

Service  
Service  
**Service**

**TE3.1E**  
CA



# Service Manual

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# 1. Technical Specifications, Connections and Chassis Overview

## 1.1 Technical Specifications

### Index of this chapter:

- 1.1 Technical Specifications
- 1.2 Connections / Control Facilities
- 1.3 Chassis Overview

### Notes:

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

### 1.1.1 Reception

|                    |                                                   |
|--------------------|---------------------------------------------------|
| Tuning system      | : PLL                                             |
| Colour systems     | : PAL B/G, D/K, I                                 |
|                    | : SECAM B/G, L/L'                                 |
| Sound systems      | : FM/FM (5.5 - 5.74) (B/G)                        |
|                    | : NICAM B/G (5.5 - 5.85), NICAM D/K               |
|                    | : NICAM I (6.0 - 6.52), NICAM L (6.5 (AM) - 5.85) |
| A/V connections    | : NTSC 3.58                                       |
|                    | : NTSC 4.43                                       |
| Channel selections | : 100 channels                                    |
|                    | : UVSH                                            |
| IF frequency       | : 38.9 MHz                                        |
| Aerial input       | : 75 $\Omega$ , Coax                              |

### 1.1.2 Miscellaneous

|                           |                           |
|---------------------------|---------------------------|
| Audio output (RMS)        | : 2 x 3 W stereo          |
| Mains voltage             | : 220 - 240V              |
| Mains frequency           | : 50 / 60 Hz ( $\pm$ 5 %) |
| Ambient temperature       | : + 5 to + 45 deg. C      |
| Maximum humidity          | : 90%                     |
| Power consumption         | : 55W $\pm$ 10%           |
| Standby Power consumption | : < 3W                    |

## 1.2 Connections / Control Facilities

### 1.2.1 Side Connections and Front Control

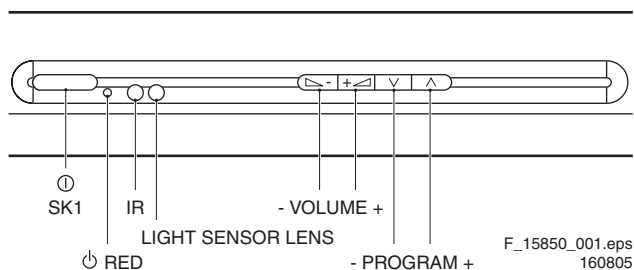


Figure 1-1 Front Control

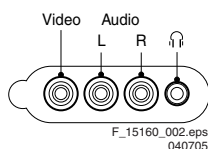
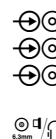


Figure 1-2 Side AV

### Audio / Video In

|               |                                     |
|---------------|-------------------------------------|
| 1 - Video     | CVBS (1 Vpp / 75 $\Omega$ )         |
| 2 - Audio     | L (0.5 Vrms / 10 k $\Omega$ )       |
| 3 - Audio     | R (0.5 Vrms / 10 k $\Omega$ )       |
| 4 - Headphone | 3.5 mm (8 - 600 $\Omega$ / <100 mW) |



### 1.2.2 Rear Connections

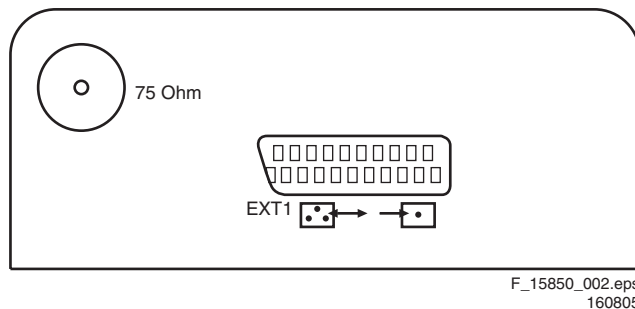


Figure 1-3 Rear Connections

### TV Aerial In

Aerial input : 75  $\Omega$ , Coax (IEC-type)

### External 1: RGB in + CVBS in/out

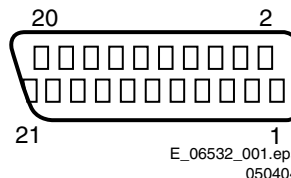
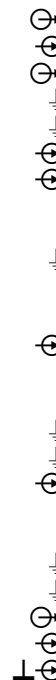


Figure 1-4 SCART connector

|                 |                                              |
|-----------------|----------------------------------------------|
| 1 - Audio       | R (0.5 Vrms 1 k $\Omega$ )                   |
| 2 - Audio       | R (0.5 Vrms 10 k $\Omega$ )                  |
| 3 - Audio       | L (0.5 Vrms 1 k $\Omega$ )                   |
| 4 -             | GND                                          |
| 5 -             | GND                                          |
| 6 - Audio       | L (0.5 Vrms 10 k $\Omega$ )                  |
| 7 - Blue        | (0.7 Vpp / 75 $\Omega$ )                     |
| 8 - CVBS-status | 0 - 2.0 V: INT<br>4.5 - 12 V: EXT 4:3        |
| 9 -             | GND                                          |
| 10 -            |                                              |
| 11 - Green      | (0.7 Vpp / 75 $\Omega$ )                     |
| 12 -            |                                              |
| 13 -            | GND                                          |
| 14 -            | GND                                          |
| 15 - Red        | (0.7 Vpp / 75 $\Omega$ )                     |
| 16 - RGB-status | 0 - 0.4 V: INT<br>1 - 3 V: EXT / 75 $\Omega$ |
| 17 -            | GND                                          |
| 18 -            | GND                                          |
| 19 - CVBS       | (1 Vpp / 75 $\Omega$ )                       |
| 20 - CVBS       | (1 Vpp / 75 $\Omega$ )                       |
| 21 - Earth      | GND                                          |



### 1.3 Chassis Overview

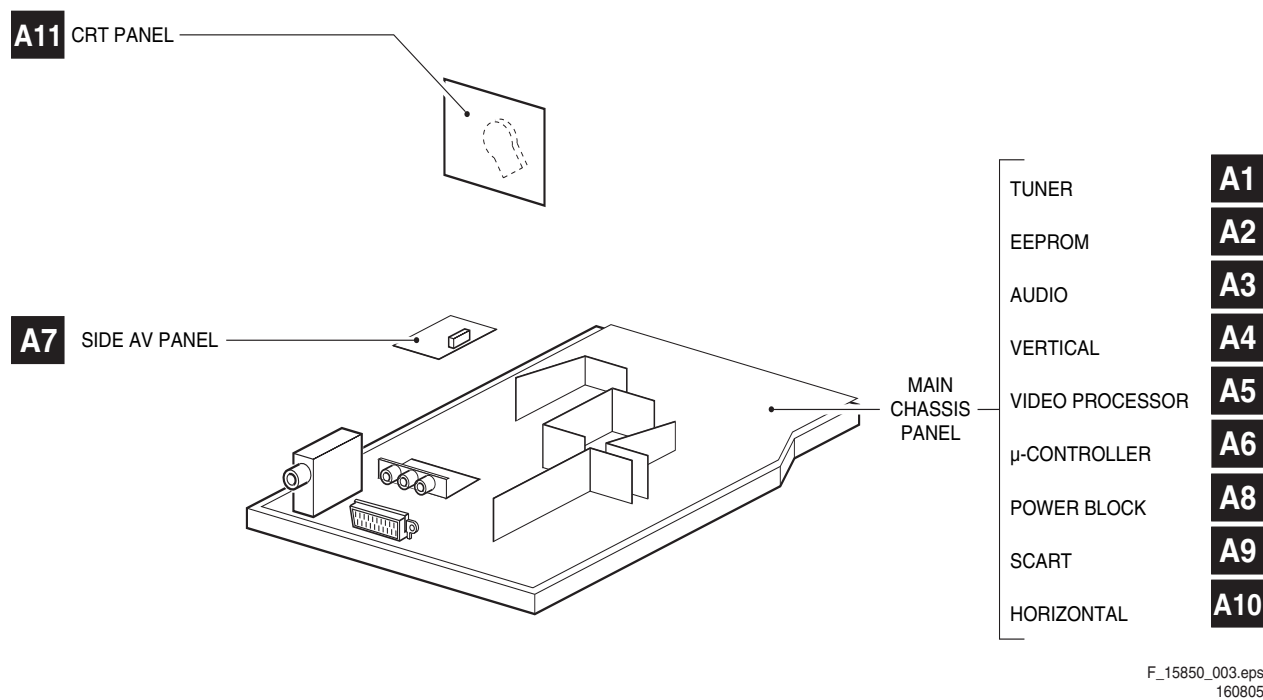


Figure 1-5 Chassis Overview

## 2. Safety Instructions, Warnings, and Notes

### Index of this chapter:

- 2.1 Safety Instructions
- 2.2 Warnings
- 2.3 Notes

### 2.1 Safety Instructions

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

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

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

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

### 2.2 Warnings

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD ▲). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this same potential. Available ESD protection equipment:
  - Complete kit ESD3 (small tablemat, wristband, connection box, extension cable and earth cable) 4822 310 10671.
  - Wristband tester 4822 344 13999.
- Be careful during measurements in the high voltage section.
- Never replace modules or other components while the unit is switched "on".
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

### 2.3 Notes

#### 2.3.1 General

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

#### 2.3.2 Schematic Notes

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

#### 2.3.3 Rework on BGA (Ball Grid Array) ICs

##### General

Although (LF)BGA assembly yields are very high, there may still be a requirement for component rework. By rework, we mean the process of removing the component from the PWB and replacing it with a new component. If an (LF)BGA is removed from a PWB, the solder balls of the component are deformed drastically so the removed (LF)BGA has to be discarded.

##### Device Removal

As is the case with any component that, is being removed, it is essential when removing an (LF)BGA, that the board, tracks, solder lands, or surrounding components are not damaged. To remove an (LF)BGA, the board must be uniformly heated to a temperature close to the reflow soldering temperature. A uniform temperature reduces the risk of warping the PWB. To do this, we recommend that the board is heated until it is certain that all the joints are molten. Then carefully pull the component off the board with a vacuum nozzle. For the appropriate temperature profiles, see the IC data sheet.

##### Area Preparation

When the component has been removed, the vacant IC area must be cleaned before replacing the (LF)BGA. Removing an IC often leaves varying amounts of solder on the mounting lands. This excessive solder can be removed with either a solder sucker or solder wick. The remaining flux can be removed with a brush and cleaning agent.

After the board is properly cleaned and inspected, apply flux on the solder lands and on the connection balls of the (LF)BGA.

**Note:** Do not apply solder paste, as this has been shown to result in problems during re-soldering.

#### Device Replacement

The last step in the repair process is to solder the new component on the board. Ideally, the (LF)BGA should be aligned under a microscope or magnifying glass. If this is not possible, try to align the (LF)BGA with any board markers. So as not to damage neighbouring components, it may be necessary to reduce some temperatures and times.

#### More Information

For more information on how to handle BGA devices, visit this URL: [www.atyourservice.ce.philips.com](http://www.atyourservice.ce.philips.com) (needs subscription, not available for all regions). After login, select "Magazine", then go to "Workshop Information". Here you will find Information on how to deal with BGA-ICs.

### 2.3.4 Lead-free Solder

Philips CE is producing lead-free sets (PBF) from 1.1.2005 onwards.

**Identification:** The bottom line of a type plate gives a 14-digit serial number. Digits 5 and 6 refer to the production year, digits 7 and 8 refer to production week (in example below it is 1991 week 18).



E\_06532\_024.eps  
230205

Figure 2-1 Serial number example

Regardless of the special lead-free logo (which is not always indicated), one must treat all sets from this date onwards according to the rules as described below.

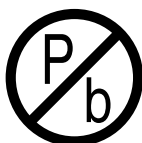


Figure 2-2 Lead-free logo

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

- Use only lead-free soldering tin Philips SAC305 with order code 0622 149 00106. If lead-free solder paste is required, please contact the manufacturer of your soldering equipment. In general, use of solder paste within workshops should be avoided because paste is not easy to store and to handle.
- Use only adequate solder tools applicable for lead-free soldering tin. The solder tool must be able:
  - To reach a solder-tip temperature of at least 400°C.
  - To stabilise the adjusted temperature at the solder-tip.
  - To exchange solder-tips for different applications.
- Adjust your solder tool so that a temperature of around 360°C - 380°C is reached and stabilised at the solder joint. Heating time of the solder-joint should not exceed ~ 4 sec. Avoid temperatures above 400°C, otherwise wear-out of tips will increase drastically and flux-fluid will be destroyed.

To avoid wear-out of tips, switch "off" unused equipment or reduce heat.

- Mix of lead-free soldering tin/parts with leaded soldering tin/parts is possible but PHILIPS recommends strongly to **avoid** mixed regimes. If this cannot be avoided, carefully clear the solder-joint from old tin and re-solder with new tin.
- Use only original spare-parts listed in the Service-Manuals. Not listed standard material (commodities) has to be purchased at external companies.
- Special information for lead-free BGA ICs: these ICs will be delivered in so-called "dry-packaging" to protect the IC against moisture. This packaging may only be opened shortly before it is used (soldered). Otherwise the body of the IC gets "wet" inside and during the heating time the structure of the IC will be destroyed due to high (steam-) pressure inside the body. If the packaging was opened before usage, the IC has to be heated up for some hours (around 90°C) for drying (think of ESD-protection!).  
**Do not re-use BGAs at all!**
- For sets produced before 1.1.2005, containing leaded soldering tin and components, all needed spare parts will be available till the end of the service period. For the repair of such sets nothing changes.

In case of doubt whether the board is lead-free or not (or with mixed technologies), you can use the following method:

- Always use the highest temperature to solder, when using SAC305 (see also instructions below).
- De-solder thoroughly (clean solder joints to avoid the mixing of two alloys).

**Caution:** For BGA-ICs, you **must** use the correct temperature profile, which is coupled to the 12NC. For an overview of these profiles, visit the website [www.atyourservice.ce.philips.com](http://www.atyourservice.ce.philips.com) (needs subscription, but is not available for all regions). You will find this and more technical information within the "Magazine", chapter "Workshop information". For additional questions please contact your local repair help desk.

### 2.3.5 Practical Service Precautions

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

### 3. Directions for Use

You can download this information from the following websites:

<http://www.philips.com/support>

<http://www.p4c.philips.com>

## 4. Mechanical Instructions

### Index of this chapter:

- 4.1 Exploded view
- 4.2 Rear Cover Removal
- 4.3 Service Position Main Panel
- 4.4 Side I/O Panel Removal
- 4.5 Rear Cover Mounting

### 4.1 Exploded View

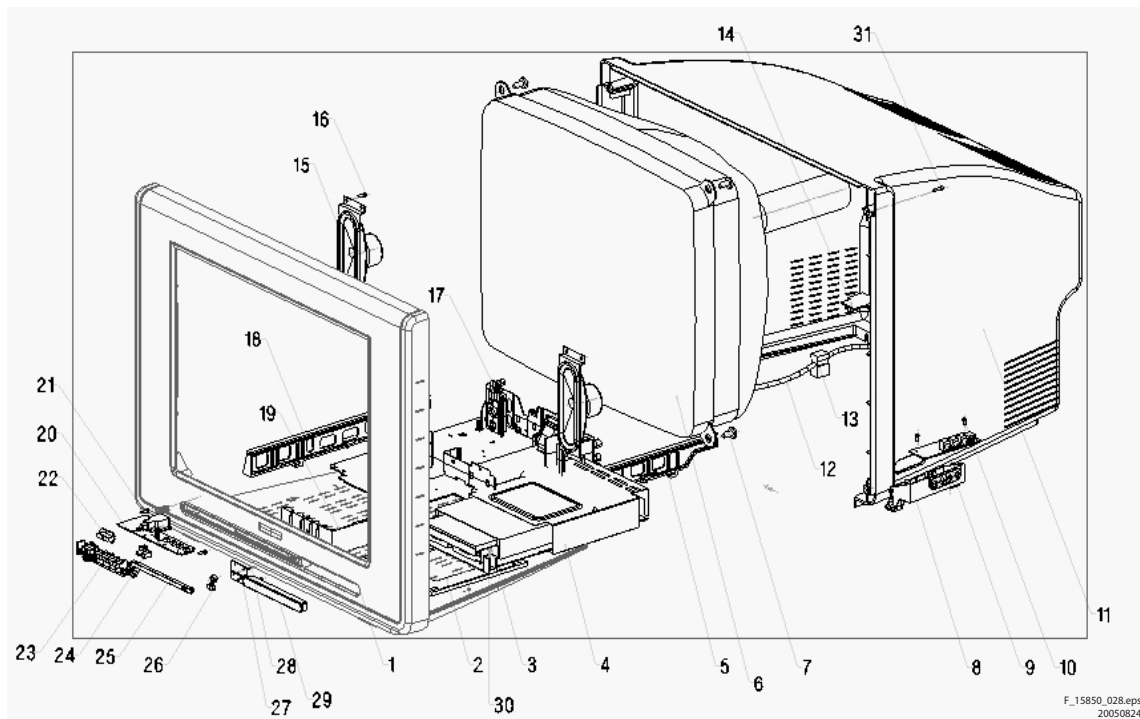


Figure 4-1 Exploded view

### 4.2 Rear Cover Removal

1. Remove all fixation screws (9x) of the rear cover.
2. Pull the rear cover a little backwards.
3. Now pull the rear cover backwards to remove it.

### 4.3 Service Position Main Panel

1. Remove the main panel [1]. At the same time, pull the panel away from the CRT [2].
2. Turn the panel 90 degrees clockwise [3].
3. Flip the panel 90 degrees [4], with the components towards the CRT

### 4.4 Side I/O Panel Removal

Remove the side I/O panel after unscrewing the screws (2x) at the bottom of the set.

### 4.5 Rear Cover Mounting

To reassemble the set, perform all described processes in reverse order.

Be sure that, before the rear cover is mounted:

- The mains cord is mounted correctly in its guiding bracket.
- All wires/cables are returned in their original position

## 5. Service Modes, Error Codes and Fault Finding

Index of this chapter

1. Service Modes
2. Fault Finding

### 5.1 Service Modes

The Service Mode offers features, which the service technician can use to repair a set. Any feature change, made via the Service Menu, will respond at the same time. All displayed text strings in the Service Modes are in English.

#### 5.1.1 TV Service Mode

##### **Purpose**

- To perform alignments (e.g. colour adjustment and geometry alignments)
- To change option settings

##### **Specifications**

All service unfriendly modes (if present) are disabled, like:

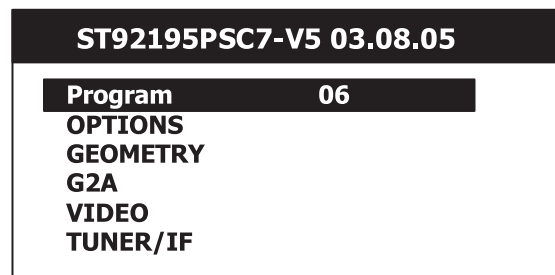
- Auto switch 'off' (when there is no 'ident' signal)
- Timer switch to a channel
- Automatic user menu time-out
- The NVM is unprotected
- AV functions are not working

##### **How to enter the Service Mode**

Screen menu's must be 'off', when you enter the Service Mode.

