

HITACHI

SERVICE MANUAL

NTSC NA6DV CHASSIS

PA

No. 0118

27CX29B501
27CX29B511

R/C:

HL00761

CAUTION: Before servicing this chassis, it is important that the service technician read the "Safety Precaution" and "Product Safety Notices" in this Service Manual.

This television will display television Closed Captioning (☐ CC or ☐) in accordance with paragraph 15.119 of the FCC rules.

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SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

SOLID STATE COLOR TELEVISION

JUNE 1999

HHEA-MANUFACTURING DIVISION

SAFETY PRECAUTIONS

NOTICE: Comply with all cautions and safety-related notes located on or inside the cabinet and on the chassis or picture tube.

WARNING: Since the chassis of this receiver is connected to one side of the AC power supply during operation, whenever the receiver is plugged in, service should not be attempted by anyone unfamiliar with the precautions necessary when working on this type of receiver.

The following precautions should be observed:

1. Do not install, remove, or handle the picture tube in any manner unless shatterproof goggles are worn. People not so equipped should be kept away from the picture tube while handling.
2. When service is required, an isolation transformer should be inserted between power line and the receiver before any service is performed on a "HOT" chassis receiver.
3. When replacing a chassis in the receiver, all protective devices must be put back in place, such as barriers, nonmetallic knobs, adjustment and compartment covershields, isolation resistors, capacitors, etc.
4. When service is required, observe the original lead dress in the high voltage circuitry area.
5. Always use the manufacturer's replacement components. Critical components as indicated on the circuit diagram should not be replaced by another manufacturer's. Furthermore, where a short circuit has occurred, replace those components that indicate evidence of overheating.
6. Before returning a serviced receiver to the customer, the service technician must thoroughly test the unit to be certain that it is completely safe to operate without danger of electrical shock, and be sure that no protective device built into the receiver has become defective, or inadvertently defeated during servicing.

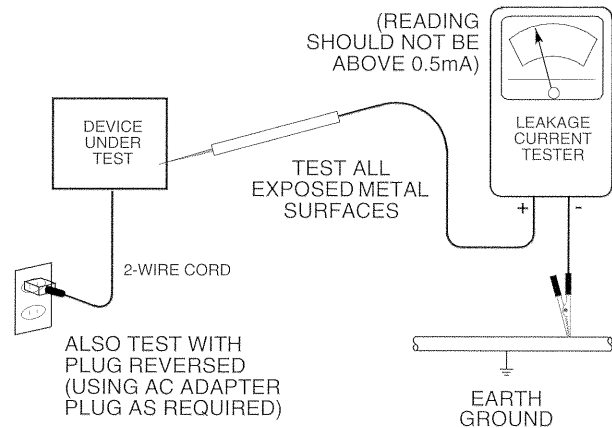
Therefore, the following checks should be performed for the continued protection of the customer and service technician.

Leakage Current Cold Check

With the AC plug removed from the 120V AC 60Hz source, place a jumper across the two plug prongs. Turn the AC power switch ON. Using an insulation tester (DC500V), connect one lead to the jumpered AC plug and touch the other lead to each exposed metal part (antennas, screwheads, metal overlays, control shafts, etc.), particularly any exposed metal part having a return path to the chassis should have a minimum resistor reading of $0.24\text{M}\Omega$ and a maximum resistor reading of $12\text{M}\Omega$. Any resistance value below or above this range indicates an abnormality which requires corrective action. An exposed metal part not having a return path to the chassis will indicate an open circuit.

Leakage Current Hot Check

Plug the AC cord directly into a 120V AC 60Hz outlet (do not use an isolated transformer for this check). Turn the AC power ON. Using a Leakage Current Tester (Simpson's Model 229 or equivalent), measure for current from all exposed metal parts of the cabinet (antennas, screwheads, overlays, control shafts, etc.). Any current measured must not exceed 0.5 milliamps.



AC LEAKAGE TEST

ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND MUST BE CORRECTED BEFORE RETURNING THE RECEIVER TO THE CUSTOMER.

High voltage

This receiver is provided with a hold down circuit for clearly indicating that voltage has increased in excess of a predetermined value. Comply with all notes described in this service manual regarding this hold down circuit when servicing, so that this hold down circuit is operated correctly.

Serviceman Warning

With minimum BRIGHTNESS, PICTURE, SHARPNESS, and COLOR, the operating high voltage in this receiver is lower than $29.25\text{kV} \pm 1.25\text{kV}$. In case any component having influence on the high voltage is replaced, confirm that high voltage with minimum BRIGHTNESS, PICTURE, SHARPNESS, and COLOR is lower than $29.25\text{kV} \pm 1.25\text{kV}$. To measure high voltage use a High Impedance High Voltage meter. Connect (-) to chassis earth and (+) to the CRT ANODE button. (See the connection diagram on page 4.)


Note: Turn power switch OFF without fail before the connection to the Anode Button

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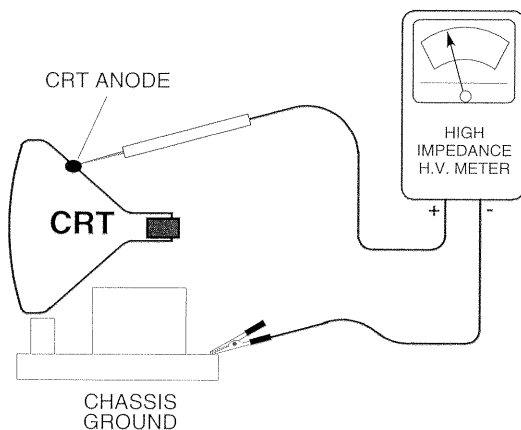
PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in HITACHI television receivers have special safety-related characteristics. These 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. Replacement parts which have these special safety characteristics are identified in this Service manual.

Electrical components having such features are identified with a  mark in the schematics and parts list in this Service Manual.

The use of a substitute replacement component which does not have the same safety characteristics as the HITACHI recommended replacement component, shown in the parts list in this Service Manual, may create shock, fire, X-radiation, or other hazards.

Production safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult the current HITACHI Service Manual. A subscription to, or additional copies of HITACHI Service Manuals may be obtained at a nominal charge from HITACHI Sales Corporation.



X-Radiation

TUBE: The primary source of X-Radiation in this receiver is the picture tube. The 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 HITACHI-approved type.

When troubleshooting and making test measurements in a receiver with excessive high voltage problem, avoid being unnecessarily close to the picture tube and high voltage components.

Do not operate the chassis longer than is necessary to locate the cause of excessive voltage.


This Service Manual is intended for qualified service technicians; it is not meant for the casual do-it-yourselfer. Qualified technicians have the necessary test equipment and tools, and have been trained to properly and safely repair complex products such as those covered by this manual. Improperly performed repairs can adversely affect the safety and reliability of the product and may void warranty. Consumers should not risk trying to do the necessary repairs and should refer to a qualified service technician.

WARNING

Lead in solder used in this product is listed by the California Health and Welfare agency as a known reproductive toxicant which may cause birth defects or other reproductive harm (California Health and Safety Code, Section 25249.5).

When servicing or handling circuit boards and other components which contain lead in solder, avoid unprotected skin contact with solder. Also, when soldering do not inhale any smoke or fumes produced.

SAFETY NOTICE USE ISOLATION TRANSFORMER WHEN SERVICING

Components having special safety characteristics identified by  on the parts list in this service manual and its supplements and bulletins. Before servicing this product, it is important that the service technician read and follow the "Safety Precautions" and the "Product Safety Notices" in this Service Manual.

For continued X-Radiation protection, replace picture tube with original type or HITACHI equivalent type.

POWER SOURCE

This television receiver is designed to operate on 120Volt/60Hz, AC house current. Insert the power cord into a 120Volts/60Hz outlet.

NEVER CONNECT THE TV TO OTHER THAN THE SPECIFIED VOLTAGE OR TO DIRECT CURRENT.

Service Notes

IMPORTANT: To protect against possible damage to the solid state devices due to arcing or static discharge, make certain that all ground wires and CRT DAG wire are securely connected.

CAUTION: The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the Receiver to avoid damage to the test equipment or to the chassis. Connect the test equipment to the proper ground (⚡) or (⚡) when servicing, or incorrect voltages will be measured.

WARNING: This Receiver has been designed to meet or exceed applicable safety and X-ray radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to X-ray radiation and shock and fire hazard, parts indicated with the symbol ⚠ on the schematic must be replaced with identical parts. Order parts from the manufacturer's parts center using the parts numbers shown in this service manual, or provide the chassis number and the part reference number.

For optimum performance and reliability, all other parts should be replaced with components of identical specification.

Horizontal Oscillator Disable Circuit

This chassis employs a special circuit to protect against excessive high voltage and beam current. If, for any reason, the high voltage and beam current exceed a predetermined level this protective circuit activates and detunes the horizontal oscillator that limits the high voltage. The over-voltage protection circuit is not adjustable. However, if components indicated by the symbol ⚠ on the schematic in either the horizontal sweep system or the over-voltage protection circuit itself are changed, the operation of the circuit should be checked using the following procedure:

Equipment needed to check the disabled circuit:

1. Voltmeter (0 - 200V scale)
2. High Voltage Meter (0- 50kV)
3. Variac or Isolation Transformer

Procedure:

1. Tune in a station to verify that the horizontal is in sync.
 2. Obtain a Monoscope pattern or a signal generator crosshatch pattern
 3. Connect the voltmeter (-) lead to TPD2 and the (+) lead to TPD1 (junction of D555 anode, R556 & R557). Set **Bright** level to zero (0) and **Picture** for a 1.8 volt reading on the voltmeter.
 4. Turn the Receiver OFF. Connect a jumper across IC803 pin 3 and pin 4. Apply +9V DC to cathode of D001.
 5. Reduce the AC supply voltage to approximately 45V. Connect the high voltage meter to the CRT anode. (H.V. button).
- Note:** Use the Dag Ground (C10 on the CRT Board) to connect the (-) lead of the meter.
6. Turn the Receiver ON. Slowly increase the AC supply voltage and verify that the high voltages does not exceed **37.1kV**, when horizontal; just begins to pull out of sync. If the high voltage is not within the specified limit, the cause must be determined and corrected before the Receiver is returned to the customer.

Receiver Feature Table

FEATURE/MODEL	27CX29B-501	27CX29B-511
Chassis	NA6DV	NA6DV
Tuning system	40K	40K
# of channels	181	181
Menu language	Eng/Span/Fr	Eng/Span/Fr
Closed Caption	X	X
V-Chip	X	X
75 Ω input	X	X
Remote Model #	HL00761	HL00761
Picture tube	M68LGLO61X	M68LGLO61X
Notch filter	P	P
V/A norm (X=both)	V	V
MTS/SAP/DBX	X	X
AI Sound (DXL:*,SMPL:X)	X	X
Built-in audio power	1.5Wx2 (10%)	1.5Wx2 (10%)
# of speakers	2	2
A/V in (rear/front)	1(1/0)	1(1/0)
Dimensions mm (HxWxD) in	600x665x534 23.62x26.18x21	600x661x534 23.62x26x21
Weight (kg/lbs)	34.25/75.35	34.56/76
Power source (V/Hz)	120/60	120/60
Anode voltage	29.25kV \pm 1.25kV	29.25kV \pm 1.25kV
Video input jack	1V _{p-p} 75 Ω , phono jack	1V _{p-p} 75 Ω , phono jack
Audio input jack	500mV RMS 47k Ω	500mV RMS 47k Ω
A-Board TNP2AH012	DU	DU
C-Board TNP2AA047	AB	AB

Table 1. Receiver Features

Specifications are subject to change without notice or obligation.
Dimensions and weights are approximate.

Location of Controls (Receiver)



Figure 1. Location of Controls Receiver
Quick Reference Control Operation

Quick Reference Control Operation	
1	Power Button - Press to turn ON or OFF.
2	Volume Buttons - Press to adjust Sound Level, or to adjust Audio Menus, Video Menus, and select operating features when menus are displayed
3	Channel Buttons - Press to select programmed channels. Press to highlight desired features when menus are displayed.
4	Menu Button - Press to display Main Menu and access On Screen feature and Adjustment Menus.
5	Input Button - Press to select TV or one of two Video Inputs.

Location of Controls (Remote)

Power Button

Press to turn On or Off.

Mute Button

Press to mute sound. A second press resumes sound. Press also to toggle Closed Captioning.

Input Button

Press to select TV or video input.

Menu Button

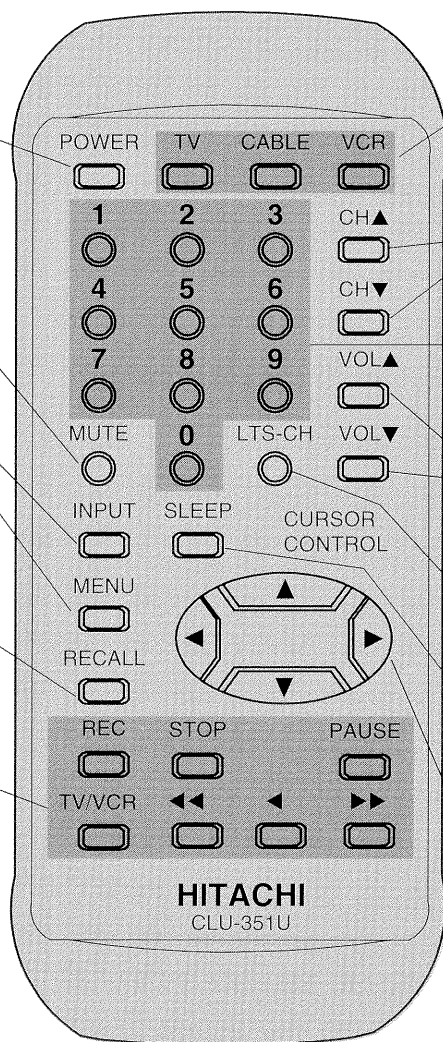
Press to display main menu and access or exit onscreen features or Adjustment menus.

Recall Button

Press to display Time status of sleep timer, channel, video mode, channel I.D. and audio mode.

Precoded VCR Buttons

These buttons transmit the chosen precoded VCR codes.



Mode Buttons

These buttons allow the remote to control your TV, VCR, or cable box depending on which mode button is selected.

Channel Buttons

Press to select channels.

Keypad Buttons

Press desired channel number to access channel.

Volume Buttons

Press to adjust TV sound level.

LST-CH (Last Channel) Button

Press to switch to the previously tuned channel.

Sleep Button















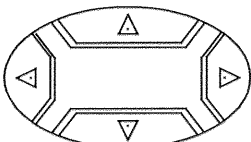




Press to turn TV Off in 30, 60, or 90 minutes.

















Cursor Button

Press to adjust Audio menus, Video menus, and select operating features when menus are displayed.

Figure 2. Location of Controls (Remote)

Remote Control Quick Reference Functional Key Chart

Key	Operates	
POWER 	TV CABLE VCR	Turns TV On and Off Turns Cable Box On and Off Turns VCR On and Off
INPUT 	TV	Selects the TV Input Mode
MENU 	TV	Activates and Exits TV Menus
<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; justify-content: space-around; width: 100%;"> 123 </div> <div style="display: flex; justify-content: space-around; width: 100%;">    </div> <div style="display: flex; justify-content: space-around; width: 100%;"> 456 </div> <div style="display: flex; justify-content: space-around; width: 100%;">    </div> <div style="display: flex; justify-content: space-around; width: 100%;"> 789 </div> <div style="display: flex; justify-content: space-around; width: 100%;">    </div> <div style="display: flex; justify-content: center; width: 100%;"> 0 </div> <div style="display: flex; justify-content: center; width: 100%;">  </div> </div>	TV VCR CABLE	Selects Channel Selects code in Video Lock Menu Selects Channel in Channel I.D. Menu Selects Channel in Timer Menu Selects Precoded VCR codes when programming remote Selects Precoded CABLE codes when programming remote
RECALL 	TV	Display Channel, Time, Channel I.D. and Audio Mode
	TV	Menu Navigation
CH ▲  CH ▼ 	TV CABLE	Channel Up/Down Channel Up/Down
VOL ▲  VOL ▼ 	TV	Volume Up/Down

Key	Operates	
SLEEP 	TV	Selects 30, 60 or 90 minutes for Automatic Turn Off. Also use to turn Sleep Timer off by selecting NO
MUTE 	TV	Mutes TV Audio Access and exit Closed Captioning
LST-CH 	TV	Select previously tuned channel
Mode Selection Buttons TV  CABLE  VCR 	TV CABLE VCR	Selects TV Mode for the remote control Selects Cable Mode for the remote control Selects VCR Mode for the remote control
Standard VCR Control Buttons REC        STOP  PAUSE  TV/VCR 	VCR VCR VCR VCR VCR VCR VCR VCR CABLE	Record Rewind Fast Forward Play Stop Pause Selects TV or VCR Mode Selects A/B Mode

Using the Remote to Control VCR and Cable box Functions

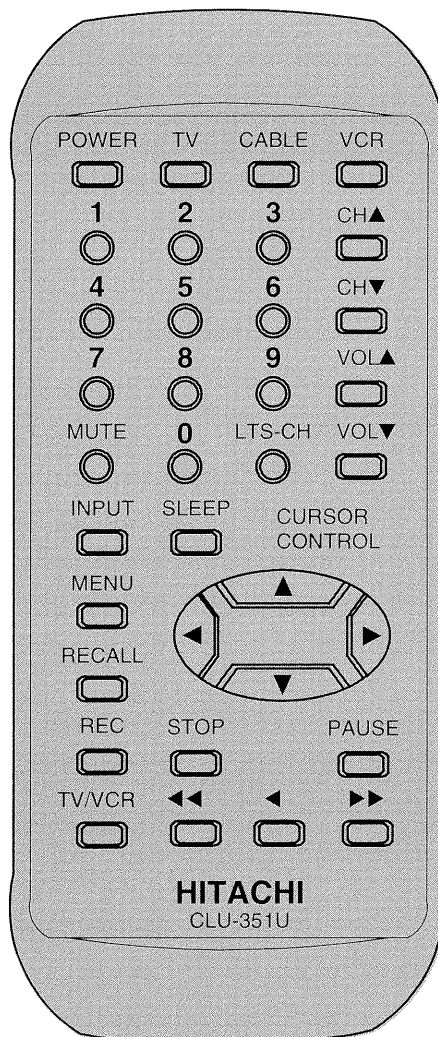
Operating the Precoded Function for Your VCR

This remote is designed to operate different types of VCRs. You must first program the remote to match the remote system in your VCR. (Refer to the VCR Code Index section.)

1. Turn on your VCR.
2. Aim the remote control at the front of your VCR.
3. Press the VCR button to switch to VCR precoded mode.
4. While holding down the VCR button, enter the 2-digit preset code that matches your VCR*. The remote will turn on your VCR when the correct 2-digit preset code is entered. When this occurs, the remote control is programmed for your VCR. If your VCR does not turn off after 5 seconds, try a different 2-digit preset code.
5. The remote will now control your VCR.

NOTES:

- If your VCR cannot be operated after performing the above procedures, this means that your VCR codes have not been precoded into the remote.
- In the unlikely event that your VCR cannot be operated after performing the above procedures, consult your VCR operating guide.
- The remote control will remember the codes you have programmed in until the batteries are removed. After replacing the batteries repeat the entire programming procedure stated above.
- If your VCR does not have a power function, the remote will issue the CHANNEL UP function.



* (Codes are listed on page 12)

Operating the Precoded Function for Your Cable Box

1. Turn on your cable box.
2. Aim the remote control at the front of your cable box.
3. Press the cable box button to switch to cable box precoded mode.
4. While holding down the CABLE button, enter the 2-digit preset code that matches your cable box*. The remote will turn on your cable box when the correct 2-digit preset code is entered. When this occurs, the remote control is programmed for your cable box. If your cable box does not turn off after 5 seconds, try a different 2-digit preset code.
5. The remote will now control your cable box.

NOTES:

- If your cable box cannot be operated after performing the above procedures, this means that your cable box codes have not been precoded into the remote.
- In the unlikely event that your cable box cannot be operated after performing the above procedures, consult your cable box operating guide.
- The remote control will remember the codes you have programmed in until the batteries are removed. After replacing the batteries repeat the entire programming procedure stated above.
- If your cable box does not have a power function, the remote will issue the CHANNEL UP function.
- For some models, the remote control's channel ▲ and ▼ will control the cable box channel. The number buttons will control your television channel although you are in cable mode.

VCR and Cable Box Codes Index

The remote is capable of operating many brands of VCRs and cable boxes. You must first program the remote control to match the remote system in your VCR or cable box.

NOTE: The remote control memory is limited. Some models of VCRs or cable boxes may not operate. The remote control is not designed to control all features that are available in all models.

Code Index For VCRs


VCR Brand	Code (s)
Emerson	00,01,10,16,23,33,37,40, 43
Funai	00
GE	09,22
Hitachi	00,14,15
JVC	14,26
Magnavox	09,12,28
Mitsubishi	16,23,26,45
Panasonic	09,35,46
RCA	15,22
Sony	06,07,08,09
Toshiba	16,17,42
Zenith	07,08,12

Code Index for Cable Boxes

Cable Box Brand	Code(s)
G.I.	09
Jerrold	03, 09, 10, 12, 13, 51
Magnavox	40
Philips	40
Pioneer	39
Samsung	39
Scientific Atlantic	04, 06, 14, 52, 56
Zenith	00

Disassembly for Service

Back Cover

Remove all the screws marked with an arrow() from the back of the Receiver.

