1986 CTC130

Color Television Basic Service Data

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Add prefix **64** to **Module** stock numbers.
Add prefix **70** to **Tuner** stock numbers.
Add prefix **62** to **all other** stock numbers.

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SAFETY NOTICE

USE ISOLATION TRANSFORMER WHEN SERVICING

Components having special safety characteristics are identified by shading or stars on schematics and by ★ stars on the parts list in this Service Data and its supplements and bulletins. Before servicing this chassis, it is important that the service technician read and follow the "Safety Precautions" and "Product Safety Notices" in this Service Data.

★ For continued x-radiation protection, replace picture tube with original type or RCA-approved equivalent type. If field replacement of picture tube is required, an ADJUSTABLE TYPE BEAM BENDER must be ordered and installed on the neck of the replacement picture tube. Consult parts list for correct stock number.

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SAFETY PRECAUTIONS

1. **Before returning an instrument to the customer,** always make a safety check of the entire instrument, including, but not limited to, the following items:

   a. Be sure that no built-in protective devices are defective and/or have been defeated during servicing. (1) Protective shields are provided on this chassis to protect both the technician and the customer. Correctly replace all missing protective shields, including any removed for servicing convenience. (2) When reinstalling the chassis and/or other assembly in the cabinet, be sure to put back in place all protective devices, including, but not limited to, nonmetallic control knobs, insulating fishpapers, adjustment and compartment covers/shields, and isolation resistor/capacitor networks. **Do not operate this instrument or permit it to be operated without all protective devices correctly installed and functioning. Servicers who defeat safety features or fail to perform safety checks may be liable for any resulting damage.**

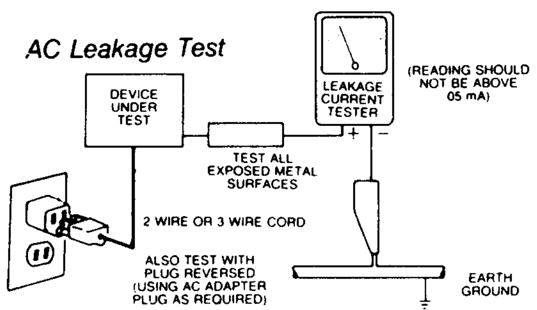
   b. Be sure that there are no cabinet openings through which an adult or child might be able to insert their fingers and contact a hazardous voltage. Such openings include, but are not limited to, (1) spacing between the picture tube and the cabinet mask, (2) excessively wide cabinet ventilation slots, and (3) an improperly fitted and/or incorrectly secured cabinet back cover.

   c. **Antenna Cold Check** — With the instrument AC plug removed from any AC source, connect an electrical jumper across the two AC plug prongs. Place the instrument AC switch in the on position. Connect one lead of an ohmmeter to the AC plug prongs tied together and touch the other ohmmeter lead in turn to each tuner antenna input exposed terminal screw and, if applicable, to the coaxial connector. If the measured resistance is less than 1.0 megohm or greater than 5.2 megohm, an abnormality exists that must be corrected before the instrument is returned to the customer. Repeat this test with the instrument AC switch in the off position.

   d. **Leakage Current Hot Check 2 Wire or 3rd Wire Ground Cord Sets** — With the instrument completely re-assembled, plug the AC line cord into a 3 prong polarized to 2 prong plug adaptor. Plug the 2 prong adaptor directly into a 120 volt AC outlet. (Do NOT ground the 3rd wire of the adaptor plug and do NOT use an isolation transformer during this test.) Use a leakage current tester or a metering system that complies with American National Standards Institute (ANSI) *C101.0 Leakage Current for Appliances* and Underwriters Laboratories (UL) *1410 (50.7)*. With the instrument AC switch first in the on position and then in the off position, measure from a known earth ground (metal waterpipe, conduit, etc.) to all exposed metal parts of the instrument (antennas, handle bracket, metal cabinet, screwheads, metallic overlays, control shafts, etc.), especially any exposed metal parts that offer an electrical return path to the chassis. Any current measured must not exceed 0.5 milliamp. Reverse the adaptor plug in the AC outlet and repeat the test.

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

   AC Leakage Test

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

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

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

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

5. **Hot Chassis Warning** — **a.** Some TV receiver chassis are electrically connected directly to one conductor of the AC power cord and may be safely serviced without an isolation transformer only if the AC power plug is inserted so that the chassis is connected to the *ground* side of the AC power source. To confirm that the AC power plug is inserted correctly, with an AC voltmeter measure between the chassis and a known earth ground. If a voltage reading in excess of 1.0V is obtained, remove and reinsert the AC power plug in the opposite polarity and again measure the voltage potential between the chassis and a known earth ground. **b.** Some TV receiver chassis normally have 85V AC (RMS) between chassis and earth ground regardless of the AC plug polarity. These chassis can be safely serviced only with an isolation transformer inserted in the power line between the receiver and the AC power source, for both personnel and test equipment protection. **c.** Some TV receiver chassis have a secondary ground system in addition to the main chassis ground. This secondary ground system is *not isolated* from the AC power line. The two ground systems are electrically separated by insulating material that must not be defeated or altered.

6. Observe original lead dress. Take extra care to assure correct lead dress in the following areas: a. near sharp edges, b. near thermally hot parts — be sure that leads and components do not touch thermally hot parts, c. the AC supply, d. high voltage, and e. antenna wiring. Always inspect in all areas for pinched, out-of-place, or frayed wiring. Do not change spacing between components, and between components and the printed-circuit board. Check AC power cord for damage.

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

8. **PRODUCT SAFETY NOTICE** — Many TV electrical and mechanical parts have special safety-related characteristics some of which are often not evident from visual inspection, nor can the protection they give necessarily be obtained by replacing them with components rated for higher voltage, wattage, etc. Parts that have special safety characteristics are identified in RCA service data by a star (★) or *shading* on schematics and by a (★) in the parts list. Use of a substitute replacement that does not have the same safety characteristics as the recommended replacement part in RCA service data parts list might create shock, fire, and/or other hazards. Product Safety is under review continuously and new instructions are issued whenever appropriate. For the latest information, always consult the appropriate current RCA service literature. A subscription to, or additional copies of, RCA service literature may be obtained at a nominal charge from your RCA Consumer Electronics Distributor or from RCA Technical Publications, P.O. Box 1976, Indianapolis, IN 46206, or Canadian residents may order from RCA Inc., Technical Publications, 5575 Royalmount Ave., Town of Mount-Royal, Quebec H4P 1J8 Canada.

MODEL-TO-MAJOR ASSEMBLY CROSS REFERENCE

● INDICATES ASSEMBLY USED

	CHASSIS—CTC130C	TRANSMITT—CRK40A	MCY005A	MSD002A	MTT001A	PW SB	PW SOUND	PW SPA2	PW VIPUR	PW VI2	PIX TUBE A66ABU10X	PIX TUBE A51ABU10X															
FMR 570ER, TR	●	●	●	●	●	●	●	●	●	●		●															FMR 570ER, TR
FMR 722ER, TR	●	●	●	●	●	●	●	●	●	●	●																FMR 722ER, TR

SERVICING PRECAUTIONS

CAUTION: Before servicing instruments covered by this service data and its supplements and addendums, read and follow the *SAFETY PRECAUTIONS* in this publication. *NOTE:* If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions on Safety Precautions page in this publication, always follow the safety precautions. *Remember: Safety First.*

General Servicing Precautions

1. Always unplug the instrument AC power cord from the AC power source before:
   a. Removing or reinstalling any component, circuit board, module, or any other instrument assembly.
   b. Disconnecting or reconnecting any instrument electrical plug or other electrical connection.
   c. Connecting a test substitute in parallel with an electrolytic capacitor in the instrument.

      Caution: A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.
   d. Discharging the picture tube anode.
2. Test high voltage only by measuring it with an appropriate high voltage meter or other voltage measuring device (DVM, FETVOM, etc.) equipped with a suitable high voltage probe. *Do not test high voltage by "drawing an arc".*
3. Discharge the picture tube anode only by (a) first connecting one end of an insulated clip lead to the degaussing or kine aquadag grounding system shield at the point where the picture tube socket ground lead is connected, and then (b) touch the other end of the insulated clip lead to the picture tube anode button, using an insulating handle to avoid personal contact with high voltage.
4. Do *not* spray chemical on or near this instrument or any of its assemblies.
5. Unless specified otherwise in this service data, clean electrical contacts by applying the following mixture to the contacts with a pipe cleaner, cotton-tipped stick or comparable nonabrasive applicator: 10% (by volume) Acetone and 90% (by volume) isopropyl alcohol (90% - 99% strength). **Caution:** *This is a flammable mixture.*

   Unless specified otherwise in this service data, lubrication of contacts is not required.
6. Do *not* defeat any plug/socket B+ voltage interlocks with which instruments covered by this service data might be equipped.
7. Do *not* apply AC power to this instrument and/or any of its electrical assemblies unless *all* solid-state device heat sinks are correctly installed.
8. Always connect the test instrument ground lead to the appropriate instrument chassis ground *before* connecting the test instrument positive lead. Always remove the test instrument ground lead *last.*
9. Use with this instrument only the test fixtures specified in this service data. **CAUTION:** Do *not* connect the test fixture ground strap to any heatsink in this instrument.

Electrostatically Sensitive (ES) Devices

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

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed for potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a *grounded-tip* soldering iron to solder or unsolder ES devices.
4. Use only an *anti-static* type solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do *not* use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do *not* remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material.)
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed. **CAUTION:** Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

General Soldering Guidelines

1. Use a grounded-tip, low-wattage soldering iron and appropriate tip size and shape that will maintain tip temperature within the range 500°F to 600°F.
2. Use an appropriate gauge of RMA resin-core solder composed of 60 parts tin/40 parts lead.
3. Keep the soldering iron tip clean and well tinned.
4. Thoroughly clean the surfaces to be soldered. Use a small wire-bristle (0.5 inch, or 1.25 cm) brush with a metal handle. Do not use freon-propelled spray-on cleaners.
5. Use the following unsoldering technique:
   a. Allow the soldering iron tip to reach normal temperature (500°F to 600°F).
   b. Heat the component lead until the solder melts.
   c. Quickly draw away the melted solder with an anti-static, suction-type solder removal device or with solder braid.

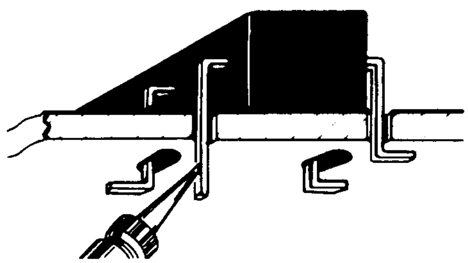
      CAUTION: Work quickly to avoid overheating the circuit board printed foil.
6. Use the following soldering technique:
   a. Allow the soldering iron tip to reach normal temperature (500°F to 600°F).
   b. First, hold the soldering iron tip and solder strand against the component lead until the solder melts.

SERVICING PRECAUTIONS (Continued)

c. Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.

CAUTION: Work quickly to avoid overheating the circuit board printed foil or components.

d. Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.



Use Soldering Iron To Pry Leads

IC Removal/Replacement

Some RCA unitized chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique as outlined in paragraphs 5 and 6 above.

Removal

1. Desolder and straighten each IC lead in one operation by gently prying up on the lead with the soldering iron tip as the solder melts.
2. Draw away the melted solder with an anti-static suction-type solder removal device (or with solder braid) before removing the IC.

Replacement

1. Carefully insert the replacement IC in the circuit board.
2. Carefully bend each IC lead against the circuit foil pad and solder it.
3. Clean the soldered areas with a small wire-bristle brush. (It is not necessary to reapply acrylic coating to the areas.)

"Small-Signal" Discrete Transistor Removal/Replacement

1. Remove the defective transistor by clipping its leads as close as possible to the component body.
2. Bend into a "U" shape the end of each of three leads remaining on the circuit board.
3. Bend into a "U" shape the replacement transistor leads.
4. Connect the replacement transistor leads to the corresponding leads extending from the circuit board and crimp the "U" with long nose pliers to insure metal to metal contact, then solder each connection.

Power Output Transistor Devices Removal/Replacement

1. Heat and remove all solder from around the transistor leads.
2. Remove the heatsink mounting screw (if so equipped).
3. Carefully remove the transistor from the circuit board.
4. Insert new transistor in circuit board.
5. Solder each transistor lead, and clip off excess lead.
6. Replace heatsink.

Diode Removal/Replacement

1. Remove defective diode by clipping its leads as close as possible to diode body.
2. Bend the two remaining leads perpendicularly to the circuit board.
3. Observing diode polarity, wrap each lead out of the new diode around the corresponding lead on the circuit board.
4. Securely crimp each connection and solder it.
5. Inspect (on the circuit board copper side) the solder joints of the two "original" leads. If they are not shiny, reheat them and, if necessary, apply additional solder.

Fuse and Conventional Resistor Removal/Replacement

1. Clip each fuse or resistor lead at top of circuit board hollow stake.
2. Securely crimp leads of replacement component around stake 1/8 inch from top.
3. Solder the connections.

CAUTION: Be sure the insulated jumper wire is dressed so that it does not touch components or sharp edges.

Circuit Board Foil Repair

Excessive heat applied to the copper foil of any printed circuit board will weaken the adhesive that bonds the foil to the circuit board, causing the foil to separate from, or "lift-off", the board. The following guidelines and procedures should be followed whenever this condition is encountered.

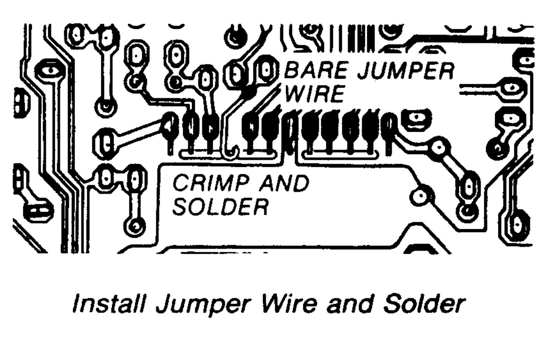
In Critical Copper Pattern Areas

High component/copper pattern density and/or special voltage/current characteristics make the spacing and integrity of copper pattern in some circuit board areas more critical than in others. The circuit foil in these areas is designated as *Critical Copper Pattern* and is identified and illustrated in this service data in the section titled *Safety Related Copper Pattern* (see table of contents for page number). Because Critical Copper Pattern requires special soldering techniques to ensure the maintenance of reliability and safety standards, contact your local RCA Consumer Electronics Distributor Service Manager before attempting repair of Critical Copper Pattern.

At IC Connections

To repair defective copper pattern at IC connections, use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections.)

1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary.)
2. Carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.