Use a standard customer RC transmitter and key in the code 062596 directly followed by the MENU button in 10 seconds.

The following screen is visible when you enter the Service Mode:



F\_15850\_005.eps  
160805

Figure 5-1 TV Service Mode Menu

- LLLLLLL. This is the used IC type.
- PAB#-XX. This is the software identification.
  - P = Philips.
  - A = the region (W = West Europe, E = East Europe).
  - B = sound specification (M = Mono, S = Stereo).
  - # = number of TXT pages.
  - XX = the software version number (the first X is the main software version number and the second X is the sub software version number).
- PROGRAM. ....
- OPTIONS. Three codes possible.
- GEOMETRY. To align the geometry (see chapter 8.x for a detailed description).
- G2A. To align the G2 (see chapter 8.x for a detailed description).
- VIDEO. To adjust RGB, R\_cut-off and G\_cut-off.
- TUNER/IF. To align the tuner.

##### **How to navigate**

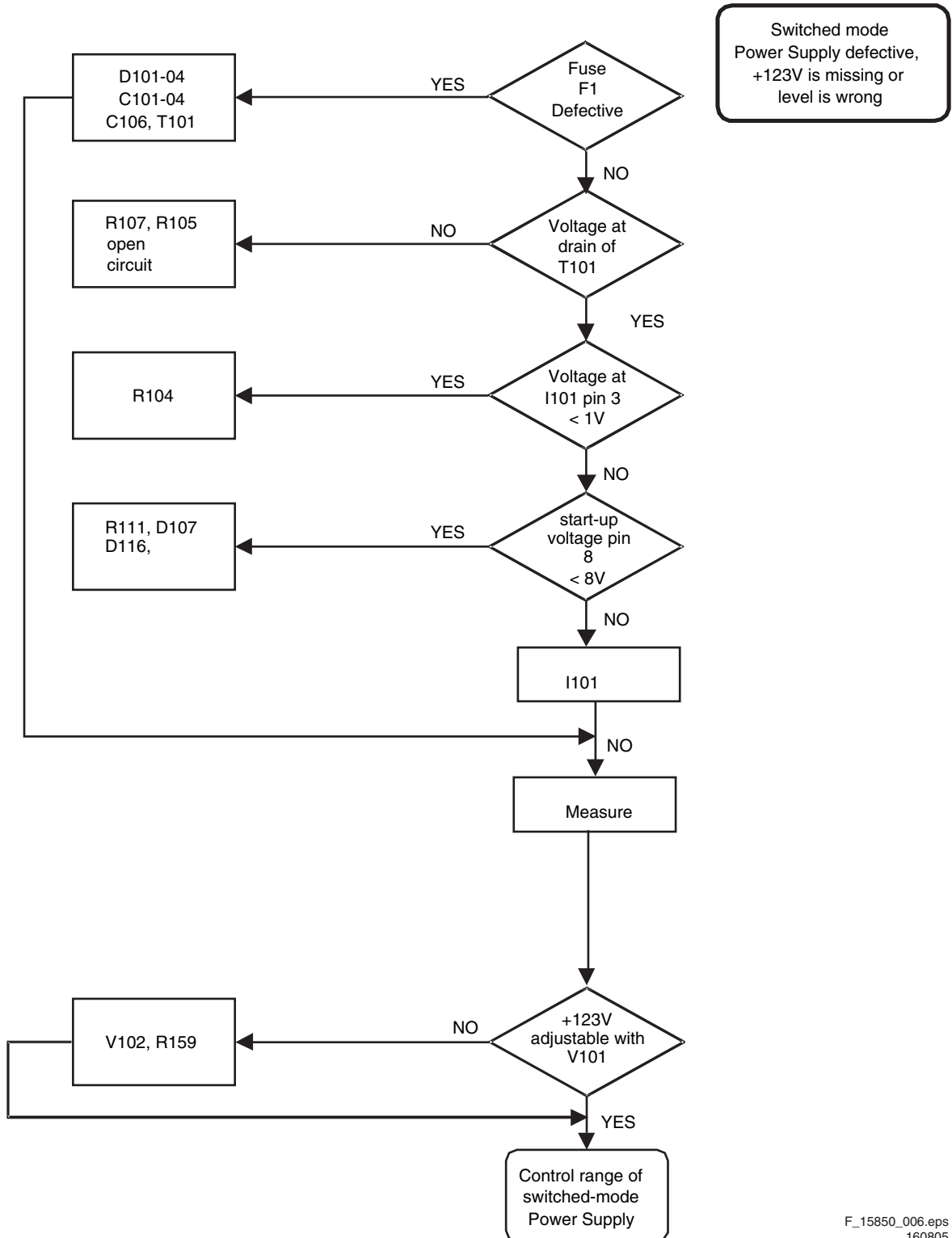
- Select menu items with the CURSOR UP/DOWN keys.
- With the CURSOR LEFT/RIGHT keys, it is possible to change the value of the first item (Program)
- With the CURSOR RIGHT and OK keys, activate the selected menu item.
- When you press the MENU key in a sub menu, you will return to the previous menu.
- When you press the MENU key in the Service Mode menu, you will return to the Main menu.

##### **How to exit**

- With the STANDBY command, the set switches to Standby.
- With the MENU key, the set returns to the Main menu. Switching the set 'off' and 'on' with the mains switch, brings the set into normal operation again. All changes in the Service Mode are stored immediately.

## 5.2 Fault Finding

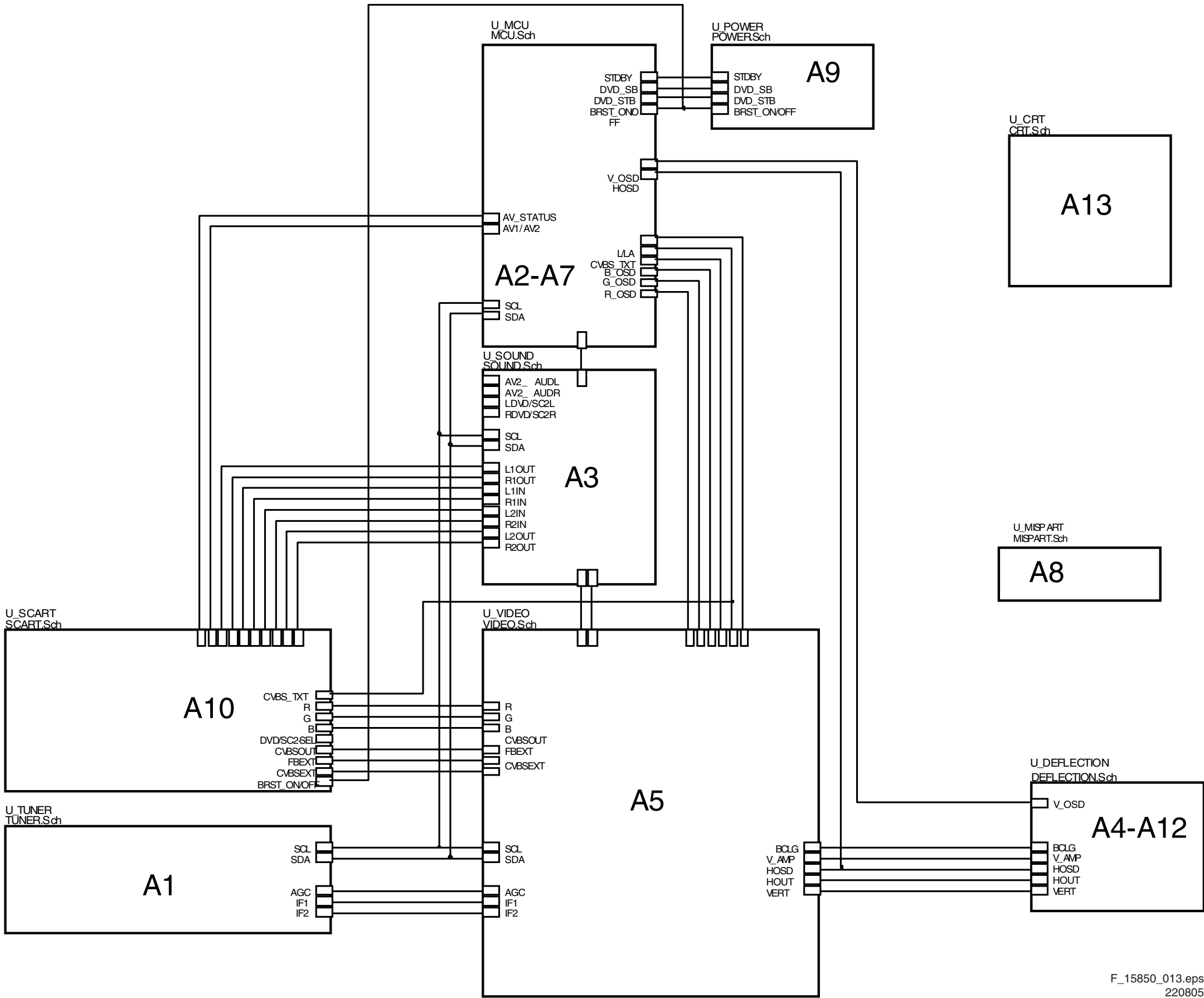
### 5.2.1 Fault Tracing Diagram for Power Supply