Note: *Screw configuration, type, and number of screws vary depending on the model of the Receiver serviced and the application; various models are covered in this Manual. Use same hardware when reassembling the receiver.*

- 3 screws at the top edge of the Receiver.
- 1 screw at each lower corner of the Receiver.
- 1 screw by the retainer plate of the AC power cord.
- 1 screw by the Flyback assembly.
- 1 screw by the A/V jacks.

A-Board - Main Chassis

1. Slide the chassis completely out of the guide rails.
2. Stand the Receiver on its edge. The underside of the board is completely accessible for component replacement.

Note: *Some tie-wraps that secure the wire dressings may need to be unfastened for chassis removal.*

C-Board - CRT Output

Plugs into the socket on the CRT neck.

Speakers

Each speaker is secured to the cabinet's front with 4 screws.

Keyboard Push Button Assembly

Fastened to the inside of the cabinet front with up to 3 screws.

Disassembly for CRT Replacement

1. Discharge the CRT as instructed in the **Safety Precautions** (see page 2).
2. Disconnect the yoke (DY) plug, degaussing coil (DEG) plug and the CRT 2nd anode button from the main board.
3. Remove the C-Board from the CRT base and unplug the black wire (CRT dag ground) C10.
4. Disconnect the A11, A12, and Speakers plugs from the A-Board.
5. Lift the Main Chassis (A-Board) and all mounted boards completely out with the CRT Board attached.

CRT Replacement

1. Perform **Disassembly for CRT Replacement** procedure.
2. Insure that the CRT H.V. Anode button is discharged before handling the CRT. Read the **Safety Precautions** (see page 2) on handling the picture tube.
3. Remove the components from the CRT neck and place the cabinet face down on a soft pad.
4. Note the original order for the CRT mounting hardware as they are remove from the CRT mounting brackets at each corner of the CRT.
5. Remove the CRT with the degaussing coil and the dag ground braid attached.
6. Note the original locations and mounting of the degaussing coil and the dag ground assembly to insure proper reinstallation on the replacement CRT.
To remove and re-mount the degaussing coil:
The degaussing coil is held in place by clampers fastened to the CRT corner ears. These clampers must be installed onto the replacement CRT prior to mounting the degaussing coil.
To remove and re-mount the dag ground braid:
 - a. Unhook the coil spring from the bottom corners of the CRT ears.
 - b. Release the braid loop from the upper corners of the CRT ears.
7. Mount the dag ground braid on the replacement CRT. Position the degaussing coil with new ties. Dress coil as was on the original CRT.
8. Replace the components on CRT neck and re-install into cabinet. Verify that all ground wires and circuit board plugs get connected.

Chassis Service Adjustment Procedures

All service adjustments are factory preset and should not require adjustment unless controls and/or associated components are replaced.

Note: Connect the (-) lead of the voltmeter to the appropriate ground. Use IC803's heat sink when the HOT ground symbol (⚡) is used. Otherwise, use COLD ground (⚡) — Tuner shield, IC451's heat sink or FA2.

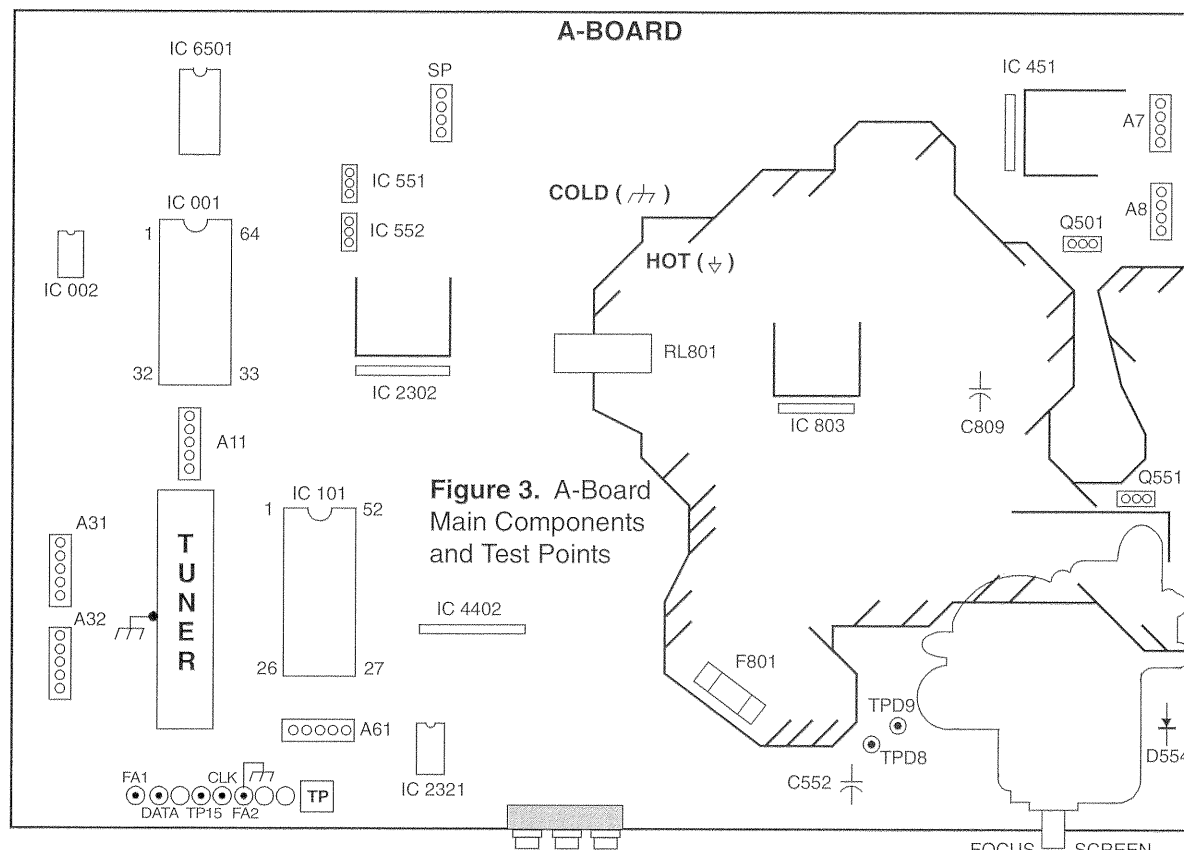


Figure 3. A-Board Main Components and Test Points

MOMENTARILY CONNECT A JUMPER FOR ENTERING SERVICE MODE (FA1 to FA2)

131.0V B+ Voltage Confirmation

1. Set the **Bright** and the **Picture** to Minimum by using the Picture Menu.
2. Connect the DVM between C809(+ side) and cold ground (⚡).
3. Confirm that B+ voltage is **131.0V ± 2.5V**. This voltage supplies B+ to the Horizontal Output & Flyback circuits.

Source Voltage Chart

120V AC line input. Set the **Bright** and the **Picture** to Minimum by using the Picture Menu. Use cold ground (⚡) for the (-) lead of the DVM.

C572 (+)	+5.0V ± 0.25V
TPD9	+13.0V ± 2V
C552(+)	+8.0V ± 1V
TPD8	+27.4V ± 2V
IC551 pin3	+9.0V ± 0.5V
CATHODE OF D554	+220.0V ± 5V

Adjust Picture Menu for normalized video adjustments.

B+ 5V Source Voltages

Volatile 5V:

C572, + side = IC552 pin 3, Tuner BP, IC101 (IF 5V).

MPU 5V:

Emitter Q002 = IC001 (V_{DD}, AV_{DD}).

Standby 5V:

IC001 (key in 1), I²C EEPROM (IC002), Remote Receiver.

B+ 9V Source Voltage

IC551 pin 3 = IC101 (IF 9V), Tuner (BM).

B+ 12V (Stand- by) *Note: +16V when power is on*

Cathode D001 = RL801 (on-off relay), Q002 (+5V Reg).

High Voltage Check

1. Select an active TV channel and confirm that horizontal is in sync.
2. Adjust Brightness and Picture using Picture Icon menu so video just disappears.
3. Confirm B+ 131V is within limit.
4. Using a high voltage meter confirm that the High Voltage is **29.25kV ± 1.25kV**.

Purity and Convergence Procedure

Adjustment is necessary only if the CRT or the deflection yoke is replaced or if the setting was disturbed. The complete procedure consists of:

1. Initial static convergence.
2. Setting the purity.
3. Final static convergence.

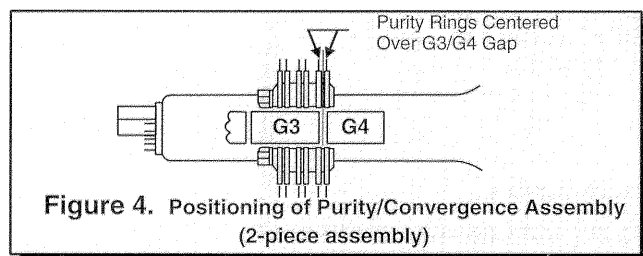
When the CRT or the Yoke is Replaced

Place the yoke on the CRT neck (do not tighten the clamp).

For a 2-piece assembly (see Fig. 4):

Position purity/convergence assembly as shown and tighten clamp snugly. Cut the hot-melt glue seal on assembly and place like tabs of purity device together at 12 o'clock to reduce its magnetic field effect. Manually degauss the CRT.

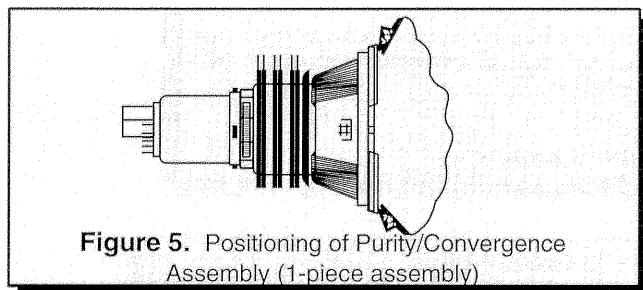
Turn the Receiver ON and slide the deflection yoke back and forth on the neck of the CRT. Stop at the position that produces a near white, uniform raster.



For a 1-piece assembly (see Fig. 5):

Place like tabs of purity devices together at 12 O'clock to reduce any magnetic field effect. Manually degauss the set.

Connect a Black/White pattern generator and tune the receiver to the signal. Slide the deflection yoke & purity ring assembly back and forth on the CRT neck. Stop at a position that produces a near white signal.



Initial Center Static Convergence

Connect a dot/crosshatch generator to the Receiver and tune in signal. Observe misconvergence at center of the screen only.

Adjust the 4 pole magnet (center rings); separate tabs and rotate to converge blue with red.

Adjust the 6 pole magnet (rear rings); separate tabs and rotate to converge blue and red (magenta) with green.

Note: Precise convergence at this point is not important.

Purity Adjustment

When the Receiver is in the Servicemen Mode for making electronic adjustments, press the **Recall** button on the Remote Control to enter Purity Check. (See **Service Adjustments Electronic Controls.**)

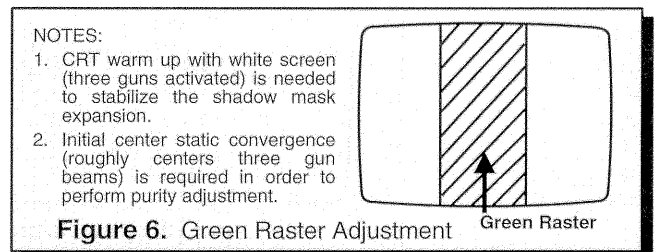
Operate the Receiver for 60 minutes using the first Purity Check field (white screen) to stabilize the CRT. Fully degauss the Receiver by using an external degaussing coil.

Press the **Recall** button on the Remote Control again until the Purity Check (green screen) appears.

For a 2-piece assembly (see Fig. 4):

Loosen the deflection yoke clamp screw and move the deflection yoke back as close to the purity magnet as possible.

Adjust the front rings to set the vertical green raster precisely at the center of the screen (see Fig. 6).



Slowly move the deflection yoke forward until the best overall green screen is displayed.

For a 1-piece assembly (see Fig. 5):

Slowly move the deflection yoke and purity rings assembly toward the CRT board and adjust the purity magnet rings to set vertical green raster at center of screen (see Fig. 6).

Gradually move the deflection yoke & purity rings forward and adjust for best overall green screen.

Continue from here for either assemblies:

Tighten the deflection yoke clamp screw.

Press the **Recall** button on the Remote Control again until the purity check (blue screen) and (red screen) appear and observe that good purity is obtained on each respective field.

Press the **Recall** button on the Remote Control again until Purity check (white screen) appears. Observe the screen for uniform white. If purity has not been achieved, repeat the above procedure.

Final Convergence Procedure (see Fig. 7 through Fig. 9):

Note: Vertical size and focus adjustments must be completed prior to performing the convergence adjustment. Connect a dot pattern generator to the Receiver. The **Brightness** level should not be higher than necessary to obtain a clear pattern.

Converge the red and the blue dots at the center of the screen by rotating the 4 pole (R with B) Static Convergence Magnets.

Align The converged red/blue dots with the green dots at the center of the screen by rotating the 6 pole (R/B with G) Static Convergence Magnets. Melt wax with soldering iron to reseal the magnets.

Slightly tilt vertically and horizontally (do not rotate) the deflection yoke to obtain a good overall convergence. If convergence is not reached at the edges, insert permalloy (see following section) from the DY corners to achieve proper convergence. Recheck for purity and readjust if necessary.

Permalloy Convergence Corrector Strip (Part No. 0FMK014ZZ)

This strip is used in some sets to match the yoke and CRT for optimum convergence. If the yoke or CRT is replaced, the strip may not be required. First converge the set without the strip and observe the corners.

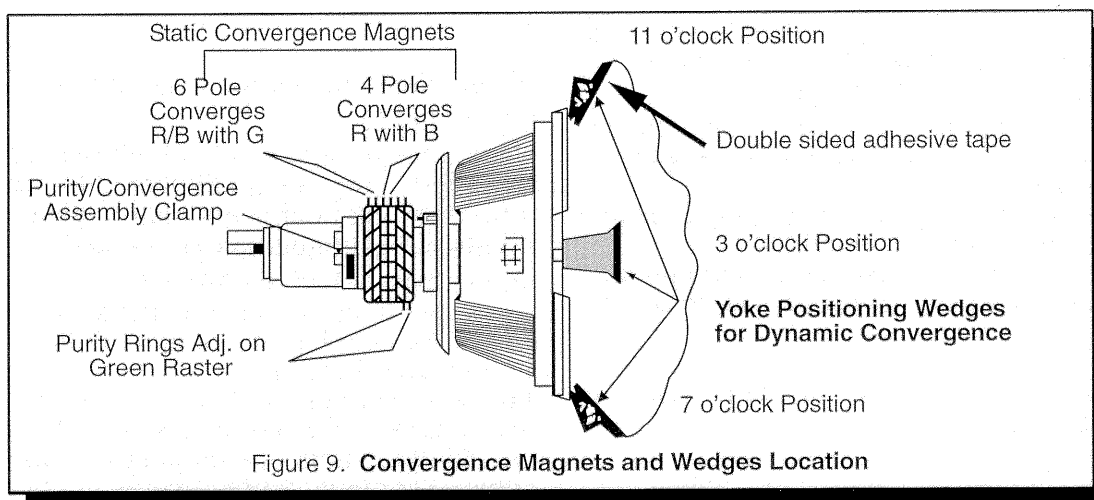
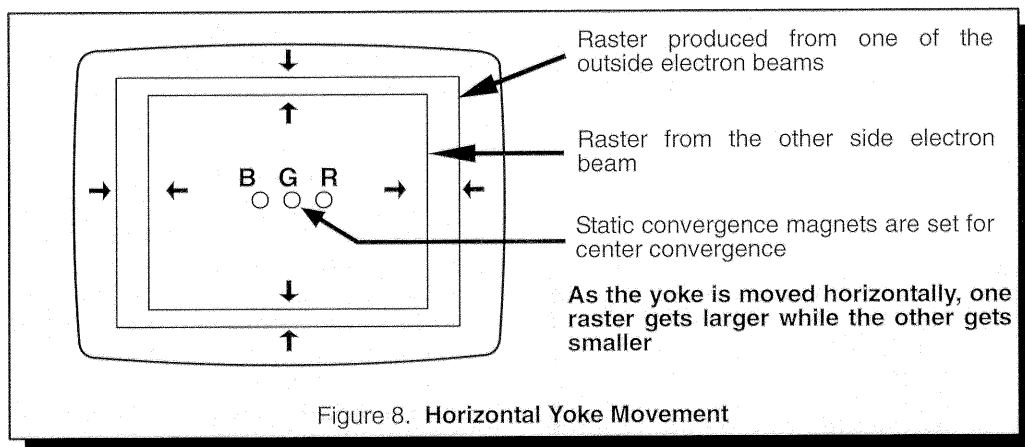
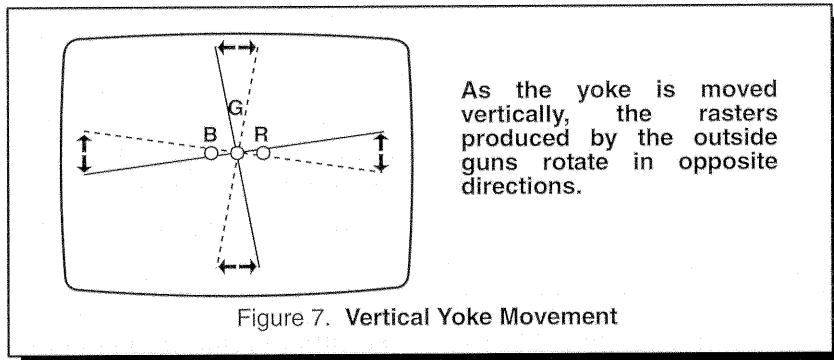
After vertical adjustment of the yoke, insert wedge at 11 o'clock position, then make the horizontal tilt adjustment.

Secure the deflection yoke by inserting two side wedges at 3 and 7 o'clock positions.

Apply adhesive between tab (thin portion) of wedge and CRT and place tape over the tab to secure to the CRT.

If correction is needed:

1. Place strip between CRT and yoke, in quadrant needing correction. Slowly move it around for desired results.
2. Press adhesive tightly to the CRT and secure with tape.



Serviceman Mode (Electronic Controls)

This Receiver has electronic technology using the I²C Bus Concept. It performs as a control function and it replaces many mechanical controls. Instead of adjusting mechanical controls individually, many of the control functions are now performed by using "On Screen Display Menu". (The **Serviceman Adjustment Mode**.)

Note: It is suggested that the technician reads all the way through and understand the following procedure for Entering/Exiting the **Serviceman Adjustment Mode**; then proceed with the instructions working with the Receiver. When becoming familiar with the procedure, the Flow Chart for Serviceman Mode may be used as a quick guide.

Quick Entry to Serviceman Mode:

At times when minor adjustments need to be done to the electronic controls, the method of Entering the serviceman Mode without removal of the cabinet back is as follows using the Remote Control:

1. Select SET-UP icon and select CABLE mode.
2. Select TIMER icon and set SLEEP time for 30 Min.
3. Press MENU button twice to exit menus.
4. Tune to the Channel 124.
5. Adjust VOLUME to minimum (0).
6. Press the VOL ◀ button (decrease) **on Receiver**. Red "CHK" appears in upper corner.

To toggle between Aging and Serviceman modes:

While the "CHK" is displayed on the left top corner of the CRT, pressing the Menu and the Volume Up buttons on the Receiver simultaneously will toggle between the modes. Red "CHK" for Serviceman and yellow "CHK" for Aging.

7. **Press** the **Power** Button on the **Remote Control** to select one of six Serviceman Adjustment Modes.
 - 1) **B**= Serviceman VCJ SUB-DATA ADJUSTMENT.
 - 2) **C**= Serviceman VCJ CUT-OFF ADJUSTMENT.
 - 3) **S**= Serviceman OPTIONS (PIP and CLOCK) ADJUSTMENT.
 - 4) **M**= Serviceman MTS ADJUSTMENTS.
 - 5) **X** = Serviceman COMB FILTER ADJUSTMENT.
 - 6) **"CHK"** = Normal operation of CHANNEL ▲▼ and VOLUME ◀▶.

Note: Only the applicable settings for the Receiver serviced will be available (See a in Fig. 10).

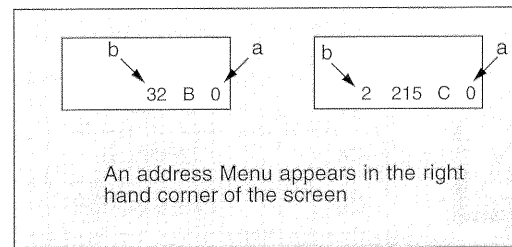


Figure 10. **Serviceman Mode Menu Adjustments.**

Exiting the Serviceman Mode:

Press the **Menu** and the **Power** buttons on the **Receiver** simultaneously for at least 2 seconds.

THE RECEIVER EXITS SERVICEMAN MODE.

The Receiver momentarily shuts off; then comes back on tuned to channel 3 with a preset level of sound. Any programmed channels, channels caption data and some others user defined settings will be erased.

IMPORTANT NOTE:
Always Exit the Serviceman Mode
Following Adjustments.


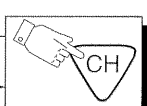
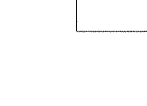
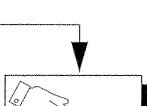
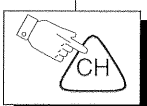




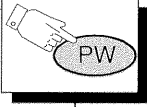
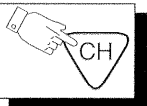
Press the **Power Button** on the **Remote Control** to select the Serviceman Adjustment.

For Adjustments:

1. Press **Channel Up/Down** on the **Remote Control** to select one of the available Service Adjustments (a in Fig. 10).

Note: Write Down the original value set (b in Fig. 10) for each address before modifying anything. It is easy to erroneously adjust the wrong item.

