

Technical Service Data

Model no.: 20PT6245/37

First Publish: 04-21-2005

Rev. Date: 05-18-2005

Print Date: 1/20/2006

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

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REFER TO SAFETY GUIDELINES

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

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

Philips Consumer Electronics

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Manual 7646

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Safety Notes

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GENERAL SAFETY NOTES



IMPORTANT SAFETY NOTICE

Proper service and repair is important to the safe, reliable operation of all Philips Consumer Electronics Company** equipment. The service procedures recommended by Philips and described in this service manual are effective methods of performing service operations. Some of these service operations require the use of tools specially designed for the purpose. The special tools should be used when and as recommended.

It is important to note that this manual contains various **CAUTIONS** and **NOTICES** which should be carefully read in order to minimize the risk of personal injury to service personnel. The possibility exists that improper service methods may damage the equipment. It also is important to understand that these **CAUTIONS** and **NOTICES ARE NOT EXHAUSTIVE**. Philips could not possibly know, evaluate and advise the service trade of all conceivable ways in which service might be done or of the possible hazardous consequences of each way. Consequently, Philips has not undertaken any such broad evaluation. Accordingly, a servicer who uses a service procedure or tool which is not recommended by Philips must first satisfy himself thoroughly that neither his safety nor the safe operation of the equipment will be jeopardized by the service method selected.

** Hereafter throughout this manual, Philips Consumer Electronics Company will be referred to as Philips.

WARNING

Critical components having special safety characteristics are identified with a  or "S" by the Ref. No. in the parts list and enclosed within a broken line* (where several critical components are grouped in one area) along with the safety symbol  on the schematics or exploded views. Use of substitute replacement parts which do not have the same specified safety characteristics may create shock, fire, or other hazards. Under no circumstances should the original design be modified or altered without written permission from Philips. Philips assumes no liability, express or implied, arising out of any unauthorized modification of design. Servicer assumes all liability.

- Broken Line _____

SAFETY CHECKS

After the original service problem has been corrected, a complete safety check should be made. Be sure to check over the entire set, not just the areas where you have worked. Some previous servicer may have left an unsafe condition, which could be unknowingly passed on to Your customer. Be sure to check all of the following:

FIRE AND SHOCK HAZARD

IMPLOSION


X-RADIATION

LEAKAGE CURRENT COLD CHECK

LEAKAGE CURRENT HOT CHECK

PICTURE TUBE REPLACEMENT

FIRE AND SHOCK HAZARD

1. Be sure all components are positioned in such a way as to avoid the possibility of adjacent component shorts. This is especially important on those chassis which are transported to and from the service shop.
2. Never release a repaired unit unless all protective devices such as insulators, barriers, covers, strain reliefs, and other hardware have been installed in accordance with the original design.
3. Soldering and wiring must be inspected to locate possible cold solder joints, solder splashes, sharp solder points, frayed leads, pinched leads, or damaged insulation (including the ac cord). Be certain to remove loose solder balls and all other loose foreign particles.
4. Check across-the-line components and other components for physical evidence of damage or deterioration and replace if necessary. Follow original layout, lead length, and dress.
5. No lead or component should touch a receiving tube or a resistor rated at 1 watt or more. Lead tension around protruding metal surfaces or edges must be avoided.
6. Critical components having special safety characteristics are identified with an '**S**' by the Ref. No. in the parts list and enclosed within a broken line* (where several critical components are grouped in one area) along with the safety symbol  on the schematic diagrams and /or exploded views.
7. When servicing any unit, always use a separate isolation transformer for the chassis. Failure to use a separate isolation transformer may expose you to possible shock hazard, and may cause damage to servicing instruments.
8. Many electronic products use a polarized ac line cord (one wide pin on the plug). Defeating this safety feature may create a potential hazard to the servicer and the user. Extension cords which do not incorporate the polarizing feature should never be used.
9. After reassembly of the unit, always perform an ac leakage test or resistance test from the line cord to all exposed metal parts of the cabinet. Also, check all metal control shafts (with knobs removed), antenna terminals, handles, screws, etc., to be sure the unit may be safely operated without danger of electrical shock.

* **Broken line** _____

IMPLOSION

1. All picture tubes used in current model receivers are equipped with an integral implosion system. Care should always be used, and safety glasses worn, whenever handling any picture tube. Avoid scratching or otherwise damaging the picture tube during installation.
2. Use only replacement tubes specified by the manufacturer.

X-RADIATION

1. Be sure procedures and instructions to all your service personnel cover the subject of X-radiation. Potential sources of X-rays in TV receivers are the picture tube and the high voltage circuits. The basic precaution which must be exercised is to keep the high voltage at the factory recommended level.
2. To avoid possible exposure to X-radiation and electrical shock, only the manufacturer's specified anode connectors must be used.
3. It is essential that the service technician has an accurate HV meter available at all times. The calibration of this meter should be checked periodically against a reference standard.
4. When the HV circuitry is operating properly there is no possibility of an X-radiation problem. High voltage should always be kept at the manufacturer's rated value - no higher - for optimum performance. Every time a color set is serviced, the brightness should be run up and down while monitoring the HV with a meter to be certain that the HV is regulated correctly and does not exceed the specified value. We suggest that you and your technicians review test procedures so that HV and HV regulation are always checked as a standard servicing procedure, and the reason for this prudent routine is clearly understood by everyone. It is important to use an accurate and reliable HV meter. It is recommended that the HV reading be recorded on each customer's invoice, which will demonstrate a proper concern for the customer's safety.
5. When troubleshooting and making test measurements in a receiver with a problem of excessive high voltage, reduce the line voltage by means of a Variac to bring the HV into acceptable limits while troubleshooting. Do not operate the chassis longer than necessary to locate the cause of the excessive HV.
6. New picture tubes are specifically designed to withstand higher operating voltages without creating undesirable X-radiation. It is strongly recommended that any shop test fixture which is to be used with the new higher voltage chassis be equipped with one of the new type tubes designed for this service. Addition of a permanently connected HV meter to the shop test fixture is advisable. The CRT types used in these new sets should never be replaced with any other types, as this may result in excessive X-radiation.
7. It is essential to use the specified picture tube to avoid a possible X-radiation problem.
8. Most TV receivers contain some type of emergency "Hold Down" circuit to prevent HV from rising to excessive levels in the presence of a failure mode. These various circuits should be understood by all technicians servicing them, especially since many hold down circuits are inoperative as long as the receiver performs normally.

LEAKAGE CURRENT COLD CHECK

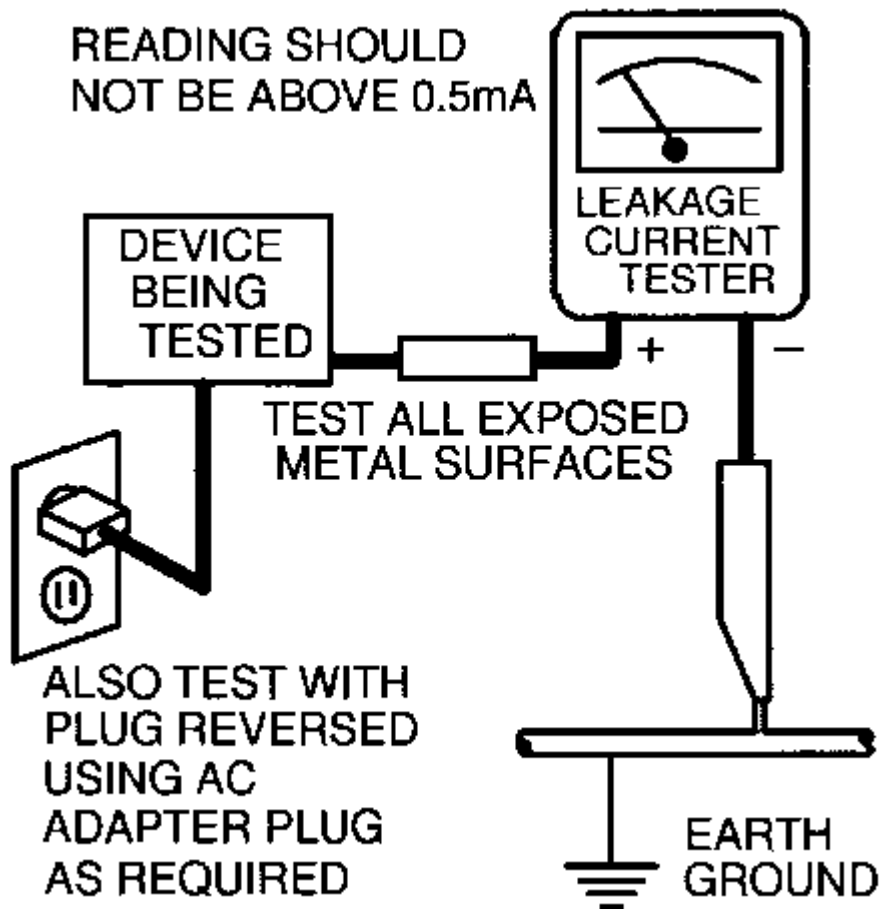
1. Unplug the ac line cord and connect a jumper between the two prongs of the plug.
2. Turn on the power switch.
3. Measure the resistance value between the jumpered ac plug and all exposed cabinet parts of the receiver, such as screw heads, antennas, and control shafts. When the exposed metallic part has a return path to the chassis, the reading should be between 1 megohm and 5.2 megohms. When the exposed metal does not have a return path to the chassis, the reading must be infinity. Remove the jumper from the ac line cord.

LEAKAGE CURRENT HOT CHECK

1. Do not use an isolation transformer for this test. Plug the completely reassembled receiver directly into the ac outlet.
2. Connect a **1.5k, 10W resistor** paralleled by a **0.15uF. capacitor** between each exposed metallic cabinet part and a **good earth ground** such as a water pipe, as shown below.
3. Use an ac voltmeter with at least 5000 ohms/volt sensitivity to measure the potential across the resistor.
4. **The potential at any point should not exceed 0.75 volts.** A leakage current tester may be used to make this test; leakage current must not exceed 0.5milliamp. If a measurement is outside of the specified limits, there is a possibility of shock hazard. The receiver should be repaired and rechecked before returning it to the customer.
5. **Repeat the above procedure with the ac plug reversed.** (Note: An ac adapter is necessary when a polarized plug is used. Do not defeat the polarizing feature of the plug.)

OR

With the instrument completely reassembled, plug the AC line cord directly into a 120V AC outlet. **(Do not use an isolation transformer during this test.)** Use a leakage current tester or a metering system that complies with American National Standards Institute (ANSI) C101.1 Leakage Current for Appliances and Underwriters Laboratories (UL) 1410, (50.7). **With the instrument AC switch first in the on position and then in the off position, measure from a known earth ground (metal water pipe, conduit, etc.) to all exposed metal parts of the instrument (antennas, handle brackets, metal cabinet, screw heads, metallic overlays, control shafts, etc.), especially any exposed metal parts that offer an electrical return path to the chassis. Any current measured must not exceed 0.5 milliamp.** Reverse the instrument power cord plug in the outlet and repeat the test. See graphic below.



PICTURE TUBE REPLACEMENT

The primary source of X-radiation in this television receiver is the picture tube. The picture tube utilized in this chassis is specially constructed to limit X-radiation emissions. For continued X-radiation protection, the replacement tube must be the same type as the original, including suffix letter, or a Philips approved type.

PARTS REPLACEMENT

Many electrical and mechanical parts in Philips television sets have special safety related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. The use of a substitute part which does not have the same safety characteristics as the Philips recommended replacement part shown in this service manual may create shock, fire, or other hazards

TV SAFETY NOTES

SAFETY CHECKS

IMPLOSION

X-RADIATION
PICTURE TUBE REPLACEMENT
PARTS REPLACEMENT

WARNING

Before removing the CRT anode cap, turn the unit **OFF** and short the **HIGH VOLTAGE** to the **CRT DAG** ground.

SERVICE NOTE: The **CRT DAG** is not at chassis ground.

TV-VCR COMBI SAFETY NOTES

IMPORTANT SAFETY PRECAUTIONS

Prior to shipment from the factory, our products are strictly inspected for recognized product safety and electrical codes of the countries in which they are to be sold. However, in order to maintain such compliance, it is equally important to implement the following precautions when a set is being serviced.

SAFETY PRECAUTIONS FOR TV CIRCUITS

1. Before returning an instrument to the customer, always make a safety check of the entire instrument, including, but not limited to, the following items:
 - a. Be sure that no built-in protective devices are defective or have been defeated during servicing. (1) Protective shields are provided on this chassis to protect both the technician and the customer. Correctly replace all missing protective shields, including any removed for servicing convenience. (2) When reinstalling the chassis and/or other assembly in the cabinet, be sure to put back in place all protective devices, including but not limited to, nonmetallic control knobs, insulating fishpapers, adjustment and compartment covers/shields, and isolation resistor/capacitor networks. Do not operate this instrument or permit it to be operated without all protective devices correctly installed and functioning. Servicers who defeat safety features or fail to perform safety checks may be liable for any resulting damage.
 - b. Be sure that there are no cabinet openings through which an adult or child might be able to insert their fingers and contact a hazardous voltage. Such openings include, but are not limited to, (1) spacing between the picture tube and the cabinet mask, (2) excessively wide cabinet ventilation slots, and (3) an improperly fitted and/or incorrectly secured cabinet back cover.
 - c. Do a LEAKAGE CURRENT CHECK

ANY MEASUREMENTS NOT WITHIN THE LIMITS SPECIFIED HEREIN INDICATE A POTENTIAL SHOCK HAZARD THAT MUST BE ELIMINATED BEFORE RETURNING THE INSTRUMENT TO THE CUSTOMER OR BEFORE CONNECTING THE ANTENNA OR ACCESSORIES.

d. **X-Radiation and High Voltage Limits** - Because the picture tube is the primary potential source of X-radiation in solid-state TV receivers, it is specially constructed to prohibit X-radiation emissions. For continued X-radiation protection, the replacement picture tube must be the same type as the original. Also, because the picture tube shields and mounting hardware perform an X-radiation protection function, they must be correctly in place. High voltage must be measured each time servicing is performed that involves B+, horizontal deflection or high voltage. Correct operation of the X-radiation protection circuits also must be reconfirmed each time they are serviced. (X-radiation protection circuits also may be called "horizontal disable" or "hold down.") Read and apply the high voltage limits and, if the chassis is so equipped, the X-radiation protection circuit specifications given on instrument labels and in the **Product Safety & X-Radiation** Warning note on the service data chassis schematic. High voltage is maintained within specified limits by close tolerance safety-related components/adjustments in the high-voltage circuit. If high voltage exceeds specified limits, check each component specified on the chassis schematic and take corrective action.

2. Read and comply with all caution and safety-related notes on or inside the receiver cabinet, on the receiver chassis, or on the picture tube.

3. **Design Alteration Warning** - Do not alter or add to the mechanical or electrical design of this TV receiver. Design alterations and additions, including, but not limited to circuit modifications and the addition of items such as auxiliary audio and/or video output connections, might alter the safety characteristics of this receiver and create a hazard to the user. Any design alterations or additions will void the manufacturer's warranty and may make you, the servicer, responsible for personal injury or property damage resulting therefrom.

4. **Picture Tube Implosion Protection Warning** - The picture tube in this receiver employs integral implosion protection. For continued implosion protection, replace the picture tube only with one of the same type number. Do not remove, install, or otherwise handle the picture tube in any manner without first putting on shatterproof goggles equipped with side shields. People not so equipped must be kept safely away while picture tubes are handled. Keep the picture tube away from your body. Do not handle the picture tube by its neck. Some "in-line" picture tubes are equipped with a permanently attached deflection yoke; because of potential hazard, do not try to remove such "permanently attached" yokes from the picture tube.

5. Hot Chassis Warning

a. Some TV receiver chassis are electrically connected directly to one conductor of the ac power cord and may be serviced safely without an isolation transformer only if the ac power plug is inserted so that the chassis is connected to the ground side of the ac power source. To confirm that the ac power plug is inserted correctly, with an ac voltmeter, measure between the chassis and a known earth ground. If a voltage reading in excess of 1.0V is obtained, remove and reinsert the ac power plug in the opposite polarity and again measure the voltage potential between the chassis and a known earth ground.


b. Some TV receiver chassis normally have 85Vac (RMS) between chassis and earth ground regardless of the ac plug polarity. This chassis can be safety-serviced only with an isolation transformer inserted in the power line between the receiver and the ac power source, for both personnel and test equipment protection. Some TV receiver chassis have a secondary ground system in addition to the main chassis ground. This secondary ground system is not isolated from the ac power line. The two ground systems are electrically separated by insulation material that must not be defeated or altered.

6. Observe original lead dress. Take extra care to assure correct lead dress in the following areas: **a.** near sharp edges, **b.** near thermally hot parts - be sure that leads and components do not touch

thermally hot parts, **c.** the ac supply, **d.** high voltage, and **e.** antenna wiring. Always inspect in all areas for pinched, out of place, or frayed wiring. Check ac power cord for damage.

7. Components, parts, and/or wiring that appear to have overheated or are otherwise damaged should be replaced with components, parts, or wiring that meet original specifications. Additionally, determine the cause of overheating and/or damage and, if necessary, take corrective action to remove any potential safety hazard.

PRECAUTIONS DURING SERVICE

A. Parts identified by the  symbol are critical for safety. Replace only with part number specified.

B. In addition to safety, other parts and assemblies are specified for conformance with regulations applying to spurious radiation. These must also be replaced only with specified replacements.

Examples: RF converters, RF cables, noise blocking capacitors, and noise blocking filters, etc.

