

Service Manual

Color Television

Main Manual
(NA8)



Panasonic

Models	Chassis
CT-27D10B	AP338
CT-27D10UB	AP338
CT-27D10DB	AP338

This Service manual is issued as a service guide for the models of the **NA8** family listed above. Included in this manual are a set of schematic, block diagrams, functional descriptions, alignment procedures, disassembly procedures, and a complete parts list.


“WARNING! This Service Manual is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. **Products powered by electricity should be serviced or repaired only by experienced professional technicians.** Any attempt to service or repair the product or products dealt with in this Service Manual by anyone else could result in serious injury or death.”

The service technician is required to read and follow the **“Safety Precautions”** and **“Important Safety Notice”** in this Main Manual.

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Important Safety Notice

Special components are used in this television set which are important for safety. These parts are identified on the schematic diagram by the symbol  and printed in **BOLD TYPE** on the replacement part list. It is essential that these critical parts are replaced with the manufacturer's specified replacement part to prevent X-ray radiation, shock, fire or other hazards. Do not modify the original design without the manufacturer's permission.

Safety Precautions

General Guidelines

An **Isolation Transformer** should always be used during the servicing of a receiver whose chassis is not isolated from AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the Receiver from being damaged by accidental shorting that may occur during servicing.

When servicing, observe the original lead dress, especially in the high voltage circuit. Replace all damaged parts (also parts that show signs of overheating.)

Always Replace Protective Devices, such as fishpaper, isolation resistors and capacitors, and shields after servicing the Receiver. Use only manufacturer's recommended rating for fuses, circuits breakers, etc.

High potentials are present when this Receiver is operating. Operation of the Receiver without the rear cover introduces danger for electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautions when servicing high-voltage equipment.

Extreme care should be practiced when **Handling the Picture Tube**. Rough handling may cause it to implode due to atmospheric pressure. (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, use safety goggles and heavy gloves for protection. **Discharge the picture tube** by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging connect cold ground (i.e. dag ground lead) to the anode with a well insulated wire or use a grounding probe.

Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to X-ray radiation.

The **Test Picture Tube** used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provide shielding for the tube viewing area against X-ray radiation as well as implosion. The magnetic shield limits the X-ray radiation around the bell of the picture tube in addition to the restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling **40kV** without causing X-ray radiation.

Before returning a serviced receiver to the owner, the service technician must thoroughly test the unit to ensure that is completely safe to operate. **Do not use a line isolation transformer when testing.**

Leakage Current Cold Check

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and expose metallic parts such as screwheads, antenna terminals, control shafts, etc. If the exposed

metallic part has a return path to the chassis, the reading should be between 240kΩ and 5.2MΩ. If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

Leakage Current Hot Check (Fig. 1)

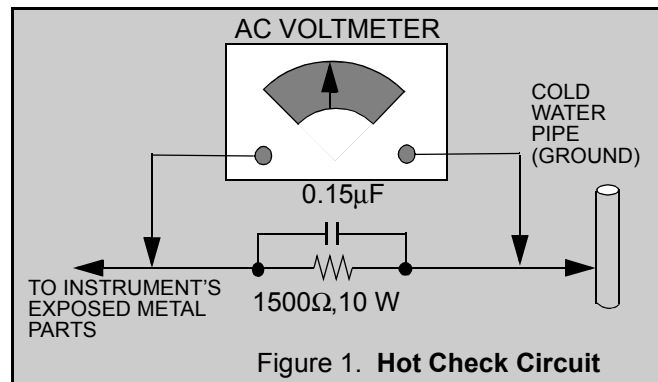
Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check.

Connect a 1.5kΩ 10 watt resistor in parallel with a 0.15μF capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe.

Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor.

Repeat the procedure and measure the voltage present with all other exposed metallic parts.

Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such a Simpson Model 229, Sencore Model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 1/2 milliamp. If any measurement is out of the specified limits, there is a possibility of a shock hazard and the Receiver must be repaired and rechecked before it is returned to the customer.



X-ray Radiation

WARNING: The potential source of X-ray radiation in the TV set is in the High Voltage section and the picture tube.

Note: *It is important to use an accurate, calibrated high voltage meter.*

Set the **brightness, picture, sharpness** and **color** controls to Minimum. Measure the High Voltage. The high voltage should be **28.30kV ± 1.25kV**. If the upper limit is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

Horizontal Oscillator Disable Circuit Test

This test must be performed as a final check before the Receiver is returned to the customer. See **Horizontal Oscillator Disable Circuit Procedure Check** in this manual.

Table of Contents

Important Safety Notice	2	Service Adjustments	
Safety Precautions	2	(Electronic Control)	24
Service Notes	4	Sub-Brightness	24
Horizontal Oscillator Disable Circuit	5	Sub-Contrast	24
 <i>SPECIFICATIONS</i>		Tint/Color Adjustment	24
Receivers Feature Table	6	Color Temperature Adjustment	25
 <i>OPERATION</i>		Complete Adjustment	25
Location of Controls (Receiver)		Horizontal Centering	26
Receiver Front Control Panel	7	MTS Circuit Adjustment	26
Location of Controls (Remote)		Input Level Adjustment	26
EUR511502	8	Stereo Separation Adjustment	26
 <i>SERVICE</i>		Clock Adjustment	27
Disassembly for Service	9	Vertical Size	27
Disassembly for CRT Replacement	9	Service Adjustments	
Chassis Service Adjustment Procedures	10	(Mechanical Controls)	27
131.0V B+ Voltage Confirmation	10	VCO Field Adjustment L105	27
Source Voltage Chart	10	Focus (Part of T551)	27
High Voltage Check	10	 <i>CIRCUITS & BLOCK DIAGRAMS</i>	
Purity and Convergence Procedures	11	Audio Signal Path Block Diagram	28
Serviceman Mode (Electronic Controls)	14	Video Signal Path Block Diagram	29
Entering Serviceman Mode	14	Video-Chroma Signal Path Block Diagram	30
Toggle between Modes	14	IC101 VCJ IN/OUT Pins and Functions	31
Exiting the Serviceman Mode	14	IC001 MPU IN/OUT Pins and Functions	32
Sub-Data Adjustment (B)	15	Component Identification	33
Cut-Off Adjustment (C)	15	Parts List	36
Pin Cushion Adjustment (D)	16	 <i>FOLDOUTS</i>	
MTS Adjustment (M)	16	Schematics and Voltages	
PIP Adjustment (P)	17	A-Board (Left Portion)	Sheet-1A
Options Adjustment (S)	18	A-Board (Right Portion)	Sheet-2A
Comb Filter Adjustment (X)	19	C-Board	Sheet-1B
To Check Purity	20	Waveforms	Sheet-1B
Helpful Hints	20	 Layouts	
Instructional Flow Chart		A & C-Boards	Sheet-1B
for Serviceman Mode	21		

Service Notes

Note: These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the ICs when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.

Leadless Chip Component (surface mount)

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chips capacitor or resistor board solder pads may have holes through the board, however the hole diameter limits standard resistor replacement to 1/8 watt. Standard capacitor may also be limited for the same reason. It is recommended that identical components be used.

Chip resistor have a three digit numerical resistance code - 1st and 2nd significant digits and a multiplier. Example: 162 = 1600 or 1.6kΩ resistor, 0 = 0Ω (jumper). Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.

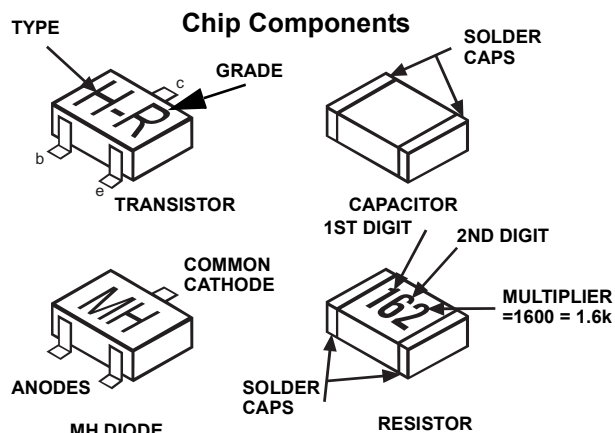
Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

Component Removal

1. Use solder wick to remove solder from component end caps or terminal.
2. Without pulling up, carefully twist the component with tweezers to break the adhesive.
3. Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.

Chip Component Installation

1. Put a small amount of solder on the board soldering pads.
2. Hold the chip component against the soldering pads with tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.

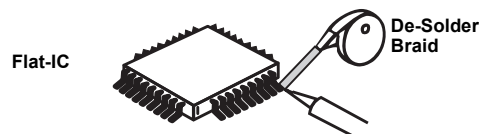


How to Replace Flat-IC

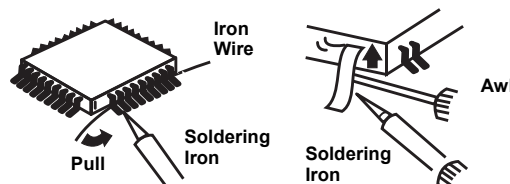
- Required Tools -

- Soldering iron
- De-solder braids
- Iron wire or small awl
- Magnifier

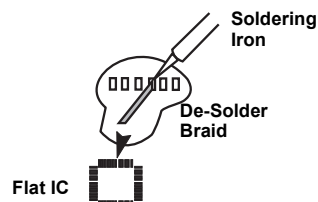
1. Remove the solder from all of the pins of a Flat-IC by using a de-solder braid.



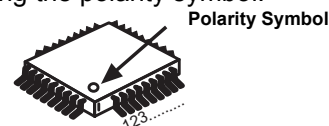
2. Put the iron wire under the pins of the Flat-IC and pull it in the direction indicated while heating the pins using a soldering iron. A small awl can be used instead of the iron wire.



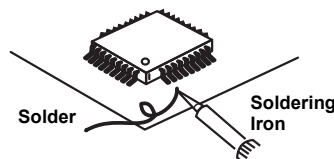
3. Remove the solder from all the pads of the Flat-IC by using a de-solder braid.



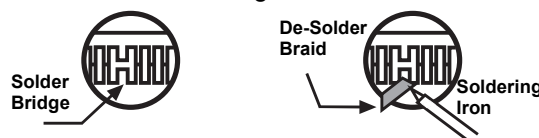
4. Position the new Flat-IC in place (apply the pins of the Flat-IC to the soldering pads where the pins need to be soldered). Properly determine the positions of the soldering pads and pins by correctly aligning the polarity symbol.



5. Solder all pins to the soldering pads using a fine tipped soldering iron.



6. Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de-solder braid as shown in the figure below.




Service Notes (Continued)

IMPORTANT: To protect against possible damage to the solid state devices due to arcing or static discharge, make certain that all ground wires and CTR 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 D55b anode, R556 & R557). Set **Bright** level to (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	CT-27D10B/UB	CT-27D10DB
Chassis	NA8	NA8
Tuning system	96K	96K
# 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 #	EUR511502	EUR511502
Picture tube	M68LGL061X	M68LGL061X
Black Face Regular Tube	X	X
Comb Filter	3 Line Digital	3 Line Digital
H. Edge Correction	X	X
V/A norm	X	X
Color Temp	X	X
MTS/SAP/DBX	X	X
BASS/BL/TRE Control	X	X
AI Sound	X	X
Surround	X	X
Built-in audio power	5Wx2 (10%)	5Wx2 (10%)
# of speakers	2	2
A/V in (rear/front)	3(2/1)	3(2/1)
S-VHS Input (rear/front)	1/0	1/0
Component Input (Y,Pb,Pr)	1	1
Audio Out (FAO: F, VAO: V)	F,V	F,V
Headphone Jack	Mini plug	Mini plug
Dimensions mm in (WxDxH)	665.2x544.5x594.8 26.2x21.5x23.5	665.2x544.5x594.8 26.2x21.5x23.5
Weight (kg/lbs)	35/77.2	35/77.2
Power source (V/Hz)	120/60	120/60
Anode voltage	28.30kV \pm 1.25kV	28.30kV \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 TNP2AH017	NIL	NIL
C-Board TNP2AA047	AP	AP

Table 1. Receiver Features

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

Location of Controls (Receiver)

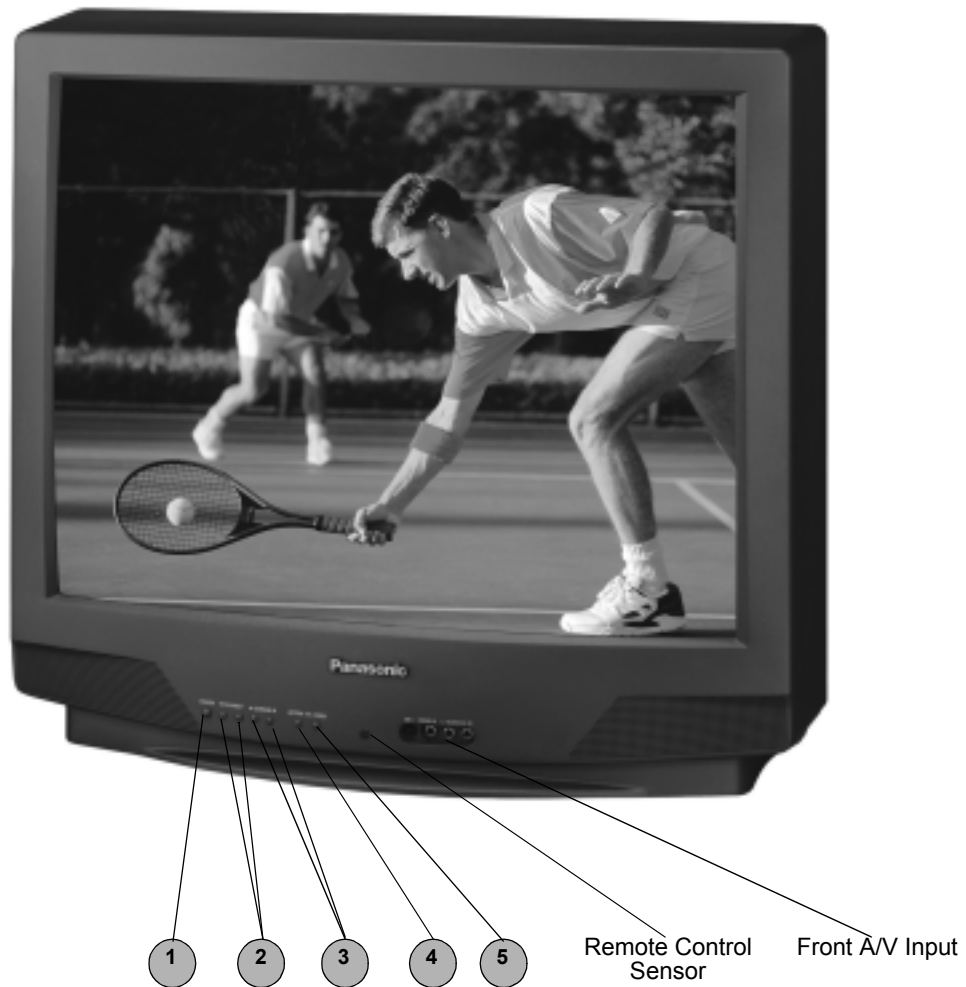


Figure 2. Location of Controls (Receiver).

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. Also use to select Cable Converter box channels after programming Remote Control Infra-red codes (the TV/AUX/CABLE switch must be set in CABLE position).
4	Action Button - Press to display Main Menu and access On Screen feature and Adjustment Menus.
5	TV/Video Button - Press to select TV or Video Input.

Location of Controls (Remote)

REMOTE CONTROL

POWER

Press to turn ON and OFF.

Presione para ENCENDER y APAGAR.

Appuyer pour établir ou couper le contact.

LIGHT

Press to light remote control buttons.

Presione para iluminar los botones del control remoto.

Appuyer pour éclairer les touches de la télécommande.

TV/VIDEO

Press to select TV or Video Mode.

Presione para seleccionar la Modalidad de Televisión ó Video.

Appuyer pour sélectionner le mode télé ou vidéo.

TV, VCR, DBS/CBL, DVD

Press to select remote operation.

Presione para seleccionar el funcionamiento del Control Remoto.

Appuyer pour sélectionner le fonctionnement télécommandé.

VOL

Press to adjust TV sound and navigate in menus.

Presione para ajustar el sonido de la Televisión y accesar opciones en los menús.

Appuyer pour régler le niveau sonore et se déplacer au sein des menus.

EXIT/GUIDE

DBS function buttons.

Botones de función DBS.

Touches de fonctions DBS.

MUTE

Press to mute sound. Press to access and cancel (CC) Closed Caption.

Presione para silenciar el sonido. También presione para activar y cancelar la Modalidad de Subtítulos (CC).

Appuyer pour couper le son. Appuyer pour mettre le décodeur de sous-titres (CC) en ou hors circuit.

CH

Press to select next channel and navigate in menus.

Presione para seleccionar el siguiente canal u opción en el menú.

Appuyer pour sélectionner le prochain canal et pour se déplacer au sein des menus.

ACTION

Press to access menus.

Presione para accesar los menús.

Appuyer pour accéder aux menus.

"0"~ "9"

Press numeric keypad to select any channel.

Presione el teclado numérico para seleccionar cualquier canal.

Appuyer sur une touche numérique du clavier pour sélectionner un canal.

RECALL

Press to display time, channel, sleep timer, and other options.

Presione para visualizar la Hora (Time), Canal (Channel), Cronómetro de Apagado Automático (Sleep Timer), y otras opciones.

Appuyer pour afficher l'heure, le numéro du canal, l'état de la minuterie-sommeil et d'autres options.

R-TUNE

Press to switch to previously viewed channel or video mode.

Presione para regresar al canal previamente visto.

Appuyer pour revenir au canal précédemment capté.

REW, PLAY, FF, TV/VCR, STOP, PAUSE, REC, VCR/DBS CH

Component function buttons.

Botones de función de los componentes.

Touches de fonctions d'appareil auxiliaire.




EUR511502

Figure 3. Location of Controls (Remote).

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 AC cord assembly.
- 1 screw by the A/V jacks.
- 1 screw by the Fly-back assembly.

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

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.

