RCC TELEVISION Service Manual

PUBLISHED BY RADIO COLLEGE OF CANADA, TORONTO

1966 Supplement No. 68

INDEX

CHECK YOUR TUBE INVENTORY

A list of tubes types used in receivers covered by this supplement appears on page 104.

ADMIRAL

ELECTROHOME

Model

CMTR-4 Alignment see Chancellor Theatre in Supplement #62.
CMTR-4 Other data see CCT-3 in Supplement #65.
CMTR-4 Radio chassis see page 21 Supp. #65. Circuit changes:

Added C9 across R10.
Removed connection between top end of R5 and PC1#3.
Added connection between top end of R 10 and PC1#3.
Connected top of R5 directly to slider of R10.

MARCONI

RCA-VICTOR

SIMPSONS-SEARS

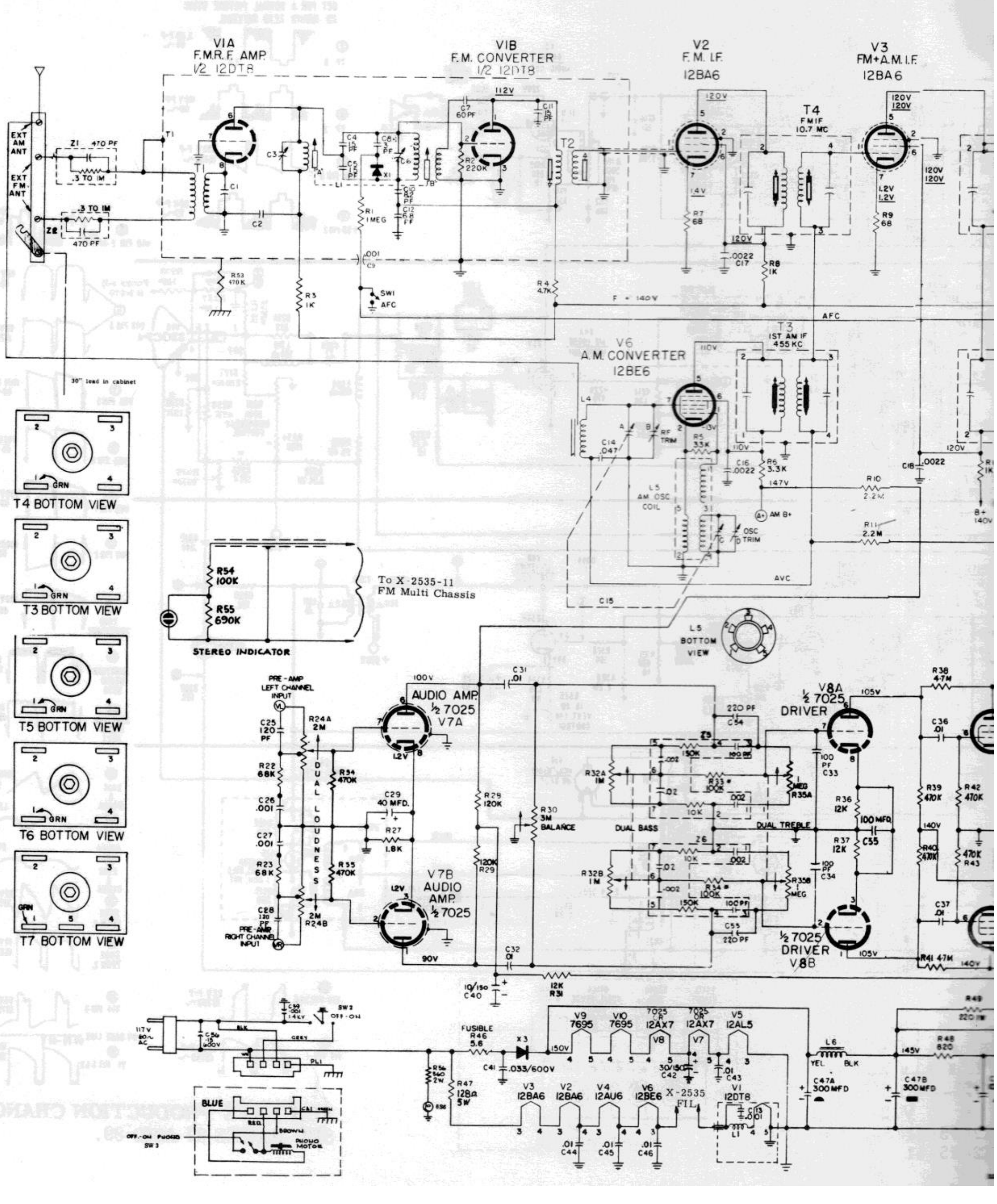
VIKING

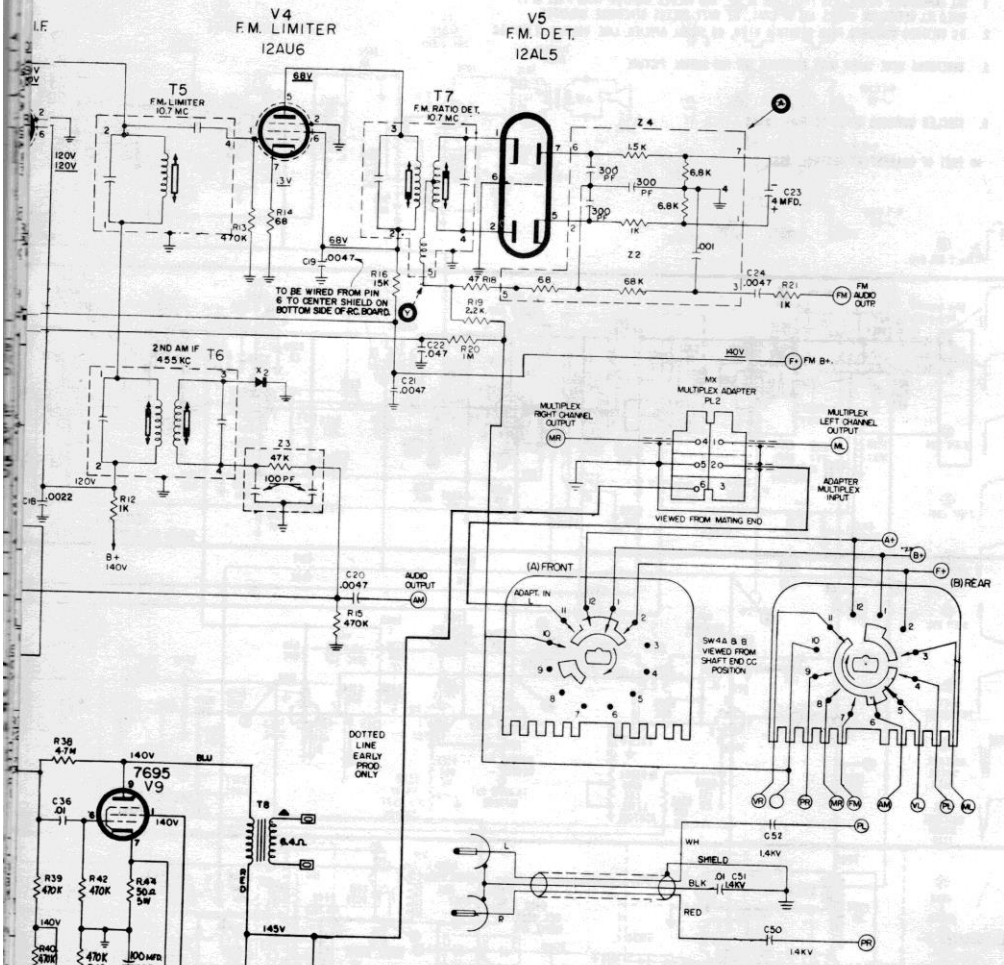
COLOR

WESTINGHOUSE

ZENITH

RCC TELEVISION Supplement No. 68


V1A
F.M.R.F. AMP
1/2 12DT8
V1B
F.M. CONVERTER
1/2 12DT8
V2
F.M. I.F.
12BA6
V3
FM+A.M.I.F.
12BA6
T4
FMIF
10.7 MC
T3
1ST AM IF
455 KC
V6
A.M. CONVERTER
12BE6
L5
AM OSC
COIL
AM B+
AVC
AFC
SW1
AFC
To X-2535-11
FM Multi Chassis
STEREO INDICATOR
R54
100K
R55
690K
30" lead in cabinet
T4 BOTTOM VIEW
T3 BOTTOM VIEW
T5 BOTTOM VIEW
T6 BOTTOM VIEW
T7 BOTTOM VIEW
L5
BOTTOM
VIEW
PRE-AMP
LEFT CHANNEL
INPUT
PRE-AMP
RIGHT CHANNEL
INPUT
DUAL LOUDNESS
AUDIO AMP
1/2 7025
V7A
V7B
AUDIO
AMP
1/2 7025
R30
3M
BALANCE
DUAL BASS
DUAL TREBLE
V8A
1/2 7025
DRIVER
1/2 7025
DRIVER
V8B
FUSIBLE
R46
5.6
X3
150V
V9
7695
V10
7695
V8
7025
OR
12AX7
V7
7025
OR
12AX7
V5
12AL5
V3
12BA6
V2
12BA6
V4
12AU6
V6
12BE6
X-2535
FIL.
V1
12DT8
L6
YEL
BLK
C47A
300 MFD
C47B
300 MFD
145V
117V
60~
AC
SW2
OFF-ON
BLUE
RED
BROWN
OFF-ON PHONO
SW3
PHONO
MOTOR



