



Television Service Tips

Volume XXII
Issue 2
January 29, 1971

Important Information for your Service Department

Prepared and Distributed by **RCA Sales Corporation, Product Performance**
600 N. Sherman Drive, Indianapolis, Indiana 46201

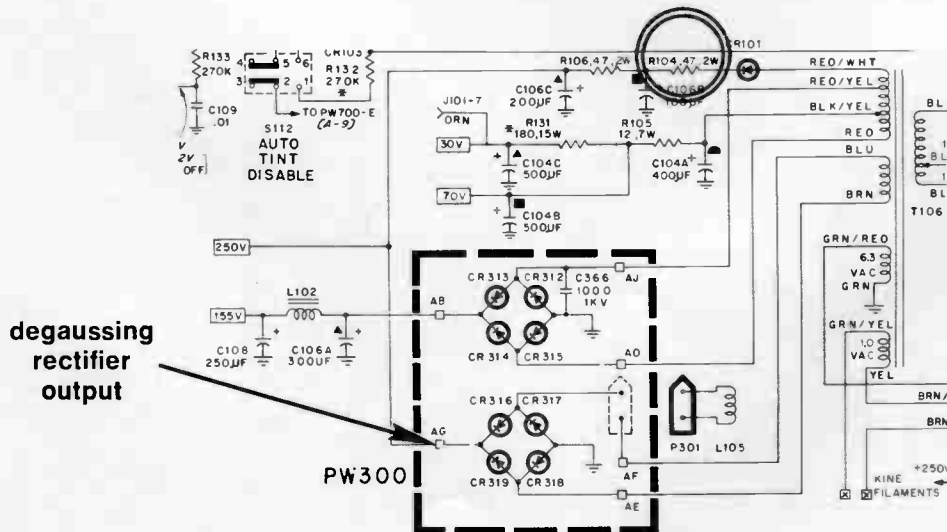
Hum Bars and/or Degaussing "Interference"—CTC 44, CTC 47

Service Data
1969 No. T19
1970 No. T15

R104, in the 250V DC supply circuit, is a 47 ohm, 2 watt flame retardative (film) type resistor in early-production instruments. In the event this resistor fails, the instrument may continue to operate on the 220V DC supplied by the degaussing bridge rectifier output. See **Automatic Degaussing** on pages 49 and 50 of the **RCA 1971 Product Technical Manual** for a detailed circuit explanation.

Symptoms for R104 failure may include a hum bar and/or degaussing "interference" in the raster. For a quick check unplug the degaussing coils. Loss of video will result if the 250V DC supply is inoperative.

In those specific chassis where R104 fails, replace with a 47 ohm, 4 watt flame retardative type resistor (Stock No. 132879, Drawing No. 993118-241). Replacement information for R106 (47 ohm, 2w-film) is: Stock No. 132951, Drawing No. 1408729-393.



Power supply circuit—CTC 44



Television Service Tips

Volume XXII
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January 29, 1971

Important Information for your Service Department

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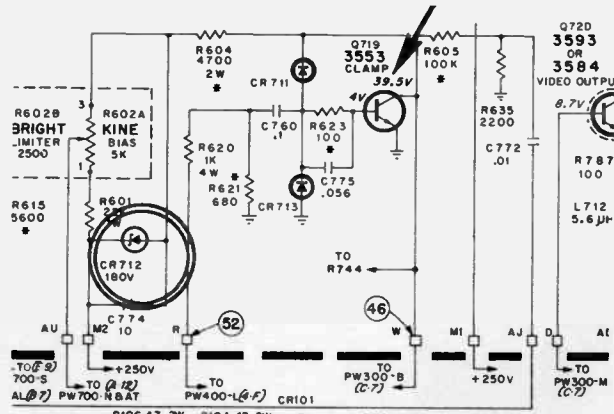
Service Data
1968 No. T20
1969 No. T17
1969 No. T19
1970 No. T15
1970 No. T16

Brightness Symptoms—CR 712 CTC 40, CTC 44, CTC 47

Some brightness symptoms in these chassis which are generally associated with CRT circuitry may be due to a leaky or shorted zenor diode, CR712. Symptoms may include: Retrace lines in raster; inability to cut off raster with brightness control; not possible to extinguish lines with screen and/or kine bias controls during color temperature setup procedure.

Also, in Service Data 1970 No. T15 (the CTC 44 chassis) on page 30 of the schematic diagram the collector voltage of Q719 clamp transistor should read "139.5V".

**schematic correction
normal reading 139.5V**



Kine bias, clamp circuitry—CTC 44



Television Service Tips

Volume XXII
Issue 4
January 29, 1971

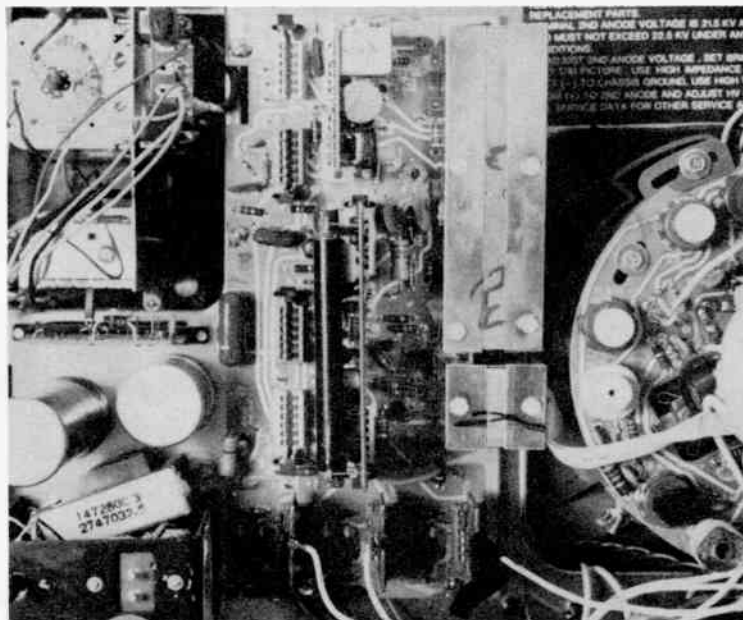
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CAUTION: When troubleshooting any chassis using plug-in modules, keep spray chemicals away from the module sockets.

This caution note pertains to both the 36 terminal type socket used in the CTC 47 Tuner Control Assembly (TCA) and the 6-terminal type socket. The 6-terminal type is utilized in several color chassis, including the CTC 49, as well as those black and white chassis equipped with plug-in modules. It has been found that certain ingredients in spray-type chemical troubleshooting aids (especially circuit coolers) attack the socket material and cause failures.

In those instances where high contact resistance at the plug-in connections is suspected, clean the edge connectors of the module with an ordinary pencil eraser. Normally the socket contacts can then be cleaned by inserting, then removing the module two or three times.



Module sockets, PW 300—CTC 49



Television Service Tips

Volume XXII
Issue 5
January 29, 1971

Important Information for your Service Department

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Remote Amplifier Service CTC 44/CTP 19A

Service Data
1970 No. T15

"U" function only

If the VHF to UHF Driver transistor (Q1108) in the CTP 19A remote amplifier fails (shorts) the instrument will go to the "U" function only.

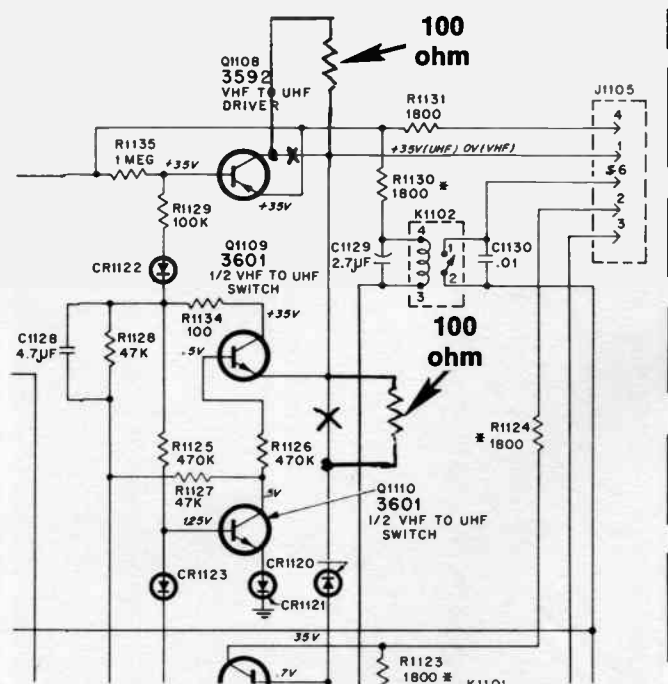
Should this failure occur in early-production versions of this chassis the following circuit changes will improve reliability. Later-production chassis have these changes.

1. Add a 100 ohm, 1/2 W resistor (Stock No. 502110, Drawing No. 735730-50) in series with the collector lead when replacing Q1108.
2. Unsolder CR1120 cathode lead and add a 100 ohm, 1/2 W resistor (Stock No. 502110, Drawing No. 735730-50) in series.

Mechanical buzz or hum

Mechanical buzz or hum in instruments utilizing the CTC 44/CTP 19A chassis may be from the remote power transformer mounting. The buzz will be evident any time the Master switch is "on".

In those specific instruments exhibiting a buzz, tighten, then solder the remote power transformer (T1102) mounting tabs.



Circuit modifications—CTP 19A



Television Service Tips

Volume XXII
Issue 6
January 29, 1971

Important Information for your Service Department

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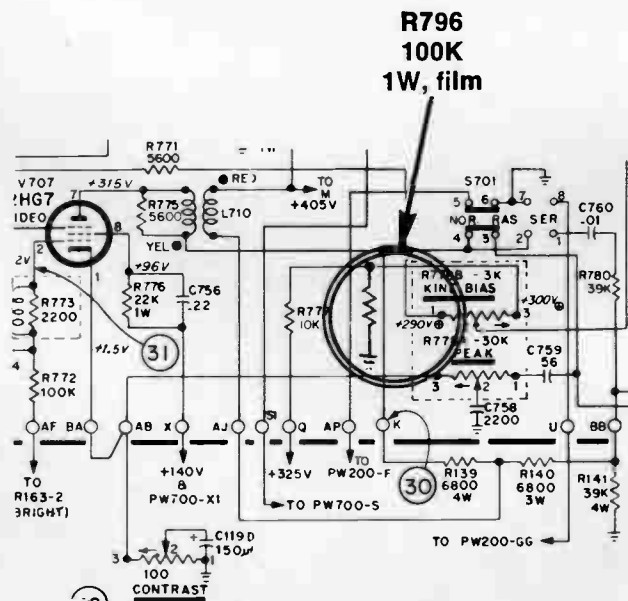
Reduced Accu-Tint Operation CTC 39X

Service Data
1970 No. T3

Reduced Accu-Tint range in the CTC 39 chassis may be the result of a resistor (R796, 100K, 1/2 watt) changing value. There also may be a tendency towards blooming during scenes which contain large areas of red information.

In the event of R796 failure use the following replacement information.

SYMBOL No.	STOCK No.	DRAWING No.	DESCRIPTION
R796	133057	993115-273	100K ohm, 1 watt, film



Kine bias control circuit—CTC 39X



Television Service Tips

Volume XXII
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Service Data
1968 No. T18
1969 No. T8
1970 No. T3
1970 No. T8

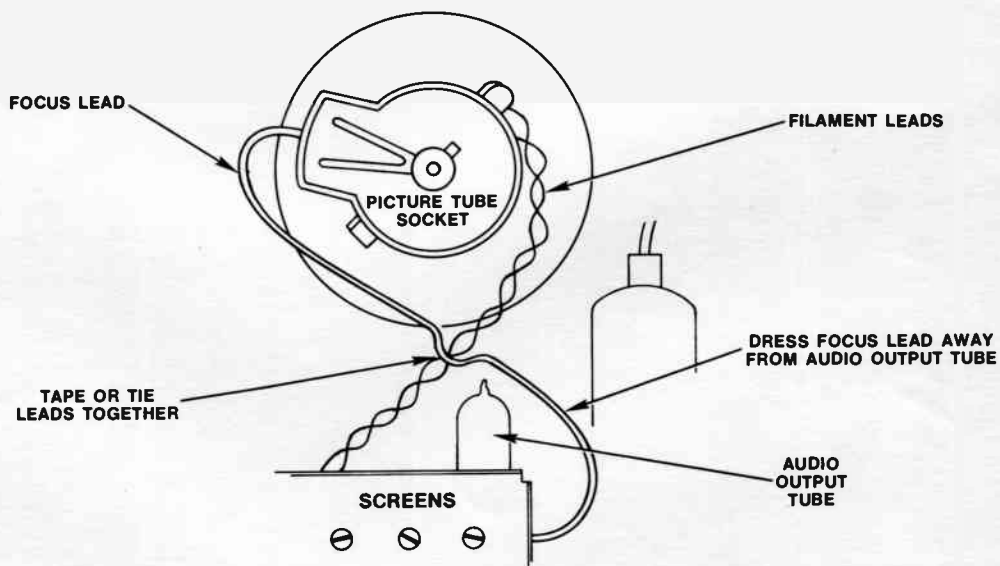
Picture Tube Focus Lead— CTC 38, CTC 39

Lead dress is established in a specific configuration in television instruments for several reasons. One reason is to prevent interference between the various circuits in the receiver. Another important reason is to insure the reliability and safety of the instrument.

The consequences of changing leads from their intended position can be severe. Symptoms and hazards bearing no relation to the original service problem can be induced into the instrument.

One such possibility concerns the lead dress of the focus lead attached to the picture tube socket of the CTC 38 and CTC 39 chassis. During manufacture the black focus lead is attached with tape or a wire tie to the two brown filament leads. This lead dress is established to keep the focus lead away from the audio output tube. If this lead dress is not maintained, over a period of time heat from the tube may cause deterioration of the insulation. The end result can be an audio output tube failure due to arcing between the lead and the tube elements.

To insure maximum reliability this lead dress should be checked whenever the instrument is serviced for any reason.