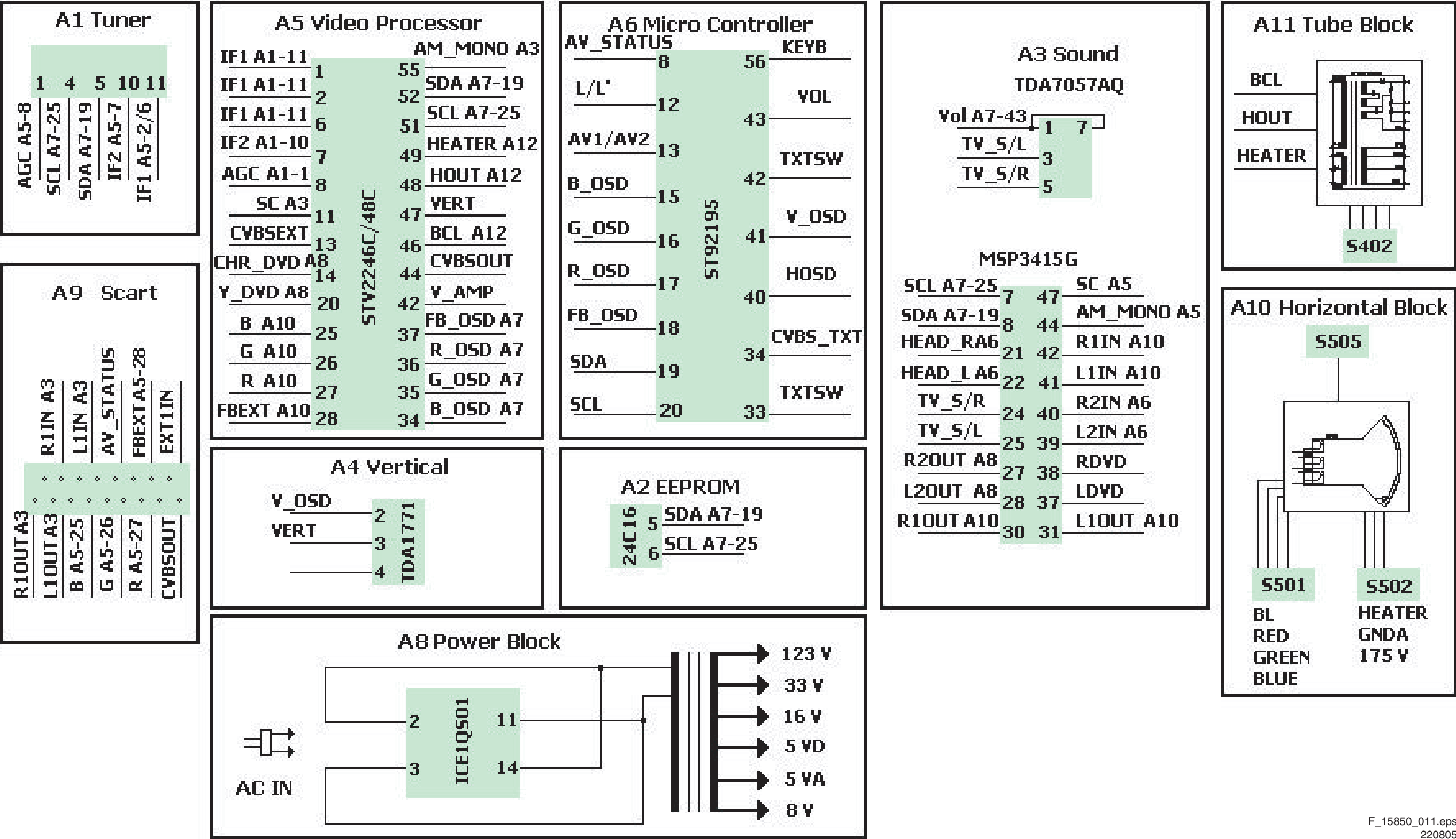


6. Block Diagrams, Test Point Overviews, and Waveforms

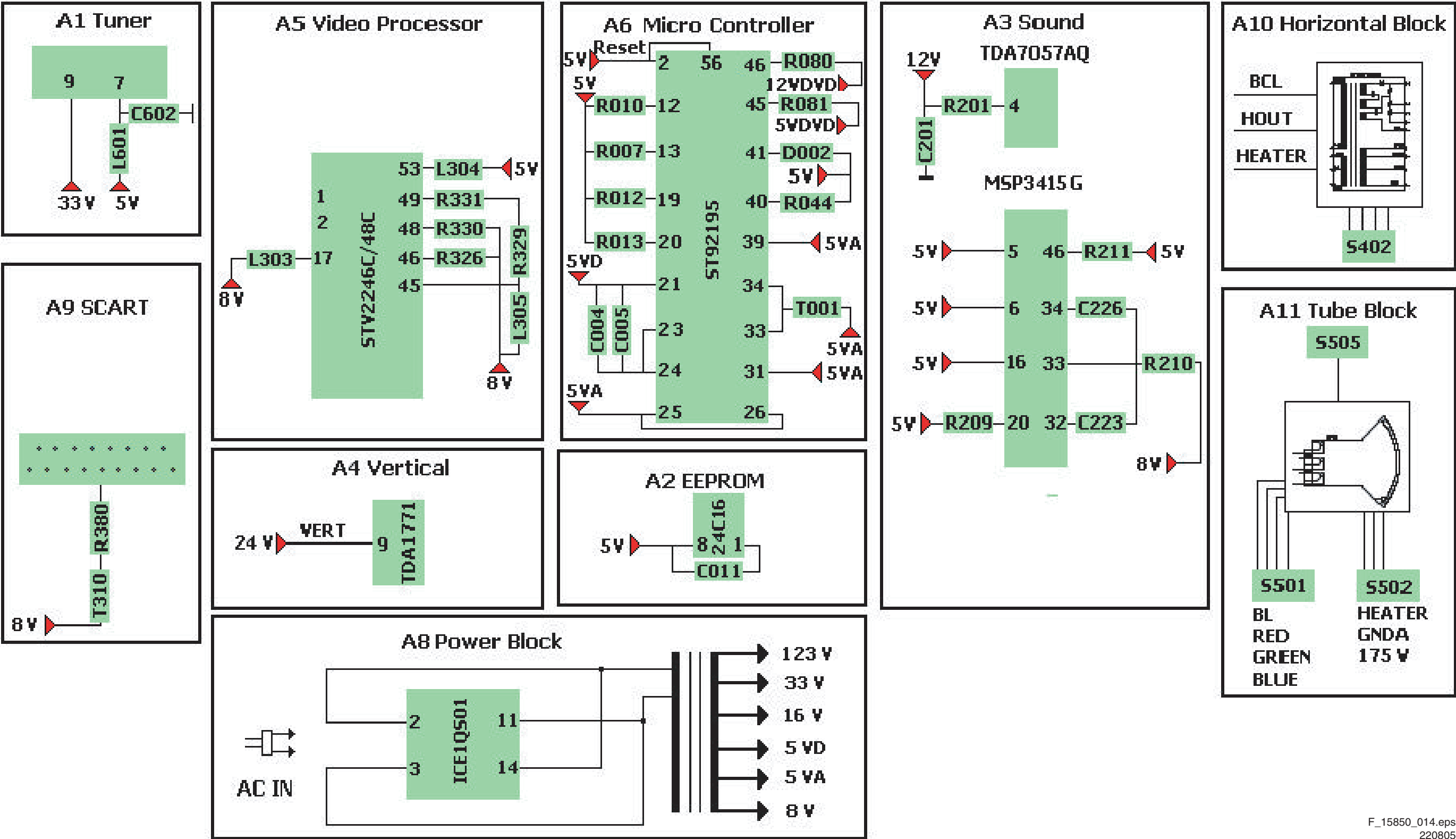
Wiring Diagram



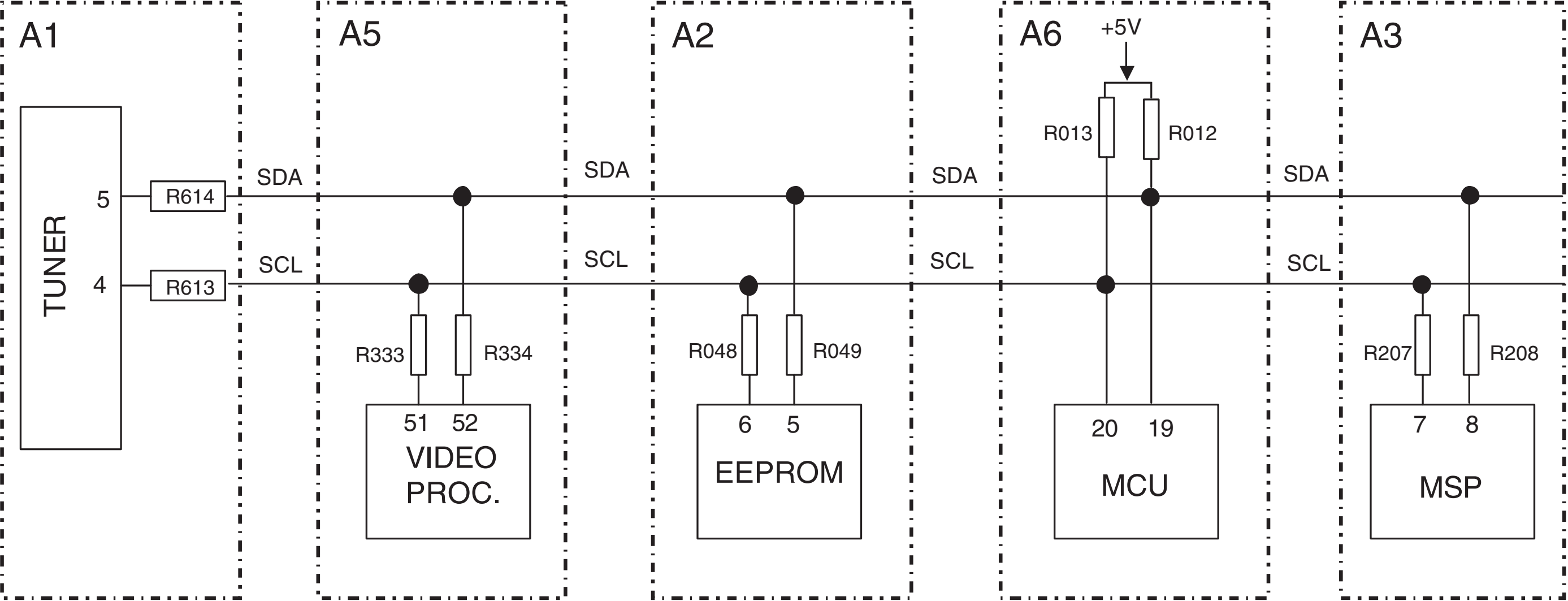
Block Diagram Main



Block Diagram Power Supply

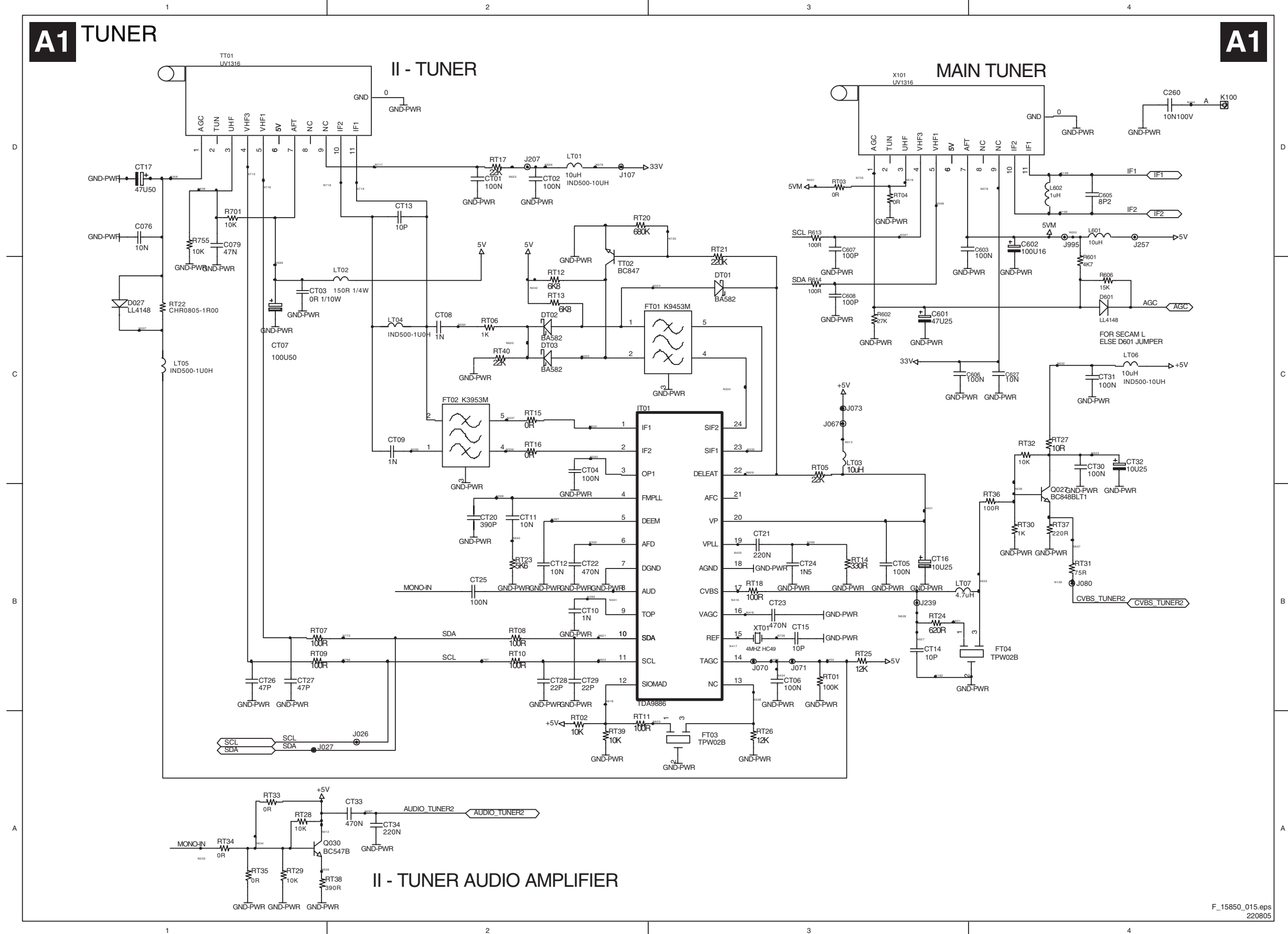


I<sup>2</sup>C Diagram

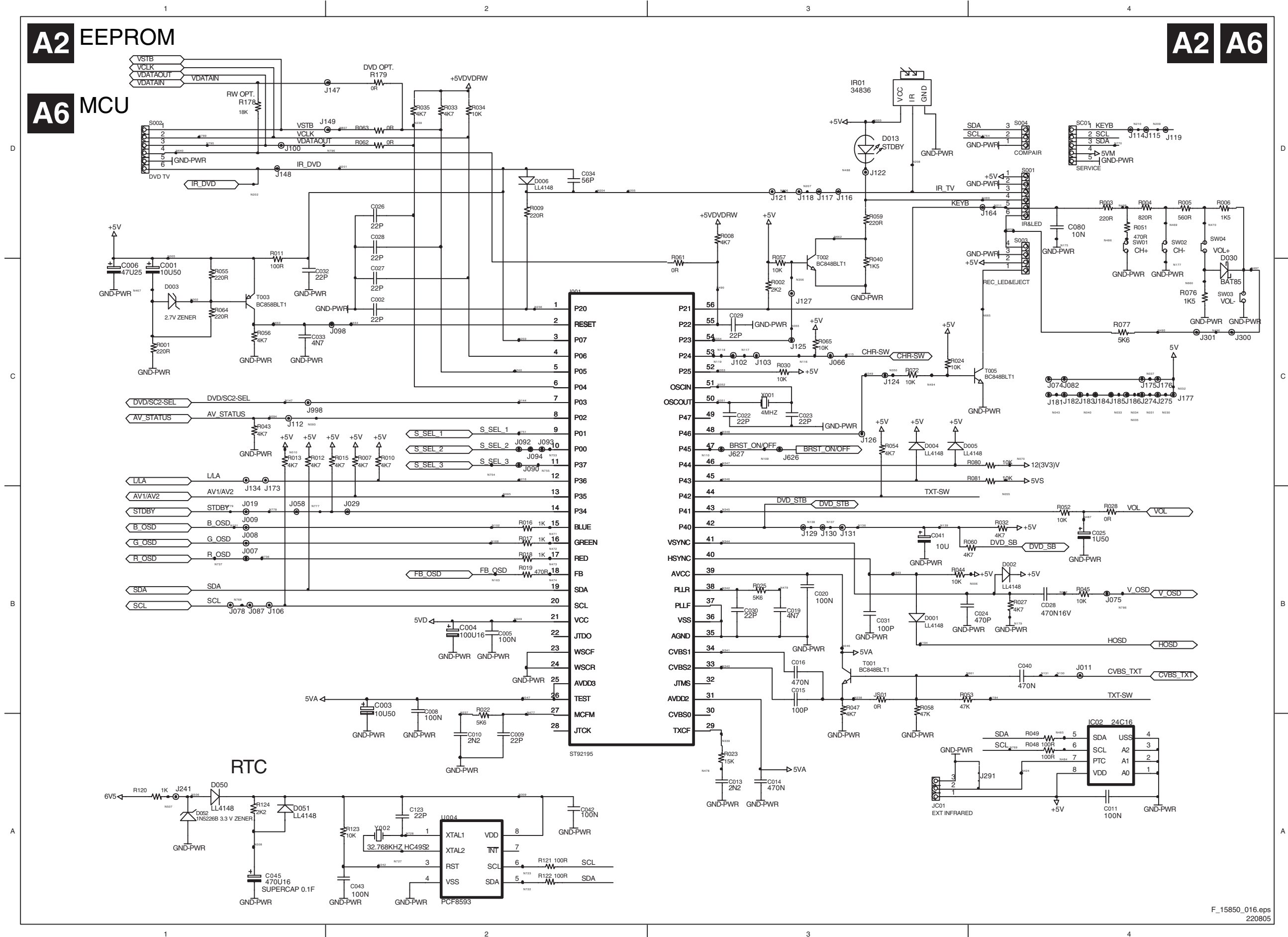


7. Circuit Diagrams and PWB Layouts

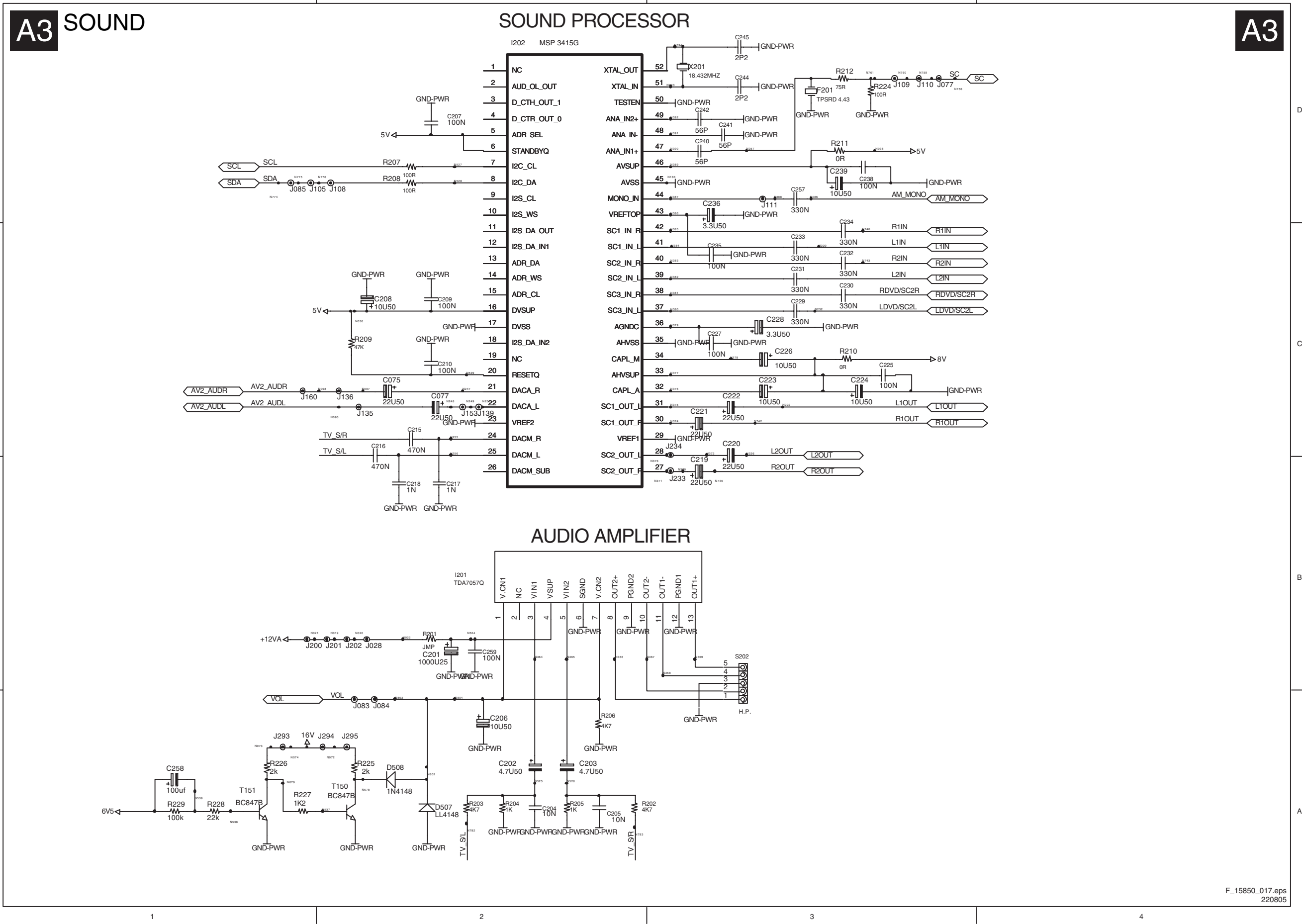
Main Panel: Tuner



## Main Panel: EEPROM and MCU



Main Panel: Sound



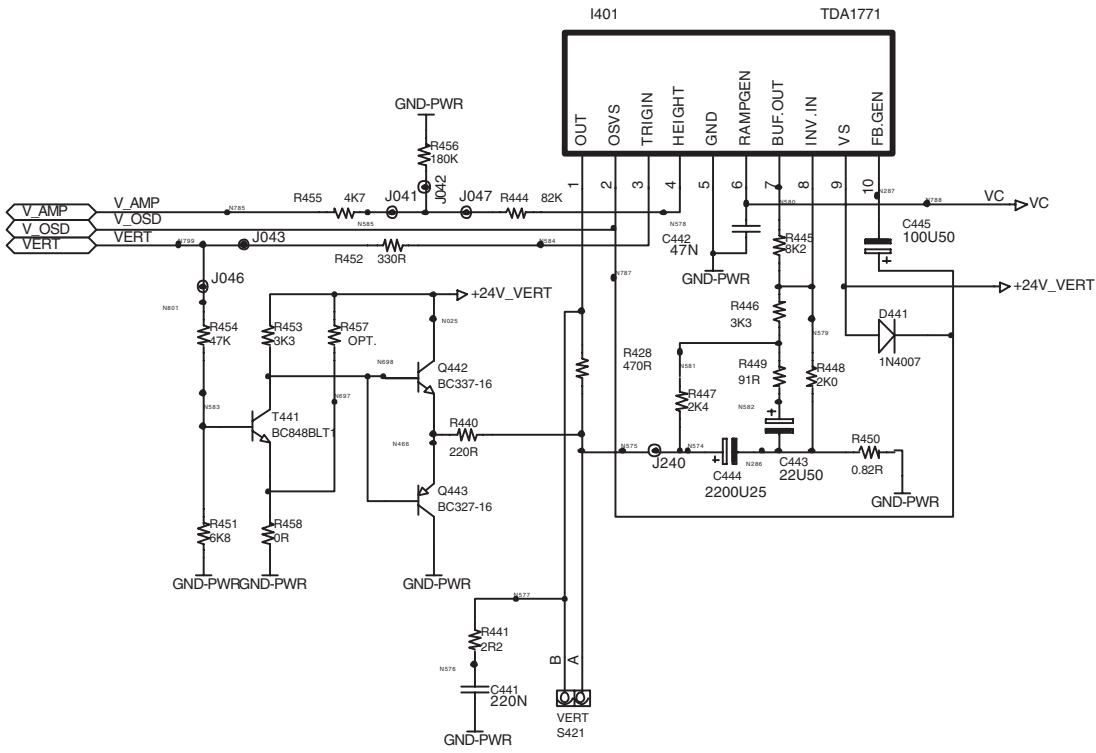
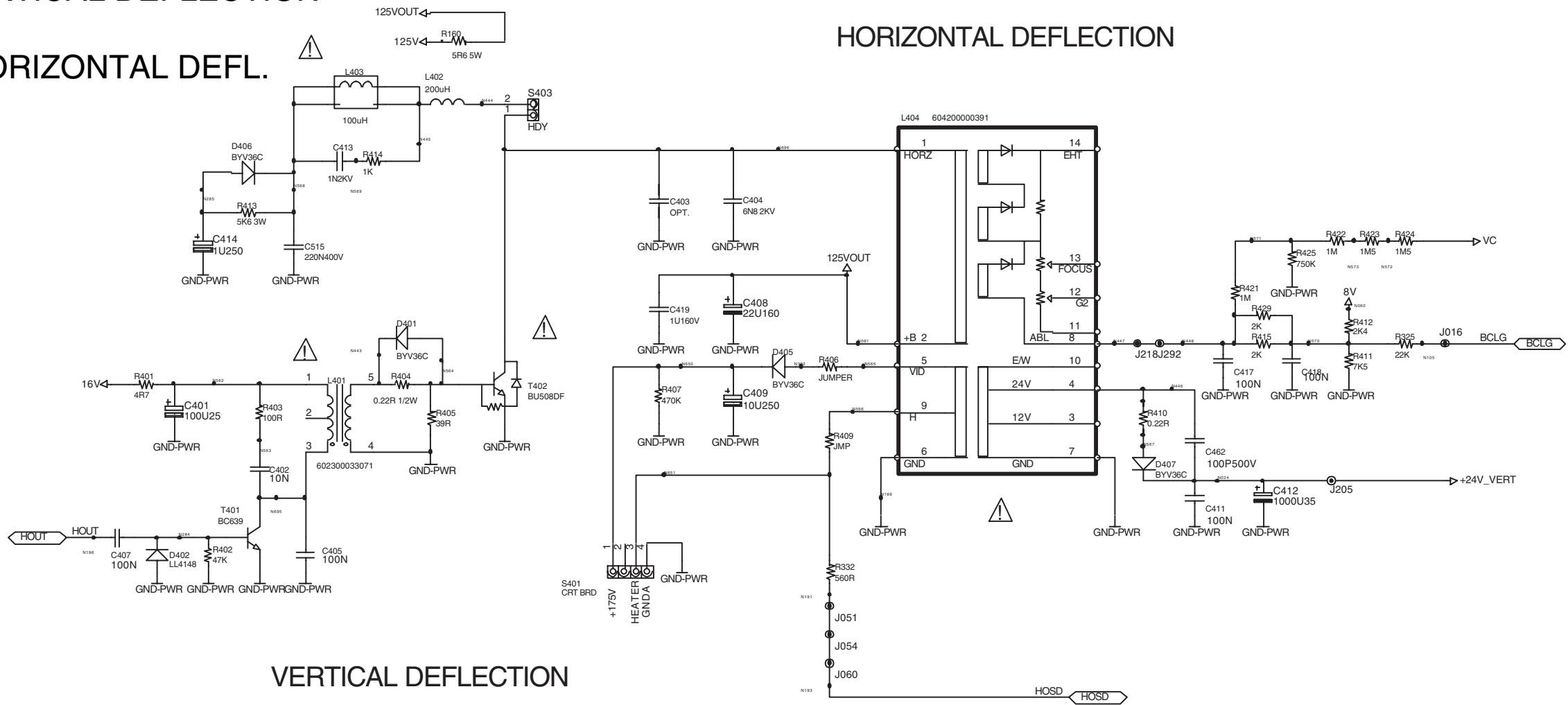
Main Panel: Deflection

