pressing on RC03333/01 the following sequence : Picture, sound, cursor up, cursor down, cursor left, cursor right followed by the button (MUTE)
- RC7150 (DST) or a standard RC by pressing the sequence 062596 followed by the button (MUTE)

Exit the Customer Service Mode.

- pressing the "MENU" or any key on the Remote Control handset (except "P+" or "P-")
- switching off the TV set with the mains switch.

All settings that were changed at activation of CSM are set back to the initial values

#### The Customer Service Mode information screen

The following information is displayed on screen:

```
-----
CUSTOMER SERVICE MENU
• Software version F19DBC X.Y_####)
```

- Code 1: contains the last 5 error codes
  - Code 2: contains the first 5 error codes with the last received error at the most left-hand side.
  - Service unfriendly modes
- ```
-----
```

## 5.4 Error code buffer and error-codes

The error code buffer contains all errors detected since the last time the buffer was erased. The buffer is written from left to right.

In case of non-intermittent faults, clear the error buffer before starting the repair to prevent that "old" error codes are present. If possible check the entire content of the error buffers. In some situations an error code is only the RESULT of another error code (and not the actual cause).

Note: a fault in the protection detection circuitry can also lead to a protection

The error code buffer will be cleared in the following cases:

- exiting SDM or SAM with the "Standby" command on the remote control
- transmitting the commands "EXIT" with the DST (RC7150)
- transmitting the commands "DIAGNOSE-9-9-OK" with the DST.

The error buffer is not reset by leaving SDM or SAM with the mains switch.

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: 5 6 0 0 0 : Error code 6 was first detected and error code 5 is the last detected (newest) error

| Error-nr | Type of Error        | Possible defect/cause                                                                                                                                  |
|----------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | +5V                  | +5V pin at mP is low.                                                                                                                                  |
| 2        | 8V6                  | 8V6 pin at mP is low                                                                                                                                   |
| 3        | Fan_prot             | Gives an indication that 1 or more FAN(s) does not function, or that 1 or more fan control circuits is defect                                          |
| 4        | Over-temp_prot       | Temperature at the heatsink of the VsVa supply or the Preconditioner is too high                                                                       |
| 5        | DC_prot              | Audio-amplifier IC, its supply or the Audio amplifier is defect                                                                                        |
| 6        | Over_voltage_prot    | Vs or Va supply voltage is too high                                                                                                                    |
| 7        | Vrr                  | Powersupply of the display is not correct. Ignorance of the signal during startup by the software.                                                     |
| 8        | Power_OKE            | Power supply or modules that uses this voltage. If this signal is NOT activated means that all supply voltages are available (exception Audio supply ) |
| 9        | Blocked NVM IIC bus  | NVM IIC bus is correct                                                                                                                                 |
| 10       | Blocked slow IIC bus | Slow IIC bus is correct                                                                                                                                |
| 11       | TDA9860              | No acknowledge of Audio controller                                                                                                                     |
| 12       | TDA4885              | No acknowledge of Video controller                                                                                                                     |
| 13       | MC141585             | No acknowledge of OSD Generator                                                                                                                        |
| 14       | uPD93687G D-LBD      | No acknowledge of Limesco                                                                                                                              |
| 15       | PCF8574AT            | No acknowledge of I/O Expander                                                                                                                         |

| Error-nr | Type of Error | Possible defect/cause      |
|----------|---------------|----------------------------|
| 16       | NVM           | No acknowledge of NVM      |
| 17       | Communication | Fault in the communication |

## 5.5 The "blinking LED" procedure

The contents of the error buffer can also be made visible through the "blinking LED" procedure. This is especially useful when there is no picture. There are two methods:

- When the SDM is entered, the LED will blink the number of times, equal to the value of the last (newest) error code (repeatedly).
- With the DST all error codes in the error buffer can be made visible. Transmit the command: "DIAGNOSE x OK" where x is the position in the error buffer to be made visible x ranges from 1, (the last (actual) error) to 5 (the first error). The LED will operate in the same way as in the previous point, but now for the error code on position x.

Example:

Error code position 1 2 3 4 5

Error buffer: 8 9 5 0 0

- after entering SDM: blink (8x) - pause - blink (9x) - etc.
- after transmitting "DIAGNOSE- 2- OK" with the DST: blink (9x) - pause - blink (9x) - etc.
- after transmitting "DIAGNOSE- 3- OK" with the DST: blink (5x) - pause - blink (5x) - etc.
- after transmitting "DIAGNOSE- 4- OK" with the DST: nothing happens

## 5.6 Fault finding tips

### 5.6.1 Pre-conditioner

The Pre-conditioner delivers the following output voltages:

- 5 VSTBY
- 5 VSTBY\_switched
- 380 VDC
- Internal 12 VSTBY to supply the relay, which switches the mains input

To trouble shoot the pre-conditioner, first check the LED of the display-box.

- No red, green or orange LED indicates the absence of the +5Vstby\_switched at the VsVa panel.

Check the +5Vstby\_switched on pin 5 of connector PR08. If this voltage is present check the presence of this voltage at the VsVa-panel on pin 2 of connector FD04. See the wiring diagram of the monitor for more details.

If the voltage is not present, check R3508 and fuse 1500. In case of a defective R3508, check/replace item 7500, opto-coupler 7501, regulator 7502, and diode 6501 + 6502.

In case of an open circuit of fuse 1500, check/replace bridge 6500 and capacitor C2501.

If both component are alive, measure the voltage at pin 5 of IC7500 - Topswitch. If the waveforms resembles a burst-signal, the output is too heavy loaded. Check the output diode D6504 and capacitor C2508 of the 12VSB and diode 6505 and capacitor C2510 of the 5VSTBY.

- The red LED is blinking (+5Vstby is OK!), which is an indication of a protection.

Disconnect the VGA-cable between the E-box and the Monitor. Now the Monitor is operating as a stand-alone unit. Switch the monitor via the DST, (command "Default") or via the RC (special sequence) to the SDM.

Automatically the orange coloured LED of the monitor will blink the content of the error-buffer. If the sequence contains error-code 8, the cause could be a defective pre-conditioner. Error-

code 8 is an indication that the +5V and/or the Vs/Va of the VsVa supply are not correct.

In case of error-code 4, switch OFF the set and check the temperature of the heatsink. In case of a high temperature of the heatsink, check MOSFET T7610 and the drive-circuit around T7640, T7641 and T7608.

In case of error-code 8, remove connector PR09 from the board. Short-circuit pin 2 of T7681 to ground, simulation of "SUPPLY\_ON". (Caution - Protections overruled!!!)

Measure voltage at C2616. Is voltage 380Vdc?

Yes, the cause was a too heavy load/short-circuit at the VsVa panel.

No, measure the voltage at C2606/C2607. Is this voltage a DC voltage of approx. 300V with a strong ripple at a mains-input of 230Vac? If NO, check if relay 5690 is activated via the transistors T7684 + T7690. Check also PTC's 3600, 3601 and 3602 at their resistor-value.

Voltage is present at C2606. Check/replace NFR 3663 and 3668, if one of them is an open-circuit. In case R3663 is an open circuit, check/replace diode 6660, 6661 and capacitor C2664 plus IC 7660. If IC7660 is defect, check/replace IC 7650 and C2262. In case of an open circuit of NFR 3668, replace IC 7650.

NFR 3663 and NFR 3668 are not defect. Measure waveform a base of T7608. Is a square waveform present at gate of T7610? Check/replace MOSFET T7610 and the drive-circuit around T7640, T7641 and T7608.

### 5.6.2 VsVa-supply

The red LED is blinking (+5Vstby is OK!), which is an indication of a protection.

Disconnect the VGA-cable between the E-box and the Monitor. The Monitor is now operating as a stand-alone unit.

Switch the monitor via the DST, (command "Default") or via the RC (special sequence) to the SDM.

- Error-code 1, check the +5V supply

Check fuse 1103. If the fuse is an open circuit, check/replace IC 7201. If fuse 1103 is OK, check the presence of the 17V. If this voltage is not present check fuse 1102 + 1104 and D6121 + D6122. If the 17V is present, then remove connector FD05. The reason could be a too heavy load or a short-circuit of the +5V supply. If after disconnection of connector FD05 the set still goes into protection, check D6203, NFR 3205 and the circuit around IC 7201.

- Error-code 2, check the 8V6 supply

Check regulator IC 7203, NFR 3099 and D6204.

- Error-code 8 there is something wrong with the POWER\_OKE signal. When the POWER\_OKE signal is low, the Vs and Va and the +5V are available.

Measure the voltage Va at C2120. Is the voltage between 55V and 65V? If not check fuse 1105 and D6120. If both components are OK, the cause could be a too heavy load.

Measure the voltage Vs at C2020. Is the voltage between 165V and 185V? If not check D6020. If D6020 is OK, the cause could be a too heavy load.

If both voltage are not present, check fuse 1004 at the input.

If fuse 1004 is an open circuit, check the MOSFET's 7005 and 7006 for a short-circuit. In case of short-circuit use the repair-kit.

If fuse 1004 is OK, check the voltage at pin 15 of IC 7001. Is the voltage at pin 15 approx. 16-17V? If NO, check NFR 3002 and D6002 + D6030. If YES, check the waveforms FD49 and FD50 at pin 14 and 12. If they are present, check pulse transformer 5001 and the driver-circuits around MOSFET 7005 and 7006. If the waveforms FD49 and FD50 are not present, replace IC7001.

- Error-code 5, check the audio-supply or the Audio amplifier IC.

Check/replace fuse 1201 + 1202 and diode 6201 + 6202. If the components are OK, check the audio-amplifier IC.

- Error-code 6, check the Vs and/or the Va supply voltage.

The regulation-circuit of one of these voltages is not working correctly.

For the Va supply check opto-coupler 7102 and IC 7110.

For the Vs supply check opto-coupler 7002 and IC 7010

## 5.7 ComPair

### 5.7.1 ComPair mode

The monitor, as a stand-alone unit, can be diagnosed via a PC/laptop by using ComPair via the ComPair connector. Before connecting the ComPair-cable at the AV Control panel on connector AVC34, the monitor must be put in the "ComPair - Mode ". This can be done by changing the jumpers at connector AVC39. Connector AVC39 is situated close to the up panel.

The figure below shows how to do it.

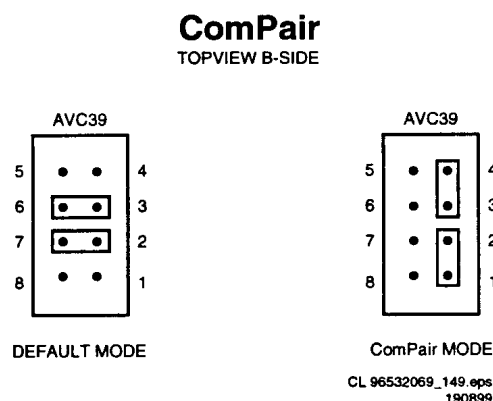


Figure 5-1

After switching ON the set, the red LED will blink as an indication that the monitor is in the ComPair mode.

### 5.7.2 Introduction

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

- ComPair helps you to quickly get an understanding how to repair the FTV1.9 in short time by guiding you step by step 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; ComPair takes care of this.
- ComPair speeds up the repair time since it can automatically communicate with the FTV1.9 (when the microprocessor is working) and all repair information is directly available. When ComPair is installed together with the SearchMan FTV1.9 electronic manual, schematics and PCBs are only a mouse-click away.

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 FTV1.9 chassis, the ComPair interface box and the FTV1.9 communicate via an I2C cable (bi-directional). The ComPair fault finding program is able to determine the problem of the defective television. ComPair can gather diagnostic information in 2 ways:

1. Communication to the television (automatic)
2. Asking questions to you (manually)

ComPair combines this information with the repair information in its database to find out how to repair the FTV1.9.

#### Automatic information gathering

Reading out the error buffer, ComPair can automatically read out the contents of the entire error buffer.

Diagnosis 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 FTV1.9.

#### Manual information gathering

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 and showing you examples. You can answer by clicking on a link (e.g. text or an waveform pictures) that will bring you to the next step in the faultfinding process.

A question could be: Do you see snow? (Click on the correct answer)

YES / NO

An example can be: Measure testpoint I7 and click on the correct oscillogram you see on the oscilloscope

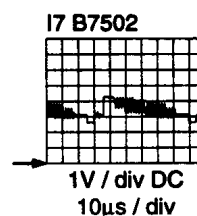


Figure 5-2

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.

#### Additional features

Beside fault finding, ComPair provides some additional features like:

- Uploading/downloading of pre-sets
- Managing of pre-set lists
- Emulation of the Dealer Service Tool

### 5.7.3 Searchman (Electronic Service Manual)

If both ComPair and SearchMan are installed, all the schematics and PCB's of the faulty set are available when clicking on the hyper-link of a schematic or a PCB in ComPair. Example : Measure the DC-voltage on capacitor C2568 (Schematic/Panel) at the Monocarrier.

Clicking on the PCB hyper-link, automatically shows the PCB with a highlighted capacitor C2568. clicking on the schematic hyper-link, automatically shows the position of a highlighted capacitor C2568 at the schematic.

### 5.7.4 Connecting the ComPair interface

The ComPair Browser software should be installed and setup before connecting ComPair to the FTV1.9. (See the ComPair Browser Quick Reference Card for installation instructions):

1. Connect the RS232 interface cable to a free serial (COMM) port on the PC and the ComPair interface PC connector (connector marked with "PC").
2. Place the ComPair interface box straight in front of the television with the infrared window (marked "IR") directed to the television LED. The distance between ComPair interface and television should be between 0.3 and 0.6

- meter. (Note: make sure that (also) in the service position, the ComPair interface infra red window is pointed to the standby LED of the television set (no objects should block the infra red beam))
3. Connect the mains adapter to the connector marked "POWER 9V DC" on the ComPair interface
  4. Switch the ComPair interface OFF
  5. Switch the television set OFF with the mains switch
  6. Remove the rear cover of the television set
  7. Connect the interface cable (4822 727 21641) to the connector on the rear side of the ComPair interface that is marked "I2C" (See Figure)
  8. Connect the other end of the interface cable to the ComPair connector on the monocarrier (see figure 5.xx)
  9. Plug the mains adapter in the mains outlet and switch ON the interface. The green and red LED's light up together. The red LED extinguishes after approx. 1 second (the green LED remains lit).
  10. Start-up Compair and select "File" menu, "Open...."; select "FTV1.9 Fault finding" and click "OK"
  11. Click on the <xxxx> icon to switch ON the communication mode (the red LED on the Compair interface will light up)
  12. Switch on the television set with the mains switch
  13. When the set is in standby. Click on "Start-up in ComPair mode from standby" in the ComPair FTV1.9 fault finding tree, otherwise continue.

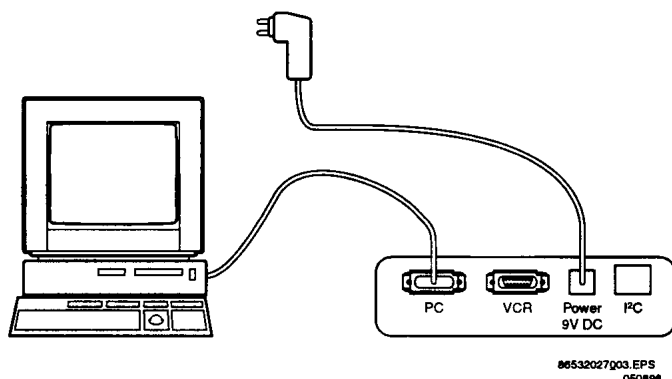


Figure 5-3

The set has now started up in ComPair mode. Follow the instruction in the FTV1.9 fault finding tree to diagnose the set. Note that the OSD works but that the actual user control is disabled

### 5.7.5 Preset installation

Presets can be installed in 2 ways with the FTV1.9.

- Via infra red
  - only sending TO the television
  - the rearcover does NOT have to be removed

Click on "File" "Open" and select "TV - use ComPair as DST" to use infra red

- Via cable
  - sending TO the television and reading FROM the television
  - the rearcover has to be removed

Click on "File" "Open" and select "FTV1.9 fault finding" to use the cable

Presets can be installed via menu "Tools", "Installation", "Presets".

### 5.7.6 Ordering ComPair

ComPair order codes:

- Starterkit ComPair + SearchMan software + ComPair interface (excluding transformer): 4822 727 21629

- ComPair interface (excluding transformer): 4822 727 21631
- ComPair transformer (continental) Europe: 4822 727 21632
- ComPair transformer United Kingdom: 4822 727 21633
- Starterkit ComPair software: 4822 727 21634
- Starterkit SearchMan software: 4822 727 21635
- Starterkit ComPair + SearchMan software: 4822 727 21636
- ComPair CD (update): 4822 727 21637
- SearchMan CD (update): 4822 727 21638
- ComPair interface cable (for FTV1.9): 4822 727 21641

# 1. Alignments

General: the Service Default Mode (SDM) and Service Alignment Mode (SAM) are described in chapter 5 'Service modes, faultfinding and repair tips'.

## 1.1 Alignment conditions

All electrical adjustments should be performed under the following conditions:

- Supply voltage : 220 - 240 VAC (+/- 10 %)
- Warm-up time: 10 minutes
- The voltages and oscillograms are measured in relation to the tuner earth.
- Test probe: Ri > 10MΩ Ci < 2,5 pF.

### 1.1.1 Selection of the SAM-menu

- By transmitting the "ALIGN" command with the RC7150 Dealer Service Tool, followed by password "3140" and < OK > button.
- Standard RC sequence 062596 (within OSD time-out) OSD
- By shorting test-point M28 and M29 on the AV Control panel on the monitor while switching on the set.

## 1.2 Adjustments on the D-box

### 1.2.1 Electrical Alignments

#### **Pre-conditioner +5Vstby (PR3)**

Connect a voltmeter to capacitor C2510 (PR2). With the aid of R3504 adjust the voltage to 5.2 V +/- 50 mV.

#### **VsVa supply (FD)**

##### *Va-supply (Addressing of the PDP - FD1)*

De-activated the PDP.

Connect a voltmeter to capacitor C2120 (FD1). With the aid of R3126 adjust the voltage to 55 V +/- 0.5 V.

##### *Vs-supply (Sustain pulses - FD2)*

De-activated the PDP.

Connect a voltmeter to capacitor C2020 (FD2). With the aid of R3026 adjust the voltage to 165 V +/- 0.5 V.

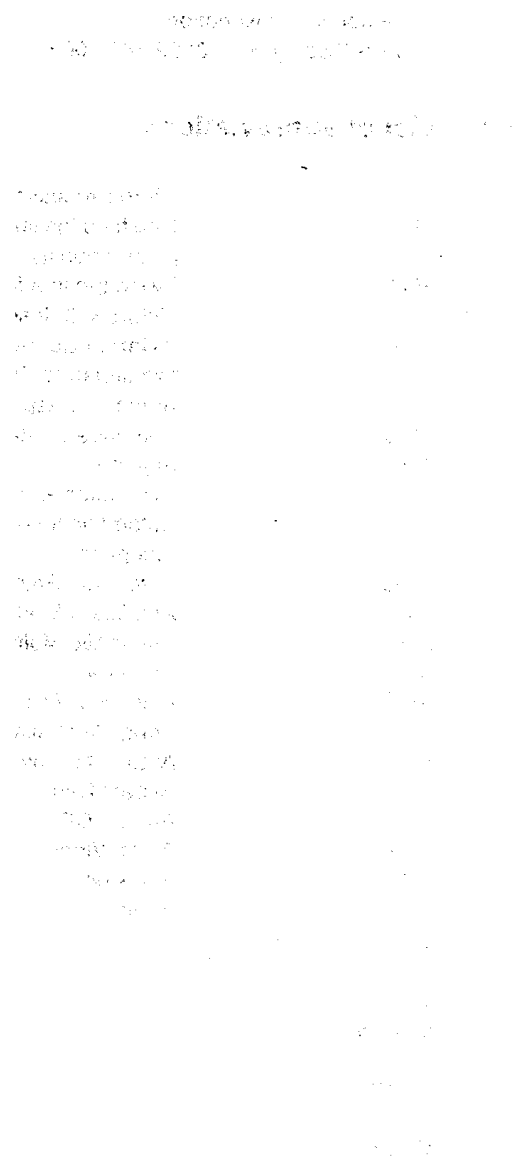
### 1.2.2 Software Alignments

#### **White point**

- Select the item "PDP test pattern" of the Service Alignment menu and set it to "ON".
- Select item " White point" of the Service Alignment menu.
- Enter the "white point" menu and adjust the value of one of the 4 submenu if necessary. Only the selected menu-item including its value remain on the screen when selected. The value has to changed within 5 seconds otherwise the main menu reappears again.

The 4 sub menu-items of the White point menu:

- "RED"
- "GREEN"
- "BLUE"
- "COLOUR TEMPERATURE"
- Leave the sub-menu by pressing "cursor up", "cursor down", "OK" or the "MenuOnOff" button and return to the main menu.
- Select the item "PDP test pattern" of the Service Alignment menu and set it to "OFF".



## 2. Circuit description and list of abbreviations

### 2.1 Circuit description

For a detailed description of the circuits see Training Manual FTV1.9 Display Box (3122 785 10036).

### 2.2 List of abbreviations

|        |                                                                                       |
|--------|---------------------------------------------------------------------------------------|
| μP     | Micro Processor                                                                       |
| 1FH    | One time the line frequency for normal picture quality                                |
| 2FH    | Twice the line frequency for a better picture with less field flicker                 |
| 2CS    | 2 Carrier Sound (sound system using two separate FM carriers at 5.5 MHz)              |
| AARA   | Automatic Aspect Ratio Adaptation                                                     |
| ADC    | Analogue Digital Converter                                                            |
| ADJ    | Adjust -                                                                              |
| AFC    | (S1) Automatic Frequency Control. Automatic fine-tuning circuit for signal reception. |
| AGC    | Automatic Gain Control                                                                |
| AM     | Amplitude Modulation                                                                  |
| AMV    | Automatic Multi Voltage                                                               |
| ANT    | Antenna                                                                               |
| AP     | Asian Pacific region (Covering Hong Kong, Australia, Singapore etc.)                  |
| APC    | Automatic Power Control                                                               |
| ASP    | Aspect Ratio 4:3 or 14:9 or 16:9                                                      |
| AUD    | Audio - GFL                                                                           |
| AVB    | Audio Video Buffer or Audio Video Blanking                                            |
| BC     | Beam current - GFL                                                                    |
| BNC    | Professional connector for higher frequencies                                         |
| C      | Centre                                                                                |
| CINCH  | Common connector for several kinds of signals                                         |
| COMP   | COMB-filter                                                                           |
| CRT    | Cathode Ray Tube                                                                      |
| CVBS   | Composite Video Blanking Synchronisation, video signal                                |
| DAC    | Digital Analogue Converter                                                            |
| DEC    | Decoder                                                                               |
| DFB    | Double Window Fast Blanking                                                           |
| DU     | Double Window - U_signal                                                              |
| DV     | Double Window - V_signal                                                              |
| DW     | Double Window                                                                         |
| DY     | Double Window - Y_signal                                                              |
| E-Box  | Electronic Box                                                                        |
| EHT    | Extra High Tension - GFL                                                              |
| ELPS   | Eco Low Power Supply - GFL                                                            |
| EWD    | East West Drive - GFL                                                                 |
| EXT    | External                                                                              |
| FBL    | Fast Blinking                                                                         |
| FBX    | Feature Box                                                                           |
| FE     | FrontEnd                                                                              |
| FM     | Frequency Modulation                                                                  |
| FMS    | Functional Module Specification                                                       |
| FRNT   | Front                                                                                 |
| FRS    | Functional Requirement Specification                                                  |
| FTV    | Fiat TeleVision                                                                       |
| GFL    | Global Feature Line (high end TV chassis)                                             |
| GFL-FL | GFL Feature (up)Lift                                                                  |
| GND    | Ground                                                                                |
| HFB    | Horizontal FlyBack (display system sync. pulse)                                       |
| HP     | Headphone                                                                             |

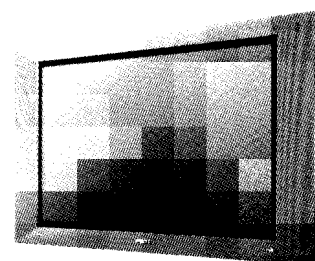
|           |                                                                           |
|-----------|---------------------------------------------------------------------------|
| HSI       | Hardware Software Interface                                               |
| HW        | HardWare                                                                  |
| I/O       | Input / Output                                                            |
| I2C       | IC bus, Inter Integrated circuit, on-board communication line             |
| IF        | Intermediate Frequency                                                    |
| IRQ       | Interrupt ReQuest.                                                        |
| L         | Left                                                                      |
| L_CL VL   | Left_Constant_Level Variable_Level                                        |
| L_REC SEL | Left_Record_Select                                                        |
| LED       | Light Emitting Diode                                                      |
| LP        | Low Pass                                                                  |
| LTP       | Luminance Transient Processor                                             |
| MAC       | (Apple) MACintosh                                                         |
| MAC13     | or MACII (Apple) MACintosh format for 13" monitors                        |
| MACP      | Motion Adaptive Colour Plus                                               |
| ML-2      | Media Line 2                                                              |
| Monitor   | PDP Display with all the electronic boards (incl. self developed boards). |
| MU        | Main U_signal                                                             |
| MV        | Main V_signal                                                             |
| MY        | Main Y_signal                                                             |
| NICAM     | Near Instantaneous Companding Audio Multiplex (digital terrestrial sound) |
| NTSC      | National TV Standard Committee                                            |
| OE        | (AQ) Output Enable                                                        |
| PAL       | Phase Alternating Lines (Colour video standard)                           |
| PDP       | Plasma Display Panel                                                      |
| PIP       | Picture In Picture                                                        |
| PLL       | Phase Locked Loop                                                         |
| POR       | Power On Reset / Power Off Reset (depending on context)                   |
| QPSK      | Quadruple Phase Shift Keying                                              |
| R         | Right                                                                     |
| RAM       | Random Access Memory                                                      |
| RC5       | Remote Control 5 (infrared signal transmission protocol)                  |
| RECEI-RC5 | Received RC5-code                                                         |
| REF       | Reference                                                                 |
| RES       | Resistor                                                                  |
| RGB       | Red Green Blue, video signals                                             |
| SC-1FH    | Sandcastle 1FH                                                            |
| SCL       | Serial Clock Line of the IC bus                                           |
| SDA       | Serial Data Line of the IC bus                                            |
| SECAM     | SEquential Couleur A Memoire (Colour video standard)                      |
| SIF       | Second Intermediate frequency                                             |
| SND       | Sound                                                                     |
| SOG       | Sync On Green                                                             |
| SP_GAIN   | Splitter GAIN                                                             |
| SPHsync   | Splitter Horizontal Sync                                                  |
| SPVsync   | Splitter Vertical Sync                                                    |
| SSP       | Small Signal Panel (of the GFL chassis)                                   |
| STBY      | Standby                                                                   |
| SW        | SoftWare / SubWoofers (depending on context)                              |
| SYNC      | Synchronisation                                                           |
| SYS       | System                                                                    |
| Terr      | Terrestrial                                                               |
| TP        | Testpoint                                                                 |
| TRASN     | (AQ)                                                                      |
| TSD       | Terrestrial Sound Decoder (combination of 2CS and NICAM decoder)          |
| TUN       | Tuner                                                                     |

|            |                                                                          |
|------------|--------------------------------------------------------------------------|
| TXT        | TeleteXT                                                                 |
| TXT-KILL   | Teletext killer (Signal to disable Teletext)                             |
| U-VIDCONTR | U-VideoContrast                                                          |
| VCO        | Voltage Controlled Oscillator                                            |
| VD         | Vertical Drive                                                           |
| VGA        | Video Graphics Array. In this document, the term VGA is used for all VGA |
| WE         | Write Enable                                                             |
| Xtal       | Crystal (Oscillator)                                                     |
| Y/C        | Luminance (Y) signal / Chrominance signal (C)                            |
| YUV        | Combination of colour difference signals                                 |

Service  
Service  
Service

FTV1.9DE

AA



CL 955320690 163 eps  
020999

# Service Manual

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# PHILIPS



# 1. Technical specifications

## 1.1 Technical data D-box

|                      |               |
|----------------------|---------------|
| Mains voltage        | : 85 - 264Vac |
|                      | : 50Hz - 60Hz |
| Power dissipation    | : 400W        |
| Stand-by dissipation | : < 1W        |

## 1.2 Connection facilities

### 1.2.1 Specification of the terminal sockets

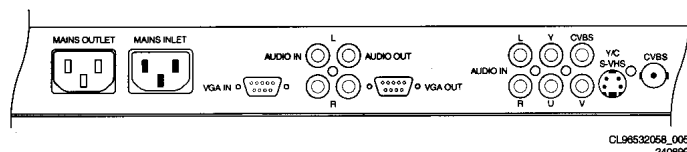


Figure 1-1

#### VGA-in

|                                |              |
|--------------------------------|--------------|
| 1 - R                          | (0.7Vpp 75Ω) |
| 2 - G                          | (0.7Vpp 75Ω) |
| 3 - B                          | (0.7Vpp 75Ω) |
| 4 - Reserved                   |              |
| 5 - Bus-gnd                    |              |
| 6 - R-gnd                      |              |
| 7 - G-gnd                      |              |
| 8 - B-gnd                      |              |
| 9 - RC5                        |              |
| 10 - GND                       |              |
| 11 - Config_Ident              |              |
| 12 - Bus1 (TxD/<br>Rxd or SDA) |              |
| 13 - Hsync                     |              |
| 14 - Vsync                     |              |
| 15 - Bus2 (TxD/<br>Rxd or SDA) |              |

#### VGA-out

|       |              |
|-------|--------------|
| 1 - R | (0.7Vpp 75Ω) |
|-------|--------------|

|               |              |
|---------------|--------------|
| 2 - G         | (0.7Vpp 75Ω) |
| 3 - B         | (0.7Vpp 75Ω) |
| 4 - Reserved  |              |
| 5 - gnd       |              |
| 6 - R-gnd     |              |
| 7 - G-gnd     |              |
| 8 - B-gnd     |              |
| 9 - Reserved  |              |
| 10 - GND      |              |
| 11 - Reserved |              |
| 12 - Reserved |              |
| 13 - Hsync    |              |
| 14 - Vsync    |              |
| 15 - Reserved |              |

#### Audio VGA-in

|                 |                   |
|-----------------|-------------------|
| - Cinch Audio L | (0.5Vrms >= 10kΩ) |
| - Cinch Audio R | (0.5Vrms >= 10kΩ) |

#### Audio VGA-out

|                 |                  |
|-----------------|------------------|
| - Cinch Audio L | (0.5Vrms >= 1kΩ) |
| - Cinch Audio R | (0.5Vrms >= 1kΩ) |

#### SVHS

|         |                |
|---------|----------------|
| 1 - GND |                |
| 2 - GND |                |
| 3 - Y   | (1Vpp / 75Ω)   |
| 4 - C   | (0.3Vpp / 75Ω) |

#### Audio\_in:

|                 |                   |
|-----------------|-------------------|
| - Cinch Audio L | (0.5Vrms >= 10kΩ) |
| - Cinch Audio R | (0.5Vrms >= 10kΩ) |

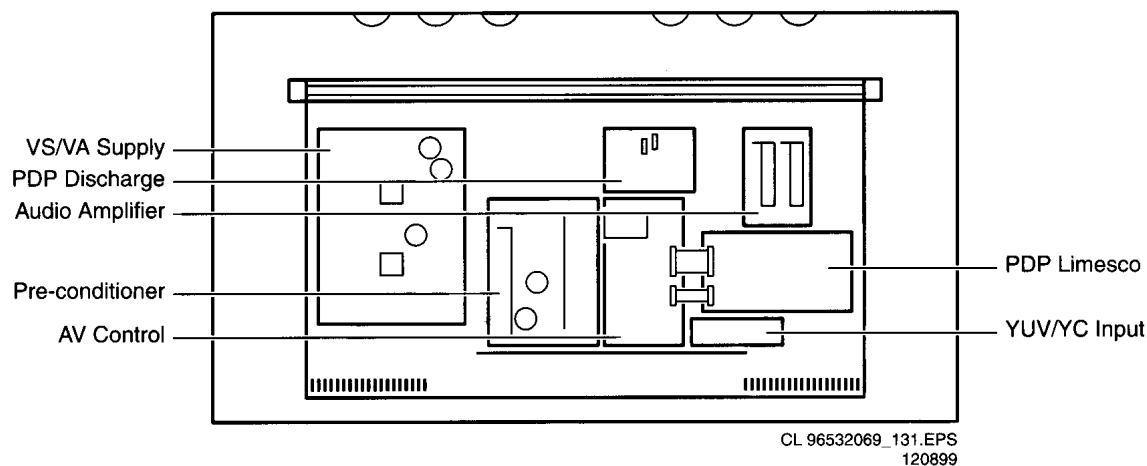
#### CVBS

|              |              |
|--------------|--------------|
| - BNC - CVBS | (1Vpp / 75Ω) |
|--------------|--------------|

#### YUV

|       |              |
|-------|--------------|
| - Y   | (1Vpp / 75Ω) |
| 3 - U | (1Vpp / 75Ω) |
| 4 - V | (1Vpp / 75Ω) |

## 1.3 Chassis overview



CL 96532069\_131.EPS  
120899

Figure 1-2

## 2. Safety instructions, warnings and notes

### 2.1 Safety instructions

It is not allowed to operate the FTV-set without glass plate. One function of this glass plate is to absorb Infrared Radiation. Without this glass plate the level of Infrared Radiation produced by the plasma display could damage your eyes.

1. Safety regulations require that during a repair:
  - the set should be connected to the mains via an isolating transformer ( in this particular case a transformer of  $\geq 800$  VA);
  - safety components, indicated by the symbol , should be replaced by components identical to the original ones;
2. Safety regulations require that after a repair the set must be returned in its original condition. In particular attention should be paid to the following points.
  - Note: The wire trees should be routed correctly and fixed with the mounted cable clamps.
  - The insulation of the mains lead should be checked for external damage.
  - The electrical DC resistance between the mains plug and the secondary side should be checked (only for sets that have a mains isolated power supply). This check can be done as follows:
    - unplug the mains cord and connect a wire between the two pins of the mains plug;
    - set the mains switch to the on position (keep the mains cord unplugged!);
    - measure the resistance value between the pins of the mains plug and the metal shielding of the tuner or the aerial connection on the set. The reading should be between  $4.5\text{ M}\Omega$  and  $12\text{ M}\Omega$ ;
    - switch off the TV and remove the wire between the two pins of the mains plug.
  - The cabinet should be checked for defects to avoid touching of any inner parts by the customer.

4. If DST reacts with 'error 2', there is no communication between set and DST. Note that IR-transmitter LED is positioned at right side of IR-receiver eye of the E-box. Take into account that receiver-LED on DST is positioned not in the middle but at the left side. Point corresponding LED's to each other. In case the amount of Infrared produced by the screen pollutes the communication, the set can be set in Standby-mode. Then still the error-messages can be retrieved.

### 2.2 Warnings

#### 1. ESD

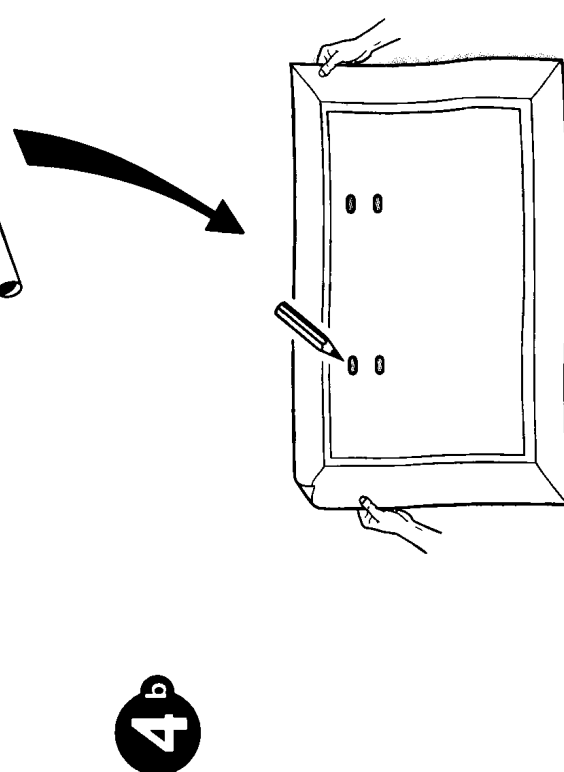
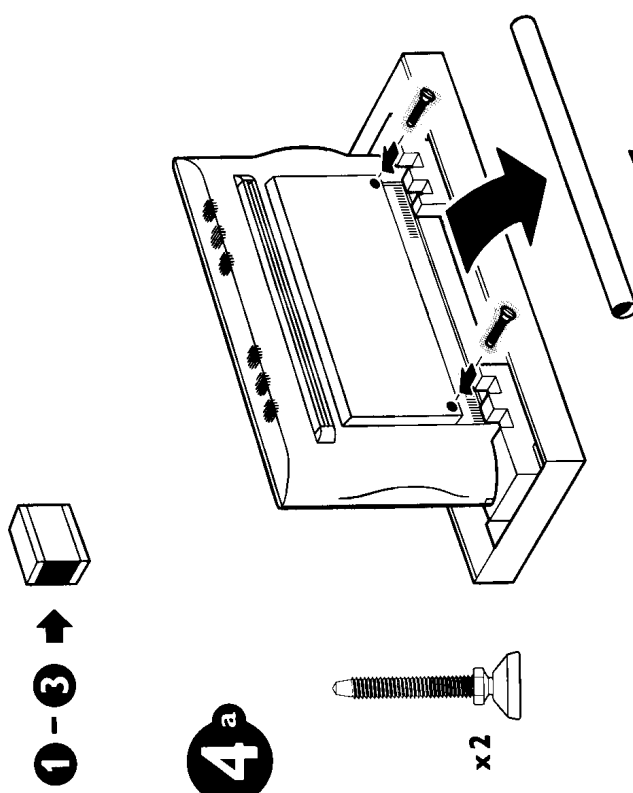
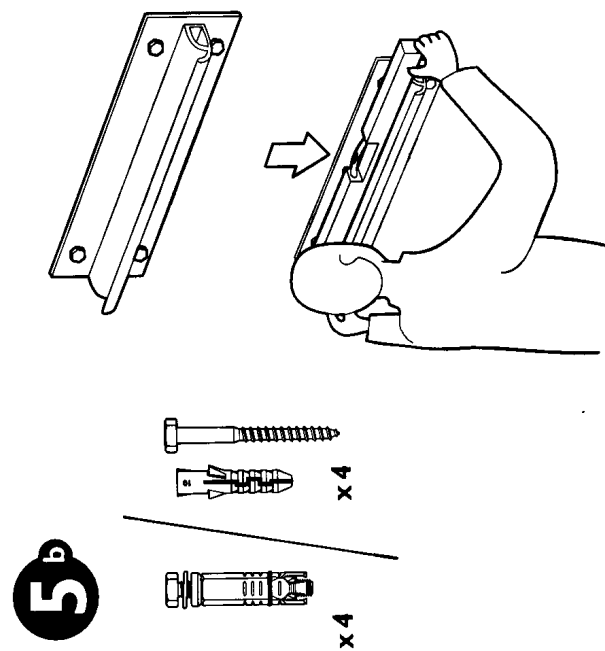
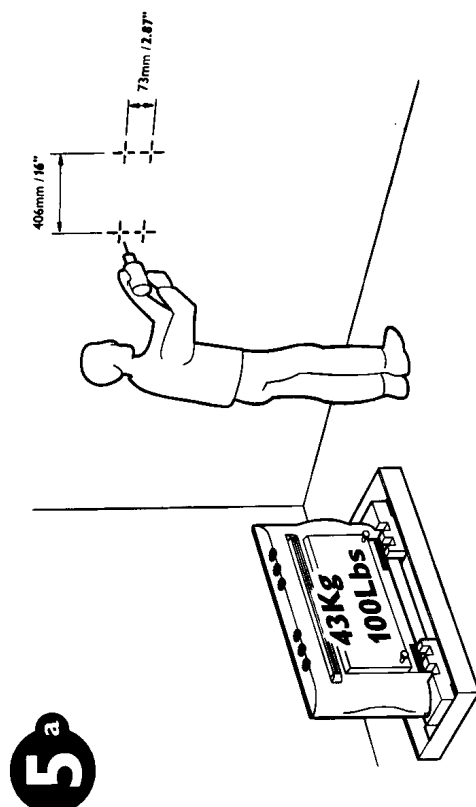
All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD ). Careless handling during repair can reduce life drastically. When repairing, make sure that you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this same potential.