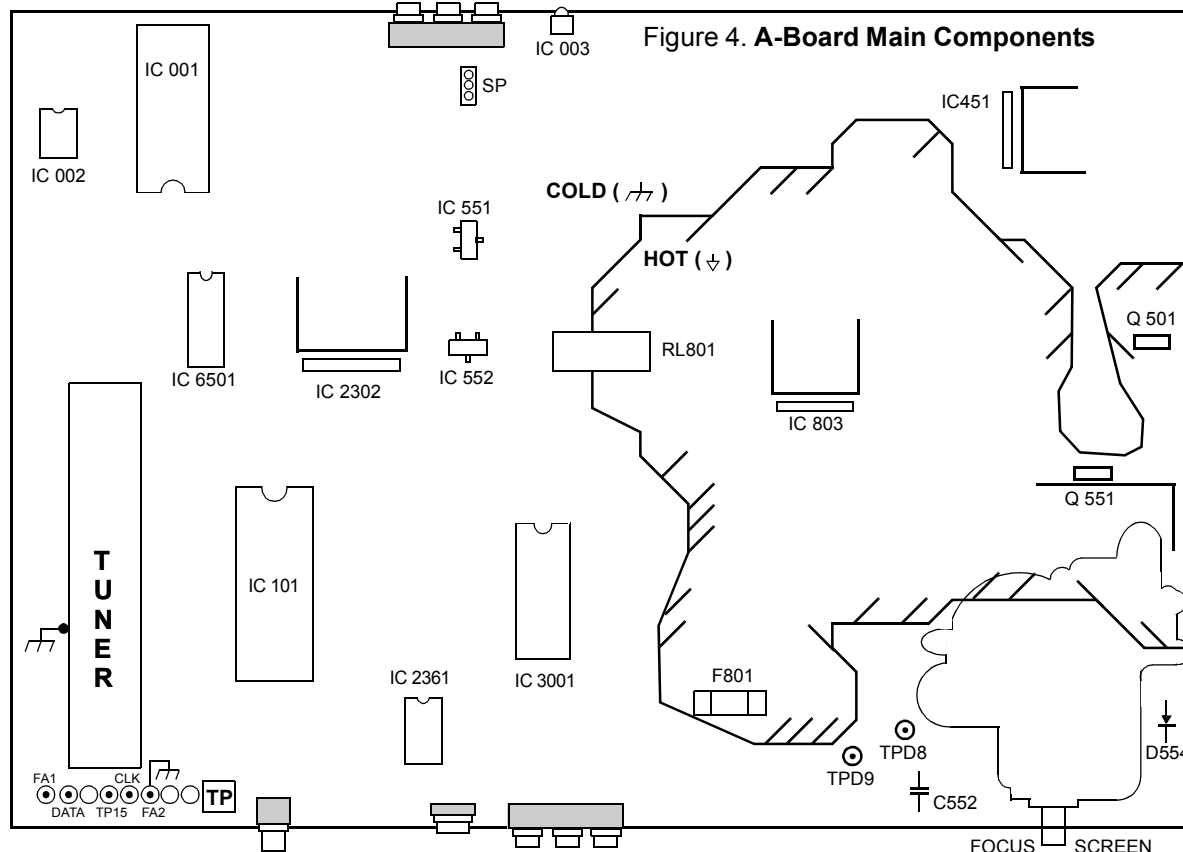
b. Release the braid loop from the upper corners of the CRT ears.

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 reinstall 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.



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 \pm 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.

LOCATION	VOLTAGE
TPD8	27.4V \pm 2V
TPD9	13.0V \pm 2V
C552 (+) side	8.0V \pm 1V
IC551 Pin3	9.0V \pm 0.5V
D554 Cathode	220V \pm 15V
C572 (+) side	5.0V \pm 0.25V

Adjust Picture Menu for normalized video adjustments.

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 **28.30kV \pm 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:

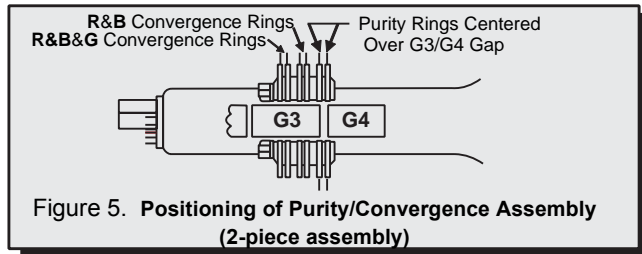
1. Vertical Raster Shift Adjustment. (**Only for Models with Purity/Convergence Assembly with 4 Pairs of Rings**).
2. Initial static convergence.
3. Setting the purity.
4. Final static convergence.

When the CRT or the Yoke is Replaced

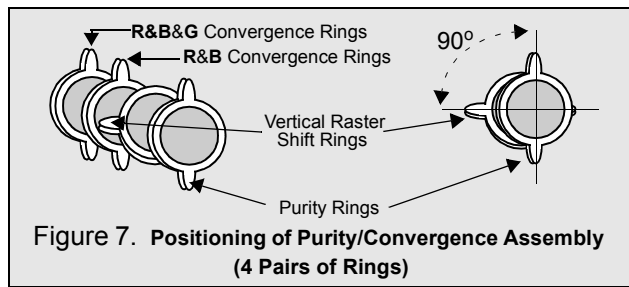
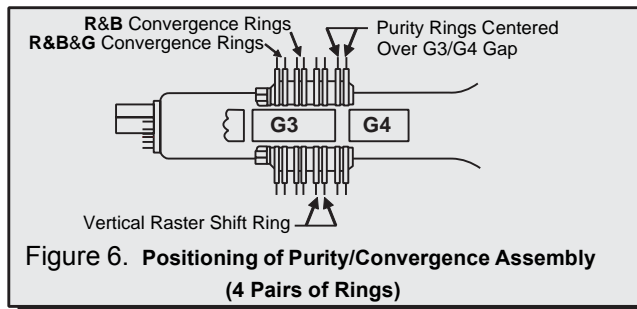
Place the yoke on the CRT neck (do not tighten the clamp).

For a 2-piece assembly (see Fig. 5):

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

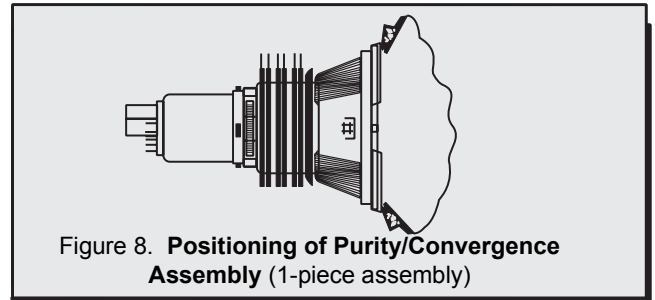


For models using 4 pairs of rings, place the vertical raster shift tabs at 3 o'clock (90° from the purity and convergence tabs, see Fig. 6 and Fig. 7)



For a 1-piece assembly (see Fig. 8):

Position like tabs of purity devices together at 12 o'clock to reduce any magnetic field effect. (For better results, note part number and look for specifications at Service Center)



For either assemblies:

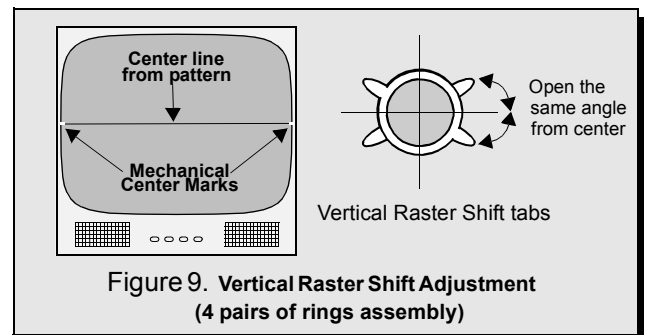
Turn the Receiver ON. Operate the Receiver for 60 minutes using the first Purity Check field (white screen) to stabilize the CRT.

Fully degauss the Receiver by using an external degaussing coil.

Slide the deflection yoke back and forth on the neck of the CRT until it produces a near white, uniform raster.

Vertical Raster Shift Adjustment (Only for Models with Purity/Convergence Assembly with 4 Pairs of Rings).

Apply a green pattern with a horizontal line, adjust the Deflection Yoke so that has no tilt, then secure it. Adjust center line of the pattern with the mechanical center of the CRT, this center is determined by two marks at the side edges of the screen. To adjust the line, once the vertical raster shift tabs are place at 3 o'clock to reduce its magnetic field effect (see Fig. 6 and Fig. 7) open the tabs the same angle from the center, until the center line of the pattern becomes a straight line, centered with the marks of the CRT. (see Fig. 9)



Initial Center Static Convergence

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

Adjust the R&B pole magnets; by separating tabs and rotating to converge blue with red.

Adjust the R&B and R&B&G pole magnets: by separating tabs and rotating 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 Serviceman Mode for making electronic adjustments, press the **Recall** button on the Remote Control to enter Purity Check. (See the **Service Adjustments Electronic Controls** procedure).

Operate the Receiver for 60 minutes using the first Purity Check field (white screen) to stabilize the CRT.

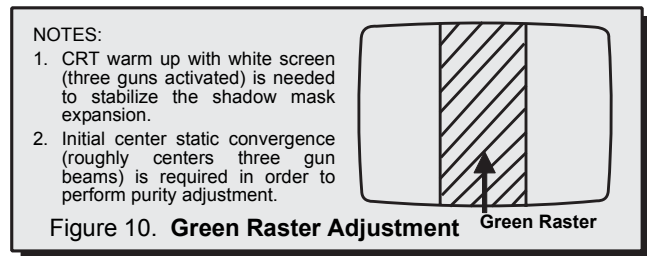
Fully degauss the Receiver by using an external degaussing coil.

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

For a 2-piece assembly (see Fig. 5):

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

Adjust the Purity rings to set the vertical green raster precisely at the center of the screen (see Fig. 10).



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

For a 1-piece assembly (see Fig. 8):

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. 10).

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. 11 through Fig. 13):

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 R&B pole Static Convergence Magnets.

Align The converged red/blue dots with the green dots at the center of the screen by rotating the R&B&G pole 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.

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.

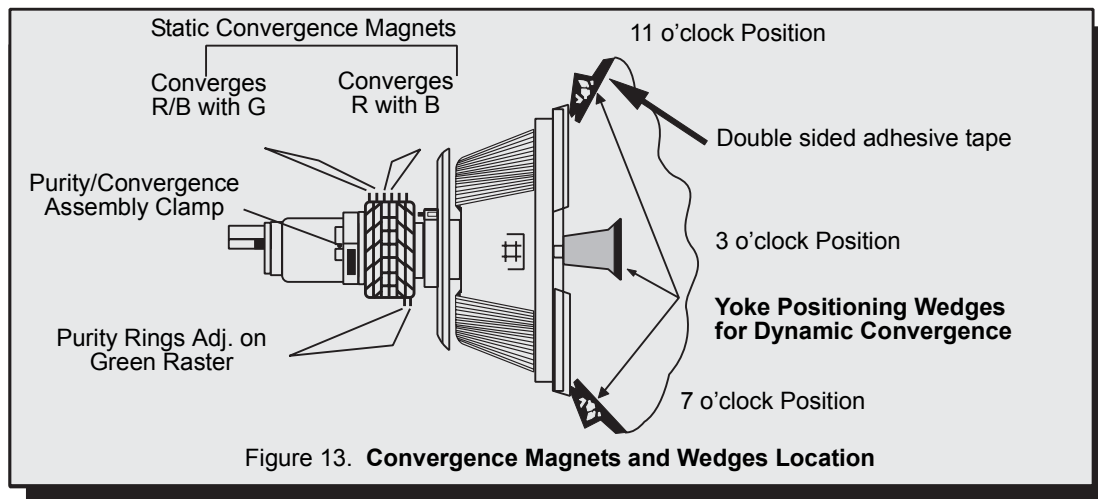
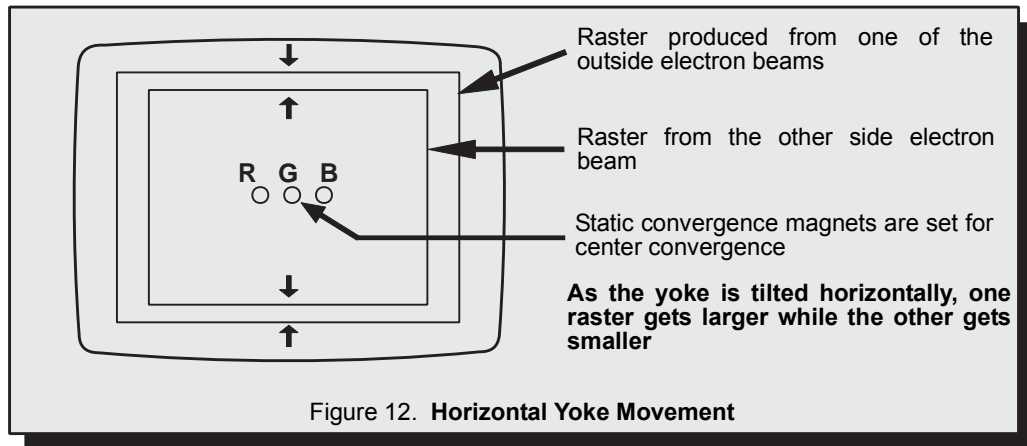
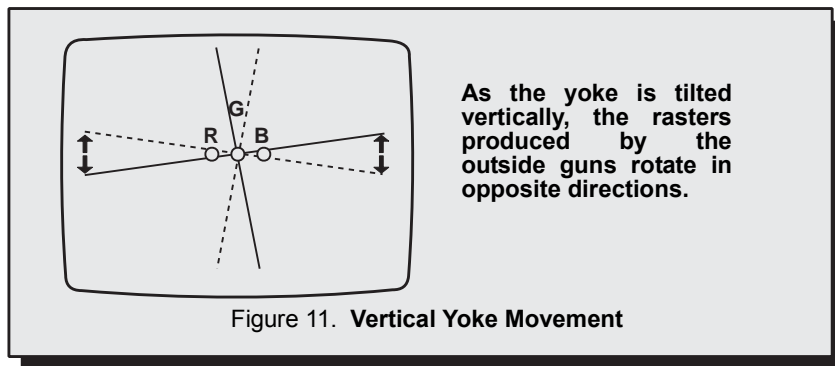
Permalloy Convergence Corrector Strip (Part No. 0FMK014ZZ)

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.

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.



Note: For models using 4 pairs of rings assemblies see Fig. 6 for details

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 ACTION button 3 times 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 Action 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 seven Serviceman Adjustment Modes.
 - 1) **B**= Serviceman VCJ SUB-DATA ADJUSTMENT.
 - 2) **C**= Serviceman VCJ CUT-OFF ADJUSTMENT.
 - 3) **D**= Serviceman PIN CUSHION ADJUSTMENT.
 - 4) **M**= Serviceman MTS ADJUSTMENTS.
 - 5) **P**= Serviceman PIP ADJUSTMENT. (*Models with PIP only*)
 - 6) **S**= Serviceman OPTIONS ADJUSTMENTS.
 - 7) **X** = Serviceman COMB FILTER ADJUSTMENT.
 - 8) **"CHK"** = Normal operation of CHANNEL ▲▼ and VOLUME ◀▶.

Note: *Only the applicable settings for the Receiver serviced will be available (See a in Fig. 14).*

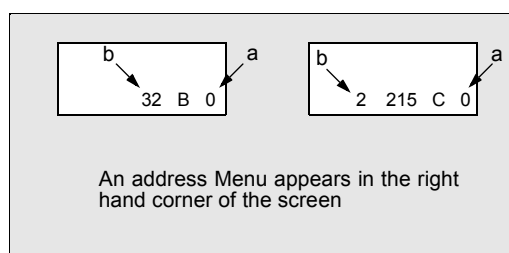


Figure 14. **Serviceman Mode Menu Adjustments.**

Exiting the Serviceman Mode:

Press the **Action** 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.

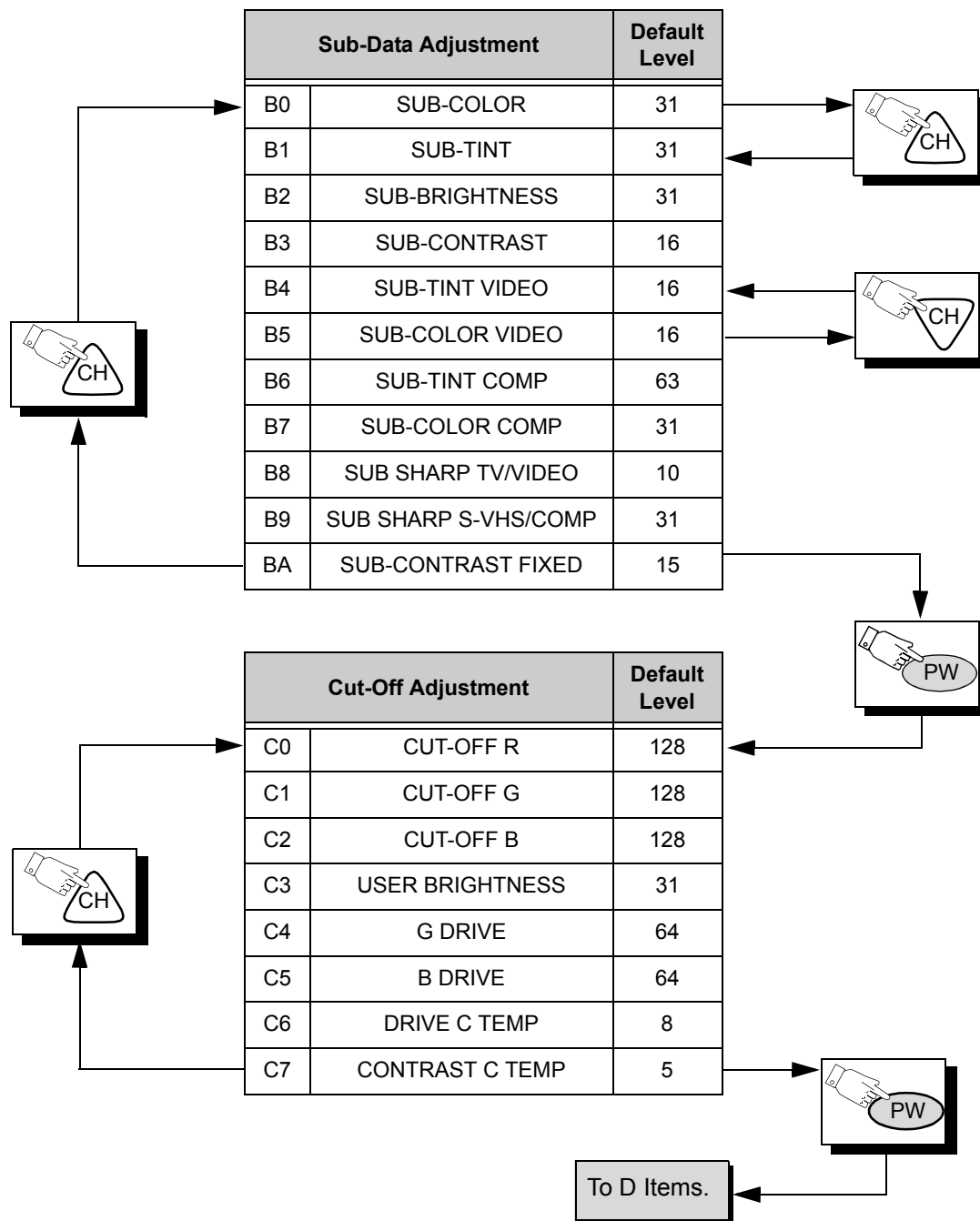
Press the **Power Button** on the **Remote Control** to select the Serviceman Adjustment .