A4 VERTICAL DEFLECTION

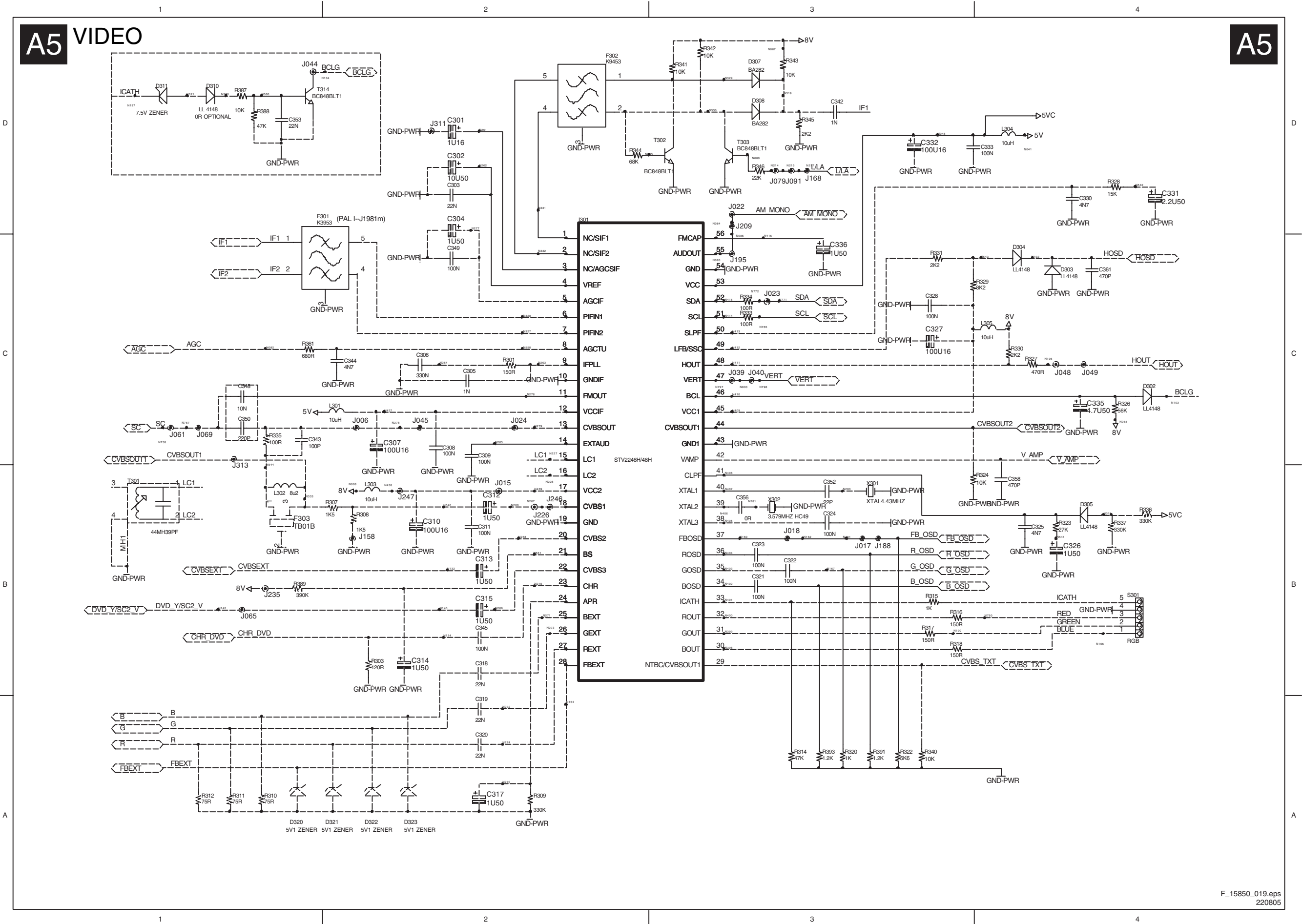
A10 HORIZONTAL DEFL.

A4

A10



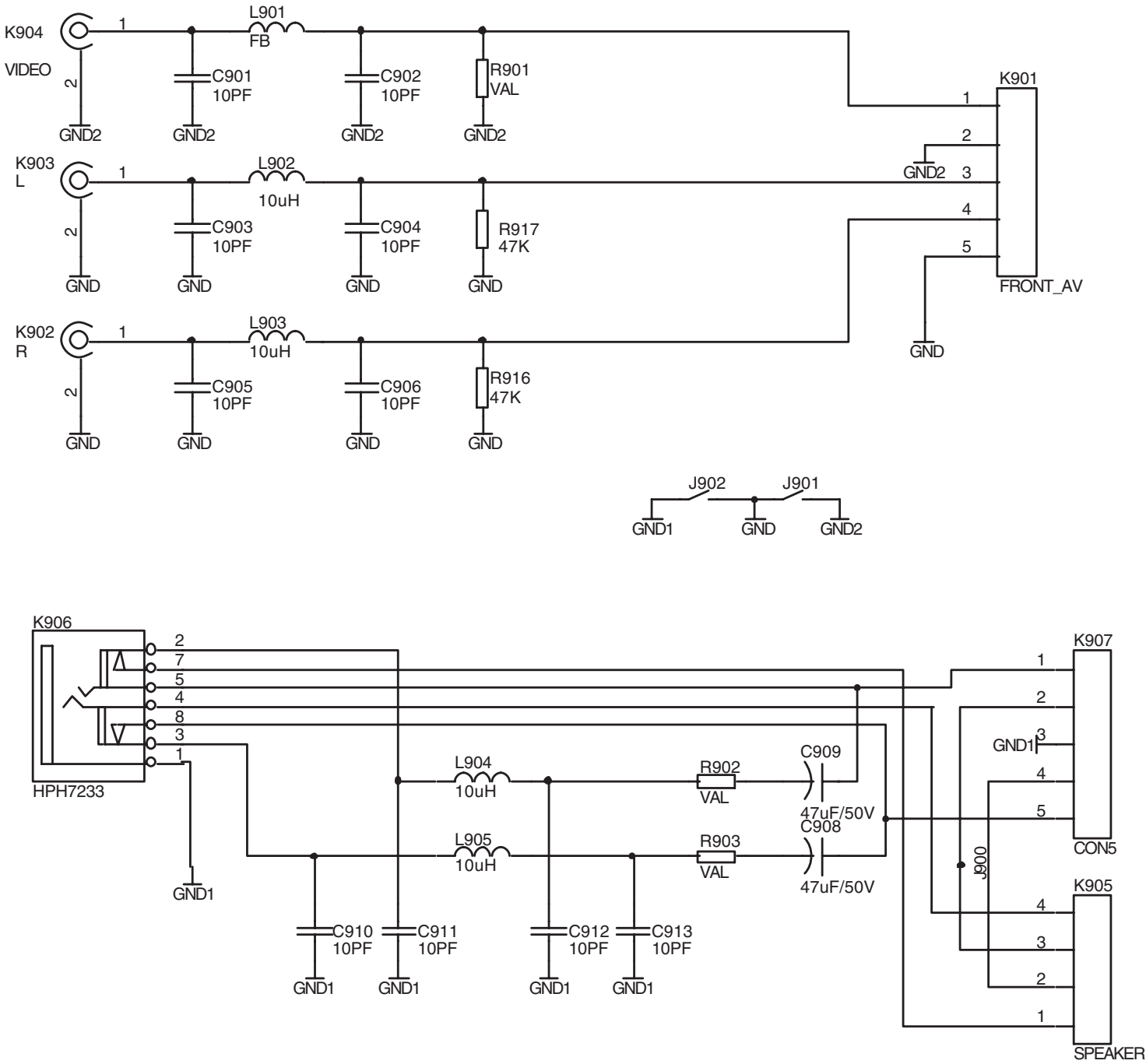
Main Panel: Video



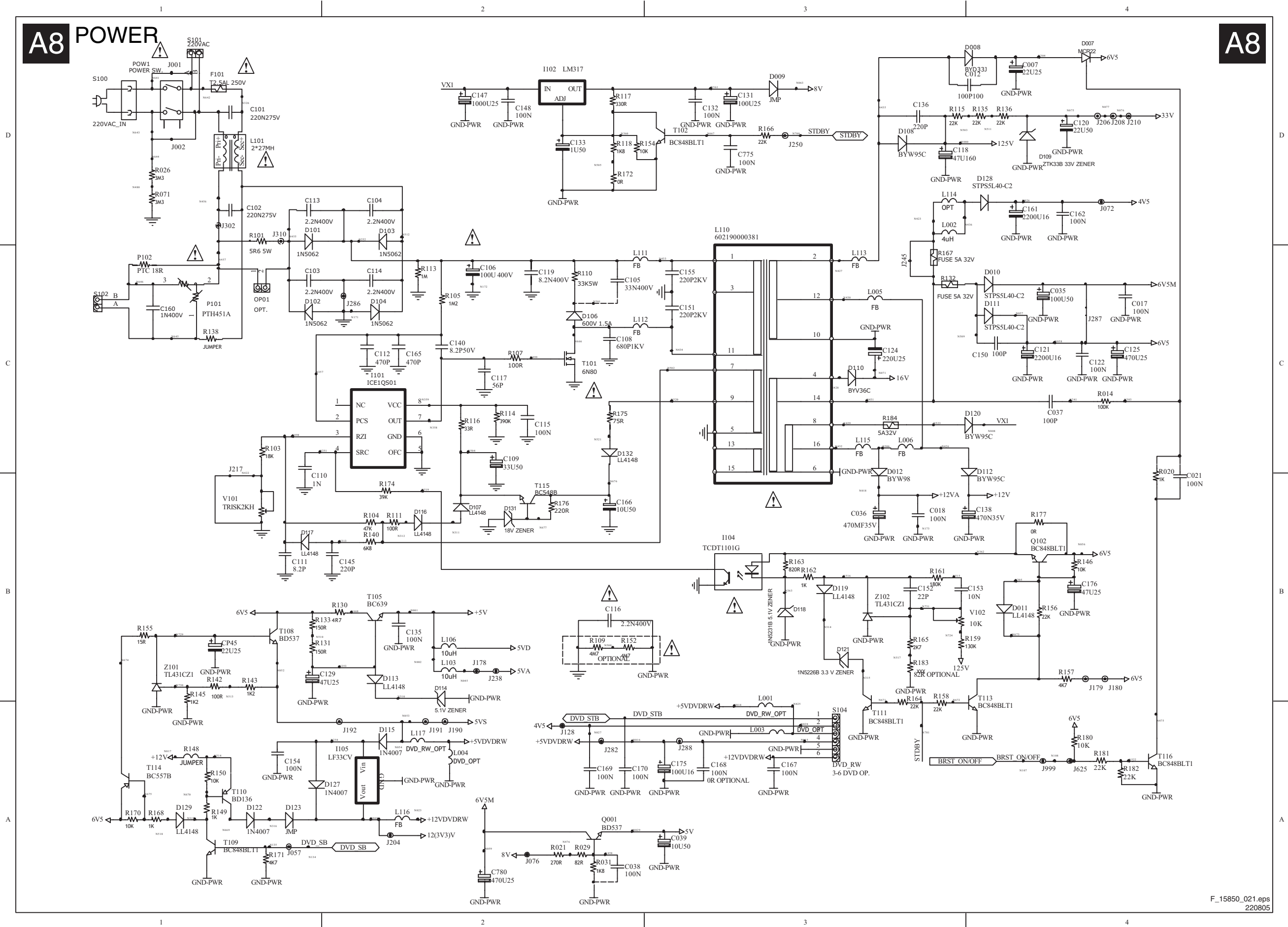
Side AV Panel

A7 SIDE AV

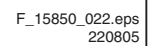
A7



Main Panel: Power



## A9 SCART



## A11 CRT



PT190R  
05TA023H

DANGER! LIVE PART

220VAC

250V

100V

50V

25V

12.5V

6.25V

3.125V

1.5625V

0.78125V

0.390625V

0.1953125V

0.09765625V

0.048828125V

0.0244140625V

0.01220703125V

0.006103515625V

0.0030517578125V

0.00152587890625V

0.000762939453125V

0.0003814697265625V

0.00019073486328125V

0.000095367431640625V

0.0000476837158203125V

0.00002384185791015625V

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0.0000000000028421709430404007434844970703125V

0.00000000000142108547152020037174224853515625V

0.000000000000710542735760100185871124267578125V

0.0000000000003552713678800500929355621337890625V

0.00000000000017763568394002504646778106689453125V

0.000000000000088817841970012523233890533447265625V

0.0000000000000444089209850062616169452667236328125V

0.00000000000002220446049250313080847263336171640625V

0.000000000000011102230246251565404236316680858203125V

0.0000000000000055511151231257827021181583340291015625V

0.00000000000000277555756156289135105907916701455078125V

0.000000000000001387778780781445675529539583507275390625V

0.0000000000000006938893903907228377647697917536376953125V

0.00000000000000034694469519536141888238489587681884765625V

0.000000000000000173472347597680709441192447939409423828125V

0.0000000000000000867361737988403547205962239697207119140625V

0.0000000000000000433680868994201773602981119848603555703125V

0.00000000000000002168404344971008868014905599243017778515625V

0.000000000000000010842021724855044340074527996215088892578125V

0.0000000000000000054210108624275221700372639981075444464640625V

0.0000000000000000027105054312137610850186319990537722232303125V

0.000000000000000001355252715606880542500930999526886111611515625V

0.00000000000000000067762635780344027125004654997634430555765625V

0.000000000000000000338813178901720135625023274998817172778828125V

0.0000000000000000001694065894508600678125116374994408863894140625V

0.00000000000000000008470329472543003390625581874972044319470703125V

0.000000000000000000042351647362715016953125290937360222197353515625V

0.00000000000000000002117582368135750847656251454686801109867678125V

0.000000000000000000010587911840678754238281250727343400549338890625V

0.0000000000000000000052939559203393771196412503636717002746694453125V

0.00000000000000000000264697796016968855982062518183585013733472265625V

0.000000000000000000001323488980084844279910312509091792518667361328125V

0.000000000000000000000661744490042422139955156250454589625833869640625V

0.0000000000000000000003308722450212110699775781250227294829169348203125V

0.00000000000000000000016543612251060553499888906250113647145496741015625V

0.000000000000000000000082718061255302767499444531250056823727483705078125V

0.0000000000000000000000413590306276513837497222656250028411863744175390625V

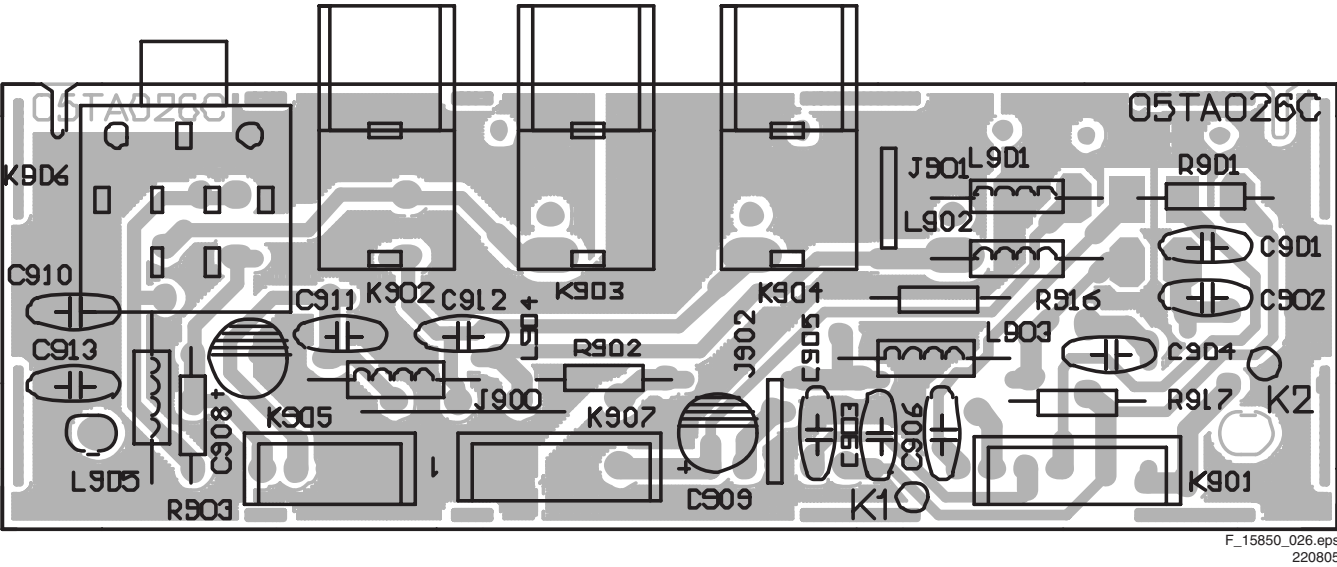
0.000000000000000000000020679515313825691874861132812500142

HT1  
HT2-GND  
R 61  
GND

125 UOUT

DANGER LIVE PART

Layout Side I/O Panel (Top Side)



## 8. Electrical Alignments

### Index of this chapter:

- 8.1 Hardware Alignments
- 8.2 Software Alignments/Settings

### 8.1 Hardware Alignments

#### 8.1.1 System Voltage Adjustment

- Switch the TV in AV mode by pressing the AV button on the remote control unit (minimum beam current condition).
- Adjust the V101 potentiometer until you measure 123 V DC on the cathode of diode D108.

### 8.2 Software Alignments/Settings

Enter the TV Service Mode. The Service Mode menu will now appear on the screen.

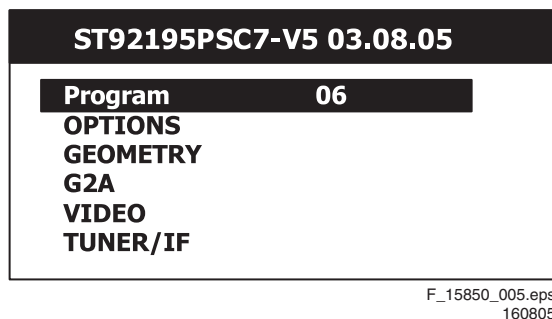


Figure 8-1 Service Mode Menu

Select one of the following alignments:

1. OPTIONS.
2. GEOMETRY.
3. G2ADJ.
4. VIDEO.
5. TUNER/IF.

#### 8.2.1 Options

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

An Option byte represents a number of different options. All options are controlled via three option bytes.

#### Options

```
011 1 1 1 1 1 1 1
020 1 0 1 0 0 0 0
031 1 1 0 0 1 1 1
```

#### How to change an Option byte

Select the option byte (01, 02 or 03) by pressing the CURSOR UP/ DOWN keys.

Use a digit key (0 to 7) to change the relevant option bit. The bit values will change from 0 to 1 and from 1 to 0 on each pressing of the relevant digit key.