1. ALL CAPACITANCE VALUES IN MFD. AND ALL RESISTANCE VALUES IN OHMS, ½ WATT, UNLESS OTHERWISE SPECIFIED.
2. D.C. VOLTAGES MEASURED FROM POINTS INDICATED TO CIRCUIT GROUND, NO SIGNAL APPLIED, USING A V.T.V.M., LINE VOLTAGE SET AT 117 V.A.C. NO SIGNAL INPUT. LOUDNESS AT MIN. TUNING CAP. AT MAX.
3. *R33 & R34 NOT INCLUDED IN PACKAGE CIRCUITS Z5 & Z6.
4. UNDERLINED VOLTAGES ARE TAKEN IN FM. POSITION.
5. ALL REFERENCES TO LEFT & RIGHT ARE AS VIEWED FACING FRONT OF SET.
6. SW4A, B IS SHOWN IN THE CCW POSITION, (AM. POSITION).
7. REAR SECTIONS OF CONTROLS (FARTHEST FROM SHAFTS) ARE RIGHT CHANNEL.
8. ARROWS ON CONTROLS INDICATE CW ROTATION (CONTROL VIEWED FROM SHAFT END.)

X-2515-34

CHASSIS X2515-35
C50 and C52 are 4700 PF 1-4 KV

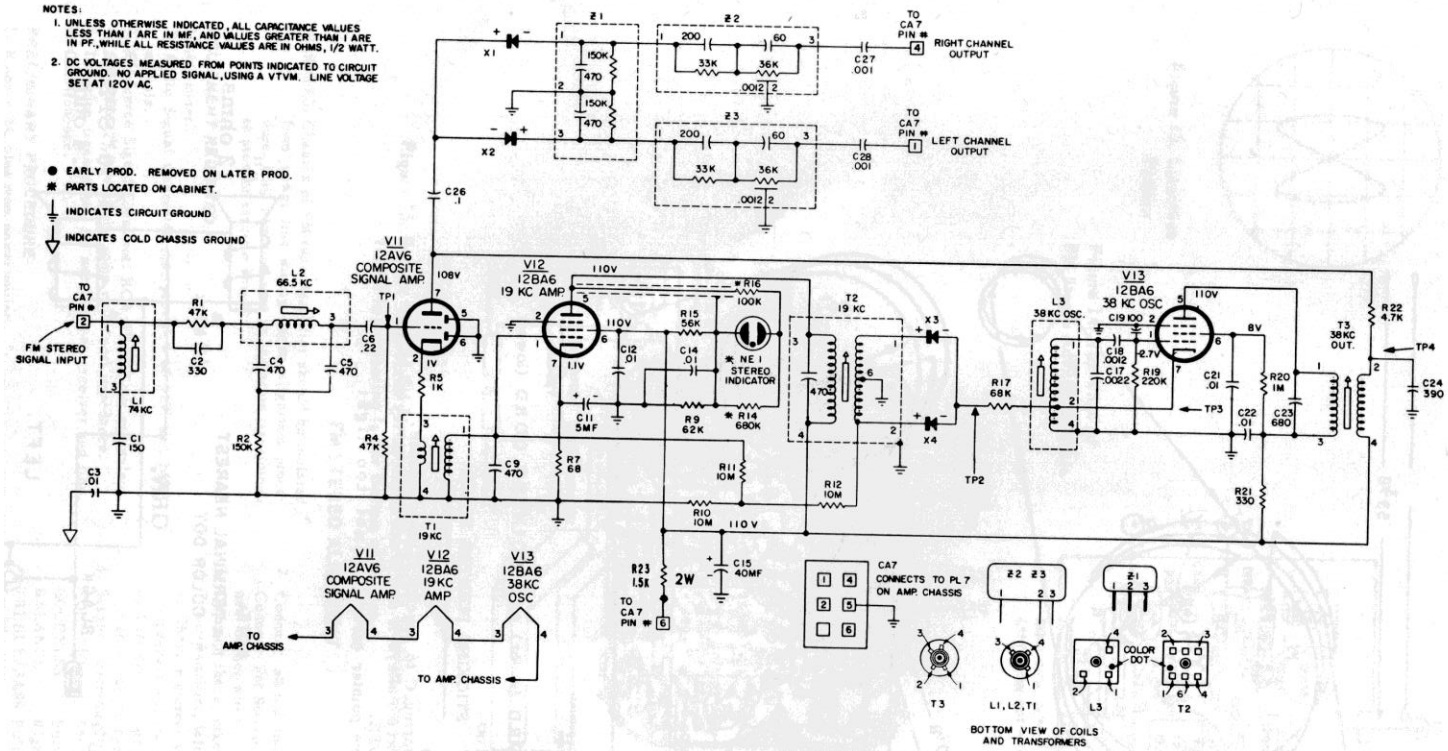


FIGURE 12 SCHEMATIC X2535-11 FM STEREO

FM STEREO TUBE COMPLEMENT AND RESISTANCE MEASUREMENTS

TUBE	TUBE TYPE	FUNCTION	RESISTANCE MEASUREMENTS						
			PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V11	12AV6	Composite Signal Amp.	47K	1K	●52	●30	0	0	*4.7K
V12	12BA6	19KC Amp.	220	0	●30	●15	*200	*0	68
V13	12BA6	38KC osc.	220K	0	●15	●0	*380	*1M	4

Resistances measured from tube pin indicated to circuit ground.
* Resistances measured from tube pin indicated to CA7 pin 6 (B+ input)
● Tube filaments measured with V13 pin 4 connected to circuit ground.

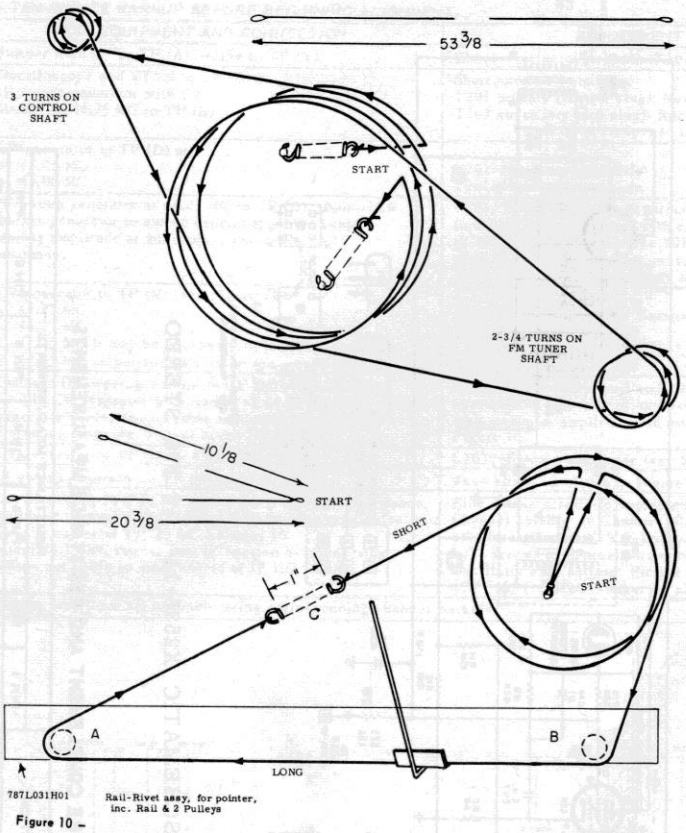


Figure 10 –

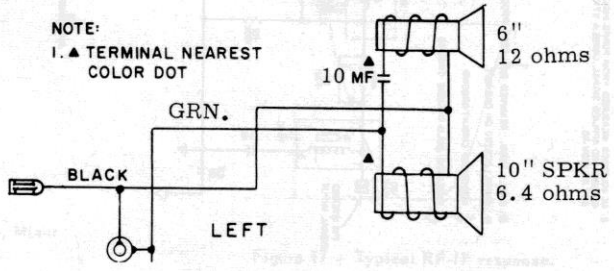
C5000 TUNING CORD (upper) and POINTER CORD (lower)

STICKING POINTER DRIVE

If this occurs:
(1) Stretch spring C to exactly 1" then release.
(2) Lubricate Pulleys A and B and double pulley shaft with MOLYKOTE.
(3) Make sure pointer carriage is not too tight.

