ELECTRONIC TECHNICIAN's

101

TV-RADIO SCHEMATICS

Including "SHOP HINTS" Almanac

Volume 2

ELECTRONIC TECHNICIAN's 101 TELEVISION & RADIO SCHEMATICS

Including "SHOP HINTS" Almanac

TELEVISION SCHEMATICS

(Continued on next page)

RADIO SCHEMATICS

SHOP HINTS ALMANAC

Schematic for 17XP3 Television Chassis.

SCHEMATIC NOTES

(A1), (A2),...... (Y), (Z), etc. indicate alignment points and alignment connections.

IMPORTANT: Before making waveform and voltage measurements, see instructions below.

Fixed resistor values shown in ohms ± 10% tolerance, ½ watt; capacitor values shown in micromicrofarads ± 20% tolerance unless otherwise specified.

NOTE: K= x 1000, MEG= x 1,000,000 MF= microfarad.

CAUTION: The chassis of this receiver is connected to one side of the power line. Operation of the chassis outside of the cabinet or with the cabinet back removed involves a shock hazard. **Do not ground this chassis or connect test equipment to it unless an isolation transformer is used.**

CONDITIONS FOR OBSERVING WAVEFORMS

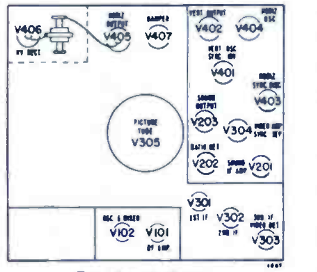
Warning: Pulsed high voltages are present on the caps of V405 and V406, and at pin 3 of V407. **Do not attempt to observe wave forms at these points unless suitable test equipment is used.** Waveforms at these points may be taken with a capacitive voltage divider probe. The waveform at pin 3 of V407 may also be taken by clipping or twisting the lead from the high side of the oscilloscope over the insulation on the lead connecting to pin 3. If the waveform is taken in this manner, its shape will be the same, but the peak-to-peak voltage will be somewhat lower, depending on the degree of coupling between the oscilloscope and the lead connecting to pin 3 of V407.

- Waveforms should closely resemble those shown on the schematic.
- Waveforms are taken with a transmitted signal input to the television chassis.
- Set all controls for a normal picture. After the receiver is set for a normal picture, turn the **Contrast** control fully clockwise.
- Oscilloscope sweep is set at 30 cycles for vertical waveforms and at 7,875 cycles for horizontal waveforms to permit 2 complete cycles to be observed.
- Peak-to-peak voltages will vary slightly from those shown on the schematic, depending on the test equipment employed and chassis parts tolerance.

CONDITIONS FOR MEASURING VOLTAGES

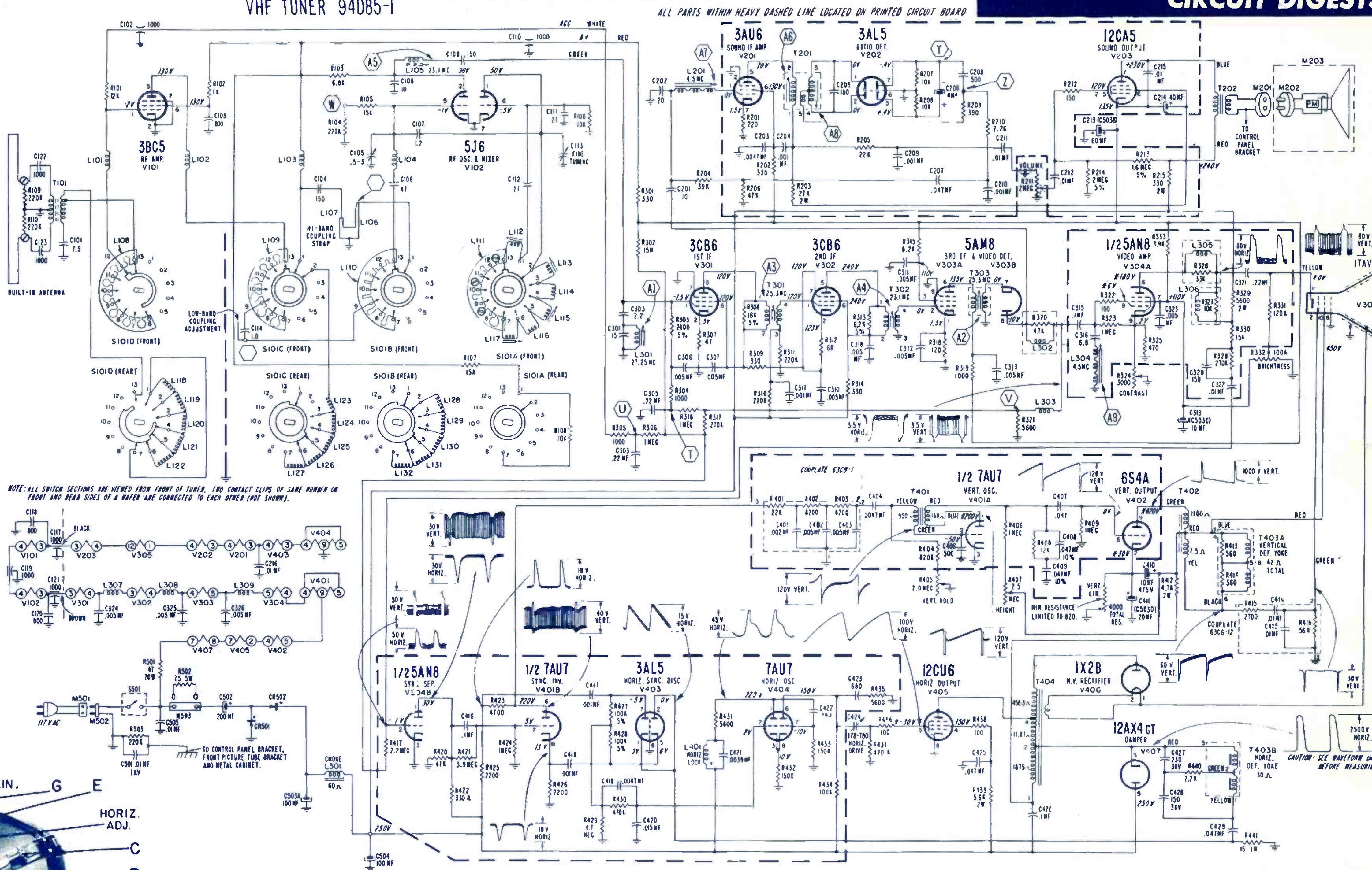
Warning: Pulsed high voltages are present on the caps of V405 and V406, and at pin 3 of V407. **Do not attempt to measure voltages** at these points without suitable test equipment. A VTVM with a high voltage probe may be used when measuring picture tube 2nd anode voltage.

- Set the **Channel Selector** on an unused channel. **Contrast** control fully clockwise. All other controls counter-clockwise. Do not disturb Horizontal Hold or Horiz. Drive adjustments.
- Antenna disconnected and terminals shorted together.
- Line voltage: 117 volt AC.
- DC voltages measured with a VTVM between tube socket terminals and chassis, unless otherwise indicated.
- Voltages at V101, V102 and V305 measured from the top of the chassis with tubes in socket. Use of an adapter is recommended.
- Voltages marked (*) will vary widely with control settings.

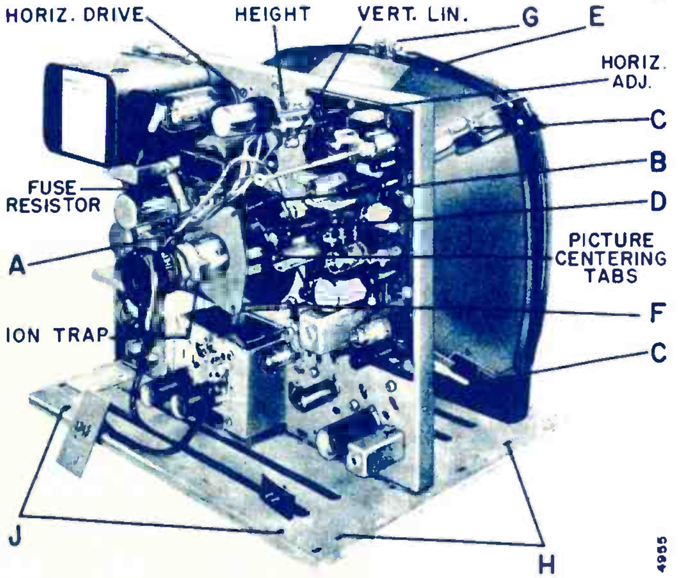


Top View of Chassis.

V101—3BC5
V102—5J6
V201—3AU6
V202—3AL5
V203—12CA5
V301—3CB6
V302—3CB6
V303—5AM8
V304—5AN8
V305—17AVP4
V401—7AU7
V402—6S4A
V403—3AL5
V404—7AU7
V405—12CU6
V406—1X2B
V407—12AX4GT



Rear View of 17XP3 Chassis Showing Rear Adjustment Locations.



Channel adjustment of each station should be checked upon installation and at every service call. With proper adjustment, best picture is obtained at approximate center rotation of **Fine Tuning** control.

Before proceeding with adjustment, see illustration at right for location of channel screws. Note that channels 3 to 12 are provided with one channel screw for each two channels. Channels 2 and 13 have individual adjustments.

Important: Adjustments should be made on the highest channel first, since adjustment on one channel will affect all other lower channels.

Channel adjustment can be made without removing the chassis from the cabinet.

Adjust as follows:

a. Turn the set on and allow 15 minutes to warm up.

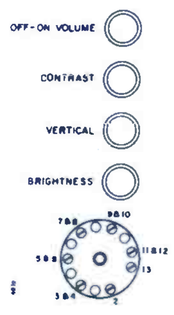
b. Set **Channel Selector** for highest channel in operation; set other controls for normal picture and sound.

c. Set **Fine Tuning** control at center of its range by rotating it approximately one-fourth way. Do this before adjusting each channel.

d. Remove **Channel Selector** and **Fine Tuning** knobs.

e. Locate the channel screw for the channel to be adjusted. See illustration.

Using a non-metallic screwdriver (preferably with a ⅛" metal tipped blade) engage the channel screw and carefully adjust it for best picture. (Note correct adjustment may not be the point at which sound is loudest). **Caution:** Only slight rotation of screw is generally required. Do not exert excessive pressure or turn screw completely in (clockwise) as damage to switch wafer or coils may result.



Operating Controls, CHANNEL Knob Removed.

f. After adjusting highest channel, replace **Channel Selector** knob and set **Channel Selector** to each lower channel. Before making adjustment, be sure that **Fine Tuning** control is at center of its range. Adjust proper channel screw.

Note: If adjustment screws for channels 7 to 12 do not have sufficient range, make adjustment using channel 13 screw. If adjustment screws for channels 2 to 4 do not have sufficient range, make adjustment using channel 6 screw. If channels 13 or 6 are in operation, use the next lower channel for extending adjustment range.

Chassis 17XP3: Models T1801 (Pasadena), T1802 (Palm Beach), T1806 (Palm Springs), T1807 (Palo Alto)

ADMIRAL
Chassis 17XP3

Technician **CIRCUIT DIGEST**

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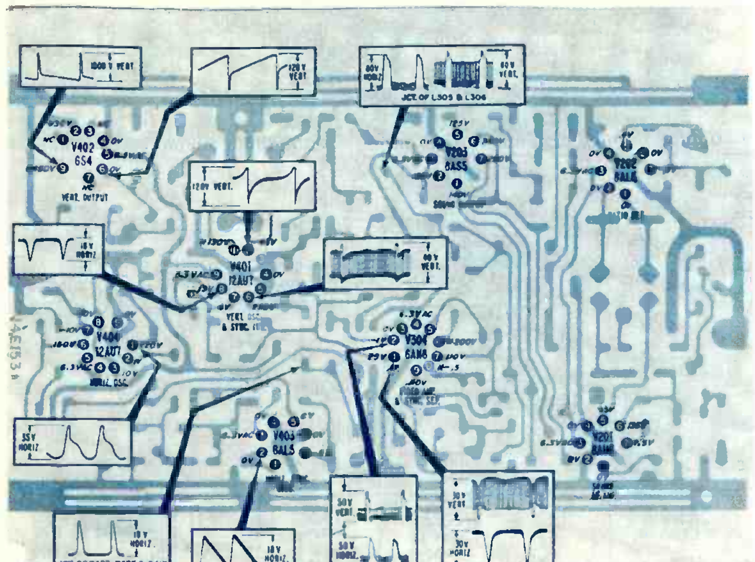


Figure [illegible]. Wiring Side of Printed Circuit Assembly Showing Voltages and Waveforms Measured from Wiring Side.

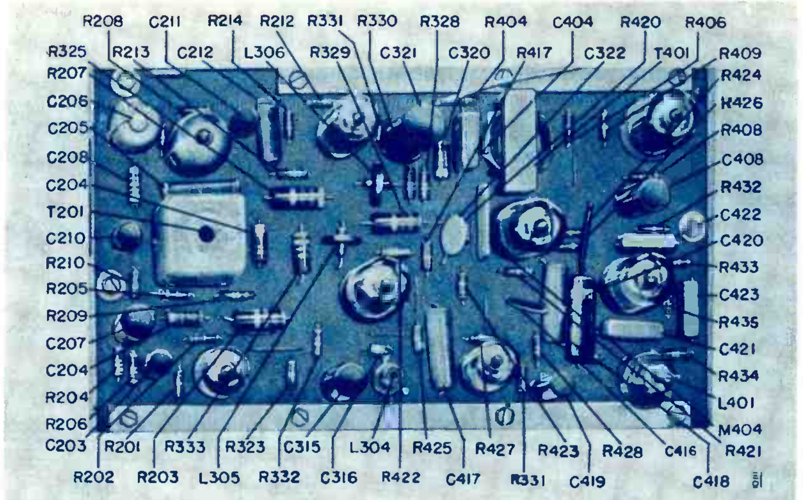
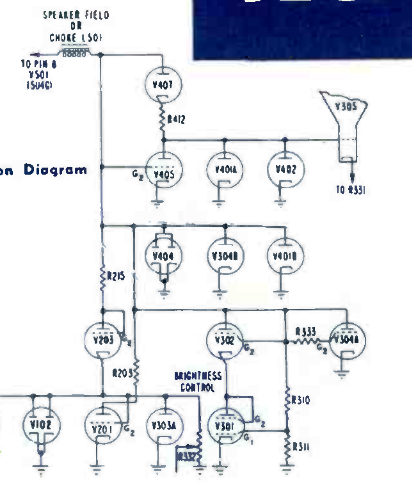
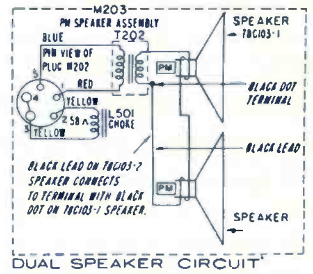


Figure 60. View of Component Side of Printed Circuit Assembly Showing Location of Components.

Figure 57. Simplified B+ Distribution Diagram for 18XP4BZ Chassis.





DUAL SPEAKER CIRCUIT

PRODUCTION CHANGES

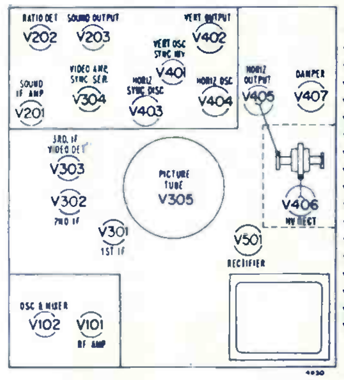
(1) Start of production

(2) Change to prevent capacitor breakdown. C407 and C409 changed from upright to conventional paper type.

(3) Change to prevent capacitor breakdown. C416 and C420 changed from molded to conventional paper type; C212 changed from molded to ceramic type.

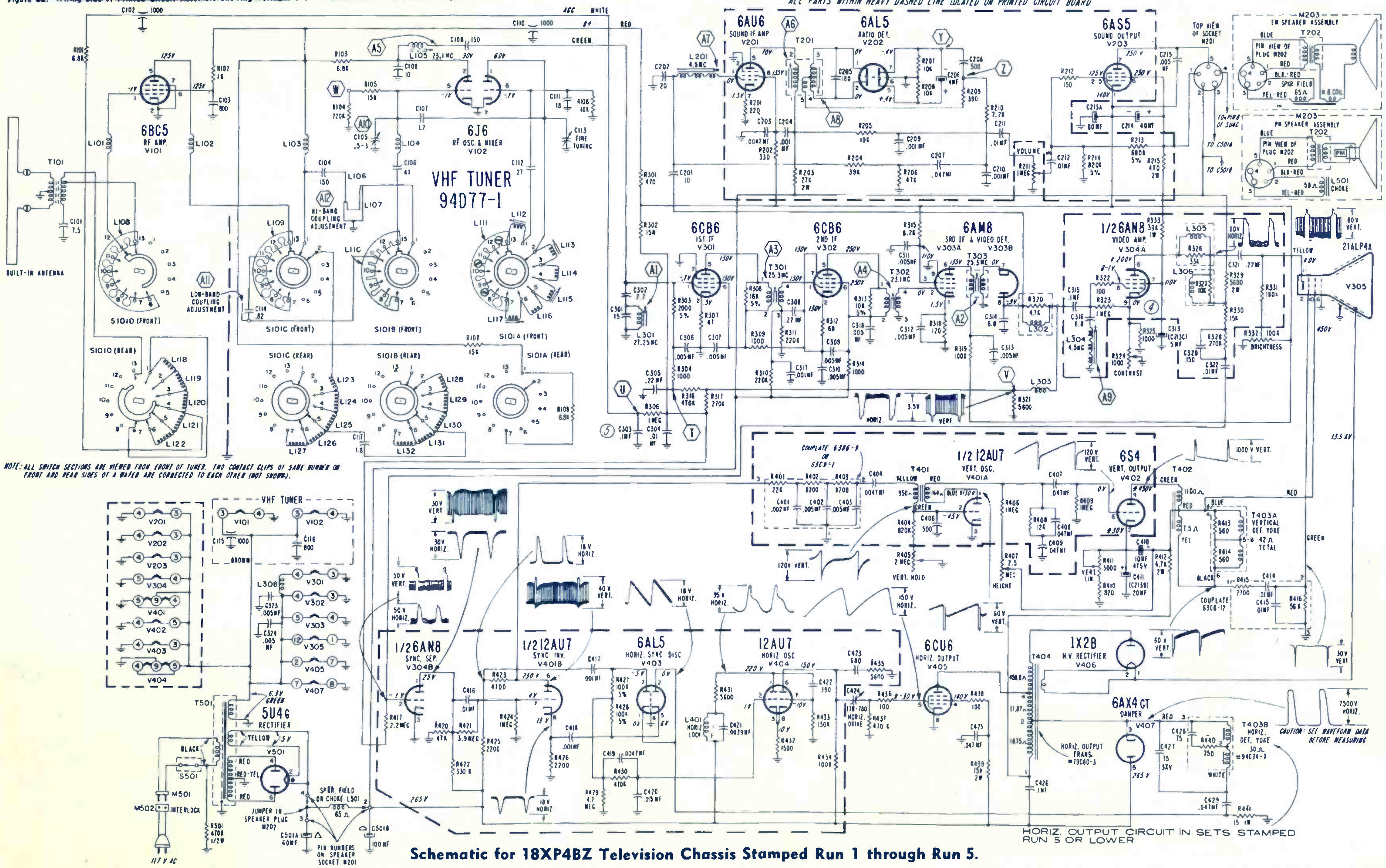
(4) Change to increase range of R324. R325 changed from 470 to 1000 ohms.

(5) Circuitry simplified. R306 (1000 ohms) and C302 (.005 mf.) were deleted. R305 was connected between white lead (AGC) of tuner to junction of C303 and R306. C302 was connected from junction of tuner AGC lead and R305 to chassis ground.



V101—6BC5
V102—6J6
V201—6AU6
V202—6AL5
V203—6AS5
V301—6CB6
V302—6CB6
V303—6AM8
V304—6AN8
V305—21ALP4A
V401—12AU7
V402—6S4
V403—6AL5
V404—12AU7
V405—6CU6
V406—1X2B
V407—6AX4GT
V501—5U4G or 5U4GA

Rear View of 18XP4BZ Chassis.



Schematic for 18XP4BZ Television Chassis Stamped Run 1 through Run 5.

Chassis 18XP4BZ: Models T2301Z (Nassau), T2302Z (Bahamas), T2326Z (Jamaica), T2327Z (Martinique), T2336Z (Hawaii), T2337Z (Honolulu)

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IMPORTANT ALIGNMENT HINTS
(For all 18-series chassis.)

The following suggestions should be performed if difficulty is experienced during the alignment procedure.

1. IF CIRCUIT INSTABILITY: When spot frequency aligning the IF amplifiers, the VTVM pointer may swing when the hand is placed too near the IF transformers. When viewing the IF response curve on an oscilloscope, the curve may change shape with hand capacity, especially when aligning 3rd IF transformer T303. To correct either of these conditions, the following alignment hints should be tried:

(a) Check the generator output leads to be certain that the unshielded portion (especially the grounded lead) is as short as practicable.

(b) Be sure that a decoupling network is used at the video detector output and that the leads on the network are kept as short as possible; see figure 21.

(c) The use of a nine inch hexagonal alignment tool will permit adjustment without encountering "hand capacity" effects. See "Alignment Tools" above.

2. RECEIVER OVERLOADING WHEN CHECKING THE OVER-ALL RESPONSE CURVE: Due to the inherent high sensitivity of these receivers, it is very easy to cause overloading of the third IF amplifier stage. In some cases, generator leakage alone is enough to produce a response curve on the oscilloscope. To prevent overloading, the following things should be done:

(a) Be certain that the generator output attenuators are set for a minimum output.

(b) Some generators have a built-in pad in the output cable. Be sure that the pad in the cable is properly connected in the circuit. Refer to the generator instruction manual for details.

(c) If a pad is not built in, the 12 db pad shown below in figure 20 can be constructed and connected between the generator and the antenna terminals.

3. SPECIAL TUBE SHIELD: For injecting 21MC or 41MC IF Signals, use an insulated tube shield over the VHF Oscillator-Mixer tube. Insulate bottom of tube shield with masking tape, see figure 19.

Figure 19. Special Tube Shield for IF Alignment and IF Response Curve Check.

4. CONNECT SPEAKER AND DEFLECTION YOKE: Speaker and deflection yoke must be connected to chassis during alignment.

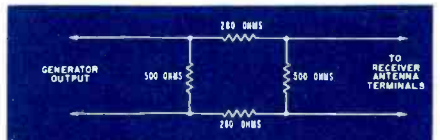

Figure 20. Illustration of 12 db Attenuation Pad for Viewing Over-all RF-IF Response Curve.

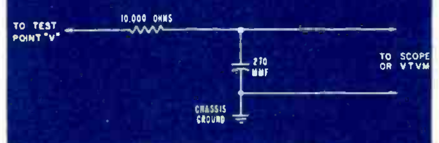

Figure 21. Decoupling Filter.

* Note: These steps are not performed on VHF only receivers.
† Required for UHF alignment only.

Information on this page applies only to 18XP4BZ chassis.

IF RESPONSE CURVE CHECK (Using sweep generator and oscilloscope)

Receiver Controls and Bias Battery	Sweep Generator	Marker Generator	Oscilloscope	Instructions
Set Channel Selector on channel 12 or an unassigned high channel. Contrast control fully to the left. Connect negative of 3 volt bias supply through 10K resistor to test point "T"; positive to chassis.	Connect high side to 6J6 mixer-osc. insulated tube shield, see fig. 19. Connect low side to chassis near tube shield. Set sweep frequency to 23MC, and sweep width approximately 7MC.	If an external marker generator is used, loosely couple high side to sweep generator lead on tube shield, low side to chassis. Marker frequencies indicated on IF Response Curve.	Connect high side to test point "V" through a decoupling filter, see figs. 21 and 22.	Check curve obtained against ideal response curve in fig. 24. Note tolerances on curve. Keep marker and sweep outputs at very minimum to prevent overloading. A reduction in sweep output should reduce response curve amplitude without altering the shape of the response curve. If the curve is not within tolerance or the markers are not in the proper location on the curve, touch-up with IF slugs as instructed below. **Important:** If curve changes shape with hand capacity, see section 1 of "Important Alignment Hints."

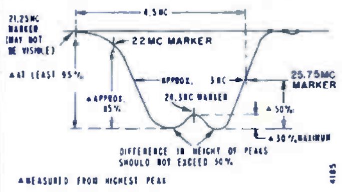

Figure 24. Ideal IF Response Curve.

Figure 25. IF Response Curves, Incorrect Shape.

If it is necessary to adjust for approximate equal peaks and marker location, carefully adjust alignment slugs as instructed under the above figures. It should not be necessary to turn the slugs more than one turn in either direction.

If the curve cannot be made to resemble the response curve shown at left, repeat all steps under "IF Amplifier and Trap Alignment" making sure that generator frequencies are accurate and adjustments are carefully made. If a satisfactory curve cannot be obtained after repeating these steps, it may be necessary to change IF amplifier tubes or check for a defective circuit component to be sure that each stage is operating properly.

TOUCH-UP OF RATIO DETECTOR SECONDARY (A8) USING TELEVISION SIGNAL

Adjustment need be made on one channel only.

Proceed as follows:

a. Turn set on and allow about 15 minutes for warm up.
b. Tune set for normal picture and sound.
c. Carefully adjust the secondary slug (A8) of the Ratio Detector Transformer using a non-metallic alignment tool with a hexagonal end (part number 98A30-12). Both slugs (A6 and A8) have hollow cores. Either slug may be adjusted from the top or bottom of the chassis by passing the alignment tool through the core of the first slug encountered. A8 is the slug closest to the chassis.

Adjust A8 for best sound with minimum buzz level. Do this carefully as only slight rotation in either direction will generally be required. Correct adjustment point is located between the two maximum buzz peaks that will be noticed when turning the slug back and forth about ¼ to ½ turn.

d. If necessary, repeat individual channel VHF oscillator adjustment and conclude with retouching the ratio detector secondary. Note: If oscillator adjustment is required for other channels, it will *not* be necessary to repeat the ratio detector secondary adjustment after *once* correctly adjusting it.

ALIGNMENT OF 4.5 MC TRAP A9, USING A TELEVISION SIGNAL

Beat interference (4.5 MC) appears in picture as very fine vertical or diagonal lines, very close together, having a "gauze-like" appearance, the pattern will vary with speech, forming a very fine herringbone pattern.

The trap can be tuned by watching the picture and adjusting the slug A9 for minimum 4.5 MC interference.

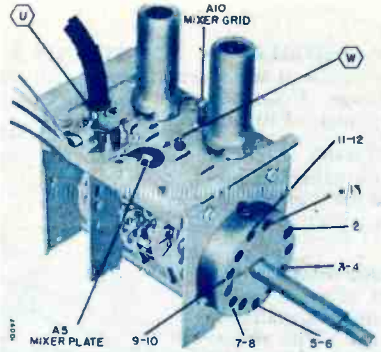

Figure 28. Top Front View of Tuner 94D77-1 Showing Test Point and Adjustment Locations.

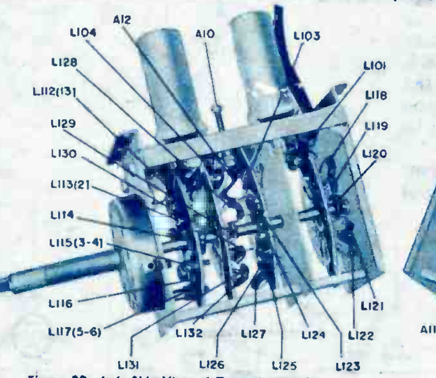

Figure 29. Left Side View of Tuner 94D77-1 Showing Adjustment Locations.

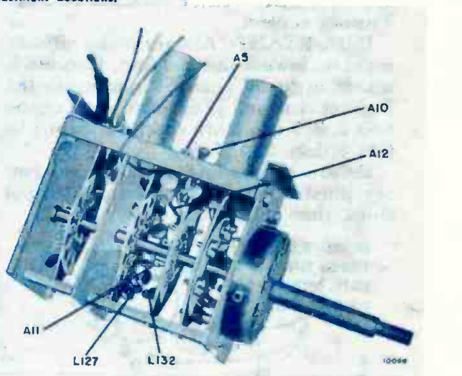

Figure 30. Right Side View of Tuner 94D77-1 Showing Adjustment Locations.

IF AMPLIFIER AND TRAP ALIGNMENT

- Connect negative of 3 volt bias supply through 10 K resistor to test point "T", see figure 22, positive to chassis.
- Disconnect antenna. Connect a jumper wire across the antenna terminals.
- Set Channel Selector to channel 12 or other unassigned high channel, to prevent interference during alignment.
- Set the Contrast control fully to the left (counter-clockwise).
- Allow about 15 minutes for receiver and test equipment to warm up.
- Use lowest DC scale on VTVM.

Step	Signal Gen. Freq.	VTVM and Signal Generator Connections	Instructions	Adjust
Before proceeding, be sure to check the signal generator used in alignment against a crystal calibrator or other frequency standard for absolute frequency calibration required for this operation.				
1	27.25 MC	VTVM high side to test point "V" through a decoupling filter; see figs. 22 and 21, common to chassis. Generator high side to 6J6 (V102) insulated tube shield. Connect low side to chassis.	Use lowest DC scale on VTVM. When peaking, keep reducing generator output for VTVM reading of approx. 1 volt or less. If unstable, refer to section 1 of the "Important Alignment Hints".	A1 for minimum.
2	25.3 MC			A2 and A3 for maximum.
3	23.1 MC			A4 and A5 for maximum.
4	27.25 MC			Repeat step 1 above.
5	To insure correct IF alignment, make the "IF Response Curve Check."			

SIMPLIFIED ALIGNMENT

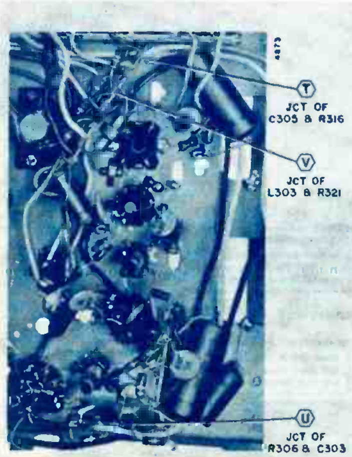

Figure 22. View of Wiring Side of Chassis Showing Test Point Locations.

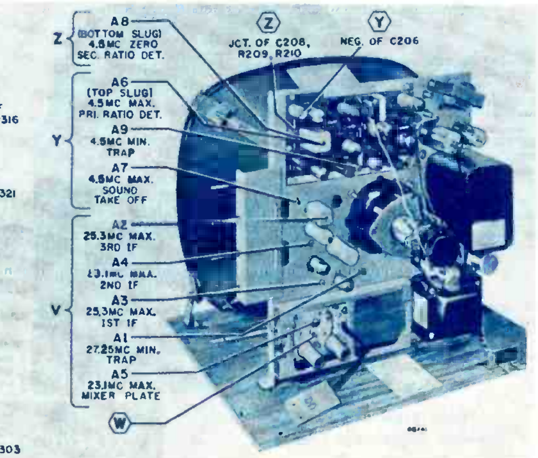

Figure 23. Rear View of 18XP4BZ Chassis Showing Test Point Connections and IF Alignment Data.

ALIGNMENT INFORMATION FOR VHF TUNER 94D77-1

The antenna, VHF amplifier and mixer grid circuits of this tuner each have six coils (covering channels 6 to 2) and a metal strip inductance (covering channels 13 to 7). The oscillator circuit has seven coils (covering channel 13 and channels 6 to 2) and a metal strip inductance (covering channels 12 to 7). The coils and metal strip are connected in series to form the tuned circuit of each wafer switch section. Channel selection is accomplished by rotating the Channel Selector which incrementally adds or subtracts a portion of the inductance of each tuned circuit.

Complete tuner alignment should seldom, if ever, be required. Tubes may generally be replaced without the need for alignment. However, tube selection is recommended when replacing the Oscillator-Mixer tube V102 (6J6). No attempt should be made to align the tuner until the balance of the receiver is known to be in proper operating condition and in proper alignment.

VHF and Mixer alignment consists of first checking the VHF response curve with a sweep generator and oscilloscope. Compare the VHF response curve with the ideal VHF response curve given in figure 26. Minor deviations from the ideal curve may occur. The permissible limits are given in figure 27.

Since the coils or inductances of each tuned circuit (wafer switch section) are connected in series, alignment should be made on the highest channel first, then on each lower channel. Location of essential alignment data is given in figures 28, 29 and 30. Description of alignment adjustments is given below.

VHF and Mixer alignment adjustments consist of a trimmer adjustment (A10), spacing of capacitor leads (A11 and A12), and the spreading or compressing of coil turns; see figures 29 and 30. VHF oscillator alignment consists entirely of screw adjustments; see figure 28. Note that channels 12 to 3 are provided with one channel screw for each two channels. Channels 13 and 2 have individual adjustment screws.

94D77-1 TUNER ADJUSTMENT IDENTIFICATION

See figures 28, 29 and 30 for location of adjustments.

Sym. or Adj.	Function	Sym. or Adj.	Function	Sym. or Adj.	Function
A5	Slug, Mixer Plate Coil (23.1 MC)	L113	Coil, Oscillator, Channel 2 (screw adj. 2)	L121	Coil, Antenna, Channel 5
A10	Trimmer, Mixer Grid (Capacitor C105)	L114	Coil, Oscillator, Channel 3 (no adjustment)	L122	Coil, Antenna, Channel 6
A11	Lead of Capacitor C114 (Low-band coupling adj.)	L115	Coil, Oscillator, Channel 4 (screw adj. 4-3)	L123	Coil, RF Plate, Channel 2
A12	Lead of Capacitor C104 (High-band coupling adj.)	L116	Coil, Oscillator, Channel 5 (no adjustment)	L124	Coil, RF Plate, Channel 3
L101	Coil, Antenna, Channels 13 to 7	L117	Coil, Oscillator, Channel 6 (screw adj. 6-5)	L125	Coil, RF Plate, Channel 4
L103	Coil, RF Plate, Channels 13 to 7	L118	Coil, Antenna, Channel 2	L126	Coil, RF Plate, Channel 5
L104	Coil, Mixer Grid, Channels 13 to 7	L119	Coil, Antenna, Channel 3	L127	Coil, RF Plate, Channel 6
L111	Metal Strip, Channels 12 to 8 (screw adj. 12-11, 10-9, 8-7)	L120	Coil, Antenna, Channel 4	L128	Coil, Mixer Grid, Channel 2
L112	Coil, Oscillator, Channel 13 (screw adj. 13)			L129	Coil, Mixer Grid, Channel 3
				L130	Coil, Mixer Grid, Channel 4
				L131	Coil, Mixer Grid, Channel 5
				L132	Coil, Mixer Grid, Channel 6

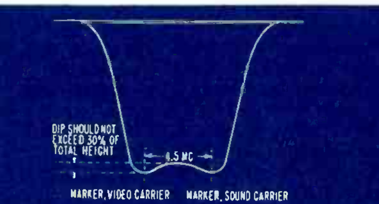

Figure 26. Ideal VHF Response Curve.

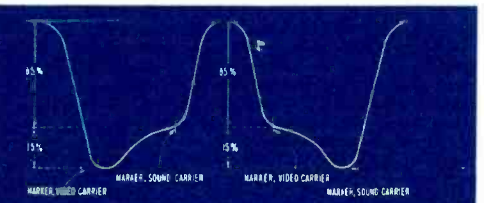

Figure 27. VHF Response Curves, Maximum Permissible " " Shown.

VHF AMPLIFIER AND MIXER ALIGNMENT

- Connect negative of 3 volt bias supply to test point "U", positive to chassis, see figure 22.
- Connect sweep generator 300 ohm output to antenna terminals. If sweep generator does not have a built-in marker generator, loosely couple a marker generator to the antenna terminals. To avoid distortion of the response curve, keep sweep generator output at a minimum, marker pips just barely visible.
- Connect oscilloscope through a 10,000 ohm resistor to test point "W" on tuner (figure 28). Keep scope leads away from chassis.
- Allow about 15 minutes for receiver and test equipment to warm up.
- See figures 22, 28, 29 and 30 for adjustment locations and identification.

Following the order of steps given below, check for response curve resembling figure 26. Consistent with proper bandwidth and marker locations, response curves must have maximum amplitudes and flat top appearance. Minor deviations from the ideal curve may occur, the permissible limits are given in figure 27.

If alignment is required for one or several channels, start with the highest channel repeating checks or alignment (if required) on all lower channels.

Adjustment of coils is made by spreading or squeezing turns. Adjustment of low band coupling capacitor C114 is made by bending the free end (adjustment A11) closer or away from the body of the coupling capacitor. Adjustment for high band coupling is made by bending the insulated ground lead of capacitor C104 (adjustment A12) closer or away from the metal strap connecting from the chassis to mixer ground return; see figure 29.

Step	Marker Gen. Freq. (MC)	Sweep Gen. Frequency	Adjust	INSTRUCTIONS
1	*211.25 **215.75	Sweeping Channel 13	Coil L101 Coil L103 Coil L104	Check VHF response curve; see Ideal Curve, figure 26. If alignment is required, alternately adjust coils L101, L103 and L104 (figure 29) as required to obtain maximum amplitude with equal peaks and symmetry, consistent with proper bandwidth and marker location. Adjust coils L103 and L104 for bandwidth and marker location. If required, adjust coil L101 for maximum amplitude.
2	175.25 179.75	7	Trimmer A10	Check VHF response curve. Adjust trimmer A10 as required to obtain equal peak amplitudes and symmetry, consistent with proper bandwidth and marker location.
3	211.25 215.75	13	Coil L104 Lead A12	Recheck VHF response curve. Slight touch-up of coil L104 may be required for proper shaped response curve. If bandwidth is too broad, move lead A12 (ground lead of capacitor C104) away from mixer grid ground strap; see figure 30. If bandwidth is too narrow, bend ground lead A11 closer to mixer grid ground strap.
4	175.25 179.75	7	Lead A11	Recheck VHF response curve. If bandwidth is too broad, move lead A11 (extending across body of capacitor C114) closer to capacitor body. If bandwidth is too narrow, move lead A11 away from capacitor body. Note: Since A11 is primarily a low band coupling adjustment, use core so as not to disturb bandwidth of channels 6 to 2.
5	205.25 209.75	12	See note at right.	Check VHF response curves. If previous steps were made properly, response curves should be within limits as shown in figure 27. If response is not within limits for a channel which is in operation, make compromise alignment by repeating adjustments in steps 1 to 4, being careful not to greatly disturb the response curve for other channels in operation.
6	199.25 203.75	11		
7	193.25 197.75	10		
8	187.25 191.75	9		
9	181.25 185.75	8		
10	83.25 87.75	6	†Coil L122 Coil L127 Coil L132	Check VHF response curve. If alignment is required, alternately adjust coils (for particular channel) to obtain curve with maximum amplitude with equal peaks and symmetry, consistent with proper bandwidth and marker location. Note: Adjust coils with (†) for maximum amplitude. Coils not indicated are adjustments for tilt and marker placement. If bandwidth is too narrow or too wide, move lead of capacitor C114 (lead A11) closer or away from body of capacitor as required.
11	77.25 81.75	5	†Coil L121 Coil L126 Coil L131	
12	67.25 71.75	4	†Coil L120 Coil L125 Coil L130	
13	61.25 65.75	3	†Coil L119 Coil L124 Coil L129	
14	55.25 59.75	2	†Coil L118 Coil L123 Coil L128	

* Picture Carrier Frequency (MC). ** Sound Carrier Frequency (MC). † See instructions for steps 10 through 14.

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INSTALLATION ADJUSTMENTS

To insure best performance, it is important to make all checks and adjustments shown in the figures below. Note: Removal of cabinet back is required only for adjustment of ion trap, picture tilt and centering.

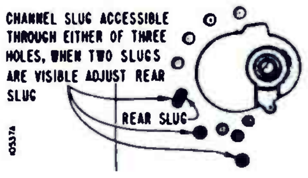
IMPORTANT CAUTION: Limited space is available when adjusting picture centering tabs and ion trap. Picture centering tabs may be adjusted using a non-metallic rod.

CHANNEL ADJUSTMENT

Channel adjustment of each station should be checked upon installation and at every service call. With proper adjustment, best picture is obtained at approximately center rotation of **Fine Tuning** control.

IMPORTANT: Always make adjustment on lowest channel first, then work up, in order of channel number to the **highest channel. (For example, if channels 2, 9, 7 and 5 are received, adjust in** this order: 2, 5, 7, 9.)

Before proceeding with adjustment, see illustration for location of channel slugs, then adjust as follows:



View of VHF Tuner. Knobs and Escutcheon removed.

a. Turn the set on and allow 15 minutes to warm up.
b. Set **Channel Selector** for lowest channel to be adjusted. Set other controls for normal picture and sound.
c. Set **Fine Tuning** control at center of its range by rotating it approximately halfway between its stops.
d. Remove **Channel Selector** and **Fine Tuning** knobs and the gold escutcheon under the knobs.
e. Using a 1/8" blade non-metallic tool (Part No. 98A 30-19), carefully adjust the channel slug for best picture. (Note that sound is not loudest at this point.) Repeat procedure for remaining stations, adjusting them in order of their channel number (from lowest channel to highest channel).

REMOVING CABINET BACK & FRONT

The cabinet back and front are removable. Remove mounting screws; then pull away from set. In sets with carrying handle, mounting screws must be removed from handle.

To remove chassis from cabinet shell, remove back, front and screws at bottom. Remove chassis through front.

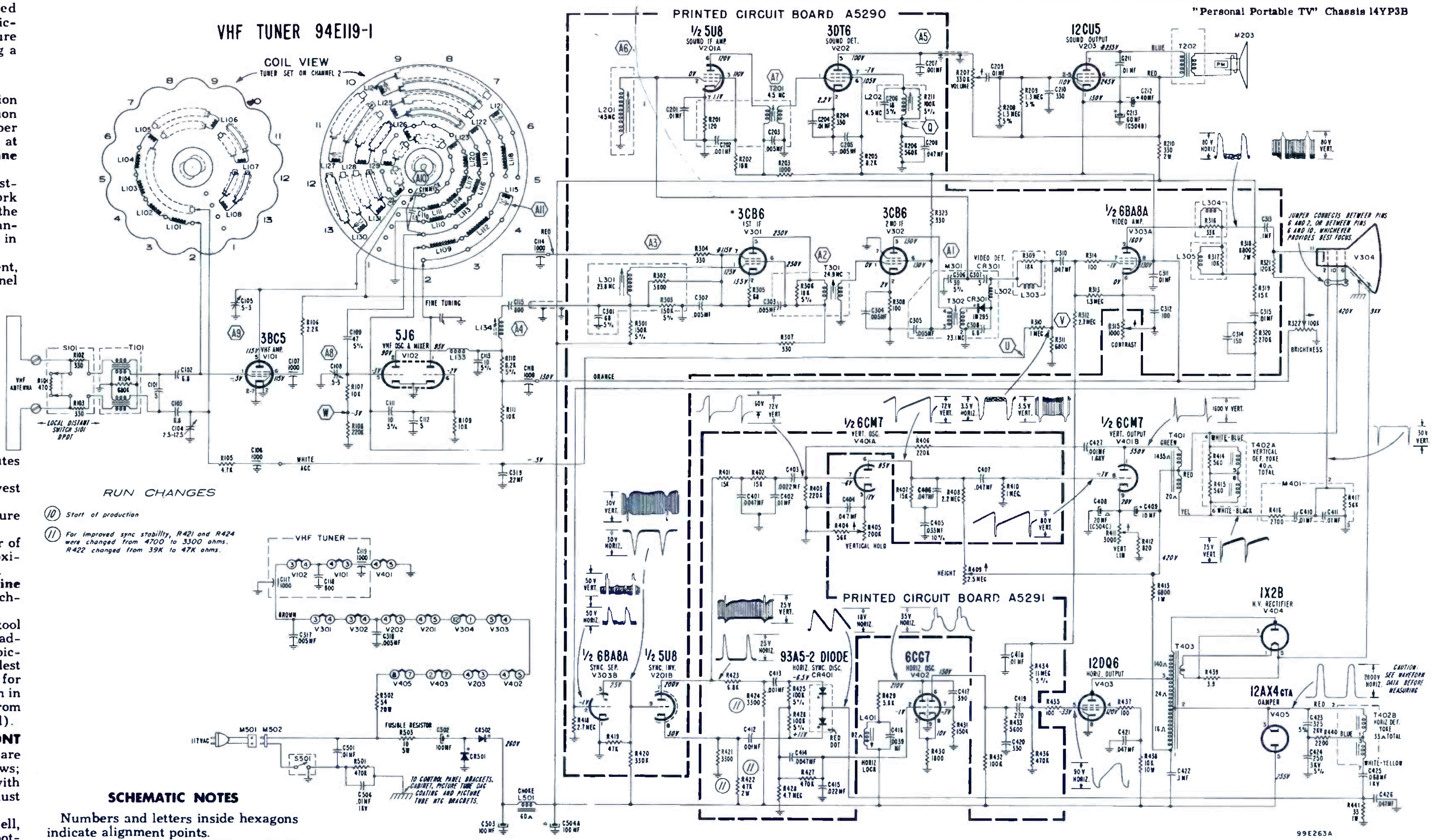
FUSIBLE RESISTOR

A pig-tail type fusible resistor (Part No. 61A22) is used as a B+ and initial surge fuse. It is located below the tuner.

REPLACING TUBES

The tubes of this receiver (with the exception of picture tube and tubes in the VHF tuner) are accessible for replacement by removing the cabinet back. The tubes on the main (rear) printed circuit board can more conveniently be removed after removing the mounting screws from the printed circuit board and tilting it back. Tube heater circuit shown in tube location diagram.

Replacement of picture tube and VHF tuner tubes require chassis removal. The tube shields of some tubes are captivated (telescopic) type. To remove tubes, press upper section of tube shield toward tube base.



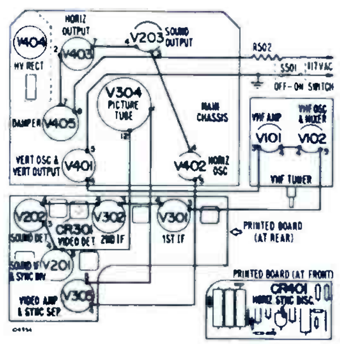
SCHEMATIC NOTES

Numbers and letters inside hexagons indicate alignment points.

Fixed resistor values shown in ohms ± 10% tolerance, ½ watt; capacitor values shown in micromicrofarads ± 20% unless otherwise specified.

NOTE: K = x 1000, MEG = x 1,000,000, MF = microfarad.

TUBE LOCATIONS



HIGH VOLTAGE WARNING

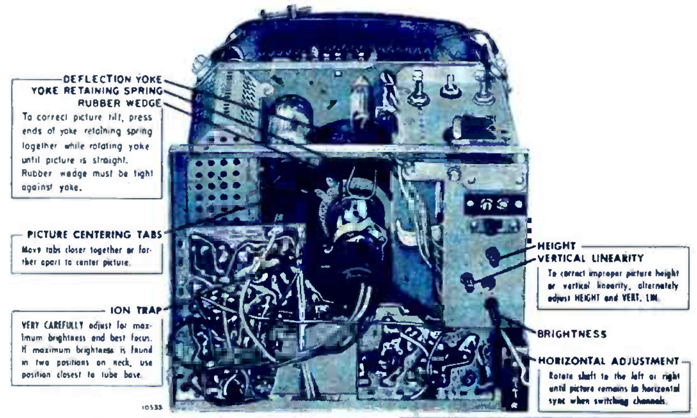
High voltage is present at some points in this receiver. Operation of the set without the cabinet or with cabinet back removed involves shock hazard. Exercise necessary high voltage precautions.

The chassis of this receiver is connected directly to one side of the 117 volt, 60 cycle power line. Depending upon the position of the line cord plug in the wall outlet, the total AC line voltage may exist between the chassis and any grounded object. When installing or servicing, do not touch the chassis unless adequate safety precautions are taken. Never touch the chassis and a ground (radiators, pipes, etc.) at the same time.

Do not ground chassis or connect test equipment directly to it unless an isolation transformer is used. If an isolation transformer is not available, a neon lamp can be used to determine if the chassis is "hot".

VOLTAGES AND WAVEFORMS

- Isolation transformer used. Line Voltage: 117 volts AC.
- Set Channel Selector on an unused channel. Contrast control fully clockwise; all other controls counterclockwise. Do not disturb Horizontal Lock adjustment.
- Antenna disconnected and terminals shorted together.
- DC voltages measured with VTVM between tube socket terminals and chassis, unless otherwise indicated.
- Voltages marked (*) will vary widely with control settings.
- Waveforms taken with transmitted signal input to television chassis.
- For waveform measurement, all controls set for normal picture.
- Peak-to-peak voltages may vary slightly from those shown.



Rear View of Chassis Showing Adjustment Locations.

TECHNICIAN
CIRCUIT DIGESTS

NOTES:

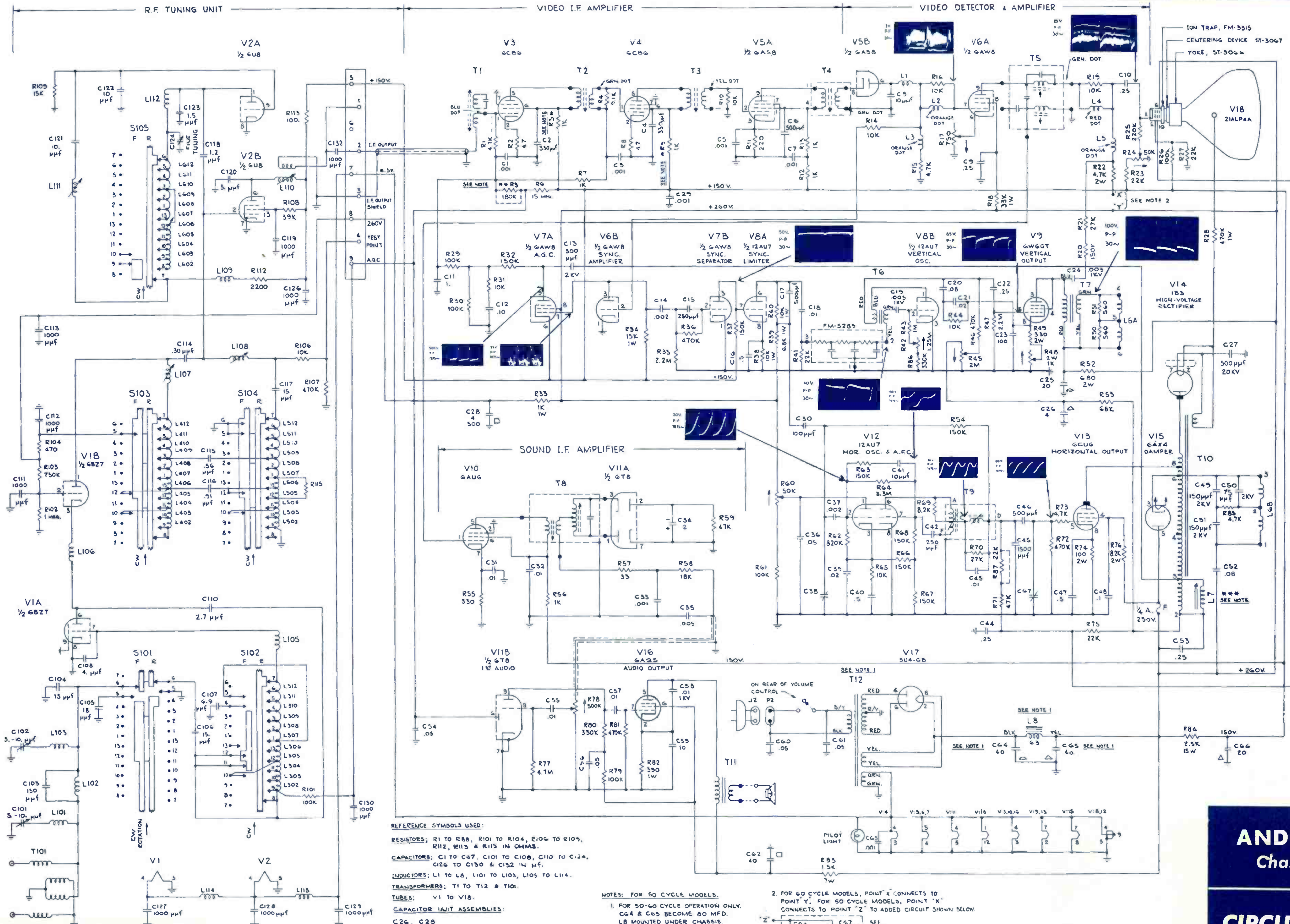
* - R3 & R9 - 10%

** - R5 - JUMPER USED IN LARGE SIGNAL AREAS. REMOVE JUMPER FOR MEDIUM SIGNAL AREAS.

*** - REMOVE WIDTH COIL UNDER EXTREME LOW LINE VOLTAGE CONDITIONS.

ARROWS ON CONTROLS INDICATE CW ROTATION.

CHANNEL SELECTOR SHOWN IN CHANNEL 13 POSITION.



REFERENCE SYMBOLS USED:

RESISTORS; R1 TO R88, R101 TO R104, R106 TO R109, R112, R113 & R115 IN OHMS.

CAPACITORS; C1 TO C67, C101 TO C108, C110 TO C124, C126 TO C130 & C132 IN µf.

INDUCTORS; L1 TO L8, L101 TO L103, L105 TO L114.

TRANSFORMERS; T1 TO T12 & T101.

TUBES; V1 TO V18.

CAPACITOR UNIT ASSEMBLIES:

C26, C28
C64, C65
C23, C25, C62 & C66

NOTES: FOR 50 CYCLE MODELS.

1. FOR 50-60 CYCLE OPERATION ONLY. C64 & C65 BECOME 80 MFD. L8 MOUNTED UNDER CHASSIS. T12 = ST-3069, 50 CYCLE. HEATER WIRING - SPECIAL.

2. FOR 60 CYCLE MODELS, POINT "X" CONNECTS TO POINT "Y". FOR 50 CYCLE MODELS, POINT "X" CONNECTS TO POINT "Z" TO ADDED CIRCUIT SHOWN BELOW.

"Z" — R88 2.2K 2W — C67 8MF 450V. — TO "Y" +260V — SEE NOTE 1

RECEIVERS

T-V021
C-V021
MC-V021

SPEAKERS

SL-4018 - 5"
SL-4019 - 10"
SL-4020 - 8"

ANDREA
Chassis V021

Chassis V021: Models T-V021 (Montauk), MC-V021 (Capri), C-V021 (Hampton)

Technician CIRCUIT DIGEST

7

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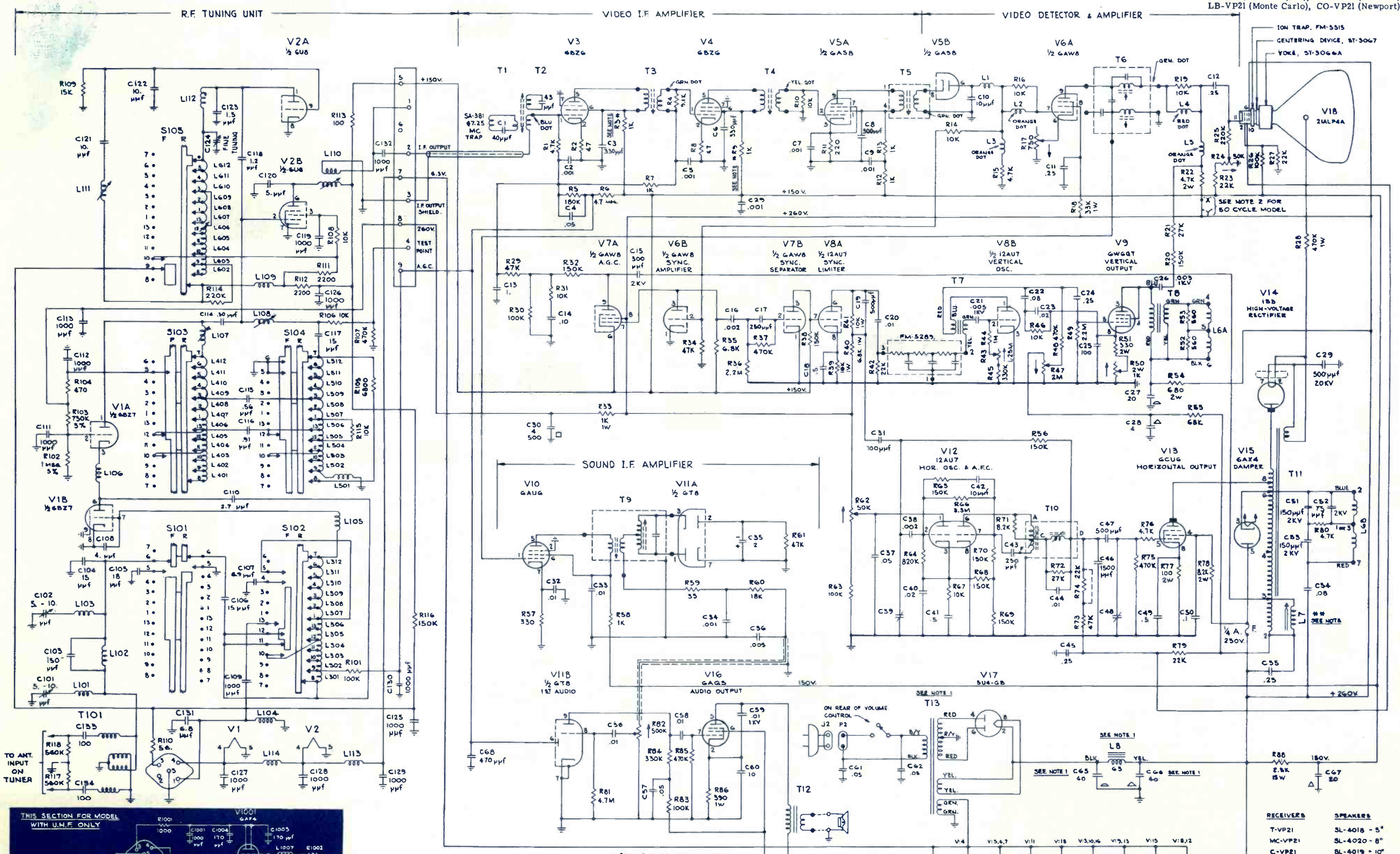
TECHNICIAN CIRCUIT DIGEST

ANDREA Chassis VP21

Chassis VP21: Models T-VP21 (Hollywood), C-VP21 (New Hampton), MC-VP21 (Catalina), LB-VP21 (Monte Carlo), CO-VP21 (Newport)

CAPACITOR UNIT ASSEMBLIES:
C28, C30
C65, C66
C25, C27, C63 & C67

REFERENCE SYMBOLS USED:
RESISTORS; R1 TO R89, R101 TO R118, R1001 TO R1003 IN OHMS.
CAPACITORS; C1 TO C69, C101 TO C134, C1001 TO C1012, C1014 & C1015 IN μf.
INDUCTORS; L1 TO L8, L101 TO L114, L1001 TO L1007.
TRANSFORMERS; T1 TO T13 & T101.
TUBES; V1 TO V18, V1001



NOTES: FOR 50 CYCLE MODELS.

1. FOR 50-60 CYCLE OPERATION ONLY. C65 & C66 BECOME 80 MFD. L8 MOUNTED UNDER CHASSIS. T13 = ST-5069, 50 CYCLE. HEATER WIRING - SPECIAL.
2. FOR 60 CYCLE MODELS, POINT "X" CONNECTS TO POINT "Y". FOR 50 CYCLE MODELS, POINT "X" CONNECTS TO POINT "Z" TO ADDED CIRCUIT SHOWN BELOW

"Z" — R89 2.2K 2W — C69 8MF 450V. — TO "Y" +260V — SEE NOTE 1

NOTES:
* = R3 & R9 = 10%.
** = REMOVE WIDTH COIL UNDER EXTREME LOW LINE VOLTAGE CONDITIONS.
ARROWS ON CONTROLS INDICATE CW ROTATION.
CHANNEL SELECTOR SHOWN IN CHANNEL 13 POSITION.

RECEIVERS	SPEAKERS
T-VP21	SL-4018 - 5"
MC-VP21	SL-4020 - 8"
C-VP21	SL-4019 - 10"
LB-VP21	SL-4019 - 10"; SL-4022 - 4" CONNECTED IN SHUNT.

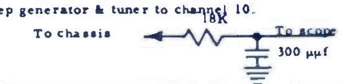
STAGGER-TUNED I.F. ALIGNMENT PROCEDURE

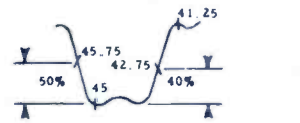
1. Set tuner to channel 9-10 or 11.
2. Connect variable bias supply to junction R211 & C207. Adjust bias for -2 volts.
3. Connect VTVM across R212. Isolate VTVM with 18K resistor. Use -5V scale.
4. Connect RF signal generator to mixer tube shield (V15 5J6). Lift mixer tube shield until it is just ungrounded.
5. Good R.F. grounding between TV receiver on test and test equipment is necessary. A metal surface bench top should be used to insure proper RF grounding. Use isolation transformer between chassis and AC line.

STEP	FREQUENCY	ADJUSTMENT	INSTRUCTIONS
1.	41.25 Mc	L201 for min.	
2.	42.9 Mc	Tuner coil for max.	L7 (top of tuner)
3.	45 Mc	L202 for max.	Recheck steps 2 and 3
4.	42.9 Mc	T201 for max.	
5.	45.3 Mc	T202 for max.	
6.	44 Mc	T203 for max.	
			Recheck steps 4, 5 and 6

OVERALL SWEEP CHECK

1. Connect RF signal generator to chassis near V4 for marker generator. Push shield down on mixer tube.
2. Connect oscilloscope across R212. Isolate oscilloscope lead with 300 µµf to ground and 18K resistor in series.
3. Increase bias to -2.5 volts
4. Connect sweep generator to antenna terminals. Adjust sweep generator & tuner to channel 10.





ADJUSTMENT	INSTRUCTIONS
T202 T201 T203	T202 positions 45.75 marker T201 positions 42.75 T203 adjusts tilt of curve

Note: If desired curve cannot be obtained, slight adjustment of tuner coil and L202 may be necessary.

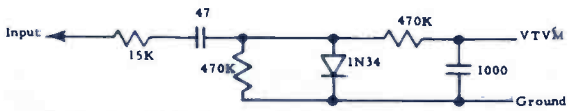
SOUND AND 4.5 MC TRAP ALIGNMENT

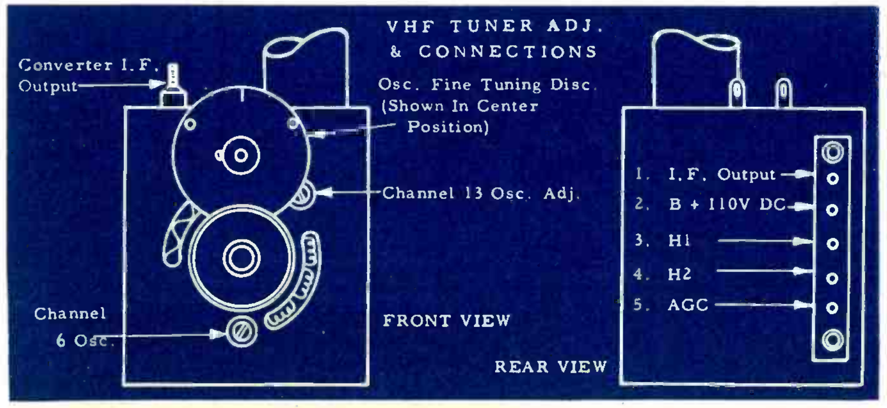
1. Tune in available TV station and reduce signal into set until hiss is heard with sound. This can be done by inserting an attenuator in the antenna lead-in or by removing antenna lead-in from the set and stray feeding in signal by placing lead-in in close proximity of the set.
2. Set buzz control in the middle of its range. Adjust take off coil (top L101), L102, Quadrature coil (L103) and buzz control for cleanest sound and minimum buzz. If any adjustment cause hiss to disappear reduce signal into set until hiss reappears and continue with adjustments.

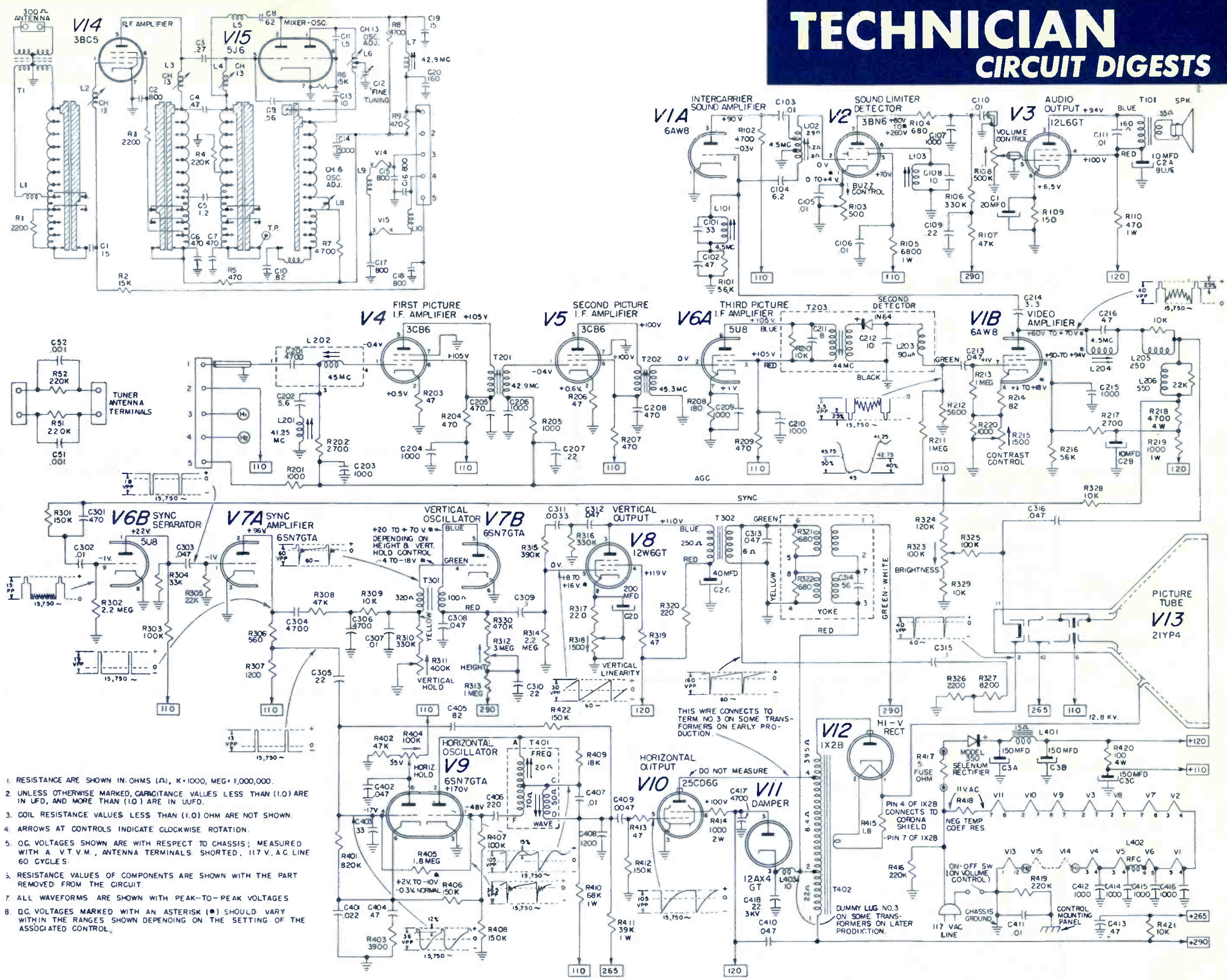
Note: If difficulty is encountered either in reducing signal sufficiently or adjustments being very broad. The following proceedure may be used.

STEP	EQUIPMENT	CONNECTION	FREQUENCY	ADJUSTMENT	INSTRUCTIONS
1.	Det. jig *	Input of jig to pin 2 of V2			Keep lead between 15K resistor and pin 2 as short as possible
2.	VTVM	Output of jig	Tune in available channel	L101 and L102 for max.	
3.		Remove jig	Same	Quadrature coil (L103) for max. sound	Set buzz control in middle of its range before adjusting L102
4.			Same	Buzz control for minimum buzz R103	Correct adjustment of buzz control is approx. middle of its range
5.	Det jig *	Junction C316 and R325			Connect VTVM to output of jig
6.	RF signal generator	Pin 7 (V1)	4.5 Mc	Tune 4.5 Mc trap L204 for min.	

* Detector jig

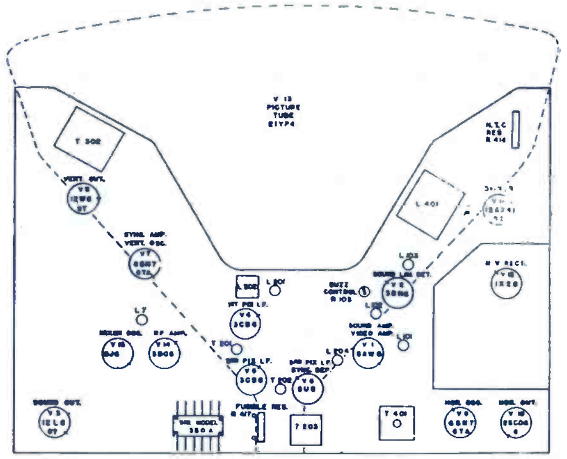




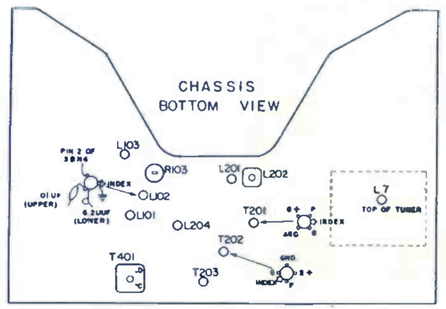


1. RESISTANCE ARE SHOWN IN OHMS (Ω), K = 1000, MEG = 1,000,000.
2. UNLESS OTHERWISE MARKED, CAPACITANCE VALUES LESS THAN (1.0) ARE IN UFD, AND MORE THAN (1.0) ARE IN UUFD.
3. COIL RESISTANCE VALUES LESS THAN (1.0) OHM ARE NOT SHOWN.
4. ARROWS AT CONTROLS INDICATE CLOCKWISE ROTATION.
5. DC VOLTAGES SHOWN ARE WITH RESPECT TO CHASSIS; MEASURED WITH A V.T.V.M., ANTENNA TERMINALS SHORTED, 117 V. AC LINE 60 CYCLES.
6. RESISTANCE VALUES OF COMPONENTS ARE SHOWN WITH THE PART REMOVED FROM THE CIRCUIT.
7. ALL WAVEFORMS ARE SHOWN WITH PEAK-TO-PEAK VOLTAGES
8. DC VOLTAGES MARKED WITH AN ASTERISK (*) SHOULD VARY WITHIN THE RANGES SHOWN DEPENDING ON THE SETTING OF THE ASSOCIATED CONTROL.

TUBE LAYOUT



Chassis "E" 383-VHF: Models 21-554, 555, 557



ARVIN
Chassis "E" 383-VHF

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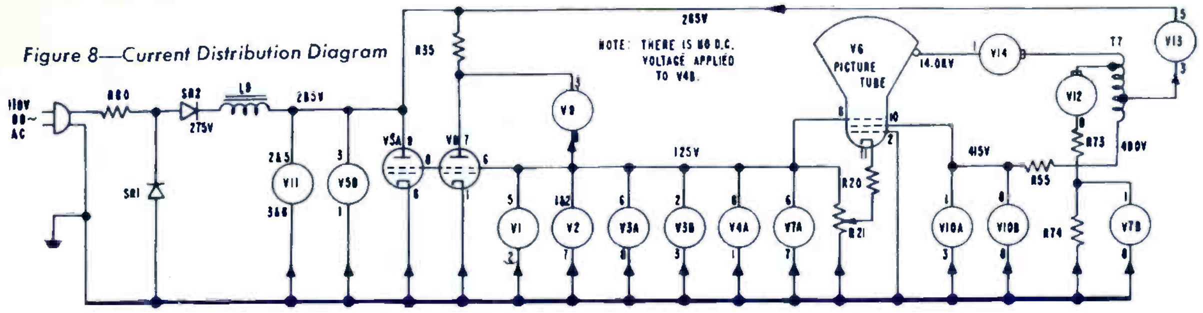
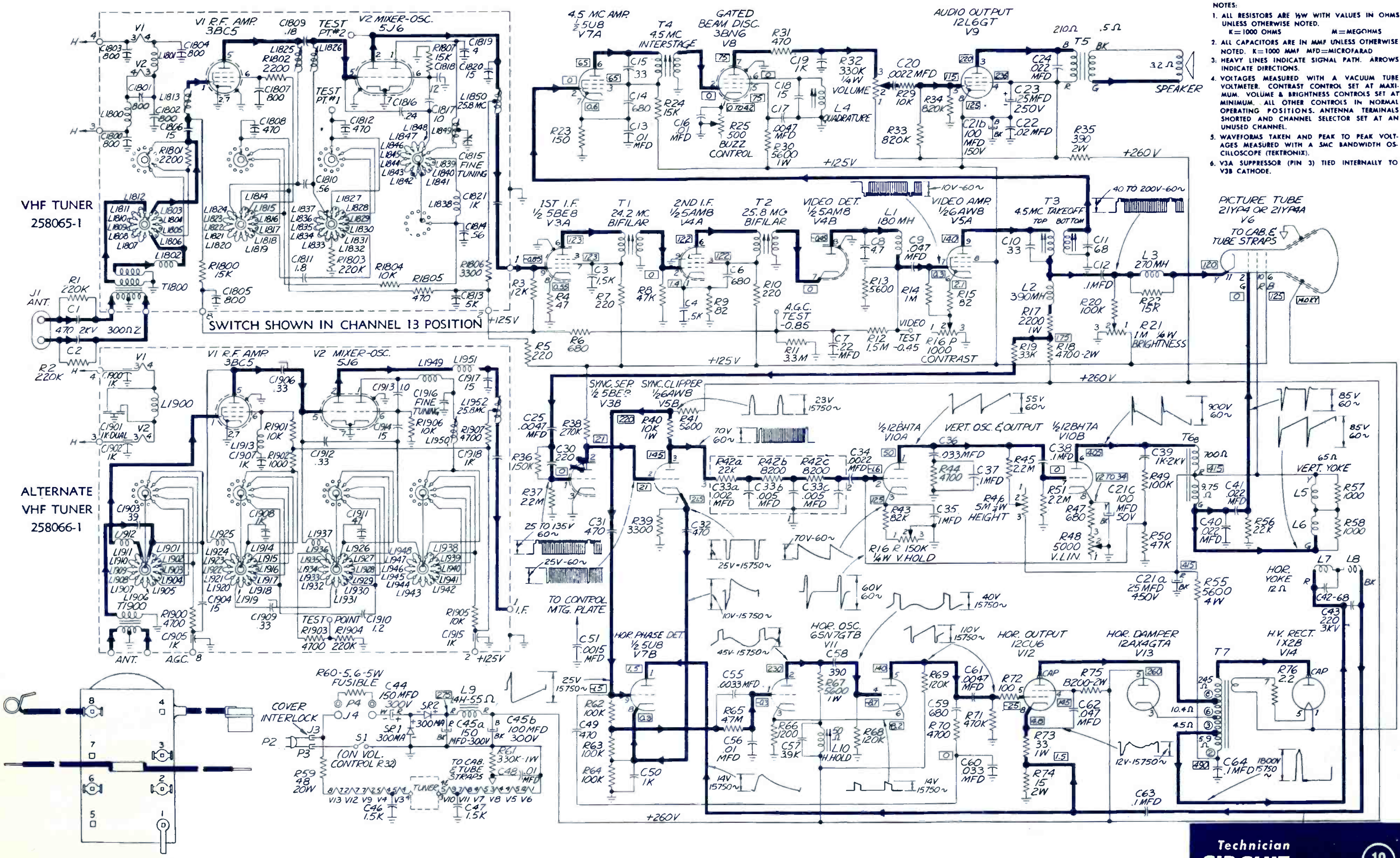
TECHNICIAN CIRCUIT DIGEST

BENDIX Chassis T19

Chassis T19: Models T2100E (Vanguard), T2100M (Valiant), T2101M (Vigilant)

Figure 8—Current Distribution Diagram





17 CONNECTIONS

NOTES:
1. ALL RESISTORS ARE ½W WITH VALUES IN OHMS UNLESS OTHERWISE NOTED.
   K=1000 OHMS M=MEGOHMS
2. ALL CAPACITORS ARE IN MMF UNLESS OTHERWISE NOTED. K=1000 MMF MFD=MICROFARAD
3. HEAVY LINES INDICATE SIGNAL PATH. ARROWS INDICATE DIRECTIONS.
4. VOLTAGES MEASURED WITH A VACUUM TUBE VOLTMETER. CONTRAST CONTROL SET AT MAXIMUM. VOLUME & BRIGHTNESS CONTROLS SET AT MINIMUM. ALL OTHER CONTROLS IN NORMAL OPERATING POSITIONS. ANTENNA TERMINALS SHORTED AND CHANNEL SELECTOR SET AT AN UNUSED CHANNEL.
5. WAVEFORMS TAKEN AND PEAK TO PEAK VOLTAGES MEASURED WITH A 5MC BANDWIDTH OSCILLOSCOPE (TEKTRONIX).
6. V3A SUPPRESSOR (PIN 3) TIED INTERNALLY TO V3B CATHODE.

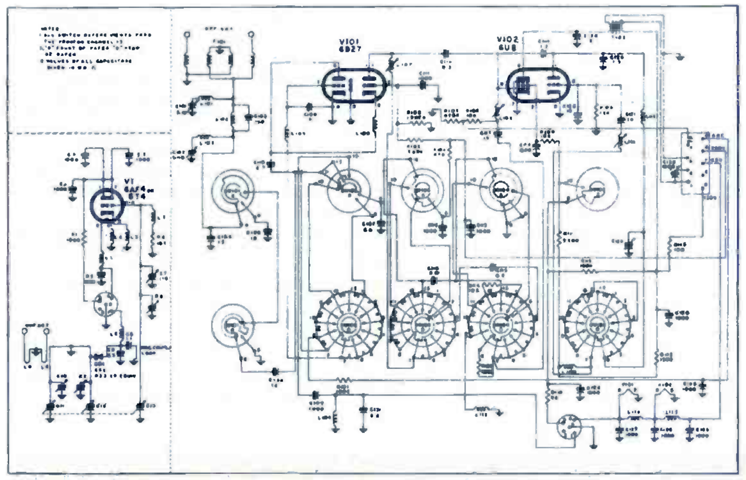
ALIGNMENT INSTRUCTIONS

General Information

Before attempting either complete or partial alignment of the tuned circuits in this receiver, it is recommended that all of the alignment data included here be read thoroughly. After once becoming familiar with the suggested procedure it will be relatively easy to make the necessary adjustments referring only to the alignment charts. Note that there is no procedure listed for alignment of either the UHF or VHF tuners. These units are designed and built for maximum stability and they are carefully aligned at the factory, therefore, no further adjustments should be required. Before making any alignment adjustments you are cautioned to make certain that the remainder of the receiver is operating properly and that the difficulty is misalignment. The tuned circuits and in particular those in the R-F Unit are only minor sources of potential difficulty.

Other than for occasional replacement of a circuit tube the R-F Units should be trouble free. It is always good practice when replacing tubes in any tuner to try several different tubes (which are known to be good) and to select the one which will produce the most satisfactory results. The circuits of the tuner used in this chassis are sufficiently broad that if a selected replacement is used no adjustment should be required other than a possible "touch-up" of the VHF Oscillator.

A suggested list of Test Equipment needed for proper alignment of the receiver is listed here. Under no circumstances should alignment be attempted without the proper equipment. When connecting the test equipment to the various points in the receiver, be certain that a good connection is made and that the leads are as short as possible. All equipment used must be adequately grounded to the receiver chassis. Always allow sufficient time for both test equipment and receiver to warm up before starting the alignment.



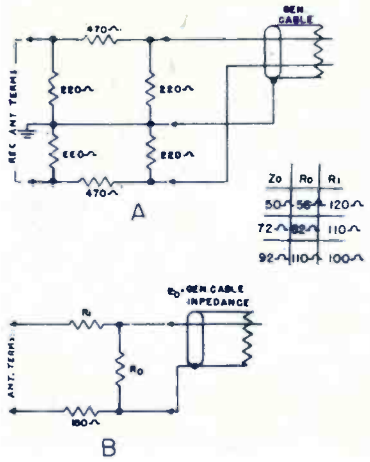


Figure 1

TECHNICIAN
CIRCUIT DIGESTS

CAPEHART CX-38 CHASSIS TUBE SOCKET RESISTANCE CHART

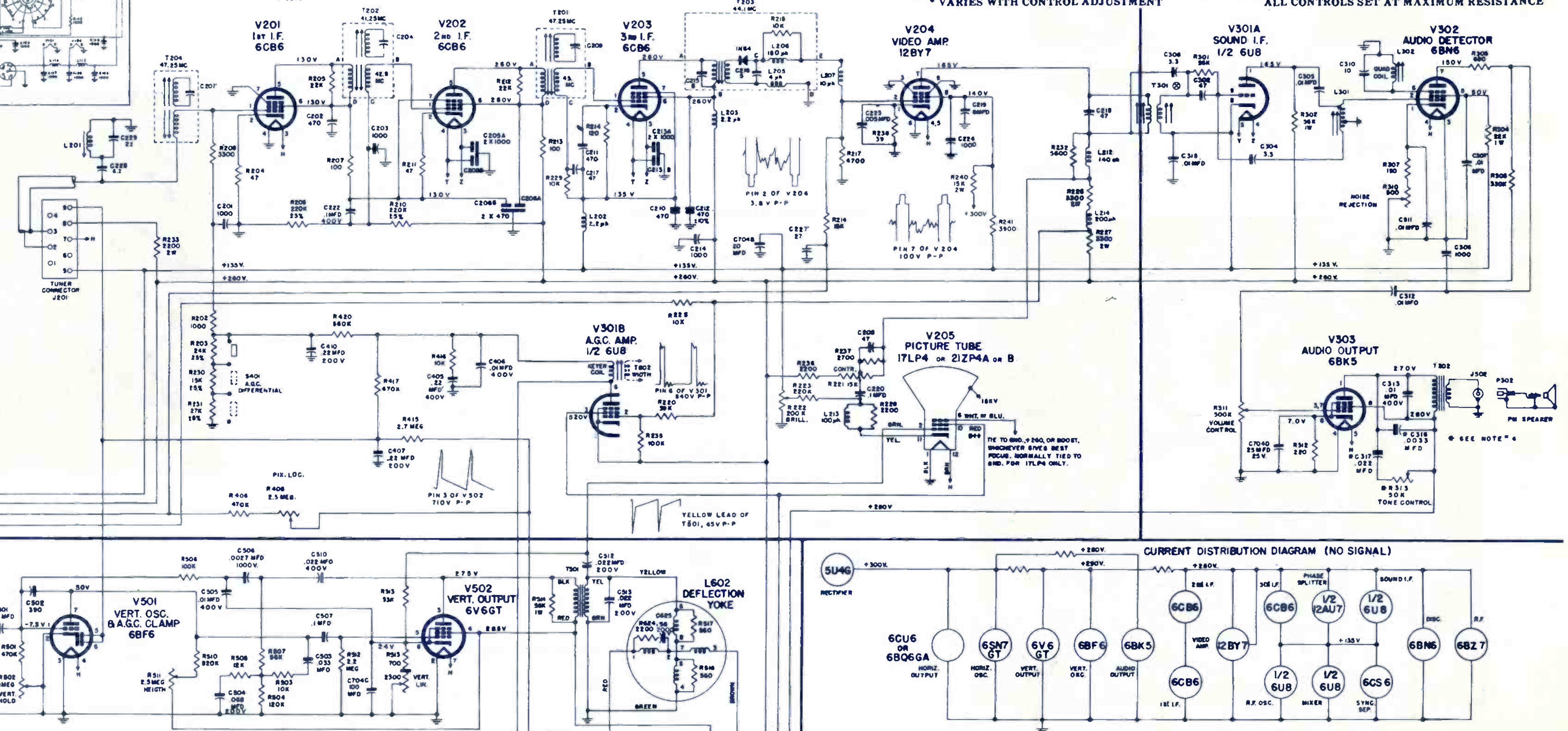
REFERENCE TUBE NO.	PIN NO. 1	PIN NO. 2	PIN NO. 3	PIN NO. 4	PIN NO. 5	PIN NO. 6	PIN NO. 7	PIN NO. 8	PIN NO. 9
V1	90K	10K	0	0	0	10K	90K		
V101	90K	50K	INF.	0	0	INF.	90K	0	0
V102	INF.	50K	90K	0	0	90K	0	0	15K
V201	75K	50 OHMS	.5	0	INF.	INF.	0		
V202	120K	INF.	80K	80K	80K	80K	INF.		
V203	45K	45K	80K	80K	80K	80K	45K		
V204	45 OHMS	500 OHMS	0	.5	.5	0	100K	124K	0
V205	0	33K	NC	(PIN 10) INF.	(PIN 11) 330K	0	(Pin 12) .5	NC	NC
V301	120K	100K	INF.	100K	100K	90K	68K	90K	140
V302	150 OHMS	4.2 OHMS	0	.5	90K	7 OHMS	470K		
V303	90K	6 OHMS	30 OHMS	0	.5	220 OHMS	4 OHMS	90K	90
V401	20K	0	0	.5	180K	90K	6.8 MEG.		
V402	220K	270K	100K	100K	100K	90K	0	100K	120K
V501	170K*	0	0	.5	80K	80K	2.2 MEG.		
V502	NC	.5	80K	80K	2.2 MEG.	NC	.5	33K*	
V601	2.2 MEG.	100K	1.2K	150K*	150K	1.2K	.5	0	
V602	NC	.5	150K	100K	1.2 MEG.	NC	0	0	
V603	NC	INF.	NC	NC	100K	NC	100K	NC	
V604	40K	NC	INF.	NC	18K	NC	75K	75	
V701	NC	100K	NC	22 OHMS	NC	22 OHMS	NC	100K	

* VARIES WITH CONTROL ADJUSTMENT

ALL CONTROLS SET AT MAXIMUM RESISTANCE

NOTES

1. UNLESS OTHERWISE SPECIFIED: MICA & CERAMIC COND. RATED IN MMFD. (NOT SPECIFIED) 500 VDC WORKING. PAPER CAPACITORS RATED IN MFD, 600 VDC WORKING. RESISTORS 1/2 WATT, VALUE IN OHMS (K = 1000 OHMS, MEG = 1 000 000 OHMS).
2. COLORS REFER TO SOLID COLORS OF WIRE OR TRACER COLOR ON WHITE WIRE.
3. CORE TUNING ADJUSTMENTS AVAILABLE FROM TOP OR REAR OF THE CHASSIS ARE INDICATED BY ARROWS POINTING UP. CORE TUNING ADJUSTMENTS AVAILABLE BENEATH THE CHASSIS ARE INDICATED BY ARROWS POINTING DOWN. COILS MARKED ⊗ ARE TUNABLE FROM EITHER TOP OR BOTTOM.
4. WHEN TONE CONTROL IS NOT USED DELETE PARTS C316, C317, & R313. WHEN TONE CONTROL IS USED, DELETE C315.
5. VOLTAGES MEASURED WITH VOLTOHMYST OR EQUIVALENT FROM CHASSIS GROUND WITH NO SIGNAL INPUT. TOLERANCE OF VOLTAGE ± 20 %.
6. WAVEFORMS FOR 117 V LINE, 1000 MICROVOLTS OR GREATER SIGNAL, & ALL CONTROLS ADJUSTED FOR A NORMAL PICTURE.
7. WAVEFORMS MEASURED WITH A HIGH DEFINITION WIDE BAND OSCILLOSCOPE. WAVEFORMS CAN BE EXPECTED TO BE MODIFIED BY NARROW BAND OSCILLOSCOPE.
8. VOLTAGES WITH + PRECEDING THEM DESIGNATE BUS LINES IN SET.



PRODUCTION CHANGE NOTES

The above schematic is correct for chassis coded "CX-38 R-2". Chassis coded "CX-38 R-1" do not contain the following changes:

(1) To eliminate the possibility of "blocking" in the 3rd I-F.

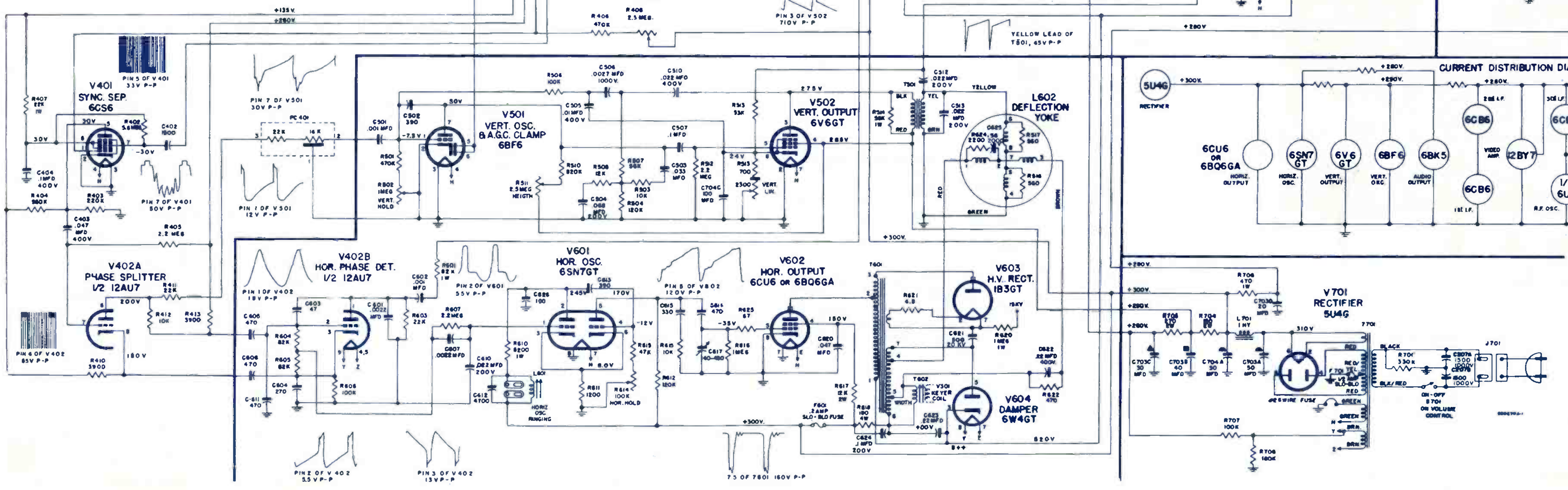
A. R229 (10K, ½W, 10%) was added between terminal "C" of T201 and the junction of L202, R214 and C211. Previously terminal "C" was connected directly to this junction.

B. C217 (47mmf., Tubular Ceramic) was added in parallel with R229.

(2) To eliminate the possibility of "blocking" in the Video Amplifier.

A. R240 (15K, 2W, 10%) was added from pin 8 of V204 to +300V. R219 (33K, 1W, 10%) which was connected from pin 8 to +260V was deleted.

B. R241 (3.9K, ½W, 10%) was added from pin 8 of V204 to +135V. R702 (33K, 2W, 10%) which was connected from +135V to +300V was deleted.



CAPEHART-FARNSWORTH
Chassis "CX-38" Series

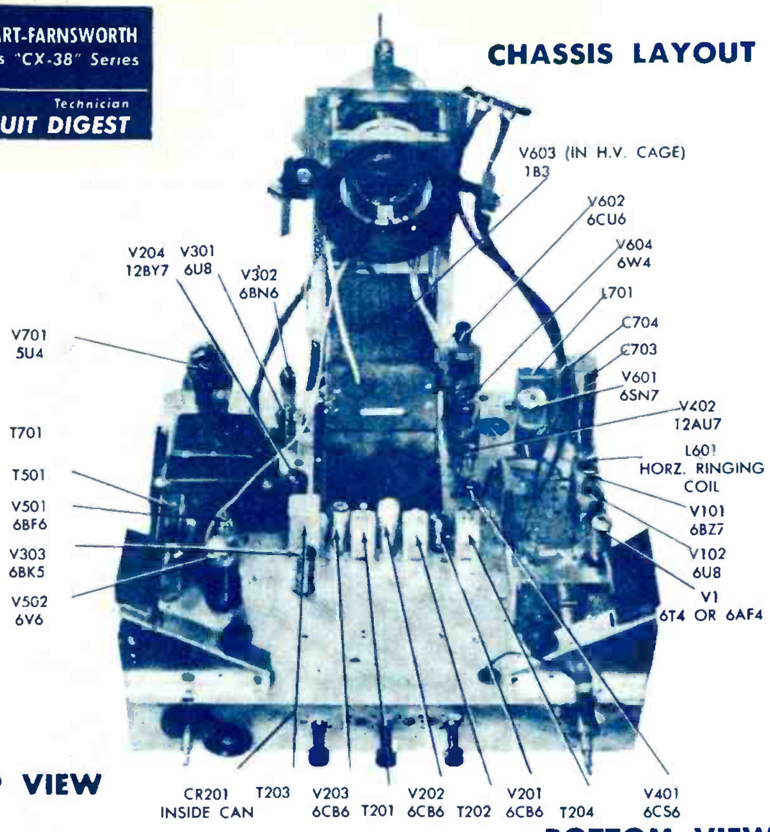
See Reverse Side for Model Nos.

Technician
CIRCUIT DIGEST

CAPEHART-FARNSWORTH
Chassis "CX-38" Series

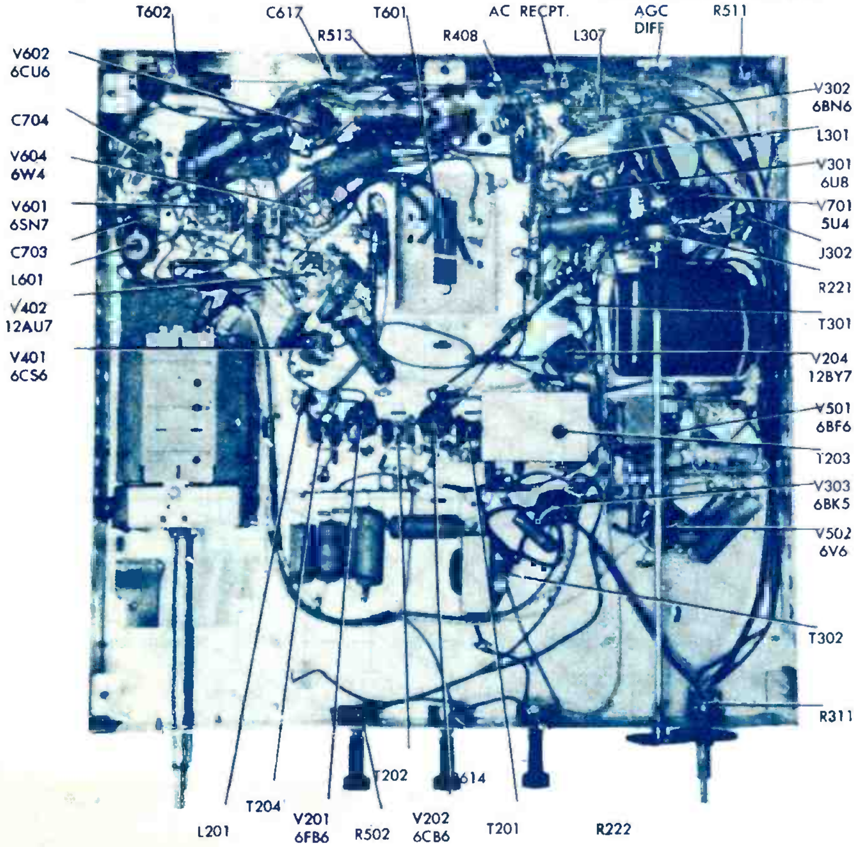
Technician
CIRCUIT DIGEST

CHASSIS LAYOUT



TOP VIEW

BOTTOM VIEW



ALIGNMENT INSTRUCTIONS (Cont.)

Test Equipment Specifications

1. R-F Sweep Generator.
   a. Frequency Ranges.
      4.5 MC with 25 KC Sweep Width.
      44 MC with apprx. 10 MC Sweep Width.
      50 - 90 MC, 170 - 220 MC with at least 10 MC Sweep Width.
   b. Constant Output within the sweep range.
   c. Signal Output not less than 0.1 volt maximum.
2. Marker Generator.
   a. Frequency Ranges.
      39.75 - 47.25 MC
      55.25 - 215.75 MC
      4.5 MC
      I-F Markers
      Picture-Sound Carrier Markers
      Sound I-F and 4.5 MC Trap

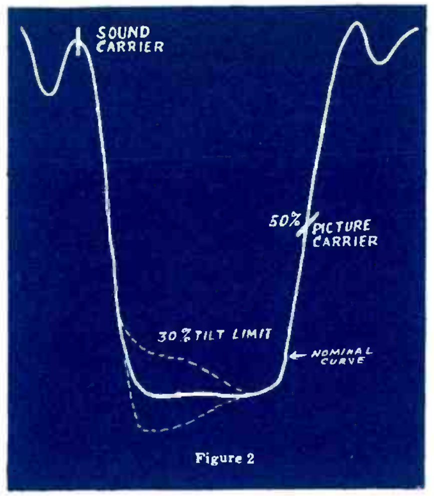


Figure 2

   b. Modulated Signal over I-F Range (optional.)
   c. 50% AM modulation at 4.5 MC.
3. Oscilloscope.
   a. Good sensitivity in Vertical Amplifier.
   b. Preferably a 5 in. screen or larger.
4. Vacuum Tube Voltmeter.
   a. High input resistance.
   b. Accurate low voltage range.
5. Crystal Detector Network.
   a. Refer to construction detail in figure 3.

OSCILLATOR ALIGNMENT CHART

Step No.	Set Sweep Generator to:	Set Marker Generator to:	Connect Generator Output Cable to:	Connect Oscilloscope to:	Set Channel Selector to:	Adjust	Refer to Note/s:
1	Sweep Channel 13	211.25MC, 215.75MC			Channel 13	A1	1, 2, 3, 4, 5, 6
2	Sweep Channel 12	205.25MC, 209.75MC			Channel 12		
3	Sweep Channel 11	199.25MC, 203.75MC			Channel 11		
4	Sweep Channel 10	193.25MC, 197.75MC			Channel 10		7
5	Sweep Channel 9	187.25MC, 191.75MC	Receiver		Channel 9		
6	Sweep Channel 8	181.25MC, 185.75MC	Antenna Input	Pin 2 of V204 (12BY7)	Channel 8		
7	Sweep Channel 7	175.25MC, 179.75MC	Terminals		Channel 7		
8	Sweep Channel 6	83.25MC, 87.75MC			Channel 6	A2	8
9	Sweep Channel 5	77.25MC, 81.75MC			Channel 5		
10	Sweep Channel 4	67.25MC, 71.75MC			Channel 4		9
11	Sweep Channel 3	61.25MC, 65.75MC			Channel 3		
12	Sweep Channel 2	55.25MC, 59.75MC			Channel 2		

VIDEO I-F ALIGNMENT CHART

Step No.	Set Sweep Generator To:	Set Marker Generator To:	Connect Sweep Generator To:	Connect Oscilloscope To:	Adjust	Refer to Note/s
1.	44MC (10MC Sweep)	41.25MC			T202 (Top)	1-2-3-4
2.	44MC (10MC Sweep)	47.25MC			T201 (Top)	1-2-3-5
3.	44MC (10MC Sweep)	44.1MC	Pin #1 of V201-Grid of First I. F. Amplifier Test Point on R.F. Unit (Pin #4)	Thru a 10K Isolation Resistor To Pin #2 of V204 Grid of Video Amplifier	T203 (Bottom)	1-2-3-6
4.	44MC (10MC Sweep)	42.5MC			T202 (Bottom)	1-2-3-7
5.	44MC (10MC Sweep)	45.75MC			T201 (Bottom)	1-2-3-8
6.	44MC (10MC Sweep)	47.25MC			T204 (Top)	9-10
7.	44MC (10MC Sweep)	39.75MC			L201 (Bottom)	9-10
8.	Channel #9 (10MC Sweep)	Channel #9 Picture Carrier	VHF Antenna Terminals	Thru the Detector Network to First I. F. Amplifier	T102 (on tuner) T204 (Bottom)	11-12 13-14

Local Oscillator Alignment

Note:

1. Connect the sweep generator output cable to the receiver antenna input terminals through the proper terminating network. If the sweep generator used has a 300 ohm balanced output use the matching pad shown in Figure 1. For other generators use the proper values of R_0 and R_1 for the output cable impedance of the particular generator. Adjust the generator to sweep Channel 13.
2. Couple an accurately calibrated marker generator into the antenna input to provide picture and sound carrier markers for Channel 13.
3. Connect the oscilloscope (high side) through a 10K isolating resistor to Pin 2 of V204 (12BY7).
4. Remove the AGC Amplifier tube (V301-6U8) and connect a bias source from the junction of R202 and R203, with a jumper to Pin 5 or 6 of the AGC Clamp (V501-6BF6), and ground. A bias source may be obtained from a 4.5 volt battery with a 1K pot connected across its terminals. Connect the positive end of the battery to chassis ground and connect the arm of the pot to the junction point above. Connect a VTVM to the arm of the pot and adjust the pot for a negative 3.5 reading on the VTVM.
5. Set the Channel Selector to Channel 13, adjust the Fine Tuning control to mid position and check the response curve obtained against the ideal curve shown in Figure 4. If the shape of the curve is not within these limits, it will be necessary to repeat the I-F Amplifier Alignments. The I-F Amplifiers must be properly aligned before the oscillator adjustments can be correctly made.
6. Adjust A1 (oscillator slug located on top of the tuner, refer to illustration shown on page 5) to properly position the markers on the curve as shown in figure 2.
7. Check channels 12 thru 7 for proper location of the markers on the curve as shown in figure 4. If necessary make a slight readjustment of A1 for the best compromise on all channels.
8. Adjust A2, (also on top of the tuner) to properly position the markers on the curve as shown in Figure 4 with the sweep and marker generators adjusted for channel 6.
9. Check channels 6 thru 2 for proper location of the markers on the curve as in figure 4. If necessary make a slight readjustment of A2 for the best compromise on all channels.

Video I.F. Alignment

Note:

1. Disconnect the tuner lead from Terminal "D" of the first I.F. transformer (T204) and connect the sweep (40MC) generator to the grid (Pin 1) of the first I.F. Amplifier (V201 - 6CB6); through a .001 mfd. isolating capacitor. If a separate marker generator is used, it should be coupled to the same point through a 10K isolation resistor.
2. Remove the AGC Amplifier tube (V301-6U8) and connect a bias source from the junction of R202 and R203, with a jumper to Pin 5 or 6 of the AGC Clamp (V501-6BF6), and ground. A bias source may be obtained from a 4.5 volt battery with a 1K pot connected across its terminals. Connect the positive end of the battery to chassis ground and connect the arm of the pot to the junction point above. Connect a VTVM to the arm of the pot and adjust the pot for a minus 3 volt reading on the VTVM.
3. Connect the oscilloscope "Vertical Input" cable through a 10K isolation resistor, to the grid (Pin 2) of the video amplifier (V204-12BY7). Connect the ground side of the input cable to chassis ground.
4. Adjust the marker generator to provide a marker at 41.25 MC and adjust the top slug of T202 (CO-channel Sound I.F. Trap) for minimum response at the marker frequency. This adjustment may be made easier by running the sweep generator output high so that the trap "dips" are easily visible.
5. Adjust the marker generator to 47.25 MC and adjust the top slug of T201 (Adjacent Channel Sound I.F. Trap) for minimum response at the marker frequency.
6. Reduce the sweep generator output so that a normal curve is seen. Adjust the marker generator to 44.1 MC and adjust the bottom of T203 for maximum amplitude of the 44.1 MC marker with minimum tilt.
7. Adjust the marker generator to 42.5 MC and adjust the bottom of T202 to position the 42.5 marker within 40% to 60% of maximum amplitude of the curve on one side.
8. Adjust the marker generator to 45.75 MC and adjust the bottom of T201 to position the 45.75 MC marker within 40% to 60% of maximum amplitude of the curve on the other side.
9. After repeating the above steps, reconnect the tuner lead to terminal "D" of T204 and connect the Sweep and Marker Generator to Pin 4 (test point) of J201 on the back of the VHF tuner.
10. Adjust the marker generator to 47.25 MC and adjust the top of T204 for minimum response at the marker frequency. Then adjust the marker generator to 39.75 MC and adjust the trap (L201) for minimum response at that marker frequency.
11. Now connect the Sweep Generator to the VHF Antenna terminals and the oscilloscope to the tuner test point (Pin 4 of J201) and select a channel with a flat response. After selecting the proper channel, connect a marker generator to the VHF antenna terminals and apply a sound carrier marker signal.
12. With the oscilloscope again connected as in Note 3 above, adjust the Fine Tuning setting until the Sound Carrier marker falls directly into the sound trap.
13. After adjustment of the fine tuning setting, connect the scope, through the detector circuit shown in Figure 3 to the first I.F. Amplifier. Now short Pin 5 to Pin 6 (plate to screen) on V202 the second I.F. Amplifier tube.
14. Adjust the marker generator to the picture carrier frequency and then adjust T102 (on top of tuner) and T204 (bottom) for maximum amplitude without tilt, positioning the picture carrier marker at the high frequency corner of the response curve shown in figure 4.

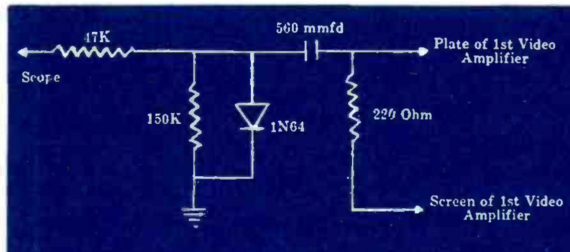


Figure 3

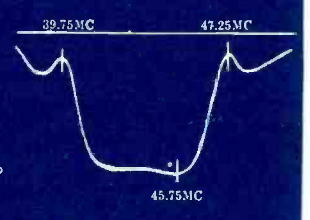


Figure 4

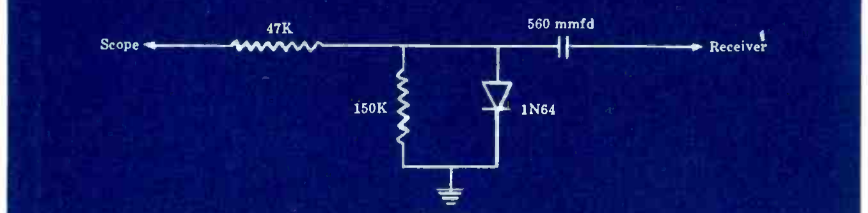


Figure 5

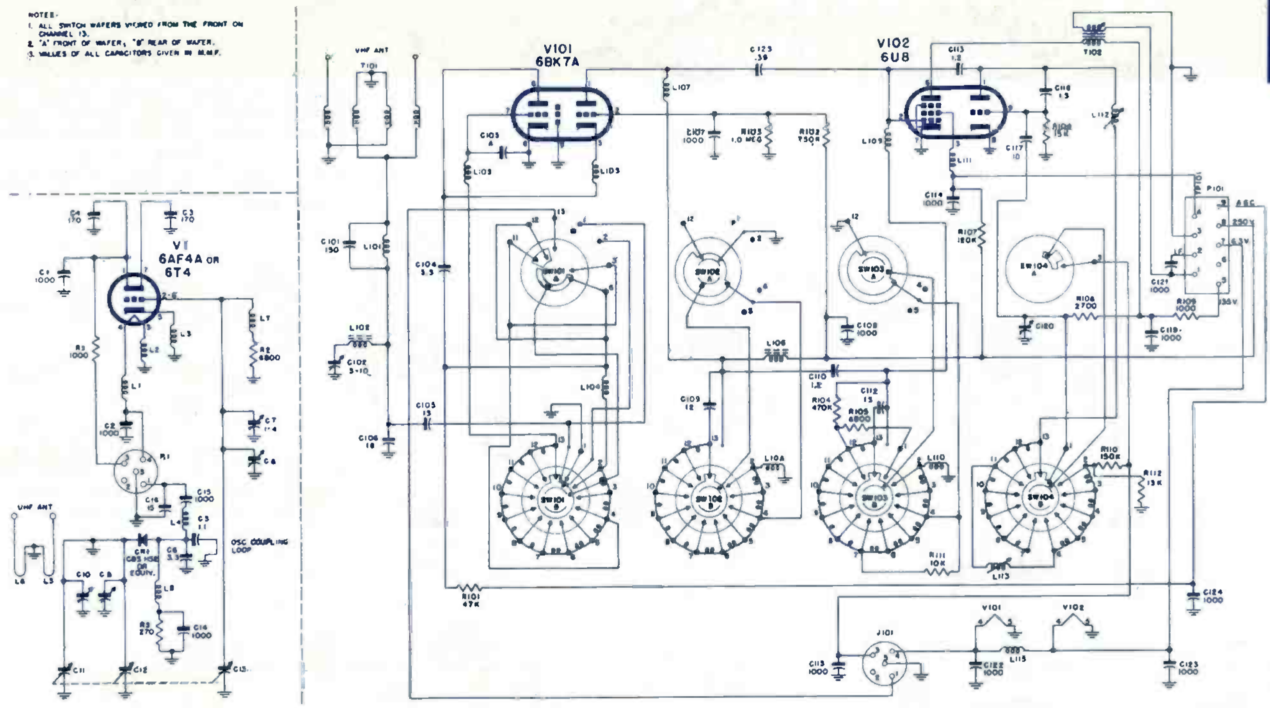
MODELS USING THE CX-38 SERIES TV CHASSIS

MODEL	CHASSIS	MODEL	CHASSIS	MODEL	CHASSIS	MODEL	CHASSIS
1T175ES-4	CT-109	3T215BD-4	CT-171	8C215MD-4	CT-171	12F215BD-4	CT-171
1T175ES-5	CT-139	3T215BD-5	CT-172	8C215MD-5	CT-172	12F215BD-5	CT-172
2T215MSD-4	CT-157	7C215MA-4	CT-157	8C215BD-4	CT-171	14F215M-4	CT-125
2T215MSD-5	CT-158	7C215MA-5	CT-158	8C215BD-5	CT-172	14F215M-5	CT-140
2T215BSD-4	CT-157	7C215BA-4	CT-157	9C215MD-4	CT-157	14F215B-4	CT-125
2T215BSD-5	CT-158	7C215BA-5	CT-158	9C215MD-5	CT-158	14F215B-5	CT-140
2T215ES-4	CT-125	7C215M-4	CT-157	9C215BD-4	CT-157	18C215M-4	CT-171
2T215ES-5	CT-140	7C215M-5	CT-158	9C215BD-5	CT-158	18C215M-5	CT-172
3T215MD-4	CT-171	7C215B-4	CT-157	12F215MD-4	CT-171	18C215B-4	CT-171
3T215MD-5	CT-172	7C215B-5	CT-158	12F215MD-5	CT-172	18C215B-5	CT-172

TECHNICIAN
CIRCUIT DIGEST

CAPEHART
Chassis CX-38S Series

Chassis CX-38S Series: Models 3T216MD-4 (MD-5, BD-4, BD-5), 6T216MD-4 (MD-5, BD-4, BD-5), 11C216MD-4 (MD-5, BD-4, BD-5), 16C216MD-4 (MD-5, BD-4, BD-5, FD-4, FD-5)



CAPEHART CX-38S CHASSIS TUBE SOCKET RESISTANCE CHART

REF. TUBE NO.	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V1 6AF4	INF	7.5K	Short	Short	Short	7.5K	70K		
V101 6BK7A	50K	470K	INF	Short	Short	INF	1.2 meg	Short	Short
V102 6U8	200K	500K	150K	Short	Short	7K	Short	Short	1.5K
V201 6BZ6	60K	47 ohm	Short	Short	INF	INF	Short		
V202 6BZ6	120K	INF	Short	Short	75K	75K	Open		
V203 6AM8	100. ohm	Short	75K	Short	Short	75K	1.8K	6K	Short
V204 12BY7	39 ohn	6.0K	Short	Short	Short	Short	60K	75K	Short
V205 CRT	100K	100K	Pin 10 1.2 meg	Pin 11 1.1 meg	Pin 12 100K	**Short			
V301 6U8	300K	100K	1.2 meg.	100K	100K	700K	75K	75K	120K
V302 6BN6	*850 ohm	3.6 ohm	Short	Short	80K	5.5 ohm	400K		
V306 6AV6	1. meg	Short	Short	Short	1.1 meg	1.1 meg	400K		
V307 6AQ5	470K	560 ohm	Short	Short	75K	75K	470K		
V401 6CS6	33K	Short	Short	Short	160K	75K	5 meg		
V402 12AU7	22K	330K	100K	100K	100K	70K	2.7 meg	INF	80K
V508 6SN7	1.1 meg	270K	680 ohm	*2.7 meg	*3. meg	680 ohm	Short	Short	
V504 6AQ5	2.2 meg	*1.5K	Short	Short	70K	70K	2.2 meg		
V601 6SN7	2.2 meg	70K	1200 ohm	*147K	190K	1200 ohm	Short	Short	
V602 6CU6	1.2 meg	Short	1.2 meg	70K	1. meg	180K	Short	Short	
V603 1B3	NC	INF	NC	NC	NC	NC	INF	NC	
V604 6AX4	60K	NC	1.25 meg	NC	70K	1.25 meg	100K	100K	
V701 5U4GA	1.2 meg	70K	1.0 meg	13	90K	13	90K	50K	

*Varies with a Control Setting. **Varies with Focus Tap Position. (With 20,000 Ohm per Volt Meter)

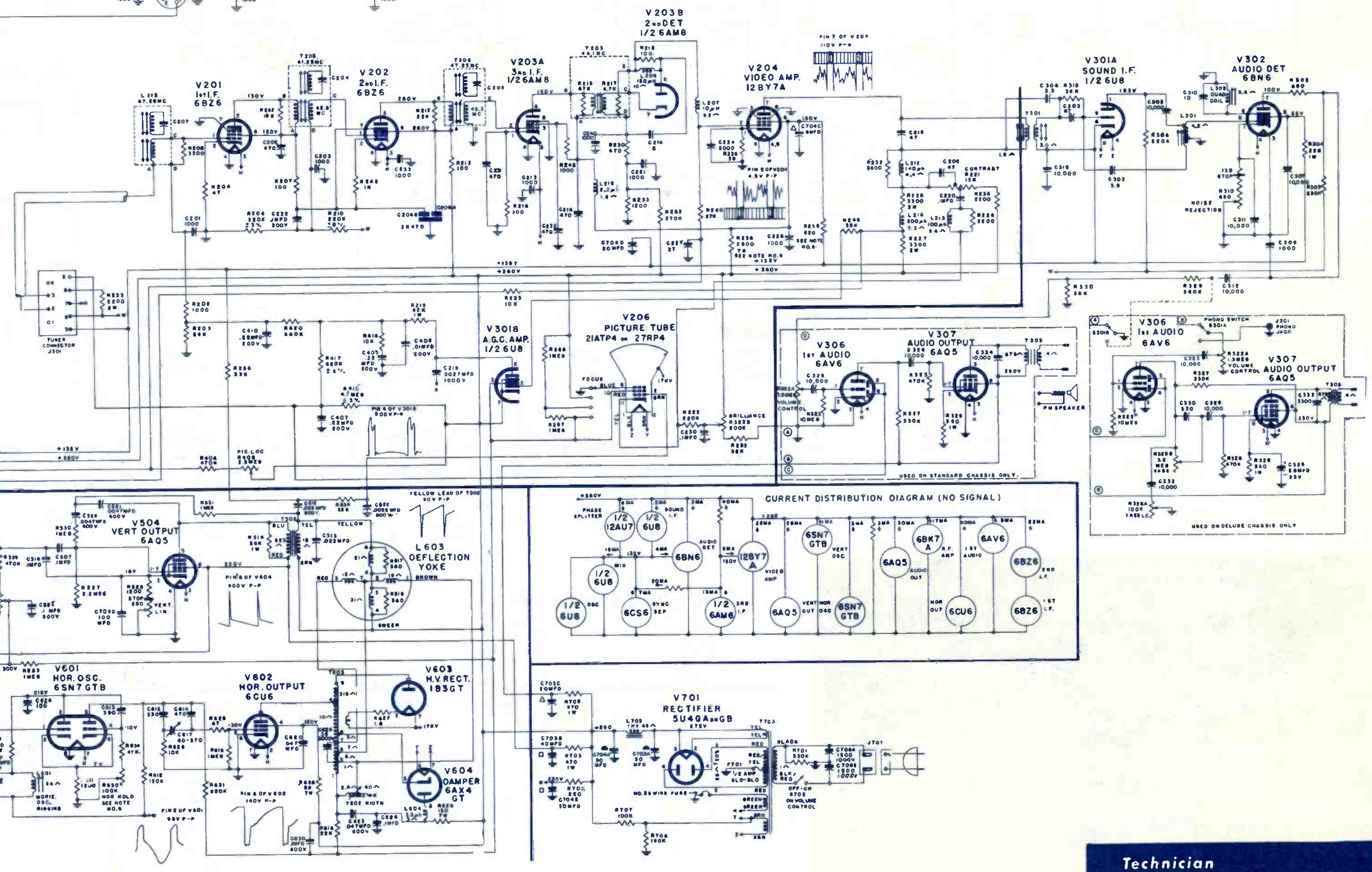
PRODUCTION CHANGES

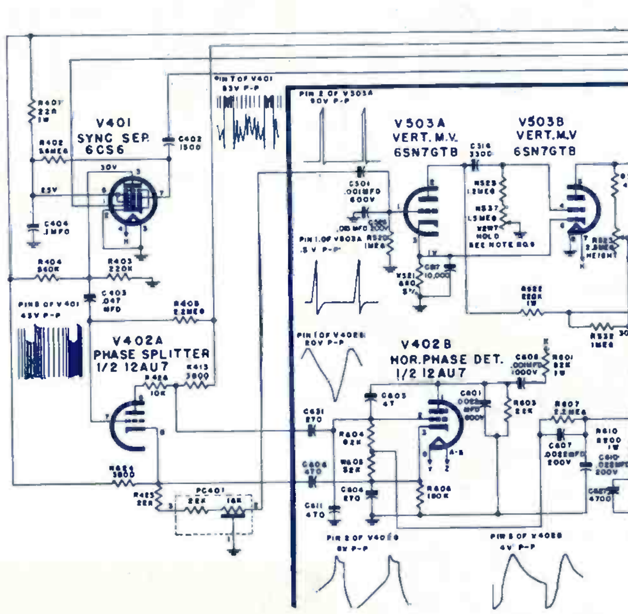
The schematic diagram shown here is correct for chassis coded R-2. The chassis coded R-1 will differ from those coded R-2 in the following manner:

1. R262 (18K-½W-10%) is R205 (22K-½W-10%).
2. C240 (1000 mmf) is not used.
3. C528 (.015-200V) is C519 (10K mmf Disc).
4. R608 (180K-½W-10%) is R606 (100K-½W-10%).
5. C529 (.0047-600V) is C525 (.01-600V).

NOTES.

1. UNLESS OTHERWISE SPECIFIED MICA & CERAMIC CAPACITORS RATED IN MMF (NOT SPECIFIED) 300V DC WORKING. PAPER CAPACITORS RATED IN MFD., 400V DC WORKING. RESISTORS 1/2 WATT, VALUE IN OHMS (K=1000 OHMS, MEG=1,000,000 OHMS.).
2. COLORS REFER TO SOLID COLORS OF WIRE OR TRACER COLOR ON WHITE WIRE.
3. CORE TUNING ADJUSTMENTS AVAILABLE FROM TOP OR REAR OF THE CHASSIS ARE INDICATED BY ARROWS POINTING UP. CORE TUNING ADJUSTMENTS AVAILABLE FROM BENEATH THE CHASSIS ARE INDICATED BY ARROWS POINTING DOWN. COILS TUNABLE FROM ABOVE & BENEATH THE CHASSIS ARE INDICATED BY ARROWS POINTING UP & DOWN.
4. VOLTAGES MEASURED WITH VOLTOHMYST OR EQUIVALENT FROM CHASSIS GROUND WITH NO SIGNAL INPUT. TOLERANCE OF VOLTAGES ± 20%.
5. WAVEFORMS FOR 117V LINE, 1000 MICROVOLTS OR GREATER SIGNAL, & ALL CONROLS ADJUSTED FOR NORMAL PICTURE.
6. R337 & R430 ARE REPLACED WITH R324A & B ON THE DELUXE CHASSIS.
7. WAVEFORMS MEASURED WITH A HIGH DEFINITION WIDE BAND OSCILLOSCOPE. WAVEFORMS CAN BE EXPECTED TO BE MODIFIED BY A NARROW BAND OSCILLOSCOPE.
8. VOLTAGES WITH + PRECEEDING THEM DESIGNATE B+ LINES IN SET.
9. IN SOME CHASSIS R265 WILL BE 3.3K, 7 WATT & R255 WILL BE 8.2K, 1/2 WATT. THIS SERIES COMBINATION WILL BE PARALLELED WITH 12K, 2 WATT.





TECHNICIAN CIRCUIT DIGEST

CBS-COLUMBIA Chassis 1610, 1611

Chassis 1610: Models U3T602, U3T615, U3T616, U3T621, U3T622, U3T623, U3T624, U3C627, U3C628, U3C631, U3C632, U3C633, U3C634, U3C635, U3C636 Chassis 1611: Models 3T602, 3T615, 3T616, 3T621, 3T622, 3T623, 3T624, 3C627, 3C628, 3C631, 3C632, 3C633, 3C634, 3C635, 3C636

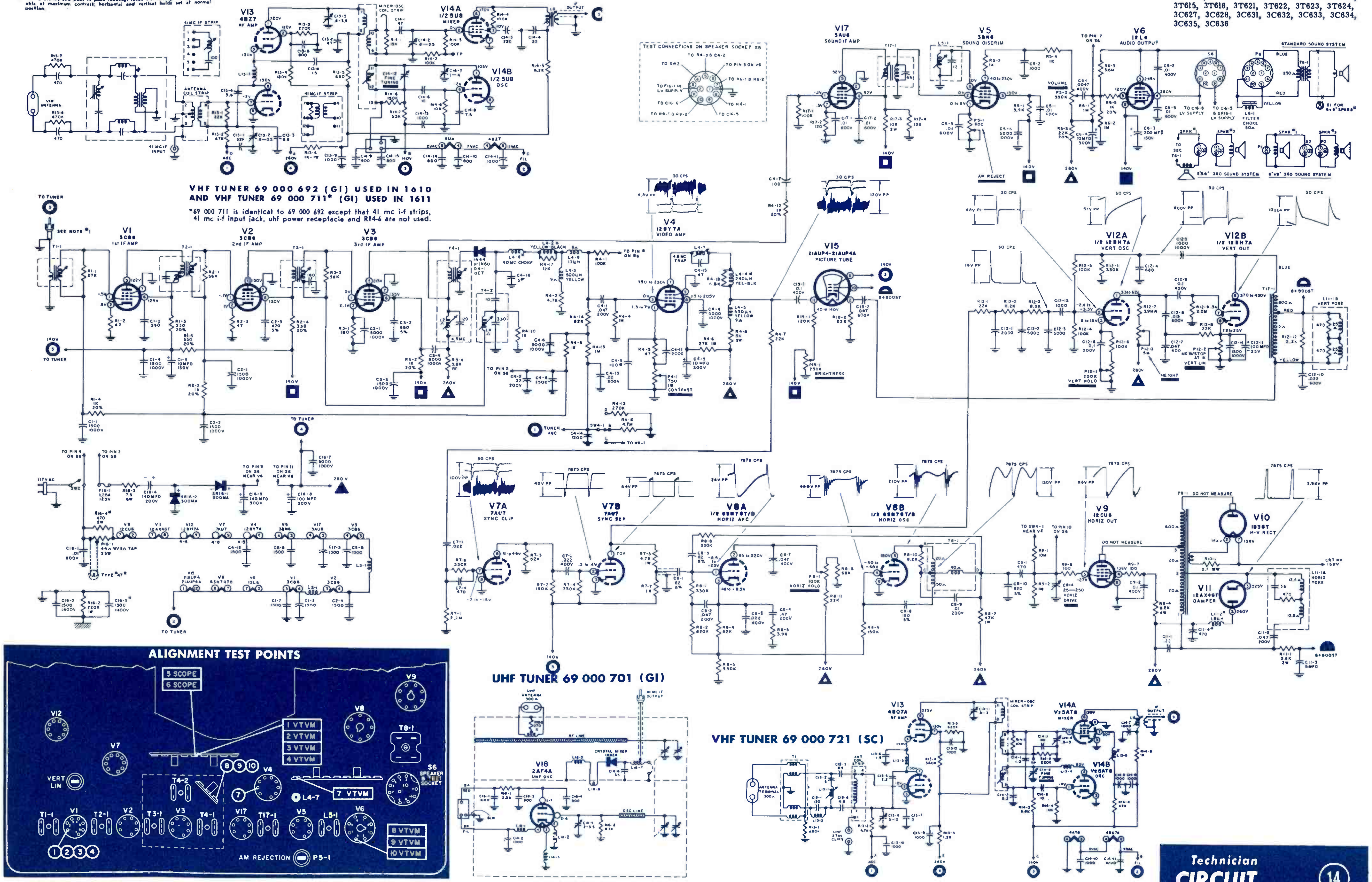
SCHEMATIC NOTES

1. In the 1610 chassis, the I.F. input plugs into the tuner. In the 1611 chassis, a shielded lead which is part of the tuner is soldered to T1-1.
2. Solid geometric symbols indicate B+ voltage sources — open symbols indicate points of application.
3. Numbered circles indicate tuner lead connections.
4. Component symbols are coded to indicate tube near which component is located on schematic. Ex. C9-2; capacitor, located near V9.
5. All d-c voltages measured with a VTVM connected between the chassis and tube socket terminals, with channel selector set between channels and the Normal-Local-Distant switch (SW4-1) in the normal position. Where readings are affected by control settings, voltages are shown for the clockwise and counterclockwise positions of the controls. Tuner voltages taken with channel selector set to an unused channel and the Normal-Local-Distant switch in the normal position.
6. All waveforms and peak to peak readings taken with strongest signal available at maximum contrast; horizontal and vertical holds set at normal position.
7. All resistors are ½W, ±10% unless otherwise indicated. K=X1,000; M=X1,000,000.
8. All capacitors are 500 WV unless otherwise indicated. Values less than one are microfarads and values more than one are micro-microfarads, unless otherwise indicated.
9. All coil and winding resistances were taken with the components disconnected from the circuit.

*Indicates change in schematic, as listed below.

In 1611 chassis
R16-4 and C4-16 are omitted.

In some chassis
L4-2 is 16 001 362 and R4-18 is 18K, ½W.
L4-4 is 16 001 362 and R4-17 is 8.2K, ½W.
6" x 9" speakers are used which have their voice coils connected to the secondary of T6-1 (audio output trans.) through a socket and plug.
The pilot light is omitted.
L4-8 is omitted, C16-3 is added and C4-3 is 220 mmfd. or L4-8 is added, C16-3 is omitted and C4-3 is 100 mmfd.
L11-2 and C11-4 are omitted.



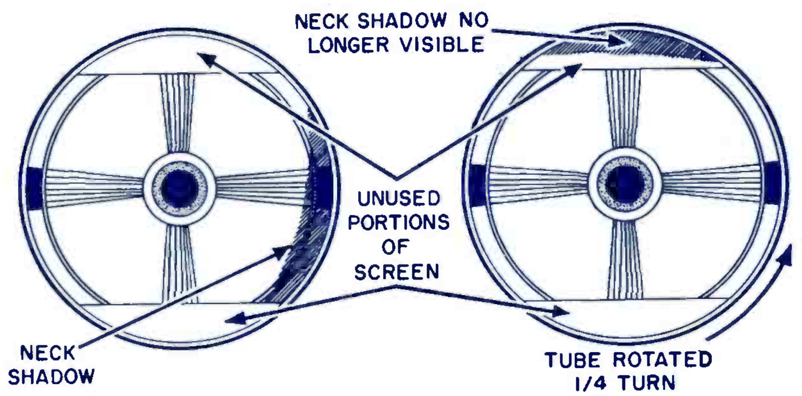
Shop Hints

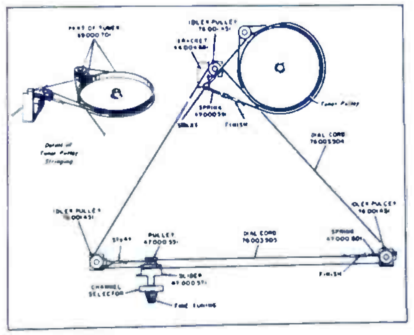
Neck Shadow Remedy

Many cases of picture tube neck shadow can't be completely removed by the ordinary methods, such as deflection yoke positioning, adjustment of centering magnets, focus coil positioning, and correct ion-trap magnet settings. These unremovable neck shadows are most often caused by slight irregularity in the construction of the picture tube itself, with the electron gun structure being out of alignment with the tube neck. Where round picture tubes are in use, there should be little difficulty in eliminating a shadow due to such a defect.

Assume that the shadow is evident in a portion of the screen as shown to the left in the accompanying illustration. Rotate the tube about a quarter of a turn one way or the other, so as to place the portion of the screen most subject to shadow in the normally unused area above or below the picture. Other controls may then be adjusted for best picture. If some shadow, still exists, turn the tube either way until it disappears. Sometimes it will be found that better results can be obtained by using the bottom of the tube in which to "lose" the shadow instead of the top, or vice versa. If no change can be achieved at all with this method, at least one other objective is accomplished: this would tend to establish the fact that the picture tube itself is not the cause of the neck shadow. To achieve proper adjustment, it is often necessary to lengthen the second-anode lead so that the tube can be rotated to best position.—*Charles Garrett, New London, Connecticut*

Easy cure for neck-shadow problems due to inherent gun misalignment works on round pix tubes.





UHF tuner stringing diagram and part numbers.

UHF Oscillator Tube Replacement—After replacing the UHF oscillator tube, check the UHF Channel Indicator and Dial Scale for correct alignment. If the indicator is not positioned correctly for the channel being received, readjust the UHF oscillator slug.

The slug is located next to the oscillator tube socket and is accessible from the rear through the space between the baseplate and the chassis. To adjust the oscillator place the UHF Channel Selector on a channel in use in your area and adjust the slug for best picture and sound, using a long insulated alignment tool. Check the UHF dial calibration on all channels available and readjust the slug if required.

Anti-Barkhausen Magnet Adjustment — In UHF models, an anti-barkhausen magnet is mounted on the glass envelope of the 12CU6 horizontal output tube. If a barkhausen oscillation (narrow vertical line in picture) occurs on one or more UHF channels rotate the magnet until the oscillation disappears. Check all channels in use and readjust the magnet if barkhausen appears on another channel.

Servicing Small Tubes—Remove the cabinet back and the two wing screws (A in figure 5) from the lower left and right hand chassis supporting brackets. If the speaker leads are clamped to the right hand chassis support, open the clamp to release the leads and pull the top of the chassis back into the tube servicing position as shown in figure 5.

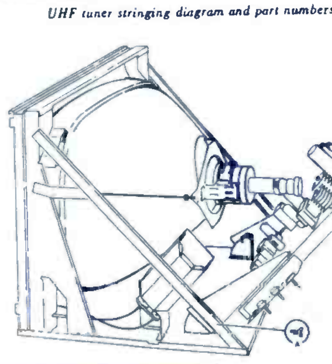
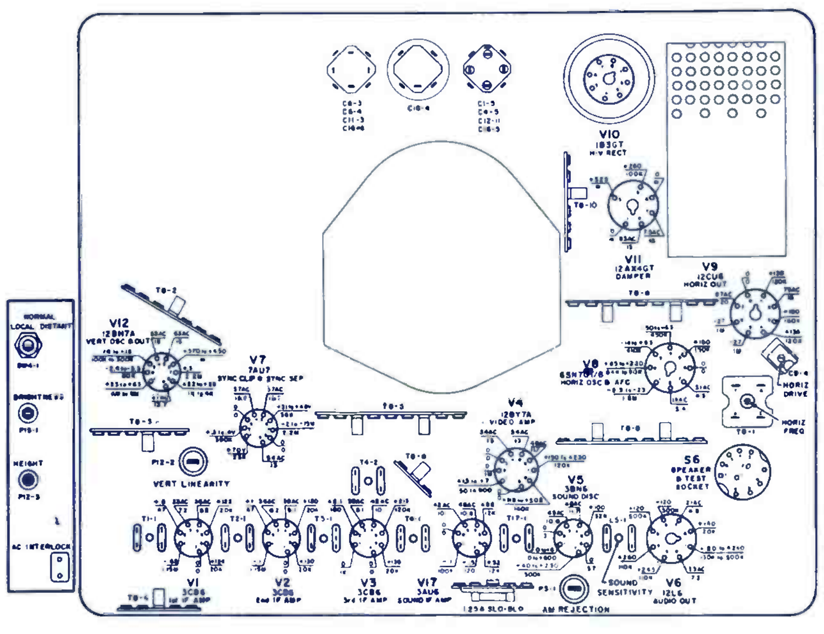


Figure 5

CBS-COLUMBIA
Chassis 1610, 1611

Technician
CIRCUIT DIGEST
15

REAR VIEW OF CHASSIS



Voltages are shown above and resistances below the lines drawn from the socket terminals.

PARTS LIST

CAPACITORS

SYM.	PART NO.	DESCRIPTION
C1-1	23 064 640	Ceramic Disc., 1500 mmfd 1000V
C1-2	23 002 190	Ceramic, 390 mmfd 500V 10%
C1-3	23 064 640	Ceramic Disc., 1500 mmfd 1000V
C1-4	23 064 640	Ceramic Disc., 1500 mmfd 1000V
C1-5	21 001 131	Elec., 10 mfd 150V w/C12-11, C16-5, C4-5
C1-7	23 064 640	Ceramic Disc., 1500 mmfd 1000V
C2-1	23 064 640	Ceramic Disc., 1500 mmfd 1000V
C2-2	23 064 640	Ceramic Disc., 1500 mmfd 1000V
C2-3	23 004 700	Ceramic, 470 mmfd 500V 5%
C2-4	23 064 640	Ceramic Disc., 1500 mmfd 1000V
C3-1	23 064 680	Ceramic Disc., 5000 mmfd 1000V
C3-2	23 004 720	Ceramic, 680 mmfd 500V 5%
C3-3	23 064 640	Ceramic Disc., 1500 mmfd 1000V
C3-4	23 064 680	Ceramic Disc., 5000 mmfd 1000V
C3-5	23 064 640	Ceramic Disc., 1500 mmfd 1000V
C4-1	22 011 240	Paper, .047 mfd 200V 20%
C4-2	22 011 320	Paper, .22 mfd 200V 20%
C4-3	23 001 620	Ceramic, 100 mmfd 500V 20%
C4-4	23 064 680	Ceramic Disc., 5000 mmfd 1000V
C4-5	21 001 131	Elec., 10 mfd 300V w/C12-11, C16-5, C1-5
C4-6	23 064 680	Ceramic Disc., 5000 mmfd 1000V
C4-7	23 001 620	Ceramic, 100 mmfd 500V 20%
C4-8	23 064 640	Ceramic Disc., 1500 mmfd GMV
C4-11	23 000 591	Ceramic, 2000 mmfd 500V 20%
C4-12	23 064 640	Ceramic, 1500 mmfd 1000V GMV
C4-13	22 011 320	Paper, .22 mfd 200V 20%
C4-14	23 064 640	Ceramic Disc., 1500 mmfd GMV
C4-15		Part of L4-7
C4-16	23 001 990	Ceramic, 5 mmfd 500V 10%
C5-1	23 066 020	Ceramic Disc., .01 mfd 600V
C5-2	23 001 740	Ceramic, 1000 mmfd 500V 20%
C5-3	23 066 020	Ceramic Disc., .01 mfd 600V
C5-6	23 064 680	Ceramic Disc., 5000 mmfd 1000V
C5-8	23 064 640	Ceramic, 1500 mmfd 1000V GMV
C6-1	22 011 620	Paper, .0047 mfd 400V 20%
C6-2	22 011 660	Paper, .01 mfd 400V 20%
C6-3	21 001 121	Elec. 200 mfd 150V w/C16-6, C11-3, C6-4
C6-4	21 001 121	Elec., 10 mfd 300V w/C16-6, C11-3, C6-3
C6-5	23 066 020	Ceramic Disc., .01 mfd 600V GMV
C7-1	22 011 700	Paper, .022 mfd 400V 20%
C7-2	22 011 700	Paper, .022 mfd 400V 20%
C7-4	23 002 200	Ceramic, 470 mmfd 500V 10%
C8-1	20 007 010	Mica, 82 mmfd 500V 5%
C8-2	22 014 240	Paper, .047 mfd 200V 10%
C8-3	22 008 200	Paper, .022 mfd 400V 10%
C8-4	27 007 840	Paper, .47 mfd 200V 10%
C8-5	20 007 010	Mica, 82 mmfd 500V 5%
C8-7	22 008 240	Paper, .047 mfd 400V 10%
C8-8	20 007 090	Mica, 180 mmfd 500V 5%
C8-9	27 014 160	Paper, .01 mfd 200V 10%
C8-10	20 007 270	Mica, 820 mmfd 500V 5%
C9-1	23 002 200	Ceramic, 470 mmfd 500V 10%
C9-2	22 011 780	Paper, .1 mfd 400V 20%
C9-4	25 000 061	Mica Trimmer, 25-250 mmfd
C11-1	22 008 320	Paper, .22 mfd 400V 10%
C11-2	22 007 740	Paper, .047 mfd 200V 10%
C11-3	21 001 121	Elec., 5 mfd 500V w/C16-6, C6-3, C6-4
C11-4	23 002 200	Ceramic, 470 mmfd 500V 10%
C12-1	23 000 591	Ceramic, 2000 mmfd 500V 20%
C12-2	23 000 601	Ceramic, 5000 mmfd 500V 20%
C12-3	23 000 601	Ceramic, 5000 mmfd 500V 20%
C12-4	23 001 720	Ceramic, 680 mmfd 500V 20%
C12-5	23 065 070	Ceramic Disc., 1000 mmfd 1000V 20%
C12-6	22 011 280	Paper, .1 mfd 200V 20%
C12-7	22 008 240	Paper, .047 mfd 400V 10%
C12-8	22 008 680	Paper, .015 mfd 600V 10%
C12-9	22 008 280	Paper, .1 mfd 400V 10%
C12-10	22 012 200	Paper, .022 mfd 600V 20%
C12-11	21 001 131	Elec., 100 mfd 25V w/C4-5, C16-5, C1-5
C12-13	23 001 240	Ceramic, 1000 mmfd 500V 10%
C12-14	23 064 640	Ceramic, 1500 mmfd 1000V 10%
C14A-9	23 067 020	Ceramic Disc., 5000 mmfd 1400V
C15-1	22 011 780	Paper, .1 mfd 400V 20%
C15-2	22 012 240	Paper, .047 mfd 600V 20%
C16-1	22 017 660	Paper, .01 mfd 600V 20%
C16-2	23 067 010	Ceramic Disc., 1500 mmfd 1400V
C16-3	23 067 010	Ceramic Disc 1500 mmfd 1400V
C16-4	21 000 981	Electrolytic, 140 mfd 200V
C16-5	21 001 131	Elec., 140 mfd 300V w/C4-5, C12-11, C1-5
C16-6	21 001 121	Elec., 100 mfd 300V w/C6-3, C11-3, C6-4
C16-7	23 064 680	Ceramic Disc., 5000 mmfd 1000V
C17-1	23 066 020	Ceramic Disc., .01 mfd 600V GMV
C17-2	23 066 020	Ceramic Disc., .01 mfd 600V GMV
C17-3	23 064 640	Ceramic Disc., 1500 mmfd 1000V

RESISTORS

SYM.	PART NO.	DESCRIPTION
R1-1	30 273 230	Carbon, 27K ohm ½W 10%
R1-2	30 470 230	Carbon, 47 ohm ½W 10%
R1-3	30 331 330	Carbon, 330 ohm ½W 20%
R1-4	30 102 330	Carbon, 1K ohm ½W 20%
R1-5	30 331 330	Carbon, 330 ohm ½W 20%
R2-1	30 563 230	Carbon, 56K ohm ½W 10%
R2-2	30 102 330	Carbon, 1K ohm ½W 20%
R2-3	30 470 230	Carbon, 47 ohm ½W 10%
R2-4	30 331 330	Carbon, 330 ohm ½W 20%
R3-1	30 181 230	Carbon, 180 ohm ½W 10%
R3-2	30 102 330	Carbon, 1K ohm ½W 20%
R3-3	30 563 230	Carbon, 56K ohm ½W 10%
R3-4	30 562 240	Carbon, 5.6K ohm 1W 10%
R4-1	30 104 330	Carbon, 100K ohm ½W 20%
R4-2	30 472 130	Carbon, 4.7K ohm ½W 5%
R4-3	30 105 330	Carbon, 1 meg ½W 20%
R4-4	30 105 330	Carbon, 1 meg ½W 20%
R4-5	30 470 230	Carbon, 47 ohm ½W 10%
R4-6	30 273 240	Carbon, 27K ohm 1W 10%
R4-7	30 223 230	Carbon, 22K ohm ½W 10%
R4-8	31 000 531	WW 5K ohm 5W 5%
R4-10	30 102 230	Carbon, 1K ohm ½W 10%
R4-12	30 102 330	Carbon, 1K ohm ½W 20%
R4-13	30 274 230	Carbon, 270K ohm ½W 10%
R4-14	30 823 230	Carbon, 82K ohm ½W 10%
R4-15	30 105 230	Carbon, 1 meg ½W 10%
R4-16	30 475 230	Carbon, 4.7 meg ½W 10%
R4-17	30 123 230	Carbon, 12K ohm ½W 10%
R4-18	30 682 230	Carbon, 6.8K ohm ½W 10%
R5-1	30 392 240	Carbon, 3.9K ohm 1W 10%
R5-2	30 102 230	Carbon, 1K ohm ½W 10%
R5-3	30 223 330	Carbon, 22K ohm ½W 20%
R5-4	30 102 330	Carbon, 1K ohm ½W 20%
R6-1	30 105 230	Carbon, 1 meg ½W 10%
R6-2	30 105 230	Carbon, 1 meg ½W 10%
R6-3	30 565 230	Carbon, 5.6 meg ½W 10%
R6-5	30 102 330	Carbon, 1K ohm ½W 20%
R7-1	30 225 230	Carbon, 2.2 meg ½W 10%
R7-2	30 154 230	Carbon, 150K ohm ½W 10%
R7-3	30 823 230	Carbon, 82K ohm ½W 10%
R7-4	30 334 230	Carbon, 330K ohm ½W 10%
R7-5	30 472 240	Carbon, 4.7K ohm 1W 10%
R7-7	30 102 230	Carbon, 1K ohm ½W 10%
R7-8	30 334 230	Carbon, 330K ohm ½W 10%
R8-1	30 334 230	Carbon, 330K ohm ½W 10%
R8-2	30 824 230	Carbon, 820K ohm ½W 10%
R8-3	30 334 230	Carbon, 330K ohm ½W 10%
R8-4	30 823 230	Carbon, 82K ohm ½W 10%
R8-5	34 392 230	Carbon, 3.9K ohm ½W 10%
R8-6	30 683 230	Carbon, 68K ohm ½W 10%
R8-7	30 473 240	Carbon, 47K ohm 1W 10%
R8-8	30 334 230	Carbon, 330K ohm ½W 10%
R8-9	30 154 230	Carbon, 150K ohm ½W 10%
R8-10	30 822 230	Carbon, 8.2K ohm ½W 10%
R8-11	30 223 230	Carbon, 22K ohm ½W 10%
R9-1	30 106 230	Carbon, 10 meg ½W 10%
R9-2	30 105 230	Carbon, 1 meg ½W 10%
R9-4	31 000 473	WW, 8.2K ohm 4W 10%
R9-6	30 101 330	Carbon, 100 ohm ½W 20%
R9-7	30 101 330	Carbon, 100 ohm ½W 20%
R10-1	31 000 990	WW, 2.7 ohm ½W 10%
R11-1	30 562 250	Carbon, 5.6K ohm 2W 10%
R12-1	30 223 230	Carbon, 22K ohm ½W 10%
R12-2	30 822 230	Carbon, 8.2K ohm ½W 10%
R12-3	30 822 230	Carbon, 8.2K ohm ½W 10%
R12-4	30 104 230	Carbon, 100K ohm ½W 10%
R12-5	30 104 230	Carbon, 100K ohm ½W 10%
R12-6	30 104 230	Carbon, 100K ohm ½W 10%
R12-7	30 395 230	Carbon, 3.9 meg ½W 10%
R12-8	30 223 230	Carbon, 22K ohm ½W 10%
R12-9	30 225 230	Carbon, 2.2 meg ½W 10%
R12-11	30 334 230	Carbon, 330K ohm ½W 10%
R12-12	30 222 230	Carbon, 2.2K ohm ½W 10%
R15-1	30 124 230	Carbon, 120K ohm ½W 10%
R15-2	30 223 230	Carbon, 22K ohm ½W 10%
R16-1	31 000 486	WW, 44 ohm 25W 10% w/11 ohm tap
R16-2	30 224 240	Carbon, 220K ohm 1W 10%
R16-3	31 000 472	WW, 7.5 ohm 6W 10%
R16-4	30 471 250	Carbon, 470 ohm 2W 10%
R17-1	30 104 230	Carbon, 100K ohm ½W 10%
R17-2	30 121 230	Carbon, 120 ohm ½W 10%
R17-3	34 103 250	Carbon, 10K ohm 2W 10%
R17-4	30 123 230	Carbon, 12K ohm ½W 10%

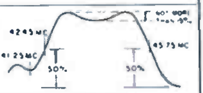
MISCELLANEOUS

SYM.	PART NO.	DESCRIPTION
D4-1	63 000 091	1N60 or 1N64 Crystal Diode
F16-1	43 000 070	Fuse, 1.25 Amp Slo-Blo w/pigtails
L2-1	15 000 651	Filament Choke
L3-1	15 000 651	Filament Choke
L4-2	16 001 364	Peaking Coil, Yellow-Black
L4-3	16 000 045	Peaking Coil, Yellow
L4-4	16 001 364	Peaking Coil, Yellow-Black
L4-5	16 000 045	Peaking Coil, Yellow
L4-6	15 000 701	Choke
L4-7	16 001 401	4.5 MC Trap
L4-8	16 001 461	40 MC Choke
L5-1	15 000 721	Quadrature Coil
L6-1	14 000 111	Filter Choke, 6" x 9" speakers only
L6-1		Filter Choke, part of 5", 6" & 8" spkrs.
L11-1A, B	16 001 481	Deflection Yoke
L11-2	15 000 702	Choke
P4-1	36 001 421	Contrast Cont., 750 ohm 1W Dual w/P5-2
P5-1	36 001 311	AM Rejection, 600 ohm ½W
P5-2	36 001 421	Volume Control, 350K ¼W Dual w/P4-1
P8-1	36 001 431	Horiz. Hold, 100K ½W Dual w/P12-1
P12-1	36 001 431	Vert. Hold, 200K ½W Dual w/P8-1
P12-2	36 001 281	Vert. Lin., 4K ½W, 1K Stop
P12-3	36 001 471	Height, 5M ½W
P15-1	36 001 461	Brightness, 250K ½W
S6	44 002 250	Speaker and Test Socket
SR16-1	62 000 061	Selenium Rectifier, 300MA
SR16-2	62 000 061	Selenium Rectifier, 300MA
SW2		Switch, Off-On, part of Volume Control
SW4-1	40 000 361	Switch, Local-Normal-Distant
T1-1	12 001 171	1st IF Transformer
T2-1	12 001 111	2nd IF Transformer
T3-1	12 001 031	3rd IF Transformer
T4-1	12 001 041	Reflex Coil—4th IF
T4-2	15 000 671	4.5 MC Take-Off Coil
T6-1	10 000 671	Audio Trans., 6" x 9" speakers only
T6-1		Audio Trans., part of 5", 6" & 8" spkrs.
T8-1	15 000 741	Horiz. Sync. Stabilizer Coil
T9-1	12 001 091	Horiz. Output Transformer
T12-1	10 000 611	Vertical Output Transformer
T17-1	12 001 151	4.5 MC Sound IF Transformer

ALIGNMENT PROCEDURE.

VIDEO ALIGNMENT

Place channel selector between channels (to disable oscillator) and set Local-Distant switch in NORMAL position. Disconnect ground lead from the cathode (pin 8) of V9, the 12CU6 horizontal-deflection amplifier. Apply -3V bias to AGC line. Use lowest possible VTVM range for all steps.

Step	Signal Generator		Output Indicator	Connect to	Adjust
	Freq.	Connect to			
1	42.7 mc No sweep	Pin #1 of V1, thru 1000 mmf. (1)	VTVM	Open end of R4-1 [1 VTVM]	Front slug T2-1 for maximum reading. Set sig. gen. for VTVM reading of —2.5 to —3V with T2-1 properly adjusted.
2	41.25 mc No sweep	As above (2)	VTVM	As above [2 VTVM]	Rear slug T2-1 for minimum reading. Set sig. gen. for reading of —2.5 to —3V with T2-1 properly adjusted.
3	45.5 mc No sweep	As above (3)	VTVM	As above [3 VTVM]	T3-1 for maximum reading. Set sig. gen. for VTVM reading of —2.5 to —3V with T3-1 properly adjusted.
4	44.2 mc No sweep	As above (4)	VTVM	As above [4 VTVM]	Rear slug T4-1 for maximum reading. Set signal generator for reading of —2.5 to —3V with T4-1 properly adjusted.
5	43 mc Center freq. 10 mc deviation 42.45 mc and 45.75 mc	Mixer shield See Note 1 (5)	SCOPE	As above [5 SCOPE]	T1-1 and tuner i-f coil (L-6) to place 45.75 & 42.45 markers at 50% point (see curve). 
6	43 mc Center freq. 10 mc deviation	As above (6)	SCOPE	As above [6 SCOPE]	If necessary retouch T2-1 & T3-1 to correct positions of 45.75 & 42.45 mc markers and rear slug of T4-1 for symmetrical curve.
7	4.5 mc No sweep	Pin #2 of V4, thru 1000 mmf. (7)	VTVM thru hi-Z xtal probe	Junction L4-4 & L4-5 [7 VTVM]	L4-7 for minimum reading.

SOUND ALIGNMENT

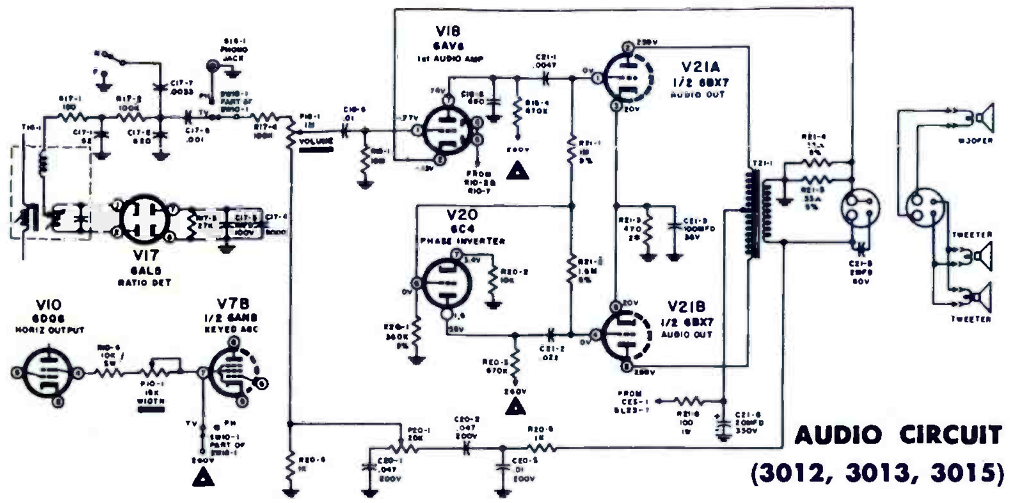
Step	Signal Generator		Output Indicator	Connect to	Adjust
	Freq.	Connect to			
8	4.5 mc AM 30% mod.	Junction L4-2 & L4-3 (8)	VTVM (AC)	Pin #3 V6 thru 0.01 mfd [8 VTVM]	Front slug of T4-1, T4-2 and T17-1 for maximum output indication. Use lowest signal generator output that gives satisfactory indication. Increase bias to —6V and set Local-Distant switch to Local before performing this step.
9	4.5 mc FM 25 kc dev.	As above (9)	VTVM (AC)	As above [9 VTVM]	Volume control to approximate center and adjust L5-1 (quadrature coil) for maximum output indication.
10	4.5 mc AM 30% mod.	As above (10)	VTVM (AC)	As above [10 VTVM]	P5-1 (A-M Rejection) for minimum output indication and repeat step 9.

NOTES: 1. Connect signal generator output lead to mixer-oscillator shield. Slip shield partially off tube and hold in place with tape. Do not ground shield.

TECHNICIAN CIRCUIT DIGEST

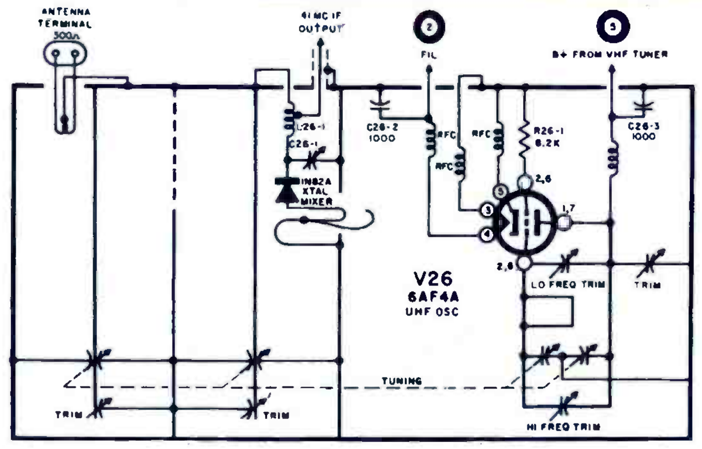
CBS-COLUMBIA
Chassis 3001, 3002, 3003, 3012, 3013, 3015

Chassis 3001: Models 7T307, 7T309, 7T310, 7K325, 7K326 Chassis 3002: Models 7T307U, 7T309U, 7T310U, 7K325U, 7K326U, 7K329U, 7K330U, 7K332U Chassis 3003: Models 7TR11, 7TR312, 7KR329, 7KR330, 7KR332
Chassis 3012: Models 7K333U, 7K334U
Chassis 3013: Models 7KR333, 7KR334
Chassis 3015: Models 7KR335, 7KR336



AUDIO CIRCUIT (3012, 3013, 3015)

UHF TUNER 69 000 861 (RC)

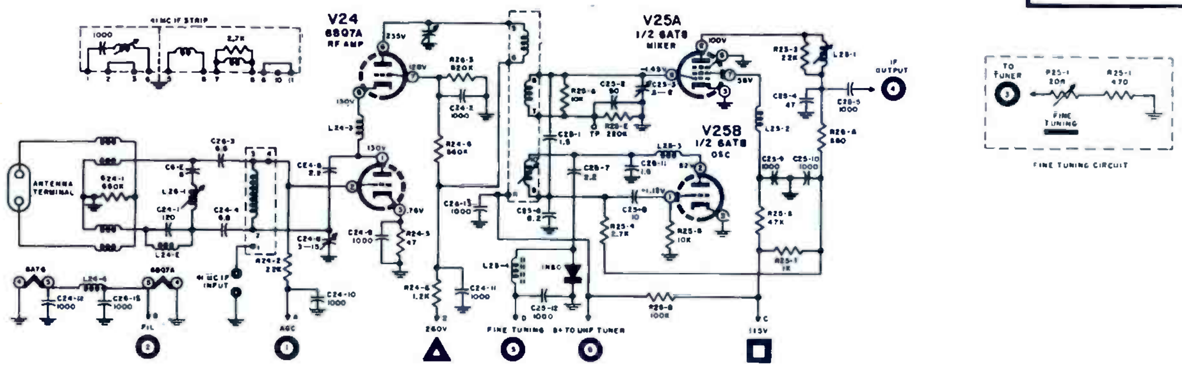


SCHEMATIC NOTES

1. Solid geometric symbols indicate B+ voltage sources—open symbols indicate points of application.
2. Numbered circles indicate tuner lead connections.
3. Component symbols are coded to indicate tube near which component is located on schematic. Ex. C9-2; capacitor, located near V9.
4. All d-c voltages measured with a VTVM connected between the chassis and tube socket terminals, with channel selector set between channels and the Normal-Fringe switch (SW4-1) in the normal position. Where readings are affected by control settings, voltages are shown for the clockwise and counterclockwise positions of the controls. Tuner voltages taken with channel selector set to an unused channel and the Normal-Fringe switch in the normal position.
5. All waveforms and peak to peak readings taken with strongest signal available at maximum contrast; horizontal and vertical holds set at normal position.
6. All resistors are ½W, ±10% unless otherwise indicated. K=X1,000; M=X1,000,000.
7. All capacitors are 500 WV unless otherwise indicated. Values less than one are microfarads and values more than one are micro-microfarads, unless otherwise indicated.
8. All coil and winding resistances taken with the components disconnected from the circuit.

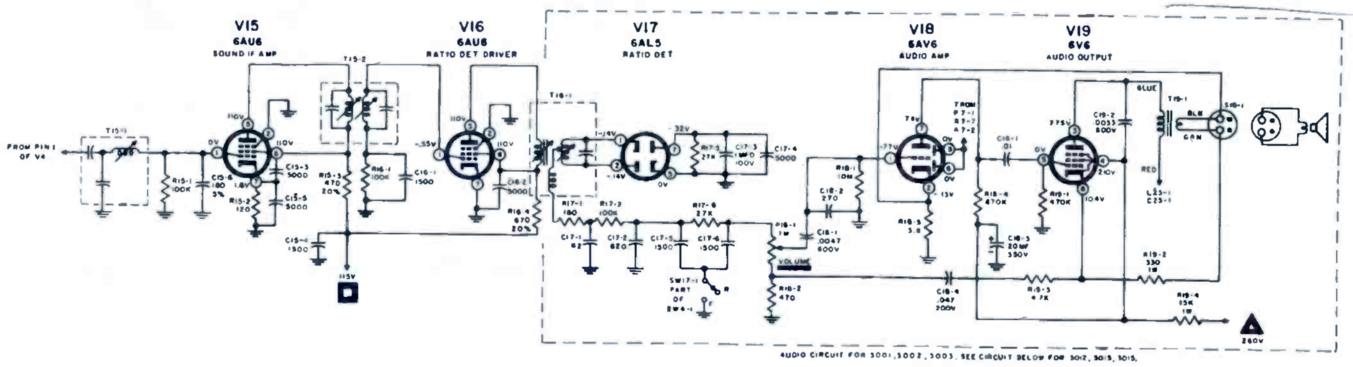
* Indicates change in schematic, as listed below.

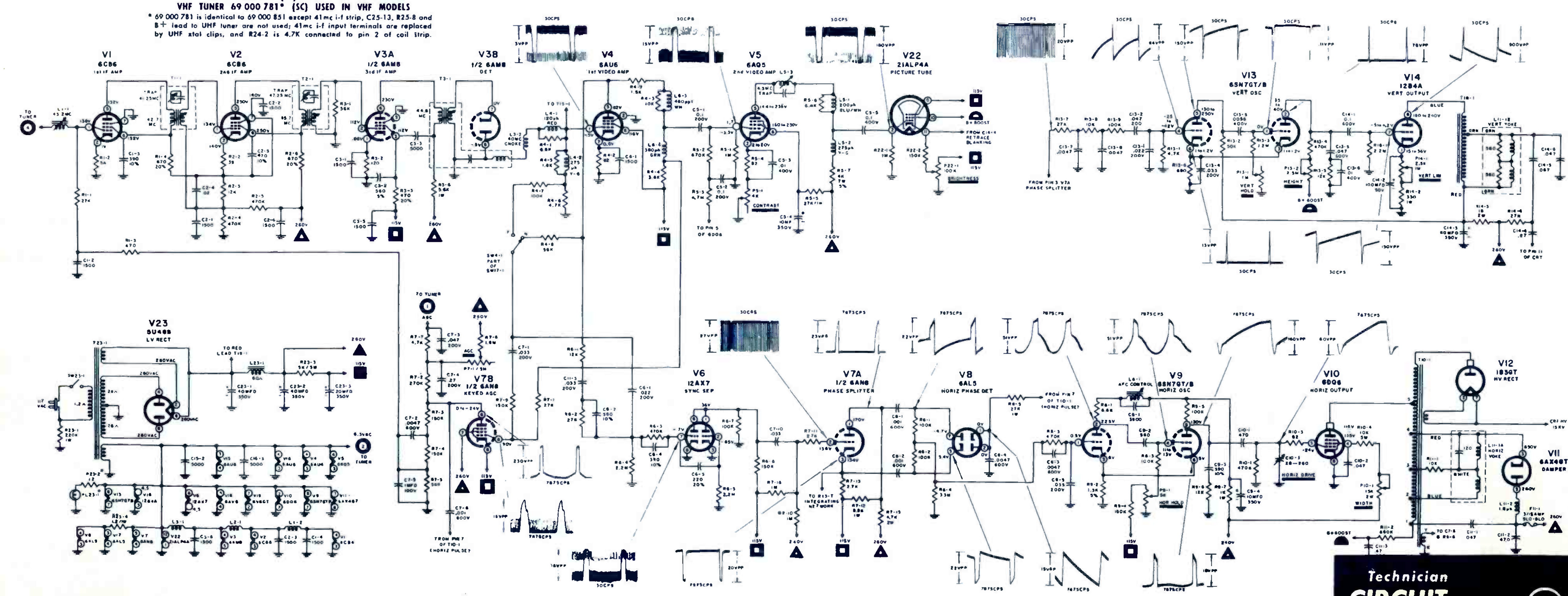
In 3003, 3013 and 3015 chassis, R23-2 is .82 ohm, WW, #31 000 930 and PL 23-1 is replaced by two type #44 bulbs.



VHF TUNER 69 000 851 (SC) USED IN UHF MODELS AND VHF TUNER 69 000 781* (SC) USED IN VHF MODELS

* 69 000 781 is identical to 69 000 851 except 41mc i-f strip, C25-13, R25-8 and B+ lead to UHF tuner are not used; 41mc i-f input terminals are replaced by UHF xtal clips, and R24-2 is 4.7K connected to pin 2 of coil strip.



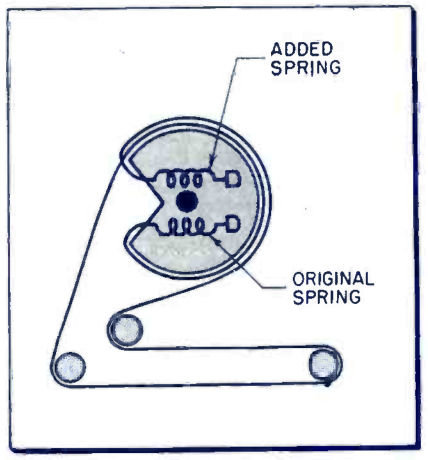


Shop Hints

Dial Cord Slippage

Repairing dial cable mechanisms on small radios is a frequent task. Often, because the sets are inexpensively made, annoying comebacks result as the repairs may not last too long.

In these receivers, the dial cable usually has only one spring at one of its ends. It is a simple matter to add another. Two springs will pull the cord much tighter, eliminating "sloppy" tuning and annoying backlash. Since they take up a greater amount of slack than one spring will, tuning action will remain "tight" for much longer. The very sharp tuning thus permitted is especially valuable if the set happens to have a short-wave band. In the long run, making the addition of the extra spring a standard practice results in a longer-lasting, customer-satisfying repair.—*Joseph Amorose, Richmond, Virginia.*



Extra dial-cord spring improves radio tuning.

Oscillator Drift

The servicing of horizontal drift that appears after the set has been on for an hour or more is often difficult. The trouble is usually caused by some component heating up and changing in value. Putting a heat lamp near the horizontal circuits heats up too many of the components at the same time, I have found, making it more difficult yet to find the defective part.

A short cut to locating the defective component is to place the tip of a hot soldering gun just *under* each component being tested, while the set is still cold (i.e., immediately after the set has been turned on, after being off for a considerable period.) When the iron is placed under the defective component, the drift symptom will generally make itself evident immediately.—*F. S. Mattioli, Racine, Wisconsin*

Anti-Barkhausen Magnet Adjustment—In UHF models, an anti-barkhausen magnet is mounted on the glass envelope of the 6DQ6 horizontal output tube. If a barkhausen oscillation (narrow vertical line in picture) occurs on one or more UHF channels rotate the magnet until the oscillatior disappears. Check all channels in use and readjust the magnet if barkhausen appears on another channel.

UHF Oscillator Tube Replacement—After replacing the UHF oscillator tube, check the UHF Channel Indicator and Dial Scale for correct alignment. If the indicator is not positioned correctly for the channel being received, readjust the UHF oscillator slug. To make the adjustment, the chassis must be removed from the cabinet.

Looking from the front, the slug is located on the right side of the tuner near the lower front corner. To adjust the oscillator place the UHF Channel Selector on a channel in use in your area and adjust the slug for best picture and sound. Check the UHF dial calibtration on all channels available and readjust the slug if required.

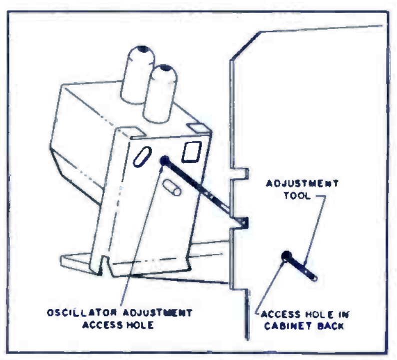


Figure 2

CBS-COLUMBIA
Chassis 3001, 3002, 3003, 3012, 3013, 3015

Technician **CIRCUIT DIGEST**

ALIGNMENT PROCEDURE

VIDEO ALIGNMENT

Place channel selector between channels (to disable oscillator), and remove V10, 6DQ6, horizontal output tube. Connect jumper between tuner AGC terminal and IF AGC line, and apply −3V bias. Adjust output of signal generator to maintain VTVM reading of −2 to −3V at all times.

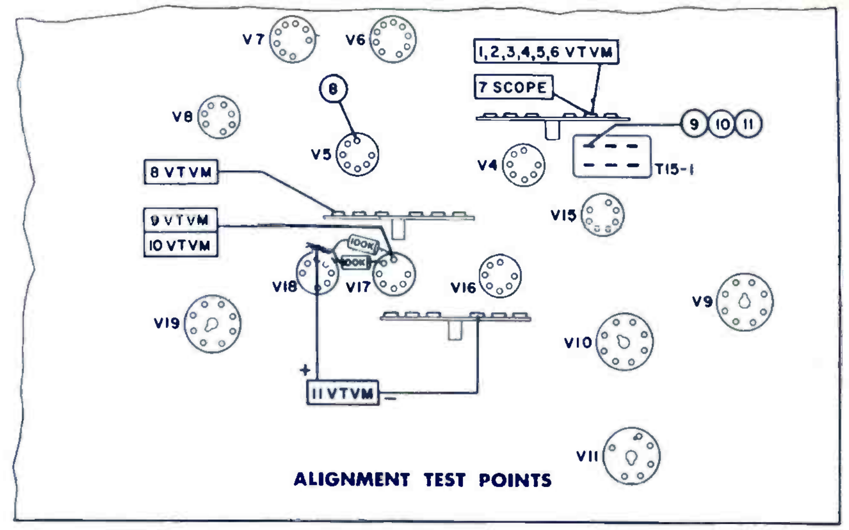
Step	Signal Generator		Output Indicator	Connect to	Adjust
	Freq.	Connect to			
1	44.8 mc No sweep	Mixer shield See note 1	VTVM	R4-6 thru 27K resistor 1 VTVM	T3-1 for maximum indication on VTVM.
2	45.75 mc No sweep	As above	VTVM	As above 2 VTVM	Bottom slug T2-1 for maximum indication.
3	47.25 mc No sweep	As above	VTVM	As above 3 VTVM	Top slug T2-1 for minimum indication.
4	42.75 mc No sweep	As above	VTVM	As above 4 VTVM	Bottom slug T1-1 for maximum indication.
5	41.25 mc No sweep	As above	VTVM	As above 5 VTVM	Top slug T1-1 for minimum indication.
6	43.25 mc No sweep	As above	VTVM	As above 6 VTVM	L1-1 and tuner i-f coil (L25-1) for maximum indication.
7	43 mc center freq. 10 mc dev. 42.75 & 45.75 mc	As above	Scope	As above 7 SCOPE	T3-1 for minimum tilt. Bottom T2-1 to place 45.75 mc at 50% point (see curve). 42.45 MC 45.75 MC 41.25 MC 50% 50% 47.25 MC
8	4.5 mc No sweep	Pin #7 of V5 thru 1000 mmf 8	VTVM thru Hi-Z xtal probe	Junction L5-1 & L5-2 8 VTVM	L5-3 for minimum indication.

SOUND ALIGNMENT

Step	Signal Generator		Output Indicator	Connect to	Adjust
	Freq.	Connect to			
9	4.5 mc No sweep	Input T15-1 9	VTVM	Pin #7, V17 (Neg. pol.) 9 VTVM	T15-1 and top and bottom slug T15-2 for maximum indication. Recheck adjustment of each slug of T15-2 alternately until maximum indication is obtained.
10	As above	As above 10	VTVM	As above 10 VTVM	Bottom slug T16-1 for maximum indication.
11	As above	As above 11	VTVM	See note 2 11 VTVM	Top slug T16-1 for zero output indication. Use zero-center scale of VTVM.

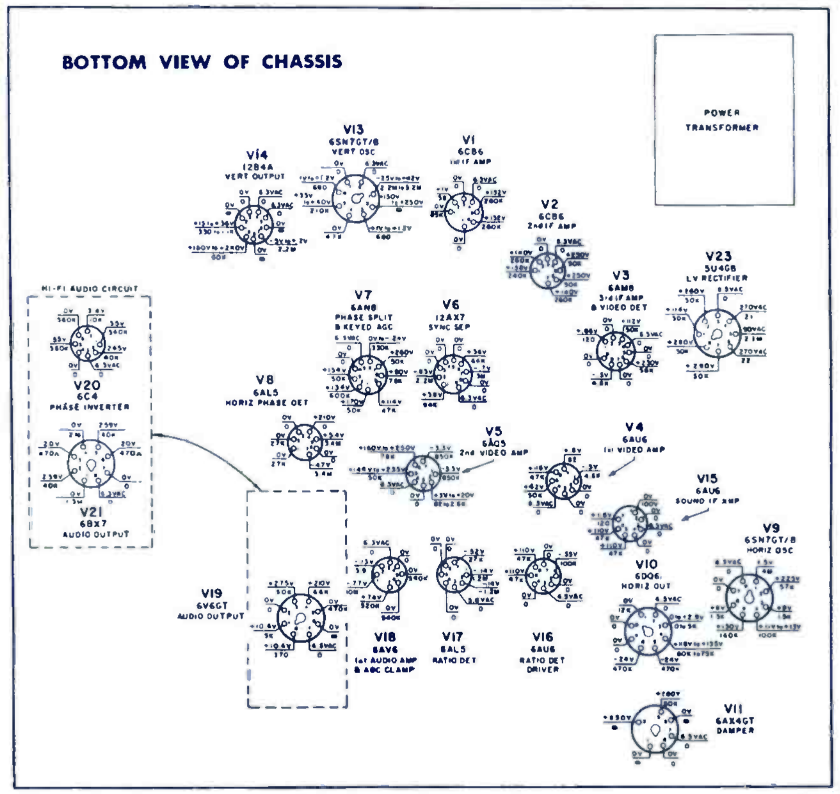
NOTES

1. Connect signal generator output lead to mixer-oscillator shield. Slip shield partially off tube and hold in place with tape. Do not ground shield.
2. Connect two matched 100K resistors in series across R17-5. Connect positive lead of VTVM to junction of these resistors and negative lead to junction of R17-2 and C17-2.



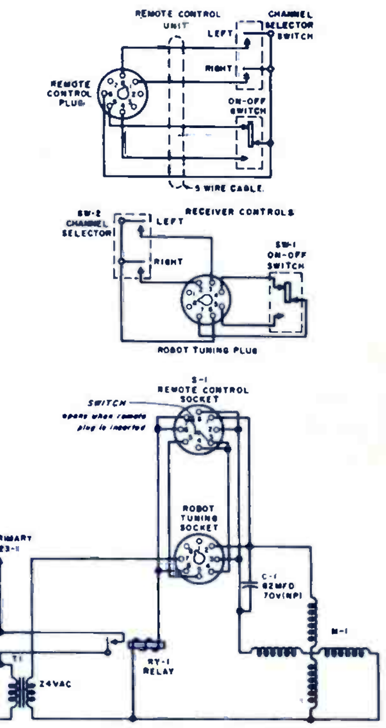
ALIGNMENT TEST POINTS

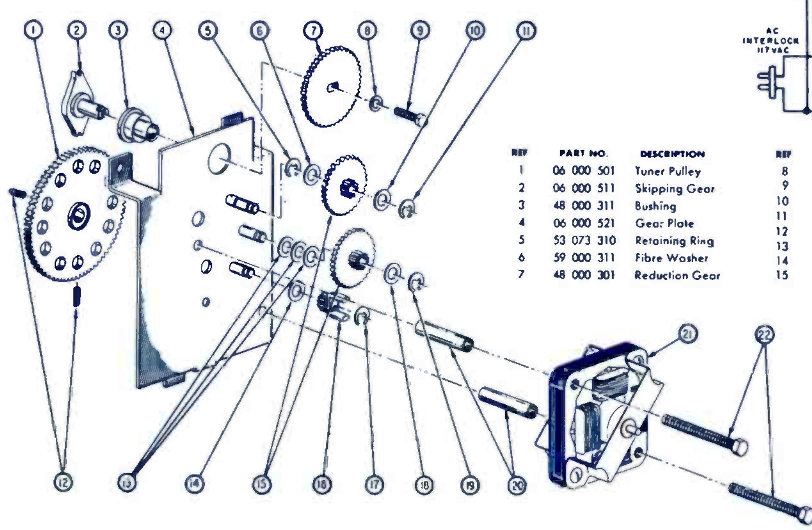
BOTTOM VIEW OF CHASSIS



Voltages are shown above and resistances below the lines drawn from the socket terminals.

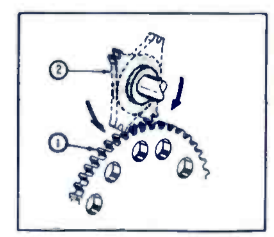
ROBOT TUNING





Robot Tuning Mechanism—When replacing the tuner gear (1) or the gear plate (4), the tuner gear must be carefully aligned with the skipping gear (2) so that both gears mesh in either direction of rotation of the skipping gear, as shown in the detailed view. Tighten set screws (12) to hold tuner gear firmly in place.

REF	PART NO.	DESCRIPTION	REF	PART NO.	DESCRIPTION	REF	PART NO.	DESCRIPTION
1	06 000 501	Tuner Pulley	8	58 003 270	Flat Washer	16	48 000 371	Clutch Gear
2	06 000 511	Skipping Gear	9	56 104 010	Screw	17	53 073 310	Retaining Ring
3	48 000 311	Bushing	10	59 000 311	Fibre Washer	18	59 000 311	Fibre Washer
4	06 000 521	Gear Plate	11	53 073 310	Retaining Ring	19	53 073 310	Retaining Ring
5	53 073 310	Retaining Ring	12	56 154 020	Set Screw	20	47 001 511	Spacer
6	59 000 311	Fibre Washer	13	59 000 311	Fibre Washer	21	66 000 022	Motor
7	48 000 301	Reduction Gear	14	59 000 311	Fibre Washer	22	56 000 871	Screw
			15	48 000 291	Reduction Gear			

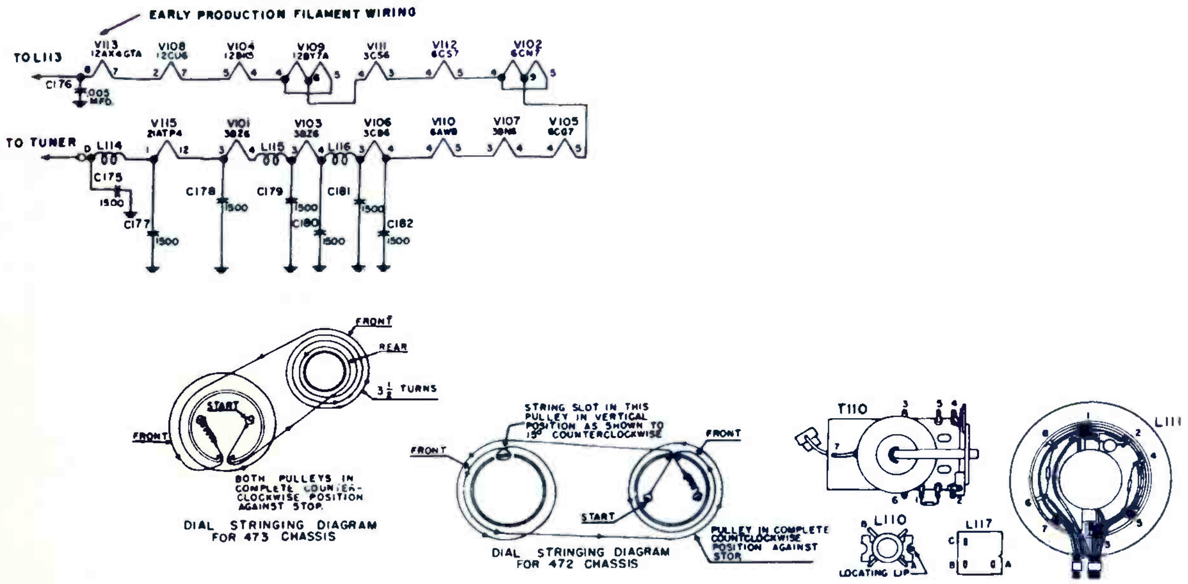


DETAIL OF TUNER GEAR ALIGNMENT

TECHNICIAN
CIRCUIT DIGEST

CROSLEY
Chassis 472, 473

Chassis 472: Models J-21 TKMF, J-21 TKBF, J-21 TKLMF, J-21 TKLBF, J-21 CKMF, J-21 CKBF, J-21 LKBF Chassis 473: Models J-21 TKMU, J-21 TKBU, J-21 TKLMU, J-21 TKLBU, J-21 CKMU, J-21 CKBU, J-21 LKBU



NOTES

1. All voltages measured with an electronic voltmeter connected from socket lug to chassis. Some voltages are variable and voltages shown were measured with a normal picture on the picture tube and the contrast and brightness control set for 60 volts peak to peak on the cathode (pin #11) of the picture tube. Socket voltages tolerance 10%. Input signal 6000 microvolts, minimum for these readings. Area switch in local position. SW104 in TV position.
2. Supply voltage, 117 volts 60 cycle A. C.
3. K-1000
4. All capacitance values in mmf. and all resistance values in ohms unless otherwise noted.
5. R185 or R186 will be clipped off on some chassis.
6. SW101B is open when SW101A is closed.
7. Terminals of T104. T105 and L119 are viewed from coil side.
8. On some chassis R153 and R159 are replaced by R180, 12K ohm. 3 watt resistor (Part No. B-170773-3).
9. On some chassis C200 (100 mmf) may be replaced with two capacitors connected in parallel:

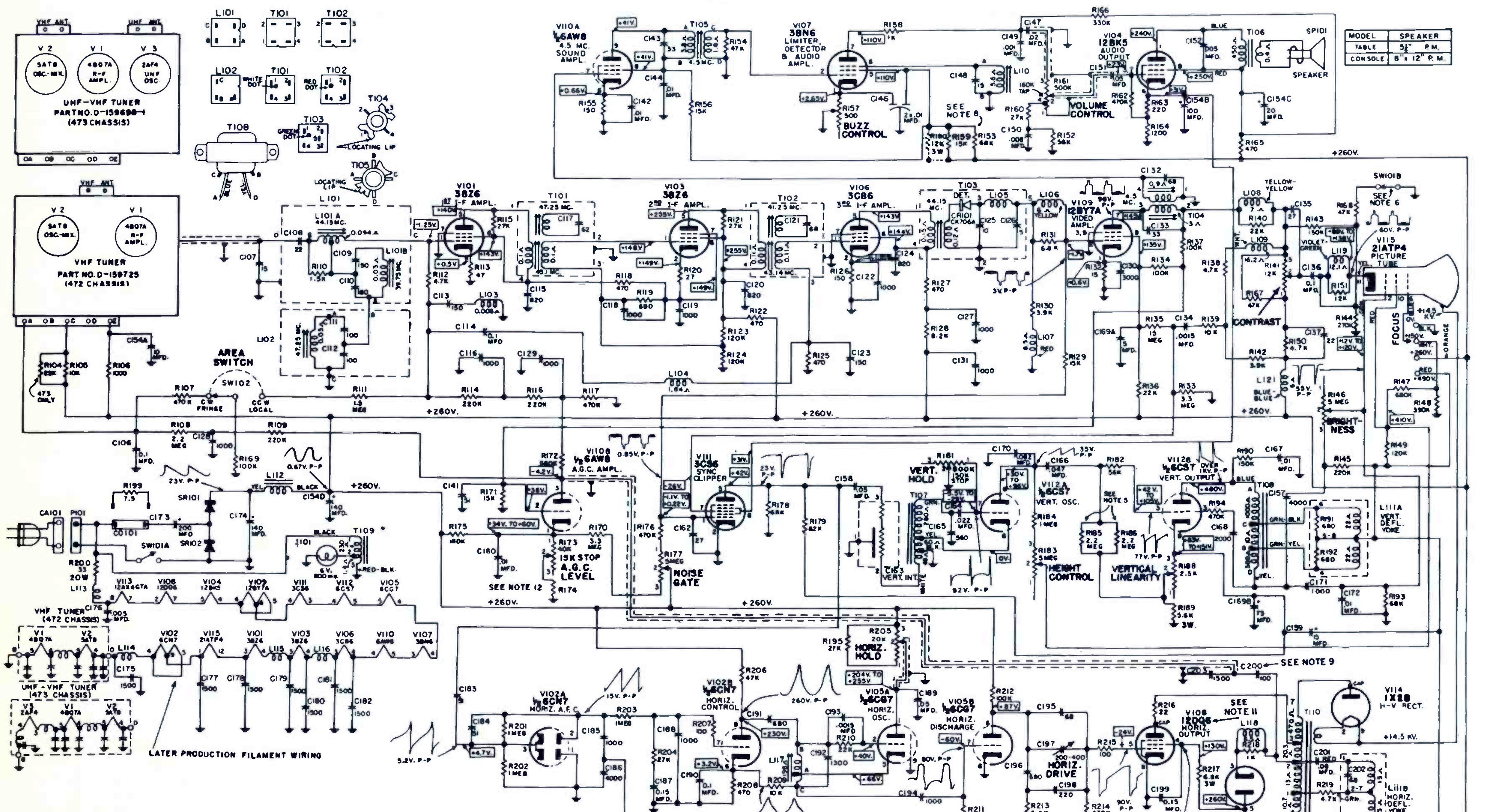
158215-2	47mmf, 10%, 3 kv, disc
and 158215-32	82mmf, 10%, 3 kv, disc
or	
158215-3	68mmf, 10%, 3 kv, disc
and 158215-56	56mmf, 10%, 3 kv, disc

This change of parts is made on some chassis in order to increase picture width. It is not used on all chassis and is not designated by a code letter change.

10. There were a few pilot run chassis 472 Code A and 473 Code A which were wired as shown in Figure 1. The differences between these and later production chassis are (1) the bottom winding of the transformer, (2) the value of R198, and (3) the use of R197 and C205.

All service replacement transformers are like those used in the later production. Therefore, when installing replacement transformers, remove C197 and C205, change R198 to a 22K resistor and connect the bottom winding of the transformer as shown in the complete schematic.

11. Tube type 12DQ6 is used in later production chassis instead of 12CU6. It is also recommended to use the 12DQ6 as a replacement horizontal output tube in any Crosley chassis where a 12CU6 was originally used. The new type 12DQ6 tube was created because the standards for the 12CU6 proved to be inadequate. These standards allowed too wide tolerances with the result that some manufacturers were making lower output 12CU6's while other manufacturers were making 12CU6's with higher output. In many instances, a low output 12CU6 can not be used in a circuit that requires a higher output tube. In the 12DQ6 the standards are adequate to specify a tube which is the equivalent of the high output 12CU6, but with narrow tolerances, to avoid another problem of interchangeability.
12. On later production chassis R173 AGC Level Control is Part No. 170501-1; it is the same as 159863-1 but without the 15K stop. For replacement purposes, use whichever control is currently available.



SCHEMATIC CHASSIS 472 (CODE B) and 473 (CODE B)

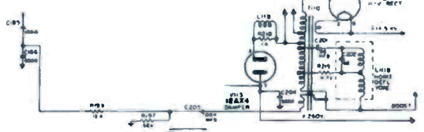


Fig. 1

CHASSIS CODE LETTERS

Code Letters are stamped on the chassis directly following the chassis number. and are used to indicate that certain circuit changes are incorporated in that chassis which are not found in chassis with earlier code letters. Unless otherwise stated, the circuit changes identified by a certain code letter are also carried over into chassis with later letters. The schematic shows the circuits found in Code B chassis.

Code A - Certain components shown in the schematic and schematic parts list are not used in chassis 472 Code A and 473 Code A, but were added in Code B chassis to improve picture quality and to improve IF sensitivity. Other components were changed in value. Certain wiring changes were also made at the same time.

The list below describes the differences between Code A and Code B chassis 472 and 473.

1. R169 between arm of SW102 and ground was not used on Code A chassis; arm of switch was connected directly to ground.
2. R115 was 15,000 ohm, 10%, 1/2 w resistor on Code A chassis.
3. R120 was 47 ohm, 10%, 1/2 w resistor on Code A chassis.
4. L108-R140 was Part No. 170255-1, with coil wound on the 5600 ohm resistor. D.C. Resistance of coil, 6.2 ohms; color dots, blue and gray.
5. L119-R151 was Part No. 170466-1, with coil wound on the 10,000 ohm resistor. D.C. Resistance of coil, 9.5 ohms; color dots, brown and blue.
6. L121 was not used on Code A chassis. Junction of R142 and R150 was directly connected to 260 volts.
7. R170 was not used on Code A chassis. There was nothing connected to Noise Gate Control terminal #3.
8. R174 was 12,000 ohms, 10%, 1/2 w on Code A chassis.

In Code B chassis it was necessary to lower the value of R174 to 10,000 in order to obtain proper adjustment of AGC level control. In some cases where the 12,000 ohm resistor was tried, the range of the control was insufficient to reduce the signal at the Video detector to 3 volts peak-to-peak.

Code B - Chassis 472 (Code B) and 473 (Code B) are as shown in the printed schematic.

