Most - Often - Needed

1952

Television

Servicing Information

Compiled by

M. N. BEITMAN

SUPREME PUBLICATIONS

CHICAGO

FOREWORD

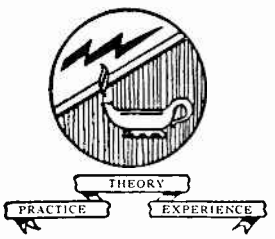
In this new "1952 Television Servicing Information" manual are included circuit diagrams and essential service facts on every popular set of this period of all makes. The flattering reception given to the previous volumes of SUPREME TV series, encouraged us to believe that our selection and editing of factory material for these manuals fits your liking and requirements.

The list of Contents is given on pages 3 and 4, while a complete Index by manufacturers and model (or chassis) numbers begins on page 191. Refer to this list and index to find the TV material you need.

Our sincere thanks and appreciation is extended to all manufacturers whose television sets are described in this manual.

M. N. Beitman

March 1, 1952
Chicago.



THIS IS A MARK OF SUPREME PUBLICATIONS

CONTENTS

MOST-OFTEN-NEEDED 1952 TELEVISION SERVICING INFORMATION

Admiral

Admiral SERVICE NOTES for models using 21T1, 21V1, 21W1, 21Y1 21B1, 21C1, 21D1, 21E1, 21F1, 21G1, 21H1, 21J1, 21K1, 21L1, 21M1, 21N1, 21P1, 21Q1 and 5D2, 3C1 CHASSIS

THESE IMPORTANT NOTES MUST BE READ AND CLEARLY UNDERSTOOD IN ORDER TO CORRECTLY APPLY MATERIAL IN THIS ADMIRAL SECTION TO VARIOUS CHASSIS.

The basic circuit of Chassis 21F1, 21G1, 21M1, 21N1, 21P1, 21Q1, 21T1, and 21V1 of recent production is shown on pages 10 and 11. This is basically the same circuit as used in all 21-series chassis, but the main differences of types and various production runs are explained under the PRODUCTION CHANGES section, pages 12 to 15, 18, and 19. The early sets of this series used conventional AGC (V304 was a 6AL5), and are similar to the sets described in the "1951 Television Servicing" manual on pages 15 to 18. The circuit of recent production sets (in this book on pages 10 and 11) shows the TV chassis with 3C1 AM radio, and this circuit uses gated AGC (V304 is now a 6AU6). The straight TV sets of this type omit the radio and the associated connector plug. For sets that use 5D2 AM-FM radio, refer to the 1951 volume for needed radio data.

Chassis 21W1 and 21Y1 use a similar circuit to those of other sets in the 21-series and is shown on pages 16 and 17. The main difference is in the use of a built-in AM radio tuner.

The alignment material presented on pages 6 to 9 inclusive, is applicable in the main to all these sets.

Since a great many Admiral television models used more than one type or run of chassis, it is suggested that in each case you locate the actual chassis number and run number to serve as your guide to the right service material. Such chassis information is stamped on the back of each chassis. Because of this fact, model numbers will not be listed here or covered in the index. In general, model numbers have a special reference only to the cabinets employed.

TOUCH-UP OF RATIO DETECTOR SECONDARY USING TELEVISION SIGNAL (A7, BOTTOM SLUG OF T201)

*This adjustment is accessible through the ¼" hole (just below T201) in bottom of the cabinet or the chassis mounting shelf, located toward the left side facing the rear of the set. Removal of the chassis is therefore not required. ***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. Slightly advance the picture and volume controls until the buzz is audible.

c. Carefully insert a non-metallic alignment tool through the opening in cabinet bottom below T201. An alignment tool with a screwdriver blade or hexagonal end is required depending on the transformer used, see * note below. When the alignment tool engages the bottom tuning slug A7, adjust the slug 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 slug 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.

* If ratio detector transformer (T201) has hollow hexagonal core slugs, bottom slug adjustment A7 can be made from top of chassis, if you use alignment tool #98A30-7 (available at Admiral Distributor). Bottom slug (A7) can be reached through the hole in the core of the upper slug (A5).

Admiral 21B1, 21C1, 21D1, 21E1, 21F1, 21G1, 21H1, 21J1, 21K1, 21L1, 21P1, 21Q1,

TELEVISION ALIGNMENT PROCEDURE

GENERAL

Complete alignment consists of the following individual procedures and should be performed in this sequence.

a. IF Amplifier Alignment.
b. IF Response Curve Check.
c. 4.5 MC Sound IF Alignment.
d. RF and Mixer Alignment.
e. Overall RF and IF Response Curve Check.
f. HF Oscillator Adjustment.

TEST EQUIPMENT

To properly service this receiver, it is recommended that the following test equipment be available.

IMPORTANT: Many service instruments do not meet the requirements given below. A list of recommended equipment is available from Admiral distributors.

Oscilloscope

Standard oscilloscope, preferably one with a wide band vertical deflection, vertical sensitivity at least .5 volt (RMS) per inch.

Signal Generator

4.5 MC frequency.
18 to 30 MC frequency range.
50 to 90 MC frequency range.
170 to 225 MC frequency range.
Must have a built-in calibration crystal for checking dial accuracy.

Sweep Generator

Sweep generator must provide sweep frequencies from
18 to 30 MC range:
50 to 90 MC range:
170 to 225 MC range:
} with at least 10 MC sweep width.

Output: adjustable; at least one-tenth volt maximum.
Output impedance: 300 ohms balanced to ground.

A sweep generator not having constant output voltage over the swept range and linear sweep, will produce curves which are widely different from the ideal curves shown in the following pages. If repeated difficulty is encountered in obtaining these curves, the sweep generator should be checked. A simple check is to observe the response curve for a set that is in alignment.

Before suspecting the generator, be sure the alignment instructions in this manual have been followed carefully.

Vacuum-Tube Voltmeter

Preferably with low range (3 volt) DC zero center scale and a high voltage probe (30,000 volt range).

ALIGNMENT TOOLS

An alignment tool kit consisting of one metallic and one non-metallic screwdriver is available under part number 98A30-3. A non-metallic alignment tool with a screwdriver point at one end and hexagonal wrench (for hollow hexagonal core slugs) at the other is available under part number 98A30-7.

IF AMPLIFIER ALIGNMENT

To service TV chassis with radio disconnected, complete the heater circuit by connecting a jumper from pin "L" to pin "K" of socket M503. See schematic.

a. Before starting alignment, be sure IF cover shield is mounted to the chassis. If the set does not have a cover shield, do not use one.
b. Connect negative terminal of a 3 volt bias battery to test point "T", positive to chassis.
c. Set receiver to channel 12 or an unassigned high channel to prevent signal interference during IF alignment. Set Picture control fully to right (clockwise).
d. **Allow about 15 minutes for receiver and test equipment to warm up.**

Step	Signal Gen. Freq.	VTVM and Signal Generator Connections	Instructions	Adjust
1	25.3 MC	VTVM high side to test point "V", common to chassis. Generator high side to 6J6 (V102) tube shield; insulate shield from chassis. Connect low side to chassis near 6J6 tube base.	Use lowest DC scale on VTVM. When peaking, keep reducing generator output for VTVM reading of approx. 1 volt or less.	A1 and A2 for maximum.
2	23.1 MC			A3 and A4 for maximum.
3	Make the "IF Response Curve Check" given below.			

IF RESPONSE CURVE CHECK

Receiver Controls and Bias Battery	Sweep Generator	Marker Generator	Oscilloscope	Instructions
Set Channel Selector on channel 12 or an unassigned high channel. Picture control fully to the right. Connect negative of 3 volt bias battery to test point "T"; positive to chassis.	Connect high side to 6J6 mixer-osc. tube shield. Insulate tube shield from chassis, low side to chassis ground. 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 to test point "V" through a de-coupling filter. See figure 7. Marker pips on scope will be more distinct if a condenser from 100 mmfd to 1000 mmfd is connected across the oscilloscope input.	Check curve obtained against ideal response curve in fig. 9A. 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 indicated in fig. 9B.

21B1, 21C1, 21D1, 21E1, 21F1, 21G1, 21H1, 21J1, 21K1, 21L1, 21P1, 21Q1, **Admiral**

4.5 MC SOUND IF ALIGNMENT

See page 5 for touch-up of ratio detector using television signal without test equipment.

a. Connect signal generator high side to point "V" through a .01 mfd. condenser, connect low side to chassis.
b. Allow about 15 minutes for receiver and test equipment to warm up.
c. Set Picture control fully to the right (clockwise).
d. Use a NON-METALLIC alignment tool. If Ratio Det. Transformer (T201) has hollow core slugs, bottom slug adjustment A7 can be made from top of chassis, if you use alignment tool #98A30-7 obtainable from Admiral Distributor.

Step	Signal Gen. Freq. (MC)	VTVM Connections	Instructions	Adjust
	When using a signal generator, be sure to check it against a crystal calibrator or other frequency standard for accurate frequency calibration at 4.5 MC. Accuracy required is within one kilocycle. IMPORTANT: If a signal generator and frequency standard are not available, alignment can be made using a TV station signal. Tune in a station and follow steps 1 and 2 below. If necessary use a higher scale on the VTVM.			
1	Set to exactly 4.5 MC	High side to test point "Y"; common to chassis.	Use lowest DC scale on VTVM.	A5 and A6 for maximum (keep reducing generator output to keep VTVM at approx. 1 volt).
2		High side to test point "Z"; common to chassis.	Use zero center scale on VTVM, if available.	A7 for zero on VTVM (the correct zero point is located between a positive and a negative maximum). If A7 was far off, repeat step 1.

ALIGNMENT HINT

After becoming familiar with alignment procedure, some servicemen simplify subsequent alignment of sets by merely using the essential alignment data given in figures 7 and 8.

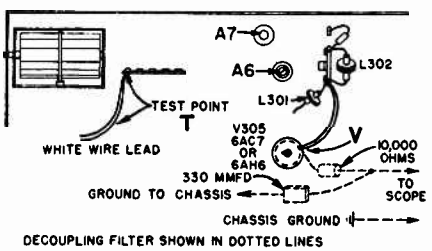


Figure 7. Bottom View Showing Test Point Connections.

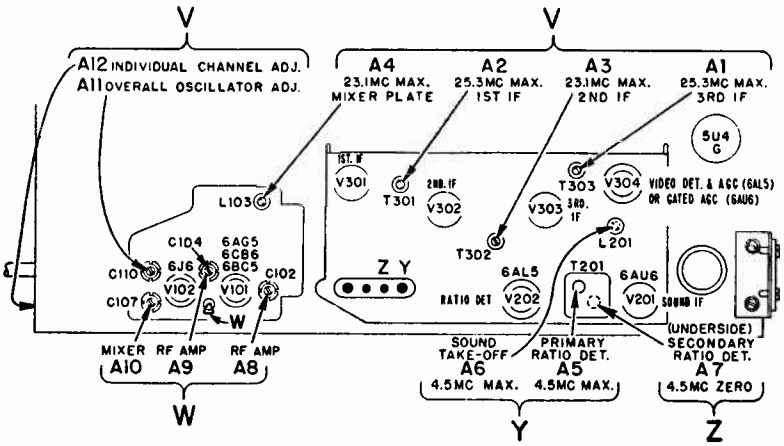


Figure 8. Top View of Chassis Showing Alignment Data.

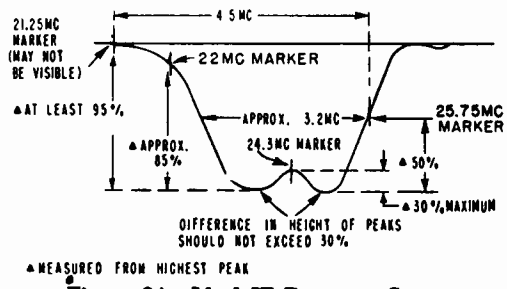


Figure 9A. Ideal IF Response Curve.

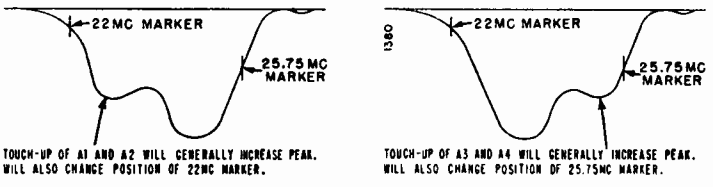


Figure 9B. IF Response Curves, Incorrect Shape.

Admiral 21B1, 21C1, 21D1, 21E1, 21F1, 21G1, 21H1, 21J1, 21K1, 21L1, 21P1, 21Q1,

RF AND MIXER ALIGNMENT

a. Connect negative of 3 volt bias battery to test point "T", positive to chassis. If it is difficult to to obtain a curve of sufficient amplitude, remove battery and connect a wire jumper from test point "T" to chassis.

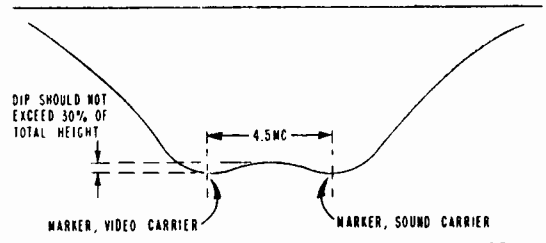
b. Connect sweep generator to antenna terminals. If sweep generator does not have a built-in marker generator, loosely couple a marker generator to the antenna terminals. To avoid distortion of the response curve, keep sweep generator output at a minimum, marker pips just barely visible.

c. Connect oscilloscope through a 10,000 ohm resistor to test point "W" on tuner (Fig. 11). Keep scope leads away from chassis.

d. Set channel selector to Channel 12.

e. Allow about 15 minutes for receiver to warm up and test equipment.

Step	Marker Gen. Freq. (MC)	Sweep Gen. Frequency	Instructions
1	205.25 (Video Carrier) 209.75 (Sound Carrier)	Sweeping Channel 12. See frequency table below.	Check for curve shown below. If necessary, adjust A8, A9 and A10 (figure 11) as required. Adjusting A9 will generally shift the center of the response curve in relation to the video and sound carrier markers. A8 and A10 should be alternately adjusted for best gain with flat top appearance. Consistent with proper band width and correct marker location, response curve should have maximum amplitude and flat top appearance.
2	Set the sweep generator to sweep the channel to be checked. Set the marker generator for the corresponding video carrier frequency and sound carrier frequency.		Check each channel operating in the service area for curve shown below. In general, the adjustment performed in step 1 is sufficient to give satisfactory response curves on all channels. However, if reasonable alignment is not obtained on a particular channel, (a) check to see that coils have not been intermixed, or (b) try replacing the pair of coils for that particular channel, or (c) repeat step 1 for the weak channel as a compromise adjustment to favor this particular channel. If a compromise adjustment is made, other channels operating in the service area should be checked to make certain that they have not been appreciably affected.



Full skirt of curve will generally not be visible.

Figure 10. RF Response Curve.

FREQUENCY TABLE

Channel Number	Channel Freq., MC	Video Carrier, MC	Sound Carrier, MC	HF Osc., MC
2	54- 60	55.25	59.75	81
3	60- 66	61.25	65.75	87
4	66- 72	67.25	71.75	93
5	76- 82	77.25	81.75	103
6	82- 88	83.25	87.75	109
7	174-180	175.25	179.75	201
8	180-186	181.25	185.75	207
9	186-192	187.25	191.75	213
10	192-198	193.25	197.75	219
11	198-204	199.25	203.75	225
12	204-210	205.25	209.75	231
13	210-216	211.25	215.75	237

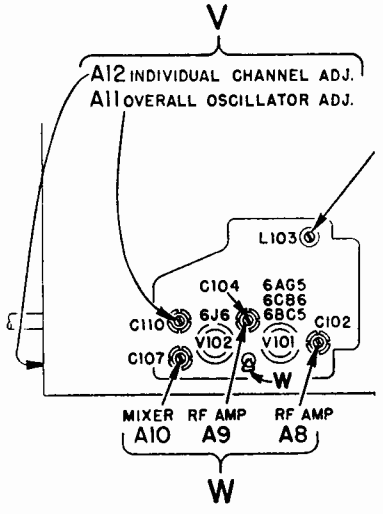


Figure 11. Top of TV Tuner, Showing Adjustment Location.

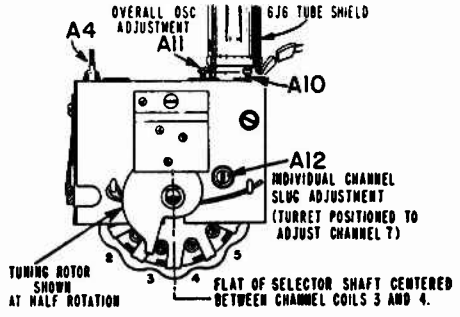


Figure 12. Front View of TV Tuner.

OVERALL RF AND IF RESPONSE CURVE CHECK

(Using sweep generator and oscilloscope)

Receiver Controls and Bias Battery	Sweep Generator	Marker Generator	Oscilloscope	Instructions
Picture Control fully to the right. Channel selector on Channel 12 or other unassigned high channel. Connect negative of 3 volt bias battery to test point "T", positive to chassis.	Connect to antenna terminals. Set generator to sweep channel selected. Keep generator output as low as possible, to prevent overloading. See frequency table on opposite page.	If an external marker generator is used, loosely couple high side to sweep generator lead. Marker frequencies are shown in frequency table on opposite page.	Connect to point "V" through a decoupling network as shown in fig. 7.	Compare the response curve obtained against the ideal curve shown in figure 13A. If the curve is not within tolerance, touch up the IF slugs as instructed below. It should never be necessary to turn slugs more than one turn in either direction. If the curve is satisfactory on the channel checked, all other channels should also be satisfactory. IMPORTANT: When sweep output is reduced, response curve amplitude on scope should also decrease, but curve shape should remain the same. If curve shape changes, reduce sweep output and/or the scope gain until the shape does not change.

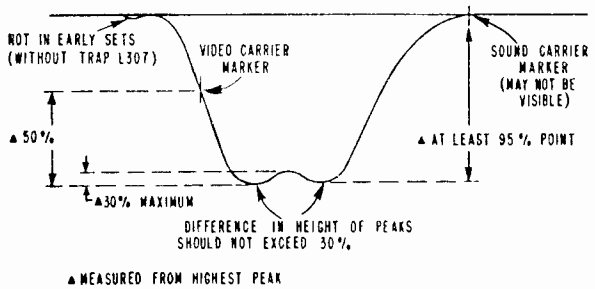


Figure 13A. Ideal Overall RF and IF Response Curve.

Note that video carrier (marker) on the "Overall RF-IF Response Curve" will appear on the opposite side of the curve as compared to the "IF Response Curve" figure 9A. This is due to action of the mixer tube.

Figure 13B. Overall RF and IF Response Cures, Incorrect Shape.

HF OSCILLATOR ADJUSTMENT

(Using a signal generator)

HF oscillator adjustment can be made using a crystal calibrated signal generator. Note that adjustment "All" (figure 11) is an overall oscillator adjustment and should only be made when the mixer-oscillator tube is replaced. Generally "A11" adjusts with about 3/16" of screw thread exposed. Make adjustments as follows:

Receiver Control Settings	Signal Generator	Instructions
Set channel selector for each channel to be adjusted. Set "Tuning" control at half rotation. Turn volume control fully to the right (clockwise).	Connect to antenna terminals. Set generator to exact frequency of HF oscillator. See frequency table on opposite page. *Set generator for maximum output.*	Connect a wire jumper from test point "W" on the tuner to test jack "Z". See figure 8. Remove the ratio detector tube V202 (6AL5). Carefully adjust the individual oscillator slug A12 until a whistle (beat) is heard in the speaker of the receiver.

SCHEMATIC NOTES

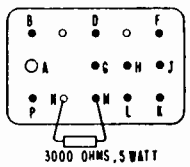
Run numbers are rubber stamped at the rear of the chassis.

Numerical symbols [1], [2], [3], etc. indicate run numbers for 21B1 chassis, numerical symbols ⚠1, ⚠2, ⚠3, etc. indicate run numbers for 21F1 chassis (1), (2), (3), etc. indicate run numbers for 21K1 chassis, and numerical symbols ①, ②, ③, etc. indicate run numbers for all 21 series. (A1), (A2),.....(Y), (Z), etc. indicate alignment points and alignment connections.

SERVICING RADIO SEPARATELY

The radio can be operated without the television chassis if a 2PA1 power supply (used in TV-radio-phono models employing the 20Z1 (12") television chassis) is available. To operate the radio, connect a 3,000 ohm, 5 watt resistor (part 61A1-15) from pin "M" to "N" on the power supply socket.

This resistor drops the B plus voltage for proper operation.



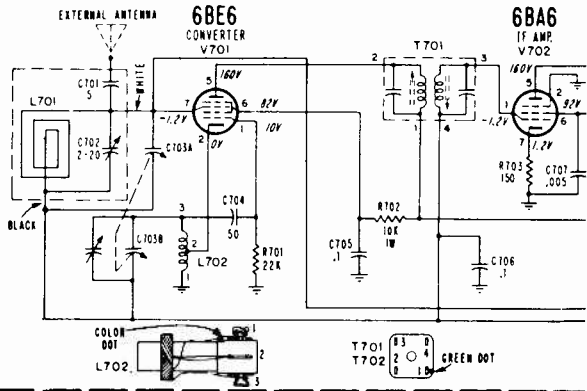
Power Supply Socket, (Inside Chassis View).

SERVICING TV SEPARATELY

In combination models, to service the television chassis with the radio disconnected, it will be necessary to complete the heater circuit by connecting a jumper wire between pins "L" and "K" of socket M503.

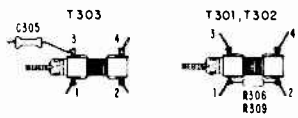
See page 12 for waveform and voltage data, several production changes, and top view of chassis.

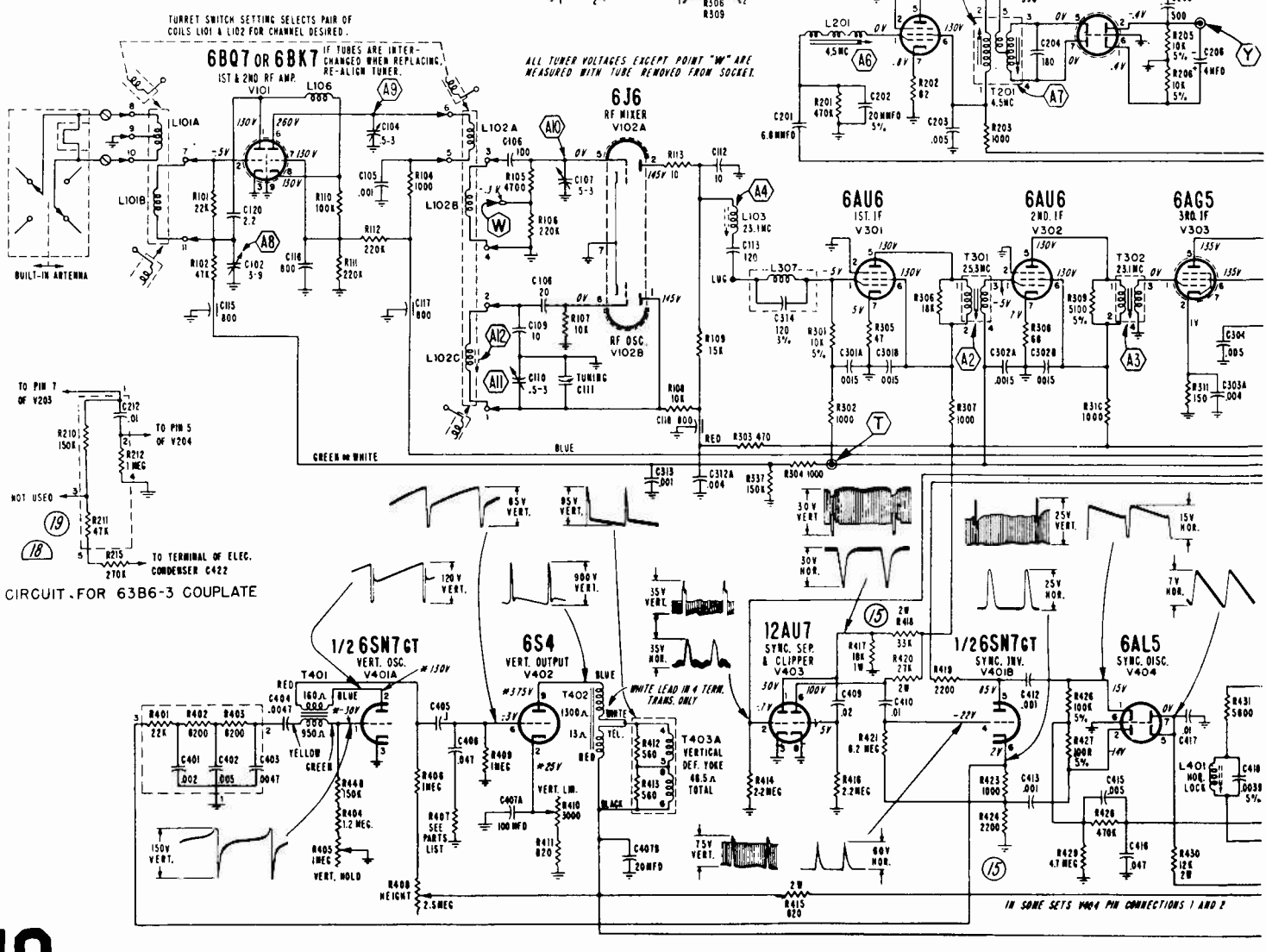
Schematic



CIRCUIT ABOVE BROKEN LINE DOES NOT APPLY TO "TELEVISION ONLY" MODELS.

TV TUNER 94C37-1

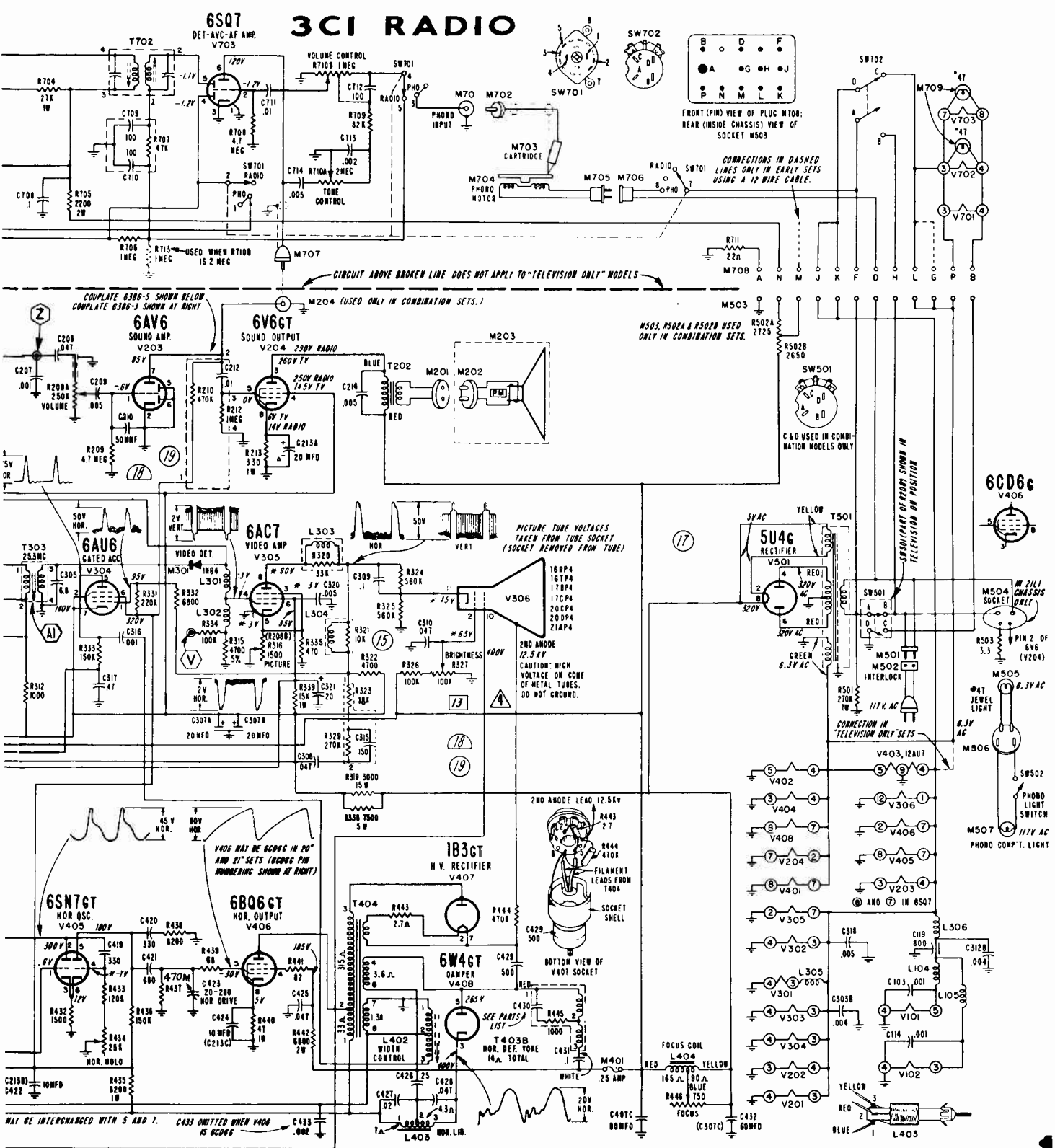




for 21F1, 21G1, 21M1, 21N1, 21P1, 21Q1, 21T1, 21V1 Television Chassis; 3C1 (AM only) radio.

Note: This schematic applies only to chassis stamped Run 18 to Run 20.

Admiral



Admiral data below refers to schematic pp. 10-11.

WAVEFORM DATA
(Waveforms given on schematic)

Waveforms taken with picture control set fully to the right, all other controls set for normal picture (in sync).

Waveforms at video and sync stages obtained with transmitted signal input to receiver.

The oscilloscope sweep is adjusted for 30 cycles (which is one-half of the vertical frequency), or for 7875 cycles (which is one-half of the horizontal frequency) so that two pulses appear on the screen.

The peak-to-peak voltage readings shown are subject to some variations due to response of the oscilloscope and parts tolerances.

TV VOLTAGE DATA
(Voltages given on schematic)

- PICTURE control turned fully clockwise. CHANNEL control set on an unused channel. Other front controls set at approximately half rotation. Vert. Lin. and Height set at approximately half rotation.
- Voltages marked with an asterisk * will vary widely with control setting. In combination models, B+ voltages in TV chassis will be slightly higher when set is switched to radio position. Alternate voltage readings for radio and TV are shown for sound output tube V204 (6V6GT).
- Line voltage 117 volts AC.
- Voltages measured with a vacuum tube voltmeter between tube socket terminals and chassis, unless otherwise indicated.
  Voltages at V101, V102, V306 measured from top of socket with tube removed.
- Antenna disconnected from set with terminals shorted.

CAUTION

Pulsed high voltages are present on the cap of V406, and on the filament terminals and cap of the 1B3GT tube. NO ATTEMPT SHOULD BE MADE TO TAKE MEASUREMENTS FROM THESE POINTS WITHOUT SUITABLE TEST EQUIPMENT.

Picture tube 2nd anode voltage can be measured from the 2nd anode connector and should be taken only with a high voltage instrument such as a kilovoltmeter. 2nd anode voltage is approximately 12.5 KV. Proper filament voltage check of the 1B3GT tube may be made by observing filament brilliancy as compared with that obtained with a 1.5 volt dry cell battery.

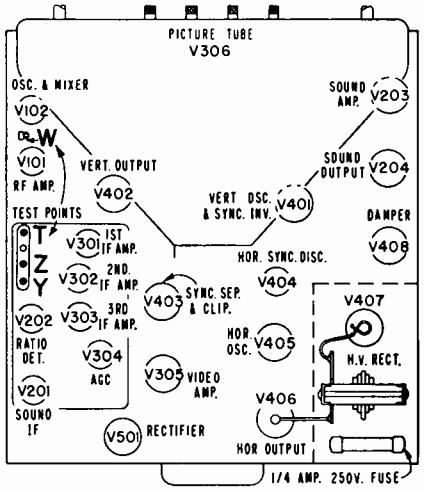
PRODUCTION CHANGES

B PLUS AND AUDIO COUPLATE CIRCUIT CHANGE

RUN 18 in 21K1 Chassis, RUN 19 in 21F1, 21G1, 21M1, 21N1, 21P1, 21Q1 Chassis, RUN 20 in 21T1 and 21V1 Chassis

Changes were made in the B+ circuit to the sound amplifier V203 (6AV6) and to the first anode (pin 10) of picture tube V306. The schematic in this supplement has these changes incorporated. Fuse failure in sets having these changes will result in loss of both sound and picture.

In some sets audio couplate, part number 63B6-3 was replaced with couplate 63B6-5. When couplate 63B6-3 is used, terminal 3 is unused and R215 (270,000 ohms, ½ watt) is connected in series with terminal 5. When couplate 63B6-5 is used, R210 is 470,000 ohms, and R211 is omitted. Couplate 63B6-5 is shown in the schematic. A sketch of couplate 63B6-3 is shown at the **left** of schematic.



Top View of Chassis

SERVICE HINTS

REMOVING VERTICAL BARS FROM PICTURE

Shadow-type vertical bars (usually at the left of the picture) can be eliminated or minimized by adding a filter (part number A3459S) to the horizontal output circuit. However, before deciding that a filter is required, be certain that the horizontal drive and width controls have been adjusted according to the instructions on page 8 of this service manual. Also check to see that the picture tube cathode lead (from pin 11) is not close to the horizontal output tube V406. This lead should be dressed as far away as possible from the horizontal output tube.

If vertical bars are still present after picture tube socket lead dress has been checked, install a filter (part number A3459S) according to the instructions packed with each filter. This filter should eliminate the vertical bars, or reduce the brightness of the bars to a minimum.

BUZZ CAUSED BY PICKUP THROUGH SHIELDED AUDIO CABLE

High buzz level can be caused by pickup through components in the audio circuit which are spaced too close to components in the vertical sweep circuits. A common cause of high sync buzz level is that the shielded audio cable (connecting to the volume control R208A) is too close to the vertical output tube (V402). The shielded audio cable should be dressed so that it will not come close to the vertical output tube. Also be sure that one end of the shield is soldered to the chassis.

INTERMITTENT SOUND, PICTURE or SYNC (in sets with socket M509 and plug M510)

Poor contact between the color converter plug M510 and socket M509 can cause (1) no sound (2) no sync (3) no picture, sound or raster, or a combination of these troubles.

If poor socket contact is suspected as being the cause of trouble, remove the plug and tighten the socket contacts with a pair of long nose pliers.

21B1, 21C1, 21D1, 21E1, 21F1, 21G1, 21H1, 21J1, 21K1, 21L1, 21P1, 21Q1, **Admiral**

PRODUCTION CHANGES

At the start of production, chassis were not stamped with a run number, therefore some chassis will not have a run number stamp.

Production changes are coded RUN 1, RUN 2, etc., as given in the headings below. Run number (stamped on chassis) indicates that this chassis has the change(s) incorporated which are explained under that particular run number heading below, as well as all changes (lower run numbers) made prior to that time. For example, a 21C1 chassis stamped RUN 4 will also include the changes incorporated in the 21C1 chassis under RUN 1, RUN 2, and RUN 3.

RESISTOR R303 CHANGED to INCREASE B+ VOLTAGE to RF TUNER

In later production resistor R303 was changed from 1000 ohms to 470 ohms, ½ watt, part number 60B8-471. Changing this resistor to a lower value increases the B+ voltage applied to the RF tuner, thereby providing an increase in sensitivity. This increased sensitivity will be apparent in fringe or weak signal areas. This resistor change should be made only in sets having less than 105 volts at the RF tuner B+ lead.

R430 WATTAGE CHANGED

‡ Run 1 in 21C1 Chassis

Resistor R430 was changed from 12,000 ohms, ½ watt to 12,000 ohms, 2 watt (part #60B20-123) to prevent possible increase in resistance of R430.

CHANGE to IMPROVE AUDIO RESPONSE on RADIO OPERATION

‡ Run 2 in 21C1 Chassis

R210 was changed from 270,000 ohms to 150,000 ohms, (part #60B8-154) and R211 was changed from 100,000 ohms to 47,000 ohms, (part #60B8-473) to improve audio response on radio operation.

C433 ADDED to OBTAIN SUFFICIENT WIDTH

‡ Run 3 in 21C1 Chassis

To obtain sufficient sweep width, C433 (.002 mfd, 600V) was added across width coil L402. Do not make this change in sets with gated AGC.

HERRINGBONE PATTERN INTERFERENCE

‡ Run 4 in 21C1 Chassis, Run 1 in 21B1 Chassis

Later production sets have an Adjacent Lower Channel Sound Trap (L307, C314) added between the connector lug (terminal of C113) on the TV tuner and pin 1 of the 1st IF amplifier tube V301. This trap (part number 72A102) is pre-tuned to 27.25 MC.

This trap will eliminate herringbone interference pattern produced by the sound carrier of the adjacent lower channel in the same locality, especially when the wanted station is weaker than the interfering station. Close examination of this type of interference will reveal that the fine lines of the herringbone pattern will vary in accordance with the speech or music on the adjacent lower channel. This can be checked by quickly turning the channel selector to the lower channel.

Since FM interference from other sources will also produce a herringbone pattern, it should definitely be determined that the interference is caused by the adjacent lower channel before installing the trap. After installing the trap, realign slug A4 (mixer plate coil L103); see "IF Amplifier Alignment", page 6.

CHANGE to IMPROVE SYNC STABILITY

‡ Run 5 in 21C1 Chassis, Run 2 in 21B1 Chassis

An RC filter consisting of a parallel combination of a 270,000 ohm, ½ watt resistor (part number 60B8-274) and a 150 mmfd, mica condenser (part number 65B21-151) is connected between resistor R323 and condenser C308. Resistor R323 was changed from 8,200 ohms to 18,000 ohms, ½ watt (part number 60B8-183). These changes will improve sync stability (immunity to noise) in areas having low signal strength and a high noise level.

DIFFERENT TUBES USED in 2nd and 3rd IF STAGES

Runs 3 & 4 in 21B1 Chassis produced at Cortland*
Run 5 in 21B1 Chassis produced at Bloomington*
Run 1 in 21D1 Chassis, Run 1 in 21J1 Chassis

Some sets use a 6AU6 tube in the 1st IF stage, and a pair of 6AG5, 6BC5, or 6CB6 tubes, instead of 6AU6 tubes in the 2nd and 3rd IF stages (V302, V303). For complete information on the use of these tubes, see schematic. Note that these tubes are not directly interchangeable, since they differ in pin numbering, in use of tube shields, and in use of R330.

IMPORTANT: Alignment is generally required after replacing IF tubes. Check the IF alignment, and preferably, also the over-all RF and IF response curve after tube replacement.

C433 CHANGED to OBTAIN SUFFICIENT WIDTH

Run 2 in 21D1 Chassis, Run 2 in 21J1 Chassis.

C433 is .002 mfd, .0047 mfd, or .01 mfd, 600 volts, as required to obtain sufficient width. Increasing the size

‡ This change was incorporated at beginning of production of all other chassis.

* The 21B1 chassis has been run at two plants. Sets produced at the Cortland plant have "Cortland Plant" printed on the model label. Sets produced at Bloomington have "Bloomington Plant" printed on the model number label.

of condenser C433 provides greater sweep width with slight reduction in picture brightness. When adding or replacing C433 use the smallest capacity possible which will produce sufficient sweep width. Do not make this change in sets with gated AGC.

VERTICAL OUTPUT TUBE (V402) CHANGED

Run 4 in 21B1 Chassis produced at Bloomington*

The vertical output tube 6S4 (V402) was changed to a 6SN7GT. See inset on figure 26 for circuit. Note that resistance values of R404, R406, and R411 are changed when a 6SN7GT is used.

Some sets may also use a 6SN7GT tube instead of a 6S4 tube at V402. Note that 6SN7GT pin numbering differs from that of the 6S4.

DIFFERENT TUBE USED for SYNC SEPARATOR and CLIPPER (V403)

Run 5 in 21B1 Chassis produced at Bloomington*

A 6SN7GT tube is used instead of a 12AU7 at V403. Note that 6SN7GT pin numbering differs from the 12AU7.

DIFFERENT SOUND AMPLIFIER TUBE (V203)

Run 3 in 21D1 Chassis, Run 5 in 21D1 Chassis

Runs 1, 2, 5 use a 6AV6 miniature tube in the sound amplifier stage V203, while Runs 3 and 4 use a 6SQ7 metal or a 6SQ7GT glass tube. To prevent pick-up of hum, a tube shield (part number 87A8) is used with the 6SQ7GT glass tube. Note that the 6SQ7 pin numbering differs from the 6AV6.

DIFFERENT TUBE USED for SYNC DISCRIMINATOR (V404)

Run 4 in 21D1 Chassis (see same heading at right).

PILOT LIGHT SOCKET ADDED

Run 3 in 21J1 Chassis

A pilot light socket, part #87A6-3 was added, to accommodate the 110 volt phono compartment pilot light.

CHANGES to REDUCE AUDIO HUM on TV OPERATION

Run 5 in 21B1 Chassis, Run 8 in 21C1 Chassis, Run 6 in 21D1 Chassis

In some chassis (especially early 21D1 chassis) a sharp audible hum can be heard in the speaker with and without a TV station tuned in. Check for trouble as follows:

1. If the brightness control also varies hum level, it will generally be found that the sound amplifier (V203) is a glass 6SQ7 tube which may be used without a tube shield. To minimize hum level either use a tube shield or change to a metal 6SQ7 tube.
2. If the vertical hold control also varies the hum frequency, the hum is introduced from the vertical output stage. Change Condenser C211 from a .047 to at least a .47 mfd., 400 volt condenser. In many cases it may be necessary to use an electrolytic condenser as large as 10 mfd. to completely eliminate the hum.
3. If hum (buzz) is only evident when station is tuned in, check IF alignment. In some 21D1 chassis, three 6AG5 tubes were used in the IF stages. In order to obtain a good IF curve (with the sound carrier low enough), it is necessary to change the first IF tube to a 6AU6, ground pin 2, and re-align the IF stages. Be sure that the 4.5 MC sound IF adjustments are aligned with a station signal as described on page 15. Buzz can generally be reduced farther after alignment on station signal by turning sound take off coil L201 slug out about ¼ turn.

INTERLOCK OMITTED FROM YOKE and FOCUS COIL CONNECTORS USED in 19" SETS

Run 1 in 21H1 Chassis, Run 4 in 21J1 Chassis

The 110 volt AC interlock circuit connections were omitted from the focus coil and deflection yoke connectors (M404 and M406) used in 19" sets.

SOCKET and PLUG ADDED for ATTACHMENT of a COLOR CONVERTER

Run 6 in 21B1 Chassis; Run 9 in 21C1 Chassis; Run 7 in 21D1 Chassis; Run 5 in 21J1 Chassis; Run 2 in 21H1 Chassis

A 9 contact socket M509 was added at the rear of the TV chassis to provide B+ voltages and 110 volt AC power for attachment of a color converter. See schematic, figure 26 or 27.

Plug M510 fits into socket M509 to complete the B+ circuits when a color converter is not used. The plug has jumpers wired between pins 1 and 2, between pins 3 and 4, and between pins 5 and 6.

A few of the early sets with socket M509 had electrolytic condenser C432 (60 mfd) connected to pin 8 of V501 (5U4G) tube.

Note: In some later 21B1 chassis, plug M510 and wiring connections to socket M509 were omitted.

DIFFERENT TUBES USED for SYNC DISCRIMINATOR (V404)

Run 6 in 21J1 Chassis; Run 4 in 21D1 Chassis Run 7 in 21B1 Chassis; Run 10 in 21C1 Chassis;

A 12H6 tube may be used instead of a 6AL5 tube for V404 sync discriminator. A 6H6 tube was also used in some sets. The pin numbering for the 12H6 and 6H6 is identical; the 6AL5 pin numbering is different.

When the 12H6 tube is used for V404, an auto-trans-

* The 21B1 chassis has been run at two plants. Sets produced at the Cortland plant have "Cortland Plant" printed on the model label. Sets produced at Bloomington have "Bloomington Plant" printed on the model number label.

former T502 (part number 80B32) is used to step up the 6.3 volts to 12.6 volts required for the heater of the 12H6 tube. The low end (black lead) of T502 connects to chassis ground, the center tap (green lead) connects to pin 7 of V408, the high end (yellow lead) connects to pin 7 of 12H6 (V404).

The circuit for the 6H6 is the same as for the 12H6 tube except that T502 auto-transformer is not used. Heater voltage (6.3 volts AC) connects to pin 7 of 6H6 tube (V404).

Replacing 12H6 Tube with a 6H6 Tube. If a 12H6 is not available for replacement, a type 6H6 tube may be used in place of the 12H6 if the following changes to the heater circuit are made:

1. Remove the transformer lead from pin 7 of the V404 (12H6) socket. Tape the lead to prevent it shorting to chassis.
2. Connect a lead from pin 7 of V404 socket to pin 7 of V401 socket.

CHANGE in FOCUS CIRCUIT

Run 10 in 21B1 Chassis

In late 21B1 chassis, a permanent magnet focusing assembly (part number 94C35-1) is used. The parts eliminated from the B plus (filter) circuit when the PM focus assembly is used are focus coil L404 and focus control R446. These parts have been replaced with choke coil L405 (part number 74B18-4) and resistor R449 (100 ohms, 7.5 watt, part number 61A1-20) connected in series. The choke with the resistor in series are in the filter circuit between filter condensers C407 and C432.

VIDEO DETECTOR and AGC CIRCUIT CHANGED

Run 12 in 21B1 Chassis, Run 3 in 21F1 Chassis

Late production 21B1 sets and 21F1 sets employ a 1N64 germanium diode (M301) as a video detector and a 6AU6 tube (V304) as a gated AGC stage. These sets use a 6AU6 tube in the 1st and 2nd IF stages and a 6AG5 tube in the 3rd IF stage. A cover shield is not used on the bottom of the IF amplifier sub-chassis. For sets with these circuit changes, see figures 18A and 18B.

CHANGE to PREVENT PICTURE CUT-OFF and to STABILIZE PICTURE BRIGHTNESS

Run 13 in 21B1 Chassis, Run 4 in 21F1 Chassis

The following changes were made to the B+ circuit to prevent possible picture cut-off due to blocking of the video amplifier. (This blocking may occur if the TV set is tuned to a very strong TV signal which could drive the video amplifier to cut-off. With the video amplifier at cut-off, B+ voltage applied to the cathode of the picture tube will increase thereby making the grid voltage more negative with respect to cathode, driving the picture tube to cut-off. Also since the gated AGC tube is dependent upon voltage from the video amplifier for its operation, blocking of the video amplifier will cause no AGC voltage to be developed and the system will remain blocked.)

Diagrams of voltage distribution and partial schematics before and after the change was made are shown in figures 17A, 17B, 18A and 18B. Note the changes made in the B+ circuit to the 3rd IF amplifier, AGC tube, video amplifier and picture tube. Resistor R336 (4,000 ohms, 5 watt).

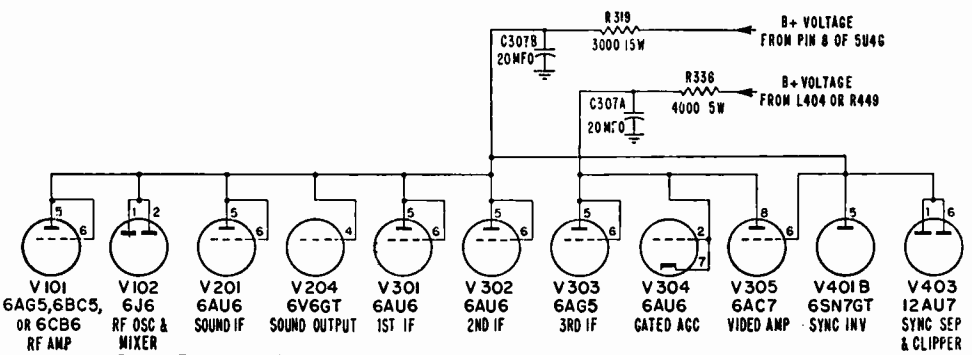


Figure 17A. Diagram Showing Section of B+ Distribution of 21B1 Chassis Stamped Run 12 and 21F1 Chassis Stamped Run 3. Partial schematic shown in figure 18A.

Continued on page 18.

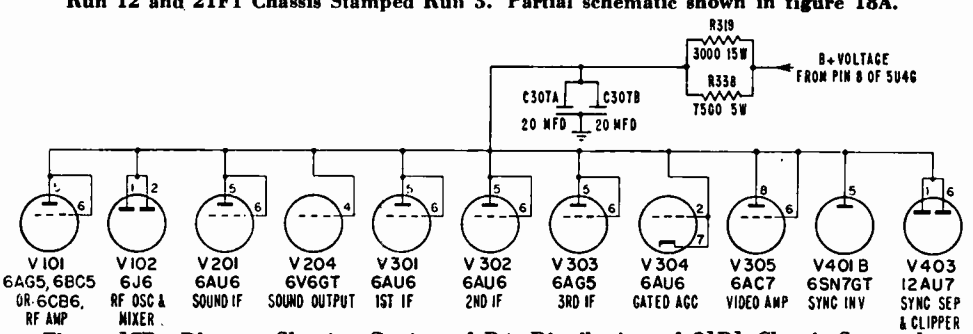


Figure 17B. Diagram Showing Section of B+ Distribution of 21B1 Chassis Stamped Run 13 or Run 14 and 21F1 Chassis Stamped Run 4 or Run 5. Partial schematic shown in figure 18B.