Figure 11 –

C5000
LEFT CHANNEL
2 Speakers



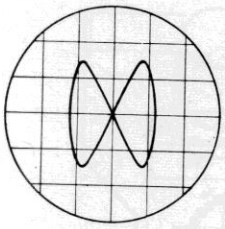


Figure 13. Lissajous Pattern

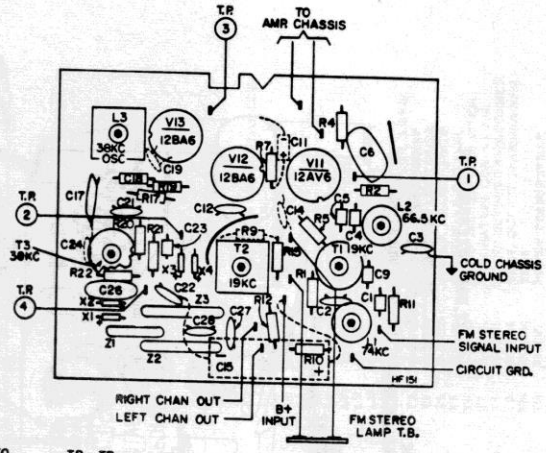


Figure 14. Top View of FM Stereo Adapter Chassis

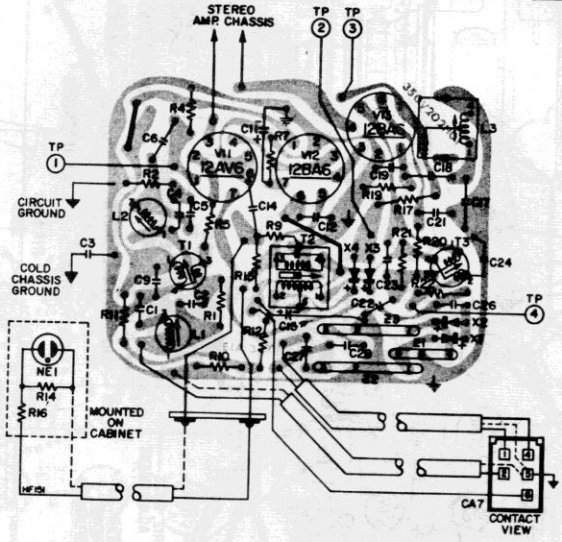


Figure 15. Bottom View of FM Stereo Adapter Chassis Showing Top Components in Solid Outline. Tube Pin Numbering Is For Bottom of Socket.

FM STEREO ALIGNMENT

WARNING: Chassis of FM tuner-amplifier should be isolated from power line during entire alignment procedure. Plug line cord into an isolation transformer to prevent electric shock.

EQUIPMENT REQUIRED

1. AC meter.
2. Audio Signal Generator that provides 66.5KC and 74KC signals.
3. FM-Stereo Signal Simulator: RCA WR-51A, or equivalent.
4. Speakers (2), having the same voice coil impedance.
5. Isolation transformer, for use between receiver and line.
6. Oscilloscope.

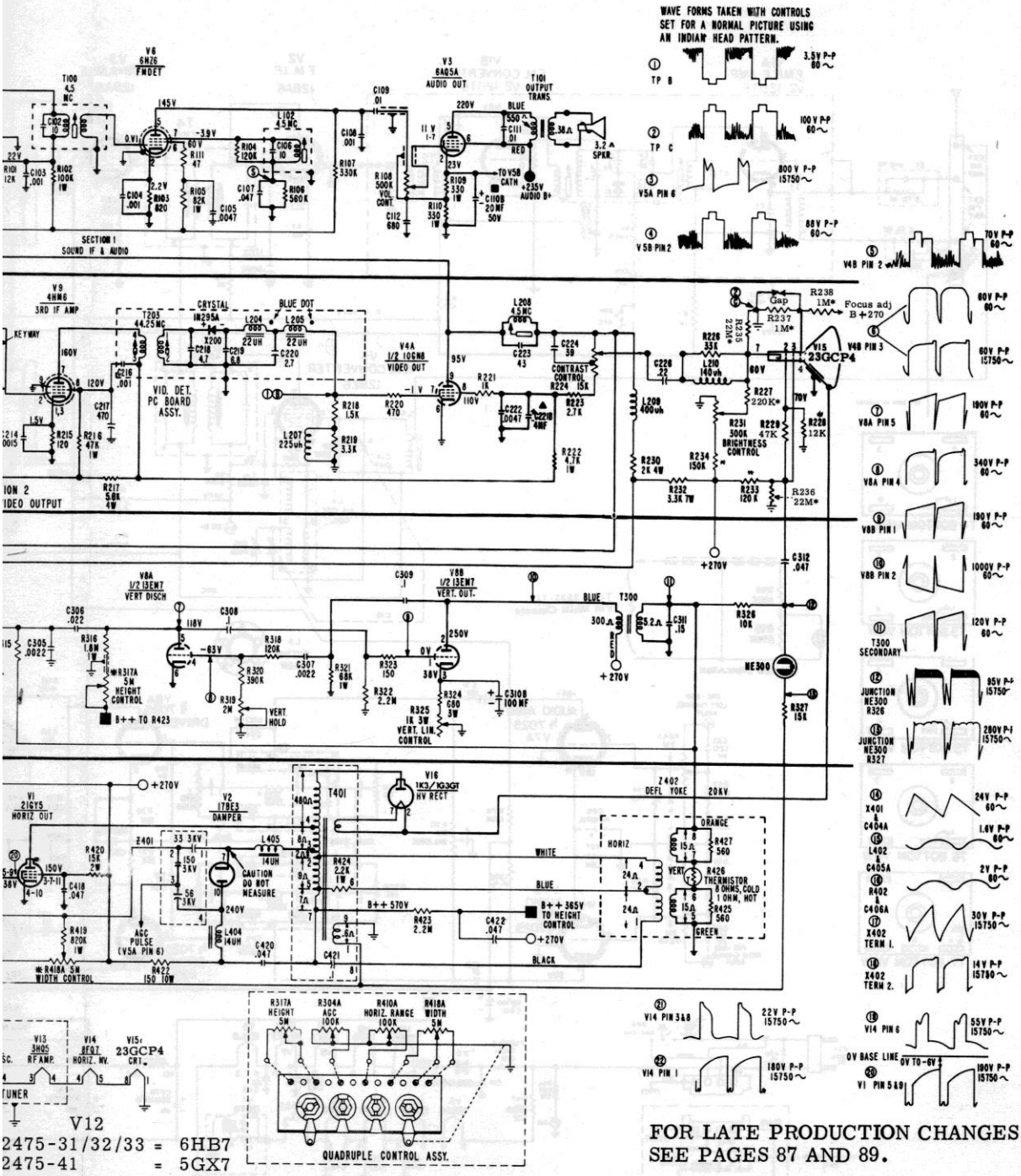
PRELIMINARY PROCEDURE

1. Remove AC plug from power outlet.
2. Connect stereo indicator light to FM Stereo Adapter. Connect FM Stereo adapter to Tuner-Amplifier and connect heater wires.
3. Connect the speakers to the output transformers of the Tuner-Amplifier, left and right channels.
   a. Observe correct speaker phasing, identified by dots on speakers and transformers.
   b. Left channel speaker on left side of test position and right channel speaker on right side of test position.
4. Set the Tuner-Amplifier controls as follows:

FUNCTION	FM Stereo	Next to last position clockwise
LOUDNESS	Full	Maximum clockwise
BALANCE	Right	Maximum clockwise
TREBLE/BASS	Full Boost	Maximum clockwise
FM TUNING	Low End	Maximum clockwise

WESTINGHOUSE

X-2475-31 etc.