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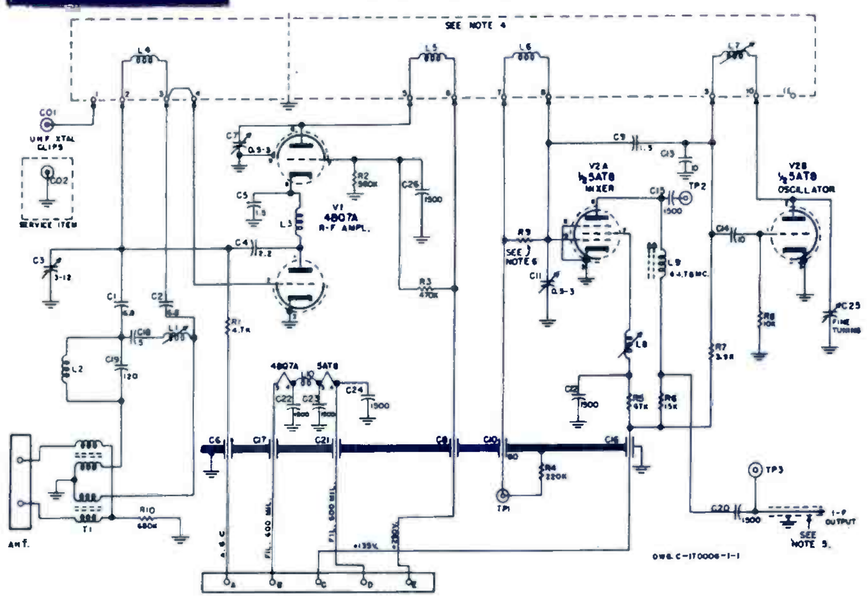
VHF TUNER
(Part No. 159725-1)



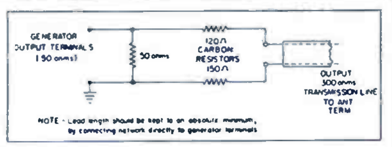
NOTES:

1. All capacitance values are in mmf. and all resistance values in ohms unless otherwise specified.
2. K = 1000.
3. Feed thru capacitors are 1000 mmf. unless otherwise noted.
4. One of twelve V.H.F. channel strips mounted in drum.
5. Distributed capacity between lead and shield of output cable, 17 mmf.
6. On some models R9 is 5.6K ohms. on others R9 is 6.8K ohms. Replace with same value. Also on some tuners C9 is 1.0 mmf, C13 is 8.2 mmf, and there is a choke L11 added between the oscillator plate and the junction of C25 and stator contact #10. On these tuners the front drum retaining spring is located inside the case.

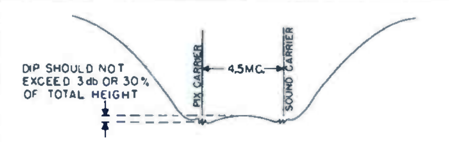
TUNER ALIGNMENT

R.F. AND MIXER ALIGNMENT

Station Selector	Oscilloscope	Bias	Sweep Generator Connection	Adjust
Chan. #10	High side through a 10,000 ohm resistor to TP1 on Tuner. Ground lead to Tuner Case.	Connect 2.5v negative bias to junction of R107 and C106 (RF AGC). Connect negative 3v. bias to junction of R108 and C128 (IF AGC).	Connect Sweep Generator to Antenna lead-in thru dummy antenna. Set Generator to sweep channel 10 frequencies. Loosely couple Marker Gen. to sweep output cable. Set Marker to either pix nr sound carrier for channel #10.	On chassis 472, adjust C3, C7, & C11 to produce a response curve of maximum gain and of a similar shape to R.F. and Mixer Response Curve. On chassis 473, adjust C1, C6, & C11.



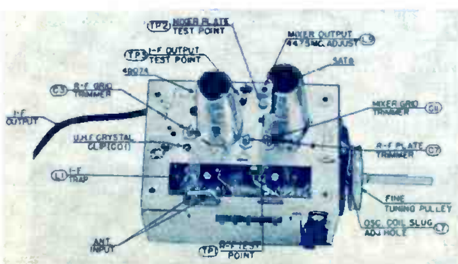
DUMMY ANTENNA



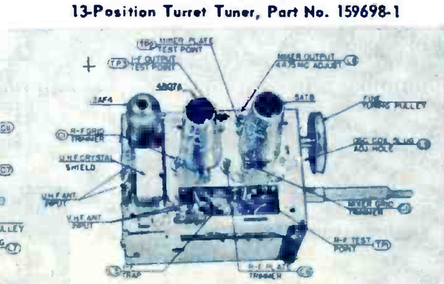
R.F. & MIXER RESPONSE CURVE

Without disturbing the R.F. Grid, R.F. plate, and mixer-grid trimmers, check the response on the other VHF TV channels by setting the station selector to the desired channel and changing the frequency of the sweep generator to correspond to the channel being checked. The response curve should be essentially the same on all channels and the markers should fall in similar positions on the response curve. A slight amount of tilt can be tolerated. The amount of tilt indicated by the relative amplitudes of the response curves where the picture and sound markers rest should not exceed 30% of the overall response curve amplitude.

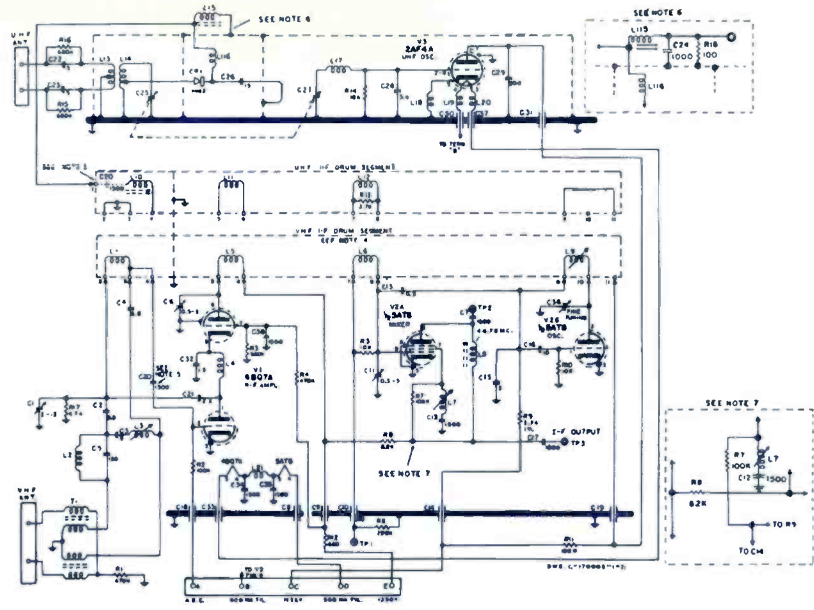
VHF TURRET TUNER Part No. 159725-1



COMBINATION VHF-UHF
13-Position Turret Tuner, Part No. 159698-1



UHV - VHF TUNER
(Part No. 159698-1)

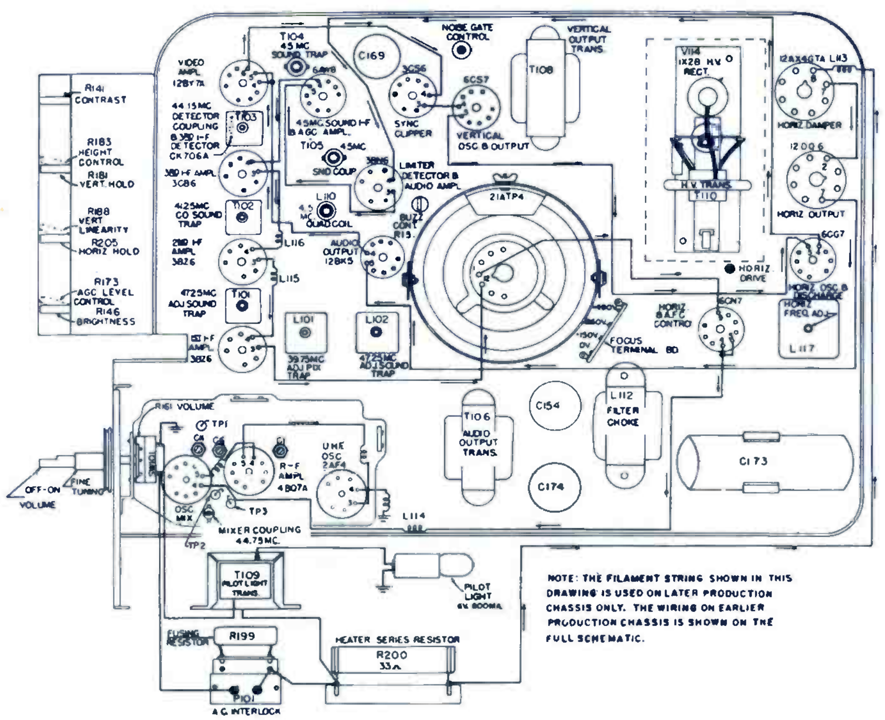


NOTES

1. All values of capacitance are in mmf. and all values of resistance are in ohms unless otherwise noted. All resistors 1/2 watt unless otherwise noted.
2. K = 1000.
3. Feed thru capacitors are 1000 mmf. minimum unless otherwise noted.
4. One of twelve VHF channel strips mounted in drum.
5. Components and wiring on some early production tuners are different from the schematic. On these early tuners, C11 was 0.5-3 mmf; R2 was 22K; R5 was 4.7K; R18 was not used. R7 was connected between the mixer screen and the junction of R9 and C14, as shown in the lower right hand corner of the schematic. C20 was located on the UHF strip on early tuners (shown in dotted lines); on later production tuners it is between stator contact #4 and pin #2 of V1. It is important, when replacing the UHF strip, to be sure that the capacitor is present at one of the two locations. If it is not present, it should be added, for it serves to keep RF AGC bias on the grid of the tube.
6. A change in the UHF section deleted a test point and two parts, C24 and R18. They were originally connected in early production tuners as shown in the upper right hand corner of the schematic.
7. Early production tuners have "E" type tuner strips, whereas "EA" type strips were used on later production tuners. For replacements use same type as removed.

170494-1	UHF strips, E type		170990-1	UHF strips, EA type	
170494-2 through 170494-13	VHF strips, E type	Channel 2 through Channel 13	170990-2 through 170990-13	VHF strips, EA type	Channel 2 through Channel 13

TUBE SIDE OF CHASSIS 473
(Tube and Alignment Locations and Tube Filament Wiring)



NOTE: THE FILAMENT STRING SHOWN IN THIS DRAWING IS USED ON LATER PRODUCTION CHASSIS ONLY. THE WIRING ON EARLIER PRODUCTION CHASSIS IS SHOWN ON THE FULL SCHEMATIC.

TUNER ALIGNMENT

OSCILLATOR ALIGNMENT (Using Scope)

Oscilloscope	Channel Selector	Bias	Sweep Generator	Marker Generator	Adjust
High side of scope to lug 5 of T103.	Channel #2	Connect 3v. negative bias to junction of R107 and C106 (RF AGC). Connect 3v. negative bias to junction of R108 and C128 (IF AGC).	Set to channel 2 frequencies. Connect Generator output in series with dummy antenna to antenna lead-in. See sketch of dummy antenna, above.	59.75 Sound Carrier.	Channel 2 oscillator slug so that marker falls into bottom of valley on curve (the point corresponding to the 41.25 mc marker as shown on Nominal over-all I.F. Response Curve sketch on page 10.) Be sure that the Fine Tuning Control is set to the center of its range.

Repeat the above procedure for each of the remaining channels, by resetting the sweep generator and the marker generator to the correct frequencies for each channel that is to be adjusted.

ALTERNATE OSCILLATOR ALIGNMENT

In the tuners used on chassis 472 and 473, there is an oscillator adjustment for each channel. When the receiver is installed, the oscillator should be adjusted for each channel on which a station is operating in the area.

Set the Channel Selector to the channel that is to be adjusted. Turn the Fine Tuning control to as near the center of its range as will permit the slug to be adjusted. The oscillator trimmer slug is to the right of the channel selector shaft, and is accessible thru a hole in the front of the tuner after the tuner knobs have been removed. Use a non-metallic screw driver and adjust the oscillator trimmer slug until the proper tuning point is in the center of the Fine Tuning Range.

I.F. ALIGNMENT

All lead connections from the signal marker generator and sweep generator must be shielded. Keep exposed ends and ground leads as short as possible (about one inch). Always locate the ground lead connections as close as possible to their respective "hot" leads in the television receiver chassis. To prevent overloading the receiver circuits, the sweep generator output and signal generator output must be kept low. Turn AGC level control and contrast control fully clockwise, and Noise Gate control fully counter-clockwise. Set the fine tuning control to the center of its range, set the tuner to an unused channel, and short the antenna input leads to prevent noise feed-thru.

CAUTION: One side of the chassis is connected to the power line. Therefore, test equipment should not be connected to the receiver unless an isolation transformer is used between the power line and the receiver. DO NOT GROUND THE RECEIVER CHASSIS UNLESS AN ISOLATION TRANSFORMER IS USED.

The two sides of the chassis are referred to as the "wiring side" and the "tube side" of the chassis.

The tuning slugs of shielded coils are referred to as the "bottom slug", which is nearest the base and terminals of the coil, and the "top slug" which is at the opposite end of the coil.

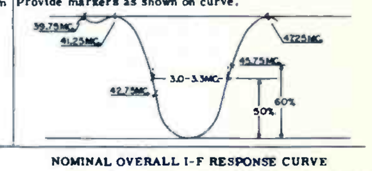
VIDEO I. F. ALIGNMENT (with VTVM)

Step No.	Connect Signal Generator Through a .01 Capacitor	Signal Generator Freq. M.C.	Connect VTVM	Miscellaneous Connections and Instructions	Adjust
1.	Test Point No. 2. wire protruding from Tuner closest to 5AT8 (V2).	44.15 mc.	Lug 5 on T103 (junction of R130 and L106)	Connect 3v. negative bias battery to junction of R107 and C106 (RF AGC). Connect 3v. negative bias battery to junction of R108 and C128 (IF AGC).	T103 for maximum indication on meter, limit input to make peak indication - 2 volts D.C. on VTVM. Use first peak from bottom end of coil.
2.	"	43.14 mc.	"	"	Bottom slug of T102 for maximum. Use first peak from bottom end of coil.
3.	"	41.25 mc.	"	"	Top slug of T102 for minimum. First null when running slug into winding from top end is correct tuning point.
4.	Repeat steps 2 and 3.				
5.	Test Point No. 2.	45.1 mc.	"	"	Bottom slug of T101 for maximum. Use first peak from bottom end of coil. Do not use more input than required for -2 volt D.C. indication of VTVM.
6.	"	47.25 mc.	"	"	Top slug of T101 for minimum. First null when running slug into winding from top end is correct tuning point.
7.	Repeat steps 5 and 6.				
8.	Test Point No. 2.	44.15 mc.	"	"	Bottom slug of L101 for maximum. Use first peak from bottom end of coil.
9.	"	39.75 mc.	"	"	Top slug of L101 for minimum. First null when running slug into winding from top end is correct tuning point.
10.	Repeat steps 8 and 9.				
11.	Test Point No. 2.	47.25 mc.	"	"	Top slug of L102 for minimum. First null when running slug into top is correct tuning point.
12.	Repeat steps 9 and 11.				
13.	Test Point No. 1. See Tube and Alignment Diagram.	44.75 mc.	"	Connect dummy load (consisting of 100 ohm resistor and 100 mmf capacitor in series) from grid of V101, pin #1, to chassis.	Mixer output coil on Tuner for maximum. (L9 on 472; L8 on 473).

TO CHECK I. F. ALIGNMENT (with scope)

Excessive sweep input will overload the circuit and cause distortion in the wave form. Check for possible overload by temporarily increasing and decreasing the signal input level and noting any change in the wave form. Excessive signal from the marker generator will also distort the wave form. Be sure to keep the marker at the minimum usable amplitude.

NOTE: Be sure, when checking the I. F. alignment, to set the channel selector switch to a channel where moving the fine tuning control does not affect the shape or position of the I. F. response curve.

Sweep Generator Connected to	Scope Connected	Bias	Set Sweep Generator	Remarks
High side to ungrounded aluminum foil around 5AT8 (V2). Low side to grounded tube shield. See Note 1 and Figures below.	Through 68K ohms to lug 5 of T103.	Connect negative lead of one 3v. bias battery to junction of R107 and C106 (RF AGC) and positive lead to chassis. Connect negative lead of 2nd 3v. bias battery to junction of R108 and C128 (IF AGC) and positive lead to chassis.	To sweep from 39 to 49 mc.	Provide markers as shown on curve. 

NOMINAL OVERALL I-F RESPONSE CURVE

A slight deviation in response is tolerable, but if any great deviation is noted, the I. F. stages will have to be realigned.

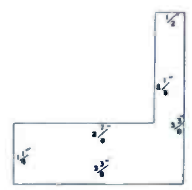


FIG. A

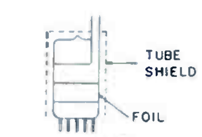
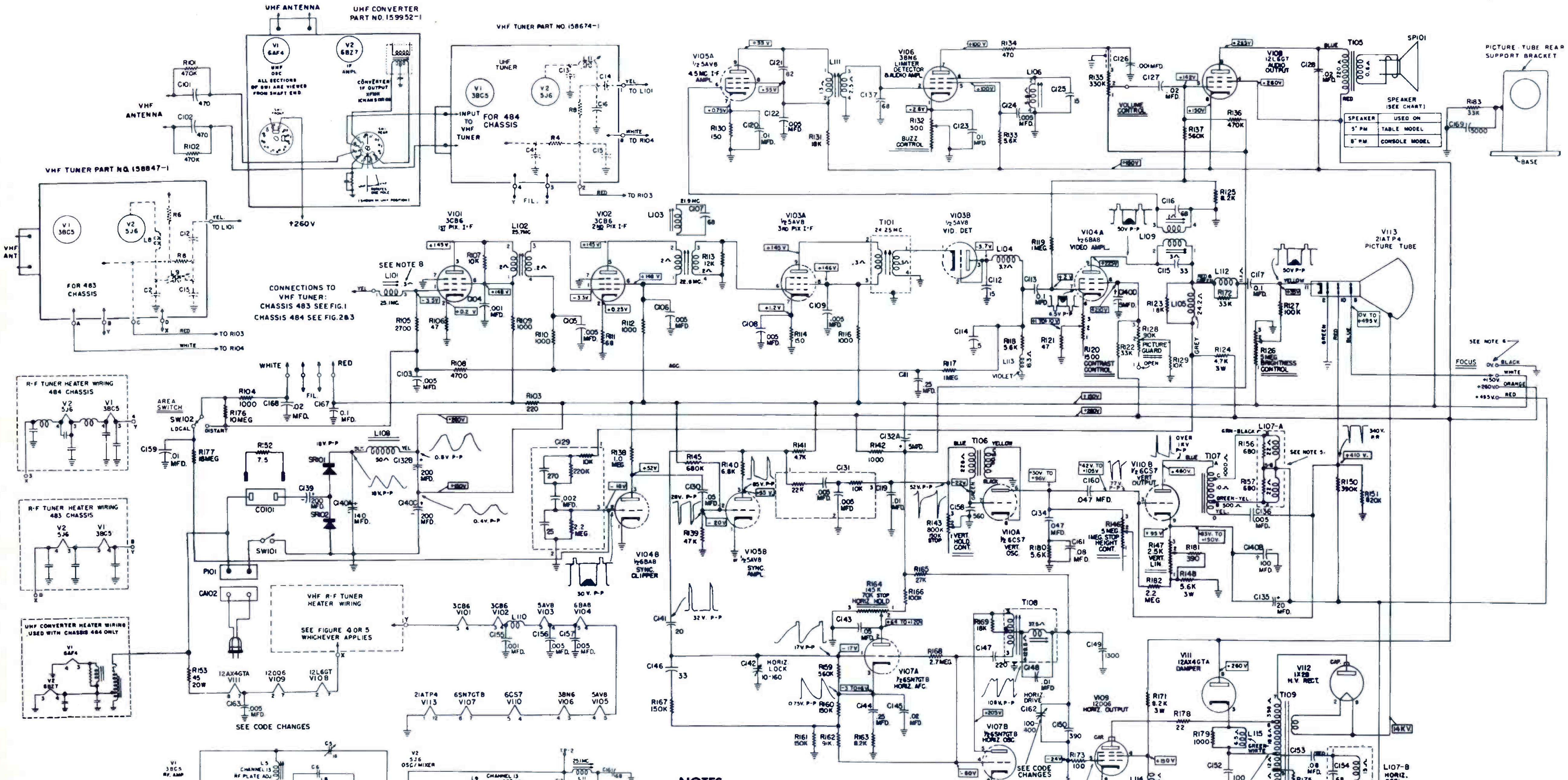
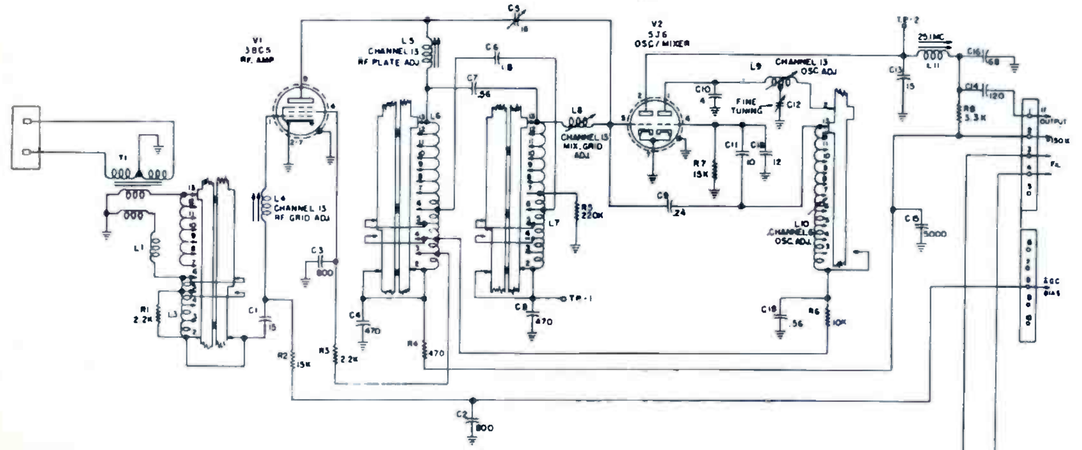


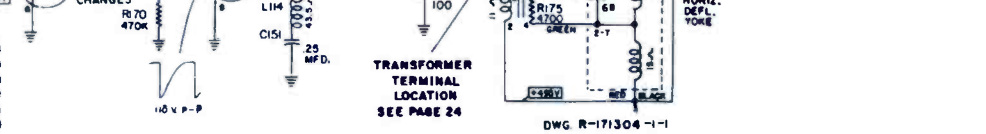
FIG. B

NOTE 1.
Cut aluminum foil to dimensions shown in Fig. A. Wrap foil around the tube and take scotch tape and wrap around the foil to hold it in place and to insulate it from the tube shield as shown in Fig. B. Replace the tube and tube shield. Connect the high side of sweep generator to the (ungrounded) foil extending from the top of the tube shield and the ground lead from sweep generator to tube shield.

Chassis 483: Models J-21TAMH, J-21CAMH, J-21TABH, J-21CABH, J-21TAWH, J-21RABH, J-21RAMH Chassis 484: Models J-21TAMU, J-21CAMU, J-21TABU, J-21CABU, J-21TAWU, J-21RABU, J-21RAMU





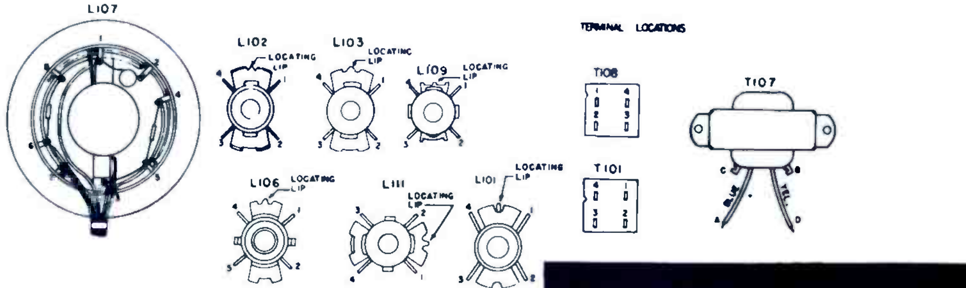


VHF SWITCH TYPE TUNER, Part No. 158674-1

NOTES:
1. ALL CAPACITANCE IN MMF AND ALL RESISTANCE IN OHMS UNLESS OTHERWISE NOTED.
2. K = 1000

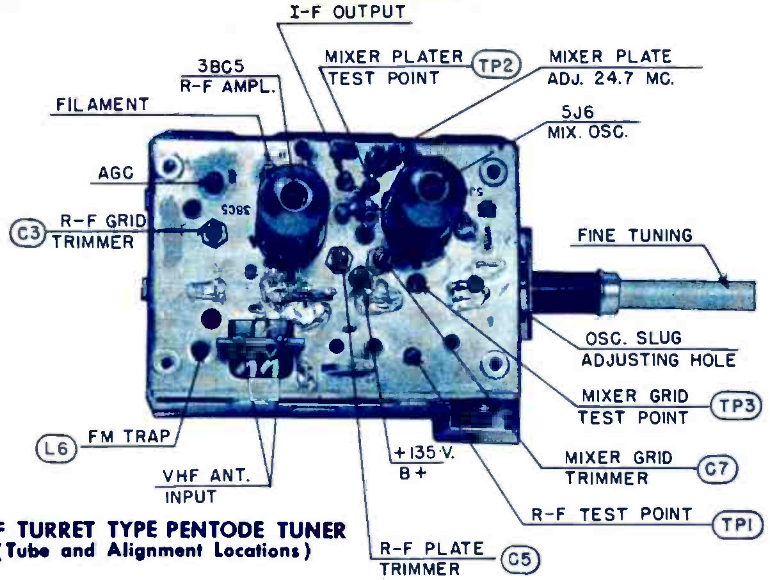
NOTES

1. All voltages measured with an electronic voltmeter connected from socket lug to chassis. Voltages shown on schematic were taken on a typical chassis. Voltages will vary between chassis and also with input signal and other settings of the controls. Some voltages are variable; Voltages shown were measured with a normal picture on the picture tube and the Contrast and Brightness controls set for 50 volts peak to peak on the cathode (pin 11) of the picture tube. Socket voltage tolerance ±10%. Noise Gate in open position for these readings. Input signal 3000 microvolts minimum.
2. Supply voltage 117 volts 60 cycle AC.
3. K = 1000
4. All capacitance values in mmf. and all resistance values in ohms unless otherwise noted.
5. Lug 3 connected to boost voltage and lug 3, 8 and 5 connected internally.
6. Terminal board located to lower right of Deflection Yoke allows adjustment of Focus voltage to individual tube characteristics.
7. Outlines of the following transformers and coils are viewed from the wiring side of Chassis: L101, L102, L103, L106, L109, L111, T101, and T108.
8. L101 is designed so that an adjacent sound channel trap (Part No. 158194-1) can be added in areas where such interference is prevalent.

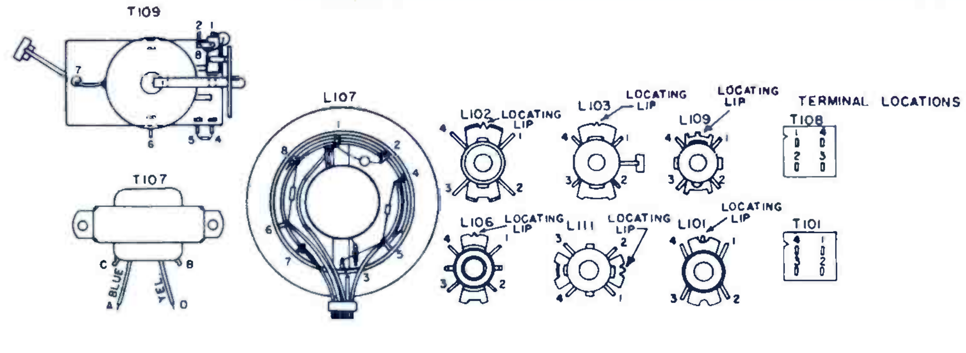


COIL AND TRANSFORMER LUGS

Chassis 487:
Models AT-10M, AT-10B, AC-10M, AC-10B, AH-10B

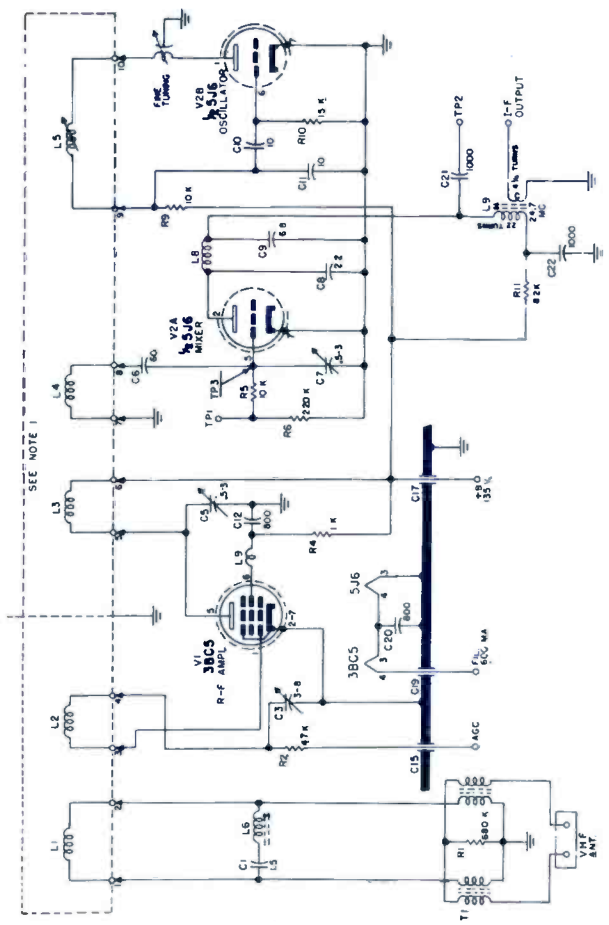


VHF TURRET TYPE PENTODE TUNER
(Tube and Alignment Locations)

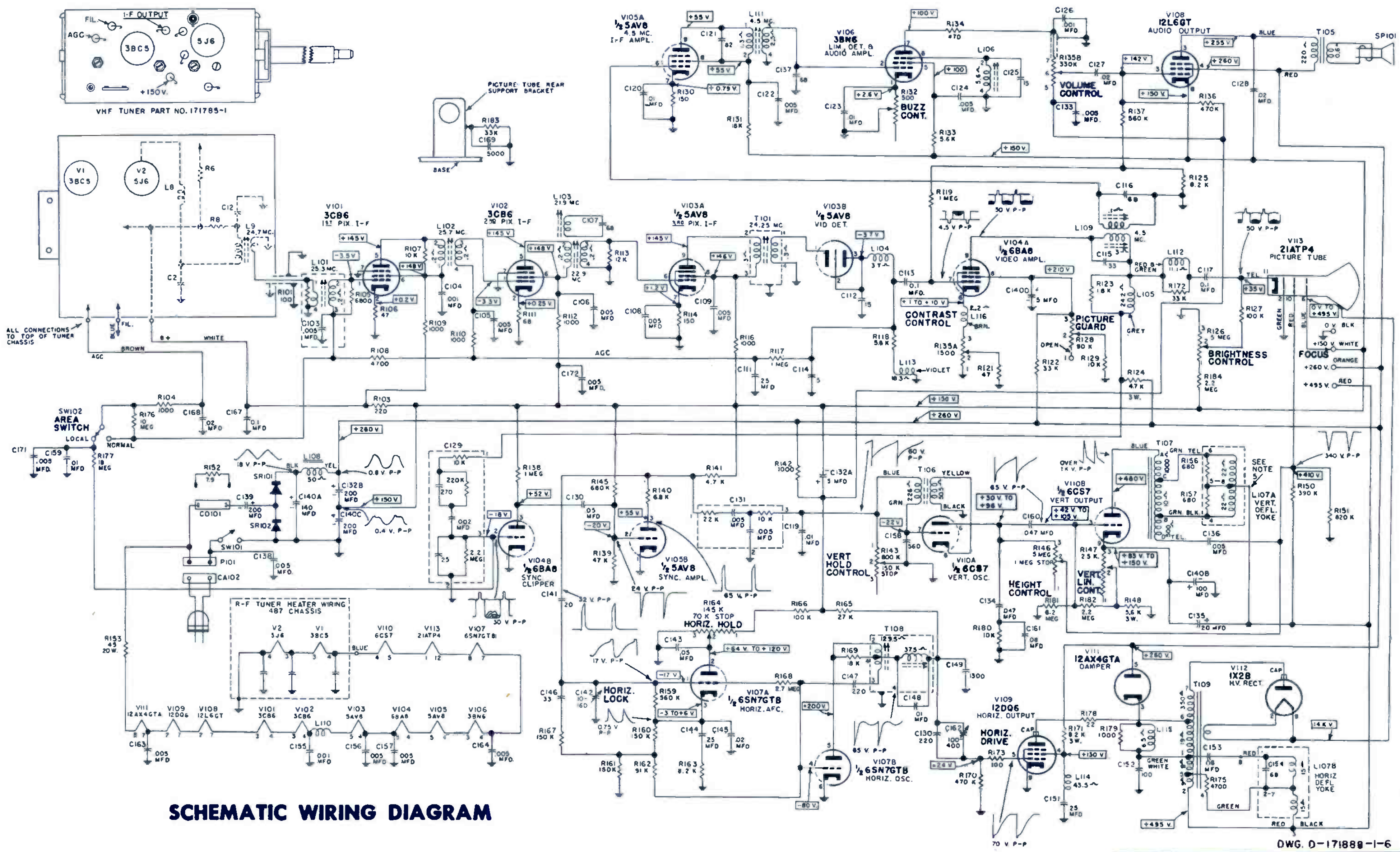


NOTES:

1. ONE OF TWELVE V. H. F. CHANNEL STRIPS MOUNTED IN DRUM.
2. ALL CAPACITANCE VALUES ARE IN MMF. AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.
3. K = 1000.
4. FEED THRU CAPACITORS ARE 800 MMF. MINIMUM UNLESS OTHERWISE NOTED.



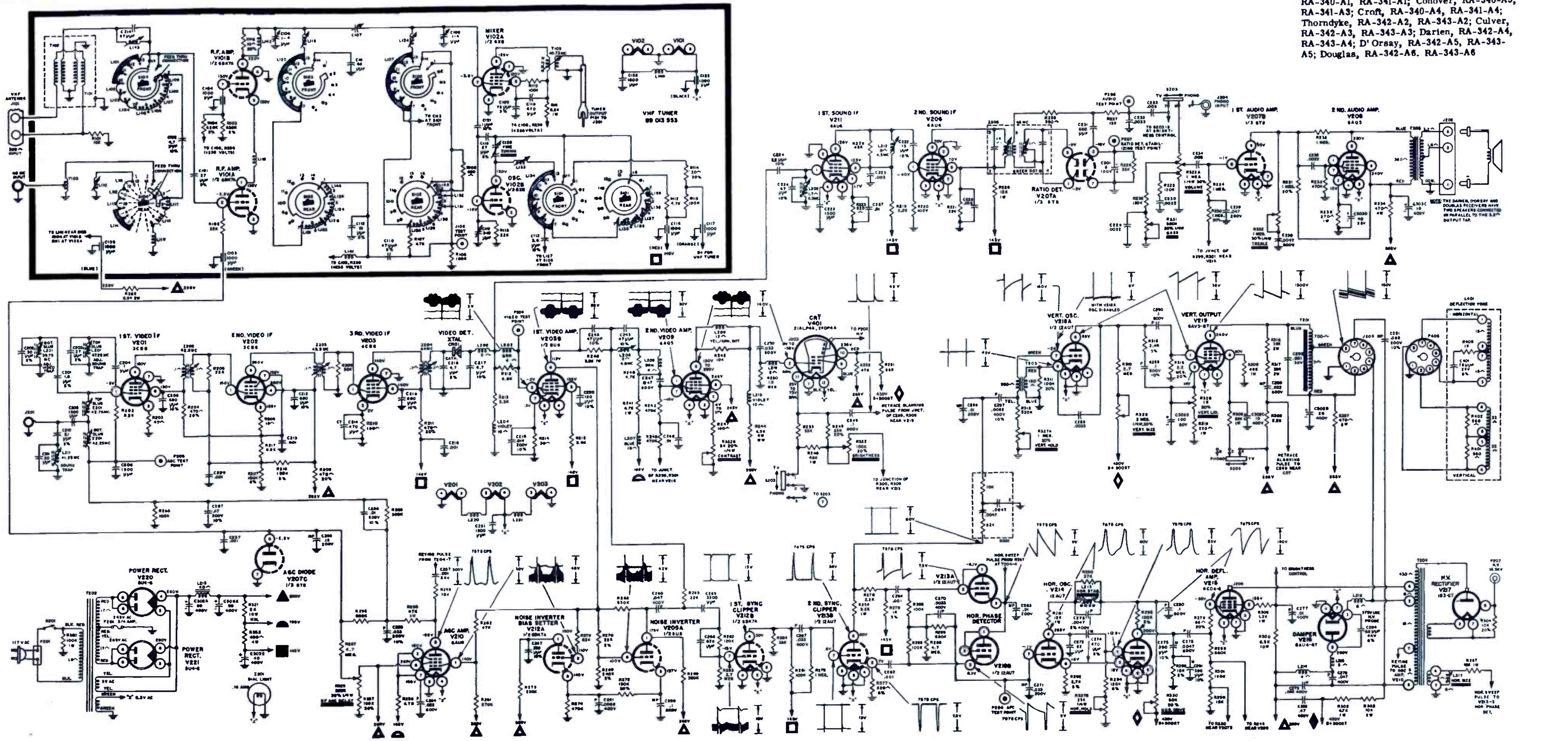
TUNER SCHEMATIC DIAGRAM



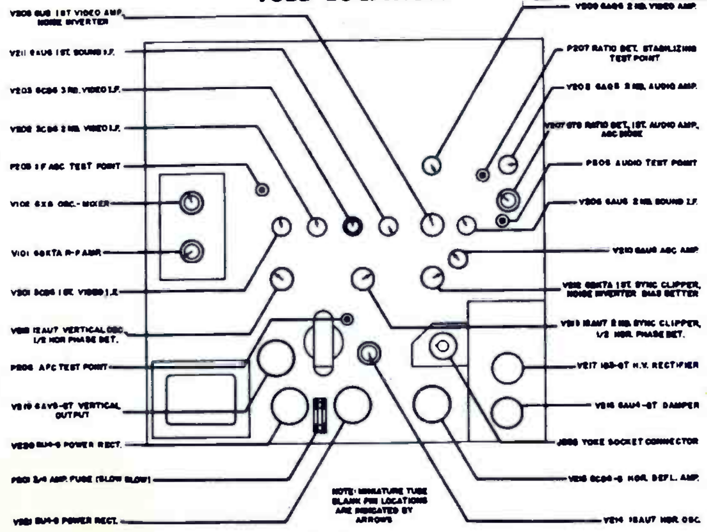
SCHEMATIC WIRING DIAGRAM

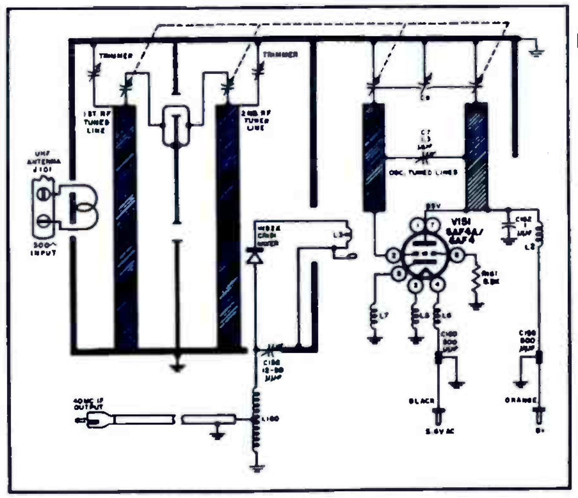
DUMONT
Chassis RA-340/341, 342/343

Chassis RA-340/341, 342/343: Models Templer, RA-340-A1, RA-341-A1; Conover, RA-340-A3, RA-341-A3; Croft, RA-340-A4, RA-341-A4; Thorndyke, RA-342-A2, RA-343-A2; Culver, RA-342-A3, RA-343-A3; Darien, RA-342-A4, RA-343-A4; D'Orsay, RA-342-A5, RA-343-A5; Douglas, RA-342-A6. RA-343-A6



TUBE LOCATION





UHF TUNER 89 013 771

TUNER NOTES

1. VHF tuner 89 013 553 is used in RA-340 and RA-342 chassis.
2. A UHF/VHF tuner combination consisting of VHF tuner 89 013 553 and UHF tuner 89 013 771 is used in RA-341 and RA-343 chassis.
3. RA-341 and RA-343 chassis are equipped with an antenna cross-over network part number 88 001 021 and a high pass filter, part number 88 000 773.

USE OF SYMBOLS

Solid symbol indicates source of voltage.
Open symbol indicates point to which voltage is applied.
Solid bar indicates an adjustable control.

CHASSIS NOTES

1. All waveforms were taken under operating conditions. The receiver was tuned to an average strength TV signal and the R-F AGC Delay control was adjusted for -5 volts at P203, the agc test point.
2. All wave forms were observed with a 30 cps. sweep rate unless otherwise indicated.
3. Voltages 20% of those shown are normal.
4. All resistors are 10%, one-half watt unless otherwise indicated. W.W. indicates wire wound resistor.
5. All capacitors are 20%, 500 volts, unless otherwise indicated. All capacitors are ceramic, unless indicated as follows:
   CT-Tubular Ceramic, M-Mica, P-Paper
   MP-Molded Paper, ± Electrolytic.
6. In some sets R300 consists of two resistors connected in series. In some sets R247 consists of two resistors connected in parallel.

Shop Hints

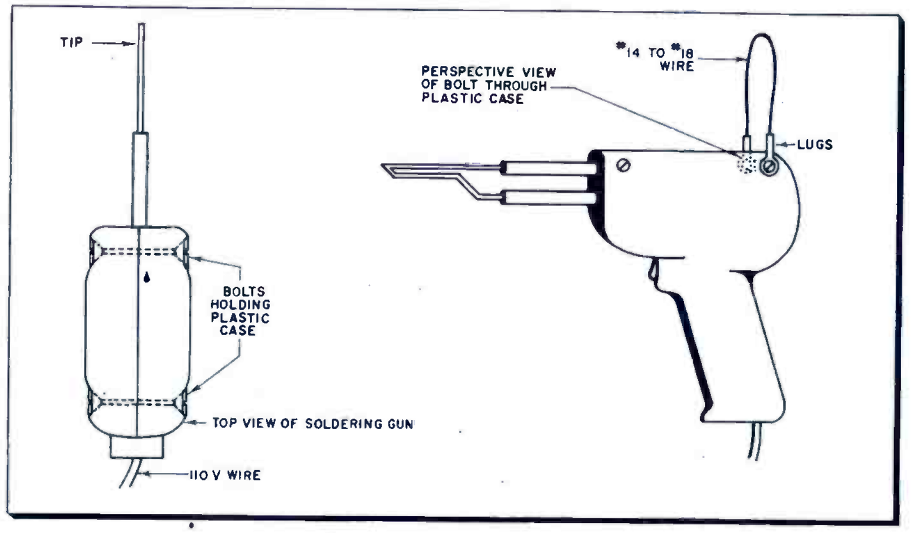
Self-tapping Screw Holes

Whenever making chassis mounts that require the use of sheet-metal (self-tapping) screws, *punch* the holes instead of *drilling* them. Drilling leaves a clean hole with a regular surface. However, the uneven surface left around the hole by punching is more desirable. There is more surface for the screw to cut into in making a grip for itself. Also, the slight hump caused by the punch will pull tighter against the screw.—*Henry Josephs, Gardenville, Pennsylvania.*

Solder Gun Mount

The accompanying sketch shows a soldering gun connected to a wire loop, by means of which the gun can be hung within reach but out of the way under or over the work bench, or elsewhere in some convenient place near it. The wire hook is made of no. 14 or some other comparable heavy wire, fashioned into the form of a loop with two small loops, one at each end. Most soldering guns have a long bolt that goes through the plastic case as shown, holding the case together. The two loops are fastened to the gun at either end of this bolt. Since one accidental fall from the work bench may be enough to break the entire gun case, this means of keeping the gun out of harm will be useful in preventing such accidents. —*Hyman Herman, Flushing, N. Y.*

Details for adding wire hook, used to hang soldering gun out of harm's way, to gun case.



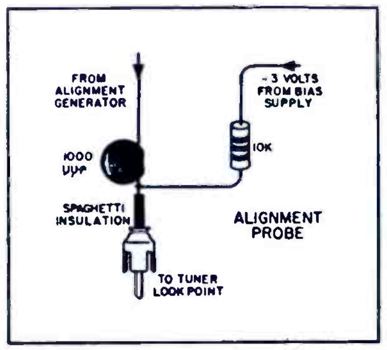
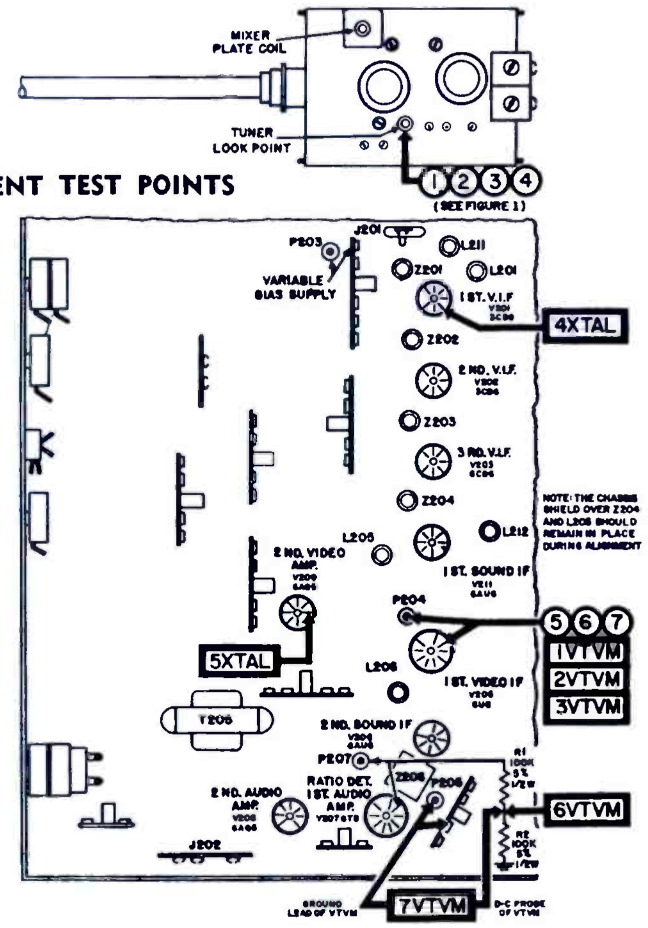


Figure 1. Probe for use in connecting alignment equipment and bias to grid of mixer stage. The probe is plugged into the tuner look point.

ALIGNMENT TEST POINTS



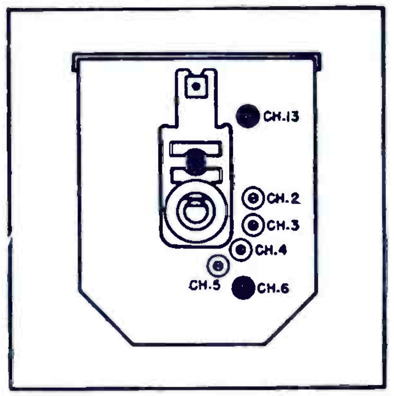


Figure 2. Oscillator slugs for VHF tuner 89 013 553.

TUNER OSCILLATOR ADJUSTMENT

If one or more stations cannot be tuned in properly, within the range of the Fine Tuning control, the tuner oscillator slugs require readjustment.

If the highest frequency station that cannot be tuned in properly is between channels 2 and 6 readjust the oscillator slugs as follows:

1. Turn the Station Selector knob to the highest channel that does not tune in properly.

2. Readjust the oscillator slug of that channel (see figure 2) so that proper tuning, within the range of the Fine Tuning control, is obtained.

3. Turn the Station Selector knob to each lower channel and check the fine tuning. Repeat steps 1 and 2 of the above procedure for each available lower frequency station that does not tune properly.

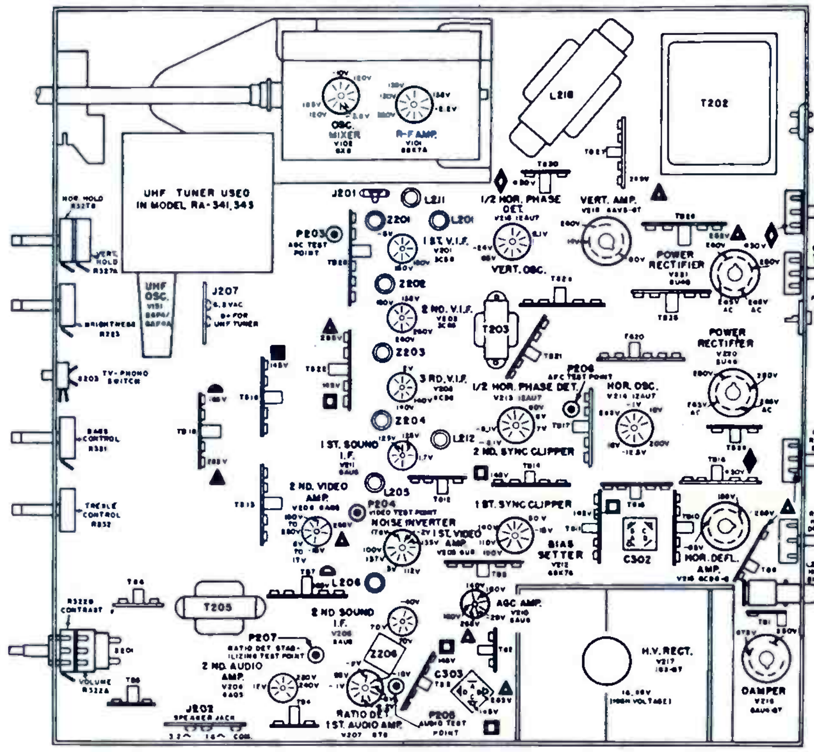
Note: If channel 5 is the highest low channel station available, readjust the channel 6 oscillator slug when the channel 5 slug does not have sufficient range. If a lower channel oscillator slug does not have sufficient range for proper tuning, the next highest channel oscillator slug should also be readjusted.

If the highest frequency station that cannot be tuned in properly, within the range of the Fine Tuning control, is between channels 7 and 13, readjust the oscillator slugs as follows:

1. Check the tuning of the available stations between channels 7 and 13. If one or more stations does not tune properly, adjust the channel 13 oscillator slug so that all available stations between channel 7 and 13 can be properly tuned, within the range of the Fine Tuning control.

2. Check the tuning of all available stations between channels 2 and 6. If the tuning of one or more stations is not proper, repeat the previous procedure on the adjustment of the oscillator slugs for stations between channels 2 and 6.

UNDERCHASSIS VOLTAGE POINTS



Step	Signal Generator Frequency	Signal Generator Connect To	Output Indicator	Connect To	Bias	Adjust
VIDEO IF ALIGNMENT RA-340/341, RA-342/343						
Remove the Horizontal Deflection Amplifier and Damper tubes. Use the tuner look point probe (see figure 1) to connect the alignment generator and a −3 volts bias supply to the mixer grid. Connect a second variable bias supply to P203. Rotate the Station Selector one position clockwise from Channel 13.						
1	44 MC (Marker) (No Sweep)	Tuner Look Point (See Figure 1) ①	VTVM	Pin 2, V205 1VTVM	Tuner Look Point −3 volts. P203 −4.5 volts.	Z204 for maximum negative reading.
2	45.5 MC (Marker) (No Sweep)	As Above ②	As Above	As Above 2VTVM	As Above	Z203 for maximum negative reading.
3	42.5 MC (Marker) (No Sweep)	As Above ③	As Above	As Above 3VTVM	As Above	Z202 for maximum negative reading.
4	43.3 MC Center Freq. 10 MC Deviation	As Above ④	Oscillograph through XTAL	Pin 5, V201 4XTAL	Tuner Look Point −3 volts. P203 −3 volts.	L211 for 41.25 MC trap. L201 (top) for 47.25 MC trap. L201 (bottom) for 39.75 MC trap. Adjust simultaneously Mixer plate coil and Z201 (top) for 45.75 MC Marker, Z201 (bottom) for 42.25 MC Marker. Note: Repeat adjustments until markers are positioned as specified.
5	4.5 MC 400 CPS AM	Pin 2, V205 ⑤	As Above	Pin 7, V209 5XTAL	None Required	L204 for minimum amplitude.
SOUND IF ALIGNMENT						
6	4.5 MC (Marker) (No Sweep)	Pin 2, V205 ⑥	VTVM	Junction of R1-R2 6VTVM	None Required	(Note: Add R1 and R2, see Alignment Test Point Drawing) Z206 (bottom), L212 and L205 for maximum negative reading.
7	As Above	As Above ⑦	VTVM	Between P205 and junction of R1-R2 7VTVM	As Above	(Note. Set VTVM to zero center scale. Connect VTVM D-C probe to junction of R1-R2 and VTVM ground lead to P205) Z206 (top) for null point. Remove R1-R2.
ALTERNATE SOUND IF ALIGNMENT – USING TV SIGNAL						
6	TV Signal, Teleset must be tuned for best picture		VTVM	Junction of R1-R2 6VTVM	None Required	(Note: Add R1 and R2, see Alignment Test Point Drawing) Z206 (bottom), L212 and L205 for maximum negative reading.
7	As Above		VTVM	Between P205 and junction of R1-R2 7VTVM	As Above	(Note. Set VTVM to zero center scale. Connect VTVM D-C probe to junction of R1-R2 and VTVM ground lead to P205) Z206 (top) for null point. Remove R1-R2.

NOTE: When the sound I.F alignment has been completed, adjust the tuning slugs of Z206 (bottom), L212 and L205 approximately ½ turn for best sound quieting (least sound background hiss). Make this adjustment with a weak TV signal exhibiting picture snow.

RESISTANCE MEASUREMENTS

All Readings to Ground

		1	2	3	4	5	6	7	8	9
V101	6BK7A	INF	1M	0	0	.05	20K	350K	INF	0
V102	6X8	0	22K	20K	.05	0	0	100K	130K	25K
V201	3CB6	100K	47	.4	0	70K	70K	0		
V202	3CB6	63K	70K	.4	.05	15K	15K	70K		
V203	6CB6	.1	180	.05	0	15K	15K	0		
V205	6U8	340K	70-1K*	20K	0	.05	25K	39	620K	40K
V206	6AU6	100K	0	0	.05	15K	15K	0		
V207	6T8	INF	33K	INF	.05	0	900K	0	2M	500K
V208	6AQ5	470K	270	.05	0	15K	15K	470K		
V209	6AQ5	1.1M	270-5.3K	0	.05	20K	15K	1.1M		
V210	6AU6	60K	20K	0	.05	500K	15K	20K		
V211	6AU6	1.7	0	0	.05	15K	15K	220		
V212	6BK7A	250K	50K	470K	0	.05	25K	2.7M	0	.05
V213	12AU7	4.8M	4.8M	18K	0	0	20K	1M	820	.05
V214	12AU7	240K-280K	150K-200K	2.7K	.05	.05	150K-200K	5.3M	2.7K	0
V215	6CD6-G	180K	.05	0	15K	750K	60K	0	20K	
V216	6AU4GT	NC	NC	150K		15K		.05	0	
V217	1B3-GT		INF	NC			NC	INF		
V218	12AU7	18K	18K	4.8M	.05	.05	3M-6M	820K-1.8M	175	0
V219	6AV5-GT	2.2M	0	220-1.2K		15K		.05	40K	
V220	5U4-G	NC	15K	NC	17	NC	17	NC	15K	
V221	5U4-G	NC	15K	NC	17	NC	17	NC	15K	
V401	CRT†	0	1.5M				0			

†10	11	12
60K	20K-24K	.05

*Reading depends upon crystal detector and VTVM scale used.

The above resistance readings were taken with an RCA Model WV97A VTVM. All readings are in ohms, K=1000, M=million. When the reading is affected by a control two readings are given. These readings indicate the variation produced by the control.

DUMONT
Chassis RA-340/341, 342/343

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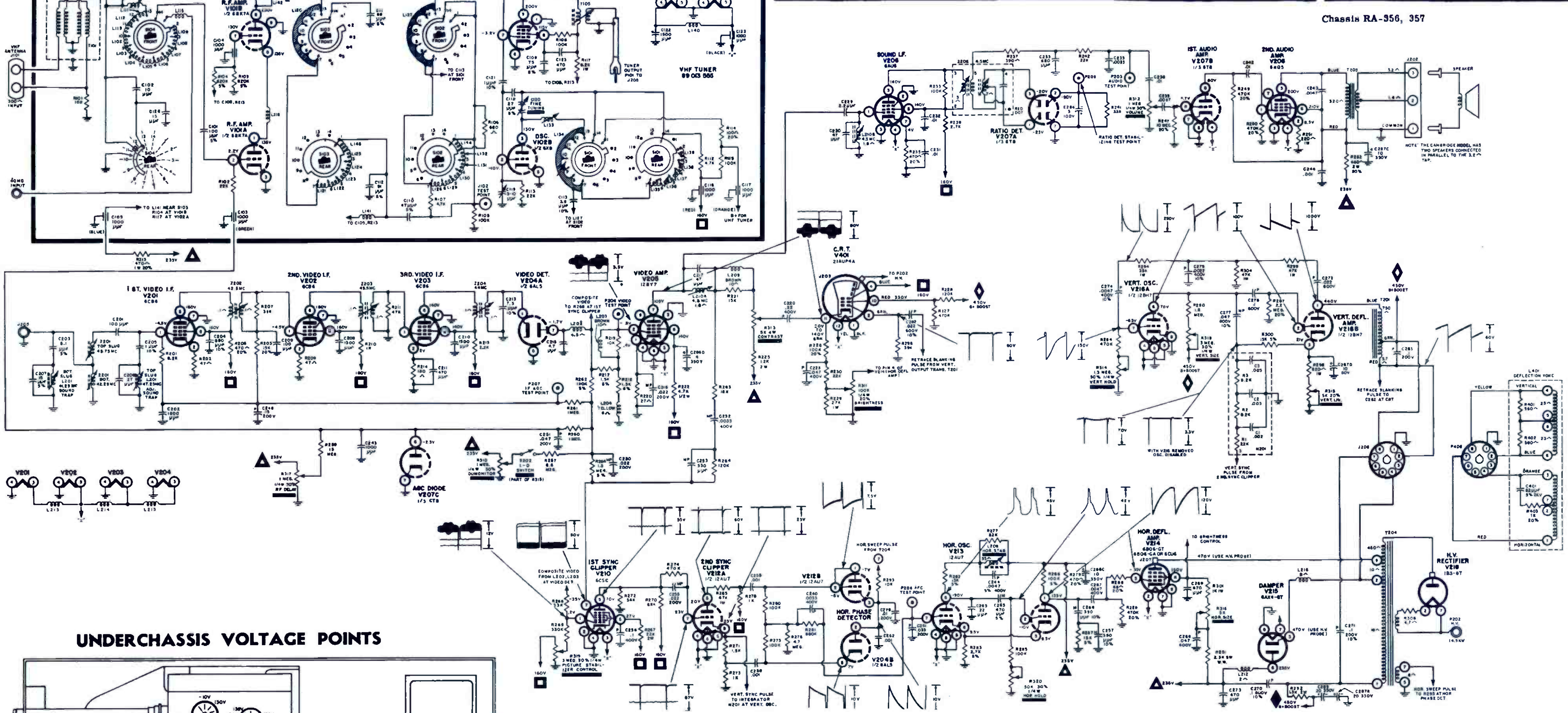
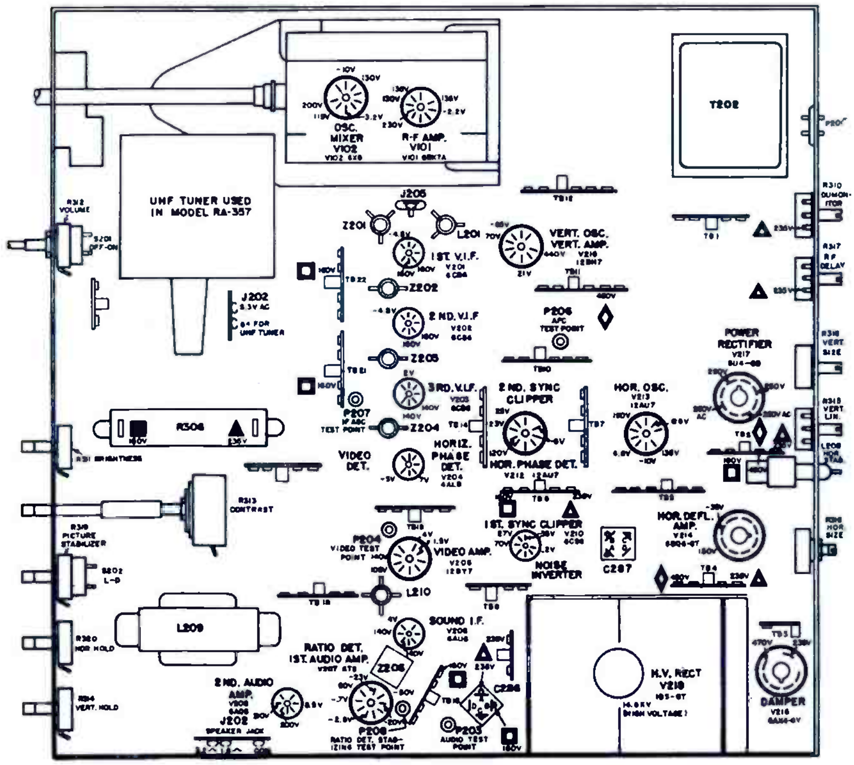
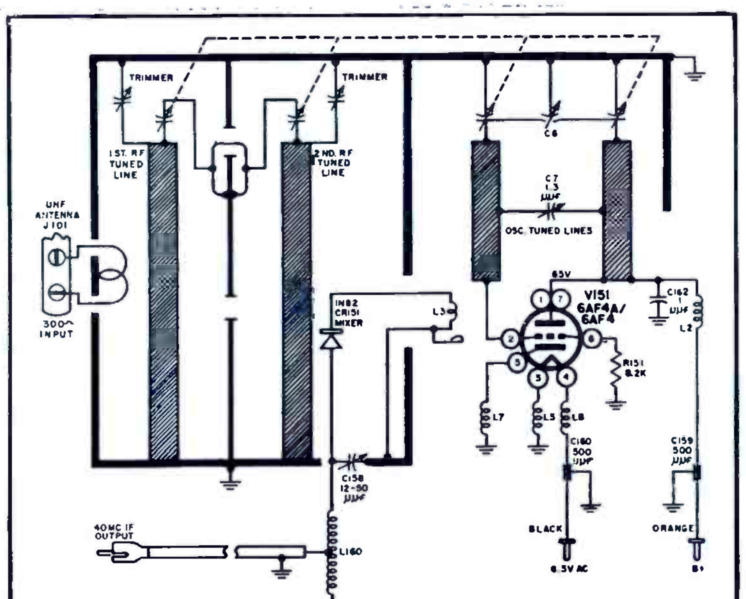
Chassis RA-356, 357

Chassis RA-356, 357



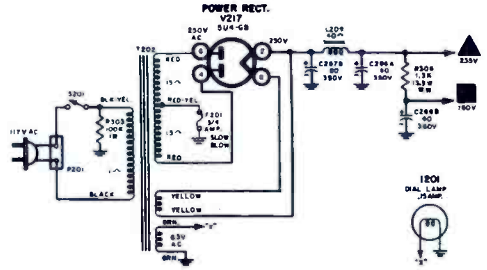
UNDERCHASSIS VOLTAGE POINTS




UHF TUNER 89 013 771

CHASSIS NOTES

1. All waveforms and voltages were taken under operating conditions. The receiver was tuned to an average strength TV signal, the Contrast control rotated fully clockwise and the Picture Stabilizer control was rotated fully counter-clockwise.
2. The Picture Stabilizer control and switch consists of a potentiometer, R319, and a snap switch, S202. When R319 is rotated fully counter-clockwise S202 opens (Local position as shown in the schematic).
3. Voltages ± 20% of those shown are normal.
4. All resistors are 10%, one-half watt, unless otherwise indicated. W. W. indicates wire wound resistor.
5. All capacitors are 20%, 500V, unless otherwise indicated. All capacitors are ceramic, unless indicated as follows: M-Mica, P-Paper, ± -Electrolytic, MP-Molded Paper



USE OF SYMBOLS
Solid symbol indicates source of voltage.
Open symbol indicates point to which voltage is applied.
Solid bar indicates an adjustable control.

TUNER NOTES

1. Tuner 89 013 555 is used in RA-356 Chassis.
2. A UHF/VHF tuner combination consisting of VHF tuner 89 013 555 and UHF tuner 89 013 771 is used in RA-357 Chassis.
3. RA-357 Chassis are equipped with an antenna crossover network, part number 88 001 021.

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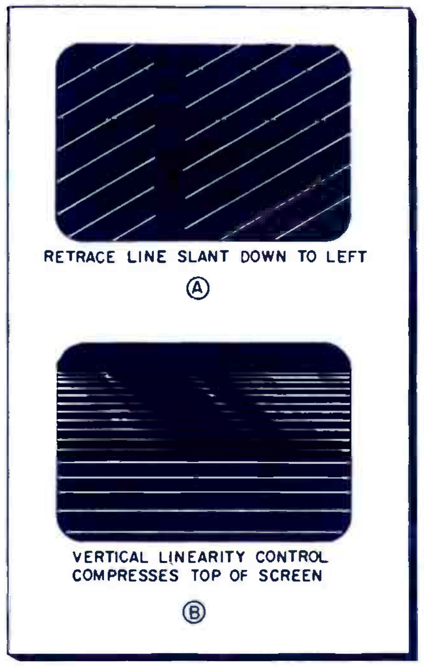
Shop Hints

Wiring Replacement Yokes

When a defective deflection yoke is replaced with another that is entirely acceptable, but that is of another brand, it often turns out that the picture is upside down or reversed from left to right or both, because of differences in the color coding of wires. With a picture on the air, it is not difficult to get the raster right side up, but there is often no way to identify the hook-up of the horizontal section unless one wants to spend time waiting for some writing or lettering to show up in the picture.

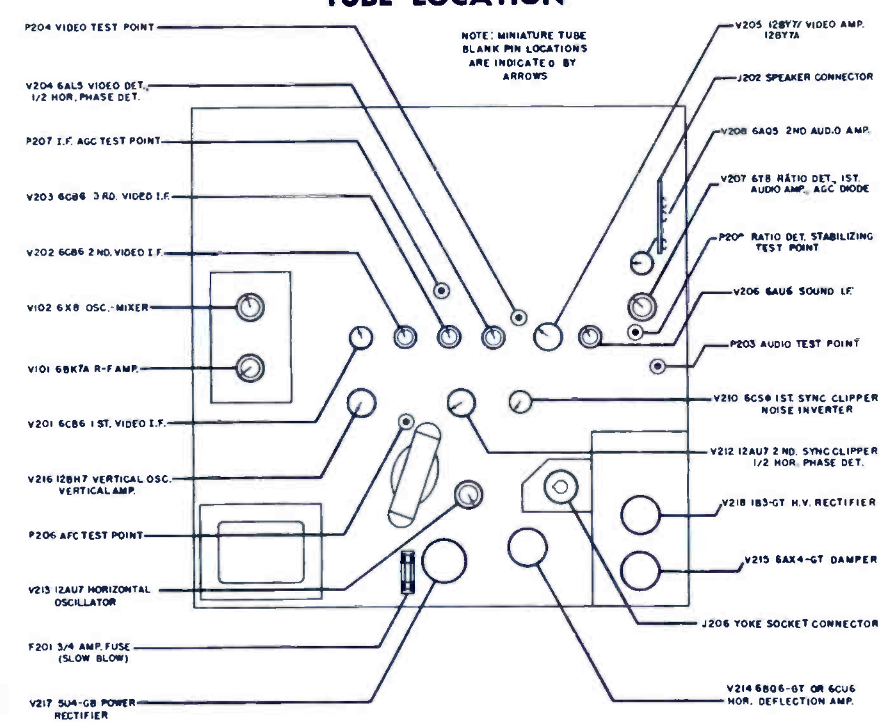
Delay can be avoided, I have found, by using the vertical retrace lines as an indicating device. The retrace lines always slant down to the left and, when a picture is on, have a break in their structure on the left side of the screen. See part A of the illustration. By reducing contrast and increasing brightness, these lines can be made visible on most sets.



When no picture is on the air or no antenna is handy, the vertical linearity and height controls can be used to determine whether the raster is right side up. Manipulation of the linearity control will compress or expand the top half of the screen, while the height control will show similar action on the bottom half. See part B. In Motorola receivers, the reverse effect is shown by the vertical controls.—*Charles Garrett, New London, Connecticut.*

(As far as left-to-right deflection is concerned, you're still not cooked if you have no picture or if an effective blanking circuit kills off all retrace lines. You can temporarily misadjust the horizontal drive control to produce bright vertical lines. If the yoke is properly wired, these lines will appear at the left of the raster. When using this method, be sure to note the original position of the control, to which it should be restored after misadjustment has served its purpose.—Ed.)

TUBE LOCATION



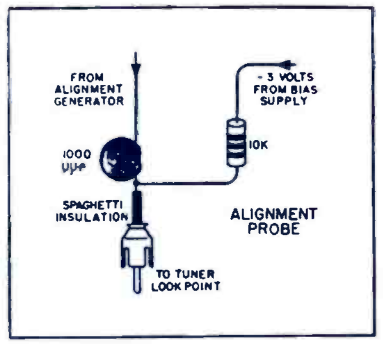


Figure 1. Probe for use in connecting alignment equipment and bias to grid of mixer stage. The probe is plugged into the tuner look point.

RESISTANCE MEASUREMENTS
All Readings to Ground

Symbol	Tube	1	2	3	4	5	6	7	8	9
V101	6BK7A	INF	1M	0	0	.05	20K-40K	350K	INF	0
V102	6X8	0	22K	25K-45K	.05	0	0	100K	150K	30K-50K
V201	6CB6	1M	47	.05	0	20K-40K	20K-40K	0		
V202	6CB6	1M	47	.05	0	20K-40K	20K-40K	0		
V203	6CB6	.1	180	.05	0	20K-40K	20K-40K	0		
V204	6AL5	.1	10K	.1	0	4.8M	0	3K		
V205	12BY7	27	1.5K	0	.05	.05	0	25K-45K	25K-45K	0
V206	6AU6	1.5	0	0	.05	20K-40K	20K-40K	470		
V207	6T8	INF	33K	INF	.05	0	1M	0	10M	500K
V208	6AQ5	470K	220	0	.05	20K-40K	20K-40K	NC		
V210	6CS6	35K	0	.05	0	35K	45K-60K	2M		
V212	12AU7	4.8M	4.8M	10K	.05	.05	25K-45K	530K	2.5K	0
V213	12AU7	120K	100K-150K	2.7K	.05	.05	35K-50K	5.5M	2.7K	0
V214	6BQ6-GT	15K-40K	.05	NC	15K-40K	470K	NC	0	0	Cap 600K
V215	6AX4-GT	NC	NC	600K		20K-40K		.05	0	
V216	12BH7	600K	2.2M	820-5.8K	.05	.05	2.5M-5.5M	470K-2M	0	0
V217	5U4-GB	NC	20K-40K	NC	18	NC	18	NC	20K-40K	
V218	1B3-GT	NC	INF	NC	NC	NC	INF	INF	NC	Cap 600K
V401*	CRT	0	39K				20K-40K			

*10	11	12
470K	130K-140K	.05

The above resistance readings were taken with an RCA Model WV97A VTVM. All readings are in ohms, K=1000, M=million. When the reading is affected by a control two readings are given. These readings indicate the variation produced by the control.

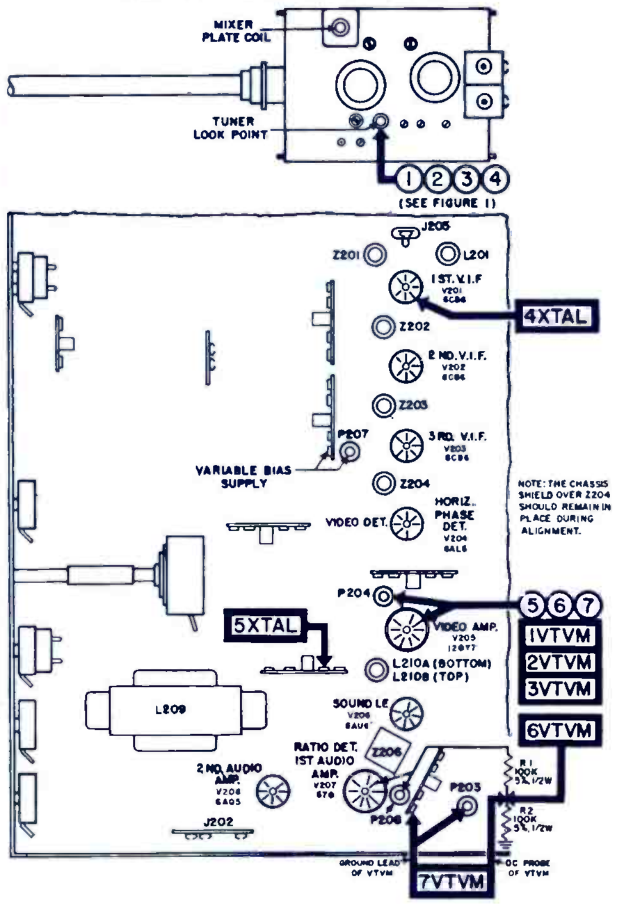
VIDEO IF ALIGNMENT RA-356/357

Remove the Horizontal Deflection Amplifier and Damper tubes. Use the tuner look point probe (see figure 1) to connect the alignment generator and a −3 volts bias supply to the mixer grid. Connect a second variable bias supply to P207. Rotate the Station Selector one position clockwise from Channel 13.

Step	Signal Generator Frequency	Signal Generator Connect To	Output Indicator	Connect To	Bias	Adjust
1	44 MC (Marker) (No Sweep)	Tuner Look Point (See Figure 1) ①	VTVM	Pin 2, V205 1VTVM	Tuner Look Point −3 volts. P207 −4.5 volts.	Z204 for maximum negative reading.
2	45.5 MC (Marker) (No Sweep)	As Above ②	As Above	As Above 2VTVM	As Above	Z203 for maximum negative reading.
3	42.5 MC (Marker) (No Sweep)	As Above ③	As Above	As Above 3VTVM	As Above	Z202 for maximum negative reading.
4	43.5 MC Center Freq. 10 MC Deviation	As Above ④	Oscillograph through XTAL	Pin 5, V201 4XTAL	Tuner Look Point −3 volts. P207 −3 volts.	L201 (top) for 47.25 MC trap. L201 (bottom) for 41.25 MC trap. Adjust simultaneously Mixer plate coil and Z201 (top) for 45.75 MC Marker. Z201 (bottom) for 42.25 MC Marker. Note: Repeat adjustments until markers are positioned as specified.
5	4.5 MC 400 CPS AM	Pin 2, V205 ⑤	As Above	Junction of L205 & R313 5XTAL	None Required	L210A (bottom) for minimum amplitude.
SOUND IF ALIGNMENT						
6	4.5 MC (Marker) (No Sweep)	Pin 2, V205 ⑥	VTVM	Junction of R1-R2 6VTVM	None Required	(Note: Add R1 and R2, see Alignment Test Point Drawing) Z206 (bottom) and L210B (top) for maximum negative reading.
7	As Above	As Above ⑦	VTVM	Between P203 and junction of R1-R2 7VTVM	As Above	(Note: Set VTVM to zero center scale. Connect VTVM D-C probe to junction of R1-R2 and VTVM ground lead to P203) Z206 (top) for null point. Remove R1-R2.
ALTERNATE SOUND IF ALIGNMENT – USING TV SIGNAL						
6	TV Signal, Teleset must be tuned for best picture		VTVM	Junction of R1-R2 6VTVM	None Required	(Note: Add R1 and R2, see Alignment Test Point Drawing) Z206 (bottom) and L210B (top) for maximum negative reading.
7	As Above		VTVM	Between P203 and junction of R1-R2 7VTVM	As Above	(Note: Set VTVM to zero center scale. Connect VTVM D-C probe to junction of R1-R2 and VTVM ground lead to P203) Z206 (top) for null point. Remove R1-R2.

NOTE: When the sound i-f alignment has been completed, adjust the tuning slug of L210B (top) approximately ¼ turn for best sound (quieting (least sound background hiss). Make this adjustment with a weak TV signal exhibiting picture snow.

ALIGNMENT TEST POINTS



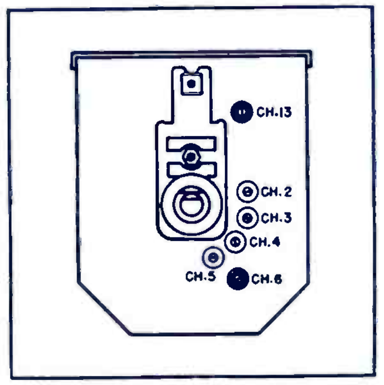


Figure 2. Oscillator slugs for VHF tuner 89 013 555.

TUNER OSCILLATOR ADJUSTMENT

If one or more stations cannot be tuned in properly, within the range of the Fine Tuning control, the tuner oscillator slugs require readjustment.

If the highest frequency station that cannot be tuned in properly is between channels 2 and 6 readjust the oscillator slugs as follows:

1. Turn the Station Selector knob to the highest channel that does not tune in properly.

2. Readjust the oscillator slug of that channel (see figure 2) so that proper tuning, within the range of the Fine Tuning control, is obtained.

3. Turn the Station Selector knob to each lower channel and check the fine tuning. Repeat steps 1 and 2 of the above procedure for each available lower frequency station that does not tune properly.

Note: If channel 5 is the highest low channel station available, readjust the channel 6 oscillator slug when the channel 5 slug does not have sufficient range. If a lower channel oscillator slug does not have sufficient range for proper tuning, the next highest channel oscillator slug should also be readjusted.

If the highest frequency station that cannot be tuned in properly, within the range of the Fine Tuning control, is between channels 7 and 13, readjust the oscillator slugs as follows:

1. Check the tuning of the available stations between channels 7 and 13. If one or more stations does not tune properly, adjust the channel 13 oscillator slug so that all available stations between channel 7 and 13 can be properly tuned, within the range of the Fine Tuning control.

2. Check the tuning of all available stations between channels 2 and 6. If the tuning of one or more stations is not proper, repeat the previous procedure on the adjustment of the oscillator slugs for stations between channels 2 and 6.

DU MONT
Chassis RA-356, 357

Technician
CIRCUIT DIGEST

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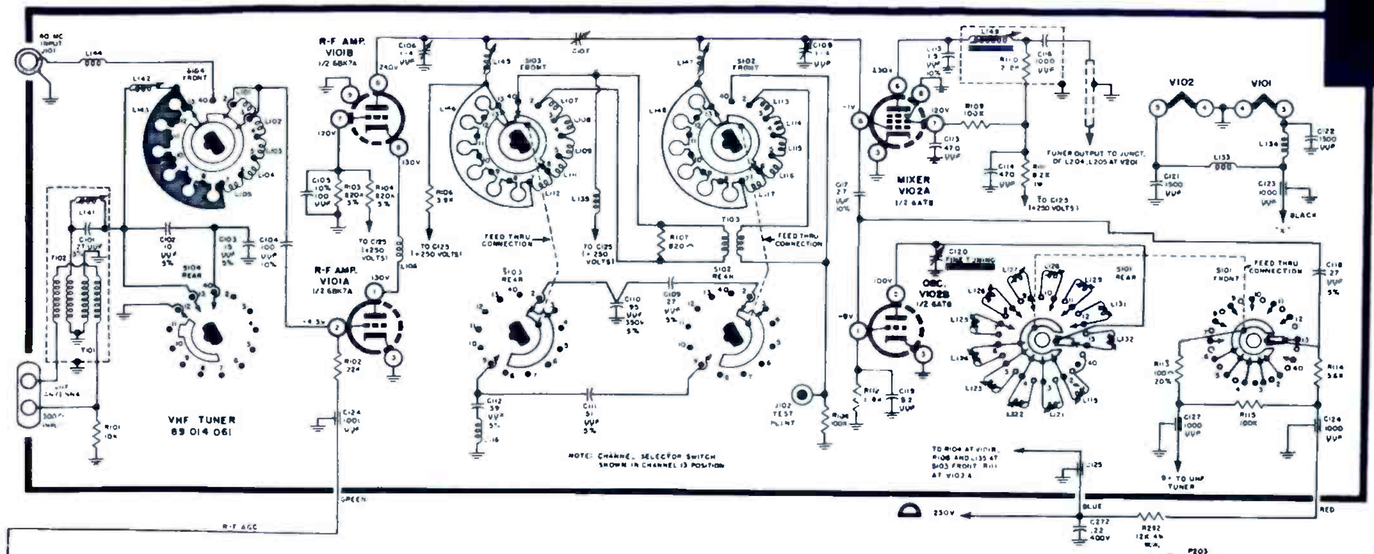

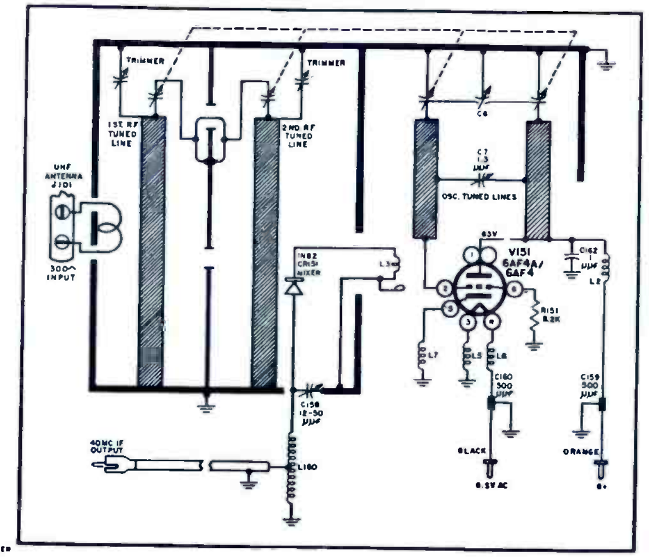

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USE OF SYMBOLS

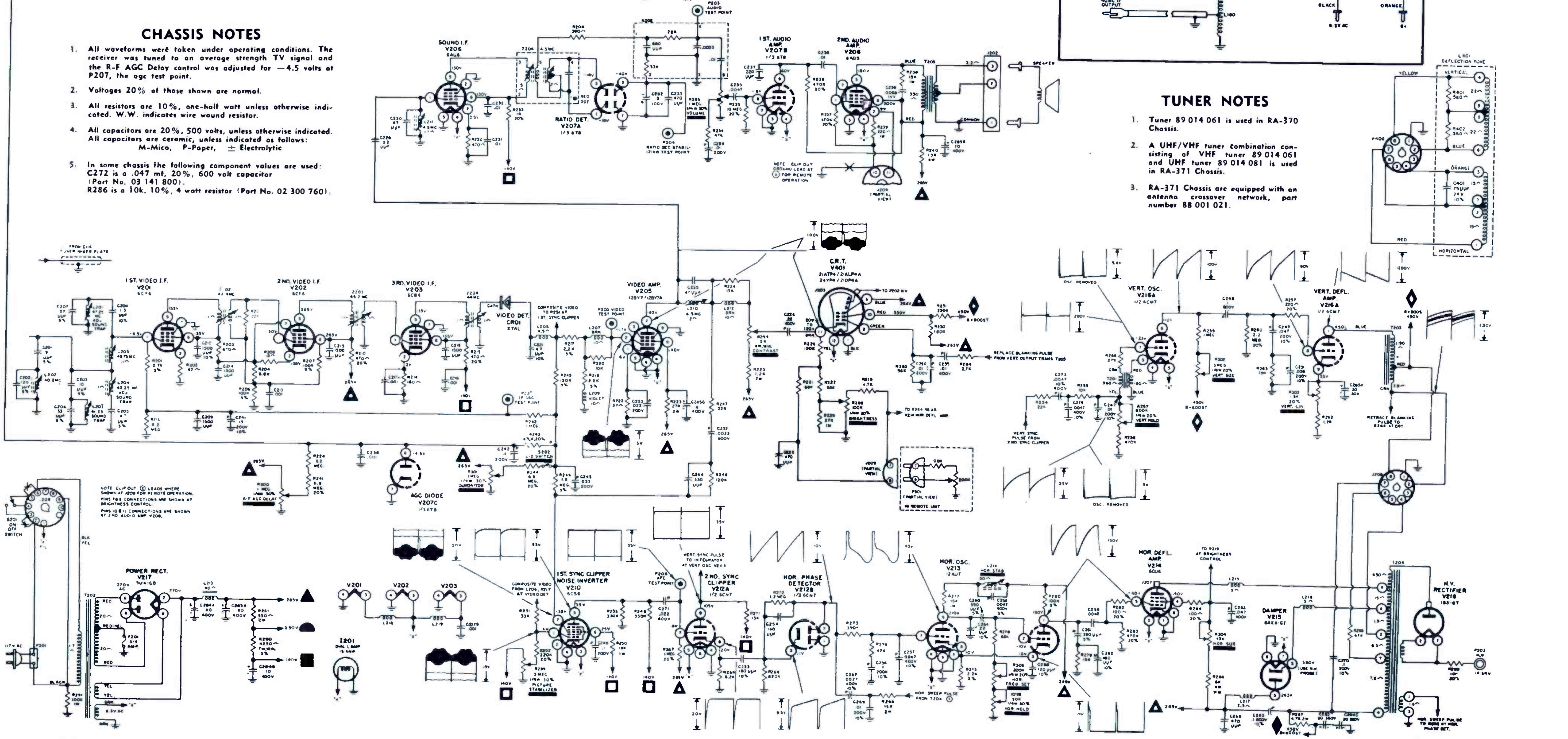
Solid symbol indicates source of voltage.
Open symbol indicates point to which voltage is supplied.
Solid bar indicates an adjustable control.

TUNER NOTES

1. Tuner 89 014 061 is used in RA-370 Chassis.
2. A UHF/VHF tuner combination consisting of VHF tuner 89 014 061 and UHF tuner 89 014 081 is used in RA-371 Chassis.
3. RA-371 Chassis are equipped with an antenna crossover network, part number 88 001 021.

CHASSIS NOTES

1. All waveforms were taken under operating conditions. The receiver was tuned to an average strength TV signal and the R-F AGC Delay control was adjusted for —4.5 volts at P207, the agc test point.
2. Voltages 20% of those shown are normal.
3. All resistors are 10%, one-half watt unless otherwise indicated. W.W. indicates wire wound resistor.
4. All capacitors are 20%, 500 volts, unless otherwise indicated. All capacitors are ceramic, unless indicated as follows: M-Mica, P-Paper, ± Electrolytic
5. In some chassis the following component values are used: C272 is a .047 mf, 20%, 600 volt capacitor (Part No. 03 141 800). R286 is a 10k, 10%, 4 watt resistor (Part No. 02 300 760).



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ALIGNMENT TEST POINTS

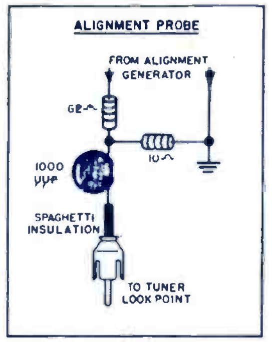


Figure 1. Probe for use in connecting alignment equipment to grid of mixer stage. The probe is plugged into the tuner look point.

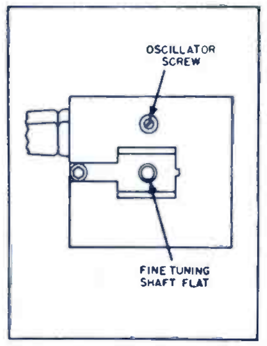
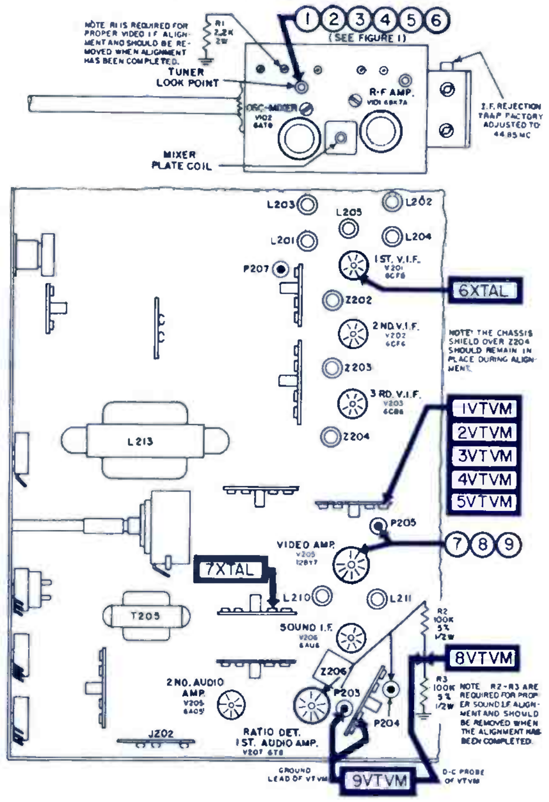


Figure 2. Oscillator slugs for VHF tuner 89 014 061.



TUNER OSCILLATOR ADJUSTMENT — Individual oscillator adjustment screws are provided to permit precise adjustments to suit the receiving condition for each channel in your area. These screws are set at the factory for average conditions and do not require adjustment when the receiver is installed. However, it is often possible to obtain better reception by readjusting the oscillator screws to suit the particular conditions at the location where the receiver is installed.

The following procedure should be used:
1. Place the chassis on its side so that the tuner is positioned, as shown in figure 2.
2. Turn the Station Selector to the channel on which the oscillator is to be adjusted.
3. Set the Fine Tuning control so that the flat on the shaft faces downward. The oscillator screw is accessible through the hole just above the tuning shaft.
4. Using an insulated alignment tool, adjust the screw for best picture and sound.

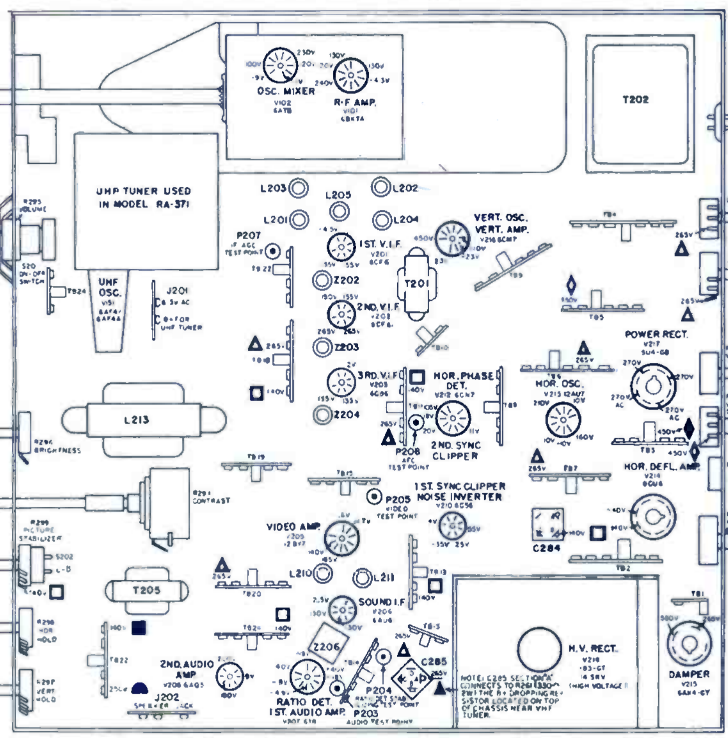
VIDEO IF ALIGNMENT RA370/371

Remove the Horizontal Deflection and Damper tubes. Use the tuner look point probe (see figure 1) to connect the alignment generator. Connect a variable bias supply to P207 the IF AGC test point. Turn the Station Selector to Channel 13. Connect R1, a 2.2K, 2W resistor to junction of R292 and tuner terminal (red lead) and ground.

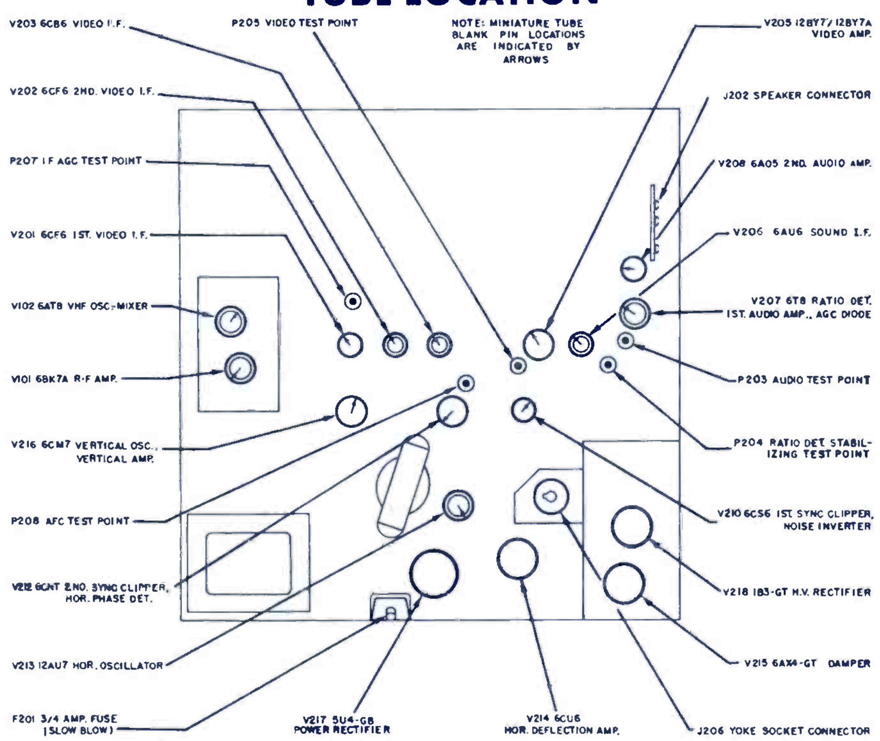
Step	Signal Generator Frequency	Signal Generator Connect to	Output Indicator	Connect to	Bias	Adjust
1	47.25 MC (Marker) (No Sweep)	Tuner Look Point (See Figure 1) ①	VTVM	Junction of R217, L206 [1 VTVM]	P207 −4.5 volts	L204 and L201 for minimum negative reading.
2	41.25 MC (Marker) (No Sweep)	As Above ②	As Above	As Above [2 VTVM]	As Above	L203 for minimum negative reading.
3	44 MC (Marker) (No Sweep)	As Above ③	As Above	As Above [3 VTVM]	As Above	Z204 for maximum negative reading.
4	45.2 MC (Marker) (No Sweep)	As Above ④	As Above	As Above [4 VTVM]	As Above	Z203 for maximum negative reading.
5	42.9 MC (Marker) (No Sweep)	As Above ⑤	As Above	As Above [5 VTVM]	As Above	Z202 for maximum negative reading.
6	43.5 MC Center Freq. 10 MC Deviation	As Above ⑥	Oscillograph through XTAL	Pin 5, V201 [6 XTAL]	P207 −2 volts	L202 for 40.2 MC sound kickback peak. Adjust simultaneously mixer plate coil and L205 until markers are positioned as specified on pass band. Recheck L202 for 40.2 MC marker. Remove R1.
7	4.5 MC 400 CPS AM	Pin 2, V205 ⑦	As Above	Junction of L212, R294 [7 XTAL]	None Required	L210 for minimum amplitude.
SOUND IF ALIGNMENT						
8	4.5 MC (Marker) (No Sweep)	Pin 2, V205 ⑧	VTVM	Junction of R2 - R3 [8 VTVM]	None Required	(Note: Add R2 and R3, see Alignment Test Point Drawing) Z206 (bottom), L211 for maximum negative reading.
9	As Above	As Above ⑨	As Above	Between junction of R2 - R3 & P203 [9 VTVM]	As Above	(Note: Set VTVM to zero center scale. Connect VTVM D-C probe to junction of R2-R3 and VTVM ground lead to P203). Z206 (top) null point. Remove R2-R3.
ALTERNATE SOUND IF ALIGNMENT — USING TV SIGNAL						
8	TV Signal, Teleset must be tuned for best picture		VTVM	Junction of R2 - R3 [8 VTVM]	None Required	(Note: Add R2 and R3, see Alignment Test Point Drawing). Z206 (bottom), L217 and L210 for maximum reading.
9	As Above		As Above	Between junction of R2 - R3 & P203 [9 VTVM]	As Above	(Note: Set VTVM to zero center scale. Connect VTVM D-C probe to junction of R2-R3 and VTVM ground lead to P203). Z206 (top) for null point. Remove R2-R3.

NOTE: When the sound i-f alignment has been completed, adjust the tuning slug of L211 approximately 1/4 turn for best sound quieting (least sound background hiss). Make this adjustment with a weak TV signal exhibiting picture snow.

UNDERCHASSIS VOLTAGE POINTS



TUBE LOCATION



RESISTANCE MEASUREMENTS

All Readings to Ground

		1	2	3	4	5	6	7	8	9
V101	6BK7A	INF	600K	0	0	.05	25K-45K	350K	INF	0
V102	6AT8	6.8K	40K-60K	0	.05	0	30K-50K	120K	0	100K
V201	6CF6	1M	47	.05	0	65K	65K	0		
V202	6CF6	55K	65K	.05	0	25K-45K	25K-45K	65K		
V203	6CB6	.1	180	.05	0	25K-45K	25K-45K	0		
V205	12BY7	27	1.2K	0	.05	.05	0	30K-50K	50K-70K	0
V206	6AU6	1.7	0	0	.05	25K-45K	25K-45K	470		
V207	6T8	INF	33K	INF	.05	0	600K	0	10M	500K
V208	6AQ5	470K	220	0	.05	25K-45K	25K-45K	470K		
V210	6CS6	35K	0	.05	0	170K	45K-65K	2M		
V212	6CN7	0	2M	820K	0	.05	8.2K	1M	40K-60K	NC
V213	12AU7	120K	68K-320K	2.2K	.05	.05	35K-55K	2.4M	2.2K	0
V214	6CU6	NC	.05	400K	20K-40K	470K	470K	0	0	
V215	6AX4-GT	NC	NC	400K		25K-45K		.05	0	
V216	6CM7	400K	750K	180	0	.05	1.5M-4.5M	500K-1M	2.2M	1.2K-2.7K
V217	5U4-GB	NC	25K-45K	NC	20	NC	20	NC	25K-45K	
V218	1B3-GT	NC	INF	NC	NC	NC	INF	INF	NC	
V401*	CRT	0	56K				25K-45K			

*10	11	12
180K	200K	.05

The above resistance readings were taken with an RCA Model WV97A VTVM. All readings are in ohms. K=1000, M=million. When the reading is affected by a control two readings are given. These readings indicate the variation produced by the control.

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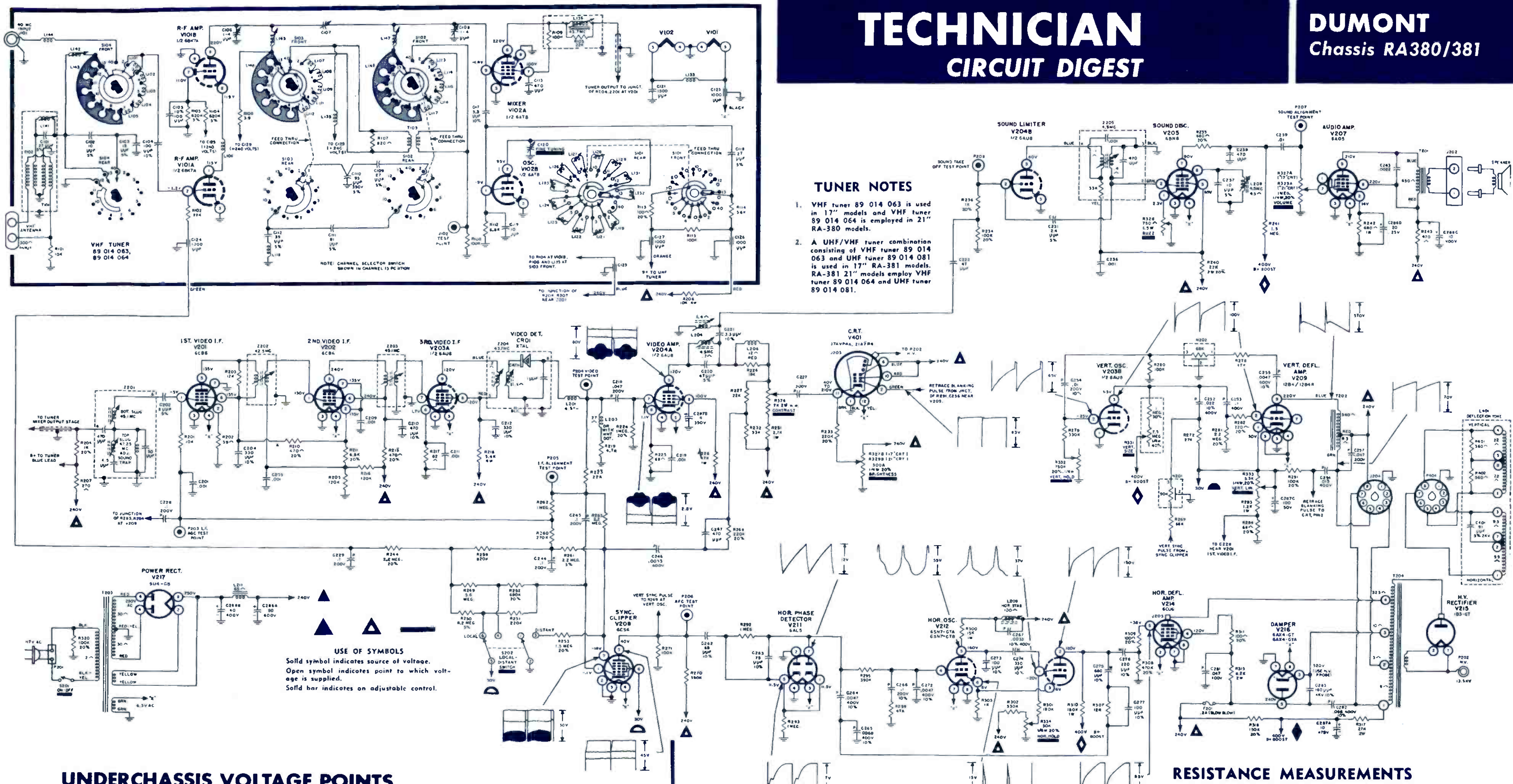
TECHNICIAN CIRCUIT DIGEST

DUMONT Chassis RA380/381



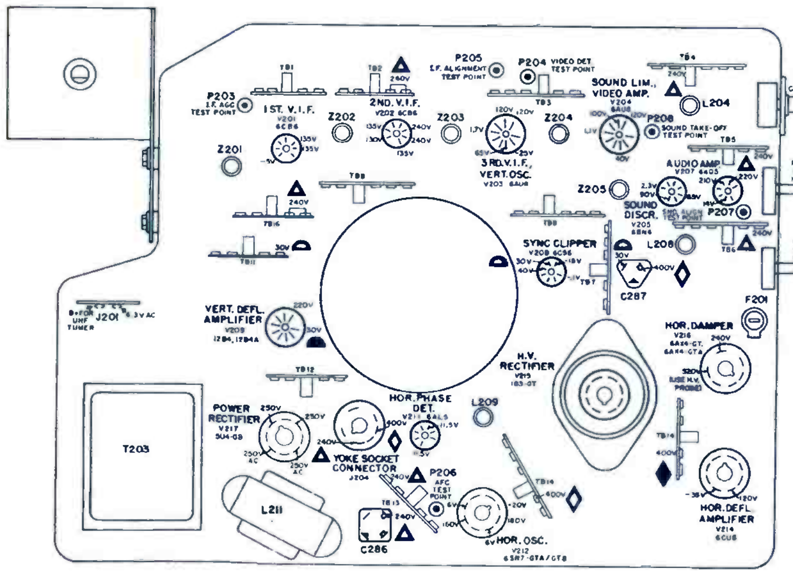
TUNER NOTES

1. VHF tuner 89 014 063 is used in 17" models and VHF tuner 89 014 064 is employed in 21" RA-380 models.
2. A UHF/VHF tuner combination consisting of VHF tuner 89 014 063 and UHF tuner 89 014 081 is used in 17" RA-381 models. RA-381 21" models employ VHF tuner 89 014 064 and UHF tuner 89 014 081.

USE OF SYMBOLS

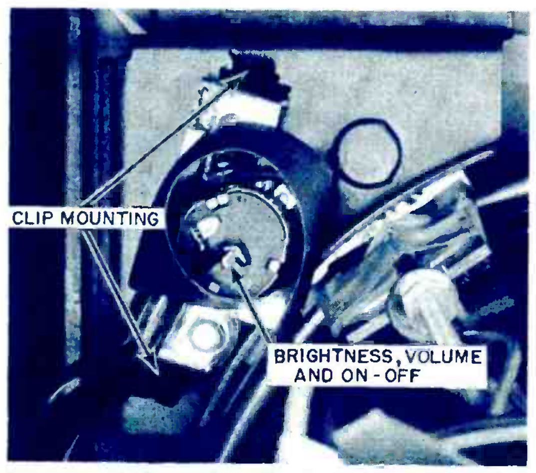
Solid symbol indicates source of voltage.
Open symbol indicates point to which voltage is supplied.
Solid bar indicates on adjustable control.

UNDERCHASSIS VOLTAGE POINTS



CHASSIS NOTES

1. All waveforms and voltages were taken under operating conditions. The receiver was tuned to an average strength TV signal and the Local-Distant switch was placed in its Local position.
2. Voltages 20% of those shown are normal.
3. All resistors are 10%, one-half watt unless otherwise indicated. WW indicates wire wound resistor.
4. All capacitors are 20%, 500 volts, unless otherwise indicated. All capacitors are ceramic, unless indicated as follows: C-Composition, M-Mica, P-Paper, ± Electrolytic
5. In some chassis C265 is a .0047 mf, 10%, 400 volt capacitor (Part No. 03 140 580).
6. In some chassis a 47K. 10%, ½ watt resistor (Part No. 02 251 970) is connected between pins 5 and 6 of V202.



Location of the spring clip mounting employed to hold the front panel Brightness, Volume and On-Off control.

RESISTANCE MEASUREMENTS
All Readings to Ground

		1	2	3	4	5	6	7	8	9
V101	6BK7A	INF	3.8M	0	0	.05	90K	350K	INF	0
V102	6AT8	6.8K	100K	0	0	.05	90K	200K	0	100K
V201	6CB6	750K	56	0	.05	90K	90K	0		
V202	6CB6	80K	90K	0	.05	95K	85K	90K		
V203	6AU8	0	330K-1M	1.2M-8.6M	0	.05	82	1	90K	90K
V204	6AU8	0	100K	120K	0	.05	68	1M	130K	100K
V205	6BN6	0-750	.4	0	.05	110K	4.5	1.7M		
V207	6AQ5	0-1M	680	0	.05	85K	85K	0-1M		
V208	6CS6	200K	0	0	.05	55K	1.2K-4.7K	1.3M		
V209	12B4	1.2K-4.7K	2.2M	0	.05	.05	0	2.2M	2.2M	85K
V211	6AL5	1M	0	.05	0	1M	NC	2M		
V212	6SN7-GTA	180K-230K	430K	1K	2.4M	100K	1K	.05	0	
V214	6CU6	NC	.05	NC	90K	470K	NC	0	0	
V215	1B3-GT	NC	INF	NC	NC	NC	NC	INF	NC	
V216	6AX4-GT	NC	NC	250K		85K		0	.05	
V217	5U4-GB	NC	95K	NC	30	NC	30	NC	85K	
V401*	CRT	0	100K				85K			

*10	11	12
85K	220K-450K	.05

The above resistance readings were taken with an RCA Model WV97A VTVM. All readings are in ohms, K=1000, M=million. When the reading is affected by a control two readings are given. These readings indicate the variation produced by the control.

MODELS Brewster, Berkeley, Bedford, Bryan, Bellmore

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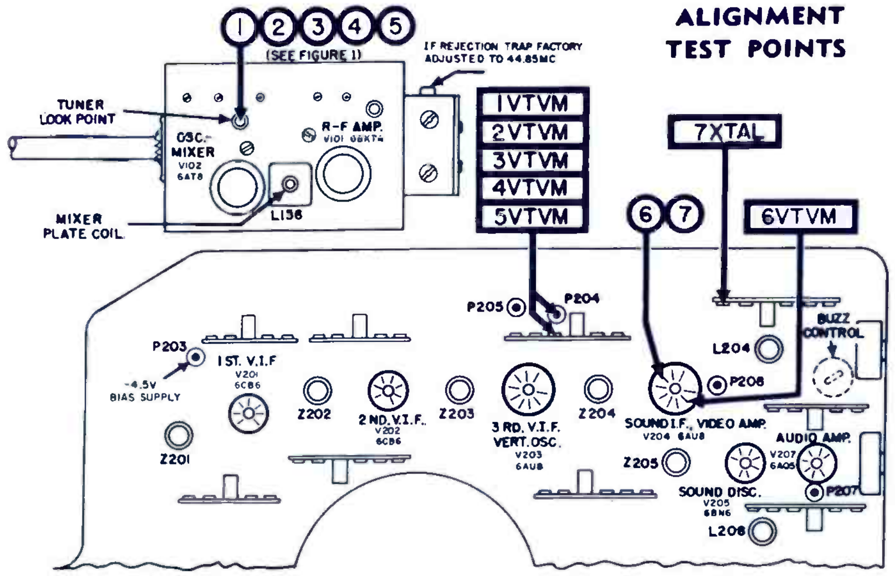
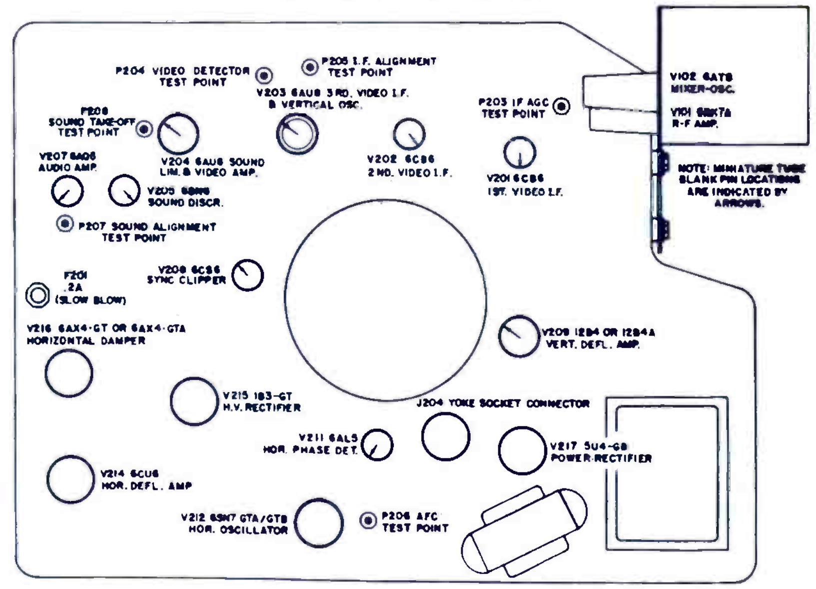
<table>
<tr><td colspan="8">VIDEO IF ALIGNMENT RA-380/381
Connect the alignment generator to the tuner look point through probe shown in Figure 1. Connect a -4.5 volts bias supply to P203, the I.F. AGC test point. Turn the Station Selector to channel 3. Set Buzz Control (R328) to mid-range.</td></tr>
<tr><td rowspan="2">Step</td><td colspan="2">Signal Generator</td><td rowspan="2">Output Indicator</td><td rowspan="2">Connect to</td><td rowspan="2">Bias</td><td rowspan="2">Adjust</td></tr>
<tr><td>Frequency</td><td>Connect to</td></tr>
<tr><td>1</td><td>43.7 MC No Sweep</td><td>Tuner Look Point (see Figure 1) ①</td><td>VTVM</td><td>Junction of L201, L203 (P204) [1 VTVM]</td><td>P203 -4.5 volts</td><td>Z204 (Top and Bottom) and L136 (Mixer Plate Coil) for maximum negative reading</td></tr>
<tr><td>2</td><td>47.25 MC No Sweep</td><td>As Above ②</td><td>As Above</td><td>As Above [2 VTVM]</td><td>As Above</td><td>Z201 (Top) for minimum negative reading</td></tr>
<tr><td>3</td><td>45.1 MC No Sweep</td><td>As Above ③</td><td>As Above</td><td>As Above [3 VTVM]</td><td>As Above</td><td>Z203 and Z201 (Bottom) for maximum negative reading.</td></tr>
<tr><td>4</td><td>42.5 MC No Sweep</td><td>As Above ④</td><td>As Above</td><td>As Above [4 VTVM]</td><td>As Above</td><td>Z202 for maximum negative reading</td></tr>
<tr><td>5</td><td>43.7 MC No Sweep</td><td>As Above ⑤</td><td>As Above</td><td>As Above [5 VTVM]</td><td>As Above</td><td>L136 (Mixer Plate Coil) for maximum negative reading</td></tr>
<tr><td colspan="7">SOUND IF ALIGNMENT</td></tr>
<tr><td>6</td><td>4.5 MC 400 CPS AM</td><td>Pin 7, V204A ⑥</td><td>VTVM thru 470K ohm resistor (see fig. 2)</td><td>Pin 2, V204B (P208) [6 VTVM]</td><td>None Required</td><td>L204 (Top) for maximum negative reading</td></tr>
<tr><td>7</td><td>4.5 MC 400 CPS AM</td><td>As Above ⑦</td><td>Oscillograph through XTAL</td><td>CRT Cathode Pin 11 [7 XTAL]</td><td>As Above</td><td>L204 (Bottom) for minimum amplitude</td></tr>
<tr><td>8</td><td colspan="2">Strong TV Signal with Teleset tuned for best picture</td><td></td><td></td><td>As Above</td><td>Z205 and L208 for maximum audio</td></tr>
<tr><td>9</td><td colspan="2">Very weak TV Signal with Teleset tuned for best picture</td><td></td><td></td><td>As Above</td><td>Z205 and L208 for maximum audio</td></tr>
</table>

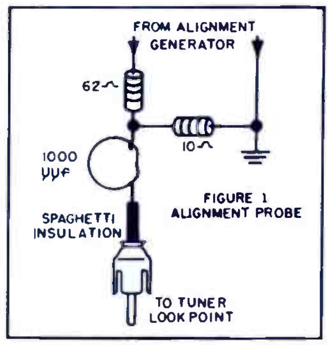
NOTE: After alignment has been completed adjust the Buzz Control (R328) for best sound under signal conditions available.

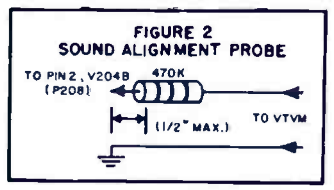
ALIGNMENT TEST POINTS



TUBE LOCATION





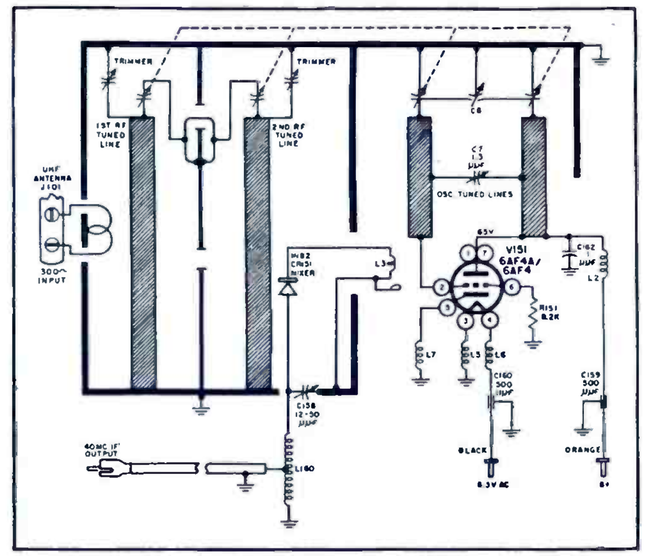


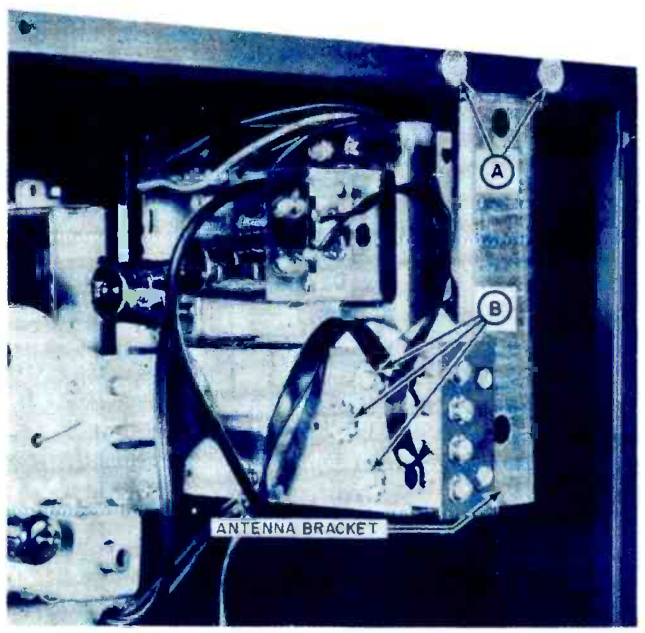
TUNER OSCILLATOR ADJUSTMENT—Individual oscillator adjustment screws are provided to permit precise adjustments to suit the receiving condition for each channel in your area. These screws are set at the factory for average conditions and do not require adjustment when the receiver is installed. However, it is often possible to obtain better reception by readjusting the oscillator screws to suit the particular conditions at the location where the receiver is installed.

The following procedure should be used.

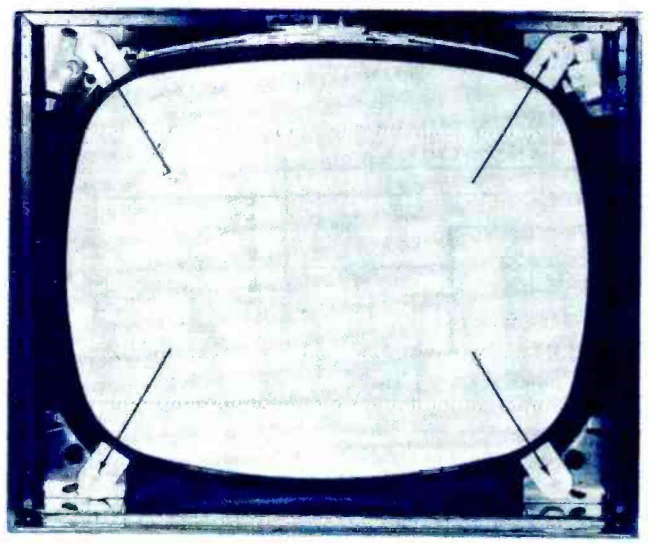
1. Turn the Station Selector to the channel on which the oscillator is to be adjusted.
2. Set the Fine Tuning control so that the flat on the shaft faces upward. The oscillator screw is accessible through the hole just below the tuning shaft.
3. Using an insulated alignment tool, adjust the screw for best picture and sound.

UHF TUNER 89 014 081

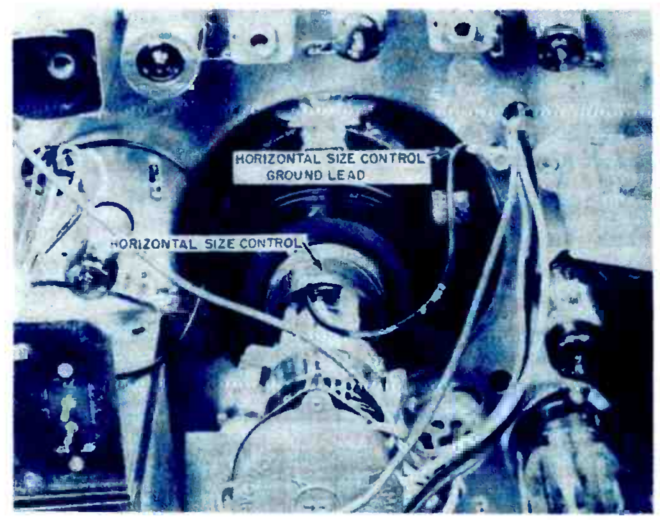




Location of RA-380/381 antenna bracket screws holding chassis to the cabinet.



RA-380/381 cabinet with mask and safety glass removed showing the location of the four hex-head nuts holding the CRT harness assembly.



Location of the RA-380/381 Horizontal size control and its chassis ground lead.

TECHNICIAN
CIRCUIT DIGESTS

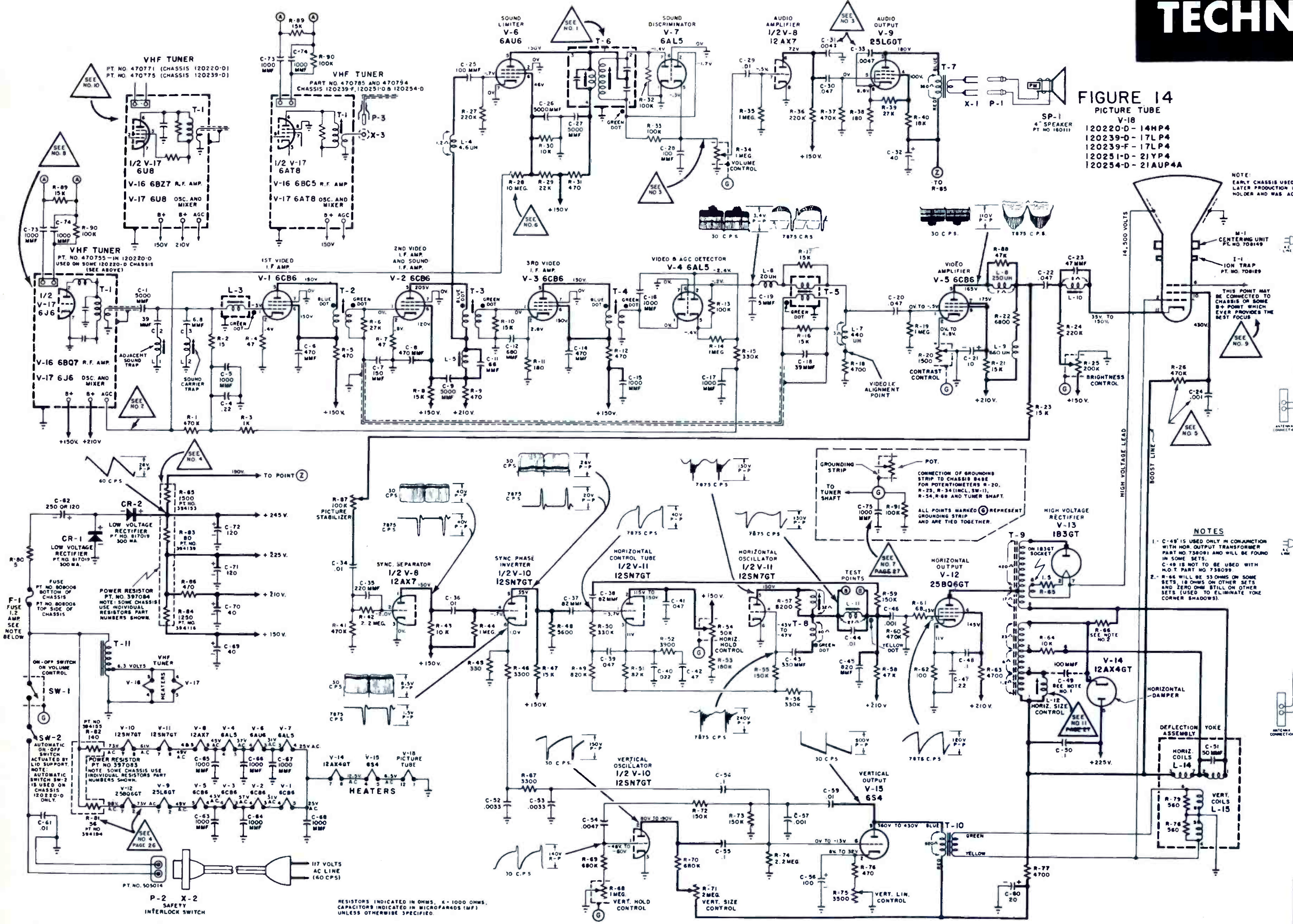


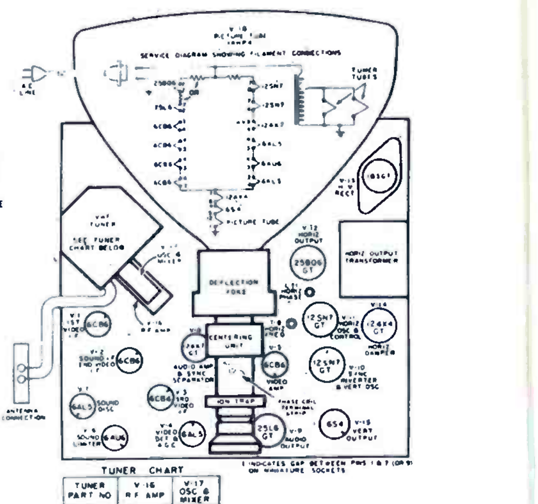
FIGURE 14
PICTURE TUBE
V-18
120220-D - 14HP4
120239-D - 17LP4
120239-F - 17LP4
120251-D - 21YP4
120254-D - 21AUP4A

NOTE:
EARLY CHASSIS USED A FUSE (F-1 PT NO 808006) WHICH WAS MOUNTED UNDER THE CHASSIS. LATER PRODUCTION USED A FUSE (F-1 PT. NO 808008) WHICH WAS MOUNTED IN A FUSE HOLDER AND WAS ACCESSIBLE FROM THE TOP SIDE OF CHASSIS.

NOTES

1.- C-49 IS USED ONLY IN CONJUNCTION WITH HOR. OUTPUT TRANSFORMER PART NO 738081 AND WILL BE FOUND IN SOME SETS.
C-49 IS NOT TO BE USED WITH H.O.T. PART NO. 738099.

2.- R-66 WILL BE 53 OHMS ON SOME SETS, 18 OHMS ON OTHER SETS AND ZERO OHM STILL ON OTHER SETS (USED TO ELIMINATE YOKE CORNER SHADOWS).



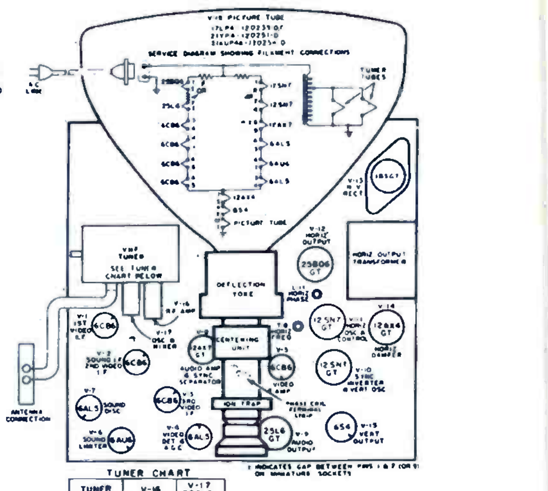
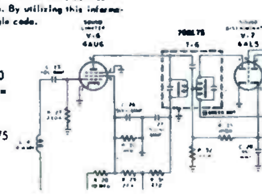


Figure 16 - TUBE LOCATIONS DIAGRAM FOR CHASSIS 120220-D, 120239-D, F., 120251-D, & 120254-D.

PRODUCTION CHANGES

In the course of production various changes were incorporated in the order shown below. Changes as listed under a particular letter also include changes as listed under all previous letters unless otherwise noted. All changes released after this note is printed will be sent out to our distributors in the form of field service bulletins. These should be kept together with the service note for future reference. By utilizing this information the schematic can be easily modified to correspond to a chassis of any triangle code.

1 - 120220-D, 120239-D chassis coded triangle A incorporate sound discriminator transformer pt. No. 708210 instead of pt. No. 708175. Location of R-33 and R-32 have been changed. All other chassis covered by this service note use the 708210 transformer in initial production.
The insert shown here is the connection of the 708175 transformer in uncoded 120220-D and 120239-D chassis.



2 - To eliminate the possibility of a hum bar in the raster:

On non-synchronous programs, it was sometimes noticed that a horizontal hum bar would move vertically in the background at a rate equal to the slight difference in frequency between the power fed to the transmitter and the television receiver. To eliminate this, a .047, 400 volt condenser, part #922554 has been added from the tuner AGC lug (at tuner) to the chassis.

Chassis already incorporating this change have been coded as follows:

120220-D B, 120239-D B, 120239-F A, 120251-D and 120254-D initial prod.

3 - To improve audio response:

a- A 6800 ohm 1/2 watt resistor has been placed in series with the top side of the volume control (between junction C-28, pin #5, 6AL5 and R-34).

b- A .0022 mf, 400 volt condenser has been placed across the volume control (R-34).

c- C-31 has been changed to .001 mf, 400 volt and C-33, to .01 mf, 600 volts. Chassis already incorporating this change are coded as follows:

120220-D C, 120239-D C, 120239-F 120251-D and 120254-D Initial Production.

Note: As production progressed, it was found that under certain conditions (variations in 12AX7 tubes), the above change had a tendency to cause audio buzz. This was eliminated, however, by changing C-31 back to its original value. This necessitated removing the 6800 ohm resistor and the added .0022 mf condenser in order to restore audio balance. C-33 was left at .01 mf, 600 volts.

Chassis already incorporating this changeover were coded as follows:

120239-D G, 120220-D G, 120239-F B, 120251-D and 120254-D Initial Production

4 - Use of individual power resistors instead of single multiply units:

To further simplify servicing of these chassis, individual power resistors are now use multiple resistor units. These are mounted on terminal board assemblies to the top side of the chassis. S- for part numbers of individual resistors.

EMERSON
Chassis 120220-D, 120239-D, 120239-F, 120251-D, 120254-D

Chassis 120220-D: Models 1030D, 1032D Chassis 120239-D: Models 1058D, 1060D, 1062D, 1064D Chassis 120239-F: Models 1060F, 1062F, 1062H Chassis 120251-D: Model 1104D Chassis 120254-D: Models 1106D, 1106F

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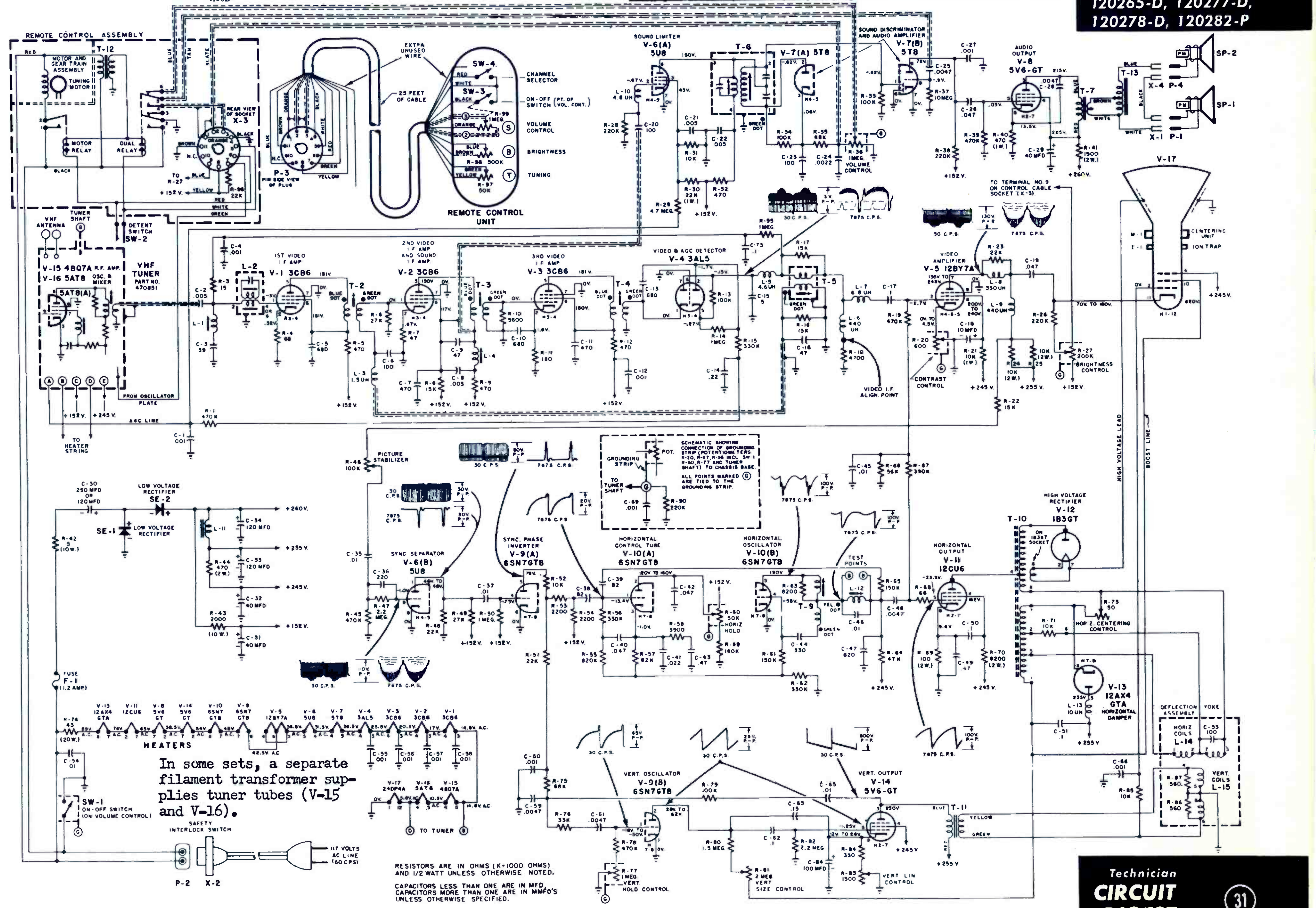
TECHNICIAN
CIRCUIT DIGEST

EMERSON
Chassis 120257-D, -P, 120258-D, 120263-D, -P, 120265-D, 120277-D, 120278-D, 120282-P

Chassis 120257-D: Models 1108D, 1110D, 1112D, 1116D, 1120D, 1126D, 1138D, 1140D, 1150D, 1152D, 1154D, 1162F
Chassis 120257-P: Models 1108F, 1126F, 1138F, 1140F, 1150F, 1152F, 1154F, 1162D, 1164D

Chassis 120258-D: Models 1109D, 1111D, 1113D, 1117D, 1121D, 1127D, 1139D, 1141D, 1151D, 1153D, 1155D, 1163D, 1165D
Chassis 120263-D: Models 1122D, 1124D, 1156F
Chassis 120263-P: Models 1122F, 1124F, 1156D, 1160D

Chassis 120265-D: Models 1123D, 1125D, 1157D, 1161D
Chassis 120277-D: Model 1144D
Chassis 120278-D: Model 1145D
Chassis 120282-P: Model 1158A

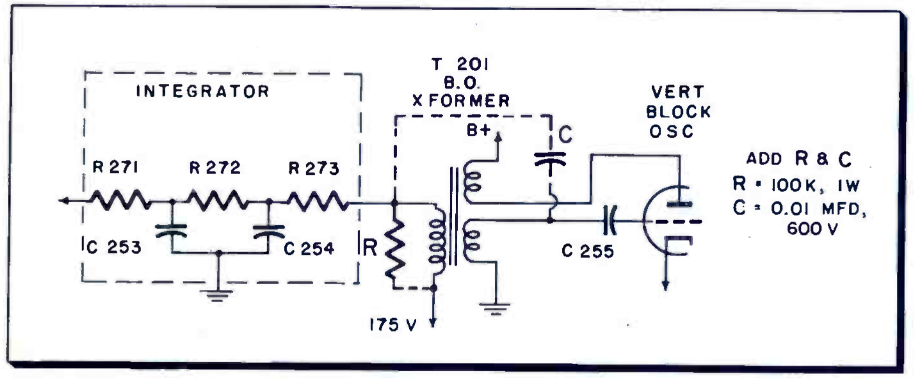


Shop Hints

Simple Xformer Repair

This is a suggestion for a quick, inexpensive repair on older receivers similar to the Du Mont RA-103. The same circuit was used in many receivers made by Crosley and other manufacturers. When these sets lose vertical sync, the cause is often an open winding (primary) in the vertical blocking oscillator transformer. As shown, this circuit uses three instead of two windings on the transformer, with transformer coupling of the sync pulse from the vertical integrating network to the grid of the oscillator, instead of direct coupling. When this occurs, the fault can be corrected without the necessity of transformer replacement, simply by converting the circuit to use the conventional direct coupling from integrator to oscillator grid found in most b-o circuits. Only two additional parts are needed: a 0.01-mfd condenser at 600 volts and a 100k (1-watt) resistor. They are inserted where shown in the illustration.—*Donald F. Marcy, Seaside Heights, New Jersey.*

If defective, the primary of this blocking-oscillator transformer need not be replaced.



Cure for Noisy Speakers

When rattling or distorted output is the result of a defective speaker cone, I have found that coating the defective cone with ordinary shellac will instantly stop the noise in most cases. Apply shellac to the cone with the radio playing. By the time the application is completed, the noise should be all gone. Make sure to get the shellac on heavy around the edge of the cone.

The writer has repaired many speaker cones in this way, several of which have been in use for six months or more. They are still working as good as new, with no apparent need to replace the cones.—*W. C. Beasley, Arcanum, Ohio.*

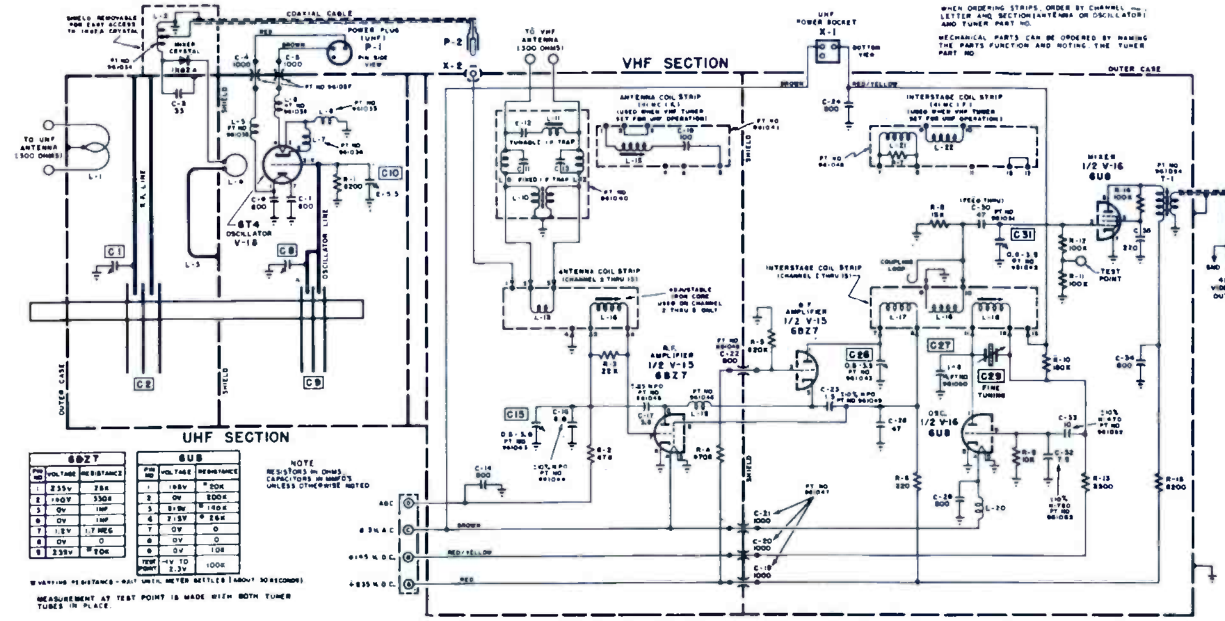


Figure 13. SCHEMATIC DIAGRAM OF UHF-VHF TUNER 470800 USED ON CHASSIS 120258-D, 120265-D and 120278-D.

UHF - VHF TUNER PART NO. 470800

RESISTANCE READINGS

SYMBOL	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V-1	1.3 Meg	68	*2.8	*3.9	*17K	*17K	0		
V-2	2.0	47	*3.9	*4.8	*17K	*30K	0		
V-3	0	180	*4.8	*5.8	*17K	*17K	0		
V-4	0	1.0 Meg	*5.8	*6.5	90K	0	4.7 K		
V-5	Contrast Cont. 0 to 600	470K	0	*8.6	*8.6	*10	*23K	30K	0
V-6	17K	220K	8.5K	*7.5	*8.6	*17K	0	0	2.7 Meg.
V-7	90K	90K	170K	*7.5	*6.5	0	0	1.0 Meg	*250K
V-8	N.C.	*14	*21K	*20K	470K	N.C.	*15	470	
V-9	Vertical Hold 470K to 1.5 Meg	*INF.	0	1 Meg.	*30K	0	*11.5	*10	
V-10	1.4 Meg.	*Horiz. Hold 18K to 45K	420K	480K	*60K	0	*11.5	*13	
V-11	N.C.	*17.2	N.C.	*35K	400K	N.C.	*15	100	
V-12	D O	N O T	M E A S U R E						
V-13	N.C.	N.C.	Inf.	N.C.	*18K	N.C.	*17.2	*19.6	
V-14	N.C.	*13	*18K	*18K	2.2 Meg.	N.C.	*14	Vertical Lin. 330 to 1800	

SYMBOL	PIN 1	PIN 2	PIN 6	PIN 10	PIN 11	PIN 12
V-17	0	10K	*18K	*Inf.	Bright Control 220K to 300K	*2.8

*Indicates varying resistance - wait until meter settles (about 30 seconds.)

EMERSON
Chassis 120257-D, 120257-P, 120258-D, 120263-D, 120263-P, 120265-D, 120277-D, 120278-D, 120282-P

Technician CIRCUIT DIGEST 32

TUNER TROUBLE SHOOTING CHART

V-15 6BZ7 or 6BQ7A	PIN NO.	NORMAL READINGS VOLTAGE	RESISTANCE
	Pin 1	235V.	*30K
	Pin 2	155V.	400K
	Pin 3	0V.	INF.
	Pin 6	0V.	INF.
	Pin 7	1.26V.	1.4 MEG.
	Pin 8	0V.	0V.
	Pin 9	260V.	*27K

V-16 6U8	PIN NO.	NORMAL READINGS VOLTAGE	RESISTANCE
	Pin 1	145V.	*23K
	Pin 2	0V.	220K
	Pin 3	235V.	*140K
	Pin 6	235V.	*27K
	Pin 7	0V.	0
	Pin 8	0V.	0
	Pin 9	0V.	10K
	Test Point	-.6V to -2.3V	100K

V-15 4BQ7A	PIN NO.	NORMAL READINGS VOLTAGE	RESISTANCE
	Pin 1	126V.	INF.
	Pin 2	-.72V.	1.3 MEG.
	Pin 3	0V	0
	Pin 6	234V.	20K
	Pin 7	126V.	400K
	Pin 8	126V.	INF.

V-16 5AT8	PIN NO.	NORMAL READINGS VOLTAGE	RESISTANCE
	Pin 1	-3.5V.	10.5 K
	Pin 2	100V.	*22K
	Pin 3	0V	0
	Pin 6	132V.	*17K
	Pin 7	95V.	*72K
	Pin 8	0V	0
	Pin 9	2.8V	250K
	Test Point	-3.6 to -4.2K	220K

*Varying Resistance Wait Until Meter Settles.

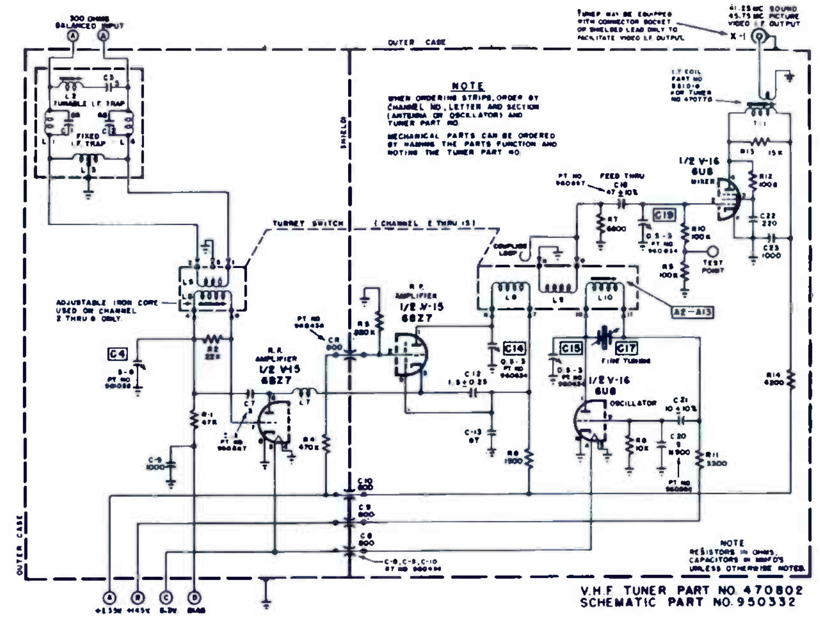


Figure 14 - SCHEMATIC DIAGRAM OF TURRET TYPE TUNER PT. NO. 470802 USED ON VHF CHASSIS 120257-D, 120263-D.

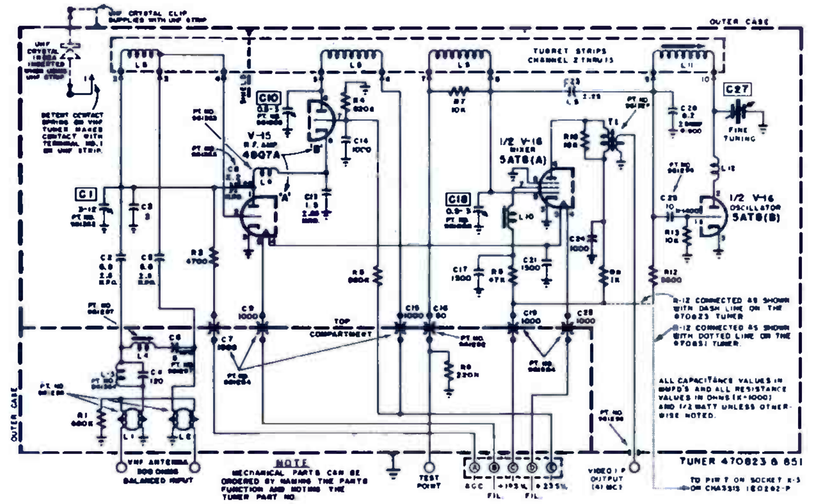


Figure 15 - SCHEMATIC DIAGRAM OF TURRET TYPE TUNER PT. NO. 470823 USED ON VHF CHASSIS 120257-P, 120263-P AND TUNER 470851 USED ON CHASSIS 120282-P.

PRODUCTION CHANGES

In the course of production various changes were incorporated in the order shown below. Changes as listed under a particular letter also include changes as listed under all previous letters unless otherwise noted. All changes released after this note is printed will be sent out to our distributors in the form of field service bulletins. These should be kept together with the service note for future reference. By utilizing this information the schematic can be easily modified to correspond to a chassis of any triangle code.

1- 120257-D and 120258-D chassis coded Triangle A already have the following changes incorporated.

a) An R. F. choke part #708021 has been added from pin #5 of 12AX4 to plus 245 volts to reduce the possibility of oscillation at the extreme left hand edge of the raster.

b) A 220,000 ohm 1/2 watt resistor has been added from the front picture tube mounting bracket to chassis to eliminate the possibility of a static charge building up on this insulated bracket.

c) C-9, 47 mmf has been changed to a 39 mmf capacitor (part #928082 to make up for additional capacity of a longer shielded sound reflex lead.
Note: Above changes are already shown in the service note schematic.

2- To reduce tuner overload in very strong signal areas.

Tuner overload can result in streaky pictures, an interfering beat, cross modulation effect, etc. To increase the point at which tuner overload takes place, the following A.G.C. change has been made.

a) Omit R-2 (1,000 ohm, 1/2 watt resistor).

b) Add a 1 meg 1/2 watt resistor from junction of R-17, L-5 to terminal strip lug previously holding R-2 (1,000 ohm).

c) Add a .1 200 volt capacitor part #922315 from this same terminal strip lug to chassis.

Chassis already incorporating this change are coded as follows:

120257-D, 120258-D (Triangle B) — 120263-D, 120265-D (Triangle A) — (120257-P, 120263-P) initial (120278-D, 120282-P) production (Triangle)

3- To improve audio response at high volume settings.

R-37 was changed from 1 meg to 10 meg on chassis coded as shown above. This change increases the grid bias on the tube and allows for additional undistorted audio output.

4- On 21" chassis 120257-D and 120258-D, R-70 (15,000 ohm, 2 watt) horizontal output screen resistor has been changed to 10,000 ohm, 2 watt part #760732. This change was made to increase horizontal picture size and picture tube second anode voltage. 120257-D and 120258-D chassis already incorporating this change are coded Triangle C.

5- To increase tuner gain and provide for optimum field adjustment of tuner A.G.C. delay.

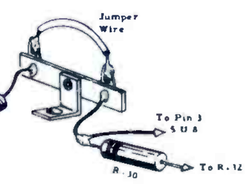
a) R-29 has been changed from 10 meg to 4.7 meg.

b) The lead from R-30 (22K) to R-29 has been removed.

c) A two lug terminal strip has been added to the top of the chassis. A jumper wire is connected between the two lugs. One lug is then connected to R-30 and the other to R-29 to replace lead removed in "b" above.

Chassis already incorporating this change are coded as follows:

120257-D, 120258-D (Triangle D) — 120263-D, 120265-D (Triangle B) — 120257-P, 120263-P) initial 120278-D, 120282-P) production (Triangle)



By means of this top of chassis terminal strip, the value of the delay resistor can be increased to any value above 4.7 meg. If tuner overload results in strong signal areas, add a 5 or 10 meg resistor in place of the jumper wire on the terminal strip to eliminate it. In very strong signal areas, the A.G.C. delay can be eliminated by clipping the jumper wire. This increases the A.G.C. voltage to a minimum reducing the gain of the tuner.

6- 120257-D and 120258-D chassis coded Triangle D1 use horizontal output transformer part #738111 instead of part #738106. This entails the following changes. Performance is not affected by this change.

a) R-70 is changed to 8,200 ohms, 2 watts.

b) R-72 and C-52 are removed from the circuit.

c) C-49 is changed to a .22 mfd, 200 volt capacitor part #922325.

Note: The suffix #1 denotes the use of this horizontal output transformer and not the triangle letter. In other words, if a triangle E change is made at a later date and has suffix #1, it will indicate the use of #738111 horizontal output transformer. If no suffix #1 is used with triangles D, E, F, etc., then #738106 is used.

7- 120263-D and 120265-D chassis coded with a suffix No. 1 within the triangle such as triangle B1, use a picture tube with an R.T.M.A. vendor code no. 188. The screen of these picture tubes are connected directly to B+ boost (Junction C-51, Lug No. 1 on H.O.T.).

8- To reduce residual audio buzz.

Chassis coded as shown below incorporate the addition of a 1000 MMF condenser across R-91 (120257-D and 120258-D only) and also the reversing of the wire to the secondary of the Sound take-off transformer (T-5).

120257-D, 120258-D (Triangle E1) — 120263-D, 120265-D (Triangle C) — 120257-P, 120263-P) initial 120278-D, 120282-P) production (Triangle)

TECHNICIAN
CIRCUIT DIGEST

EMERSON
Chassis 120292-P, 120292-V, 120299-V, 120293-T, 120293-X, 120300-X

Chassis 120292-P, -V: Models 1176, 1178, 1180 Chassis 120299-V: Models 1186, 1188 Chassis 120293-T, -X: Models 1177, 1179, 1181 Chassis 120300-X: Models 1187, 1189

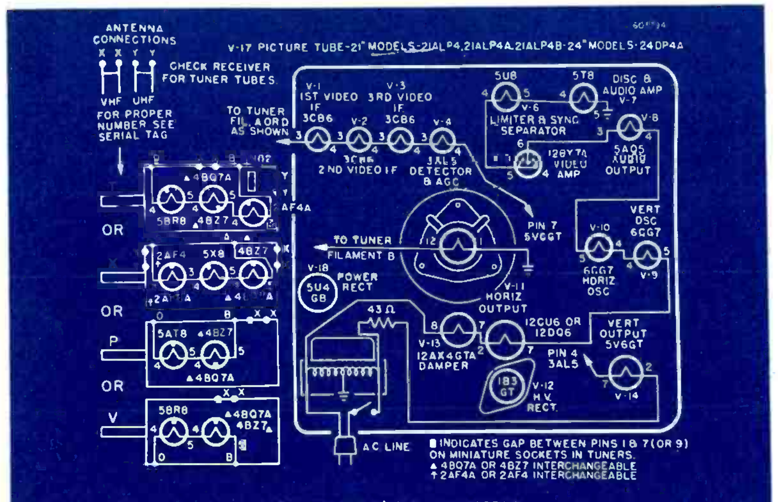
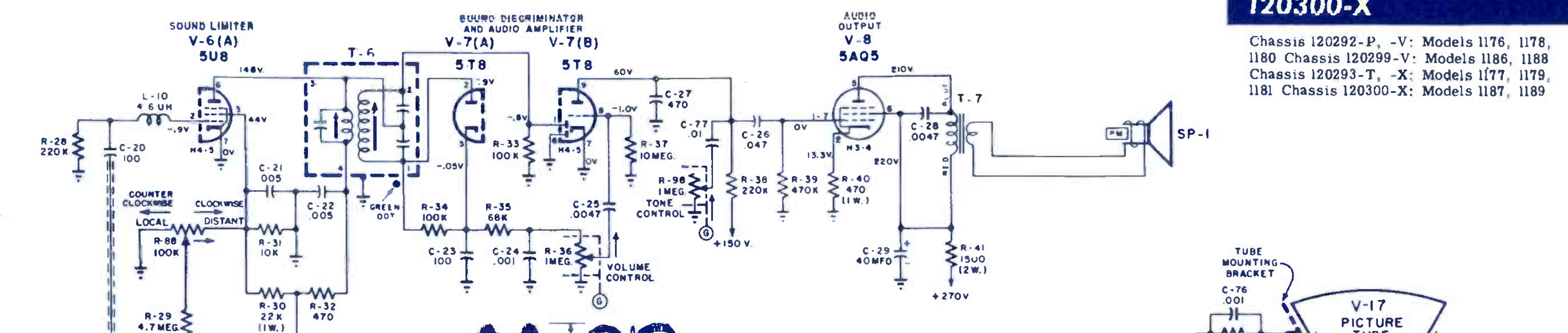
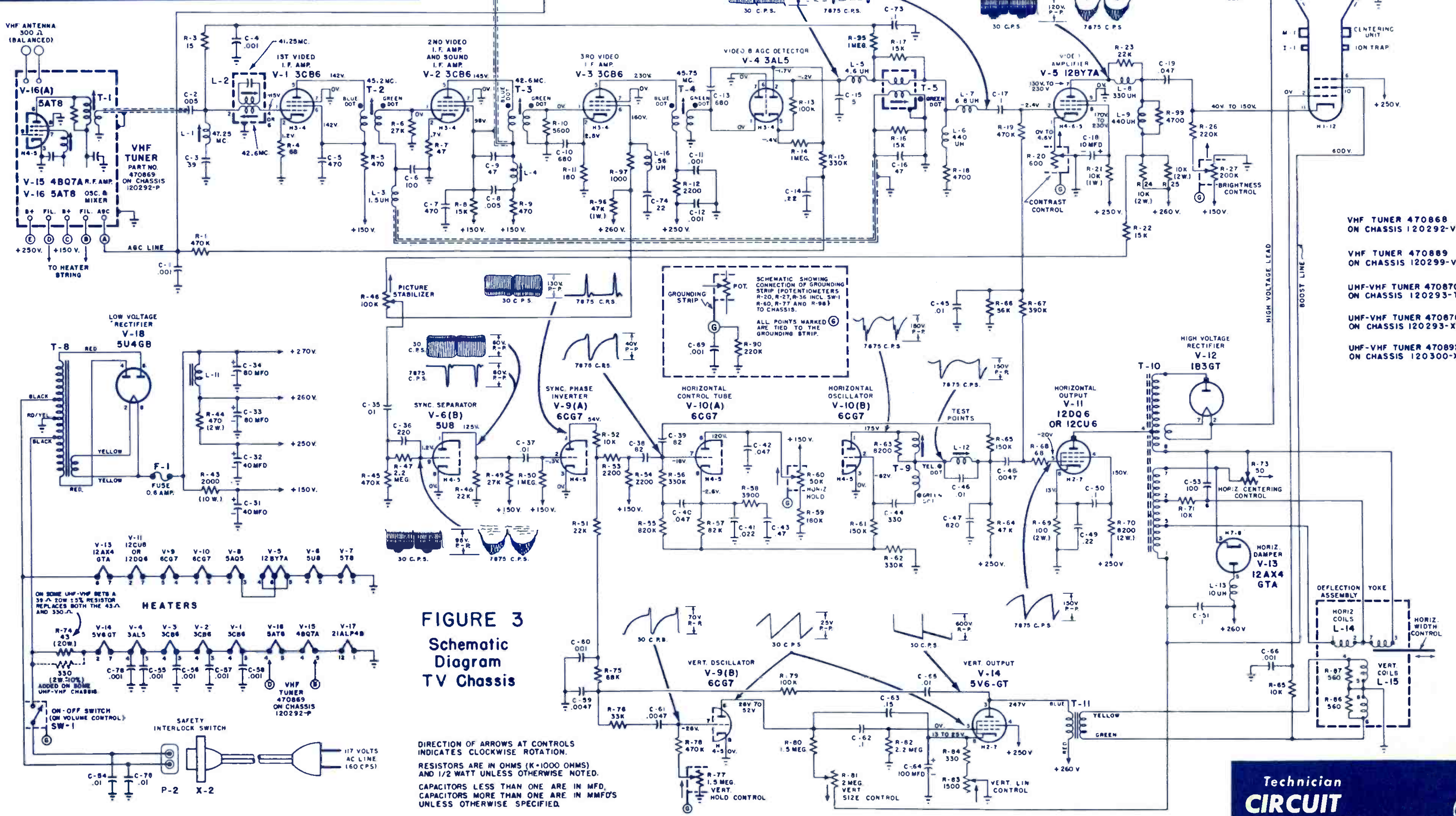


Figure 1 – TUBE LOCATION DIAGRAM





VHF TUNER 470868 ON CHASSIS 120292-V.

VHF TUNER 470869 ON CHASSIS 120299-V.

UHF-VHF TUNER 470870 ON CHASSIS 120293-T.

UHF-VHF TUNER 470876 ON CHASSIS 120293-X.

UHF-VHF TUNER 470892 ON CHASSIS 120300-X.

FIGURE 3
Schematic Diagram TV Chassis

DIRECTION OF ARROWS AT CONTROLS INDICATES CLOCKWISE ROTATION.

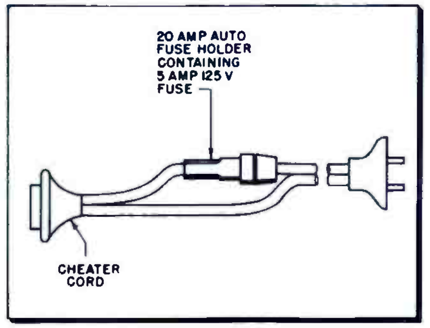
RESISTORS ARE IN OHMS (K=1000 OHMS) AND 1/2 WATT UNLESS OTHERWISE NOTED.

CAPACITORS LESS THAN ONE ARE IN MFD, CAPACITORS MORE THAN ONE ARE IN MMFD'S UNLESS OTHERWISE SPECIFIED.

Shop Hints

Fused Cheater Cords

To prevent the possibility of blowing the ac fuse in the home of a customer and creating the extra difficulties associated with such an occurrence, we fuse all cheater cords used in servicing. A 5-amp 125-v fuse is put in one leg of each cheater by inserting a plastic fuse holder, as shown in the illustration, in the cord. The holder used is the type made to accommodate a 20-amp auto-radio fuse.—*Joseph F. Valenti, Bronx, N. Y.*



Fused cheater cords facilitate field work.

A Musical Slant

A handy accessory that we have been using around the shop for the past two years is an ordinary music stand. We use it as a stand for holding circuit diagrams. It helps provide more bench elbow room; it can be adjusted to a comfortable viewing level; and it is light enough to be moved out of the way without difficulty when it is not in use.—*Pat E. McGee, Monmouth, Illinois.*

Simple Fuse Check

On many models of TV receivers made during the past few years, particularly some by Motorola, both the high-voltage fuse and the h-v rectifier are located under the chassis, thus making a check of these parts difficult without removal of the set from its cabinet. To overcome this obstacle, I take a capacitor of 0.1 mfd or larger, rated at 600 volts, and contact the positive lead to the cap of the horizontal output tube. The other lead is touched to the chassis. If there is a charge spark, the fuse is good. If there is no spark, the fuse is bad or there is no B-plus for some other reason. In any case, the set will then have to be pulled. Be careful not to use a capacitor too large in value. If you do, the surge current may blow out a perfectly good fuse. —*J. Lee Elmore, Cambridge, Massachusetts.*

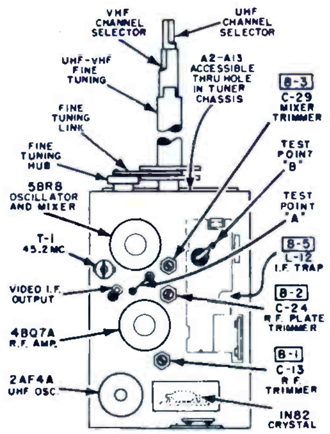


FIGURE 2
ALIGNMENT POINTS

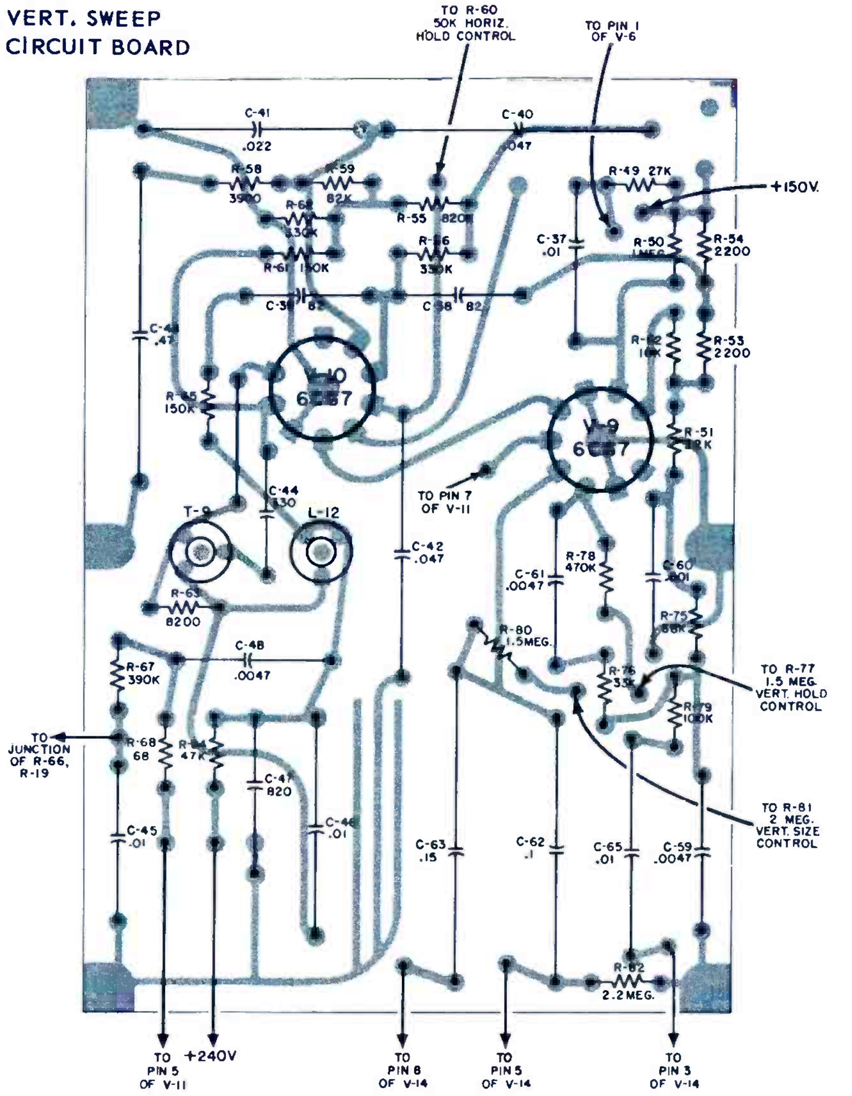
SERVICING OF PRINTED BOARDS

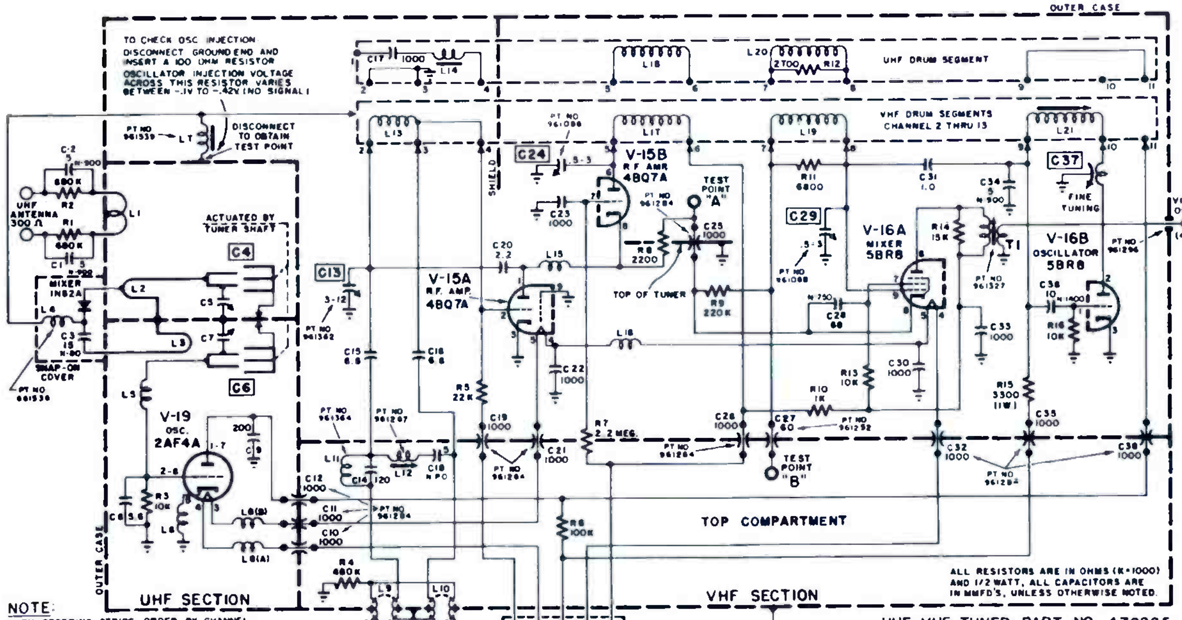
To remove defective components one of several methods may be used. A recommended method is to cut close to the body of the defective component and solder the new part to the remaining leads. Another method is to apply heat at the junction point of the component wire lead and the printed board and lift out the component. If the wire lead is bent over, first heat and pry lead wire up. A defective component with many terminals may be removed by clipping into several parts and removing a small section at a time.

Use a low wattage (20 to 30 watts) soldering iron. Be careful not to apply excessive heat since this may cause the printed foil to loosen. Broken foil leads may be repaired by soldering a hookup wire across the break.

A small stiff bristled brush should be used to wipe away melted solder before it has a chance to accumulate or drip on adjacent parts or printed wiring.

HORIZ. & VERT. SWEEP PRINTED CIRCUIT BOARD





NOTE: WHEN ORDERING STRIPS, ORDER BY CHANNEL NO., LETTER AND TUNER PART NO. MECHANICAL PARTS CAN BE ORDERED BY NAMING THE PARTS FUNCTION AND NOTING THE TUNER PART No.

FIGURE 1 – SCHEMATIC DIAGRAM OF UHF-VHF TURRET TYPE TUNER PART NO. 470825 USED IN CHASSIS 120285-T & 120287-T

EMERSON
Chassis 120292-P, 120292-V, 120299-V, 120293-T, 120293-X, 120300-X

Technician **CIRCUIT DIGEST**
34

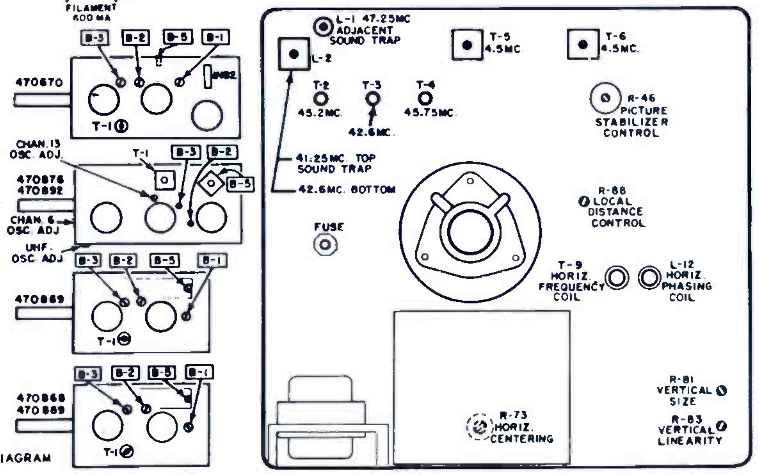
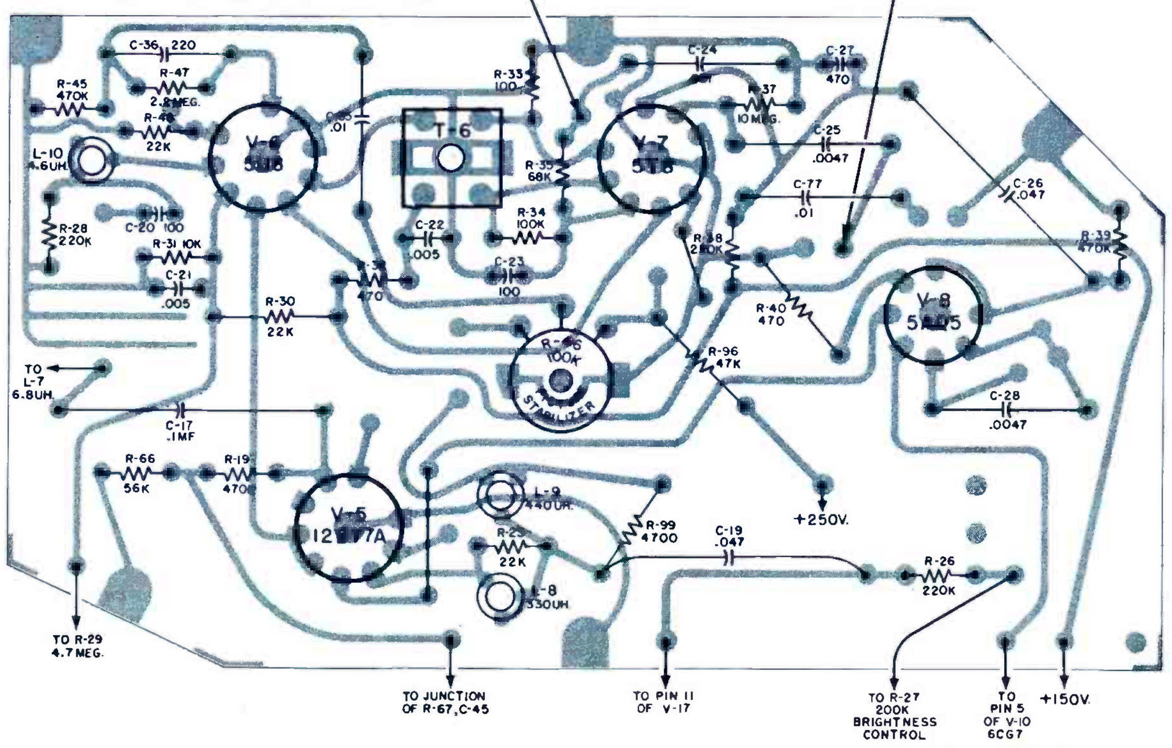


Figure 2 – ALIGNMENT POINT DIAGRAM

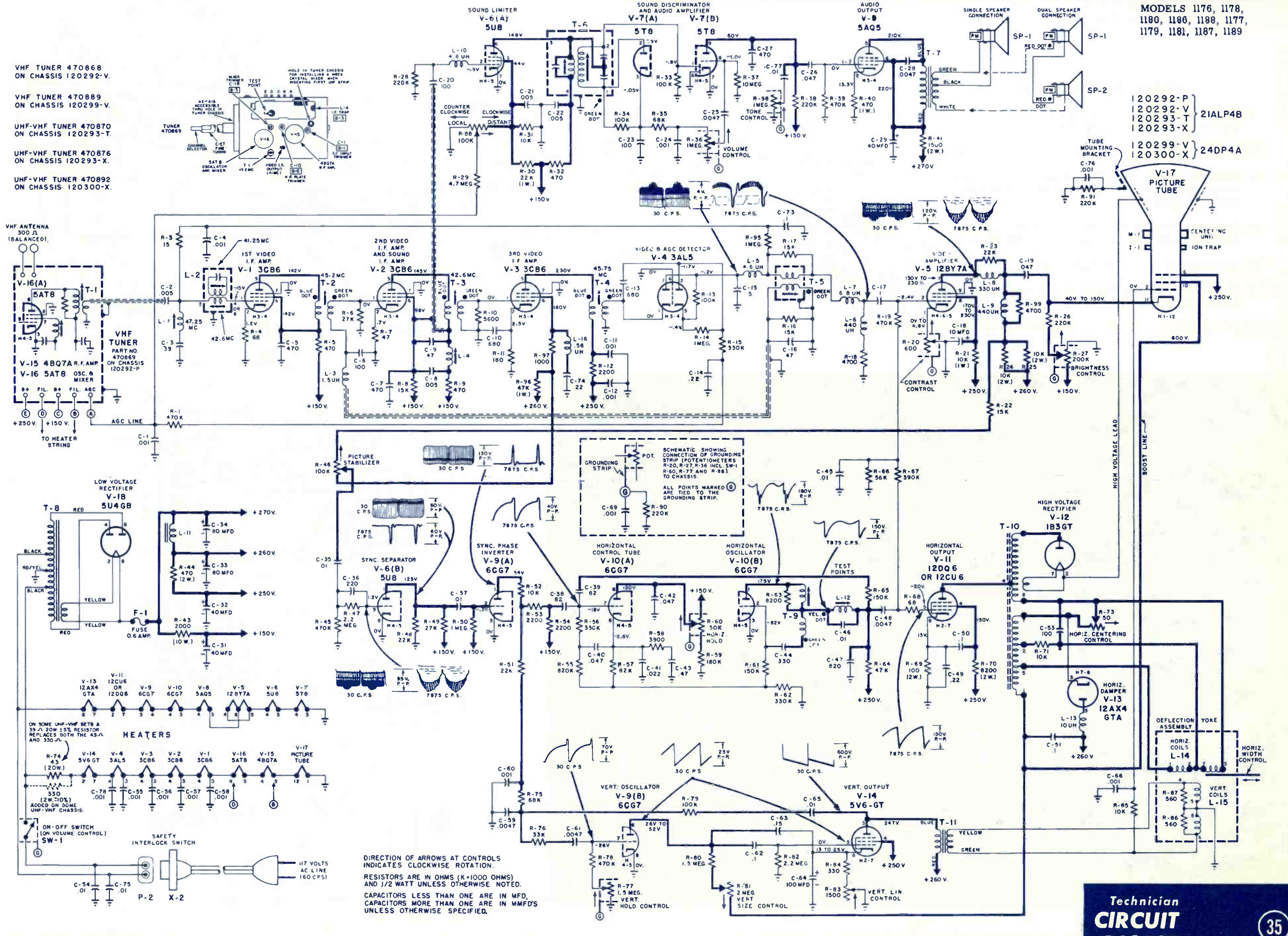
SOUND & VIDEO PRINTED CIRCUIT BOARD



TECHNICIAN CIRCUIT DIGEST

EMERSON
Chas 120292-P, 120292-V, 120299-V, 120293-T, 120293-X, 120300-X

MODELS 1176, 1178, 1180, 1186, 1188, 1177, 1179, 1181, 1187, 1189

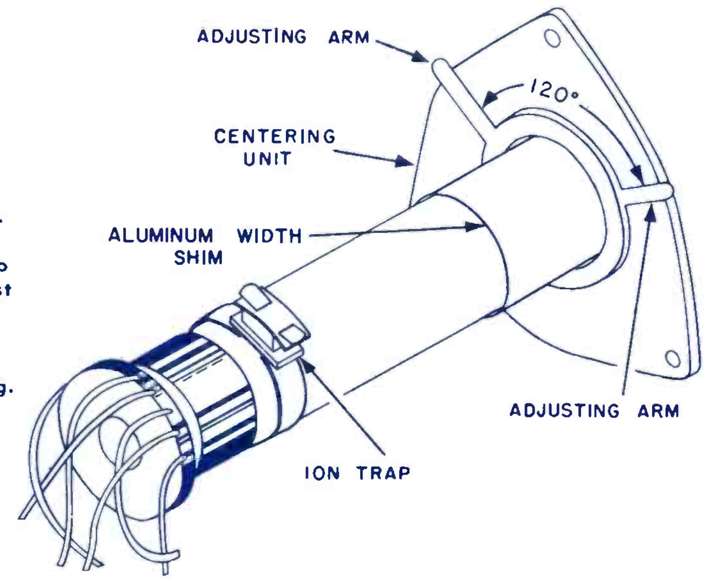


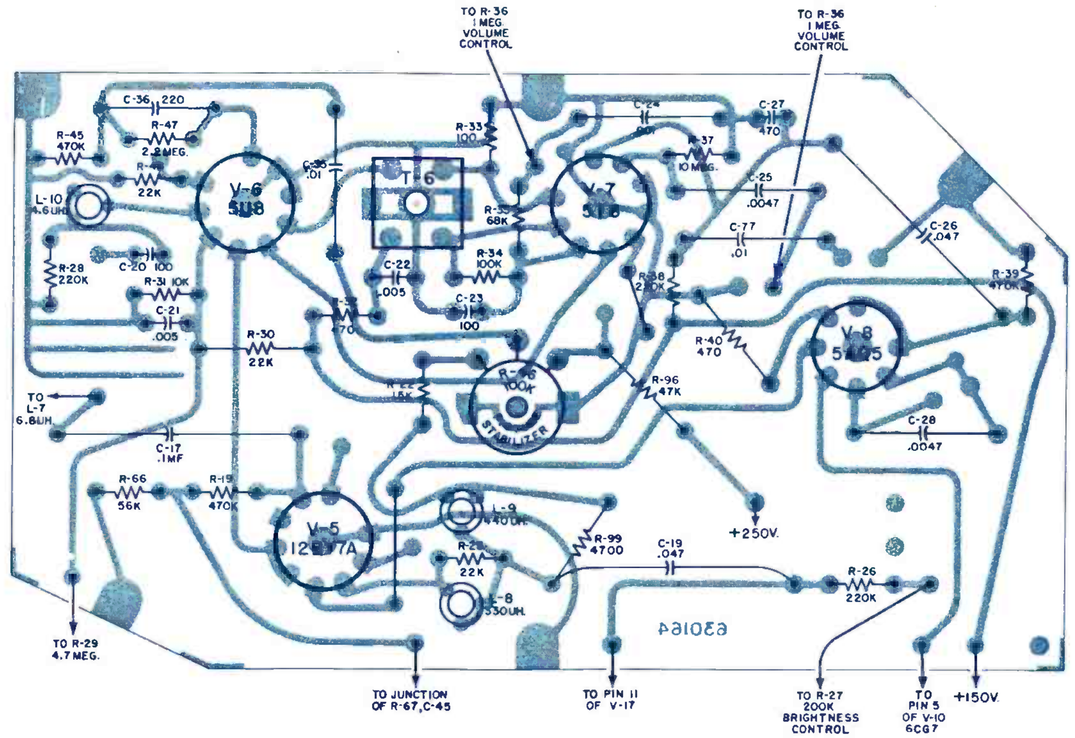
EMERSON
Chassis 120292-P, -V, 299-V, 293-T, -X, 300-X

Technician **CIRCUIT DIGEST**

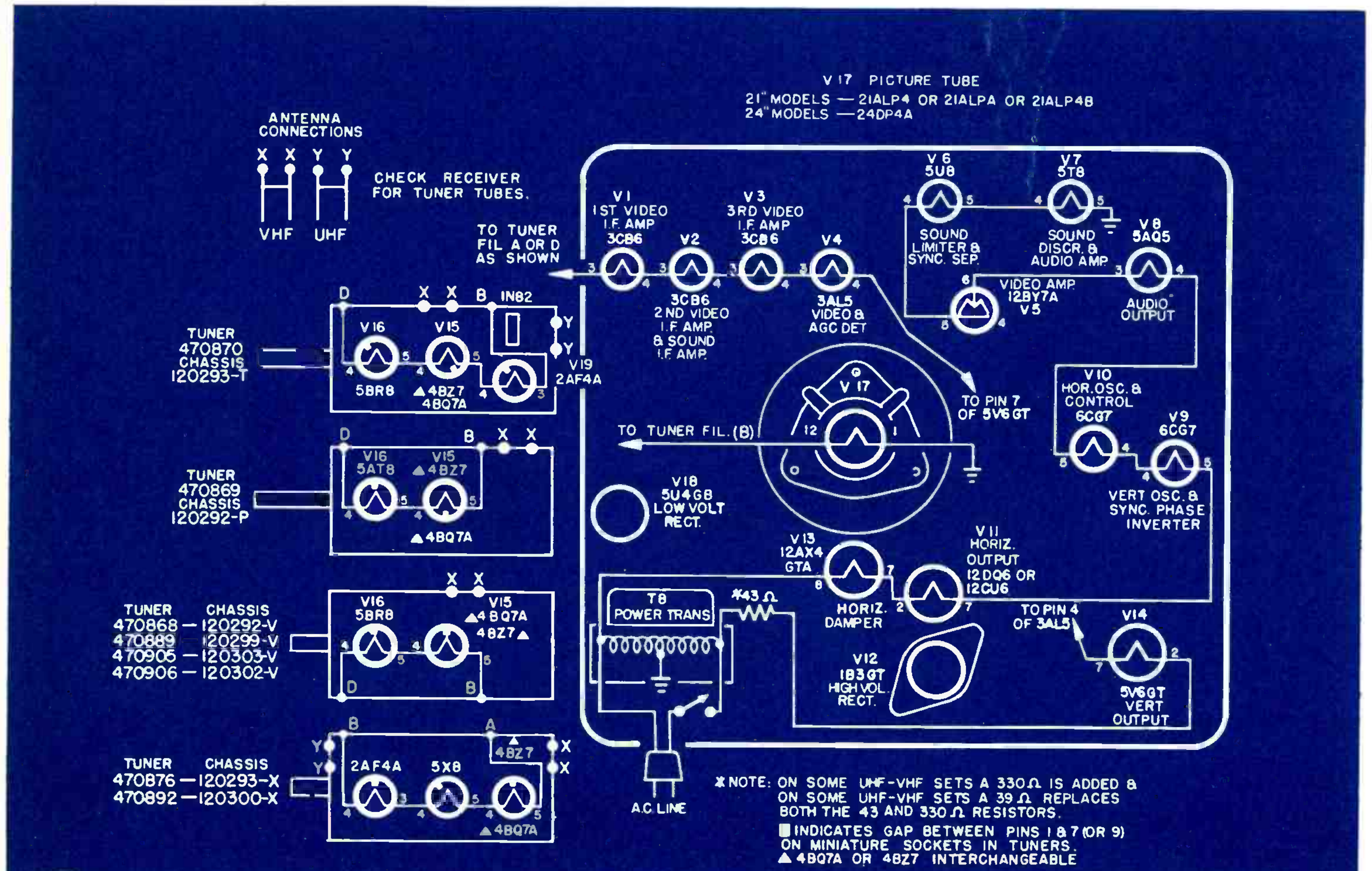
CENTERING PROCEDURE

1. Set the magnets so that the adjusting arms are approximately 120° apart (Figure 2).
2. Adjust the ion trap magnet for maximum brightness.
3. Rotate the whole unit, this will cause the picture to move around a circle. Stop where the picture is most nearly centered.
4. Rotate the magnets separately, in equal distances but in opposite directions to complete the centering.
5. Repeat Steps 3, 4 and 5 if necessary.
6. Readjust the ion trap magnet to give maximum brightness.