For Adjustments:

1. Press **Channel Up/Down** on the **Remote Control** to select one of the available Service Adjustments (a in Fig. 14).

Note: Write Down the original value set (b in Fig. 14) 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. 14).



IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

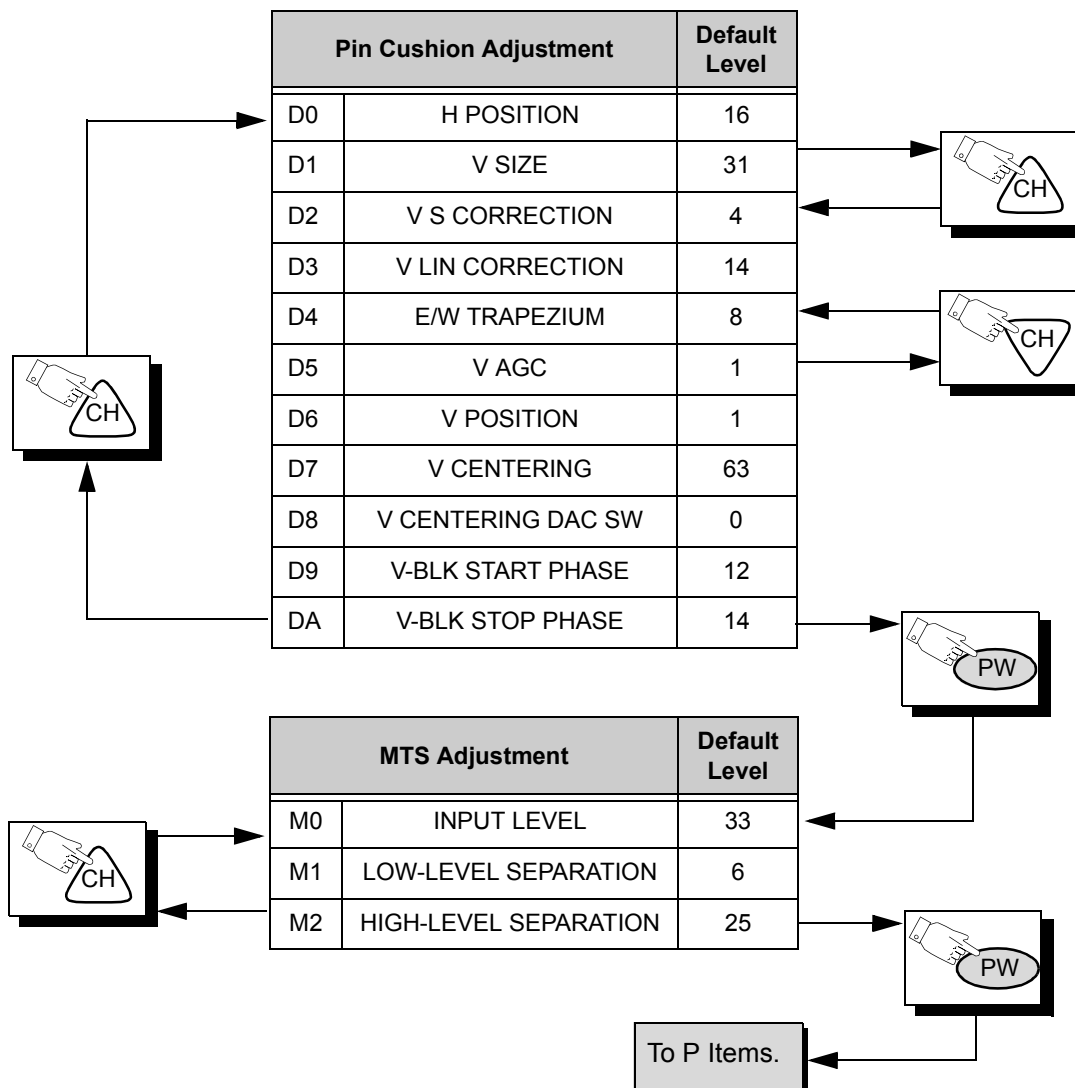
Press the Power Button on the Remote Control to select the Serviceman Adjustment

For Adjustments:

1. Press Channel Up/Down on the Remote Control to select one of the available Service Adjustments (a in Fig. 14).

Note: Write Down the original value set (b in Fig. 14) 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. 14).



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

IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

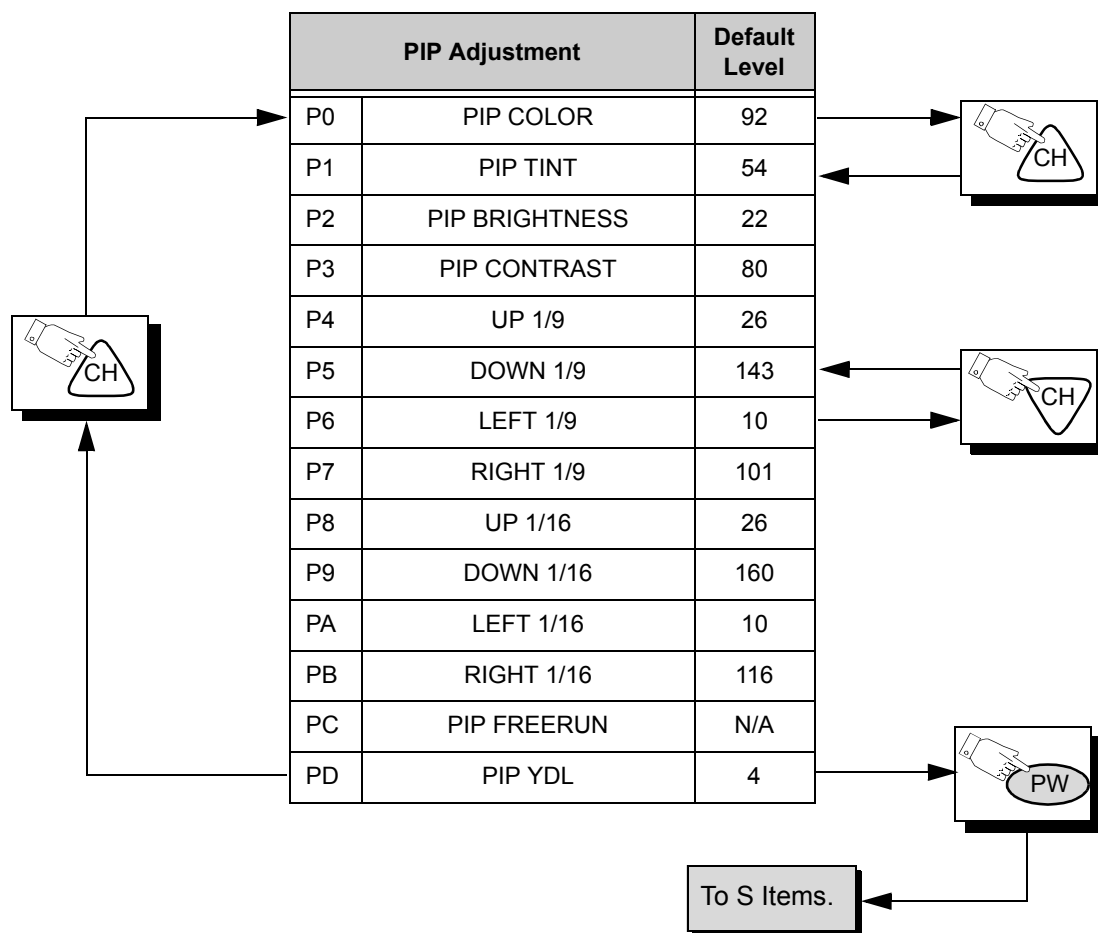
Press the Power Button on the Remote Control to select the Serviceman Adjustment

For Adjustments:

1. Press Channel Up/Down on the Remote Control to select one of the available Service Adjustments (a in Fig. 14).

Note: Write Down the original value set (b in Fig. 14) 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. 14).



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

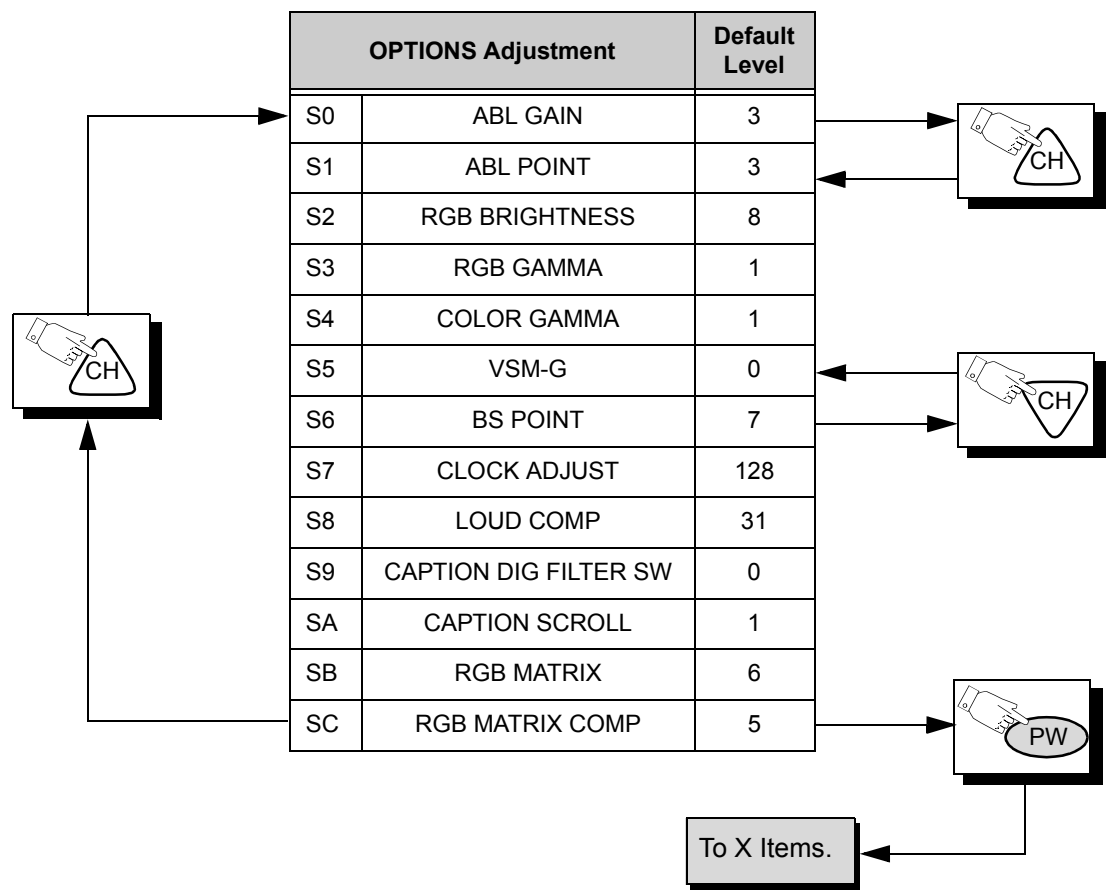
IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

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. 14).

Note: Write Down the original value set (b in Fig. 14) 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. 14).



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

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. 14).

Note: Write Down the original value set (**b** in Fig. 14) 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. 14).

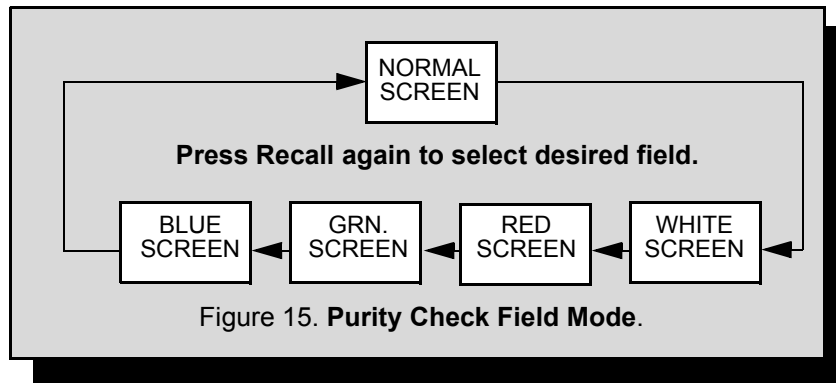
Comb Filter Adjustment		Default Level
X0	CLIP LEVEL	152
X1	CSOK	12
X2	COMB LIMIT	24
X3	COMB CORE	41
X4	COMB RF DELAY	20
X5	COMB VIDEO DELAY	18
X6	COMB VMLM	90
X7	COMB VMCO	24
X8	COMB SHARP	123
X9	COMB VM LEVEL	255
XA	COMB VMPKF	1
XB	H LOCK MODE	1
XC	H LOCK	70
XD	H SEP 1	313
XE	H SEP 2	266
XF	SUB H LOCK MODE	0
X10	SUB H LOCK	70
X11	SUB H SEP1	313
X12	SUB H SEP2	266

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

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 **Action** 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 customer controls are set to nominal level).

IMPORTANT NOTE:
Always Exit the Serviceman
Mode Following Adjustments.

Instructional Flow Chart for Serviceman Mode

IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

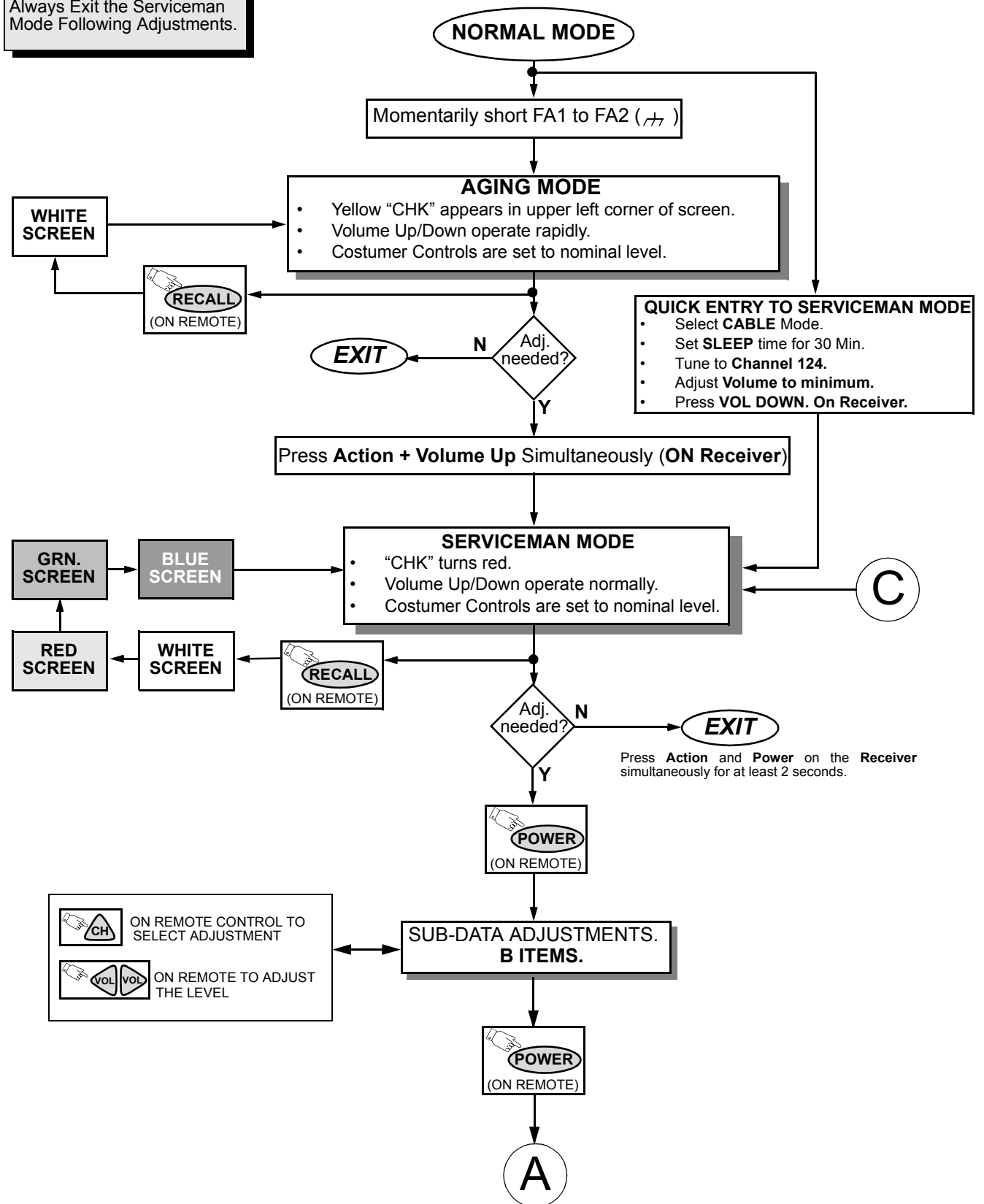


Figure 16. Flow Chart for Serviceman Mode.