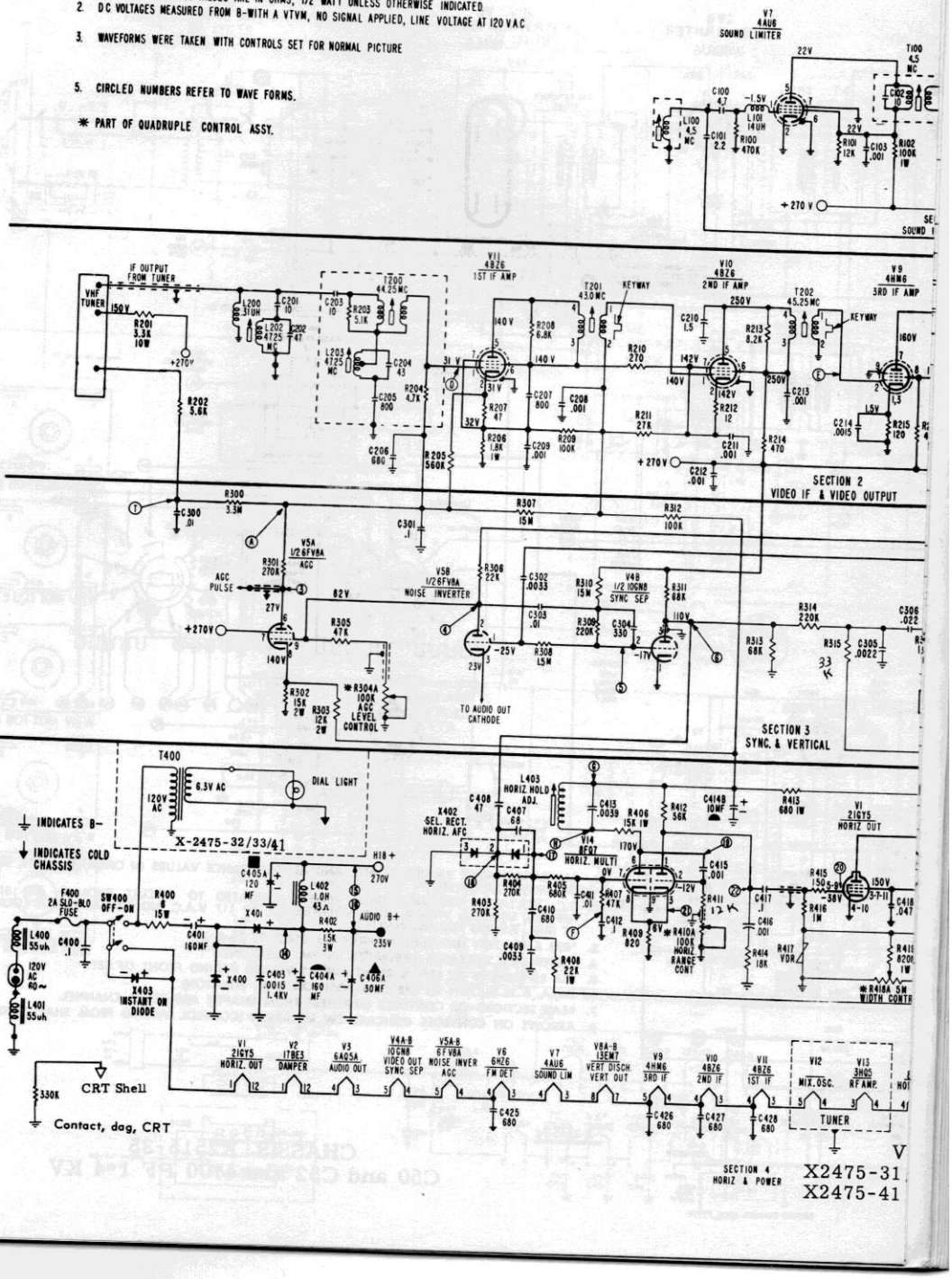


FOR LATE PRODUCTION CHANGES SEE PAGES 87 AND 89.

NOTES:

1. ALL CAPACITANCE VALUES LESS THAN 1 ARE IN MF AND VALUES GREATER THAN 1 ARE IN PF WHILE ALL RESISTANCE VALUES ARE IN OHMS, 1/2 WATT UNLESS OTHERWISE INDICATED.
2. DC VOLTAGES MEASURED FROM B-WITH A VTVM, NO SIGNAL APPLIED, LINE VOLTAGE AT 120 VAC
3. WAVEFORMS WERE TAKEN WITH CONTROLS SET FOR NORMAL PICTURE
5. CIRCLED NUMBERS REFER TO WAVE FORMS.

* PART OF QUADRUPLE CONTROL ASSY.



X2475-31
X2475-41

MECHANICAL INFORMATION

CHASSIS REMOVAL
23" Models
1. Remove the control knobs.
2. Remove the back cover.
3. Disconnect the leads joining the CRT dag spring to the tuner bracket and to the chassis.
4. Disconnect the high voltage wire and socket from the CRT.
5. Loosen the yoke clamp.
6. Disconnect the speaker wires.
7. Remove the 6 screws holding the chassis to the cabinet, the 6 screws holding the control panel to the mask and 1 screw in the escutcheon.
8. Remove the yoke from the CRT and carefully remove the chassis.

19" Models
1. Remove all control knobs except the Vertical and Brightness thumbwheels and the fine tuning knob. (The thumbwheels are removed with the control bracket from the rear of the cabinet. The fine tuning knob is secured to the tuner and pulls out with the chassis.)
2. Disconnect the antenna leads.
3. Remove the back cover.
4. Remove the mounting screw at each of the following locations:
   A. Control bracket - 1
   B. Tuner bracket - 2
   C. Top center of chassis - 1
   D. Right centre of chassis - 1
5. Disconnect the speaker leads.
6. Disconnect the CRT socket and high-voltage wire, and loosen the yoke clamp.
7. Carefully remove the chassis with the yoke, tuner, and control bracket.

CRT REMOVAL
23" Models
1. Remove the chassis.
2. Lay the cabinet face down on a soft cloth.
3. Remove screws holding dag spring to cabinet.
4. Remove the four CRT retaining nuts and washers and note locations of the 4 bottom washers.

19" Models
1. Remove the chassis.
2. Lay the cabinet face down on a soft cloth.
3. Loosen the screw that holds the wire retaining ring around the CRT.
4. Unhook the four corner retainers from the cabinet.
5. Remove the retaining ring with the four corner retainers.
6. Remove the CRT.

PILOT LAMP REPLACEMENT
X2475-32/33
1. Remove all knobs.
2. Remove screw under F.T. knob.
3. Pull off escutcheon and replace the lamp.

X2475-21 Chassis
1. Remove the chassis.
2. Remove the pilot lamp mask and replace the lamp.

CAUTION: This is a neon lamp, and exact replacement is recommended.

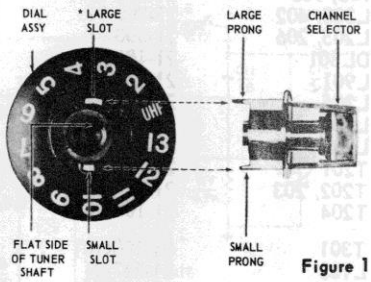
FUSE
The power supply fuse (F400) is located at the rear of the chassis below the AC input plug (see Figure 5). The fuse is a 2-amp, 125-volt slo-blo type.

PC BOARD ACCESSIBILITY 19" MODELS
To provide access to the underside of the PC board while the set is operating:
1. Remove the chassis.
2. Turn the chassis around.
3. Connect the CRT socket, yoke, and high voltage lead (use a jumper). A test speaker may be connected to the audio output transformer.

WARNING: To operate the set partially disassembled, connect a jumper from the aquadag CRT coating to chassis ground. Be careful that the high-voltage anode lead does not short or arc to the frame.

When servicing sets that have a Shel-bond CRT, connect a jumper from the metal cabinet to chassis ground.

CHANNEL SELECTOR REPLACEMENT, 19" MODELS
(Refer to Figure 1)
1. Turn the dial so that the larger slot is above and parallel to the flat of the tuner shaft.
2. Insert the large prong of the channel selector into the large slot in the dial, and the small prong into the small slot.



* Large slot is set above and parallel to the flat of the tuner shaft.

Figure 1 – Channel Selector mounting, 19" models.

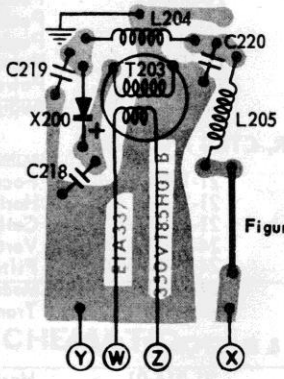


Figure 2 – Bottom view of video detector PC board.