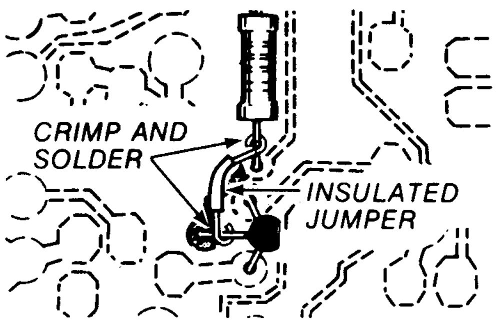
Install Jumper Wire and Solder

SERVICING PRECAUTIONS (Continued)

3. Bend a small "U" in one end of a small-gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
4. Route the jumper wire along the path of the cut-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area, and clip off any excess jumper wire.

At Other Connections

Use the following technique to repair defective copper pattern at connections other than IC Pins. This technique involves the installation of a jumper wire on the component side of the circuit board.



Insulated Jumper Wire

1. Remove the defective copper pattern with a sharp knife. Remove at least 1/4 inch of copper, to ensure that a hazardous condition will not exist if the jumper wire opens.
2. Trace along the copper pattern from both sides of the pattern break and locate the nearest component that is directly connected to the affected copper pattern.
3. Connect insulated 20-gauge jumper wire from the lead of the nearest component on one side of the pattern break to the lead of the nearest component on the other side. Carefully crimp and solder the connections.

   CAUTION: Be sure the insulated jumper wire is dressed so that it does not touch components or sharp edges.

Frequency Synthesis (FS) Tuning Systems

1. Always unplug the instrument AC power cord before disconnecting or reconnecting FS tuning system cables and before removing or reinserting FS tuning system modules.
2. The FS tuner must never be disconnected from the FS tuning control module while power is applied to the instrument.
3. When troubleshooting intermittent problems that might be caused by defective cable connection(s) to the FS tuning system, remove the instrument AC power as soon as the defective connector is found and finish confirming the bad connection with a continuity test. This procedure will reduce the probability of electrical overstress of the FS system semiconductor components. ■

F013.1.2

CIRCUIT PROTECTION

Fuse (or Device)	Circuit Protected	Physical Location
F101 ...... 5.0 Amp	Main Fuse (AC Input)	AC Input Circuit
R120 Fusible Resistor	Power Supply	

Test Fixture Data

The following information is provided for adapting the CTC130 chassis to TeleMatic/RCA Test Fixture 10J106/A/AX/B and Test Fixture Adaptor 10J107.

Vertical/Horizontal Switch

Horizontal Impedance Switch to—1.2mH
Vertical Resistance Switch to—14.0 ohms

Adaptors Required

Deflection Yoke—10J760
Picture Tube Socket—10J667
Degausser—Leave Open
Convergence—Leave Open
Focus Supply—FVS3950

SPECIFICATIONS

Power Input:	120 Volts AC, 60Hz
Power Consumption:	157 Watts @ Max Beam
Antenna Impedance:	300 Ohm Balanced UHF, 300 Ohm Balanced VHF, 75 Ohm Coaxial VHF
Receiving Channels:	All normal VHF/UHF and up to 94 Cable channels
Intermediate Frequency:	Pix I-F 45.75MHz Sound I-F 41.25MHz Color Subcarrier 42.17MHz
Circuit Board Assemblies:	PW Master-Main Chassis PW MTT-Tune System PW RC-Rear Control PW VI2-Video In/Out PW SPA-Stereo Power Amp PW VIPUR-Variable Switching Power Supply PW 5000-Kine Driver/Socket PW PIN-Pin Correction PW SB-Stereo Broadcast Decoder PW EXP-Expander Board PW MSD-On-Screen Display
Speakers:	3"X7" Oval, 8 Ohm (2ea.)

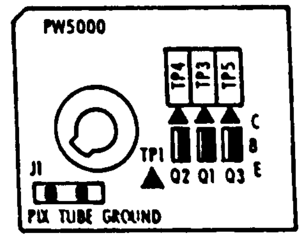
CHASSIS LAYOUT

SERVICE INFORMATION CTC-130A/B/C

REFER TO QUALIFIED SERVICE PERSONNEL AND SERVICE DATA FOR MORE DETAILED INFORMATION

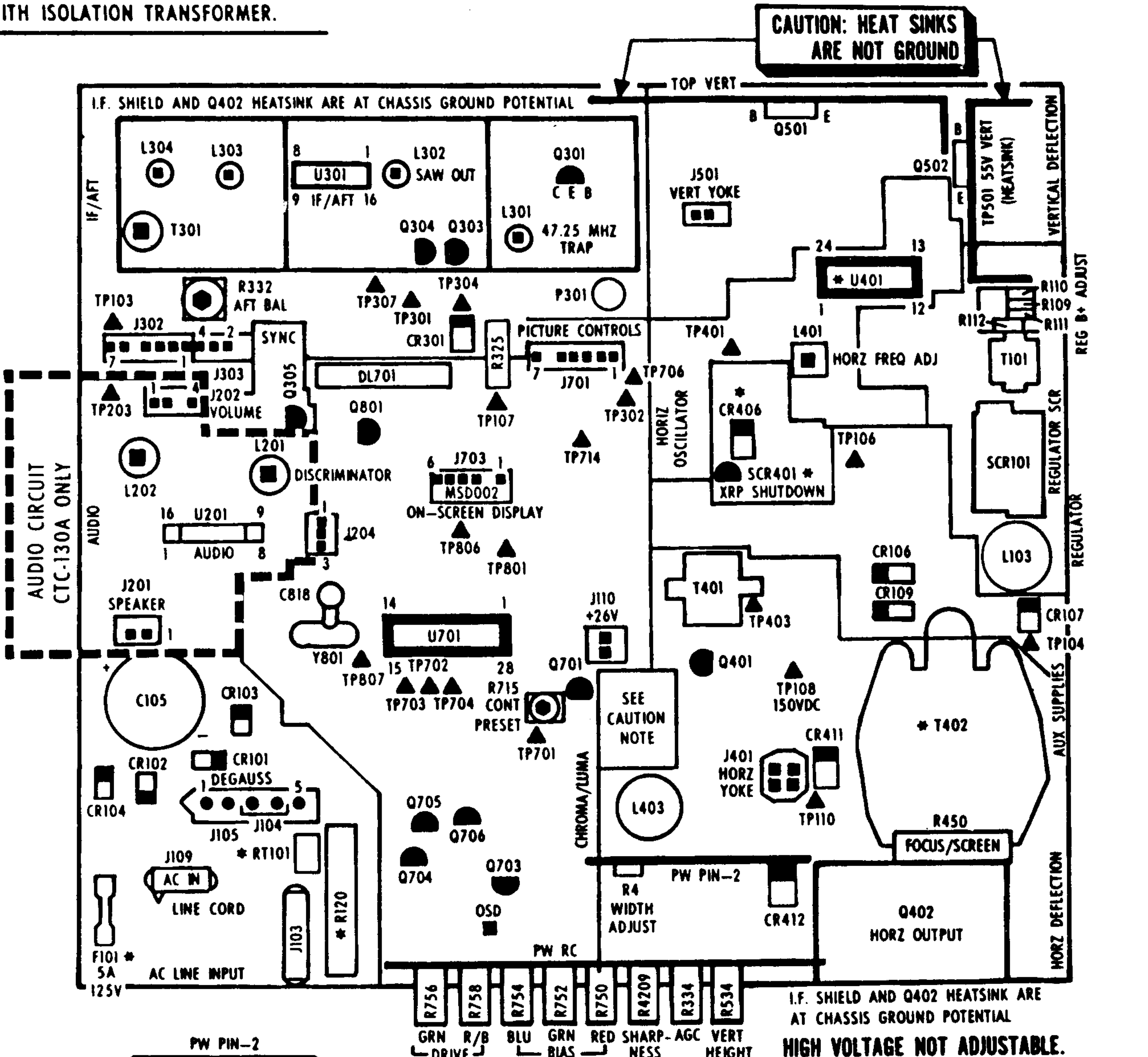
● CENTER CONVERGENCE IS NON-ADJUSTABLE FROM THE FACTORY. WEDGES ARE FOR ADJUSTING EDGE CONVERGENCE. IF FERRITE TAPE BEAM BENDER IS REMOVED. REPLACE IT WITH STOCK NO. 158699 FOR ADJUSTING CENTER CONVERGENCE.

PICTURE TUBE
20" A51ABU10X
25" A63ABP13X (CONSOLES)
25" A63ABP12X (TABLE MODELS)
26" A66ABU10X



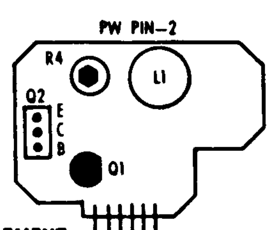
CAUTION:

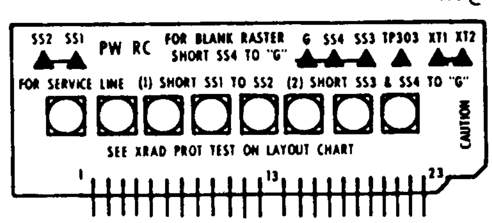
TO AVOID SHOCK ALWAYS SERVICE WITH ISOLATION TRANSFORMER.

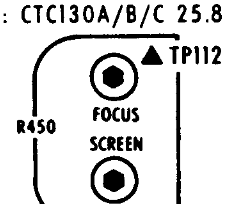


HIGH VOLTAGE NOT ADJUSTABLE.

HV@ I_B=0: CTC130A/B/C 25.8 KV







SAFETY REQUIREMENT

X-RADIATION PROTECTION CIRCUIT TEST

SERVICEMAN—DO THIS TEST WHENEVER HIGH VOLTAGE IS SERVICED. WITH RECEIVER BACKCOVER REMOVED, APPLY NOMINAL 120V AC SUPPLY TO RECEIVER. ADJUST BLACK LEVEL AND PICTURE CONTROLS TO MAX. SHORT X-RAD STAKES TOGETHER. RECEIVER MUST SHUT DOWN. IF THIS DOES NOT OCCUR, THE X-RADIATION PROTECTION CIRCUIT IS NOT OPERATING AND MUST BE MADE OPERATIONAL BEFORE RETURNING RECEIVER TO THE CUSTOMER.

Continued

INSTRUMENT DISASSEMBLY

Cabinet Back Removal

CAUTION: Before removing the cabinet back read "Safety Precautions" section of this Service Data.

1. Disconnect power cord from AC outlet.
2. Disconnect antenna leads from antenna block assembly at rear of cabinet.
3. Remove all 1/4" hex head screws securing cabinet back.
4. To replace cabinet back, reverse above procedure.

Chassis Removal/Service Position

The main chassis circuit board slides into a chassis mounting frame which is secured to the floor of the cabinet (console instruments only) or into chassis guide rails molded into the cabinet (table model instruments only). With cabinet back removed, slide chassis to the rear just far enough to gain access to the interconnecting plug and cable assemblies.

Note: On Console Models, to slide chassis to the rear, remove 4 ea. 1/4 inch hex head, chassis mounting screws located at chassis rear apron.

Most servicing procedures can be performed in this position. For complete chassis removal disconnect the following:

1. Connectors:
   P104-Degaussing
   IF Link cable from Tuner (disconnect at Tuner)
   Audio IF Link cable (disconnect at PW SB) when used
   P401-Horizontal Yoke
   P501-Vertical Yoke
   P103-Standby Power to PW VIPUR when used
   P1VIPUR-"HOT" 150 VDC from Chassis to PW VIPUR when used
   P2VIPUR-"COLD" 150 VDC from PW VIPUR to Chassis when used
   P3VIPUR-On/Off to PW VIPUR when used
   P1VI2-Video In/Out from chassis when used
   P701-From Front Auxiliary Control Panel
   P302-Interconnect from Tuner
   P303-Control from MTT
   High Voltage Anode lead from picture tube.
2. Circuit Boards:
   PW5000-Kine Driver/Pcture Tube socket assembly from the picture tube.
3. The Main Chassis circuit board may now be removed from the cabinet.
4. To replace, reverse procedure.

Deflection Yoke/Beam Bender Assembly Removal

1. Remove Kine Driver/Picture Tube Socket Assembly (PW5000) and Deflection Yoke plugs P401 and P501.
2. Remove tape beam bender from neck of picture tube. For adjustable type, loosen Phillips head screw on beam bender clamp and slide beam bender to the rear and off the neck of the picture tube. For magnetic tape beam bender, simply remove, discard, and replace with adjustable type.

Note: The magnetic "tape" beam bender is NOT adjustable and cannot be reused. Replace with ADJUSTABLE BEAM BENDER. See Replacement Parts List for stock number.

3. Loosen 1/4" hex head screw on yoke clamp. Slide yoke assembly back away from picture tube bell and off neck of picture tube.

Note: Purity and Convergence adjustment procedures must be performed each time beam bender and/or yoke assemblies are removed from picture tube.

4. To reassemble, reverse procedure.

Picture Tube Removal

CAUTION: Read "Safety Precautions", Item 4, before removing or replaceing picture tube.

1. Remove chassis and lay instrument, face down, on rubber pad or soft cloth.
2. Remove beam bender and deflection yoke assemblies.

Note: Magnetic "Tape" Beam Bender cannot be reused, replace with Adjustable type Beam Bender. See Replacement Parts List for Stock Number.

3. Remove four (4) 5/16" hex head screws, one at each corner of picture tube.
4. Using caution, lift picture tube up and out of cabinet.
5. Release wire ties holding the degaussing coil assembly to picture tube. Remove degaussing coil assembly and picture tube grounding strap.
6. To replace, reverse procedure. ■

PURITY

Preliminary Information

Face instrument in north or south position to perform purity adjustments. This assures that any effect of the earth's magnetic field upon beam landing will be negligible when the the instrument is finally placed in any viewing position.

The instrument should be at room temperature (60 degrees or above) for six (6) hours and be operating at low beam current (dark background) for approximately 20 to 30 minutes before performing purity adjustments.

Adjustment Procedure:

Note: Allow sufficient instrument warm up time. To ensure maximum long term stability of Purity, Convergence, and Color Temperature adjustments, the instrument should be operated a minimum of 20 to 30 minutes prior to performing these adjustments.

Purity Adjustment

1. Place the receiver in the position it will be serviced (preferably where it will be used) if possible. DO NOT move the receiver until purity adjustments are completed.
2. Degauss the receiver.

Note. Degaussing (external followed by internal) is critical to achieving good purity.

a. External Degauss—With the receiver off, manually degauss the mask/picture tube faceplate with a strong ring degaussing coil.

b. Internal Degauss—Turning the receiver ON from a cold start (degauss thermistor cool) cycles the internal degaussing.

