

Recommended Safety Parts

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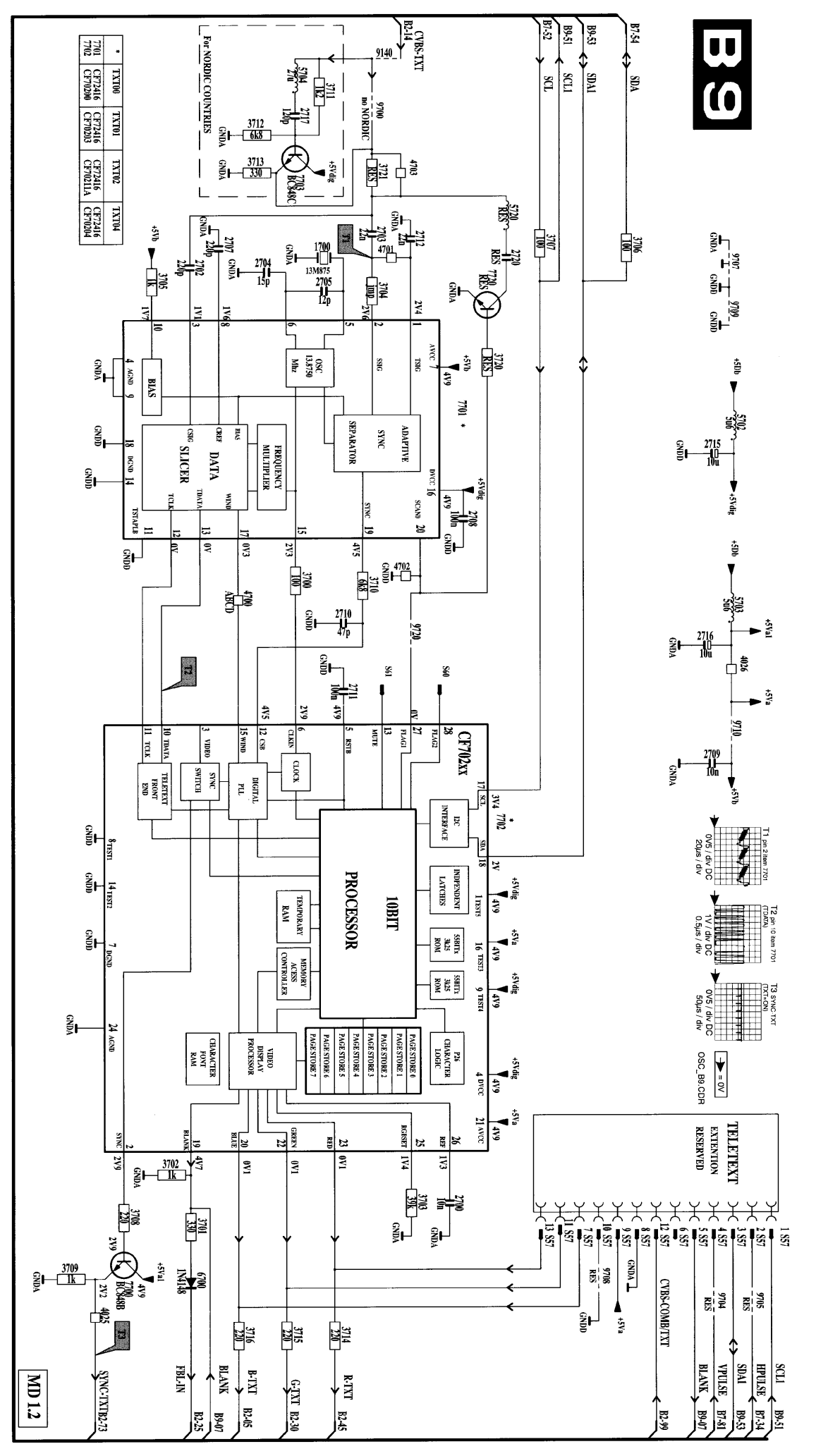
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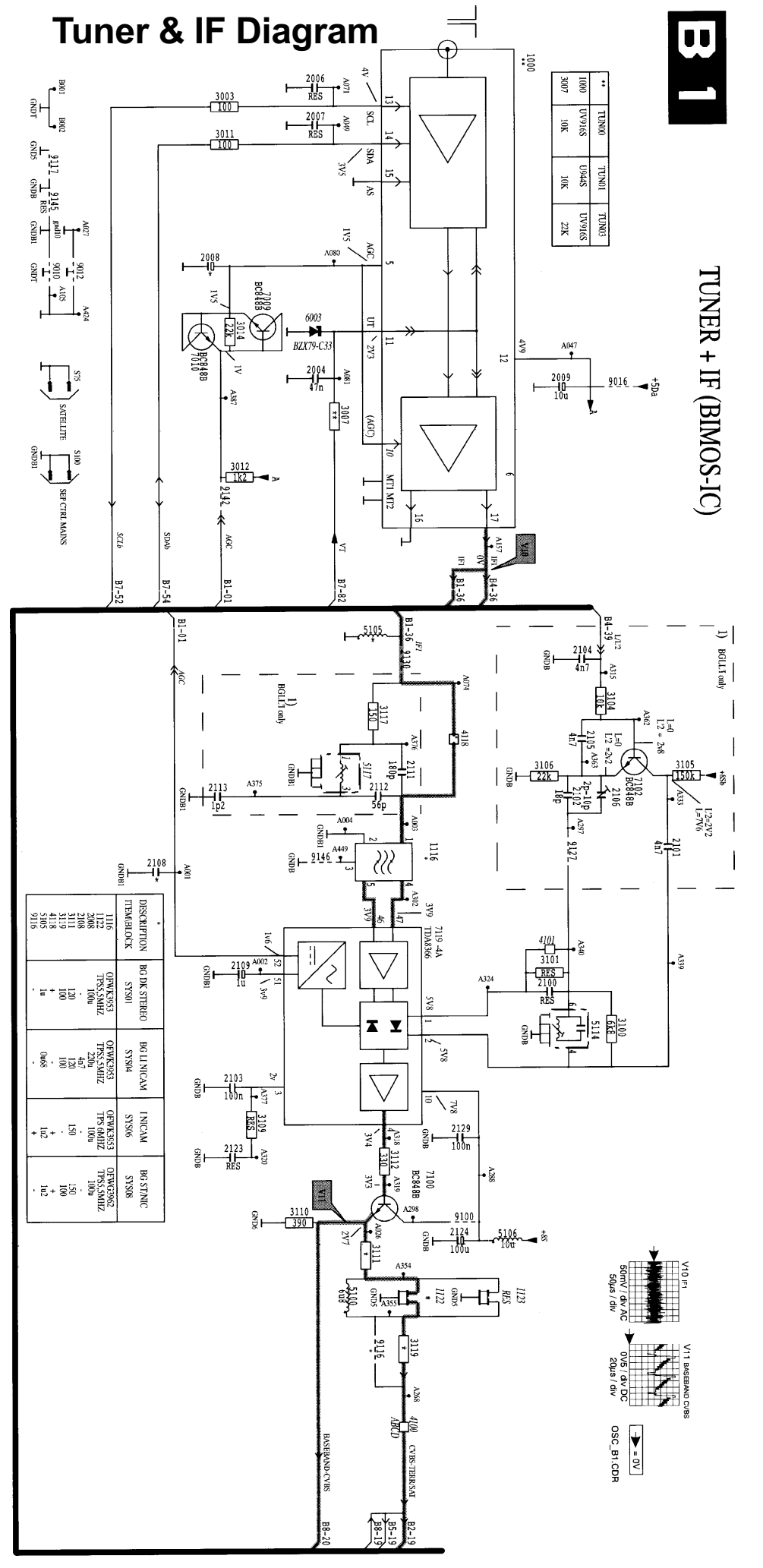
## Recommended Safety Parts

Item	Part No.	Description
3395	4822 051 20008	0 ohm jumper
3443	4822 051 20332	3k3 5% 0.1W
3444	4822 051 20332	3k3 5% 0.1W
3613	4822 051 20008	0 ohm jumper
3614	4822 051 20008	0 ohm jumper
3615	4822 051 20008	0 ohm jumper
3616	4822 051 20008	0 ohm jumper
3626	4822 051 20153	15k 5% 0.1W
5351	4822 157 51462	10uH
6384	4822 130 30621	1N4148
7350	4822 209 83163	LM833N
7351	4822 209 83163	LM833N
7382	5322 130 41982	BC848B
7383	5322 130 41982	BC848B
7387	5322 130 41982	BC848B
7389	5322 130 41982	BC848B
7415	5322 130 41982	BC848B
7420	5322 130 41982	BC848B
7427	5322 130 41982	BC848B
7430	5322 130 41982	BC848B
7432	5322 130 41982	BC848B
7433	5322 130 41982	BC848B
	4822 492 62076	Spring fix. transistors
	4822 265 31251	Con. 5P eco-duo 1,25
2757	4822 124 41579	10uF 20% 50V
2758	4822 124 41579	10uF 20% 50V
2787	4822 122 30103	22nF 80% 63V
2788	4822 122 30103	22nF 80% 63V
3752	4822 052 10828	8 ohm 2 5% 0.33W
3753	4822 052 10828	8 ohm 2 5% 0.33W
6770	4822 130 30621	1N4148
2759	4822 124 41579	10nF 20% 50V
2760	4822 124 41579	10uF 20% 50V
2761	4822 124 41579	10uF 20% 50V
2762	4822 126 10002	100nF 20% 25V
2763	4822 124 41579	10uF 20% 50V
2776	4822 122 33893	18nF 10% 63V
2779	4822 126 10002	100nF 20% 25V
2786	4822 124 41579	10uF 20% 50V
2787	4822 124 41579	10uF 20% 50V
2788	4822 122 33893	18nF 10% 63V
2789	4822 126 10002	100nF 20% 25V
3761	4822 051 20332	3k3 5% 0.1W
3762	4822 051 20332	3k3 5% 0.1W
3779	4822 051 20332	3k3 5% 0.1W
3794	4822 051 20332	3k3 5% 0.1W
3798	4822 051 20332	3k3 5% 0.1W
3799	4822 051 20332	3k3 5% 0.1W
6775	4822 130 30621	1N4148
6790	4822 130 30621	1N4148
7770	5322 130 41982	BC848B
7771	5322 130 41982	BC848B
7773	5322 130 41982	BC848B
7780	5322 130 41982	BC848B
	4822 276 13603	Mains switch
	4822 265 30389	Con. 2P (Fixed pin)
	4822 256 91766	Led holder
3520	4822 053 21475	4M7 5% 0.5W
3521	4822 053 21475	4M7 5% 0.5W
7811	4822 130 44197	BC558B
7812	4822 130 44197	BC558B
	4822 265 10429	Pin strip (F92)
2406	4822 124 41579	10uF 20% 50V
2409	4822 124 40196	220uF 20% 16V
2410	5322 126 10223	4.7nF 10% 63V
2420	4822 122 33177	10nF 20% 50V
2424	4822 126 12944	47nF 10% 50V
2425	4822 126 12944	47nF 10% 50V
3420	4822 051 20472	4k7 5% 0.1W
3427	4822 052 10479	47 ohm 5% 0.33W
3429	4822 051 20332	3k3 5% 0.1W
3432	4822 051 20472	4k7 5% 0.1W
3448	4822 051 20472	4k7 5% 0.1W
6401	4822 130 30621	1N4148
6402	4822 130 30621	1N4148
6403	4822 130 30621	1N4148
6404	4822 130 30621	1N4148
6405	4822 130 30621	1N4148
6410	4822 130 42489	BYD33G
7402	5322 130 41982	BC848B
7403	5322 130 41982	BC848B
7404	5322 130 41982	BC848B
7405	5322 130 41982	BC848B
7406	5322 130 41982	BC848B
7411	5322 130 41982	BC848B
7420	5322 130 41982	BC848B
	4822 276 13592	Mains switch
	4822 265 30389	Con. 2P
	4822 256 91766	LED holder
2604	4822 124 40196	220uF 20% 16V
3520	4822 053 21475	4M7 5% 0.5W
3521	4822 053 21475	4M7 5% 0.5W

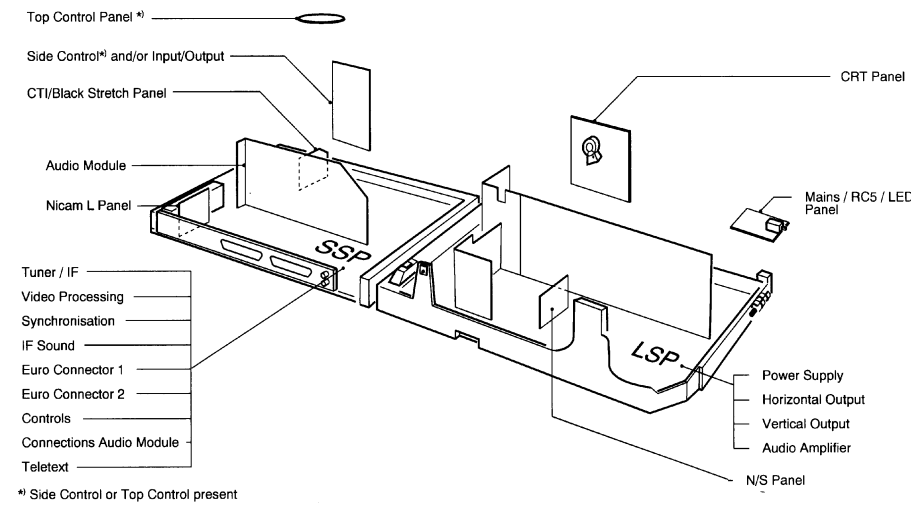
## Text Diagram



## Tuner & IF Diagram



## PCB Identification



### Safety instructions for repairs,

### Maintenance instructions, Warnings and Notes

#### Safety instructions for repairs

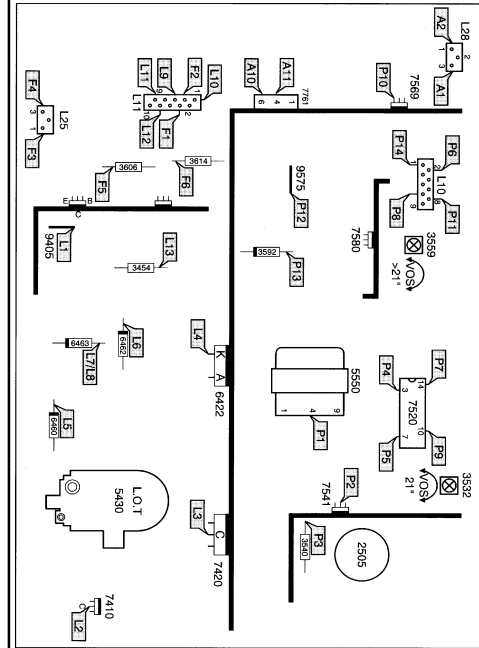
- Safety regulations require that during a repair the set should be connected to the mains via an isolating transformer; safety components, indicated by the symbol ▲ should be replaced by components identical to the original ones; when replacing the CRT, safety goggles must be worn.
- Safety regulations require that after a repair the set must be returned in its original condition. In particular attention should be paid to the following points:
  - As a strict precaution, we advise you to resolder the solder joints through which the horizontal deflection current is flowing, in particular:
    - all pins of the line output transformer (LOT);
    - fly-back capacitor(s);
    - S-correction capacitor(s);
    - line output transistor;
    - pins of the connector with wires to the deflection coil;
    - other components through which the deflection current flows.

- Note:  
 This resoldering is advised to prevent bad connections due to metal fatigue in solder joints and is therefore only necessary for television sets older than 2 years.
- The wire trees and EHT cable should be routed correctly and fixed with the mounted cable clamps.
  - The insulation of the mains lead should be checked for external damage.
  - The mains lead strain relief should be checked for its function in order to avoid touching the CRT, hot components or heat sinks.
  - The electrical DC resistance between the mains plug and the secondary side should be checked (only for sets which 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 MO and 12 MO;
    - switch off the TV and remove the wire between the two pins of the mains plug.

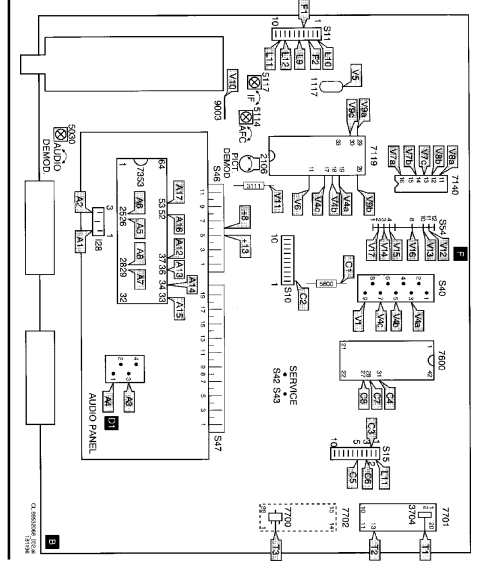
- The cabinet should be checked for defects to avoid touching of any inner parts by the customer.