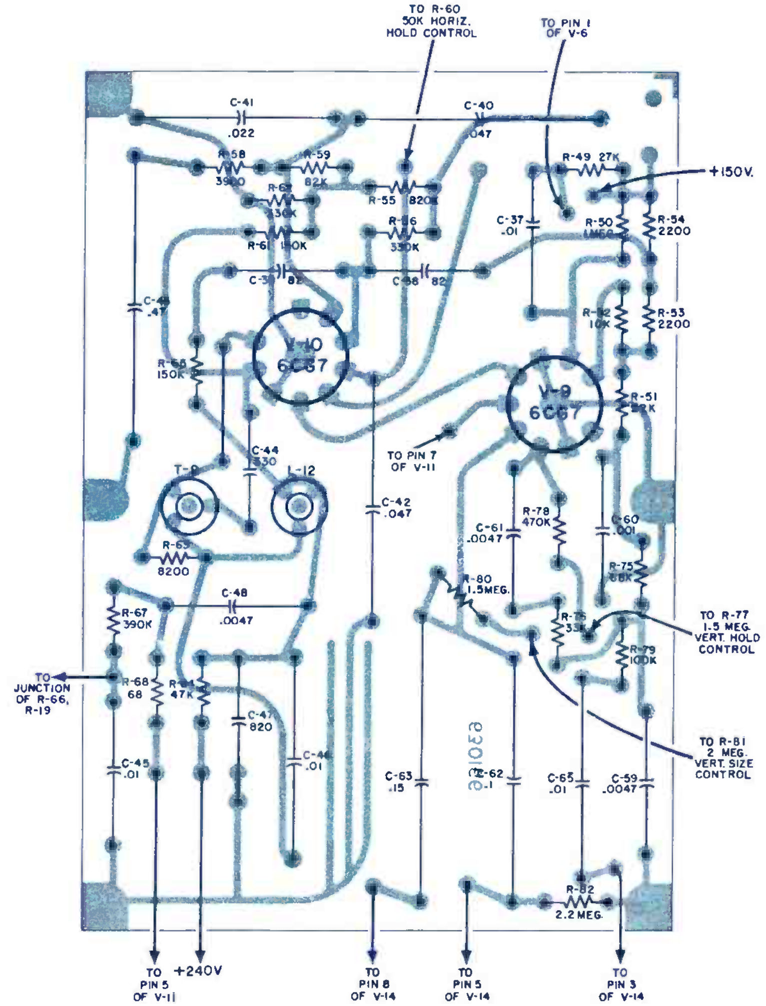




SOUND & VIDEO PRINTED CIRCUIT BOARD



TUBE LOCATIONS DIAGRAM



HORIZ. & VERT. SWEEP PRINTED CIRCUIT BOARD

More Data on Reverse Side

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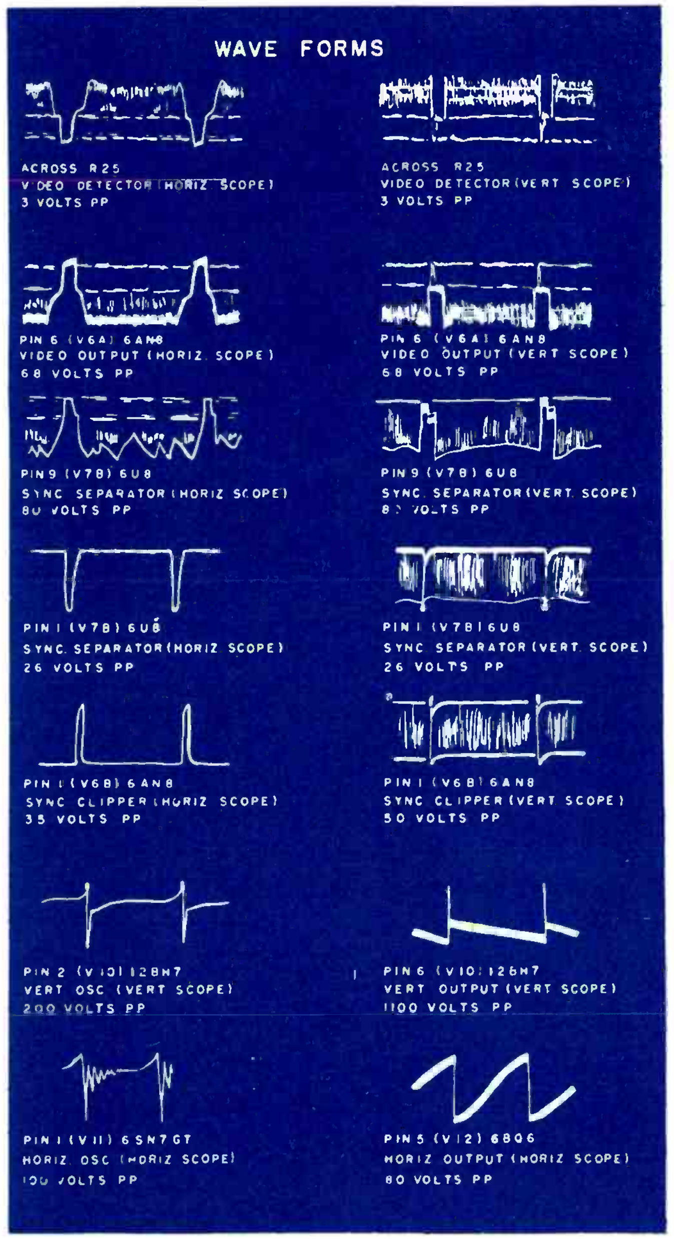
TECHNICIAN CIRCUIT DIGEST

FADA Deluxe 400 Series Chassis

Deluxe 400 Series Chassis: Models DL400T, DL400TLO, DL400TB, DL400TBLO, DL400K, DL400KLO, DL400KD



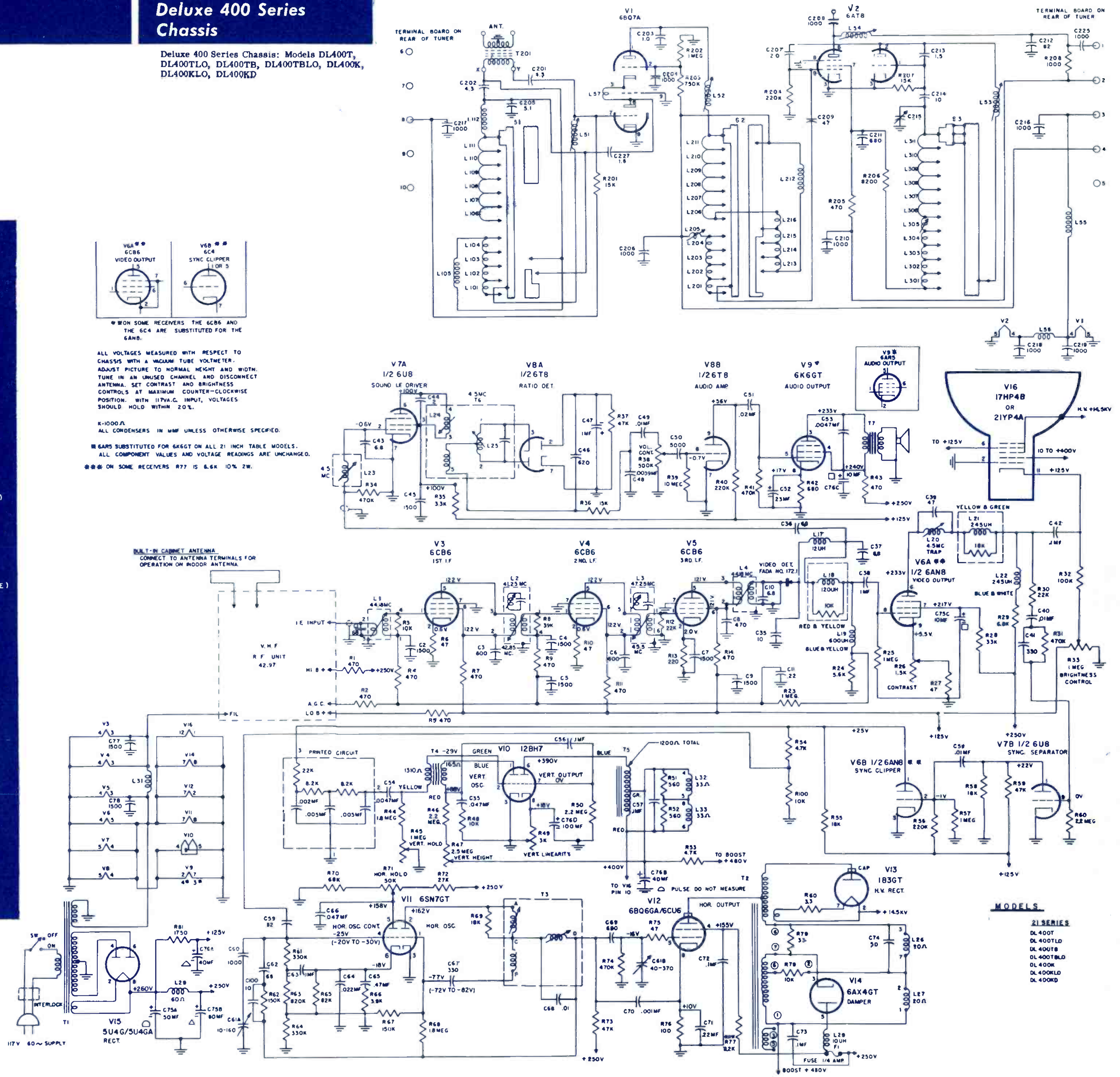
✱✱ ON SOME RECEIVERS THE 6CB6 AND THE 6C4 ARE SUBSTITUTED FOR THE 6AN8.

ALL VOLTAGES MEASURED WITH RESPECT TO CHASSIS WITH A VACUUM TUBE VOLTMETER. ADJUST PICTURE TO NORMAL HEIGHT AND WIDTH. TUNE IN AN UNUSED CHANNEL AND DISCONNECT ANTENNA. SET CONTRAST AND BRIGHTNESS CONTROLS AT MAXIMUM COUNTER-CLOCKWISE POSITION. WITH 117V A.C. INPUT, VOLTAGES SHOULD HOLD WITHIN 20%.

K-1000Ω
ALL CONDENSERS IN MMF UNLESS OTHERWISE SPECIFIED.

■ 6AR5 SUBSTITUTED FOR 6K6GT ON ALL 21 INCH TABLE MODELS. ALL COMPONENT VALUES AND VOLTAGE READINGS ARE UNCHANGED.

✱✱✱ ON SOME RECEIVERS R77 IS 6.6K 10% 2W.



MODELS

21 SERIES
DL 400T
DL 400TLO
DL 400TB
DL 400TBLO
DL 400K
DL 400KLO
DL 400KD

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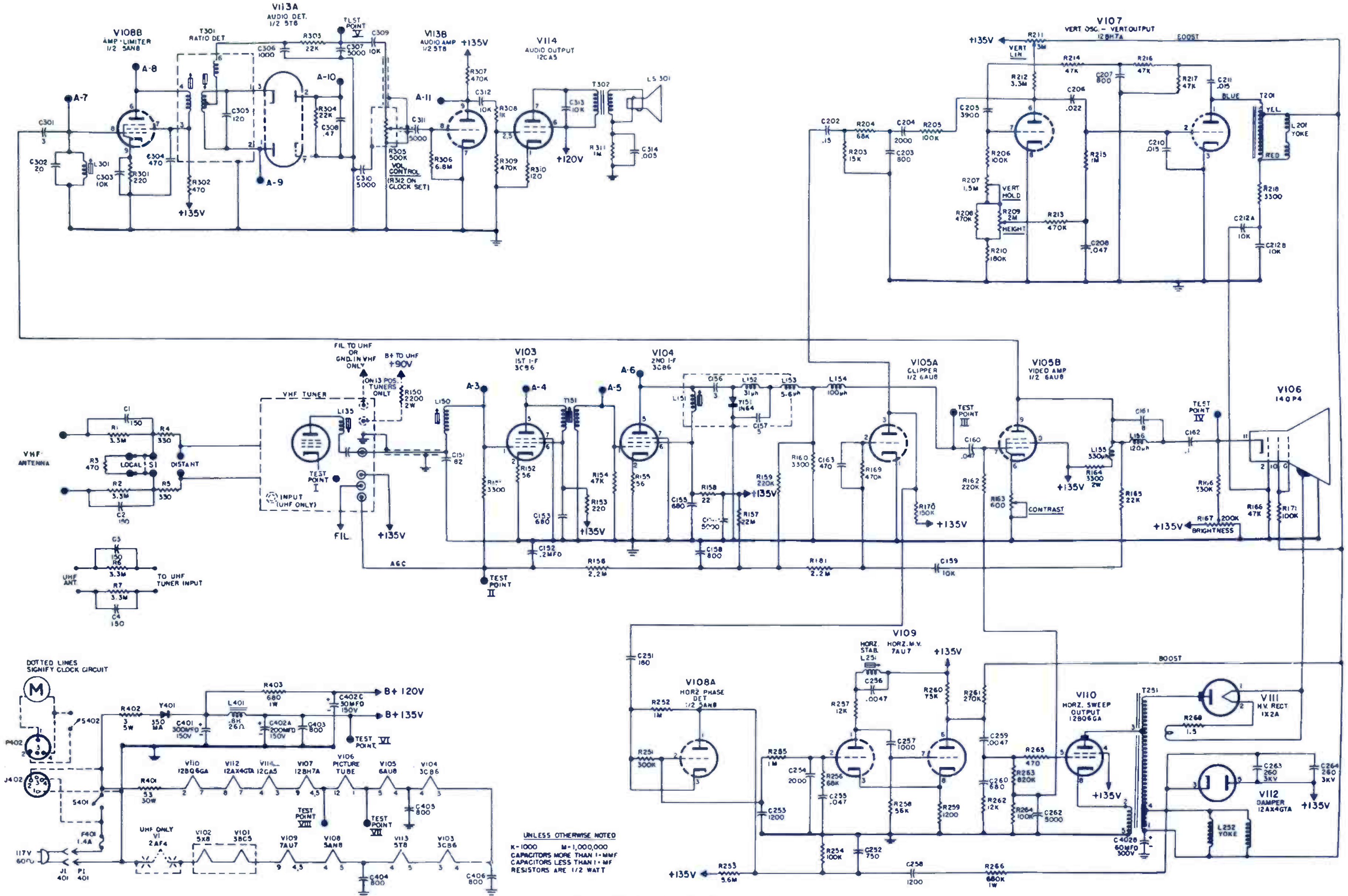

FIGURE 4. MAIN CHASSIS SCHEMATIC

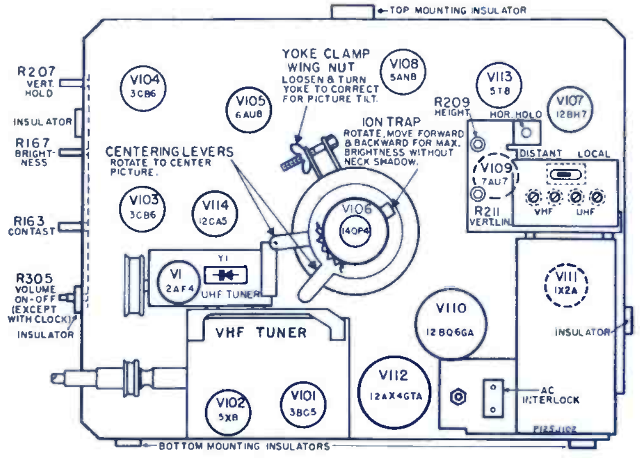

FIGURE 1. REAR VIEW SHOWING TUBES & CONTROLS

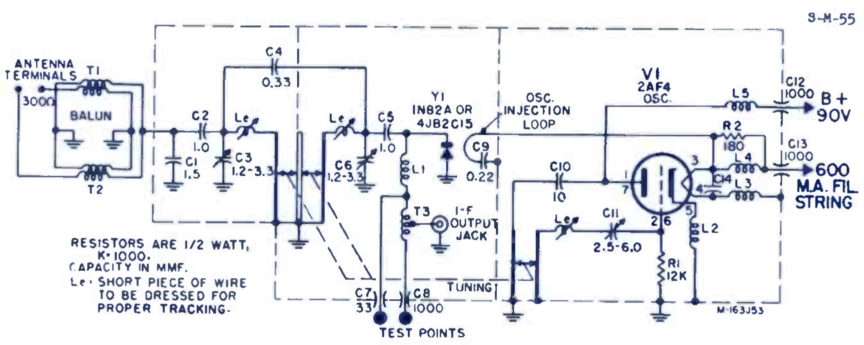

FIGURE 5. UHF TUNER SCHEMATIC RUX-013

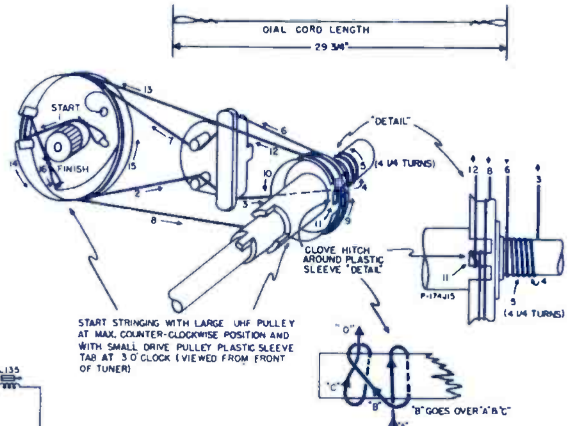

FIGURE 6. UHF TUNER DIAL STRINGING

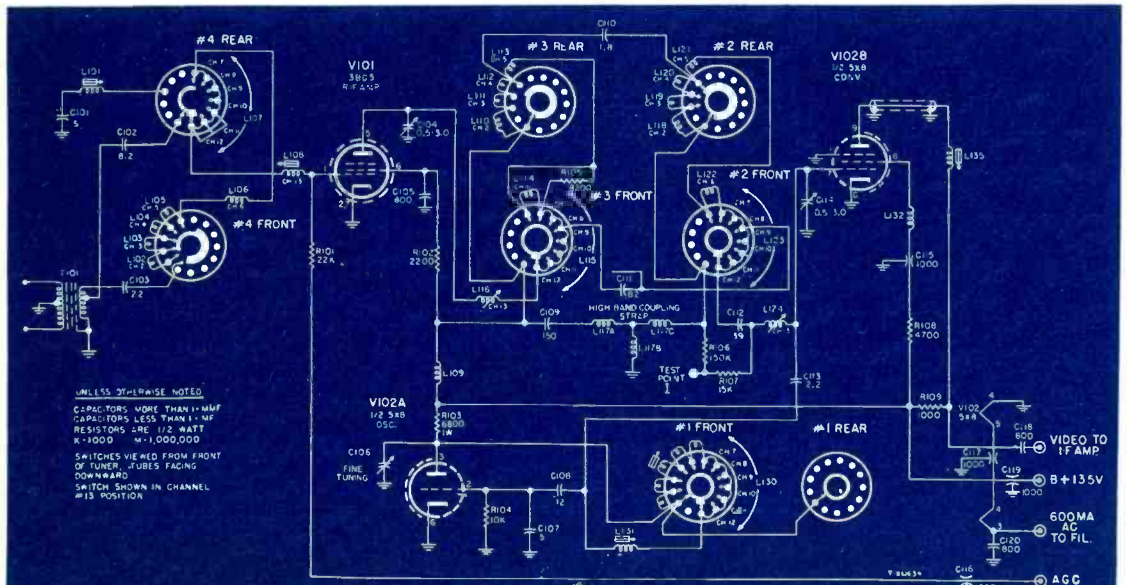

FIGURE 2. 12-POSITION (VHF ONLY) TUNER SCHEMATIC (RJX-078)

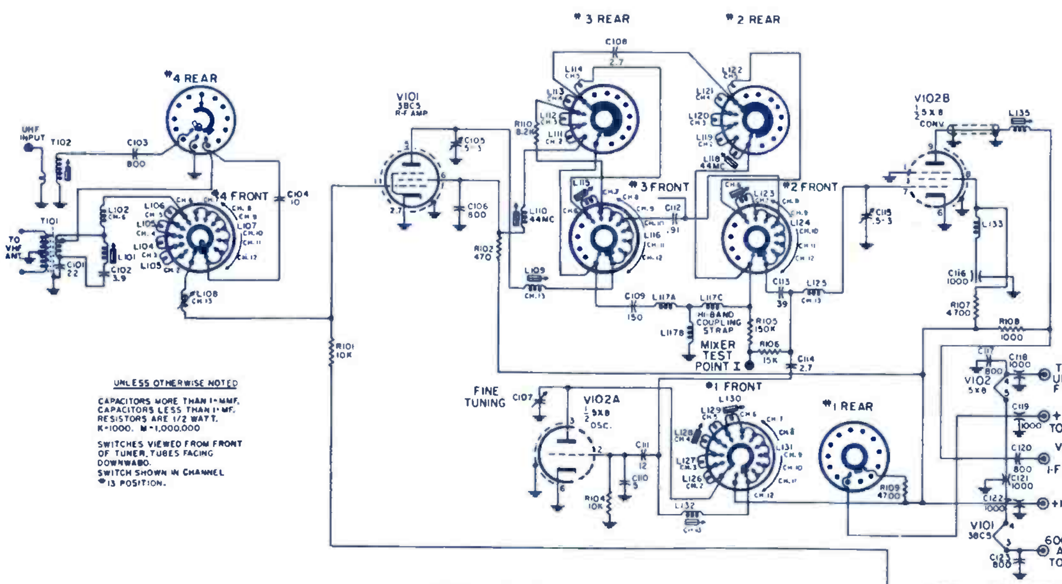

FIGURE 3. 13-POSITION (VHF-UHF) TUNER SCHEMATIC (RJX-077)

Chassis "M" series: Models 14T007, 14T008, 14T009, 14T010

GENERAL ELECTRIC

Chassis "M" series Portable

Technician CIRCUIT DIGEST

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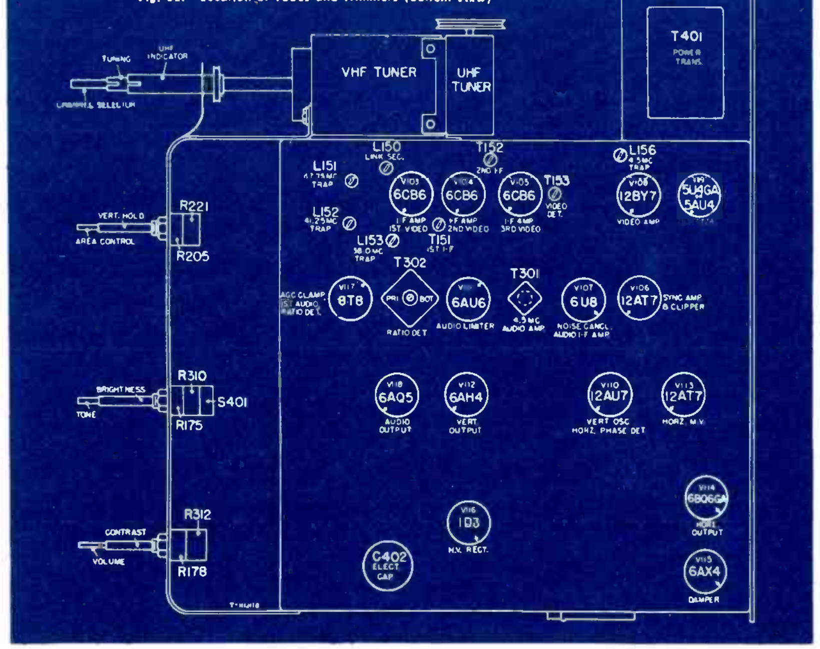
TECHNICIAN CIRCUIT DIGEST

GENERAL ELECTRIC
Chassis "O" Line

Chassis "O" Line: Models 21C40, 21C128, 21C129, 21C130, 21C131, 21C151, 21C152, 21C156, 21C157, 21T029, 21T030

Fig. 52. Location of Tubes and Trimmers (bottom view)



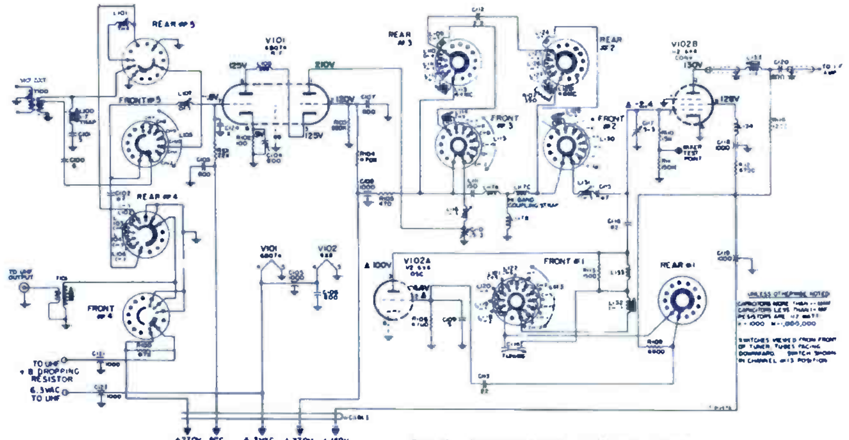


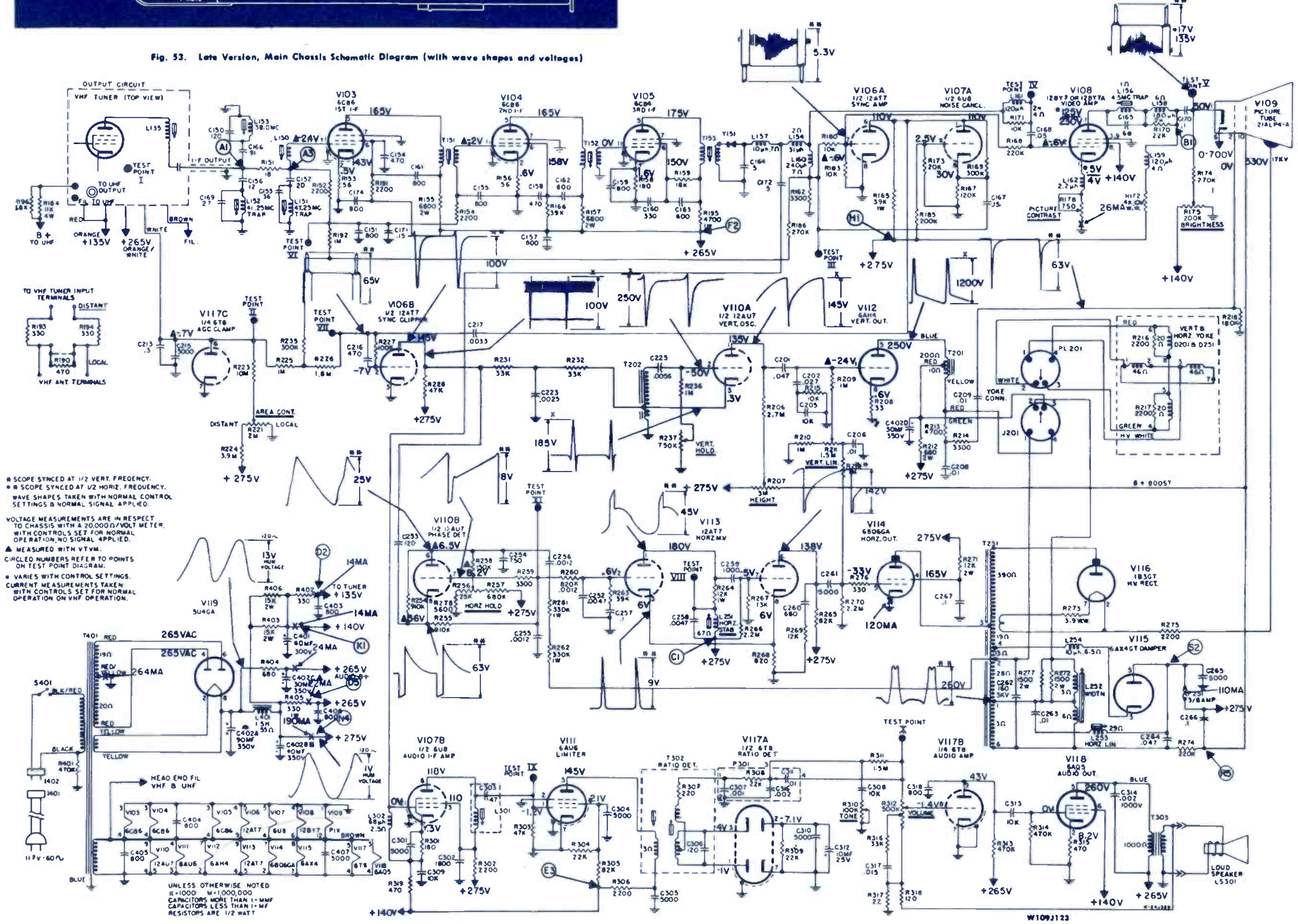
Fig. 40. Schematic Diagram of R-F Tuner (VHF)

OSCILLATOR ALIGNMENT CHART

SWEEP GENERATOR SWEEP WIDTH 10-15 MC

STEP	RECEIVER & MARKER POSITION	MARKER GENERATOR FREQUENCY	SIGNAL INPUT POINT	OBSERVE RESPONSE CURVE AT	ADJUST
1	No. 13	211.25 MC			L132 Channel No. 13 oscillator adjustment.
2	No. 12	205.25 MC			L123 Channel No. 12 oscillator adjustment.
3	No. 11	199.25 MC			L123 Channel No. 11 oscillator adjustment.
4	No. 10	193.25 MC			L123 Channel No. 10 oscillator adjustment.
5	No. 9	187.25 MC	Antenna terminals (see Note 3)	Test Point III (Video detector diode load)	L123 Channel No. 9 oscillator adjustment.
6	No. 8	181.25 MC			L123 Channel No. 8 oscillator adjustment.
7	No. 7	175.25 MC			L123 Channel No. 7 oscillator adjustment.
8	No. 6	83.25 MC			L122 Channel No. 6 oscillator adjustment.
9	No. 5	77.25 MC			L121 Channel No. 5 oscillator adjustment.
10	No. 4	67.25 MC			L120 Channel No. 4 oscillator adjustment.
11	No. 3	61.25 MC			L119 Channel No. 3 oscillator adjustment.
12	No. 2	55.25 MC			L118 Channel No. 2 oscillator adjustment.

Fig. 53. Late Version, Main Chassis Schematic Diagram (with wave shapes and voltages)



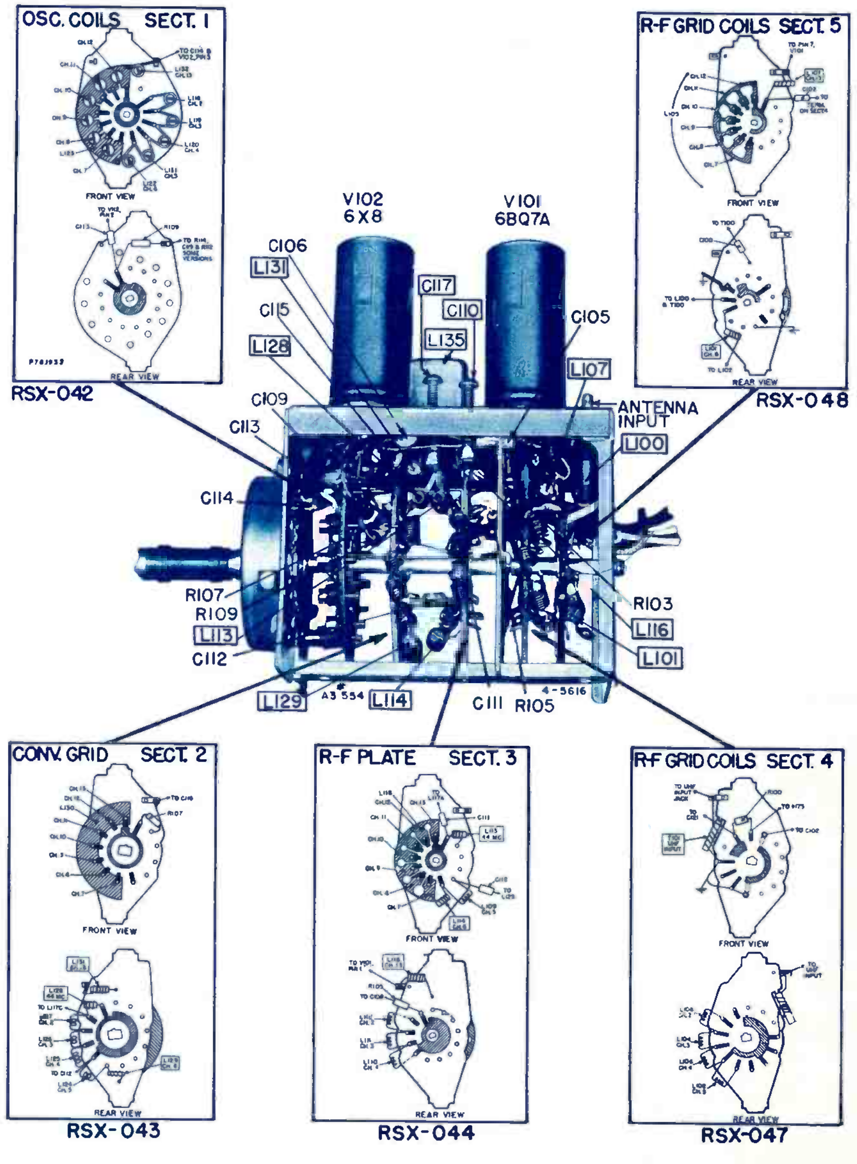


Fig. 18. R-F Tuner with Switch Wafer Diagrams

GENERAL ELECTRIC
Chassis "O" Line

Technician
CIRCUIT DIGEST

RECEIVER ALIGNMENT

OSCILLATOR ALIGNMENT

NOTES:

1. The i-f system must be in proper alignment.
2. Disconnect the 300-ohm transmission line from the antenna input transformer, T100.
3. Connect the sweep generator to the r-f tuner antenna input transformer using the G-E ST-8A balanced adapter to obtain 300 ohms output. . . . . The adapter should be connected to the r-f tuner through approximately three feet of 300-ohm transmission line and a resistor pad.
4. Set fine tuning control to two thirds from the counter-clockwise stop and leave fixed in this position throughout the entire alignment procedure.
5. Make indicated adjustments so that the picture carrier marker for the channel falls at 50% on the high-frequency slope of the response curve.

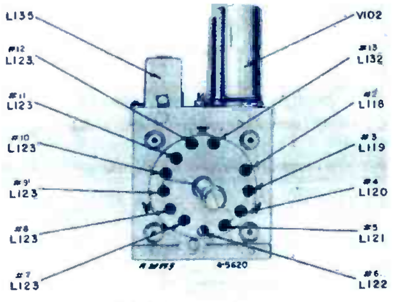
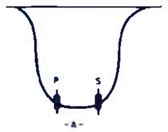


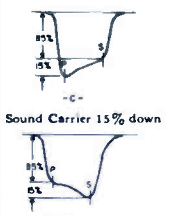
Fig. 25. Oscillator Adjustments

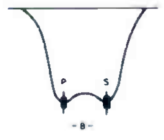
R-F ALIGNMENT CHART

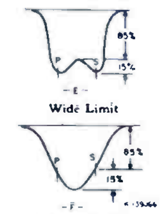
(a) Set generator sweep width to 10–15 mc.
(b) Signal input point at r-f tuner input transformer T100.
(c) Observe response curve at Test Point I, through 10,000-ohm resistor. Connect test equipment ground lead to r-f tuner chassis.
(d) Adhere to following order when performing a complete alignment.
(e) When following the procedure below, an attempt should be made to obtain the indicated ideal response curves. Recheck steps 13–24 and readjust where necessary. Minor deviations from the ideal curves may occur on any channel, the maximum limits of "tilt" and/or bandwidth being shown in the "Remarks" column.

STEP	RECEIVER AND SWEEP GENERATOR CHANNEL	MARKER GENERATOR FREQUENCY MC	ADJUST		REMARKS AND LIMITS
13	No. 13	211.25 215.75	L116, L131 for maximum gain symmetry and "ideal" bandwidth.	(Steps 13-19) Ideal Curve	If peaks or tilt are excessive, knife L134. Knife as little as possible to prevent loss of gain.
14	No. 7	175.25 179.75	C110, C117 for proper curve, symmetry and bandwidth. Adjust L107 for maximum gain and equal peaks.		Adjust spacing between L114 and L129 for proper coupling where necessary, being careful not to allow the coils to touch each other.
15	No. 12	205.25 209.75	Adjust L116, L131 and/or C110, C117 for suitable tilt compromise for channels 7–13, if necessary.		Sound Carrier 15% down
16	No. 11	199.25 203.75			
17	No. 10	193.25 197.75			
18	No. 9	187.25 191.75			Picture Carrier 15% down Tilt Limit Curves
19	No. 8	181.25 185.75			
20	No. 6	83.25 87.75	L101, L114, L129 for maximum gain and optimum flatness.	(Steps 20-24) Ideal Curve	Wide Limit
21	No. 5	77.25 81.75	Check tracking, knife if necessary, L102, L109, L124.		
22	No. 4	67.25 71.75	Check tracking, knife if necessary, L103, L110, L125.		Narrow Limit Bandwidth Limit Curves
23	No. 3	61.25 65.75	Check tracking, knife if necessary, L104, L111, L126.		
24	No. 2	55.25 59.75	Check tracking, knife if necessary, L106, L112, L127.		









ALIGNMENT OF 40 MC CHANNEL IN VHF TUNER

(UHF POSITION)

1. Apply −3 volt bias to tuner AGC line.
2. Disconnect i-f output link at main chassis and terminate cable with a 68 ohm resistor.
3. Place oscilloscope through a 10,000-ohm resistor on Test Point I of VHF tuner.
4. Through resistor network as shown in Fig. 26 insert sweep signal to the output side of UHF crystal. Use sweep cable and attenuator.
5. Set VHF tuner to UHF position, tune UHF for minimum tilt over center tuning area (approx. 620 mc.).

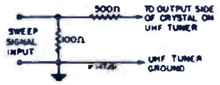
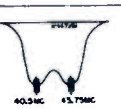


Fig. 26. Resistor Network

40 MC CHANNEL ALIGNMENT CHART

STEP	TUNE	TO SET		REMARKS
25	L128	40.5 mc for maximum		Spacing between coils varies bandwidth. Do not allow coils to touch. Disregard possibility of notch caused by I-F trap L100.
26	L113	45.75 mc for maximum		
27	T101	For maximum gain and zero tilt		

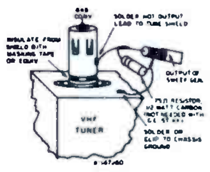


Fig. 27. I-F Sweep Connection

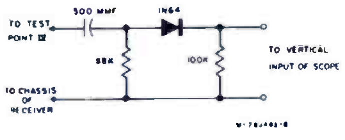


Fig. 28. Detector Network

VIDEO I-F SYSTEM

The following alignment data is divided into two separate procedures. Because of the large trap attenuation, the conventional method of sweep observation of these traps becomes difficult. Hence all traps shall be pre-tuned by applying an amplitude-modulated signal and adjusted for minimum signal output.

The second portion of this procedure involves the shaping of the i-f response curve in the conventional manner by the application of a sweep generator signal. During this procedure, observe the usual precautions regarding warm-up time, equipment cable lead dress and generator output cable termination.

GENERAL NOTES:

1. Allow receiver and alignment equipment to warm up for 20 minutes before proceeding.
2. Set channel selector switch to channel No. 11, 12 or 13. Check for oscillator influence by turning the fine tuning control. If the shape of the response curve changes, switch to another high-frequency channel where oscillator influence is not noted. Set tuning control maximum clockwise.
3. Turn the volume control fully counterclockwise. Turn the picture contrast control fully clockwise.
4. Bias V114 to cut off by placing −45v on the grid (pin 5).
5. In order that the action of the noise inverter (V107A) does not cause false information during alignment, it is advisable to connect a 100,000-ohm resistor between pin No. 8 (V107) and B+ 275V. Be sure to remove the resistor after alignment.

TRAP ALIGNMENT

GENERAL

As noted above, an AM signal is required for trap alignment. In many cases, the technician will have a suitable AM signal generator available. It should cover the range of 35 to 48 megacycles at fundamental frequency, with available internal 400-cycle modulation. When this type of signal is used, the traps should be adjusted for minimum 400-cycle signal as observed on the oscilloscope.

Users of General Electric sweep equipment may obtain the required amplitude modulated carrier frequencies by a simple manipulation of the controls as has been explained in previous publication and technical literature supplied by the manufacturer.

Those technicians who do not have equipment available to produce suitable signals should not attempt the trap alignment procedure. With the exception of the 4.5 mc audio trap L156, the traps should not become seriously misaligned due to tube change. The 4.5 mc audio trap L156 may be sweep aligned, if necessary, by substituting a 4.5 mc sweep signal in Step 3 below. The trap may then be tuned for minimum response at 4.5 mc as marked by a calibrated signal.

TRAP ALIGNMENT CHART

STEP	AM-GENERATOR INPUT POINT	AM-GENERATOR FREQUENCY	ADJUST	REMARKS
1	Plate of conv. tube thru. ungnd. tube shield. See Fig. 27.	47.25 mc 41.25 mc 39.25 mc	L151 } for minimum L152 } L153 for maximum	Connect scope to Test Point V; maximum vertical gain may be required.
2	Test Point IV (Diode Load)	4.5 mc	L156	Connect detector network between oscilloscope input and receiver Test Point V.

I-F SYSTEM, SWEEP ALIGNMENT

Now that the traps have been set at their proper frequencies, the i-f curve may be shaped.

PRE-PEAKING:

Should difficulty be experienced in obtaining the proper video i-f response as may be experienced when the set is far out of alignment, the tuning of the individual coils may be checked.

If each coil is peaked at the respective frequency specified below with an AM signal as prescribed for setting traps, an over-all i-f response curve which closely approximates the proper curve will be achieved. After this is done, the sweep method may be used to thus permit proper final curve shaping. This peaking may be done by using an AM signal as prescribed for setting the traps, or the sweep method may be used by adjusting the coils for maximum amplitude at the desired marker points.

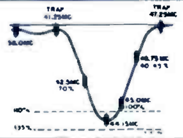
Since it may be possible to obtain two peaks through the coil adjustment range, make certain the coil is aligned for the first peak (slug starting from out position).

Begin alignment of Peaking Frequencies with T153.
T153 —44.15 mc T151 —44.8 mc
L150—44.15 mc T152—42.9 mc
L135—43.0 mc

NOTES:

1. Turn picture contrast control to minimum.
2. Observe sweep waveform at Test Point III through a 10,000-ohm resistor. Oscilloscope should be calibrated so that 5-volt signal will provide 2-inch vertical deflection.
3. Apply a negative 4½ volt battery bias voltage to Test Point VI. Connect positive lead of battery to chassis.
4. Note that the following procedure uses 45.0 mc as the 100% reference point. Maintain the sweep generator output level so that the baseline-to-45 mc marker amplitude equals two inches.

VIDEO I-F ALIGNMENT CHART

CONNECT SWEEP GENERATOR	ADJUST	DESIRED RESPONSE	REMARKS
To ungrounded tube shield, Fig. 27, center sweep frequency approximately 44 mc. Sweep width approximately 10 mc.	T153 for max. at 44.15 mc T152 to set 42.5 mc marker at 70% T151 to set 45.75 mc marker at 40% L135 } See remarks column L150 }		L135 and L150 should be adjusted to shape peak region of curve for symmetrical response consistent with proper 47.45 mc marker placement. Peak of curve may fall between the limits of 110% and 135% of 45 mc 100% reference point.

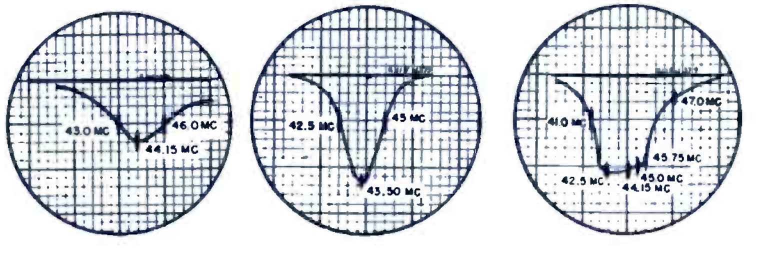
In order to provide a method of checking individual stages of the I-F system using a sweep method, the curves A, B and C are included. These curves represent an approximate ideal alignment of the I-F section. The sweep signal generator is terminated as outlined in the video alignment chart.

The oscilloscope is connected to Test Point III thru a 10,000-ohm resistor. Increased scope gain is sometimes necessary to obtain usable curves.

Curve A is obtained by shorting T152 primary, such that previous stages do not interfere with the last I-F. The generator is connected to V105 grid, pin 1, and set for 40-50 mc sweep.

Curve B results when T151 primary is shorted and the generator input is moved to V104 grid (pin 1).

Curve C shows the curve obtained when the signal is fed to the grid of V103, ¾ volt used to produce 2 squares of deflection.



-A- -B- -C-

UHF TUNER

MODEL RUX-008/009

GENERAL

The UHF Tuner, Model RUX-008/009, incorporated in the "O" series receiver, is of the continuous tuning type covering the entire band between 470 and 890 megacycles. The tuner converts the received television signal directly to the receiver intermediate frequency and, hence, must be used in conjunction with a UHF tuner unit having an i-f input provision and an I-F band wave trap such as shown in Fig. 35. This trap is required because of the high over-all gain utilized in the "UHF" position. This also applies to the field installation unit UHF-96, which incorporates the RUX-008/009 tuner.

SERVICING OF TUNER

Replacement of the crystal diode or the 6AF4 oscillator tube in this tuner frequently can be done without realignment of the unit. This requires trial replacement of these items by several tubes or crystals until one is found which gives proper sensitivity and dial calibration. After replacing either of these items, an air check of the receiver should be performed to assure good sensitivity, noise figure and picture quality.

In some cases, replacement of either the 6AF4 or the diode will require a slight alignment "touch-up." This procedure is noted in the alignment data which follows.

Be sure to replace the crystal diode in the correct polarity as shown by the accompanying tuner illustration. Little difference may be noted over much of the tuning band when the crystal is reversed, but in certain portions discrepancies will be found in the tracking.

In most cases, the replacement of internal tuner components will require an alignment check. This may merely require a slight "touch-up," using the available screw type adjustments. In other cases, the tank "end" inductors will require dressing to provide proper band-pass tracking. When replacing tuner output cable, the coaxial line should be cut to the original length or within the limits of 7 to 12 inches.

Note: When changing tuner unit or the interconnecting coaxial line, the 40 mc-position tune-up procedure . . . . must be performed, since the adjustments of T101 in the VHF tuner will also bring the UHF diode-output circuits into resonance.

TUNER ALIGNMENT

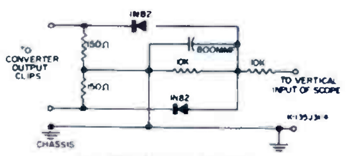


Fig. 31. 300-ohm Detector Network

GENERAL:

The tuner alignment procedure entails the adjustment of the oscillator as well as the r-f circuits, using the sweep method. After alignment of the UHF tuner unit, it should be connected to the VHF tuner and, in effect, be I-f aligned according to the 40 mc channel alignment procedure.

EQUIPMENT REQUIRED:

The following equipment is necessary for alignment and service of the subject UHF tuners.

1. UHF Sweep Generator, having available sweep width of approximately 30 megacycles with an output level of approximately ½ volt.
2. UHF Marker Generator (tunable), covering the frequencies between 460 and 910 megacycles, with built-in provision for 400-cycle AM.
3. VHF Marker Generator, providing output frequencies between 40 and 90 megacycles.
4. Terminated Balun, providing 300-ohm output (supplied, or as specified by sweep generator manufacturer).
5. Oscilloscope, General Electric ST-2A, or equivalent.
6. Milliammeter, 0–5 ma., approximately 25-ohm movement (required to read crystal diode current).
7. 300-ohm attenuator pad and 300-ohm detector network, see Figs. 31 and 32.
8. The associate VHF Television Receiver, from which power may be obtained and into which, when required, the UHF tuner output signal may be coupled.
9. Low-noise, hum-free audio amplifier with a minimum gain of 10 times.

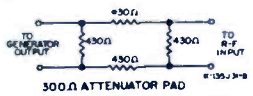


Fig. 32. 300-ohm Attenuator Pad

OSCILLATOR ALIGNMENT

NOTES:

1. In some cases, tuner may be aligned while mounted and wired into chassis. In cases where tuner adjustments are not accessible due to mounting scheme, dismount tuner, extend power leads (not coax line) and adequately ground UHF tuner to main chassis. Set VHF channel selector to UHF position. VHF tuner must be in proper alignment, particularly with respect to the UHF position I-F pass-band.
2. Connect oscilloscope through 10,000 ohms to Test Point I (VHF Tuner).
3. Connect sweep and marker generator through 300-ohm pad or other network or balancing device specified or supplied by sweep generator manufacturer to antenna input terminals of UHF tuner. Make sure that marker generator is loosely coupled to maintain a "flat" input impedance characteristic.
4. Connect negative 3-volt bias to AGC input lead of VHF tuner unit.
5. Set VHF Tuner I-F interference trap to 43.5 mc. This will provide a small "notch" in the observed pass-band which will serve as the VHF marker during alignment. This eliminates the necessity of having a separate 43.5 mc marker signal. In most cases, this trap is already factory preset to 43.5 mc.
6. After completing alignment, reset VHF tuner I-F trap to I-F interference frequency, if required. Align tuner as follows:

PROCEDURE:

1. Set UHF marker and sweep generators to 460 megacycles. Rotate UHF tuner shaft fully counterclockwise. Adjust oscillator screw, C11, Fig. 33, to make 460 mc marker coincide with "notch."
2. Set generators to 910 megacycles and rotate UHF tuner shaft fully clockwise. Adjust oscillator end inductor, Fig. 33, with a plastic crochet needle, to make 910 mc marker coincide with "notch."
3. Repeat 1 and 2 above until marker and "notch" coincidence is achieved on both ends of band.

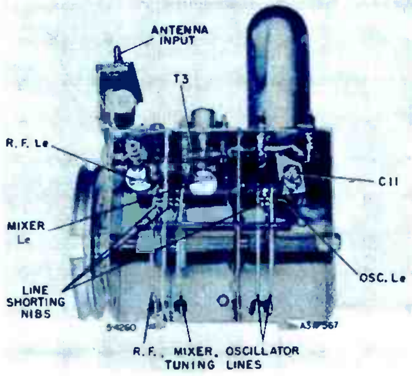


Fig. 33. UHF Tuner RUX-008/009

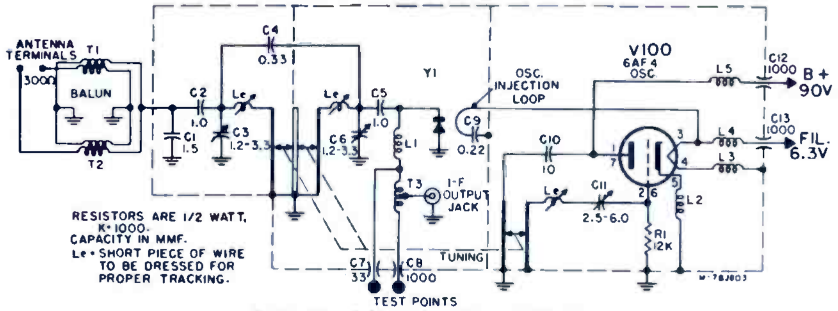


Fig. 34. Schematic Diagram for UHF Tuner, RUX-008/009

R-F ALIGNMENT PROCEDURE

1. Set UHF marker and sweep generators to 530 mc. Rotate UHF tuner shaft until 530 mc marker coincides with "notch." Retune sweep slightly, if necessary, to locate marker and notch at center of scope sweep.
2. Short feed-through capacitors C7 and C8, see Fig. 36, together, but not to ground.
3. Disconnect coaxial cable at VHF tuner and connect a 33-ohm resistor between the cable inner conductor and shield. Connect input of audio amplifier across the 33-ohm resistor and feed output of amplifier to scope. The gain of amplifier should be sufficient to allow setting of over-all amplifier and scope gain, at 60 cycles, to .1 volt peak to peak for 2 inches deflection. Set sweep generator output lead to provide approximately a 2-inch response curve.
4. With sweep still set at 530 mc, adjust C3 and C6, see Fig. 36, to provide symmetrical response on either side of the marker as shown in Fig. 37.
5. Remove short from across C7 and C8. Remove 33-ohm resistor, amplifier, and connect coax cable to VHF tuner. Connect scope through 10,000 ohm resistor to Test Point I of VHF tuner.
6. Set sweep and marker generators to 880 mc. Rotate UHF tuner shaft so that marker falls into "notch." Retune sweep slightly, if necessary, to center response curve on scope sweep.
7. Short feed-through capacitors C7 and C8 together, but not to ground. Disconnect coax cable from VHF tuner and connect 33-ohm resistor, amplifier and oscilloscope as above.
8. Adjust R-F and Mixer end inductors to give symmetrical response on either side of the marker as shown in Fig. 37.
9. Remove short across C7 and C8. Repeat steps 1 through 8 under "R-F Alignment" until symmetrical response is obtained at both 530 mc and 880 mc.
10. Sweep across entire band and observe band-pass curve. Allowable minor deviations in tilt or gain may occur, but be sure to check for abnormally low gain points within the tuning range. This is usually caused by insufficient oscillator injection and may be checked by measuring the crystal current. To do so, short C7 and C8 together, but not to ground, and connect a 0–5 ma meter across the output coaxial cable. The crystal current may read between .65 ma and 3.0 ma under normal conditions. If the crystal current readings are outside these limits, adjust the position of the oscillator injection loop with respect to the crystal clip terminal.

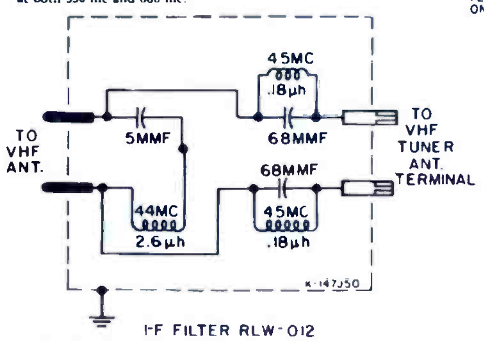


Fig. 35. I-F Band Wave Trap (supplied on UHF receivers)

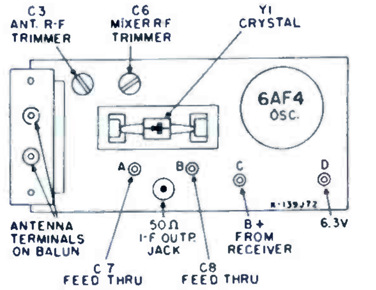


Fig. 36. Adjustments for UHF Tuner

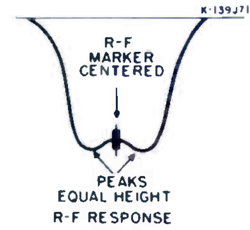


Fig. 37. R-F Response Curve

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Chassis "ST" Line: Models 21C133, -C134, -C135, -C136, -C141, -C142

OSCILLATOR ALIGNMENT CHART

SWEEP GENERATOR SWEEP WIDTH 10-15 MC

STEP	RECEIVER & MARKER POSITION	MARKER GENERATOR FREQUENCY	SIGNAL INPUT POINT	OBSERVE RESPONSE CURVE AT	ADJUST
1	No. 13	211.25 MC	Antenna terminals (See Note 2)	Test Point III (Video detector diode load thru 10,000 ohms.)	L126 Channel No. 13 oscillator adjustment.
2	No. 12	205.25 MC			No adjustment.
3	No. 11	199.25 MC			L125 Channel No. 11 oscillator adjustment.
4	No. 10	193.25 MC			No adjustment.
5	No. 9	187.25 MC			No adjustment.
6	No. 8	181.25 MC			L125 Channel No. 8 oscillator adjustment.
7	No. 7	175.25 MC			No adjustment.
8	No. 6	83.25 MC			L124 Channel No. 6 oscillator adjustment.
9	No. 5	77.25 MC			L123 may require "knifing".
10	No. 4	67.25 MC			L122 Channel No. 4 oscillator adjustment.
11	No. 3	61.25 MC			L121 may require "knifing".
12	No. 2	55.25 MC			L120 may require "knifing".

RECEIVER ALIGNMENT

"ST" R-F TUNER ALIGNMENT

INTRODUCTION:

The following procedure involves the alignment of the oscillator and signal frequency circuits of either of the "Cascode" r-f tuner units. These tuners are identified by Figure 3.

Before aligning the tuner, check the alignment of the receiver i-f system and made any necessary adjustments

It is essential that the oscillator be operating at or very near the nominal oscillator frequency for each channel. This is easily accomplished by feeding the Channel sweep and marker signal into the r-f tuner antenna terminals in the usual manner. The wave form response is observed at the video detector test point III, see Fig. 16 and the oscillator is adjusted on each channel to place the converted channel picture carrier marker at the 45% point on the high frequency slope of the observed response curve. (Remember that this response curve is essentially an i-f response and the picture carrier marker becomes the high frequency marker due to frequency inversion in the tuner unit). The channel sound carrier marker, if operating, would assume a lower frequency. Before starting the oscillator alignment, the fine tuning control should be 2/3 from its counter-clockwise position and then be left in this position throughout the entire r-f tuner alignment procedure.

After the oscillator has been aligned, the r-f (signal) circuits may be adjusted. During this procedure, observe the indicated precautions regarding cable dress and termination and note the limits of acceptability curves which are shown in the accompanying alignment chart. In all cases, an attempt should be made to obtain the indicated "Ideal" curves.

The following procedure is based upon the use of General Electric sweep equipment. If other equipment is used which incorporates an unbalanced low impedance output cable (coaxial), be sure that the generator cable is properly terminated in a balancing pad s ch as that shown in Figure 4B. The marker generator output cable should be loosely coupled to the r-f tuner to prevent overload.

OSCILLATOR ALIGNMENT

NOTES:

1. The i-f system must be in proper alignment.
2. Connect the sweep generator to T102 using the G-E ST-4A balanced adapter to obtain 300 ohms output. The adapter should be connected to the tuner through approximately three feet of 300-ohm transmission line and a resistor pad as shown in Fig.

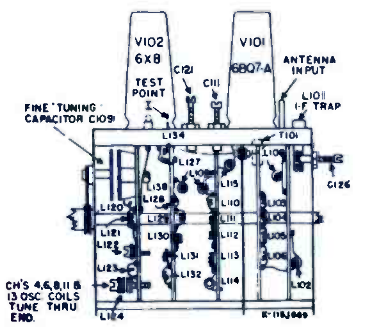


FIGURE 3. "ST" TUNER ADJUSTMENTS

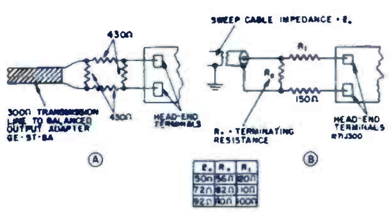


FIGURE 4. SWEEP EQUIPMENT TERMINATION

4A. When using other test equipment of the unbalanced output type, a pad as shown in Fig. 4B should be used instead. Set sweep width 10-15 mc.

3. Connect a 3 volt bias battery to Test Point II with positive lead of battery connected to the tuner chassis.

4. Set fine tuning control to two-thirds from the counter-clockwise stop and leave fixed in this position throughout the entire alignment procedure

5. Make indicated adjustments so that the picture carrier marker for the channel falls at 45% on the high frequency slope of the response curve.

R-F ALIGNMENT

NOTES:

1. Connect the sweep generator to the r-f tuner antenna input transformer using the G-E ST-8A balanced adapter, see Fig. 4A . The adapter should be connected to the r-f tuner through approximately three feet of 300-ohm transmission line and a resistor pad. When using other test equipment of the unbalanced output type, a pad as shown in Fig. 4B , should be used instead.

2. Connect a 3 volt battery to the tuner AGC line, with the positive lead of the battery connected to chassis.

3. Should it become difficult to obtain proper tracking on Channels 7-13 with the indicated adjustments, proper tracking may be achieved by dressing the convertor screen coil, L135. This coil becomes available by removing the tuner shield. This coil should be dressed with an insulated tool to prevent a B+ short.

4. On Channel 6, L102 adjusts the center frequency and L114 and L132 are knifed alternately for maximum gain.

5. Proper tracking on the low channels is achieved by knifing the coils on each channel to make each channel track. This may be done by inserting a knife blade between the windings. This method of adjustment requires the removal of the tuner shield, a procedure which will detune the circuits. However, in most cases the provided screw-type adjustments will suffice to achieve proper tracking through all channels after the shield has been replaced.

6. The picture and sound carrier marker should not be less than 85% of the peak of the r-f response curve. Refer to the "limits" curves shown in the accompanying alignment chart.

7. After completing the alignment, seal the brass cores in the coils with wax to prevent detuning. Seal the trimmers with glue.

R-F ALIGNMENT CHART

(a) Set generator sweep width to 10-15 mc.
(b) Signal input point at r-f tuner input transformer T102.
(c) Observe response curve at Test Point I, through 10,000-ohm resistor. Connect test equipment ground lead to r-f tuner chassis.
(d) Adhere to following order when performing a complete alignment.
(e) When following the procedure below, an attempt should be made to obtain the indicated ideal response curves. Minor deviations from the ideal curves may occur, the maximum limits of "tilt" and/or bandwidth being shown in the "Remarks" column.

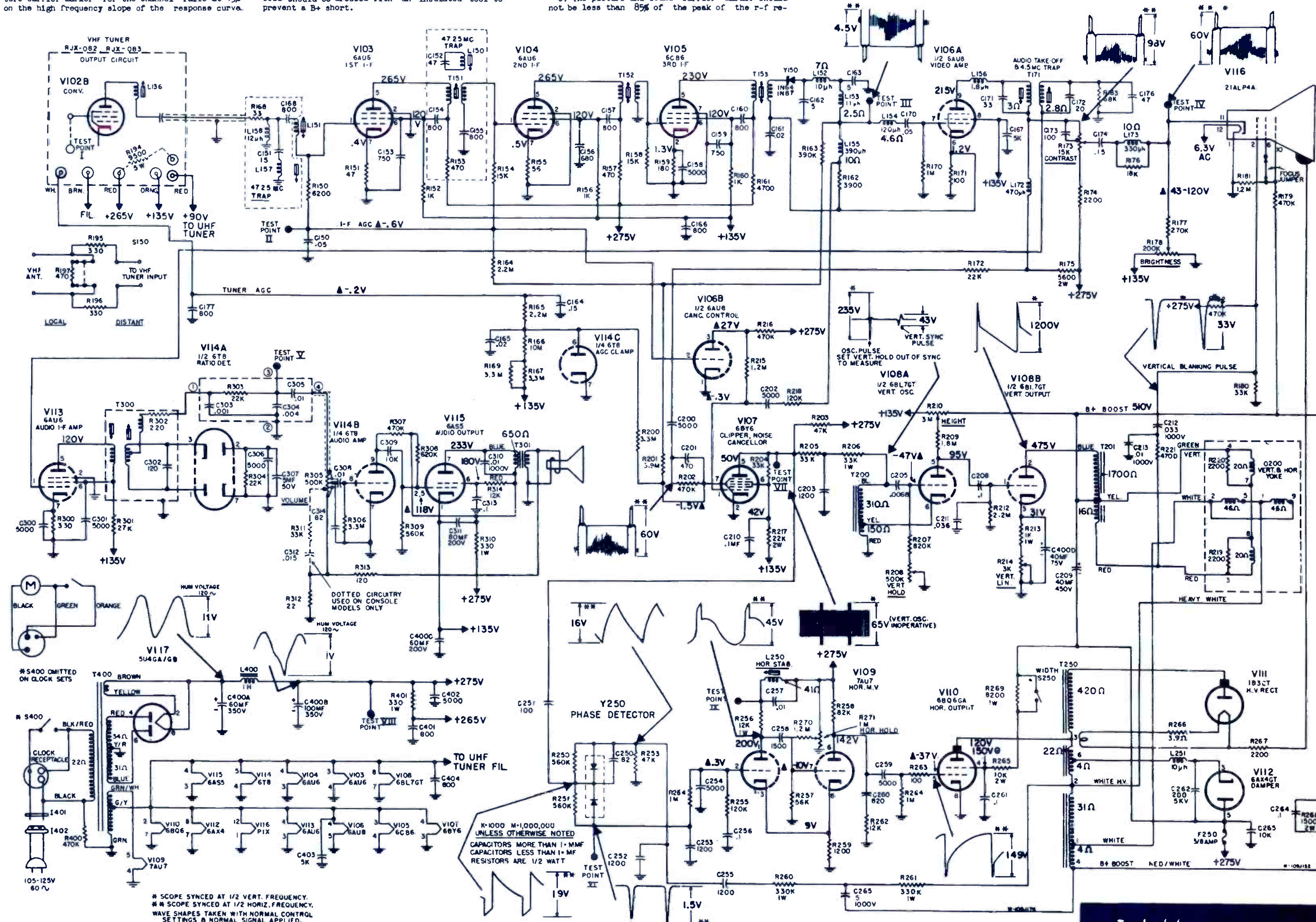


FIGURE 17. MAIN CHASSIS SCHEMATIC DIAGRAM

GENERAL ELECTRIC
Chassis "ST" Line
Technician
CIRCUIT DIGEST

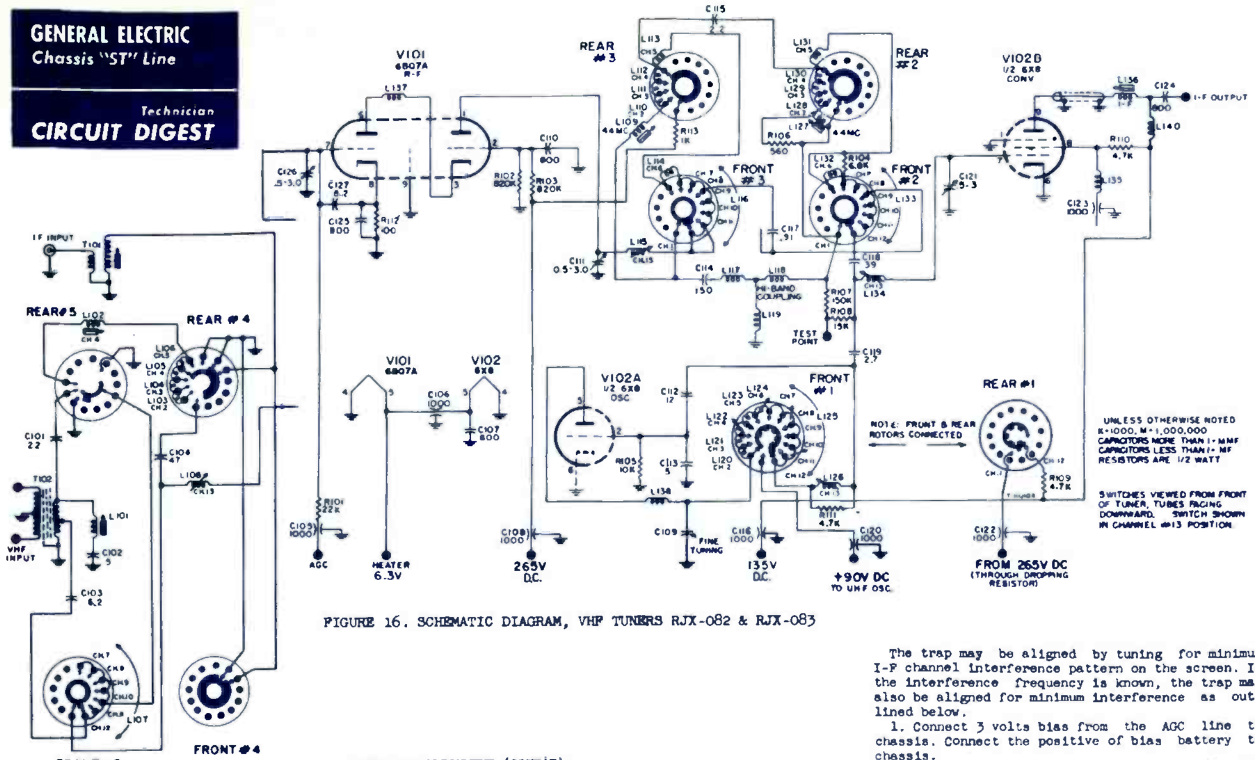
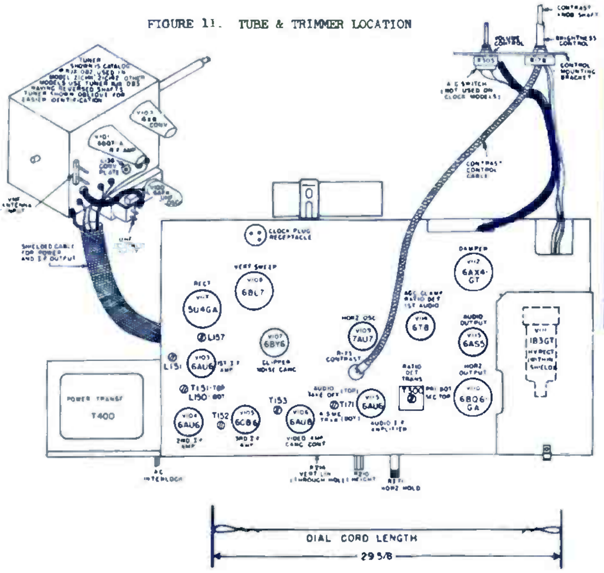


FIGURE 16. SCHEMATIC DIAGRAM, VHF TUNERS RJX-082 & RJX-083

FIGURE 11. TUBE & TRIMMER LOCATION



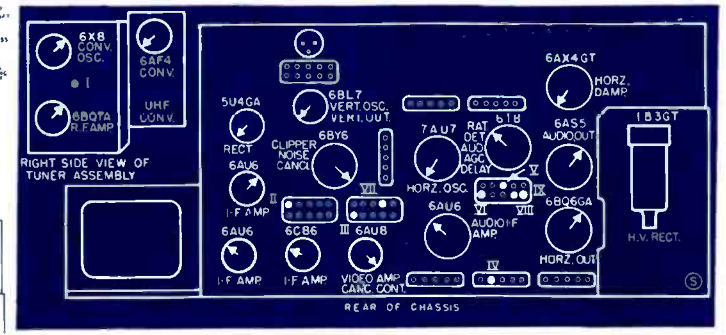


FIGURE 12. TEST POINT DIAGRAM

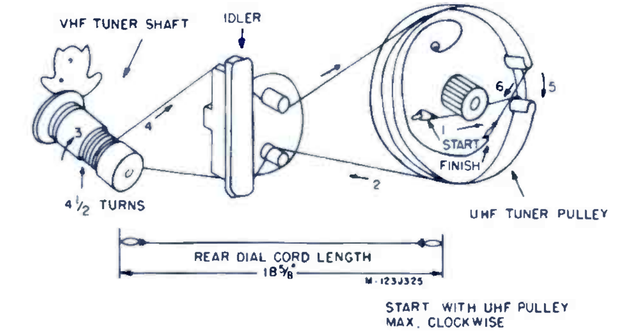


FIGURE 14. "REAR" UHF DIAL STRINGING(USED WITH VHF TUNER RJX-083)

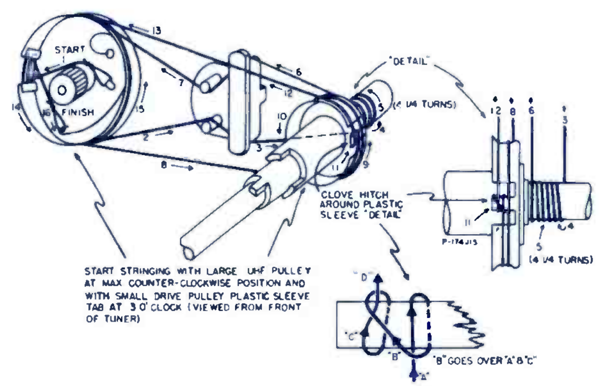


FIGURE 13. UHF DIAL STRINGING (USED WITH VHF TUNER RJX-082)

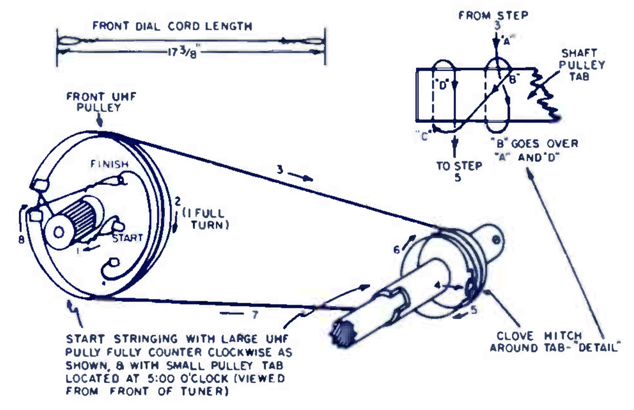
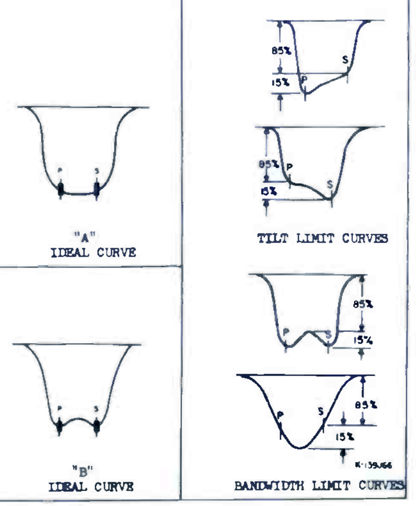


FIGURE 15. "FRONT" UHF DIAL STRINGING (USED WITH VHF TUNER RJX-083)

RECEIVER ALIGNMENT (CONT'D)

STEP	RECEIVER & SWEEP GENERATOR CHANNEL	MARKER GENERATOR FREQUENCY MC	ADJUST OR KNIFE	REMARKS AND LIMITS
1	No. 13	211.25 215.75	L108,L115, L134 for maximum gain, symmetry and "Ideal" bandwidth as shown below in curve "A".	If peaks or tilt are excessive, knife L135. Knife as little as possible to prevent loss of gain.
2	No. 7	175.25 179.75	C111, C121, C126 for proper curve,symmetry and bandwidth.	
3	No. 12	205.25 209.75	L108,L115,L134 and/or C110,C111,C121,C126, C117 for suitable tilt, compromise for channels 7-13, if necessary.	
4	No. 11	199.25 203.75		
5	No. 10	193.25 197.75		
6	No. 9	187.25 191.75		
7	No. 8	181.25 185.75		
8	No. 6	83.25 87.75	L102,L114,L132 for maximum gain and optimum flatness.	
9	No. 5	77.25 81.75	Check tracking,knife if necessary,L106,113,131	
10	No. 4	67.25 71.75	Check tracking,knife if necessary,L105,112,130	
11	No. 3	61.25 65.75	Check tracking,knife if necessary,L104,111,129	
12	No. 2	55.25 59.75	Check tracking,knife if necessary,L103,110,128	



"A" IDEAL CURVE

"B" IDEAL CURVE

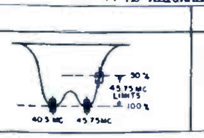
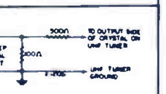
TILT LIMIT CURVES

BANDWIDTH LIMIT CURVES

ALIGNMENT OF 44 MC CHANNEL IN VHF TUNER (UHF POSITION)

1. Apply- 3 volt bias to tuner AGC line.Ground midpoint of tuner power cable shield if tuner is removed from the assembly.
2. Disconnect I-F output link from R168. Connect 68 ohm resistor across output of I-F cable.
3. Place oscilloscope through a 10,000 ohm resistor on Test Point I of VHF tuner.
4. Through resistor network shown below, insert sweep signal to the output side of UHF crystal.
5. Set VHF tuner to UHF position;tune UHF for minimum tilt over center tuning area (approx. 620 mc).

44 MC ALIGNMENT CHART

TUNE	TO SET		REMARKS	
L127 L109 T101	40.5 mc for maximum 45.75 mc for maximum For maximum gain and zero tilt		In some cases, 45.75 mc won't fall on peak, but must be within limits shown.	

L101 ALIGNMENT CHART

MARKER FREQUENCY	SWEEP FREQUENCIES & INPUT POINTS	CONNECT OSCILLOSCOPE BETWEEN CHASSIS AND	CHANNEL SWITCH SETTING	ADJUST	SEE NOTE
Interference frequency	40 to 50 MC to antenna terminals	Test Point III Through 10,000 ohms	2	Core of L101 to set trap at marker	3

ALIGNMENT OF L101 I-F TRAP

The trap, L101, Figure 3 is for the purpose of removing any frequency in the i-f range which may cause interference. It is normally aligned at the factory to 43.5 mc.

The trap may be aligned by tuning for minimum I-F channel interference pattern on the screen. If the interference frequency is known, the trap may also be aligned for minimum interference as outlined below.

1. Connect 3 volts bias from the AGC line to chassis. Connect the positive of bias battery to chassis.

2. Use an accurate marker generator to furnish marker of the same frequency as the interfering frequency.

Connect the scope to view the response curve at the output of the video detector, Test Point III.

Use a sweep generator with its center frequency set approximately at the interference frequency.

3. Do not tune L101 so it will attenuate Channel No. 2.

4. Use the GE ST-8A balanced adapter and a 3-foot piece of 300-ohm transmission line to couple the r-f sweep to the antenna terminals of the tuner.

If the shape of the response curve changes when you grasp the 300-ohm transmission line, a resistor pad, as shown in Figure 4A, should be inserted at the head-end antenna terminals.

ALIGNMENT OF UHF TUNERS, RUX-014 AND RUX-015

GENERAL:

The tuner alignment procedure entails the adjustment of the oscillator as well as the r-f circuits, using the sweep method. After alignment of the UHF tuner unit, it should be connected to the VHF tuner and, in effect, be i-f aligned according to the 44 mc channel alignment procedure found above.

OSCILLATOR ALIGNMENT

Notes: -

1. In some cases, tuner may be aligned while mounted and wired into chassis. In cases where tuner adjustments are not accessible due to mounting scheme, dismount tuner, extend power leads (not coax line) and adequately ground UHF tuner to main chassis. Set VHF channel selector to UHF position.

2. Connect oscilloscope through 10,000 ohms to Test Point I (VHF Tuner).

3. Connect sweep and marker generator through 300-ohm pad or other network or balancing device specified or supplied by sweep generator manufacturer to antenna input terminals of UHF tuner. Make sure that marker generator is loosely coupled to maintain a "flat"input impedance characteristic.

4. Connect negative 3-volt bias to AGC input lead of VHF tuner unit.

5. Set VHF Tuner I-F interference trap to 43.5 mc. This will provide a small "notch" in tthe observed pass-band which will serve as the VHF marker during alignment. This eliminates the necessity of having a separate 43.5 mc marker signal. In most cases, this trap is already factory pre-set to 43.5 mc.

6. After completing alignment, re-set VHF tuner I-F trap to I-F interference frequency,if required. Align tuner as follows:

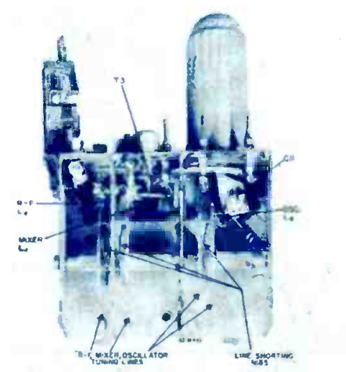
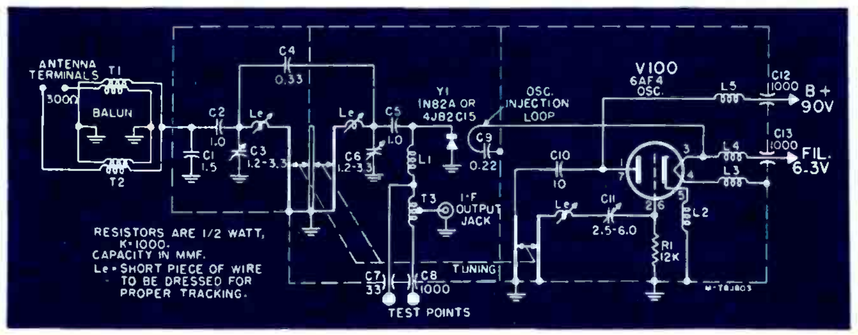


Fig. 5 UHF Tuner RUX-014 AND RUX-015

FIGURE 6.

SCHEMATIC DIAGRAM FOR UHF TUNERS, RUX-014 & RUX-015



Oscillator Alignment Procedure :

1. Set UHF marker and sweep generators to 460 megacycles. Rotate UHF tuner shaft fully counterclockwise. Adjust oscillator screw C11,Figure 5, to make 460 mc marker coincide with "notch".

2. Set generators to 910 megacycles and rotate UHF tuner shaft fully clockwise. Adjust oscillator end inductor Le, Fig. 5, with a plastic crochet needle, to make 910 mc marker coincide with"notch".

3. Repeat 1 and 2 above until marker and "notch" coincidence is achieved on both ends of band.

R-F ALIGNMENT PROCEDURE

1. Set UHF marker and sweep generators to 530 mc. Rotate UHF tuner shaft until 530 mc marker coincides with "notch". Retune sweep slightly, if necessary, to locate marker and notch at center of scope sweep.

2. Short feed-through capacitors C7 and C8, see Figure 7, together, but not to ground.

3. Disconnect coaxial cable at VHF tuner and connect a 33 ohm resistor between the cable inner conductor and shield. Connect input of audio amplifier across the 33-ohm resistor and feed output of amplifier to scope. The gain of amplifier should be sufficient to allow setting of over-all amplifier and scope gain, at 60 cycles, to .1 volt peak to peak for 2 inches deflection. Set sweep generator output level to provide approximately a 2 inch response curve.

4. With sweep still set at 530 mc, adjust C3 and C6, See Fig. 7, to provide symmetrical response on either side of the marker as shown in Figure 8.

5. Remove short from across C7 and C8. Remove 33-ohm resistor, amplifier and connect coax cable to VHF tuner. Connect scope through 10,000-ohm resistor to Test Point I of VHF tuner.

6. Set sweep and marker generators to 880 mc. Rotate UHF tuner shaft so that marker falls into "notch". Retune sweep slightly, if necessary, to center response curve on scope sweep.

7. Short feed-through capacitors C7 & C8 together but not to ground. Disconnect coax cable from VHF tuner and connect 33-ohm resistor, amplifier and oscilloscope as above.

8. Adjust R-F and Mixer end inductors(Le)to give symmetrical response on either side of the marker as shown in Figure 8.

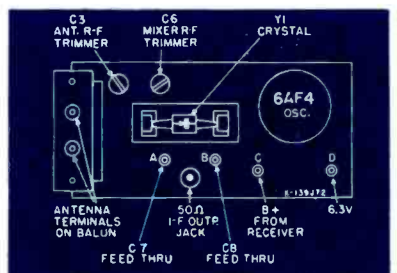


FIG. 7. TOP ADJUSTMENTS OF UHF TUNER

9. Remove short across C7 and C8. Repeat steps 1 through 8 under "R-F Alignment" until symmetrical response is obtained at both 530 mc and 880 mc.

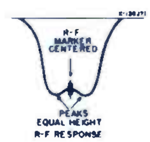


FIG. 8
UHF R-F RESPONSE CURVE

10. Sweep across entire band and observe band-pass curve. Allowable minor deviations in tilt or gain may occur, but be sure to check for abnormally low gain points within the tuning range. This is usually caused by insufficient oscillator injection and may be checked by measuring the crystal current. To do so, short C7 and C8 together, but not to ground,and connect a 0-5 ma meter across the output coaxial cable. The crystal current may read between .65 ma and 3.0 ma under normal conditions. If the crystal current readings are outside these limits, adjust the position of the oscillator injection loop with respect to the crystal clip terminal.

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Chassis "S" line: Models 21T038, 39, 41, 42, 43, 45, 48, 21C110, 11, 12, 13, 23, 24, 25, 26, 27, 24T070, 71, 24C180, 81

PRODUCTION CHANGES

Listed below are changes occurring during production of the "S" chassis. Component value changes, not listed herein or on the accompanying schematic diagrams, may be disregarded provided the recommended values indicated are adhered to when making replacements.

1. **PICTURE TUBE:** In some receivers, a 21BAP4 tube was substituted for a 21ALP4-A. The 21BAP4 does not require an ion trap. Either type may be used as a replacement.
2. **HORIZONTAL AFC SYSTEM:** Early receivers used ½ 6U8 (triode) as the horizontal phase detector, the other ½ 6U8 (pentode) serving as the 4.5 mc amplifier. Mid-production and "late" receivers use a dual selenium diode as the phase detector and a 6AU6 for the 4.5 mc amplifier. Early production circuits are shown in figure 31. Also, late production receivers incorporate a horizontal hold potentiometer in addition to the stabilizer coil. Adjustment access to the coil is through the hollow shaft of the horizontal hold potentiometer.
3. **VERTICAL BLANKING:** In early production receivers, the vertical blanking pulse is derived from the grid of the vertical output stage as shown in figure 33. Middle and late production receivers use the circuit shown in the main chassis schematic diagram, although with minor component value changes. Recommended values for replacement are shown in the schematic diagram.
4. **AGC CHANGE:** R167 in early receivers is 2.2 megohms. This was changed later to two parallel connected 3.3 megohm resistors to improve the signal-to-noise ratio. If overload is experienced in strong signal areas, one of these resistors may be clipped out.
5. **VERTICAL OSCILLATOR CAPACITOR:** Early vertical pulse shaping network consists of two parallel capacitors C207 and C211, totaling .037 mf. These are replaced by a single unit, Cat. #RCW-3238, .036 mf, ceramic, temperature compensated.
6. **SWEEP COMPONENTS:** The deflection yoke and both sweep output transformers were changed in mid-production. "Early" and "late" components cannot be interchanged unless all three units are changed simultaneously. The catalog numbers for these items appear on a label affixed to the sweep cage and in the accompanying parts list.
7. **VERTICAL HOLD RANGE:** In some receivers, a 120,000 ohm resistor is added in series with the vertical hold potentiometer to center the range. When changing 6BL7 tubes, it may be necessary to remove this resistor.
8. **VALUE CHANGE OF C167:** This capacitor was changed from 5000 mmf to 10,000 mmf; Cat. #RCW-3186 to prevent tendency toward picture ringing.
9. **POWER SUPPLY:** R402 was removed in mid-production. This resistor, used in early receivers only, could be damaged if set is operated with audio output tube removed.
10. **I-F CHANGE:** In late receivers, the position of C155, 800 mmf, is changed from the bottom to the top lead of T151 as shown in the chassis schematic diagram. This prevents bleeding off of AGC voltage, in the event of minute leakage between windings.
11. **MISCELLANEOUS VALUE CHANGES:** R217 may be 12,000, 15,000 or 22,000 ohms. R213 may be 1000 ohms or 820 ohms. R265 may be 12,000, 15,000 or two parallel 27,000 ohm resistors. R180 may be 15,000 ohms in series with pix tube pin #2 or: either 33,000 or 180,000 ohms between picture tube pin #2 and ground.

Fig. 34. Tube and Trimmer Location—Top View

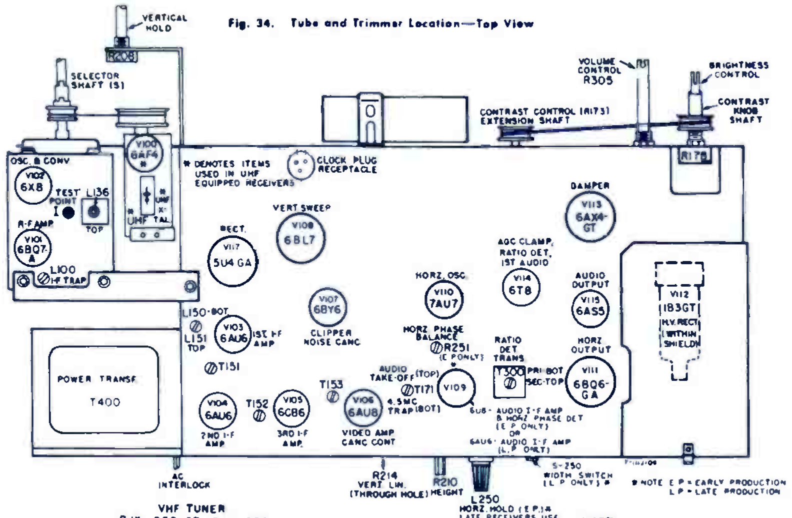
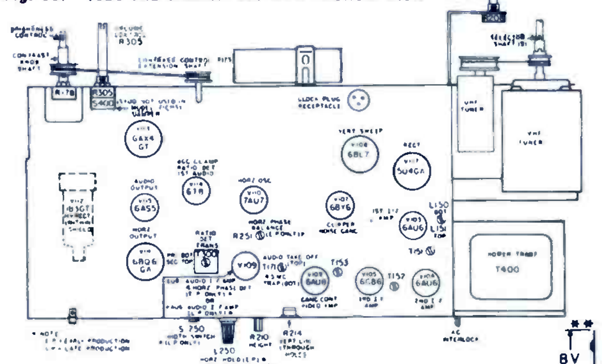


Fig. 35. Tube and Trimmer Location—Bottom View



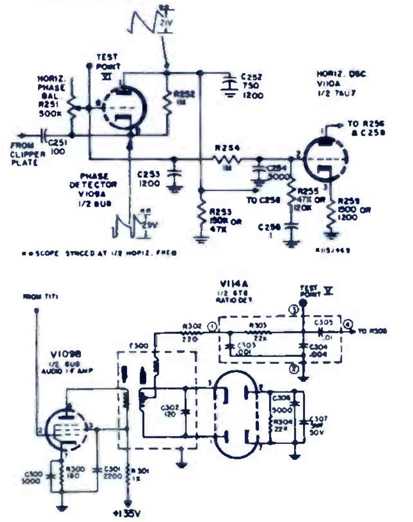
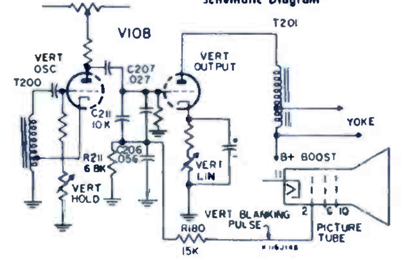
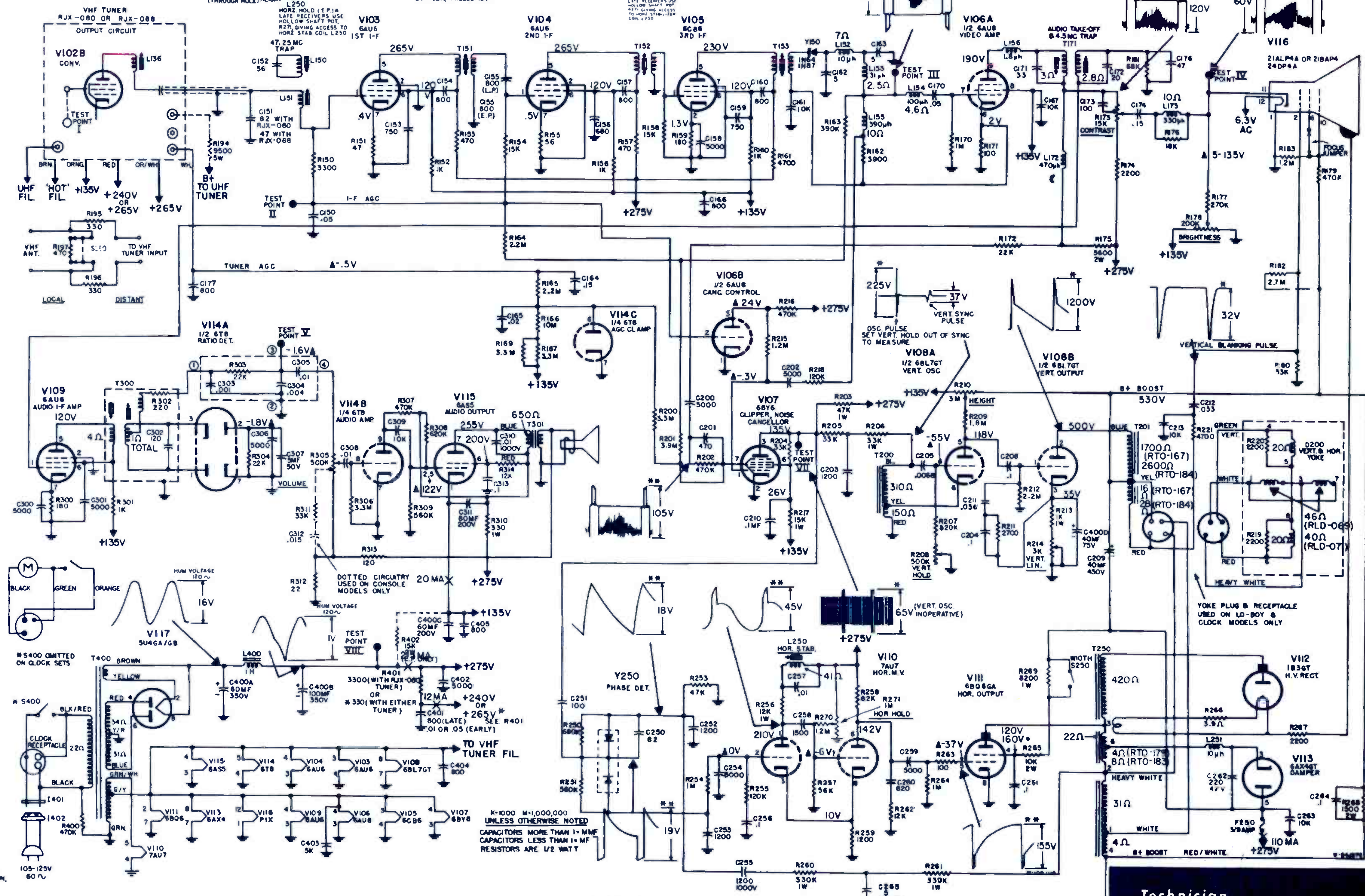


Fig. 31. "Early" Horizontal Phase Detector and Audio I-F System Diagram

Fig. 33. Early Vertical Blanking Schematic Diagram





* SCOPE SYNCED AT 1/2 VERT. FREQUENCY.
** SCOPE SYNCED AT 1/2 HORIZ. FREQUENCY.
WAVE SHAPES TAKEN WITH NORMAL CONTROL SETTINGS & NORMAL SIGNAL APPLIED
VOLTAGE MEASUREMENTS ARE IN RESPECT TO CHASSIS WITH A 20,000Ω/VOLT METER, WITH CONTROLS SET FOR NORMAL OPERATION, NO SIGNAL APPLIED, 117 VAC LINE.
▲ MEASURED WITH VTVM.
● VARIES WITH CONTRAST CONTROL.
• VARIES WITH WIDTH SWITCH POSITION.

K=1000 M=1,000,000
UNLESS OTHERWISE NOTED
CAPACITORS MORE THAN 1=MMF
CAPACITORS LESS THAN 1=MF
RESISTORS ARE 1/2 WATT

Fig. 38. Schematic Diagram, Main Chassis

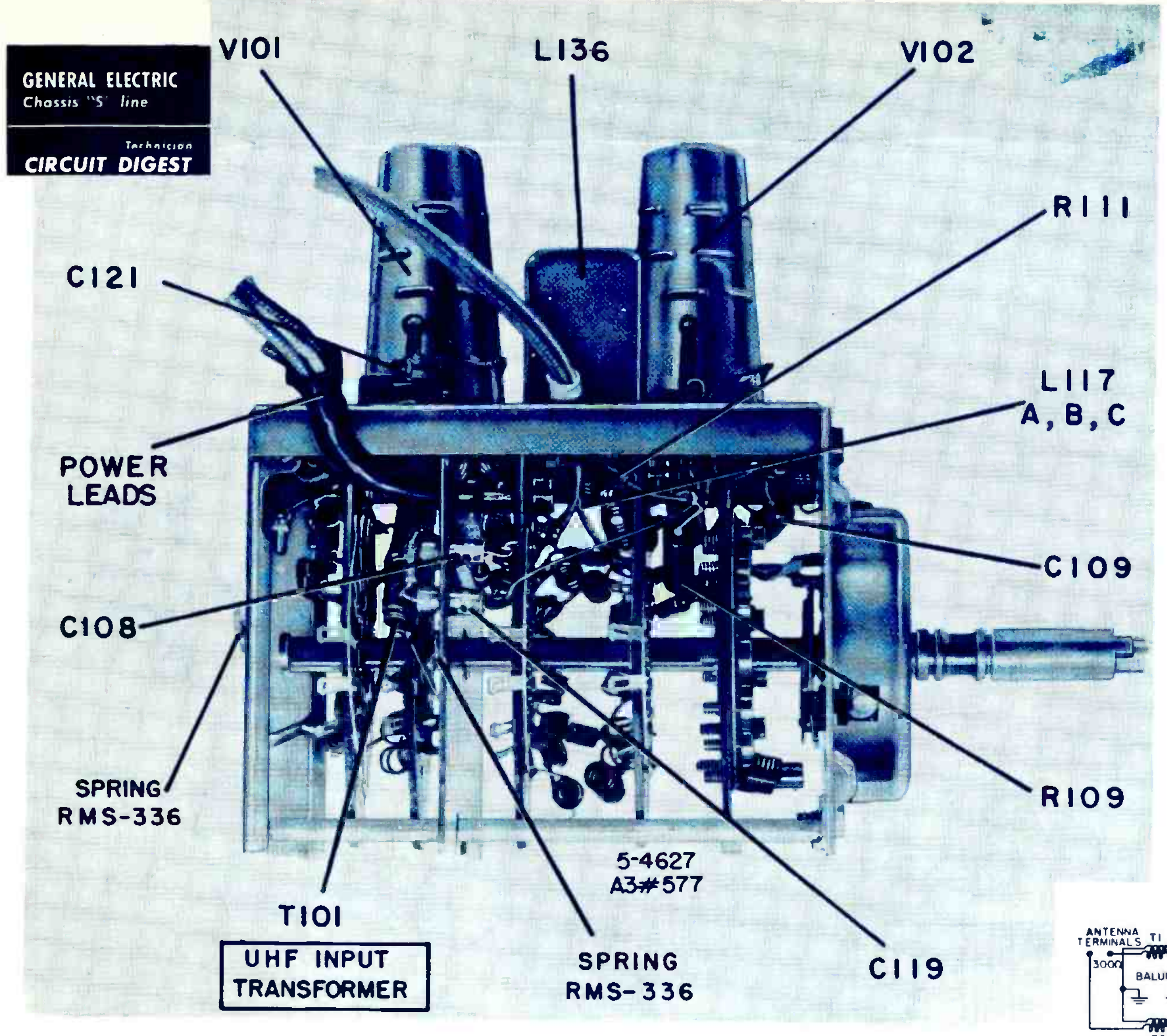


Fig. 10. Side View of RJX-080 VHF Tuner

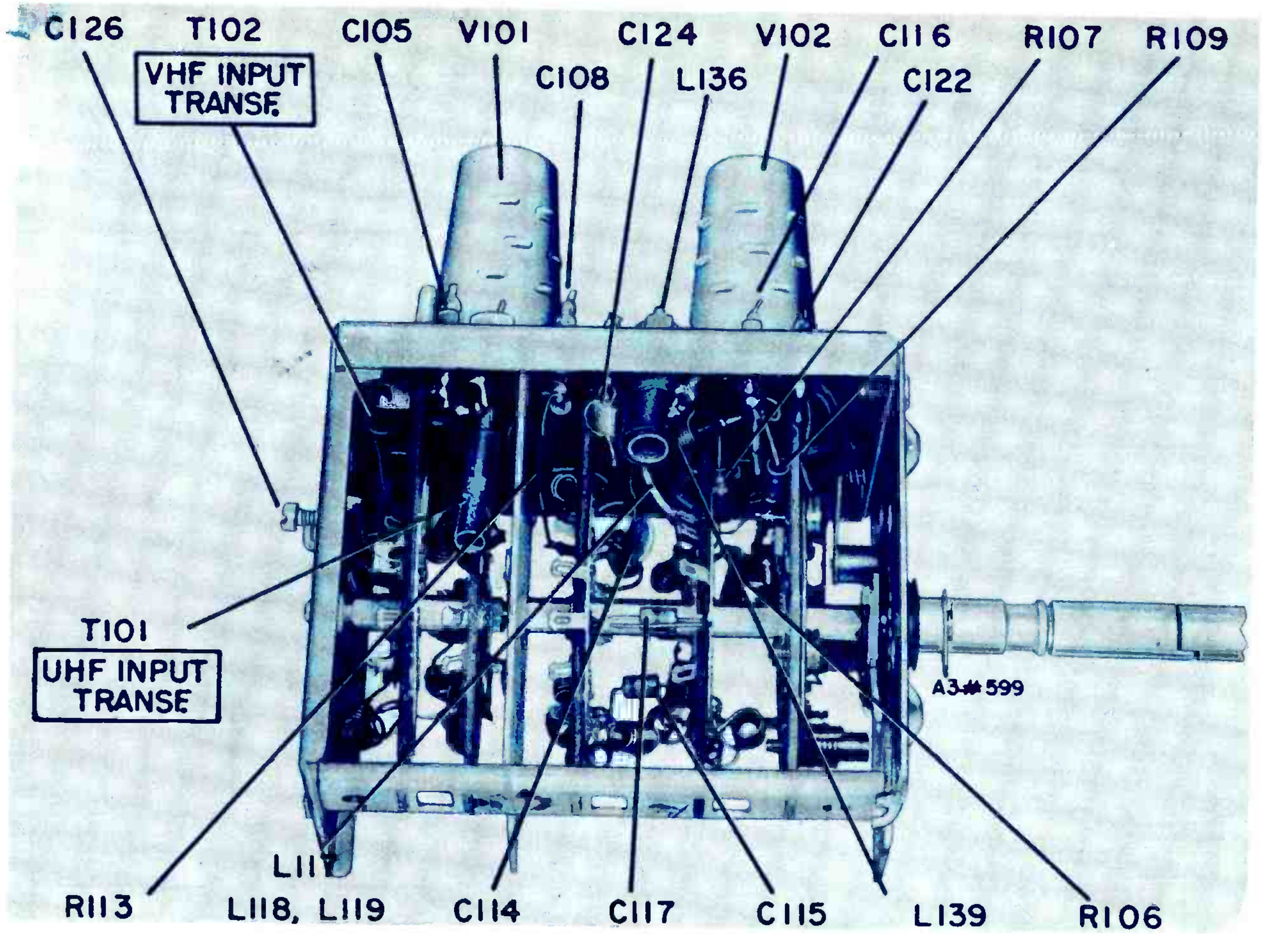


Fig. 12. Side View of RJX-088 VHF Tuner

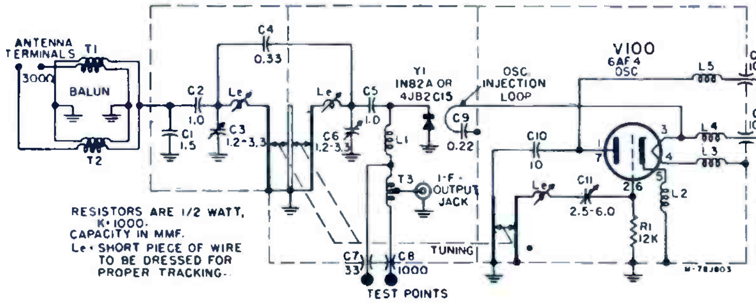


Fig. 41. Schematic Diagram for UHF Tuner, RUX-014

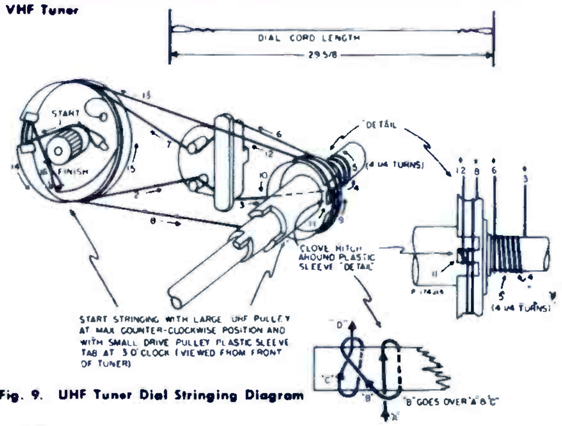


Fig. 9. UHF Tuner Dial Stringing Diagram

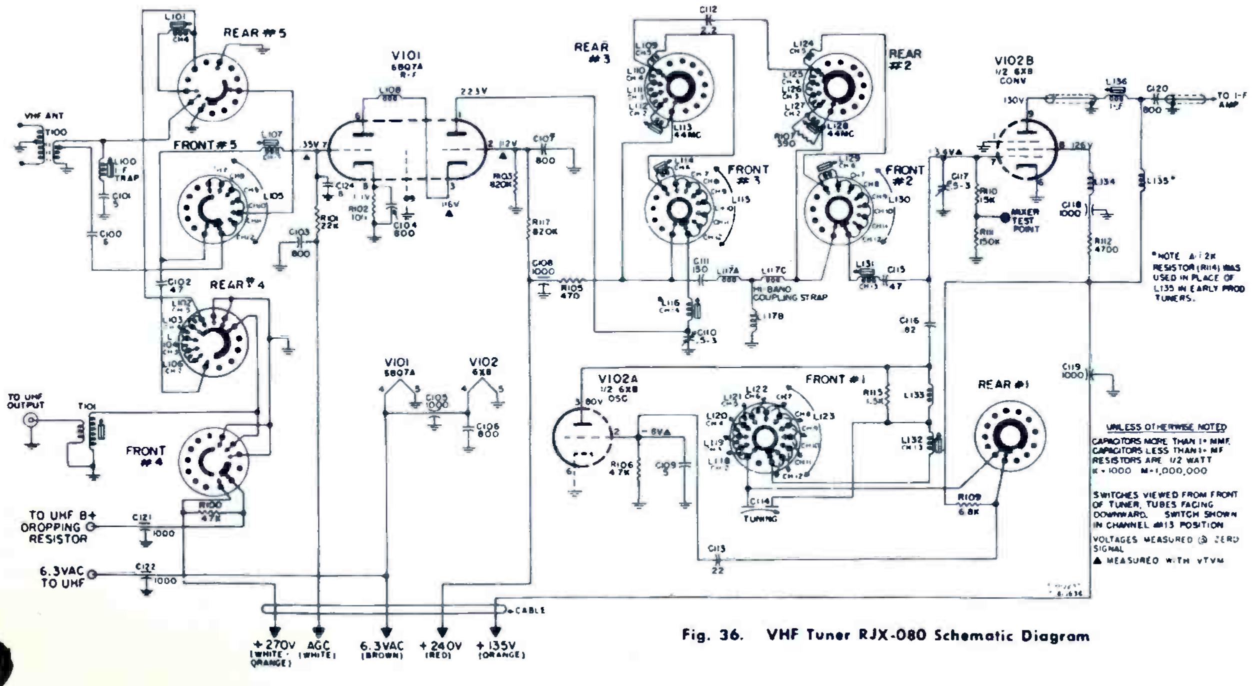


Fig. 36. VHF Tuner RJX-080 Schematic Diagram

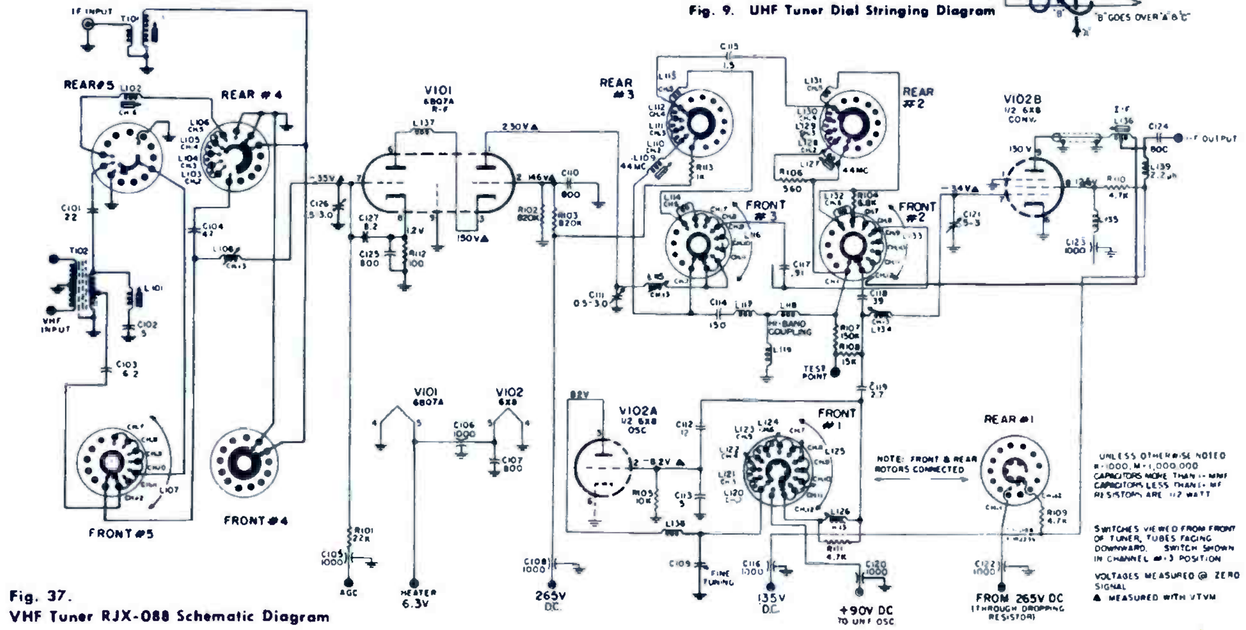


Fig. 37.
VHF Tuner RJX-088 Schematic Diagram

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GENERAL ELECTRIC
9-in. Portable TV Chassis "T" line

CHASSIS "T" LINE:
Models 9T001, 9T002

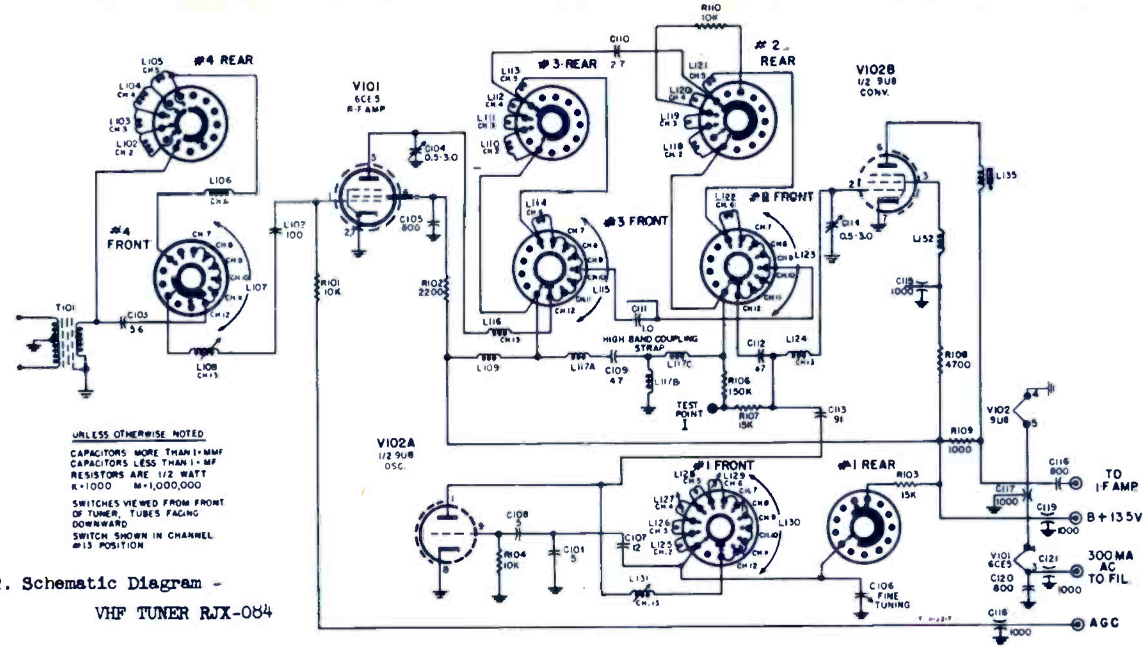


Fig. 2. Schematic Diagram - VHF TUNER RJX-084

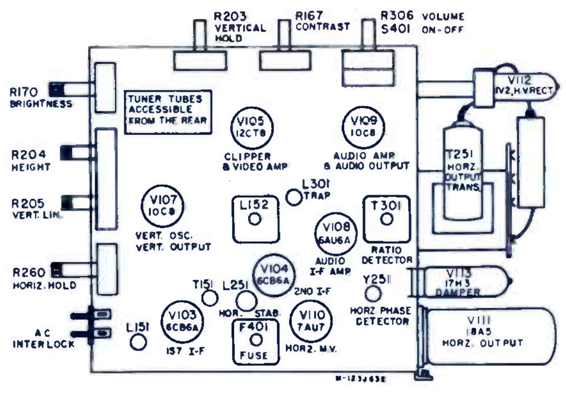


Fig. 3. Tube and Trimmer Location

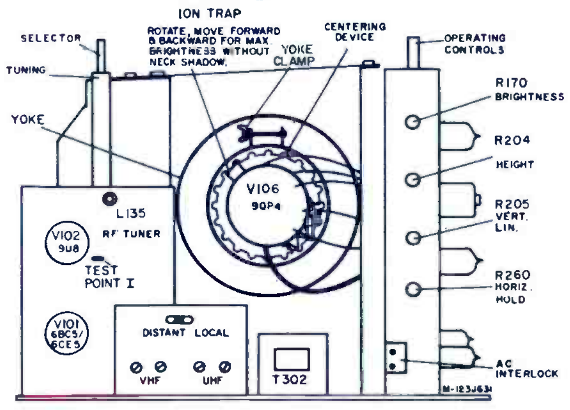


Fig. 1. Rear View of Chassis Cabinet Removed

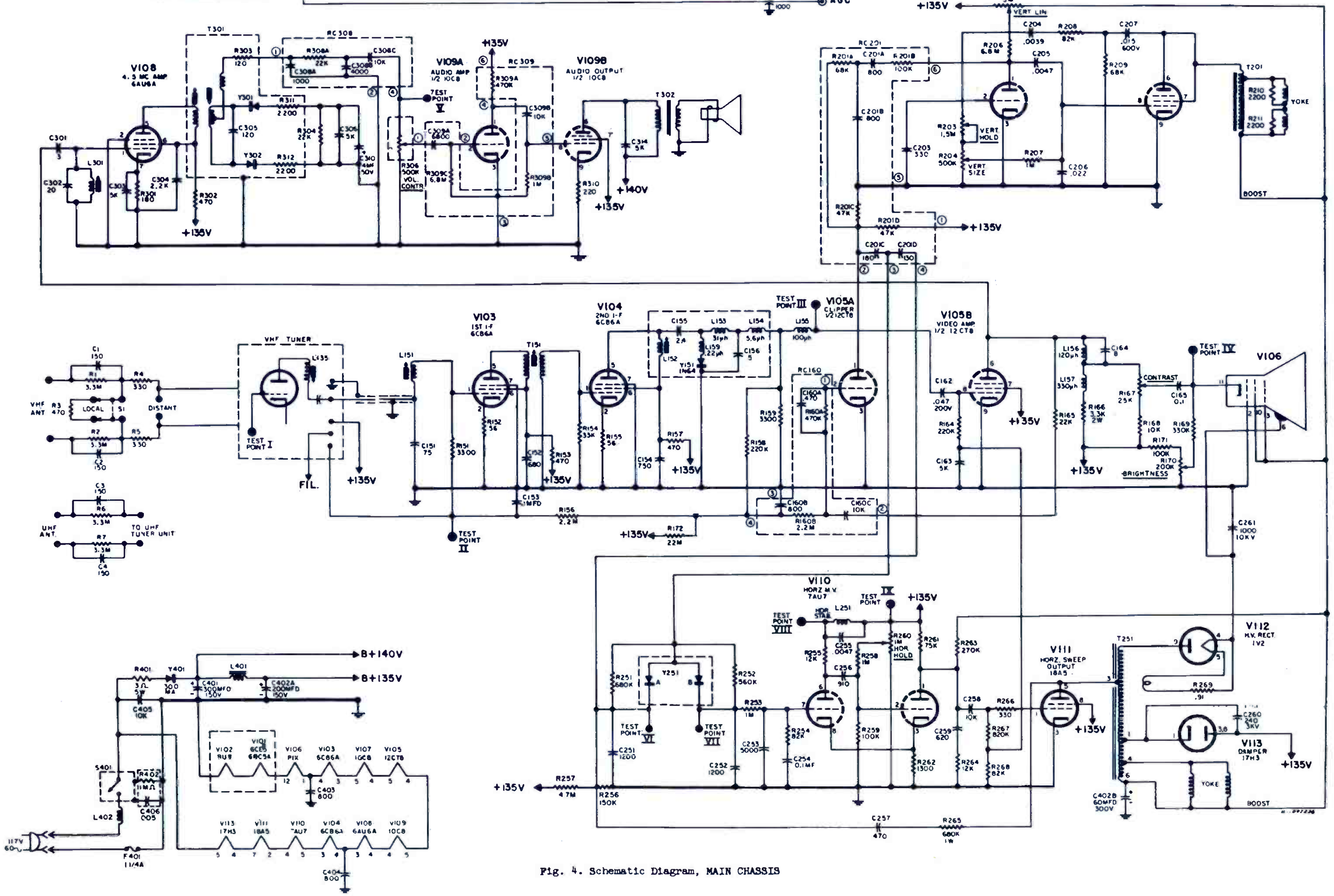


Fig. 4. Schematic Diagram, MAIN CHASSIS

GENERAL INFORMATION

The new General Electric "T" Line of receivers are available for straight VHF reception (Channel 2-13), as well as for VHF-UHF reception (Channels 2-83).

The chassis used in the "T" series receivers is completely new mechanically using a single printed circuit board and a new picture tube of blown-glass construction which is strong and lightweight. The high voltage anode is connected to a base pin of the picture tube. The greatly improved electrostatic focus retains good focus under varying conditions such as changes in power line voltage thus eliminating the need for adjustment of the focus in this receiver. "Spot blooming" and "snow" interference are reduced in fringe areas.

Features of these receivers include top tuning, a "local distant" range switch to accomodate all signal strengths, extreme portability due to lightness (less than 13 lbs.) and "Travelized" aluminum cabinet with chrome carrying handle. The speaker uses a moisture-proof aluminum voice coil. The 45 MC I-F and oscillator shielding prevents this receiver from interfering with other TV receivers.

The tuners incorporated in the "T" series of receivers are of the pentode type (use a pentode R-F stage). The RJX-084 being the 12 position tuner for VHF only, and the RJX-085, 13 position tuner along with RUX-013 for UHF-VHF reception.

The front molding and picture window are made from polystryene and caution should be used when cleaning it. Use only a mild solution of soap and water and wipe clean with a soft dry cloth. Cleaning agents sometimes contain harmful chemicals that will damage the plastic and should be avoided.

Service of the plated circuit board may be made without removal of the board from the main chassis. Leads should be clipped from the defective parts and new parts soldered to the existing leads. Where lead length is short, the part may be cut in half and then the remaining ends broken away from the leads to give extra length. The use of a small soldering iron (not exceeding 50 watts) is recommended as the plating may be affected by excessive heat.

OPERATIONAL FREQUENCIES:	Picture I-F Carrier.........	45.75 MC
	Sound I-F Carrier..........	41.25 MC
	Intercarrier Sound Take-Off.	4.5 MC

HALLICRAFTERS
Chassis A2000D, B2000D, C2000D, D2000D

Chassis A2000D, B2000D, C2000D, D2000D: Models 21TT500, M, B; 21K520, M, B; 21KT540, M, B; 21TT501, M, B; 21K521, M, B; 21KT541, M, B; 24TT510, M, B; 24KT550, M, B; 24TT511, M, B; 24KT551, M, B

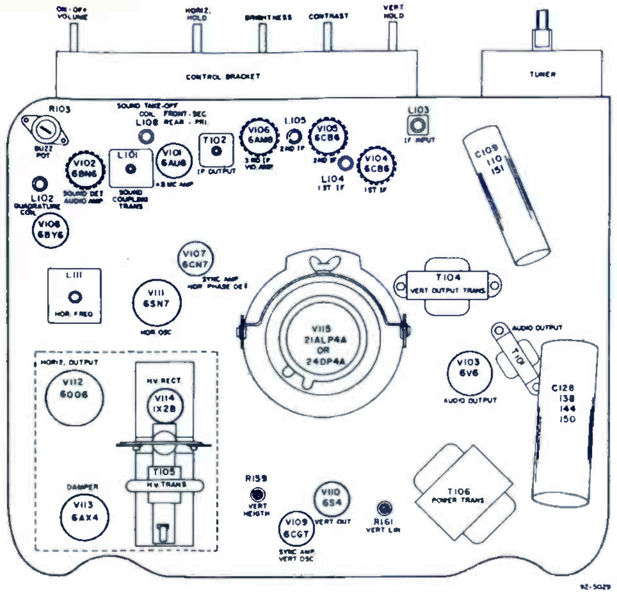


Fig. 1. Tube and Alignment Locations for 2000D

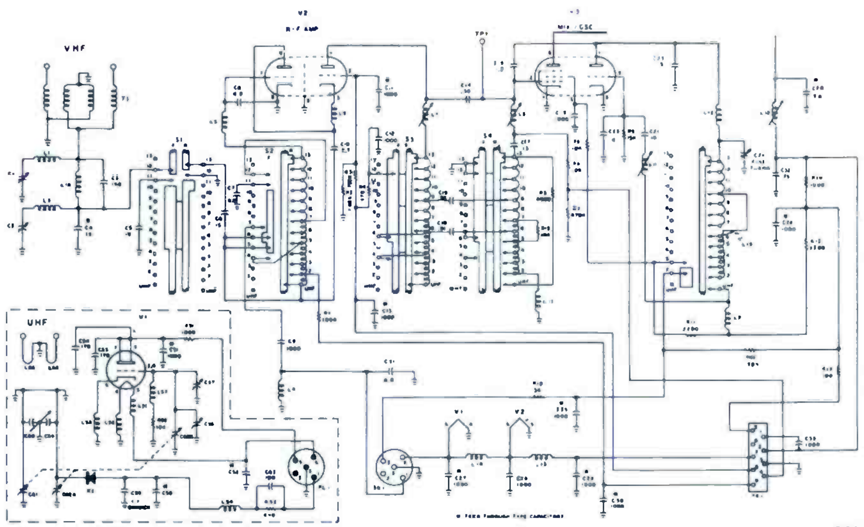


Fig. 7. VHF-UHF Tuner Schematic

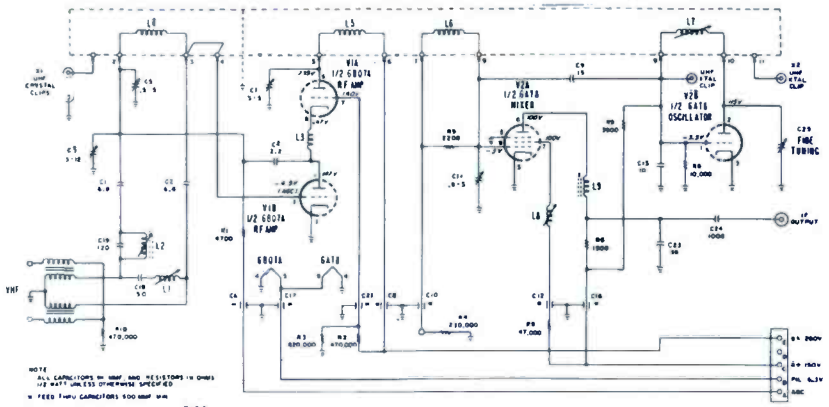
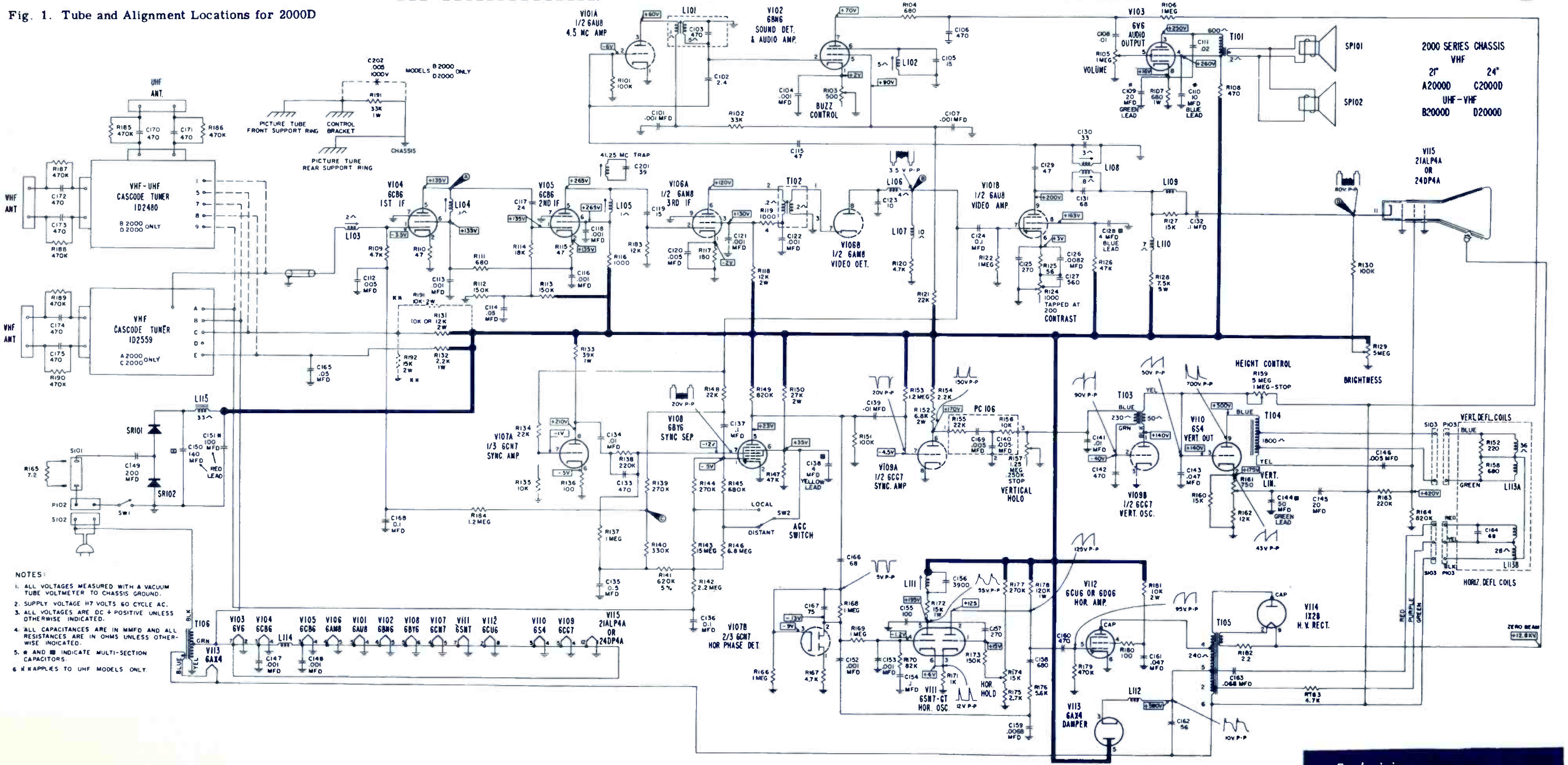


Fig. 9. VHF Tuner Schematic



NOTES:

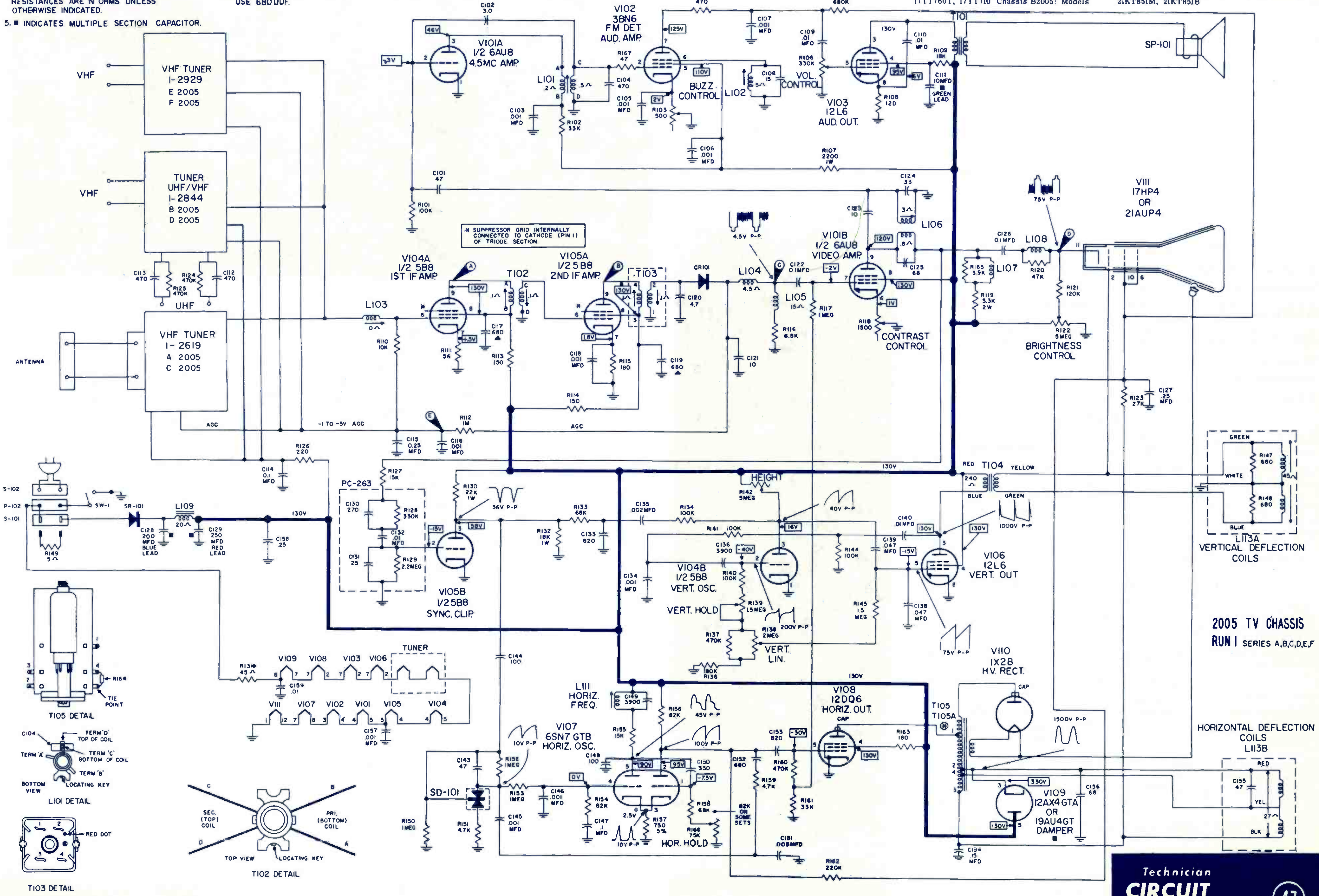
1. ALL VOLTAGES MEASURED WITH A VACUUM TUBE VOLTMETER TO CHASSIS GROUND.
2. SUPPLY VOLTAGE 117 VOLTS 60 CYCLE AC.
3. ALL VOLTAGES ARE DC + POSITIVE UNLESS OTHERWISE INDICATED.
4. ALL CAPACITANCES ARE IN MMFD AND ALL RESISTANCES ARE IN OHMS UNLESS OTHERWISE INDICATED.
5. ● AND ■ INDICATE MULTI-SECTION CAPACITORS.
6. ✕ ✕ APPLIES TO UHF MODELS ONLY.

HALLICRAFTERS
Chassis A2005, B2005, C2005, D2005

Chassis A2005: Models 17TT700M, 17TT700E, 17TT760T, 17TT710 Chassis B2005: Models 17TT701M, 17TT701E, 17TT761T, 17TT711 Chassis C2005: Models 21TT750M, 21KT850M, 21KT850B, Chassis D2005: Models 21TT751M, 21KT851M, 21KT851B

NOTES:

1. ALL VOLTAGES MEASURED WITH A VACUUM TUBE VOLTMETER TO CHASSIS GROUND.
2. SUPPLY VOLTAGE 117 VOLTS 60 CYCLE AC.
3. ALL VOLTAGES ARE DC + POSITIVE UNLESS OTHERWISE INDICATED.
4. ALL CAPACITANCES ARE IN MMFD AND ALL RESISTANCES ARE IN OHMS UNLESS OTHERWISE INDICATED.
5. ■ INDICATES MULTIPLE SECTION CAPACITOR.
6. ■ 12AX4GTA ON SETS 2005A,B,E, ONLY. 19AU4GT ON SETS 2005C,D,F, ONLY.
7. ⊛ T105-A,B,E, CHASSIS. T105A-C,D,F, CHASSIS.
8. ● SETS 2005 A,E, 45 OHMS. SET 2005B-40 OHMS. SETS 2005 C,F, -35 OHMS. SET 2005D-30 OHMS.
9. ▲ MAY BE 390 ON SOME SETS, WHEN REPLACING USE 680 UUF.



HALLICRAFTERS
Chassis A2005, B2005, C2005, D2005

Technician
CIRCUIT DIGEST

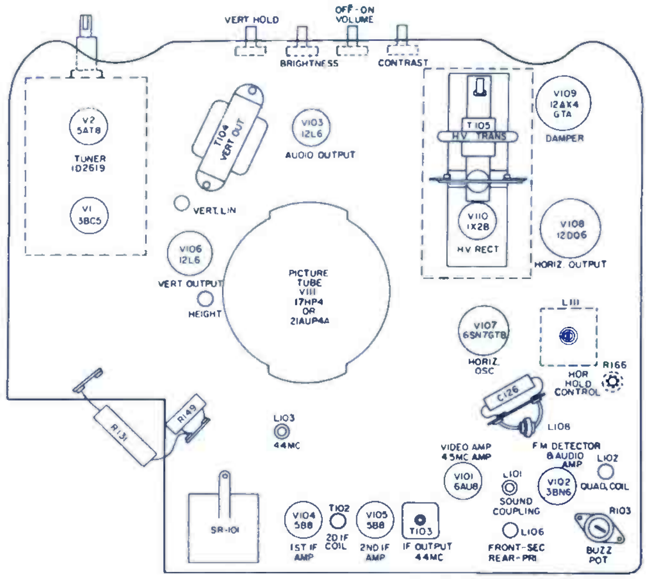


Fig. 1. Tube and Alignment Locations for 2005 Chassis

GENERAL ALIGNMENT INSTRUCTIONS

1. To nullify AGC, connect negative terminal of 3 volt battery to point E and positive terminal to chassis.
2. Couple generator to input test points through 1000 mmf. capacitor.
3. A detector circuit (Fig. 6) is required to couple the scope to the output test points in alignment steps 1 and 2. The detector in the receiver functions for steps 3 and 4.
4. Disable oscillator section of mixer/oscillator tube (5AT8 in tuner) by replacing with a 5AT8 tube with pin 1 removed, or disconnect antenna from set and short antenna input.
5. Set signal generator to IF frequency band.
6. Adjust marker frequencies to 42.75 and 45.75 MC to establish band width of desired curve (Fig. 9).
7. It is necessary that all interconnecting leads be as short as possible.

I.F. ALIGNMENT

GENERATOR — MARKER CONNECTIONS	SCOPE CONNECTION	ADJUSTMENTS
1. Grid test point on mixer See Figs. 3 or 5	Through Det. Ckt. to "A"	Mixer plate coil and L-103 for curve (Fig. 8).
2. 1st I.F. grid.	Through Det. Ckt. to "B"	T-102 for curve in Fig. 8
3. 2nd I.F. grid.	"C"	T-103 for curve in Fig. 8
4. Mixer grid test point.	"C"	Refine adjustments on coils above for curve in Fig. 9.
5. Remove battery from AGC line and re-establish oscillator circuit in tuner.		

GENERAL ALIGNMENT INSTRUCTIONS

1. Couple generator to set at point "C" through 1000 mmf capacitor.
2. For step 1 couple scope to set through detector circuit of Fig. 7.
3. Set contrast control to maximum clockwise, volume control to 1/2 maximum clockwise, and buzz control 90 degrees from clockwise stop.
4. Keep generator output below level where limiting occurs except as shown in chart.
5. Coil slug adjustments are indicated as from the underside of chassis. Slug adjustment into coil is counterclockwise. Slug adjustment out of coil is clockwise.

SOUND ALIGNMENT

GENERATOR FREQ	SCOPE CONNECTION	ADJUSTMENTS
1. 4.5 mc/30% 400 cps AM modulation	Detector ckt Point "D".	L-106 primary slug completely out of coil. L-106 secondary slug completely out of coil. L-106 primary slug into coil for minimum scope indication.
2. 4.5 mc/7.5 kc. deviation FM	Across secondary of audio output transformer.	L-102 slug out of coil and then in for maximum scope indication. L-101 slug into coil for maximum indication. L-106 secondary slug into coil for maximum indication.
3. Increase output level above limiting - 4.5 mc/30% 400 cps AM	Across secondary of audio output transformer.	Buzz control for minimum scope indication.
4. Output level above limiting. 4.5 mc/7.5 kc. deviation FM	Across secondary of audio output transformer.	L-102 slug in for maximum scope indication. Refine adjustments for L-101, L-102, and L-106 for maximum scope indication.

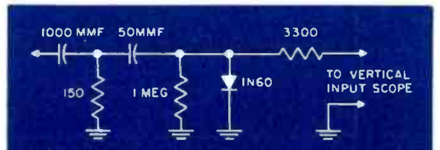


Fig. 6. IF Detector Ckt.

Fig. 7. FM Detector Ckt.

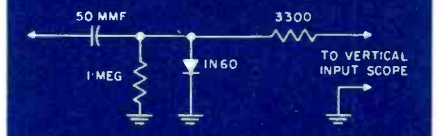


Fig. 8. Individual Response Curve

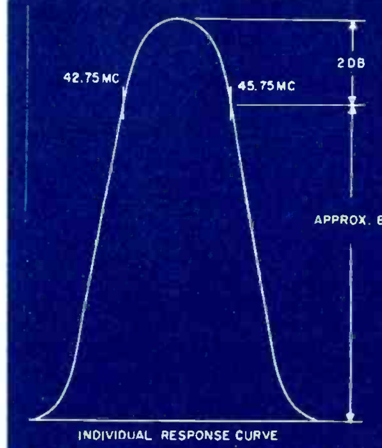


Fig. 9. Overall Response Curve

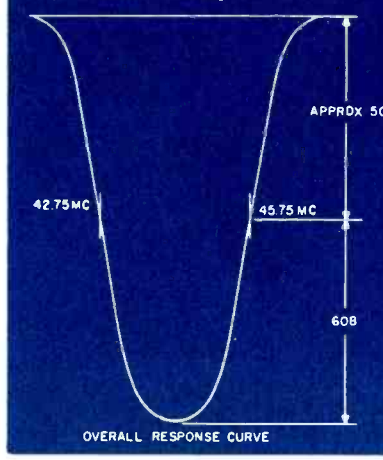


Fig. 2. Schematic 1E2619 VHF Tuner

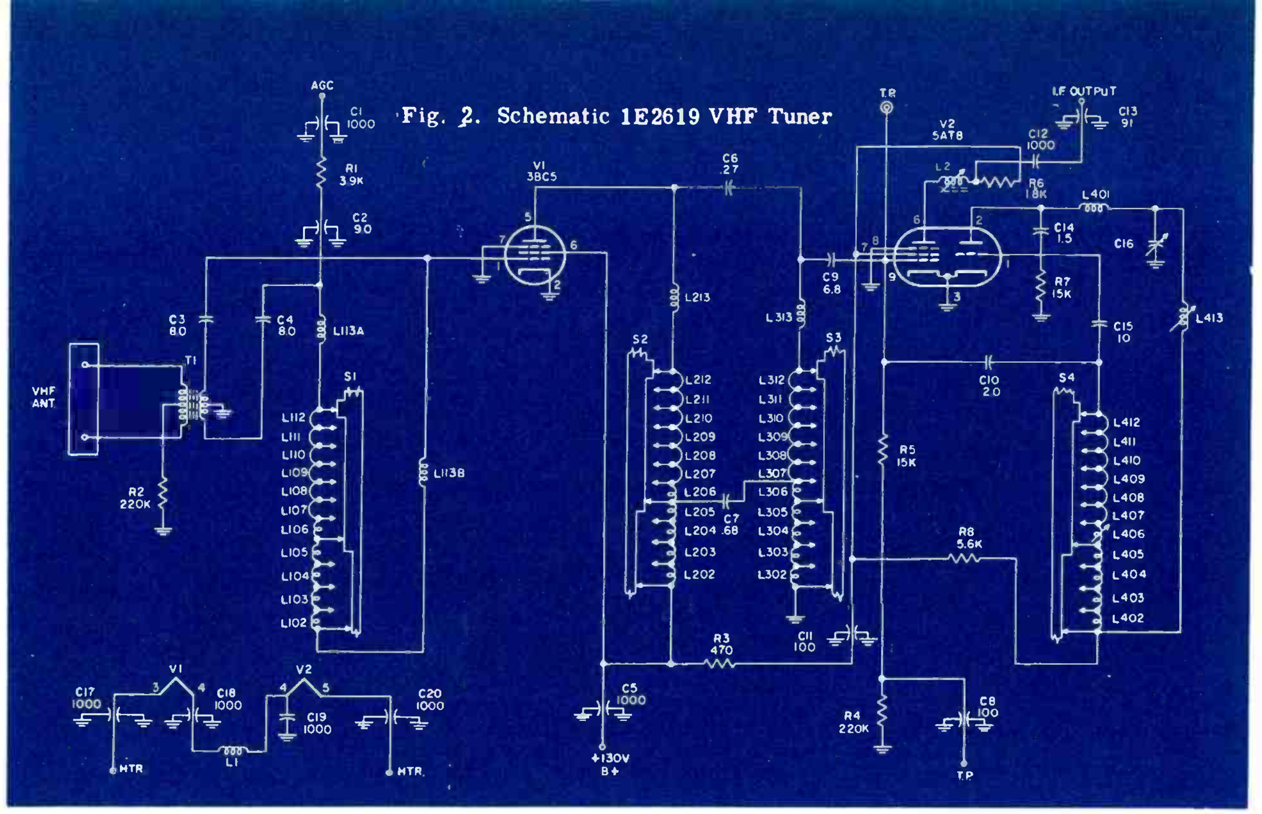
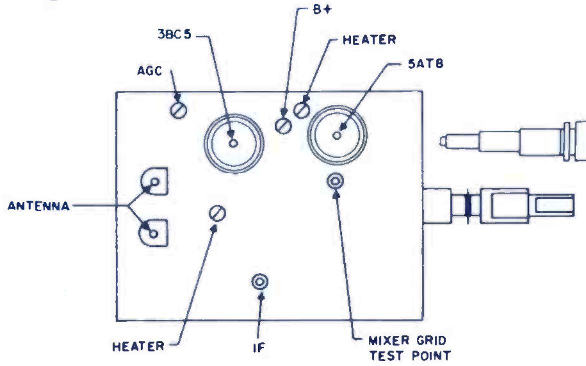


Fig. 3. 1E2619 VHF Tuner



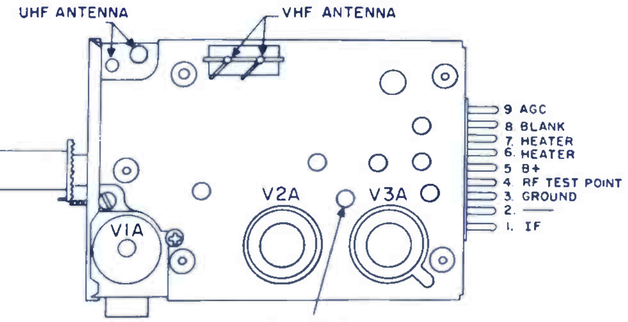


Fig. 5. 1-2844 VHF/UHF Tuner

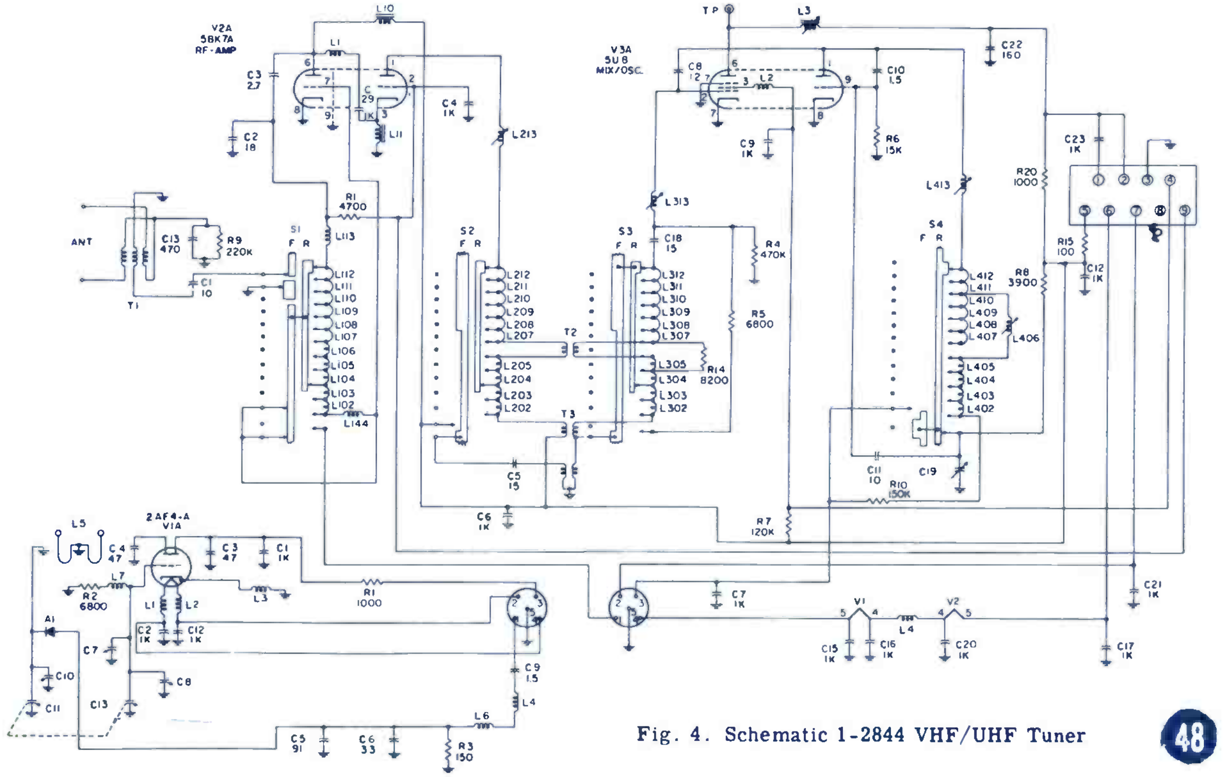
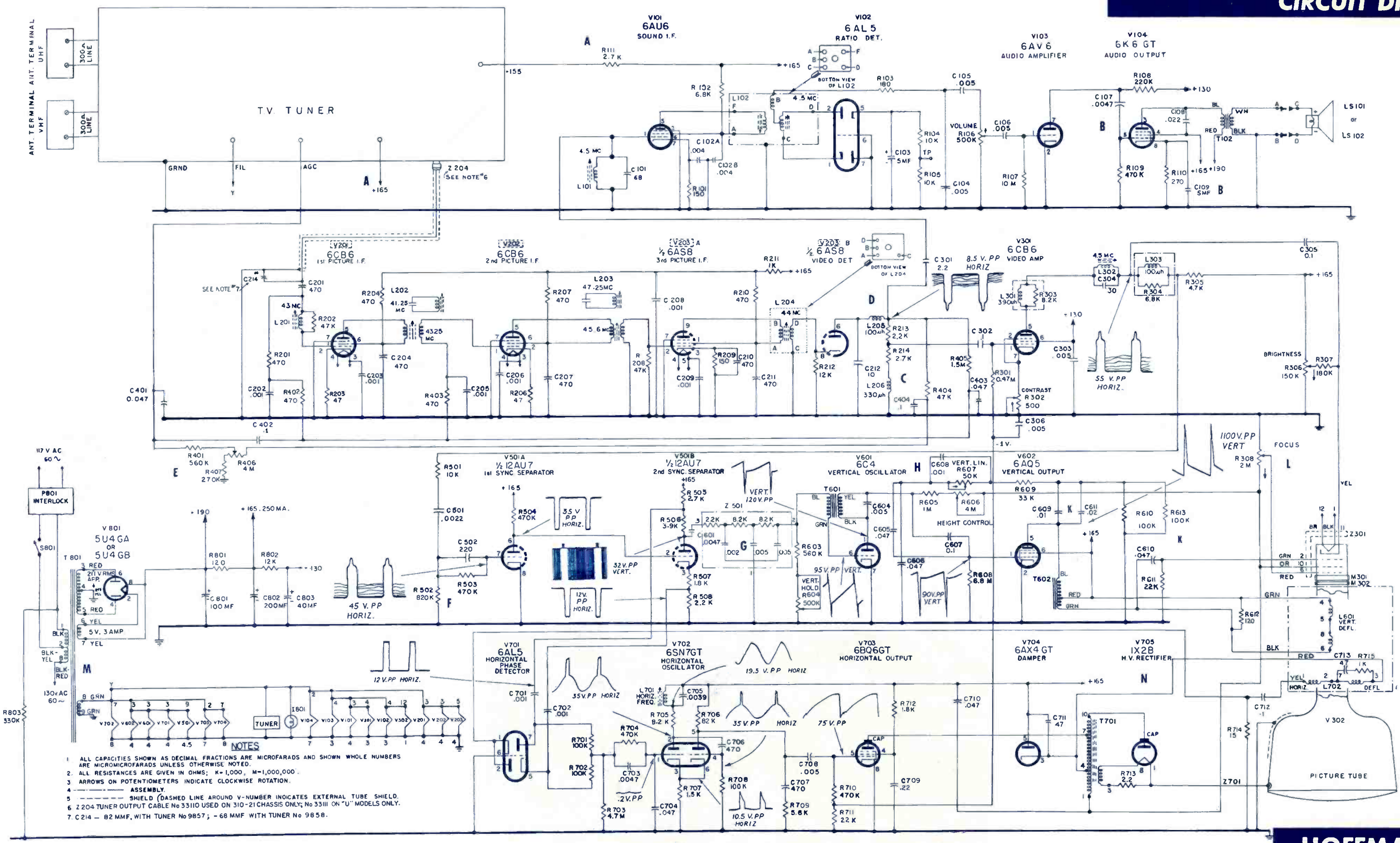


Fig. 4. Schematic 1-2844 VHF/UHF Tuner

SCHEMATIC DIAGRAM FOR CHASSIS 306-21, 307-17, 308-21, 309-21, 310-21



NOTES

1. ALL CAPACITIES SHOWN AS DECIMAL FRACTIONS ARE MICROFARADS AND SHOWN WHOLE NUMBERS ARE MICROMICROFARADS UNLESS OTHERWISE NOTED.
2. ALL RESISTANCES ARE GIVEN IN OHMS; K=1,000, M=1,000,000.
3. ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
4. —·—·—·— ASSEMBLY.
5. - - - - - - - SHIELD (DASHED LINE AROUND V-NUMBER INDICATES EXTERNAL TUBE SHIELD.
6. Z 204 TUNER OUTPUT CABLE No 33110 USED ON 310-21 CHASSIS ONLY; No 33111 ON "U" MODELS ONLY.
7. C 214 — 82 MMF, WITH TUNER No 9857; - 68 MMF WITH TUNER No 9858.

IDENTIFICATION

Chassis 306-21 is used in Models 21M175S, 21B176S, 21P177S, 21M183, 21B184, 21P185, 21U205S, 21M357, 21B358, 21P359.

Chassis 307-17 is used in Models 7M181, 7B182, 7W181

Chassis 308-21 is used in Models 21M183P, 21B184P, 21B185P, 21M357P, 21B358P, 21P359P.

Chassis 309-21 is used in Models 21K186, 21M187, 21B188, 21-189, 21W360, 21M360, 21B361, 21P362.

Chassis 310-21 is used in Models 21W190, 21M190, 21B191, 21P192.

PRODUCTION VARIATIONS

A. B+ Supply to Tuner. R111 value of 1.2K is used with pentode tuner. Value is increased 2.7K with cascode and All Wave tuners. 165Volt B+ terminal for RF section of tuner is used only with cascode and All Wave tuners. Pentode tuner RF section is supplied from common B+ terminal by internal connection to +155 volt lead terminal.

B. Audio Amplifier. Sets produced prior to Serial L588881 did not have C109 and C107 was .001 instead of .0047. If additional sound volume is desired change C107 to .0047 and add C109. Also see Item D.

C. Video Detector Load Circuit. Before Serial J577201, R213 and R214 were reversed in value on pentode tuner models. Cascode tuner models had R213 1K, R214 3.9K. Change to values on schematic when adding AGC circuit.

D. Audio I.F. Gain. Following Serial J577201, L205 was changed from 180 u h to 100 u h to give increased audio I. F. gain at low input signal to the receiver.

E. AGC Circuit. Changed after serial J577201. Check for values of R401, R404, R406, R407, C402, C403 and C404 on all AGC service problems. When adding AGC control to pentode tuner models remove 4.7 meg resistor from I. F. AGC bus to chassis ground. On cascode tuner models and all wave models, remove 2.2 meg resistor from R. F. AGC bus to chassis ground. See Item C above.

F. First Sync Separator. On sets prior to Serial B614642, R502 was 820K. Change to 2.2 meg for improved sync stability on strong signal.

G. Integrator Network. A small quantity of receivers were produced with integrator composed of separate components. They need not be replaced with 9695 network unless defective due to normal failure.

H. Vertical Retrace Elimination. Check value of C608 for .001 mfd value if retrace lines are evident.

K. Vertical Linearity. Following Serial B614642 a .01 mfd capacity was added in parallel to C609 and C611 and R610 was changed from 100K to 68K for additional adjustment range on the vertical linearity control. In some cases, R610 is paralleled with R613 100K resistor.

L. Focus Control R308. Added on chassis produced after L588881. Prior to addition of this control terminal 6 of the picture tube socket was grounded. Focus may be improved on models without the focus control by connecting pin 6 to B+ or B+ boost instead of chassis ground.

M. Power Transformer. Following serial K584623 a power transformer with an additional 130V primary tap was used. This tap is to be used in areas where excessive line voltage is encountered. This will assure adequate component protection against excessive voltage and compensate for sweep problems due to incorrect voltages.

N. High Voltage Rectifier. Some models having Chassis 306-21 and 308-21 use a 1B3GT high voltage rectifier tube. All of the other components in the high voltage circuit and horizontal deflection circuit are as indicated on the chassis schematic and parts list.

Chassis 306-21: Models 21M175S, 21B176S, 21P177S, 21M183, 21B184, 21P185, 21U205S, 21M357, 21B358, 21P359
Chassis 307-17: Models 7M181, 7B182, 7W181
Chassis 308-21: Models 21M183P, 21B184P, 21B185P, 21M357, 21B358P, 21P359P
Chassis 309-21: Models 21K186, 21M187, 21B188, 21-189, 21W360, 21M360, 21B361, 21P362
Chassis 310-21: Models 21W190, 21M190, 21B191, 21P192

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Chassis 306-21, 307-17, 308-21, 309-21, 310-21

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HOFFMAN
Chassis 306-21, 307-17, 308-21, 309-21, 310-21

Technician **CIRCUIT DIGEST**

TUNER IDENTIFICATION AND SERVICE

TUNER AND CHASSIS CROSS REFERENCE LIST BY PART STOCK NO.

DESCRIPTION	DESIGNATION	306-21	307-17	308-21	309-21	310-21	VHF	UHF STRIP
Cascode	No Suffix	9839	------	------	------	9857	R	Type "R"
Pentode	"P"	------	9843	9829	------	------	W	Type "W"
Single Board Pentode	"P2"	------	9850	------	9855	------	TB	Type "TB"
Step Type All Wave	"U"	9838	------	------	------	------	R	
Continuous All Wave	"U2"	------	------	------	9858	9858	U	

All above tuners have 41MC I. F. output

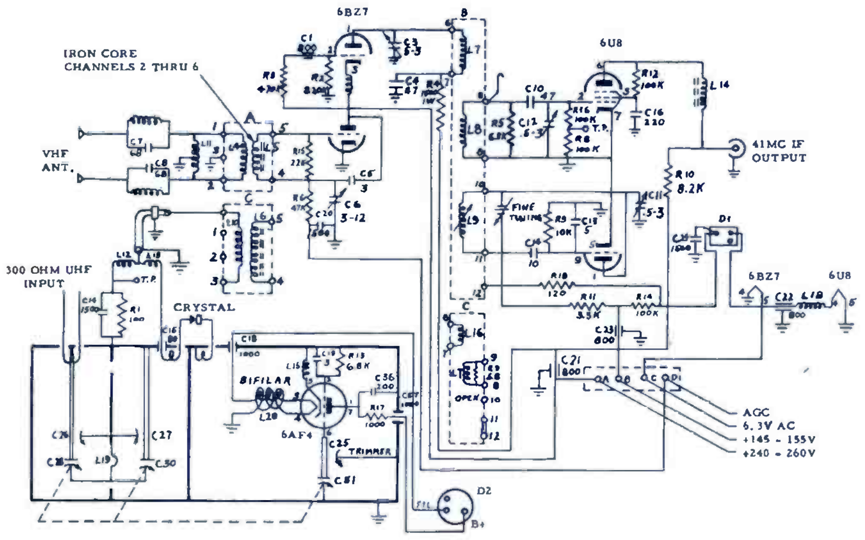


Figure 9 SCHEMATIC DIAGRAM FOR TUNER 9858

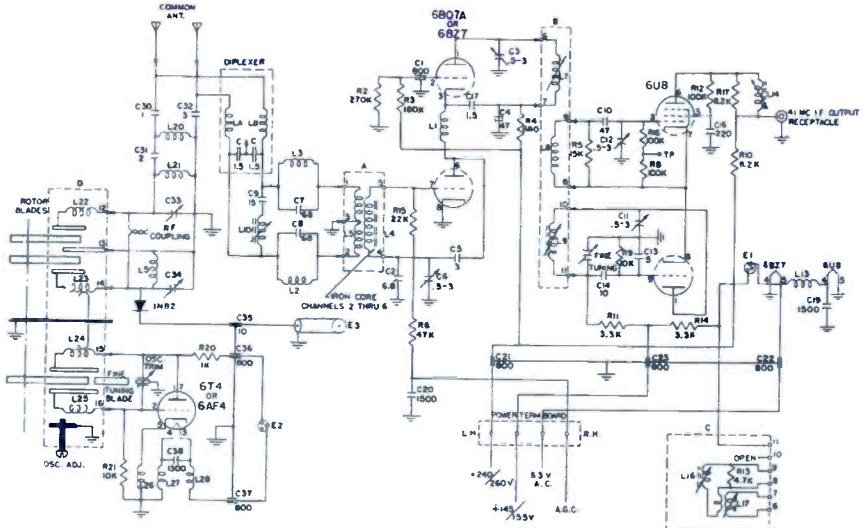


Figure 11 SCHEMATIC DIAGRAM FOR TUNER 9838

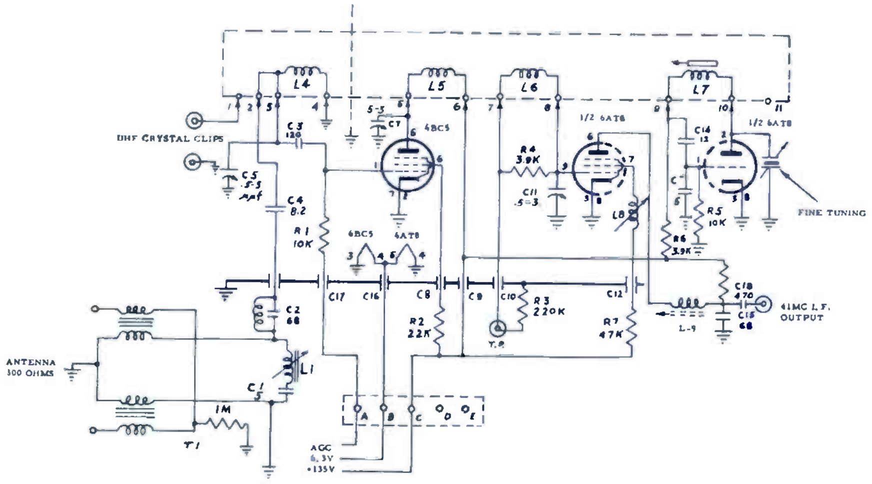
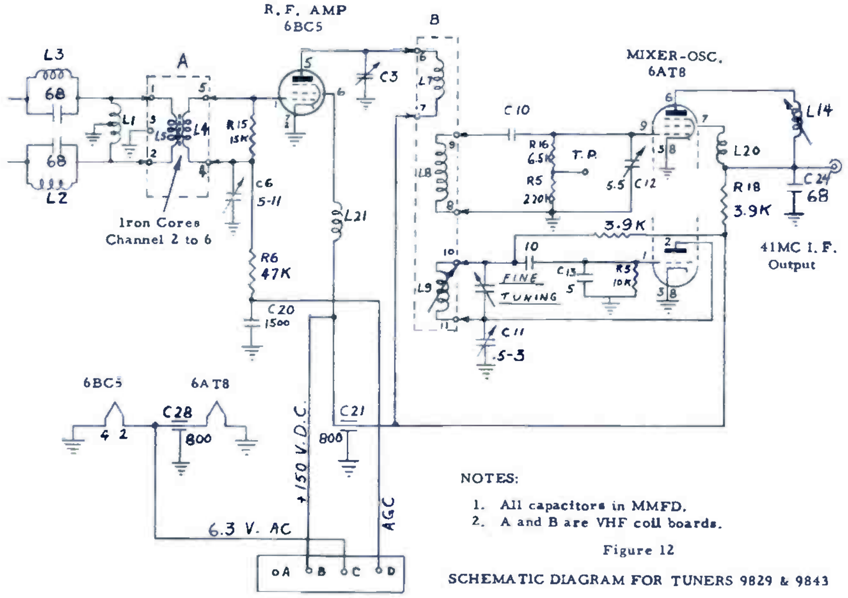


Figure 10 SCHEMATIC DIAGRAM FOR TUNERS 9850 & 9855



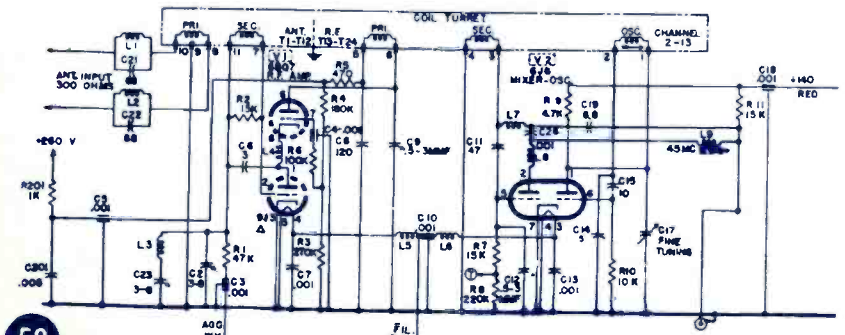
NOTES:

1. All capacitors in MMFD.
2. A and B are VHF coil boards.

Figure 12

SCHEMATIC DIAGRAM FOR TUNERS 9829 & 9843

Figure 8 SCHEMATIC DIAGRAM FOR TUNER 9839



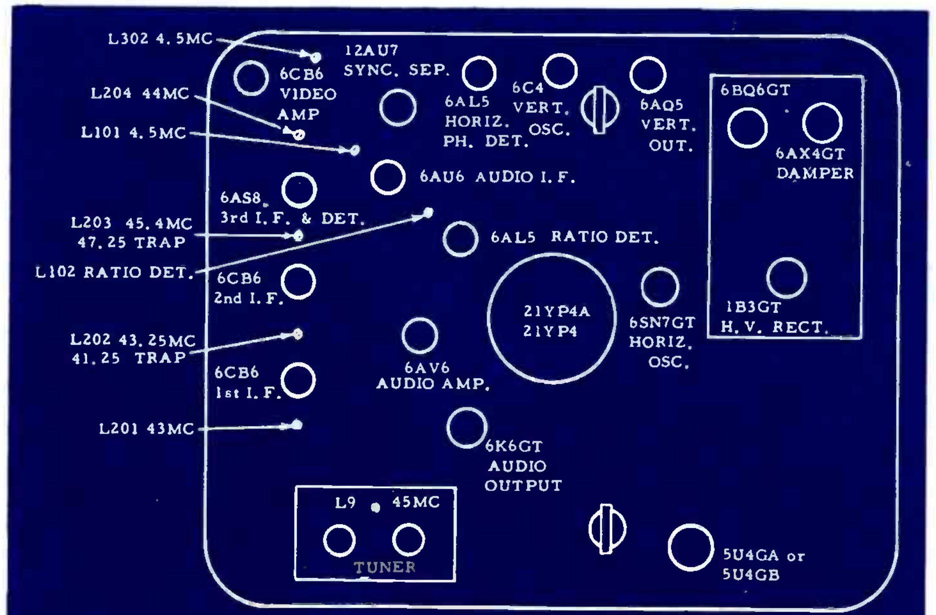


Figure 18 BACKVIEW OF CHASSIS 307

VOLTAGE CHART

TUBE NO.	TUBE TYPE	FUNCTION	PLATE PIN	PLATE VOLTS	CATHODE PIN	CATHODE VOLTS	GRID PIN	GRID VOLTS	SCREEN PIN	SCREEN VOLTS
V101	6AU6	Sound I. F.	5	120	7	1.1	1	0	6	125
V102	6AL5	Ratio Det.	7 2	0 15	1 5	13 27				
V103	6AV6	Audio Amp.	7	77	2	0	1	-0.7		
V104	6K6GT	Audio Output	3	185	8	8.3	5	0	4	167
V201	6CB6	1st Pix. I. F.	5	148	2	0.4	1	0.2	6	153
V202	6CB6	2nd Pix. I. F.	5	146	2	0.4	1	0.2	6	153
V203A	1/2 6AS8	3rd Pix. I. F.	9	146	3	1.5	2	0	1	147
V203B	1/2 6AS8	Video Det.	6	-5	8	0				
V301	6CB6	Video Amp.	5	138	7	1.0	1	0	6	135
V501A	1/2 12AU7	1st Sync Sep	6	34	8	0	7	-19		
V501B	1/2 12AU7	2nd Sync Sep.	1	115	3	34	2	34		
V601	6C4	Vert. Osc.	1	147	7	0	6	-27		
V602	6AQ5	Vert. Output	5	160	2	0	1	-8	6	170
V701	6AL5	Hor. Ph. Det.	7 2	-10 0	1 5	0 9.5				
V702	6SN7GT	Hor. Osc.	2 5	141 96	3 6	7 7	1 4	-0.2 -7.8		
V703	6BQGT	Hor. Output	Cap	*	8	0	5	-28	4	154
V704	6W4GT	Damper	5	166	3	430				

*Do not measure - High amplitude spikes of D. C. may damage meter. D. C. value will be about same as boost voltage. Boost voltage at pin #1 of horizontal output transformer about 400 volts.

Voltages taken with VTVM meter on 309-21 chassis operating as follows: A. C. line voltage 117 volts, receiver tuned to station with normal setting of all controls, negative 5 volts developed at plate of video detector by signal received. All voltages are positive D. C. unless otherwise indicated.

These readings are prepared as a service reference and should not be considered as minimum or maximum specifications for the operation of these chassis. Variations within limits will be noted, due to operating conditions and the normal allowable tolerances in component values. Differences in sweep circuit voltages will also be found on 17 inch chassis.

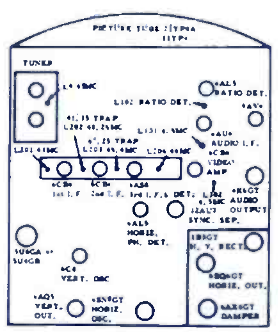


Figure 19 TOP VIEW OF CHASSIS 306 & 308

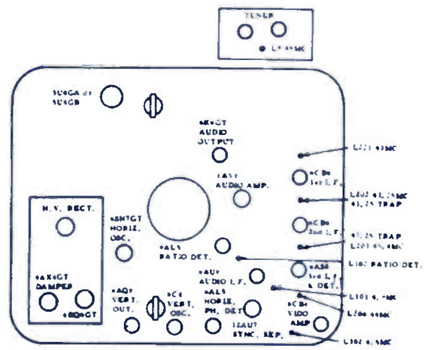


Figure 20 INSIDE VIEW OF CHASSIS 309 & 310

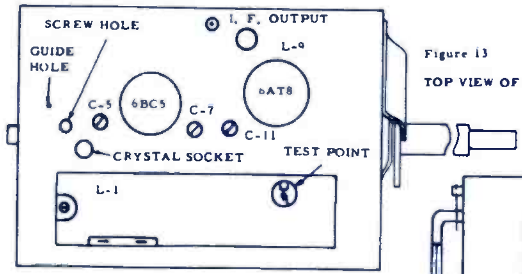


Figure 13

TOP VIEW OF TUNERS 9850 & 9855

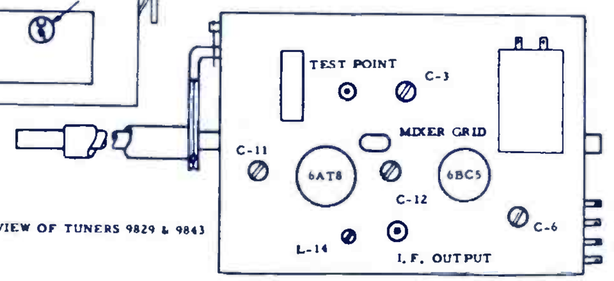


Figure 14 TOP VIEW OF TUNERS 9829 & 9843

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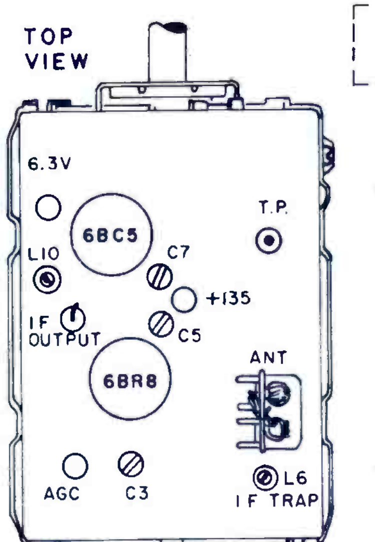
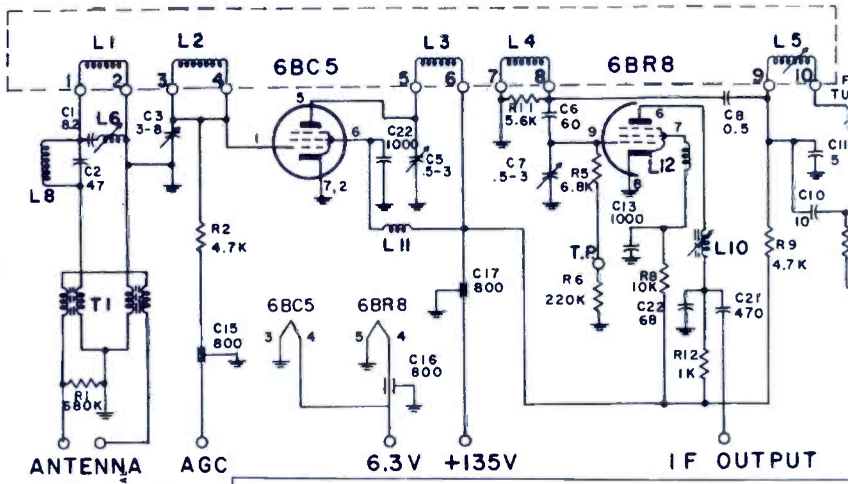
TECHNICIAN CIRCUIT DIGEST

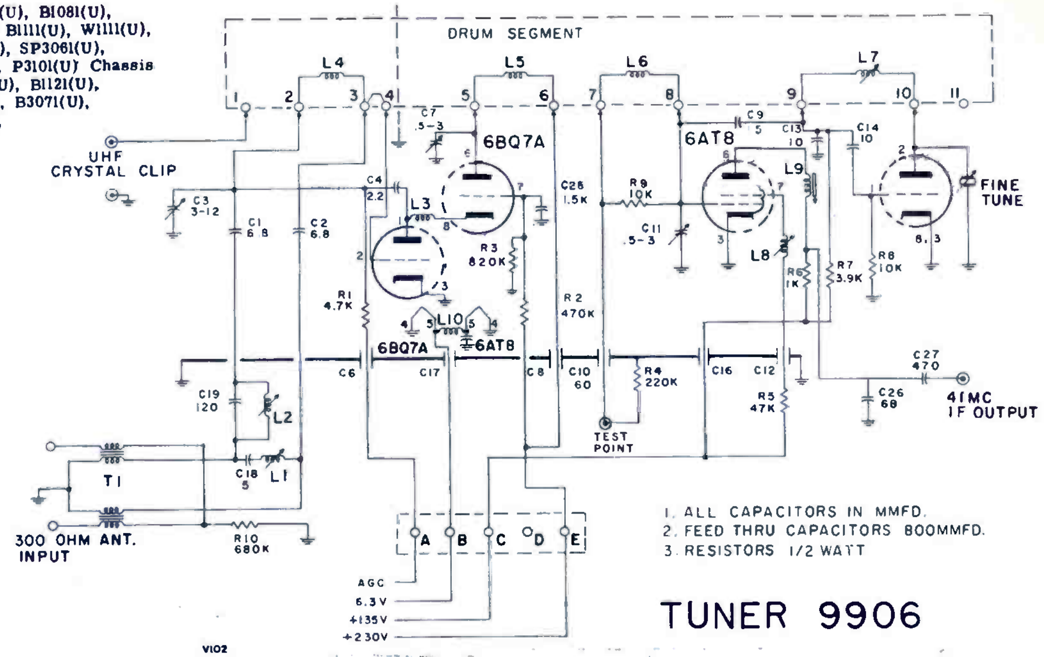
HOFFMAN Chassis 321, 322

Chassis 321(U): Models K1081(U), B1081(U), B1091(U), M1091(U), M1111(U), B1111(U), W1111(U), M3061(U), B3061(U), W3061(U), SP3061(U), M3101(U), B3101(U), W3101(U), P3101(U) Chassis 322: Models M1121(U), W1121(U), B1121(U), P1121(U), M3071(U), W3071(U), B3071(U), P3091(U), M3114(U), W3114(U), B3114(U), P3114(U)



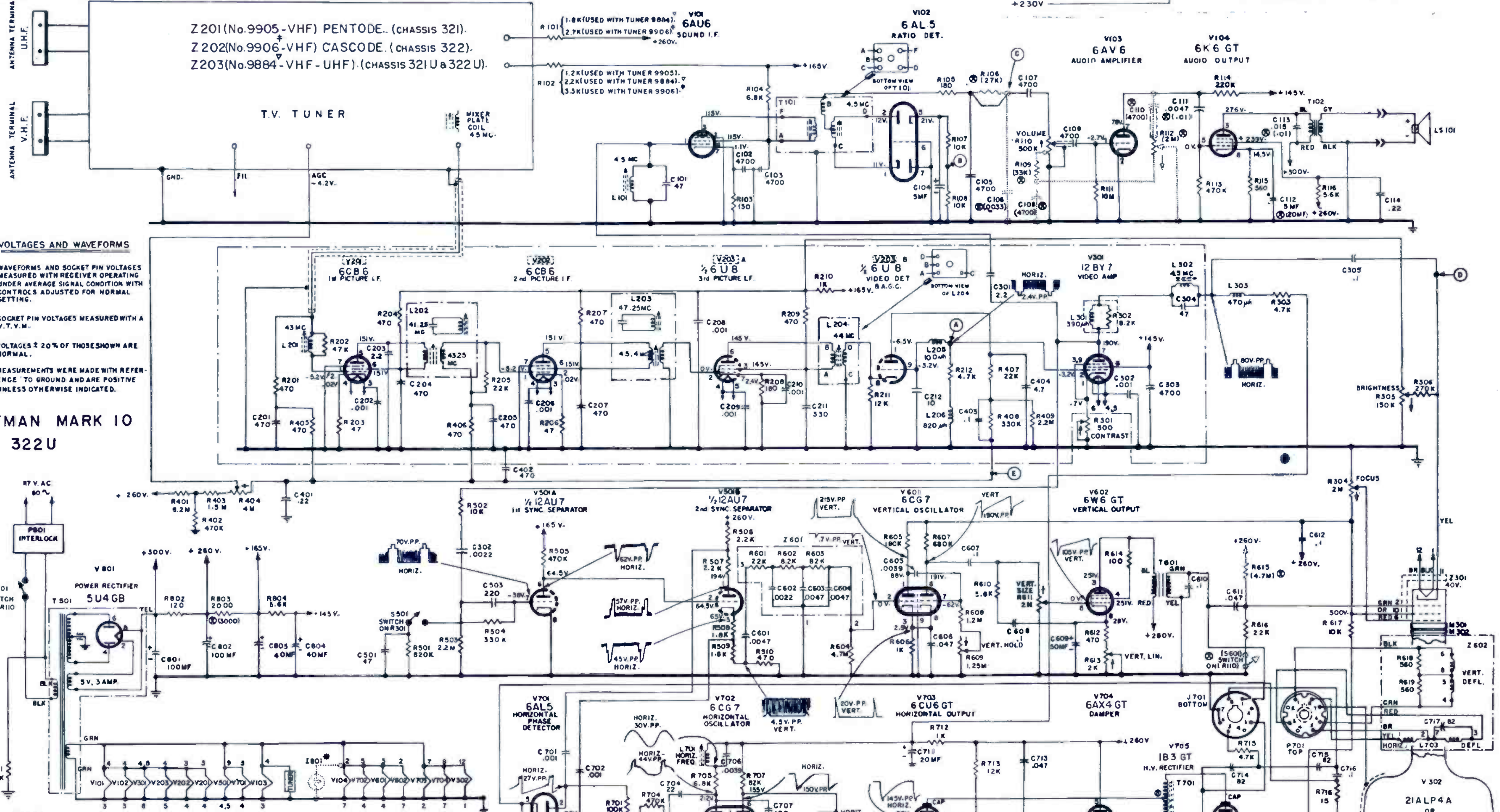


TUNER 9905



1. ALL CAPACITORS IN MMFD.
2. FEED THRU CAPACITORS 800MMFD.
3. RESISTORS 1/2 WATT

TUNER 9906



VOLTAGES AND WAVEFORMS

a) WAVEFORMS AND SOCKET PIN VOLTAGES MEASURED WITH RECEIVER OPERATING UNDER AVERAGE SIGNAL CONDITION WITH CONTROLS ADJUSTED FOR NORMAL SETTING.

b) SOCKET PIN VOLTAGES MEASURED WITH A V.T.V.M.

c) VOLTAGES ± 20% OF THOSE SHOWN ARE NORMAL.

d) MEASUREMENTS WERE MADE WITH REFERENCE TO GROUND AND ARE POSITIVE UNLESS OTHERWISE INDICATED.

SCHEMATIC DIAGRAM FOR HOFFMAN MARK 10 CHASSIS 321, 321U, 322, 322U

NOTES:

1. ALL CAPACITIES SHOWN AS DECIMAL FRACTIONS ARE MICROFARADS AND SHOWN WHOLE NUMBERS ARE MICROMICROFARADS UNLESS OTHERWISE NOTED.
2. ALL RESISTANCES ARE GIVEN IN OHMS; K=1,000, M=1,000,000.
3. ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
4. —·—·— ASSEMBLY.
5. - - - - - SHIELD (DASHED LINE AROUND V-NUMBER INDICATES EXTERNAL TUBE SHIELD.)
6. ● RESISTORS & CAPACITORS WITH VALUE INDICATED IN PARENTHESIS—USED ON MODELS 322 & 322U ONLY.
7. ENCIRCLED LETTERS ARE REFERED TO IN ALIGNMENT INFORMATION.
8. ✱ PILOT LIGHT I 801 USED ON SOME MODELS.
9. ǂ ALTERNATE PART No. 9908.
10. ▽ ALTERNATE PART No. 9922.

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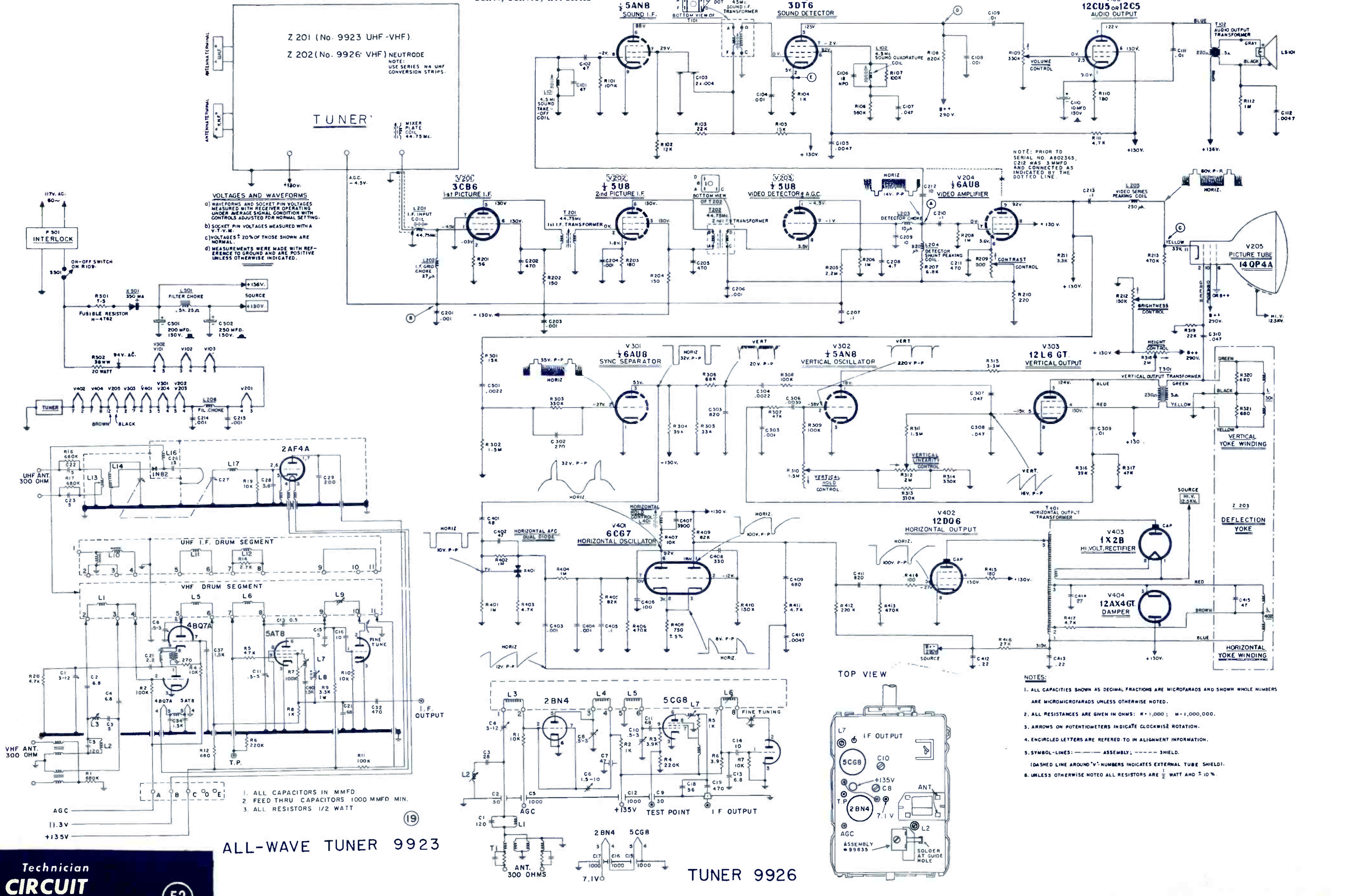
HOFFMAN
Chassis 326
(Featherlite)

SCHEMATIC DIAGRAM FOR HOFFMAN CHASSIS 326, 326U

Chassis 326: Models PT1144, PT1144U, SG1144, SG1144U, 1144 series



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TECHNICIAN
CIRCUIT DIGEST

HOTPOINT
Chassis "MM" line

Chassis "MM" line:
Models 17S301, 17S302

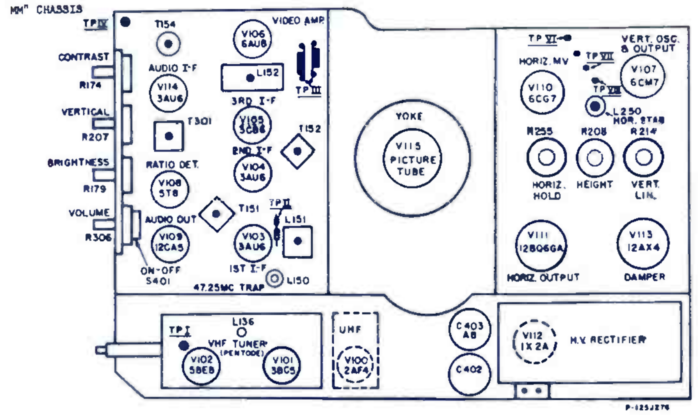


FIGURE 1. REAR VIEW OF CHASSIS

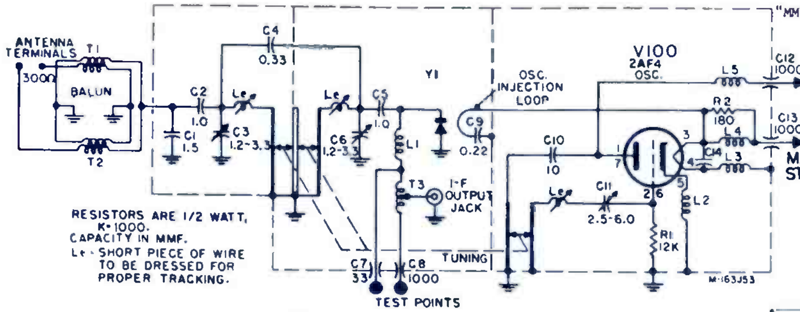
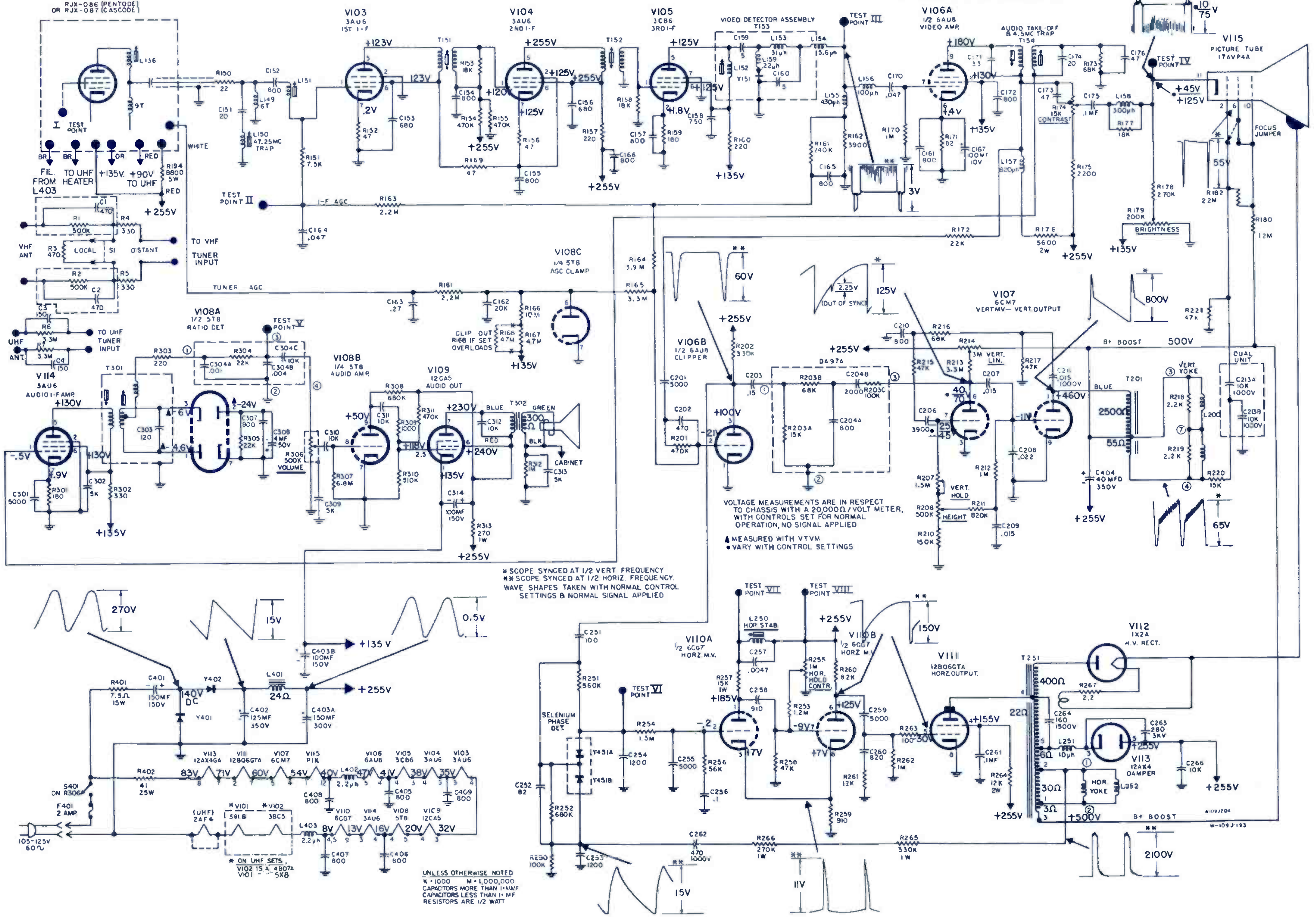


FIGURE 9. SCHEMATIC DIAGRAM FOR UHF TUNER RUX-016

More Data on Reverse Side



RECEIVER ALIGNMENT

VIDEO I-F SYSTEM

The alignment of the I-F system involves the adjustment of 1 trap and 5 pass-band tank circuits. Allow at least 15 minutes warm-up for the receiver and test equipment before proceeding. Follow the usual precuaitons regarding equipment termination and cable dress. Some tuning cores will apparently go through two peaks. In all cases, the cores should be tuned to the first peak starting from the "out" position. Adjustment locations are indicated in Figure 1.