3. Obtain white raster by shorting stake SS4 to ground or use a signal generator that allows individual selection of red, green or blue fields.
4. Operate the receiver with a green field displayed. Turn red and blue bias controls fully CCW and green bias control fully CW. Again, limited video drive is best (to keep the shadow mask cool).
5. Loosen deflection yoke clamp (loosen the yoke clamp only enough to move the yoke, and still maintain up-down/left-right orientation). Remove the convergence wedges and slide the deflection yoke all the way forward against the picture tube funnel. Tighten yoke clamp to hold but not to full torque. With the yoke forward and green field displayed the green "bar" should be centered on the screen with approximately equal red and blue vertical bands on either side (Fig. B3-1).

Note: This preceding procedure (Step 5) may be performed without replacing the Magnetic Tape Beam Bender. While the tape beam bender is not adjustable, another key purity adjustment—deflection yoke position— is adjustable. A centered green "bar" indicates the purity portion of the beam bender alignment is correct. If the green "bar" is significantly off center, it must be corrected using an Adjustable Beam Bender.

The following three steps (6,7 and 8) are necessary only if an Adjustable Beam Bender is used and the centered green "bar" is significantly off center.

6. Loosen beam bender locking ring (turn in CCW direction as viewed from rear). Loosen only enough to permit movement of rings.
7. The purity tabs are the front most pair of tabs on the adjustable beam bender assembly when viewed from the rear of the picture tube (Fig. B5-1). Starting with the tabs together and pointing straight up (12:00 O'Clock) or straight down (6:00 O'Clock), spread the tabs an equal distance apart from the vertical center-line until the green vertical "bar" is centered horizontally on the screen as shown in Fig. B3-1. DO NOT rotate the pair of purity rings together (in the same direction) either CW or CCW away from the vertical center-line unless the raster requires vertical centering. Rotating the rings together will decrease the effect of the two pole magnets on the desired horizontal movement of the green beam but will introduce vertical offset (centering) to the raster.
8. Tighten adjustable beam bender locking ring (turn in CW direction as viewed from rear) until finger tight.
9. Loosen deflection yoke clamp and slowly move the yoke back until the green field fills the screen. Notice there is a movement range of approximately 1/8 inch where the green field is pure. Set the yoke at the forward edge of this range. Rotate yoke to level the raster. DO NOT allow the front of the yoke to tilt down appreciably while performing this operation or undesired axial movement of the yoke may occur when tightening the yoke clamp. While carefully maintaining the axial position of the yoke tighten the deflection yoke clamp securely (6 in.-lb.). Make certain the clamp draws down flat on the neck of the picture tube and is not twisted on the anchor tape underneath.
10. Examine the blue and red fields for purity. The eye is more sensitive to impurities in the red field, thus, use the red field for the final purity check. It may be necessary to move the yoke slightly further to the rear to achieve purity.

PURITY (Continued)

Note: Impurities in the red and blue fields may also indicate that convergence errors are present and should be checked/corrected before attempting readjustment of purity.

11. Reinstall convergence wedges. Follow the "Dynamic Edge Convergence" procedure outlined in the convergence section of this service data.
12. Perform color temperature adjustment and check for uniform overall white raster. If uniformity has not been obtained, check center convergence or re-converge center of screen and repeat purity adjustment procedure.
13. Disconnect signal generator or remove shorting clip from stake SS4 to ground. ■

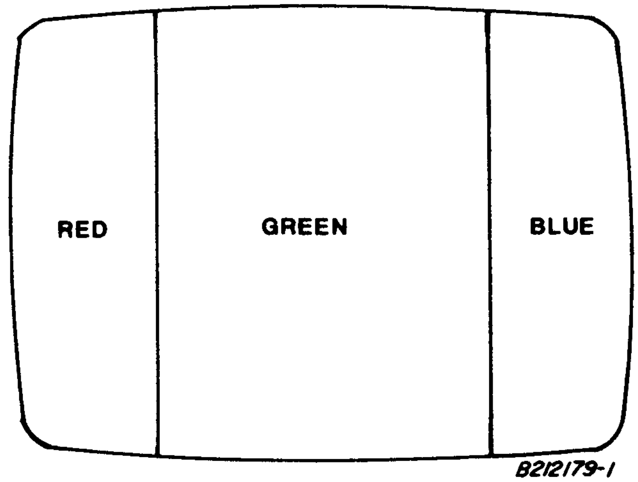


Fig. B3-1 Center Green Raster

COLOR TEMPERATURE

Preliminary Information

The color temperature of this television receiver is set to 6500 degrees Kelvin (warm white) at the factory. This color temperature value produces the truest color reproduction, providing the best possible color picture. It is possible that during the first few minutes of operation the picture may have a slight tinted appearance due to the warm up characteristics of the picture tube guns/kine driver circuits.

Do Not adjust color temperature of this television receiver above 6500 degrees Kelvin (toward a blue white). Adjusting the color temperature to other than 6500 degrees Kelvin will not produce the optimum color picture this instrument is capable of providing.

Adjustment Procedures:

Note: For optimum color temperature adjustments turn channel selector to an active program channel.

1. Obtain service Line (see Service Adjustments).
2. Presets (Fig. B4-1):
   a. Black level (brightness) control to mid range.
   b. Picture (contrast) control to mid range.
   c. Color bias controls (R/G/B) fully CCW.
   d. Color drive (R/B, G) controls fully CW.
   e. Screen control fully CCW.
3. Advance Screen control CW to just produce a thin horizontal line at center screen(either red, green, or blue).
4. Depending on color of line produced in step 3, advance remaining color bias controls (CW) to just produce a white horizontal line.

Note: At completion of the color bias control adjustment one of the bias controls must remain fully CCW.

5. Remove shorting clips installed to obtain service line.
6. Obtain white raster by shorting stake SS4 to ground.
7. Advance Black Level (brightness) and Picture (contrast) controls fully CW.
8. Adjust color drive controls to obtain a 6500 degree Kelvin color temperature (warm white) raster.
9. Remove shorting clip from stake SS4 to ground.
10. Check low light to high light gray scale tracking (black and white picture). Should any color, other than gray or white, be dominant in low light to high light areas the temperature settings have not been properly performed.
11. Repeat procedure if necessary.

Note: The color bias controls affect low light (dark) areas while the color drive controls affect high light (white) areas. ■

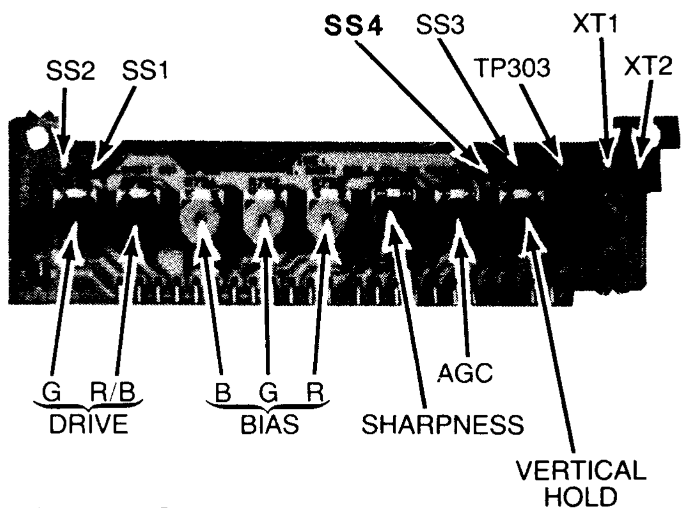


Fig. B4-1 Color Temperature Adjust

CONVERGENCE

Center (Static) Convergence

Preliminary Information

Center (static) convergence is accomplished with two pairs of concentric magnets (4 and 6 poles). The center green color is the stationary reference color line. The adjustable magnets move the red and blue lines in order to converge them with the green line. The rear pair of magnets (closest to the beam bender clamp) are 4 pole magnets designed to move red and blue in both a vertical (up and down) and lateral (horizontal) direction. Spreading the tabs apart causes blue and red to move in opposite directions away from green. Conversely, moving the tabs together causes blue and red to move closer to green. Rotating the pair of tabs together moves blue and red up and down (vertically) with respect to green. The center pair of tabs are 6 pole magnets which move red and blue as a pair in both a vertical (up and down) and lateral (horizontal) direction with respect to green. Spredding the tabs apart causes red and blue to move to the right and up away from green. Conversely, moving the tabs together will cause red and blue to move to the left and down away from green.

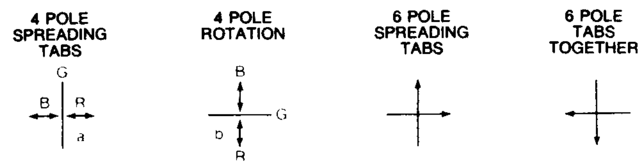
DO NOT rotate the center pair of tabs (6 pole magnets) together either CW or CCW away from vertical center. Rotating the pair of tabs together will only move the green center color line slightly.

Adjustment Procedure:

Note: The magnetic tape beam bender is NON ADJUSTABLE. The following procedures are for the adjustment of the ADJUSTABLE beam bender ONLY. If center convergence adjustment is required and a magnetic tape beam bender is mounted on the neck of the picture tube, it must be replaced with an ADJUSTABLE BEAM BENDER. Consult the Replacement Parts List for the stock number.

1. Connect Color-Bar Generator to VHF Antenna terminals and display a crosshatch pattern.
2. Loosen beam bender assembly locking ring (Fig. B5-1) so that convergence rings can be moved without binding. Do not loosen locking ring any more than necessary.
3. Starting with all tabs at the 12:00 o'clock position, spread and /or rotate the rear (4 pole) set of magnets and spread the center pair (6 pole) of magnets as required to converge the line in the center, prime viewing area.
4. Rotate moveable locking ring CCW to secure the adjustments.

CAUTION: DO NOT over tighten beam bender locking ring.



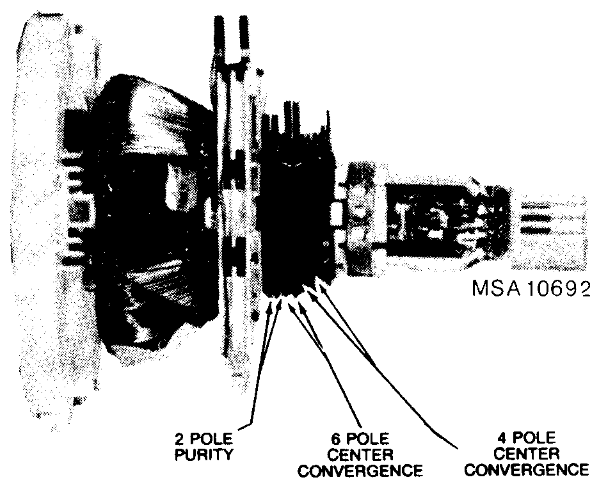


Fig. B5-1 Adjustable Beam Bender

CONVERGENCE (Continued)

Dynamic (Edge) Convergence

Preliminary Information

Edge convergence is accomplished by tilting the front of the deflection yoke up-down ("Y" axis) and left-right ("X" axis). Optimum center crosshatch (prime viewing area) convergence is desired before attempting edge convergence. The center crosshatch convergence procedure requires an ADJUSTABLE TYPE BEAM BENDER.

Adjustment Procedures:

1. Temporarily remove the three (3) wedges from under the front of the deflection yoke assembly (Fig. B6-2).
2. Applying a vertical rocking motion (up-down) to the deflection yoke balance the convergence error of the center red and blue vertical lines, both top and bottom, so that they are separated equally (if any) and do not cross over each other on opposite sides top and bottom (Fig. B6-1).
3. Replace wedge at 12:00 O'Clock position (Fig. B6-2).
4. Applying a horizontal rocking motion (left-right) to the deflection yoke balance the convergence error of the center red and blue horizontal lines, both top and bottom, so that they are separated equally (if any) with either the red or blue lines high or low but not either one high at top or low at bottom (Fig. B6-1).
5. Replace wedges at 4:00 O'Clock and 8:00 O'Clock while maintaining position of yoke.
6. Confirm overall convergence and purity.

Note: Due to the interaction of the purity and convergence adjustments it may be necessary to repeat procedures to obtain optimum results.

7. Place anchor tape over the three wedges.■

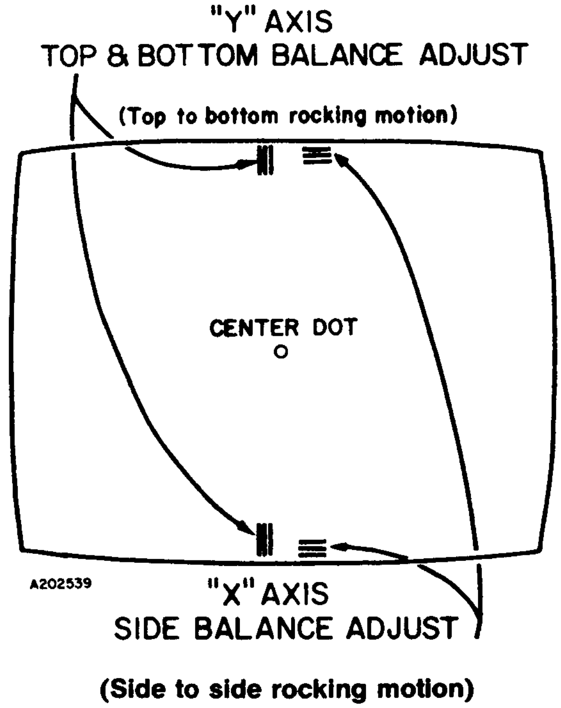


Fig. B6-1 Center Dot and Edge Convergence

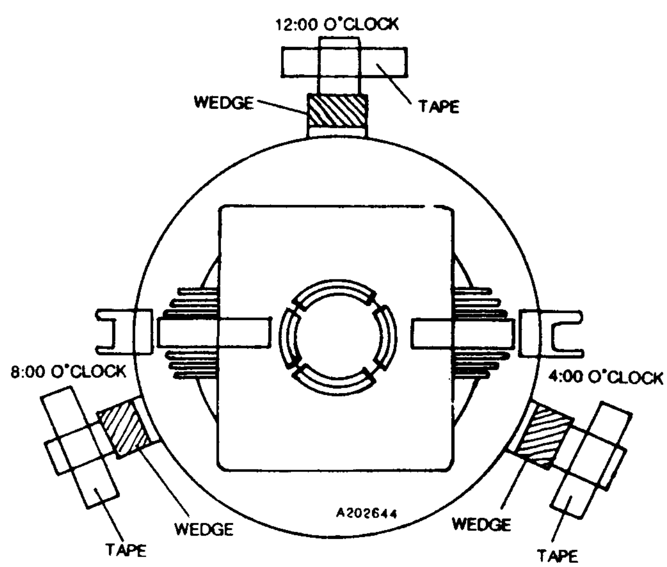


Fig. B6-2 Yoke Wedge Placement

SERVICE ADJUSTMENTS

CAUTION: Read "Safety Precautions" section of this Service Data before performing service adjustments.