2. Press **Volume Up/Down** on the **Remote Control** to adjust the level of the selected Service Adjustment (b in Fig. 10).

Sub-Data Adjustment		Adj. Range	Default Level	
B0	SUB-COLOR	0 ~ 63	33	
B1	SUB-TINT	0 ~ 63	33	
B2	SUB-BRIGHTNESS	0 ~ 255	80	
B3	SUB-CONTRAST	0 ~ 63	34	
B4	KILLER/ABL/GAMMA	0 ~ 7	5	
B5	VIDEO ADJUSTMENT	0 ~ 15	8	
B6	AUDIO ADJUSTMENT	0 ~ 31	16	
B7	V-SIZE	0 ~ 61	20	
Cut-Off Adjustment		Adj. Range	Default Level	
C0	CUT-OFF R	0 ~ 1 0 ~ 255	0 128	
C1	CUT-OFF G	0 ~ 255	64	
C2	CUT-OFF B	0 ~ 1 0 ~ 255	0 128	
C3	DRIVE R	0 ~ 255	64	
C4	DRIVE B	0 ~ 255	64	
C5	YNR SWITCH	0 ~ 1	0	
C6	AFT	0 ~ 1 0 ~ 128	128 64	
C7	RF-AGC	0 ~ 255	192	
C8	YNR VIDEO ADJUSTMENT	0 ~ 7	0	
C9	HORIZONTAL CENTER	0 ~ 31	16	
Ca	BEAM LIMIT	0 ~ 7	0	
Cb	VCJ TEST H	0 ~ 2	0	
MTS Adjustment		Adj. Range	Default Level	
M0	INPUT LEVEL	0 ~ 63	33	
M1	HIGH-LEVEL SEPARATION	0 ~ 63	25	
M2	LOW-LEVEL SEPARATION	0 ~ 16	6	

IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

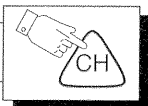
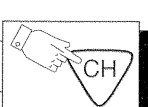
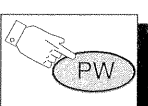
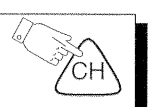
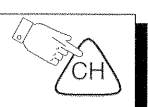
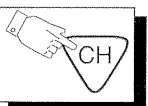
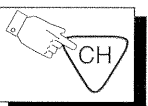
Press the Power Button on the Remote Control to select the Serviceman Adjustment

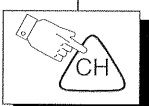
For Adjustments:

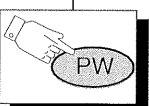
1. Press Channel Up/Down on the Remote Control to select one of the available Service Adjustments (a in Fig. 10).

Note: Write Down the original value set (b in Fig. 10) for each address before modifying anything. It is easy to erroneously adjust the wrong item.

2. Press Volume Up/Down on the Remote Control to adjust the level of the selected Service Adjustment (b in Fig. 10).

Options Adjustment		Adj. Range	Default Level	
S0	PIP COLOR	0 ~ 127	80	
S1	PIP CONTRAST	0 ~ 127	52	
S2	UP 1/9	0 ~ 255	26	
S3	DOWN 1/9	0 ~ 255	146	
S4	LEFT 1/9	0 ~ 255	9	
S5	RIGH 1/9	0 ~ 255	103	
S6	UP 1/16	0 ~ 255	27	
S7	DOWN 1/16	0 ~ 255	163	
S8	LEFT 1/16	0 ~ 255	9	
S9	RIGH 1/16	0 ~ 255	118	
Sa	FREERUN	N/A	0	
Sb	CLOCK ADJUSTMENT	0 ~ 255	128	
Sc	PIP TINT	0 ~ 255	50	
Sd	LOUDNESS COMPENSATION	0 ~ 63	52	
Comb Filter Adjustment		Adj. Range	Default Level	
X0	COMB GAIN	0 ~ 255	152	
X1	COMB SWITCH	0 ~ 63	12	
X2	COMB LIMIT	0 ~ 63	24	
X3	COMB CORE	0 ~ 127	41	
X4	COMB RF DELAY	0 ~ 127	18	
X5	COMB VIDEO DELAY	0 ~ 127	18	
X6	COMB VMLM	0 ~ 127	90	
X7	COMB VM SW	0 ~ 63	24	
X8	COMB CHARP	0 ~ 255	67	
X9	COMB VM LEVEL	0 ~ 255	255	
Xa	COMB VMPKF	0 ~ 1	01	
Xb	COMB ADJ SHARP	0 ~ 63	10	



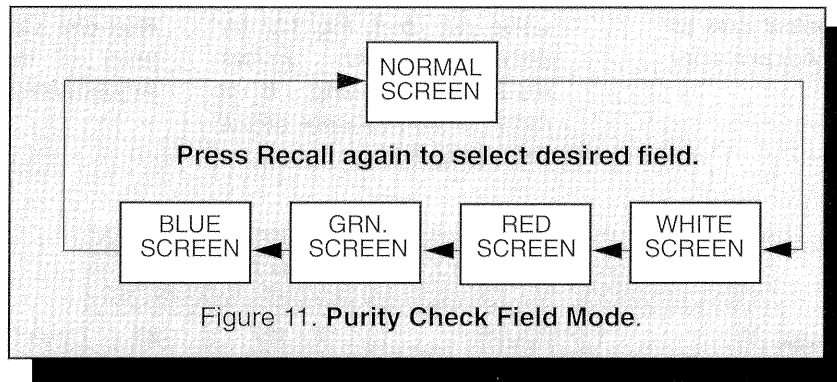


To B Items.

IMPORTANT NOTE:
 Always Exit the Serviceman Mode Following Adjustments.

To Check Purity:

Press the **Recall** Button on the **Remote Control** when in Serviceman Mode (red "CHK" is displayed) to enter the Purity Field Check Mode.



Helpful Hints

Entering Serviceman Mode (Back-Open Method)

1. While the Receiver is ON and operating in Normal Mode, momentarily short test point **FA1** (TP8) to Cold Ground (\nearrow) **FA2** (TP3) A-Board.
The Receiver enters the Aging Mode.
Yellow letters "CHK" appear in the upper left corner of the CRT.
(The Volume Up/Down will adjust rapidly).
2. Simultaneously press the **Menu** and the **Volume Up** buttons on the **Receiver** Control Panel.
The Receiver enters the Serviceman Mode.
The letter in "CHK" turn red.
(The Volume Up/Down will adjust normally).
(All costumer controls are set to nominal level).

IMPORTANT NOTE:
Always Exit the Serviceman
Mode Following Adjustments.

Instructional Flow Chart for Serviceman Mode

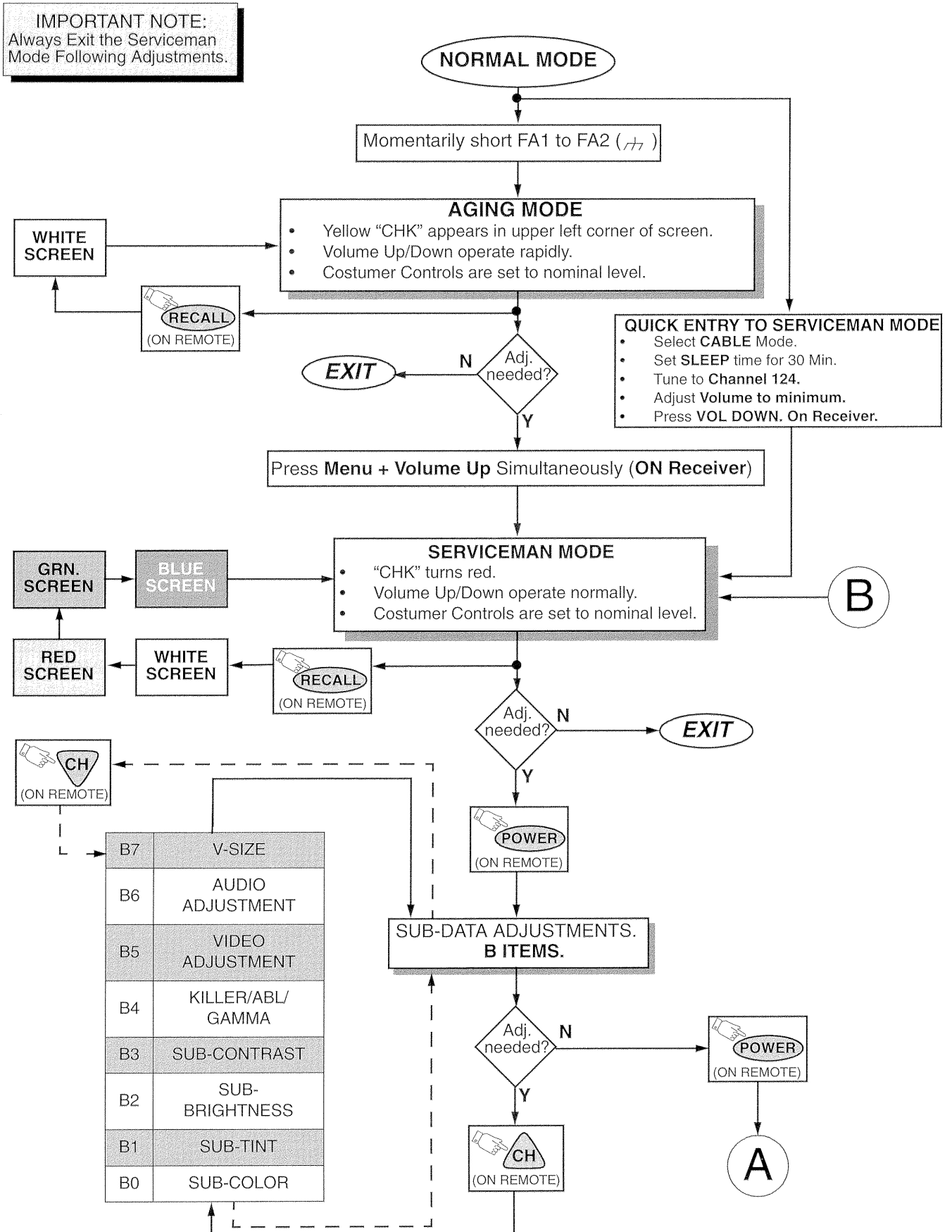


Figure 12. Flow Chart for Serviceman Mode.

Instructional Flow Chart for Serviceman Mode - Continued

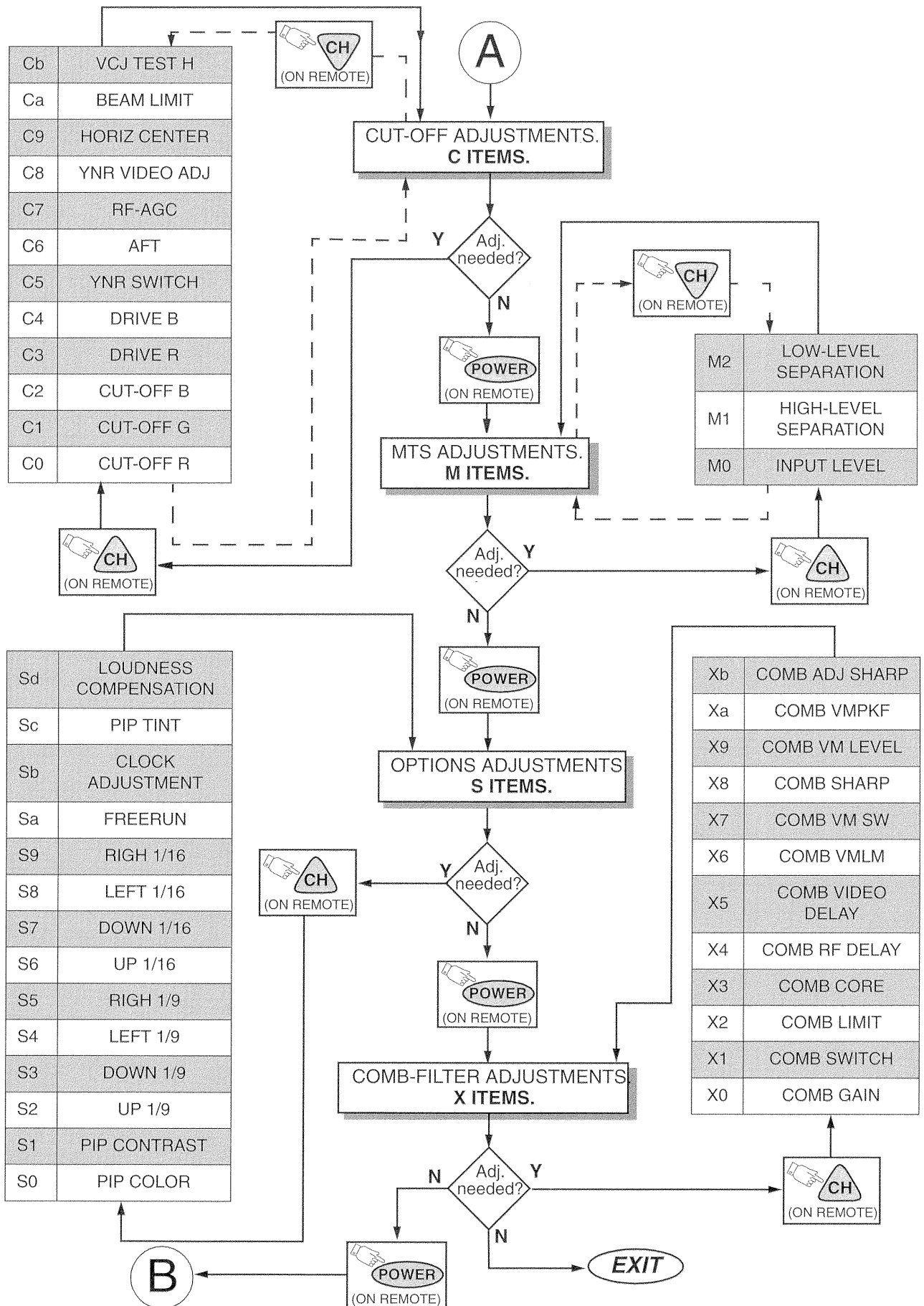


Figure 13. Flow Chart for Serviceman Mode (Continued).

Service Adjustments (Electronic Controls)

Sub-Brightness

Serviceman DAC Adjustment (B2)

Adjustment of this control is important for setting proper operation of customer brightness and picture controls. This adjustment must be made after Sub-Contrast or Color Temperature adjustments are made. **Do not adjust SCREEN** after the Sub-Brightness is set.

Preparation:

Apply a color bar signal with 100 IRE white and 7.5 IRE black. (Switch Color to "OFF" on the signal generator.) Operate the Receiver for a minimum of 10 minutes prior to performing this adjustment.

Procedure:

In the Serviceman Mode for making electronic adjustments, select the DAC adjustment (B2) and adjust until the black starts to look gray. Then decrease the level to the point where gray turns to black.

Note: You may set the accurate value following the Preparation steps and the Procedure step No. 2 of the Sub-Contrast adjustment described below.

Video Adjustment Level

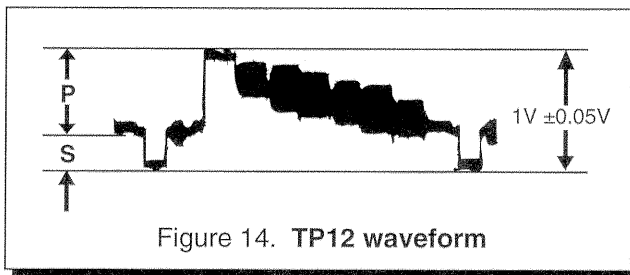
Serviceman DAC Adjustment (B5)

Preparation:

1. Obtain an NTSC color bar pattern with 100 IRE white and 87.5% modulation.
2. Connect the oscilloscope to TP12. Use cold ground for scope connection. Set the scope at Horizontal Sweep rate (20 μ s) time base.

Procedure:

1. In the Serviceman Mode for making electronic adjustments, select DAC Video Adjustment Level (B5) and adjust for 1V from sync tip to white level. See Fig. 14.



2. Check that the sync signal amplitude (ratio between the sync signal to detection output) is within the range of $30 \pm 5\%$ ($S/(S+P) = 30 \pm 5\%$).
3. Set the DAC Sub-Contrast Adjustment (B3).

Sub-Contrast

Serviceman DAC Adjustment (B3)

This adjustment is factory set. **Do not adjust** unless repairs are made to associated circuit, the CRT Board or when the CRT is replaced.

Preparation:

1. Apply a color bar signal pattern with 87.5% modulation, 70% saturated color bar with a 100 IRE white and 7.5 black.

Note: The pattern used in this procedure is an EIA color bar pattern with 87.5% modulation with 100 IRE white and 7.5 black. Correlate the information in this procedure to the pattern used if another signal is used.

2. Preset the following controls:

- Brightness Center.
- Color Min.
- Picture Max.
- Sharpness Center.

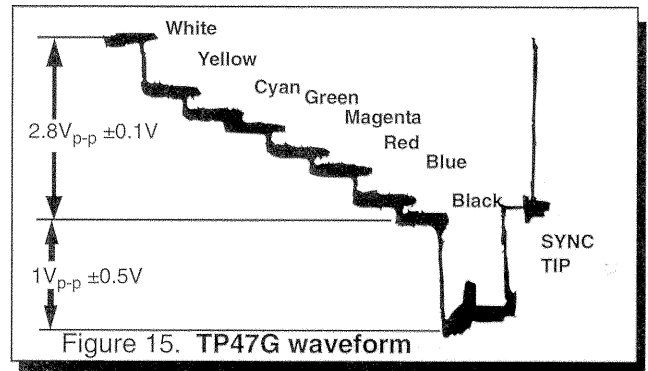
3. Connect the oscilloscope to the CRT-Board connector C1-2. Set the scope time base to 20 μ s (horizontal).

4. Connect a jumper from TPD2 to ground (\nearrow).

5. Connect a jumper from IC101 pin 28 to ground (\nearrow).

Procedure:

1. In the Serviceman Mode, select DAC Sub-Brightness Adjustment (B2) and adjust for 1.0-1.5Vp-p between blanking and 7.5 IRE level. (See video waveforms detail, Fig. 14).



2. In the Serviceman Mode for electronic adjustments, select DAC Sub-Contrast Adjustment (B3) and adjust for 2.8Vp-p $\pm 0.1V$ from white level to black level on video waveform (see video waveforms detail, Fig. 15).
3. Remove the jumpers (Preparation steps 4 & 5).

Tint/Color Adjustment

Serviceman DAC Adjustment (B1) (B0)

Preparation:

1. Apply a rainbow color bar signal.

2. Preset the following controls:

- Brightness Min.
- Color Center.
- Tint Center.
- Picture Max.
- Sharpness Min.

3. Connect the oscilloscope to TP47B (A-Board).

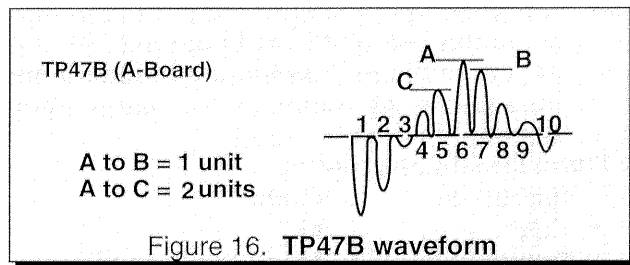
4. Connect a jumper from TPD2 to GND (\nearrow).

5. Connect a jumper from IC101 pin 28 to ground (\nearrow).

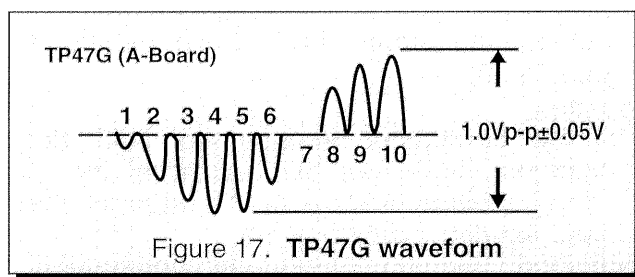
Service Adjustments (Electronic Controls, cont.)

Procedure:

1. In the Serviceman Mode for making electronic adjustments, select DAC Sub-Tint Adjustment (B1). Adjust until the waveform measured is as the one shown in Fig. 16.



2. Connect the oscilloscope to TP47G (A-Board).
3. Select DAC Sub-Color Adjustment (B0) and adjust for peak to peak amplitude to be $0.9V_{p-p} \pm 0.05V$, as shown in Fig. 17.



4. Remove the jumpers (Preparation steps 4 & 5).

Color Temperature Adjustment (B/W Tracking)

Serviceman DAC Adjust. (C1) (C2) (C3) (C4) (C5) Minor Touch-Up Method

OBSERVE low and high brightness areas of a B/W picture for proper tracking. Adjust only as required for "good gray scale and warm highlights".

1. LOW LIGHT areas – In Serviceman Mode for making electronic adjustments, select Cutoff (C0) RED, (C1) GRN, (C2) BLU and adjust the picture for gray.
2. HIGH LIGHT areas – In Serviceman Mode for making electronic adjustments, select Drive (C3) RED, (C4) BLU and adjust the picture for warm whites.

Complete Adjustment

Preparation:

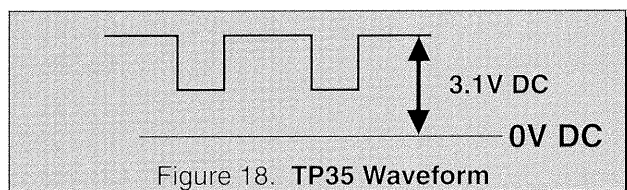
1. Turn the Receiver "ON" and allow 10 minutes warm up at high brightness.
2. Apply a color bar signal with color "OFF".
3. Turn the SCREEN control (part of FBT T551) fully counterclockwise.

