

SERVICE INSTRUCTIONS

GENERAL ELECTRIC

RADIO AND TELEVISION DEPARTMENT

C21T2, C21C7
Sheet 1

PRELIMINARY INFORMATION.

These television receivers are 12 channel "Strato-power" models containing 20 tubes plus 6 rectifiers (3 high-voltage rectifiers, 2 selenium power rectifiers and a crystal diode). The receiver is designed so that operation on the UHF channels may be incorporated at a later date.

This receiver bears C. S. A. approval and incorporates a 21 inch rectangular picture tube and built-in antenna. A power outlet receptacle designated "UHF translator" is located at the rear of the receiver and may be used to supply power to a UHF translator.

Other features of this receiver are: two R-F amplifier stages, noise cancellation, automatic horizontal frequency control (AFC), vertical and horizontal retrace blanking and automatic gain control. An AGC level potentiometer located on the receiver rear apron is used to optimize the receiver performance for weak and strong television signal areas. In its extreme clockwise position, an attached switch permits increased sync sensitivity for use in weak signal areas.

Built into the R-F tuner unit is an adjustable I-F interference trap for elimination or reduction of I-F interferences in the 40-50 mc range. Additional features include intercarrier sound and channel selector knob illumination.

SPECIFICATIONS	
POWER INPUT RATING:	Frequency.....25 or 60 cycles Voltage.....115 volts Current.....1.7 amps.
R-F FREQ. RANGE:	Channels..... No. 2 thru No. 13 Frequencies.... 54-88 mc, 174-216 mc
OPERATIONAL FREQUENCIES:	Picture I-F carrier..... 45.75 mc Adjacent channel audio traps..... 47.25 mc Sound I-F carrier..... 41.25 mc Adjacent channel video traps..... 38.00 mc Intercarrier sound take-off..... 4.5 mc
AUDIO POWER OUTPUT:	Undistorted..... 2 watts Maximum..... 4 watts

LOUDSPEAKER:	Type..... Alnico PM Cone Diameter, C21T2 5 1/4 inches Cone Diameter, C21C7 ... 12 inches Voice Coil Impedance @ 400 cycles..... 3.2 ohms
ANTENNA INPUT:	Built-in antenna provided External antenna terminals Impedance - 300 ohms balanced to ground

TUBES & RECTIFIERS:

SYMBOL	PURPOSE	TYPE
V101	1st R-F Amplifier.....	6AB4
V102	2nd R-F Amplifier.....	6AK5
V103	Mixer-oscillator.....	12AT7
V104	1st I-F Amplifier.....	6CB6
V105	2nd I-F Amplifier.....	6CB6
V106	3rd I-F Amplifier.....	6CB6
V107	Video Amplifier.....	12BH7
V108	Picture Tube.....	21EP4-A
V109	Audio I-F Amplifier.....	6CB6
V110	Audio I-F Limiter.....	6AU6
V111	Ratio Detector & 1st Audio Amplifier.....	6T8
V112	Audio Power Output.....	6AQ5
V113	Sync Amplifier & noise inverter....	12AT7
V114	Vertical Oscillator.....	12BH7
V115	Vertical Amplifier.....	6BX7-GT
V116	Sync clipper & horizontal blanking.....	12AX7
V117	Horizontal phase Detector & Horizontal discharge.....	12AU7
V118	Horizontal React. & Horizontal Oscillator.....	12AU7
V119	Horizontal output.....	25BQ6
V120	Horizontal Damper.....	6V3
V121	High Voltage Rectifier.....	1X2A
V122	High Voltage Rectifier.....	1X2A
V123	High Voltage Rectifier.....	1X2A
Y151	Video Detector Diode.....	1N64
PICTURE TUBE:	Type..... 21EP4-A Size..... 21 inches Construction..... Glass, rectangular Deflection Angle..... 70 degrees Mask..... Rectangular, elliptical sides Picture size..... 13 5/8 high X 18 3/4 wide	

CAUTION NOTICE

THE REGULAR B+ VOLTAGES ARE DANGEROUS AND PRECAUTION SHOULD BE TAKEN WHEN THE CHASSIS IS REMOVED FROM THE CABINET FOR SERVICE. THE HIGH VOLTAGE SUPPLY (16,000 VOLTS) AT THE PICTURE TUBE ANODE WILL GIVE AN UNPLEASANT SHOCK BUT DOES NOT SUPPLY ENOUGH CURRENT TO GIVE A FATAL BURN OR SHOCK. HOWEVER, SECONDARY HUMAN REACTIONS TO OTHERWISE HARMLESS SHOCKS HAVE BEEN KNOWN TO CAUSE INJURY. ALWAYS DISCHARGE THE PICTURE TUBE ANODE TO THE RECEIVER CHASSIS BEFORE HANDLING THE TUBE. SINCE THE HIGH VOLTAGE IS OBTAINED FROM THE B+ VOLTAGE CERTAIN PORTIONS OF THE HIGH VOLTAGE GENERATING CIRCUIT ARE DANGEROUS AND EXTREME CAUTION SHOULD BE OBSERVED.

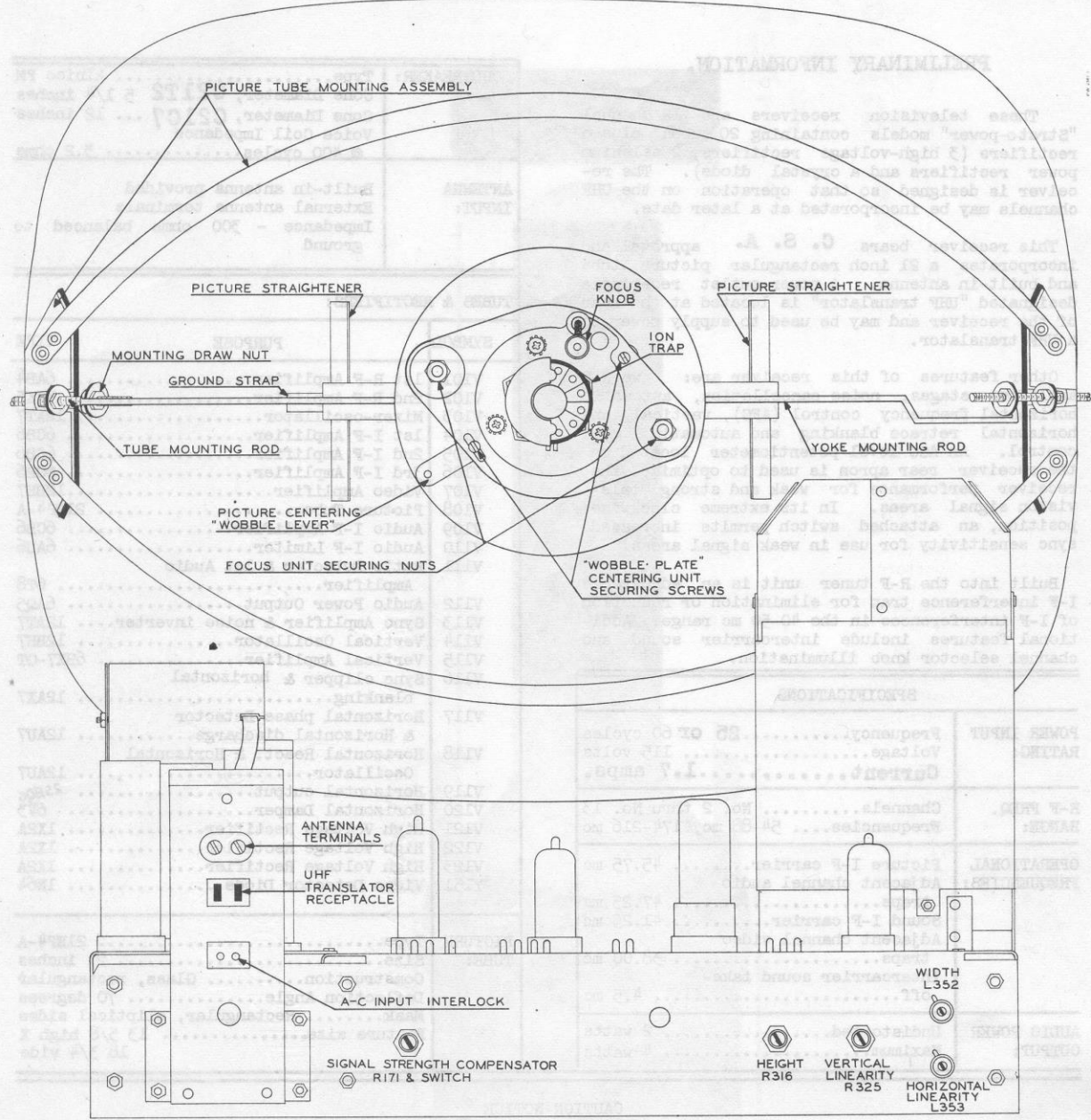
THE PICTURE TUBE IS HIGHLY EVACUATED AND IF BROKEN, GLASS FRAGMENTS WILL BE VIOLENTLY EXPELLED. WHEN HANDLING THE PICTURE TUBE ALWAYS WEAR GOGGLES.