AGC Delay

The AGC Delay control (R334) has been preset at the factory for optimum operation over a wide range of RF signal input conditions. Readjustment of this control should not be necessary unless; —Tuner has been replaced,—IF circuit has been repaired,— AGC Delay control (R334) has been misadjusted, or unusual local signal conditions exist.

Adjusting the AGC Delay control to one extreme end of rotation will usually provide a relatively poor signal-to-noise ratio, and at the other extreme end of rotation a degradation of overload capabilities such as; Channel 6 color beat, or in the case of Cable TV- adjacent channel interference. After the AGC Delay (R334) control is adjusted, check all local channels for proper operation.

Vertical Size

At nominal 120 volt AC line voltage, adjust vertical size control (R534), on chassis rear apron, for approximately 1/8" overscan at top and bottom of screen.

Horizontal Pin/Width

Horizontal Width on the CTC 130 chassis is adjustable. At nominal AC line voltage (120 volts AC) adjust the width control (R4 on the PW LIN circuit board) for no more than 1/4 inch overscan right and left sides.

Horizontal Oscillator Adjust (Fig. B7-1)

Note: The CTC 130 series chassis has no customer operated horizontal or vertical hold controls.

1. Short TP401 to ground.
2. Adjust L401 for stable or slowly floating horizontal lines.
3. Remove short from TP401.

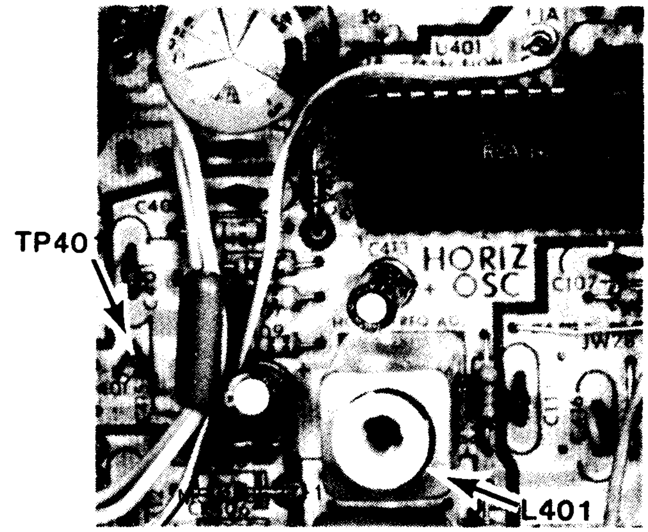


Fig. B7-1 Horizontal Oscillator Adjust

Focus Adjust

1. Preset Brightness Control (R4202) and Contrast Control (R4207) fully CW to insure maximum kine beam current.
2. Adjust Focus Control (part of Focus/Screen Assy—mounted to IHVT) for best overall focus on an inactive UHF channel (UHF snow).
3. Restore brightness and contrast controls to normal viewing level.

High Voltage

CAUTION: High Voltage IS NOT ADJUSTABLE

To measure high voltage, adjust brightness control (R4202), contrast control (R4207), and color control (R4203) fully CCW to insure minimum beam current. Defeat LDR circuit (ColorTrak models only) by removing P702 and shorting J702 pins together on the main chassis circuit board.

Connect the high voltage probe of a VTVM to the picture tube high voltage anode button (use 500 volt scale on VTVM). Measure the high voltage.

CAUTION: High Voltage for the CTC 130 series chassis is 25.8 kV when measured as described and MUST NOT exceed 32.0kV under any circumstances. The meter (VTVM with high voltage probe) used for measuring high voltage must have a resistance of 1000 megohms or more and be accurate within 5% or better.

SERVICE ADJUSTMENTS (Continued)

Service Line (Fig. B8-1)

To obtain a service line (for color temperature adjustments):

1. Short stake SS1 to stake SS2 (make sure neither stake is accidently shorted to ground).
2. Short stakes SS3 and SS4 to ground.

Note: Stakes are part of PW RC (rear control) circuit board.

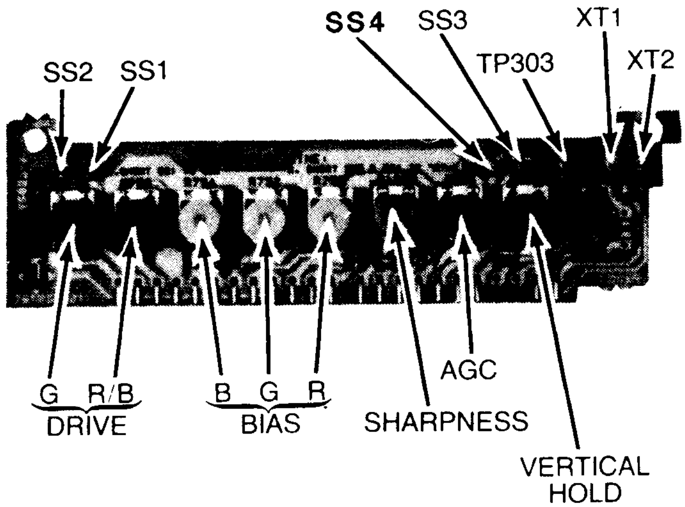


Fig. B8-1 Service Line/White Raster/Test Stake Location

3. When color temperature adjustments are complete remove shorting clips.

White Raster

To obtain a white raster, as required for screen purity and color temperature adjustments, short stake SS4 (located on PW RC circuit board) to ground and rotate color control fully CCW.

X-Radiation Protection Circuit Test

When any service has been performed on the horizontal deflection, high voltage, or B+ regulator system, the X-Radiation circuit must be tested for proper operation as follows:

1. Apply 120 volt AC using a variac transformer for accurate input voltage.
2. Allow for instrument warm-up and adjust all customer controls for normal viewing.
3. Locate stakes labled XT1 and XT2 on the PW RC (rear control) circuit board (Fig. B8-1) and schematic (zone 23-G).
4. Short stake XT1 to stake XT2 with a short clip lead momentarily. The instrument should shut down immediately.

Note: If the instrument does not shut down during this test, service is required in the X-Ray Protect circuit.

Degaussing

This television receiver is equipped with an automatic degaussing circuit. To check it's operation:

1. Turn instrument "off" and allow RT101 on main chassis circuit board to cool off (approximately 5 minutes).
2. Remove P104 (degaussing coil plug).
3. Turn receiver on. While observing the screen, plug in the degaussing coil (P104) and watch the momentary action as degaussing takes place.

Sharpness (Peaking) Control

Clockwise (CW) rotation of the Sharpness Control (R4209 on the chassis rear apron) increases picture sharpness while a softer picture is obtained by turning the control counterclockwise (CCW). This control should be adjusted, by the user, to optimize the quality of the picture.

Contrast Preset

This control is a factory preset and, under normal conditions, should require no further adjustment. However, if adjustment is deemed necessary see "Contrast Preset Adjustment" under Chassis Alignment procedures. ■

GENERAL INFORMATION

General Information

The CTC 130 series chassis uses a single (main chassis) planer circuit board design. The majority of the signal processing is accomplished on this single circuit board. The CTC 130, however, uses various other circuit board assemblies to provide the High End features found in this chassis series. For example; The PW VI2 (video/audio in-out) circuit board assembly is used in Monitor versions of this chassis series to provide the video and audio input / output functions.

The PW SB (stereo broadcast) and the PW EXP (expander) circuit boards are used to receive and decode the stereo broadcast signal.

The PW VIPUR (variable frequency switching power supply) is used to provide "Hot" to "Cold" ground isolation required in consumer TV Monitor applications.

The PW SPA (stereo power amp) provides stereo audio output of 5 Watts per channel.

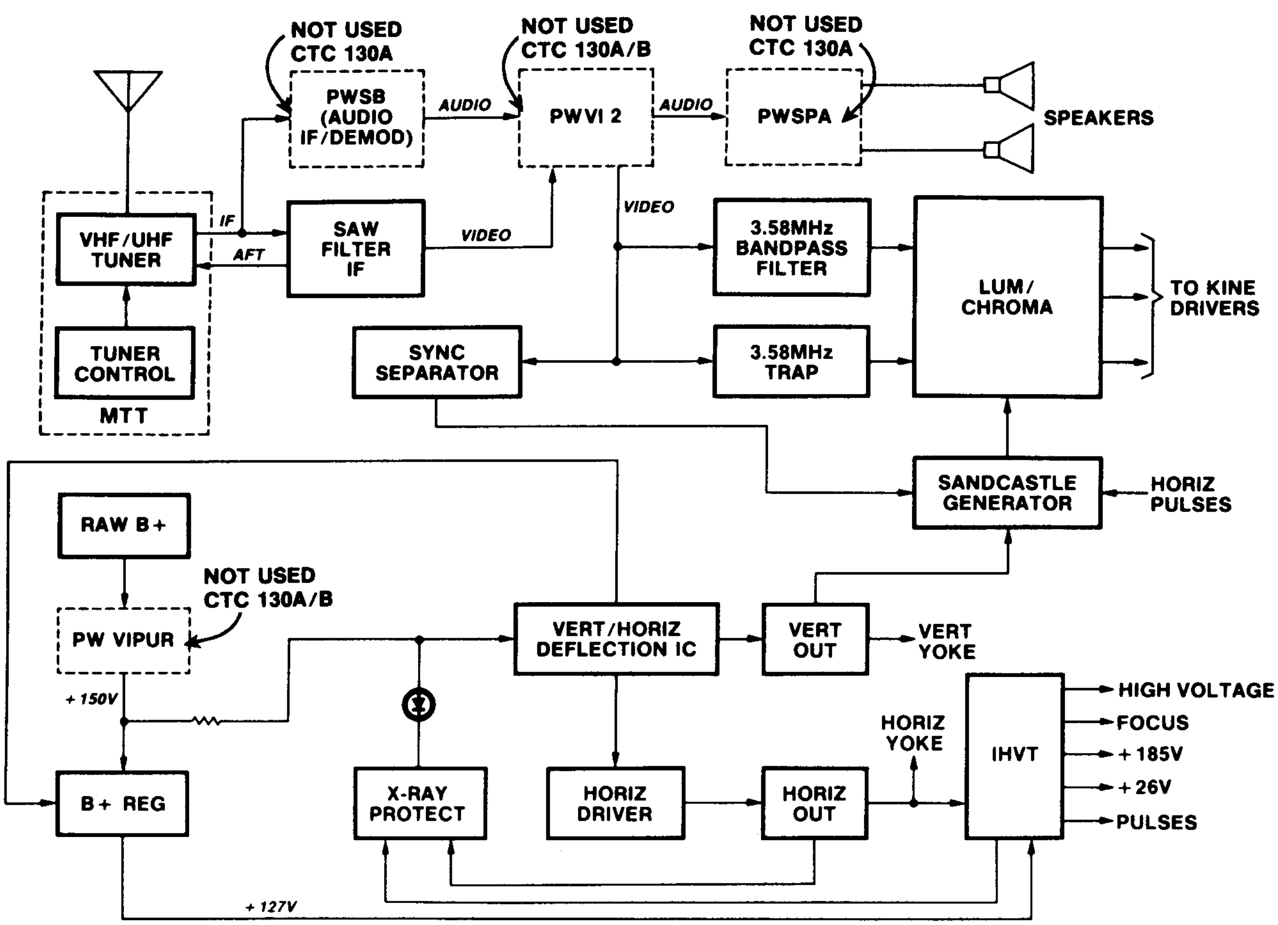
The CTC 130 series represents an evolution of the CTC 120 series chassis. The majority of changes to the main chassis are in component value and location. The functional block diagram is very similar to that of the CTC 120 series chassis. Some of the major changes include a separate sound IF for Stereo Broadcast reception and the addition of a varible frequency switching power supply to provide a "Cold" ground chassis configuration for consumer TV Monitor applications.

Circuit-Related Component Numbering

Serviceability of the CTC 130 series chassis is enhanced by logical physical arrangement of circuits on the main chassis circuit board. The board is segmented by circuit area, and further enhanced by prominent road mapping on the circuit board. In addition, the component numbering system relates to general circuit areas:

100 series-AC Input, Voltage regulator
200 series-Sound Processing
300 series-IF /AFT, AGC, and Sync Processing
400 series-Horizontal deflection, X-ray detection, pincushion processing
500 series-Vertical deflection
700 series-Luminance processing
800 series-Chroma processing
4200 series-Auxiliary controls
5000 series-Kine Drive circuits

FUNCTIONAL BLOCK DIAGRAM

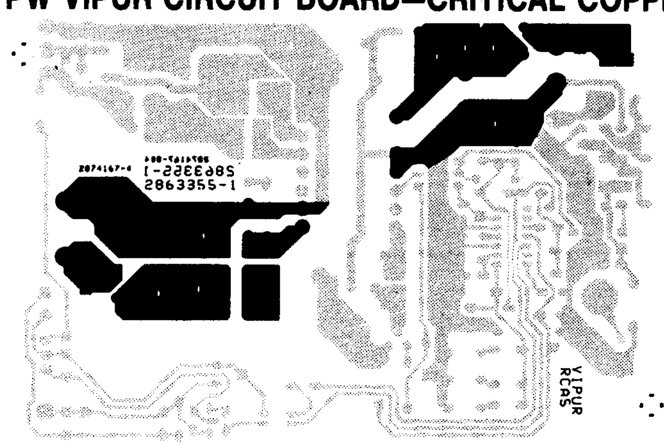


SAFETY RELATED COPPER PATTERN

Modern circuit design/manufacturing techniques dictate a rather high component density on the printed circuit board utilized in this chassis. It naturally follows that the area available for "printing" copper patterns is also restricted. To maintain high reliability and safety standards, the printed circuit boards are manufactured under carefully controlled conditions and to extremely close tolerances. Some areas of the board are more critical than others due to spacing, pattern size, voltage/current requirements, etc. RCA has concluded, as a result of extensive studies, that less-than-optimum repair of copper patterns in these specific areas can degrade the reliability/safety of the instrument. The critical copper patterns are shown as "dark black" in the illustrations (Figs. C2-1 and C2-2). In the event printed circuit damage is evident in these designated areas (copper pattern broken, lifted, etc..) special soldering techniques are necessary to maintain reliability and safety standards. Contact your local RCA Consumer Electronics Distributor Service Manager before attempting copper pattern repairs in the designated areas on the circuit board layout.

FIG. C2-1 MAIN CHASSIS CIRCUIT BOARD—CRITICAL COPPER PATTERN

FIG. C2-2 PW VIPUR CIRCUIT BOARD—CRITICAL COPPER PATTERN



Circuit Overview

AC Input and Initial Operation

The CTC 130C series chassis is a "Cold" chassis configuration due to the use of a separate "Hot" to "Cold" ground barrier regulated power supply circuit board assembly termed the PW VIPUR. The purpose and circuit overview of this unit will be discussed later.