Procedure:

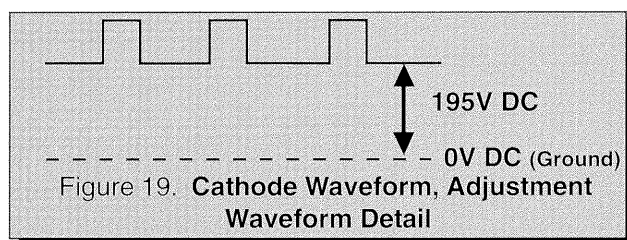
Preset the following Serviceman DACs for best results:

- C0 0 128
- C1 64
- C2 0 128
- C3 64
- C4 64

1. Connect the oscilloscope to C1-2 (CRT-Board).
2. In Serviceman Mode for making electronic adjustment, select the Sub-Bright DAC (B2).
3. Press the LST-CH key on the remote.
4. Observe the oscilloscope waveform at Horizontal rate and adjust the Serviceman Mode Sub-Bright DAC (B2) level until a scanning period of 3.1V above DC ground is measured, as indicated in Fig. 18.



5. Connect the scope to GRN Cathode (KG) on the CRT-Board.
6. In the Serviceman Mode for making electronic adjustments, select the GREEN CUTOFF DAC (C1).
7. Press the LST-CH key on the remote.
8. View scope trace at Horizontal rate and adjust the Serviceman Mode DAC (C1) level until a scanning period of 195V above DC ground is measured, as indicated in Fig. 19.



9. Connect the scope to the RED Cathode (KR).
10. In Serviceman Mode for making electronic adjustments, select the RED CUTOFF DAC (C0).
11. Press the LST-CH key on the Remote
12. View the scope trace and adjust the Serviceman Mode DAC (C0) for the scanning period to be 195V above DC ground. (See Fig. 19)
13. Connect the scope to the BLU Cathode (KB).
14. In Serviceman Mode for making electronic adjustments, select the BLU CUTOFF (C2).
15. Press the LST-CH key on the Remote.
16. View the scope trace and adjust the Serviceman Mode DAC (C2) for the scanning period to be 195V above DC ground. (See Fig. 19)
17. Turn the Screen Control (part of FBT) slowly clockwise until a color horizontal line appears.
18. With the other two colors Serviceman Mode DAC CUTOFF adjustments (C0) RED, (C2) BLU; increase the colors to create a white horizontal line.
19. Confirm that a good gray scale is established by viewing B/W color bar pattern.
20. In the Serviceman Mode for making electronic adjustments select the DAC DRIVE adjustments (C3) RED, (C4) BLUE and adjust for warm white in a white color bar pattern.

Service Adjustments (Electronic Controls, cont.)

21. EXIT the Serviceman Mode.
22. Adjust the Picture Menu Video Adjustments **Bright** and **Picture** from low scale to high scale and check Black and White tracking.
23. If correction is needed: Re-Enter the Serviceman Mode and perform the **Minor Touch – Up Method**.
24. Perform **Sub-Brightness** Adjustment procedure if needed.

Horizontal Centering

Serviceman DAC Adjustment (C9)

Preparation:

Connect a crosshatch generator.

Procedure:

1. In the Serviceman Mode for making electronic adjustments. Select the Horizontal Centering Adjustment DAC (C9) and adjust until the center of the crosshatch pattern is centered on CRT.
2. EXIT the Serviceman Adjustment Mode.

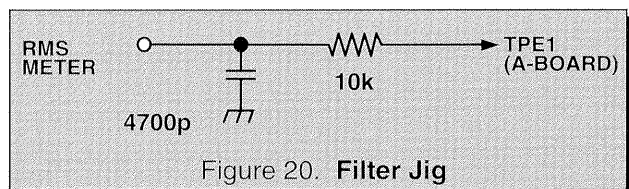
Audio Adjustment

Serviceman DAC Adjustment (B6)

This adjustment is factory set and needs to be performed only when IC002 or IC101 is replaced.

Preparation:

1. Apply the following signal at the antenna (70dB \pm 5dB, 75 Ω open P/S 10dB): audio signal set to monaural, 300Hz. 100% modulation; video input of 100 IRE flat field, 30% modulation.
2. Connect the RMS Meter with filter jig as shown in Fig. 20.



Procedure:

1. In the Serviceman Mode for making electronic adjustments, select the Audio Adjustment DAC (B6) and adjust until 75mV RMS \pm 5.0mV RMS is measured.
2. EXIT the Serviceman Adjustment Mode.

MTS Circuit Adjustments

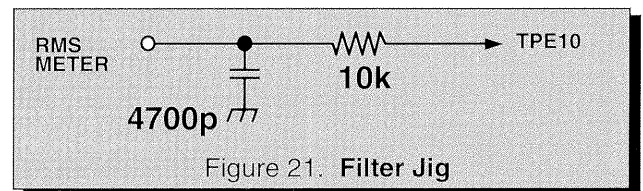
The MTS Circuit Adjustments require two steps:

1. Input Level Adjustment.
2. Stereo Separation Adjustment.

Input Level Adjustment (M0)

Preparation:

1. Connect an RMS meter with filter jig as shown in Fig. 21.



2. Connect an RF signal generator to the RF antenna input.

Procedure:

1. Apply the following signal from the RF signal generator:
Video: 100 IRE flat field, 30% modulation.
Audio: 300Hz, 100% modulation, monaural (70 \pm 5dB, 75 Ω OPEN, P/S 10dB).
2. Adjust the MTS Input Level Adjustment (M0) until the voltage measured is 106 \pm 6.0mV rms.

Stereo Separation Adjustment (M1 & M2)

Preparation:

1. Connect an RF signal generator to the RF antenna input.
2. Connect a scope to TPE10.

Procedure:

1. Select Stereo Mode in Audio menu
2. Apply the following signal from the RF signal generator:
Video: 100 IRE flat field, 30% modulation.
Audio: 300Hz, 100% modulation, stereo (left only) (70 \pm 5dB, 75 Ω OPEN, P/S 10dB).
3. Adjust the MTS Low-Level Separation Adjustment (M2) until the amplitude displayed on the scope is minimum.
4. Apply the following signal from the RF signal generator:
Video: 100 IRE flat field, 30% modulation.
Audio: 3KHz, 100% modulation, stereo (left only) (70 \pm 5dB, 75 Ω OPEN, P/S 10dB).
5. Adjust the MTS High-Level Separation Adjustment (M1) until the amplitude displayed on the scope is minimum.
6. Repeat above steps 2 through 5 until the amplitude is at minimum for both signals.

Service Adjustments (Electronic Controls, cont.)

Clock Adjustment (Sb)

Preparation:

Connect the frequency counter from TPS1 (IC001 Pin 13) to cold ground (\varnothing).

Note: Frequency Counter probe capacitance should be 8pF or less.

Procedure:

1. Turn the Receiver "OFF" with the AC power applied.
2. Measure TPS1 (IC001 pin 13) for the frequency of the waveform and record the reading.

Note: Pin 13 measurement must have at least four digits of resolution following the decimal point.
Example: 000.0000

3. Turn the Receiver back "ON".
4. Place the Receiver into Serviceman Mode for making electronic adjustment, select the Clock Adjustment DAC (Sb).

5. Calculate and set Sb based on the following formula:

$$Sb = 128 + 0.901 \times 10^6 \frac{244.1406 - pin13[Hz]}{244.1406}$$

Note: Pin 13 measurement will not change regardless of the value stored in Sb.

Vertical Size (B7)

1. Adjust the VERTICAL SIZE DAC control, B7, until the top and the bottom edges of the raster are visible.
2. Adjust the VERTICAL SIZE control, B7, until the top and the bottom of the raster touch the bezel edge. The advance SIZE control to obtain an approximately 10% overscan. Linearity adjustment is don automatically when the size is being adjusted. (Best results can be obtained with a round test patter.)

Service Adjustments (Mechanical Controls)

VCO Field Alignment L105 (IC101 pins 35 & 36)

1. Connect a balance antenna and select a midband channel (Ch 10, 11 or 12)
2. Attenuate the signal strength for a weak noisy video.
3. While observing the picture tube, adjust L105 until best picture appears.
4. Change channels and observe that they are tuning properly.
5. If the channel monitored is not clear, repeat steps 1, 3 and 4 while applying a stronger signal.

Focus (part of T551)

Preparation:

Connect a Signal generator and select a dot pattern.

Procedure:

Adjust the FOCUS control to obtain the sharpest and clearest dot pattern.

- a. Adjust for best center.
- b. Adjust for best area between the center and top right corner.

The schematic diagram illustrates the internal components and signal paths of the A-board. The board is divided into two main sections: the left side for video processing and the right side for audio processing.

Video Processing Section (Left):

- Inputs:** L TV IN (pin 1) and R TV IN (pin 2) are connected to the video input section.
- IC101 VCJ:** This integrated circuit handles video detection and processing. It includes a VIF DET (Video Input Filter Detector) and a SIF DET (Sound Input Filter Detector).
- IC2201 MTS AN5828S-E1:** This integrated circuit handles MTS (Matrix Stereo) processing. It includes a STEREO FILTER, L-R DEMOD, PILOT DET, PLL, L-R DEMOD, SAP DEMOD, NOISE DET, and NOISE FILTER.
- IC201 X201:** A video output driver IC.
- VIDEO CIRCUIT:** A block representing the video output stage.
- Outputs:** L VAO OUT (pin 45) and R VAO OUT (pin 47) are connected to the video output section.

Audio Processing Section (Right):

- Inputs:** L TV IN (pin 1) and R TV IN (pin 2) are connected to the audio input section.
- IC2302 AUDIO OUT AMP AN5272:** This integrated circuit handles audio output amplification. It includes a VOLUME control and a VOLUME DET.
- IC001 MPU:** A microprocessor unit (MPU) that controls the system. It has pins for SP ON/OFF, VOL, and a connection to the VOLUME control.
- Outputs:** L OUT (pin 11) and R OUT (pin 12) are connected to the audio output section.

Other Components:

- TUNER:** A block representing the tuner circuit.
- IC101 VCJ:** A video control IC.
- IC201 X201:** A video output driver IC.
- IC2201 MTS AN5828S-E1:** A matrix stereo processing IC.
- IC2302 AUDIO OUT AMP AN5272:** An audio output amplifier IC.
- IC001 MPU:** A microprocessor unit (MPU).

The diagram shows the interconnections between these components, including the flow of video and audio signals, control lines, and power supply connections.

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Video-Chroma Signal Path Block Diagram

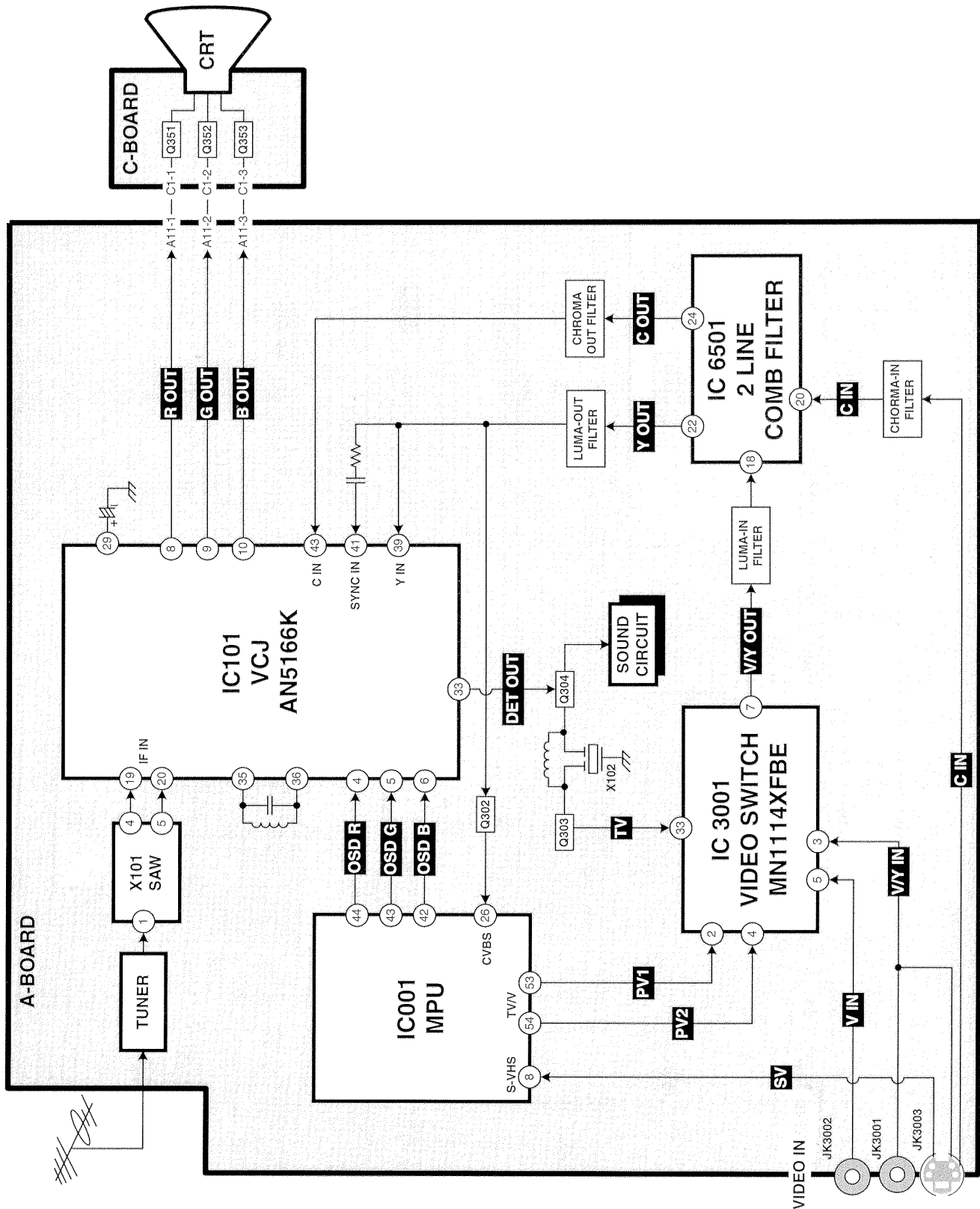


Figure 23. Video-Chroma Signal Path Block Diagram.

IC101 IN/OUT Pins and Functions (VCJ)

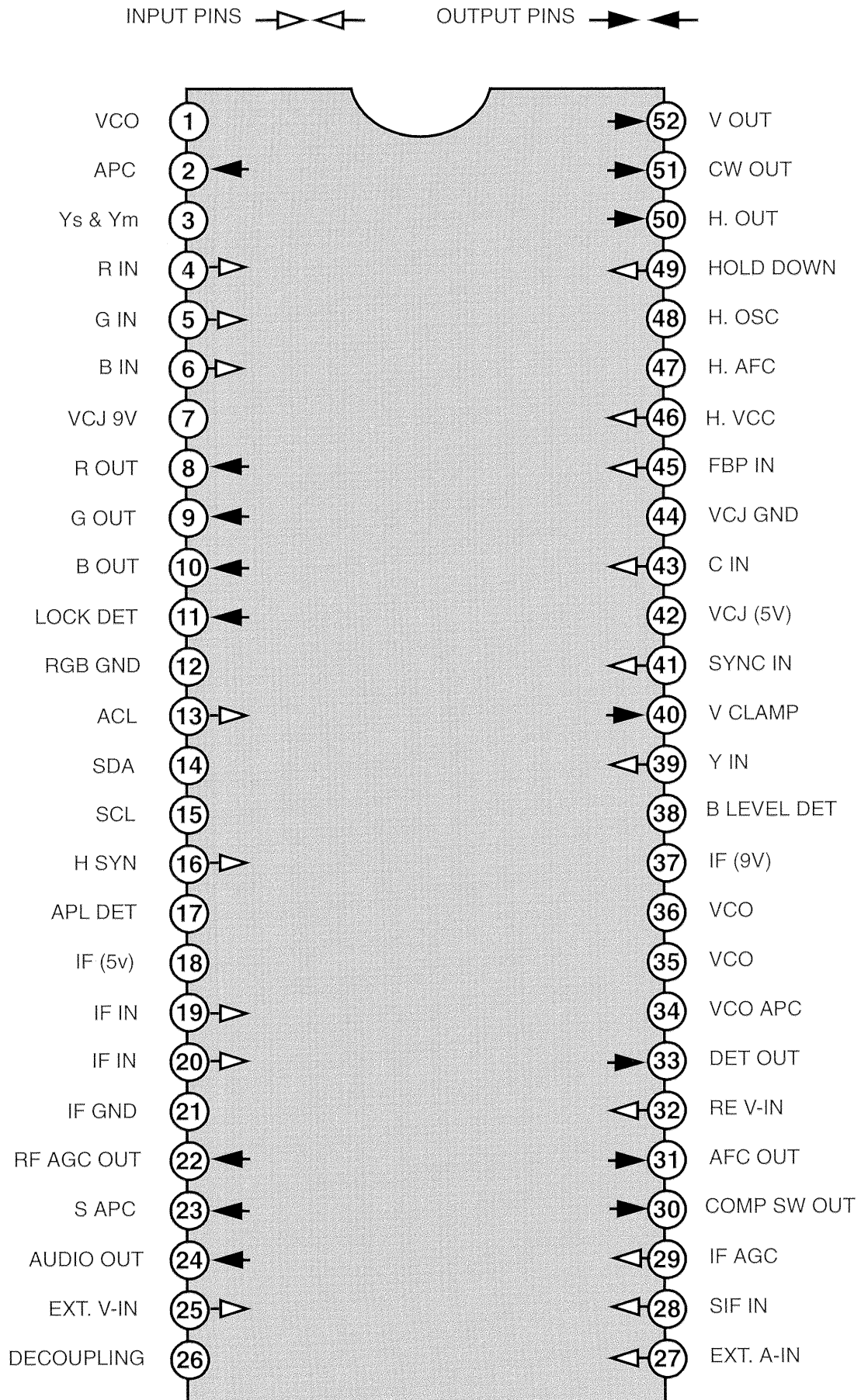


Figure 24. VCJ IN/OUT Pins and Functions.

IC001 IN/OUT Pins and Functions (MPU)

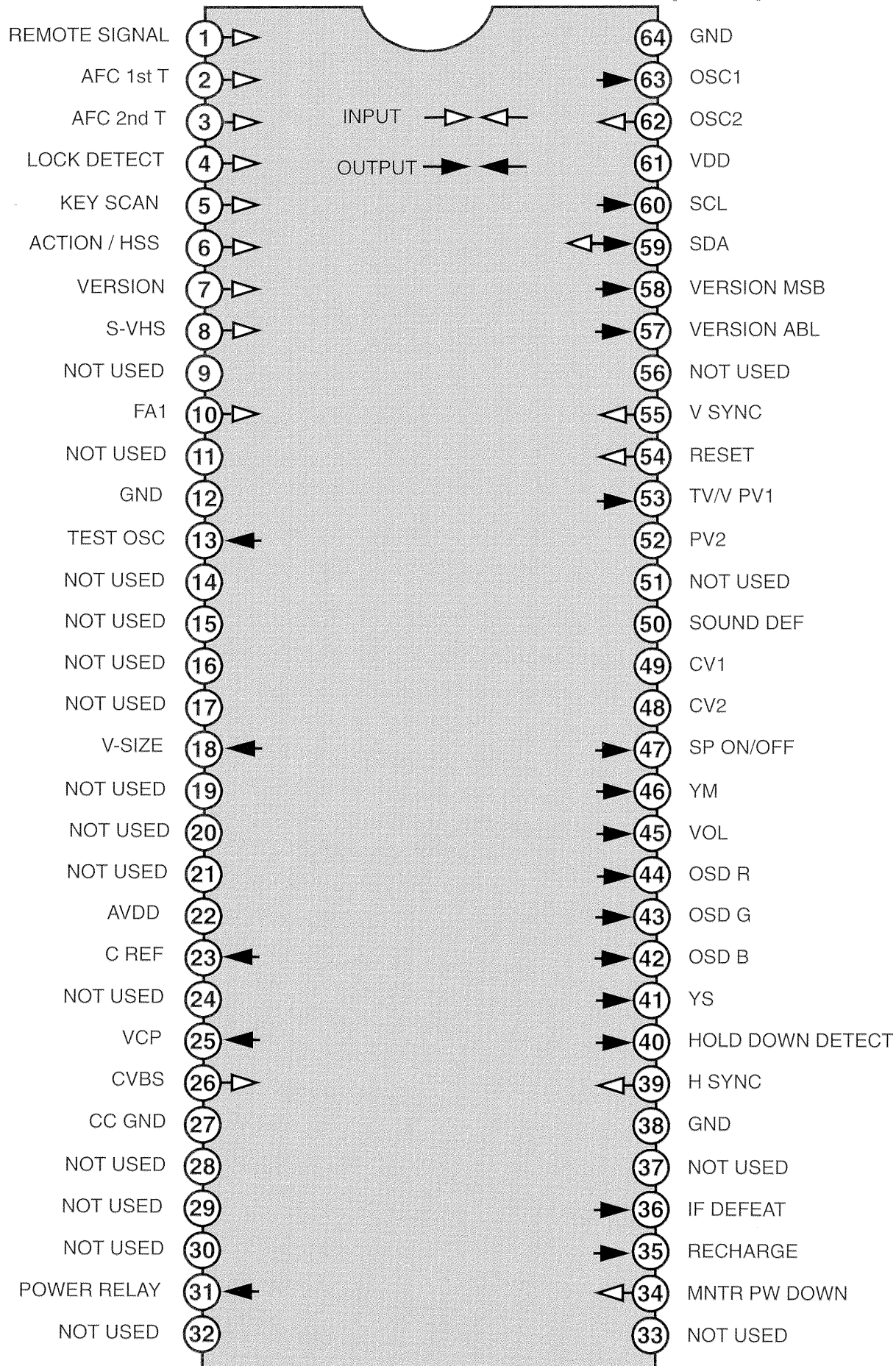


Figure 25. MPU IN/OUT Pins and Functions.