Picture tube focus lead—CTC 38



Television Service Tips

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Important Information for your Service Department

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Unstable Vertical Sweep CTC 36

Service Data
1968 No. T19
1969 No. T6
1970 No. T10

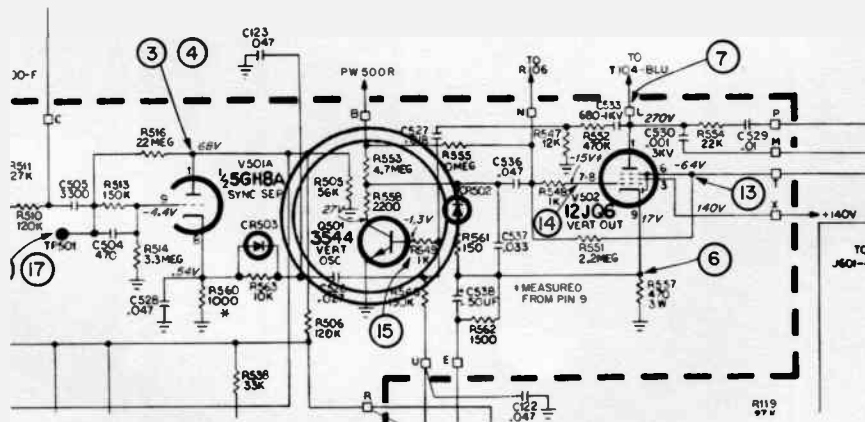
Loss of vertical sweep in this chassis when no sync input is present (i.e. during channel changes, when tuner is on an inactive channel, etc.) may be the result of an off-tolerance vertical oscillator transistor, Q501.

To test for this condition:

1. Turn instrument power off.
2. Disable sync input to Q501 by moving service switch to "raster" position.
3. Turn instrument power on.

No vertical sweep (oscillator does not restart) under these conditions indicates the possibility of an off-tolerance Q501.

Caution: Output components (such as tube V502 and/or cathode resistor R557) may be damaged if the instrument has been operated any length of time without the vertical oscillator running.



Vertical deflection circuit—CTC 36



Television Service Tips

Volume XXII
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Important Information for your Service Department

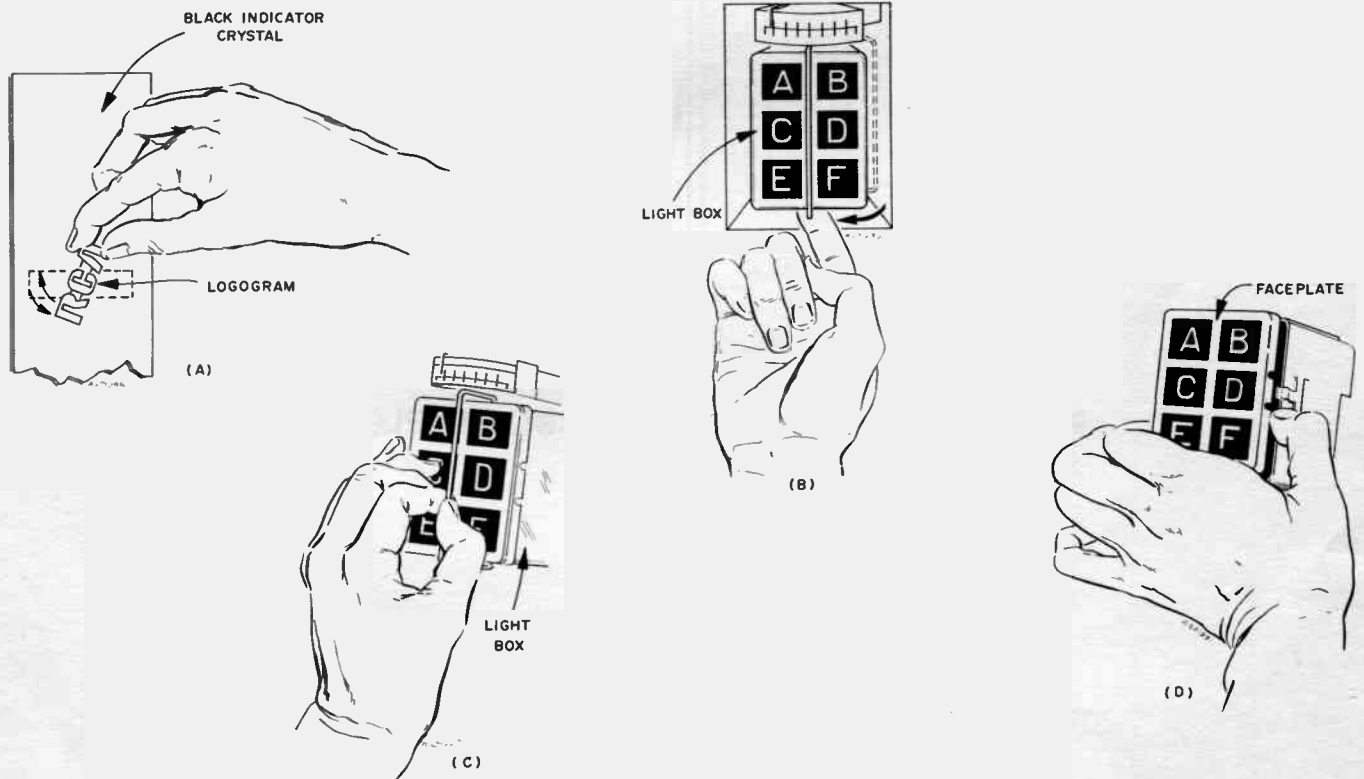
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UHF Channel Number Insert Installation CTC 46 (TMA 427A, KRK 170C)

Service Data
1971 No. T8

Remove TV power cord plug from "AC" outlet. Remove black channel indicator crystal by turning the "RCA" logogram one-quarter ($\frac{1}{4}$) turn counter clockwise and remove crystal from set (illustration A). Reach under the indicator light box and swing wire handle to the front (illustration B); then pull gently on the wire handle and remove indicator light box from set (illustration C). Swing wire handle back to its original position on right side of light box. Lift right side of indicator faceplate and remove faceplate from light box, exposing letter strips (illustration D). Remove exposed letters and replace with channel numbers, corresponding to active channels in your particular area, from number sheet furnished with each television receiver. Place channel numbers into slots in indicator light box. (Channel numbers are also available through Parts and Accessories—Stock No. 135221.)

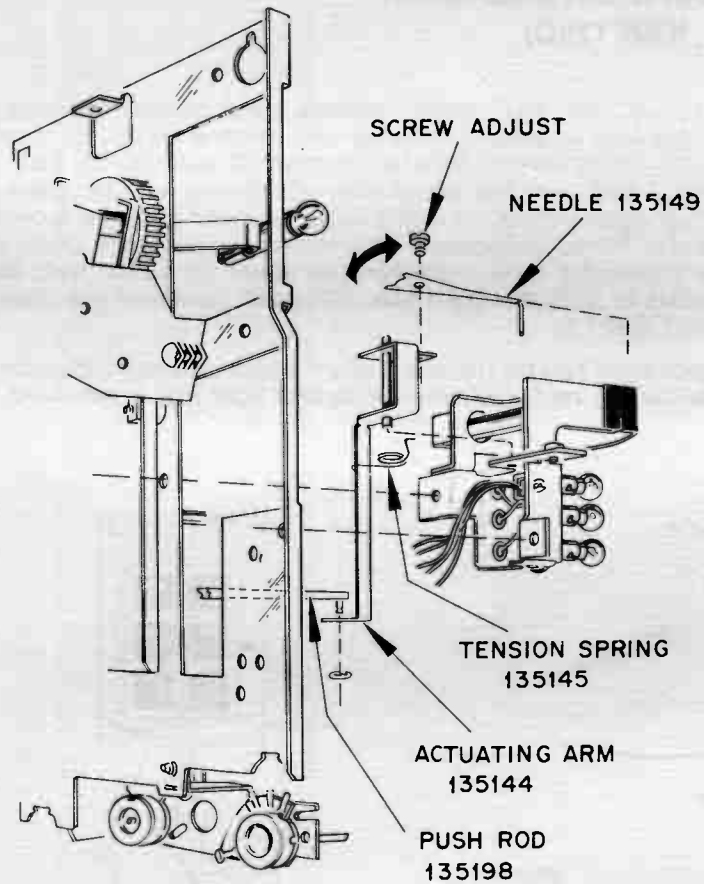
NOTE: The ACM indicator light can be replaced when black channel indicator crystal is removed. The UHF channel indicator lights can be replaced when indicator light box is removed.



(over)

Readout Indicator

The readout indicator of this UHF tuner is a mechanical function. The indicator needle is secured to the actuating arm by a screw. If for any reason adjustment of the needle is required, loosen the screw and adjust the needle to indicate the channel being received.



READ-OUT INDICATOR ASSEMBLY EXPLODED



Television Service Tips

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600 N. Sherman Drive, Indianapolis, Indiana 46202

Chroma I Module CTC 49/CTC 46, 54

Service Data
1970 No. T19
1971 No. T8
1971 No. T13

Due to production scheduling and other considerations the Chroma I module used in late-production CTC 49 chassis is slightly different from that utilized in early-production. Also, replacement CTC 49 Chroma I modules supplied by Parts and Accessories (under Stock No. 132583) are the later version. Electrically, the two versions are the same and are directly interchangeable. The differences are in component layout and board identification.

Component layout is of no consequence. However, the board identification number is quite important since these late-production CTC 49 Chroma I modules are labeled "MAC 002A" which is the same designation as that used for Chroma I in the CTC 46 and CTC 54 chassis. **CTC 49 Chroma I modules are not interchangeable with CTC 46/54 Chroma I modules.**

Visual identification of modules labeled "MAC 002A" is simple: The **CTC 49 Chroma I** module has **two** variable resistors; the **CTC 46/54 Chroma I** module has **three** variable resistors.

Use the following cross reference to identify the three versions of the Chroma I module:

Chassis	Stock No.	Module ID No.	Physical Landmarks
CTC 49	132583	MAC 001A	Two variable resistors
CTC 49	132583	MAC 002A	Two variable resistors
CTC 46/54	134007	MAC 002A	Three variable resistors

To prevent confusion, replacement CTC 49 Chroma I modules in stock (Stock No. 132583) that are incorrectly identified as "MAC 002A" should be relabeled "MAC 001A".

In summary, there are three Chroma I modules presently in the field: (1) MAC 001A, Stock No. 132583 originally produced for the CTC 49 chassis; (2) MAC 002A, Stock No. 132583 later version produced for the CTC 49; (3) MAC 002A, Stock No. 134007 produced for the CTC 46 and 54 chassis. Remember, the CTC 49 type (Stock No. 132583) has two variable resistors and the CTC 46/54 type (Stock No. 134007) has three variable resistors. Thus, modules identified as MAC 002A are interchangeable only if the Stock Numbers match.



Television Service Tips

Volume XXII
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Important Information for your Service Department

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VHF and UHF Channel Programming CTC 54

Service Data
1971 No. T13

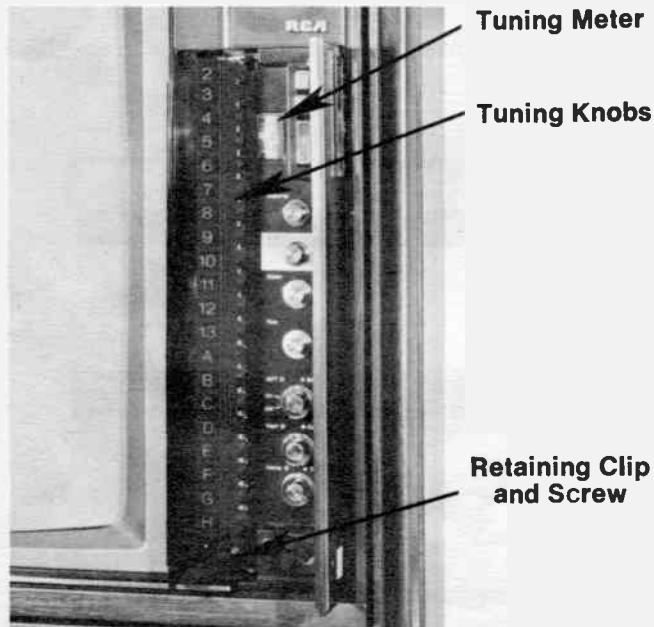
Normal Programming. 12 VHF and Up to 8 UHF Channels

CTC 54 equipped receivers are factory tuned to receive all 12 VHF channels. Eight UHF channel positions are provided—all are adjusted to receive channel 14. These positions are identified as channels "A" to "H" on the channel indicator—see photograph.

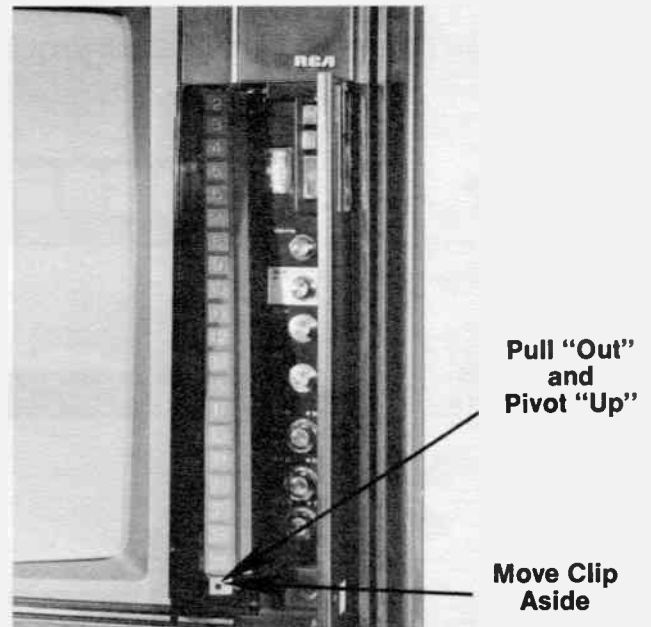
VHF Channels

Proper operation of CTC 54 receivers requires that the tuner control system be programmed to stop only on active channels. Hence all unused VHF channels must be programmed to be bypassed. This is accomplished as follows:

1. Open auxiliary controls door, and door covering tuning knobs—as pictured.
2. Using *Channel-UP* or *DOWN* touch-bar, advance tuner to first unused VHF channel. Now turn tuning knob counter-clockwise (one located next to lighted indicator) until the tuner automatically advances to the next channel. If the next VHF channel is active, the tuning knob should be fine-tuned for best reception. The tuner should then be advanced through the channels. Each channel should be programmed "out" or fine-tuned as required.



Tuning Controls Location—CTC 54



Removing Channel-Indicator Assembly—CTC 54

UHF Channels (Up to 8)

1. To program UHF channels, advance tuner to UHF position "A".
2. Determine lowest numbered UHF channel to be received. Using tuning meter as a guide, rotate position "A" tuning knob clockwise until correct channel is received.
3. Fine-tune for best reception and advance to next position ("B" in this case) and program next highest channel. Repeat Steps 1-3 until all desired UHF channels are programmed.
 - less than eight UHF channels are received, it is necessary to program "out" the unused UHF positions by advancing the tuner to each and rotating the tuning knob counter-clockwise in the same manner as for VHF.