CAUTION: The CTC 130A/B series chassis is a "HOT" chassis. Read "Safety Precautions" paragraph 5 before servicing this chassis.

AC power is applied through a line fuse, F101, and the instrument "on/off" switch to a full-wave bridge rectifier circuit (CR101 through CR104), the output of which is filtered by capacitor C105 developing a raw B+ of approximately 150 volts D.C. used to power the chassis.

At this point, in the CTC 130C configuration version of this chassis series, the Raw B+ (+150 volts DC) is routed from the main chassis to the PW VIPUR circuit board. The CTC 130C chassis version is dedicated solely for use in TV Monitor instruments. Thus the reason for the PW VIPUR circuit board. Further discussion of this subject will be found in the PW VIPUR circuit discussion.

In the CTC 130A/B chassis versions the raw B+ of 150 volts DC is applied to SCR101 in the B+ regulator circuit. The SCR regulator circuit provides a regulated B+ (+127 volts) to the horizontal deflection circuit. Regulated B+ is also supplied to the horizontal driver transistor through resistor R402 and diode CR410 to supply initial B+ and reduce squegging at turn-on until the scan derived horizontal drive B+ supply line begins operation and becomes the primary power supply source for the horizontal driver transformer. At the same time raw B+ is also applied to capacitor C115 via resistors R115 and R116. Capacitor C115 (initially uncharged) charges to a level determined by the raw B+, the value of resistors R115,R116 and capacitor C115. When the horizontal oscillator starts (U401 pin 4) and integrated circuit (IC) U401 begins to draw current, C115 tends to "dump", "recharge", and "dump" (again and again) until the horizontal deflection system becomes operational.

Pulses output from pin 16, U401 are applied to the base of horizontal driver transistor Q401, through the driver transformer (T401) to the base of the horizontal output transistor (Q402) and used to drive the integrated high voltage transformer (IHVT), T402.

A regulator trigger pulse developed at pin 7, U401 is applied via the regulator transformer (T101) to the gate of the regulator SCR (SCR 101). The output of the regulator SCR (cathode) is applied to the B+ regulator circuit which develops the regulated 127 volt B+ used, primarily, to power the horizontal output stage.

IF Operation

The CTC 130 chassis uses a semiconductor device called a Surface Acoustical Wave (SAW) filter and a IF processor integrated circuit (IC). These devices eliminate the IF interstage tuned circuits. The SAW filter device generates the proper IF responses without interstage transformers used in conventional IF circuits. The SAW filter made it possible to consolidate the rest of the IF operation in one integrated circuit (IC). The single IF IC contains three stages of IF amplification, plus synchronous video detection, AFT, and AGC circuits.

The SAW filter is made up of a piezoelectric material onto which are plated two pairs of transducer electrodes— one is the input transducer, and the other is the output transducer. The frequency response of the SAW filter is similar to that of a conventional discrete IF system.

Since the IF response is determined during SAW filter manufacture, field alignment of the IF response is no longer necessary nor possible. The SAW filter characteristics cannot be changed after manufacture.

The IF signal from the tuner is amplified by Q301. A 47.25 MHz trap in the base circuit of Q301 eliminates the adjacent channel sound carrier. The extra amplification is required to make up for the SAW filter insertion loss. The output of the SAW filter is an IF signal that has the proper frequency response. It is applied differentially to the IF IC. The signal passes through three stages of IF amplification in the IC. The IF signal then is applied to a synchronous video detector. Synchronous detection is used to provide the lowest possible distortion in the video output signal. After being detected, the video signal is amplified and passed through a noise inverter, and exits the IC as the composite video output signal.

Note: In the CTC 130A chassis version only, the composite video output of pin 12 is coupled via T301 (a 4.5 MHz trap) to TP 203 and used to supply sound carrier information to the sound circuit.

IF AGC is developed internally in the IF processor IC. It is used to vary the gain of the first, second, and third IF stages. The IF AGC is also compared against the setting of the RF AGC control to develop RF AGC voltage.

Another feature of this IF circuit is that the AGC voltage is no longer keyed by a horizontal pulse. This makes the horizontal oscillator pull-in more effective because phaseing problems between the horizontal keying pulse and the transmitted horizontal sync are eliminated. The noise limiting circuit also eliminates the need for more conventional AGC circuits.

The IF processor IC is powered from the +12 volt source. The AFT voltage supplied to the tuner is derived from pins 5 and 6 of the IC. Nominal AFT voltage is 6.5 volts (no signal applied).

Sync Separator

The 4.5 volt p-p negative sync composite video signal from the video amplifier stage, Q303 and Q304, is applied to the Sync Separator transistor Q305. Output of the sync separator stage is positive going composite sync. It is used to trigger the Burst/ Clamp Keyer (Q801) and supplies sync to the Deflection IC U401.

Luminance/Chrominance Processing

The CTC 130 chassis series uses a combined luminance/chrominance processing integrated circuit (IC), U701, which provides all the processing for both luminance and chrominance. The combining of the two signal processing systems into one integrated circuit allows color and contrast tracking to be built into the integrated circuit.

The chroma input signal is applied to pin 3 of the IC. The 3.58-MHz local oscillator is controlled by pins 11, 12, and 13 of the IC. Pin 14 is the variable DC input point for Tint control. Pins 18 and 19 are the inputs for the phase-shifted 3.58-MHz oscillator which is used for I and Q demodulation of the chrominance information.

CIRCUIT OVERVIEW (Continued)

Luminance information is applied to the IC at pin 27. The signal is then amplified and applied to the luminance/chrominance matrix amplifiers in the IC. The contrast (or picture level) is controlled via a variable DC voltage which is applied to pin 26 of the IC. The output of the picture control amplifier IC is applied to the luminance amplifier providing color and contrast tracking. The picture control amplifier is also controlled by the beam limiting circuit to provide contrast tracking with beam limiting. The beam limiter circuit is controlled by the High Voltage Resupply line to the IHVT and the customer brightness (black level) control. Brightness is set by comparing the setting of the customer brightness control (pin 24) to the level of the blue blanking output signal. During horizontal retrace, the brightness DC voltage and the level of the blue output blanking signal are compared, and a resultant voltage is developed which controls the brightness of the luminance amplifier. This maintains consistent brightness ratios dependent upon incoming blanking levels. Brightness limiter operation is accomplished by sampling the DC beam current to the high voltage windings of the IHVT through a resistor which is connected to pin 28 of IC U701. With a normal brightness picture, the voltage at pin 28 of the IC is approximately 12 volts. As the beam current increases, the voltage at pin 28 drops. When the voltage drops below 12 volts, the beam limiter circuit conducts, reducing the beam current by acting upon the luminance amplifier in the IC.

The luminance and chrominance signals are matrixed together in the matrixing amplifier. Output from the matrix amplifier is the three (green, red, and blue) color video signals which are coupled through blanker/buffer stages to the output of the IC at pins 20, 21, and 22 respectively. Horizontal and vertical blanking are accomplished in the blanker/buffer stages prior to exiting the IC.

The signals governing horizontal and vertical blanking, burst keying , and black level clamping are applied to the IC via pin 7. The input waveform consists of a matrixed combination of horizontal and vertical blanking and burst keying pulses. This input signal is called a "Sandcastle" signal (referring to the unique shape of the waveform). The IC has an internal decoder network which decodes the three signals and applies them to the proper circuits inside the IC.

Sandcastle Signal Generation

The Sandcastle Waveform must be present at pin 7 of IC U701. If the complete Sandcastle Waveform is not present there will be no output from the IC.

The Sandcastle Waveform is developed by combining the Horizontal blanking, Vertical blanking, and Burst Keying Pulses prior to application to the Luminance/Chrominance processing IC.

The Burst/Clamp Keying pulse from Q801 is coupled, via CR705 and R710, to the anodes of CR 706 and CR707. The Horizontal Blanking pulse, from pin 10 of T402, is coupled via R705 and CR707. The Vertical Blanking pulse, from pin 23 of U401, is coupled via R704 to the cathode of CR706.

During the horizontal and vertical blanking period these three separate pulses are combined at the cathode of CR706 to form the Sandcastle Waveform. The sandcastle waveform is then coupled, via R744, to pin 7 of the Luma/Chroma IC, U 701.The normal sandcastle waveform can be viewed at TP 806.

Kine Drive Circuit

Green, Red, and Blue video signals from U701 pins 20, 21, and 22 respectively are applied to the base of bias transistors Q704, Q705, and Q706. The DC voltage applied to the collectors of the bias transistors is controlled by the setting of the individual bias controls. The outputs of the bias transistors are direct coupled to the emitters of the Kine Drive Transistors Q5001, Q5002, and Q5003.

Collector voltage for the Kine Driver transistors is +185 volts supplied from the IHVT secondary. Base bias for the kine drivers is fixed at +10.7 volts. The control grid of the picture tube is fixed at a low positive potential. Focus and Screen voltages for the picture tube are supplied from the IHVT via a combined focus/screen assembly mounted on the rear of the IHVT, T402. For improved focus/screen tracking from low to high beam, the current through the focus/screen Control Pac is returned to the high voltage resupply point.

Sound Processing

Sound take-off in the CTC 130A series chassis is accomplished by center tapping the 4.5 MHz trap, T301. When the 4.5 MHz trap is adjusted for minimum 4.5 MHz signal in the video information the sound portion of the signal is maximized and is present at TP 203. From this point on the sound information is processed in much the same manner as in previous unitized chassis.

After being processed by bandpass coil L202, the sound information is applied to IC U201 (Sound Processor) at pins 14 and 15, . R4201 provides a variable DC voltage, via pins 12 and 16, to gain controlled stages in the preamplifier portion of the IC permitting control of the audio level. The gain controlled audio signal is then coupled via C206, at pins 9 and 7, to the output portion of the IC. The sound output, pin 2 of the IC, is then capacitively coupled via C201 to a 32 ohm impedance speaker load.

Note: The CTC 130B/C versions of this chassis series are equipped for stereo broadcast reception. Therefore, the normal monaural audio components will not be operational/present on the main chassis circuit board.

IHVT Derived B+ and Pulse Distribution

Most of the operational B+ supplies and horizontal keying pulses are derived from the secondary windings of the Integrated High Voltage Transformer (IHVT),T402..The primary winding of the IHVT is switched by the horizontal output transistor (Q402). B+ for the primary winding is supplied by the regulated (+127 volt) B+ circuit. The energy developed across the primary winding of the IHVT, as a result of the switching of the horizontal output transistor, is induced into the secondary windings and used to develop the derived operational supply voltages and horizontal keying pulses. Among these are: High Voltage,Focus Voltage, Screen Voltage, and Filament Voltage for the picture tube.The DC return path for the High Voltage supply is through the Beam Limiter circuit inside the Luma/Chroma IC (U701, pin 28).

A negative going volt p-p pulse at pin 7 of the IHVT is "trace" rectified by CR109 and filtered by C121. This provides the distributed +16 volt supply used by various circuits throughout the instrument. The +16 volt supply is applied to dropping resistor R325 and zener diode CR301

CIRCUIT OVERVIEW (Continued)

to develop the +12 volt supply and then to dropping resistor R745 to develop the +11.2 volt supplies which are used extensively throughout the IF and Luma/Chroma processing circuits.

A negative-going 200V p-p pulse at pin 1 of the IHVT is "trace" rectified by CR106 and filtered by C120. This provides the main distributed B+ source of +26V. Positive going horizontal pulses developed at pin 10 of the IHVT (used primarily for picture tube filament supply) are sampled by the X-Ray protection circuit. If the pulses exceed a predetermined level the X-Ray protect circuit is activated, this in turn defeats the horizontal oscillator circuit at U401 pin 4, and the instrument goes into the shut-down mode.

A positive going 200V p-p horizontal pulse developed at pin 2 of the IHVT is "trace" rectified by CR107 and used to power the horizontal driver circuit. The output of CR107 is then applied to R114 and filtered by C105 to provide a +185 volt source. This voltage is used to power the Kine driver stages. In some models, employing this chassis, this voltage (+185 volts DC) source also supplies B+ to the tuner.

Horizontal Synchronization and Vertical Countdown

An integrated circuit (IC), U401, performs the dual operation of horizontal synchronization (oscillator) and vertical countdown. This combined IC, along with other functions, provides horizontal drive for the horizontal output stage and vertical drive for the vertical output stage. The IC (U401) is powered from the +26V source via R116 connected to pin 5. Internal to the IC, pin 5 is connected to a +10V shunt regulator. A vertical blanking pulse is output at pin 23 and the regulator B+ trigger pulse is output at pin 7.

Horizontal Dual-Phase Control Loop

The horizontal synchronization system uses a dual phase-lock-loop (PLL) design with an oscillator operating at exactly 16 times the horizontal rate. The frequency of the oscillator is determined by the oscillator tank circuit (L401, C406, and R411) connected between pins 4 and 5 of the IC (U401).

The PLL circuit is used to control the horizontal oscillator and maintain it in proper frequency and phase with the incoming horizontal sync signal. To compensate for load-dependent variations in the delay of the horizontal deflection stage, a second PLL is used. The second PLL includes a phase detector, one input of which is coupled from the first PLL via a 4 uS delay, and a second input (pin 6 of the IC) which is coupled from pin 10 of the IHVT (XRP pulse). A loop filter, with a relatively fast time constant, is coupled to the output of the second phase detector (pin 13) for filtering the control currents to form a control signal which maintains proper phase relationship between video and the horizontal yoke current.

The SCR regulator control circuit consists of an internal 6-volt zener which senses the high voltage resupply line (pin 11), and a error amplifier controlled by the zener output and the regulated B+ sensor line (pin 10).

The output of the error amplifier controls the SCR driver stage. Output of the SCR driver stage (pin 7) gates SCR 101 for B+ regulation control.

Vertical Countdown System

The vertical countdown portion of IC U401 is a two-mode system. One mode is the countdown operation, the other is a sync operation. The two modes of operation allow the system to be compatible with nonstandard sync signals. The vertical countdown portion of the IC internally switches between the two modes of operation, depending upon the type of signal being received.

The vertical countdown concept is based on a 525 to 1 relationship between horizontal and vertical sync frequencies. The master oscillator, in U401, oscillates at 251 kHz. The oscillator output then is divided by 16 to provide horizontal pulses, and by 525 to provide the proper vertical rate pulses.

To achieve the necessary functions the countdown system uses counters, shift registers, coincidence gates, flip-flops, and other logic circuits.

Horizontal Driver

Horizontal drive pulses are output from the countdown IC, U401, at pin 16.

NOTE: To obtain an output from pin 16 of U401 the master oscillator must be running (if the master oscillator is not running, the X-Ray protect circuit may be activated disabling the oscillator).

The horizontal drive pulse is applied to the horizontal driver transistor Q401.