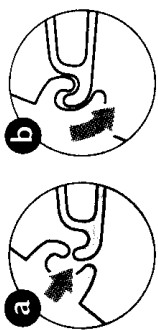
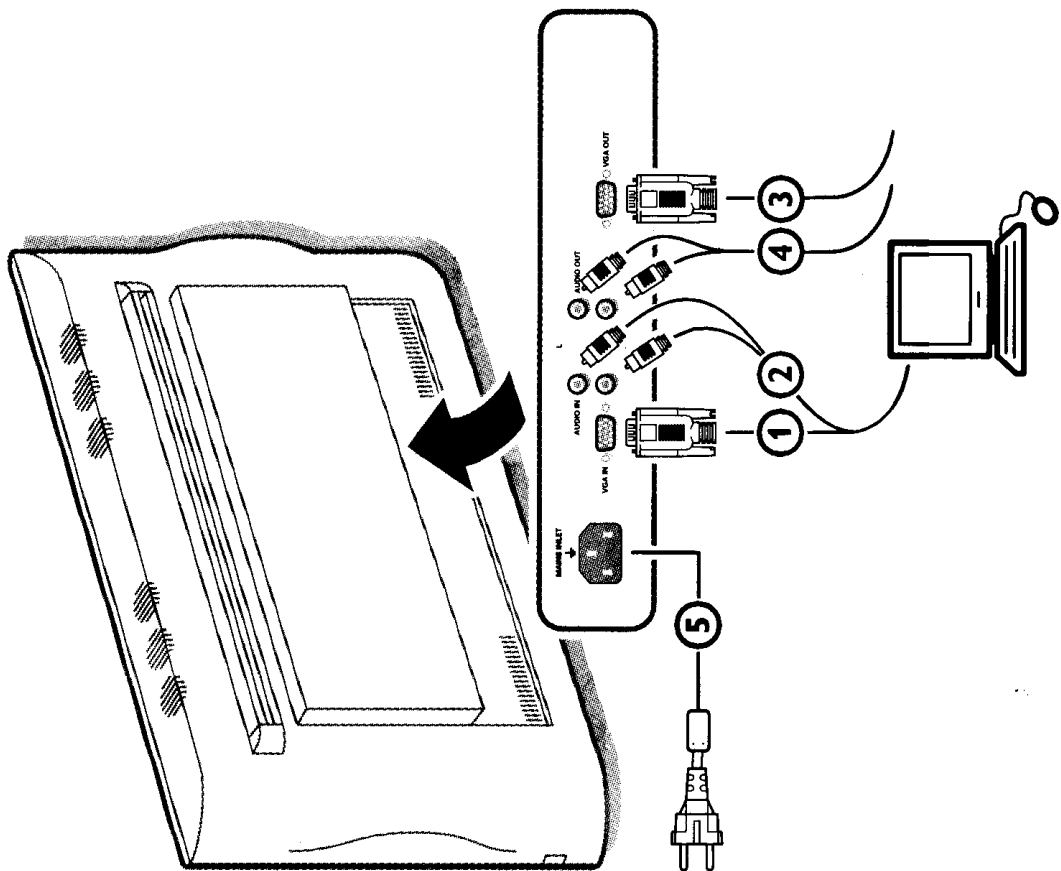
1. Available ESD protection equipment:
  - complete kit ESD3 (combining all 6 prior products - small table mat) 4822 310 10671
  - wristband tester 4822 344 13999
2. Never replace modules or other components while the unit is switched on.
3. When making settings, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

### 2.3 Notes

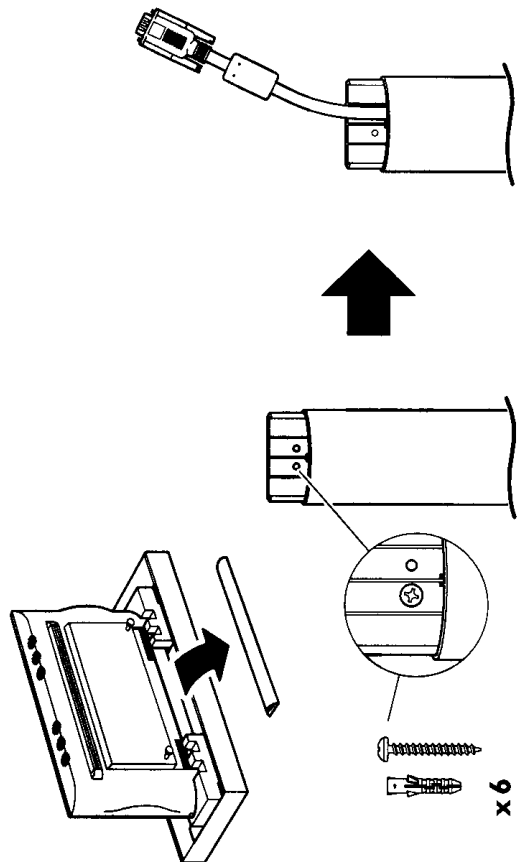
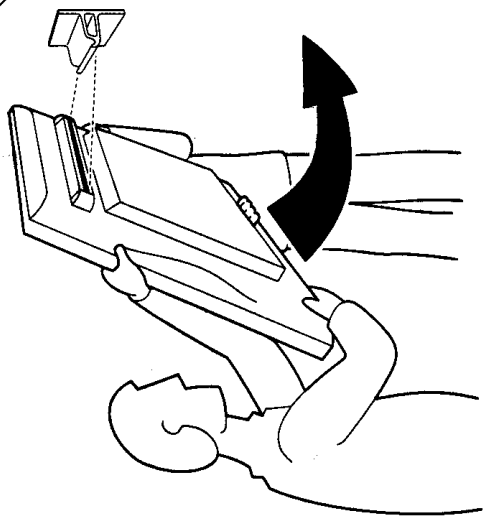
1. A glass plate is positioned before the plasma display. This glass plate can be cleaned with a slightly humid cloth. If due to circumstances there is some dirt between the glass plate and the plasma display panel it is recommended to do some maintenance by a qualified service employee only.
2. Never disconnect the power display cable when the set is operating
3. With DST no failures (error-codes) can be read, when the set is in Service-mode.

### 3. Directions for use





6



## Unpacking and wall mounting instructions

For the unpacking instructions follow the illustrated steps printed on the packaging (outside and inside).

For the wall mounting instructions follow the illustrated steps ④ to ⑥ printed on the first pages of this instruction booklet.

Make sure that the wall mount is being fixed securely enough so that it meets safety standards. The weight of the monitor (excl. packaging) is about 43 kg.

## Connect your computer

- 1 Connect one end of the VGA cable ① supplied to the video card of the computer and the other end to the **VGA IN** connector at the rear side of the monitor. Fix the connectors firmly with the screws on the plug.

- 2 In case of a Multimedia computer, connect the audio cable ② to the audio outputs of your Multimedia computer and to the **AUDIO IN R** (right) and **L** (left) inputs of the monitor.

## Daisy chaining

The Active Loop Through facility makes it possible to make a daisy chain with a second VGA monitor.

- 3 Connect one end of another VGA cable ③ to the **VGA OUT** connector at the rear side of the monitor and the other end to the **VGA IN** connector of a second VGA monitor.

- 4 In case of a Multimedia computer, also connect the audio cables ④ to the **AUDIO L** and **R** outputs of the monitor and to the **AUDIO IN L** and **R** inputs of the second VGA monitor.

*Note: only use the VGA cables supplied or use cables that are specially delivered with the monitor.*

## Connect your Apple Macintosh\* computer

*Attention: Macintosh computers with separate H and V synchronisation signals can be used together with the supplied adaptor. Macintosh computers with Composite Sync and Sync on Green signals may need a special (not supplied) adaptor or cable. Contact your dealer.*

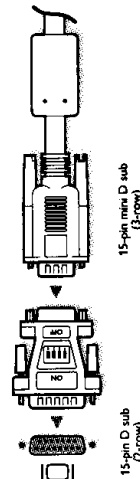
Connect the supplied switchable adaptor for Apple video connectors to one end of a VGA cable.

Put the DIP switches on the adaptor in the following positions :

- |     |     |    |    |
|-----|-----|----|----|
| 1   | 2   | 3  | 4  |
| off | off | on | on |

Connect the end of the VGA cable with the adaptor to the video card of the computer and the other end to the **VGA IN** connector on the back of the monitor.

Screw the connectors down firmly.



## Computer Display modes

|        |          |            |       |
|--------|----------|------------|-------|
| VGA    | 640x480  | 31.468 kHz | 60 Hz |
| VGA    | 640x400  | 31.468 kHz | 70 Hz |
| VGA    | 640x350  | 31.468 kHz | 70 Hz |
| MAC II | 640x480  | 35.000 kHz | 67 Hz |
| SVGA   | 800x600  | 35.156 kHz | 56 Hz |
| XGA    | 1024x768 | 45.000 kHz | 56 Hz |

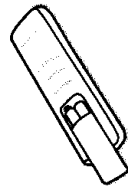
When a VGA computer is connected, the selection is made automatically.

A message is displayed when the monitor does not support one of the above mentioned VGA modes.

Switch your computer to a correct display mode.

## Operation

- 1 Insert the mains plug ⑤ (see previous page for the illustration) supplied into the mains inlet at the back of the monitor and in the wall socket. Please, only use the supplied rim-earthed mains cord with its built-in filter.



- 2 Remote control: remove the cover of the battery compartment. Insert the 2 batteries supplied (Type LR6AA-1.5V).

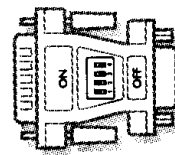
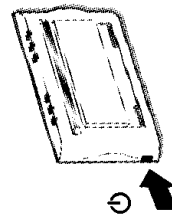
*The batteries supplied do not contain the heavy metals mercury and cadmium. Nevertheless in many countries batteries may not be disposed of with your household waste. Please check on how to dispose of batteries according to local regulations.*

- 3 Switch the monitor on : Press the power button ⑥ at the right side of the monitor.

A green indicator lights up and the screen comes on.

When the monitor does not receive a certain VGA signal the screen remains black.

Make sure that your PC is switched on and is in the correct display mode.



- 3 Press the ◀ and ▶ keys to alter the selected adjustment.
- 4 Press the MENU key again to switch off the VGA menu.

## 4. Mechanical instructions

### 4.1 Introduction:

There are pre-defined service positions for the following panels:

1. VS/VA SUPPLY panel.
2. PDP DISCHARGE panel.
3. AUDIO AMPLIFIER panel.
4. PRE-CONDITIONER panel.
5. AV CONTROL panel.
6. PDP LIMESCO panel.
7. YUV/YC INPUT panel.
8. LED DISPLAY panel.
9. SWITCH DISPLAY panel.

Before these panels can be accessed, the rear cover has to be removed:

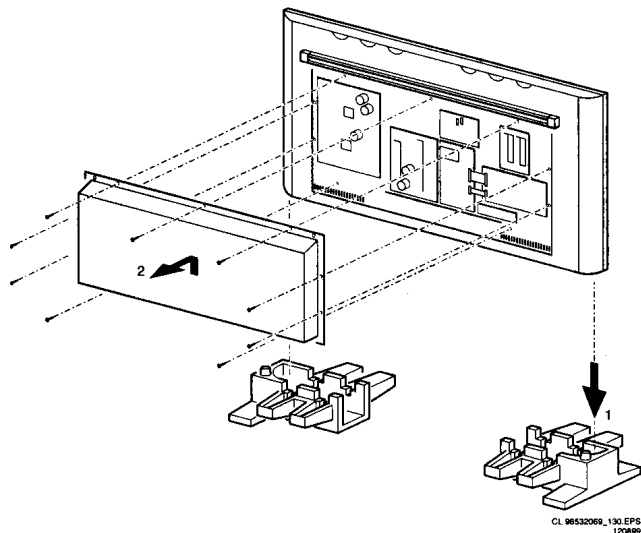


Figure 4-1

1. Place the Display Box in the service stand via 2 reinforced cushions (order code: 3122 126 30181).
2. Remove the 9 fixation screws of the rear cover.
3. Remove the rear cover (during removal push it slightly upwards).

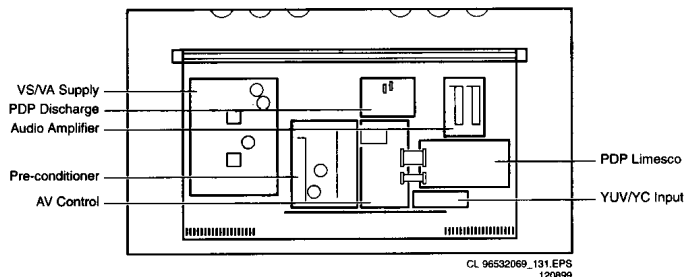


Figure 4-2

1. All panels are now accessible.

#### 4.1.1 VS/VA SUPPLY panel.

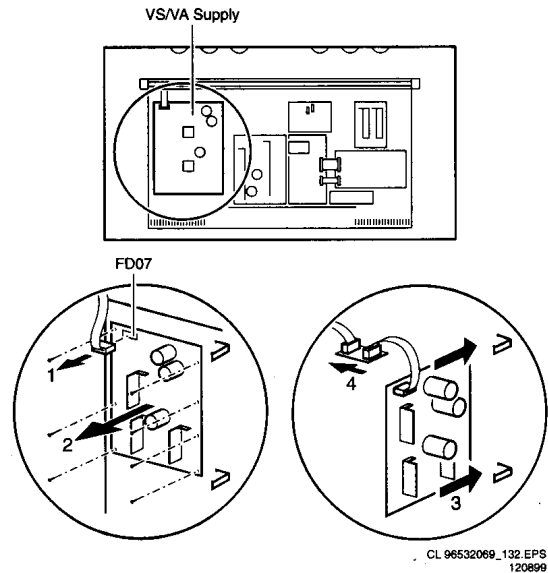


Figure 4-3

1. Disconnect Fan Supply cable from connector FD07 in the upper left corner [1].
2. Remove the 7 fixation screws of the panel [2].
3. Place panel on the 2 hinges, which are located near the right corners of the panel [3].
4. Use the mechanical service part (extension cable assembly, 12NC: 3122 785 90006) to extend the Fan Supply cable [4].
5. The copper side is now accessible from the left.

#### 4.1.2 PDP DISCHARGE panel.

As in the FTV 1.5, this panel must be exchanged completely if defective.

#### 4.1.3 AUDIO AMPLIFIER panel.

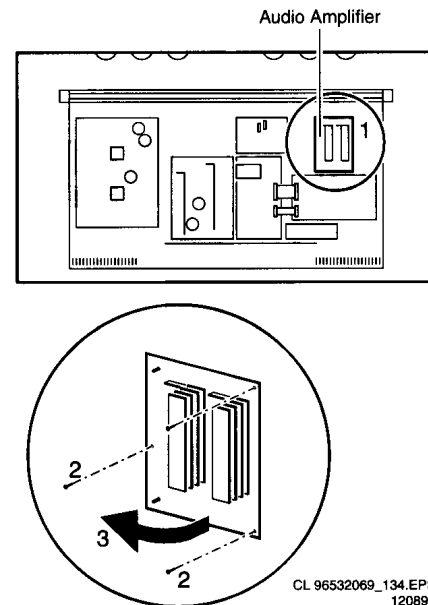


Figure 4-4

1. Some testpoints are accessible at the B-side [1].
2. If this is not sufficient, remove the 3 fixation screws of the panel [2].
3. Panel now can be hinged on the left side to access the A-side (soldering side) [3].

#### 4.1.4 PRECONDITIONER panel.

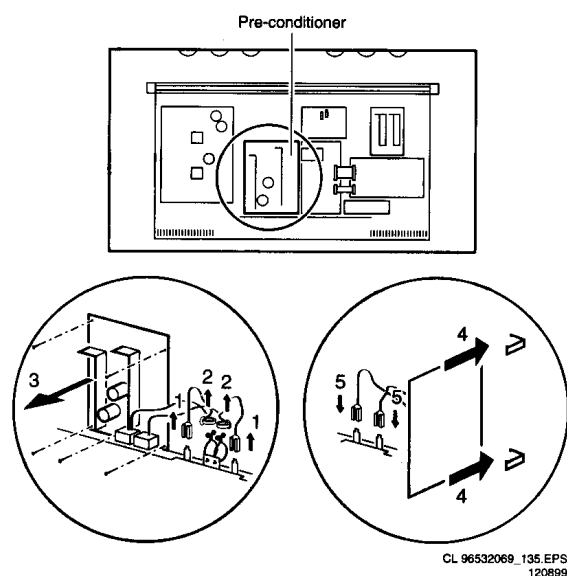


Figure 4-5

1. Disconnect the 2 grounding wires from the shielding plate by pressing the small lever on the connector while pulling [1].
2. Remove the 2 ferrite ring cores from their fixations [2].
3. Remove the 5 fixation screws of the panel [3].
4. Place panel on the 2 hinges, which are located, near the left corners of the panel [4].
5. Reconnect grounding wires to the extra connectors on the shielding plate at the left side [5].
6. The copperside becomes accessible now from the right side.

#### 4.1.5 AUDIO VIDEO CONTROL panel.

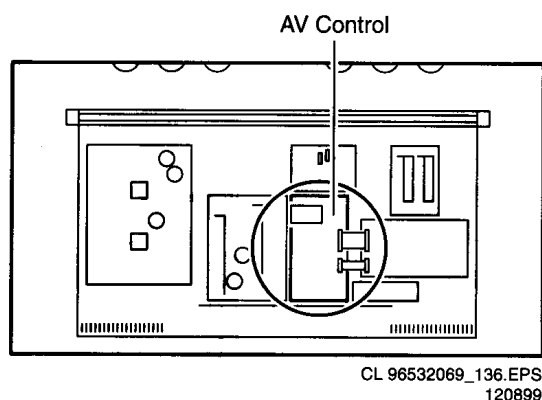


Figure 4-6

This panel has no service position for accessing the A-side, however all service test points are accessible at the B-side (see Service Manual).

In case some components must be (de)soldered, all fixation screws (6 for the panel, 5 at the metal connector plate) and all cables must be removed to access the A-side.

#### 4.1.6 PDP LIMESCO panel.

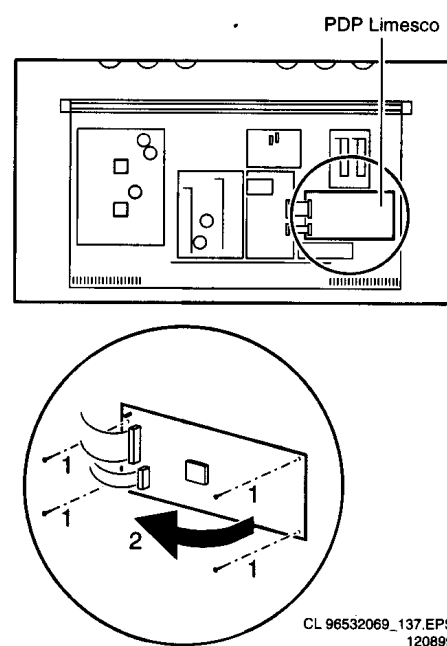


Figure 4-7

All SMC's are located on the B-side, so all testpoints are accessible. In case some components must be (de)soldered, the hinge construction can be used to access the A-side.

1. Remove the 4 fixation screws of the panel [1].
2. Panel can now be hinged to access soldering side [2].

#### 4.1.7 YUV/YC INPUT panel.

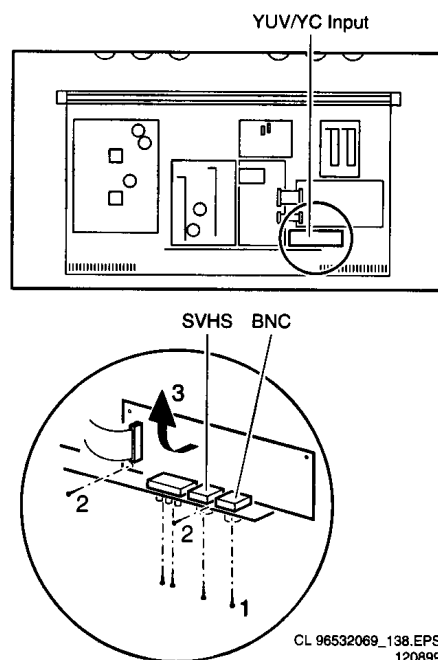


Figure 4-8

This panel has no pre-defined service position. For access of the A-side, the panel has to be removed:

1. Remove the 4 screws at the metal connector plate [1].
2. Remove the 2 fixation screws of the panel [2].
3. Panel can be removed now to access the A-side [3].



## 4.1.8 LED DISPLAY panel.

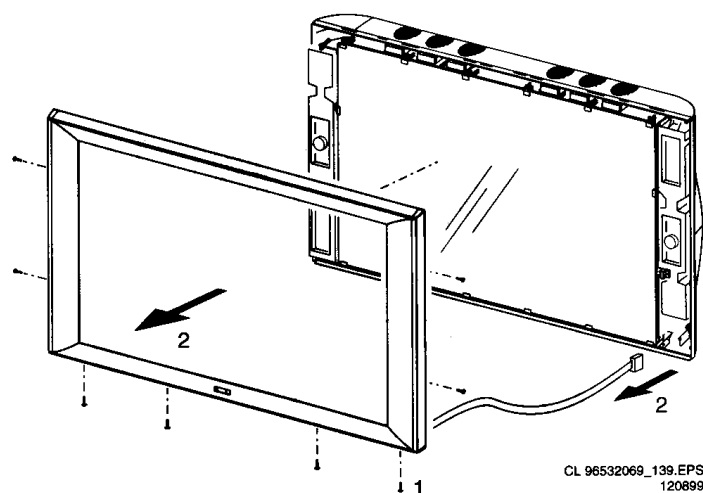


Figure 4-9

1. Remove 2 x 2 screws at the sides and 4 screws at the bottom of the front cover [1].
2. Remove the front cover (it hinges at the top). During removal unplug the cable of the LED DISPLAY panel at the SWITCH DISPLAY panel (connector SD11) [2].

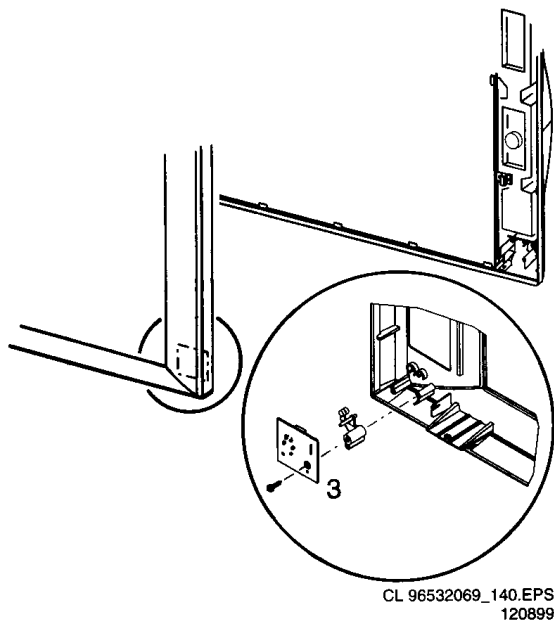


Figure 4-10

1. The LED DISPLAY panel can be removed now by unscrewing 1 fixation screw [3].

## 4.1.9 SWITCH DISPLAY panel.

1. Remove front cover (for a description see Chapter 1.1.8 'LED DISPLAY panel').

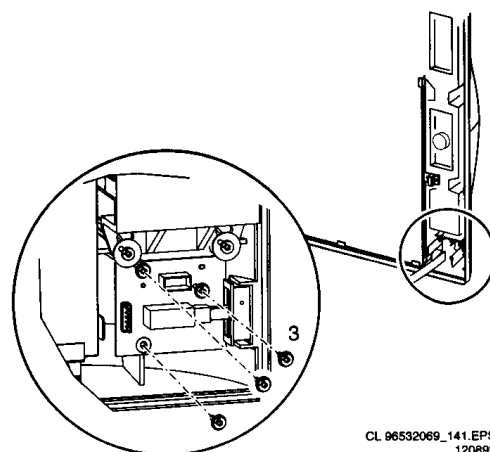


Figure 4-11

1. The SWITCH DISPLAY panel can be removed now by unscrewing 3 fixation screws [3].

## 4.2 Exchanging parts

Some parts of the FTV1.9 Display Box must be exchanged if defective:

1. GLASS PLATE.
2. LOUDSPEAKER.
3. PLASMA DISPLAY PANEL [PDP].

## 4.2.1 Exchanging of the GLASS PLATE.

1. First unplug (remove Mains and VGA cable) the Display Box .
2. Remove front cover (for a description see Chapter 1.1.8 'LED DISPLAY panel').

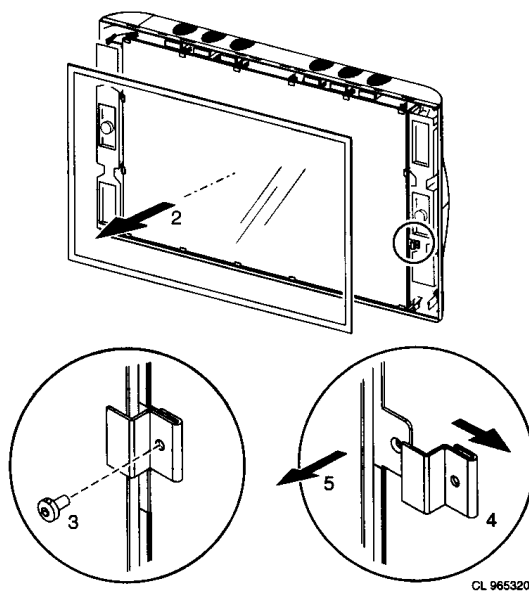


Figure 4-12

1. Now the GLASS PLATE can be removed by unscrewing all screws [3] and removing all glass clips [4].

#### 4.2.2 Exchanging of a LOUDSPEAKER.

1. First unplug (remove Mains and VGA cable) the Display Box.
2. Remove front cover (for a description see Chapter 1.1.8 'LED DISPLAY panel').

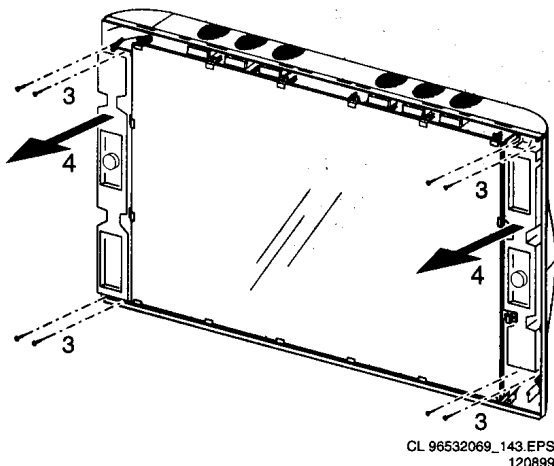


Figure 4-13

1. The LOUDSPEAKER can now be removed by disconnecting its cable and removing the 4 fixation screws at the top and bottom of the speakerbox. Be sure to remove the correct screws, otherwise the speaker system will be damaged (it is an airtight system).

#### 4.2.3 Exchanging of the PDP.

1. First unplug (remove Mains and VGA cable) the Display Box.
2. Place the rear side of the Display Box on a foam cushion (be sure the metal rear cover is mounted in order to prevent damaging of the electronic panels).
3. Remove front cover (for a description see Chapter 1.1.8 LED DISPLAY panel).
4. Now the GLASS PLATE can be removed by unscrewing all screws and removing all glass clips (for a description see Chapter 1.2.1. 'Exchanging of the GLASS PLATE').

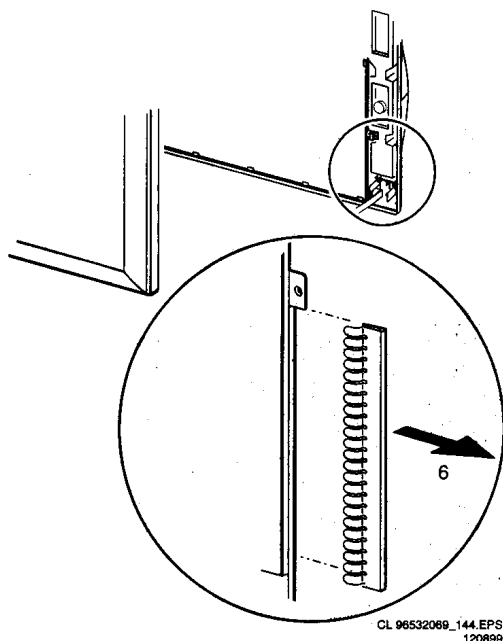


Figure 4-14

1. Remove all copper EMC SHIELDING springs mounted around the display [6].
2. Now flip the complete Display Box and place it with the Plasma Display down on a foam cushion. Be 100 % sure a large foam cushion is placed underneath the PDP, as it will drop about 10 mm after removing its fixation screws !!
3. Disassemble metal rear cover (for a description see Chapter 1.1 'Introduction').

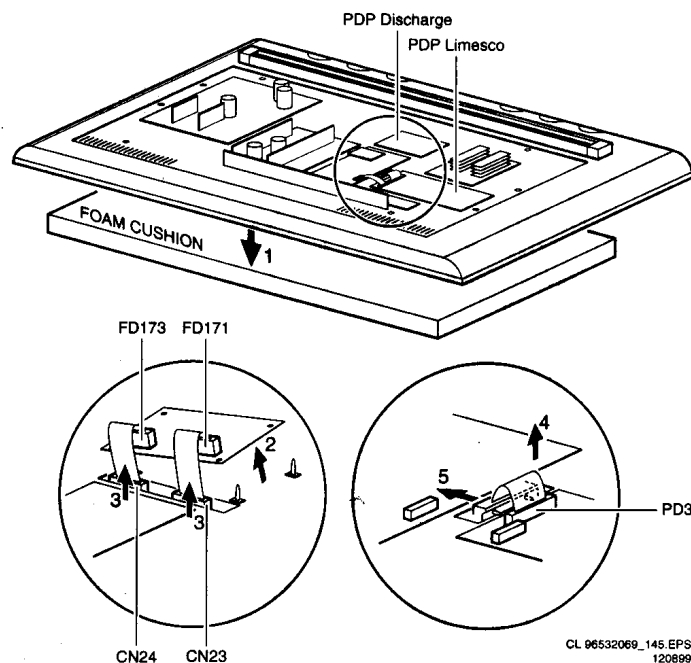


Figure 4-15

1. Disconnect the following cables:
  - Cables coming from connectors CN23 and CN24 of the PDP DISPLAY panel [3] (for easiest access lift the PDP DISCHARGE panel from its fixations [2]).
  - Flat cable on connector PD3 of the PDP LIMESCO panel [4]. Also remove the ferrite 'flat cable shield' completely by unlocking its fixations [5].

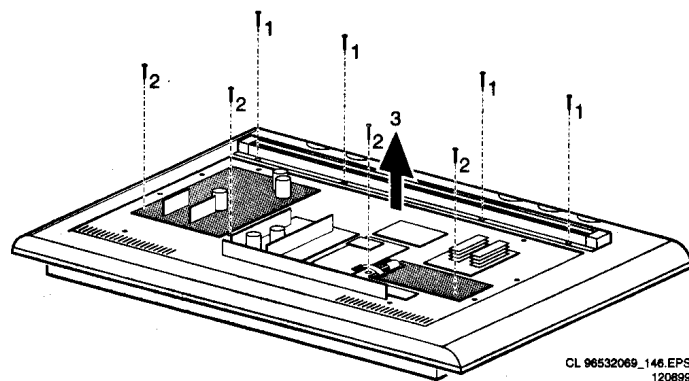


Figure 4-16

1. Now remove the 8 large screws which hold the PDP:
  - 4 screws are located at the top: they also hold the aluminium wall mount [1].
  - The other 4 are located at the bottom: the 2 outer screws are hidden behind panels. Therefore unscrew the VS/VA SUPPLY and the PDP-LIMESCO panel (grey panels) [2].
2. Lift encasing from PDP and replace PDP [3].

## 5. Service modes, fault finding and repair tips

For the FTV1.9, the Monitor can be used in two applications.

- A stand-alone configuration, a separate device which can also be sold and serviced separately.
- TV configuration, where the monitor is combined with the E-box.

The monitor, as a stand-alone unit, can be serviced by using a test pattern coming from the PDP-LIMESCO panel on the rear of the monitor itself or via a PC/laptop by using ComPair via the ComPair connector.

In this chapter the following paragraphs are included:

1. Test points
2. Dealer Service Tool (DST)
3. Service Modes
4. Error code buffer and error codes
5. The "blinking LED" procedure
6. Fault-finding tips
7. ComPair

### 5.1 Test points

The FTV1.9 chassis is equipped with test points in the service printing. These test points are referring to the functional blocks:

- A1-A2-A3, etc.: Test points for the Audio amplifier (A)
- C1-C2-C3, etc.: Test points for the AV control circuit (AVC)
- FD1-FD2-FD3, etc.: Test points for the VsVa supply (FD1-FD2) and the PDP discharge panel
- L1-L2-L3, etc.: Test points for the PDP LIMESCO (PD1-PD9)
- PR1-PR2-PR3, etc.: Test points for the Pre-conditioner (PR1-PR3)
- Y1-Y2-Y3, etc.: Test points for the Y/C YUV monitor panel (UY1-YC4)

Measurements are performed under the following conditions:  
Video: colour bar signal; Audio: 3 kHz left, 1 kHz right

### 5.2 Dealer Service Tool (DST)

For easy installation and diagnosis the dealer service tool (DST) RC7150 can be used. When there is no picture (to access the error code buffer via the OSD), DST can enable the functionality of displaying the contents of the entire error code buffer via the blinking LED procedure, see also paragraph 5.5. The ordering number of the DST (RC7150) is 4822 218 21232.

#### 5.2.1 Installation features for the dealer

The dealer can use the RC7150 for programming the TV-set with pre-sets. 10 Different program tables can be programmed into the DST via a GFL TV-set (downloading from the GFL to the DST; see GFL service manuals) or by the DST-I (DST interface; ordering code 4822 218 21277). For explanation of the installation features of the DST, the directions for use of the DST are recommended (For the FTV1.9 chassis, download code 4 should be used).

#### 5.2.2 Diagnose features for service

FTV1.9 sets can be put in two service modes via the RC7150. These are the Service Default Mode (SDM) and the Service Alignment Mode (SAM).

### 5.3 Service Modes

Below described sequence is only valid for the "Monitor Only Configuration". When a Receiver box is connected to the

Display Box (TV Configuration), please check chapter 5 in the Training Manual of the Receiver Box.

#### 5.3.1 Service Default Mode (SDM)

The purpose of the SDM is:

- Provide a situation with predefined settings to get the same measurements as in this manual.
- Access to the error buffer via the blinking LED procedure.
- Inspection of the error buffer.
- Possibility to overrule software protections via the service pins (caution: override of software protections! ).

Entering the SDM:

- By transmitting the "DEFAULT" command with the RC7150 Dealer Service Tool (this works both while the set is in normal operation mode or in the SAM).
- By pressing on a standard RC the following sequence 0, 6, 2, 5, 9, 6 followed by the "MENU" key.
- By short-circuiting the SDM pin on the  $\mu$ P panel.

In the SDM the following information is displayed on the screen:

```
-----
F19DBC X.Y_12345 (1) LLLL (2) SDM (3)
ERR 02 01 14 ## ## ## ## ## ## ##
-----
```

Explanation notes/references:

- (1) Software identification of the main micro controller (F19DBC X.Y\_12345)
  - F19D is the chassis name for FTV1.9 display
  - B is the region identification
  - C is the language cluster
  - X = (main version number)
  - Y = (subversion number)
  - ##### are 5 digits of the serial number
- (2) "LLLL" Normal display operation in hours
- (3) "SDM" To indicate that the TV set is in the service default mode
- (4) "ERR 02 01 14 ## ## ## ## ## ## ##" This line shows the contents of the error buffer (max. 10 errors). The last error that occurred is displayed at the most left position. When less than 10 errors have occurred the rest of the line is empty. When the errorlist is empty "No errors" is displayed. No duplicate errors.

Exit the SDM:

Push the "STANDBY" button on the Remote Control.

The SDM sets the following pre-defined conditions:

- Volume level is set to 25% (of the maximum volume level).
- Linear Audio and Video settings are set to 50%.
- Colour temperature is set to normal.

The following functions are "overruled" in SDM since they interfere with diagnosing/repairing a set

- Video blanking.
- Slow demute.
- Anti-ageing.
- Automatic switch to "Standby" when H- and/or V-sync signals are lost.

All other controls operate normally.

#### 5.3.2 Service Alignment Mode (SAM)

The purpose of the SAM is to align and or adjust settings.

For recognition of the SAM, "SAM" is displayed at the top of the right side of the screen

Entering the SAM-menu:

- By pressing the "ALIGN" button on the RC7150 Dealer Service
- Standard RC sequence 062596 followed by the "OSD" button.

- By short-circuiting the SAM pin on the  $\mu$ P panel (Caution: override of software protections !!)

In the SAM the following information is displayed on the screen:

```
-----
F19DBC X.Y_12345      SAM
ERROR## ## ## ## ##
WHITE POINT
PDP TEST PATTERN    [ON/OFF]
STORE
RESET ERROR BUFFER
-----
```

### *The menus and submenus*

#### *White point*

The white point sub menu contains the following items:

- RED
- GREEN
- BLUE
- COLOUR TEMPERATURE

#### *PDP Test pattern*

By selecting this item, all OSD disappears from the screen. The screen now changes from light grey to dark grey in a slow regular rhythm. One can so easily check if all pixels of the monitor are correct.

#### *Store*

The change values are stored in the NVM.

#### *Reset Error Buffer*

This option will reset the error buffer.

Exit the SAM:

Push the "STANDBY" button on the Remote Control.

SAM menu control:

Menu items can be selected with the "UP" or "DOWN" key.

Entry into the selected items (sub menus) is done by the "LEFT" or "RIGHT" key. The selected item will be highlighted.

With the same "LEFT/RIGHT" keys, it is possible to increase/decrease the value of the selected item.

Return to the former screen by pushing the "MENU" button.

The item values are stored in NVM if the sub menu is left.

### 5.3.3 Customer Service Mode (CSM) Display

FTV1.9 monitors are equipped with the "Customer Service Mode" (CSM). CSM is a special service mode that can be activated and de-activated by the customer, upon request of the service technician/dealer during a telephone conversation in order to identify the status of the set. This CSM is a 'read only' mode, therefore modifications in this mode are not possible.

Entering the Customer Service Mode.

- By pressing on RC03333/01 the following sequence : Picture, sound, cursor up, cursor down, cursor left, cursor right followed by the "MUTE" button.

Exit the Customer Service Mode.

- pressing the "MENU" or any key on the Remote Control handset (except "P+" or "P-")
- switching off the TV set with the mains switch.

All settings that were changed at activation of CSM are set back to the initial values

#### *The Customer Service Mode information screen*

The following information is displayed on screen:

```
-----
CUSTOMER SERVICE MENU
• Software version F19DBC X.Y_####
• Code 1: contains the last 5 error codes
```

- Code 2: contains the first 5 error codes with the last received error at the most left-hand side.
- Service unfriendly modes

## 5.4 Error code buffer and error-codes

The error code buffer contains all errors detected since the last time the buffer was erased. The buffer is written from left to right.

In case of non-intermittent faults, clear the error buffer before starting the repair to prevent that "old" error codes are present. If possible check the entire content of the error buffers. In some situations an error code is only the RESULT of another error code (and not the actual cause).

Note: a fault in the protection detection circuitry can also lead to a protection

The error code buffer will be cleared in the following cases:

- exiting SDM or SAM with the "Standby" command on the remote control
- transmitting the commands "DIAGNOSE-9-9-OK" with the DST.

Leaving SDM or SAM with the mains switch does not reset the error buffer.