Identification of Components

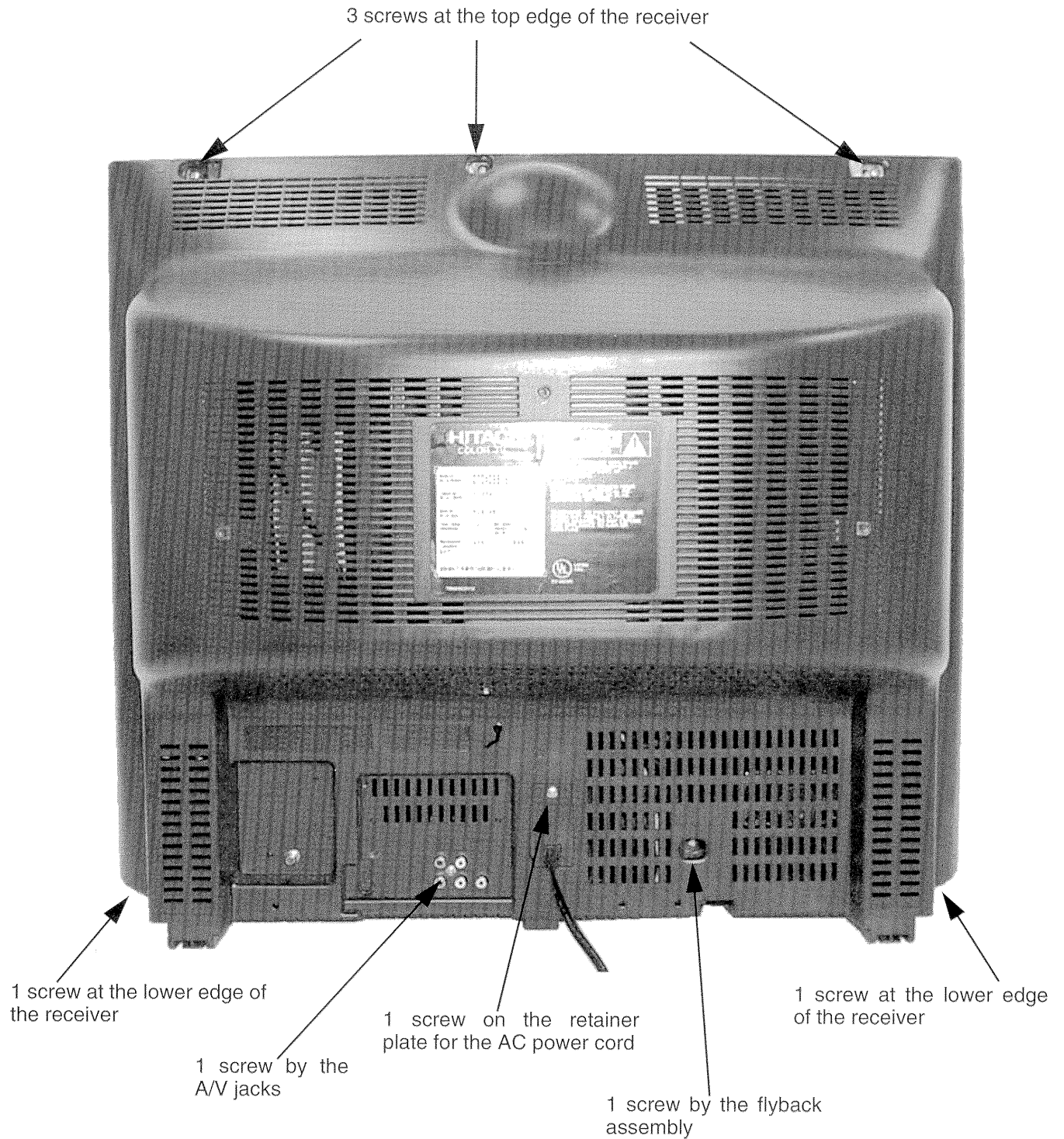
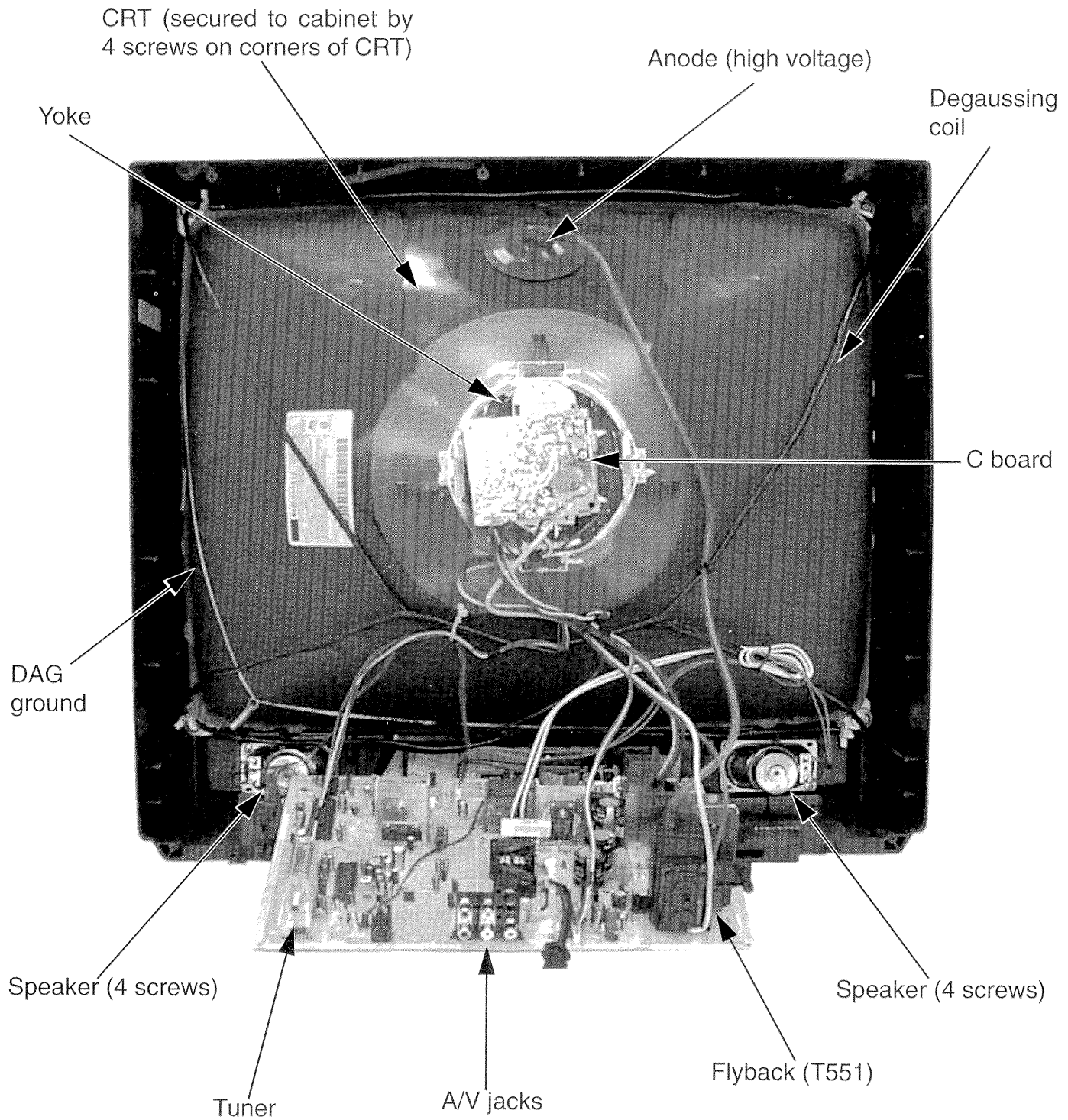


Figure 26. Back Cover Removal

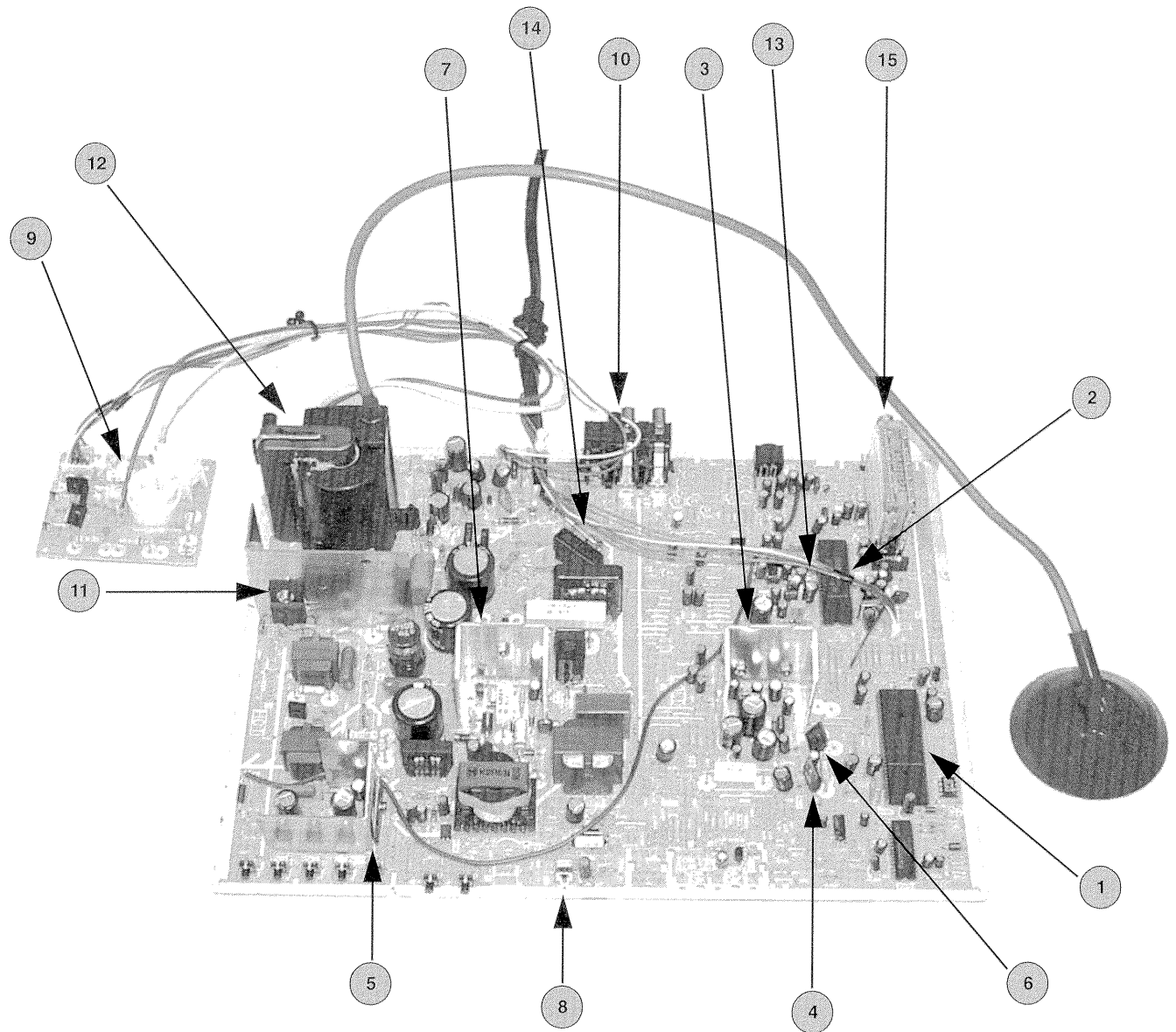
Identification of Components



Note: After servicing the receiver, remember to dress the cables, as shown.

Figure 27. Rear View

Identification of Components



NO.		LOCATION OF COMPONENTS							
INTEGRATED CIRCUITS		CONNECTORS		TRANSISTORS		VARIOUS			
1	IC 001 MPU	9	CRT SOCKET	11	Q551 HOR.	12	T551 (FLYBACK)		
2	IC 101 VCJ	10	REAR AV IN			13	L105		
3	IC 2302 AUDIO					14	FUSE		
4	IC 551 REG.					15	TUNER		
5	IC 451 VERTICAL.								
6	IC 552 REG.								
7	IC 803 REG.								
8	IC 003 REMOTE SENSOR								

Figure 28. View of Main Board Assemblies

REPLACEMENT PARTS LIST

Models: 27CX29B-501 & 27CX29B-511

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
CAPRISTORS			C312	ECA1EM220	CAP,E 22UF/25V
CRA801	EXNFGV	RES-CAP	C351	TACCW331T50	V CAP,C 330PF/50V
CRA802	EXNFGV	RES-CAP	C352	TACCW331T50	V CAP,C 330PF/50V
CAPACITORS			C353	TACCW331T50	V CAP,C 330PF/50V
C003	ECA1HM4R7	CAP,E 4.7UF/50V	C354	ECKD3D102KB	CAP,C .001UF-K-2KV
C005	ECA1AM101	CAP,E 100UF/10V	C357	EEANA1E1R0B	CAP,E 1.0UF-25V
C008	TCUX1H103ZF	N CAP,C .01UF-Z-50V	C401	ECQB1H153JM	CAP,P .015UF-J-50V
C010	TCUX1H103ZF	N CAP,C .01UF-Z-50V	C402	ECUX1H471JC	X CAP,C 470PF-J-50V
C011	ECA1CM221	CAP,E 220UF/16V	C403	ECA1HM2R2	CAP,E 2.2UF/50V
C013	ECA0JM101	CAP,E 100UF/6.3V	C451	ECA1CHG470B	CAP,E 47UF-16V
C016	ECUX1H101JC	X CAP,C 100PF-J-50V	C452	ECSF1EE105	CAP,T 1.0UF/25V
C017	ECUX1H220JC	X CAP,C 22PF-J-50V	C453	ECEA1HFS010	CAP,E 1UF/50V
C018	ECUX1H220JC	X CAP,C 22PF-J-50V	C454	ECA1EM102	CAP,E 1000UF/25V
C019	ECA0JM101	CAP,E 100UF/6.3V	C455	ECA1VHG101B	CAP,E 100UF-35V
C020	ECA1CM471	CAP,E 470UF/16V	C456	ECQB1H103JM	CAP,P .01UF-J-50V
C021	TCUX1H103ZF	N CAP,C .01UF-Z-50V	C459	ECA1VHG471E	CAP,E 470UF-35V
C022	ECA1CM471	CAP,E 470UF/16V	C460	ECQM1104JZ	CAP,P .1UF-J-100V
C024	ECA1EM4R7	CAP,E 4.7UF/25V	C462	ECA1HM100	CAP,E 10UF/50V
C025	ECUX1H101JC	X CAP,C 100PF-J-50V	C502	ECQB1H223JM	CAP,P .022UF-J-50V
C026	ECA1HM010	CAP,E 1.0UF/50V	C503	ECA1HM2R2	CAP,E 2.2UF/50V
C031	ECUX1H821KB	X CAP,C 820PF-K-50V	C504	ECUX1H221JC	X CAP,C 220PF-J-50V
C032	ECA1CM470	CAP,E 47UF/16V	C505	ECUX1H221JU	X CAP,C 220PF-J-50V
C033	ECUX1H680JC	X CAP,C 68PF-J-50V	C506	ECA1CM221	CAP,E 220UF/16V
C034	ECUX1H680JC	X CAP,C 68PF-J-50V	C508	ECUX1H331JC	X CAP,C 330PF-J-50V
C036	ECUX1H220JC	X CAP,C 22PF-J-50V	C510	ECCD2H100D	CAP,C 10PF-D-500V
C037	ECUX1H220JC	X CAP,C 22PF-J-50V	C511	ECKD2H821KB	CAP,C 820PF-K-500V
C038	ECUX1H220JC	X CAP,C 22PF-J-50V	C512	ECKD2H101KB	CAP,C 100PF-K-500V
C101	ECJ2VF1H223	Z CAP,C .022UF-Z050V	C531	ECA1EM220	CAP,E 22UF/25V
C102	ECA1AM101	CAP,E 100UF/10V	C532	ECA1CM102	CAP,E 1000UF/16V
C103	ECUX1H300JC	X CAP,C 30PF-J-50V	C534	TCUX1H103ZF	N CAP,C .01UF-Z-50V
C105	ECUX1H221JC	X CAP,C 220PF-J-50V	C551	ECA1VM331	CAP,E 330UF/35V
C106	ECA1HMR47	CAP,E .47UF/50V	C552	ECA1CM331	CAP,E 330UF/16V
C107	ECUX1H390JC	X CAP,C 39PF-J-50V	C553	ECA1CM331	CAP,E 330UF/16V
C108	ECA1HMR22	CAP,E .22UF/50V	C554	ECKD2H561KB	CAP,C 560PF-K-500V
C110	TCUX1H103ZF	N CAP,C .01UF-Z-50V	C555	ECA2EM220	CAP,E 22UF-250V
C111	ECA1EM100	CAP,E 10UF/25V	C556	ECA1CM102	CAP,E 1000UF/16V
C113	ECA1EM100	CAP,E 10UF/25V	C557	ECKD2H102KB	CAP,C .001UF-K-500V
C114	ECUX1H120JC	X CAP,C 12PF-J-50V	C558	ECA1CM221	CAP,E 220UF/16V
C151	ECA1HMR22	CAP,E .22UF/50V	C560	ECEA1HN2R2U	CAP,E 2.2UF/50V
C201	TCUX1H103ZF	N CAP,C .01UF-Z-50V	C561	ECKD2H561KB	CAP,C 560PF-K-500V
C202	ECUX1H101JC	X CAP,C 100PF-J-50V	C562	ECKD2H561KB	CAP,C 560PF-K-500V
C203	ECA1EM4R7	CAP,E 4.7UF/25V	C563	ECWH12H822J	S CAP,P .0082UF-J-1.2KV
C301	ECUX1H390JC	X CAP,C 39PF-J-50V	C564	ECWH12H272J	S CAP,P .0027UF-J-1.2KV
C302	EEANA1E1R0B	CAP,E 1.0UF-25V	C565	ECKD3D821JB	CAP,C 820PF-J-2KV
C304	ECEA1HNR47U	CAP,E .47UF-50V	C566	ECKD3D181JB	CAP,C 180PF-J-2KV
C305	ECA1HM4R7	CAP,E 4.7UF/50V	C568	ECQM2274JZ	CAP,P .27UF-J-200V
C306	ECA1CM221	CAP,E 220UF/16V	C569	ECWF2474JBK	CAP,M .47UF-J-200V
C308	ECQB1H823JM	CAP,P .082UF-J-50V	C571	ECA1CM471	CAP,E 470UF/16V
C309	ECA1AM101	CAP,E 100UF/10V	C572	ECA1EM100	CAP,E 10UF/25V
C310	ECA1EM4R7	CAP,E 4.7UF/25V	C573	ECA1CM101	CAP,E 100UF/16V
C311	ECA1EM4R7	CAP,E 4.7UF/25V	C601	ECUX1H102KB	X CAP,C .001UF-K-50V