CRT FOCUS TAPS AND GAPS

On many TV receivers it is standard practice to provide alternate voltage points for the focussing anodes. On the Schematic the focussing anode (Pin 4) is shown connected to ⏚ - B. Where the CRT does not focus correctly it is necessary to use a positive bias on pin 4 -- see illustration.

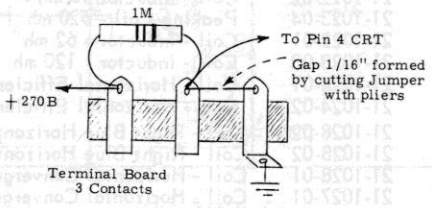


Figure 3 - X2475-21 CRT Focus Anode Tap with Gap to prevent arc-back from damaging components on the +270B line.

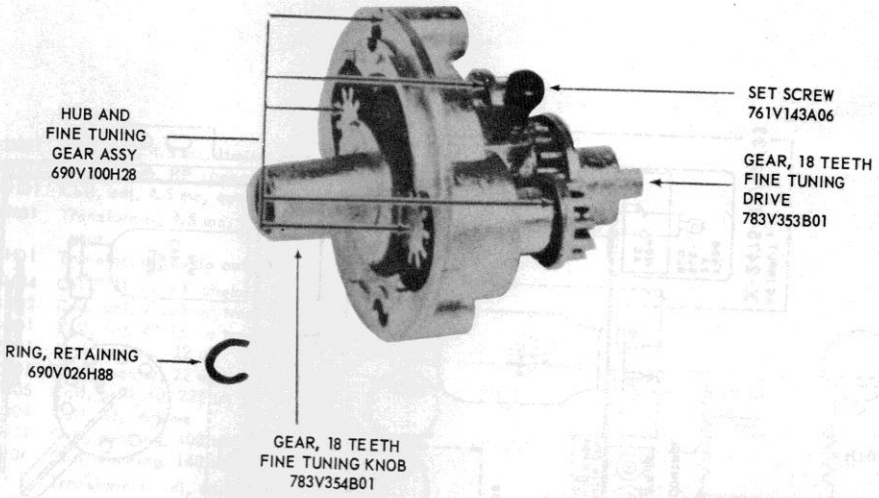


Figure 3 – Tuner Hub and Fine Tuning Gear Assembly.

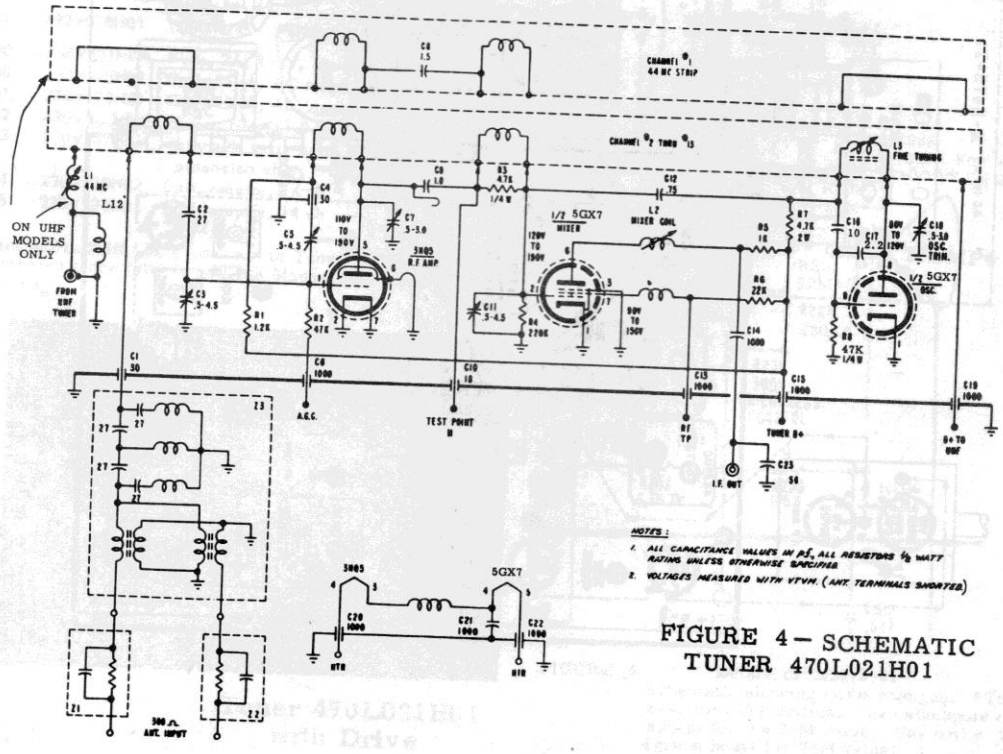
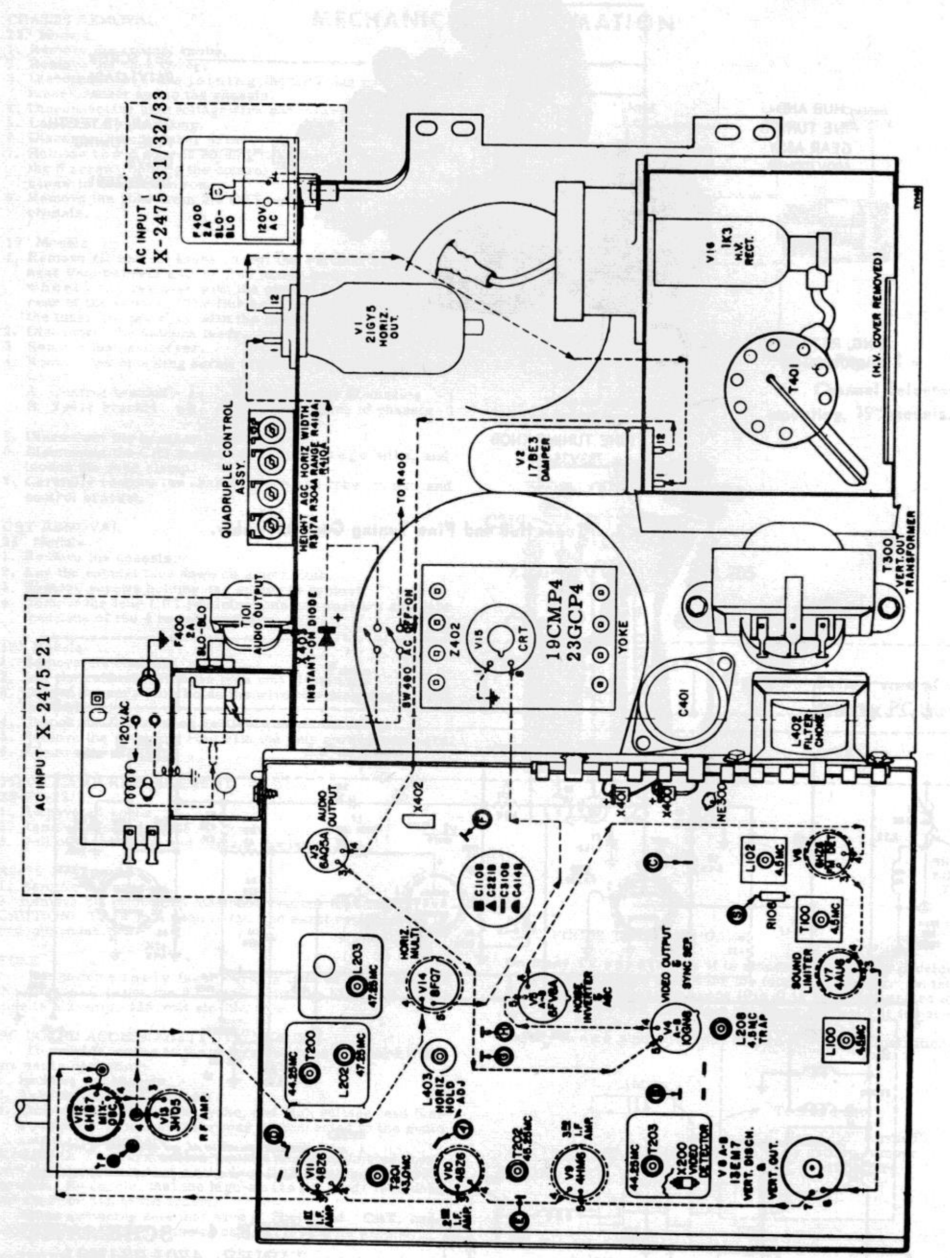
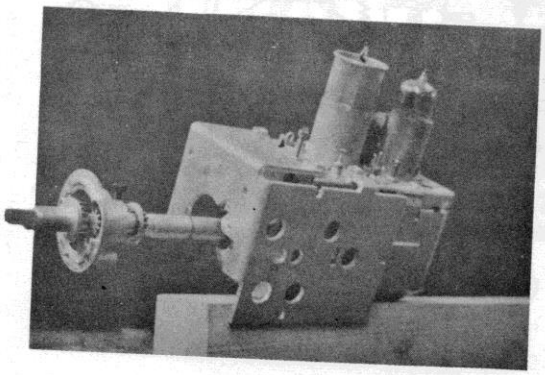