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: 5 6 0 0 0 : Error code 6 was first detected and error code 5 is the last detected (newest) error

| Error -nr | Type of Error        | Possible defect/cause                                                                                                                                 |
|-----------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1         | +5V                  | +5V pin at $\mu$ P is low.                                                                                                                            |
| 2         | 8V6                  | 8V6 pin at $\mu$ P is low.                                                                                                                            |
| 3         | Fan_prot             | Gives an indication that 1 or more FAN(s) does not function, or that 1 or more fan control circuits is defect                                         |
| 4         | Over-temp_prot       | Temperature at the heatsink of the VsVa supply or the Preconditioner is too high                                                                      |
| 5         | DC_prot              | Audio-amplifier IC, its supply or the Audio amplifier is defect                                                                                       |
| 6         | Over_voltage_prot    | Vs or Va supply voltage is too high                                                                                                                   |
| 7         | Vrr                  | Powersupply of the display is not correct. Ignorance of the signal during startup by the software.                                                    |
| 8         | Power_OKE            | Power supply or modules that uses this voltage. If this signal is NOT activated means that all supply voltages are available (exception Audio supply) |
| 9         | Blocked NVM IIC bus  | NVM IIC bus is not correct                                                                                                                            |
| 10        | Blocked slow IIC bus | Slow IIC bus is not correct                                                                                                                           |
| 11        | TDA9860              | No acknowledge of Audio controller                                                                                                                    |
| 12        | TDA4885              | No acknowledge of Video controller                                                                                                                    |
| 13        | MC141585             | No acknowledge of OSD Generator                                                                                                                       |
| 14        | uPD93687 GD-LBD      | No acknowledge of Limesco                                                                                                                             |

| Error-nr | Type of Error | Possible defect/cause          |
|----------|---------------|--------------------------------|
| 15       | PCF8574 AT    | No acknowledge of I/O Expander |
| 16       | NVM           | No acknowledge of NVM          |
| 17       | Communication | Fault in the communication     |

## 5.5 The "blinking LED" procedure

The contents of the error buffer can also be made visible through the "blinking LED" procedure. This is especially useful when there is no picture. There are two methods:

- When the SDM is entered, the LED will blink the contents of the error-buffer. Error-codes = 10 are shown as followed. A long blink of 1 second which is an indication of the decimal digit, followed by a pause, followed by n short blinks. When all the error-codes are displayed, the sequence is finished with a led display of about 3 seconds. The sequence starts again.
- With the DST all error codes in the error buffer can be made visible. Transmit the command: "DIAGNOSE x OK" where x is the position in the error buffer to be made visible x ranges from 1, (the last (actual) error) to 10 (the first error). The LED will operate in the same way as in the previous point, but now for the error code on position x.

Example:

Error code position 1 2 3 4 5

Error buffer: 12 9 5 0 0

- after entering SDM: 1 long blink of 1 sec. + 2 short blinks - pause - 9 short blinks - pause - 5 short blinks - pause - long blink of 3 sec. --etc.
- after transmitting "DIAGNOSE- 1- OK" with the DST: 1 long blink 2 short blinks - pause - 1 long blink + 2 short blinks - etc.
- after transmitting "DIAGNOSE- 2- OK" with the DST: blink (9x) - pause - blink (9x) - etc.
- after transmitting "DIAGNOSE- 3- OK" with the DST: blink (5x) - pause - blink (5x) - etc.
- after transmitting "DIAGNOSE- 4- OK" with the DST: nothing happens

## 5.6 Protection structure

### 5.6.1 General

The protection structure of the FTV1.9 D-box is shown at figure 5.5.

The FTV1.9 monitor has one microprocessor, which is situated on the AV-control panel and is supplied by the 5V standby supply. The microprocessor is even active when the set is switched to standby. The microprocessor controls the "supply-on" line which switches first relay 5680 and then relay 5690. In de standby-mode or the protection-mode the "supply-on" line is "low" and both relays are switched off. The preconditioner is disconnected from the mains.

The protections of the FTV1.9 monitor can be divided into 5 subgroups:

- Fan\_prot
- Over\_temp\_prot
- DC\_prot
- Over\_voltage\_prot
- Vrr

For the Fan-, Over\_temp, DC and the Over\_voltage protections the signals for the  $\mu P$  are latching, using the 5Vstby-switched for powering the circuits permanently. The  $\mu P$  has sufficient time for diagnosis and for storing the error-codes in the NVM. Vrr, which is an indication of the powersupply of the display is correct, is directly fed to the  $\mu P$ .

### 5.6.2 Signal line "PROTECTION STATUS" and errorcodes

When one of the protection mechanism is triggered, the 5Vstby-switched is connected via a saturated transistor and a pre-defined resistor to signal line "protection status", which is connected to the  $\mu P$ .

Signal line "protection status" is connected to ground via resistor R3378 and 3379. For each separate fault condition mechanism we get a pre-defined voltage at the  $\mu P$ .

This results in the following table

| Protection-mode | Series resistor | Voltage at "protection-status" line | Error-code |
|-----------------|-----------------|-------------------------------------|------------|
| None            | -----           | < 0.3V                              | none       |
| Fan_prot        | 1K $\Omega$     | 0.30V < Vprot < 1.90V               | 3          |
| Vs or Va_prot   | 470 $\Omega$    | 1.90V < Vprot < 2.80V               | 4          |
| Temp_prot       | 220 $\Omega$    | 2.80V < Vprot < 3.75V               | 5          |
| DC-prot         | 68 $\Omega$     | 3.75V < Vprot < 4.7V                | 6          |
| Vrr             | -----           | -----                               | 7          |

Protection signal Vrr coming from the PDP, to indicate that the powersupply is ok or not ok ( "1" or "0" ) is directly connected to the  $\mu P$ . Error-code 7 is stored in the NVM and the set is switched to standby.

When one of the protections is activated, the power supplies of the Vs and Va are shut down and the set is switched to standby.

### 5.6.3 Fan protection

When this protection is activated, the Va- and Vs power supply are shut down. The set is switched to the standby mode and error-code 3 is stored in the NVM.

The fan voltage is powered by 17V, but clamped to 12V to prevent damage. In order to be able to verify whether the fans are running, a fault detection circuit is implemented for each of the 6 fans. A running fan gives pulses in the same speed as the rotation of the blades. The circuit uses these pulses to trigger the discharge of an elcap. The elcap is continuously charged through a resistor.

Example : Capacitor C2319 is charged through R3356 and at every pulse discharged by T7322. When fan 6 is blocked, C2314 is charged via D6326 en triggers thyristor 7315, because C2319 is no longer discharged via T7322. The current now flows from the 5Vstby-switched via resistor 3383 and 3325 driving transistor T7321 into saturation. The voltage dividing of R3323 and resistor R3378 and 3379 now determine the voltage "protection status". (neglect the Vce of 0.2V of T7321.).

#### Reset of the VsVa-supply.

Transistor T7339 is shorted now by the presence of the "protection status" signal. T7339 connects resistor R3376 and R3389 to ground, switching on T7338. Thyristor 7333 is now triggered, shorting signal PROTS to ground. To follow the signal flow, go to the right upper corner of schematic FD1. Connecting PROTS to ground, will start a current flow through opto-coupler diode 7103 and the opto-coupler transistor connects supply voltage Vcc2 to the fault input ( pin 10 ) of IC 7101. When the voltage at pin 10 exceeds 1.0V, IC7101 stops oscillating. The Va-supply stops functioning.

To continue the signal flow, go to the right upper corner of schematic FD2. Connecting PROTS to ground also results in a current flow through the opto-coupler diode of 7003. The opto-coupler transistor connects supply voltage Vcc1 to the fault input ( pin 10 ) of IC 7001. When the voltage at pin 10 exceeds 1.0V, IC7001 stops oscillating. The Vs-supply stops functioning.

### 5.6.4 Vs and Va protection

#### **Va protection**

When this protection is activated, the Va- and Vs power supply are shut down. The set is switched to the standby mode and error-code 4 is stored in the NVM.

When the Va-supply exceeds the 68V, regulator 7112 is triggered and will switch on T7113. Capacitor 2132 is charged via the 5Vstby-switched and will trigger thyristor 7114, which will switch on T7341. The voltage dividing of R3386 and resistor R3378 and 3379 now determine the voltage "protection status". ( neglect the Vce of 0.2V of T7341 ). See schematic FD2.

The presence of the voltage at "protection status" line will eventually reset the VsVa-supply. For more info see subparagraph - Reset of the VsVa-supply.

#### **Vs protection**

When this protection is activated, the Vs power supply is shut down. The set is switched to the standby mode and error-code 4 is stored in the NVM.

When the Vs supply exceeds the 198V, regulator 7012 is triggered and will switch on T7016. Capacitor 2032 is charged via the 5Vstby-switched and will trigger thyristor 7013. Thyristor 7013 is fired and connects signal Aa to ground. To follow the signal flow, go to the right upper corner of schematic FD1. When signal Aa is shorted to ground, T7341 is switched on. The voltage dividing of R3386 and resistor R3378 and 3379 now determine the voltage "protection status". ( neglect the Vce of 0.2V of T7341 ). See schematic FD2.

The presence of the voltage at "protection status" line will eventually reset the VsVa-supply. For more info see subparagraph - Reset of the VsVa-supply.

### 5.6.5 Temperature Protection

When this protection is activated, the Va- and Vs power supply are shut down. The set is switched to the standby mode and error-code 5 is stored in the NVM.

When the temperature of the heatsink on the Preconditioner panel or on one of the 2 heatsink on the VsVa panel exceeds the 110°C, the PTC resistance increases drastically. The voltage at pin 3 of IC7330 will drop and the output of 7330 will do the same. The current flow through opto-coupler diode 7331 results also in a current flow through the opto-coupler transistor and will trigger thyristor 7332. The fired thyristor switches transistor 7337 on. The voltage dividing of R3339 and resistor R3378 and 3379 now determine the voltage "protection status". ( neglect the Vce of 0.2V of T7337 ).

The presence of the voltage at "protection status" line will eventually reset the VsVa-supply. For more info see subparagraph - Reset of the VsVa-supply.

### 5.6.6 DC Protection - Audio Amplifier

When this protection is activated, the Va- and Vs power supply are shut down. The set is switched to the standby mode and error-code 6 is stored in the NVM.

In case of a fault in the Audio amplifier or when a DC voltage appears on the speaker output, a signal called DCProt is generated. See schematic FD2 - F7. In case of a fault, thyristor 7314 is triggered and switches on T7340. The voltage dividing of R3380 and resistor R3378 and 3379 now determine the voltage "protection status". ( neglect the Vce of 0.2V of T7340 ).

The presence of the voltage at "protection status" line will eventually reset the VsVa-supply. For more info see subparagraph - Reset of the VsVa-supply.

### 5.6.7 Vrr - PDP supplies

Vrr is a logical signal ( "high" in normal circumstances ) that comes from the PDP. Its purpose is to trigger the switch-off of the Pre-conditioner supply in case Vrr becomes "low", to trigger the shutdown of the VsVa supply and to initialise that error-code 7 is stored in the NVM.

When signal Vrr becomes "low", see FD1 - section F13, the output of IC7301-B becomes "high". This results in two actions. It will trigger thyristor 7302 and short signal PROTS to ground. This results eventually in a reset of the VsVa supply. Switching on T7371, which again switches on T7370 via the 5Vstby-switched supply. Signal-line "supply-on" is now grounded. This results in switching off relay 5680 and 5690, disconnecting the mains from the pre-conditioner. The standby supply ( 5Vstby-switched ) is still functional. (See Fig. 5-5)

## 5.7 Fault finding tips

### 5.7.1 Pre-conditioner

The Pre-conditioner delivers the following output voltages:

- 5 VSTBY
- 5 VSTBY\_switched
- 380 VDC
- Internal 12 VSTBY to supply the relay, which switches the mains input

To trouble shoot the pre-conditioner, first check the LED of the display-box.

- No red, green or orange LED indicates the absence of the +5Vstby\_switched at the VsVa panel.

Check the +5Vstby\_switched on pin 5 of connector PR08. If this voltage is present check the presence of this voltage at the VsVa-panel on pin 2 of connector FD04. See the wiring diagram of the monitor for more details.

If the voltage is not present, check R3508 and fuse 1500. In case of a defective R3508, check/replace item 7500, opto-coupler 7501, regulator 7502, and diode 6501 + 6502. In case of an open circuit of fuse 1500, check/replace bridge 6500 and capacitor C2501.

If both component are alive, measure the voltage at pin 5 of IC7500 - Topswitch. If the waveforms resemble a burst-signal, the output is too heavily loaded. Check the output diode D6504 and capacitor C2508 of the 12VSB and diode 6505 and capacitor C2510 of the 5VSTBY.

- The red LED is blinking (+5Vstby is OK!), which is an indication of a protection.

Disconnect the VGA-cable between the E-box and the Monitor. Now the Monitor is operating as a stand-alone unit.

Switch the monitor via the DST, (command "Default") or via the RC (special sequence) to the SDM.

Automatically the orange coloured LED of the monitor will blink the content of the error-buffer. If the sequence contains error-code 8, the cause could be a defective pre-conditioner. Error-code 8 is an indication that the +5V and/or the Vs/Va of the VsVa supply are not correct.

In case of error-code 4, switch OFF the set and check the temperature of the heatsink. In case of a high temperature of the heatsink, check MOSFET T7610 and the drive-circuit around T7640, T7641 and T7608.

In case of error-code 8, remove connector PR09 from the board. Short-circuit pin 2 of T7681 to ground, simulation of "SUPPLY\_ON". (Caution - Protections overruled!!!)

Measure voltage at C2616. Is voltage 380Vdc?

Yes, the cause was a too heavy load/short-circuit at the VsVa-panel.

No, measure the voltage at C2606/C2607. Is this voltage a DC-voltage of approx. 300V with a strong ripple at a mains-input of 230Vac? If NO, check if relay 5690 is activated via the transistors T7684 + T7690. Check also PTC's 3600, 3601 and 3602 at their resistor-value.

Voltage is present at C2606. Check/replace NFR 3663 and 3668, if one of them is an open-circuit. In case R3663 is an open circuit, check/replace diode 6660, 6661 and capacitor C2664 plus IC 7660. If IC7660 is defect, check/replace IC 7650 and C2262. In case of an open circuit of NFR 3668, replace IC 7650.

NFR 3663 and NFR 3668 are not defect. Measure waveform at base of T7608. Is a square waveform present at gate of T7610? Check/replace MOSFET T7610 and the drive-circuit around T7640, T7641 and T7608.

## 5.7.2 VsVa-supply

The red LED is blinking (+5Vstby is OK!), which is an indication of a protection.

Disconnect the VGA-cable between the E-box and the Monitor. The Monitor is now operating as a stand-alone unit.

Switch the monitor via the DST, (command "Default") or via the RC (special sequence) to the SDM.

- Error-code 1, check the +5V supply  
Check fuse 1103. If the fuse is an open circuit, check/replace IC 7201. If fuse 1103 is OK, check the presence of the 17V. If this voltage is not present check fuse 1102 + 1104 and D6121 + D6122. If the 17V is present, then remove connector FD05. The reason could be a too heavy load or a short-circuit of the +5V supply. If after disconnection of connector FD05 the set still goes into protection, check D6203, NFR 3205 and the circuit around IC 7201.

- Error-code 2, check the 8V6 supply  
Check regulator IC 7203, NFR 3099 and D6204.

- Error-code 8 there is something wrong with the POWER\_OKE signal. When the POWER\_OKE signal is low, the Vs and Va and the +5V are available.

Measure the voltage Va at C2120. Is the voltage between 55V and 65V? If not check fuse 1105 and D6120. If both components are OK, the cause could be a too heavy load. Measure the voltage Vs at C2020. Is the voltage between 165V and 185V? If not check D6020. If D6020 is OK, the cause could be a too heavy load.

If both voltage are not present, check fuse 1004 at the input. If fuse 1004 is an open circuit, check the MOSFET's 7005 and 7006 for a short-circuit. In case of short-circuit use the repair-kit.

If fuse 1004 is OK, check the voltage at pin 15 of IC 7001. Is the voltage at pin 15 approx. 16-17V? If NO, check NFR 3002 and D6002 + D6030. If YES, check the waveforms FD49 and FD50 at pin 14 and 12. If they are present, check pulse transformer 5001 and the driver-circuits around MOSFET 7005 and 7006. If the waveforms FD49 and FD50 are not present, replace IC7001.

- Error-code 5, check the audio-supply or the Audio amplifier IC.

Check/replace fuse 1201 + 1202 and diode 6201 + 6202. If the components are OK, check the audio-amplifier IC.

- Error-code 6, check the Vs and/or the Va supply voltage. The regulation-circuit of one of these voltages is not working correctly.

For the Va supply check opto-coupler 7102 and IC 7110.

For the Vs supply check opto-coupler 7002 and IC 7010

## 5.8 ComPair

### 5.8.1 ComPair mode

The monitor, as a stand-alone unit, can be diagnosed via a PC/laptop by using ComPair via the ComPair connector. Before connecting the ComPair-cable at the AV Control panel on connector AVC34, the monitor must be put in the "ComPair - Mode ". This can be done by changing the jumpers at connector AVC39. Connector AVC39 is situated under the uP panel.

The figure below shows how to do it.

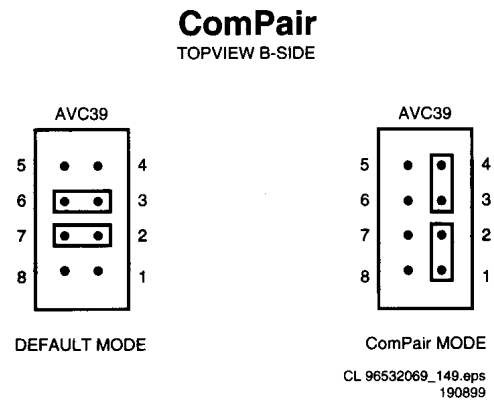


Figure 5-1

After switching ON the set, the red LED will blink as an indication that the monitor is in the ComPair mode.

### 5.8.2 Introduction

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

- ComPair helps you to quickly get an understanding how to repair the FTV1.9 in short time by guiding you step by step 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; ComPair takes care of this.
- ComPair speeds up the repair time since it can automatically communicate with the FTV1.9 (when the microprocessor is working) and all repair information is directly available. When ComPair is installed together with the SearchMan FTV1.9 electronic manual, schematics and PCBs are only a mouse-click away.

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 FTV1.9 chassis, the ComPair interface box and the FTV1.9 communicate via an I2C cable (bi-directional). The ComPair fault finding program is able to determine the problem of the defective television. ComPair can gather diagnostic information in 2 ways:

1. Communication to the television (automatic)
2. Asking questions to you (manually)

ComPair combines this information with the repair information in its database to find out how to repair the FTV1.9.

#### Automatic information gathering

Reading out the error buffer, ComPair can automatically read out the contents of the entire error buffer.

Diagnosis 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 FTV1.9.

#### Manual information gathering

Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extent. When this is not the case, ComPair will guide you through the faultfinding tree by asking you questions and showing you examples. You can answer by clicking on a link (e.g. text or an

waveform pictures) that will bring you to the next step in the faultfinding process.

A question could be: Do you see snow? (Click on the correct answer)

YES / NO

An example can be: Measure testpoint I7 and click on the correct oscillogram you see on the oscilloscope

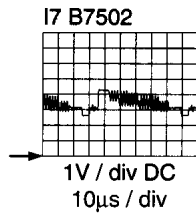


Figure 5-2

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.

#### Additional features

Beside fault finding, ComPair provides some additional features like:

- Uploading/downloading of pre-sets
- Managing of pre-set lists
- Emulation of the Dealer Service Tool

### 5.8.3 Searchman (Electronic Service Manual)

If both ComPair and SearchMan are installed, all the schematics and PCB's of the faulty set are available when clicking on the hyper-link of a schematic or a PCB in ComPair. Example : Measure the DC-voltage on capacitor C2568 (Schematic/Panel) at the Monocarrier.

Clicking on the PCB hyper-link, automatically shows the PCB with a highlighted capacitor C2568. clicking on the schematic hyper-link, automatically shows the position of a highlighted capacitor C2568 at the schematic.

### 5.8.4 Connecting the ComPair interface

The ComPair Browser software should be installed and setup before connecting ComPair to the FTV1.9. (See the ComPair Browser Quick Reference Card for installation instructions):

1. Connect the RS232 interface cable to a free serial (COMM) port on the PC and the ComPair interface PC connector (connector marked with "PC").
2. Place the ComPair interface box straight in front of the television with the infrared window (marked "IR") directed to the television LED. The distance between ComPair interface and television should be between 0.3 and 0.6 meter. (Note: make sure that (also) in the service position, the ComPair interface infra red window is pointed to the standby LED of the television set (no objects should block the infra red beam))
3. Connect the mains adapter to the connector marked "POWER 9V DC" on the ComPair interface
4. Switch the ComPair interface OFF
5. Switch the television set OFF with the mains switch
6. Remove the rear cover of the television set
7. Connect the interface cable (4822 727 21641) to the connector on the rear side of the ComPair interface that is marked "I2C" (See Figure 5-4)
8. Connect the other end of the interface cable to the ComPair connector AVC34 (0334) at the right/bottom side of the AV-Control panel.

9. Plug the mains adapter in the mains outlet and switch ON the interface. The green and red LED's light up together. The red LED extinguishes after approx. 1 second (the green LED remains lit).
10. Start-up Compair and select "File" menu, "Open..."; select "FTV1.9 Fault finding" and click "OK"
11. Click on the icon (Fig. 5-3) to switch ON the communication mode (the red LED on the ComPair interface wil light up)
12. Switch on the television set with the mains switch
13. When the set is in standby. Click on "Start-up in ComPair mode from standby" in the ComPair FTV1.9 fault finding tree, otherwise continue.



Figure 5-3

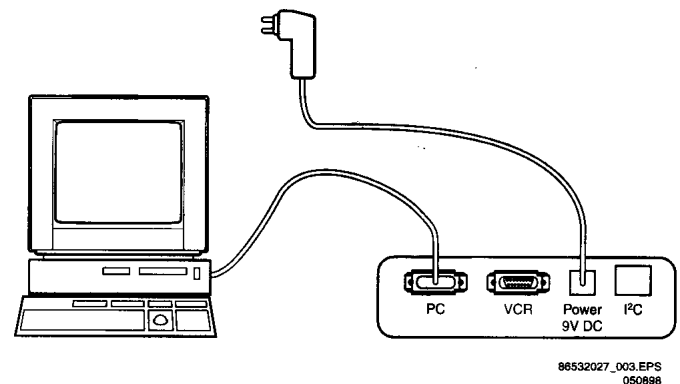


Figure 5-4

The set has now started up in ComPair mode. Follow the instruction in the FTV1.9 fault finding tree to diagnose the set. Note that the OSD works but that the actual user control is disabled

### 5.8.5 Preset installation

Presets can be installed in 2 ways with the FTV1.9.

- Via infra red
  - only sending TO the television
  - the rearcover does NOT have to be removed

Click on "File" "Open" and select "TV - use ComPair as DST" to use infra red

- Via cable
  - sending TO the television and reading FROM the television
  - the rearcover has to be removed

Click on "File" "Open" and select "FTV1.9 fault finding" to use the cable

Presets can be installed via menu "Tools", "Installation", "Presets".

### 5.8.6 Ordering ComPair

ComPair order codes:

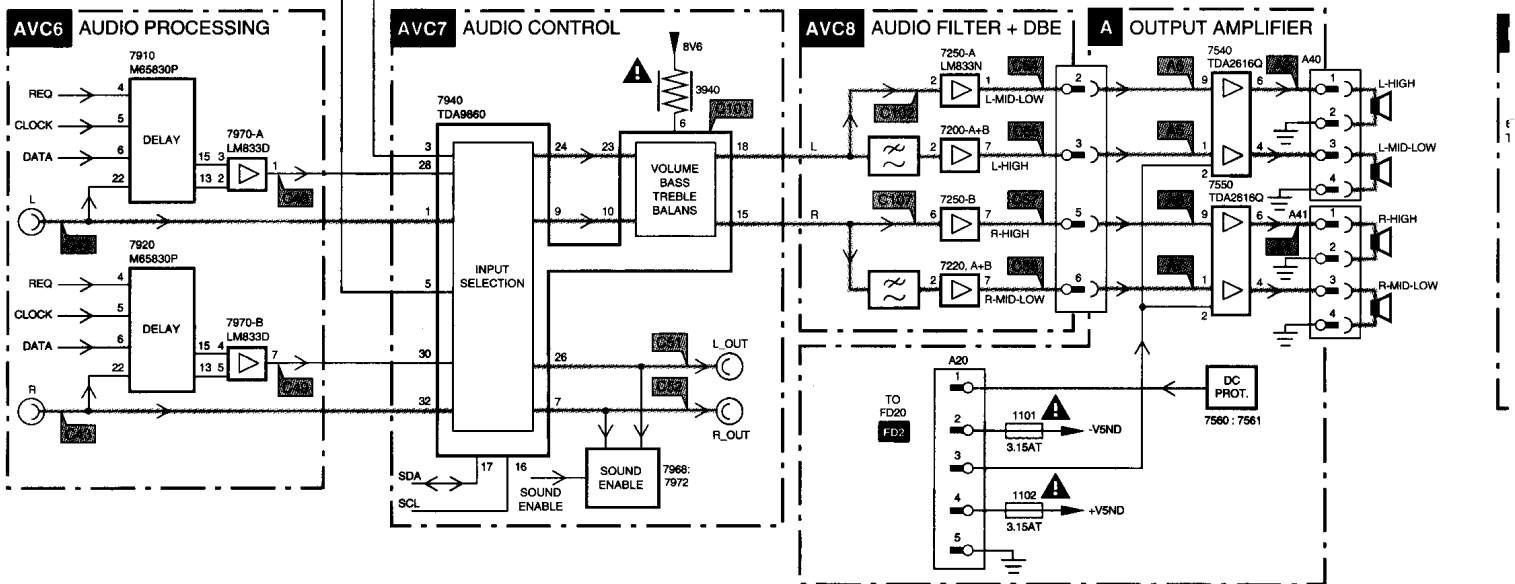
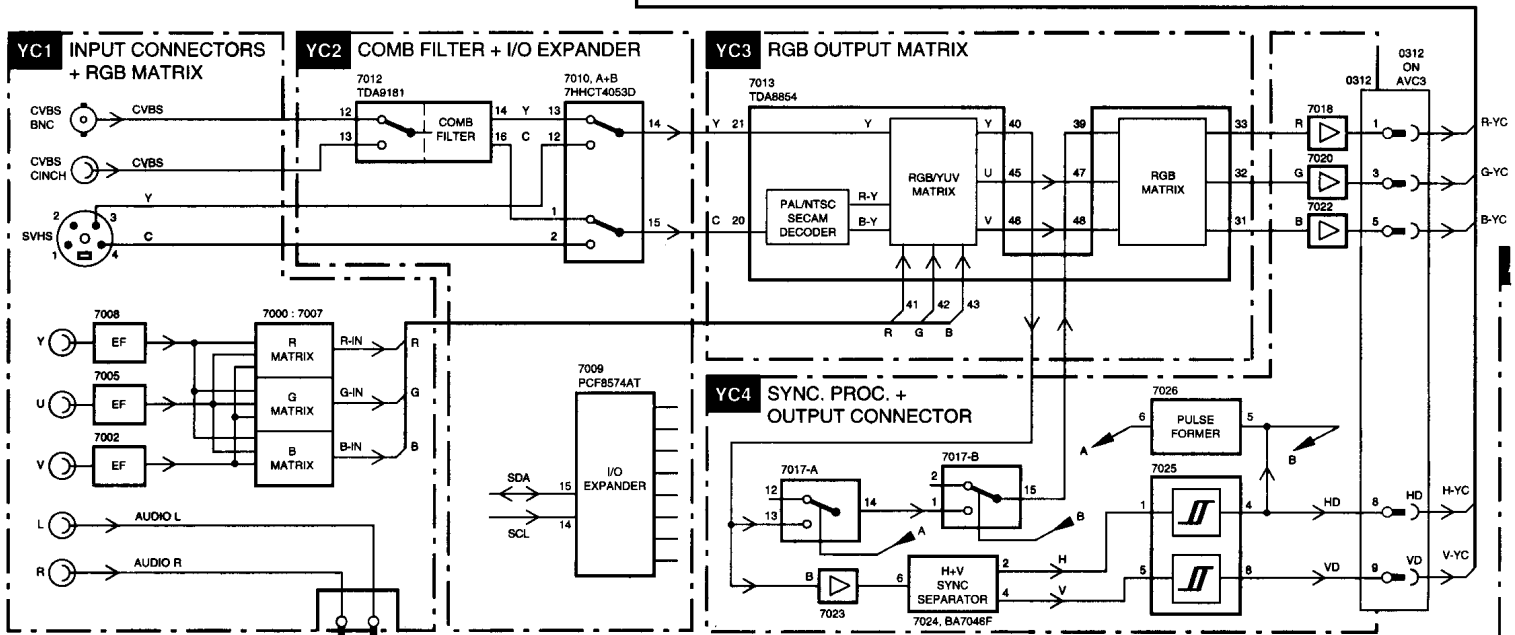
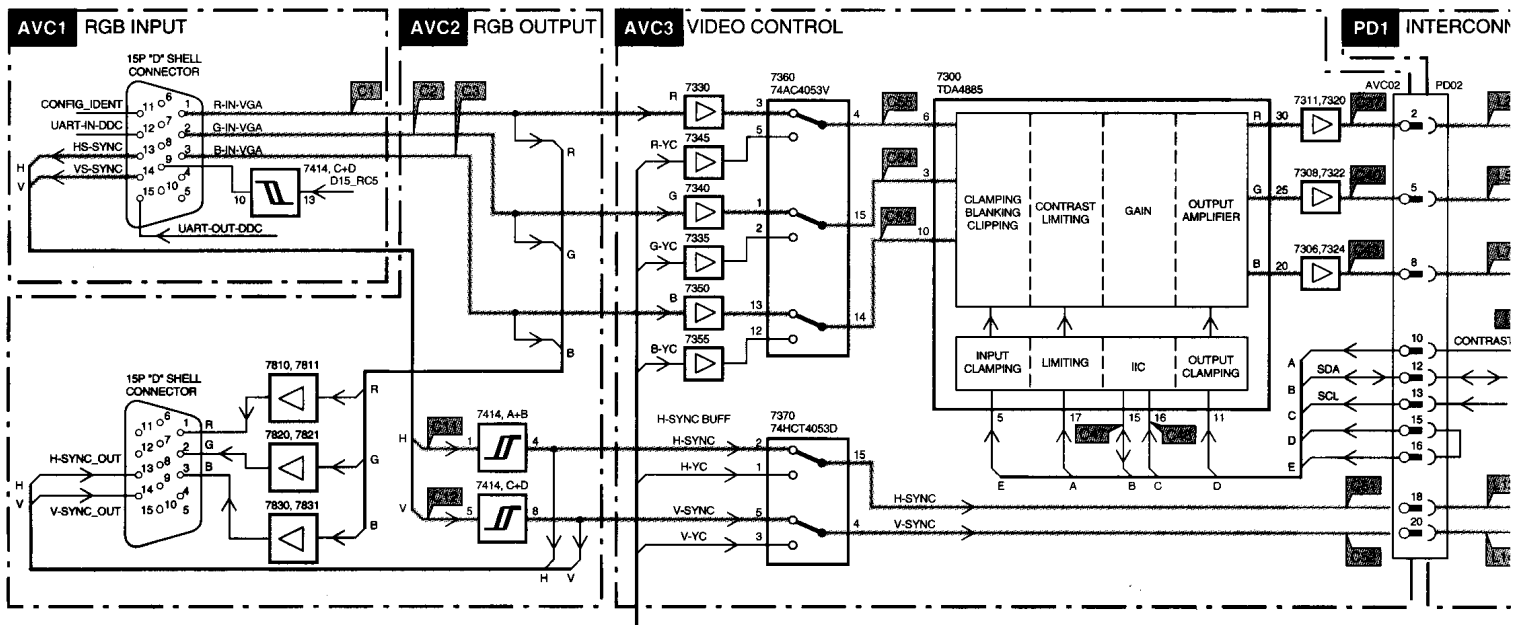
- Starterkit ComPair + SearchMan software + ComPair interface (excluding transformer): 4822 727 21629
- ComPair interface (excluding transformer): 4822 727 21631
- ComPair transformer (continental) Europe: 4822 727 21632
- ComPair transformer United Kingdom: 4822 727 21633
- Starterkit ComPair software: 4822 727 21634

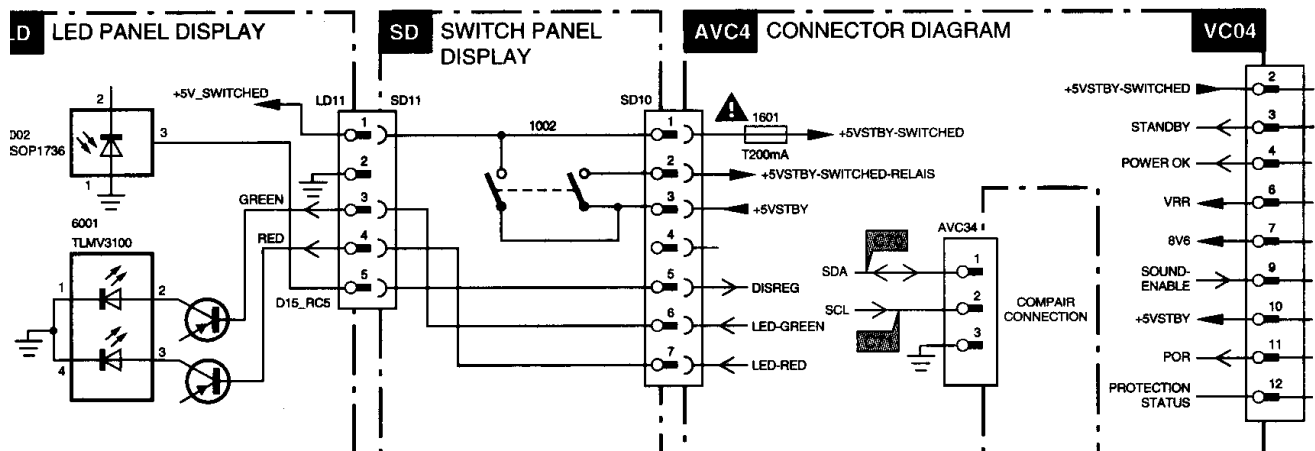
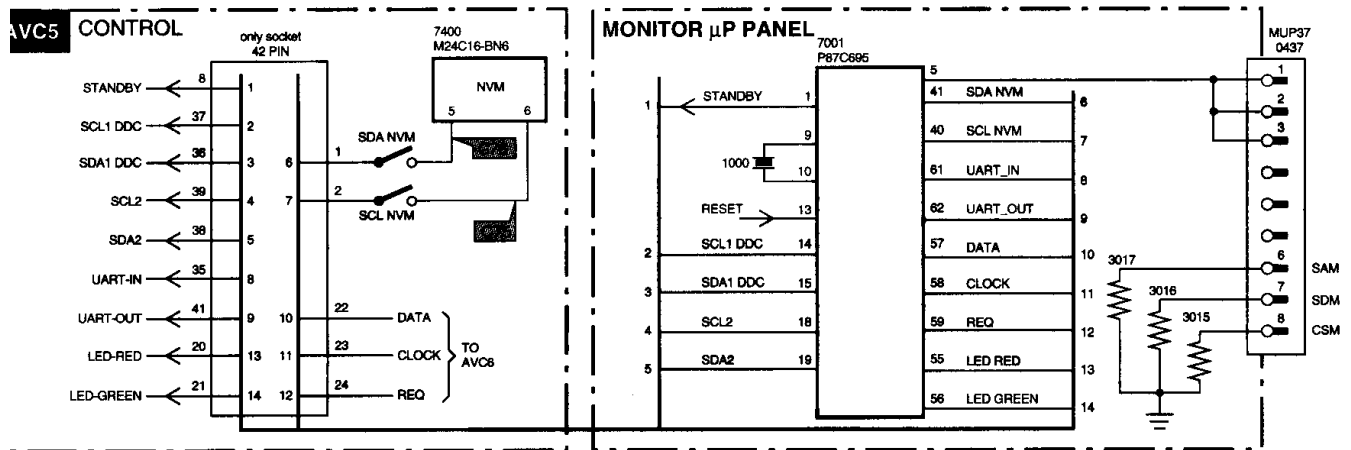
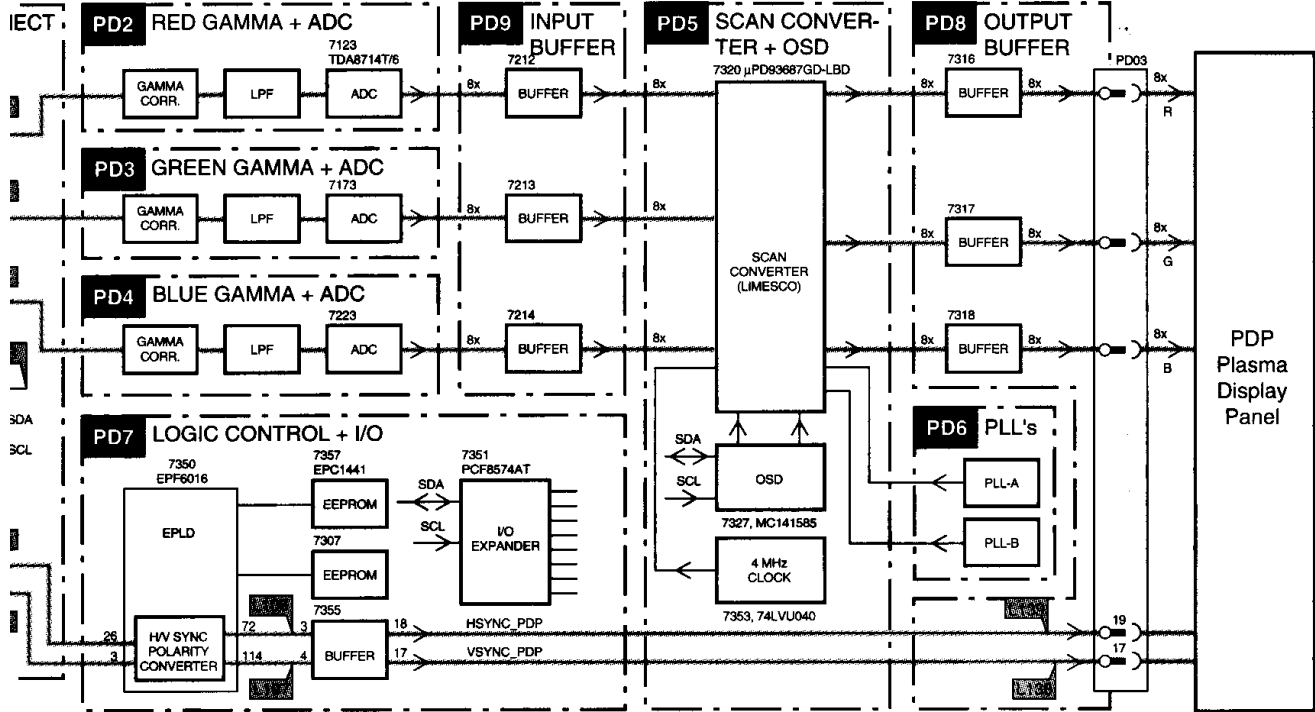