Instructional Flow Chart for Serviceman Mode - Continued

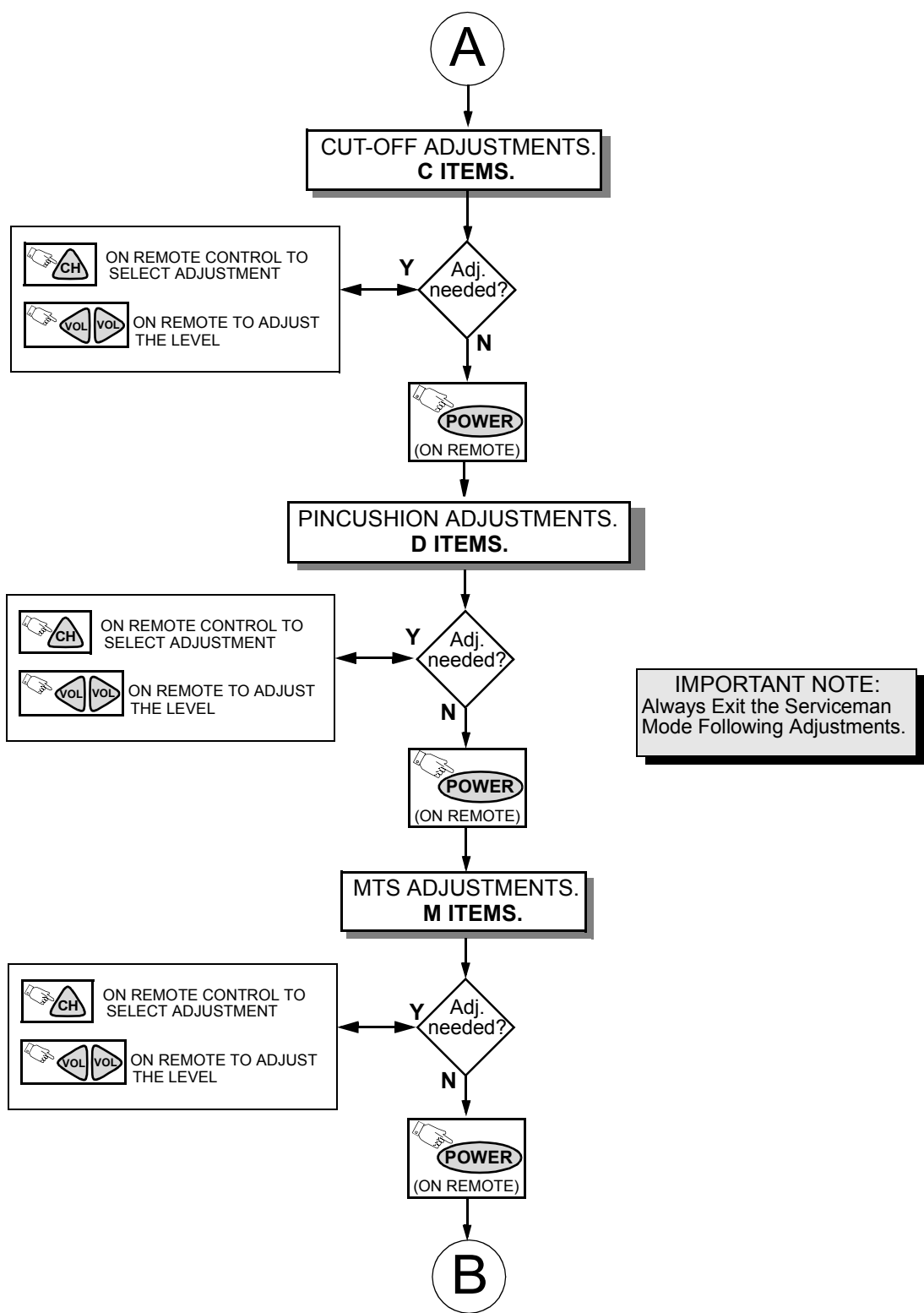
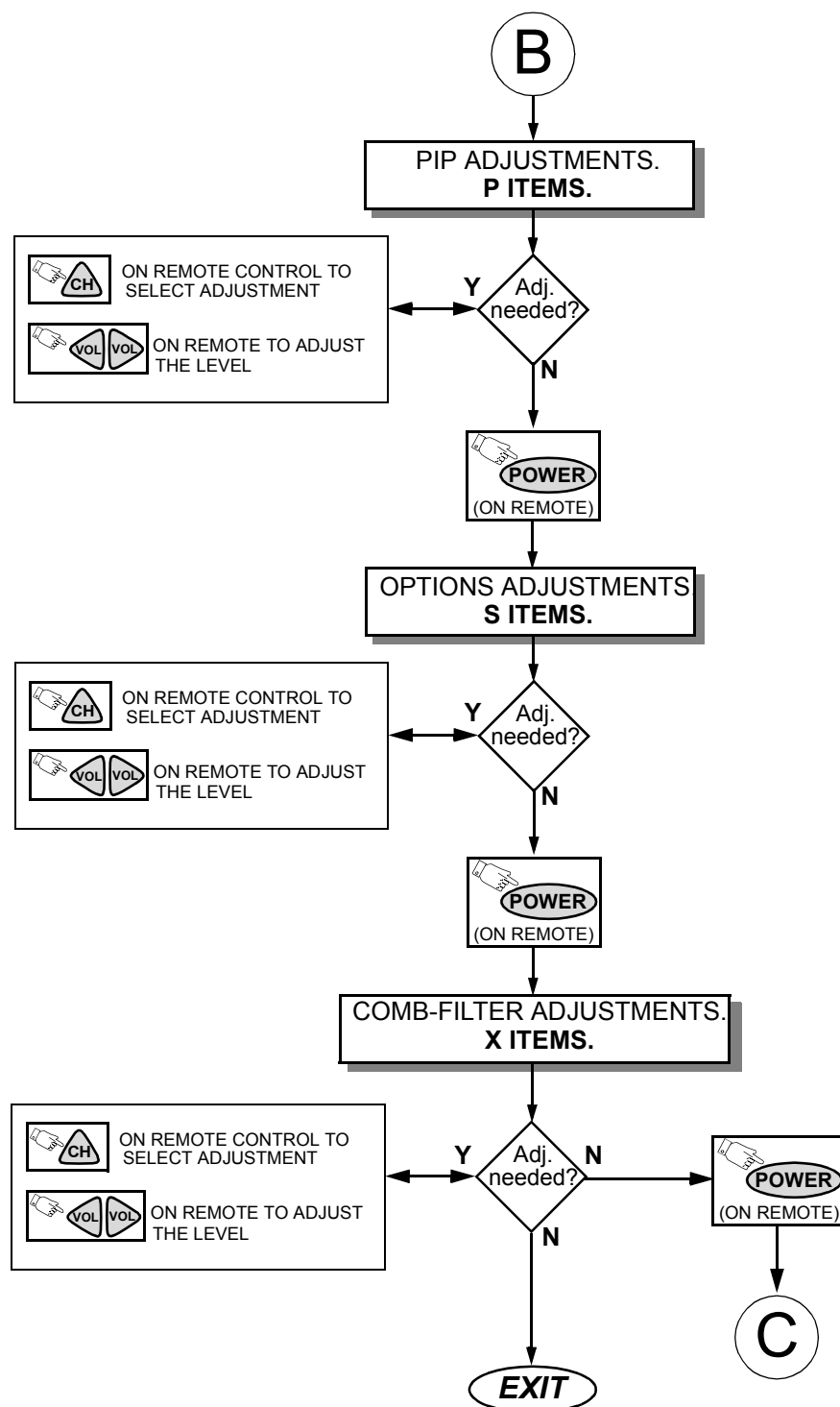


Figure 17. Flow Chart for Serviceman Mode (cont).

Instructional Flow Chart for Serviceman Mode - Continued



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

Figure 18. Flow Chart for Serviceman Mode (cont).

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

IMPORTANT NOTE:
Always Exit the Serviceman Mode Following Adjustments.

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.

Sub-Contrast

Serviceman DAC Adjustment (B3)

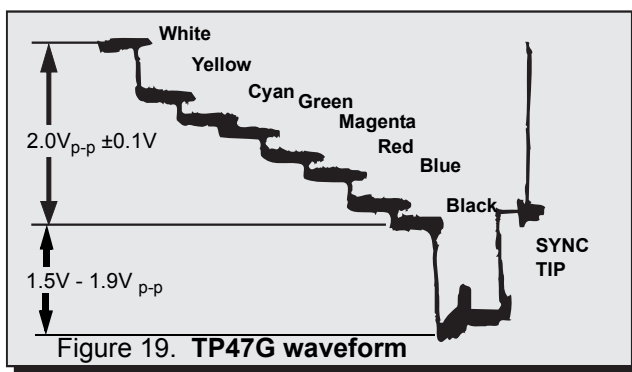
This adjustment is factory set. **Do not adjust** unless repairs are made to associated circuit, the CRT Board or when the CRT is replaced.

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 TP47R. Set the scope time base to 20 μ s (horizontal).
4. Connect a jumper from TPD2 to ground (\nearrow)..



Procedure:

1. In the Serviceman Mode, select DAC Sub-Brightness Adjustment (B2) and adjust for **1.5-1.9Vp-p** between blanking and 7.5 IRE level. (See video waveforms detail, Fig. 19)
2. In the Serviceman Mode for electronic adjustments, select DAC Sub-Contrast Adjustment (B3) and adjust for **2.0Vp-p ± 0.1V** white level to black level on video waveform (see video waveforms detail, Fig. 19).
3. Remove the jumper (Preparation step 4).

Tint/Color Adjustment

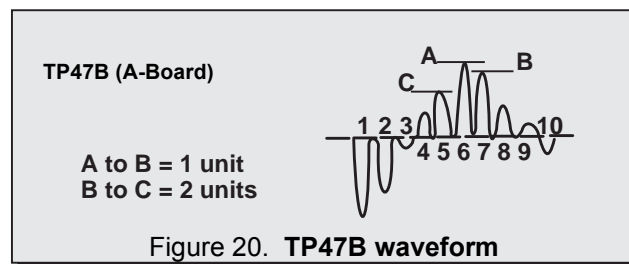
Serviceman DAC Adjustment (B1) (B0)

Preparation:

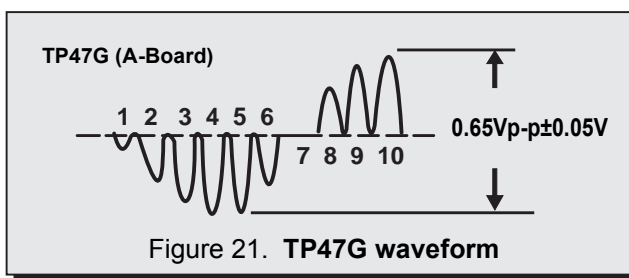
1. Apply a rainbow color bar signal.
2. Preset the following controls:
 - Brightness Min.
 - Color Center.
 - Tint Center.
 - Picture Max.
 - Sharpness Min.
3. Connect the oscilloscope to TP47B (A-Board).
4. Connect a jumper from TPD2 to GND (\nearrow).
5. Change the value of DAC S3 from 1 to 0.

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. 20.



2. Connect the oscilloscope to TP47G (A-Board).
3. Select DAC Sub-Color Adjustment (B0) and adjust for peak to peak amplitude to be **0.65Vp-p ± 0.05V** for 27" models as shown in Fig. 21.



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

Service Adjustments (Electronic Controls, cont.)

Color Temperature Adjustment (B/W Tracking)

Serviceman DAC Adjust. (C0) (C1) (C2) (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 (C4) GRN, (C5) BLU and adjust the picture for warm whites.

Complete Adjustment

Preparation:

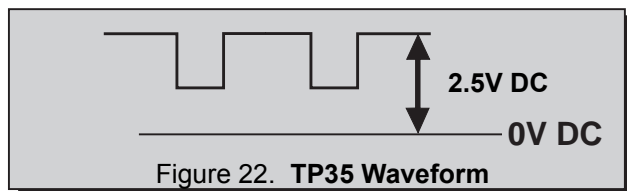
1. Turn the Receiver "ON" and allow 10 minutes warm up at high brightness.
2. Apply a color bar signal with color "OFF".
3. Turn the SCREEN control (part of FBT T551) fully counterclockwise.

Procedure:

Preset the following Serviceman DACs for best results:

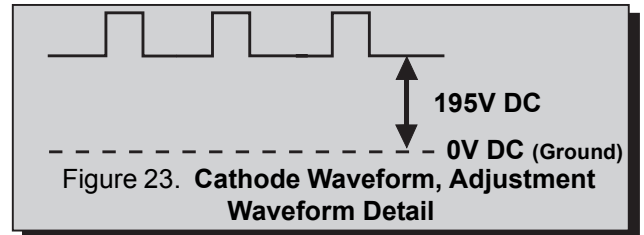
- C0128
- C1 128
- C2128
- C464
- C564

1. Connect the oscilloscope to C1-1 (CRT-Board).
2. In Serviceman Mode for making electronic adjustment, select the Sub-Bright DAC (B2).
3. Press the R-Tune 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 **2.5V** above DC ground is measured, as indicated in Fig. 22.



5. Connect the scope to RED Cathode (KR) on the CRT-Board.
6. In the Serviceman Mode for making electronic adjustments, select the RED CUTOFF DAC (C0).
7. Press the R-Tune key on the remote.

8. View scope trace at Horizontal rate and adjust the Serviceman Mode DAC (C0) level until a scanning period of **195V** above DC ground is measured, as indicated in Fig. 23.
9. Connect the scope to the GRN Cathode (KG).
10. In Serviceman Mode for making electronic adjustments, select the GRN CUTOFF DAC (C1).
11. Press the R-Tune key on the Remote



12. View the scope trace and adjust the Serviceman Mode DAC (C1) for the scanning period to be **195V** above DC ground. (See Fig. 23)
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 R-Tune 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. 23)
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 (C4) GRN, (C5) BLUE and adjust for warm white in a white color bar pattern.
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.

Service Adjustments (Electronic Controls, cont.)

Horizontal Centering

Serviceman DAC Adjustment (D0)

Preparation:

Connect a monoscope pattern generator.

Procedure:

1. In the Serviceman Mode for making electronic adjustments. Select the Horizontal Centering Adjustment DAC (D0) and adjust until the center of the monoscope pattern is centered on CRT.
2. EXIT the Serviceman Adjustment Mode.

MTS Circuit Adjustments

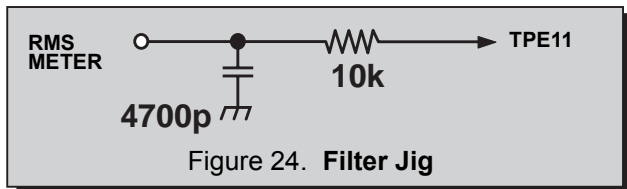
The MTS Circuit Adjustments require two steps:

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. 24.



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 (M1) 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 (M2) 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 (S7)

Preparation:

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

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 (S7).

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 (D1)

1. Adjust the VERTICAL SIZE DAC control, D1, until the top and the bottom edges of the raster are visible.
2. Adjust the VERTICAL SIZE control, D1, 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 de obtained with a round test patter.)

Service Adjustments (Mechanical Controls)

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.

Audio Signal Path Block Diagram

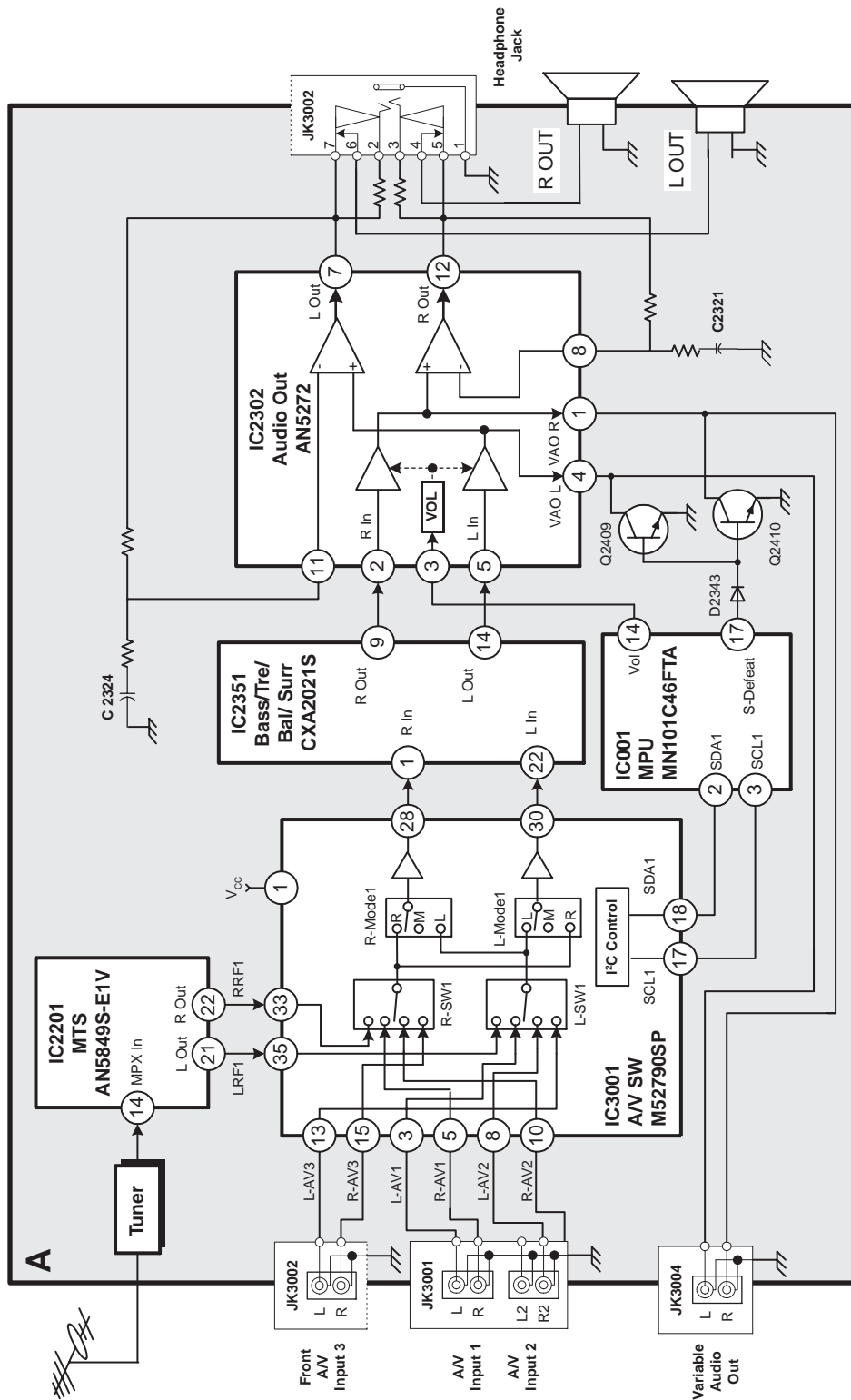


Figure 25. Audio Signal Path Block Diagram.