C. Use specified internal wiring. Note especially:

- 1) Wires covered with PVC tubing
- 2) Double insulated wires
- 3) High voltage leads

D. Use specified insulating materials for hazardous live parts. Note especially:

- 1) Insulation Tape
- 2) PVC tubing
- 3) Spacers
- 4) Insulators for transistors

E. When replacing ac primary side components (transformers, power cord, etc.), wrap ends of wires securely about the terminals before soldering.

F. Observe that the wires do not contact heat producing parts (heatsinks, oxide metal film resistors, fusible resistors, etc.)

G. Check that replaced wires do not contact sharp edged or pointed parts.

H. When a power cord has been replaced, check that 10-15 kg of force in any direction will not loosen it.

I. Also check areas surrounding repaired locations.

J. Use care that foreign objects (screws, solder droplets, etc.) do not remain inside the set.

K. Crimp type wire connector

When replacing the power transformer in sets where the connections between the power cord and power transformer primary lead wires are performed using crimp type connectors, in order to prevent shock hazards, perform carefully and precisely the following steps.

Replacement procedure

- 1) Remove the old connector by cutting the wires at a point close to the connector. **Important:** Do not re-use a connector (discard it).

- 2) Strip about 15 mm of the insulation from the ends of the wires. If the wires are stranded, twist the strands to avoid frayed conductors.
- 3) Align the lengths of the wires to be connected. Insert the wires fully into the connector.
- 4) Use the crimping tool to crimp the metal sleeve at the center position. Be sure to crimp fully to the complete closure of the tool.

L. When connecting or disconnecting the VCR connectors, first, disconnect the ac plug from the ac supply socket.

SAFETY CHECK AFTER SERVICING

Examine the area surrounding the repaired location for damage or deterioration. Observe that screws, parts and wires have been returned to original positions. Afterwards, perform the following tests and confirm the specified values in order to verify compliance with safety standards.

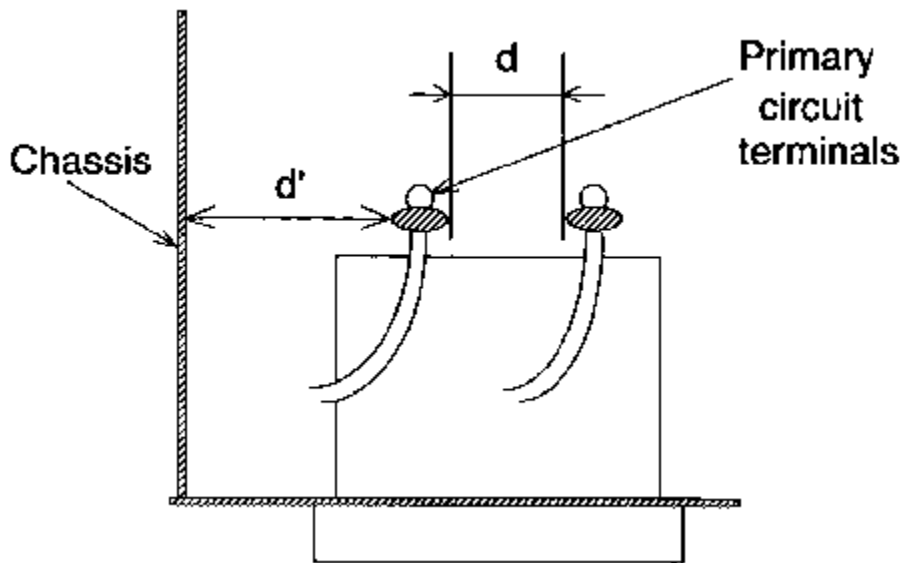
1. Clearance Distance

When replacing primary circuit components, confirm specified clearance distance (d) and (d') between soldered terminals, and between terminals and surrounding metallic parts. (See graphic below)

Table 1 : Ratings for selected area

AC Line Voltage	Region	Clearance Distance (d) (d')
110 to 130 V	USA or CANADA	> 3.2 mm (0.126 inches)

Note: This table is unofficial and for reference only. Be sure to confirm the precise values.



2. LEAKAGE CURRENT CHECKS

VCR SAFETY NOTES

FIRE & SHOCK HAZARD (VCR)

1. Be sure that all components are positioned in such a way to avoid possibility of shorts to adjacent components. This is especially important on those chassis which are transported to and from the repair shop.
2. Always replace all protective devices such as insulators and barriers after working on a set.
3. Check for damaged insulation on wires including the ac cord.
4. Check across-the-line components for damage and replace if necessary.
5. After re-assembly of the unit, always perform an ac leakage test on the exposed metallic parts of the cabinet such as the knobs, antenna terminals, etc. to be sure the set is safe to operate without danger of electrical shock. **Do not use a line isolation transformer during this test.** Use an ac voltmeter having 5000 ohms per volt or more sensitivity in the following manner: Connect a 1500 ohm 10 watt resistor, paralleled by 0.15 MFD ac type capacitor, between a known good earth ground (water pipe, conduit, etc.) and the exposed metallic parts, one at a time. Measure the ac voltage across the combination 1500 ohm resistor and 0.15 MFD capacitor. Reverse the ac plug on the set and repeat ac voltage measurements again for each exposed metallic part. Voltage measured must not exceed 0.6 volts R.M.S. This corresponds to 0.4 milliamp ac. Any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.

GENERAL

Power Supply-This receiver is designed for operation on 120 Volts, 60Hz alternating current (ac) only. Never connect to a supply having a different frequency or voltage.

IMPORTANT NOTICE

This device employs many circuits, components, and mechanical parts designed for protection against fire, shock and RF interference. For continued safety any servicing should be performed by qualified personnel and exact replacement parts should be used. Under no circumstances should the original design be altered.

PRODUCT SAFETY GUIDELINES FOR ALL PRODUCTS

CAUTION: Do not modify any circuit. Service work should be performed only after you are thoroughly familiar with all of the following safety checks. Risk of potential hazards and injury to the user increases if safety checks are not adhered to.

USE A SEPARATE ISOLATION TRANSFORMER FOR THIS UNIT WHEN SERVICING.

PREVENTION OF ELECTROSTATIC DISCHARGE (ESD)

Some semiconductor solid state devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by electrostatic discharge (ESD).

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any ESD on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging ESD wrist strap, which should be removed for potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static solder removal device. Some solder removal devices not classified as "antistatic (ESD protected)" can generate an electrical charge sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.

CAUTION : Be sure no power is applied to the chassis or circuit and observe all other safety precautions.

8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your feet from a carpeted floor can generate static electricity (ESD) sufficient to damage an ES device.)

NOTE to CATV system Installer:

This reminder is provided to call the CATV system installer's attention to article 820-22 of the NEC that provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical.

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Mechanical Assembly

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

4. Mechanical Instructions

Index:

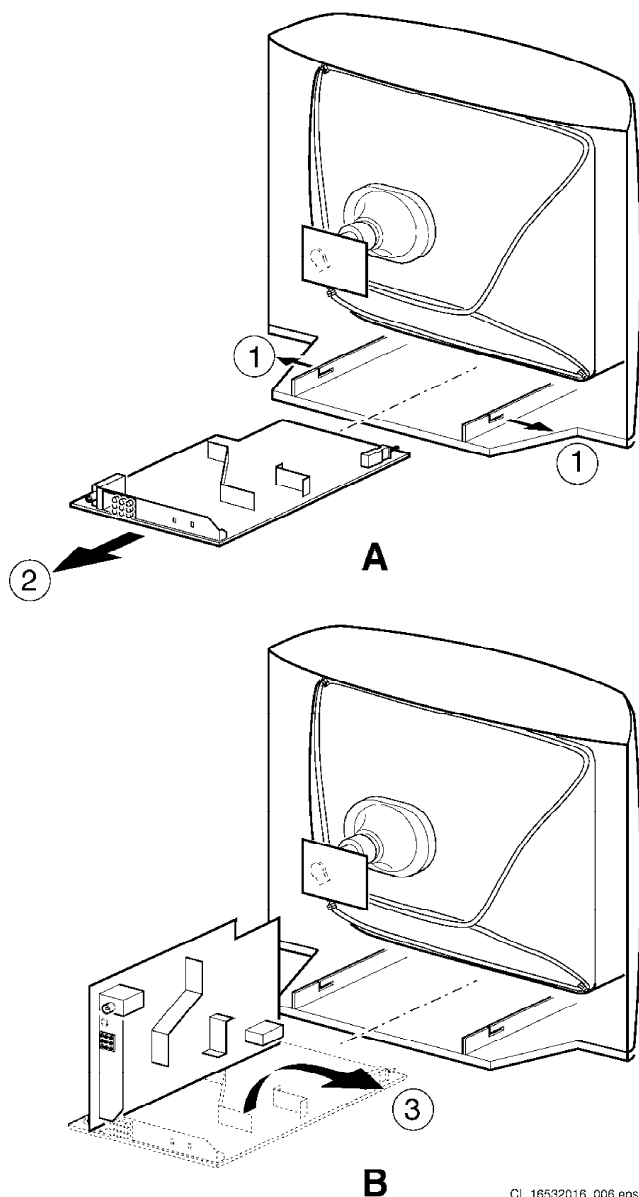
1. Rear cover removal.
2. Service Position Main panel.
3. Rear cover mounting.

4.1 Rear Cover Removal

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

4.2 Service Position Main Panel

1. Disconnect the strain relief of the AC power cord.
2. Remove the main panel, by pushing the two center clips outward [1]. At the same time pull the panel away from the CRT [2].
3. If necessary disconnect the degaussing coil by removing the cable from (red) connector 0212.
4. Move the panel somewhat to the left and flip it 90 degrees [3], with the components towards the CRT.



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220501

Figure 4-1 Service Position

4.3 Rear Cover Mounting

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

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

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Troubleshooting

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Test Points

This chassis is equipped with test points in the service printing. In the schematics test points are identified with a rectangle box around Fxxx or lxxx. On the PCB, test points are specifically mentioned in the service manual as “half moons” with a dot in the center.

Table 5-1 Test Point Overview

TEST POINT	CIRCUIT	DIAGRAM
Fxxx, lxxx	POWER SUPPLY	A1
Fxxx, lxxx	Deflection	A2
Fxxx, lxxx	TUNER & IF	A3
Fxxx, lxxx	VIDEO PROCESSING	A4
Fxxx, lxxx	AUDIO PROCESSING	A5
Fxxx, lxxx	AUDIO AMPLIFIER + MONO SOUND PROCESSING	A6
Fxxx, lxxx	FRONT IO + FRONT CONTROL + HEAD- PHONE	A7
Fxxx, lxxx	DVD POWER SUPPLY	A9
Fxxx, lxxx	CRT PANEL	B1

Perform measurements under the following conditions:

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

Service Modes

Service Default Alignment Mode (SDAM) offers several features for the service technician.

There is also the option of using ComPair, a hardware interface between a computer (see requirements) and the TV chassis. It offers the ability of structured trouble shooting, error code reading and software version readout for all chassis.

Requirements: To run ComPair on a computer (laptop or desktop) requires, as a minimum, a 486 processor, Windows 3.1 and a CD-ROM drive. A Pentium Processor and Windows 95/98 are however preferred (see also paragraph 5.4).

Table 5-2 SW Cluster

SW Cluster	Software name	UOC type	UOC Diversity	Special Features
L3SUS1	L03US1 x.y	TDA9377	55K ROM Size	Stereo
L3SUS2	L03US2 x.y	TDA9377	55K ROM Size	Magnavox Stereo

Abbreviations in Software name: U = Natfa, S = Stereo.

Service Default Alignment Mode (SDAM)

Purpose

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

Specifications

- Tuning frequency: 61.25 MHz (channel 3) for NTSC-sets (Natfa).
- Color system: NTSC-M.
- All picture settings at 50 % (brightness, color contrast, hue).
- Bass, treble and balance at 50 %; volume at 25 %.
- All service-unfriendly modes (if present) are disabled, like:
 - (Sleep) timer,
 - Child/parental lock,
 - Blue mute,
 - Hotel/hospitality mode
- Auto switch-off (when no "DENT" video signal is received for 15 minutes),
- Skip / blank of non-favorite presets / channels,
- Auto store of personal presets,
- Auto user menu time-out.

- Operation hours counter.
- Software version.
- Option settings.
- Error buffer reading and erasing.
- Software alignments.

How to enter SDAM

Use one of the following methods:

- Use a standard customer RC-transmitter and key in the code 062596 directly followed by the "W" (menu) button or Short jumper wires 9257 and pin 4 of 7200 on the mono carrier (see Fig. 8-1) and apply AC power. Then press the power button (remove the short after start-up).
- Caution: Entering SDAM by shorten wires 9257 and pin 4 of 7200 will override the +8V-protection. Do this only for a short period. When doing this, the service-technician must know exactly what he is doing, as it could lead to damaging the set.
- Or via ComPair.

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

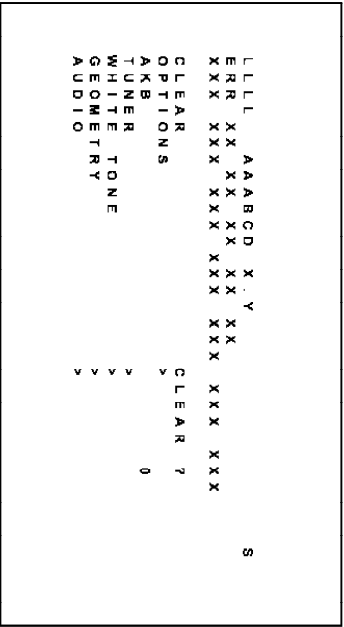


Figure 5-1 SDAM Menu

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

- **AAABCD-X.Y.** This is the software identification of the main micro controller:

- A = the project name (L03).
- B = the region: E = Europe, A = Asia Pacific, U = NAFTA, L = LATAM.
- C = the feature of software diversity: N = stereo non-DBX, S = stereo DBX, M = mono, D = DVD
- D = the language cluster number:
- X = the main software version number.
- Y = the sub software version number.

- **S.** Indication of the actual mode. S = SDAM = Service Default Alignment mode.
- **Error buffers.** Five errors possible.
- **Option bytes.** Seven codes possible.
- **Clear.** Erase the contents of the error buffer. Select the CLEAR menu item and press the CURSOR RIGHT key. The content of the error buffer is cleared.
- **Options.** To set the Option Bytes. See chapter 8.3.1 for a detailed description.
- **AKB.** Disable (0) or enable (1) the "black current loop" (AKB = Auto Kine Bias).
- **Tuner.** To align the Tuner. See chapter 8.3.2 for a detailed description.
- **White Tone.** To align the White Tone. See chapter 8.3.3 for a detailed description.
- **Geometry.** To align the set geometry. See chapter 8.3.4 for a detailed description.
- **Audio.** Use default value (Stereo set only), align when necessary. See chapter 8.3.x for a detailed description.

<<<<<<<<

How to navigate

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

How to store settings

To store settings, leave the SDAM mode with the Standby button on the remote.

How to exit

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

Problem Solving Tips

Picture Problems

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

No colors / noise in picture

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

Colors not correct / unstable picture

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

Picture too dark or too bright

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

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

The new "Personal" preference value is automatically stored.

White line around picture elements and text

Decrease the SHARPNESS value when:

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

The new "Personal" preference value is automatically stored.

Snowy picture

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

Snowy picture and/or unstable picture

- A scrambled or decoded signal is received.

Black and white picture

Increase the COLOR value when:

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

The new "Personal" preference value is automatically stored.

Menu text not sharp enough

Decrease the CONTRAST value when:

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

The new "Personal" preference value is automatically stored.

Sound Problems

No sound or sound too loud (after channel change / switching on)

Increase / decrease the VOLUME level.

Press the Smart Sound button repeatedly to access 4 different types of sound settings and choose your desired setting.

ComPair

Introduction

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

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

Specifications

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

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

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

- **Automatic** (by communication with the television): ComPair can automatically read out the contents of the entire error buffer. Diagnosis is done on I2C level. ComPair can access the I2C bus of the television. ComPair can send and receive I2C commands to the micro controller of the television. In this way, it is possible for ComPair to communicate (read and write) to devices on the I2C busses of the TV-set.
 - **Manually** (by asking questions to you). Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extends. When this is not the case, ComPair will guide you through the faultfinding tree by asking you questions (e.g. *Does the screen give a picture? Click on the correct answer: YES / NO*) and showing you examples (e.g. *Measure test-point 17 and click on the correct oscillogram you see on the oscilloscope*). You can answer by clicking on a link (e.g. text or a waveform picture) that will bring you to the next step in the faultfinding process.
- By a combination of automatic diagnostics and an interactive question / answer procedure, ComPair will enable you to find most problems in a fast and effective way.

Beside fault finding, ComPair provides some **additional**

features like:

- Up- or downloading of pre-sets.
- Managing of pre-set lists.
- Emulation of the Dealer Service Tool (DST).
- If both ComPair and SearchMan (Electronic Service Manual) are installed, all the schematics and the PWMs of the set are available by clicking on the appropriate hyperlink. **Example:** Measure the DC-voltage on capacitor C2568 (*Schematic/Panel*) at the *Mono-carrier*.
- Click on the 'Panel' hyperlink to automatically show the PWM with a highlighted capacitor C2568.
- Click on the 'Schematic' hyperlink to automatically show the position of the highlighted capacitor.