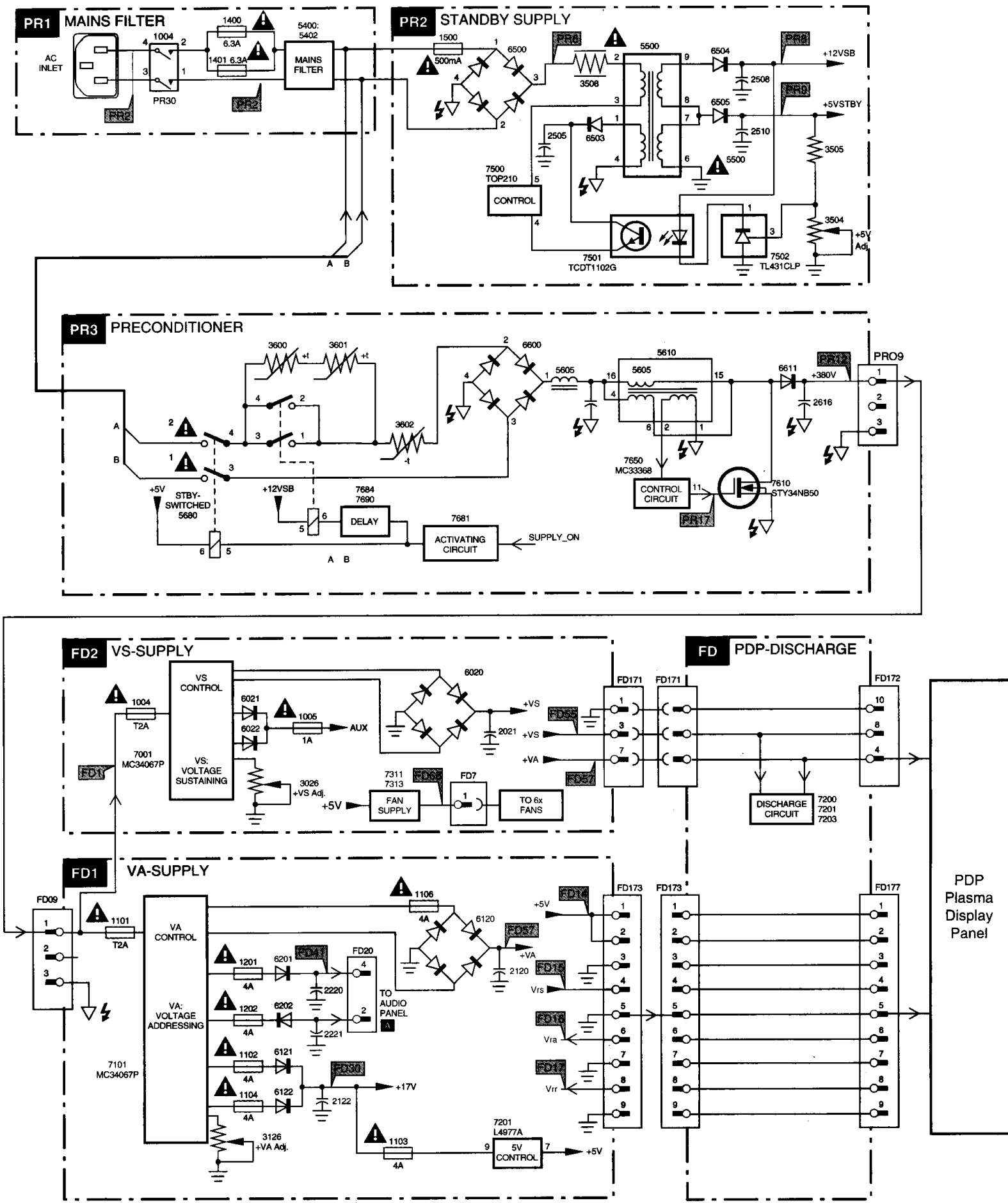
## 6. Block diagrams

### Block diagram (Part 1)

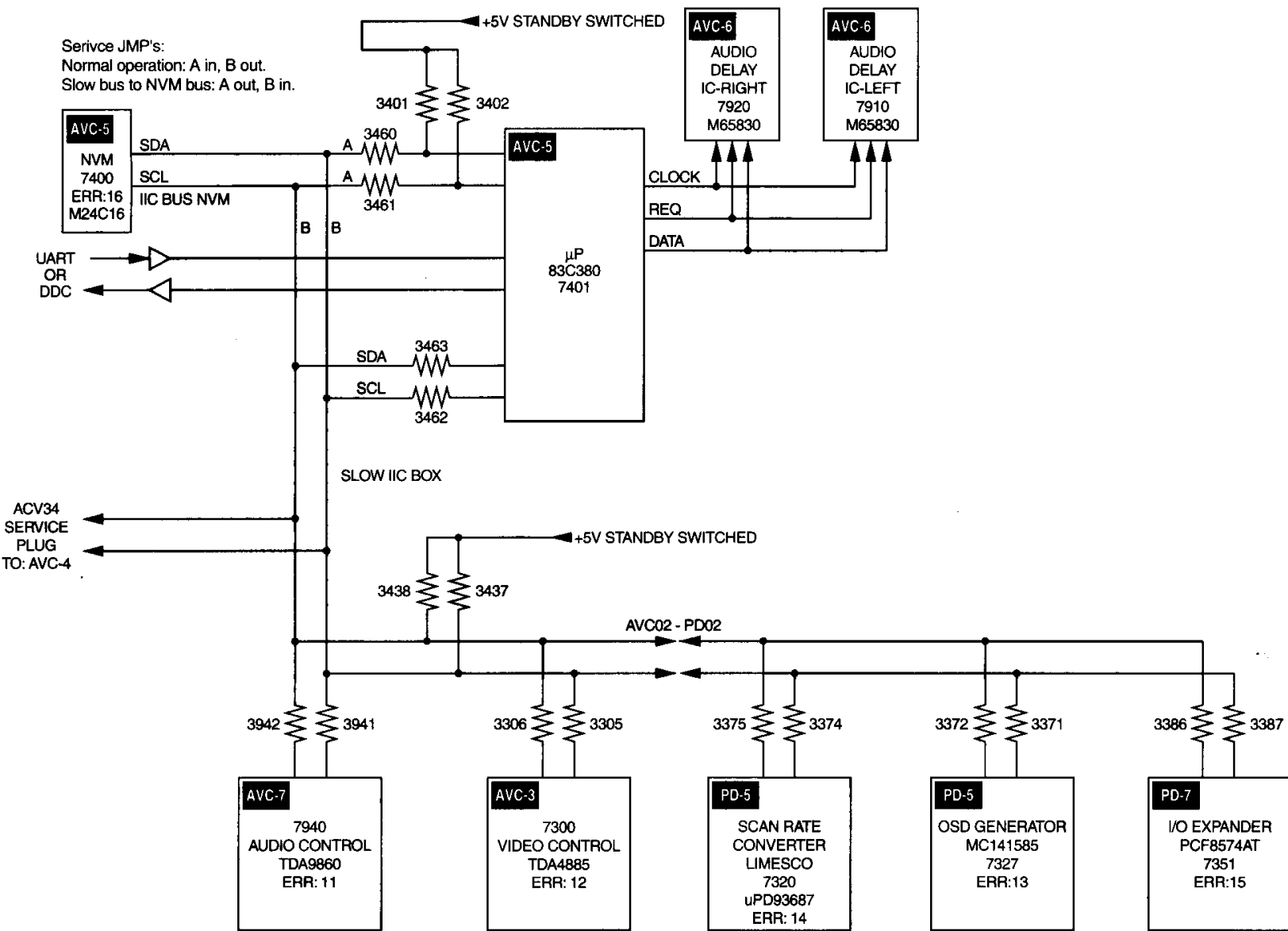




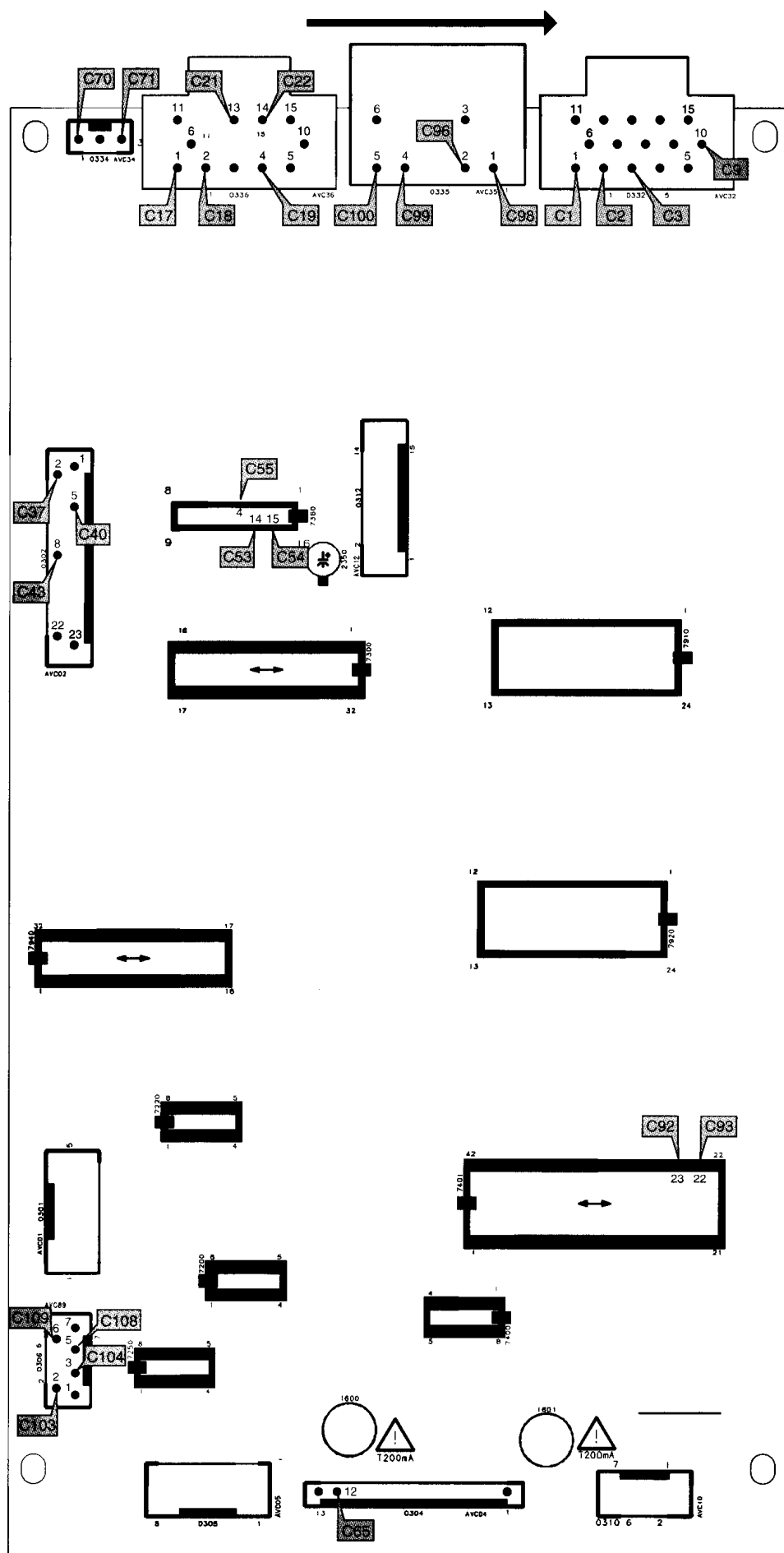
Block diagram (Part 2)

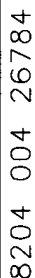


I2C bus interconnection diagram

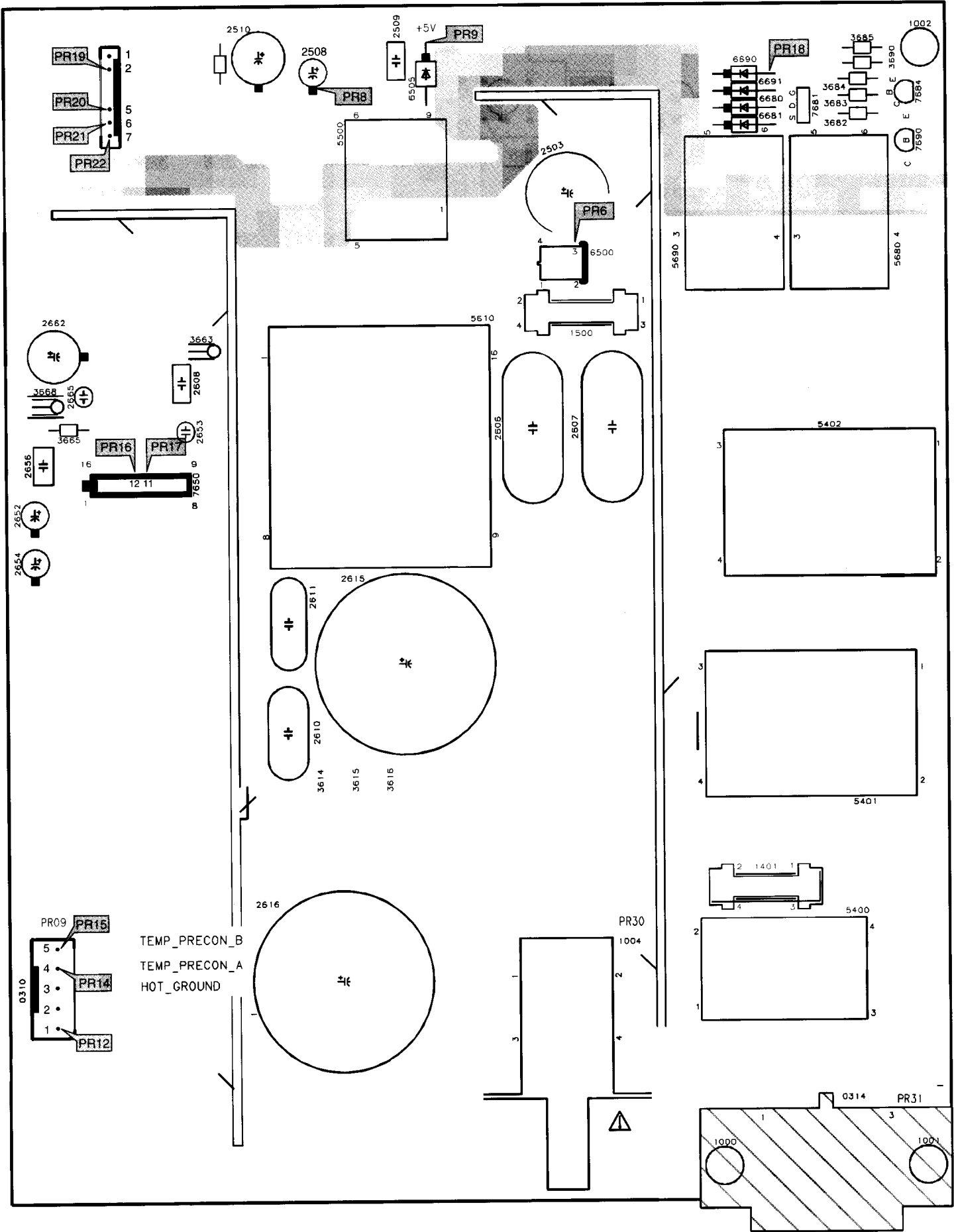


## Testpoint overview AV Control



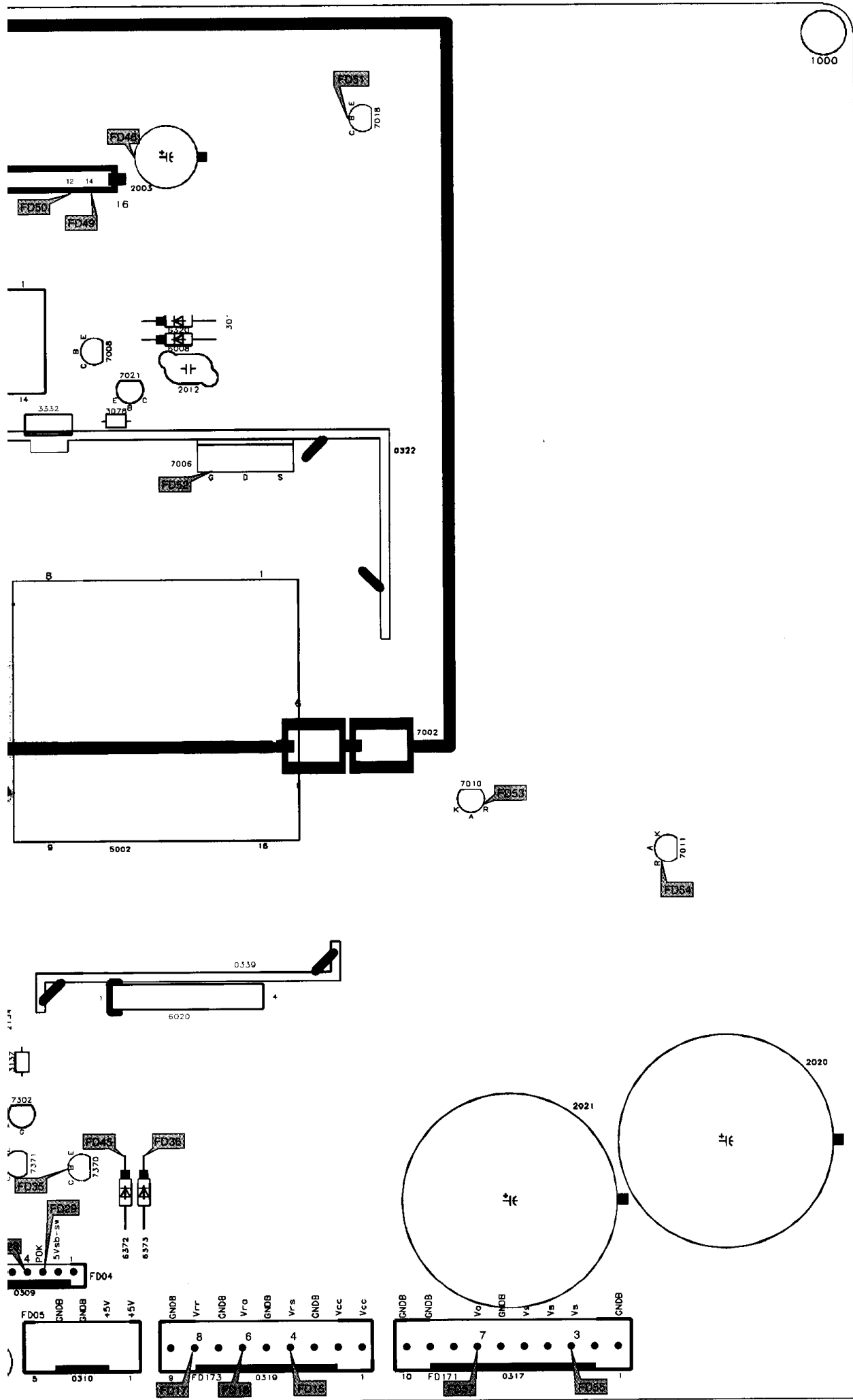


Testpoint overview Preconditioner

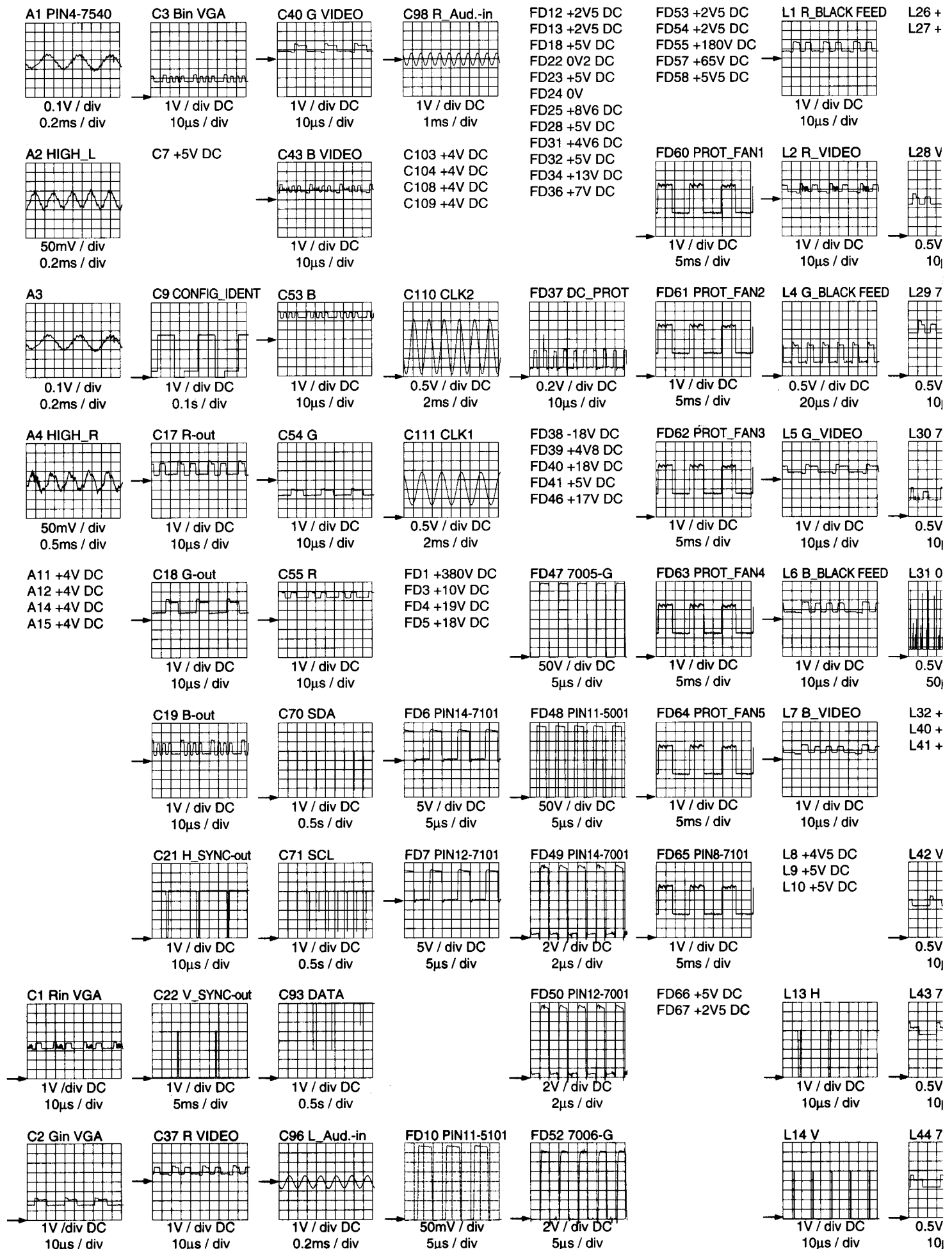


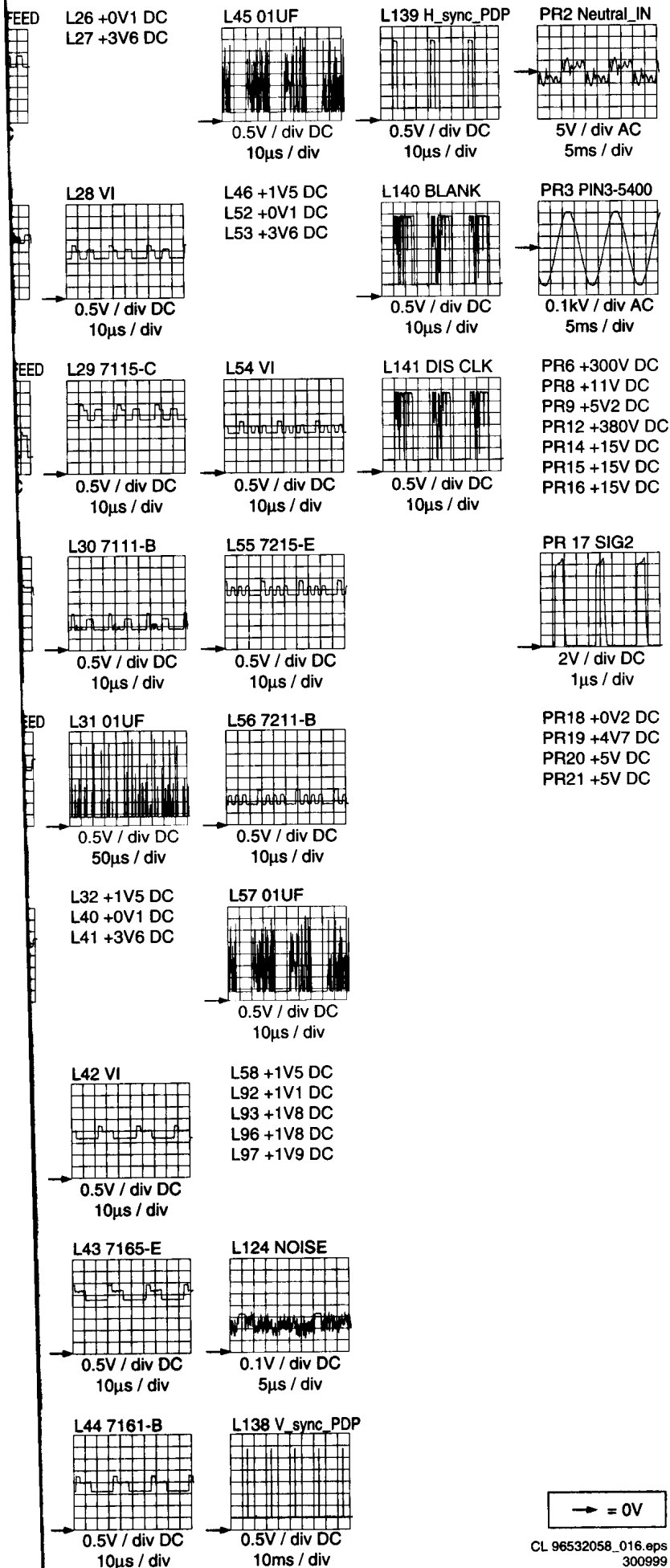




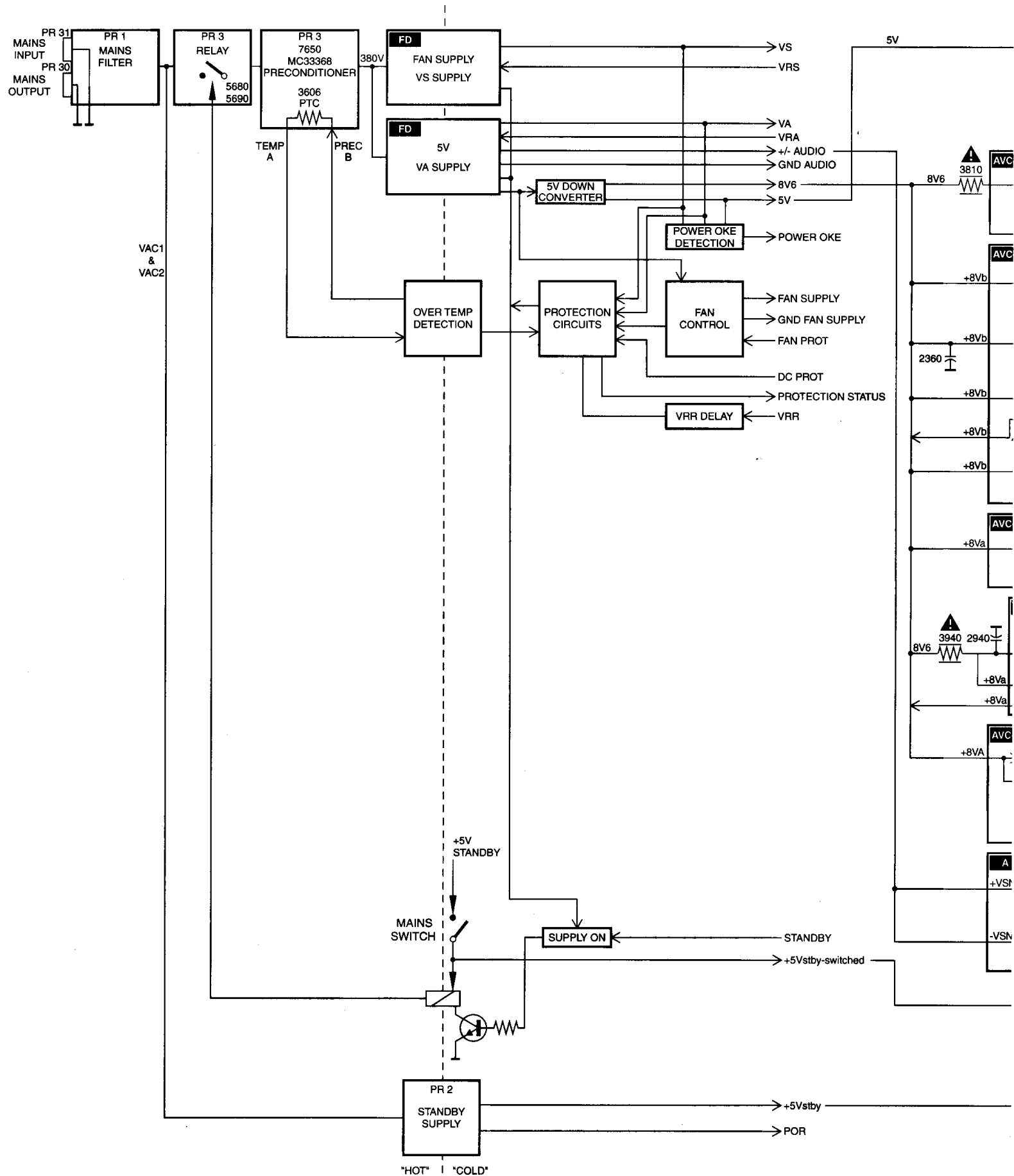


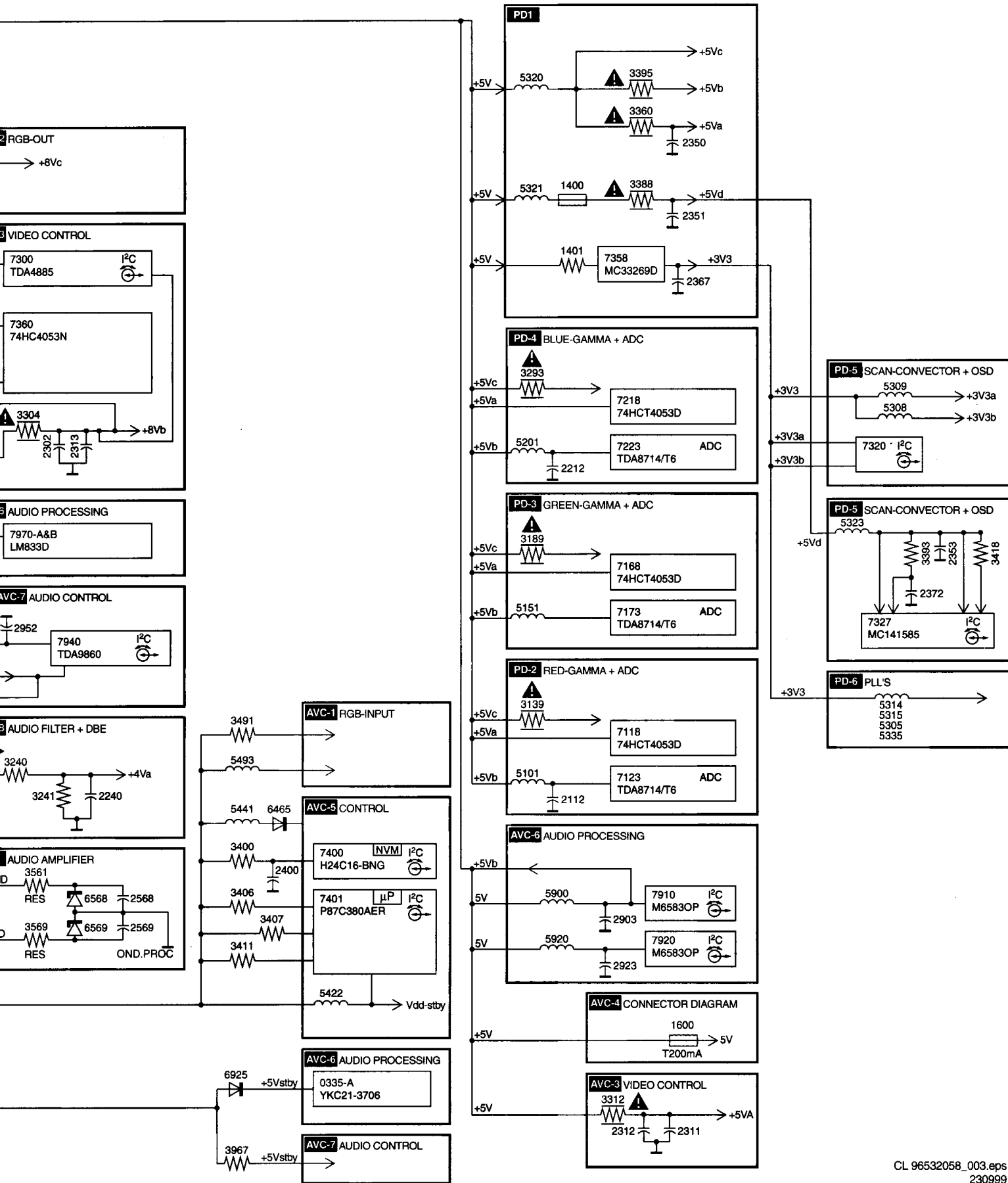
## Oscillograms



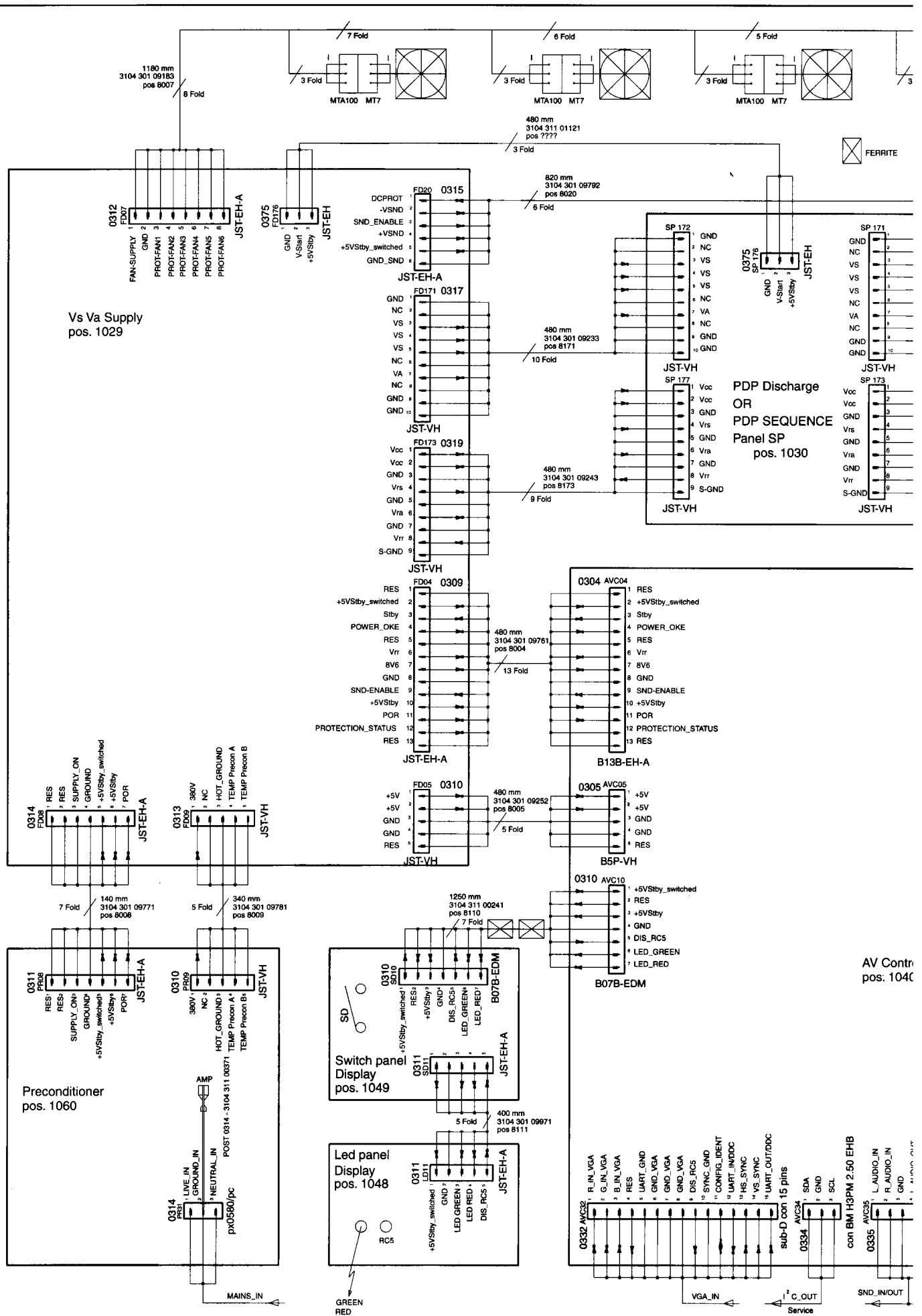


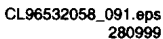
Supply voltage diagram





## Wiring diagram

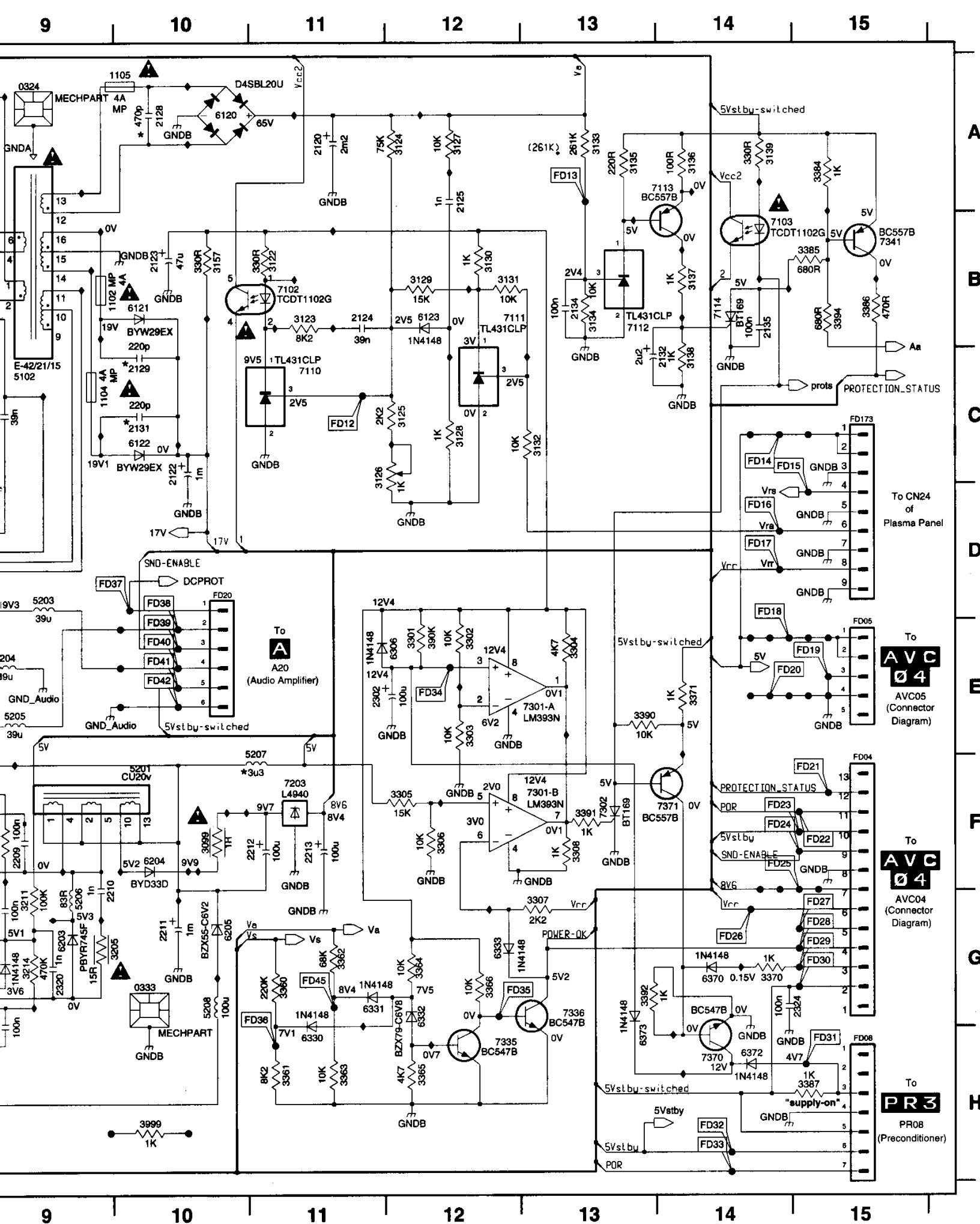






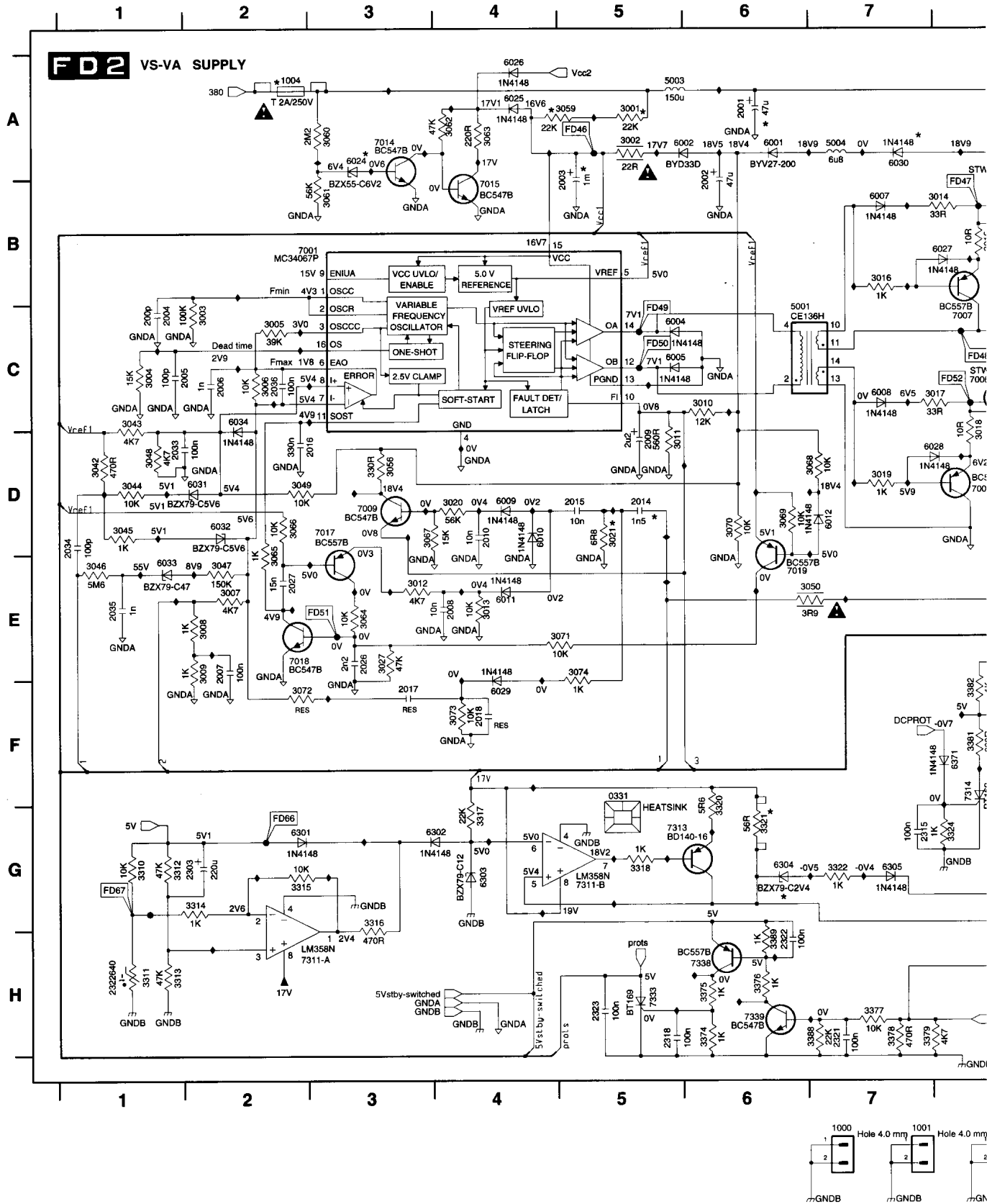
### VsVa supply (FD)