UHF Channel-Indicator Inserts

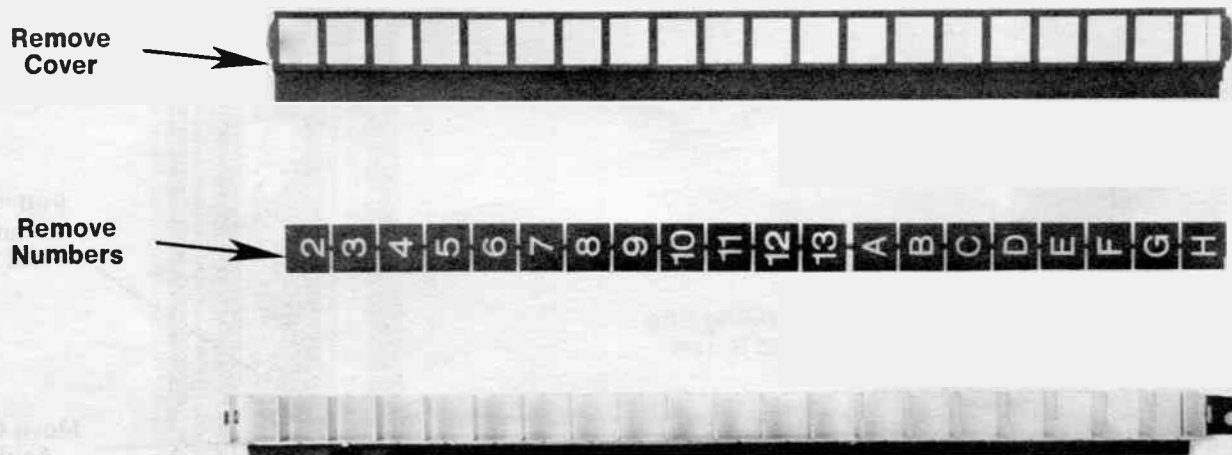
A set of 70 UHF channel numbers is supplied with the instrument. The correct UHF channel number should be substituted for "A" through "H" inserts on all active UHF channels. This is easily accomplished as follows:

1. Move retaining clip at bottom of channel-indicator assembly aside as illustrated. (Loosen screw if required.)
2. Carefully pull "out" at bottom of channel-indicator assembly and pivot "up" until assembly can be removed.
3. Put channel-indicator assembly on table with number side up.
4. Remove black metal strip covering channel numbers. Remove strip of numbers.
5. Separate VHF channel number strip from UHF "A" through "H" inserts. Reinsert VHF numbers.
6. Select appropriate UHF channel numbers from set supplied. Individually insert required UHF channel numbers in correct indicator positions.
7. Install inserts from "A"- "B"- "C" strip in nonprogrammed UHF channels.
8. Reassemble and reinstall channel indicator assembly.

Reprogramming VHF and UHF Channels

1. Rotate tuning knob of desired new channel 3-4 turns clockwise.
2. Advance tuner (*Channel-UP* or *DOWN* touchbar) to new channel position and turn tuning knob clockwise until desired channel is indicated on tuning meter.

NOTE: If new channel is UHF, correct channel number should be inserted in channel-indicator assembly.



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Service Data
1967 No. T11
1968 No. T7
1969 Nos. T12, T18
1970 Nos. T11, T14

Damper Diodes CTC 22; CTC 41, 42, 43

For maximum reliability of the solid state damper diode as utilized in these chassis, it is advisable to use two devices in parallel when replacement is required.

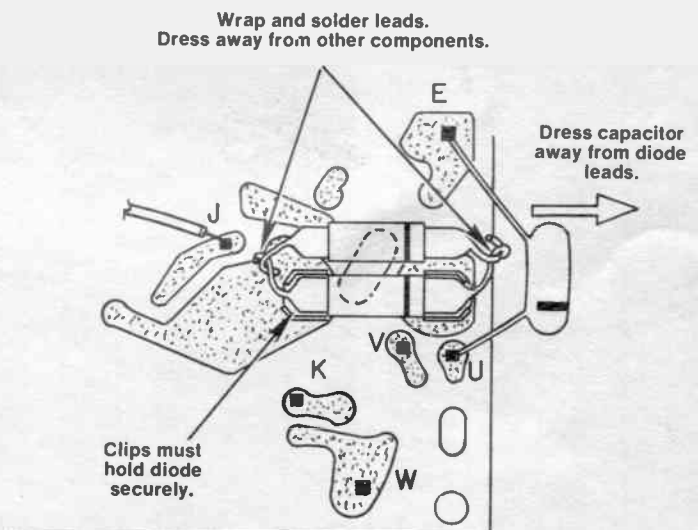
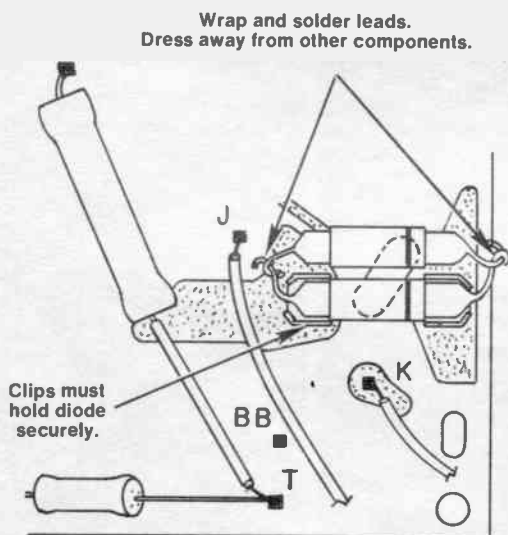
Note: Damper diodes are supplied by two vendors. The black plastic barrel portion of one is slightly larger than the other. Always use two of the same configuration.

Parts and Accessories will be packaging, under Stock No. 135320, two diodes which are the same as those previously supplied except they will have leads attached to either end. Installation instructions will be included. Single diodes (without leads) Stock No. 120818, will not be available.

Installation Instructions

1. Wrap the diode leads together and solder. Make a good mechanical and electrical bond. Keep leads as short as possible, clip off excess. Space diodes approximately $\frac{1}{8}$ " apart for easier installation.
2. Install the diodes as shown in the appropriate illustration.

Caution: Relatively high differences in potential exist between the damper diode terminals and other components in the immediate area. These components include capacitors, the metal chassis, board terminal stakes and associated leads, and printed circuitry on the PW400 board itself as well as adjacent boards. Be sure the diode leads are dressed well away from these components. Make certain the mounting clips hold the diodes securely in position after proper lead dress has been established.



Installation of damper diodes in parallel



Television Service Tips

Volume XXII
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Important Information for your Service Department

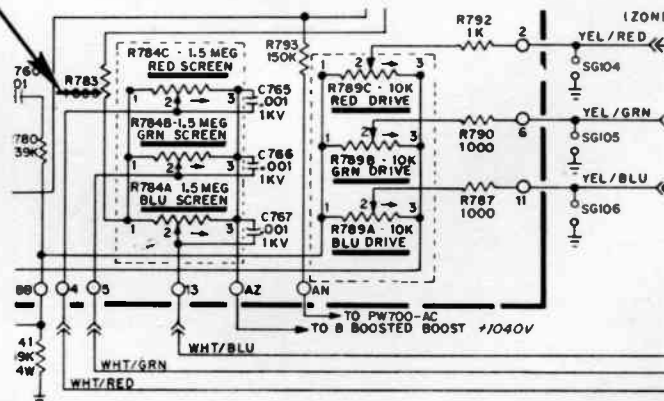
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Schematic Correction CTC 39X

Service Data 1970 No. T3

The resistance of R783 is shown on the schematic as "1000". The correct value is 100K. Using a 1000 ohm resistor in this application may result in color temperature setup problems and/or reduced Screen control (R784A,B,C) life.

Should Read "100K"



Screen Control Circuitry—CTC 39X



Television Service Tips

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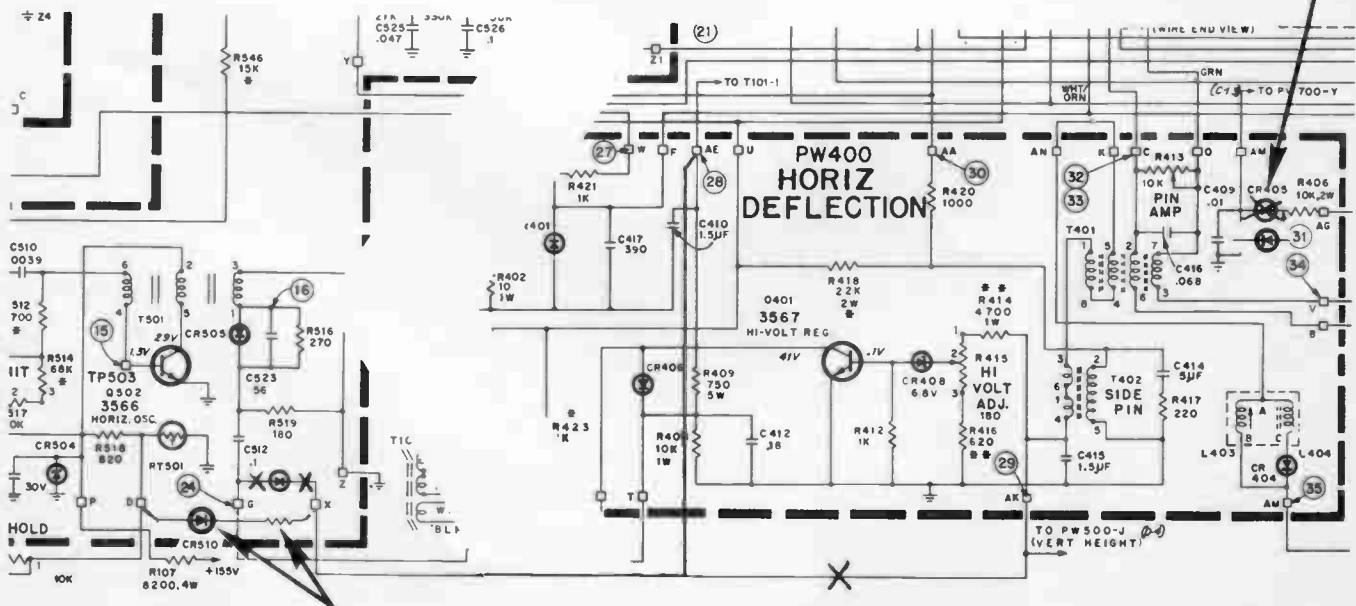
A. Commutator SCR 102 Protection B. Schematic Correction—CR 405 CTC 44

Service Data
1970 No. T15

A. Should commutator SCR (SCR 102) failure occur in early-production versions of the CTC 44 chassis the following circuit change should be made to optimize reliability.

1. Move CR 510 anode lead from PW 500-G to PW 500-D.
2. Add to 1000 ohm, 20%, 1/2 watt resistor in series with CR 510 cathode lead (to PW 500-X). Use heat shrinkable tubing or spaghetti over the diode and resistor.
3. Change the jumper connecting terminal PW 500-X to the PW 400 board from terminal AK to AE.

B. CR 405 is reversed on the schematic. The cathode rather than the anode should connect to terminal PW 400-AH.





Television Service Tips

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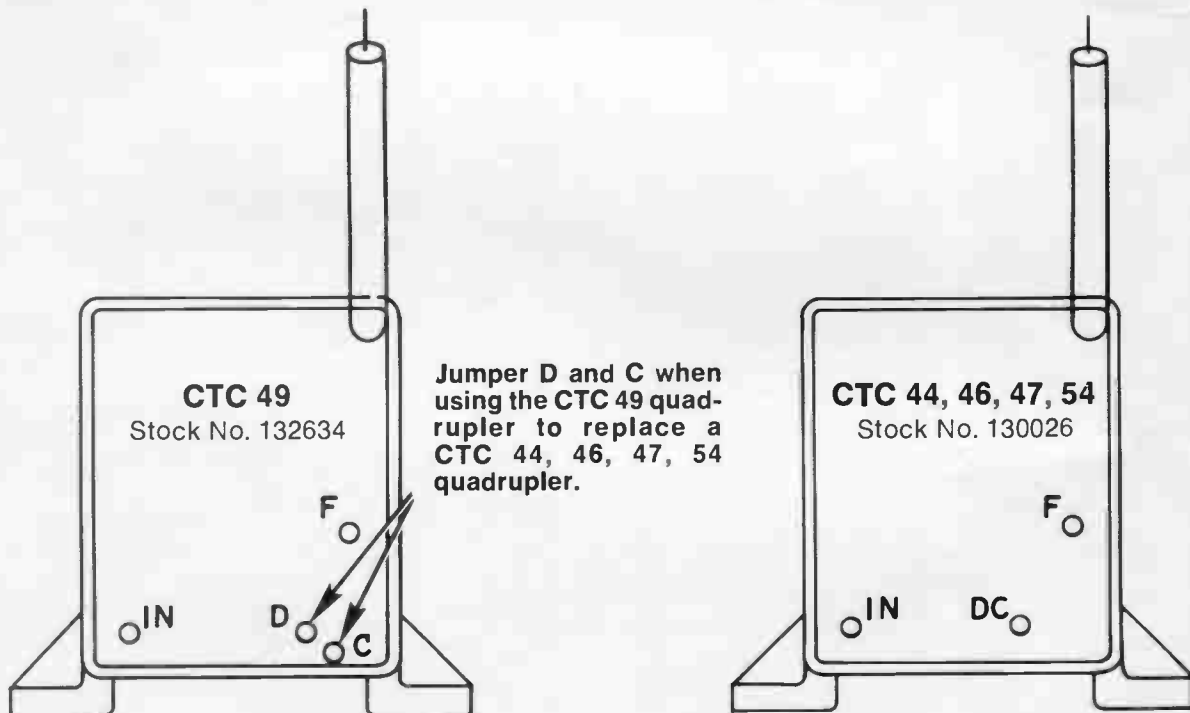
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Service Data
1969 No. T19
1970 No. T15
1970 No. T19
1971 No. T8
1971 No. T13

High Voltage Quadrupler Interchangeability CTC 49/CTC 44, 46, 47, 54

The CTC 49 quadrupler (Stock No. 132634, Drawing No. 1463641-2) can be used as a direct replacement for the CTC 44, 46, 47, 54 quadrupler (Stock No. 130026, Drawing No. 1463641-1) by jumpering quadrupler terminals "D" and "C" together and using that point for the "DC" connection. Stock No. 130026 **cannot** be used in the CTC 49 chassis.