How To Connect ComPair

1. First, install the ComPair Browser software (see the Quick Reference Card for installation instructions).
2. Connect the RS232 interface cable between a free serial (COM) port of your PC and the PC connector (marked with "PC") of the ComPair interface.
3. Connect the AC power adapter to the supply connector (marked with "POWER 9V DC") on the ComPair interface.
4. Switch the ComPair interface OFF.
5. Switch the television set OFF (remove the AC power).
6. Connect the ComPair interface cable between the connector with "I2C") and the ComPair connector on the mono carrier (see figure 8-1 suffix D).
7. Plug the AC power adapter in the AC power outlet and switch on the interface. The green and red LEDs light up together. The red LED extinguishes after approx. 1 second while the green LED remains lit.
8. Start the ComPair program and read the "Introduction" chapter.

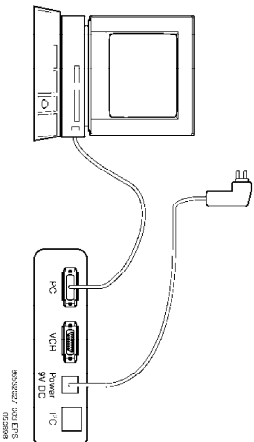


Figure 5-2 ComPair connection

How To Order

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

Error Buffer

The error code buffer contains all detected errors since the last time the buffer was erased. The buffer is written from left to right. When an error occurs that is not yet in the error code buffer, it is written at the left side and all other errors shift one position to the right.

How To Read The Error Buffer

- You can read the error buffer in 3 ways:
- On screen via the SDAM (only if you have a picture).
- Examples:
- ERROR: 0 0 0 0: No errors detected
 - ERROR: 6 0 0 0: Error code 6 is the last and only detected error
 - ERROR: 9 6 0 0: Error code 6 was first detected and error code 9 is the last detected (newest) error
- Via the blinking LED procedure (when you have no picture). See next paragraph.
- Via ComPair.

How To Clear The Error Buffer

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

Note:

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

Error Codes

In case of non-intermittent faults, clear the error buffer before you begin the repair. These to ensure that old error codes are no longer present.

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

Table 5-3 Error Code Table

ERROR	Device	Error description	Check item	Dia-gram
0	Not applicable	No Error	-	-
1	Not applicable	X-Ray Protection (USA)	7421, 2423, 6421, 6422	A2
2	Not applicable	Horizontal Protection	7421, 7422, 7423	A2
3	Not applicable	Vertical Protection	7461, 7462, 7463, 7464, 7465, 7466	A2
4	AN5691K & AN5629S	Tone control & Audio processor I2C identification error	7821 (tone IC), 7841 (Stereo/Sap)	A5
5	TD493XX	POR 3.3V / 8V Protection	7200, 7541, 7491, 7493, 7496	A4, A1
6	I2C bus	General I2C bus error	7200, 3604, 3605	A4
7	Not applicable	-	-	-
8	Not applicable	EW Protection (Large Screen)	-	-
9	M24C16	NVM I2C identification error	7641, 3641, 3642, 3643	A4
10	Tuner	Tuner I2C identification error	1000, 3003, 3004	A3
11	Not applicable	Black current loop protection	3313, 7307, 7308, 7309, 7310, 7311, 7312, 7313, 7314, 7315, 7316, 7317, 7318, CRT	B1
12	Not applicable	MAP I2C identification error (USA)	-	-
13	Not applicable	VC I2C identification error (Eu)	-	-
14	Not applicable	DVD I2C identification error	-	-

The Blinking LED Procedure

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

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

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

Example of error buffer: 12 9 6 0 0

After entering SDAM:

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

Protections

If a fault situation is detected an error code will be generated and if necessary the set will be put in the protection mode.

Blinking of the red LED at a frequency of 3 Hz indicates the protection mode. In some error cases, the microprocessor does not put the set in the protection mode. The error codes of the error buffer can be read via the service menu (SDAM), the blinking LED procedure or via ComPair.

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

- The Service Default Alignment Mode (SDAM). Start-up of the set in a predefined way and adjustment of the set via a menu and with the help of test patterns.

Repair Tips

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

- **Set is dead and makes hiccupping sound.** “Main Supply” is available. Hiccupping stops when de-soldering L5563, meaning that problem is in the “Main Supply” line. No output voltages at LOT, no horizontal deflection. Reason: line transistor 7421 is defective.
- **Set is dead, and makes no sound.** Check power supply IC 7520. Result: voltage at pins 2, 6, 7, 9 and 11 are about 180 V and pin 14 is 0 V. The reason why the voltage on these pins is so high is because the output driver (pin 11) has an open load. That is why MOSFET 7521 is not able to switch. Reason: feedback resistor 3523 is defective.
Caution: be careful measuring on the gate of 7521; circuitry is very high ohmic and can easily be damaged!
- **Set is in hiccup mode and shuts down after 8 s.** Blinking LED (set in SDM mode) indicates error 5. As it is unlikely that the “POR” and “+8V protection” happen at the same time, measure the “+8V”. If this voltage is missing, check transistor 7491 & 7496.
- **Set is non-stop in hiccup mode.** Set is in over current mode; check the secondary sensing (opto coupler 7515) and the “Main Supply” voltage. Signal “Stdbby_con” must be logic low under normal operation conditions and goes to high (3.3 V) under standby and fault conditions.
- **Set turns on, but without picture and sound.** The screen shows snow, but OSD and other menus are okay. Blinking LED procedure indicates error 11, so problem is expected in the tuner (pos. 1000). Check presence of supply voltages. As “Vlotaux+5V” at pin 5 and 7 are okay, “VT_supply” at pin 9 is missing. Conclusion: resistor 3449 & 3450 are defective

Technical Service Data

Model no.: 20PT6245/37
First Publish: 04-21-2005
Rev. Date: 05-18-2005
Print Date: 1/20/2006

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

Electrical Adjustments

REFER TO SAFETY GUIDELINES

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

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

8. Alignments

Index of this chapter:

1. General Alignment Conditions
2. Hardware Alignments
3. Software Alignments and Settings

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

8.1 General Alignment Conditions

Perform all electrical adjustments under the following conditions:

- AC voltage and frequency: according to country's standard.
- Connect the television set to the AC power via an isolation transformer.
- Allow the television set to warm up for approximately 20 minutes.
- Measure the voltages and waveforms in relation to chassis ground (with the exception of the voltages on the primary side of the power supply). Never use heatsinks as ground.
- Test probe: $R_i > 10\text{ M}\Omega$, $C_i < 2.5\text{ pF}$.
- Use an isolated trimmer/screwdriver to perform the alignments.

8.2 Hardware Alignments

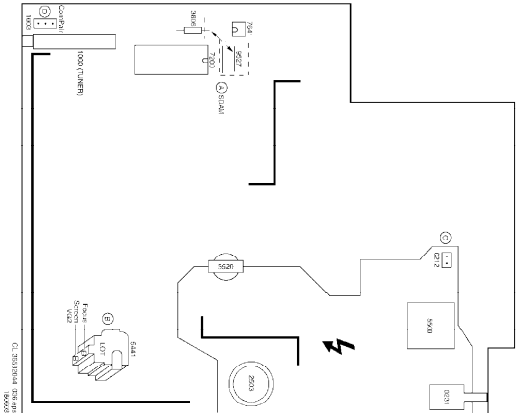


Table 6-3 Option Bit Assignment

Option Bit #	Option Bit Definition	Bit = [0]	Bit = [1]	Default setting
OB00 CHINA or NTSC ONLY	Bit = [0] Tuning is not for China set or NTSC only set, or this option bit is not applicable	Tuning is for China set or NTSC only set	LATAM & NAFTA: 0 for other sets, 1 for mono sets	
OB01 VIRGIN_MODE	Virgin mode is disabled or not applicable	Virgin mode is enabled. Plug and Play menu item will be displayed to perform installation at the initial startup of the TV when VIRGIN_MODE is set to 1. After installation is finished, this option bit will be automatically set to 0	LATAM & NAFTA: 0	
OB02 UK_FNP	UK's default Plug and Play setting is not available or not applicable	UK's default Plug and Play setting is available. When UK_FNP and VIRGIN_MODE are set to 1 at the initial setup, LANGUAGE = ENGLISH, COUNTRY = GREAT BRITAIN and after exiting from menu, VIRGIN_MODE will be set automatically to 0 while UK_FNP remains 1	LATAM & NAFTA: 0	
1				
OB03 ACI	ACI feature is disabled or not applicable	ACI feature is enabled	LATAM & NAFTA: 0	
OB04 AT3 (EU) or FINE TUNING (NAFTA) or LANGUAGE_MALAY (AP)	Feature is disabled or not applicable	Feature is enabled	LATAM & NAFTA: 0	
OB05 LNA	Auto Picture Booster is not available or not applicable	Auto Picture Booster is available	LATAM & NAFTA: 0	
OB06 FM_RADIO	FM radio feature is disabled or not applicable	FM radio feature is enabled	LATAM & NAFTA: 0	
OB07 PHILIPS_TUNER	ALPS / MASCO compatible tuner is in use	Philips compatible tuner is in use	LATAM & NAFTA: 0	
OB08 HUE	Hue/Tint Level is disabled or not applicable	Hue/Tint Level is enabled	LATAM & NAFTA: 1	
OB09 COLOR_TEMP	Color Temperature is disabled or not applicable	Color Temperature is enabled	LATAM & NAFTA: 1	
OB10 CONTRAST_PLUS	Contrast+ is disabled or not applicable	Contrast+ is enabled	LATAM & NAFTA: 1	
OB11 TILT	Rotate Picture is disabled or not applicable	Rotate Picture is enabled	LATAM & NAFTA: 0	
2				
OB14 NOISE_REDUCTION	Noise Reduction (NR) is disabled or not applicable	Noise Reduction (NR) is enabled	LATAM & NAFTA: 0	
OB15 CHANNEL_NAMING	Name FM Channel is disabled or not applicable	Name FM Channel is enabled	LATAM & NAFTA: 0 (Note: Name FM channel can be enabled only when FM_RADIO=1)	
OB16 SMART_PICTURE	Smart Picture is disabled or not applicable	Smart Picture is enabled	LATAM & NAFTA: 1	
OB17 SMART_SOUND	Smart Sound is disabled or not applicable	Smart Sound is enabled	LATAM & NAFTA: 0 for mono sets, 1 for stereo sets	
OB18 AVL	AVL is disabled or not applicable	AVL is enabled	LATAM & NAFTA: 1	
OB19 WSSB or HOME_CINEMA	WSSB is disabled or not applicable	WSSB is enabled	LATAM & NAFTA: 0 (Note: This option bit can be set to 1 only when WIDE_SCREEN= 1)	
OB20 WIDE_SCREEN	Software is used for 4:3 set or not applicable	Software is used for 16:9 set	LATAM & NAFTA: 0	
OB21 Virtual Doby			LATAM & NAFTA: 1	
OB24 MSP34X6_VOL_CTRL			LATAM & NAFTA: 0 (Note: For 2 x 10 W sets only)	
3				
OB35 COMPRESS_16_9	COMPRESS_169 selection is not applicable, item should not be in the FORMAT menu list	COMPRESS_169 selection is applicable, item should not be in the FORMAT menu list	LATAM & NAFTA: 0	
OB36 EXPAND_4_3	Expand 4:3 selection is not applicable, item should not be in the FORMAT menu list	Expand 4:3 selection is applicable, item should be in the FORMAT menu list	LATAM & NAFTA: 1	
OB37 EW_FUNCTION	EW function is disabled, only Expand 4:3 is allowed, Compress 16:9 is not applicable	EW function is enabled, in this case, both Expand 4:3 and Compress 16:9 are applicable.	LATAM & NAFTA: 0	
OB38 STEREO_NON_DBX	For AP_NTSC, chip TDA 9853 is not present	For AP_NTSC, chip TDA 9853 is present	LATAM & NAFTA: 0 for mono sets, 1 for stereo sets	
OB39 STEREO_DBX	For AP_NTSC, chip MSP 3445 is not present	For AP_NTSC, chip MSP 3445 is present	LATAM & NAFTA: 0	
OB40 STEREO_RB or KOREAN_2CS	For AP_PAL, chip MSP3465 is not present	For AP_PAL, chip MSP3465 is present	LATAM & NAFTA: 0	
OB41 STEREO_NICAM_2C	For EU and AP_PAL, chip MSP 3415 is not present	For EU and AP_PAL, chip MSP 3415 is present	LATAM & NAFTA: 0	
4				
OB44 DBM4 applicable	Delta Volume level is disabled or not applicable	Delta Volume Level is enabled	LATAM & NAFTA: 0 for mono sets, 1 for stereo sets	
OB45 ULTRA_BASS	Ultra Bass is disabled or not applicable	Ultra Bass is enabled	LATAM & NAFTA: 0	
OB46 VOLUME_LIMITER	Volume Limiter Level is disabled or not applicable	Volume Limiter Level is enabled	LATAM & NAFTA: 0	
OB47 INCOR_SUR	Incredible Surround feature is disabled	Incredible Surround feature is enabled	LATAM & NAFTA: 0 for mono sets, 1 for stereo sets	

Option Bit #	Option Bit Definition	Feature is disabled or not applicable	Feature is enabled	LATAM & NAFTA: 0
OB50 PIP or CLOCK	Feature is disabled or not applicable	Feature is enabled	LATAM & NAFTA: 0 for stereo sets, 1 for mono sets	
OB01 HMI	HMI is disabled or not applicable	HMI is enabled	LATAM & NAFTA: 0 (Note: This option bit is not applicable for EU)	
OB02 SVHS	SVHS source is not available	SVHS source is available	LATAM & NAFTA: 0	
OB03 CVI	CVI source is not available	CVI source is available	LATAM & NAFTA: 0	
5				
OB04 AV3	SideFront AV3 source is not present	SideFront AV3 source is present	LATAM & NAFTA: 0	
OB05 AV2	AV2 source is not present	AV2 source is present	LATAM & NAFTA: 0 (Note: For EU, when AV2=1, both EPP7 and SVHS2 should be included in the OSD loop)	
OB06 AV1	AV1 source is not present	AV1 source is present	LATAM & NAFTA: 1	
OB07 NTSC_PLAYBACK	NTSC playback feature is not available	NTSC playback feature is available	LATAM & NAFTA: 1	
OB08 BASS_FILTER	Feature is not available	Feature is available	LATAM & NAFTA: 0 for mono sets, 1 for stereo sets	
6				
OB01 SMART_TEXT	Smart Text Mode and Favorite Page are disabled or not applicable	Smart Text Mode and Favorite Page are enabled	LATAM & NAFTA: 0	
OB02 SMART_LOCK	Child Lock and Lock Channel are disabled or not applicable for EU	Child Lock and Lock Channel are enabled for EU	LATAM & NAFTA: 1	
OB03 VCHIP (LATAM & NAFTA & NAFTA)/ TX1_IPG (EU)	Feature is disabled	Feature is enabled	LATAM & NAFTA: 0	
OB04 WAKEUP_CLOCK	Wake up clock feature is disabled or not applicable	Wake up clock feature is enabled	LATAM & NAFTA: 0	
OB05 SMART_CLOCK	Smart Clock Using Teleret and Smart Clock Using PBS is disabled or not applicable	Smart Clock Using Teleret and Smart Clock Using PBS is enabled. For NAFTA, menu item AUTOCHRON is present in the INSTALL submenu	LATAM & NAFTA: 0	
OB06 SMART_SURF	Smart Surf feature is disabled or not applicable	Smart Surf feature is enabled	LATAM & NAFTA: 1	
OB07 PERSONAL_ZAPPIN G	Personal Zapping feature is disabled or not applicable	Personal Zapping feature is enabled	LATAM & NAFTA: 0	
OB08 SYSTEM_LT_1 and SYSTEM_LT_2	These two option bits are allocated for LATAM system selection. (00: NTSC-M; 01: NTSC-M; PAL-M; 10: NTSC-M; PAL-M and PAL-N; 11: NTSC-M; PAL-M, PAL-N, and PAL-BG)			
OB01				
OB02 SOUND_SYSTEM_AP	OB70, OB71, OB72: These three option bits are allocated for AP_PAL, sound system selection. (000: BG; 001: BG / DK; 010: / DK; 011: BG // DK; 100: BG // DK / M)			
OB03 COLOR_SYSTEM_AP	(This option bit is allocated for AP-PAL color system selection)	Auto, PAL, 4.43, NTSC 4.43, and SECAM 3.58	LATAM & NAFTA: 0	
7				
OB04 SIGNAL_STRENGTH / DVD_WAKEUP_TIMER (3D COMBI), 3D COMBI/ITER (NAFTA)			LATAM & NAFTA: 1	
OB05 LNA_PP (for LOT AP cluster)			LATAM & NAFTA: 0	
OB06 ACTIVE_CONTROL			LATAM & NAFTA: 1	
OB07 TIME_WINT	The time window is set to 1.2 s	The time window is set to 2 s	LATAM & NAFTA: 0 (Note: The time-out for all digi entries depends on this setting)	

8.3.2 TUNER

Note: Described alignments are only necessary when the NVM (part reference number 7841) is replaced.

IFPLL
This adjustment is auto-aligned. Therefore, no action is required (default= "30").

AGC (AGC take over point)

- Connect the RF output of a video pattern generator to the antenna input.
 - Input a color bar test pattern to the television set.
 - Set the amplitude of the video pattern generator to 10 mV and set the frequency to 475.25 MHz (PAL/SECAM) or 61.25 MHz (NTSC).
 - Connect a DC multimeter to pin 1 of the tuner (item 1000 on the main chassis).
- Activate SDAM by pressing the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed by the MENU button (do not allow the display to time out between entries while keying the sequence).
 - Use the MENU UP/DOWN keys to highlight the TUNER sub menu.
 - Press the MENU LEFT/RIGHT keys to enter the TUNER sub menu.
 - Use the MENU UP/DOWN keys to select AGC.
 - Use the MENU LEFT/RIGHT keys to adjust the AGC value (default value is "32") until the DC-voltage at pin 1 of the tuner lies is 3.3 V.
 - Press the MENU button to return to the top level SDAM menu.
 - To ensure the AGC change takes effect:
 - Turn the television set off by using the POWER button on the remote control transmitter or the local keyboard.
 - Disconnect the television set from AC power for at least ten seconds.