#### Test Point

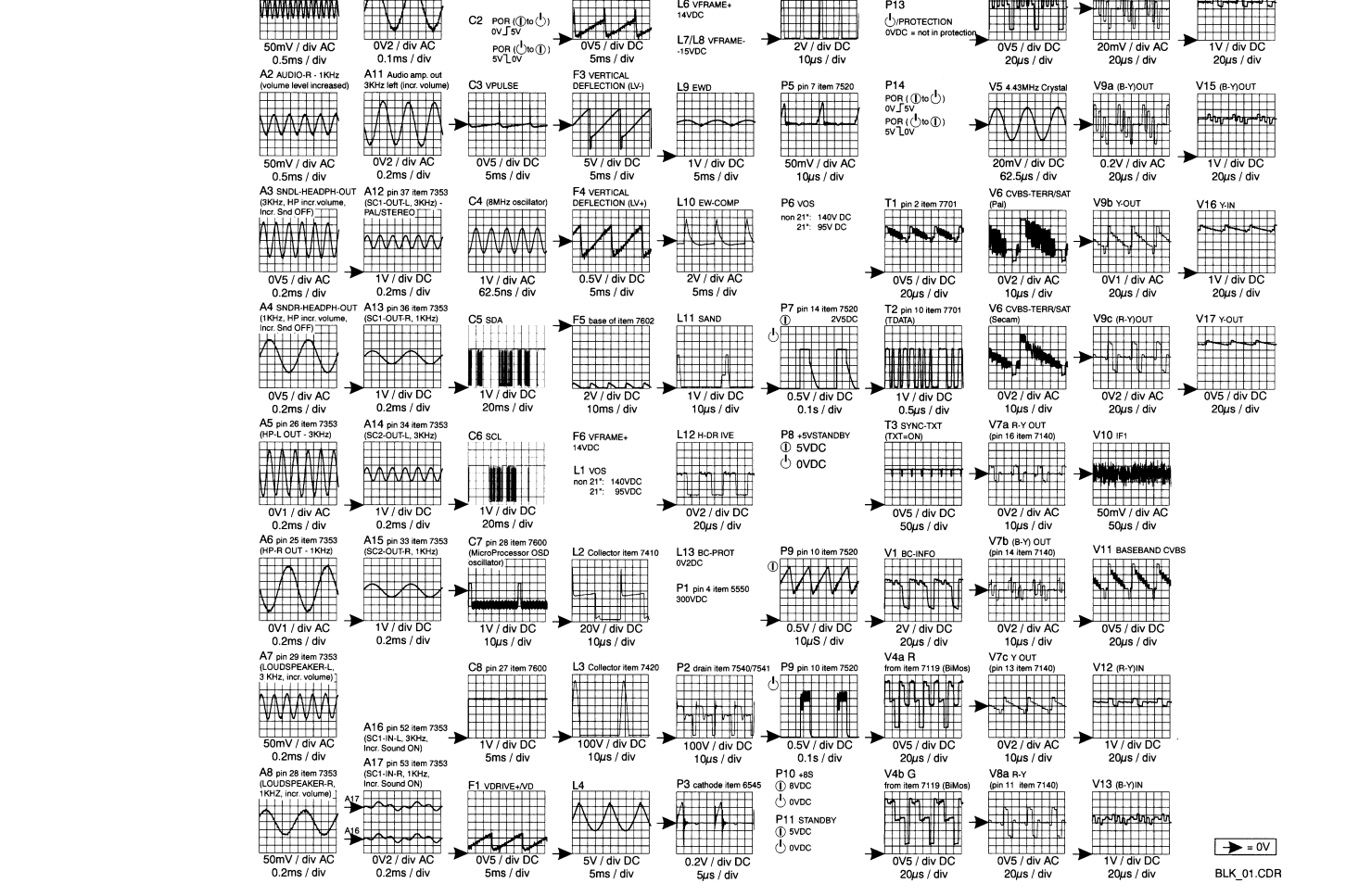
##### Large signal panel



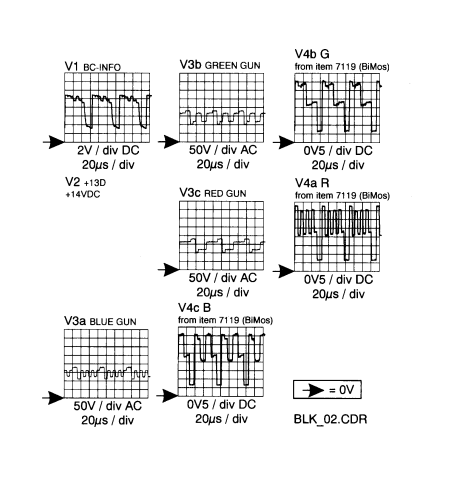
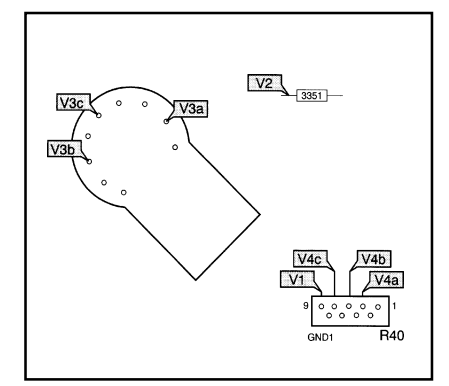
##### Small signal panel



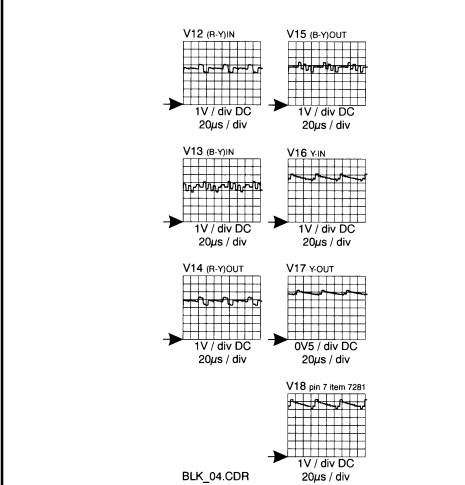
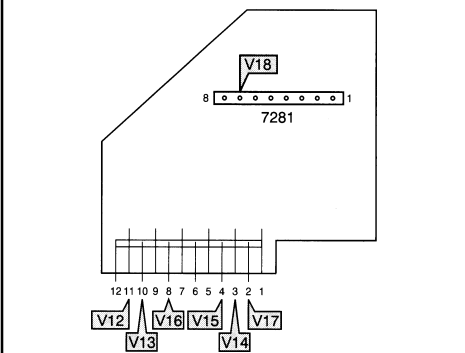
## Waveforms



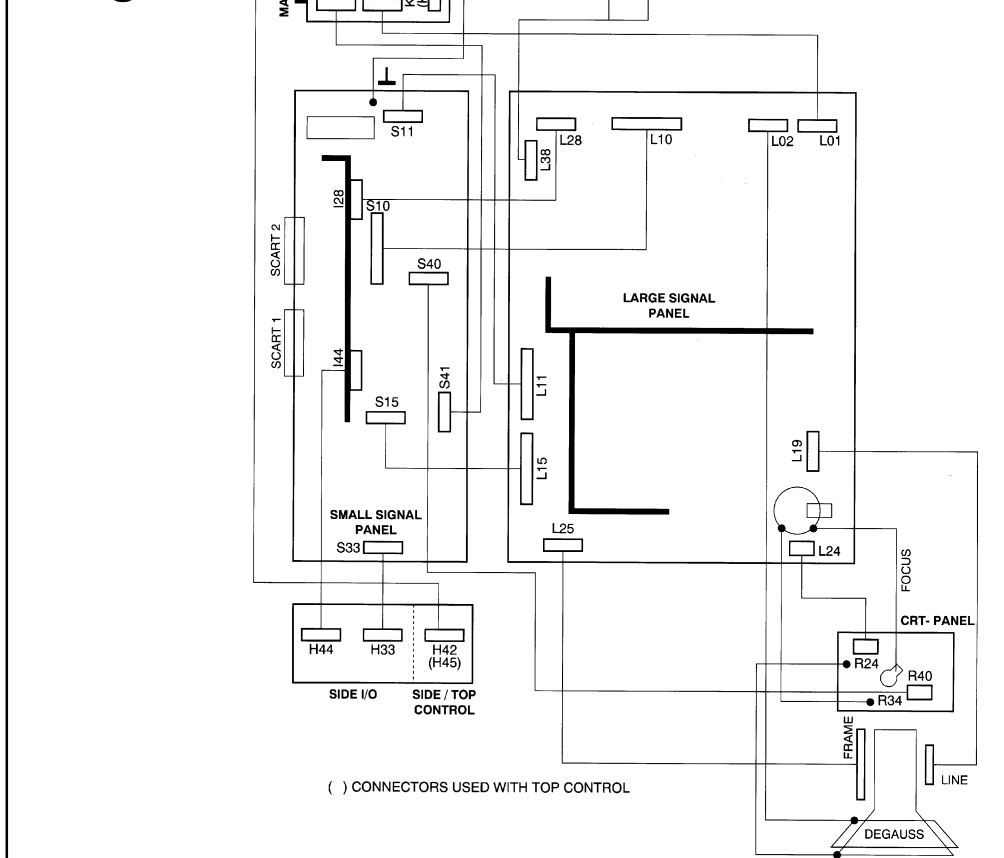
## Test Point - CRT Panel



## Test Point - CTI/Black Stretch Panel



## Wiring Diagram



## Service Modes

### DST, Error messages, Protections, Faultfinding and repair tips

In this chapter the following paragraphs are included:

- 6.1 Test points
- 6.2 Service Modes and Dealer Service Tool (DST)
- 6.3 Error codes and "blinking LED" procedure
- 6.4 Protections
- 6.5 Fault finding and repair tips

The MD1 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 processing circuitry
- \* C1-C2-C3, etc.: Test points for the control circuitry
- \* F1-F2-F3, etc.: Test points for the frame drive and frame output circuitry
- \* L1-L2-L3, etc.: Test points for the line drive and line output circuitry
- \* P1-P2-P3, etc.: Test points for the power supply
- \* T1-T2-T3, etc.: Test point for the teletext circuitry
- \* V1-V2-V3, etc.: Test points for the video processing circuitry

### 6.2 Service modes and Dealer Service Tool(DST)

For easy installation and diagnosis the dealer remote control RC7150 is introduced. The RC7150 can be used for all new TV sets, including all set of the MD1 chassis. The

## Service Modes Cont'd

RC7150 is also called Dealer Service Tool or DST. The ordering number of the DST (RC7150) is 4822 218 21232.

### 6.2.1 Installation features for the dealer

The dealer can use the RC7150 for programming the TV-set with presets, TV-settings, Dish settings.

10 Different program tables can be programmed into the DST via a GFL or MD2 TV-set (downloading from the GFL or MD2 to the DST; see GFL or MD2 service manuals) or by the DST-I (DST/PC 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 MD1 chassis, download code 4 should be used).

### 6.2.2 Diagnose features for the service

The MD1.2 sets can be put in the two service modes via the DST RC7150. These are the Service Alignment Mode (SAM) and the Service Default Mode (SDM). SDM can also be entered by short circuiting the "service" pins on the SSP.

#### 6.2.2.1 Service Default Mode (SDM)

Entering the SDM:

- By transmitting the "DEFAULT" command with the RC7150 Dealer Service Tool.
- By temporarily shorting pins S42 and S43 on the Small Signal Panel.

Exiting the SDM:

- Switch the set to stand-by (the error buffer is also cleared).

#### Note:

When the mains power is switched off while the set is in SDM, the set will enter to SDM immediately when the mains is switched on again.

The SDM has the following pre-defined conditions for all microprocessor controlled tuning and linear functions:

- For recognition of the SDM "SER" is displayed at the top of the screen.
  - Tuning at 475.25 MHz (Secam on Multi France sets (with Nicam L), PAL on other sets).
  - Volume level is set to 25% (of the maximum volume level). Other picture and sound settings are set to 50%.
  - Auto switch off disabled (normally the set is automatically switched off when no video signal (IDENT) was received for 15 minutes).
  - Sleep timer is disabled.
  - All other controls operate normally.
  - When the microprocessor supports the blinking LED" procedure (See 6.3) and an error code is present in the error buffer, the LED will blink the number of times, equal to the value of the last error code.
- This function will also work when there is no sound or picture.**

#### 6.2.2.2 Service Alignment Mode (SAM)

Entering SAM:

- By transmitting the "ALIGN" command with the RC7150 Dealer Service Tool (this works both while the set is in normal operation mode or in the SDM).
- By pressing the "MENU" and "-" key on the local keyboard simultaneously when the set is in SDM.

Exiting SAM:

Switch the set to stand-by.

#### Note:

When the mains power is switched off while the set is in SAM, the set will enter SDM immediately when the mains is switched on again.

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

- Software version (the software version of the microprocessor in the set is displayed. This software version identification corresponds with the software versions in the Software Survey as published in the Product Survey.
- Error code buffer (see paragraph 6.3).
- Options (see paragraph 8.4).
- Alignment and geometry information (see paragraph 8.2.1, 8.3.1 and 8.3.2).

#### Service Modes, DST, Error messages,

- (1) Software version
- (2) Error buffer
- (3) Options
- (4) Alignments and geometry

The screenshot shows a grid of characters representing the SAM screen. At the top, it says 'M12XXx-x.x' and 'ER 0 0 0 0 0 0 0'. Below that, there are several rows of characters representing options and error codes. For example, 'E2 N', 'UO N', 'LL N', 'NI N', 'TT N', 'ET N', 'HI N', '14 N' are visible. To the right of these are characters like 'xx', 'RD', 'xx', 'VA', 'xx', 'BD', 'xx', 'VL', 'xx', 'HD', 'xx', 'VS', 'xx', 'HW', 'xx', 'VG', 'xx', 'HP', 'xx', 'VA', 'xx', 'HC', 'xx', 'NL', 'xx', 'HT', 'xx'.

Figure 6.1

Screen of the Service Alignment Mode (SAM)

### 6.3 Error codes and "blinking LED" procedure

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

- The last error detected (actual) is the error at the left side
- The error buffer will be reset in the following cases:

1. exiting the SAM with the "standby" command on the remote control
  2. transmitting the commands "DIAGNOSE 9 9 OK" with the DST
- By leaving the SAM with the mains switch, the error buffer is not reset.

Examples:

ERROR:	0 0 0 0 0 0:	No error code detected
ERROR:	3 0 0 0 0 0:	Error code 3 is the last and only detected error
ERROR:	5 3 0 0 0 0:	Error code 3 first and error code 5 last detected

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:

1. When the SDM is entered, the LED will blink the number of times, equal to the value of the last error code. The LED will stay off briefly and blink again the number of times, equal to the value to the last error code
2. With the DST all error codes in the error buffer can be made visible. While in SDM, 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 7 (the first error)

The LED will operate in the same way as in point 1, but now for the error code on position x.

Example:

Error code position	1	2	3	4	5	6	7
Error buffer	2	4	1	0	0	0	0

- after entering SDM blink (2x) - pause - blink (2x)
- after transmitting "DIAGNOSE 2 OK" with the DST blink (4x) -pause - blink (4x)
- after transmitting "DIAGNOSE 3 OK" with the OST blink - pause - blink
- after transmitting "DIAGNOSE 4 OK" with the DST nothing happens

#### Note!

Note that it may take up to 7 seconds before the set response to a DIAGNOSE command. Interruption of the blinking sequence may lead to incorrect results.

#### Important!

Not all software versions of the MD1.2E chassis support the blinking LED procedure and the DIAGNOSE 99 command. Software versions NOT supporting the blinking LED procedure are M12BAx-x.x and M12COx-3.x.

Error code	Error Description	Blinking LED	Possible defective components
0	No error detected	—	—
1	BIMOS (TDA8366) error (SSP)	1x	IC7119
2	M5P3400/341 0 error (SSP)	2x	IC7353
3	I <sup>2</sup> C bus error	3x	All I <sup>2</sup> C-related components
4	Wrong EEPROM	4x	IC7685 (SSP)
5	EEPROM defective	5x	IC7685 (SSP)
6	Tuner error	6x	U1000 (SSP)
7	TXT error	7x	IC7702 (SSP)
8	Histogram Proc. error (reserved)	8x	IC7210
9	16:9 processor error (16x9 module)	9x	IC7440
10	WSSB module error (WSSB module)	10x	IC7540
11	Dolby processor error (Audio module)	lix	IC7600

Table 6.1 Error code list

### Protections, Faultfinding and Repair tips

#### 6.4 Protections

6.4.1 In the MD 1 .2E the following protections are possible:

- Protections generated by the power supply:
- Overload protection → Hick up mode
  - Underload → Hick up mode
  - Over voltage → Hick up mode
  - Under voltage → Hick up mode

Deflection:

- Horizontal Protection → Supply to standby
- EW-Protection → Supply to standby
- Vertical Protection → BIMOS standby mode

Software protection

- BIMOS 1C71 19 defective → (Error code 1) Set can be switched between standby and ON, but there is no picture, no OSD, sound is only noise.
- SDA or SCL shorted → (Error code 3) Set is switched to standby via standby line, set tries to restart.
- No +5Db or +8Sc at pC → Set is switched to standby via standby line, set tries to restart.

#### 6.4.2 Power supply protections

The power supply will go to a very good audible hick-up mode in the following situations:

- Overload protection
- Under load
- Over voltage
- Under voltage

In hick-up mode

Pin 1 of IC7520 starts up from the start circuit for approximately 2 seconds, immediately after that the protection is activated. This cycle is constantly repeated in hick-up mode. When the set is in hick-up mode a short squeak is audible every 2 seconds.

#### 6.4.3 Horizontal-protection

When the beam current becomes too high for a long period the voltage across C2450 will drop. D6450 will start conducting and as soon as the voltage drop across R3456 is 0V7, TS7450 will conduct, making PROT high. Via the hold circuitry of the power supply, the set will stay in the protection mode (standby) and can only be reset by switching the set off and on via the mains switch. If the fault is still present, the set will switch to standby (protection mode) again.

#### 6.4.4 EW-protection (not for 21" sets)

The East/West protection switches the power supply to standby via the signal line STANDBY-SUPPLY PROTECTION. Via the hold-circuitry of the power supply, the set will stay in the protection mode (standby) and can only be reset by switching the set off and on via the mains switch. If the fault is still present, the set will switch to standby (protection mode) again. The East/West protection detects when the current through the East/West power output stage with T57480 is too high.