NOTES:

1. Set channel selector to channel 11. Turn fine tuning control fully counter-clockwise. Set contrast control fully clockwise.

2. Connect sweep generator to capacity type jig shown in Figure 2. If General Electric sweep equipment is used, the indicated resistor should be omitted.

3. Connect a 3 volt battery from Test Point II to chassis (positive battery lead to chassis).

4. Connect -45 volts between chassis and pin 5, V111. (Positive to chassis).

5. Connect scope through 10,000 ohms to Test Point III. Calibrate vertical gain of scope for 3 volts peak to peak for 2 inch deflection. When aligning, base-line to 45 mc marker should be kept at 2 inches. Refer to pre-peaking chart if alignment difficulty is experienced. Align as follows:

A-M PRE-PEAKING FREQUENCIES

Tune for Maximum	
L136	45.0 mc
L151	42.5 mc
L152	44.15 mc
T151	42.9 mc
T152	45.1 mc
Tune for Minimum	
L150	47.25 mc

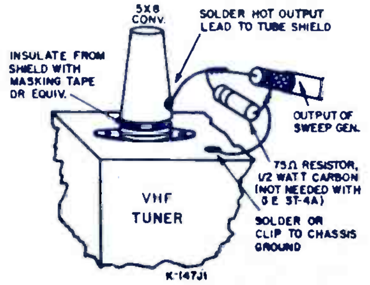
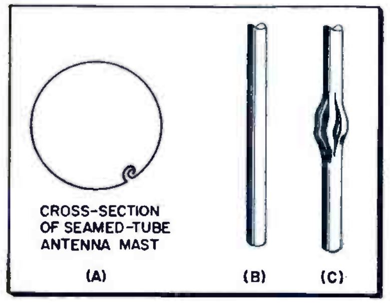


FIGURE 2. I-F SWEEP JIG

Shop Hints

What Freezing Can Do to Mast

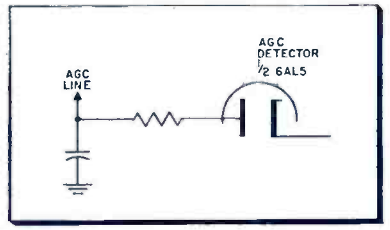
Servicers who install seamed-tube antenna masts should take great care to make sure (1) the bottom of the mast is so positioned that it drains freely, or (2) that the top of the mast is so corked or stoppered that water cannot enter the hollow tube.



If water can get into the hollow tube and stays there, the mast may be destroyed at the base or other weakest point by the expansion force of freezing during cold snaps or prolonged zero weather. The accompanying sketch shows the results when A and B are filled with water changing to ice, with the destructive results shown by C.

Quick AGC Check

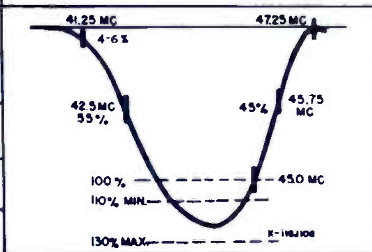
A shortcut that is frequently helpful in troubleshooting agc-related stages, such as the i-f strip or the tuner, involves a meter check on either side of the resistor in the agc line. Readings taken on either side of the resistor (usually 500k to 1 meg) shown in the sketch should be very close to each other. If the reading is noticeably higher (less negative) on the side of the resistor nearest the condenser than it is on the other side, a defective tube or a defect in the tube's circuit is permitting too much current to be drawn, and the agc line is being loaded.



Check on each side of resistor shows fault.

To localize the bad tube or stage, leave the vtvm connected to the point along the agc line where the high reading is obtained and substitute or remove tubes in the video i-f and tuner sections. If substitution or removal of a tube restores the reading, so that it is the same on either side of the resistor, the fault is localized.—*W. A. Skowron, Wichita, Kans.*

VIDEO I-F ALIGNMENT CHART

STEP	ADJUST	DESIRED RESPONSE	REMARKS
1	L150 for minimum at 47.25 mc.		Adjust L136 simultaneously with L151. 41.25 mc marker is very critical and should be kept between limits of 4 to 6%. Peak of curve may fall between limits of 110% and 130% using 45 mc as the 100% reference.
2	T151 to set 42.5 mc marker at 55%.		
3.	T152 to set 45.75 mc marker at 45%.		
4	L136 to set width of peak region of curve.		
5	L152 & L151 for peak region symmetry.		

4.5 MC TRAP ALIGNMENT

1. Turn contrast control fully clockwise.
2. Connect detector network (Figure 4) to Test Point IV and set contrast to maximum. Connect oscilloscope to network.
3. Apply a 4.5 mc AM signal through .001MF to Test Point III.
4. Tune the bottom core of T154 for minimum signal observed on oscilloscope.

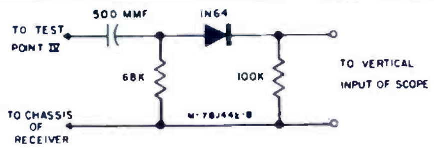


FIGURE 4. DETECTOR NETWORK

AUDIO I-F ALIGNMENT

NOTES:

1. Tune in a television signal. This will provide a 4.5 mc signal source for audio I-F alignment. Keep the volume control turned down unless the speaker is connected.

2. Connect two matched 100,000 ohm resistors(in series) between pin #2 of V108A (5T8) and chassis.

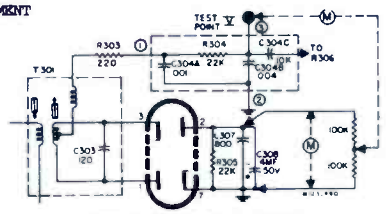


FIGURE 3. RATIO DETECTOR

AUDIO ALIGNMENT CHART

STEP	CONNECT VTVM OR 20,000 OHMS/VOLT METER	ADJUST	METER INDICATION	REMARKS
1	Between Pin #2 of V108A and chassis. (See Figure 3).	T154 secondary (top)	Adjust for maximum deflection.	Repeat steps 1, 2 and 3 to assure proper bandwidth.
2		T301 primary (bottom)	Adjust for maximum deflection.	
3	Between Test Point V and the center of the two 100,000 ohm resistors (Figure 3).	T301 secondary (top)	Adjust for zero volts d-c output	

RJX-086 R-F TUNER ALIGNMENT

HOTPOINT
Chassis "MM" line

Technician
CIRCUIT DIGEST
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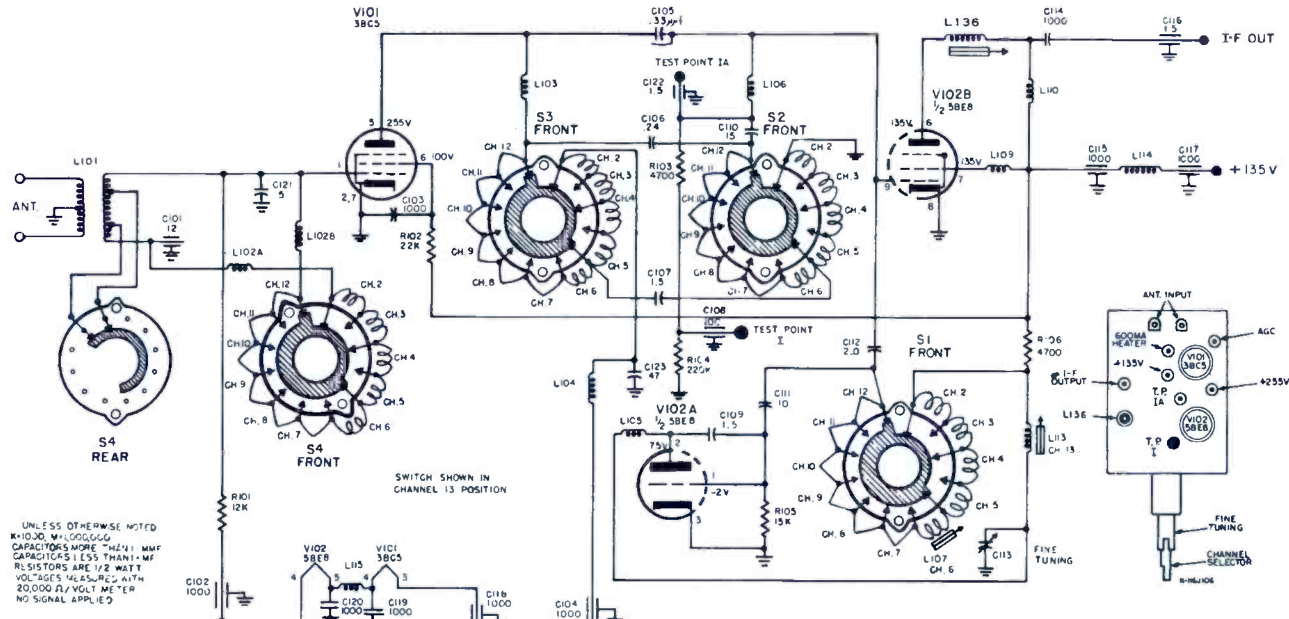
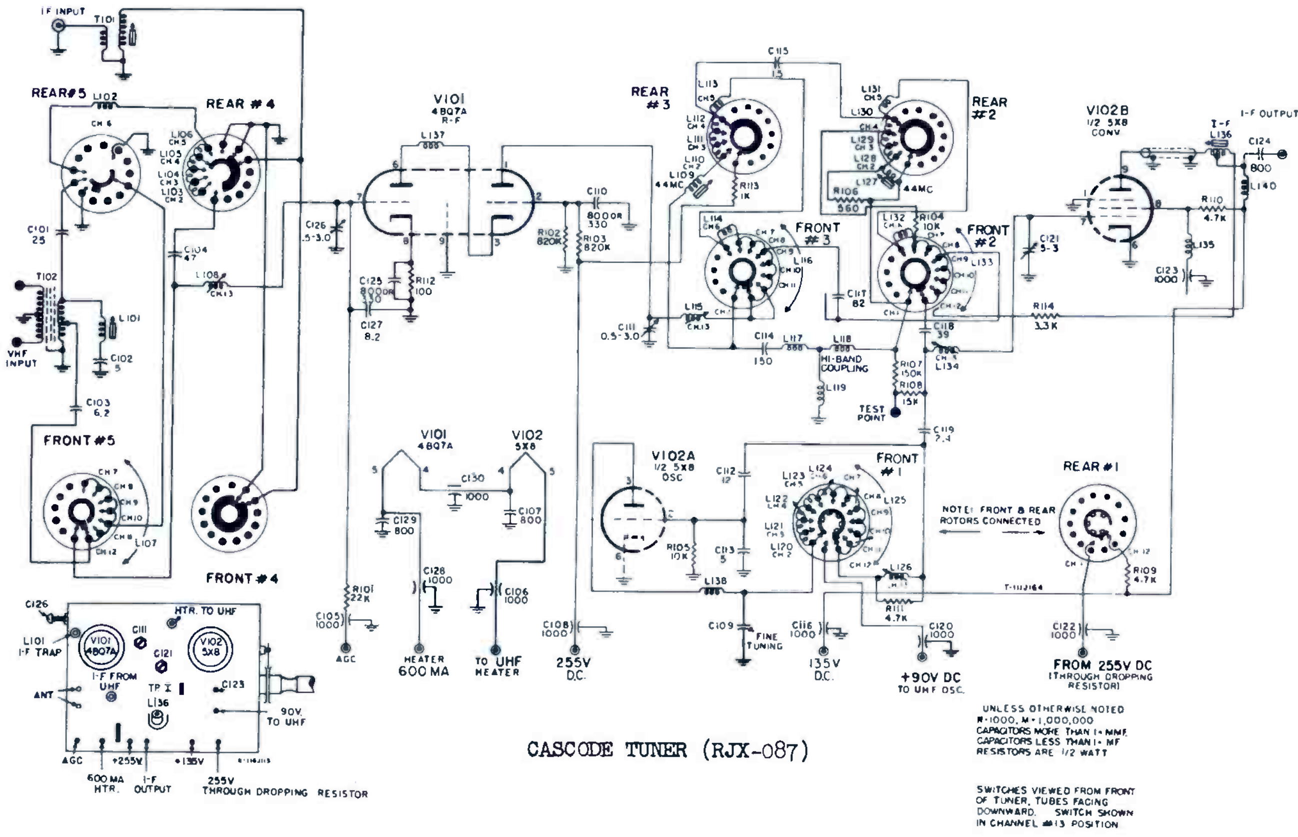
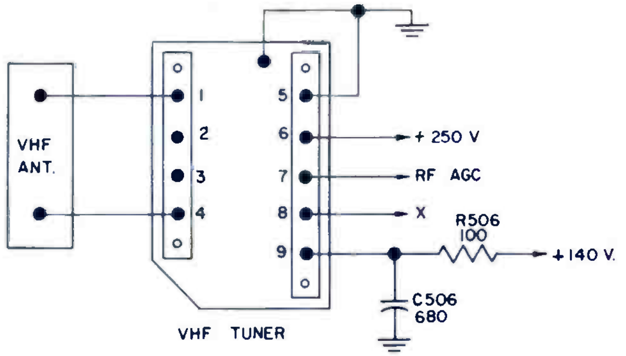


PENTODE TUNER (RJX-086)



CASCODE TUNER (RJX-087)

TECHNICIAN
CIRCUIT DIGESTS



CT CHASSIS TUNER CONNECTIONS

VIDEO IF ALIGNMENT					
Connect positive terminal of a tapped 4½ volt "C" battery to chassis, -1½ volt tap to junction of C213 and R224, and -3 volt tap to junction of C212 and R223. Set "Fringe-Local" switch to local position and Contrast control fully counter-clockwise (min. contrast).					
SWEEP GEN. COUPLING	**SWEEP GEN. FREQUENCY**	**MARKER GEN. COUPLING**	**MARKER GEN. FREQUENCY**	**CONNECT SCOPE**	**ADJUSTMENTS**
1st IF grid (test point TP1 on main chassis)	43mc. Adjust gain so trap suckout is visible.	Converter grid. (Use test point lead wire thru top of VHF Tuner)	47.25mc modulated. Adjust gain so pip is just visible.	Across vid. det. load R211. Place 10K res. in series with probe.	Adjust trap (top of T202) to center pip in suckout. See Fig. 1. Max. attenuation is at two core positions, use one with slug furthest out.
"	43 mc. Set gen. output for approx. 2V P/P output at scope.	"	Unmodulated 42.75 mc. 45.0 mc. 45.75 mc.	"	Check for response curve similar to Fig. 2. Tune T203 for max. gain between 42.75 mc and 45.75 mc. Tune T202 (bottom slug) to place 45.75 mc marker at 60% response. Tune T201 to place 42.75 mc marker at 60% of response. Recheck 47.25 mc trap.
Converter grid (use wire test point lead fed thru top of VHF Tuner)	"	Loosely couple	Same as above	"	Set VHF Tuner to clear channel (6-13). Tune converter plate coil L3 for max. gain with 45.75 mc marker at 50% response. (See Fig. 2.) Tune 1st IF grid coil T201 for max. gain and proper tilt. Interaction might require repeating these two adjustments until Fig. 2 is duplicated.
VHF ant. terms. Use network in Fig. 4 if cable is not balanced.	Channels 2 thru 13 R.F.	"	Same as above	"	Check all channels for bandwidth, slope and position of carrier. Use oscillator trimmer to set osc. at high VHF channel for middle of fine tuner range. Refer to Magnavox Manual 5250 for complete VHF Tuner alignment.
UHF crystal term. nearest UHF osc. tube use 1K isolation resistor.	43 mc. same gain	"	Same as above	"	Set VHF Tuner to UHF position. Adjust R.F. amp. grid coil A41 for min. tilt (slug of A41 is at top rear of VHF Tuner). Response should conform to Fig. 2.

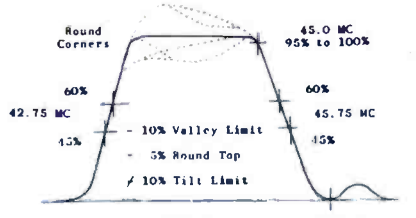
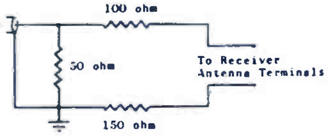


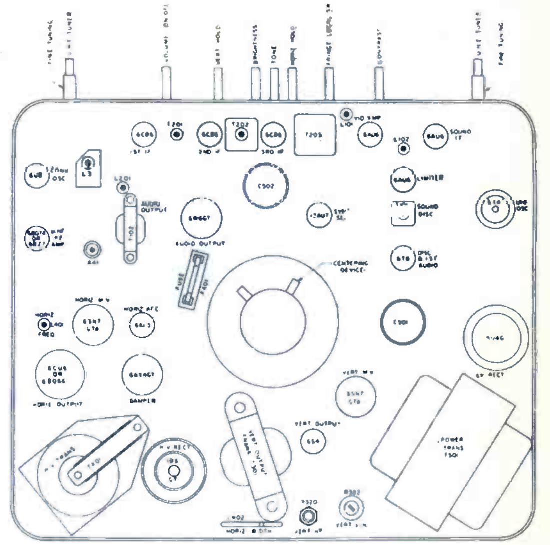
Fig. 2



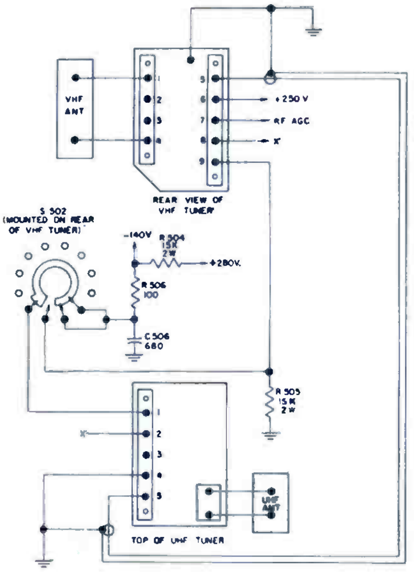
IMPEDANCE MATCHING NETWORK

Fig. 3

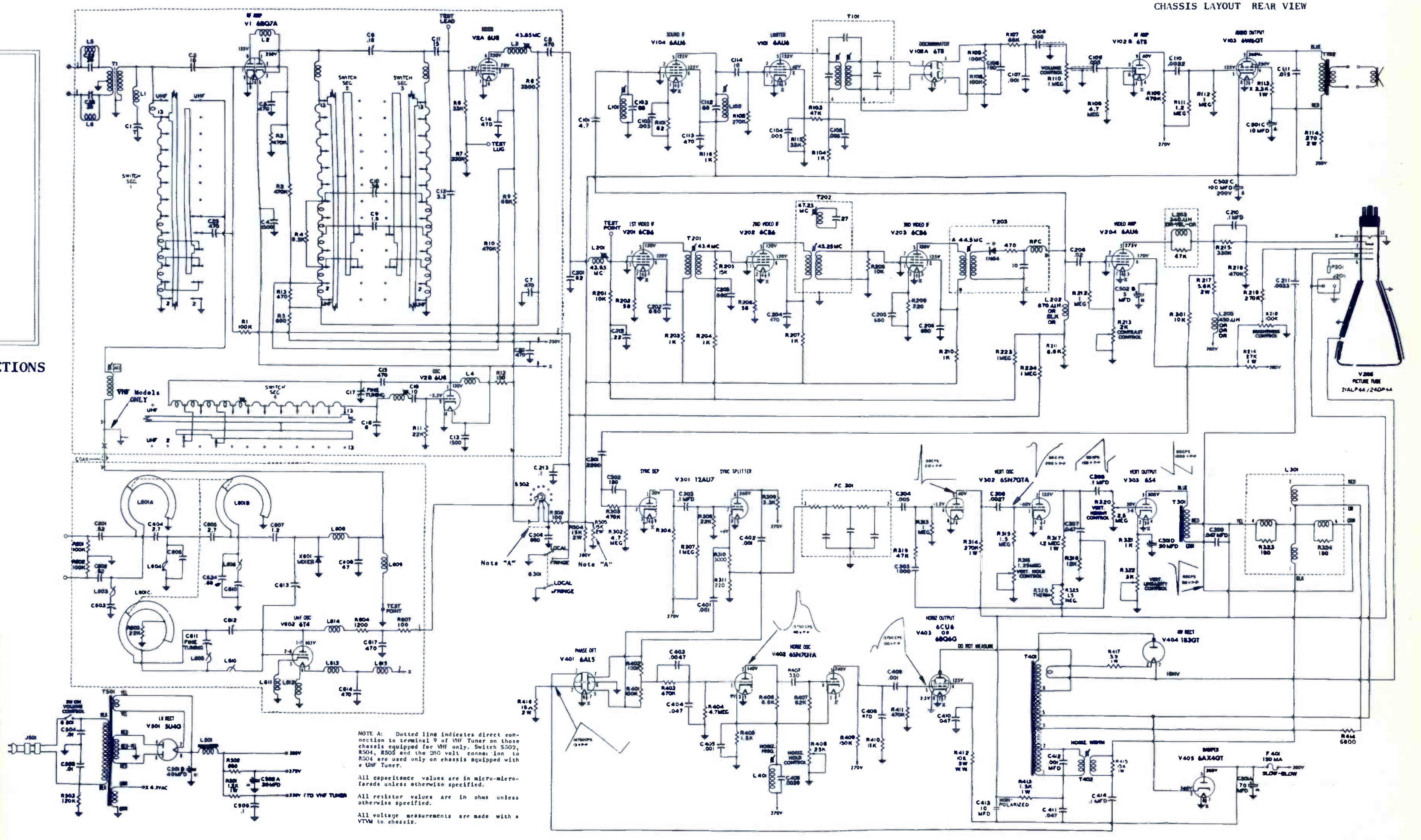
Fig. 1



CHASSIS LAYOUT REAR VIEW



CMU CHASSIS TUNER CONNECTIONS



NOTE A: Dotted line indicates direct connection to terminal 9 of VHF Tuner on those chassis equipped for VHF only. Switch S502, R504, R505 and the 280 volt connection to R504 are used only on chassis equipped with a UHF Tuner.

All capacitance values are in micro-micro-farads unless otherwise specified.

All resistor values are in ohms unless otherwise specified.

All voltage measurements are made with a VTVM to chassis.

Chassis 600 series: Models CTA440AA, CMUA440AA, CTA441AA, CMUA441AA, CTA442AA, CMUA442AA

MAGNAVOX
Chassis 600 series

Technician
CIRCUIT DIGEST

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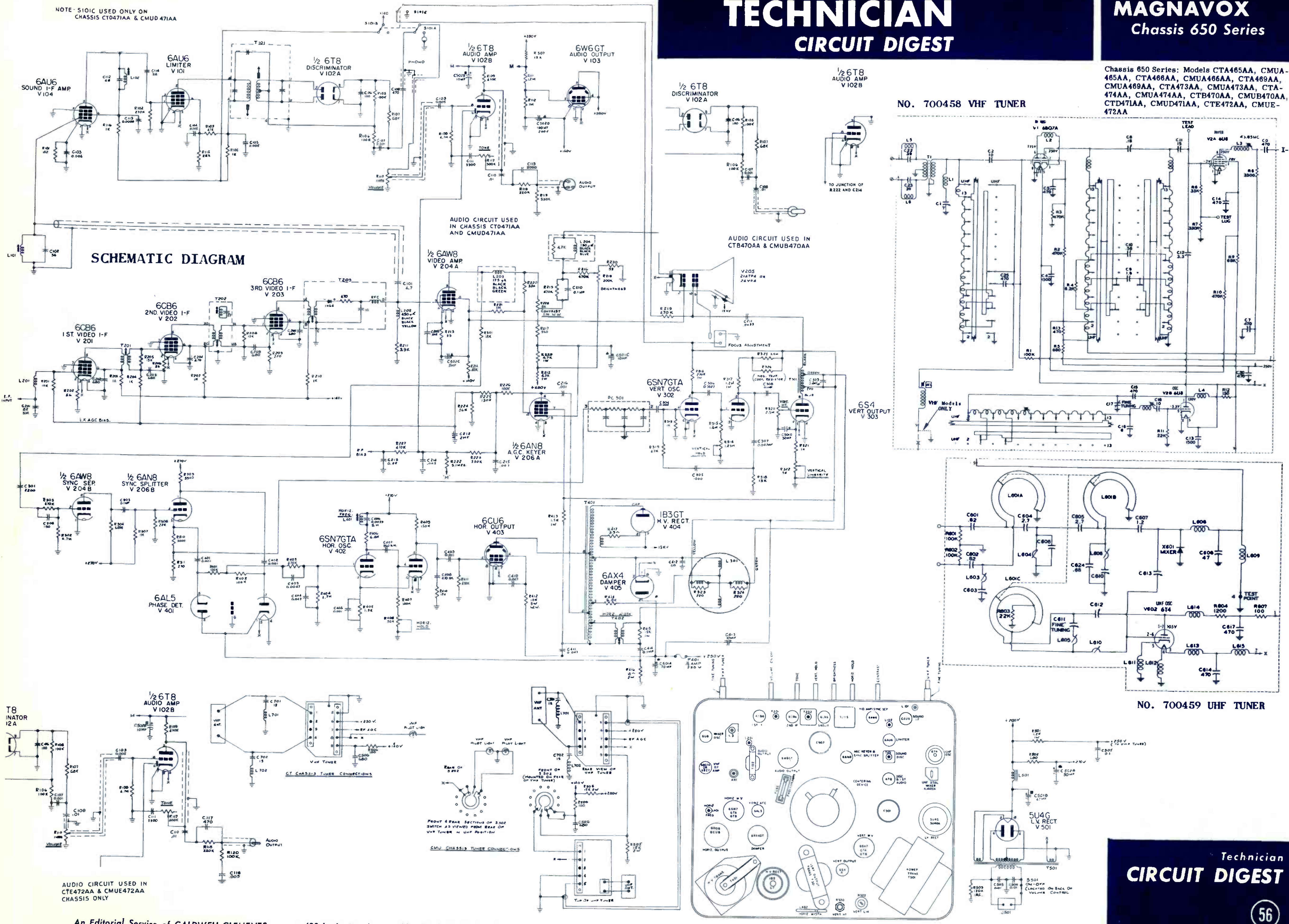
TECHNICIAN CIRCUIT DIGEST

MAGNAVOX Chassis 650 Series

Chassis 650 Series: Models CTA465AA, CMUA-465AA, CTA466AA, CMUA466AA, CTA469AA, CMUA469AA, CTA473AA, CMUA473AA, CTA-474AA, CMUA474AA, CTB470AA, CMUB470AA, CTD471AA, CMUD471AA, CTE472AA, CMUE-472AA



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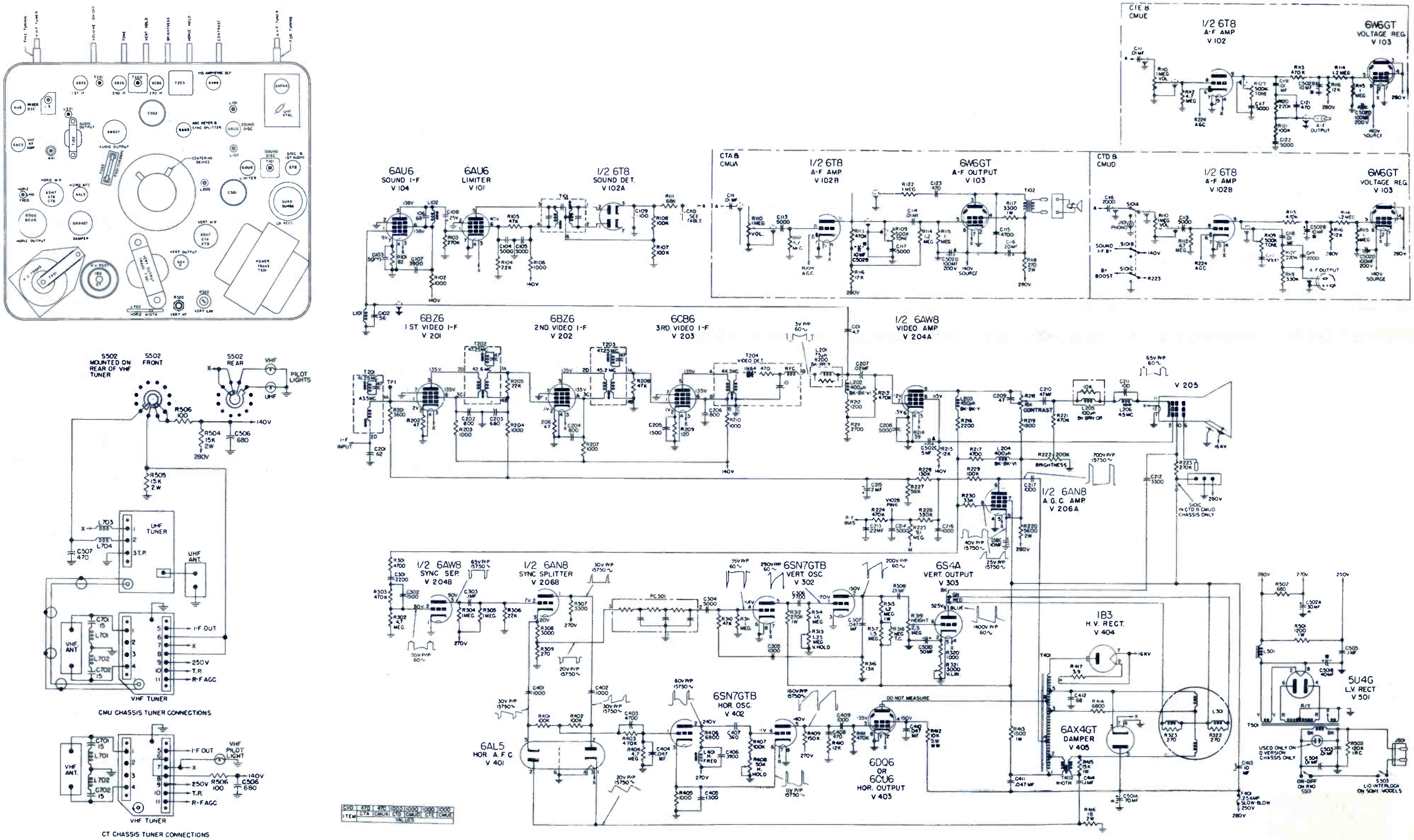
MAGNAVOX
Chassis 117 Series

Chassis 117 series: Models CTA/CMUA 487AA, 488AA, 489AA, 490AA, CTA/CMUA 491AA, 492AA, CTE/CMUE 493AA, 494AA, CTD/CMUD 495AA

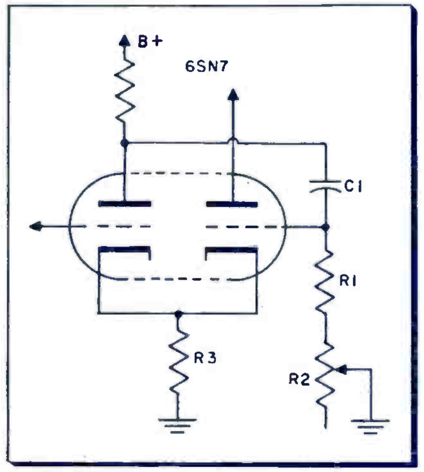


SCHEMATIC DIAGRAM

Shop Hints

Hor. Oscillator Blocking

When used as a horizontal multivibrator-type oscillator, the 6SN7 will sometimes show a tendency to block. The symptom is either a double image, which may be intermittent, or a sudden cutoff of a part of the horizontal scan for a number of lines.

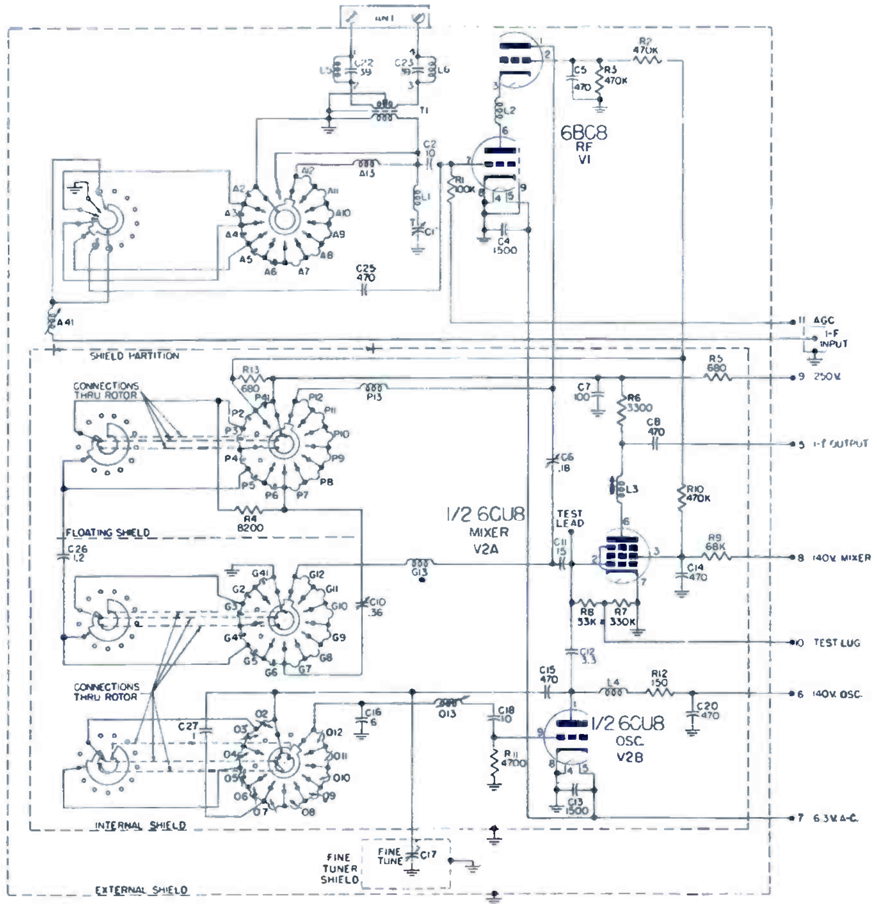


The difficulty crops up if the value of the coupling condenser, *C-1*, going from one plate to the opposite grid (the one to which the hold control, *R-2*, is connected) is too high in value. If residual gas in the tube is high, a value for *C-1* in excess of 2000 mmfd may cause blocking. Remedial measures include lowering the value of *C-1* and trying other tubes. Note that, as far as tube replacement is concerned, a seasoned tube is less likely to have excessive gas than a fresh one.

In substituting a part with less capacitance for *C-1*, note that the value of resistance in the circuit (*R-1, R-2*) may have to be increased correspondingly to maintain the proper time constant. The percent by which circuit resistance is increased should be about the same as the percent by which capacitance is decreased. For example, if a 2500-mmfd condenser is replaced with a 2000-mmfd unit, reduction is by about 20 percent; so resistance would be increased by about the same amount.—*J. A. McRoberts, Brooklyn, N. Y.*

Nut Driver Extension

I ran into a situation in which I had trouble removing a high-voltage cage. Because of the location of the cage in a tight spot, I would have needed a nut driver with a shaft at least 6 in. long to get to the ¼-in. hex-head screws that were securing the cage to the chassis. My ¼-in. nut driver has a shaft only 3 in. long. I procured a length of separate shaft 4 in. long, which I was able to fit snugly into the head of the nut driver. At the outer end of the shaft extension, I connected another ¼-in. socket head. This made the nut driver more than long enough to do the job. Incidentally, any size socket head can be secured to this type of shaft for different types and sizes of nuts. Sets of these heads and shafts are available in hardware stores.—*George Mancini, Methuen, Massachusetts.*



NO. 700541
VHF TUNER

MAGNAVOX
Chassis 117 Series

Technician
CIRCUIT DIGEST
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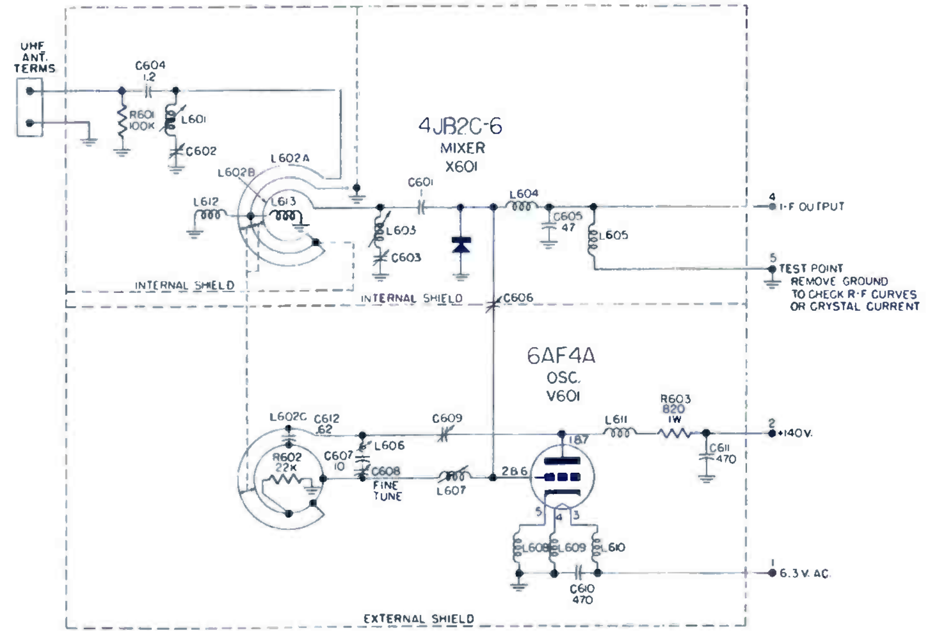


FOR SINGLE ANTENNA OPERATION USE EXTERNAL COUPLING UNIT TO COUPLE SINGLE ANTENNA TO UHF AND VHF TUNER INPUTS.

NO. 700530 UHF TUNER

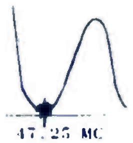


Fig. 1

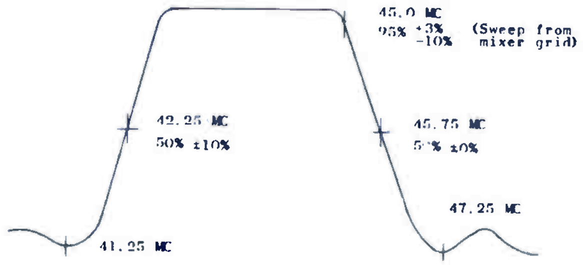
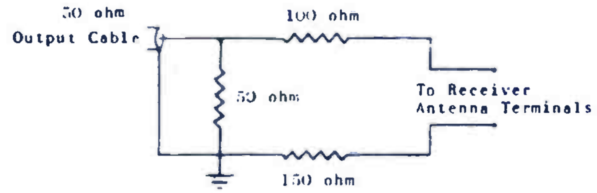


Fig. 2



IMPEDANCE MATCHING NETWORK

Fig. 3

SOUND IF ALIGNMENT

SIG. GEN. COUPLING	SIG. GEN. FREQUENCY	VTVM CONNECTION	ADJUSTMENTS
Couple thru .005 mfd. capacitor to terminal "D" of video detector transformer.	Unmodulated 4.5mc ±.01%	Probe to pin 3 of 6T8 discriminator tube in series with 10K isolation resistor at probe end. low side of meter to chassis.	Tune primary of T101. L102 and L101 all for max. output on meter. Keep input signal at lowest point possible for an accurate indication.
"	"	"	Tune secondary of T101 descriminator transformer for zero indication on meter. True indication is point where indicating voltage swings positive or negative.

VIDEO I-F ALIGNMENT

Note 1: Before attempting alignment of the chassis, allow a 10-20 minute warm up of the chassis and test equipment
Note 2: Connect positive terminal of a tapped 4½ volt "C" battery to chassis, -3 volt tap to junction of R201 and R204, and -1½ volt tap to junction of C213 and R224.

SWEEP GEN. COUPLING	SWEEP GEN. FREQUENCY	MARKER GEN. COUPLING	MARKER GEN. FREQUENCY	CONNECT SCOPE	ADJUSTMENTS
1st i-f grid (test point TP1 on main chassis)	43 mc. Adjust gain so trap suckout is visible.	Converter grid. (Use test point lead wire thru top of VHF tuner.)	47.25mc modulated. Adjust gain so pip is just visible.	Across vid. det. load R211. Place 10 K res. in series with probe.	Adjust traps (ton of T202 and top of T203) to center pip in suckout. See Fig. 1. Max. attenuation is at two core positions, use one with slug furthest out.
"	43 mc. Set gen. output for approx. 3V P/P output at scope.	"	Unmodulated 42.25 mc. 45.0 mc. 45.75 mc.	"	Check for response curve similar to Fig. 2. Tune T203 for max. gain between 42.25 mc and 45.75 mc. Tune T202 (bottom slug) to place 45.75 mc marker at 50% response. Tune T201 to place 42.25 mc marker at 50% of response. Recheck 47.25 mc trap.
Converter grid. (Use test point wire thru top of VHF tuner).	43 mc. Adjust gain so trap suckout is visible.	" Loosely couple.	41.25 mc.	"	Adjust trap (top of T201) to center pip in suckout. Max. attenuation is at two core positions. Use one with slug furthest out.
Converter grid. (Use wire test point lead fed thru top of VHF tuner).	43 mc. Set gen. output for approx. 3V P/P output at scope.	"	Unmodulated 42.25 mc. 45.0 mc. 45.75 mc.	"	Set VHF tuner to clear channel (4 or 5). Tune converter plate coil L3 for max. gain with 45.75 mc marker at 50% response. (See Fig. 2) Tune 1st i-f grid coil T201 for max. gain and proper tilt. Interaction might require repeating these two adjustments until Fig. 2 is duplicated. Recheck 41.25 mc. trap.
VHF ant. terms. Use network in Fig. 4 if cable is unbalanced.	Channels 2 thru 13 r-f	"	Same as above.	"	Check all channels for bandwidth, slope and position of carrier. Use oscillator trimmers to set osc. for middle of fine tuner range on all channels.
UHF xtal term. nearest i-f input jack 1K isolation resistor	43 mc. same gain.	"	Same as above	"	Set VHF tuner to UHF position. Adjust r-f amp. grid coil A41 for min. tilt (slug of A41 is at top rear of VHF tuner). Response should conform to Fig. 2.

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MONTGOMERY WARD
Models WG40-, 41-, 50-, 51- series

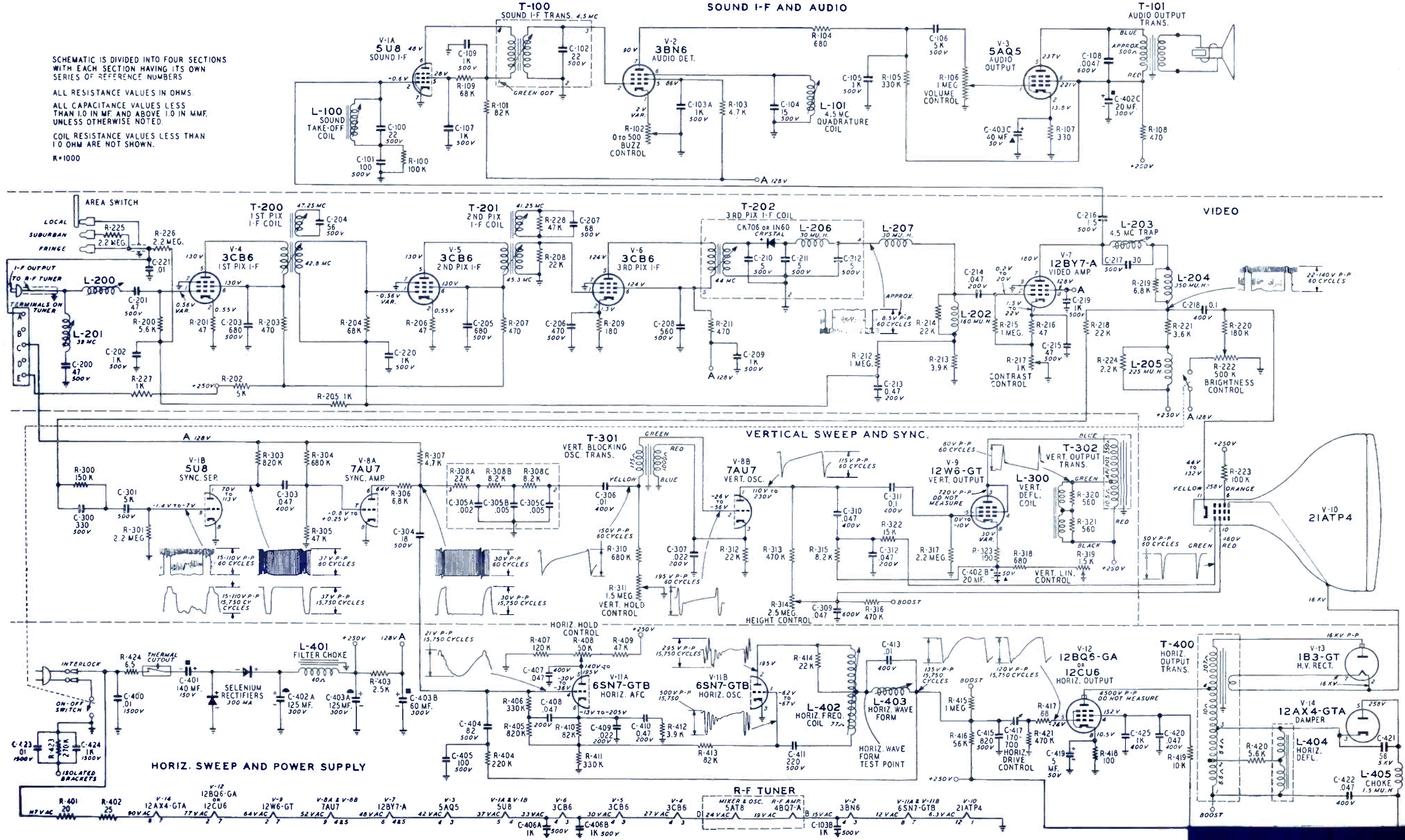
Models WG4011B, 4012B, 5011B, 5014B, 4111C, 5111C, 4112C, 5114C, 5016A, 5116A, 5017A, 5117A, 5018A, 5118A

OSCILLOSCOPE WAVEFORM PATTERNS

The waveforms shown on the schematic diagram are as observed on a Tektronix type 524D wide bond television oscilloscope with the receiver tuned to a reasonably strong signal and a normal picture. The voltages shown on each waveform are the approximate peak to peak amplitudes. The frequency accompanying each waveform indicates the repetition rate of the waveform not the sweep rate of the oscilloscope. If the waveforms are observed on the oscilloscope with a poor high frequency response, the corners of the pulses will tend to be more rounded than those shown on the schematic diagram and the amplitude of any high frequency pulse will tend to be less.

DC SOCKET VOLTAGES

All DC socket voltages shown on the schematic are measured with a high impedance VTVM and under zero signal conditions.



NOTE—In UHF receivers the filament voltages in the tuner and above the tuner in the heater string will be slightly greater because of the filament voltages of the tuner tubes.
In 24 inch receivers the picture tube is a 24YP4.

TECHNICIAN CIRCUIT DIGEST

MOTOROLA Chassis TS-533, TS-533Y

Chassis TS-533, TS-533Y: Models 21C4, Y21C4, 21C4B, Y21C4B, 21K41, Y21K41, 21K41B, Y21K41B, 21K42, Y21K42, 21K42B, Y21K42B, 21K43, Y21K43, 21K43B, Y21K43B, 21K44B, Y21K44B, 21K44W, Y21K44W, 21K45, Y21K45, 24K10, Y24K10, 24K10B, Y24K10B, 24K11, Y24K11, 24K11B, Y24K11B, 24T4, Y24T4, 24T4B, Y24T4B

WAVESHAPES

The following photographs were taken at some of the more important points in the receiver. To facilitate photography, a Tektronix oscilloscope was used. The waveshapes will appear much the same, however, on the average wideband oscilloscope. When a limited bandwidth oscilloscope is used, some interpretation may be necessary to compensate for the waveshape differences (rounding of corners, for example).

The input signal used during photography was a comparatively strong television station signal. Receiver contrast was turned to maximum; all other receiver controls were set for normal viewing.

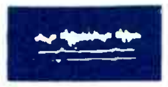
Note that waveshape amplitudes are based on a 4V peak-to-peak composite video voltage at the grid of the video amplifier.

Variations in composite video signal are a result of variations in the type of scene being scanned at the time the photograph was taken. In some waveshapes (18, for example) the video signal near the baseline is noticeable only because of the high contrast control setting.

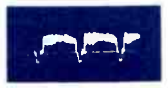
Vertical gain of the oscilloscope was adjusted so that, regardless of the value of peak-to-peak voltage, all traces would be approximately the same height on the photograph.

Note particularly such items as peak-to-peak voltage, the amplitude relationship of vertical to horizontal portions of the video signal and the oscilloscope limitations. This will be important to the proper circuit analysis.

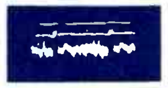
W1 - Composite video signal, grid of video amplifier (pin 2, V-6). 4 volts PP (Oscilloscope synced near vertical rate)



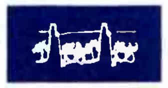
W2 - Composite video signal, grid of video amplifier (pin 2, V-6). 4 volts PP. (Oscilloscope synced near horizontal rate)



W3 - Composite video signal, plate of video amplifier (pin 7, V-6). 110 volts PP. (Oscilloscope synced near horizontal rate)



W4 - Composite video signal, plate of video amplifier (pin 7, V-6). 110 volts PP. (Oscilloscope synced near horizontal rate.



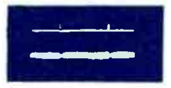
W5 - Composite video signal, grid of sync clipper (pin 1, V-11). 45 volts PP. (Oscilloscope synced near vertical rate)

W6 - Composite video signal, grid of sync clipper (pin 1, V-11). 45 volts PP. (Oscilloscope synced near horizontal rate)

W7 - Vertical sync pulse, plate of sync clipper (pin 2, V-11). 32 volts PP. (Oscilloscope synced near vertical rate)

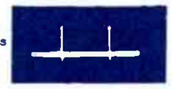
W8 - Horizontal sync pulse, plate of sync clipper (pin 2, V-11). 32 volts PP. (Oscilloscope synced near horizontal rate)

W9 - Vertical sync pulse, plate of sync clipper (pin 5, V-11). 40 volts PP. (Oscilloscope synced near vertical rate.



W10 - Horizontal sync pulse, plate of sync clipper (pin 5, V-11). 35 volts PP. (Oscilloscope synced near horizontal rate)

W11 - Vertical sync pulse, junction of 22K and .0047 in integrator network. 32 volts PP. (Oscilloscope synced near vertical rate)



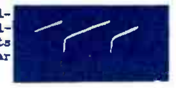
W12 - Vert. pulse, junction of .01 and 10K in integrator. 42 volts PP. (Oscillator tube in circuit) Sync pulse is combined with oscillator voltage, which is "kicked back" into network.

W13 - Vertical sync pulse, junction of .02 and 10K in integrator network. 42 volts PP. (Oscilloscope synced near vertical rate) (vertical oscillator tube in circuit)

W14 - Blocking oscillator voltage, grid of vertical oscillator (pin 4, V-12). 150 volts PP. (Oscilloscope synced near vertical rate)

W15 - Same as 12 but with vertical oscillator tube removed. 9 volts PP.

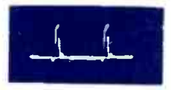
W16 - Vertical oscillator voltage, plate of vertical oscillator (pin 5, V-12). 70 volts PP. (Oscilloscope synced near vertical rate)



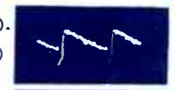
W17 - Vertical output voltage, plate of vertical output (pin 2, V-12). 980 volts PP. (Oscilloscope synced near vertical rate)

W18 - Horizontal sync pulse, cathode of sync clipper (pin 6, V-11). 11 volts PP. Note slight amount of video. This is result of setting contrast on maximum with high input signal.

W19 - Horizontal sync pulse, junction of 6.8K and 2.7K in sync clipper. 11 volts PP. (Oscilloscope synced near horizontal rate)

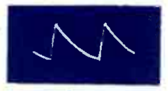


W20 - Voltage at cathode of phase detector (pin 6, V-9B). 11 volts PP. (Oscilloscope synced near horizontal rate)

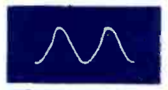


W21 - Voltage at grid of phase detector (pin 4, V-9B). 11 volts PP. (Oscilloscope synced near horizontal rate)

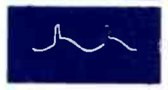
W22 - Voltage at plate of phase detector (pin 5, V-9B). 9 volts PP. (Oscilloscope synced near horizontal rate)



W23 - Voltage at horizontal oscillator coil connection to service test receptacle. 20 volts PP. (Oscilloscope synced near horizontal rate)

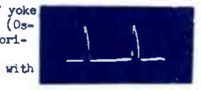


W24 - Horizontal oscillator voltage, plate of horizontal oscillator (pin 5, V-14). 38 volts PP. (Oscilloscope synced near horizontal rate.

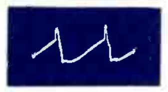


W25 - Voltage at grid of horizontal output (pin 5, V-15). 130 volts PP. (Oscilloscope synced near horizontal rate)

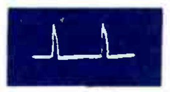
W26 - Voltage at pin 5 of yoke socket. 2000 volts PP. (Oscilloscope synced near horizontal rate) CAUTION: Do not measure with ordinary equipment.



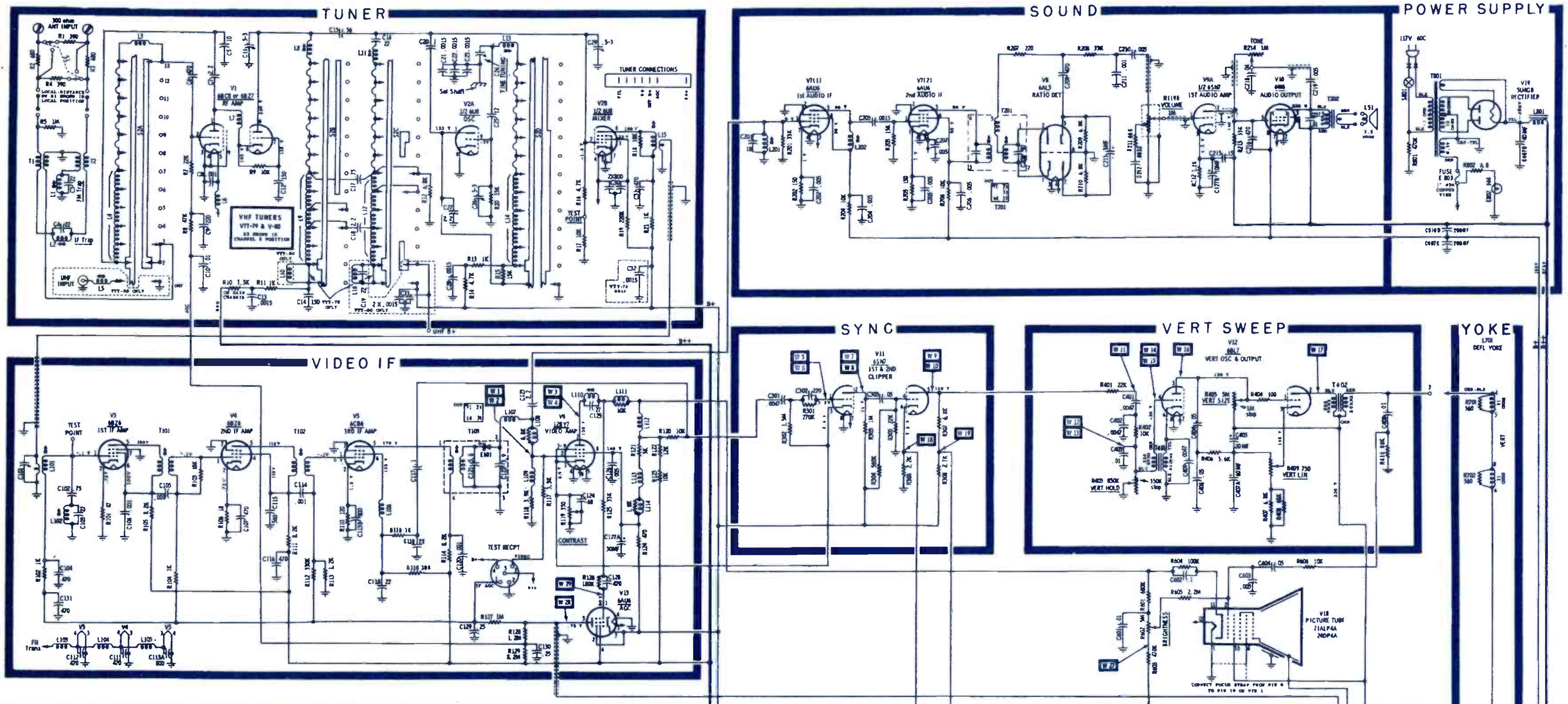
W27 - Voltage at junction of 470K and brightness control. 50 volts PP. (Oscilloscope synced near horizontal rate)

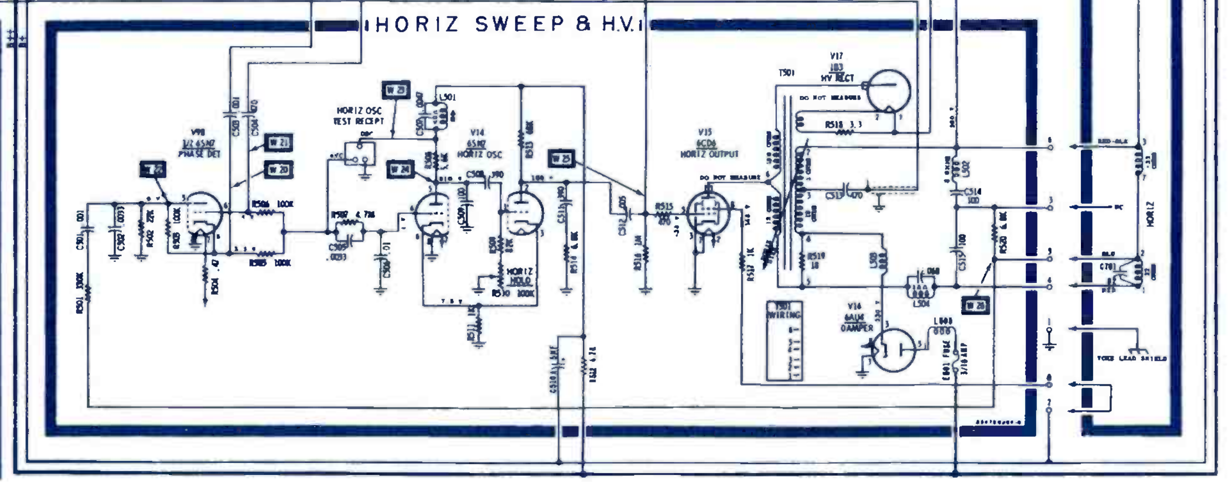


W28 - Keying pulse on plate of AGC (pin 5, V-13). 520 volts PP. (Oscilloscope synced near horizontal rate)



W29 - Composite video signal at grid of AGC (pin 1, V-13). 60 volts PP. (Oscilloscope synced near horizontal rate)





CAPACITOR VALUES UNDER 1000 ARE IN MMF.
ALL OTHERS IN MF UNLESS OTHERWISE SPECIFIED.

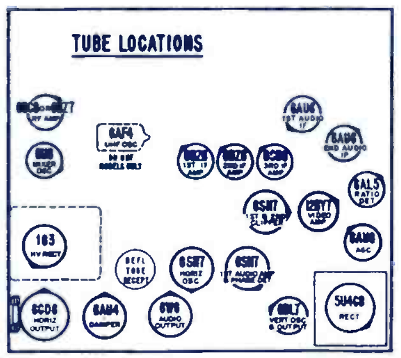
NOTES

VOLTAGE MEASUREMENTS

1. Made with a VTVM from point indicated to chassis.
2. Line voltage - 117 volts
3. Antenna disconnected and input shorted across.
4. Channel selector switch on channel which develops least noise at pin #3 of test receptacle.
5. Contrast control "off", maximum counterclockwise position.
6. All other controls in normal operating position.
7. Voltages associated with variable-control circuitry will vary with control setting.

WAVEFORMS

1. Designated by "W" prefix and numerical reference.
2. Photographs of waveforms are on pages preceding the schematic.
3. Required circuit conditions are given with each waveform.
4. Waveforms observed on wide-band oscilloscope.



TELEVISION CHASSIS
TS-533A-00 SERIES

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MOTOROLA
Chassis TS-533, TS-533Y

Technician
CIRCUIT DIGEST

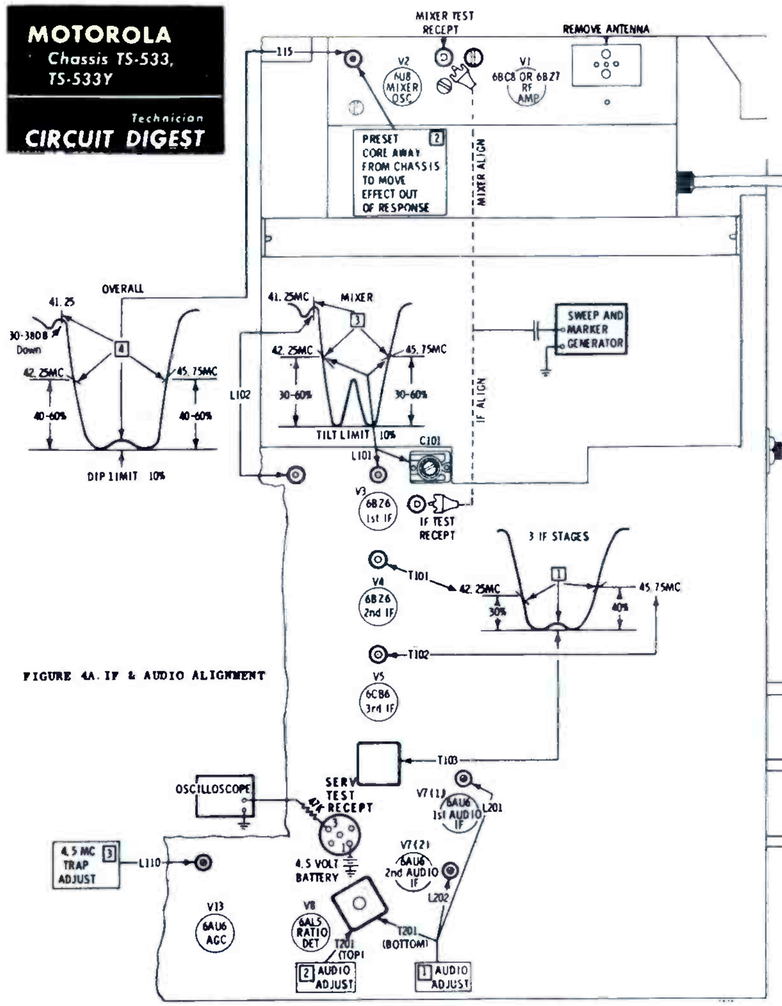


FIGURE 4A. IF & AUDIO ALIGNMENT

ALIGNMENT

Equipment Required:

Sweep generator: 18 to 220 Mc, 10 Mc sweep width, linear and capable of .1 volt output.

Accurately calibrated, adjustable marker generator and/or AM signal generator.

Variac.

Isolation transformer.

IMPORTANT NOTES: NEVER GROUND THE RECEIVER CHASSIS DURING TESTING OPERATIONS OR INSTALLATION UNLESS AN ISOLATION TRANSFORMER IS USED.

Keep marker generator output low at all times, to prevent the marker from distorting the response curve.

Some coils resonate at two settings of the core; set cores as specified in specs.

Line voltage must be 117 volts; if not, adjust to 117 volts with variac. At 117 volts, B+ should be 145 to 160 volts and B++ should be a minimum of 250 volts.

IF AND MIXER ALIGNMENT

Equipment Arrangement

I. Preparing Receiver

A. Remove yoke plug to eliminate horizontal interference. Connect a 2500 ohm 10 watt resistor from B++ to chassis ground to normalize voltages.

B. Connect a 6 volt battery between pin #1 (IF AGC bus) of Service Test Receptacle and ground. Positive side of battery goes to chassis ground.

C. Disable tuner oscillator by grounding pin #9 of V-2 (6U8).

D. Remove antenna, set tuner to channel 13 and contrast control to minimum.

II. Preparing Equipment

E. Connect sweep generator (through 1000 to 5000 mmf capacitor) to: IF test receptacle for step 1 : mixer test receptacle for steps 2 3 and 4. Center sweep frequency at 44 Mc. Set sweep width to 10 Mc. Adjust generator output level below point of receiver limiting (approximately 3 to 5 volts peak-to-peak at video detector load).

F. Loosely couple marker generator to IF test receptacle.

G. Connect oscilloscope to R-117 at pin #3 of Service Test Receptacle (through 47K ohm resistor).

IF Alignment

With sweep generator connected to IF Test Receptacle-

[1] ADJUST T-101 to position 42.25 Mc marker (core tuned away from chassis)
T-102 to position 45.75 Mc marker (core tuned away from chassis)
T-103 to shape curve center (core tuned toward chassis).

With sweep generator connected to Mixer Test Receptacle - Short across R-16 (4.7K)

[2] PRE-SET mixer primary coil, L-15, by tuning away from chassis until coil's effect is moved out of response. Failure to adjust core away from chassis will upset mixer coupling and make it difficult, if not impossible, to align properly.

[3] ADJUST capacitor C-101, mixer secondary coil, L-101 and 41.25 Mc trap, L-102, to get response and markers shown in "Mixer" curve.

To see trap clearly, it may be necessary to either increase the input appreciably or remove the IF bias momentarily. The core in L-101 is tuned toward the chassis and the core in L-102 is tuned away from chassis.

[4] ADJUST mixer primary coil, L-15, so that it is tuned into the center of the IF response so as to place the markers as shown in "Overall" curve.

AUDIO ALIGNMENT AND 4.5 MC TRAP ADJUSTMENT

This alignment is made by injecting an accurate 4.5 Mc signal into pin #3 of the Service Test Receptacle. The station alignment method which follows is practical in that an accurate 4.5 Mc signal is available, and should be used whenever possible. The procedure is the same whether the test signal originates from a station or from a generator.

Preparation

Tune in station (or connect 4.5 Mc crystal-controlled generator to pin #3 of Service Test Receptacle).

Connect VTVM from positive terminal of electrolytic capacitor C-213 to ground.

Adjust signal input to maintain 5 to 10 volts at this point.

Set contrast control for minimum contrast.

Audio Alignment

[1] ADJUST audio take-off coil, L-201, interstage coil, L-202, and primary (bottom) of ratio detector transformer, T-201, for maximum reading.

[2] SET VTVM to junction of R-208 (33K) and C-210 (.005) and ground.

ADJUST secondary (TOP) of ratio detector trans, T-201 for zero reading. NOTE: The primary and secondary of the ratio detector transformer, T-201, have two tuning points; one with cores outside the coils and one with the cores towards the inside of the coil. The proper position of cores should be towards the outside of the coil.

4.5 Mc Trap Adjustment

[3] Carefully tune receiver to local station and advance contrast control.

ADJUST L-110 to find the two points of adjustment at which beat is just noticeable on the picture tube screen. Rotate the core toward center of two points. Use minimum amount of inductance (core out of coil) that will result in no apparent beat interference.

CHANNEL CHART

CHANNEL	SWEEP GEN.	MARKER GENERATOR	
		SOUND	VIDEO
2 (54-60 Mc)	57 Mc	59.75	55.25
3 (60-66 Mc)	63 Mc	65.75	61.25
4 (66-72 Mc)	69 Mc	71.75	67.25
5 (76-82 Mc)	79 Mc	81.75	77.25
6 (82-88 Mc)	85 Mc	87.75	83.25
7 (174-180 Mc)	177 Mc	179.75	175.25
8 (180-186 Mc)	183 Mc	185.75	181.25
9 (186-192 Mc)	189 Mc	191.75	187.25
10 (192-198 Mc)	195 Mc	197.75	193.25
11 (198-204 Mc)	201 Mc	203.75	199.25
12 (204-210 Mc)	207 Mc	209.75	205.25
13 (210-216 Mc)	213 Mc	215.75	211.25

TUNER ALIGNMENT

GENERAL INFORMATION

It is very unlikely that the Motorola tuner will need alignment unless it has been damaged, is being replaced, or has had components replaced in the tuned circuits. Tubes may be changed, in most cases, without realignment but care must be used in selection or realignment may be required.

The tuner operates by shorting out an antenna, RF and oscillator coil section consecutively for each higher channel. When switched to the lowest channel, all coils of any one section will be series connected. Therefore, alignment must start at the highest channel and each adjustment properly completed before the next lower channel adjustment is attempted.

HIGH CHANNEL ANTENNA AND RF ALIGNMENT

General Information

Antenna and RF alignment on the high channels is accomplished by adjusting the end inductors, L-8 and L-11 on channel 13 and capacitors C-11 and C-29 on channel 7.

The tuner and sweep generator are set to the channel being aligned. The marker generator is set to provide both sound and video markers for that channel. (Refer to Channel Chart.)

Marker limits, along with curve limits, are shown in diagram.

The order of alignment is given in numerical sequence in the following description. Boxed numbers on diagram coincide with steps in description.

Equipment Arrangement

Connect oscilloscope through a 47K ohm resistor to Mixer Test Receptacle. (It is convenient to use male plug. Motorola Part No. 28A737473.)

Important: Set vertical gain of oscilloscope to provide two-inch deflection with 1.5 volts peak-to-peak signal (.5V RMS approx).

Connect sweep generator to antenna input receptacle. (Use male plug, Motorola Part No. 28K703310, for convenience.)

Loosely couple marker generator to antenna input receptacle. Markers used for each channel are the sound and video markers for that channel.

(The oscilloscope vertical gain adjustment is specified to insure proper signal level from the sweep generator. Make certain, also, that the marker generator signal level is maintained as low as possible at all times.)

Pre-setting

[1] Pre-set capacitors C-11 and C-29 to mid-capacity.

[2] Pre-set IF trap coil, L-2 to maximum inductance (core in coil).

[3] Pre-set FM trap coil, L-1, to minimum inductance (core out of coil toward chassis top).

High Channel Alignment

[4] SET tuner and sweep generator to channel 13. Marker generator to 211.25 Mc and 215.75 Mc.

ADJUST end inductors L-8 and L-11 to get proper tilt, maximum gain and proper marker positions.

[5] SET tuner and sweep generator to channel 7. Marker generator to 175.25 Mc and 179.75 Mc.

ADJUST capacitors C-11 and C-29 to get proper tilt, maximum gain and proper marker positions.

Examine response on channels 7 through 13. Repeat steps 4 and 5, if necessary.

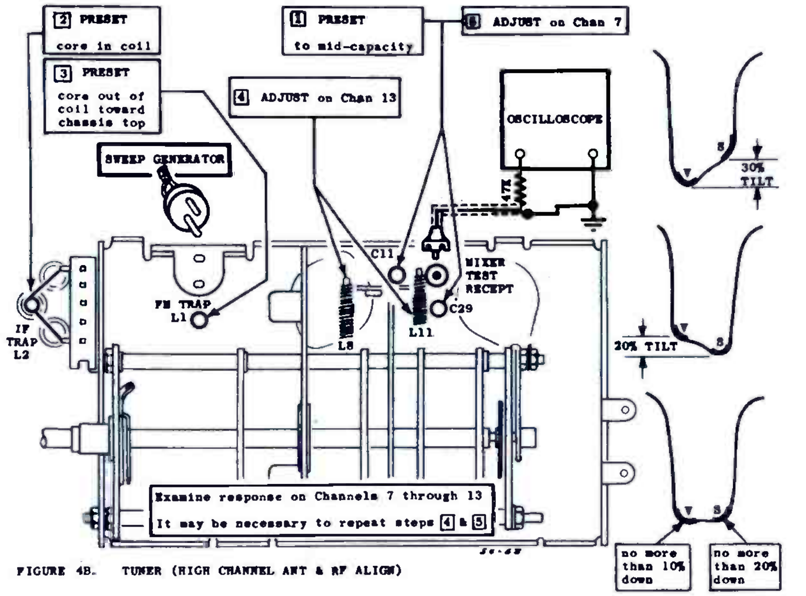


FIGURE 4B. TUNER (HIGH CHANNEL ANT & RF ALIGN)

LOW CHANNEL ANTENNA AND RF ALIGNMENT (including FM and IF traps, UHF)

GENERAL INFORMATION

Antenna and RF alignment on the low channels is accomplished by compressing or spreading the low channel sections of L-9, L-12 and L-4. NOTE: A small manipulation of the coils will result in a rather large frequency change.

The tuner and sweep generator are set to the channel being aligned. The marker generator is set to provide both sound and video markers for that channel. (Refer to Channel Chart.)

Marker limits, along with curve tilt limits, are shown in diagram. The order of alignment is given in numerical sequence in the following description. Boxed numbers on diagram coincide with steps in description.

Equipment Arrangement

Connect oscilloscope through a 47K ohm resistor to Mixer Test Receptacle. (It is convenient to use male plug, Motorola Part No. 28A737473.)

Connect sweep generator to antenna input receptacle. (Use male plug, Motorola Part No. 28K703310, for convenience.)

Loosely couple marker generator to antenna input receptacle. Markers used for each channel are the sound and video markers for that channel.

(Maintain sweep and marker generator output as low as possible at all times.)

Presetting

No presetting is required in this part of the alignment.

Low Channel Alignment

NOTE: It is important to adjust: first, L-9 and L-12 for marker position; then, L-4 for proper tilt and maximum gain.

[1] SET tuner and sweep generator to channel 6. Marker generator to 83.25 Mc and 87.75 Mc.

ADJUST E-sections of coils L-9 and L-12 for marker positions; E-section of L-4 for proper tilt and maximum gain.

[2] ADJUST FM trap, L-1, to point where curve is just beginning to be affected at the sound marker.

[3] SET tuner and sweep generator to channel 5. Marker generator to 77.25 Mc and 81.75 Mc.
ADJUST D-sections of coils L-9 and L-12 for marker positions; D-section of L-4 for proper tilt and maximum gain.

[4] SET tuner and sweep generator to channel 4. Marker generator to 67.25 Mc and 71.75 Mc.
ADJUST C-sections of coils L-9 and L-12 for marker positions; C-section of L-4 for proper tilt and maximum gain.

[5] SET tuner and sweep generator to channel 3. Marker generator to 61.25 Mc and 65.75 Mc.
ADJUST B-sections of coils L-9 and L-12 for marker positions; B-section of L-4 for proper tilt and maximum gain.

[6] SET tuner and sweep generator to channel 2. Marker generator to 55.25 Mc and 59.75 Mc.
ADJUST A-sections of coils L-9 and L-12 for marker positions; A-section of L-4 for proper tilt and maximum gain.

[7] SET tuner to channel 2; sweep generator to 45 Mc center frequency. Marker generator to 45 Mc. Oscilloscope through 47K ohm resistor to pin 3 of Service Test Receptacle for this adjustment only.
ADJUST IF trap coil, L-2, for minimum response at 45 Mc.

UHF Alignment

[8] SET tuner to UHF; sweep generator to center frequency of 44 Mc. Marker generator to 41.25 Mc and 45.75 Mc. Sweep generator to UHF receptacle on tuner for this adjustment only. Oscilloscope to Mixer Test Receptacle.
ADJUST coils L-10 and L-16 for marker position; L-5 for proper tilt and maximum gain.

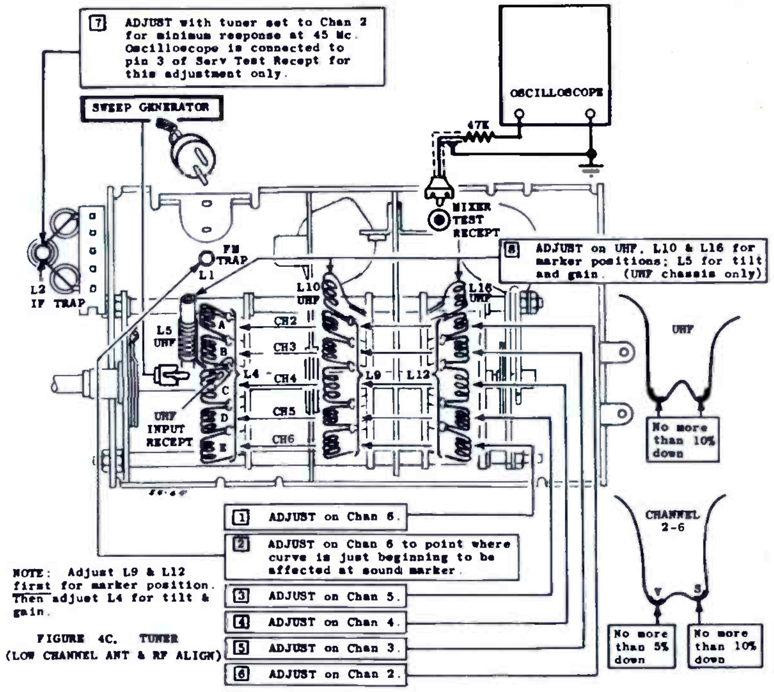


FIGURE 4C. TUNER (LOW CHANNEL ANT & RF ALIGN)

HIGH AND LOW CHANNEL OSCILLATOR ALIGNMENT

General Information

Generally, during high channel alignment, the sound marker is placed slightly higher in frequency on the response curve; during low channel alignment, the marker is placed slightly lower in frequency. More specifically, it will be necessary to determine the channel at which the frequency shift changes direction. This can be done by replacing and detaching the tuner cover while examining the response on the mid-channels.

Equipment Arrangement

Connect: oscilloscope through 47K resistor to pin #3 of Service Test Receptacle; sweep and marker generator to antenna input receptacle. Marker used for each channel is the sound marker for that channel. (Refer to Channel Chart.)

Pre-setting

Set the following to mid-capacity:

[1] Fine tuning capacitor, so that capacity will increase with counterclockwise rotation.

[2] Oscillator grid capacitor, C-26.

High Channel Alignment

[3] SET tuner and sweep generator to channel 12. Marker generator to 209.75 Mc.

ADJUST (from chassis top) oscillator grid coil L-13 to move 209.75 Mc sound marker into proper position.

[4] Examine response on channels 13 through 7. When a fine tuning rotation of 30 or more degrees is required to position marker:

[4A] SET tuner and sweep generator to channel 7.

ADJUST oscillator grid capacitor, C-26 to move 179.75 Mc sound marker into proper position. (C-26 has greatest effect on channels 7 to 9.)

[4B] SET tuner and sweep generator to channel 13.

READJUST oscillator grid coil, L-13 to move 215.75 Mc sound marker into proper position. (L-13 has greatest effect on channels 10 to 13.)

Low Channel Alignment

NOTE: Low channel sections of L-14 are adjusted by compressing or spreading coils.

[5] SET tuner and sweep generator to channel 6. Marker generator to 87.75 Mc.

ADJUST L-14E to move 87.75 Mc sound marker into proper position. Accuracy of this alignment is extremely important to alignment of remaining low channels.

[6] SET tuner and sweep generator to channel 5. Marker generator to 81.75 Mc.

ADJUST L-14D to move 81.75 Mc sound marker into proper position.

[7] SET tuner and sweep generator to channel 4. Marker generator to 71.75 Mc

ADJUST L-14C to move 71.75 Mc sound marker into proper position.

[8] SET tuner and sweep generator to channel 3. Marker generator to 65.75 Mc.

ADJUST L-14B to move 65.75 Mc sound marker into proper position.

[9] SET tuner and sweep generator to channel 2. Marker generator to 59.75 Mc.

ADJUST L-14A to move 59.75 Mc sound marker into proper position.

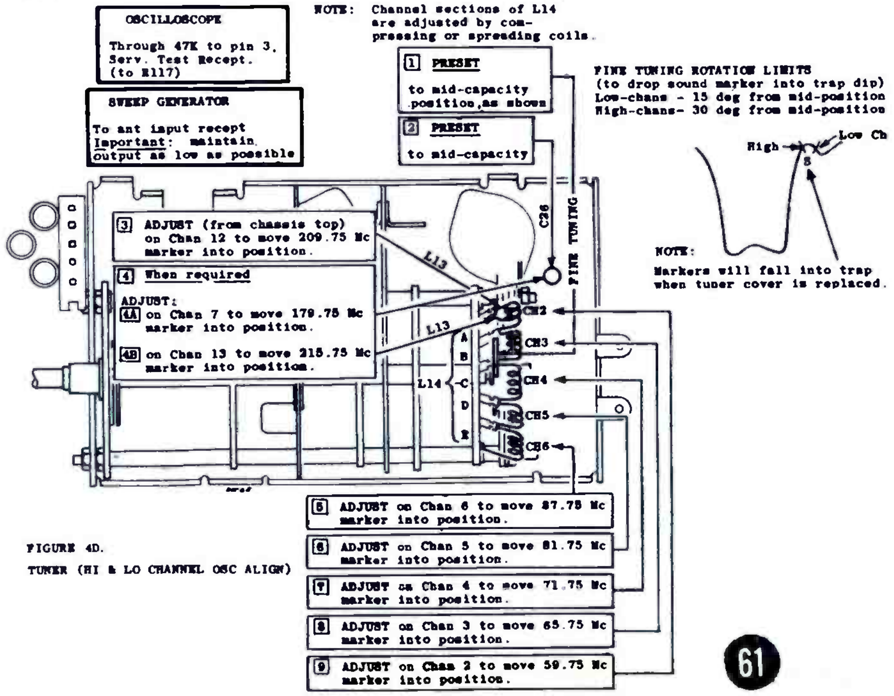
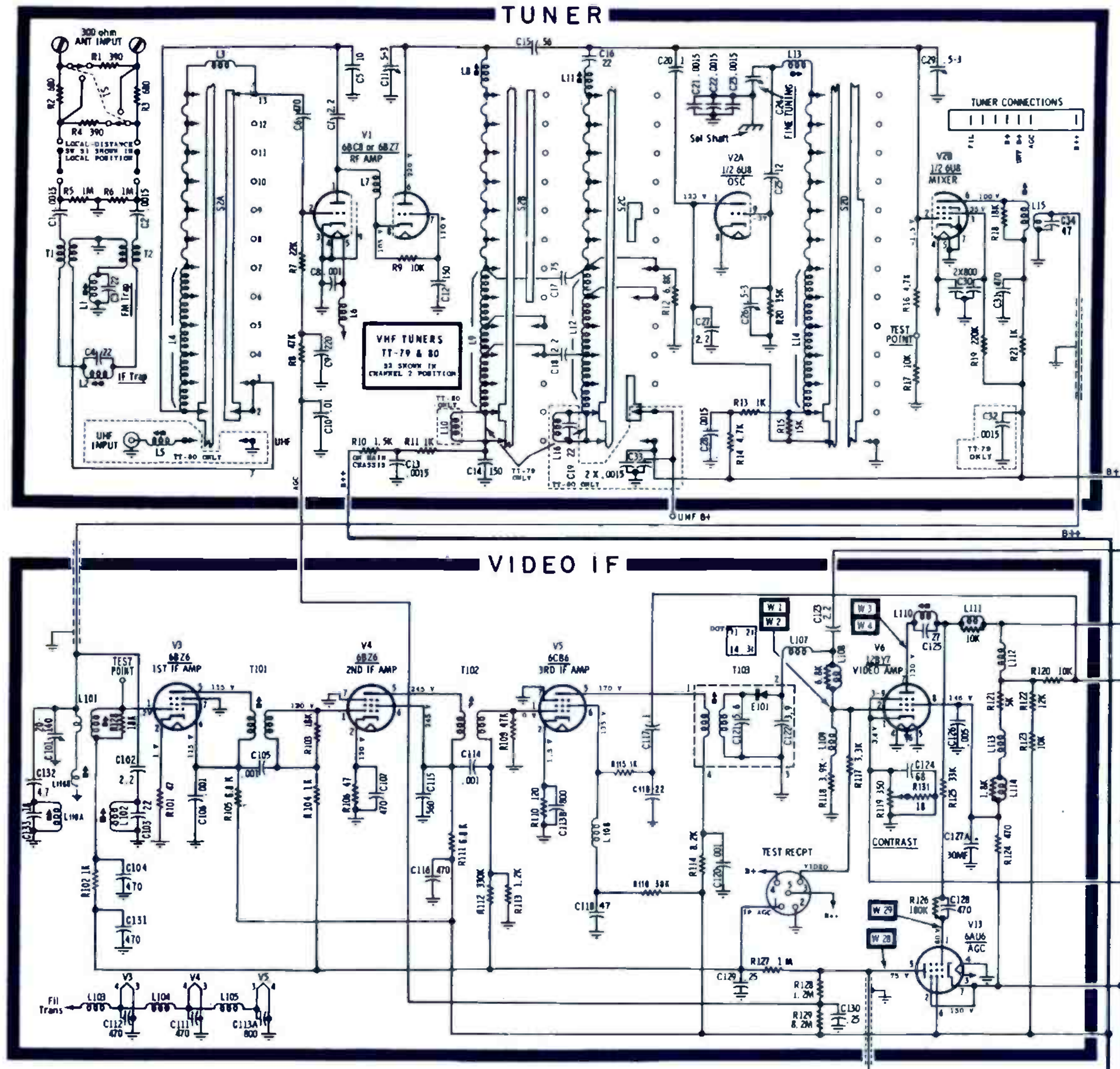


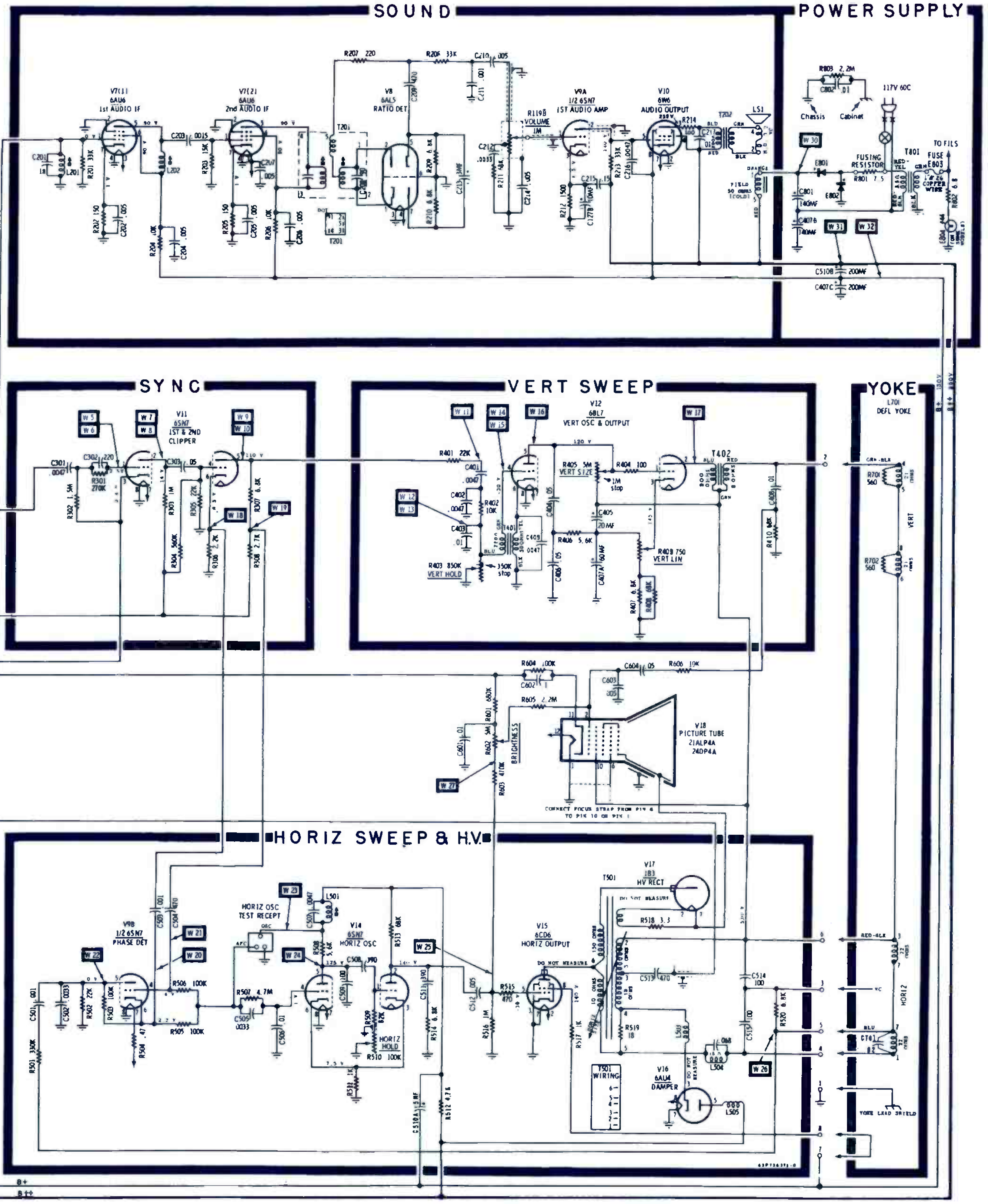
FIGURE 4D.
TUNER (HI & LO CHANNEL OSC ALIGN)

MOTOROLA
Chassis TS-534, TS-534Y

Chassis TS-534, TS-534Y: Models 21K48M, Y21K48M, 21K48B, Y21K48B

TELEVISION CHASSIS TS-534D-00 SERIES





CAPACITOR VALUES UNDER 1000 ARE IN MMF.
ALL OTHERS IN MF UNLESS OTHERWISE SPECIFIED.

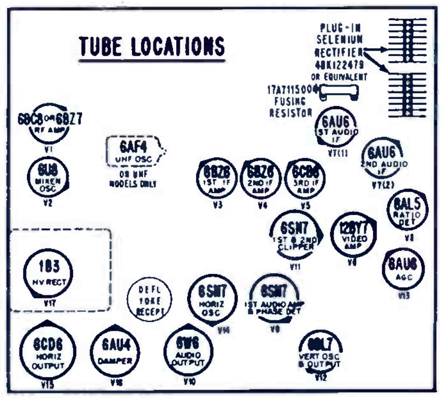
NOTES

VOLTAGE MEASUREMENTS

1. Made with a VTVM from point indicated to chassis.
2. Line voltage - 117 volts (use Isolation Transformer).
3. Antenna disconnected and input shorted across.
4. Channel selector switch on channel which develops least noise at pin #3 of test receptacle.
5. Contrast control "off", maximum counterclockwise position.
6. All other controls in normal operating position.
7. Voltages associated with variable-control circuitry will vary with control setting.

WAVEFORMS

1. Designated by "W" prefix and numerical reference.
2. Photographs of waveforms are on pages preceding the schematic.
3. Required circuit conditions are given with each waveform.
4. Waveforms observed on wide-band oscilloscope.



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NOTES:

CAPACITORS - Decimal values in MF. all others in MMF unless otherwise specified.

VOLTAGE MEASUREMENTS

1. Made with a VTVM from point indicated to chassis.
2. Line voltage - 117 volts (use Isolation Transformer).
3. Antenna disconnected and input shorted across.
4. Channel selector switch on channel which develops least noise at detector test receptacle.
5. Contrast control at maximum counterclockwise position.
6. All other controls in normal operating position.
7. Voltages associated with variable-control circuitry will vary with control setting.

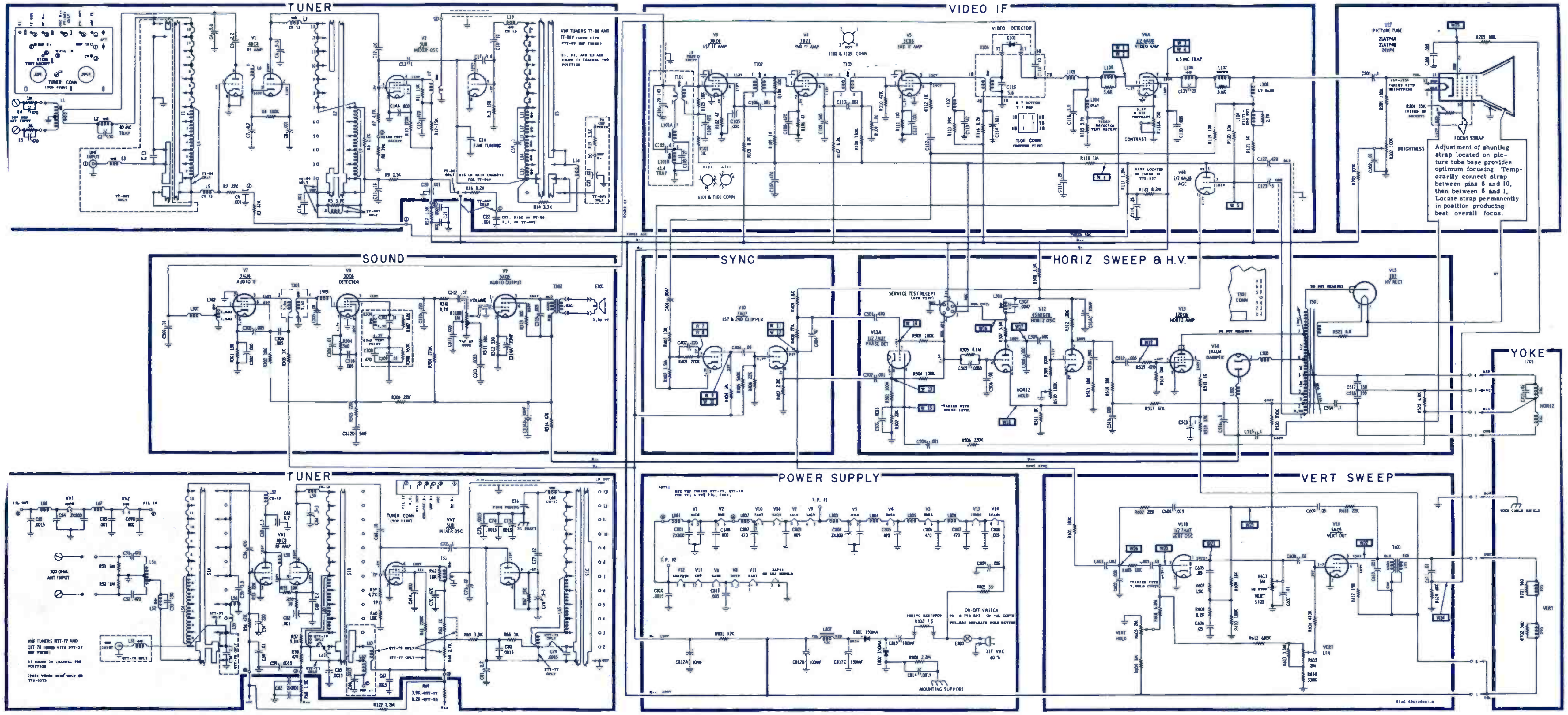
WAVEFORMS

1. Designated by "W" prefix and numerical reference.
2. Photographs of waveforms are on pages preceding the schematic.
3. Required circuit conditions are given with each waveform.
4. Waveforms observed on wide-band oscilloscope.

TECHNICIAN CIRCUIT DIGEST

MOTOROLA Chassis TS-537

CHASSIS TS-537: Models 21T32BA, 21T32CHA, 21T32MGA, 21T34BA, 21T34MA, 21K53BA, 21K53MA, 21K55BA, 21K55MA



TUNER ALIGNMENT

It is very unlikely that the Motorola tuner will need alignment unless it has been damaged, is being replaced, or has had components replaced in the tuned circuits. Tubes may be changed in most cases without realignment, but care must be used in selection or realignment may be required.

The tuner operates by adding antenna, RF and oscillator coil sections consecutively for each lower channel. When the tuner is switched to the lowest channel, all coils of any one section (antenna, RF or oscillator) will be series connected. Therefore, alignment must start at the highest channel and each adjustment properly completed before the next lower channel adjustment is attempted.

On the TT-77, 78 tuner, the low band channels (6-2) may be individually adjusted by stretching or compressing the coil turns...the appropriate channel coil for the antenna, RF and oscillator must be adjusted while on channel.

The high band inductances (7-13) are formed by a stamped metal plate that is precision-cut to give correct individual channel tuning. The plate is provided with an adjustable end inductor and capacitor which allows adjusting the high band as a unit.

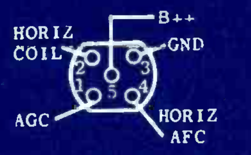
On the TT-86 tuner, the antenna and RF sections may be individually adjusted on each low band channel (6-2) by stretching or compressing the coil turns...the appropriate channel coil for the antenna and RF section must be adjusted while on channel. The oscillator section is provided with tuning screws for all channels which are adjustable from the front of the tuner.

The high band channels (7-13) of the TT-86 tuner utilize a stamped metal plate for the antenna and RF section which is tuned as a unit by an end inductor and capacitor similar to the previously described TT-77, 78 tuner. As stated, the oscillator section is provided with tuning screws for all channels.

SERVICE TEST POINTS

A SERVICE TEST RECEPTACLE, accessible from the rear of the cabinet, after the back has been removed, provides the following test points....

Pin	Connection To
1	IF AGC bus
2	Horiz coil
3	Chassis ground
4	Horiz AFC
5	B++ (250 volts)



These test points provide rapid checking of the power supply voltage---giving the approximate condition of the selenium rectifiers and an indication of the house power line voltage.

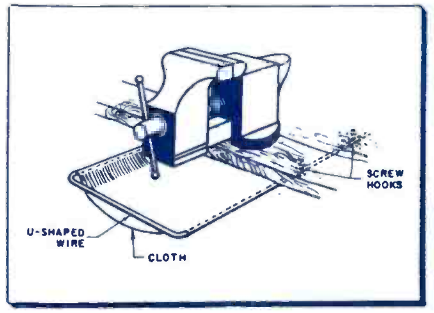
Pins 2 and 4 are provided for convenience in adjusting the horizontal lock coil.

Pin 1 allows rapid checking of the AGC voltage. It is suggested that this voltage be checked and recorded at the first opportunity of the service technician: Use a receiver in normal operating condition for this check. Such AGC voltage information may be invaluable when checking sets in which the AGC action is doubtful. This voltage varies according to the signal strength of the area and may range as follows: 0 to -6V...fringe area
-6 to -9V...average signal strength areas
-9 to -12V..strong signal area

Shop Hints

Vise Net Catches Parts

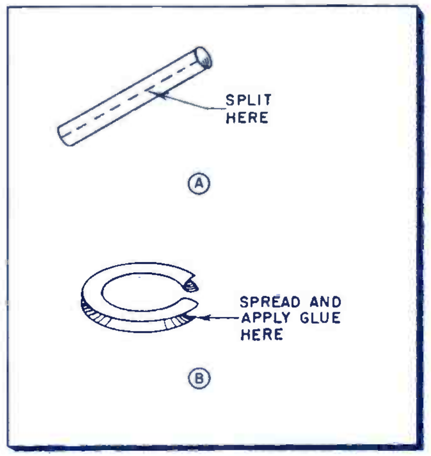
When parts are worked in a vise on the bench, there is often trouble because small parts fall from the vise to the floor of the shop. This can be avoided by the use of a simple cloth net, supported on a wire frame, placed right underneath the vise below the bench top. The frame is made of stiff wire bent into an approximate U shape, as shown in the illustration. The frame slides in and out of screw eyes or hooks, so that the net can be removed when needed. The edges of the cloth may be hemmed to fit over the wire, or held in place with safety pins.—*Stanley Clark, E. Bradenton, Fla.*



Net under bench vise catches falling parts.

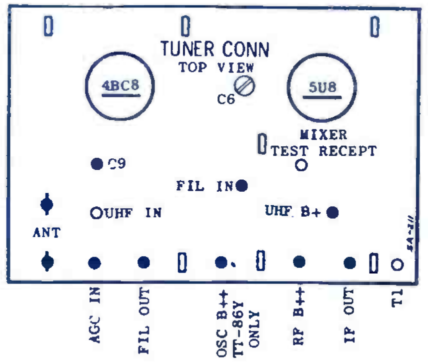
Home-made Grommets

We keep a length of auto windshield-wiper hose in the shop, to bush odd-sized or odd-shaped holes in all sorts of chassis and appliances. Suitable grommets are readily made to fit any shape of opening by cutting off the proper length of wiper hose, splitting it open (as shown in sketch A), applying cement to the cut edges, and curling the hose into shape (as at B) so that it can be put snugly into place to line the hole.—*Henry Josephs, Gardenville, Penna.*



Windshild wiper hose is source for grommets.

More Data on Reverse Side



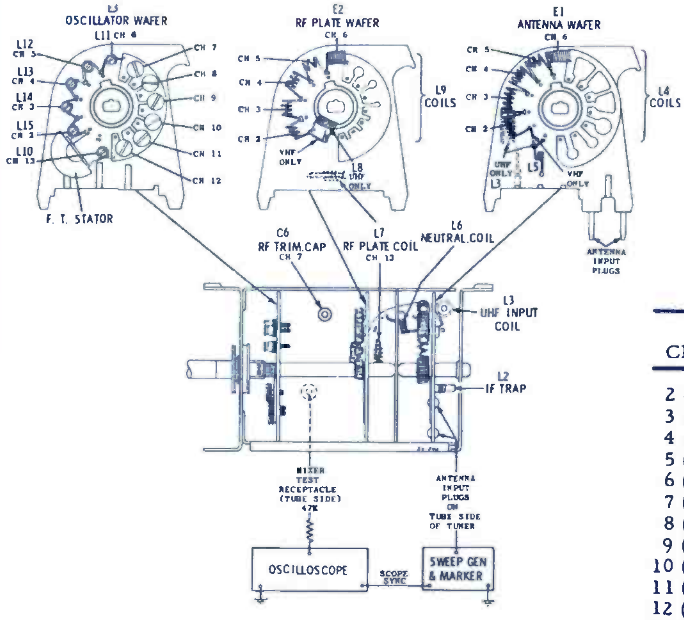


FIGURE 5. TUNER ALIGNMENT, DETAIL (TT-86)

CHANNEL CHART

Channel	Sweep Gen.	Marker Generator Sound Mc	Video Mc
2 (54-60 Mc)	57 Mc	59.75	55.25
3 (60-66 Mc)	63 Mc	65.75	61.25
4 (66-72 Mc)	69 Mc	71.75	67.25
5 (76-82 Mc)	79 Mc	81.75	77.25
6 (82-88 Mc)	85 Mc	87.75	83.25
7 (174-180 Mc)	177 Mc	179.75	175.25
8 (180-186 Mc)	183 Mc	185.75	181.25
9 (186-192 Mc)	189 Mc	191.75	187.25
10 (192-198 Mc)	195 Mc	197.75	193.25
11 (198-204 Mc)	201 Mc	203.75	199.25
12 (204-210 Mc)	207 Mc	209.75	205.25
13 (210-216 Mc)	213 Mc	215.75	211.25

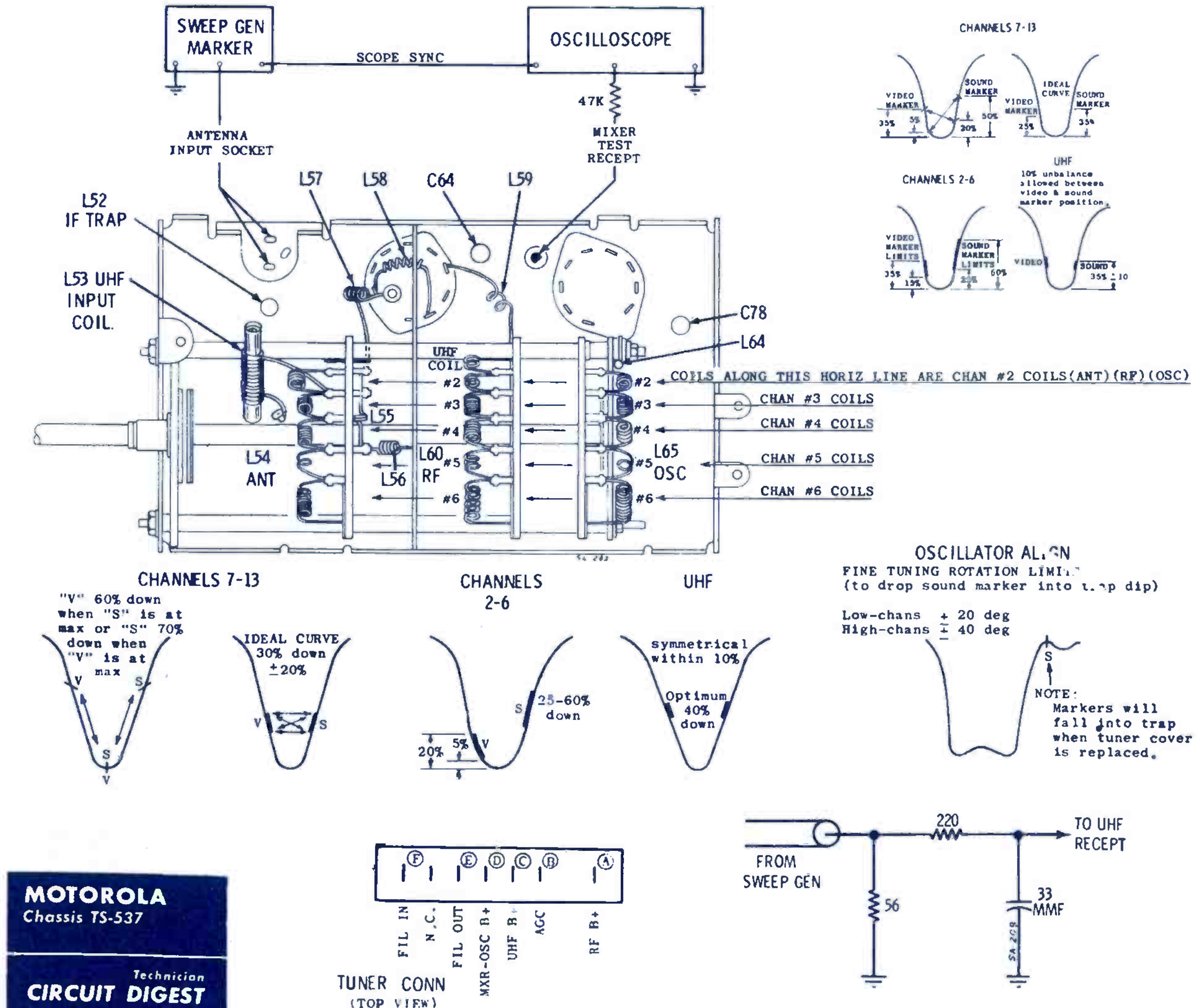


FIGURE 4. TUNER ALIGNMENT, DETAIL (TT-77 & 78)

MOTOROLA
Chassis TS-537

Technician
CIRCUIT DIGEST

64

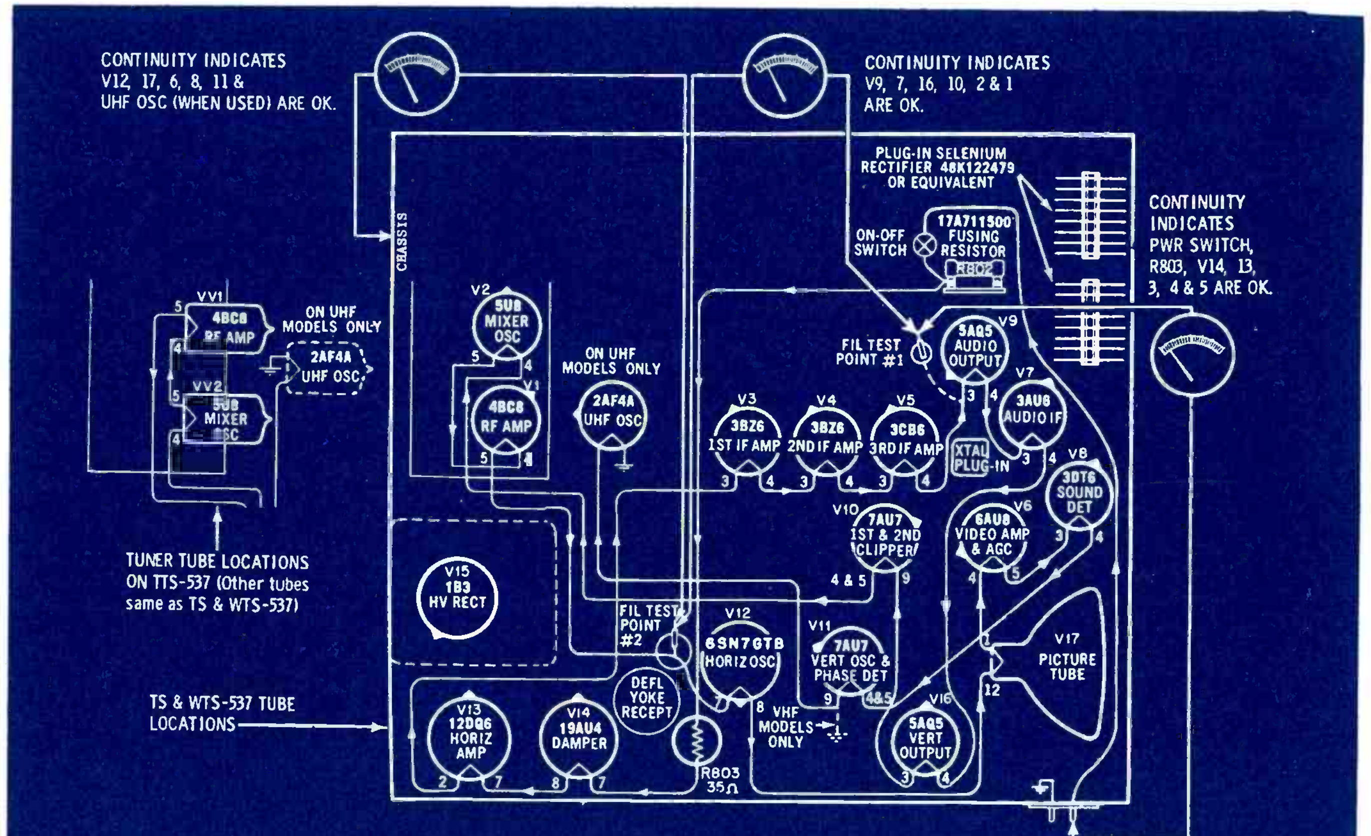
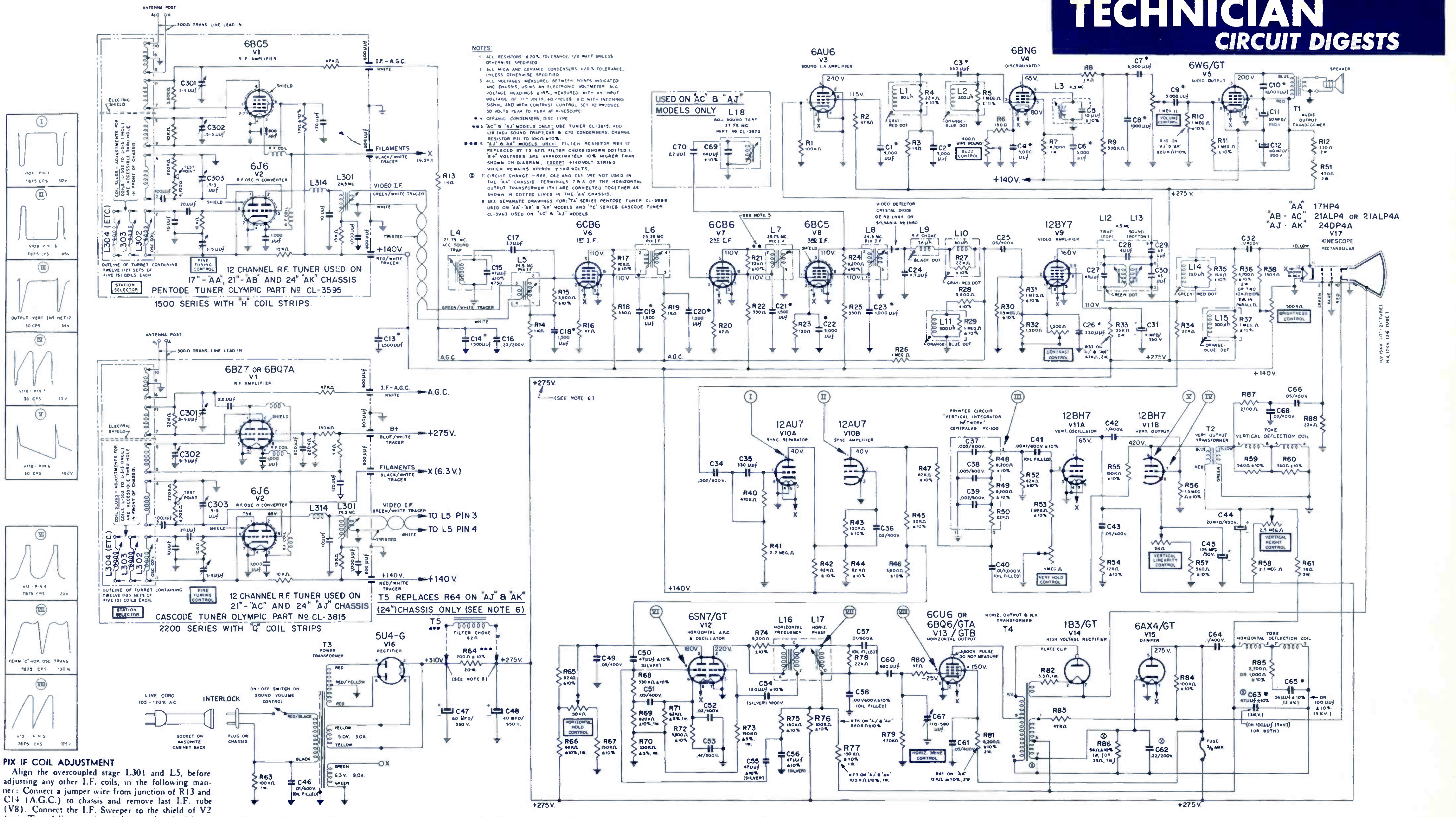


FIGURE 14. FILAMENT TEST POINTS



PIX IF COIL ADJUSTMENT

Align the overcoupled stage L301 and L5, before adjusting any other I.F. coils, in the following manner: Connect a jumper wire from junction of R13 and C14 (A.G.C.) to chassis and remove last I.F. tube (V8). Connect the I.F. Sweeper to the shield of V2 (as in Trap Adjustment) and the crystal probe (shown in figure 4) between the vertical input terminals of the oscilloscope and the plate (pin 5) of the 1st I.F. tube (V6). Adjust the tuner slug L301 and first I.F. slug L5 so that the 22.75 MC marker falls just on the trap (21.75MC) side of the peak. Both slugs should be adjusted such that both peaks are of equal maximum height as illustrated in figure 5. Remove jumper wire and replace V8.

Note: After setting L301 and L5 DO NOT readjust to improve wave shape.

Adjust the following slugs for maximum output at frequencies and sequence indicated with meter and generator;

L6	23.25 MC
L7	25.75 MC
L8	24.5 MC

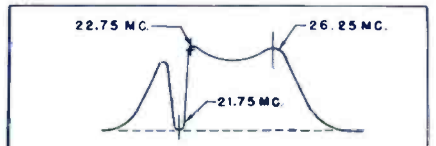
If oscillation occurs during alignment, temporarily raise frequency of L8 by turning screw counterclockwise until screw projects approximately ¾". Oscillation is evidenced by high reading on voltmeter (— 5V to — 20V) with signal generator OFF and no signal coming in through the antenna terminals. After properly adjusted L301, L5, L6 and L7 reset L8 to proper frequency, if it had been necessary to detune.

Connect hot lead of sweep generator through a 330 uuf condenser to test point on tuner and connect ground lead to chassis.

Connect vertical input terminal of oscilloscope to junction of peaking coil L10 and C25 and connect ground lead of scope to chassis.

Connect 1.5V flashlight battery with positive terminal to chassis and negative terminal to junction of R13 and C14. This point is AGC bias voltage. Set tuner to Channel 9 unless local station is operating on this frequency, in which case an adjacent channel should be used.

Set Sweep Generator frequency to IF sweep on the 20 to 30 MC range.



NORMAL CURVE FOR OVERCOUPLED STAGE

FIG. 5

Adjust sweep generator output to produce a curve on the scope which is approximately ⅔ of the screen diameter.

Loosely couple output of RF signal generator by using shield on V2 and set frequency of RF signal generator to 26.25 MC (marker).

Curve shown on scope should be similar to the response curve shown in Figure 6. For proper setting of the pix carrier the 26.25 MC marker should appear on the curve at apoint approximately 50% of the vertical height of the curve.

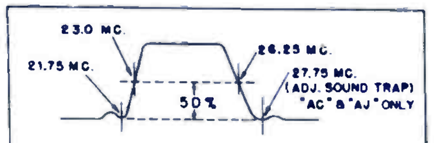
To obtain this setting retouch L8.

Reset RF signal generator frequency to 23.0 MC and retouch L6 for correct positioning of marker on curve.

Recheck setting at 26.25 MC marker to make sure that position has not shifted on curve.

Disconnect bias battery.

Note: If the curve cannot be made to appear as above due to a local station or other interference, or if multiple markers appear, remove (V1 — 6BC5) RF tube from tuner.



STANDARD RESPONSE CURVE

FIG. 6

Chassis AA: Models 17CA20, 17TA19, 17TA32, 17TA33 Chassis AB: Models 21CB35, 21CB41, 21DB71, 21KB24, 21KB26, 21KB36, 21KB76, 21TB34, 21TB40, 22DB series Chassis AC: Models 21CC55, 21CC70, 21DC71, 21KC44, 21KC46, 21KC56, 21TC54, 22DC series Chassis AJ: Model 24CJ68 Chassis AK: Models 24CJ68BK, 24CJ68MK, 24CK77

OLYMPIC
Chassis AA, AB, AC, AJ, AK

TECHNICIAN CIRCUIT DIGEST

OLYMPIC Chassis BD, BF

Chassis BD: Models C21BD35, K21BD34, T21BD19
Chassis BF: Models C21BF21, T21BF20

IF ALIGNMENT PROCEDURE

ORDER OF ALIGNMENT

When complete receiver alignment is necessary, it should be performed in the following sequence:

(1) Accompanying Sound Trap
(2) Pix IF Coils
(3) 4.5 MC Trap
(4) 4.5 MC Sound Discriminator
(5) Tuner

After removing chassis from cabinet re-connect power, speaker, pix anode and yoke plugs.

If a local station is not operating on Channel 9 set the tuner to this channel, turn on power switch and proceed as follows: (If 9 is a local station, use Channel 8 or 10.)

ACCOMPANYING SOUND TRAP

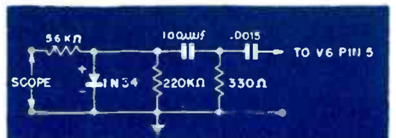
Insert a 100,000 ohm ½ watt resistor in series with the "Hot Lead" of the electronic voltmeter and connect it to the junction of L10 and C25. Meter switch should be set to the lowest negative scale. Ground lead of meter should be connected to chassis.

Remove the shield of the RF Oscillator and Mixer tube (V2) from ground clips leaving shield resting on tube and connect hot lead of the RF Signal Generator to it.. This will couple generator output to mixer plate.

Set the generator frequency accurately to 21.75 MC, and adjust (L4) sound trap (See Fig. 8 Tube and Trimmer Layout) for minimum reading on voltmeter.

PIX IF COIL ADJUSTMENT

Align the overcoupled stage L301 and L5, before adjusting any other I.F. coils, in the following manner: Connect a jumper wire from junction of R13 and C14 (A.G.C.) to chassis and remove last I.F. tube (V8). Connect the I.F. Sweeper to the shield of V2



CRYSTAL PROBE FOR OVERCOUPLED STAGE ALIGNMENT
FIG. 4

(as in Trap Adjustment) and the crystal probe (shown in figure 4) between the vertical input terminals of the oscilloscope and the plate (pin 5) of the 1st I.F. tube (V6). Adjust the tuner slug L301 and first I.F. slug L5 so that the 22.75 MC marker falls just on the trap (21.75MC) side of the peak. Both slugs should be adjusted such that both peaks are of equal maximum height as illustrated in figure 5. Remove jumper wire and replace V8.

Note: After setting L301 and L5 DO NOT readjust to improve wave shape.

Adjust the following slugs for maximum output at frequencies and sequence indicated with meter and generator connected as in "ACC. Sound Trap" adjustment.

L6	23.25 MC
L7	25.75 MC
L8	24.5 MC

If oscillation occurs during alignment, temporarily raise frequency of L8 by turning screw counterclockwise until screw projects approximately ¾". Oscillation is evidenced by high reading on voltmeter (— 5V to — 20V) with signal generator OFF and no signal coming in through the antenna terminals. After properly adjusted L301, L5, L6 and L7 reset L8 to proper frequency, if it had been necessary to detune.

Connect hot lead of sweep generator through a 330 uuf-condenser to test point on tuner and connect ground lead to chassis.

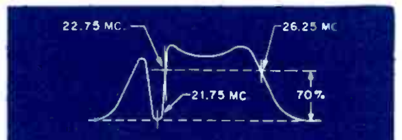
Connect vertical input terminal of oscilloscope to junction of peaking coil L10 and C25 and connect ground lead of scope to chassis.

Connect 1.5V flashlight battery with positive terminal to chassis and negative terminal to junction of R13 and C14. This point is AGC bias voltage. Set tuner to Channel 9 unless local station is operating on this frequency, in which case an adjacent channel should be used.

Set Sweep Generator frequency to IF sweep on the 20 to 30 MC range.

Adjust sweep generator output to produce a curve on the scope which is approximately 3 volts peak to peak.

Loosely couple output of RF signal generator by using shield on V2 and set frequency of RF signal generator to 26.25 MC (marker).

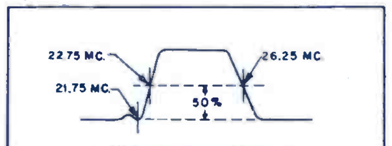


NORMAL CURVE FOR OVERCOUPLED STAGE
FIG. 5

Curve shown on scope should be similar to the response curve shown in Figure 6. For proper setting of the pix carrier the 26.25 MC marker should appear on the curve at a point approximately 50% of the vertical height of the curve.

To obtain this setting retouch L8.

Reset RF signal generator frequency to 22.75 MC



STANDARD RESPONSE CURVE
FIG. 6
IB-67-4

and retouch L6 for correct positioning of marker on curve.

Recheck setting at 26.25 MC marker to make sure that position has not shifted on curve.

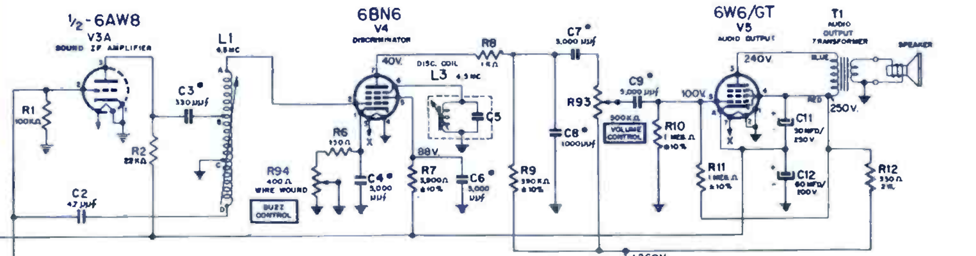
Disconnect bias battery.

Note: If the curve cannot be made to appear as above due to a local station or other interference, or if multiple markers appear, remove (V1 — 6BC5) RF tube from tuner.

4.5 MC TRAP ALIGNMENT

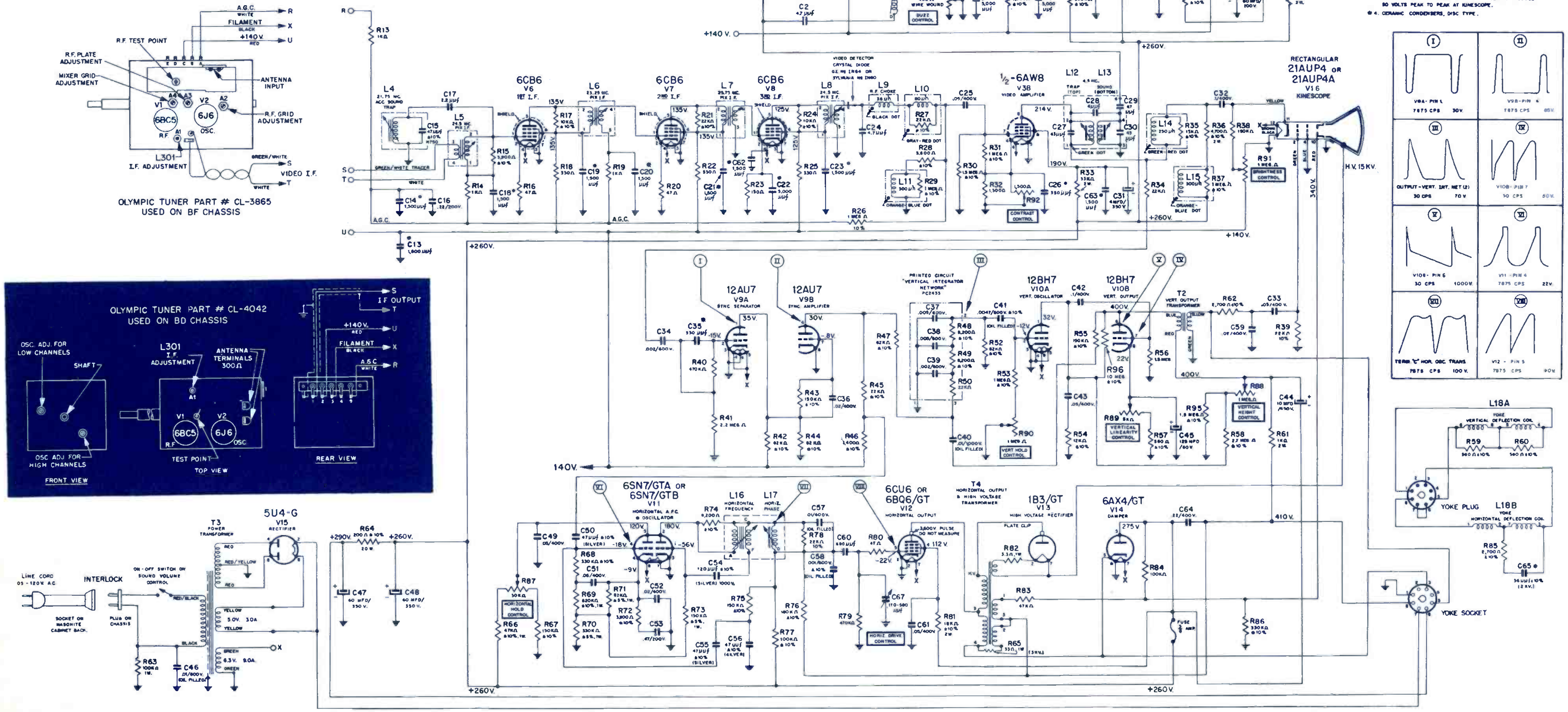
Connect voltmeter lead to Diode crystal rectifier. . . . . .Connect Diode crystal rectifier between C. R. Tube Cathode lead (yellow wire) and chassis ground. Signal generator is connected at junction of L10 and C25. Set contrast control at maximum and voltmeter to 3 volt scale (negative). Remove 6CB6 (V8) from socket. Use maximum output of generator at 4.5 MC. Adjust L12 for minimum reading on meter.

When it is necessary to retouch this trap in the field, proper adjustment can be made by using the local station signal and turning the Fine Tuning Control to bring fine herringbone sound beat into the picture. The 4.5 MC trap (L12) should then be adjusted to minimize this beat interference.



NOTES:

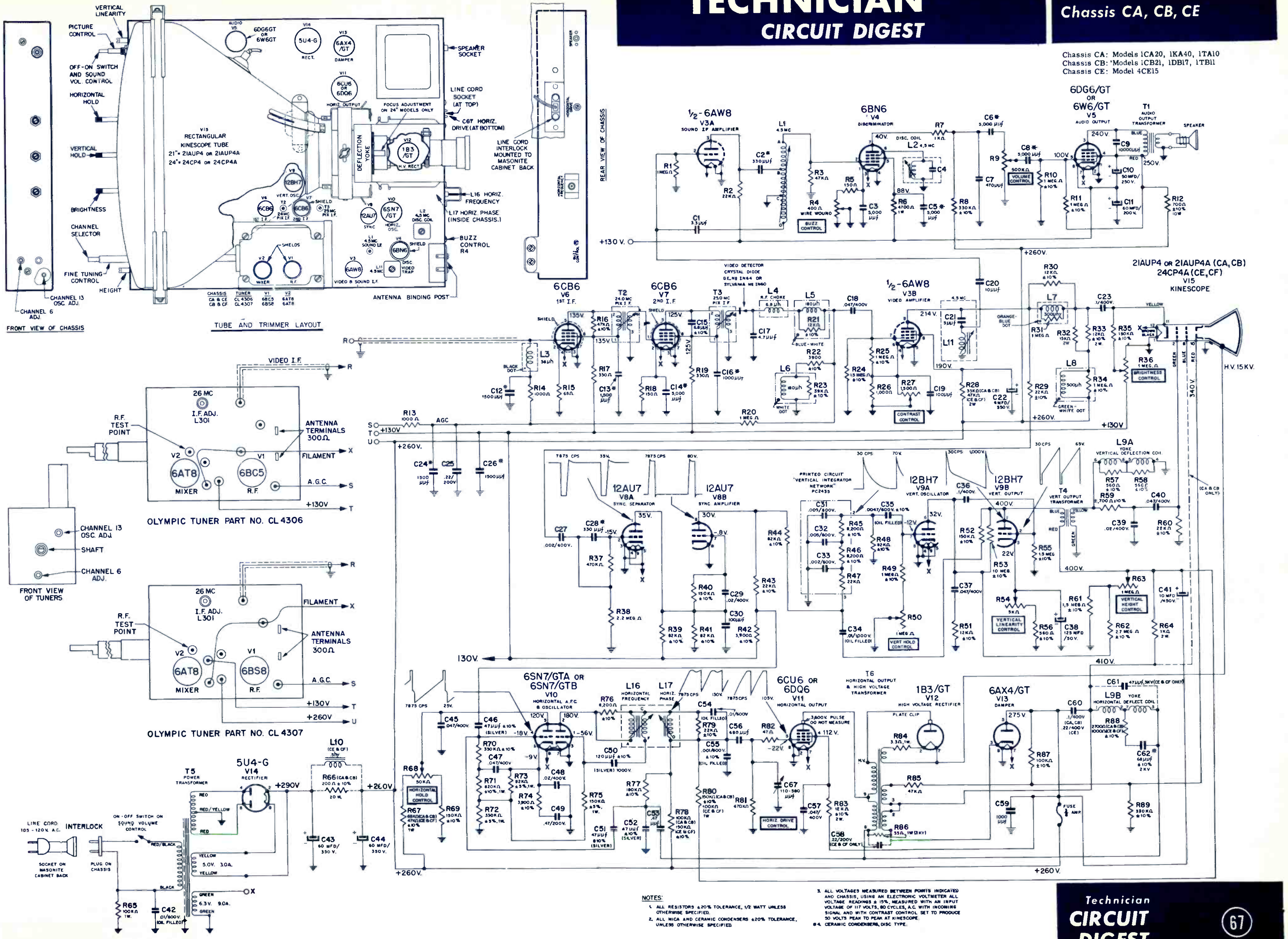
1. ALL RESISTORS ±20% TOLERANCE, 1/2 WATT UNLESS OTHERWISE SPECIFIED
2. ALL MICA AND CERAMIC CONDENSERS ±20% TOLERANCE, UNLESS OTHERWISE SPECIFIED.
3. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND CHASSIS, USING AN ELECTRONIC VOLTMETER. ALL VOLTAGE READINGS ±15%, MEASURED WITH AN INPUT VOLTAGE OF 117 VOLTS, 60 CYCLES, A.C. WITH INCOMING SIGNAL AND WITH CONTRAST CONTROL SET TO PRODUCE 80 VOLTS PEAK TO PEAK AT KINESCOPE.
● 4. CERAMIC CONDENSERS, DISC TYPE.



TECHNICIAN
CIRCUIT DIGEST

OLYMPIC
Chassis CA, CB, CE

Chassis CA: Models 1CA20, 1KA40, 1TA10
Chassis CB: Models 1CB21, 1DB17, 1TB11
Chassis CE: Model 4CE15

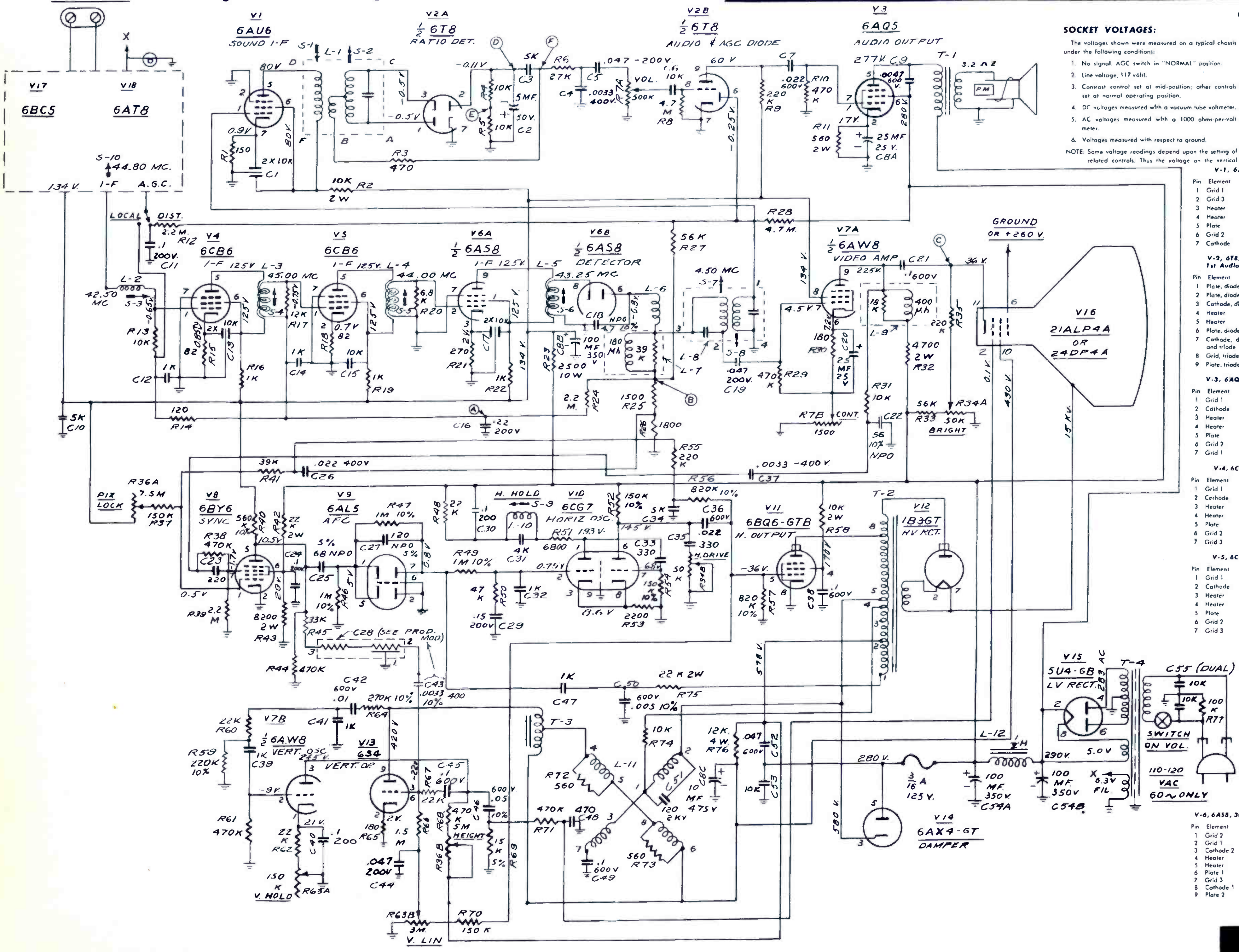


NOTES:

1. ALL RESISTORS ±20% TOLERANCE, 1/2 WATT UNLESS OTHERWISE SPECIFIED.
2. ALL MICA AND CERAMIC CONDENSERS ±20% TOLERANCE, UNLESS OTHERWISE SPECIFIED.
3. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND CHASSIS, USING AN ELECTRONIC VOLTMETER. ALL VOLTAGE READINGS ± 15%, MEASURED WITH AN INPUT VOLTAGE OF 117 VOLTS, 60 CYCLES, A.C. WITH INCOMING SIGNAL AND WITH CONTRAST CONTROL SET TO PRODUCE 50 VOLTS PEAK TO PEAK AT KINESCOPE.

\#4. CERAMIC CONDENSERS, DISC TYPE.

Fig. 9. Schematic Diagram, Chassis 88S1



Chassis 88S1: Models 21ST1, 24ST1, 21SC1

SOCKET VOLTAGES:

The voltages shown were measured on a typical chassis under the following conditions:

1. No signal. AGC switch in "NORMAL" position.
2. Line voltage, 117 volts.
3. Contrast control set at mid-position; other controls set at normal operating position.
4. DC voltages measured with a vacuum tube voltmeter.
5. AC voltages measured with a 1000 ohms-per-volt meter.
6. Voltages measured with respect to ground.

NOTE: Some voltage readings depend upon the setting of related controls. Thus the voltage on the vertical oscillator tube V-7B depends on the setting of the vertical hold control.

Tube location is shown on Fig. 9, which is a bottom view of the chassis.

V-1, 6AU6, Sound I-F

Pin	Element	Voltage
1	Grid 1	0
2	Grid 3	0
3	Heater	0
4	Heater	6.3 AC
5	Plate	80
6	Grid 2	80
7	Cathode	0.9

V-2, 6T8, Ratio Detector, 1st Audio, and AGC Diode

Pin	Element	Voltage
1	Plate, diode 3	−0.5
2	Plate, diode 2	−0.11
3	Cathode, diode 2	−0.5
4	Heater	6.3 AC
5	Heater	0
6	Plate, diode 1	0.25
7	Cathode, diodes 1, 3, and triode	0
8	Grid, triode	0
9	Plate, triode	60

V-3, 6AQ5, Audio Output

Pin	Element	Voltage
1	Grid 1	0
2	Cathode	17
3	Heater	0
4	Heater	6.3 AC
5	Plate	277
6	Grid 2	280
7	Grid 1	0

V-4, 6CB6, 1st Pix I-F

Pin	Element	Voltage
1	Grid 1	0.65
2	Cathode	0.85
3	Heater	0
4	Heater	6.3 AC
5	Plate	125
6	Grid 2	125
7	Grid 3	0

V-5, 6CB6, 2nd Pix I-F

Pin	Element	Voltage
1	Grid 1	−0.75
2	Cathode	0.7
3	Heater	0
4	Heater	6.3 AC
5	Plate	125
6	Grid 2	125
7	Grid 3	0

V-6, 6AS8, 3rd Pix I-F & Detector

Pin	Element	Voltage
1	Grid 2	125
2	Grid 1	0
3	Cathode 2	2
4	Heater	0
5	Heater	6.3 AC
6	Plate 1	0
7	Grid 3	0
8	Cathode 1	0
9	Plate 2	125

V-7, 6AW8, Video Amplifier and Vertical Oscillator

Pin	Element	Voltage
1	Cathode, triode	21
2	Grid, triode	9
3	Plate, triode	245
4	Heater	0
5	Heater	6.3 AC
6	Cathode, pentode	7.2
7	Grid 1, pentode	4.5
8	Grid 2, pentode	134
9	Plate, pentode	225

V-8, 6BY6, Sync Separator & Pix Stabilizer

Pin	Element	Voltage
1	Grid 1	0.5
2	Cathode, grid 5	0
3	Heater	0
4	Heater	6.3 AC
5	Plate	10.5
6	Grids 2 & 4	29
7	Grid 3	−1.7

V-9, 6AL5, AFC

Pin	Element	Voltage
1	Cathode 1	5
2	Plate 2	0
3	Heater	0
4	Heater	6.3 AC
5	Cathode 2	5
6	Shield	0
7	Plate 1	0.8

V-10, 6CG7, Horizontal Oscillator

Pin	Element	Voltage
1	Plate 2	193
2	Grid 2	0.75
3	Cathode 2	8.6
4	Heater	0
5	Heater	6.3 AC
6	Plate 1	145
7	Grid 1	−6.8
8	Cathode 1	8.6
9	Internal shield	0

V-11, 6BQ6-GA or 6BQ6-GTB/6CU6, Horizontal Output

Pin	Element	Voltage
1	No connection	
2	Heater	6.3 AC
3	No connection	
4	Grid 2	170
5	Grid 1	−36
6	No pin	
7	Heater	0
8	Cathode, grid 3	0
Cap	Plate	Do not measure

V-12, 1B3-GT, HV Rectifier

Do not measure voltage

V-13, 6S4, Vertical Output

Pin	Element	Voltage
1	Internal connection	
2	Cathode	2
3	Grid	−22
4	Heater	6.3 AC
5	Heater	0
6	Same as 3	
7	Internal connection	
8	Internal connection	
9	Plate	420

V-14, 6AX4-GT, Damper

Pin	Element	Voltage
1	No connection	
2	No connection	
3	Cathode	580
4	No connection	
5	Plate	280
6	No connection	
7	Heater	0
8	Heater	6.3 AC

V-15, 5U4-GB, LV Rectifier

Pin	Element	Voltage
2	Filament	290
4	Plate	283 AC

V-16, Picture Tube, 21ALP4A/B or 24DP4A

Pin	Element	Voltage
1	Heater	0
2	Grid 1	0.1
6	Grid 4	0 or 260
10	Grid 2	430
11	Cathode	36
12	Heater	6.3 AC
Cap	Grids 3, 5, & Collector	15 KV.

TECHNICIAN CIRCUIT DIGEST

PACKARD-BELL
Chassis V8-1

Chassis V8-1: Models 17VT1, 21VT1, 17VT1-U, 21VT1-U

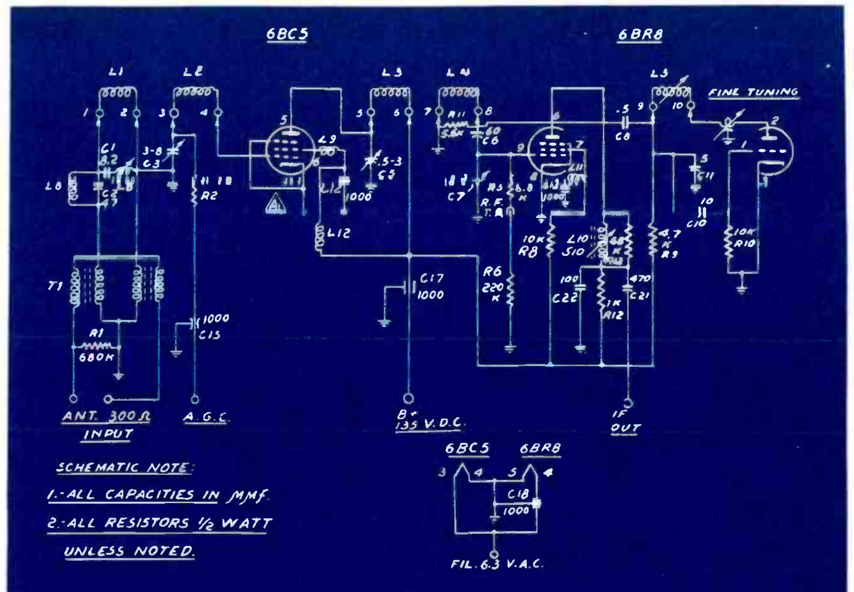
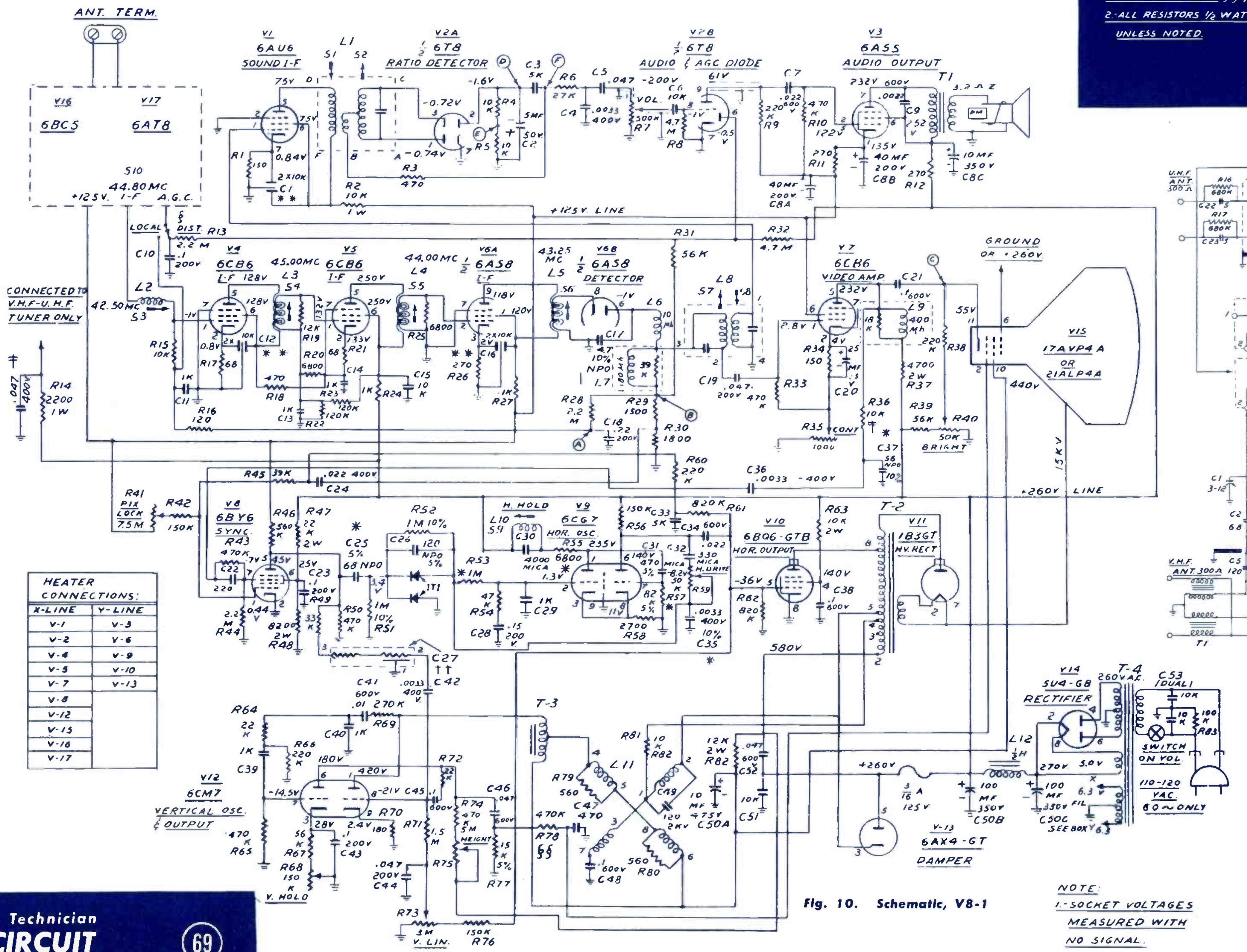


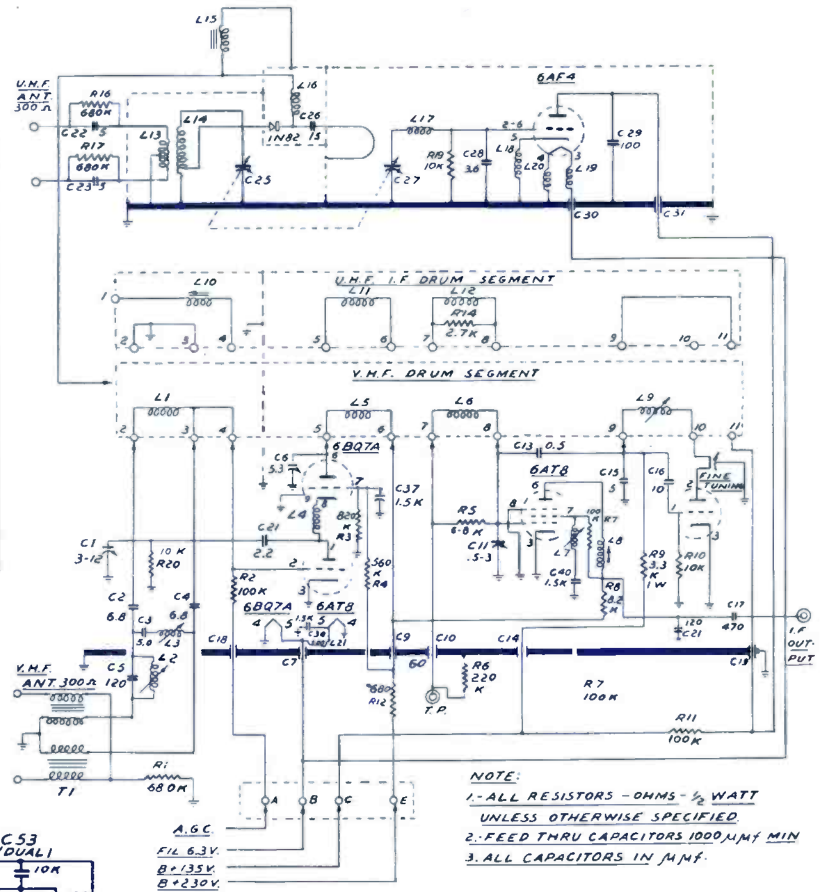
Fig. 13. Schematic, Tuner 10554



HEATER CONNECTIONS:	
X-LINE	Y-LINE
V-1	V-3
V-2	V-6
V-4	V-9
V-5	V-10
V-7	V-13
V-8	
V-12	
V-15	
V-16	
V-17	

Fig. 10. Schematic, V8-1

NOTE:
1.-SOCKET VOLTAGES MEASURED WITH NO SIGNAL.



NOTE:
1.-ALL RESISTORS - OHMS - ½ WATT UNLESS OTHERWISE SPECIFIED
2.-FEED THRU CAPACITORS 1000 μμf MIN
3.-ALL CAPACITORS IN μμf.

Fig. 9. Schematic, Tuner 10550

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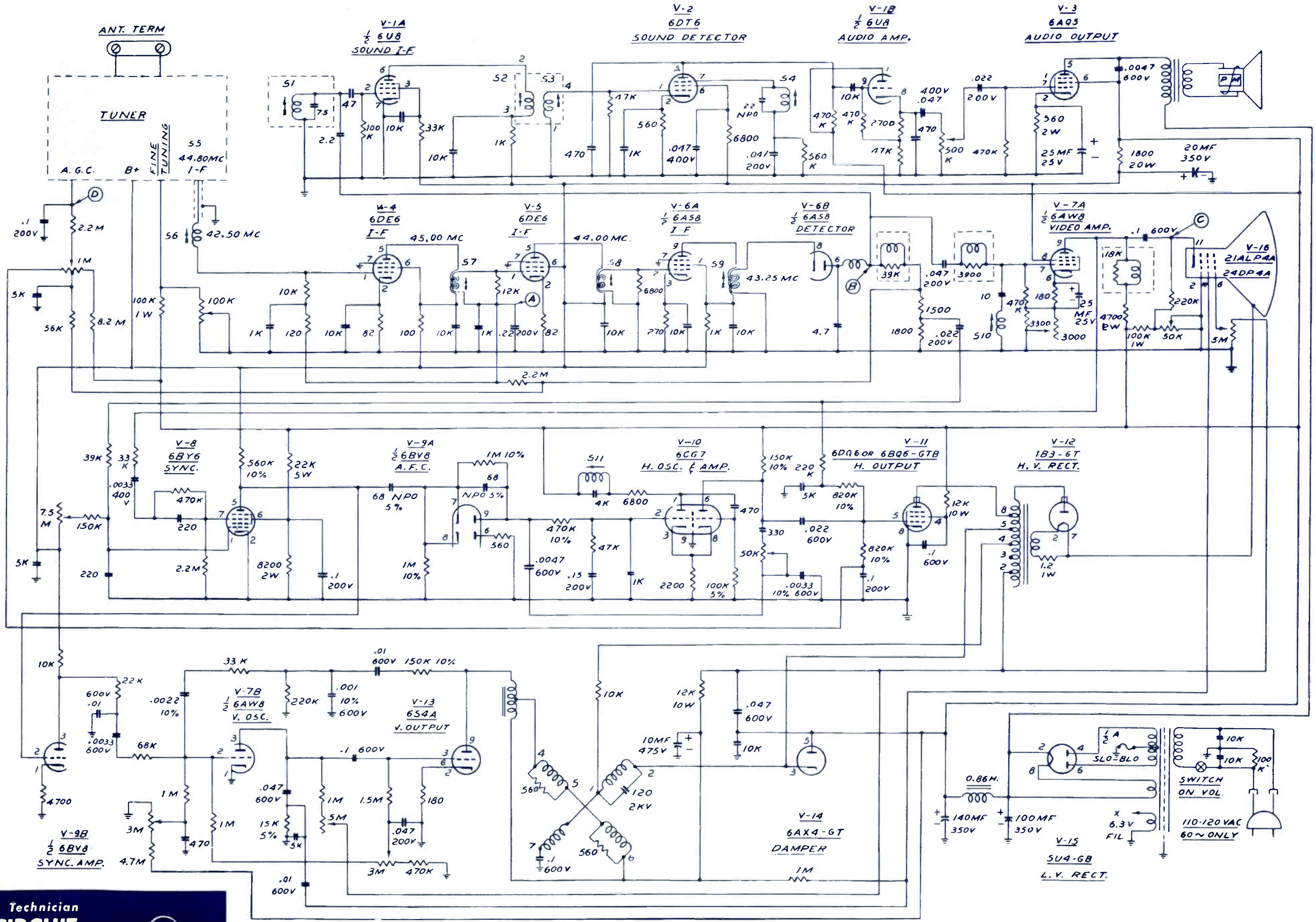
TECHNICIAN CIRCUIT DIGEST

PACKARD-BELL
Chassis 88S2



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TECHNICIAN
CIRCUIT DIGESTS

OSCILLOSCOPE WAVEFORM PATTERNS

These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 3.5 volts at the video detector. The voltages given with the waveforms are approximate peak-to-peak values. The frequencies shown are those of the waveforms — not the sweep rate of the oscilloscope. The waveforms were taken with an oscilloscope having good high-frequency response. With oscilloscopes having poor high-frequency response, the sharp peaks of the horizontal waveforms will be more rounded than those shown, and the peak-to-peak voltages will differ from those shown.

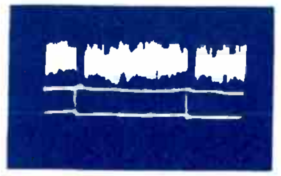


Fig. 8. Video Detector Output, Pin 2 of TS1, 3.5 volts, 60 c.p.s.

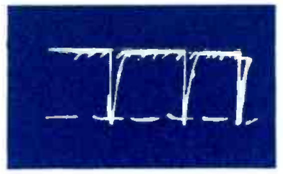


Fig. 12. Sync Separator Plate, Pin 5, 41 volts, 15,750 c.p.s.

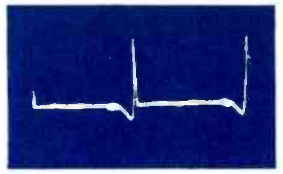


Fig. 13. Vertical-Oscillator Grid, Pin 2, .34 volts, 60 c.p.s.

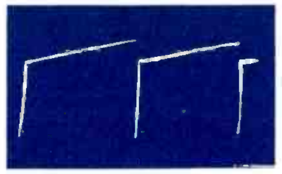


Fig. 14. Vertical-Output Grid, Pin 6, 80 volts, 60 c.p.s.

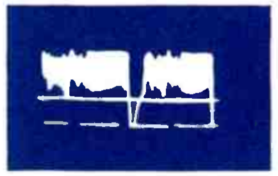


Fig. 9. Video Detector Output, Pin 2 of TS1, 3.5 volts, 15,750 c.p.s.

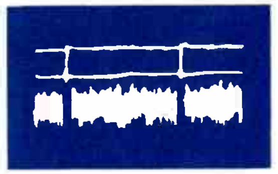


Fig. 10. Video Amplifier Plate, Pin 7, 83 volts, 60 c.p.s.

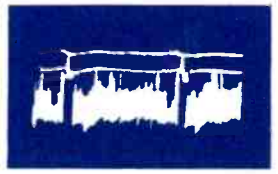


Fig. 11. Sync Separator Grid, Pin 7, 38 volts, 60 c.p.s.

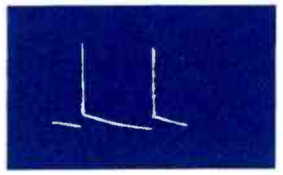


Fig. 15. Vertical Output Plate, Pin 9, 1100 volts, 60 c.p.s.

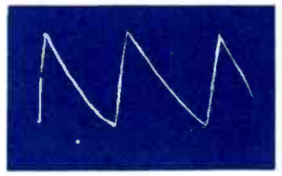


Fig. 16. Phase Comparer, Pin 2, 11 volts, 15,750 c.p.s.

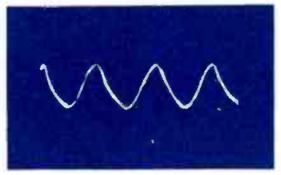


Fig. 17. Horizontal Oscillator, 43 volts, 15,750 c.p.s. test point.

Fig. 18. Horizontal-Oscillator Cathode, Pins 3 and 8, 18 volts, 15,750 c.p.s.

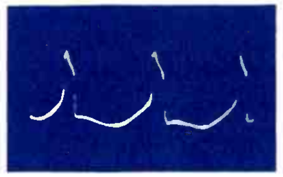


Fig. 19. Horizontal-Oscillator Grid, Pin 2, 65 volts, 15,750 c.p.s.

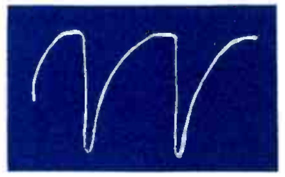
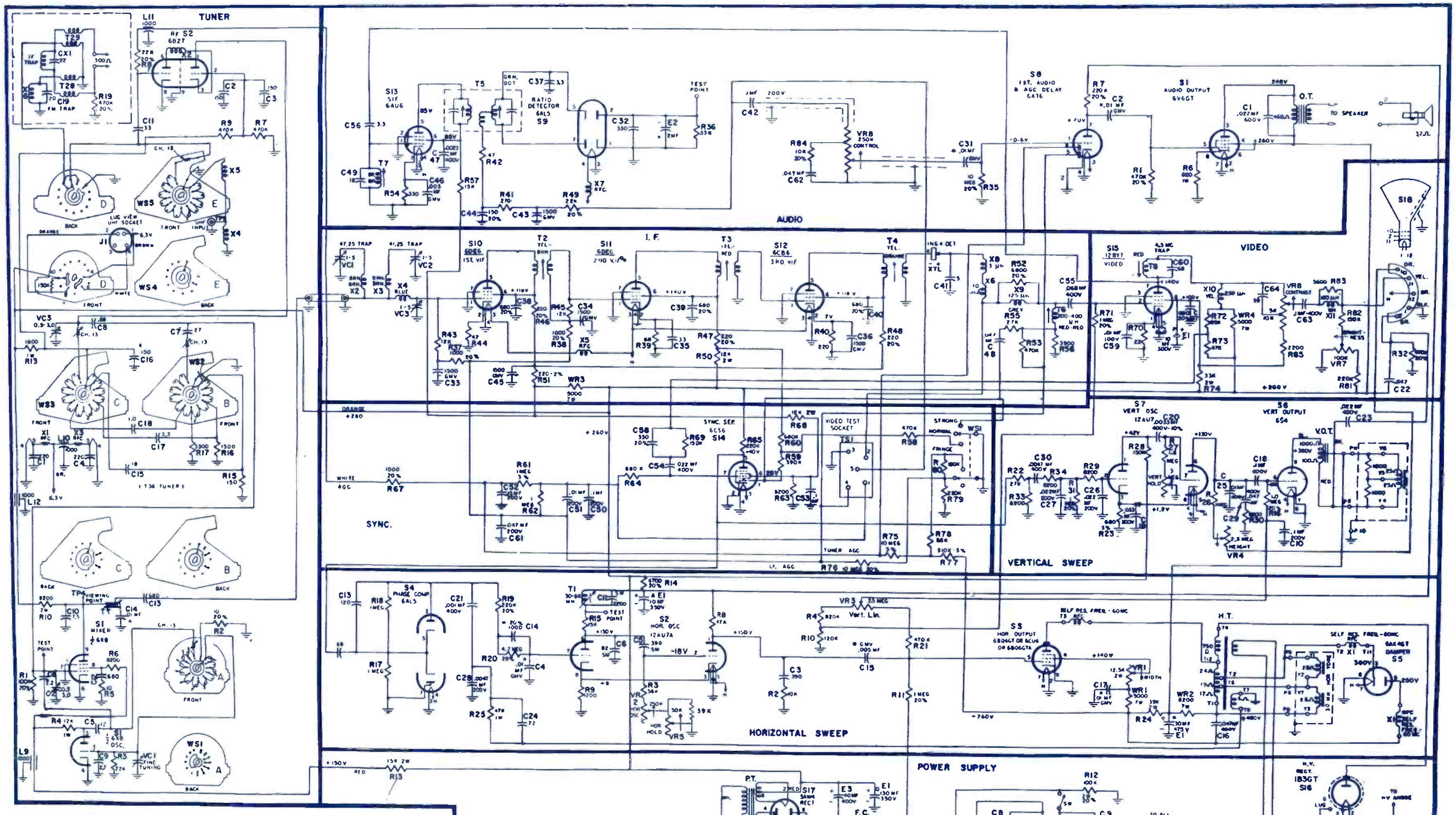


Fig. 20. Horizontal-Output Grid, Pin 5, 160 volts, 15,750 c.p.s.



Voltage readings taken with a Philco Model No. 7001: VTVM. All capacity values in micro-microfarads unless otherwise noted. Direction of arrow though control arms indicates clockwise rotation. * All capacitors so marked are of ceramic disc type. Capacitors marked GMV have tolerance —0% +100%. Letters on tuner switch wafers read from front back of tuner. All resistors are ½ watt 10% unless otherwise noted. Resistance values noted for coil and transformer windings are D.C. readings. Mica and ceramic capacitors are ±10% unless otherwise noted. For sets with UHF see PR-2811, File C8 for UHF schematic.

Fig. 25. Schematic Diagram — TV-350 Chassis.

VIDEO PEAKING-COIL ADJUSTMENT

The peaking coil, T6, is adjusted at the factory for proper transient response of the video circuits. Ordinarily, this coil will require no further adjustment by the serviceman. On any station where excessive overshoot or excessive smear is present, a slight adjustment of T6 may improve the picture quality on that station; however, this adjustment may sacrifice the quality on other channels. If T6 is replaced in servicing, adjustment will be required.

Before adjusting T6, check the tuner alignment and I-F alignment. (Never adjust T6 until the alignment of a receiver is correct.) Then tune in a station and adjust T6 until there are no trailing whites or smear in the picture. Turning T6 clockwise reduces trailing whites and overshoot; turning T6 counter-clockwise reduces picture smear and increases trailing whites. The proper position is the point where no smear or trailing whites appear in the picture.

The above procedure for adjustment of T6 applies to a particular station exhibiting smear or overshoot. After T6 is adjusted, reception on all the other stations should be checked, to make certain that the adjustment has not impaired the picture quality.

TELEVISION ALIGNMENT

General

The alignment procedure follows the general pattern of first checking the tuner response with an FM sweep generator and oscilloscope, comparing the response curve with that given in the manual, and aligning the tuner if necessary. After it is established that the tuner is in correct alignment, the video I-F channel is aligned by tuning each coil to its assigned pole frequency, using an AM signal, and then feeding in a sweep signal at the antenna terminals and retouching the I-F adjustments to obtain the desired pass band. Finally, the sound channel is aligned, using an AM signal, by tuning the sound take-off coil and the I-F and ratio-detector transformers.

The over-all response curve (r-f, i-f) of the circuits from the antenna terminals to the video detector, after the I-F stages have been aligned, should appear essentially the same, regardless of the channel under test. If not, the tuner should be aligned.

The video-carrier intermediate frequency is 45.75 mc., and the sound intermediate (intercarrier) frequency is 4.5 mc. Alignment of these circuits requires careful workmanship and good equipment. The following precautions must be observed:

(Continued on reverse side)

Chassis 350: Models 22C4016, 22C4016L, 22C4124, 22C4124L, 22C4126, 22C4312, 22C4412

PHILCO
Chassis 350

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TELEVISION ALIGNMENT

(Continued from reverse side)

1. There must be a good bond between the receiver chassis and the test equipment. This is most easily obtained by having the top of the workbench metallic. The receiver chassis should be placed tuner-side down on the bench. If the bench has no metallic top, the test equipment and chassis can be bonded by a strip of copper about 2 inches wide. The section of the chassis nearest the tuner should rest on the strip.

2. Do not disconnect the picture tube yoke, or speaker while the receiver is turned on.

3. Allow the receiver and test equipment to warm up for 15 minutes before starting the alignment.

4. The marker (AM) signal generator should be calibrated accurately to the frequencies used and to the sound and video r-f carriers of each channel used during alignment. If Philco Alignment Generator Model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. An alternate method for calibrating the signal generator to the sound and video i-f carrier frequencies is to zero-beat the signal generator with the received signals.

JIGS AND ADAPTERS REQUIRED

Mixer Jig

Connections to the grid of the mixer tube may be made through the test point provided for this purpose. To connect the generator to this point, a mixer-grid jig, Philco Part No. 45-1739, and a connecting cable, Philco Part No. 45-1635, may be used. As an alternate, a Philco alligator-clip adaptor, Part No. 45-1636, with as short a ground lead as possible, may be ued to connect the alignment jack. The ground lead should be connected as close as possible to the mixer tube. It is essential that the signal-generator output lead be terminated with a 68-ohm resistor (carbon), so that regeneration, caused by connection of the lead to the mixer, is held to a minimum.

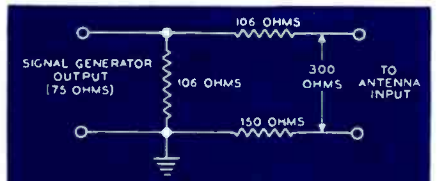
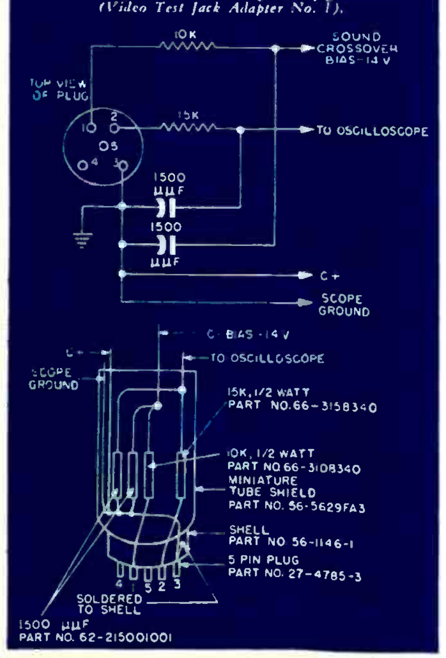


Fig. 1. Antenna-Input matching network.

Antenna-Input Matching Network

An impedance-matching network for coupling the signal generator to the antenna input terminals of the receiver is shown in figure 1. This network, which is designed to have an input impedance of 75 ohms and an output impedance of 300 ohms is used to match a 75-ohm generator to a 300-ohm antenna-input circuit. The resistors used in this network should be of carbon-composition construction, and should be chosen from a group, to obtain values within ten percent of those indicated. The resistors should be placed in a shield can, to prevent variable effects. An antenna-matching jig, Philco Part No. 45-1736, which consists of a matching transformer and connecting box, may be used in place of the resistor network.

Fig. 2. Video I-F Alignment Jig (Video Test Jack Adapter No. 1).



Video I-F Alignment Jig

(Video Test Jack Adapter No. 1)

The alignment jig used at TS1 and shown in figure 2, should be used during the i-f alignment, to apply the proper bias to the a-g-c bus, and to provide a convenient oscilloscope connection. This adapter consists of a five-pin plug, two 10,000 ohm resistors, and a 1500 mmf condenser for isolation of the bias supply. To isolate the oscilloscope from the receiver circuits, a 15,000-ohm resistor, by-passed by a 1500 mmf. condenser, is used. A suggested method of fabricating the jig is also shown in figure 2. This jig should not be used to observe the composite video from the video detector output.

(Video Test Jack Adapter No. 2)

To observe the composite video, at TS1, a jig may be made with a five-pin plug and a 2200 ohm resistor. (See figure 3.) The 2200 ohm resistor should be connected to pin 2 of the plug. A ground lead should be connected to pin 3. To observe the composite video, connect the oscilloscope to the 2200 ohm resistor and the ground lead. This jig is also used for injection of the 4.5 mc. signal during s-i-f alignment.

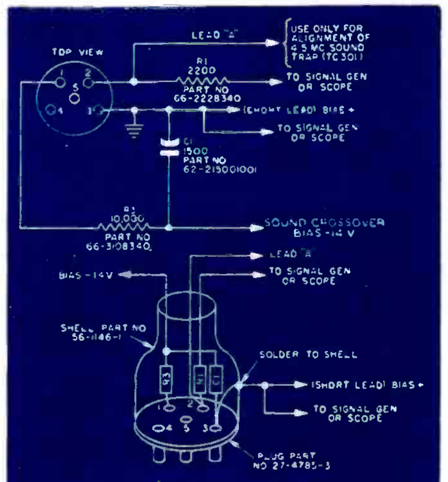


Fig. 3. Sound I-F Input Alignment Jig (Video Test Jack Adapter No. 2).

TUNER BAND PASS ALIGNMENT

(See Table No. 2)

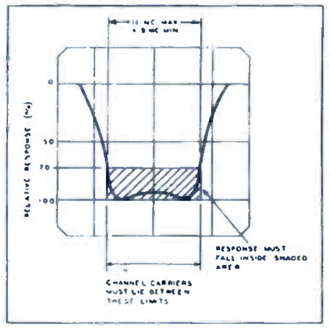


Fig. 4. Television tuner response curve, showing bandpass limits.

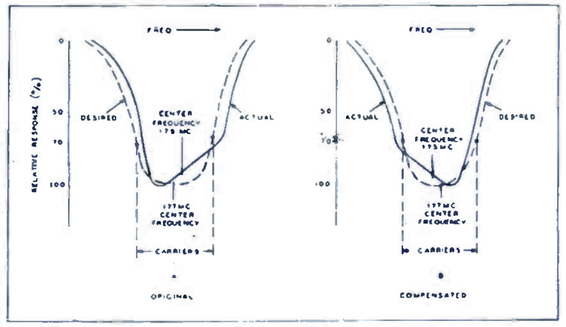


Fig. 5. Television tuner response curve, showing tracking compensation.

TUNER OSCILLATOR ALIGNMENT

TABLE NO. 1

STEP	AM GENERATOR DIAL SETTING	RECEIVER TUNING	ADJUST	REMARKS
1	257 mc.	channel 13	VC4 for zero beat on scope.	a. If regeneration occurs, inject bias; bias may be increased up to 3 volts, if necessary at pin 1 video test jack — TS1. b. Preset fine tuning adjustment so that it is in the middle of its range.
2	251 mc.	channel 12	VC5 for zero beat on scope.	
3	245 mc.	channel 11	VC6 for zero beat on scope.	
4	239 mc.	channel 10	VC7 for zero beat on scope.	
5	233 mc.	channel 9	VC8 for zero beat on scope.	
6	227 mc.	channel 8	VC9 for zero beat on scope.	
7	221 mc.	channel 7	VC10 for zero beat on scope.	
8	64.5 mc.	channel 6	VC11 for zero beat on scope.	2nd harmonic gives 129 mc.
9	113 mc.	channel 4	VC12 for zero beat on scope.	
10	101 mc.	channel 2	VC13 for zero beat on scope.	

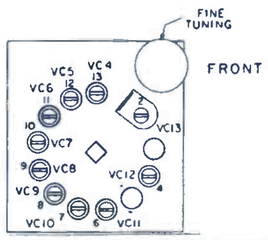
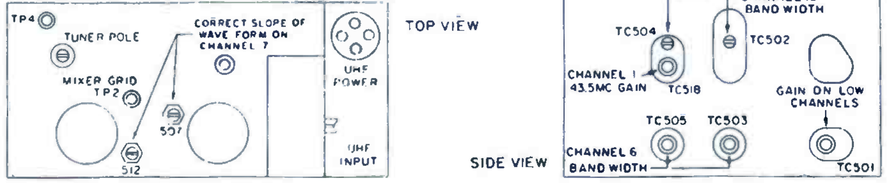


Fig. 6. Tuner Layout.

AM GENERATOR: Connect to receiver antenna-input terminals. (No matching network is required.) Use unmodulated r-f output.

OSCILLOSCOPE: Connect the vertical-input lead, in series with a 1000-ohm resistor, to the mixer grid test point. Connect the scope ground lead to the chassis, near the test point.

RECEIVER CIRCUIT ALTERATIONS: Disconnect tuner a-g-c (white) lead from main chassis, and connect a 1.5 volt bias battery, with negative terminal to white lead from tuner, and positive terminal to chassis.



TUNER BANDPASS ALIGNMENT

SWEEP (FM) GENERATOR: Connect to antenna-input circuit through antenna-input matching network (See figure 1).

OSCILLOSCOPE: Connect the vertical-input lead, in series with a 1000-ohm resistor, to the mixer plate test point, TP4.

Connect scope ground lead to the chassis, near TP4.

RECEIVER CIRCUIT ALTERATIONS: Disconnect tuner a-g-c (white) lead from main chassis, and connect a 1.5 volt bias battery, with negative terminal to white lead from tuner, and positive terminal to chassis. Disconnect tuner link from terminal board, B-9, and connect a 40 to 70-ohm carbon resistor across the link.

VIDEO I-F ALIGNMENT

AM GENERATOR: Connect to mixer test point, TP2, through a mixer jig, and adjust the generator for approximately 30 percent modulation at 400 cycles. Adjust the output of the generator during alignment, to keep the output at the second detector below 4 volt, peak to peak.

SWEEP (FM) GENERATOR: After step 7, connect to antenna-input circuit through antenna input matching network. (See figure 1.)

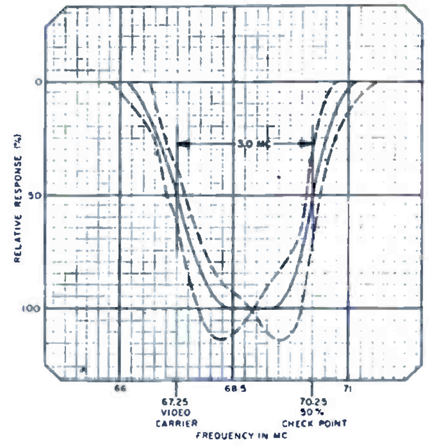
OSCILLOSCOPE: Connect the vertical-input lead to the 15K resistor of the video i-f alignment jig. Connect scope ground lead to the ground lead of the jig. Plug jig into TS1.

PRESET: Contrast and Brightness controls fully counterclockwise, and channel selector to channel 4. Adjust AGC switch to normal position.

BIAS: Apply —14 volts of negative bias to pin 1 of video i-f alignment jig; ground positive side of bias supply to pin 3 of jig. (See figure 2.)

NOTE: If the i-f shield has been removed for repairs, it must be replaced before proceeding with the alignment.

Fig. 7. Over-all R-F, I-F response curve, showing tolerance limits.



SOUND IF ALIGNMENT

AM GENERATOR: Connect "hot" lead through a 2200 ohm resistor to pin 2 of TS1, using the video i-f alignment jig. Connect ground lead of generator to ground lead of jig.

VOLTMETER: Use v.t.v.m. or 20,000 ohms-per-volt voltmeter. Connect to sound test point.

OSCILLOSCOPE: Connect through crystal probe to cathode (pin 11) of picture tube.

STEP	AM GENERATOR DIAL SETTING	ADJUST	REMARKS
1	4.5 mc.	T7 for maximum indication on voltmeter.	Remove 1st video i-f tube, and adjust the volume control for moderate speaker output.
2	4.5 mc.	T5 primary (bottom of T5) for maximum indication on voltmeter.	
3	4.5 mc.	T5 secondary (top of T5) for maximum indication on voltmeter and minimum speaker output.	The point of maximum meter indication for TC5 should also be the point of minimum speaker output.
4	4.5 mc.	T8 for minimum indication as view on the oscilloscope.	
5	use station signal	T5 primary (bottom of T5) for minimum AM (noise or buzz), using speaker output for indication.	Replace 1st video i-f tube, and tune in a station, setting fine tuning control to obtain a crisp picture, with a small amount of beat.

Fig. 24. Dial cord stringing arrangement

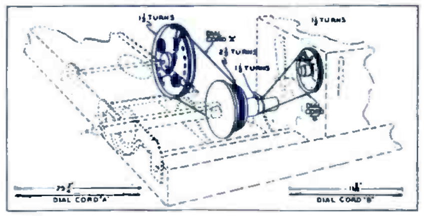


TABLE NO. 2

STEP	SWEEP (FM) GENERATOR: SWEEP DIAL SETTING	SWEEP (FM) GENERATOR: MARKER DIAL SETTING	RECEIVER TUNING	ADJUST	REMARKS
1	channel 13 (213 mc. with 10-mc. sweep width.)	Set first to 210 mc. and note position of marker on response curve. Then set to 216 mc. and note position of marker on response curve.	channel 13		Use oscilloscope gain as high as possible with respect to hum level and "bounce". Pips fix channel limits on curve. Response curve should be flat between limits (see fig. 5). If not, proceed with step 2.
2	channel 13	213 mc.	channel 13	TC502 counterclockwise until single peak appears.	CAUTION: Care must be taken not to unscrew core far enough to make it drop out of the coil.
3	channel 13	213 mc.	channel 13	TC504 until peak falls on 213 mc. marker.	It may be necessary to increase sweep-generator output.
4	channel 6 (85 mc. with 10-mc. sweep width.)	Set first to 82 mc. and note position of marker on response curve. Then set to 88 mc. and note position of marker on response curve.	channel 6		Curve should be symmetrical and centered in pass band. If not, proceed with step 5.
5	channel 6	85 mc.	channel 6	TC503 counterclockwise until single peak appears.	CAUTION: Care must be taken not to unscrew core far enough to make it drop out of the coil.
6	channel 6	85 mc.	channel 6	TC505 until peak falls on 85 mc. marker.	It may be necessary to increase sweep-generator output.
7	channel 6	85 mc.	channel 6	TC503 for maximum curve height and symmetry of single peak.	After adjusting TC503, recheck as in step 4. If necessary, reduce sweep-generator output to avoid overloading.
8	channel 6	85 mc.	channel 6	Retouch TC503 and TC505 for symmetrical response, centered about 85 mc. marker.	To retouch, only turn cores slightly.
9	channel 1 (UHF)	44 mc.	channel 1 (UHF)	Retouch TC503 and TC505 for symmetrical response centered about 44 mc.	After this adjustment recheck channel 6 and be sure it is within limits.

NOTE: On channel 7, observe the tilt and center frequency of the response curve. The curve should be centered on the pass band and should be symmetrical. If it is not symmetrical, and appears unbalanced, as in figure 6, adjust C507 and C512 (figure 5) to obtain a response curve which is in the mirror image (tilt in the opposite direction) of the original: for example, if channel 7 response curve appears as in figure 6A, adjust C507 and C512 until the curve appears as in figure 7B. This adjustment over-compensates to make allowance for the effect of channel 13 adjustments upon channel 7 response.

TABLE NO. 3

STEP	AM GENERATOR DIAL SETTING	SWEEP (FM) GENERATOR: SWEEP DIAL SETTING	SWEEP (FM) GENERATOR: MARKER DIAL SETTING	ADJUST	REMARKS
1	47.25	not used	not used	VC1 for minimum indication on scope.	It is necessary to keep the generator output sufficiently high that a null indication may be observed on the oscilloscope; however, avoid overloading of the receiver by excessive signal.
2	41.25	not used	not used	VC2 for minimum indication on scope.	
3	45.4	not used	not used	TT for maximum indication on scope.	Adjust the output of the AM generator, to keep the output at the second detector below 4 volt, peak to peak. (For convenience, the oscilloscope may be calibrated for this purpose beforehand.)
4	45.4	not used	not used	T2 for maximum indication on scope.	
5	43.0	not used	not used	VC3 for maximum indication on scope.	
6	42.7	not used	not used	T3 for maximum indication on scope.	
7	44.4	not used	not used	T4 for maximum indication on scope.	
8	not used	channel 4 (69 mc., with 6-mc. sweep width)	Run marker along curve, checking against the curve limits given in fig. 7.	If necessary, retouch T1, T2, T3, & T4 as directed in REMARKS column. CAUTION: Do not touch settings of VC1 and VC2.	Set Fine Tuning Cam to reference point previously made in step 1 of Table 1. If response curve does not fall within limits shown in fig. 7, retouch T1 & T2 for proper level of curve at video carrier frequency; adjust T4 to level top of curve and T3 for proper slope of low-frequency side of curve. CAUTION: To retouch, only turn the adjustments slightly, particularly T2.

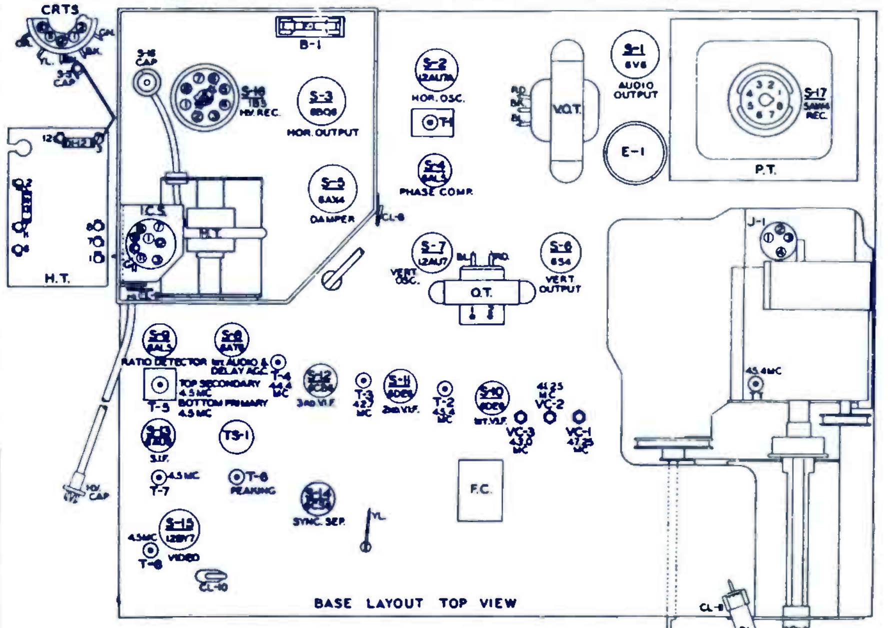


Fig. 27. Base layout, top view — TV-350.

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TECHNICIAN
CIRCUIT DIGESTS

OSCILLOSCOPE WAVEFORM PATTERN — TV-300

These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 6 volts at the video detector. The voltages given with the waveforms are approximate peak-to-peak values. The frequencies shown are those of the waveforms — not the sweep rate of the oscilloscope. The waveforms were taken with an oscilloscope having good high-frequency response. With oscilloscopes having poor high-frequency response, the sharp peaks of the horizontal waveforms will be more rounded than those shown, and the peak-to-peak voltages will differ from those shown.

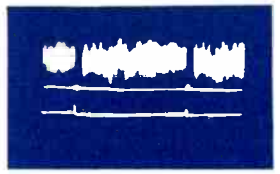


Fig. 8. Composite Signal, Pin 2 of 12BY7, 6 volts, 60 c.p.s.

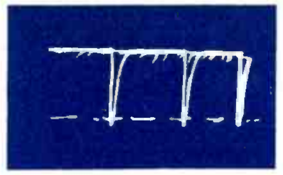


Fig. 12. Sync Separator Plate, Pin 1, 30 volts, 15,750 c.p.s.

Fig. 13. Vertical-Oscillator Grid, Pin 7, 140 volts, 60 c.p.s.

Fig. 14. Vertical-Output Grid, Pin 1, 72 volts, 60 c.p.s.

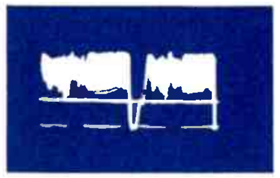


Fig. 9. Composite Signal, Pin 2 of 12BY7, 6 volts, 15,750 c.p.s.

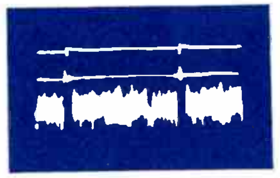


Fig. 10. Video Amplifier Plate, 83 volts, 60 c.p.s.

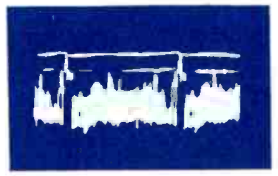


Fig. 11. Sync Separator Grid, Pin 2, 90 volts, 60 c.p.s.

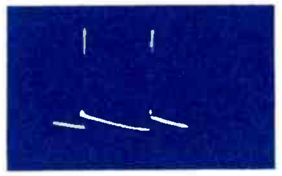


Fig. 15. Vertical-Output Plate, Pin 9, 900 volts, 60 c.p.s.

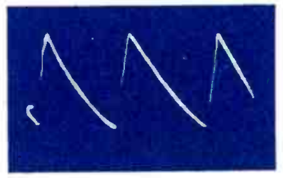


Fig. 16. Phase Comparer, Pin 6, 7 volts, 15,750 c.p.s.

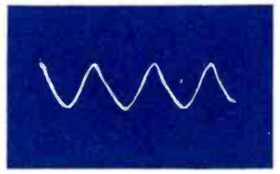


Fig. 17. Horizontal Oscillator, junction of L800 and R806, 43 volts, 15,750 c.p.s.

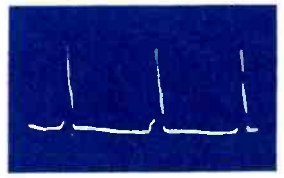


Fig. 18. Horizontal-Oscillator Cathode, Pins 3 and 8, 18 volts, 15,750 c.p.s.