#### Option bit definition

##### Option byte 1 (01): System configuration

###### b0

- 1: Welcome bit enabled
- 0: Welcome bit disabled

###### b1

- 1: PAL I enabled (/05 selected)
- 0: PAL I disabled (/01 and /58 selected)

###### b2

- 1: SECAM L enabled
- 0: SECAM L disabled

###### b3

- 1: not available
- 0: not available

###### b4

- 1: Standby after power 'on'
- 0: Last state after power 'on'

###### b5

- 0: not available
- 1: not available

###### b6

- 0: not available
- 1: not available

###### b7

- 0: EXT2 not available
- 1: EXT2 available

##### Option byte 2 (02): Video configuration

###### b0

- 1: QSS application
- 0: Intercarrier application

###### b1

- 1: Blue Screen enabled
- 0: Blue Screen disabled

###### b2

- 1: OSD Contrast Control enabled
- 0: OSD Contrast Control disabled

###### b3

- 1: APR ON (Auto Peak Regulation 'on')
- 0: APR OFF (Auto Peak Regulation 'off')

#### b7-b6-b5-b4

```
0000: APR 50 IRE
0001: APR 53.33 IRE
0010: APR 56.66 IRE
0011: APR 60 IRE
0100: APR 63.33 IRE
0101: APR 66.66 IRE
0110: APR 70 IRE
0111: APR 73.33 IRE
1000: APR 76.66 IRE
1001: APR 80 IRE
1010: APR 83.33 IRE
1011: APR 86.66 IRE
1100: APR 90 IRE
1101: APR 93.33 IRE
1110: APR 96.66 IRE
1111: APR 100 IRE
```

Option byte 3 (03): Feature configuration

- b0**
- 1: DVD available
- 0: DVD not available
- b1**
- 1: 2248E (microprocessor)
- 0: 2248C (microprocessor)
- b2**
- 1: One Crystal applied (4.43 MHz)
- 0: Two crystals applied (for NTSC playback)
- b3**
- 1: Internal CVBS Out 2.3 V
- 0: Internal CVBS Out 2.0 V
- b4**
- 1: not available
- 0: not available
- b5**
- 1: not available
- 0: not available
- b7-b6**
- 00: Thomson/Orega CTFF5510
- 01: Philips UV1316
- 10: Alps
- 11: Samsung

Table 8-1 Option codes

|       | Option 1  | Option 2  | Option3   |
|-------|-----------|-----------|-----------|
| PALI  | 0010 1011 | 1111 1000 | 0011 0111 |
| MULTI | 0010 1101 | 1111 1001 | 0011 0111 |

8.2.2 Geometry

The Geometry Alignments menu contains several items to align the set, in order to obtain a correct picture geometry.

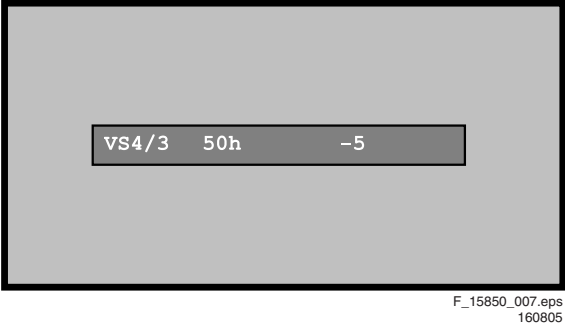


Figure 8-2 Geometry

Enter the Service Mode and select the GEOMETRY settings. Standard geometry adjustments are carried out by VS, VP and HP settings.

VS 16/9 50h setting has to be carried out until 3 cm distance between upper and lower parts of the screen. Same adjustments are valid for 60h 16/9 and 4/3.

- V.S4/3 50h Vertical size property of picture at 50 Hz 4/3 aspect ratio broadcast (default value 10).
- V.S4/3 Expand 50h Vertical size property of picture at 50 Hz 4/3 Expand aspect ratio broadcast (default value 15).
- V.S4/3 60h Vertical size property of picture at 60 Hz 4/3 aspect ratio broadcast (default value 7).
- V.S4/3 Expand 60h Vertical size property of picture at 60 Hz 4/3 Expand 9 aspect ratio broadcast (default value 11).
- V.P To adjust the vertical position of the picture (default value 0).
- H.P To adjust the horizontal position of the picture (default value 0).

8.2.3 G2 Adjust menu

In this menu we will see a comparative display according to the preset. To adjust the G2, turn the G2 potentiometer on the LOT until you reach the ':' sign. If the colon is highlighted, adjustment is achieved ('<' means you have to decrease and '>' means you have to increase).

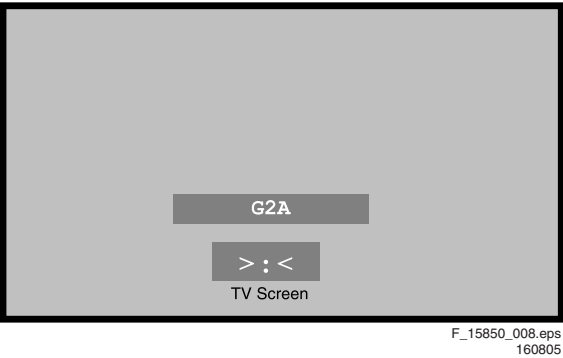


Figure 8-3 G2 adjustment menu

8.2.4 8.2.4Video

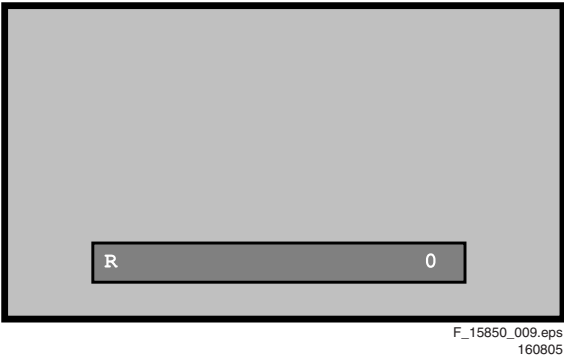


Figure 8-4 Video alignment menu

1. Apply a 'white' pattern (at 100 IRE)
2. Set CONTRAST to 70% and BRIGHTNESS and COLOUR SATURATION in the middle.
3. Place the colour analyser.
4. Via R, G, and B, it is possible to modify the 'peak white'.
5. Adjust to obtain the necessary values for x and y.
  - R (default value = 0)
  - G (default value = 0)
  - B (default value = 0)
1. Apply a 'dark gray' pattern (at 10 IRE).
2. Set CONTRAST to 70% and BRIGHTNESS and COLOUR SATURATION in the middle.
3. Adjust to obtain the necessary values for x and y by changing the R CFF and G CFF
  - R CFF (default value = 0)
  - G CFF (default value = 0)

Remark: After the low light alignment it may be necessary to check and to re-align the high light, and to repeat several times the procedure to obtain a good alignment for both low and high light.

## 8.2.5 Tuner/IF



Figure 8-5 Tuner alignment menu

**AGC adjustment**

Select AGC, and adjust the settings until the ':' indicator (displayed as >:<) turns into red by pressing < and > on the remote control.

PIF adjustment for BG/DK/L systems:

1. Apply a 38.9 MHz PAL BG signal.
2. Enter the Service Mode.
3. Select TUNE IF.
4. Choose the PIF C and PIF F items, and adjust the settings until the ':' indicator (displayed as >:<) turns into red by pressing < and > on the remote control.
  - PIF C (default value = 0)
  - PIF F (default value = 0)

PIF adjustment for L' system:

1. Apply a 33.9 MHz SECAM L' signal.
2. Enter the Service Mode.
3. Select TUNE IF.
4. Choose the PIF COARSE L' and PIF FINE L' items, and adjust the settings until the ':' indicator (displayed as >:<) turns into red by pressing < and > on the remote control.
  - PIF CL' (default value = 0)
  - PIF FL' (default value = 0)

## 9. Circuit Description and Abbreviation List

### Index of this chapter:

- 9.1 BASIC HARDWARE DESCRIPTIONS
- 9.2 FUNCTIONAL DESCRIPTION
- 9.3 List of Abbreviations
- 9.4 IC Data Sheets

### 9.1 BASIC HARDWARE DESCRIPTIONS

#### 9.1.1 ST92195C/D Microcontroller

##### General Features :

- Register File based 8/16 bit Core Architecture with RUN, WFI, SLOW, HALT modes
- 00 to +700C operating temperature range
- Up to 24MHz. operation @  $5V \pm 10\%$
- Min. Instruction cycle time: 165ns @ 24MHz.
- 48, 56, 64, 84 or 96 Kbytes ROM
- 256 bytes RAM of Register file (accumulators or index registers )
- 256 to 512 bytes of on-chip static RAM
- 2 or 8 Kbytes of TDSRAM (Teletext and Display Storage RAM )
- 28 fully programmable I/O pins
- Serial Peripheral Interface
- Flexible Clock controller for OSD, Data Slicer and Core Clocks running from a single low frequency external crystal.
- Enhanced display controller with 26 rows of 40/80 characters
  - 2 sets of 512 characters, 10x10 dot matrix, definable by user
  - Serial and Parallel attributes
  - 4/3 and 4/3 Expand supported in 50/60Hz mode
  - Rounding, fringe, double width, double height, scrolling, cursor, full background colour, half intensity colour, translucency and half-tone modes
- Teletext unit, including DataSlicer, Acquisition unit and up to 8Kbytes RAM for data storage
- VPS and Wide Screen Signalling slicer
- Integrated Sync Extractor and Sync Controller
- 14-bit Voltage Synthesis for tuning reference voltage
- Up to 6 external interrupts plus one Non - Maskable Interrupt
- 8 x 8-bit programmable PWM outputs with 5V open-drain or push-pull capability
- 16-bit watchdog timer with 8-bit prescaler
- 1 or 2 16-bit standard timer(s) with 8-bit prescaler
- I2C Master/Slave (on some devices )
- 4-channel A/D converter; 5-bit guaranteed
- Rich instruction set and 14 addressing modes
- Versatile development tools, including Assembler, Linker, C-compiler, Archiver, Source Level Debugger and hardware emulators with Real-Time Operating System available from third parties
- Pin-compatible EPROM and OTP devices available

##### I/O Ports

Up to 28 I/O lines are dedicated to digital input/output. These lines are grouped into up to 5 I/O Ports and can be configured on a bit basis under sw control to provide timing, status signals, timer and output, analog inputs, external interrupts and serial or parallel I/O.

##### TV Peripherals

A set of on-chip peripherals form a complete system for TV set and VCR applications:

- Voltage Synthesis
- VPS / WSS Slicer
- Teletext Slicer
- Teletext Display RAM
- OSD

##### On Screen Display

The human interface is provided by the On Screen Display module, this can produce up to 26 lines of up to 80 characters from a ROM defined 512 character set. The character resolution is 10X10 dot. Four character sizes are supported. Serial attributes allow the user to select foreground and background. Parallel attributes can be used to select additional foreground and background colours and underline on a character-by-character basis.

##### Teletext and Display Storage RAM

The Internal Teletext and Display storage RAM can be used to store Teletext pages as well as Display parameters.

##### Teletext VPS and WSS Data Slicers

The three on-board data slicers using a single external crystal are used to extract the teletext, VPS and WSS information from the video signal. Hardware hamming decoding is provided.

##### Voltage Synthesis Tuning Control

14-bit Voltage Synthesis using the PWM /BRM technique can be used to generate tuning voltages for TV set applications. The tuning voltage is output on one of two separate output pins.

##### PWM Output

Control of TV settings can be made with up to eight 8-bit PWM outputs, with a maximum frequency of 23.437Hz at 8-bit resolution (INTCLK = 12MHz). Low resolutions with higher frequency operation can be programmed.

##### Serial Peripheral Interface (SPI)

The SPI bus is used to communicate with external devices via the SPI, or I2C bus communication standards. The SPI uses a single data line for data input and output. A second line is used for a synchronous clock signal.

##### Standard Timer

The ST92195C has one Standard Timer (STIMO) that includes a programmable 16-bit down counter an associated 8-bit prescaler with Single and Continuous counting modes.

##### Analog/Digital Converter

In addition there is a 4-channel analog to Digital Converter with integral sample and hold, fast 5.7ms conversion time and 6-bit guaranteed resolution.

#### 9.1.2 ST24C16 EEPROM

- 1 Million erase / write cycles with 40 years data retention
- Single Supply Voltage :3V to 5.5V
- Programmable write protection
- Two wire serial interface, fully I2C bus compatible
- Byte and multibyte write (up to 8 byte)
- Page write (up to 16 byte)
- Byte, random and sequential read modes
- Self timed programming cycle
- Automatic address incrementing
- Enhanced esd/latch up performances

## 9.2 FUNCTIONAL DESCRIPTION

This chapter describes the functions of 21" RF TV. The ST92195C/D MCU in TV part, handle the overall control of the system.

ST92195 C/D:

- Decodes the serial data from the remote control unit
- Scans the local keyboard
- Controls the OSD
- Exchanges information via the serial I2C bus
- Selects the proper tuner band
- Selects the proper IF and the sound demodulator
- Analog picture controls
- Switches between internal and external audio and video signals

### 9.2.1 Tuning

- Frequency Synthesis Tuning system with 62.5kHz resolution based on PLL technology
- Silent Automatic search tuning based on AFC and IDENT
- Auto Store function to find and store all transmitters (from 44 MHz to 860 MHz )
- ATS Algorithm capability (See country List on 4.2.2 Installation Menu)
- Fine Tuning capability (-4 MHz ÷ +4 MHz)
- Automatic PAL/SECAM/NTSC recognition both RF and AV
- Automatic sound recognition on program switching
- Suitable for positive and negative modulation
- Selection of 100 programmes (0 ... 99)
- Dark programme switching
- TV channel installation menu
- 5-character program name
- Manual Search and Store capability
- Manual Sort capability
- Plug and Play function

### 9.2.2 AFC

Controller tries to keep locked to the transmitter by means of following the AFC signal, which may be effected by the changes in frequency due to deviations in component ratings. When a station is detected and stored thereupon is equipped with the auto-following feature by default. However, the memorisation after fine-tuning disables auto-following for that station. In order to enable auto-following, the station must be tuned again by automatic search. AFC bit in NVM

0: Auto-following Disabled (Store after fine tune)

1: Auto-following Enabled (Store after auto search)

**Table 9-1 AFC Reference Values**

| AFC Out | Frequency                      |
|---------|--------------------------------|
| 0       | -60 kHz < FPLL - F0 < +60 kHz  |
| 2       | -300 kHz < FPLL - F0 < -60 kHz |
| 3       | FPLL - F0 < -300 kHz           |
| 4       | +60 kHz < FPLL - F0 < +300 kHz |
| 5       | +300 kHz < FPLL - F0           |

### 9.2.3 Picture

#### Screen Format Selection

2 different formats are available; 4:3, 4:3 Expand. When Clear/Format key is pressed for the first time an OSD stating the current screen format is displayed on the screen. In order to select another screen format this key must be pressed before the OSD disappears (within 5 seconds).

#### Picture Control

- Brightness 64 Steps (00 ... 63)
- Colour 64 Steps (00 ... 63)
- Contrast 64 Steps (00 ... 63)
- Sharpness 16 Steps (00 ... 15)
- Colour Temperature
  - Normal Red (offset), Green (offset)
  - Warm Red (offset + 9), Green (offset + 7)
  - Cool Red (offset - 10), Green (offset - 7)
- Hue 64 Steps (-32 ... +31)  
(Hue control setting is available only for NTSC settings.)
- Noise Reduction On/Off
- Contrast+ On/Off

#### Smart Picture Modes

5 different Smart Picture Modes (Rich, Natural, Soft, Multimedia and Personal) are available in RF, AV Modes. User can select any of these modes or return to the personal selections. Using the Smart Picture key on the RC unit can perform selection of different modes or returning to personal selections. When Smart Picture key is pressed for the first time, an OSD stating the current mode will be displayed. In order to select another mode this key must be pressed before the OSD disappears (within 5 seconds). The last selected mode is always stored to NVM.

**Table 9-2 Smart Picture Mode Settings**

|                   | Brightness | Colour | Contrast | Sharpness | Color Temp | NR  | Contrast+ |
|-------------------|------------|--------|----------|-----------|------------|-----|-----------|
| <b>Rich</b>       | 32         | 33     | 55       | 14        | Cool       | OFF | ON        |
| <b>Natural</b>    | 26         | 26     | 44       | 8         | Normal     | OFF | ON        |
| <b>Soft</b>       | 24         | 24     | 27       | 7         | Normal     | ON  | OFF       |
| <b>Multimedia</b> | 26         | 26     | 50       | 12        | Normal     | OFF | ON        |

## 9.2.4 Sound

**Sound Mode Selection**

- German Stereo (A2) Mono / Stereo / Dual I-II
- NICAM Stereo Mono / NICAM Stereo / Dual I-II
- Czech Stereo Mono / Czech Stereo / Dual I-II
- Mono Only mono

**Table 9-3 Sound Mode Selection**

| Received Audio Signal | Response                                                     |
|-----------------------|--------------------------------------------------------------|
| Mono                  | No other option possible                                     |
| German stereo         | Toggle between mono and stereo mode                          |
| German dual language  | Toggle between language I-II                                 |
| NICAM mono            | Toggle between the NICAM and the FM carrier signal           |
| NICAM stereo          | Toggle between the NICAM stereo and the FM carrier signal    |
| NICAM dual language   | Toggle between NICAM language I-II and the FM carrier signal |

**Table 9-4 Default Audio Modes**

| Received Audio Signal | Automatically selected mode |
|-----------------------|-----------------------------|
| MONO                  | MONO                        |
| STEREO                | STEREO                      |
| DUAL LANGUAGE         | DUAL I, II                  |
| NICAM                 | NICAM I                     |

**Digital NICAM Behaviour**

If the signal received does not indicate a valid and error free NICAM sound, then analog FM/AM sound is selected. Otherwise NICAM is selected automatically. After each programme change, the NICAM sound will be preferred. NICAM sound preference will be respected if the received sound type indicates that the NICAM sound is related to the picture. Otherwise NICAM preference will be overruled by switching to analog FM or AM mono. Whenever the user forces a different sound mode, the automatic following of the received sound type will be terminated and forced preference of the user is assigned the higher priority. The bit error rate is monitored regularly to check the quality of the NICAM signal. The analog FM/AM mono channel is forced when the bit error rate exceeds a maximum value. The previous sound mode will be restored as soon as the bit error rate drops below the maximum value. If the previous sound mode happens to be analog FM or AM, then this will have no effect.

**Sound Control**

- Volume 64 Steps (00 ... 63)
- Bass 48 Steps (-24 ... +24)
- Treble 48 Steps (-24 ... +24)
- Balance 64 Steps (-31 ... +31)
- AVL ON/OFF

**Volume:**

Volume can be controlled within local keyboard or by the remote control unit. If mute is active and volume up key is pressed, audio will exit mute and volume will start to increase from the indication mark where it was muted previously. If mute is active and volume down key is pressed, audio will stay in mute and start to decrease from the indication mark where it was muted previously. When mute is deactivated audio value will preserve its last setting.

**Mute:**

LS sound can be switched off temporarily with the MUTE key. Sound can be switched on again by;

- Re-pressing the mute key.
- Pressing the V+ key.
- While mute is active and the volume down key is pressed, preserving the mute condition audio will start to decrease from where it was muted previously. When mute is deactivated audio value will keep it's last setting.