Note:

*A current through the East/West stage that is too high can be caused by a defective part in the line-deflection circuitry!*

The current through the East/West stage is measured on the LSP via 2 precision resistors (R3483 and R3484). In case of a line problem, the east/west-current becomes too high and the voltage across resistors R3483 and R3484 rises. When the voltage level exceeds 0.6V, D6480 starts to conduct and STANDBY-SUPPLY PROTECTION becomes HIGH. When the voltage across C2480 is very high (e.g. when a line problem is already present when the set is switched on with the mains switch), D6481 and D6482 conduct and EW-PROTECTION is activated very fast.

The East/West protection becomes active in the following cases:

1. Bad contacts of horizontal deflection circuit:
    - bad contacts of horizontal deflection coil
    - bad contacts of linearity corrector coil L5421
    - bad contacts of S-correction capacitor C2427
  2. Bad contacts of flyback capacitor C2425.
  3. Shorted flyback diode D6421 or D6423.
  4. Shorted S-correction capacitor C2427.
  5. Bad solder contacts in the line output stage.
- When EW-protection has been active, the line output transistor 7420 may also be defective.

#### 6.4.5 Vertical-protection

The vertical output stage creates VERTICAL-PROTECTION pulses at every flyback pulse when it is functioning correctly. These pulses are sensed by the BIMOS IC7119-4D on pin 37. When the pulse train is interrupted, the BIMOS will switch to BIMOS STANDBY mode. In the BIMOS STANDBY mode, the BIMOS switches

off the VDRIVE+ and VDRIVE- while the RGB outputs are blanked. Circuit breaker 1463 may be open. Probably, the line output stage will not work and the power supply will switch to hick-up mode (under voltage protection).

#### 6.4.6 Software protection

The software protection is managed by the microprocessor. It continuously verifies the presence of the +5 and +8 supply voltages on pin 34 and the activity of the PC bus. When the protection becomes active, the software will switch the power supply on and off continuously via the STANDBY line. In this situation the power supply produces a squeaking sound.

#### Service Modes, DST, Error messages,

- I<sup>2</sup>C protection

The I<sup>2</sup>C bus is controlled at each I<sup>2</sup>C command. Therefore every I<sup>2</sup>C command has a defined start/stop condition. When the defined start/stop condition is repeatedly incorrect, error 3 is placed in the error buffer and the set switches to software protection.

I<sup>2</sup>C protection is generated in the following situations:

- SDA shorted to earth
- SCL shorted to earth
- SDA and SCL shorted

When SCL or SDA is shorted, the set tries to restart and the LED lights in a clearly recognizable pattern.

- SDA/SCL shorted when the set is switched ON with the mains switch: LED is 8 seconds RED, 8 seconds GREEN, flashes RED, 8 seconds GREEN, flashes RED, 8 seconds GREEN, flashes RED, etcetera.
- SDA/SCL shorted during operation LED is 8 seconds GREEN, flashes RED, 8 seconds GREEN, flashes RED, et cetera.

- +5Db and +8Sc protection of the microprocessor +5Db and +8Sc are the main supply voltages of the entire small signal processing of the set. At pin 34 the microprocessor senses whether the supply voltages +5SSDb or +8Sc coming from the power supply are present. When one or both the supply voltages are missing, the set switches to software protection.

#### 6.5 Fault finding and repair tips

Note that for 21" sets, voltages and waveforms may differ.

##### 6.5.1 General

LED indication after start-up procedure is completed

- No LED Set is switched OFF, supply problem or microprocessor problem.
- LED continuously Set is in standby, control part defective, standby mode defective.
- LED blinking Set in SDM, transmitting error buffer.

##### Audible checks

- Demagnetisation audible: mains voltage is present at LSP.
- EHT audible: supply is operational (line output stage only works in case VOS (+140V for 25 & 29"; +95V for 21") is present.
- Hick-up sound power supply audible: power supply is shorted. Check the LOT (item 5430) and the line output transistor T57420.

#### 6.5.2 Fault finding in the power supply

In case of a power supply problem, the power supply can be simplified to a stand alone power supply at low voltages (low risk) as follows:

##### Control part of the power supply

1. Disconnect the SSP (as a result the line will not function any more and therefore will no longer be a load of the power supply) or disconnect the line by removing jumper 9400 and R3400 (if present) on the LSP.
2. Connect an external DC power supply between supply pin 1 IC7520 (via a diode - e.g. BYD33D - with cathode to supply pin 1 IC7520) and hot earth (e.g. earth of the big smoothing capacitor C2505).
3. Connect a oscilloscope to test point P4 at pin 3 IC7520.
4. Turn up the external DC supply voltage slowly to 17V DC.

##### Remark:

The IC starts at a supply voltage of 14V DC, after that the supply voltage can drop to approx. 9V DC. At approximately 18V DC, over voltage protection becomes active, resulting in a supply voltage drop below 7V DC before a new start-up is performed by turning up the supply voltage above 14V DC.

5. The correct (measured) situation is displayed in . Other results indicate a defect in the power supply control part (IC7520 or peripheral components at pins 10 or 11).

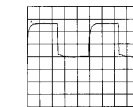


Figure 6.2

5V/div; → 5u5/div  
40KHz pulse

Energy transfer of the power supply (only if control part is OK)

6. Apply action 1, 2 and 4 as described earlier..
7. Connect a lamp of 230V/100W across the VOS output capacitor C2569.
8. Connect a 1kΩ resistor between the +5 STANDBY (connector 7L10) and the STANDBY line (connector 8L10) to switch the power supply to normal operation.
9. Connect the mains connector to a VARIAC but leave it at 0.
10. Connect a voltmeter across C2569 and an oscilloscope between the drain of T57541 (25 & 29") or T57540 (21") and hot earth.
11. Slowly increase the mains input voltage by the VARIAC (in this way further damage to the power supply can be avoided).

##### Protections, Faultfinding and Repair tips,

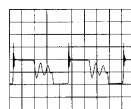
The waveforms for the following mains voltage are given:

Mains in voltage	
10V AC:	20kHz and VOS 7V5
20V AC:	40kHz and VOS 30V
40V AC:	40kHz and VOS 80V
65V AC:	40kHz and VOS 140V
> 65V AC:	Stable situation, so 40kHz and 140V

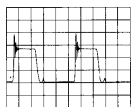
In case of a feedback problem, the situation will not stabilise or the voltage will exceed 140V (95V with 21")

## Service Mode Cont'd

- Figure 6.3:  
Mains in 10VAC  
10V/div; bus/div



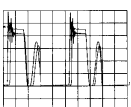
- Figure 6.4:  
Mains in 20V AC  
20V/div; 5uS/div  
→ 40kHz pulse  
→ VOS 30V



- Figure 6.5:  
Mains in 40V AC  
50V/div; 5uS/div  
→ 40kHz pulse  
→ VOS 80V



- Figure 6.6:  
Mains in 65V AC  
50V/div; 5uS/div  
→ 40kHz pulse  
→ VOS 140V



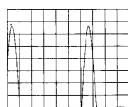
### 6.5.3 Fault finding of the horizontal circuitry

When the horizontal circuitry itself is defective, it can be simplified to a stand alone "switched mode supply" at low voltages (low risk) as follows:

- Disconnect the set from mains.
- Disconnect the SSP by removing all cables to the SSP.
- Connect an external 50V DC (or 40V DC) supply with current measurement possibility across C2400.
- Replace the HDRIVE by an external LF generator (1TL level (between 0 and 5V); duty cycle 50%) with a 16 kHz pulse at the base of TS741 0 (near LOT at the side of the PCB).
- Connect an oscilloscope to test point L1 (collector of line output transistor 7420).

#### Possibilities:

- Figure 6.7:  
L3; test point at collector line output transistor (7420)  
50V/div; 10pS/div  
Current from external DC supply approx. 100mA

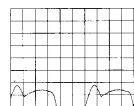


**Observation:** normal 16kHz pulses and 100mA supply current

#### Correct horizontal circuitry

Note that the amplitude of the signal strongly depends on the frequency of the generator.

- Figure 6.8:  
L3; test point at collector line output transistor (7420)  
50V/div; 10uS/div

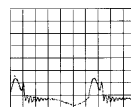


Line deflection open:  
Current from external DC supply is approximately 100mA.

**Observation:** small pulse followed by wide pulse and 100mA supply current

**Causes:** horizontal deflection coil open linearity coil L5421 open S-correction C2427 open

- Figure 6.9:  
L3; test point at collector line output transistor (7420)  
50V/div; 10uS/div Current from external DC supply approx 500mA!!

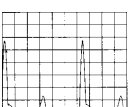


**Observation:** fast oscillations and 500mA supply current

**Cause:** horizontal deflection shorted (e.g. line deflection coil shorted)

When the line deflection is not completely shorted but only a number of windings are shorted, the waveform does not show the oscillation and the current of the external DC supply is approximately 200mA.

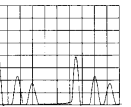
- Figure 6.10:  
L3; test point at collector line output transistor (7420)  
100V/div; 10uS/div



Current from external DC supply is approximately 150mA

**Observation:** flyback time is shorter, one extra pulse in between, 150mA supply current  
**Cause:** flyback capacitor C2425 open

- Figure 6.11:  
L3; test point at collector line output transistor (7420)  
100V/div; 10uS/div



Current from external DC supply > 1A

**Observation:** 2 pulses per cycle extra and supply current from more than 1A

**Cause:** short-circuit in picture tube (e.g. EHT to Aquadag)

#### Service Modes, DST, Error messages,

**6.5.4 Fault finding "no picture, no protection" (problem in the video controller IC part TDA8366-4C)**

When there is no picture and no protection, it is most likely that there is a problem with the BC\_INFO caused by the TDA8366, the RGB amplifiers or the picture tube.

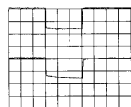
For measuring, connect a video generator (e.g. PM5518) at the aerial input with a white pattern to the tuner. Trigger the oscilloscope field

frequent. A stable picture is obtained if triggered with VDRIVE+ at pin 4 S11.

#### Normal start up procedure

- First phase of start up; 4 white measuring lines (lines 15,16, 17, 18) and the main picture is muted (wave forms are better visible if the picture tube is cold);

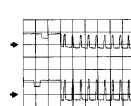
Figure 6.12:  
Red (pin 8 of connector R43 on the CRT panel) and green gun (pin 6) 100V/div DC; 100 uS/div



The total beam current is measured and fed back to pin 16 TDA8366 (IC7119)  
The TDA8366 checks the voltage at pin 16 of the TDA8366 during these lines <4.5V: set remains in this phase ≤4.5V: set continues with start up phase 2

- Second phase of start up; each beam is separately measured and the main picture is still muted. Line 15 is Red, line 16 is Green and line 17 is Blue. BC\_INFO is measured.
  - differences between the lines (guns) are compensated
  - when the differences are minimal the set continues with phase 3, otherwise it remains in phase 2

Figure 6.13:  
Red (lower line) (pin 8 of connector R43 on the CRT panel) and green (upper line) gun (pin 6) 50V/div AC; 100uS/div



- After start up the picture is present and differences in cut-off points of the R, the G and the B gun are compensated continuously.

#### Repair procedure

**Typical situation: no picture and no error codes**

- Switch the set on.
- In a 4:3 set, press "picture size" to switch the set to "16:9 compressed" mode.
- In a 16:9 set, shift down the picture with the cursor keys.

The start up phase of the set can be identified:

- A bright white horizontal line at the top; the rest of the picture is dark (set hangs in first phase of start up procedure) Oscilloscope picture of the voltage over the guns looks like figure 6.12.

*TDA8366 (IC7119), picture tube and RGB amplifiers are OK*

There should be 4.5V at pin 16 TDA8366.

**Possible problem:** if there is no 4.5V present at pin 16 of TDA8366, there is a defect (in one or more of the components) in the BC\_INFO feedback loop.

- Small horizontal red, green and blue lines at the top; the rest of the picture is dark (set hangs in second phase of start up procedure)

*TDA8366 is OK*

**Possible problem:** one or more of the guns of

the picture tube are bad.  
Measure at pin 16 TDA8366 which feedback line(s) (the R or G or B line) is/are smaller; the corresponding amplifier(s) or gun(s) is/are faulty.

#### 3. No lines visible (picture dark)

Measure pin 16 TDA8366; possible measurements:

- 0V: Check TDA8366 (sandcastle and the supply voltage)  
Check RGB amplifiers  
Short pin 16 TDA8366 to ground, now there will be measuring lines (at continuously 5V, phase 1 and 2 is bypassed) there is a measuring line, so the TDA8366 is OK  
Measure on cathode on the CRT panel if the measuring lines are present:  
Yes → BC\_INFO circuit is open or no HEATER voltage  
No → RGB amplifier problem
- 5V:
- Pulses:

#### 8. Electrical alignments

General: the Service Default Mode (SDM) and Service Alignment Mode (SAM) are described in chapter 6.

##### Alignment conditions:

All electrical adjustments should be performed under the following conditions:

- Power supply voltage: 240V±10%, 50Hz ±5%.
- 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.

#### 8.1 Adjustments on the large signal panel

##### 8.1.1 95V/140V supply voltage

###### For 21" TV-sets

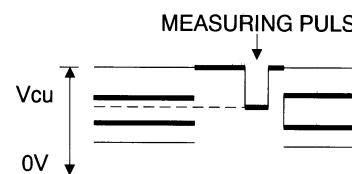
Connect a voltmeter to the cathode of D6567. With the aid of R3532 adjust the power supply voltage to 95V ± 0,5V

###### For sets 21"

Connect a voltmeter to the cathode of D6567. With the aid of R3559 adjust the power supply voltage to 140V± IV.

##### 8.1.2 VG2 adjustment

Connect a pattern generator displaying a full black picture. Switch the TV-set to the service default mode (see chapter 6). Connect an oscilloscope to the picture tube cathodes for red, green and blue (pins 6, 8 en 11 of the picture tube socket). Set the oscilloscope to DC, 50 V/div and 2 ms/div. Measure the DC level of the measuring pulses at the end of the frameblanking (see fig. 8.1). Using the Vg2 potentiometer on the linetransformer (bottom potentiometer) the measuringpulse with the highest level must be set to +160V ± 2V.



##### 8.1.3 Focusing

Is aligned using the focuspotentiometer on the linetransformer (top potentiometer).

#### 8.2 Alignments on the small signal panel

##### 8.2.140.4 MHz IF filter (only for sets with SECAM LL' reception)

Using a signal generator (e.g. PM5326) and a capacitor of 5,6 pF supply a 40,4 MHz signal to pin 17 of the tuner. Connect an oscilloscope to pin 1 of filter 1016. Switch on the set and select in the installation menu MANUAL; SYSTEM EUR.W. Align coil L5117 for maximum DC output voltage.

##### 8.2.2 AFC

Switch the set to service default mode (see chapter 8).  
Using a pattern generator (e.g. PM5518) supply a signal on a frequency of 475,25 MHz  
Align coil L5114 for optimal picture quality.

##### 8.2.3 Picture demodulator (only for sets with SECAM LL' reception)

Using a signal generator (e.g. PM5326) supply a 32.95MHz signal via a 5,6 pF capacitor to pin 17 of the tuner. Align the signal level of the generator so that the DC-voltage on pin 5 of the tuner is 5V.  
Switch on the set and select in the installation menu MANUAL; SYSTEM FRANCE. Align capacitor C2106 for minimal voltage on pin 5 of the tuner.

##### 8.2.4 RF-AGC

If the signal of a strong local transmitter is distorted, align the value for AX (AGC crossover) in the service menu (see chapter 8) until the picture is no longer distorted.

##### 8.2.5 Audio demodulator (Not for sets with LL' and NICAM reception possibility)

Using a signal generator (e.g. PM5326) supply a 38.9MHz signal via a 5,6 pF capacitor to pin 17 of the tuner.  
Connect an oscilloscope (2ms/div) to pin 12 of IC7033 (TDA3845). Align coil L5030 for minimal amplitude.

#### 8.3 Picture tube alignments

##### 8.3.1 White balance

Connect a pattern generator and select a white picture. Set contrast to maximum (63) for 21" or to 40 for 21" tv-sets. Use the ↑ / ↓ keys to select an alignment and the ← / → keys to change the value. Set GD to 50, RD to 57 and BD to 45.  
If necessary change the settings for RD and BD for a correct white balance.

##### 8.3.2 Geometry adjustments (for software versions M12COX-3.x and M12BAX-x.x)

Connect a pattern generator and select a geometry pattern (signal at 475.25 MHz)

- Switch to the Service Default Mode, then to the Service Alignment Mode.
- Select the desired alignment with the ↑ / ↓ keys.
- Change the selected alignment with the ← / → keys.
- A value between 0 and 63 can be selected.
- Changed values are stored immediately.

##### Vertical

- VP: Vertical Shift  
Set this for the correct vertical position.
- VA: Picture height  
Set this for the correct picture height.
- VL: Vertical linearity  
Set this so that the vertical centre of the

picture is at the centre of the tube.  
VS: Vertical S-correction

Set this so that the height of the squares in the top of the picture equal the height in the bottom of the picture.

##### Horizontal

HD: Horizontal shift.  
Set this so that the horizontal centre of the picture is on the centre of the tube.

For sets with a screen size larger than 21", the following alignments can be done as well. For 21" sets these alignments have no function.

- HW: East-west width  
Align the picture width with this.
- HP: East-west parabola correction  
Set this so that the vertical lines at the sides of the screen are straight.
- HC: East-west corner-correction.  
Set this so that the vertical lines are straight in the corners.
- HT: Trapezium correction  
Set this so that the vertical lines are as vertical as possible.