- Reconnect the television set to AC power.
- Turn the television set 'on' by using the 'POWER' button on the remote control transmitter or the local keyboard.

SL (Slicing Level)

This adjustment sets the sync slicing level for non-standard signals. You must turn it 'on' to have no picture instability in premium decoded cable channels.

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

To adjust SL:

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

CL (Cathode Drive Level)

Fixed value is 77 %.

WHITE TONE

The values of the 'black out-off level' can be adjusted in the 'WHITE TONE' sub menu.

Normally, no alignment is needed for 'WHITE TONE', and the given default values are used.

Default settings for **NORMAL** (color temperature= 11500 K):

NORMAL RED = 22
NORMAL GREEN = 21
NORMAL BLUE = 26

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

1. Connect the RF output of a video pattern generator (e.g. PM5418) to the antenna input.
2. Set the amplitude of the video pattern generator to at least 1 mV and set the frequency to 475.25 MHz (PAL/SECAM) or 61.25 MHz (NTSC).
3. Input a '100 IRE white' pattern to the television set.
4. Activate SDAM by pressing the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed by the MENU button (do not allow the display to time out between entries while keying the sequence).
5. Use the MENU UP/DOWN keys to highlight the WHITE TONE sub menu.
6. Press the MENU LEFT/RIGHT keys to enter the WHITE TONE sub menu.
7. Use the MENU UP/DOWN keys to select NORMAL RED, NORMAL GREEN, or NORMAL BLUE.
8. Set the Minolta CA100 color analyzer (or equivalent) in RGB mode, and set all color temperature settings to their default values.

9. Place the color sensor of the meter in the middle of the screen.
10. Set the meter in 'T-DUV-Y' mode, and set CONTRAST to make the light output 'Y' on the meter 90 mV ± 15%.
11. Use the MENU LEFT/RIGHT keys to adjust the value of NORMAL GREEN and/or NORMAL BLUE.
12. When all desired changes to the WHITE TONE sub menu values are made, press the MENU button to return to the top level SDAM menu.
13. To ensure the WHITE TONE settings are saved:
 - Turn the television set 'off' by using the 'POWER' button on the remote control transmitter or the local keyboard.
 - Disconnect the television set from AC power for at least ten seconds.
 - Reconnect the television set to AC power.
 - Turn the television set 'on' by using the 'POWER' button on the remote control transmitter or the local keyboard.

8.3.4 GEOMETRY

Introduction

The geometry alignment menu contains several items for correct picture geometry alignment.

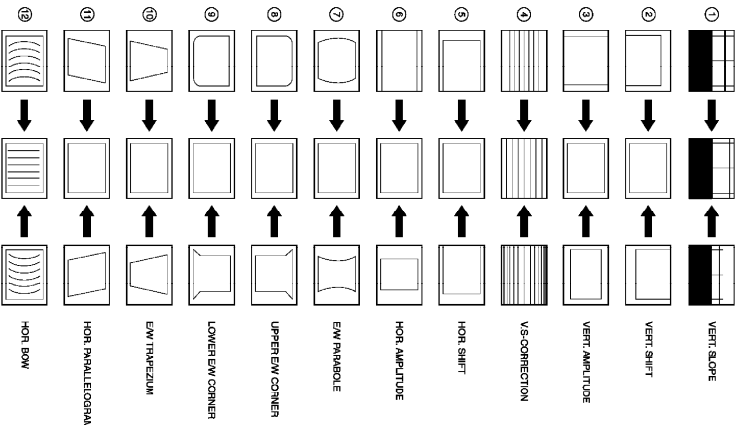


Figure 8-4 Geometry alignments

1. Connect the RF output of a video pattern generator to the antenna input.
2. Input a crosshatch test pattern to the television set.
3. Set the amplitude of the video pattern generator to at least 1 mV and set the frequency to 475.25 MHz (PAL/SECAM) or 61.25 MHz (NTSC).

4. Press the SMART PICTURE button on the remote control transmitter repeatedly to choose PERSONAL or MOVIES picture mode.
5. Activate SDAM by pressing the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed by the MENU button (do not allow the display to time out between entries while keying the sequence).
6. Use the MENU UP/DOWN keys to highlight the GEOMETRY sub menu.
7. Press the MENU LEFT/RIGHT keys to enter the GEOMETRY sub menu.
8. Use the MENU UP/DOWN keys to highlight either the HORIZONTAL sub menu or the VERTICAL sub menu.
9. Press the MENU LEFT/RIGHT keys to enter either the HORIZONTAL sub menu or the VERTICAL sub menu.
10. Use the MENU UP/DOWN keys to select items in the HORIZONTAL sub menu or the VERTICAL sub menu.
11. Use the MENU LEFT/RIGHT keys to adjust the values of items in the HORIZONTAL and VERTICAL sub menus.
12. When all desired changes to the HORIZONTAL and VERTICAL sub menu values are made, press the MENU button twice to return to the top level SDAM menu.
13. To ensure the GEOMETRY settings are saved:
 - Turn the television set 'off' by using the 'POWER' button on the remote control transmitter or the local keyboard.
 - Disconnect the television set from AC power for at least ten seconds.
 - Reconnect the television set to AC power.
 - Turn the television set 'on' by using the 'POWER' button on the remote control transmitter or the local keyboard.

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

Horizontal Alignments:

- Horizontal Shift (HSH): Select Horizontal Shift to center the picture on the screen.
- Picture Width (PW): Aligns the width of the picture.

Vertical Alignments:

- Vertical Slope (VSL): Aligns the picture so the proportions are the same at the top and bottom of the screen. This alignment must be performed first, before all other vertical alignments. Turning SBL 'on' will assist in performing this alignment.
- Vertical Amplitude (VAM): Aligns the height of the picture (other vertical alignments are NOT compensated).
- Vertical S-Correction (VSC): Aligns the vertical linearity, so that the vertical intervals of the grid-patterns are the same over the entire height of the screen.
- Vertical Shift (VSH): Aligns the vertical center of the picture to the vertical center of the CRT. After performing this alignment, it may be necessary to perform the VAM alignment again.
- Service blanking (SBL): Turns the blanking of the lower half of the screen 'on' or 'off' (to be used in combination with the vertical slope alignment).

Methods of Adjustment

1. Select SERVICE BLANKING (SBL) and set it to 1. The lower half of the picture will be blanked.
2. Press the MENU UP/DOWN buttons to select VERTICAL SLOPE (VSL).
3. Align VSL to start the blanking exactly at the horizontal while line at the center of the test circle (align the bottom of the screen so that castellations just disappear).
4. Press the MENU UP/DOWN buttons to select SBL and set it back to 0. The full picture reappears.
5. Select VERTICAL AMPITUDE (VAM) and align the picture height to approximately 13.0 - 13.1 blocks (align the top of the screen so that castellations just disappear).

6. Select VERTICAL SHIFT (VSH) and align for vertical centering of the picture on the screen.
7. Repeat the last two steps if necessary.

Horizontal/Phase

1. Set PW to '0'.
2. Select Horizontal Shift (HSH) to center the picture on the screen.

Horizontal and Vertical Shift Offset for NTSC (TRINOMA and PAL chassis)

1. Align the set for VSH and HSH (according to above mentioned procedures) with a PAL system signal.
2. Change the signal to NTSC system and adjust HORIZONTAL SHIFT OFFSET (H60) and VERTICAL SHIFT OFFSET (V60) to center the picture on the screen.
3. Repeat if necessary.

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

Table 8-4 Default geometry values

Alignment	Description	Value
PW 31	Picture Width	1F
HSH	Horizontal Shift	35
VSL	Vertical Slope	33
VAM	Vertical Amplitude	26
VSC	Vertical S correction	23
VSH	Vertical Shift	31

8.3.5 AUDIO

Necessary measuring equipment:

- MTS (Multi-channel Television Sound) generator (e.g. Fluke 54200).
- AC millivolt meter.

ILA (Input Level Alignment)

1. Activate SDAM by pressing the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed by the MENU button (do not allow the display to time out between entries while keying the sequence).
2. Use the MENU UP/DOWN keys to highlight the AUDIO sub menu.
3. Press the MENU LEFT/RIGHT keys to enter the AUDIO sub menu.
4. Use the MENU UP/DOWN keys to select ILA.
5. Apply a BTSC sound signal with a signal strength of 60 dBuV (1 mV_rms) to the aerial input. Measure the output on pin 21 (L_OUT) of IC7/81 with an AC millivoltmeter via a **Low Pass Filter** (f_c = 10 kHz, C = 1.5 nF, measure on the capacitor).
6. Use the MENU LEFT/RIGHT keys to adjust the meter reading to 106 mV_rms ± 2 mV_rms (default ILA value is 317).
7. Press the MENU button to return to the top level SDAM menu.
8. To ensure the ILA setting is saved:
 - Turn the television set 'off' by using the 'POWER' button on the remote control transmitter or the local keyboard.
 - Disconnect the television set from AC power for at least ten seconds.
 - Reconnect the television set to AC power.
 - Turn the television set 'on' by using the 'POWER' button on the remote control transmitter or the local keyboard.

LSA (Low Separation Alignment)

1. Activate SDAM by pressing the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed

- by the MENU button (do not allow the display to time out between entries while keying the sequence).
2. Use the MENU UP/DOWN keys to highlight the AUDIO sub menu.
 3. Press the MENU LEFT/RIGHT keys to enter the AUDIO sub menu.
 4. Use the MENU UP/DOWN keys to select LSA.
 5. Apply a 300 Hz BTSC sound signal with a signal strength of 60 dBuV (1 mV_{rms}) to the aerial input (only the left channel of the stereo signal). Measure the output on pin 22 (R_OUT) of IC7841 with an AC millivoltmeter.
 6. Use the MENU LEFT/RIGHT keys to adjust the meter reading to a minimum value (default LSA value is "7" for stereo sets, and "0" for mono sets).
 7. Press the MENU button to return to the top level SDAM menu.
 8. To ensure the LSA setting is saved:
 - Turn the television set 'off' by using the 'POWER' button on the remote control transmitter or the local keyboard.
 - Disconnect the television set from AC power for at least ten seconds.
 - Reconnect the television set to AC power.
 - Turn the television set 'on' by using the 'POWER' button on the remote control transmitter or the local keyboard.

HSA (High Separation Alignment)

1. Activate SDAM by pressing the following key sequence on the remote control transmitter: 0 6 2 5 9 6 directly followed by the MENU button (do not allow the display to time out between entries while keying the sequence).
2. Use the MENU UP/DOWN keys to highlight the AUDIO sub menu.
3. Press the MENU LEFT/RIGHT keys to enter the AUDIO sub menu.
4. Use the MENU UP/DOWN keys to select HSA.
5. Apply a 3 kHz BTSC sound signal with a signal strength of 60 dBuV (1 mV_{rms}) to the aerial input (only the left channel of the stereo signal). Measure the output on pin 22 (R_OUT) of IC7841 with an AC millivoltmeter.
6. Use the MENU LEFT/RIGHT keys to adjust the meter reading to a minimum value (default HSA value is "31").
7. Press the MENU button to return to the top level SDAM menu.
8. To ensure the HSA setting is saved:
 - Turn the television set 'off' by using the 'POWER' button on the remote control transmitter or the local keyboard.
 - Disconnect the television set from AC power for at least ten seconds.
 - Reconnect the television set to AC power.
 - Turn the television set 'on' by using the 'POWER' button on the remote control transmitter or the local keyboard.

Service Modes

Service Default Alignment Mode (SDAM) offers several features for the service technician.

There is also the option of using ComPair, a hardware interface between a computer (see requirements) and the TV chassis. It offers the ability of structured trouble shooting, error code reading and software version readout for all chassis.

Requirements: To run ComPair on a computer (laptop or desktop) requires, as a minimum, a 486 processor, Windows 3.1 and a CD-ROM drive. A Pentium Processor and Windows 95/98 are however preferred (see also paragraph 5.4).

Table 5-2 SW Cluster

SW Cluster	Software name	UOC type	UOC Diversity	Special Features
L3SUS1	L03US1 x.y	TDA9377	55K ROM Size	Stereo
L3SUS2	L03US2 x.y	TDA9377	55K ROM Size	Magnavox Stereo

Abbreviations in Software name: U = Natfa, S = Stereo.

Service Default Alignment Mode (SDAM)

Purpose

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

Specifications

- Tuning frequency: 61.25 MHz (channel 3) for NTSC-sets (Natfa).
- Color system: NTSC-M.
- All picture settings at 50 % (brightness, color contrast, hue).
- Bass, treble and balance at 50 %; volume at 25 %.
- All service-unfriendly modes (if present) are disabled, like:
 - (Sleep) timer,
 - Child/parental lock,
 - Blue mute,
 - Hotel/hospitality mode
- Auto switch-off (when no "DENT" video signal is received for 15 minutes),
- Skip / blank of non-favorite presets / channels,
- Auto store of personal presets,
- Auto user menu time-out.

- Operation hours counter.
- Software version.
- Option settings.
- Error buffer reading and erasing.
- Software alignments.

How to enter SDAM

Use one of the following methods:

- Use a standard customer RC-transmitter and key in the code 062596 directly followed by the "W" (menu) button or Short jumper wires 9257 and pin 4 of 7200 on the mono carrier (see Fig. 8-1) and apply AC power. Then press the power button (remove the short after start-up).
- Caution: Entering SDAM by shorten wires 9257 and pin 4 of 7200 will override the +8V-protection. Do this only for a short period. When doing this, the service-technician must know exactly what he is doing, as it could lead to damaging the set.
- Or via ComPair.

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

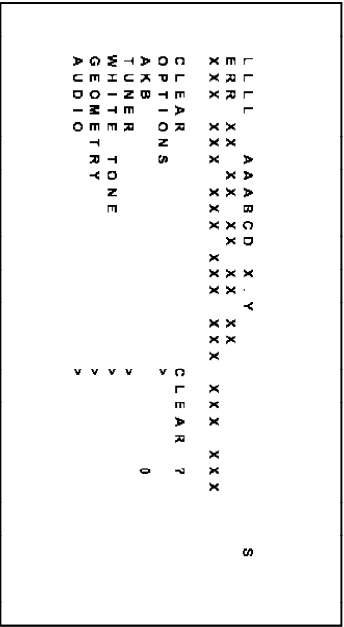


Figure 5-1 SDAM Menu

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

- **AAABCD-X.Y.** This is the software identification of the main micro controller:

- A = the project name (L03).
- B = the region: E = Europe, A = Asia Pacific, U = NAFTA, L = LATAM.
- C = the feature of software diversity: N = stereo non-DBX, S = stereo DBX, M = mono, D = DVD
- D = the language cluster number:
- X = the main software version number.
- Y = the sub software version number.

- **S.** Indication of the actual mode. S = SDAM = Service Default Alignment mode.
- **Error buffers.** Five errors possible.
- **Option bytes.** Seven codes possible.
- **Clear.** Erase the contents of the error buffer. Select the CLEAR menu item and press the CURSOR RIGHT key. The content of the error buffer is cleared.
- **Options.** To set the Option Bytes. See chapter 8.3.1 for a detailed description.
- **AKB.** Disable (0) or enable (1) the "black current loop" (AKB = Auto Kine Bias).
- **Tuner.** To align the Tuner. See chapter 8.3.2 for a detailed description.
- **White Tone.** To align the White Tone. See chapter 8.3.3 for a detailed description.
- **Geometry.** To align the set geometry. See chapter 8.3.4 for a detailed description.
- **Audio.** Use **default value (Stereo set only)**, align when necessary. See chapter 8.3.x for a detailed description.

<<<<<<<<

How to navigate

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

How to store settings

To store settings, leave the SDAM mode with the Standby button on the remote.