Admiral Corporation

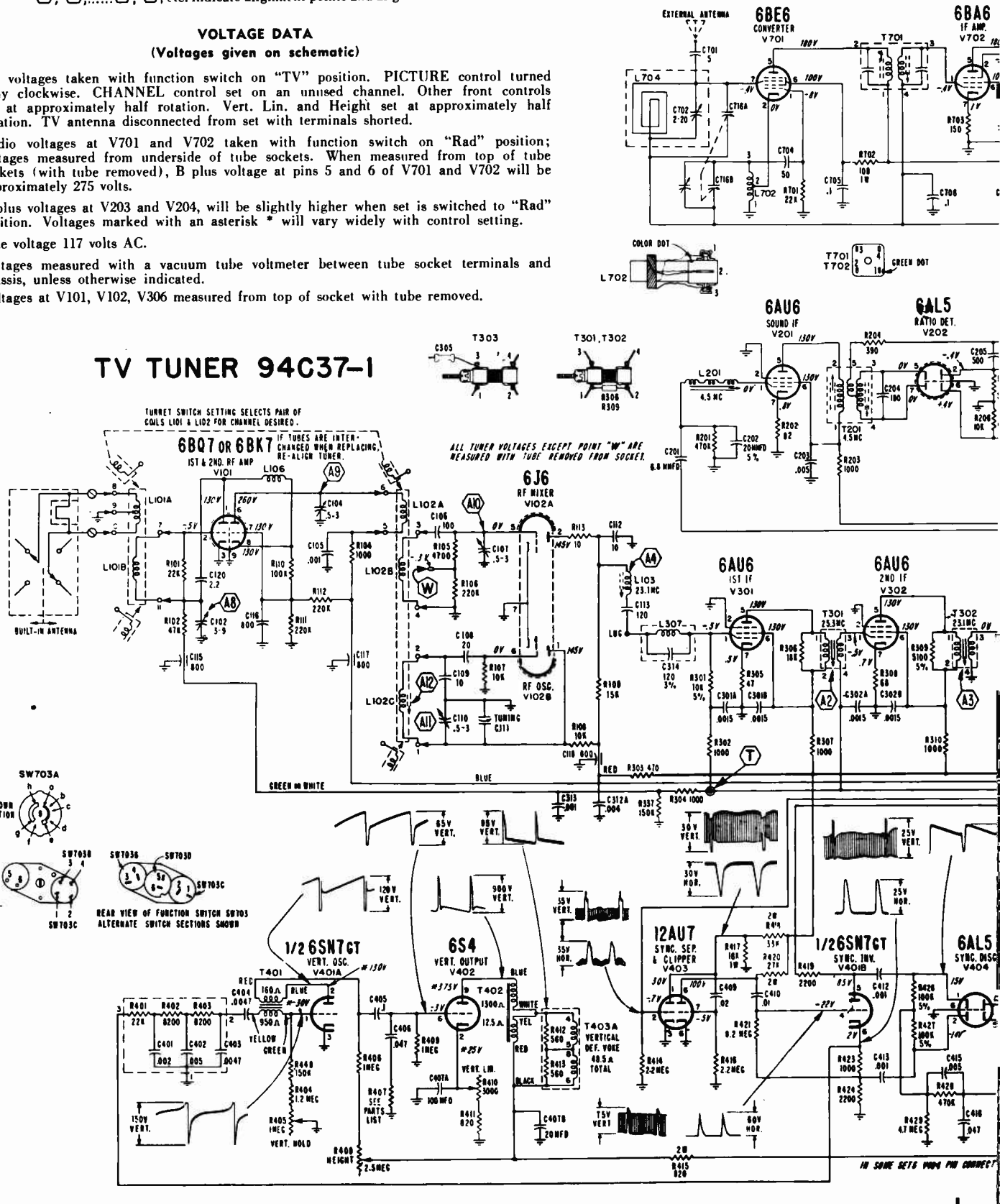
Schematic for 21W1, 21Y1 Televisio

Ⓐ1, Ⓐ2,.....Ⓨ, Ⓩ, etc. indicate alignment points and alignment connections.

VOLTAGE DATA
(Voltages given on schematic)

- TV voltages taken with function switch on "TV" position. PICTURE control turned fully clockwise. CHANNEL control set on an unused channel. Other front controls set at approximately half rotation. Vert. Lin. and Height set at approximately half rotation. TV antenna disconnected from set with terminals shorted.
- Radio voltages at V701 and V702 taken with function switch on "Rad" position; voltages measured from underside of tube sockets. When measured from top of tube sockets (with tube removed), B plus voltage at pins 5 and 6 of V701 and V702 will be approximately 275 volts.
- B plus voltages at V203 and V204, will be slightly higher when set is switched to "Rad" position. Voltages marked with an asterisk * will vary widely with control setting.
- Line voltage 117 volts AC.
- Voltages measured with a vacuum tube voltmeter between tube socket terminals and chassis, unless otherwise indicated.

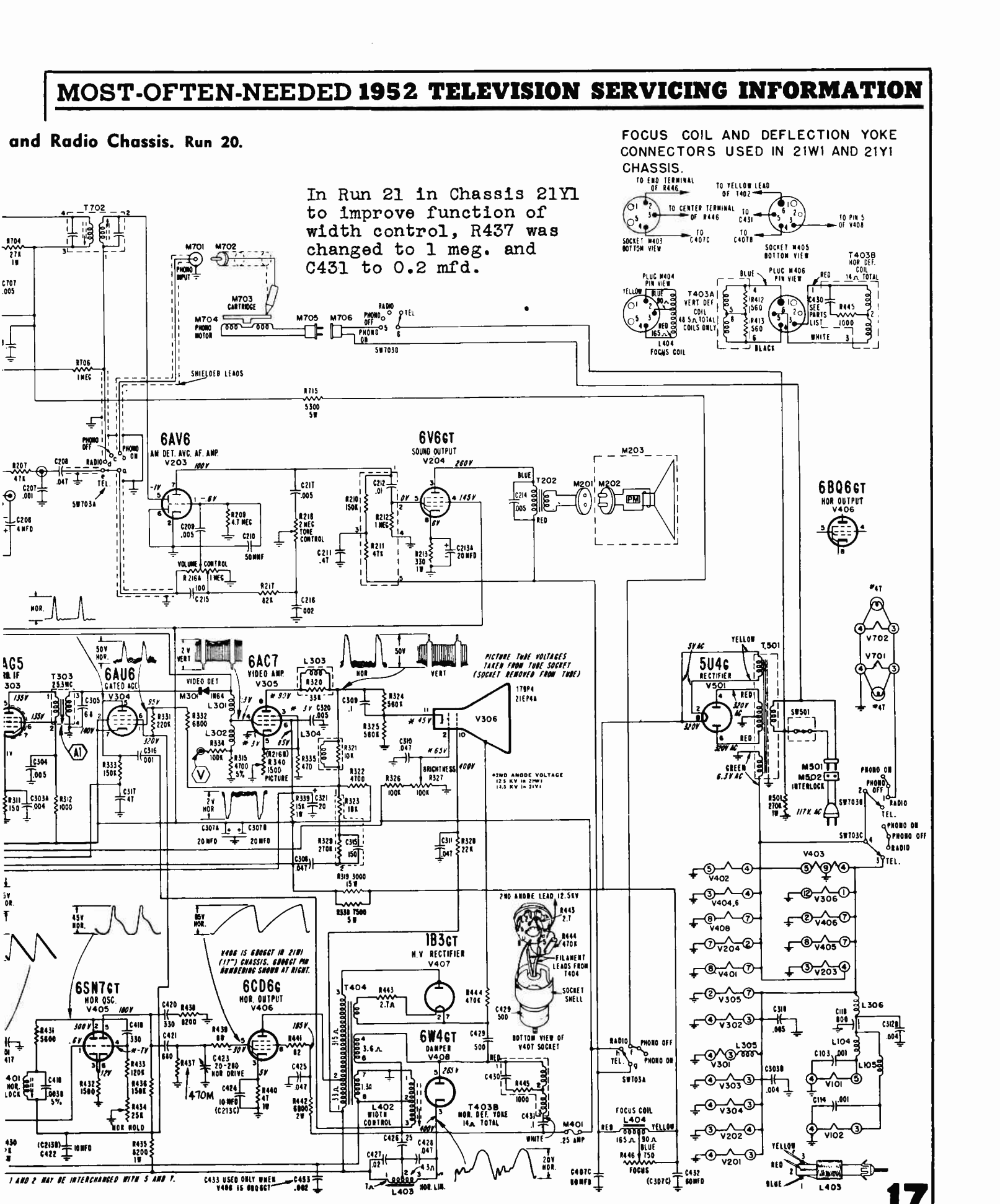
  Voltages at V101, V102, V306 measured from top of socket with tube removed.



and Radio Chassis. Run 20.

In Run 21 in Chassis 21Y1 to improve function of width control, R437 was changed to 1 meg. and C431 to 0.2 mfd.

FOCUS COIL AND DEFLECTION YOKE CONNECTORS USED IN 21W1 AND 21Y1 CHASSIS.



Admiral 21B1, 21C1, 21D1, 21E1, 21F1, 21G1, 21H1, 21J1, 21K1, 21L1, 21P1, 21Q1,

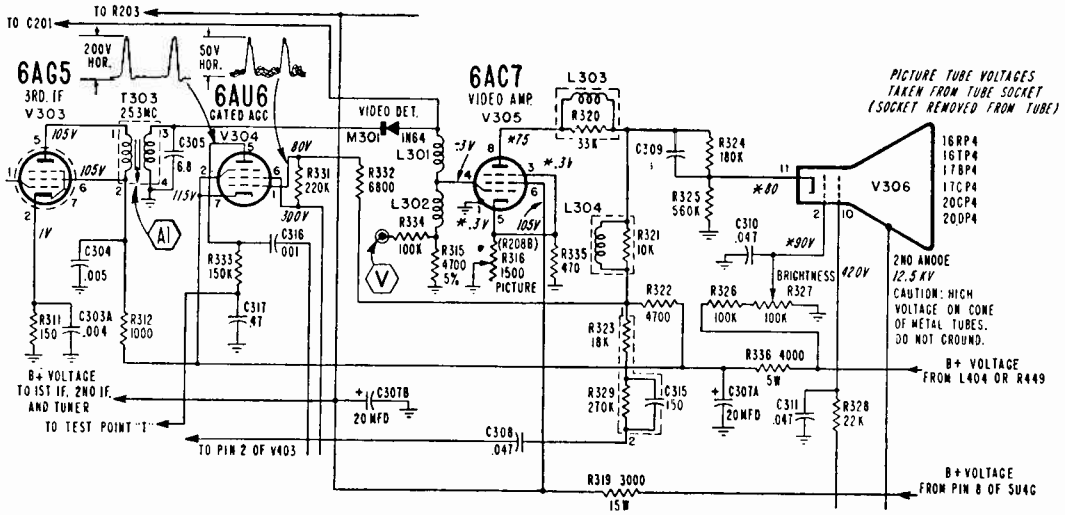


Figure 18A. Partial Schematic Showing B+ and Picture Tube Circuit in 21B1 Chassis Stamped Run 12 and 21F1 Chassis Stamped Run 3.

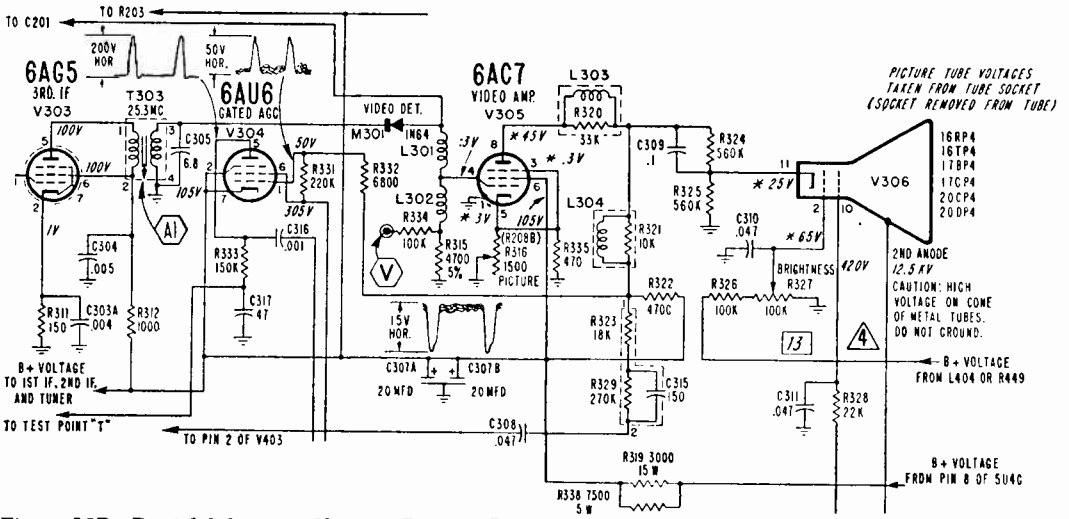


Figure 18B. Partial Schematic Showing B+ and Picture Tube Circuit in 21B1 Chassis Stamped Run 13 or Run 14 and 21F1 Chassis Stamped Run 4 or Run 5.

was omitted from the circuit. Resistor R338 (7,500 ohms, 5 watt) was wired in parallel with R319.

To prevent a decrease in brightness when strong signals are received, resistor R324 (in the cathode circuit of the picture tube) was changed from 180,000 ohms to 560,000 ohms.

Adding Changes to Prevent Picture Cut-off

If picture cut-off resulting from blocking of the video amplifier is experienced with a 21B1 chassis stamped Run 12 or 21F1 chassis stamped Run 3, the changes below should be made. See figure 19 and proceed as follows:

1. Remove resistor R336 (4,000 ohms).
2. Connect a 7,500 ohm, 5 watt resistor R338 (part number 61A1-18) across R319.
3. Connect together the positive terminals of filter condensers C307A and C307B.
4. Change resistor R324 from 180,000 ohms to 560,000 ohms, ½ watt (part number 60B8-564).
5. Erase the old run number from the chassis and mark in the next higher run number.

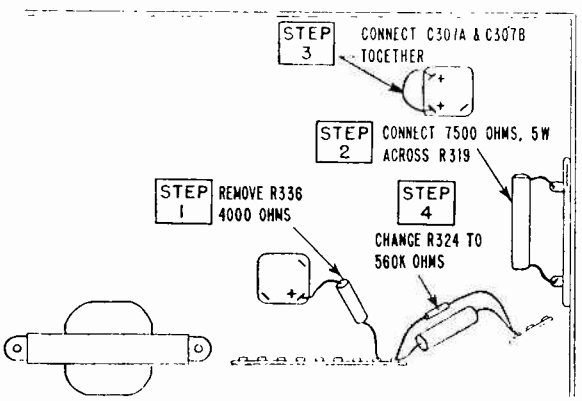


Figure 19. Diagram Showing Changes to be Added to Prevent Picture Cut-off in 21B1 Chassis Stamped Run 12 and 21F1 Chassis Stamped Run 3.

SOCKET M509 and PLUG M510 ADDED and AGC TEST POINT WIRED to a TEST JACK

Run 14 in 21B1 Chassis, Run 5 in 21F1 Chassis

Color Connectors. A 9-contact socket M509 was added at the rear of the TV chassis to provide B+ voltages, and 110 volt AC power for attachment of a color converter. Plug M510 fits into the socket to complete the B+ circuits when a color converter is not used. The plug has jumpers wired between pins 1 and 2, between pins 3 and 4, and between pins 5 and 6. In some earlier production sets, plug M510 and the wiring to socket M509 were omitted. **Note:** Sets which have the B+ circuits wired to socket M509 will not operate unless the plug (with jumpers connected) or a color converter is plugged into the socket to complete the B+ circuits.

AGC Test Point. To make test point "T" (AGC buss) available from the top of the chassis, this test point has been wired to the test jack adjacent to test jack "Z". See figure 7 and figure 8 for location of test points.

CHANGE TO IMPROVE FOCUS

Run 8 in 21B1 Chassis

Some long neck 16TP4 picture tubes (Raytheon and Dumont brands) were used in some 21B1 chassis stamped Run 8. In order to obtain satisfactory focus when these picture tubes were used, a 10 watt bleeder resistor from 12,000 to 15,000 ohms was added from junction of resistors R326 and R211 to chassis ground. Important: It may be necessary to remove this resistor to obtain satisfactory focus when replacing an original long neck 16TP4 tube with a short neck tube.

DIFFERENT TUBE USED FOR VIDEO AMPLIFIER V305

In some late 21B1 sets a 6AH6 miniature tube is used in place of the 6AC7 tube for video amplifier V305. No circuit changes are necessary when substituting tubes but the socket will have to be changed.

CHANGE in 3C1 RADIO to IMPROVE TONE QUALITY

The following changes were made in later production 3C1 radio chassis for improved tone quality.

Resistor R709 was changed from 27,000 ohms to 82,000 ohms (part number 60B8-823).

Condenser C712 was changed from 250 mmfd. to 100 mmfd. (part number 65B6-3). C713 was changed from .01 mfd. to .002 mfd. (part number 64B5-25). C714 was changed from .002 to .005 mfd. (part number 64B5-12). The schematic figure shows the 3C1 radio with these changes added.

DIFFERENT TUBE (V703) USED in 3C1 RADIO

Early sets used a 6AV6 tube for V703 (Det-AVC-AF). Later production sets use the 6SQ7 tube, which is the metal tube equivalent. Note that 6SQ7 pin numbering differs from that of 6AV6.

SERVICE HINTS

VERTICAL ROLL in 21D1 CHASSIS

In some sets enough 60 cycle ripple from the vertical output stage may be present in the B+ supply to appear in the sync circuits. This ripple voltage will occasionally be strong enough to trigger the vertical oscillator. If this 60 cycle ripple has shifted in phase with respect to the original vertical output signal, it will cause vertical "roll" (loss of vertical sync).

This condition can be corrected by changing the B+ connections of the vertical output tube V402 (6W6GT) as follows:

1. Locate the red lead from vertical output transformer T402 which connects to the terminal strip directly below the transformer. Also locate the white lead with black tracer (from the deflection yoke) which connects to same terminal. Disconnect both leads from terminal strip.
2. Connect both leads to the junction of C427 and L403, through a 5,000 ohm, 5 watt decoupling resistor, (part number 61A1-8). The decoupling resistor may be three 15,000 ohm, 2 watt resistors (part number 60B20-153) connected in parallel.
3. Connect a 20 mfd, 450 volt electrolytic condenser (part number 67A21-1) from the junction of the two leads and the decoupling resistor to chassis ground. (Connect the negative of the condenser to chassis ground.)

SYNC TROUBLE DUE to INCORRECT VALUE of R323 RESISTOR

If sync difficulty or picture fuzziness is experienced, check resistor R323 to see that it is 18,000 ohms.

REMOVING RETRACE LINES

In some areas, where the signal strength is low, it is often desirable to operate a receiver with the contrast reduced and the brightness turned up.

Under these conditions several bright retrace lines may be visible in the picture. If the following changes are made, the brightness control may be turned fully on without the retrace lines being visible. To add this change to the circuit proceed as follows:

1. Connect a 270,000 ohm, ½ watt resistor (part number 60B8-274) in series with pin 2 (grid) of the picture tube and the lead connected from the junction of C310 and R327.
2. Connect a .05 mfd condenser (part number 64B5-22) from the junction of C406 and R407 to pin 2 (grid) of the picture tube.

NOTE: If picture smears on white screen, use a 47,000 ohm resistor in place of the 270,000 ohm resistor. Also, if shading at the top of the picture is evident reduce the condenser value in step 2 to as low as .001 mfd.

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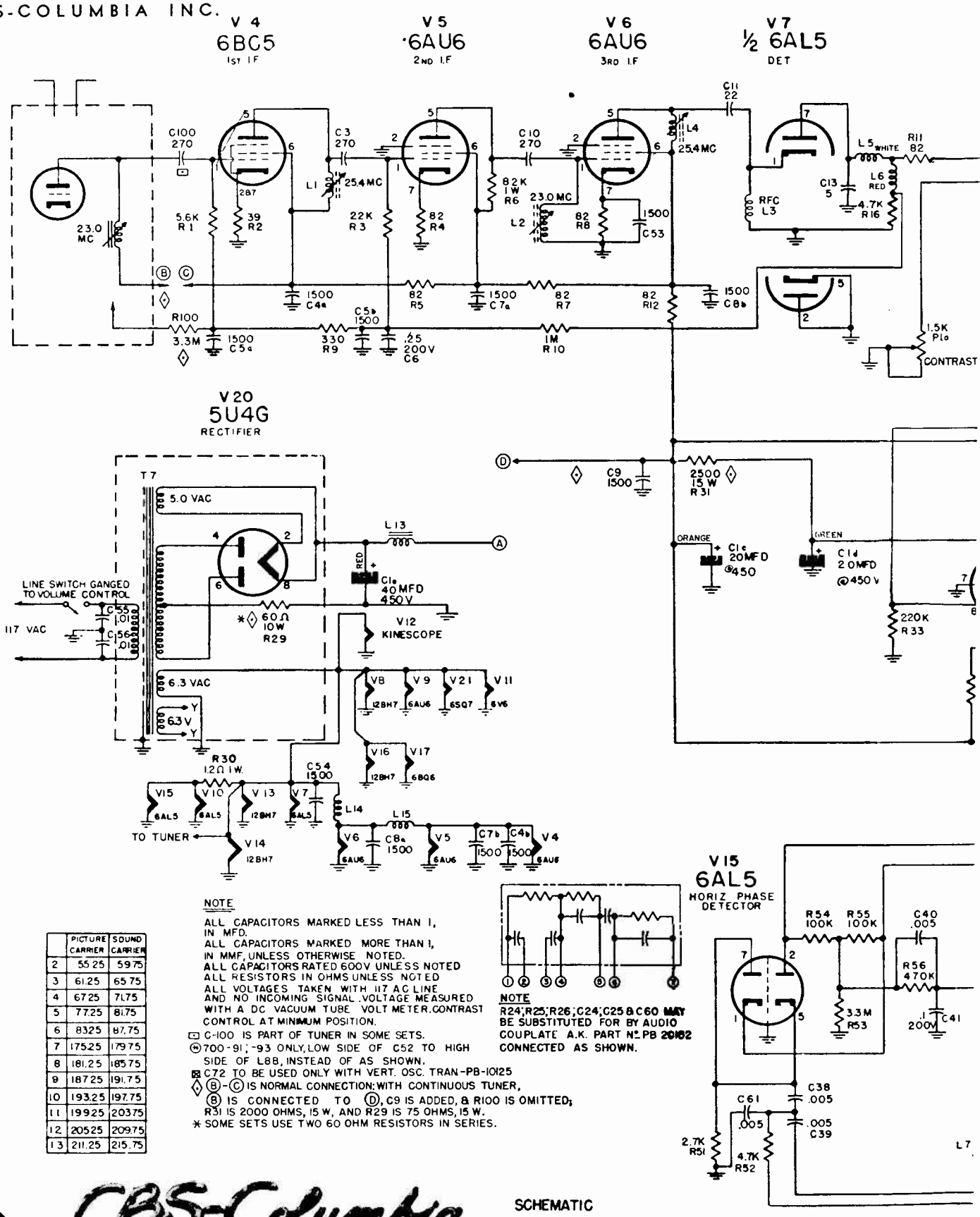


	PICTURE CARRIER	SOUND CARRIER
2	55.25	59.75
3	61.25	65.75
4	67.25	71.75
5	77.25	81.75
6	83.25	87.75
7	175.25	179.75
8	181.25	185.75
9	187.25	191.75
10	193.25	197.75
11	199.25	203.75
12	205.25	209.75
13	211.25	215.75

NOTE

ALL CAPACITORS MARKED LESS THAN 1, IN MFD.
ALL CAPACITORS MARKED MORE THAN 1, IN MMF, UNLESS OTHERWISE NOTED.
ALL CAPACITORS RATED 600V UNLESS NOTED
ALL RESISTORS IN OHMS UNLESS NOTED
ALL VOLTAGES TAKEN WITH 117 AC LINE AND NO INCOMING SIGNAL. VOLTAGE MEASURED WITH A DC VACUUM TUBE VOLT METER. CONTRAST CONTROL AT MINIMUM POSITION.

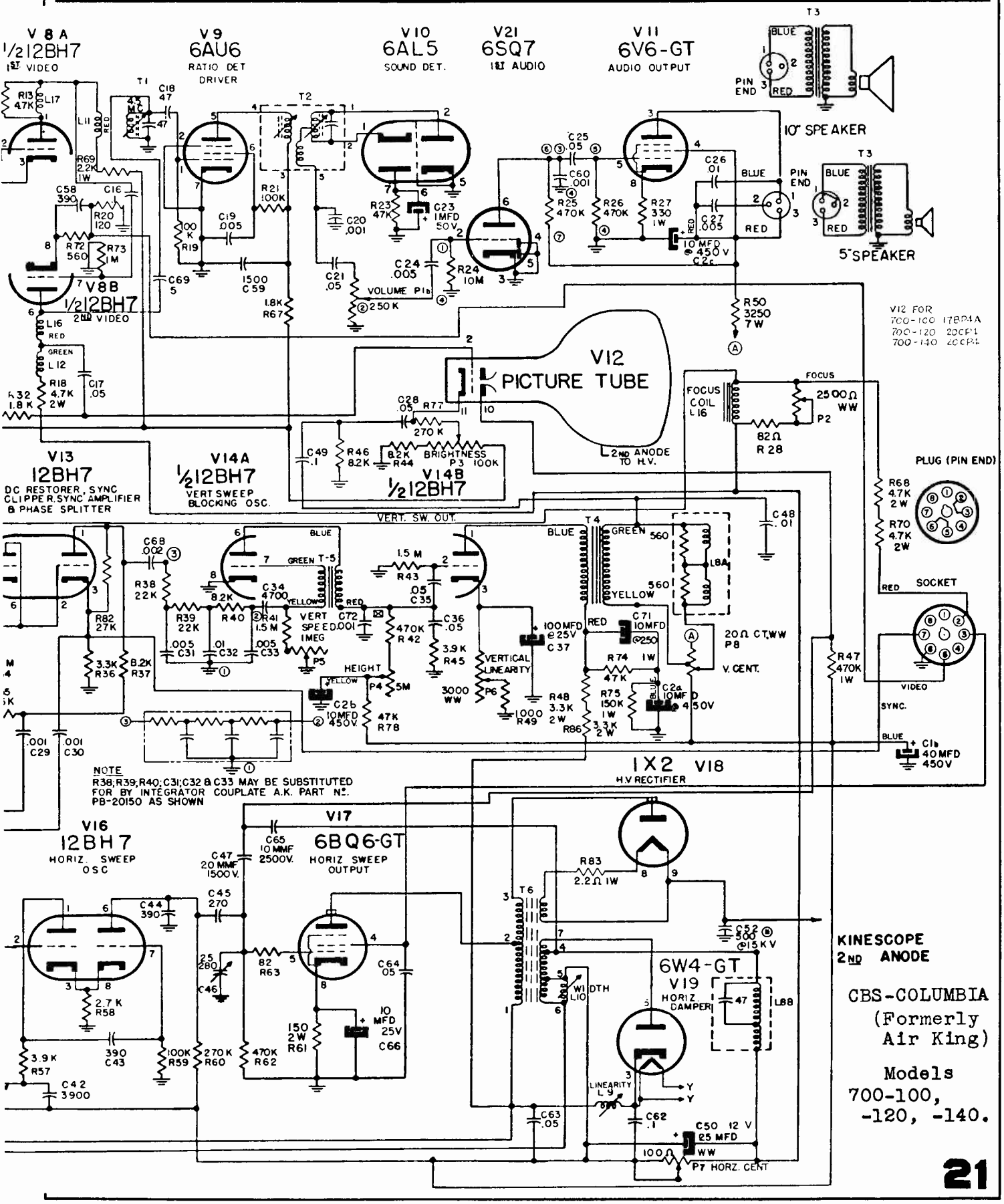
⊡ C-100 IS PART OF TUNER IN SOME SETS.
Ⓜ 700-91, -93 ONLY, LOW SIDE OF C52 TO HIGH SIDE OF L88, INSTEAD OF AS SHOWN.
⊠ C72 TO BE USED ONLY WITH VERT. OSC. TRAN-PB-10125
◇ Ⓑ-Ⓒ IS NORMAL CONNECTION; WITH CONTINUOUS TUNER, Ⓑ IS CONNECTED TO Ⓓ, C9 IS ADDED, & R100 IS OMITTED; R31 IS 2000 OHMS, 15 W, AND R29 IS 75 OHMS, 15 W.
✳ SOME SETS USE TWO 60 OHM RESISTORS IN SERIES.

NOTE

R24, R25, R26, C24, C25 & C60 MAY BE SUBSTITUTED FOR BY AUDIO COUPLATE A.K. PART Nº PB 20182 CONNECTED AS SHOWN.

CBS-Columbia

SCHEMATIC
700-100, -120, -140


V8A
1/2 12BH7
1ST VIDEO
V9
6AU6
RATIO DET DRIVER
V10
6AL5
SOUND DET.
V21
6SQ7
1ST AUDIO
V11
6V6-GT
AUDIO OUTPUT
T3
BLUE
PIN END
RED
10" SPEAKER
5" SPEAKER
T1
T2
R13 47K
L17
L11
R69 2.2K 1W
C18 47
C58 390
C16
R20 120
R72 560
R73 1M
C19 .005
100K R19
R21 100K
C20 .001
R23 47K
C23 1MFD 50V
C24 .005
VOLUME P1a
250K
R24 10M
C21 .05
1.8K R67
C69 5
1500 C59
V8B
1/2 12BH7
2ND VIDEO
L16 RED
GREEN L12
R18 4.7K 2W
C17 .05
R32 1.8K
C25 .05
C60 .001
R25 470K
R26 470K
R27 330 1W
C26 .01
C27 .005
10 MFD @ 450V C2c
R50 3250 7W
V12 FOR
700-100 17BP4A
700-120 20CP1
700-140 20CP4
V12
PICTURE TUBE
2ND ANODE TO H.V.
FOCUS COIL L16
FOCUS
2500Ω WW
P2
82Ω R28
C28 .05
R77 270K
C49 .1
R46 8.2K
R44 8.2K
BRIGHTNESS P3 100K
V13
12BH7
DC RESTORER, SYNC CLIPPER, SYNC AMPLIFIER & PHASE SPLITTER
V14A
1/2 12BH7
VERT SWEEP BLOCKING OSC.
V14B
1/2 12BH7
VERT. SW. OUT.
PLUG (PIN END)
R68 4.7K 2W
R70 4.7K 2W
SOCKET
RED
VIDEO
SYNC.
BLUE
C1b 40MFD 450V
C48 .01
T4
GREEN
YELLOW
560
560
L8A
20Ω CT WW P8
V. CENT.
R47 470K 1W
C68 .002
R38 22K
R82 27K
3.3K R36
8.2K R37
T-5
C34 4700
R39 22K
R40 8.2K
R41 1.5M
VERT SPEED 1MEG P5
C72 .001
C31 .005
C32 .01
C33 .005
1.5 M R43
C35 .05
C36 .05
3.9K R45
470K R42
HEIGHT P4 5M
C26 10MFD 450V
47K R78
VERTICAL LINEARITY P6 3000 WW
R48 3.3K 2W
1000 R49
R86 3.3K 2W
C37 100MFD @25V
C71 10MFD @250
R74 1W 47K
R75 150K 1W
C2a 10MFD 450V
C29 .001
C30 .001
1X2 V18
H.V. RECTIFIER
NOTE
R38; R39; R40; C31; C32 & C33 MAY BE SUBSTITUTED FOR BY INTEGRATOR COUPLATE A.K. PART NO. PB-20150 AS SHOWN
V16
12BH7
HORIZ. SWEEP OSC
V17
6BQ6-GT
HORIZ SWEEP OUTPUT
C65 10 MMF 2500V.
C47 20 MMF 1500V.
C45 270
C44 390
25 280 C46
82 R63
C64 .05
2.7K R58
3.9K R57
390 C43
100K R59
270K R60
470K R62
150 2W R61
10 MFD 25V C66
C42 3900
R83 2.2Ω 1W
T6
C52 500 @15KV
WIDTH L10
6W4-GT
V19
HORIZ. DAMPER
47
L8B
LINEARITY L9
C63 .05
C62 .1
C50 12V 25 MFD
100Ω WW
P7 HORZ. CENT
Y
Y
KINESCOPE 2ND ANODE
CBS-COLUMBIA
(Formerly Air King)
Models 700-100, -120, -140.

ARVIN

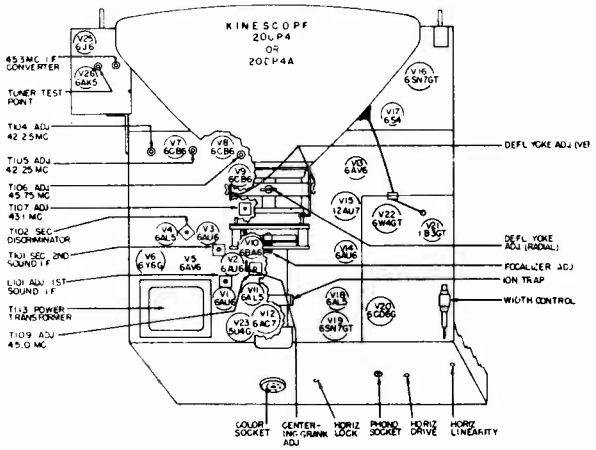
ARVIN INDUSTRIES, Inc.

MODELS 5204-5206-5210-5211-5212

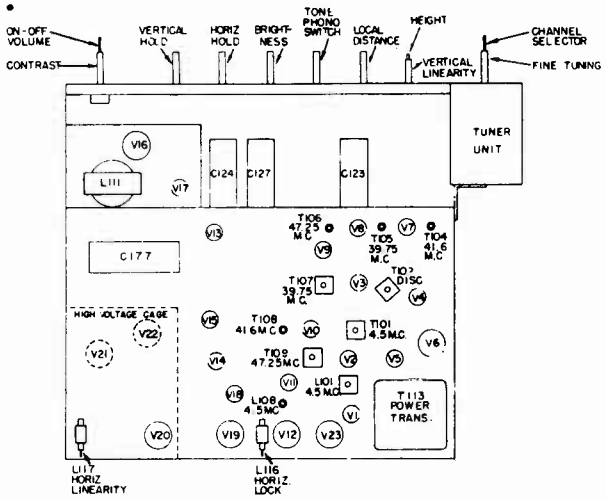
CHASSIS TE 300, TE 315

The circuit diagram on pages 24 and 25, is exact for a recent production of Chassis TE315. Chassis TE300 uses a 20" picture tube and is almost identical in circuit to the TE315. The alignment for these two chassis is the same and is presented here. Refer to the correct chassis views as given below and on page 23.

You will find Chassis TE286, used in Model 4162, with a 16" tube, and Chassis TE302, used in Models 5170, 5171, 5172, 5173, with a 17" tube, are similar to the sets covered in these pages. There are some circuit differences, as for example, V17 is 6SN7GT and not 6S4, cathode of V12 is returned to ground and not -12 v. In the main, however, these sets are sufficiently similar for you to benefit through the use of these notes in servicing these additional Arvin sets.



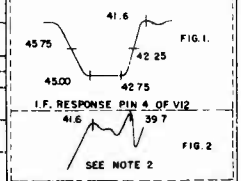
TOP VIEW — CHASSIS TE300



BOTTOM VIEW — CHASSIS TE300

HI-VOLTAGE WARNING— ON METAL PIX TUBE RECEIVERS UNCOUPLE ANODE CONNECTOR LEAD AT SOCKET BEFORE ALIGNMENT.

1. ALLOW ABOUT 15 MINUTES FOR RECEIVER AND TEST EQUIPMENT TO WARM UP.
2. PULL THE A.G.C. TUBE, V14, OUT.
3. CONNECT A BIAS BATTERY (-2V) TO THE A.G.C. -- PIN 1 OF V13, POSITIVE BATTERY TERMINAL TO GROUND.
4. USE A NON-METALLIC ALIGNMENT SCREWDRIVER TOOL.
5. GOOD GROUND CONNECTIONS BETWEEN RECEIVER AND TEST EQUIPMENT IS VERY NECESSARY -- A METAL SURFACE BENCH TOP FOR THE EQUIPMENT TO BE BONDED TO IS HIGHLY DESIRABLE.
6. LOCAL-DISTANCE SWITCH IN "DISTANCE" POSITION.

STEP	EQUIPMENT	CONNECT TO	FREQUENCIES	ADJUST	INSTRUCTIONS
1.	VTVM	ACROSS R138			ISOLATE VTVM LEAD WITH 18K ISOLATING RESISTOR.
2.	R.F. SIGNAL GENERATOR	PIN 1, V7 OR TUNER TEST POINT.	39.75 MC	BOTTOM OF T105 & T107 FOR MIN.	VTVM ON LOWEST SCALE-TUNER ON CHANNEL 2.
3.	SAME	SAME	47.25 MC	BOTTOM OF T109 FOR MIN.	
4.	SAME	SAME	47.25 MC	BOTTOM OF T106 FOR MIN.	
5.	SAME	SAME	41.6 MC	BOTTOM OF T103 FOR MIN.	
		TUNER TEST POINT	41.3 MC	BOTTOM OF T104 FOR MIN.	
6.	SAME	SAME	42.25MC	TOP OF T104 & T105 FOR MAX.	
7.	SAME	SAME	43.1 MC	TOP OF T107 FOR MAX	
8.	SAME	SAME	45 MC	TOP OF T109 FOR MAX.	
9.	SAME	SAME	45.3 MC	TUNER UNIT, T1, FOR MAX.	START WITH CORE IN AND TUNE OUT.
10.	SAME	SAME	45.75 MC	TOP OF T106 FOR MAX.	
11.	SAME	GROUNDED SHIELD UNDER V7	45.75, 45, 42.75, 42.25, 41.6		USED AS A MARKER GENERATOR
12.	OSCILLOSCOPE	ACROSS R138			ISOLATE SCOPE LEAD WITH 18K RESISTOR. SET BIAS AT -3 VOLTS.
13.	SWEEP GENERATOR	ANTENNA TERMINALS	CHANNEL 10	TOUCH-UP CORES ON TOP FOR DESIRED RESPONSE CURVE.	SWITCH TUNER TO CHANNEL 10.
14.	SAME	SAME	MARKER 41.6 39.7	T108 (CATHODE TRAP)	SEE NOTE 2
15.	SAME	SAME		CHECK ALL CHANNELS.	

NOTE 1: T106 & T1 AFFECTS HIGH FREQUENCY SIDE -- T107 & T109 AFFECTS TILT ON TOP OF CURVE -- T104 & T105 AFFECTS LOW FREQUENCY SIDE

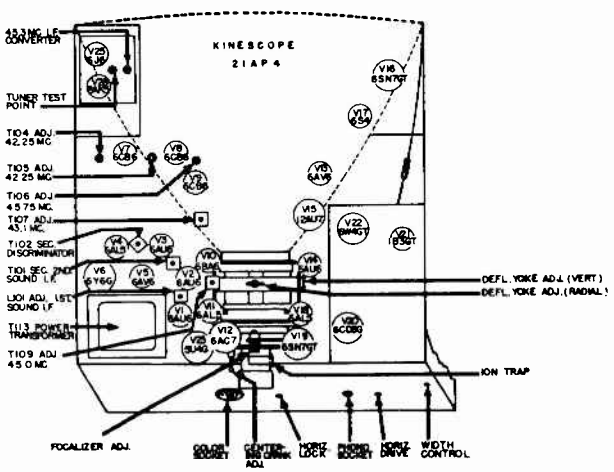
NOTE 2: INCREASE SCOPE GAIN TO SEE SOUND PORCH BETWEEN 41.6 AND 39.7 MARKERS T108 ADJUST TO FLATTEN PORCH -- SEE FIG. 2.

VIDEO I F AND TRAP ALIGNMENT

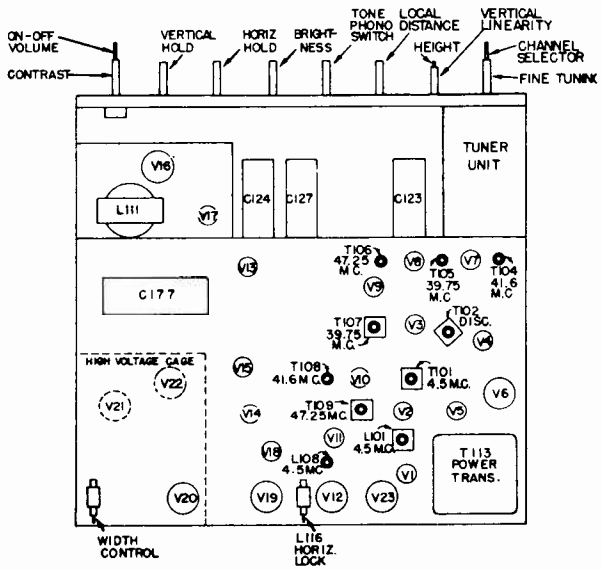
Arvin Chassis TE300, TE315, Models 5204, 5206, 5210, 5211, 5212, continued

SOUND I.F ALIGNMENT TABLE					
STEP	EQUIPMENT	CONNECT TO	FREQUENCIES	ADJUST	INSTRUCTIONS
1.	VTVM	ACROSS R107 (T101)			-5V SCALE
2.	SIGNAL GENERATOR	PIN 2 OF V11	4.5 MC	TOP & BOTTOM OF T101 & TOP OF L101 FOR MAX. OUTPUT ON VTVM.	SET SIGNAL INPUT FOR APPROXIMATELY -2V ON VTVM
3.	VTVM	JUNCTION OF R111 AND R112 (DISCRIMINATOR OUTPUT)		BOTTOM OF T102 FOR MAXIMUM OUTPUT.	SAME INPUT AS STEP 2.
4.	VTVM	JUNCTION OF R113 & C115 (DISCRIMINATOR OUTPUT)		TOP OF T102 FOR ZERO.	SAME INPUT AS STEP 2
5.	VTVM	ACROSS R107 (T101)			-1.50 SCALE
6.	SIGNAL GENERATOR	PIN 4 OF V12	4.5 MC	ADJUST L108 FOR MINIMUM.	USE 20K ISOLATING RESISTOR IN SIGNAL GENERATOR LEAD.

NOTE 1: DISCONNECT ALL TEST EQUIPMENT, TUNE IN A STATION FOR BEST PICTURE IF BUZZ IS PRESENT ADJUST TOP OF T102 FOR MINIMUM.



TOP VIEW — CHASSIS TE315



BOTTOM VIEW — CHASSIS TE315

TUNER OSCILLATOR ADJUSTMENT

A High-Channels adjustment, A4, and a Low-Channels adjustment, A5, of the R. F. oscillator is accessible when the channel tuning knobs are removed. These two adjustments are shown on the Tuner Unit View.

HIGH-CHANNELS

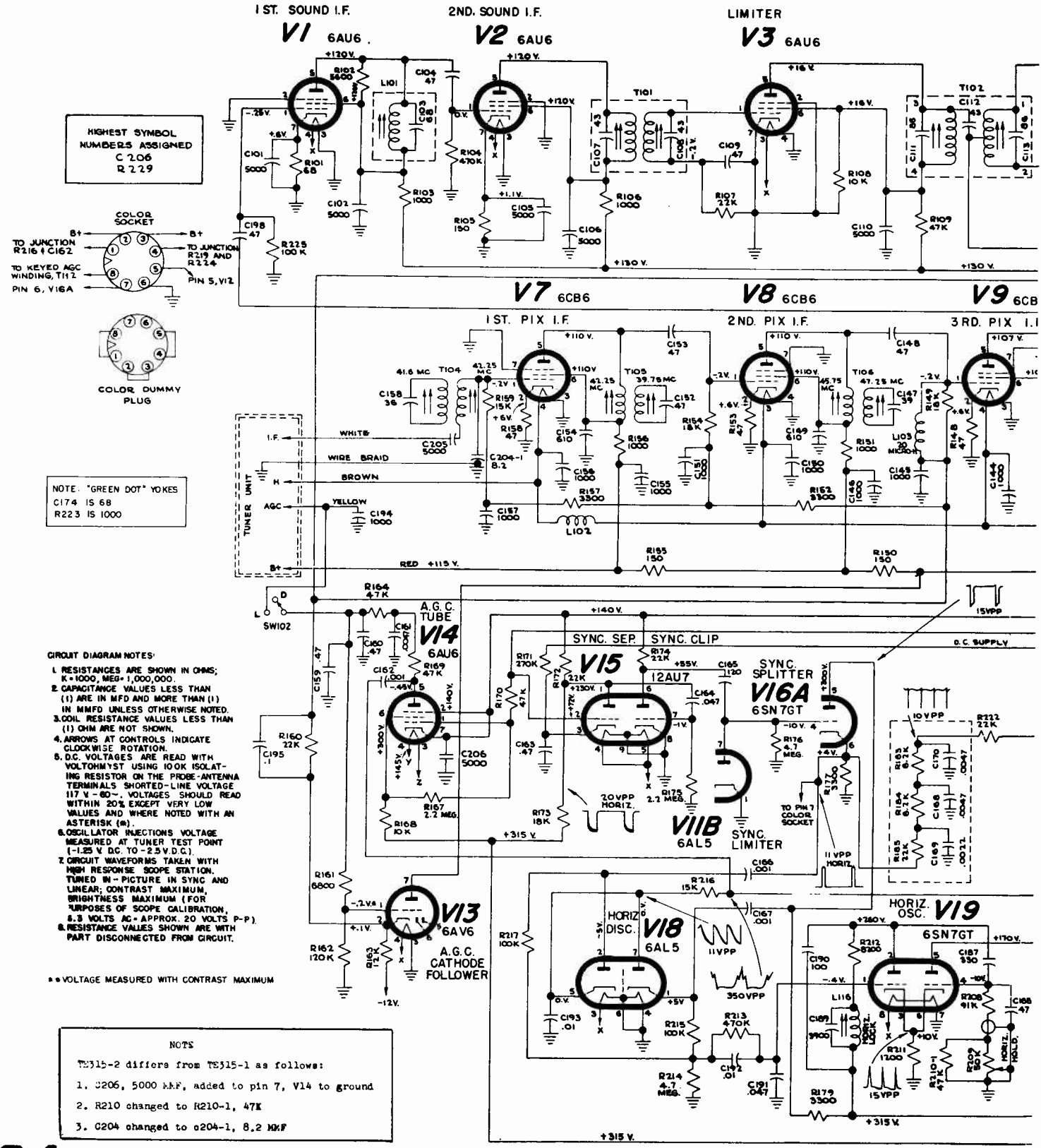
1. Set the Channel Selector Switch to the **highest** available station between channels 7 and 13.
2. Set the Fine Tuning to mid-position.
3. Adjust A4 for best picture definition.
4. The remaining lower "High-Channels" should be within the range of the Fine-Tuning.

LOW-CHANNELS

1. Set the Channel Selector Switch to the **highest** available station between channels 2 and 6.
2. Set the Fine-Tuning to mid-position.
3. Adjust A5 for best picture definition.
4. The remaining lower "Low-Channels" should be within the range of the Fine-Tuning.

NOTE: The design purpose of A4 and A5 is for optimum adjustment for channel 13 and channel 6—for optimum High and Low channels coverage. The above procedure gives optimum adjustment for any available stations.

SCHEMATIC DIAGRAM Arvin



CIRCUIT DIAGRAM NOTES:

1. RESISTANCES ARE SHOWN IN OHMS; K = 1000, MEG = 1,000,000.
2. CAPACITANCE VALUES LESS THAN (1) ARE IN MFD AND MORE THAN (1) IN MMFD UNLESS OTHERWISE NOTED.
3. COIL RESISTANCE VALUES LESS THAN (1) OHM ARE NOT SHOWN.
4. ARROWS AT CONTROLS INDICATE CLOCKWISE ROTATION.
5. D.C. VOLTAGES ARE READ WITH VOLTOHMYST USING 100K ISOLATING RESISTOR ON THE PROBE-ANTENNA TERMINALS SHORTED-LINE VOLTAGE 117 V - 60~. VOLTAGES SHOULD READ WITHIN 20% EXCEPT VERY LOW VALUES AND WHERE NOTED WITH AN ASTERISK (*).
6. OSCILLATOR INJECTIONS VOLTAGE MEASURED AT TUNER TEST POINT (-1.25 V. D.C. TO -2.5 V.D.C.).
7. CIRCUIT WAVEFORMS TAKEN WITH HIGH RESPONSE SCOPE STATION TUNED IN - PICTURE IN SYNC AND LINEAR; CONTRAST MAXIMUM, BRIGHTNESS MAXIMUM (FOR PURPOSES OF SCOPE CALIBRATION, 8.3 VOLTS AC = APPROX. 20 VOLTS P-P).
8. RESISTANCE VALUES SHOWN ARE WITH PART DISCONNECTED FROM CIRCUIT.