Television Service Tips

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COLOR TELEVISION TROUBLESHOOTING HINTS

This Service Tip is designed to aid the television technician in servicing current RCA instruments by listing troubleshooting hints. The lists are compiled from field reports of servicing incidents and are grouped according to chassis number. As an example, to use the information in this tip when servicing a CTC 38 chassis with the symptom of "no picture": first, turn to the CTC 38 section; then determine the General Symptom Area, which in this case would be Video; next, in the Video section, find the specific symptom under Symptom Description—in this instance No Picture; finally, listed under Components and Comments is a list of components that, based on reports of multiple servicing incidents, have caused this specific symptom.

Also, additional helpful hints may be found in other sections which pertain to another chassis of the same "family." The following cross reference can be used as an aid in locating more information on a specific chassis.

Chassis Being Serviced:	Page Number:	Also Refer To:	Page Number:
CTC 38	3	CTC 39	6
CTC 39	6	CTC 38	3
CTC 40	7	CTC 44, CTC 47	11, 15
CTC 41	9	*	
CTC 42	9	*	
CTC 43	9	*	
CTC 44	11	CTC 40, CTC 47	7, 15
CTC 46	13	CTC 49	17
CTC 47	15	CTC 40, CTC 44	7, 11
CTC 49	17	CTC 46	13
CTC 50‡		CTC 38, CTC 39	3, 6
CTC 51	19	†	
CTC 52	19	†	
CTC 53	19	†	
CTC 55	19	†	

* These chassis are grouped in one section.

† These chassis are grouped in one section.

‡ No separate listing for the CTC 50. Use the CTC 38 and/or CTC 39 sections.

NOTES

CTC 38 Chassis

General Symptom Area	Symptom Description	Components and Comments
Audio	No sound	T103 (Audio output) T203 (Quadrature Coil) C203 (Base of Q201) R236 (Cathode of CR201) T202 (IF transformer) Q201 (1st Sound IF Amp) Q202 (2nd Sound IF Amp)
	Weak sound	C205 (Emitter of 201) C211 (V201 Pin 6) R201 (V201 Pin 6)
	Distorted Sound	T203 (Quadrature Coil) T202 (IF transformer)
	Distorted and Intermittent Sound	R153 (Volume Control) T203 (Quadrature Coil) T202 (IF Transformer) Q201 (1st Sound IF Amp) Q202 (2nd Sound IF Amp)
Video	No picture	DL101 (Delay Line) C249 (V203 Pin 9) R231 (Collector Q206) L211 (V202 Pin 2) L208 (41.25 MHz trap) L209 (Cathode CR202) L210 (Anode CR202) CR202 (2nd detector)
	Picture smear	DL101 (Delay Line) L217 (Cathode CR202)
	Overloaded picture	R101 (AGC Control) C249 (V203 Pin 9) L212 (4.5 MHz trap) L205 (IF output) C725 (V702 Pin 7) Q206 (AGC)
	No control of brightness	L710 (Video output coil) CR708 (PW700—AE) C276 (V204 Pin 7) R140 (PW700—BB)
	Intermittent or No Brightness (High Voltage Normal)	C127 (V105 Pin 2) DL 101 (Delay Line) R161 (Brightness Limiter) R163 (Brightness) C111 (V103 Pin 2) CR101 (T102 Pin 3) R124 (T101 Pin 2) R777 (V704 Pin 6) L708 (Anode CR708) C276 (V204 Pin 9) R252 (V203 Pin 8) SG704 (V706 Pin 2) R755 (V704 Pin 6)
	Intermittent or No Video	L710 (Video Output Coil)

CTC 38 Chassis (Continued)

General Symptom Area	Symptom Description	Components and Comments
Video/Audio	No picture or sound	R143 (Power supply bleeder) R162 (PW200—KK) T105 (Power transformer) CR204 thru 207 (Bridge rectifier) L203 (Video IF Coil) L30 (Link Mixer Coil) C9 (In tuner) Q1 (On tuner) Q2 (On tuner) Q3 (In tuner) Q203 (1st video IF) Q204 (2nd Video IF) Q205 (3rd Video IF) R222 (Bias 1st Video IF)
Sync	No Horizontal Sync	CR203 (Horizontal AFC) L205 (IF Output) RV202 (V204 Pin 1) L215 (Sinewave Coil) R149 (Horizontal Hold)
	No Vertical Sync	C119 (Power Supply Filter)
Vertical Frequency/Sweep	No Vertical Deflection	R108 (Vertical Hold Control) C131 (PW200—L) R129 (Vertical Output Transformer) R130 (Vertical Output Transformer) R132 (Vertical Output Transformer) R115 (T102 Pin 1) R276 (V205 Pin 9) C260 (V205 Pin 9)
	Vertical Jitter Low Height	CR101 (T102 Pin 3) SG102 (Series T102 Pin 1) R107 (Vertical Linearity) CR101 (Series T102 Pin 1) R164 (PW200—L) R114 (Cathode CR101) SG103 (V102 Pin 5)
Horizontal Sweep/High Voltage	Low or No High Voltage	T108 (Side Pincushion) L215 (Sinewave Coil) T102 (High Voltage) T101 (Focus Coil) R118 (SG103 to ground) C278 (L215 Term.—E) C749B (Horizontal Eff. Coil) SG103 (V102 Pin 5) L710 (Video Output Coil)
Color	Weak or Intermittent color	T703 (3.58 MHz osc.) C725 (Horizontal hold) Q702

CTC 38 Chassis (Continued)

General Symptom Area	Symptom Description	Components and Comments
Color (Continued)	Weak or No Color	R728 (Q702 collector) L704 (V703 Pin 3) R159 (Color Control) R733 (T702 Term.—B) Q701 (Color Killer) Q702 T703 (3.58 MHz osc.)
	Weak or No Color Sync	R733 (T702 Term. B) C726 (T702 Term. B) T702 (Burst Transformer) C728 (Q702 Collector)
	Weak or Intermittent Green	CR706 (G-Y Clamp) SG105 (Green Drive) C721 (Anode CR706) R784 (Green Drive Control)
	No Red	SG701 (Red Grid) R718 (V705 Pin 5) R752 (Cathode CR705) L702 (V705 Pin 1)
	No Blue	C732 (T703 Term. E) R707 (B-Y Clamp) CR704 (PW700—M)
	No Control of Color Poor or no Tint Action	R159 (Color Control) L703 (Series with CR703) L705 (Series with V704, Pin 2) C731 (T703 Term. C) L704 (V703 Pin 3) V701A (G-Y Amp)
	No Control Primary Color	CR705 (R-Y Clamp)
	No Primary Color	C732 (T703 Term. E) R718 (V705 Pin 5)
	No Color Killer Action	Q701 (Color Killer)
	Vertical Bars on Color Only	T701
	Color on Highlights Only	Q702
	Green Band Left Side	L705 (V704 Pin 2)
	Power Supply	Low or No B +
No AC		L111 (Linechoke)
Flicker		C114 (Filter)

CTC 39 Chassis

General Symptom Area	Symptom Description	Components and Comments
Video	Hum bars RF in pix with AFT on Weak pix, no snow High brightness Overloaded pix	C119 (Bad Gnd.) C4005 C703 (Shorted or Leaky) C275 (Leaky) L212 (Open at Term. C)
Horizontal Sweep/High Voltage	No High Voltage, No B + to Horizontal Oscillator	C104, R105
Video/Audio	No Pix, No Sound	Q206 (Open Base) Q202 (Short E-B) R777, R145, R796
Horizontal Frequency	Horiz. Pulling	C274 (Loose Connection)
Remote	Remote Dead	C911 (Open)
Color	No color Weak color Poor accu-tint action No burst Green strips in color	Q701 Y101 Q702 R796 (Change to 100K 1W) T701 3.58 MHz crystal
Power Supply	B+ short (R145 hot)	C105 (Shorted)
Tuner	VHF RF osc. drifting Intermittent pix and sound	Q3 Osc. contacts

CTC 40 Chassis

General Symptom Area	Symptom Description	Components and Comments
Audio	No sound	Q102 (Audio output) R111 (Coll. audio output) CR104 (Coll. audio output) T104 (Output trans.) IC301 (Audio chip) T302
	Weak or distorted sound (TV only)	Q102 (Audio output) Q99 (Audio Pre-Amp)
	Buzz-hum in sound	Q102 (Audio output)
Video	No pix	Q311 (AGC inverter) Q302 (1st pix IF) L308 (Coll. 2nd IF) Q718 (Video output)
	No, or intermittent brightness, (High voltage normal)	Q313 (4th video) Q312 (3rd video) Q308 (2nd video) C354 (Leaky)
	No control of brightness	Q313 (4th video) Q312 (3rd video) CR706 (Kine grid)
	No focus	CR1501, CR1502 (Focus rect.) CR405 (PW400—AH)
	No or intermittent video	Q313 (4th video) Q308 (2nd video) Q304 (3rd pix IF) Q305 (1st video) Q309 (Sync sep. amp) DL301 (Delay line)
	Intermittent AGC	Q311 (AGC inverter)
	Snowy pix	Q5 (RF amp)
Video/Audio	No pix or sound	Q304 (3rd pix IF) Q311 (AGC transistor) Q302 (+155 supply) CR306 (+155 supply) RT301 (+155 supply) CB101 (Circuit breaker) CR301 (Shorted)
Sync	No sync	Q309 (Sync sep. amp) Q310 (Sync sep.) Q501 (Phase splitter)
	No horizontal sync	Q501 (Phase splitter)
Vertical Frequency/Sweep	Wrong vertical frequency	Q503 (Vertical switch)
	No vertical deflection	Q503 (Vertical switch) Q101 (Vertical output) Q506 (Lin. clamp) Q505 (Vertical driver) CR401 (Trace diode open)
	Low height	Q503 (Vertical switch) Q506 (Lin. clamp) T401 (Pincushion trans.)

CTC 40 Chassis (Continued)

General Symptom Area	Symptom Description	Components and Comments
Horizontal Frequency	Horizontal ocs. hunting	CR407 (Shorted)
Horizontal Sweep/High Voltage	No or low high voltage	V101 (3CZ3) (H.V. rect.) SCR101 (Trace) SCR102 (Retrace) CR401 (Trace diode) CR403 (Protection diode) CR101 (250V supply) CR402 (Retrace diode) C403 (Comm. capacitor) T101 (High voltage trans.) T103 (Shorted trans.)
	No high voltage	C415 (Shorted) R414 (Open)
Color	Weak or Intermittent color	Q702 (Chroma amp) Q701 (Burst amp)
	Intermittent or excessive green	CR706 (Kine grid circuit)
	No or weak color sync	Q701 (Burst amp)
	No color	Q702 (1st chroma) Q703 (2nd chroma) Q103 (Phase splitter) Q708 (Bandpass amp.) T702 (Q707 collector) Q704 (Color osc.) CR705 (Q708 collector)
	No red	Q709 (R-Y driver) R603 (Screen control) Q712 (R-Y amplifier)
	No blue	Q710 (B-Y driver) R607 (Screen control) Q713 (B-Y amp.)
	No primary color	L704 (Q709 base)
Power Supply	Circuit breaker trips	CR306 (+155 supply) SCR102 (Checks O.K.)
	Low B +, no B +	CR306 (155V supply) RT301 (155V supply) CR402 (SCR102) CR101 (250V supply) CR307 (82V supply)
	No AC	S101 (On-Off switch) T106 (Power trans.)
	Circuit breaker open	CR306 (155V supply) V101 (H.V. rect.) CR307 (82V supply) SCR102 (Retrace)
	No B +	CR306 (PW300)

CTC 41/42/43 Chassis

General Symptom Area	Symptom Description	Components and Comments
Audio	No sound	J201B (Contact) CRM1
	Hum in sound	IC299
	Sound decreasing or fades	PW1700 (CRM1)
	Garbled—Hum	C1104
Video	Hum in raster	V402 (31LQ6)
	No pix	V402 and CR401
	Snow on UHF (VHF dead)	Q3 (VHF tuner)
	No video, no chroma	CR203
	No raster	DL701
	AGC overload	Q201
Video/Audio	No pix, no sound, no brill.	CR101
	No pix, no sound	Q204 (E-B short) Q202 (E-B open) Q203 R95, C17 (Cap shorted— resistor open) Q3 (VHF tuner) Q202 Q207
	Intermittent video and sound	Q207
	Intermittent video and sound (UHF)	Q1 (UHF tuner)
Sync	Weak sync	R526
Vertical Frequency/Sweep	No vertical deflection	T104 (Open)
Horizontal Frequency	No horiz. osc.	C519 (Leaky)
Horizontal Sweep/High Voltage	No H.V.	CR401 (Damper diode) T102
	No H.V., low bias horiz. osc.	C515
	H.V. loads down	SG123 (shorted)
Color	Intermittent brill., flashing	Q702
	No red in chroma, B&W too red	CR706 (Low front to back)
	No red in chroma, B&W OK with pink highlights	A701 (Chroma demod. substrate)
	No color	C706 (Leaky)
	Intermittent color	Q701
	No X color	A701
	Intermittent green bar	L707 (Open)

CTC 41/42/43 Chassis (Continued)

General Symptom Area	Symptom Description	Components and Comments
Power Supply	Circuit breaker trips	CR712 (Shorted) CR401 (Shorted)
	No pix or sound—shorted rect., open fuse	CR712 and F101
Remote	Excessive sensitivity to random noise	CR1117
	Phantom channel change	Q1101
	No control local volume, Remote OK	CR1102 (Open) CR1113 (Shorted)
	Remote dead	C1108 CR1117 T101 K101 Q901 CR1117, C1106 and Q901 IC901 C1108 (Open)
	Volume up and down inoperative after warmup	CR1118

CTC 44 Chassis

General Symptom Area	Symptom Description	Components and Comments	
Audio	No sound	R111 (Open) CR102 (Shorted)	
	Intermittent sound	IC301 Tone control (Lead dress short) T302	
	Hum in sound	C1109	
	Hum in sound and color	C1131	
	No audio	R111 (Open) Q102 (Shorted)	
Video	Bright raster, no video	R104 (Open)	
	No video	R250 Q720 (Open) Q303 (Shorted) R345 (Open) Q304	
	Dark, bending, contrasting pix	CR203 (Open)	
	Intermittent snowy raster	Q3 (VHF tuner)	
	Intermittent video	Q312 Q304	
	Bright line and hum right side of raster	C318	
	Snowy pix	Q5 (VHF tuner)	
	Can't kill brilliance	CR712 (Shorted)	
	No control of brilliance	CR101, R104	
	No AGC	Q311	
	Hum bars on color and hum in sound	C1107 C1109	
	Hum in pix	R104 R106 (Open) C354 CR101	
	Video/Audio	No pix, no sound— snow in raster	L27 (Open)
		No pix or sound	CR302 Q307
Sync	No sync	Q310	
Vertical Frequency/Sweep	No vertical deflection after ½ hr.—freeze spray used to locate	Q505	
	Foldover—no gate pulse at SCR101	L401	
	No vertical sweep	Q101	
Horizontal Frequency	Horizontal drift	Q502 CR504	
	Horizontal bending	C354	