GENERAL ELECTRIC

RADIO AND TELEVISION DEPARTMENT

SERVICE INSTRUCTIONS

CARTER, CARLOS
Sheet 1



REAR VIEW OF CHASSIS AND PICTURE TUBE ASSEMBLY.

FIG. 1

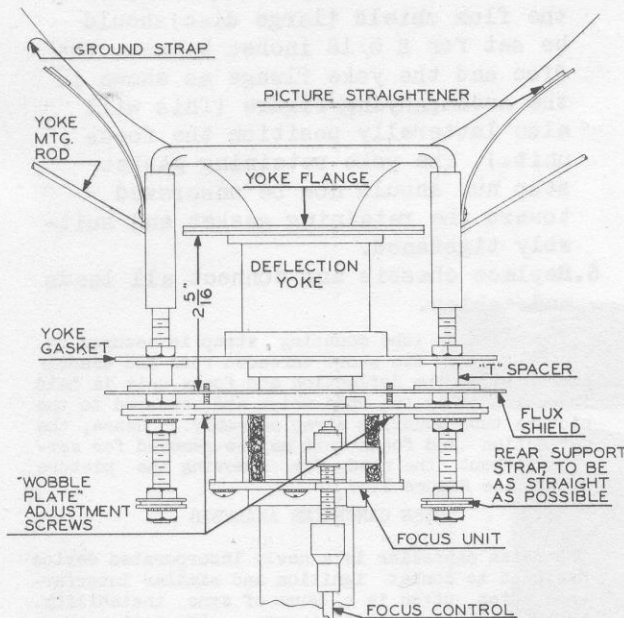


Figure 1A

INSTALLATION ADJUSTMENTS

Should any of the preset controls be out of adjustment due to handling, they may be checked as follows: Refer to Figure 1 and 1A.

1. Remove cabinet back.
2. Apply power to the receiver, turn set on and tune in a test pattern.
3. Adjust the necessary controls to correct any existing mal-adjustments. These control functions are as follows:

MECHANICAL ADJUSTMENTS

ION TRAP: Set the brightness control (under front panel trap door) to its maximum clockwise position and alternately slide and rotate the ion trap for maximum brightness.

YOKE POSITIONING: The yoke is self-positioning and requires adjustment for tilt only. To correct tilt, grasp the yoke near the back and turn until picture is straight with tube.

Caution: Avoid contact with the "hot" terminal at the pointed end of the yoke flange.

FOCUS UNIT: Recheck the 2 5/16" spacing between yoke flange and flux shield. Make sure that the focus unit is perpendicular to, and concentric around, the picture tube neck. Adjust the focus knob for best focus.

PICTURE CENTERING: The wobble plate lever which is located on the forward end of the focus unit is the centering control. Loosen its two securing screws and move the lever in a restricted circular path until the picture is centered. Readjust the focus knob if the picture centering process disturbed the focus adjustment.

PICTURE STRAIGHTENERS: These are the two anti-pincushioning magnets mounted near the bell of the picture tube. Adjust these magnets as follows:

- a) Reduce the picture size so that the raster edges are visible.
- b) Adjust the straightening magnets so that the raster edges are perfectly straight. These magnets will have an affect upon the width, but their important function is to keep the raster edges from being "bowed" in or out.
- c) Return picture to normal size with the size controls.

ELECTRICAL ADJUSTMENTS

HEIGHT AND VERTICAL LINEARITY: These controls should be adjusted simultaneously to provide proper picture height consistent with good vertical linearity. The final adjustment should extend the picture approximately 1/8 inch beyond the mask limits.

HORIZONTAL SIZE (WIDTH) & HORIZONTAL LINEARITY: These controls should be adjusted simultaneously to provide proper picture width consistent with good horizontal linearity. The adjustments, when completed, should extend the picture approximately 1/4 inch beyond the mask limits. When viewing a test pattern, the horizontal wedges should be of equal length.

HORIZONTAL HOLD: The coil, L351, See Figure 4, should be adjusted so that the horizontal sync will remain locked over the entire range of the horizontal hold control, R325. Also, the "pull-in" range of sync should be evenly distributed on each end of the horizontal hold control range. This may be checked by switching off and on station and observing the "pull-in" ability at either extreme of the control.

I-F INTERFERENCE TRAP: The R-F Tuner unit incorporates a tunable I-F interference trap in the 40-50 mc range. This trap should be adjusted after it has been determined that interfering signals in the I-F range are causing picture degradation. This trap adjustment is the rear-most adjustment on the top of the r-f tuner. See Figure 4 on page 6 for the location of this trap. It is designated as L106. If there is a station in the area on Channel #2, check to see that the tuning of the I-F trap has not affected the Channel #2 response.

SIGNAL STRENGTH COMPENSATOR.

This control is located at the rear of the receiver and should be adjusted at the time of the receiver installation.

Adjust Compensator Control so that the strongest signal to be received does not cause picture sync distortion. The extreme clockwise "switch" position of the control should be used in the weaker signal areas to improve the sync stability in the presence of ignition and similar interferences.

OVER-LOAD PROTECTION: A "slow-blow" 1.6 ampere fuse is incorporated in this receiver to protect the power supply rectifiers from over-load. Should the receiver fail to operate, the fuse should be checked and the cause of overload remedied.

REMOVAL OF RECEIVER FROM CABINET

- A) To Remove Chassis:
 1. Remove cabinet back.
 2. Remove all knobs.
 3. Remove the four chassis bolts.
 4. Disconnect the following leads and/or cables.
 - a) Picture tube socket.

- b) Horizontal yoke "Hot" lead (white with connector).
 - c) Yoke plug.
 - d) High voltage lead (discharge to chassis first).
 - e) Speaker leads.
5. Slide chassis back and out of cabinet.

B) To remove Picture Tube:

1. Remove chassis as above.
2. Remove ion trap.
3. Loosen and remove nuts and washers which secure rear support rods, and move straps aside.
4. Remove focus unit and deflection yoke. (To more easily remove the yoke remove the two retaining clips on the yoke. Place the thumbs of both hands on the tube base key and the remainder of the fingers against the forward edge of the yoke. Remove the yoke by applying moderate pressure between the tube base key and the yoke, being careful not to damage the wiring, etc. on the textolite yoke terminal ring.
5. Loosen nut at picture tube assembly strap, unhook support rods and remove focus unit support assembly.
6. Lay cabinet face down on a soft non-scratching surface.
7. Loosen nuts securing picture tube strap assembly to cabinet and remove strap assembly.
8. Remove picture tube.

INSTALLATION OF PICTURE TUBE & CHASSIS

1. Before inserting picture tube into mask, the sponge rubber dust seal should be placed into the space between the mask front bezel and the inside rim. The dust seal should then be pulled through the eight tab holes arranged around the mask inside rim. Hook the dust seal on the eight tabs.
2. Replace picture tube.
3. Replace, in reverse order, all parts removed in "A" above.
4. After the side rods have been tightened and the assembly secured so that the picture tube can't possibly move or shift, the dust seal may be positioned. Push the dust seal off of the eight tabs in the mask rim. The dust seal will then fall into its proper place between the picture tube and the mask.
5. The nut between the yoke retaining gasket and the yoke support should be turned by finger fully forward.

The nut immediately to the rear of the flux shield (large disc) should be set for 2 5/16 inches between the disc and the yoke flange as shown in the accompanying figure (This will also laterally position the focus unit.) The yoke retaining gasket stop nut should now be unscrewed toward the retaining gasket and suitably tightened.

6. Replace chassis and connect all leads and cables.

The picture tube mounting strap is secured to the cabinet by two short threaded rods and associated nuts. The deflection and focus unit is held in position by two rods which are secured to the picture tube mounting strap assembly. Hence, the deflection and focus unit may be removed for service without the need for removing the picture tube. See Figure 1.