** VOLTAGE MEASURED WITH CONTRAST MAXIMUM

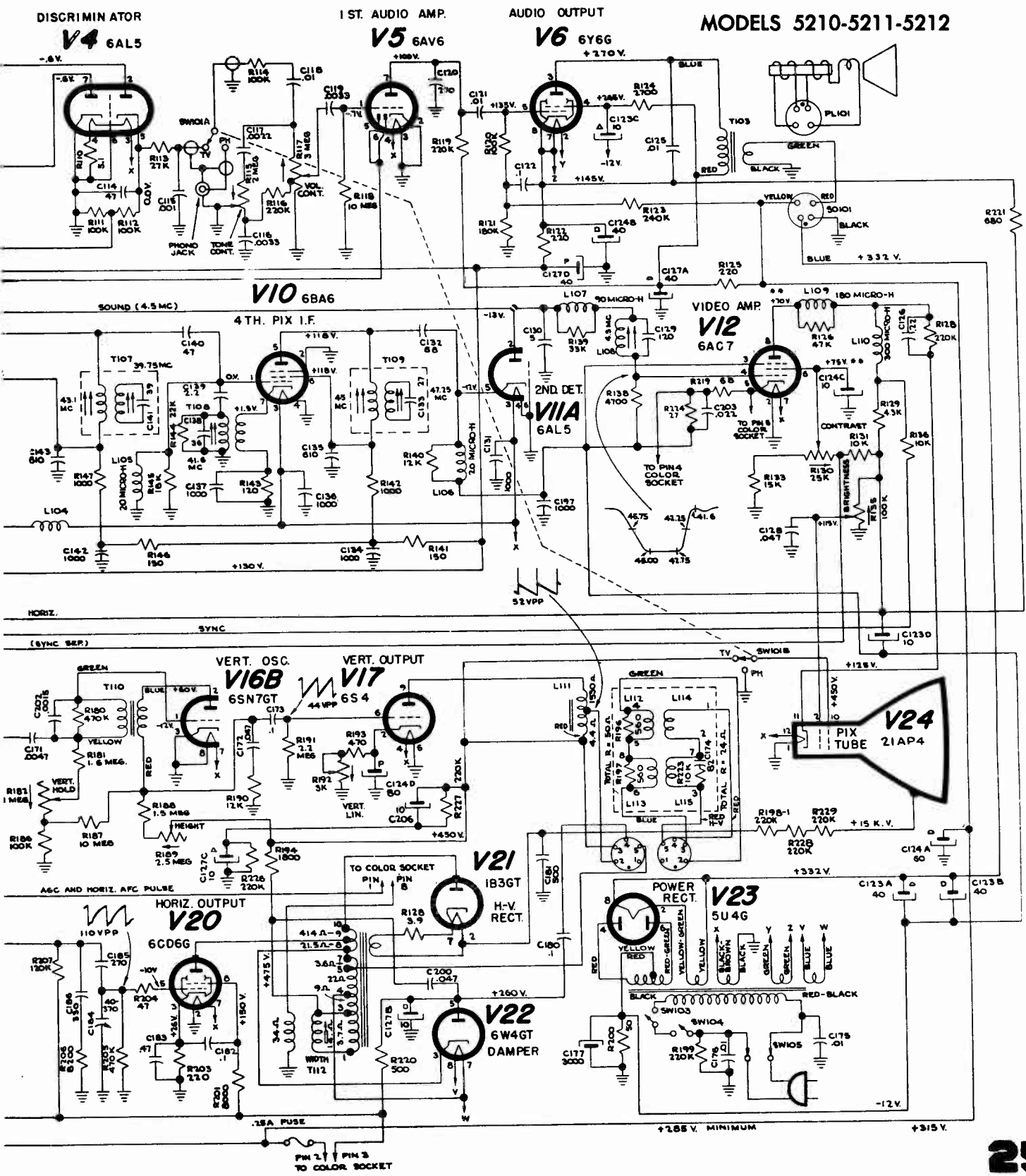
NOTE

TS315-2 differs from TS315-1 as follows:

1. C206, 5000 MMF, added to pin 7, V14 to ground
2. R210 changed to R210-1, 47K
3. C204 changed to c204-1, 8.2 MMF

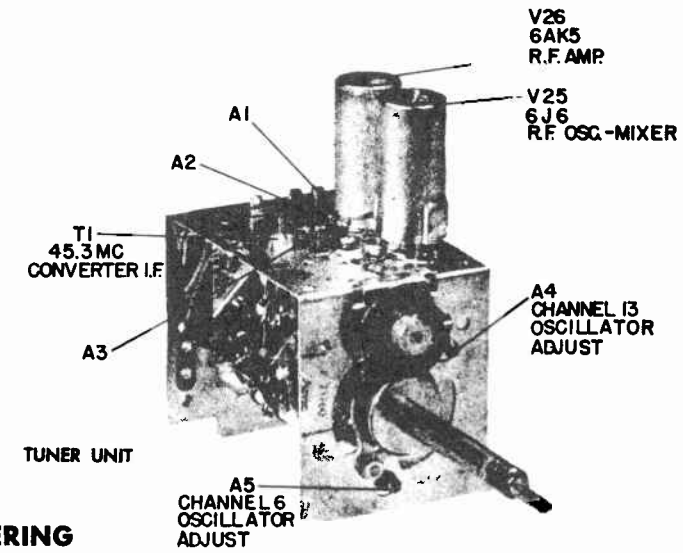
TELEVISION CHASSIS TE315-2

MODELS 5210-5211-5212



ARVIN TELEVISION

Chassis TE300, TE315,
Models 5204, 5206,
5210, 5211, 5212,
(Continued)



CENTERING

A Centering Crank (see chassis—top view) adjusts centering as follows:

Moving Crank to the right moves picture down.
Moving Crank to the left moves picture up.
Moving Crank up moves picture to the left.
Moving Crank down moves picture to the right.

The Horizontal Hold Control will move the picture horizontally and should be set first to the middle of its range of movement of the picture. The Centering-Crank should then be used to center the picture within the mask and remove corner-shadows. If corner-shadows persist, check to see that the Yoke and Mounting Frame are as far forward onto the cone of the picture tube as possible. When the Yoke and Ion-Trap are positioned properly, the Crank will readily center the picture without corner shadows.

HORIZONTAL DRIVE

Adjust HORIZONTAL DRIVE TRIMMER (C184) to the point where "overdrive" lines just disappear. "Overdrive" lines appear as a vertical white line in the left portion of the picture. The Horizontal Driver Trimmer is located in the control grid circuit of the Horizontal Output Tube (6CD6G) controlling operating characteristics of the tube. Turning the Horizontal Drive Screw clockwise reduces Horizontal Drive.

WIDTH ADJUSTMENT

Adjust WIDTH CONTROL (T112) to obtain a picture with sufficient width to just fill the picture frame. Maximum width occurs when the screw protrudes about ½" from the coil mounting-clip. This adjustment regulates the amount of deflection current flowing in the horizontal deflection coils controlling the horizontal dimension or width of the picture.

HEIGHT CONTROL

When the picture is too large or too small vertically, adjust the HEIGHT control for size. Note that the adjustment of this control may require a readjustment of the VERTICAL LINEARITY control.

VERTICAL LINEARITY

When the picture is not uniform vertically adjust the VERTICAL LINEARITY control until the picture is symmetrical from top to bottom. The HEIGHT control may also have to be readjusted.

HORIZONTAL LOCK ADJUSTMENT

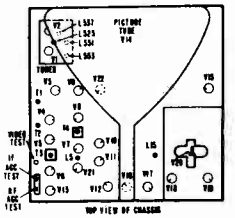
1. Tune in an available station.
2. Set the horizontal hold control at its maximum counter-clockwise position.
3. Adjust the Horizontal Lock adjustment on the middle—rear of the chassis until it is in sync. (See chassis view).
4. Turn Horizontal Lock adjustment clockwise until the picture goes out of sync.
5. Turn Horizontal Lock Adjustment counter-clockwise until picture just pulls into sync. The picture should now hold sync over the complete range of the horizontal hold control.

Bendix Radio

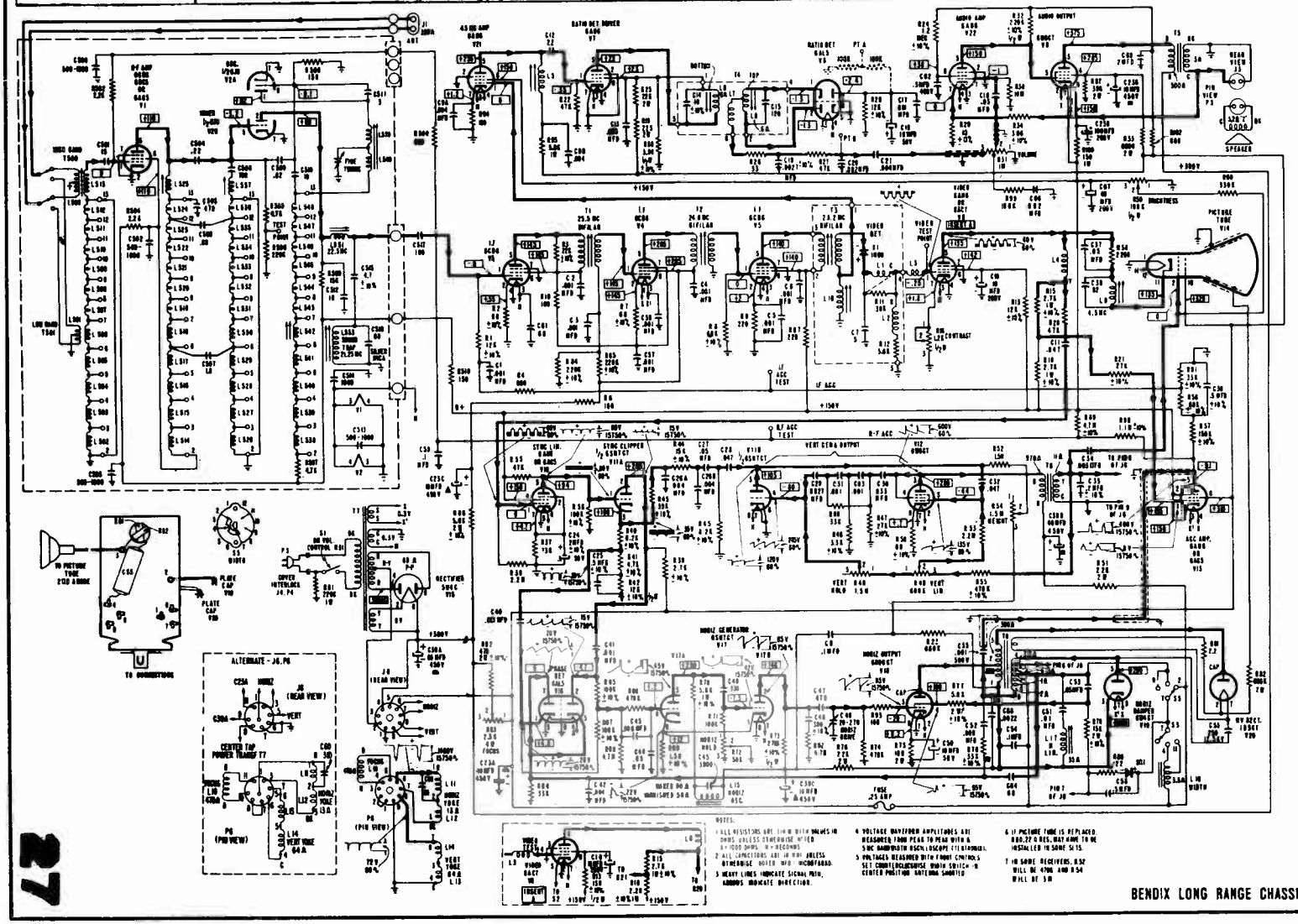
T171, C172, C182, C200

IF ALIGNMENT

Generator Freq.	*VTVM Connections*	*Adjustments*	*Remarks*
23.2 MC	To Video Test Point & Ground	T3	Adjust for Max.
24.6 MC	To Video Test Point & Ground	T2	Adjust for Max.
25.5 MC	To Video Test Point & Ground	T1	Adjust for Max.
22.5 MC	To Video Test Point & Ground	L551	Adjust for Max.
21.25 MC	To Video Test Point & Ground	L553	Adjust for Min. with output of Signal Gen. at Max.



TOP VIEW OF CHASSIS

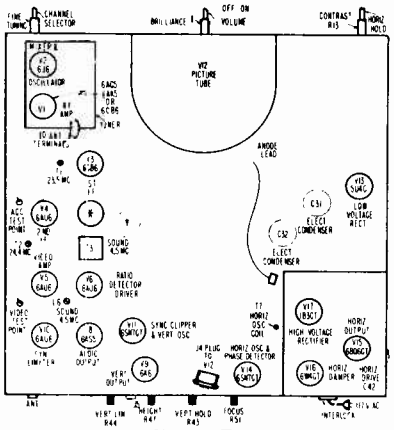


BENDIX LONG RANGE CHASSIS

BENDIX AVIATION CORP.

Bendix Radio Division

Models T170, T173, C174, C176, C176B, T190, 2060, 2070, and 7001 use the circuit on this page with a 17" picture tube. Additional Models 2051, 3051, 6001, 6003, and 6100, use 14" and 16" picture tubes and are almost identical in circuit to the ones described on this page. Model 6100 uses a separate radio section which employs only the speaker in common with the TV section.



(*) In some receivers V7 is 6T8, Ratio Det & 1st Audio, in this position. In some receivers V18 (6AT6, 6AQ6, 6AV6) will be in this position.

(‡) In some receivers V7 will be 6AL5, Ratio Det, in this position. V18 (6AT6, 6AQ6, 6AV6) is then used as 1st Audio.

IF ALIGNMENT

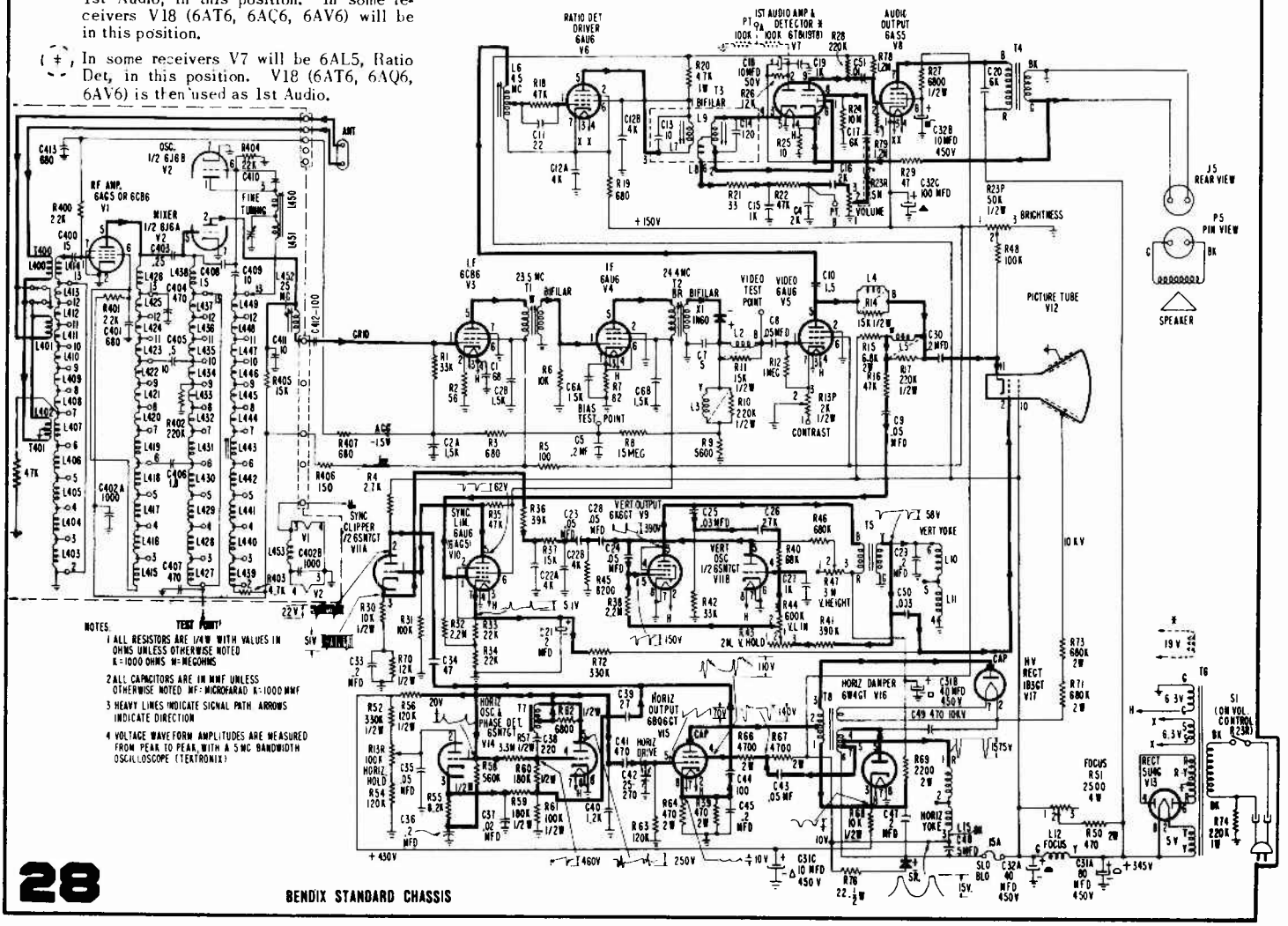
Generator Freq.	*VTVM Connections*	*Adjustment*	*Remarks*
24.4 MC	To Video Test Point & Ground	T2	Adjust for Max.
23.5 MC	To Video Test Point & Ground	T1	Adjust for Max.
25.0 MC	To Video Test Point & Ground	L452	Adjust for Max.

SOUND ALIGNMENT

Alignment using AM signal generator and VTVM:

The value of the two 100K resistors connected in step one should be within 1% of each other.

Signal Generator Coupling	*Signal Generator Frequency*	*Connect*	*Adjust*	*Remarks*
High side to Video Test Point. Low side to Chassis.	4.5 MC	Parallel C19 with two 100K Resistors. DC probe of VTVM to point A. Common lead to chassis.	L6 and L7	Adjust for maximum reading in order given, then repeat.
High side to Video Test Point. Low side to Chassis.	4.5 MC	DC probe of VTVM to point B. Common lead to point A.	L9	Adjust for zero reading at crossover.



CROSLEY

Models: DU-17CDM, DU-17CHB, DU-17CHM, DU-17CHN, DU-17COB, DU-17COM, DU-17TOB, DU-17TOL, DU-17TOM
(Chassis 356-1)

The material on the next six pages covers service information on Chassis 356-1 used in models listed above. The suffix -1 indicates a definite production run, so that suffix -2 or others after this chassis number would suggest a circuit with but minor variations. Many other chassis used in models of this same period are very similar to Chassis 356-1, and therefore this material may be used as an aid in servicing these additional Crosley sets. Some of these sets use 16", 17", 20", or 21" picture tubes, may have similar-function but differently numbered tubes in some of the circuits, some are combinations and have switching arrangements, and these various sets may also differ in other respects. In the main, however, these service notes will be applicable to:

Chassis 321-4, Models S11-447MU, S11-459MU,

Chassis 323-3, 323-4, Models 20-CDC1, 20-CDC2, 20-CDC3,

Chassis 323-6, Models S20-CDC1, S20-CDC2, S20-CDC3,

Chassis 331, 331-1, 331-2, Models 17-CDC1, 17-CDC2, 17-CDC3, 17-CDC4, 17-COC1, 17-COC2, 17-COC3,

Chassis 331-4, Models S11-442M1U, S11-444MU, S11-453MU, S11-472B1U, S11-474BU, S17-CDC1, S17-CDC2, S17-CDC3, S17-CDC4, S17-COC1, S17-COC2, S17-COC3,

Chassis 357, Models DU-20CDM, DU-20CHB, DU-20CHM, DU-20COB, DU-20COM,

Chassis 357-1, Models DU-21CDM1, DU-21CDN, DU-21CHM1, DU-21COB1 DU-21COL, DU-21COLB, and DU-21COM1,

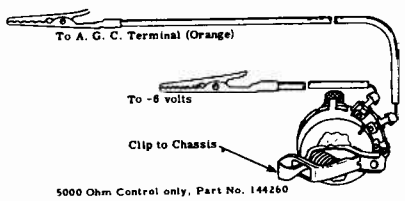
Chassis 359, Models DU-17PDB, DU-17PDM, DU-17PHB, DU-17PHM, DU-17PHN, DU-17PHN1,

Chassis 363 (used with 362 and 371), Model DU-20PDM.

I.F. ALIGNMENT*

1. To Check I.F. Alignment on Oscilloscope:

   a. Apply a negative bias of approximately 3.5 volts to the grids of the I.F. tubes V101 and V102. This bias can be obtained by the use of a 5000 ohm variable control with suitable leads attached (see sketch). Connect one side of the control to -6 volts on the lug of terminal board TB9 and connect the other side to the chassis (ground). Connect the center tap of the control to the AGC terminal (orange lead) on the terminal board TB1, located close to L102 on the I.F. strip. By adjusting the control, bias voltage may be varied from zero to -6 volts.



VARIABLE BIAS CONTROL ASSEMBLY

   b. Connect high side of scope to pin 1 of the AGC Amplifier V108, and the low side to ground (chassis).

   c. Remove R.F. Amplifier tube V1 to eliminate spurious responses.

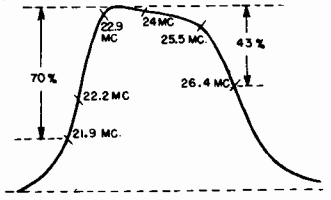
   d. Lift the shield on the Oscillator-Mixer tube V2 sufficiently to clear the socket ground clips. Connect sweep signal generator "hot" lead to the ungrounded tube shield and generator ground lead to the tuner chassis. Leads should be as short and direct as possible.

   e. With the generator sweep set at zero, connect an electronic voltmeter across the detector load resistor R117, and adjust output of generator to obtain a reading of 2 volts d.c. on the meter.

   f. Set generator to sweep from 20 mc. to 30 mc.

   g. Set tuner near the low frequency end of the range.

   h. Connect marker generator to sweep generator output leads and adjust to provide markers at 21.9 mc., 22.9 mc., 24 mc., 25.5 mc., and 26.4 mc.



NOMINAL OVERALL I. F. RESPONSE CURVE

   i. Observe curve and position of markers (see nominal response curve). The 21.9 mc. marker should be approximately 70% down from the peak and the 26.4 mc. marker approximately 43% down. Slight deviation in shape from the nominal response curve is permissible, but if any great deviation is noted, it will be necessary to realign the I.F. Amplifier. NOTE: The response curve may be distorted unless care is used in the method of connection to prevent feedback or regeneration. (It may sometimes be necessary to connect a 1 megohm isolating resistor at the end of the scope lead to prevent feedback.)

*NOTE: In normal signal areas, align the I.F.'s with the contrast control completely counter-clockwise and the bias as high as possible (reduced only enough to permit a suitable deflection on the scope or meter). Keep the signal sufficiently low to prevent overloading of the 2nd. detector.

CROSLEY Chassis 356-1, Models DU-17CDM, DU-17CHM, and others, continued.

I.F. ALIGNMENT (Continued)

j. Disconnect the generators, scope, and the 5000 ohm variable bias control from -6 volts, the AGC terminal and ground. Replace R.F. tube and shield and push Oscillator-Mixer tube shield into grounding clips.

2. I.F. Alignment Procedure.

a. Apply a negative bias to the I.F. tubes V101 and V102 as in (a) of "I.F. Alignment Check".

b. Connect an electronic voltmeter across the 2nd Detector load resistor R117.

c. Remove R.F. Amplifier tube V1 to eliminate spurious responses. Connect signal generator as in (d) of "I.F. Alignment Check".

d. Set tuner near low frequency end of range.

e. Set signal generator to 24 mc. and adjust L105 for maximum meter deflection, limiting meter deflection to 2 volts d.c. by adjusting input attenuator.

f. Reset signal generator to 22.2 mc. and tune L104 in a similar manner.

g. Next set signal generator to 26.55 mc. and tune L103 for maximum meter deflection.

h. Reset signal generator to 22.9 mc. and tune L102.

i. Set signal generator to 25.5 mc. and tune L101 for maximum meter deflection.

j. Repeat steps 5, 6,.7, 8, and 9.

k. Disconnect signal generator, electronic voltmeter and the 5000 ohm variable bias control from -6 volts, the AGC terminal and ground. Replace R.F. tube and shield. Push Oscillator-Mixer tube shield into grounding clips.

SOUND ALIGNMENT

1. Connect "hot" lead of signal generator to grid (pin 1) of V106. Set signal generator to 4.5 mc. with 400 cycle amplitude modulated signal, modulated 30% or greater.
2. Connect scope to picture tube grid (pin 2) through detector probe.
3. Connect two 100,000 ohm resistors (matched to within 1%) in series across ratio detector load resistor, R143. Connect common lead of the electronic voltmeter to the junction of the matched 100,000 ohm resistors, and the d.c. lead of the voltmeter to chassis (ground).
4. Using a high level signal input with the Contrast control set at maximum, tune the Sound Take-off Transformer (T101) primary (bottom of chassis) for minimum deflection on the scope.
5. Reduce signal input to below limiting in V107 (Sound Detector Driver) and adjust the Sound Take-off Transformer (T101) secondary (top of chassis), and the Ratio Detector Transformer (T102) primary (bottom of chassis) for peak meter reading.
6. Repeat steps 4 and 5.
7. Remove the detector probe and scope from the grid of the picture tube.
8. Transfer d.c. lead only of the electronic voltmeter to junction of R144 and C133 (top lug of TB6).
9. Return to high level input for limiting in V107 and adjust the Ratio Detector Transformer (T102) secondary (top of chassis) for zero meter reading.
10. Remove the two 100,000 ohm resistors and all test equipment from the receiver.

HORIZONTAL DRIVE

The setting of the HORIZONTAL DRIVE trimmer should be checked to see that no change in linearity in the center of the picture occurs with change in Contrast setting. In adjusting the HORIZONTAL DRIVE trimmer, it is necessary to observe the picture width and set the trimmer to the point of maximum width (toward minimum capacity). To set the trimmer correctly, turn it counter-clockwise until the picture width starts to decrease or until a compression in the center of the picture is noted, whichever condition occurs first. In the extreme case, the compression in the center of the picture will appear as a vertical white line.

A check should then be made to see if the horizontal linearity in the center of the picture changes with Contrast control setting. If it does, turn the drive trimmer slightly clockwise just enough to eliminate this change in linearity.

If the drive trimmer is misadjusted so that insufficient drive is applied to the tube, it will draw excessive current which will seriously shorten the life of the tube. This condition corresponds to the drive trimmer being adjusted too far in the clockwise direction.

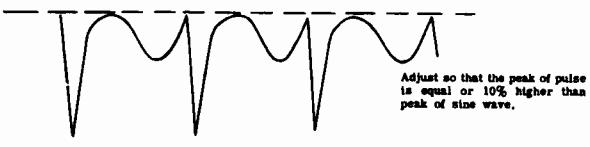
After tube replacement, readjust the drive trimmer as outlined in the paragraph above. The best horizontal linearity coincides with the lowest plate dissipation of the horizontal driver tube and this linearity should be obtained with the adjusting screw of the HORIZONTAL LINEARITY inductance as far out of the coil as possible. It should be noted that changing the linearity adjustment makes it necessary to readjust the HORIZONTAL DRIVE trimmer.

A.G.C. ADJUSTMENT

Tune in a station witn a weak signal and adjust the AGC THRESHOLD LEVEL control on the rear apron of the chassis to a point where the receiver will just begin to overload with the CONTRAST control set at maximum. If the receiver overloads on a strong signal, turn the CONTRAST control toward minimum to prevent overload.

HORIZONTAL BLOCKING OSCILLATOR ALIGNMENT

1. Tune receiver to a television signal and adjust CONTRAST control for normal picture below limiting in the video amplifier.
2. Adjust the HORIZONTAL HOLD control and the HORIZONTAL FREQUENCY adjustment (top of T106) until picture is in sync.
3. Connect scope in series with a 10 mmf. capacitor to terminal 5 of the HORIZONTAL TBO TRAP (bottom of T106) for the following wave form; keeping raster in sync by adjusting the HORIZONTAL HOLD control, HORIZONTAL FREQUENCY and/or HORIZONTAL LOCK adjustment.

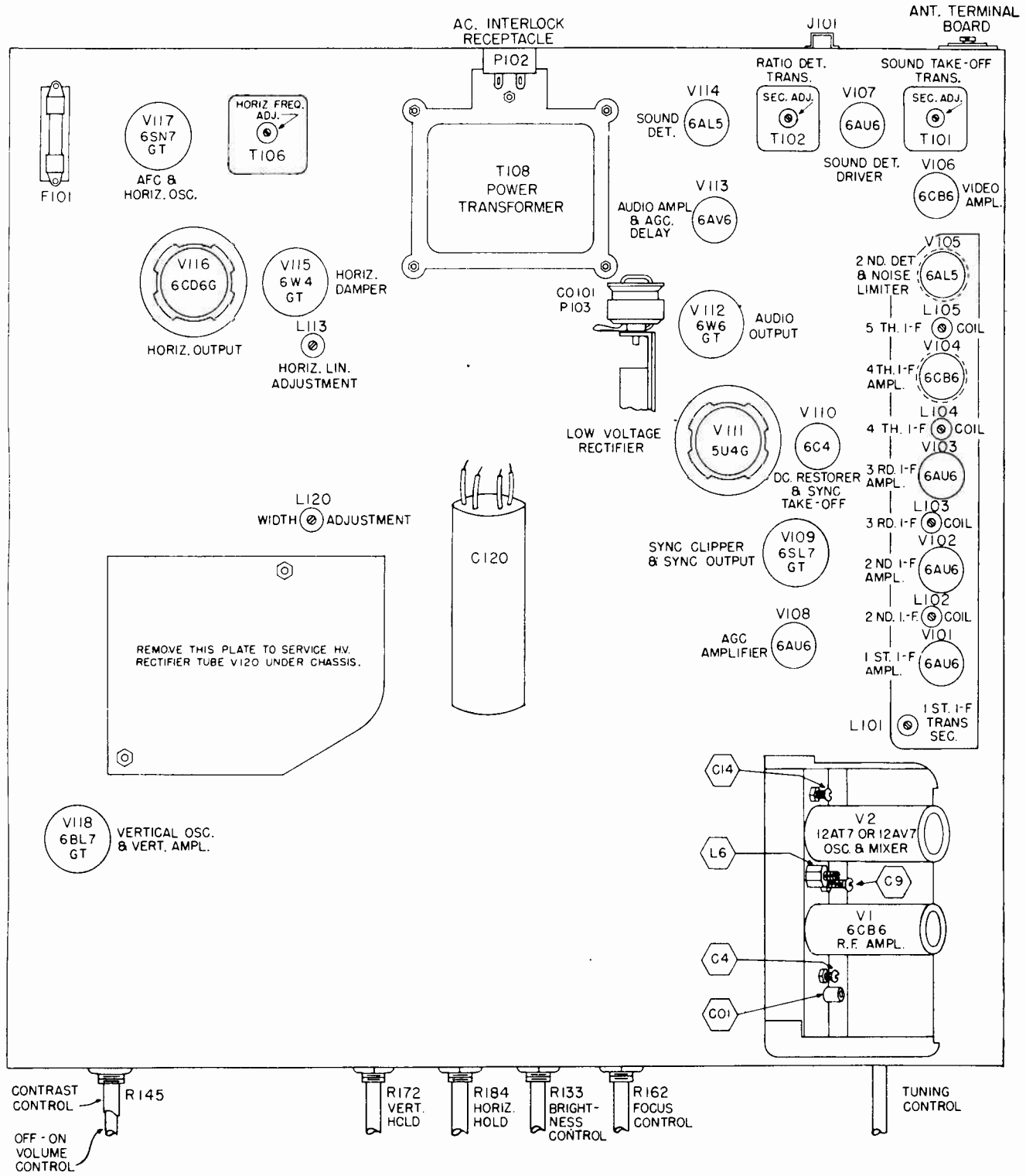


Adjust so that the peak of pulse is equal or 10% higher than peak of sine wave.

4. Turn the HORIZONTAL HOLD control fully clockwise. Adjust the HORIZONTAL FREQUENCY control (top of T106) by turning out until the raster is just out of sync, and then turning the FREQUENCY control in slowly until the raster is just ready to fall into sync (indicated by a wide black vertical or diagonal horizontal blanking bar).
5. Turn the HORIZONTAL HOLD control fully counter-clockwise. Picture should normally be in sync. Remove the signal by tuning off the station, then return to the signal. If more than seven bars are present, adjust the HORIZONTAL LOCK trimmer slightly counter-clockwise until five to seven bars appear before the picture falls into sync when the HORIZONTAL HOLD control is set in the extreme counter-clockwise position. If less than five bars are present, adjust the LOCK trimmer clockwise. As the Lock-in trimmer adjustment affects the horizontal frequency, the adjustment of both the Horizontal Frequency control and the Lock-in trimmer must be repeated until the conditions outlined above in steps 4 and 5 exist simultaneously at the extreme positions of the Horizontal Hold control. Check the pull-in range. Pull-in range should be 120° minimum and 220° maximum.
6. The final setting of the Horizontal Hold control should be made with a very weak picture. Rotate the tuning knob on and off the stations frequency, and set the Horizontal Hold control so that the picture returns completely in sync.

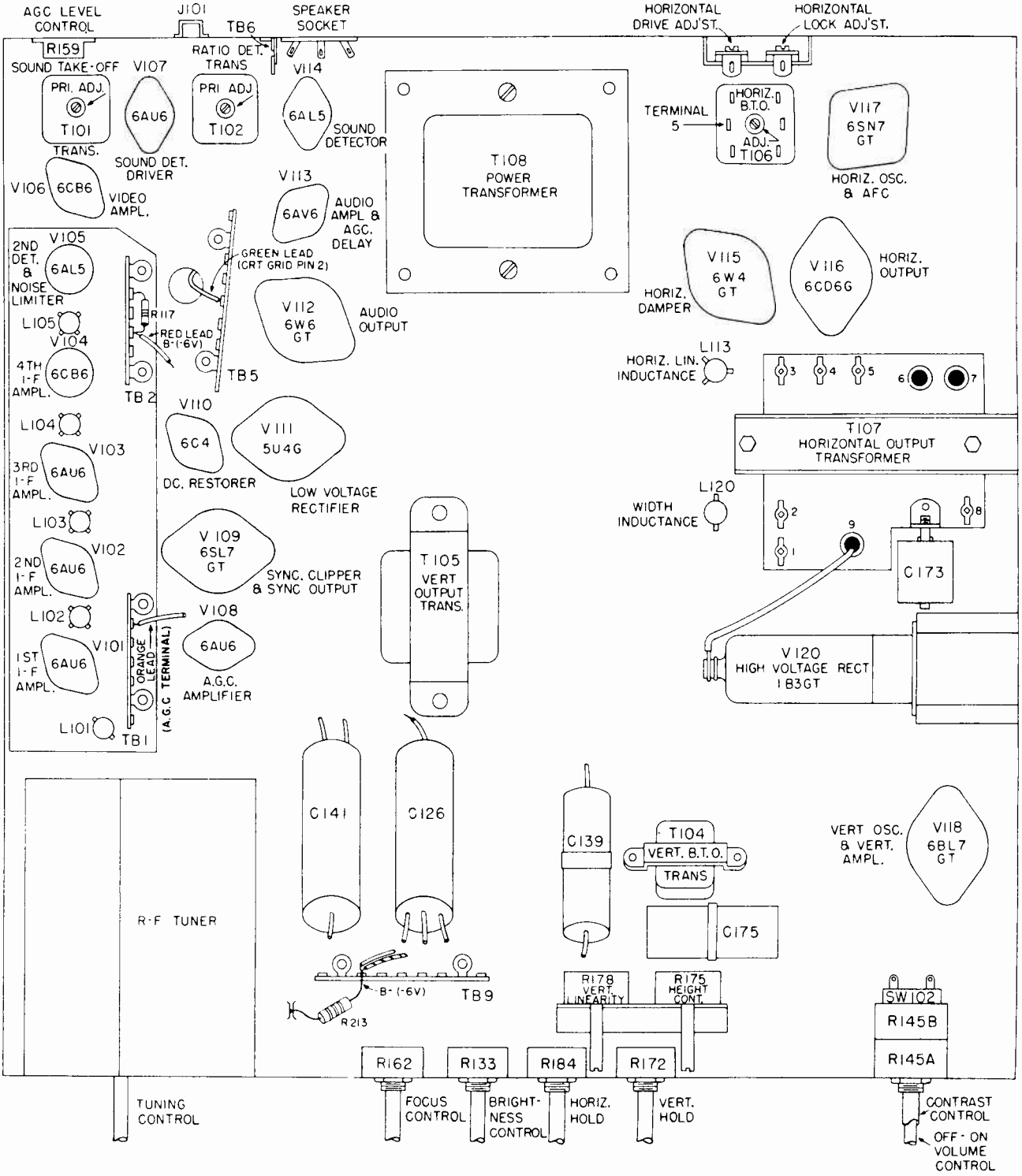
The most important points in the Horizontal Oscillator and the AFC Alignment for most stable operation are: (1) that the raster just falls into synchronism at the clockwise end of the Horizontal Hold control, and (2) that the pull-in range is between 120° and 220°.

CROSLEY Chassis 356-1, Models DU-17CDM, DU-17CHM, and others, continued.



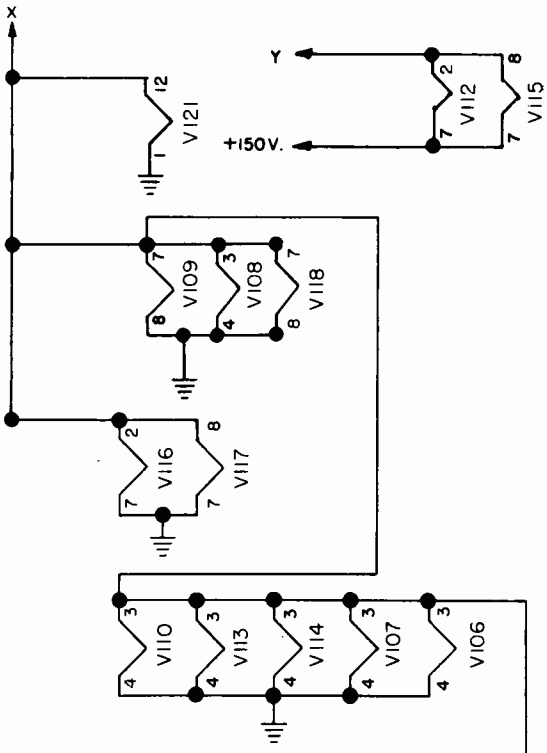
Chassis Top View Showing Tube and Alignment Locations

CROSLEY Chassis 356-1, Models DU-17CDM, DU-17CHM, and others, continued.



Chassis Bottom View Showing Tube Socket and Alignment Locations

CROSLEY Chassis 356-1, Models DU-17CDM, DU-17CHM, and others, continued.



ADJUSTMENTS

The DEFLECTION YOKE is positioned as far forward as possible on the cathode ray tube and rotated so as to make the top and bottom of the raster parallel with the top of the chassis.

The FOCUS COIL should be adjusted to be approximately perpendicular to the cathode ray tube axis with the front surface of the focus coil housing approximately 15/32 inch from the rear surface of the deflection and focus coil mounting bracket.

The ION TRAP is positioned for maximum brightness, with low to medium setting of the BRIGHTNESS CONTROL and for no neck shadow at high setting of the BRIGHTNESS CONTROL.

Center the picture by adjusting the three FOCUS COIL mounting nuts. Readjust the ION TRAP.

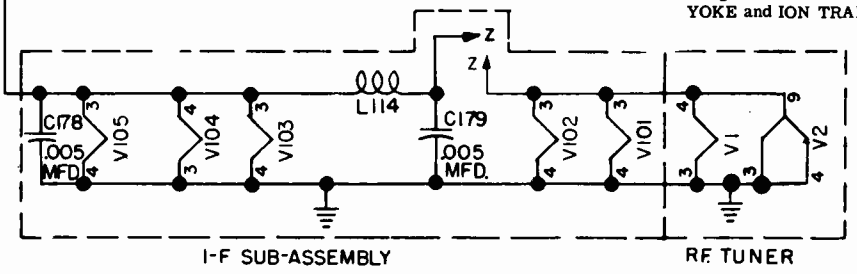
Adjust size of picture to fill the screen by means of the HEIGHT, WIDTH and HORIZONTAL DRIVE controls. When adjusting HEIGHT CONTROL, it is sometimes necessary to adjust the VERTICAL LINEARITY CONTROL. Before adjusting the HORIZONTAL DRIVE CONTROL, be sure to refer to HORIZONTAL DRIVE information.

HORIZONTAL HOLD CONTROL is adjusted with a weak picture to center of pull-in range.

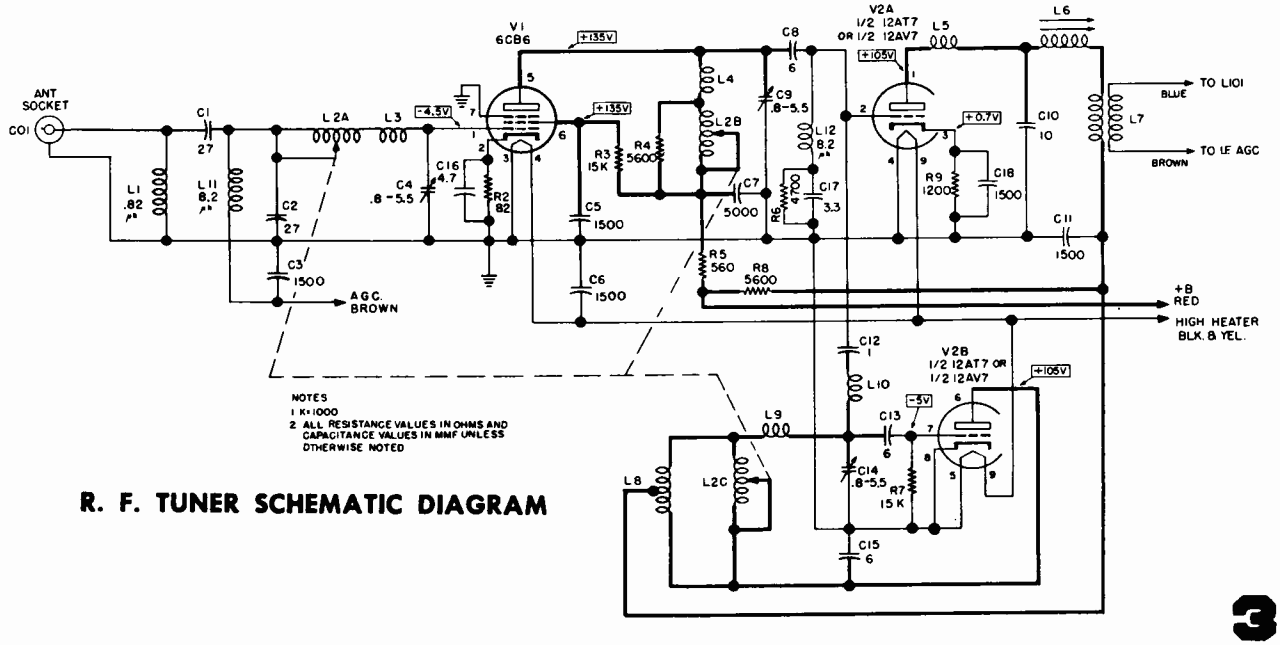
VERTICAL HOLD CONTROL is also adjusted with a weak picture to center of pull-in range.

Vertical linearity is adjusted by the VERTICAL LINEARITY CONTROL and the HEIGHT CONTROL. Horizontal size of picture is adjusted by the HORIZONTAL LINEARITY and WIDTH adjustments.

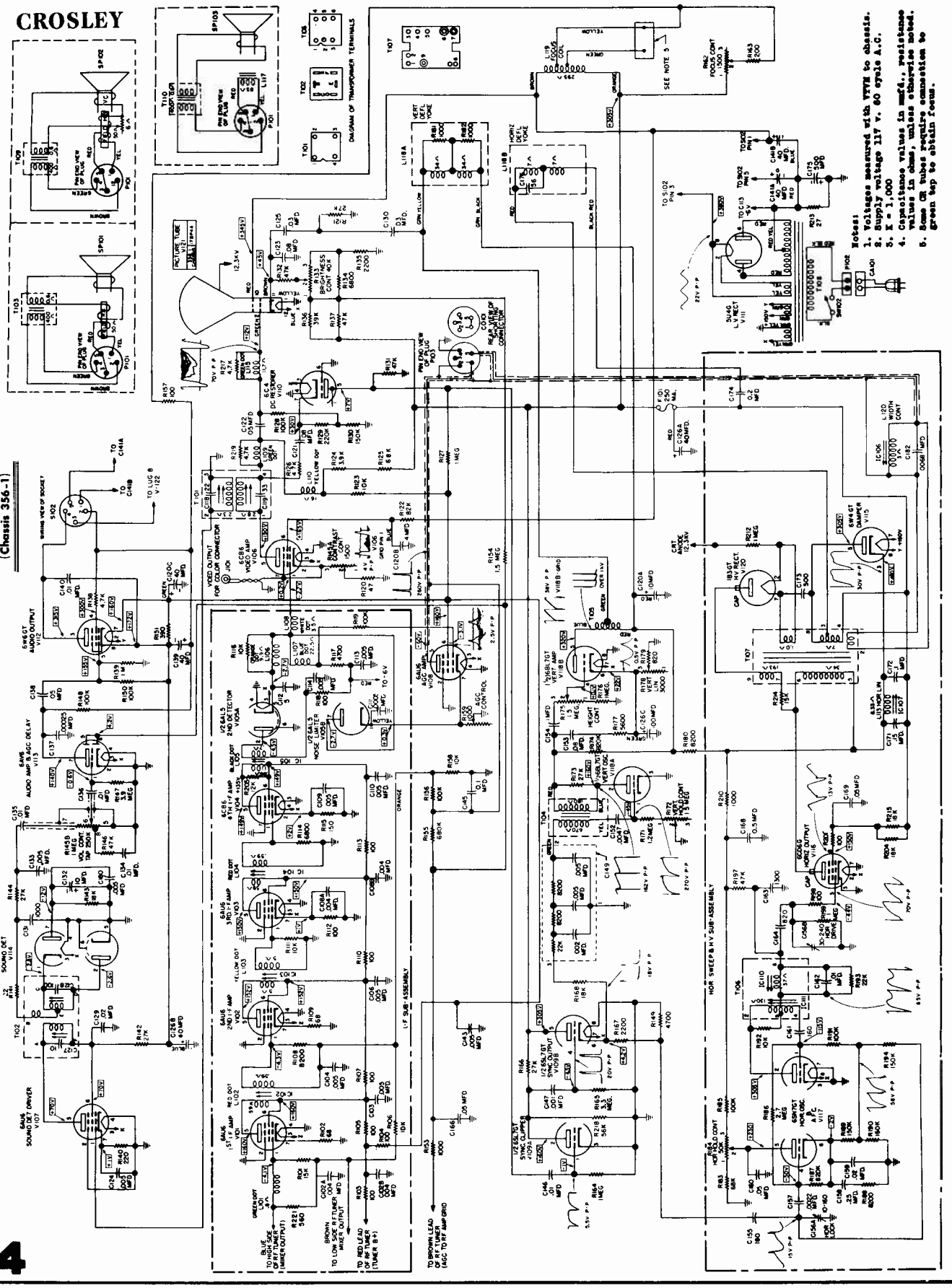
The FOCUS CONTROL is adjusted for best focus of the vertical and horizontal wedges at the center of the test pattern. If there is any astigmatism, the focus should be set in favor of the vertical wedges. If corner focus is poor, check position of DEFLECTION YOKE and ION TRAP.



In later production sets, color converter connections J101, C0101, and P103 are deleted and lug 5 of V108 is wired directly to L120. Also C182 was changed to .0082 mfd., 10%, 1000 v. capacitor.



R. F. TUNER SCHEMATIC DIAGRAM

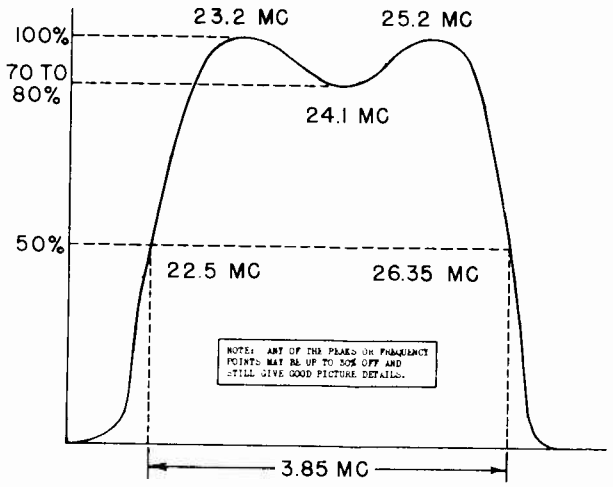


MODELS: DU-17CDB, DU-17CDM, DU-17CHB, DU-17CHM, DU-17CHN, DU-17COB, DU-17COM, DU-17TOB, DU-17TOL, DU-17TOM

DeWald Radio Manufacturing Corp.

Models ET-140R, ET-141R, DT-162R, DT-163R, ET-170, ET-171, ET-172, DT-190D.