Video Signal Path Block Diagram

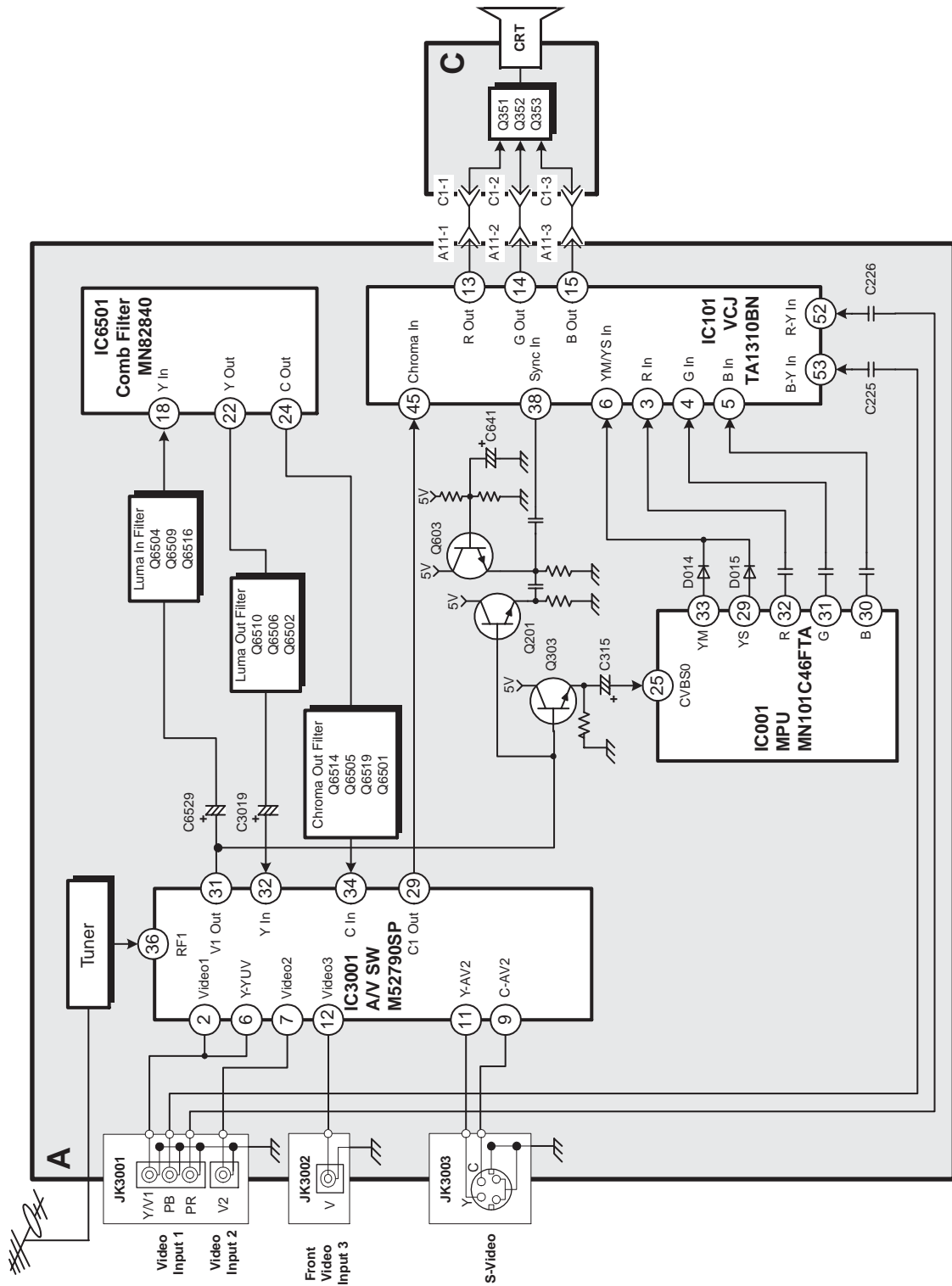


Figure 26. Video Signal Path Block Diagram.

Video-Chroma Signal Path Block Diagram

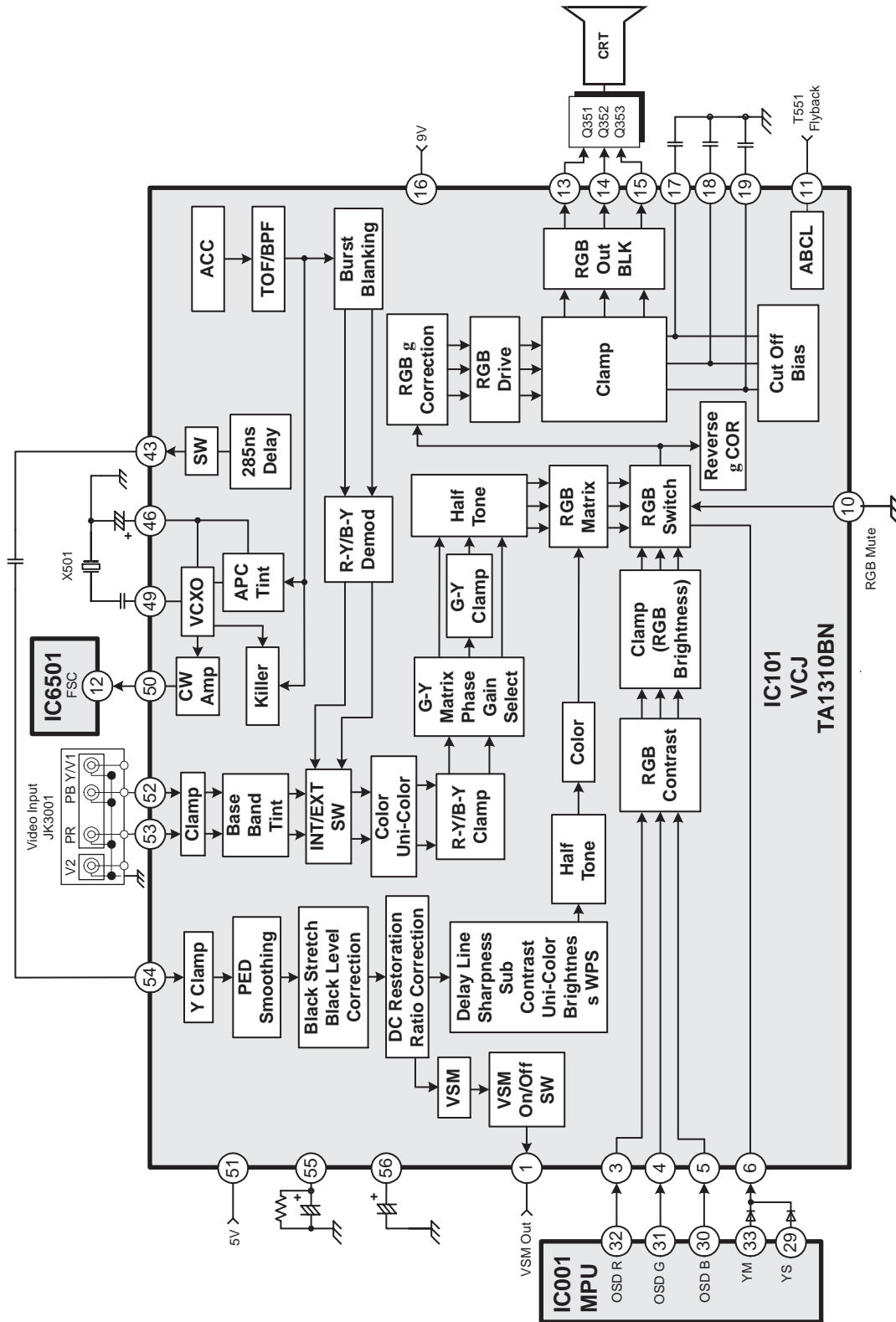


Figure 27. Video-Chroma Path Block Diagram..

IC101 IN/OUT Pins and Functions (VCJ)

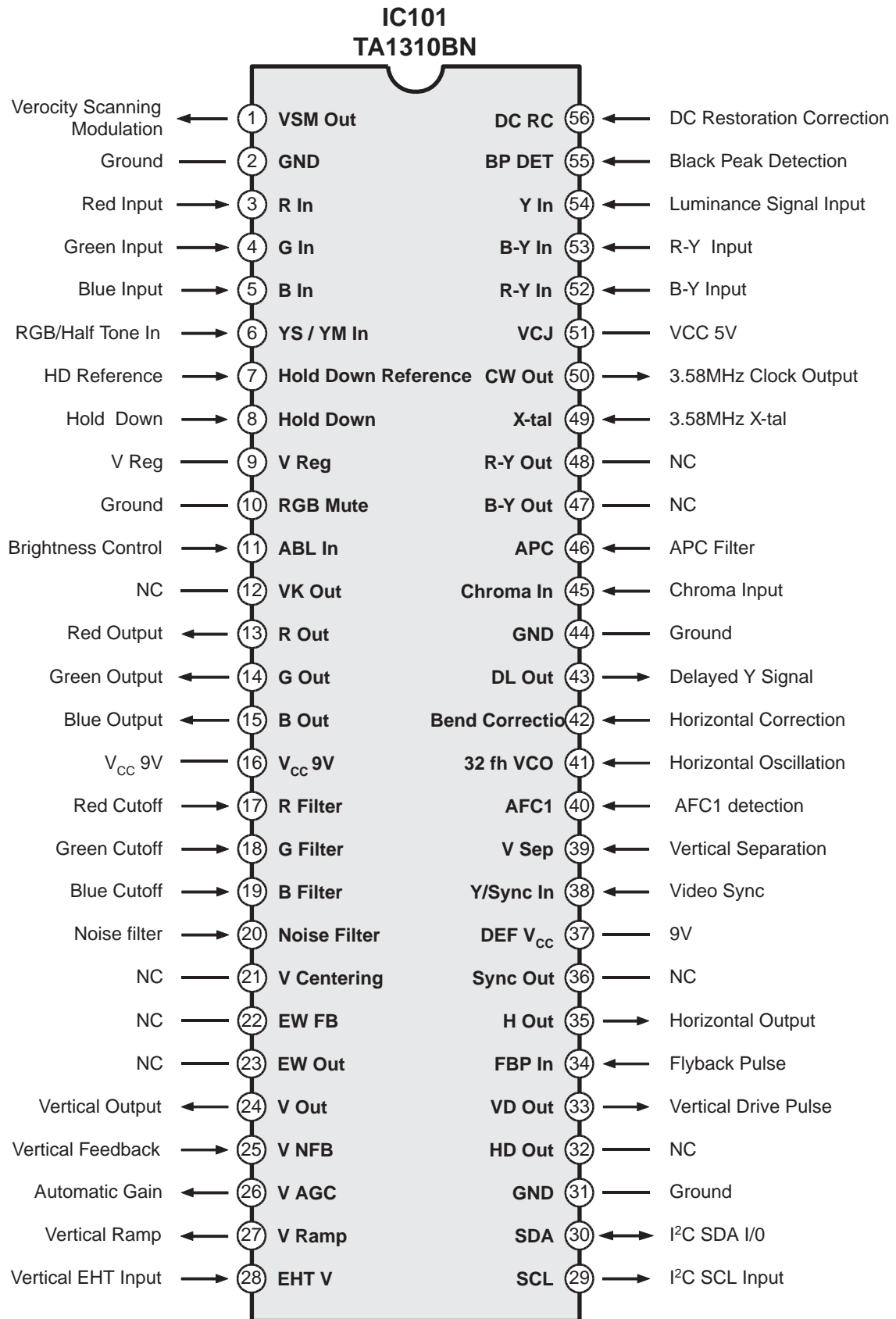


Figure 28. IC101 IN/OUT Pins and Functions (VCJ).

IC001 IN/OUT Pins and Functions (MPU)

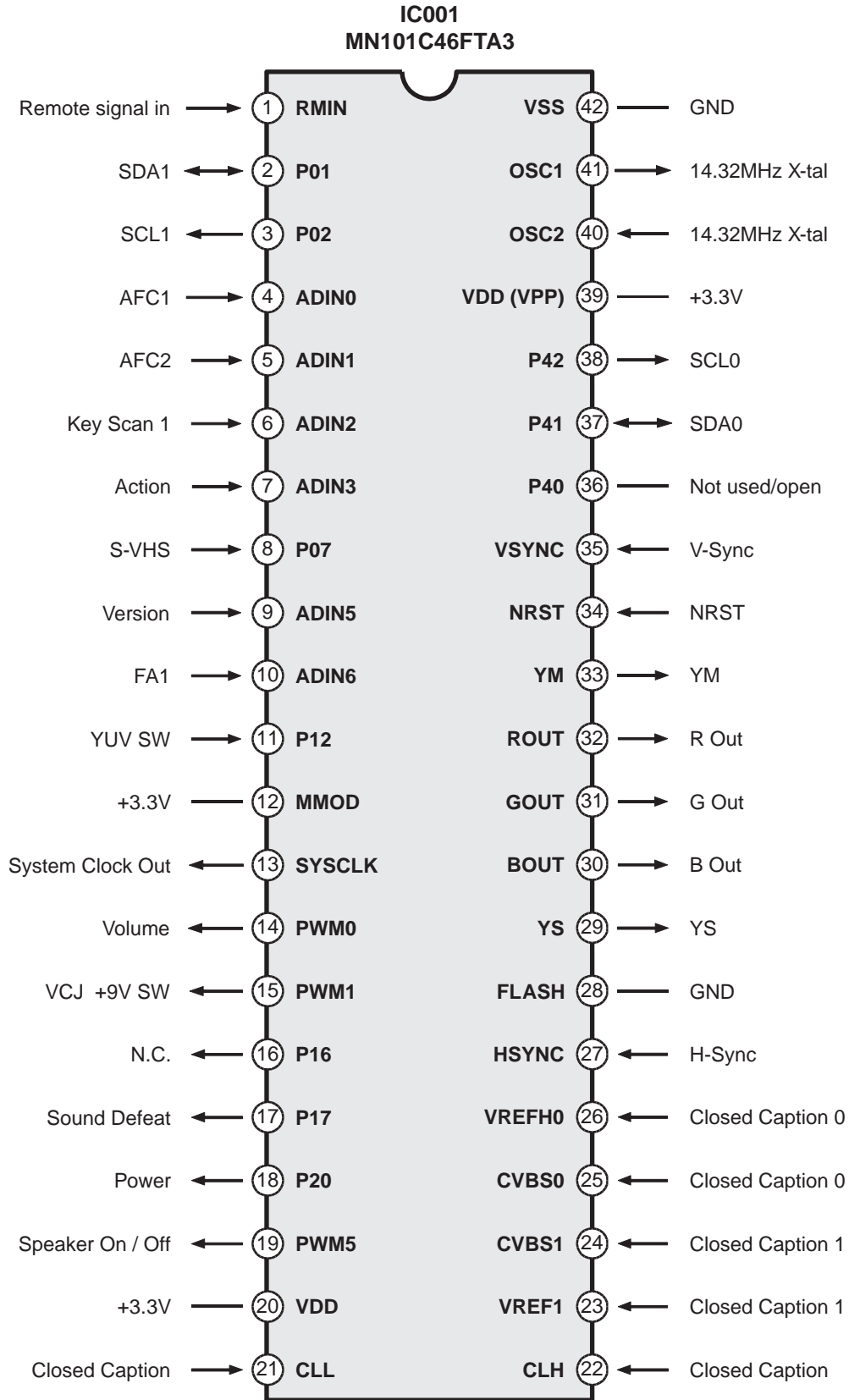


Figure 29. IC001 IN/OUT Pins and Functions (MPU).