REPLACEMENT PARTS LIST

Models: 27CX29B-501 & 27CX29B-511

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
C604	ECUX1H150JU	X CAP,C 15PF-J-50V	C2351	ECA1HM010	CAP,E 1.0UF/50V
C605	ECUX1H332KB	X CAP,C .0033UF-K-50V	C2353	ECA1HM010	CAP,E 1.0UF/50V
C606	ECA1HM010	CAP,E 1.0UF/50V	C2359	ECA1HM010	CAP,E 1.0UF/50V
C801	ECKDAE472ZE	D CAP,C .4700PF-Z-250VAC	C2360	ECA1HM010	CAP,E 1.0UF/50V
C802	ECKDAE472ZE	D CAP,C .4700PF-Z-250VAC	C2362	ECA1AM470	CAP,E 47UF/10V
C803	ECKDAE472ZE	D CAP,C .4700PF-Z-250VAC	C3012	ECA1HM010	CAP,E 1.0UF/50V
C804	ECKDAE472ZE	D CAP,C .4700PF-Z-250VAC	C3014	ECA1CM100	CAP,E 10UF/16V
C805	EC0S2DA221B	B CAP,E 220UF/200V	C3018	ECA1HM010	CAP,E 1.0UF/50V
C806	EC0S2DA221B	B CAP,E 220UF/200V	C3025	ECA1HM100	CAP,E 10UF/50V
C807	ECA1HM2R2	CAP,E 2.2UF/50V	C3234	ECA1AM470	CAP,E 47UF/10V
C808	ECA1CM101	CAP,E 100UF/16V	C3240	TCUX1H103ZF	N CAP,C .01UF-Z-50V
C809	EC0S2DG151D	G CAP,E 151UF/200V	C6501	ECEA1CKA101	CAP,E 100UF/16V
C810	ECQU2A153MV	CAP,P .015UF-M-250V	C6502	TCUX1H103ZF	N CAP,C .01UF-Z-50V
C811	ECQU2A153MV	CAP,P .015UF-M-250V	C6503	TCUX1H103ZF	N CAP,C .01UF-Z-50V
C812	ECQU2A224MV	CAP,P .22UF-M-250VAC	C6504	ECUX1H330JC	X CAP,C 33PF-J-50V
C814	ECQB1H823JM	CAP,P .082UF-J-50V	C6506	ECUX1H120JC	X CAP,C 12PF-J-50V
C815	ECA1EHG101B	CAP,E 100UF-25V	C6507	ECUX1H120JC	X CAP,C 12PF-J-50V
C818	ECKD3A821KB	CAP,C 820PF-K-1KVDC	C6509	ECUX1H270JC	X CAP,C 27PF-J-50V
C820	ECA1JHG100B	CAP,E 10UF-63V	C6510	ECUX1H120JC	X CAP,C 12PF-J-50V
C821	ECKD2H561KB	CAP,C 560PF-K-500V	C6511	ECEA1HKA010	CAP,E 1.0UF/50V
C822	ECA1EM221	CAP,E 220UF/25V	C6512	TCUX1H103ZF	N CAP,C .01UF-Z-50V
C823	ECA160V33UE	CAP,E 33UF/160V	C6513	ECUX1H270JC	X CAP,C 27PF-J-50V
C824	ECKD3A331KB	CAP,C 330PF-K-1KV	C6514	TCUX1H103ZF	N CAP,C .01UF-Z-50V
C825	ECKD3A471KB	CAP,C 470PF-K-1KV	C6516	TCUX1H103ZF	N CAP,C .01UF-Z-50V
C2201	ECA1HM4R7	CAP,E 4.7UF/50V	C6517	ECEA1HN010U	CAP,E 1UF/50V
C2202	ECA1HM2R2	CAP,E 2.2UF/50V	C6518	TCUX1H103ZF	N CAP,C .01UF-Z-50V
C2203	ECA1HM4R7	CAP,E 4.7UF/50V	C6520	ECEA1CKA100	CAP,E 10UF/16V
C2204	ECSF16E10VB	CAP,E 10PF-16V	C6521	ECEA1CKA470	CAP,E 47UF/16V
C2205	ECA1HM010	CAP,E 1.0UF/50V	C6522	ECUX1H221JC	X CAP,C 220PF-J-50V
C2206	ECQB1H223JM	CAP,P .022UF-J-50V	C6523	ECJ2VF1H104	Z CAP,C .1UF-Z-50V
C2207	ECSF16E3R3	CAP,T 3.3UF/16V	C6524	ECEA1HKA010	CAP,E 1.0UF/50V
C2208	ECJ2VB1C104	K CAP,C .1UF-I-16V	C6525	TCUX1H103ZF	N CAP,C .01UF-Z-50V
C2209	ECJ2VB1C104	K CAP,C .1UF-I-16V	C6526	ECEA1CKA100	CAP,E 10UF/16V
C2210	ECJ2VB1C104	K CAP,C .1UF-I-16V	C6527	ECJ2VF1H104	Z CAP,C .1UF-Z-50V
C2212	ECQB1H473JM	CAP,P .047UF-J-50V	C6528	ECEA1CKA470	CAP,E 47UF/16V
C2215	ECA0JM101	CAP,E 100UF/6.3V	C6529	ECEA1CKA100	CAP,E 10UF/16V
C2218	ECA1HMR47	CAP,E .47UF/50V	C6531	TCUX1H103ZF	N CAP,C .01UF-Z-50V
C2220	EEANA1E100B	CAP,E 10UF-25V	C6532	TCUX1H103KB	N CAP,C .01UF-K-50V
C2301	ECA1VM102	CAP,E 1000UF/35V	DIODES		
C2302	ECA1HM010	CAP,E 1.0UF/50V	D001	ERA15-01	DIODE
C2305	ECA1HM010	CAP,E 1.0UF/50V	D002	MA165	DIODE
C2306	TCUX1H103ZF	N CAP,C .01UF-Z-50V	D003	MA4047H	DIODE
C2307	ECA1CM102	CAP,E 1000UF/16V	D006	MA4330H	DIODE
C2309	ECQB1H473JM	CAP,P .047UF-J-50V	D008	MA165	DIODE
C2311	ECA1HM3R3	CAP,E 3.3UF/50V	D009	MA165	DIODE
C2313	ECA1EM101	CAP,E 100UF/25V	D011	MA165	DIODE
C2314	ECQB1H473JM	CAP,P .047UF-J-50V	D014	MA165	DIODE
C2315	ECA1EM100	CAP,E 10UF/25V	D015	MA165	DIODE
C2321	ECA1EM100	CAP,E 10UF/25V	D016	MA165	DIODE
C2324	ECA1EM100	CAP,E 10UF/25V	D017	MA165	DIODE
C2325	ECA1CM102	CAP,E 1000UF/16V	D451	ERA15-01	DIODE

REPLACEMENT PARTS LIST

Models: 27CX29B-501 & 27CX29B-511

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
D452	MA4047M	DIODE, ZENER	COILS		
D453	MA165	DIODE	L001	EXCELSA35	FERRITE BEAD
D461	MA27WTA	DIODE	L002	ELESN390KA	COIL, PEAKING 39UH
D501	MA4082L	DIODE	L003	TLTABT2R2K	COIL, PEAKING 2.2UH
D531	AS01	DIODE	L004	TLTABT2R2K	COIL, PEAKING 2.2UH
D532	MA4062L	DIODE	L005	ELESN390KA	COIL, PEAKING 39UH
D551	TVSRU2N	DIODE	L006	EXCELSA24T	FERRITE BEAD
D554	BYD33G-143	DIODE	L008	TLTABT470K	COIL, PEAKING 47UH
D555	MA165	DIODE	L103	ELESN120JA	COIL, PEAKING 12UH
D556	MA4360H	DIODE, ZENER	L104	TLUABTA390K	COIL, PEAKING 39UH
D557	TVSRU2N	DIODE	L105	EIV7EN053B	COIL, VCO
D558	RS3FS	DIODE	L106	ELESN180JA	COIL, PEAKING 18UH
D559	BYD33G-113	DIODE	L107	TLUABTA390K	COIL, PEAKING 39UH
D560	MA165	DIODE	L351	TLTABT101K	COIL, PEAKING
D561	BYD33G-143	DIODE	L541	EXCELD35	FERRITE BEAD
D801	GP15KL-042	DIODE	L551	ELH5L7103	COIL
D802	GP15KL-042	DIODE	L554	EXCELSA24T	FERRITE BEAD
D805	TRPW5B0M050	D THERMISTOR	L555	EXCELSA24T	FERRITE BEAD
D806	MA4047M	DIODE, ZENER	L556	EXCELSA24T	FERRITE BEAD
D807	MA165	DIODE	L801	ELF20N020A	COIL, 2UH
D809	RU3YX-M	DIODE	L803	ELF17N007A	LINE FILTER
D820	EU02V1	DIODE	L804	EXCELSA39	FERRITE BEAD
D821	EU02V1	DIODE	L805	EXCELSA39	FERRITE BEAD
D822	EU02V1	DIODE	L2302	TLTABT2R2K	COIL, PEAKING 2.2UH
D823	RL30A	DIODE	L6502	ELESN330JA	COIL, PEAKING 33UH
D824	EU02V1	DIODE	L6504	ELESN330JA	COIL, PEAKING 33UH
D825	TVSSR2KL	DIODE, PROTECTION	L6505	ELESN330JA	COIL, PEAKING 33UH
D826	EU02V1	DIODE	L6507	ELESN150KA	COIL, PEAKING 15UH
D829	MA165	DIODE	TRANSISTORS		
D830	MA4270M	DIODE	Q001	2SD601ARTX	TRANSISTOR
D2301	MA165	DIODE	Q002	2SC1685QRS	TRANSISTOR
D2315	MA165	DIODE	Q003	2SB709ARTX	TRANSISTOR
D2342	MA165	DIODE	Q004	2SB709ARTX	TRANSISTOR
D2343	MA165	DIODE	Q005	2SD601ARTX	TRANSISTOR
D3001	MA4110M	DIODE, ZENER	Q302	2SD601ARTX	TRANSISTOR
D3002	MA4110M	DIODE, ZENER	Q303	2SB709ARTX	TRANSISTOR
	FUSES		Q304	2SD601ARTX	TRANSISTOR
F801	XBA2A00101	FUSE 6.3A 125V	Q351	2SC3063	TRANSISTOR
INTEGRATED CIRCUITS			Q352	2SC3063	TRANSISTOR
IC001	MN1874085TX	1 INT CKT	Q353	2SC3063	TRANSISTOR
IC002	24LC04BIP	INT CKT	Q430	2SD601ARTX	TRANSISTOR
IC101	AN5166K	INT CKT	Q451	2SD601ARTX	TRANSISTOR
IC451	LA7838	INT CKT	Q452	2SD601ARTX	TRANSISTOR
IC551	AN78M09	PLUS 9V AVR	Q501	2SC4212H	TRANSISTOR
IC552	AN78M05	PLUS 5V AVR	Q551	2SD2539MA1	TRANSISTOR
IC801	PC817X2	INT CKT	Q801	2SC1685RSTA	TRANSISTOR
IC803	STR58041A	INT CKT	Q802	2SC1384RS	TRANSISTOR
IC2201	AN5828NS-E1	V INT CKT	Q2302	2SB709ARTX	TRANSISTOR
IC2302	AN5272	INT CKT	Q2303	2SD601ARTX	TRANSISTOR
IC3001	MM1114XFBE	INT CKT	Q2362	2SB709ARTX	TRANSISTOR
IC6501	MN8284	INT CKT	Q2363	2SD601ARTX	TRANSISTOR

REPLACEMENT PARTS LIST

Models: 27CX29B-501 & 27CX29B-511

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
Q2409	2SD601ARTX	TRANSISTOR	R040	ERJ6GEYJ223	RES,M 22K-J-1/10
Q2410	2SD601ARTX	TRANSISTOR	R043	ERJ6GEYJ223	RES,M 22K-J-1/10
Q6501	2SD601ARTX	TRANSISTOR	R044	ERJ6GEYJ471	RES,M 470-J-1/10
Q6502	2SD601ARTX	TRANSISTOR	R045	ERJ6GEYJ223	RES,M 22K-J-1/10
Q6503	2SD601ARTX	TRANSISTOR	R046	ERJ6GEYJ103	RES,M 10K-J-1/10
Q6504	2SD601ARTX	TRANSISTOR	R047	ERJ6GEYJ562	RES,M 5.6K-J-1/10
Q6505	2SD601ARTX	TRANSISTOR	R048	ERJ6GEYJ221	RES,M 220-J-1/10
Q6506	2SD601ARTX	TRANSISTOR	R049	ERJ6GEYJ221	RES,M 220-J-1/10
Q6507	2SD601ARTX	TRANSISTOR	R052	ERJ6GEYJ103	RES,M 10K-J-1/10
Q6509	2SD601ARTX	TRANSISTOR	R055	ERJ6GEYJ103	RES,M 10K-J-1/10
Q6510	2SB709ARTX	TRANSISTOR	R057	ERJ6GEYJ103	RES,M 10K-J-1/10
Q6516	2SB709ARTX	TRANSISTOR	R060	ERJ6GEYJ102	RES,M 1K-J-1/10
Q6517	2SD601ARTX	TRANSISTOR	R065	ERJ6GEYJ471	RES,M 470-J-1/10
Q6519	2SD601ARTX	TRANSISTOR	R066	ERJ6GEYJ222	RES,M 2.2K-J-1/10
RELAYS			R067	ERJ6GEYJ222	RES,M 2.2K-J-1/10
RL801	TSEH8007	RELAY	R068	ERJ6GEYJ222	RES,M 2.2K-J-1/10
RESISTORS			R101	ERJ6GEYJ750	RES,M 75-J-1/10
R002	ERJ6GEYJ182	RES,M 1.8K-J-1/10	R102	ERJ6GEYJ683	RES,M 68K-J-1/10
R003	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R104	ERJ6GEYJ681	RES,M 680-J-1/10
R004	ERDS1TJ181	RES,C 180-J-1/2	R105	ERJ6GEYJ681	RES,M 680-J-1/10
R005	ERDS2TJ101	RES,C 100-J-1/4	R107	ERJ6GEYJ471	RES,M 470-J-1/10
R006	ERJ6GEYJ102	RES,M 1K-J-1/10	R108	ERJ6GEYJ222	RES,M 2.2K-J-1/10
R007	ERJ6GEYJ102	RES,M 1K-J-1/10	R109	ERJ6GEYJ183	RES,M 18K-J-1/10
R008	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R152	ERJ6GEYJ183	RES,M 18K-J-1/10
R009	ERJ6GEYJ221	RES,M 220-J-1/10	R153	ERJ6GEYJ223	RES,M 22K-J-1/10
R010	ERJ6GEYJ104	RES,M 100K-J-1/10	R154	ERJ6GEYJ393	RES,M 39K-J-1/10
R011	ERJ6GEYJ474	RES,M 470K-J-1/10	R201	ERJ6GEYJ471	RES,M 470-J-1/10
R012	ERJ6GEYJ473	RES,M 47K-J-1/10	R202	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R013	ERJ6GEYJ223	RES,M 22K-J-1/10	R203	ERJ6GEYJ222	RES,M 2.2K-J-1/10
R014	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R303	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R015	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R304	ERJ6GEYJ332	RES,M 3.3K-J-1/10
R016	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R305	ERJ6ENF3001	RES,M 3K-F-1/10
R017	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R306	ERJ6ENF1651	RES,M 1.65K-F-1/10
R020	ERJ6GEYJ474	RES,M 470K-J-1/10	R308	ERJ6GEYJ102	RES,M 1K-J-1/10
R021	ERJ6GEYJ101	RES,M 100-J-1/10	R309	ERJ6GEYJ393	RES,M 39K-J-1/10
R022	ERJ6GEYJ101	RES,M 100-J-1/10	R310	ERJ6GEYJ393	RES,M 39K-J-1/10
R023	ERJ6GEYJ102	RES,M 1K-J-1/10	R311	ERJ6GEYJ185	RES,M 1.8MEG-J-1/10W
R024	ERJ6GEYJ221	RES,M 220-J-1/10	R313	ERJ6GEYJ471	RES,M 470-J-1/10
R025	ERJ6GEYJ223	RES,M 22K-J-1/10	R314	ERJ6GEYJ102	RES,M 1K-J-1/10
R026	ERJ6GEYJ103	RES,M 10K-J-1/10	R317	ERJ6GEYJ684	RES,M 680K-J-1/10
R027	ERJ6GEYJ133	RES,M 13K-J-1/10	R320	ERJ6GEYJ102	RES,M 1K-J-1/10
R030	ERJ6GEYJ102	RES,M 1K-J-1/10	R351	ERG2FJ123H	RES,M 12K-J-2W
R031	ERJ6GEYJ471	RES,M 470-J-1/10	R352	ERG2FJ123H	RES,M 12K-J-2W
R032	ERJ6ENF1002	RES,M 10K-F-1/10	R353	ERG2FJ123H	RES,M 12K-J-2W
R033	ERJ6GEYJ222	RES,M 2.2K-J-1/10	R354	ERDS1TJ272	RES,C 2.7K-J-1/2
R034	ERJ6GEYJ222	RES,M 2.2K-J-1/10	R355	ERDS1TJ272	RES,C 2.7K-J-1/2
R035	ERJ6GEYJ332	RES,M 3.3K-J-1/10	R356	ERDS1TJ272	RES,C 2.7K-J-1/2
R036	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R357	ERDS2TJ301	RES,C 300-J-1/4
R037	ERJ6GEYJ103	RES,M 10K-J-1/10	R358	ERDS2TJ301	RES,C 300-J-1/4
R038	ERJ6GEYJ223	RES,M 22K-J-1/10	R359	ERDS2TJ301	RES,C 300-J-1/4
R039	ERJ6GEYJ102	RES,M 1K-J-1/10	R360	ERDS2TJ122	RES,C 1.2K-J-1/4

REPLACEMENT PARTS LIST

Models: 27CX29B-501 & 27CX29B-511

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
R361	ERDS2TJ122	RES,C 1.2K-J-1/4	R561	ERG2FJ102H	RES,M 1K-J-2W
R362	ERDS2TJ122	RES,C 1.2K-J-1/4	R563	ERDS2TJ683	RES,C 68K-J-1/4
R363	ERDS2TJ101	RES,C 100-J-1/4	R564	ERDS2TJ823	RES,C 82K-J-1/4
R364	ERDS2TJ101	RES,C 100-J-1/4	R565	ERJ6GEYJ103	RES,M 10K-J-1/10
R365	ERDS2TJ101	RES,C 100-J-1/4	R566	ERDS1FJ1R0	RES,C 1.0-J-1/2
R401	ERJ6GEYJ102	RES,M 1K-J-1/10	R602	ERJ6GEYJ331	RES,M 330-J-1/10
R430	ERJ6GEYJ103	RES,M 10K-J-1/10	R603	ERJ6GEYJ331	RES,M 330-J-1/10
R432	ERJ6GEYJ102	RES,M 1K-J-1/10	R604	ERJ6GEYJ331	RES,M 330-J-1/10
R451	ERDS1FJ1R0	RES,C 1.0-J-1/2	R614	ERJ6GEYJ332	RES,M 3.3K-J-1/10
R453	ERJ6GEYJ224	RES,M 220K-J-1/10	R801	ERF7ZK1R5	RES,W 1.5-K-7W
R454	ERJ6GEYJ473	RES,M 47K-J-1/10	R804	ERW12PK1R8	RES,W 1.8-K-1/2W
R455	ERJ6GEYJ183	RES,M 18K-J-1/10	R805	ERDS2TJ274	RES,C 270K-J-1/4
R456	ERJ6GEYJ223	RES,M 22K-J-1/10	R806	ERDS2TJ274	RES,C 270K-J-1/4
R457	ERJ6GEYJ182	RES,M 1.8K-J-1/10	R808	ERDS1FJ1R0	RES,C 1.0-J-1/2
R458	ERJ6GEYJ333	RES,M 33K-J-1/10	R809	ERDS1FJ1R0	RES,C 1.0-J-1/2
R459	ERJ6GEYJ683	RES,M 68K-J-1/10	R810	ERDS1FJ272	RES,C 2.7K-J-1/2
R460	ERDS2TJ102	RES,C 1K-J-1/4	R812	ERDS1TJ183	RES,C 18K-J-1/2
R462	ERJ6GEYJ473	RES,M 47K-J-1/10	R813	ERJ6GEYJ562	RES,M 5.6K-J-1/10
R463	ERJ6GEYJ473	RES,M 47K-J-1/10	R815	ERC12ZGM825	RES,S 8.2MEG-M-1/2
R464	ERDS1FJ1R5	RES,C 1.5-J-1/2	R818	ERQ12HJR56	RES,F .56-J-1/2
R465	ERJ6GEYJ103	RES,M 10K-J-1/10	R820	ERJ6GEYJ153	RES,M 15K-J-1/10
R466	ERJ6GEYJ103	RES,M 10K-J-1/10	R821	ERJ6GEYJ392	RES,M 3.9K-J-1/10
R467	ERJ6GEYJ104	RES,M 100K-J-1/10	R822	ERD50FJ474	RES,C 470K-J-1/2W
R468	ERJ6GEYJ101	RES,M 100-J-1/10	R823	ERDS2TJ222	RES,C 2.2K-J-1/4
R469	ERJ6GEYJ220	RES,M 22-J-1/10	R824	ERG3FJ390H	RES,M 39-J-3W
R471	ERJ6GEYJ223	RES,M 22K-J-1/10	R825	ERDS2TJ102	RES,C 1K-J-1/4
R501	ERJ6GEYJ102	RES,M 1K-J-1/10	R826	ERF2AKR22	RES,W .22-K-2W
R502	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R827	ERDS1FJ561	RES,C 560-J-1/2
R503	ERJ6GEYJ822	RES,M 8.2K-J-1/10	R828	ERG3FJ470	RES,M 47-J-3W
R504	ERJ6GEYJ561	RES,M 560-J-1/10	R829	ERQ14AJ6R8	RES,F 6.8-J-1/4
R505	ERJ6GEYJ682	RES,M 6.8K-J-1/10	R2201	ERJ6GEYJ224	RES,M 220K-J-1/10
R506	ERJ6GEYJ182	RES,M 1.8K-J-1/10	R2206	ERJ6GEYJ102	RES,M 1K-J-1/10
R507	ERJ6GEYJ392	RES,M 3.9K-J-1/10	R2207	ERJ6GEYJ102	RES,M 1K-J-1/10
R508	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R2220	ERJ6GEYJ101	RES,M 100-J-1/10
R509	ERDS2TJ331	RES,C 330-J-1/4	R2301	ERQ2CJP120	RES,F 12-J-2W
R510	ERG3FJ362H	RES,M 3.6K-J-3W	R2305	ERD25FJ180	RES,C 18-J-1/4
R511	ERG3FJ362H	RES,M 3.6K-J-3W	R2306	ERD25FJ180	RES,C 18-J-1/4
R512	ERG2FJ392H	RES,M 3.9K-J-2W	R2307	ERJ6GEYJ221	RES,M 220-J-1/10
R531	ERD25FJ470	RES,C 47-J-1/4	R2308	ERJ6GEYJ221	RES,M 220-J-1/10
R532	ERJ6ENF5602	RES,M 56K-F-1/10	R2311	ERJ6GEYJ392	RES,M 3.9K-J-1/10
R533	ERJ6ENF2102	RES,M 21K-F-1/10	R2312	ERJ6GEYJ822	RES,M 8.2K-J-1/10
R536	ERJ6GEYJ223	RES,M 22K-J-1/10	R2318	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R537	ERJ6GEYJ473	RES,M 47K-J-1/10	R2319	ERJ6GEYJ223	RES,M 22K-J-1/10
R550	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2323	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R551	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2329	ERJ6GEYJ751	RES,M 750-J-1/10
R552	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2330	ERJ6GEYJ153	RES,M 15K-J-1/10
R553	ERG2FJ470H	RES,M 27-J-3W	R2332	ERJ6GEYJ751	RES,M 750-J-1/10
R556	ERJ6GEYJ272	RES,M 2.7K-J-1/10	R2333	ERJ6GEYJ153	RES,M 15K-J-1/10
R557	ERJ6GEYJ103	RES,M 10K-J-1/10	R2352	ERJ6GEYJ472	RES,M 4.7K-J-1/10
R558	ERQ1CKPR56	RES,F .56-K-1W	R2357	ERJ6GEYJ221	RES,M 220-J-1/10
R559	ERG2FJ683H	RES,M 12K-J-2W	R2359	ERJ6GEYJ472	RES,M 4.7K-J-1/10