(Presented below and the next three pages)



TYPICAL OVERALL RESPONSE CURVE OF PICTURE I.F.'S

TO ADJUST PICTURE I.F.'S:

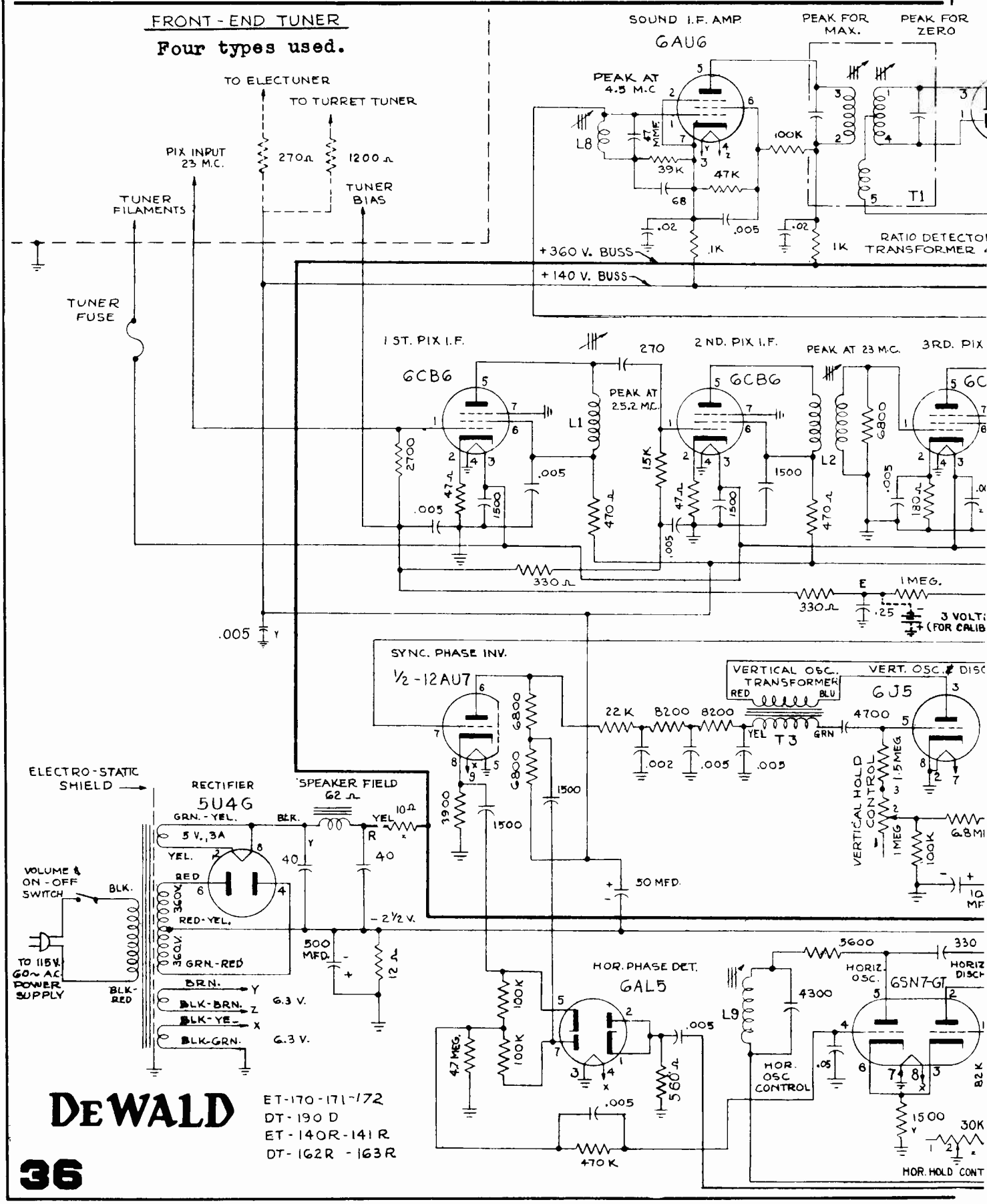
1. Connect the negative terminal of a 3 volt "A" battery to the junction of the 1 megohm and .25 Mfd in the AGC bias line, (point E on schematic) and positive terminal to a chassis ground. Set the contrast control to the fully clockwise position. Set fine tuning control with flat in horizontal position.
2. Set channel switch to channel 3 or any clear channel.
3. Connect a VoltOhmyst across the second picture detector load resistor of 4700 ohms. Plus end to go to junction point of peaking coil L-5 and 4700 ohm resistor and minus end to other side of load resistor (junction of 4700 ohm, 1K ohm and .1 Mfd condenser).
4. Couple the high side of the signal generator to the mixer tube of tuner by slipping a tight fitting insulated tube shield over the tube envelope and connecting the generator lead to it. Connect the ground side of the signal generator to the frame of the tuning unit.
5. Set A.M. Signal generator to 25.2 Mc and peak detector I.F. (L-3) and first picture I.F. coil (L-1) for maximum gain on VoltOhmyst.
6. Set A.M. Signal generator to 23 Mc and peak second I.F. coil (L-2) and converter I.F. coil on top of tuner for maximum output on VoltOhmyst.
7. When using an oscilloscope and a wide band oscillator for calibrating and checking bandwidth of the I.F.'s, connect sweep generator to the point indicated under step 4. Connect the oscilloscope high side (in series with a 40K ohm resistor) to the junction of the peaking coil L-5 and 4700 ohm resistor, and the ground terminal to chassis. Align the picture I.F. to produce a response curve similar to the one shown.

NOTE: During picture I.F. alignment the common lead of VoltOhmyst is connected to approximately minus 2.5 volts with respect to chassis. Avoid grounding the VoltOhmyst case.

TUBE	POSITION	PIN NUMBERS AND VOLTAGES (20,000 OHMS PER VOLT)							
		1	2	3	4	5	6	7	8
5U4G	Rectifier								400
6CB6	1st Pix I.F.	1.0	0.5			125		*Contract Control fully c-w	
6CB6	2nd Pix I.F.		0.8			125		"	"
6CB6	3rd Pix I.F.		1.70			120		"	"
6AL5	Video Det. A.G.C. Rect.	3.0	-2.5			-1		"	"
6AH6	Video Amp.	-2.0	1.8	Cont. Contr. CCW		160	160	1.8	
6AU6	Sound Input*	130				330	180	135	
6T8	Sound Det.* 1st Audio	125	115	115			Pin 9 195	130	120
6V6GT	Audio Output*			280	300	125			130
12AU7	Sync. Sep. & Amp. D.C. Rest.	20	0	2.0	Cont. Contr. CCW		70	20	20
6SN7GT	Hor. Osc. & Disch.	-6.2	100	10		250	10	H-Hold fully ccw	
6BG6GT	Hor. Output			7		-13.5			270
6W4GT	Damper			510		360		135	
6AL5	Phase Det.	0	0			8.6		-8.2	
6J5GT	Vert. Osc.			250		-60	V-Hold fully ccw		
6V6GT	Vert. Output			280		- 7	V-Lin & Height full clockwise		14
	Kinescope	#2 0	#10 Red 325	#11 Yellow B'tness Cntrl: cw, 35; ccw, 70					#12 Brn 6.3 v. AC

Main B+ Bus 350 v. to 360 v.
Intermediate B+ Bus 135 v.

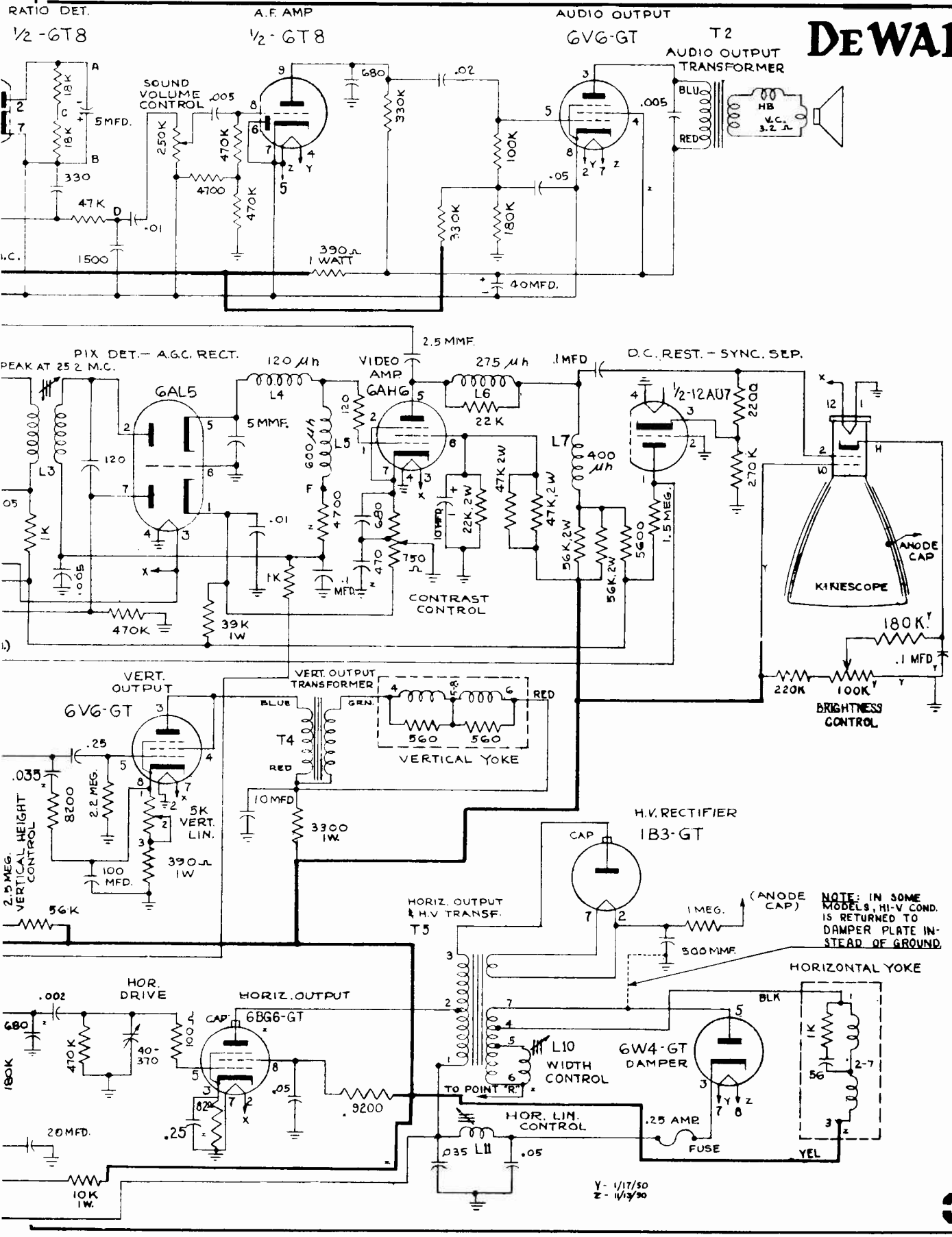
NOTE: All voltages measured to ground.

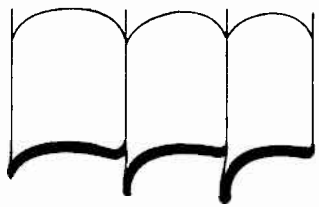


DEWALD

ET-170-171-172
DT-190 D
ET-140R-141R
DT-162R - 163R

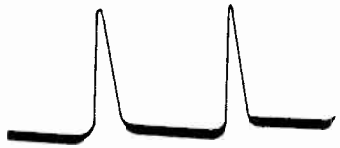
DEWALD


RATIO DET.
½-6T8
A.F. AMP
½-6T8
AUDIO OUTPUT
6V6-GT
T2
AUDIO OUTPUT TRANSFORMER
SOUND VOLUME CONTROL
5MFD.
330
47K
1500
390Ω 1 WATT
40MFD.
PIX DET.— A.G.C. RECT.
PEAK AT 25.2 M.C.
6AL5
120 μh
L4
5MMF.
L5
600 μh
VIDEO AMP.
6AH6
275 μh
L6
22K
2.5 MMF.
.1MFD
D.C. REST. — SYNC. SEP.
½-12AU7
L7
400 μh
47K 2W
56K 2W
5600
1.5 MEG.
CONTRAST CONTROL
39K 1W
470K
KINESCOPE
ANODE CAP
180K
.1 MFD
220K
100K
BRIGHTNESS CONTROL
VERT. OUTPUT
6V6-GT
VERT. OUTPUT TRANSFORMER
T4
BLUE
GRN.
RED
560
560
VERTICAL YOKE
10MFD
3300 1W.
5K VERT. LIN.
390Ω 1W
100 MFD.
2.5 MEG. VERTICAL HEIGHT CONTROL
56K
H.V. RECTIFIER
1B3-GT
CAP
HORIZ. OUTPUT & H.V TRANSF.
T5
1 MEG.
(ANODE CAP)
500 MMF.
NOTE: IN SOME MODELS, HI-V COND. IS RETURNED TO DAMPER PLATE INSTEAD OF GROUND.
HORIZONTAL YOKE
HOR. DRIVE
HORIZ. OUTPUT
6BG6-GT
L10
WIDTH CONTROL
6W4-GT
DAMPER
TO POINT "R"
HOR. LIN. CONTROL
.25 AMP. FUSE
.035 L11
.05
.9200
20MFD.
10K 1W.
BLK
YEL
Y- 1/17/50
Z- 11/13/50



OUTPUT OF SYNC. SEPARATOR
VERTICAL

12AU7 SYNC. AMP. - PIN 6 — 50 V. P-P



OUTPUT OF SYNC. SEPARATOR
HORIZONTAL

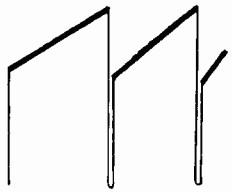
12AU7 SYNC. AMP. - PIN 6 — 45 V. P-P

OUTPUT OF INTEGRATING
NETWORK - VERTICAL

VERTICAL OSC. TRANS.
YELLOW LEAD — 25 V. P-P

GRID OF VERTICAL OSC. TUBE

6J5GT - PIN 5 — 160V. P-P



INPUT TO VERTICAL OUTPUT TUBE

RED LEAD OF VERTICAL
OSC. TRANSFORMER — 130V. P-P

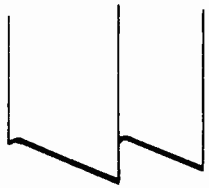
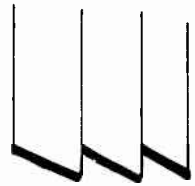


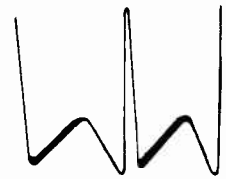
PLATE OF VERTICAL OUTPUT TUBE

6V6GT - PINS 3 & 4 — 550 V. P-P



VOLTAGE ACROSS
VERTICAL DEFLECTION COILS

VERTICAL OUTPUT TRANS.
GREEN LEAD — 120 V. P-P



HORIZONTAL PHASE DETECTOR

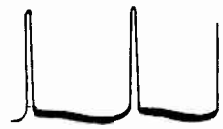
6AL5 - PIN 7 — 17V. P-P

HORIZONTAL PHASE DETECTOR

6AL5 - PIN 5 — 17V. P-P

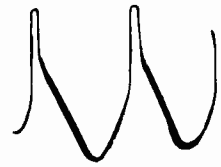
HORIZONTAL PHASE CONTROL
VOLTAGE

6AL5 - PINS 1 & 2 — 15V. P-P



HORIZONTAL OSC.

CATHODE OF
6SN7GT - PINS 3 & 6 — 15V. P-P



HORIZONTAL OSC.

PLATE OF
6SN7GT - PIN 5 — 45V. P-P

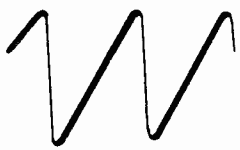
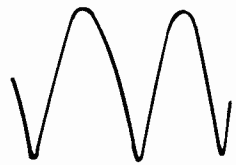


PLATE OF HORIZONTAL DISCH. TUBE

6SN7GT - PIN 2 — 72V. P-P

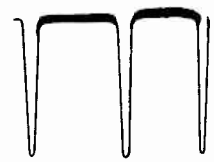
GRID OF HORIZONTAL OUTPUT TUBE

6BG6G - PIN 5 — 65V. P-P



TERMINAL NO. 1 OF HIGH VOLTAGE
FLYBACK TRANSFORMER & GROUND

85V. P-P



VOLTAGE ACROSS
HORIZONTAL DEFLECTION COILS

DAMPER
6W4GT - PIN 5 — APPROX. 1200V. P-P

NOTE: ALL MEASUREMENTS MADE WITH THE LOW SIDE OF OSCILLOSCOPE CONNECTED TO CHASSIS

DU MONT TELESETS

RA-111A	RA-112A	RA-113
Putnam	Ardmore	Brookville
Guilford	Westerly	Revere
	Mt. Vernon	Burlingame
		Tarrytown

The double-spread circuit shown on the next two pages and the INPUTUNER circuit on the page following are exact for chassis used in RA-111A. The chassis used in RA-112A and RA-113 Telesets is basically the same as the one described. The main differences are briefly explained below.

The Inputuner used in RA-112A with serial number under 122696, and in RA-113, under 132211, is electrically the same as used with RA-111A. The later sets used a different I.F. transformer in the plate circuit of the mixer. These sets also had another type Z204 transformer. The fourth video I.F. tube (V208) was changed to 6B05 from 6AU6, and this required that R231 be 220 ohms instead of 120.

The sound I.F. and audio amplifier sections are practically identical in all of these models. Since the model known as Tarrytown includes AM radio and record changer, in this model certain provisions have been added to the audio output stage for this purpose.

The coupling of cathode of V209A to the grid of V212, is made through a 20 mmfd. capacitor instead of direct, and a coil is added from grid to ground. A "local-distant" switch is added to AGC circuit.

The vertical sweep circuit has these differences: R288 is changed from 2.7K to 3.3K, C271 from .003 to .01 mfd., R293 from 1.8 megohms to 390K ohms, R296 from 5.1K to 4.7Kohms, a 30 mfd. capacitor is added in series with C248A, the plate circuits of V220B and V221 are returned to terminal 5 of transformer T401.

The horizontal deflection amplifier (V215) uses a 6BG6 in RA-112A and RA-113. The high voltage circuit has been modified and uses two 1X2 tubes in cascade. When 6BG6 is used as V215, no cathode bias resistor and condenser are used, and R271, 25K ohms, is used instead of 3.9K.

The low voltage power supply of RA-112A and RA-113, is similar to that used in RA-111A, with the following main differences: a separate filament transformer is used for 6W4 (V217), a 100K resistor is connected from one side of the AC line and ground, R280 is now 1200 ohms, and R281 is 1650.

TROUBLESHOOTING HINTS

Symptom: Interaction between Contrast and Brightness controls; when contrast is turned up the brightness increases.

Probable Fault: L202 in plate of V210 is open.

Remedy: Replace L202.

Symptom: Setting of contrast control is critical.

Probable Fault: L203, in the grid circuit of the video amplifier (V210), is open.

Remedy: Replace L203.

Symptom: Fine tuning or fine *and* coarse tuning knobs cannot be turned or are difficult to turn at one point in each rotation. In some cases the Teleset does not tune as the vernier knob is rotated.

Probable Fault: The tuner dial assembly vernier gear is split.

Remedy: Replace the assembly shaft and vernier gear.

SCHEMATIC DIAGRAM

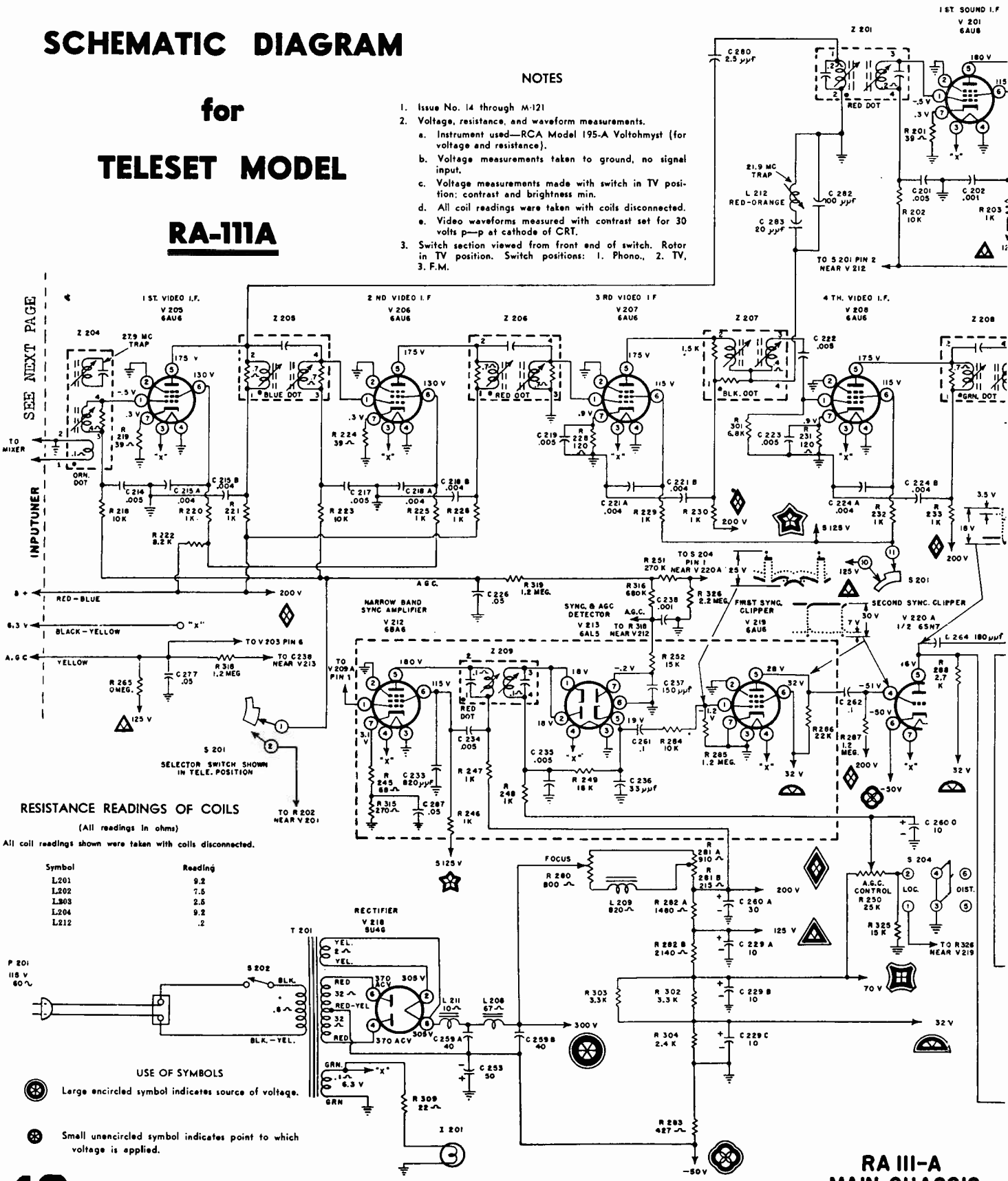
for

TELESET MODEL

RA-111A

NOTES

1. Issue No. 14 through M-121
2. Voltage, resistance, and waveform measurements.
   a. Instrument used—RCA Model 195-A Voltohmyst (for voltage and resistance).
   b. Voltage measurements taken to ground, no signal input.
   c. Voltage measurements made with switch in TV position; contrast and brightness min.
   d. All coil readings were taken with coils disconnected.
   e. Video waveforms measured with contrast set for 30 volts p—p at cathode of CRT.
3. Switch section viewed from front end of switch. Rotor in TV position. Switch positions: 1. Phono., 2. TV, 3. F.M.



RESISTANCE READINGS OF COILS

(All readings in ohms)

All coil readings shown were taken with coils disconnected.

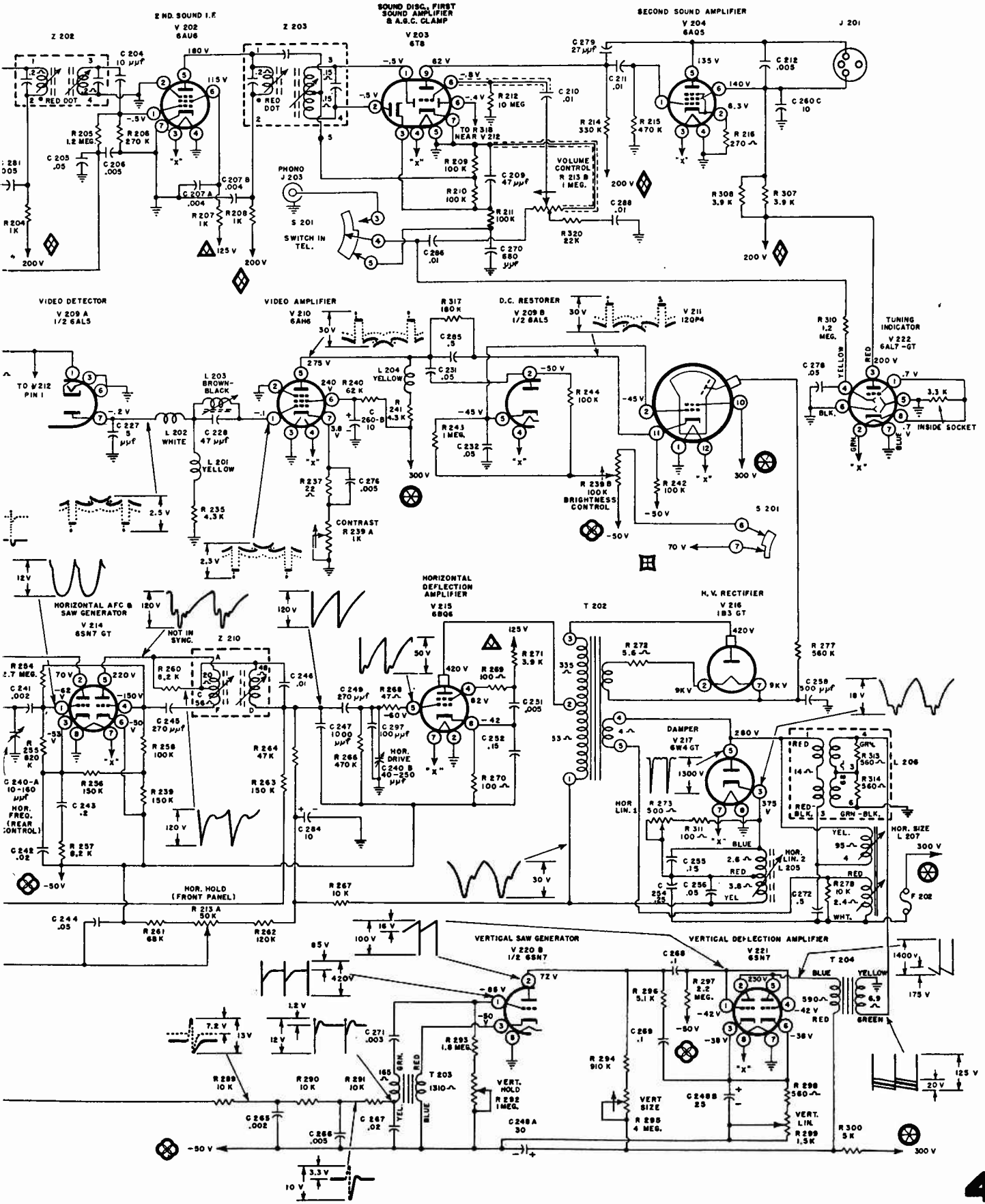
Symbol	Reading
L201	9.2
L202	7.5
L203	2.5
L204	9.2
L212	.2

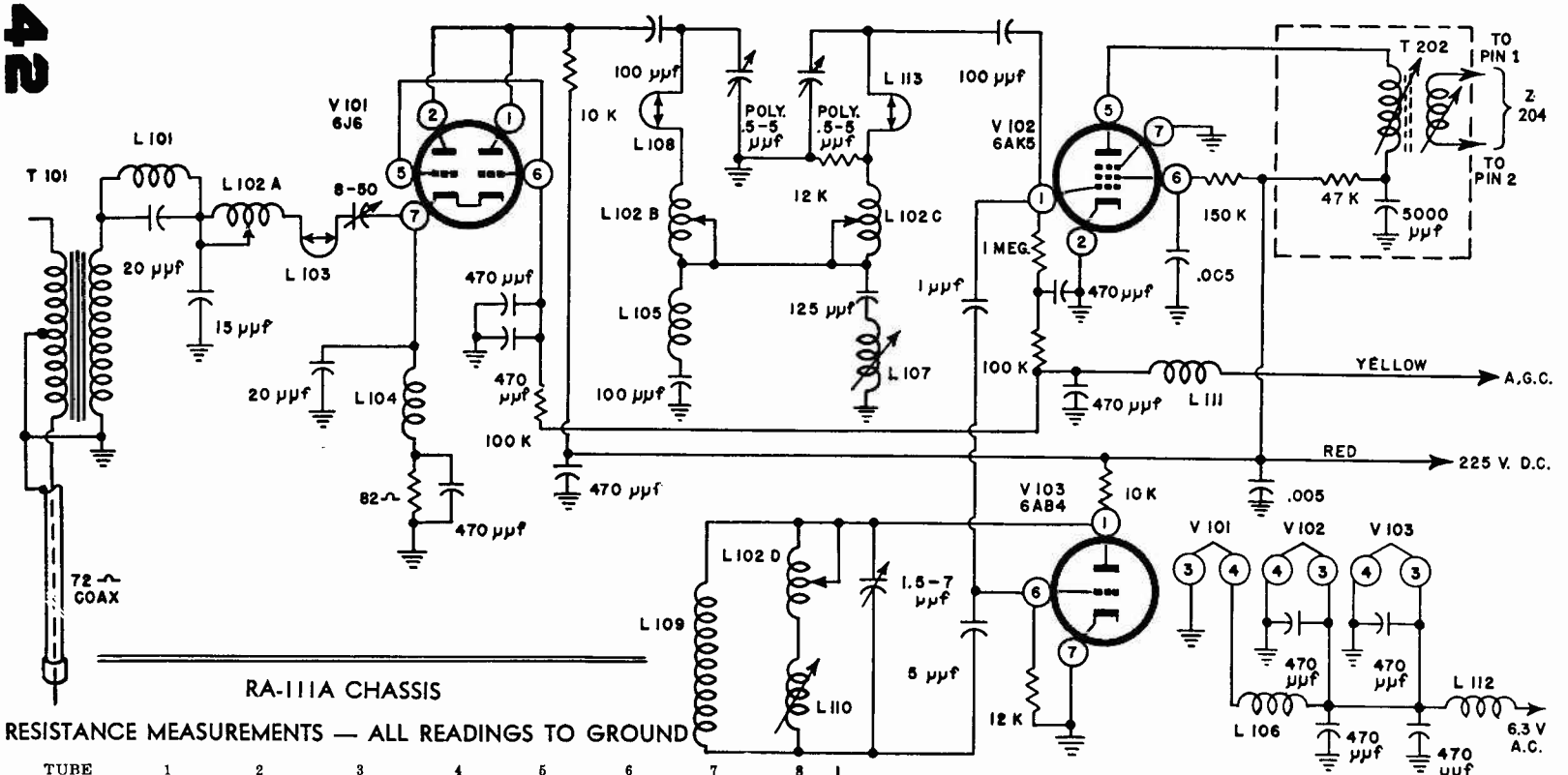
USE OF SYMBOLS

Large encircled symbol indicates source of voltage.

Small unencircled symbol indicates point to which voltage is applied.

RA III-A MAIN CHASSIS


2 ND. SOUND I.F
V 202
6AU6
Z 202
Z 203
SOUND DISC., FIRST SOUND AMPLIFIER & A.G.C. CLAMP
V 203
6T8
SECOND SOUND AMPLIFIER
V 204
6AQ5
J 201
VOLUME CONTROL R 213 B 1 MEG.
PHONO J 203
S 201
SWITCH IN TEL.
VIDEO DETECTOR
V 209 A
1/2 6AL5
VIDEO AMPLIFIER
V 210
6AH6
D.C. RESTORER
V 209 B
1/2 6AL5
V 211
12QP4
TUNING INDICATOR
V 222
6AL7-GT
INSIDE SOCKET
CONTRAST R 239 A 1K
BRIGHTNESS CONTROL
HORIZONTAL AFC & SAW GENERATOR
V 214
6SN7 GT
HORIZONTAL DEFLECTION AMPLIFIER
V 215
6BQ6
T 202
H.V. RECTIFIER
V 216
1B3 GT
DAMPER
V 217
6W4 GT
HOR. FREQ. (REAR CONTROL)
HOR. HOLD (FRONT PANEL)
HOR. DRIVE
HOR. LIN. 1
HOR. LIN. 2
HOR. SIZE
VERTICAL SAW GENERATOR
V 220 B
1/2 6SN7
VERTICAL DEFLECTION AMPLIFIER
V 221
6SN7
T 204
T 203
VERT. HOLD
VERT SIZE
VERT. LIN.
F 202



RA-111A CHASSIS

RESISTANCE MEASUREMENTS — ALL READINGS TO GROUND

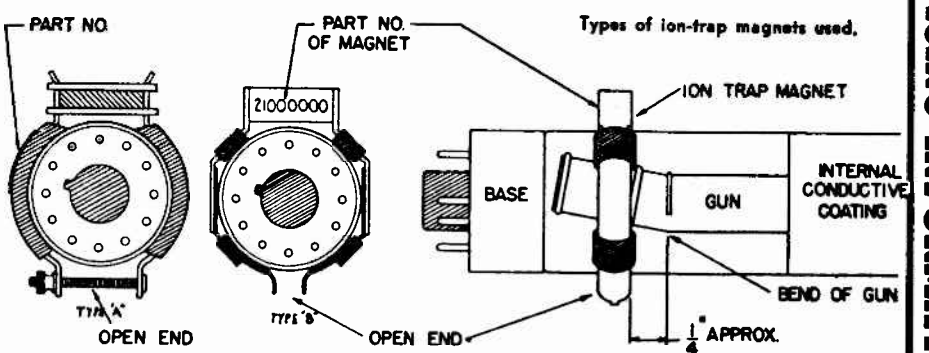
TUBE	1	2	3	4	5	6	7	8
V201	1.6M	0	0	Fil.	8.2K	7K	39	
V202	270K	0	0	Fil.	8.2K	7K	0	
°V203	100K	100K	200K	Fil.	0	1.9M	0	10M
V204	470K	270	Fil.	0	9.5K	9.3K	N.C.	
V205	1.6M	0	0	Fil.	8.2K	18K	39	
V206	1.6M	0	0	Fil.	8.2K	18K	39	
V207	.5	0	0	Fil.	10K	7K	120	
V208	6.8K	0	0	Fil.	8.2K	7K	120	
V209	.5	105K	0	Fil.	1M	0	4.7K	
V210	4.7K	0	0	Fil.	12K	75K	1K	
*V211	0	1M						
V212	.5	0	0	Fil.	8.2K	7K	340	
V213	7.2K	7.2K	0	Fil.	27K	0	1M	
V214	1M	110K	310K	260K	310K	427	Fil.	0
†V215	N.C.	0	N.C.	10K	500K	500K	Fil.	527
**V216	N.C.	Inf.	Inf.	Inf.	N.C.	N.C.	Inf.	
V217	N.C.	N.C.	280K	280K	8K	280K	Fil.	0
V218	N.C.	8K	N.C	470	N.C.	470	N.C.	8K
V219	1.2M	0	0	Fil.	27K	2.4K	0	
V220	1.8M-2.8M	1M-5M	625	1.2M	5K	427	Fil.	0
V221	2.3M	14K	1.7K	2.3M	14K	1.7K	0	Fil.
V222	3.3K	Fil.	7K	1.5M	0	0	0	3.3K

	9		10	11	12		**V216	†V215
°V203	350K	*V211	8.2K	70K	Fil.	Cap	265K	265K

Selector switch in 'Television' position.
Instrument Used — RCA Model 195-A Voltohmyst (for voltage and resistance).
All readings in ohms K= thousand M= million

Two readings for a given point indicate an adjustable resistance is in the measured circuit.

R.F. ASSEMBLY
(FOUR CIRCUIT BOTTOM COUPLED INPUTUNER)



(Thumbscrew of Type A should be tightened by hand only — do not use tools.)

Emerson Television

MODELS — 686L
687L
696L

CHASSIS — 120142—B

TABLE I - I-F ALIGNMENT

STEP	SIGNAL GENERATOR INPUT		MEASURING INSTRUMENT	ADJUST	PROCEDURE
	CONNECTION	FREQUENCY			
1	Marker generator through .001 Mfd. to Pin 1 (Grid) of V1. Low side to chassis.	Marker — 23.8 MC.	Connect V.T.V.M. to junction of L-1 and R-46. Low side to chassis.	T-4	Peak for maximum response.
2	"	Marker — 21.25 MC.	"	T-3 (bottom)	Adjust trap for minimum response.
3	"	Marker — 22.8 MC.	"	T-3 (top)	Peak for maximum response. Repeat step 2
4	"	Marker — 27.25 MC.	"	T-2 (bottom)	Adjust trap for minimum response.
5	"	Marker — 25.25	"	T-2 (top)	Peak for maximum response. Repeat step 4
6	Connect sweep generator through .001 uf. to Pin 1 of V1. Low side to chassis. (Marker gen. lightly coupled in parallel.)	Marker — 25.75, 22.25, 21.25.	Scope connected in place of V.T.V.M. through 10k isolating resistor.	T-2 (top) T-3 (top) T-4	Adjust for overall response as shown in Curve B. Adjust T-2 (top) to position 25.75 Mc. marker accurately. Adjust T-3 (top) to position 22.25 Mc. marker. Adjust T-4 to level top of response.
7	Sweep gen. coupled to converter (V-22) input, using 3 turn loop slipped over tube. Marker gen. in parallel.	Marker — 25.75, 22.25.	Scope connected through detector network* to Pin 5 (plate) of V-1. Low side to chassis. *Low impedance (200~)	T-1 A and T-1 B	Adjust for response shown in figure 1, Curve A.
8	"	"	Scope connected as in step 6.	T-2 T-3 T-4	Same as step 6.

TABLE II - SOUND ALIGNMENT

1	Marker gen. through .01 mfd. to Pin 2 of V-4. Low side to chassis.	Marker-4.5 MC. (400 cycle AM)	Connect VTVM through 10k resistor to junction of C-17, R-19, R-21. Low side to chassis.	T-5 (top)	Peak for maximum response. Adjust generator input to produce one volt at grid of V6.
2	"	Marker-4.5 MC. (400 cycle mod.)	"	T-6 (Top and bottom)	"
3	Connect sweep generator in parallel with marker gen. (Marker gen. lightly coupled)	Sweep-4.5 MC. (450 Kc. sweep) Marker-4.5 MC.	Replace v.t.v.m. with scope connected through 10K resistor to junction of R-26 and C-20. Low side to chassis.	T-7 (secondary) Top #708018 Bottom #708017	Position 4.5 MC. marker at center of S-curve by adjusting secondary at bottom of chassis. See Fig. 1, Curve C.
4	"	"	"	T-7 (Primary)	Peak primary for maximum amplitude and linearity. Repeat step 3. See Fig. 1, Curve C.

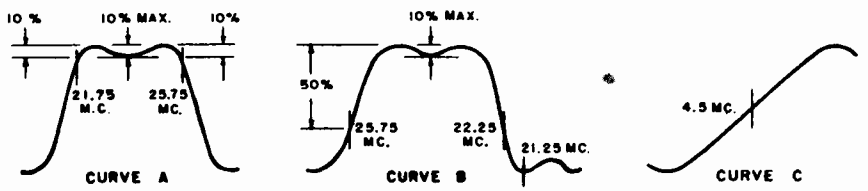


FIGURE I - I.F. RESPONSE CURVES

Continued on the next three pages.

EMERSON

SCHEMATIC DIAGRAM

CHASSIS 120142-B

Model Numbers

686L, 687L, 696L

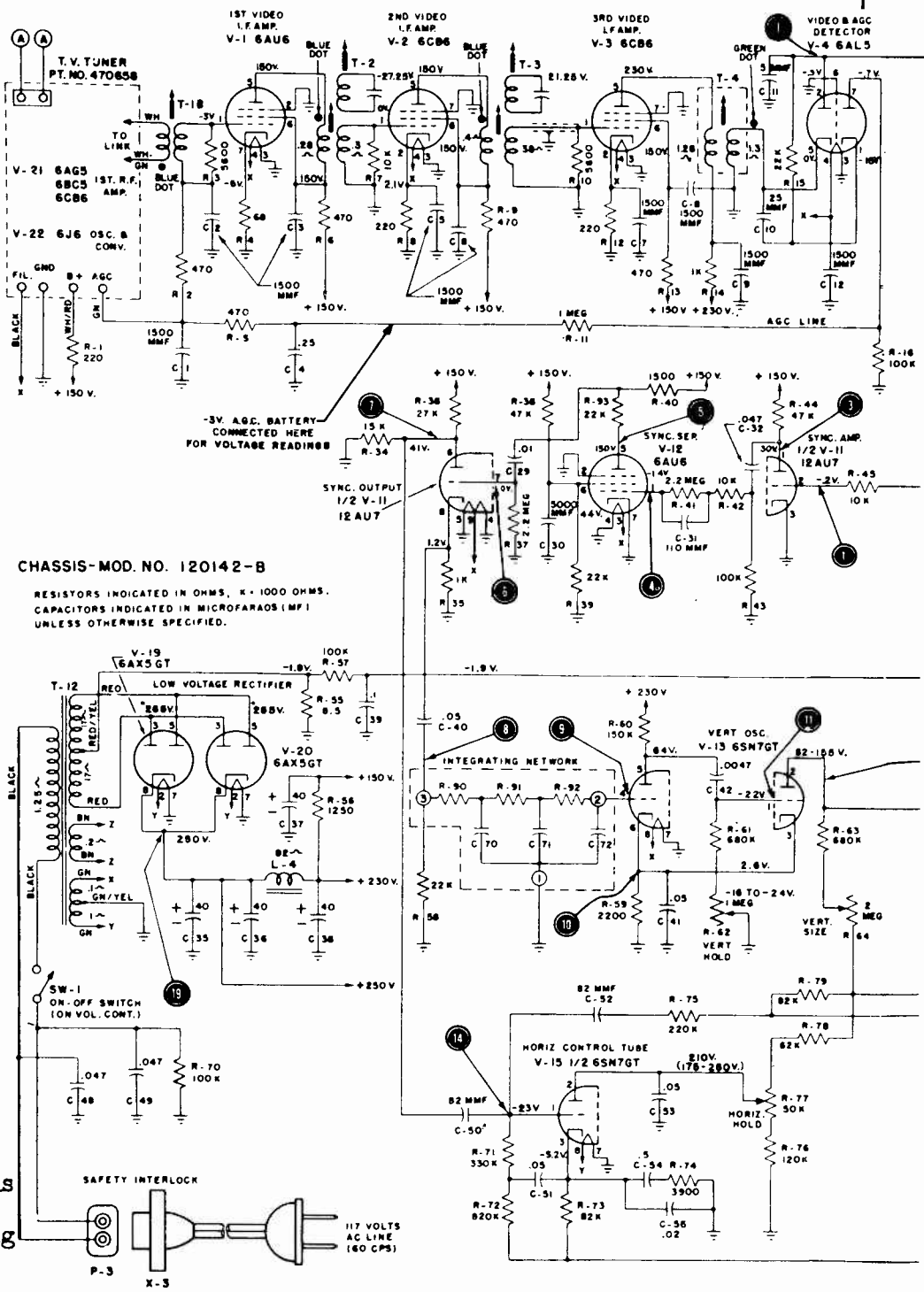
Circuit Modification

Sets coded Triangle C, have R-79 changed from 82K to 68K, R-76 is replaced by a jumper wire which is connected to B+230 v. point instead of chassis.

Sets coded Triangle D, have this change which is recommended for fringe areas:

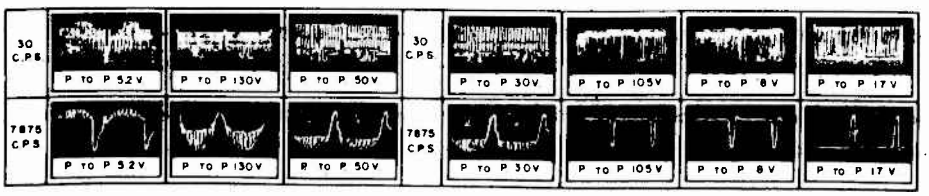
Remove R-15 (22K), replace with jumper wire. Remove R-16, 100K. Remove pigtail of R-2 from lug of terminal board and reconnect to empty lug on strip. Add jumper from R-2 new position to empty lug near audio output transformer. Add 1 meg. resistor from this lug to Pin 7 of V-4. Connect .25 mfd. from this lug to chassis. Remove pigtail of C-10, 25 mmfd. from Pin 1 to Pin 7 of V-4. Add 1 meg. ½ w. resistor from Pin 1 to Pin 7 of V-4. Break ground connection from Pin 5 of V-8, and connect this pin to junction R-5, R-11, & C-4. To this junction also connect 10 meg. ½ w. resistor leading to Pin 6 of V-6.

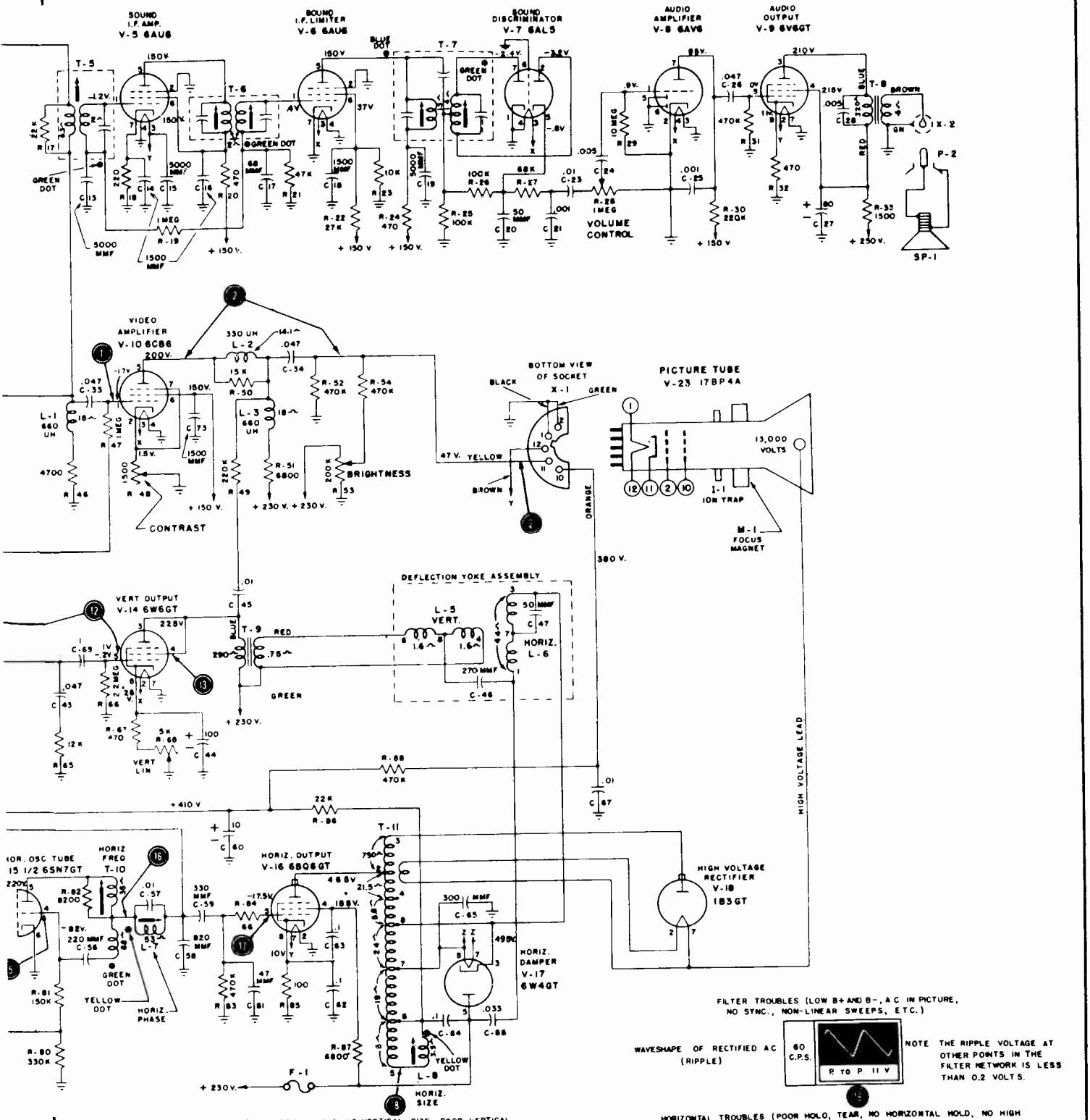
Sets coded Triangle G, have the fuse wired in a different manner and a ½ ampere fuse is used.



NOTE → BEFORE TAKING WAVE SHAPES, SEE NEXT PAGE FOR CONDITIONS AS TO HOW THEY WERE TAKEN

VIDEO AND/OR SYNC TROUBLES (LACK OF CONTRAST, TEAR, OVERLOAD, NO HORIZONTAL OR VERTICAL HOLD, POOR HOLD, JITTER, ETC.)





FILTER TROUBLES (LOW B+ AND B−, A C IN PICTURE, NO SYNC., NON-LINEAR SWEEPS, ETC.)

WAVESHAPE OF RECTIFIED A C (RIPPLE)

60 C.P.S. — P TO P 11 V

NOTE THE RIPPLE VOLTAGE AT OTHER POINTS IN THE FILTER NETWORK IS LESS THAN 0.2 VOLTS.