NOISE CANCELLER ANALYSIS

The noise canceller is a newly incorporated device designed to combat ignition and similar interference which often is a cause of sync instability. Refer to the schematic diagram. Its action is as follows:

The composite sync and video information from the crystal diode is amplified by V113A and passed to the sync clipper V116A in the usual fashion. The negative grid voltage developed by sync-tip clipper grid rectification is used for AGC bias.

The noise inverter or canceller, V113B is tied across the output of the sync amplifier V113A. The cathode of the canceller has a fixed positive bias applied by virtue of R301, R302. Its grid is maintained at a negative bias level equal to the peak voltage of the incoming signal sync tips. This negative grid bias is obtained from the crystal diode, Y151, and suitably filtered by R166 and C169. These two bias voltages combine to cut off the canceller tube, V113B, so that it will normally not conduct in the presence of a received television signal.

The cathode of the canceller, V113B, is fed a signal consisting of video and negative going sync as well as impulse noise, if any. Since the canceller is cut off and will not pass any signals equal to or less than the sync-tip level, nothing happens until a noise pulse of greater-than-sync tip level occurs. When this happens, the canceller tube, V113B, will conduct heavily, and effectively short-circuit the output of the sync amplifier. Of course, during the time interval of the noise pulse, neither sync nor noise will be present in the output of the sync clipper. At these times, the inertia of the sweep circuits or "fly-wheel" effect is relied upon to maintain proper frequency. After the noise pulse is over, the canceller tube, V113B, ceases to conduct and the circuits return to normal operation.

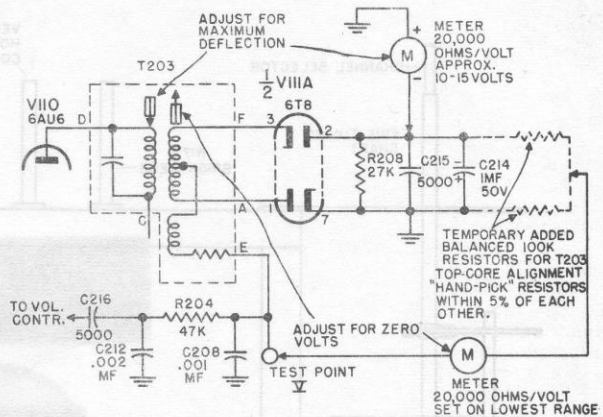
HORIZONTAL AFC

The horizontal AFC discriminator functions in a manner very similar to the AFC discriminator used in previous production receivers. However, instead of using a double diode (6AL5 or 6AQ7), a triode, V117A (1/2 12AU7) is used. It may be considered as being a double diode with both cathodes tied together and with the grid and plate acting as the two plates in a double diode.

The AFC control voltage from this discriminator is then suitably filtered and applied to the grid of a conventional reactance control tube, V118A.

AUDIO I-F ALIGNMENT

2. Figure 1 shows a simple resistor network needed for the alignment of T203 secondary. These two 100K resistors should be chosen as accurately as possible, for equal resistance. Be sure to remove these resistors after completing the alignment. Align as follows:



STEP NO.	CONNECT VTVM OR 20,000 OHMS/VOLTMETER	ADJUST	METER INDICATION	REMARKS
1	To test point VI and chassis.	L160 and T201 (top and bottom cores)	Adjust for Maximum Deflection	Voltage to be read is negative with respect to chassis.
2	VIIIA, Pin 2 and chassis	T203 primary, (bottom core)		
3	Test Point V and center of two 100K resistors. See Figure 2.	T203 Secondary, (top core)	Adjust for zero volts, D-C, output.	Repeat steps two and three to assure proper final adjustment.

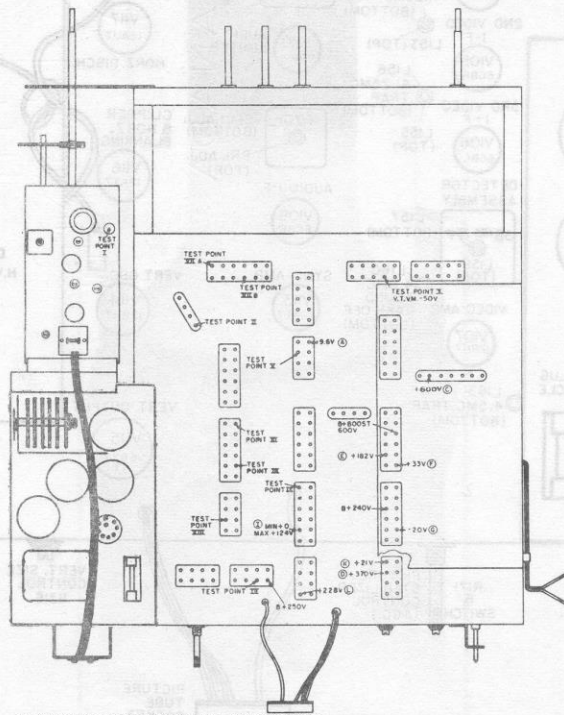


FIG. 3.

TEST POINT LOCATION

ALL VOLTAGES TAKEN WITH 20,000 Ω /VOLTMETER UNLESS OTHERWISE INDICATE

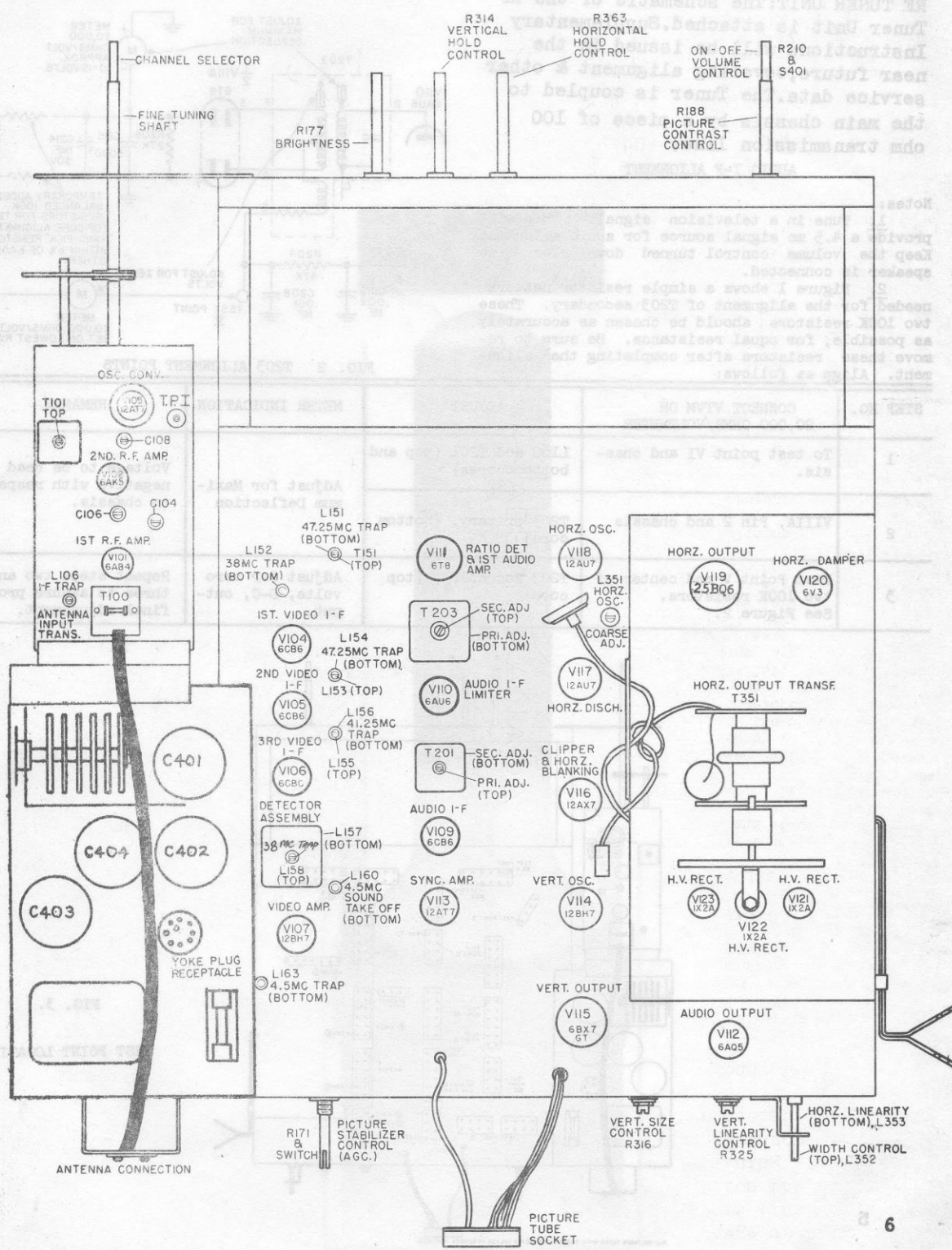


FIG. 4. TUBE & TRIMMER LOCATION

VIDEO I-F ALIGNMENT:

The usual precautions should be observed regarding the proper termination of the sweep output cable, warm-up time, equipment cable dress, etc. Always use an Isolation Transformer when servicing this receiver.