REPLACEMENT PARTS LIST

Models: 27CX29B-501 & 27CX29B-511

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
R2361	ERJ6GEYJ221	RES,M 220-J-1/10	R6555	ERJ6GEYJ153	RES,M 15K-J-1/10
R2362	ERJ6GEYJ103	RES,M 10K-J-1/10	R6556	ERJ6GEYJ333	RES,M 33K-J-1/10
R2363	ERJ6GEYJ471	RES,M 470-J-1/10	R6557	ERJ6GEYJ123	RES,M 12K-J-1/10
R2366	ERDS2TJ222	RES,C 2.2K-J-1/4	R6558	ERJ6GEYJ331	RES,M 330-J-1/10
R2367	ERDS2TJ222	RES,C 2.2K-J-1/4	R6559	ERJ6GEYJ272	RES,M 2.7K-J-1/10
R2418	ERJ6GEYJ471	RES,M 470-J-1/10	R6560	ERJ6GEYJ124	RES,M 120K-J-1/10
R2419	ERJ6GEYJ471	RES,M 470-J-1/10	R6565	ERJ6GEYJ102	RES,M 1K-J-1/10
R3016	ERJ6GEYJ750	RES,M 75-J-1/10	R6566	ERJ6GEYJ681	RES,M 680-J-1/10
R3017	ERJ6GEYJ750	RES,M 75-J-1/10	R6567	ERJ6GEYJ222	RES,M 2.2K-J-1/10
R3026	ERDS2TJ331	RES,C 330-J-1/4	R6568	ERJ6GEYJ471	RES,M 470-J-1/10
R3033	ERJ6GEYJ101	RES,M 100-J-1/10	R6570	ERJ6GEYJ103	RES,M 10K-J-1/10
R3034	ERJ6GEYJ101	RES,M 100-J-1/10	SWITCHES		
R3041	ERDS2TJ102	RES,C 1K-J-1/4	S001	EVQQKH06K	SWITCH, PUSH
R3042	ERDS2TJ102	RES,C 1K-J-1/4	S002	EVQQKH06K	SWITCH, PUSH
R6501	ERJ6GEYJ471	RES,M 470-J-1/10	S003	EVQQKH06K	SWITCH, PUSH
R6502	ERJ6GEYJ471	RES,M 470-J-1/10	S004	EVQQKH06K	SWITCH, PUSH
R6503	ERJ6GEYJ103	RES,M 10K-J-1/10	S005	EVQQKH06K	SWITCH, PUSH
R6504	ERJ6GEYJ103	RES,M 10K-J-1/10	S006	EVQQKH06K	SWITCH, PUSH
R6505	ERJ6GEYJ471	RES,M 470-J-1/10	S007	EVQQKH06K	SWITCH, PUSH
R6506	ERJ6GEYJ471	RES,M 470-J-1/10	TRANSFORMERS		
R6507	ERJ6GEYJ102	RES,M 1K-J-1/10	T001	TLP16297	TRANSFORMER, POWER SUPPLY
R6508	ERJ6GEYJ102	RES,M 1K-J-1/10	T501	TLH15452	TRANSFORMER, HORIZONTAL DRIVER
R6509	ERJ6GEYJ471	RES,M 470-J-1/10	T502	ETE19Z30AY	TRANSFORMER, HORIZONTAL COUPLING
R6510	ERJ6GEYJ102	RES,M 1K-J-1/10	T551	TLF2AA002	TRANSFORMER, FLYBACK
R6511	ERJ6GEYJ123	RES,M 12K-J-1/10	T801	ETS29AK2R6N	C TRANSFORMER
R6512	ERJ6GEYJ102	RES,M 1K-J-1/10	CRYSTALS/FILTERS		
R6513	ERJ6GEYJ152	RES,M 1.5K-J-1/10	X001	TSS2080MX	CRYSTAL, 12 MHZ CLOCK
R6515	ERJ6GEYJ102	RES,M 1K-J-1/10	X101	M1969M	SAW FILTER
R6516	ERJ6GEYJ103	RES,M 10K-J-1/10	X102	EFCS4R5MW5B	A FILTER, BANDPASS
R6517	ERJ6GEYJ562	RES,M 5.6K-J-1/10	X201	SFSH4R5MDB	CRYSTAL
R6518	ERJ6GEYJ333	RES,M 33K-J-1/10	X501	TAFCBSB503F3	8 CRYSTAL, CLOCK
R6519	ERJ6GEYJ333	RES,M 33K-J-1/10	X601	TSS2AA001	CRYSTAL, 3.58MHZ
R6520	ERJ6GEYJ511	RES,M 510-J-1/10W	OTHERS		
R6521	ERJ6GEYJ102	RES,M 1K-J-1/10	M001	EAS9D22A0	SPEAKER, 16 OHM/1.5W
R6522	ERJ6GEYJ102	RES,M 1K-J-1/10	TNR001	ENV56D37G3R	TUNER
R6523	ERJ6GEYJ562	RES,M 5.6K-J-1/10	IC003	PIC-12042SR	B RECEIVER, REMOTE CONTROL
R6524	ERJ6GEYJ471	RES,M 470-J-1/10	M002	ETC33X82NA	YOKE, CONVERGENCE
R6526	ERJ6GEYJ102	RES,M 1K-J-1/10	M003	HL00761	TRANSMITTER, REMOTE CONTROL
R6529	ERJ6GEYJ223	RES,M 22K-J-1/10	M004	H462271	WARRANTY CARD 27CX29B-501
R6530	ERJ6GEYJ223	RES,M 22K-J-1/10	M005	H462471	WARRANTY CARD 27CX29B-511
R6535	ERJ6GEYJ181	RES,M 180-J-1/10	M006	M68LGL061X	CRT 27"
R6537	ERJ6GEYJ392	RES,M 3.9K-J-1/10	M007	TBM2AA0031	BADGE, HITACHI
R6538	ERJ6GEYJ122	RES,M 1.2K-J-1/10	M008	TBX2A50281G	BUTTON, 7 KEY
R6540	ERJ6GEYJ151	RES,M 150-J-1/10	M009	TJSC00300	CRT SOCKET
R6542	ERJ6GEYJ680	RES,M 68-J-1/10	DY	TLY2AA006	DEFLECTION YOKE
R6543	ERJ6GEYJ122	RES,M 1.2K-J-1/10	M010	TMM2A30702	WEDGE, YOKE
R6545	ERJ6GEYJ221	RES,M 220-J-1/10	M011	TQB2AA0310	MANUAL, OWNERS 27CX29B-501
R6549	ERJ6GEYJ222	RES,M 2.2K-J-1/10	M012	TQB2AA0311	MANUAL, OWNERS 27CX29B-511
R6552	ERJ6GEYJ101	RES,M 100-J-1/10	M013	TQB2AA7052	V-CHIP MANUAL
R6553	ERJ6GEYJ101	RES,M 100-J-1/10			
R6554	ERJ6GEYJ473	RES,M 47K-J-1/10			

REPLACEMENT PARTS LIST

Models: 27CX29B-501 & 27CX29B-511

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
M014	TSX2AA0111	AC LINE CORD	DEG	0LK19045A	COIL, DEGAUSSING 27"
M015	TXFKU49ASER	ASSY. CABINET BACK	M019	2784243	BATTERY
M016	TXFKU50ASER	ASSY. CABINET BACK	JK3001	TJB2A9063B	ASSY. JACK 1A/V
M017	TXF3A01ZER	ASSY. DAG GROUND	JK3003	TJB2AA0171	TERMINAL, A/V
M018	0FMK014ZZ	CONVERGENCE CORRECTOR STRIP			

DESCRIPTION OF ABBREVIATIONS GUIDE

RESISTOR			
TYPE		TOLERANCE	
C	Carbon	F	+/- 1%
F	Fuse	J	+/- 5%
M	Metal Oxide	K	+/- 10%
S	Solid	M	+/- 20%
W	Wire Wound	G	+/- 2%

RES, C 270-J-1/4

CAPACITOR			
TYPE		TOLERANCE	
C	Ceramic	C	+/- 0.25pF
E	Electrolytic	D	+/- 0.5pF
P	Polyester	F	+/- 1pF
S	Styrol	J	+/- 5%
T	Tantalum	K	+/- 10%
		L	+/- 15%
		M	+/- 20%
		P	+10% -0%
		Z	+80% -20%

CAP, P .068UF-K-50V

NOTES

SERVICEMAN MODE (ELECTRONIC CONTROL) SERVICE ADJUSTMENT VALUES

Model _____ Ser # _____ Date _____

Note: Record the original settings PRIOR to modifying the registers.

Mode	Service Adjustment	Adjustment Range	Def. Val.	Original Value	New Value
Sub Adjustments					
B0	SUB-COLOR	0 ~ 63	33		
B1	SUB-TINT	0 ~ 63	33		
B2	SUB-BRIGHTNESS	0 ~ 255	80		
B3	SUB-PICTURE	0 ~ 63	34		
B4	KILLER/ABL/ GAMMA	0 ~ 7	5		
B5	VIDEO ADJUSTMENT	0 ~ 15	8		
B6	AUDIO ADJUSTMENT	0 ~ 31	16		
B7	V-SIZE	0 ~ 61	20		
Cut-Off Adjustments					
C0	CUT-OFF R	0 ~ 1 0 ~ 255	0 128		
C1	CUT-OFF G	0 ~ 255	64		
C2	CUT-OFF B	0 ~ 1 0 ~ 255	0 128		
C3	DRIVE R	0 ~ 255	64		
C4	DRIVE B	0 ~ 255	64		
C5	YNR SWITCH	0 ~ 1	0		
C6	AFT	0 ~ 1 0 ~ 128	128 64		
C7	RF-AGC	0 ~ 255	192		
C8	YNR VIDEO ADJUSTMENT	0 ~ 7	0		
C9	HORIZONTAL CENTER	0 ~ 31	16		
Ca	BEAM LIMIT	0 ~ 7	0		
Cb	VCJ TEST H	0 ~ 2	0		
MTS Adjustments					
M0	INPUT LEVEL	0 ~ 63	33		
M1	HIGH-LEVEL SEPARATION	0 ~ 63	25		
M2	LOW-LEVEL SEPARATION	0 ~ 16	6		

Mode	Service Adjustment	Adjustment Range	Def. Val.	Original Value	New Value
Options Adjustments					
S0	PIP COLOR	0 ~ 127	80		
S1	PIP CONTRAST	0 ~ 127	52		
S2	UP 1/9	0 ~ 255	26		
S3	DOWN 1/9	0 ~ 255	146		
S4	LEFT 1/9	0 ~ 255	9		
S5	RIGH 1/9	0 ~ 255	103		
S6	UP 1/16	0 ~ 255	27		
S7	DOWN 1/16	0 ~ 255	163		
S8	LEFT 1/16	0 ~ 255	9		
S9	RIGH 1/16	0 ~ 255	118		
Sa	FREERUN	N/A	0		
Sb	CLOCK ADJUSTMENT	0 ~ 255	128		
Sc	PIP TINT	0 ~ 255	50		
Sd	LOUDNESS COMPENSATION	0 ~ 63	52		
Comb Filter Adjustments					
X0	COMB GAIN	0 ~ 255	152		
X1	COMB SWITCH	0 ~ 63	12		
X2	COMB LIMIT	0 ~ 63	24		
X3	COMB CORE	0 ~ 127	41		
X4	COMB RF DELAY	0 ~ 127	18		
X5	COMB VIDEO DELAY	0 ~ 127	18		
X6	COMB VMLM	0 ~ 127	90		
X7	COMB VM SW	0 ~ 63	24		
X8	COMB CHARP	0 ~ 255	67		
X9	COMB VM LEVEL	0 ~ 255	255		
Xa	COMB VMPKF	0 ~ 1	01		
Xb	COMB ADJ SHARP	0 ~ 63	10		

Note: Some adjustments modes may not be available in some models depending on available options.



HITACHI

A-Board Schematic (Left Portion)

TNP2AH012DU (A)

1

2

3

4

HITACHI

Sheet 1 of 2
Side A

5

Boards Designation

- A-Board - Main Chassis
- C-Board - CRT Drive

Voltage Measurements

- Voltage measurement:
 - AC input to the Receiver is 120V. NTSC (HD, 1125i & 525P when applicable) signal generator is connected to the antenna of the Receiver. (Color bar pattern of 100 IRE white and 7.5 IRE black.) All Picture and Audio adjustments are set to Normalize.
 - TV ANT/CABLE - (Set-Up Menu) in TV/ANT Mode
 - Volume - Min
 - TV/Video SW - TV position
 - Audio Mode - Stereo
- Voltage readings are nominal and may vary $\pm 10\%$ on active devices. Some voltage reading will vary with signal strength and picture content. Supply voltages are nominal.
- Ground symbol \downarrow indicates ground lead connection of meter. Incorrect ground connection will result in erroneous readings.
CAUTION: Incorrect ground connection of the test equipment will result in erroneous readings.

Schematic Notes

- Resistors are carbon 1/4W unless noted otherwise.
- Capacitors are ceramic 50V unless noted otherwise.
- Coil value notes is inductance in μH . Test point indicated by ∇ . Test point but no pin ∇ .
- Components indicated with Δ are critical parts and replacement should be made with manufacture specified replacement parts only.
- (BOLD LINE)** indicates the route of B+ supply.
- The schematic diagrams are current at the time of printing and are subject to change without notice.
- Ground symbol \downarrow indicates **HOT** GROUND CONNECTION. ∇ indicates **COLD** GROUND.
- NOTE:** All other component symbols are used for engineering design purposes.

Waveform Measurements

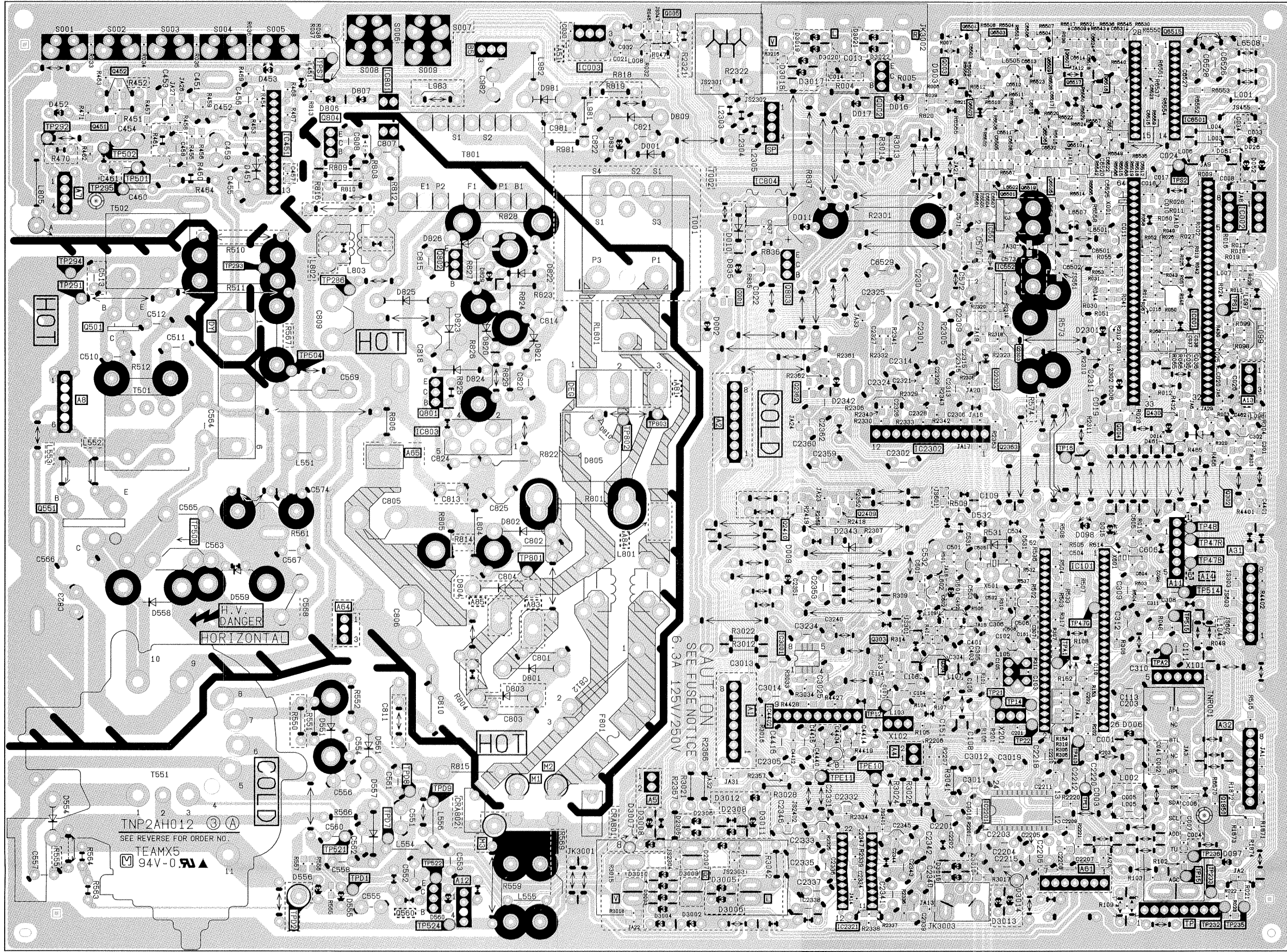
- Indicates waveform measurement. Measurement can be taken at the best accessible location in common to the indicated point.
- Taken with an NTSC signal generator connected to the antenna terminal. (NTSC color bar pattern of 8 bars of FEA colors, 100 IRE white and 7.5 IRE black.)
- Customer Controls: (Picture/Audio Menu) are set to Normalize. Volume is set to "MIN".
- All video and color waveforms are taken with a wideband scope and a probe with low capacitance (10 to 1). Shape and peak altitudes may vary depending on the type of Oscilloscope used and its settings.
- Ground symbol \downarrow shown on waveform number indicates (Hot) ground lead connection of the Oscilloscope.
CAUTION: Incorrect ground connection of the test equipment will result in erroneous readings.

IMPORTANT SAFETY NOTICE

THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES THAT ARE IMPORTANT FOR PROTECTION FROM RADIATION, FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING, IT IS ESSENTIAL THAT ONLY MANUFACTURERS' SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS DESIGNATED WITH A Δ IN THE SCHEMATIC.

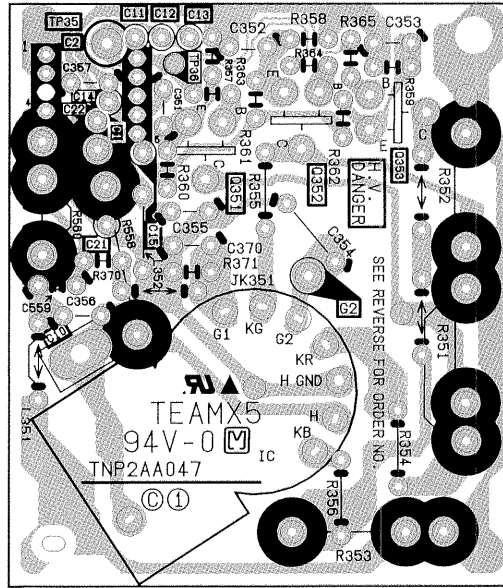
See Sheet 2 Side A for Right Portion of Schematic

A-Board Layout - TNP2AH012

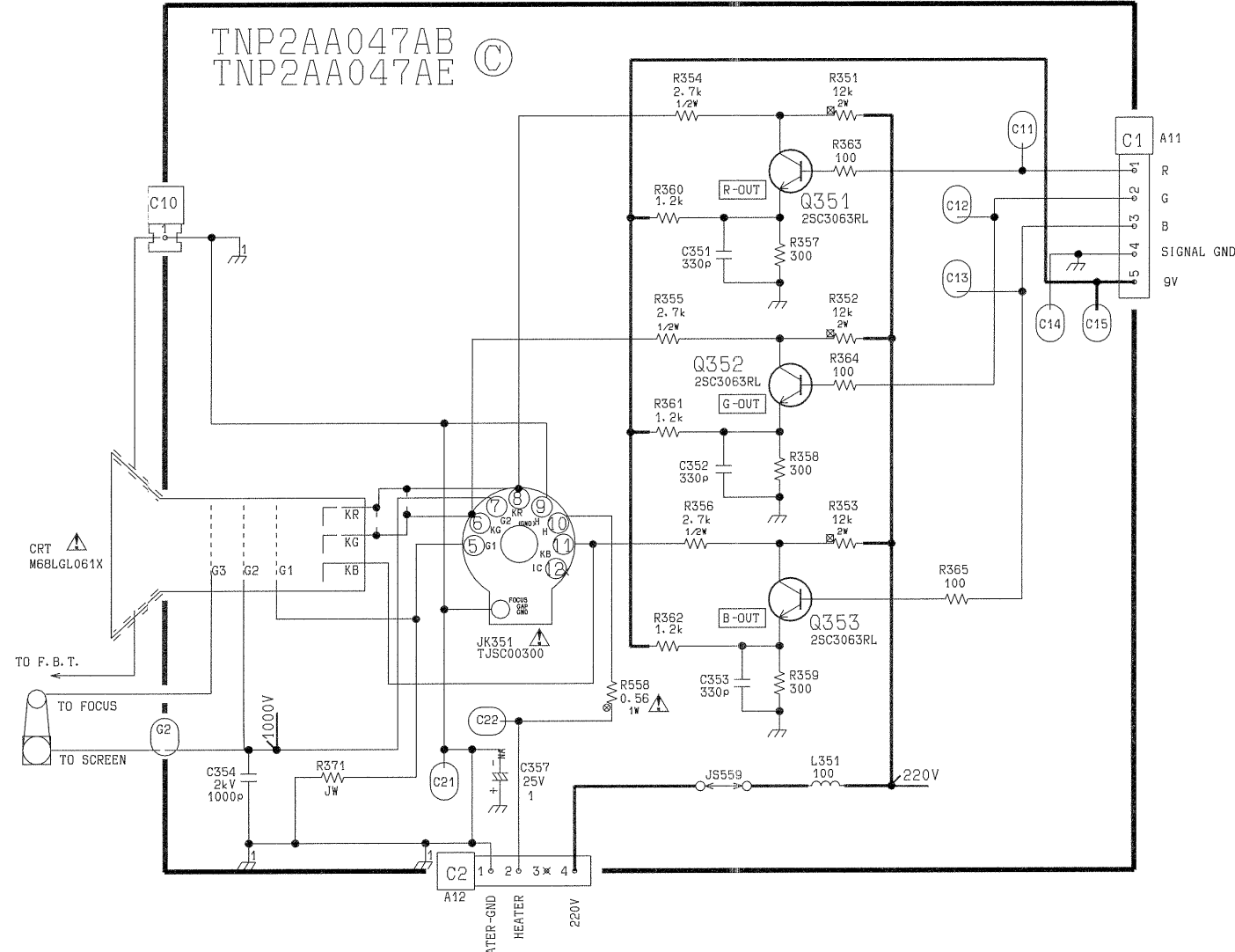


Note:
The board above has been modified to enhance and display traces otherwise hidden by a mask.