VERTICAL TROUBLES (NO VERTICAL HOLD, NO VERTICAL SIZE, POOR VERTICAL HOLD, VERTICAL JITTER, POOR VERTICAL LINEARITY, ETC)

HORIZONTAL TROUBLES (POOR HOLD, TEAR, NO HORIZONTAL HOLD, NO HIGH VOLTAGE, POOR HORIZONTAL LINEARITY).

8 9 10 11 12 13 14 15 16 17 18

* FOR THIS MEASUREMENT READJUST VERTICAL HOLD TO STOP PICTURE ROLL.

P TO P = PEAK TO PEAK

EMERSON RADIO AND PHONOGRAPH CORPORATION

RESISTANCE READINGS FOR CHASSIS 120142-B (Continued)

SYMBOL	TUBE PIN NUMBERS											
	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9	PIN 10	PIN 11	PIN 12
V-1	1 MEG	0	0	.1	*14.2 K	*14.2 K	58					
V-2	.2	225	0	.1	*14.5 K	*14.5 K	0					
V-3	.2	225	0	.1	*17 K	*15 K	0					
V-4	29 K	4.8 K	0	.1	1.6	0	100 K					
V-5	900 K	0	.1	0	*14.5 K	*14.2 K	230					
V-6	50 K	0	0	.1	*14.5 K	9.8 K	0					
V-7	0	100 K	.1	0	200 K	0	100 K					
V-8	10.6 MEG	0	0	.1	0	0	242 K					
V-9	N.C.	.1	*17.5 K	*17.5 K	540 K	*14 K	0	475				
V-10	1 MEG	6.5	.1	0	*22 K	*14 K	6.5					
V-11	*75 K	14.3 K	0	0	0	*11 K	2 MEG	900	.1			
V-12	2.3 MEG	0	.1	0	*48 K	17 K	0					
V-13	1.3 MEG	2.3 MEG	2200	74 K	*156 K	2200	0	.1				
V-14	N.C.	.1	*15 K	*15 K	2.2 MEG	820	0	1330				
V-15	1.5 MEG	170 K	440 K	500 K	*370 K	0	0	.1				
V-16	N.C.	0	N.C.	*22 K	.5 MEG	.5 MEG	.1	96				
V-17	N.C.	N.C.	*280 K	N.C.	*15 K	N.C.	*290 K	*290 K				
V-18	FILAMENT RESISTANCE INFINITY PLATE CAP = *280 K											
V-19	N.C.	.1	26	N.C.	26	N.C.	0	*15 K				
V-20	N.C.	.1	26	N.C.	26	N.C.	0	*15 K				
V-23	0	0								*800 K	240 K	.1

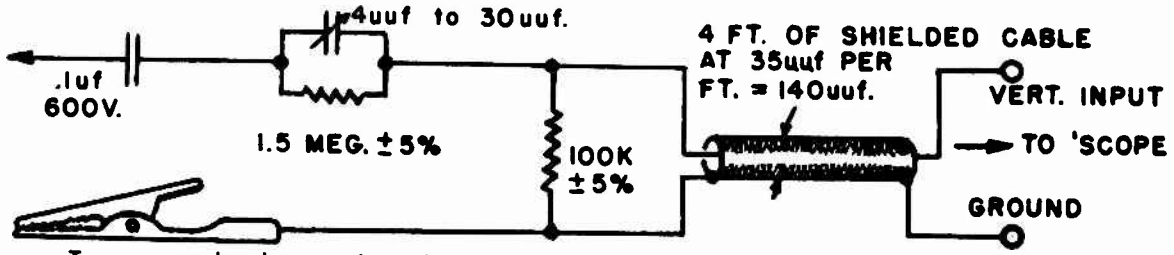
*varying resistance wait until meter settles (about 30 sec.)

CONDITIONS FOR TAKING VOLTAGE AND RESISTANCE READINGS.

The resistance measurements listed below are for chassis 120142-B with no triangle codes. Due to component variations, voltage and resistance readings may vary slightly from those given here. Slight variations may also be noticed if chassis is not coded as mentioned above.

1. Antenna disconnected and antenna terminals shorted.
2. Line voltage 117 volts.
3. 3-volt bias battery in A.G.C. circuit. Positive terminal to ground; negative terminal to junction of C-4, R-5 and R-11 (Voltage readings only)
4. All controls in position for normal picture.
5. All measurements taken with a vacuum tube voltmeter and ohmeter.
6. All readings listed in tables were taken between points shown and chassis.
7. Resistance readings are given in ohms unless otherwise noted.
8. N.C. denotes no connection.

WAVE SHAPE ANALYSIS CHART FOR CHASSIS 120142-B



To accurately observe the following wave shapes, the relatively high input capacity of an oscilloscope must be reduced so as not to change the operating characteristics of the television set. Failure to do this will result in wrong wave shape readings.

The use of a special low capacity probe (circuit of this appears above), will reduce this input capacity to a minimum.

Connect antenna and tune receiver to channel where best reception has been obtained in the past.

Low end of the probe is connected to CHASSIS and the contrast control is set at MAXIMUM CONTRAST.

The 30 and 7875 C.P.S. oscilloscope sweep settings are used so as to permit the serviceman to observe two cycles of the wave shape.

Note: A wave shape seen in your oscilloscope may be upside down from same wave shape shown here. This will depend on the number of stages of amplification.

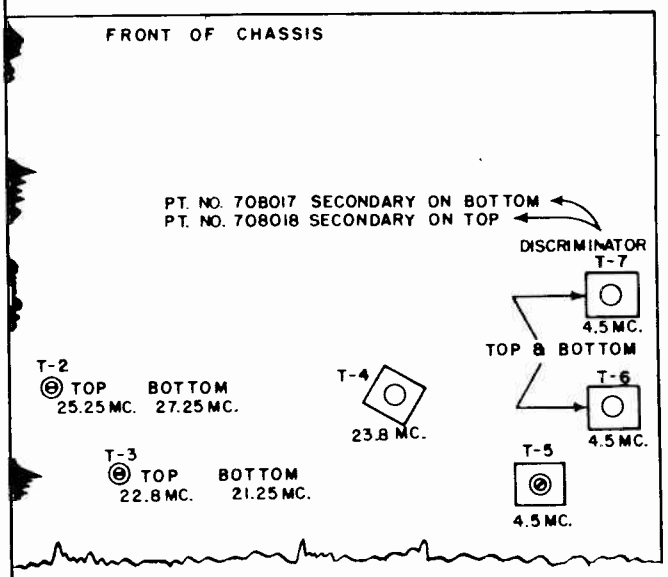
Emerson Television

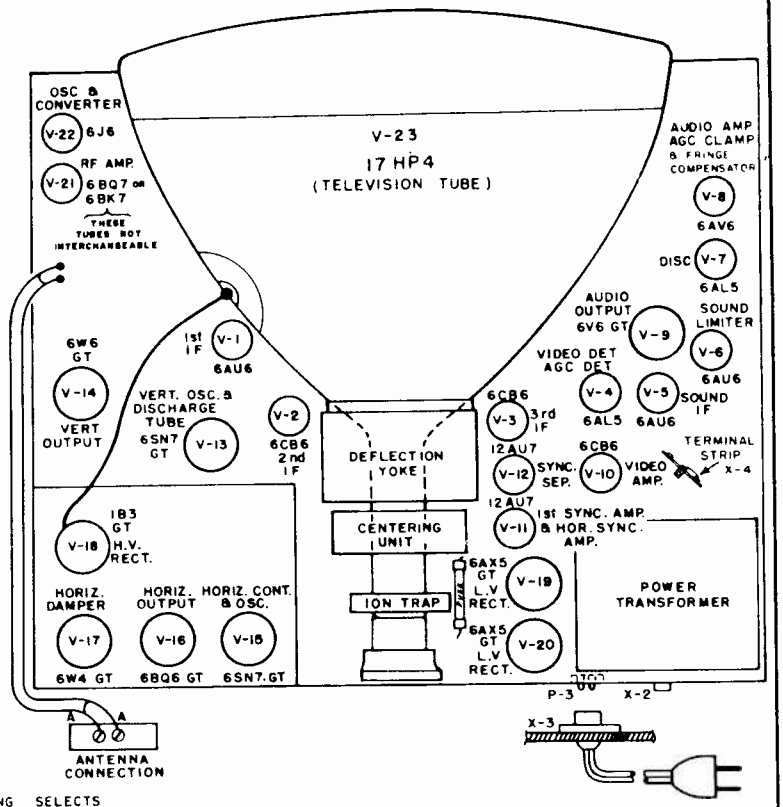
MODELS — 700B
701B

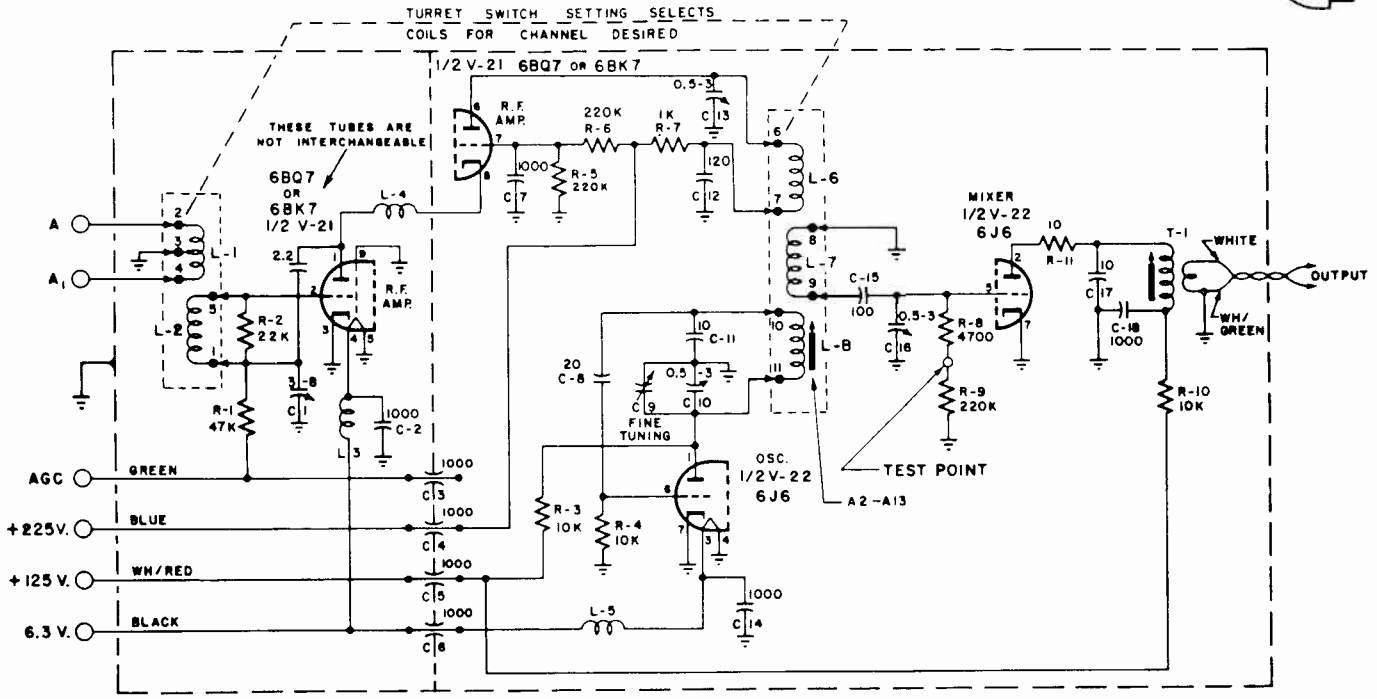
CHASSIS — 120153-B

(Chassis 120158-B used in Models 700D and 701D, and Chassis 120148-B used in Model 699B are similar to Chassis 120153-B described below and on the next three pages.)

ALIGNMENT POINTS (TOP VIEW)





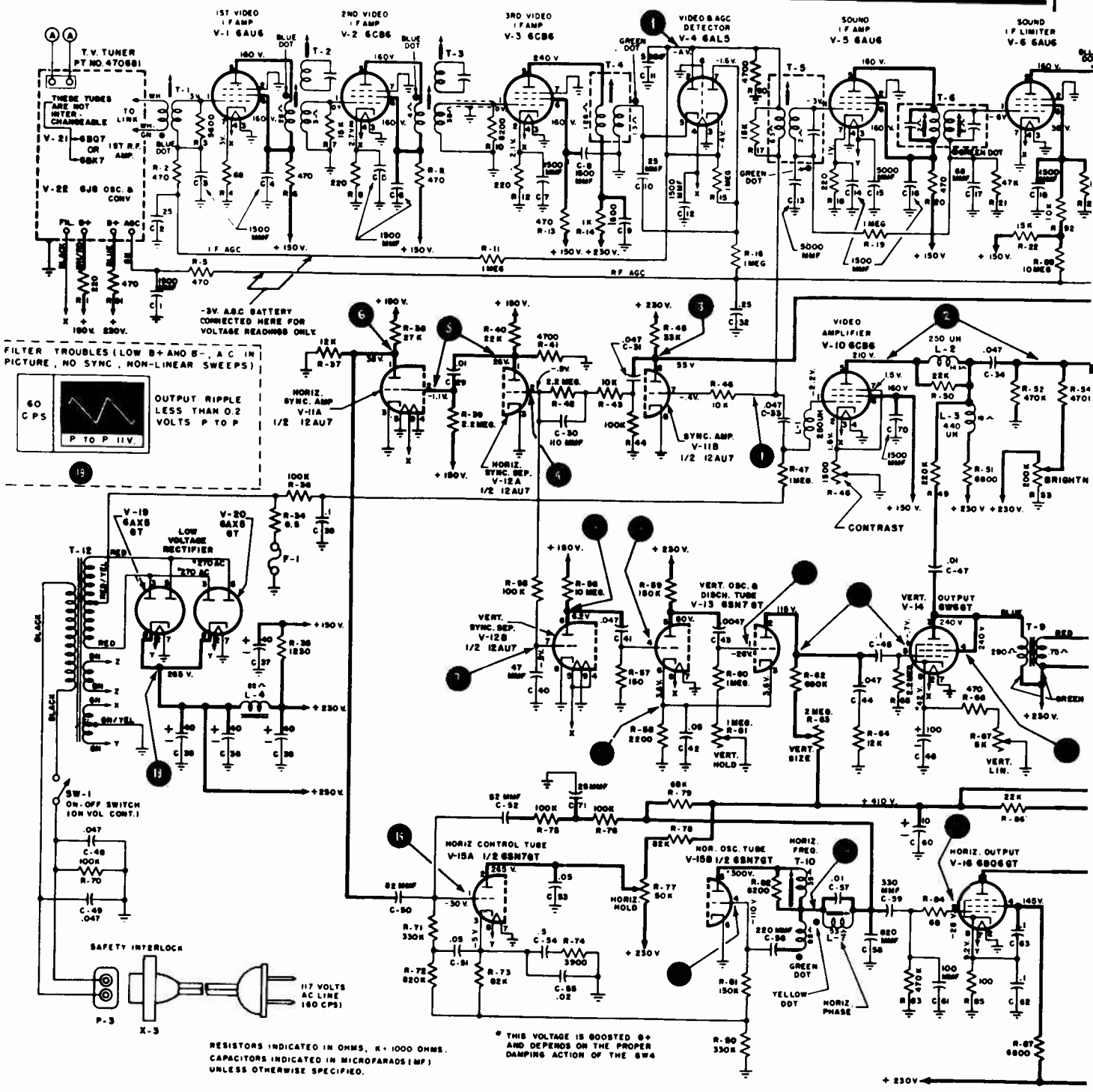


NOTES:
1- L-1, L-2, L-6, L-7 AND L-8 ARE MOUNTED ON INDIVIDUAL CHANNEL STRIPS ON TURRET.

2- SWITCH POINTS ARE NUMBERED IN THE ORDER OF THEIR RESPECTIVE LOCATION FROM THE REAR END OF THE TUNER.

3- ALL RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MMF UNLESS OTHERWISE INDICATED.

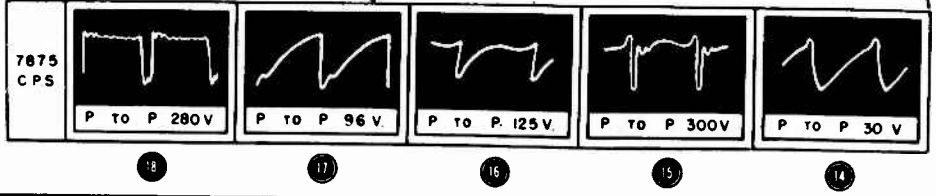
SCHEMATIC DIAGRAM OF TURRET TYPE TUNER #470681 USED ON CHASSIS 120153-B



NOTE → BEFORE TAKING WAVE SHAPES, SEE NEXT PAGE FOR CONDITIONS UNDER WHICH THEY WERE TAKEN.

* FOR THIS MEASUREMENT READJUST VERTICAL HOLD TO STOP PICTURE ROLL.
† HORIZ. GAIN ON SCOPE FULLY OPEN.
P TO P = PEAK TO PEAK

HORIZONTAL TROUBLES (POOR HOLD, TEAR, NO HORIZONTAL HOLD, NO HIGH VOLTAGE, POOR HORIZONTAL LINEARITY)

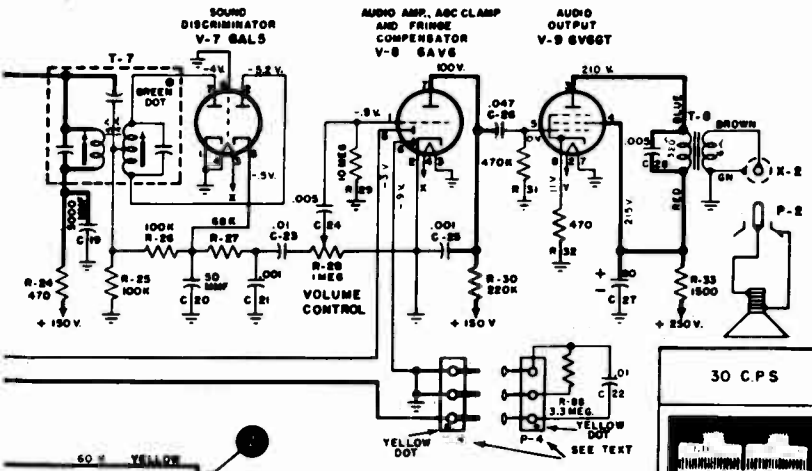


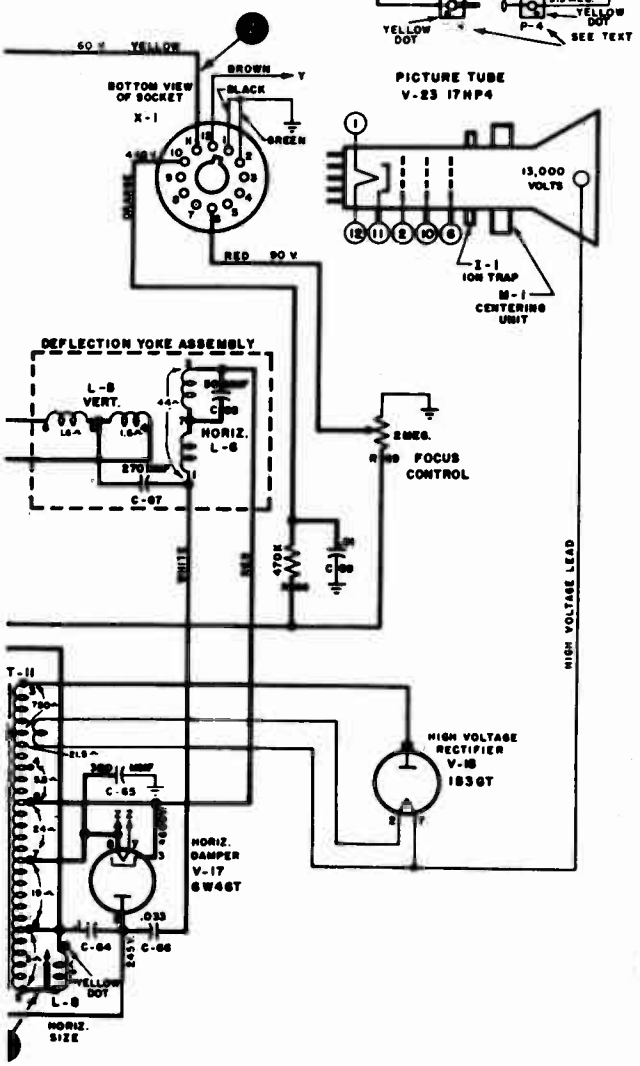
SCHEMATIC OF CHASSIS 120153-B

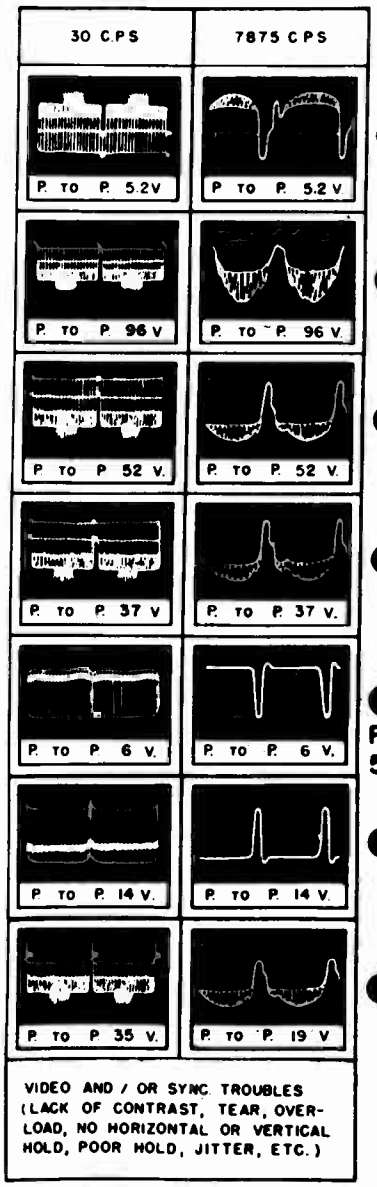
EMERSON RADIO & PHONOGRAPH

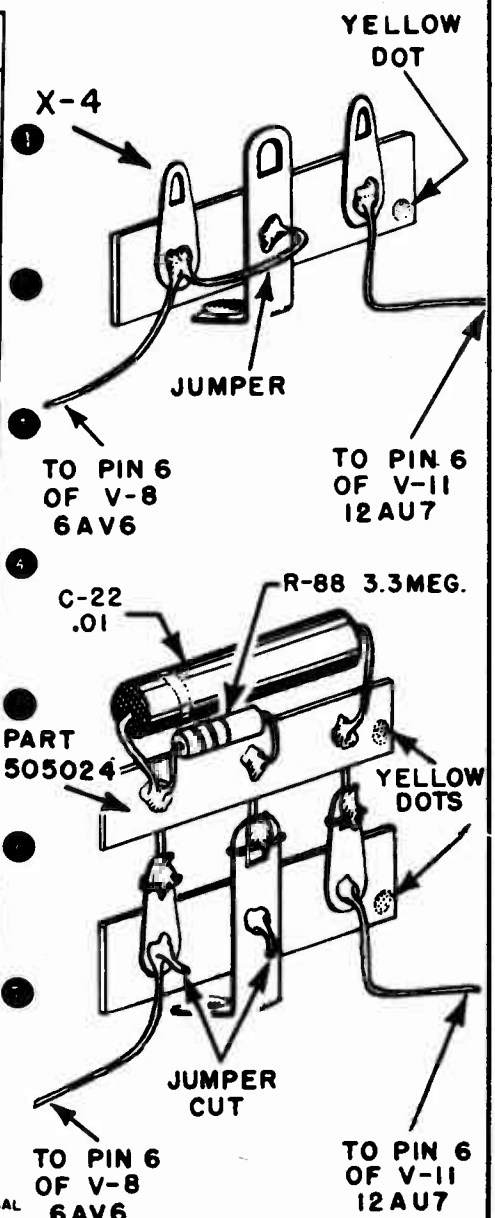
MODELS — 700B
701B

CHASSIS — 120153-B

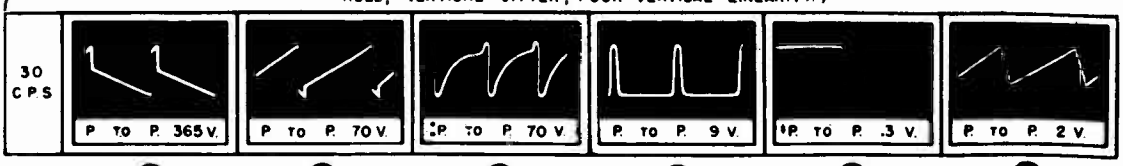








VERTICAL TROUBLES (NO VERTICAL HOLD, NO VERTICAL SIZE, POOR VERTICAL HOLD, VERTICAL JITTER, POOR VERTICAL LINEARITY.)



To install Part 505024 shown, cut jumper on X-4, and attach

RESISTANCE READINGS FOR CHASSIS 120153-B

SYMBOL	TUBE PIN NUMBERS											
	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9	PIN 10	PIN 11	PIN 12
V-1	1.1 MEG	0	0	.05	*11 K	*11 K	75					
V-2	.3	225	0	.05	*11 K	*11 K	0					
V-3	.3	225	0	.05	*13 K	*11 K	0					
V-4	4.7 K	4.7 K	0	.05	1.3	0	900 K					
V-5	900 K	0	.05	0	*11 K	*11 K	230					
V-6	50 K	0	0	.05	*11 K	* 8 K	0					
V-7	0	100 K	.05	0	200 K	0	100 K					
V-8	10 MEG	0	0	.05	1.8 MEG	3.3 MEG	250 K					
V-9	N.C.	.05	*13.5 K	*13.5 K	500 K	*11 K	0	470				
V-10	1 MEG	6.5	.05	0	*20 K	*11 K	6.5					
V-11	10 K	2.2 MEG	0	0	0	55 K	15 K	0	.05			
V-12	4 K	2.8 MEG	0	.05	.05	12 MEG	2.8 MEG	0	0			
V-13	1.3 MEG	1.8 MEG	2600	165	170 K	2600	0	.05				
V-14	N.C.	.05	*12 K	*12 K	2.4 MEG	2000	0	2500				
V-15	1.5 MEG	30 K	450 K	500 K	*220 K	0	0	.05				
V-16	N.C.	0	N.C.	*20 K	470 K	470 K	.05	105				
V-17	N.C.	N.C.	*160 K	N.C.	*11 K	N.C.	*160 K	*160 K				
V-18	FILAMENT RESISTANCE INFINITE - PLATE CAP = *160 K											
V-19	N.C.	.05	30	N.C.	30	N.C.	0	*11.5 K				
V-20	N.C.	.05	30	N.C.	30	N.C.	0	*11.5 K				
V-23	0	0				350 K				650 K	250 K	.05

*Varying resistance wait until meter settles (about 30 sec.)

CONDITIONS FOR TAKING VOLTAGE AND RESISTANCE READINGS

The resistance measurements listed below are for chassis 120153-B with no triangle codes. Due to component variations, voltage and resistance readings may vary slightly from those given here. Slight variations may also be noticed if chassis is not coded as mentioned above.

1. Antenna disconnected and antenna terminals shorted.
2. Line voltage 117 volts.
3. 3 volt bias battery connected to both I.F. and R.F. A.G.C. circuits, positive terminal to chassis, negative terminal to junction of R-16, C-32. Add a jumper wire from this junction to junction of R-11, C-2, R-2 so that bias battery is also applied to I.F. A.G.C. See Schematic note. BIAS BATTERY USED FOR VOLTAGE READINGS ONLY.
4. All controls in position for normal picture.
5. All measurements taken with a vacuum tube voltmeter and ohmmeter.
6. All readings listed in tables were taken between points shown and chassis.
7. Resistance readings are given in ohms unless otherwise noted.
8. N.C. denotes no connection.

WAVE SHAPE ANALYSIS CHART FOR CHASSIS 120153-B

Slight peak to peak voltage differences may be noticed if chassis is triangle code marked. The wave shapes shown here are arranged so as to give the serviceman an easy method of signal tracing. The peak to peak voltage given may vary slightly depending on signal strength and component variations.

To accurately observe the following wave shapes, the relatively high input capacity of an oscilloscope must be reduced so as not to change the operating characteristics of the television set. Failure to do this will result in wrong wave shape readings. This is accomplished by using an Emerson low capacity probe as outlined previously in the service note for Models 686L, 687L and 696L using chassis 120142-B.

Connect antenna and tune receiver to channel where best reception has been obtained in the past.

Low end of the probe is connected to CHASSIS and the contrast control is set at MAXIMUM CONTRAST.

The 30 and 7875 C.P.S. oscilloscope sweep settings are used so as to permit the serviceman to observe two cycles of the wave shape.

Note: A wave shape seen in your oscilloscope may be upside down from same wave shape shown here. This will depend on the number of stages of amplification in the oscilloscope used.

FADA RADIO & ELECTRIC CO., Inc.

Models S7C20—S7C30—S20C10—S20T20

The service material on the models listed above is presented below on this page and on the next five pages. You will find that this material is applicable to a large degree to Models S1055, S1055X, S6C55, S6T65, S7T65, and S1060, and may be used to guide you in servicing these additional television sets.

ALIGNMENT

PRECAUTION

Disconnect the antenna. Set picture control for minimum. Adjust channel tuning to a non-assigned channel 2-3-4 on the low band, 7-8-9 on the high band depending upon the location to prevent television signals from interfering with alignment.

For all IF Alignment, insert a 47K ohm resistor in series with the VTVM probe; also, a 47K ohm resistor should be inserted between the take-off point and the oscilloscope lead for decoupling.

SOUND RATIO DETECTOR AND IF ALIGNMENT

1. Connect probe of the VTVM to the diode plate of the ratio detector tube V20B (6T8, pin 2). Common to ground. See Figure 7.

2. Connect high side of the signal generator to the grid of the ratio detector driver. V21 (6AU6, pin 1). Common to ground. See Figure 7.

3. Tune the signal generator to exactly 4.5mc and attenuate the generator so it does not exceed 8 volts on the VTVM.

4. Peak L16 bottom core (FIG. 7) for maximum.

5. Peak L17 top core (FIG. 8) for maximum.

6. Adjust attenuator of signal generator to give exactly eight volts on the VTVM.

7. Move probe of VTVM to junction of R35, C28 and C29. (FIG. 7).

8. Adjust L17 top core (FIG. 8) for exactly 4 volts on the VTVM.

9. Move signal generator to video output tube V8 (6AG7, pin 4) (FIG. 7) and repeat steps number 1 and 3.

10. Peak L12 bottom (FIG. 7) and L13 top (FIG. 8) for maximum.

11. Repeat with care steps 1-3-4-5-6-7-8.

ALTERNATIVE PROCEDURE FOR STEPS 6-7-8:

1. Connect common lead of VTVM to junction of R33 and R34. (FIG 7).

2. Connect probe of VTVM to junction of R35, C28, and C29. (FIG. 7).

3. Adjust L17 top (FIG. 8) for zero reading on the VTVM.

PICTURE IF TRANSFORMER

Rough Alignment

1. Remove the shield cover from the converter tube V2 (6J6) (FIG. 8). Compress the sides of the shield slightly between fingers to form an oval, slip cover back over converter tube V2 (6J6) carefully making certain that the shield does not touch chassis ground. Connect the output of the signal generator to the floating shield. Ground generator to rear apron of RF unit.

2. Connect the probe of the VTVM to the junction of L11 and R16 (FIG. 7). Common to ground.

3. Set the signal generator to 23.4mc. Output of signal generator to be kept low as possible.

4. Peak first video IF coil (located on RF Tuner), and the third video IF coil L6 (FIG. 8) for maximum.

5. Reset signal generator to 25.7Mc.

6. Peak second video IF coil L3 and the fourth video IF coil L9 (FIG. 8) for maximum.

PICTURE IF FLAT-TOPPING

1. Remove signal generator and VTVM.

2. Connect the sweep generator to the ungrounded converter shield (FIG. 8).

3. Connect the oscilloscope probe to the junction of L11 and R16.

4. Place signal generator lead near converter tube V2 (6J6) shield. Ground all equipment to rear apron of the RF unit.

5. For best results the video IF should be aligned on a non-assigned channel, 2-3-4 on the low end, and 7-8-9 on the high end, depending upon location. If signal pips are noticed on the curve, adjust the channel tuning control until the pips are eliminated. The shape of the IF curve should not change when the tuning control is adjusted.

6. Set the signal generator to zero output and connect the VTVM probe to the A.G.C. buss. See FIG. 7. Vary the output of the sweep generator until the VTVM reads minus 1.5 volts.

7. Set the signal generator to 26.1mc. and advance the output until a marker pip is visible on the video IF curve, on the oscilloscope. Adjust L3 and L9 so that the marker pip is at the 50% point. See FIG. 6. IF CURVES AND MARKERS.

8. Set the signal generator to 23.8mc. and flat-top video curve by adjusting the first video IF coil (located on RF Tuner) and the third video IF coil L6 (FIG. 8). Marker should be near end of curve. See FIG. 6. IF CURVES AND MARKERS.

9. Repeat steps 7 and 8 until an acceptable curve is achieved.

10. Set the signal generator to 21.6mc., this marker pip should appear at the bottom of the curve as shown in FIG. 6 IF CURVES AND MARKERS. The exact position of the 23.8mc. marker is governed by where the 21.6mc. marker falls. Should the 21.6mc. marker be more than 5% up on the curve intercarrier buzz will result, and if the marker is too low weak audio will result. The 21.6mc. marker should be kept as low as possible and yet give enough audio signal.

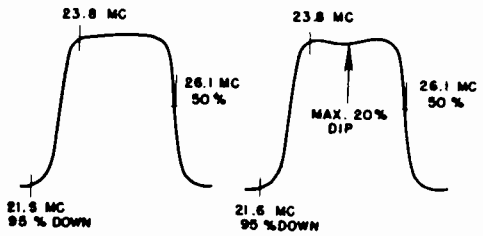


FIG. 6.

FADA RADIO Television Models S7C20, S7C30, S20C10, and S20T20, continued.

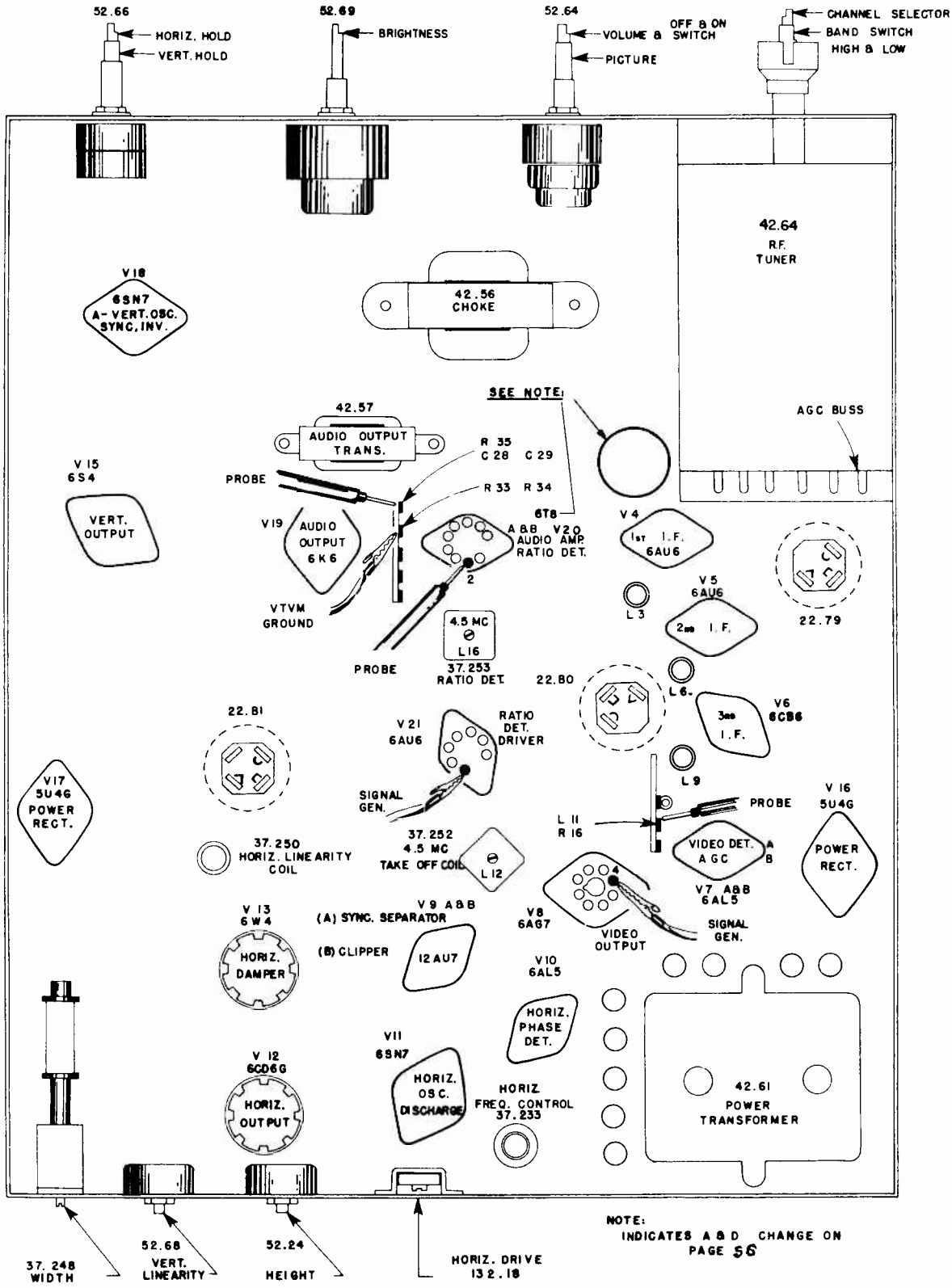


FIG. 7. BOTTOM VIEW OF CHASSIS

FADA RADIO Television Models S7C20, S7C30, S20C10, and S20T20, continued.

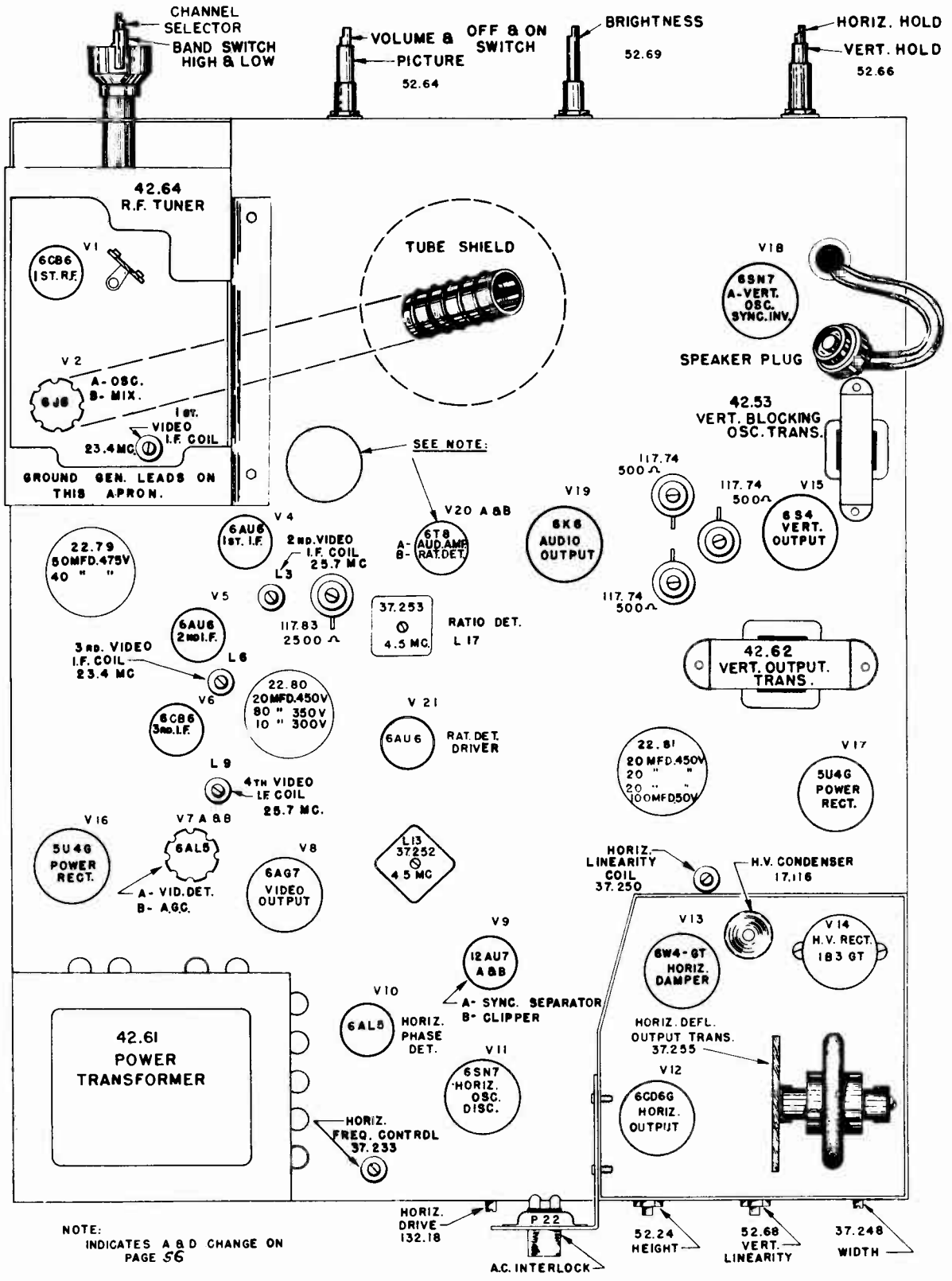


FIG. 8. TOP VIEW OF CHASSIS

FADA RADIO & ELECTRIC CO., Inc.

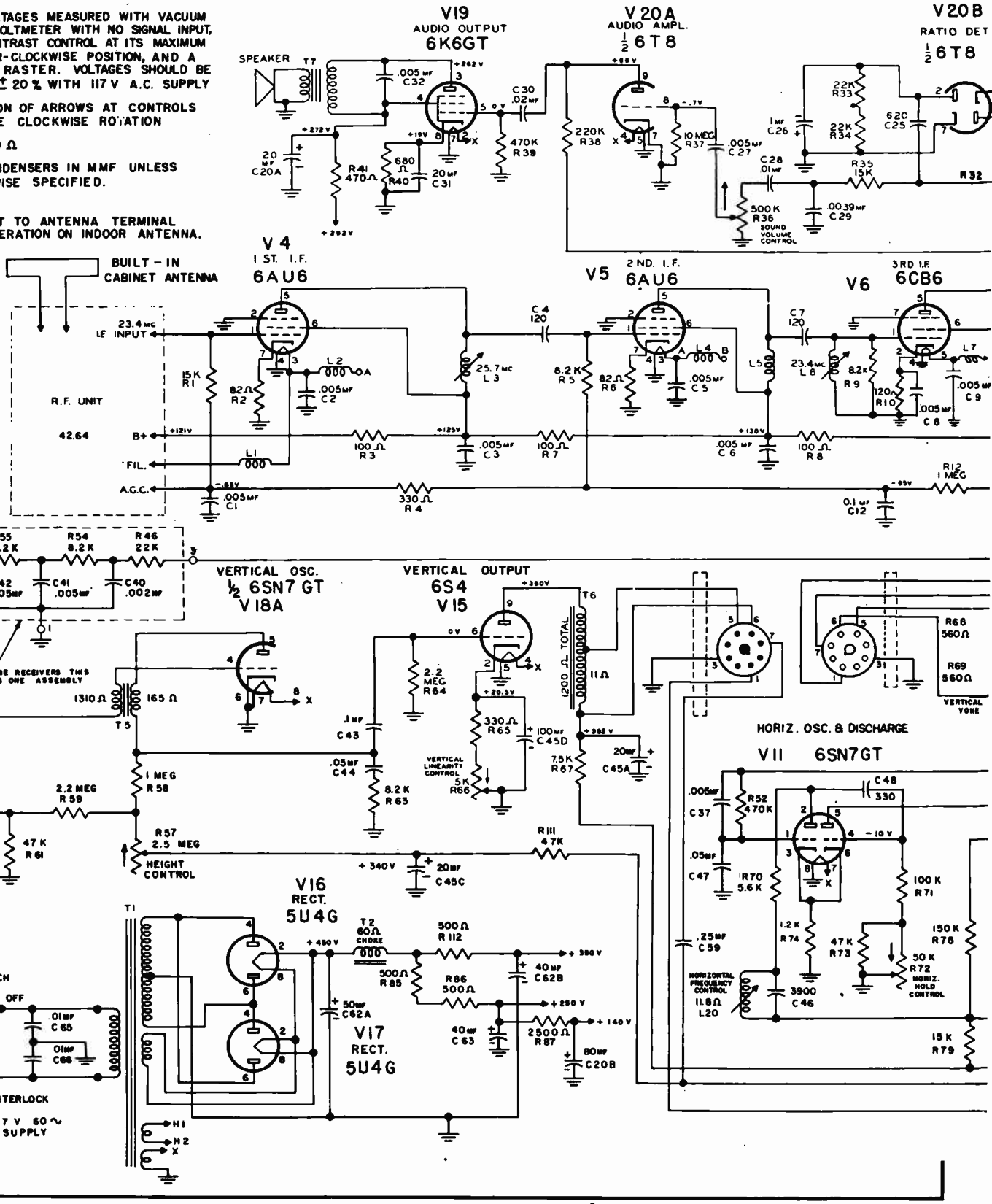
ALL VOLTAGES MEASURED WITH VACUUM TUBE VOLTMETER WITH NO SIGNAL INPUT, THE CONTRAST CONTROL AT ITS MAXIMUM COUNTER-CLOCKWISE POSITION, AND A NORMAL RASTER. VOLTAGES SHOULD BE WITHIN ± 20 % WITH 117 V A.C. SUPPLY

DIRECTION OF ARROWS AT CONTROLS INDICATE CLOCKWISE ROTATION

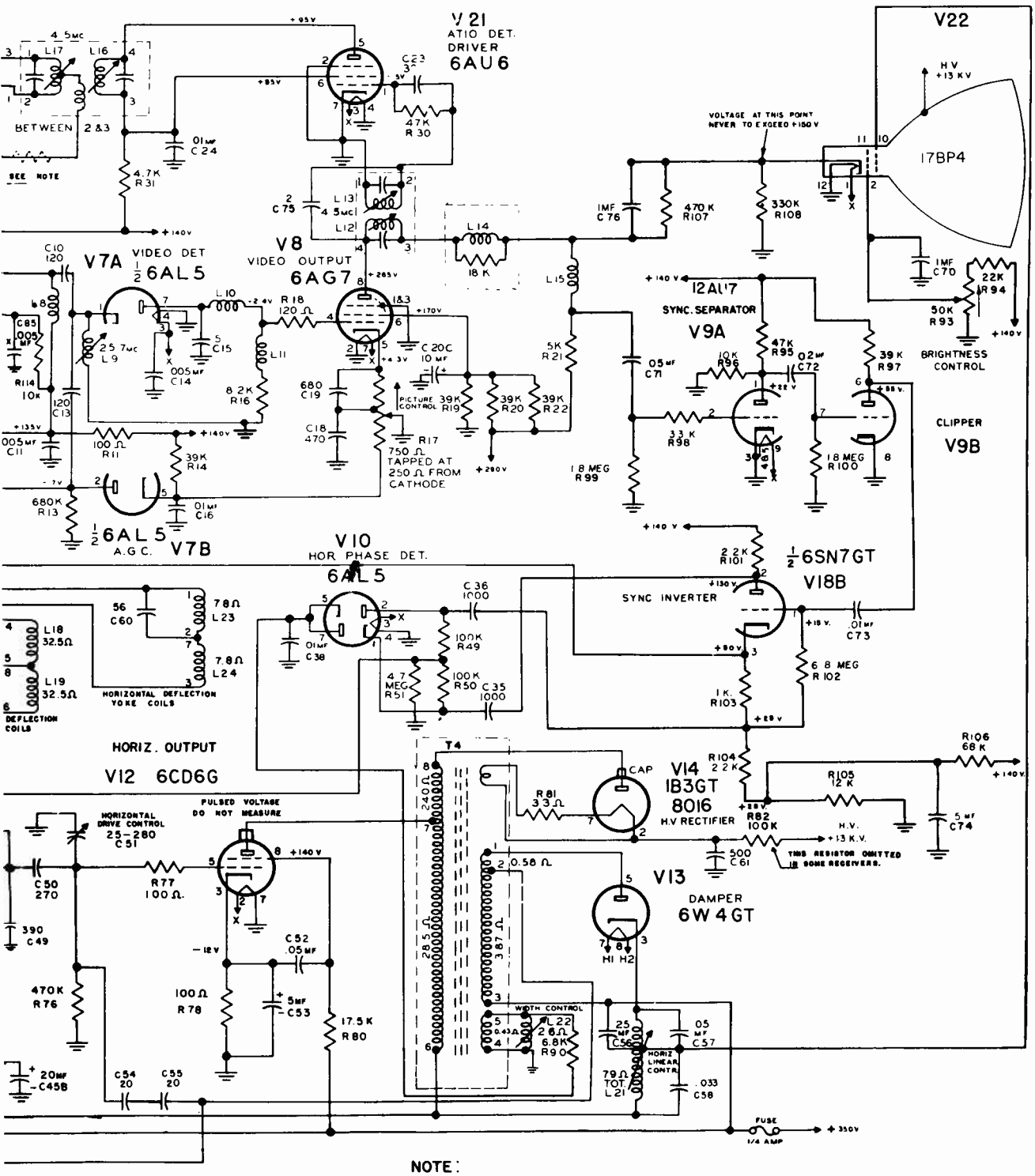
K = 1000 Ω

ALL CONDENSERS IN MMF UNLESS OTHERWISE SPECIFIED.