How to exit

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

Philips Consumer Electronics

Technical Service Data

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

Manual 7646

Model no.: 20PT6245/37
First Publish: 04-21-2005
Rev. Date: 05-18-2005
Print Date: 1/20/2006

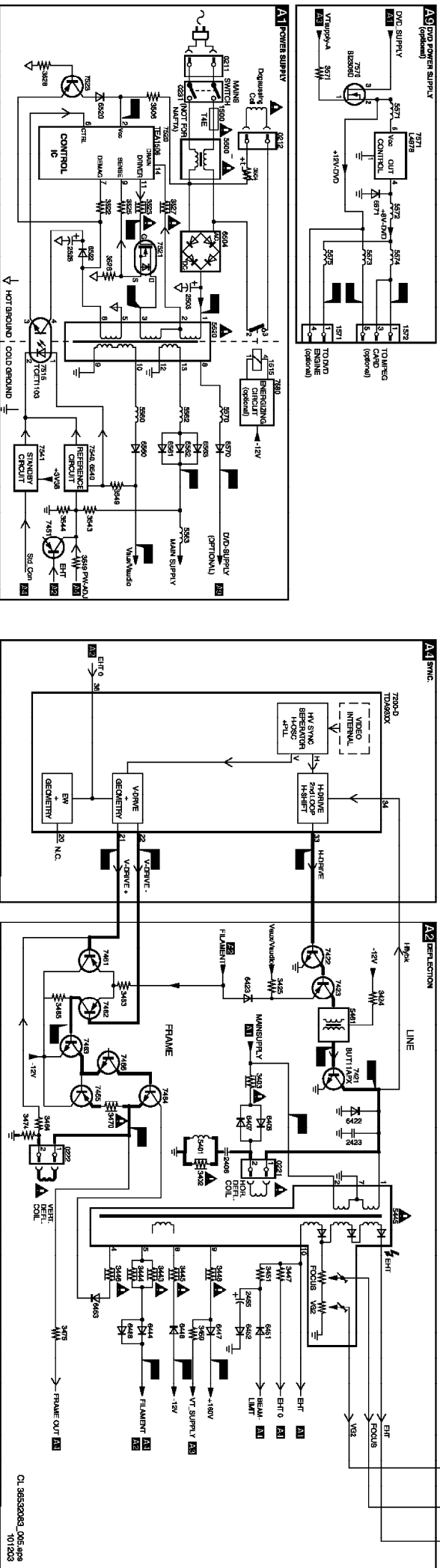
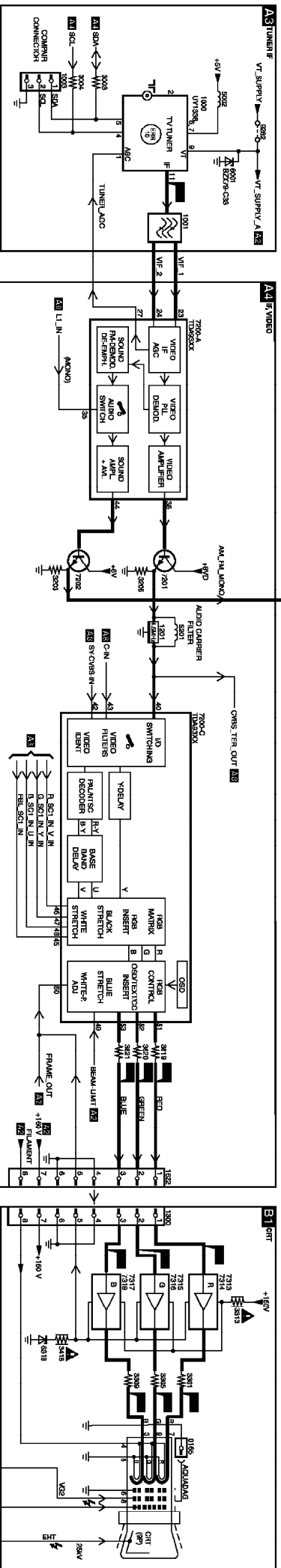
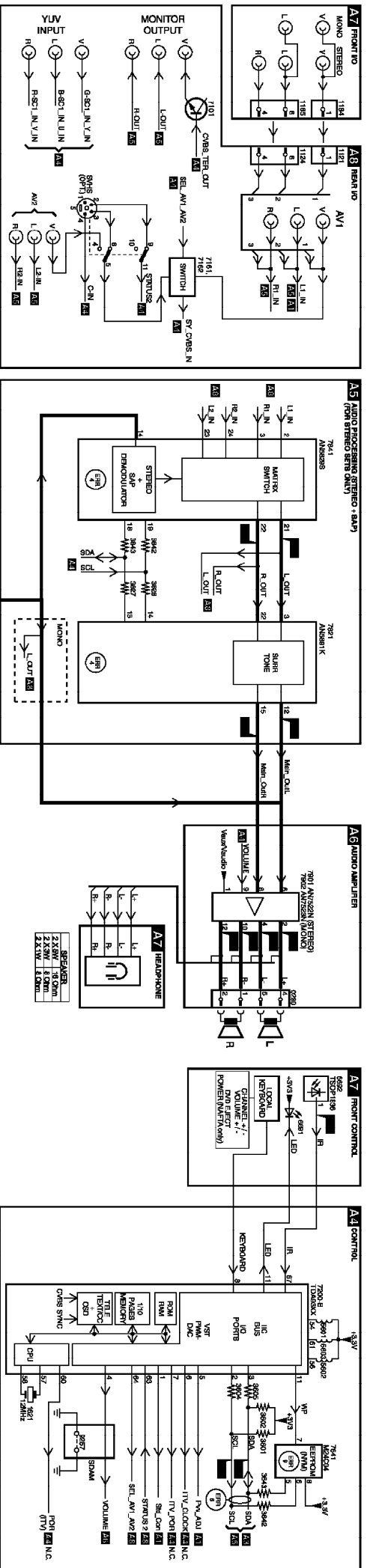
Training Information

REFER TO SAFETY GUIDELINES

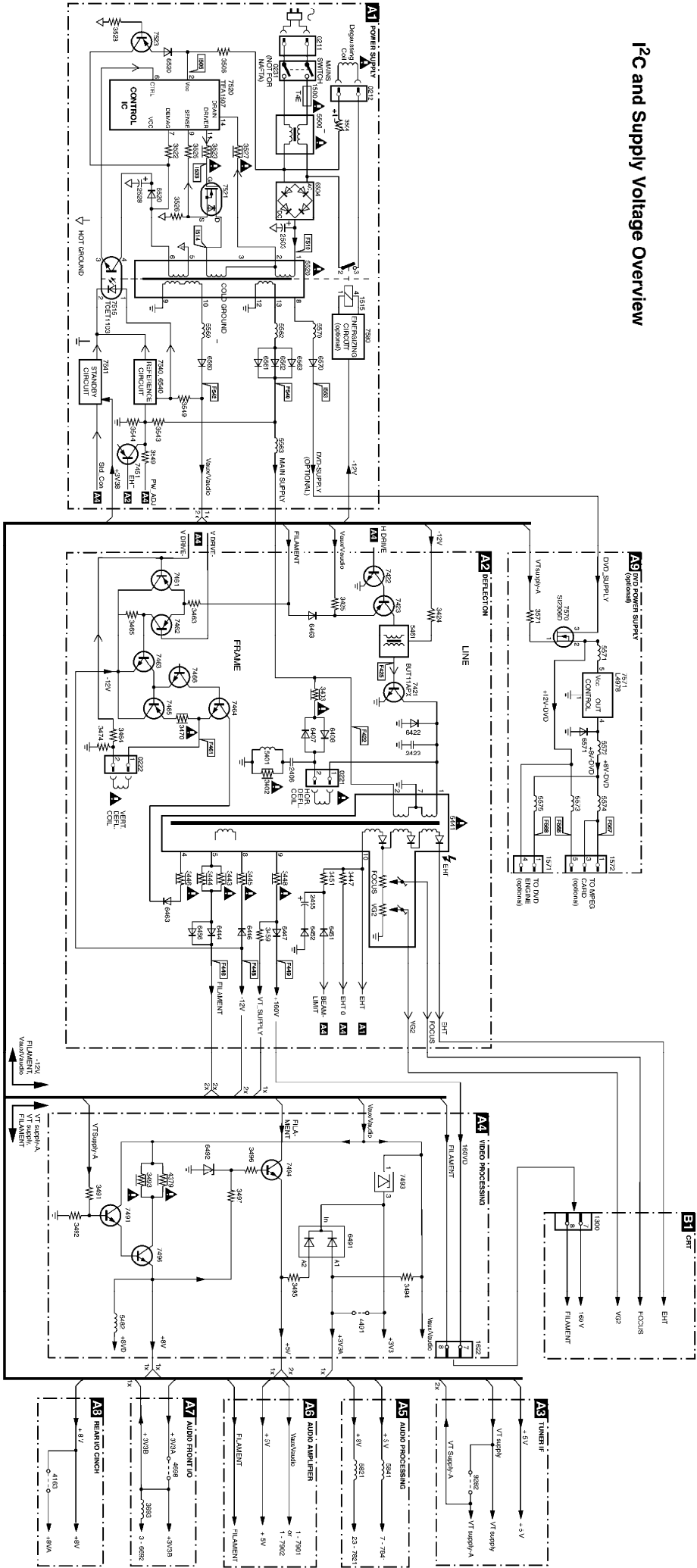
SAFETY NOTICE: ANY PERSON ATTEMPTING TO SERVICE THIS CHASSIS MUST FAMILIARIZE HIMSELF WITH THE CHASSIS AND BE AWARE OF THE NECESSARY SAFETY PRECAUTIONS TO BE USED WHEN SERVICING ELECTRONIC EQUIPMENT CONTAINING HIGH VOLTAGES.

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

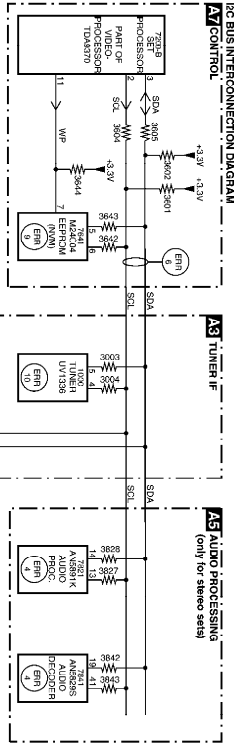
Block Diagram



I²C and Supply Voltage Overview

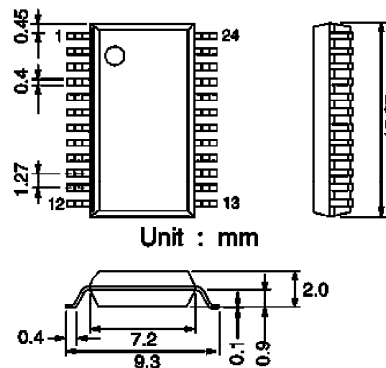
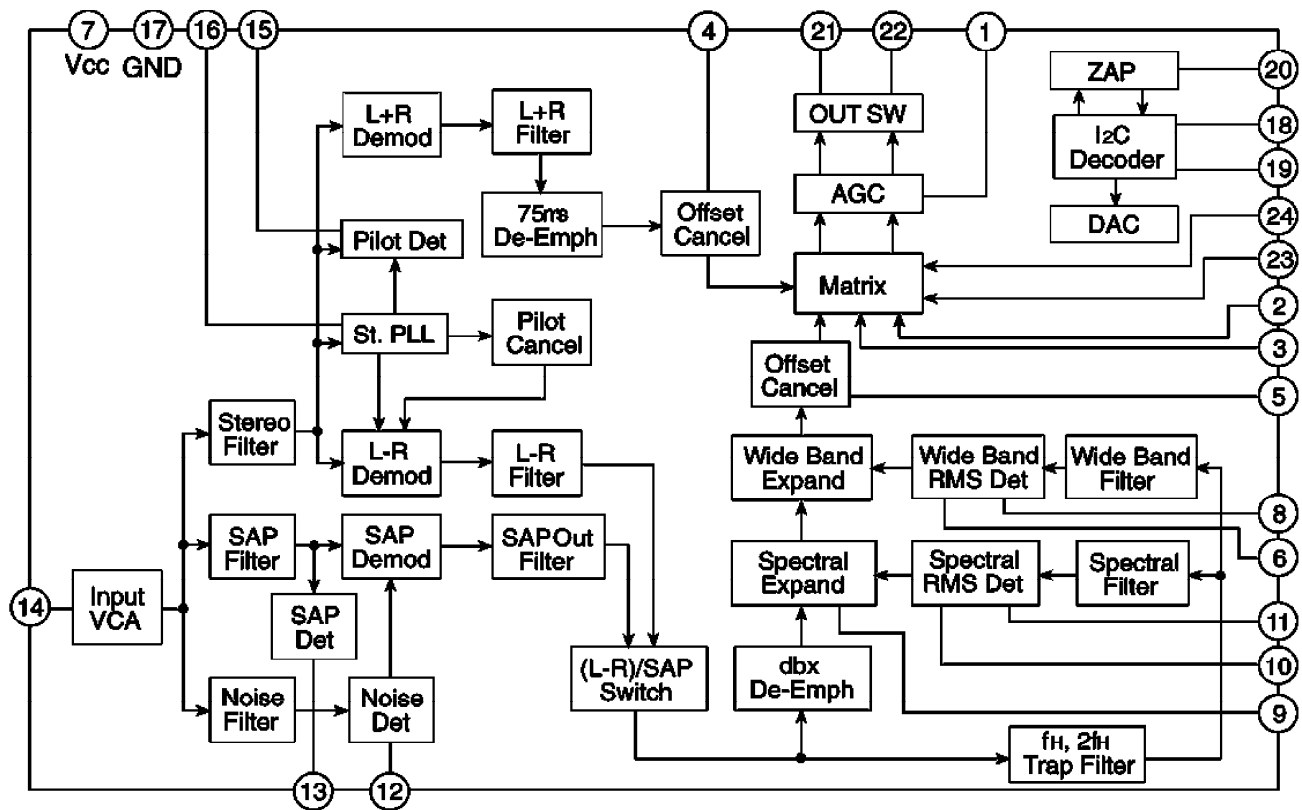


Error	Device	Error description	Check item	Diagram
0	Not applicable	No Error	-	-
1	Not applicable	X-Ray Protection (USA)	7421, 7422, 7423	A2
2	Not applicable	Horizontal Protection	7441, 7442, 7443, 7444	A2
3	Not applicable	Vertical Protection	7461, 7462, 7463, 7464	A2
4	ANS891K & ANS829S	Tone control & Audio processor I2C identification (StereoSap)	7821 (tone IC), 7841	A5
5	TDAB3XX	PCR 3.3V / 8V Protection	7820, 7841, 7481, 7483	A4, A1
6	TDAB3XX	General I2C bus error	7203, 8004, 3005	A4
7	Not applicable	ENV Protection (Large Screen)	7841, 3041, 3042, 3043	-
8	Not applicable	NMVA I2C identification error	1000, 3003, 3004	A4
9	M24C16	Tuner I2C identification error	3313, 7207, 7308, 7309	A3
10	Tuner	Black current loop protection	3313, 7207, 7308, 7309	B1
11	Not applicable	-	7314, 7315, 7316, 7317, 7318, 7319	-
12	Not applicable	M2P I2C identification error (USA)	-	-
13	Not applicable	VC I2C identification error (EU)	-	-
14	Not applicable	DVD I2C identification error	-	-



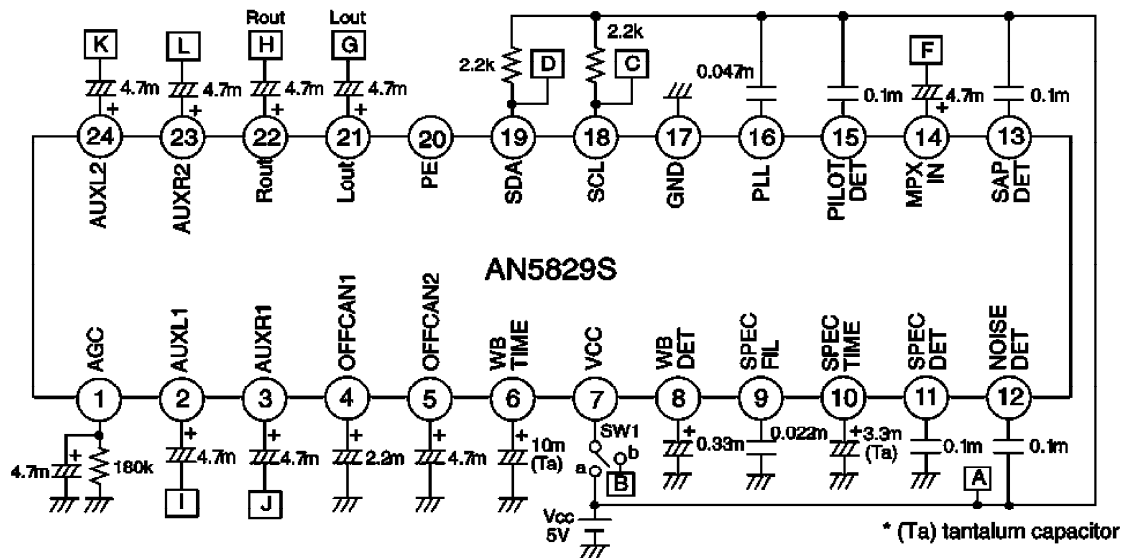
CL 30550083_005.qps
101203

Block Diagram



24-Lead PANAFLAT Package (SO-24D)

Test Circuit

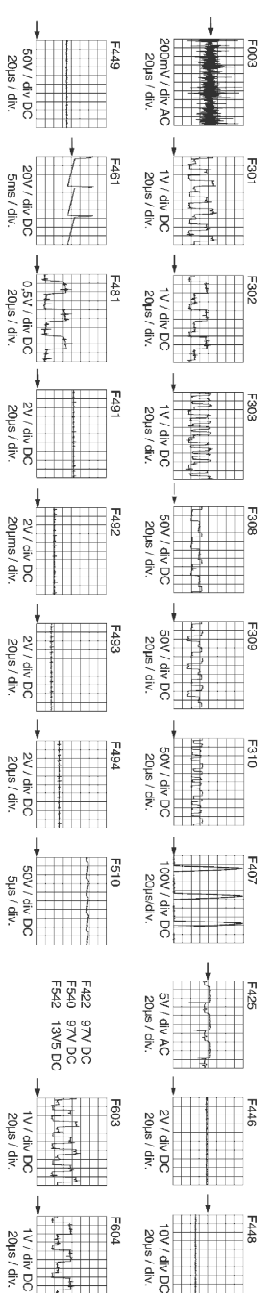


* (Ta) tantalum capacitor

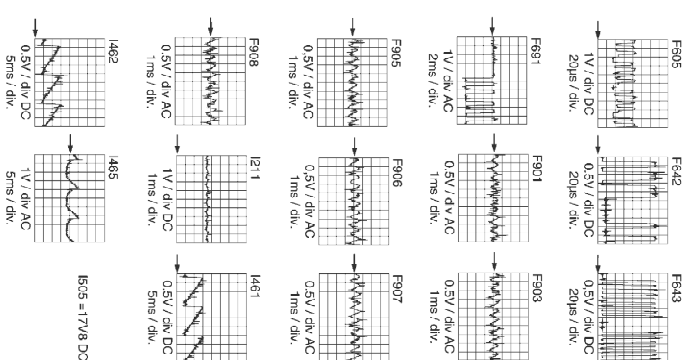
CL 36532044_040.eps
171203

Figure 9-5 Internal Block Diagram and Pin Configuration

MONO CARRIER TRACK SIDE VIEW



CRT TRACK SIDE VIEW



Introduction

The "L03" chassis is a global TV chassis for the model year 2003 and is used for TV sets with screen sizes from 14 inch to 21 inch, in Super Flat and Real Flat executions. In comparison to its predecessor (the "L01"), this chassis is further simplified: it contains economized executions of the power supply, the video processing (microprocessor), and the audio processing.