B+ for the horizontal driver stage is provided by the 185 volt supply source developed in the IHVT (T402) secondary. The initial B+ required to enable the driver stage is approximately 130 volts and is derived from the regulated B+ source via R402 and CR410.

Horizontal Output

Current is drawn from the regulated B+ supply through the IHVT (T402) primary winding and from the horizontal yoke winding to ground through horizontal output transistor Q402 and resistor R418. Q402 turns off as the beam reaches the right edge of the picture tube, starting the beginning of horizontal retrace. After Q402 turns off, current flows from the horizontal yoke and the IHVT primary windings into retrace capacitor C423 where energy from the system is temporarily stored. When retrace capacitor C423 is fully charged, the current flow reverses and begins flowing from C423 back into the primary winding of the IHVT and the horizontal yoke windings. This action deflects the electron beam from the right edge of the picture tube back to the left edge to begin the next line, completing retrace.

After C423 has been discharged, the current flow is then controlled by the damper diode, CR412, which begins drawing current from B+ to ground and storing it in the IHVT primary winding and through the horizontal yoke winding and storing it in yoke return capacitor C425. The turning on of the damper diode starts the beginning of the first half of the horizontal scan period. The first half of horizontal scan continues as the current flow through the damper diode to the yoke and IHVT primary decreases toward zero. When the current flow reaches zero (electron beam in the center of the picture) Q402 begins to conduct. This reverses the current flow and begins drawing current from the IHVT primary winding and from the horizontal yoke winding to ground through R418, completing the second half of scan.

Regulated B+ Control

The B+ regulator provides line and load regulated B+ for the horizontal output circuit (Q402 and T402 primary

CIRCUIT OVERVIEW (Continued)

winding). Since the horizontal output circuit B+ supply is line and load regulated, all supply voltages derived from the IHVT secondary windings will also be line and load regulated.

Gating (on/off control) of the regulator SCR (SCR101) is controlled by countdown IC U401, pin 7, via regulator transformer T101. An error amplifier (internal to IC U401) helps control the gating pulse by comparing the high voltage resupply line (pin 11) from the IHVT to the regulated B+ supply line (pin 10) creating an error voltage which is applied to a comparator circuit (also internal to the IC). The comparator circuit then compares the error voltage to an internal reference which, in turn, controls the SCR driver (gating) pulse output at U401 pin 7.

If the regulated B+ voltage begins to decrease, the voltage applied to U401 pin 10 will also decrease. This signals the comparator circuit (internal to U401) to output an SCR driver (gating) pulse earlier.

If the regulated B+ voltage begins to increase, the voltage applied to U401 pin 10 will also increase. This signals the comparator circuit (internal to U401) to output an SCR driver (gating) pulse later.

The regulation characteristics of the regulated B+ supply and the high voltage winding of the IHVT (T402) are designed to "track" uniformly with any fluctuation of the high voltage resupply line.

If not corrected, differences in regulation characteristics would cause the picture size to change as the picture brightness changes. Pin 11 of IC U401 is supplied a sample of the high voltage resupply current. Pin 11 of IC U401 is also supplied a sample of the raw (unregulated +150 volts) B+ voltage. Thus the regulator circuit is permitted to compensate for picture size due to line voltage or high voltage resupply current variations.

Vertical Deflection

The vertical output circuit receives a drive pulse from the deflection IC (U401) via pin 18. The "bottom" vertical output transistor, Q502, acts as the driver transistor for the "top" output transistor, Q501. Diodes provide the necessary switching and biasing functions. The main power supply for the vertical output circuit is +26 volts supplied via R509. Additional B+ to aid in speeding up retrace time is supplied through R506 from the regulated B+ supply source. The vertical drive signal is generated by charging capacitor C502 through the vertical size control to ground. Vertical retrace is initiated by an internal switch between pins 21 and 22 of U401 which discharges C502. As capacitor C502 charges and discharges it generates a sawtooth voltage which is coupled via C503 to pin 20 of U401 where, internal to the deflection IC it is amplified and compared to the feedback voltage at pin 19. The feedback voltage is derived from the vertical yoke current through R508 and coupled to pin 19. This feedback maintains vertical linearity.

The vertical drive signal from pin 18, of U401, is applied to the base of bottom output transistor Q502. During the first half of scan, Q502 amplifies this signal and controls the base drive of the top output transistor, Q501, through diode CR504. During the second half of vertical scan, Q502 acts as an output device by pulling vertical yoke current through CR505.

Pin 23, of IC401, provides a vertical blanking pulse which is supplied to the Sandcastle circuit to provide vertical blanking of the video signal during vertical retrace.

Vertical Output Trace

At the beginning of vertical scan Q501 is in full conduction drawing current from the +26 volt supply source via R509, CR502, and the vertical yoke windings into capacitor C508. Q501 is turned on by the current flowing through the series combination of R511, CR501, R517 and R521 into the base of Q501. The bottom output transistor, Q502, shunts some of the base current of Q501 to ground during the top half of scan by drawing base current through R513, CR504, and the collector/emitter of Q502. This shunting of base current causes the collector current through Q501 and into the yoke to begin decreasing. Q502 will continue shunting away the top output base current until it has shunted enough current to turn Q501 off. After Q501 is turned off the collector voltage of Q502 will continue to drop until CR505 turns on. This action allows the yoke current to flow through CR505 and Q502 to complete the bottom half of scan. At this time, Q502 reverses the current flow through the vertical yoke windings by discharging capacitors C508 and C509 through the vertical yoke windings, CR505 and the collector/emitter of Q502 to ground.

Vertical Output Retrace

Current will continue flowing from the coupling capacitors through the vertical yoke and Q502 to ground until the end of scan, at which time Q502 will turn off due to the initiation of retrace. At the time Q502 turns off, the current in the yoke is at maximum. Since it is impossible to immediately stop current flow through an inductor, the current in the yoke continues flowing; however, since Q502 is turned off, the current now flows through diode CR503 into the base-collector junction of the top output transistor. This action causes Q501 to conduct in the reverse mode (emitter to collector), storing retrace energy in capacitor C506. Operation of the top vertical output transistor (Q501) in this mode is not detrimental to the performance or reliability of the device. C506 and the vertical yoke windings now form a series L-C-R resonant circuit during retrace, while CR501 and CR502 prevents the retrace current from flowing into the +26 volt supply.

As the current flowing through the yoke and into capacitor C506 decreases toward zero, the beam is moved back toward the center of the picture tube. When this occurs the top output transistor turns on and saturates due to the stored charge in C505. Q501 now begins conducting the energy stored in C506 back into the vertical yoke to move the beam to the top of the picture tube. To shorten the retrace time, the voltage at the top output transistor is boosted by regulated B+ during the second half of vertical trace. This action supplies extra voltage to force current into the vertical yoke to move the beam back to the top of the picture tube.

At the end of the second half of vertical retrace, the current flowing through Q501 into the vertical yoke is now maximum. At this point, the bottom output transistor Q502 is again turned on and begins shunting away base current from Q501 through diode CR504. This begins the first half of the vertical trace cycle.

X-Ray Protect/Overcurrent Shutdown

To prevent catastrophic failures, the chassis uses a shutdown circuit which will disable the set if the High Voltage or Power demand of the horizontal output circuit increases above predetermined limits.

There are two inputs to the shutdown circuit. One is a sample pulse (XRP) from the IHVT and the second is overcurrent sensing from the horizontal output transistor emitter resistor (R418). The XRP sample pulse is rectified by diode CR409 and under normal conditions develops

CIRCUIT OVERVIEW (Continued)

approximately +24 volts DC. This voltage is divided down to approximately 18 volts by R430 and R416 then applied to a +20 volt zener diode (CR406). As long as the voltage remains below +20 volts, the zener diode (CR406) will not conduct. During a malfunction where this voltage exceeds +20 volts the zener diode (CR406) will conduct and turn on the shutdown SCR (SCR401). The SCR connects the anode of CR408 to ground. CR408 becomes forward biased and in turn forward biases CR405. This action loads down the horizontal oscillator to the point that the oscillator is no longer functional, shutting down the entire receiver. The SCR remains in conduction due to current from raw B+ flowing through R115, R116, L401, CR405 and CR411 into SCR401. The SCR will "turn-off" when the AC switch is opened and the charge on C105 (raw B+ filter) "bleeds off". Instruments with the remote feature -turn off- by shunting the anode current of CR405 to ground through R117. The second input to the shutdown circuit basically monitors the current through the horizontal output transistor. Any malfunction that causes this current to increase above normal limits activates the shutdown circuit.

Note: The following circuits are used only in the CTC 130B/C versions of this chassis series.

Broadcast Stereo

CTC 130B/C-equipped instruments employ a TV Broadcast-FM Stereo/Audio B assembly. This multichannel audio receiver circuit assembly not only provides off-the-air TV Broadcast stereo but also provides the capability of selecting a secondary audio program (Audio B). The secondary audio program (Audio B) is a switch-selectable audio channel, transmitted by the broadcast station, containing alternate audio (perhaps bilingual) sound information.

The Stereo/Audio B audio transmission standard is comprised of a wideband composite audio signal containing subcarriers for the conventional monophonic L+R channel, the stereo difference L-R (left minus right audio)channel and the second audio program channel (Audio B). The stereo subcarrier is twice the horizontal scan rate frequency and is a AM modulated signal with suppressed carrier. The second audio program (Audio B) channel is a FM signal centered at 5 times the horizontal scan rate frequency. Both the stereo difference channel (L-R) and the second audio program channel (Audio B) signals are compressed (companded) at the transmitter in accordance with the dbx* television noise reduction system. A pilot CW tone signal is transmitted at the horizontal scan rate frequency to indicate the presence of stereo audio.

The complete sound processing system for the CTC 130B/C chassis series is on a separate assembly containing sound IF, sound demodulation, stereo matrix and the dbx* expander circuits. The main chassis circuit board assembly contains no functional audio processing circuits.

Because of the wide baseband audio requirements of TV broadcast stereo, the audio signal cannot be processed by the Video IF circuit. Instead the IF signal output from the tuner assembly is routed to two separate IF processing circuits: the Pix IF processing circuit located on the main chassis circuit board, and the Sound IF processing circuit on the new sound system subassembly.

The 45MHz IF signal output from the tuner assembly is applied to the sound IF/Det stage (on the PW SB circuit board), where a 4.5MHz sound IF signal is developed in almost the same manner as the video IF signal is developed on the main chassis circuit board. The sound IF signal then is applied to a Sound Detector stage where the 4.5MHz is detected. The detected 4.5MHz (baseband composite audio) containing the monophonic audio (L+R) and the Stereo (L-R)/Audio B signals is applied to the Demodulator IC's U3 (stereo demod) and U6 (audio B demod). The Stereo and Audio B Demodulator stages recover the Stereo (L-R), Audio B and the Monophonic (L + R) signals. The Stereo (L-R) signal or Audio B signal then is selected for further processing by the Expander stage. The monophonic (L+R) signal is applied to a Delay stage that is also located within the Expander circuit.

During the transmission process, only the Stereo (L-R)/ Audio B signals require dbx* companding. Therefore they are the only signals which must be expanded by the receiver. The expander stage (through the dbx* expanding process) restores the applied signal (either Stereo (L-R) or Audio B) to its original state prior to companding for transmission. The monophonic signal (L+R) is applied to a audio delay stage within the expander circuit to maintain its proper phase relationship with the signal requiring expansion.

The outputs of the expander stage and the delay stage are then applied to a Matrix Amp stage. The outputs of the matrix amp stage (L and R signals) then are routed to the PW SPA (stereo power amp) circuit board.

Note: In the CTC 130C chassis equipped instruments the outputs of the matrix amp stage are routed through the PW VI2 assembly.

Video/Audio In-Out (PW VI2)

Note: This assembly is used in conjunction with the CTC 130C chassis ONLY.

The control signals for switching both the video and audio signals are supplied to the PW VI2 (Video/Audio in-out) module from the tuner control assembly on logic control lines A1 and A2. These logic signals are applied to switching transistors Q7 and Q8. Transistors Q7 and Q8 are used to control the switching state of the video switching IC's U3 and U5, and audio switching IC U2.

External Video Input signals from the AUX 1 and AUX 2 jacks are applied to video switch U3. When either one of these inputs is selected, the video input signal will be routed through IC U3 and applied to a buffer/preemphasis stage consisting of transistors Q1, Q2 and Q3. The video signal is then routed through video switch IC U5 and applied a buffer amp. From the buffer amp stage the video signal then is routed to the main chassis circuit board for normal video processing. Video switch IC U5 is also used (along with transistors Q16, Q15, Q4, Q5 and Q6) to provide the video loop-through function necessary for normal TV viewing.

The audio signals are input from either the AUX 1 and AUX 2 audio input jacks on the back of the PW VI2 module or from the PW SB stereo decoder. These inputs are routed to the audio switching IC U2. The selected outputs are then passed through the left and right channel buffer amplifier transistors Q12 and Q13. The output from transistors Q12 and Q13 is tapped off and routed to the rear panel selected audio out jacks. This signal is a fixed level signal and is not affected by the volume, mute or tone controls. The output of transistors Q12 and Q13 is also routed to the audio preamplifier IC U6. This IC contains inputs for volume level, mute, tone and balance control of the audio signal. The left and right channel audio outputs

CIRCUIT OVERVIEW (Continued)

of U6 are applied to buffer transistors Q9 and 11. The audio signal then is routed from the PW VI2 circuit board to the PW SPA (stereo power amplifier) circuit board. The outputs of transistors Q9 and Q11 are also routed to the left and right audio Hi-Fi jacks (J9 and J10) on the rear panel of PW VI2. The audio output signal at these jacks is affected by the volume, mute and tone controls and is used primarily to connect the audio output to a external stereo amplifier which is not remote controlled. This allows the audio and muting to be controlled from the TV remote hand unit.

The AUX input logic control signals A1 and A2, from the tuner control module, are applied to the base of transistors Q7 and Q8 (the AUX 1 and AUX 2 logic switches). These logic signals are then applied through resistors R127 and R128 to the audio switching IC U2.

When either line A1 or A2 from the tuner control module goes "Hi" the appropriate transistor turns "on" supplying a "Lo" to the corresponding pin of IC U2. When either pin 9 or 10 goes "Lo," the appropriate switch segment will close routing the AUX 1, AUX 2 or TV audio through the switch.

PW SPA (Stereo Power Amp)

The PW SPA (stereo power amp)circuit board uses conventional audio circuits and does not require further discussion in this publication. This circuit board is used in conjunction with the CTC 130B/C chassis ONLY.

PW VIPUR (Variable Frequency Switching Power Supply)

Note: The PW VIPUR circuit is used in conjunction with the CTC 130C chassis ONLY.