CTC 44 Chassis (Continued)

General Symptom Area	Symptom Description	Components and Comments
Horizontal Sweep/High Voltage	Low brilliance	R406
	No H.V., breaker trips, DC resistance low	T102 (Shorted turns)
	Low H.V.	SQM101
	Intermittent brilliance level, no H.V.	Q401
	No high voltage, breaker may trip	C403 (Shorted) may read OK with ohmmeter or cause intermittent tripping of breaker
	No high voltage	CR401 (Shorted) C415 Q502 (Open emitter) C402 (Open)
	No H.V., circuit breaker trips	CR315, CR312, SCR101, SCR102, C403
	Severe ringing in raster	L401 (Open)
Color	No control of tint	R614 (Not connected) Q1105
	Very little control of tint	Q711
	Intermittent color	C734 Q709
	High red screen	CR706 (Open)
	Too much color, no control	CR709 (Open)
	No color	Q703 Q710 (E-B short) Q704 T702 CR715 (Shorted) Q702 Q707 L708 (DC resistance OK but had shorted turns)
		Weak color
Power Supply	Circuit breaker trips	CR402
	B + short	SCR101
	200V P/P on 155V source	C108 (Open)
Remote	UHF tuner runs	Q1111 (Leakage)
	Remote dead	C1131
	Remote insensitive	C1131
	Turns off but comes back on	K1103 (tip of armature missing)
	Intermittent shut-off	K1103
	VHF channel selector stops only on UHF position	Q1108 (E-C leakage)
	Full volume, no control	CRM1103 (solder joint)
	On-off OK, all other funct. out	Q1112

CTC 46 Chassis

General Symptom Area	Symptom Description	Components and Comments
Audio	No sound	MAN module PM200 module
	Sync buzz	Add 3.3K from TP4 to gnd. (See "Service Goldenrod, 1971 No. T8") MAK module
	Poor sound	C1104 PM200 module MAK module
Video	No control of brill.	R-608 (Open) Cracked board at bias control
	No brill., color can be seen	MAL module Poor ground on parent board
	No brill.	R103 (Open)
	No brill., sound & H.V. OK	MAE module
	Excessive brill.	R155
	Intermittent brill.	R608B Q302 (Connections) R4209
	AFT critical No pix, snowy pix	R9 adjustment MAL module MAE module Q302
Video/Audio	No pix, loud hum	C105B (Open)
	No pix, no sound, with raster	R317 (Open)
	No pix, no sound	RT101 (Open) MAK module
Sync	No sync/poor sync	MAL module MAG module
Vertical Frequency/Sweep	Vertical jitter	MAG module Noise control adj
	No vertical sweep	MAG module Q101, Q102, and R221 CR102 C416
Horizontal Frequency	No horiz sync	Q402 CR401 MAH module MAL module
	No high voltage	SCR101 (Shorted) SCR 102 (Shorted) PW600 board cracked between term. H and pin #10 of MAB socket Quadrupler MAH module CR401, 402 CR408, R424 R407 R317 T403

CTC 46 Chassis (Continued)

General Symptom Area	Symptom Description	Components and Comments
Horizontal Sweep/High Voltage	No high voltage (Shorted under load)	Quadrupler
	Horiz foldover	CR401, T401
	Narrow raster	CR401 SCR101
	Low high voltage	Quadrupler
	SCR101 shorts	T405 (Shorted)
	High voltage arcing	R114, R114 cover Second anode connection
	Drive lines in raster	C406
Color	No color	MAC module MAE module AFPC alignment 3.58 mHz crystal
	No ACM	ACM switch
	No ACM light	ACM lamp
	Weak color	MAC module
	Color fades	MAL module
	No control of tint	MAE module
	No control of red	MAD module (Red)
	No blue	MAD module (Blue)
	Green screen	Kine (H-K short)
	Color level wrong with ACM on	Readjust ACM level
	Changing purity	Picture Tube
	Power Supply	C.B. trips
No AC		CB101 (Open)
No AC (Jumpering P105 restores T.V. operation)		Q1102 (Shorted) K101 remains energized
Arcing		R103
Tuner	No pix, no sound	Mixer transistor
	No AFT action	MAK module Shorted AFT switch
Remote	No remote OFF	K101
	No remote ON	Q1102
	No control of sound	CRM1101 Hold down wire shorted to L1102
	No remote	C1104, T104 Transducer

CTC 47 Chassis

General Symptom Area	Symptom Description	Components and Comments
Video	Snow, all channels	C61 (Feed thru cap open)
	Tint changes with brill level	C124 (Cap open)
Video/Audio	No pix or sound	Q304 (Open emitter)
Horizontal Sweep/High Voltage	No H.V.	SCR101, CR401 (Circuit breaker trips) SCR101 (Circuit breaker trips) SQM101 (Quadrupler)
Color	No color sync	Q701 (Open emitter junc.)
	Intermittent color changes	R779 (Poor connection on board)
Remote	No remote on-off, No remote VHF, No remote color, UHF OK, Volume OK, Tint OK	PW3200 (Board making intermittent contact at connector.)
	Receiver will not turn on-off	K101 Relay (Latch broken)
	No video muting while UHF searches	Q103
	Won't change channels, receives ch. 13 only	IC3404
	Insensitive remote	PW3700 (Mike wired to 30V supply instead of 270 V supply)
	Won't stop ch. 2	Q3501 (Open emitter base)
	Only gets ch. 12 ch. 11 lamp stays on	Q3510 (Upper channel osc. running at all times)
	Remote or manual won't change channels	CR3701 (Zener shorts killing 5V supply)
	Set goes to VHF when UHF button is pushed	UHF dial lamp lead shorted to ground
	No VHF channel change	Q3707

NOTES

CTC 49 Chassis

General Symptom Area	Symptom Description	Components and Comments
Audio	No sound or intermittent sound	PM200 module
Video	Intermittent change in brill.	Kine socket spark gap
	No pix	MAL socket
	No pix, no brill.	MAL module
	No pix, no control of brill.	MAC module CR307
	No brill.	MAE module
	Shaded raster (Top)	MAE module
	No "raster" position	R302
	Dark raster, no focus	Kine
	Hum in pix	CR305
Video/Audio	Poor pix, buzz in sound	MAK module
	No pix, no sound	MAK module
	Beat in pix after warmup	MAK module
Sync	No sync	MAL module
	Poor sync	MAL module
Vertical Frequency/Sweep	No vert sweep	Q101, Q102, R221 CR104 MAG module
	Intermittent vert. sweep	Q101
	Insufficient vert. deflection	MAG module
	Vert. stretching and shading running thru pix	CR303 (Open)
Horizontal Frequency	Horiz off freq. C.B. trips	MAH module
Horizontal Sweep/High Voltage	No high voltage	MAH module SCR101—R424 Commutating coil lead broken (L104)
	No high volt. regulation	Q401
	Poor width	T401
	Intermittent side pincushion	C417
	Horiz foldover	C401
	Arcing high volt.	R428 and C420
	Very wide pix	Q401 (H.V. regulator)

CTC 49 Chassis (Continued)

General Symptom Area	Symptom Description	Components and Comments
Color	No control of tint	MAE module
	All red raster	MAD module (Red)
	All blue raster	MAD module (Blue)
	No green	MAD module (Green)
	Intermittent blue	MAD module (Blue) R201
	No color lock	MAC module
Power Supply	C.B. trips	MAB module CB101 (Open) MAH module SCR102
Tuner	No AFT action	AFT switch C4005 (Shorted)
	Snowy low channels	C17 (Shorted)

CTC 51/52/53/55 Chassis

General Symptom Area	Symptom Description	Components and Comments
Audio	No sound/poor sound	PM200 module V201 T299 (Adjust) L214 T103
Video	Hour glass shaped raster at low brightness only	R541
	No pix, sound & brightness OK	Q207
	No AGC	T104 (Open at pin 4)
	No pix	Q202 R134 C520 V706 Q206 L221 V102 L211 R746 Q203
	Low brightness	CR401
	Double image	R211 (AGC control)
	Intermittent pix	Link cable connection Antenna connection Q205, R730
Video/Audio	No pix, no sound, dim raster	L113 (Open)
	No pix, no sound	CR706 CR707 Q203 C712 L405 CR706 RV701, RT102 S4101
Sync	No sync, AGC	Q501 T102 L220 Q502 CR501 CR502
Vertical Frequency/Sweep	Insufficient vertical sweep	C530 T601 connections
	Poor vertical linearity	V502 Height control
	No vertical	V502 C520 C530 C540

CTC 51/52/53/55 Chassis (Continued)

General Symptom Area	Symptom Description	Components and Comments
Horizontal Frequency	No horiz. hold	V501 L501 CR501 C529 R555 R547
Horizontal Sweep/High Voltage	No high voltage	V102 V401 V402 V501 C512 (Leaky) R402 R134 (Open lead) C519
	Horiz. singing	T102 V402
	High volt. arcing	H.V. socket
	Drive line	V401
	Poor focus	V402, V102
	Retrace lines	CR702
Color	Purple shading top 1/2 of pix on color programs only	Incorrect color Killer setting
	No color	Q701 V704 MAS module T701 V705 V703 Q206
	Poor color	V701 MAS module AFPC adj.
	Intermittent color	T702/704 connections
	Poor gray scale	CR703 CR704 CR705
Remote	Skips channels	Increase hand unit tone rod damping
	Remote dead	Master on/off sw Defective hand unit
Power Supply	C.B. trips	CR706 C519 (Shorted) CB101 (Open)
Tuner	Snowy pix	V1 (RF amp)
	No AFT action	IC201

Important Information for your Service Department

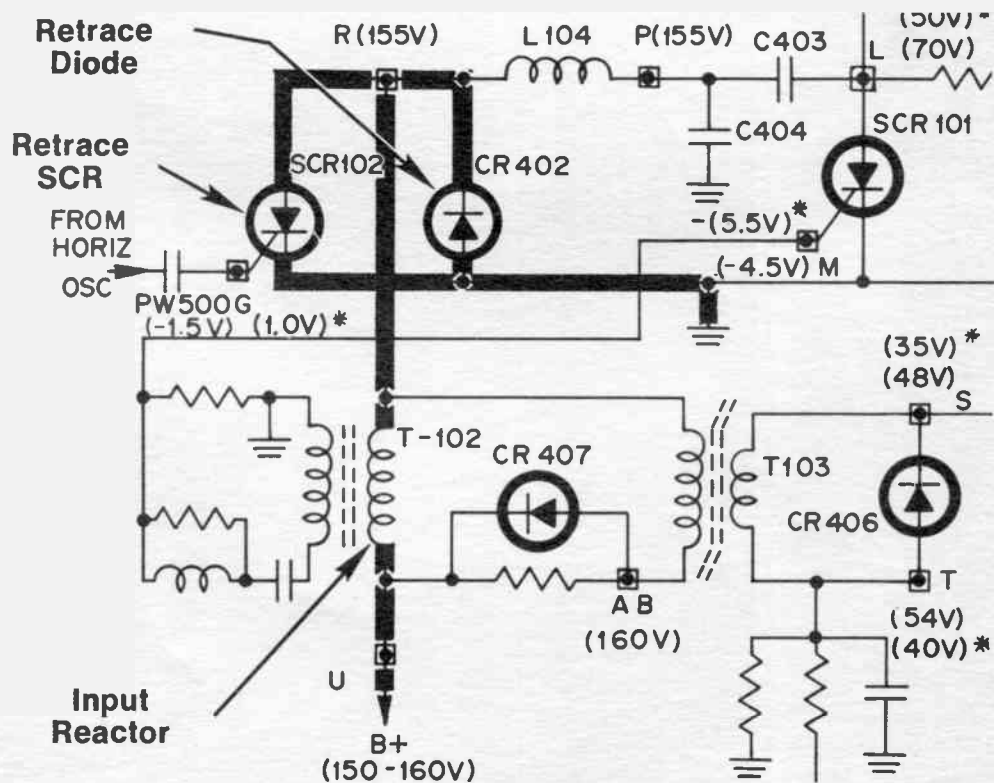
Prepared and Distributed by RCA Consumer Electronics, Technical Services
600 N. Sherman Drive, Indianapolis, Indiana 46202

Retrace SCR/Diode—Input Reactor CTC 40, 44, 47 SCR Sweep Systems

A poor, but common troubleshooting technique—the practice of jumpering the circuit breaker in order to locate B+ shorts—can often make a difficult service job out of a relatively simple one as it may cause additional component failures. Locating the **induced** problems usually requires more involved troubleshooting techniques than finding the **original** one.

One example of this can become quite evident when servicing the SCR Sweep System. In the event the Retrace SCR (SCR 102) or Retrace Diode (CR 402) fails (shorts), the 155 volt supply is connected to ground via the Input Reactor (T102) primary winding. Consequently the circuit breaker will trip—the normal protective action. If circuit breaker action is defeated for only a short time (4-8 seconds) either by holding the breaker “in” or by jumpering, the Input Reactor will be overloaded, resulting in the possibility of shorted turns. Now, after the original defective component (shorted Retrace SCR or Retrace Diode) is replaced, a new induced symptom of “No High Voltage, Circuit Breaker Holds” will be evident. Additional servicing time will be required to find that the Trace SCR has no gate pulse because the Input Reactor has shorted primary turns.

Also, damage to the filter choke and/or power transformer can be expected if the chassis is operated for any length of time with the circuit breaker jumpered. Current instruments utilizing such chassis as the CTC 46, CTC 49, and CTC 54 have a fuse in series with the circuit breaker for protection in the event breaker action is defeated.



Basic SCR Deflection System—Partial Schematic



Television Service Tips

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Important Information for your Service Department

Prepared and Distributed by RCA Consumer Electronics, Technical Services
600 N. Sherman Drive, Indianapolis, Indiana 46202

SERVICING RCA X-RADIATION PROTECTION CIRCUITS

This Service Tip is designed to aid the television service technician in servicing the X-Radiation protection circuits used by RCA to comply with the rules and regulations of the U. S. Department of Health Education and Welfare.