FIGURE 4 – SCHEMATIC
TUNER 470L021H01


AC INPUT X-2475-31/32/33
AC INPUT X-2475-21
QUADRUPLE CONTROL ASSY.
HEIGHT R317A
AGC R304A
HORIZ RANGE R418A
WIDTH R410A
TO R400
V1 21GY5 HORIZ. OUT.
V2 17BE3 DAMPER
V16 1K3 H.V. RECT.
(H.V. COVER REMOVED)
T401
T300 VERT. OUT TRANSFORMER
19CMP4
23GCP4
YOKE
Z402
C401
L402 FILTER CHOKE

L100	230V083H01	Coil, adj, 4.5 mc, limiter grid
L101	230V130H02	Coil, 14 uh, RF choke
L102	230V031H01	Coil, adj, 4.5 mc, quadrature
T100	235V046H01	Transformer, 4.5 mc, FM detector grid
T101	430V154H01	Transformer, audio output
L200	230V065H04	Coil, .31 uh, RF choke
L202	230V076H02	Coil, adj, 47.25 mc trap
L203	230V076H01	Coil, adj, 47.25 mc trap, tapped
L204	230V142H01	Coil, reactor, 22 uh
L205	230V142H01	Coil, reactor, 22 uh
L207	230V141H05	Coil, peaking, 225 uh
L208	230V030H09	Coil, adj, 4.5 mc
L209	230V141H07	Coil, peaking, 400 uh
L210	230V141H06	Coil, peaking, 140 uh
T200	235V049H01	Transformer, adj, 44.25 mc, IF input
T201	235V048H01	Transformer, adj, 43.0 mc, 1st IF
T202	235V048H04	Transformer, adj, 45.25 mc, 2nd IF
T203	235V116H01	Transformer, adj, 44.25 mf, 3rd IF
T400	410L006H01	Transformer, dial light, 6.3V, 150 ma, X-2475-32/33
T401	493V017H01	Transformer, horiz out, X-2475-31/32/33
T401	493V018H01	Transformer, horiz out, X-2475-21
F400	758V001H09	Fuse, 2A, 125V, slo-blo
L400	230V125H01	Coil, 55 uh, AC input
L401	230V125H01	Coil, 55 uh, AC input
L402	430V121H02	Choke, filter, 1.0 Hy
L403	230V137H01	Coil, adj, horiz hold, incl: extension shaft
L404	230V130H02	Coil, reactor, 14 uh
L405	230V130H02	Coil, reactor, 14 uh

Tuner 470L021H01 is similar to Tuner 470L020H01 which is illustrated more fully in Service Manual RS-411B.



Tuner 470L021H01 with Drive

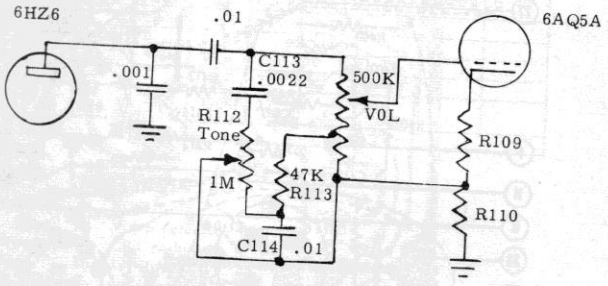


FIGURE 7 - X2475-41 TONE CONTROL CIRCUIT

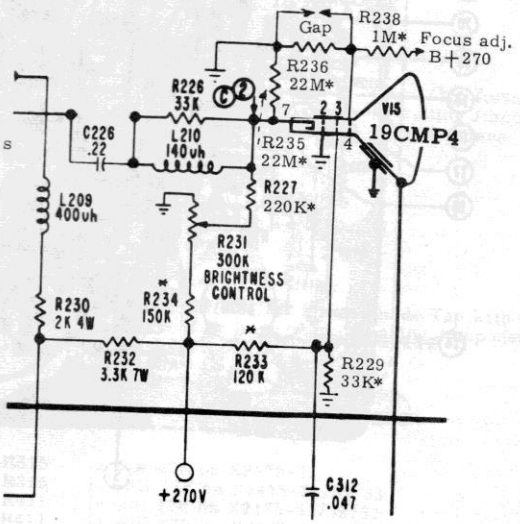


FIGURE 6 Detail of X2475-21 Schematic showing late changes. *These resistors are critical - use stackpole only, except for the 22M value. Use only 1RC (green body) for 22M value.

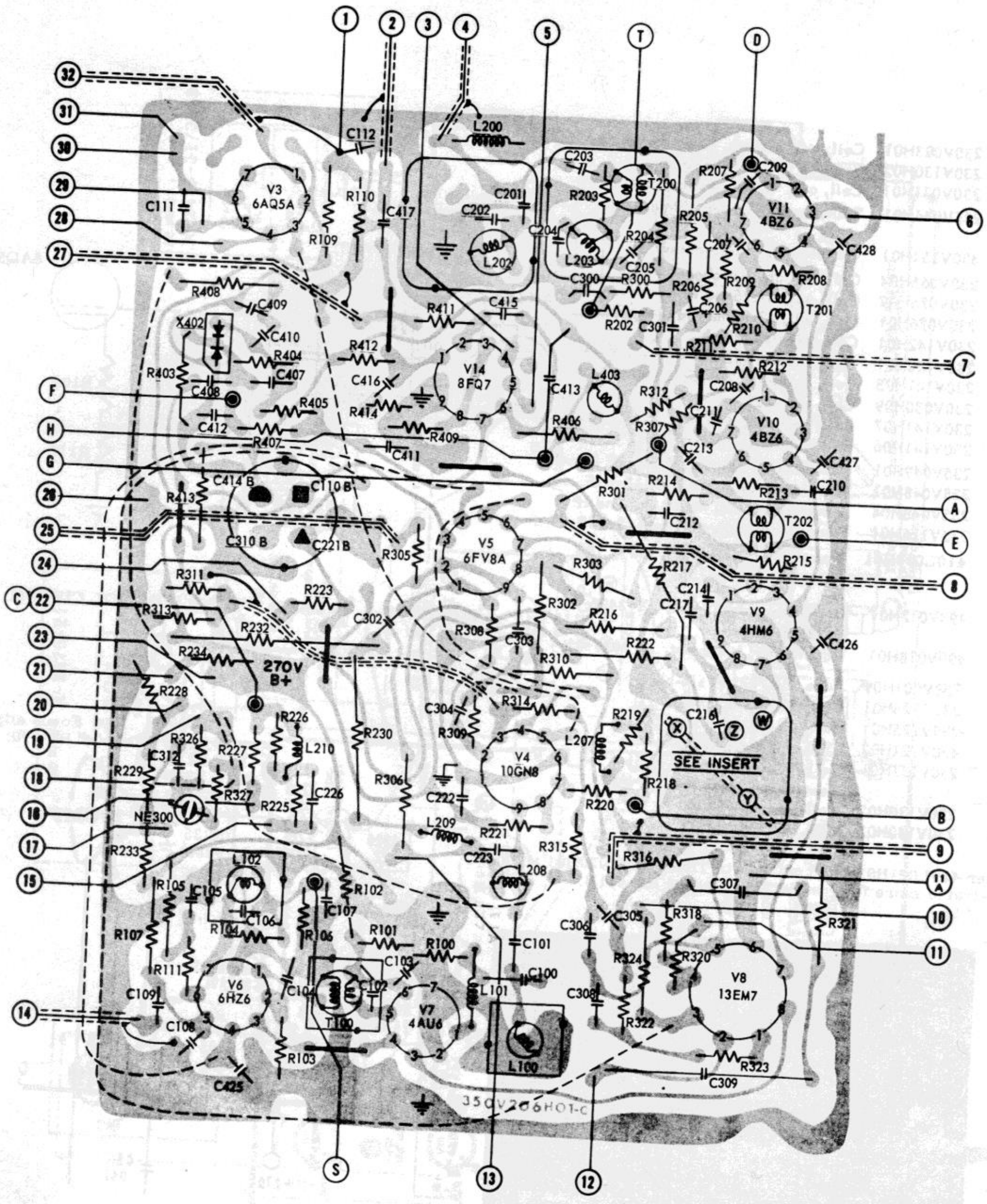


Figure 6 – Bottom view of PC board, showing top components in solid outline. Tube pin numbering is for bottom of socket.