CONNECT TO ANTENNA TERMINAL FOR OPERATION ON INDOOR ANTENNA.



The schematic diagram on these two pages is exact for Fada Television Models S7C20 and S7C30. The circuit for Models S20C10 and S20T20 is almost identical, but a 20CP4 picture tube is used. In S20T20 terminals 1 and 3 of L23-L24 are reversed, and terminals 4 and 6 of L18-L19 are reversed.



NOTE:
WHEN RATIO DETECTOR COIL 37.253 IS USED C25 IS 625 MMF AND R32 IS ELIMINATED.
WHEN RATIO DETECTOR COIL 37.230 IS USED, C25 BECOMES 330MMF AND R32 330 OHMS IS ADDED.

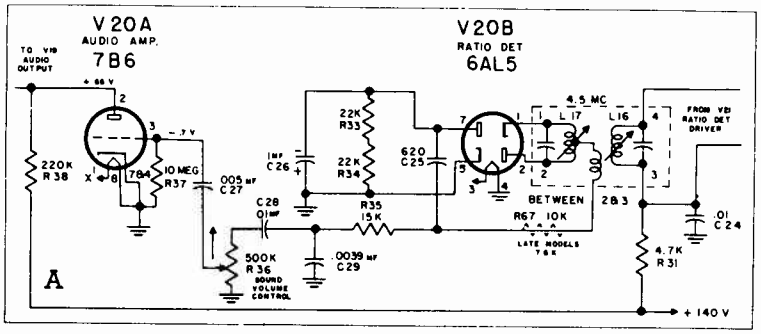
IN EARLY MODELS V6, 6CB6, 3RD I.F. WAS 6AU6

FADA RADIO Television Models S7C20, S7C30, S20C10, and S20T20, cont.

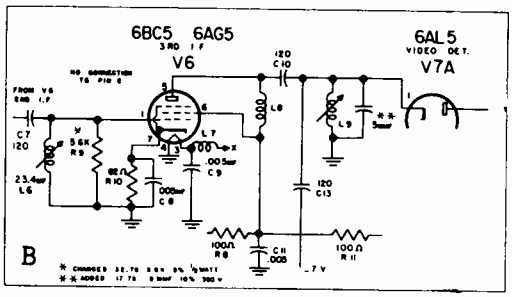
TUBE CHANGES

Large RED letters stamped on rear apron of chassis indicate one of, or a combination of, the following changes:

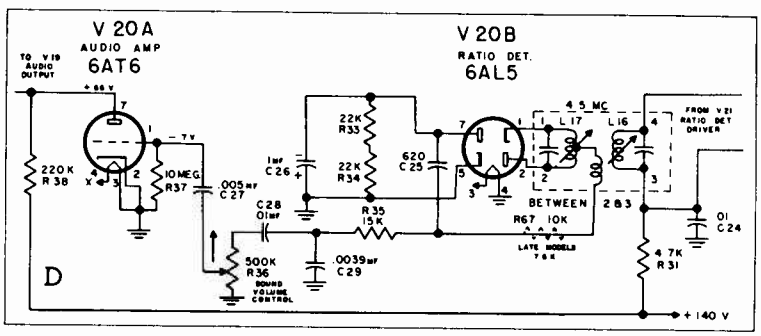
The letter "C" indicates a 6CB6 is being used in place of a 6AU6 in the 3rd IF.



The letter "A" indicates that a 7B6 and a 6AL5 have been substituted for the 6T8—V20 A & B —Audio Amplifier and Ratio Detector.

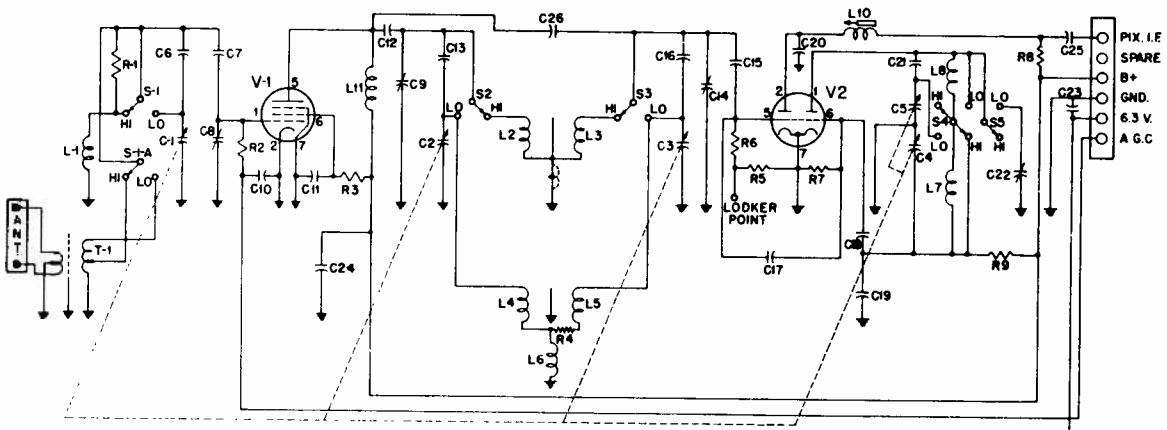


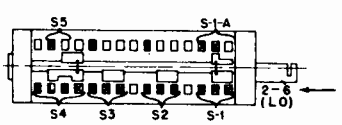
The letter "B" indicates that a 6AG5 or a 6BC5 has been substituted for 6AU6—V6—3rd I.F. stage.



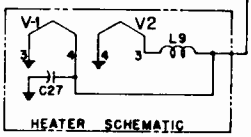
The letter "D" indicates that a 6AT6 and a 6AL5 have been substituted for the 6T8—V20 A & B —Audio Amplifier and Ratio Detector.

MODEL 42.64 TUNER





NOTES-
1 SWITCH SECTIONS S-1 TO 5 ARE PARTS OF A TWO POSITION SLIDE SWITCH AS PICTURED.
2 SWITCH SHOWN IN POSITION FOR HI-BAND RECEPTION.
R REVERSED CONTACT
X SHORT CONTACT
L LONG CONTACT
B MOUNTING LUG



Gamble-Skogmo, Inc.

CORONADO TELEVISION RECEIVER MODELS { **15TV1-43-8957A**, **15TV1-43-9015A**, **15TV1-43-9016A**

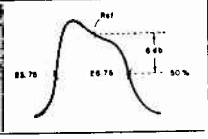
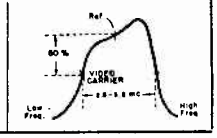
The material on pages 57 to 60 is exact for models listed above. The additional models listed below, are similar to these in their television circuits and incorporate an additional AM tuner.

CORONADO TELEVISION RECEIVER MODELS { **15TV1-43-8958A**, **15TV1-43-9020A**, **15TV1-43-9021A**

PRE-ALIGNMENT PRECAUTIONS

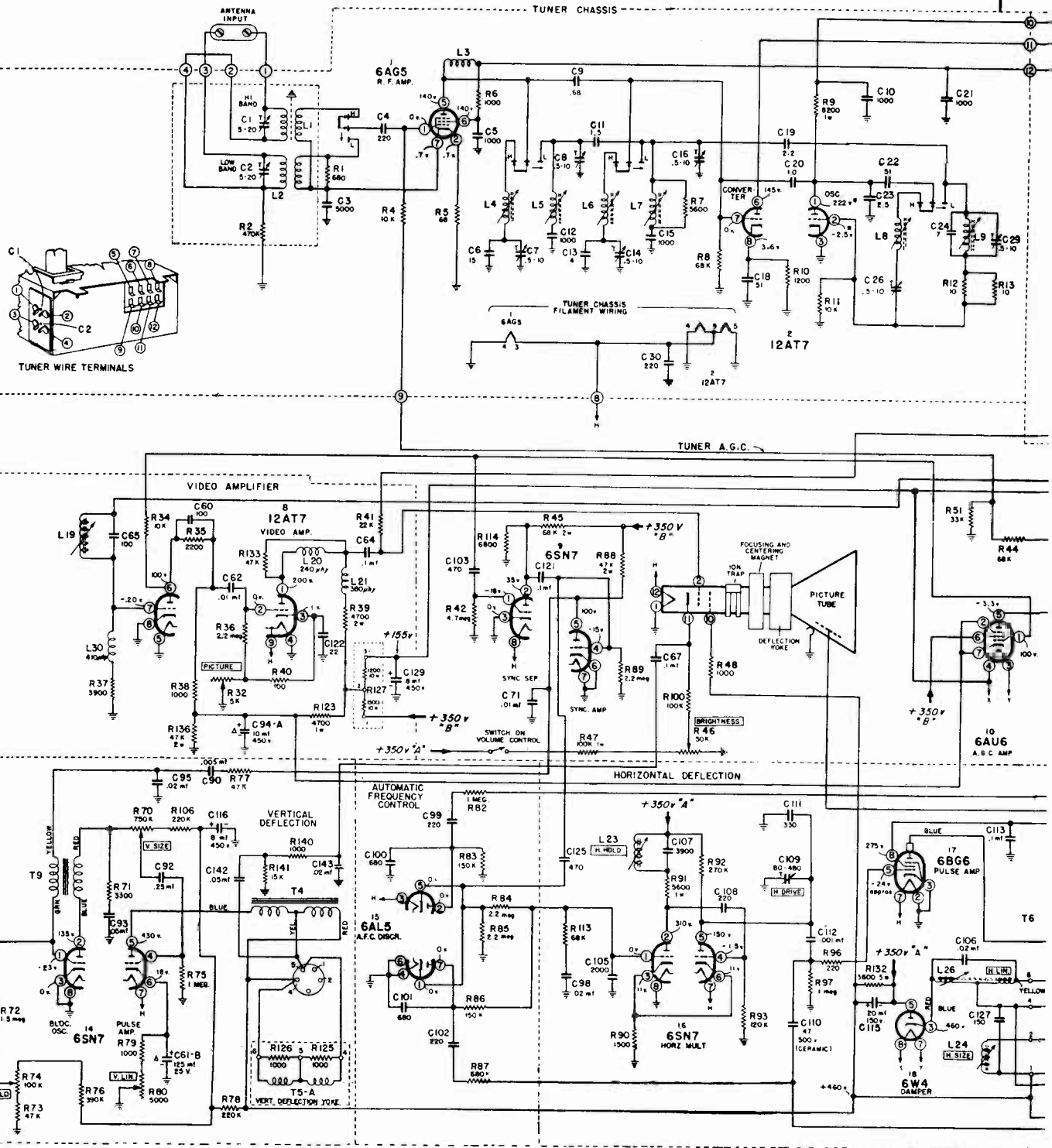
1. If sweep generator does not have a balanced output, connect a 150 ohm resistor in series with the ground lead and 150 ohms minus the internal resistance of the generator in series with the hot lead.
2. Connect a 1000 mmf capacitor across scope terminal and a 10K ohm resistor in series with hot scope lead.
3. Connect signal generator thru a 1000 mmf capacitor.
4. Set Picture control to maximum.
5. When aligning the I.F. Amplifier be sure the tuner is tuned to a high band channel (any channel).

VIDEO IF ALIGNMENT

Step No.	Signal Generator Freq. (mc.)	Sweep Generator Freq. (mc.)	Signal Input Point	Output Point	Adjust	Remarks	Response
1	26.5	———	Converter Grid	VTVM at pin 7 of tube 8 (12AT7)	L-11 L-13	Adjust generator for output of approx. 1 volt	Maximum Reading
2	24.1	———	Converter Grid	VTVM at pin 7 of tube 8 (12AT7)	L-12 L-14	Adjust generator for output of approx. 1 volt	Maximum Reading
3	25.4	———	Converter Grid	VTVM at pin 7 of tube 8 (12AT7)	T-1	Adjust generator for output of approx. 1 volt	Maximum Reading
4	25.5		Converter Grid	VTVM at pin 7 of tube 8 (12AT7)	———	SENSITIVITY Generator output should be less than 100 microvolts (If not repeat alignment)	1 volt VTVM Reading (above noise)
5	26.75 23.75	25.0	Converter Grid	Scope at pin 7 of tube 8 (12AT7)	T1 for proper ratio as in #6 below	SELECTIVITY Markers should be as shown in response column (If not repeat alignment).	
6	Connect scope and sweep generator as in step 5. Connect VTVM as in step 4. Adjust marker generator until marker reaches peak. Record VTVM reading (V1), keeping generator output constant, adjust marker generator until marker reaches shoulder. Record VTVM reading (V2). The ratio of the response V1/V2 should be between 1.4 to 1.6.						
7	———	Channels 2-4 6-7-10-12	Antenna Terminals	Scope at pin 7 of tube 8 (12AT7)	———	Check channels for band width (2.8 mc to 3.2 mc)	

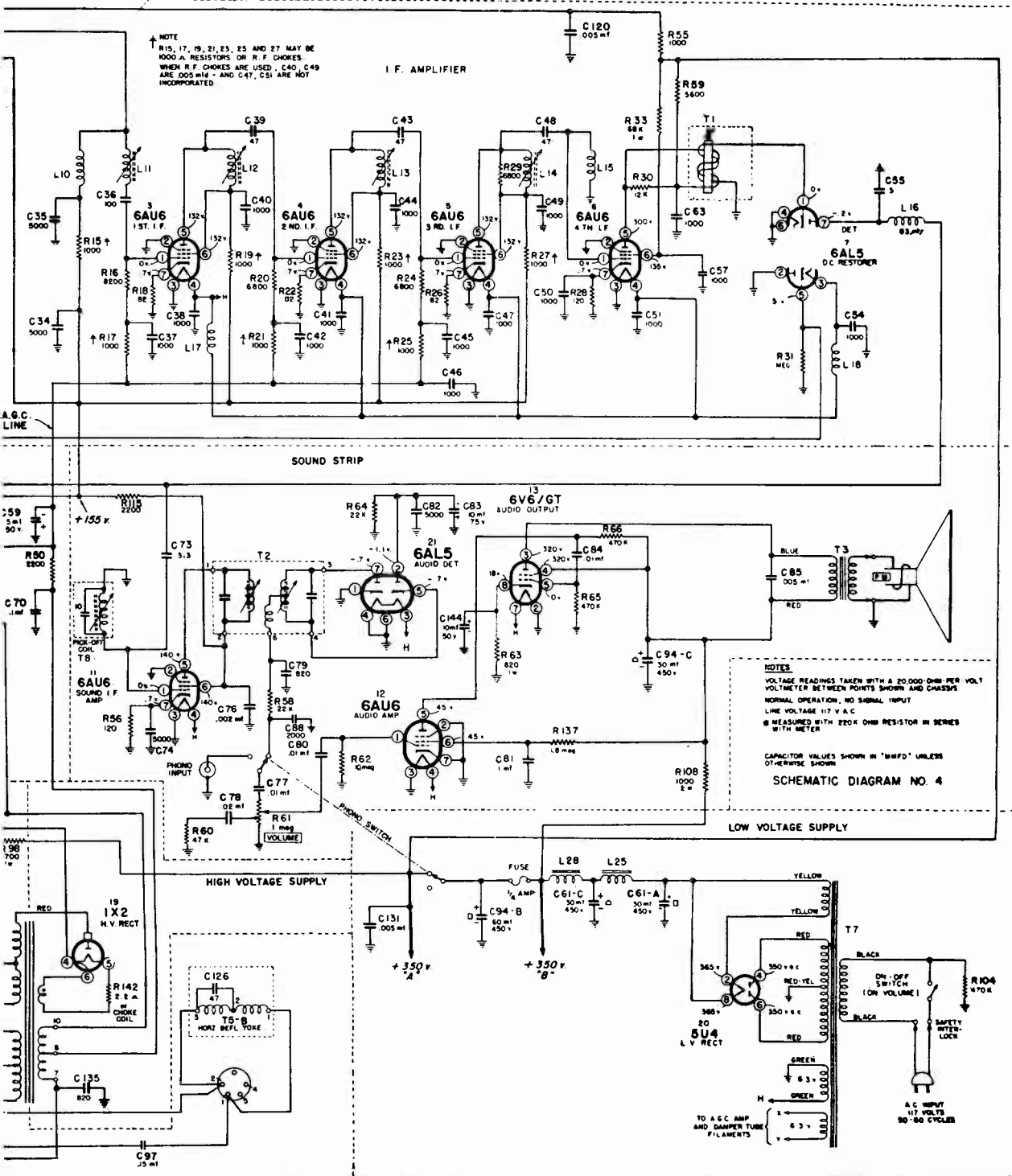
Picture I.F. frequency 26.75 mc — Sound I.F. frequency 22.25 mc.

Gamble-Skogmo Models 15TV1-43-8957A, 15TV1-43-9015A, 15TV1-43-9016A



PRODUCTION DEVIATIONS—Due to procurement difficulties the chassis components may deviate slightly from that shown in the schematic diagram. Parallel and series combinations of components and value differences may be noticed. When replacement is necessary, replace with the value shown in the schematic diagram.

CORONADO TELEVISION RECEIVER MODELS { 15TV1-43-8957A, 15TV1-43-9015A, 15TV1-43-9016A



SCHEMATIC DIAGRAM

† NOTE: R15, 17, 19, 21, 23, 25 or 27 may be either 1000 ohm resistors or RF chokes. When RF chokes are used capacitors C-40 and C-49 are .005 mfd and C-47, C-51 are not incorporated.

Continued on the next page.

Gamble-Skogmo, Coronado Models 15TV1-43-8957A, etc., continued.

TROUBLE-SHOOTING

Trouble	Probable Location
No Raster No Sound	1. Phono TV switch defective or in "DOWN" position. 2. Defective 5U4 tube (20). 3. Defective power transformer (T-7). 4. Defective filter choke (L-25 or L-28). 5. Defective filter condenser (C-61 or C-94). 6. Defective fuse.
No Raster Sound Normal	1. High voltage lead disconnected. 2. Ion trap magnet incorrectly positioned. 3. Yoke plug not in place or loose. 4. Insufficient or no high voltage. 5. Defective resistors R-46-47-48-100 or capacitor C-67. 6. Defective picture tube.
No Picture No Sound Raster Normal	1. Defective antenna or lead-in. 2. Defective tuner tubes (1or 2). 3. Defective tuner. 4. Defective tubes 3 to 7. 5. Improper voltages or resistances at sockets of tubes 3 thru 7. 6. Improper alignment. 7. Open coils L16, L19, L30 or resistor R37.
No Sound Picture Normal	1. Defective tubes 11, 12, 13 and 21 or associated circuits. 2. Improper voltages or resistances at sockets of tubes 11, 12, 13 and 21. 3. Speaker leads broken or not in place. 4. Defective speaker. 5. Defective transformer T2 or T8. 6. Improper alignment of transformer T2, T8.
No Picture Raster Normal Sound Normal	1. Defective tubes 7, 8, 10. 2. Improper voltages or resistances at sockets of tubes 7, 8, 10. 3. Defective capacitors C-64 and coils L-20-21. 4. Defective AGC.
No Sync	1. Defective tubes 8, 9, 10. 2. Defective capacitors C-103, 121 and resistors R-45, 114. 3. Defective AGC.
No Vertical Sync Picture otherwise normal	1. Defective capacitors C-71, C-90, C-95. 2. Defective tube 9. 3. Defective resistors R-73, R-77, R88.
No Horiz. Sync Picture otherwise normal	1. Defective tubes 15, 16. 2. Defective resistors R-82-83-84-85-86-87, and capacitors C-98-99-100-101-102-105-125-139. 3. Defective Horizontal transformer T-6.
No Vertical Sweep	1. Defective tube 14. 2. Defective transformers T-9, T-4, T-5A. 3. Defective capacitors C-92, 95, 116 and resistors R-75, 78.
Picture cannot be Centered	1. Defective ion trap magnet. 2. Defective focus magnet. 3. Defective picture tube. 4. Focus magnet not centered on picture tube neck.
Picture cannot be Focused	1. Focus magnet not properly located or centered on the picture tube neck. 2. Ion trap magnet not properly adjusted or defective. 3. Defective picture tube. 4. Improper high voltage.
No High Voltage	1. Defective tubes 16, 17, 18, 19. 2. Defective transformer T-6, yoke T-5B. 3. Defective capacitors C-108, 112, 113, or resistors R-90 through R-98 and R-112-118-119-120.
Bunching or folding at side of Picture	1. Improper adjustment of horizontal drive control C-109. 2. Defective tubes, 17, 18. 3. Defective C-115 or H. Linearity coil.
Audio in Picture	1. Improper alignment and ratio of video carrier to sound response. 2. Microphonic tubes 3, 4, 5 or 6.
Snow or poor Signal	1. Insufficient signal input. 2. Defective antenna or lead-in. 3. Improper alignment of C1 and C2. 4. Defective capacitors C59, C62 or coil L21. 5. Weak tubes 1, 3, 4, 5, 6 or 8.

A.G.C.

A defective AGC system may not affect the sound but over-load the video amplifier circuit and the result will be a loss of both horizontal and vertical sync and very weak video. This condition can easily be noticed and checked by measuring the AGC voltage and the voltage at pin 7 of tube 8. Under normal operating conditions these two voltages will be approximately the same. A defective AGC system will cause a large increase in voltage at pin 7 of tube 8 and a decrease in AGC voltage.

To determine the cause for trouble check the 6AU6 tube, capacitors C-70 and C-59 and resistors R-44, R-50 and R-51. To check the AGC winding of the horizontal deflection transformer, place a scope on pin 5 of the AGC tube and a horizontal pulse similar to wave shape should be obtained.

GENERAL ELECTRIC

MODELS 17T1, 17T2, 17T3, 17C103, 17C104, 17C105, 17C107, 17C108, 17C109

The chassis in models 17T4, 17T5, 17T6, 17C112 and 17C114 are very similar to the chassis used in models 17T1, 17T2, 17T3, 17C103, 17T104, 17T105, 17T108, and 17T109.

Models 16T5, 16C117 are similar.

VIDEO I-F ALIGNMENT

1. Connect a bias battery from junction of C261, R263 and the Picture control to B—. Connect positive of battery to B—. Adjust contrast control to give a —2.7 volts bias at the grid pin 1 of V4 measured with a VTVM. Disconnect VTVM leads during alignment. Adjust sweep generator output for ¾ volt as shown in Fig. 21.

2. The sweep generator should be properly terminated in its characteristic impedance. Couple the signal to the point of input through a .01 mf. capacitor.

3. The traps L227 and L253 must be detuned before aligning the amplifier by turning the cores all the way out of the coil. Retune these traps to 47.25 mc (as in step 6) for minimum amplitude. This adjustment is greatly enhanced by increasing the scope gain.

4. Set the Channel switch to Channel #12 or #13. Check for oscillator influence by turning the tuning control. If the shape of the response curve changes, switch to another channel where oscillator influence is not noted.

5. In most cases it is only necessary to perform an over-all alignment of the video i-f, as in Step 7 of the Video Alignment Chart, to obtain i-f response curve of Figure 21-E.

When aligning the i-f coils, L251 will adjust the audio or low frequency side of the i-f response curve, while L252 will adjust the video or high frequency side of the i-f response curve. L226 and L254 should be adjusted simultaneously to reduce the saddleback at the peak of the curve and to give maximum gain and retain 45.75 mc and 42.50 mc markers at the 50% mark.

6. It is necessary to detune the i-f coils by shorting as noted in the alignment chart to prevent the coil preceding the signal input point from influencing the response curve.

7. The 45.75 mc marker should fall at the 50% point to give proper sideband response. See Fig. 21-E.

8. After adjustment of the two adjacent sound traps, readjust as in step 7 to obtain the proper curve and marker as illustrated.

VIDEO I-F ALIGNMENT CHART

Step	Marker Generator Frequency	Sweep Generator Frequency	Signal Input Points Between	Connect Oscilloscope Between	Adjust	See Note No.
1		40 to 50 MC		Point A (Fig. 30) Junction L256, R265, C268 and R266 thru 10K ohms and B— on V7 socket.	Detune L227 and L253 by turning cores out of coil.	3
2	44.50 MC		Point B (Fig. 29) V6 grid (pin 1) thru .01 mf. cap. and B— on head-end shield. Short L252.		Core of L254 for curve of Fig. 21-1A.	1, 2, 4, 6
3	45.75 MC		Point C (Fig. 29) V5 grid (pin 1) thru .01 mf. cap. and B— on head-end shield. Short L251. Remove short on L252.		Core of L252 for curve of Fig. 21-B.	
4	42.50 MC, 45.75 MC		Point D (Fig. 29) V4 grid (pin 1) thru .01 mf. cap. and B— on head-end shield. Short L226. Remove short on L251.		Core of L251 for curve of Fig. 21-C.	
5	44.2 MC		Point D (Fig. 29) Junction L215 and L216 on second r-f switch wafer thru .01 mf. cap. and B— on head-end shield. Remove short on L226.		Core of L226 for curve of Fig. 21-D.	
6	47.25 MC				Cores of L227 and L253 for min. output at 47.25 MC (Fig. 21-E).	1, 2, 3, 4, 7
7	41.25 MC, 42.50 MC, 45.00 MC, 45.75 MC, 47.25 MC				Cores of L251, L252, L254 and L226 for curve of Fig. 21-E.	1, 2, 4, 5, 7, 8

Models 17C113, 17C115, 17C120 are similar in circuit to these models, but their tuner is like the "head end unit" of Model 20C150 of the next section.

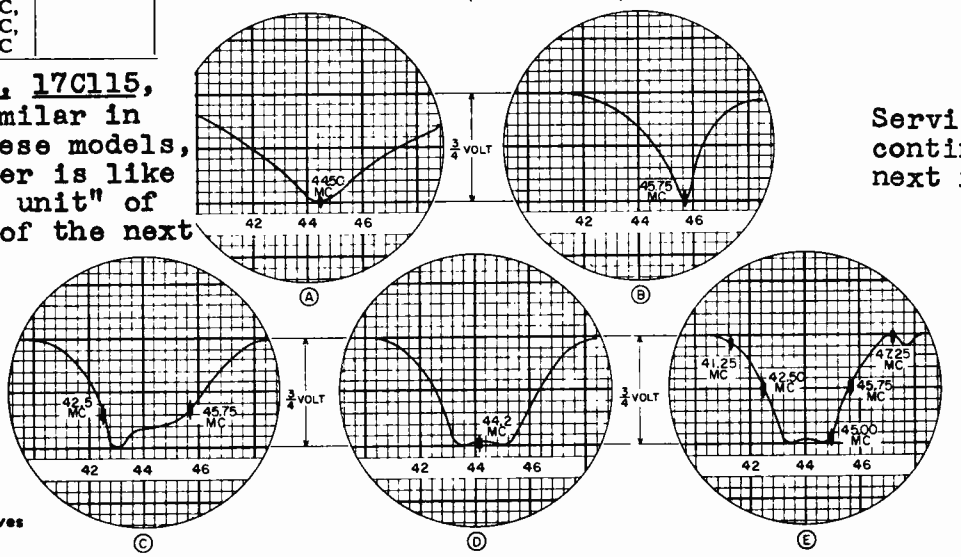


Fig. 21. Video I-F Curves

Service material continued on the next five pages.

General Electric Models 17T1, 17T2, 17T3, 17C103, 17C104, etc., continued.

AUDIO I-F ALIGNMENT

1. Audio i-f alignment is performed by putting in a 4.5 mc ±500 kc sweep and viewing the response curve as noted in the audio i-f chart.

2. As a final check, step 12, the secondary of T402 adjustment, should be checked on a television signal if possible. Try several operating television stations and if buzz in the audio is heard, the secondary of T402 should be readjusted as follows:

Tune in the station and adjust the contrast control for a weak sound output. Readjust the secondary of T402 until the buzz is a minimum or disappears, and the best quality audio is obtained.

3. Keep the input of the sweep generator low enough so that limiting does not take place, otherwise the response curve will broaden out, permitting slight misadjustment. Check by increasing the output of the sweep generator; the response curve should increase in amplitude.

4. T401 is adjusted for maximum amplitude and symmetry of the response curve about the 4.5 mc marker as shown in Figure 23-A.

5. The secondary of T402 is adjusted for the curve of Figure 23-B. This adjustment should give as straight a slope as possible between the positive and negative peaks of the curve with the center of the 4.5 mc marker falling midway between the peaks.

6. The primary of T402 is adjusted for maximum of the positive and negative peaks with as straight a trace as possible between the peaks. If necessary, readjust the secondary of T402 so that the marker falls midway between the peaks.

7. An alternate method to the visual alignment is the sound output method using an operating television station, preferably when transmitting tone modulation during the test pattern.

(a) Tune the receiver for optimum detail.

(b) Keep the input below limiting level by reducing the contrast by the Picture control or by using a resistor pad in the antenna circuit.

(c) Adjust primary and secondary of T401 for maximum sound output. Adjust primary of T402 for maximum audio output.

(d) Adjust the secondary of T402 for best quality audio (low distortion, least noise) and for minimum buzz in the output.

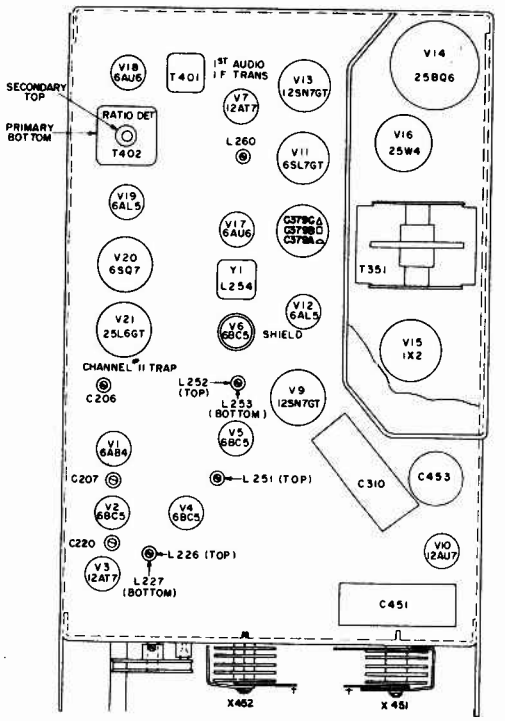


Fig. 22. Tube and Trimmer Location

AUDIO I-F ALIGNMENT CHART

Step	Marker Generator Frequency	Sweep Generator Frequency	Signal Input Points Between	Connect Oscilloscope Between	Adjust	See Note No.
8	4.5 MC	4.5 MC. ±500 KC keep signal below limiting level of receiver.	Point F (Fig. 29) Pin 1 of V17 through .01 mfd. cap. and B−.	Point G Junction of R404 and C404 & sec. of T401 through 10K and B−.	Primary and secondary of T401. See Figure 23-A.	1, 3, 4
9			Point H Pin 1 of V18 through .01 mfd. cap. and B−.	Point I (Fig. 29) Junction of R408, C411 and R411 through 10K and B−.	Secondary of T402. See Figure 23-B.	1, 3, 5
10					Primary of T402. See Figure 23-B.	1, 3, 6
11					Secondary of T402. See Figure 23-B.	1, 3, 5
12	Recheck alignment of step 11 on operating station as in note 2.					

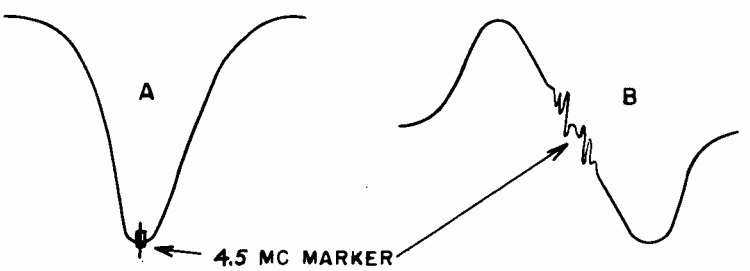


Fig. 23. Audio I-F Curve

General Electric Models 17T1, 17T2, 17T3, 17C103, 17C104, etc., continued.

R-F ALIGNMENT

R-F Alignment Notes

1. Disconnect the transmission line to the antenna terminals at the head-end. Couple the input of the sweep generator to the head-end terminals through balanced output adapter G-E ST-8A and a 430-ohm pad, or equivalent. Couple the adapter to the 430-ohm pad with a piece of 300-ohm transmission line. Terminate the 300-ohm line in a pad, as shown in Figure 20A.

If a balanced output is not available for the sweep generator a matching network as shown in Figure 20B may be used. A balanced output is recommended since a matching network as shown in Figure 20B may introduce frequency shift and cause a misleading tilt to the response curve.

Ro shown in Figure 20B is the terminating resistor. If this resistor is not already incorporated in the output of the sweep generator, it should be added to the matching network as shown.

2. It is necessary to connect a bias battery from the junction of the Picture control, C261, and R263 to B−. Connect plus of bias battery to B−. Adjust the Picture control to give a −2.7 volts bias measured from pin 1 of V2 to the head-end chassis B−.

3. Shunt L226 with a 680 ohm, ½ watt resistor during r-f alignment to prevent the oscillator from influencing the response curve. In order to reduce the effect of hum on the response curve, connect a 100-ohm resistor in series with the head-end B+ and connect an electrolytic capacitor of approximately 400 mf, 350 volt from head-end B+ to head-end B−.

4. On all channels the picture carrier marker should not be less than 75% of the peak of the r-f response curve. The sound carrier marker should not be less than 50% of the peak of the response curve. However, the two minimum values should not occur simultaneously. On the high channels the picture carrier marker should ride up nearer to the top of the curve provided the sound carrier marker does not go below 50%. On the low channels the picture carrier marker should ride as high up on the curve as possible and still keep the sound carrier marker above 50%.

5. Coils for Channels No. 12 through No. 7 are fixed inductances. Check the alignment on these channels as in steps 16 through 21 for proper response curve. Readjust L210 and L217 on Channel No. 13 and C207 and C220 on Channel No. 7 if necessary.

6. Coils for Channels No. 5 and No. 4 are fixed inductances. Check the alignment on these channels for proper curve. Readjust coils L208 and L215 to give proper curve on Channels No. 6, No. 5 and No. 4.

7. The coil for Channel No. 2 is a fixed inductance. Check the alignment on this channel for proper curve. Readjust L205 and L212 to give proper curve on Channels No. 3 and No. 2.

8. The trimmers C207 and C220 may be used to compensate for differences in tube capacities which affect tracking when it is necessary to change the tubes V1 or V2. The variations in tube capacities normally have little effect on the over-all performance of the head-end.

R-F ALIGNMENT CHART

Step No.	Marker Generator Frequency	Sweep Generator Frequency	Signal Input Point	Connect Oscilloscope	Channel Switch	Adjust	See Note
13	211.25 MC, 215.75 MC	No. 13 with 15 MC sweep	Antenna terminals at head-end (see Note 1.)	Point J Fig. 29 Junction of L226, C217 and R218 thru 10K-resistor and B− at head-end chassis.	No. 13	Screw of L210, screw of L217, for Fig. 24-A.	1, 2, 3, 4
14	175.25 MC, 179.75 MC	No. 7 with 15 MC sweep			No. 7	Trimmer C207 and C220 for response curve, Fig. 24-A.	1, 2, 3, 4 8
15	211.25 MC, 215.75 MC	No. 13 with 15 MC sweep			No. 13	Readjust screw of L210 and screw of L217 for curve, Fig. 24-A.	1, 2, 3, 4
16	205.25 MC, 209.75 MC	No. 12 with 15 MC sweep			No. 12	No adjustment.	5
17	199.25 MC, 203.75 MC	No. 11 with 15 MC sweep			No. 11		
18	193.25 MC, 197.75 MC	No. 10 with 15 MC sweep			No. 10		
19	187.25 MC, 191.75 MC	No. 9 with 15 MC sweep			No. 9		
20	181.25 MC, 185.75 MC	No. 8 with 15 MC sweep			No. 8		
21	175.25 MC, 179.75 MC	No. 7 with 15 MC sweep			No. 7		
22	83.25 MC, 87.75 MC	No. 6 with 15 MC sweep			No. 6	Screw of L208 to place 83.25 MC marker and screw of L215 to place 87.75 MC marker as shown in Fig. 24-B.	1, 2, 3, 4
23	77.25 MC, 81.75 MC	No. 5 with 15 MC sweep			No. 5	No adjustments.	6
24	67.25 MC, 71.75 MC	No. 4 with 15 MC sweep			No. 4		
25	61.25 MC, 65.75 MC	No. 3 with 15 MC sweep			No. 3	Screw of L205 to place 61.25 MC marker and screw of L212 to place 65.75 MC marker, as shown in Fig. 24-B.	1, 2, 3, 4
26	55.25 MC, 59.75 MC	No. 2 with 15 MC sweep			No. 2	No adjustment.	7

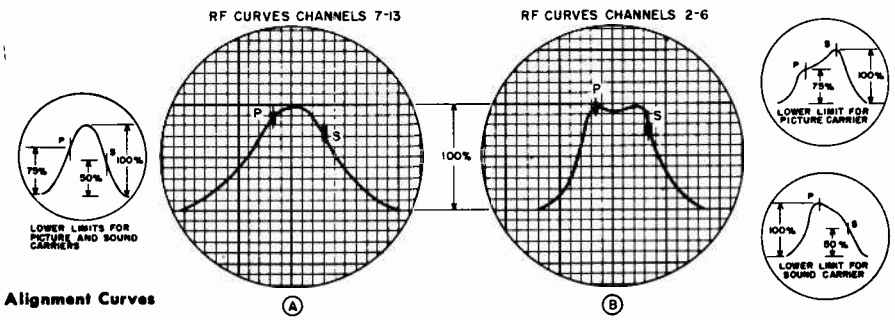


Fig. 24. R-F Alignment Curves

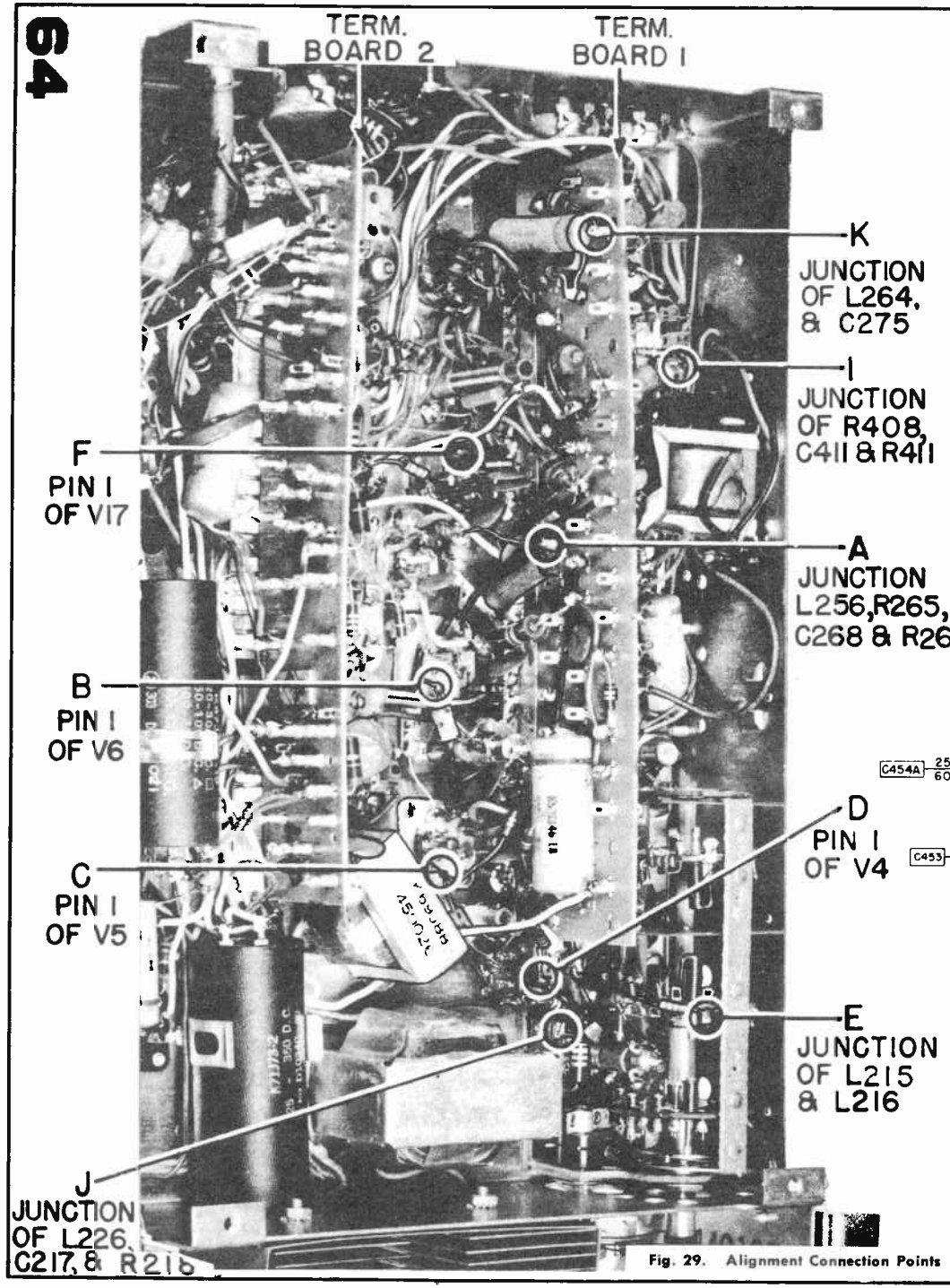
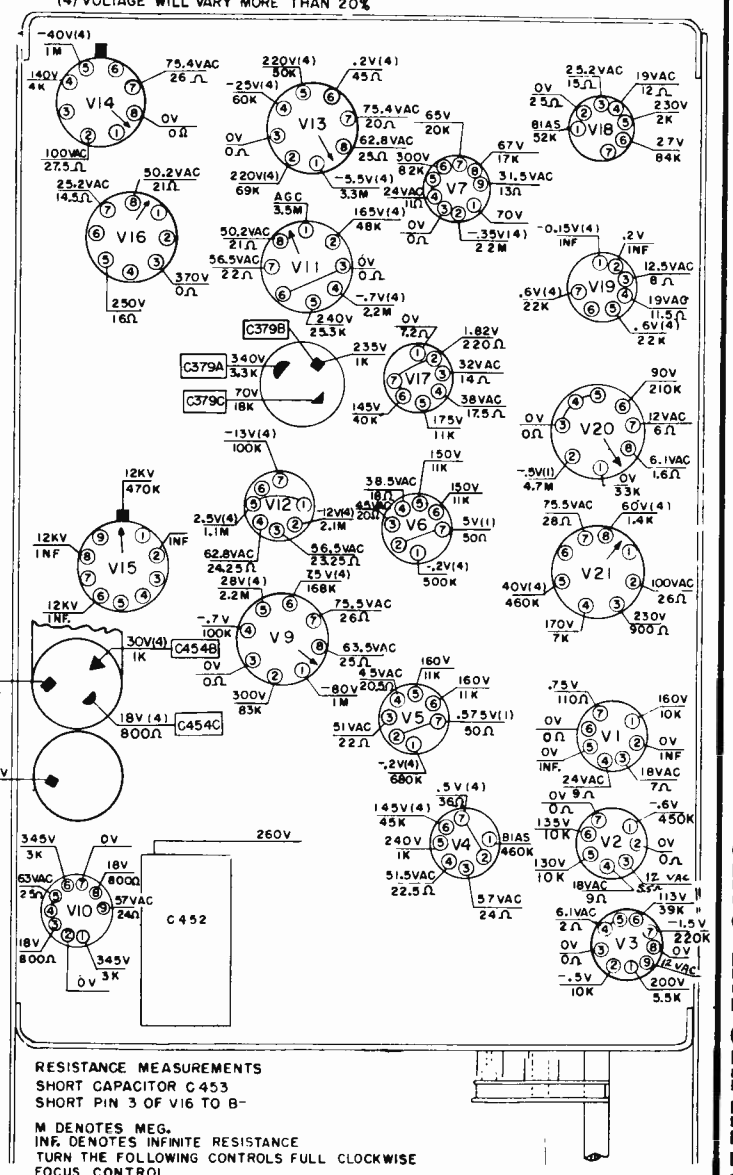


Fig. 29. Alignment Connection Points

VOLTAGE MEASUREMENTS

INPUT 117V, 60 ~
ALL CONTROLS SET FOR NORMAL SWEEPS, FOCUS AND BRIGHTNESS
MEASUREMENTS ARE IN RESPECT TO B- WITH A 20,000Ω / VOLT METER

(1) 2.5 VOLT RANGE
(2) 10 " "
(3) 25 " "
(4) VOLTAGE WILL VARY MORE THAN 20%



RESISTANCE MEASUREMENTS

SHORT CAPACITOR C453
SHORT PIN 3 OF V16 TO B-

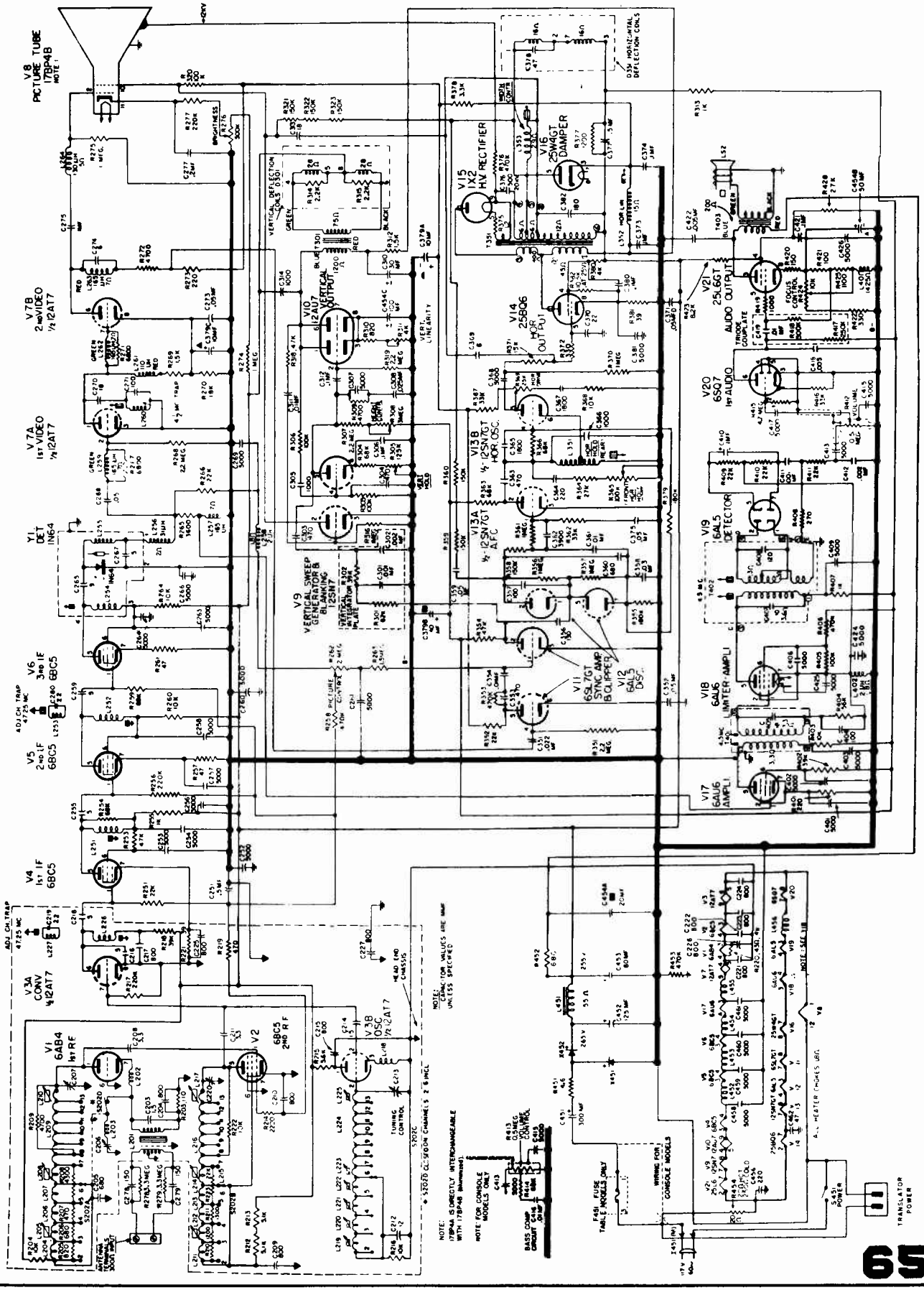
M DENOTES MEG.
INF. DENOTES INFINITE RESISTANCE
TURN THE FOLLOWING CONTROLS FULL CLOCKWISE
FOCUS CONTROL
CONTRAST VERTICAL HOLD
BRIGHTNESS VERTICAL SIZE
VERTICAL LINEARITY
VALUES LISTED MAY HAVE A TOLERANCE OF ± 20%

Fig. 30. Socket Voltage Diagram

GENERAL ELECTRIC

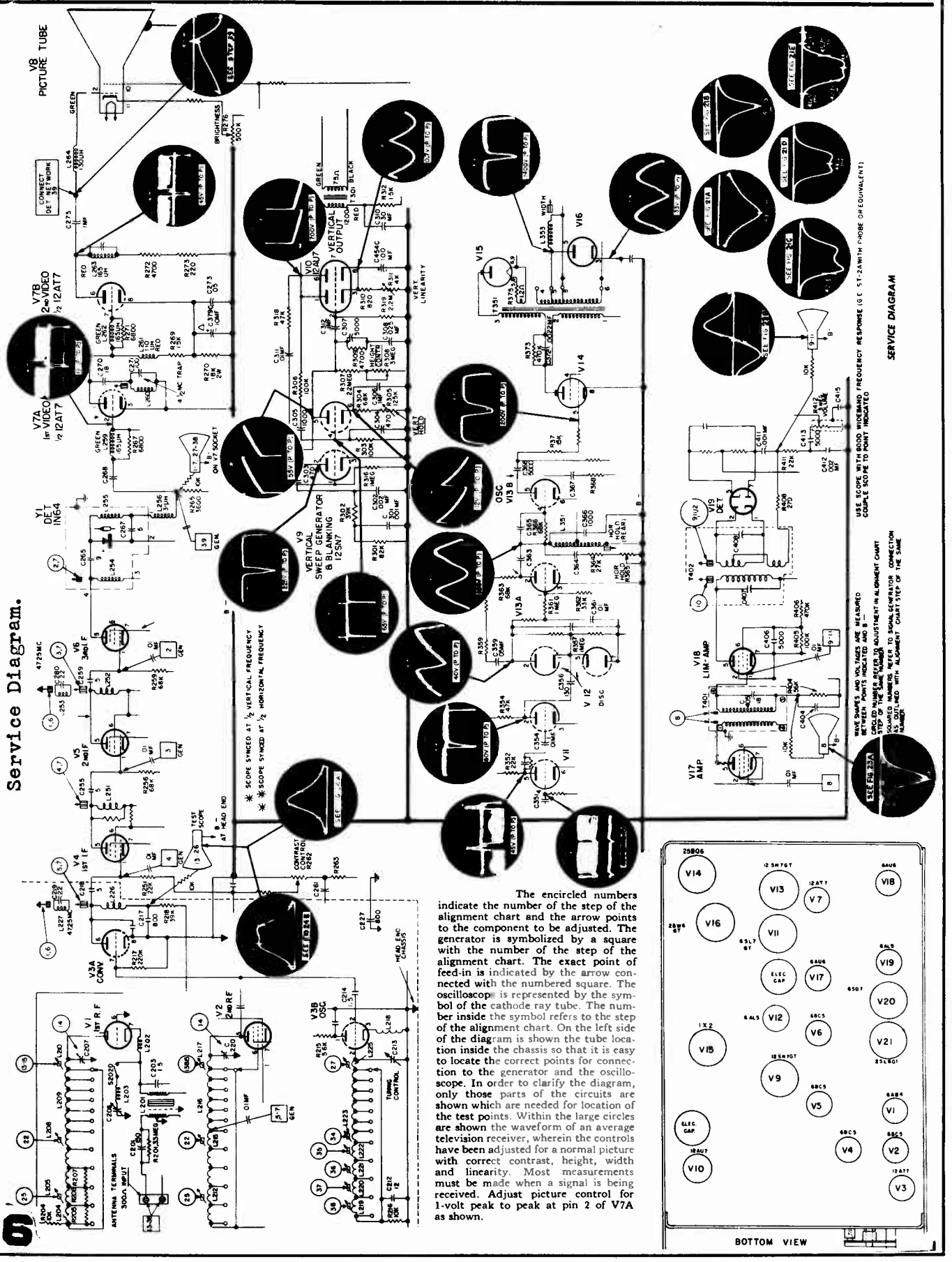
MODELS 17T1, 17T2, 17T3, 17C103, 17C104,
17C105, 17C107, 17C108, 17C109

TELEVISION RECEIVERS



GENERAL ELECTRIC Models 17T1, 17T2, 17T3, 17C103, 17C104, 17C105, 17C107, 17C108, 17C109.