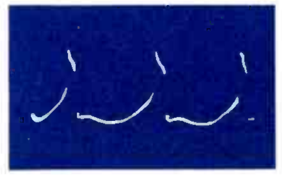
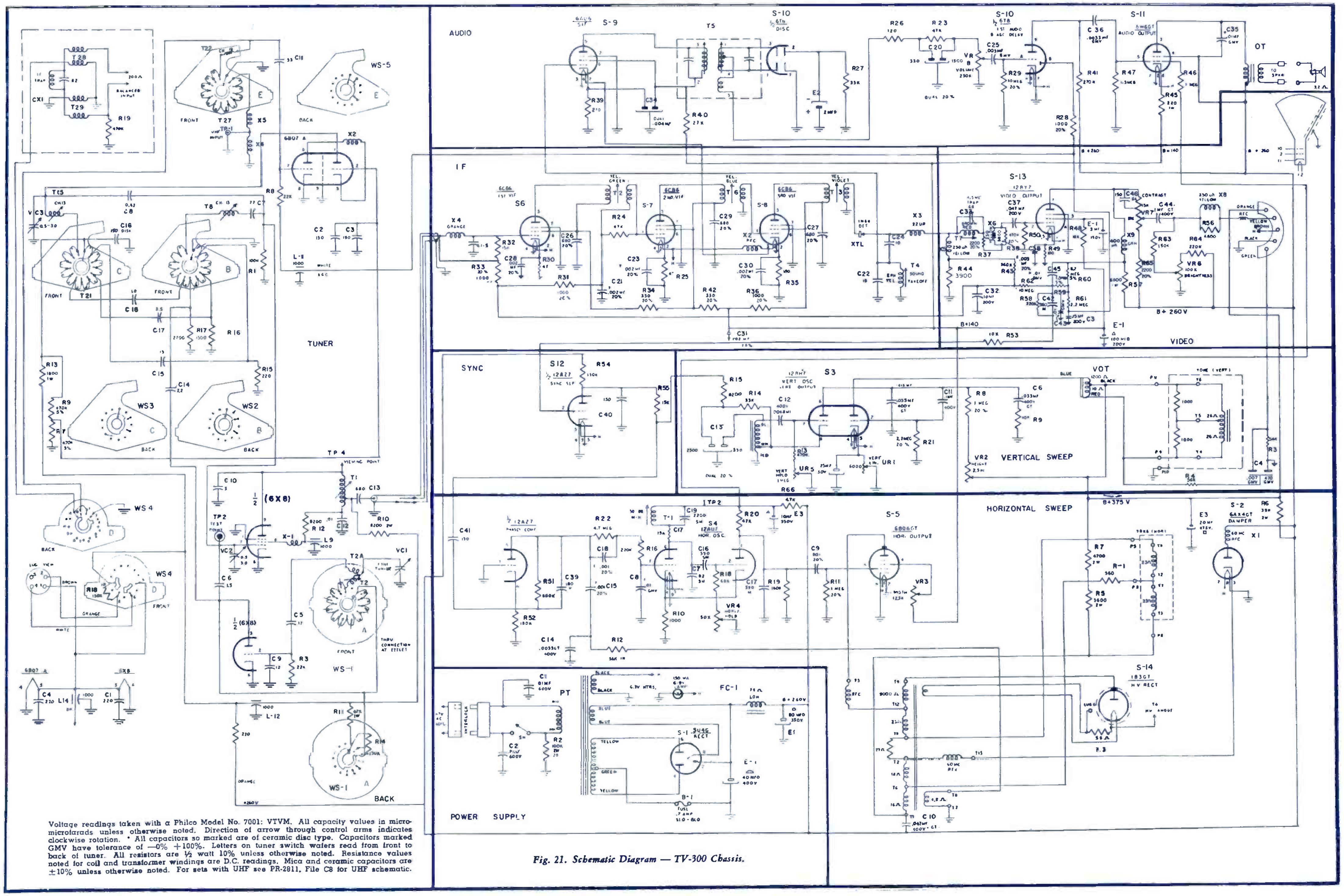


Fig. 19. Horizontal-Oscillator Grid, Pin 2, 40 volts, 15,750 c.p.s.

Fig. 20. Horizontal-Output Grid, Pin 5, 120 volts, 15,750 c.p.s.



Voltage readings taken with a Philco Model No. 7001: VTVM. All capacity values in micro-microfarads unless otherwise noted. Direction of arrow through control arms indicates clockwise rotation. • All capacitors so marked are of ceramic disc type. Capacitors marked GMV have tolerance of —0% +100%. Letters on tuner switch wafers read from front to back of tuner. All resistors are ½ watt 10% unless otherwise noted. Resistance values noted for coil and transformer windings are D.C. readings. Mica and ceramic capacitors are ±10% unless otherwise noted. For sets with UHF see PR-2811, File C8 for UHF schematic.

Fig. 21. Schematic Diagram — TV-300 Chassis.

THE TV-300 AND TV-301 DIFFERENCE

The TV-301 is similar to the TV-300, the difference being in the picture tube used and the shorting out of one resistor in the TV-300 to make the TV-301 chassis.

The TV-300 chassis uses a 21XP4A picture tube which is an electrostatic focus tube. When this tube is used the 27 ohm resistor in the high voltage transformer is necessary for proper electrical centering of the picture.

The TV-301 chassis uses a 21WP4A picture tube which is an electromagnetic focus picture tube. When this picture tube is used the 27 ohm resistor is shorted out and the chassis is called the 301.

This is the only difference between these two chassis.

General

The alignment procedure follows the general pattern of first checking the tuner response with an FM sweep generator and oscilloscope, comparing the response curve with that given in the manual, and aligning the tuner if necessary. After it is established that the tuner is in correct alignment, the video I-F channel is aligned by tuning each coil to its assigned pole frequency, using an AM signal, and then feeding in a sweep signal at the antenna terminals and retouching the I-F adjustments to obtain the desired pass band. Finally, the sound channel is aligned, using an AM signal, by tuning the sound take-off coil and the I-F and ratio-detector transformers.

The over-all response curve (r-f, i-f) of the circuits from the antenna terminals to the video detector, after the I-F stages have been aligned, should appear essentially the same, regardless of the channel under test. If not, the tuner should be aligned.

The video-carrier intermediate frequency is 45.75 mc., and the sound intermediate (intercarrier) frequency is 4.5 mc. Alignment of these circuits requires careful workmanship and good equipment. The following precautions must be observed:

1. There must be a good bond between the receiver chassis and the test equipment. This is most easily obtained by having the top of the workbench metallic. The receiver chassis should be placed tuner-side down on the bench. If the bench has no metallic top, the test equipment and chassis can be bonded by a strip of copper about 2 inches wide. The section of the chassis nearest the tuner should rest on the strip.

2. Do not disconnect the picture tube yoke, or speaker while the receiver is turned on.

3. Allow the receiver and test equipment to warm up for 15 minutes before starting the alignment.

4. The marker (AM) signal generator should be calibrated accurately to the frequencies used and to the sound and video r-f carriers of each channel used during alignment. If model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. An alternate method for calibrating the signal generator to the sound and video r-f carrier frequencies is to zero-beat the signal generator with the received signals.

(Continued on reverse side)

Chassis TV-300, TV-301: Models 22C4119, 4120, 4120L, 4123, 4310, 4310L, 4011, 4013, 4013L, 4013X, 4015, 4119X, 4124, 4124L, 4127, 4120X, 4123, 4124S, 4125H, 4125M, 4311H, 4311M

PHILCO
Chassis TV-300, TV-301

Technician
CIRCUIT DIGEST

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ALIGNMENT

(Continued from reverse side)

JIGS AND ADAPTERS REQUIRED

Mixer Jig

Connections to the grid of the mixer tube may be made through the alignment jack provided for this purpose. To connect the generator to this point, a mixer-grid jig, Philco Part No. 45-1739, and a connecting cable, Philco Part No. 45-1635, may be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible, may be used to connect the alignment jack. The ground lead should be connected as close as possible to the mixer tube. It is essential that the signal-generator output lead be terminated with a 68-ohm resistor (carbon), so that regeneration, caused by connection of the lead to the mixer, is held to a minimum.

Antenna-Input Matching Network

An impedance-matching network for coupling the signal generator to the antenna input terminals of the receiver is shown in figure 1. This network, which is designed to have an input impedance of 75 ohms and an output impedance of 300 ohms is used to match a 75-ohm generator to a 300-ohm antenna-input circuit. The resistors used in this network should be of carbon-composition construction, and should be chosen from a group, to obtain values within ten percent of those indicated. The resistors should be placed in a shield can, to prevent variable effects. An antenna-matching jig, Philco Part No. 45-1736, which consists of a matching transformer and connecting box, may be used in place of the resistor network.

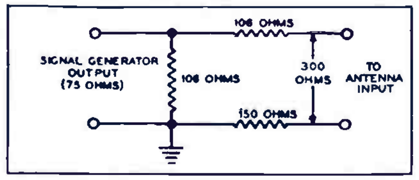


Fig. 1. Antenna-Input Matching Network.

TUNER OSCILLATOR ALIGNMENT
TABLE 1

AM GENERATOR: Connect to the receiver antenna-input terminals. (No matching network is required.) Use in modulated R-F output.

OSCILLOSCOPE: Connect the vertical-input lead, in series with a 1000-ohm resistor, to the mixer plate test point, TP-2. Connect the scope ground lead to the chassis, near TP-4.

RECEIVER CIRCUIT ALTERATIONS: Disconnect tuner AGC (white) lead from main chassis, and connect a 1.5-volt bias battery, with negative terminal to white lead from tuner, and positive terminal to chassis.

STEP	AM GENERATOR DIAL SETTING	RECEIVER TUNING	ADJUST	REMARKS
1	257 mc.	channel 13	TC-506 for zero beat on scope.	a. If regeneration occurs, increase bias; bias may be increased up to 4 or 5 volts, if necessary. b. Preset fine tuning control to center of its range.
2	251 mc.	channel 12	TC-507 for zero beat on scope.	
3	245 mc.	channel 11	TC-508 for zero beat on scope.	
4	239 mc.	channel 10	TC-509 for zero beat on scope.	
5	233 mc.	channel 9	TC-510 for zero beat on scope.	a. To adjust channel 8 use channel 9 tuning core, then recheck channel 9.
6	221 mc.	channel 7	TC-511 for zero beat on scope.	a. Repeat steps 1 thru 6 and readjust if necessary until channels are within 500 kc. of proper frequency.
7	129 mc.	channel 6	TC-512 for zero beat on scope.	
8	113 mc.	channel 4	TC-513 for zero beat on scope.	
9	101 mc.	channel 2	TC-514 for zero beat on scope.	

VIDEO I-F ALIGNMENT
TABLE 2

A.M. GENERATOR: Connect to mixer test point, TP-2, through a mixer jig, and adjust the generator for approximately 30% modulation at 400 cycles. Adjust the output of the generator during alignment to keep the output at the CRT cathode below 40 volts peak to peak.

SWEEP (FM) GENERATOR: After step 5 connect to antenna-input circuit through antenna-input matching network (see figure 7)

OSCILLOSCOPE: Connect vertical-input lead to pin No. 11 at the cathode ray tube.

PRESET: Contrast control full on. Channel selector to channel position No. 1.

BIAS: Apply 5.0 volts of negative bias into TP-1 (AGC system).

NOTE: I-F shield must be in place.

STEP	AM GENERATOR DIAL SETTING	SWEEP (FM) GENERATOR: SWEEP DIAL SETTING	SWEEP (FM) GENERATOR: MARKER DIAL SETTING	ADJUST	REMARKS
1	45.5 mc.			TT for maximum indication on scope.	The scope level must not be permitted to exceed 40 volts peak to peak or overloading will occur.
2	43.1 mc.			VC-1 for maximum indication on scope.	
3	42.7 mc.			T-2-IF for maximum indication on scope.	
4	45.0 mc.			T6-IF for maximum indication on scope.	
5	44.4 mc.			T3-IF for maximum indication on scope.	
6		Channel 4 (69 mc. with 6 mc. sweep width).	Run marker along curve checking against curve limits given in figure 6.	If necessary retouch TT, VC1, T2-IF, T6-IF, T3-IF.	Adjust carrier level with TT and T6 level curve with T-3. Position 42.5 mc. slope with VC-1 and T-2. CAUTION: Retouch only slightly.

TUNER BANDPASS ALIGNMENT — See Table 3

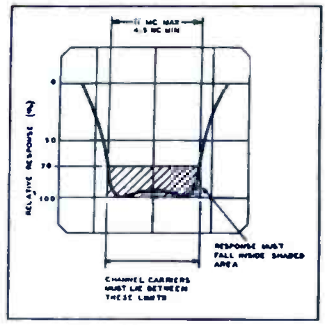


Fig. 2. Television tuner response curve, showing bandpass limits.

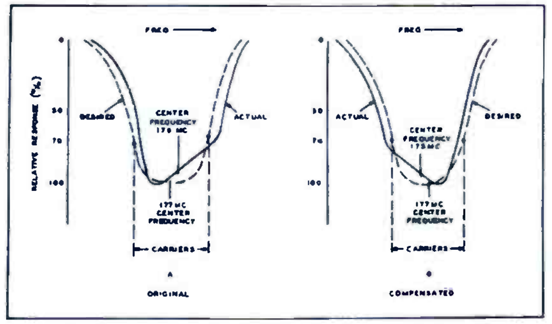


Fig. 3. Television tuner response curve, showing tracking compensation.

TUNER BANDPASS ALIGNMENT
TABLE 3

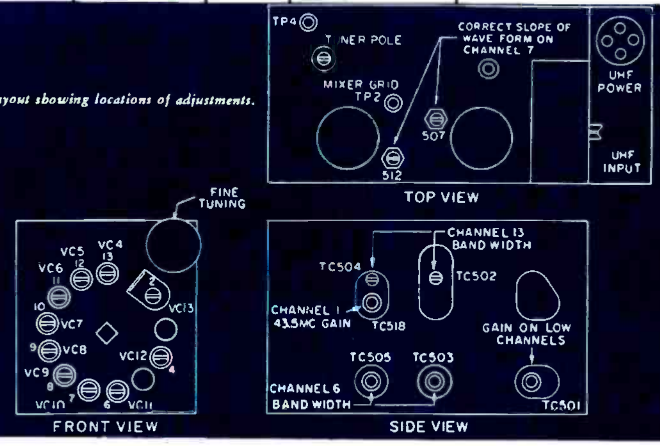
SWEEP (FM) GENERATOR: Connect to receiver antenna-input circuit through antenna-input matching network (see figure 1).

OSCILLOSCOPE: Same as in Chart 1.

RECEIVER CIRCUIT ALTERATIONS: Bias same as Chart 1. Disconnect the tuner coupling link leads and connect a 40- to 70-ohm carbon resistor across the open end of the lead from the tuner.

STEP	SWEEP (FM) GENERATOR: SWEEP DIAL SETTING	SWEEP (FM) GENERATOR: MARKER DIAL SETTING	RECEIVER TUNING	ADJUST	REMARKS
1	Channel 13 (213 mc., with 10-mc. sweep width.)	Set first to 210 mc. and not position of marker on response curve. Then set to 216 mc. and note position of marker on response curve.	Channel 13		Use oscilloscope gain as high as possible with respect to hum level and "bounce". Pips fix channel limits on curve. Response curve should be flat between limits (see figure 2). If not, proceed with step 2.
2	Channel 13	213 mc.	Channel 13	T-8 — WS2 counter-clockwise until single peak appears.	CAUTION: Care must be taken not to un screw core far enough to make it drop out of the coil.
3	Channel 13	213 mc.	Channel 13	T-15—WS3 until peak falls on 213-mc. marker.	It may be necessary to increase sweep-generator output.
4	Channel 7 (177 mc., with 10-mc. sweep width.)	Set first to 174 mc. and note position of marker on response curve. Set to 180 mc. and note position of marker on response curve.	Channel 7		Note curve with respect to tilt and center frequency. Curve should be centered in pass band and symmetrical. If not, proceed with step 5.
5	Channel 7	174 mc. & 180 mc.	Channel 7	VC-3 and VC-2 to obtain correct tilt on top of curve.	VC3 and VC2 compensate for the tuning effect of Channel 13 adjustment upon Channel 7. (See figure 3.)
6	Channel 13	213 mc.	Channel 13	Retouch T-15 of WS3 and T-8 — WS2 for symmetrical response, centered about 213-mc. marker.	To retouch, only turn cores slightly.
7	Channel 7	117 mc.	Channel 7	Repeat step 5.	Check response curve for correct center frequency and symmetry.
8				Repeat steps 6 and 7.	Repeat Channel 13 and Channel 7 adjustments, alternately, until favorable curves are obtained on both.
9	Channel 6 (85 mc., with 10-mc. sweep width.)	Set first to 82 mc. and note position of marker on response curve. Then set to 88 mc. and note position of marker on response curve.	Channel 6		Curve should be symmetrical and centered in pass band. If not, proceed with step 10.
10	Channel 6	85 mc.	Channel 6	T-14 of WS2 counter-clockwise until single peak appears.	CAUTION: Care must be taken not to unscrew core far enough to make it drop out of the coil.
11	Channel 6	85 mc.	Channel 6	T-21—WS3 until peak falls on 85-mc. marker.	It may be necessary to increase sweep-generator output.
12	Channel 6	85 mc.	Channel 6	T-27 — WS5 for maximum curve height and symmetry of single peak.	After adjusting TC501, recheck as in step 9. If necessary, reduce sweep-generator output to avoid overloading.
13	Channel 6	85 mc.	Channel 6	Retouch T-21 — WS3 and T-14 — WS2 for symmetrical response, centered about 85-mc. marker.	To retouch, only turn cores slightly.

Fig. 4. Tuner layout showing locations of adjustments.



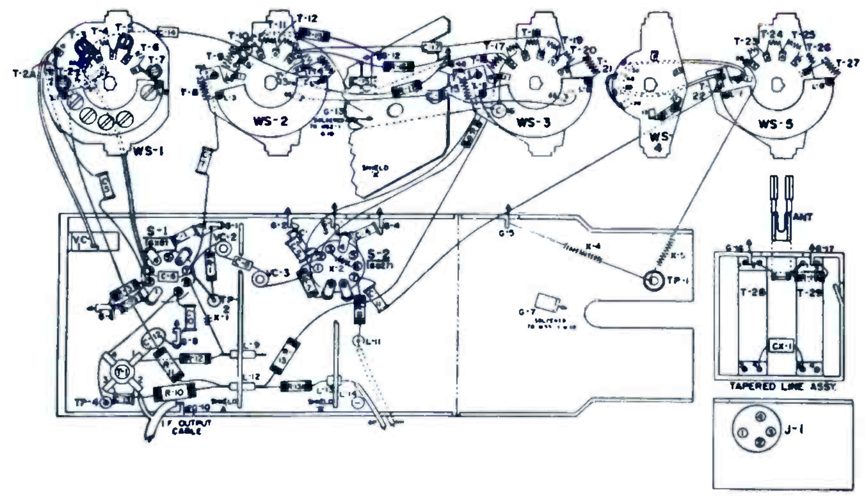


Fig. 5. Tuner Wiring Diagram.

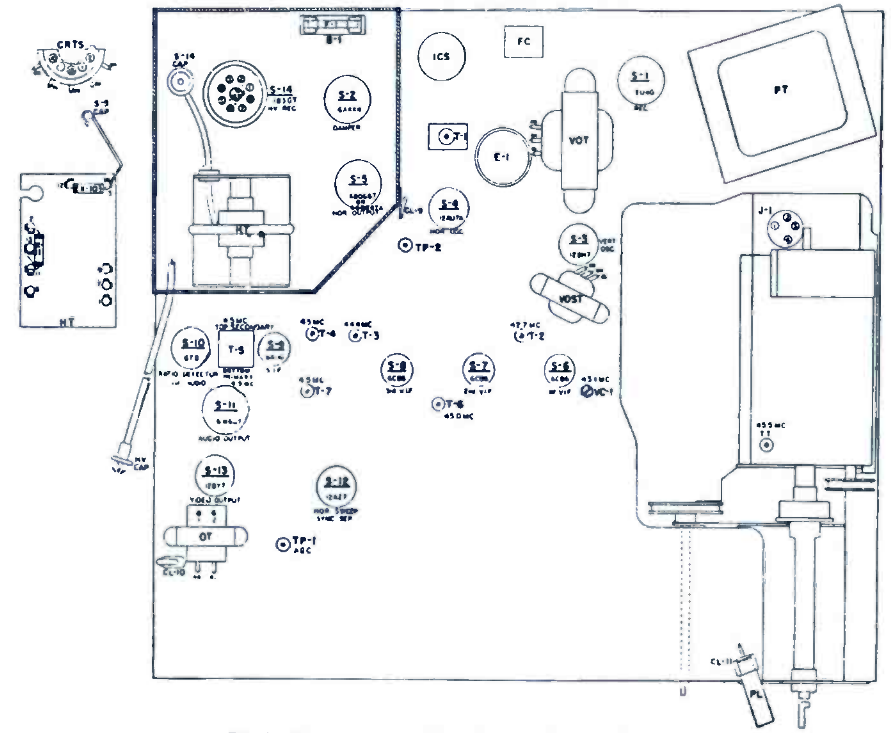
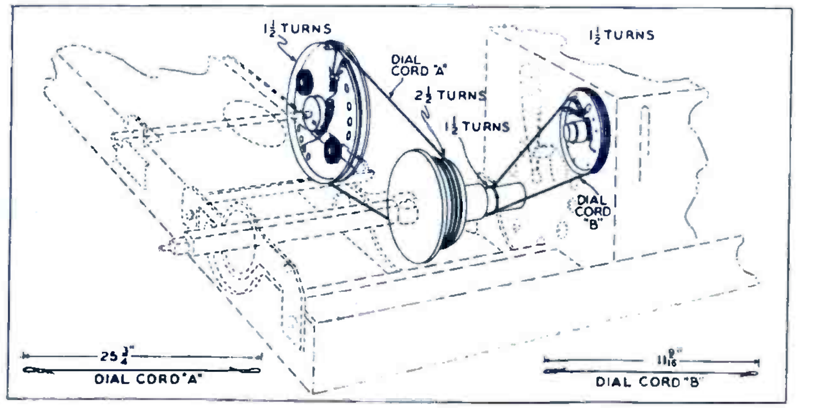


Fig. 7. Base Layout — Top View — TV-300 Chassis.

Fig. 23. Dial Cord Stringing Arrangement.



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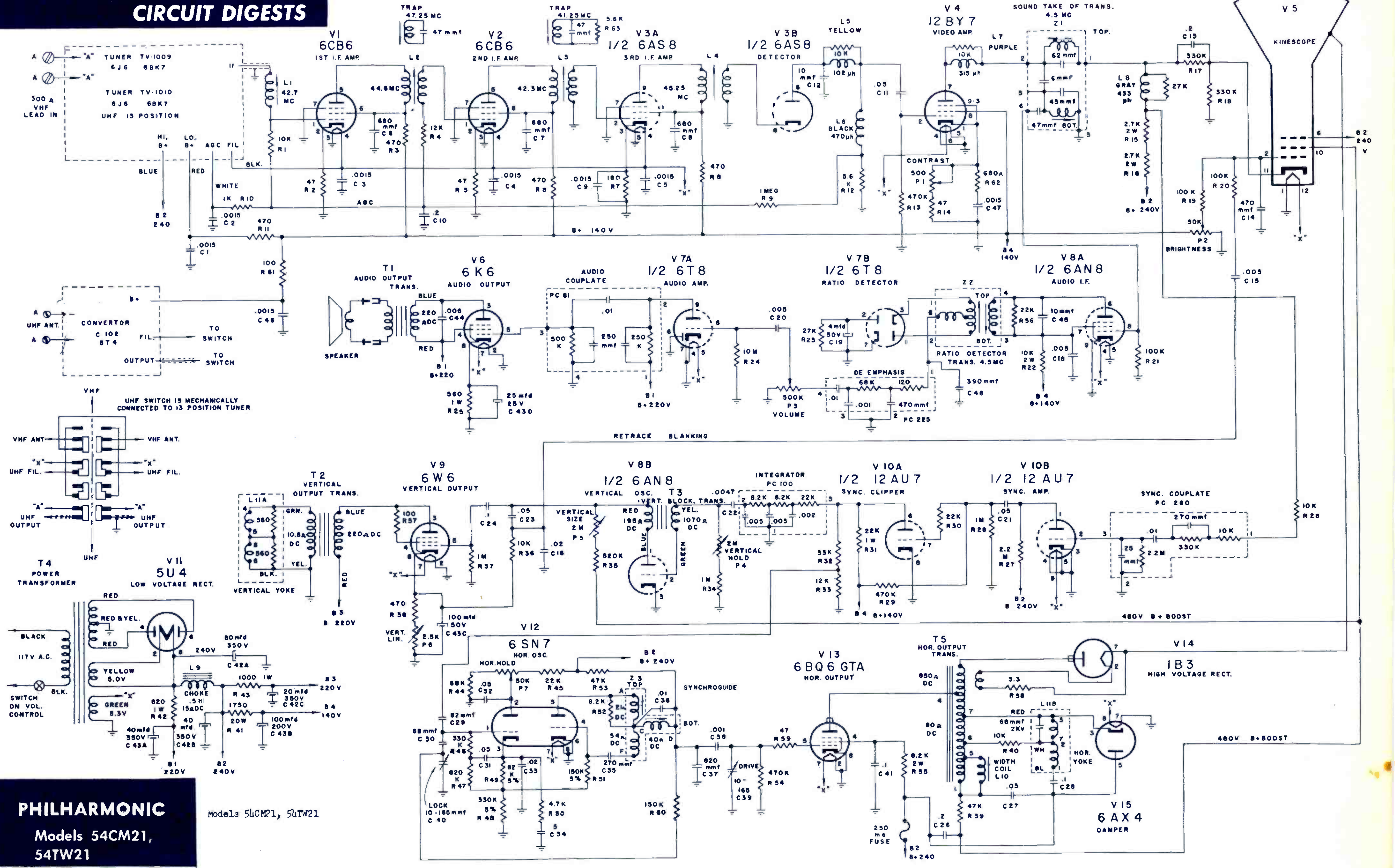
CIRCUIT DIGESTS



PHILHARMONIC
Models 54CM21,
54TW21

Models 54CM21, 54TW21

Technician
CIRCUIT DIGEST

TECHNICIAN CIRCUIT DIGEST

RAYTHEON
Aristocrat Series Chassis 21T40-41, 21T43-46

Chassis 21T40: Models M-210-B, M-210-M, C-214-B, C-214-M Chassis 21T41: Models UM-211-B, UM-211-M, UC-213-B, UC-213-M, UC-215-B, UC-215-M Chassis 21T43: Model C-218 Chassis 21T44: Model UC-219 Chassis 21T45: Models C-216-B, C-216-M Chassis 21T46: Models UC-217-B, UC-217-M

UHF TUNER ALIGNMENT

NOTE: IF Amplifiers and VHF Tuner must be correctly aligned before attempting UHF Tuner alignment. UHF Tuner must be in chassis and properly connected.

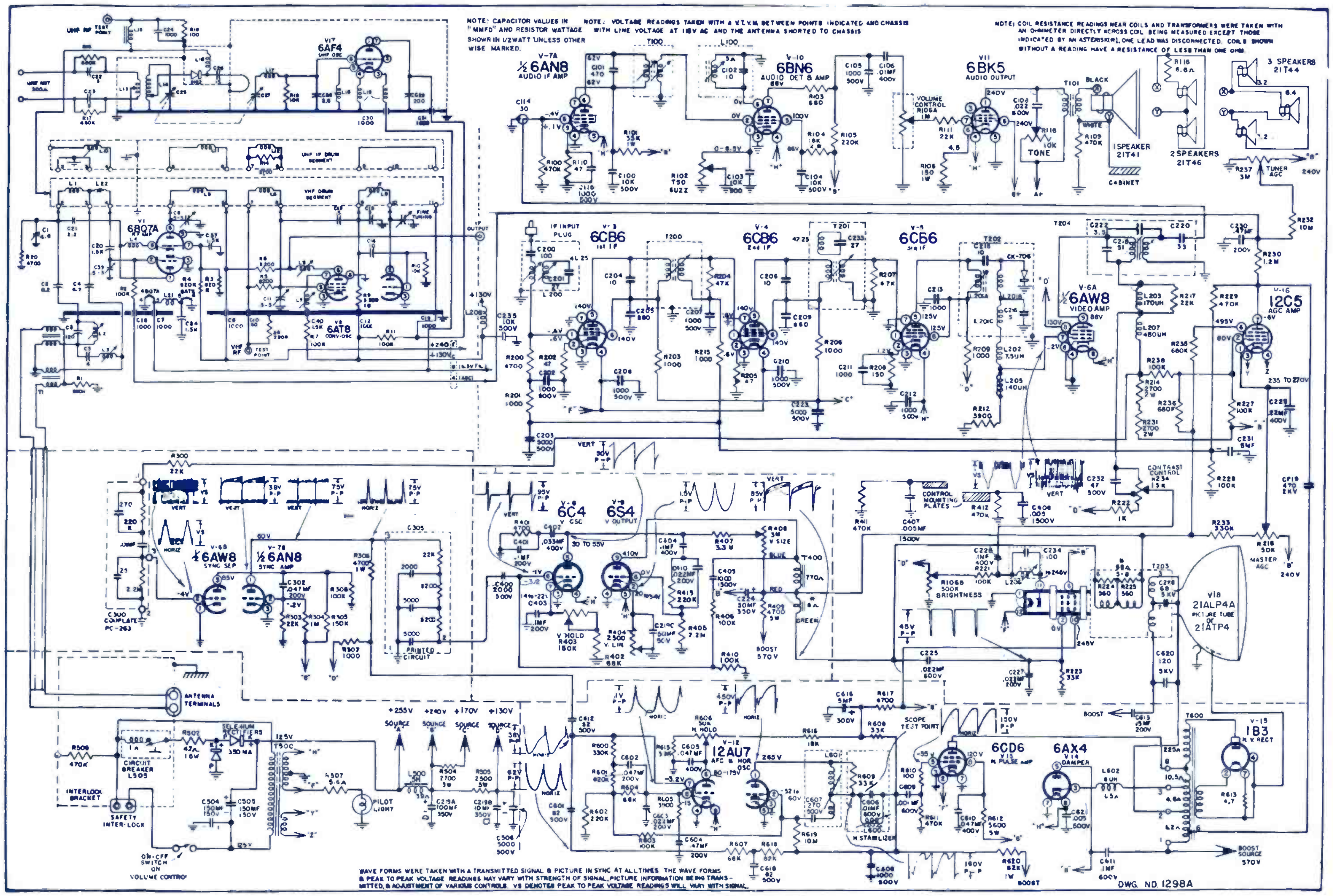
1	Turn UHF Station Selector to channel 35.						
2	——	600	UHF Antenna Terminals	Scope at junction of L205-R212	Keep generator output as low as possible to obtain required response—Adjust for maximum amplitude.	L10	
3	Turn UHF Station Selector to channel 14.						
4	——	470	UHF Antenna Terminals	Scope at junction of L205-R212	Response curve should appear as shown	Check Point	
5	Turn UHF Station Selector to channel 80.						
6	——	870	UHF Antenna Terminals	Scope at junction of L205-R212	Response curve should appear as shown	Check Point	
7	Degree of response curve tilt should be approximately equal for step 4 and 6. Adjust L10 for equal degree of tilt.						

VHF TUNER ALIGNMENT

NOTE: I F Amplifiers must be correctly aligned before attempting tuner alignment. Tuner must be in chassis and properly connected.
CONNECT -1.5 VOLTS BIAS TO TUNER A.G.C. SET FINE-TUNING CONTROL TO MID-RANGE.

V-Video
S-Sound

Step No.	Signal Generator Freq. (mc.)	Sweep Generator Freq. (mc.)	Signal Input Point	Output Point	Remarks	Adjust (VHF only tuner)	Adjust (VHF-UHF tuner)	Response
1	V-193.25 S-197.75	Channel 10	Antenna Terminals	Scope at VHF R. F. Test Point	Adjust for maximum response with markers as shown and less than 30% difference between valley and peaks	C-5 C-7 C-11	C-1 C-6 C-11	V S
2	V-67.25 S-71.75	Channel 4	Antenna Terminals	Scope at VHF R. F. Test Point	Adjust for maximum response with markers as shown and less than 30% difference between valley and peaks	C-5 C-7 C-11	C-1 C-6 C-11	V S
3	V-211.25 S-215.75	Channel 13	Antenna Terminals	Scope at VHF R. F. Test Point	Set Tuner to various channels. Response curve and markers should be as indicated. Response curve tilt of not more than 30% is permissible. (If not, repeat step 1).	Check Points Only	Check Points Only	V S
	V-205.25 S-209.75	Channel 12						
	V-199.25 S-203.75	Channel 11						
	V-187.25 S-191.75	Channel 9						
	V-181.25 S-185.75	Channel 8						
	V-175.25 S-179.75	Channel 7						
	V-83.25 S-87.75	Channel 6						
	V-77.25 S-81.75	Channel 5						
	V-61.25 S-65.75	Channel 3						
	V-55.25 S-59.75	Channel 2						
4	V-193.25	Channel 10	Antenna Terminals	Scope at junction of L205-R212	Adjust until marker is 50% down on low frequency slope.	Oscillator Slug	Oscillator Slug	50% V
5	REPEAT STEP 4 FOR EACH CHANNEL							
6	105	——	Antenna Terminals	VTVM at junction of L205-R212	Set Tuner to Channel 2	L-1 L-2	L-2 L-3	Minimum VTVM Reading



21T41 - 21T44 - 21T46 SCHEMATIC DIAGRAM

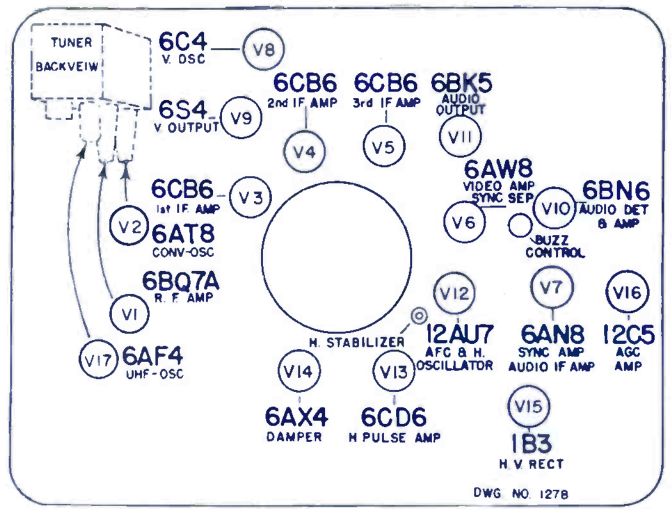
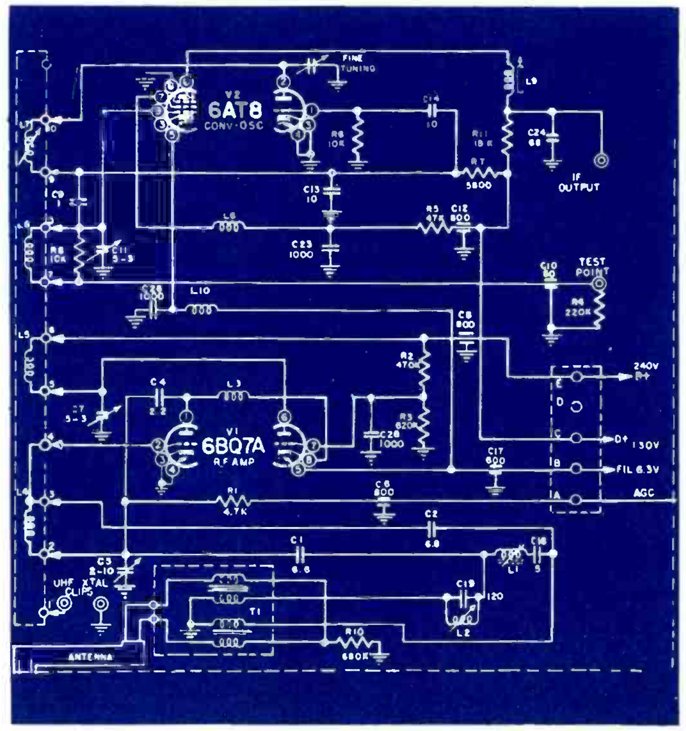


Figure 8. Tube Layout



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TECHNICIAN CIRCUIT DIGEST

RAYTHEON
Aristocrat Series
Chassis 21T42

Aristocrat Series Chassis 21T42; Models C-2128, C-212M, C-220

PRODUCTION CHANGES

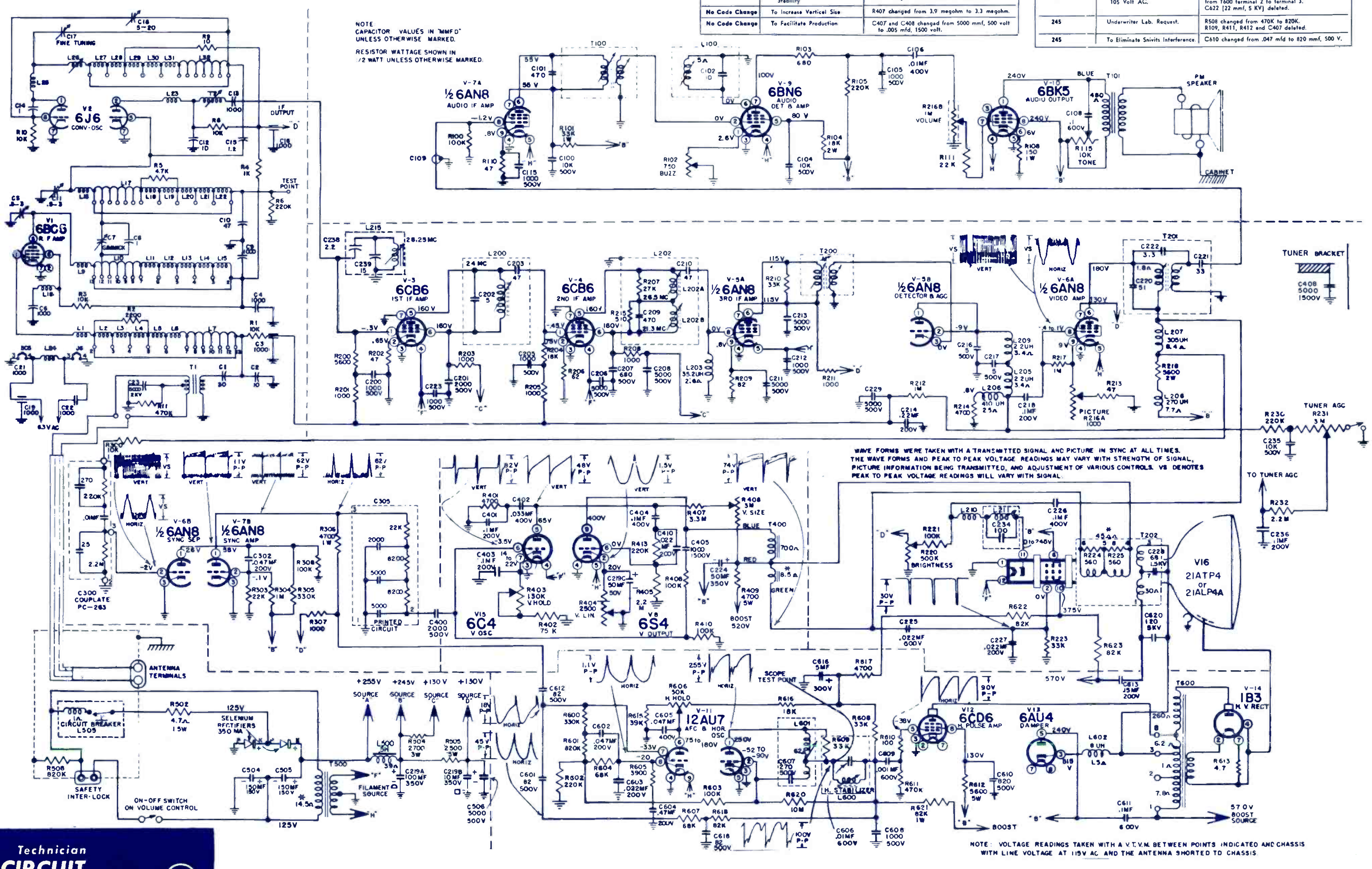
The coding system presently being used to determine production changes is in the form of three numbers following the basic chassis number stamped on the rear flange of the chassis. The three numbers represent the RTMA date code system and are stamped in reverse order. The code number changes only when a production change is incorporated and remains until the next production change. Chassis were coded 325 at start of production.

CIRCUIT CHANGES

CODE	REASON	CHANGE
No Code Change	To Improve Vertical Oscillator Stability	R410 changed from 47K ohm to 100K ohm.
No Code Change	To Increase Vertical Size	R407 changed from 3.9 megohm to 3.3 megohm.
No Code Change	To Facilitate Production	C407 and C408 changed from 5000 mmf, 500 volt to .005 mfd, 1500 volt.

CODE	REASON	CHANGE
No Code Change	To Increase Horizontal Size	C622 (22 mmf, 5000 volt) added in parallel with C620 across yoke winding.
No Code Change	To Improve Vertical Sync	R402 changed from 68K ohm to 75K ohm.
725	To Improve Picture Focus	C.R.T. pin 6 rewired from boost to 245 volt B plus.
335	To Prolong C.R.T. Life	C.R.T. pin 10 rewired from 245 volt B plus to junction of R622 and R623. R622 and R623 (82K ohm) added.
No Code Change	To Improve Horizontal Linearity.	Two anti-pin cushion magnets added (part no. 201-26614).
935	To Reduce Audio Hum.	T101 primary rewired from B+ source A to source B.
045	To Eliminate Audio Buzz.	R100 changed from 470K to 100K. C103 (10K, 500 volt) deleted.
245	To Increase Horizontal Size at 105 Volt AC.	V-13 changed from 6AX4 to 6AU4. Yoke rewired from T600 terminal 2 to terminal 3. C622 (22 mmf, 5 KV) deleted.
245	Underwriter Lab. Request.	R508 changed from 470K to 820K. R109, R411, R412 and C407 deleted.
245	To Eliminate Snivits Interference.	C610 changed from .047 mfd to 820 mmf, 500 V.

NOTE: COIL RESISTANCE READINGS NEAR COILS AND TRANSFORMERS WERE TAKEN WITH AN OHMMETER DIRECTLY ACROSS COIL BEING MEASURED EXCEPT THOSE INDICATED BY AN ASTERISK(*), ONE LEAD WAS DISCONNECTED. COILS SHOWN WITHOUT A READING HAVE A RESISTANCE OF LESS THAN ONE OHM.



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The schematic is shown in the latest condition at the time of printing.
All resistance values in ohms. K = 1000.

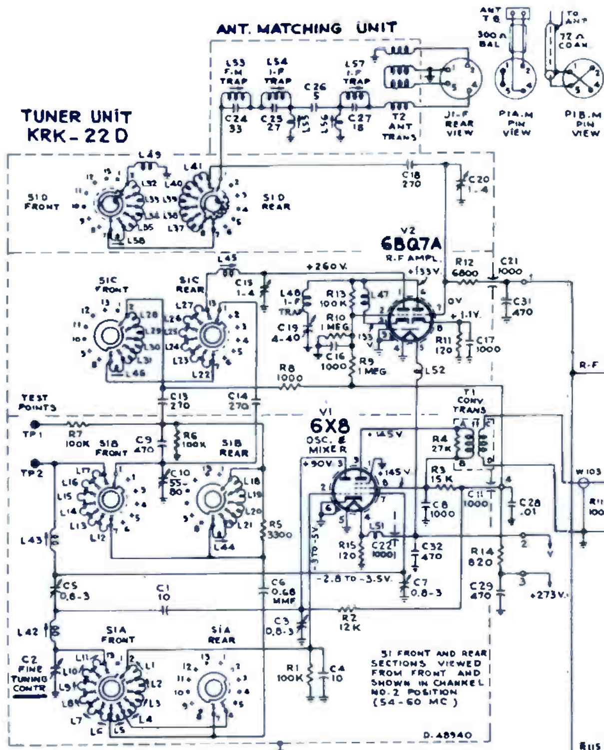
All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

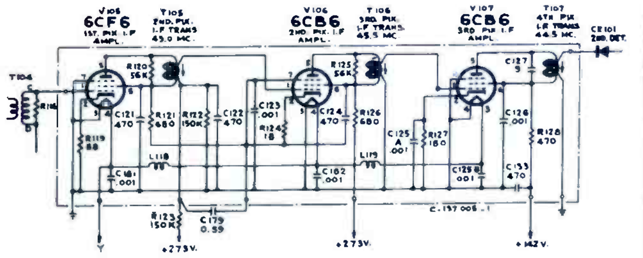
Direction of arrows at controls indicates clockwise rotation.

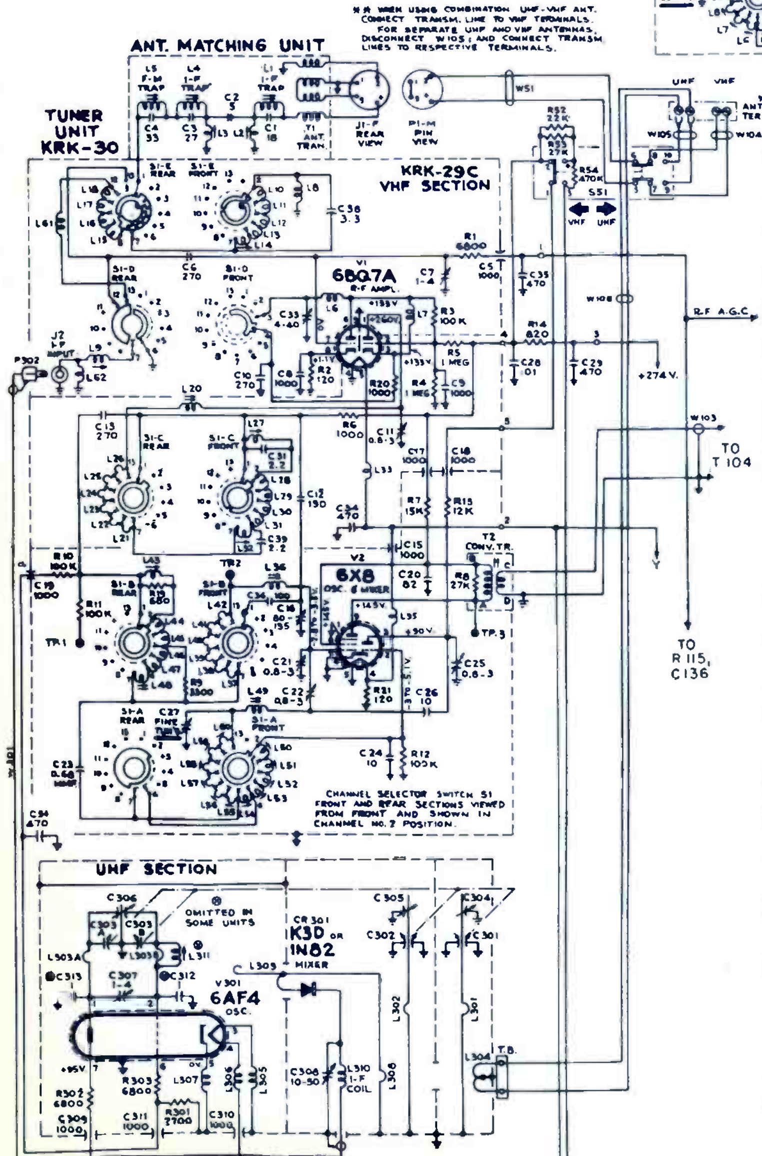
All voltages measured with "VoltOhmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

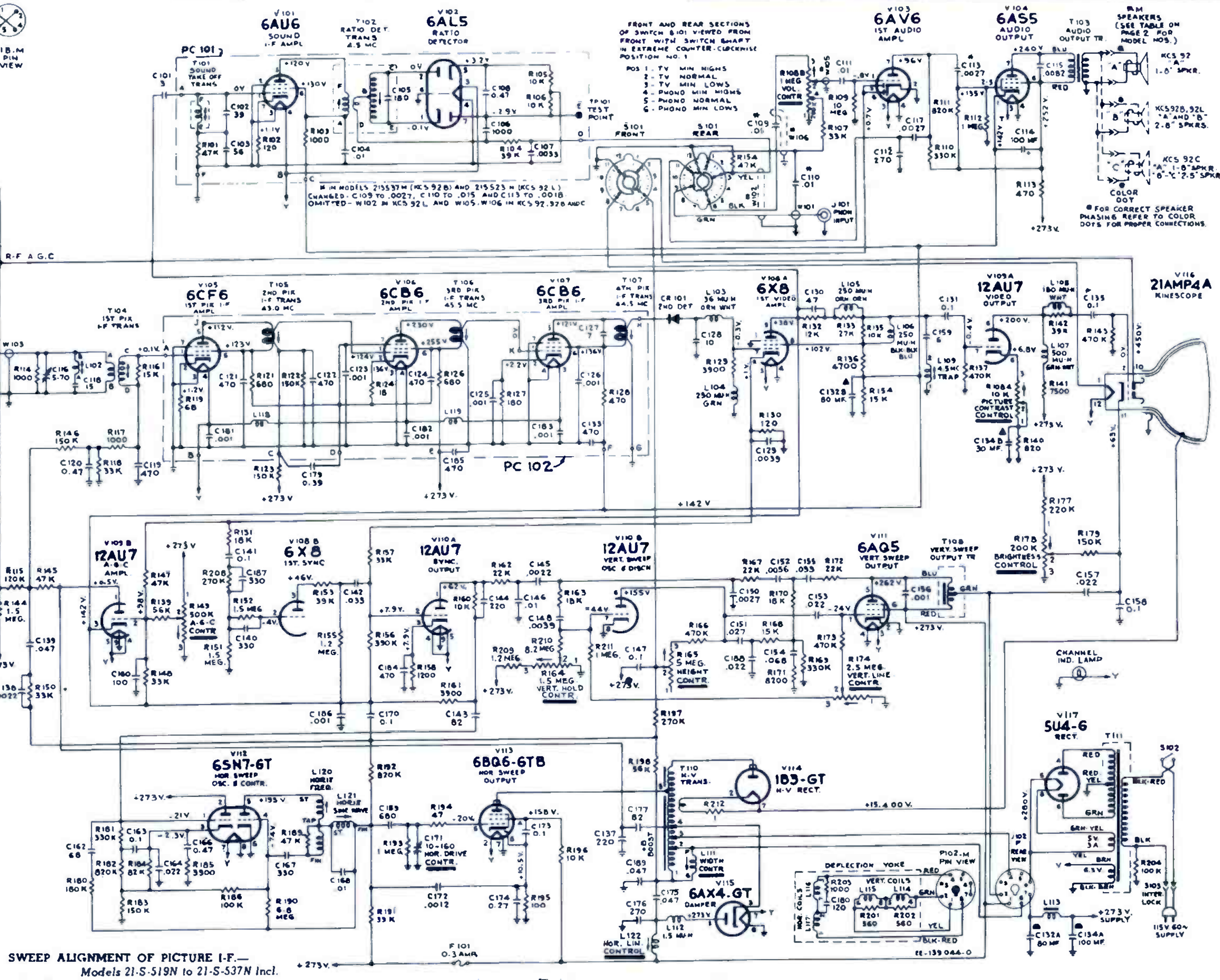
NOTE: Chassis designations with an "X" stamped after the final letter (such as KCS92CX) use plate assembly Z102, instead of printed circuit PC102, for picture IF section and are connected as shown below.

Figure 26—Circuit Schematic Diagram KCS92, KCS92B, KCS92C or KCS92L, KCS92D, KCS92F, KCS92H or KCS92M









ALIGNMENT PROCEDURE

PICTURE I-F TRANSFORMER ADJUSTMENTS.—

Models 21-S-519N to 21-S-537N Incl.

Connect the i-f signal generator, in series with a 1500 mmf. ceramic capacitor, to the mixer grid test point TP2.

Connect the "VoltOhmyst" to the junction of R118, R146 and C120 and to ground. Turn the AGC control fully clockwise.

Obtain two 7.5 volt batteries capable of withstanding appreciable current drain and connect the ends of a 1,000 ohm potentiometer across each. Connect the battery positive terminal of one to the chassis and the potentiometer arm to the junction of R118, R146 and C120. The second battery will be used later.

Set the bias to produce approximately —4.0 volt of bias at the junction of R118, R146 and C120.

Connect the "VoltOhmyst" to the junction of R129 and L103 and to ground.

Set the VHF signal generator to each of the following frequencies and peak the specified adjustment for maximum indication on the "VoltOhmyst." (Note: These transformers should be peaked with their cores at the ends of the coils nearest the chassis.) During alignment, reduce the input signal if necessary in order to produce 3.0 volts of d-c at R129 and L103 with —4.0 volts of i-f bias at the junction of R118, R146 and C120.

44.5 mc.	T107
45.5 mc.	T106
43.0 mc.	T105

Set the VHF signal generator to the following frequency and adjust the picture i-f trap for minimum d-c output at R129, L103. Use sufficient signal input to produce 3.0 volts of d-c on the meter when the adjustment is made.

47.25 mc.	L102

(Note: Core should be at end of coil nearest chassis when properly adjusted.)

Models 21-S-519NU to 21-S-537NU

Connect the i-f signal generator in series with a 1500 mmf. ceramic capacitor, to the mixer grid test point TP2.

Connect the "VoltOhmyst" to the junction of R118, R146 and C120.

Turn the AGC control fully clockwise.

Obtain a 7.5 volt battery capable of withstanding appreciable current drain and connect the ends of a 1,000 ohm potentiometer across it. Connect the battery positive terminal to chassis and the potentiometer arm to the junction R118, R146 and C120. Adjust the potentiometer for —4.0 volts indication on the "VoltOhmyst."

Connect the "VoltOhmyst" to the junction of R129 and L103 and to ground.

Set the VHF generator to each of the following frequencies and with a thin fiber screwdriver tune the specified adjustment for maximum indication on the "VoltOhmyst." In each instance the generator should be checked against a crystal calibrator to insure that the generator is on frequency.

During alignment, reduce the Input signal if necessary in order to produce 3.0 volts of d-c at R129 and L103 with —4.0 volts of i-f bias at the junction of R118, R146 and C120.

44.5 mc.	T107
45.5 mc.	T106
43.0 mc.	T105

(Note: Peak transformers with cores at end of coils nearest chassis.)

Set the signal generator to the following frequency and adjust the picture i-f trap for minimum d-c output at junction of R129 and L103. Use sufficient signal input to produce 3.0 volts of d-c on the meter when adjustment is made.

47.25 mc.	L102

(Note: Core should be at end of coil nearest chassis when properly adjusted.)

SWEEP ALIGNMENT OF PICTURE I-F.—

Models 21-S-519N to 21-S-537N Incl.

To align the mixer plate circuit, connect the sweep generator to the mixer grid test point TP2, in series with a 1500 mmf. ceramic capacitor. Use the shortest leads possible, with not more than one inch of unshielded lead at the end of the sweep cable. Connect the sweep ground lead to the top of the tuner.

Set the channel selector switch to channel 4.

Clip a 330 ohm resistor between pin 1 of V107 and ground.

Preset C116 to minimum capacity.

Adjust the bias box potentiometer to obtain —4.0 volts of bias as measured by a "VoltOhmyst," at the junction of R118 R146 and C120.

Connect a 180 ohm composition resistor from pin 5 of V105 to pin 6 of V105. Connect the oscilloscope diode probe to pin 5 of V105 and to ground.

Couple the signal generator loosely to the diode probe in order to obtain markers.

Adjust T1 (top) and T104 (top) for maximum gain and with 45.75 mc. at 75% of maximum response.

Set the sweep output to give 0.3 to 0.5 volt peak-to-peak on the oscilloscope when making the final touch on the above adjustment.

Adjust C116 until 42.5 mc. is at 70% response with respect to the low frequency shoulder of the curve as shown in Figure 9. Maximum allowable tilt is 20%.

Disconnect the diode probe, the 180 ohm and the 330 ohm resistors.

Connect the oscilloscope to the junction of R129 and L103.

Leave the sweep generator connected to the mixer grid test point TP2 with the shortest leads possible.

Adjust the output of the sweep generator to obtain 3.0 to 5.0 volts peak-to-peak on the oscilloscope.

Couple the signal generator loosely to the grid of the first pix i-f amplifier. Adjust the output of the signal generator to produce small markers on the response curve.

Retouch T105, T106 and T107 to obtain the response shown in Figure 10.

Increase sweep output ten times and check attenuation at 41.25 mc. Adjust T105 and T107 to set 41.25 mc. between 25 and 35 times down with curve as shown in Figure 10.

Move the sweep generator to the antenna terminals. Connect —3.0 volts bias to pin 5 of V103. Adjust T106 and T107 slightly to correct for any overall tilt while switching from channel to channel.

Models 21-S-519NU to 21-S-537NU Incl.

To align the mixer plate circuit, connect the sweep generator to the mixer grid test point TP2, in series with a 1500 mmf. ceramic capacitor. Use the shortest leads possible, with not more than one inch of unshielded lead at the end of the sweep cable. Connect the sweep ground lead to the top of the tuner.

Set the channel selector switch to channel 4.

(Continued on reverse side)

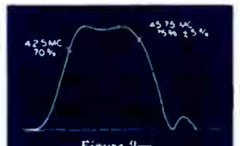


Figure 9—KRK22D T1 and T104 Response

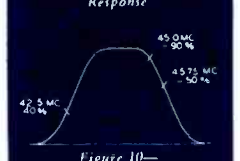


Figure 10—Overall I-F Response with KRK22D

Chassis KCS92: Models 21-S-503N, 21-S-504N, 21-S-505N, 21-S-506N, 21-S-507N, 21-S-519N, 21-S-521N, 21-S-522N Chassis KCS92A: Models 21-S-510N, 21-S-511N, 21-S-516N Chassis KCS92B: Model 21-S-537N Chassis KCS92C: Model 21-S-526N Chassis KCS92D: Models 21-S-503NU, 21-S-504NU, 21-S-505NU, 21-S-506NU, 21-S-507NU, 21-S-519NU, 21-S-521NU, 21-S-522NU Chassis KCS92E: Models 21-S-510NU, 21-S-511NU, 21-S-516NU Chassis KCS92F: Model 21-S-537NU Chassis KCS92H: Model 21-S-526NU Chassis KCS92L: Model 21-S-523N Chassis KCS92M: Model 21-S-523NU

See replacement parts list for these chassis at right.

RCA
Chassis KCS92, KCS92A, KCS92B, KCS92C, KCS92D, KCS92E, KCS92F, KCS92H, KCS92L, KCS92M

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RCA TV CHASSIS KCS92 SERIES — REPLACEMENT PARTS LIST

For further Information concerning these replacements, contact manufacturers directly or their local distributors

RESISTIVE CONTROLS

SYMBOL NO.	DESCRIPTION	RCA STOCK NO.	CENTRALAB	CLAROSTAT	IRC	MALLORY
R108A,B	On-off vol. & Pix control (KCS92J&K chassis)	79707				
R108A,B	On-off vol. & Pix control (all chassis except KCS92K&J)	78208	F1-25, R2-57, KB-1	RTV-443	QJ-504	UE775S, UF14L, UR16T254-US-26
R149	AGC control	78808	AB-59, AK-1	A47-500K-S FKS-1/4	B11-133, TM-2	SU-50
R164	Vertical hold control	78210	AB-75, AK-4	A47-1.5 meg.-S KSS-3	Q11-138	U-155
R165	Height control	79871		A47-5 meg.-S FKS-1/4	Q11-141, SQ	
R174	Vertical linearity control	78807	AB-83, AK-1	A47-2.5 meg.-S FKS-1/4	B11-239, TM-3	SU-565
R178	Brightness control	79139	AB-46, AK-4	A47-200K-S KSS-3	Q11-129	U-43

SPEAKERS

DESCRIPTION	RCA STOCK NO.	JENSEN	PERMOFLUX	QUAM	UTAH
5" PM speaker, with cone and 3.2Ω voice coil	77000	Viking 5J6	45B	5A1- or 5A01	SP5Z
8" PM speaker, with cone and 3.2Ω voice coil	74664	P8-T, ST-117	75K	8A31 or 8A21	SP75D

FUSE

SYMBOL NO.	DESCRIPTION	RCA STOCK NO.	BUSSMANN
F101	Fuse-.3 amp.	78214	AGC 3/10

CAPACITORS (all except fixed paper)

Units described below are fixed-value, ceramic types unless otherwise identified

SYMBOL NO.	DESCRIPTION	RCA STOCK NO.	AEROVOX NO.	ASTRON NO.	CENTRALAB NO.	CORNELL-DUBILIER NO.	ERIE NO.	ILLINOIS NO.	MALLORY NO.	PYRAMID NO.	SANGAMO NO.	SPRAGUE NO.
C101	3 mmf., ±1 mmf., 500 v. DC. Part of PC101	76507	N750-S1-1-3			GO-11						5TCCB-V33
C102	39 mmf., ±10%, 500 v. DC. Part of PC101	79323	NPO-S1-2-39			GO-31						5GA-Q39
C103	56 mmf., ±10%, 500 v. DC. Part of PC101	79324	NPO-S1-56			GO-36			DC525			5GA-Q56
C104	.01 mf., +100%, -0%, 500 v. DC. Part of PC101	73960	BPD-.01		D6-103	K-082			DC511			5HK-S1
C105	Part of T101											
C106	Mica, 1000 mmf., 500 v. DC. Part of PC101	53300	1467-.001			5W5T5					K-1210	MS-21
C112	270 mmf., ±10%, 500 v. DC. For KCS92B, F, L & M	47617	D1-270 (±10%)	BP 6-001	TCZ-270	GO-54	ED-270		UC-5327			5GA-T27
C114	Electrolytic, 100 mf, -10%, +100% 250 v. DC.	79314	PRS-450V-100	MM 100-250		GO-42		IHT 100250	FP129.1	TD-100-250	MT-25100	TVL-1535
C118	15 mmf., ±5%, 500 v. DC.	39044	N750S1-1-15		D6-150	GO-21	TCO-15					MS-415
C119	470 mmf., +100%, -0%, 500 v. DC.	77293	BPD-.00047		D6-471	GO-60	ED-.00047					5GA-T5
C121	470 mmf., ±20%, 500 v. DC. Part of PC102 or Z102	78622	SI-470		DD-471	GO-60						5GA-T47
C122	470 mmf., +100%, -0%, 500 v. DC. Part of PC102 or Z102	77293	BPD-.00047		D6-471	GO-60						5GA-T5
C123	1000 mmf., +100%, -0%, 500 v. DC. Part of PC102 or Z102	77252	BPD-.001		D6-102	GO-69						5HK-D1
C124	Same as C121		SI-470		DD-471		GP-470					5GA-T47
C125	Same as C123 (PC102 only)		BPD-.001		D6-102							5HK-D1
C125 A,B	2 sections:--.001 mf., 500 v. DC. (Z102 only)	79319	BPD-2-.001		DD2-102	DKO-69	ED2-.001		DCD-.521			5HK-2D1
C126	1000 mmf., ±20%, 500 v. DC. Part of PC102 or Z102	78623	D1-.001		DD-102	GO-69						5GA-D1
C127	Insulated, 7 mmf., ±0.5 mmf, 500 v. DC. Part of PC102 only.	79809	NPO-S1-1-6.8			GO-14						5TCCB-V68
C127	9 mmf., ±0.5 mmf., 500 v. DC. (Z102 only)	79164	NPO-S1-1-10			GO-18						R9043
C128	10 mmf., ±10%, 500 v. DC.	33098	N750-S1-1-10		TCZ-10	GO-18	ED-10		UC-541			5GA-Q1
C130	47 mmf., ±10%, 500 v. DC.	39042	N750-S1-27-47		D6-470	GO-33	ED-47		UC-5447			5GA-Q47
C132 A,B	Electrolytic, 80/80 mfd, 400/200 v. DC.	79147	AFH-2-44-90	EYD-633		B-081		UMP 488	FP375.5	TM-D80-450	D-344	TVL-3764*
C133	Same as C122		BFO-.00047									5GA-T5
C134 A,B	Electrolytic, 100/30 mfd, 400/50 v. DC.	79146	AFH-2-64-25	EYD-617				UMP 4103	FP247	TM-100-450 TD-50-50	D-343	TVL-3672**
C137	Mica, 220 mmf., ±10%, 100 v. DC.	79021	1469-220		TCZ-220	5A5T22	TCO-220		UC-5322		RR-1322	MS-322
C140	Mica, 330 mmf., ±10%, 500 v. DC.	39640	1469-330			22A5T33					RR-1333	MS-333
C143	Mica, 82 mmf., ±5%, 1000 v. DC.	76474	1469-82		TCZ-82	22A5082					K-3482	MS-482
C144	Mica, 220 mmf, ±10%, 500 v. DC.	58271	1469-220		TCZ-220	22A5T22	TCO-220		UC-5322		RR-1322	MS-322
C159	6 mmf., ±1.0 mmf., 500 v. DC.	77364	NPO-S1-1-6.2			GO-14						5GA-V6
C160	100 mmf., ±10%, 500 v. DC.	39396	N750-S1-7-100		TCN-100	GO-42	ED-100		UC-531			5GA-T1
C162	Mica, 68 mmf., ±5%, 1000 v. DC.	76475	1468LS-HV-68 ±5%		TCZ-68	VQ68					RR-1468	10GA-Q68
C167	Mica, 330 mmf., ±5%, 1000 v. DC.	76476	1468LS-HV-330 ±5%			5P15T33					K-2333	10GA-T33
C171	Trimmer--10-160 mmf, Horizontal drive	71807										
C176	Mica, 270 mmf., ±20%, 1000 v. DC.	79022	1468LS-HV-270		TCZ-270	22A5T27			MCK327		K-2327	10GAB-T27
C177	82 mmf., ±10%, 3500 v. DC.	78225										R9044
C180	Part of Yoke											20GA-T12
C181, C182	Same as C123 (PC102 or Z102)		BPD-.001		D6-102							5HK-D1
C183	Same as C123 (PC102 only)		BPD-.001		D6-102							5HK-D1
C184	470 mmf., ±20%, 500 v. DC.	78622	S1-1-470		DD-471	GO-60	GP-470		UC-5347			5GA-T47
C185	Same as C122 (PC102 only)		BPD-.00047		D6-471							5GA-T5
C186	.001 mf., +100%, -0%, 500 v. DC.	77252	BPD-.001		D6-102	GO-69	ED-.001		DC-521			5HK-D1
C187	Same as C140		1469-330									MS-333

* Parallel 40 mf. sections. ** Parallel 10 mf. & 20 mf. sections.

CAPACITORS (fixed paper)

Replacements for standard units listed below are available in the following brands: Aerovox, Astron, Centralab, Cornell-Dubilier, Erie, Illinois, Mallory, Pyramid, Sangamo and Sprague.

SYMBOL NO.	DESCRIPTION	RCA STOCK NO.
C107	.0033, ±10%, 400 v. DC. Part of PC101	79315
C108	0.47, ±10%, 200 v. DC. Part of PC101	79148
C109	.01, ±20%, 200 v. DC. For KCS92,C,D&H	79014
C109	.0027, ±10%, 600 v. DC. For KCS92B,F,L&M	73599
C109	.0047, ±20%, 400 v. DC. For KCS92A&E	79017
C110	.01, ±10%, 200 v. DC. For KCS92,C,D&H	79316
C110	.015, ±10%, 200 v. DC. For KCS92B,F,L&M	79530
C111	.01 mf, ±20%, 200 v. DC.	79014
C112	.001, ±10%, 600 v. DC. For KCS92A&E only	75643
C113	.0027, ±10%, 600 v. DC. For KCS92C,D&H	73599
C113	.0018, ±10%, 600 v. DC. For KCS92B,F,L&M	79531
C115	.0082, ±10%, 1000 v. DC.	73808
C117	.0027, ±10%, 600 v. DC. Same as C113 (For all chassis except KCS92A&E)	73599
C120	0.47, ±20%, 200 v. DC.	73787
C129	.0039, ±10%, 400 v. DC.	79018
C131	0.1, ±20%, 600 v. DC.	79149
C135	0.1, ±20%, 600 v. DC.	73557
C136	0.33, ±20%, 200 v. DC.	76994
C138	.0022, ±10%, 600 v. DC.	73595
C139	.047, ±10%, 600 v. DC.	73592
C141	0.1, ±20%, 400 v. DC.	73551
C142	.033, ±20%, 400 v. DC.	73552
C146	0.01, ±10%, 400 v. DC.	73561

SYMBOL NO.	DESCRIPTION	RCA STOCK NO.
C148	.0039, ±10%, 600 v. DC.	73796
C150	.0027, ±10%, 600 v. DC. Same as C113	73599
C151	.027, ±10%, 600 v. DC.	75345
C152	.0056, ±10%, 400 v. DC.	73788
C153	.022, ±20%, 600 v. DC.	73798
C154	0.068, ±10%, 200 v. DC.	79016
C155	.033, ±10%, 600 v. DC.	73596
C156	0.001, ±20%, 1600 v. DC.	73849
C157	Same as C153	
C158	Same as C141	
C163	Same as C141	
C164	0.022, ±20%, 400 v. DC.	73562
C166	Same as C120	
C168	0.01, ±5%, 600 v. DC.	73594
C169	680, ±10%, 600 v. DC.	76479
C170	Same as C135	
C172	0.0012, ±5%, 600 v. DC.	76995
C173	Same as C135	
C174	0.27, ±10%, 200 v. DC.	73786
C175	0.047, ±10%, 1000 v. DC.	73597
C179	0.39, ±10%, 200 v. DC.	79318
C188	.022, ±10%, 200 v. DC.	79925
C189	Same as C175	

INDUCTIVE COMPONENTS

SYMBOL NO.	DESCRIPTION	RCA STOCK NO.	HALLDORSON	MERIT	MILLER	RAM	THORDARSON	TRIAD
L102	1st I-F Grid trap	78204		TV-153	6226		20-1049	
L103	Peaking coil, 36 uh	76011		TV-180	6176		19-3036	
L104	Peaking coil, 250 uh	71526		TV-185	6181		19-3250	
L105	Peaking coil, 250 uh (includes R133)	77674		TV-185(f)	6181		19-3250(f)	
L106	Peaking coil, 250 uh (includes R135)	79321		TV-185(g)	6181		19-3250(g)	
L107	Peaking coil, 500 uh	75252		TV-188	6174		19-3500	
L108	Peaking coil, 180 uh (includes R142)	71528		TV-183	6179		19-4180	
L109	4.5 mc trap	79157						
L111	Width coil	79144		MWC-1		201R16	WC-18(j)	WC-12(a)
L112	Insulated choke, 1.5 mh Reactor - R-F	76640						
L113	Filter choke	77676	C5037	C-2996(b)			26C44(b)	C-23X(b)
L114 to L117	Part of yoke	78869	See yoke replacement numbers					
L118, 119	Second & thrid Pix I-F Choke coils (Part of PC102 or V102)	73477		TV-189			19-3001	
L120	Hor. Freq. coil	79534		TV-162(i)	6212		20-1402	
L121	Hor. sine wave coil	79161		TV-162(i)	6314		20-1402	
L122	Hor. lin. coil	76442		MWC-6		201R15	WC-22	WC-12(a)
T101	Sound take-off transformer Part of PC101	79140		TV-113(h)			17-3495	
T102	Ratio detector transformer	79141		TV-115(h)			17-3497	
T103	Audio output transformer for KCS92B,C,F,H,L & M chassis	79476		A-3019			26S60(b)	S-5Z
T103	Audio output transformer for KCS92A,D,E,J & K chassis	79159	Z1006	A-3019			26S60(b)	
T104	1st I-F grid transformer	78203		TV-130			17-4522	
T105 to T107	Part of PC102			TV-130				
T105 to T107	1st, 2nd or 3rd Pix I-F transformer (Z102 only)	76433		TV-130			17-4522	
T108	Vertical output transformer	79143	Z1802			V307	26S73	A-108X(c)
T110	High voltage transformer	79870	FB419				Fly-60	D-50(d)
T111	Power transformer	79869						R-61BC(e)
YOKE	Deflection yoke, complete with 6 contact male connector for all models except 21-S-523N & NU. Includes C180, L114, L115, L116, L117, R201 & R202.	78869	DF606	MOF-91			Y-14(k)	Y-40-1
	Deflection yoke with 6 contact male connector for models 21-S-523N & NU. Includes C180, L114, L115, L116, L117, R201 & R212.	79490	DF606	MDF-91				

(a) Connect to coded red and blue terminals.
(b) Drill new mounting hole.
(c) Connect as auto transformer, mount on tuner bracket.
(d) Drill new mounting hole, orig. #5 to new #9, orig. #4 to new #7, orig. #3 to new #7, orig. #2 to new #3, orig. #1 to new #1.
(e) Parallel and phase 6 amp 6.3 windings. Tape 1.2 amp leads.
(f) Parallel with 27K resistor.
(g) Parallel with 10K resistor.
(h) Terminals are sufficient mtg. support.
(i) Replaces both the horiz. OSC. & horizontal phase coils, cut out chassis and drill mtg. holes.
(j) Enlarge mtg. hole.
(k) For all models except 21-S-523N & NU.

RESISTORS (fixed)

All units are composition, 1/2-watt, unless otherwise stated.

SYMBOL NO.	DESCRIPTION	RCA STOCK NO.
R101	47,000, ±10%, Part of PC101	502347
R102	120, ±10%, Part of PC101	502112
R103	1000, ±20%, Part of PC101	502210
R104	39,000, ±10%, Part of PC101	502339
R105, 106	10,000, ±10%, Part of PC101	502310
R107	33,000, ±10%	502333
R109	10 meg, ±20%	502610
R110	330,000, ±20%	502433
R111	820,000, ±5%	502482
R112	1 meg, ±5%	502510
R113	470 ohm, ±20%, 2 w.	522147
R114	1000, ±20%	502210
R115	120,000, ±5%	502412
R116	15,000, ±10%	502315
R117	Same as R114	
R118	33,000, ±5%	502333
R119	68, ±10%, Part of PC102 or Z102	502068
R120	56,000, ±5%, (Z102 only)	502356
R121	680, ±20%, Part of PC102 or Z102	502168
R122, 123	150,000, ±5%, Part of PC102 or Z102	502415
R124	18, ±10%, Part of PC102 or Z102	502018
R125	Same as R120 (Z102 only)	
R126	Same as R121	
R127	180, ±10%, Part of PC102 or Z102	502118
R128	470, ±20%, Part of PC102 or Z102	502147
R129	3900, ±5%	502239
R130	120, ±10%	502112
R131	18,000, ±10%	502318
R132	12,000, 1 w.	512312
R133	Part of L105	
R134	15,000, ±20%, 2 w.	522315
R135	Part of L106	
R136	4700, ±10%	502247
R137	470,000, ±20%	502447
R139	56,000, ±10%	502356
R140	820, ±10%, 1/2 w.	502182
R141	7500, ±5%, 1 w.	512275
R142	Part of L108	
R143	Same as R137	
R144	1.5 meg, ±5%	502515
R145	47,000, ±20%, 2 w.	522347
R146	Same as R123	
R147	47,000, ±10%	502347
R148	Same as R107	
R150	Same as R107	
R151, 152	1.5 meg, ±10%	502515
R153	39,000, ±10%	502339
R154	Same as R147	
R155	1.2 meg, ±10%	502512
R156	390,000, ±10%	502439
R157	Same as R107	
R158	1200, ±10%	502212
R160	10,000, ±10%, 1 w.	512310
R161	Same as R129	
R162	22,000, ±10%	502322
R163	Same as R131	
R166	Same as R137	
R167	Same as R162	
R168	Same as R116	
R169	330,000, ±10%	502433
R170	18,000, ±5%	502318
R171	8200, ±10%	502282
R172	22,000, ±5%	502322
R173	Same as R137	
R177	220,000, ±10%	502422
R179	150,000, ±20%	502415
R180	180,000, ±10%	502418
R181	Same as R169	
R182	820,000, ±10%	502482
R183	Same as R123	
R184	82,000, ±5%	502382
R185	3900, ±10%	502239
R186	100,000, ±5%, 1 w.	512410
R189	Same as R147	
R190	6.8 meg, ±10%	502568
R191	39,000, ±10%, 1 w.	512339
R192	Same as R182	
R193	1 meg, ±10%	502510
R194	47, ±20%	502047
R195	100, ±5%, 2 w.	74015

RCA
Chassis KCS92, Series

Technician
CIRCUIT DIGEST

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ALIGNMENT PROCEDURE

(Continued from reverse side)

Clip a 330 ohm resistor between pin 1 of V107 and ground.

Preset C116 to minimum capacity.

Adjust the bias box potentiometer to obtain —4.0 volts of bias as measured by a "VoltOhmyst" at the junction of R118, R146 and C120.

Connect a 180 ohm composition resistor from pin 5 of V105 to pin 6 of V105. Connect the oscilloscope diode probe to pin 5 of V105 and to ground.

Couple the signal generator loosely to the diode probe in order to obtain markers.

Adjust T2 (top) and T104 (top) for maximum gain and with 45.75 mc. at 75% of maximum response.

Set the sweep output to give 0.3 to 0.5 volt peak-to-peak on the oscilloscope when making the final touch on the above adjustment.

Adjust C116 until 42.5 mc. is at 70% response with respect to the low frequency shoulder of the curve as shown in Figure 11. Maximum allowable tilt is 20%.

Disconnect the diode probe, the 180 ohm and the 330 ohm resistors.

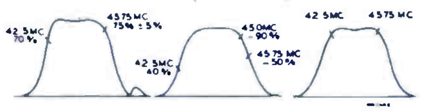

Figure 11—KRK30 T2 and T104 Response   *Figure 12—Overall I-F Response with KRK30*   *Figure 13—KRK30 L9 and C308 I-F Response*

Connect the oscilloscope to the junction of R129 and L103.

Leave the sweep generator connected to the mixer grid test point TP2 with the shortest leads possible.

Adjust the output of the sweep generator to obtain 3.0 to 0.5 volts peak-to-peak on the oscilloscope.

Couple the signal generator loosely to the grid of the first pix i-f amplifier. Adjust the output of the signal generator to produce small markers on the response curve.

Retouch T105, T106 and T107 to obtain the response shown in Figure 12.

Increase sweep output ten times and check attenuation at 41.25 mc. Adjust T105 and T107 to set 41.25 mc. between 30 and 40 times down with curve as shown in Figure 12.

To align the I-F amplifier circuit of the KRK30, connect the VHF sweep generator to the front terminal of the 1N82 crystal holder in series with a 1000 ohm resistor and a 1500 mmf. ceramic capacitor. Use the shortest leads possible, grounding the sweep ground lead to the tuner case.

To do this, remove the crystal cover and connect the resistor, after insulating the lead with tubing, to the crystal front terminal.

Set the UHF CHANGEOVER switch to the UHF position, and the UHF TUNING between channels 68 and 69 at 800 mc.

Connect a 180 ohm composition resistor and a 1500 mmf. capacitor in series between test point TP3 and ground with the capacitor connected to TP3 and the resistor to ground. Connect the oscilloscope diode probe to the junction between the resistor and capacitor.

Couple the VHF signal generator loosely to the diode probe in order to obtain markers.

Connect the potentiometer arm of the second bias supply to the AGC terminal on the tuner and ground the battery positive terminal to the tuner case. Adjust the bias potentiometer to produce —3.0 volts of bias, as measured by the "VoltOhmyst" at the AGC terminal on the tuner.

Set the sweep generator to produce 0.5 volt or less peak-to-peak on the oscilloscope.

Adjust C308, on the UHF section, and L9, on the VHF section, of the tuner for maximum gain with 45.75 mc. and 42.5 mc. markers as shown in figure 13.

If necessary adjust L27 to place the 45.75 mc. marker at the peak of the curve. Adjust L43 for minimum tilt of the curve as shown in figure 13.

Remove the resistor, capacitor and diode probe from TP3 and connect the oscilloscope to the junction of R129 and L103. Use 3.0v peak-to-peak on the oscilloscope.

Connect the VHF sweep generator to the antenna terminals. Keep the AGC bias at —3.0 V and the I-F bias at —4.0 volts.

Couple the signal generator loosely to the grid of the first picture I-F amplifier.

Switch through all VHF channels and check for proper curve shape as in figure 12. Retouch T106 and T107 slightly to correct for any overall tilt that is essentially the same on all channels.

Disconnect the VHF sweep generator and connect the UHF sweep generator to the antenna terminals. Check on all UHF channels for proper wave shape as shown in figure 12, retouching C308 and L9 if necessary to correct any overall tilt.

Do not retouch T2, T104, T105, T106 or T107.

Remove the sweep and marker generators and the bias supplies.

KRK22D TUNER ALIGNMENT.—

Models 21-S-519N to 21-S-537N Incl.

A tuner unit which is operative and requires only touch up adjustments, requires no presetting of adjustments. For such units, skip the remainder of this paragraph. For units which are completely out of adjustment, preset C2 all the way out. Set channel 7 to 13 oscillator slugs one turn from tight. Turn T1 slug all the way out. Do not change any of the adjustments in the antenna matching unit.

Disconnect the link from terminals "A" and "B" or T104 and terminate the link with a 39 ohm composition resistor.

Turn the receiver channel selector switch to channel 2.

The 43.5 mc. trap is adjusted with zero bias. To insure that the bias will remain constant, take a clip lead and short circuit the AGC terminal of the tuner at the terminal board to ground.

Connect the oscilloscope to the test point TP1 on top of the tuner unit. Set the oscilloscope to maximum gain.

Connect the output of the VHF signal generator to the output of the antenna matching unit at the junction of L53 and C24 at the bottom of the FM trap L53.

Tune the signal generator to 43.5 mc. and modulate it 30% with a 400 cycle sine wave. Adjust the signal generator for maximum output.

Adjust C19 on top of the tuner, for minimum 400 cycle indication on the oscilloscope. If necessary, this adjustment can be retouched in the field to provide additional rejection to one specific frequency in the i-f band pass. However, in such cases, care should be taken not to tune C19 into channel 2, thereby reducing sensitivity on channel 2.

Connect the potentiometer arm of one of the bias supplies to the AGC terminal on the tuner and ground the battery positive terminal to the tuner case. Adjust the bias potentiometer to produce —3.0 volts of bias, as measured by the "VoltOhmyst" at the AGC terminal on the tuner.

Set the channel selector switch to channel 8.

Preset C5 to read —3.0 volts at the test point TP1, as read on the "VoltOhmyst". The limits for oscillator injection voltage are 2 volts minimum and not exceeding a maximum of 5.5 volts.

Turn the fine tuning control fully clockwise.

Adjust C3 for proper oscillator frequency, 227 mc. This may be done in several ways. The easiest way and the way which will be recommended in this procedure will be to use the signal generator as a heterodyne frequency meter and beat the oscillator against the signal generator. To do this, tune the signal generator to 227 mc. with crystal accuracy. Insert one end of a piece of insulated wire into the tuner unit through the hole provided for the adjustment of C10. Be careful that the wire does not touch any of the tuned circuits as it may cause the frequency of the tuner oscillator to shift. Connect the other end of the wire to the "r-f in" terminal of the signal generator. Adjust C3 to obtain an audible beat with the signal generator.

Turn C2 clockwise until the beat note just begins to change, then turn one full turn in the same clockwise direction.

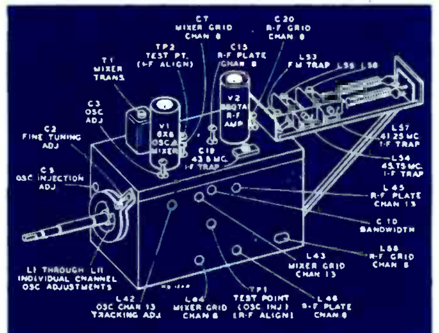

Figure 14— KRK22D Tuner Adjustments

Return the fine tuning control to the mechanical center of its range.

Note.—If on some units, it is not possible to reach the proper channel 8 oscillator frequency by adjustment of C3, switch to channel 13 and adjust L42 to obtain proper channel 13 oscillator frequency as indicated in the table on page 8. Then, switch to channel 12 and adjust L11 to obtain proper channel 12 oscillator frequency. Continue down to channel 8, adjusting the appropriate oscillator trimmer to obtain the proper frequency on each channel. Then again on channel 8, adjust C3 to obtain proper channel 8 oscillator frequency. Switch back to channel 13 and readjust L42 and back to channel 8 and adjust C3.

Set the T1 core for maximum inductance (core turned counter-clockwise).

Connect the sweep generator through a suitable attenuator, as shown in figure 15, to the input terminals of the antenna matching unit.

Figure 15—Sweep Attenuator Pads

Connect the signal generator loosely to the antenna terminals.

Set the sweep generator to cover channel 8.

Set the oscilloscope to maximum gain and use the minimum input signal which will produce a usable pattern on the oscilloscope. Excessive input can change oscillator injection during alignment and produce consequent misalignment even though the response as seen on the oscilloscope may look normal.

Insert markers of channel 8 picture carrier and sound carrier, 181.25 mc. and 185.75 mc.

Adjust C7, C10, C15 and C20 for approximately correct curve shape, frequency, and band width as shown in figure 16.

The correct adjustment of C20 is indicated by maximum amplitude of the curve midway between the markers. C15 tunes the r-f amplifier plate circuit and affects the frequency of the pass band most noticeably. C7 tunes the mixer grid circuit and affects the tilt of the curve most noticeably (assuming that C20 has been properly adjusted). C10 is the coupling adjustment and hence primarily affects the response band width.

Connect the "VoltOhmyst" to test point TP1. Adjust C5 to read —3.0 volts dc on the "VoltOhmyst" at TP1. Readjust C2, C7, C10 and C15 for proper response. Adjust C20 for maximum gain at midpoint of the curve. Repeat if necessary until the proper response is obtained.

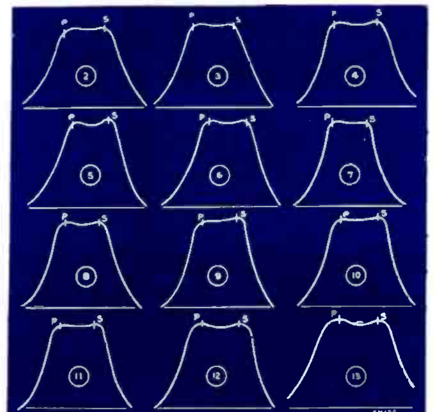

Figure 16—KRK22D Tuner R-F Responses

Set the receiver channel switch to channel 13.

Adjust the signal generator to the channel 13 oscillator frequency 257 mc.

Turn the fine tuning control fully clockwise.

Adjust L42 to obtain an audible beat. Slightly overshoot the adjustment of L42 by turning the slug an additional turn in the same direction from the original setting, then reset the oscillator to proper frequency by adjusting C2 to again obtain the beat.

Set the sweep generator to channel 13.

From the signal generator, insert channel 13 sound and picture carrier markers, 211.25 mc. and 215.75 mc.

Adjust L43 and L45 for proper response as shown in figure 16.

Turn off the sweep and signal generators.

Connect the "VoltOhmyst" to the tuner test point TP1.

Check the oscillator injection voltage to be within limits as previously specified. Adjust if necessary to bring within range.

If it was necessary to readjust C5, turn the sweep and signal generators back on and recheck the channel 13 response. Readjust L43 and L45 if necessary.

Set the receiver channel selector switch to channel 8 and readjust C2 for proper oscillator frequency, 227 mc.

Set the sweep generator and signal generator to channel 8.

Readjust C7, C10, C15 and C20 for correct curve shape, frequency and band width.

Turn off the sweep and signal generators, switch back to channel 13 and check the oscillator injection voltage at TP1 if C7 was adjusted in the recheck of channel 8 response.

If the initial setting of the oscillator injection trimmer was far off, it may be necessary to adjust the oscillator frequency and response on channel 8, adjust the oscillator injection on channel 13 and repeat the tracking procedure several times before the proper setting is obtained.

Turn off the sweep generator and switch the receiver to channel 6.

Adjust the signal generator to the channel 6 oscillator frequency 129 mc.

Set the fine tuning control to the center of its mechanical range.

Adjust L5 for an audible beat. Adjust L44, L46 and L58 for proper curve shape as shown in figure 16. Recheck the oscillator injection voltage at TP1, to insure that it is within the limits specified. Readjust C5 if necessary.

If C5 required adjustment, switch the receiver and the signal generator to channel 8. Readjust C7 for correct curve shape and recheck C2 and C3 for proper oscillator frequency.

Check the response of channels 2 through 6 by switching the receiver channel switch, sweep generator and marker generator to each of these channels and observing the response and oscillator injection voltage obtained. See figure 16 for typical response curves. It should be found that all these channels have the proper response with the markers above 80% response.

If the markers fail to fall within this requirement readjust L44, L46 and L58 in order to obtain curves within the proper limits.

Switch the channel selector, signal generator and marker generator through channels 7 to 13 and observe the response curves, referring to figure 16 for proper wave shape. Check the injection voltage at each channel to be within limits. If necessary readjust C15, C7, or C10 to obtain the proper response.

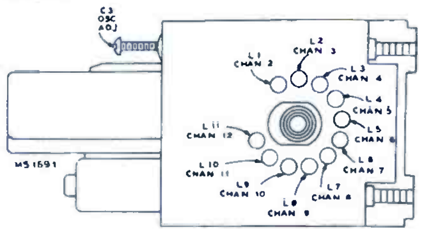

Figure 17—KRK22D Tuner Oscillator Adjustments

With the receiver and signal generator on channel 13 adjust L42 for an audible beat with the signal generator.

Adjust the oscillator to frequency on all channels by switching the receiver and the frequency standard to each channel and adjusting the appropriate oscillator slug to obtain the audible beat. It should be possible to adjust the oscillator to obtain the audible beat on each channel. Recheck the oscillator injection voltage on each channel to verify that the voltage is within the specified limits.

KRK22D or KRK30 ANTENNA MATCHING UNIT ALIGNMENT.—The antenna matching unit is accurately aligned at the factory. Adjustment of this unit should not be attempted in the customer's home since even slight misalignment may cause serious attenuation of the signal especially on channel 2. The r-f unit is aligned with a particular antenna matching transformer in place. If for any reason, a new antenna matching transformer is installed, the r-f unit should be re-aligned.

The F-M Trap which is mounted in the antenna matching unit may be adjusted without adversely affecting the alignment of the unit.

To align the antenna matching unit disconnect the lead from the F-M trap L53 (L5) to the channel selector switch S4 (S1E).

With a short jumper, connect the output of the matching unit through a 1000 mmf. capacitor to the grid of the second pix i-f amplifier, pin 1 of V107.

Replace the cover on the matching unit while making all adjustments.

Remove the first pix i-f amplifier tube V106.

Connect the positive terminal of a bias box to the chassis and the potentiometer arm to the junction of R118, R146 and C120. Set the potentiometer to produce approximately —5.0 volts of bias at the junction of R118, R146 and C120.

Connect an oscilloscope to the junction of R129 and L103 and set the oscilloscope gain to maximum.

Connect a VHF signal generator to the antenna input terminals. Modulate the signal generator 30% with an audio signal.

Tune the signal generator to 45.75 mc. and adjust the generator output to give an indication on the oscilloscope. Adjust L54 (L4) in the antenna matching unit for minimum audio indication on the oscilloscope.

Tune the signal generator to 41.25 mc. and adjust L57 (L11 for minimum audio indication on the oscilloscope.

Remove the jumper from the output of the matching unit.

Connect a 300 ohm ½ watt composition resistor from L53 (L5) to ground, keeping the leads as short as possible.

Connect an oscilloscope low capacity crystal probe from L53 (L5) to ground. The sensitivity of the oscilloscope should be approximately 0.03 volts per inch. Set the oscilloscope gain to maximum.

Connect the VHF sweep generator to the matching unit antenna input terminals. In order to prevent coupling reactance from the sweep generator into the matching unit, it is advisable to employ a resistance pad at the matching unit terminals. Figure 15 shows three different resistance pads for use with sweep generators with 50 ohm co-ax output, 72 ohm co-ax output or 300 ohm balanced output. Choose the pad to match the output impedance of the particular sweep employed.

Connect the signal generator loosely to the matching unit antenna terminals.

Set the sweep generator to sweep from 45 mc. to 54 mc. With RCA Type WR59A sweep generators, this may be accomplished by retuning channel number 1 to cover this range. With WR59B sweep generators this may be accomplished by retuning channel number 2 to cover the range. In making these adjustments on the generator, be sure not to turn the core too far clockwise so that it becomes lost beyond the core retaining spring.

Adjust L55 (L3) and L56 (L2) to obtain the response shown in figure 18. L55 (L3) is most effective in locating the position of the shoulder of the curve at 52 mc. and L56 (L2) should be adjusted to give maximum amplitude at 53 mc. and above consistent with the specified shape of the response curve. The adjustments in the matching unit interact to some extent. Repeat the above procedure until no further adjustments are necessary.

Restore the connection between L53 (L5) and S4 (S1E). Replace V106.

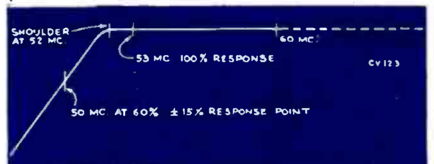

Figure 18—KRK22D or KRK30 Antenna Matching Unit Response

KRK30 TUNER ALIGNMENT

Models 21-S-519NU to 21-S-537NU Incl.

(Alignment instructions for the KRK30 tuner appear in Circuit Digest 140, Issue No. 24, August, 1954. Instructions for a similar tuner, KRK30A, appear in Circuit Digest 154, Issue No. 26, October, 1954.)

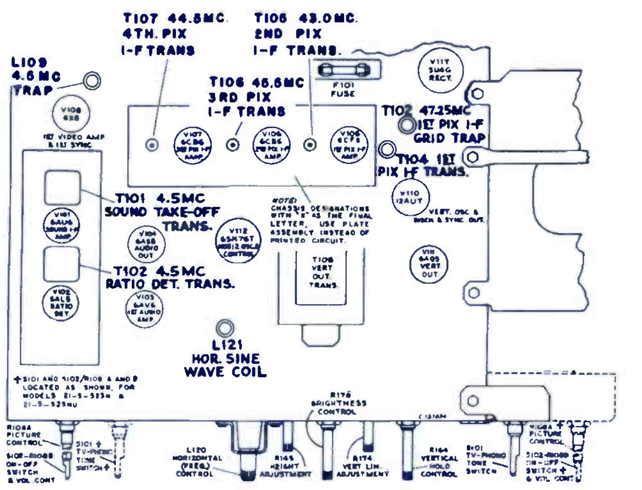

Figure 24—Top Chassis Adjusts.

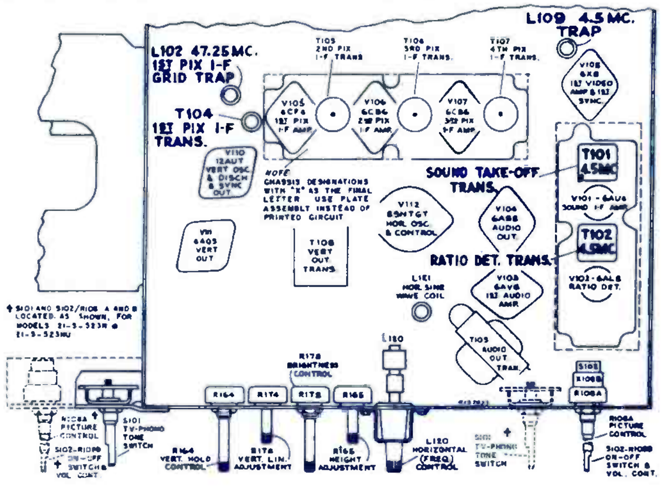

Figure 25—Bottom Chassis Adjustments

VOLTAGE CHART

The following measurements represent two sets of conditions. In the first condition, a 30000 micro-volt test pattern signal was fed into the receiver, the picture synced and the AGC control properly adjusted. The second condition was obtained by removing the antenna leads and short circuiting the receiver antenna terminals. Voltages shown are read with a type WV97A senior "VoltOhmyst" between the indicated terminal and chassis ground and with the receiver operating on 117 volts, 60 cycles, a-c. The symbol < means less than.

Tube No.	Tube Type	Function	Operating Condition	E Plate Pin No.	E Plate Volts	E Screen Pin No.	E Screen Volts	E Cathode Pin No.	E Cathode Volts	E Grid Pin No.	E Grid Volts	Notes on Measurements
V1 (V2) KRK22D or KRK30	6BQ7A	R-F Amplifier	30000 Mu. V. Signal	6	170			8	0.1	7		
			No Signal	6	133			8	1.1	7	0	
		R-F Amplifier	30000 Mu. V. Signal	1	270			3	170	2	-	
			No Signal	1	260			3	133	2	-	
V2 (V1) KRK22D or KRK30	6X8	Mixer	30000 Mu. V. Signal	9	160	6	160	6	0	7	-2.4 to -3.0	
			No Signal	9	145	8	145	6	0	7	-2.8 to -3.5	
		R-F Oscillator	30000 Mu. V. Signal	3	95			6	0	2	-3.8 to -5.5	
			No Signal	3	90			6	0	2	-3.0 to -5.1	
V101	6AU6	Sound I-F Amp	30000 Mu. V. Signal	5	126	6	136	7	1.2	1	0.2	
			No Signal	5	120	6	130	7	1.1	1	0	
V102	6AL5	Ratio Detector	30000 Mu. V. Signal	7	-8.0			1	-0.3			7.5 kc deviation at 1000 cycles
			No Signal	7	-2.9			1	-0.1			
		Ratio Detector	30000 Mu. V. Signal	2	-0.4			5	7.2			
			No Signal	2	-0			5	3.2			
V103	6AV6	1st Audio Amplifier	30000 Mu. V. Signal	7	98			2	0	1	-0.8	At min. volume
			No Signal	7	96			2	0	1	-0.6	At min. volume
V104	6AS5	Audio Output	30000 Mu. V. Signal	7	250	6	262	1	149	2 & 5	141	At min. volume
			No Signal	7	240	6	252	1	142	2 & 5	135	At min. volume
V105	6CF6	1st Pix. I-F Amplifier	30000 Mu. V. Signal	5	132	6	144	2	0	1	-4.7	*Unreliable measuring point
			No Signal	5	112	6	123	2	1.2	1	*0.1	
V106	6CB6	2nd Pix. I-F Amplifier	30000 Mu. V. Signal	5	250	6	278	2	145	1	129	
			No Signal	5	230	6	255	2	136	1	124	
V107	6CB6	3rd Pix. I-F Amplifier	30000 Mu. V. Signal	5	130	6	142	2	2.3	1	0	
			No Signal	5	121	6	136	2	2.2	1	0	
V108A	6X8	1st Video Amplifier	30000 Mu. V. Signal	9	70	8	118	6	0.8	7	-1.5	AGC control set for normal operation
			No Signal	9	38	8	102	6	1.0	7	-0.3	AGC control set for normal operation
V108B	6X8	1st Sync	30000 Mu. V. Signal	3	50		-	6	0.8	2	-34	
			No Signal	3	46			6	1.0	2	-4	
V109A	12AU7	Video Output	30000 Mu. V. Signal	6	235		-	8	4.0	7	-8.5	Contrast control at maximum
			No Signal	6	200			8	6.8	7	-0.4	
V109B	12AU7	AGC Amplifier	30000 Mu. V. Signal	1	-43			3	148	2	112	
			No Signal	1	0.5			3	142	2	98	
V110A	12AU7	Sync Output	30000 Mu. V. Signal	1	65			3	8.0	2	7.4	
			No Signal	1	62			3	7.9	2	7.9	
V110B	12AU7	Vertical Oscillator & Discharge	30000 Mu. V. Signal	6	160			8	0	7	-48	Depends on setting of Vert. hold control
			No Signal	6	155			8	0	7	-44	Voltages shown are synced pix adjustment
V111	6AQ5	Vertical Output	30000 Mu. V. Signal	5	268	6	280	2	0	1	-26	
			No Signal	5	262	6	273	2	0	1	-24	
V112	6SN7GT	Horizontal Osc. Control	30000 Mu. V. Signal	2	280			3	-2.5	1	-23.5	
			No Signal	2	273			3	-2.3	1	-21	
	6SN7GT	Horizontal Oscillator	30000 Mu. V. Signal	5	200			6	0	4	-75	
			No Signal	5	193			6	0	4	-74	
V113	6BQ6GTB	Horizontal Output	30000 Mu. V. Signal	Cap	*	4	164	8	11.0	5	-21	*High Voltage Pulse Present
			No Signal	Cap	*	4	158	8	10.5	5	-20	*High Voltage Pulse Present
V114	1B3GT/8016	H. V. Rectifier	30000 Mu. V. Signal	Cap	*			2 & 7	16,000			*High Voltage Pulse Present
			No Signal	Cap	*			2 & 7	15,400		-	*High Voltage Pulse Present
V115	6AX4GT	Damper	30000 Mu. V. Signal	5	280			3	*		-	*High Voltage Pulse Present
			No Signal	5	273			3	*			*High Voltage Pulse Present
V116	21AMP4A	Kinescope	30000 Mu. V. Signal	Cap	16,000	10	465	11	65	2	0	At average Brightness
			No Signal	Cap	15,400	10	450	11	63	2	0	At average Brightness
V117	5U4G	Rectifier	30000 Mu. V. Signal	4 & 6				2 & 8	290			
			No Signal	4 & 6				2 & 8	280			

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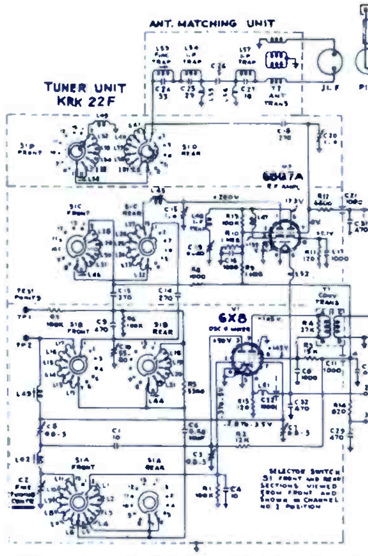
TECHNICIAN CIRCUIT DIGESTS



The schematic is shown in the latest condition at the time of printing.

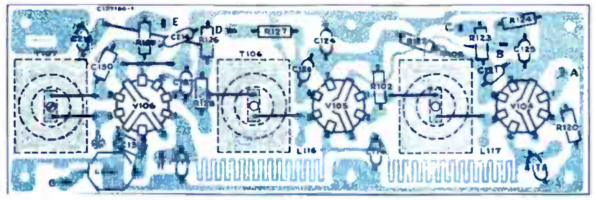
All resistance value in ohms. K = 1000.

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

All voltages measured with "Volt-Ohmyst" and with no signal input. Voltages should be within ±20% with 117 v. a-c supply.

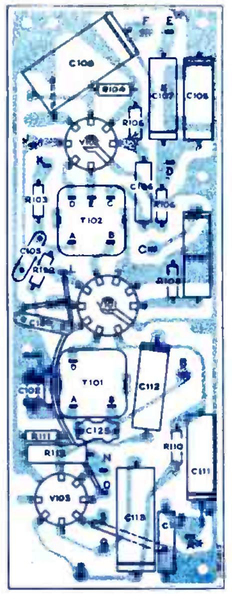
Directions of arrows at controls indicate clockwise rotation.

PRINTED CIRCUIT ASSEMBLIES

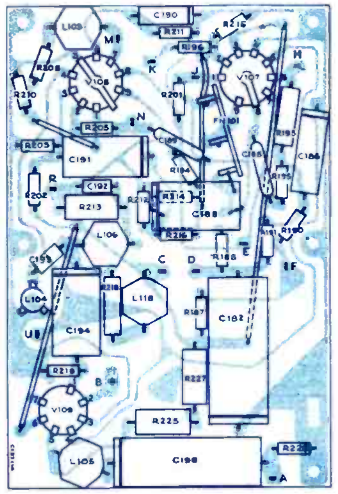


PC102—PICTURE I-F UNIT LAYOUT

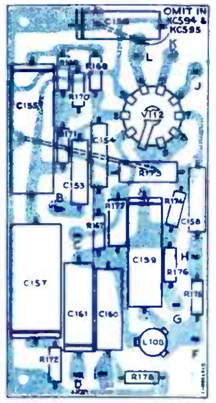
*PC101 Note: On Models without TV-PH Switch—C107 added, C117 omitted, C111 grounded, Terminal "E" added and Terminal "A" omitted.



PC101—SOUND I-F UNIT LAYOUT



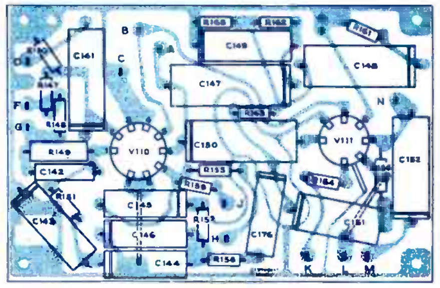
PC103—VIDEO & 1ST SYNC UNIT LAYOUT



PC105—HORIZONTAL OSCILLATOR UNIT LAYOUT

IMPORTANT WIRING NOTICE

Many of the wiring connections in these receivers employ a new type solderless wire-wrap connection. These connections consist of six or seven turns of tightly machine-wrapped wire around special square studs. They are both electrically and mechanically equal or superior to conventional soldered connections, and should not be considered to require soldering. However, where rewiring is required or the original tightly wrapped connection has once been unwound, conventional soldering methods must be used.



PC104—VERTICAL OSC. & SYNC OUTPUT UNIT LAYOUT

ALIGNMENT PROCEDURE

PICTURE I-F TRANSFORMER ADJUSTMENTS.—
Models 21-T-6082 to 21-T-6257 Incl.

Connect the i-f signal generator, in series with a 1500 mmf. ceramic capacitor, to the mixer grid test point **TP2**.

Connect the "VoltOhmyst" to the junction of R119 and R118 and to ground. Turn the noise limiter control fully counter-clockwise. Turn the AGC control fully clockwise.

NOTE:—Improper alignment will result if the above controls are not set as indicated. If the horizontal circuit is disabled during alignment, a bias of –20 volts must be applied to the grid, pin 2 of V108 and the AGC control must be fully clockwise to avoid damage to V107 and V108.

Obtain two 7.5 volt batteries capable of withstanding appreciable current drain and connect the ends of a 1,000 ohm potentiometer across each. Connect the battery positive terminal of one to the chassis and the potentiometer arm to the junction of R119 and R188. The second battey will be used later.

Set the bias to produce approximately –5.0 volt of bias at the junction of R119 and R188.

Connect the "VoltOhmyst" to the junction of terminal "G" of PC102 and to ground.

Set the VHF signal generator to each of the following frequencies and peak the specified adjustment for maximum indication on the "VoltOhmyst." During alignment, reduce the input signal if necessary in order to produce 3.0 volts of d-c at terminal "G" of PC102 with –5.0 volts of i-f bias at the junction of R119 and R188.

44.5 mc. T107
45.5 mc. T106
43.0 mc. T105

Set the VHF signal generator to the following frequency and adjust the picture i-f trap for minimum d-c output at terminal "G" of PC102. Use sufficient signal input to produce 3.0 volts of d-c on the meter when the adjustment is made.

47.25 mc. L101

Models 21-T-6082U to 21-6257U Incl.

Connect the i-f signal generator in series with a 1500 mmf. ceramic capacitor, to the mixer grid test point TP2.

Connect the "VoltOhmyst" to the junction of R119 and R188.

Turn the noise limiter control fully counter-clockwise. Turn the AGC control fully clockwise.

NOTE:—Improper alignment will result if the above controls are not set as indicated. If the horizontal circuit is disabled during alignment, a bias of –20 volts must be applied to the grid, pin 2, of V108 and the AGC control must be fully clockwise to avoid damage to V107 and V108.

Obtain a 7.5 volt battery capable of withstanding appreciable current drain and connect the ends of a 1,000 ohm potentiometer across it. Connect the battery positive terminal to chassis and the potentiometer arm to the junction R115 and R188. Adjust the potentiometer for –5.0 volts indication on the "VoltOhmyst."

Connect the "Volt-Ohmyst" to the junction of terminal "G" of PC102 and to ground.

Set the VHF generator to each of the following frequencies and with a thin fiber screwdriver tune the specified adjustment for maximum indication on the "VoltOhmyst." In each instance the generator should be checked against a crystal calibrator to insure that the generator is on frequency.

During alignment, reduce the input signal if necessary in order to produce 3.0 volts of d-c at terminal "G" of PC102 with –5.0 volts of i-f bias at the junction of R119 and R188.

44.5 mc. T107
45.5 mc. T106
43.0 mc. T105

Set the signal generator to the following frequency and adjust the picture i-f trap for minimum d-c output at terminal "G" of PC102. Use sufficient signal input to produce 3.0 volts of d-c on the meter when adjustment is made.

47.25 mc. L101

KRK22F TUNER ALIGNMENT.—
Models 21-T-6082 to 21-T-6257 Incl.

A tuner unit which is operative and requires only touch up adjustments, requires no presetting of adjustments. For such units, skip the remainder of this paragraph. For units which are completely out of adjustment, preset C2 all the way out. Set channel 7 to 13 oscillator slugs one turn from tight. Turn T1 slug all the way out. Do not change any of the adjustments in the antenna matching unit.

Disconnect the link from the terminals of T1 and shunt the terminals with a 39 ohm composition resistor.

Turn the receiver channel selector switch to channel 2.

The 43.5 mc. trap is adjusted with zero bias. To insure that the bias will remain constant, take a clip lead and short circuit the AGC terminal of the tuner at the terminal board to ground.

Connect the oscilloscope to the test point TP1 on top of the tuner unit. Set the oscilloscope to maximum gain.

Connect the output of the VHF signal generator to the output of the antenna matching unit at the junction of L53 and C24 at the bottom of the FM trap L53.

Tune the signal generator to 43.5 mc. and modulate it 30% with a 400 cycle sine wave. Adjust the signal generator for maximum output.

Adjust C19 on top of the tuner, for minimum 400 cycle indication on the oscilloscope. If necessary, this adjustment can be retouched in the field to provide additional rejection to one specific frequency in the i-f band pass. However, in such cases, care should be taken not to tune C19 into channel 2, thereby reducing sensitivity on channel 2.

Connect the potentiometer arm of one of the bias supplies to the AGC terminal on the tuner and ground the battery positive terminal to the tuner case. Adjust the bias potentiometer to produce –3.0 volts of bias, as measured by the "VoltOhmyst" at the AGC terminal on the tuner.

Set the channel selector switch to channel 8.

Preset C5 to read –3.0 volts at the test point TP1, as read on the "VoltOhmyst." The limits for oscillator injection voltage are 2 volts minimum and not exceeding a maximum of 5.5 volts.

Turn the fine tuning control fully clockwise.

(Continued on reverse side)

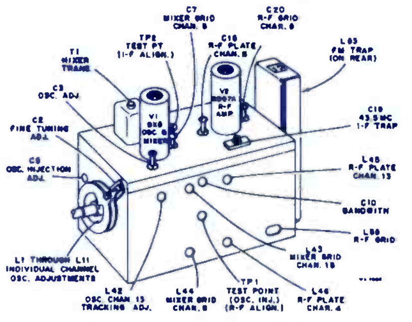
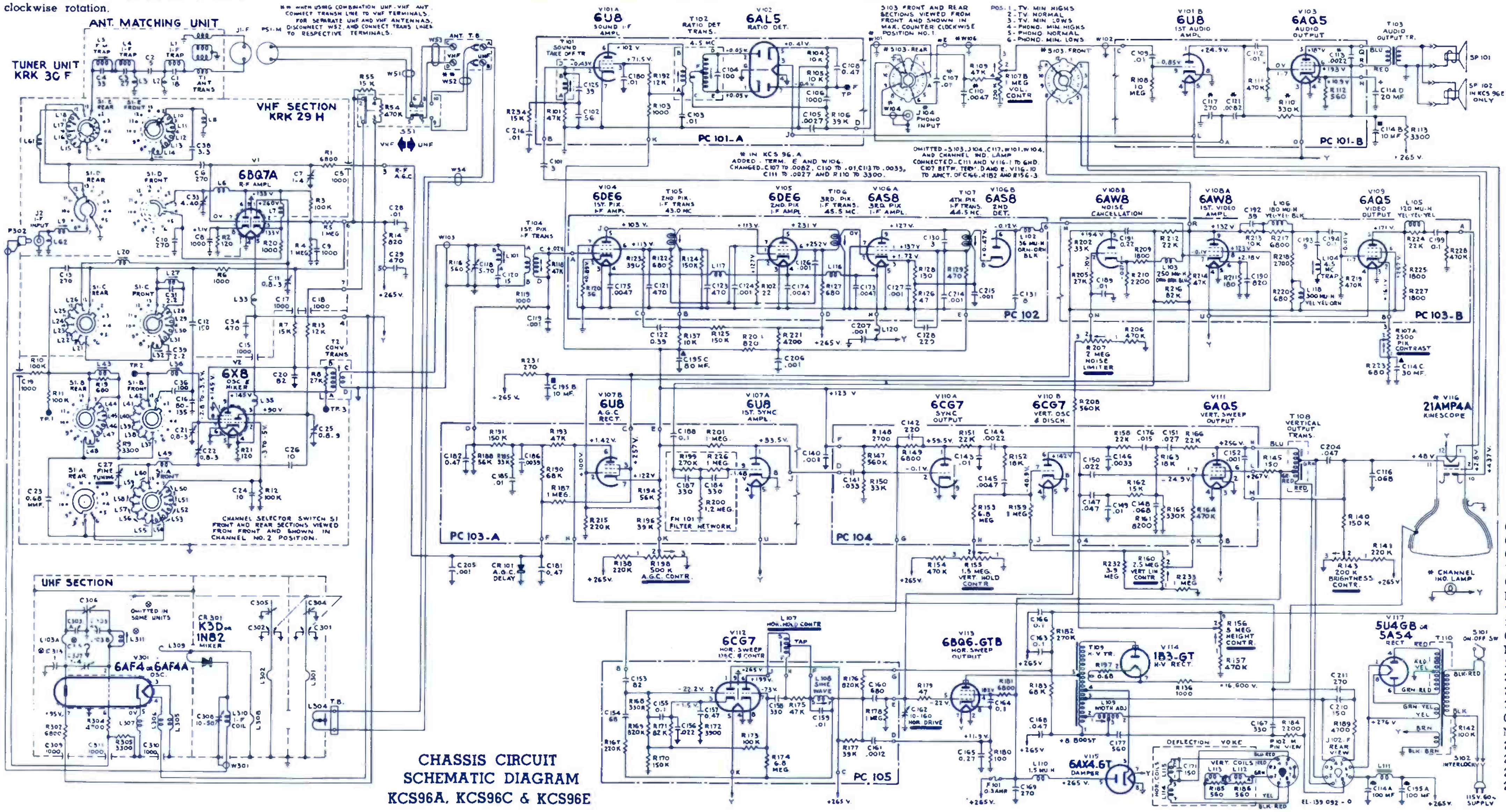


Figure 13—KRK22F Tuner Adjustments



CHASSIS CIRCUIT SCHEMATIC DIAGRAM
KCS96A, KCS96C & KCS96E

Chassis KCS96: Models 21-T-6082, 21-T-6083
Chassis KCS96A: Models 21-T-6082U, 21-T-6083U
Chassis KCS96B: Models 21-T-6114, 21-T-6115, 21-T-6117
Chassis KCS96C: Models 21-T-6114U, 21-T-6115U, 21-T-6117U
Chassis KCS96D: Models 21-T-6225, 21-T-6227, 21-T-6255, 21-T-6256, 21-T-6257
Chassis KCS96E: Models 21-T-6225U, 21-T-6227U, 21-T-6255U, 21-T-6256U, 21-T-6257U

RCA VICTOR
Chassis KCS96, KCS96A, KCS96B, KCS96C, KCS96D, KCS96E

Technician
CIRCUIT DIGEST
81

RCA VICTOR
Chassis KCS96, KCS96A, KCS96B, KCS96C, KCS96D, KCS96E

Technician
CIRCUIT DIGEST

ALIGNMENT PROCEDURE
(Continued from reverse side)

Adjust C3 for proper oscillator frequency, 227 mc. This may be done in several ways. The easiest way and the way which will be recommended in this procedure will be to use the signal generator as a heterodyne frequency meter and beat the oscillator against the signal generator. To do this, tune the signal generator to 227 mc. with crystal accuracy. Insert one end of a piece of insulated wire into the tuner unit through the hole provided for the adjustment of C10. Be careful that the wire does not touch any of the tuned circuits as it may cause the frequency of the tuner oscillator to shift. Connect the other end of the wire to the "r-f in" terminal of the signal generator. Adjust C3 to obtain an audible beat with the signal generator.

Turn C2 clockwise until the beat note just begins to change, then turn one full turn in the same clockwise direction.

Return the fine tuning control to the mechanical center of its range.

Note. If on some units, it is not possible to reach the proper channel 8 oscillator frequency by adjustment of C3, switch to channel 13 and adjust L42 to obtain proper channel 13 oscillator frequency as indicated in the table on page 8. Then, switch to channel 12 and adjust L11 to obtain proper channel 12 oscillator frequency. Continue down to channel 8, adjusting the appropriate oscillator trimmer to obtain the proper frequency on each channel. Then again on channel 8, adjust C3 to obtain proper channel 8 oscillator frequency. Switch back to channel 13 and readjust L42 and back to channel 8 and adjust C3.

Set the T1 core for maximum inductance (core turned counter-clockwise).

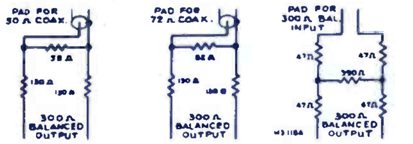


Figure 14—Sweep Attenuator Pads

Connect the sweep generator through a suitable attenuator, as shown in figure 15, to the input terminals of the antenna matching unit.

Connect the signal generator loosely to the antenna terminals.

Set the sweep generator to cover channel 8.

Set the oscilloscope to maximum gain and use the minimum input signal which will produce a usable pattern on the oscilloscope. Excessive input can change oscillator injection during alignment and produce consequent misalignment even though the response as seen on the oscilloscope may look normal.

Insert markers of channel 8 picture carrier and sound carrier, 181.25 mc. and 185.75 mc.

Adjust C7, C10, C15 and C20 for approximately correct curve shape, frequency, and band width as shown in figure 15.

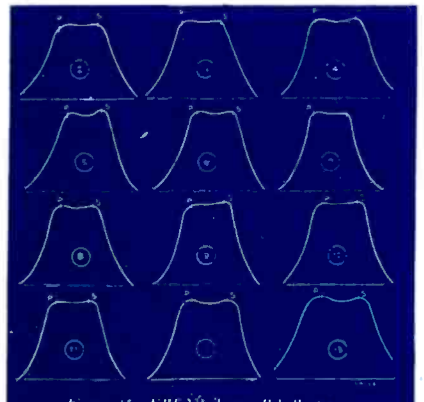


Figure 15—KRK22F Tuner R-F Responses

The correct adjustment of C20 is indicated by maximum amplitude of the curve midway between the markers. C15 tunes the r-f amplifier plate circuit and affects the frequency of the pass band most noticeably. C7 tunes the mixer grid circuit and affects the tilt of the curve most noticeably (assuming that C20 has been properly adjusted). C10 is the coupling adjustment and hence primarily affects the response band width.

Connect the "VoltOhmyst" to test point TP1. Adjust C5 to read -3.0 volts dc on the "VoltOhmyst" at TP1. Readjust C2, C7, C10 and C15 for proper response. Adjust C20 for maximum gain at midpoint of the curve. Repeat if necessary until the proper response is obtained.

Set the receiver channel switch to channel 13.

Adjust the signal generator to the channel 13 oscillator frequency 257 mc.

Turn the fine tuning control fully clockwise.

Adjust L42 to obtain an audible beat. Slightly overshoot the adjustment of L42 by turning the slug an additional turn in the same direction from the original setting, then reset the oscillator to proper frequency by adjusting C2 to again obtain the beat.

Set the sweep generator to channel 13.

From the signal generator, insert channel 13 sound and picture carrier markers, 211.25 mc. and 215.75 mc.

Adjust L43 and L45 for proper response as shown in figure 15.

Turn off the sweep and signal generators.

Connect the "VoltOhmyst" to the tuner test point TP1.

Check the oscillator injection voltage to be within limits as previously specified. Adjust if necessary to bring within range.

If it was necessary to readjust C5, turn the sweep and signal generators back on and recheck the channel 13 response. Readjust L43 and L45 if necessary.

Set the receiver channel selector switch to channel 8 and readjust C2 for proper oscillator frequency, 227 mc.

Set the sweep generator and signal generator to channel 8.

Readjust C7, C10, C15 and C20 for correct curve shape, frequency and band width.

Turn off the sweep and signal generators, switch back to channel 13 and check the oscillator injection voltage at TP1 if C7 was adjusted in the recheck of channel 8 response.

If the initial setting of the oscillator injection trimmer was far off, it may be necessary to adjust the oscillator frequency and response on channel 8, adjust the oscillator injection on channel 13 and repeat the tracking procedure several times before the proper setting is obtained.

Turn off the sweep generator and switch the receiver to channel 6.

Adjust the signal generator to the channel 6 oscillator frequency 129 mc.

Set the fine tuning control to the center of its mechanical range.

Adjust L5 for an audible beat. Adjust L44, L46 and L58 for proper curve shape as shown in figure 15. Recheck the oscillator injection voltage at TP1, to insure that it is within the limits specified. Readjust C5 if necessary.

If C5 required adjustment, switch the receiver and the signal generator to channel 8. Readjust C7 for correct curve shape and recheck C2 and C3 for proper oscillator frequency.

Check the response of channels 2 through 6 by switching the receiver channel switch, sweep generator and marker generator to each of these channels and observing the response and oscillator injection voltage obtained. See figure 15 for typical response curves. It should be found that all these channels have the proper response with the markers above 80% response.

If the markers fail to fall within this requirement readjust L44, L46 and L58 in order to obtain curves within the proper limits.

Switch the channel selector, signal generator and marker generator through channels 7 to 13 and observe the response curves, referring to figure 15 for proper wave shape. Check the injection voltage at each channel to be within limits. If necessary readjust C15, C7, or C10 to obtain the proper response.

With the receiver and signal generator on channel 13 adjust L42 for an audible beat with the signal generator.

Adjust the oscillator to frequency on all channels by switching the receiver and the frequency standard to each channel and adjusting the appropriate oscillator slug to obtain the audible beat. It should be possible to adjust the oscillator to obtain the audible beat on each channel. Recheck the oscillator injection voltage on each channel to verify that the voltage is within the specified limits.

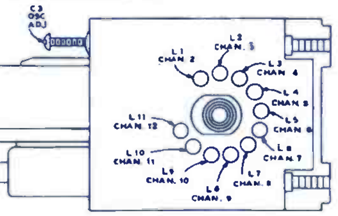


Figure 16—KRK22F Tuner Oscillator Adjustments

KRK22F or KRK30F ANTENNA MATCHING UNIT ALIGNMENT. The antenna matching unit is accurately aligned at the factory. Adjustment of this unit should not be attempted in the customer's home since even slight misalignment may cause serious attenuation of the signal especially on channel 2. The r-f unit is aligned with a particular antenna matching transformer in place. If for any reason, a new antenna matching transformer is installed, the r-f unit should be re-aligned.

The F-M Trap which is mounted in the antenna matching unit may be adjusted without adversely affecting the alignment of the unit.

To align the antenna matching unit disconnect the lead from the F-M trap L53 (L5) to the channel selector switch S1D (S1E).

With a short jumper, connect the output of the matching unit through a 1000 mmf. capacitor to the grid of the second pix i-f amplifier, pin 1 of V105.

Replace the cover on the matching unit while making all adjustments.

Remove the first pix i-f amplifier tube V104.

Connect the positive terminal of a bias box to the chassis and the potentiometer arm to the junction of R119 and R188. Set the potentiometer to produce approximately -5.0 volts of bias at the junction of R119 and R188.

Connect an oscilloscope to terminal "G" of PC104 and set the oscilloscope gain to maximum.

Connect a VHF signal generator to the antenna input terminals. Modulate the signal generator 30% with an audio signal.

Note.—Inductances in KRK30F matching units are not slug tuned and therefore must be knifed for adjustment except those units in which C1, C2 and C3 are variable.

Tune the signal generator to 45.75 mc. and adjust the generator output to give an indication on the oscilloscope. Adjust L4 or L54 (core or knife coil) or C3 in the antenna matching unit for minimum audio indication on the oscilloscope.

Tune the signal generator to 41.25 mc. and adjust L1 or L57 (core or knife coil) or C1 for minimum audio indication on the oscilloscope.

Remove the jumper from the output of the matching unit.

Connect a 300 ohm 1/2 watt composition resistor from L5 or L53 to ground, keeping the leads as short as possible.

Connect an oscilloscope low capacity crystal probe from L5 or L53 to ground. The sensitivity of the oscilloscope should be approximately 0.03 volts per inch. Set the oscilloscope gain to maximum.

Connect the VHF sweep generator to the matching unit antenna input terminals. In order to prevent coupling reactance from the sweep generator into the matching unit, it is advisable to employ a resistance pad at the matching unit terminals. Figure 14 shows three different resistance pads for use with sweep generators with 50 ohm co-ax output, 72-ohm co-ax output or 300 ohm balanced output. Choose the pad to match the output impedance of the particular sweep employed.

Connect the signal generator loosely to the matching unit antenna terminals.

Set the sweep generator to sweep from 45 mc. to 54 mc. With RCA Type WR59A sweep generators, this may be accomplished by retuning channel number 1 to cover this range. With WR59B sweep generators this may be accomplished by retuning channel number 2 to cover the range. In making these adjustments on the generator, be sure not to turn the core too far clockwise so that it becomes lost beyond the core retaining spring.

Adjust L2 or L56 and L3 or L55 (core or knife coil) or C2 to obtain the response shown in figure 18. L3 or L55 is most effective in locating the position of the shoulder of the curve at 52 mc. and L2 or L56 should be adjusted to give maximum amplitude at 53 mc. and above consistent with the specified shape of the response curve. The adjustments in the matching unit interact to some extent. Repeat the above procedure until no further adjustments are necessary. (Note.—Second harmonic output from the sweep generator may cause distortion of the response. Tune L5 or L53 F-M trap for maximum inductance to eliminate distortion when adjusting the matching unit. Be sure to return the L5 or L53 slug to its original position after adjusting the maching unit to prevent attenuation on channel 5 or 6.)

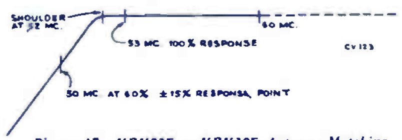


Figure 17—KRK22F or KRK30F Antenna Matching Unit Response

Restore the connection between L5 (L53) and S1D (S1E). Replace V104.

KRK30F TUNER ALIGNMENT
Models 21-T-6082U to 21-T-6257U Incl.

VHF ALIGNMENT.—A tuner unit which is operative and requires only touch up adjustments, requires no presetting of adjustments. For such units, skip the remainder of this paragraph. For units which are completely out of adjustment, preset C27 all the way out. Set channel 7 to 13 oscillator slugs one turn from tight. Turn T2 slug all the way out. Do not change any of the adjustments in the antenna matching unit.

Disconnect the link from the terminals of T2 shunt the terminals with a 39 ohm composition resistor.

Turn the receiver channel selector switch to channel 2.

The 43.5 mc. trap is adjusted with zero bias. To insure that the bias will remain constant, take a clip lead and short circuit the AGC terminal of the tuner at the terminal board to ground.

Connect the oscilloscope to the test point TP2 on top of the tuner unit. Set the oscilloscope to maximum gain.

Connect the output of the VHF signal generator to the output of the antenna matching unit at the junction of L5 and C4 at the bottom of the FM trap L5.

Tune the signal generator to 43.5 mc. and modulate it 30% with a 400 cycle sine wave. Adjust the signal generator for maximum output.

Adjust C33 on top of the tuner, for minimum 400 cycle indication on the oscilloscope. If necessary, this adjustment can be retouched in the field to provide additional rejection to one specific frequency in the i-f band pass. However, in such cases, care should be taken not to tune C33 into channel 2, thereby reducing sensitivity on channel 2.

Connect the potentiometer arm of one of the bias supplies to the AGC terminal on the tuner and ground the battery positive terminal to the tuner case. Adjust the bias potentiometer to produce -3.0 volts of bias, as measured by the "VoltOhmyst" at the AGC terminal on the tuner.

Set the channel selector switch to channel 8.

Preset C22 to read -3.0 volts at the test point TP1, as read on the "VoltOhmyst". The limits for oscillator injection voltage are 2 volts minimum and not exceeding a maximum of 5.5 volts.

Turn the fine tuning control fully clockwise.

Adjust C25 for proper oscillator frequency, 227 mc. This may be done in several ways. The easiest way and the way which will be recommended in this procedure will be to use the signal generator as a heterodyne frequency meter and beat the oscillator against the signal generator. To do this, tune the signal generator to 227 mc. with crystal accuracy. Insert one end of a piece of insulated wire into the tuner unit through the hole provided for the adjustment of C16. Be careful that the wire does not touch any of the tuned circuits as it may cause the frequency of the tuner oscillator to shift. Connect the other end of the wire to the "r-f" in terminal of the signal generator. Adjust C25 to obtain an audible beat with the signal generator.

Turn C27 clockwise until the beat note just begins to change, then turn one full turn in the same clockwise direction.

Return the fine tuning control to the mechanical center of its range.

NOTE:—If on some units, it is not possible to reach the proper channel 8 oscillator frequency by adjustment of C25, switch to channel 13 and adjust L49 to obtain proper channel 13 oscillator frequency as indicated in the table on page 8. Then, switch to channel 12 and adjust L60 to obtain proper channel 12 oscillator frequency. Continue down to channel 8, adjusting the appropriate oscillator trimmer to obtain the proper frequency of each channel. Then again on channel 8, adjust C25 to obtain proper channel 8 oscillator frequency. Switch back to channel 13 and readjust L49 and back to channel 8 and adjust C25.

Set the T2 core for maximum inductance (core turned counter-clockwise).

Connect the sweep generator through a suitable attenuator, as shown in figure 14 to the input terminals of the antenna matching unit.

Connect the signal generator loosely to the antenna terminals.

Set the sweep generator to cover channel 8.

Set the oscilloscope to maximum gain and use the minimum input signal which will produce a usable pattern on the oscilloscope. Excessive input can change oscillator injection during alignment and produce consequent misalignment even though the response as seen on the oscilloscope may look normal.

Insert markers of channel 8 picture carrier and sound carrier, 181.25 mc. and 185.75 mc.

Adjust C21, C16, C11 and C7 for approximately correct curve shape, frequency, and band width as shown in figure 18.

The correct adjustment of C7 is indicated by maximum amplitude of the curve midway between the markers. C11 tunes the r-f amplifier plate circuit and affects the frequency of the pass band most noticeably. C21 tunes the mixer grid circuit and affects the tilt of the curve most noticeably (assuming that C27 has been properly adjusted). C16 is the coupling adjustment and hence primarily affects the response band width.

Connect the "VoltOhmyst" to test point TP1. Adjust C22 to read -3.0 volts dc on the "VoltOhmyst" at TP1. Readjust C27, C21, C16 and C11 for proper response. Adjust C7 for maximum gain at midpoint of the curve. Repeat if necessary until the proper response is obtained.

Set the receiver channel switch to channel 13.

Adjust the signal generator to the channel 13 oscillator frequency 257 mc.

Turn the fine tuning control fully clockwise.

Adjust L49 to obtain an audible beat. Slightly overshoot the adjustment of L49 by turning the slug an additional turn in the same direction from the original setting, then reset the oscillator to proper frequency by adjusting C27 to again obtain the beat.

Set the sweep generator to channel 13.

From the signal generator, insert channel 13 sound and picture carrier markers, 211.25 mc. and 215.75 mc.

Adjust L36 and L20 for proper response as shown in figure 18.

Turn off the sweep and signal generators.

Connect the "VoltOhmyst" to the tuner test point TP1.

Check the oscillator injection voltage to be within limits as previously specified. Adjust if necessary to bring within range.

If it was necessary to readjust C22, turn the sweep and signal generators back and recheck the channel 13 response. Readjust L36 and L20 if necessary.

Set the receiver channel selector switch to channel 8 and readjust C27 for proper oscillator frequency, 227 mc.

Set the sweep generator and signal generator to channel 8.

Readjust C21, C16, C11 and C7 for correct curve shape, frequency and band width.

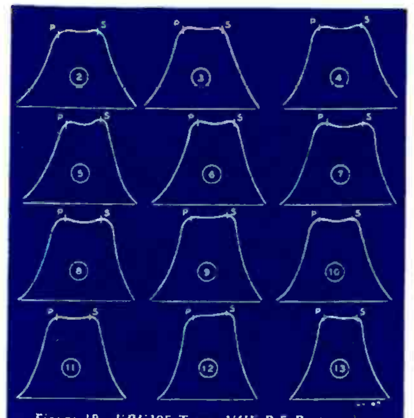


Figure 18—KRK30F Tuner VHF R-F Responses

Turn off the sweep and signal generators, switch back to channel 13 and check the oscillator injection voltage at TP1 if C21 was adjusted in the recheck of channel 8 response.

If the initial setting of the oscillator injection trimmer was far off it may be necessary to adjust the oscillator frequency and response on channel 8, adjust the oscillator injection on channel 13 and repeat the tracking procedure several times before the proper setting is obtained.

Turn off the sweep generator and switch the receiver to channel 6.

Adjust the signal generator to the channel 6 oscillator frequency 129 mc.

Set the fine tuning control to the center of its mechanical range.

Adjust L54 for an audible beat. Adjust L14, L48 and L32 for proper curve shape as shown in figure 18. Recheck the oscillator injection voltage at TP1, to insure that it is within the limits specified. Readjust C22 if necessary.

If C22 required adjustments, switch the receiver and the signal generator to channel 8. Readjust C21 for correct curve shape and recheck C27 and C25 for proper oscillator frequency.

Check the response of channels 2 through 6 by switching the receiver channel switch, sweep generator and marker generator to each of these channels and observing the response and oscillator injection voltage obtained. See figure 18 for typical response curves. It should be found that all these channels have the proper response with the markers above 80% response.

If the markers fail to fall within this requirement readjust L48 and L32 in order to obtain curves within the proper limits.

Switch the channel selector, signal generator and marker generator through channels 7 to 13 and observe the response curves, referring to figure 18 for proper wave shape. Check the injection voltage at each channel to be within limits. If necessary readjust C11, C21 or C16 to obtain the proper response.

With the receiver and signal generator on channel 13 adjust L49 for an audible beat with the signal generator.

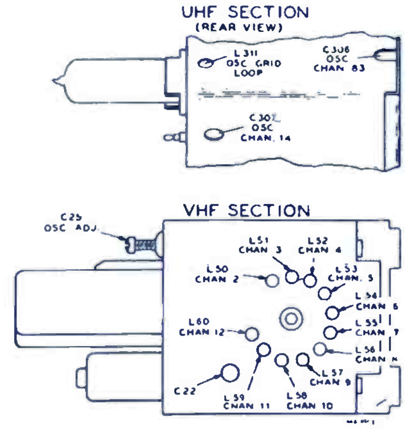


Figure 20—KRK30F Tuner Oscillator Adjustments

Adjust the oscillator to frequency on all channels by switching the receiver and the frequency standard to each channel and adjusting the appropriate oscillator slug to obtain the audible beat. It should be possible to adjust the oscillator to obtain the audible beat on each channel. Recheck the oscillator injection voltage on each channel to verify that the voltage is within the specified limits.

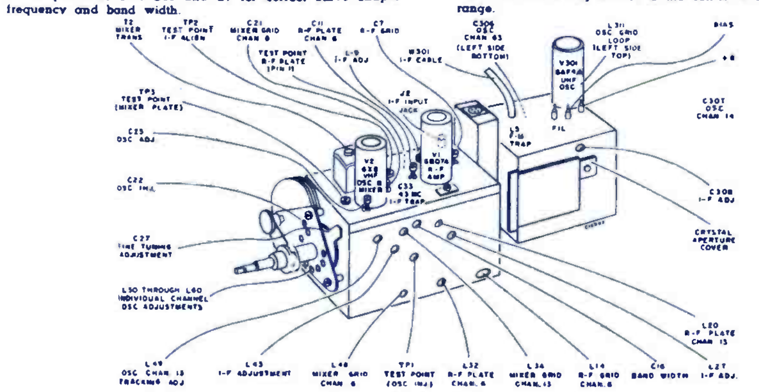


Figure 19—KRK30F Tuner Adjustments

VOLTAGE CHART

The following measurements represent two sets of conditions. In the first condition, a 30,000 microvolt test pattern signal was fed into the receiver, the picture synchronized and the AGC control properly adjusted. The second condition was obtained by removing the antenna leads and short circuiting the receiver antenna terminals. Voltages shown are read with a type WV97A senior "VoltOhmyst" between the indicated terminal and chassis ground and with the receiver operating on 117 volts, 60 cycles, a-c.

Tube No.	Tube Type	Function	Operating Condition	E Plate Pin No.	E Plate Volts	E Screen Pin No.	E Screen Volts	E Cathode Pin No.	E Cathode Volts	E Grid Pin No.	E Grid Volts	I Plate (ma.)	I Screen (ma.)	Notes on Measurements
V1 (V2) KRK22F or KRK30F	6X8	Mixer	30,000 Mu. V. Signal	6	140	6	140	8	0	7	-2.4 to -3.0	—	—	
			No Signal	6	145	6	145	8	0	7	-1.8 to -3.5	—	—	
		R-F Oscillator	30,000 Mu. V. Signal	3	85	—	—	8	0	2	-3.8 to -6.5	—	—	
			No Signal	3	60	—	—	8	0	2	-3.0 to -6.1	—	—	
V2 (V1) KRK22F or KRK30F	6BQ7A	R-F Amplifier	30,000 Mu. V. Signal	6	175	—	—	8	0.1	7		—	—	
			No Signal	6	130	—	—	8	1.1	7	0	—	—	
		R-F Amplifier	30,000 Mu. V. Signal	1	270	—	—	3	170	2	—	—	—	
			No Signal	1	200	—	—	3	133	2	—	—	—	
V101A	6U8	Sound I-F Amp.	30,000 Mu. V. Signal	6	*118	3	78	7	0	2	*-0.8	0.11	3.50	*Measured with 1 Megohm, 1/2 watt resistor in series with probe
			No Signal	6	*108	3	71.5	7	0	2	*-0.43	7.75	2.45	
V101B	6U8	1st Audio Amp.	30,000 Mu. V. Signal	1	33.2	—	—	8	0	9	-0.80	0.16	—	
			No Signal	1	34.8	—	—	8	0	9	-0.86	0.16	—	
V102	6AL5	Ratio Detector	30,000 Mu. V. Signal	2 / 7	*-4.75 / -4.7	—	—	5 / 1	4.25 / -4.75	—	—	0.20 / 0.20	—	*Measured with 1 Megohm, 1/2 watt resistor in series with probe
			No Signal	2 / 7	*0.05 / -0.08	—	—	5 / 1	0.41 / *0.05	—	—	0.03 / 0.03	—	
V103	6AQ5	Audio Output	30,000 Mu. V. Signal	5	180	6	180	2	11	1	0	21.6	1.57	At min. volume
			No Signal	5	187	6	183	2	10.9	1	0	21.8	1.55	
V104	6DE6	1st Pix. I-F Amplifier	30,000 Mu. V. Signal	5	*130	6	140	2	0.85	1	-0.45	6.07	0.21	
			No Signal	5	*180	6	113	2	0.80	1	*0.02	11.6	2.4	
V105	6DE6	2nd Pix. I-F Amplifier	30,000 Mu. V. Signal	5	*240	6	271	2	130	1	*122	0.53	0.14	*Measured with 1 Megohm, 1/2 watt resistor in series with probe
			No Signal	5	*231	6	263	2	127	1	*119	11.9	3.05	
V106A	6AN8	3rd Pix. I-F Amplifier	30,000 Mu. V. Signal	6	*121	1	142	3	1.82	2	*0	7.07	1.33	
			No Signal	6	*127	1	137	3	1.72	2	*0	7.10	1.22	
V106B	6AN8	2nd Det.	30,000 Mu. V. Signal	6	-1.10	—	—	8	*0.40	—	—	0.30	—	
			No Signal	6	-0.12	—	—	8	*0.07	—	—	0.03	—	
V107A	6U8	1st Sync. Amp.	30,000 Mu. V. Signal	1	36	—	—	8	0	9	-10.8	0.11	—	
			No Signal	1	33.5	—	—	8	0	9	-1.40	0.11	—	

VOLTAGE CHART

Tube No.	Tube Type	Function	Operating Condition	E Plate Pin No.	E Plate Volts	E Screen Pin No.	E Screen Volts	E Cathode Pin No.	E Cathode Volts	E Grid Pin No.	E Grid Volts	I Plate (ma.)	I Screen (ma.)	Notes on Measurements
V107B	6U8	AGC Rectifier	30,000 Mu. V. Signal	6	-38.4	3	282	7	133	2	120	0.27	—	AGC control set for normal operation
			No Signal	6	1.42	3	237	7	123	2	100	0	0.34	
V108A	6AW8	1st Video Amp.	30,000 Mu. V. Signal	6	140	8	133	8	1.06	7	-1.21	6.02	0	
			No Signal	6	133	8	123	8	2.10	7	-0.11	8.80	1.42	
V108B	6AW8	Noise Cancellation	30,000 Mu. V. Signal	3	160	—	—	1	-0.80	2	-10.8	0	2.18	
			No Signal	3	184	—	—	1	-0.07	2	-10.9	0	—	
V109	6AQ5	Video Output	30,000 Mu. V. Signal	5	177	6	262	2	10.9	1-7	0.01	22.1	—	At maximum contrast
			No Signal	5	171	6	257	2	10.1	1-7	-0.01	21.8	2.44	
V110A	6CG7	Sync. Output	30,000 Mu. V. Signal	1	66.5	—	—	3	0	2	-1.40	7.75	2.80	
			No Signal	1	60.5	—	—	3	0	2	0.10	7.20	—	
V110B	6CG7	Vert. Osc. & Discharge	30,000 Mu. V. Signal	6	160	—	—	8	0	7	-42.3	.27	—	
			No Signal	6	143	—	—	8	0	7	-40.9	.30	—	
V111	6AQ5	Vertical Output	30,000 Mu. V. Signal	5	262	6	272	2	0	1	-35.5	21.8	2.83	
			No Signal	5	280	6	267	2	0	1	-34.9	21.6	2.8	
V112	6CG7	Horizontal Osc. Control	30,000 Mu. V. Signal	1	272	—	—	3	2.75	2	-32.9	0.33	—	
			No Signal	1	280	—	—	3	-1.20	2	-32.2	0.31	—	
		Horizontal Oscillator	30,000 Mu. V. Signal	6	260	—	—	8	0	7	-72.8	2.8	—	
			No Signal	6	160	—	—	8	0	7	-73.8	2.83	—	
V113	6BQ6 GTB	Horizontal Output	30,000 Mu. V. Signal	Cap	†127	4	160	8	12.2	5	-62.5	90.3	11.7	†High Voltage Pulse Present 100 Megs. in series with VTVM
			No Signal	Cap	†128	4	160	8	11.8	5	-62.0	94.5	11.5	
V114	1B3GT	H. V. Rectifier	30,000 Mu. V. Signal	Cap	†	—	—	2 & 7	17,000	—	—	0.10	—	†High Voltage Pulse Present
			No Signal	Cap	†	—	—	2 & 7	16,000	—	—	0.05	—	
V115	6AX4GT	Damper	30,000 Mu. V. Signal	5	272	—	—	3	†130	—	—	100	—	†High Voltage Pulse Present 100 Megs. in series with VTVM
			No Signal	5	280	—	—	3	†130	—	—	91	—	
V116	21AMP4A	Kinescope	30,000 Mu. V. Signal	Cone	17,000	10	440	11	50	2	2.8	0.10	0	At average brightness
			No Signal	Cone	16,000	10	437	11	48	2	1.8	0.05	0	
V117	5U4GB or 5AS4	Rectifier	30,000 Mu. V. Signal	4 & 6	—	—	—	2 & 8	282	—	—	250	—	
			No Signal	4 & 6	—	—	—	2 & 8	270	—	—	200	—	

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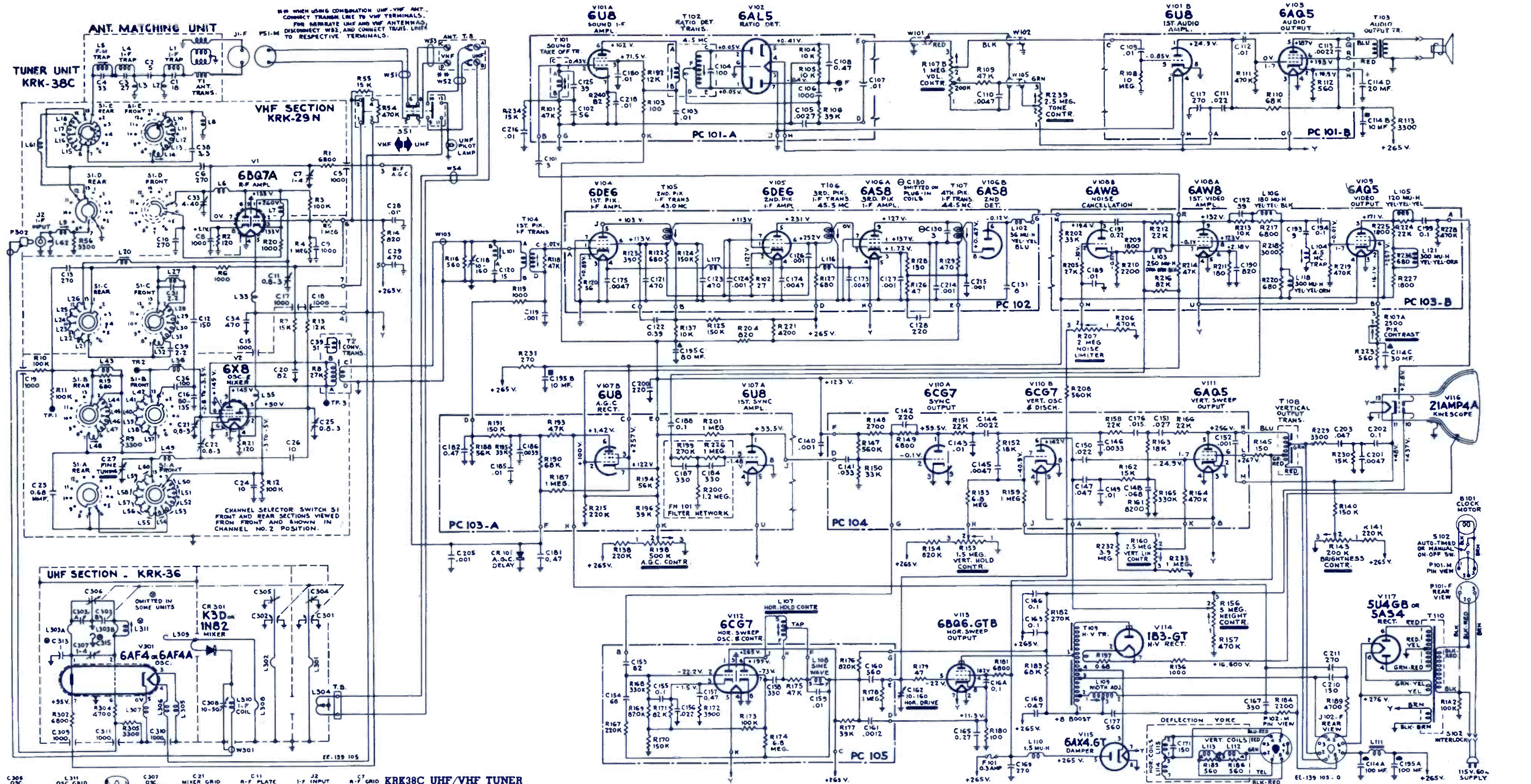
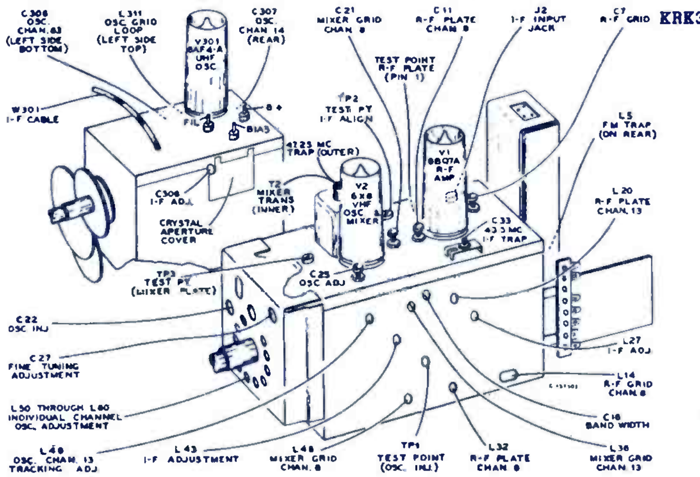
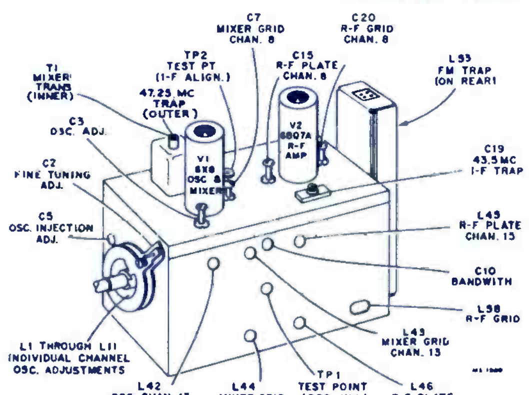
TECHNICIAN CIRCUIT DIGEST

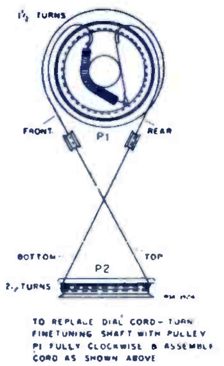
RCA-VICTOR
Clock TV
Chassis KCS101, KCS101A

Chassis KCS101, KCS101A: Models 21-T-639, 21-T-639U

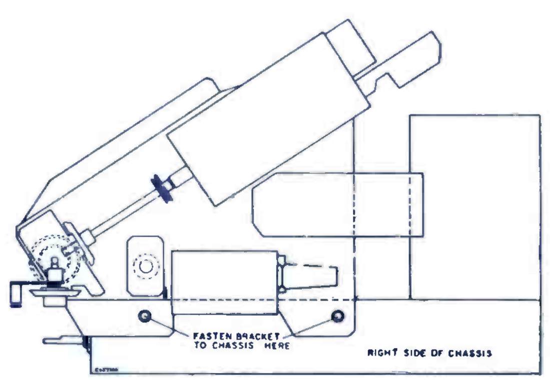








DIAL CORD



TUNER BRACKET FASTENED TO CHASSIS

The schematic is shown in the latest condition at the time of printing.
All resistance value in ohms. K = 1000.

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

All voltages measured with "VoltOhmyst" ® and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

Direction of arrows at controls indicates clockwise rotation.

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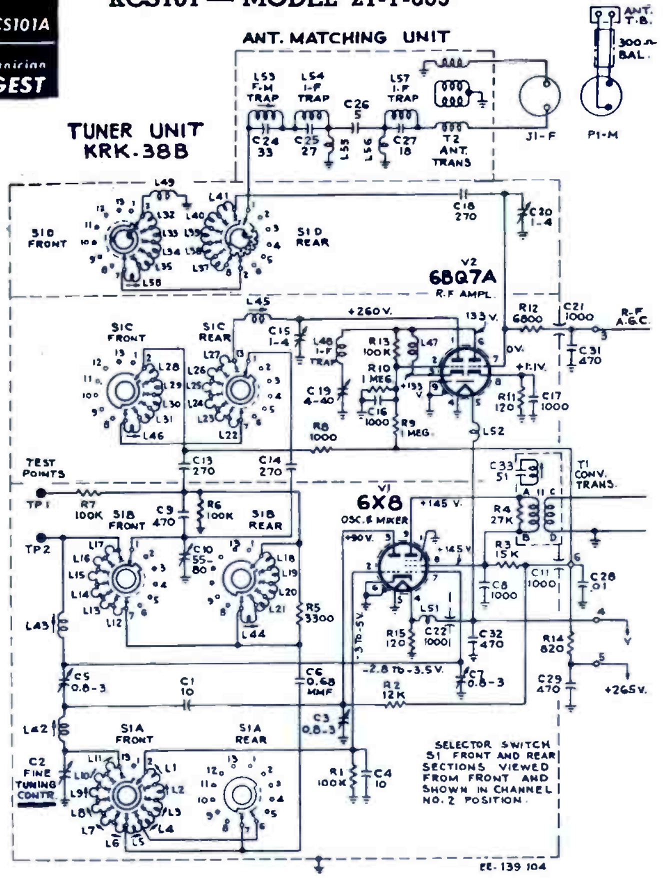
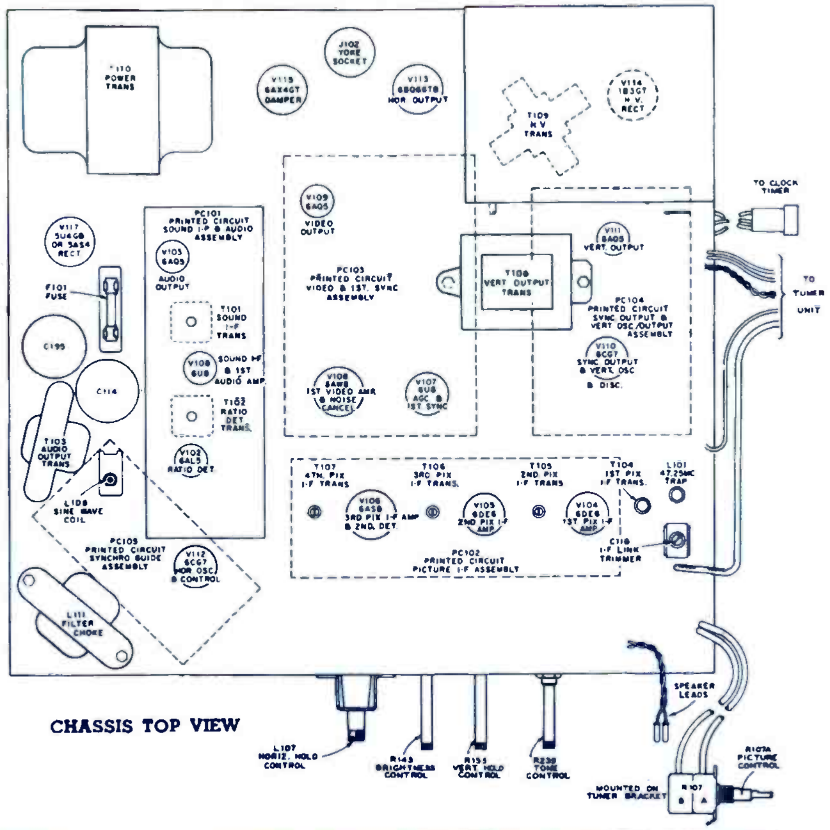
RCA-VICTOR
Clock TV
Chassis KCS101, KCS101A

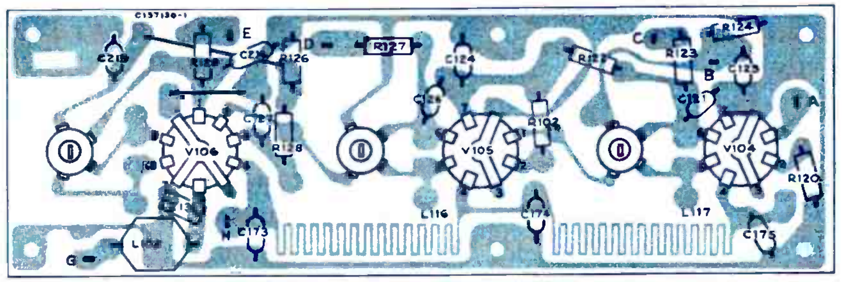
Technician **CIRCUIT DIGEST**

TUNER CIRCUIT SCHEMATIC DIAGRAM
KCS101 — MODEL 21-T-639





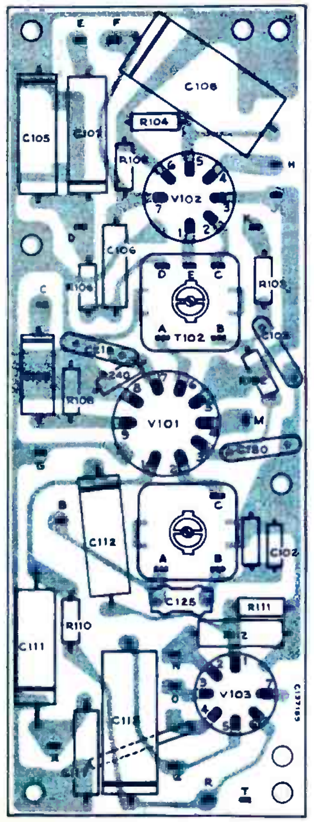
CHASSIS TOP VIEW



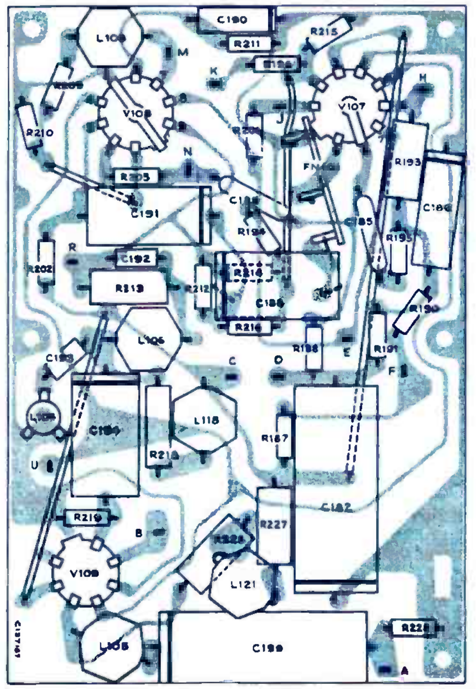
PC102—PICTURE I-F UNIT LAYOUT

(See Note below)

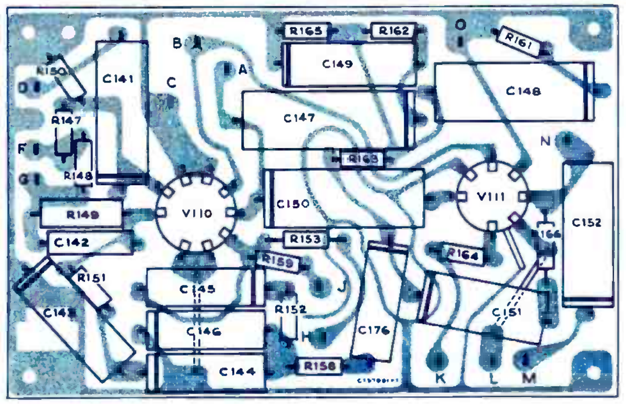
PRINTED CIRCUIT ASSEMBLIES



PC-101—SOUND I-F & AUDIO UNIT LAYOUT



PC-103—VIDEO & 1ST SYNC UNIT LAYOUT



PC-104—VERTICAL & SYNC OUTPUT UNIT LAYOUT

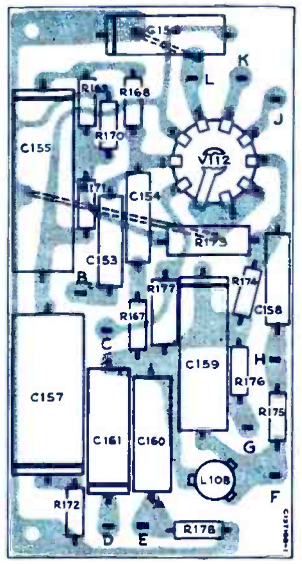
The assemblies represented above are viewed from the component side of the boards and are oriented as they will usually be viewed on the chassis.

The printed writing, on the reverse side of the boards, is presented in "phantom" views super-imposed on the component layouts. This will enable circuit tracing without removing the assemblies from the chassis to see the printed wiring on the reverse side.

Component replacement, when necessary, should be made following the techniques outlined in Printed Circuit Board Service Data 1955 No. T13 dated 11/15/55.

SPECIAL NOTE: Some receivers employ PC102 picture I.F. boards with printed coils for T105, T106 & T107 (for replacement use 76433 coil with 47,000 ohm resistor 502347 across plate and screen when used as T106).

Some receivers employ PC102 picture I.F. boards with plug-in coils for T105, T106 & T107 (for replacement use 101588 coil).



PC105—HORIZONTAL OSCILLATOR UNIT LAYOUT

VOLTAGE CHART

Measurements on this voltage chart represent two conditions. First, a 30,000 microvolt test pattern signal was fed to the receiver, and sync and AGC adjusted. Second condition was obtained by shorting antenna terminals. Voltages shown are between terminal and chassis.

Tube No.	Tube Type	Function	Operating Condition	E Plate Pin No.	E Plate Volts	E Screen Pin No.	E Screen Volts	E Cathode Pin No.	E Cathode Volts	E Grid Pin No.	E Grid Volts	I Plate (ma.)	I Screen (ma.)	Notes on Measurements
V1 (V2) KRK38B or KRK38C	6X8	Mixer	30,000 Mu. V. Signal	8	180	8	180	6	0	7	-2.4 to -3.0	—	—	
			No Signal	8	145	8	145	6	0	7	-2.8 to -3.5	—	—	
		R-F Oscillator	30,000 Mu. V. Signal	3	95	—	—	6	0	2	-3.8 to -5.5	—	—	
			No Signal	3	90	—	—	6	0	2	-3.0 to -5.1	—	—	
V2 (V1) KRK38B or KRK38C	6BQ7A	R-F Amplifier	30,000 Mu. V. Signal	6	170	—	—	8	0.1	7		—	—	
			No Signal	6	133	—	—	8	1.1	7	0	—	—	
		R-F Amplifier	30,000 Mu. V. Signal	1	270	—	—	3	170	2	—	—	—	
			No Signal	1	260	—	—	3	133	2	—	—	—	
V101A	6U8	Sound I-F Amp.	30,000 Mu. V. Signal	6	*110	3	78	7	0	2	*-0.6	8.11	3.58	*Measured with 1 Megohm, ½ watt resistor in series with probe
			No Signal	6	*102	3	71.5	7	0	2	*-0.43	7.75	3.45	
V101B	6U8	1st Audio Amp.	30,000 Mu. V. Signal	1	25.2	—	—	8	0	9	-0.88	0.56	—	
			No Signal	1	24.9	—	—	8	0	9	-0.85	0.55	—	
V102	6AL5	Ratio Detector	30,000 Mu. V. Signal	2 7	-0.75 -3.7	— —	— —	5 1	4.25 -0.75	— —	— —	0.29 0.29	— —	*Measured with 1 Megohm, ½ watt resistor in series with probe
			No Signal	2 7	*0.05 -0.40	— —	— —	5 1	0.41 *0.05	— —	— —	0.03 0.03	— —	
V103	6AQ5	Audio Output	30,000 Mu. V. Signal	5	190	6	198	2	11	1	0	21.8	1.57	At min. volume
			No Signal	5	187	6	193	2	10.9	1	0	21.0	1.55	
V104	6DE6	1st Pix. I-F Amplifier	30,000 Mu. V. Signal	5	*128	6	140	2	0.05	1	*-5.45	0.87	0.21	*Measured with 1 Megohm, ½ watt resistor in series with probe
			No Signal	5	*100	6	113	2	0.89	1	*0.02	11.6	3.4	
V105	6DE6	2nd Pix. I-F Amplifier	30,000 Mu. V. Signal	5	*249	6	271	2	150	1	*132	0.52	0.14	
			No Signal	5	*231	6	252	2	127	1	*113	11.9	3.05	
V106A	6AS8	3rd Pix. I-F Amplifier	30,000 Mu. V. Signal	8	*131	1	142	3	1.82	2	*0	7.67	2.33	
			No Signal	8	*127	1	137	3	1.72	2	*0	7.16	2.22	
V106B	6AS8	2nd Det.	30,000 Mu. V. Signal	6	-1.19	—	—	8	*0.48	—	—	0.38	—	
			No Signal	6	-0.12	—	—	8	*0.47	—	—	0.03	—	
V107A	6U8	1st Sync. Amp.	30,000 Mu. V. Signal	1	35	—	—	8	0	9	-10.8	0.11	—	
			No Signal	1	33.5	—	—	8	0	9	-1.68	0.11	—	
V107B	6U8	AGC Rectifier	30,000 Mu. V. Signal	6	-38.4	3	262	7	133	2	120	0.37	—	AGC control set for normal operation
			No Signal	6	1.42	3	257	7	122	2	100	0	0.24	
V108A	6AW8	1st Video Amp.	30,000 Mu. V. Signal	9	168	9	133	6	1.66	7	-1.21	6.08	0	
			No Signal	9	132	9	123	8	2.18	7	-0.11	8.90	1.42	
V108B	6AW8	Noise Cancellation	30,000 Mu. V. Signal	3	198	—	—	1	-0.68	2	-10.0	0	2.10	
			No Signal	3	194	—	—	1	-0.07	2	-10.0	0	—	
V109	6AQ5	Video Output	30,000 Mu. V. Signal	5	177	6	262	2	18.8	1-7	0.01	22.1	—	At maximum contrast
			No Signal	5	171	6	257	2	18.1	1-7	-0.01	21.6	3.44	
V110A	6CG7	Sync. Output	30,000 Mu. V. Signal	1	65.5	—	—	3	0	2	-1.48	7.75	2.89	
			No Signal	1	59.5	—	—	3	0	2	0.10	7.30	—	
V110B	6CG7	Vert. Osc. & Discharge	30,000 Mu. V. Signal	6	140	—	—	8	0	7	-42.2	.27	—	
			No Signal	6	142	—	—	8	0	7	-40.8	.26	—	
V111	6AQ5	Vertical Output	30,000 Mu. V. Signal	5	262	6	272	2	0	1	-25.5	21.9	3.82	
			No Signal	5	256	6	267	2	0	1	-24.9	21.9	3.9	
V112	6CG7	Horizontal Osc. Control	30,000 Mu. V. Signal	1	272	—	—	3	2.75	2	-23.2	0.33	—	
			No Signal	1	265	—	—	3	-1.50	2	-22.2	0.32	—	
		Horizontal Oscillator	30,000 Mu. V. Signal	6	206	—	—	8	0	7	-73.0	2.9	—	
			No Signal	6	199	—	—	8	0	7	-73.0	2.82	—	
V113	6BQ6 GTB	Horizontal Output	30,000 Mu. V. Signal	Cap	†137	4	189	8	12.2	5	-22.5	98.3	11.7	†High Voltage Pulse Present (40 Megs. in series with VTVM)
			No Signal	Cap	†135	4	182	8	11.9	5	-22.0	94.5	11.5	
V114	1B3GT	H. V. Rectifier	30,000 Mu. V. Signal	Cap	†	—	—	2 & 7	17,000	—	—	0.10	—	†High Voltage Pulse Present
			No Signal	Cap	†	—	—	2 & 7	16,600	—	—	0.05	—	
V115	6AX4GT	Damper	30,000 Mu. V. Signal	5	272	—	—	3	†132	—	—	100	—	†High Voltage Pulse Present (40 Megs. in series with VTVM)
			No Signal	5	265	—	—	3	†130	—	—	91	—	
V116	21AMP4A	Kinescope	30,000 Mu. V. Signal	Cone	17,000	10	445	11	59	2	28	0.10	0	At average Brightness
			No Signal	Cone	16,600	10	437	11	48	2	28	0.05	0	
V117	5U4GB or 5AS4	Rectifier	30,000 Mu. V. Signal	4 & 6	—	—	—	2 & 8	282	—	—	250	—	
			No Signal	4 & 6	—	—	—	2 & 8	276	—	—	266	—	

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The schematic is shown in the latest condition at the time of printing.

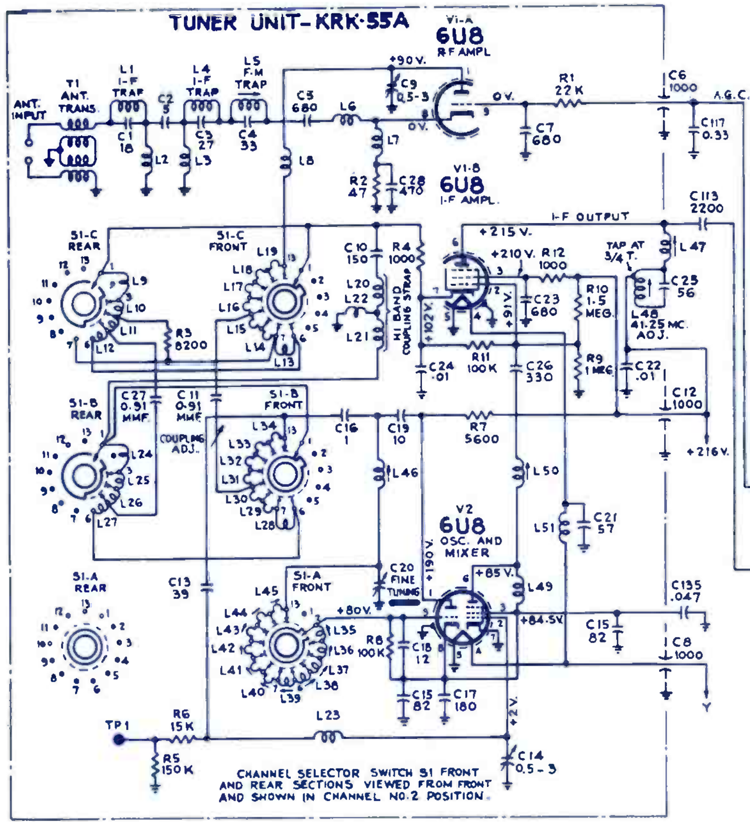
All resistance value in ohms. K = 1000.

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

Direction of arrows at controls indicates clockwise rotation.

All voltages measured with "Volt-Ohmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

Chassis KCS100B: Models 8-PT-7030, 8-PT-7031, 8-PT-7034



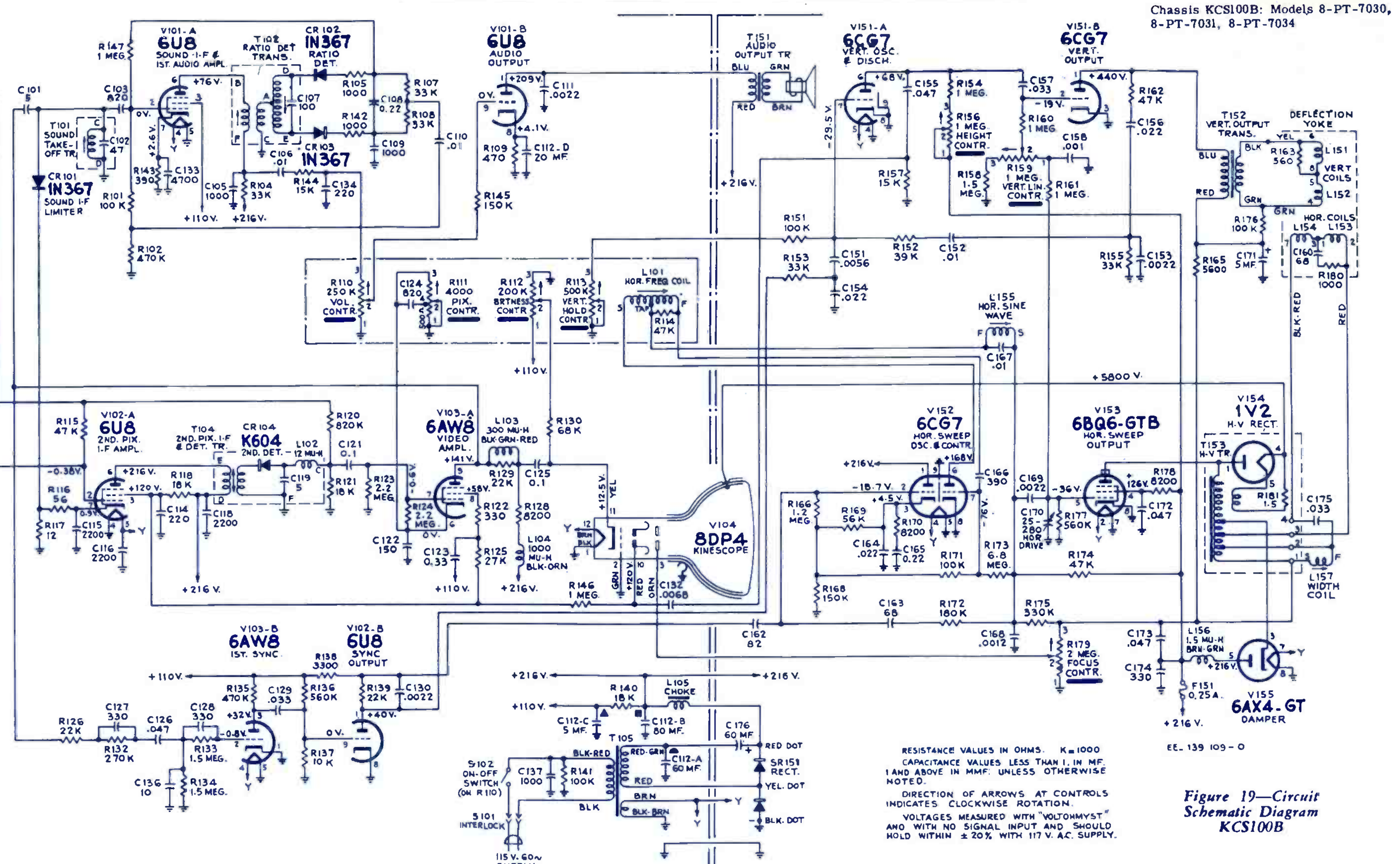


Figure 19—Circuit Schematic Diagram KCS100B

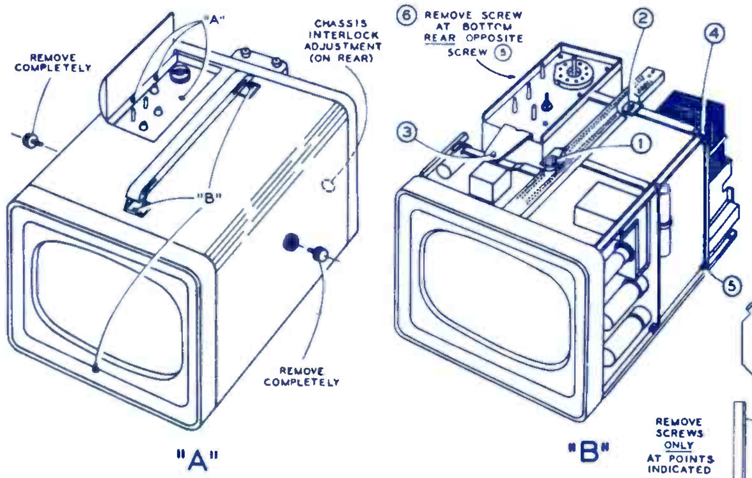
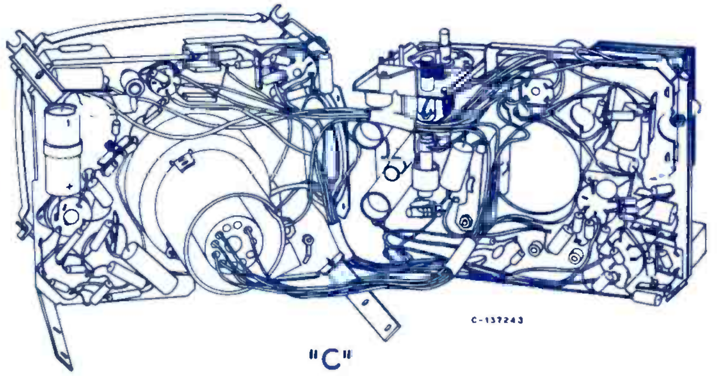
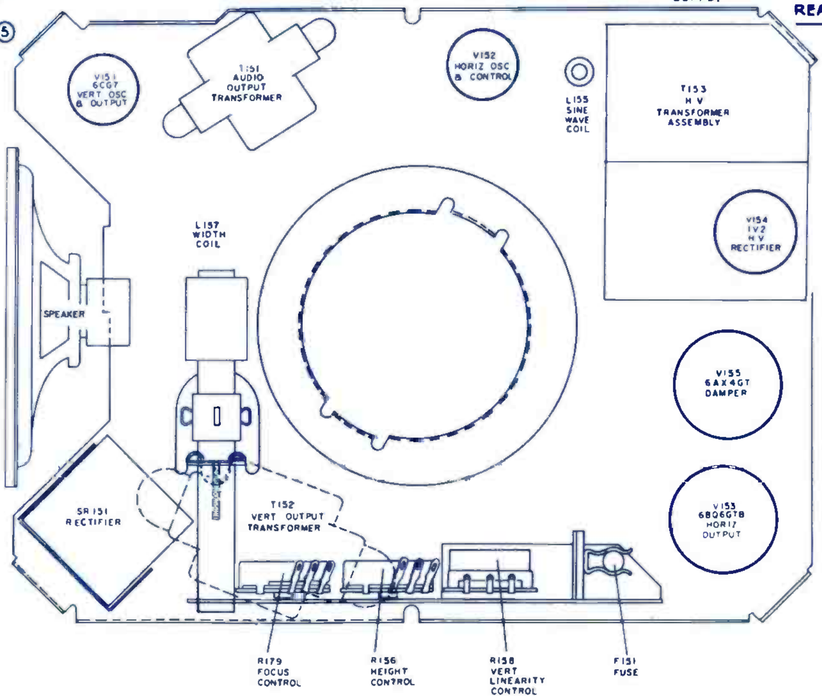


Figure 2—Chassis Removal





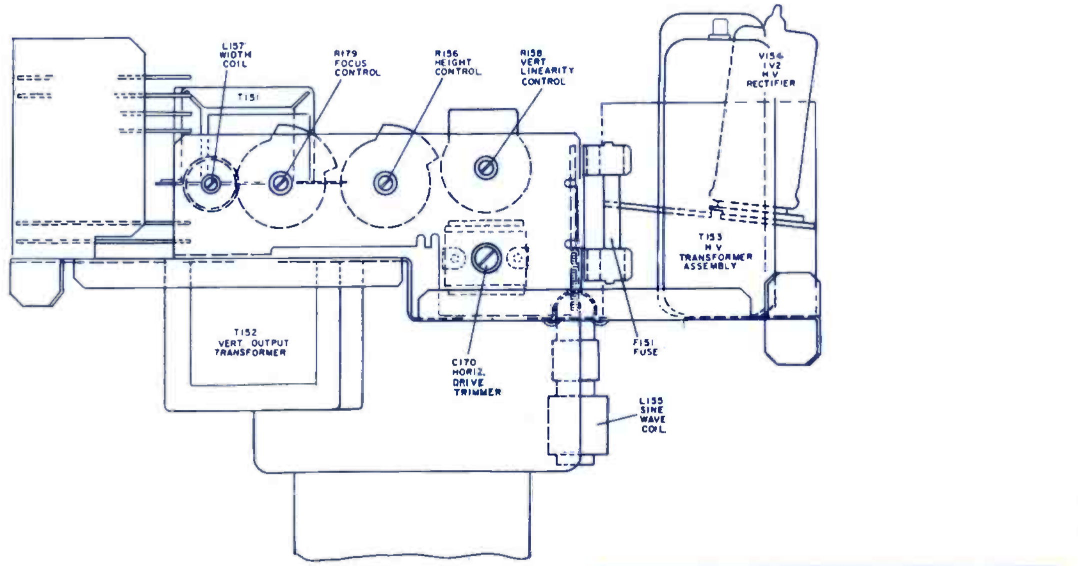


Figure 6—Front Chassis (Tube side)

RCA VICTOR
Chassis KCS100B

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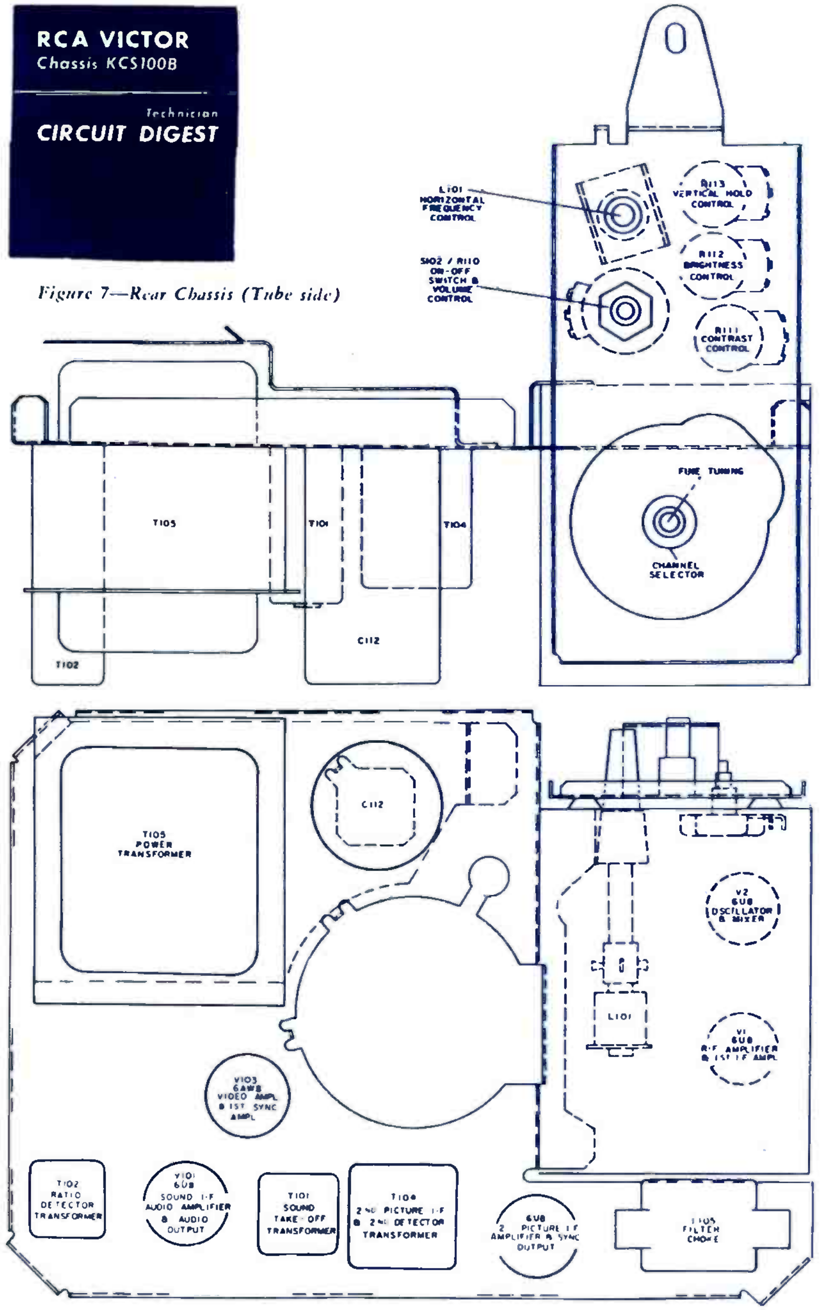
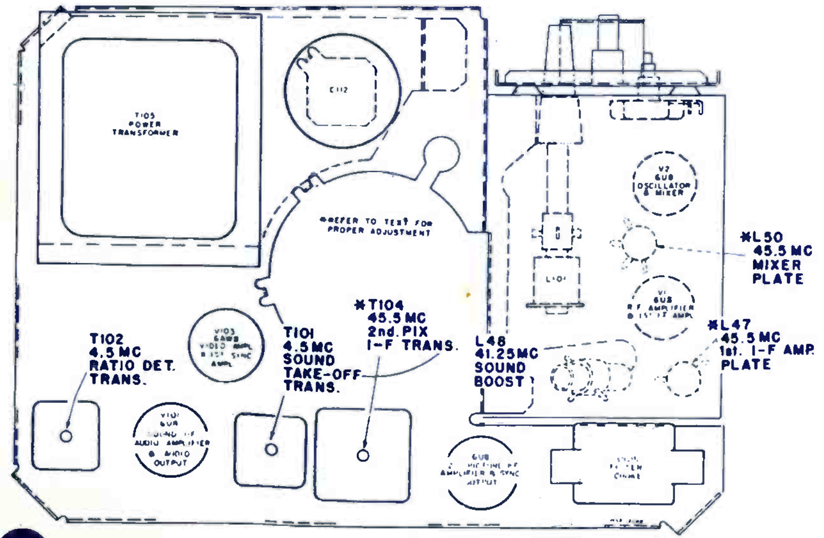


Figure 7—Rear Chassis (Tube side)

Figure 18—Alignment Adjustments (All on rear chassis)



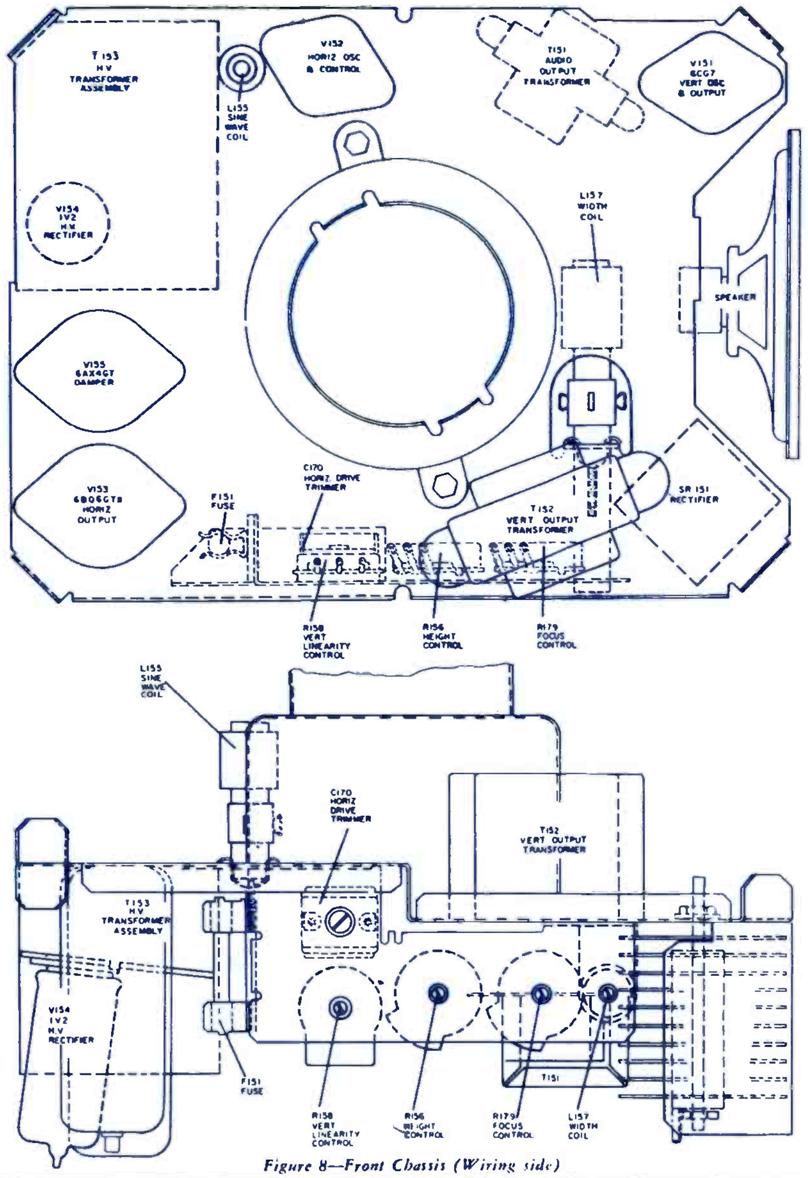


Figure 8—Front Chassis (Wiring side)

INSTALLATION INSTRUCTIONS

TUBE REPLACEMENT.—The receiver chassis must be removed from the cabinet for replacement of tubes. Follow instructions under CHASSIS REMOVAL below.

Refer to CHASSIS SERVICING when tube replacement in the tuner unit is required.