TUBE COMPLEMENT AND RESISTANCE CHART

TUBE	TYPE	FUNCTION	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin 10	Pin 11	Pin 12
V1	21GY5	Horiz. out.	40	2.4M	*15K	0	2.4M	47	*15K	NC	2.4M	0	*15K	33
V2	17BE3	Damper	33	NC	*197	NC	NC	NC	Inf.	NC	NC	*197	NC	28
V3	6AQ5A	Audio Out.	300K	660	27	28	*2K	*1.5K	300K					
V4	10GN8	Video Out. Sync. Sep.	0	*15M	*38K	23	27	0	•850	*9K	*4.8K			
V5	6FV8A	Noise Inv., AGC	*17M	*25K	660	21	23	830K	*47	*10K	*25K			
V6	6HZ6	FM Det.	4	820	19	21	*330K	*82K	560K					
V7	4AU6	Sound Lim.	470K	0	17	19	*24K 12K	*24K 12K	0					
V8	13EM7	Vert. Disch. Vert. Out.	2.2M	*350	1.3K	2M	–	0	13	17				
V9	4HM6	3rd IF Amp.	120	.1	120	11	13	.1	*5.6K	*47K	0			
V10	4BZ6	2nd IF Amp.	*60K	*90K	10	11	*520	*520	*90K					
V11	4BZ6	1st IF Amp.	567K	1.5K	9	10	*90K	*90K	1.5K					
V12	6HB7	Mix.-Osc.	0	220K	0	7	9	*4.3K	*25K	*8K	3.3K			
V13	3HQ5	RF Amp.	4M	0	7	5.5	*4.5K	0	0					
V14	8FQ7	Horiz. MV	*57K	40K	820	5.5	2	*16K	1.2M	820	0			
V15	23GCP4	CRT	0	27K	40K	0	–	–	120K	2				
	19CMP4	CRT	0	18K	40K	0	–	–	120K	2				
V16	1K3/1G3GT	HV Rect.	INFINITE											

Resistances measured from tube pin to circuit ground.
*Resistance measured from tube pin to junction of X401 & L402.
•R x 100 scale.
NC = No connection.

PC BOARD LEGEND

1. Volume control, low side
2. VI pin 2, and R415
3. Tuner filament
4. IF input
5. CRT pin 8
6. Tuner filament
7. Tuner AGC
8. (V-2475-1,-4) Junction C423, C424
8. (V-2475-11,-12,-13) Z401 pin 3
9. Height control, high side
10. Vertical Linearity control, high side
11. Vertical Hold control, high side
11A. Vertical Hold control, arm
12. T300, blue wire
13. Contrast control, high side
14. Volume control, high side
15. Contrast control, arm
16. Brightness control, arm
17. CRT pin 3
18. T401 lug 1
19. Junction T300 secondary, C311, and yoke orange wire
20. CRT pin 2
21. Brightness control, high side
22. CRT pin 7
23. Tuner B+ terminal board, to R201
24. Contrast control, low side
25. AGC Level control (R304A), high side
26. CRT pins 1 and 4 (two wires)
27. Horizontal Range control (R410A), high side
28. V2 pin 12
29. T101, blue wire
30. T101, red wire
31. Junction R402 and C406A
32. Volume control, arm

TEST POINTS

A. AGC for IF
B. Video detector
C. CRT cathode
D. 1st IF grid
E. 3rd IF grid
F. Horiz MV
G. Horiz Hold adjust coil
H. Horiz Hold adjust coil
S. Quad coil
T. AGC for tuner

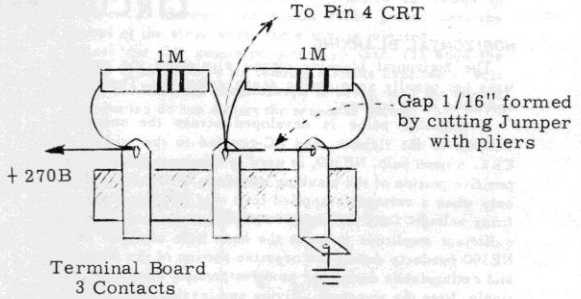


Figure 7 X2475-31/32/33 CRT Focus Anode Tap with Gap to prevent arc-back from damaging components on the +270B line.

OTHER LATE PRODUCTION CHANGES

R315	is now 43K on X2475-21
R315	is still 33K on X2475-31/32/33
R411	is now 12K on X2475-31/32/33
R411	is still 27K on X2475-21
L200	is not included in the same shielded assembly as L202 etc.
L402	430V121H02 now is 430V121H01
X403	295V023H01 is now superseded by 295V006H03

ADJUSTMENTS

CENTERING

The centering rings, located at the rear of the deflection yoke, should be rotated to center the raster.

DEFLECTION YOKE

The deflection yoke should be as far forward as possible (touching the bell of the CRT). Rotation of the deflection yoke is used to level the raster.

HORIZONTAL HOLD ADJUSTMENT COIL, L403

1. Connect a jumper between TP Ⓖ and TP Ⓗ to short out coil L403.

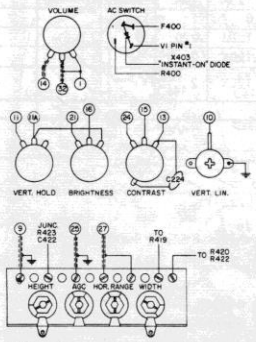


Figure 10 – Control wiring diagram. All views seen from the rear.

2. Calibrate a VTVM to 0V center scale on the 1.5V range. Connect the meter to measure DC voltage between TP Ⓕ and circuit ground.
3. Tune the receiver to a station of normal signal strength. Adjust the Horizontal Range Control, R410A (part of the Quadruple Control Assembly, located at the top right of the chassis) to lock the picture into horizontal sync. Then adjust R410A for zero volts on the VTVM.
4. Remove the jumper across L403.
5. Tune L403 to lock the picture into horizontal sync. Adjust the core to the first position that will lock the picture into horizontal sync as the core is moved from the top of the coil form toward the PC board. Then adjust L403 for zero volts on the VTVM.

WIDTH AND HEIGHT

The Width and Height controls are part of the Quadruple Control Assembly, located at the top right of the chassis (see Figure 5).

VERTICAL LINEARITY

The Vertical Linearity control is mounted on the chassis above the yoke (see Figure 5). This control has a screwdriver adjustment slot at the back.

AGC LEVEL CONTROL

This adjustment is factory set. Normally, no adjustment will be needed in the field.

Should adjustment be necessary, select the channel with the strongest signal. Turn the control (part of the Quadruple Control Assembly) clockwise until a slight bend appears at the top of the picture. Then turn the control slowly counterclockwise about ¼ turn past the point at which the bend disappears.

CIRCUIT FEATURES

HORIZONTAL BLANKING

The horizontal blanking circuit eliminates the vertical light bar usually seen during scene switching. The circuit operation is as follows:

A negative pulse is developed across the secondary winding of the flyback, and RC-coupled to the grid of the CRT. A neon bulb, NE300, is used to eliminate ripple on the positive portion of the blanking waveform. The bulb conducts only when a voltage is applied to it that is greater than its firing voltage. Only the negative portion of the waveform has sufficient amplitude to make the neon bulb conduct. Thus, NE300 conducts during the negative portion of the waveform and extinguishes during the positive portion, eliminating the ripple. Note the waveform arriving and leaving the neon bulb

INSTANT ON

"Instant On" provides immediate operation when the set is turned on, because no tube warm-up time is necessary.

Silicon diode X403 is connected in series with the AC line and the tube filament string. With the line cord plugged into an AC receptacle and the OFF-ON switch in the OFF position, the AC line voltage is rectified by silicon diode X403. This permits a pulsating direct current to flow thru the tube filament string to keep the tubes warm. No B+ is present when the OFF-ON switch is in the OFF position.

When the OFF-ON switch is turned to ON, one section of the switch places a short across diode X403 and the other side completes the AC input to R400.

VOLTAGE-DEPENDENT RESISTOR R417

Pulses from the flyback transformer are reduced in amplitude by capacitive voltage divider Z401 and applied to VDR R417. A steady positive voltage is also applied to the VDR through Width control R418A and isolation resistor R419.

The pulses applied to the VDR reach large positive values (approximately 1000 volts). Each pulse is of very short duration compared to the time between pulses. When a pulse is applied to the VDR, the resistance of the VDR drops very sharply, thereby reducing the amplitude of the pulse.