Adjustments for 16:9 sets (reserved)

- 16 = N 4:3 tube (options SS, D1, D2, D3 and D4 not available (blue))
- 16 = Y 16:9 tube (options SS, D1, D2, D3 and D4 available)

#### 8.4 Options

- E2: Number of Euro/Scart connectors (options N or Y)  
N 1 Euro/Scart connector present  
Y 2 Euro/Scart connectors present
- UO: Tuner type  
N UHF/NHF tuner (item 1000 is UV9165)  
Y UHF tuner (item 1000 is UV9445).  
Used in the United Kingdom (/05 sets)

- LL: Nicam L (options N or Y)  
N Nicam L not present  
Y Nicam L present (Nicam L panel required and item 7353 is M5P3410)

- NL: Nicam (stereo) sound (options N or Y)  
N Only 2C5 stereo, no Nicam (item 7353 is M5P3400)  
Y 2C5 and Nicam stereo (item 7353 is M5P3410)

- U: Teletext (options N or Y)  
N No Teletext present  
Y Teletext present
- ET: (Eastern Europe) teletext type (options N or Y)  
N No Eastern Europe teletext  
Y Eastern Europe teletext (/58 sets)

- 14: 14:9 Picture format supported by 4:3 tube (options N or Y)  
N Not supported  
Y Supported

- HI: Histogram (not with software version M12BAX-x.x)

- N No Histogram present (options VG, VA and NL not available (blue))
- Y Histogram present (options VG, VA and NL available)

- M2: MD1 .1 E or MD1 .2E chassis (only with software version M12BAX-x.x)  
N MD1.1E chassis  
Y MD1.2E chassis

## Alignments

### (16:9 & Surround Sound)

8. See MD1.2E AA for a description of the basic alignments for the MD1.2E AA software.

Software version:  
 M12BAx-4.x  
 M1200x-3.2  
 4:3 sets (NO flashing LED procedure, replaced by M12COx-4.0)  
 M12COx-4.0  
 4:3 sets (WITH flashing LED procedure, replaces M1200x-3.2)

In the Service Default and Service Alignment Mode widescreen sets switch to Wide Screen format. All the geometry alignments also have to be made in the WideScreen mode.

In this supplement the additional options for 16:9 and Dolby Pro Logic sets with the following software are described:

- M12COx-5.1 (or later) 16:9 sets (also suitable for 4:3 sets)
- MI 2DOx-1.0 (or later) Dolby Pro Logic sets (4:3 and 16:9)

### 8.1 Options and alignments

- HI Histogram option. This option is not used and is not selectable.
- WB Format detection for 4:3, 14:9 or 16:9 picture (16:9 sets only) and Dolby Pro Logic sound (Dolby Pro Logic sets only) by the teletext IC.
- Y Automatic detection on
- N Automatic detection off
- Automatic 16:9 detection via the Scart cable also functions if 'WB N' is set.
- 16 Picture tube aspect ratio
  - Y 16:9 picture tube
  - N 4:3 picture tube
  - If '16 N' is set, parameters WB\*, RT, SS, DI, D2, D3 and D4 automatically become blue and are made non-selectable.

\* In Dolby Pro Logic sets the WB option can be selected independently of the 16 option, as the automatic sound detection can also be switched on and off in this manner.

- RT Rotation coil (picture tilt)
- Y Rotation coil present; An option to tilt the picture appears under the YELLOW key in the operating menu.
- N No rotation coil present.
- D1 HD-value deviation in 4:3, Zoom 14:9 and Zoom 16:9 in relation to WideScreen mode.
- D2 HD-value deviation in SuperWide (panorama) format in relation to WideScreen mode.
- D3 HP-value deviation in 4:3, Zoom 14:9 and Zoom 16:9 in relation to WideScreen mode.
- D4 HP-value deviation in SuperWide (panorama) format in relation to WideScreen mode.

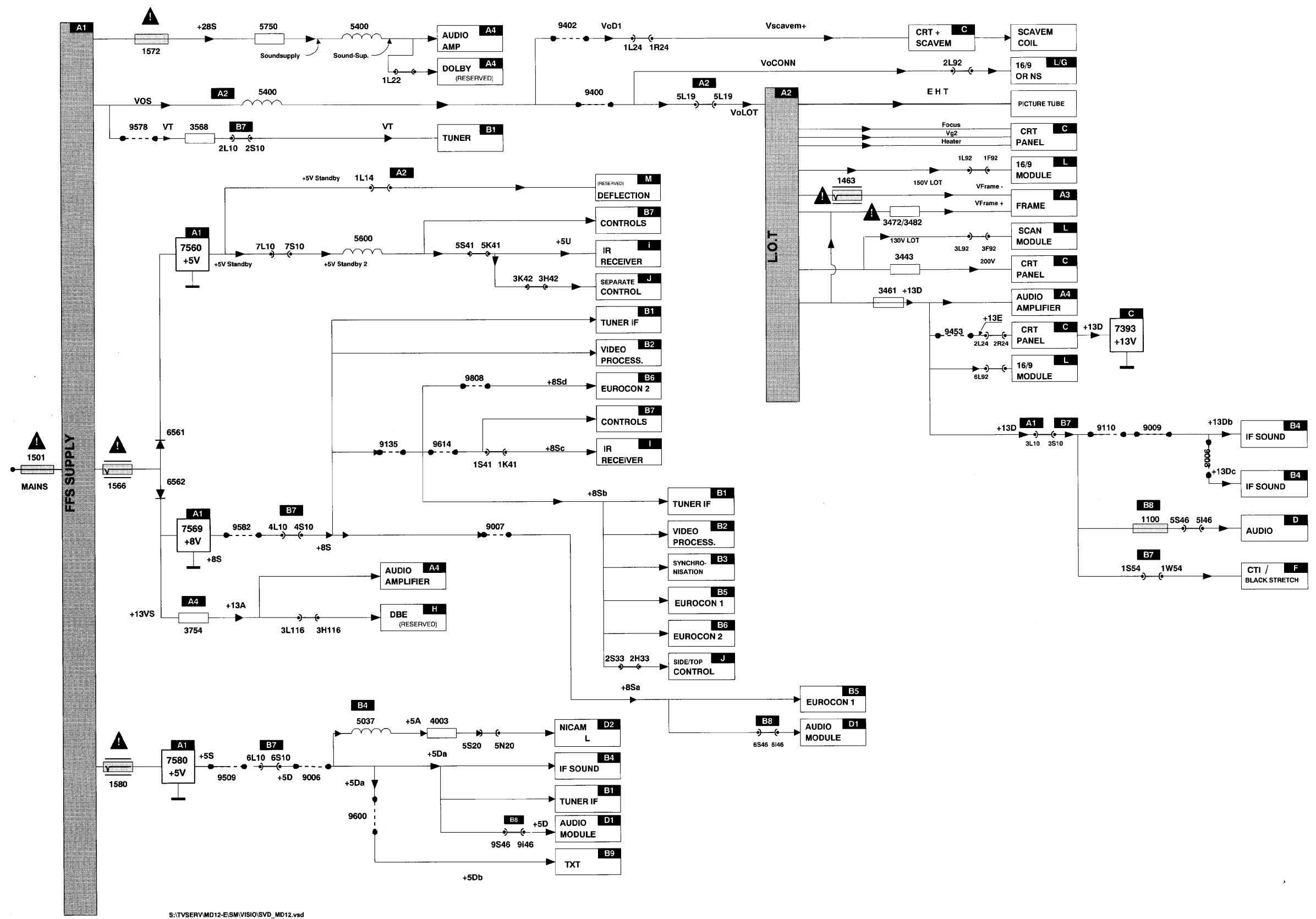
The alignment settings are dependent on picture tube format:

Picture tube format	20"	24"	28"	32"
D1	12	9	9	8
D2	2	3	3	5
D3	10	9	9	8
D4	7	9	9	8

SS Picture dimension and rotation coil dependent setting.

SS	Picture tube / rotation coil
1	32" with rotation coil
2	28" with rotation coil
3	24" with rotation coil
4	32" without rotation coil
5	28" without rotation coil
6	24" without rotation coil

## Supply Voltage Diagram

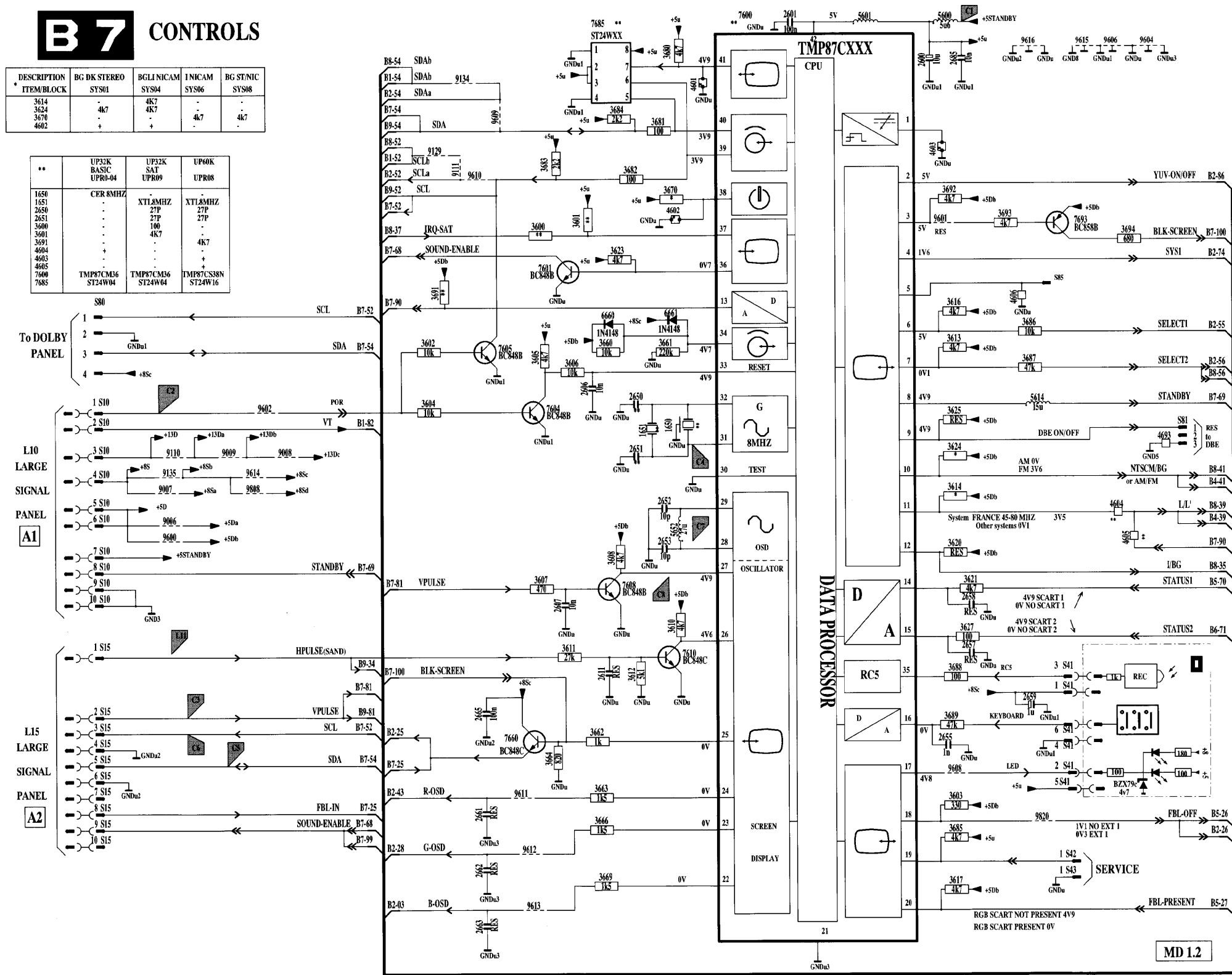


Controls Diagram

**B7** CONTROLS

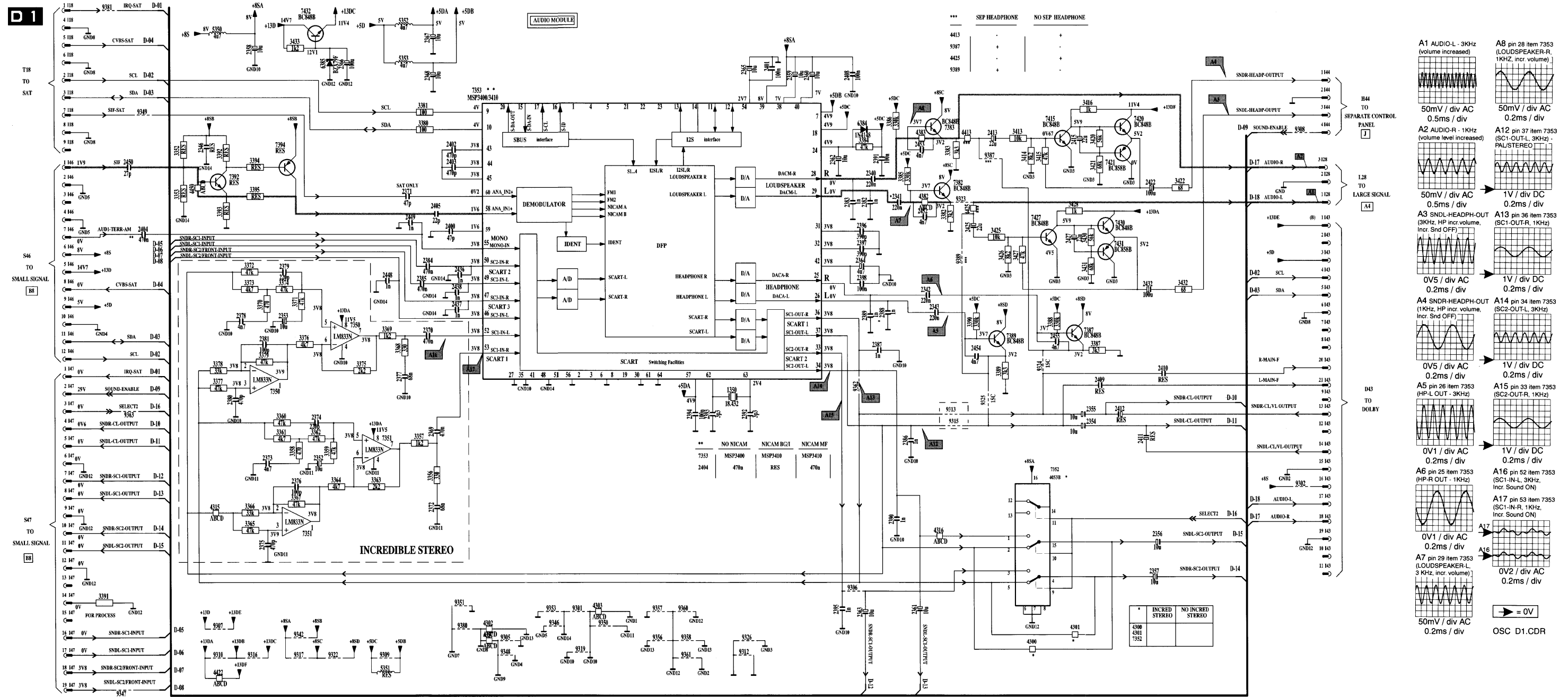
DESCRIPTION ITEM/BLOCK	BG DK STEREO SYS01	BGLI NICAM SYS04	INICAM SYS06	BG ST/NIC SYS08
3614	-	4K7	-	-
3624	4K7	4K7	-	-
3670	-	-	4K7	-
4602	-	-	-	4K7

**	UP32K BASIC UPR0-04	UP32K SAT UPR09	UP60K UPR08
1650	CER 8MHZ	XTL 8MHZ	XTL 8MHZ
2650	-	27P	27P
2651	-	27P	27P
3600	-	100	-
3601	-	4K7	-
3691	-	-	4K7
4604	-	-	-
4603	-	-	-
4605	-	-	-
7600	TMP87CM36 ST24W04	TMP87CM36 ST24W04	TMP87CS38N ST24W16
7685	-	-	-