[illegible]



## VsVa supply (FD)

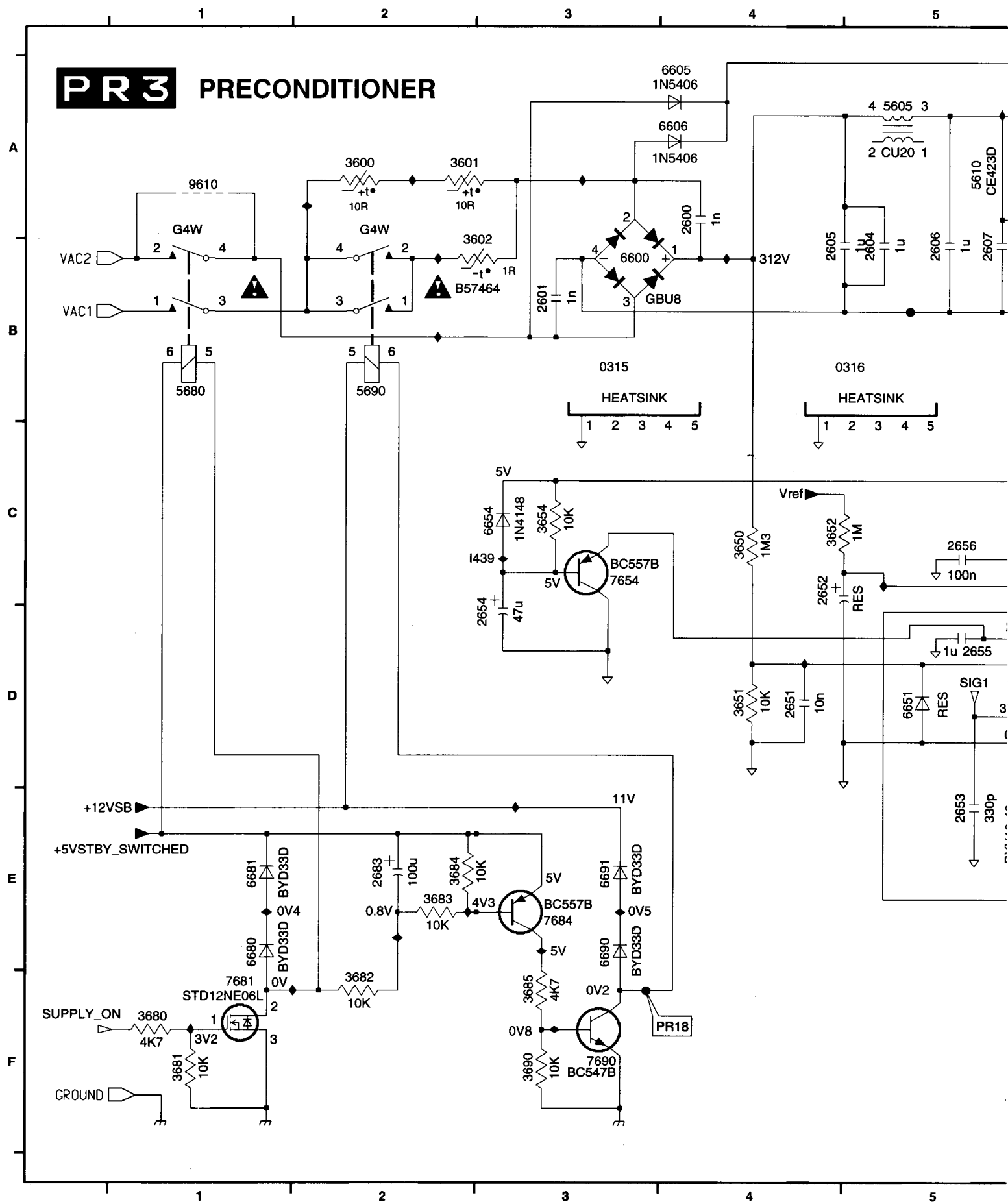
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|----------|----------|----------|----------|---------|----------|----------|----------|---------|----------|----------|----------|---------|----------|-----|
| 0312 E15 | 2009 D5  | 2026 E3  | 2307 E12 | 3002 A5 | 3018 D8  | 3035 A14 | 3056 D3  | 3072 F2 | 3320 G6  | 3355 H10 | 5002 C9  | 6024 A3 | 6311 D11 | 634 |
| 0317 B15 | 2010 D4  | 2027 E2  | 2308 F11 | 3003 C2 | 3019 D7  | 3036 A14 | 3057 A11 | 3073 F4 | 3321 G6  | 3356 H14 | 5003 A5  | 6025 A4 | 6312 E11 | 634 |
| 0318 D15 | 2011 D9  | 2028 A10 | 2309 F12 | 3004 C1 | 3020 D4  | 3037 C13 | 3058 A13 | 3074 E5 | 3322 G7  | 3357 H15 | 5004 A7  | 6026 A4 | 6313 F11 | 634 |
| 0322 A9  | 2012 C8  | 2029 B10 | 2310 G11 | 3005 C2 | 3021 D5  | 3038 C14 | 3059 A5  | 3075 B9 | 3323 G10 | 3374 H6  | 6001 A6  | 6027 B8 | 6314 G11 | 634 |
| 0331 F5  | 2013 B8  | 2030 F9  | 2311 G12 | 3006 C2 | 3022 A11 | 3039 B12 | 3060 A3  | 3076 C9 | 3324 G8  | 3375 H6  | 6002 A6  | 6028 D8 | 6315 H11 | 634 |
| 0339 A13 | 2014 D5  | 2032 C14 | 2312 H11 | 3007 E2 | 3023 B11 | 3040 A12 | 3061 B3  | 3077 D9 | 3325 H9  | 3376 H6  | 6004 C5  | 6029 F4 | 6316 H13 | 634 |
| 1004 A2  | 2015 D5  | 2033 D1  | 2313 H12 | 3008 E2 | 3024 A12 | 3041 C12 | 3062 A4  | 3078 D9 | 3340 D12 | 3377 H7  | 6005 C5  | 6030 A7 | 6317 B9  | 634 |
| 1005 B10 | 2016 D2  | 2034 D1  | 2314 H10 | 3009 E2 | 3025 C12 | 3042 D1  | 3063 A4  | 3079 D9 | 3341 D12 | 3378 H7  | 6007 B7  | 6031 D2 | 6318 C8  | 634 |
| 2001 A6  | 2017 F3  | 2035 E1  | 2315 G7  | 3010 C6 | 3026 C12 | 3043 C1  | 3064 E3  | 3080 D9 | 3342 E12 | 3379 H7  | 6008 C7  | 6032 D2 | 6319 C9  | 70K |
| 2002 B6  | 2018 F4  | 2036 C2  | 2317 H15 | 3011 D5 | 3027 E3  | 3044 D1  | 3065 E2  | 3081 D9 | 3343 E12 | 3380 F8  | 6009 D4  | 6033 E1 | 6320 D8  | 70K |
| 2003 B5  | 2020 A11 | 2037 B13 | 2318 H5  | 3012 E3 | 3028 B12 | 3045 D1  | 3066 D2  | 3082 D9 | 3344 E12 | 3381 F8  | 6010 D4  | 6034 C2 | 6321 D11 | 70K |
| 2004 C1  | 2021 A12 | 2038 C14 | 2319 H14 | 3013 E4 | 3030 B13 | 3046 E1  | 3067 D3  | 3083 D9 | 3345 G2  | 3382 F8  | 6011 E4  | 6035 G2 | 6322 E11 | 70K |
| 2005 C1  | 2022 C10 | 2039 G2  | 2321 H7  | 3014 B8 | 3031 B13 | 3047 E2  | 3068 D7  | 3084 D9 | 3346 G2  | 3383 G9  | 6012 D7  | 6036 G4 | 6323 F11 | 70K |
| 2006 C2  | 2023 A10 | 2040 D11 | 2322 H6  | 3015 B8 | 3032 C13 | 3048 D1  | 3069 D6  | 3085 D9 | 3347 G2  | 3384 H7  | 6020 A11 | 6037 G4 | 6324 G11 | 70K |
| 2007 E2  | 2024 B12 | 2041 D12 | 2323 H5  | 3016 B7 | 3033 A13 | 3049 D2  | 3070 D6  | 3086 D9 | 3348 G2  | 3385 H7  | 6021 B10 | 6038 G6 | 6325 H11 | 70K |
| 2008 E4  | 2025 A12 | 2042 E11 | 3001 A5  | 3017 C8 | 3034 B13 | 3050 E7  | 3071 E5  | 3087 G5 | 3349 H12 | 3386 H7  | 6023 B12 | 6039 G7 | 6326 H14 | 70K |



[illegible]

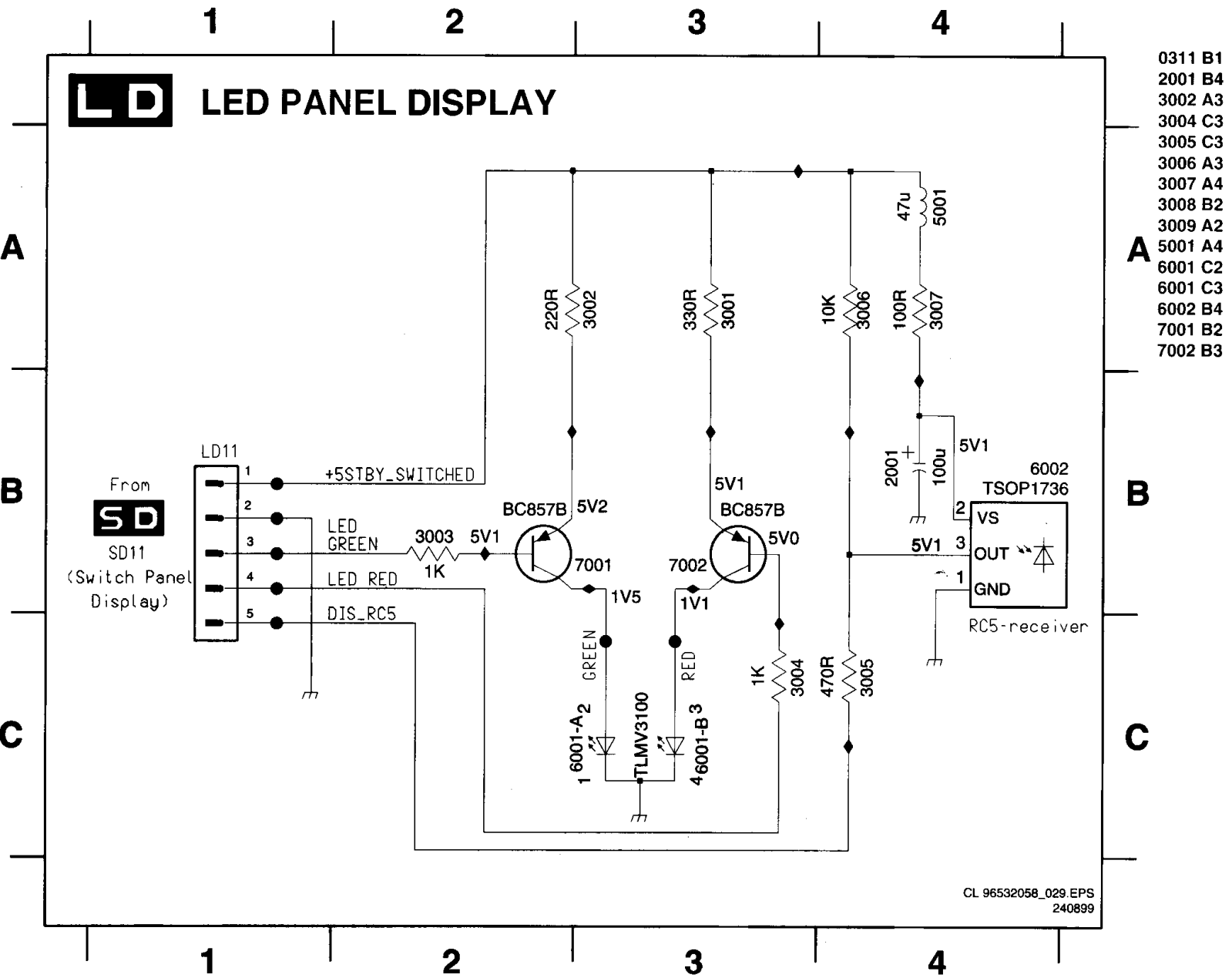


## Pre conditioner (PR)





LED panel

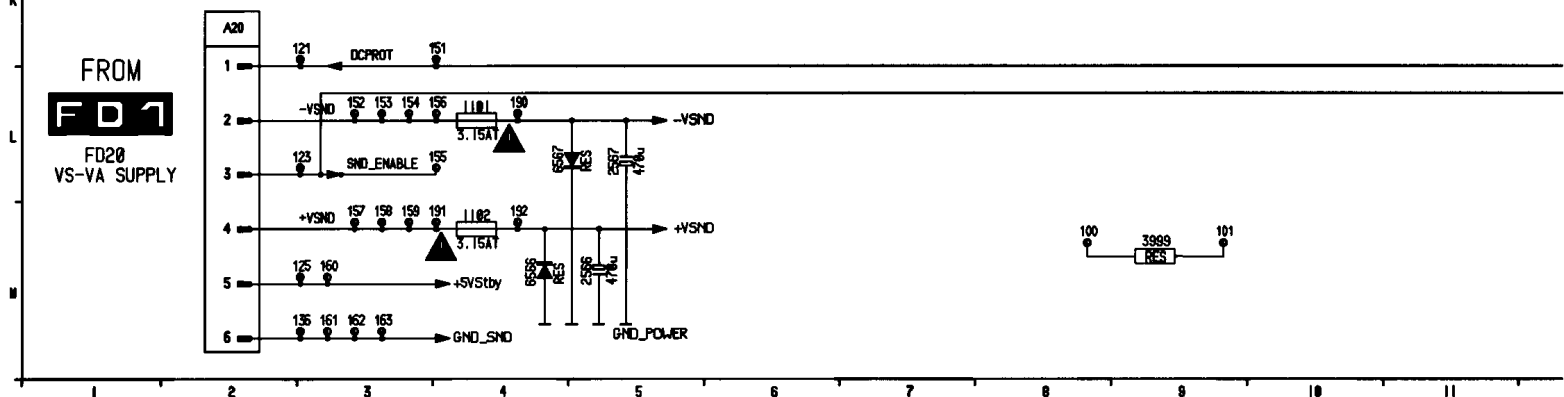
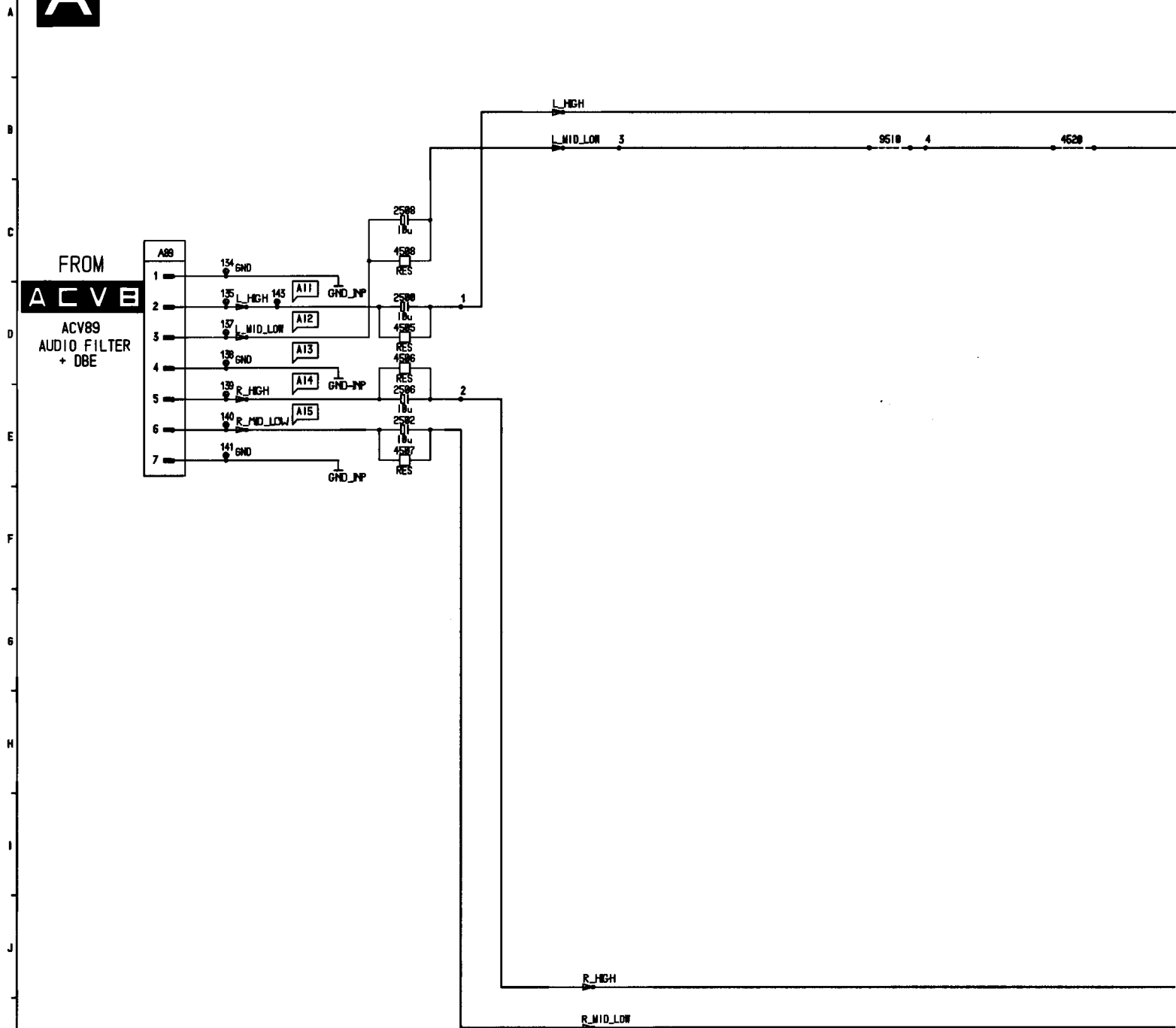




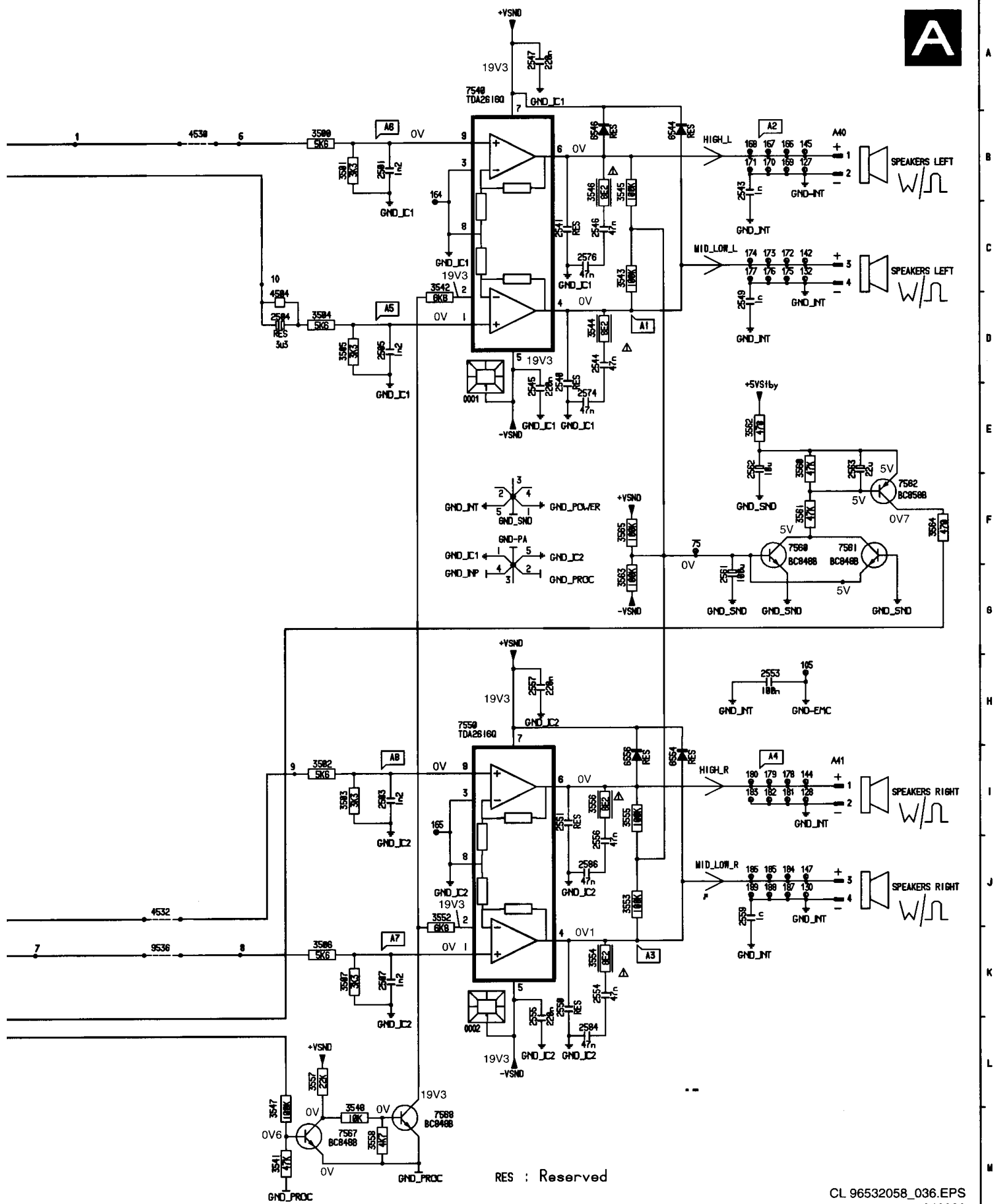
## Audio amplifier A1

|      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |      |     |
|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|
| 0001 | E17 | 1102 | M 2 | 2502 | E 3 | 2505 | D16 | 2508 | C 3 | 2543 | B20 | 2546 | C18 | 2550 | K18 | 2554 | K18 | 2557 | H18 | 2582 | E20 | 2587 | L 3 | 2584 | L18 | 3501 | B16 | 3504 | D15 | 3507 | K18 | 3543 | C19 |
| 0002 | L17 | 2500 | D 3 | 2503 | I16 | 2506 | E 3 | 2540 | D18 | 2544 | D18 | 2547 | A18 | 2551 | I18 | 2555 | K18 | 2559 | J20 | 2583 | E21 | 2574 | E18 | 2584 | J18 | 3502 | I16 | 3505 | D16 | 3541 | M15 | 3544 | D18 |
| 1101 | L 2 | 2501 | B16 | 2504 | D15 | 2507 | K16 | 2541 | C18 | 2545 | E18 | 2549 | D20 | 2553 | H20 | 2556 | J18 | 2561 | G20 | 2566 | M 3 | 2576 | C18 | 2586 | B15 | 3503 | I16 | 3506 | K15 | 3542 | C17 | 3545 | B19 |

|   |   |   |   |   |   |   |   |   |    |    |
|---|---|---|---|---|---|---|---|---|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|----|----|

**A****AUDIO AMPLIFIER**

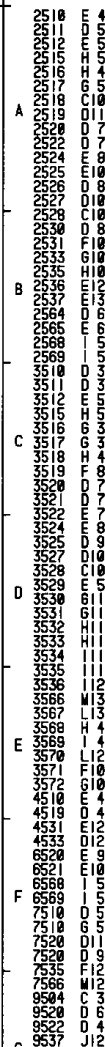
A



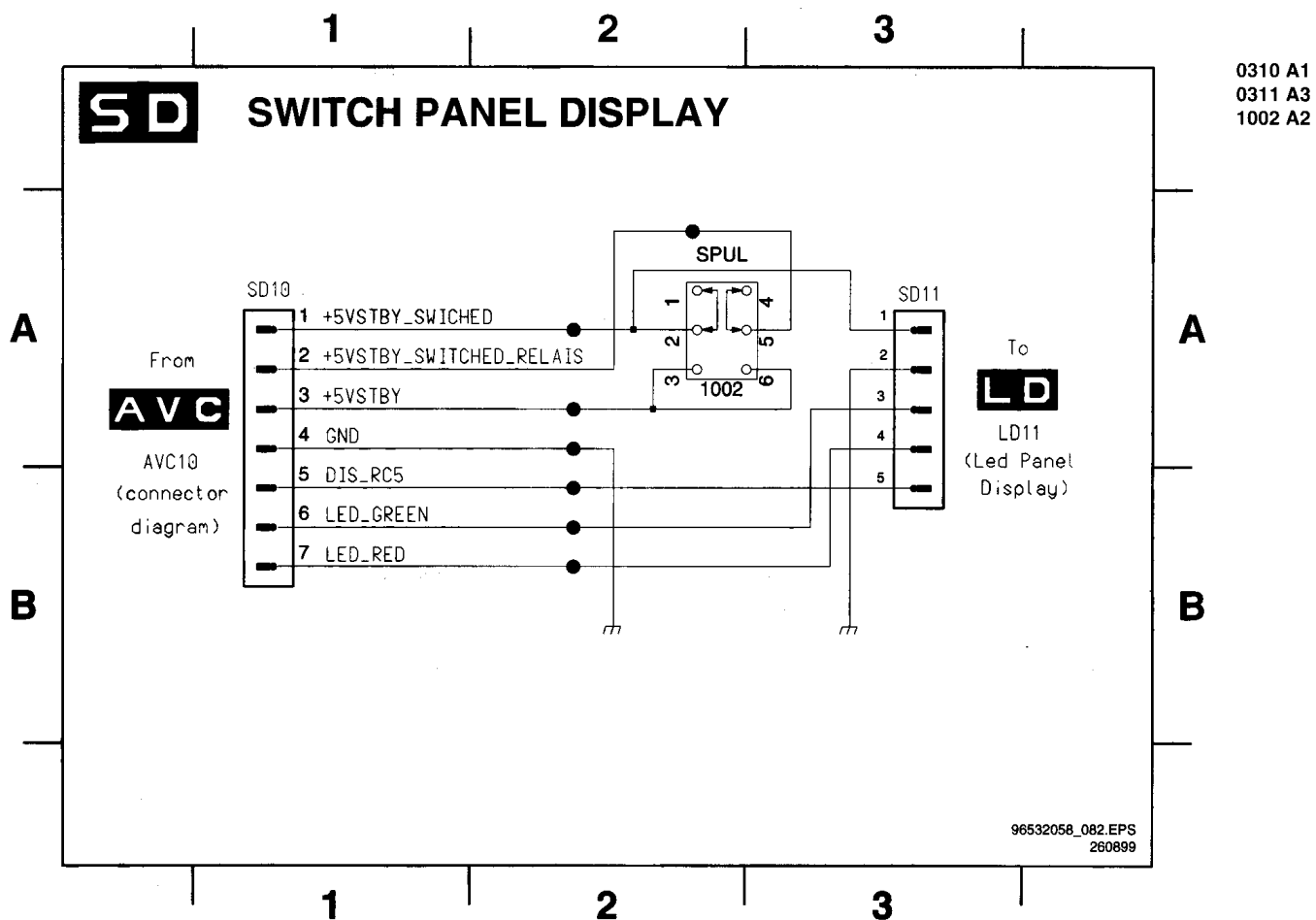
## A

The schematic diagram illustrates the audio amplifier circuit, divided into several functional blocks:

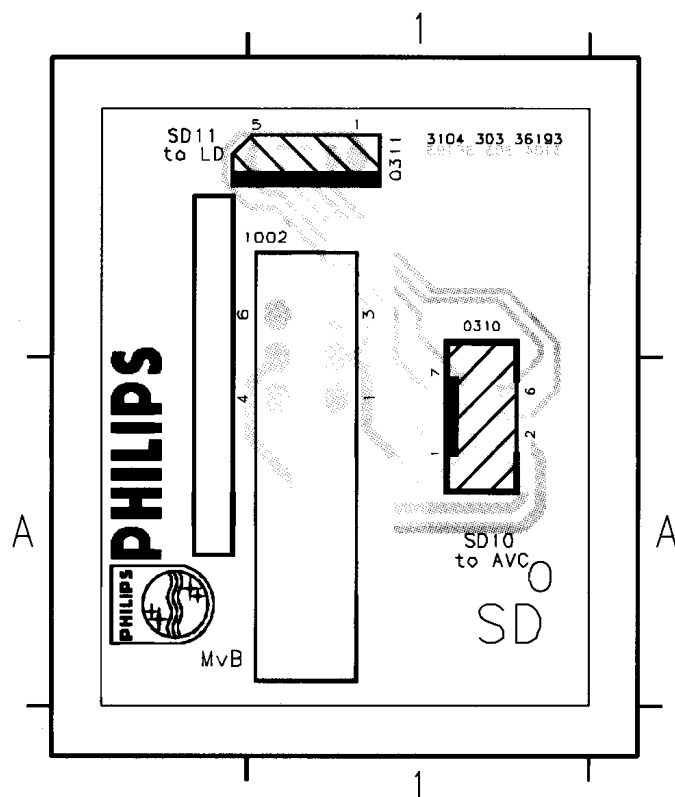
- Input Stage:** The input signal is split into two channels (1 and 2). Channel 1 passes through a 12K resistor (3510) and a 12K resistor (3511) before entering the non-inverting input (pin 5) of the first op-amp (7510). Channel 2 passes through a 12K resistor (3516) and a 12K resistor (3517) before entering the inverting input (pin 2) of the same op-amp. The op-amp is powered by +6V8 and -6V8 rails. The output (pin 1) is connected to the input of the dynamic bass enhancement circuit.
- Dynamic Bass Enhancement Circuit:** This circuit is a feedback loop around the first op-amp. It consists of a network of resistors (3520, 3521, 3522, 2520, 2521, 2522, 2524, 3524, 3525, 3526, 3527, 3528, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 2681, 2682, 2683, 2684, 2685, 2686, 2687, 2688, 2689, 2690, 2691, 2692, 2693, 2694, 2695, 2696, 2697, 2698, 2699, 2700, 2701, 2702, 2703, 2704, 2705, 2706, 2707, 2708, 2709, 2710, 2711, 2712, 2713, 2714, 2715, 2716, 2717, 2718, 2719, 2720, 2721, 2722, 2723, 2724, 2725, 2726, 2727, 2728, 2729, 2730, 2731, 2732, 2733, 2734, 2735, 2736, 2737, 2738, 2739, 2740, 2741, 2742, 2743, 2744, 2745, 2746, 2747, 2748, 2749, 2750, 2751, 2752, 2753, 2754, 2755, 2756, 2757, 2758, 2759, 2760, 2761, 2762, 2763, 2764, 2765, 2766, 2767, 2768, 2769, 2770, 2771, 2772, 2773, 2774, 2775, 2776, 2777, 2778, 2779, 2780, 2781, 2782, 2783, 2784, 2785, 2786, 2787, 2788, 2789, 2790, 2791, 2792, 2793, 2794, 2795, 2796, 2797, 2798, 2799, 2800, 2801, 2802, 2803, 2804, 2805, 2806, 2807, 2808, 2809, 2810, 2811, 2812, 2813, 2814, 2815, 2816, 2817, 2818, 2819, 2820, 2821, 2822, 2823, 2824, 2825, 2826, 2827, 2828, 2829, 2830, 2831, 2832, 2833, 2834, 2835, 2836, 2837, 2838, 2839, 2840, 2841, 2842, 2843, 2844, 2845, 2846, 2847, 2848, 2849, 2850, 2851, 2852, 2853, 2854, 2855, 2856, 2857, 2858, 2859, 2860, 2861, 2862, 2863, 2864, 2865, 2866, 2867, 2868, 2869, 2870, 2871, 2872, 2873, 2874, 2875, 2876, 2877, 2878, 2879, 2880, 2881, 2882, 2883, 2884, 2885, 2886, 2887, 2888, 2889, 2890, 2891, 2892, 2893, 2894, 2895, 2896, 2897, 2898, 2899, 2900, 2901, 2902, 2903, 2904, 2905, 2906, 2907, 2908, 2909, 2910, 2911, 2912, 2913, 2914, 2915, 2916, 2917, 2918, 2919, 2920, 2921, 2922, 2923, 2924, 2925, 2926, 2927, 2928, 2929, 2930, 2931, 2932, 2933, 2934, 2935, 2936, 2937, 2938, 2939, 2940, 2941, 2942, 2943, 2944, 2945, 2946, 2947, 2948, 2949, 2950, 2951, 2952, 2953, 2954, 2955, 2956, 2957, 2958, 2959, 2960, 2961, 2962, 2963, 2964, 2965, 2966, 2967, 2968, 2969, 2970, 2971, 2972, 2973, 2974, 2975, 2976, 2977, 2978, 2979, 2980, 2981, 2982, 2983, 2984, 2985, 2986, 2987, 2988, 2989, 2990, 2991, 2992, 2993, 2994, 2995, 2996, 2997, 2998, 2999, 3000, 3001, 3002, 3003, 3004, 3005, 3006, 3007, 3008, 3009, 3010, 3011, 3012, 3013, 3014, 3015, 3016, 3017, 3018, 3019, 3020, 3021, 3022, 3023, 3024, 3025, 3026, 3027, 3028, 3029, 3030, 3031, 3032, 3033, 3034, 3035, 3036, 3037, 3038, 3039, 3040, 3041, 3042, 3043, 3044, 3045, 3046, 3047, 3048, 3049, 3050, 3051, 3052, 3053, 3054, 3055, 3056, 3057, 3058, 3059, 3060, 3061, 3062, 3063, 3064, 3065, 3066, 3067, 3068, 3069, 3070, 3071, 3072, 3073, 3074, 3075, 3076, 3077, 3078, 3079, 3080, 3081, 3082, 3083, 3084, 3085, 3086, 3087, 3088, 3089, 3090, 3091, 3092, 3093, 3094, 3095, 3096, 3097, 3098, 3099, 3100, 3101, 3102, 3103, 3104, 3105, 3106, 3107, 3108, 3109, 3110, 3111, 3112, 3113, 3114, 3115, 3116, 3117, 3118, 3119, 3120, 3121, 3122, 3123, 3124, 3125, 3126, 3127, 3128, 3129, 3130, 3131, 3132, 3133, 3134, 3135, 3136, 3137, 3138, 3139, 3140, 3141, 3142, 3143, 3144, 3145, 3146, 3147, 3148, 3149, 3150, 3151, 3152, 3153, 3154, 3155, 3156, 31