NOTES:

1. In many cases, it will only be necessary to start with Step 2 of the procedure below. Step 1 is included only as a "Starting" point for use in cases where the receiver has become seriously misaligned, or when the correct setting of the 38.0 mc trap (L158) is difficult to determine in the "over-all" I-F curve.

2. Connect a 100K, 1/2 watt resistor across R302 (2.2 meg.) to cut off the noise inverter which otherwise would cause a false I-F curve indication. Remove this resistor after completing the alignment.

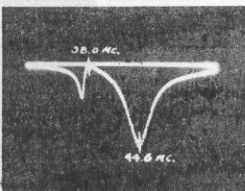
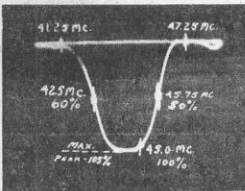
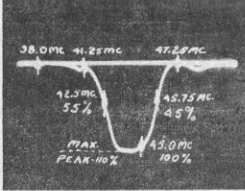
3. Connect the negative lead of a 3 volt bias battery to test point VIIA. Connect the positive lead to the nearest top chassis ground point.

Similarly, insert a 45.0 volt negative bias at test point X to prevent horizontal pulse information from appearing on the sweep waveforms.

4. Calibrate the vertical gain of the oscilloscope so that 3/4V A-C will provide the desired curve size. Next, connect the oscilloscope vertical input to test point III. Connect the ground side of the cable to the nearest top-chassis ground point.

5. The actual photographs of curves shown below were made from a typical receiver, however, minor variations may be expected. If the proper curves are extremely difficult to obtain, check the tubes involved first. Next, check the crystal diode, since its forward resistance will effect the loading of coil, L157. This does not mean that the crystal is bad, since, in many cases, it will perform properly in other receivers. If the shape of the I-F response curve changes as the tuning control (C118) is rotated, switch to another channel where oscillator tuning influence is not noted. Align as follows:

ALIGNMENT CHART

Step	Sweep Input	Adjust	Desired Waveform	Remarks
1	Into Pin 1 of V106 thru .001 mf. Center sweep frequency approx. 44 mc. Sweep width approx. 15 mc.	L158 (Trap) to 38.0 mc L157 - to peak at 44.6mc		Use full available sweep width. Adjust sweep input level to produce a 3/4 volt deflection on the oscilloscope
2	Into Test Point #2 thru .001 mf. Center sweep frequency approx. 44 mc. Sweep width approx. 10 mc.	L156 (Trap) to 41.25 mc L154 (Trap) to 47.25 mc L153 set 45.75 mc @ 50% L155 set 42.5 mc @ 60% L157 "Level-off" curve peak		Check all indicated marker frequencies. If necessary, increase sweep input level to observe traps. Top of curve should be fairly flat and not "tilted"
3	Into Test Point #1 (on R-F Tuner) thru .001 mf. center sweep frequency approx. 44 mc. Sweep width approx. 10 mc.	L152 (Trap) to 38.0 mc L151 (Trap) to 47.25 mc T101 & T151 for max. gain T101 for proper markers as shown. Readjust L153 & L155 to obtain proper 42.5 & 45.75 markers, if necessary		Use full output level of sweep generator to observe traps. Max. curve peak @ 110% of 45.0 mc marker point. Min. curve peak flattened off at 105% of 45.0 mc marker point. Do not align with "saddle-back".
4	Into R-F Tuner input thru balanced adapter & 300 ohm pad and line. Sweep Channels 2-13. Sweep width approx. 10 mc.	C108 (R-F Tuner)	Align for zero "tilt" on ch. 12. Check chs. 7-13 and make further compromise adjustment so that each channel will have no more than ±20% "tilt" with the fine tuning adjusted to provide the proper sound and picture I-F markers.	
		L124 & L127 (R-F Tuner)	Align for zero "tilt" on channels 3 & 6. Check chs. 2-6 and make further compromise adjustment so that each channel will have no more than ±20% "tilt" with the fine tuning adjusted to provide the proper sound and picture I-F markers.	

PRODUCTION CHANGES

Due to the preliminary nature of this Service Instruction it is probable that changes will be made in production, particularly in schematic diagrams and parts list. Additional sheets will be issued from time to time covering these changes.

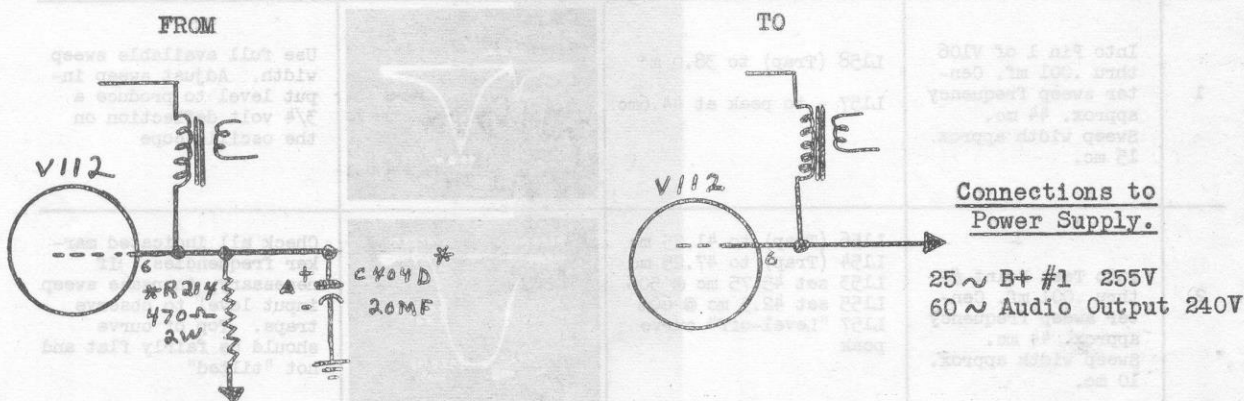
The following corrections to the attached schematics should be noted.

SCHEMATIC DIAGRAM: In the screen circuit of V119 the value of Resistor R373 should be changed from 22K to 15K.

AUDIO CIRCUIT: Change volume control symbol from R201 to R210.

Under note in lower left corner Delete "R214 and C404 are located in power supply on 25 cycle sets".

In the upper right corner change schematic:-



REPLACEMENT PARTS LIST: Please make the following corrections and additions:-
 R1026 - Change description to read Insulator - Head end
 R1029 - Plug - Add under description - For Speaker.

VIDEO DETECTOR: A few early receivers used a video detector assembly mounted in a two piece shield can assembly. The main can assembly was mounted on the chassis by means of spade bolts and nuts. The crystal was mounted on top of the assembly under the "lift off" top portion of the can assembly.

Current production use a detector assembly mounted in a single can and mounted by self tapping screws through the two brackets on the can, into the chassis. The crystal is mounted inside the can. Both units are of plug in connection type and are electrically interchangeable.

Only the new type will be stocked in renewal parts and if replacing one of the early type it will be necessary to drill two holes spaced $1\frac{3}{4}$ " centre to centre in the chassis if it is desired to lock it securely in place.

REPLACEMENT PARTS LIST

CALTE, C21C7
Sheet 5.