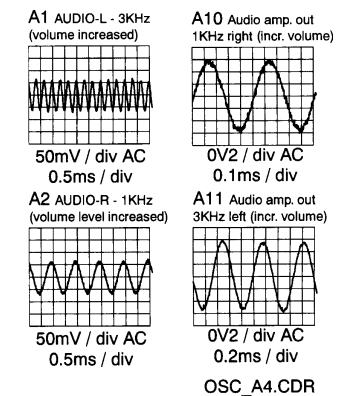
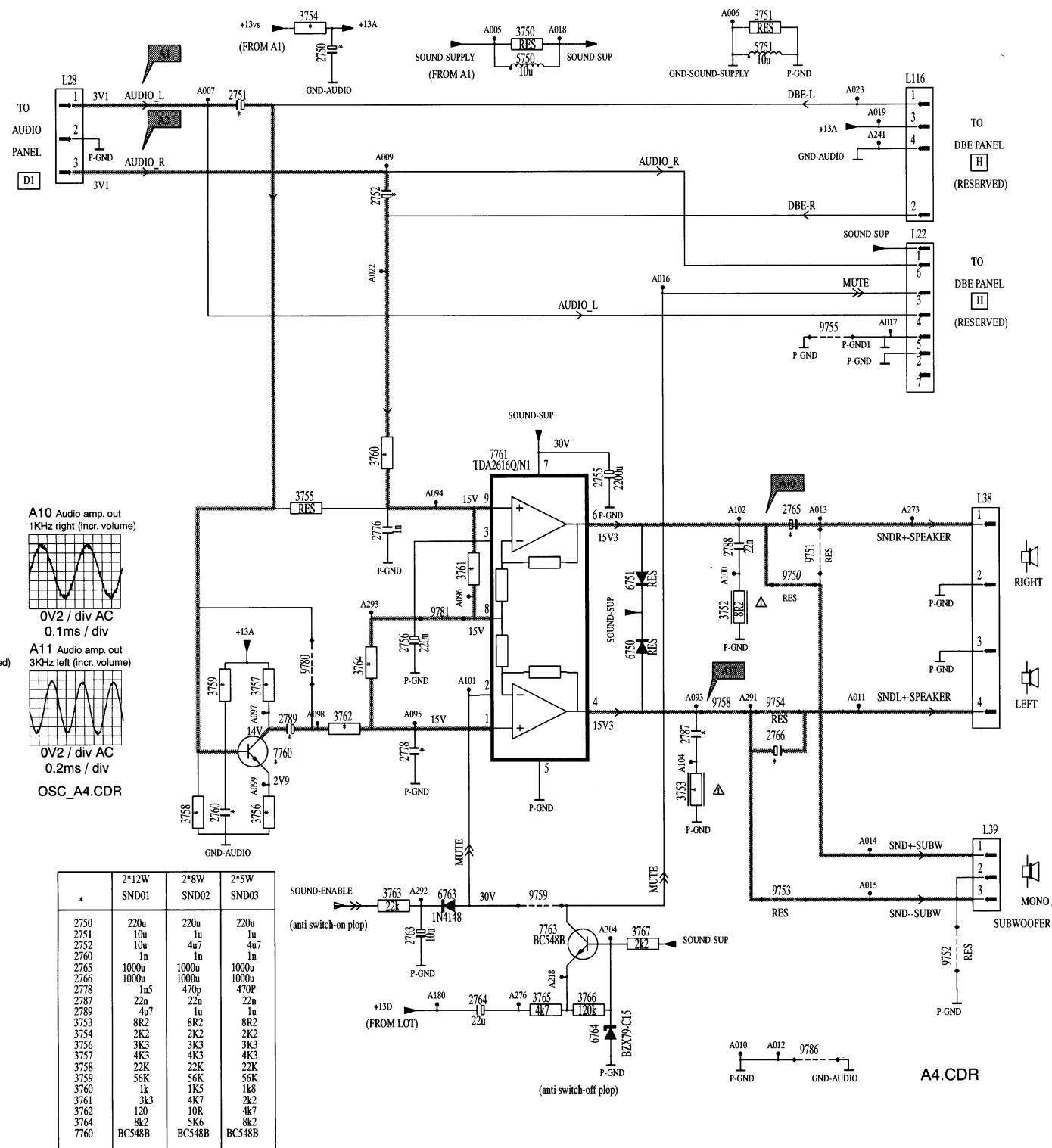
- C1 +5STANDBY (Pin 42 item 7600) 5VDC
  - C2 POR (① to ①) 0V<sub>5V</sub> POR (① to ①) 5V<sub>LOV</sub>
  - C3 VPULSE
  - C4 (8MHz oscillator)
  - C5 SDA
  - C6 SCL
  - C7 pin 28 item 7600 (MicroProcessor OSD oscillator)
  - C8 pin 27 item 7600
  - L11 SAND
- = 0V
- OSC B7.CDR

# Audio Module Diagram



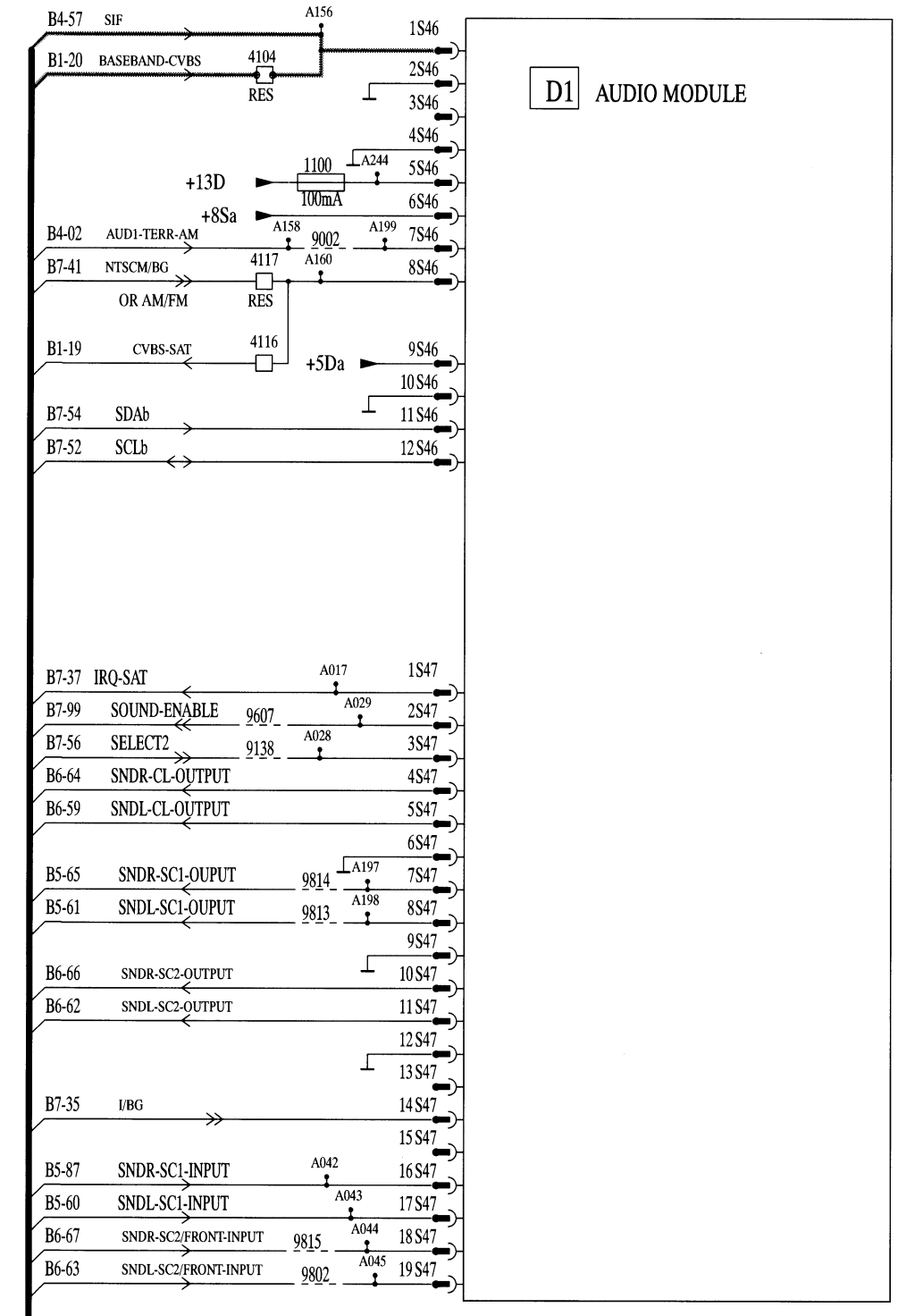


### Audio Output Diagram

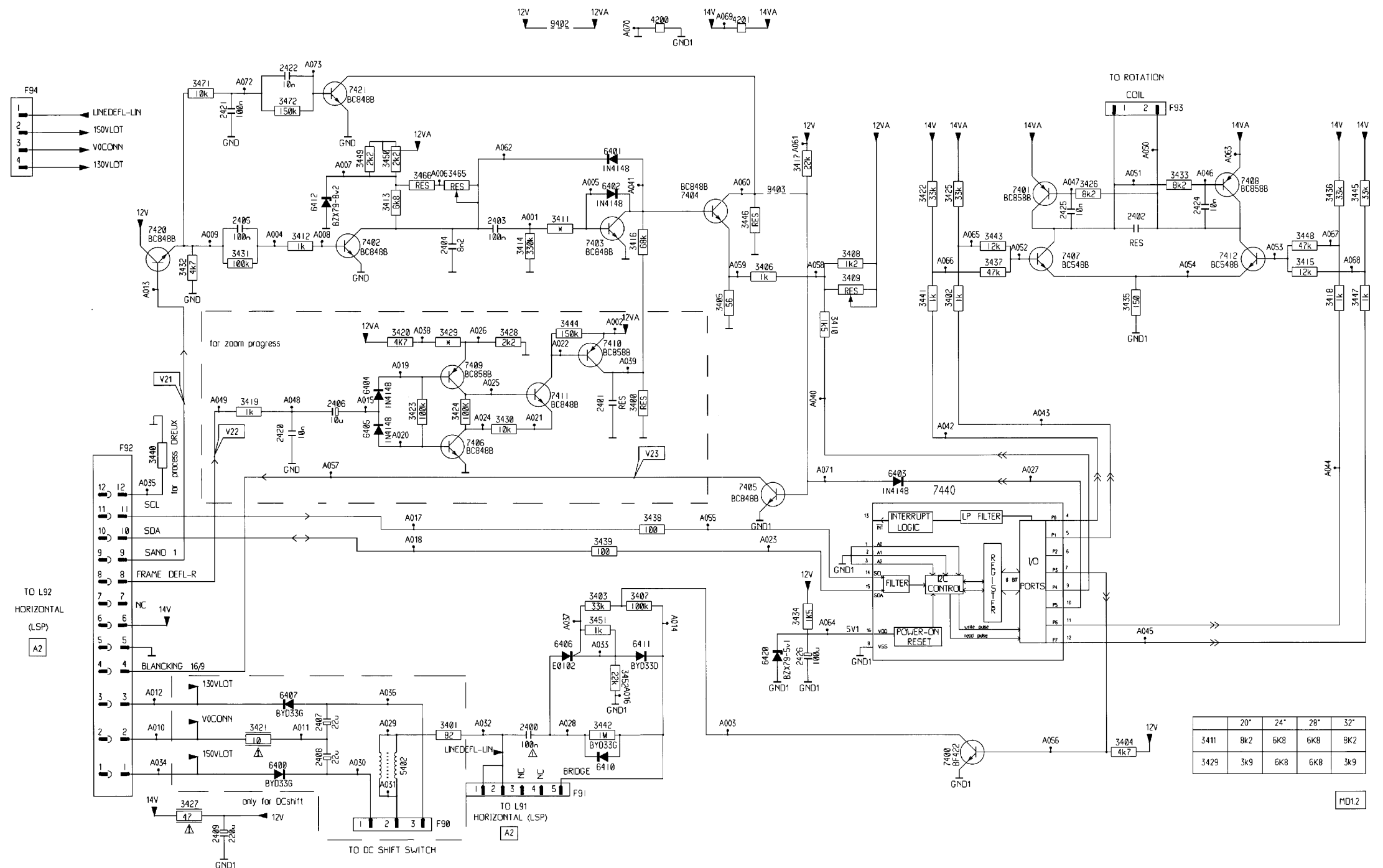
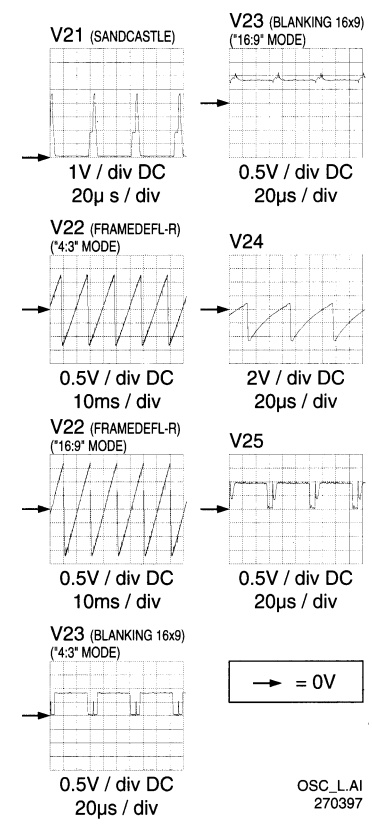


*	2*12W SND01	2*8W SND02	2*5W SND03
2750	220u	220u	220u
2751	10u	1u	1u
2752	10u	4u7	4u7
2760	1n	1n	1n
2765	1000u	1000u	1000u
2766	1000u	1000u	1000u
2778	1n5	470p	470p
2787	22n	22n	22n
2789	4u7	1u	1u
3753	8R2	8R2	8R2
3754	2K2	2K2	2K2
3756	3K3	3K3	3K3
3757	4K3	4K3	4K3
3758	22K	22K	22K
3759	56K	56K	56K
3760	1k	1K5	1k8
3761	3k3	4K7	2k2
3762	120	10R	4k7
3764	8k2	5K6	8k2
7760	BC548B	BC548B	BC548B