Component Identification

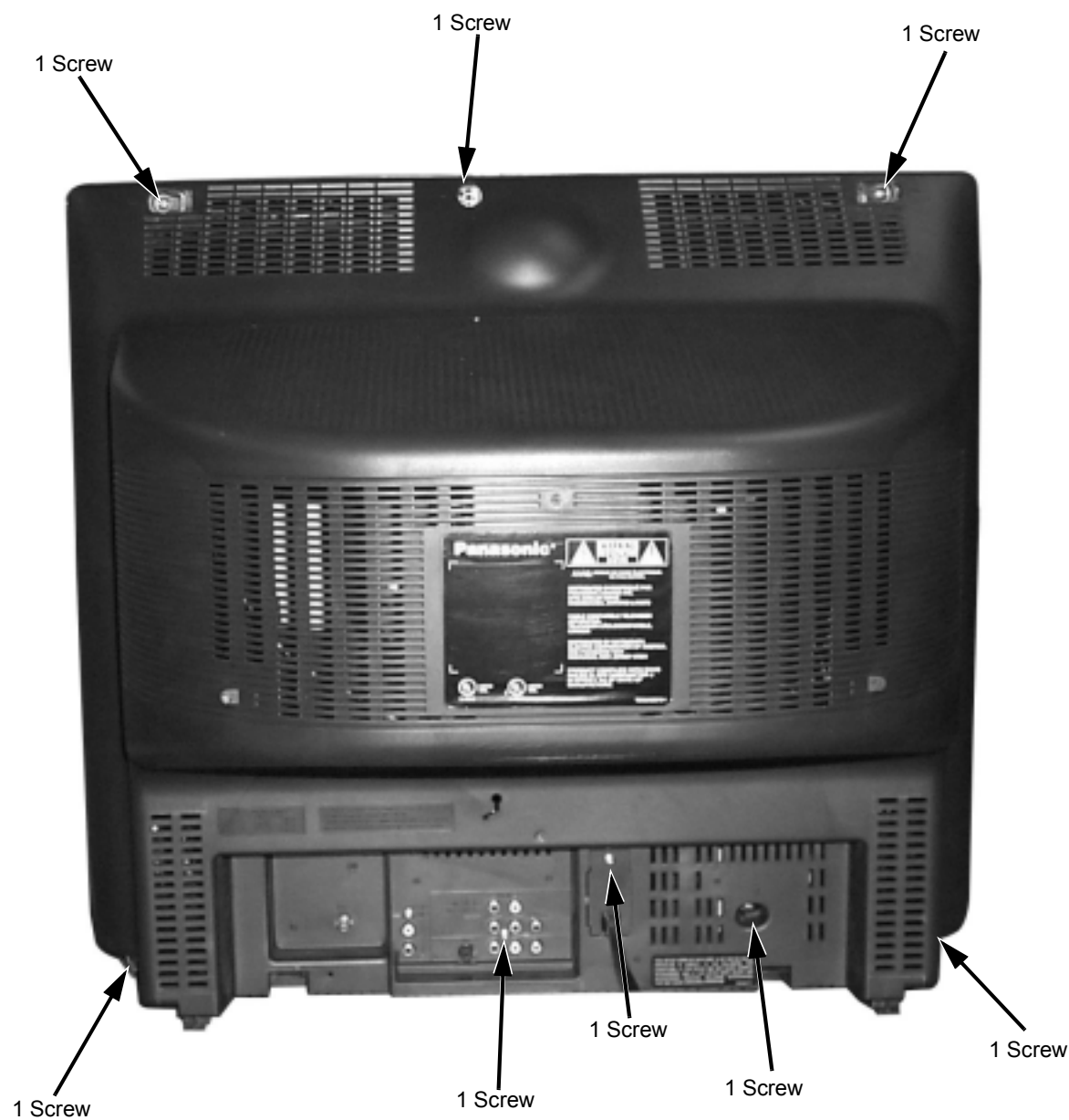


Figure 30. **Cabinet Back**

Component Identification

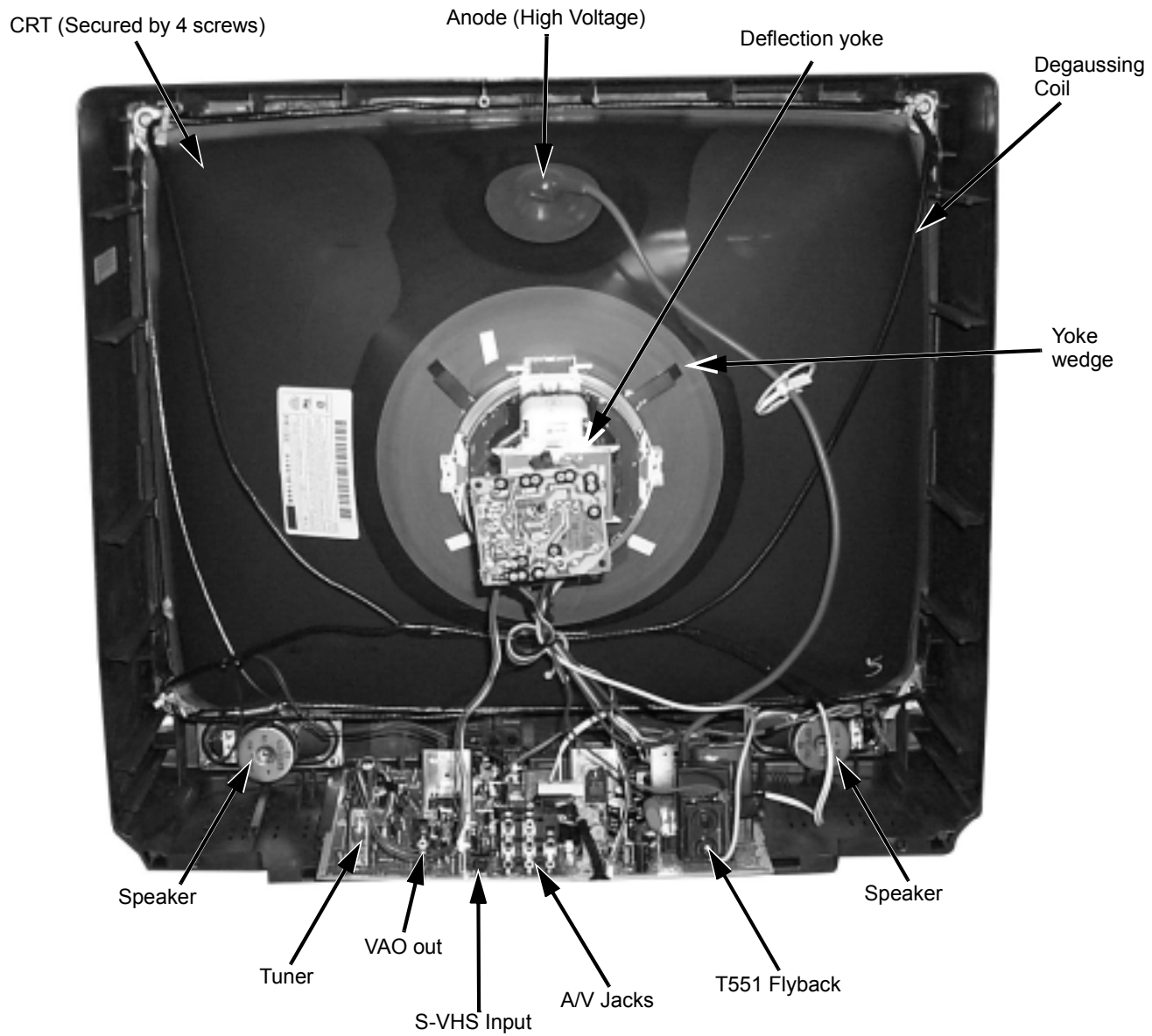


Figure 31. **Rear View**

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

Component Identification

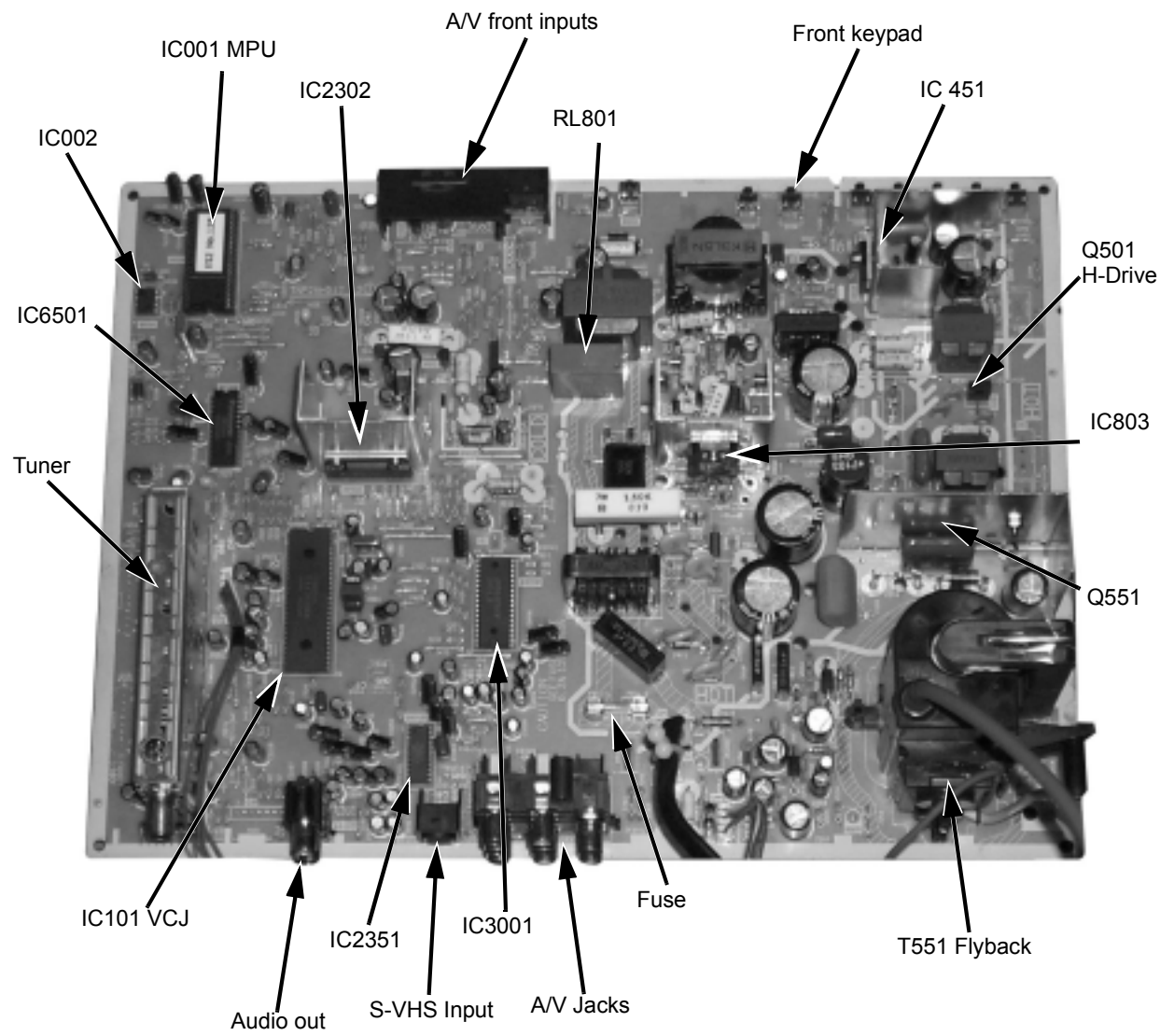


Figure 32. **A-Board**

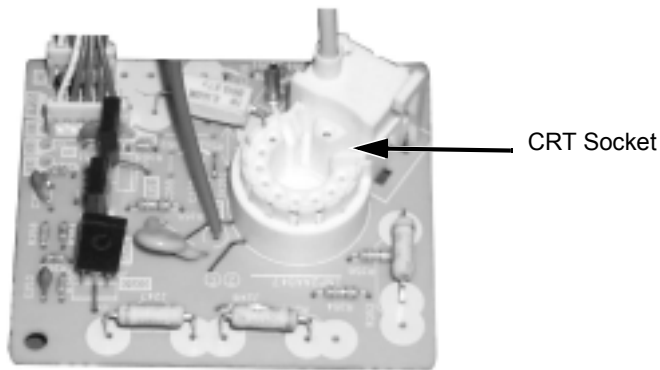


Figure 33. **C-Board**

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

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
CAPRISTORS		
CRA801	TP00842-51	TAPING GAP TERMINAL
CRA802	TP00842-51	TAPING GAP TERMINAL
CAPACITORS		
C001	ECA1CM470	CAP,E 47UF/16V
C002	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C003	ECA1HM4R7	CAP,E 4.7UF/50V
C005	ECA1CM470	CAP,E 47UF/16V
C006	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C008	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C010	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C013	ECA0JM101	CAP,E 100UF/6.3V
C016	ECJ2VC1H101J	CAP,C 100PF-J-50V
C017	ECJ2VC1H270J	CAP,C 27PF-J-50V
C018	ECJ2VC1H270J	CAP,C 27PF-J-50V
C020	ECA0JM331	CAP,E 330UF/6.3V
C021	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C022	ECA1CM471	CAP,E 470UF/16V
C024	ECA1HM4R7	CAP,E 4.7UF/50V
C025	ECA1HM010	CAP,E 1.0UF/50V
C026	ECA1HM010	CAP,E 1.0UF/50V
C032	ECA1CM331	CAP,E 330UF/16V
C033	ECJ2VC1H680J	CAP,C 68PF-J-50V
C034	ECJ2VC1H680J	CAP,C 68PF-J-50V
C036	ECJ2VC1H101J	CAP,C 100PF-J-50V
C043	ECA1HM2R2	CAP,E 2.2UF/50V
C044	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C047	ECA0JM102	CAP,E 1000UF/6.3V
C048	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C201	ECJ2VB1C104K	CAP,C .1UF-I-16V
C224	ECJ2VB1C104K	CAP,C .1UF-I-16V
C225	ECJ2VB1C104K	CAP,C .1UF-I-16V
C226	ECJ2VB1C104K	CAP,C .1UF-I-16V
C301	ECJ2VB1C104K	CAP,C .1UF-I-16V
C302	ECJ2VB1C104K	CAP,C .1UF-I-16V
C303	ECJ2VB1C104K	CAP,C .1UF-I-16V
C307	ECA1HM0R1	CAP,E 0.1UF/50V
C309	ECJ2VC1H390J	CAP,C 39PF-J-50V
C310	ECJ2VC1H390J	CAP,C 39PF-J-50V
C314	EEANA1E1R0B	CAP,E 1.0UF-25V
C315	EEANA1E1R0B	CAP,E 1.0UF-25V
C320	ECJ2VF1H104Z	CAP,C .1UF-Z-50V
C321	ECJ2VB1H103K	CAP,C .01UF-K-50V
C322	ECJ2VB1H103K	CAP,C .01UF-K-50V
C323	ECJ2VB1H103K	CAP,C .01UF-K-50V
C324	ECJ2VF1H104Z	CAP,C .1UF-Z-50V
C330	ECA1AM101	CAP,E 100UF/10V
C331	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C337	ECA1HM2R2	CAP,E 2.2UF/50V
C342	ECA1HM010	CAP,E 1.0UF/50V

REF NO.	PART NO.	DESCRIPTION
C351	TACCW331T50V	CAP,C 330PF/50V
C352	TACCW331T50V	CAP,C 330PF/50V
C353	TACCW331T50V	CAP,C 330PF/50V
C354	ECKD3D102KB	CAP,C .001UF-K-2KV
C357	EEANA1E1R0B	CAP,E 1.0UF-25V
C401	ECJ2VB1C104K	CAP,C .1UF-I-16V
C402	ECA1HM470	CAP,E 47UF/50V
C403	ECA1HM010	CAP,E 1.0UF/50V
C404	ECA1HM010	CAP,E 1.0UF/50V
C405	ECSF1EE105	CAP,T 1.0UF/25V
C407	ECA1HM470	CAP,E 47UF/50V
C409	ECJ2VC1H101J	CAP,C 100PF-J-50V
C415	ECJ2VF1H104Z	CAP,C .1UF-Z-50V
C451	ECA1HM2R2	CAP,E 2.2UF/50V
C452	ECQB1H473JM	CAP,P .047UF-J-50V
C453	ECA1VM471	CAP,E 470UF/35V
C454	ECA1VM221	CAP,E 220UF/35V
C455	ECA1VM222	CAP,E 2200UF/35V
C456	ECCF1H020CC	CAP,C 2PF-C-50V
C457	ECJ2VB1C104K	CAP,C .1UF-I-16V
C458	ECA1CM101	CAP,E 100UF/16V
C459	ECQM1104JZ	CAP,P .1UF-J-100V
C502	ECA1CM221	CAP,E 220UF/16V
C503	ECJ2VC1H221J	CAP,C 220PF-J-50V
C504	ECQB1H222JM	CAP,P 2200PF-J-50V
C505	ECJ2VC1H180J	CAP,C 18PF-J-50V
C506	ECA1AM101	CAP,E 100UF/10V
C507	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C508	ECJ2VC1H102J	CAP,C .001UF-J-50V
C510	ECCD2H100D	CAP,C 10PF-D-500V
C511	ECKD2H821KB	CAP,C 820PF-K-500V
C512	ECKD2H101KB	CAP,C 100PF-K-500V
C514	ECA1HMR22	CAP,E .22UF/50V
C515	ECJ2VC1H222J	CAP,C .0022UF-J-50V
C516	ECJ2VC1H391J	CAP,C 390PF-J-50V
C517	ECJ2VC1H221J	CAP,C 220PF-J-50V
C518	ECJ2VC1H151J	CAP,C 150PF-J-50V
C531	ECA1EM220	CAP,E 22UF/25V
C551	ECA1VM331	CAP,E 330UF/35V
C552	ECA1CM331	CAP,E 330UF/16V
C553	ECA1CM331	CAP,E 330UF/16V
C554	ECKD2H561KB	CAP,C 560PF-K-500V
C555	ECA2EM220	CAP,E 22UF-250V
C556	ECA1CM102	CAP,E 1000UF/16V
C557	ECKD2H102KB	CAP,C .001UF-K-500V
C558	ECA1CM221	CAP,E 220UF/16V
C560	ECEA1HN2R2U	CAP,E 2.2UF/50V
C561	ECKD2H561KB	CAP,C 560PF-K-500V
C562	ECKD2H561KB	CAP,C 560PF-K-500V
C563	ECWH12H822JS	CAP,P .0082UF-J-1.2KV