C-Board Layout - TNP2AA047

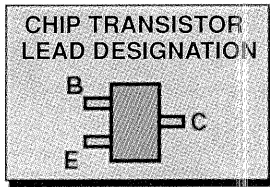


C-Board Schematic



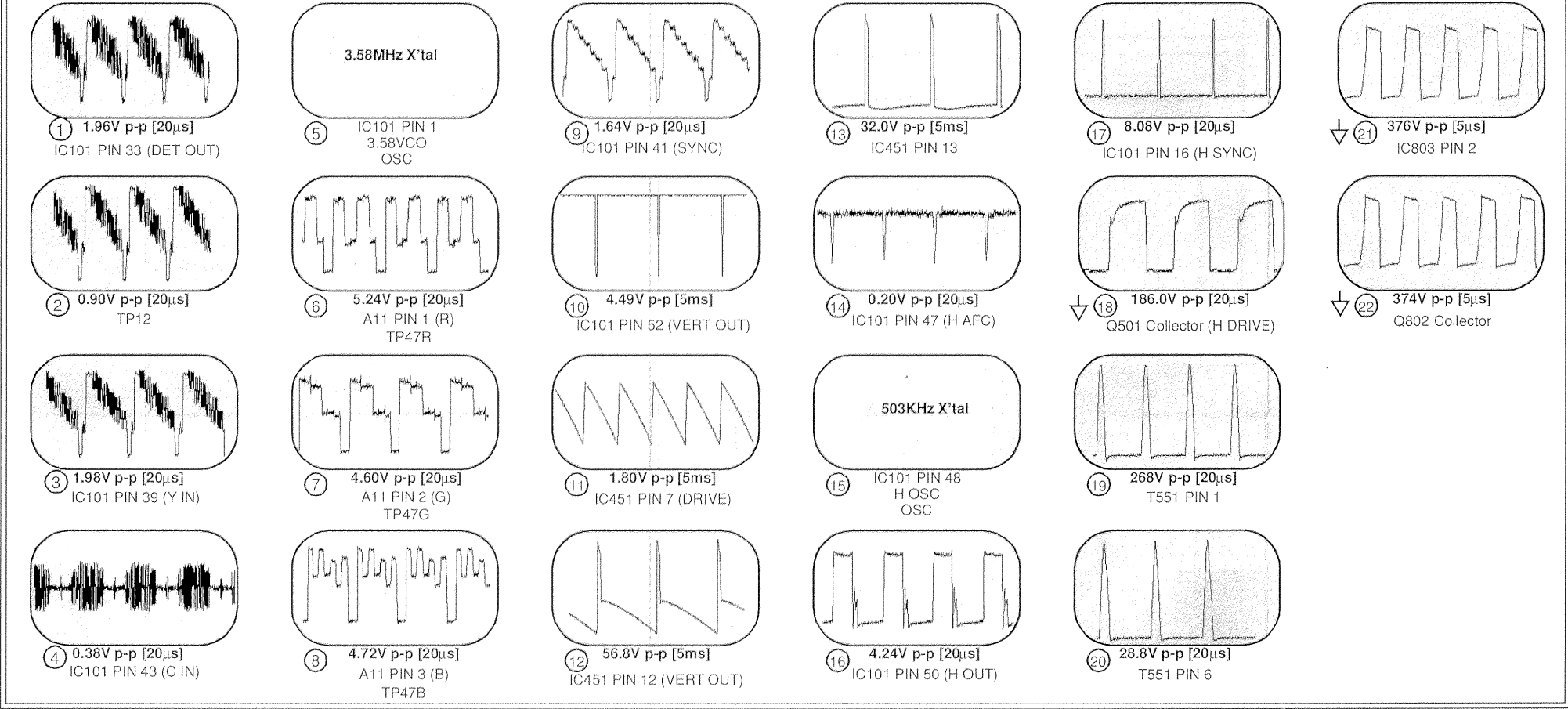
C-Board Voltage Measurements (Transistors)

	Q351	Q352	Q353
B	3.53	3.28	3.30
C	163.00	166.20	165.10
E	3.09	2.95	2.97



Note:
Voltages were obtained using a digital multimeter.

Waveforms - A-Board



Boards Designation

- A-Board - Main Chassis
- C-Board - CRT Drive

Waveform Measurements

- Indicates waveform measurement. (Measurement can be taken at the best accessible location in common to the indicated point.)
- Taken with an NTSC signal generator connected to the antenna terminal. (NTSC color bar pattern of 8 bars of EIA colors, 100 IRE white and 7.5 IRE black.)
- Customer Controls (Picture/Audio Menu) are set to Normalize. Volume is set to 'MIN'.
- All video and color waveforms are taken with a wideband scope and a probe with low capacitance (10 to 1). Shape and peak altitudes may vary depending on the type of Oscilloscope used and its settings.
- Ground symbol \downarrow shown on waveform number indicates (Hot) ground lead connection of the Oscilloscope.
CAUTION: incorrect ground connection of the test equipment will result in erroneous readings.

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Voltage Measurements

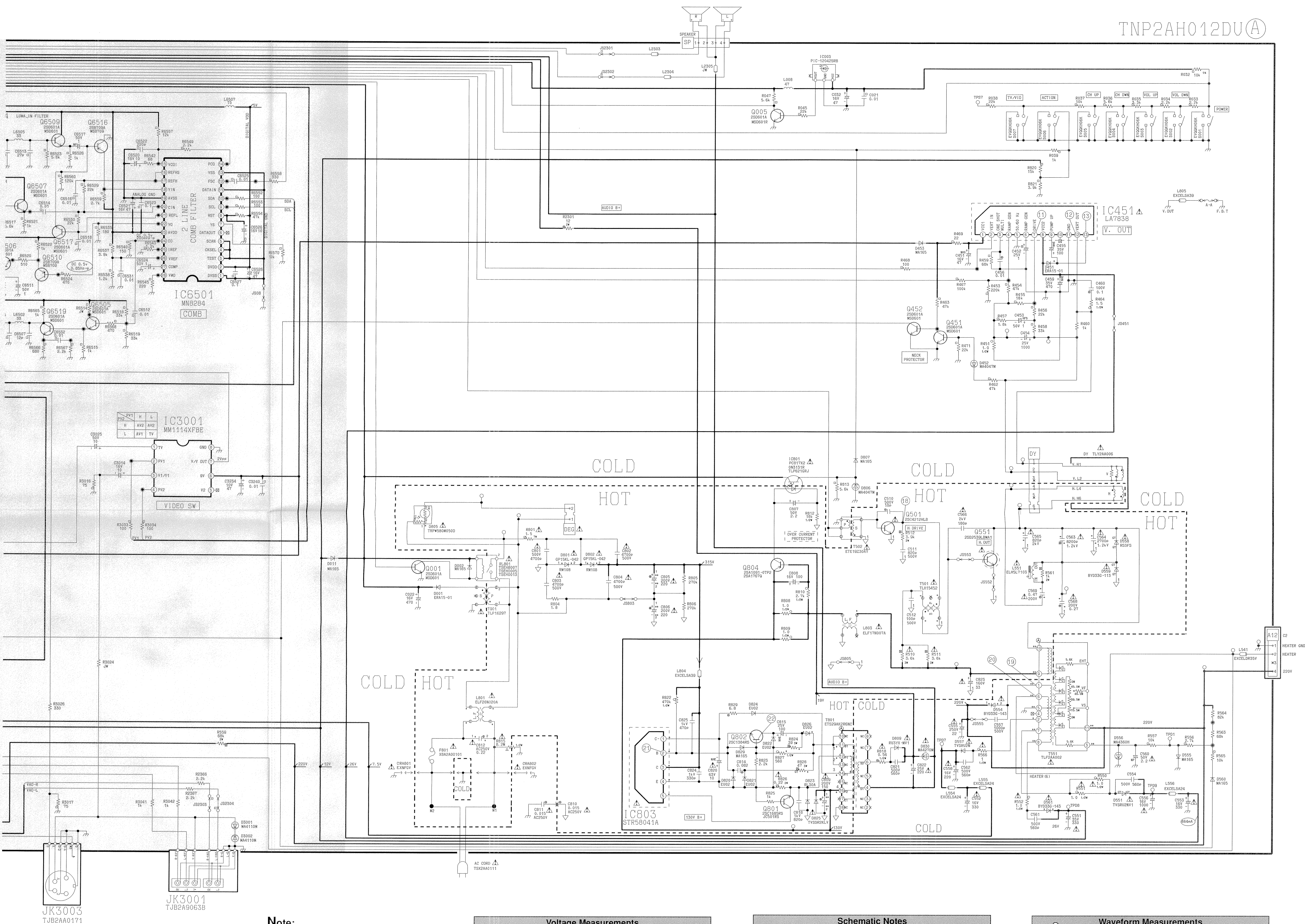
- Voltage measurement:
AC input to the Receiver is 120V. NTSC (HD, 1125i & 525P when applicable) signal generator is connected to the antenna of the Receiver. (Color bar pattern of 100 IRE white and 7.5 IRE black.)
All Picture and Audio adjustments are set to Normalize.
TV ANT/CABLE - (Set Up Menu) in TV/ANT Mode
Volume - Min
TV/Video SW - TV position
Audio Mode - Stereo
- Voltage readings are nominal and may vary $\pm 10\%$ on active devices. Some voltage reading will vary with signal strength and picture content. Supply voltages are nominal.
Ground symbol \downarrow indicates ground lead connection of meter. Incorrect ground connection will result in erroneous readings.
CAUTION: incorrect ground connection of the test equipment will result in erroneous readings.

Schematic Notes

- Resistors are carbon 1/4W unless noted otherwise.
- Capacitors are ceramic 50V unless noted otherwise.
- Coil value notes is inductance in μ H. Test point indicated by \uparrow ; Test point OUT to pin 1.
- Components indicated with Δ are critical parts and replacement should be made with manufacture specified replacement parts only.
- BOLD LINE:** indicates the route of B+ supply.
- The schematic diagrams are current at the time of printing and are subject to change without notice.
- Ground symbol \downarrow indicates **HOT GROUND CONNECTION**. \downarrow indicates COLD GROUND.
- NOTE:** All other component symbols are used for engineering design purposes.

Overlapping Section
See Sheet 1 Side A for Left Portion of Schematic

A-Board Schematic (Right Portion)



Note:

Voltages were obtained
using a digital multimeter.

Boards Designation

- A-Board - Main Chassis
- C-Board - CRT Drive

Voltage Measurements

- Voltage measurement:
AC input to the Receiver is 120V.
NTSC (HD, 1125i & 525P when applicable) signal generator is connected to the antenna of the Receiver. (Color bar pattern of 100 IRE white and 7.5 IRE black.) All Picture and Audio adjustments are set to Normalize.
TV ANT/CABLE - (Set Up Menu) in TV ANT Mode
Volume - Min
TV Video SW - TV position
Audio Mode - Stereo
- Ground symbol \downarrow indicates ground lead connection of meter. Incorrect ground connection will result in erroneous readings.
CAUTION: Incorrect ground connection of the test equipment will result in erroneous readings.

Voltage readings are nominal and may vary $\pm 10\%$ on active devices. Some voltage reading will vary with signal strength and picture content. Supply voltages are nominal.

Schematic Notes

- Resistors are carbon 1/4W unless noted otherwise.
- Capacitors are ceramic 50V unless noted otherwise.
- Coil value notes is inductance in μH . Test point indicated by \uparrow . Test point but no pin \uparrow .
- Components indicated with Δ are critical parts and replacement should be made with manufacturer specified replacement parts only.
- (BOLD LINE)** indicates the route of B+ supply.
- The schematic diagrams are current at the time of printing and are subject to change without notice.
- Ground symbol \downarrow indicates **HOT GROUND CONNECTION**. **HOT** indicates COLD GROUND.
- NOTE: All other component symbols are used for engineering design purposes.**

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Waveform Measurements

- Indicates waveform measurement. (Measurement can be taken at the best accessible location in common to the indicated point).
- Taken with an NTSC signal generator connected to the antenna terminal. (NTSC color bar pattern of 8 bars of EIA colors, 100 IRE white and 7.5 IRE black.)
- Customer Controls: (Picture/Audio Menu) are set to Normalize. Volume is set to 'MIN'.
- All video and color waveforms are taken with a wideband scope and a probe with low capacitance (10 to 1). Shape and peak altitudes may vary depending on the type of Oscilloscope used and its settings.
- Ground symbol \downarrow shown on waveform number indicates (Hot) ground lead connection of the Oscilloscope.
- CAUTION: Incorrect ground connection of the test equipment will result in erroneous readings.**

A-Board Voltage Measurements
(ICs and Transistors)

IC001				IC002			
1	0.03	33	n.c	1	GND	41	n.c
2	2.39	34	5.23	2	GND	42	0.01
3	n.c	35	5.25	3	GND	43	0.01
4	3.39	36	n.c	4	GND	44	0.01
5	5.24	37	n.c	5	3.46	45	1.73
6	2.82	38	GND	6	3.53	46	-0.10
7	2.97	39	0.15	7	GND	47	0.09
8	5.24	40	4.17	8	5.25	48	n.c
9	n.c	41	0.01	9	n.c	49	n.c
10	5.24	42	0.01	10	n.c	50	0.09
11	n.c	43	0.01	11	2.91	51	n.c
12	GND	44	0.01	12	GND	52	0.05
13	2.62	45	1.73	13	GND	53	0.04
14	n.c	46	-0.10	14	2.91	54	5.00
15	n.c	47	0.09	15	GND	55	4.10
16	n.c	48	n.c	16	8.12	56	n.c
17	n.c	49	n.c	17	4.09	57	0.00
18	0.66	50	0.09	18	4.07	58	1.78
19	n.c	51	n.c	19	4.12	59	3.47
20	n.c	52	0.05	20	4.14	60	3.53
21	5.25	53	n.c	21	3.77	61	5.25
22	0.00	54	4.10	22	26.90	62	2.39
23	n.c	55	4.10	23	2.77	63	5.19
24	n.c	56	n.c	24	2.77	64	GND
25	1.29	57	0.00	25	2.77		
26	1.78	58	5.25	26	2.77		
27	GND	59	3.47	27	2.77		
28	n.c	60	3.53	28	2.77		
29	n.c	61	5.25	29	2.77		
30	n.c	62	2.39	30	2.77		
31	5.19	63	5.19	31	2.77		
32	n.c	64	GND	32	2.77		

IC551				IC101			
1	13.57	1	2.93	27	n.c	1	2.93
2	GND	2	5.58	28	3.12	2	5.58
3	8.86	3	0.01	29	2.50	3	0.01
4	0.00	4	0.00	30	n.c	4	0.00
5	0.01	5	0.01	31	4.37	5	0.01
6	0.01	6	0.01	32	n.c	6	0.01
7	8.83	7	8.83	33	2.89	7	8.83
8	3.39	8	3.39	34	2.57	8	3.39
9	3.30	9	3.30	35	3.36	9	3.30
10	3.32	10	3.32	36	3.36	10	3.32
11	4.20	11	4.20	37	8.51	11	4.20
12	GND	12	GND	38	5.75	12	GND
13	3.58	13	3.58	39	4.23	13	3.58
14	3.46	14	3.46	40	2.82	14	3.46
15	3.53	15	3.53	41	4.28	15	3.53
16	0.26	16	0.26	42	4.92	16	0.26
17	3.40	17	3.40	43	4.39	17	3.40
18	4.90	18	4.90	44	GND	18	4.90
19	2.70	19	2.70	45	0.36	19	2.70
20	2.70	20	2.70	46	6.13	20	2.70
21	GND	21	GND	47	4.10	21	GND
22	5.22	22	5.22	48	2.17	22	5.22
23	4.70	23	4.70	49	5.40	23	4.70
24	3.90	24	3.90	50	2.88	24	3.90
25	n.c	25	n.c	51	6.24	25	n.c
26	5.35	26	5.35	52	4.10	26	5.35

IC2201				IC2302			
1	1.38	1	6.36	1	6.36	1	6.36
2	2.19	2	6.79	2	6.79	2	6.79
3	2.19	3	0.40	3	0.40	3	0.40
4	2.20	4	6.26	4	6.26	4	6.26
5	2.19	5	6.80	5	6.80	5	6.80
6	0.33	6	20.29	6	20.29	6	20.29
7	4.93	7	12.20	7	12.20	7	12.20
8	2.26	8	12.50	8	12.50	8	12.50
9	2.35	9	12.50	9	12.50	9	12.50
10	0.44	10	26.80	10	26.80	10	26.80
11	2.21	11	12.60	11	12.60	11	12.60
12	2.84	12	12.20	12	12.20	12	12.20
13	3.19	13	12.20	13	12.20	13	12.20
14	2.19	14	12.20	14	12.20	14	12.20
15	3.37	15	12.20	15	12.20	15	12.20
16	3.46	16	12.20	16	12.20	16	12.20
17	GND	17	GND	17	GND	17	GND
18	3.54	18	12.20	18	12.20	18	12.20
19	3.45	19	12.20	19	12.20	19	12.20
20	n.c	20	12.20	20	12.20	20	12.20
21	2.26	21	12.20	21	12.20	21	12.20
22	2.21	22	12.20	22	12.20	22	12.20
23	n.c	23	12.20	23	12.20	23	12.20
24	n.c	24	12.20	24	12.20	24	12.20

IC3001				IC6501			
1	3.91	1	2.78	1	GND	15	2.78
2	0.04	2	3.41	2	4.93	16	3.41
3	3.93	3	3.41	3	GND	17	3.41
4	0.05	4	2.26	4	GND	18	2.26
5	n.c	5	GND	5	GND	19	GND
6	n.c	6	2.42	6	n.c	20	2.42
7	0.00	7	1.46	7	0.00	21	1.46
8	4.91	8	0.51	8	4.91	22	0.51
9	3.51	9	4.94	9	3.51	23	4.94
10	3.45	10	0.41	10	3.45	24	0.41
11	GND	11	1.18	11	GND	25	1.18
12	2.32	12	1.18	12	2.32	26	1.18
13	GND	13	3.27	13	GND	27	3.27
14	2.37	14	0.59	14	2.37	28	0.59

	Q001	Q002	Q003	Q004	Q302	Q303
B	0.75	5.90	5.02	5.19	2.51	1.16
C	0.11	10.40	5.85	GND	4.93	GND
E	GND	5.25	5.90	5.23	1.91	1.84

	Q304	Q430	Q451	Q452	Q501 ↴	Q551 ↴
B	2.88	0.42	0.61	0.00	0.00	0.00
C	8.84	2.28	0.00	3.68	89.40	129.20
E	2.27	GND	GND	GND	GND	GND

	Q801 ↴	Q802 ↴	Q804 ↴	Q2302	Q2303	Q2362
B	129.80	130.60	130.80	21.00	0.09	9.07
C	130.60	130.70	0.52	GND	21.00	-0.07
E	130.40	130.60	131.10	16.12	GND	9.02

	Q2363	Q2409	Q2410	Q6501	Q6502	Q6503
B	-0.06	0.06	0.06	3.14	3.17	2.44
C	0.41	0.00	0.00	4.93	4.93	2.64
E	GND	GND	GND	2.54	2.52	1.82

	Q6504	Q6505	Q6506	Q6507	Q6509	Q6510
B	3.27	2.37	2.27	2.64	2.25	0.41
C	4.93	4.93	3.19	4.93	4.93	GND
E	2.65	1.76	1.67	2.01	1.64	1.08

	Q6516	Q6517	Q6519
B	1.63	1.45	1.76
C	GND	4.93	3.17
E	2.24	1.63	1.15