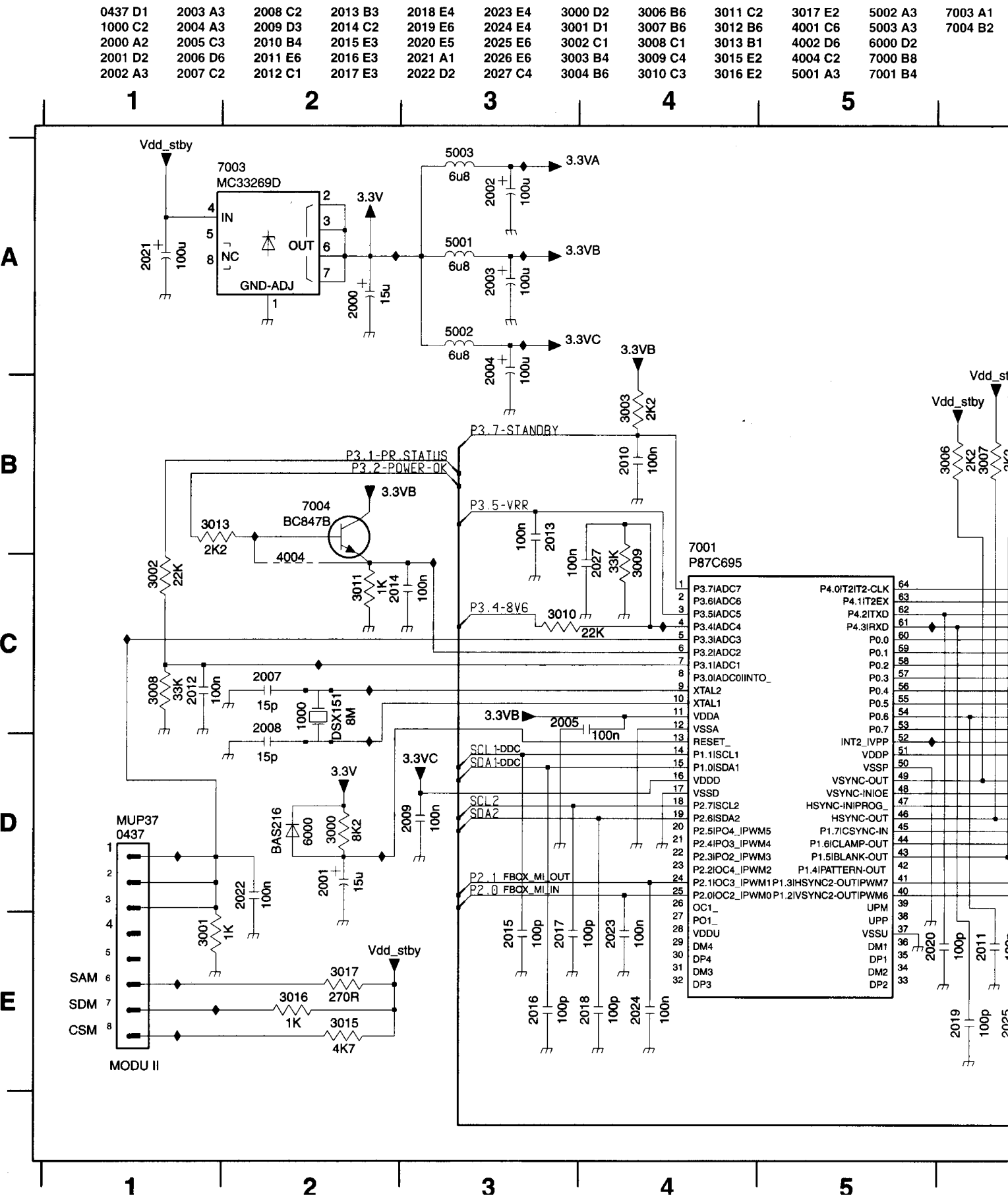
## Switch panel

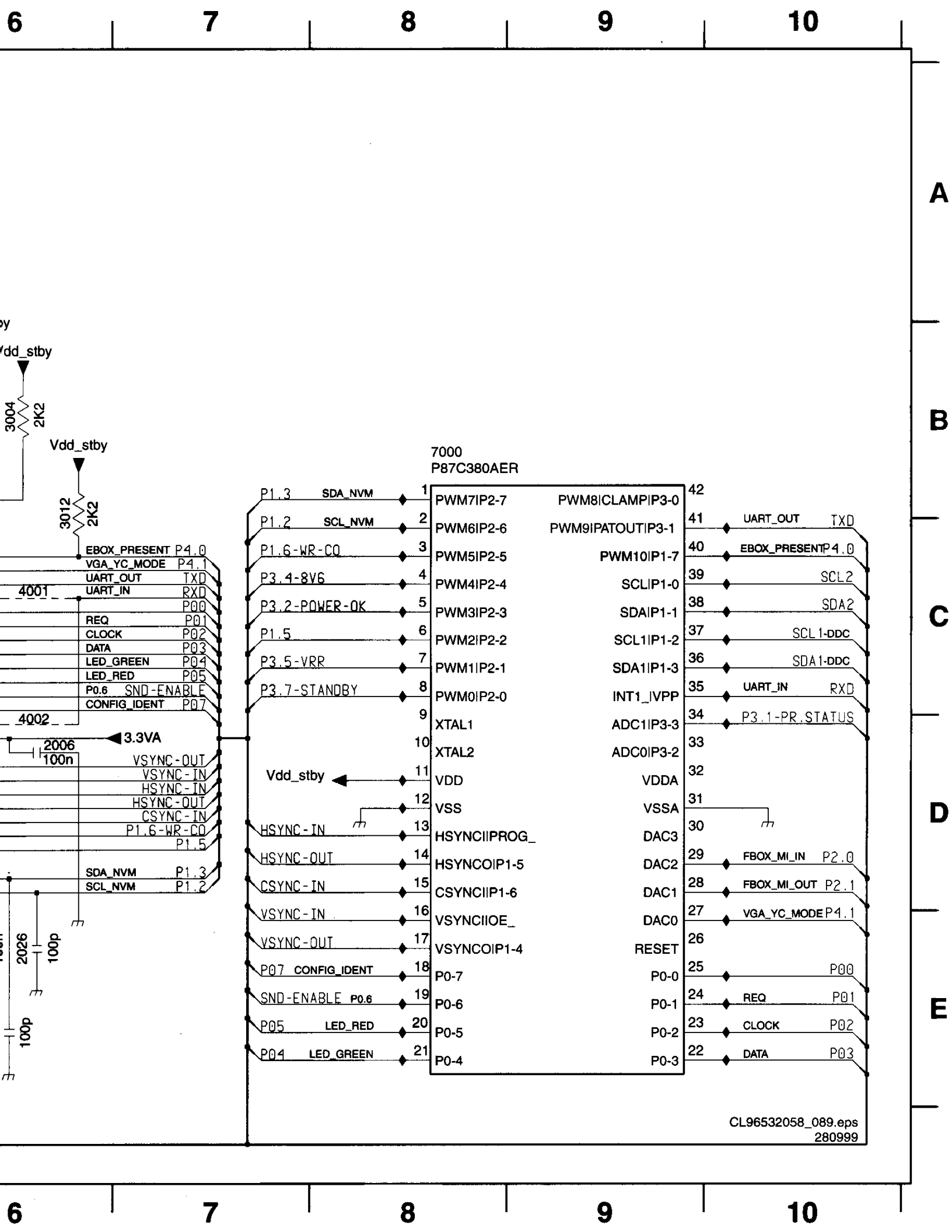


## Switch panel (component side)



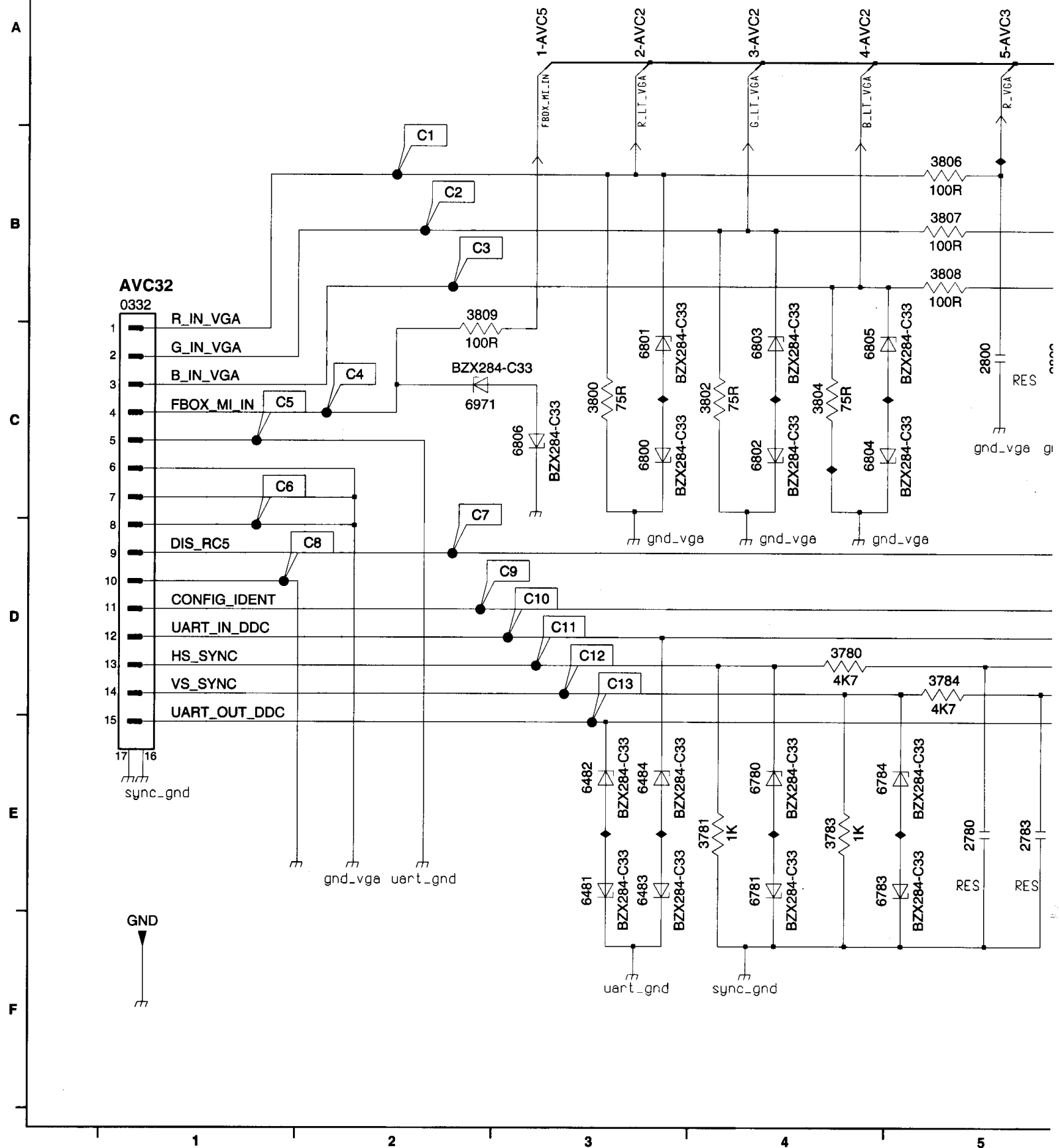
Monitor microprocessor panel



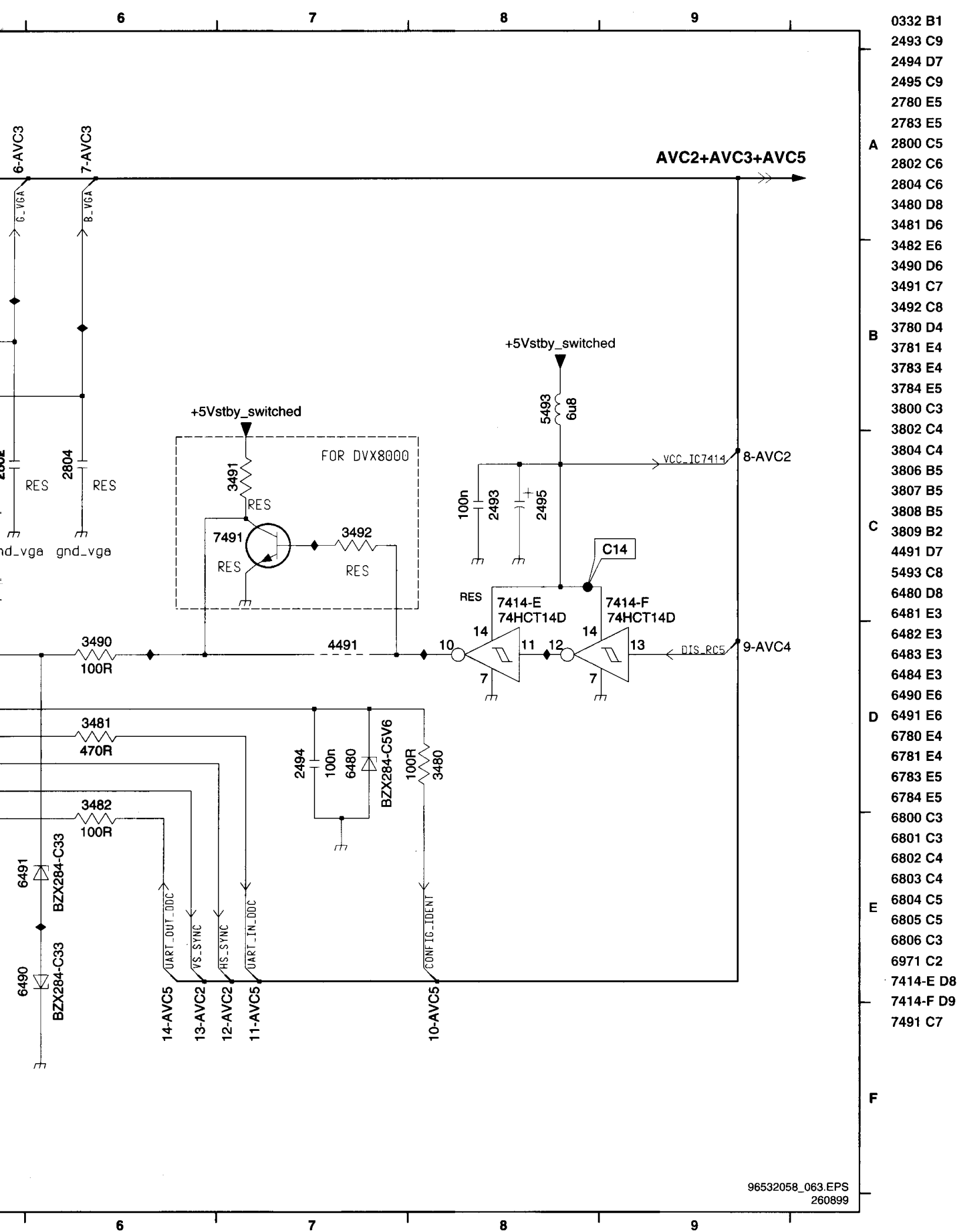


AV control

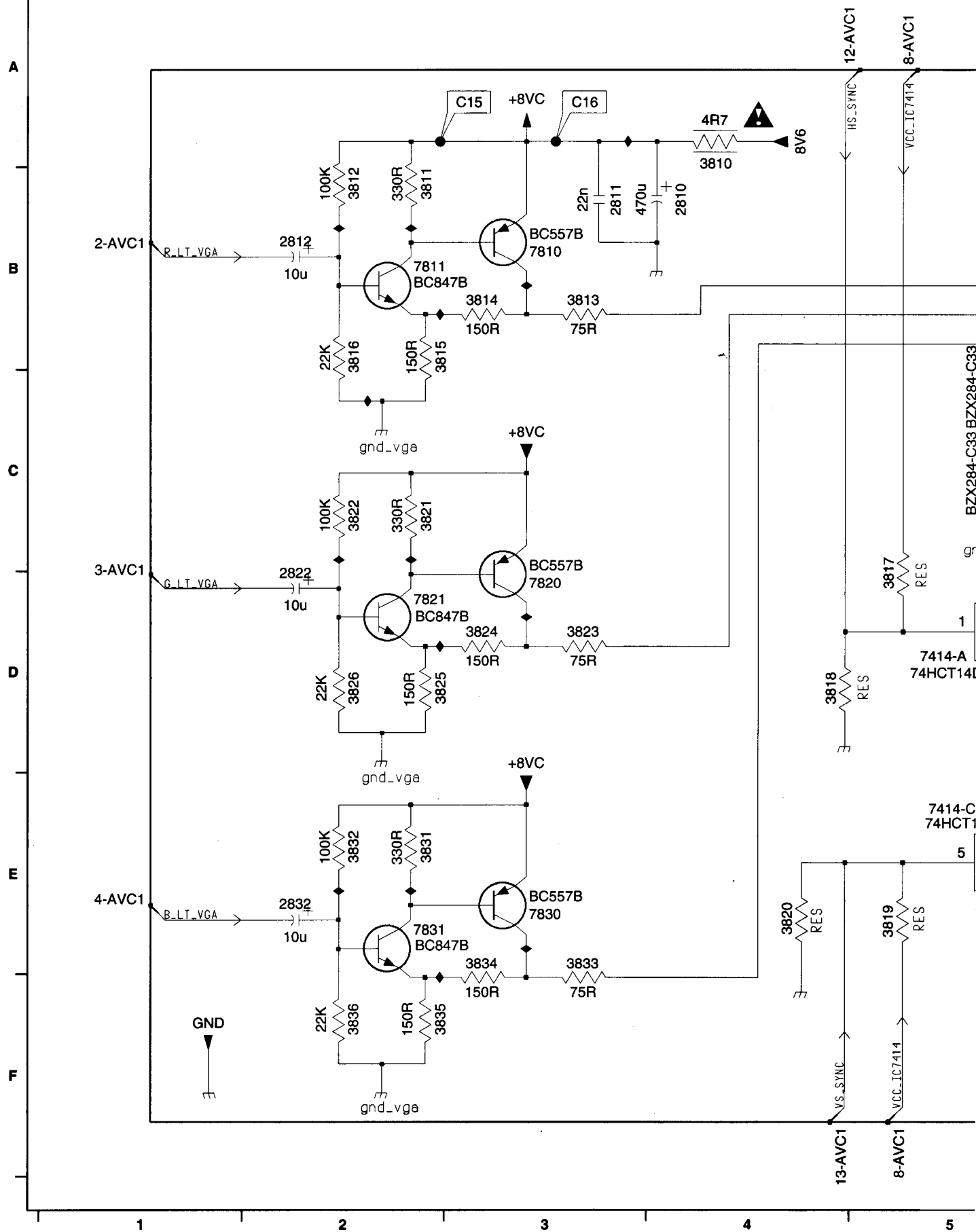
AVC 1 RGB INPUT

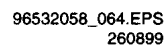






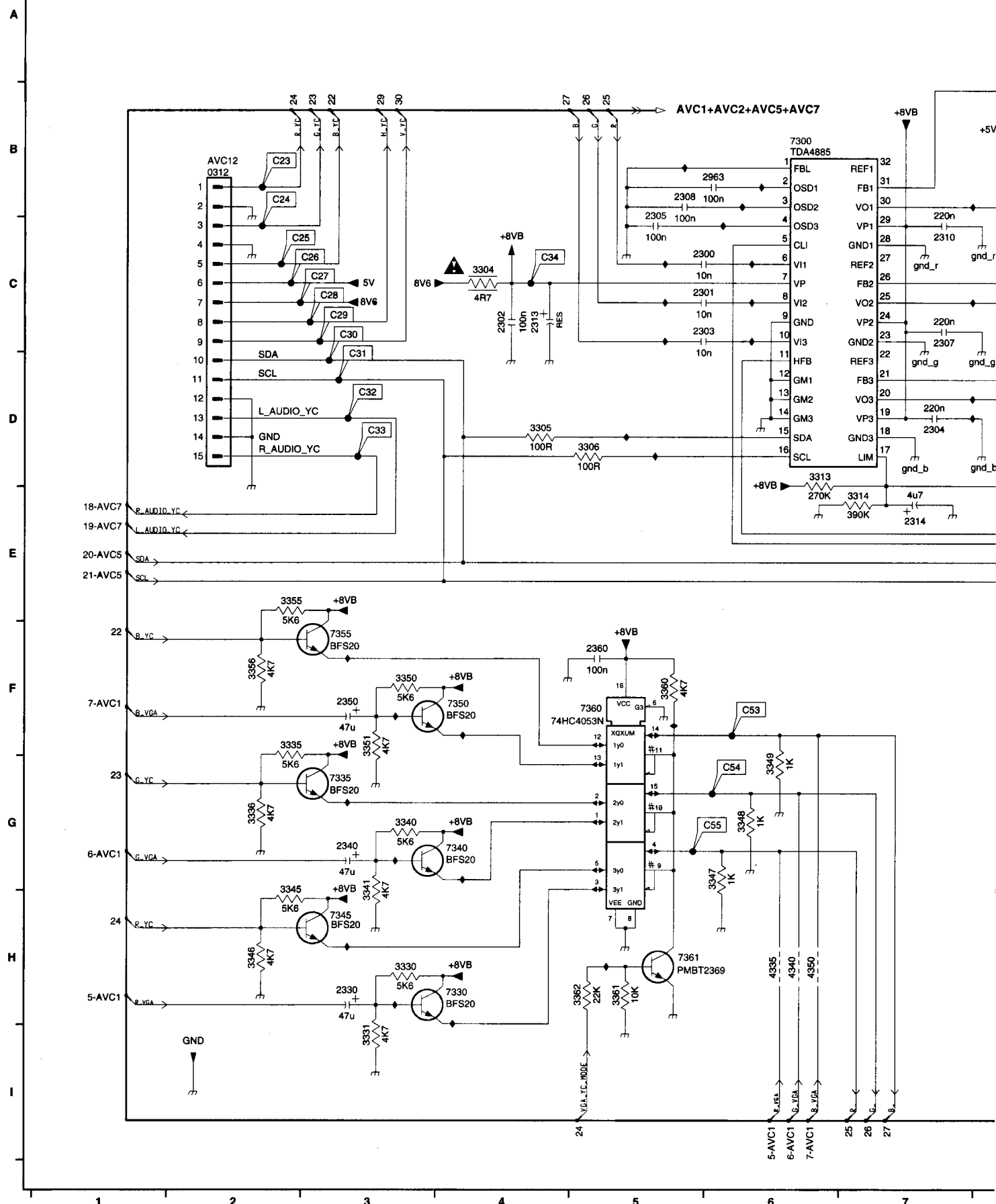
## AV control

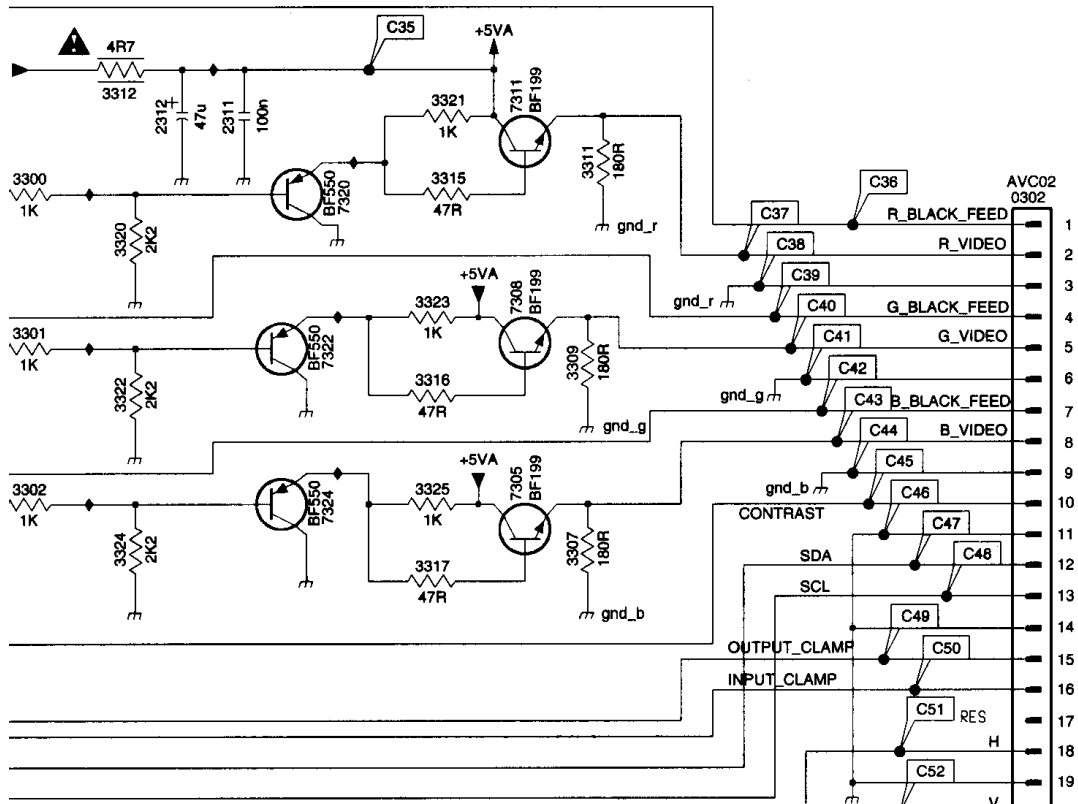
**AVC2****RGB OUTPUT**



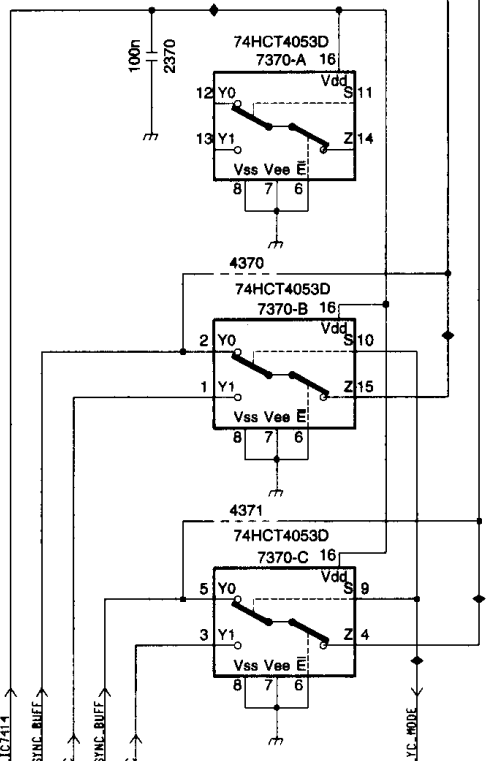
## AV control

# AVC3 VIDEO CONTROL



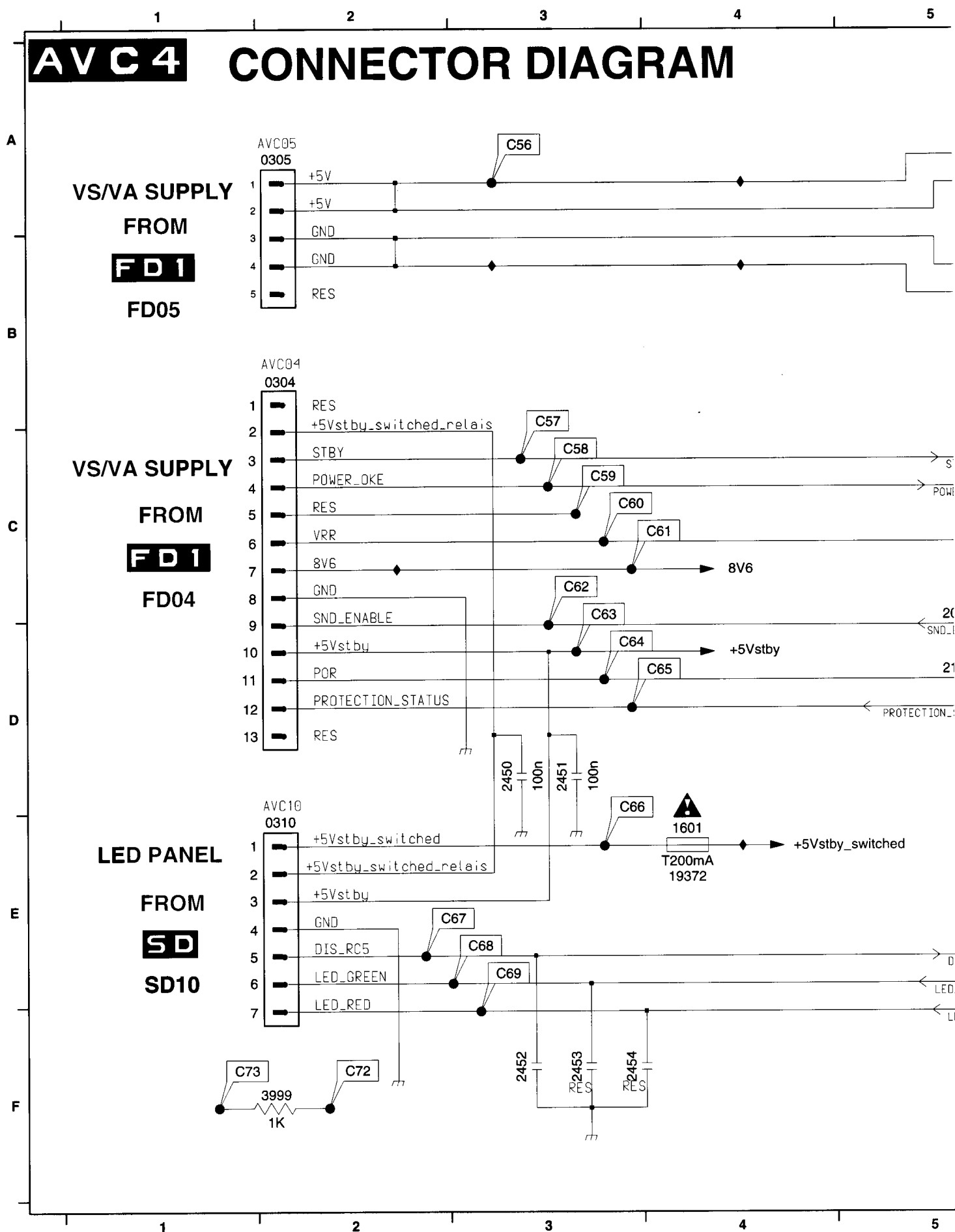


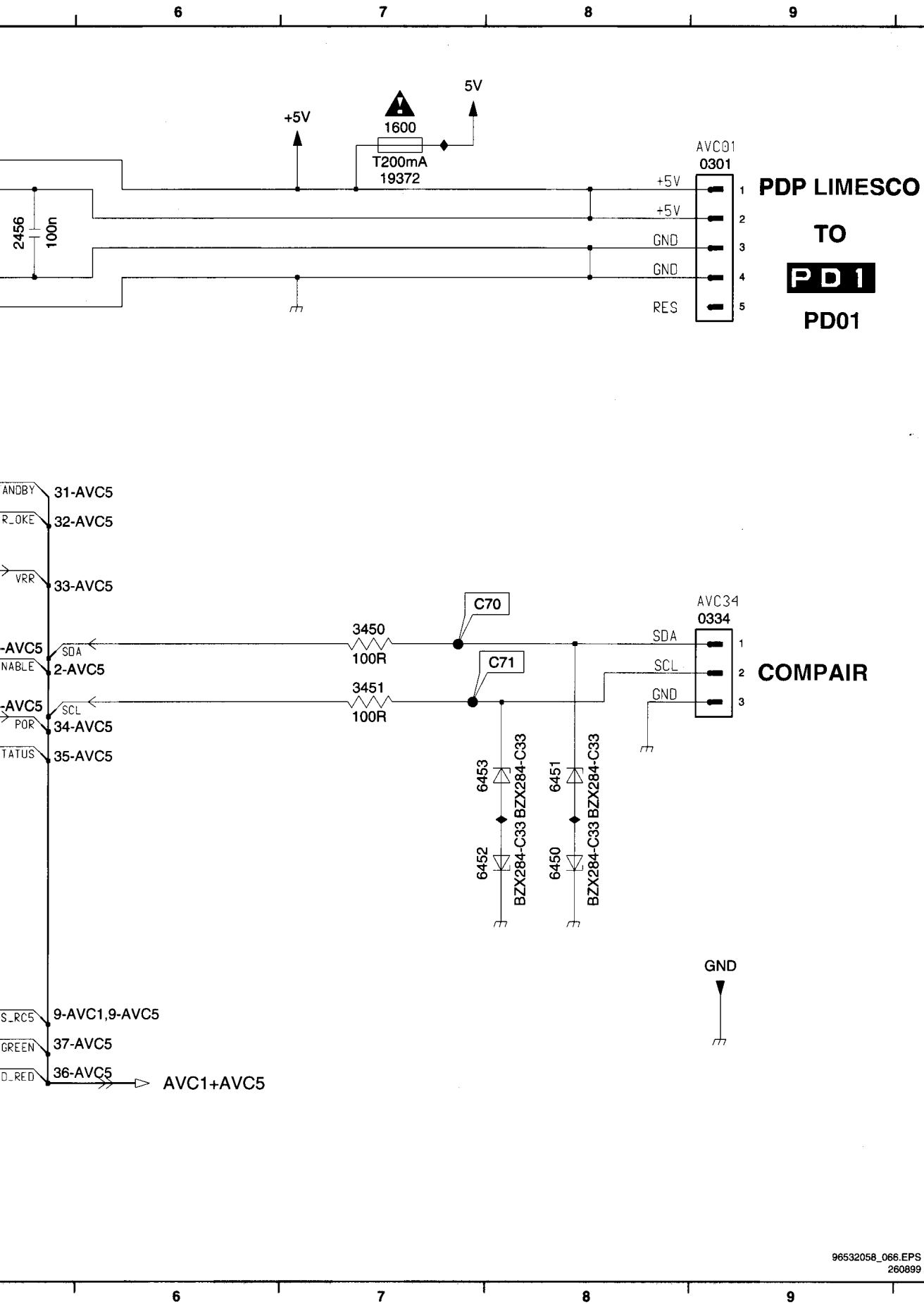
PDP LIMESCO  
TO  
**PD 1**  
PD02



- 0302 B12
- 0312 B2
- 2300 B5
- 2301 C5
- 2302 C4
- 2303 C5
- A 2304 E7
- 2305 B5
- 2307 D8
- 2308 B5
- 2310 B8
- 2311 A10
- 2312 A10
- 2313 C5
- B 2314 D7
- 2330 H3
- 2340 F3
- 2350 E3
- 2360 E5
- 2370 G10
- 2963 B5
- 3300 B8
- C 3301 C7
- 3302 E8
- 3304 B4
- 3305 D5
- 3306 D5
- 3307 E10
- 3309 D10
- 3311 B10
- D 3312 A11
- 3313 D6
- 3314 D7
- 3315 B9
- 3316 C9
- 3317 D9
- 3320 B8
- 3321 A9
- E 3322 D8
- 3323 C9
- 3324 E8
- 3325 D9
- 3330 G4
- 3331 H4
- 3335 G3
- F 3336 G3
- 3340 F4
- 3341 G4
- 3345 H3
- 3346 H3
- 3347 G6
- 3348 F6
- 3349 F6
- G 3350 E4
- 3351 E4
- 3355 E3
- 3356 F3
- 3360 F6
- 3361 I5
- 3362 H5
- 4335 E6
- H 4340 E6
- 4350 E6
- 4370 G9
- 4371 I9
- 7300 B6
- 7305 D10
- 7308 C10
- 7311 B10
- I 7320 B8
- 7322 C8
- 7324 D8
- 7330 H4
- 7335 G3
- 7340 F4
- 7345 H3
- 7350 E4
- 7355 E3
- 7360 F6
- 7361 H6
- 7370-A G11
- 7370-B G9
- 7370-C H9

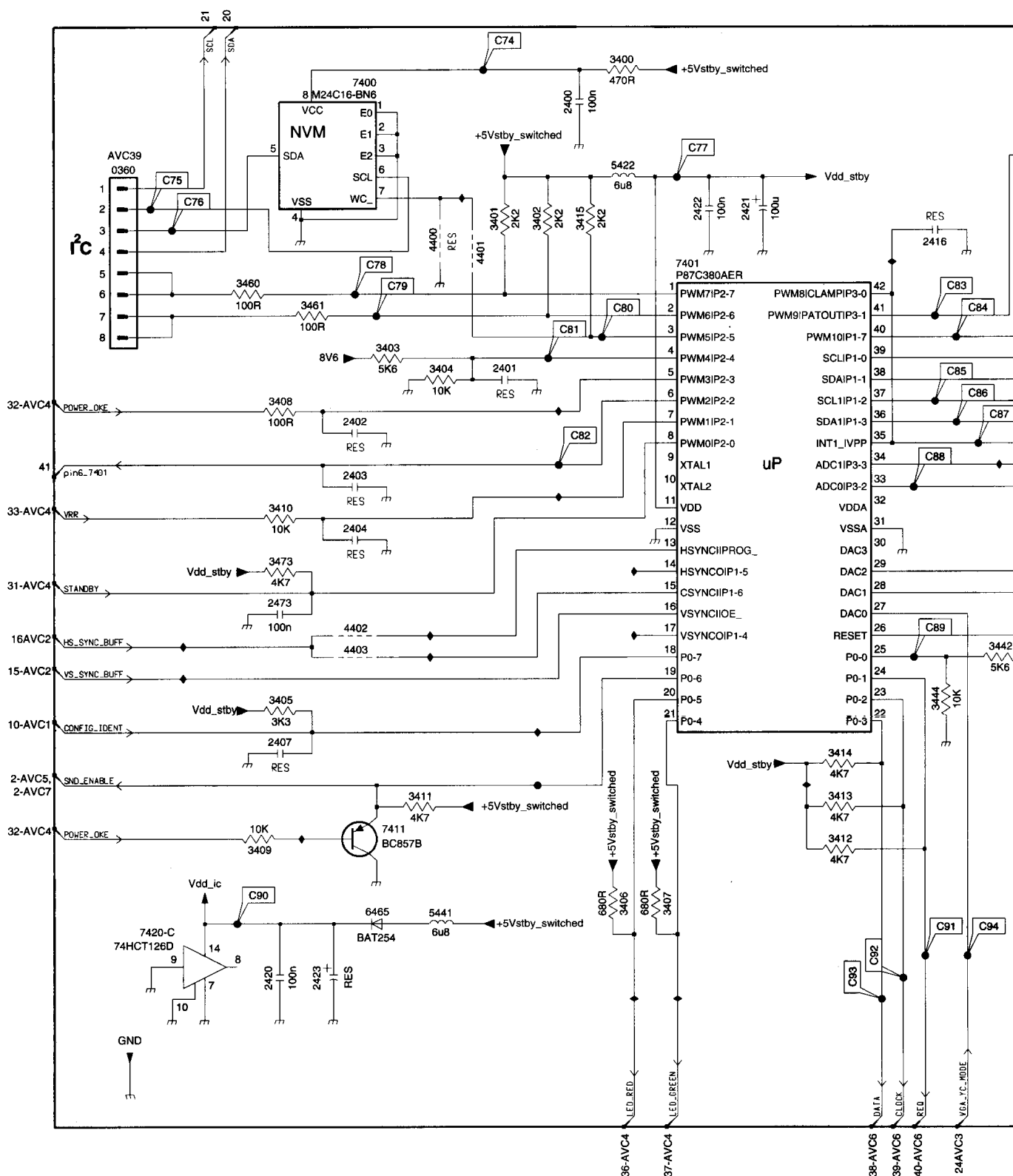
## AV control



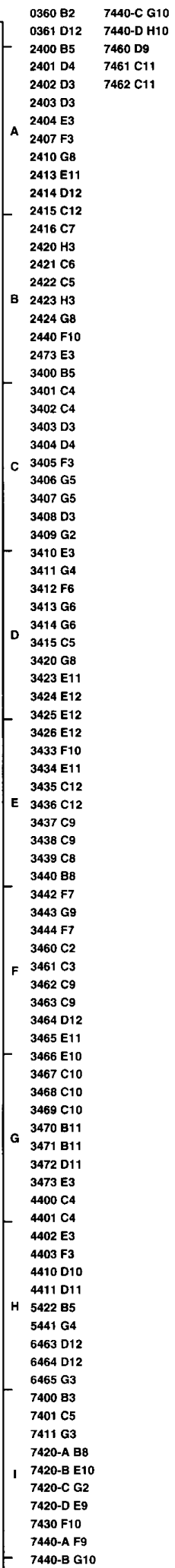


0301 A9  
 0304 B2  
 0305 A2  
 0310 E2  
 0334 C9  
 1600 A7  
 1601 E4  
 2450 D3  
 2451 D3  
 2452 F3  
 2453 F3  
 2454 F3  
 2456 A5  
 3450 C7  
 3451 D7  
 3999 F2  
 6450 E8  
 6451 D8  
 6452 E8  
 6453 D8