MAIN CHASSIS PARTS

Cat.#	Symbol	Description
R1000	-	Bushing - insulating
R1001	-	Clamp - Plastic
R1002	L355	Coil - flexible choke 30UH
R1003	L404	" - Choke 1.4UH
R1004	L163	" - trap 4.5MC
R1005	L352	" - horizontal size
R1006	L353	" - horizontal Linearity
R1007	L351	" - horizontal oscillator
R1008	{L402, L403, L405	" - Choke 2. 2UH
R1009	L202	" - Choke 3. 3UH
R1010	{L357, L167, L356	" - Choke 10UH
R1011	L161	" - Peaking 120UH includes R164
R1012	L166	" - Peaking -165UH " R172
R1013	L165	" - Peaking -425UH
R1014	L162	" - Peaking -265UH
R1015	L152	" - Trap 38MC - includes C153, C176
R1016	L153, L154	" - 1st I.F. Plate - includes C165
R1017	L155, L156	" - 2nd I.F. Plate - includes C164
R1018	L160	" - Audio Take-off 4.5MC includes C167, C166
R1019	-	Connector - yoke (female)
R1020	-	" - high voltage - anode
R1021	-	Coupling (textolite)
R1022	-	Disc - friction drive
R1023	Y151	{L157, L158, L159, L168 Detector - video - includes C162, C163, C179, IN64
R1024	-	Focus Unit
-	F401	Fuse - slow blow-Bussman 1.6 amps 125v
R1025	-	Insulator - tuning shaft
R1026	-	Insulator - lead end
R1027	-	Insulator, rectifier
R1028	P301	Integrator plate for R309, R310, R311, C305, C306, C307
R1029	-	Plug
R1030	-	Plug
R1031	L401	Reactor - filter 25/60 cycle
R1032	L 600	Reactor - filter 25 cycle
R1033	-	Receptacle - translator power
R1034	-	Receptacle - Power Cord
R1035	X401, X402	Rectifier - selenium
R1036	-	Shaft - tubular
R1037	-	" - flexible

REPLACEMENT PARTS LIST (Cont'd)

Cat.#	Symbol	Description
R1038	-	Shaft - selector
R1039	-	Shield - pilot light
R1040	-	Socket
R1041	-	Socket - 1X2A rectifier
R1042	-	" - yoke
R1043	-	" - tube - (8) pinplate
R1044	-	" - tube - (7) pinplate
R1045	-	" - tube - (9) pinplate
R1046	-	" - tube - (9) adaptor
R1047	-	" - tube - (7) adaptor
R1048	-	" - tube - (8) adaptor
R1049	-	" - Pilot light
R1050	-	" - Picture tube
R1051	-	Spring - tuning control shaft
R1052	-	Straightener - picture straightener
R1053	T401	Transformer - filament 60 cycle
R1054	T401	" " 25 cycle
R1055	T151	" - I.F. input - includes C175, L151
R1056	T202	" - output - audio
R1057	T351	" - output - horizontal sweep
R1058	T301	" - output - vertical sweep
R1059	T203	" - ratio detector - includes C218, C219, R220
R1060	T201	" - 4.5MC - includes C204
R1061	-	Wheel - tuner drive
R1062	D301 - D351	Yoke - deflection yoke assy - includes L357, R320, R321

C A P A C I T O R S.

R1063	C301	Capacitor - electrolytic - 1 mfd - 50v
R1064	C404 A,B,C,D	" " -50 mfd - 25v
		40 MFD-300V, 30MFD-300V
		20 MFD-300V
R1065	C402	" - electrolytic 125 MFD-350V
R1066	C403 A,B,C	" " {125 MFD-350V, 100MFD-75V, 5MFD-200V
R1067	C401	" - electrolytic - 300MFD-150V
R1068	C158	" - Mica - 18 MMFD-500V-5%
R1069	C155	" - Ceramic - 24MMFD - 500V-5%
R1070	C209	" - Mica - 43MMFD - 500V-10%
R1071	C205	" - Mica - 47MMFD - 500V-20%
R1072	C353-C362	" - Mica -100MMFD - 500V-10%
R1073	C354	" - Mica -180MMFD - 800V-10%

REPLACEMENT PARTS LIST (Cont'd)

Cat.#	Symbol	Description
R1074	C173, C174	Capacitor - Mica - 180MMFD - 3KV-10%
R1075	C359	" - Mica - 220MMFD - 500V-10%
R1076	C352	" - Mica - 300MMFD - 500V-10%
R1077	C152	" - Mica - 470MMFD - 300V- 5%
R1078	C356, C358	" - Mica - 470MMFD - 500V-10%
R1079	C303	" - Mica - 470MMFD - 500V-20%
R1080	C379, C377	" - Ceramic - 500MMFD - 20KV.
R1081	C154, C157	" - Ceramic - 680MMFD - 500V-10%
R1082	C416, C417	" - Ceramic - 800MMFD - 500V-10%
R1083	C160	" - Ceramic - 820MMFD - 500V-10%
R1084	C355	" - Mica - 1000MMFD - 800V-10%
R1085	C203	" - Ceramic 1300MMFD - 500V-20%
R1086	C381	" - Paper 2700MMFD -3000V-10%
R1087	C386	" - Paper 3300MMFD - 500V-10%
R1088	{C201, C202, C206, C207	
R1089	{C215, C217, C406, C407	" - Ceramic - 5000MMFD
R1090	C216	Capacitor - Ceramic - 10,000MMFD 450V
R1091	C208	" - Paper .001MFD 200V
R1092	C361-C375	" - Paper .001MFD 600V-10%
R1093	C360	" - Paper .0012 MFD 600V-10%
R1094	C212	" - Paper .002MFD 200V
R1095	C304	" - Paper .003MFD 600V
R1096	C316, C318, C383	" - Paper .0039MFD 600V-10%
R1097	C308	" - Paper .004MFD 600V
R1098	C315, C363, C365, C385	" - Paper .0047MFD - 600V - 20%
R1099	C213	" - Paper .008MFD - 1000V
R1100	C211	" - Paper .01MFD - 200V
R1101	C369	" - Paper .01MFD-600V
R1102	C311	" - Paper .01MFD-600V 10%
R1103	C302	" - Paper .01MFD-600V 20%
R1104	C384	" - Paper .015MFD-600V 10%
R1105	C313, C351	" - Paper .02MFD-600V
R1106	C370	" - Paper .025MFD 200V 10%
R1107	C310	" - Paper .047MFD-600V 10%
R1108	C170, C180	" - Paper .05MFD-200V
R1109	C367	" - Paper .05MFD-400V
R1110	C405, C411, C415, C210	" - Paper .05MFD-600V
R1111	C309	" - Paper .056MFD-600V 10%
R1112	C314, C357	" - Paper .1MFD-200V
R1113	C171	" - Paper .1MFD-600V 20%
R1114	C317	" - Paper .1MFD-1000V
R1115	C371	" - Paper .25MFD-600V
R1116	C151	" - Paper .5MFD-200V
R1117	C169, C172	" - Paper .2MFD-200V

REPLACEMENT PARTS LIST (Cont'd)

CONTROLS (VARIABLE RESISTORS)

Cat.#	Symbol	Description
R1117	R325	Control - vertical linearity - 2000 OHMS
R1118	R316	" - height - 4 Meg. OHMS
R1119	R171	" - automatic gain & switch 2 Meg OHMS
R1120	R210 } R188 }	" - { dual volume 500,000 OHMS contrast 3,000 OHMS
R1121	R363 } R177 }	" - { dual horizontal hold - 100,000 OHMS brightness - 100,000 OHMS
R1122	R314	" - vertical hold - 125,000 OHMS

RESISTORS (FIXED)

R1123	R401	Resistor - W.W. - 4.6 OHMS 5 Watt 10%
-	R600	" - W.W. 20 OHMS 5 Watt (IRC Type "1A")
-	R153, R156	" - Carbon 47 OHMS 1/2 Watt 5%
-	R213	" - Carbon 47 OHMS 1/2 Watt 20%
-	R377	" - Wire wound 150 OHMS 5 Watt 10%
-	R159, R201	" - Carbon 180 OHMS 1/2 Watt 10%
-	R212	" - Carbon 220 OHMS 1 Watt 10%
-	R368	" - Carbon 330 OHMS 1/2 Watt 20%
-	R379	" - Carbon 330 OHMS 1 Watt 10%
-	R178	" - Carbon 470 OHMS 1/2 Watt 20%
-	R318	" - Carbon 470 OHMS 2 Watt 10%
-	R214, R319	" - Carbon 470 OHMS 2 Watt 20%
-	(R154, R157)	" - Carbon 1000 OHMS 1/2 Watt 20%
-	(R211, R370)	" - Carbon - 1200 OHMS 1 Watt 10%
-	R403	" - Carbon - 1500 OHMS 1/2 Watt 10%
-	R167	" - Carbon 2200 OHMS 1/2 Watt 10%
-	R320-R321	" - W.W. 3000 OHMS 7.5 Watt 10%
R1124	R404	" - Carbon 3900 OHMS 1/2 Watt 5%
-	R162	" - Carbon 3900 OHMS part of L164
-	R168	" - Carbon 4700 OHMS 1 Watt 20%
-	R161, R203	" - Carbon 5600 OHMS 1/2 Watt 5%
-	R155	" - W.W. 5600 OHMS 10 Watt 10%
R1125	R406	" - Carbon 6800 OHMS 1/2 Watt 10%
-	R365	" - Carbon 6800 OHMS 2 Watt 10%
-	R170	" - Carbon 8200 OHMS part of L166
-	R172	" - Carbon 10,000 OHMS 1/2 Watt 10%
-	R306, R358	" - Carbon 10,000 OHMS 1/2 Watt 20%
-	R174, R180	" - Carbon 15,000 OHMS 1/2 Watt 10%
-	R301	" - Carbon 15,000 OHMS part of L161
-	R164	" - Carbon 15,000 OHMS 2 Watt 10%
-	R373	" - " 150 OHMS 1/2 Watt 20%
-	R601, R602, R603	" - " 150 OHMS 1/2 Watt 20%