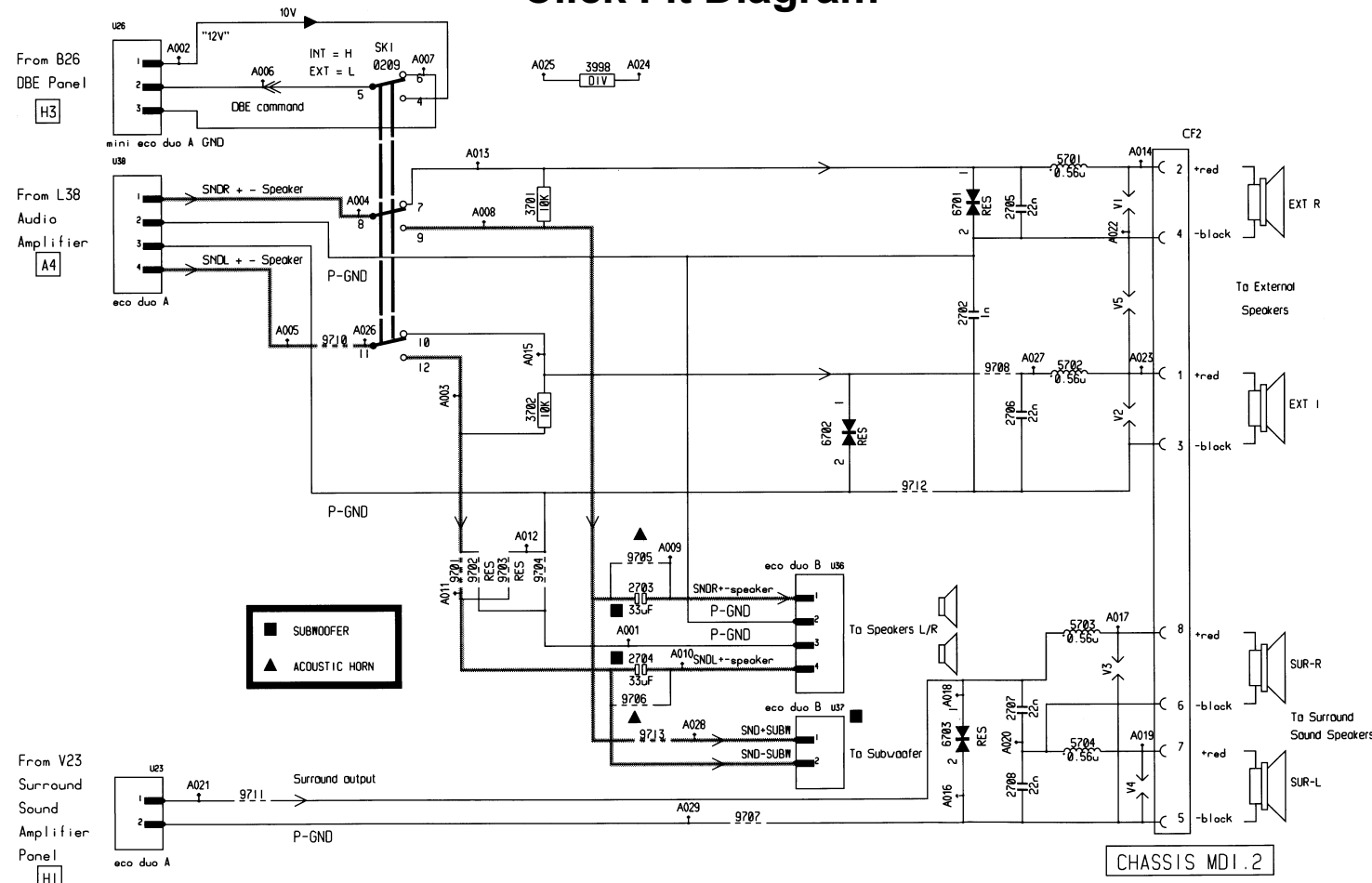
### Audio Module Connections Diagram



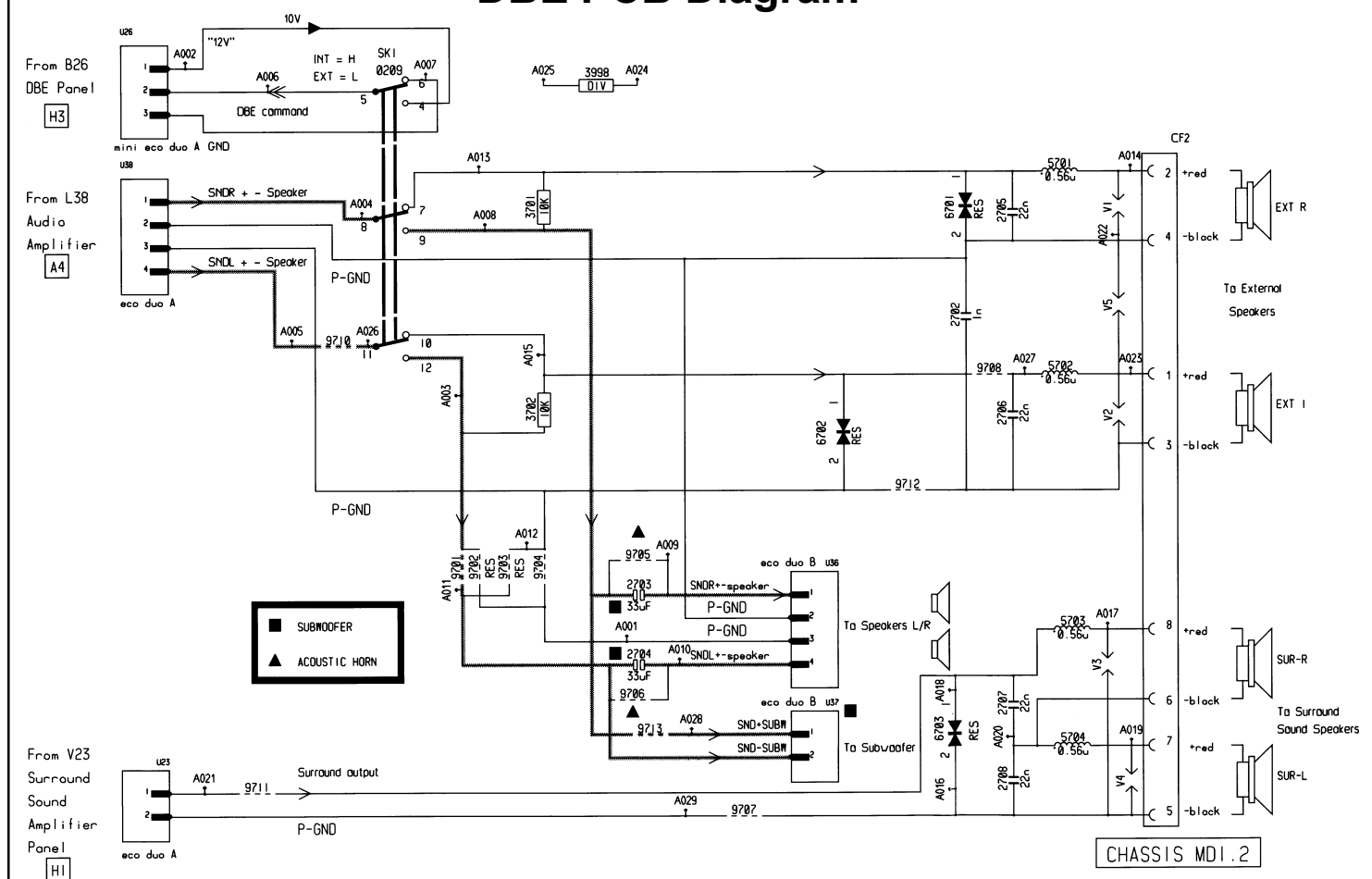
16:9 PCB Diagram



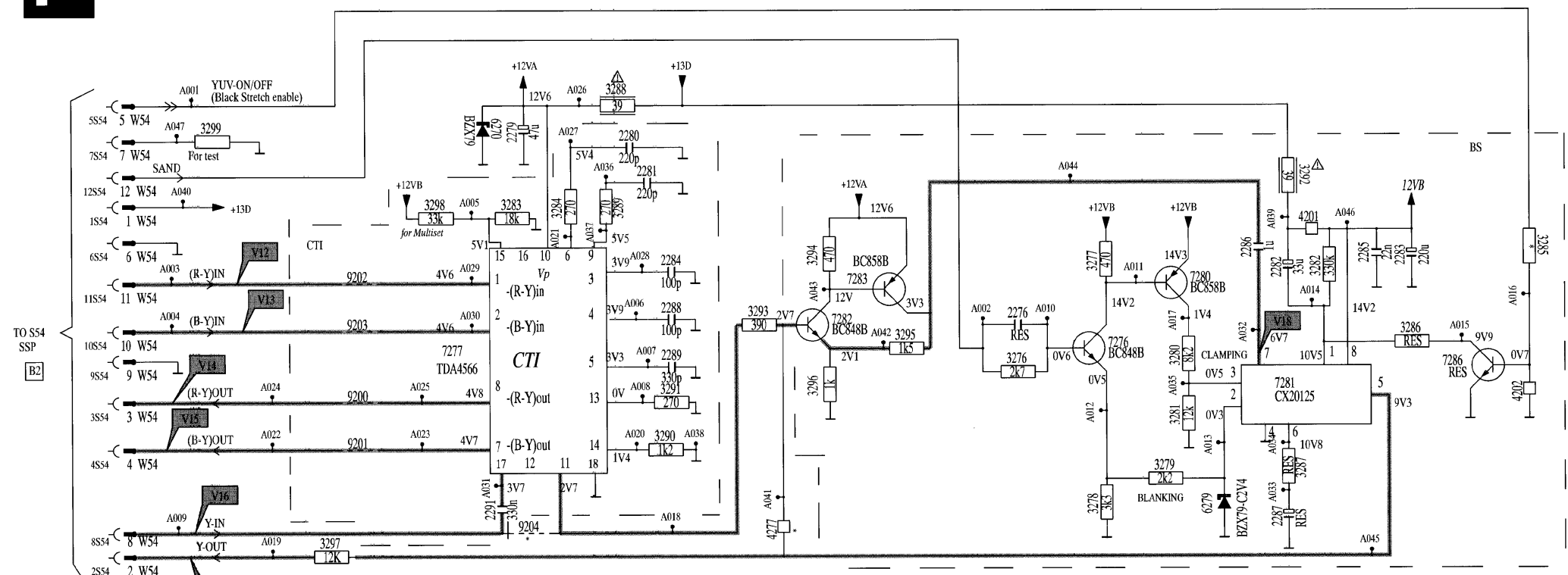
Click Fit Diagram



DBE PCB Diagram



CTI/Black Stretch Diagram



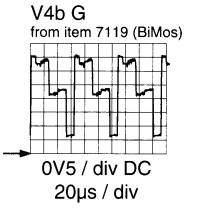
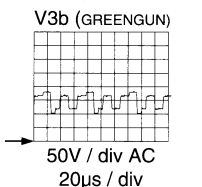
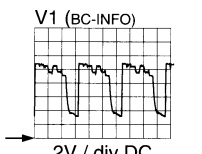
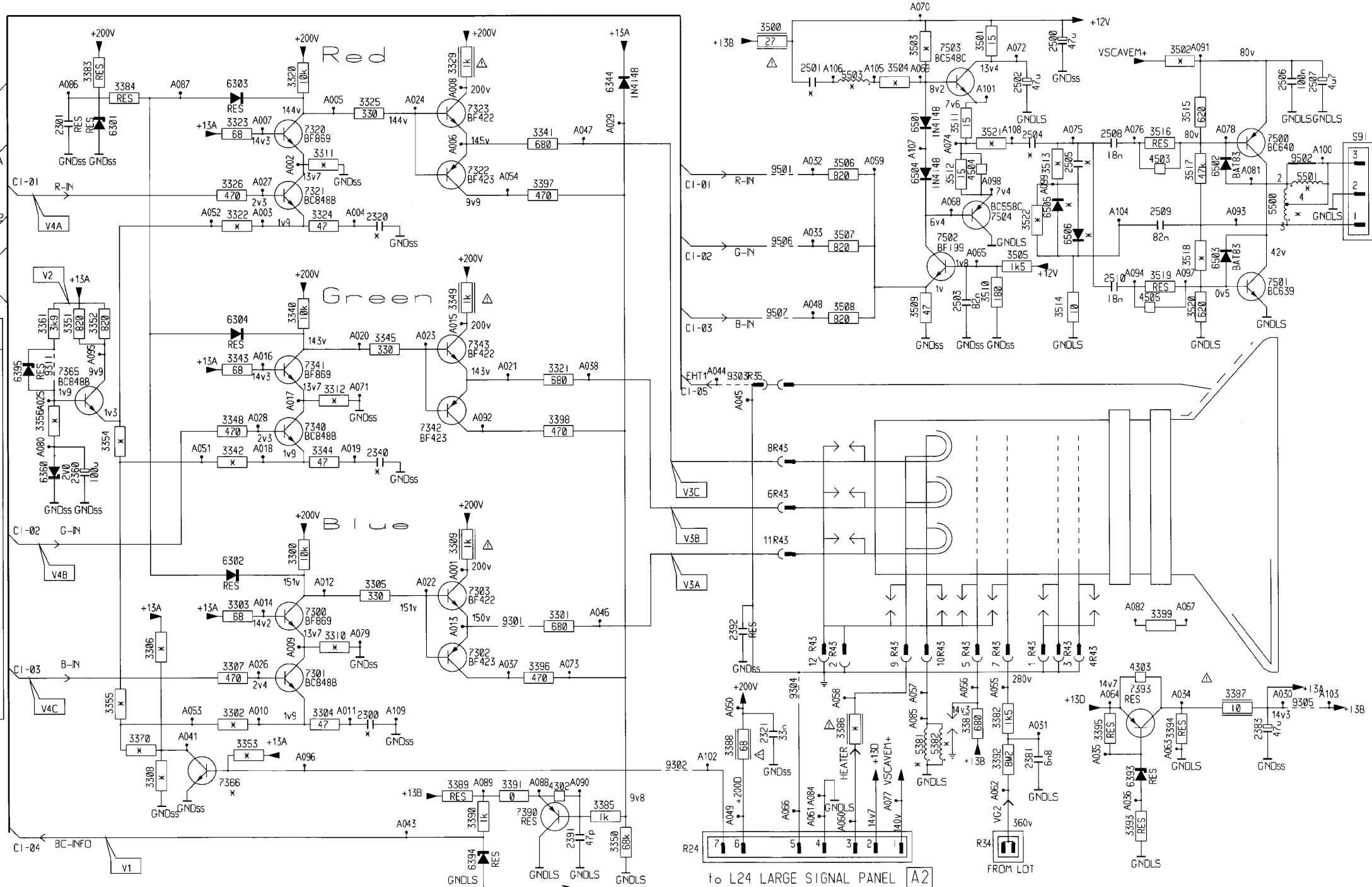
	BS	CTI	BS+CTI
3285	12k	-	1k
4277	-	+	-
9204	-	-	-

CRT Base PCB Diagram  
(16:9 & Surround Sound)

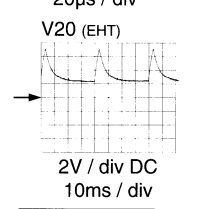
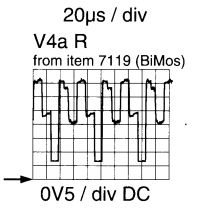
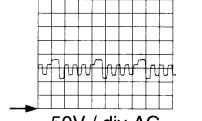
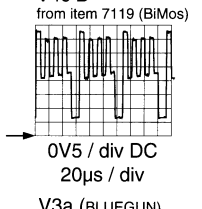
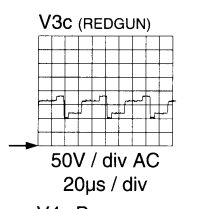


to  
S40  
SMALL  
SIGNAL  
PANEL  
B2

*	CRT00 28"WS	CRT01 24"WS	CRT06 32"WS	CRT08 20"WS	CRT09 29"SF
2300	180p	180p	220P	180p	270P
2320	220p	220P	330p	180p	270P
2340	270p	220P	330p	180p	270P
2501	18p	-	18p	-	10P
2504	1n	-	1n	-	1n
2505	res	-	res	-	RES
3129	100	220K	100k	470K	150K
3302	220R	330	220R	270	220
3306	15k	15k	15k	15k	-
3308	10k	10k	10k	10k	imp
3310	10k	8K2	12K	12K	15K
3311	10k	5K6	6K8	6K8	5K6
3312	6K8	5K6	6K8	6K8	5K6
3322	180	330	180	220	180
3342	180	330	180	220	180
3353	10k	10k	10k	10k	10k
3354	4R7	4R7	4R7	4R7	4R7
3355	15	15	15	15	15
3356	82	4R7	100	4R7	JMP
3370	39	39	39	39	39
3386	1	1R2	1R	1R2	1
3502	5K5	-	5K6	-	5K6
3503	820	-	820	-	390
3504	820	-	820	-	1k
3513	100	-	100	-	47
3521	jmp	-	jmp	-	jmp
3522	47	-	47	-	22
5381	33U	33U	33U	-	33U
5382	-	-	-	27U	-
5500	RES	-	RES	-	RES
5501	RES	-	RES	-	RES
5503	56u	-	56u	-	100u
6505	-	-	1N4148	-	1N4148
6506	-	-	1N4148	-	1N4148
7366	BC848B	BC848B	BC848B	BC848B	RES



V2  
+13D +14V DC

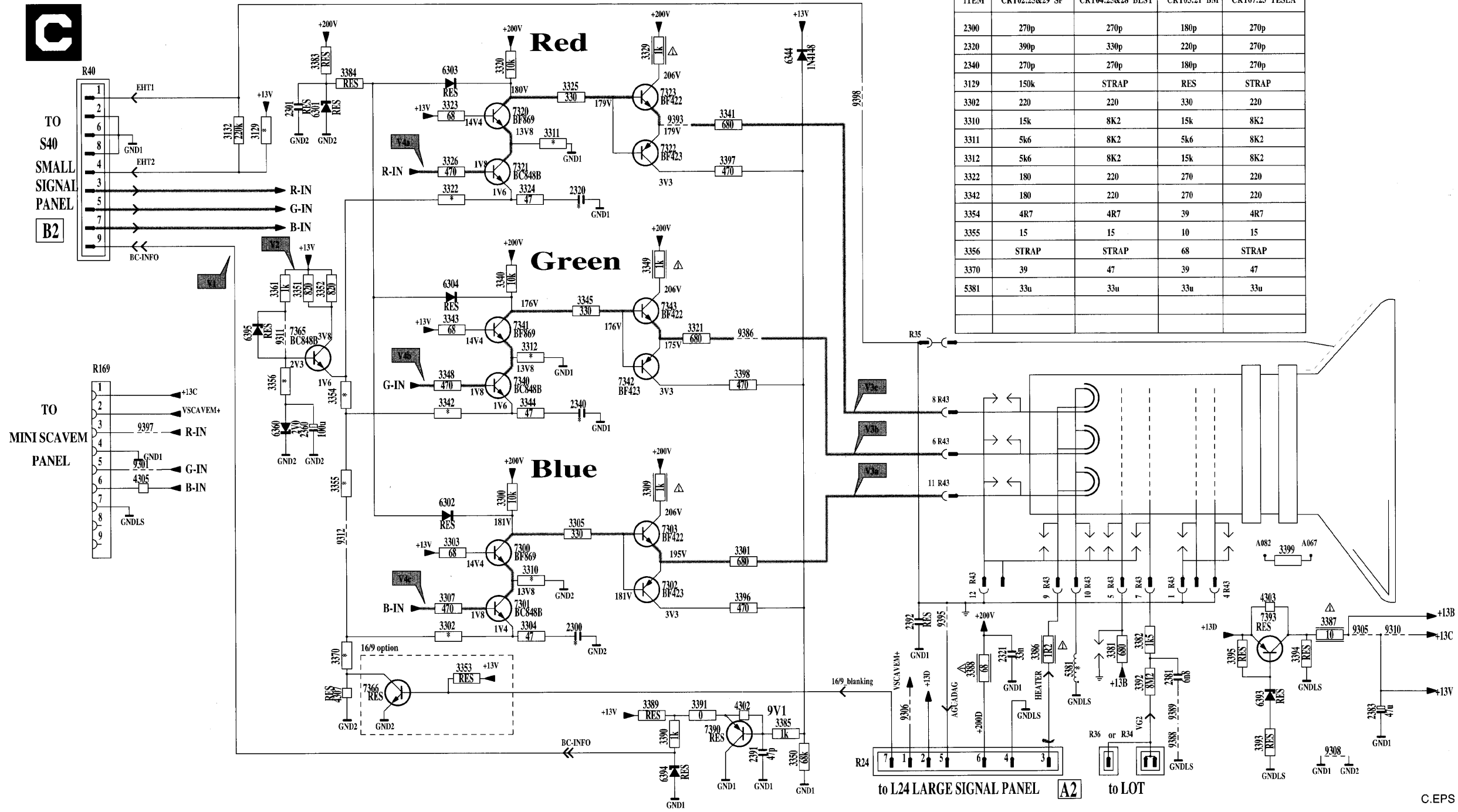


→ = 0V

to L24 LARGE SIGNAL PANEL A2

FROM LOT

CRT PCB Diagram

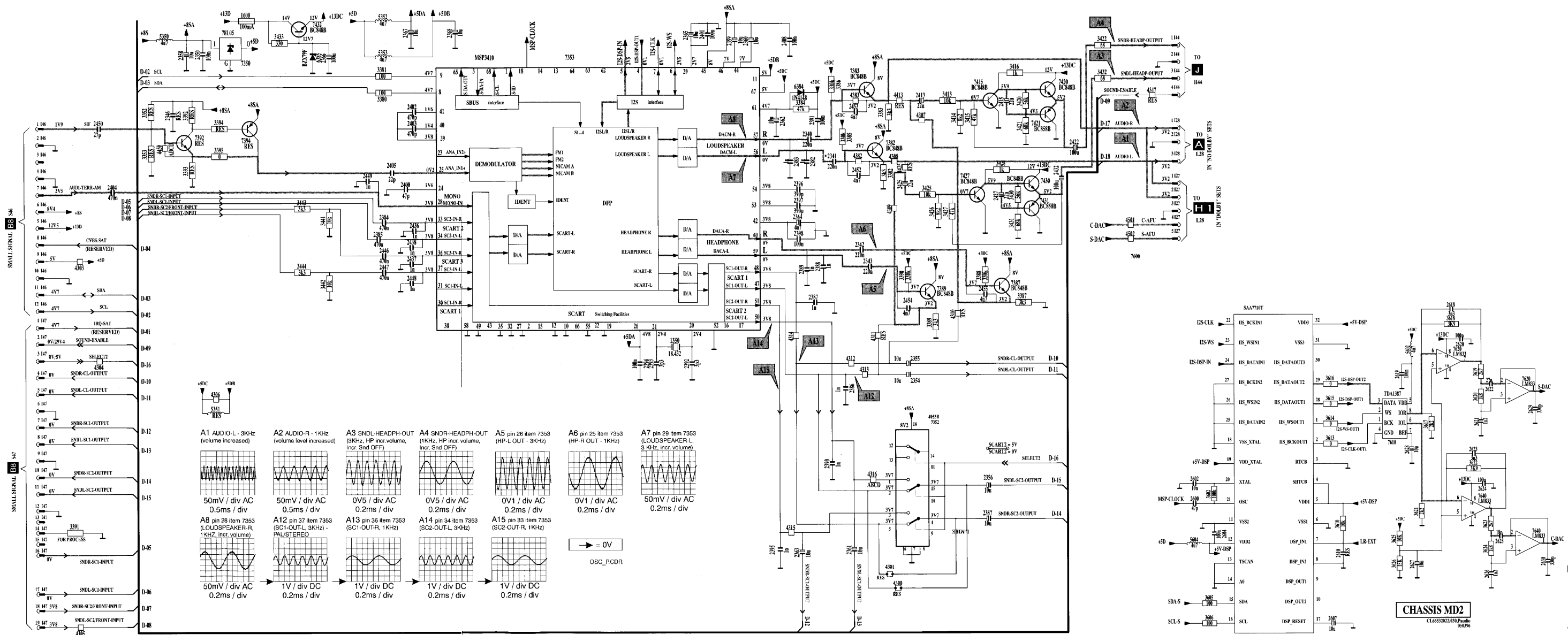


- V1 BC-INFO  
2V / div DC  
20µs / div
  - V2 +13D  
+14VDC
  - V3a BLUE GUN  
50V / div AC  
20µs / div
  - V3b GREEN GUN  
50V / div AC  
20µs / div
  - V3c RED GUN  
50V / div AC  
20µs / div
  - V4a R  
from item 7119 (BiMos)  
0V5 / div DC  
20µs / div
  - V4b G  
from item 7119 (BiMos)  
0V5 / div DC  
20µs / div
  - V4c B  
from item 7119 (BiMos)  
0V5 / div DC  
20µs / div
- = 0V  
OSC\_C.CDR