The tip provides the theory of operation, troubleshooting symptoms and procedures, together with the steps required to verify proper operation of these circuits. **For continued product safety**, it is recommended that these verification steps be used every time service is performed on the horizontal sweep circuits of these receivers.

Note: This Service Tip is designed to be used in conjunction with the appropriate chassis service data. Pay particular attention to observe the safety precautions listed in these data.

Introduction

X-Radiation safety requirements for television receivers manufactured after June 1, 1971 have been extended to cover any single circuit fault or component failure within the receiver, that, at a line voltage of 130 VAC, with customer and service controls misadjusted to produce maximum X-Radiation, this radiation will not exceed 0.5 mR (milliroentgens) per hour at a distance of 5.0 cm from any surface of the television receiver so long as it is displaying a usable picture. Simply stated, this means that the radiation level of a television receiver be as safe as sunbathing at the beach.

To assure that RCA receivers comply with these new requirements, new circuits have been incorporated into a number of Black and White, and Color TV chassis. These circuits accomplish their purpose by one of two means: either by producing a non-synchronous picture in the event of excessive high voltage, or by redundant (back-up) high voltage regulation circuits.

This tip covers the operation and servicing of these circuits, chassis-by-chassis. For continued reliability and safety, all tube and related circuit components should be exact replacement types as specified in Service Data. In addition, all shields required in each chassis are listed. It is important (for your safety and your customer's) that all shields be in the proper position before the rear cover is replaced.

BLACK AND WHITE CHASSIS

KCS 171, 172, 174, 179, 183 Oscillator Disable Circuit—Theory of Operation

The function of the Horizontal Oscillator Disable Circuit is to provide a non-synchronous picture when the high voltage exceeds a predetermined level.

The **Horizontal-Hold** control in the circuit shown in Figure-1 determines the free-running frequency of the horizontal multivibrator. Notice that the ground return for the hold control is through transistor Q102. The base bias for Q102 is the resultant of two voltages; a regulated positive input supplied from the 145V B+ supply and a negative DC input developed by rectifying a flyback transformer pulse. In normal operation (high voltage within limits) Q102 is saturated providing a normal ground return for the **Horizontal-Hold** control. In the event of a fault that would cause an **increase** in high voltage, the flyback pulse **increases**. Thus, the negative voltage produced by diode CR 107 and filter capacitor C129 increases, driving the base of transistor Q102 negative, cutting it off. With Q102 cut off, the hold control loses its low resistance ground return, causing the

oscillator frequency to shift well beyond the normal operating range—resulting in an unusable picture (out of horizontal sync).

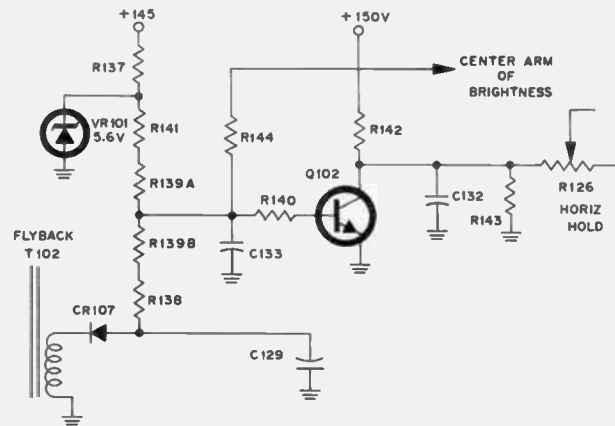


Figure 1—Typical Oscillator Disable Circuit in Black and White Receivers

IMPORTANT—DO NOT DEFEAT OR ATTEMPT TO ADJUST THESE SPECIAL CIRCUITS EXCEPT AS DESCRIBED IN THE FOLLOWING PROCEDURES.

KCS 171, 172, 174, 179, 183—Isolating Sync Problems Related to the Horizontal Oscillator Disable Circuit.

The U. S. Dept. of Health Education and Welfare requires that this circuit be operational at all times. **Note:** Unless otherwise specified all voltage measurements are made with a VoltOhmyst, with 120 VAC line voltage, and with all controls set for normal viewing.

Step-1 Connect a **temporary** jumper from the collector of Q102 to ground and follow (a) or (b) as indicated.

- If horizontal **sync is not restored** within the range of the hold control, troubleshoot the oscillator and sync circuits.
- If horizontal sync is restored within the range of the **Horizontal-Hold** control, proceed to Step-2.

Step-2 Set the **Brightness** control to minimum and measure the high voltage—see **Table-1** for correct high voltage for specific chassis.

- If the high voltage exceeds these limits, verify proper AC line voltage (120 VAC) and proper width adjustment. If both are correct, the problem is in the high-voltage circuitry.
- If the high voltage is correct, the fault is in the horizontal oscillator disable circuit. Troubleshoot and repair the cause (Q102 and VR 101 are the only active devices). Proceed to Step-3.

Important: If any component in the oscillator disable circuit is replaced, the following procedure **MUST** be performed. **PRECISELY CALIBRATED TEST EQUIPMENT IS REQUIRED FOR THE FOLLOWING MEASUREMENTS.** It is suggested that such equipment be calibrated at regular intervals.

Step-3 Remove the temporary jumper that was installed in Step-1.

Step-4 Set the width jumper for maximum width, as outlined in Service Data.

Step-5 Adjust the **Brightness** control to maximum and the **Contrast** control to minimum.

Step-6 **Temporarily** connect a short across the component in **Table-2**, and shown in Figure-2(a or b).

Step-7 Increase the line voltage until horizontal sync is lost and cannot be restored by adjusting the hold control—**DO NOT EXCEED 135 VAC.** (**Note:** If the receiver fails to lose sync at 135 VAC, troubleshoot for insufficient high voltage.)

Step-8 Slowly reduce the line voltage until sync can be restored by adjusting the hold control.

Step-9 Measure the high voltage at this line voltage—see **Table-3** for correct voltage reading.

Step-10 If the high voltage does not lie within this range, replace the **sensitivity resistor** (sealed potentiometer) and adjust it to produce a very slight picture bend with the line voltage adjusted to produce the high voltage specified in **Table-4** for the specific chassis.

Step-11 Remove the **temporary** short across the “defeated” component (Step-6).

Step-12 Adjust the width jumper to its proper position at **108 VAC**.

Step-13 Verify that the receiver will maintain horizontal sync throughout the range of **Brightness** control at **130 VAC** line voltage.

Step-14 Using epoxy cement, carefully seal the **sensitivity resistor**.

Note: Later production receivers are not equipped with the subject Oscillator Disable Circuit. Instead, they use certain circuit refinements that limit the maximum high voltage developed under the failure mode described in the introduction. These chassis can be readily identified by noting that they do not contain the epoxied potentiometer and its associated components.

TABLE-1

Chassis	Nominal High Voltage
KCS 171	17 kV ± 2 kV
KCS 172	20 kV ± 2 kV
KCS 174	20 kV ± 2 kV
KCS 179	20 kV ± 2 kV
KCS 183	20 kV ± 2 kV

TABLE-3

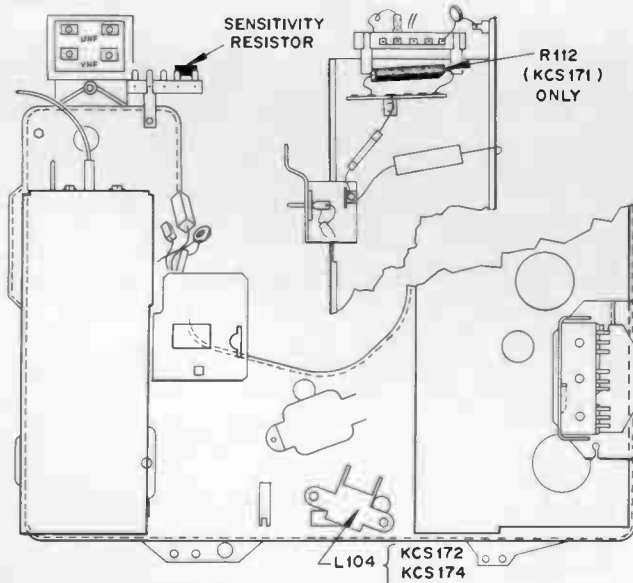
Chassis	Minimum	Maximum
KCS 171	19.3 kV	20.2 kV
KCS 172	22.1 kV	22.7 kV
KCS 174	22.1 kV	22.7 kV
KCS 179	22.1 kV	22.7 kV
KCS 183	22.1 kV	22.7 kV

TABLE-2

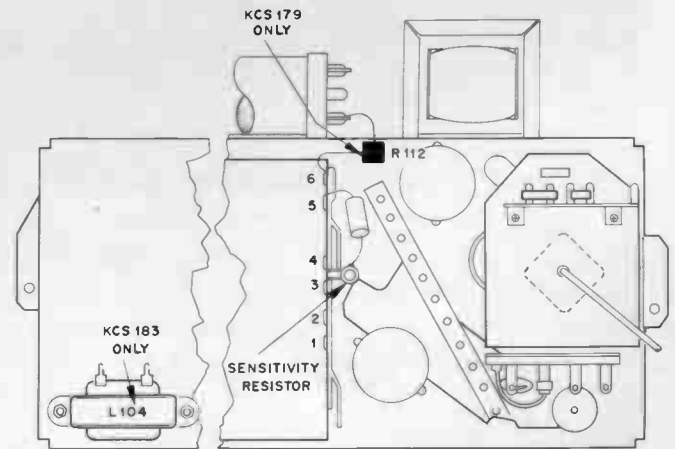
Chassis	Short Across	Figure
KCS 171	R112	(a)
KCS 172	L104	(a)
KCS 174	L104	(a)
KCS 179	R112	(b)
KCS 183	L104	(b)

TABLE-4

Chassis	Adjust Line Voltage for
KCS 171	19.6 kV
KCS 172	22.4 kV
KCS 174	22.4 kV
KCS 179	22.4 kV
KCS 183	22.4 kV



(a) KCS 171, KCS 172, and KCS 174



(b) KCS 179 and KCS 183

Figure 2—Disable Circuit Component Locations

COLOR CHASSIS

CTC 39 and CTC 50 High-Voltage Regulator Circuits—Theory of Operation

(Component Numbers Refer to CTC 39)

In addition to the primary shunt regulator system, the CTC 39 and CTC 50 chassis, after June 1, 1971, have a redundant regulator circuit as shown in Figure-3. This circuit provides grid regulation of the horizontal output in the event of failure of the shunt regulator.

Failure of the shunt regulator reduces the load on the high-voltage rectifier and the flyback transformer. With this reduced load, the flyback transformer voltage will increase. A sample of this voltage, taken from pin 3 of the flyback, is coupled through capacitor C141 and resistor R185 to diode CR 103 which clamps this input voltage to a nega-

tive DC level. This voltage is developed across resistor R186, coupled through diode CR 106 and resistor R187 to the zener diode CR 107. If the pulse from the flyback is large enough, sufficient voltage is developed to couple through the zener diode CR 107 network, charge the filter circuit (composed of capacitor C127 and resistor R165) and bias the control grid of the horizontal output tube. This increase in negative bias on the tube reduces its conduction, reduces the energy supplied to the flyback transformer, resulting in a lowering of high voltage—maintaining it well below the specified limit.

Other than schematic reference numbers, the operation of the CTC 50 redundant regulator system is identical.

CTC 39 Chassis—Checking the Operation of the Redundant Control Grid Regulator

The U. S. Dept. of Health Education and Welfare requires that this circuit be operational at all times. The following procedure will provide a means of assuring proper operation of the circuit.

Step-1 Set the input line voltage to **120 VAC**.

Step-2 Set the **Brightness** control to minimum.

Step-3 Measure the voltage at the junction of C127

and CR 107 (Figure-4a). It must lie within the range of $-78 \text{ VDC} \pm 10 \text{ VDC}$.

(a) If the voltage is high, troubleshoot high voltage circuits.

(b) If the voltage is low, troubleshoot the redundant regulator circuit.

Step-4 Check to be certain that the shunt regulator and degaussing shields are in their proper positions.

CTC 50 Chassis—Checking the Operation of the Redundant Control Grid Regulator

The U. S. Dept. of Health Education and Welfare requires that this circuit be operational at all times. The following procedure will provide a means of assuring proper operation of this circuit.

Step-1 Set the input line voltage to **120 VAC**.

Step-2 Set the **Brightness** control to minimum.

Step-3 Measure the voltage at the junction of C106

and CR 105 (Figure-4b). It must lie within the range of $-63 \text{ VDC} \pm 7 \text{ VDC}$.

(a) If the voltage is high, troubleshoot high voltage circuits.

(b) If the voltage is low, troubleshoot the redundant regulator circuit.

Step-4 Check to be certain that the shunt regulator and degaussing shields are in their proper positions.