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

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
C564	ECWH12H272JS	CAP,P .0027UF-J-1.2KV	C2307	ECA1CM102	CAP,E 1000UF/16V
C565	ECKD3D821JB	CAP,C 820PF-J-2KV	C2309	ECQB1H473JM	CAP,P .047UF-J-50V
C566	ECKD3D181JB	CAP,C 180PF-J-2KV	C2311	ECA1HM3R3	CAP,E 3.3UF/50V
C568	ECQM2274JZ	CAP,P .27UF-J-200V	C2313	ECA1EM101	CAP,E 100UF/25V
C569	TACFV2E474J	CAP,M .47UF-J-200V	C2314	ECQB1H473JM	CAP,P .047UF-J-50V
C571	ECA1CM471	CAP,E 470UF/16V	C2315	ECA1EM100	CAP,E 10UF/25V
C572	ECA1CM100	CAP,E 10UF/16V	C2321	ECA1EM100	CAP,E 10UF/25V
C573	ECA1CM101	CAP,E 100UF/16V	C2324	ECA1EM100	CAP,E 10UF/25V
C601	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	C2325	ECA1CM102	CAP,E 1000UF/16V
C603	ECQB1H223JM	CAP,P .022UF-J-50V	C2326	ECJ2VB1H223K	CAP,C .022UF-K-50V
C616	ECJ2VB1C104K	CAP,C .1UF-I-16V	C2327	ECJ2VB1H223K	CAP,C .022UF-K-50V
C641	ECA1HM100	CAP,E 10UF/50V	C2328	ECJ2VB1H223K	CAP,C .022UF-K-50V
C801	ECKDAE472ZED	CAP,C .4700PF-Z-250VAC	C2329	ECJ2VB1H223K	CAP,C .022UF-K-50V
C802	ECKDAE472ZED	CAP,C .4700PF-Z-250VAC	C2331	ECA1HM010	CAP,E 1.0UF/50V
C803	ECKDAE472ZED	CAP,C .4700PF-Z-250VAC	C2333	ECA1HM010	CAP,E 1.0UF/50V
C804	ECKDAE472ZED	CAP,C .4700PF-Z-250VAC	C2339	ECA1HM010	CAP,E 1.0UF/50V
C805	EC0S2DA221BB	CAP,E 220UF/200V	C2340	ECA1HM010	CAP,E 1.0UF/50V
C806	EC0S2DA221BB	CAP,E 220UF/200V	C2342	ECA1AM470	CAP,E 47UF/10V
C807	ECA1HM2R2	CAP,E 2.2UF/50V	C2350	EEANA1E100B	CAP,E 10UF-25V
C808	ECA1CM101	CAP,E 100UF/16V	C2351	ECJ2VB1C104K	CAP,C .1UF-I-16V
C809	EC0S2DG151DG	CAP,E 151UF/200V	C2352	ECJ2VB1H472K	CAP,C .0047UF-K-50V
C810	ECQU2A153MV	CAP,P .015UF-M-250V	C2353	ECA1HM4R7	CAP,E 4.7UF/50V
C811	ECQU2A153MV	CAP,P .015UF-M-250V	C2354	ECA1HM4R7	CAP,E 4.7UF/50V
C812	ECQU2A224MV	CAP,P .22UF-M-250VAC	C2355	ECA1HM4R7	CAP,E 4.7UF/50V
C814	ECQB1H823JM	CAP,P .082UF-J-50V	C2356	ECA1HMR47	CAP,E .47UF/50V
C815	ECA1EHG101B	CAP,E 100UF-25V	C2357	ECA1CM100	CAP,E 10UF/16V
C818	ECKD3A821KB	CAP,C 820PF-K-1KVDC	C2358	EEANA1E100B	CAP,E 10UF-25V
C820	ECA1JHG100B	CAP,E 10UF-63V	C2359	ECJ2VB1C104K	CAP,C .1UF-I-16V
C821	ECKD2H561KB	CAP,C 560PF-K-500V	C2360	ECJ2VB1H472K	CAP,C .0047UF-K-50V
C822	ECA1EM221	CAP,E 220UF/25V	C2361	ECA1AM470	CAP,E 47UF/10V
C823	ECA160V33UE	CAP,E 33UF/160V	C2362	ECQB1H104JM	CAP,P .1UF-J-50V
C824	ECKD3A331KB	CAP,C 330PF-K-1KV	C2363	ECJ2BV1C104K	CAP,C .1UF-I-16V
C825	ECKD3A471KB	CAP,C 470PF-K-1KV	C2364	ECA1HM4R7	CAP,E 4.7UF/50V
C2202	ECA1HM2R2	CAP,E 2.2UF/50V	C2365	ECA1AM470	CAP,E 47UF/10V
C2203	ECA1HM4R7	CAP,E 4.7UF/50V	C2366	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C2204	AP106K016CAE	CAP,T 10UF/16V	C3001	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C2205	ECA1HM010	CAP,E 1.0UF/50V	C3002	ECA1AM101	CAP,E 100UF/10V
C2206	ECQB1H223JM	CAP,P .022UF-J-50V	C3003	ECA1CM100	CAP,E 10UF/16V
C2207	AP335K016CAE	CAP,T 3.3UF/16V	C3004	ECA1HM010	CAP,E 1.0UF/50V
C2208	ECJ2VB1C104K	CAP,C .1UF-I-16V	C3006	ECA1HM010	CAP,E 1.0UF/50V
C2209	ECJ2VB1C104K	CAP,C .1UF-I-16V	C3007	ECA1CM100	CAP,E 10UF/16V
C2210	ECJ2VB1C104K	CAP,C .1UF-I-16V	C3008	ECA1CM100	CAP,E 10UF/16V
C2211	ECA1CM100	CAP,E 10UF/16V	C3009	ECA1HM010	CAP,E 1.0UF/50V
C2212	ECQB1H473JM	CAP,P .047UF-J-50V	C3010	ECJ2VF1H103Z	CAP,C .01UF-Z-50V
C2215	ECA0JM101	CAP,E 100UF/6.3V	C3011	ECA1HM010	CAP,E 1.0UF/50V
C2218	ECA1HMR47	CAP,E .47UF/50V	C3012	ECA1CM100	CAP,E 10UF/16V
C2301	ECA1VM102	CAP,E 1000UF/35V	C3013	ECA1CM100	CAP,E 10UF/16V
C2302	ECA1HM010	CAP,E 1.0UF/50V	C3014	ECA1HM010	CAP,E 1.0UF/50V
C2305	ECA1HM010	CAP,E 1.0UF/50V	C3016	ECA1HM010	CAP,E 1.0UF/50V
C2306	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	C3018	ECA1CM100	CAP,E 10UF/16V

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

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REF NO.	PART NO.	DESCRIPTION	REF NO.	PART NO.	DESCRIPTION
C3019	ECA1CM100	CAP,E 10UF/16V	D557	TVSRU2N	DIODE
C3020	ECA1HM010	CAP,E 1.0UF/50V	D558	RS3FS	DIODE
C3021	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D559	BYD33G-113	DIODE
C3022	ECA1HM010	CAP,E 1.0UF/50V	D561	BYD33G-163	DIODE
C3023	ECA1CM100	CAP,E 10UF/16V	D801	GP15KL-042	DIODE
C6501	ECA0JM101	CAP,E 100UF/6.3V	D802	GP15KL-042	DIODE
C6502	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D805	TRPW5B0M050D	THERMISTOR
C6504	ECJ2VC1H270J	CAP,C 27PF-J-50V	D806	MA4047M	DIODE, ZENER
C6507	ECJ2VC1H120J	CAP,C 12PF-J-50V	D807	MA165	DIODE
C6510	ECJ2VC1H120J	CAP,C 12PF-J-50V	D809	RU3YX-M	DIODE
C6511	ECA1HM010	CAP,E 1.0UF/50V	D820	EU02V1	DIODE
C6512	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D821	EU02V1	DIODE
C6513	ECJ2VC1H270J	CAP,C 27PF-J-50V	D822	EU02V1	DIODE
C6516	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D823	RL30A	DIODE
C6517	ECEA1HN010U	CAP,E 1UF/50V	D824	EU02V1	DIODE
C6518	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D825	TVSSR2KL	DIODE, PROTECTION
C6520	ECA1CM100	CAP,E 10UF/16V	D826	EU02V1	DIODE
C6521	ECA1AM470	CAP,E 47UF/10V	D829	MA165	DIODE
C6522	ECJ2VC1H221J	CAP,C 220PF-J-50V	D830	MA4270M	DIODE
C6523	ECJ2VF1H104Z	CAP,C .1UF-Z-50V	D2301	MA165	DIODE
C6524	ECA1HM010	CAP,E 1.0UF/50V	D2305	MA4110M	DIODE, ZENER
C6525	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D2306	MA4110M	DIODE, ZENER
C6526	ECA1HM3R3	CAP,E 3.3UF/50V	D2307	MA4110M	DIODE, ZENER
C6527	ECJ2VF1H104Z	CAP,C .1UF-Z-50V	D2308	MA4110M	DIODE, ZENER
C6528	ECA1AM470	CAP,E 47UF/10V	D2315	MA165	DIODE
C6529	ECA1CM100	CAP,E 10UF/16V	D2342	MA165	DIODE
C6531	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D2343	MA165	DIODE
C6532	ECJ2VF1H103Z	CAP,C .01UF-Z-50V	D3001	MA4110M	DIODE, ZENER
DIODES			D3002	MA4110M	DIODE, ZENER
D001	ERA15-01	DIODE	D3003	MA4110M	DIODE, ZENER
D002	MA165	DIODE	D3004	MA4110M	DIODE, ZENER
D003	MA4056M	DIODE	D3005	MA4110M	DIODE, ZENER
D006	MA4330H	DIODE	D3006	MA4110M	DIODE, ZENER
D007	ERA15-01	DIODE	D3007	MA4110M	DIODE, ZENER
D008	ERA15-01	DIODE	D3008	MA4110M	DIODE, ZENER
D009	ERA15-01	DIODE	D3009	MA4110M	DIODE, ZENER
D011	MA165	DIODE	D3010	MA4110M	DIODE, ZENER
D014	MA165	DIODE	D3015	MA4110M	DIODE, ZENER
D015	MA165	DIODE	D3016	MA4110M	DIODE, ZENER
D018	MA165	DIODE	D3017	MA4110M	DIODE, ZENER
D451	ERA15-01	DIODE	D3018	MA4110M	DIODE, ZENER
D502	MA4062L	DIODE	D3019	MA4110M	DIODE, ZENER
D530	MA4082L	DIODE	D3020	MA4110M	DIODE, ZENER
D531	AS01	DIODE	D3021	MA4110M	DIODE, ZENER
D532	MA4091M	DIODE, ZENER	D3022	MA4110M	DIODE, ZENER
D551	TVSRU2N	DIODE	D6501	MA165	DIODE
D554	BYD33G-163	DIODE	FUSES		
D555	MA165	DIODE	F801	XBA2A00101	FUSE 6.3A 125V
D556	MA4360H	DIODE, ZENER	F801-1	TP00351-51	FUSE CLIP

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

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
F801-2	TP00351-51	FUSE CLIP	Q003	2SD601ARTX	TRANSISTOR
INTEGRATED CIRCUITS			Q004	2SC1685QRS	TRANSISTOR
IC001	MN101C46FTA	INT CKT	Q005	2SD601ARTX	TRANSISTOR
IC002	24LC08BIP	INT CKT	Q201	2SD601ARTX	TRANSISTOR
IC003	PIC-26042SR	INT CKT	Q302	2SD601ARTX	TRANSISTOR
IC005	PQ1R33	INT CKT	Q303	2SD601ARTX	TRANSISTOR
IC006	PST9229NR	INT CKT	Q351	2SC3063	TRANSISTOR
IC101	TA1310BN	INT CKT	Q352	2SC3063	TRANSISTOR
IC451	LA7845N	INT CKT	Q353	2SC3063	TRANSISTOR
IC551	AN78M09	PLUS 9V AVR	Q401	2SD601ARTX	TRANSISTOR
IC552	AN7805	INT CKT	Q402	2SD601ARTX	TRANSISTOR
IC801	PC817X2	INT CKT	Q501	2SC4212H	TRANSISTOR
IC803	STR58041A	INT CKT	Q509	2SD601ARTX	TRANSISTOR
IC2201	AN5849S-E1V	INT CKT	Q515	2SD601ARTX	TRANSISTOR
IC2302	AN5272	INT CKT	Q551	2SD2539MA1	TRANSISTOR
IC2351	CXA2021S	INT CKT	Q603	2SD601ARTX	TRANSISTOR
IC3001	M52790SP	INT CKT A/V SWITCH	Q801	2SC1685RSTA	TRANSISTOR
IC6501	MN82840	INT CKT	Q802	2SC1384RS	TRANSISTOR
COILS			Q2302	2SB709ARTX	TRANSISTOR
L001	EXCELSA35	FERRITE BEAD	Q2303	2SD601ARTX	TRANSISTOR
L003	TLTABT2R2K	COIL, PEAKING 2.2UH	Q2342	2SB709ARTX	TRANSISTOR
L004	TLTABT2R2K	COIL, PEAKING 2.2UH	Q2343	2SD601ARTX	TRANSISTOR
L005	ELESN330KA	COIL, PEAKING 33UH	Q2409	2SD601ARTX	TRANSISTOR
L006	EXCELSA24T	FERRITE BEAD	Q2410	2SD601ARTX	TRANSISTOR
L008	TLTABT470K	COIL, PEAKING 47UH	Q6501	2SD601ARTX	TRANSISTOR
L010	TLTABT2R2K	COIL, PEAKING 2.2UH	Q6502	2SD601ARTX	TRANSISTOR
L011	TLTABT2R2K	COIL, PEAKING 2.2UH	Q6504	2SD601ARTX	TRANSISTOR
L012	TLTABT2R2K	COIL, PEAKING 2.2UH	Q6505	2SD601ARTX	TRANSISTOR
L013	TLTABT2R2K	COIL, PEAKING 2.2UH	Q6506	2SD601ARTX	TRANSISTOR
L106	EXCELSA35T	FERRITE BEAD	Q6509	2SD601ARTX	TRANSISTOR
L218	EXCELSA35T	FERRITE BEAD	Q6510	2SB709ARTX	TRANSISTOR
L351	TLTABT101K	COIL, PEAKING	Q6514	2SB709ARTX	TRANSISTOR
L501	ELESN3R3KA	COIL, PEAKING 3.3UH	Q6516	2SB709ARTX	TRANSISTOR
L518	TLTABT120K	COIL, PEAKING 12UH	Q6517	2SD601ARTX	TRANSISTOR
L541	EXCELD35	FERRITE BEAD	Q6519	2SD601ARTX	TRANSISTOR
L551	ELH5L7103	COIL	RELAYS		
L554	EXCELSA24T	FERRITE BEAD	RL801	TSEH8007	RELAY
L555	EXCELSA24T	FERRITE BEAD	RESISTORS		
L556	EXCELSA24T	FERRITE BEAD	R002	ERJ6GEYJ182	RES,M 1.8K-J-1/10
L801	ELF20N020A	COIL, 2UH	R003	ERJ6GEYJ562	RES,M 5.6K-J-1/10
L803	ELF17N007A	LINE FILTER	R004	ERDS1TJ122	RES,C 1.2K-J-1/2
L804	EXCELSA39	FERRITE BEAD	R005	ERDS2TJ101	RES,C 100-J-1/4
L2310	TLTABT2R2K	COIL, PEAKING 2.2UH	R006	ERDS1TJ181	RES,C 180-J-1/2
L6502	ELESN330JA	COIL, PEAKING 33UH	R007	ERJ6GEYJ103	RES,M 10K-J-1/10
L6505	ELESN330JA	COIL, PEAKING 33UH	R008	ERJ6GEYJ103	RES,M 10K-J-1/10
L6507	ELESN150KA	COIL, PEAKING 15UH	R009	ERJ6GEYJ221	RES,M 220-J-1/10
L6508	EXCELSA35T	FERRITE BEAD	R010	ERJ6GEYJ103	RES,M 10K-J-1/10
TRANSISTORS			R012	ERJ6GEYJ103	RES,M 10K-J-1/10
Q001	2SD601ARTX	TRANSISTOR	R013	ERJ6GEYJ223	RES,M 22K-J-1/10
Q002	2SC1685QRS	TRANSISTOR	R014	ERJ6GEYJ472	RES,M 4.7K-J-1/10

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

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
R015	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R310	ERJ6GEYJ332	RES,M 3.3K-J-1/10
R016	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R312	ERJ6GEYJ393	RES,M 39K-J-1/10
R017	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R328	ERJ6GEYJ334	RES,M 330K-J-1/10
R020	ERJ6GEYJ682	RES,M 6.8K-J-1/10	R341	ERJ6GEYJ474	RES,M 470K-J-1/10
R021	ERJ6GEYJ101	RES,M 100-J-1/10	R351	ERG2FJ123H	RES,M 12K-J-2W
R022	ERJ6GEYJ101	RES,M 100-J-1/10	R352	ERG2FJ123H	RES,M 12K-J-2W
R023	ERJ6GEYJ102	RES,M 1K-J-1/10	R353	ERG2FJ123H	RES,M 12K-J-2W
R024	ERJ6GEYJ221	RES,M 220-J-1/10	R354	ERDS1TJ272	RES,C 2.7K-J-1/2
R025	ERJ6GEYJ223	RES,M 22K-J-1/10	R355	ERDS1TJ272	RES,C 2.7K-J-1/2
R027	ERJ6GEYJ103	RES,M 10K-J-1/10	R356	ERDS1TJ272	RES,C 2.7K-J-1/2
R028	ERJ6GEYJ223	RES,M 22K-J-1/10	R357	ERDS2TJ181	RES,C 180-J-1/4
R030	ERJ6GEYJ102	RES,M 1K-J-1/10	R358	ERDS2TJ181	RES,C 180-J-1/4
R031	ERJ6GEYJ102	RES,M 1K-J-1/10	R359	ERDS2TJ181	RES,C 180-J-1/4
R032	ERJ6ENF1002	RES,M 10K-F-1/10	R360	ERDS2TJ821	RES,C 820-J-1/4
R033	ERJ6GEYJ272	RES,M 2.7K-J-1/10	R361	ERDS2TJ821	RES,C 820-J-1/4
R034	ERJ6GEYJ222	RES,M 2.2K-J-1/10	R362	ERDS2TJ821	RES,C 820-J-1/4
R035	ERJ6GEYJ362	RES,M 3.6K-J-1/10	R363	ERDS2TJ101	RES,C 100-J-1/4
R036	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R364	ERDS2TJ101	RES,C 100-J-1/4
R037	ERJ6GEYJ103	RES,M 10K-J-1/10	R365	ERDS2TJ101	RES,C 100-J-1/4
R038	ERJ6GEYJ223	RES,M 22K-J-1/10	R401	ERJ6GEYJ102	RES,M 1K-J-1/10
R039	ERJ6GEYJ102	RES,M 1K-J-1/10	R402	ERJ6GEYJ471	RES,M 470-J-1/10
R040	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R403	ERJ6GEYJ622	RES,M 6.2K-J-1/10
R041	ERJ6GEYJ472	RES,M 4.7K-J-1/10	R405	ERJ6GEYJ102	RES,M 1K-J-1/10
R042	ERJ6GEYJ102	RES,M 1K-J-1/10	R406	ERJ6GEYJ223	RES,M 22K-J-1/10
R045	ERJ6GEYJ223	RES,M 22K-J-1/10	R407	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R046	ERJ6GEYJ333	RES,M 33K-J-1/10	R408	ERJ6GEYJ471	RES,M 470-J-1/10
R047	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R409	ERJ6GEYJ271	RES,M 270-J-1/10
R049	ERJ6GEYJ101	RES,M 100-J-1/10	R410	ERJ6GEYJ153	RES,M 15K-J-1/10
R060	ERJ6GEYJ471	RES,M 470-J-1/10	R411	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R065	ERJ6GEYJ101	RES,M 100-J-1/10	R412	ERDS2TJ123	RES,C 12K-J-1/4
R066	ERJ6GEYJ103	RES,M 10K-J-1/10	R452	ERDS1FJ1R8	RES,C 1.8-J-1/2
R067	ERJ6GEYJ103	RES,M 10K-J-1/10	R453	ERJ6GEYJ123	RES,M 12K-J-1/10
R068	ERJ6GEYJ103	RES,M 10K-J-1/10	R454	ERJ6GEYJ473	RES,M 47K-J-1/10
R072	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R455	ERJ6GEYJ103	RES,M 10K-J-1/10
R073	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R456	ERG3FJ151H	RES,M 150-J-3W
R074	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R457	ERDS1FJ1R5	RES,C 1.5-J-1/2
R075	ERJ6GEYJ102	RES,M 1K-J-1/10	R458	ERDS1FJ2R7	RES,C 2.7-J-1/2
R076	ERJ6GEYJ102	RES,M 1K-J-1/10	R460	ERJ6GEYJ103	RES,M 10K-J-1/10
R077	ERJ6GEYJ102	RES,M 1K-J-1/10	R461	ERJ6GEYJ223	RES,M 22K-J-1/10
R201	ERJ6GEYJ331	RES,M 330-J-1/10	R465	ERJ6GEYJ103	RES,M 10K-J-1/10
R223	ERJ6GEYJ561	RES,M 560-J-1/10	R468	ER0S2CKF4321	RES,M 4.32K-F-1/4
R225	ERJ6GEYJ331	RES,M 330-J-1/10	R469	ER0S2CKF1471	RES,M 1.47K-F-1/4
R226	ERJ6GEYJ331	RES,M 330-J-1/10	R470	ERDS2TJ102	RES,C 1K-J-1/4
R245	ERJ6GEYJ224	RES,M 220K-J-1/10	R501	ERJ6GEYJ301	RES,M 300-J-1/10
R301	ERJ6GEYJ331	RES,M 330-J-1/10	R502	ERJ6GEYJ562	RES,M 5.6K-J-1/10
R302	ERJ6GEYJ331	RES,M 330-J-1/10	R504	ERJ6GEYJ333	RES,M 33K-J-1/10
R303	ERJ6GEYJ331	RES,M 330-J-1/10	R505	ERDS1TJ181	RES,C 180-J-1/2
R305	ERJ6GEYJ682	RES,M 6.8K-J-1/10	R506	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R306	ERJ6GEYJ682	RES,M 6.8K-J-1/10	R507	ERJ6GEYJ561	RES,M 560-J-1/10
R309	ERJ6GEYJ332	RES,M 3.3K-J-1/10	R508	ERJ6GEYJ471	RES,M 470-J-1/10