During each positive pulse, the VDR side of the top capacitor in Z401 is charged negatively. Because its charge time constant is shorter than its discharge time constant, this side of the capacitor is maintained at a negative average voltage. This negative voltage, together with the positive voltage supplied through the Width control, establishes the grid bias on the horizontal-output tube.

Unlike circuits that do not use a VDR, the horizontal-output tube does not draw grid current. The Width control setting determines the length of time that the output tube conducts during each pulse from the horizontal multivibrator. If the flyback pulse amplitude drops for any reason, the VDR action will be less and the more-positive bias on the grid will maintain the sweep width.

Reduced Horizontal Frequency Radiation

Two iron core reactors L400 and L401 are connected in series with the power supply line to prevent the horizontal oscillator frequency from reaching the power line and radiating interference.

SPECIFICATIONS

Operating voltage	nominal 120 vac, 60 cps
Power consumption	185 watts
Audio output power, maximum	2.5 watts

ALIGNMENT

SOUND ALIGNMENT

EQUIPMENT: VTVM
PROCEDURE:

1. Select the strongest station available (preferably with test pattern and test tone) and adjust the FINE TUNING for best reception. Adjust the VOLUME control so that the station sound is audible.
2. Adjust the quad coil (L102) for maximum sound from the speaker.
3. Disconnect the antenna. Use a jumper wire to short TP Ⓑ to B−.
4. Connect the VTVM to TP Ⓢ.
5. Adjust interstage transformer T100 for maximum negative voltage on the VTVM.
6. Remove the jumper wire used to short TP Ⓑ to B−.
7. Place the antenna input close to the antenna terminals so that the signal is loosely coupled to the receiver and the picture is barely visible. A pronounced noisiness (hiss) should accompany the sound.
8. Adjust the limiter input coil (L100) for maximum negative voltage on the VTVM. If the VTVM indicates a broad response while making this adjustment, the receiver input signal is too strong. When the signal coupling described in step 7 is at the necessary low point, no limiting takes place and the VTVM will indicate a sharp response to the limiter input coil adjustment.

4.5 MC TRAP ALIGNMENT

Disconnect the antenna and turn contrast control to maximum clockwise. Inject a 4.5 MC CW signal through a .001mf capacitor to TP Ⓑ. Connect a .001mf capacitor to a demodulation probe tip. Connect the other end of the probe to a VTVM and the capacitor to TP Ⓒ. Set the VTVM to 1.5-2V DC range. Turn the set on and allow ten minutes for warmup. Then adjust L208 for minimum on the VTVM.

IF ALIGNMENT

EQUIPMENT

1. **Sweep Generator** with a 10 MC wide sweep at center frequencies from 10 MC to 90 MC and 170 MC to 216 MC.
2. **CW (Marker) Generator** which accurately produces the IF and RF frequencies from 4.5 MC to 216 MC.
3. **Oscilloscope** with good low frequency response characteristics.
4. **VTVM**
5. **Bias Supply** of −2.5 volts.
6. **Standard Alignment Tool** with a 3/32" hexagonal tip. (long enough to reach bottom slugs)

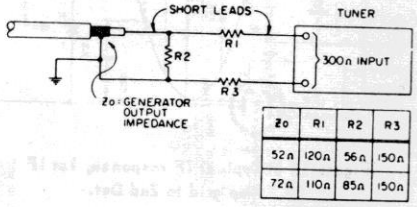
TERMINATION AND ADJUSTMENT OF EQUIPMENT

These instructions on termination and adjustment of equipment will apply throughout the IF Alignment procedure.

All test equipment cables and leads should be as short and direct as possible.

Oscilloscope and VTVM – Use a low-capacitance direct probe terminated with the decoupling network shown in Figure 13. Keep the oscilloscope calibrated for 2 volts peak to peak (P-P). Use a VTVM range suitable for measuring -1.5 volts.

Generators – Except where otherwise noted, all signal generating equipment should be terminated as shown in Figure 12. Connect the signal cable ground near the ground of the stage where the signal is injected.
Adjust the CW generator output so that: (1) When the VTVM is being used its reading remains near the -1 volt point. (2) When the oscilloscope is being used the marker frequencies do not distort the response curve.



Zo	R1	R2	R3
52Ω	120Ω	56Ω	150Ω
72Ω	110Ω	85Ω	150Ω

Figure 11 – Impedance Matching Network

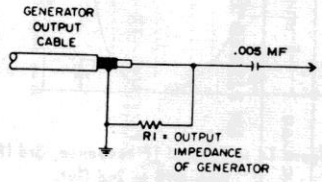


Figure 12 – Generator Cable Termination

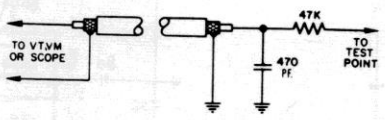


Figure 13 – Decoupling Network

ALLOW A TEN-MINUTE WARMUP BEFORE BEGINNING ALIGNMENT.

STEP	TEST EQUIPMENT AND CONNECTION	ADJUSTMENT
1.	Jumper from B– to TP (A), –2.5v to TP (T)	Channel selector to channel 10
2.	Oscilloscope and VTVM to TP (B) IF sweep generator with CW Marker at 44.25 MC to TP (E)	Short antenna terminals. T203 primary (bottom slug): Maximum amplitude T203 secondary (top slug): Rocking symmetrical response (see Figure 14)
3.	CW generator to TP (D) at: a. 45.25 MC b. 43.00 MC	T202: Maximum amplitude T201: Maximum amplitude
4.	IF sweep generator at 44.25 MC to TP (D). Couple CW marker generator to sweep generator cable. Keep marker amplitude at minimum to avoid distorting response.	T201, T202, T203: Slight retouching may be necessary to obtain response curve with correctly placed markers as shown in Figure 15. Use T203 (top slug) to flatten peak of curve, T201 to adjust low frequency slope and T202 to adjust high frequency slope.
5.	CW generator to TP (M) (see Figure 20): a. 44.25 MC b. 44.25 MC c. 47.25 MC It may be necessary to increase generator d. 47.25 MC output and/or remove the ground from TP (A).	Tuner mixer output coil: Maximum on VTVM T200: Maximum on VTVM L202: Minimum on VTVM L203: Minimum on VTVM
6.	Connect IF sweep generator to TP (M) at 44.25 MC. Couple CW generator with marker at 44.25 MC to IF sweep generator cable. Keep marker amplitude low to avoid distorting response. Adjust scope for 2V-PP.	Adjust mixer output coil and T200 for a "rocking" symmetrical response at approximately 44.25 MC with maximum amplitude and markers as shown in Figure 16.
7.	CW generator to TP (M) at 47.25 MC.	L203: Minimum amplitude (see Step 5d).
8.	IF sweep generator to TP (M) at 44.25 MC.	Wave shape as shown in Figure 16.
9.	Oscilloscope, 2V-PP. RF sweep generator thru impedance matching network (See Figure 11) to antenna terminals. Set pix marker at 193.25 MC Channel 10. Inject 45.75 MC marker into IF section by connecting CW output cable to outer shield of IF link cable.	Fine tuning screws to approximate center of range. Channel selector to Channel 10. If necessary, adjust oscillator trimmer C18 to bring channels in range with F.T. screws at approximate center of range. Oscillator slug setting: Picture carrier should fall at 45.75 MC (±300KC) marker on scope. (See Figure 17).
10.	Repeat step 9 for all channels using corresponding channel markers.	

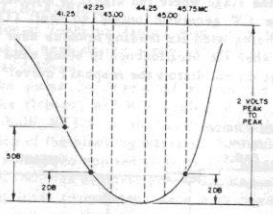


Figure 14 – Typical IF response, 3rd IF Amp grid to 2nd Det.

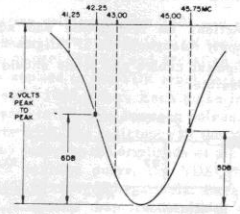


Figure 15 – Typical IF response, 1st IF Amp grid to 2nd Det.

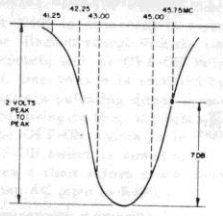


Figure 16 – Typical IF response, Mixer Amp grid to 2nd Det.

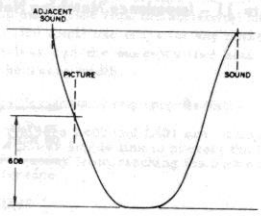


Figure 17 – Typical RF-IF response.