ADJUSTMENT LOCATION.—The adjustments for Vertical Linearity, Height, Focus, Width and Horizontal Drive are accessible from the bottom of the receiver cabinet. Their locations are shown in Figure 6.

Adjustments for the R-F oscillator require removal of the control knob cover and case assembly as outlined under CHASSIS REMOVAL.

The adjustment of the 41.25 mc. Sound Boost, F-M Trap, Ion Trap Magnet, Yoke and Centering Magnets require removal of the receiver chassis from the cabinet.

CHASSIS REMOVAL.—The chassis must be removed from the cabinet to replace tubes or the kinescope and to perform certain adjustments as explained above.

Take the receiver off its stand and completely remove the two knurled screws at the sides of the cabinet. Never attempt to remove the chassis unless these two screws are completely removed, as their projection inside the cabinet may result in internal damage as the chassis is pulled from the case. See Figure 2A.

Remove the knobs on the controls located in the cover and case assembly and take out the three screws holding the assembly to the cabinet. Their location is indicated at "A" in Figure 2A. Lift the control case and cover directly upward to remove.

Take off the carrying handle by removing the two screws at the ends of the handle. Also, remove the screw at the bottom front edge of the receiver case. These three screws are indicated in Figure 2A at "B."

Slide the chassis assembly, which includes the front frame and kinescope, out of the receiver cabinet. The antenna and A.C. interlock will automatically disengage as the chassis is removed.

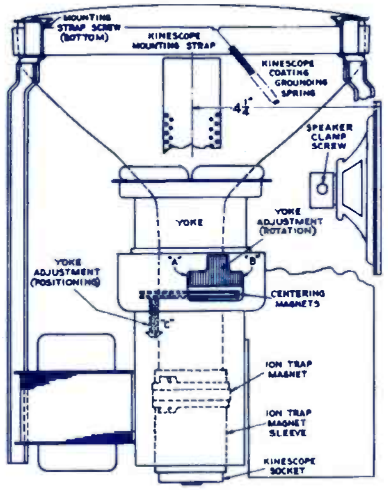


Figure 4—Magnet Adjustments

SOUND AND PICTURE TRACKING and R-F OSCILLATOR ADJUSTMENTS.—A condition of weak sound at best picture, or poor picture at maximum sound, should not be interpreted as R-F oscillator misadjustment. Should this condition exist the setting of the 41.25 mc. adjustment in the tuner should be checked. Using a weak signal (if necessary use an attenuating pad to decrease signal strength) tune the fine tuning control for maximum picture signal. If it is impossible to tune through the maximum signal point, readjust the R-F oscillator on the channel being used until this can be accomplished. Adjust L48 the 41.25 mc. adjustment to obtain maximum

VOLTAGE CHART

The following measurements represent two sets of conditions. In the first condition, a 30000 microvolt test pattern signal was fed into the receiver and the picture synced. The second condition was obtained by removing the antenna leads and short circuiting the receiver antenna terminals. Voltages shown are read with a type WV97A Senior "VoltOhmyst" between the indicated terminal and chassis ground and with the receiver operating on 117 volts, 60 cycles, a-c.

Tube No	Tube Type	Function	Operating Condition	E. Plate		E. Screen		E. Cathode		E. Grid		Notes on Measurements
				Pin No.	Volts	Pin No.	Volts	Pin No.	Volts	Pin No.	Volts	
V1A	6U8	R-F Amplifier	30000 Mu V	1	110	—	—	8	0	9	3	
			No Signal	1	90	—	—	8	0	9	0	
V1B	6U8	1st Pix. I-F Amplifier	30000 Mu V	6	202	3	200	7	115	2	112	
			No Signal	6	215	3	210	7	102	2	91	
V2 KRK55A	6U8	Mixer	30000 Mu. V. Signal	6	84	3	82.5	7	0	2	2	
			No Signal	6	85	3	84.5	7	0	2	2	
		R-F Oscillator	30000 Mu. V. Signal	1	181	—	—	8	82.5	9	78	
			No Signal	1	190	—	—	8	84.5	9	80	
V101A	6U8	Sound I-F Amp. & Audio Amp.	30000 Mu. V.	6	80	3	118	7	1.2	2	—2.5	
			No Signal	6	76	3	110	7	2.6	2	0	
V101B	6U8	Audio Output	30000 Mu. V.	1	213	—	—	8	4.25	9	0	
			No Signal	1	209	—	—	8	4.1	9	0	
V102A	6U8	2nd Pix. I-F Amplifier	30000 Mu. V.	6	220	3	176	7	.42	2	—3.2	Normal contrast
			No Signal	6	216	3	120	7	.92	2	—.38	Maximum contrast
V102B	6U8.	Sync Output	30000 Mu. V.	1	42	—	—	8	0	9	—1.3	
			No Signal	1	40	—	—	8	0	9	0	
V103A	6AW8	Video Amplifier	30000 Mu. V. Signal	9	191	8	147	6	9.5	7	4.9	Normal contrast
			No Signal	9	141	8	58	6	0	7	—.6	Maximum contrast
V103B	6AW8	1st Sync	30000 Mu. V. Signal	3	61	—	—	1	0	2	—9.3	
			No Signal	3	32.5	—	—	1	0	2	—.87	
V104	8DP4	Kinescope	30000 Mu. V. Signal	Cap	—	10	176	11	16.5	2	0	Pin 3 Focus Anode 0-500V. depending on focus control setting
			No Signal	Cap	—	10	120*	11	12.5	2	0	*Maximum contrast
V151A	6CG7	Vertical Oscillator	30000 Mu. V. Signal	6	69	—	—	8	0	7	—30.5	Depends on setting of Vert. hold control
			No Signal	6	68	—	—	8	0	7	—29.5	Voltages shown are synced pix adjustment
V151B	6CG7	Vertical Output	30000 Mu. V. Signal	1	448	—	—	3	0	2	—19.5	
			No Signal	1	440	—	—	3	0	2	—19	
V152	6CG7	Horizontal Osc. Control	30000 Mu. V. Signal	1	220	—	—	3	13.3	2	—13	
			No Signal	1	216	—	—	3	4.5	2	—18.7	
		Horizontal Oscillator	30000 Mu. V. Signal	6	171	—	—	8	0	7	—72	
			No Signal	6	168	—	—	8	0	7	—76	
V153	6BQ6GTB	Horizontal Output	30000 Mu. V. Signal	Cap	†	4	129	8	0	5	—36.5	†High Voltage Pulse Present
			No Signal	Cap	†	4	126	8	0	5	—36	†High Voltage Pulse Present
V154	1V2	H.V. Rectifier	30000 Mu. V. Signal	1	†	—	—	4 & 5	*5,850	—	—	†High Voltage Pulse Present
			No Signal	1	†	—	—	4 & 5	*5,800	—	—	*Measured with H.V. Probe
V155	6AX4GT	Damper	30000 Mu. V. Signal	5	220	—	—	3	†	—	—	†High Voltage Pulse Present
			No Signal	5	216	—	—	3	†	—	—	†High Voltage Pulse Present

sound output. Refer to Figure 5 for adjustment location. Complete oscillator adjustment should be made only after the above check and adjustment of L48, if necessary, have been performed.

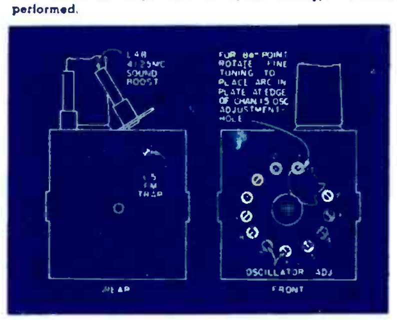
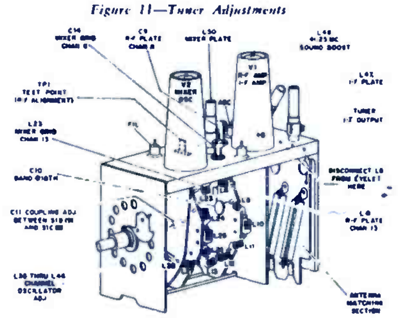


Figure 5—Sound Boost and R-F Oscillator Adjustments

The control cover and case assembly must be removed to make R-F oscillator adjustments. Remove the knobs on the operating controls and take out the control cover and case assembly as explained previously under "CHASSIS REMOVAL." Set the fine tuning control to a point 84° from full counter-clockwise rotation of the control as indicated in Figure 5. Switch to all available stations to see that the oscillator is adjusted to the proper frequency on all channels. If adjustment is required, this should be made as outlined in the method under tuner alignment on page 12, beginning with Channel 13 and proceeding downward to Channel 2. The location of the adjustments for the individual channels are shown in Figure 5. The fine tuning control should not be changed from the 84° point when making oscillator adjustments.

Figure 11—Tuner Adjustments



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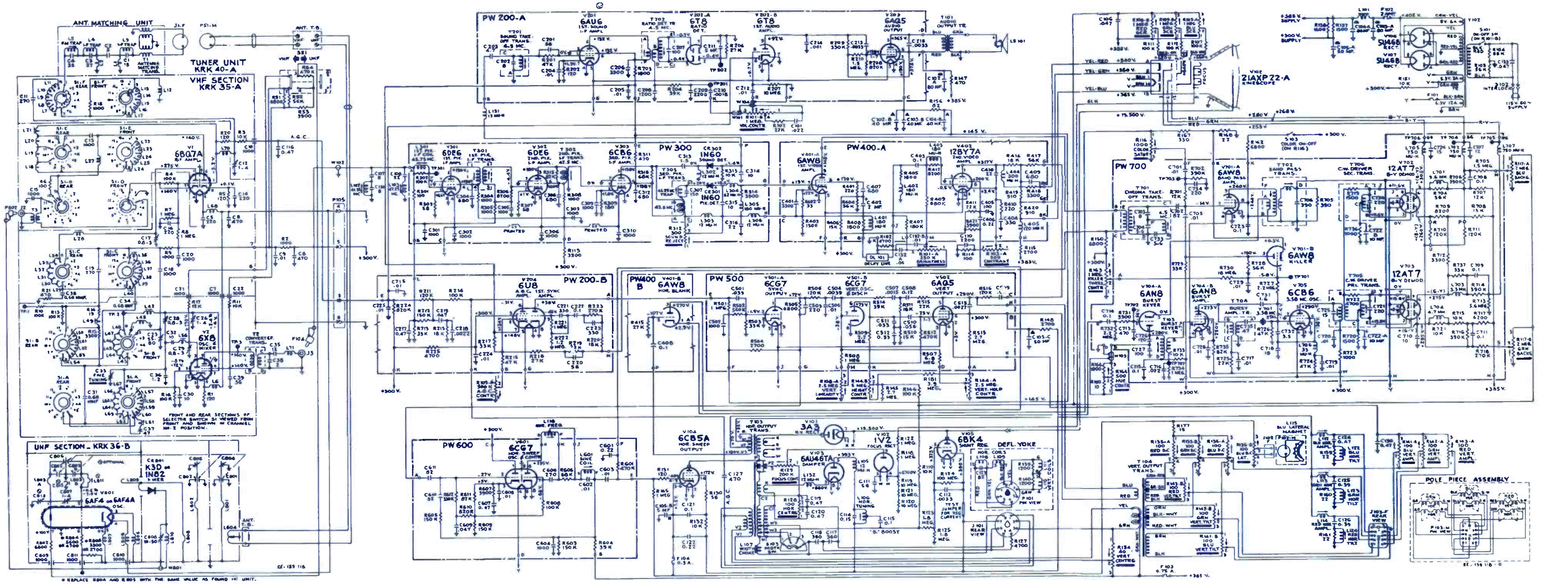
RCA VICTOR
Color TV Chassis CTC5, CTC5A

COLOR TV CHASSIS CTC5, CTC5A:
Models 21-CS-7815, 21-CS-7815U,
21-CS-7817, 21CS-7817U

Direction of arrows at controls indicates clockwise rotation.

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted. All resistance values in ohms. K — 1000.

All voltages measured with "Volt-Ohmyst" and 1000 microvolt black and white signal. Voltages should hold within ±20% with 117 v. a-c supply.



COMPLETE SET-UP PROCEDURE

INITIAL ADJUSTMENTS.—Adjust the receiver for a black and white picture.

At this point it is necessary to check the horizontal oscillator and the conventional adjustments of height, vertical linearity, width, focus, and electrical centering. (Refer to Check List.)

PRELIMINARY CONVERGENCE ADJUSTMENT.—The dot signal generator should be connected to the receiver to provide a dot pattern on the kinescope for making convergence adjustments.

Preset the red, green and blue horizontal and vertical amplitude controls to minimum, fully counter-clockwise. Refer to chassis top view for control locations. Preset the red, green and blue vertical tilt controls to mid-range.

Adjust the three D.C. control adjustments and the blue D.C. lateral control to produce a white dot in the center of the screen.

COLOR PURITY ADJUSTMENTS.—Set all the magnets on the field equalizing assembly at their maximum counter-clockwise position. (Located under front trim—See safety glass removal.)

The kinescope and associated components should be subjected to a strong magnetic field at this point using the degaussing coil. Slowly move the coil around the kinescope, the sides and front of the receiver and very slowly withdraw to about six feet before disconnecting the coil.

Set the contrast control fully counter-clockwise and the brightness control fully clockwise.

Set the red screen control to fully clockwise and the green and blue screen controls fully counter-clockwise.

Rotate one or both of the rings of the purifying magnet, by the tabs, or rotate the entire assembly, to achieve minimum color contamination of the red field. The yoke should also be adjusted by moving forward or backward on the kinescope neck.

Advance the green and blue screen controls and then adjust all three screen controls to produce a white screen. Color contamination may be noted around the edges of the screen.

Adjust the individual field equalizing magnets adjacent to the area of contamination to produce the most uniform white field over the entire screen. Recheck the individual screens for purity after field magnet adjustments.

NOTE.—Relocation of the receiver may disrupt the purity adjustments, if the receiver passes through the influence of stray magnetic fields. Purity should be checked at the location in which the instrument is to be operated.

KINESCOPE TEMPERATURE, SCREEN AND BACKGROUND ADJUSTMENTS.—Set the screen controls maximum counter-clockwise and the green and blue background controls 30% from maximum counter-clockwise.

Turn the contrast control to the center of its mechanical range.

Measure the bias on the red gun between the grid and cathode using the "VoltOhmyst". Adjust the brightness control for a reading of −70 volts on the meter.

Leave the brightness control at this setting and adjust the three screen controls for a grey picture (Color temperature of 8200° Kelvin) at a very low light level.

After setting the screen controls do not change the setting of the red screen control during the balance of this procedure.

Advance the contrast control and observe the picture. One color will normally predominate in the high brightness areas of the picture. Depending on the color which is predominant proceed as follows:

1. **Green Predominant In Highlights**—Turn the green background control slightly counter-clockwise making the picture magenta and observing the low light areas adjust the green screen control clockwise to achieve grey in low light areas.
2. **Blue Predominant In Highlights**—Turn the blue background control slightly counter-clockwise making the picture yellow and observing the low light areas adjust the blue screen control clockwise to achieve grey in low light areas.
3. **Blue Green (Cyan) Predominant In Highlights**—Turn both the blue and green background controls slightly counter-clockwise making the picture red and adjust the blue and green screen controls clockwise to achieve grey in low light areas.
4. **Magenta Predominant In Highlights**—Turn the green background control slightly clockwise making the picture green and observing the low light areas adjust the green screen control counter-clockwise to achieve grey in low light areas.
5. **Yellow Predominant In Highlights**—Turn the blue background control slightly clockwise making the picture blue and observing the low light areas adjust the blue screen control counter-clockwise to achieve grey in low light areas.
6. **Red Predominant In Highlights**—Turn both the blue and green background controls slightly clockwise making the picture cyan and observing the low light areas adjust both the blue and green screen controls counter-clockwise to achieve grey in low light areas.

Vary the brightness control through its range and observe all areas of the picture. No color should be predominant in either high or low brightness areas at any setting of the brightness control. At the point of extinction of the three guns, observation with a microscope should show the three guns cutting off at the same time when the low light tracking is correct.

DYNAMIC CONVERGENCE ADJUSTMENTS

VERTICAL CONVERGENCE.—Vertical dynamic convergence should be performed before horizontal convergence.

Turn the dot/bar generator back on and set for vertical bars.

Referring to the vertical bar at the center of the screen, turn the red vertical amplitude control fully clockwise and adjust the red vertical tilt control for maximum displacement of the red bar at the center of the screen.

Turn the green vertical amplitude control fully clockwise and adjust the green vertical tilt control for maximum displacement of the green bar at the center of the screen. The direction of center displacement should be opposite to red.

Adjust the red and green vertical amplitude and tilt controls to produce straight vertical red and green bars parallel to the blue bar. Converge the three bars using the red and green D.C. controls to form a single white vertical bar at the center of the screen. Slight adjustment of the red and green amplitude and tilt controls will probably be required to achieve this condition. Refocus if necessary.

Turn the generator to horizontal bars and using the blue D.C. control displace the blue bar slightly from the other bars. Adjust the blue vertical amplitude and tilt controls for equal displacement of the blue bars along the vertical center line. The pattern along the vertical center line should show the blue bars equally displaced from the other bars along the vertical center line of the screen.

HORIZONTAL CONVERGENCE.—The procedure for horizontal convergence is approximately the same as that used for vertical convergence. The horizontal row of bars nearest the center, however, is used for reference.

Turn the blue horizontal amplitude control clockwise until a bow in the blue bar appears in the center of the screen. Alternately adjust the blue horizontal phasing and amplitude controls to produce a straight horizontal blue bar across the center of the screen.

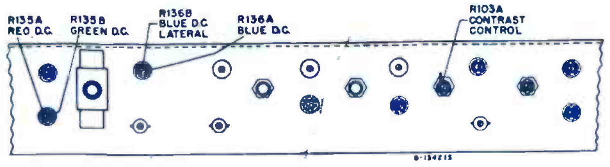
Shunt the red grid of the kinescope at the chassis rear apron through a 100,000 ohm resistor to ground. Alternately adjust the green horizontal amplitude and tilt controls to produce a green bar parallel to the blue bar over its entire length at the center of the screen.

Remove the shunt from the red grid and shunt the green grid to ground. Alternately adjust the red horizontal amplitude and tilt controls to produce a red bar parallel to the blue bar over its entire length at the center of the screen. Remove the shunt on the green grid.

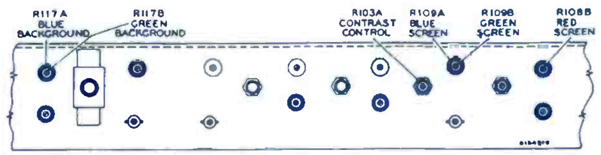
Using the blue D.C. control move the blue bar close to the red and green bars and, if necessary, touch up the above adjustments slightly until all three bars are equally displaced along the entire center line of the screen.

Turn the generator to a dot pattern and using the red, green and blue D.C. controls converge the dot pattern. The dot pattern should now show maximum convergence over the entire area of the screen.

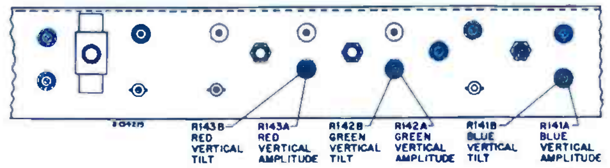
More Data on Reverse Side



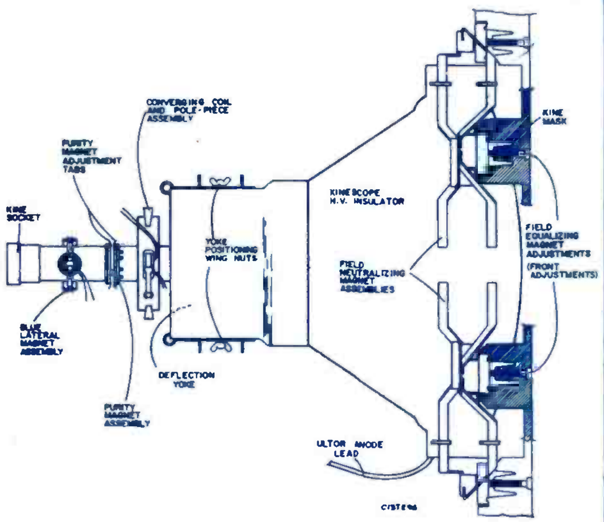
STATIC CONVERGENCE CONTROLS



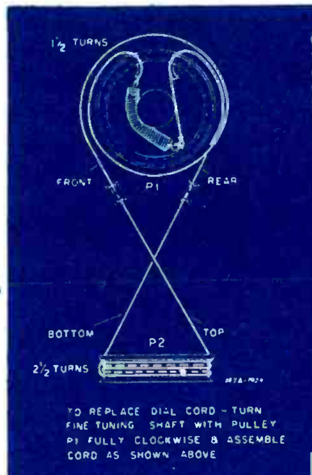
SCREEN AND BACKGROUND CONTROLS



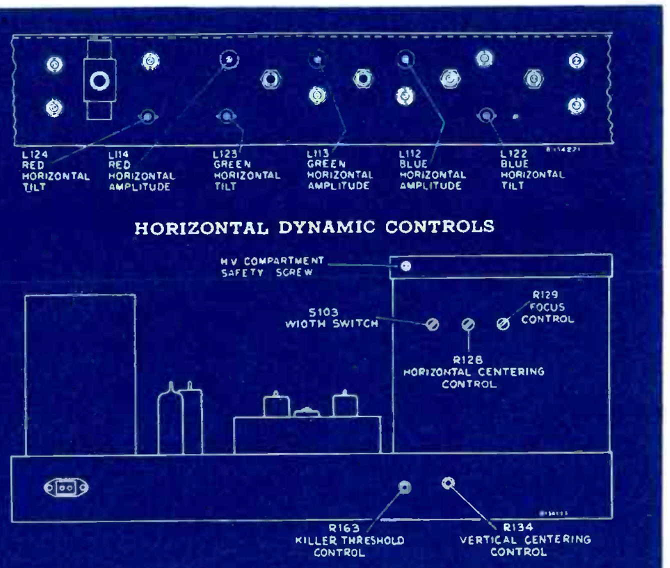
VERTICAL DYNAMIC CONTROLS



KINESCOPE ADJUSTMENTS AND COMPONENTS



TUNER DIAL CORD



REAR CHASSIS ADJUSTMENTS

21-CS-7815, 21-CS-7817
21-CS-7815U, 21-CS-7817U

VOLTAGE CHART

The following measurements represent the following conditions. A 1000 microvolt black and white signal was fed into the receiver, the picture synchronized and the AGC control properly adjusted. Voltages shown are read with a type WV97A Senior "VoltOhmyst" between the indicated terminal and chassis ground and with the receiver operating on 117 volts, 60 cycles, a-c.

Tube No.	Tube Type	Function	Operating Condition	E Plate Pin No.	E Plate Volts	E Screen Pin No.	E Screen Volts	E Cathode Pin No.	E Cathode Volts	E Grid Pin No.	E Grid Volts	Notes on Measurements
V1	6BQ7A	R-F Amplifier	1000 Mu. V. Signal	6	140	–	–	8	0.1	7	–3.2	
			No Signal	6	130	–	–	8	1.1	7	0	
KRK40 KRK40A		R-F Amplifier	1000 Mu. V. Signal	1	275	–	–	3	140	2	–	
			No Signal	1	240	–	–	3	130	2	–	
V2	6X8	Mixer	1000 Mu. V. Signal	9	140	8	140	6	0	7	–2.4 to –4.0	
			No Signal	9	120	8	120	6	0	7	–2.8 to –4.5	
KRK40 KRK40A		R-F Oscillator	1000 Mu. V. Signal	3	170	–	–	6	0	2	–8 to –12	
			No Signal	3	160	–	–	6	0	2	–7 to –11	
V801	6AF4 or 6AF4A	UHF Osc.	1000 Mu. V. Signal	1-7	100	–	–	5	0	2-8	–.5 to –2.5	Measured at bias terminal
			No Signal	1-7	95	–	–	5	0	2-6	–.5 to –2.5	Measured at bias terminal
V101	3A3	H.V. Rectifier	1000 Mu. V. Signal	Cap	*	–	–	2-7	19,500	–	–	
V102	1V2	Focus Rectifier	1000 Mu. V. Signal	Cap	*	–	–	4	6,700	–	–	*H.V. Pulse present
V103	6AU4GTA	Damper	1000 Mu. V. Signal	5	393	–	–	3	880	–	–	
V104	6CB5A	Horizontal Output	1000 Mu. V. Signal	Cap	*	1-8	172	3-6	7.5	4-5	–40	*H.V. Pulse present
V105	6BK4	Shunt Regulator	1000 Mu. V. Signal	Cap	19,500	–	–	1	390	5	375	
V106	5U4GB	L.V. Rectifier	1000 Mu. V. Signal	–	–	–	–	2-8	405	–	–	
V107	5U4GB	L.V. Rectifier	1000 Mu. V. Signal	–	–	–	–	2-8	405	–	–	
V108	21AXP22A	Kinescope Red	1000 Mu. V. Signal	Ultor Anode	19,500	3	620	4	340	2	255	
		Kinescope Green				7	640	5	350	6	268	
		Kinescope Blue				11	660	13	365	12	280	
V201	6AU6	1st Sound I-F Amp.	1000 Mu. V. Signal	5	132	6	132	7	1.3	1	0	
V202A	6T8	Ratio Detector	1000 Mu. V. Signal	2	–13	–	–	5	–3.9	–	–	
				7	–3.5	–	–	1	12	–	–	
V202B	6T8	1st Audio Amplifier	1000 Mu. V. Signal	9	92	–	–	7	–	8	–0.7	
V203	6AQ5	Audio Output	1000 Mu. V. Signal	5	365	6	375	2	150	7	128	

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21-CS-7815, 21-CS-7817
21-CS-7815U, 21-CS-7187U

VOLTAGE CHART

Tube No.	Tube Type	Function	Operating Condition	E Plate Pin No.	E Plate Volts	E Screen Pin No.	E Screen Volts	E Cathode Pin No.	E Cathode Volts	E Grid Pin No.	E Grid Volts	Notes on Measurements
V204A	6U8	AGC Amplifier	1000 Mu. V. Signal	6	–31	5	300	7	148	2	124	*H.V. Pulse present
V204B	6U8	1st Sync. Amplifier	1000 Mu. V. Signal	1	38	–	–	8	0	9	–45	
V301	6DE6	1st Pix I-F Amplifier	1000 Mu. V. Signal	5	190	6	190	2	0.65	1	–4.0	
V302	6DE6	2nd Pix I-F Amplifier	1000 Mu. V. Signal	5	180	6	180	2	1.0	1	–4.5	
V303	6CB6	3rd Pix I-F Amplifier	1000 Mu. V. Signal	5	138	6	138	2	1.8	1	0	
CR301	1N60	Pix Det.	1000 Mu. V. Signal	–	18.5	–	–	–	20	–	–	
CR302	1N60	Sound Det.	1000 Mu. V. Signal	–	–1.4	–	–	–	0	–	–	
V401A	6AW8	1st Video Amplifier	1000 Mu. V. Signal	9	148	8	170	6	22	7	19	
V401B	6AW8	Hor. Blanking	1000 Mu. V. Signal	3	270	–	–	1	2.9	2	–107	
V402	12BY7A	2nd Video Amplifier	1000 Mu. V. Signal	7	317	8	200	1	3.4	2	–.5	
V501A	6CG7	Sync. Output	1000 Mu. V. Single	1	72	–	–	3	0	2	–1.5	
V501B	6CG7	Vertical Oscillator	1000 Mu. V. Signal	1	73	–	–	8	0	7	–38	
V502	6AQ5	Vertical Output	1000 Mu. V. Signal	5	290	6	300	2	3	1 & 7	–23	
V601A	6CG7	Horizontal Oscillator	1000 Mu. V. Signal	6	235	–	–	8	0	7	–88	
V601B	6CG7	Horizontal Osc. Control	1000 Mu. V. Signal	1	300	–	–	3	5	2	–27	
V701A	6AW8	Band Pass Amplifier	1000 Mu. V. Signal	9	240	8	240	6	0	7	–14	
V701B	6AW8	Killer	1000 Mu. V. Signal	3	190	–	–	1	.3	2	–5.8	
V702A	12AT7	"B-Y" Demodulator	1000 Mu. V. Signal	6	305	–	–	8	11.6	7	0	
V702B	12AT7		1000 Mu. V. Signal	1	260	–	–	3	11.6	2	0	
V703A	12AT7	"G-Y" Demodulator	1000 Mu. V. Signal	1	295	–	–	3	13.8	2	0	
V703B	12AT7		1000 Mu. V. Signal	6	275	–	–	8	13.8	7	0	
V704A	6AN8	Burst Keyer	1000 Mu. V. Signal	1	280	–	–	3	0	2	–66	
V704B	6AN8	Burst Amplifier	1000 Mu. V. Signal	6	275	7	250	9	0	8	–7	
V705	6CB6	3.58 MC. Oscillator	1000 Mu. V. Signal	5	290	6	136	2	0	1	–7.4	

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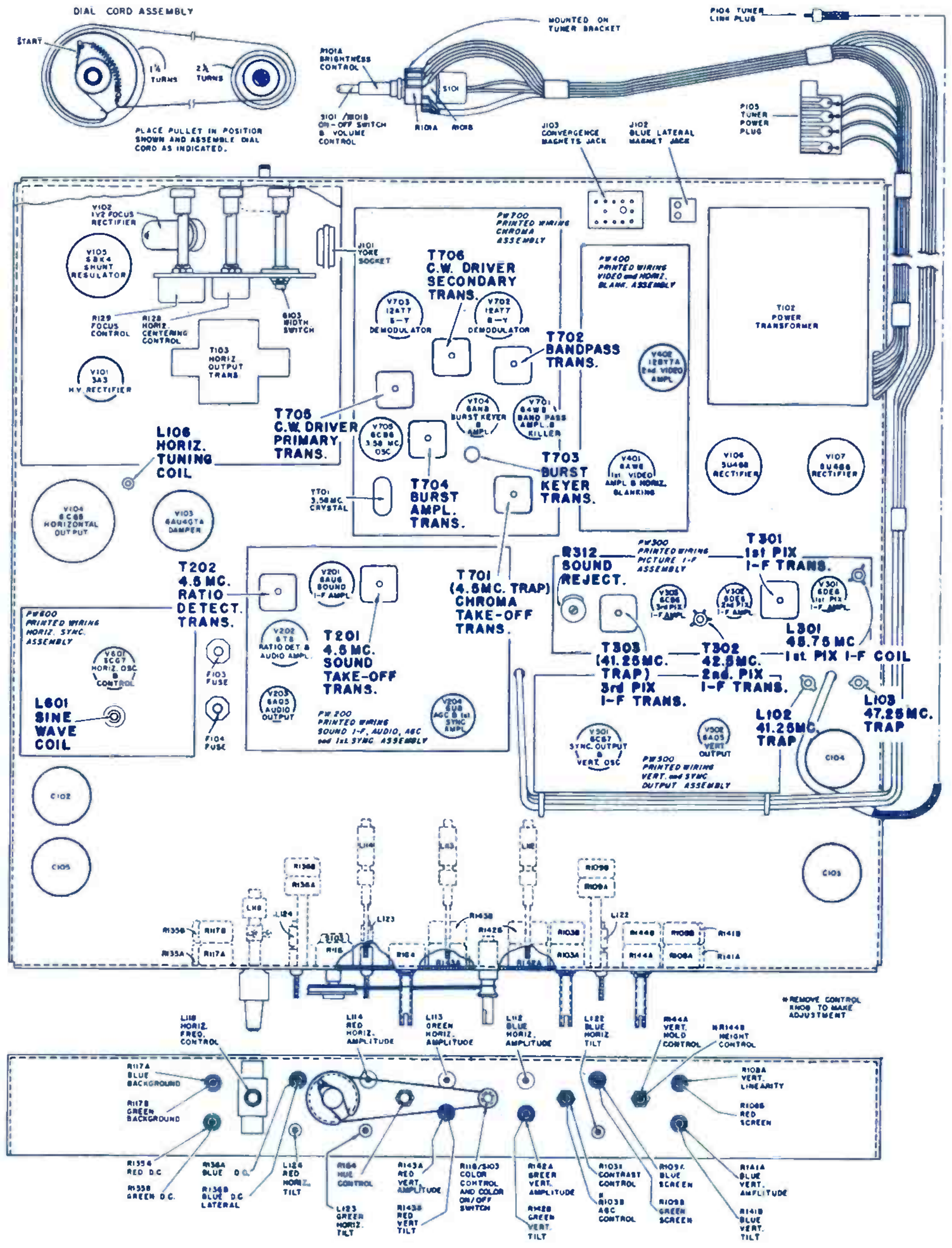
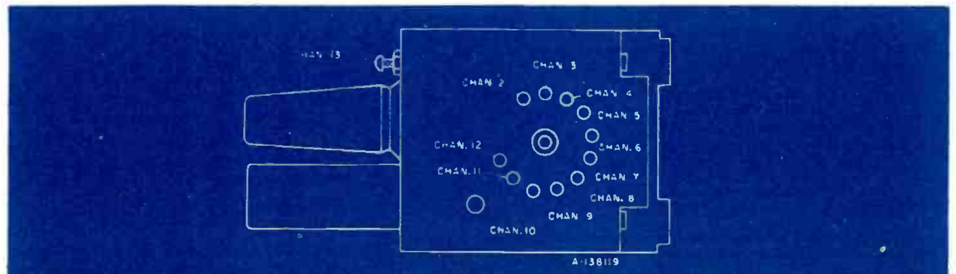


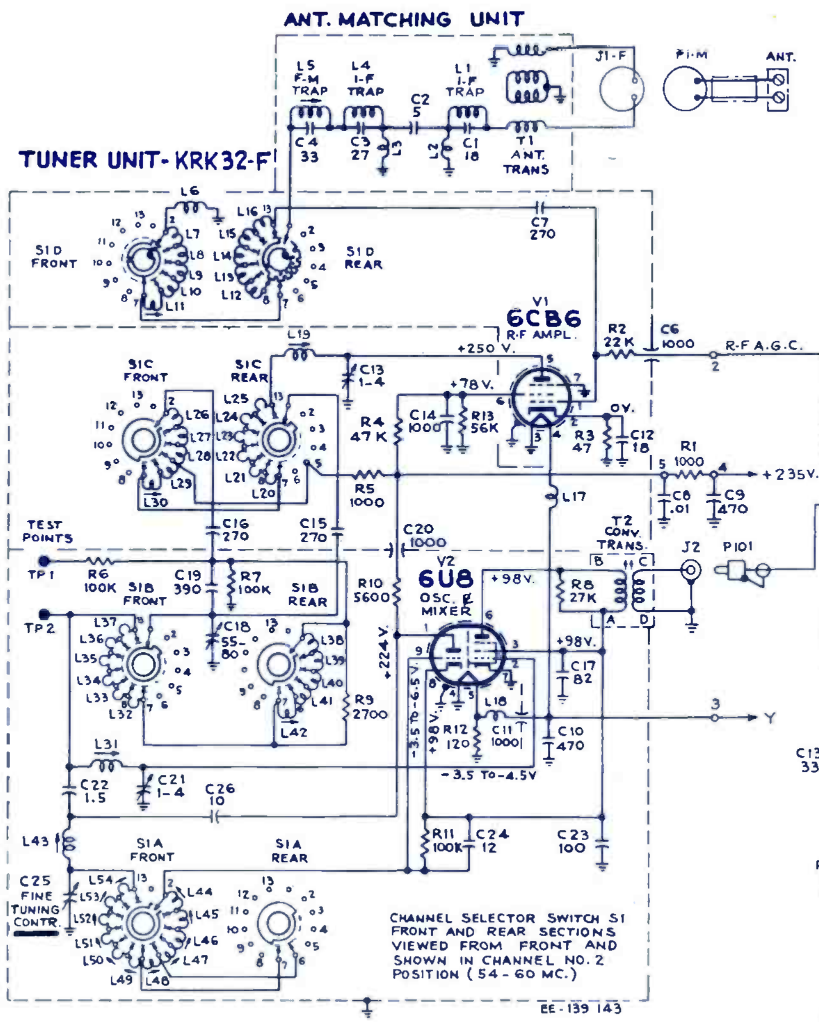
CHASSIS TOP VIEW



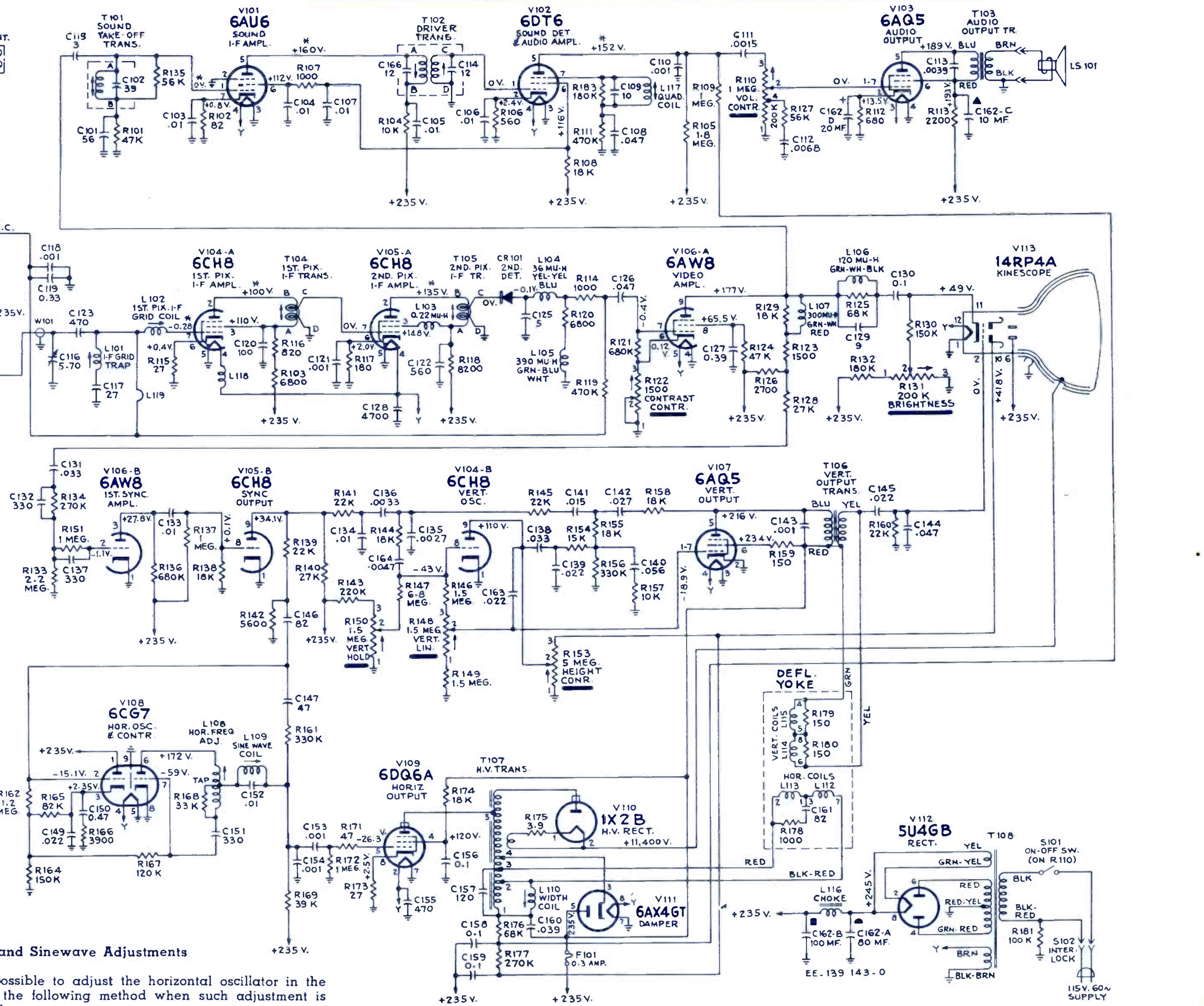
VHF R-F OSCILLATOR ADJUSTMENT

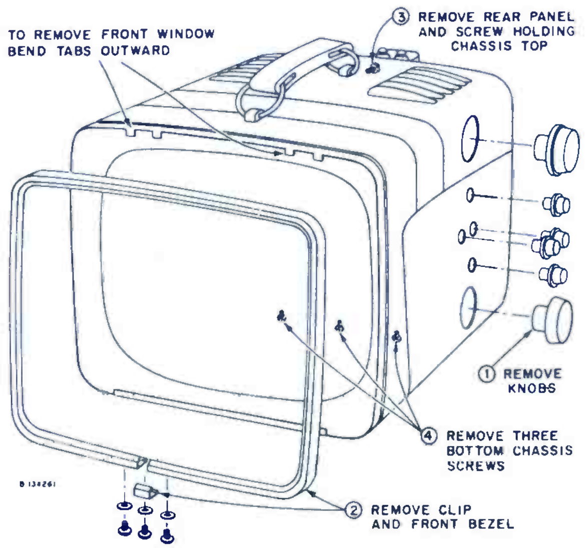
More Data on Reverse Side

KRK29W/36 Tuner Used in KCS102D



*Measured with 1 megohm ½ watt resistor in series with meter probe.





CHASSIS REMOVAL

*Width and Sinewave Adjustments

It is possible to adjust the horizontal oscillator in the field by the following method when such adjustment is indicated.

A. Set the width coil fully counter-clockwise.

B. Adjust width for ¾" overscan at each side, with normal line voltage and normal brightness.

C. Turn horizontal hold control to the left, out of sync, to the point where interrupted oscillation occurs.

D. Adjust sinewave core, as the horizontal hold control is rotated to the left beyond the locked-in position, until 3 to 4 bars occur between the fall out point and interrupted oscillation.

The schematic is shown in the latest condition at the time of printing.
All resistance value in ohms. K = 1000.

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

Direction of arrows at controls indicates clockwise rotation.

All voltages measured with "Volt-Ohmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

MODELS 14-S-7052(U), 14-S-7071(U)
14-S-7070(U), 14-S-7074(U)

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Shop Hints

Noisy Tuning Condensers

Quite often a small radio will come in with a complaint of noisy and intermittent tuning. This is often due to fine particles of the plating on tuning gang condensers flaking or powdering off the base metal of the plates, and shorting out as the plates are rotated. This difficulty can be quickly cleared up by removing the gang assembly from the chassis and giving it a bath in muriatic acid for a few minutes. This acid, which is very inexpensive, can be purchased in a local paint shop.

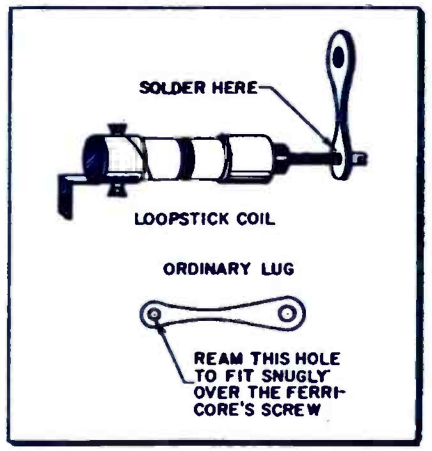
The tuning assembly is then bathed in water, rinsed in denatured alcohol and allowed to dry. When re-assembling the tuning unit into the set, make doubly sure that the oscillator and r-f trimmers are dry. Re-align the oscillator and r-f stages as usual, lubricate pivot points and bearings and—presto—clean, noiseless tuning. — *Philip Smith, New York, N.Y.*

Loopstick Adjustment

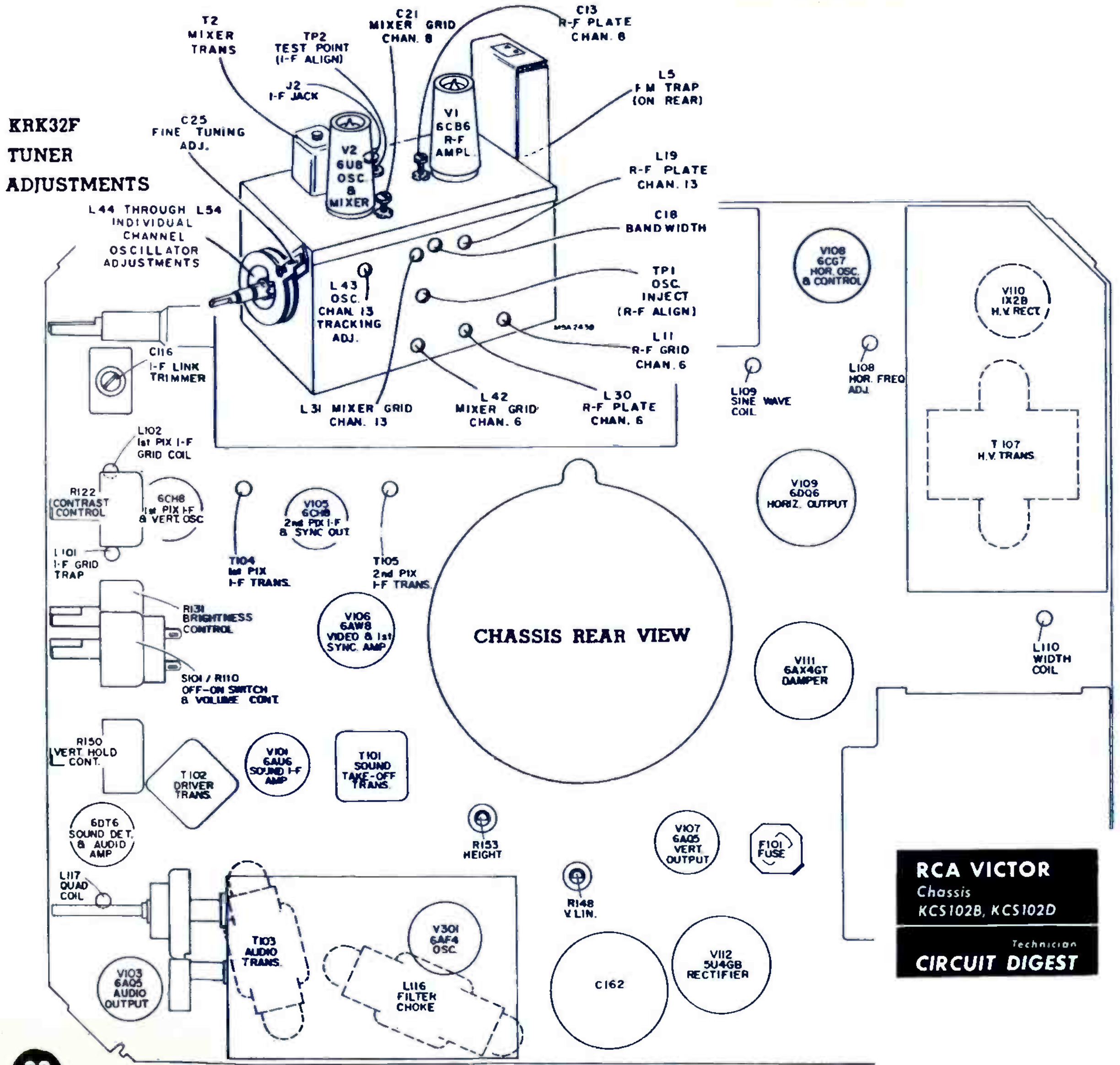
Widely used as original AM receiver antennas as well as for replacement, the adjustable loopstick-type aerials are often annoying and tedious to adjust. As the coils come from the manufacturer, they are provided with a tiny screwdriver slot at the end of the core's screw, often making them difficult to tune. Much time can be wasted in attempting this procedure with the small screwdriver.

By soldering an ordinary lug on the screw as shown in the accompanying illustration, you can easily speed up the process of tuning and adjusting. If space around the loopstick coil is at a premium, the lug may be conveniently bent at right angles. Also, if it is desirable to do so, the lug can be snipped off shorter than is shown. It will still provide a convenient way of making the desired adjustments.—*Joseph Amorose, Richmond, Virginia.*

Lug on loopstick coil facilitates adjustment.



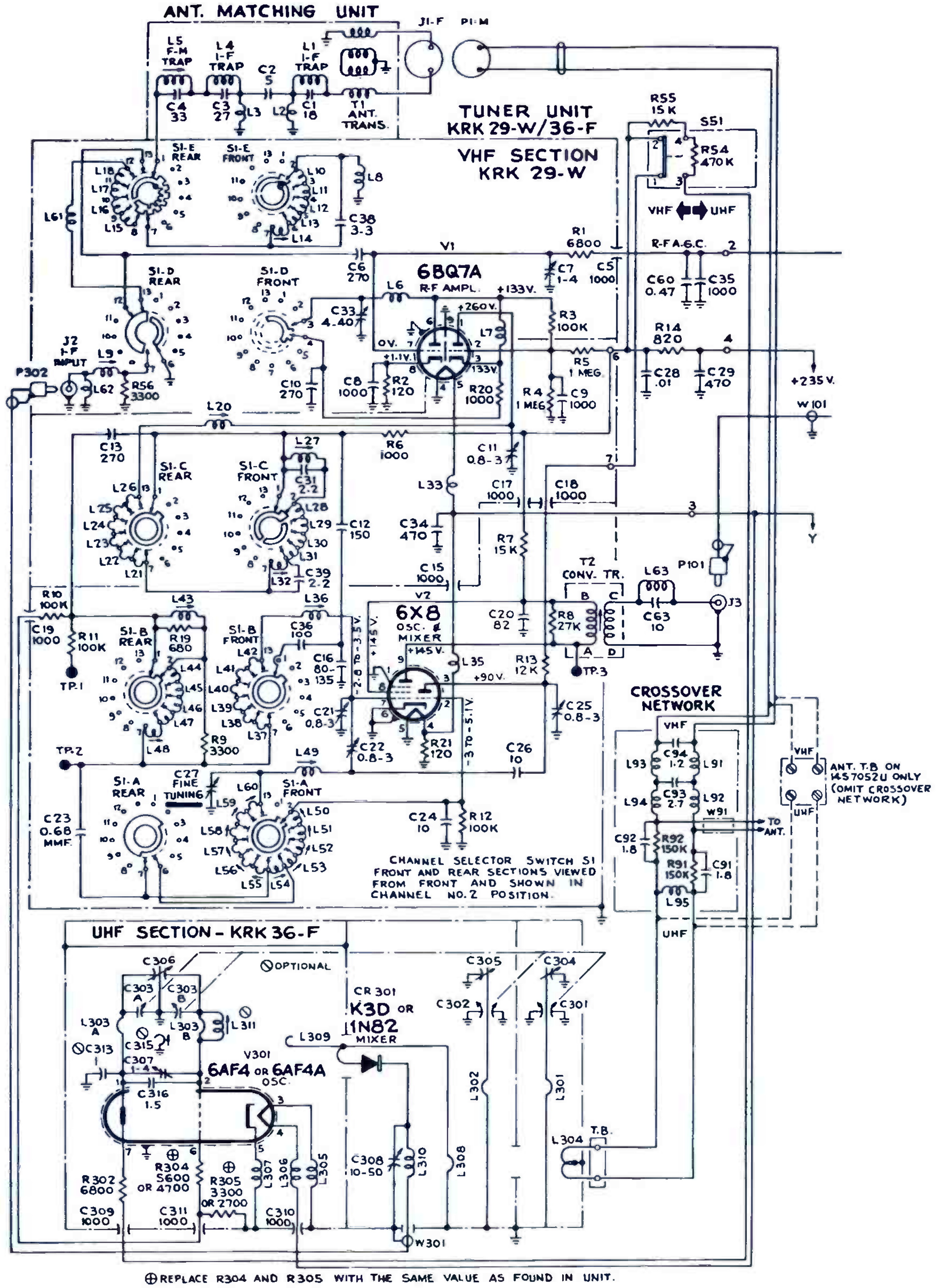
KRK32F TUNER ADJUSTMENTS



RCA VICTOR
Chassis
KCS102B, KCS102D

Technician
CIRCUIT DIGEST

More Data on Reverse Side



KRK29W/36 TUNER CIRCUIT SCHEMATIC DIAGRAM FOR MODELS 14-S-7052U TO 14-S-7074U INCL.

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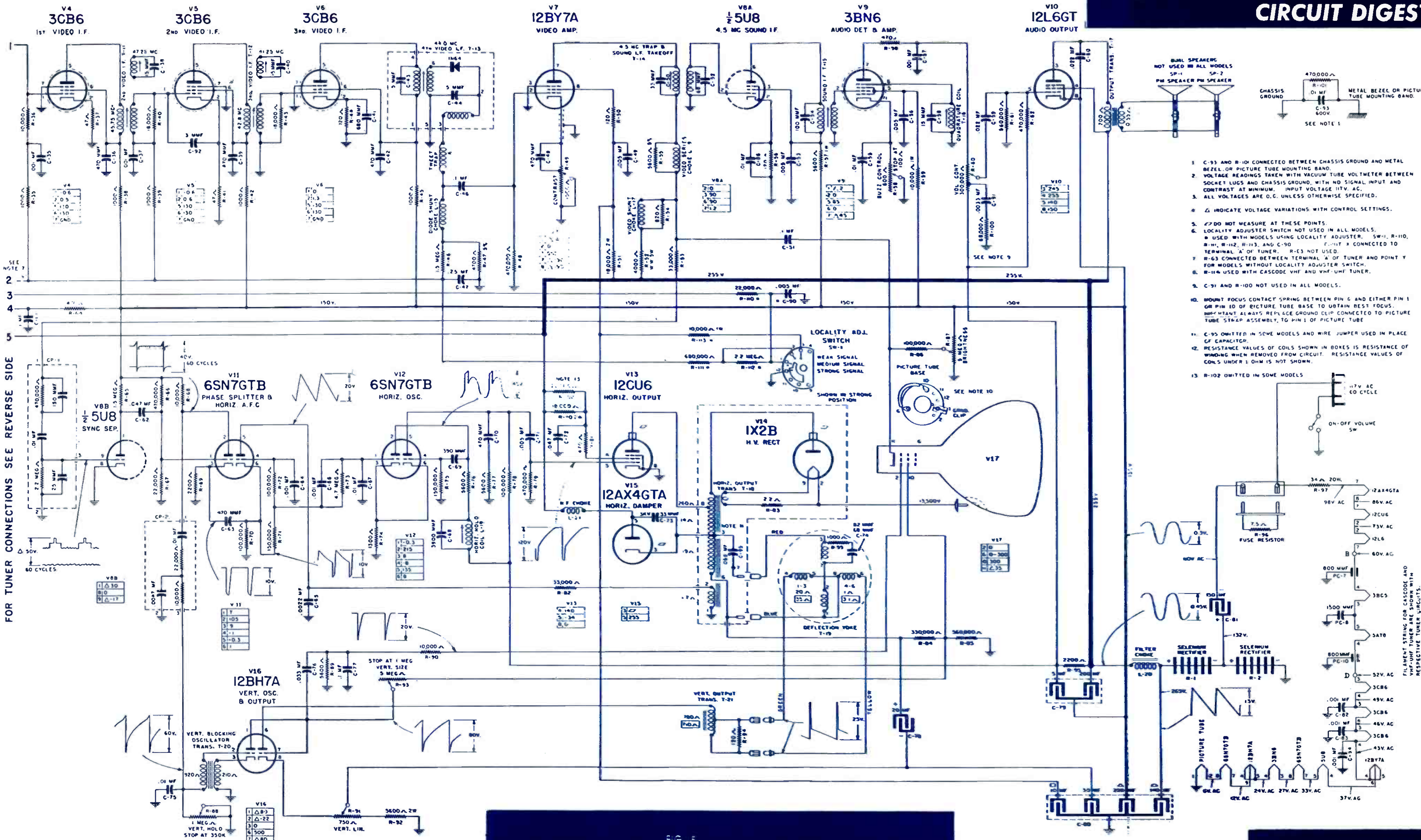


1. C-93 AND R-101 CONNECTED BETWEEN CHASSIS GROUND AND METAL BEZEL OR PICTURE TUBE MOUNTING BAND.
2. VOLTAGE READINGS TAKEN WITH VACUUM TUBE VOLTMETER BETWEEN SOCKET LUGS AND CHASSIS GROUND, WITH NO SIGNAL INPUT AND CONTRAST AT MINIMUM. INPUT VOLTAGE 117V. AC.
3. ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
4. △ INDICATE VOLTAGE VARIATIONS WITH CONTROL SETTINGS.
5. ▱ DO NOT MEASURE AT THESE POINTS.
6. LOCALITY ADJUSTER SWITCH NOT USED IN ALL MODELS. ● USED WITH MODELS USING LOCALITY ADJUSTER. SW-1, R-110, R-111, R-112, R-113, AND C-90 [illegible] POINT X CONNECTED TO TERMINAL 'A' OF TUNER. R-63 NOT USED.
7. R-63 CONNECTED BETWEEN TERMINAL 'A' OF TUNER AND POINT Y FOR MODELS WITHOUT LOCALITY ADJUSTER SWITCH.
8. R-114 USED WITH CASCODE VHF AND VHF-UHF TUNER.
9. C-91 AND R-100 NOT USED IN ALL MODELS.
10. MOUNT FOCUS CONTACT SPRING BETWEEN PIN 6 AND EITHER PIN 1 OR PIN 10 OF PICTURE TUBE BASE TO OBTAIN BEST FOCUS. IMPORTANT ALWAYS REPLACE GROUND CLIP CONNECTED TO PICTURE TUBE STRAP ASSEMBLY, TO PIN 1 OF PICTURE TUBE
11. C-95 OMITTED IN SOME MODELS AND WIRE JUMPER USED IN PLACE OF CAPACITOR.
12. RESISTANCE VALUES OF COILS SHOWN IN BOXES IS RESISTANCE OF WINDING WHEN REMOVED FROM CIRCUIT. RESISTANCE VALUES OF COILS UNDER 1 OHM IS NOT SHOWN.
13. R-102 OMITTED IN SOME MODELS

VHF ALIGNMENT DATA

ALIGNMENT PROCEDURE

All circuits are very stable and will seldom require adjustment. Only when major parts of the tuner or the video I-F strip have been replaced or tampered with will it be necessary to realign the receiver.

Generally under normal conditions only the INDIVIDUAL CHANNEL TRIMMERS in the tuner unit may require adjustment by the service technician.

CAUTION

One side of the chassis is connected to the power line. Therefore, test equipment should not be connected to the receiver unless an isolation transformer is used between the power line and the receiver. DO NOT GROUND THE RECEIVER CHASSIS UNLESS AN ISOLATION TRANSFORMER IS USED.

PICTURE I-F ALIGNMENT

Receiver should be run for at least ¼ hour before proceeding with alignment.

EQUIPMENT REQUIRED

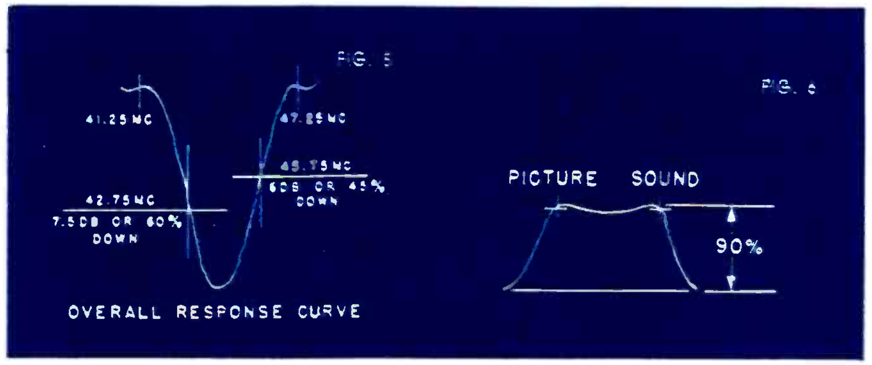
VACUUM TUBE VOLTMETER
For video I-F alignment maintain readings in middle of low volt scale.

SIGNAL GENERATOR supplying a 4.5 MC. (within .25%) 40 to 216 MC. (within 1%) signal. With output adjustable to at least .1 volt maximum.

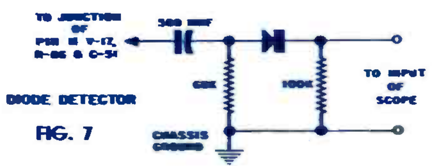
CATHODE-RAY OSCILLOSCOPE. Must have good frequency and phase response from 10 cycles to at least 2 MC.

SWEEP GENERATOR. Capable of covering 40 to 270 MC. with a 10 MC. sweep with output adjustable to at least .1 volt maximum.

3 VOLT "A" BATTERY to provide fixed bias during video I-F and R-F alignment.



Models 1U-1101, 1U-1111, 1U-1121, 1U-1124, 1U-1126, 1U-1127, 1U-1131, 1U-1134, 1U-1136, 1U-1137, 1U-1145, 1U-1147, 1U-1155, 1U-1157, 21101, 21121, 21145



DIODE DETECTOR

FIG. 7

SENTINEL

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SENTINEL

Technician
CIRCUIT DIGEST

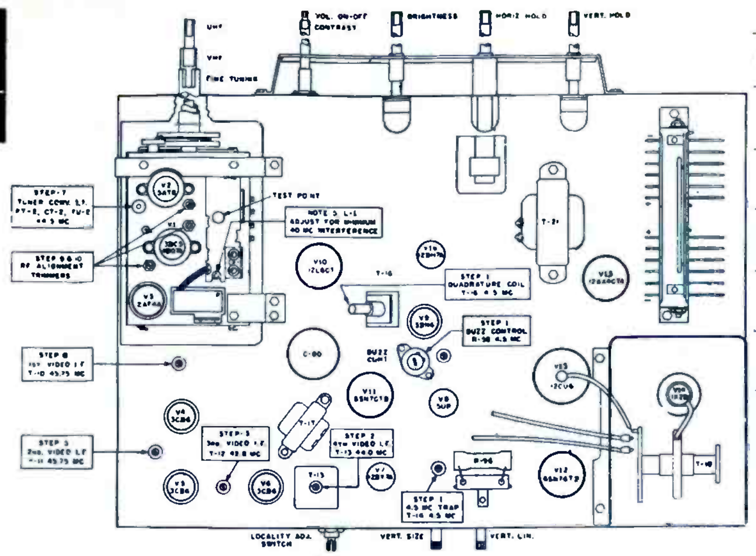


FIG. 8

PICTURE I-F ALIGNMENT

Step No.	Connect Signal Generator to	Sig. Gen. Freq.	Connect Voltmeter to	Miscellaneous Instructions	Adjust
2	Ungrounded converter tube (5AT8) shield	44.0 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. See Note 1.	T-13 (top) for maximum reading. See fig. 8.
3	Ungrounded converter tube (5AT8) shield	42.8 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. See Note 1.	T-12 (top) for maximum reading. See fig. 8.
4	Ungrounded converter tube (5AT8) shield	41.25 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. Repeat Steps 3 & 4. See Note 1.	T-12 (bottom) for minimum reading.
5	Ungrounded converter tube (5AT8) shield	45.75 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. See Note 1.	T-11 (top) for maximum reading. See fig. 8.
6	Ungrounded converter tube (5AT8) shield	47.25 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. Repeat Steps 5 & 6. See Note 1.	T-11 (bottom) for minimum reading.
7	Ungrounded converter tube (5AT8) shield	44.5 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. See Note 1. NOTE: Detune T-10 by turning slug out as far as possible.	PT-2 or CT-2 or TU-2 (top) for maximum reading. See fig. 8.
8	Ungrounded converter tube (5AT8) shield	45.75 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. See Note 1.	T-10 (top) for maximum reading. See fig. 8.

NOTE 1: FOR MODELS WITH LOCALITY ADJUSTER CONTROL: Locality adjuster control must be in the STRONG position when making the Video and RF alignment adjustments.

NOTE 2: For visual check of IF response curve (see fig. 5) connect signal and sweep generator to ungrounded converter tube shield (5AT8). Connect oscilloscope in series with 47,000 ohm resistor to junction of R-46 and L-15.

TUNER R-F ALIGNMENT

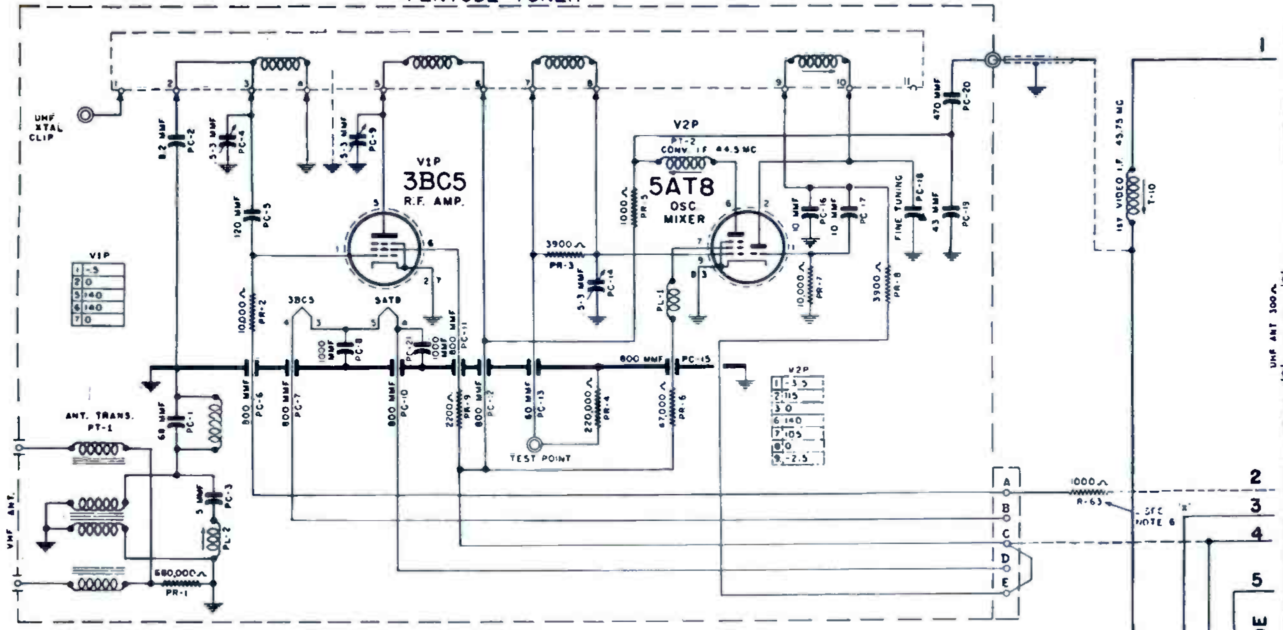
NOTE 3: NEVER ADJUST (PC-4, PC-9, PC-14 PENTODE TUNER), (CC-1, CC-12, CC-16 CASCODE TUNER), (CU-21, CU-27, CU-38 VHF-UHF COMBO TUNER) UNLESS ABSOLUTELY NECESSARY. They are factory preset by special equipment.

Step No.	Connect Marker Generator to	Marker Gen. Freq.	Connect Sweep Gen. to	Sweep Gen. Chan.	Connect Oscilloscope to	Miscellaneous Connections	Adjust
9	Loosely couple to sweep gen. leads.	205.25 MC. and 209.75 MC.	Antenna terminals.	12	Test point on tuner. See fig. 8.	Tuner on channel 12 3 volt bias across C-47 postive side to ground. See Note 1.	Adjust RF trimmers for max. response having linear peaks with picture and sound markers at 90% maximum response. See fig. 6.
10	OBSERVE RESPONSE CURVE FOR ALL CHANNELS USING CORRECT FREQUENCIES AND CHANNELS. A SLIGHT COMPROMISE SHOULD BE MADE WITH RF TRIMMERS IF MARKERS ARE BELOW 70%.						

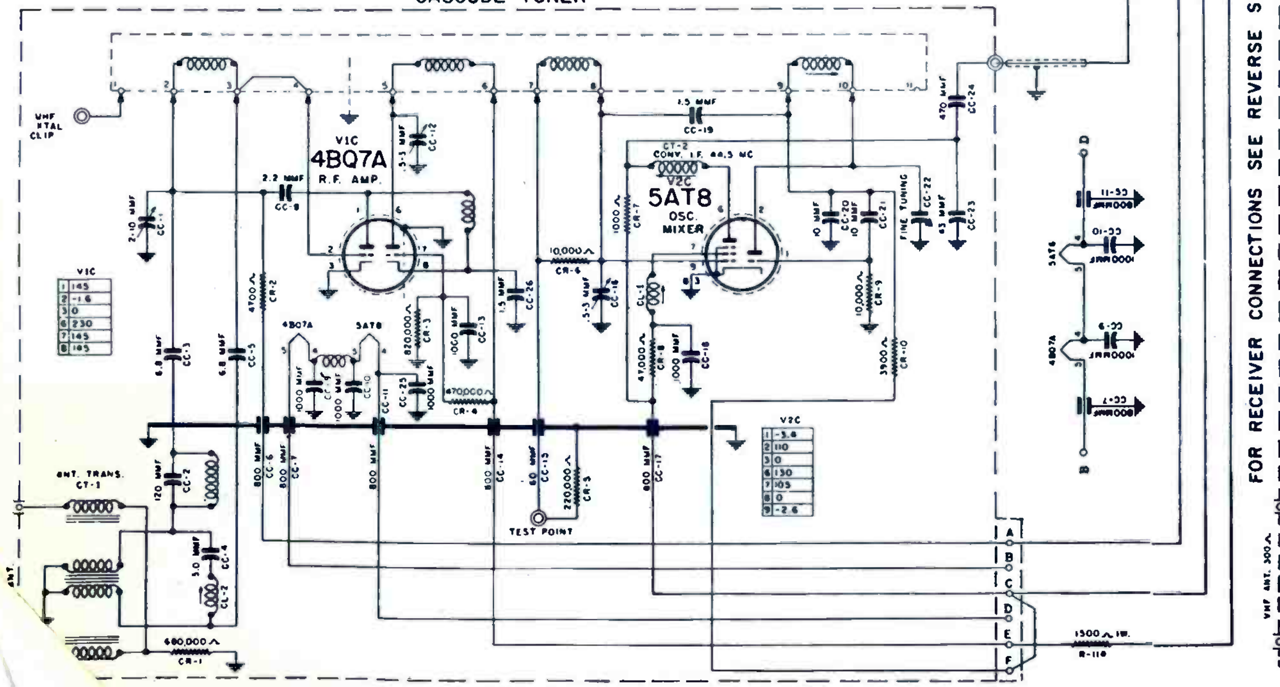
NOTE 4: RF OSCILLATOR ALIGNMENT: Set the VHF channel selector to the station needing alignment. Set the fine tuning to the center of the fine tuning range. Carefully adjust the individual oscillator slugs for best picture detail. NOTE: USE A NON-METALLIC SCREWDRIVER.

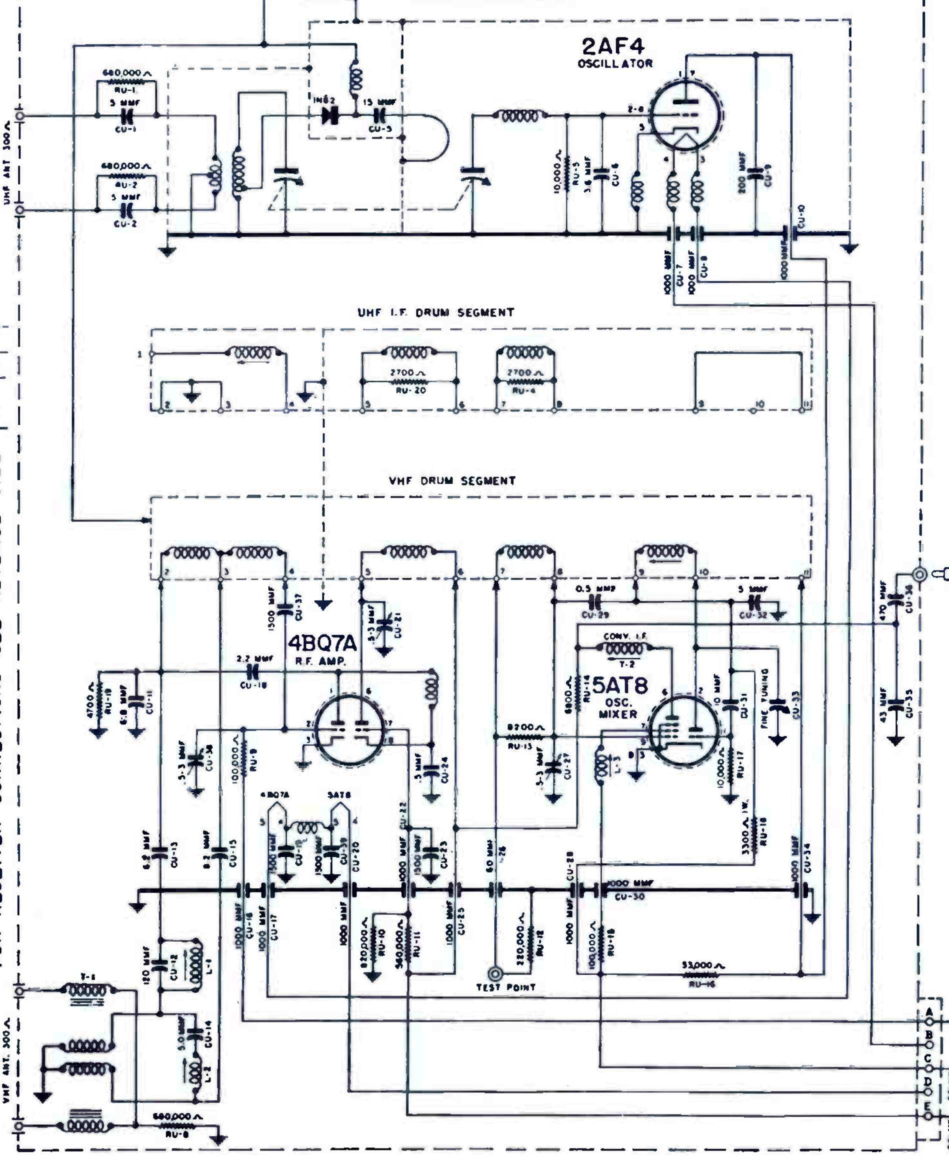
NOTE 5: 40 to 45 MC. TRAP: The 40 MC. trap, located on tuner (see fig. 8) (VHF-UHF tuners have adjustments on side of tuner), need only be adjusted when local interference from 40 thru 45 MC. affects the picture. Adjust for minimum 40 MC. beat in picture with a station signal.

PENTODE TUNER



CASCODE TUNER





NOTES FOR UHF MODELS ONLY

1. C-61 NOT USED.
   C-96, C-97, C-98, AND C-99 AS DESCRIBED IN NOTES 2, 3, 4, AND 5 ARE NOT SHOWN ON CIRCUIT DIAGRAM.
2. C-96 A .001 MF CAPACITOR ADDED BETWEEN PIN 3 OF 1ST. VIDEO I.F. TUBE (V4) AND CHASSIS GROUND.
3. C-97 A 3 MMF CAPACITOR ADDED BETWEEN TERMINAL 3 OF THE 4TH VIDEO I.F. TRANSFORMER T-13 AND CHASSIS GROUND.
4. C-98 A .001 MF CAPACITOR ADDED BETWEEN LOCALITY ADJUSTER SWITCH MOUNTING FRAME AND CHASSIS GROUND.
5. C-99 A .005 MF CAPACITOR ADDED BETWEEN VOLUME-CONTRAST CONTROL HOUSING AND CHASSIS GROUND.

SOUND AND TRAP ALIGNMENT

Sound and 4.5 MC. Trap alignment is made on the sound carrier of a TV station.

STEP 1 (METHOD 1)

4.5 MC. TRAP ALIGNMENT

Adjust Fine Tuning control so that sound appears with picture. Adjust T-14 (top) for minimum 4.5 MC. beat on picture with a station signal.

SOUND ALIGNMENT

When making alignment by ear, a hiss must accompany the sound when aligning T-14 (bottom) Sound Take-off and T-15 (top) Sound I.F. Simply reduce station signal input to the receiver by spray feeding or attenuation method.
Set Contrast control to minimum (fully counter-clockwise).
Set Buzz control R-58 to its center position.
Adjust T-14 (bottom) and T-15 (top) for maximum signal.
NOTE: Further reduce signal input to receiver if hiss disappears upon reaching maximum signal level.
Connect antenna to receiver for normal receiver operation.
Adjust T-16 QUADRATURE coil for clearest and maximum sound.
Turn Contrast control to maximum (fully clockwise).
Adjust R-58 BUZZ control for minimum buzz.

STEP 1 (METHOD 2)

EQUIPMENT REQUIRED: VTVM, SIGNAL GENERATOR 4.5 MC. (within ¼ of 1% of 4.5 MC.) and 4.5 MC. TRAP ALIGNMENT CRYSTAL DIODE PROBE as shown in fig. 7.

4.5 MC. TRAP ALIGNMENT

Connect Crystal Diode probe between VTVM and junction of pin 11 of V-17, R-86 and C-51; ground side of probe to chassis. (VTVM on low-DC scale).

Set Contrast control to maximum (fully clockwise).

Connect Signal Generator thru a 1000 ohm resistor to pin 2 of V-7 12BY7A.

Accurately set Signal Generator to 4.5 MC. (maximum output).

Ground pin 1 of V-6 3CB6.

Adjust T-14 (top) for minimum reading. Remove equipment.

SOUND ALIGNMENT

Connect Crystal Diode probe between VTVM and pin 2 of V-9 3BN6; ground side of probe to chassis ground.

Reduce station signal input to receiver to produce a weak signal.

Set Contrast control to minimum (fully counter-clockwise).

Adjust T-14 (bottom) and T-15 (top) for maximum signal reading on meter.

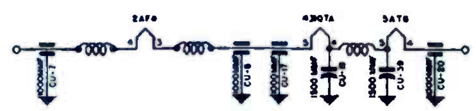
Disconnect Crystal Diode probe.

Connect Antenna to receiver for normal receiver operation.

Adjust T-16 for clearest and maximum sound.

Turn Contrast control to maximum (fully clockwise).

Adjust R-58 BUZZ control for minimum buzz.



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TECHNICIAN
CIRCUIT DIGEST

SENTINEL

Models 1U-1202, -1205, -1208, -1212, -1215, -1218

UHF TUNER DATA

The UHF TUNER has been aligned for optimum operation by special factory equipment and should not require alignment.

The 6T4 OSCILLATOR TUBE and 1N82 CRYSTAL are parts that may require replacement. The 1N82 crystal, located on top of UHF TUNER under square metal cover, is a snap-in type and no soldering is required.

Great care should be taken that parts location and lead dress are not altered in UHF TUNER.

UHF ALIGNMENT SHOULD NOT BE ATTEMPTED UNLESS ABSOLUTELY NECESSARY.

UHF TUNER ALIGNMENT

EQUIPMENT REQUIRED

UHF SWEEP GENERATOR — UHF MARKER GENERATOR — CATHODE RAY OSCILLOSCOPE

PROCEDURE

Set VHF tuner to UHF position.
Connect sweep generator to UHF antenna terminals.

NOTE: Sweep generator must match the 300 Ohm input impedance.
Loosely couple UHF marker generator to UHF sweep generator leads.
Connect oscilloscope to test point on VHF tuner.

Locality adjuster control at maximum clockwise position.
Carefully detune TU-2 mixer IF coil located on VHF tuner by turning core OUT exactly 10 turns.

NOTE: Radiated horizontal pulses may appear on the response curve. This will not affect the response or tilt of curve. DO NOT disable the horizontal sweep circuit; damage to the horizontal output tube may result.

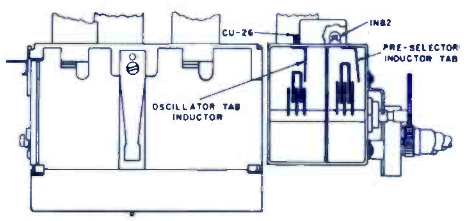


FIG. 1

ALIGNMENT

(1) Set sweep and marker generator to 460 MC.

Set UHF tuner to maximum counter-clockwise position.

Adjust CU-26 until marker is in the center of response curve.

If marker cannot be centered on response curve: carefully bend and move oscillator inductor tab Fig. 1 and re-adjust CU-26 until marker is in center of response curve.

DO NOT BEND OR MOVE INDUCTOR TABS INDISCRIMINATELY OR EXCESSIVELY.

(2) Leave marker and sweep generator at 460 MC.

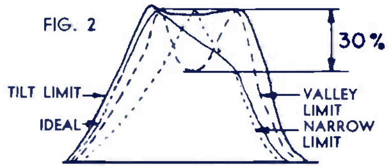
Leave UHF tuner at maximum counter-clockwise position.

Carefully bend and move PRESELECTOR INDUCTOR TAB Fig. 1 for maximum response and minimum tilt. See response curve Fig. 2.

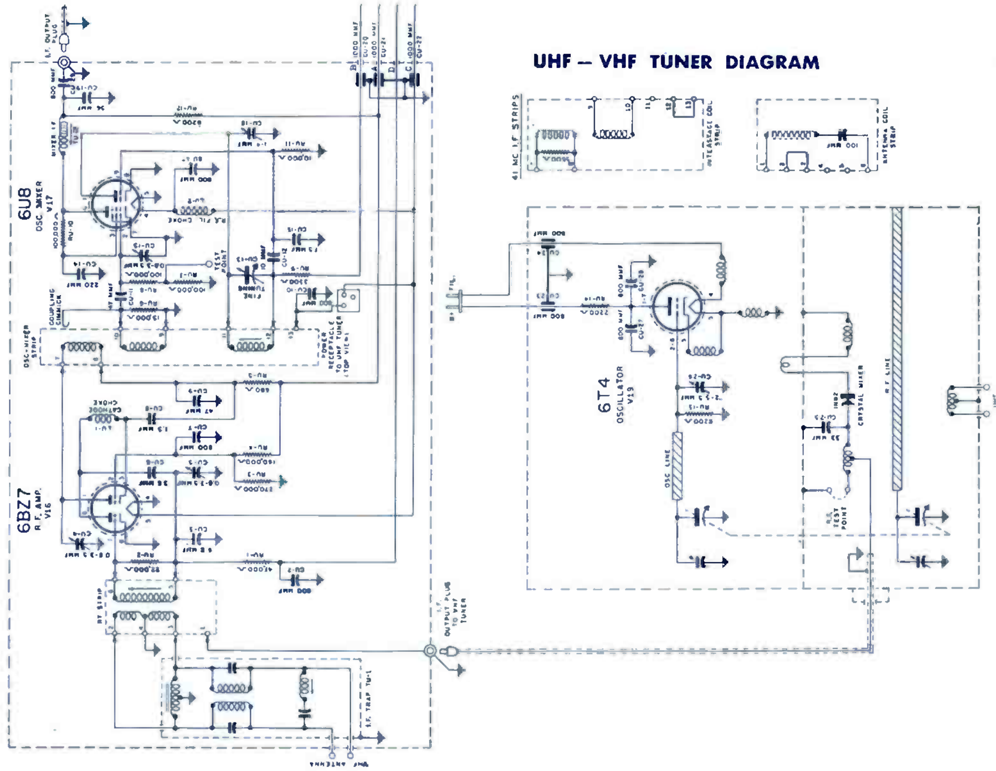
Repeat steps 1 and 2.

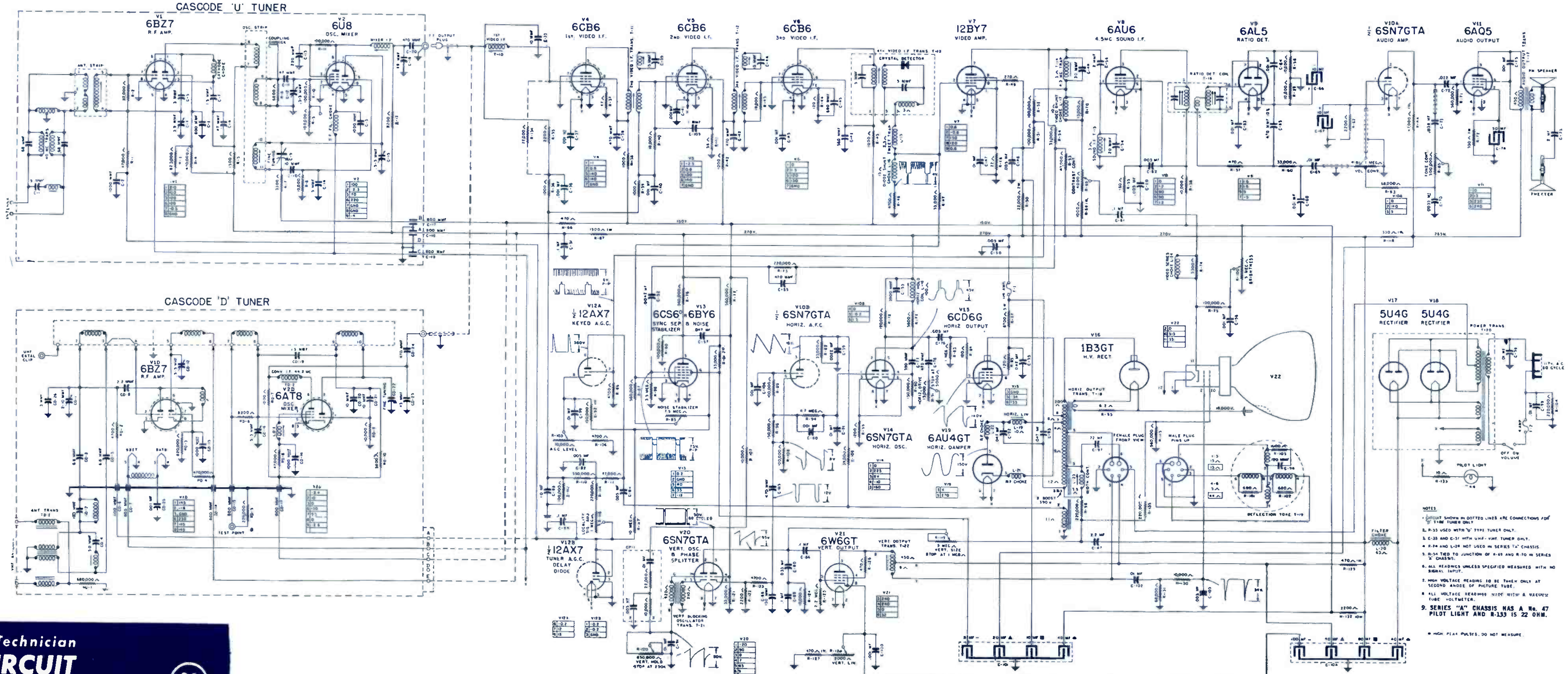
(3) Turn TU-2 mixer IF coil located on VHF tuner IN 10 turns until exact position is reached as before alignment.

FIG. 2



UHF – VHF TUNER DIAGRAM





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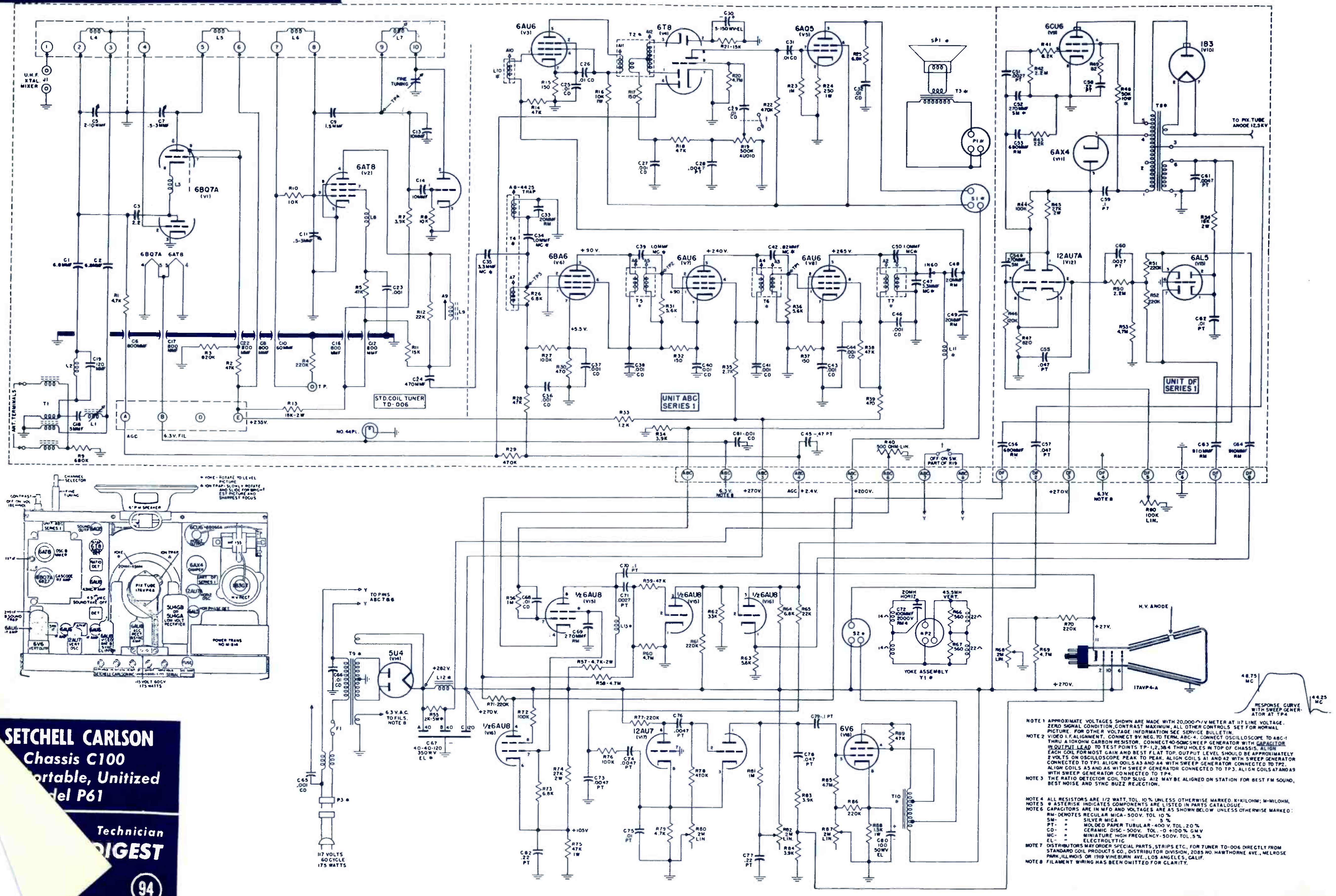


NOTE 1 APPROXIMATE VOLTAGES SHOWN ARE MADE WITH 20,000 ~/V METER AT 117 LINE VOLTAGE. ZERO SIGNAL CONDITION, CONTRAST MAXIMUM, ALL OTHER CONTROLS SET FOR NORMAL PICTURE. FOR OTHER VOLTAGE INFORMATION SEE SERVICE BULLETIN.

NOTE 2 VIDEO I.F. ALIGNMENT. CONNECT 9V. NEG. TO TERM. ABC-4. CONNECT OSCILLOSCOPE TO ABC-1 THRU A 10KOHM CARBON RESISTOR. CONNECT 40-50MC SWEEP GENERATOR WITH CAPACITOR IN OUTPUT LEAD TO TEST POINTS TP-1,2,3&4 THRU HOLES IN TOP OF CHASSIS. ALIGN EACH COIL FOR MOST GAIN AND BEST FLAT TOP. OUTPUT LEVEL SHOULD BE APPROXIMATELY 2 VOLTS ON OSCILLOSCOPE PEAK TO PEAK. ALIGN COILS A1 AND A2 WITH SWEEP GENERATOR CONNECTED TO TP1. ALIGN COILS A3 AND A4 WITH SWEEP GENERATOR CONNECTED TO TP2. ALIGN COILS A5 AND A6 WITH SWEEP GENERATOR CONNECTED TO TP3. ALIGN COILS A7 AND A9 WITH SWEEP GENERATOR CONNECTED TO TP4.

NOTE 3 THE RATIO DETECTOR COIL TOP SLUG A12 MAY BE ALIGNED ON STATION FOR BEST FM SOUND, BEST NOISE AND SYNC BUZZ REJECTION.

NOTE 4 ALL RESISTORS ARE 1/2 WATT, TOL. 10% UNLESS OTHERWISE MARKED. K=KILOHM; M=MILOHM.

NOTE 5 * ASTERISK INDICATES COMPONENTS ARE LISTED IN PARTS CATALOGUE.

NOTE 6 CAPACITORS ARE IN MFD AND VOLTAGES ARE AS SHOWN BELOW UNLESS OTHERWISE MARKED:

RM- DENOTES REGULAR MICA - 500V. TOL 10 %
SM- " SILVER MICA " " 5 %
PT- " MOLDED PAPER TUBULAR - 400 V. TOL. 20 %
CD- " CERAMIC DISC - 500V. TOL. -0 +100 % GMV
MC- " MINIATURE HIGH FREQUENCY - 500V. TOL. 5 %
EL- " ELECTROLYTIC

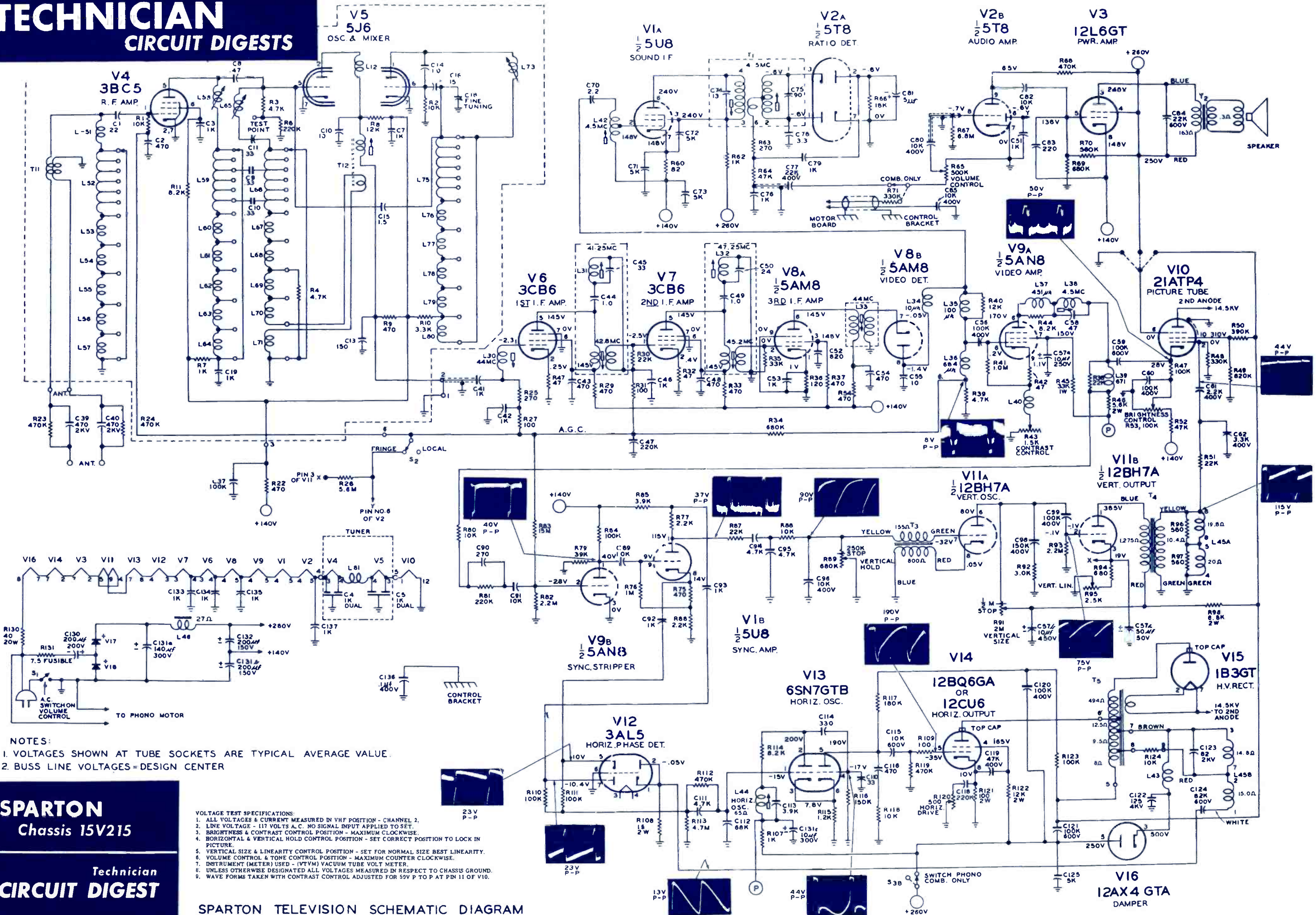
NOTE 7 DISTRIBUTORS MAY ORDER SPECIAL PARTS, STRIPS ETC., FOR TUNER TD-006 DIRECTLY FROM STANDARD COIL PRODUCTS CO., DISTRIBUTOR DIVISION, 2085 NO. HAWTHORNE AVE., MELROSE PARK, ILLINOIS OR 1919 VINEBURN AVE., LOS ANGELES, CALIF.

NOTE 8 FILAMENT WIRING HAS BEEN OMITTED FOR CLARITY.

SETCHELL CARLSON
Chassis C100
ortable, Unitized
del P61

Technician DIGEST 94

TECHNICIAN
CIRCUIT DIGESTS



NOTES:

1. VOLTAGES SHOWN AT TUBE SOCKETS ARE TYPICAL AVERAGE VALUE.
2. BUSS LINE VOLTAGES = DESIGN CENTER

VOLTAGE TEST SPECIFICATIONS:

1. ALL VOLTAGES & CURRENT MEASURED IN VHF POSITION - CHANNEL 2.
2. LINE VOLTAGE - 117 VOLTS A.C. NO SIGNAL INPUT APPLIED TO SET.
3. BRIGHTNESS & CONTRAST CONTROL POSITION - MAXIMUM CLOCKWISE.
4. HORIZONTAL & VERTICAL HOLD CONTROL POSITION - SET CORRECT POSITION TO LOCK IN PICTURE.
5. VERTICAL SIZE & LINEARITY CONTROL POSITION - SET FOR NORMAL SIZE BEST LINEARITY.
6. VOLUME CONTROL & TONE CONTROL POSITION - MAXIMUM COUNTER CLOCKWISE.
7. INSTRUMENT (METER) USED - (VTVM) VACUUM TUBE VOLT METER.
8. UNLESS OTHERWISE DESIGNATED ALL VOLTAGES MEASURED IN RESPECT TO CHASSIS GROUND.
9. WAVE FORMS TAKEN WITH CONTRAST CONTROL ADJUSTED FOR 50V P TO P AT PIN 11 OF V10.

SPARTON TELEVISION SCHEMATIC DIAGRAM

CHASSIS TYPE 15V215

SPARTON
Chassis 15V215

Technician
CIRCUIT DIGEST

95

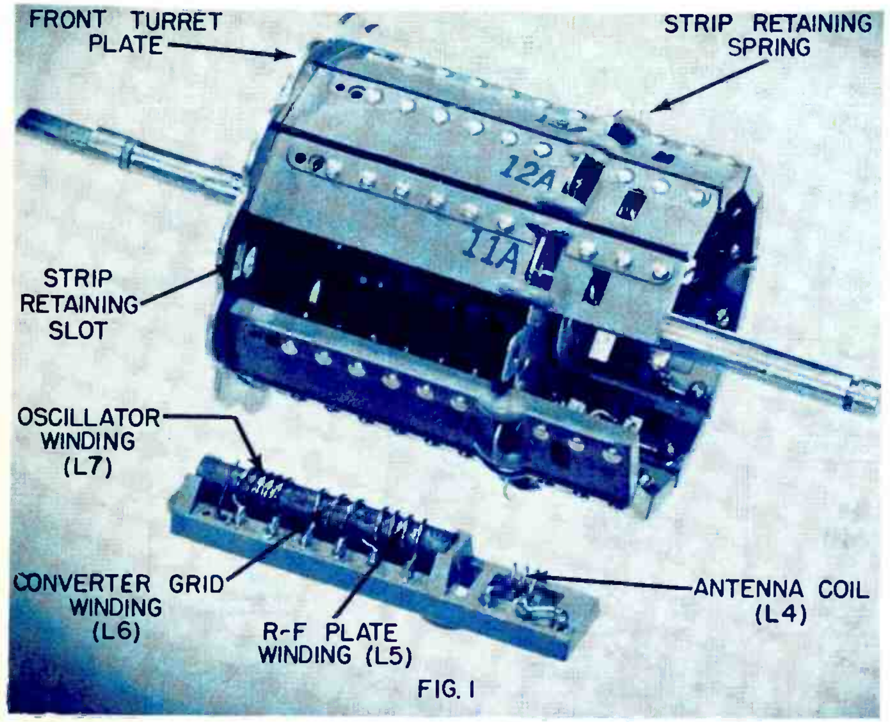


FIG. 1

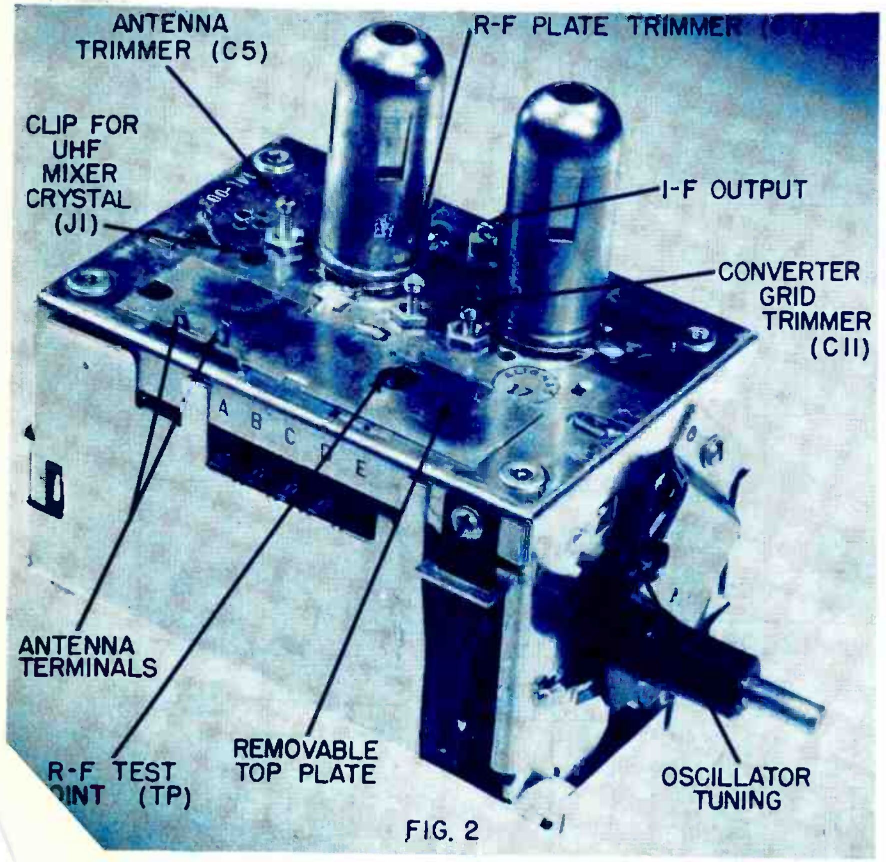
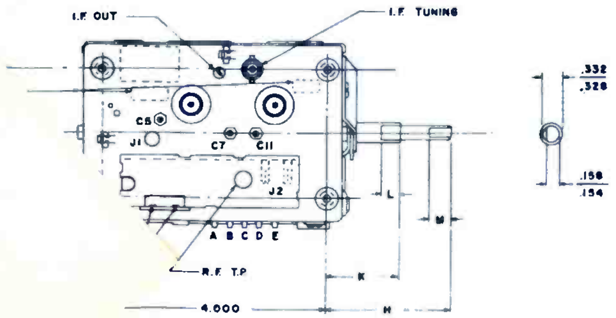
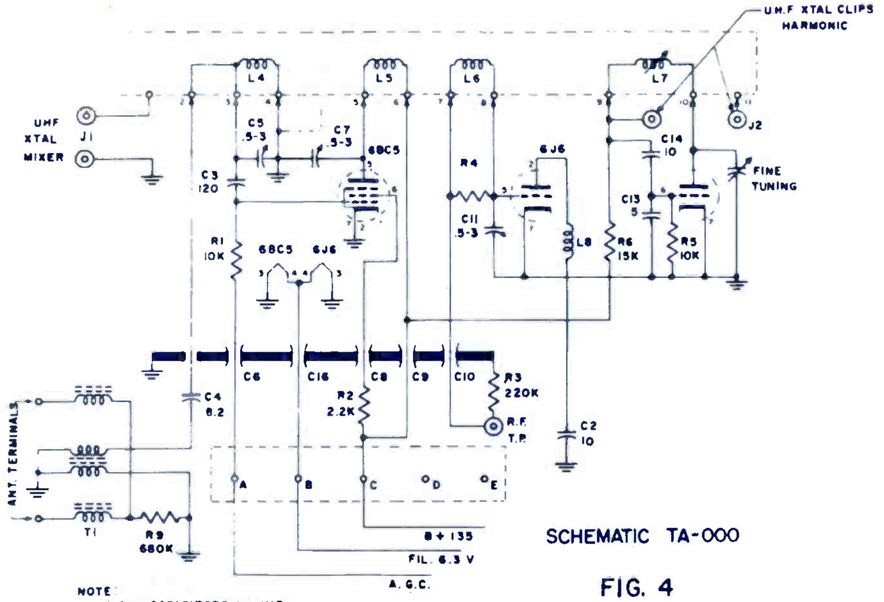


FIG. 2

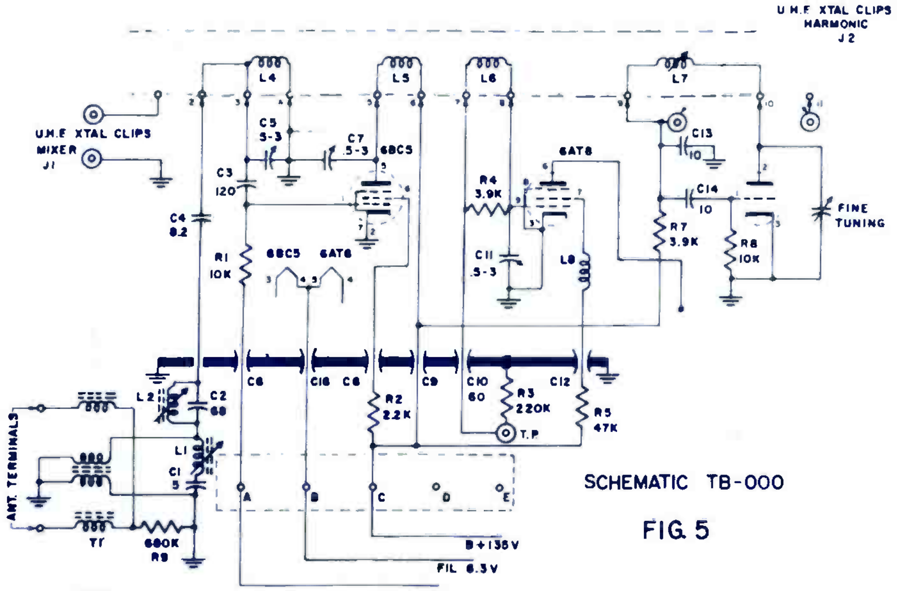




SCHEMATIC TA-000

FIG. 4

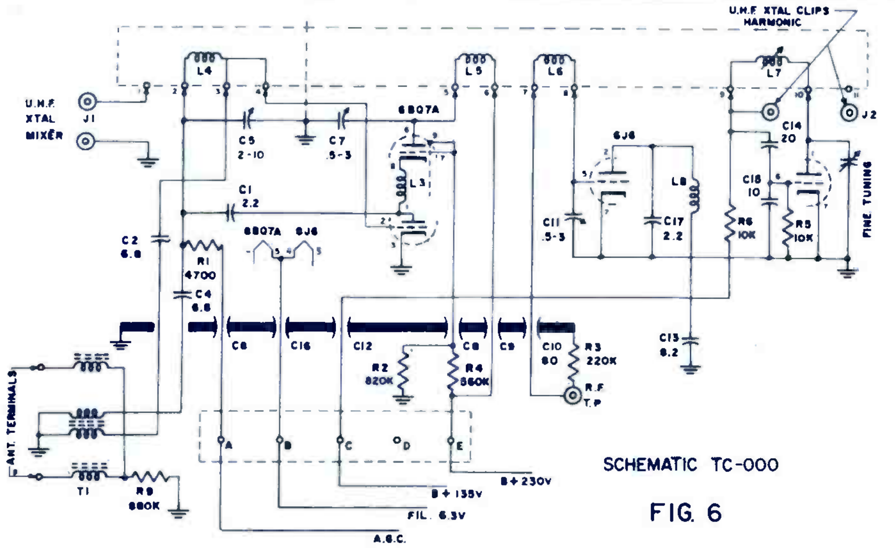
NOTE:
1. ALL CAPACITORS IN MMF
2. FEED THRU CAPACITORS 800 MMF MIN. UNLESS NOTED.
3. ALL RESISTORS 1/2 WATT UNLESS NOTED.



SCHEMATIC TB-000

FIG. 5

NOTE:
1. ALL CAPACITORS IN MMF
2. FEED THRU CAPACITORS 800 MMF MIN. UNLESS NOTED.
3. ALL RESISTORS 1/2 WATT UNLESS NOTED.



SCHEMATIC TC-000

FIG. 6

NOTE:
1. ALL CAPACITORS IN MMF
2. FEED THRU CAPACITORS 1000 MMF MIN. UNLESS NOTED.
3. ALL RESISTORS 1/2 WATT UNLESS NOTED.

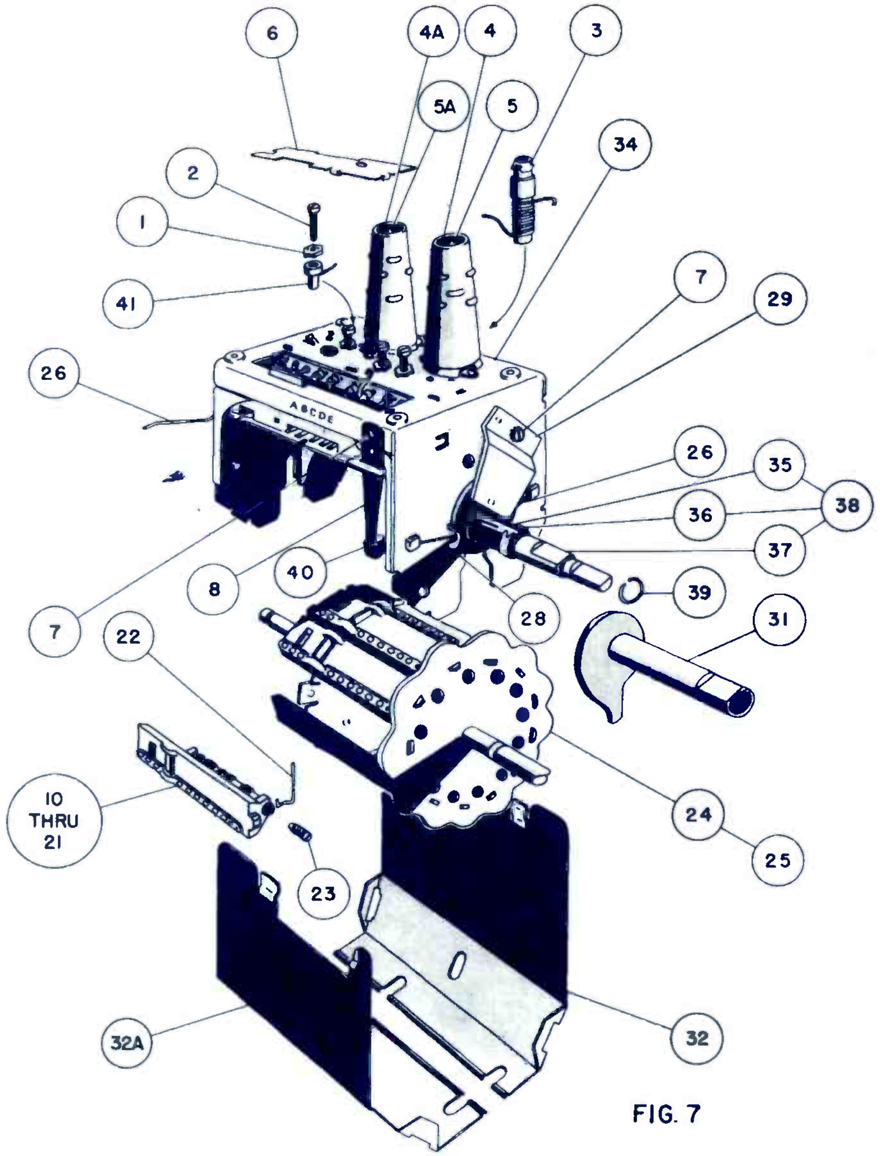


FIG. 7

Model "T" series

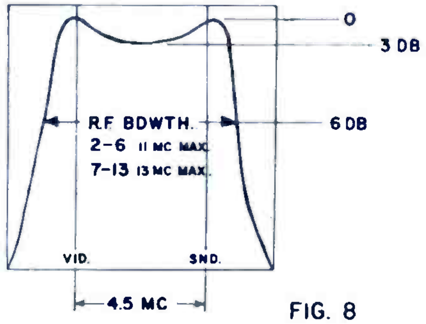


FIG. 8

STANDARD COIL
Model "T" Series

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Shop Hints

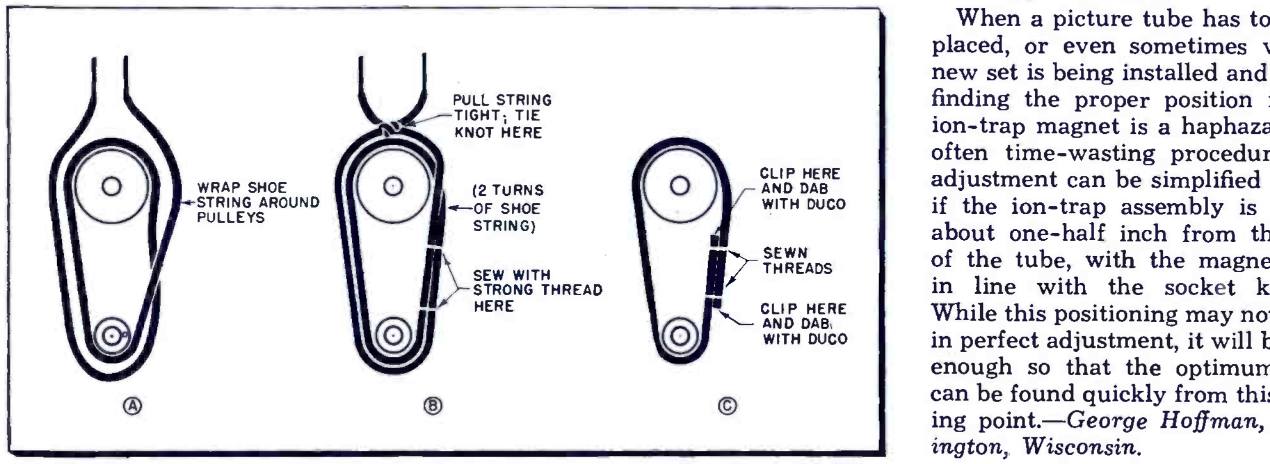
Dial Belt Replacement—Managing on a Shoestring

Many radio receivers still use belts instead of cables to operate the dial movement mechanism. Sizes of these belts vary. There is no standard, and keeping many sizes in stock is a problem. However, the ordinary shoestring is a near approach to a "universal" belt.

To make the substitute belt, wrap the string twice around the pulleys, as shown at A. Pull the two ends tight and knot them as shown at B. With needle and very strong thread, sew the string at the two points as shown; after which snip the strings beyond the sewn places (sketch C). Put a dab of cement under each clipped end, applying a clamping pressure with long-nose pliers until the cement has set; then let dry.

Thus prepared, the belt will glide smoothly over the pulleys, especially after a liberal coat of dial cord dressing. I've used one such shoestring-belt for over two years.—*J. Amorose, Richmond, Va.*

Step-by-step procedure for custom-fabricating dial belt substitutes with ordinary shoestring.



Ion-Trap Technique

When a picture tube has to be replaced, or even sometimes when a new set is being installed and set up, finding the proper position for the ion-trap magnet is a haphazard and often time-wasting procedure. The adjustment can be simplified greatly if the ion-trap assembly is started about one-half inch from the base of the tube, with the magnet itself in line with the socket keyway. While this positioning may not result in perfect adjustment, it will be close enough so that the optimum point can be found quickly from this starting point.—*George Hoffman, Washington, Wisconsin.*

INTRODUCTION

Tuners in series TA, TB, TC and TD consist of 4 basic types. Two pentode tuners (one for 21-mc i-f circuits, one for 41-mc use) and two cascode tuners (also one each for 21- and 41-mc i-f receivers) make up the basic line. These 4 basic models are being used by various TV manufacturers in either 12- or 13-position turret models, with either solid or insulated shafts, and with tubes either for parallel-filament 6.3-volt operation or for 600-ma series-filament circuits. A more complete breakdown of tuner types is presented in Table 1.

SPECIAL FEATURES

While earlier Standard Coil turret tuners used a pair of coil strips for each channel position, the new turrets are equipped with all coils mounted on a single molded strip for each channel. Each strip is held in place by spring tension, but in a manner that is somewhat different from that used in earlier models. To remove a strip, exert pressure on the strip retaining spring, which is located, as shown in Fig. 1, at the rear of the tuner, and lift outward. The opposite end of the strip is engaged in a slot in the front turret plate, also indicated in Fig. 1.

Another departure is in the provision made for uhf reception with individual uhf strips. In earlier designs, each pair of uhf strips carried its own harmonic generator crystal as well as its own mixer crystal. While individual harmonic generator crystals are still used, a single mixer crystal may now be mounted in the tuner to accommodate all uhf strips. This crystal is mounted at J1 (Fig. 2 and 3), where it is held in place by a bracket and screw. One end of the mixer is grounded through the bracket. The other end, when the crystal is properly seated, engages stationary spring contact finger no. 1, which in turn connects to coil-strip contact no. 1, as shown in the schematics.

Fig. 2 is an external view of the complete "T" series tuner, with important elements identified. Fig. 3 is an outline view of the top of the tuner. Figs. 1, 2 and 3 are applicable to all tuners in the series. Figs. 4, 5 and 6 are schematics for the TA, TB and TC series, respectively. Although the schematic for the TD tuner is not shown, all pertinent information is included in Figs. 5 and 6. The r-f section for the TD tuner is similar to the r-f section of the TC series (Fig. 6); while the oscillator-mixer and i-f output section is similar to that of the TB series (Fig. 5). The series-filament variations are schematically identical to their 6.3-volt prototypes except for heater wiring.

STANDARD COIL
Model "T" Series

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CIRCUIT DIGEST
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ALIGNMENT

Proper alignment is important since a misaligned tuner may adversely affect the over-all operation of the set.

Four sections of the tuner are related to alignment operations. These are the r-f stage (two trimmers), the mixer stage (one trimmer), the oscillator stage (slug in the coil strip) and the i-f coil in the output of the mixer.

The alignment of all Standard Coil tuners follows substantially the same method with but few exceptions. The variables appear in the amount of grid bias which must be applied to the agc bus. This is critical, and the information given here should be followed. If this is in conflict with data contained in a receiver manufacturer's service manual, the latter should be followed. In the absence of such information, the instructions contained herein should be observed.

The adjustment of the oscillator-coil slug for each channel is the same on all vhf tuners. In order to obtain access to this slug through the hole in the front wall of the tuner, it is necessary to position the fine tuning dielectric blade correctly. The proper position is its electrical mid-range. All shields must be in place before and during alignment.

TEST EQUIPMENT REQUIRED

1. Sweep generator which will cover the 12 TV channels with a sweep width of approximately 15 mc. Generator should also provide frequencies for sweeping the 21-mc and 41-mc i-f system. Suitable markers must be provided either internally or with a separate external marker generator.
2. Cathode-ray oscilloscope with at least from 10 to 50 millivolt sensitivity in the vertical amplifiers and with good low frequency response and low phase distortion.
3. An electronic voltmeter.
4. Suitable non-metallic aligning tools.
5. Proper means for matching the output of the sweep generator to the balanced 300 ohm input of the tuner.

I-F ALIGNMENT

1. Apply a fixed bias voltage on the agc bus, usually from -1.0 v to -1.5 v. A convenient source for a fixed bias is a dry battery and potentiometer.
2. Connect the oscilloscope vertical input through a 10,000-ohm isolating resistor across the video load resistor.
3. Connect the sweep generator, with suitable markers, to the test point TP which may be reached through the hole in the removable top cover of the tuner. See Figures 2 and 3. Set the sweep generator to the center frequency of i-f system being aligned; usually 23.5 mc or 43.5 mc.
4. Set the i-f tuning adjustments according to the i-f curve recommended by the set manufacturers. This includes setting the converter i-f coil in the tuner. If an AM generator is used instead of a sweep generator, the i-f coils should be tuned to the specific frequencies recommended by the set manufacturer.

TABLE I

TUNER	I.F. (mc)	TUBE COMPLEMENT			
		PARALLEL HEATERS		SERIES HEATERS	
		R-F	MIX/OSC	R-F	MIX/OSC
TA-000	21	6BC5	6J6		
TAS-000	21			3BC5	5J6
TB-000	41	6BC5	6AT8		
TBS-000	41			3BC5	5AT8
TC-000	21	6BQ7A	6J6		
TCS-000	21			4BQ7A	5J6
TD-000	41	6BQ7A	6AT8		
TDS-000	41			4BQ7A	5AT8

R-F AND MIXER ALIGNMENT

1. Set station selector to Channel 10.
2. Connect the oscilloscope vertical input through the 10,000-ohm isolating resistor to the test point TP; ground the oscilloscope ground lead near by.
3. Apply -2.5 v fixed bias to tuner agc terminal "A".
4. Connect the sweep generator, with suitable markers, to the antenna terminals. Make certain that the proper impedance match exists and that termination is correct. See Figure 9. To insure a balanced 300-ohm match from 300-ohm generator output, a pad may be used. See Figure 9.
5. Set the sweep generator to Channel 10. Use minimum output from the sweep generator consistent with a readable trace on the oscilloscope screen.
6. Adjust the antenna trimmer (C5), r-f plate trimmer (C7) and the converter grid trimmer (C11) to produce a symmetrical pattern with the sound and picture markers appearing as shown in Figure 8. Care should be taken not to "stagger tune" these circuits. "Stagger tuning" is eliminated by tuning for maximum pattern height at the point midway between the two marker frequencies.
7. Without disturbing the above trimmer adjustments, check the response curves of the remaining TV channels. Curves should be substantially the same as on Channel 10, however, peak-to-peak tilts and peak-to-valley variations of 30% are normal.

OSCILLATOR ALIGNMENT FOR INTERCARRIER SYSTEMS

1. Set the station selector to the alignment channel.
2. Connect the oscilloscope across the load resistor of the video detector.
3. With the sweep generator fed into the antenna and the marker generator set at the frequency of the video carrier channel, adjust the oscillator slug until the marker is at the 50% point on the high frequency slope of the i-f response curve.
4. Adjust the oscillator slug for each of the other channels with the generator set to the proper frequencies for each channel.

ADJUSTING CONTACT FINGER SPRINGS

In the event that the stationary contact fingers have been damaged and make poor contact with the contacts on the coil strips, the tension on the stationary contact springs can be increased.

1. Remove the drum or several coil strips from the drum so that the contacts may be reached.
2. Pull slightly outward on the spring contacts. Do not pull beyond the point where the free end of the spring disengages the slot in the stator board or rubs the insulated portion of the drum coil strips. A piece of wire with a right angle bend, or other suitable tool, may be used for reforming the contacts.

CLEANING AND LUBRICATION

When it becomes necessary to clean the contacts and springs, proceed as follows. Contacts on coil strips can be cleaned without removing the coils from the turret by using a small piece of soft cloth dipped in carbon tetrachloride; do not douse coils. Allow a few minutes for evaporation and then wipe the coil contacts with a lint-free cloth to remove film deposit.

To clean the stationary contacts, remove several coil strips so as to expose them. Clean with a small piece of soft cloth dipped into carbon tetrachloride and remove film deposit with clean lint-free cloth. Do not damage or deform contacts. Remove any accumulation of dirt and grease from contact plate surface in the same manner. After cleaning contacts it may be necessary to reset them; see procedure for adjusting contact finger springs.

In the event that lubrication of tuner contacts is necessary, which is generally so after cleaning, use a sulphur and acid-free, non-drying lubricant such as Viscosity Oil Company #7069. Do not use any so-called noise-eliminating lubricants or cleaning substances. Lubricate all moving parts including the stationary and moving coil contacts, the inner side of the outer shaft, and all bearings and springs. For lubricating bearings use Viscosity Oil Company #8857 lubricant or light vaseline.

PARTS REPLACEMENT

When it becomes necessary to replace electrical parts in the tuner, extreme care must be exercised. The replacement part must be exactly the same as the original. This applies to its electrical value, tolerance and temperature coefficient if applicable, physical dimension, location, and lead length. The lead dress is extremely important. Observe the lead dress arrangement before making parts changes.

In the case of fixed resistors which must be replaced, make certain that the type used is that originally used in the tuner.

If the feed-through capacitors are replaced use the minimum amount of heat and, if possible, use silver-bearing solder to avoid damage to the silver surface on the feed-through.

SERVICE PARTS LIST FOR "T" SERIES TUNER

Standard Coil Products Part Number

ITEM	TA	TB	TC	TD	DESCRIPTION
1	10E-406	10E-406	10E-406	10E-406	Nut, Trimmer Spring
2	9YS43610PC-7	9YS43610PC-7	9YS43610PC-7	9YS43610PC-7	Screw, Trimmer
3	SPECIFY STANDARD COIL PRODUCTS TV NUMBER WHEN ORDERING				I. F. Coil Assembly
4	16S-012	16S-013	16S-012	16S-013	Shield Tube
4A	16S-012	16S-012	16S-013	16S-013	Shield Tube
5	6J6	6AT8	6J6	6AT8	Osc. Mixer Parallel Heaters
	5J6	5AT8	5J6	5AT8	Osc. Mixer Series Heaters
5A	6BC5	6BC5	6BQ7A	6BQ7A	R. F. Amp. Parallel Heaters
	3BC5	3BC5	4BQ7A	4BQ7A	R. F. Amp. Series Heaters
6	14K-105	14K-105	14K-105	14K-105	Plate, Cover
7	9A-629-3	9A-629-3	9A-629-3	9A-629-3	Screw
8	31B-005-04	31B-005-04	31B-005-04	31B-005-04	Spring Detent
9					
10	31M-302A	31M-302B	31M-302C	31m-302D	
	thru	thru	thru	thru	Coil Board Assembly
21	31M-313A	31M-313B	31M-313C	31M-313D	
22	31A-010	31A-010	31A-010	31A-010	Spring, Slug Retainer
23	31B-029-03	31B-029-03	31B-029-03	31B-029-03	Slug, Oscillator
24	SPECIFY STANDARD COIL PRODUCTS TV NUMBER WHEN ORDERING				Coil & Drum Assembly
25	SPECIFY STANDARD COIL PRODUCTS TV NUMBER WHEN ORDERING				Coil Support Ass'y W/o Coils
26	31K-118-02	31K-118-02	31K-118-02	31K-118-02	Spring, Drum Retainer
27					
28	31B-008	31B-008	31B-008	31B-008	Spring Fine Tuning Ground
29	14K-109	14K-109	14K-109	14K-109	Bracket, Fine Tuning W/ Stops
	14K-109-01	14K-109-01	14K-109-01	14K-109-01	Bracket, Fine Tuning W/o Stops
30					
31	SPECIFY STANDARD COIL PRODUCTS TV NUMBER WHEN ORDERING				Fine Tuning Assembly
32	14K-108-02	14K-108-02	14K-108-02	14K-108-02	Cover Bottom
32A	14K-108-01	14K-108-01	14K-108-01	14K-108-01	Cover Bottom Detent Side
33					
34	31T-103	31T-111	31T-121	31T-141	Chassis Ass'y Parallel Heaters
	31T-101	31T-113	31T-123	31T-143	Chassis Ass'y Series Heaters
35	31B-175	31B-175	31B-175	31B-175	Cam Fine Tuning
36	23A-056	23A-056	23A-056	23A-056	Spring Compression
37	SPECIFY STANDARD COIL PRODUCTS TV NUMBER WHEN ORDERING				Shaft, Fine Tuning
38	SPECIFY STANDARD COIL PRODUCTS TV NUMBER WHEN ORDERING				Fine Tuning Assembly
39	31A-152	31A-152	31A-152	31A-152	Retainer Ring
40	31B-016	31B-016	31B-016	31B-016	Roller Detent
41	31B-902	31B-902	31B-902	31B-902	Trimmer Dowel

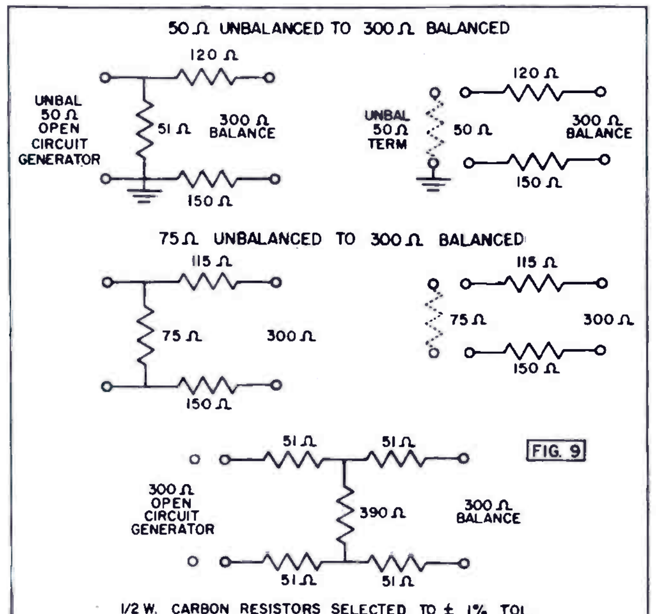
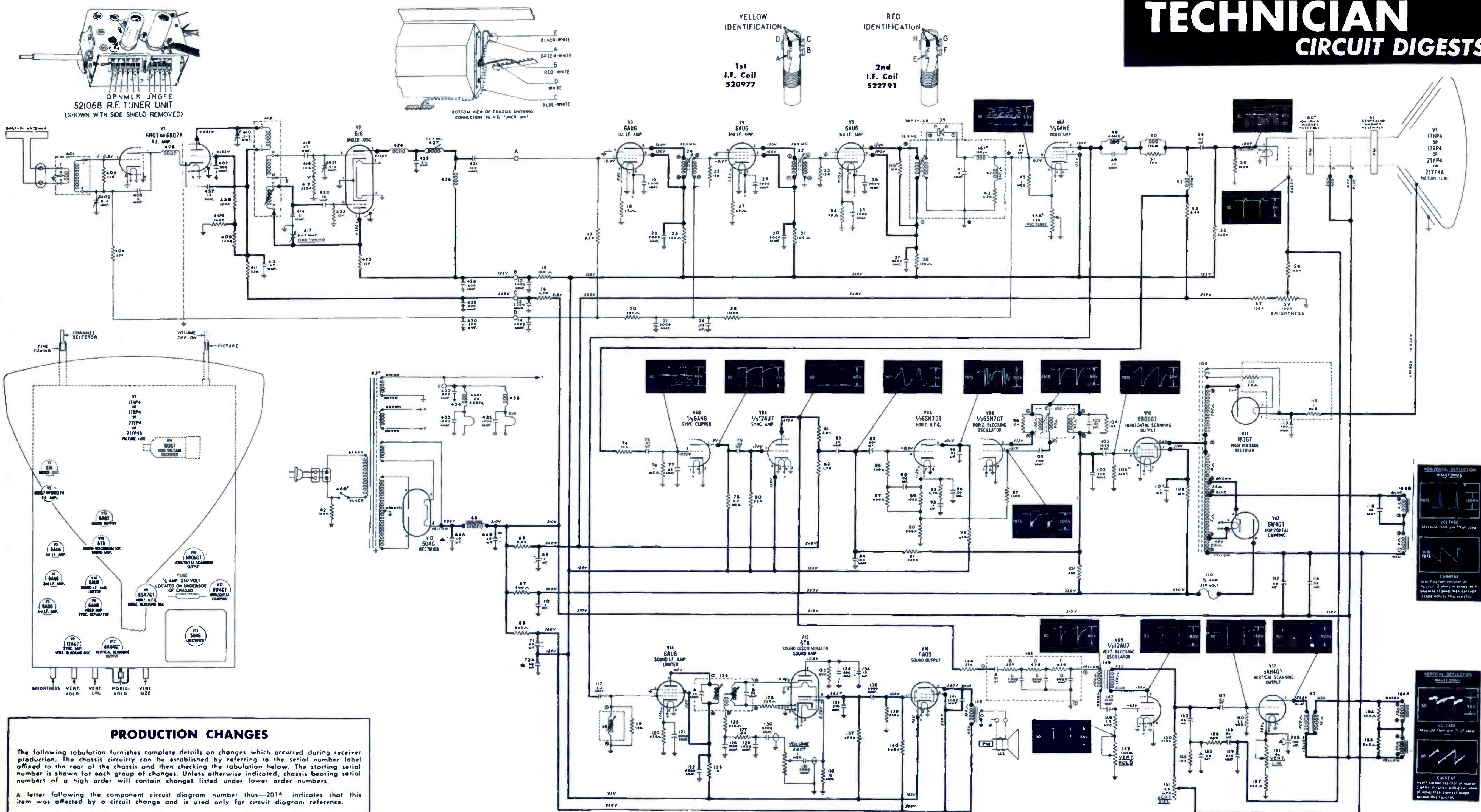


FIG. 9

TECHNICIAN
CIRCUIT DIGESTS



PRODUCTION CHANGES

The following tabulation furnishes complete details on changes which occurred during receiver production. The chassis circuitry can be established by referring to the serial number label affixed to the rear of the chassis and then checking the tabulation below. The starting serial number is shown for each group of changes. Unless otherwise indicated, chassis bearing serial numbers of a high order will contain changes listed under lower order numbers.

A letter following the component circuit diagram number thus—201A indicates that this item was affected by a circuit change and is used only for circuit diagram reference.

SERIAL NUMBER	DESCRIPTION OF CHANGE
104,601	Initial Production
106,601	The following change was incorporated to reduce drive bar and affected components have circuit diagram reference A. 1. Resistor 169 was added between the center tap of the power transformer 63 and chassis ground. 2. Resistor 106 in grid circuit of tube V10, Horizontal Scanning Output, was changed from 470,000 Ohms to 330,000 Ohms.
106,701	The components affected by the following changes have circuit reference B. The following change was incorporated to provide a longer antenna lead-in. 1. R.F. Tuner part number was changed from 522514 to 522931. There are no electrical differences between these two units. The following change was incorporated to reduce radiation of harmonic frequencies being fedback through antenna lead-in.

SERIAL NUMBER	DESCRIPTION OF CHANGE
	1. Tube shields were added to the three I.F. Amplifier tubes V3, V4, and V5. 2. Antenna lead-in was dressed against side of chassis and antenna terminals were lowered to lower part of cabinet. 3. Resistor 168 (15,000 Ohms) was added across primary of 3rd I.F. transformer. 4. Peaking Coil 167 was added between detector 40 and condenser 44. The following change was incorporated to facilitate production. 1. Power Transformer 63 part number was changed from 522677 to 522973. When latter transformer is used, resistor 169 is no longer required, therefore, it was omitted. 2. Ion trap, 60 part number was changed from 521183 to 523001. The following change was incorporated to improve the taper of the Picture control. 1. Volume and Picture potentiometers, 46-A,B,C part number was changed from 522515 to 522744. When the latter control is used, resistor 47 is no longer required, therefore, it was omitted.

OSCILLOGRAMS

All oscillograms taken with ground lead of 'Scope connected to receive chassis and controls set for normal reception. Picture control adjusted to give 42 volts peak to peak at cathode of picture tube. Oscilloscope vertical amplified response was flat to within 20% at 2 MC.

Number appearing to the left of oscillogram specifies setting of horizontal sweep frequency control on 'Scope.

● VOLTAGE MEASUREMENTS

All voltages measured with a 20,000 Ohm per volt meter with the receiver connected to a 117 volt 60 cycle power supply.

Tuner set to an inactive channel with antenna terminals shorted and connected to ground.

Controls set for normal reception—Picture control completely counterclockwise.
Voltages marked with an asterisk (*) will vary widely with control settings.

All voltages shown, except R.F. Tuner socket measurements, were taken under the above conditions.

‡ R. F. tuner socket voltage measurements were taken with tubes removed from sockets.

No voltage reading at a tube element indicates zero voltage or voltage which cannot be accurately measured with a 20,000 Ohm per volt meter.

Models 17T-9620A, 17T-9620B, 21C-9630C, 21C-9630CB, 21C-9630D, 21T-9630A, 21T-9630AB

STEWART-WARNER

Technician
CIRCUIT DIGEST

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TECHNICIAN
CIRCUIT DIGESTS

ALIGNMENT PROCEDURE

Apply AGC bias of approximately 3 volts to AGC line (across C-160).

Maintain the output level of the sweep generator to obtain a second detector output of 2 volts peak-to-peak. Oscilloscope should be calibrated to read 1-VOLT per inch vertical deflection.

NOTE: To Perform IF Alignment it is not necessary to Remove Picture Tube. Use a non metallic aligning tool such as Walsco No. 2526 or equivalent which permits all slugs to be adjusted from the underside of the chassis.

SIGNAL GENERATOR CONNECTION	OSCILLOSCOPE OR VTVM CONNECTION	ADJUSTMENTS
1. Output of 40MC. sweep generator to grid of 1st IF tube, pin 1 of V9, 6CB6 thru 100 MMF isolating capacitor.	Input of scope to grid of Video Amp., pin 1 of V-13, 6AU6 thru 47K-Ohm isolating resistor.	1. Adjust the bottom slug of T-7 1st IF transformer for low intermediate frequency (43.2 MC approx.). 2. Adjust the bottom slug of T-9 3rd IF transformer for low frequency. (42.0 MC approx.). 3. Adjust the bottom slug of T-8 2nd IF transformer for high frequency. (45.0 MC approx.). 4. Adjust the bottom slug of T-10 4th IF transformer for high intermediate frequency. (44.5 MC approx.). 5. Maintaining the above relative frequency positions of the individual stages, adjust the slugs to produce a curve as shown with the 41.9 and 45.75 MC markers at 50% response Fig. # 1.
2. Output of 40MC sweep generator to junction of T-6 and L-18. Using 39.75MC marker.	Same as Step # 1.	1. Adjust the top slug of T-6 for response 39.75MC as shown on curve Fig. 2.
3. Same as Step # 2. Using 41.25MC marker.	Same as Step # 1.	1. Adjust the top slug of T-7 and T-11 for response as shown on curve Fig. 2.
4. Same as Step # 1 using 47.25 MC marker.	Same as Step # 1.	1. Adjust the top slug of T-8 for response curve as shown on Fig. 3. 2. Repeat Step # 1 (IF response) to reproduce the curve as shown in Fig. 1.
5. Raise converter tube shield from ground and connect output of 40 MC sweep generator to the shield.	Same as Step # 1.	1. Adjust the bottom slug of T-6 and T-5 tuner assembly to produce a curve as shown in Fig. 4.
6. Connect a 400 cycle modulated 4.5 MC signal to the junction of Video Detector M-13 and C-126. Adjust generator output to a level to indicate 1.5 volts VTVM.	Connect 2-100K resistors in series from the plate of ratio detector, pin 2 of V-18, 6T8 to ground, connect VTVM from junction of the resistors to ground.	1. Adjust L-21, T-15, and the bottom slug of T-16 for maximum indication.
7. Same as Step # 6.	Connect VTVM ground lead to the junction of the 2-100K resistors (see step # 6 above). Connect VTVM D.C. lead to the junction of C-181 and R-181.	1. Adjust the secondary (top slug) of T-16 for zero volts between the positive and negative excursions. (Increase generator output for good deflection).

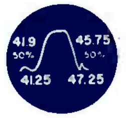


FIG. 1

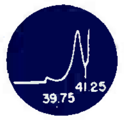


FIG. 2

FIG. 3

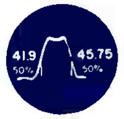
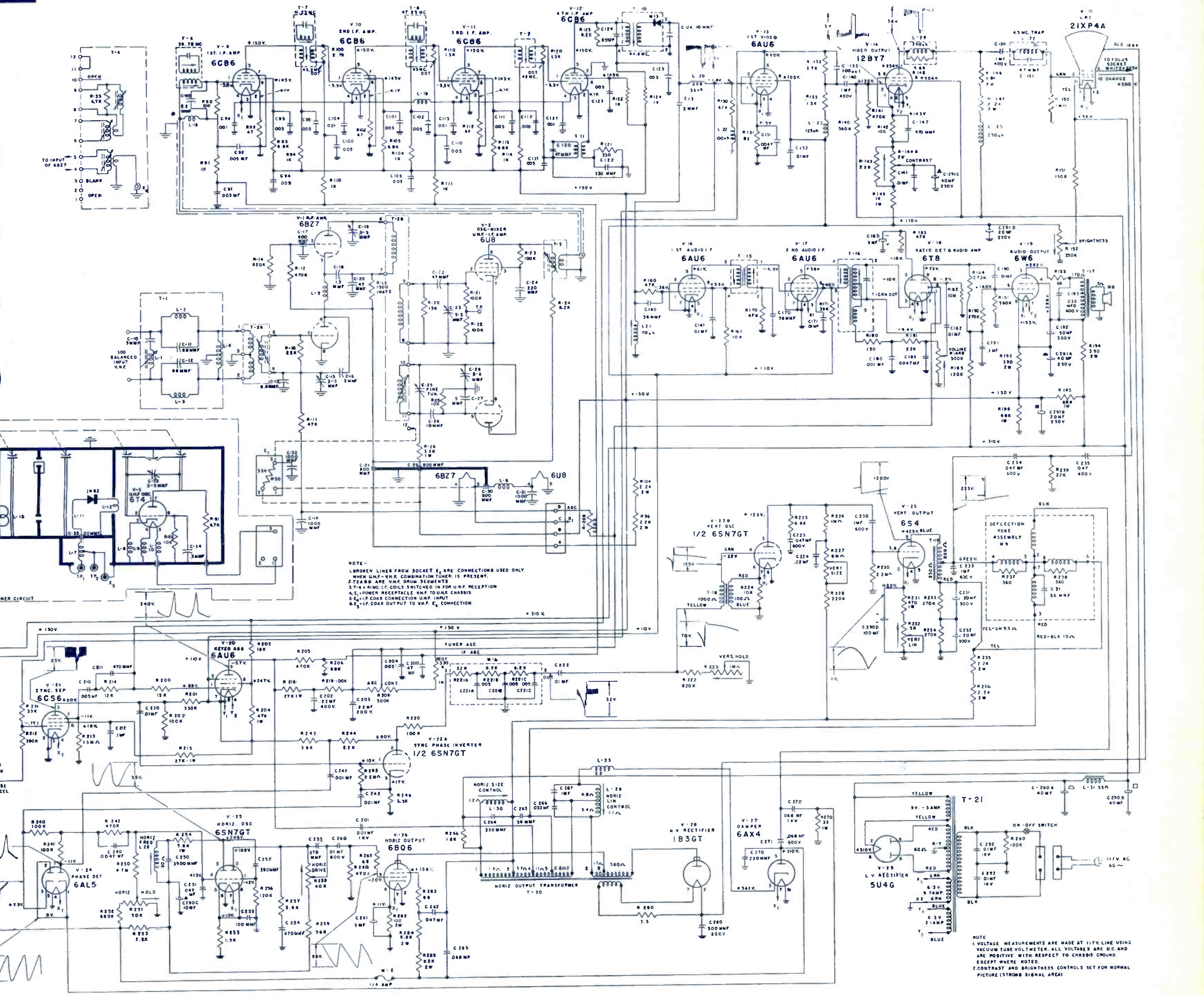


FIG. 4

ALTERNATE TRAP ALIGNMENT
IF THIS METHOD IS USED,
IT SHOULD BE PERFORMED BEFORE THE IF CURVE ALIGNMENT

SIGNAL GENERATOR CONNECTION	OSCILLOSCOPE OR VTVM CONNECTION	ADJUSTMENTS
1. Connect a modulated (400 cycle) 39.75 MC signal to the grid of 1st IF tube, pin 1 of V-9, 6CB6.	Same as Step # 1. (above).	1. Adjust top slug of T-6 for minimum response on scope.
2. Connect a modulated (400 cycle) 47.25 MC signal to the grid of 1st IF tube, pin 1 of V-9, 6CB6.	Same as Step # 1.	2. Adjust top slug of T-8 for minimum response on scope.
3. Connect a modulated (400 cycle) 41.25 MC signal to the grid, pin 1 of V-9, 6CB6.	Same as Step # 1.	3. Adjust top slug of T-7 and T-11 for minimum response on scope.

Chassis 21T-22T: Models
21TQ, 21TM, 21TB, 21TW, 21TF



STROMBERG-CARLSON
Chassis 21T-22T Series

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TECHNICIAN CIRCUIT DIGESTS

IMPORTANT
READ THESE INSTRUCTIONS CAREFULLY AND OBSERVE THE CONDITIONS NOTED WHEN TAKING VOLTAGE READINGS OR OBSERVING WAVE FORMS.

"DASH" VERSIONS OF PARTS CODING NUMBERS INDICATE VALUE REVISIONS AFTER INITIAL PRODUCTION. FIRST REVISION DESIGNATED BY "-1", SECOND BY "-2", ETC.

VOLTAGE MEASUREMENT CONDITIONS UNLESS OTHERWISE SPECIFIED:

1. VOLTAGES MEASURED TO CHASSIS USING SYLVANIA VACUUM TUBE VOLTMETER
2. AC POWER SOURCE 117V 60~ LINE ("VARIAC" REGULATED)
3. ANTENNA DISCONNECTED; ANTENNA TERMINALS SHORTED TOGETHER AND GROUNDED TO CHASSIS.
4. CONTRAST CONTROL SET TO MAXIMUM; BRIGHTNESS CONTROL SET TO MINIMUM; CHANNEL SELECTOR SET TO FREE CHANNEL.
5. AVERAGE VOLTAGES INDICATED ARE PREPARED AS SERVICE REFERENCE ONLY. VARIATIONS WITHIN LIMITS WILL BE OBSERVED.

SPECIAL VOLTAGE MEASUREMENT CONDITIONS

■ MEASURED WITH VTVM HIGH VOLTAGE PROBE AT AC LINE VOLTAGE OF 117 V. UNDER CONDITIONS OF NORMAL SIGNAL, NO BRIGHTNESS AND CORRECT SCAN SIZE.

▲ HIGH PEAK VOLTAGE OF SHORT DURATION MAY DAMAGE METER USED FOR THIS MEASUREMENT.

VOLTAGE READINGS IN BRACKETS ARE OBTAINED UNDER FOLLOWING CONDITIONS: ANTENNA CONNECTED, CHANNEL SELECTOR SET TO STRONG LOCAL STATION DEVELOPING APPROXIMATELY -4V. ON IF AGC BUS. (JUNCTION OF R142 AND C137.)

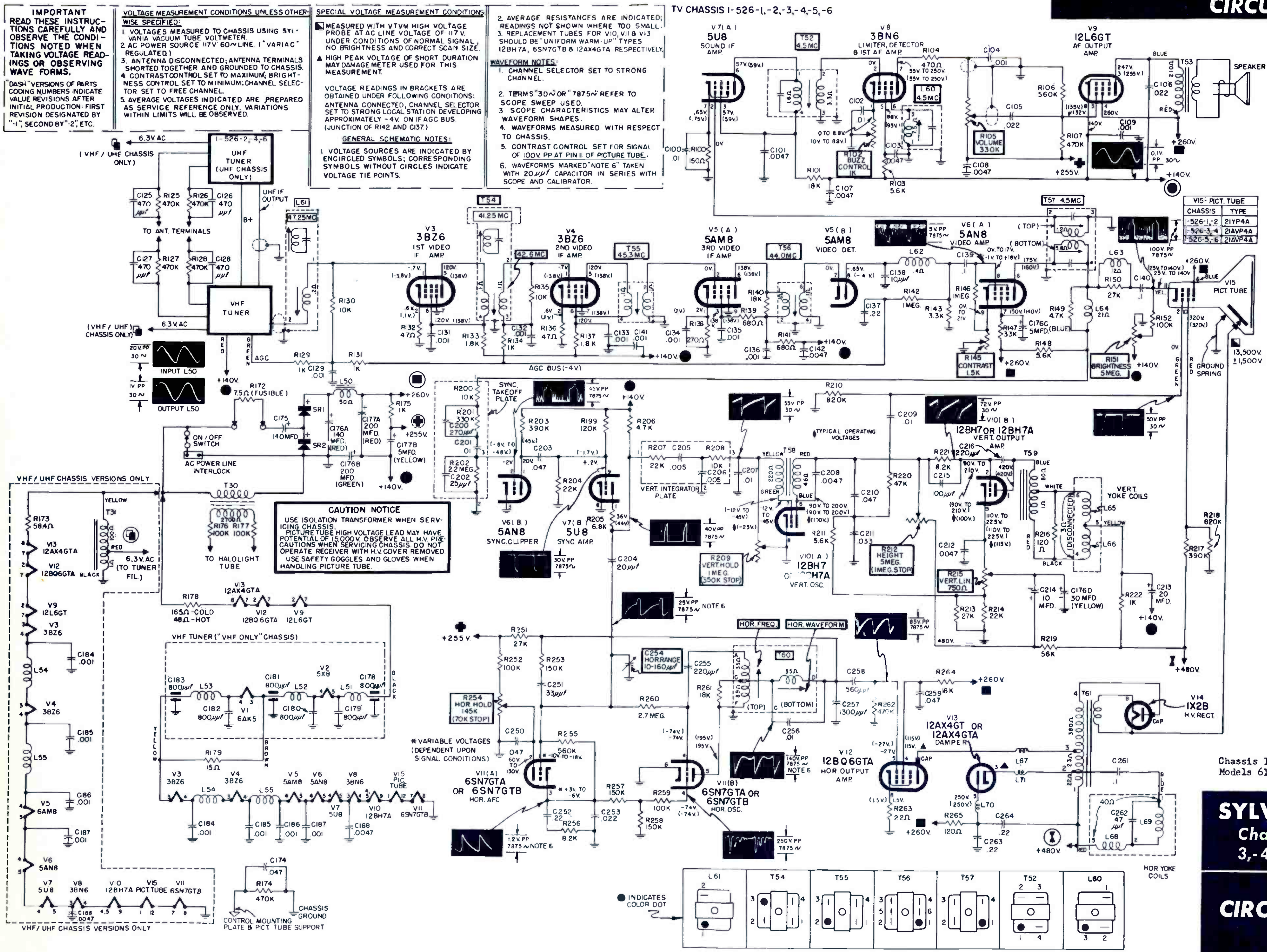
GENERAL SCHEMATIC NOTES:

1. VOLTAGE SOURCES ARE INDICATED BY ENCIRCLED SYMBOLS; CORRESPONDING SYMBOLS WITHOUT CIRCLES INDICATE VOLTAGE TIE POINTS.
2. AVERAGE RESISTANCES ARE INDICATED; READINGS NOT SHOWN WHERE TOO SMALL.
3. REPLACEMENT TUBES FOR V10, V11 & V13 SHOULD BE "UNIFORM WARM-UP" TYPES 12BH7A, 6SN7GTB & 12AX4GTA RESPECTIVELY.

WAVEFORM NOTES:

1. CHANNEL SELECTOR SET TO STRONG CHANNEL.
2. TERMS "30~" OR "7875~" REFER TO SCOPE SWEEP USED.
3. SCOPE CHARACTERISTICS MAY ALTER WAVEFORM SHAPES.
4. WAVEFORMS MEASURED WITH RESPECT TO CHASSIS.
5. CONTRAST CONTROL SET FOR SIGNAL OF 100V. PP AT PIN 11 OF PICTURE TUBE.
6. WAVEFORMS MARKED "NOTE 6" TAKEN WITH 20μμf CAPACITOR IN SERIES WITH SCOPE AND CALIBRATOR.

TV CHASSIS 1-526-1,-2,-3,-4,-5,-6



Chassis 1-526-1,-2,-3,-4,-5,-6:
Models 612, 614, 622 series

SYLVANIA
Chassis 1-526-1,-2,-3,-4,-5,-6

Technician
CIRCUIT DIGEST

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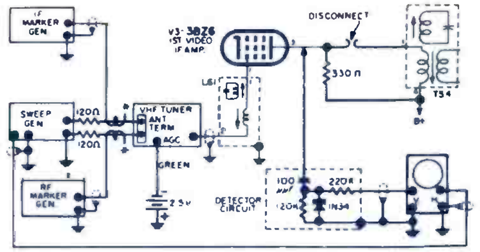
SYLVANIA
Chassis 1-526-1,-2,-3,-4,-5,-6

Technician
CIRCUIT DIGEST



VHF TUNER ALIGNMENT

GENERAL ALIGNMENT

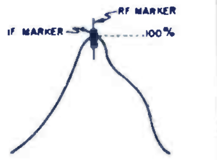
1. Connect an ISOLATION TRANSFORMER between chassis and power line.
2. Use shielded leads between all test equipment and chassis.
3. Keep all exposed ends of "hot" leads as short as possible; minimum length precautions also apply to all ground leads including metal braid and shielding.
4. Terminate all ground leads and lead shields as close as possible to their respective "hot" leads.
5. Use high scope gain and lowest usable sweep generator output.
6. Keep marker generator coupling to a minimum to avoid distortion of response curve. Use a turn or two of wire around points marked "*" in alignment setups.
7. Use non-metallic tools for all alignment adjustments.

OSCILLATOR ALIGNMENT (ALL CHASSIS)

OSCILLATOR ALIGNMENT SETUP NOTES:

1. Unsolder primary of T54 from pin 5 of V3 (3BZ6). Connect 330 ohm resistor from pin 5 of V3 (3BZ6) to terminal 4 of T54 in place of T54 primary.
2. Connect 2.5V. D.C. source (-) terminal to junction of green tuner lead and R129 (1K) and connect terminal to chassis.
3. Use non-metallic screwdriver for alignment adjustments.

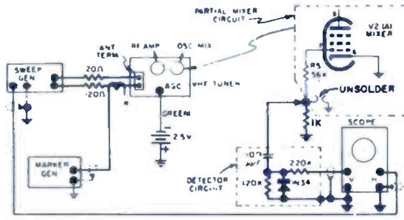
STEP	TUNER SETTING	GENERATORS SWEEP (10 MC)	GENERATORS IF MARKER	GENERATORS RF MARKER	TUNER ADJUSTMENT 3 WAFER PENTODE	TUNER ADJUSTMENT 5 WAFER CASCODE	ACCEPTABLE RESPONSE CURVES
1.	Channel 13	Channel 13 213 MC	45.75 MC	211.25 MC	L8 Screw on Wafer 3	L18 Screw on Wafer 5	COINCIDE IF and RF markers as shown:
2.	Channel 11	Channel 11 201 MC	45.75 MC	199.25 MC	L3.11 Screw on Wafer 3	L5.11 Screw on Wafer 5	
3.	Channel 9	Channel 9 189 MC	45.75 MC	187.25 MC	L3.9 Screw on Wafer 3	L5.9 Screw on Wafer 5	
4.	Channel 7	Channel 7 177 MC	45.75 MC	175.25 MC	L3.7 Screw on Wafer 3	L5.7 Screw on Wafer 5	
5.	Channel 6	Channel 6 85 MC	45.75 MC	83.25 MC	L3.6 Screw on Wafer 3	L5.6 Screw on Wafer 5	
6.	Channel 4	Channel 4 69 MC	45.75 MC	67.25 MC	L3.4 Screw on Wafer 3	L5.4 Screw on Wafer 5	
7.	If appropriate markers for Channels 5, 3 or 2 cannot be coincided within range of Fine Tuning control, "spike" (squeeze or spread) turns of appropriate coils on Oscillator wafer until coincidence does occur.						NOTE: Curve may not be symmetrical until RF alignment is completed.



RF ALIGNMENT ("VHF ONLY" CHASSIS)

RF ALIGNMENT SETUP NOTES:

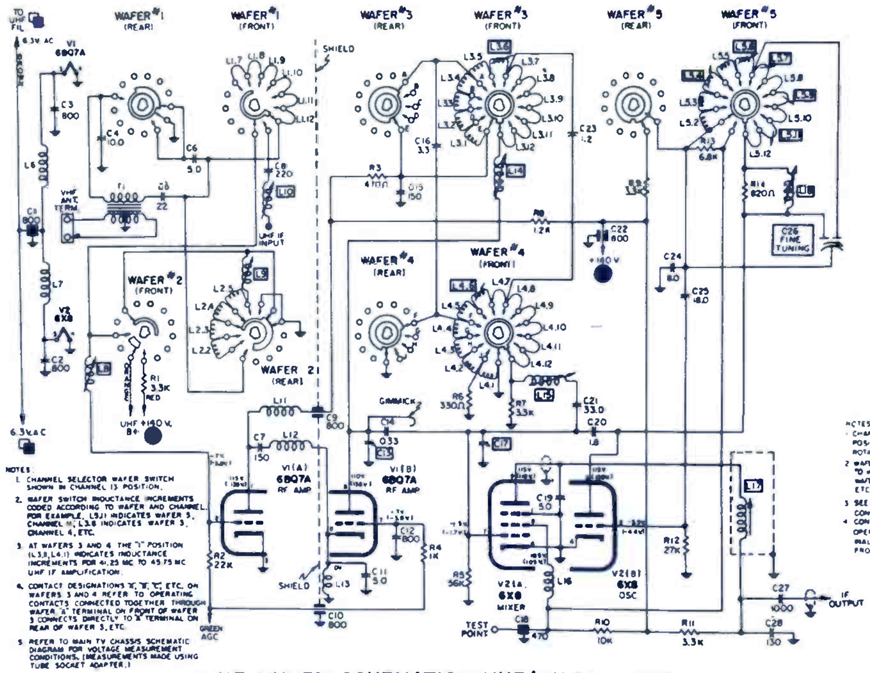
1. Remove VHF tuner mounting screws; disassemble VHF tuner cover to facilitate the following steps.
2. Unsolder R5 (56K) Mixer grid resistor located at pin 7 of V2 (5X8 or 6X8) from its chassis connections.
3. Connect a 1K resistor from R5 (56K) to chassis.
4. Connect "hot" scope lead to junction of R5 (56K) and 1K resistor through detector circuit.
5. Connect a ground strap between VHF tuner and TV chassis.



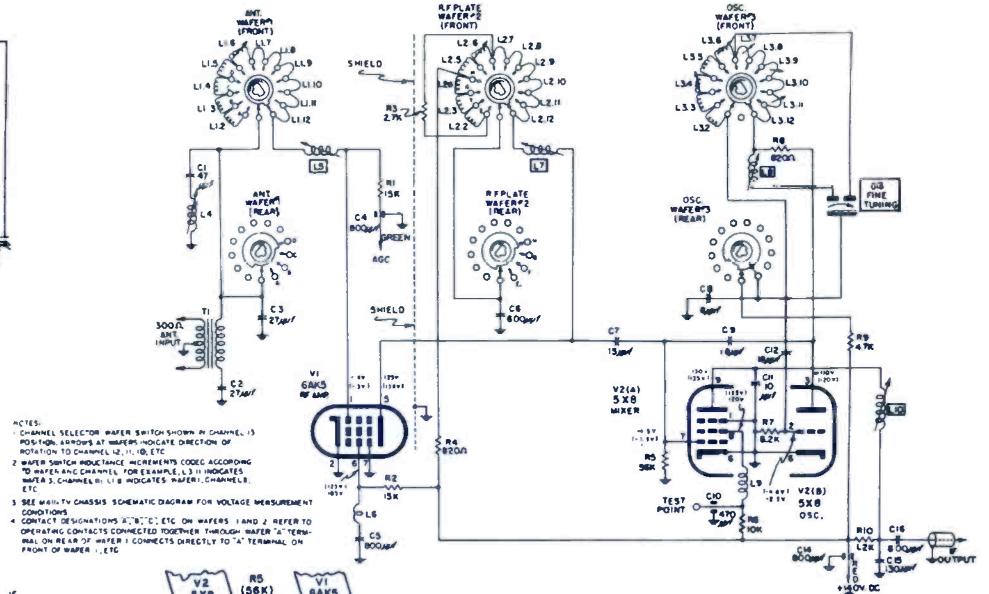
RF ALIGNMENT (VHF/UHF CHASSIS)

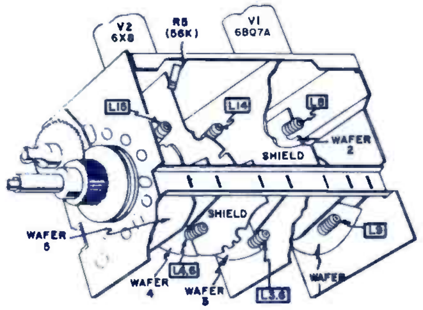
SEE RF ALIGNMENT SETUP NOTES ABOVE

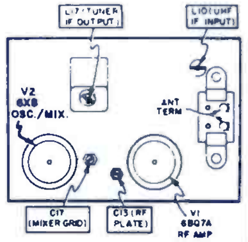
STEP	TUNER SETTING	GENERATORS SWEEP (10 MC)	GENERATORS RF MARKER	ADJUST
1.	Channel 13	Channel 13 213 MC	211.25 MC (P) 215.75 MC (S)	L5 core for maximum height. L7 core to position markers.
2.	Switch VHF tuner and generators through channels 7 to 12 and observe response curve. If any response curve is not within acceptable limits, repeat step 1 and compromise the adjustments.			
3.	Channel 6	Channel 6 85 MC	83.25 MC (P) 87.75 MC (S)	L1.6 for maximum height. L2.6 to position markers.
4.	Switch VHF tuner and generators through channels 5 to 2 and observe response curve. If any response curve is not within acceptable limits, "spike" (squeeze or spread) turns of appropriate coils on Wafers 1 and 2 until response curve is acceptable. SEE VHF TUNER PARTS LAYOUT DRAWING AND VHF TUNER SCHEMATIC DIAGRAM FOR LOCATIONS OF SPECIFIC CHANNEL COILS AND WAFERS.			
5.	REWAX COIL CORES by placing hot soldering iron close to coil.			



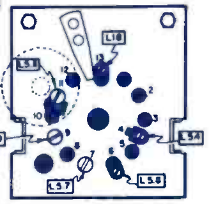
VHF TUNER SCHEMATIC – VHF/UHF CHASSIS

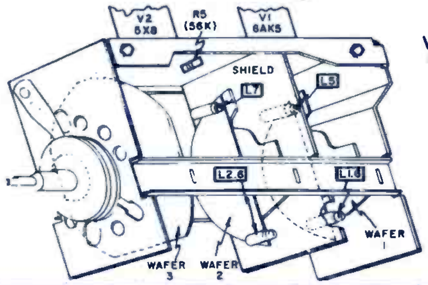




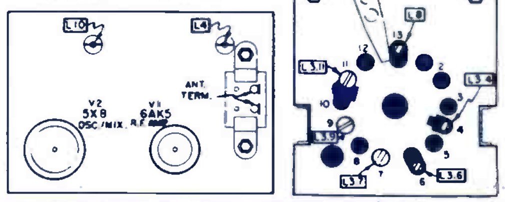


VHF TUNER PARTS LAYOUT VHF/UHF CHASSIS

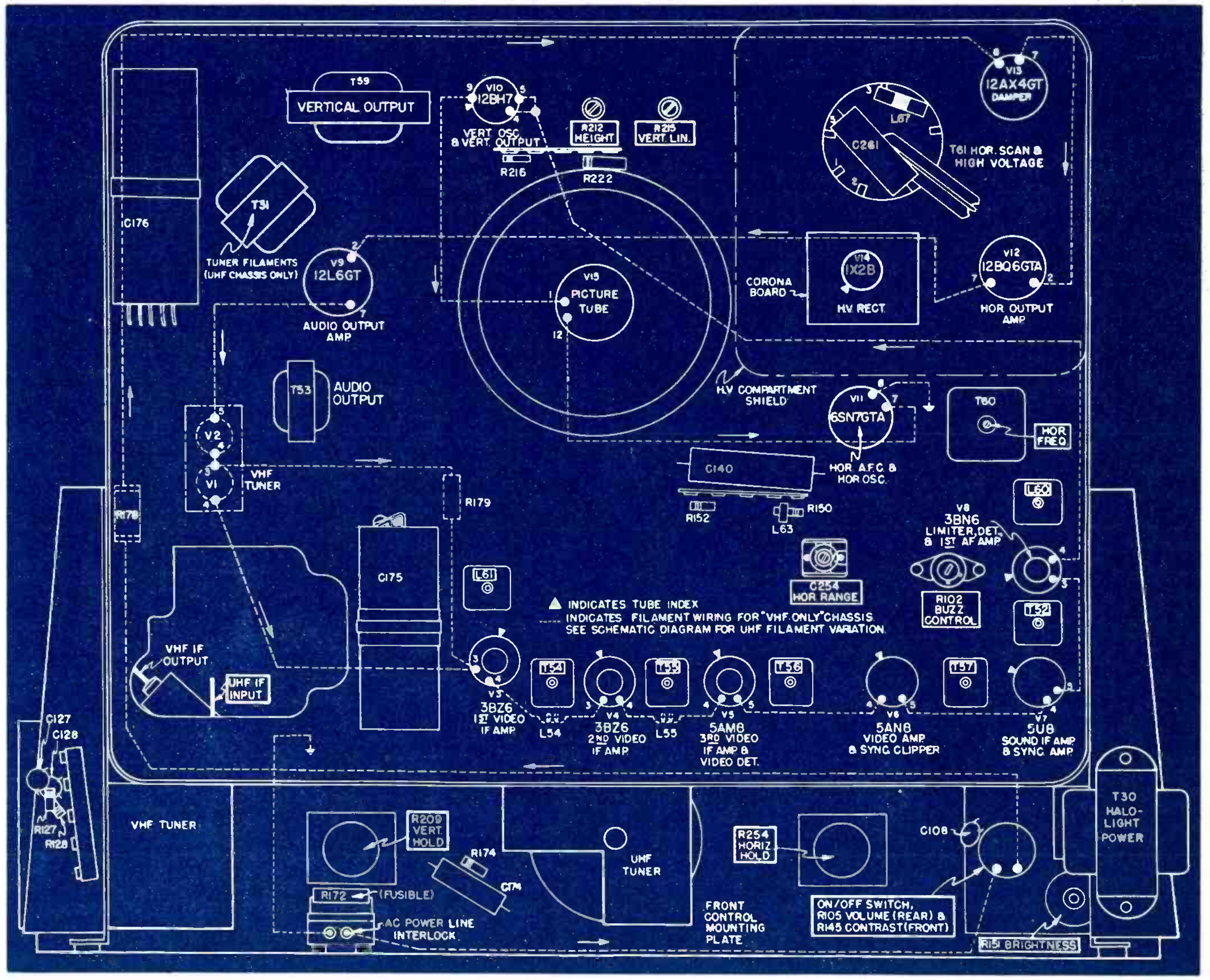




VHF TUNER PARTS LAYOUT "VHF ONLY" CHASSIS



CHASSIS TOP – PARTS LAYOUT



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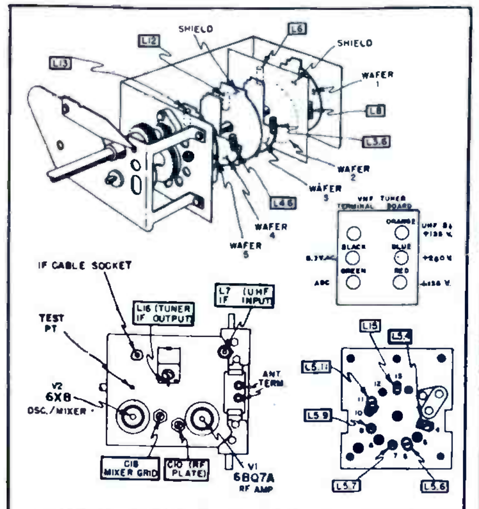
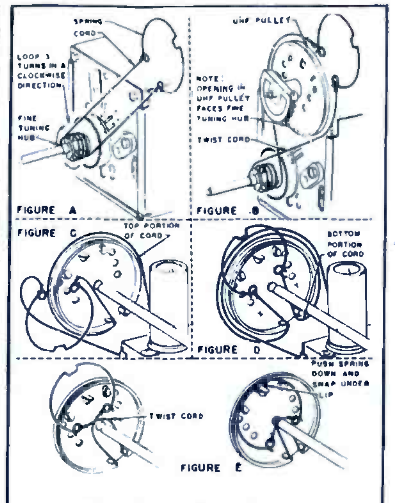
TECHNICIAN
CIRCUIT DIGEST

SYLVANIA
Chassis 1-533-1, -2

Chassis 1-533-1, -2: Models 21T201, 21T301, 21C-501, 21C502, 21C601, 21D802, 24T301, 24C601 Series



VHF Tuner Parts Layout



Dial Cord Stringing

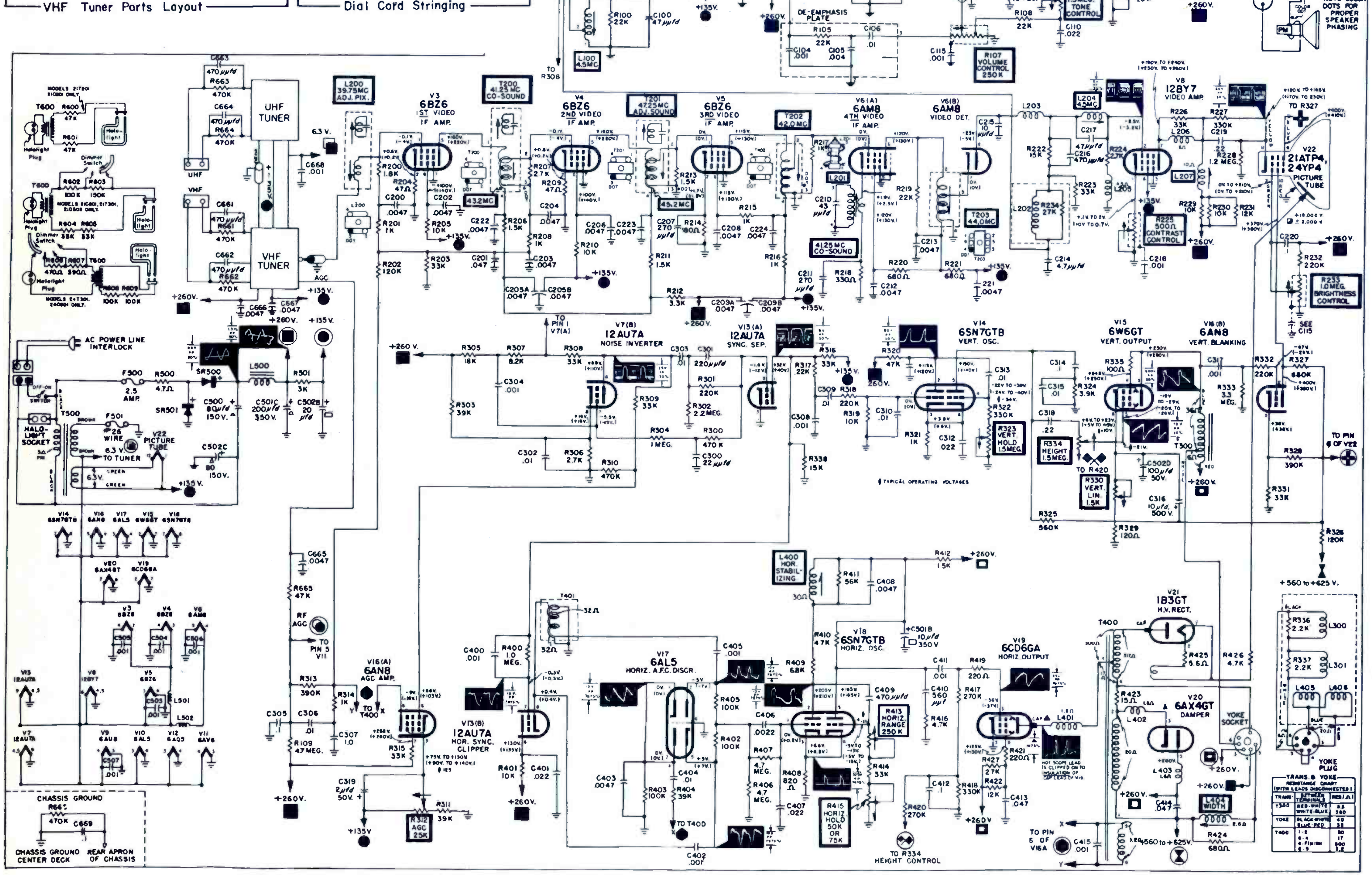
SCHEMATIC DIAGRAM FOR 1-533-1-2 TV CHASSIS

CAUTION

ALWAYS USE ISOLATION TRANSFORMER AND, ALSO POSITION H.V. SHORTING SWITCH IN THE NON-SHORTING POSITION WHEN SERVICING THE CHASSIS.

THE HIGH VOLTAGE LEAD TO THE PICTURE TUBE MAY HAVE A POTENTIAL OF 20,000 VOLTS. PRECAUTIONS SHOULD BE OBSERVED WHEN THE CHASSIS IS REMOVED FROM THE CABINET FOR SERVICE PURPOSES. DO NOT OPERATE THE RECEIVER WITH THE H.V. COVER REMOVED.

ALWAYS USE SAFETY GOGGLES AND GLOVES WHEN NECESSARY TO REMOVE THE PICTURE TUBE.



IMPORTANT	
READ THESE INSTRUCTIONS CAREFULLY AND OBSERVE THE CONDITIONS NOTED WHEN TAKING VOLTAGE READINGS OR OBSERVING WAVEFORMS.	4. CONTRAST CONTROL SET TO MAXIMUM; BRIGHTNESS CONTROL SET TO MINIMUM; CHANNEL SELECTOR SET TO FREE CHANNEL
VOLTAGE MEASUREMENT CONDITIONS UNLESS OTHERWISE SPECIFIED: 1. VOLTAGES MEASURED TO CHASSIS CENTER DECK USING SYLVANIA VACUUM TUBE VOLTMETER. (POLYMETER) 2. A.C. POWER SOURCE 117V. 60~ LINE ("VARIAC" REGULATED). 3. ANTENNA DISCONNECTED; ANTENNA TERMINALS SHORTED TOGETHER AND GROUNDED TO CHASSIS	5. VOLTAGE READINGS IN BRACKETS ARE OBTAINED UNDER FOLLOWING CONDITIONS: (A) ANTENNA CONNECTED; CHANNEL SELECTOR SET TO LOCAL STATION (B) AGC CONTROL PROPERLY ADJUSTED DEVELOPING 4V PEAK-TO-PEAK AT PIN 2 OF V8. (C) SIGNAL AT ANTENNA TERMINALS PRODUCING APPROXIMATELY -4V ON IF AGC BUS (JUNCTION OF R201 AND R202.) 6. VOLTAGE VALUES SHOWN ARE AVERAGE READINGS, VARIATIONS MAY BE OBSERVED DUE TO NORMAL PRODUCTION TOLERANCES.

SPECIAL VOLTAGE MEASUREMENT CONDITIONS

- MEASURED WITH VTVM HIGH VOLTAGE PROBE UNDER CONDITIONS OF NORMAL SIGNAL, NO BRIGHTNESS AND CORRECT SCAN SIZE
- ▲ HIGH PEAK VOLTAGE OF SHORT DURATION MAY DAMAGE METER USED FOR THIS MEASUREMENT

WAVEFORM MEASUREMENT CONDITIONS

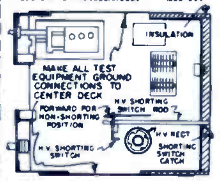
1. CHANNEL SELECTOR SET TO STRONG STATION
2. TERMS "30~" OR "7875~" REFER TO SCOPE SWEEP USED.
3. SCOPE CHARACTERISTICS MAY ALTER WAVEFORM SHAPES
4. WAVEFORMS MEASURED WITH RESPECT TO CHASSIS CENTER DECK
5. WAVEFORMS SHOWN TAKEN WITH CONTRAST CONTROL SET FOR SIGNAL OF 60V PEAK-TO-PEAK AT PIN #11 OF PICTURE TUBE (SYLVANIA 404 SCOPE USED)

GENERAL SCHEMATIC NOTES

1. VOLTAGE SOURCES ARE INDICATED BY ENCIRCLED SYMBOLS; CORRESPONDING SYMBOLS WITHOUT CIRCLES INDICATE VOLTAGE TIE POINTS
2. AVERAGE RESISTANCES OF COILS AND TRANSFORMER WINDINGS ARE INDICATED AND TAKEN WITH COMPONENT CONNECTED IN CIRCUIT
3. ARROWS AT CONTROLS INDICATE CLOCKWISE ROTATION OF CONTROLS

PARTS CODING

TUNER SECTION	1-99
SOUND SECTION	100-199
VIDEO SECTION	200-299
VERTICAL & SYNC. SECTION	300-399
HORIZONTAL & H.V. SECTION	400-499
L.V. POWER SUPPLY & FIL. SECTION	500-599
HALOLIGHT & MISCELLANEOUS	600-699



CAUTION

The receiver chassis is connected to one side of the 117 volt, 60 cycle power line. For your protection CONNECT ISOLATION TRANSFORMER BETWEEN THE POWER LINE AND THE RECEIVER when servicing the chassis; also BE SURE TO PUSH H.V. SHORTING SWITCH ROD TO THE NON-SHORTING POSITION BEFORE TURNING ON RECEIVER. HOLD H.V. SHORTING SWITCH ROD IN THIS POSITION BY PLACING SHORTING SWITCH CATCH OVER END OF ROD.

VHF TUNER ALIGNMENT

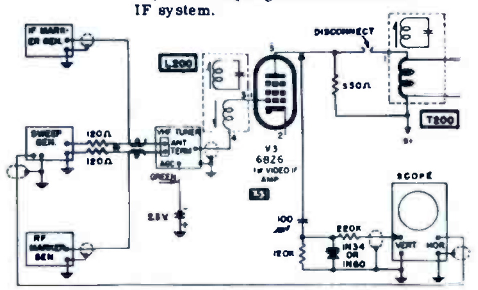
Preliminary Instructions

1. Construct detector circuit with short leads.
2. Use shielded leads where indicated.
3. Remove Horizontal Output tube V19-6CD6GA to eliminate pickup radiation from Horizontal Output stage. Note: During "Alternate VHF Oscillator Alignment" the Horizontal Output tube V19-6CD6GA must be reinserted.
4. Connect -2.5 V. bias supply to green (AGC) lead of VHF tuner.
5. A turn or two of wire around points marked "*" will provide sufficient marker coupling without distorting response curve.
6. Use lowest usable generator output.
7. Use non-metallic tools for all alignment adjustments.

OSCILLATOR ALIGNMENT

Set up Notes

1. Unsolder primary of T200 from plate (pin 5) of V3-6BZ6 1st Video IF Amp. Connect 330 ohm resistor in place of primary winding.
2. Remove V4-6BZ6 2nd Video IF Amp. to prevent coupling back from receiver IF system.



(Continued on reverse side)

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SYLVANIA
Chassis 1-533-1, -2

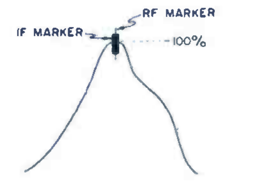
Technician
CIRCUIT DIGEST

STEP	TUNER SETTING	GENERATORS			ADJUST
		SWEEP (10 MC)	IF MARKER	RF MARKER	
1.	Channel 13	Channel 13 213 MC	45.75 MC	211.25 MC	L15 Screw on Wafer 5
2.	Channel 11	Channel 11 201 MC	45.75 MC	199.25 MC	L5.11 Screw on Wafer 5
3.	Channel 9	Channel 9 189 MC	45.75 MC	187.25 MC	L5.9 Screw on Wafer 5
4.	Channel 7	Channel 7 177 MC	45.75 MC	175.25 MC	L5.7 Screw on Wafer 5
5.	Channel 6	Channel 6 85 MC	45.75 MC	83.25 MC	L5.6 Screw on Wafer 5
6.	Channel 4	Channel 4 69 MC	45.75 MC	67.25 MC	L5.4 Screw on Wafer 5

7. If appropriate markers for Channels 5, 3 or 2 cannot be coincided within range of Fine Tuning control, "spike" (squeeze or spread) turns of L5.5, L5.3 or L5.2 coils, respectively, on Wafer 5 until coincidence does occur.

ACCEPTABLE RESPONSE CURVE

COINCIDE IF and RF markers as shown below.



NOTE: Curve may not be symmetrical until RF alignment is completed.

ALTERNATE OSCILLATOR ALIGNMENT

The following is an oscillator adjustment procedure using actual station signals.

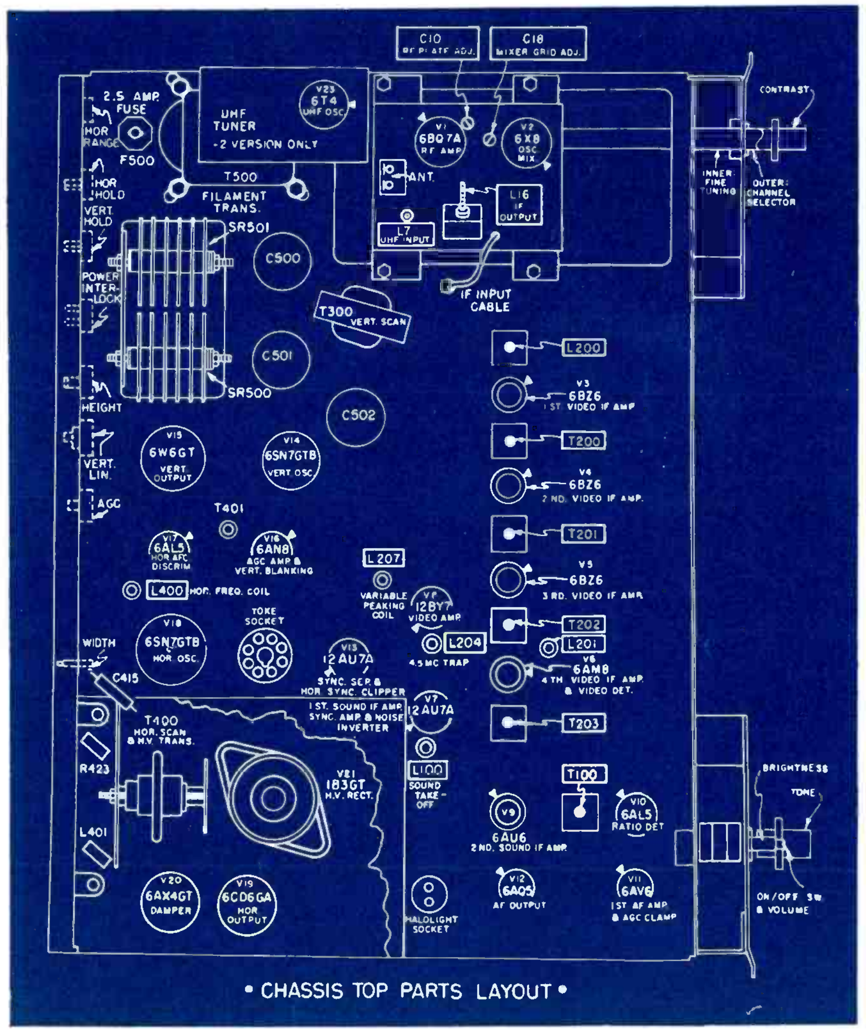
To determine whether or not the oscillator requires readjustment, tune the fine tuning control on each operating channel and observe the picture. If the picture can be almost blanked out with only sound bars on the screen at one extreme of the control and turns into a picture that lacks detail at the other extreme of the control, the oscillator is adjusted properly. If this range is not obtained, the oscillator must be adjusted so that the fine tuning does "tune through" as described above.

A. If the highest frequency channel that cannot be "tuned through" is between channels 7 and 13, adjust L15 oscillator screw as follows: (If it is between 2 and 6, proceed to step B.

Tune to highest available channel between 7 and 13. Adjust L15 to achieve proper fine tuning range on that channel.

B. If a channel between channels 2 and 6 cannot be "tuned through", adjust L5.6 oscillator screw as follows:

Tune to highest available channel between 2 and 6. Adjust L5.6 to achieve proper fine tuning range on that channel.

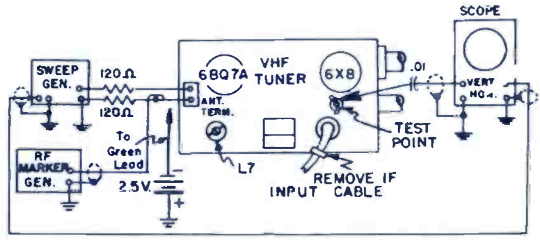


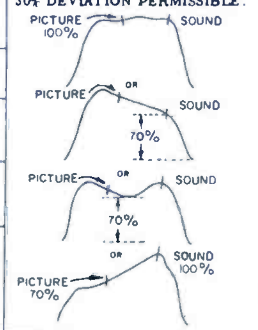
• CHASSIS TOP PARTS LAYOUT •

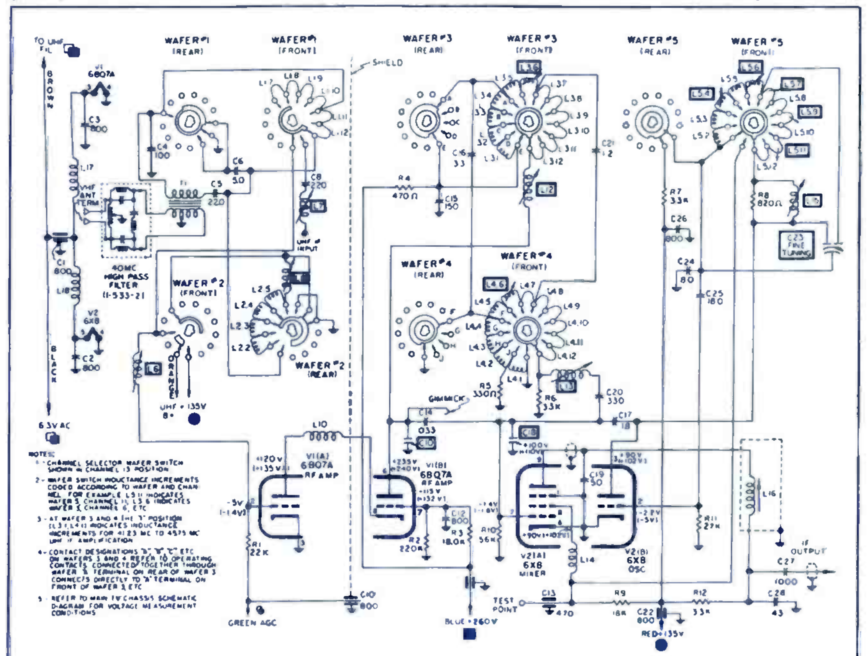
RF ALIGNMENT

Set up Notes

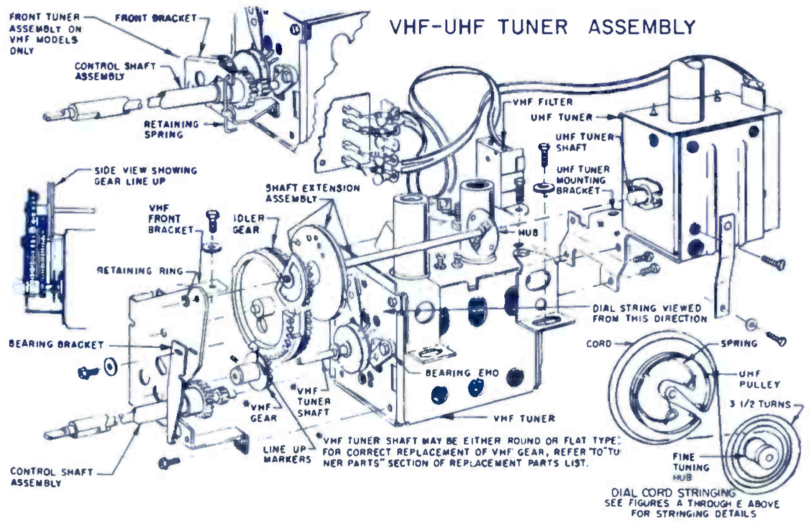
1. Connect "hot" scope lead to Test Point on VHF tuner through a .01 Mfd. capacitor.
2. Remove IF Input cable from VHF tuner socket.
3. Remove VHF tuner cover to gain access to internal coils and adjustments.