Mute will be stored to NVM before cold power on and will stay in it's last state after switching the TV set on. All through the time mute is active, mute symbol will be displayed on the screen permanently.

**Back-end Mute:**

The loudspeakers and the headphone are automatically muted when there is no ident from the video processor. Audio is muted within 200msec after the back-end ident disappears. Mute stays active for 1sec. after ident returns. For all internal and external sources that are selected, this ident control and sound mute will be performed.

**Front-end Mute:**

If the terrestrial front-end does not deliver any ident, audio is muted within 200 msec. after the front-end ident disappears. Mute stays active for 1 sec. after the ident returns.

**Smart Sound Modes**

4 different Smart Sound Modes (Voice, Music, Theatre and Personal) are available. User can select any of these modes or return to the personal selections. Using the Smart Sound key on the Remote Control unit can perform selection of different modes or returning to personal selections. When Smart Sound key is pressed for the first time, an OSD stating the current mode will be displayed. In order to select another mode this key must be pressed before the OSD disappears (within 5 seconds). The last selected mode is always stored to NVM.

**Table 9-5 Smart sound mode settings**

|         | Balance | Treble (Telra) | Bass (Telra) | AVL |
|---------|---------|----------------|--------------|-----|
| Voice   | 0       | 38 (-6)        | 28 (-11)     | ON  |
| Music   | 0       | 40 (-5)        | 42 (-4)      | OFF |
| Theatre | 0       | 45 (-2)        | 52 (+1)      | OFF |

- It takes 3 seconds for the changes on Picture or Sound settings to be stored into NVM.

## 9.2.5 Peri-TV

- EXT has audio/video input/output, RGB (Full SCART)
- AV has audio/video input, CVBS

**Table 9-6 Peri TV Outputs**

|     | Peri-TV Output     |
|-----|--------------------|
| TV  | Current RF Program |
| EXT | Last RF Program    |
| AV  | Last RF Program    |

**Pin8 Behaviour for EXT:**

- While the set is going out of Standby (if the last state of the set is not Standby State before cold power off, set will go out of Standby automatically after cold power on), if the Scart Pin8 is activated set will automatically switch to external source.
- While the set is in RF mode (if not any menu displaying and if teletext is not activated), if Pin8 is activated (including Canal +) set will automatically switch to external source.
- If set switches to external source with Pin8, P+/P- keys on the RC or keyboard will react as if set is in the last program or source before switching to external source not in external mode.

ie:

- Set is in Program 5 Press P+ - Set is in Program 6
- Pin8 activated while set is in Program6 - Set switches to EXT
- Press P+(or P-) - Set will switch to Program7 (or Program5)

**Pin16 Behaviour for EXT:**

- Pin16 is activated when the voltage is more than 0,7 Volts.  
In this case, EXT sets to RGB mode.

**9.2.6 Memory**

21 RF TV system requires 1KB NVM (24C16). This size of memory gives the ability to store.

- Storage of preferred picture and sound settings
- Storage of 100 preset data
- Storage of service settings and option bytes, Storage of childlock password
- Storage of last state (stand-by or not) before cold power off.

**9.3 List of Abbreviations**

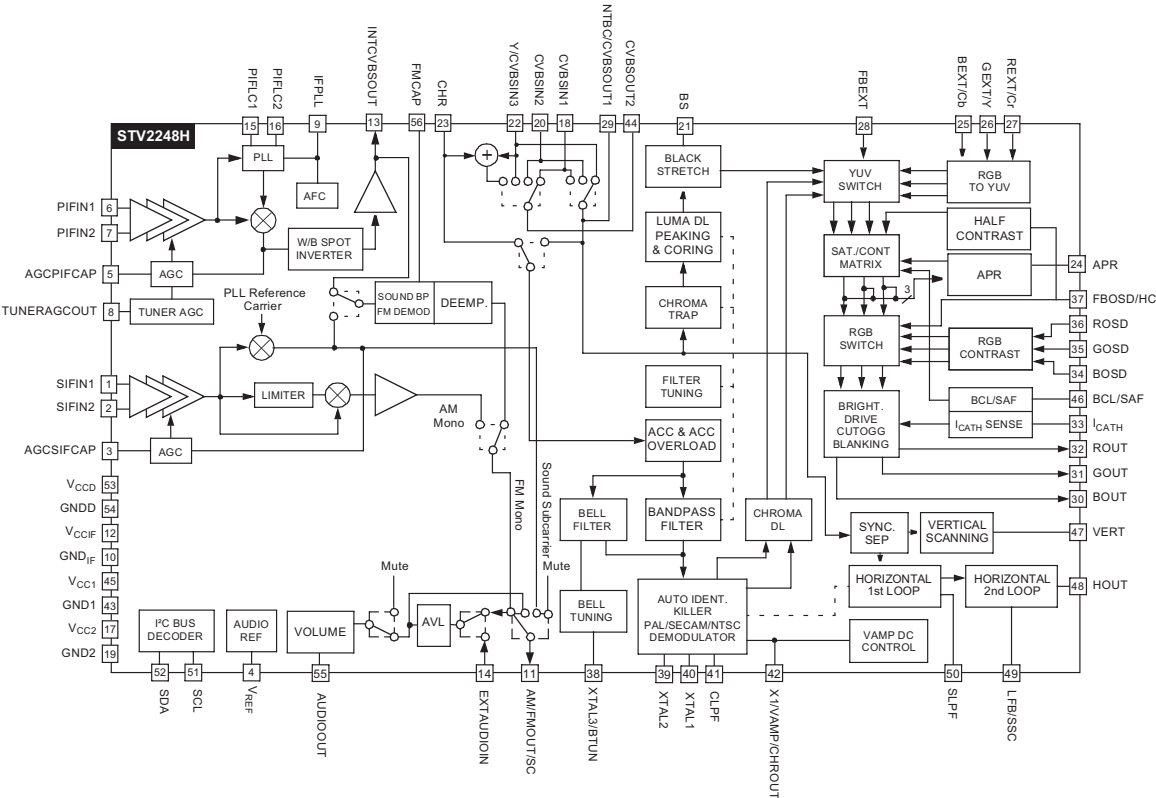
|           |                               |
|-----------|-------------------------------|
| 123VOUT   | 123 V Horizontal power supply |
| 24_VERT   | 24 V Vertical power supply    |
| 5VA       | 5 V analog                    |
| 5VD       | 5 V digital                   |
| AGC       | Auto Gain Control             |
| EXT       | EXT information               |
| AV_STATUS | AV Status                     |
| B         | Blue                          |
| B_OSD     | OSD Blue input                |
| BCL       | Beam Current Limiter          |
| CVBS      | Composite Video Signal        |
| CVBSEXT   | External CVBS input           |
| CVBSOUT   | Second Video Switch Output    |
| CVBSTXT   | Teletext CVBS                 |
| DOC       | Depends on Chassis            |
| FB_OSD    | OSD Fast blanking Input       |
| FBEXT     | Fast Blanking External        |
| FBT       | Flyback Transformer           |
| FLM.      | Flaman                        |
| G         | Green                         |
| G_OSD     | OSD Green input               |
| HOSD      | Horizontal OSD                |
| HOUT      | Horizontal Output pulse       |
| IF1       | Intermediate Frequency 1      |
| IF2       | Intermediate Frequency 2      |
| IR        | Infrared led                  |
| KEYB      | Front panel keyboard          |
| L/L'      | Secam L/L' sound standard     |
| LOUT      | Left out                      |
| MDO       | Mode control data output      |
| ON/STBY   | On/Standby                    |
| PRST      | Preset                        |
| R         | Red                           |
| R_OSD     | OSD Red input                 |
| RIN       | Red in                        |
| RMOT      | Remote Control                |
| SCL       | I2C Clock                     |
| SDA       | I2C Data                      |
| SW1       | Switch 1                      |
| TXTSW     | Teletext switch               |
| V_AMP     | Vertical Amplitude DAC output |
| V_OSD     | Vertical OSD                  |
| VERT      | Vertical Output pulse         |
| VGUARD    | Vertical guard voltage        |
| VMEM      | Voltage supplied for Eeprom   |
| VOL       | Volume                        |
| Vol-      | Volume -                      |
| Vol+      | Volume                        |

9.4 IC Data Sheets

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

9.4.1 STV224X

Block Diagram



Pin Configuration

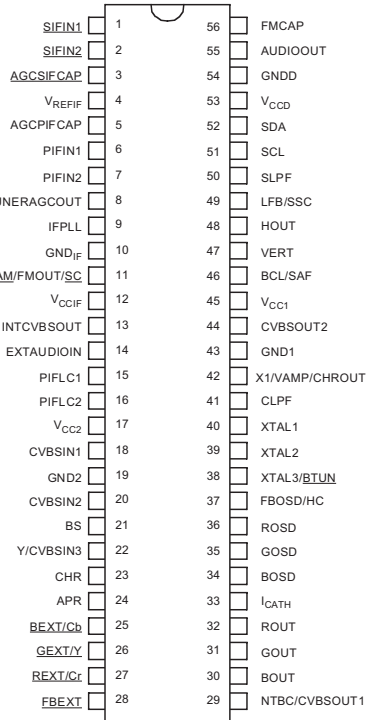
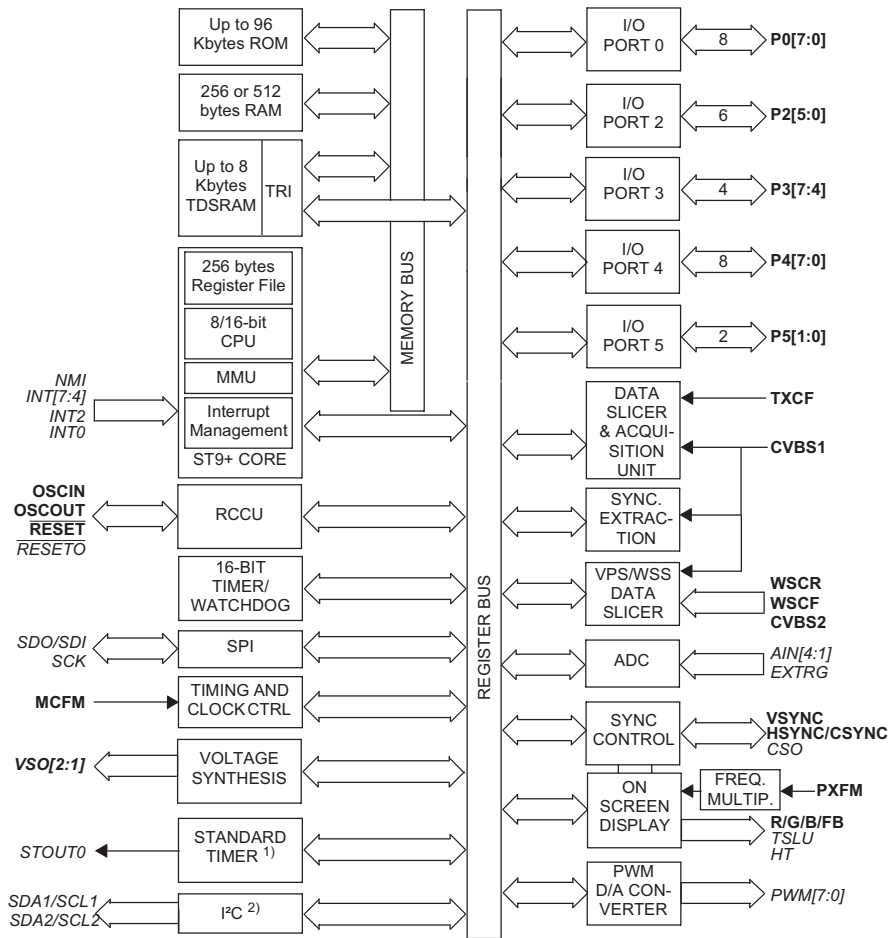


Figure 9-1 Internal block diagram and pin configuration

## 9.4.2 ST92195C/D

## Block Diagram



## Pin Configuration

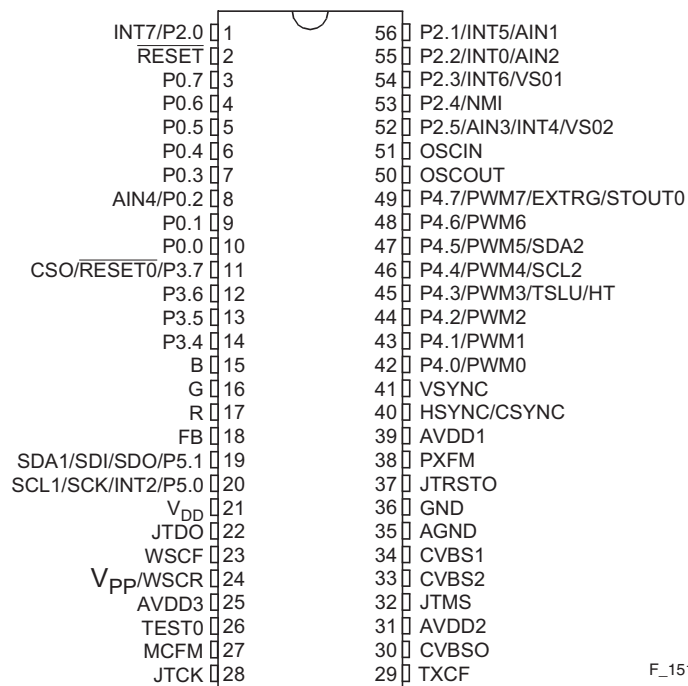
F\_15160\_048.eps  
070705

Figure 9-2 Internal block diagram and pin configuration

9.4.3 MSP3415G

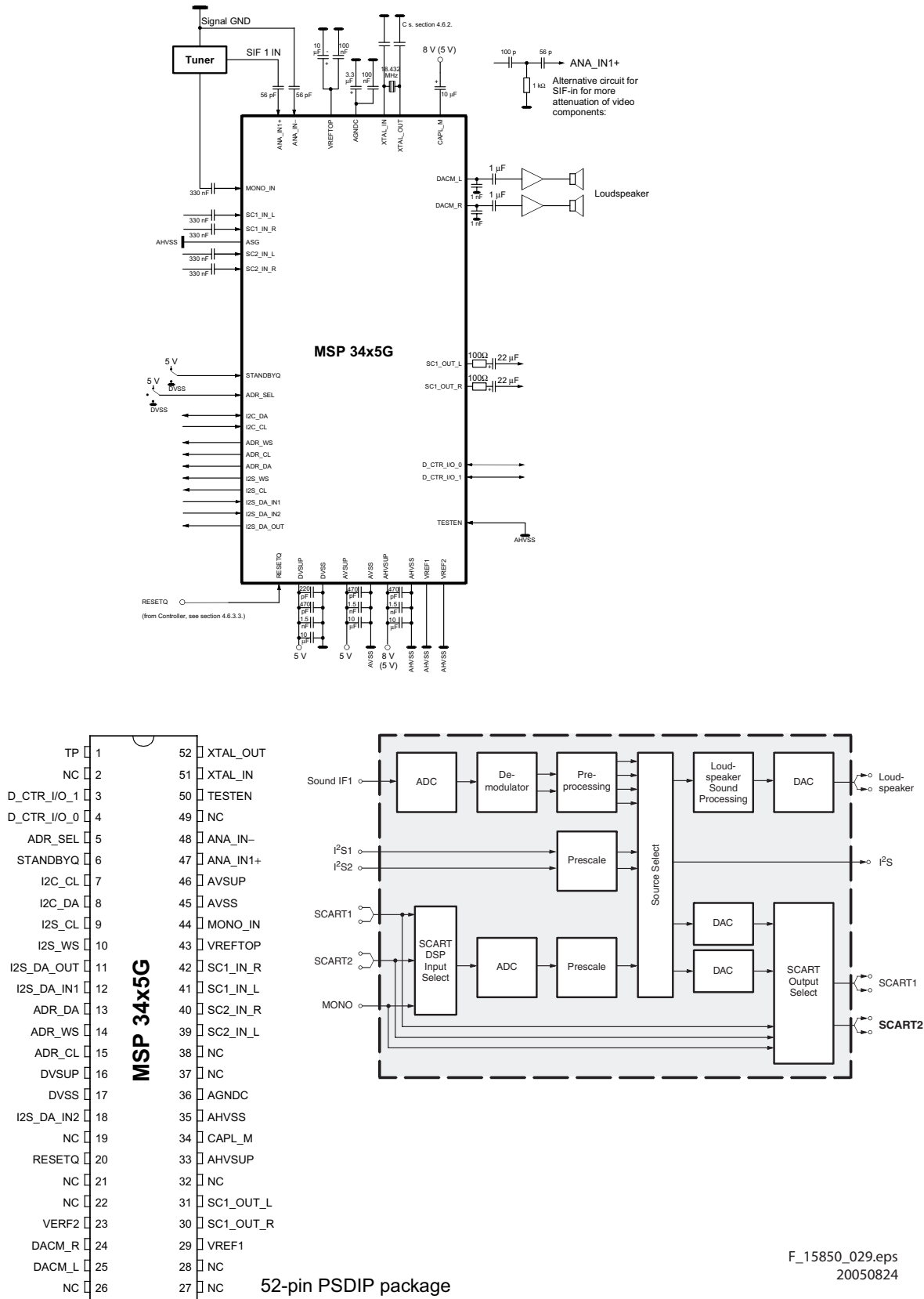
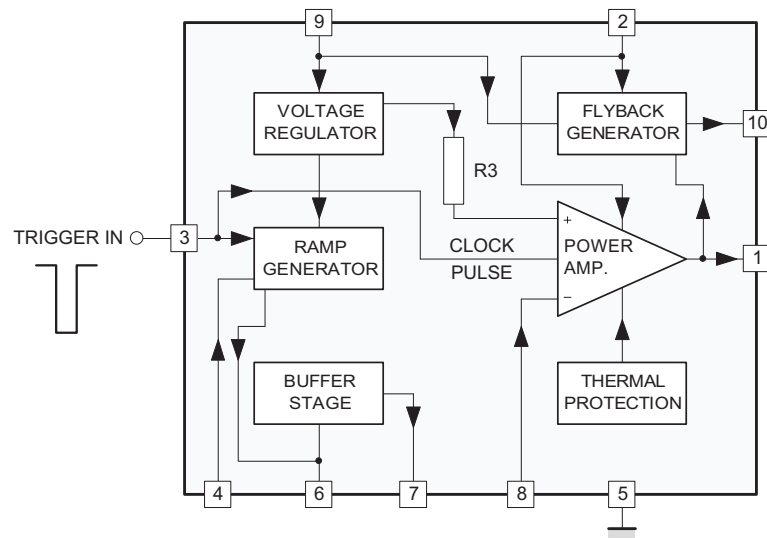


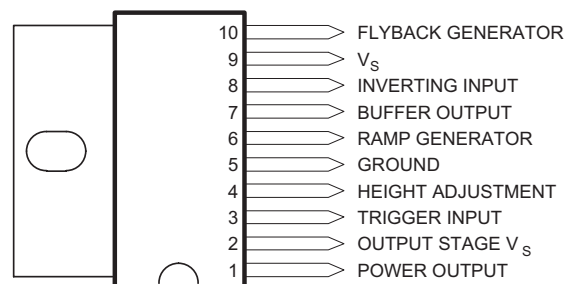
Figure 9-3 Internal block diagram and pin configuration