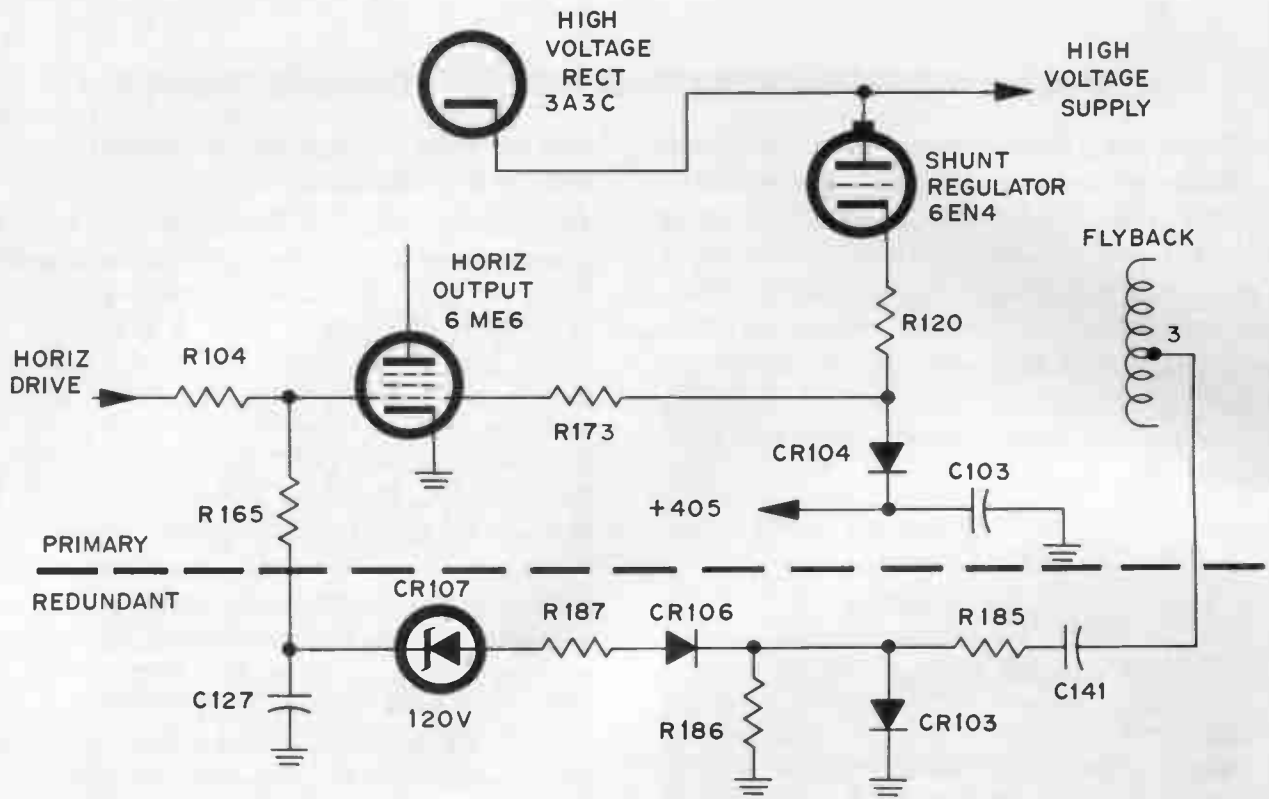
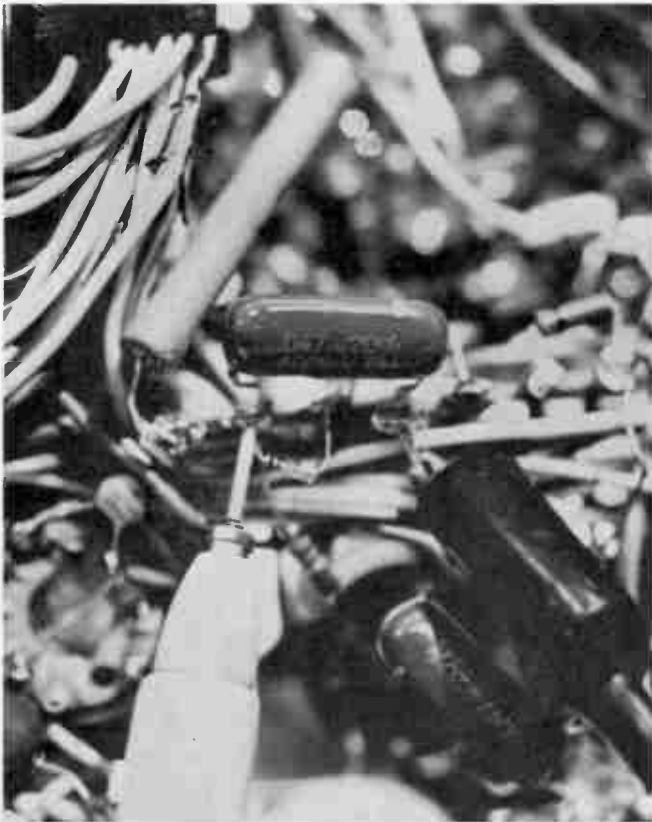
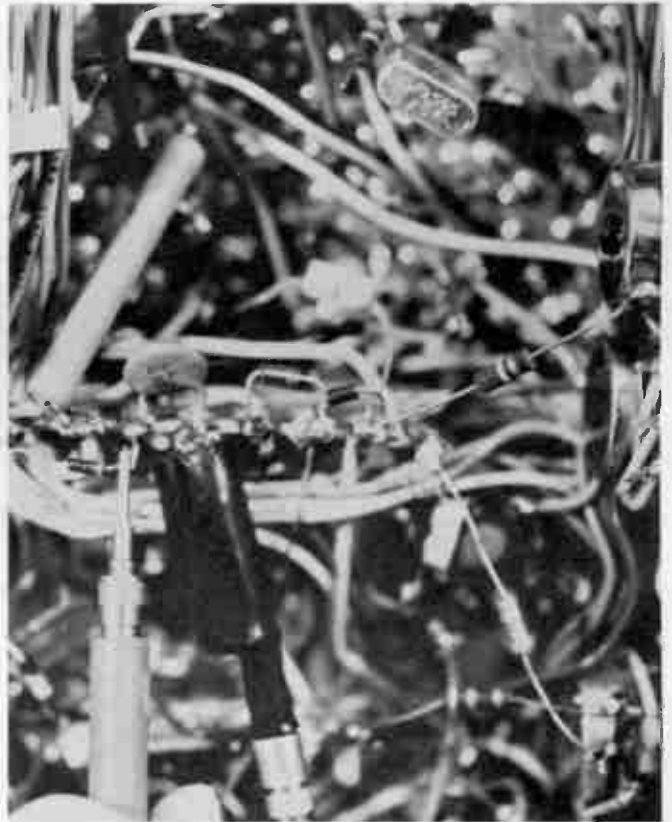


Figure 3—CTC 39 High Voltage Regulator Circuits



(a) CTC 39



(b) CTC 50

Figure 4—Test Point Locations

CTC 46 and CTC 54 Oscillator Disable Circuit—Theory of Operation

The CTC 46 and CTC 54 chassis employ the oscillator disable circuit shown in Figure-5. During normal circuit operation, transistor Q402 is non-conducting due to the emitter-base bias provided by zener diode CR 409 and voltage divider resistors R425, R426, and R427. The collector voltage (approximately +32 VDC) is applied to the bottom of **Horizontal-Hold** control during normal operation, supplied by zener diode CR 7 and associated components.

The Oscillator Disable Circuit, under normal conditions, and for all practical purposes, has no effect on the horizontal hold circuit. Notice that the existing voltage on C409 (normal operation) is approximately +50 VDC—back biasing diode CR 408 in the collector circuit.

The disable circuit functions in the following manner: the DC charge on capacitor C409 is proportional to the energy available to the flyback transformer; C409 is connected in parallel with respect to DC, to the capacitor that is in series

with the yoke (through the transformer, the yoke, and the pin magnets).

The positive voltage on capacitor C409 is applied to the voltage divider composed of resistors R425, R426, and R427. The voltage across R427 is applied to the base of transistor Q402. It is, under normal circuit conditions (high voltage within specified range), too small to overcome emitter bias provided by CR 409. Therefore, there will be no conduction of transistor Q402, the **Horizontal-Hold** control will have its normal operating potential (DC level), and the picture will remain in synchronization.

Failure of the high-voltage regulator lets more energy be supplied to the flyback, increasing the positive charge on capacitor C409. This action drives the base voltage of Q402 more positive, turning the transistor "on", reducing collector voltage significantly. The new collector voltage **now** applied to the bottom of the **Horizontal-Hold** control (approximately 10 VDC), shifts the horizontal oscillator frequency well beyond the range of the hold control—causing a loss of sync.

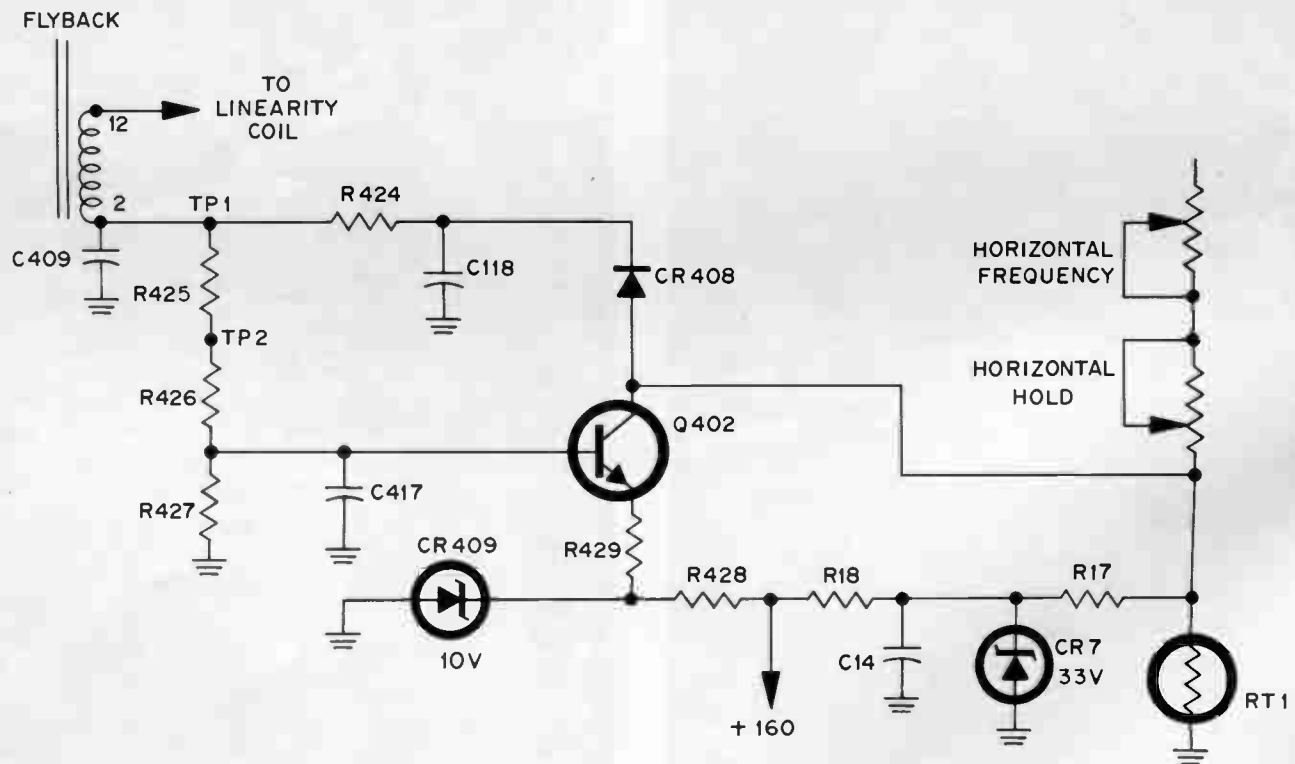


Figure 5—CTC 46 and CTC 54 Oscillator Disable Circuit Schematic Diagram

CTC 46 and CTC 54 Chassis—Isolating Sync Problems Related to the Horizontal Oscillator Disable Circuit

The U. S. Dept. of Health Education and Welfare requires that this circuit be operational at all times.

To check for proper operation of the disable circuit, set line voltage to **120 VAC** and all controls for normal viewing. Temporarily short TP-1 to TP-2 (shorts R425). A loss of horizontal sync at any setting of the **Brightness** control indicates that the circuit is operating properly.

Current production instruments have incorporated several changes to improve the reliability of this circuit. It is recommended that these changes be incorporated into any chassis where the Disable Circuit causes a problem.

1. Replace resistor R429 (82 ohm, 1/2 W located in emitter circuit of Q402) with a **permanent jumper**.
2. Change resistor R122 (4700 ohm, 1/2 W, film) to a 1000 ohm, 2 W wirewound resistor (RCA Stock No. 132881). R122 is mounted on a terminal strip located on the rear of the chassis immediately behind the quadrupler.

Troubleshooting Procedure

Note: The following procedure should be performed with nominal line voltage of **120 VAC** with the **Brightness** control set at the minimum viewable level. Measurements made with a "VoltOhmyst."

Step-1 Measure the collector voltage of Q402 (normally +32 VDC \pm 3V).

- (a) If voltage is less than +28V, but more than +10V, Q402 is probably leaky or shorted and should be replaced (RCA Stock No. 124753).

- (b) If less than +9V is measured at collector, replace zener diode CR 409 (RCA Stock No. 130044), and Q402.

- (c) If a negative voltage is measured at the collector of Q402, replace CR 401 (trace diode).

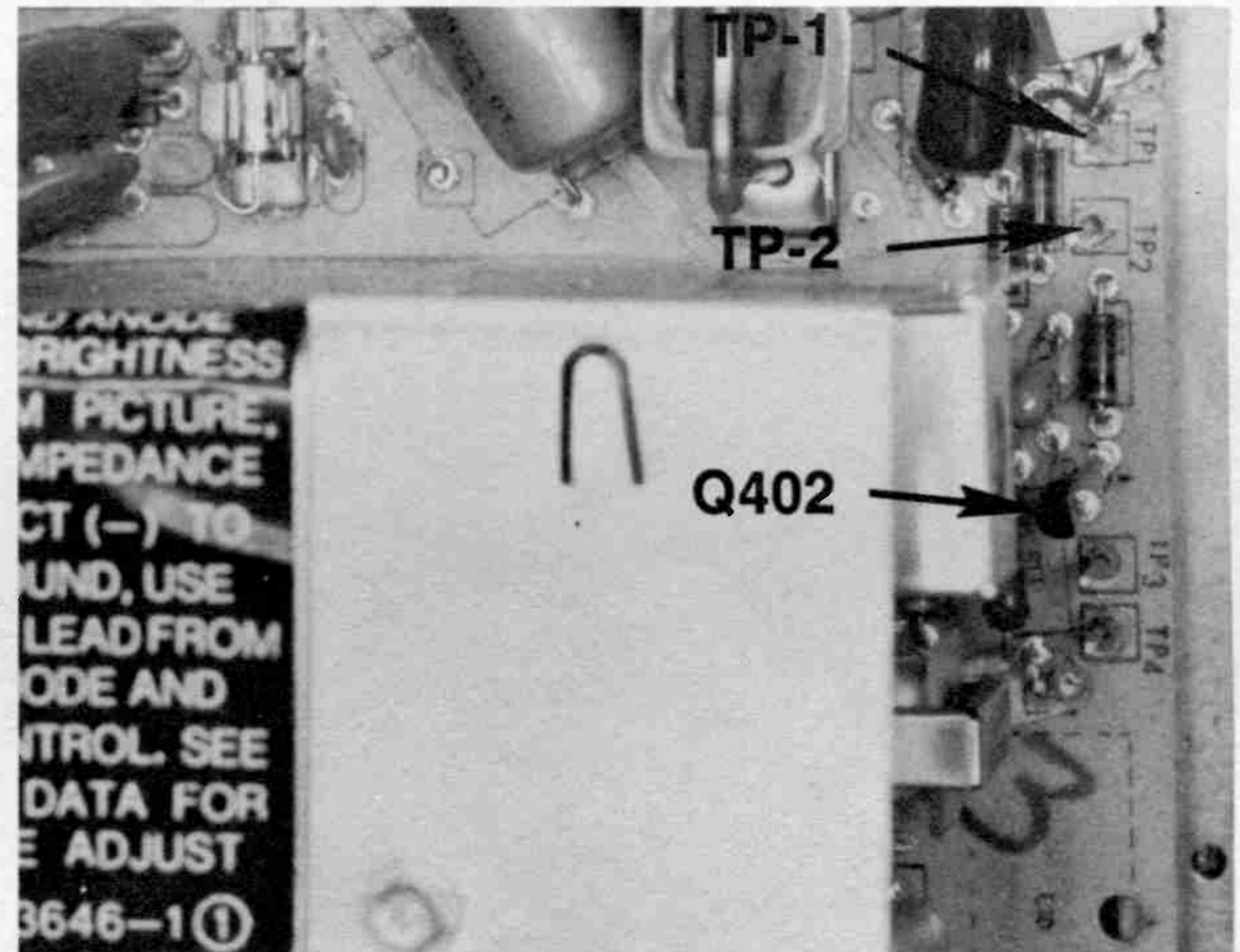


Figure 6—CTC 46 and CTC 54 (PW 400 Board)

Step-2 If Q402 collector voltage is within normal tolerances, momentarily short TP-2 to ground. If horizontal sync is restored, the Oscillator Disable Circuit is being triggered, indicating excessive high voltage—troubleshoot the high voltage and regulator circuits.