STEP	TUNER SETTING	GENERATORS		ADJUST	ACCEPTABLE RESPONSE CURVE
		SWEEP (10 MC)	RF MARKER		
1.	Channel 13	Channel 13 213 MC	211.25MC (P) 215.75MC (S)	L12 core to position markers. L13 core for flat top. L6 core for maximum height.	30% DEVIATION PERMISSIBLE. 
2.	Channel 7	Channel 7 177 MC	175.25MC (P) 179.75MC (S)	C10 and C18 trimmers for best symmetrical response.	
3.	Switch tuner and generators through channels 8 to 12 and observe response curve. If any response curve is not within acceptable limits, repeat steps 2 and 3 and, if necessary, compromise the adjustments.				
4.	Channel 6	Channel 6 85 MC	83.25MC (P) 87.75MC (S)	L3.6 core to position markers. L4.6 core for flat top. L8 core for maximum height.	
5.	Switch tuner and generators through channels 5 to 2 and observe response curve. If any response curve is not within acceptable limits, "spike" (squeeze or spread) turns of appropriate coils on wafers 2, 3 and 4 until response curve is acceptable. SEE VHF TUNER LAYOUT AND VHF TUNER SCHEMATIC DIAGRAM FOR LOCATIONS OF SPECIFIC CHANNEL COILS AND WAFERS.				
6.	REWAX COIL CORES by placing hot soldering iron near coil. Do not lay hot iron directly on coil.				



VHF Tuner Schematic



VHF-UHF TUNER ASSEMBLY

UHF TUNER ALIGNMENT

Oscillator Alignment

1. Set VHF tuner to UHF position. Connect VTVM DC probe to pin 2 of V8-12BY7 Video Amp. on TV receiver chassis.
2. Turn UHF tuner variable capacitor plates to fully meshed (maximum counterclockwise); inject 460 MC unmodulated UHF signal into antenna terminals on UHF tuner and adjust C63 trimmer screw for MAXIMUM VTVM reading. Note: Remove button on front of VHF tuner to gain access to C63.
3. Turn UHF tuner variable capacitor plates to fully unmeshed position (maximum clockwise); inject 900 MC unmodulated UHF signal into antenna terminals on UHF tuner and adjust C62 trimmer screw for MAXIMUM VTVM reading.
4. Repeat steps 2 and 3; remove test equipment.

VHF Tuner 40 MC Input Circuit Alignment

1. Temporarily remove UHF tuner from its mounting by removing the three (3) screws holding UHF tuner to bracket. Remove the two (2) screws holding case cover to UHF tuner.
2. Remove 1N82A crystal from crystal holder. Temporarily solder a 270 ohm resistor to "L65" side of crystal holder. See Figure A.
3. Connect Sweep Generator to 270 ohm resistor. Set Sweep Generator to 43.0MC with 10MC sweep. Loosely couple Marker Generator to Sweep Generator lead near 270 ohm coupling resistor. Use 42.1 MC and 45.75 MC markers. Set VHF tuner to UHF position. See Figure A.
4. Connect Oscilloscope through a .01 Mfd. capacitor to VHF tuner Test Point. Remove IF Input Cable from VHF tuner socket. Connect -2.5V. bias supply to AGC terminal on rear of VHF tuner.
5. Turn UHF tuner variable capacitor plates to fully meshed position (maximum counterclockwise) and adjust L7 screw on VHF tuner for symmetrical response curve shown in Figure B.

   NOTE: Spike (squeeze or spread) Coils L3.1 and L4.1 in VHF tuner to remove tilt from response curve.
6. Remove generators and 270 ohm coupling resistor at 1N82A crystal holder.

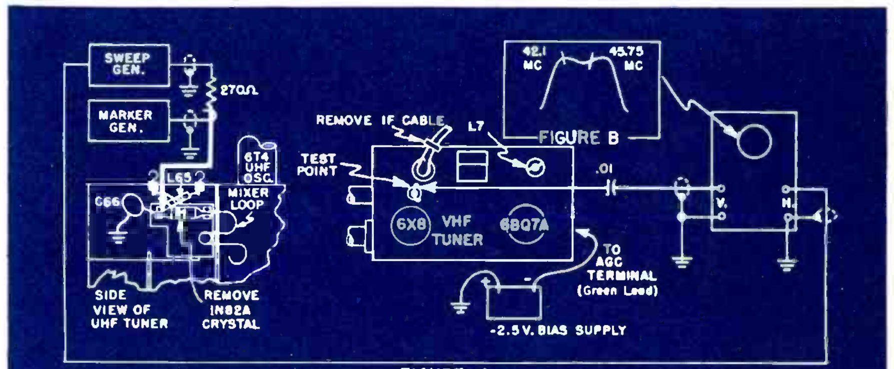
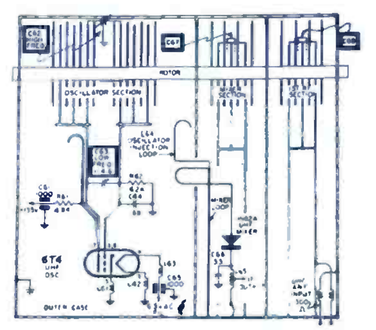


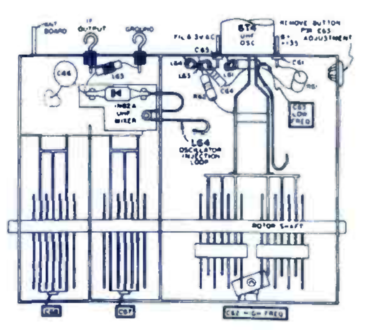
FIGURE A

Preselector Alignment

1. Leave scope and bias supply connected as shown in Figure A.
2. Reinstall 1N82A crystal. Observe polarity by matching crystal markings with UHF tuner schematic diagram. If crystal markings are illegible and tuner appears dead, try reversing crystal.
3. With VHF tuner still in UHF position, turn variable capacitor plates to fully unmeshed position.
4. Feed 900 MC UHF sweep signal to antenna terminals on UHF tuner; loosely couple 42.1 MC and 45.75 MC markers to UHF "IF Output" Lead. Adjust C67 and C68 trimmer "tabs" toward or away from stator as necessary to achieve maximum amplitude with properly positioned markers.
5. Tune UHF sweep generator and UHF tuner simultaneously across entire UHF band and observe response curve. If at any point, response curve displays excessive distortion, considerably lower amplitude, or displaced markers, stop UHF tuner rotor at that point and observe following procedure.
   a. Center response curve on scope screen with sweep generator tuning control.
   b. To correct response, squeeze or spread RF rotor plates only at point where rotor is just meshing at stator. Use a non-metallic low-loss alignment tool.
6. Continue tuning UHF sweep generator and UHF tuner simultaneously as long as response curve remains acceptable as shown in Figure B. Repeat procedure in step 5 if necessary. After reaching low frequency end of tuning range, recheck entire range to insure that adjustments at one point have not deteriorated response at other points.
7. Remove all test equipment, bias supply, and .01 Mfd. capacitor. Replace UHF tuner case cover and remount UHF tuner. Insert IF Input Cable into socket on VHF tuner.



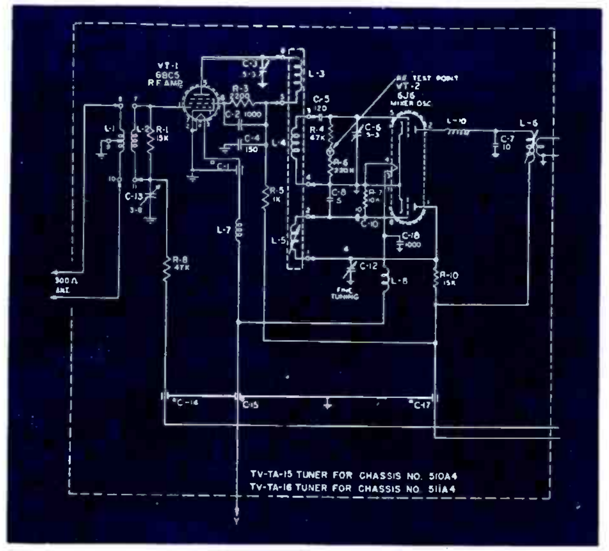
UHF Tuner Schematic



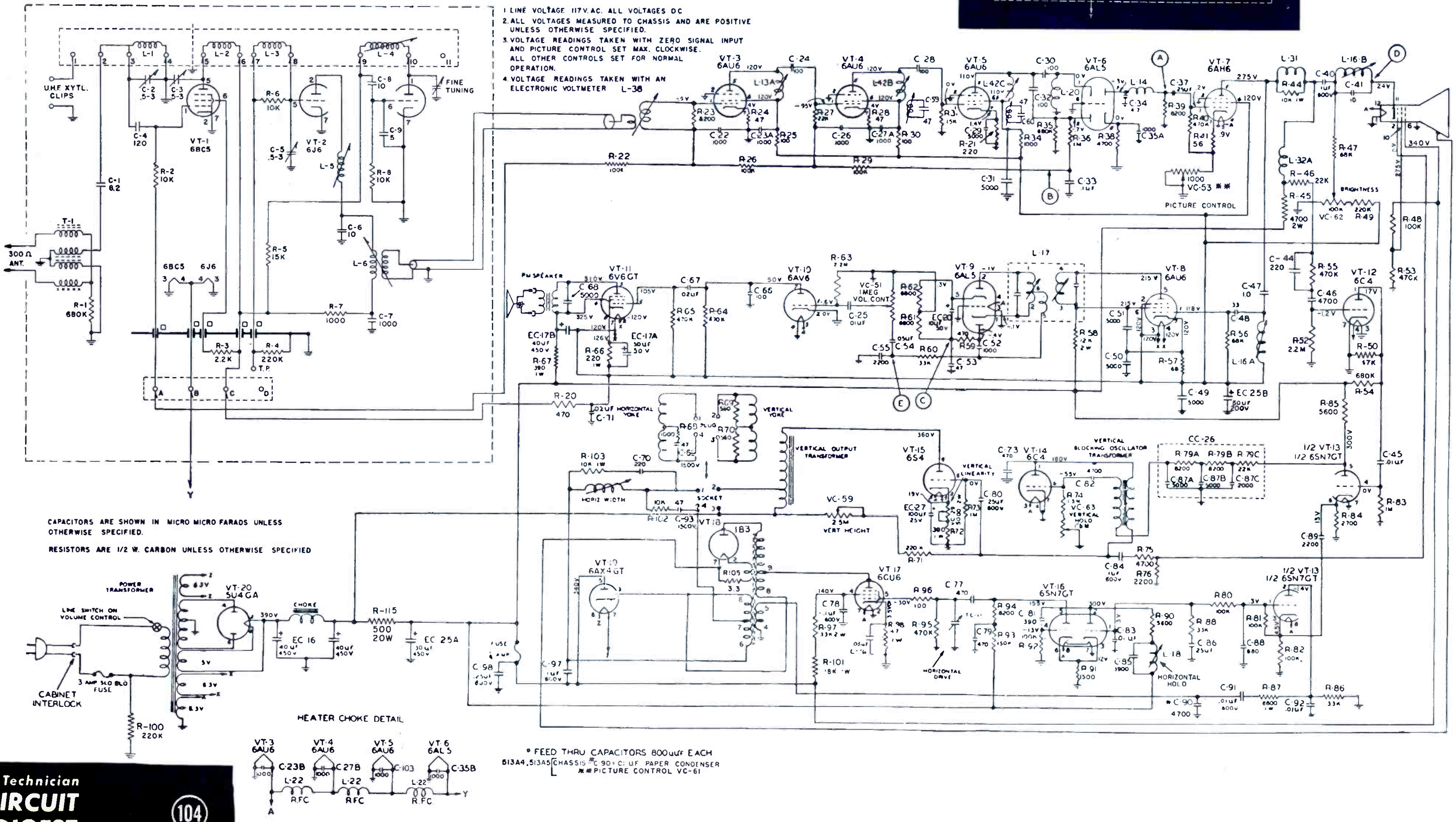
UHF Tuner Parts Layout

TRAV-LER
Chassis 510A4, 511A4, 513A4, 513A5, 514A4, 514A5

Chassis 510A4, 511A4, 513A4, 513A5, 514A4, 514A5: Models 317-56, 317-67, 321-75, 321-76, 321-770, 517-56, 517-67, 521-75, 521-76, 521-77, 521-78



1. LINE VOLTAGE 117V AC. ALL VOLTAGES DC
2. ALL VOLTAGES MEASURED TO CHASSIS AND ARE POSITIVE UNLESS OTHERWISE SPECIFIED.
3. VOLTAGE READINGS TAKEN WITH ZERO SIGNAL INPUT AND PICTURE CONTROL SET MAX. CLOCKWISE. ALL OTHER CONTROLS SET FOR NORMAL OPERATION.
4. VOLTAGE READINGS TAKEN WITH AN ELECTRONIC VOLTMETER



CAPACITORS ARE SHOWN IN MICRO MICRO FARADS UNLESS OTHERWISE SPECIFIED.

RESISTORS ARE 1/2 W. CARBON UNLESS OTHERWISE SPECIFIED

* FEED THRU CAPACITORS 800uuf EACH
513A4, 513A5 CHASSIS * C 90 .01 UF PAPER CONDENSER
** PICTURE CONTROL VC-61

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TECHNICIAN CIRCUIT DIGEST

TRAV-LER
Chassis 627A6

CHASSIS 627A6: Models 617-33, 617-34, 617-30, 621-31, 621-32, 621-R40

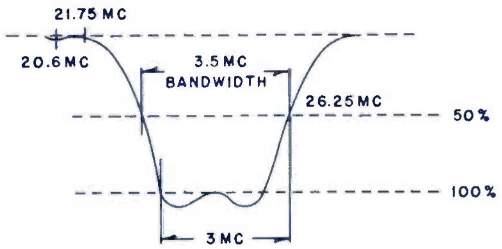


FIG. 6. IF Response Curve

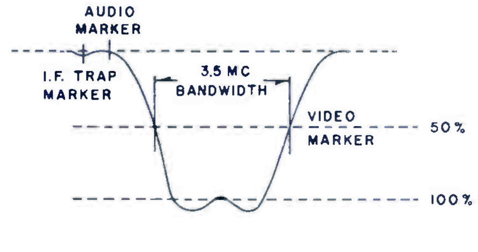
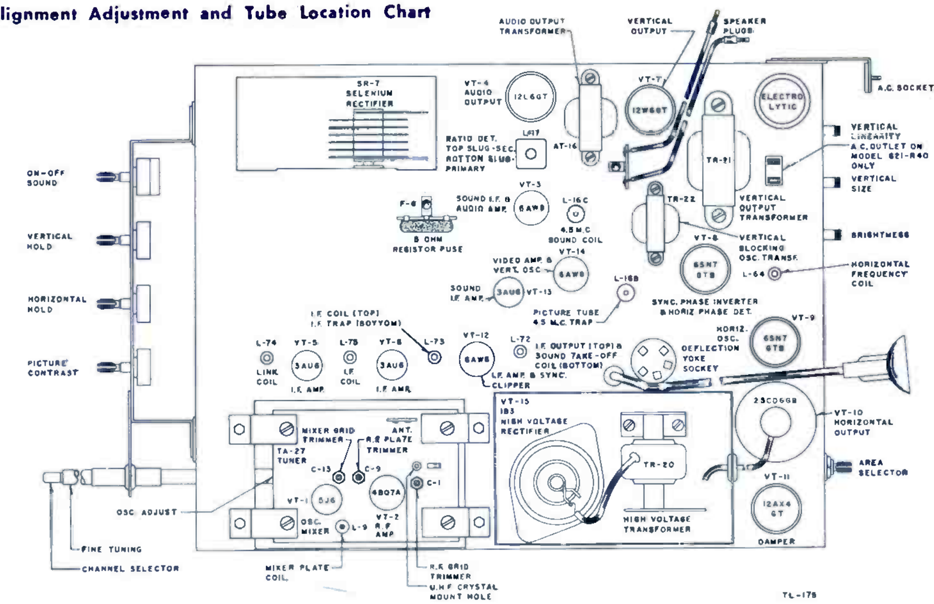
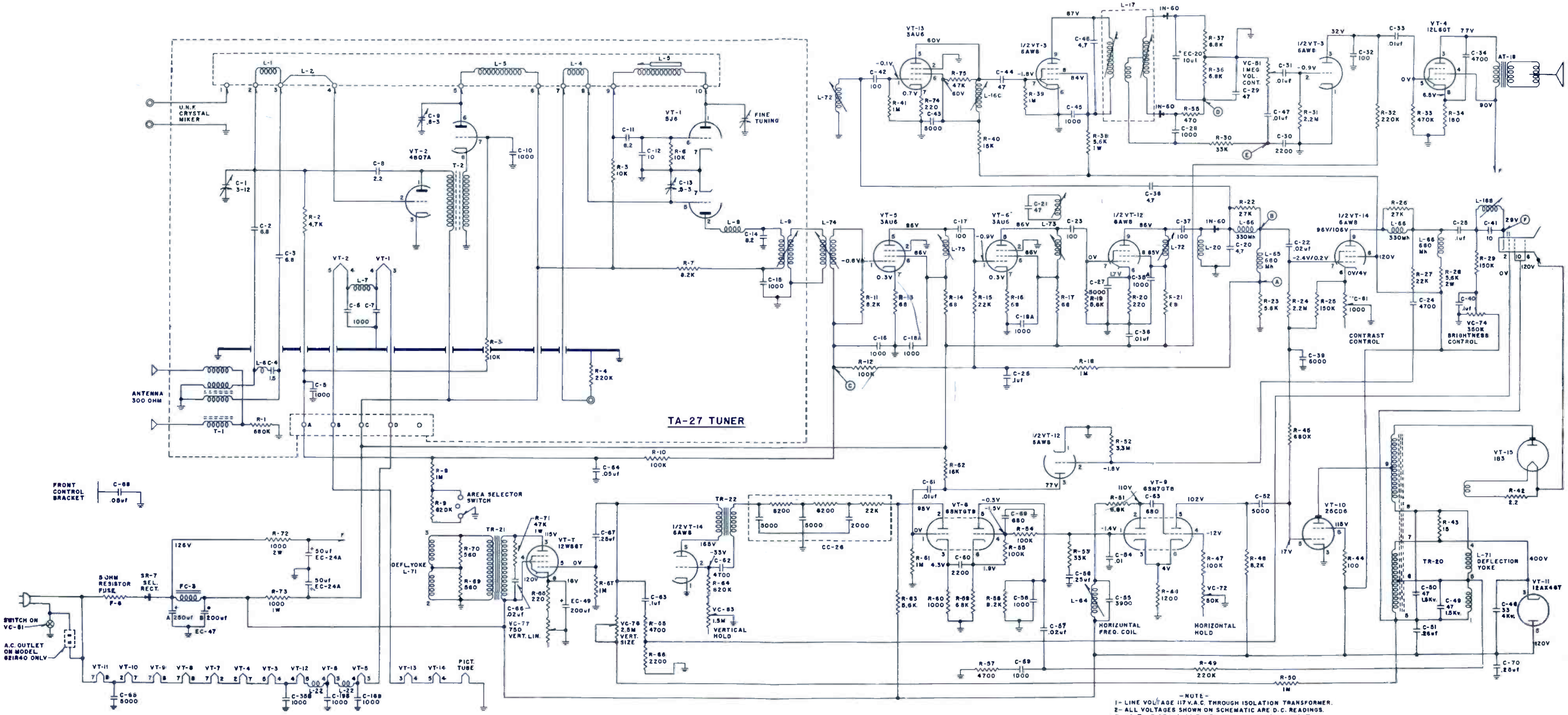


FIG. 7. Overall RF Response Curve

FIG. 8 Alignment Adjustment and Tube Location Chart





– NOTE –
1– LINE VOLTAGE 117 V.A.C. THROUGH ISOLATION TRANSFORMER.
2– ALL VOLTAGES SHOWN ON SCHEMATIC ARE D.C. READINGS.
3– VOLTAGE READINGS TAKEN WITH ZERO SIGNAL INPUT USING ELECTRONIC VOLTMETER.
4– 6AW8 VIDEO AMPLIFIER VOLTAGES ARE SHOWN AT MAXIMUM & MINIMUM SETTINGS OF CONTRAST CONTROL. ALL OTHER CONTROLS SET FOR NORMAL OPERATION.

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TECHNICIAN CIRCUIT DIGEST

TRUETONE

Models 2D1634A, 2D1636A, 2D2634A

OSCILLOSCOPE WAVEFORM PATTERNS

The waveforms shown on the schematic diagram are as observed on a Tektronix type 524D wide band television oscilloscope with the receiver tuned to a reasonably strong signal and a normal picture. The voltages shown on each waveform are the approximate peak to peak amplitudes. The frequency accompanying each waveform indicates the repetition rate of the waveform not the sweep rate of the oscilloscope. If the waveforms are observed on the oscilloscope with a poor high frequency response, the corners of the pulses will tend to be more rounded than those shown on the schematic diagram and the amplitude of any high frequency pulse will tend to be less.

DC SOCKET VOLTAGES

All DC socket voltages shown on the schematic are measured with a high impedance VTVM and under zero signal conditions.

SCHEMATIC IS DIVIDED INTO FOUR SECTIONS WITH EACH SECTION HAVING ITS OWN SERIES OF REFERENCE NUMBERS.

ALL RESISTANCE VALUES IN OHMS.

ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF. AND ABOVE 1.0 IN MMF. UNLESS OTHERWISE NOTED.

COIL RESISTANCE VALUES LESS THAN 1.0 OHM ARE NOT SHOWN.

K=1000

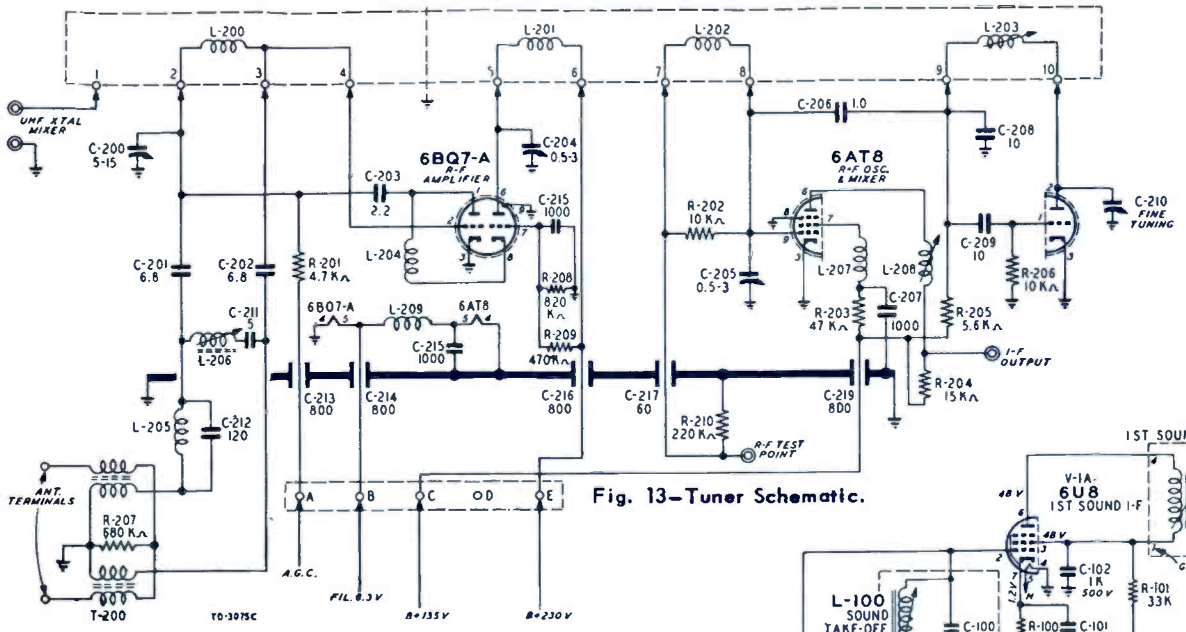
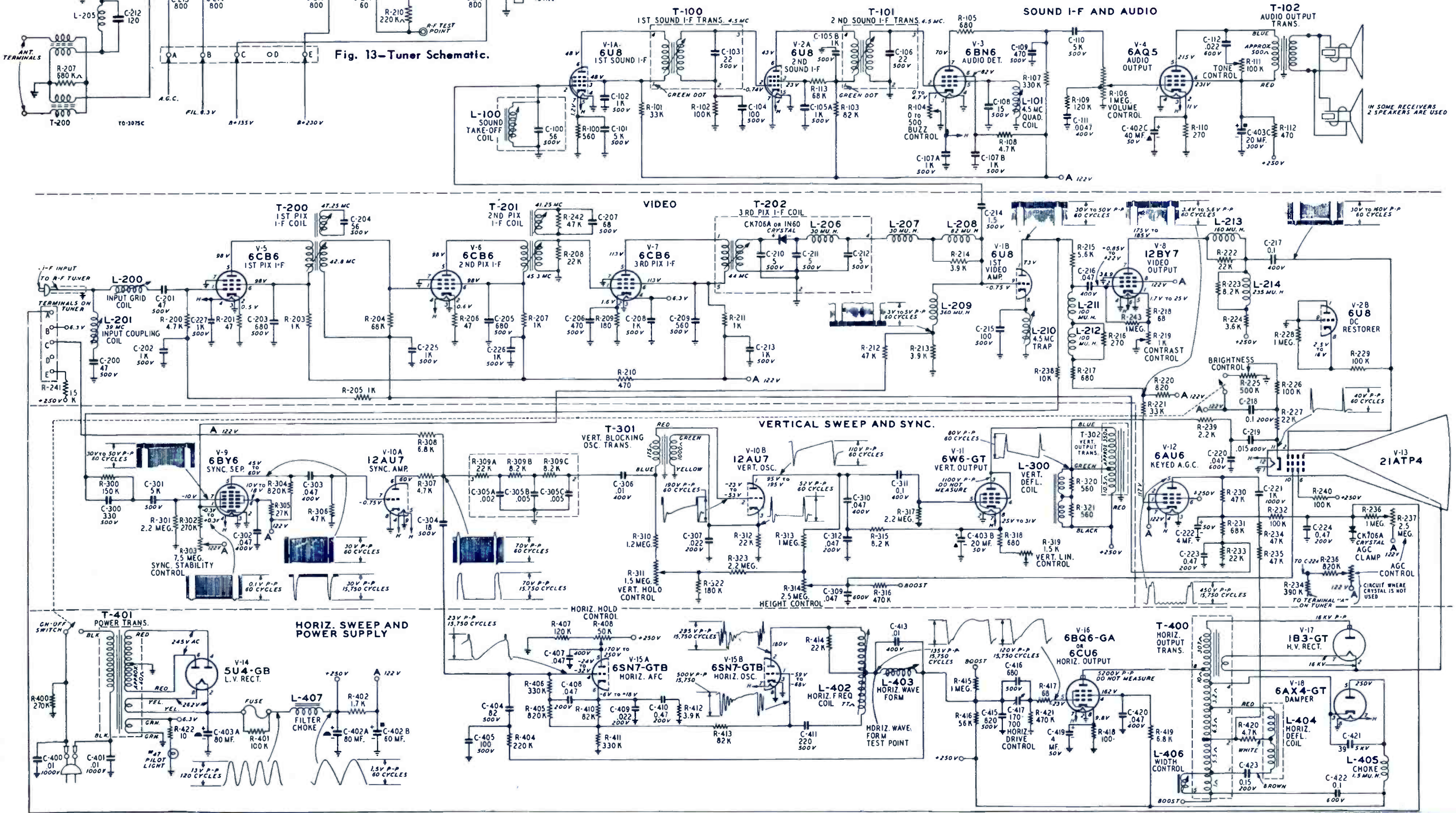


Fig. 13—Tuner Schematic.



In later production the CK706A crystal (AGC Clamp) was removed, resistor R-236 was changed to 820 K ohms ½ watt, resistor R-241 was changed to 1.5 K ohms 2 watts and resistor R-234 380 K ohms ½ watt was added. Illustration of both circuits are shown in the schematic diagram.

TECHNICIAN CIRCUIT DIGEST

WELLS-GARDNER

Models 324A59C-A-576, 324A59U-A-576, 2324A59C-A-560, 2324A59U-A-560, 321A59C-A-554, 321A59U-A-554, 2321A59C-A-556, 2321A59U-A-556, 321A59C-A-504, 321A59U-A-504, 2321A59C-A-508, 2321A59U-A-508

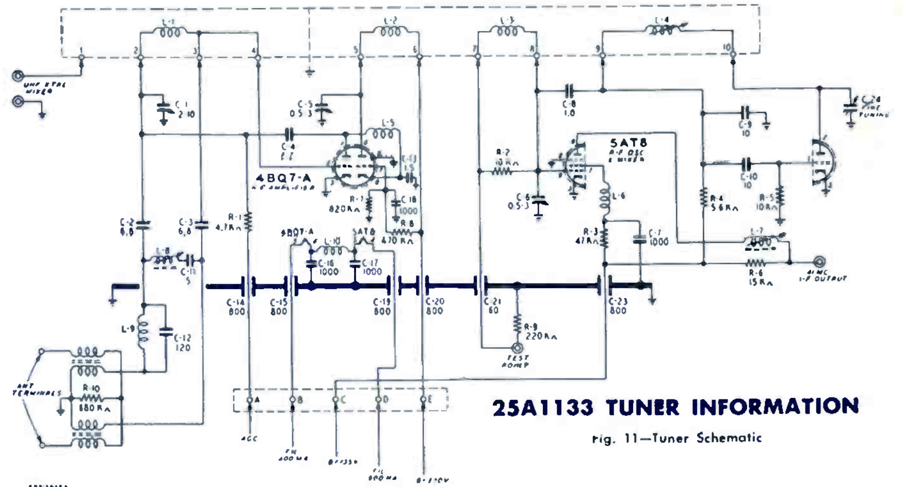
NOTE—Area Switch used only on models stamped 21A59C and 21A59U. 24A59C and 24A59U.

OSCILLOSCOPE WAVEFORM PATTERNS

The waveforms shown on the schematic diagram are as observed on a Tektronix type 524D wide band television oscilloscope with the receiver tuned to a reasonably strong signal and a normal picture. The voltages shown on each waveform are the approximate peak to peak amplitudes. The frequency accompanying each waveform indicates the repetition rate of the waveform not the sweep rate of the oscilloscope. If the waveforms are observed on the oscilloscope with a poor high frequency response, the corners of the pulses will tend to be more rounded than those shown on the schematic diagram and the amplitude of any high frequency pulse will tend to be less.

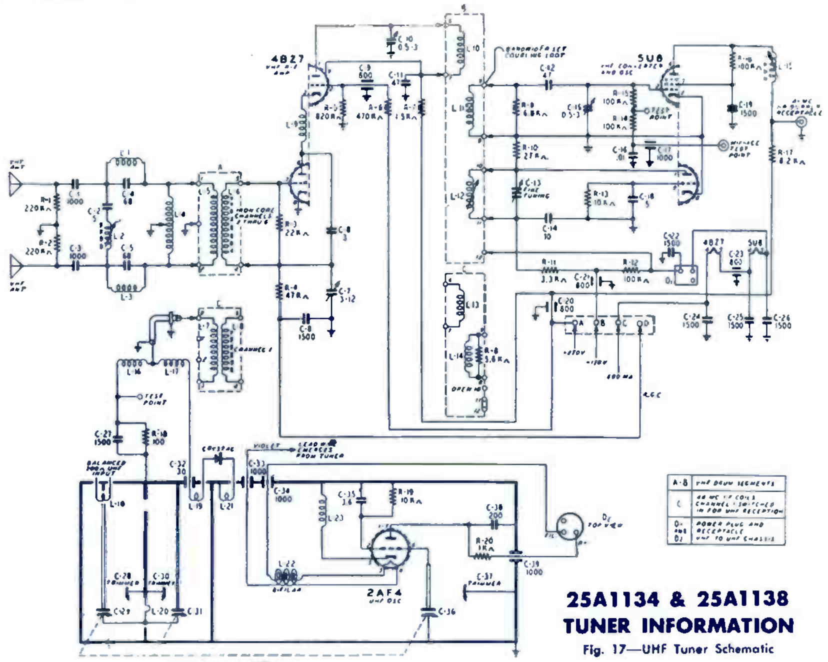
DC SOCKET VOLTAGES

All DC socket voltages shown on the schematic are measured with a high impedance VTVM and under zero signal conditions.



25A1133 TUNER INFORMATION

Fig. 11—Tuner Schematic



25A1134 & 25A1138 TUNER INFORMATION

Fig. 17—UHF Tuner Schematic

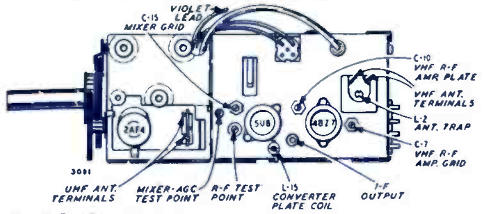


Fig. 14—Top Tuner Adjustments

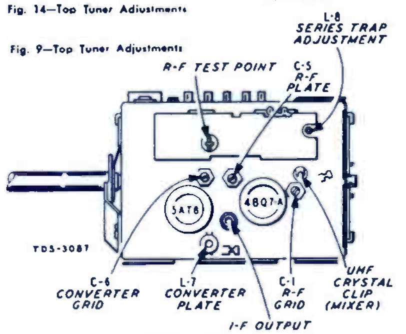


Fig. 9—Top Tuner Adjustments

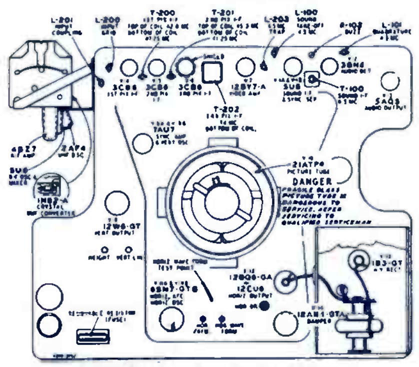
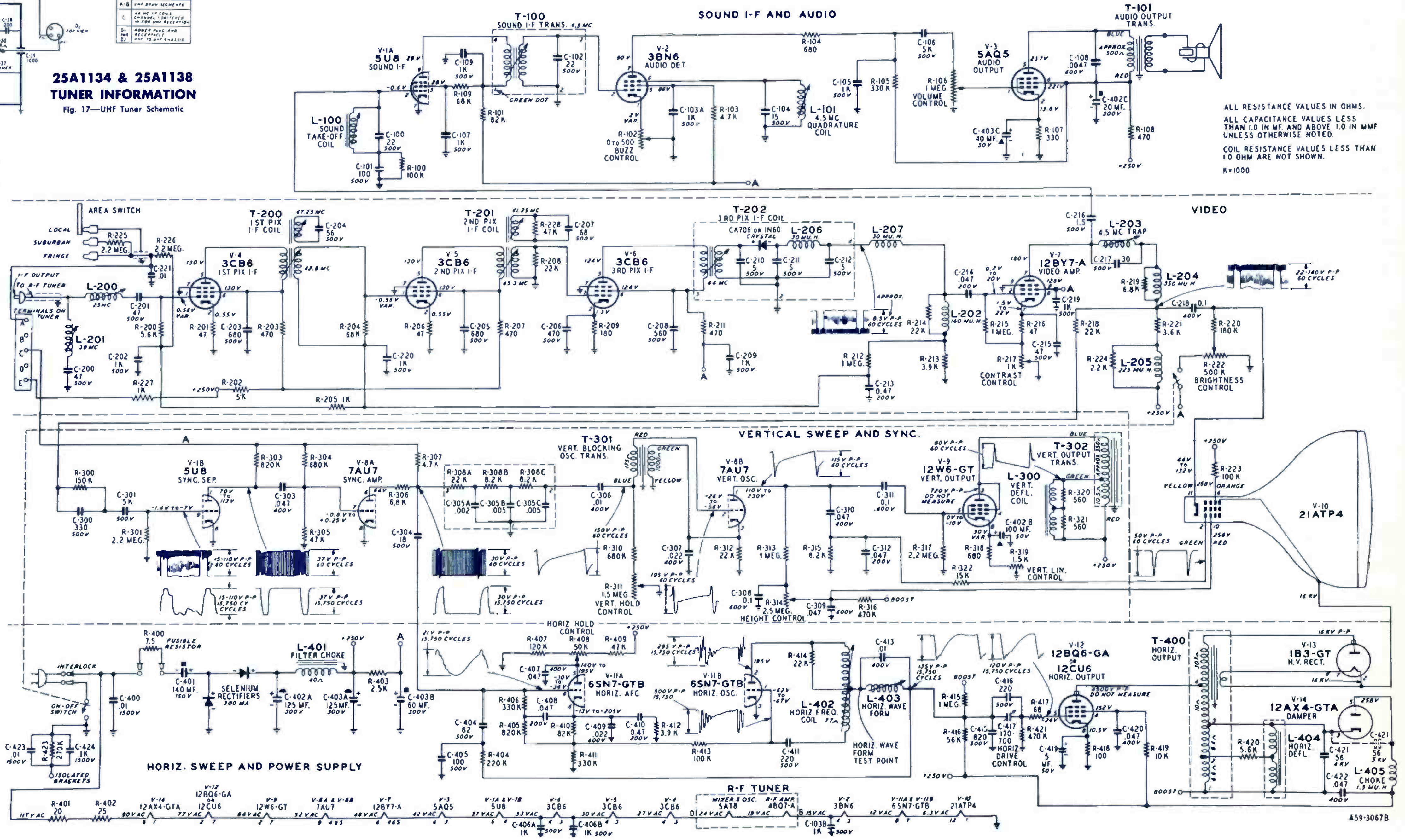


Fig. 1—UHF-VHF Chassis Tube Layout and Trimmers

NOTE—Tube layouts shown above are for 21" receivers. 24" receivers use a 24YP4 Pix tube.

NOTE—In UHF receivers the filament voltages in the tuner and above the tuner in the heater string will be slightly greater because of the filament voltages of the tuner tubes. In 24 inch receivers the picture tube is a 24YP4. In later production C-421 was repositioned as indicated with dotted line.



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PRINTED CIRCUITS

Two printed circuit assemblies are used in the V-2342 and V-2343 chassis, they are namely the IF printed board and the sweep printed board. The IF assembly includes the IF amplifiers and the crystal detector circuits. The sweep assembly includes the video amplifier, sound detector, sync separator, vertical discharge and keyed AGC, vertical output and horizontal multivibrator circuits.

Component Replacement on Printed Boards

The tools recommended in servicing a printed board are as follows:

1. Long nose pliers
2. Diagonal pliers
3. 60-40 low temperature solder with a rosin core
4. Small glue brush
5. 25 watt or less soldering iron

Apply soldering iron on the connection just long enough to melt the solder;quickly brush away the solder with a small glue brush. If soldering iron is applied too long, the copper strip may detach itself from the board. Individual replacement of components that make up the sweep and IF printed boards can be replaced independently, if necessary. In removing and replacing the part, every precaution should be taken, so as not to damage the connecting strips between components.

In replacement of transformer, simply apply enough heat to the terminals and can supports to melt the solder so that the terminal can be pushed away from the connecting strips. When installing transformer can supports and terminals they should be positioned so as to contact the connecting strips.

Replacement of tube sockets, apply heat to the socket terminals and, using a pointed tool (scribe) place between the socket terminal and connecting strip. It may be easier with a diagonal to clip the tube pin close to the socket. After all pins are clipped carefully remove the socket, Now, carefully heat the remaining tube pins removing them from the hole on the printed board. Snap the replacement socket back on the board,postioning the socket so that the terminals and ground contact the proper connecting strip. Then solder in place.

CHASSIS ASSEMBLIES V-2352 and V-2353

Chassis assemblies V-2352 and V-2353 are the same as chassis assemblies V-2342 and V-2343 except that they contain a factory installed VHF-UHF all-channel tuner, part number V-15950-1.

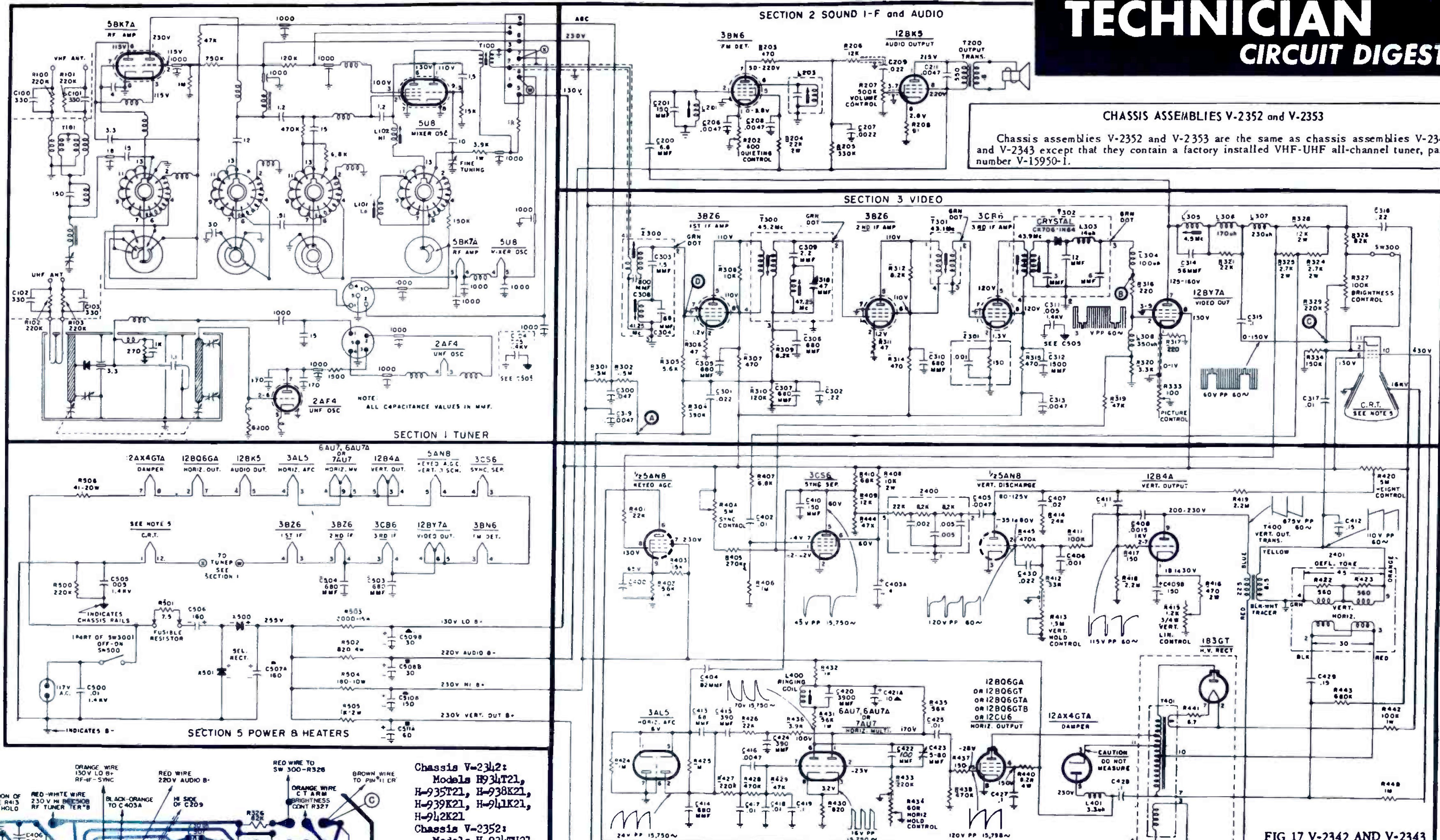


FIG 17 V-2342 AND V-2343 SCHEMATIC DIAGRAM

SECTION 4 SWEEP

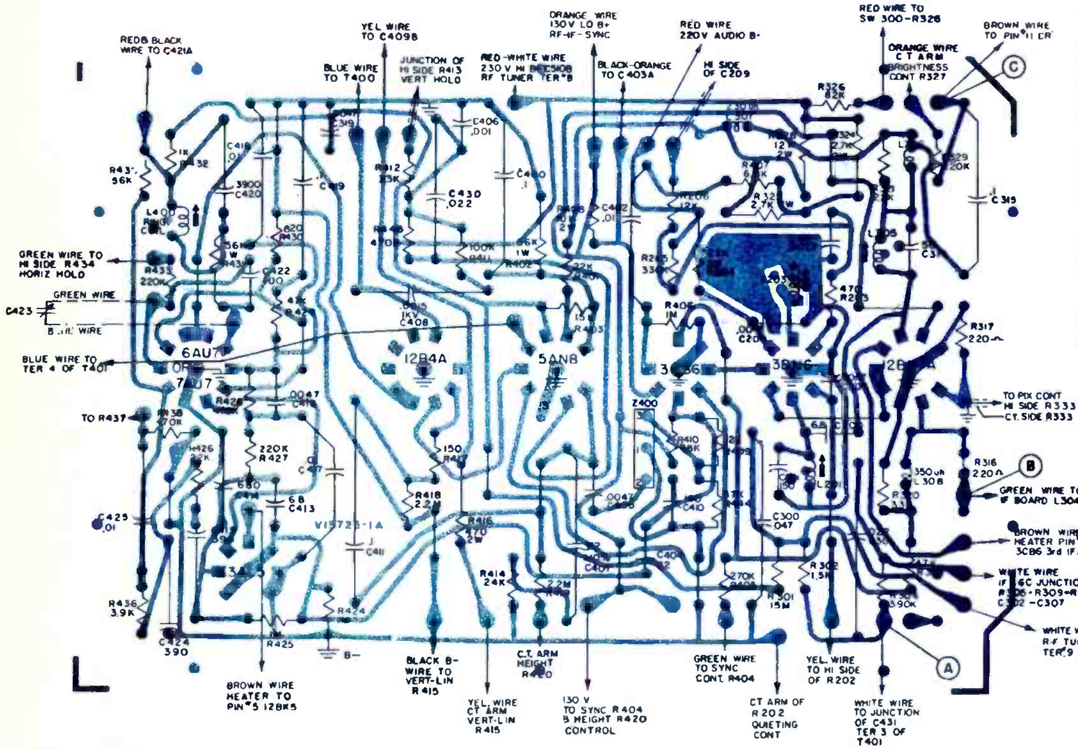
NOTES:

1. DC VOLTAGES MEASURED FROM B- WITH NO APPLIED SIGNAL USING A VTVM.
2. PEAK-TO-PEAK WAVEFORMS WERE TAKEN WITH PICTURE CONTROL SET FOR A 60 VOLT PEAK TO PEAK SIGNAL AT THE C.R.T. CATHODE. ALL OTHER CONTROLS SET FOR NORMAL PICTURE.
3. ALL CAPACITANCE VALUES IN MFD, WHILE ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE STATED.
4. UNLESS OTHERWISE STATED, RESISTORS ARE 1/2 WATT.
5. USE 21ALP4 ON V2342-14, V2352-104 CHASSIS
   USE 21ALP4A ON V2342-24, V2352-204 CHASSIS
   USE 24DP4 ON V2343-14, V2353-104 CHASSIS
   USE 24DP4A ON V2343-24, V2353-204 CHASSIS
6. A SYMBOL (-) EXPRESSES LOCATION OF PART. EXAMPLE: R305 SPECIFIES PART IS LOCATED ON IF BOARD. R304 INDICATES THE PART IS ON THE SWEEP BOARD. R506 (NO SYMBOL) INDICATES PART IS LOCATED ELSEWHERE.

FIG. 13

BOTTOM VIEW OF SWEEP PRINTED BOARD

SHOWING TOP COMPONENTS SYMBOLICALLY



Chassis V-2342:
Models H934T21, H-935T21, H-938K21, H-939K21, H-941K21, H-942K21

Chassis V-2352:
Models H-934TU21, H-935Tu21, H-938KU21, H-939KU21, H-941KU21, H-942KU21

Chassis V-2343:
Models H-950T24, H-951T24, H-954K24, H-955K24, H-956K24,

Chassis V-2353:
Models H-950TU24, H-951TU24, H-954KU24, H-955KU24, H-956Kn24

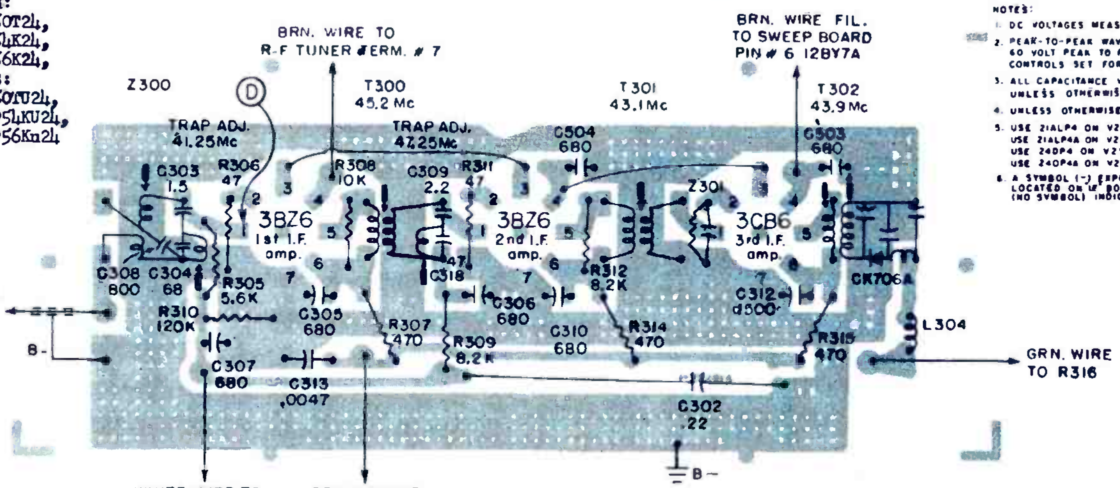


Fig. 14 Bottom View of IF Printed Board Showing Top Components Symbolically

WESTINGHOUSE
Chassis V-2342, V-2352, V-2343, V-2353

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WESTINGHOUSE
Chassis V-2341, V-2351, V-2340, V-2350

For alternate tuner, see reverse side.

Chassis V-2341: Models H-924T21A, H-924T21C H-927T21C, H-928T21C, H-929T21C, H-965K21C H-966K21C, H-974T21, H-975T21, H-976T21
Chassis V-2351: Models H-924TU21C, H-927TU-21C, H-928TU21C, H-929TU21C, H-965KU21C, H-966KU21C, H-974TU21, H-975TU21, H-976T-U21
Chassis V-2340: Models H-916T17A, H-919T17A, H-920T17A, H-921T17A, H-978T17, H-979T17, H-980T17
Chassis V-2350: Models H-916TU17A, H-919TU-17A, H-920TU17A, H-921TU17A, H-978TU17, H-979TU17, H-980TU17

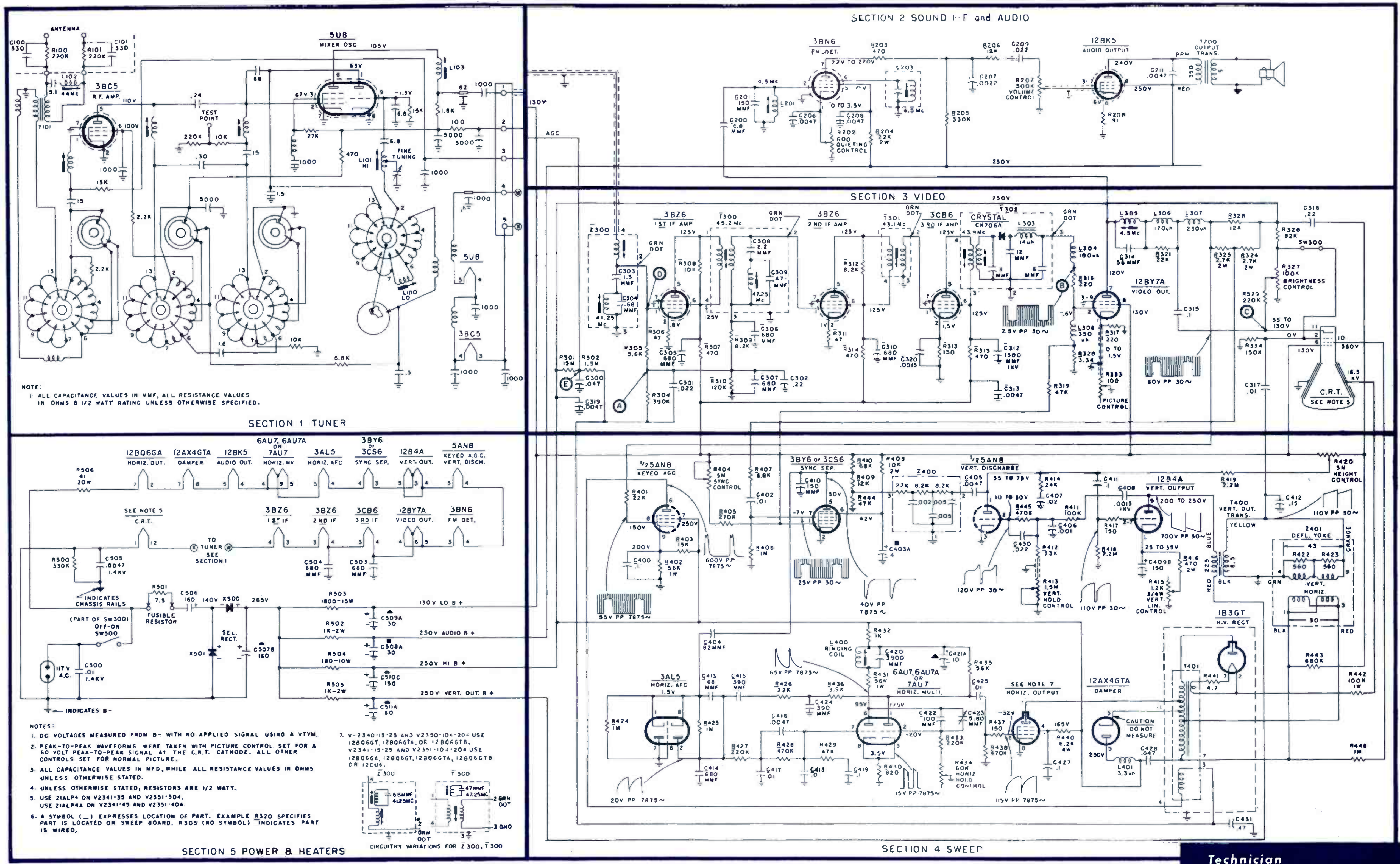


Fig. 20 Schematic Diagram for Chassis Assembly V-2340-15, V-2340-25, V-2350-104, V-2350-204, V-2341-15, V-2341-25, V-2351-104, V-2351-204

TROUBLE SHOOTING SERIES FILAMENT TUBES

The following information outlines a simple, quick check that can be made by the technician in the shop or home to find the "open" tube. No AC power need be applied to the chassis and therefore no shock hazard exists. Also, the delay of waiting for each trial tube to warm up, as occurs in the substitution method, is completely eliminated and the defective tube can be located in a few minutes.

Figure 11 shows the construction of a simple tool made from suitable tubing or by modifying a small pocket flashlight. A low current drain (150 mil) bulb such as the type 40 screw base or type 47 bayonet base is required for checking across a large number of tubes. Also, the higher voltage rating of these types assures long bulb life.

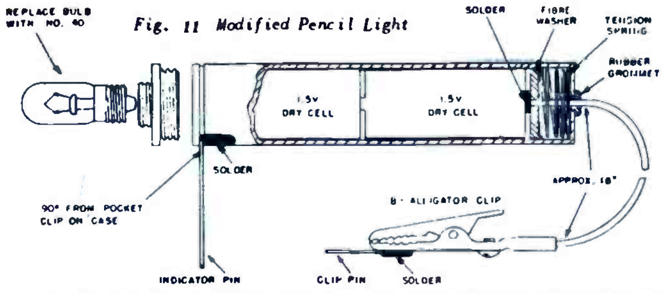
LOCATING OPEN FILAMENT TUBES

The drawing, Fig. 12, can be used as a guide in making these checks.

Step 1. With the back cover off, remove the 3BN6 as shown as Step No. 1 in Fig. 12 and check the tube from pins 3 to 4 for continuity. If the indicator does not light insert a new 3BN6. If the original 3BN6 filament is good, connect the clip lead of the indicator to any convenient B- point and insert the indicator pin into the No. 4 position of the 3BN6 tube socket. If the indicator does not light, the open filament lies between the 3BN6 tube and B- and can be located by checking at successive tube sockets between the 3BN6 tube and B- in the order shown by the dotted line in Fig. 12. If the indicator lights, continuity exists between the 3BN6 and B- and all the tube filaments between these points are good.

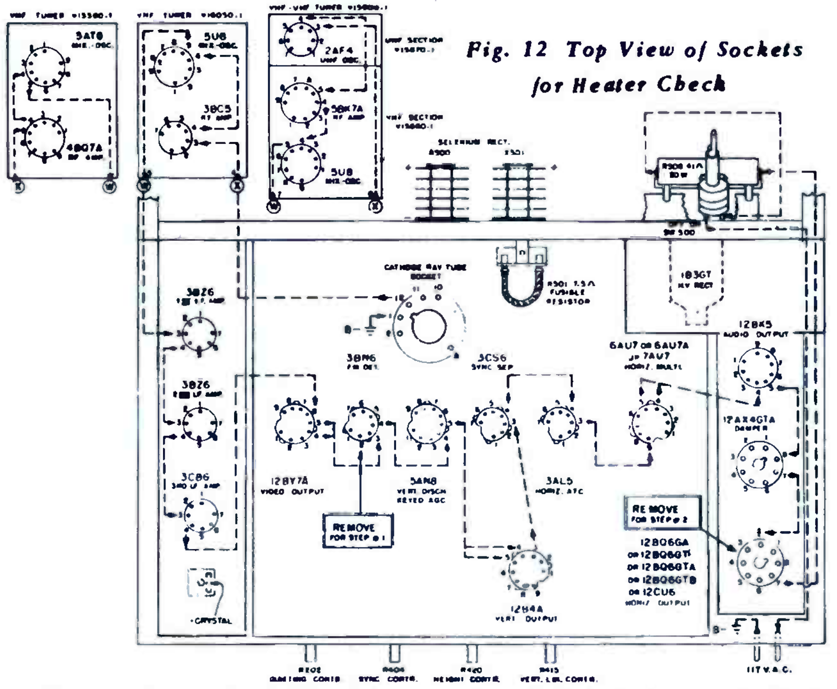
Step 2. Remove the horizontal output tube (See Fig. 12) from its socket and insert the indicator pin into the No. 2 position of the horizontal output tube socket and the pin of the clip lead into the number 5 position of the 3BN6 tube socket. If the indicator does not light the open filament lies between the horizontal output tube and the 3BN6 and can be located by checking at successive tube sockets between the horizontal output tube and the 3BN6 in the order shown by the dotted line in Fig. 12. If the indicator lights, continuity exists between the horizontal output tube and the 3BN6.

Fig. 11 Modified Pencil Light



MODIFIED PEN LITE OR PENCIL LIGHT USED FOR CHECKING SERIES FILAMENT STRING.

Fig. 12 Top View of Sockets for Heater Check



The horizontal output tube should be checked for continuity between pins 2 and 7. If continuity does not exist replace with new tube. If filament string does not function, the resistor R501 should be checked for proper resistance value.

PRINTED BOARDS

When servicing printed boards, the following list of tools are recommended:

1. Long nose pliers
2. Diagonal pliers
3. 60/40 low temperature rosin core solder
4. Small stiff wire brush and scraper
5. 25 watt or less soldering iron
6. Cleansing agent (carbon tetrochloride)
7. Soldering aid tool
8. 60 watt lamp

In a printed circuit, the conventional hookup wire is replaced by solid copper wiring etched on a plastic base by photo-engraving process. The printed circuit design offers uniform wiring, fewer wiring troubles, and enables the service technician to circuit trace quickly, and results in easier trouble shooting.

With the chassis positioned on its side, a 60 watt lamp can be located near the component side of the board, in this way the silhouette of the top components can be seen from the printed wiring side. With this technique, the leads of the top components can be seen from the bottom and can be associated to its proper printed wiring.

To remove defective components, apply the tip of the soldering iron to the connection. Keep the soldering iron on the connection just long enough to melt the solder, then quickly brush away the solder with a small stiff wire brush. After solder has been removed, separate connections. If the components have bent prongs, such as IF transformers, coils, tube sockets, etc., straighten the prongs and clip or cut close to the component, remove the defective component and then apply heat again and remove the clippings from the copper strips, then clean excess solder away with the wire brush.

Clean the area around the repair zone with carbon tetrochloride before replacement part or parts are installed. Use extreme care when inserting the new replacement part, if force is used when installing new parts the printed wiring may separate from the plastic base. When the new component part is seated back on the board, solder in place, using a good grade of 60/40 rosin core solder, TAKE CARE NOT TO OVERHEAT.

For quick replacement of parts, such as resistors, capacitors, etc., the original solder joint need not be touched. If the leads of the defective part are long enough the defective part may be removed by clipping the lead near the body of the defective component. The new part can be soldered to the connecting leads from the original.

When extracting stubborn or troublesome components, the printed wiring may break off or crack. These cracks can be so small (Micro-Cracks) that they cannot be seen with the naked eye. With the aid of a small magnifying glass these micro-cracks can be located. In the event of cracking or breaking off of the printed wiring, repairs can easily be made by soldering a small piece of tinned copper wire over the damaged or broken conductor (pigtail trimmings from capacitors and resistors are ideal for this purpose).

Location and orientation of pin contacts of both the 7 pin and 9 pin miniature tube sockets are quite easily located. Look for the slotted half moon keyway and then count in a clockwise direction. Ground contacts and jumper bar are used on some tube sockets depending on the tube and circuit used. For location of pin contacts on sockets having ground contacts, simply count in a clockwise direction the first terminal will be ground contact, not pin 1.

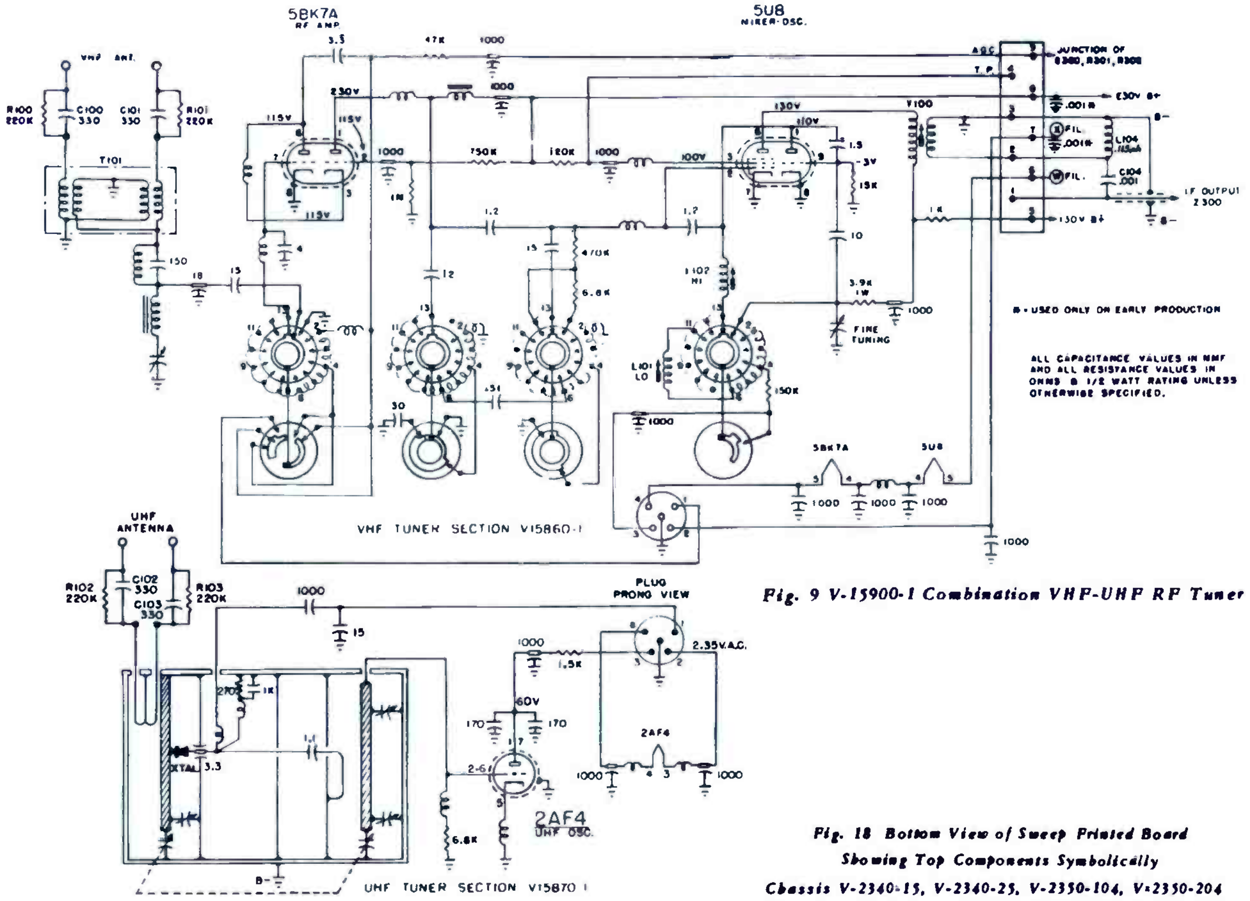


Fig. 9 V-15900-1 Combination VHF-UHF RF Tuner

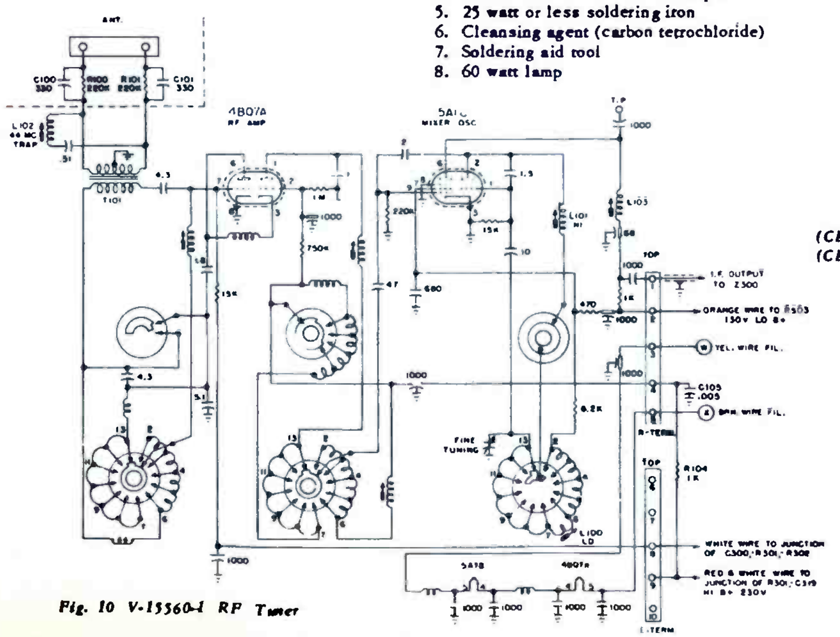


Fig. 10 V-15560-1 RF Tuner

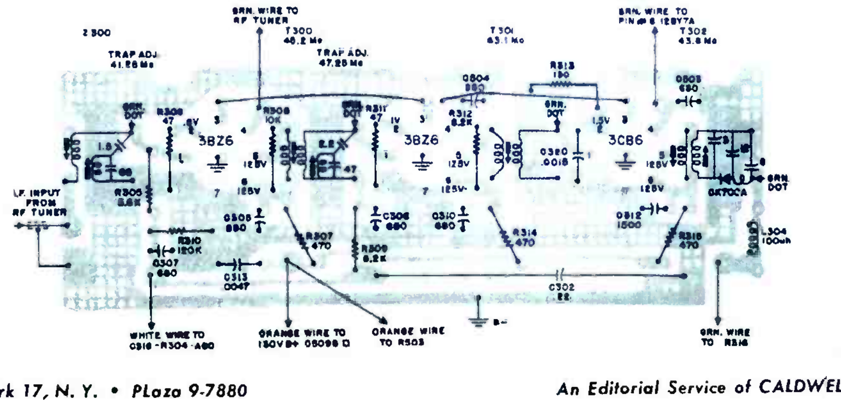
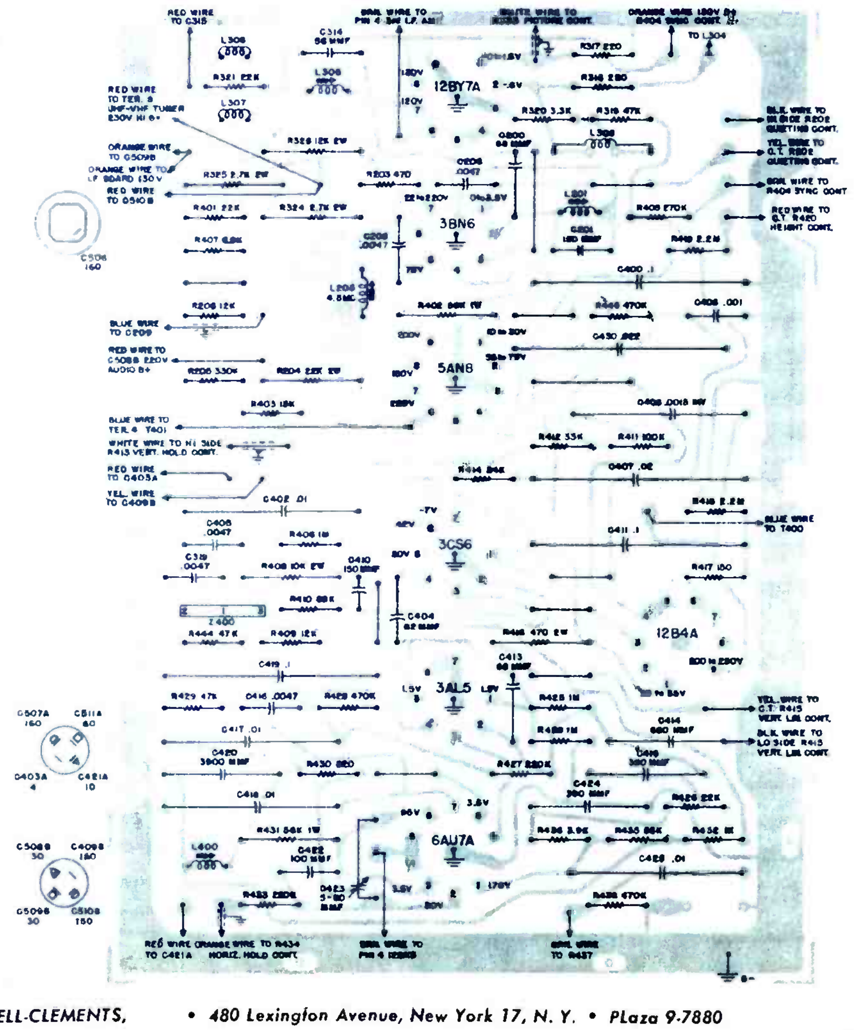


Fig. 19 Bottom View of IF Printed Board Showing Top Components Symbolically

(Chassis V-2340-15, V-2340-25, V-2350-104, V-2350-204)
(Chassis V-2341-15, V-2341-25, V-2351-104, V-2351-204)

Fig. 18 Bottom View of Sweep Printed Board Showing Top Components Symbolically

Chassis V-2340-15, V-2340-25, V-2350-104, V-2350-204
Chassis V-2341-15, V-2341-25, V-2351-104, V-2351-204



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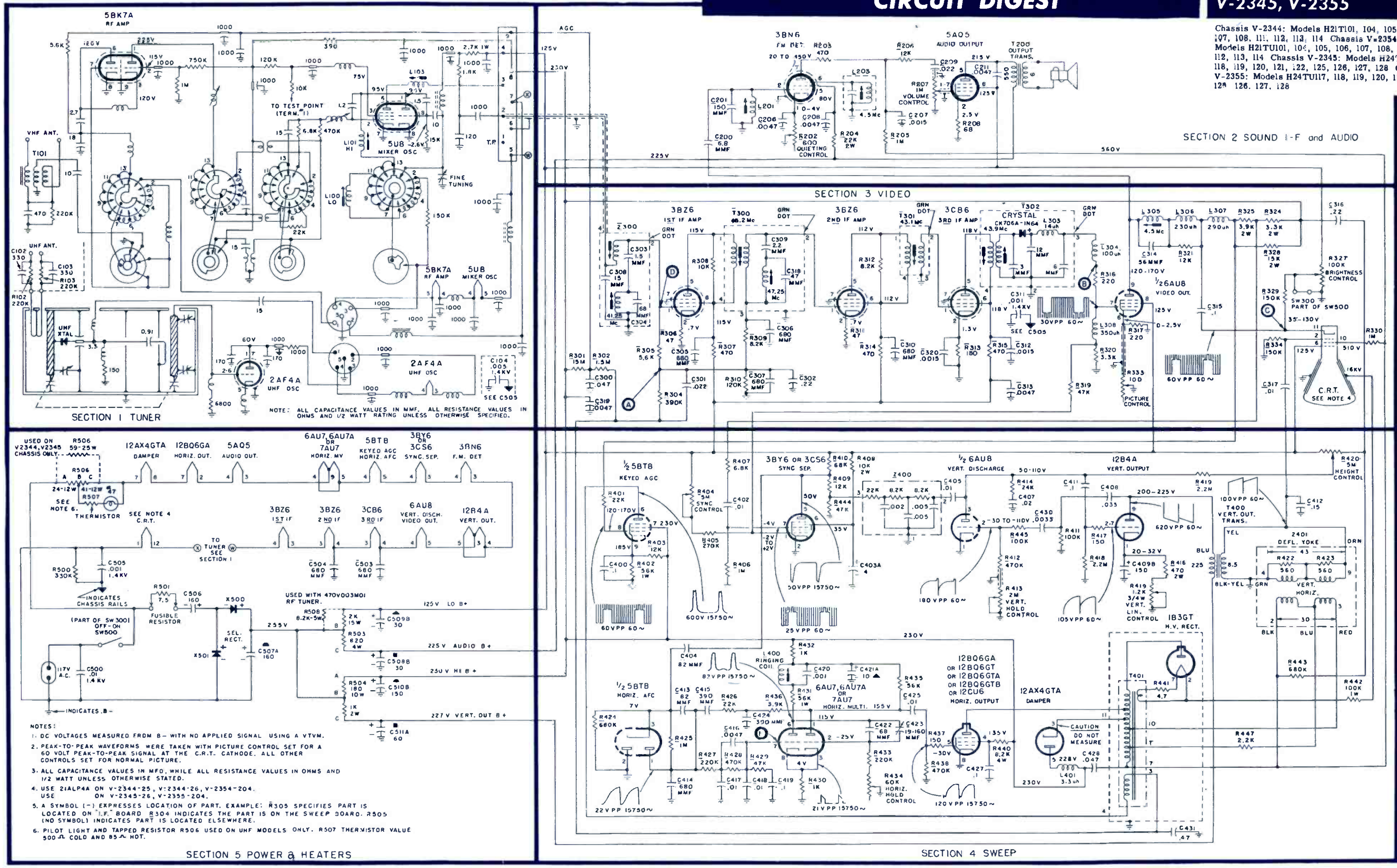
Chassis V-2344, V-2354 V-2345, V-2355

Chassis V-2344: Models H21T101, 104, 105, 106, 107, 108, 111, 112, 113, 114 Chassis V-2354: Models H21TU101, 104, 105, 106, 107, 108, 111, 112, 113, 114 Chassis V-2345: Models H24T117, 118, 119, 120, 121, 122, 125, 126, 127, 128 Chassis V-2355: Models H24TU117, 118, 119, 120, 121, 122, 125, 126, 127, 128

Figure 14 – V-2344-25-26, V-2354-204, V-2345-26, V-2355-204 Schematic Diagram



SERVICE AND ALIGNMENT

TEST EQUIPMENT

To service these chassis, the following test equipment should be available:

1. RF sweep generator that is capable of producing a 10 mc. sweep at center frequencies ranging from 10 to 90 mc. and 170 to 216 mc. The output must be adjustable from at least 100,000 microvolts down to a very low minimum, and the output must be flat at all positions of the attenuator.

2. A cathode ray oscilloscope, preferably one with a wide-band vertical deflection amplifier and a low-capacitance input probe. The oscilloscope should have good low frequency response characteristics.

3. Signal generator or generators capable of producing an accurate signal at all intermediate frequencies between 4.5 and 50 mc. and all picture and sound RF frequencies. Provisions for AM and FM modulation of the signal should be included. The accuracy of these frequencies is very important. If the signal generator does not include a crystal calibrator, a heterodyne frequency meter equipped with a crystal calibrator should be used to insure accuracy. The output level must be adjustable from at least 100,000 microvolts down to a very low minimum.

4. A vacuum tube voltmeter equipped with a high voltage multiplier probe for measurements up to 25,000 volts and an RF probe for measuring RF voltages.

IF ALIGNMENT

The video IF system is stagger-tuned to obtain the required bandwidth.

A suggested alignment procedure is given in the following steps:

1. Connect a V.T.V.M. (5 volt range) to point "B" as shown on the schematic diagram.

2. Connect the RF generator, capable of providing frequencies ranging from 40 to 50 mc. unmodulated, to point "D" as shown on .... Fig. 14. For suggested RF generator coupling and termination see Fig. 2.

3. Apply -3 volts bias to point "A" as shown in Fig. 14. A simple bias source is shown in Fig. 3.

4. Adjust T302, T301 and T300 as given in the following chart.

(Continued on reverse side)

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WESTINGHOUSE
Chassis V-2344, V-2354
V-2345, V-2355

Technician
CIRCUIT DIGEST

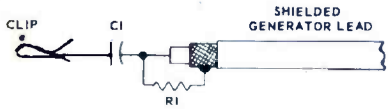
ALIGNMENT

(Continued from reverse side)

Signal Gen. Frequency	*Connect Gen. To Point*	*Adjust*	*V.T.V.M. Output*
43.9 mc	"D" Fig. 14	Top then bottom of T302	Maximum
43.1 mc	"D" Fig. 14	Bottom of T301	Maximum
47.25 mc	"D" Fig. 14	Top of T300	Minimum
45.2 mc	"D" Fig. 14	Bottom of T300	Maximum

Keep the output of the signal generator adjusted to provide a constant .1 volt output on the V.T.V.M.

NOTE: To adjust the slugs in the IF transformers Z300. T300. T301 and T302, a special tool is required. This tool must fit into the 3/32 hex type h..e ... the slug. An incorrectly designed tool will cause chipping of the slug. A suitable tool is shown in Fig. 4.



CI = .001 MFD
RI = DEPENDS UPON GEN. OUTPUT IMPEDANCE 52 Ω - 72 Ω etc.

Figure 2 – RF Generator Coupling

5. Remove the V.T.V.M. and connect the vertical input of the oscilloscope to point "B" See Fig. 14 . . . . . . using the isolation network as shown in Fig. 6.

6. Remove the RF signal generator from point "D"

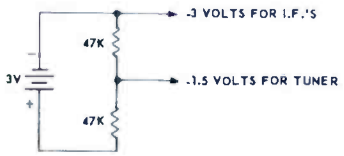


Figure 3 – Bias Supply

7. Couple the marker generator output to the IF sweep generator output so that the two signals are applied together to the points specified in the steps that follow. Some sweep generators have facilities for connecting the marker output directly into the sweep generator. With other sweep generators, the marker can be coupled to the sweep generator by wrapping a few turns of insulated wire around the center conductor of the sweep generator output cable and connecting the marker generator to this wire. The loose coupling obtained in this manner is desirable because excessive marker signal injection will distort the response curve.

8. Connect the IF sweep generator to point "D" as shown on Fig. . . . . . .14. The observed wave form should be as shown in Fig. 7 with markers as shown. A tilt in the response curve can be corrected by adjusting the bottom slug of the 3rd IF transformer, T302. To correct the bandwidth,

Figure 4 – Alignment Tool

or to set the markers, adjust the 2nd IF transformer, T301, for the low frequency side and adjust the first IF transformer, T300, for the high frequency side. If more than 3 turns are required for any of the touch up adjustments, the preceeding steps should be repeated.

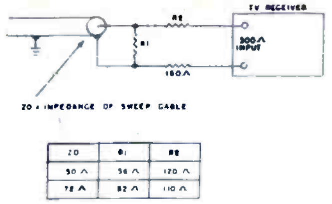


Figure 5 – Impedance Matching Network

9. Connect the RF sweep generator output cable to the antenna terminals with the proper impedance matching network. (See Fig. 5)

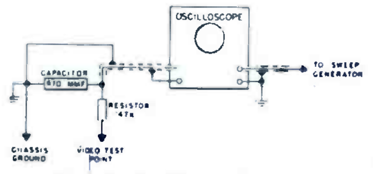


Figure 6 – Oscilloscope Connections

10. Set the channel selector to channel 13 and set the sweep generator to sweep channel 13 frequencies.

11. By adjusting T100 on the tuner for maximum amplitude of the response curve and the bottom adjustment of Z300 to correct the tilt, the curve and marker points should be as shown in Fig. 8.

The bottom adjustment of Z300 is made correctly when the response curve rocks about the center frequency of 213 mc.

The top adjustment of Z300 is the accompanying sound trap (41.25 mc) and should be adjusted to fall as shown in the response curve (Fig. 8) at 215.75 mc. After adjusting the 41.25 mc. trap it may be necessary to retouch the bottom adjustment of Z300.

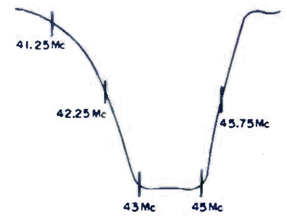


Figure 7 – I.F. Response Curve

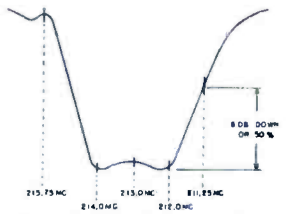


Figure 8 – Overall Response Curve

4.5 mc. TRAP ALIGNMENT

Connect Signal Gen. To	*Signal Gen. Frequency*	*Connect RF Probe of V.T.V.M. To*	*Adjust L305 For*
Point "B" (Fig. 14) Lowside to B–	4.5 mc. (unmodulated)	Point "C" (Fig. 14) Lowside to B–	Minimum

NOTE: The accuracy of the 4.5 mc. frequency is very important, it should be crystal controlled if possible and should be strong enough to produce the proper null.

The RF probe should contain a blocking capacitor, because the potential at point "C" may be as high as 150V. depending upon the setting of the brightness control.

HIGH-FREQUENCY OSCILLATOR ALIGNMENT FOR 475V001M01 TUNER

If the 5U8 oscillator tube is replaced, the different inter-electrode capacity of the new tube may change the oscillator frequency enough to necessitate re-alignment.

Alignment of the VHF oscillator for the high and low band channels is accomplished from the top of the tuner.

The adjustments are as follows:

1. Rotate the fine tuning control to the middle of its range. The flat of the shaft will be at the 1 o'clock position.

2. Set the channel selector to the highest channel in the high band (7-13) operating in your locality.

3. Using a non-metallic alignment tool (See Fig. 9) peak the hi-band oscillator slug L101 for best picture detail and sound quality.

4. Set the channel selector to the highest channel in the low band (2-6) operating in your locality.

5. Peak the low band adjustment slug (L100) for best picture detail and sound quality.

6. Check the previously made adjustments and if tuning has changed, repeat the above procedure.

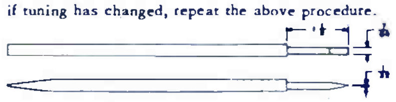


Figure 9 – Alignment Tool

PARTS IDENTIFICATION

The schematic diagram of the V-2344 and V-2345 chassis is coded so that the location of parts can be easily determined.

If the part number on the schematic diagram Fig. 14 has a dash (-) above the part number, for example C̄309, it means that the part will be found on the IF printed board. If the dash is below the number, the part will be found on the sweep board, for example, R̲404. Component numbers not having the dash will be located elsewhere on the chassis.

These associated photos will be useful when locating the part on the printed boards.

Ref. No.	*Board Location*	*Ref. No.*	*Board Location*	*Ref. No.*	*Board Location*	*Ref. No.*	*Board Location*	*Ref. No.*	*Board Location*
C200	H17	C312	E5	L307	G15	C414	R30	R412	R12
C201	G19	C313	N6	L308	H10	C415	130	R414	Q17
C206	J18	C320	F3	R301	S14	C416	M31	R416	J15
C207	N18	Crystal		R302	Q11	C417	P29	R417	M13
C208	L19	Detector	C4	R304	N10	C418	E32	R418	O13
C209	O21	L304	B6	R316	F10	C419	P29	R419	E26
L201	G19	R305	Q4	R317	G12	C420	O32	R420	C24
L203	M20	R306	P4	R319	H12	C422	L32	R424	M27
R202	C20	R307	M6	R320	G12	C423	M32	R425	L28
R203	L18	R308	N4	R321	F13	C424	F31	R426	F30
R204	O20	R309	K6	R324	C17	C425	G34	R427	L30
R205	P18	R310	O5	R325	D16	C430	N12	R428	J30
R206	P20	R311	K4	R328	F17	L400	R33	R429	N30
C300	P11	R312	I4	R329	C12	R401	F16	R430	I31
C301	M9	R313	F4	R334	P24	R402	D31	R431	O31
C314	E13	R314	H5	C400	N14	R403	D30	R432	R31
C315	E14	R315	D5	C402	E27	R404	C23	R433	O33
C316	E28	T300	L3	C404	N26	R405	D20	R435	P34
C317	P23	T301	G3	C405	F22	R406	N24	R436	D32
C319	R27	T302	C3	C407	M17	R407	D17	R438	H33
C302	H9	Z300	R3	C408	O15	R408	H25	R443	C29
C305	N5	C503	D2	C411	N14	R409	H24	R444	F23
C306	K5	C504	I3	C412	O25	R410	G26	R445	Q12
C307	P5	L305	F13	C413	L29	R411	N15	Z400	F23
C310	I5	L306	H13						

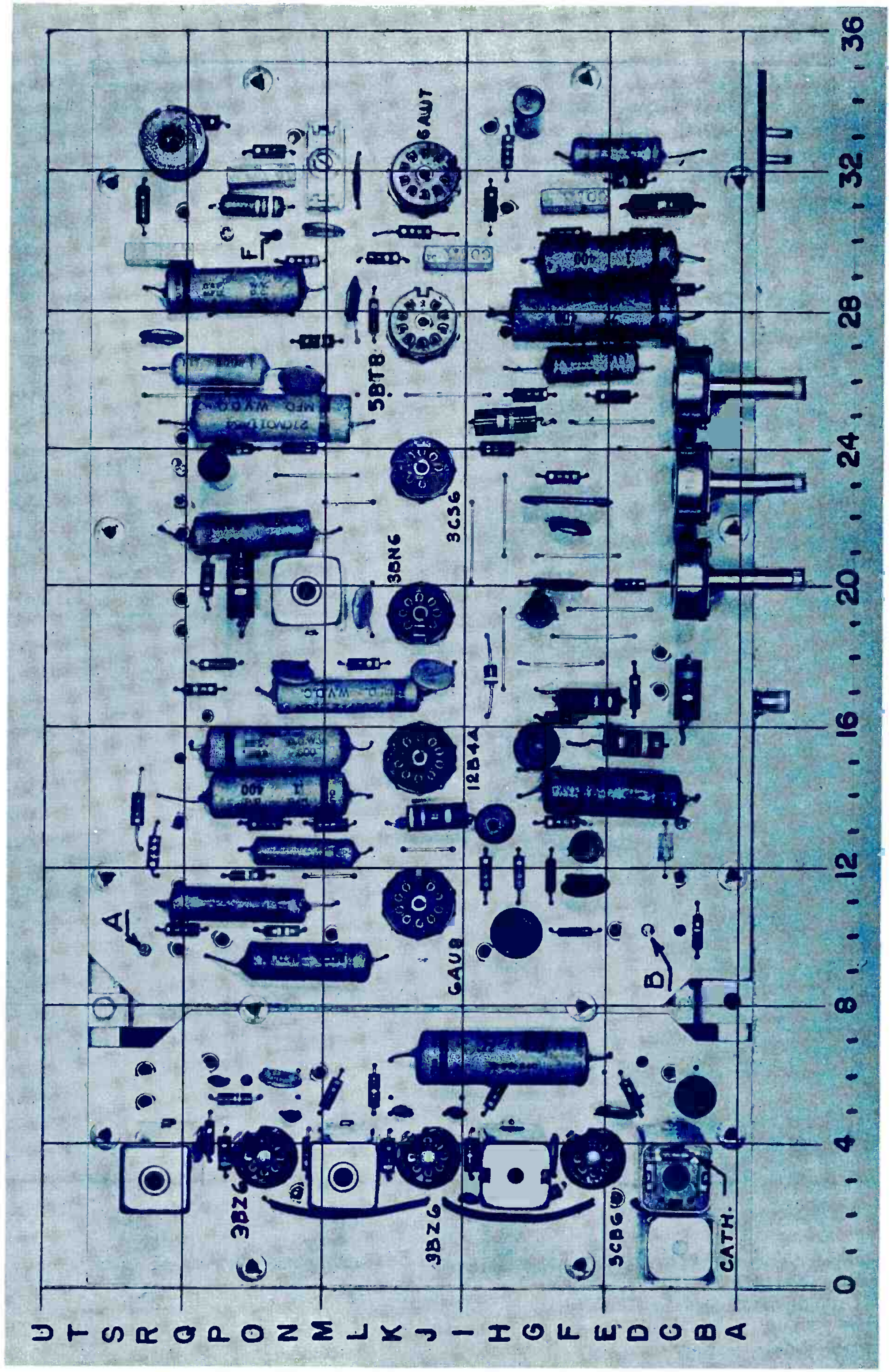
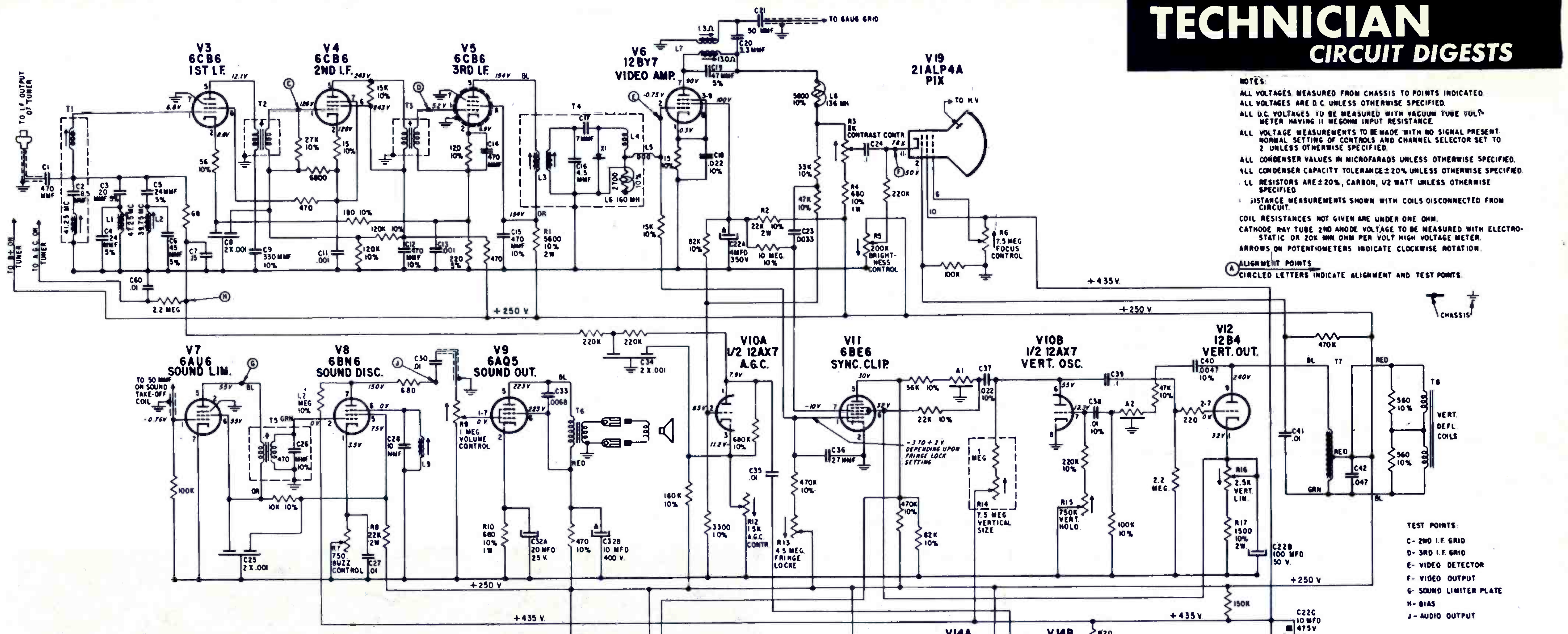


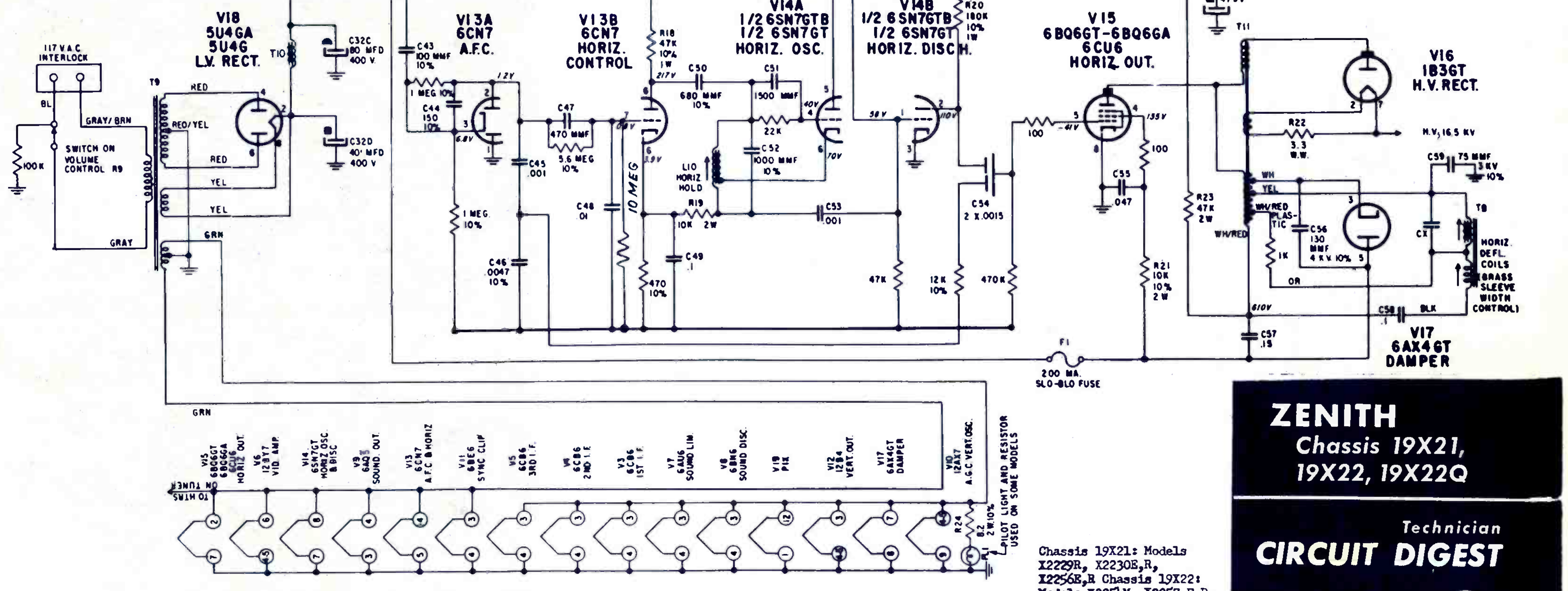
Figure 12 – IF and Sweep Board Component Location

NOTES:

ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.
ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
ALL D.C. VOLTAGES TO BE MEASURED WITH VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.
ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT, NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO 2 UNLESS OTHERWISE SPECIFIED.
ALL CONDENSER VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
ALL CONDENSER CAPACITY TOLERANCE ±20% UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS ARE ±20%, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED.
RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT.
COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM.
CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 20K MIN. OHM PER VOLT HIGH VOLTAGE METER.
ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.

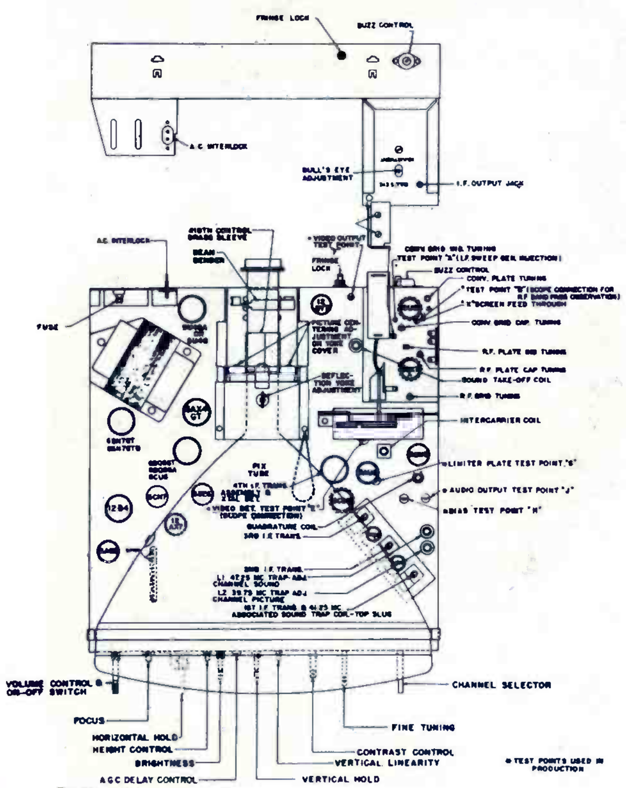
(A) ALIGNMENT POINTS
CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS.





TEST POINTS:
C- 2ND I.F. GRID
D- 3RD I.F. GRID
E- VIDEO DETECTOR
F- VIDEO OUTPUT
G- SOUND LIMITER PLATE
H- BIAS
J- AUDIO OUTPUT

Fig. 11 Tube and Trimmer Layout 19X21 Chassis.



ZENITH
Chassis 19X21, 19X22, 19X22Q

Technician
CIRCUIT DIGEST

Chassis 19X21: Models X2229R, X2230E,R, X2256E,R Chassis 19X22: Models X2254M, X2257,E,R, X2258E,R Chassis 19X22Q: Model X2264EQ,RQ

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ZENITH
Chassis 19X21, 19X22, 19X22Q

Technician CIRCUIT DIGEST

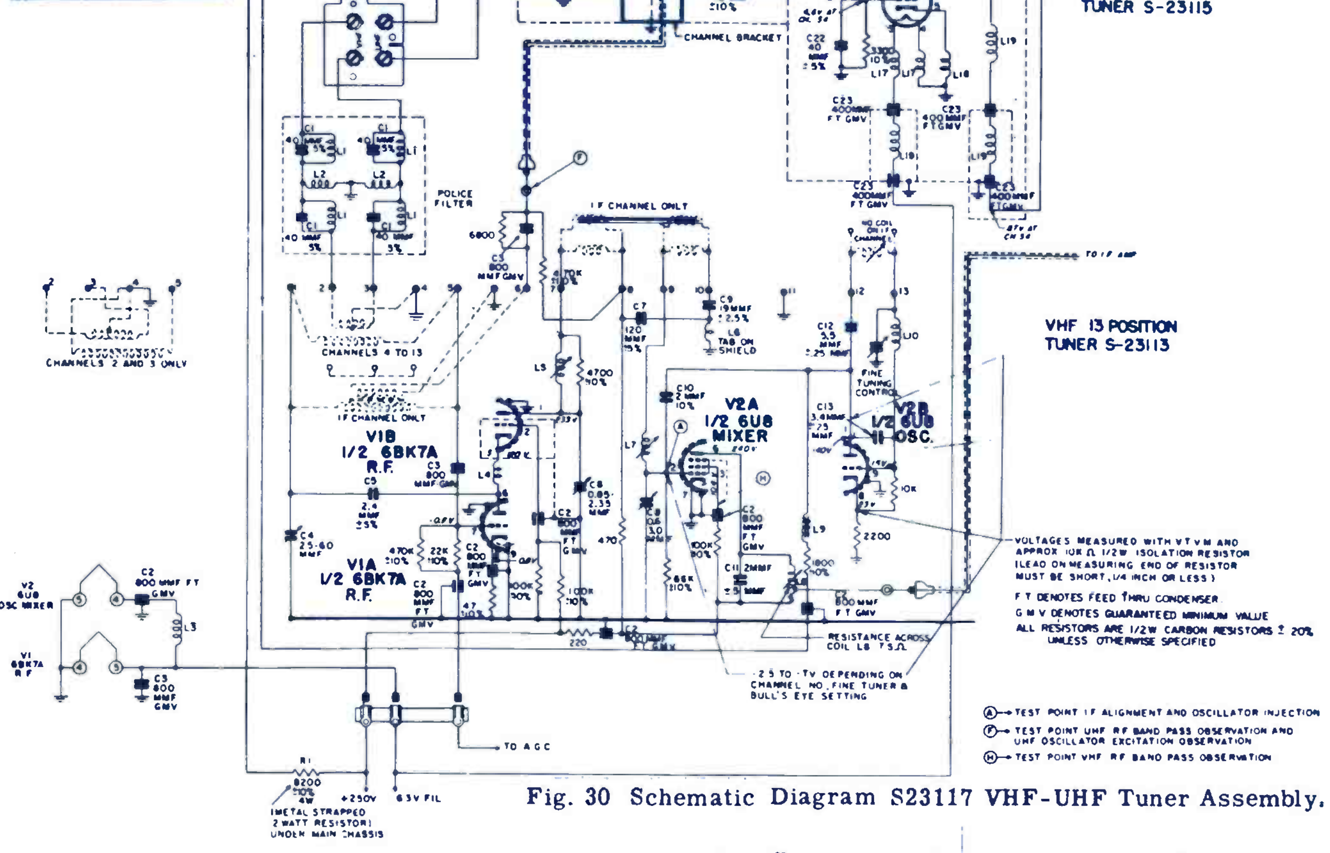


Fig. 30 Schematic Diagram S23117 VHF-UHF Tuner Assembly.

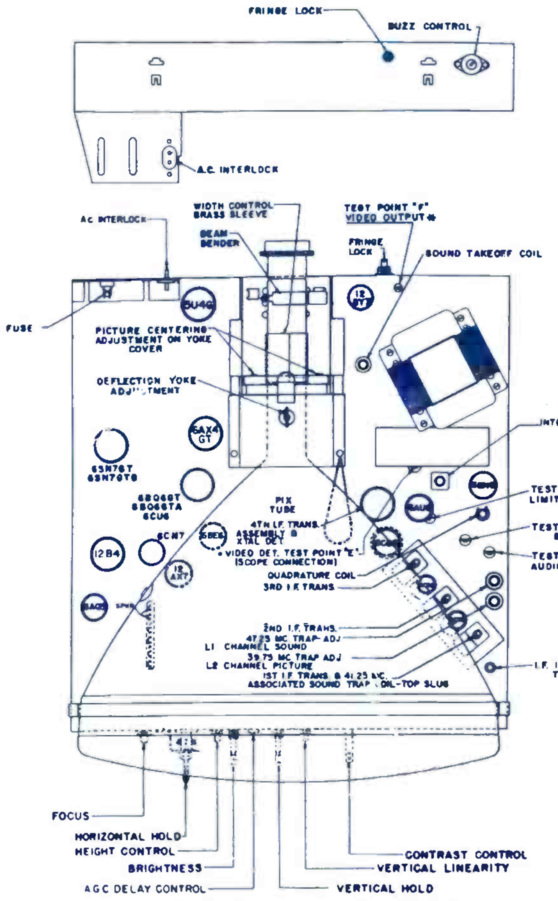


Fig. 12 Tube and Trimmer Layout 19X22 Chassis.

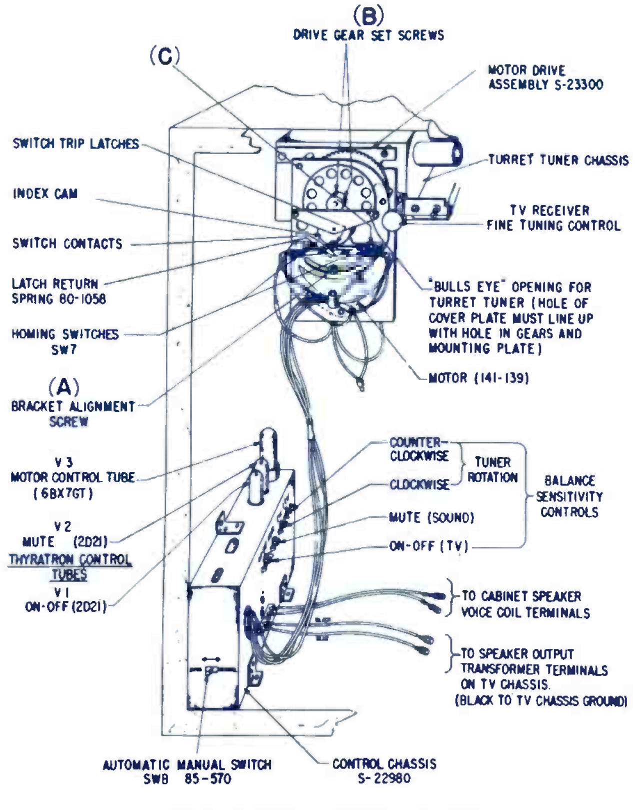


Fig. 17 Flash-Matic Remote Control Layout "Q" Models.

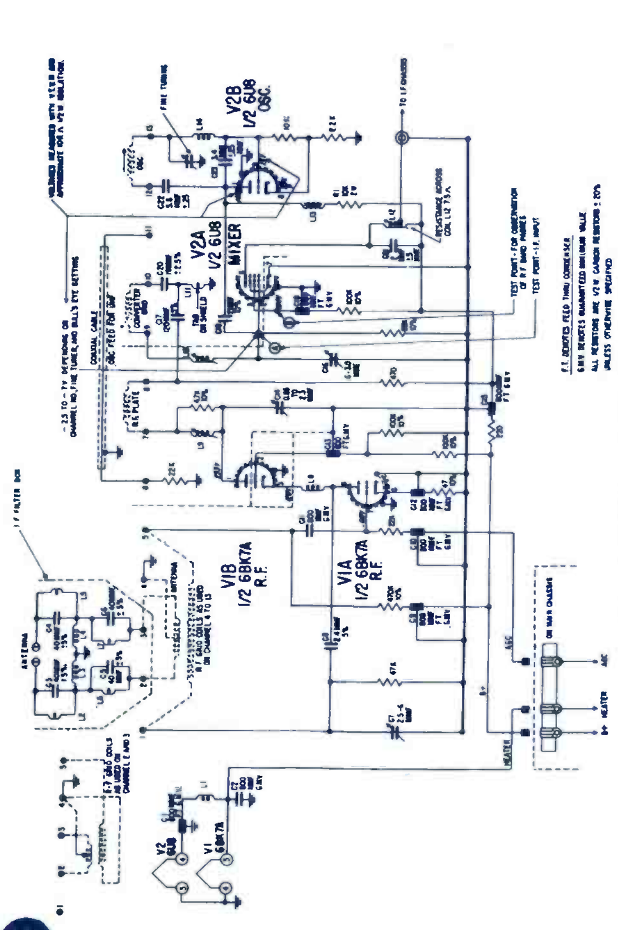


Fig. 29 Schematic Diagram S-21735 Turret Tuner.

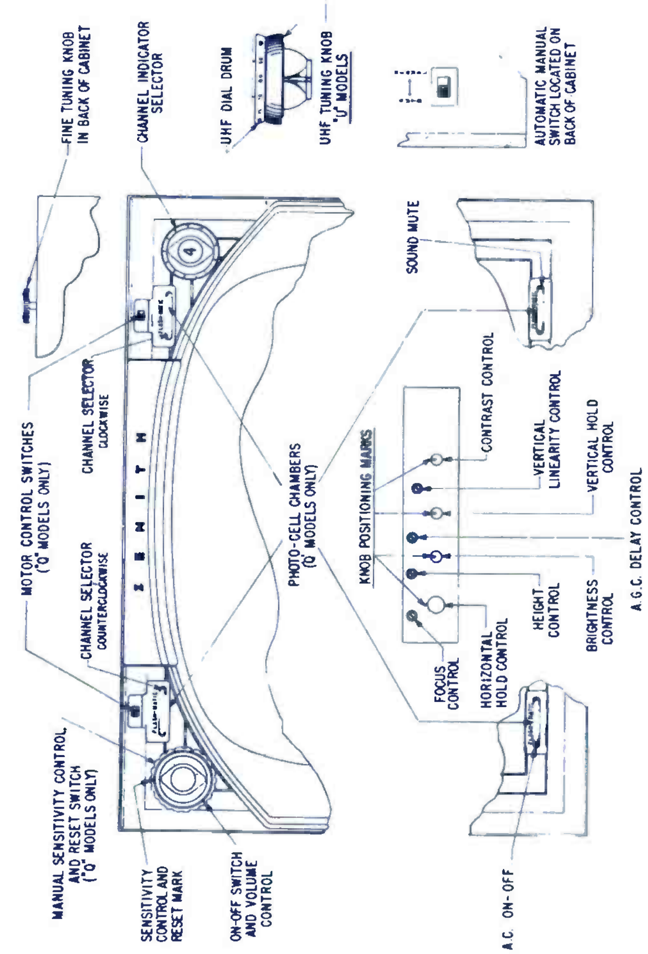
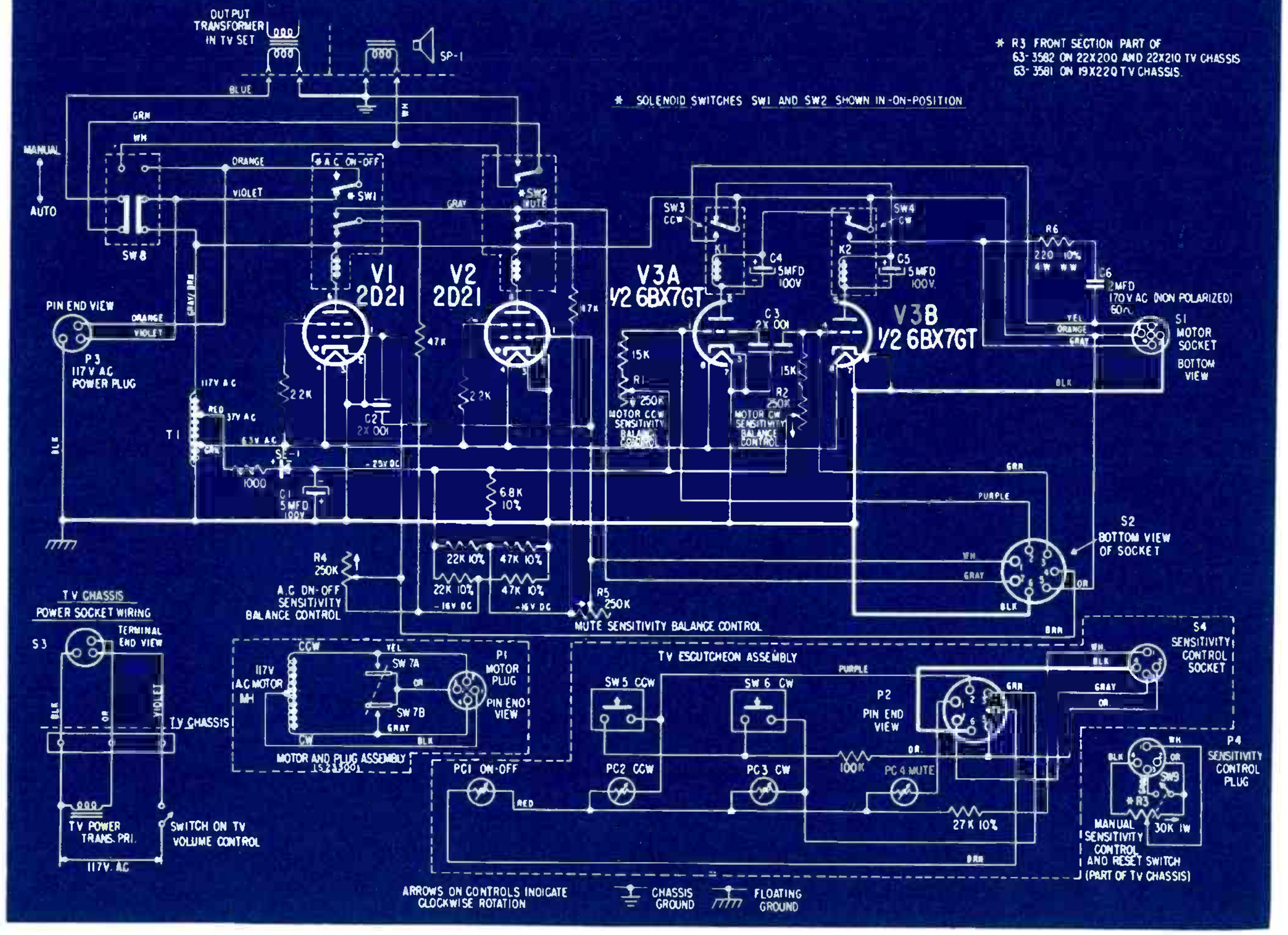


Fig. 5 Control Panel Layout 19X22Q & 19X24Q Chassis. Layout for the 19X22 & 19X24 Chassis is the same less Flash-Matic Control.

Fig. 33 Schematic Diagram Flash-Matic Remote Control.



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TUNER OSCILLATOR ADJUSTMENTS 17Y CHASSIS

To adjust the receiver oscillator adjustment screws set the fine tuning control to a position where the index hole in the drive cam is directly over the small hole just below the channel 13 adjustment screw (See Fig. 9). Without further adjustment of the fine tuning control, insert a 68-24 alignment tool into the tuner and adjust each operating channel to resonance starting with the highest channel and following each lower channel in sequence. Be certain not to move the fine tuning shaft when switching channels. It will be noted that tuning to one side of resonance results in a faded, washed-out picture with the spacing between the wedge lines fogged and tuning in the opposite direction causes the spaces between the lines to clear up. However, going beyond this point causes the picture to take on a "wormy" appearance from sound getting into the picture. Correct adjustment is obtained by tuning to the "wormy" picture and then backing the control off slightly until the picture clears up.

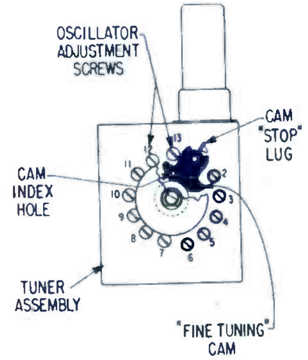


Fig. 9 Bandswitch Tuner Oscillator Adjustments

ALIGNMENT

A suitable VHF and UHF sweep generator in conjunction with an accurate marker must be used for alignment work. It is very important to have the sweep generator output cable properly terminated and to check whether or not its attenuator is reactive. If the attenuator is reactive or if the output cable is improperly terminated, correct alignment cannot be made since the degree of attenuation then may change the shape as well as the amplitude of the response curve. The position of the attenuator should only vary the amplitude and not the shape of the response curve.

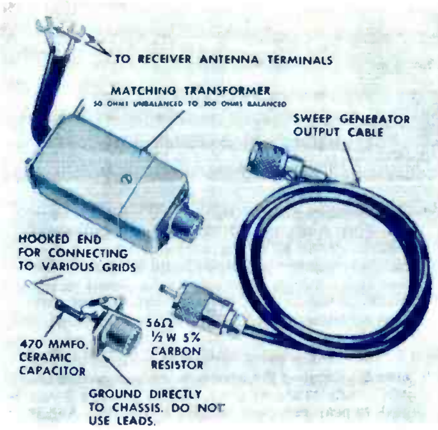


Fig. 10 IF-RF Alignment Fixtures

SOUND ALIGNMENT

Proper alignment of the 4.5 Mc intercarrier sound channel can only be made if the signal to the receiver antenna terminals is reduced to a level below the limiting point of the 6BN6 Gated Beam Detector. This level can be easily identified by the "hiss" which then accompanies the sound.

Various methods may be used to reduce the signal level; however, it is recommended that a step attenuator similar to the S-17203 unit be used for most satisfactory results.

1. Connect the step attenuator between the antenna and the receiver antenna terminals.

2. Tune in a tone modulated TV signal. Adjust the step attenuator until the signal is reduced to a level where "hiss" is heard with the sound.

3. Adjust the sound take-off coil L7 (top and bottom slugs), intercarrier transformer T5, quadrature coil L9 (L10 in 16Y & 17Y chassis) and buzz control R7 (R5 in 16Y & 17Y chassis) for the best quality sound and minimum buzz. It must be remembered that any of these adjustments may cause the "hiss" to disappear and further reduction of the signal will be necessary so that the "hiss" does not disappear during alignment.

VIDEO IF ALIGNMENT 17Y SERIES RECEIVERS

The video IF amplifier is stagger tuned, using one double tuned and four single tuned circuits. The converter plate tunes to 45.4 Mc, the first IF to 43.6 Mc, the second IF to 42.75 Mc, the third IF to 45 Mc, and the fourth IF (both cores) to 43.6 Mc. The 47.25 Mc trap is part of the first IF transformer assembly. The 40.50 Mc second IF cathode trap boosts the sound carrier under extremely weak signal conditions. Attenuation of the 41.25 Mc associated sound carrier is controlled by adjusting the band width. With the exception of the traps, a slight deviation from the above-mentioned frequencies is permissible to obtain proper band pass; however, the order must be maintained. To align the IF, proceed as follows:

1. Disable the tuner local oscillator by removing the 5U8 or 6U8 tube, wrapping a bare wire around the oscillator grid (pin 9) and inserting the tube. Ground this wire. On "U" models it is only necessary to switch the channel selector to the UHF position.

2. Connect the negative lead of a 6 volt battery or a low impedance bias supply to terminal "E" (Fig. 2) and the positive lead to chassis. Ground point "F".

3. Connect a calibrated oscilloscope through a 10K isolation resistor between terminal "C" and chassis.

4. Connect the sweep generator through a terminating network similar to that shown in Fig. 10 to the grid (pin 1) of the third IF amplifier.

5. Adjust the sweep generator to obtain a pattern similar to Fig. 11 with a detector output of 3 volts peak to peak. Do not exceed this output during alignment.

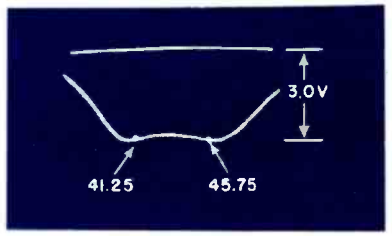


Fig. 11 4th IF Response

6. Adjust the top and bottom cores of the fourth IF transformer to obtain a response similar to Fig. 11. The 41.25 and 45.75 Mc markers should be adjusted for symmetry and should fall as close to the response curve humps as possible. If the correct response curve cannot be obtained, check the position of the two cores to see that they are not butted but are entering their respective windings from the opposite ends of the coils.

7. Connect the sweep generator to test point "A" (Fig. 2) and adjust attenuator to obtain 3 volts peak to peak output at the detector.

8. Adjust the first IF bottom core (44 Mc), second IF (42.75 Mc), third IF (45 Mc), and converter plate coil to obtain a response similar to Fig. 12.

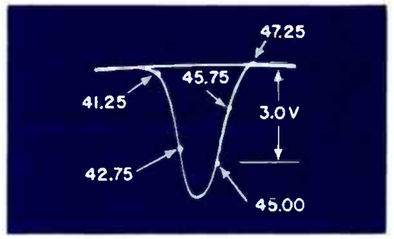


Fig. 12 Overall IF Response

9. Switch the oscilloscope to 10X gain used in the above steps to blow up the trap slots. Adjust the 47.25 Mc trap for maximum attenuation of 47.25 Mc marker (top core 1st IF transformer). The 41.25 Mc marker should be in the approximate position shown in Fig. 13. On some receivers

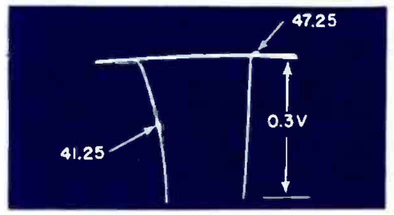
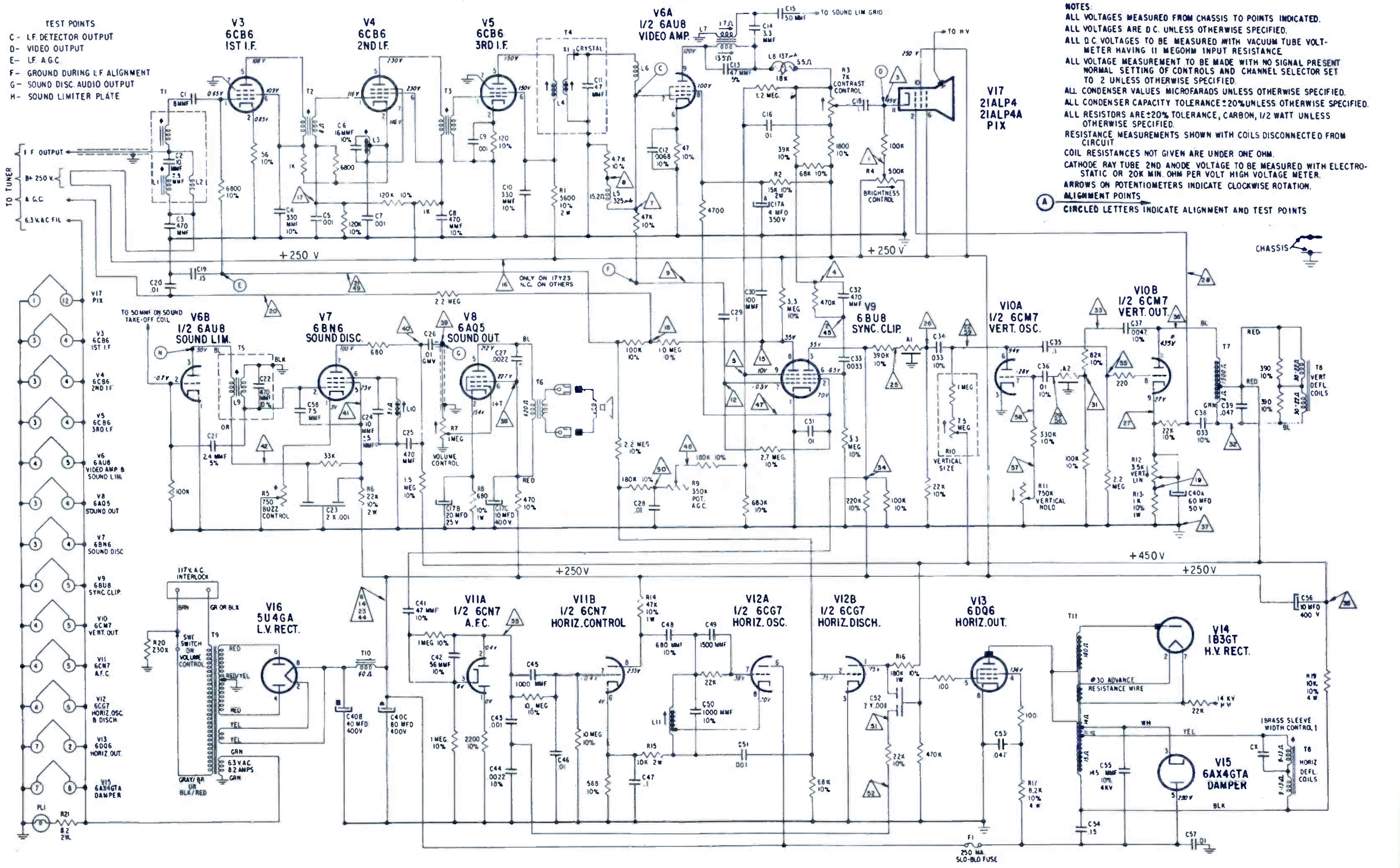


Fig. 13 Expanded View of Traps



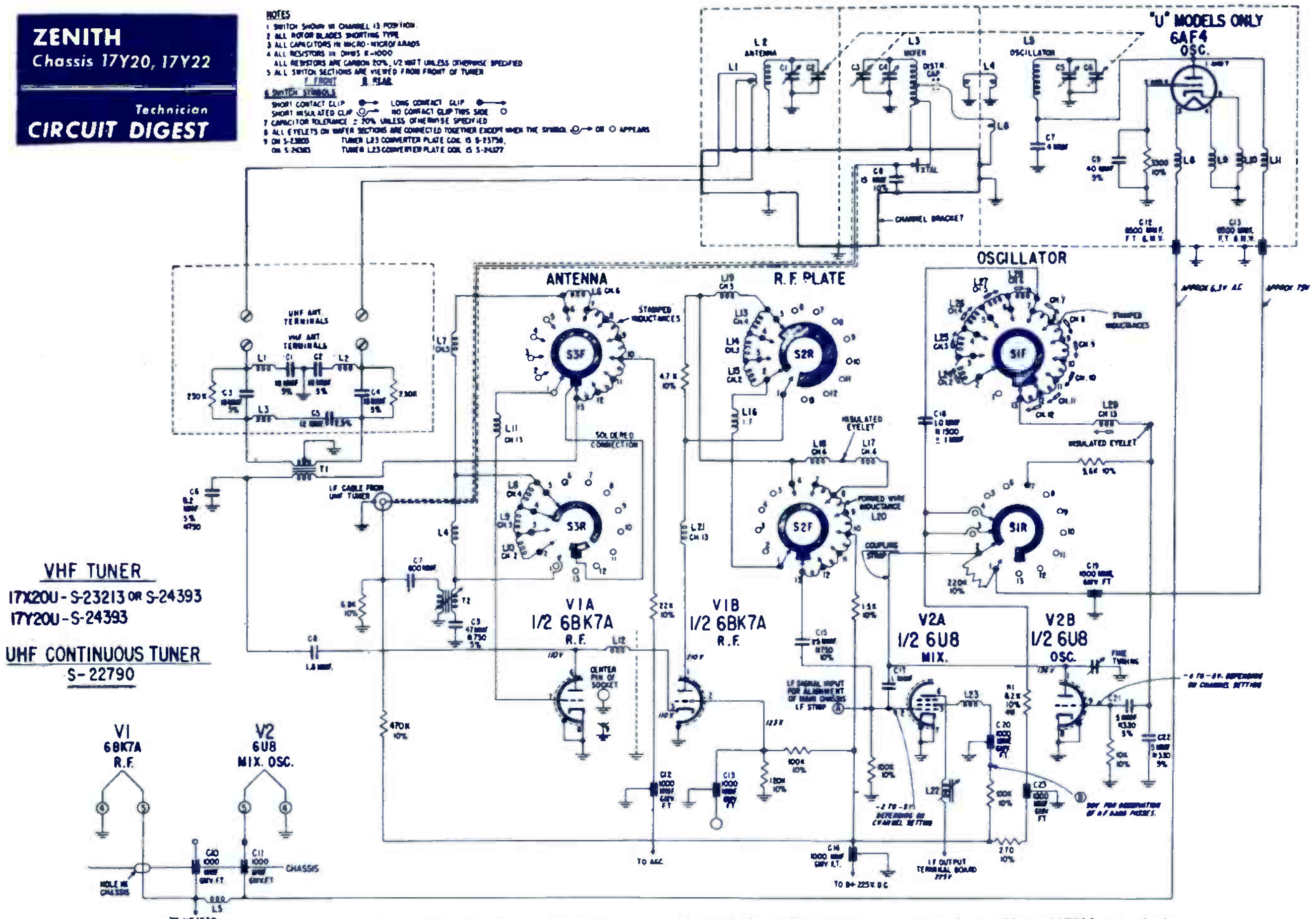
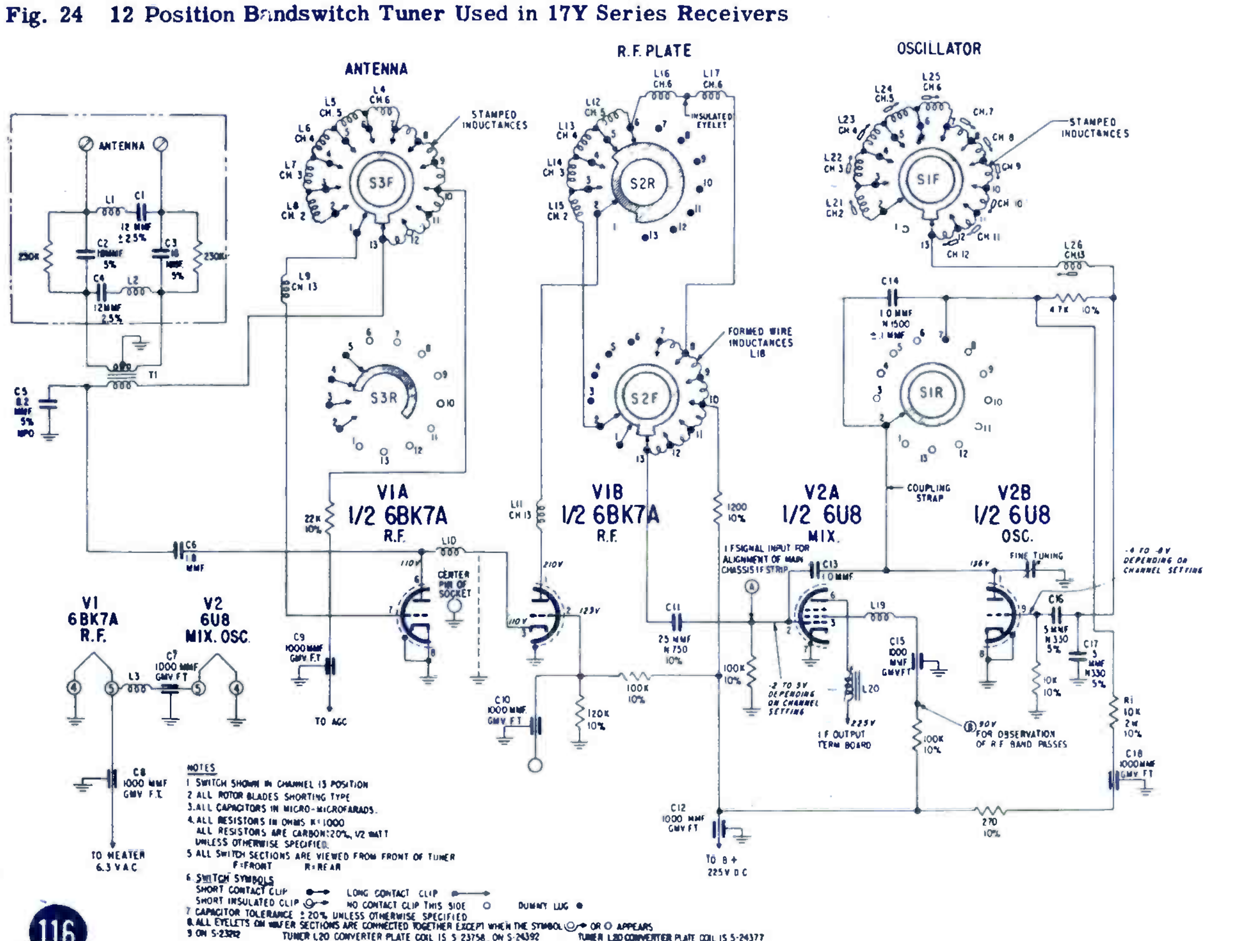


Fig. 32 Schematic Diagram VHF & UHF Tuners Used in 17Y "U" Models

Fig. 24 12 Position Bandswitch Tuner Used in 17Y Series Receivers



VIDEO IF ALIGNMENT

(Continued from reverse side)

more oscilloscope gain, more signal input, or lower bias may make the 47.25 Mc trap adjustment easier. (If the 41.25 Mc marker does not fall at the approximate position shown or nearer the base line, it may be necessary to touch up the 2nd IF. If this is done, check the overall response after adjustment).

10. Switch oscilloscope to position used in step 8. Remove the bias battery and ground the AGC. Adjust signal generator to obtain a 3 volt peak to peak response similar to Fig. 14. Adjust

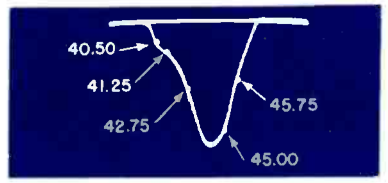


Fig. 14 Overall Response With Zero Bias For Adjusting the 40.5 Mc Trap

the 2nd IF cathode trap for maximum displacement of the 40.50 Mc marker but not to exceed the displacement of the 41.25 Mc marker.

TUNER ALIGNMENT
17Y CHASSIS

The tuner has been carefully aligned at the factory and normally does not require readjustment in the field with exception of oscillator adjustments. If alignment becomes necessary, proceed as follows:

1. Connect the negative lead of a 2 volt bias battery to the AGC feed through (See Fig. 2) and the positive lead to chassis.

2. Connect a calibrated oscilloscope to the converter screen grid feed through capacitor (Fig. 2). Use a 10K isolation resistor.

3. Use a 50 to 300 ohm matching transformer similar to Fig.10 and feed the output from the sweep generator to the antenna terminals of the tuner.

4. Turn the channel selector to channel 13 and adjust sweep generator to obtain a response curve similar to Fig. 18. Spread or squeeze the channel 13

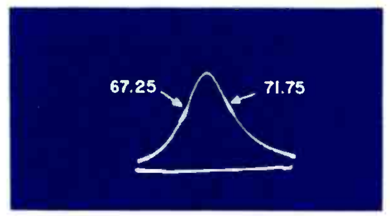


Fig. 18 Channel 4 RF Response. This Curve is Representative of Other Channels

RF plate inductance (center section of switch) until the 211.25 Mc video and 215.75 Mc sound markers fall symmetrically on the response curve. A stamped inductance is used in the antenna circuit on channels 7, 8, 9, 10, 11, 12 and 13. No adjustment is required.

5. Repeat step 4 on channels 12, 11, 10, 9, 8 and 7. In addition, on channels 6, 5, 4, 3 and 2, it will be necessary to adjust the antenna circuit for maximum amplitude of the response curve. This is done by knifing each coil when necessary. It may be desirable to use a small tuning wand to determine whether the particular coil requires knifing.

6. Install the tuner in the receiver. Connect a calibrated signal generator to the antenna terminals. (A TV signal can be used when available.) Switch selector to channel 13 and turn the fine tuning control until the index hole in the fine tuning cam is directly over the small hole just below the channel 13 oscillator adjustment screw. Adjust channel 13 to resonance. Adjust each successive lower channel to resonance.

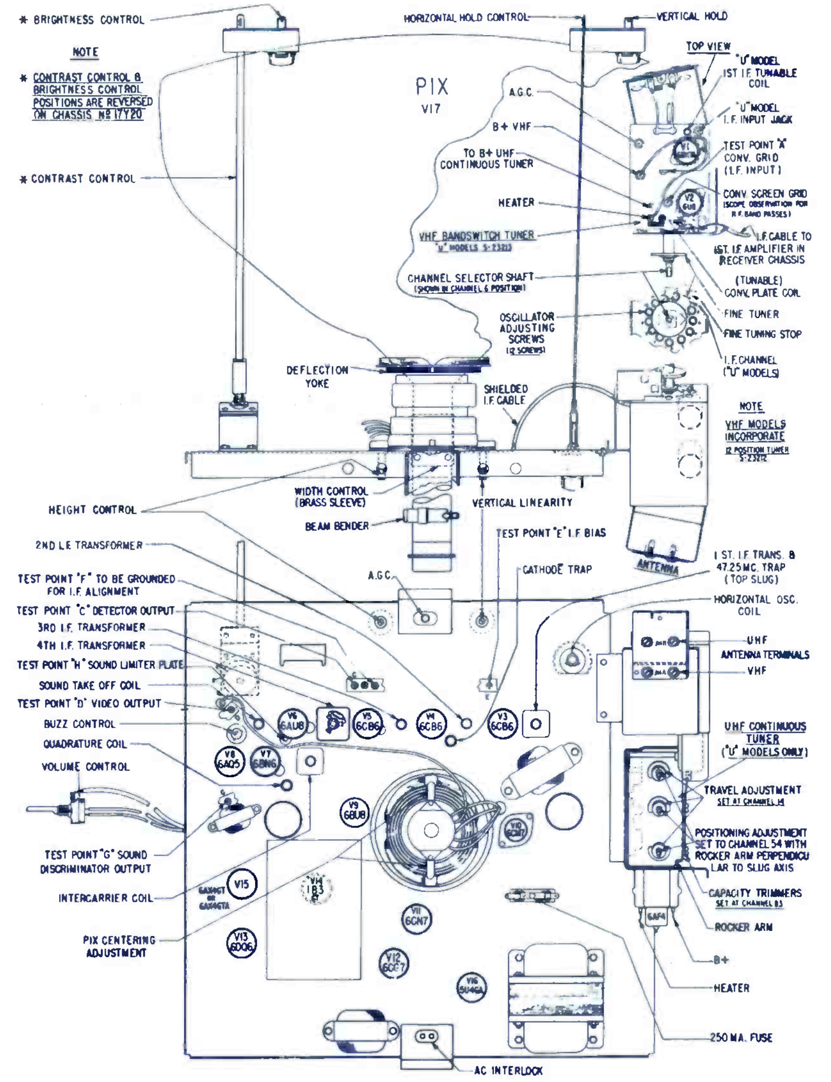
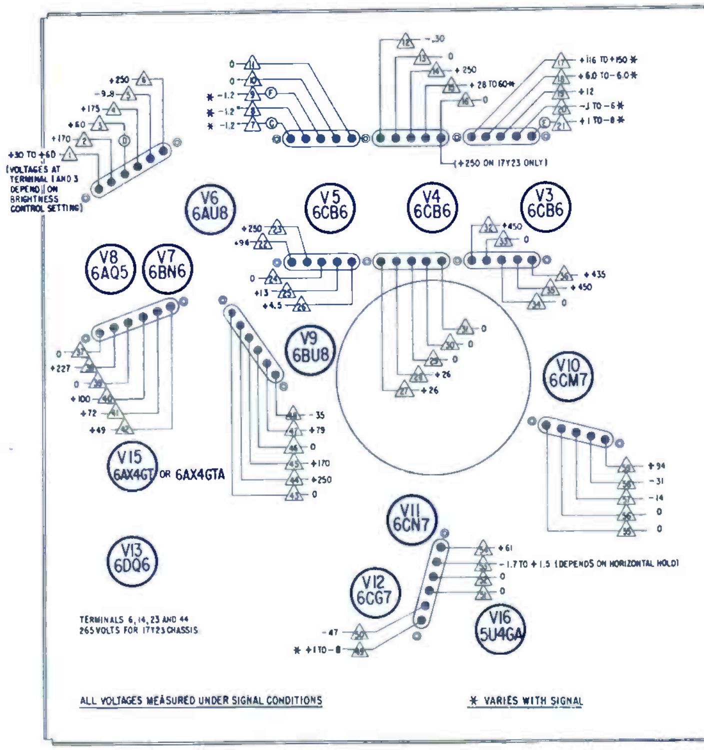


Fig. 2 Tube and Trimmer Layout 17Y20 & 17Y22 Chassis



REFERENCE TRIANGLES AND TEST POINTS ON THE TERMINAL BOARDS MATCH SIMILAR POINTS ON THE SCHEMATIC DIAGRAM

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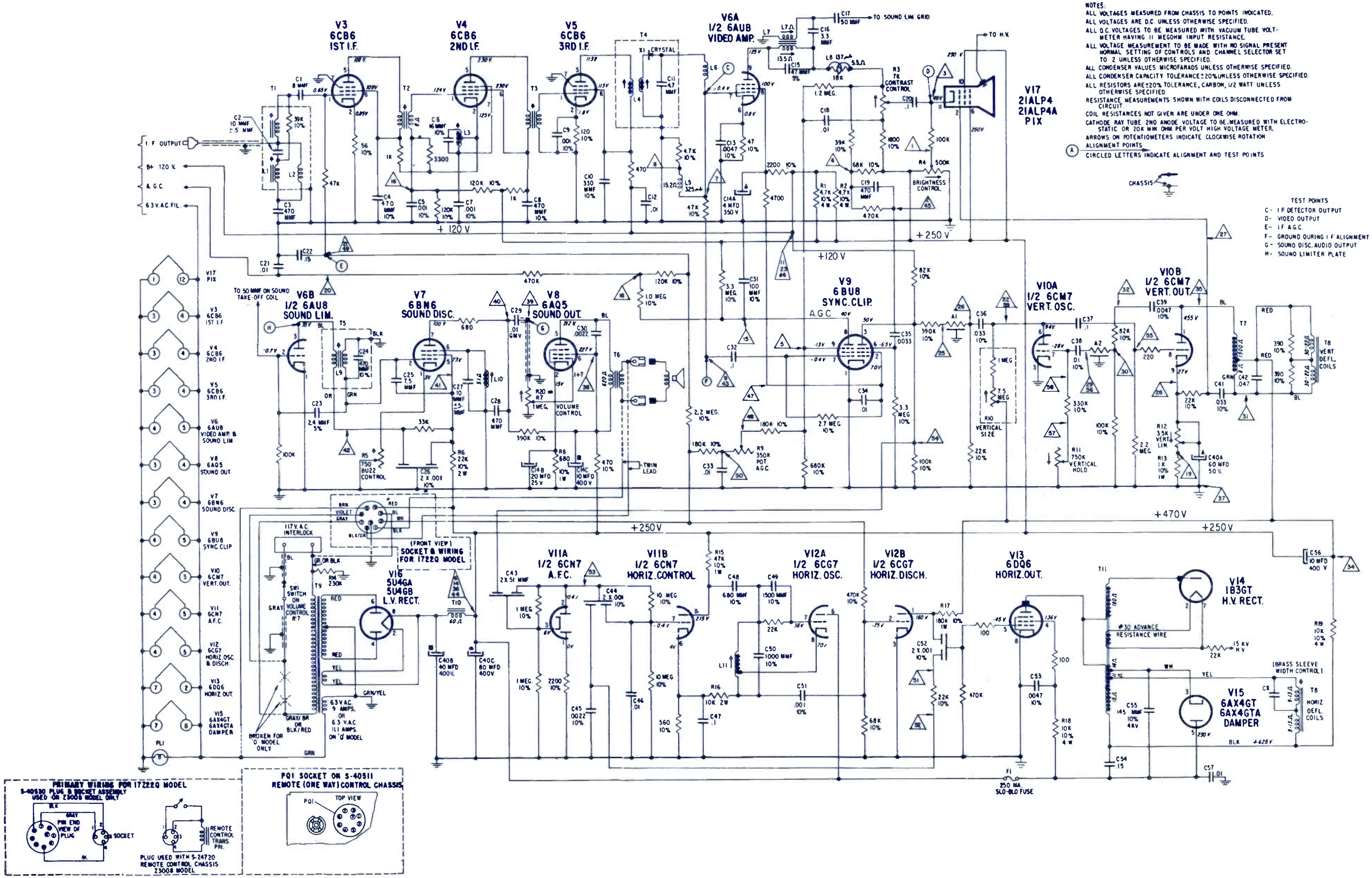
TECHNICIAN CIRCUIT DIGEST

ZENITH Chassis 17Z21, 17Z22

Chassis 17Z21, 17Z22: Models Z2222C, E, R, Y; Z2247E, H, R; Z2258E, H, R; Z2282E, R; Z3000E, R; Z3004E, R; Z3006E, R; Z3008E, R



NOTES:

ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.

ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.

ALL D.C. VOLTAGES TO BE MEASURED WITH VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.

ALL VOLTAGE MEASUREMENT TO BE MADE WITH NO SIGNAL PRESENT NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO 2 UNLESS OTHERWISE SPECIFIED.

ALL CONDENSER VALUES MICROFARADS UNLESS OTHERWISE SPECIFIED.

ALL CONDENSER CAPACITY TOLERANCE ±20% UNLESS OTHERWISE SPECIFIED.

ALL RESISTORS ARE ±20% TOLERANCE, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED.

RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT.

COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM.

CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 20K MIN. OHM PER VOLT HIGH VOLTAGE METER.

ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION

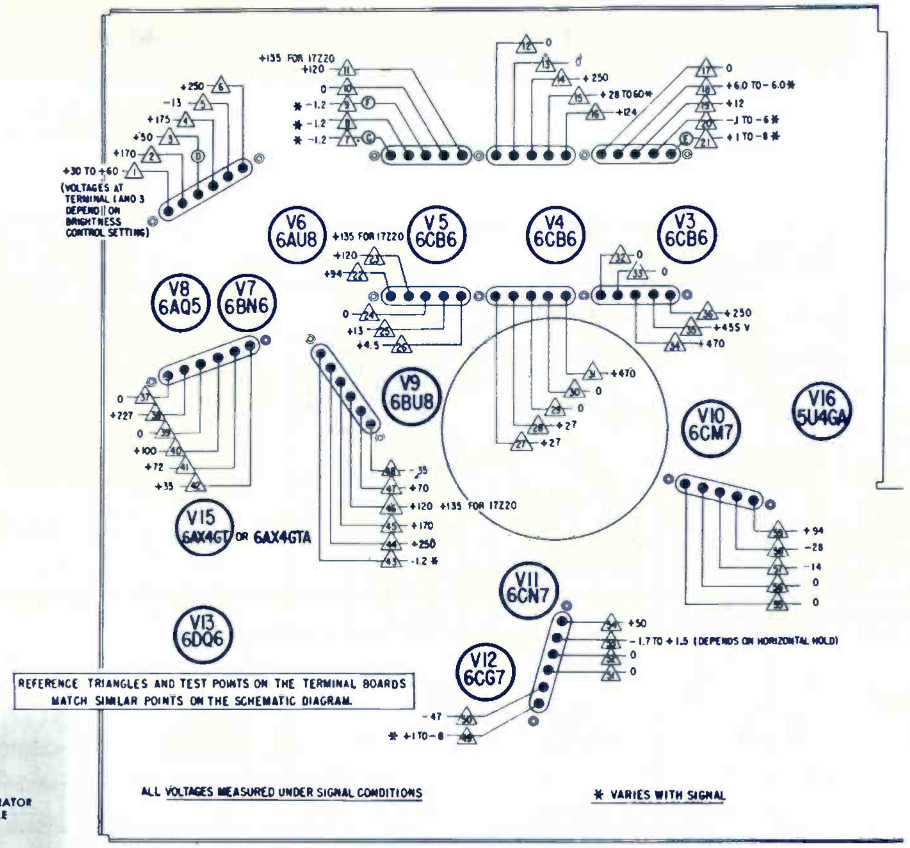
ALIGNMENT POINTS

(A) CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS

TEST POINTS

C - I.F. DETECTOR OUTPUT
D - VIDEO OUTPUT
E - I.F. A.G.C.
F - GROUND DURING I.F. ALIGNMENT
G - SOUND DISC. AUDIO OUTPUT
H - SOUND LIMITER PLATE

More Data on Reverse Side



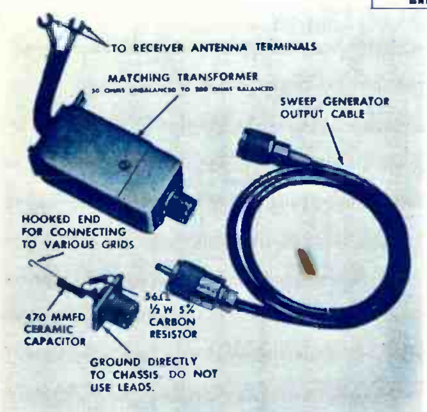


Fig. 3 IF-RF Alignment Fixtures

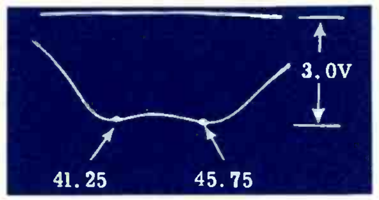


Fig. 4 4th IF Response

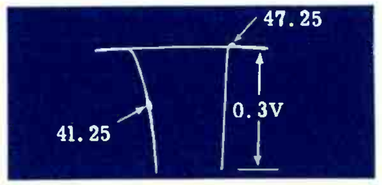


Fig. 6 Expanded View Of Traps

VIDEO IF ALIGNMENT 16Z & 17Z SERIES RECEIVERS

The video IF amplifier is stagger tuned, using one double tuned and four single tuned circuits. The converter plate coil tunes to 45.4 Mc, the first IF to 43.6 Mc, the second IF to 42.75 Mc, the third IF to 45 Mc, and the fourth IF (both cores) to 43.6 Mc. The 47.25 Mc trap is part of the first IF transformer assembly. The 40.50 Mc second IF cathode trap boosts the sound carrier under extremely weak signal conditions. Attenuation of the 41.25 Mc associated sound carrier is controlled by adjusting the band width. With the exception of the traps, a slight deviation from the above mentioned frequencies is permissible to obtain proper band pass; however, the order must be maintained. To align the IF, proceed as follows:

1. To prevent an erroneous IF response, disable the local oscillator during alignment. To do this, wrap a short bare wire around the oscillator grid and connect wire to chassis. In "U" models it is only necessary to switch the channel selector to the UHF position. Connect terminal "F" to chassis.

2. Connect the negative lead of a 6 volt battery or a low impedance bias supply to terminal "E" and the positive lead to chassis.

3. Connect a calibrated oscilloscope through a 10K isolation resistor between terminal "C" and chassis.

4. Connect the sweep generator through a terminating network similar to that shown in Fig. 3 to the grid (pin 1) of the third IF amplifier.

5. Adjust the sweep generator to obtain a pattern similar to Fig. 4 with a detector output of 3 volts peak to peak. Do not exceed this output during alignment.

6. Adjust the top and bottom cores of the fourth IF transformer to obtain a response similar to Fig. 4. The 41.25 and 45.75 Mc markers should be adjusted for symmetry and should fall as close to the response curve humps as possible. If the correct response curve cannot be obtained, check the position of the two cores to see that they are not butted but are entering their respective windings from the opposite ends of the coils.

7. Connect the sweep generator to test point "A" on tuner used and adjust attenuator to obtain 3 volts peak to peak output at the detector.

8. Adjust the first IF bottom core (44.Mc), second IF (42.75 Mc), third IF (45 Mc), and converter plate coil to obtain a response similar to Fig. 5.

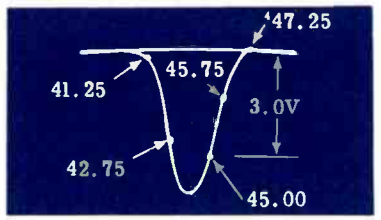


Fig. 5 Overall IF Response

9. Switch the oscilloscope to 10X gain used in the above steps to blow up the trap slots. Adjust the 47.25 Mc trap for maximum attenuation of 47.25 Mc marker (top core 1st IF transformer). The 41.25 Mc marker should be in the approximate position shown in Fig. 6. On some receivers more oscilloscope gain, more signal input, or lower bias may be necessary to adjust the 47.25 Mc trap. (If the 41.25 Mc marker does not fall at the approximate position shown or nearer the base line, it may be necessary to make a slight re-adjustment of the 2nd IF. If this is done, check the overall response after adjustment.)

10. Switch oscilloscope to position used in Step 8. Remove the bias battery and ground the AGC. Adjust the signal generator to obtain a 3 volt peak to peak response similar to Fig. 7. Adjust the 2nd IF cathode trap for maximum displacement of the 40.50 Mc marker but not to exceed the displacement of the 41.25 Mc marker.

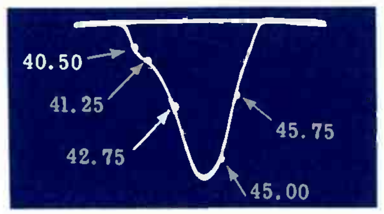


Fig. 7 Overall Response With Zero Bias For Adjusting The 40.5 Mc Trap

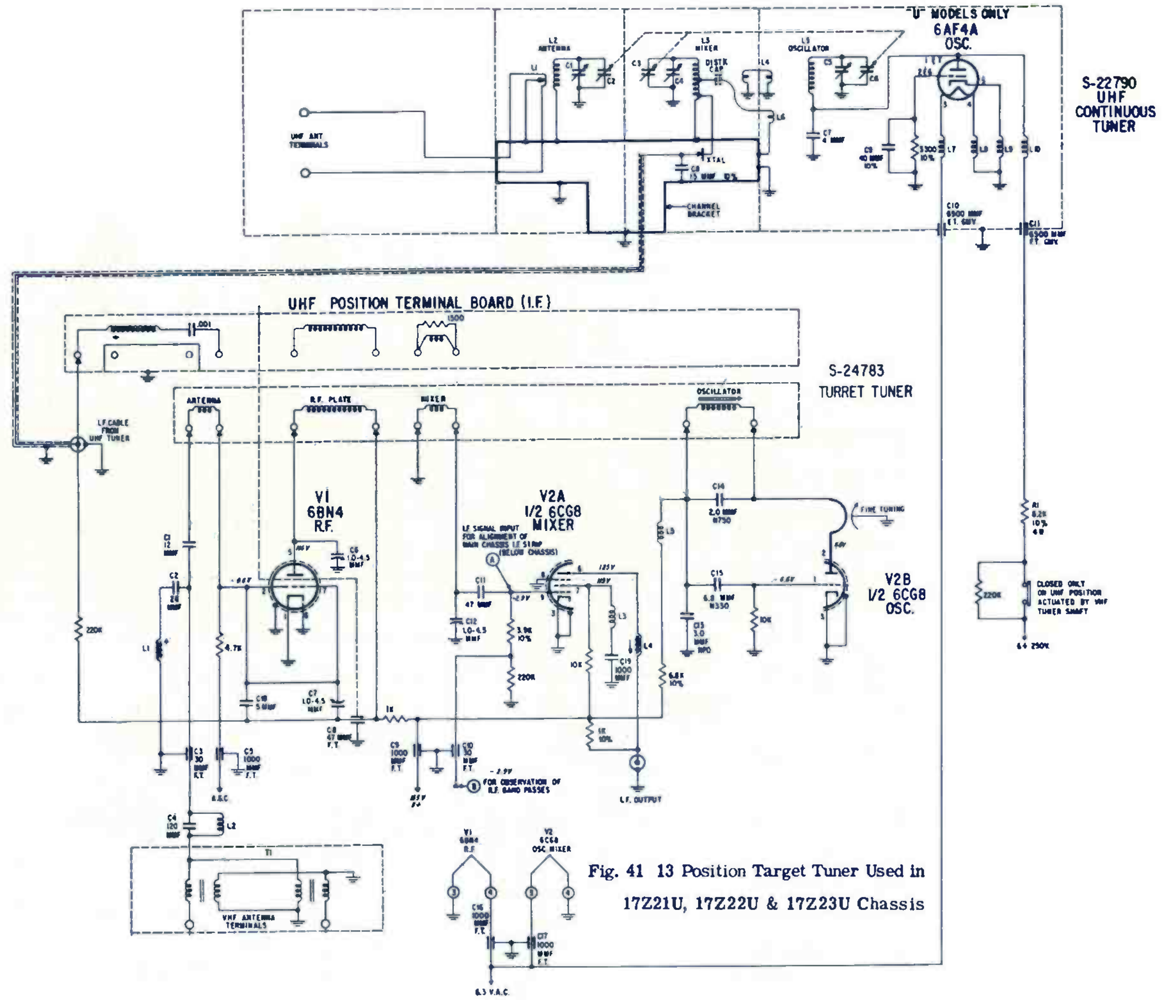
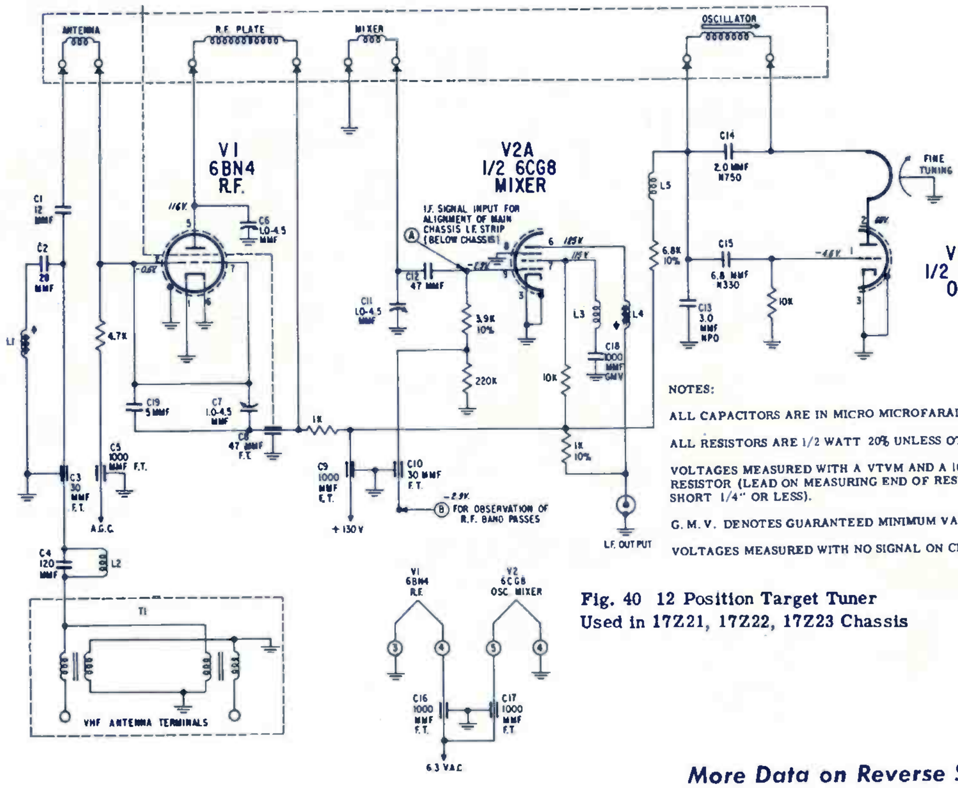


Fig. 41 13 Position Target Tuner Used in 17Z21U, 17Z22U & 17Z23U Chassis



NOTES:

ALL CAPACITORS ARE IN MICRO MICROFARADS.

ALL RESISTORS ARE 1/2 WATT 20% UNLESS OTHERWISE SPECIFIED.

VOLTAGES MEASURED WITH A VTVM AND A 10K OHM 1/2 WATT ISOLATION RESISTOR (LEAD ON MEASURING END OF RESISTOR MUST BE SHORT 1/4" OR LESS).

G. M. V. DENOTES GUARANTEED MINIMUM VALUE.

VOLTAGES MEASURED WITH NO SIGNAL ON CHANNEL #4

Fig. 40 12 Position Target Tuner Used in 17Z21, 17Z22, 17Z23 Chassis

More Data on Reverse Side

TECHNICIAN CIRCUIT DIGEST

ADMIRAL Portable Radio Chassis 4E2, 4H2

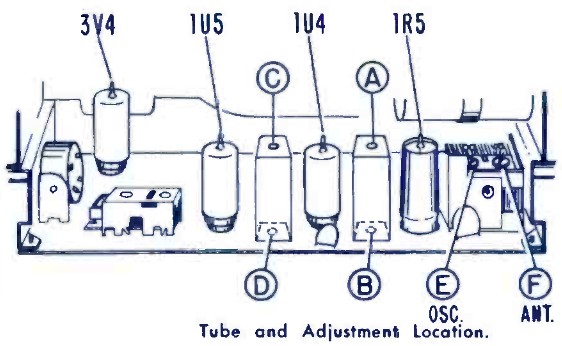
MODELS 4E21, 4F22, 4F24, 4F26, 4F28, 4H22, 4H24, 4H26, 4H28

ALIGNMENT PROCEDURE

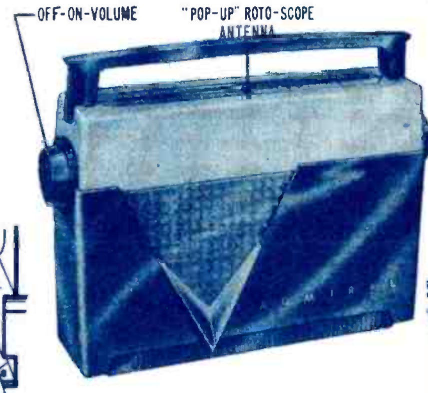
- Battery power is preferable for alignment; use FRESH batteries. If this set is to be aligned while operating on an AC power line, an isolation transformer should be used. If an isolation transformer is not available, connect a .1 mfd. capacitor in series with the signal generator low side to B minus (pin 7 of 1U5 tube).
- The case top cover must be removed to align IF (step 1).
- Set Volume control to maximum.
- Connect output meter across speaker voice coil.
- Use lowest setting of signal generator capable of producing adequate indication on lowest scale of output meter.
- Use a non-metallic alignment tool for IF transformers.
- Repeat adjustments to insure good results.

Step	Dummy Antenna in Series with Signal Generator	Connection of Signal Generator (High Side)	Signal Generator Frequency	Receiver Gang Setting	Adjustment Description	Adjustment Designation	Type of Adjustment
1	.1 mfd. capacitor	Stator of antenna tuning capacitor	455 KC	Gang fully open	2nd IF 1st IF	A, B* C, D*	Maximum output
	Install the case top section removed during IF Alignment						
2	Loop of several turns of wire, or place generator lead close to receiver for adequate signal pickup.	No actual connection (signal by radiation)	1620 KC	Gang fully open	Oscillator (on gang)	E	Maximum output
3	Loop of several turns of wire, or place generator lead close to receiver for adequate signal pickup.	No actual connection (signal by radiation)	1400 KC	Tune in generator signal	Antenna (on gang)	F	Maximum output

*Adjustments B and D are made from underside of chassis. See figure 1. To avoid splitting the slotted head of powdered iron tuning slug in IF transformers, use an alignment tool with a blade 3/32" wide.



Tube and Adjustment Location.



SCHEMATIC NOTES

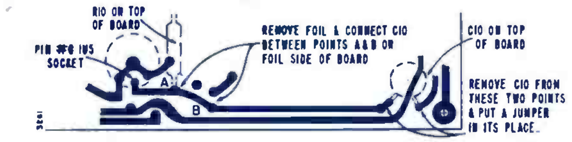
(A). . . indicates alignment points. All capacitor values shown in microfarads unless otherwise specified. Fixed resistor values shown in ohms.

VOLTAGE DATA

Voltages shown on schematic diagram.

- Interlock switch in closed position.
- All voltages taken between the tube socket terminals and B minus (pin 7 of 1U5 tube).
- Dial set at low frequency end; volume control at minimum.
- Voltages measured on 117 volts AC with vacuum-tube voltmeter.

SERVICE HINTS



View of Wiring Side of Printed Board.

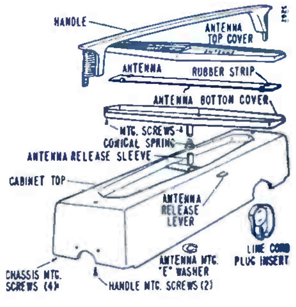
HUM: If excessive hum is encountered, check the location of audio coupling capacitor, C10, in the control grid circuit of the 1U5. If it is located on the component side of the printed circuit board, near the Volume control, move it to the wiring side of the board near the tube. See illustration above.

AUDIO OSCILLATION: If audio oscillation is encountered, dress RF bypass capacitor, C9, away from the 1U5 towards the Volume control mounting bracket.

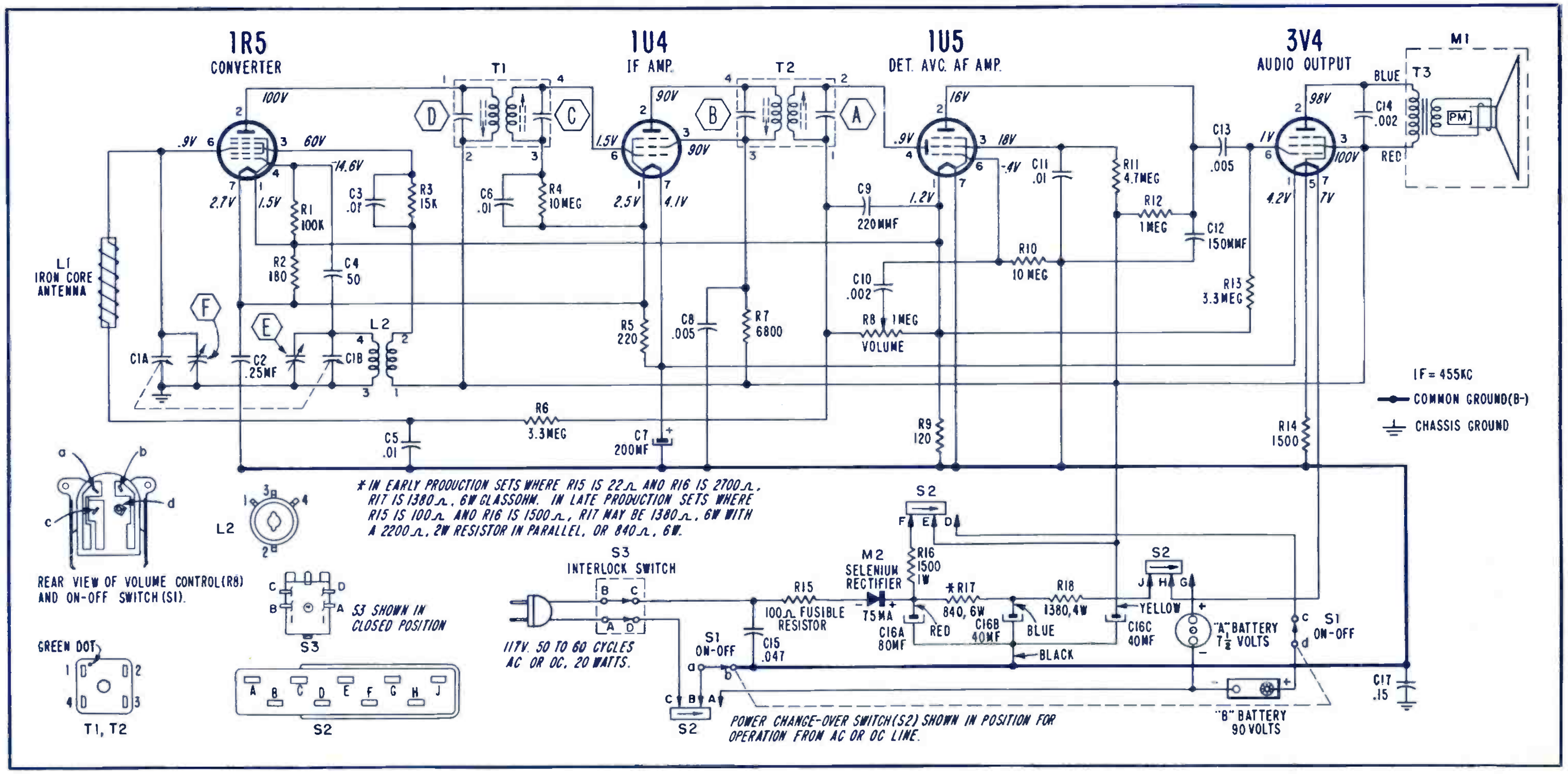
DEAD SET: Resistor R15 is a fusible type resistor used to protect the circuit. Normally it will open up only if some circuit component becomes shorted. If resistor R15 is found shorted or open, check for possible failure of selenium rectifier M2; then check the rest of the circuit.

INTERMITTENT AC-DC OPERATION: Intermittent AC-DC operation may be due to the failure of the interlock plunger to actuate the interlock switch. Insert a 1/32" spacer under the end of the interlock plunger and glue it in place.

ANTENNA OPERATION: If the antenna does not pop-up when the antenna release lever is pressed, it may be due to a lack of pressure exerted by the conical spring on the bottom of the antenna housing. Remove the spring and stretch it slightly to increase tension. If this fails to correct the problem, replace the spring.



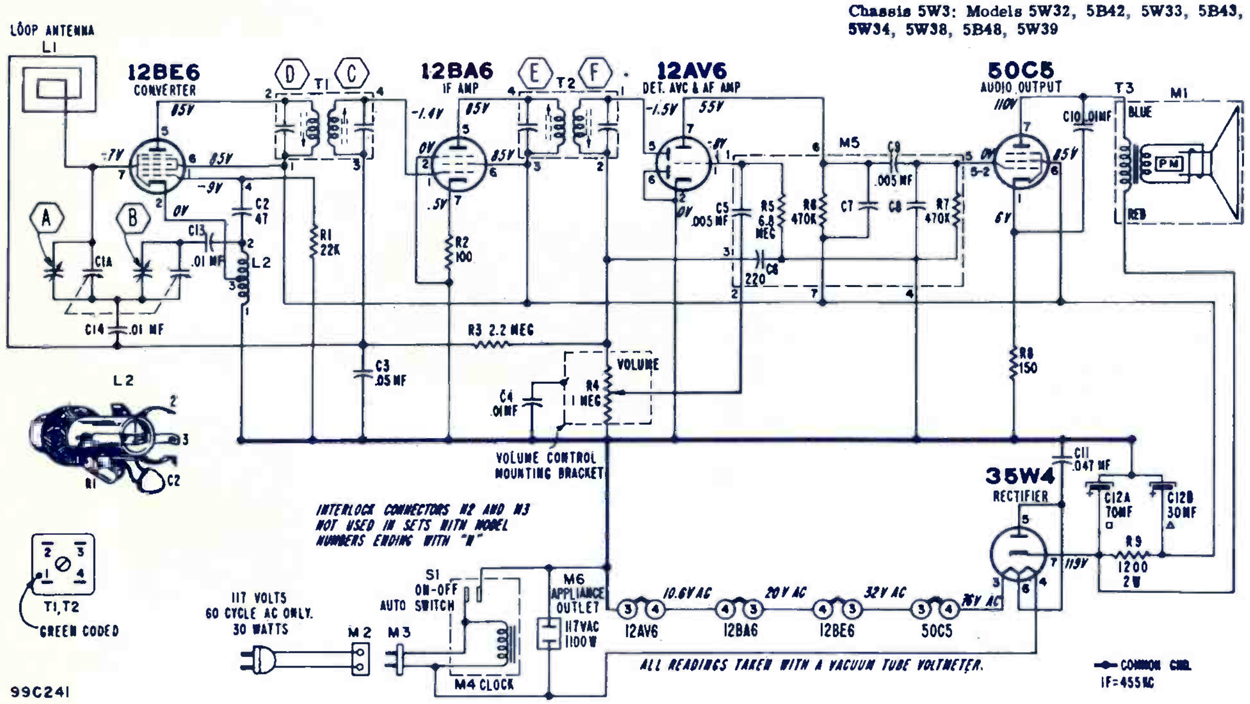
Handle and Antenna Assembly.



TECHNICIAN CIRCUIT DIGEST

ADMIRAL Clock Radio Chassis 5W3

Chassis 5W3: Models 5W32, 5B42, 5W33, 5B43, 5W34, 5W38, 5B48, 5W39



99C241

The printed circuit wiring used in this receiver results in greater uniformity of chassis wiring and component placement, simplified circuit tracing (see figure 1) and greater component accessibility. The printed circuit wiring is permanently bonded to the plastic chassis board. This board is translucent. If a light source is directed on the bottom of the chassis board, the printed wiring will be silhouetted through the board and component location for circuit tracing will be facilitated.

The printed circuit wiring has been coated with a lacquer to prevent humidity and dust from creating leakage paths between adjacent printed wires. It may be difficult to penetrate this coating with blunt tipped meter probes. The force applied to such probes may also be sufficient to crack the plastic chassis board and cause intermittent open circuits to develop later. Blunt probes also have a tendency to slip. If this happens and the probe shorts low and high voltage circuits together, the printed wiring may become damaged or burned out. It is therefore recommended that needle tipped probes be used for all circuit measurements taken either on the top or bottom of the chassis board.

The printed circuit wiring is permanently bonded to the chassis board. This bonding is rugged, but can be destroyed by excessive heat from soldering irons with large wattage ratings. The soldering iron (and other equipment listed below) is well suited for printed circuit servicing.

(1) Low wattage soldering iron with a small point or wedge (Rating should not exceed 35 watts).
(2) Small wire brush.
(3) 60% tin, 40% lead, low temperature (melts at 370°F) rosin core solder. (Do not use ordinary solder which melts at 460°F and is usually 40% tin, 60% lead.)
(4) Thin bladed knife.
(5) Small wire pick, or soldering aid.
(6) Small bottle of Silicone Resin lacquer, clear lacquer or Krylon spray.
(7) Solvent for the Silicone Resin. Recommended solvents are Xylene or Denatured Alcohol which are available at drug stores.

COMPONENT REPLACEMENT

All components used in this receiver are of standard size and design and are mounted on the top side of the chassis; see figure 2.

Resistors and capacitors should be replaced by clipping out the defective part and neatly soldering the new part to the connecting leads remaining from the original part.

If a unit, such as the oscillator coil or IF transformer is to be removed, heat the mounting lugs with a pencil type soldering iron and straighten them with a long nose pliers or metal pick. Continue heating the lugs and brush away the molten solder with a small wire brush. Remove the defective unit by lifting it off the chassis. Before inserting the new unit, be certain that the lug holes are open and free from solder. Forcing a lug against a solder filled lug hole may break the bond between the chassis base and the "printed" wiring. It is, therefore, necessary to exercise care when replacing units.

An open or damaged section of "printed" circuit wiring can be replaced by soldering a short jumper wire across the points to be connected. Pigtail trimmings from capacitors and resistors are ideal for this purpose.

Thoroughly clean the surfaces to be soldered with Xylene. After the soldering operation is completed, spray the surface with Krylon spray. This seals the surface and prevents humidity and dust from causing leakage patterns to develop between adjacent printed circuit wires.

To avoid need for complete tube socket replacement, defective tube socket pin clips may be replaced individually. Tube socket pin clips are available under part number 87A35-2.

Note: If sockets must be replaced, the tubular shield (center connection) at the bottom of each tube socket must be securely soldered to the "printed" circuit wiring, otherwise hum or oscillation will result.

TO REMOVE CHASSIS OR CLOCK FROM CABINET

To remove the chassis from the cabinet, proceed as follows:

Remove the line cord plug from the AC outlet, the knobs from the front of the cabinet, and the hex head screws in the cabinet back. Remove the screw under the Tuning knob, the screw that holds the Volume control bracket to the cabinet and the screw that holds the line cord retainer or interlock to the cabinet. Slide the chassis out of its mounting rack after disconnecting the output transformer leads.

To remove the clock from the cabinet, proceed as follows:

Remove the cabinet back, the knobs on the front of the clock face and the four screws that mount the clock to the cabinet. If complete removal is necessary, unsolder the clock leads from the chassis.

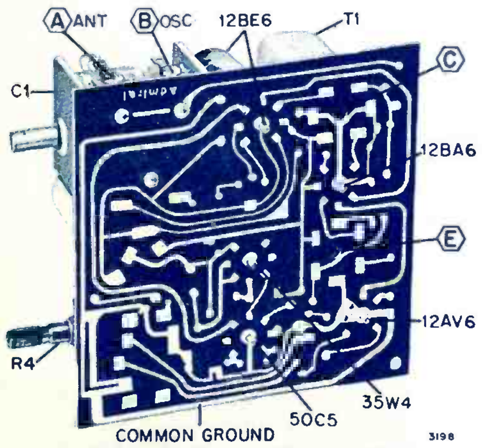


Figure 1. Bottom View of Chassis.

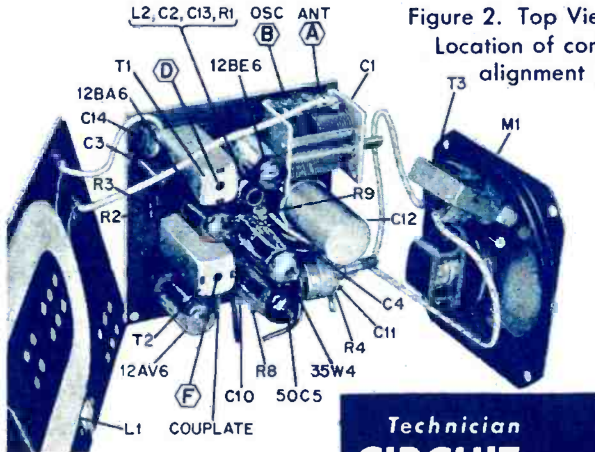


Figure 2. Top View of Chassis. Location of components and alignment points shown.

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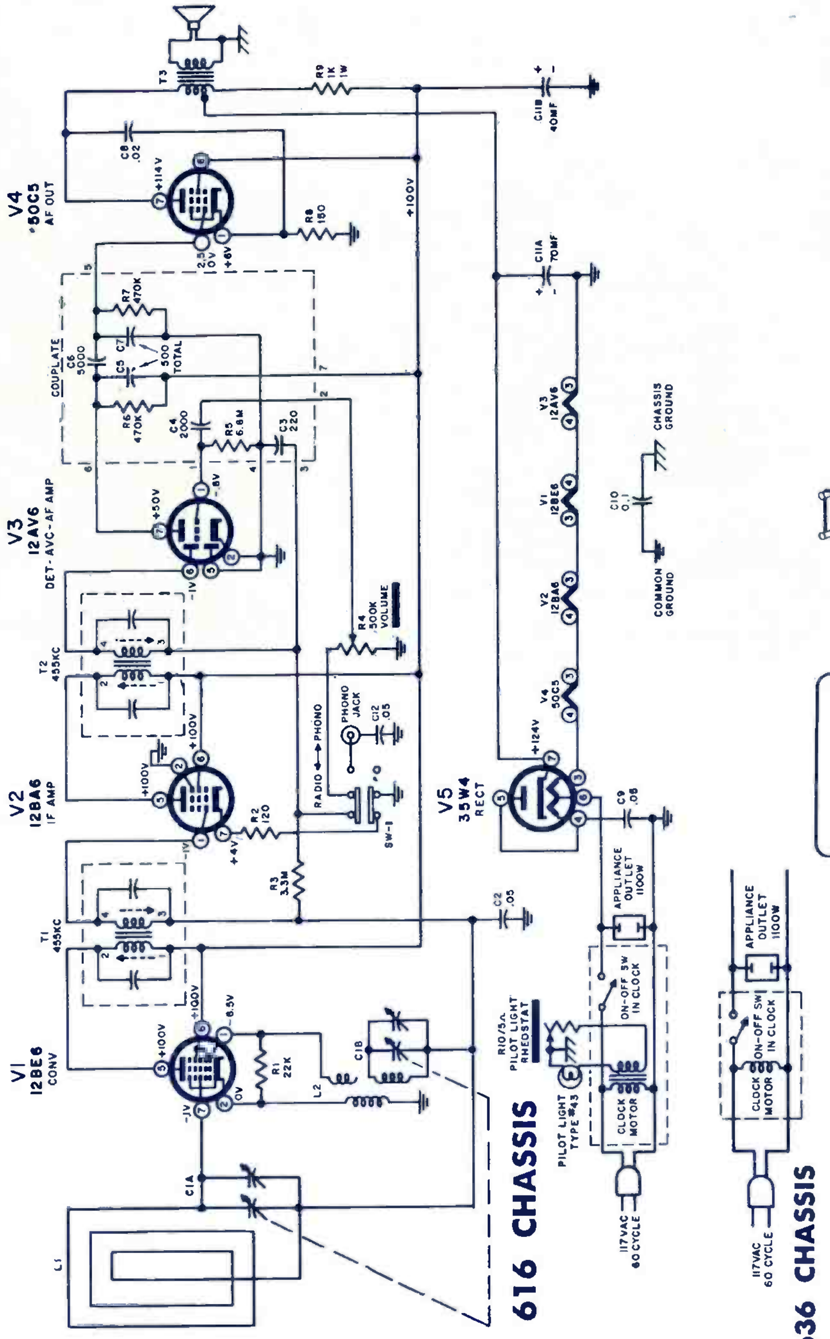
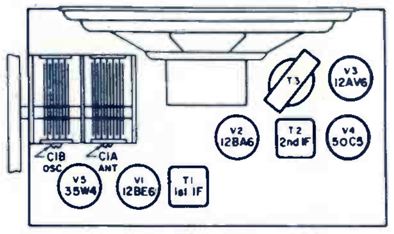
Technician CIRCUIT DIGEST

TECHNICIAN CIRCUIT DIGEST

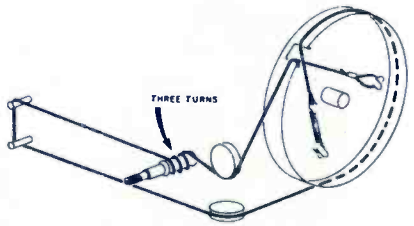
CBS-COLUMBIA Clock Radio Chassis 636, 656, 616

Clock Radio Chassis 636: Models C230, C231, C232 Chassis 656: Model C220 Chassis 616: Model C240

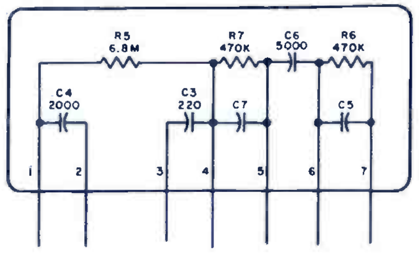




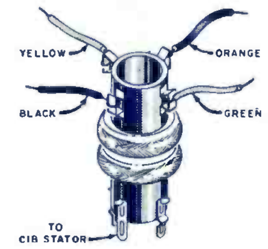
Tube and Trimmer Locations



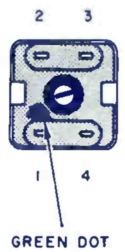
Dial Stringing.



Couplate, all Chassis



Oscillator Coil, all Chassis



IF Trans, all Chassis

Resistance Readings — 636 and 616 Chassis

Sym.	Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12BE6	22K	1	24	12	*1K	*1K	3.8M
V2	12BA6	3.8M	0	24	36	*1K	*1K	120
V3	12AV6	6.8M	0	0	12	0	.5M	*.47M
V4	50C5	150	.47M	36	80	.47M	*1K	*200
V5	35W4	*6	NC	80	115	115	110	.5M

Resistance in ohms. K = X1,000; M = X1,000,000.
*Measured from socket terminals to cathode, pin 7, 35W4. All other readings to B—.

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Technician CIRCUIT DIGEST

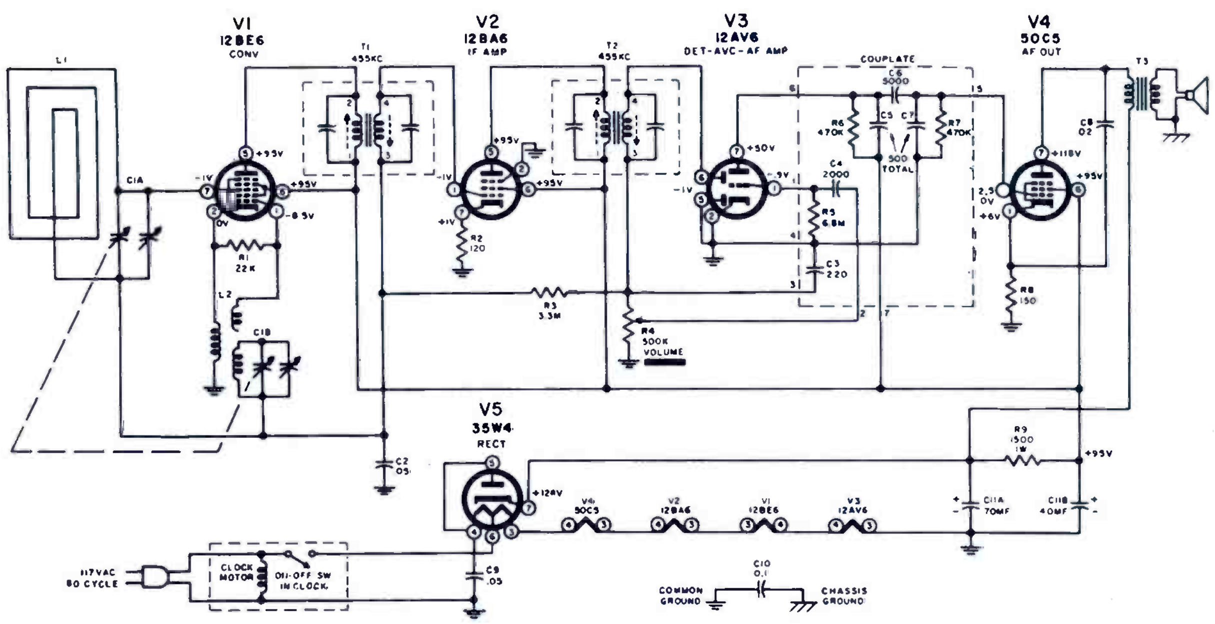
CBS-COLUMBIA
Clock Radio Chassis
636, 656, 616
Technician
CIRCUIT DIGEST

Resistance Readings — 656 Chassis

Sym.	Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12BE6	22K	1	24	12	•1.5K	•1.5K	3.8M
V2	12BA6	3.8M	0	24	36	•1.5K	•1.5K	120
V3	12AV6	6.8M	0	0	12	0	.5M	•.47M
V4	50C5	150	.47M	36	80	.47M	•1.5K	•200
V5	35W4	NC	NC	80	115	115	110	.5M

Resistance in ohms. K = X1,000; M = X1,000,000.
•Measured from socket terminals to cathode, pin 7, 35W4. All other readings to B—.

656 CHASSIS



Notes

1. Voltages taken with VTVM from tube socket terminals to common ground (not chassis). Tuning capacitor set to minimum.
2. Capacitor values less than one are microfarads, and values greater than one are micro-microfarads, unless otherwise indicated.
3. Resistors are ½W, 10% unless otherwise indicated. K = X1,000; M = X1,000,000.
4. When using AC operated test equipment, connect an isolation transformer between the chassis and the power line.