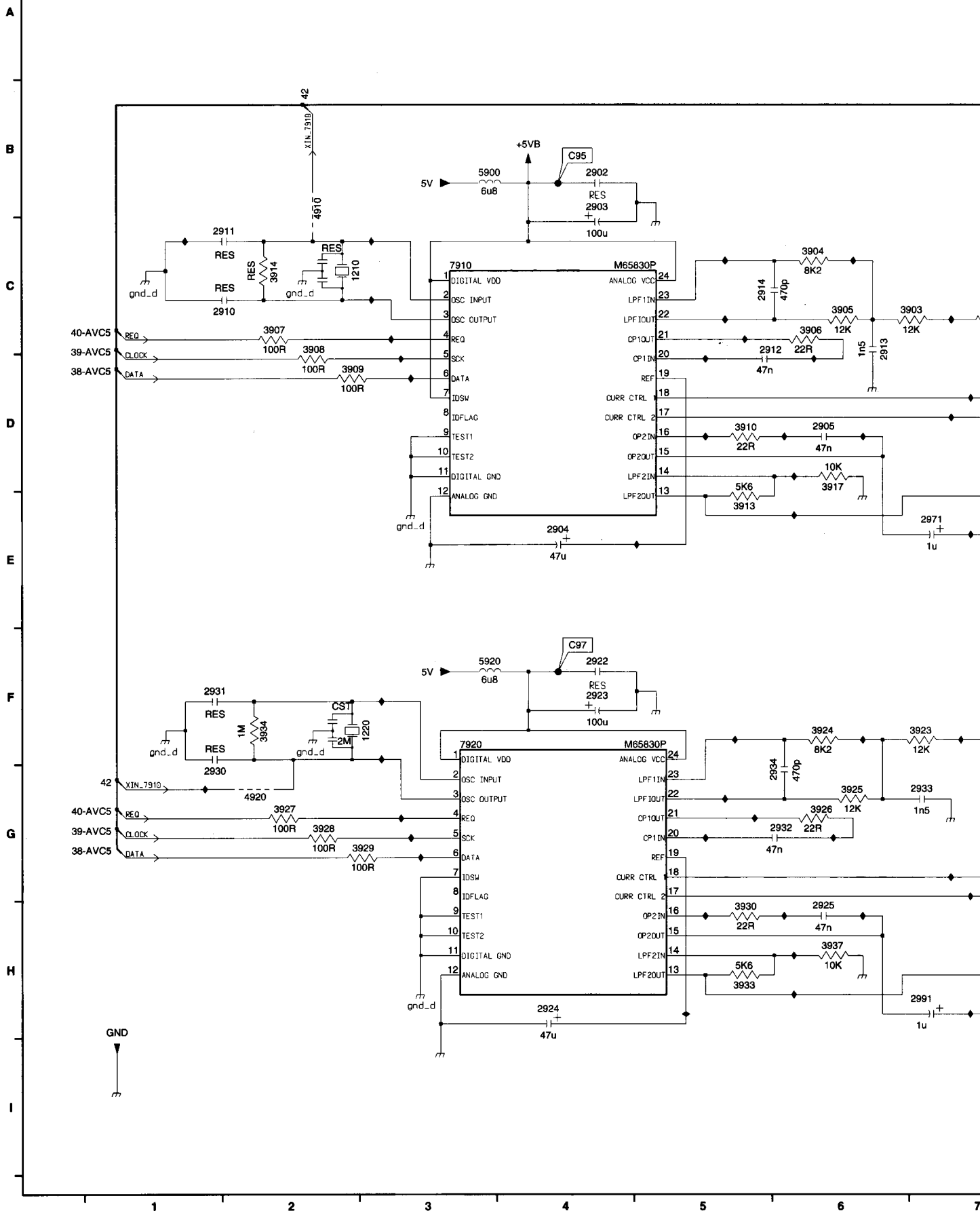
# AVC5 CONTROL

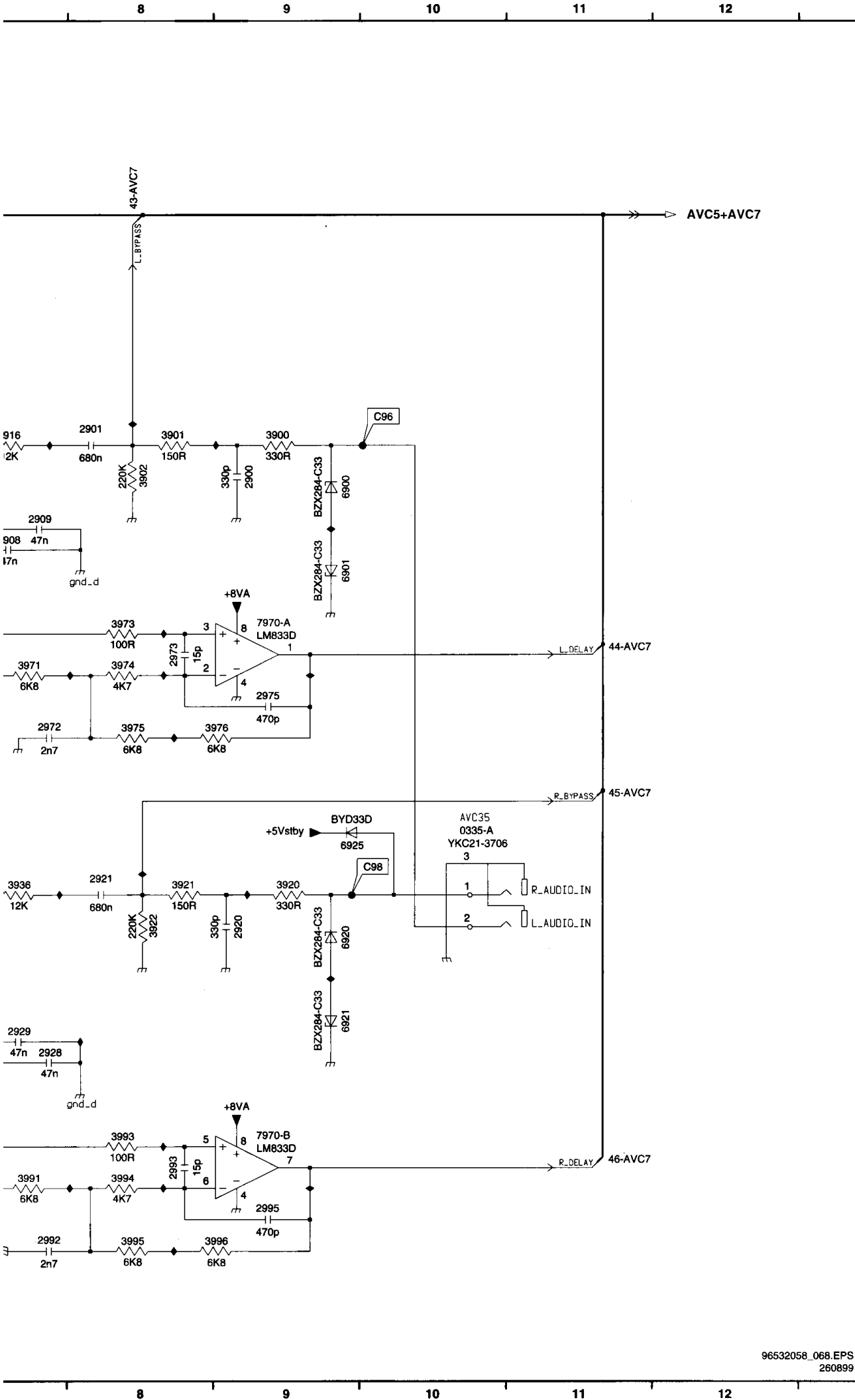






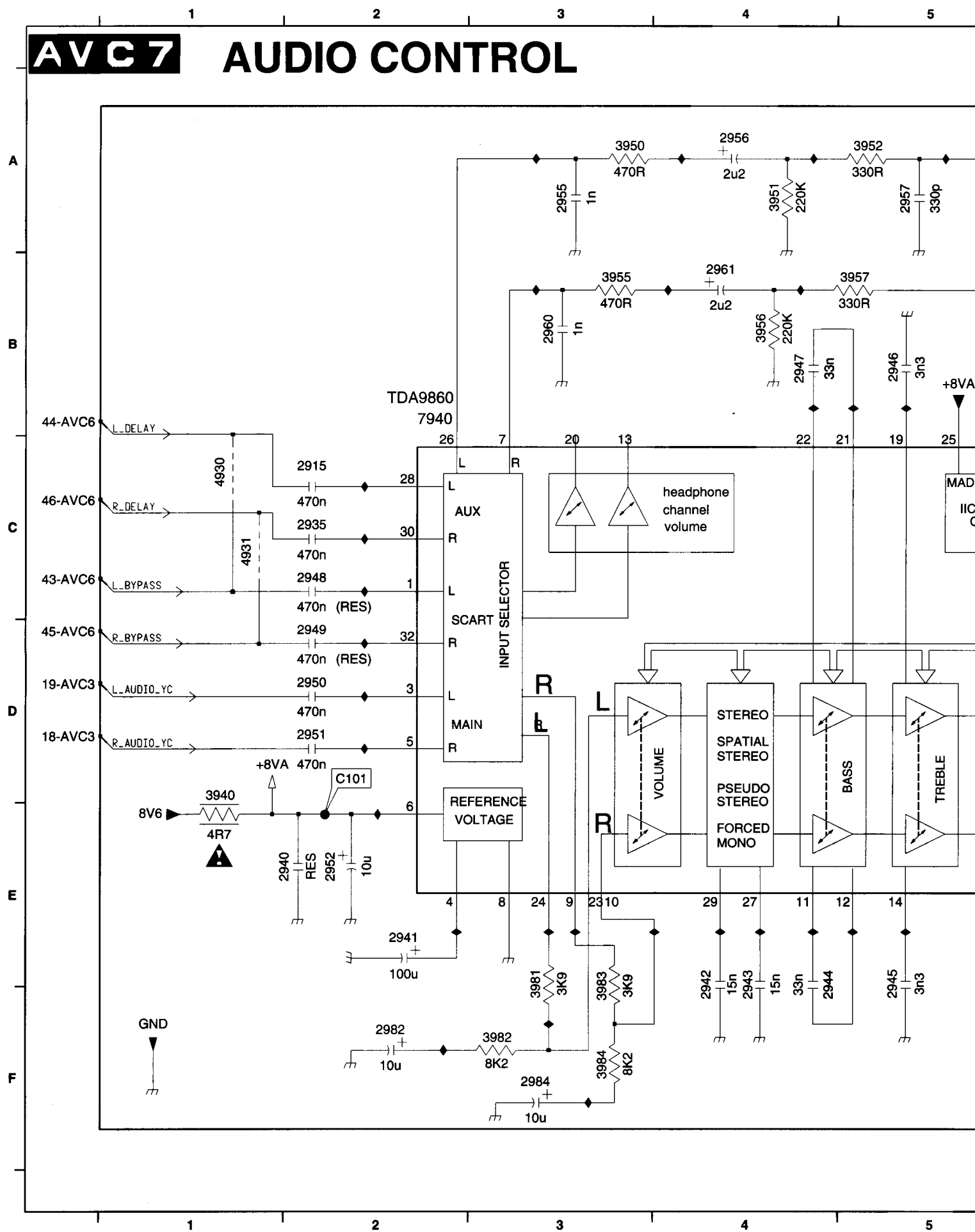
## AV control

**AVC6****AUDIO PROCESSING**



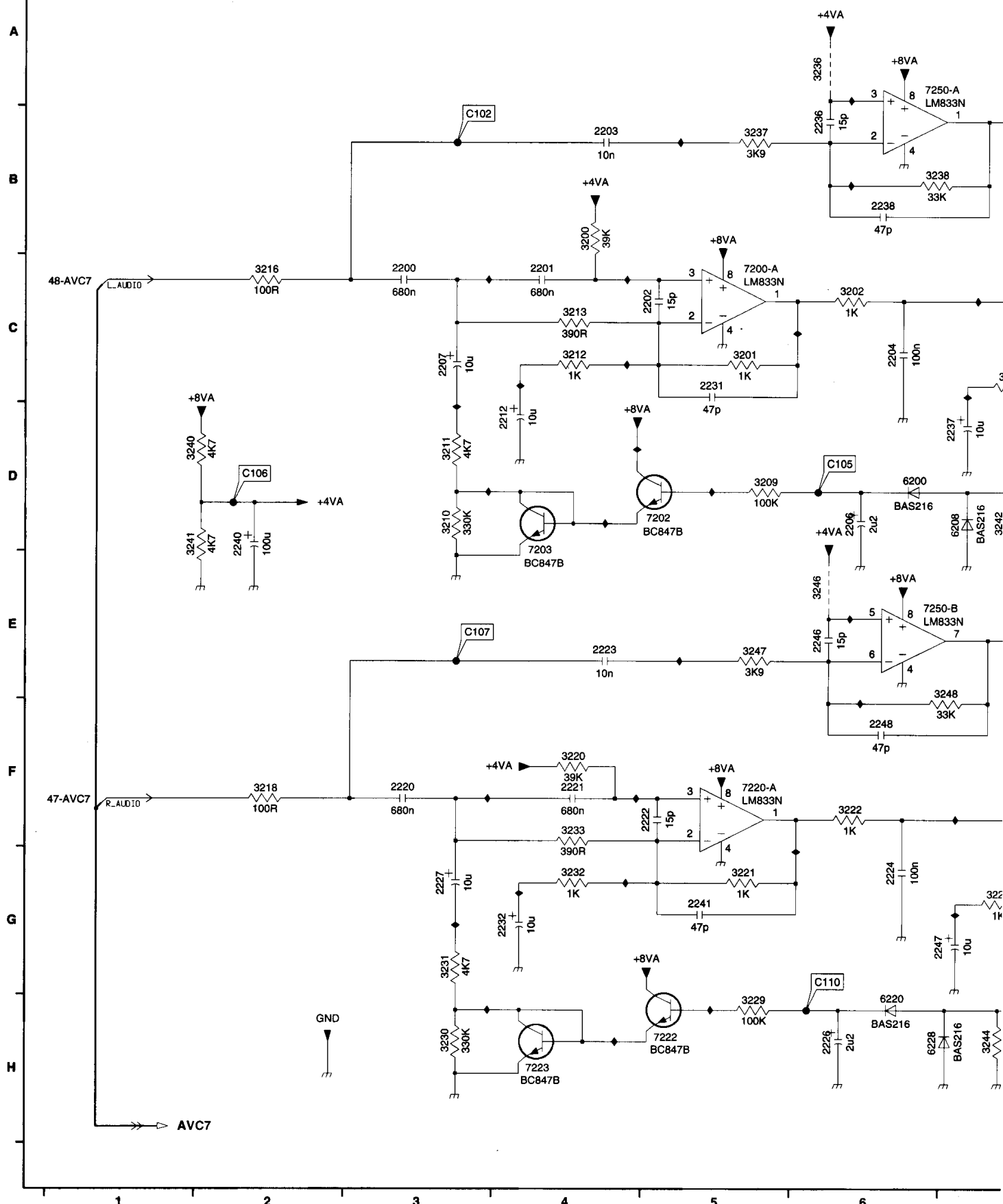
|          |            |
|----------|------------|
| 1210 B2  | 3994 H11   |
| 1220 F2  | 3995 H11   |
| 2900 A8  | 3996 H11   |
| 2901 A8  | 4910 B1    |
| 2902 A4  | 4920 G3    |
| 2903 A4  | 5900 A3    |
| 2904 C4  | 5920 E4    |
| 2905 B6  | 6900 A9    |
| 2908 B7  | 6901 B9    |
| 2909 B7  | 6920 F9    |
| 2910 C3  | 6921 F9    |
| 2911 C1  | 6925 E11   |
| 2912 B6  | 7910 A4    |
| 2913 B6  | 7920 F4    |
| 2914 A6  | 7970-A C11 |
| 2920 F8  | 7970-B G11 |
| 2921 E8  |            |
| 2922 E5  |            |
| 2923 E4  |            |
| 2924 G4  |            |
| 2925 G6  |            |
| 2928 G7  |            |
| 2929 F7  |            |
| 2930 G3  |            |
| 2931 G1  |            |
| 2932 F6  |            |
| 2933 F7  |            |
| 2934 F6  |            |
| 2971 C10 |            |
| 2972 D10 |            |
| 2973 C11 |            |
| 2975 D11 |            |
| 2991 H10 |            |
| 2992 I10 |            |
| 2993 H11 |            |
| 2995 H11 |            |
| 3900 A8  |            |
| 3901 A8  |            |
| 3902 A8  |            |
| 3903 A7  |            |
| 3904 A6  |            |
| 3905 B6  |            |
| 3906 B6  |            |
| 3907 B3  |            |
| 3908 B3  |            |
| 3909 B3  |            |
| 3910 B6  |            |
| 3913 C6  |            |
| 3914 C2  |            |
| 3916 A7  |            |
| 3917 C6  |            |
| 3920 E8  |            |
| 3921 E8  |            |
| 3922 F8  |            |
| 3923 E7  |            |
| 3924 E6  |            |
| 3925 F6  |            |
| 3926 F6  |            |
| 3927 F3  |            |
| 3928 F3  |            |
| 3929 F3  |            |
| 3930 G6  |            |
| 3933 G6  |            |
| 3934 G2  |            |
| 3936 E7  |            |
| 3937 G6  |            |
| 3971 C10 |            |
| 3973 C11 |            |
| 3974 C11 |            |
| 3975 D11 |            |
| 3976 D11 |            |
| 3991 H10 |            |

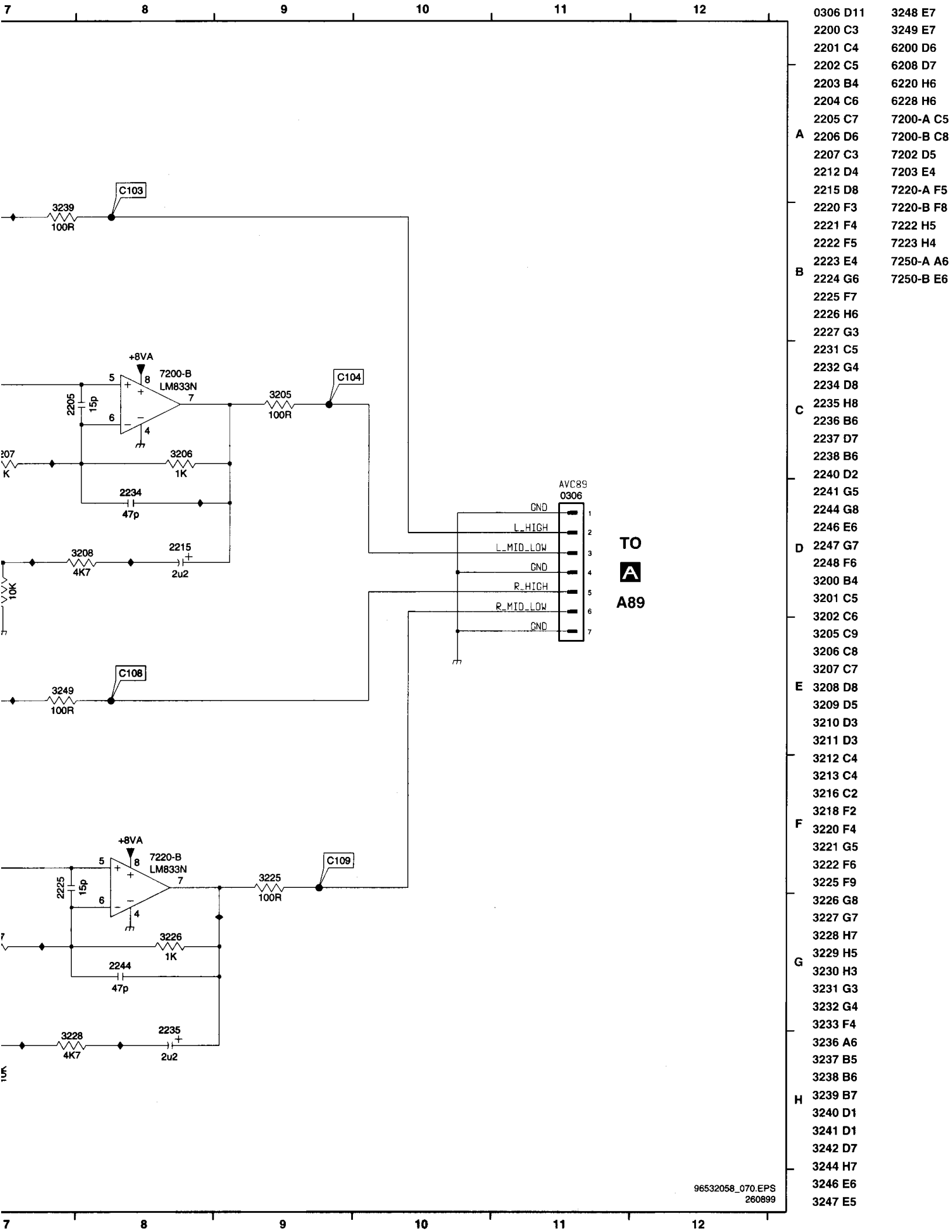
## AV control





## AV control

**AVC8 AUDIO FILTER + DBE**



## PDP limesco

**PD 1 INTERCONNECT**

A

B

C

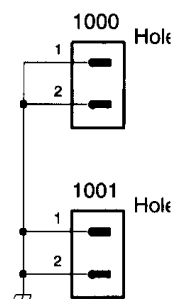
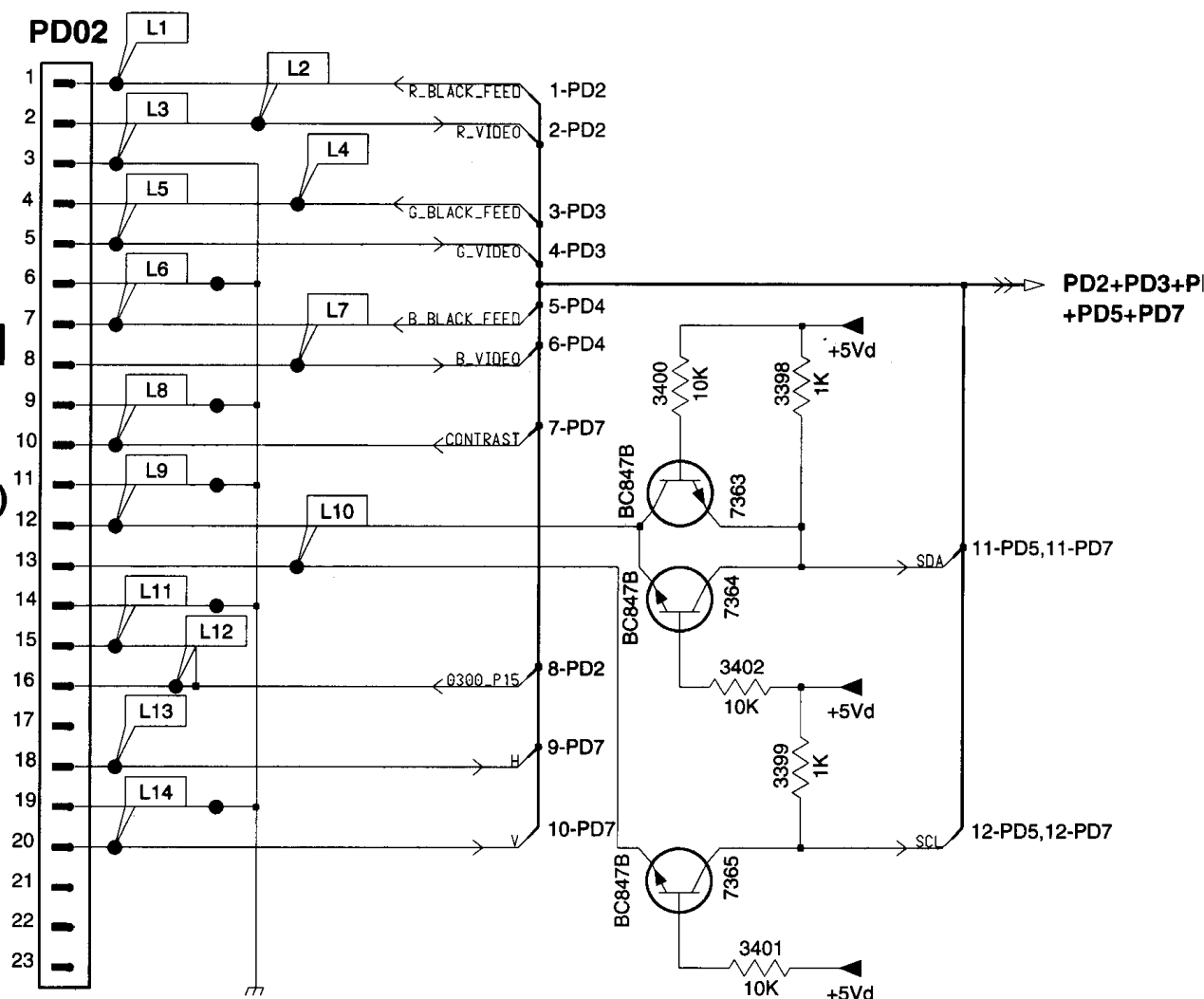
D

E

F

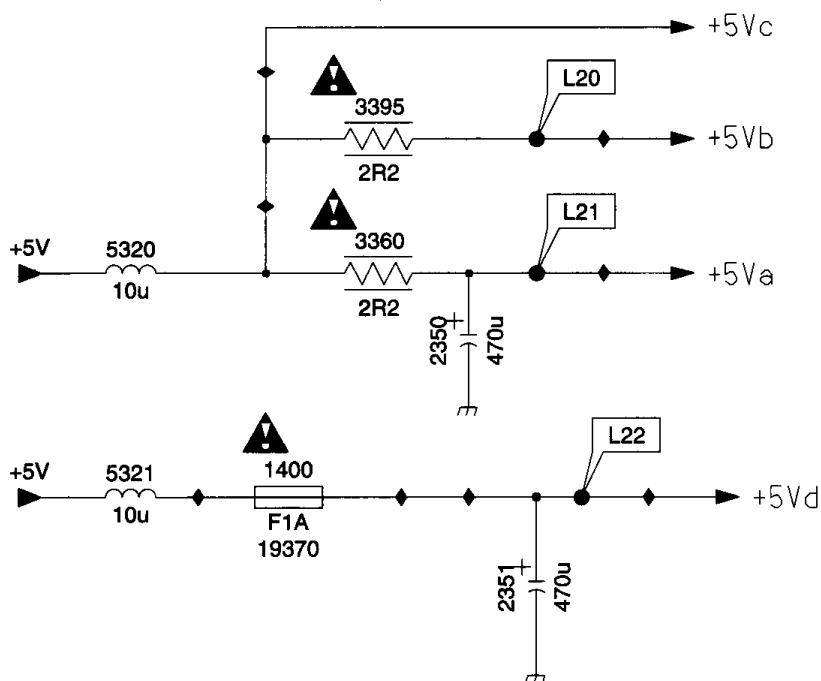
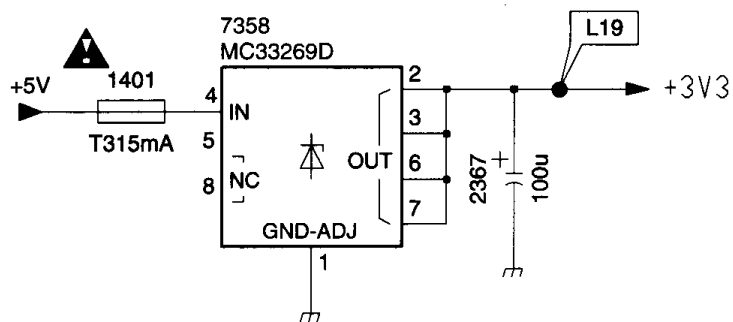
TO  
**AVC3**  
AVC02  
(VIDEO  
CONTROL)

TO  
**AVC4**  
AVC01  
(CONNECTOR  
DIAGRAM)



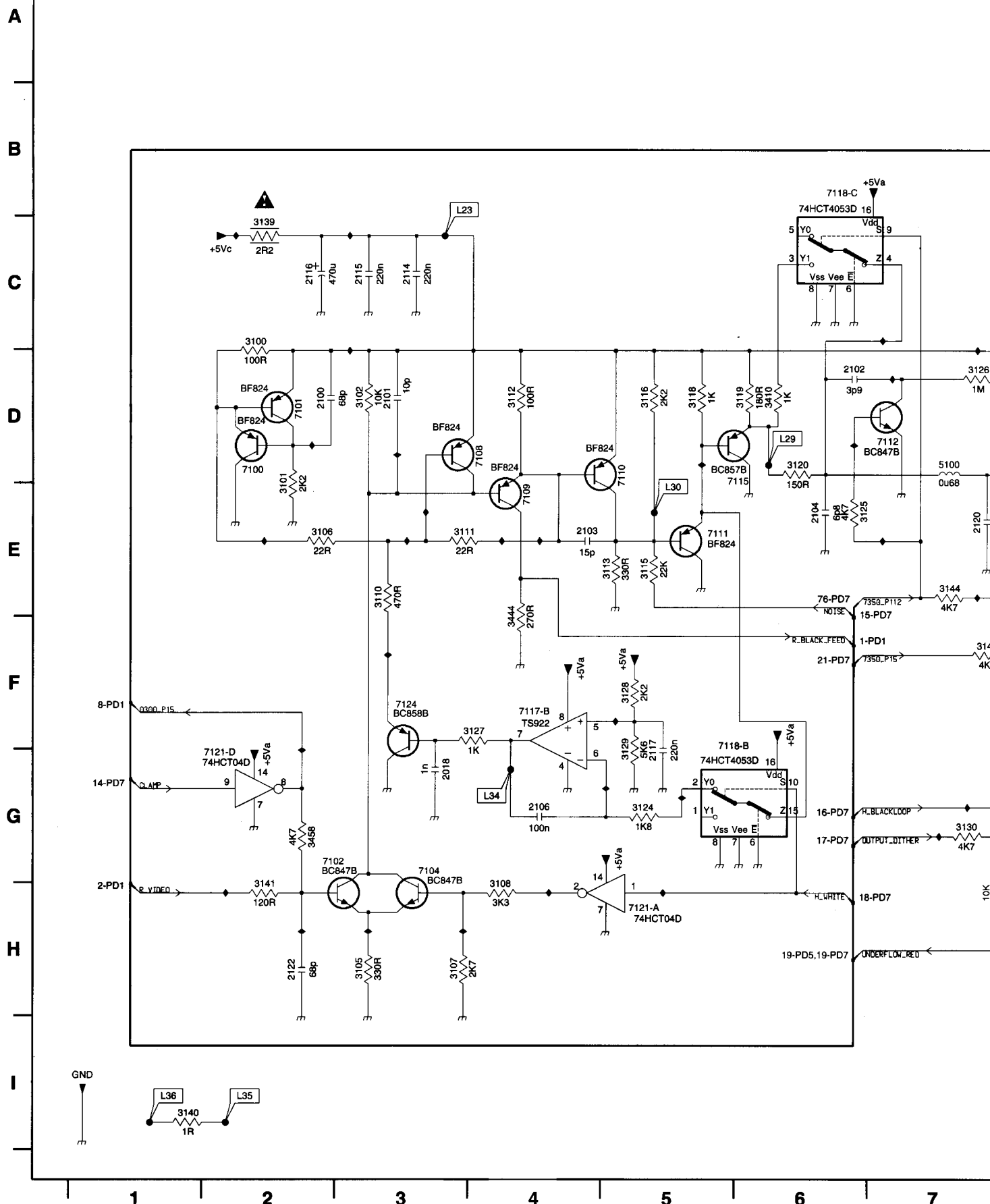


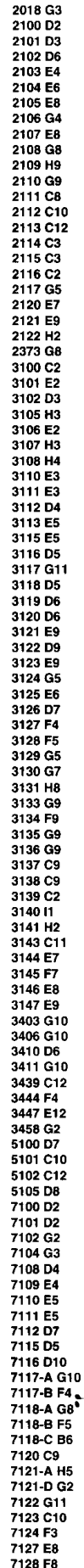
1000 E5  
1001 F5  
1400 E7  
1401 B6  
2350 D7  
2351 E8  
2367 C7  
3360 D7  
3395 D7  
3398 C4  
3399 D4  
3400 C3  
3401 E4  
3402 D4  
5320 D6  
5321 E6  
7358 B7  
7363 C4  
7364 D4  
7365 E4