REPLACEMENT PARTS LIST (Cont'd)

C21T2 C21C7
Sheet 7

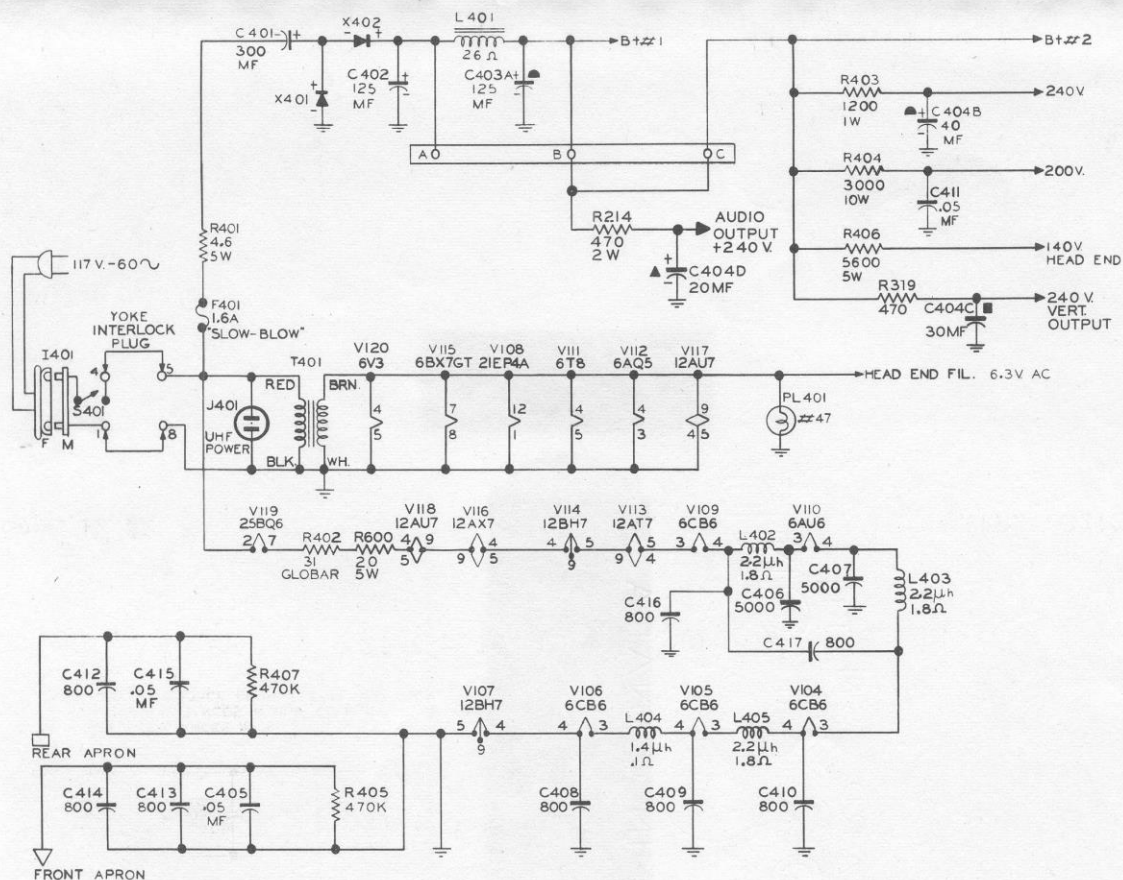
RESISTORS (FIXED)

Cat.#	Symbol	Description
-	R160, R202	Resistors - Carbon 18,000 OHMS $\frac{1}{2}$ Watt 10%
-	R152, R158	" - Carbon 20,000 OHMS $\frac{1}{2}$ Watt 5%
-	R307,	" - Carbon 22,000 OHMS $\frac{1}{2}$ Watt 10%
-	R149, R187	" - Carbon 22,000 OHMS 2 Watt 10%
-	R328	" - Carbon 22,000 OHMS 1 Watt 10%
-	R205, R208, R362	" - Carbon 27,000 OHMS $\frac{1}{2}$ Watt 10%
-	{R166, R209, R359}	" - Carbon 33,000 OHMS $\frac{1}{2}$ Watt 10%
-	R367	
-	R357	" - Carbon 33,000 OHMS $\frac{1}{2}$ Watt 20%
-	R366	" - Carbon 33,000 OHMS 1 Watt 10%
-	R186	" - Carbon 33,000 OHMS 2 Watt 10%
-	R204, R218	" - Carbon 47,000 OHMS $\frac{1}{2}$ Watt 10%
-	R312	" - Carbon 47,000 OHMS 2 Watt 10%
-	{R313, R360,}	
-	{R361, R364}	" - Carbon 68,000 OHMS $\frac{1}{2}$ Watt 10%
-	R327	" - Carbon 82,000 OHMS $\frac{1}{2}$ Watt 10%
-	{R178, R206,}	" - Carbon 100,000 OHMS $\frac{1}{2}$ Watt 10%
-	{R353, R372}	
-	R215	" - Carbon 100,000 OHMS $\frac{1}{2}$ Watt 20%
-	R352	" - Carbon 120,000 OHMS $\frac{1}{2}$ Watt 10%
-	R303	" - Carbon 150,000 OHMS $\frac{1}{2}$ Watt 10%
-	R308	" - Carbon 180,000 OHMS $\frac{1}{2}$ Watt 10%
-	R356	" - Carbon 220,000 OHMS $\frac{1}{2}$ Watt 10%
-	R176	" - Carbon 270,000 OHMS $\frac{1}{2}$ Watt 10%
-	R304, R305	" - Carbon 470,000 OHMS $\frac{1}{2}$ Watt 10%
-	{R183, R207, R216}	
-	{R217, R405, R407, R362}	" - Carbon 470,000 OHMS $\frac{1}{2}$ Watt 20%
-	R354	" - Carbon 560,000 OHMS $\frac{1}{2}$ Watt 10%
-	R165, R185, R324	" - Carbon 1 Meg OHMS $\frac{1}{2}$ Watt 10%
-	{R173, R309, R322}	" - Carbon 1 Meg. OHMS $\frac{1}{2}$ Watt 20%
-	{R323, R355, R371}	
-	R330	" - Carbon 1.5 Meg. OHMS $\frac{1}{2}$ Watt 10%
-	R175, R302, R374	" - Carbon 2.2 Meg. OHMS $\frac{1}{2}$ Watt 10%
-	R375	" - Carbon 3.3 Meg. OHMS $\frac{1}{2}$ Watt 10%
-	R181, R182, R317	" - Carbon 3.3 Meg. OHMS $\frac{1}{2}$ Watt 20%
-	R315	" - Carbon 3.9 Meg OHMS $\frac{1}{2}$ Watt 10%
-	R219	" - Carbon 6.8 Meg. OHMS $\frac{1}{2}$ Watt 20%
R1126	R402	" - Globar - 31 OHMS