The Variable Frequency Switching Power Supply used with the CTC 130C chassis is similar to that used in previous chassis. However, the components are now mounted on a separate circuit board assembly known as the PW VIPUR. The prime reason for using the variable frequency switching power supply is to provide "Hot-to-Cold" ground isolation between the primary TV power supply source ("HOT" ground) and the video/audio input/output circuit PW VI2 ("COLD" ground). This is accomplished by taking the "HOT" 150 VDC generated by the TV chassis primary power supply and applying it to the PW VIPUR circuit board. The PW VIPUR then uses this "HOT" 150 volt DC supply to generate a "COLD" 150 volt DC supply which is routed back to the main chassis.

Since the "Raw" B+ that is now supplied to the main chassis is "Cold" this makes the CTC 130C chassis a "Cold" chassis (isolated from earth ground much in the same manner as a power transformer equipped instrument would be).

The PW VIPUR module also develops the standby supply voltages for the MTT001 Tuner/Tuner Control Module (when used). It also develops DC supplies for the Stereo Broadcast circuit board (PW SB1B), the Video/Audio In/Out circuit board (PW VI2) and the Stereo Power Amp circuit board (PW SPA).

While the +150-volt output of the PW VIPUR is regulated, it is also applied to the familiar SCR regulator circuit, on the main chassis circuit board, to generate the +127 volt regulated B+.

Referring to the block diagram, 120 volts AC is routed through fuse F101 to the primary of step down/standby transformer T2. The secondary of transformer T2 supplies standby voltage via half wave rectifier CR5 to the tuner/tuner control module MTT 001A, (when used). The output of CR2 is also used to power Q2, the On/Off switching transistor.

On the main chassis circuit board, 120 volts AC is applied to a bridge rectifier circuit where a "HOT" +150 volts DC supply voltage is developed. This "HOT" +150 volt DC supply is routed to the PW VIPUR circuit board where it is applied to the primary of transformer T1. During the initial start-up cycle, this same +150 volts DC is routed through dropping resistor R2 and applied to Zener diode CR3 generating an approximate +11 volt DC source. This voltage is applied via diode CR 13 to pin 7 of IC U2, the VIPUR regulator integrated circuit. The same +11 volts is applied, via resistor R12, to the "on/off" Opto-Isolator IC U1,.

The regulator IC U2, receives On/Off commands from the remote amp circuit (part of the MTT module) or the manual On/Off button on the instrument front panel via Transistor Q2 and Opto-Isolator IC U1. U1 provides "Hot to "Cold" ground isolation along with VIPUR transformer T2.

The regulator IC, U2, provides a drive signal to the gate of power MOSFET Q1. This drive signal switches Q1 on and off causing energy to be stored in and discharged from the primary winding of switching regulator transformer T1. This energy is coupled to the secondary windings of transformer T2 where it is rectified to provide regulated supply sources of +150 volts, +25 volts and +20 volts.

In addition a "HOT" supply voltage of approximately +12.5 volts is generated and used as a run supply voltage for the switching regulator IC U2. The +12.5 volt source is also applied through a voltage divider consisting of resistors R8 and R7 and trim resistors R4,R5 and R6 to pin 1 of regulator IC U2. The voltage at pin 1 is applied to a error amp internal to the IC. The output of the error amp then is used to control the duty cycle of the VIPUR output transistor Q1.

The same "HOT" supply secondary winding (used to generate the +12.5 volt run supply for U2) is also used to generate a +26 volt supply to power the instrument degaussing coil.

Internal to the IC (U2) there is a slow start circuit. A long time constant network consisting of resistors R1, R3 and capacitor C7 controls the start-up the regulator IC by gradually allowing the pulse width modulator to reach it's operating duty cycle. This operation avoids overheating of the output MOSFET transistor Q1, during initial start-up, so that it will not destroy itself.

There is also a overcurrent protection circuit internal to IC U2. Should an overcurrent fault occur in the VIPUR output stage it will be sensed by drain resistor R16. It is then applied to pin 11 0f U2 and to the shutdown latch circuit (internal to IC U2) and used to shutdown the regulator circuit turning off all power to the instrument.

Note: The circuit surrounding the switching regulator IC and the switching regulator output transistor is referenced to "HOT" ground. As a result, it is important that the technician use a isolation transformer when servicing this instrument. Failure to use a isolation transformer may result in damage to the chassis, the equipment or injury to the technician. ■