C.EPS



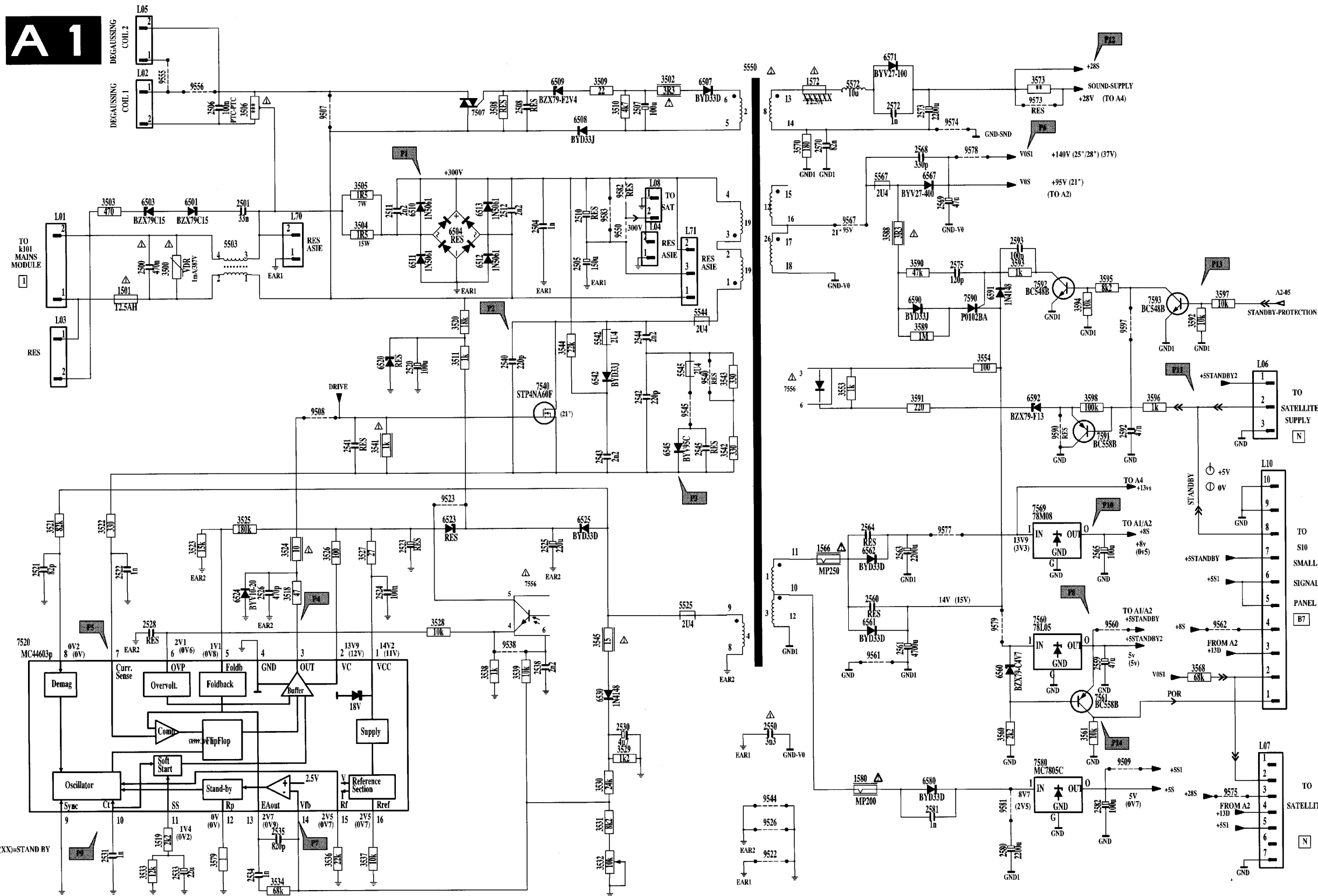
Dolby Module Diagram







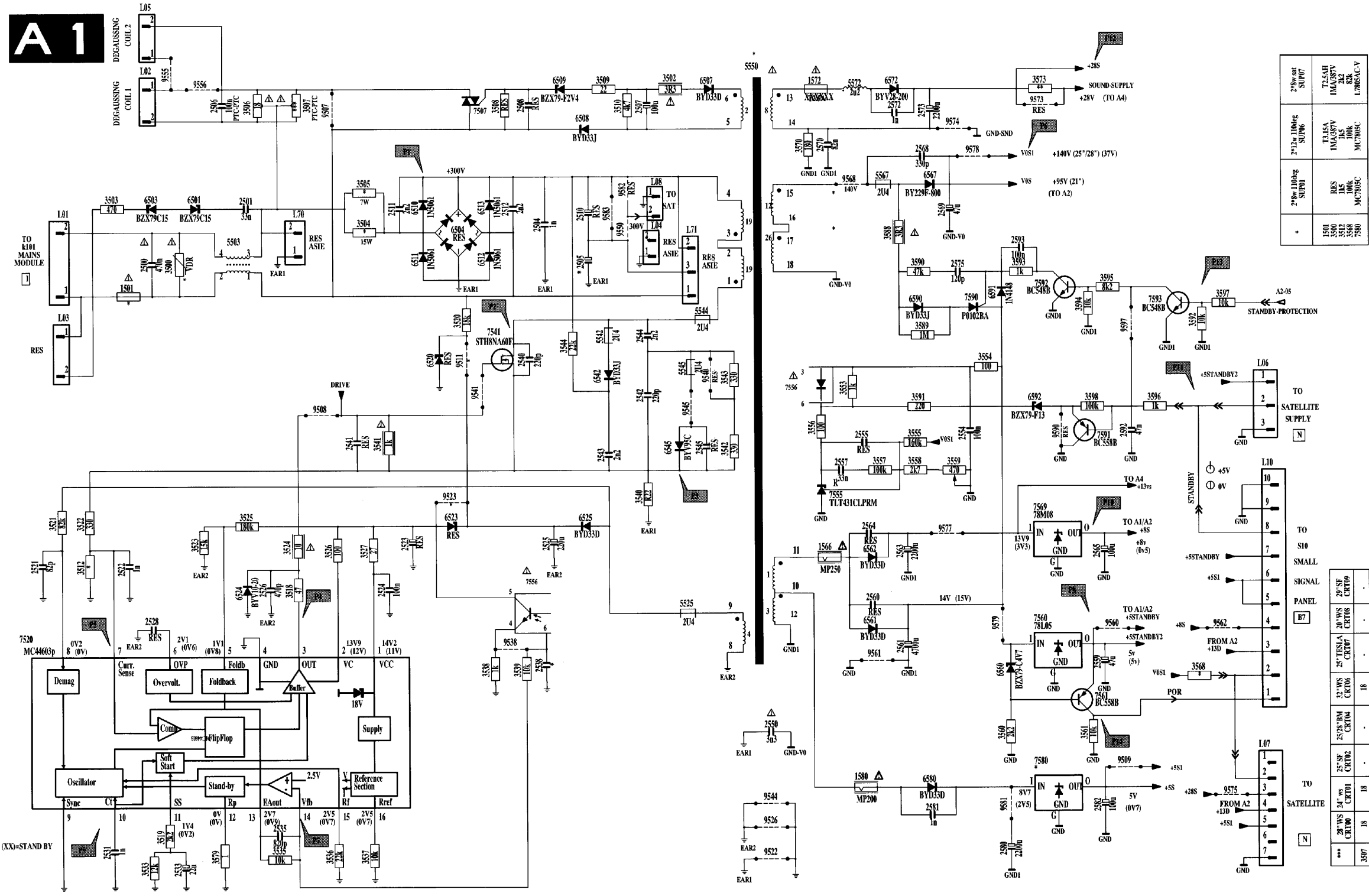
Power Supply Diagram (21" only)



- P1 pin 4 item 5550 300VDC
- P2 drain item 7540/7541  
100V / div DC  
10µs / div
- P3 cathode item 6545  
0.2V / div DC  
5µs / div
- P4 pin 3 item 7520  
2V / div DC  
10µs / div
- P5 pin 7 item 7520  
50mV / div AC  
10µs / div
- P6 VOS  
non 21": 140V DC  
21": 95V DC
- P7 pin 14 item 7520 2VSDC  
0.5V / div DC  
0.1s / div
- P8 +5VSTANDBY  
Ⓢ 5VDC  
Ⓢ 0VDC
- P9 pin 10 item 7520  
0.5V / div DC  
10µs / div
- P10 +8S  
Ⓢ 8VDC  
Ⓢ 0VDC
- P11 STANDBY  
Ⓢ 5VDC  
Ⓢ 0VDC
- P12 +28S/  
SOUND-SUPPLY  
+28VDC
- P13  
Ⓢ PROTECTION  
0VDC = not in protection
- P14  
POR (Ⓢ to Ⓢ)  
0V / 5V  
POR (Ⓢ to Ⓢ)  
5V / 0V

Power Supply Diagram (Over 21")

**A1**

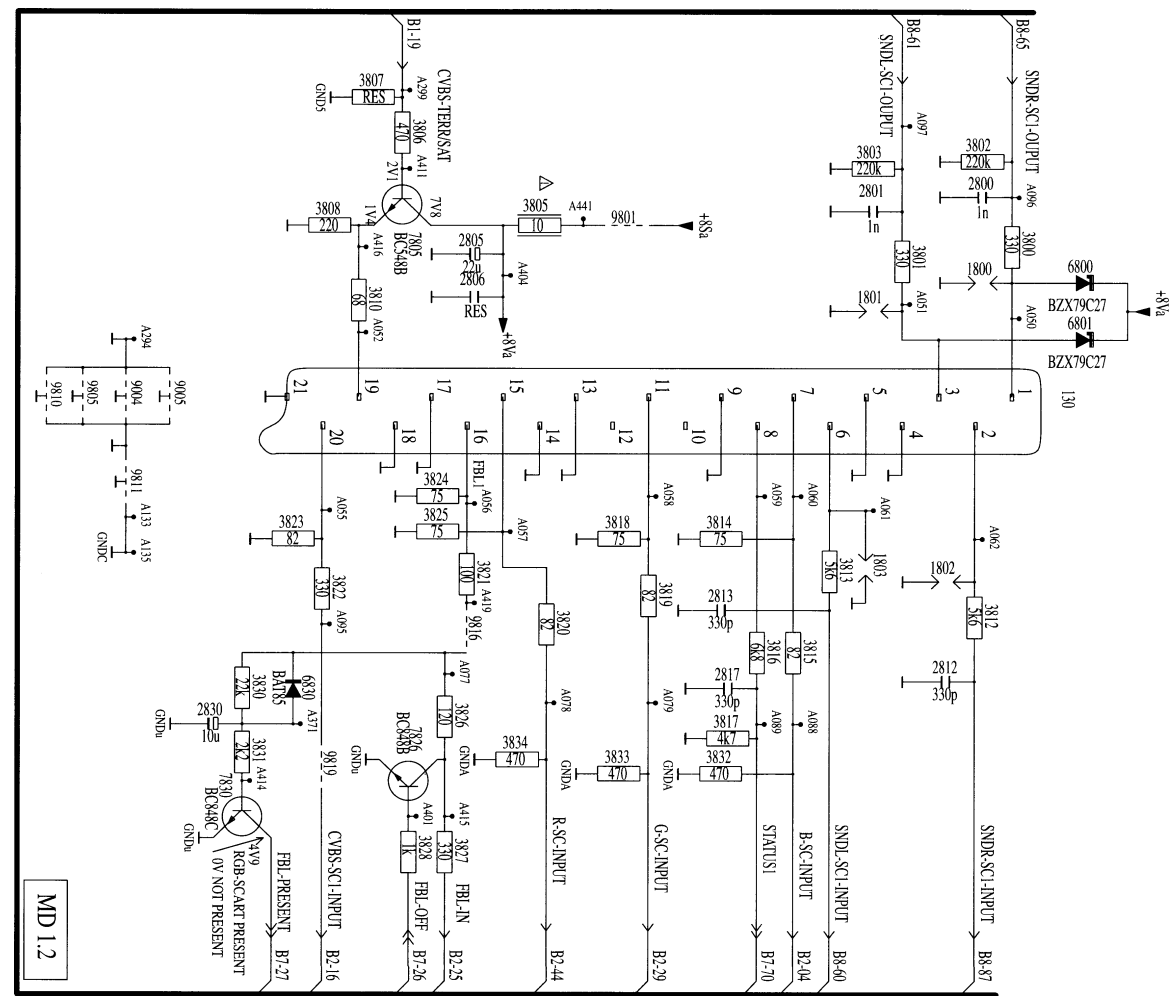


2 1/2w at SUP07	72.5AH 1MA387V 10K L7885A-CV
2 1/2w 110deg SUP06	1MA387V 10K MC7885C
2 1/8w 110deg SUP01	RES 10K MC7885C
*	1501 3500 3502 3512 3513 7580

29" WS CRT09	29" WS CRT09
25" TESLA CRT08	25" TESLA CRT08
32" WS CRT06	32" WS CRT06
25" BS CRT04	25" BS CRT04
25" SF CRT02	25" SF CRT02
28" WS CRT00	28" WS CRT00
30" WS CRT18	30" WS CRT18