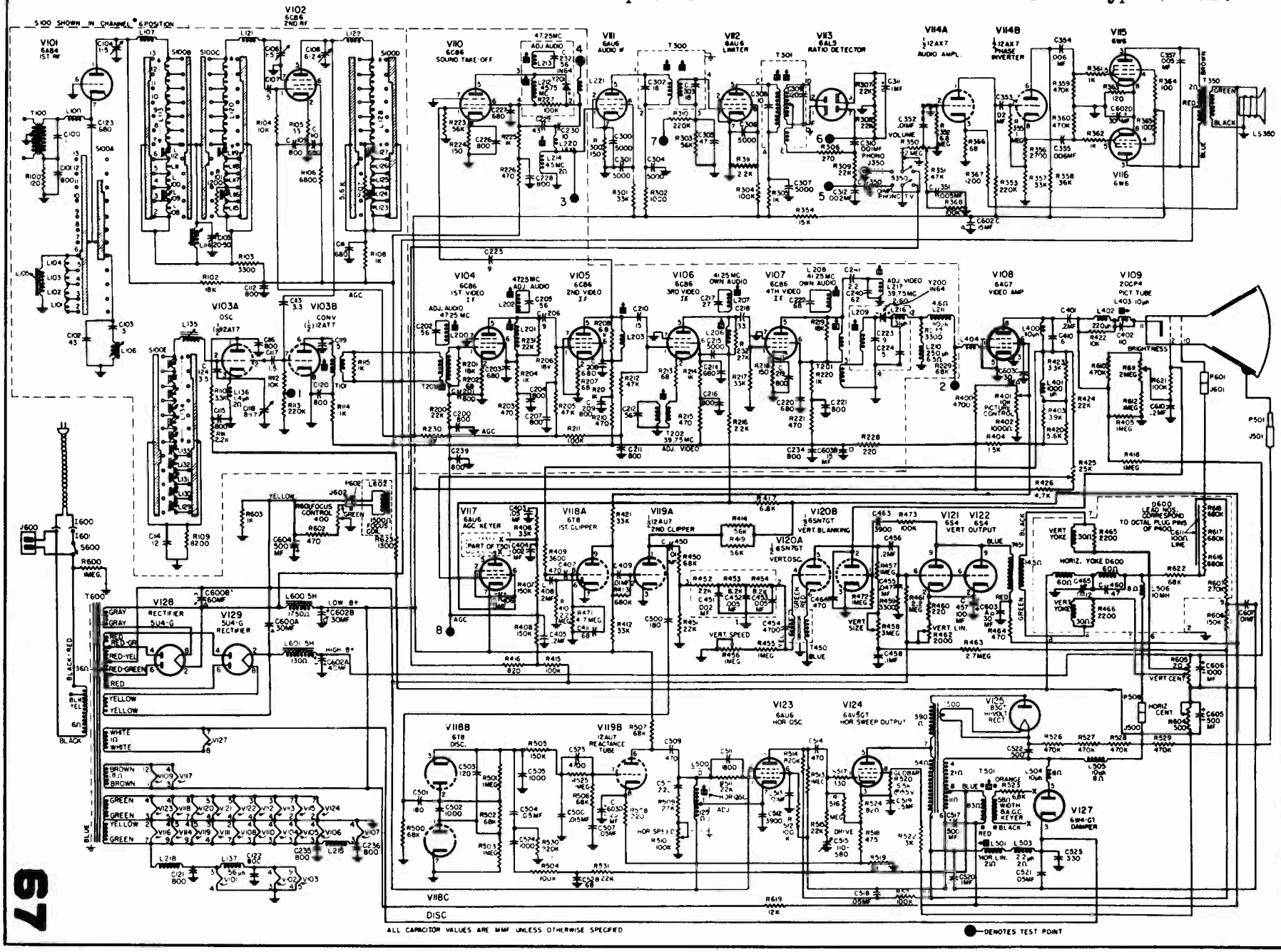
Service Diagram.



The encircled numbers indicate the number of the step of the alignment chart and the arrow points to the component to be adjusted. The generator is symbolized by a square with the number of the step of the alignment chart. The exact point of feed-in is indicated by the arrow connected with the numbered square. The oscilloscope is represented by the symbol of the cathode ray tube. The number inside the symbol refers to the step of the alignment chart. On the left side of the diagram is shown the tube location inside the chassis so that it is easy to locate the correct points for connection to the generator and the oscilloscope. In order to clarify the diagram, only those parts of the circuits are shown which are needed for location of the test points. Within the large circles are shown the waveform of an average television receiver, wherein the controls have been adjusted for a normal picture with correct contrast, height, width and linearity. Most measurements must be made when a signal is being received. Adjust picture control for 1-volt peak to peak at pin 2 of V7A as shown.

GENERAL ELECTRIC

Models 20C150 and 20C151, circuit below, additional material on the next page. Model 24C101 uses a similar circuit, but has a 24" picture tube and has a few different type tubes.



MOST-OFTEN-NEEDED 1952 TELEVISION SERVICING INFORMATION

GENERAL ELECTRIC

Models 20C150 and 20C151, continued

CAUTION -- Remove the two 5U4G rectifier tubes before removing the chassis from the cabinet. These tubes will not clear the wing bolt of the picture tube mounting board.

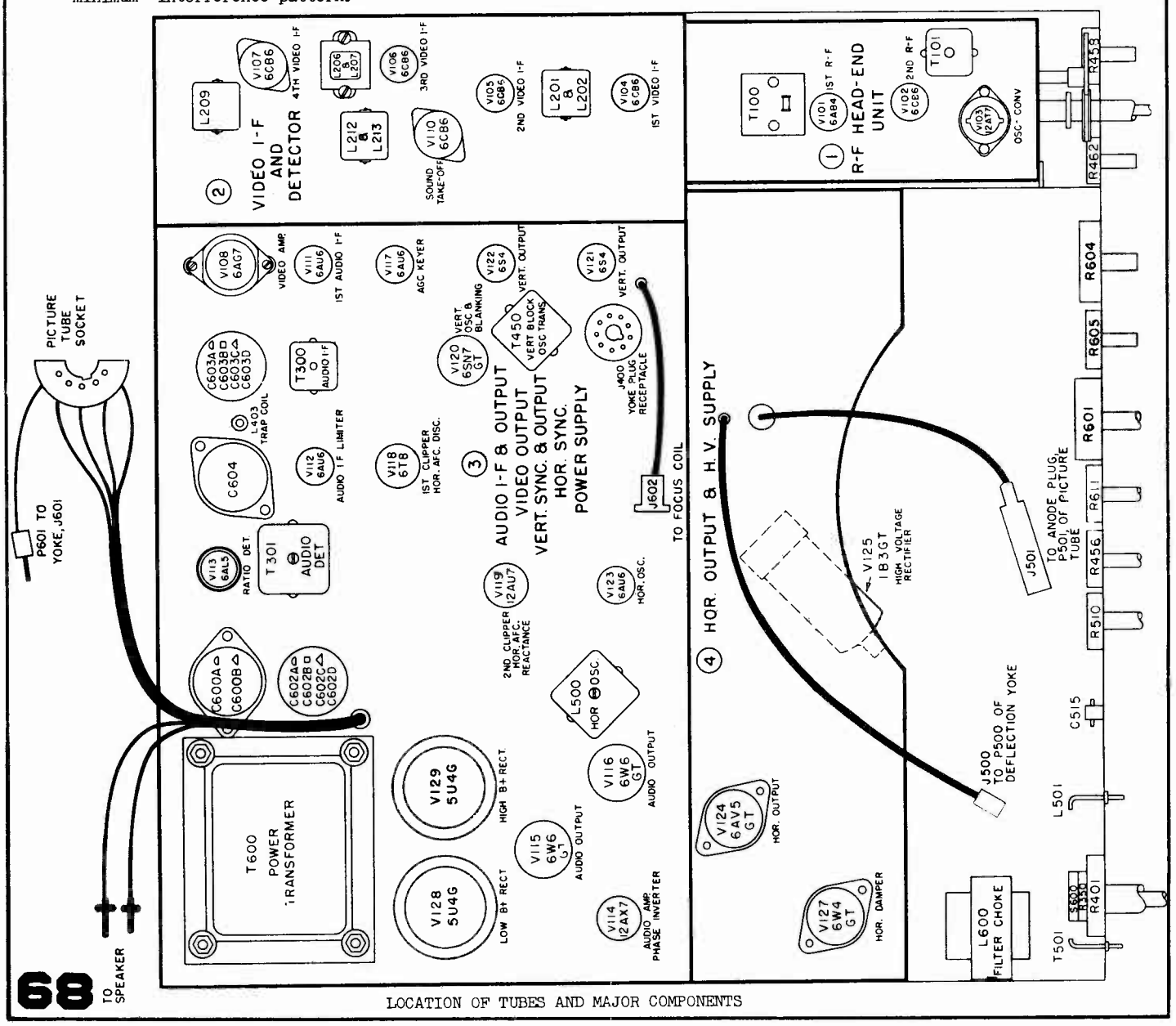
The chassis has been jigged in place in factory installation for proper control shaft alignment and control knob clearance through the knob escutcheon mark its position upon the mounting board before removing the board for chassis servicing so the chassis may be readily relocated upon reinstallation.

L106, I-F CHANNEL TRAP -- This trap reduces or eliminates F-M or A-M interfering signals at i-f frequencies (41-47 mc) that are picked up by the antenna system. This type of interference may cause moving ripples or diagonal streaks in the picture. Interferences eliminated by this trap are not affected by the receiver tuning.

To adjust the trap, turn core of L106 to give a minimum interference pattern.

AUTOMATIC GAIN CONTROL ADJUSTMENT -- The Automatic Gain Control (AGC) is the screwdriver adjustment of potentiometer R425 which is located on the rear apron of receiver chassis. The chosen position for setting of this control will depend upon receiving conditions at the location of the receiver installation relative to the strength of the signal received. The normal use of the AGC control will be in some range toward or at its maximum clockwise setting.

In fringe areas and areas of moderate signal strength the control should be set to maximum clockwise position. This setting will provide best noise rejection, an advantage in reception of the weaker stations. However, reception from a station of the strongest signal should also be checked to determine picture quality with the Picture control advanced fully clockwise. Loss of sync may occur in some receivers as evidenced by an irregular displacement of elements of the picture (picture distorts) at this setting of the Picture control. This condition indicates receiver circuit overload and the AGC control should then be back-off progressively from its maximum clockwise position until the picture returns to normal.



LOCATION OF TUBES AND MAJOR COMPONENTS

the hallicrafters co.

MODELS 17804C, 17812, 17813, 17815-H, 17819, 17824, 17825, 17838, 17848, 17849 & 17850

CHASSIS — L800D
RUNS 1 thru 3

Models 14808, 14808A, 20823, 20823B, are similar to the sets described on the next four pages, but use other size picture tubes.

Models 17811-H, 17816, 17817, 17860-H, 17861-H, are combinations which use a very similar television circuit with a switching arrangement for the AM tuner and changer.

I-F AMPLIFIER ALIGNMENT FOR CHASSIS USING 1D1055 TUNERS

1. Connect a VTVM between test terminal Ⓐ and the chassis.

2. Connect the high side of a signal generator to the shield of the OSC./MIXER tube (6J6). This connection will capacitively couple the generator output to the tube. Make sure that the shield is ungrounded by raising it above the grounded clips that hold it in place. Connect the ground return of the generator to any chassis point near the base of the tube.

3. Set the CHANNEL SELECTOR to any vacant channel.

4. Set the signal generator output (unmodulated) for a two volt dc reading on the VTVM and adjust the three i-f transformers, L-113, and L-9, according to the I-F AMPLIFIER ALIGNMENT CHART shown below. Readjust the signal generator output as required to maintain the two volt potential at the VTVM.

I-F AMPLIFIER ALIGNMENT CHART

Signal Generator Frequency (No Modulation)	Adjustment	Location	VTVM Indication
25.6 mc	T-102 (top)	Fig. 22	Maximum
23.1 mc	T-103 (top)	Fig. 22	Maximum
24.5 mc	T-104 (top)	Fig. 22	Maximum
21.75 mc	T-103 (bottom)	Fig. 25	Minimum
24.5 mc	*L-113	Fig. 22	Maximum
24.5 mc	**L-9	Fig. 22	Maximum

*NOTE: Hold the CHANNEL SELECTOR between two channels when making this adjustment.

**NOTE: Return the CHANNEL SELECTOR to the normal position on any vacant channel and shunt the 4700 ohm grid resistor (R-101) of V-101 with a 1000 ohm resistor, when making this adjustment. Remove resistor after adjustment is completed.

5. After adjusting the 21.75 mc sound trap (bottom slug of T-103), recheck the setting of the top slug of T-103.

6. Tune the signal generator from 21 mc through 26.25 mc and observe the change in indication on the VTVM. If the generator output is set to the level where a 1.5 volt meter reading is obtained at the peak i-f amplifier response, the reading should not drop below one volt between the two peaks normally obtained with this i-f amplifier. If the band-pass response is unsatisfactory, repeat the procedure or try slight modifications of the recommended settings to obtain the desired results. Avoid resonating the coils with the iron core at the bottom end of the coil form (adjustment screw near limit of its travel). Final adjustments can be made much more easily if a sweep type signal generator and oscilloscope are used.

7. Check the two carrier i-f responses, 21.75 mc and 26.25 mc. The 21.75 mc response will be approximately 20 db below the peak response (approx. 0.15 volt) and the 26.25 mc response will fall approximately 6 db below the peak, (approx. 0.75 volt). Refer to Fig. 14.

To determine the i-f amplifier sensitivity, connect a signal generator to the OSC./MIXER tube as directed in step 2 of the I-F AMPLIFIER ALIGNMENT procedure. Set the generator frequency to either i-f peak. If a generator output of 800 to 1500 microvolts produces a one volt dc reading on a VTVM connected between terminal Ⓐ and ground, the i-f amplifier sensitivity is normal.

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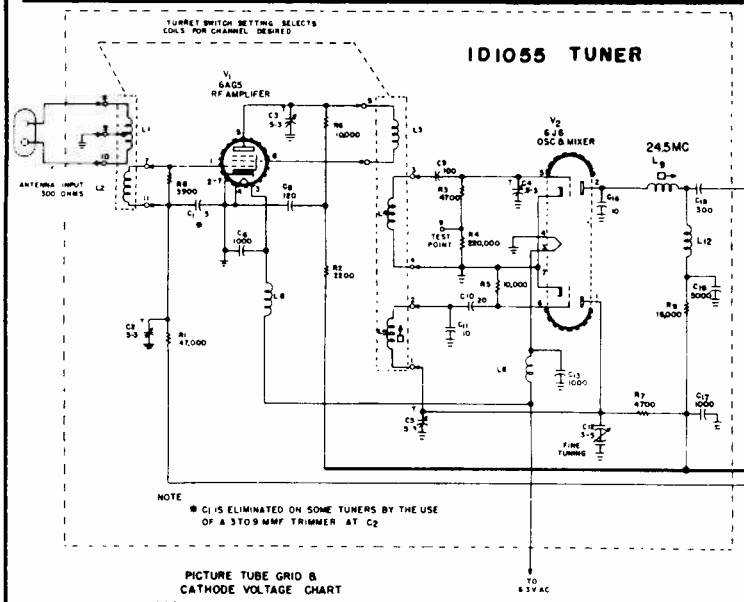
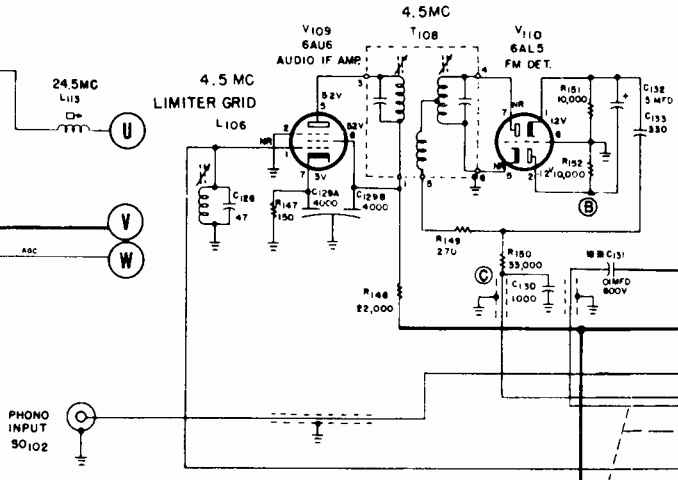
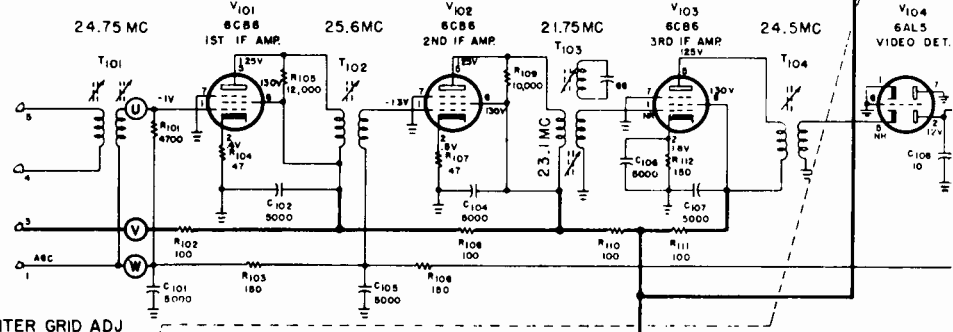




PICTURE TUBE GRID & CATHODE VOLTAGE CHART

PIN	CONTRAST MIN. / BRIGHTNESS		BRIGHTNESS MIN. / CONTRAST	
	MAX.	MIN.	MAX.	MIN.
1	155	140	140	140
2	130	65	65	65

See next page, over, for schematic of another tuner used with these sets.



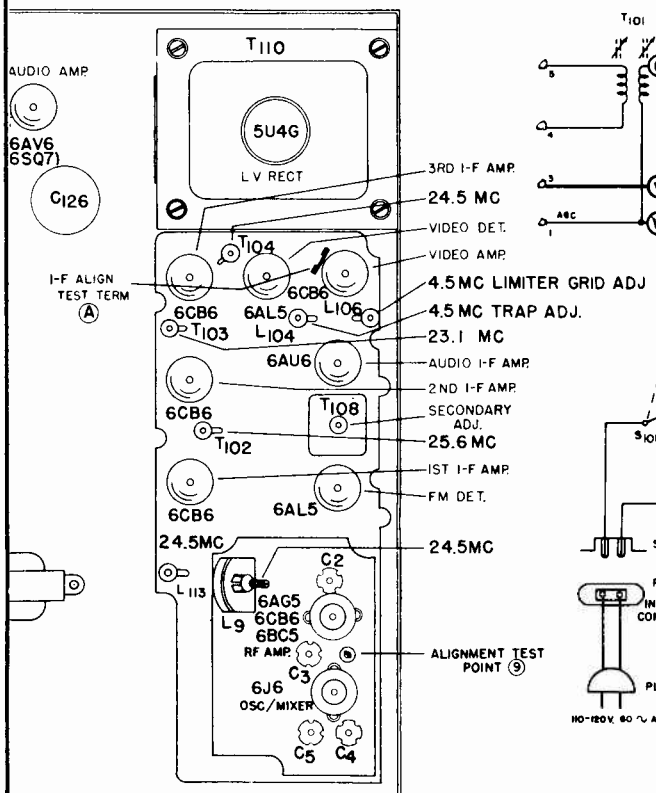
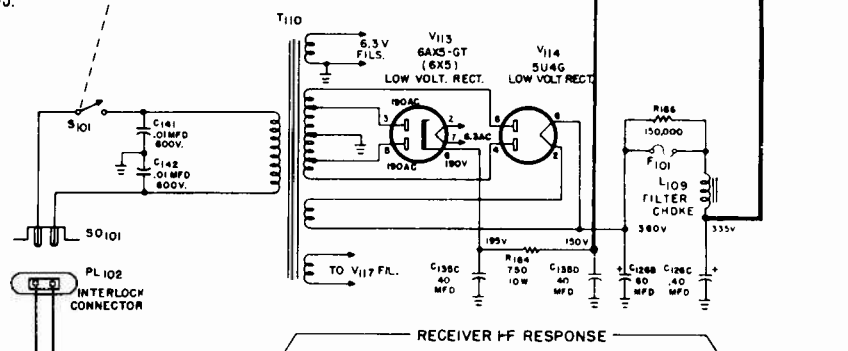
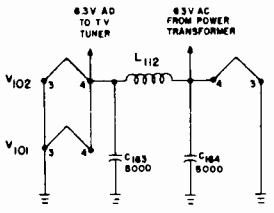


FIG. 22. TOP VIEW ALIGNMENT LOCATIONS (WITH ID1055 TUNER IN PLACE)





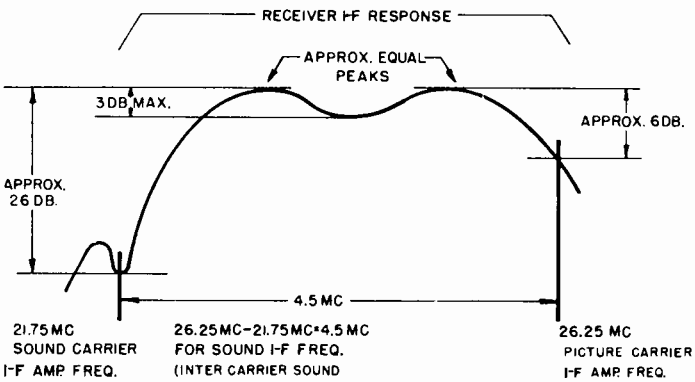
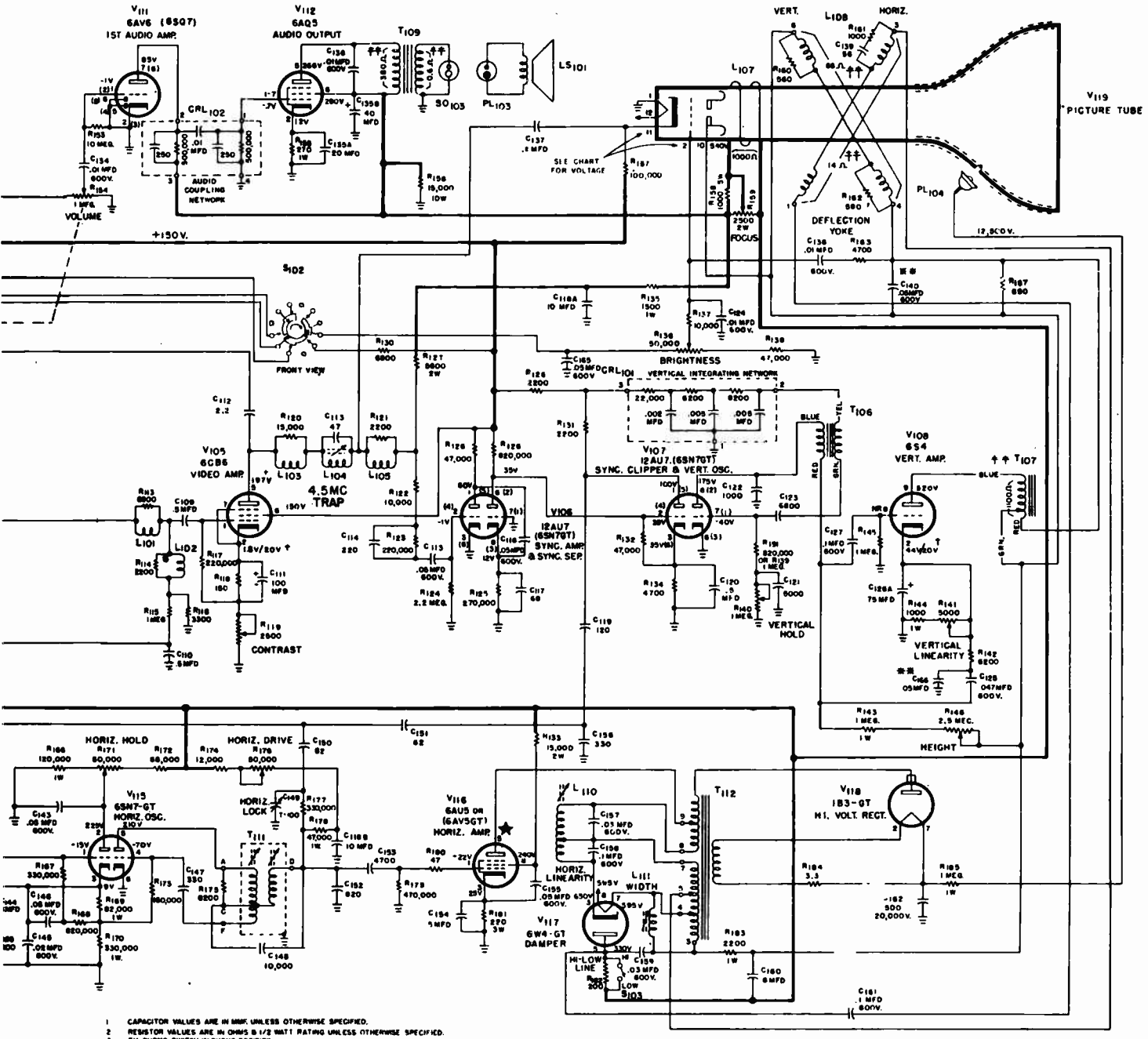


FIG. 14. I-F AMPLIFIER RESPONSE

LAST R SYMBOL R-191
LAST C SYMBOL C-167
LAST L SYMBOL L-114
LAST T SYMBOL T-112

MODELS 17804C, 17812, 17813, 17815-H, 17819, 17824, 17825, 17838, 17848, 17849 & 17850

CHASSIS — L800D



1. CAPACITOR VALUES ARE IN MMF UNLESS OTHERWISE SPECIFIED.
2. RESISTOR VALUES ARE IN OHMS & 1/2 WATT RATING UNLESS OTHERWISE SPECIFIED.
3. TV-PHONO SWITCH IN PHONO POSITION
4. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS & CHASSIS WITH ZERO SIGNAL INPUT
5. LINE VOLTAGE-117AC.
6. ALL VOLTAGES ARE DC AND POSITIVE UNLESS OTHERWISE SPECIFIED
7. DC VOLTAGES ARE MEASURED WITH A VTVM.
8. "ref-NOT READABLE. VOLTAGES MEASUREDAT THESE TERMINALS GENERALLY MEANINGLESS
9. CONTROLS SET FOR NORMAL PICTURE OPERATION UNLESS OTHERWISE SPECIFIED.
10. B+ LEADS ARE SHOWN IN HEAVY BLACK LINES.
11. NOT FOUND IN ALL SETS.
- VARIES WITH ASSOCIATED CONTROL SETTING
† † DC RESISTANCE VALUE.
★ DO NOT MEASURE VOLTAGE AT THIS POINT.

FIG. 27. SCHEMATIC DIAGRAM FOR MODELS 17804C, 17812, 17813, 17815-H, 17819, 17824, 17825, 17838, 17848, 17849 & 17850; RUNS 1 THRU 3

VALUES AND TOLERANCES SHOWN ARE NOMINAL AND VARIATIONS MAY BE FOUND. IT IS RECOMMENDED THAT THE VALUE OF ANY REPLACEMENT CORRESPOND TO THE NOMINAL VALUE OF THE PART BEING REPLACED.

The Hallicrafters Co. Models 17804C, 17812, 17813, 17815-H, etc. continued.

PRODUCTION CHANGES

Various electrical and mechanical changes on the chassis are signified by the appearance of any of the following stamps on the rear apron:

L1 High voltage adjusted by screwdriver-set potentiometer. Horizontal linearity and width coils have screwdriver adjustment. Color adapter socket mounted but not wired.

L1X High voltage adjusted by switch on rear apron of chassis. Horizontal linearity and width coils are adjusted by means of a separate sliding rod attached to each powdered iron core.

L2 Same as L1 except that R-191 replaces R-139. Also, C-166 has been added, and C-140 has been deleted. (Refer to Fig. 27, Schematic Diagram.)

L2X Includes circuit changes of L2, and does not have color adapter socket.

L3 Tuner 1D1055 and L-113 used in place of Dynamic tuner and T-101. (Refer to Fig. 27, Schematic Diagram.)

HORIZONTAL OSCILLATOR ADJUSTMENT

If the HORIZONTAL HOLD control on the front panel fails to restore synchronization, the HORIZONTAL RANGE and HORIZONTAL LOCK adjustments should be reset. Procedure for these adjustments is as follows:

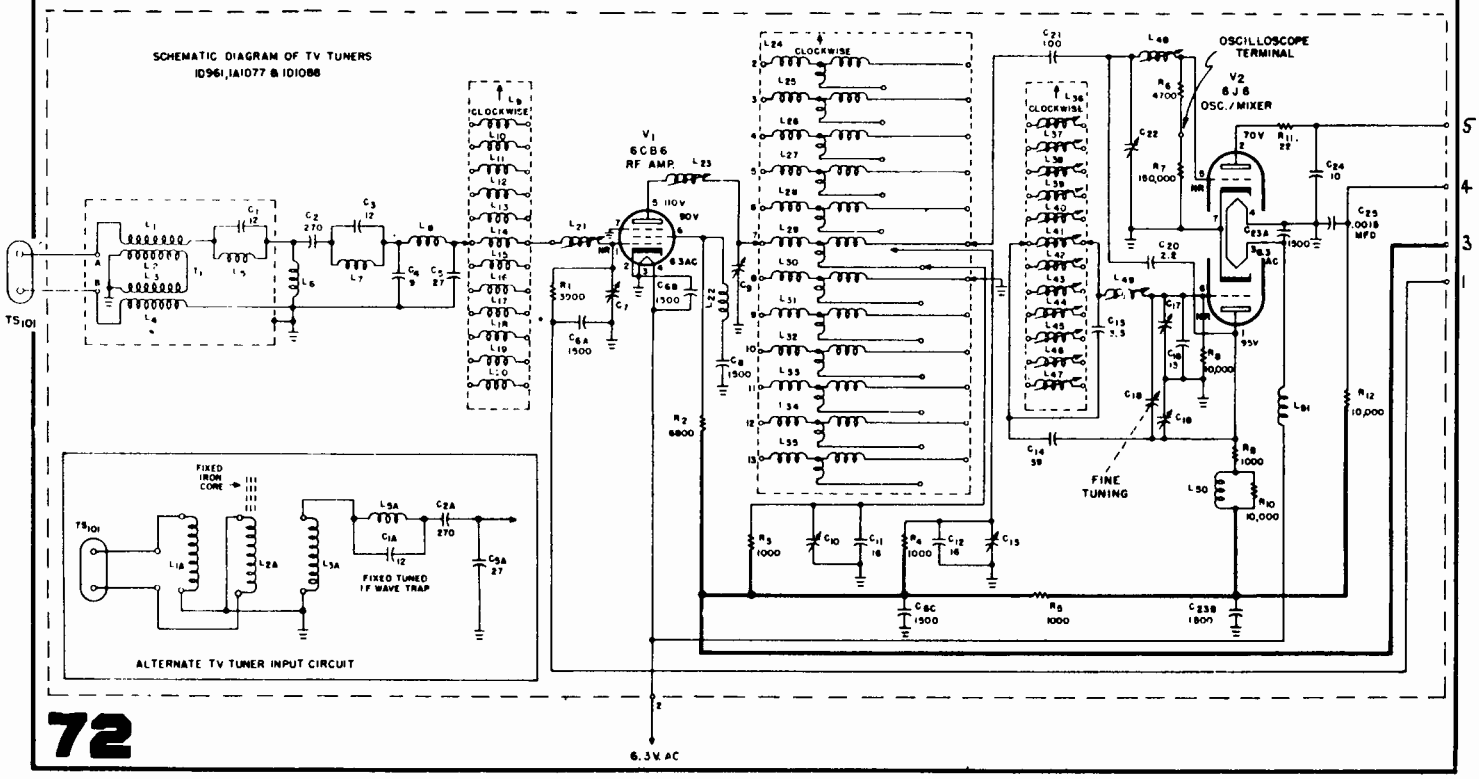
1. Turn the HOLD control to the full clockwise position. Adjust the HORIZONTAL RANGE adjustment until a vertical bar appears in the pattern.

2. Turn the HOLD control to the full counterclockwise position. Momentarily switch off the station. Three or four horizontal bars should then appear on the screen. If too many or too few bars appear, the number may be decreased by turning the HORIZONTAL LOCK adjustment in the clockwise direction, or increased by turning the HORIZONTAL LOCK adjustment in the counterclockwise direction.

3. Repeat step 1.

4. Check the action of the front controls on all active channels. Repeat the first three steps if necessary, to maintain stable synchronization.

If the above procedure fails to restore stable synchronization, make proper horizontal oscillator waveform adjustments with the aid of an oscilloscope.



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MODEL 17905 TELEVISION RECEIVER

Models 17810C, 17810M, 17810MG, 20872, use circuits which are similar to the Model 17905 covered by the material on pages 73 to 76. You will find this material of aid in servicing these additional receivers.

HORIZONTAL OSCILLATOR ALIGNMENT

If the HORIZONTAL HOLD control on the front panel fails to restore synchronization the HORIZONTAL RANGE adjustment should be reset as follows:

1. Position the HOLD control, located on the front of the receiver, in the center of the range over which it may be rotated.
2. Adjust the HORIZONTAL RANGE ADJUSTMENT on the rear apron of the chassis (See Fig. 1). until proper synchronization is obtained.
3. Test the synchronization on all other active channels. The picture should remain in synchronization when switching from one active channel to another without any adjustment of the HORIZONTAL HOLD control.
4. Repeat steps 1 and 2 if necessary.

If the above procedure fails to restore stable synchronization, a waveform adjustment may be made with the aid of an oscilloscope.

5. Connect a V.T.V.M. to test point Ⓓ (See Fig. 6) and adjust the HORIZONTAL DRIVE capacitor (See Fig. 1) for a -22.5 to a -25 volt reading.
6. Connect the oscilloscope as shown in Fig. 4. Adjust the TERTIARY WAVEFORE slug (located under chassis) until the sine wave is equal in amplitude to the peak of the sawtooth (See Fig. 5), while maintaining the picture in synchronization with the HORIZONTAL RANGE adjustment.

This adjustment is very important for correct operation of the circuit. If the broad peak of the wave on the oscilloscope is lower than the sharp peak, the noise immunity becomes poorer, the stabilizing effect of the tuned circuit is reduced and drift of the oscillator becomes more serious.

On the other hand, if the broad peak is higher than the sharp peak, the oscillator is overstabilized, the pull-in range becomes inadequate and the broad peak can cause double triggering of the oscillator, when the HORIZONTAL HOLD control approaches the extreme clockwise position.

7. Remove the oscilloscope and repeat step 5.
8. Repeat steps 1, 2, and 3 if necessary to provide positive synchronization on all active channels.

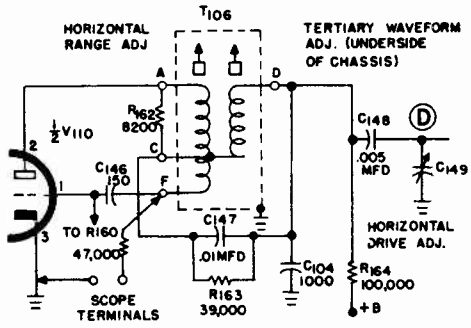

FIG. 4. ALIGNMENT CONNECTIONS USING AN OSCILLOSCOPE

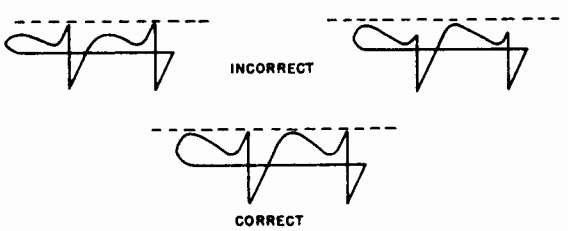

FIG. 5. WAVEFORMS FOR TERTIARY WINDING ADJUSTMENT

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Model 17905

To tuner, circuit shown on the next page, over.

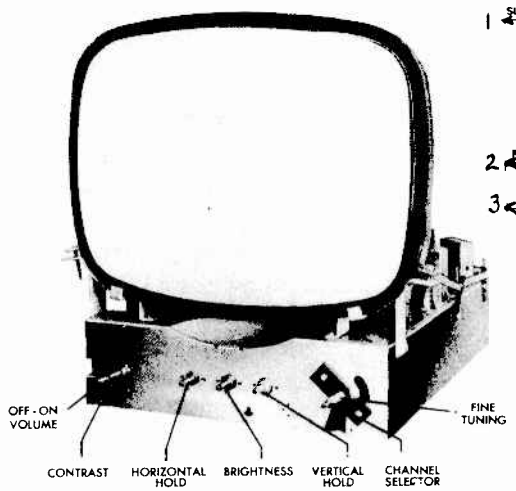

FIG. 2. FRONT CONTROLS

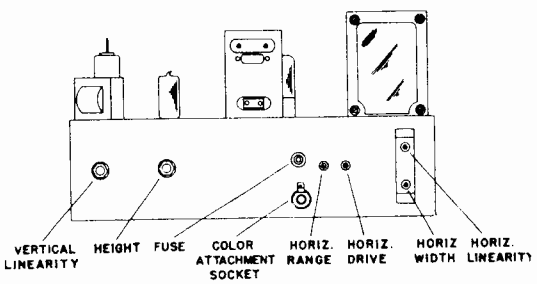

FIG. 1. REAR VIEW SERVICE ADJUSTMENTS

NOTE: COLORS REFER TO TRACERS IN TV TUNER LEAD INSULATION.

1. B+ LEADS ARE SHOWN IN HEAVY BLACK LINES.
2. CAPACITOR VALUES ARE IN MMF UNLESS OTHERWISE SPECIFIED.
3. RESISTOR VALUES ARE IN OHMS AND HAVE 1/2 WATT RATING UNLESS OTHERWISE SPECIFIED.
4. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINAL AND CHASSIS WITH ZERO SIGNAL INPUT AND ANTENNA TERMINALS SHORTED.
5. LINE VOLTAGE - 117 V.A.C.
6. ALL VOLTAGE READINGS SHOWN ARE D.C. AND POSITIVE UNLESS OTHERWISE SPECIFIED.

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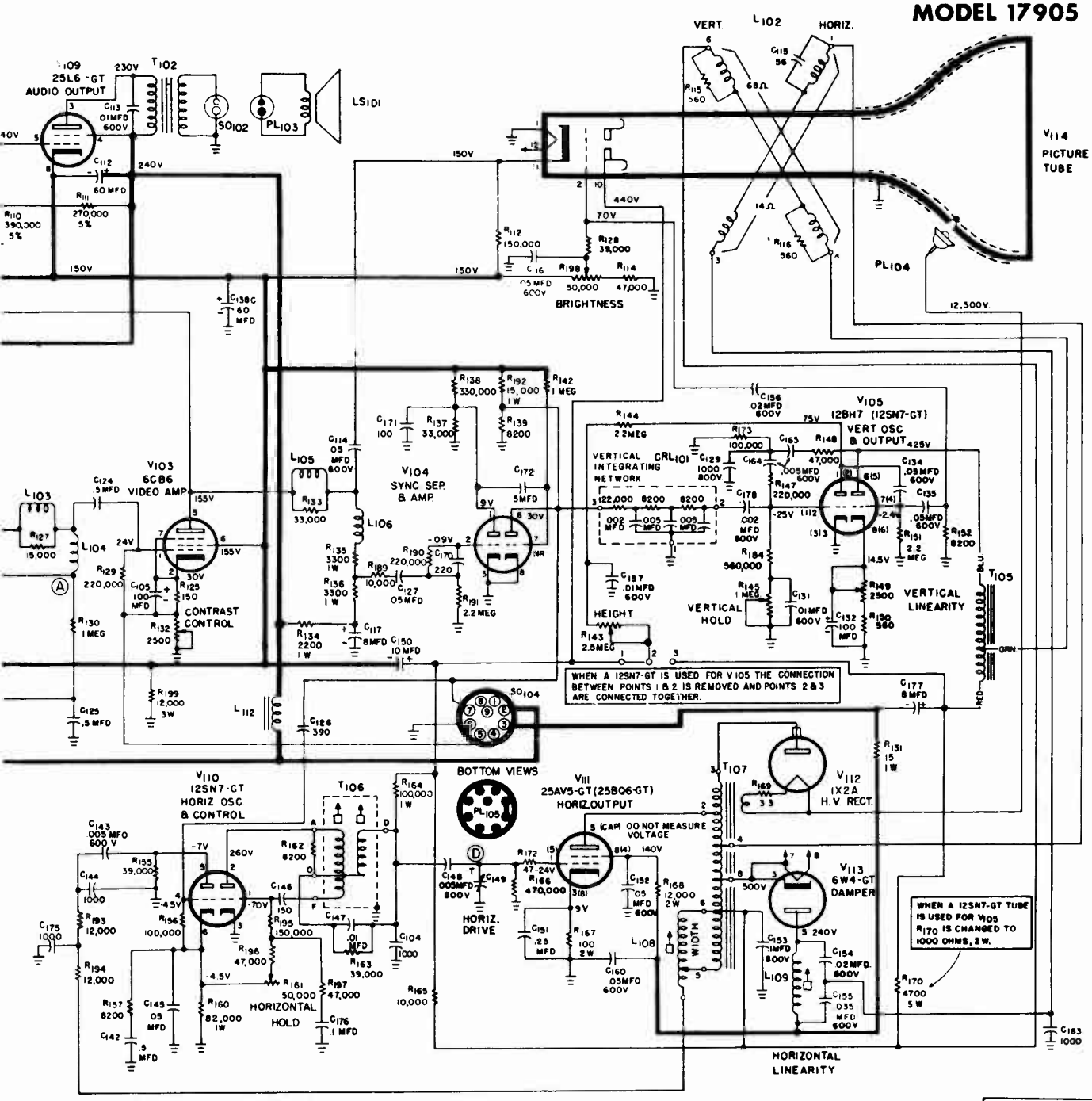
MODEL 17905



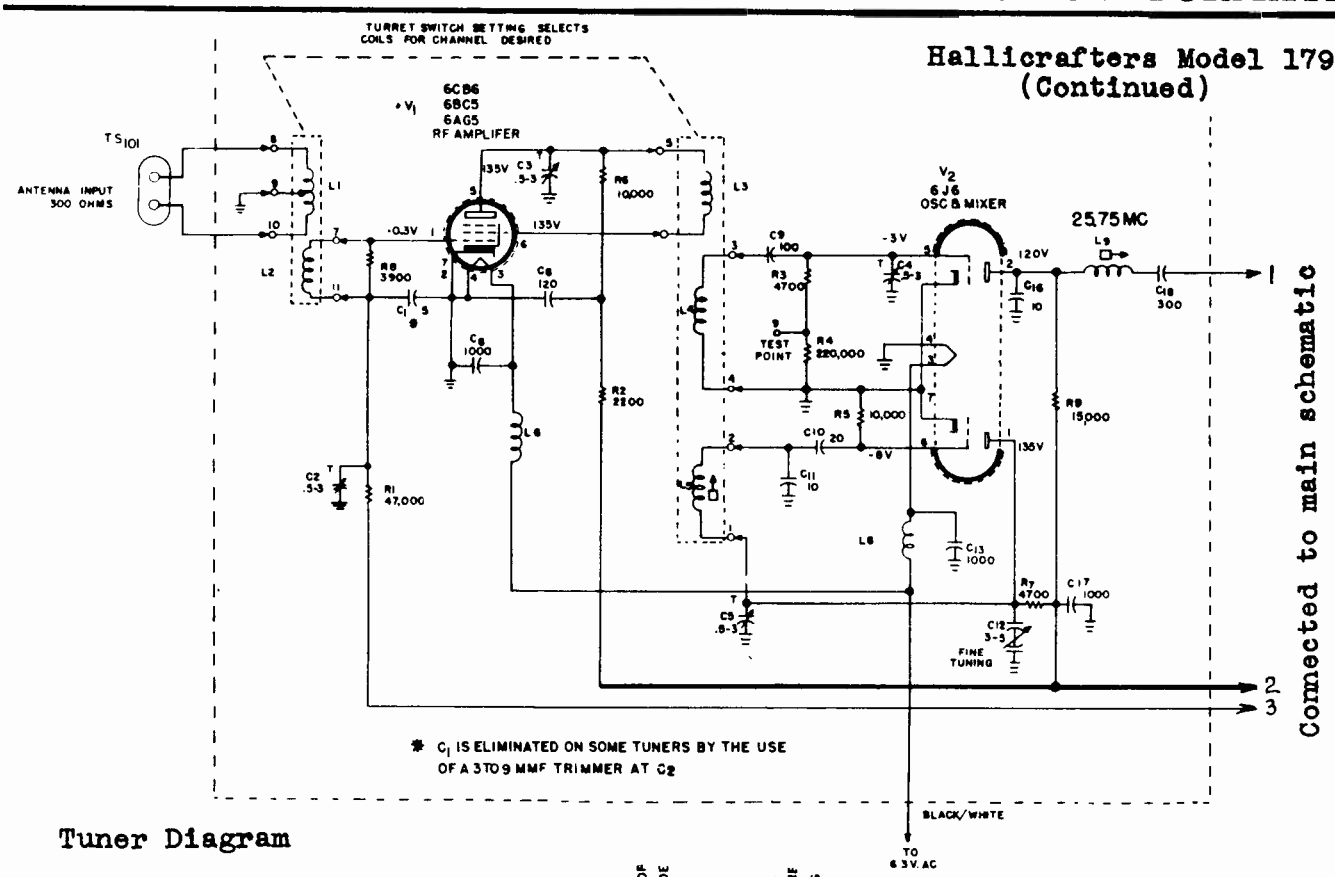
LAST R SYMBOL R-199
LAST C SYMBOL C-178
LAST L SYMBOL L-112
LAST T SYMBOL T-108

FIG. 6. SCHEMATIC DIAGRAM

7. DC VOLTAGE WAS MEASURED WITH A VACUUM TUBE VOLTMETER
8. "NR" NOT READABLE VOLTAGE AT THESE TERMINALS GENERALLY MEANINGLESS.
9. V_{114} 2ND ANODE VOLTAGE MEASURED WITH PL_{104} CONNECTED.
10. VOLTAGES MEASURED WITH REAR CONTROLS SET FOR NORMAL PICTURE AND FRONT CONTROLS IN EXTREME COUNTERCLOCKWISE POSITION.