The standard architecture consists of a Main panel (called "family board"), a Picture Tube panel, a Side I/O panel, and a Top Control panel. The Main panel consists primarily of conventional components with some surface mounted devices in the audio and video processing part.

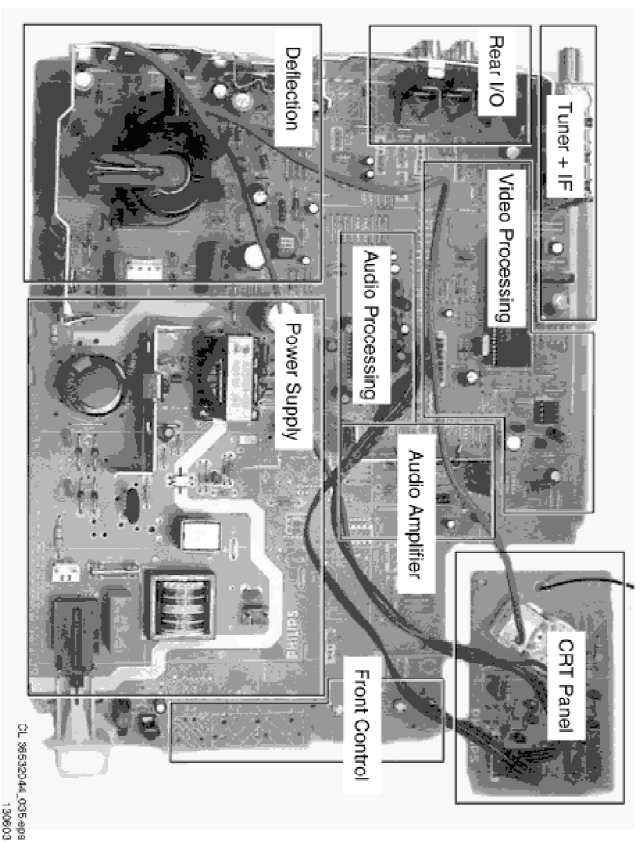


Figure 9-1 Top view family board

The functions for video processing, microprocessor (P), and CC/Teletext (TXT) decoder are combined in one IC (TDA937x), the so-called Ultimate One Chip (UOC). This chip is mounted on the component side of the main panel.

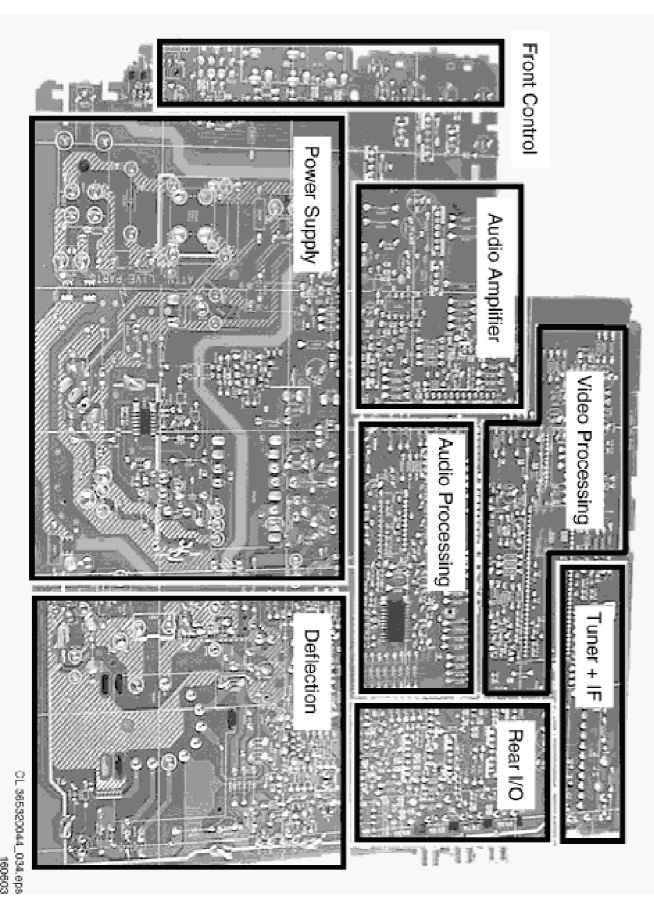


Figure 9-2 Bottom view family board

The L03 can be divided into two basic systems, i.e. mono and stereo sound. While the audio processing for the mono sound is done in the audio block of the UOC, external audio processing ICs are used for stereo sets.

The tuning system features 181 channels with on-screen display. The main tuning system uses a tuner, a microcomputer, and a memory IC mounted on the main panel. The microcomputer communicates with the memory IC, the customer keyboard, remote receiver, tuner, signal processor IC and the audio output IC via the I2C bus. The memory IC retains the settings for favorite stations, customer-preferred settings, and service / factory data.

The on-screen graphics and closed caption decoding are done within the microprocessor where they are added to the main signal.

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

Source Selection

The Source Select is divided mainly into two types, the "Mono Source Select" and the "Stereo Source Select".

- The Mono Source Select, both audio and video, will be done entirely by the UOC and will only be able to select one external audio source.
- As for the Stereo Source Select, the Panasonic IC, which is for BTSC decoding also, has 2 audio source inputs used for source selection, whereas the UOC will take care of the video selection.

Switching Function for Stereo I/O

Video Source Selection

The video source selection is done by the UOC. The video setting for LATAM / NAFTA is rather straightforward: a so-called "WYSIWYG" (what you see on the screen, is what you get from the video output).

Audio Source Selection

The AN5829 (BTSC decoder) device does the external stereo audio source selection. A maximum of three audio input sources can be selected. AV1 or FRONT is selected by the mechanical switch in the front cinch connector.

The selected external audio source is then fed to the AN5829 AUX1 input (pins 2 and 3). The AV2 is fed directly to AN5829 via AUX2 (pins 23 and 24). Then via I2C, the AN5829 IC source selection can be done.

Switching Function for Mono I/O

For the Mono configuration, only one input pin is available for the UOC.

Video Source Selection

The video switching is similar to the section above.

Audio Source Selection

The audio input (L1_IN) is connected to pin 35 of the UOC.

9.3 Audio

This chassis is targeted for the NAFTA market with Mono, Stereo, or SAP sound system.

For the "basic" Mono and Stereo sets, sound processing includes Volume control and AVL.

For stereo sets, IC AN5829S is the BTSC audio signal decoder and AN5891K is the audio processing IC.

9.3.1 Processing

This chassis uses the Intercarrier demodulation concept (one SAW filter for both video and audio). The base band (full bandwidth) BTSC audio signal from the UOC is fed to pin 14 of the stereo decoder. The Pilot detection and SAP detection registers indicate the type of transmitted audio signal such as Mono, Stereo, and/or SAP. Based on this indication, the software controls will help to output the appropriate audio signal at pins 21 and 22. The controls are done by the I2C bus connected to pins 18 and 19.

Internal or External audio (pins 2, 3, 23, and 24) can also be selected by the source selection register. For the selected audio source, the AGC function can be applied. The output is a fixed level output. The volume control function is available via the power amplifier (AN7522/23).

The selected audio output from IC7841 (AN5829) is fed to pins 3 and 22 of IC7821 (AN5891) for audio processing functions, such as Treble, Bass, Volume, Balance, and Surround sound functions. L_out and R_out are then available on pins 12 and 15.

IC7821 is also I2C controllable (pins 13 and 14). An AVL function is also available in this IC, and can be used for sets using this IC. In this case, the AVL function of the AN5829 is disabled. Subwoofer output (optional) is available on pin 20.

9.3.2 Amplifier

The output is fed to the audio amplifier (IC7901 for stereo sets or IC7902 for mono sets). This is a BTL amplifier (Bridge Tied Load), which is actually a class AB amplifier with four transistors for each channel. The advantage of BTL over the standard Class AB amplifier is that it requires a lower supply voltage to deliver a higher output.

The volume level is controlled at this IC (pin 9) by the "VOLUME" control line coming from the microprocessor. After amplification, the audio signal is sent to the speaker / headphone output connector.

9.3.3 AVL (Automatic Volume Limiting)

The "Mono AVL" function operates via the UOC. During channel change and source selection, the AVL bit is to be switched "off" and then can resume to the previous state ("on/off") as shown in the timing diagram below.

The "Stereo AVL" function operates via the AGC control of IC AN5829S. During channel change and source selection, the AGC function is to be switched "off" and then can resume to the previous state ("on/off") as shown in timing diagram below.

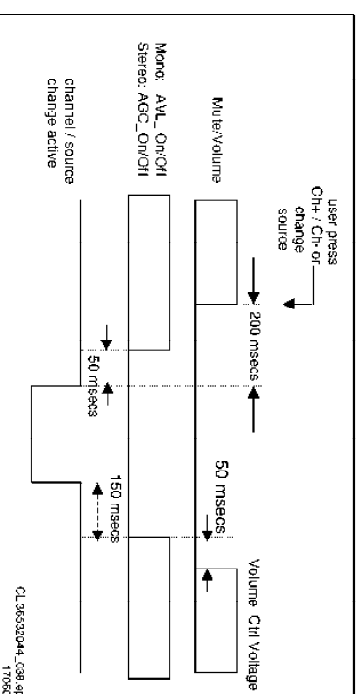


Figure 9-3 AVL timing diagram

9.3.4 Mute

The TV set must mute:

- Whenever a "User Mute" is activated.
- Whenever there is a channel change, RF to RF, RF to AV, AV to RF, and AV to AV (if any). In channel change, MUTE must be activated first before any other activity and un-MUTE must be done after every other activity has been completed.
- Whenever there is a loss in the signal.
- During cold or warm start, MUTE must be activated until all initialization processes are finished.
- When the set is going to STANDBY, MUTE must be activated first before any other activities.

Note:

1. MUTE mentioned above applies for the audio amplifier mute (= PWM volume control mute).
2. The first condition does not apply for the UOC, IC AN5891K, or IC AN5829S.
3. Above conditions refers to both mono and stereo sets.

9.4 Video

For a detailed circuit description of this part, we refer to the L01.2L AA manual (see the beginning of this chapter for the ordering codes). Please note that there can be minor differences in the text (e.g. other item numbers), but the described circuit principle is comparable.

This chassis uses the TDA937x family Ultimate One Chip TV processor (UOC), which is mounted in an SDIP 64 envelope. The various versions of the UOC series combine the function of a video processor together with a microcontroller and US Closed Caption/TXT decoder.

9.5 Synchronization

Inside IC7200 (part D) the vertical and horizontal sync pulses are separated. These "H" and "V" signals are synchronized with the incoming CVBS signal. They are then fed to the H- and V-drive circuits and to the OSD/TXT circuit for synchronization of the On Screen Display and Teletext (CC) information.

9.6 Deflection

For a detailed circuit description of this part, we refer to the L01.2L AA manual (see the beginning of this chapter for the ordering codes). Please note that there can be minor differences in the text (e.g. other item numbers), but the described circuit principle is comparable.

The L03 range consists of TV sets spanning from 14 to 21 inch using the same chassis architecture. For the chassis architecture, the CRTs used do not need East/West Correction. Therefore the geometry correction needed is horizontal shift, vertical slope, vertical amplitude, vertical S-correction, vertical shift and vertical zoom for geometry corrections (with the appropriate offsets required for NTSC channels on PAL sets).

9.7 Power Supply

For a detailed circuit description of this part, we refer to the L01.2L AA manual (see the beginning of this chapter for the ordering codes). Please note that there can be minor differences in the text (e.g. other item numbers), but the described circuit principle is comparable.

9.7.1 Introduction

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

The control IC in this power supply is the TEA1506 (L01=TEA1507). Unlike the TEA1507 control IC, the TEA1506 has no internal high voltage start-up source, and therefore needs to be started by means of an external bleeder resistor (R3506 and R3507). The operating voltage for the driver circuit is also taken from the 'hot' side of this transformer.

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

The "MainSupply" line is the reference voltage for the power supply. It is sampled by resistors 3543 and 3544 and fed to the input of the regulator 7540 / 6540. This regulator drives the feedback optocoupler 7515 to set the feedback control voltage on pin 6 of 7520.

The power supply in the set is "on" any time AC power is connected to the set.

9.7.2 Derived Voltages

The voltages supplied by the secondary windings of T5520 are:

- "MainSupply" for the horizontal output.
- "V_aux/V_audio" for the audio circuit.
- An optional "DVD_Supply" for future extensions.

Other voltages are provided by the LOT. It supplies -12 V, the tuner voltage, the filament voltage, and the +160 V source for the video drive. These secondary voltages of the LOT are monitored by the "EHT" lines.

9.8 Control

The microprocessor part of the UOC has the complete control and CC/Teletext processing on board. The User menu's and Service Default / Alignment Mode's are generated by the uP. Communication to other ICs is done via the I2C-bus.

9.8.1 I2C-Bus

The main control system, which consists of the microprocessor part of the UOC (7200), is linked to the external devices (Tuner, NVM, Audio ICs, etc) by means of the I2C-bus. An internal I2C-bus is used to control other signal processing functions, like video processing, sound IF, vision IF, synchronization, etc.

9.8.2 User Interface

The chassis uses a remote control with RC5 protocol. The incoming signal is connected to pin 67 of the UOC. The keyboard, connected to UOC pin 8, can also control the set. Button recognition is done via a voltage divider. The front LED (6691) is connected to an output control line of the microprocessor (pin 11). It is activated to provide the user information about whether or not the set is working correctly (e.g., responding to the remote control, normal operation (USA only) or fault condition)

9.8.3 I/O Selection

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

STATUS1

This signal provides information to the microprocessor on whether a video signal is available on the SCART1 AV input and output port (only for Europe). This signal is not connected in LATAM/NAFTA sets.

STATUS2

This signal provides information to the microprocessor on whether a video signal is available on the SCART2 AV input and output port (only for Europe).

For sets with an SVHS input it provides the additional information if a Y/C or CVBS source is present.

The presence of an external Y/C source makes this line 'high' while a CVBS source makes the line 'low'.

SEL_AV1_AV2

This is the source select control signal from the microprocessor. This control line is under user control or can be activated by the other two control lines.

9.8.4 Power Supply Control

The Power Supply is interfaced with the microcontroller (UOC) to provide the power supply with the control signals required for burst mode operation in standby and to vary the picture width by adjusting V_BAT.

The microprocessor part is supplied with 3.3 V and 8 V. The 3.3 V is derived from the "V_aux/V_audio" voltage via a 3V3 stabilizer (7493). The 8 V is derived from the 33V tuner voltage via TS7491 and TS7496.

Two signals are used to control the power supply: STD_CON and PW_ADJ.

STD_CON

This signal is generated by the microprocessor when over-current takes place at the "Main" line. This is done to enable the power supply into standby burst mode, and to enable this mode during a protection.

This is of logic "high" (3.3 V) under normal operation of the TV. When the TV set is in Standby (or fault) condition, this signal is a continuous pulse of 5 ms "low" (0 V) and 5 ms "high".

Note: In the L01 chassis this was inverted.

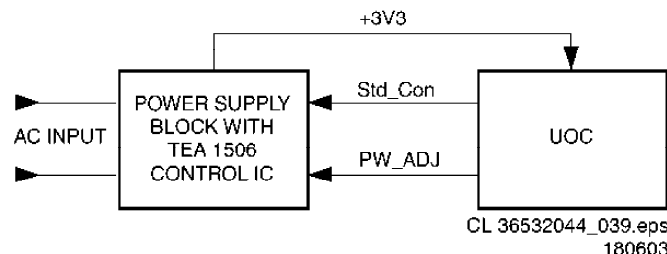


Figure 9-4 Block diagram of power supply interface with UOC

PW_ADJ

This signal is generated by the UOC through a PWM port. This PWM port is configured in Push Pull mode to generate a square wave signal of 0 to 100% duty cycle with a default value of 50% duty cycle.

PW_ADJ will eliminate tolerance and can adjust the picture wide slightly.

9.8.5 Protection Events

Several protection events are controlled by the UOC. In case one of these protections is activated, the set will go to "Standby" mode.

Deflection protections

The main protections for deflection are X-ray protection, frame amplifier failure detection, black current loop stability protection, and +8V auxiliary supply protection. For X-ray protection, the X-ray detection bit, XDT, must always be set to "1" (detection mode). High EHT protection must be triggered via software upon detection of the XPR bit switching to "1". A suitable number of checks are done before putting the set into protection mode in order to prevent false triggering. For service requirements, the Enable Vertical Guard (RGB blanking), EVG, can be disabled (set to "0") although this is not necessary.