Alignment

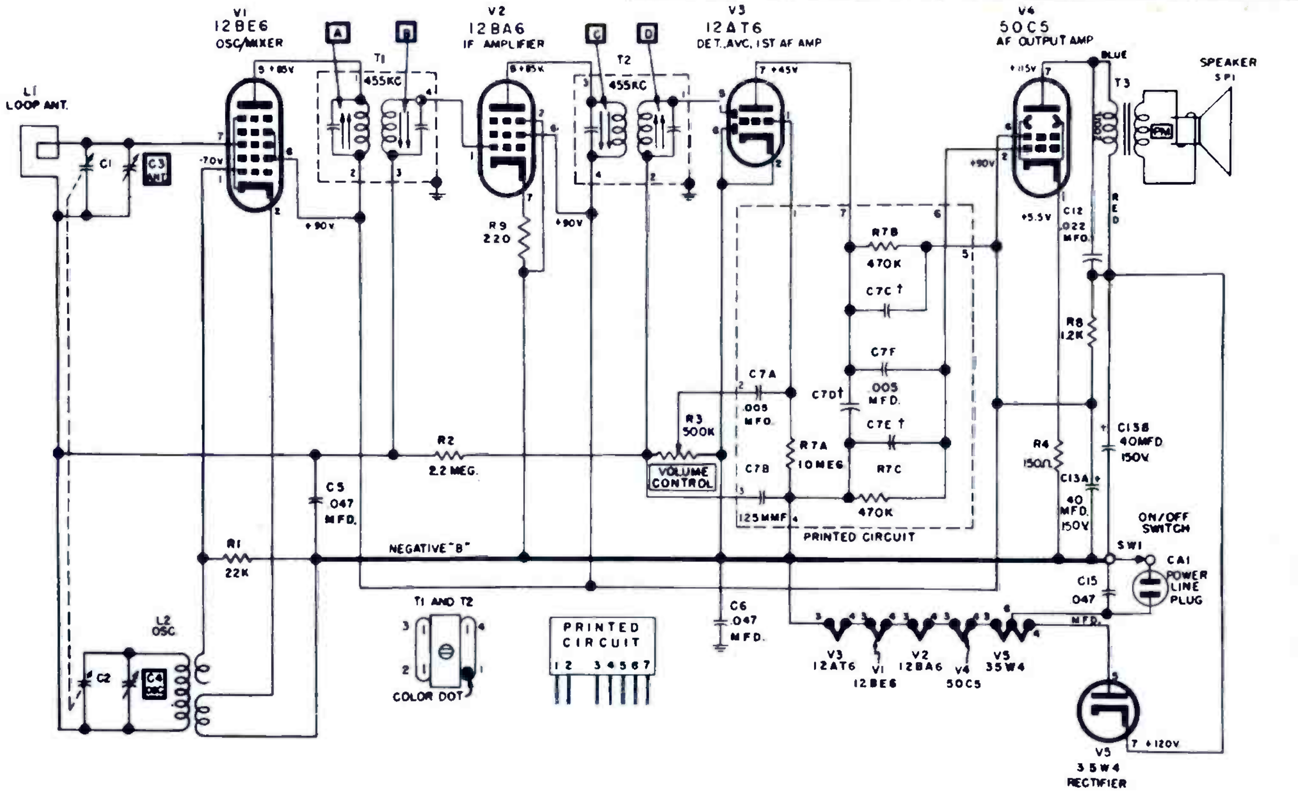
Set volume control to maximum. Adjust output of signal generator no higher than necessary for satisfactory indication. Use an insulated alignment tool.

When using AC operated test equipment connect an isolation transformer between the receiver and the power line. If an isolation transformer is not available connect a .1 mf capacitor in series with the signal generator ground lead.

Step	Signal Generator Freq.	Signal Generator Connect to	Receiver Tuning	Output Meter Connection	Adjust
1	455KC MOD.	Pin 1 of V2, 12BA6, thru .05 mf	Minimum capacity	Across voice coil	T2, top and bottom slugs, for maximum indication.
2	As above	Pin 7 of V1, 12BE6, thru .05 mf	As above	As above	T1, top and bottom slugs, for maximum indication.
3	1620KC MOD.	As above	As above	As above	C1B, oscillator trimmer, for maximum indication.
4	1400KC MOD.	Couple inductively to loop antenna	For maximum signal	As above	C1A, antenna trimmer, for maximum indication.

TECHNICIAN
CIRCUIT DIGESTS

SCHEMATIC WIRING DIAGRAM
CHASSIS R100 AND R101



NOTES
VOLTAGES MEASURED WITH 20,000 OHM/VOLT METER TO NEGATIVE "B" AT LINE VOLTAGE 117 V AC WITH NO SIGNAL INPUT
COIL RESISTANCES ARE AVERAGE VALUES
INTERMEDIATE FREQUENCY 455 KC.
VOLTAGES OR RESISTANCES NOT SHOWN WHERE TOO SMALL OR WIDELY VARIABLE.
† COMBINED VALUE OF C7C, C7D, & C7E EQUALS 100MMF
⏚ DESIGNATES CHASSIS GROUND.
K = 1000

ALIGNMENT PROCEDURE

PRELIMINARY INSTRUCTIONS

1. Remove radio chassis from cabinet.
2. Allow chassis and signal generator several minutes warm-up time.
3. Set generator for an RF output signal amplitude modulated (AM) with 400 cycles.
4. Keep generator output at lowest usable level to prevent receiver AVC action from interfering with accurate alignment.
5. Use either an audible check or connect an AC voltmeter across speaker voice coil to indicate output.
6. Adjust Volume control to full volume.

STEP	ALIGNMENT SETUP NOTES	TEST EQUIPMENT HOOKUP	ADJUST
1.	Set radio variable tuning capacitor to minimum capacity.	SIGNAL GENERATOR-"hot" lead through 0.1 mfd. capacitor to pin 7 of V1; ground lead to negative "B" in receiver. Set generator to 455 KC. AC VOLTMETER - across radio speaker voice coil.	T2-D for MAXIMUM output. T2-C for MAXIMUM output. T1-B for MAXIMUM output. T1-A for MAXIMUM output. Repeat for optimum performance.
2.	Set radio variable tuning capacitor to minimum capacity.	SIGNAL GENERATOR - radiate signal to receiver through a loop of several turns of wire. Set generator to 1650 KC. AC VOLTMETER - across radio speaker voice coil.	C4 trimmer for MAXIMUM output.
3.	Set radio variable tuning capacitor so plates are meshed approximately 1/4 inch. Adjust this setting slightly to eliminate any interfering signals.	SIGNAL GENERATOR - radiate signal to receiver through a loop of several turns of wire. Set generator to a frequency corresponding to receiver tuning capacitor setting or until signal is heard through radio speaker. AC VOLTMETER - across radio speaker voice coil.	C3 trimmer for MAXIMUM output.

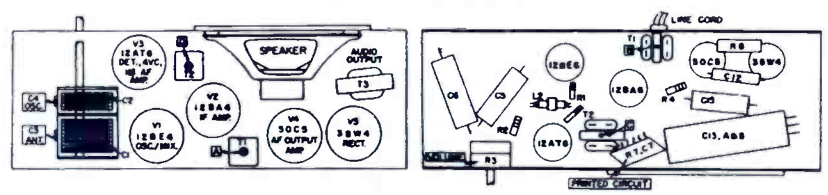
SPECIFICATIONS:

Power Supply: 25 to 60 Cycle AC, 117 Volts
Power Consumption: 30 watts
Frequency Range: 540 to 1650 KC
Intermediate Frequency: 455KC
Loudspeaker: 4" P.M.

TUBE COMPLEMENT:

V1	Oscillator-Mixer	12BE6
V2	IF Amplifier	12BA6
V3	Detector, AVC & 1st AF Ampl	12AT6
V4	Audio Output Amplifier	50C5
V5	Rectifier	35W4

TOP AND BOTTOM LAYOUTS



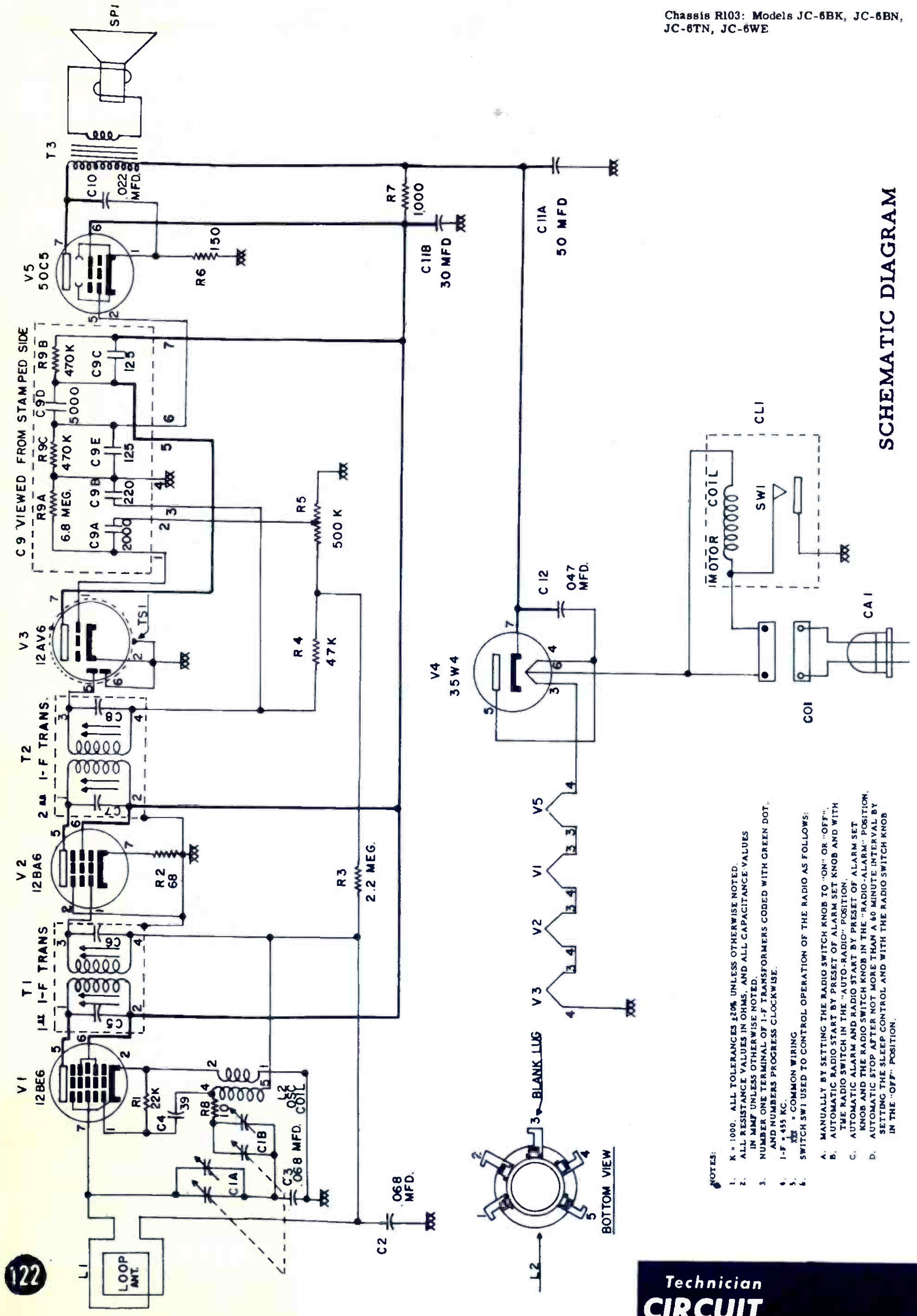
Chassis R100: Models JT3BK, JT3RD, JT3IY, JT3GN Chassis R101: Models JT4BK, JT4RD, JT4IY, JT4GN

CROSLEY
Chassis R100, R101

Technician
CIRCUIT DIGEST

CROSLEY
Clock Radio
Chassis R103

Chassis R103: Models JC-6BK, JC-6BN, JC-6TN, JC-6WE



NOTES:

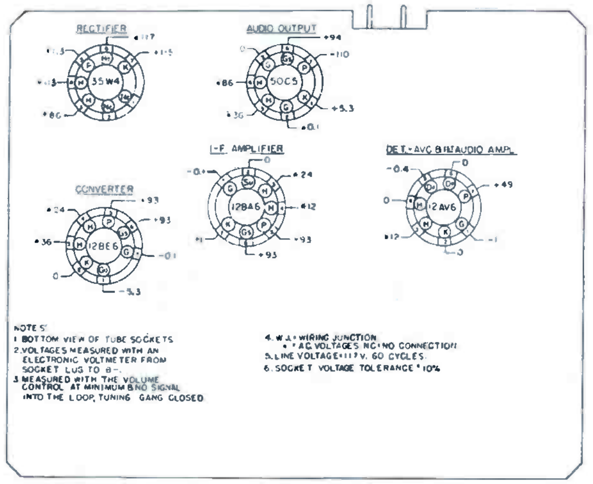
1. K = 1000. ALL TOLERANCES ±20% UNLESS OTHERWISE NOTED.
2. ALL RESISTANCE VALUES IN OHMS, AND ALL CAPACITANCE VALUES IN MMF UNLESS OTHERWISE NOTED.
3. NUMBER ONE TERMINAL OF I-F TRANSFORMERS CODED WITH GREEN DOT, AND NUMBERS PROGRESS CLOCKWISE.
4. I-F = 455 KC.
5. ⏚ = COMMON WIRING
6. SWITCH SW1 USED TO CONTROL OPERATION OF THE RADIO AS FOLLOWS:

A. MANUALLY BY SETTING THE RADIO SWITCH KNOB TO "ON" OR "OFF".
B. AUTOMATIC RADIO START BY PRESET OF ALARM SET KNOB AND WITH THE RADIO SWITCH IN THE "AUTO-RADIO" POSITION.
C. AUTOMATIC ALARM AND RADIO START BY PRESET OF ALARM SET KNOB AND THE RADIO SWITCH KNOB IN THE "RADIO-ALARM" POSITION.
D. AUTOMATIC STOP AFTER NOT MORE THAN A 60 MINUTE INTERVAL BY SETTING THE SLEEP CONTROL AND WITH THE RADIO SWITCH KNOB IN THE "OFF" POSITION.

Alignment	Signal Generator Output			Position of Tuning Gang	Adjust for Max. Output	Remarks
	Freq. In KC.	In Series With	TO			
1	455	200 mmf.	Mixer grid pin 7 of V	Open	A & B	See note 1
2	455	200 mmf.	Mixer grid, pin 7 of V	Open	C & D	See note 1
3	Repeat steps 1 and 2 until maximum output is obtained.					See note 2
4	1620	Radiated Sig.	Antenna	Open	E	See note
5	1400	Radiated Sig.	Antenna	Tune in Signal	F	See note

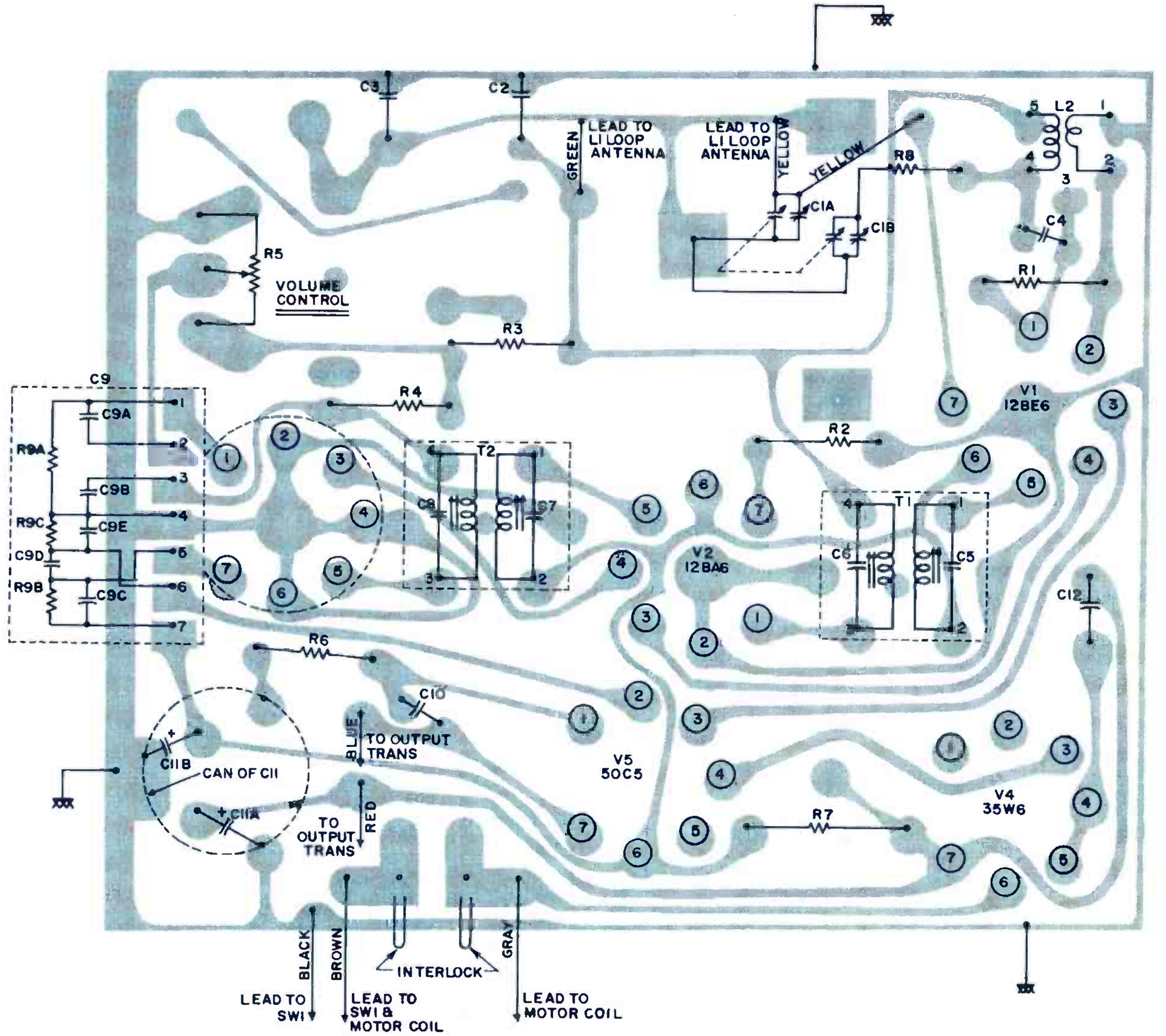
ALIGNMENT CHART

SOCKET VOLTAGE CHART



PRINTED CIRCUIT BOARD

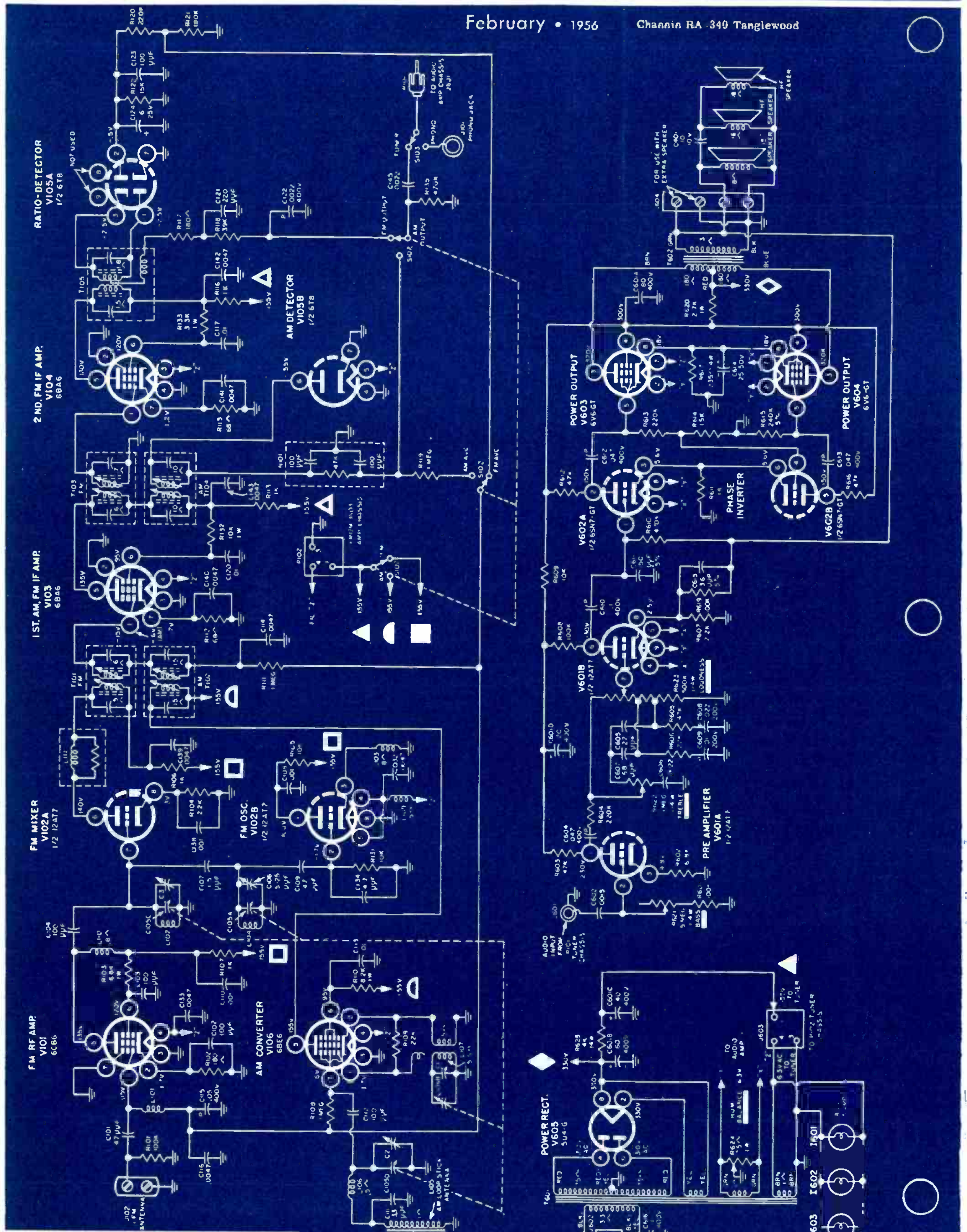
As viewed from the PRINTED WIRING SIDE of board. The shaded areas represent the printed wiring. The black symbols and lettering represent components or connections on the opposite side of the board.



TECHNICIAN
CIRCUIT DIGEST

DU MONT
Hi-Fi AM-FM Phono Console
Chassis RA-349

February • 1956



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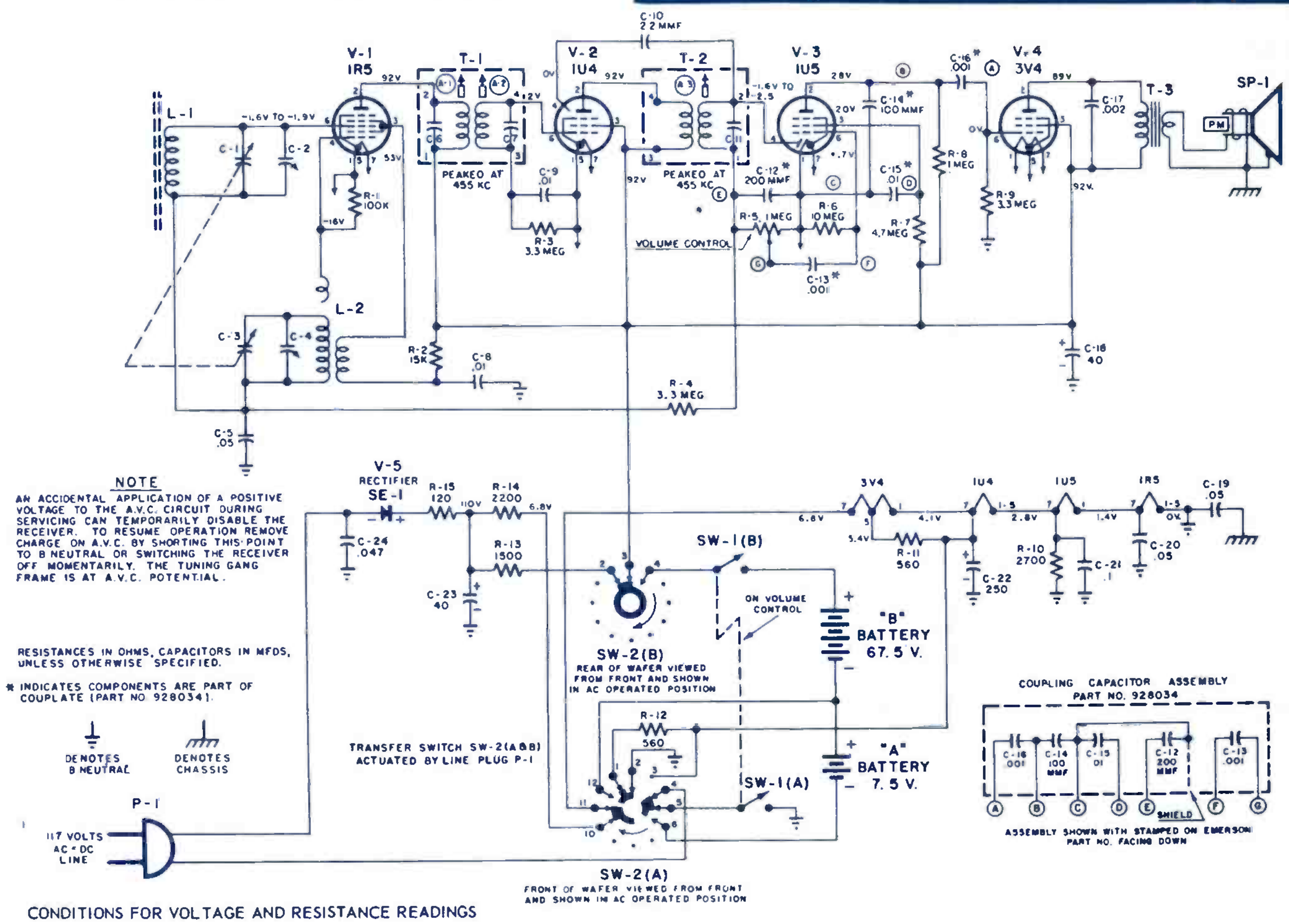
TECHNICIAN
CIRCUIT DIGESTS

Fig. 1 SCHEMATIC DIAGRAM, CHASSIS 120252-B



CONDITIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltages measured, with line voltage of 117 V. A.C.
2. Resistances measured on AC/DC position (plug removed from set and power off).
3. Voltages indicated are positive d.c., resistances in ohms, unless otherwise noted.
4. Measurements made with voltohmyst or equivalent.
5. All measurements taken between points and common B neutral (black lead of electrolytic filter condenser).
6. Volume control at maximum, no signal applied, for voltage measurements.
7. Nominal tolerance in component values makes possible a variation of ± 15% in readings.
8. K is Kilohms, MEG is megohms.

ALIGNMENT INSTRUCTIONS

1. Use isolation transformer if available. If not, connect a .25 mfd. condenser in series with low side of signal generator and B neutral.
2. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated screw driver for adjusting.

STEP	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	High side through .005 mfd. to grid (pin 6) of V-1 (1R5). Low side to B neutral. See Alignment Note #1.	455 KC	Variable condenser fully open	Across voice coil	T-2, T-1 (A-3, A-2, A-1).	Adjust for maximum output
2	Form loop of several turns and radiate signal into receiver.	1620 KC	Variable condenser fully open	Across voice coil	Trimmer C-4 (osc.)	Adjust for maximum output
3	Form loop of several turns and radiate signal into receiver.	1400 KC	Tune for maximum output	Across voice coil	Trimmer C-2 (ant.)	Adjust for maximum output

RESISTANCE READINGS FOR CHASSIS 120252–B

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V-1	1R5	0	3.8 K	18.8 K	120 K	0	4.3 MEG	19
V-2	1U4	34	3.8 K	3.8 K	INF.	34	3.3 MEG	46
V-3	1U5	19	1 MEG	4.7 MEG	1 MEG	N.C.	10 MEG	34
V-4	3V4	46	4 K	3.8 K	4.3 MEG	58	3,3 MEG	70
V-5	SELENIUM RECTIFIER							

VOLTAGE READINGS ON SCHEMATIC DIAGRAM

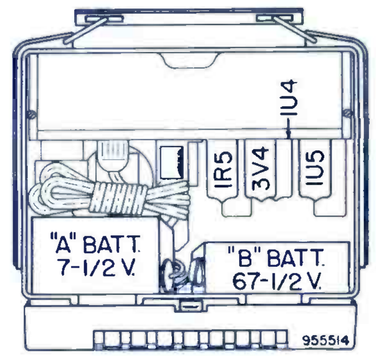


Fig. 2 BATTERY AND TUBE LOCATION

Portable Radio Chassis
120252-B: Model 830B

EMERSON
Portable Radio
Chassis 120252-B

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Shop Hints

Spill Insurance

When using a bottle of cement, soldering acid, contact cleaner or other fluid on the bench, there is always the danger of accidentally spilling the contents in the normal course of service work. An ordinary spool of solder wire provides excellent protection against such a possibility. Simply stand the spool on end beside the bottle being used and twist a turn of the solder around the bottle, as shown in the accompanying sketch.—*Harvey Muller, Danboro, Pennsylvania*

No accidental spilling with this holder.

Meter Checks Fuse Blowout

A 300-ma meter, which can be conveniently and compactly carried on service calls, may be used for determining the cause of fuse blowing in the high-voltage section. First clip the meter leads to either end of the fuse holder, with no fuse in the circuit, and turn the set on *with one hand on the power cord*. If the meter needle starts to swing up fast, a direct short is indicated, and the plug must be pulled out of the wall socket immediately.

In most cases, the set lights up and works with the meter being used instead of the fuse. Normal current will be about 75 to 100 ma. Next the damper tube is tapped. If this procedure results in a kick of the meter needle, the indication is that the damper tube is intermittently shorting and should be replaced. In other cases, the filament wiring of the damper may be shorting to chassis due to insulation breakdown, especially where the damper cathode is tied to the filament. This will show up when the set is jarred. By using the meter as a temporary replacement for the fuse, a considerable amount of assurance is provided that there will not be repeat blowouts, since the cause of fuse failure can usually be found and corrected.

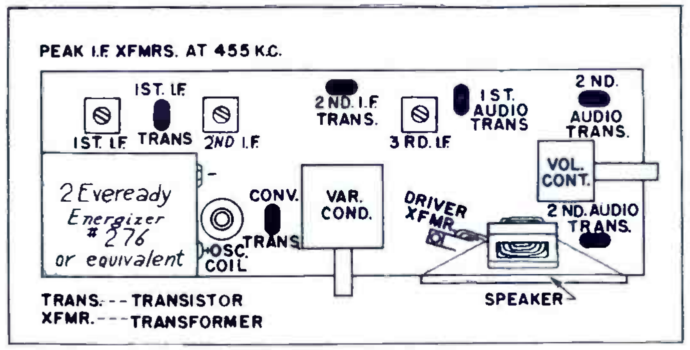
Another use for the meter, while it is connected exactly as already described, derives from the fact that it is in series with the boosted B-plus line. Other circuits that receive B-plus from the same point may also be checked. For example, if the horizontal oscillator is getting B-plus from the damper, it is easy to determine whether the oscillator is functioning. If the oscillator tube is pulled out of its socket, there should be an increase of current (about 5 to 10 ma). This change will occur if the oscillator is functioning. If the oscillator is not working, no change in current will be noted, as there is no change in the amount of current being drawn by the output tube.—*J. E. Hobbs, Atlanta, Georgia.*

ALIGNMENT INSTRUCTIONS

Volume control should be at maximum; output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to orange lead of bar loop antenna. Low side to chassis.	455 KC.	Tuning condenser fully open.	Across voice coil	T2, T3 and T1	Adjust for maximum output starting with T3.
2		Use a loop set perpendicular and about 20" from center of bar loop ant. in set.	1650 KC.	Tuning condenser fully open.	Across voice coil	C-2 (osc. trimmer)	Fashion loop of several turns of wire and radiate signal into bar loop of receiver. Adjust for maximum output.
3		"	1400 KC.	Tune for maximum output.	Across voice coil.	C-1 (Ant. trimmer)	Adjust for maximum output.
4		"	600 KC.	Tuning condenser set for 600 KC.	Across voice coil.	Osc. slug in L-2	Rock the variable cond. each side of 600 KC while adj. osc. slug for maximum response.
5		"	1650 KC.	Tuning condenser fully open.	"	C-2 Osc. trimmer	If readjustment is necessary repeat steps 2 to 4 until no further improvement is noted.

FIGURE 4 - TRANSISTOR LOCATION DIAGRAM



EMERSON
Transistor Portable Radio

Technician
CIRCUIT DIGEST
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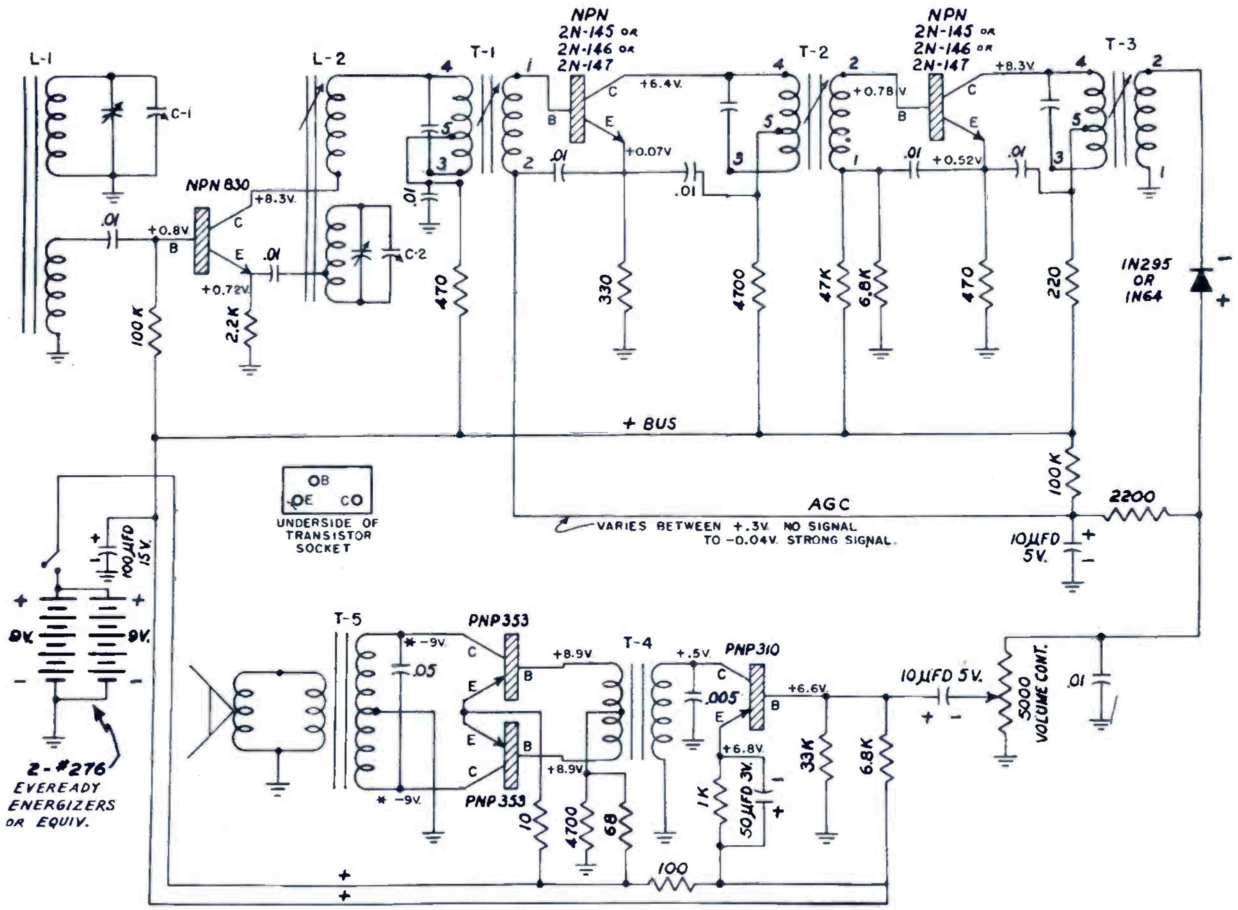
TECHNICIAN CIRCUIT DIGEST

EMERSON Transistor Portable Radio

Model 842



✱INDICATES GROUND LEAD OF V.T.V.M. CONNECTED TO B+ SIDE OF ENERGIZER

FIGURE 1 - SCHEMATIC DIAGRAM RADIO CHASSIS USED IN MODEL 842

CONDITIONS FOR VOLTAGE READINGS

1. Voltages indicated are positive unless otherwise indicated.
2. Measurements made with voltohmyst or equivalent.
3. All measurements taken from pin to chassis unless otherwise indicated.

GENERAL NOTES

If replacements are made in the r-f section of the circuit, the receiver should be carefully realigned.

The receiver has a self-contained antenna and does not require additional antenna or ground connection.

The self-contained bar loop antenna has directional properties. For maximum signal pickup on weak stations it is recommended that the set be rotated through a quarter of a circle, leaving it in the position which provides maximum volume.

It is recommended that the batteries be removed as soon as they are exhausted or if the set is not to be operated for a few months or more. Make certain that the "on-off" switch is left in the "off" position.

Servicing Transistor Receivers

Since the failure rate of a transistor is far less than that of a receiving type tube, the transistor itself should be the last item to suspect. Before inserting a new transistor, all components in the suspected circuit should be carefully checked. Voltage measurement, signal tracing and signal injection methods of trouble shooting should be used.

Two matched plug-in transistors (two PNP 353) are used as a balanced push-pull class "B" audio output stage. This type of circuit yields greater audio output power at a much lower average battery drain. To optimize performance, these transistors are supplied as a matched pair. If one of these transistors becomes defective replace both of them with a new matched pair.

We suggest you adhere to the following service precautions:

1 - Remove transistor prior to soldering to transistor socket.

2 - Set must be turned "off" before putting in a new transistor.

3 - If only one 9 volt energizer is used while servicing, make sure unused energizer cable does not short to chassis.

4 - Wherever possible, use same transistor number as original for replacement, especially in the converter and I.F. stage.

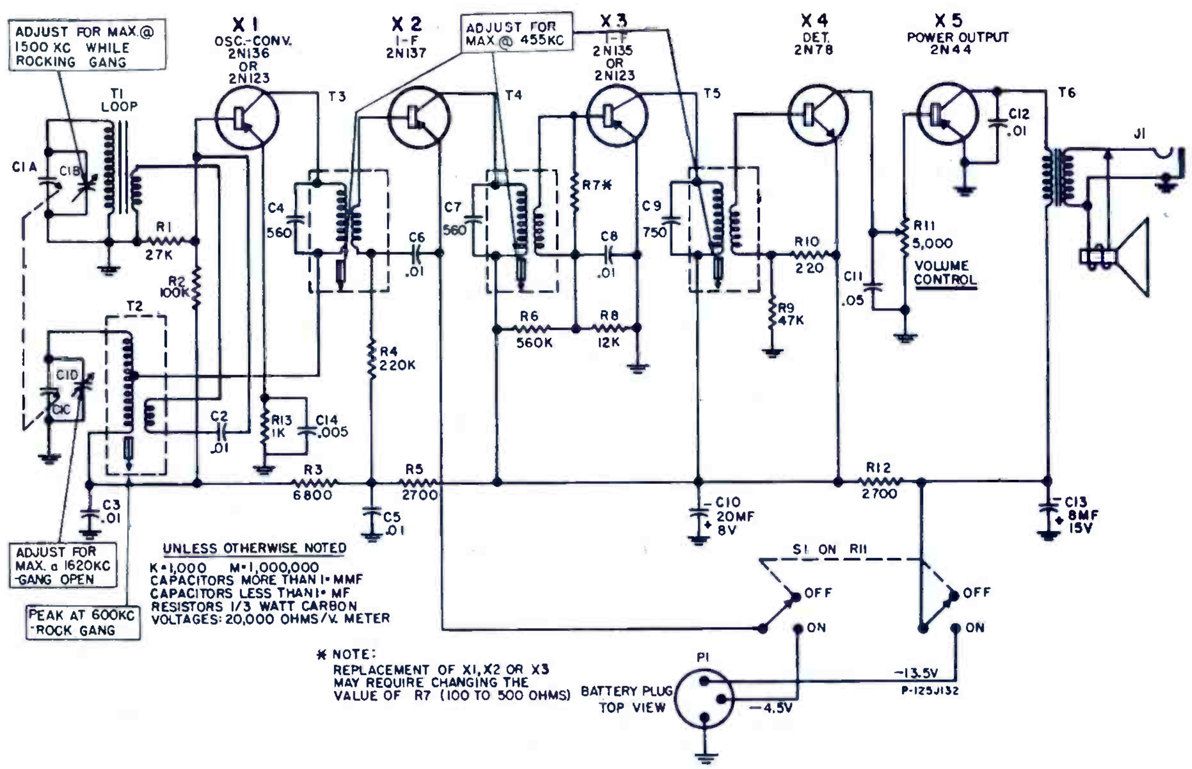
If you do not have a replacement transistor available, you can determine if the suspected transistor is actually defective by the following test.

Technician
CIRCUIT DIGEST

TECHNICIAN CIRCUIT DIGEST

GENERAL ELECTRIC Transistorized Portable Radio

Model 675



SCHEMATIC DIAGRAM - MODEL 675

ADVANCED SERVICE INFORMATION - MODEL 675
TRANSISTORIZED PORTABLE RADIO

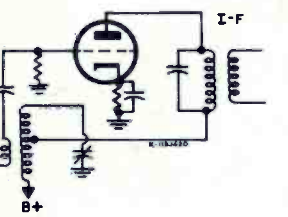
Now that the transistor radio is a reality and will soon be on its way to G.E. distributors all over the country, we thought that you should be furnished with some technical information regarding the transistor.

The Model 675 transistorized portable uses four PNP transistors and one NPN transistor. The PNP transistors function as oscillator-converter, I-F amplifiers and audio output while the NPN transistor is the detector.

In order that you might better understand the transistors function we have compiled the following circuit analysis. Following this, a short discussion on trouble-shooting is presented in the hopes that it will be of some help to you.

CIRCUIT ANALYSIS

A. OSCILLATOR CONVERTER



VACUUM TUBE EQUIVALENT
OSCILLATOR-CONVERTER

The oscillator-converter stage is similar in operation to the vacuum tube converter circuit shown above. As in all superhetrodyne circuits, the I-F transformer accepts the proper frequency from the many frequencies in the output of the converter and passes this frequency to the first I-F stage.

B. I-F AMPLIFIER

It is relatively simple to design a multi-stage I-F amplifier for vacuum tubes because there is relatively little reflection from the output side to the input side of each amplifier.

A transistorized I-F amplifier is a little more difficult to work out since the input side is closely coupled to the output side through the transistor. Actually, any change in the final output circuit will be reflected to all of the preceeding stages. Also, the input impedance of a transistor stage is much lower than its output impedance.

You will notice that in the 675 only the primary of the I-F transformers are tuned. The I-F transformer primaries are high impedance and are slug tuned. The secondaries are low impedance to match the transistor input impedance, and are not tuned.

As mentioned above, any change in a transistor circuit will be reflected to all previous stages.

Because of this, a change in the 2nd I-F stage will be reflected back into the 1st I-F and converter stages. You can now see that R7, in the grid of the 2nd I-F (X3) will affect the overall gain of the R-F and I-F system of the receiver. Therefore, the value of R7 in each receiver has been chosen so it is high enough for maximum gain but not too high to cause the R-F I-F system to regenerate.

The 1st I-F (X2) has fixed emitter bias so the AGC control on the collector and base will control the gain of this stage. (A.G.C. is discussed later in this analysis). R6 and R8 form a voltage divider network to bias the base of X3, the 2nd I-F amplifier. R9 and R10 form the divider network to furnish bias for the base of the detector, X4.

C. 2ND DETECTOR AND AUDIO OUTPUT

This detector is similar in operation to a vacuum tube plate detector. The base is biased at nearly "cut-off" so that the transistor will only conduct when a signal is applied between base and emitter, and then only on the positive half of the R-F cycle. This, of course, gives us rectified R-F in the collector circuit, which is by-passed to ground leaving only the intelligence containing envelope.

This audio voltage is applied across R11, the volume control. Because the detector X4 draws current while receiving a signal, there will be a voltage drop across R11, the polarity of which is negative and the amount in proportion to the setting of the control and the strength of the received signal. This negative voltage biases the base of the output transistor, X5, and delivers the audio signal to this stage.

You can now see that X5, the power output stage, will draw current directly proportional to the strength of the received signal and the volume control setting. The output of X5 is taken from its collector and fed through T6, the output transformer, to the loudspeaker. The transformer is necessary to match the 16 ohm speaker to the high output impedance of X5.

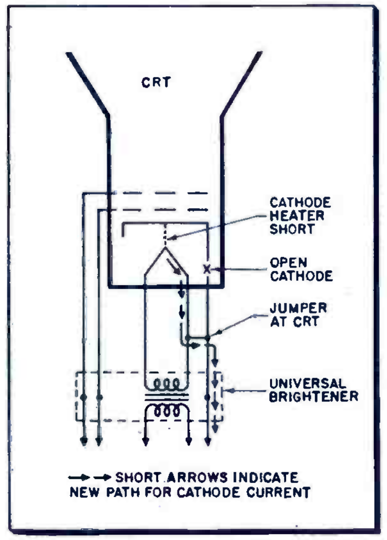
Technician
CIRCUIT DIGEST

Shop Hints

Saving a CRT

Some time ago a customer's set developed a heater-cathode short on the picture tube. Such a crt can be continued in use if a way is found to prevent the cathode from being grounded by the short, through the grounded side of the filament supply.

CRT with cathode-heater short and open cathode is restored with xformer and jumper.



This is done by using an isolation transformer between the crt filament and the filament supply. In this case, the set was restored to normal operation with the old picture tube still in use by means of a universal pix tube booster or brightener that had a separate primary and secondary.

Recently, the set lost its raster completely. High voltage was normal. However, while measuring the picture tube's bias, I accidentally had my test prod short the cathode to the heater. Strangely enough, this caused the picture to return.

Some thought on the subject led me to the following conclusion: now the cathode was open, but cathode current could flow through the preexisting cathode-heater short. With the external short in place, cathode current could flow to its normal return, as indicated in the accompanying diagram. Since either open cathodes or cathode-heater shorts separately are rather common pix tube troubles, it is logical to assume that they sometimes occur simultaneously.

In cases where the symptoms indicate an open cathode and the customer is unwilling to pay for a new tube, it is suggested that an isolation transformer be installed and that the cathode be shorted to the heater with a test prod or screw driver. If this experiment restores the picture, the full condition and the cure are both obvious. A permanent jumper from heater to cathode, as shown, will put the tube back in operation. —*Charles Fisher, Penns Grove, New Jersey.*

Pilot Bulb Removal

Extracting hard-to-reach pilot lamps, particularly those recessed in panels, is easier than it looks. Simply push a short piece of rubber tubing over the bulb. Choose tubing of such a diameter that it makes a snug fit over the bulb. The latter may then be manipulated out of its socket easily.—*Stanley Clark, East Bradenton, Florida.*

Wire Fed Through Wall

Did you ever have to run a flat lead through a hole in a wall in which a round lead was already installed? If you have, you know how difficult and tedious a job it can be. However, with a little ingenuity it becomes a snap. All you have to do is pull the round lead out of the wall by a certain amount. It should be pulled back by at least the width of the wall you wish to go through. Then, using plastic tape, tape the flat lead tightly parallel to the round lead. If you have made a good bind —not too bulky—the additional lead can be pulled through the wall with the original wire with no trouble at all.—*Sid Elliot, Miami, Fla.*

D. AUTOMATIC GAIN CONTROL

The purpose of Automatic Gain Control in a radio receiver is to maintain the carrier voltage at the second detector approximately constant. Its function is to counteract strong signals by reducing the gain of the R-F and/or I-F amplifiers. In a tube radio this is accomplished by biasing the grids of the tubes in these stages with a d.c. voltage derived by rectifying the carrier. An increase in signal increases the negative bias which reduces the gain of the unit and vice versa.

In a transistorized radio receiver the AGC system must perform the same duty as in a tube radio, but, because of the transistors, it must be accomplished in a different manner.

In the detector stage (X4) of the model 675, the emitter bias comes from the B- supply (-13.5V) through R12. X4 does not draw current until a signal is received. Therefore, with no signal the voltage drop across R12 is created only by the current drawn by the previous R-F and I-F stages. When a signal is received, X4 draws current proportional to the strength of the signal and the voltage drop across R12 will increase. Effectively then, the bias (negative) to the converter and I-F amplifiers will be less negative on a strong signal than it is on a weaker signal. This changing bias supply will change the gain of X2 (1st I-F) greatly since it changes the bias of the base and collector with respect to the emitter which has fixed bias from the battery. On the other hand, the converter (X1) and 2nd I-F (X3) will only be controlled slightly since the bias on all elements of these transistors change in unison.

You can now see that when a strong signal is received the detector (X4) will draw more current, thus increasing the drop across R12 and lowering the bias for X1, X2 and X3. X2, having a fixed emitter bias, will be controlled by this lower bias and have a lower amplification factor, thus reducing the gain of the receiver and accomplishing the overall aim of AGC.

TROUBLE SHOOTING

At the present time there is only one way to check a transistor - by substitution. Unlike a tube radio then, it is best to check the circuit thoroughly before attempting to check transistors.

This statement isn't as far fetched as it sounds. As you will read in the enclosed booklets, there is no known reason why a transistor should fail in itself. The cause of transistor failures is moisture getting through the seal. G.E. transistors are hermetically sealed so there is reason to believe that transistor failures in the Model 675 should be few and far between. This should govern you in a direction just the opposite of the tube radio philosophy - suspect the transistor only as a last resort!

Normal service procedures can be followed in trouble-shooting a transistor radio. With a voltmeter check the battery supply first. If this is ok, try any one of the well known trouble-shooting procedures. The stage by stage interruption method, starting at the output stage, works well. The signal tracing method works equally well and maybe a little better. It is really up to individual preferences whichever method is to be used.

This will only give you the stage in which the trouble is located so resistance and voltage checks must be resorted to in the defective stage. Now, if this normal procedure fails to show a defective component in the stage, the transistor in the stage must be defective and should be replaced.

While checking voltages you will notice they are exceptionally low ..... the total B- supply in the model 675 is minus 13.5 volts! The collectors on all of the PNP transistors are negative with respect to their emitters and bases so don't be worried when the polarity is just opposite that of a standard tube radio.

At this writing the five transistors are soldered into the circuit. If it becomes necessary to remove or replace a transistor use extreme caution with your soldering iron because excess heat will permanently damage the transistor.

If you find it necessary to replace X1, X2 or X3, it may be necessary to change the value of R7 for optimum receiver sensitivity consistent with no regeneration.

First make sure the battery is fresh and delivers the full 13.5 volts, then start with R7 at 470 ohms. If the set regenerates, try the next lower value resistor and so on. Use the resistor value just below the lowest value where regeneration occurs.

GENERAL ELECTRIC
Transistorized Portable Radio
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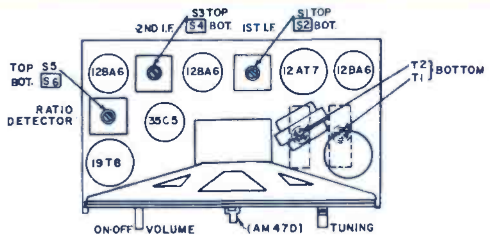
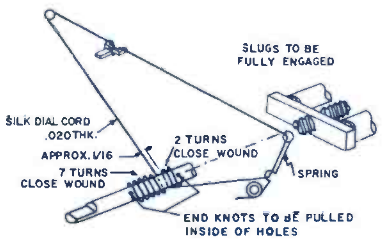
TECHNICIAN CIRCUIT DIGESTS





DISTANCE AND HOW IT AFFECTS FM RECEPTION

Generally, FM stations do not transmit over distances as great as AM stations. However, the sensitivity of your Granco Model 610, which is its ability to pull in weak signals, is high, and excellent reception may be obtained up to 30 miles from transmitter with the use of the built-in antenna.

For reception at greater distances, an outside or window antenna should be used, but first check reception with the built-in antenna. If an outside antenna is required, it may be purchased inexpensively. (See Figure 1 for outside antenna connections.)

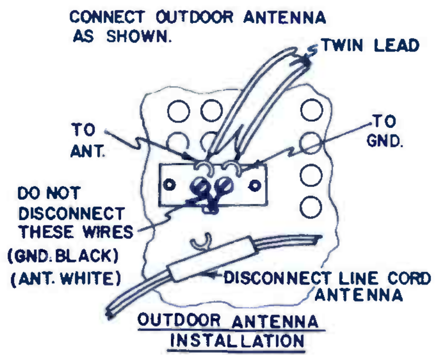
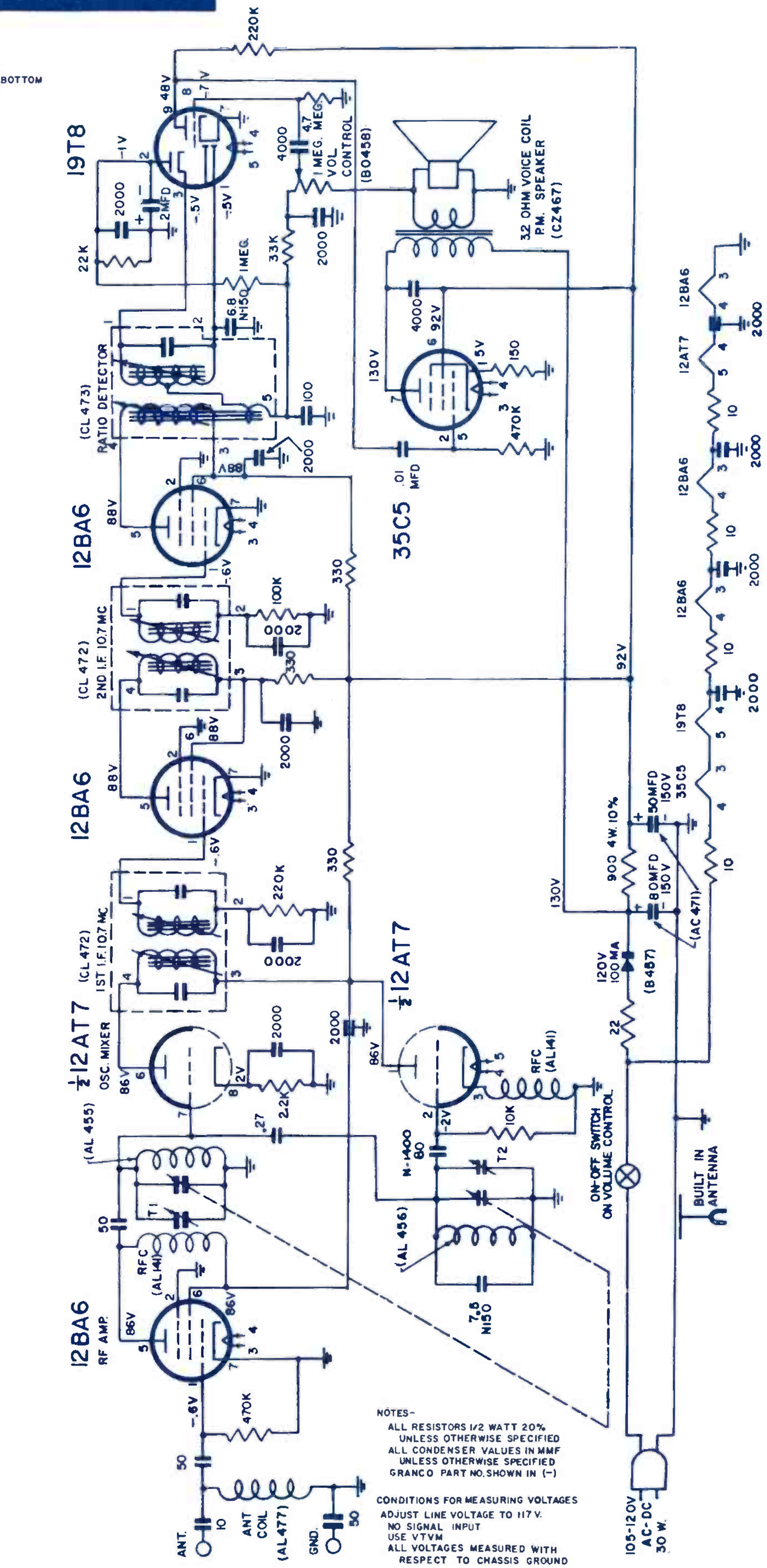


FIGURE 1



GRANCO
Table FM Radio
Model 610 FM

Technician

CIRCUIT DIGEST

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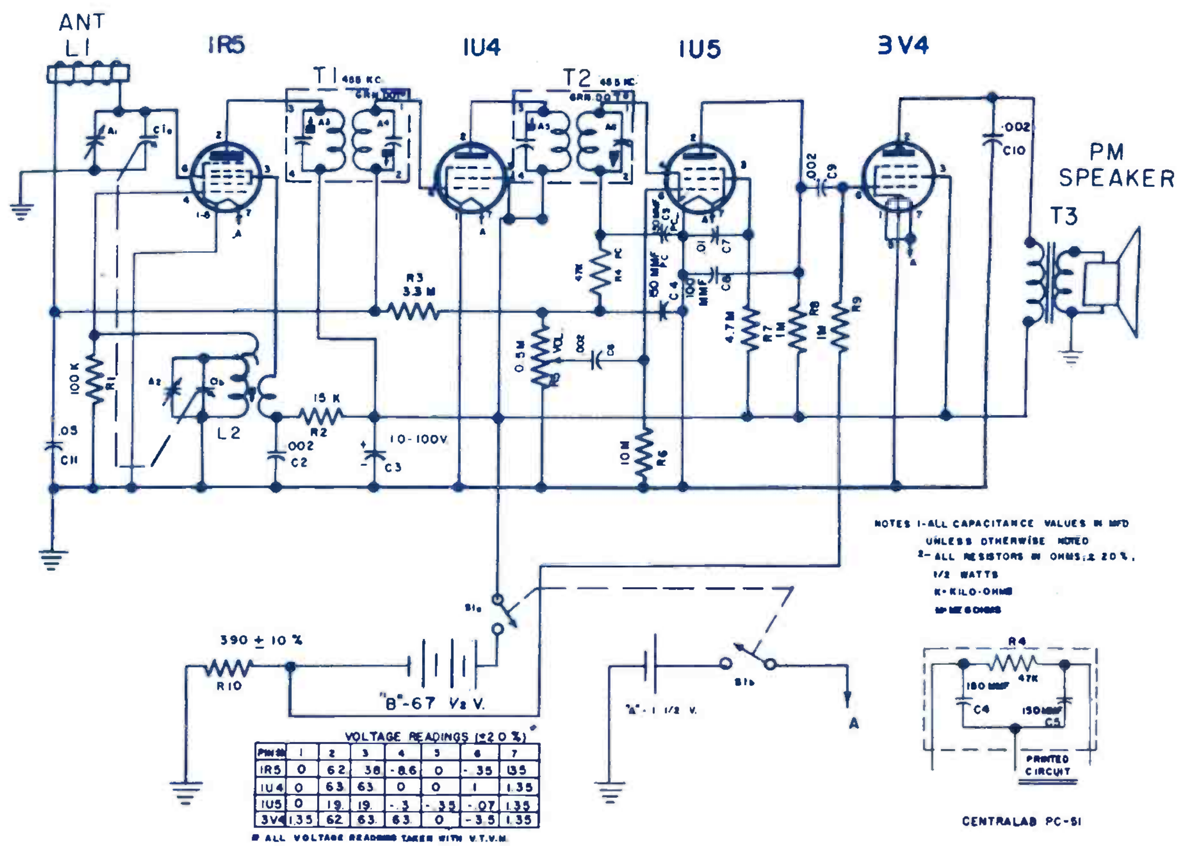
TECHNICIAN CIRCUIT DIGEST

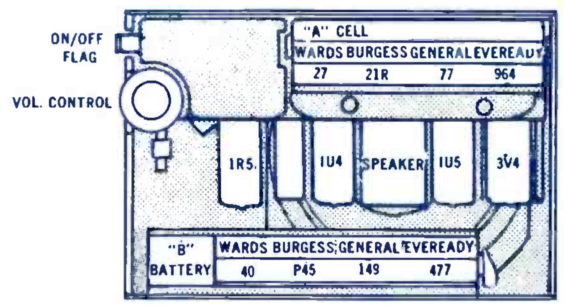
MONTGOMERY WARD
Portable Radio
Model GEN-1090A

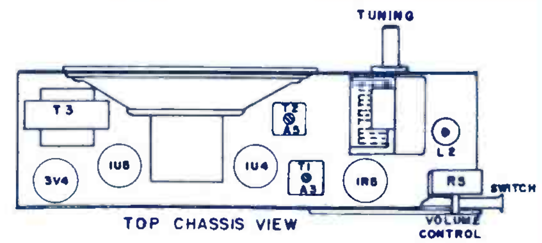


VOLTAGE READINGS (±20 %)*

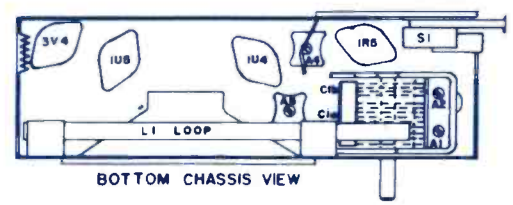
PIN #	1	2	3	4	5	6	7
1R5	0	62	38	-8.6	0	-.35	1.35
1U4	0	63	63	0	0	1	1.35
1U5	0	19	19	-.3	-.35	-.07	1.35
3V4	1.35	62	63	63	0	-3.5	1.35

* ALL VOLTAGE READINGS TAKEN WITH V.T.V.M.





TOP CHASSIS VIEW



BOTTOM CHASSIS VIEW

REF. NO.	DESCRIPTION	PART NO.
	CAPACITORS	
C1A	Tuning, 2 gang osc. 97.8 mmf to 6.5 mmf...	E3517
C1B	R.F. 221.6 to 8.8 mmf..................	
C2	Disc. .002 mmf 600V. GMV............	
C3	Electrolytic miniature 10 mfd 100V........	E3212
C4	150 mmf. (Part of ceramic couplate)........	
C5	150 mmf. (Part of ceramic couplate)........	
C6	Disc. .002 mfd. 600V. GMV............	
C7	Disc. .01 mfd 600V. GMV............	
C8	Disc. 100 mmf 600V. GMV............	
C9	Disc. .002 mfd 600V. GMV............	
C10	Disc. .002 mfd. 600V. (3/8" OD) G.P. 20%.	E3322
C11	Paper Tubular .05 mfd 200V............	
	RESISTORS	
R1	100K ohm 1/2 W......................	
R2	15 K ohm 1/2 W......................	
R3	3.3 megohm 1/2 W....................	
R4	47 K (Part of ceramic couplate)..........	
R5	.5 megohm Volume control..............	E2517
R6	10.0 megohm 1/2 W....................	
R7	4.7 megohm 1/2 W....................	
R8	1.0 megohm 1/2 W....................	
R9	1.0 megohm 1/2 W....................	
R10	390 ohm 1/2 W......................	

NOTE: Use Universal parts where part numbers are not listed.

Technician

CIRCUIT DIGEST

Shop Hints

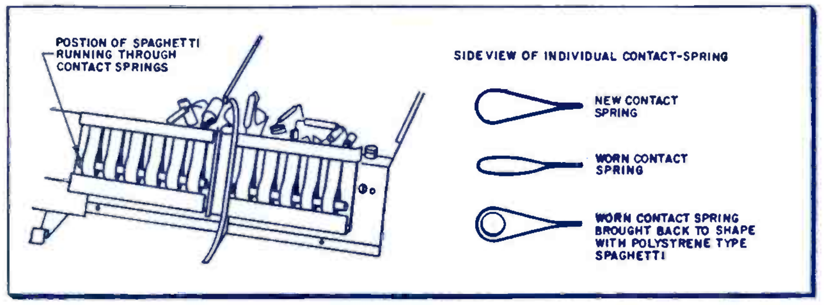
Weak Tuner Contacts

As turret-type tuners age, the contact springs, which are made out of brass, lose their springy quality. As this happens they become flatter, and the result is poor contact with the various r-f and oscillator slugs as the drum is revolved, with impaired or intermittent reception. This condition is illustrated to the right in the accompanying illustration.

The remedy described here for this flattening has proved its success for the writer. After the individual contact springs have been brought back to original shape as much as possible, a strip of spaghetti is used to retain that shape. The writer uses polystyrene spaghetti, about ⅛ in. in diameter, and pushes it through the openings in the contact springs. This spaghetti keeps the springs open, preventing flatness and thereby assuring continued good contact between the revolving drum and the stationary springs. A strip of foam rubber with an oval cross section would be just as practical for this function. The position of the strip is shown to the left in the accompanying illustration, which is an internal view of the tuner with the turret drum removed for the sake of clarity.

If any of the contact springs are found to be broken when this job is undertaken, the entire contact plate should be replaced. The spaghetti can be run through the new springs, as a preventive measure, before the plate is mounted in the tuner. Another good practice is to remove permanently the slugs for all channels not used in the area. This gives the springs a chance to "stretch" between channels as the drum is revolved, thus prolonging life of the contacts.—*Hyman Herman, Flushing, N. Y.*

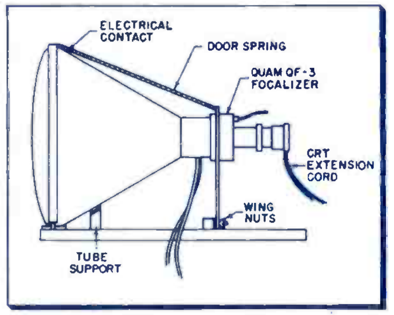
Spaghetti run through turret-tuner springs restores their shape and maintains good contact.



Substitute Shop CRT

In earlier years, it was common to mount the chassis of TV receivers separate from the picture tubes. Many such sets are now in use. Currently, separate mounting is also used for the larger picture tubes. Such chassis are easily pulled for shop repair without their picture tubes, but difficulty is experienced checking the picture in the shop. Where the volume of service warrants the investment, it is worthwhile to make up a mounted picture tube for adaptation to chassis being serviced.

A 90-degree deflection picture tube (21ACP4, in this case) has been used to make up the rig shown in the illustration. The yoke can be brought in with the defective chassis, or suitable yokes can be used on the tube with connections to a 4-prong female plug, for adapter cords to fit various chassis. Yokes equivalent to Merit MDF-70, MDF-74 (direct drive), and MDF-90 have worked in all cases so far, although not always giving a perfect match. The complete picture tube face will not be filled by a 70-degree yoke, of course, but this need not interfere with servicing.



Substitute c-r tube and associated components with mount, for chassis service in the shop.

Be sure to ground the tube mounting to the chassis being worked on. The focalizer and its mounting board are easily removed for changing yokes. A potentiometer can be inserted in place of the focus coil, if necessary, where one is used with the original tube.—*Don Phillips, Waterloo, Iowa.*

Phono Cartridge Check

When it becomes necessary to check the output of a phonograph pickup cartridge to see whether it is working, a quick and simple test can be made with a pair of headphones or a single headset. The headset need simply be connected across the output terminals of the cartridge, or more conveniently, across the leads from the output terminals, so that the connections will not interfere with placing the pickup on the record. When the cartridge is then placed on the rotating record, one need simply listen to the output through the headset. Nearly all standard cartridges (crystal and ceramic types) provide enough output to cause the earphones to operate satisfactorily. The only exceptions are the magnetic and other low-level high-fidelity types of pickups, but even these can be checked through a suitable preamplifier known to be operating properly.

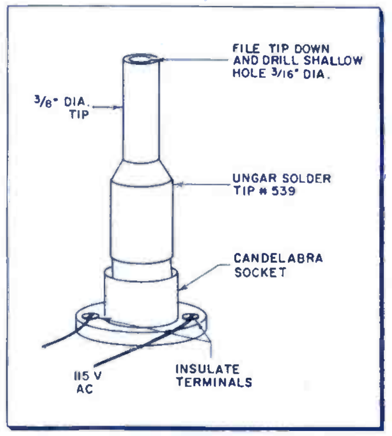
In addition to being quick and easy, the headphone method of checking can be used in the field as well as on the bench. It is only necessary to keep a single headset, which occupies a small amount of space, in the tool box.—*Ellisworth Bell, Anniston, Ala.*

Boosting Soft CRT's

When one filament booster is used to restore brightness to an aging crt, it is often not sufficient if the tube has become too "soft." A simple method of achieving enough improvement to extend the life of the picture tube is to put two crt boosters in series temporarily. This will give the filaments approximately 3 or 4 additional volts. It is not advisable to leave the two connected any longer than is necessary to bring about the desired improvement. Then one of the boosters is removed. We have found that this procedure straightens out most of the very soft picture tubes.—*Joseph F. Valenti, New York, N. Y.*

Home-Made Soldering Pot

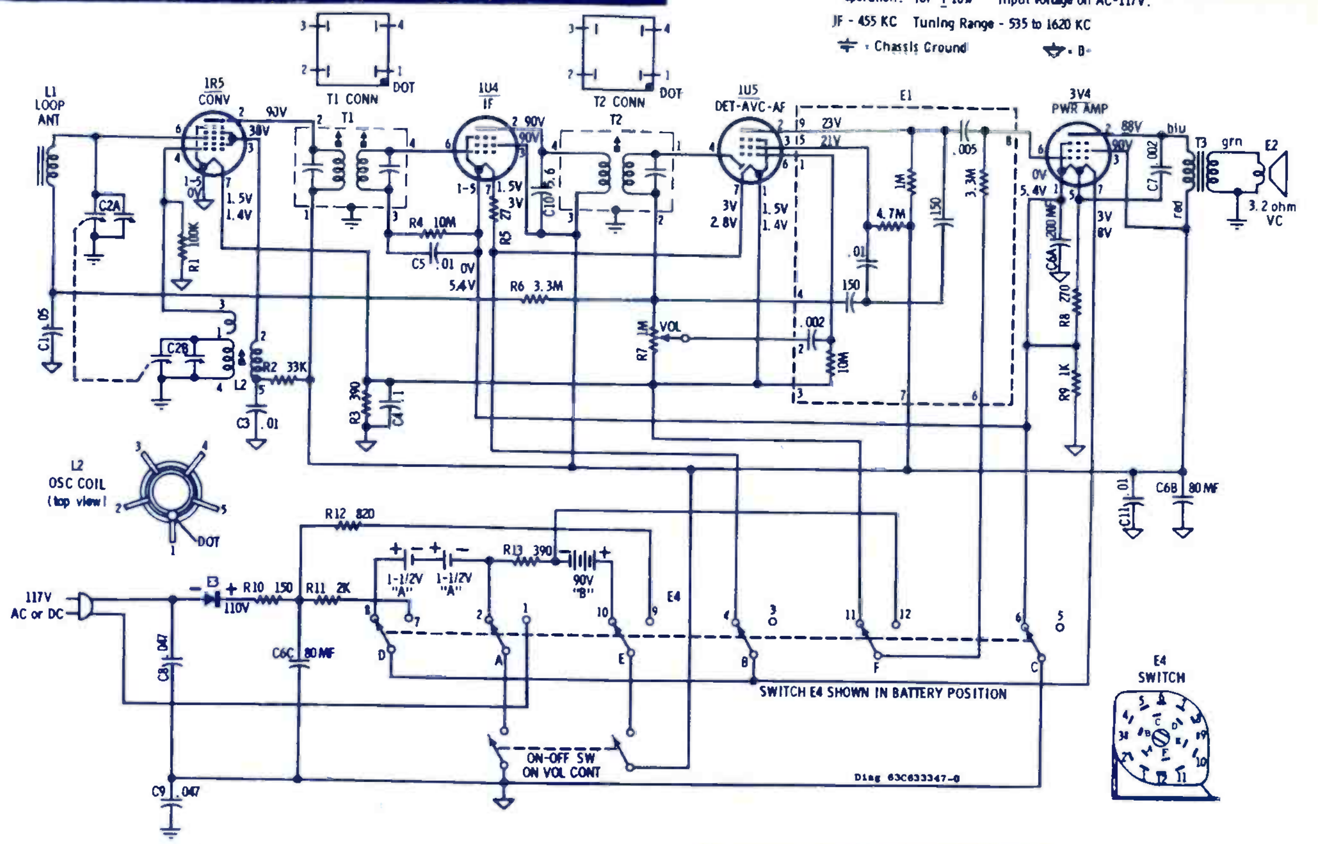
For tinning small parts, a convenient soldering pot can be constructed quickly in the following way: An Ungar soldering tip (No. 539) was used in this particular case. The tip is filed slightly to remove the point, and then a hole with a 3/16-in. diameter is drilled to a depth of about ⅛ in. at the filed end. The entire tip is then screwed into a standard candelabra socket, to which the 115-volt line is easily connected. Exposed contacts on the socket should be insulated to avoid the possibility of shock.—*A. Molinara, Hatboro, Pennsylvania.*



This pot facilitates fine work on small parts.

TECHNICIAN CIRCUIT DIGESTS

NOTES: Capacitors - Decimal values in MF. All others in MMF unless otherwise specified.
Voltages - Measured with VTVM from point indicated to B-; Where two voltage readings are shown, upper value is for battery operation & bottom value for AC operation. Tol ± 10% Input voltage on AC-117V.
IF - 455 KC Tuning Range - 535 to 1620 KC
= Chassis Ground = B-



HS-454 SCHEMATIC DIAGRAM

ALIGNMENT

Connect an output meter across the speaker voice coil. Attenuate signal generator output to maintain .4 volt on output meter to prevent overloading.

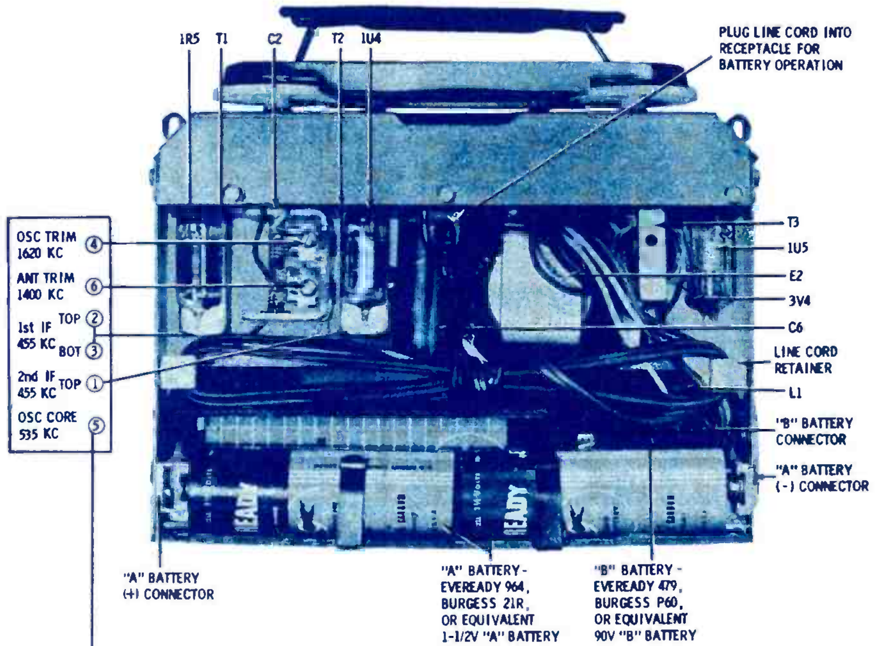
STEP	GEN CONN.	GEN FREQ.	GANG SETTING	ADJUST
IF ALIGNMENT				
1.	Ant section of gang thru .1 mf	455 Kc	Fully open	1, 2 & 3 for max
RF ALIGNMENT (Chassis cover must be in place)				
2.	Ant section of gang thru .1 mf	1620 Kc	Fully open	4 for max
3.	"	535 Kc	Fully closed	5 for max
4.	Radiation loop*	1620 Kc	Fully open	Readjust 4 for max if necessary.
5.	"	1400 Kc	Tune for max	6 for max

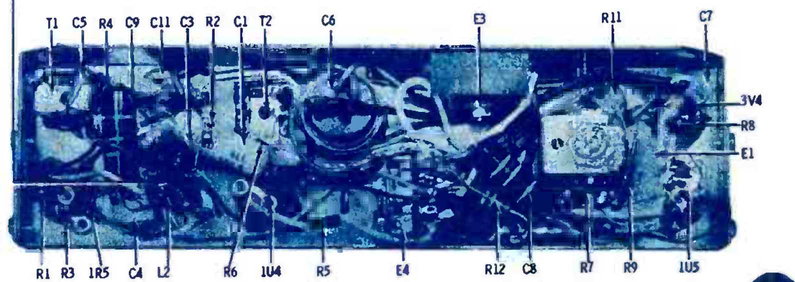
*Connect generator output across 5" diameter, 5-turn loop and couple inductively to receiver loop. Keep loops at least 12" apart.

Chassis HS-454: Models 55J1, 55J2

MOTOROLA
Chassis HS-454

Technician
CIRCUIT DIGEST





HS-454 PARTS LOCATION & ALIGNMENT ADJUSTMENTS

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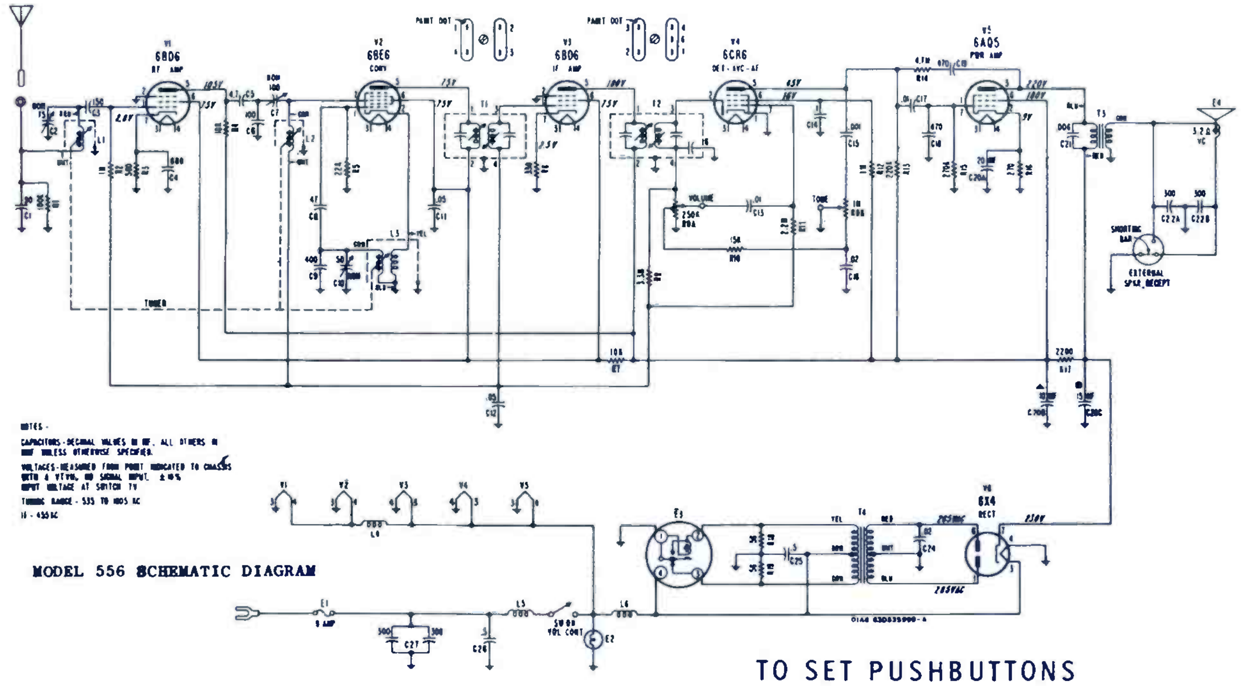
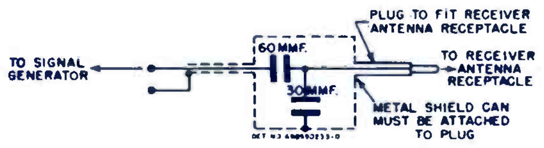
TECHNICIAN CIRCUIT DIGEST

MOTOROLA Auto Radio

Model 556



MODEL 556 SCHEMATIC DIAGRAM



DUMMY ANTENNA

TO SET PUSHBUTTONS

This receiver has an automatic tuner, with 5 "Quick Set" pushbuttons for automatic station selection.

To set the pushbuttons for automatic tuning, proceed as follows:

1. Tune in the desired station with the manual tuning knob. Tune carefully until you are exactly on the station.

2. Pull out the first pushbutton to be set, to unlock the button for station set-up, and then push button in firmly to set and lock the button.

3. Follow the above procedure for the remaining four buttons.

ALIGNMENT

Connect an output meter across the speaker voice coil. Set tone control to high and volume to maximum. Attenuate generator output to maintain 1.79 volts on output meter at all times to prevent overloading the receiver.

STEP	GENERATOR CONNECTION	GENERATOR FREQUENCY (400 cycle mod)	TUNER SET TO	ADJUST	REMARKS
IF ALIGNMENT					
1.	6BE6 grid (pin 7) through .1 mf capacitor & chassis	455 Kc	Hi end stop	1, 2, 3 & 4	Peak for maximum
RF ALIGNMENT					
2.	Ant recept through dummy (see Fig.)	1610 Kc	Hi end stop	5, 6 & 7	Peak for maximum
NOTE: Do not perform steps 3, 4, 5 & 6 unless tuner has been tampered with or components have been replaced. Remove escutcheon to expose core screws. Before proceeding with step 3, back tuning cores 1" out of coils to eliminate their effect on trimmer adjustments.					
3.	Ant recept through dummy (see Fig.)	1610 Kc	Hi end stop	5, 6 & 7	Peak for maximum
4.	"	1180 Kc	19/64" from hi end stop	8, 9 & 10	Peak for maximum using alignment tool, Motorola Part No. 66A76278
5.	"	1610 Kc	Hi end stop	5, 6 & 7	Peak for maximum
6.	Repeat steps 4 and 5 until no further increase, then cement tuning cores in place.				
ANTENNA TRIMMER					
7.	-		Weak station around 1400 Kc	7	With radio installed in car and antenna fully extended, peak antenna trimmer for maximum.

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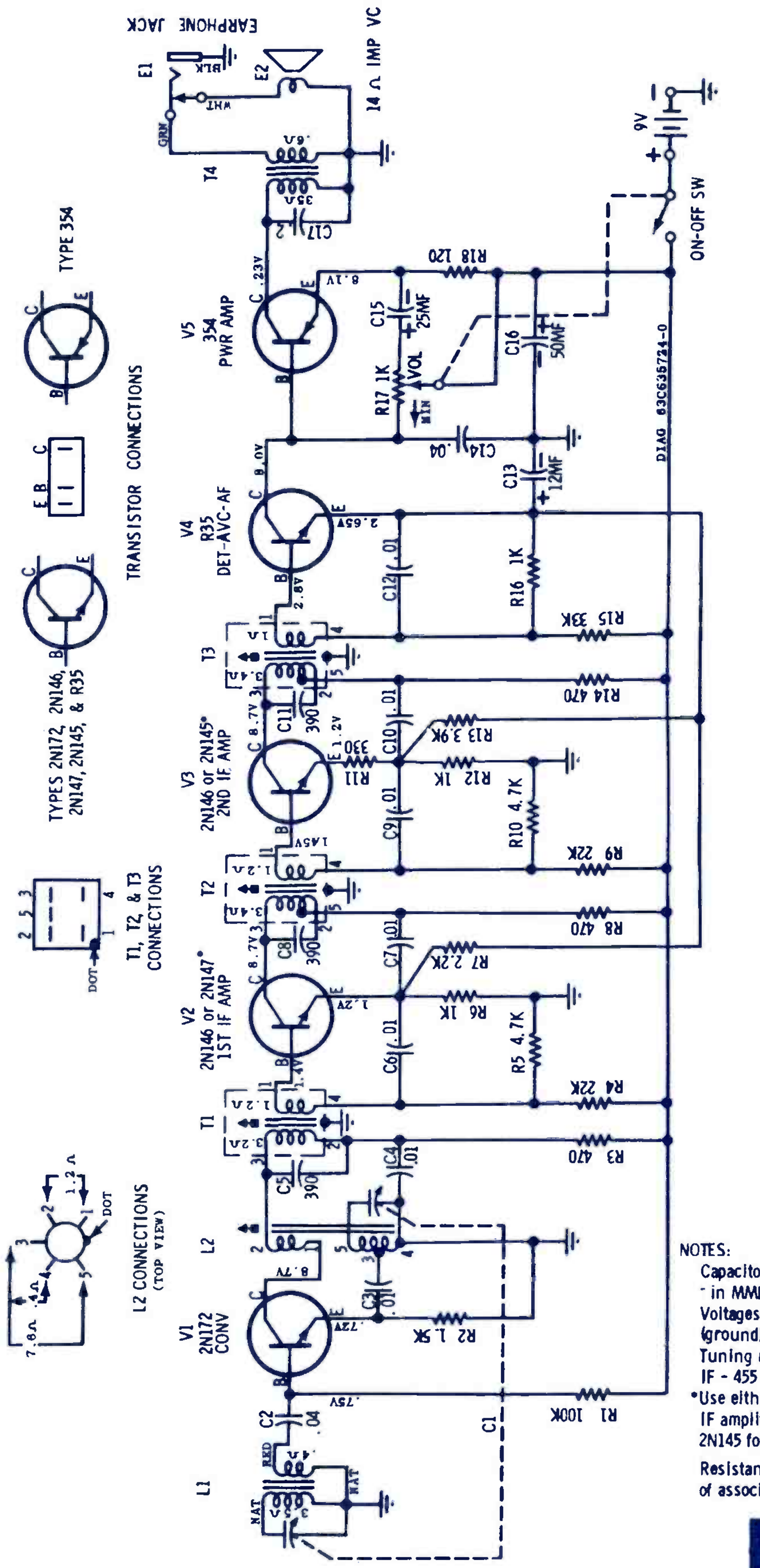
TECHNICIAN CIRCUIT DIGEST

MOTOROLA Transistor Portable Radio Chassis HS-483

Chassis HS-483: Model 56T1



SCHEMATIC DIAGRAM

GENERAL INFORMATION

TYPE - Pocket type portable superheterodyne radio using a plated circuit chassis and five transistors. An earphone socket is provided on rear of radio; insertion of earphone automatically disconnects speaker. A 15 ohm earphone for this radio (Motorola Part No. D-196) is available through Motorola Distributors.

POWER SUPPLY - Operates from one of the following or equivalent 9-volt self-contained batteries:

Standard Type - Eveready 216, Burgess 2U6, General 179

Mercury Type - Mallory TR146R, Eveready E146

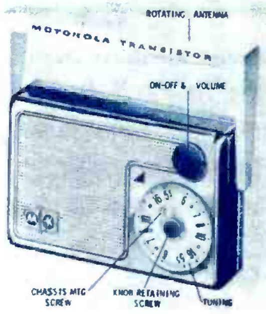
TRANSISTOR COMPLEMENT

Ref No	Type	Part No	Function
V1	2N172*	48C124216	Conv
V2	2N146** or 2N147**	48C124218 48C124221	1st IF Amp
V3	2N146** or 2N145**	48C124218 48C124220	2nd IF Amp
V4	R35***	48C124217	Det-AVC-AF Amp
V5	354	48C124219	Pwr Amp

* Type 830 used in some sets; when replacing use 2N172.

** Some sets use 2 of the 2N146 transistors; others use a 2N147 as 1st IF amp and a 2N145 as the 2nd IF amp. When replacing, use the same type transistor that the set originally used.

*** Type 880 used in some sets; when replacing use R35.



TUNING RANGE - 530 to 1620 Kc IF - 455 Kc

SERVICE NOTES

CIRCUIT DESCRIPTION

1. The circuit of this chassis is conventional - there are no built-in resistors or capacitors. Leads are plated on both sides of the chassis base, thereby replacing the usual connecting wires and making wiring more uniform.

2. The metal plating extends through all the holes on the chassis, connecting circuits on the front with those on the rear.

3. Reference to the schematic diagram and to chassis will permit the circuit to be traced easily.

SAFETY PRECAUTIONS

1. Do not service the chassis on a metal plate because of the possibility of a short circuit.

2. Do not short across the base and connector electrodes of the transistors while the radio is operating. Doing this may cause permanent damage to the transistor.

COMPONENT REPLACEMENT

1. WHEN REMOVING DEFECTIVE COMPONENTS USE ONLY A SMALL SOLDERING IRON (60 WATTS OR LESS) TO AVOID DAMAGE TO THE PLATED WIRING. DO NOT USE A SOLDERING GUN. WARNING: THE PLATED LEADS ARE VERY THIN AND EXCESSIVE HEAT WILL BURN OR LOOSEN THEM FROM THE BASE MATERIAL.

2. Plated connections or leads, if damaged, may be replaced with a jumper or regular hookup wire.

(Continued on reverse side)

NOTES:

Capacitors - Decimal values in MF, all others in MMF unless otherwise specified.

Voltages - Measured from point indicated to braided lead (ground) with a VTVM. No signal input, vol. at max.

Tuning range - 530 to 1620 Kc.

IF - 455 Kc.

*Use either a pair of 2N146's for the 1st and 2nd IF amplifiers or a 2N147 for the 1st IF AMP and a 2N145 for the 2nd IF AMP. Use no other combinations.

Resistances measured with transistor out of associated circuit.

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MOTOROLA
Transistor Portable
Radio Chassis HS-483

Technician
CIRCUIT DIGEST

3. It is recommended that multiple lug components be removed by immersing all the lugs simultaneously into a controlled temperature pot, Motorola Part No. 66T632703. The component may then be lifted off the chassis easily. If a soldering pot is not available, heat each lug individually with a small soldering iron and shake or brush off as much solder as possible. Then, by alternately heating and loosening each lug, the entire component will be freed.

4. Resistors or capacitors may be replaced by unsoldering one end at a time. CAUTION: Clean all the solder from the holes before installing a new component. Do not let the solder run onto an adjacent lead, as a short circuit will be created.

5. Volume control replacement - remove the defective volume control by dipping the control and shaft into a controlled temperature soldering pot and lifting the volume control off the chassis. Clean all the solder from the connecting holes with a small brush. Solder new control in place with a small soldering iron; DO NOT DIP THE NEW CONTROL INTO A SOLDERING POT BECAUSE THE CONTROL SHAFT WILL BE DAMAGED BY SOLDER.

CHASSIS REMOVAL

1. Pull the volume control knob from front of radio.

2. Remove tuning knob retaining screw from the tuning knob and remove the tuning knob (see cover photo).

3. Remove chassis mounting screw from under tuning knob (see cover photo).

4. Open rear cover and unsolder grounding braid from top of 1st IF transformer and capacitor C13. Care should be taken so that the IF can is not overheated, otherwise damage to the IF transformer will result.

5. Turn handle perpendicular to the plated chassis.

6. Grasp handle near one of its two mounting bushings and pull out from side of cabinet until the round portion of the mounting bushing clears hole in side of cabinet, then lift this side of handle and chassis slightly out of cabinet. Perform the same procedure on the other mounting bushing, then lift handle, chassis and speaker plate out of cabinet.

7. The plated chassis is separated from the speaker mounting plate as follows: loosen the gang mounting screws and with a small soldering iron (60 watts or less) separate gang oscillator stator terminal from plated chassis. Then unsolder, one at a time, the three chassis mounting support lugs. USE ONLY A SMALL SOLDERING IRON - 60 WATTS OR LESS. Disconnect speaker, earphone jack and antenna leads as required.

HANDLE REPLACEMENT

1. Remove chassis and speaker mounting plate from cabinet as described under CHASSIS REMOVAL.

2. Unsolder antenna leads from chassis.

3. Turn handle perpendicular to chassis and slide out of handle clips.

CABINET CLEANING

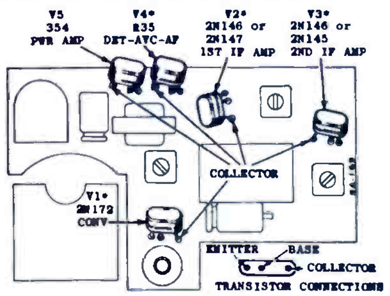
The bright metal portions of the cabinet are protected by a clear vinyl plastic coating. The metal portions of the cabinet should be cleaned with a soft, dry cloth only; do not use any polishes. The plastic handle should be cleaned only with a quality Plastic Wall Tile Cleaner.

TRANSISTOR REPLACEMENT

When replacing a transistor, the heat must be carried away from the transistor to prevent heat damage to the transistor.

1. Grasp transistor leads with a pair of long-nose pliers to dissipate the heat, and dip into controlled temperature soldering pot.

2. Lift transistor off of the chassis with the pliers.



*See TRANSISTOR COMPLEMENT under GENERAL INFORMATION

TRANSISTOR REPLACEMENT

3. Clean all the solder from the connecting holes.

4. Place new transistor into the connecting holes.

5. Grasp transistor leads with long-nose pliers to dissipate the heat, and solder the transistor to its connecting holes.

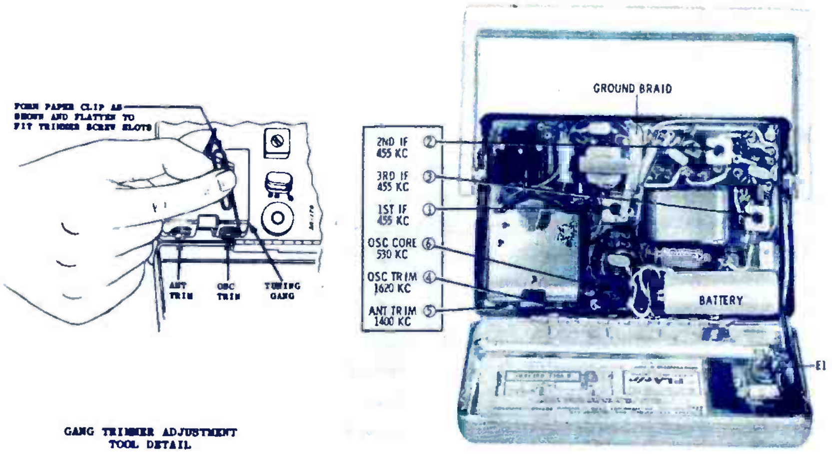
When replacing a transistor, be sure it is wired into the chassis as shown in the illustration. The collector lead is spaced from emitter and base leads, thus serving to identify leads. See illustration.

ALIGNMENT

Connect an output meter across the green & black leads of the earphone jack (speaker voice coil). Set volume to maximum. Attenuate signal generator output to maintain .25 volts on output meter at all times to prevent overloading. Radio should be aligned while chassis is in cabinet. To adjust gang trimmers, construct and use wire tool shown below.

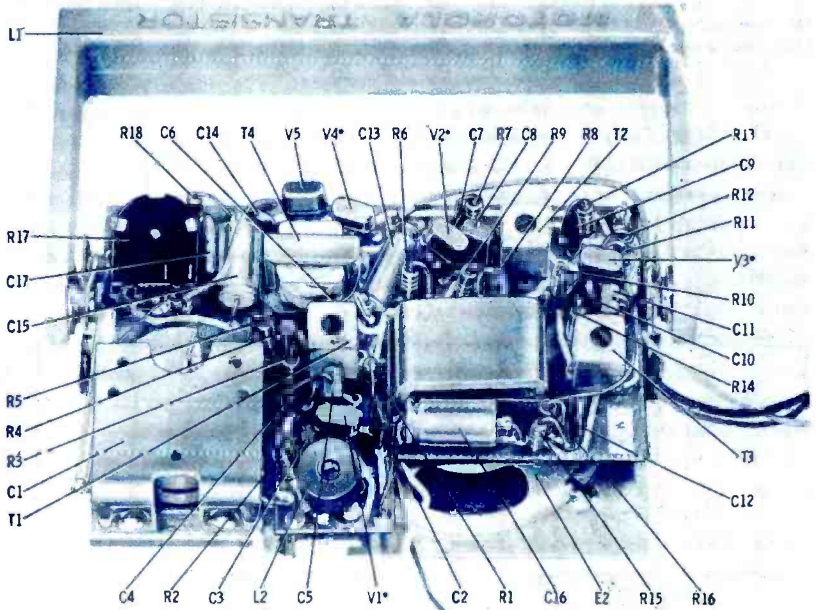
STEP	GENERATOR CONNECTION	GENERATOR FREQUENCY (400 cycle mod)	GANG SETTING	ADJUST	REMARKS
IF ALIGNMENT					
1.	Ant section of gang thru .1 mf capacitor & ground braid	455 Kc	Fully open	1, 2 and 3	Adjust for maximum.
RF ALIGNMENT					
2.	Radiation loop*	1620 Kc	Fully open	4	Adjust for maximum.
3.	Radiation loop*	1400 Kc	Tune for max	5	Adjust for maximum.
NOTE: Do not perform the following steps unless the oscillator core has been tampered with or associated components have been replaced. BEFORE PROCEEDING SET OSCILLATOR TRIMMER 1/4 TURN FROM ITS TIGHT POSITION.					
4.	Radiation loop*	530 Kc	Fully closed	6	Adjust for maximum.
5.	Radiation loop*	1620 Kc	Fully open	4	Adjust for maximum.
6. Repeat steps 4 and 5 until oscillator covers required range; step 5 should be last adjustment					
7.	Radiation loop*	1400 Kc	Tune for max	5	Adjust for maximum.

*Connect generator output across 5" diameter, 5 turn loop and couple inductively to radio loop. Keep loops at least 12" apart.



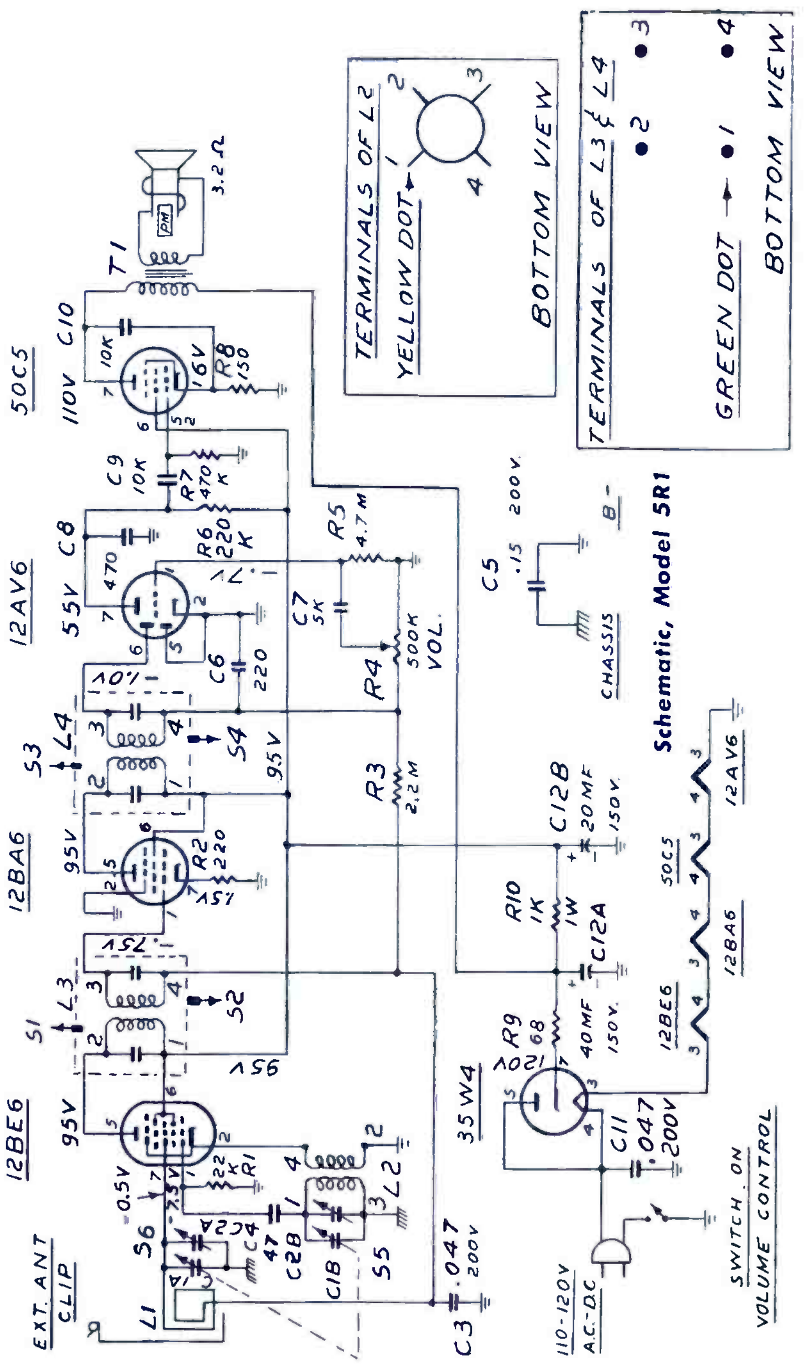
GANG TRIMMER ADJUSTMENT TOOL DETAIL

ALIGNMENT ADJUSTMENTS LOCATIONS



*See TRANSISTOR COMPLEMENT under GENERAL INFORMATION

PACKARD BELL
Table Model Radio
Model 5R1



Socket voltages measured as follows:

1. Line voltage, 117 volts AC.
2. Volume control at maximum.
3. VTVM between socket terminal and B minus bus.
4. Only DC voltages measured. Allow 10% tolerance.

SPEAKER DATA:

Type, permanent magnet dynamic
Cone diameter, 4 in.
Voice coil impedance, 3.2 ohms at 400 cycles
Magnet rating, 0.68 oz. Alnico V

SPECIAL SERVICING INFORMATION:

DC RESISTANCE MEASUREMENTS:

1st I-F Coil:
Primary, 12 ohms
Secondary, 13 ohms

2nd I-F- Coil:
Primary, 13 ohms
Secondary, 13 ohms

Oscillator Coil:
Primary, 1 ohm
Secondary, 5.5 ohms

Loop Antenna:
Resistance, 1 ohm

OSCILLATOR CATHODE VOLTAGES:

(Measured using AC vacuum tube voltmeter with an input impedance of more than 10 megohms. Line voltage 117 volts AC.)

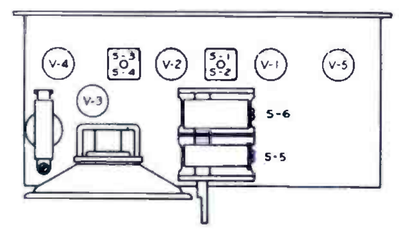
1500 Kc. 2.6 volts AC (rms)
1000 Kc. 2.3 volts AC
750 Kc. 2.1 volts
540 Kc. 2.0 volts

ALIGNMENT PROCEDURE:

The alignment of the set is accomplished by following the steps in the chart below. Connect output meter to speaker voice coil. Use isolation transformer, if available, for shock protection.

Each adjustment should be made using a minimum input signal. Connect test oscillator through a .01 mfd capacitor to the point indicated below. Ground lead of oscillator is connected to B minus bus.

STEP	CONNECT TEST OSCILLATOR TO	TEST OSCILLATOR FREQUENCY	RADIO DIAL SETTING	ADJUST
1.	Pin 1, V-1 (12BE6)	455 Kc.	540 Kc.	S-1, S-2, S-3, & S-4 for MAX.
2.	Antenna Clip	1620 Kc.	1620 Kc.	S-5 for MAX.
3.	Antenna Clip	1500 Kc.	Tune to Osc. Signal	S-6 for MAX.



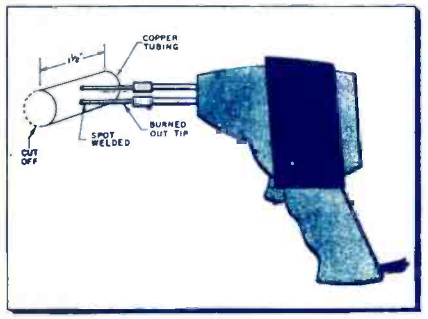
Technician
CIRCUIT DIGEST

Shop Hints

Heat for Intermittents

When heat is applied to a chassis, as with a lamp, to make an intermittent component break down, there is always the danger of damaging other parts. However, there is a way to concentrate heat on individual suspected components.

We took a burned out tip from a soldering gun and spot welded to it a half shell made from a length of ¾-in. copper tubing. The length of tubing used was 1½ in. The accompanying figure shows the completed job, with the tip replaced in the soldering gun. Different sizes and lengths of tubing can be made up on different tips, as required.



When using this device to concentrate heat on a suspected component, note that even a good part will break down if heat is applied too long. Only a few seconds are necessary if the component is intermittent to start out with.—*Joseph F. Valenti, Bronx, N.Y.*

Screw Replacement Trick

Replacing screws in hard-to-reach places on the chassis usually takes a great deal of time and patience. One way to save on both is simply to scrape a little wax from a paper condenser in the set itself. The wax is pushed into the slot of the screw, and the screwdriver is then inserted in the slot. This fastens the driver and the screw to each other very well, and makes it simple to guide the screw into its proper place without losing it.

A similar trick works just as well on a hex-head screw as it does on slotted-head screws. Put a little wax along the outer edge of the head before slipping it into a spin wrench. The screw, which is now prevented from dropping out of the wrench, is easily maneuvered into its hole.—*Richard Nowak, Maumee, Ohio.*

Soldering to Lugs

We all have trouble, at one time or another, in trying to solder a new wire to the hole in a soldering lug, or in trying to replace wires or leads in such a soldering lug, where there are already several wires using the same terminal point. This difficulty can be overcome by the use of an ice-pick. The pick is shoved through the hole in the lug or terminal while the heat of the soldering iron is being applied, and it is kept in position as the tie point is permitted to cool. After the terminal has cooled, the pick is withdrawn. This leaves a well, and makes it simple to guide convenient round hole of good size, large enough to feed a couple more wires through.—*George E. Mancini, Methuen, Massachusetts.*

TABLE OF REPLACABLE PARTS

To be assured of genuine Packard-Bell replacement parts, order by the Packard-Bell part number from your nearest Packard-Bell Service Division. Main office 1101 So. Hope St., Los Angeles 15. Over thirty branches in principal western cities. Consult your telephone directory.

CAPACITORS

Notes: Tubular paper capacitors have molded case; tolerances are RETMA standard.
Ceramic capacitors have a 20% tolerance.

REFERENCE SYMBOL	DESCRIPTION	PACKARD-BELL PART NUMBER
C-1 (A & B)	Variable, 2 gang	
C-2 (A & B)	with trimmers	23528D
C-3	Paper, .047 mfd 200 volt	23705
C-4	Ceramic, 47 mmf 350 volt	23912
C-5	Paper, .15 mfd 200 volt	23708
C-6	Ceramic, 220 mmf, 350 volt	23915
C-7	Ceramic, 5000 mmf disc	23931
C-8	Ceramic, 470 mmf 350 volt	23916
C-9	Ceramic, 10,000 mmf disc	23939
C-10	Same as C-9	
C-11	Same as C-3	
C-12 (A & B)	Electrolytic, 40-20 mfd 150 volt	24090

INDUCTANCES

L-1	Loop Antenna	29331
L-2	Oscillator Coil	29229A
L-3	First I-F Coil	29077
L-4	Second I-F Coil	29078

TRANSFORMER

T-1	Output, 2500 to 3.2 ohms	89417A

RESISTORS

Rating ½ watt except as noted.

R-1	Composition, 22,000 ohms, 20%	73141
R-2	Composition, 220 ohms, 10%	73017
R-3	Composition, 2.2 megohms, 20%	73165
R-4	Variable, 500,000 ohms w/switch	25027
R-5	Composition, 4.7 megohms, 20%	73169
R-6	Composition, 220,000 ohms, 20%	73153
R-7	Composition, 470,000 ohms, 20%	73157
R-8	Composition, 150 ohms, 20%	73115
R-9	Composition, 68 ohms, 20%	73111
R-10	Composition, 1000 ohms, 1 watt, 20%	73325

MISCELLANEOUS PARTS

Cabinet, specify color	21131A
Cord, AC power, 6 ft.	32011
Dial	38150
Knob, Volume (specify color)	52083
Knob, Tuning (specify color)	52082
Socket, Miniature 7-pin	79126
Speaker, 4 inch	83014

PACKARD BELL
Table Model Radio Model 5R1

Technician **CIRCUIT DIGEST**

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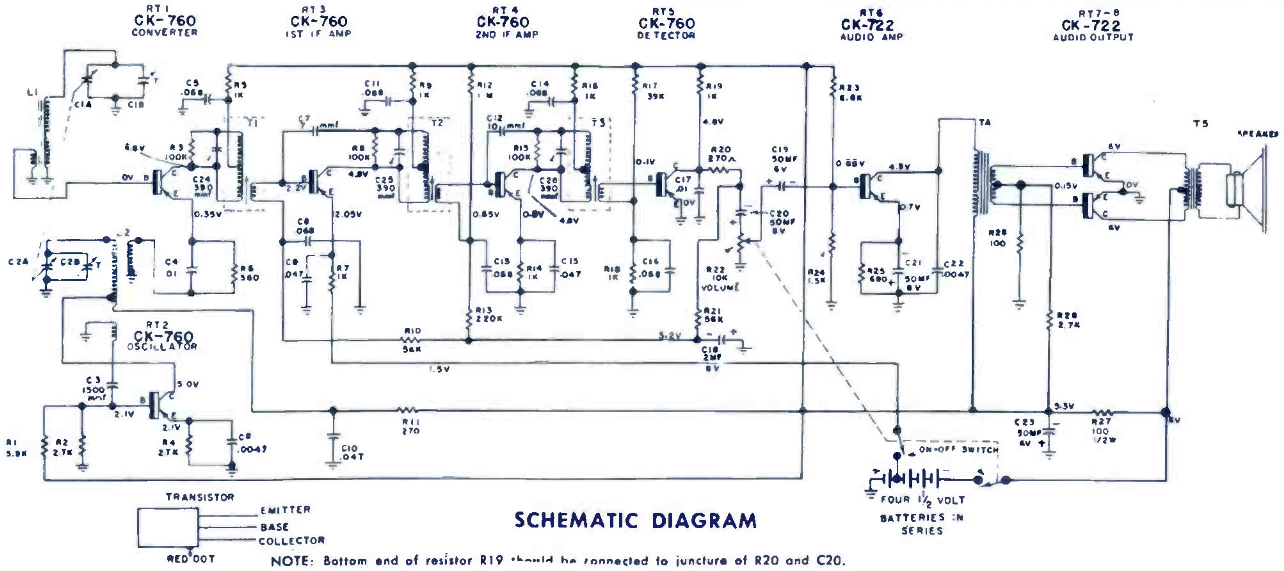
TECHNICIAN CIRCUIT DIGESTS

NOTE: UNLESS OTHERWISE SHOWN, RESISTOR VALUES ARE IN OHMS AND ARE 1/3 WATT.

CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHER OTHERWISE SHOWN.

DC VOLTAGE READINGS TAKEN UNDER NO SIGNAL CONDITIONS WITH BATTERY VOLTAGE – 6VDC. VOLTAGES AT TRANSISTOR SOCKETS WILL VARY SLIGHTLY WITH TRANSISTOR CHANGES.

USE ONLY VTVM



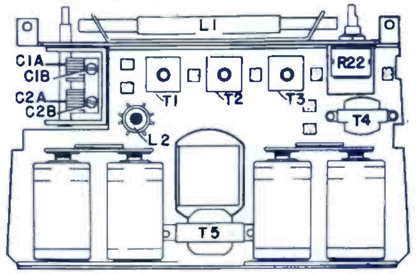
SCHEMATIC DIAGRAM

NOTE: Bottom end of resistor R19 should be connected to juncture of R20 and C20.

ALIGNMENT PROCEDURE

	SIGNAL GENERATOR FREQUENCY	COUPLING CAPACITY	CONNECTION TO RADIO	GROUND SIDE	OUTPUT METER	GANGED CAPACITY	ADJUST FOR MAXIMUM OUTPUT IN METER.
I.F.	455KC	.5MF.	to Base of RT1	To Chassis	Connected in place of speaker		Top cores of T3, T2 & T1
Repeat above step two or three times for best results, keeping generator output in all cases as low as possible as to prevent overloading of audio.							
Osc.	1620KC	.5MF.	To base of RT1	To Chassis	Connected in place of speaker	Open Gang (Fully clockwise)	Adjust C 2B
Caution: Too high an input from signal generator may cause setting of trimmer on a spurious response.							
Ant.	1400KC.	Connect 3 turn loop to generator and place near loop on receiver.			Connected in place of speaker	Ganged Condenser should be rocked.	Adjust C 1B
Check for alignment and dial calibration at 1000 KC and 600KC.							

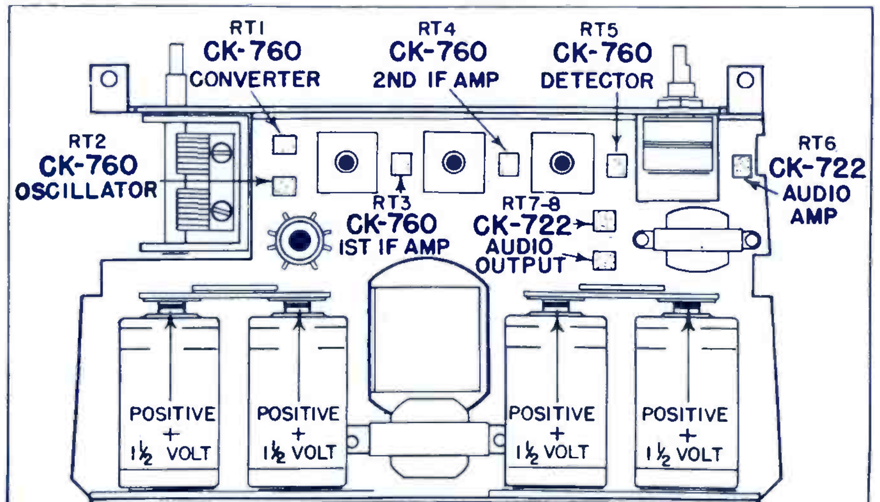
NOTES:
1. Turn Volume Control off. (Full counter-clockwise)
2. Use output meter with 15 ohms impedance
3. Insert four size "D" cells in proper positions. (Positive side towards top of chassis)
4. Turn Volume Control on. (Full clockwise position)
5. Signal generator output at 100 microvolts, 30% modulation at 400 cycles.
6. Both knobs must be in place.



TRANSISTOR REPLACEMENT

If a Transistor is suspected of being defective, substitution will be the only reliable check. When inserting a Transistor in its socket, the Red Dot on the Transistor must line up with the dimple on the socket. Do not rearrange placement of Transistors; under certain circumstances, especially in the RF section, slight realignment may be required when a Transistor substitution is made. If a component is replaced which must be soldered to the transistor socket, remove the Transistor from its socket before soldering. Excessive heat may damage the Transistor.

When checking receiver with an ohmmeter remove all transistors for accurate readings.



REPLACE ONLY WITH 1½ VOLT FLASHLIGHT BATTERIES OR MERCURIC OXIDE BATTERIES FOR LONGER LIFE.

TRANSISTOR LOCATION

DWG. NO. 1224

BATTERY REPLACEMENT

Since the receiver is small and compact, four batteries supply all the required power. When replacement is necessary, replace with type "D", 1½ volt, flashlight batteries, the same as used in any ordinary flashlight or for longer battery life, the mercuric oxide type batteries can be used. Remove back cover and replace all four old batteries by pulling straight out and insert new batteries with positive terminal (+) up as indicated in the accompanying diagram.

Approximately 500 hours performance can be experienced with ordinary flashlight batteries corresponding to approximately 2500 hours on mercuric oxide batteries. Battery replacements should be performed when the sound output is noticed to be muffled or distorted with a decrease in total output.

It is suggested that all four batteries be replaced at the same time.

Chassis 8RT1: Models 8TP1, 8TP2, 8TP3, 8TP4

RAYTHEON
Transistorized Portable Radio Chassis 8RT1

Technician **CIRCUIT DIGEST**

130

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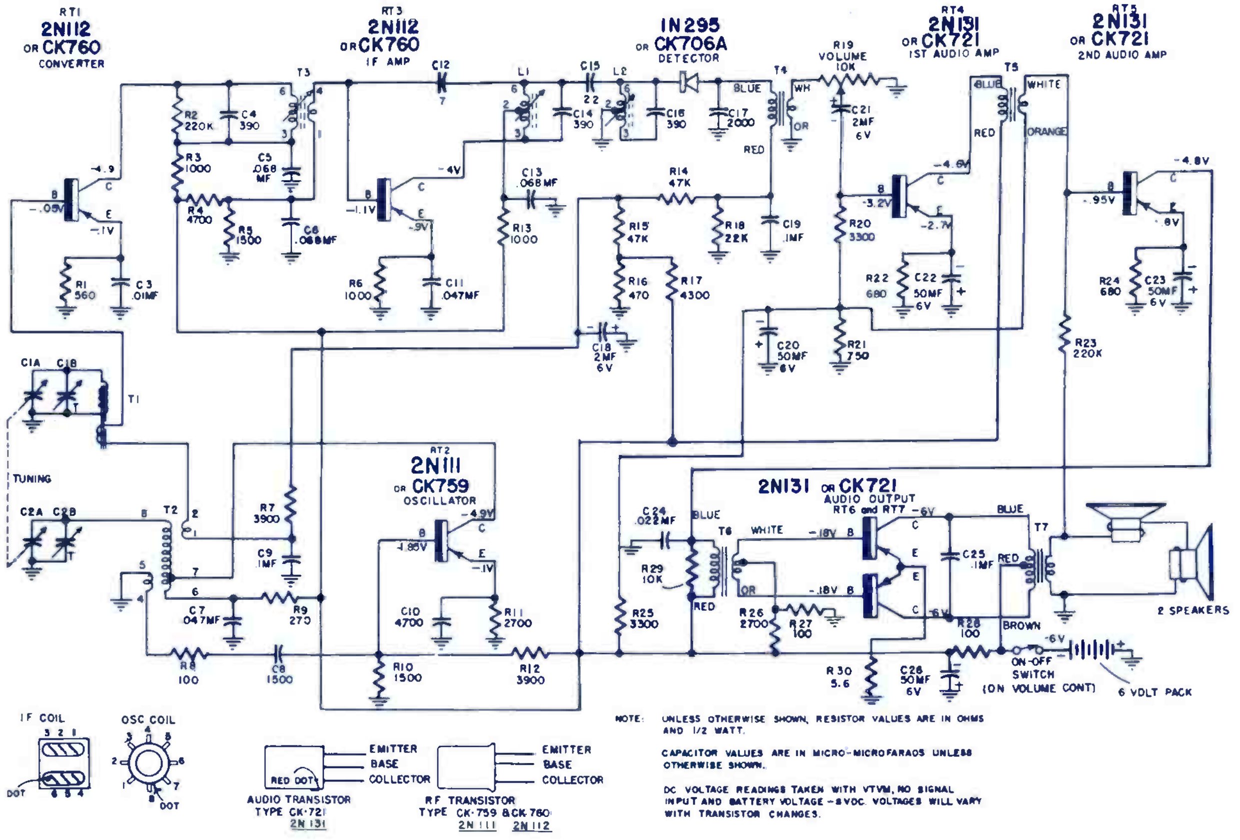
RAYTHEON
Transistor Portable Radio
Chassis 7RT4

Chassis 7RT4: Model T-2500



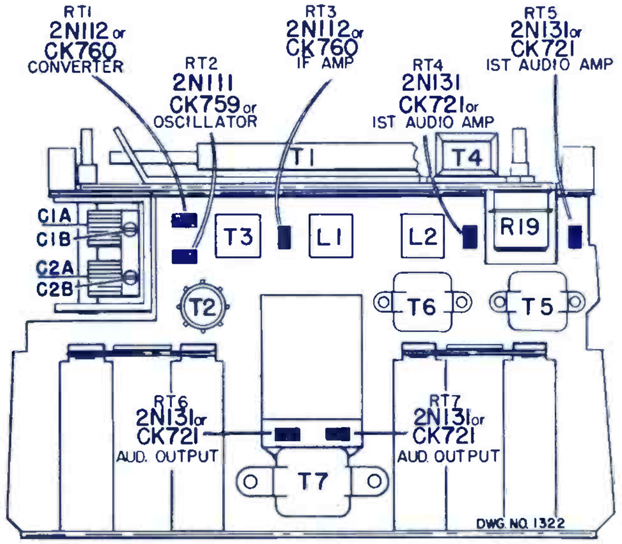
NOTE: UNLESS OTHERWISE SHOWN, RESISTOR VALUES ARE IN OHMS AND 1/2 WATT.

CAPACITOR VALUES ARE IN MICRO-MICROFARADS UNLESS OTHERWISE SHOWN.

DC VOLTAGE READINGS TAKEN WITH VTVM, NO SIGNAL INPUT AND BATTERY VOLTAGE — 6 VDC. VOLTAGES WILL VARY WITH TRANSISTOR CHANGES.

NOTE: Oscillator coil connections 1 and 2 are reversed.

SCHEMATIC DIAGRAM



Transistor Location

ALIGNMENT PROCEDURE

NOTES:
1. Turn Volume Control off. (Full counter-clockwise).
2. Use output meter with 15 ohms impedance.
3. Insert 6 volt battery pack or four size "D" cells in proper position.
4. Turn Volume Control on. (Full clockwise position).
5. Signal generator output at 100 microvolts, 30% modulation at 400 cycles.
6. Both knobs must be in place.

	SIGNAL GENERATOR FREQUENCY	COUPLING CAPACITY	CONNECTION TO RADIO	GROUND SIDE	OUTPT METER	CAPACITY GANGED	ADJUST FOR MAXIMUM OUTPUT IN METER
I.F.	455 KC.	.5 MF.	To Base of RT1	To Chassis	Connected in place of Speaker	—	Top cores of T3, L1 & L2
Repeat above step two or three times for best results, keeping generator output in all cases as low as possible to prevent overloading of audio.							
OSC.	1620 KC.	.5 MF.	To Base of RT1	To Chassis	Connected in place of Speaker	Open Gang (Fully clockwise)	Adjust C2B
CAUTION: Too high an input from signal generator may cause setting of trimmer on a spurious response.							
ANT.	1400 KC.	Connect 3 turn loop to generator and place near T1.			Connected in place of Speaker	Ganged Condenser should be rocked.	Adjust C1B
Check for alignment and dial calibration at 1000 KC. and 600 KC.							

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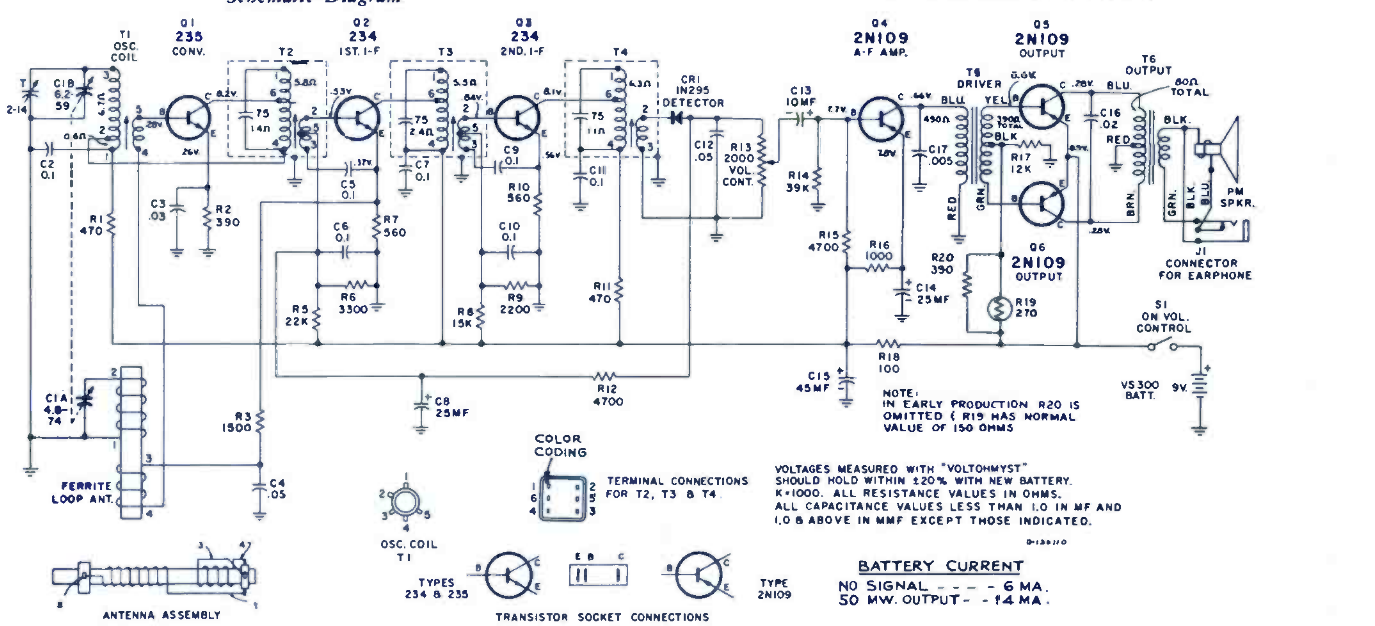
TECHNICIAN
CIRCUIT DIGEST

RCA VICTOR
Transistor Portable Radio
Chassis RC-1159

Chassis RC-1159: Model 7-BT-9J

Schematic Diagram



NOTE:
IN EARLY PRODUCTION R20 IS OMITTED & R19 HAS NORMAL VALUE OF 150 OHMS

VOLTAGES MEASURED WITH "VOLTOHMYST" SHOULD HOLD WITHIN ±20% WITH NEW BATTERY.
K=1000. ALL RESISTANCE VALUES IN OHMS.
ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF AND 1.0 & ABOVE IN MMF EXCEPT THOSE INDICATED.

BATTERY CURRENT

NO SIGNAL - - - - 6 MA.
50 MW. OUTPUT - - 14 MA.

DESCRIPTION

The "Transistor Six" is, as its name implies, a radio receiver using six transistors instead of vacuum tubes. A superheterodyne circuit is used consisting of: converter, two stages of I-f amplification, crystal diode detector, audio driver and push-pull class-B output. A 2¾" speaker is used for normal listening; a jack for earphone connection is provided when use is desired without disturbing nearby persons.

A printed circuit type of chassis is used to obtain light weight and compact size. The complete receiver including batteries weighs approximately one pound and is designed to be carried in a coat pocket. The case is two-tone aluminum and gray, and is made of non-breakable "Impac."

Power is obtained from a 9-volt battery having a life expectancy of 75 hours. The volume control circuit is designed to provide a high minimum volume level and thus minimize possibility of the set being turned on when not in use.

SERVICE HINTS

Extreme care should be used to avoid accidental shorting of transistor elements to circuit ground. This is especially true of the output transistors; if the junction of R-17-R19 should be accidentally grounded for a few seconds, the output transistors would be permanently damaged.

It is possible to damage a transistor when testing circuit continuity. Since a transistor needs only low voltage applied to its terminals for conduction, testing continuity of a circuit which includes a transistor can result in misleading continuity indications. To avoid transistor damage and misleading continuity indications, remove the transistor from its socket before making continuity tests of its circuit.

1. The first thing to check when the receiver is inoperative, is the battery. With the receiver turned on, a new battery should show 9 volts although the receiver can be expected to operate on any battery which checks between 6 volts and 9 volts.
2. To check for a circuit defect which would cause excessive battery drain, an overall current measurement and supplementary voltage measurements should be made. For reasons explained below, continuity measurements can be misleading.
3. Signal tracing by injection of a signal from a signal generator is done on transistor radios in exactly the same manner as has been done for many years with the conventional vacuum tube radios. The signal generator should be connected (as in past practice) in series with a capacitor to avoid shorting out bias voltages. With the transistors used in this receiver, the BASE is the signal input terminal (corresponding to signal grid of tubes), the COLLECTOR is the signal output terminal (corresponding to plate of tubes), and the EMITTER is the common terminal (corresponding to cathode of tubes).
4. The "Class B" output used in this receiver is a system which, although not new, has been seldom used in home radios for the past several years. It should be noted that in "Class B" output the battery current increases noticeably with increased signal input.
5. The polarity of the AVC voltage measured at the volume control end of CR1 will be slightly positive with no signal input. The negative voltage developed with signal input will not harm electrolytic capacitor C8.
6. Application of a signal from a signal generator to the input (B) of Q1 will stop oscillator action (R-F signal can not be injected at this point although 455 kc I-F signal can be injected).
7. Oscillator performance can not be judged by measurement of a d-c voltage developed across a resistor. Measurement of oscillator signal strength with an a-c voltmeter at the input of Q1 (base contact) will give an indication of oscillator performance.
8. Voltage measurements should be made only with a sensitive voltmeter, such as an RCA VoltOhmyst®.
9. Interchanging transistors in the I-F stages may necessitate realignment.
10. A transistor should always be removed from its socket before using a soldering iron on socket terminals.

ALIGNMENT PROCEDURE

Output Meter Alignment—If this method is used, connect the meter across the voice coil and turn the receiver volume control to maximum.

Test Oscillator—For all alignment operations, connect the low side of the test oscillator to the "common negative" wiring and keep the oscillator output as low as possible to avoid AVC action.

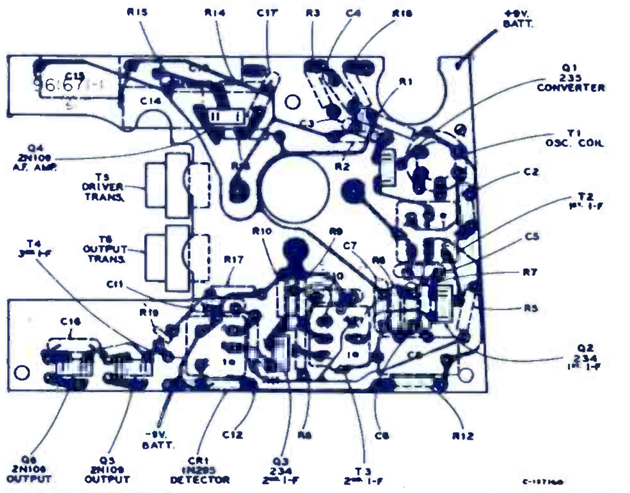
Step	Connect High Side of Sig. Gen. to —	Sig. Gen. Output	Dial Pointer Setting	Adjust for Max. Output
1	#2 terminal of ant. assembly L1	455 kc	Quiet point near 1600 kc	T4 3rd I-F T3 2nd I-F T2 1st I-F
2		Repeat Step 1		
3	Short wire placed near antenna for radiated signal	1400 kc	1400 kc rock gang	trimmer* C1-B (osc.)
4		600 kc	600 kc rock gang	T1 osc. coil
5		Repeat Steps 3 and 4		

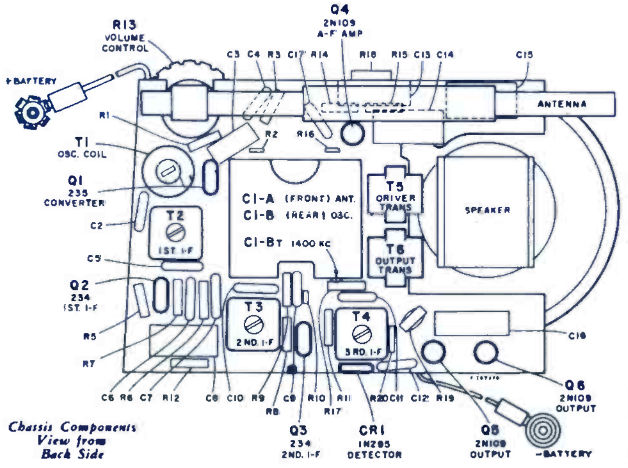
* Oscillator trimmer is located on bottom of gang.

The assembly represented above is viewed from the wiring side of the board.

The printed wiring, on the near side of the board, is presented in "phantom" view superimposed on the component layout of the reverse side.

Chassis Wiring and Components View from Wiring Side





Chassis Components View from Back Side

EARPHONE CONNECTION

Only a low impedance earphone (under 200 ohms) should be connected into the earphone jack. RCA accessory earphone Number RK-203 is recommended.

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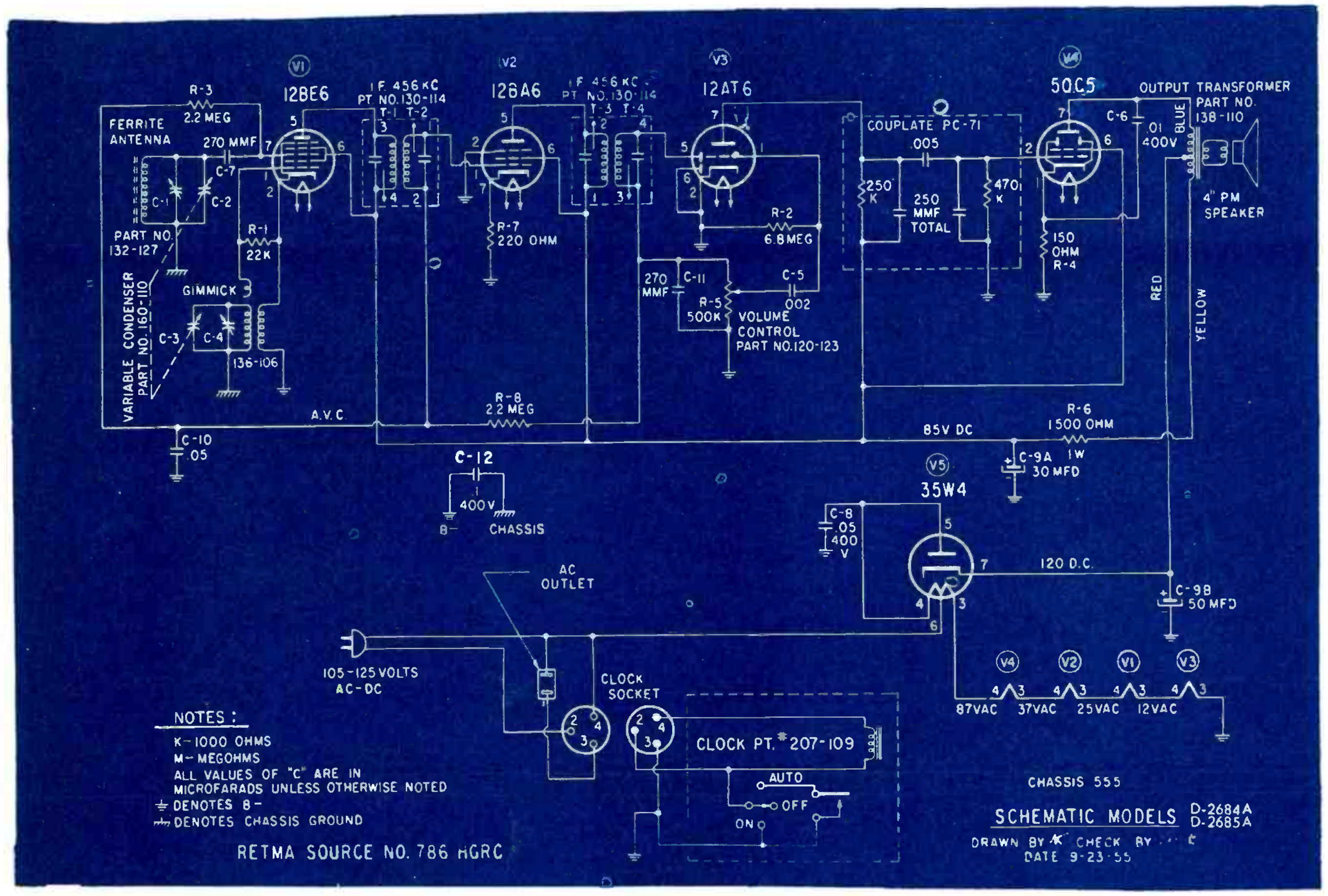
TECHNICIAN CIRCUIT DIGEST

TRUETONE
Table AM Radio
Models D2684A, D2685A



PRELIMINARY

ALIGNMENT PROCEDURE

Output meter connection .... Across 3.2 ohm speaker coil
Output meter reading to indicate 0.05 watt across speaker voice coil .... 0.4 volt
Generator Modulation .... 30%, 400 cycles
Position of volume control .... maximum (fully clockwise)
Position of pointer with Rotor full open (Plates out of mesh) ....

	POSITION OF VARIABLE	SIGNAL GENERATOR FREQUENCY	DUMMY ANTENNA	CONECTION TO RECEIVER	GND. CONN.	TRIMMER ADJUSTMENTS (in order shown)
IF	ROTOR FULL OPEN (Plates out of mesh)	455 kc.	.05mfd.	Stator of RF section of var. condenser	B-	Top and Bottom Slugs of IF Cans T1 T2 T3 and T4
	ROTOR FULL OPEN (Plates out of mesh)	1650 kc.		Stator of RF section of var. condenser	B-	Oscillator Trimmer C4
RF	1500 kc.	1500 kc.		Fashion loop of several turns of wire and radio sig. into loop of receiver adj. for max. output.		RF Trimmer C1
	600 kc.	600				Check Point

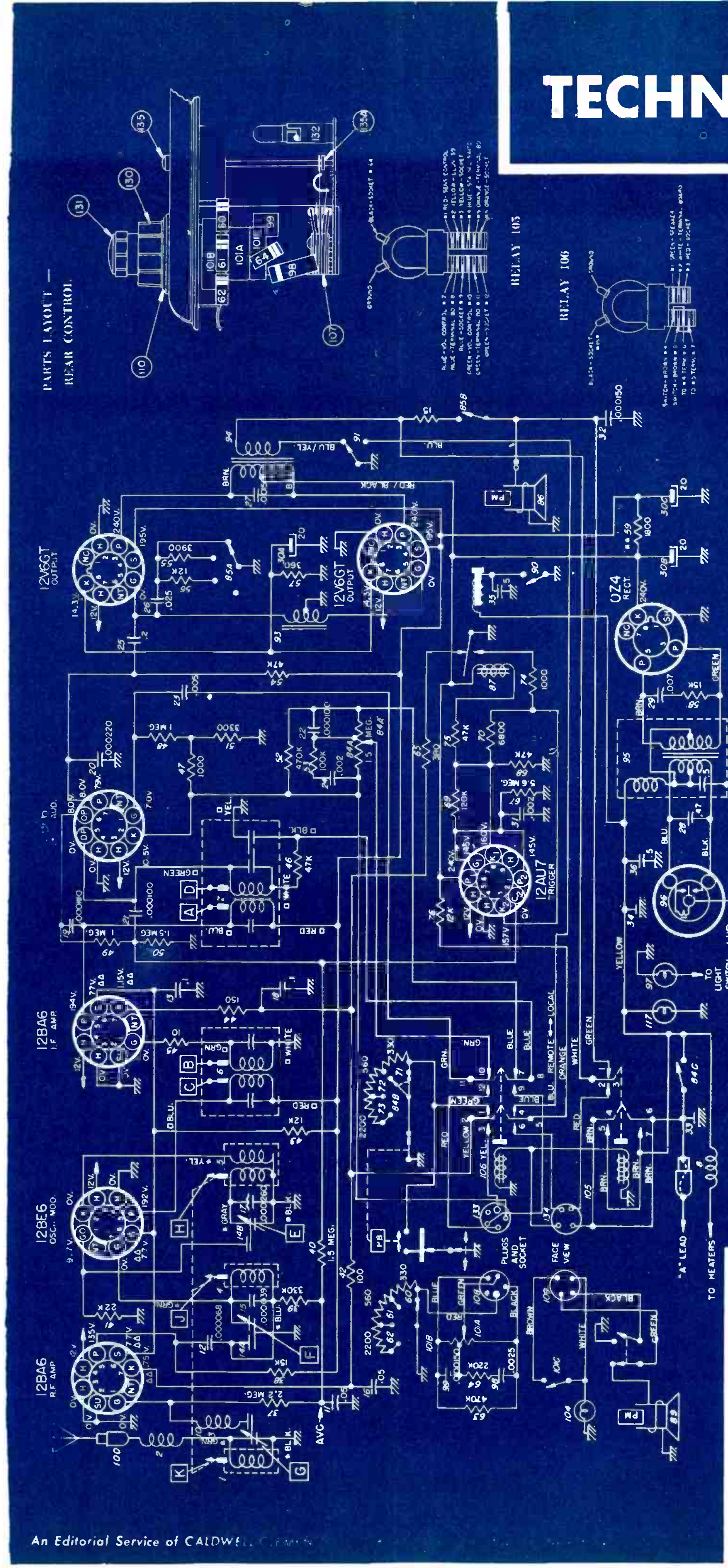
Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

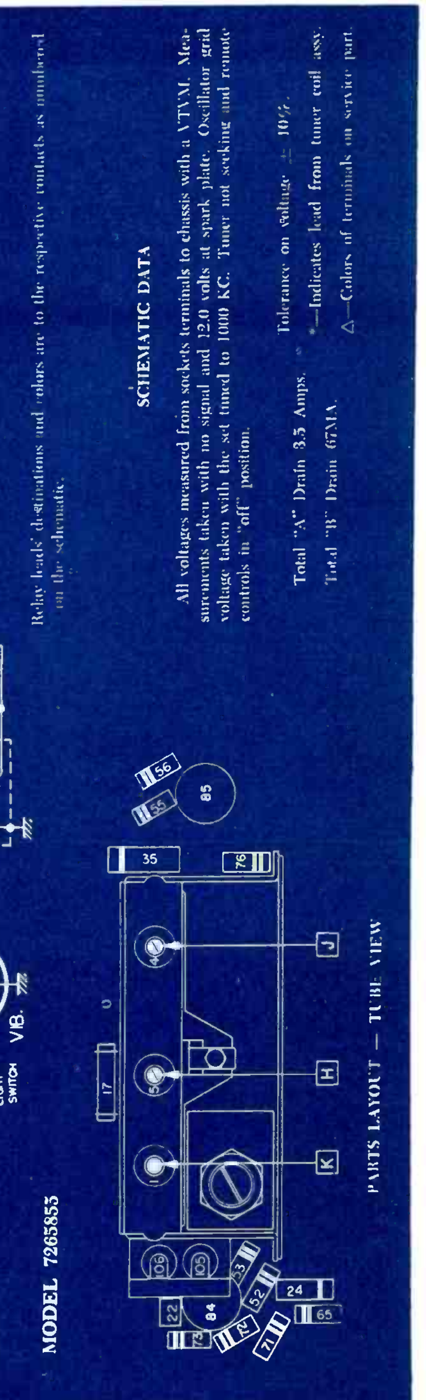
The alignment procedure should be done in the order given for greatest accuracy.

Always keep the output from the generator at its lowest possible value.

Use isolation transformer, if available, if not use .1 MFD in series with B-and low side of signal generator.

TECHNICIAN CIRCUIT DIGESTS

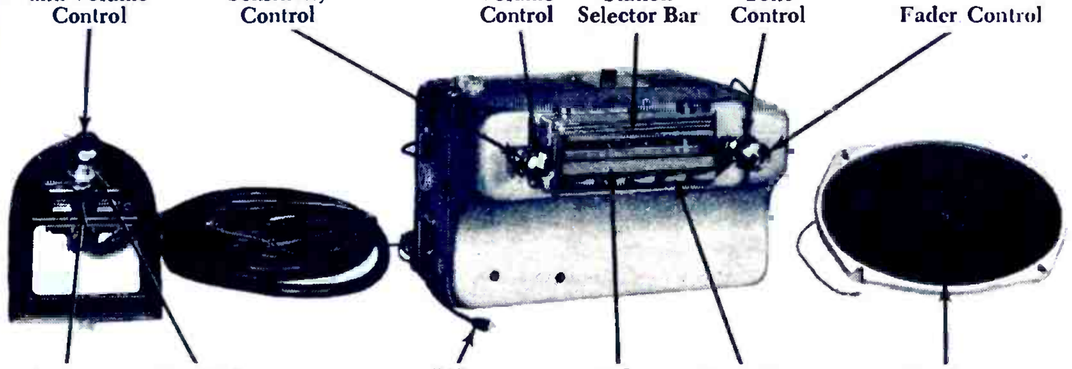




Model 7265855 (Cadillac)

UNITED MOTORS SERVICE (Div. GMC)
Auto Radio

UNITED MOTORS SERVICE (Div. GMC)
Auto Radio
Technician
CIRCUIT DIGEST



MODEL 7265855

GENERAL

MOUNTING—1955 Cadillac 75 Series Cars.

TUBES—Seven, Plus Rectifier and Trigger.

SPEAKER—6" x 9" Elliptical, Permanent Magnet, Front — 6" x 9" Elliptical, Permanent Magnet, Rear.

TUNING—Electronic, Push Button.—Series F-L

ANTENNA TRIMMER COMPENSATION — 0.000060 - 0.000085 Mfd.

TUNING RANGE—540 - 1600 KC.

FUNCTIONAL OPERATION

The Cadillac remote control signal seeker type radio has all the controls of the Cadillac Model 7265825 Radio for front seat operation and in addition has a control head mounted in the rear seat arm rest for rear seat operation. This remote control head has a switch, volume control, and station selector button.

After the rear seat control switch is turned on, only the rear controls operate the radio. The radio cannot be operated from the front seat again until the rear control switch is turned off. Two controls that can only be operated at the receiver are the tone control and the antenna control.

This radio operates from the front instrument panel in exactly the same manner as the 7265825 Model except for a front speaker switch on the right hand control knob. This switch is used only when the rear control is in operation, and it gives the front seat occupants the choice of listening at a reduced volume from normal output to the stations selected by the person operating the rear selector button or completely disconnecting the front speaker.

THEORY OF OPERATION

The energizing of relays, illustration numbers 105 and 106, is accomplished by turning the rear control switch (101C) to the "on" position. When this switch is turned on, the "A" voltage is applied across the relays, energizing the relays and closing the contacts to the rear controls. With the relays 105 and 106 energized, the rear seat controls are operative and not the front seat controls.

Once these relays are energized, the "A" supply is connected to the power transformer center-tap through contacts 4-5 and 6-7 of relay 106, regardless of the position of the front switch (84C); therefore the radio cannot be turned off until the relays are de-energized by turning off the rear switch (101C). With the relays in the de-energized position, all controls are operative at the receiver, while all remote controls in the rear arm rest are inoperative.

SERVICE PARTS LIST

Illus. No.	Service Part No.	Description
		Capacitors
36	6592	.5 mfd 100 V. tubular (†1219511)
98	1219865	.0025 mfd ± 10% 600 V. tubular
99	G-151	.000150 mfd ± 10% molded
		Resistors
60	1119	330 ohm ½ W. insulated
61	1122	560 ohm ½ W. insulated
62	1129	2200 ohm ½ W. insulated
63	1231	470,000 ohm ½W. insulated
64	1227	220,000 ohm ½ W. insulated
65	1194	390 ohm ½ W. insulated
		Miscellaneous
85	7264701	Control, tone, front speaker
85A		Tone
85B		Front speaker
89	7262245	Speaker, 6 x 9 elliptical rear
101	7263514	Control, volume, sensitivity and switch remote unit
101A		Volume
101B		Sensitivity

Illus. No.	Service Part No.	Description
		Miscellaneous
101C		Switch
105	7263470	Relay, 3 section
106	7263471	Relay, 4 section
107	7259012	Switch, station selector
		Mechanical Parts
	7264771	Cable, rear seat
108	1219679	Plug and shell package
109	1219682	Plug and shell package
110	1459670	Escutcheon, sensitivity control
130	1459673	Knob, sensitivity control
131	1459925	Knob, control
132	1219686	Socket package, light
133	7259943	Socket, cable
134	7259944	Socket, cable
135	1219687	Station selector button package
		Push button assembly
135A	7259125	Retaining ring
		Washer
		Felt washer
		"C" washer

† Part number printed on original part.

TECHNICIAN
CIRCUIT DIGESTS

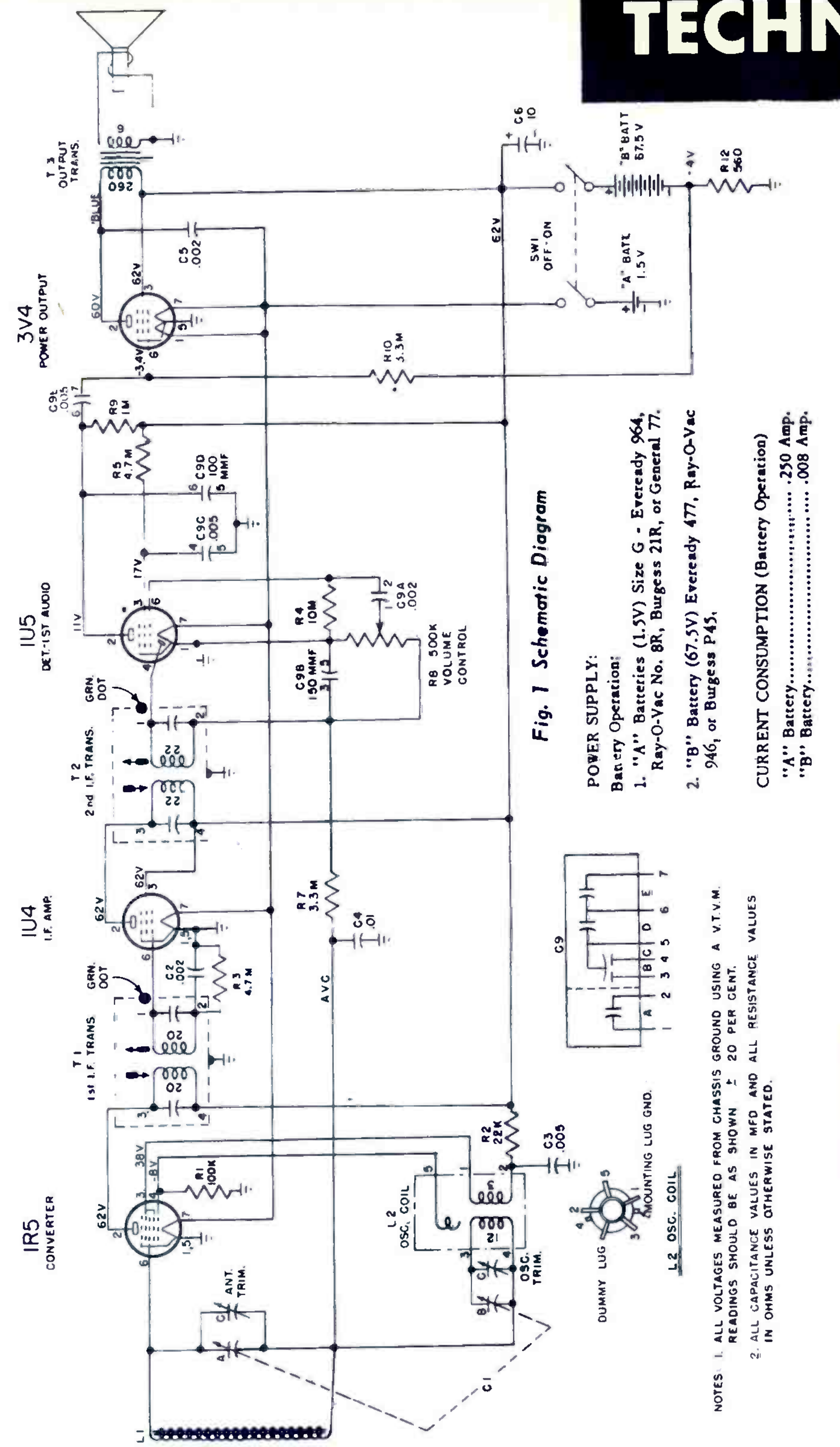


Fig. 1 Schematic Diagram

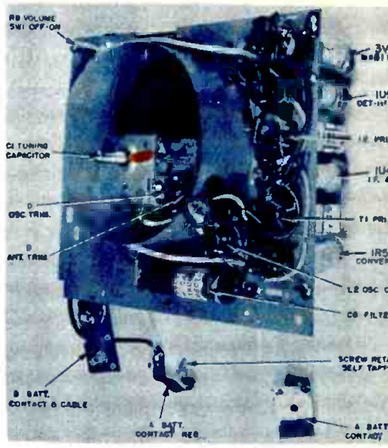


Fig. 2 Bottom View of Chassis

OPENING THE BACK COVER

To open the back cover insert the edge of a coin into the slot in the top of the cabinet, behind the handle and twist the coin.

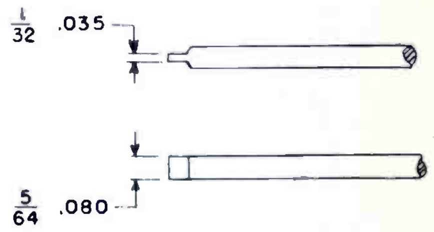


Fig. 3 Alignment Tool

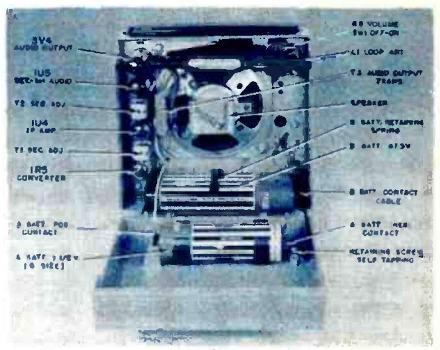


Fig. 4 Top View of Chassis and Batteries

ALIGNMENT

While making the following adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

Step	Connect Signal Generator	Signal Generator Frequency	Radio Dial	Adjust for Maximum Output
1	Stator of R-F tuning capacitor (A), through a .01 mfd. capacitor	455 kc.	Minimum capacity	Top and bottom slugs in 2nd and 1st I-F trans. in order given*
2	Radiated Signal	1600 kc.	Minimum capacity	Osc. trimmer (D)
3	Radiated Signal	1400 kc.	1400 kc.	Ant. trimmer (C)

*It is recommended that a fiber aligning tool that snugly fits the slot in the powdered iron core be used to prevent chipping of the slot. (See Fig. 3)

Chassis V-2237-2: Models H-511P4, H-512P4

WESTINGHOUSE
(Portable Radio)
Chassis V-2237-2

Technician
CIRCUIT DIGEST

TECHNICIAN CIRCUIT DIGEST

WESTINGHOUSE *Transistor Portable Radio Chassis V-2278-1*

CHASSIS V-2278-1: Models H-587P7, H-588P7, H-589P7

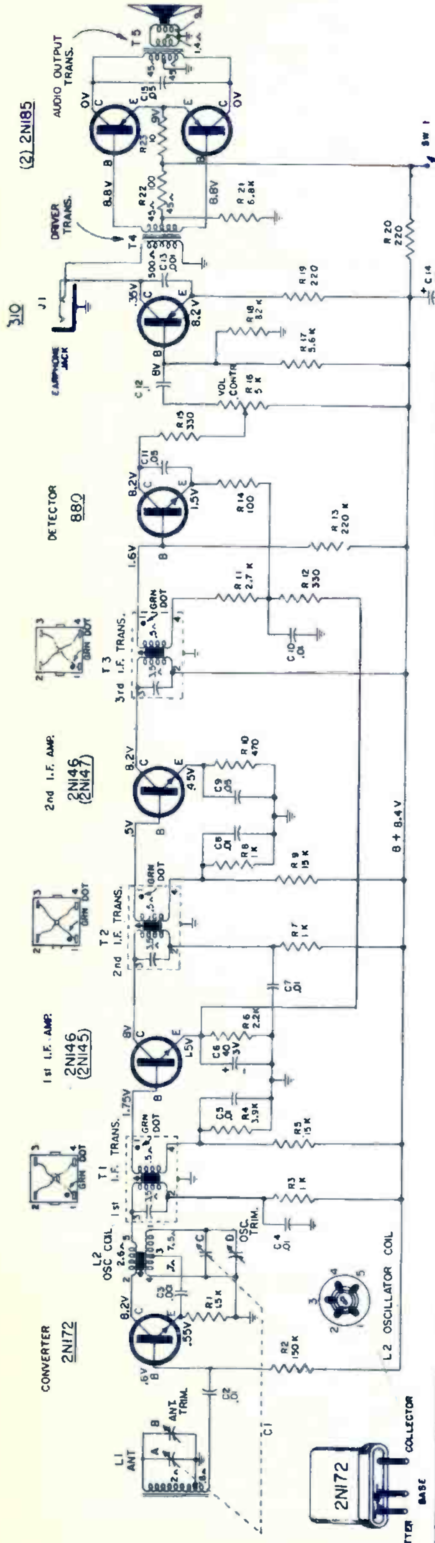
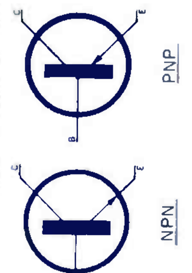


Figure 1 - Schematic Diagram

NOTE:
1. DURING SERVICING TOTAL BATTERY CURRENT SHOULD BE METERED. WITH NO SIGNAL AND VOLUME CONTROL AT MINIMUM TOTAL BATTERY DRAIN APPROX. 5 MA.
2. VOLTAGE MEASUREMENTS MADE WITH A V.T.V.M. FROM POINTS INDICATED TO GND. WITH TUNING CAPACITOR AT MAXIMUM, VOLUME CONTROL AT MINIMUM, BATTERY SOURCE AT 9 VOLTS.
3. ALTERNATE I.F. TRANSISTORS CAN BE USED. COMBINATIONS OF EITHER TWO 2N146 TRANSISTORS OR A 2N145 1st. I.F. AND A 2N147 2nd. I.F.
4. AUDIO OUTPUT TRANSISTORS 2N185 MUST BE MATCHED PAIRS.

JUNCTION TRANSISTORS

NO.	TYPE	FUNCTION
2N172	NPN	CONVERTER
2N145	NPN	I.F. AMPLIFIER
2N146	NPN	I.F. AMPLIFIER
2N147	NPN	I.F. AMPLIFIER
880	NPN	DETECTOR
310	PNP	AUDIO DRIVER
2N185	PNP	AUDIO OUTPUT



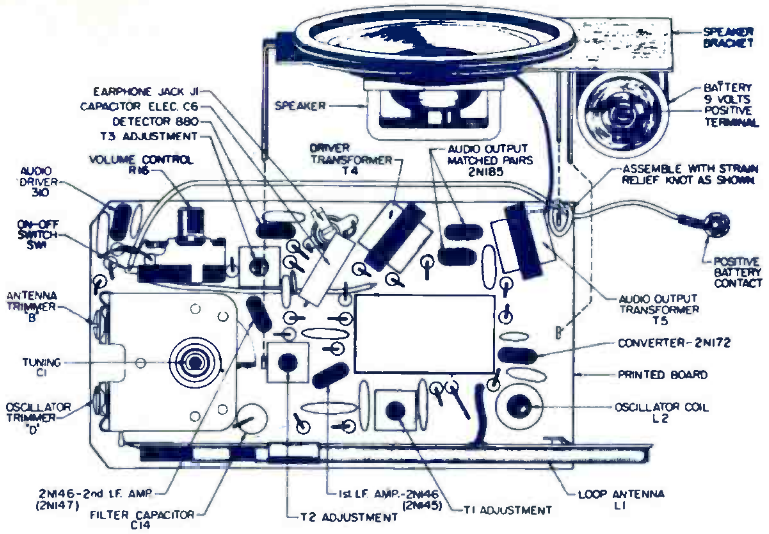


Figure 3 - Top View Parts Layout with Speaker Raised from Board

I.F. ALIGNMENT REQUIREMENTS

1. Unsolder the three feet and voice coil connection and remove the speaker bracket from the printed board.
2. Form a 4 or 5 turn loop of wire and connect across the signal generator output cable.
3. Signal generator capable of covering frequencies of 455 KC and the entire broadcast band with provisions for modulation.
4. V.T.V.M. or output meter.
5. Keep the output of the signal generator low enough just to give an indication on the V.T.V.M. or output meter. If the peak is broad or double peak occurs when rocking the I.F. slug adjustment, the signal generator output is excessive.

Either further decoupling of the generator loop or decreasing the generator output is necessary.

6. Set the volume control and tuning capacitor to maximum.

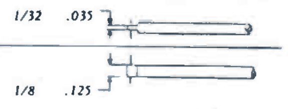
Loosely couple signal modulated from the generator to:	Generator frequency	Connect VTVM or output meter across the voice coil and and adjust
Loop L1	455 KC	T3, T2 and T1 in order indicated for max. output Reduce generator output if necessary for T2 and T1 adjustments *

R.F. ALIGNMENT REQUIREMENTS

1. Speaker bracket must be soldered in place for R.F. alignment.
2. Steps 2, 3 and 4 also apply as in the I.F. alignment.
3. Keep the output of the signal generator low enough just to give an indication on the V.T.V.M. or output meter.
4. Set the volume control to maximum.

Loosely couple modulated signal, from the generator to:	Generator Frequency	C 1 Setting	Connect VTVM or output meter across voice coil and adjust for max. output.
Loop L 1	1625 KC	Min.	Oscillator Trim. "D"
" "	1400 KC	1400 KC	Antenna Trim. "B"

Caution! Be sure during R.F. alignment that the hand or any objects on the bench do not come in close contact with the antenna loop or detuning will occur and alignment will be incorrect.



Alignment Tool

**It is recommended that a fiber aligning tool that snugly fits the slot in the ferrite core be used to prevent chipping of the slot.*

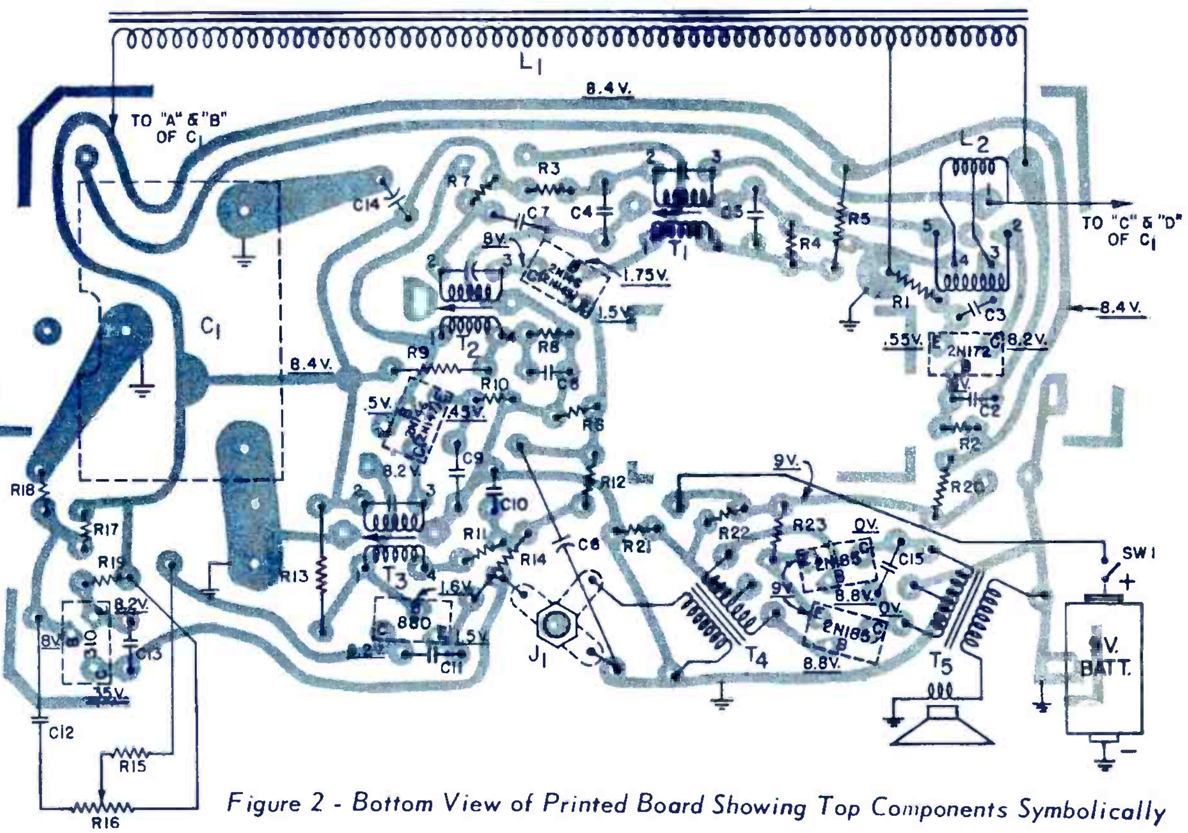


Figure 2 - Bottom View of Printed Board Showing Top Components Symbolically

GENERAL INFORMATION

The Models H-587P7, H-588P7, and H-589P7 are newly designed all transistor pocket size portable radios which will operate from a single nine volt battery.

Transistors used in these receivers have been carefully tested during manufacture and should give much longer service than the conventional electron tube.

SUGGESTED SERVICE HINTS

Before beginning service of these receivers it may be advantageous to have on hand smaller servicing tools, such as a small soldering iron (35 watts or less), tweezers and a small wire brush to clean away the excess solder.

For simple checks, such as voltages or resistances the back cover of the cabinet need only be removed by removing the screw located in the center of the back cover.

Figure 2 can be used in locating the pin orientation of the transistors and printed circuitry, and Figure 3 for locations of the components on top of the printed board.

The voltage measurements of an average receiver can be obtained from the schematic diagram Figure 1 or printed circuit chart Figure 2 and are measured with a VTVM. All voltage readings are taken with the tuning capacitor set for maximum capacity and the volume control at minimum. Battery voltage should be at nine volts.

Total battery current drain should be monitored at all times during servicing and should be, in a normal functioning receiver, with the above stipulations, approximately 5.5 milliamperes.

If all other circuit components have been checked and a faulty transistor is suspected, replacement of the transistor is the surest check. It is not advisable to check the transistors with an ohmmeter as damage to them can result. Transistors should not be soldered or unsoldered in the circuit when voltage is applied to the circuit.

The transistors themselves are very stable and have exceptionally long life. Too much heat applied, mechanical damage or application of improper voltages are the main causes of transistor failure. A fused transistor can be detected by its excessive current drain and the large voltage drop that appears across the resistor in the collector circuit.

When removing components from the printed board, including the transistors, care must be taken to avoid damaging the board.

Replacement of the converter transistor may require realignment of the oscillator and the antenna loop. For complete information refer to the RF alignment procedure.

Replacement of IF transistors usually will have no effect on the overall alignment. In some cases IF alignment may be affected. For proper IF alignment procedure refer to the section on IF alignment.

The 2N185 audio output transistors are matched pairs. Matched transistors clip the wave forms at equal levels above and below the zero reference point.

See Figure 4. A simple check can be made by applying a modulated RF signal to the antenna loop. (for proper coupling of R.F. signals to the receiver refer to the RF alignment). Connect the vertical input of an oscilloscope across the voice coil. Set the generator frequency to any clear spot within the broadcast band and the R.F. output at a strong signal level. Observe the sine wave on the oscilloscope. As the volume control is increased clipping should occur at equal amplitudes, above and below the zero reference, if the 2N185 transistors are matched.

The clipping occurs because the instantaneous potentials of the collector and the emitter of the 2N185 become equal at the peaks of the signal. Unequal clipping will cause an unbalance and distortion will be noticeably greater.

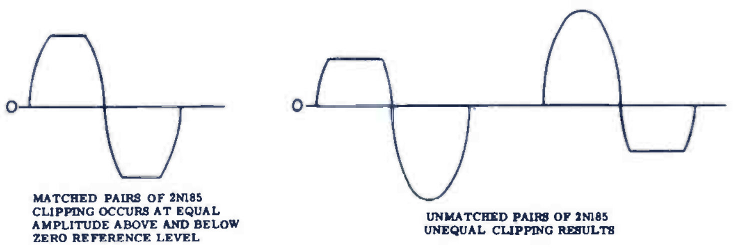
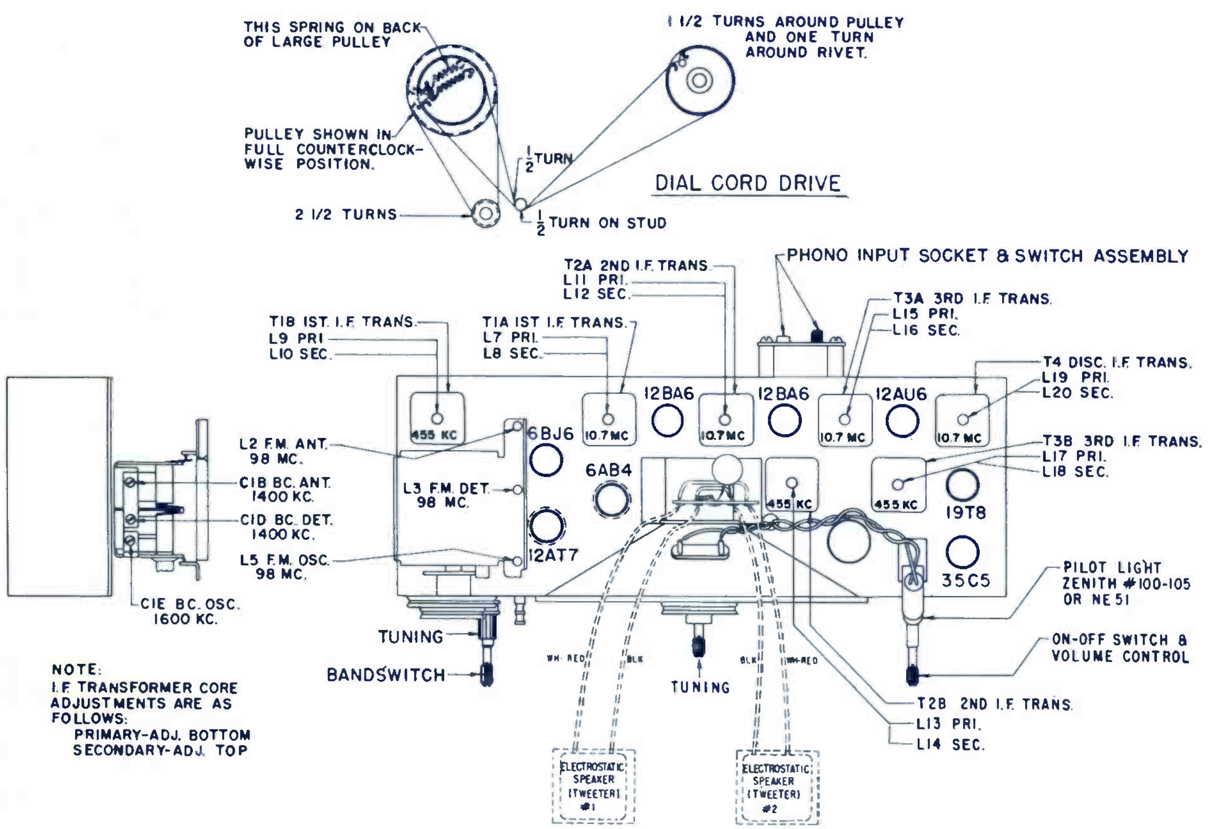


Figure 4 - sine wave output of matched and unmatched pair of 2N185's.

The 8Y02 chassis incorporates a superheterodyne circuit with two stages of IF, and one stage of RF amplification on all bands.

This receiver features an Automatic Frequency Control which keeps your receiver on the exact station frequency when you are tuned to an FM station. Turn the band switch to (FM AFC) position and tune the receiver.

TUBE AND TRIMMER LOCATION



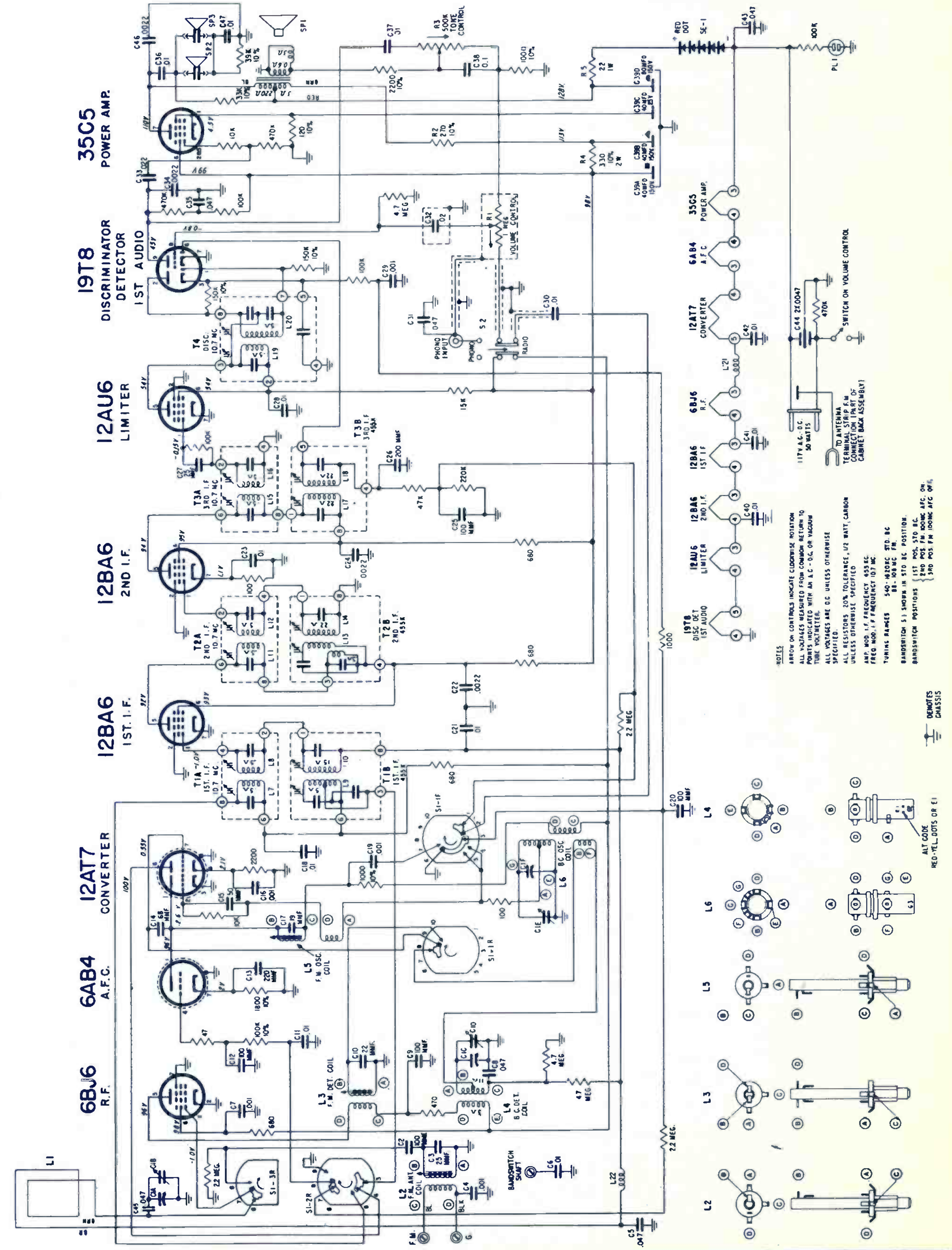
NOTE:
I.F. TRANSFORMER CORE ADJUSTMENTS ARE AS FOLLOWS:
PRIMARY-ADJ. BOTTOM
SECONDARY-ADJ. TOP

ALIGNMENT PROCEDURE

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	BAND	SET DIAL TO	ADJ. TRIMMERS	PURPOSE
1	Pin 7 12AT7 Converter	.05 Mfd.	455Kc Modulated	BC	600 Kc	L-9, 10, 13, 14, 17 and 18	Align I.F. channel for maximum output
2	2 turns loosely coupled to wavemagnet		1600 Kc Modulated	BC	1600 Kc	C1E	Set Oscillator to dial scale
3	2 turns loosely coupled to wavemagnet		1400 Kc Modulated	BC	1400 Kc	C1D and C1B	Align det. and ant. stages
4	IMPORTANT: Before attempting to align the FM portion of this receiver, the Band Switch must be in FM POSITION.						
5 (a)	Pin 1 (grid) on 12AU6 limiter	.05 Mfd.	10.7 Mc Unmodulated	FM		L 19 coil slug Primary discr.	Align primary of discriminator for maximum reading
6 (b)	Pin 1 (grid) on 12AU6 limiter	.05 Mfd.	10.7 Mc Unmodulated	FM		L 20 coil slug sec. of discr.	Adjust secondary of discriminator for zero reading
7 (c)	Pin 1 (grid) on 12BA6 2nd. IF.	.05 Mfd.	10.7 Mc Unmodulated	FM		L 15 and L 16 Pri. and Sec. of 3rd IF transformer	Align 3rd, IF transformer for maximum reading
8 (c)	Pin 1 (grid) on 12BA6 1st, IF.	.05 Mfd.	10.7 Mc Unmodulated	FM		L 11 and L 12 Pri. and Sec. of 2nd IF transformer	Align 2nd. IF transformer for maximum reading
9 (c)	Pin 7 (grid) on 12AT7 converter tube socket	.05 Mfd.	10.7 Mc Unmodulated	FM		L7 and L8 Pri. and Sec. of 1st IF transformer	Align 1st. IF transformer for maximum reading
10 (c)	REPEAT STEPS 7, 8 AND 9						
11(c)(d)	Antenna Post F (Remove line ant.)	270 Ohms	98 Mc Unmodulated	FM	98 Mc.	L5 Osc. Coil Slug	Set Oscillator to dial scale
12(c)(d)		270 Ohms	98 Mc Unmodulated	FM	98 Mc.	L3 and L2 Det. and RF coil Slugs	Align det. and ant. stages to maximum reading

ZENITH Chassis 8Y02 AM-FM Radio

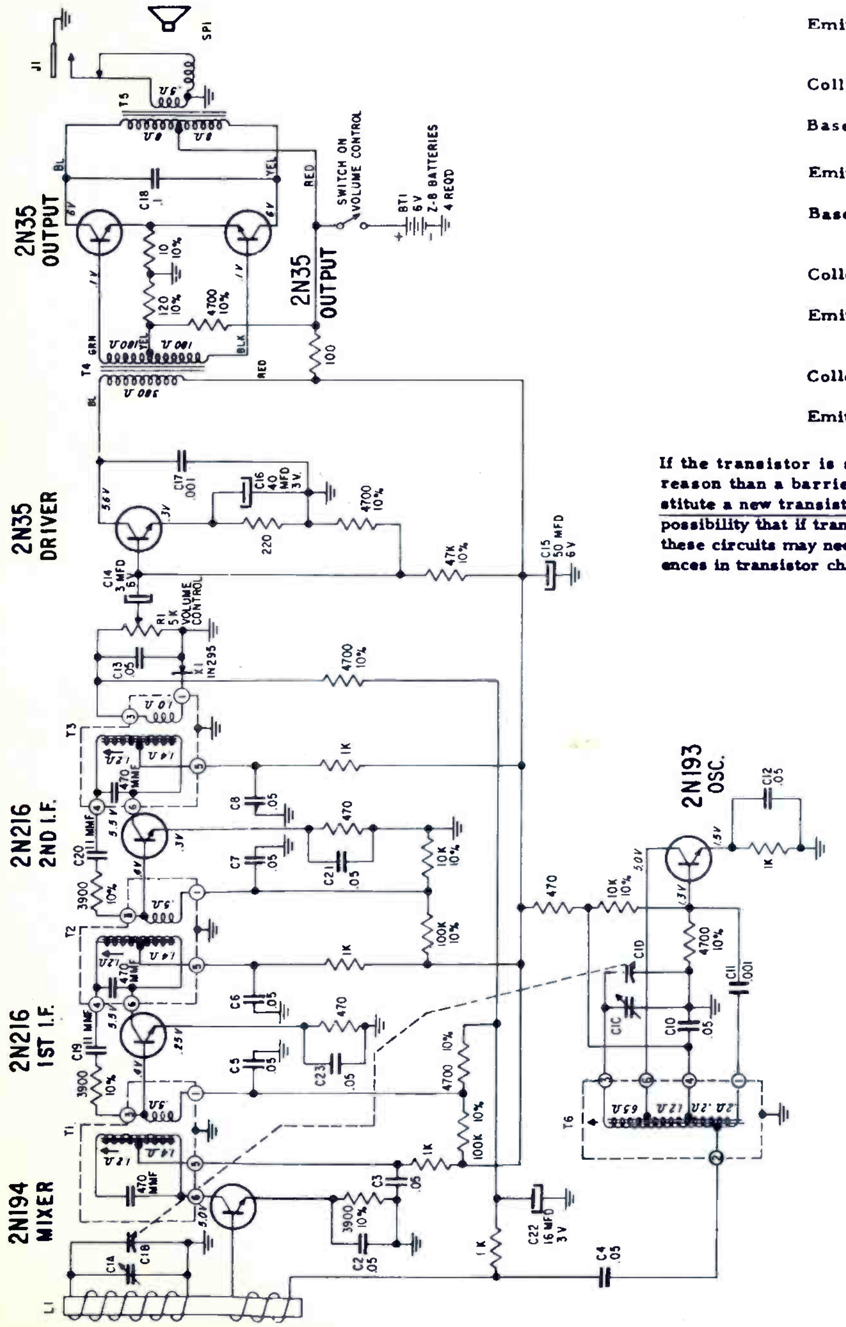
Chassis 8YO2: Models Y832R, Y832E



RESISTANCE MEASUREMENTS

When making resistance measurements in the circuit, it is most important to remove the transistors in the circuit under test otherwise readings obtained will be incorrect. This is the direct result of a transistor acting as a diode.

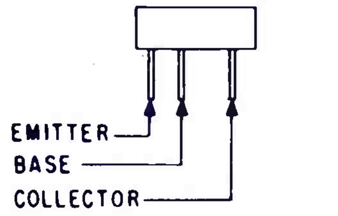
In addition to this, it is important to know the internal battery voltage of the ohm meter as well as battery polarity of the meter leads since incorrectly placing ohm meter leads across an electrolytic condenser with low working voltage may damage the capacitor due to excessive reverse current.



SCHEMATIC DIAGRAM FOR 7XT40 CIRCUIT #2

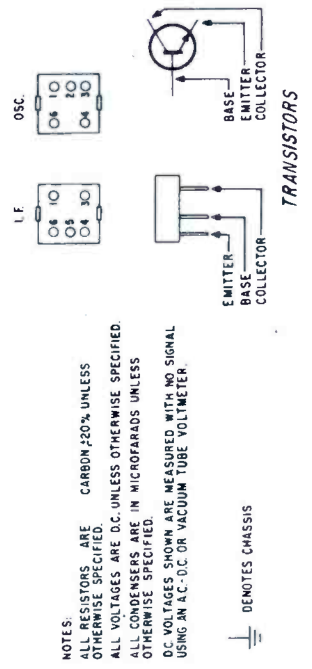
TRANSISTORS

If a transistor is suspected of being defective it can be first checked with an ohm meter, however, this test will not indicate the possible performance of the transistor. Examples illustrate typical ohmmeter readings.



Base	-)	Approximately 200-400 K ohms
Collector	+)	
Base	-)	Approximately 200-400 K ohms
Emitter	+)	
Collector	-)	Approximately 40 ohms
Base	+)	
Emitter	-)	Approximately 40 ohms
Base	+)	
Collector	+)	Approximately 40,000
Emitter	-)	
Collector	-)	Approximately 20,000
Emitter	+)	

If the transistor is suspected of being defective for any other reason than a barrier short, the only reliable check is to substitute a new transistor and then check performance. There is a possibility that if transistors are replaced in the IF or RF circuit, these circuits may need re-alignment as the result of slight differences in transistor characteristics.



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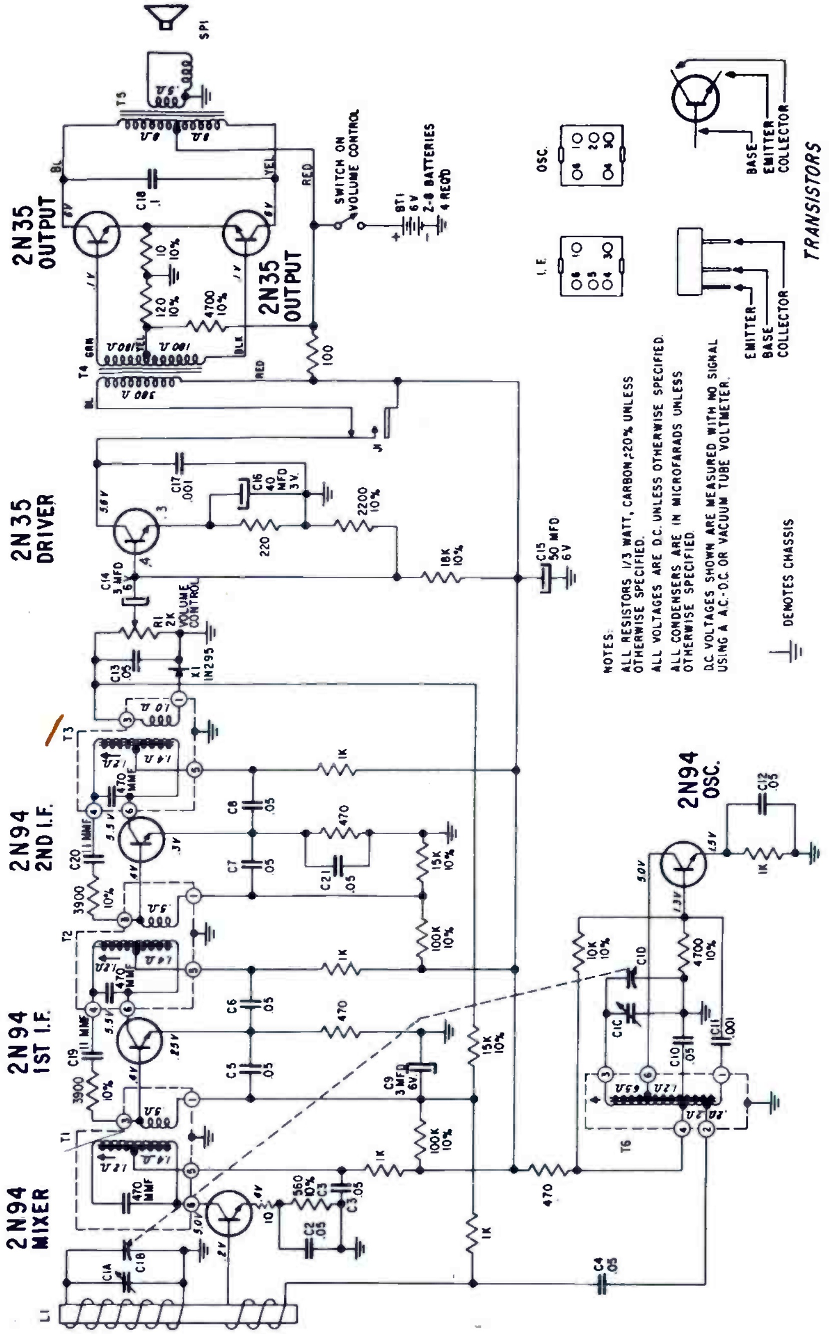
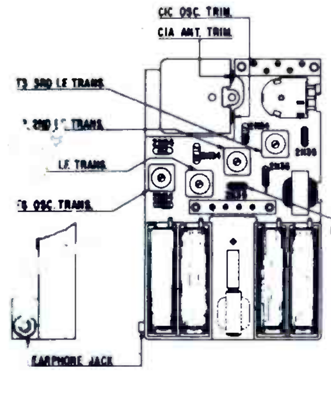
ZENITH Transistor Radio "Royal 500"

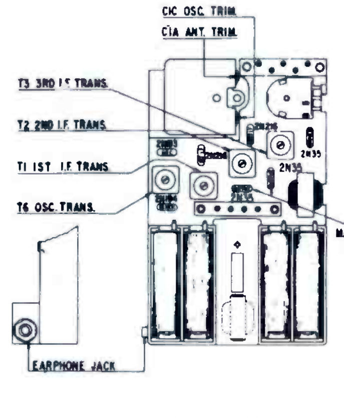
Chassis 7XT40: Model "Royal 500"



SCHEMATIC DIAGRAM FOR 7XT40 CIRCUIT #1



TRANSISTOR & TRIMMER LAYOUT FOR 7XT40 CIRCUIT #1



TRANSISTOR & TRIMMER LAYOUT FOR 7XT40 CIRCUIT #2

ALIGNMENT PROCEDURE

Operation	Input Signal Frequency	Connect Inner Conductor From Oscillator To	Connect Outer Shield Conductor From Oscillator To	Set Dial At	Trimmers	Purpose
1	455 KC	ONE TURN LOOSELY COUPLED TO WAVEMAGNET	Chassis	600 KC	Adj. T1, T2, T3 for maximum output.	For I.F. Alignment
2	1620 KC		—	Gang wide open	C1C	Set oscillator to dial scale
3	1260 KC		—	1260 KC	C1A	Align loop antenna
4	535 KC		—	Gang closed	Adjust slug in T6	Set oscillator to dial scale
5	REPEAT STEPS 2, 3 AND 4					

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