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

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
R509	ERJ6GEYJ221	RES,M 220-J-1/10	R829	ERQ14AJ6R8	RES,F 6.8-J-1/4
R510	ERG3FJ362H	RES,M 3.6K-J-3W	R2203	ERJ6GEYJ751	RES,M 750-J-1/10
R511	ERG3FJ362H	RES,M 3.6K-J-3W	R2206	ERJ6GEYJ102	RES,M 1K-J-1/10
R512	ERG2FJ392H	RES,M 3.9K-J-2W	R2207	ERJ6GEYJ102	RES,M 1K-J-1/10
R513	ERJ6GEYJ471	RES,M 470-J-1/10	R2221	ERJ6GEYJ101	RES,M 100-J-1/10
R514	ERJ6GEYJ102	RES,M 1K-J-1/10	R2301	ERQ2CJP1R0	RES,F 1.0-J-2W
R515	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R2305	ERD25FJ180	RES,C 18-J-1/4
R516	ERJ6GEYJ272	RES,M 2.7K-J-1/10	R2306	ERD25FJ180	RES,C 18-J-1/4
R517	ERJ6GEYJ181	RES,M 180-J-1/10	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	ERJ6GEYJ562	RES,M 5.6K-J-1/10
R533	ERJ6ENF2102	RES,M 21K-F-1/10	R2312	ERJ6GEYJ752	RES,M 7.5K-J-1/10
R539	ERJ6GEYJ103	RES,M 10K-J-1/10	R2313	ERJ6GEYJ332	RES,M 3.3K-J-1/10
R544	ERJ6GEYJ183	RES,M 18K-J-1/10	R2318	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R550	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2319	ERJ6GEYJ223	RES,M 22K-J-1/10
R551	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2321	ERDS2TJ181	RES,C 180-J-1/4
R552	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2322	ERDS2TJ181	RES,C 180-J-1/4
R553	ERG3FJ270H	RES,M 27-J-3W	R2323	ERJ6GEYJ822	RES,M 8.2K-J-1/10
R556	ERJ6GEYJ272	RES,M 2.7K-J-1/10	R2325	ERJ6GEYJ103	RES,M 10K-J-1/10
R557	ERJ6GEYJ103	RES,M 10K-J-1/10	R2329	ERJ6GEYJ751	RES,M 750-J-1/10
R558	ERQ1CKPR56	RES,F .56-K-1W	R2330	ERJ6GEYJ183	RES,M 18K-J-1/10
R559	ERG2FJ683H	RES,M 12K-J-2W	R2332	ERJ6GEYJ751	RES,M 750-J-1/10
R561	ERG2FJ102H	RES,M 1K-J-2W	R2333	ERJ6GEYJ183	RES,M 18K-J-1/10
R563	ERDS2TJ683	RES,C 68K-J-1/4	R2334	ERJ6GEYJ472	RES,M 4.7K-J-1/10
R564	ERDS2TJ823	RES,C 82K-J-1/4	R2336	ERJ6GEYJ472	RES,M 4.7K-J-1/10
R566	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2337	ERJ6GEYJ221	RES,M 220-J-1/10
R574	ERG2FJ270H	RES,M 27-J-2W	R2338	ERJ6GEYJ103	RES,M 10K-J-1/10
R601	ERJ6GEYJ391	RES,M 390-J-1/10	R2339	ERJ6GEYJ221	RES,M 220-J-1/10
R618	ERJ6GEYJ474	RES,M 470K-J-1/10	R2340	ERJ6GEYJ223	RES,M 22K-J-1/10
R619	ERJ6GEYJ563	RES,M 56K-J-1/10	R2341	ERJ6GEYJ152	RES,M 1.5K-J-1/10
R620	ERJ6GEYJ153	RES,M 15K-J-1/10	R2342	ERJ6GEYJ223	RES,M 22K-J-1/10
R801	ERF7ZK1R5	RES,W 1.5-K-7W	R2343	ERJ6GEYJ152	RES,M 1.5K-J-1/10
R804	ERW12PK1R8	RES,W 1.8-K-1/2W	R2344	ERJ6GEYJ471	RES,M 470-J-1/10
R805	ERDS2TJ274	RES,C 270K-J-1/4	R2350	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R806	ERDS2TJ274	RES,C 270K-J-1/4	R2351	ERJ6GEYJ105	RES,M 1.0MEG-J-1/10
R808	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2352	ERJ6GEYJ105	RES,M 1.0MEG-J-1/10
R809	ERDS1FJ1R0	RES,C 1.0-J-1/2	R2353	ERJ6GEYJ101	RES,M 100-J-1/10
R810	ERDS1FJ272	RES,C 2.7K-J-1/2	R2355	ERJ6GEYJ682	RES,M 6.8K-J-1/10
R812	ERDS1TJ183	RES,C 18K-J-1/2	R2366	ERJ6GEYJ222	RES,M 2.2K-J-1/10
R813	ERJ6GEYJ562	RES,M 5.6K-J-1/10	R2367	ERJ6GEYJ222	RES,M 2.2K-J-1/10
R815	ERC12ZGM825	RES,S 8.2MEG-M-1/2	R2418	ERJ6GEYJ471	RES,M 470-J-1/10
R818	ERQ12HJR56	RES,F .56-J-1/2	R2419	ERJ6GEYJ471	RES,M 470-J-1/10
R820	ERJ6GEYJ273	RES,M 27K-J-1/10	R3001	ERJ6GEYJ101	RES,M 100-J-1/10
R821	ERJ6GEYJ392	RES,M 3.9K-J-1/10	R3003	ERJ6GEYJ102	RES,M 1K-J-1/10
R822	ERD50FJ474	RES,C 470K-J-1/2W	R3004	ERJ6GEYJ102	RES,M 1K-J-1/10
R823	ERDS2TJ222	RES,C 2.2K-J-1/4	R3005	ERJ6GEYJ330	RES,M 33-J-1/10
R824	ERG3FJ390H	RES,M 39-J-3W	R3006	ERJ6GEYJ750	RES,M 75-J-1/10
R825	ERDS2TJ102	RES,C 1K-J-1/4	R3007	ERJ6GEYJ750	RES,M 75-J-1/10
R826	ERF2AKR22	RES,W .22-K-2W	R3008	ERJ6GEYJ750	RES,M 75-J-1/10
R827	ERDS1FJ561	RES,C 560-J-1/2	R3009	ERJ6GEYJ750	RES,M 75-J-1/10
R828	ERG3FJ470	RES,M 47-J-3W	R3010	ERJ6GEYJ750	RES,M 75-J-1/10

REPLACEMENT PARTS LIST

Models: CT-27D10B, CT-27D10UB & CT-27D10DB

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
R3011	ERJ6GEYJ750	RES,M 75-J-1/10
R3012	ERJ6GEYJ750	RES,M 75-J-1/10
R3013	ERDS2TJ331	RES,C 330-J-1/4
R3014	ERJ6GEYJ330	RES,M 33-J-1/10
R3015	ERDS2TJ102	RES,C 1K-J-1/4
R3016	ERJ6GEYJ102	RES,M 1K-J-1/10
R3017	ERJ6GEYJ330	RES,M 33-J-1/10
R3018	ERJ6GEYJ102	RES,M 1K-J-1/10
R3019	ERDS2TJ102	RES,C 1K-J-1/4
R3020	ERJ6GEYJ330	RES,M 33-J-1/10
R6501	ERJ6GEYJ471	RES,M 470-J-1/10
R6502	ERJ6GEYJ471	RES,M 470-J-1/10
R6503	ERJ6GEYJ471	RES,M 470-J-1/10
R6505	ERJ6GEYJ471	RES,M 470-J-1/10
R6509	ERJ6GEYJ471	RES,M 470-J-1/10
R6510	ERJ6GEYJ102	RES,M 1K-J-1/10
R6511	ERJ6GEYJ123	RES,M 12K-J-1/10
R6512	ERJ6GEYJ102	RES,M 1K-J-1/10
R6513	ERJ6GEYJ152	RES,M 1.5K-J-1/10
R6515	ERJ6GEYJ102	RES,M 1K-J-1/10
R6516	ERJ6GEYJ103	RES,M 10K-J-1/10
R6518	ERJ6GEYJ333	RES,M 33K-J-1/10
R6519	ERJ6GEYJ333	RES,M 33K-J-1/10
R6520	ERJ6GEYJ821	RES,M 820-J-1/10
R6522	ERJ6GEYJ102	RES,M 1K-J-1/10
R6523	ERJ6GEYJ562	RES,M 5.6K-J-1/10
R6524	ERJ6GEYJ471	RES,M 470-J-1/10
R6526	ERJ6GEYJ102	RES,M 1K-J-1/10
R6531	ERJ6GEYJ182	RES,M 1.8K-J-1/10
R6535	ERJ6GEYJ181	RES,M 180-J-1/10
R6537	ERJ6GEYJ392	RES,M 3.9K-J-1/10
R6538	ERJ6GEYJ122	RES,M 1.2K-J-1/10
R6540	ERJ6GEYJ151	RES,M 150-J-1/10
R6542	ERJ6GEYJ680	RES,M 68-J-1/10
R6543	ERJ6GEYJ122	RES,M 1.2K-J-1/10
R6544	ERJ6GEYJ102	RES,M 1K-J-1/10
R6545	ERJ6GEYJ221	RES,M 220-J-1/10
R6548	ERJ6GEYJ471	RES,M 470-J-1/10
R6549	ERJ6GEYJ222	RES,M 2.2K-J-1/10
R6553	ERJ6GEYJ101	RES,M 100-J-1/10
R6554	ERJ6GEYJ473	RES,M 47K-J-1/10
R6555	ERJ6GEYJ153	RES,M 15K-J-1/10
R6556	ERJ6GEYJ333	RES,M 33K-J-1/10
R6557	ERJ6GEYJ123	RES,M 12K-J-1/10
R6558	ERJ6GEYJ331	RES,M 330-J-1/10
R6559	ERJ6GEYJ272	RES,M 2.7K-J-1/10
R6560	ERJ6GEYJ124	RES,M 120K-J-1/10
R6565	ERJ6GEYJ102	RES,M 1K-J-1/10
R6566	ERJ6GEYJ681	RES,M 680-J-1/10
R6567	ERJ6GEYJ471	RES,M 470-J-1/10

REF NO.	PART NO.	DESCRIPTION
R6568	ERJ6GEYJ471	RES,M 470-J-1/10
SWITCHES		
S001	TSE2AD001	SWITCH
S002	TSE2AD001	SWITCH
S003	TSE2AD001	SWITCH
S004	TSE2AD001	SWITCH
S005	TSE2AD001	SWITCH
S008	TSE2AD001	SWITCH
S009	TSE2AD001	SWITCH
TRANSFORMERS		
T001	TLP16297	TRANSFORMER, POWER SUPPLY
T501	TLH15452	TRANSFORMER, HORIZONTAL DRIVER
T502	ETE19Z30AY	TRANSFORMER, HORIZONTAL COUPLING
T551	TLF2AA002	TRANSFORMER, FLYBACK
T801	ETS29AK3L5NC	TRANSFORMER, SWITCHING
CRYSTALS/FILTERS		
X001	TSSA092	CRYSTAL OSCILLATOR
X501	TSS2AA001	CRYSTAL, 3.58MHZ
X601	TAFC5B503F30	CRYSTAL
OTHERS		
M001	ETC33X82NA	YOKE, CONVERGENCE
TNR001	ENG36604G	TUNNER
M002	EUR511502	REMOTE CONTROL
M003	UR51EC975A	BATTERY COVER, REMOTE CONTROL
M004	M68LGL061X	CRT 27
M005	TAS2AA0015	SPEAKER 8-OHM 5W
M006	TBM2A10141	BADGE, PANASONIC
M007	TJS2AC00301	CRT SOCKET
M008	TKX2AA00401	GUIDE, IR
DY	TLY2AA006	DEFLECTION YOKE
M009	TMM2A30702	WEDGE, YOKE
M010	TQB2AA0331	MANUAL, OWNERS CT-27D10B/UB
M011	TQB2AA0356	MANUAL, OWNERS CT-27D10DB
M012	TQB2AA7058	REMOTE GUIDE CT-27D10B/DB/UB
M013	TQB2AA7078	V-CHIP NA8
M014	TSX2AA0111	AC LINE CORD
M015	TXFBX05BSER	ASSY, 7-KEY BUTTON
M016	TXFKU36BSER	ASSY, CABINET BACK CT-27D10B/UB
M017	TXFKU37BSER	ASSY, CABINET BACK CT-27D10DB
M018	TXFKY15BSER	ASSY, CABINET FRONT
M019	TXF3A01ZER	ASSY. DAG GROUND
M020	0FMK014ZZ	CONVERGENCE CORRECTOR STRIP
DEG	0LK19045A	COIL, DEGAUSSING 27
JK3001	TJB2AA0221	TERMINAL, A/V 8P
JK3002	TJB2AA0046	TERMINAL, FRONT A/V
JK3003	TJB2AA0171	TERMINAL, A/V
JK3004	TJB2AA0211	TERMINAL, A/V 2P

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

NOTES

SERVICEMAN MODE (ELECTRONIC CONTROL) SERVICE ADJUSTMENT VALUES

Model _____ Ser # _____ Date _____

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

Mode	Service Adjustment	Def. Val.	Original Value	New Value
Sub Adjustments				
B0	SUB COLOR	31		
B1	SUB TINT	31		
B2	SUB BRIGHTNESS	31		
B3	SUB CONTRAST	16		
B4	SUB TINT VIDEO	16		
B5	SUB COLOR VIDEO	16		
B6	SUB TINT COMPONENT	63		
B7	SUB COLOR COMPONENT	31		
B8	SUB SHARPNESS TV/VIDEO	10		
B9	SUB SHARPNESS S-VHS/COMPONENT	31		
BA	SUB CONTRAST FIXED	15		
Cut-Off Adjustments				
C0	CUT-OFF R	128		
C1	CUT-OFF G	128		
C2	CUT-OFF B	128		
C3	USER BRIGHTNESS	31		
C4	G DRIVE	64		
C5	B DRIVE	64		
C6	DRIVE C TEMP	8		
C7	CONTRAST C TEMP	5		

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

Mode	Service Adjustment	Def. Val.	Original Value	New Value
Pin Cushion Adjustments				
D0	H POSITION	16		
D1	V SIZE	31		
D2	V S CORRECTION	4		
D3	V LIN CORRECTION	14		
D4	E/W TRAPEZIUM	8		
D5	V AGC	1		
D6	V POSITION	1		
D7	V CENTERING	63		
D8	V CENTERING DAC SW	0		
D9	V-BLK START PHASE	12		
DA	V-BLK STOP PHASE	14		
MTS Adjustments				
M0	INPUT LEVEL	33		
M1	LOW-LEVEL SEPARATION	6		
M2	HIGH-LEVEL SEPARATION	25		
PIP Adjustments				
P0	PIP COLOR	92		
P1	PIP TINT	54		
P2	PIP BRIGHTNESS	22		
P3	PIP CONTRAST	80		
P4	UP 1/9	26		
P5	DOWN 1/9	143		
P6	LEFT 1/9	10		
P7	RIGHT 1/9	101		
P8	UP 1/16	26		
P9	DOWN 1/16	160		
PA	LEFT 1/16	10		
PB	RIGHT 1/16	116		
PC	PIP FREERUN	N/A		
PD	PIP YDL	4		

SERVICEMAN MODE (ELECTRONIC CONTROL) SERVICE ADJUSTMENT VALUES

Model _____ Ser # _____ Date _____

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

Mode	Service Adjustment	Def. Val.	Original Value	New Value
Options Adjustments				
S0	ABL GAIN	3		
S1	ABL POINT	3		
S2	RGB BRIGHTNESS	8		
S3	RGB GAMMA	1		
S4	COLOR GAMMA	1		
S5	VSM-G	0		
S6	BS POINT	7		
S7	CLOCK ADJUST	128		
S8	LOUD COMP	31		
S9	CAPTION DIG FILTER SW	0		
SA	CAPTION SCROLL	1		
SB	RGB MATRIX	6		
SC	RGB MATRIX COMP	5		

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

Mode	Service Adjustment	Def. Val.	Original Value	New Value
Comb Filter Adjustments				
X0	CLIP LEVEL	152		
X1	CSOK	12		
X2	COMB LIMIT	24		
X3	COMB CORE	41		
X4	COMB RF DELAY	20		
X5	COMB VIDEO DELAY	18		
X6	COMB VMLM	90		
X7	COMB VMCO	24		
X8	COMB SHARP	123		
X9	COMB VM LEVEL	255		
XA	COMB VMPKF	1		
XB	H LOCK MODE	1		
XC	H LOCK	70		
XD	H SEP1	313		
XE	H SEP2	266		
XF	SUB H LOCK MODE	0		
X10	SUB H LOCK	70		
X11	SUB H SEP1	313		
X12	SUB H SEP2	266		