The following bits are monitored:

- SUP (Supply voltage indication)
- XPR (X-ray protection)
- EVG (Enable Vertical Guard)
- NDF (Output Vertical Guard)
- BCF (Black Current Failure)

I2C protection

To check whether all I2C IC's are functioning.

9.9 Abbreviation list

2CS	2 Carrier (or Channel) Stereo	ITV	Institutional TV
ACI	Automatic Channel Installation: algorithm that installs TV sets directly from cable network by means of a predefined TXT page	LATAM	Latin American countries like Brazil, Argentina, etc.
ADC	Analogue to Digital Converter	LED	Light Emitting Diode
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency	L/L'	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I
AFT	Automatic Fine Tuning	LS	Large Screen or Loudspeaker
AGC	Automatic Gain Control: algorithm that controls the video input of the feature box	M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz
AM	Amplitude Modulation	NC	Not Connected
AP	Asia Pacific	NICAM	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, mainly used in Europe.
AR	Aspect Ratio: 4 by 3 or 16 by 9	NTSC	National Television Standard Committee. Color system mainly used in North America and Japan. Color carrier NTSC M/N = 3.579545 MHz, NTSC 4.43 = 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)
ATS	Automatic Tuning System		
AV	External Audio Video	NVM	Non Volatile Memory: IC containing TV related data e.g. alignments
AVL	Automatic Volume Leveler	OB	Option Bit
BCL	Beam Current Limitation	OC	Open Circuit
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz	OP	Option Byte
BTSC	Broadcast Television Standard Committee. Multiplex FM stereo sound system, originating from the USA and used e.g. in LATAM and AP-NTSC countries	OSD	On Screen Display
CC	Closed Caption	PAL	Phase Alternating Line. Color system mainly used in West Europe (color carrier = 4.433619 MHz) and South America (color carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)
ComPair	Computer aided rePair	PCB	Printed Circuit board
CRT	Cathode Ray Tube or picture tube	PLL	Phase Locked Loop. Used for e.g. FST tuning systems. The customer can give directly the desired frequency
CSM	Customer Service Mode	POR	Power-On Reset
CTI	Color Transient Improvement: manipulates steepness of chroma transients	PTP	Picture Tube Panel (or CRT-panel)
CVBS	Composite Video Blanking and Synchronization	RAM	Random Access Memory
CVI	Component Video Input	RC	Remote Control handset
DAC	Digital to Analogue Converter	RGB	Red, Green, and Blue video signals
DBX	Dynamic Bass Expander or noise reduction system in BTSC	ROM	Read Only Memory
D/K	Monochrome TV system. Sound carrier distance is 6.5 MHz	SDAM	Service Default / Alignment Mode
DFU	Direction For Use: description for the end user	SAP	Second Audio Program
DNR	Dynamic Noise Reduction	SC	Sandcastle: pulse derived from sync signals
DSP	Digital Signal Processing	S/C	Short Circuit
DST	Dealer Service Tool: special remote control designed for dealers to enter e.g. service mode	SCL	Serial Clock
DVD	Digital Versatile Disc	SDA	Serial Data
EEPROM	Electrically Erasable and Programmable Read Only Memory	SECAM	SEquence Couleur Avec Memoire. Color system mainly used in France and East Europe. Color carriers = 4.406250 MHz and 4.250000 MHz
EHT	Extra High Tension	SIF	Sound Intermediate Frequency
EHT-INFO	Extra High Tension information	SS	Small Screen
EPG	Electronic Programming Guide	STBY	Standby
EU	Europe	SVHS	Super Video Home System
EW	East West, related to horizontal deflection of the set	SW	Software
EXT	External (source), entering the set via SCART or Cinch	THD	Total Harmonic Distortion
FBL	Fast Blanking: DC signal accompanying RGB signals	TXT	Teletext
FILAMENT	Filament of CRT	uP	Microprocessor
FM	Field Memory or Frequency Modulation	UOC	Ultimate One Chip
H	Horizontal sync signal	V	Vertical sync signal
HP	Headphone	V_BAT	Main supply voltage for the deflection stage (mostly 141 V)
I	Monochrome TV system. Sound carrier distance is 6.0 MHz	V-chip	Violence Chip
I2C	Integrated IC bus	VCR	Video Cassette Recorder
IF	Intermediate Frequency	WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
IIC	Integrated IC bus	XTAL	Quartz crystal
		YC	Luminance (Y) and Chrominance (C)

Philips Consumer Electronics

Technical Service Data

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

Manual 7646

Model no.: 20PT6245/37
First Publish: 04-21-2005
Rev. Date: 05-18-2005
Print Date: 1/20/2006

Parts List

REFER TO SAFETY GUIDELINES

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

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

Main Chassis

	Main Chassis				2457	Cap, 470p, 10%, 500v, Ceramic.	3198	019	44710
0136	IC-Spring.	3104	301	22081	2460	Cap, 82n, 10%, 100v, Metalized Polyeste	2222	365	25823
0137	Spring.	3139	121	24583	2461	Cap, 1n, 5%, 25v, Ceramic.	3198	016	31020
0141	IC-Spring.	3104	301	22081	2462	Cap, 1n, 5%, 25v, Ceramic.	3198	016	31020
0211	Connector, 2 Pin	2422	025	16269	2463	Cap, 47u, 20%, 50v, Electrolytic. . . .	3198	025	54790
0212	Connector, 2 Pin	2422	025	16375	2464	Cap, 470p, 5%, 50v, Ceramic.	3198	016	34710
0217	Connector, 3 Pin	2412	020	00725	2465	Cap, 10u, 20%, 160v, Electrolytic. . .	2022	031	00127
0221	Connector, 4 Pin	2422	025	15503	2470	Cap, 15n, 10%, 63v, Metalized Polyester	2022	318	00126
0222	Connector, 2 Pin	2422	025	10646	2473	Cap, 470p, 5%, 50v, Ceramic.	3198	016	34710
0223	Socket, Cinch, 9 Pin	2422	026	05236	2481	Cap, 100p, 5%, 50v, Ceramic.	3198	016	31010
0225	Socket, MDIN, 10 Pin	2422	026	04926	2482	Cap, 1u, +80/-20%, 10v, Ceramic. . . .	3198	017	41050
0246	Connector, 5 Pin	2422	025	15848	2483	Cap, 4u7, +80/-20%, 10v, Ceramic. . . .	2020	552	96305
1000	Tuner, V+U PLL	2422	542	90141	2484	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040
1001	Filter, SAW, 45MHz75.	2422	549	44327	2485	Cap, 1u, +80/-20%, 10v, Ceramic. . . .	3198	017	41050
1121	Connector, 3 Pin	2412	020	00725	2486	Cap, 4n7, 10%, 50v, Ceramic.	3198	017	34720
1124	Connector, 6 Pin	2422	025	12025	2487	Cap, 2n2, 10%, 50v, Ceramic.	3198	017	32220
1201	Filter, Ceramic, 4MHz5	2422	549	40807	2488	Cap, 100n, 10%, 63v, Metalized Polyeste	2222	370	75104
1300	Connector, 8 Pin	2422	025	04856	2489	Cap, 1n, 10%, 50v, Ceramic.	3198	017	31020
S 1302	Socket, CRT, 9 Pin, N-Neck	2422	500	80076	2491	Cap, 470u, 20%, 10v, Electrolytic. . . .	3198	025	14710
S 1504	Fuse, 4A, 250V, IEC.	2422	086	10914	2492	Cap, 22u, 20%, 25v, Electrolytic. . . .	3198	029	32290
1515	Relay, 12V, 5A	2422	132	07467	2493	Cap, 470u, 20%, 10v, Electrolytic. . . .	3198	025	14710
1600	Switch, Tactile.	2422	128	02742	2494	Cap, 47u, 20%, 16v, Electrolytic. . . .	3198	028	24790
1601	Switch, Tactile.	2422	128	02742	2496	Cap, 1n, 10%, 50v, Ceramic.	3198	017	31020
1602	Switch, Tactile.	2422	128	02742	2497	Cap, 1n, 10%, 50v, Ceramic.	3198	017	31020
1603	Switch, Tactile.	2422	128	02742	2500	Cap, 470n, 20%, 275V, Metalized Polypro	2222	338	22474
1606	Switch, Tactile.	2422	128	02742	2501	Cap, 2n2, 10%, 1000v, Ceramic.	3198	019	52220
1621	Crystal, 12MHz	2422	543	01268	2502	Cap, 2n2, 10%, 1000v, Ceramic.	3198	019	52220
1622	Connector, 8 Pin	2422	025	04856	2503	Cap, 220u, 20%, 200v, Electrolytic. . .	2020	024	90585
2001	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040	S 2515	Cap, 1n5, 20%, 250v, Ceramic.	2020	554	90199
2002	Cap, 100u, 20%, 16v, Electrolytic. . . .	3198	028	21010	2520	Cap, 10n, 50v, CER2, 0603, X7R	3198	017	31030
2003	Cap, 22p, 5%, 50v, Ceramic.	3198	016	32290	2521	Cap, 22u, 20%, 50v, Electrolytic. . . .	3198	025	52290
2004	Cap, 22p, 5%, 50v, Ceramic.	3198	016	32290	2522	Cap, 1n, 10%, 50v, Ceramic.	3198	017	31020
2005	Cap, 47n, +80/-20%, 50v, Ceramic. . . .	3198	024	44730	2523	Cap, 1n5, 10%, 2000v, Ceramic.	3198	019	71520
2006	Cap, 470u, 20%, 10v, Electrolytic. . . .	3198	025	14710	2525	Cap, 680p, 10%, 50v, Ceramic.	3198	017	36810
2007	Cap, 10u, 20%, 50v, Electrolytic.	3198	025	51090	2527	Cap, 56p, 5%, 50v, Ceramic.	3198	016	35690
2101	Cap, 470n, +80/-20%, 10v, Ceramic. . . .	3198	017	44740	2528	Cap, 22u, 20%, 50v, Electrolytic. . . .	3198	025	52290
2102	Cap, 22p, 5%, 50v, Ceramic.	3198	016	32290	2540	Cap, 15n, 10%, 50v, Ceramic.	3198	017	31530
2103	Cap, 330p, 10%, 50v, Ceramic.	3198	017	33310	2541	Cap, 4n7, 10%, 50v, Ceramic.	3198	017	34720
2104	Cap, 330p, 10%, 50v, Ceramic.	3198	017	33310	2542	Cap, 470n, +80/-20%, 10v, Ceramic. . . .	3198	017	44740
2105	Cap, 10u, 20%, 25v, Electrolytic.	3198	029	31090	2543	Cap, 1n, 10%, 50v, Ceramic.	3198	017	31020
2106	Cap, 10u, 20%, 25v, Electrolytic.	3198	029	31090	2560	Cap, 2n2, 10%, 50v, Ceramic.	3198	019	12220
2111	Cap, 22p, 5%, 50v, Ceramic.	3198	016	32290	2561	Cap, 2u2, 20%, 16v, Electrolytic. . . .	3198	026	22220
2112	Cap, 22p, 5%, 50v, Ceramic.	3198	016	32290	2562	Cap, 1n, 10%, 2000v, Ceramic.	3198	019	71020
2113	Cap, 22p, 5%, 50v, Ceramic.	3198	016	32290	2564	Cap, 47u, 20%, 160v, Electrolytic. . . .	2020	021	91358
2122	Cap, 330p, 10%, 50v, Ceramic.	3198	017	33310	2580	Cap, 47u, 20%, 25v, Electrolytic. . . .	3198	025	34790
2123	Cap, 1u, +80/-20%, 10v, Ceramic.	3198	017	41050	2585	Cap, 1n, 10%, 50v, Ceramic.	3198	017	31020
2124	Cap, 330p, 10%, 50v, Ceramic.	3198	017	33310	2602	Cap, 33p, 2%, 50v, Ceramic.	2020	552	96664
2125	Cap, 1u, +80/-20%, 10v, Ceramic.	3198	017	41050	2603	Cap, 33p, 2%, 50v, Ceramic.	2020	552	96664
2132	Cap, 1u, +80/-20%, 10v, Ceramic.	2020	552	95731	2604	Cap, 10u, 20%, 16v, Electrolytic. . . .	3198	028	21090
2134	Cap, 1u, +80/-20%, 10v, Ceramic.	2020	552	95731	2605	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040
2135	Cap, 22p, 5%, 50v, Ceramic.	3198	016	32290	2607	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040
2136	Cap, 22p, 5%, 50v, Ceramic.	3198	016	32290	2608	Cap, 1u, +80/-20%, 10v, Ceramic.	3198	017	41050
2161	Cap, 2u2, +80/-20%, 10v, Ceramic.	3198	017	22250	2609	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040
2163	Cap, 2u2, +80/-20%, 10v, Ceramic.	3198	017	22250	2612	Cap, 220u, 20%, 16v, Electrolytic. . . .	3198	025	22210
2201	Cap, 4n7, 10%, 50v, Ceramic.	3198	017	34720	2615	Cap, 820p, 10%, 50v, Ceramic.	2238	586	55622
2202	Cap, 330p, 5%, 50v, Ceramic.	3198	016	33310	2616	Cap, 10u, 20%, 16v, Electrolytic. . . .	3198	028	21090
2203	Cap, 470n, +80/-20%, 10v, Ceramic. . . .	3198	017	44740	2641	Cap, 1n, 5%, 25v, Ceramic.	3198	016	31020
2205	Cap, 10u, 20%, 50v, Electrolytic.	3198	028	51090	2642	Cap, 1n, 5%, 25v, Ceramic.	3198	016	31020
2206	Cap, 33p, 5%, 50v, Ceramic.	3198	016	33390	2643	Cap, 220p, 5%, 50v, Ceramic.	3198	016	32210
2207	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040	2691	Cap, 100u, 20%, 10v, Electrolytic. . . .	3198	025	11010
2208	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040	2821	Cap, 100u, 20%, 10v, Electrolytic. . . .	3198	025	11010
2209	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040	2822	Cap, 33n, 10%, 16v, Ceramic.	3198	017	33330
2210	Cap, 220n, 10%, 10v, Ceramic.	3198	017	32240	2823	Cap, 10u, 20%, 100v, Electrolytic. . . .	3198	025	71090
2211	Cap, 1n, 5%, 25v, Ceramic.	3198	016	31020	2824	Cap, 10u, 20%, 100v, Electrolytic. . . .	3198	025	71090
2212	Cap, 220n, 10%, 10v, Ceramic.	3198	017	32240	2825	Cap, 39n, 10%, 16v, Ceramic.	2238	786	55644
2231	Cap, 22n, 10%, 25v, Ceramic.	3198	017	32230	2826	Cap, 15n, 10%, 50v, Ceramic.	3198	017	31530
2232	Cap, 22n, 10%, 25v, Ceramic.	3198	017	32230	2827	Cap, 33n, 10%, 16v, Ceramic.	3198	017	33330
2233	Cap, 22n, 10%, 25v, Ceramic.	3198	017	32230	2828	Cap, 10n, 50v, CER2, 0603, X7R	3198	017	31030
2300	Cap, 330p, 5%, 50v, Ceramic.	3198	016	33310	2829	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040
2301	Cap, 390p, 5%, 50v, Ceramic.	3198	016	33910	2830	Cap, 10u, 20%, 100v, Electrolytic. . . .	3198	025	71090
2302	Cap, 390p, 5%, 50v, Ceramic.	3198	016	33910	2831	Cap, 10u, 20%, 100v, Electrolytic. . . .	3198	025	71090
2303	Cap, 1n, 10%, 2000v, Ceramic.	3198	019	71020	2832	Cap, 10u, 20%, 100v, Electrolytic. . . .	3198	025	71090
2304	Cap, 47n, 10%, 250v, Metalized Polyeste	2222	365	45473	2833	Cap, 10u, 20%, 100v, Electrolytic. . . .	3198	025	71090
2405	Cap, 47u, 20%, 160v, Electrolytic. . . .	2020	021	91139	2835	Cap, 10n, 50v, CER2, 0603, X7R	3198	017	31030
2406	Cap, 270n, 5%, 250v, Metalized Polyprop				2836	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040
	ylene.	2022	333	00258	2837	Cap, 470n, +80/-20%, 10v, Ceramic. . . .	3198	017	44740
2420	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040	2838	Cap, 10u, 20%, 100v, Electrolytic. . . .	3198	025	71090
2421	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040	2841	Cap, 4u7, +80/-20%, 10v, Ceramic. . . .	2020	552	96305
2423	Cap, 8n2, 5%, 1K6v, Metalized Polyprop				2844	Cap, 2u2, 20%, 50v, Electrolytic. . . .	3198	028	52280
	ylene.	2022	333	00267	2845	Cap, 4u7, 20%, 50v, Electrolytic. . . .	3198	028	54780
2424	Cap, 390p, 10%, 2000v, Ceramic.	2020	558	90482	2846	Cap, 10u, 20%, 100v, Electrolytic. . . .	3198	025	71090
2426	Cap, 1n, 5%, 25v, Ceramic.	3198	016	31020	2847	Cap, 100u, 20%, 16v, Electrolytic. . . .	3198	029	21010
2427	Cap, 100n, +80/-20%, 25v, Ceramic. . . .	3198	023	41040	2848	Cap, 330n, +80/-20%, 16v, Ceramic. . . .	2238	786	19856
2428	Cap, 47u, 20%, 16v, Electrolytic.	3198	029	24790	2849	Cap, 22n, 10%, 25v, Ceramic.	3198	017	32230
2429	Cap, 220n, +80/-20%, 16v, Ceramic. . . .	3198	017	42240	2850	Cap, 3u3, 20%, 50v, Electrolytic. . . .	2020	009	90103
2441	Cap, 15n, 10%, 50v, Polyester.	3198	014	01530	2851	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040
2444	Cap, 470u, 20%, 16v, Electrolytic. . . .	3198	025	24710	2852	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040
2446	Cap, 470u, 20%, 16v, Electrolytic. . . .	3198	025	24710	2855	Cap, 1u, +80/-20%, 10v, Ceramic.	3198	017	41050
2447	Cap, 22u, 20%, 250v, Electrolytic. . . .	2020	012	93596	2856	Cap, 1u, +80/-20%, 10v, Ceramic.	3198	017	41050
2452	Cap, 22n, 10%, 25v, Ceramic.	3198	017	32230	2857	Cap, 47n, 10%, 16v, Ceramic.	3198	017	34730
2455	Cap, 10u, 20%, 16v, Electrolytic.	3198	028	21090	2858	Cap, 1u, +80/-20%, 10v, Ceramic.	3198	017	41050