## 9.4.4 TDA1771

## Block Diagram



## Pin Configuration

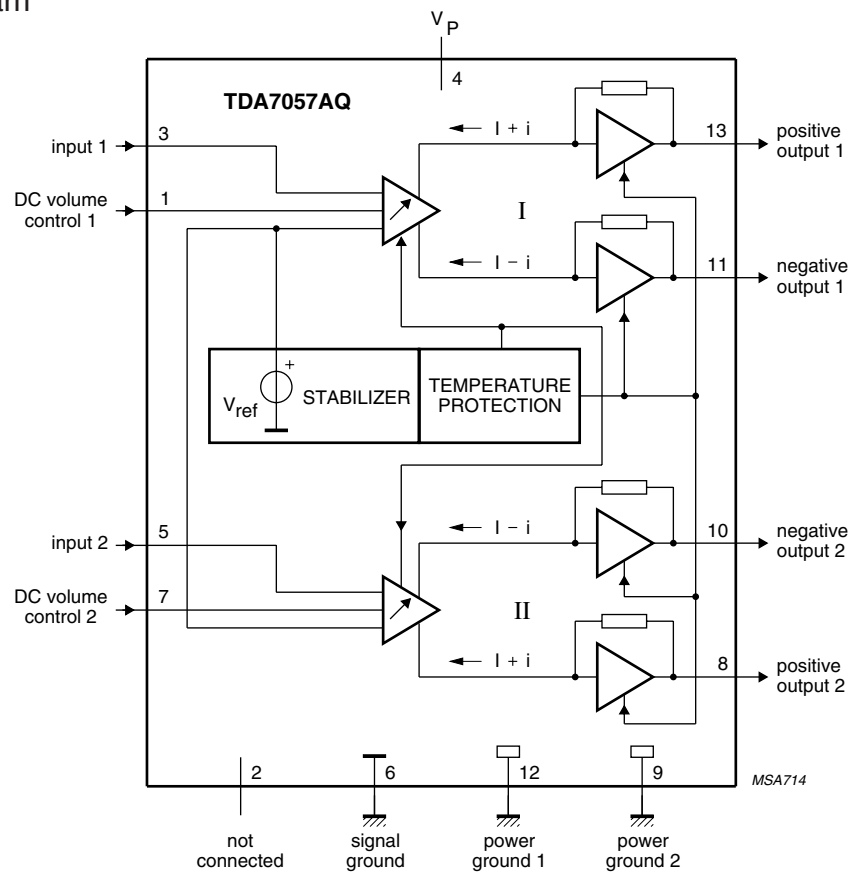


F\_15160\_049.eps  
070705

Figure 9-4 Internal block diagram and pin configuration

## 9.4.5 TDA7057A

## Block Diagram



## Pin Configuration

|            |    |                         |
|------------|----|-------------------------|
| n.c.       | 2  | not connected           |
| $V_{I(1)}$ | 3  | voltage input 1         |
| $V_P$      | 4  | positive supply voltage |
| $V_{I(2)}$ | 5  | voltage input 2         |
| SGND       | 6  | signal ground           |
| VC2        | 7  | DC volume control 2     |
| OUT2+      | 8  | positive output 2       |
| PGND2      | 9  | power ground 2          |
| OUT2-      | 10 | negative output 2       |
| OUT1-      | 11 | negative output 1       |
| PGND1      | 12 | power ground 1          |
| OUT1+      | 13 | positive output 1       |

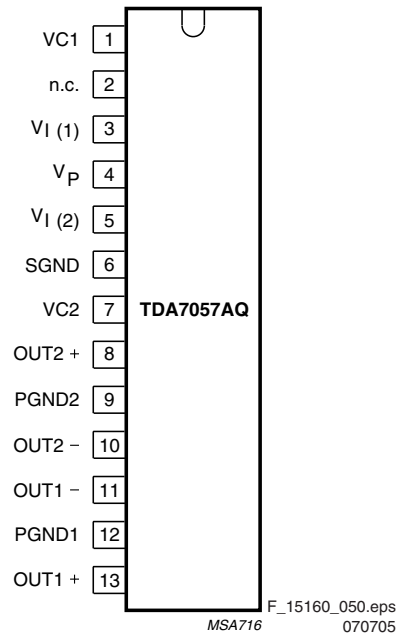


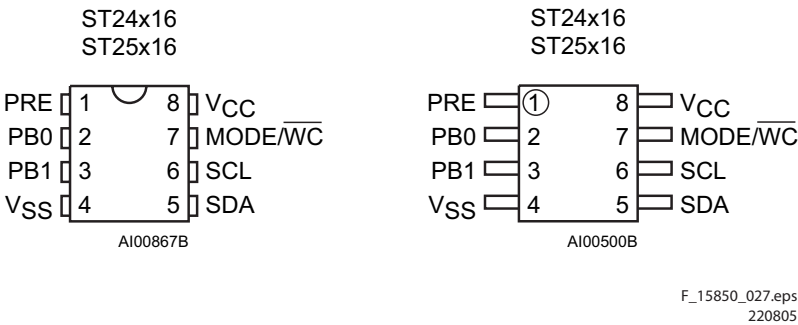
Figure 9-5 Internal block diagram and pin configuration

9.4.6 24C16

ST24/25C16, ST24/25W16

DIP Pin Connections

SO8 Pin Connections



F\_15850\_027.eps  
220805

Figure 9-6 Internal block diagram and pin configuration

# 10. SpareParts List

## Main Board [A]

### Various

|      |                |                        |
|------|----------------|------------------------|
|      | 0020 220 00931 | CABLE                  |
|      | 0020 220 00941 | CABLE 45CM             |
|      | 0025 285 54101 | CABLE POW              |
|      | 0050 510 84631 | Bead                   |
|      | 0360 160 10071 | Ferrite ring 31x7x19   |
|      | 0673 100 01831 | Fuse T2.5A 250V        |
|      | 0705 521 11831 | A51QDX993X230/TF       |
|      | 0751 102 11040 | Fuse holder            |
|      | 3995 930 00080 | BATTERY 1.5V AA        |
|      | 6085 800 03730 | COIL DEG.21°CPT 9R     |
|      | 6102 066 12121 | SPEAKER 8R 5W          |
|      | 6093 300 01211 | TSOP34836              |
| 1002 | 0487 738 09001 | KLR114L                |
| F101 | 8416 001 00000 | COMP. 2.5 AMP. FUSE    |
| F201 | 0377 300 09241 | FILTER CER 4.43MHZ     |
| F301 | 0377 300 07801 | SAW K3953M             |
| F302 | 0377 300 07771 | SAW K9453M             |
| F303 | 0377 300 07101 | Filter 5.5/6.0/6.5 MHz |
| P102 | 0347 103 03631 | PTC 18Ω 30%            |
| POW1 | 0810 000 00141 | Mains switch           |
| S100 | 0751 002 11260 | CONN 2P VRT 7.5MM      |
| S100 | 8411 400 13208 | CABLE POWER 220CM      |
| S102 | 0751 002 11781 | 2p 7.5mm               |
| S201 | 0027 400 00300 | CABLE 4P 65CM          |
| S202 | 0027 400 10390 | CABLE 5P 45CM          |
| S301 | 8411 400 10057 | CABLE 5P 45CM          |
| S302 | 0750 302 11091 | Connector 5p           |
| S302 | 8411 400 10058 | CABLE 5P 45CM          |
| S306 | 0750 402 10051 | Socket scart           |
| S401 | 0020 220 00140 | CABLE 4P 45CM          |
| S403 | 0020 272 32280 | CABLE 42CM 7.5MM       |
| S403 | 0751 002 11781 | 2p 7.5mm               |
| S421 | 0023 445 00240 | Cable 450mm vertical   |
| S421 | 0750 302 11001 | 2p v 5mm               |
| S506 | 0750 208 00031 | CRT socket Narrow neck |
| S507 | 0020 205 11160 | Cable 30mm Bk          |
| SC01 | 0751 007 11041 | Connector 5p           |
| SW01 | 0811 011 11631 | SWITCH TACT            |
| SW02 | 0811 011 11631 | SWITCH TACT            |
| SW03 | 0811 011 11631 | SWITCH TACT            |
| SW04 | 0811 011 11631 | SWITCH TACT            |
| X001 | 0490 300 00461 | Xtal 4MHz HC49U        |
| X101 | 6168 000 20141 | TUNER PLL CTF5510B     |
| X201 | 0490 300 00541 | Xtal 18.432MHz HC49U   |
| X301 | 0490 300 00501 | Xtal 4.433619MHz       |
| X302 | 0490 300 00511 | Xtal 3.579545MHz       |
| Z102 | 0451 980 00011 | IC TL431CLP            |

—||—

|      |                |                    |
|------|----------------|--------------------|
| C001 | 0424 465 01061 | 10μF 20% 50V       |
| C003 | 0424 465 01061 | 10μF 20% 50V       |
| C004 | 0421 401 61071 | 100μF 20% 16V      |
| C005 | 0400 670 41081 | 100nF 20% 50V 0805 |
| C006 | 0424 142 54761 | 47μF 20% 25V       |
| C008 | 0400 670 41081 | 100nF 20% 50V 0805 |
| C009 | 0400 310 42261 | 22pF 5% 50V 0603   |
| C010 | 0407 300 22261 | 2.2NF 50V 10% 0603 |
| C011 | 0400 670 41081 | 100nF 20% 50V 0805 |
| C013 | 0407 300 22261 | 2.2NF 50V 10% 0603 |
| C014 | 0400 440 81881 | 470NF 16V 10% 0805 |
| C015 | 0407 320 41081 | 100pF 5% 50V 0805  |
| C016 | 0400 440 81881 | 470NF 16V 10% 0805 |
| C017 | 0400 671 41061 | 100NF 50V 10% 0603 |
| C018 | 0400 671 41061 | 100NF 50V 10% 0603 |
| C019 | 0400 434 47261 | 4.7NF 50V 10% 0603 |
| C020 | 0400 670 41081 | 100nF 20% 50V 0805 |
| C022 | 0400 310 42261 | 22pF 5% 50V 0603   |
| C023 | 0400 310 42261 | 22pF 5% 50V 0603   |
| C024 | 0400 520 44861 | 470pF 5% 50V 0603  |
| C025 | 0424 165 01051 | 1μF 20% 50V        |
| C029 | 0400 310 42261 | 22pF 5% 50V 0603   |
| C030 | 0400 310 42261 | 22pF 5% 50V 0603   |
| C031 | 0407 320 41081 | 100pF 5% 50V 0805  |
| C033 | 0400 434 47261 | 4.7NF 50V 10% 0603 |
| C034 | 0400 430 45661 | 56pF 5% 50V 0603   |
| C035 | 0424 492 54771 | 470μF 20% 25V      |
| C036 | 0421 401 64791 | 470MF 35V 20% 105° |
| C039 | 0424 465 01061 | 10μF 20% 50V       |
| C040 | 0400 440 81881 | 470NF 16V 10% 0805 |
| C075 | 0424 165 02261 | 22μF 20% 50V       |
| C077 | 0424 165 02261 | 22μF 20% 50V       |
| C101 | 6200 040 62241 | 220nF 20% 275V     |
| C102 | 6200 040 62241 | 220nF 20% 275V     |

|      |                |                       |
|------|----------------|-----------------------|
| C103 | 0400 401 52211 | 2.2nF 10% 1kV         |
| C104 | 0400 401 52211 | 2.2nF 10% 1kV         |
| C105 | 6200 041 33331 | 33nF 5% 630V          |
| C106 | 0427 199 01071 | 100μF 20% 400V        |
| C108 | 0400 401 56811 | 680pF 10% 1kV         |
| C109 | 0424 165 03361 | 33MF 50V 20%          |
| C110 | 0407 520 41061 | 1NF 50V 10% 0603      |
| C111 | 0407 420 41061 | 10pF 5% 50V 0603      |
| C112 | 0400 520 43961 | 390pF 50V 5% 0603     |
| C113 | 0400 401 52211 | 2.2nF 10% 1kV         |
| C114 | 0400 401 52211 | 2.2nF 10% 1kV         |
| C115 | 0400 670 41081 | 100nF 20% 50V 0805    |
| C116 | 0400 402 02221 | 2.2nF 20% 400V        |
| C117 | 0400 430 45661 | 56pF 5% 50V 0603      |
| C118 | 0424 198 34761 | 47μF 20% 160V         |
| C119 | 6200 040 48201 | 8.2nF 10% 400V        |
| C120 | 0424 165 02261 | 22μF 20% 50V          |
| C121 | 0424 401 62281 | 2200μF 20% 16V        |
| C122 | 0400 671 41061 | 100NF 50V 10% 0603    |
| C124 | 0424 492 52271 | 220μF 20% 25V         |
| C125 | 0421 401 64791 | 470MF 35V 20% 105°    |
| C129 | 0424 142 54761 | 47μF 20% 25V          |
| C131 | 0424 142 51071 | 100μF 20% 25V         |
| C132 | 0400 670 41081 | 100nF 20% 50V 0805    |
| C133 | 0424 165 01051 | 1μF 20% 50V           |
| C140 | 0400 320 41501 | 15PF 50V 5% CH        |
| C147 | 0424 492 54771 | 470μF 20% 25V         |
| C148 | 0400 670 41081 | 100nF 20% 50V 0805    |
| C151 | 0400 401 72211 | 220pF 10% 2kV         |
| C152 | 0400 540 43361 | 33PF 50V 5% 0603      |
| C153 | 0407 300 14061 | 10NF 50V 10% 0603     |
| C155 | 0400 401 72211 | 220pF 10% 2kV         |
| C160 | 0400 670 41371 | 1nF 20% 400V          |
| C166 | 0424 465 01061 | 10μF 20% 50V          |
| C176 | 0424 142 54761 | 47μF 20% 25V          |
| C201 | 0424 402 51081 | 1000μF 20% 25V        |
| C202 | 0421 945 04751 | 4.7μF 20% 50V         |
| C203 | 0421 945 04751 | 4.7μF 20% 50V         |
| C204 | 0407 300 14061 | 10NF 50V 10% 0603     |
| C205 | 0407 300 14061 | 10NF 50V 10% 0603     |
| C206 | 0424 465 01061 | 10μF 20% 50V          |
| C207 | 0400 670 41081 | 100nF 20% 50V 0805    |
| C208 | 0424 465 01061 | 10μF 20% 50V          |
| C209 | 0400 670 41081 | 100nF 20% 50V 0805    |
| C210 | 0400 670 41081 | 100nF 20% 50V 0805    |
| C215 | 0400 440 81881 | 470NF 16V 10% 0805    |
| C216 | 0400 440 81881 | 470NF 16V 10% 0805    |
| C217 | 0407 520 41061 | 1NF 50V 10% 0603      |
| C218 | 0407 520 41061 | 1NF 50V 10% 0603      |
| C221 | 0424 165 02261 | 22μF 20% 50V          |
| C222 | 0424 165 02261 | 22μF 20% 50V          |
| C223 | 0424 465 01061 | 10μF 20% 50V          |
| C224 | 0424 465 01061 | 10μF 20% 50V          |
| C225 | 0400 670 41081 | 100nF 20% 50V 0805    |
| C226 | 0424 465 01061 | 10μF 20% 50V          |
| C227 | 0400 670 41081 | 100nF 20% 50V 0805    |
| C228 | 0420 339 01011 | 3.3μF 20% 50V         |
| C231 | 0400 520 43381 | 330nF 20-80% 50V 0805 |
| C232 | 0400 520 43381 | 330nF 20-80% 50V 0805 |
| C233 | 0400 520 43381 | 330nF 20-80% 50V 0805 |
| C234 | 0400 520 43381 | 330nF 20-80% 50V 0805 |
| C235 | 0400 670 41081 | 100nF 20% 50V 0805    |
| C236 | 0420 339 01011 | 3.3μF 20% 50V         |
| C238 | 0400 670 41081 | 100nF 20% 50V 0805    |
| C239 | 0424 465 01061 | 10μF 20% 50V          |
| C240 | 0400 430 45661 | 56pF 5% 50V 0603      |
| C241 | 0400 430 45661 | 56pF 5% 50V 0603      |
| C242 | 0400 430 45681 | 56PF 50V 5% 0805      |
| C244 | 0400 320 42281 | 2.2pF 5% 50V 0805     |
| C245 | 0400 320 42281 | 2.2pF 5% 50V 0805     |
| C257 | 0400 520 43381 | 330nF 20-80% 50V 0805 |
| C258 | 0421 401 61071 | 100μF 20% 16V         |
| C260 | 6180 040 01031 | 10nF 100V 10%         |
| C301 | 0424 165 01051 | 1μF 20% 50V           |
| C302 | 0424 465 01061 | 10μF 20% 50V          |
| C303 | 0400 400 42261 | 22nF 20% 50V 0603     |
| C304 | 0424 165 01051 | 1μF 20% 50V           |
| C305 | 0407 520 41061 | 1NF 50V 10% 0603      |
| C306 | 0400 520 43381 | 330nF 20-80% 50V 0805 |
| C307 | 0421 401 61071 | 100μF 20% 16V         |
| C308 | 0400 670 41081 | 100nF 20% 50V 0805    |
| C309 | 0400 670 41081 | 100nF 20% 50V 0805    |
| C310 | 0421 401 61071 | 100μF 20% 16V         |
| C311 | 0400 670 41081 | 100nF 20% 50V 0805    |
| C312 | 0424 165 01051 | 1μF 20% 50V           |
| C313 | 0424 165 01051 | 1μF 20% 50V           |
| C314 | 0424 165 01051 | 1μF 20% 50V           |
| C317 | 0424 165 01051 | 1μF 20% 50V           |
| C318 | 0400 400 42261 | 22nF 20% 50V 0603     |