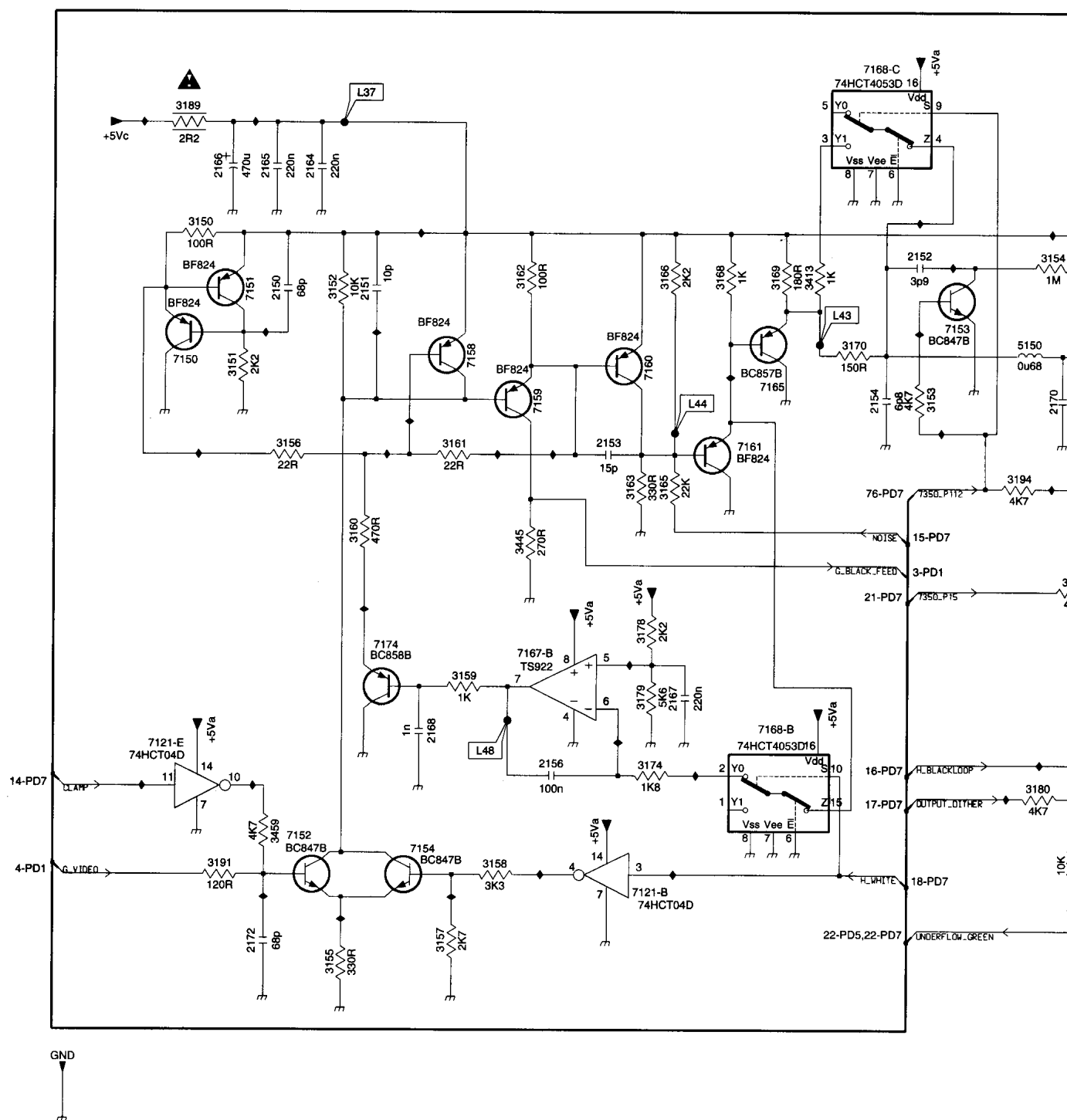
**PD 2**

## RED GAMMA + ADC





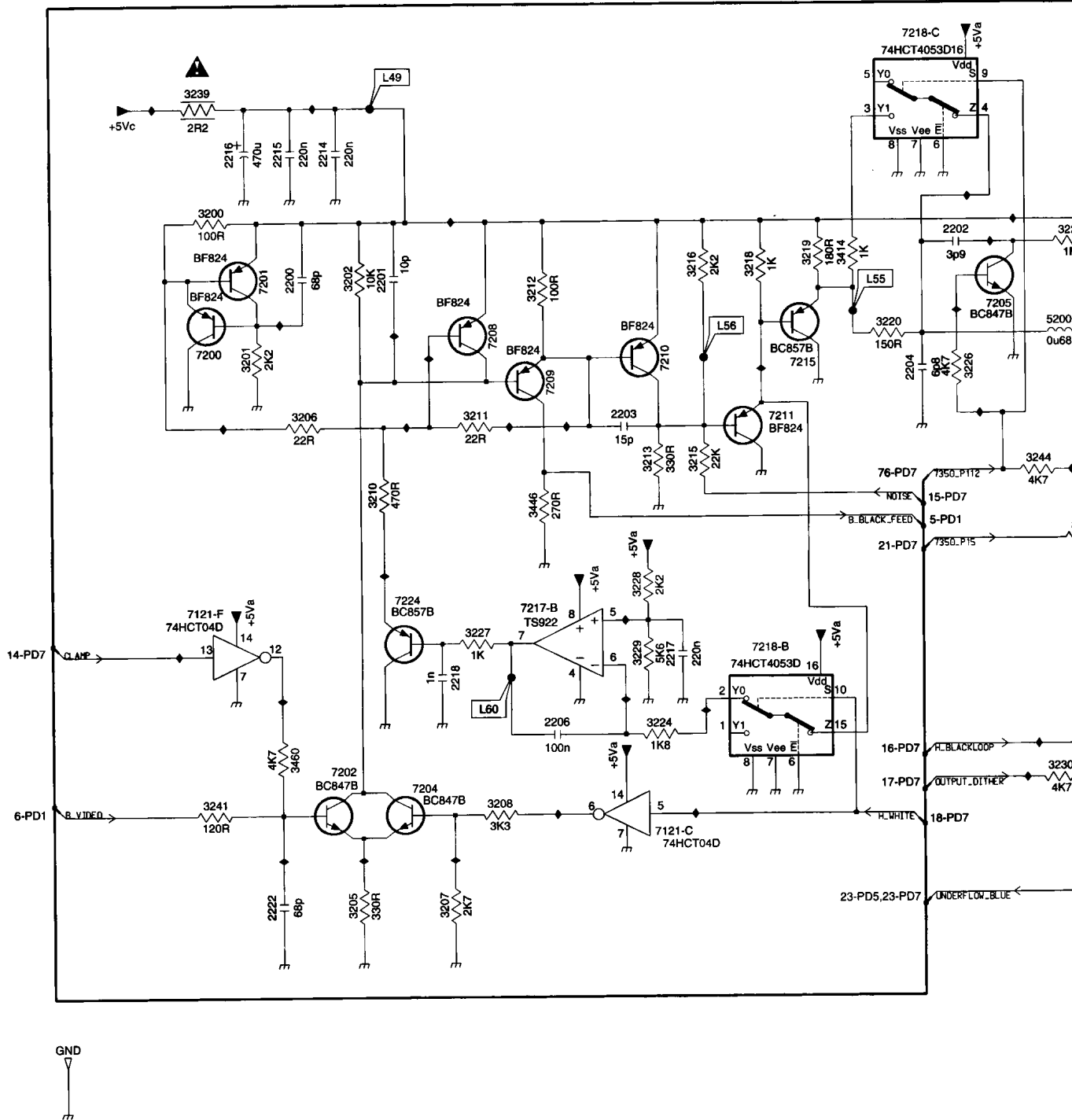
**PD3**





96532058\_075.EPS  
270899

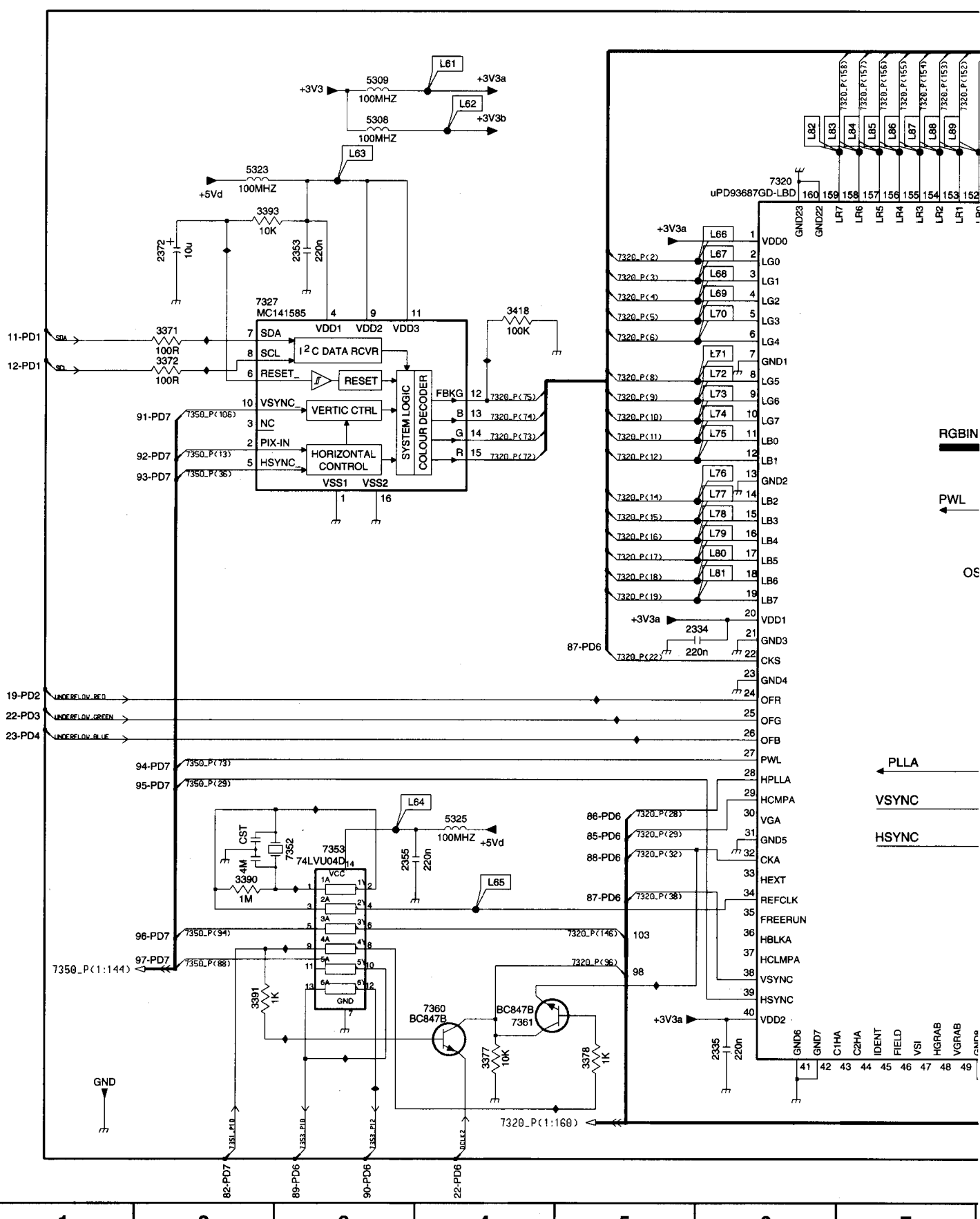
## PD 4 BLUE GAMMA + ADC



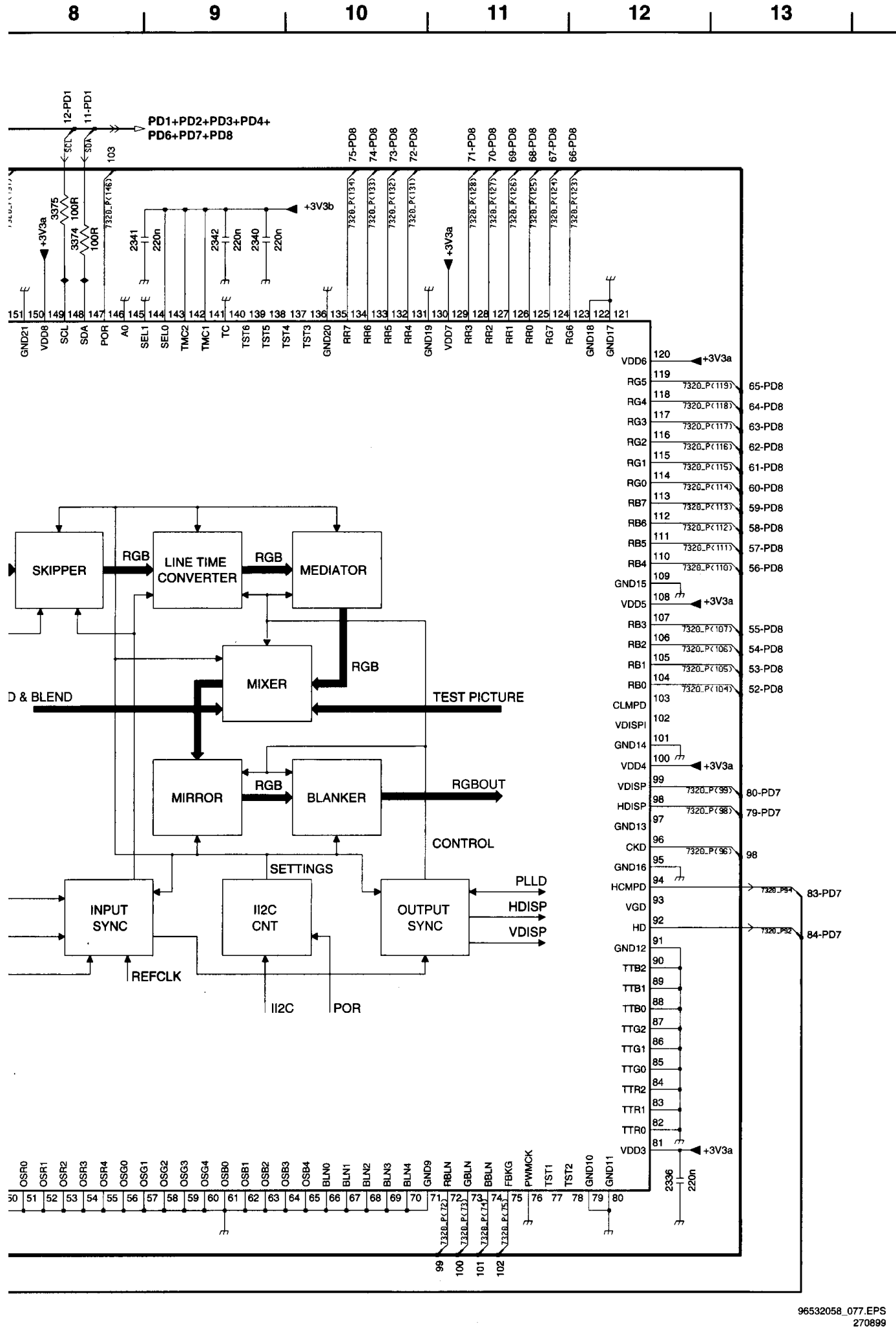


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270899

# PDF5 SCAN CONVERTER + OSD



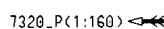


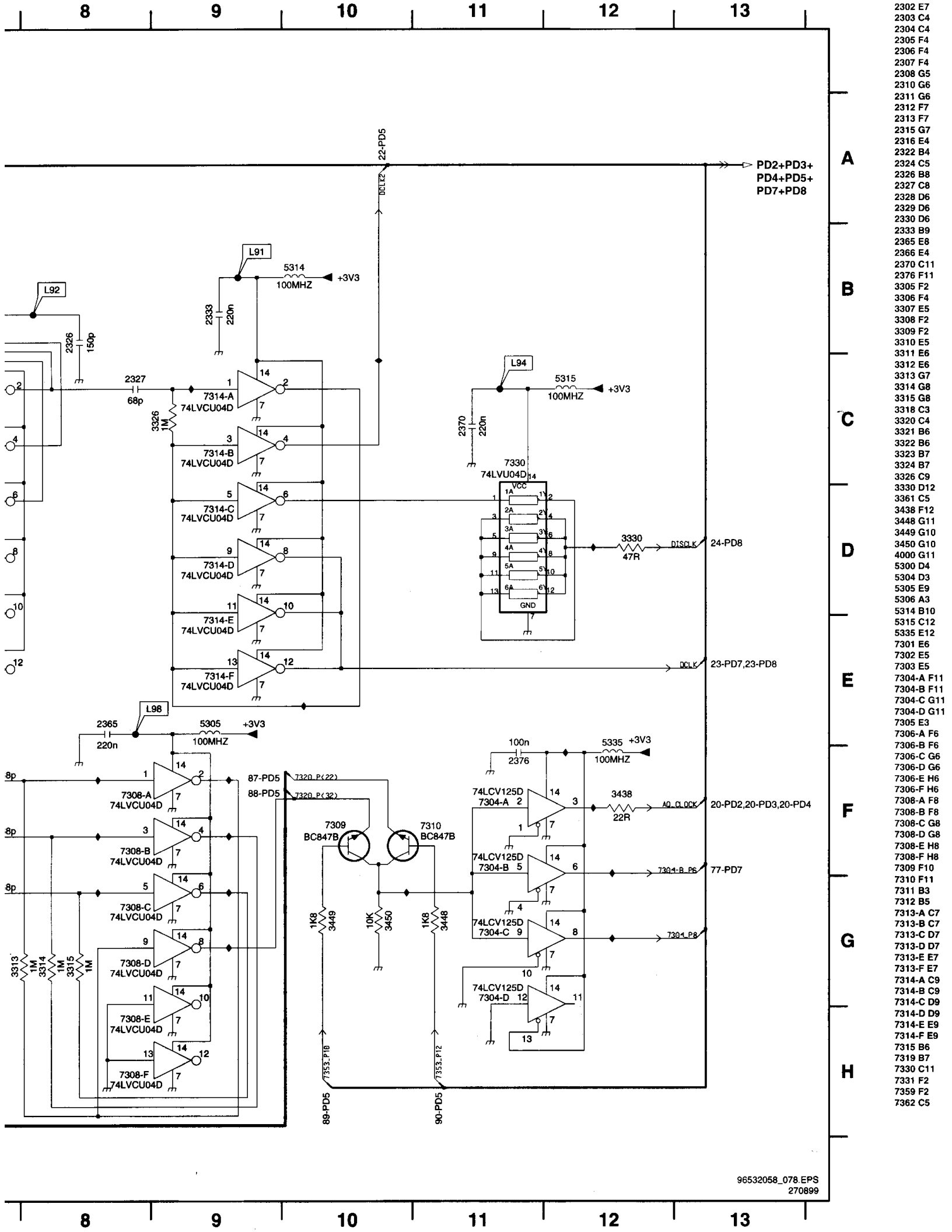


A  
B  
C  
D  
E  
F  
G  
H  
I

2334 F6  
2335 I6  
2336 I12  
2340 B9  
2341 B8  
2342 B9  
2353 C3  
2355 G3  
2372 C2  
3371 C2  
3372 D2  
3374 B8  
3375 B8  
3377 I4  
3378 I5  
3390 G2  
3391 H2  
3393 C2  
3418 C4  
5308 B3  
5309 B3  
5323 B2  
5325 G4  
7320 B6  
7327 C2  
7352 G3  
7353 G3  
7360 H4  
7361 H4

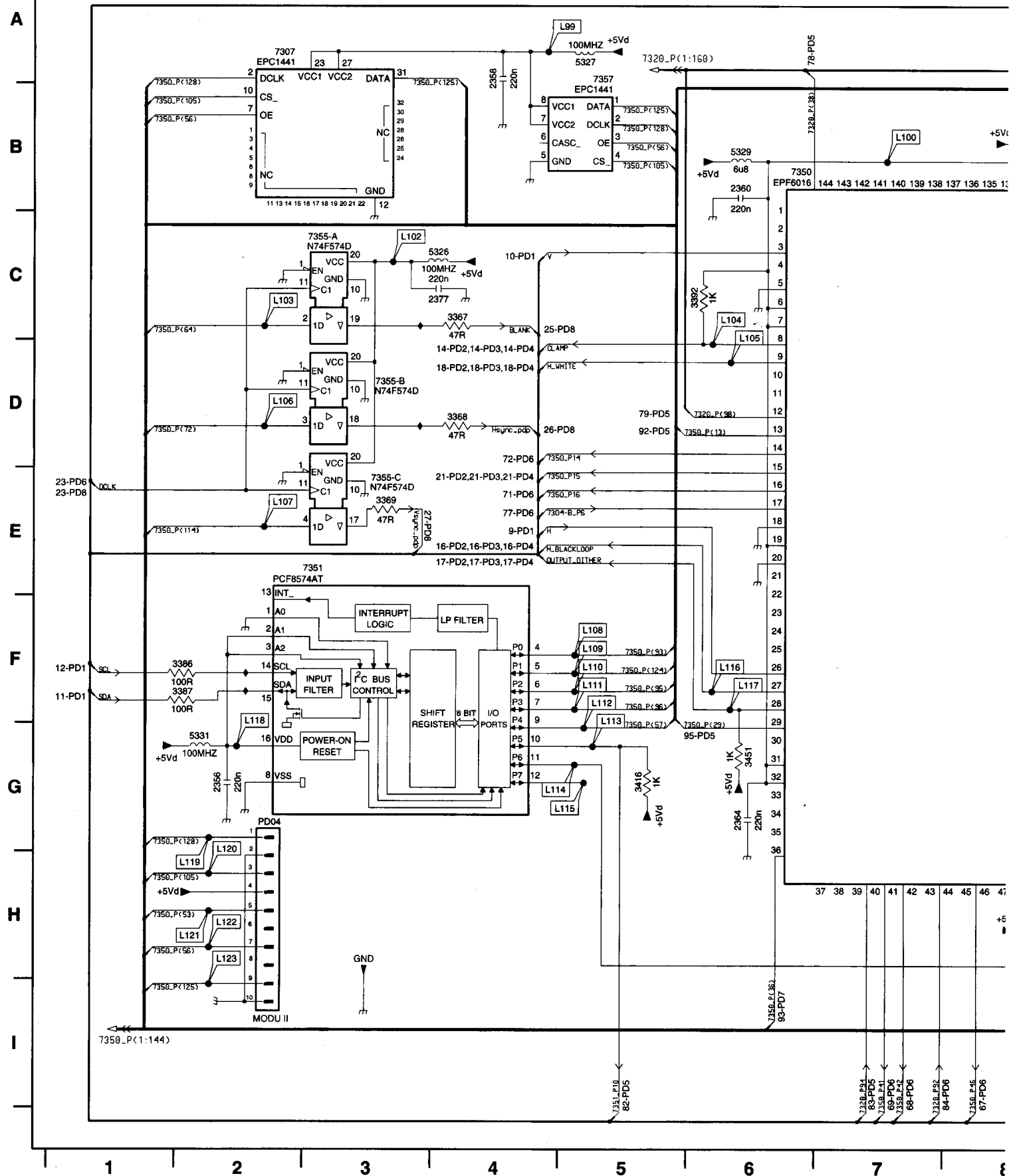
**PD6 PLL'S**





**P D 7**

## LOGIC CONTROL + I/O



9

10

11

12

13

14

2300 H12  
2301 H14  
2356 G2  
2358 A4  
2360 B6  
2361 B9  
2362 C12  
2363 G12  
2364 G6  
2377 C4  
3301 H13  
3302 I13  
3303 H14  
3367 C4  
3368 D4  
3369 E4  
3373 H12  
3379 H12  
3380 B8  
3381 B10  
3382 H8  
3383 C12  
3384 H10  
3385 H12  
3386 F2  
3387 F2  
3392 C6  
3409 F12  
3416 G5  
3417 F13  
3451 G6  
5326 C4  
5327 A5  
5329 B6  
5331 G2  
7300 H13  
7307 A2  
7350 B6  
7351 E2  
7355-A C3  
7355-B D3  
7355-C E3  
7357 A5

A

B

C

D

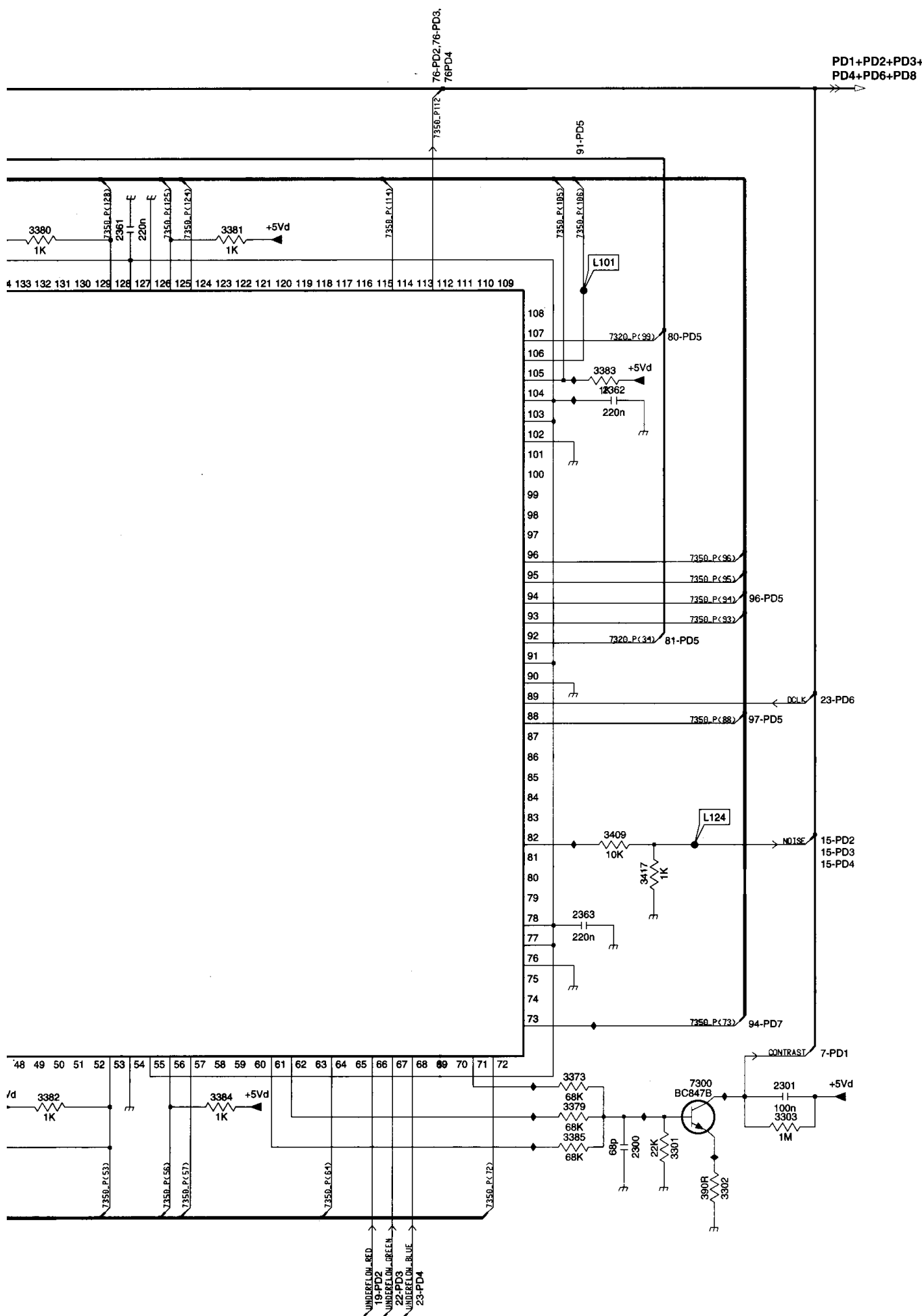
E

F

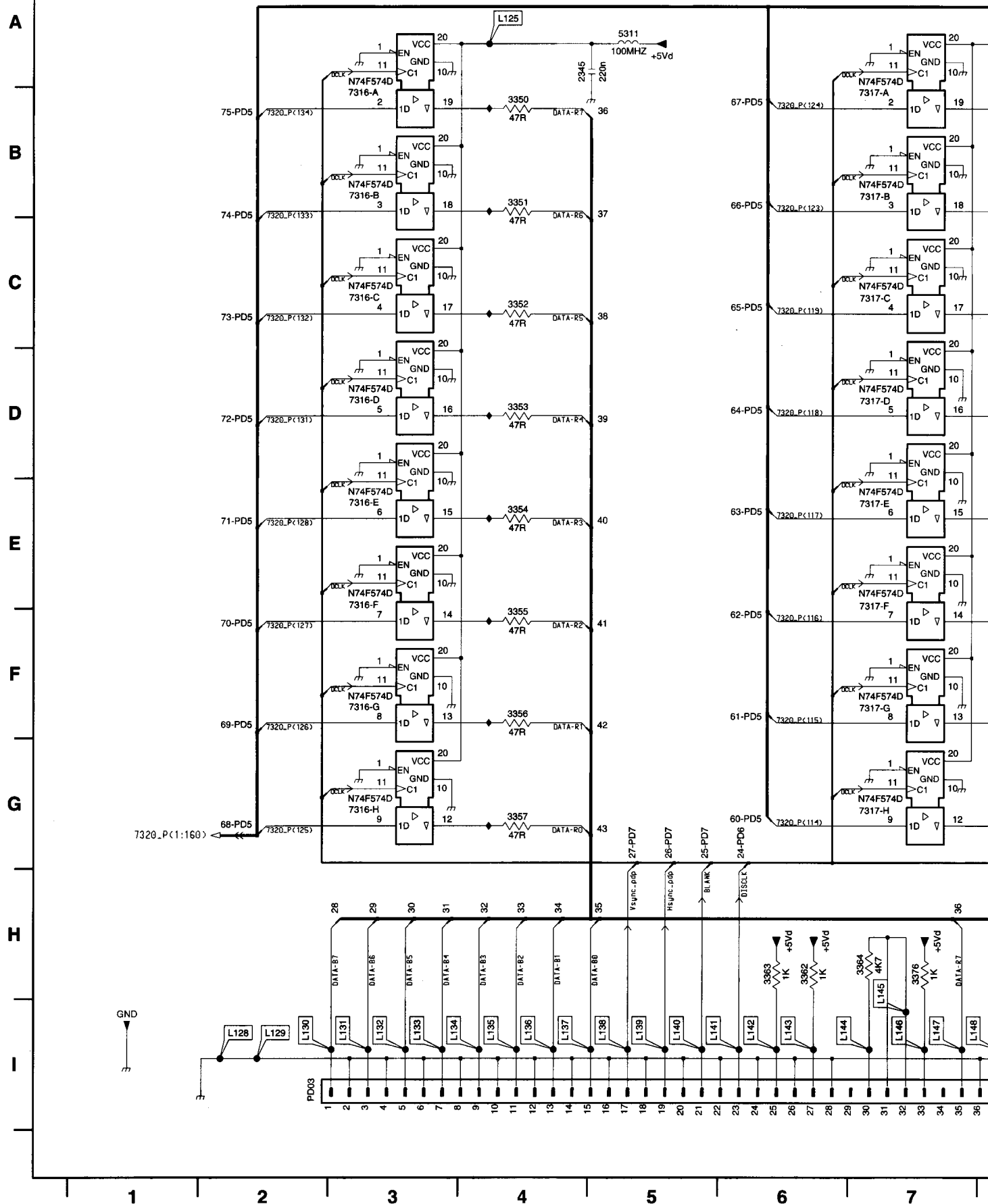
G

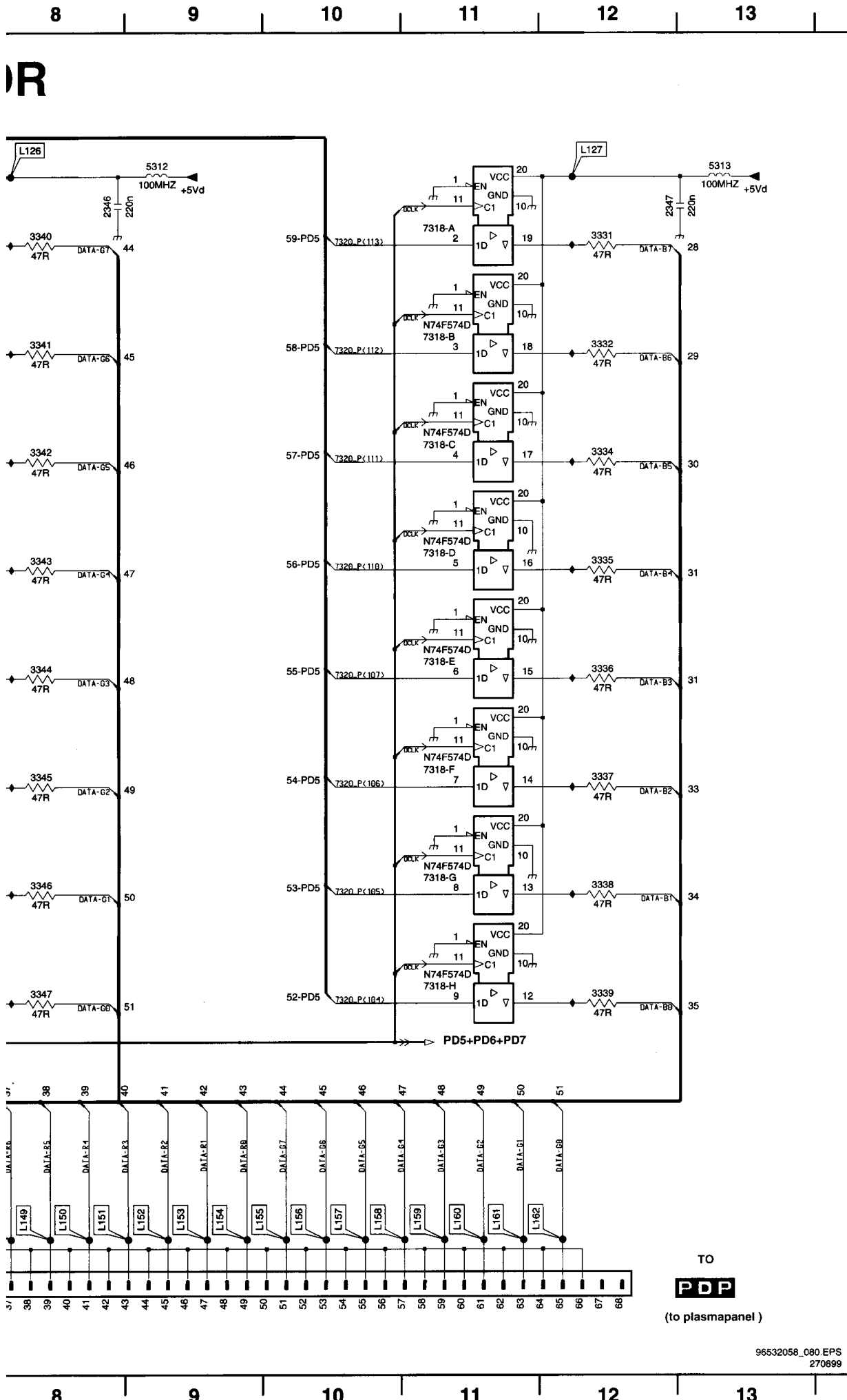
H

I



PDP limesco

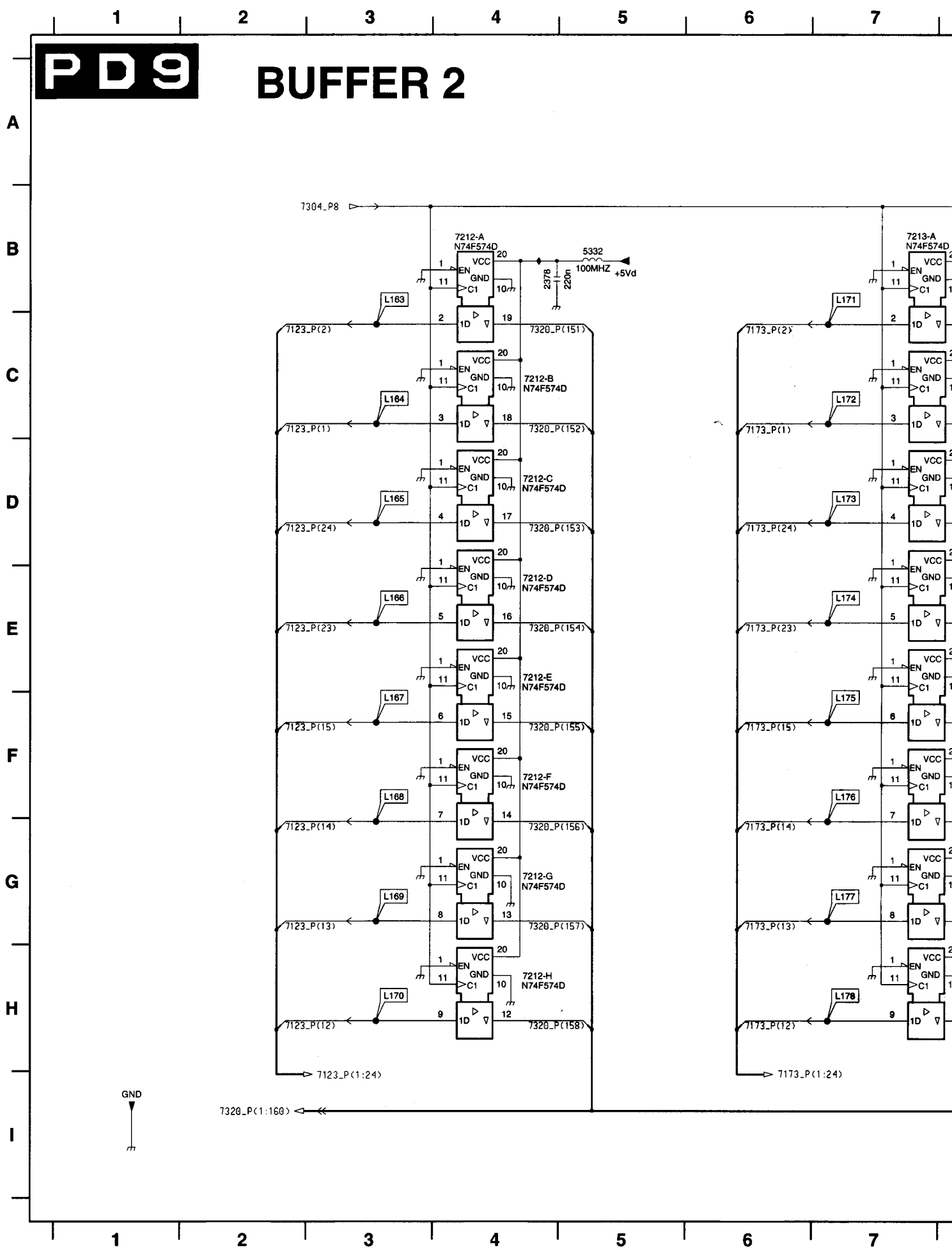
**PD8****OUTPUT BUFFER PDP-CONNECTC**



- 2345 B5
- 2346 B8
- 2347 B13
- 3331 B12
- 3332 C12
- 3334 C12
- 3335 D12
- 3336 E12
- 3337 F12
- 3338 G12
- 3339 G12
- 3340 B8
- 3341 C8
- 3342 C8
- 3343 D8
- 3344 E8
- 3345 F8
- 3346 G8
- 3347 G8
- 3350 B4
- 3351 C4
- 3352 C4
- 3353 D4
- 3354 E4
- 3355 F4
- 3356 G4
- 3357 G4
- 3362 I6
- 3363 I6
- 3364 I7
- 3376 I7
- 5311 A5
- 5312 A9
- 5313 A13
- 7316-A B3
- 7316-B C3
- 7316-C C3
- 7316-D D3
- 7316-E E3
- 7316-F F3
- 7316-G G3
- 7316-H G3
- 7317-A B7
- 7317-B C7
- 7317-C C7
- 7317-D D7
- 7317-E E7
- 7317-F F7
- 7317-G G7
- 7317-H G7
- 7318-A B11
- 7318-B C11
- 7318-C C11
- 7318-D D11
- 7318-E E11
- 7318-F F11
- 7318-G G11
- 7318-H G11

TO  
**PDP**  
 (to plasmapanel)

PDP limesco





A

B

C

D

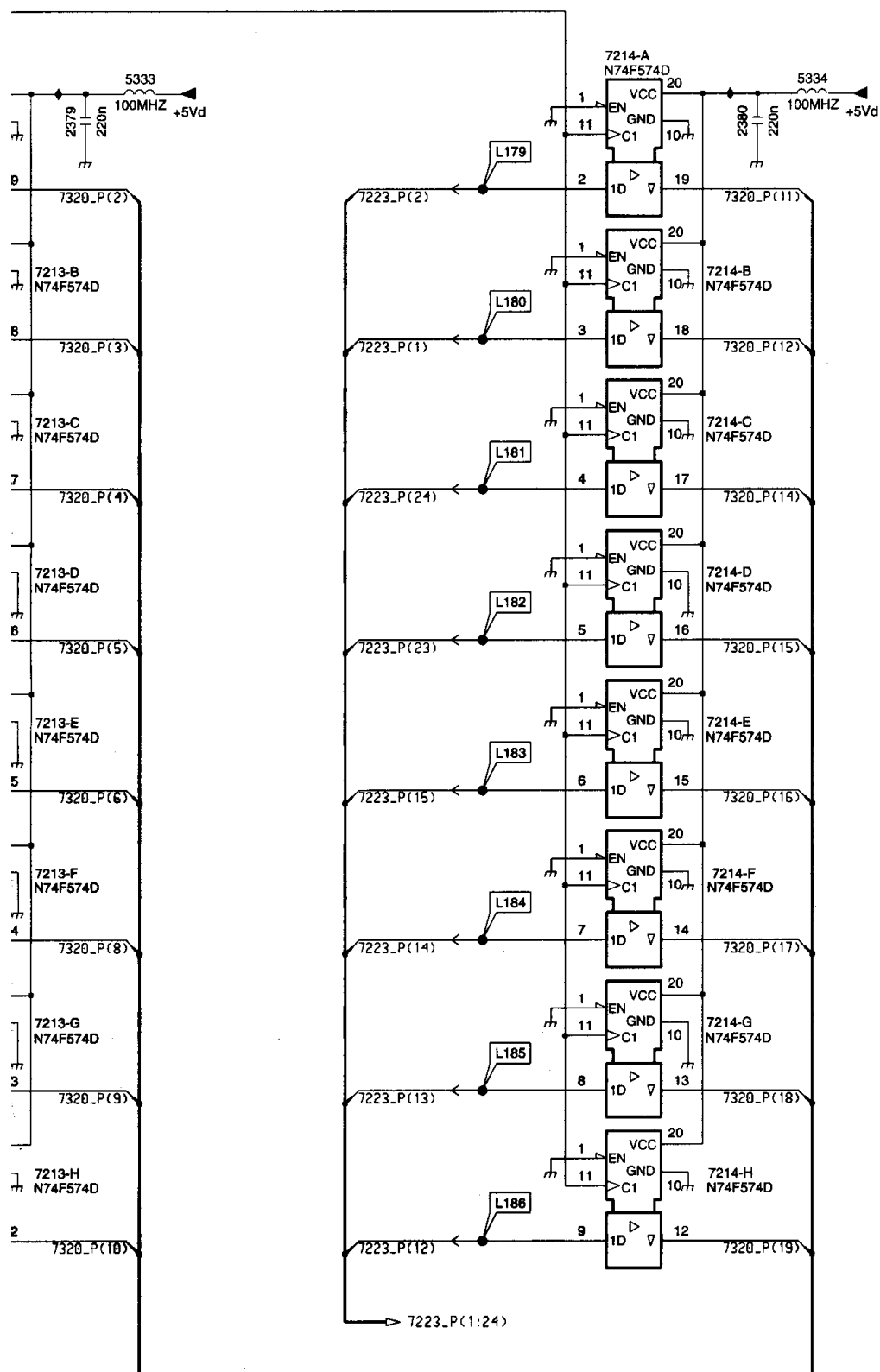
E

F

G

H

I



## 8. Alignments

General: the Service Default Mode (SDM) and Service Alignment Mode (SAM) are described in chapter 5 'Service modes, faultfinding and repair tips'.

### 8.1 Alignment conditions

All electrical adjustments should be performed under the following conditions:

- Supply voltage : 220 - 240 VAC (+/- 10 %)
- Warm-up time: 10 minutes
- The voltages and oscillograms are measured in relation to the tuner earth.
- Test probe:  $R_i > 10M\Omega$   $C_i < 2,5\text{ pF}$ .

#### 8.1.1 Selection of the SAM-menu

- By transmitting the "ALIGN" command with the RC7150 Dealer Service Tool, followed by password "3140" and < OK > button.
- Standard RC sequence 062596 (within OSD time-out) OSD
- By shorting test-point M28 and M29 on the AV Control panel on the monitor while switching on the set.

### 8.2 Adjustments on the D-box

#### 8.2.1 Electrical Alignments

##### ***Pre-conditioner +5Vstby (PR3)***

Connect a voltmeter to capacitor C2510 (PR2). With the aid of R3504 adjust the voltage to 5.2 V +/- 50 mV.

##### ***VsVa supply (FD)***

##### ***Va-supply (Addressing of the PDP - FD1)***

De-activated the PDP.

Connect a voltmeter to capacitor C2120 (FD1). With the aid of R3126 adjust the voltage to 55 V +/- 0.5 V.

##### ***Vs-supply (Sustain pulses - FD2)***

De-activated the PDP.

Connect a voltmeter to capacitor C2020 (FD2). With the aid of R3026 adjust the voltage to 165 V +/- 0.5 V.

#### 8.2.2 Software Alignments

##### ***White point***

- Select the item "PDP test pattern" of the Service Alignment menu and set it to "ON".
- Select item " White point" of the Service Alignment menu.
- Enter the "white point" menu and adjust the value of one of the 4 submenu if necessary. Only the selected menu-item including its value remain on the screen when selected. The value has to changed within 5 seconds otherwise the main menu reappears again.

The 4 sub menu-items of the White point menu:

- "RED"
- "GREEN"
- "BLUE"
- "COLOUR TEMPERATURE"
- Leave the sub-menu by pressing "cursor up", "cursor down", "OK" or the "MenuOnOff" button and return to the main menu.
- Select the item "PDP test pattern" of the Service Alignment menu and set it to "OFF".

## 9. Circuit description and list of abbreviations

### 9.1 Circuit description

For a detailed description of the circuits see Training Manual FTV1.9 Display Box (3122 785 10036).

### 9.2 List of abbreviations

|        |                                                                                       |
|--------|---------------------------------------------------------------------------------------|
| μP     | Micro Processor                                                                       |
| 1FH    | One time the line frequency for normal picture quality                                |
| 2FH    | Twice the line frequency for a better picture with less field flicker                 |
| 2CS    | 2 Carrier Sound (sound system using two separate FM carriers at 5.5 MHz)              |
| AARA   | Automatic Aspect Ratio Adaptation                                                     |
| ADC    | Analogue Digital Converter                                                            |
| ADJ    | Adjust -                                                                              |
| AFC    | (S1) Automatic Frequency Control. Automatic fine-tuning circuit for signal reception. |
| AGC    | Automatic Gain Control                                                                |
| AM     | Amplitude Modulation                                                                  |
| AMV    | Automatic Multi Voltage                                                               |
| ANT    | Antenna                                                                               |
| AP     | Asian Pacific region (Covering Hong Kong, Australia, Singapore etc.)                  |
| APC    | Automatic Power Control                                                               |
| ASP    | Aspect Ratio 4:3 or 14:9 or 16:9                                                      |
| AUD    | Audio - GFL                                                                           |
| AVB    | Audio Video Buffer or Audio Video Blanking                                            |
| BC     | Beam current - GFL                                                                    |
| BNC    | Professional connector for higher frequencies                                         |
| C      | Centre                                                                                |
| CINCH  | Common connector for several kinds of signals                                         |
| COMP   | COMB-filter                                                                           |
| CRT    | Cathode Ray Tube                                                                      |
| CVBS   | Composite Video Blanking Synchronisation, video signal                                |
| DAC    | Digital Analogue Converter                                                            |
| DEC    | Decoder                                                                               |
| DFB    | Double Window Fast Blanking                                                           |
| DU     | Double Window - U_signal                                                              |
| DV     | Double Window - V_signal                                                              |
| DW     | Double Window                                                                         |
| DY     | Double Window - Y_signal                                                              |
| E-Box  | Electronic Box                                                                        |
| EHT    | Extra High Tension - GFL                                                              |
| ELPS   | Eco Low Power Supply - GFL                                                            |
| EWD    | East West Drive - GFL                                                                 |
| EXT    | External                                                                              |
| FBL    | Fast Blinking                                                                         |
| FBX    | Feature Box                                                                           |
| FE     | FrontEnd                                                                              |
| FM     | Frequency Modulation                                                                  |
| FMS    | Functional Module Specification                                                       |
| FRNT   | Front                                                                                 |
| FRS    | Functional Requirement Specification                                                  |
| FTV    | Flat TeleVision                                                                       |
| GFL    | Global Feature Line (high end TV chassis)                                             |
| GFL-FL | GFL Feature (up)Lift                                                                  |
| GND    | Ground                                                                                |
| HFB    | Horizontal FlyBack (display system sync. pulse)                                       |
| HP     | Headphone                                                                             |

|           |                                                                           |
|-----------|---------------------------------------------------------------------------|
| HSI       | Hardware Software Interface                                               |
| HW        | HardWare                                                                  |
| I/O       | Input / Output                                                            |
| I2C       | IC bus, Inter Integrated circuit, on-board communication line             |
| IF        | Intermediate Frequency                                                    |
| IRQ       | Interrupt ReQuest.                                                        |
| L         | Left                                                                      |
| L_CL VL   | Left_Constant_Level Variable_Level                                        |
| L_REC SEL | Left_Record_Select                                                        |
| LED       | Light Emitting Diode                                                      |
| LP        | Low Pass                                                                  |
| LTP       | Luminance Transient Processor                                             |
| MAC       | (Apple) MACintosh                                                         |
| MAC13     | or MACII (Apple) MACintosh format for 13" monitors                        |
| MACP      | Motion Adaptive Colour Plus                                               |
| ML-2      | Media Line 2                                                              |
| Monitor   | PDP Display with all the electronic boards (incl. self developed boards). |
| MU        | Main U_signal                                                             |
| MV        | Main V_signal                                                             |
| MY        | Main Y_signal                                                             |
| NICAM     | Near Instantaneous Companding Audio Multiplex (digital terrestrial sound) |
| NTSC      | National TV Standard Committee                                            |
| OE        | (AQ) Output Enable                                                        |
| PAL       | Phase Alternating Lines (Colour video standard)                           |
| PDP       | Plasma Display Panel                                                      |
| PIP       | Picture In Picture                                                        |
| PLL       | Phase Locked Loop                                                         |
| POR       | Power On Reset / Power Off Reset (depending on context)                   |
| QPSK      | Quadruple Phase Shift Keying                                              |
| R         | Right                                                                     |
| RAM       | Random Access Memory                                                      |
| RC5       | Remote Control 5 (infrared signal transmission protocol)                  |
| RECEI-RC5 | Received RC5-code                                                         |
| REF       | Reference                                                                 |
| RES       | Resistor                                                                  |
| RGB       | Red Green Blue, video signals                                             |
| SC-1FH    | Sandcastle 1FH                                                            |
| SCL       | Serial Clock Line of the IC bus                                           |
| SDA       | Serial Data Line of the IC bus                                            |
| SECAM     | SEquential CouleuR A Memoire (Colour video standard)                      |
| SIF       | Second Intermediate frequency                                             |
| SND       | Sound                                                                     |
| SOG       | Sync On Green                                                             |
| SP_GAIN   | Splitter GAIN                                                             |
| SPHsync   | Splitter Horizontal Sync                                                  |
| SPVsync   | Splitter Vertical Sync                                                    |
| SSP       | Small Signal Panel (of the GFL chassis)                                   |
| STBY      | Standby                                                                   |
| SW        | SoftWare / SubWoofer (depending on context)                               |
| SYNC      | Synchronisation                                                           |
| SYS       | System                                                                    |
| Terr      | Terrestrial                                                               |
| TP        | Testpoint                                                                 |
| TRASN     | (AQ)                                                                      |
| TSD       | Terrestrial Sound Decoder (combination of 2CS and NICAM decoder)          |
| TUN       | Tuner                                                                     |

|            |                                                                          |
|------------|--------------------------------------------------------------------------|
| TXT        | TeleteXT                                                                 |
| TXT-KILL   | Teletext killer (Signal to disable Teletext)                             |
| U-VIDCONTR | U-VideoContrast                                                          |
| VCO        | Voltage Controlled Oscillator                                            |
| VD         | Vertical Drive                                                           |
| VGA        | Video Graphics Array. In this document, the term VGA is used for all VGA |
| WE         | Write Enable                                                             |
| Xtal       | Crystal (Oscillator)                                                     |
| Y/C        | Luminance (Y) signal / Chrominance signal (C)                            |
| YUV        | Combination of colour difference signals                                 |