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

2859	Cap, 1u, +80/-20%, 10v, Ceramic.	2238	246	59863	3454	Res, 10K, 5%, 1/16W, Metalized Glass . . .	3198	021	31030
2860	Cap, 100n, 10%, 16v, Ceramic.	3198	017	31040	3455	Res, 680 ohm, 5%, 1/16W, Metalized Glas	3198	021	36810
2861	Cap, 220p, 5%, 50v, Ceramic.	3198	016	32210	3459	Res, 150K, 5%, 1/6W, Carbon Film . . .	3198	011	01540
2862	Cap, 220p, 5%, 50v, Ceramic.	3198	016	32210	3460	Res, 100K, 5%, 1/16W, Metalized Glass.	3198	021	31040
2863	Cap, 220p, 5%, 50v, Ceramic.	3198	016	32210	3461	Res, 2K2, 5%, 1/16W, Metalized Glass . .	3198	021	32220
2903	Cap, 1u, 20%, 50v, Electrolytic.	3198	025	51080	3462	Res, 1M, 5%, 1/16W, Metalized Glass. . .	3198	021	31050
2904	Cap, 470n, +80/-20%, 10v, Ceramic. . . .	3198	017	44740	3463	Res, 2K2, 5%, 1/16W, Metalized Glass . .	3198	021	32220
2906	Cap, 470n, +80/-20%, 10v, Ceramic. . . .	3198	017	44740	3464	Res, 2K2, 5%, 1/6W, Carbon Film. . . .	3198	011	02220
2908	Cap, 4u7, 20%, 35v, Electrolytic.	3198	028	44780	3465	Res, 1K, 5%, 1/16W, Metalized Glass. . .	3198	021	31020
2909	Cap, 10u, 20%, 50v, Electrolytic.	3198	025	51090	3466	Res, 1K, 5%, 1/16W, Metalized Glass. . .	3198	021	31020
2950	Cap, 1n5, 10%, 50v, Ceramic.	3198	017	31520	3468	Res, 330 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	03310
2951	Cap, 820p, 5%, 25v, Ceramic.	3198	016	38210	S 3470	Res, 1 ohm, 5%, 1/3W, Metal Film . . .	2306	204	03108
2952	Cap, 820p, 5%, 25v, Ceramic.	3198	016	38210	3471	Res, 220 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	02210
3001	Res, 1K5, 5%, 1/16W, Metalized Glass . .	3198	021	31520	3472	Res, 220 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	02210
3002	Res, 8K2, 5%, 1/16W, Metalized Glass . .	3198	021	38220	3473	Res, 2R7, 1%, 3/5W, Metal Film	2312	915	12708
3003	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198	021	31010	3473	Res, 3R3, 1%, 3/5W, Metal Film	2312	915	13308
3004	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198	021	31010	3474	Res, 3R3, 1%, 3/5W, Metal Film	2312	915	13308
3005	Res, 100 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	01010	3475	Res, 10K, 5%, 1/6W, Carbon Film. . . .	3198	011	01030
3101	Res, 68 ohm, 5%, 1/16W, Metalized Glass	3198	021	36890	3476	Res, 8K2, 5%, 1/6W, Carbon Film. . . .	3198	011	08220
3102	Res, 1K, 5%, 1/16W, Metalized Glass. . .	3198	021	31020	3478	Res, 1 ohm, 5%, 1/6W, Carbon Film. . . .	3198	011	01080
3103	Res, 150 ohm, 5%, 1/16W, Metalized Glas	3198	021	31510	3479	Res, 18 ohm, 5%, 1/3W, Metal Film. . . .	2306	204	03189
3104	Res, 220K, 5%, 1/16W, Metalized Glass. .	3198	021	32240	3480	Res, 39K, 5%, 1/16W, Metalized Glass . .	3198	021	33930
3105	Res, 150 ohm, 5%, 1/16W, Metalized Glas	3198	021	31510	3481	Res, 18K, 5%, 1/16W, Metalized Glass . .	3198	021	31830
3106	Res, 220K, 5%, 1/16W, Metalized Glass. .	3198	021	32240	3483	Res, 1M, 5%, 1/6W, Carbon Film. . . .	3198	011	01050
3111	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198	021	37590	3485	Res, 1K, 5%, 1/16W, Metalized Glass. . .	3198	021	31020
3112	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198	021	31010	3486	Res, 1K, 5%, 1/16W, Metalized Glass. . .	3198	021	31020
3113	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198	021	37590	3487	Res, 33K, 5%, 1/16W, Metalized Glass . .	3198	021	33330
3114	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198	021	31010	3488	Res, 1K5, 5%, 1/6W, Carbon Film. . . .	3198	011	01520
3115	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198	021	37590	3489	Res, 10K, 5%, 1/16W, Metalized Glass . .	3198	021	31030
3116	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198	021	31010	3490	Res, 3K3, 5%, 1/6W, Carbon Film. . . .	3198	011	03320
3122	Res, Zero ohm, "Chip" Jumper	3198	021	90030	3491	Res, 47K, 5%, 1/6W, Carbon Film. . . .	3198	011	04730
3123	Res, 150 ohm, 5%, 1/16W, Metalized Glas	3198	021	31510	3492	Res, 18K, 5%, 1/16W, Metalized Glass . .	3198	021	31830
3124	Res, 47K, 5%, 1/16W, Metalized Glass . .	3198	021	34730	3493	Res, 18 ohm, 5%, 1/3W, Metal Film. . . .	2306	204	03189
3125	Res, 150 ohm, 5%, 1/16W, Metalized Glas	3198	021	31510	3495	Res, 33 ohm, 5%, 1/6W, Carbon Film . . .	3198	011	03390
3126	Res, 47K, 5%, 1/16W, Metalized Glass . .	3198	021	34730	3497	Res, 390 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	03910
3135	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198	021	37590	3498	Res, 10K, 5%, 1/6W, Carbon Film. . . .	3198	011	01030
3136	Res, 100 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	01010	3499	Res, 27K, 5%, 1/16W, Metalized Glass . .	3198	021	32730
3137	Res, 75 ohm, 5%, 1/16W, Metalized Glass	3198	021	37590	3500	Res, 3M3, 5%, 1/2W, Metalized Glass. . .	2322	242	13335
3138	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198	021	31010	3501	Res, 3M3, 5%, 1/2W, Metalized Glass. . .	2322	242	13335
3161	Res, 33K, 5%, 1/16W, Metalized Glass . .	3198	021	33330	S 3502	NTC, B57237, 3W1, 4R7, 20%	2122	612	00055
3162	Res, 10K, 5%, 1/16W, Metalized Glass . .	3198	021	31030	3503	PTC, 3R, 144v, 20%	2122	663	00019
3163	Res, 1K, 5%, 1/16W, Metalized Glass. . .	3198	021	31020	3506	Res, 330K, 5%, 1/4W, Metalized Glass . .	2322	241	53334
3164	Res, 33K, 5%, 1/6W, Carbon Film. . . .	3198	011	03330	3508	Res, 1M5, 5%, 1/2W, Metalized Glass. . .	2322	242	13155
3201	Res, 3K9, 5%, 1/16W, Metalized Glass . .	3198	021	33920	3509	Res, 220 ohm, 20%, 1/2W, Carbon Film . .	3198	013	02210
3202	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198	021	31010	S 3510	Surge Protector.	2422	549	43073
3203	Res, 1K, 5%, 1/16W, Metalized Glass. . .	3198	021	31020	3519	Res, 3K3, 5%, 1/6W, Carbon Film. . . .	3198	011	03320
3204	Res, 82 ohm, 5%, 1/16W, Metalized Glass	2322	702	60829	3520	Res, 1K2, 5%, 1/16W, Metalized Glass . .	3198	021	31220
3205	Res, 270 ohm, 5%, 1/16W, Metalized Glas	3198	021	32710	3522	Res, 330K, 5%, 1/16W, Metalized Glass. .	3198	021	33340
3206	Res, 1K, 5%, 1/16W, Metalized Glass. . .	3198	021	31020	3523	Res, 100 ohm, 5%, 1/3W, Metal Film . . .	2306	204	03101
3207	Res, 390 ohm, 5%, 1/16W, Metalized Glas	3198	021	33910	3524	Res, Zero ohm, "Chip" Jumper	3198	021	90030
3208	Res, 560 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	05610	3525	Res, 1K, 5%, 1/16W, Metalized Glass. . .	3198	021	31020
3209	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198	021	34710	3526	Res, 0R15, 5%, 3/5W, Metal Film. . . .	3198	012	11570
3210	Res, 100 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	01010	3527	Res, 2K2, 5%, 1/3W, Metal Film	2306	204	03222
3231	Res, 560 ohm, 5%, 1/16W, Metalized Glas	3198	021	35610	3528	Res, 10K, 5%, 1/16W, Metalized Glass . .	3198	021	31030
3232	Res, 1K, 5%, 1/6W, Carbon Film.	3198	011	01020	3541	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198	021	34710
3300	Res, 18K, 5%, 2 1/2W, Metal Film	2322	195	63183	3542	Res, 1K5, 5%, 1/6W, Carbon Film. . . .	3198	011	01520
3301	Res, 1K5, 20%, 1/2W, Carbon Film	3198	013	01520	3543	Res, 82K, 1%, 3/5W, Metal Film	2312	915	18203
3303	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198	021	33310	3544	Res, 6K8, 1%, 3/5W, Metal Film	2312	915	16802
3304	Res, 18K, 5%, 2 1/2W, Metal Film	2322	195	63183	3545	Res, 2K2, 5%, 1/16W, Metalized Glass . .	3198	021	32220
3305	Res, 1K5, 20%, 1/2W, Carbon Film	3198	013	01520	3546	Res, 6K8, 5%, 1/6W, Carbon Film. . . .	3198	011	06820
3307	Res, 330 ohm, 5%, 1/16W, Metalized Glas	3198	021	33310	3547	Res, 22K, 5%, 1/16W, Metalized Glass . .	3198	021	32230
3308	Res, 18K, 5%, 2 1/2W, Metal Film	2322	195	63183	3548	Res, 15K, 5%, 1/16W, Metalized Glass . .	3198	021	31530
3309	Res, 1K5, 20%, 1/2W, Carbon Film	3198	013	01520	3549	Res, 220 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	02210
3311	Res, 390 ohm, 5%, 1/16W, Metalized Glas	3198	021	33910	3580	Res, 47K, 5%, 1/16W, Metalized Glass . .	3198	021	34730
3313	Res, 68 ohm, 5%, 1/3W, Metal Film. . . .	2306	204	03689	3581	Res, Zero ohm, "Chip" Jumper	3198	021	90030
3318	Res, 220 ohm, 5%, 1/3W, Metal Film . . .	2306	204	03221	3601	Res, 2K2, 5%, 1/16W, Metalized Glass . .	3198	021	32220
3319	Res, 1K5, 20%, 1/2W, Carbon Film	3198	013	01520	3602	Res, 2K2, 5%, 1/16W, Metalized Glass . .	3198	021	32220
3402	Res, 2K2, 5%, 1/2W, Metal Film	2306	207	03222	3603	Res, 2K2, 5%, 1/6W, Carbon Film. . . .	3198	011	02220
3403	Res, 2K2, 5%, 1/2W, Metal Film	2306	207	03222	3604	Res, 100 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	01010
3410	Res, 68K, 5%, 1/6W, Carbon Film.	3198	011	06830	3605	Res, 100 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	01010
3422	Res, 330K, 5%, 1/4W, Metalized Glass . .	2322	241	53334	3606	Res, 10K, 5%, 1/6W, Carbon Film. . . .	3198	011	01030
3424	Res, 47 ohm, 5%, 1 1/3W, Metal Film. . . .	3198	012	24790	3607	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198	021	31010
3425	Res, 220 ohm, 1%, 3/5W, Metal Film	2312	915	12201	3608	Res, 150K, 5%, 1/16W, Metalized Glass. .	3198	021	31540
3426	Res, 47 ohm, 5%, 1/6W, Carbon Film . . .	3198	011	04790	3618	Res, 1K, 5%, 1/6W, Carbon Film	3198	011	01020
3428	Res, 68 ohm, 5%, 1/6W, Carbon Film . . .	3198	011	06890	3619	Res, 100 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	01010
3430	Res, 1K, 5%, 1/16W, Metalized Glass. . .	3198	021	31020	3620	Res, 100 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	01010
3432	Res, 470 ohm, 5%, 1/16W, Metalized Glas	3198	021	34710	3621	Res, 100 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	01010
3439	Res, 150K, 1%, 3/5W, Metal Film.	2312	915	11504	3624	Res, 10K, 5%, 1/6W, Carbon Film. . . .	3198	011	01030
3440	Res, 33K, 1%, 1/16W, Metalized Glass . .	2322	704	63303	3633	Res, 1K, 5%, 1/6W, Carbon Film	3198	011	01020
3441	Res, 27K, 5%, 1/16W, Metalized Glass . .	3198	021	32730	3634	Res, 1K, 5%, 1/6W, Carbon Film	3198	011	01020
3442	Res, 100K, 5%, 1/6W, Carbon Film	3198	011	01040	3641	Res, 100 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	01010
3443	Res, 3R3, 5%, 1/3W, Metal Film	2306	204	03338	3642	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198	021	31010
3444	Res, 3R3, 5%, 1/3W, Metal Film	2306	204	03338	3643	Res, 100 ohm, 5%, 1/16W, Metalized Glas	3198	021	31010
S 3445	Res, 1 ohm, 5%, 1/3W, Metal Film	2306	204	03108	3644	Res, 4K7, 5%, 1/16W, Metalized Glass . .	3198	021	34720
S 3446	Res, 1 ohm, 5%, 1/3W, Metal Film	2306	204	03108	3646	Res, 1M, 5%, 1/16W, Metalized Glass. . .	3198	021	31050
S 3447	Res, 47K, 5%, 1/16W, Metalized Glass . .	3198	021	34730	3681	Res, 820 ohm, 1%, 1/16W, Metalized Glas	2322	704	68201
S 3448	Res, 1 ohm, 5%, 1/3W, Metal Film	2306	204	03108	3682	Res, 120 ohm, 1%, 1/16W, Metalized Glas	2322	704	61201
3449	Res, 27K, 5%, 1/6W, Carbon Film.	3198	011	02730	3683	Res, 120 ohm, 5%, 1/6W, Carbon Film. . .	3198	011	01210
3450	Res, 27K, 5%, 1/6W, Carbon Film.	3198	011	02730	3685	Res, 200 ohm, 1%, 1/16W, Metalized Glas	2322	704	62001
3451	Res, 1K8, 5%, 1/16W, Metalized Glass . .	3198	021	31820	3686	Res, 430 ohm, 1%, 1/16W, Metalized Glas	2322	704	64301
3452	Res, 1M, 5%, 1/6W, Carbon Film	3198	011	01050	3687	Res, 2K2, 1%, 1/16W, Metalized Glass . .	2322	704	62202
3453	Res, 100K, 5%, 1/16W, Metalized Glass. .	3198	021	31040	3688	Res, 200 ohm, 1%, 1/16W, Metalized Glas	2322	704	62001

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0253	Socket, Phone, 1 Pin	2422	026	04747
0254	Connector, 5 Pin	2422	025	12481
0255	Connector, 4 Pin	2422	025	15847
1810	Connector, 3 Pin	2412	020	00725
2171	Cap, 330p, 10%, 50v, Ceramic	3198	019	13310
2172	Cap, 330p, 10%, 50v, Ceramic	3198	019	13310
2175	Cap, 22p, 5%, 50v, Ceramic	3198	019	02290
2176	Cap, 470p, 10%, 50v, Ceramic	3198	019	14710
2177	Cap, 10u, 20%, 50v, Electrolytic	3198	025	51090
2178	Cap, 470p, 10%, 50v, Ceramic	3198	019	14710
2179	Cap, 10u, 20%, 50v, Electrolytic	3198	025	51090
3142	Res, 100 ohm, 5%, 1/6W, Carbon Film.	3198	011	01010
3143	Res, 75 ohm, 5%, 1/6W, Carbon Film.	3198	011	07590
3144	Res, 150 ohm, 5%, 1/6W, Carbon Film.	3198	011	01510
3145	Res, 47K, 5%, 1/6W, Carbon Film.	3198	011	04730
3146	Res, 150 ohm, 5%, 1/6W, Carbon Film.	3198	011	01510
3147	Res, 47K, 5%, 1/6W, Carbon Film.	3198	011	04730
3148	Res, 270 ohm, 5%, 1/6W, Carbon Film.	3198	011	02710
3149	Res, 270 ohm, 5%, 1/6W, Carbon Film.	3198	011	02710
6171	Zener Diode, 6.8 volt.	3198	010	26880
CBA	Side Jack Panel.	3141	058	64941