|      |                |                    |
|------|----------------|--------------------|
| C319 | 0400 400 42261 | 22nF 20% 50V 0603  |
| C320 | 0400 400 42261 | 22nF 20% 50V 0603  |
| C321 | 0400 670 41081 | 100nF 20% 50V 0805 |
| C322 | 0400 670 41081 | 100nF 20% 50V 0805 |
| C323 | 0400 670 41081 | 100nF 20% 50V 0805 |
| C324 | 0400 670 41081 | 100nF 20% 50V 0805 |
| C325 | 0400 434 47261 | 4.7NF 50V 10% 0603 |
| C326 | 0424 165 01051 | 1μF 20% 50V        |
| C327 | 0421 401 61071 | 100μF 20% 16V      |
| C328 | 0400 670 41081 | 100nF 20% 50V 0805 |
| C330 | 0400 434 47261 | 4.7NF 50V 10% 0603 |
| C331 | 0424 465 02251 | 2.2μF 20% 50V      |
| C332 | 0421 401 61071 | 100μF 20% 16V      |
| C333 | 0400 670 41081 | 100nF 20% 50V 0805 |
| C335 | 0421 945 04751 | 4.7μF 20% 50V      |
| C336 | 0424 165 01051 | 1μF 20% 50V        |
| C342 | 0407 520 41081 | 1NF 50V 10% 0805   |
| C343 | 0407 320 41081 | 100pF 5% 50V 0805  |
| C344 | 0400 434 47261 | 4.7NF 50V 10% 0603 |
| C348 | 0407 300 14081 | 10NF 50V 10% 0805  |
| C349 | 0400 670 41081 | 100nF 20% 50V 0805 |
| C351 | 0424 142 54761 | 47μF 20% 25V       |
| C352 | 0400 310 42261 | 22pF 5% 50V 0603   |
| C353 | 0407 420 22261 | 22nF 5% 50V 0603   |
| C354 | 0424 142 54761 | 47μF 20% 25V       |
| C355 | 0424 465 01061 | 10μF 20% 50V       |
| C356 | 0300 106 00081 | 0R 1/8W 5% 0805    |
| C359 | 0407 520 41061 | 1NF 50V 10% 0603   |
| C361 | 0400 520 44861 | 470pF 5% 50V 0603  |
| C370 | 0400 402 53361 | 330pF 10% 50V 0603 |
| C371 | 0400 402 53361 | 330pF 10% 50V 0603 |
| C374 | 0407 300 22261 | 2.2NF 50V 10% 0603 |
| C375 | 0407 300 22261 | 2.2NF 50V 10% 0603 |
| C378 | 0424 465 01061 | 10μF 20% 50V       |
| C380 | 0400 310 42261 | 22pF 5% 50V 0603   |
| C401 | 0424 142 51071 | 100μF 20% 25V      |
| C402 | 0400 700 41031 | 10nF 50V 80-20%    |
| C404 | 6193 237 76821 | 6.8nF 2.5% 1.6kV   |
| C407 | 0400 671 41061 | 100NF 50V 10% 0603 |
| C409 | 0424 408 61061 | 10μF 20% 250V      |
| C411 | 0400 670 41081 | 100nF 20% 50V 0805 |
| C412 | 0424 163 51081 | 1000μF 20% 35V     |
| C413 | 0400 401 71021 | 1nF 10% 2kV        |
| C414 | 0424 148 61051 | 1μF 20% 250V       |
| C417 | 6200 130 81041 | 100nF 5% 63V       |
| C419 | 6210 040 71051 | 1μF 10% 160V       |
| C441 | 6200 040 72241 | 220nF 10% 63V      |
| C442 | 6200 040 14731 | 47nF 100V 10%      |
| C443 | 0424 165 02261 | 22μF 20% 50V       |
| C444 | 0424 102 52281 | 2200μF 20% 25V     |
| C445 | 0424 146 31071 | 100μF 20% 63V      |
| C462 | 0400 401 41011 | 100pF 10% 500V     |
| C501 | 0400 521 00281 | 220PF 50V 5% 0805  |
| C502 | 0400 521 00281 | 220PF 50V 5% 0805  |
| C503 | 0400 521 00281 | 220PF 50V 5% 0805  |
| C505 | 0424 468 62251 | 2.2μF 20% 250V     |
| C508 | 6200 031 34731 | 47nF 5% 630V       |
| C515 | 6200 040 22251 | 220nF 400V 5%      |
| C516 | 0400 401 71021 | 1nF 10% 2kV        |
| C601 | 0424 142 54761 | 47μF 20% 25V       |
| C602 | 0421 401 61071 | 100μF 20% 16V      |
| C603 | 0400 670 41081 | 100nF 20% 50V 0805 |
| C605 | 0407 320 82061 | 8.2PF 50V 10% 0603 |
| C606 | 0400 671 41061 | 100NF 50V 10% 0603 |
| C607 | 0407 320 41081 | 100pF 5% 50V 0805  |
| C608 | 0407 320 41081 | 100pF 5% 50V 0805  |
| C627 | 0407 300 14061 | 10NF 50V 10% 0603  |
| C775 | 0400 671 41061 | 100NF 50V 10% 0603 |
| C780 | 0424 145 04771 | 470μF 50V 20%      |
| CD28 | 0400 440 81881 | 470nF 16V 10% 0805 |
| CT03 | 0300 106 00081 | 0R 1/8W 5% 0805    |

—WW—

|      |                |                    |
|------|----------------|--------------------|
| R001 | 0300 116 22161 | 220R 1/10W5% 0603  |
| R002 | 0300 116 22261 | 2.2K 1/10W5% 0603  |
| R003 | 0300 116 22161 | 220R 1/10W5% 0603  |
| R004 | 0300 106 82161 | 820Ω 5% 1/10W 0603 |
| R005 | 0300 106 56161 | 560R 1/10W5% 0603  |
| R006 | 0300 106 15261 | 1.5K 1/10W5% 0603  |
| R007 | 0300 106 47261 | 4.7K 1/10W5% 0603  |
| R009 | 0300 116 22161 | 220R 1/10W5% 0603  |
| R012 | 0300 106 47261 | 4.7K 1/10W5% 0603  |
| R013 | 0300 106 47261 | 4.7K 1/10W5% 0603  |
| R015 | 0300 106 47261 | 4.7K 1/10W5% 0603  |
| R016 | 0300 106 10261 | 1K 1/10W5% 0603    |
| R017 | 0300 106 10261 | 1K 1/10W5% 0603    |
| R018 | 0300 106 10261 | 1K 1/10W5% 0603    |
| R019 | 0300 106 47161 | 470R 1/10W5% 0603  |

|      |                |                   |      |                |                   |      |                |                        |
|------|----------------|-------------------|------|----------------|-------------------|------|----------------|------------------------|
| R021 | 0300 106 27161 | 270R 1/10W5% 0603 | R320 | 0300 106 10261 | 1K 1/10W5% 0603   | R505 | 0300 106 10061 | 10R 1/10W 5% 0603      |
| R022 | 0300 106 56261 | 5.6K 1/10W5% 0603 | R322 | 0300 106 56261 | 5.6K 1/10W5% 0603 | R506 | 0300 106 51001 | 510R 1/8W5% 0805       |
| R023 | 0300 106 15361 | 15K 1/10W 5% 0603 | R323 | 0300 106 27361 | 27K 1/10W 5% 0603 | R507 | 0300 106 10061 | 10R 1/10W 5% 0603      |
| R025 | 0300 106 56261 | 5.6K 1/10W5% 0603 | R324 | 0300 106 10361 | 10K 1/10W5% 0603  | R508 | 0300 106 51001 | 510R 1/8W5% 0805       |
| R027 | 0300 106 47261 | 4.7K 1/10W5% 0603 | R325 | 0300 116 22361 | 22K 1/10W5% 0603  | R509 | 0300 106 10061 | 10R 1/10W 5% 0603      |
| R028 | 0300 106 00081 | 0R 1/8W 5% 0805   | R326 | 0300 106 56361 | 56K 1/10W5% 0603  | R510 | 0302 086 27311 | 27kΩ 5% 2W             |
| R029 | 0300 106 82061 | 82Ω 5% 0.1W 0603  | R327 | 0300 106 47161 | 470R 1/10W5% 0603 | R511 | 0302 086 27311 | 27kΩ 5% 2W             |
| R030 | 0300 106 10361 | 10K 1/10W5% 0603  | R328 | 0300 106 15361 | 15K 1/10W 5% 0603 | R512 | 0302 086 27311 | 27kΩ 5% 2W             |
| R031 | 0300 106 18261 | 1.8K 1/10W5% 0603 | R329 | 0300 106 82261 | 8.2K 1/10W5% 0603 | R513 | 0300 206 22131 | 220Ω 5% 1/4W           |
| R040 | 0300 106 15261 | 1.5K 1/10W5% 0603 | R330 | 0300 116 22261 | 2.2K 1/10W5% 0603 | R514 | 0300 206 22131 | 220Ω 5% 1/4W           |
| R043 | 0300 106 47261 | 4.7K 1/10W5% 0603 | R331 | 0300 116 22261 | 2.2K 1/10W5% 0603 | R515 | 0300 206 22131 | 220Ω 5% 1/4W           |
| R044 | 0300 106 10361 | 10K 1/10W5% 0603  | R332 | 0300 106 56161 | 560R 1/10W5% 0603 | R516 | 0300 106 56221 | 5.6kΩ 5% 1W fusible    |
| R045 | 0300 106 10361 | 10K 1/10W5% 0603  | R333 | 0300 106 10161 | 100R 1/10W5% 0603 | R517 | 0300 507 15221 | 1.5kΩ 1/2W             |
| R047 | 0300 106 47261 | 4.7K 1/10W5% 0603 | R334 | 0300 106 10161 | 100R 1/10W5% 0603 | R518 | 0300 507 15221 | 1.5kΩ 1/2W             |
| R048 | 0300 106 10161 | 100R 1/10W5% 0603 | R335 | 0300 106 10181 | 100R 1/8W 5% 0805 | R519 | 0300 507 15221 | 1.5kΩ 1/2W             |
| R049 | 0300 106 10161 | 100R 1/10W5% 0603 | R336 | 0300 106 33461 | 330K 1/10W5% 0603 | R520 | 0300 206 15431 | 150kΩ 5% 1/4W          |
| R051 | 0300 106 47161 | 470R 1/10W5% 0603 | R337 | 0300 106 33461 | 330K 1/10W5% 0603 | R521 | 0300 206 22511 | 2.2MΩ 5% 1/4W          |
| R052 | 0300 106 10361 | 10K 1/10W5% 0603  | R340 | 0300 106 10361 | 10K 1/10W5% 0603  | R522 | 0300 507 15221 | 1.5kΩ 1/2W             |
| R053 | 0300 116 47361 | 47K 1/10W 5% 0603 | R341 | 0300 106 10381 | 10K 1/8W 5% 0805  | R525 | 0300 106 00081 | 0R 1/8W 5% 0805        |
| R054 | 0300 106 47261 | 4.7K 1/10W5% 0603 | R342 | 0300 106 10381 | 10K 1/8W 5% 0805  | R527 | 0300 106 00081 | 0R 1/8W 5% 0805        |
| R055 | 0300 116 22161 | 220R 1/10W5% 0603 | R343 | 0300 106 10381 | 10K 1/8W 5% 0805  | R529 | 0300 106 00081 | 0R 1/8W 5% 0805        |
| R056 | 0300 106 47261 | 4.7K 1/10W5% 0603 | R344 | 0300 206 68361 | 68K 1/10W 5% 0603 | R530 | 0300 507 15221 | 1.5kΩ 1/2W             |
| R057 | 0300 106 10361 | 10K 1/10W5% 0603  | R345 | 0300 106 22281 | 2.2K 1/8W 5% 0805 | R533 | 0301 086 22921 | 2.2Ω 1W                |
| R058 | 0300 116 47361 | 47K 1/10W 5% 0603 | R346 | 0300 116 22361 | 22K 1/10W5% 0603  | R601 | 0300 106 47261 | 4.7K 1/10W5% 0603      |
| R059 | 0300 116 22161 | 220R 1/10W5% 0603 | R350 | 0300 106 10261 | 1K 1/10W5% 0603   | R602 | 0300 106 27361 | 27K 1/10W 5% 0603      |
| R061 | 0300 106 00081 | 0R 1/8W 5% 0805   | R351 | 0300 106 47161 | 470R 1/10W5% 0603 | R613 | 0300 106 10161 | 100R 1/10W5% 0603      |
| R076 | 0300 106 18361 | 18K 1/10W5% 0603  | R352 | 0300 106 10261 | 1K 1/10W5% 0603   | R614 | 0300 106 10161 | 100R 1/10W5% 0603      |
| R077 | 0300 106 56261 | 5.6K 1/10W5% 0603 | R354 | 0300 106 10261 | 1K 1/10W5% 0603   | V102 | 6113 800 11031 | TRIMPOT 10K 0.1W 30%</ |

|      |                |                      |
|------|----------------|----------------------|
| D011 | 0481 104 11111 | LS4148 SOD80         |
| D012 | 0481 104 11041 | BYW98-200            |
| D030 | 0482 102 00001 | SCHTKY BAT85 DO-34   |
| D101 | 0483 200 00611 | RECT.1N5062 SOD57    |
| D102 | 0483 200 00611 | RECT.1N5062 SOD57    |
| D103 | 0483 200 00611 | RECT.1N5062 SOD57    |
| D104 | 0483 200 00611 | RECT.1N5062 SOD57    |
| D106 | 0480 000 00021 | BYV95C               |
| D107 | 0481 104 11111 | LS4148 SOD80         |
| D108 | 0480 000 00331 | RECT.BYW95C SOD-64   |
| D109 | 0485 407 33021 | ZNR.33V ZTK33B DO-35 |
| D110 | 0480 000 00341 | RECT. BYT54J         |
| D113 | 0481 104 11111 | LS4148 SOD80         |
| D114 | 0481 132 29071 | ZNR.5V1 BZV55C       |
| D116 | 0481 104 11111 | LS4148 SOD80         |
| D120 | 0480 000 00331 | RECT.BYW95C SOD-64   |
| D131 | 0481 000 00071 | BZX79-B/C18          |
| D132 | 0481 104 11111 | LS4148 SOD80         |
| D302 | 0481 104 11111 | LS4148 SOD80         |
| D303 | 0481 104 11111 | LS4148 SOD80         |
| D304 | 0481 104 11111 | LS4148 SOD80         |
| D305 | 0481 104 11111 | LS4148 SOD80         |
| D307 | 0483 221 07001 | BA282&BA482          |
| D308 | 0483 221 07001 | BA282&BA482          |
| D310 | 0300 106 00081 | OR 1/8W 5% 0805      |
| D311 | 0485 449 26101 | 7V5 ZPD              |
| D320 | 0481 002 55101 | ZNR.5V1 ZPD DO-35    |
| D321 | 0481 132 29071 | ZNR.5V1 BZV55C       |
| D322 | 0481 132 29071 | ZNR.5V1 BZV55C       |
| D323 | 0481 132 29071 | ZNR.5V1 BZV55C       |
| D401 | 0480 000 00341 | RECT. BYT54J         |
| D402 | 0481 104 11111 | LS4148 SOD80         |
| D405 | 0480 000 00341 | RECT. BYT54J         |
| D406 | 0480 000 00341 | RECT. BYT54J         |
| D407 | 0480 000 00341 | RECT. BYT54J         |
| D441 | 0483 214 23201 | 1N4007               |
| D501 | 0481 132 29041 | GP.BAV21 DO-35       |
| D502 | 0481 132 29041 | GP.BAV21 DO-35       |
| D503 | 0481 132 29041 | GP.BAV21 DO-35       |
| D504 | 0482 102 00001 | SCHTKY BAT85 DO-34   |
| D505 | 0480 000 00041 | ZNR.8V2 BZX55C DO-35 |
| D506 | 0483 214 23201 | 1N4007               |
| D507 | 0481 104 11111 | LS4148 SOD80         |
| D508 | 0482 104 11001 | GP.1N4148 DO-35      |
| D601 | 0481 104 11111 | LS4148 SOD80         |
| DV24 | 0481 132 29071 | ZNR.5V1 BZV55C       |



|      |                |                   |
|------|----------------|-------------------|
| IC02 | 0450 000 02401 | M24C16-WBN6       |
| Q001 | 0460 015 37001 | BD537             |
| Q102 | 0468 480 00001 | BC848B            |
| Q442 | 0462 470 18001 | TRS.BC337 TO-92   |
| Q443 | 0469 862 94161 | 2SA720 / BC327    |
| GND1 | 0020 132 02700 | CABLE 1P 50CM     |
| I001 | 0450 000 91171 | ST92T195D7B1      |
| I101 | 0450 000 03631 | ICE1QS01          |
| I102 | 0452 381 03051 | LM317             |
| I104 | 0450 383 62811 | TCDT1101          |
| I201 | 0450 000 00981 | TDA7057AQ         |
| I202 | 0450 000 01511 | IC MSP3415G       |
| I301 | 0450 000 02291 | STV2248E          |
| I401 | 0450 000 01971 | TDA1771           |
| J004 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J006 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J015 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J019 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J023 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J024 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J028 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J045 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J059 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J060 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J061 | 0407 320 41061 | 100pF 50V 5% 0603 |
| J069 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J077 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J083 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J091 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J095 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J114 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J115 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J121 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J122 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J133 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J134 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J164 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J167 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J168 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J171 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J173 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J175 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J176 | 0300 106 00081 | OR 1/8W 5% 0805   |
| J188 | 0300 106 00081 | OR 1/8W 5% 0805   |

|      |                |                 |
|------|----------------|-----------------|
| J203 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J218 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J219 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J223 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J226 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J246 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J247 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J249 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J254 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J256 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J257 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J259 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J260 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J261 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J262 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J263 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J264 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J265 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J271 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J272 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J274 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J275 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J281 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J291 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J292 | 0300 106 00081 | OR 1/8W 5% 0805 |
| J995 | 0300 106 00081 | OR 1/8W 5% 0805 |
| K100 | 0020 205 11160 | Cable 30mm Bk   |

### Side AV [A7]

#### Various

|      |                |                   |
|------|----------------|-------------------|
| K1** | 0141 001 00141 | TERMINAL GND 1P   |
| K901 | 0750 302 11091 | Connector 5p      |
| K903 | 0750 128 80491 | SOCKET CHINCH     |
| K905 | 0750 302 11081 | CONN.4P VRT EH    |
| K906 | 0750 164 20221 | Socket headphone  |
| K907 | 0750 302 11501 | CONN.5P VRT BLACK |



|      |                |              |
|------|----------------|--------------|
| C902 | 0400 320 41001 | 10pF 5% 50V  |
| C903 | 0402 370 44711 | 220pF 50V 5% |
| C904 | 0402 370 44711 | 220pF 50V 5% |
| C906 | 0402 370 44711 | 220pF 50V 5% |
| C908 | 0424 142 54761 | 47μF 20% 25V |
| C909 | 0424 142 54761 | 47μF 20% 25V |
| C910 | 0400 300 14031 | 10nF 50V 10% |
| C911 | 0400 300 14031 | 10nF 50V 10% |
| C912 | 0402 370 44711 | 220pF 50V 5% |
| C913 | 0402 370 44711 | 220pF 50V 5% |



|      |                |               |
|------|----------------|---------------|
| R902 | 0300 206 68031 | 68R 1/4W 5%   |
| R903 | 0300 206 68031 | 68R 1/4W 5%   |
| R916 | 0300 206 47331 | 47kΩ 5% 0.25W |
| R917 | 0300 206 47331 | 47kΩ 5% 0.25W |



|      |                |               |
|------|----------------|---------------|
| L901 | 6087 800 02411 | bead Ferrite  |
| L902 | 0301 406 12311 | 12K 1/6W 5%   |
| L903 | 0301 406 12311 | 12K 1/6W 5%   |
| L904 | 6080 800 00331 | 33μH 5% 0.16A |
| L905 | 6080 800 00331 | 33μH 5% 0.16A |

# 11. Revision List

## 11.1 Manual xxxx xxx xxxxx.0

- First release.