(XX)=STAND BY

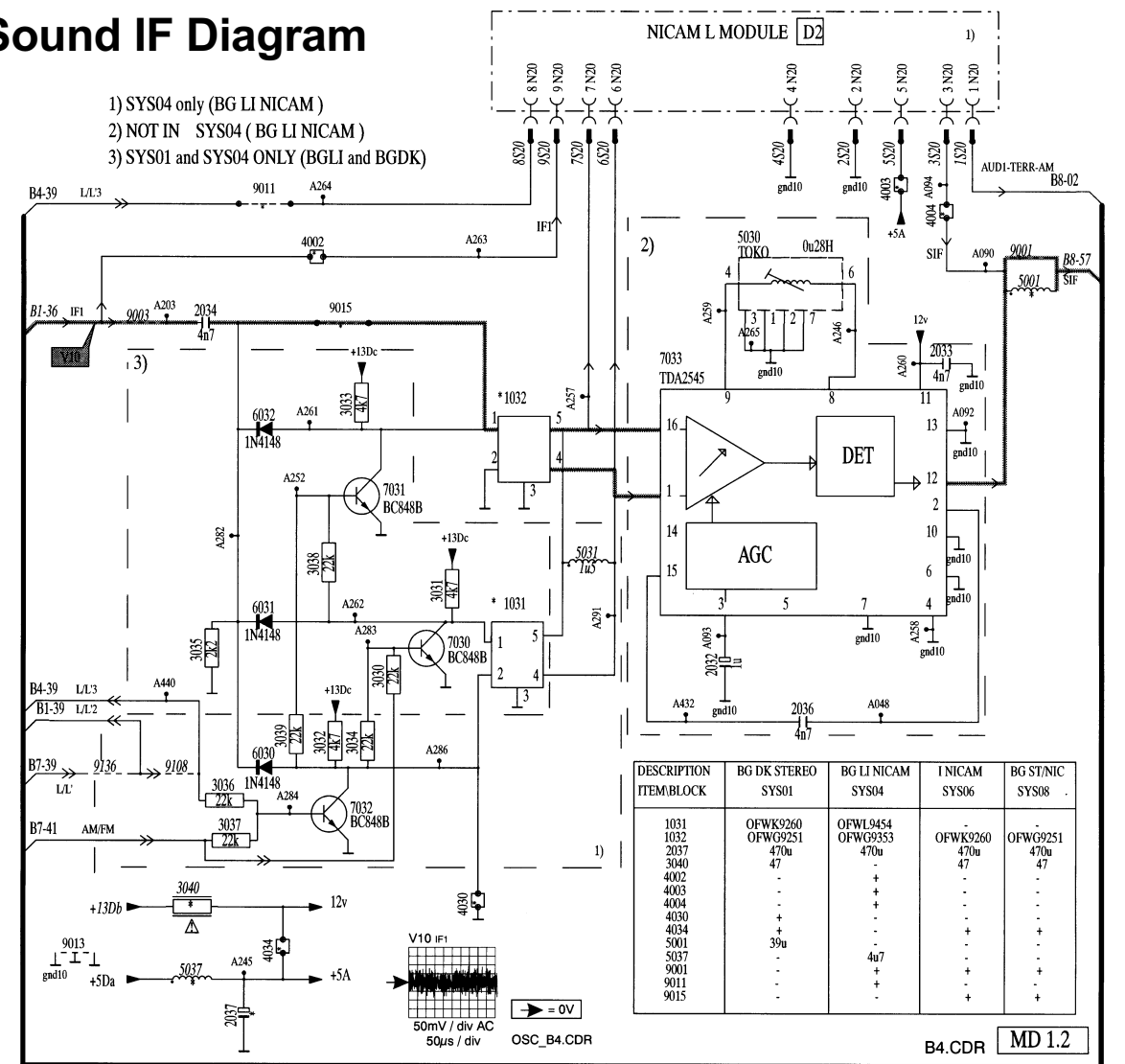
Scart Diagram 1



MD 1.2

Sound IF Diagram

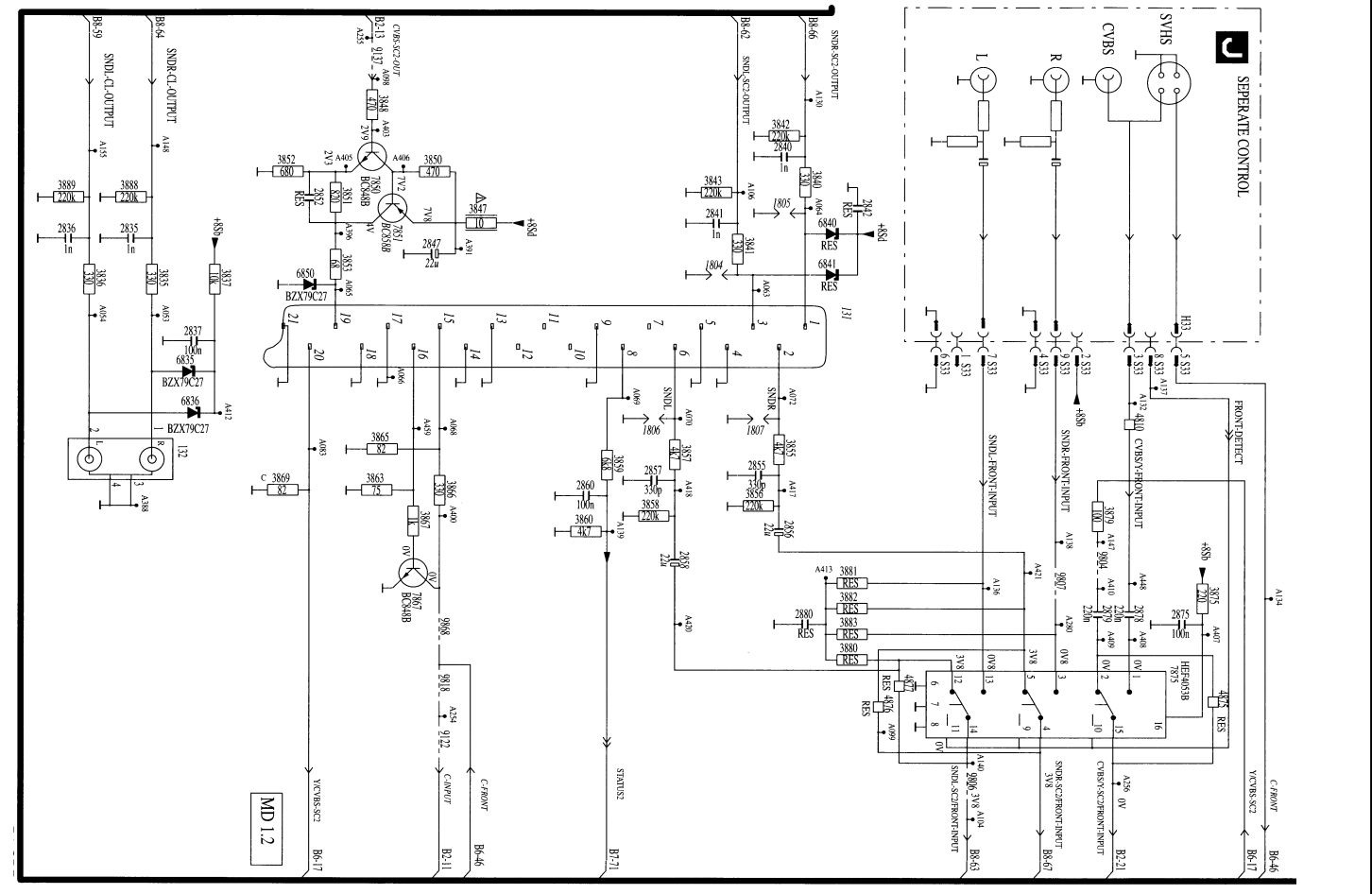
- 1) SYS04 only (BG LI NICAM)
- 2) NOT IN SYS04 (BG LI NICAM)
- 3) SYS01 and SYS04 ONLY (BGLI and BGDK)



DESCRIPTION ITEM/BLOCK	BG DK STEREO SYS01	BG LI NICAM SYS04	1NICAM SYS06	BG ST/NIC SYS08
1031	OFWK9260	OFWL9454	OFWK9260	OFWK9251
1032	OFWG9251	OFWG9251	OFWG9251	OFWG9251
2037	470u	470u	470u	470u
3040	47	47	47	47
4002	+	+	+	+
4003	+	+	+	+
4004	+	+	+	+
4030	+	+	+	+
4034	+	+	+	+
5001	39u	39u	39u	39u
5037	+	4u7	+	+
9001	+	+	+	+
9011	+	+	+	+
9015	+	+	+	+

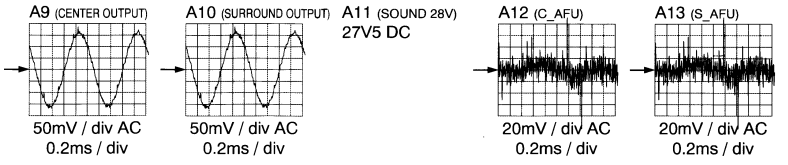
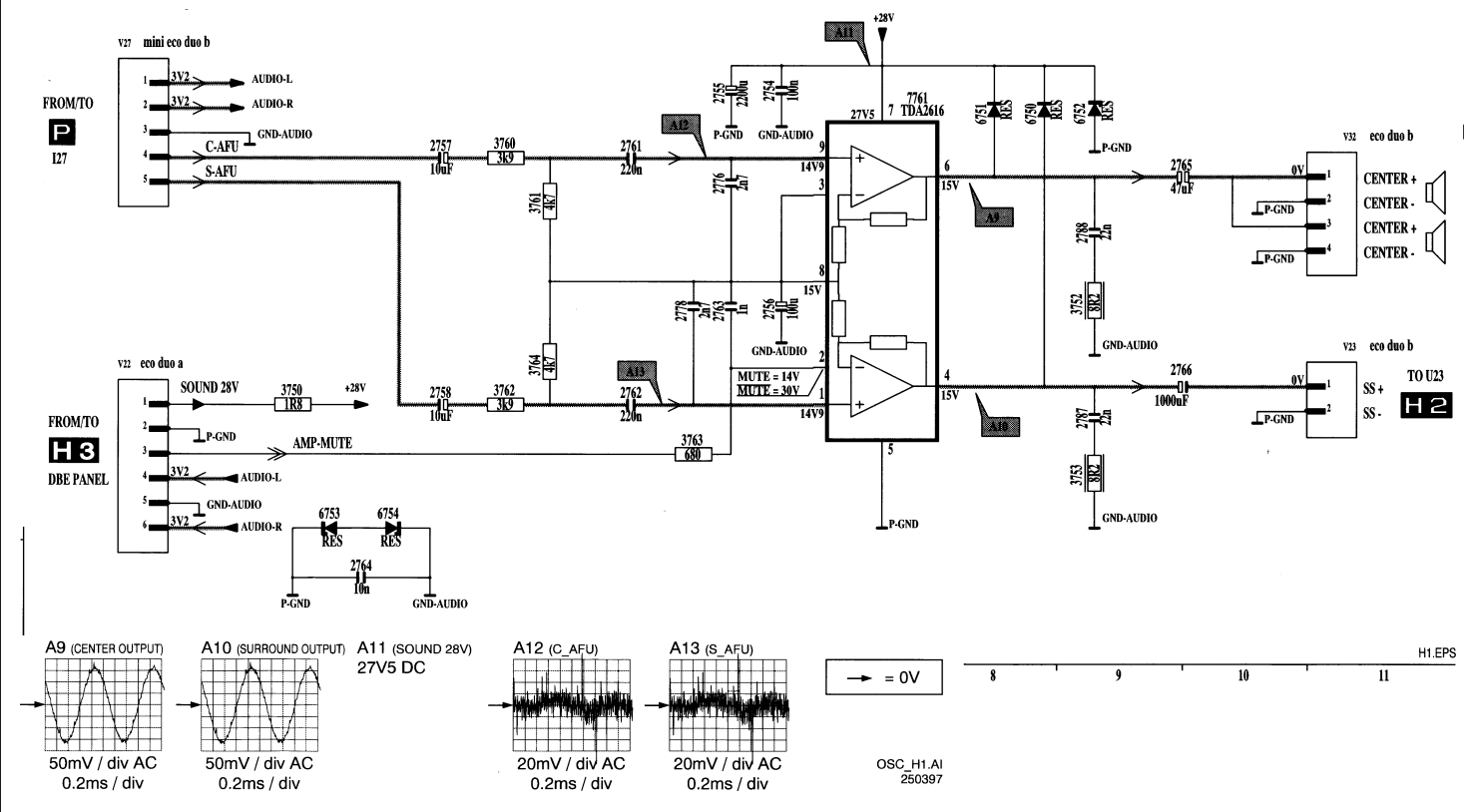
B4.CDR MD 1.2

Scart Diagram 2



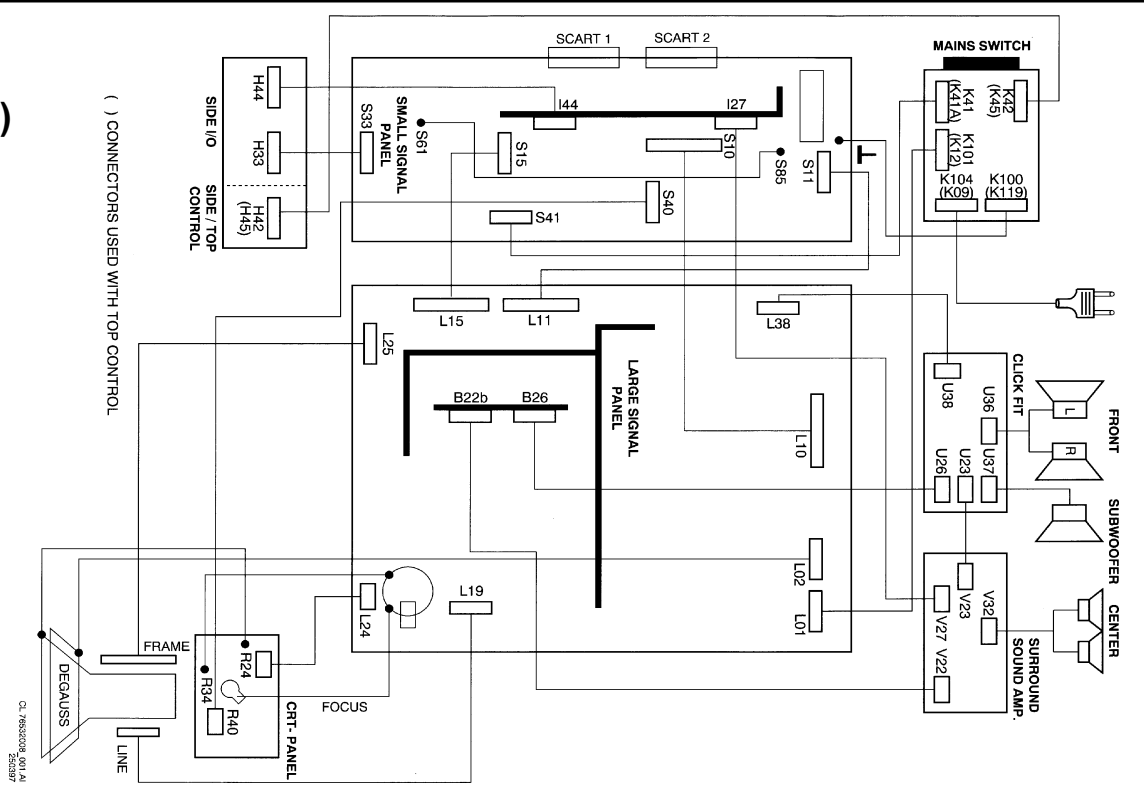
MD 1.2

Surround Sound PCB Diagram

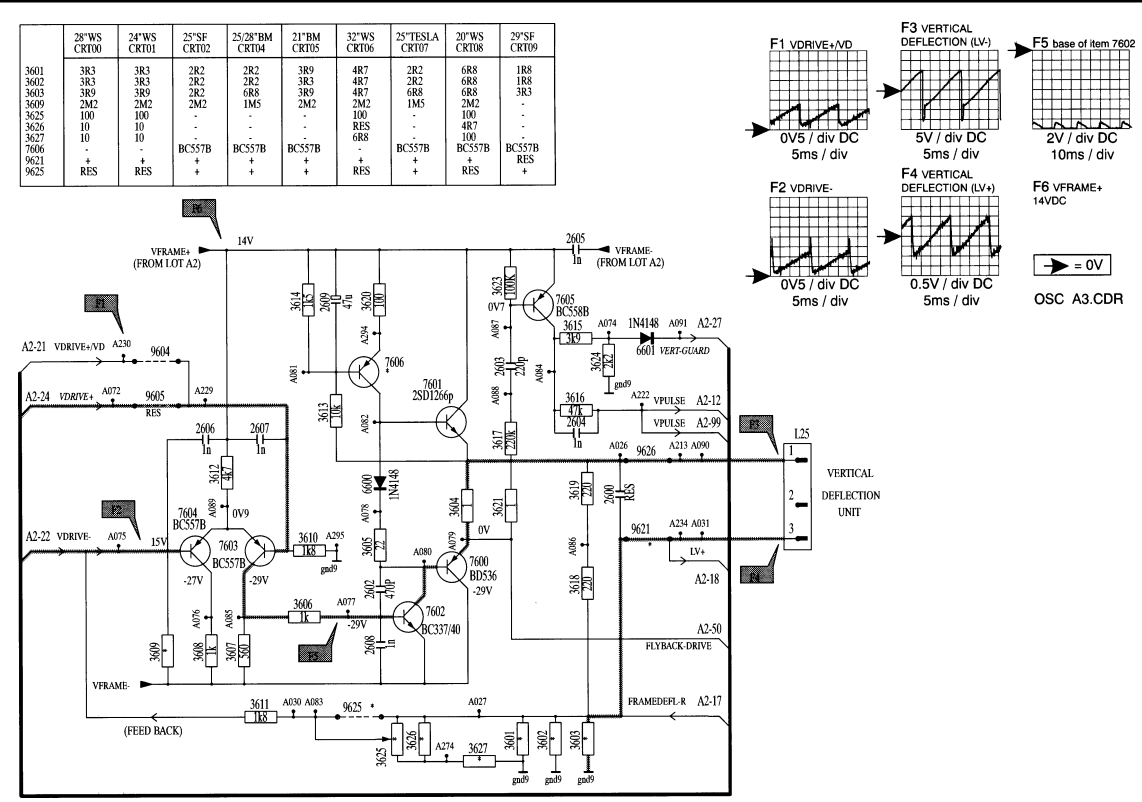


OSC\_H1.AI 250397

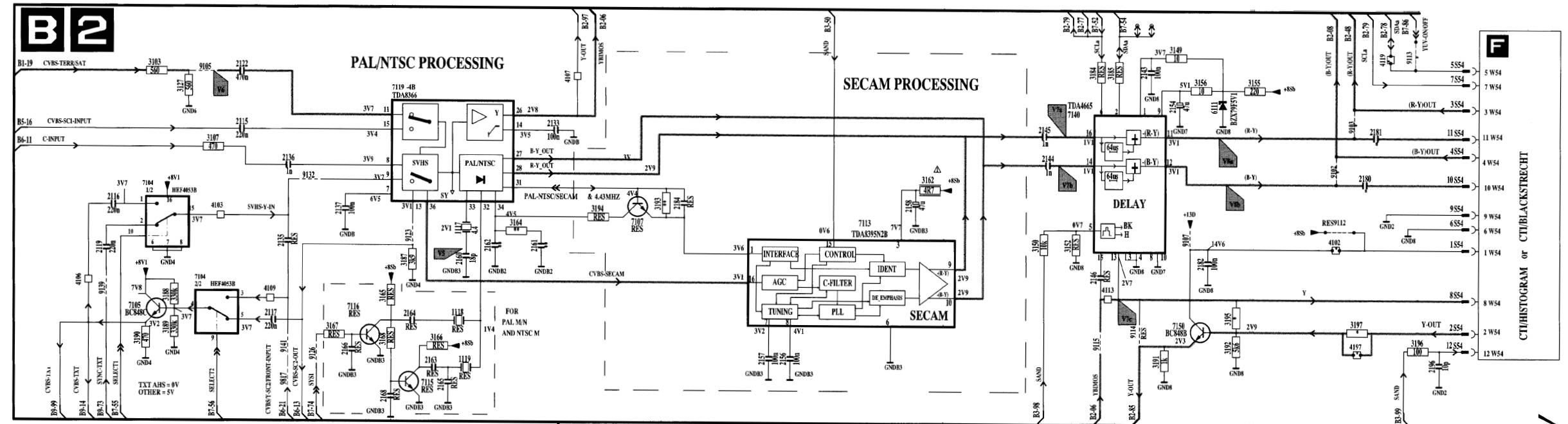
# Wiring Diagram (16:9 & Surround Sound)



# Vertical Output Diagram



# Video Processing Diagram



CTU/HIST	PCT 00	PCT 01	PCT 02	PCT 03	PCT 04
2180	220			220	
2181	220			220	
3197	1k5		1k		1k
4192					
4199					
4197					
9182					
9181					
9113					

pal/Secam	pal
2161	470n
2162	407
3164	18k
3193	jump