Continued

FIG. D1-1 STEREO BROADCAST BLOCK DIAGRAM

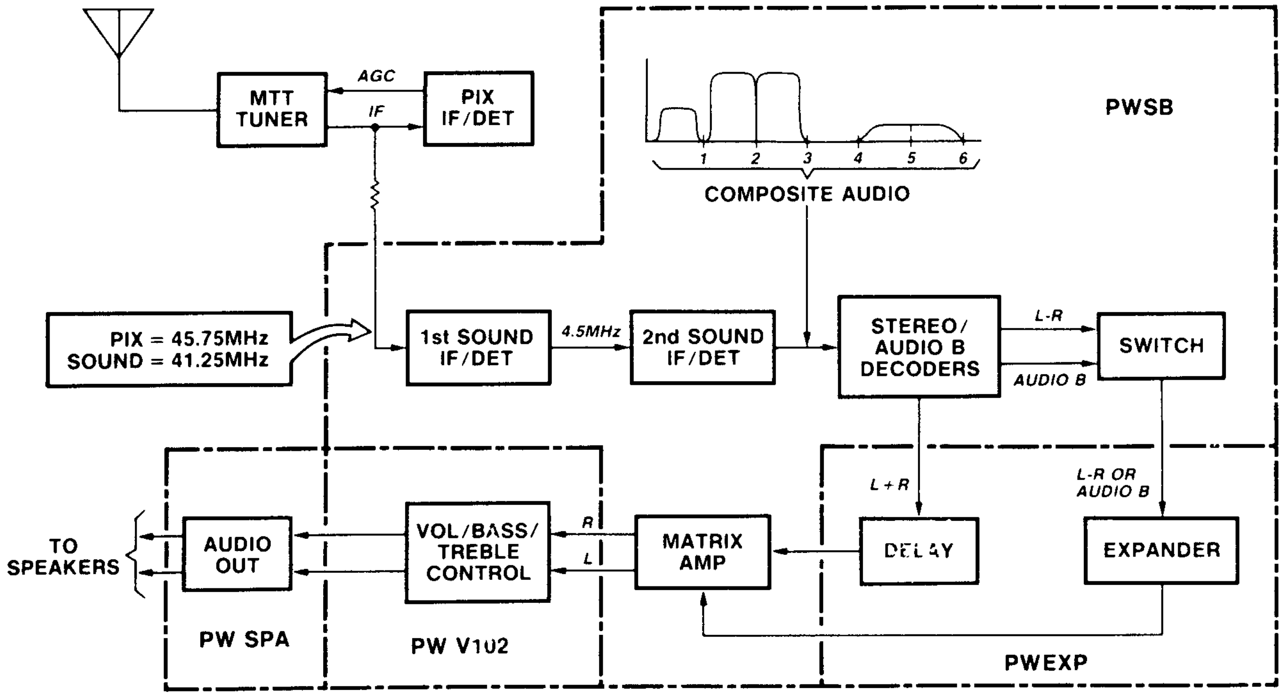


FIG. D1-2 STEREO DEMODULATOR

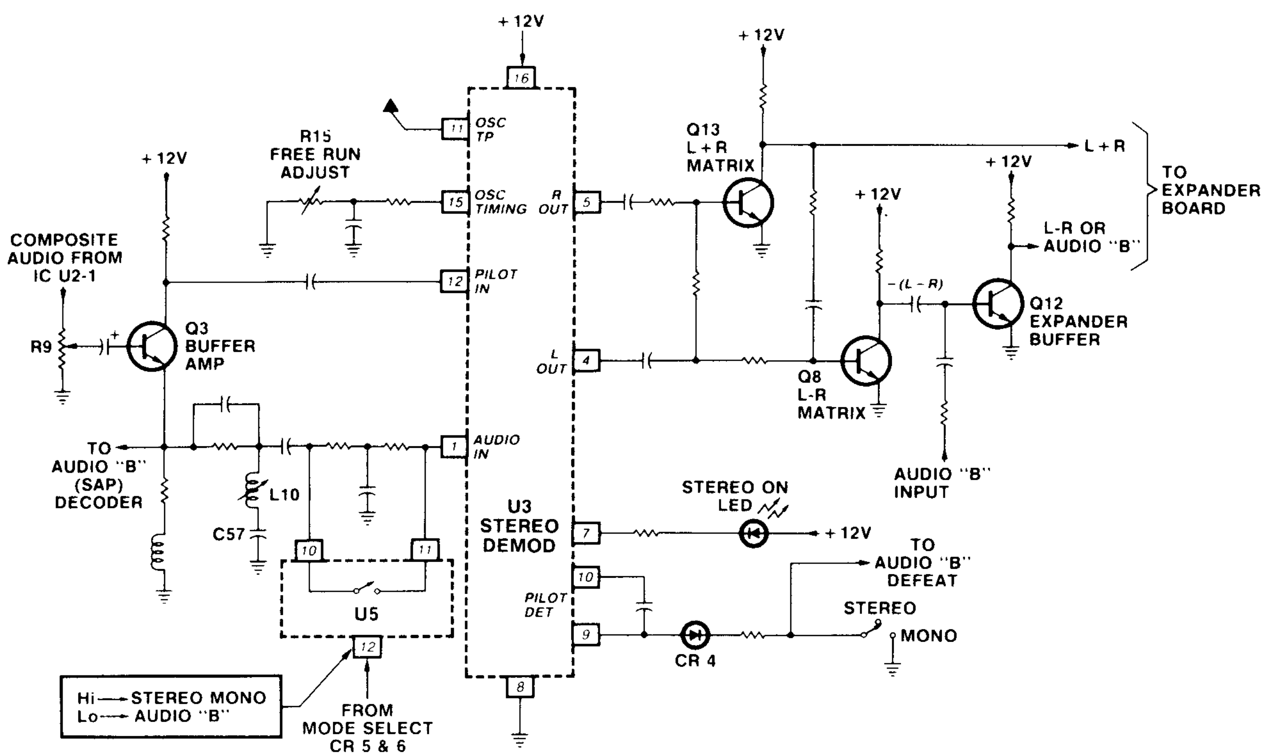


FIG. D2-1 VIDEO/AUDIO IN-OUT BLOCK DIAGRAM

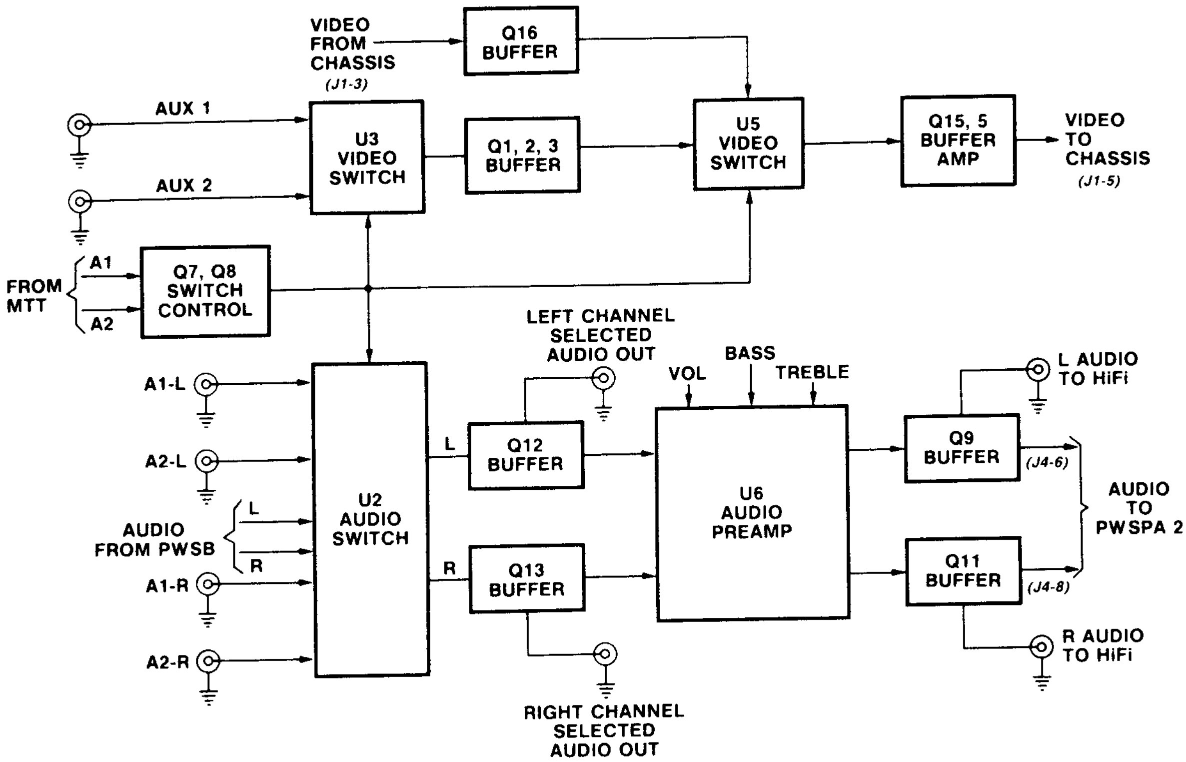


FIG. D3-1 VARIABLE FREQUENCY SWITCHING POWER SUPPLY

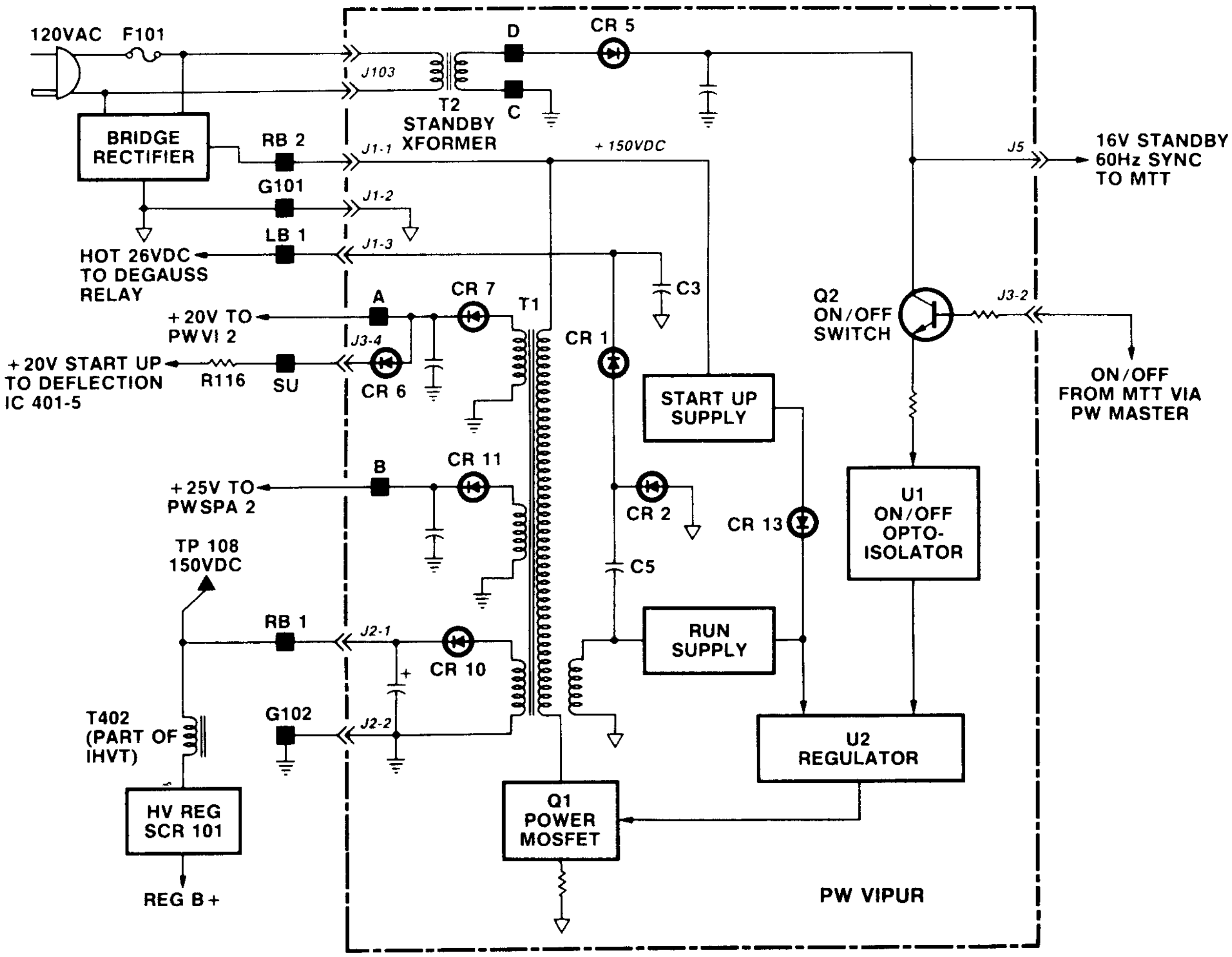
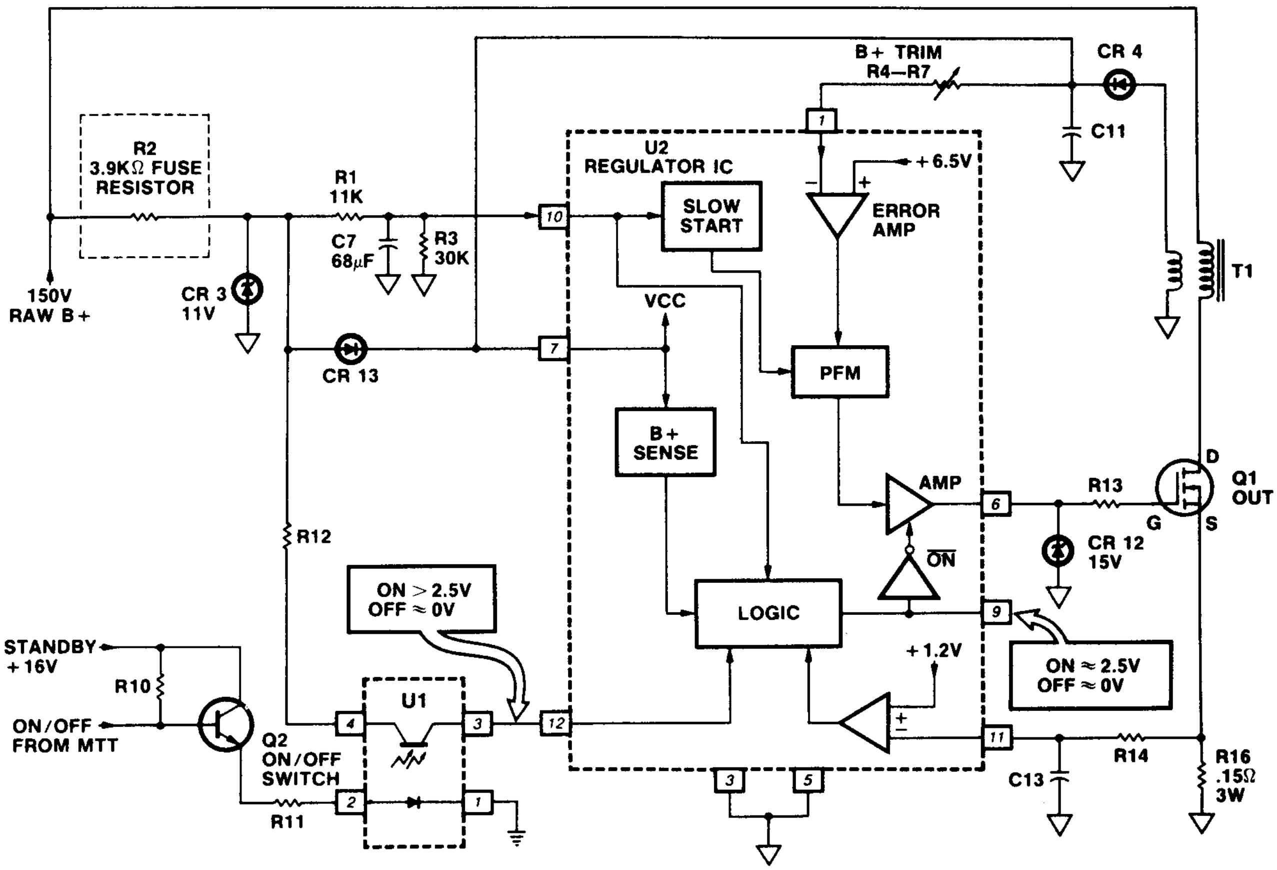


FIG. D4-1 SWITCHING POWER SUPPLY ON/OFF OPERATION



CHASSIS ALIGNMENT

Test Equipment Required:

External Marker Generator—Capable of generating markers at 47.25 MHz, 45.75 MHz, 44.00 MHz, 41.25 MHz.

Vacuum-Tube Voltmeter or Digital Voltmeter—Providing 1.5 volt DC scale.

Oscilloscope—Wide band

External Bias—Battery or well regulated, isolated AC operated variable DC bias supply (0-15 volts).

Alignment Tool—Must have .056" square end (GC No. 9440 or equivalent).

External Power Supply—For IF Alignment purposes it will be necessary to apply external power to the IF processing circuit (+16 volts to R325—TP107). It is recommended that a well filtered DC power supply capable of supplying +16 volts DC and at least 250 ma of current be used.

Preliminary Setup

Note: IF Alignment is performed with no AC power applied to chassis.

1. Allow 10 minutes warm-up time for test equipment.
2. Remove IF link cable from tuner.
3. Connect approximately +5 volts DC bias to TP307 (AGC test point).
4. Apply +16 volts DC, external power, to input side of R325 (TP107).

IF Alignment

Note: Follow Preliminary Setup procedures before performing IF Alignment.

1. Connect Marker Generator output (with 47.25 MHz marker) direct to chassis IF input (TP301).
2. Connect oscilloscope through detector probe (Fig. F1-1) to input of SAW device (SF301 pin 4).
3. Adjust L301 (47.25 MHz trap) for minimum scope deflection.
4. Remove detector probe from input of SAW device (SF301 pin 4).
5. Apply 45.75 MHz marker to IF input. Measure and note DC voltage at TP301 (collector circuit of IF output Q303).
6. Increase IF AGC bias voltage until the voltage at TP301 decreases approximately 0.5 volts.
7. Adjust L303 for minimum output voltage at TP301 (if during this adjustment the voltage at TP301 drops below 3.8 volts decrease IF AGC bias to match voltage obtained in Step 5).
8. Increase IF AGC bias until voltage at TP301 decreases an additional 0.8 volts.
9. Adjust L303 for minimum output voltage at TP301. If voltage drops below 3.0 volts repeat Step 4 thru 9 of the IF Alignment procedure.

AFT Alignment

1. Remove marker generator from IF Input (TP301) and adjust IF AGC bias voltage (at TP301) to +5 volts DC.
2. With no signal applied, adjust AFT balance control R332 for 6.5 volts DC at junction of R327 and C322.
3. Remove AGC bias from TP307.
4. Apply Marker Generator output (with 45.75 MHZ marker) to IF input (TP301).
5. Adjust L304 for 6.5 volts DC at junction of R326 and C314.

SAW Matching Adjustment:

1. Apply +5 volts DC bias to TP307.
2. Apply Marker Generator (with 44.00 MHz marker) to IF input (P301).
3. Connect Oscilloscope through detector probe (Fig. F1-1) to TP301, collector of IF output transistor Q303.
4. Adjust IF AGC bias to produce usable scope trace.
5. Detune T301 approximately 1 turn (either direction) to observe modulation.
6. Adjust T301 for minimum modulation.

Note: Remove all test equipment and external voltage connections and reconnect IF link cable to tuner.

Contrast Preset

1. Connect Color Bar Generator to antenna input. Set Contrast Control (R4207) to maximum clockwise (CW) position. Short across LDR terminals (if used). Pull Kine Socket to assure set is not in a beam limiting condition.
2. With AC power applied to chassis—adjust Contrast Preset control (R715), to produce approximately 3.3V p-p black to white signal at TP702 with 100 IRE luminance input signal (this does not include blanking).

3.58 MHz Oscillator Adjust (AFPC)

1. With color bar signal applied to antenna terminals at 100% modulation, adjust tint control (R4204) to midrange and color control (R4203) for normal viewing.
2. Connect TP801 via a short clip lead to ground.
3. Connect TP301 via a 270 pf capacitor to pin 17 of U701.
4. Adjust trimmer capacitor C818 for zero beat (stable or slow moving color bars). Remove shorting clip from TP801 and 270 pf capacitor from TP 301 to pin 17 of U701.

Sound Alignment (CTC 130A only)

1. Tune to a strong local station.
2. Set volume control for normal listening level and adjust L201 for maximum volume.
3. Tune to a weak station and adjust L202 for maximum volume and minimum background noise.

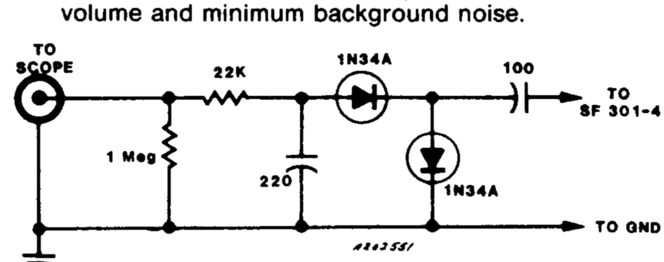


Fig. F1-1—Detector Probe

CHASSIS ALIGNMENT (Continued)

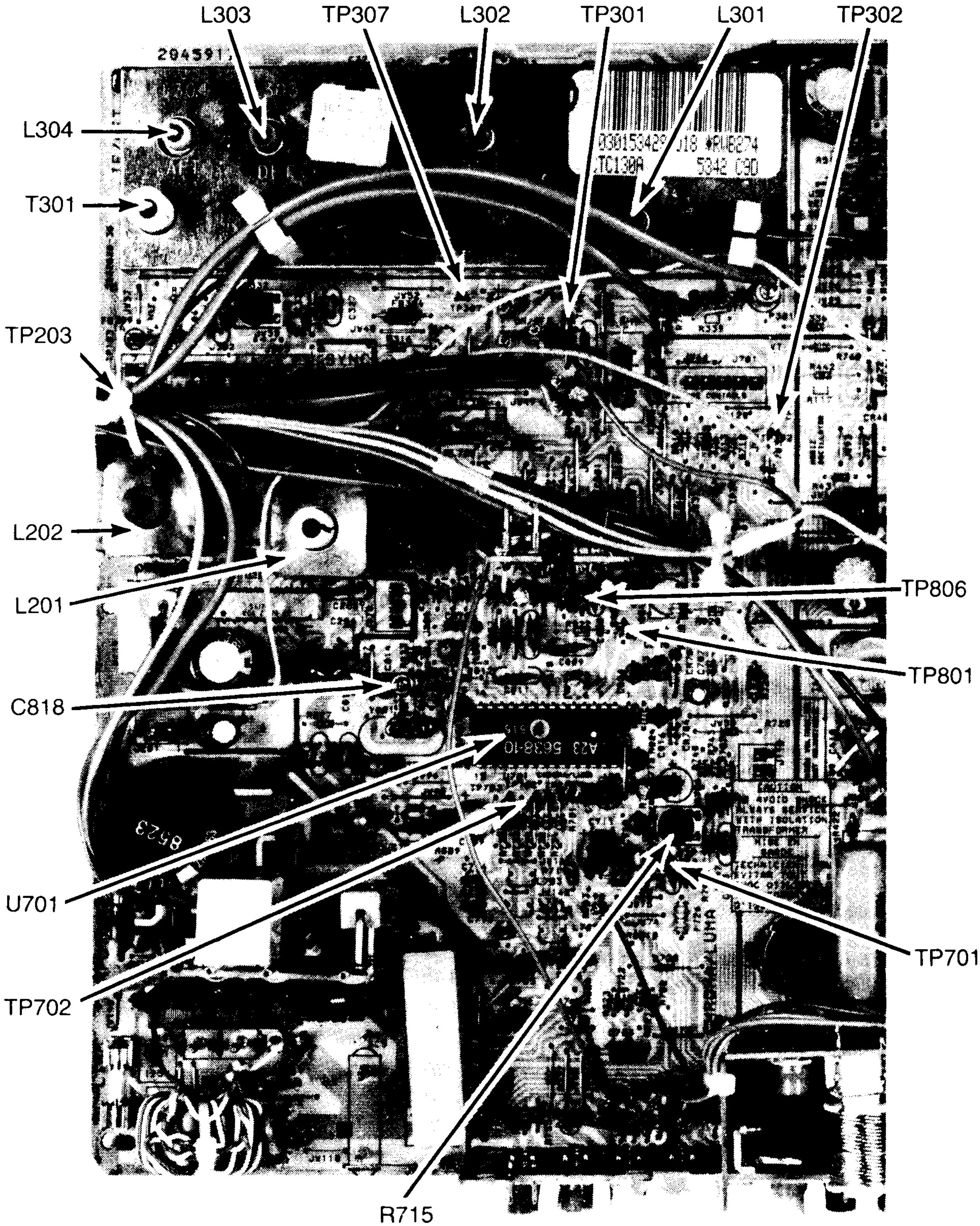


Fig. F2-1—Chassis Alignment Points