Distribution - E.S.1 - 10E P.B.4 - 10E

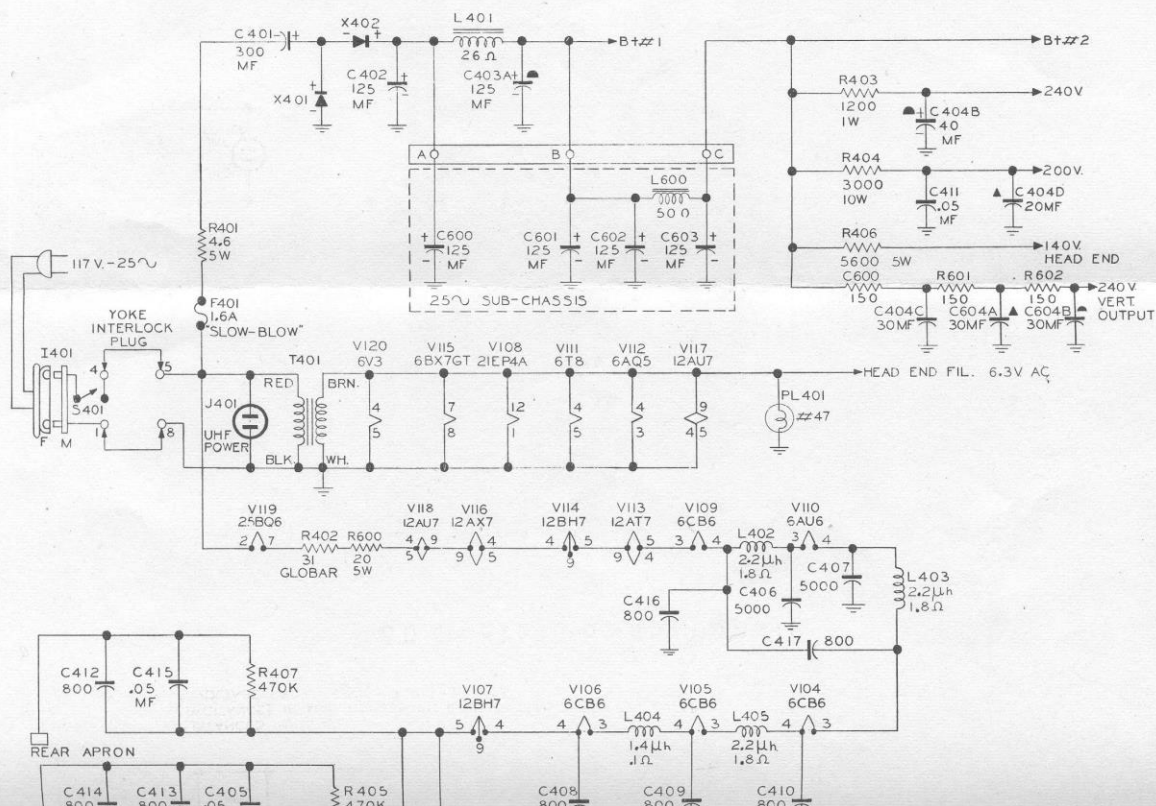
RADIO AND TELEVISION DEPARTMENT
CANADIAN GENERAL ELECTRIC COMPANY LIMITED,
TORONTO, CANADA.

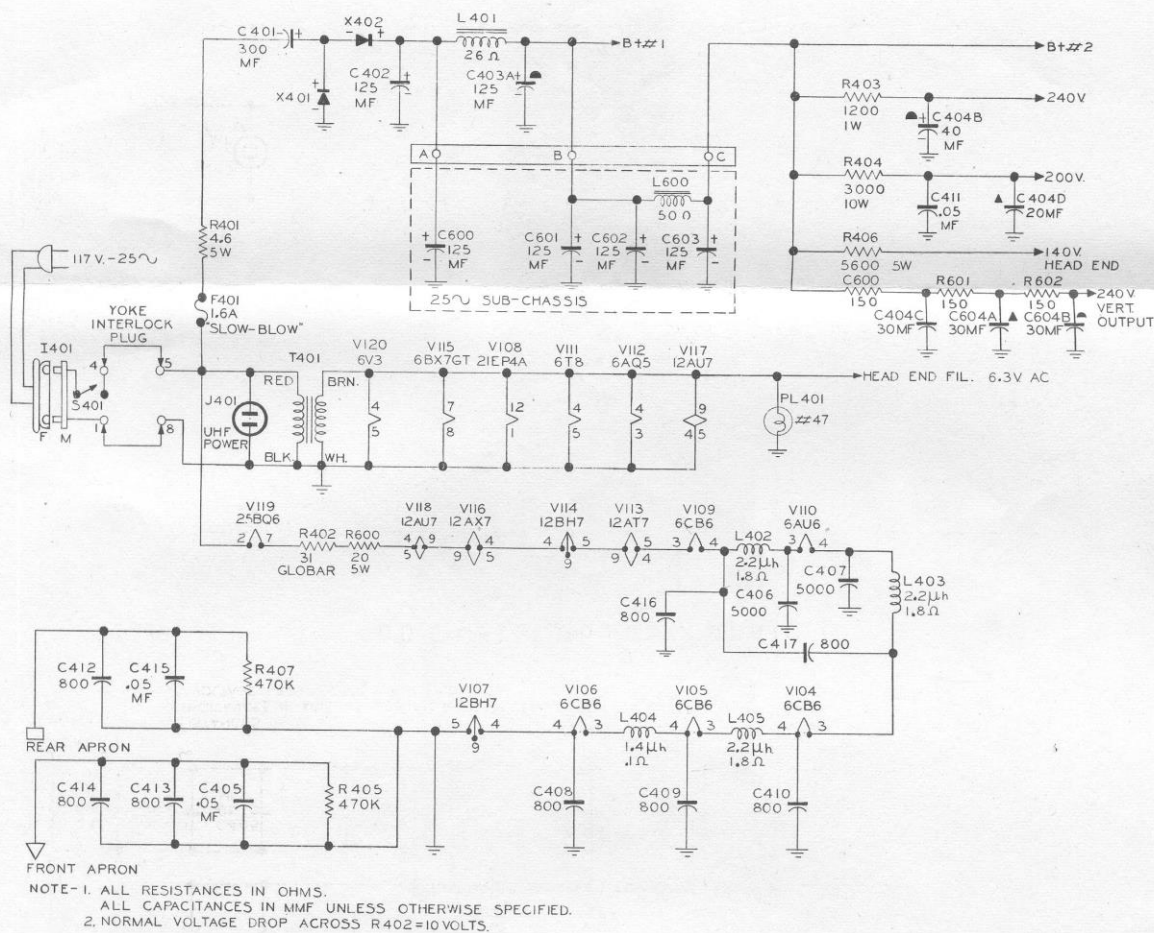
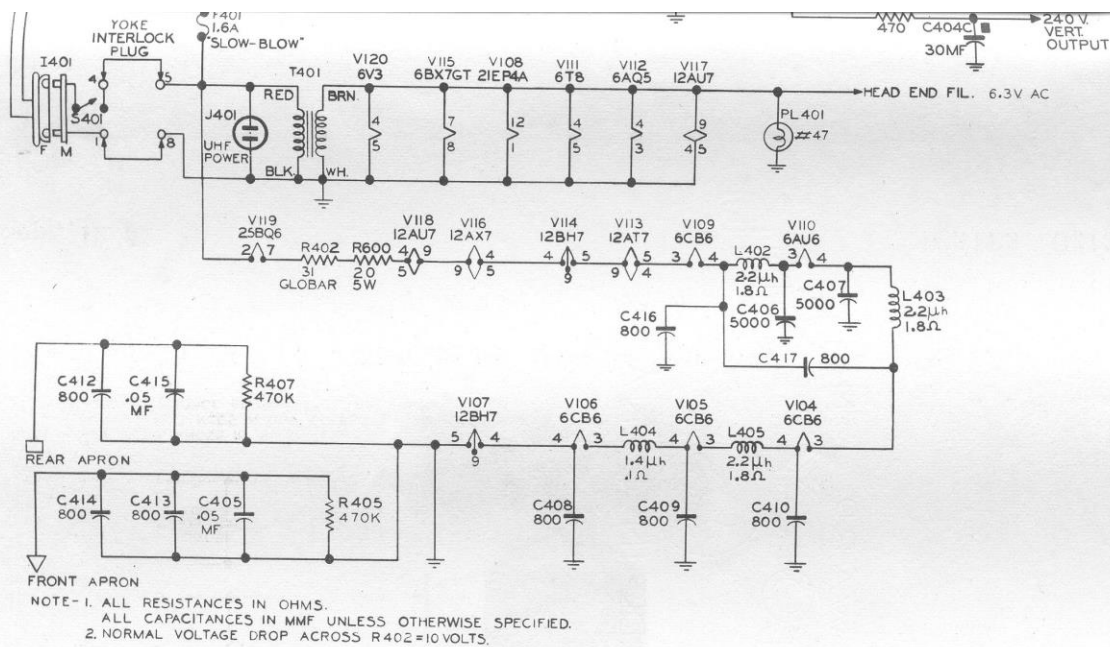
September 1952