Step-3 Be certain that the degaussing shield is in its proper position.

CTC 51, 52, 53 and 55 Chassis Redundant Screen-Grid Regulator—Theory of Operation

The high voltage regulator circuits employed in the CTC 51 are shown in Figure-7. This chassis uses a redundant regulator system that will automatically assume control of the high voltage if any failure occurs in the primary pulse-regulator circuit.

Note: In the following circuit description the CTC 51 is used as an example. (Circuit operation in the other chassis is identical, although component numbers and values will change.)

The primary regulator system in these chassis (right side of schematic) is the familiar pulse-regulator system used in many RCA color chassis. The circuit functions to control the grid bias of the horizontal output tube.

The redundant regulator system (left side of schematic) consists of screen dropping resistor R109, bypass capacitor C409 and clamping diode CR 402. The diode determines the maximum level of voltage for the **screen** grid of the horizontal output tube by clamping it to the +130V supply and its associated filter capacitance. Failure of the primary regulator circuit would allow plate and screen currents of the horizontal output tube to increase. Increased screen current thru R109, would drop the voltage at the anode of CR 402 below +130V—turn the diode off, remove the +130V filter capacitor, and produce degeneration in the screen circuit (due to the small value of C409). This degeneration reduces the energy supplied to the flyback transformer and thereby maintains the high voltage within specified limits.

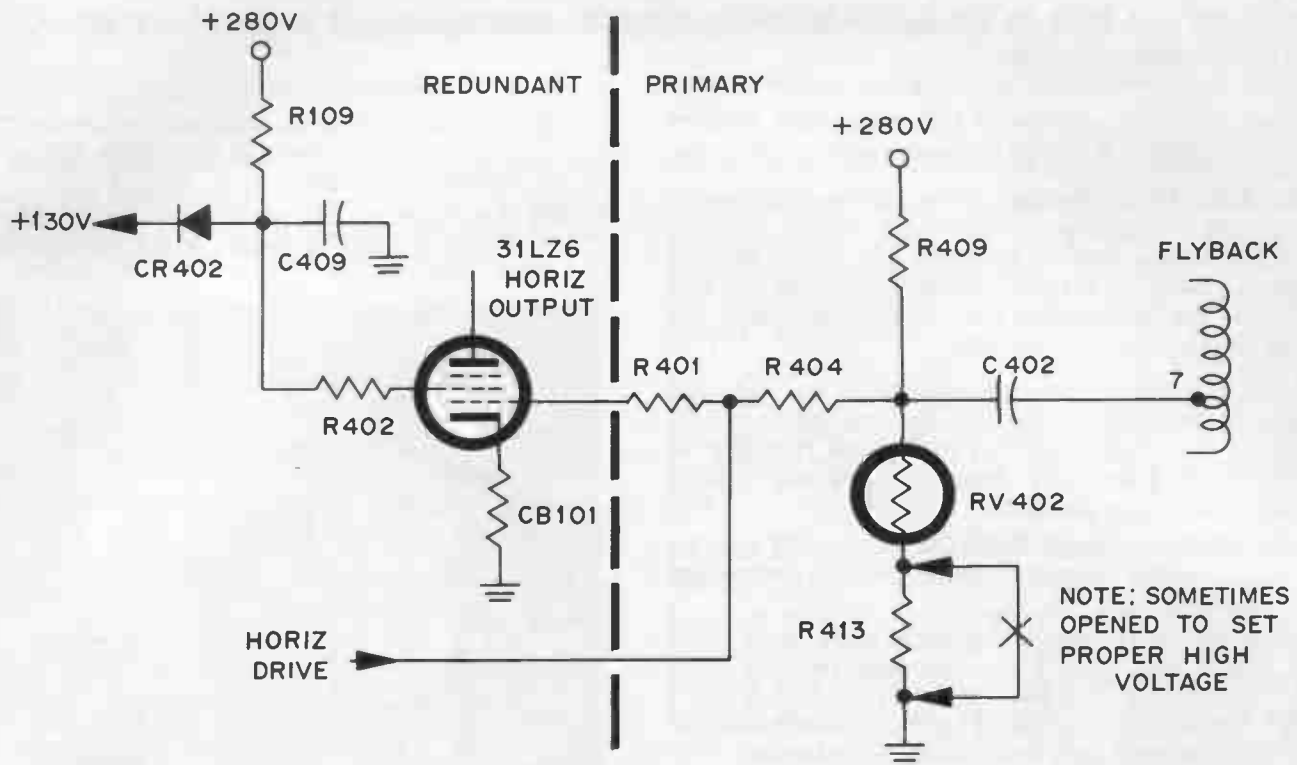


Figure 7—CTC 51 High Voltage Regulator Circuits

CTC 51, 52, 53 and 55 Chassis Checking the Operation of the Redundant Screen-Grid Regulator

The U. S. Dept. of Health Education and Welfare requires that this circuit be operational at all times. The following procedure will provide a means of assuring proper operation in the CTC 51, 52, 53, and 55 chassis.

Step-1 With line voltage set at **120 VAC** and **Brightness**, and **Color** controls set to minimum, measure the high voltage. It must not exceed 23.2kV.

Step-2 Turn the receiver "off" and temporarily connect a 6.8K, 5%, 5 W resistor from PW 400-F to ground—test points shown in Figure-8.

Step-3 Measure the voltage at PW 400T—it must drop to less than +95 VDC. If voltage exceeds 95V, check for defective resistor R109, or other defective components.

Step-4 Remove the temporary resistor connected in Step-2.

Step-5 Check to be sure the degaussing shield is in its proper position.

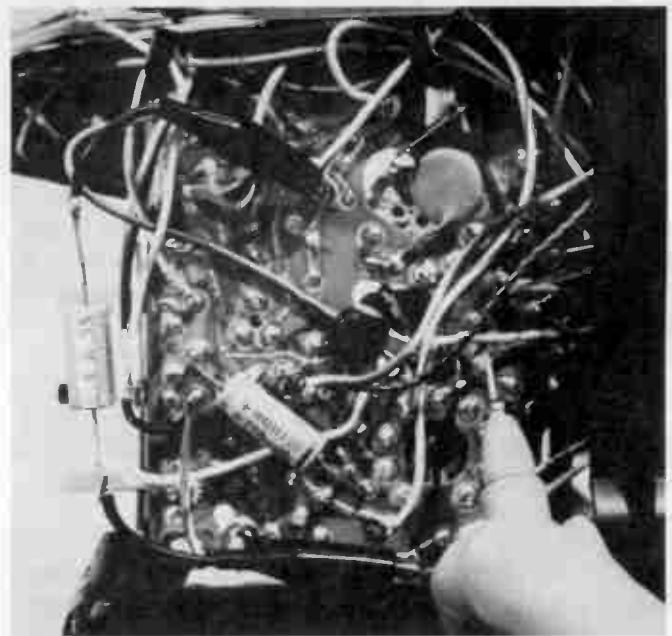


Figure 8—CTC 51, 52, 53, and 55 (PW 400 Board)



Television Service Tips

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Important Information for your Service Department

Prepared and Distributed by **RCA Consumer Electronics, Technical Services**
600 N. Sherman Drive, Indianapolis, Indiana 46202

KRK 170 6-Position Detent UHF Selector

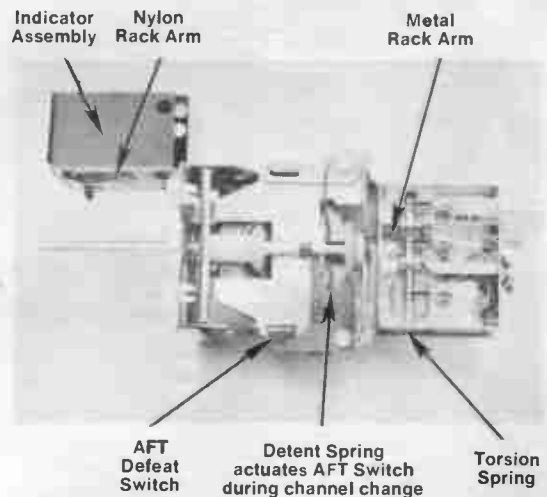
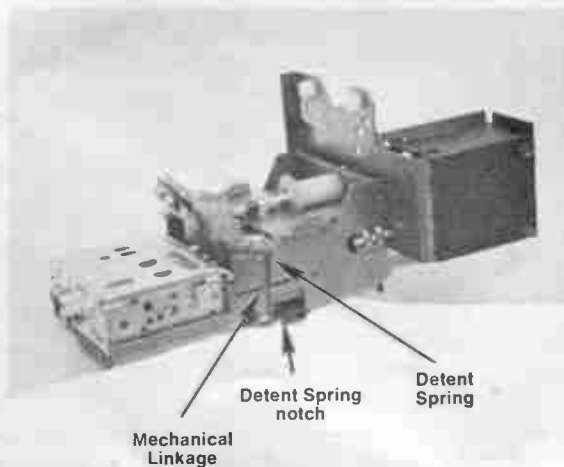
Many RCA color television models covered in Service Data File 1970 and 1971 utilize the KRK 170 6-position detent UHF tuner selector. The information in this Service Tip may be helpful in the event the KRK 170 tuner requires service.

Detent Spring Installation

Improper installation of the Detent Spring can result in poor UHF operation. If the spring is not seated in its notch (see photograph), the mechanical linkage to the UHF tuner will be restricted. This can result in the symptom of "will not tune to lower channels" or "will not tune to higher channels". Since the detent spring actuates the UHF AFT Defeat Switch during channel change, incorrect installation can result in loss of AFT during both VHF and UHF reception. In addition, there is the possibility of a weak or improperly installed Detent Spring causing the symptom of "will not return to programmed channels".

The Indicator Assembly and Rack Arms

Torque to return the tuning gang to the lowest channel is supplied by a torsion spring (see photograph for location). The indicator drum is also spring-loaded by a coil spring located inside the drum. Anything that restricts the travel of either the Nylon Rack Arm (meshes with the Drum Gear) or the Metal Rack Arm (meshes with Tuning Gang Gear in Tuner) can cause the symptom of "erratic operation". Possible areas to check should this symptom exist are: Indicator Drum rubbing its cover—due to an out-of-alignment drum or peeling of the numbered tape; Nylon Retainer not seated properly—could occur when the UHF dial light is replaced; excessive or improper lubrication.



KRK 170 Tuner Assembly

Channel Identification

In areas of multiple UHF channel reception (where the channels are relatively close together), some difficulty may be encountered identifying specific channels on instruments utilizing the six-detent U tuner (KRK 170).

Optimum channel identification can be achieved by either of the following methods. Both require removal of the TMA.

First, if the error is slight and the instrument is non-remote:

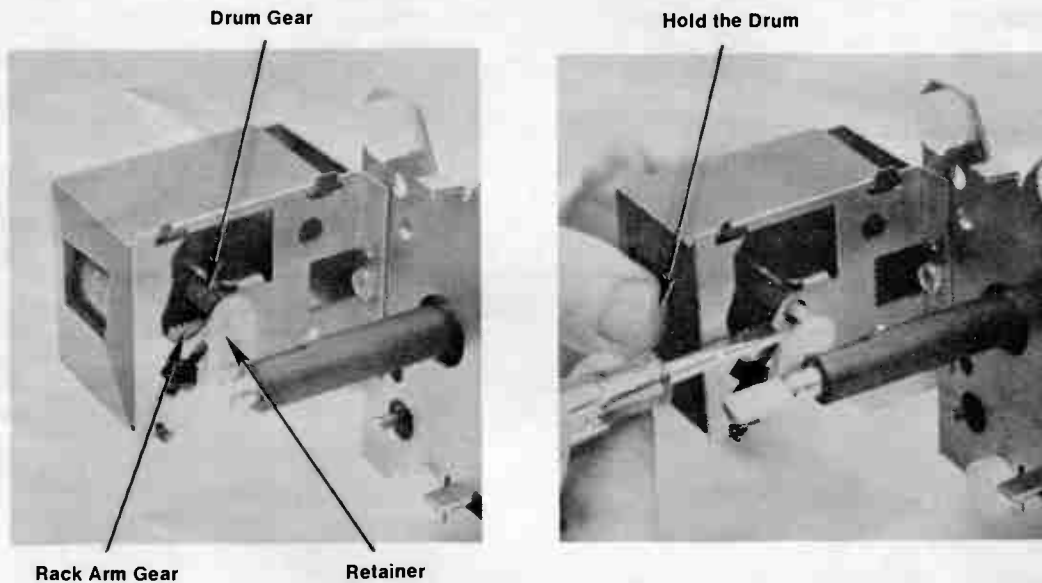
1. Tune the mechanism so that the lowest channel in the area is indicated on the drum.
2. Loosen three $\frac{1}{4}$ inch U tuner mounting screws and slide the tuner (holes are slotted) until that channel is received, then tighten the screws.

If the error is greater, or the instrument is a remote type:

1. Tune the KRK 170 for reception of a known channel, preferably one between channels 45 and 55.
2. While holding the indicator drum, spring the nylon retainer out until the teeth of the drum gear are disengaged from the teeth of the rack gear arm.

NOTE: The drum is spring-loaded. If it is inadvertently released, rotate approximately one turn after the coil spring is engaged in its notches.

3. Turn the U drum until the indicator shows the channel being received.
4. Mesh the teeth of the drum gear and the rack gear, then return the nylon retainer to its original position.



UHF channel indicator