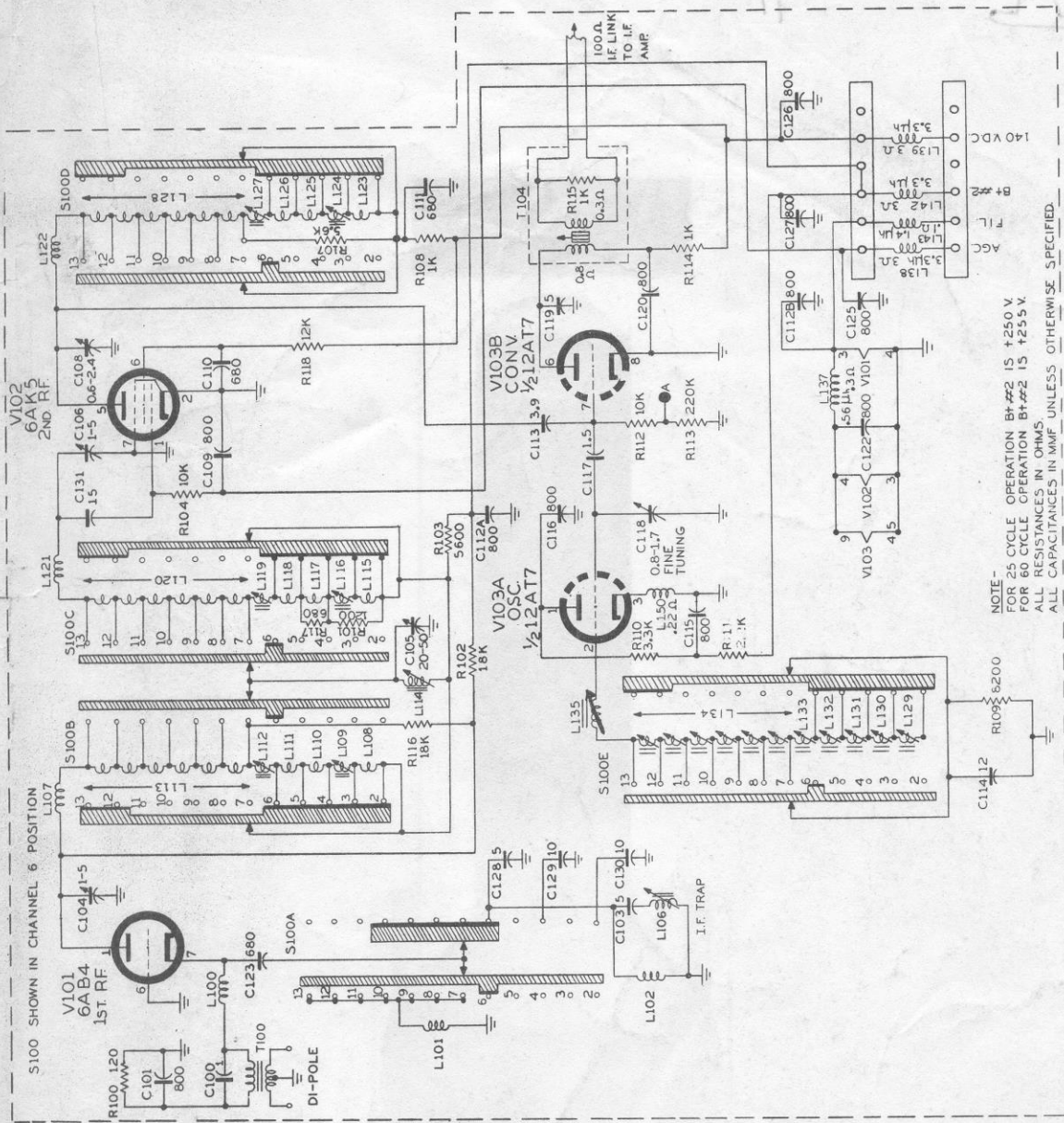


NOTE-1. ALL RESISTANCES IN OHMS.
ALL CAPACITANCES IN MMF UNLESS OTHERWISE SPECIFIED.
2. NORMAL VOLTAGE DROP ACROSS R402=10 VOLTS.

60 Cycle Power Supply

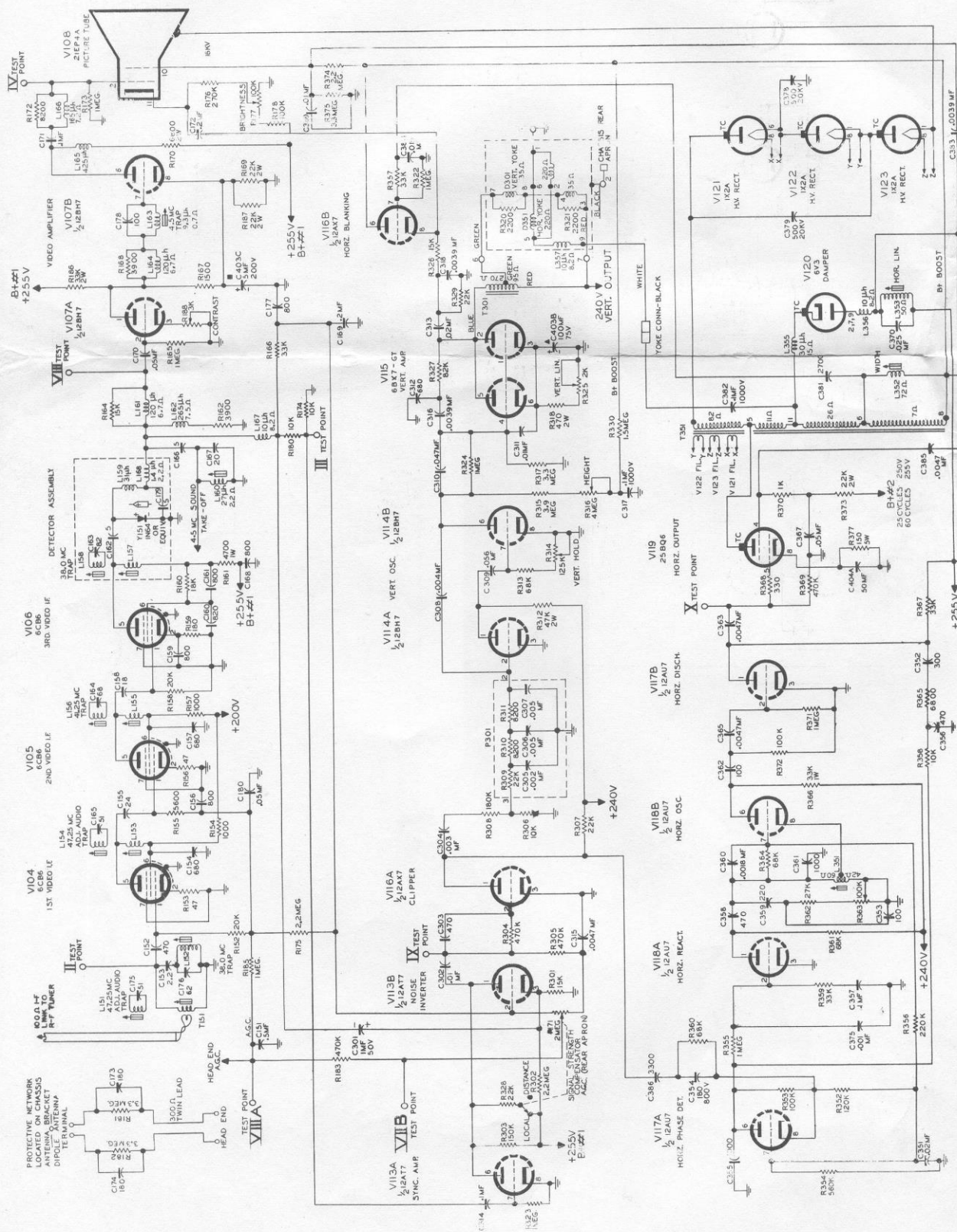






NOTE -
 FOR 25 CYCLE OPERATION BT#2 IS +250 V
 FOR 60 CYCLE OPERATION BT#2 IS +255 V
 ALL RESISTANCES IN OHMS
 ALL CAPACITANCES IN MMF UNLESS OTHERWISE SPECIFIED.

TUNER UNIT SCHEMATIC C21T2, C21C7.



NOTE - ALL RESISTANCES IN OHMS
ALL CAPACITANCES IN MMF UNLESS OTHERWISE SPECIFIED

SCHEMATIC DIAGRAM C21T2, C21C7.

Sept. 12/52