MODEL 17905

Hallicrafters Model 17905 (Continued)



Tuner Diagram

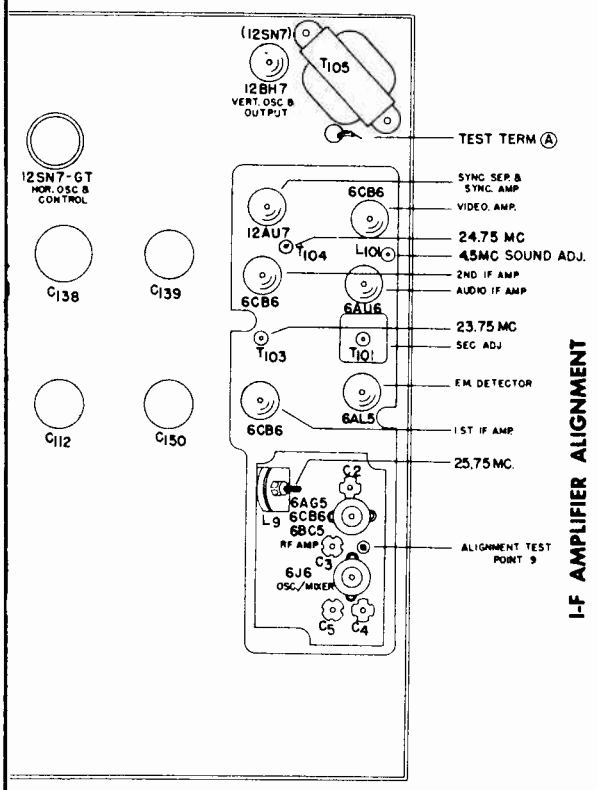


FIG. 3. TOP VIEW

I-F AMPLIFIER ALIGNMENT

1. Connect the V.T.V.M. from test point (A) to chassis ground.
2. Place a tight fitting shield over the osc./mixer tube (V-3) and connect the ungrounded RF lead of the signal generator to the shield. This shield should not be grounded. Connect the ground side of the signal generator lead to the frame of the tuning unit.
3. Turn the channel tuning control to any vacant channel.
4. Set the signal generator output (unmodulated) to develop approximately 2 volts at the V.T.V.M. Adjust the I-F amplifier coils, according to the following chart. For maximum DC voltage at the V.T.V.M. Attenuate the signal generator output as necessary to maintain the 2 volt meter reading

I-F AMPLIFIER ALIGNMENT CHART

Signal Generator Frequency (No Modulation)	Adjustment (Refer to Fig. 3)
25.75 MC	L-9 (1st IF)
23.75 MC	T-103 (2nd IF)
24.75 MC	T-104 (Detector IF)

FM SOUND CHANNEL ALIGNMENT

1. Connect the signal generator output through a .005 mfd. capacitor from test point (A) to chassis ground. See Fig. 3.
2. Connect the VTVM from test point (B) to chassis ground.
3. Set the signal generator to 4.5 MC. and adjust the unmodulated generator output level to give a 1 volt reading on the VTVM.
4. Adjust the 4.5 MC. SOUND ADJUSTMENT and the primary of T-101 (bottom core) for a maximum indication on the voltmeter. Reduce the output of the generator as the alignment progresses to keep the voltmeter reading at approximately 1 volt.
5. Connect the VTVM from test point (C) to chassis ground and adjust the secondary of T-101 (top core) for a zero reading on the VTVM between a positive and negative peak. If the zero reading occurs at more than one setting, use the position nearest the top limit of the tuning slug.
6. Shift the signal generator frequency an equal amount on each side of 4.5 MC and touch-up the primary of T-101 for approximately equal peaks.

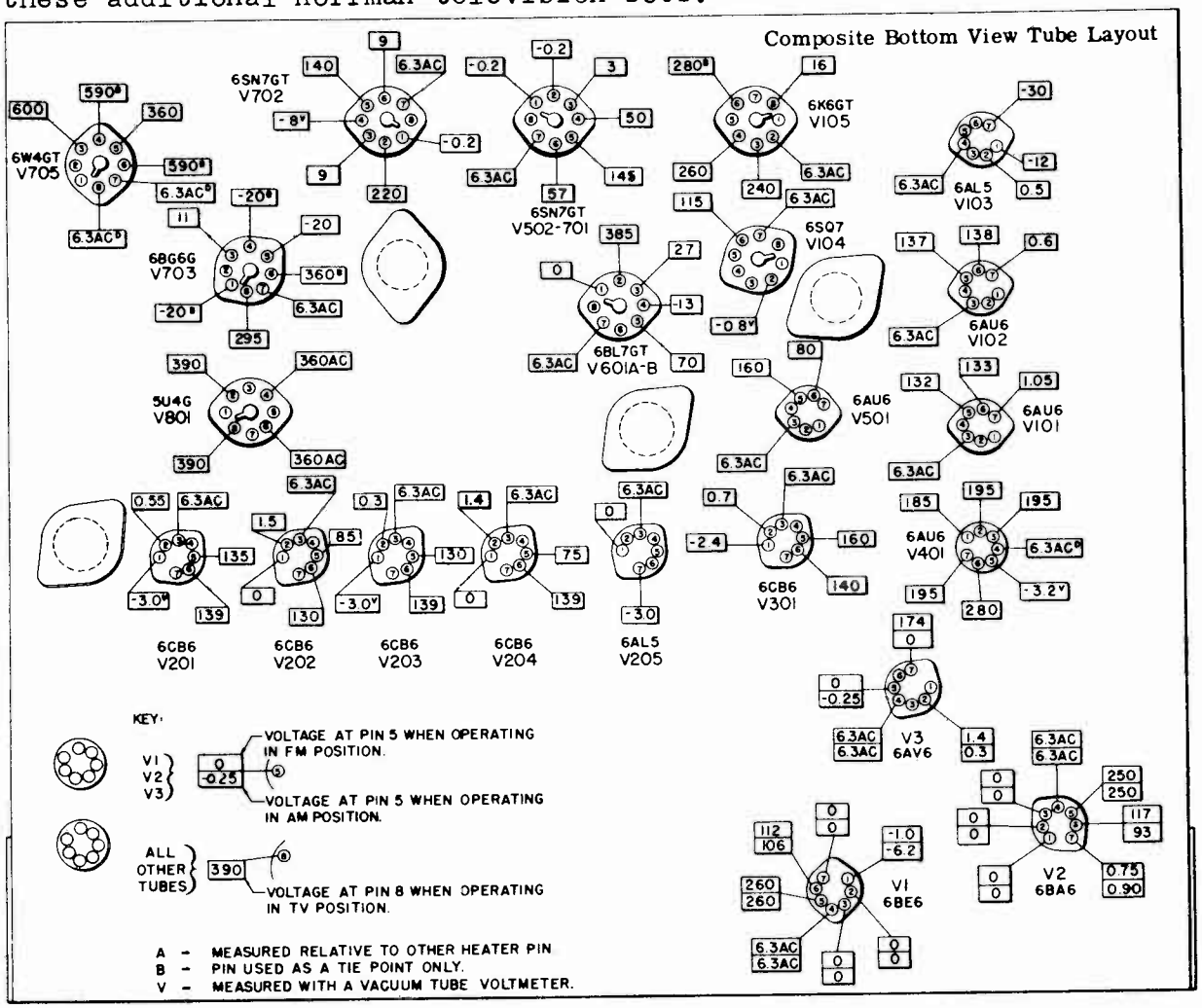
Hoffman SERVICE DATA

CHASSIS 183 – MODELS: 636, 637, 880, 881, 882, 883, 884, 885, 886, 887.
CHASSIS 184 – MODELS 953, 954, 955.
CHASSIS 185 – MODELS 893, 894, 895, 896, 897.
CHASSIS 186 – MODELS 963, 964, 965.

The material presented applies to chassis listed above. The circuit diagram is exact for Chassis 183 and 185. Chassis 184 and 186 incorporate a 3-tube AM-FM radio tuner integrally mounted at the left front portion of the chassis. A switch network permits selection of TV, AM, FM, or phono operation. In Chassis 186, a separate audio power amplifier sub-chassis is used.

Chassis 180, used in Models 637, 638, and 639, with 14" picture tubes, uses almost the same circuit as Chassis 183.

Chassis 187, used in Models 24B707 and 24M708, uses 24" picture tubes, but its circuit is very similar to Chassis 183 described on these pages and this material may be used as an aid in servicing these additional Hoffman television sets.



All voltages are DC values obtained with a 20,000 ohm/volt meter unless otherwise noted. Operating conditions are rated line voltage, signal level that developed -3 volts AGC bias, normal setting of all controls. Variations are to be expected due to variations in operating conditions and component nominal values.

HOFFMAN Alignment (Continued)

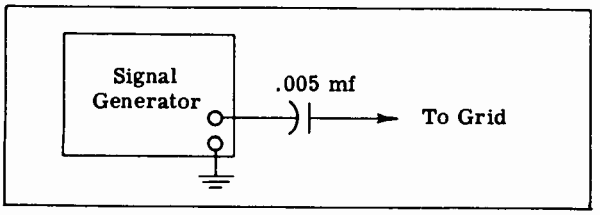


Figure 7. Signal Generator Isolation

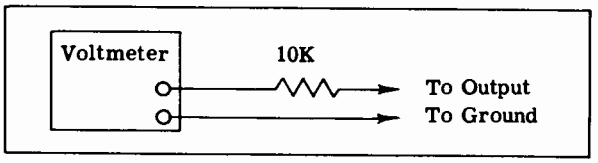


Figure 8. Voltmeter Isolation

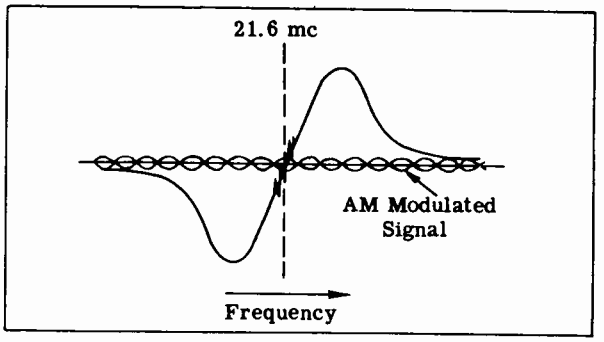


Figure 9. Ratio Detector "S" Curve with AM Modulated Marker

PICTURE I.F. ALIGNMENT

Tune the coils by setting the coil frequency on the CW generator and adjusting the coil for a maximum meter reading. Remember to attenuate the generator signal level so that the DC output voltage of the video detector remains at 1 volt as the coils are tuned. The order of tuning is from the last I.F. stage toward the TV tuner. Before tuning the grid coil of the 1st I.F. stage, temporarily detune the TV tuner converter plate coil. This coil is L17 on the continuous tuner. On the turret tuner it is L4, the coil in the rear left-hand corner of the tuner as viewed from the shaft end. After the converter plate coil has been tuned, repeat the trap and I.F. alignment procedure until no additional change in tuning is noted.

When this condition is obtained, turn on the sweep generator and tune it to about 25 mc center frequency with a 10 mc sweep. Replace the meter with the oscilloscope, using the 10K isolating resistor at the end of the vertical input lead. Check the shape of the response curve. See Figure 10. Tune the marker generator to 26.1 mc and note its position on the skirt of the curve. It should be at approximately the 50% point. If this is not the case, tune the converter plate coil so that this condition is obtained. If the top of the response curve has a tilt, tune L201 until the top is horizontal. Move

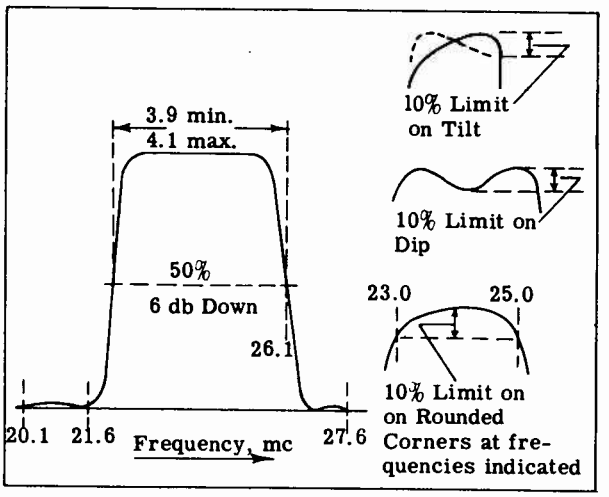


Figure 10. Picture I.F. Response Curve

the marker to the 50% point on the opposite skirt. Note the frequency calibration of the marker generator dial and subtract this value from 26.1 mc. The difference should lie between 3.9 mc and 4.1 mc, the bandpass limits taken at the 6 db points. If the bandpass does not lie within these limits, touch up the other I.F. coils until the correct curve is obtained. Any appreciable touch-up requirement should be taken as an indication that the I.F. section is not operating normally and should be checked for defects.

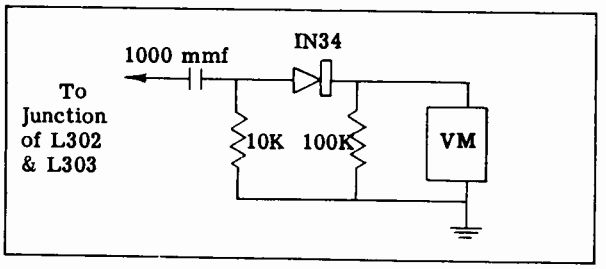
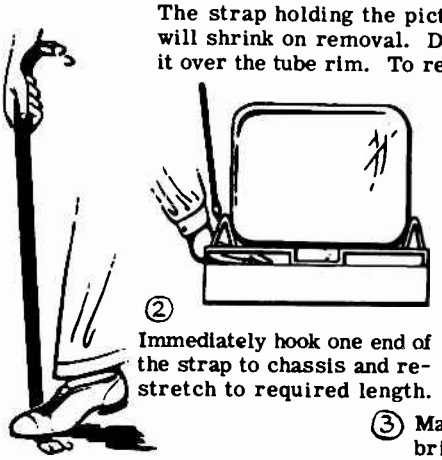


Figure 11. Detector Network

WARNING

The strap holding the picture tube in this receiver will shrink on removal. Do not attempt to restretch it over the tube rim. To reinstall, follow these steps:



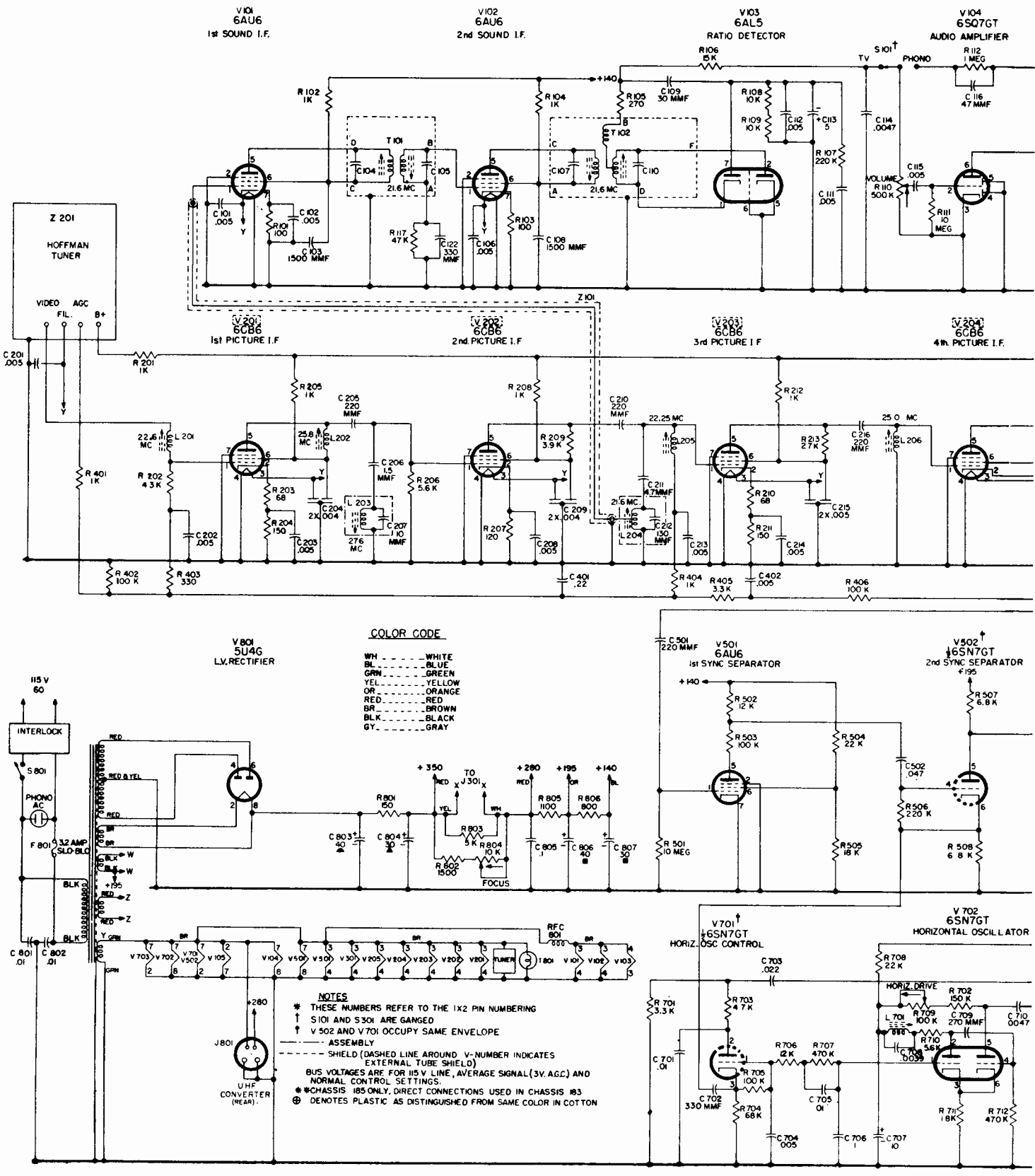
① Stretch as shown to approximate total length required.

② Immediately hook one end of the strap to chassis and restretch to required length.

③ Maintain tension on the strap, bring it over the tube, and hook the free end while holding top.

HOFFMAN — TV ALIGNMENT PROCEDURE — (Continued)

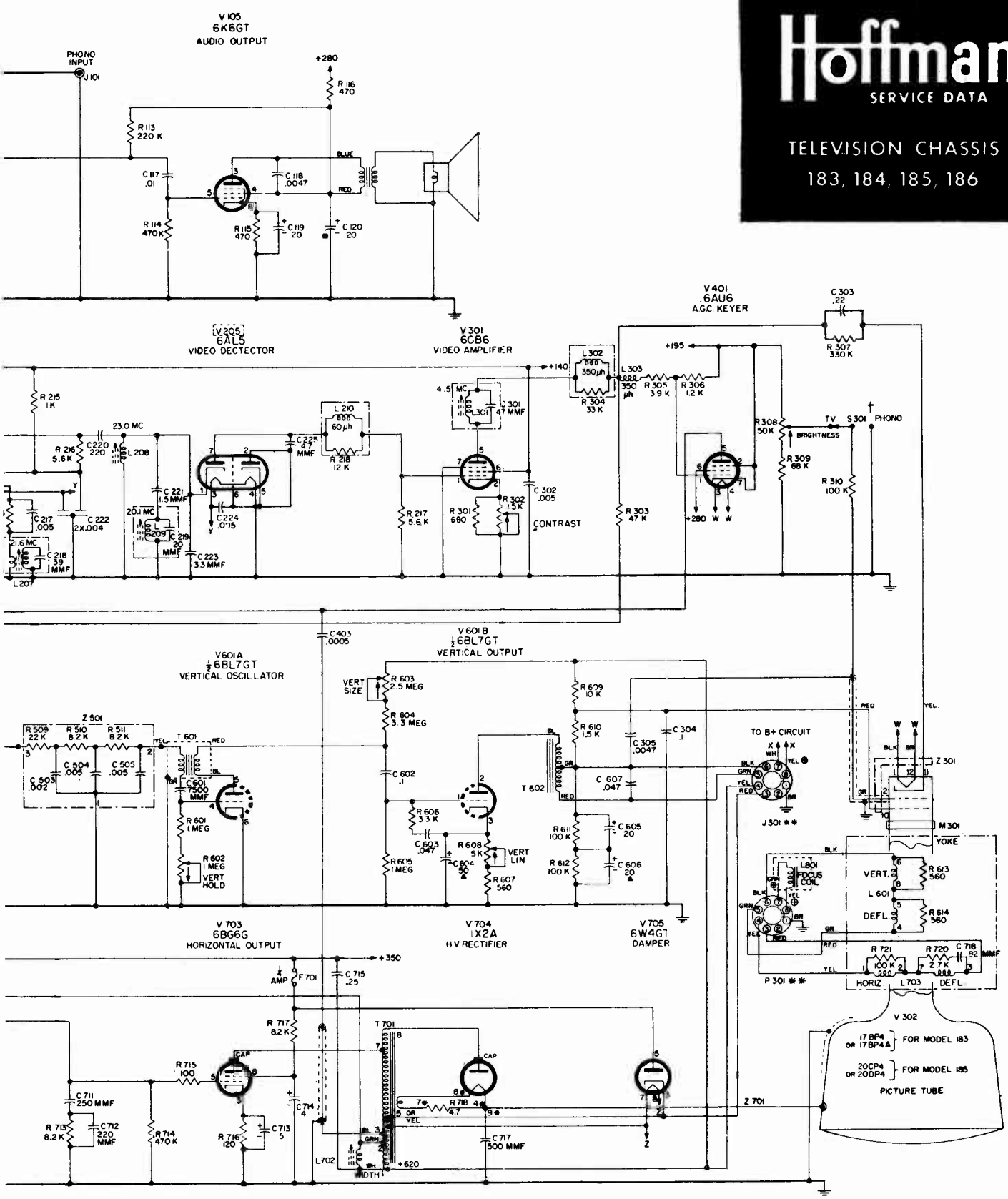
Step No.	Signal Generator Frequency MC	Connect Signal To	Output Indicator	Adjust	Instructions	Special Connections and Settings
			SOUND I.F. AND RATIO DETECTOR			
1	21.6 CW	Pin 1 of V101	Meter across pin 7 of V103 and ground	T101 Pri.,Sec. T102 Pri.	Tune for max. reading on meter.	Load secondary of T101 with 10K resistor. Signal level should be low enough to obtain approximately 6.5 to 7 volts on meter. Use isolation networks shown in figures 7 and 8 throughout steps 1 through 14.
2	21.6 CW	"	Meter across junction of R108 and R109 and switch side of R106	T102 Sec.	Tune for zero meter reading; use same signal level as in step 1	Repeat tuning of T102 primary and secondary until adjustments do not change. Remove 10K load after completing step 2.
			PICTURE I.F. AND SOUND TRAPS			
3	21.6 CW	Screw of C10 on Tuner	Voltmeter to pin 1 of V301	L204	Tune for min. reading on meter.	Apply -3V bias to AGC bus. Remove horizontal oscillator tube V702.
4	21.6 CW	"	"	L207	"	Detune L204 with fingers while tuning L207.
5	20.1 CW	"	"	L209	"	
6	27.6 CW	"	"	L203	"	
7	23.0 CW	"	"	L208	Tune for max. reading on meter.	Set contrast control for maximum contrast. Adjust signal level throughout I.F. alignment so that a 1 volt dc output is maintained at the video detector.
8	25.0 CW	"	"	L206	"	
9	22.25 CW	"	"	L205	"	Adjust signal level throughout I.F. alignment so that the video detector is maintained at 1 volt.
10	25.8 CW	"	"	L202	"	
11	22.6 CW	"	"	L201	"	Detune converter plate coil.
12	24.25 CW	"	"	Converter plate coil	"	Converter plate coil located on tuner.
13	Repeat steps 3 through 12 until adjustments do not change.					
14	Approx. 25 with 10 mc Sweep. Marker required.	Converter Tube Grid (See text for correction.)	High gain scope to pin 1 of V301	Converter plate coil and L201 first. Other coils if necessary	Set 26.1 mc mark at 50% point with converter plate coil. Eliminate tilt with L201.	Use markers to determine bandpass at 50% points. Bandpass should be between 4.1 mc and 3.9 mc. Adjust other I.F. coils to obtain proper curve only when absolutely necessary.
15	4.5 CW	Pin 1 of V301	Meter connected through detector network to junction of L302 and L303	L301	Tune for minimum reading on meter.	Detector and isolating networks shown in figures 7 and 11.



Schematic Diagram For Chassis 183 and 185

Hoffman
SERVICE DATA

TELEVISION CHASSIS
183, 184, 185, 186



For chassis parts layout and alignment points see next page.

Hoffman Chassis 183, 184, 185, and 186, continued.

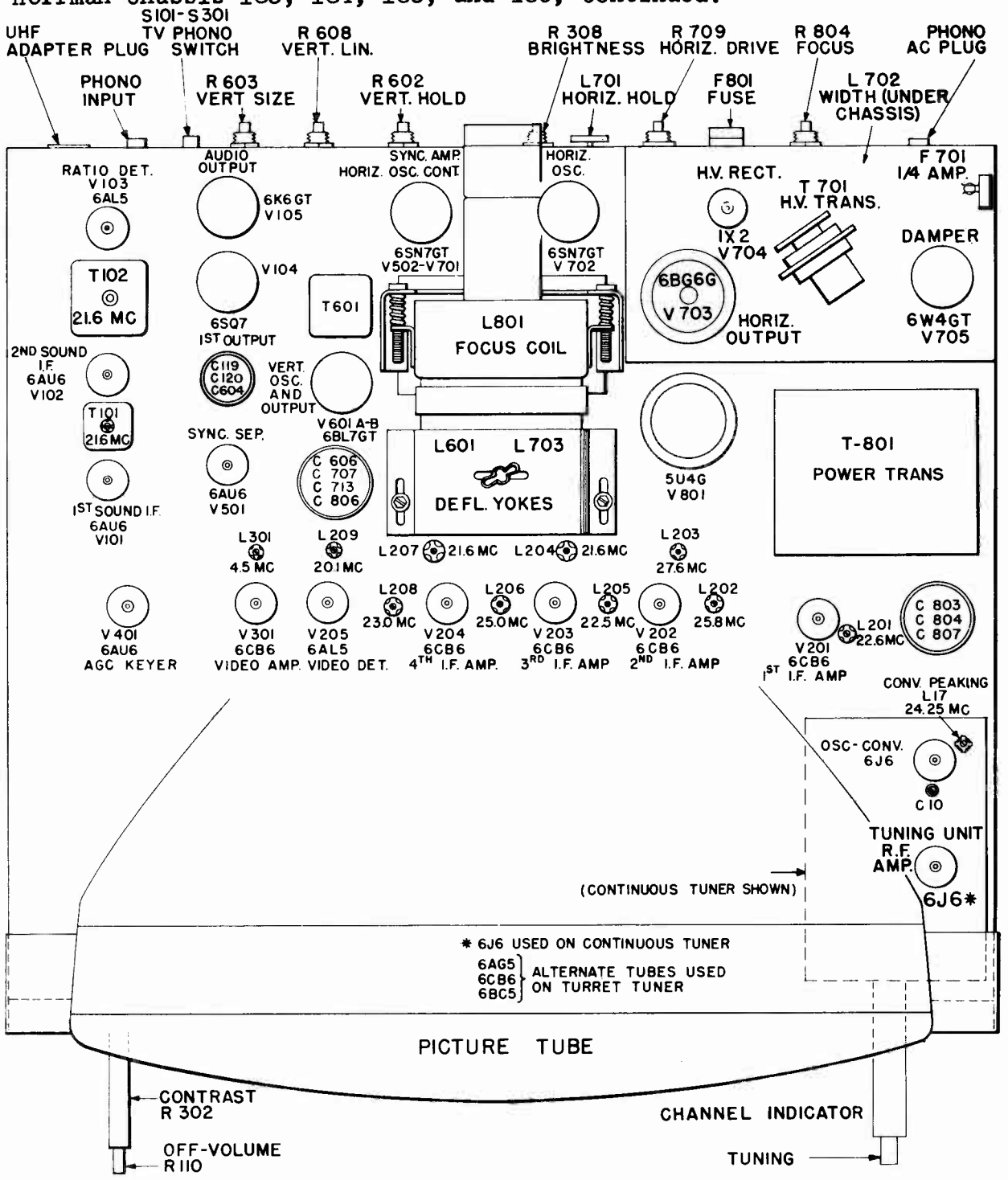


Figure 12. Top View Parts Layout For Chassis 183

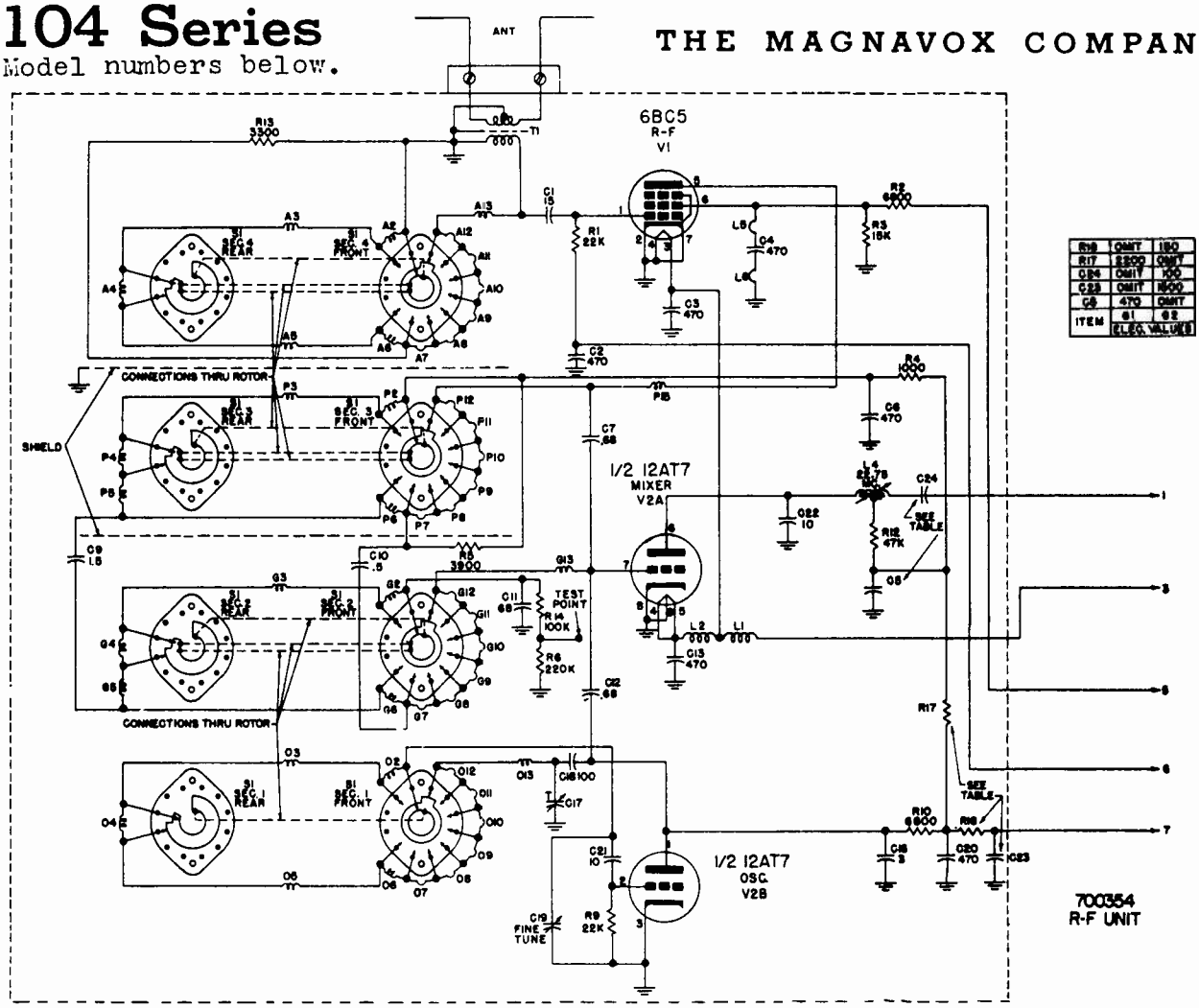
Note:

The parts layout shown in Figure 12 is representative of Chassis 183. Chassis 184 parts layout is similar with the following exceptions. An AM-FM Tuner is included. Location of the AM-FM Tuner and front panel controls is identical to Chassis 186. TV-PHONO switch, mounted on the rear apron, is deleted.

104 Series

Model numbers below.

THE MAGNAVOX COMPANY

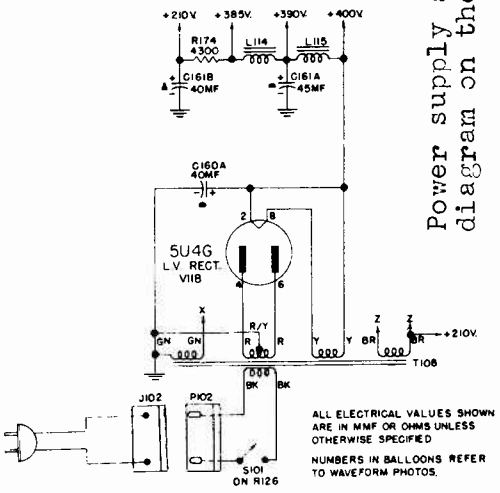


Power supply and tuner circuits connect to main schematic diagram on the next page as shown by voltage and number reference.

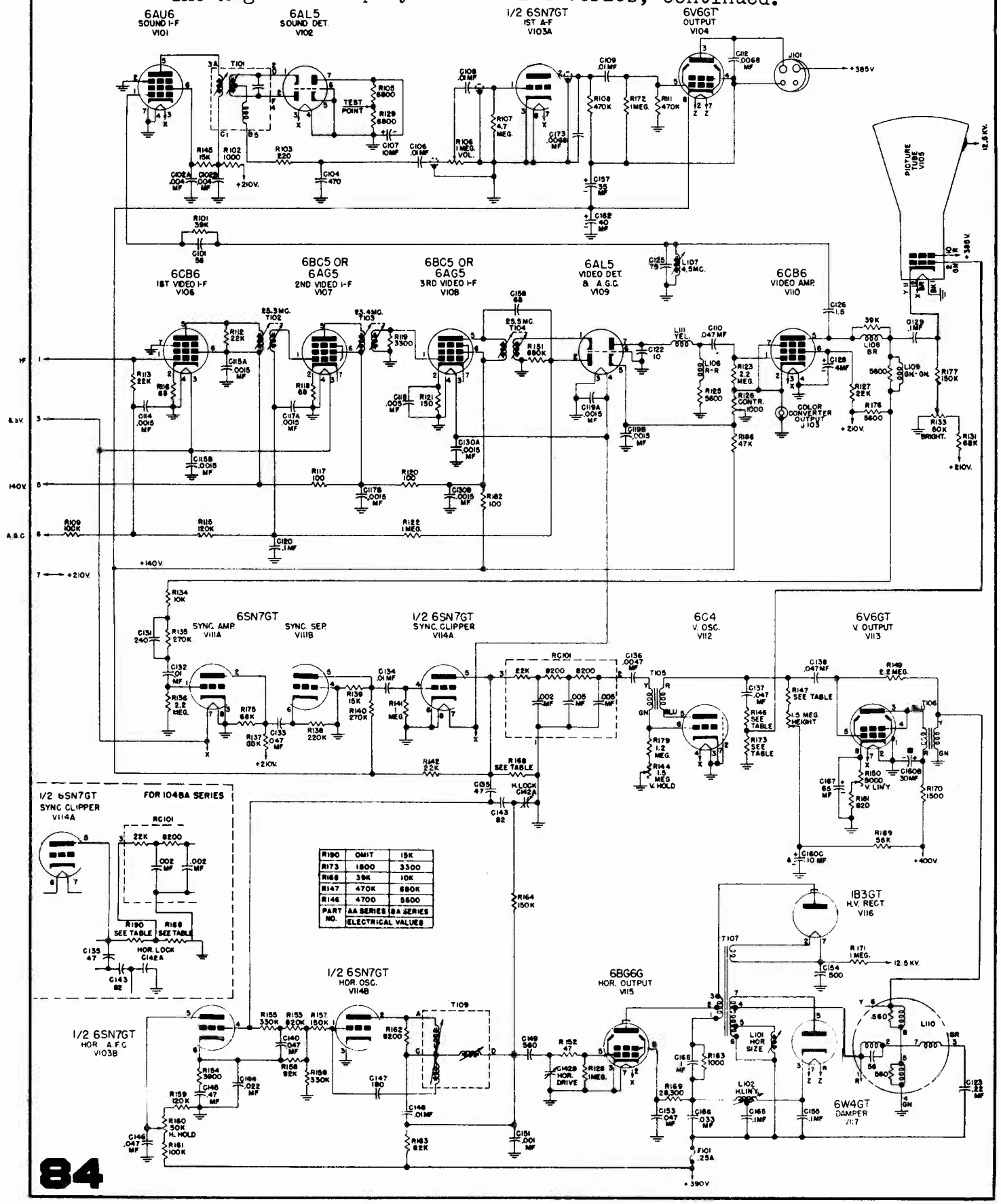
The Magnavox 104 series TV chassis are all 20 tube receivers including a direct view picture tube. The CT 301, 303, 305, 307, 309, 311 and 313 include audio amplifiers and speaker. The CT 302, 304, 306, and 310 have no audio amplifier or speaker, but are used in combination with a radio chassis audio system. The audio output stage also serves as a voltage regulator in all models.

VOLTAGE CHART

Pin No.		1	2	3	4	5	6	7	8
V101	6AU6	-.8				202	152	0	
V102	6AL5							-37	
V103	6SN7	-.7	24	0	-23	200	+4		
V104	6V6			400	425	112			143
V106	6CB6	-8.2	0.2			140	140		
V107	6BC5*	-8.2	.12			140	140		
V108	6BC5*	0	1.5			140	140		
V109	6AL5	0	-4.2			3.3		-3.8	
V110	6CB6	+.7	1.7			140	110		
V111	6SN7	-33	100	0	0	7.4	48		
V112	6C4					135	-43	0	
V113	6V6			400	400	0			35
V114	6SN7	-66	252	0	-1.2	45	0		
V115	6BG6			0		-32			300
V117	6W4			600					
V118	5U4								400



The Magnavox Company ✻✻✻ 104 Series, continued.



R190	OMIT	15K
R173	1800	3300
R168	39K	10K
R147	470K	680K
R146	4700	5600
PART NO.	AA SERIES	BA SERIES
	ELECTRICAL VALUES	

Majestic

Majestic (Garod) Series 106 and 108 Receivers.
See page 86 for a complete list of models.

TV I-F ALIGNMENT

1. Tune receiver to quiet portion of TV High Band.
2. Set contrast control fully counterclockwise.
3. Apply 3 v. negative bias between the A.G.C. bus (at C22A) and ground. (Use 2—1½ v. cells.)
4. Connect TV I-F Signal Generator through a 1500 MMF condenser to Test Point (A) of tuner unit; low side to ground. (See schematic diagram and Note #1 below.)
5. Connect negative lead of V.T.V.M. (or meter of 20,000 ohms-per-volt, or better) to 4.7K diode load resistor TEST POINT (B); positive lead to ground. (See schematic diagram.)
6. Feed 23.3 MC [23.3]* (±.05 MC) from Signal Generator, and adjust T4 for maximum deflection on meter. Maintain Signal Generator output so low that meter reads no more than 1.5 volts at peak.
7. Feed 22.1 MC [22.1]* (±.05 MC) from Signal Generator, and adjust T3 as above.
8. Feed 24.3 MC [24.2]* (±.05 MC) from Signal Generator, and adjust T2 as above.
9. Feed 24.7 MC [24.5]* (±.05 MC) from Signal Generator, and adjust T1 as above.
10. Replace the meter with the vertical input of an Oscilloscope through a 10K isolating resistor, low side to ground.
11. Remove Signal Generator. Feed a video I-F Sweep Generator (20 to 28MC) through loosely coupled shield of 6J6 converter tube, making sure shield is not grounded. (Refer to Fig. 3.)
12. Loosely couple high side of a TV I-F Marker Generator to the high Sweep Generator Lead; low side to ground.
13. Feed I-F Sweep, and observe response on 'scope. (See Fig. 5.) Use marker frequencies 20.25, 22 and 24.75 MC.
14. If response does not approximate that shown in Fig. 5, repeat steps 3 to 9, making sure that frequencies are precise, and that the Signal Generator output voltage is kept low. Continue with steps 10 to 13. A slight touch-up of individual slugs may be required to approximate the recommended curve of Fig. 5.

TV SOUND ALIGNMENT

NOTE: TV-phono switch must be in TV position.

1. Connect a 4.5 MC Signal Generator (±.01 MC) through a 1500 MMF condenser to the 4.7K video diode load resistor TESTPOINT (B); low side to ground. See schematic diagram.
2. Obtain two resistors of approximately 100,000 ohms each, whose resistances have been matched accurately with an ohmmeter. Connect them in series across the 18K resistor (R107) at the 6T8 tube socket (V9A).
3. Connect negative lead of V.T.V.M. to junction of matched resistors of step 2; positive lead to ground.
4. Feed 4.5 MC (±.01 MC) from signal generator, and adjust L22, sound take-off coil, for maximum deflection on V.T.V.M. Two points of maximum deflection may be found when making this adjustment. Correct adjustment is attained when screw is at most inward maximum reading position.
5. Adjust the bottom slug of T10 for maximum deflection on V.T.V.M.
6. Connect positive lead of V.T.V.M. to junction of C96, and R106 TEST POINT (C), leaving negative lead of V.T.V.M. connected as in step 3. See schematic diagram.
7. Adjust top of T10 for zero output on V.T.V.M. between two opposite polarity peaks.

IMPORTANT: Keep the sweep generator and marker generator outputs at minimum to avoid curve distortion. Marker pips should be kept barely visible.

*NOTE: If 3v fixed bias is unavailable and zero fixed bias is used, set signal generator at [ ] bracketed frequencies values. Subsequently, marker frequencies of Fig. 5 are 21.9 and 24.6 MC, respectively.

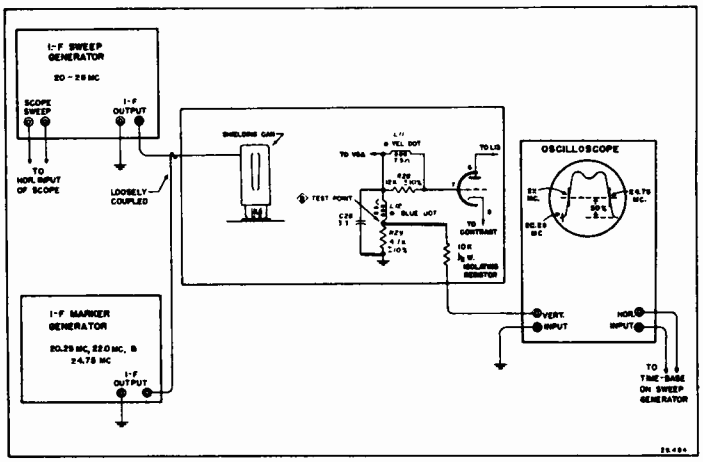


FIG. 3. IF ALIGNMENT BLOCK DIAGRAM

TABLE I RF ALIGNMENT FREQUENCIES			
CHANNEL NUMBER	SWEEP GEN. CENTER FREQ. (10MC.SWEEP)	MARKER GENERATOR FREQUENCIES	
		VIDEO CARRIER	SOUND CARRIER
2	57 MC.	55.25 MC.	59.75 MC.
3	63 MC.	61.25 MC.	65.75 MC.
4	69 MC.	67.25 MC.	71.75 MC.
5	79 MC.	77.25 MC.	81.75 MC.
6	85 MC.	83.25 MC.	87.75 MC.
7	177 MC.	175.25 MC.	179.75 MC.
8	183 MC.	181.25 MC.	185.75 MC.
9	189 MC.	187.25 MC.	191.75 MC.
10	195 MC.	193.25 MC.	197.75 MC.
11	201 MC.	199.25 MC.	203.75 MC.
12	207 MC.	205.25 MC.	209.75 MC.
13	213 MC.	211.25 MC.	215.75 MC.

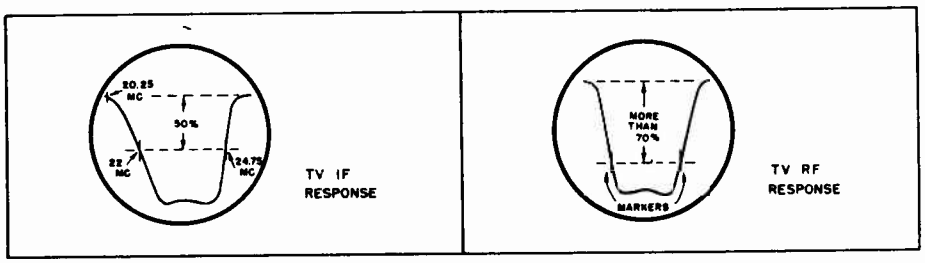
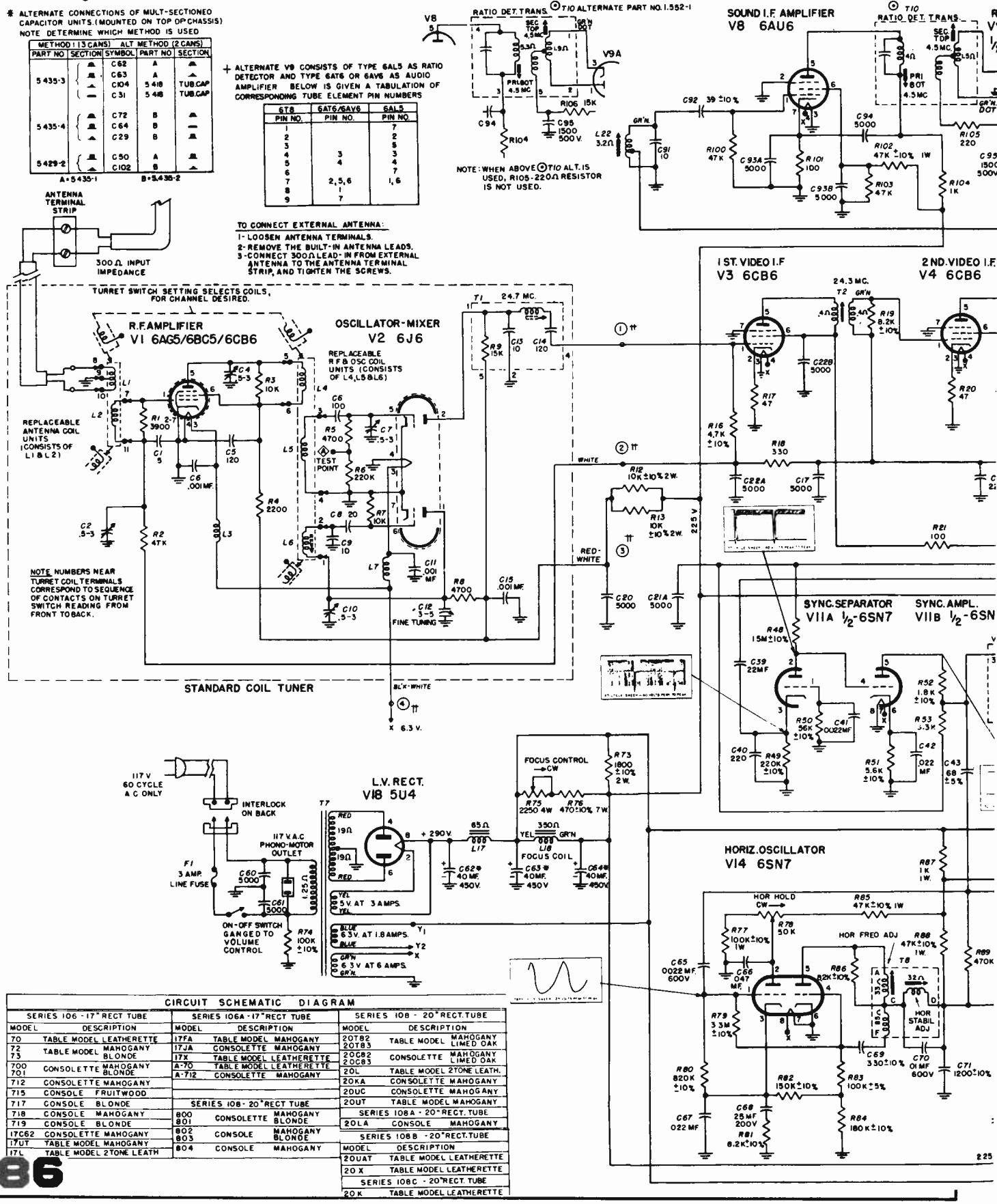


FIG. 5. RECOMMENDED RESPONSE CURVES.

Majestic (Garod) Series 106 and 108 Television Receivers.



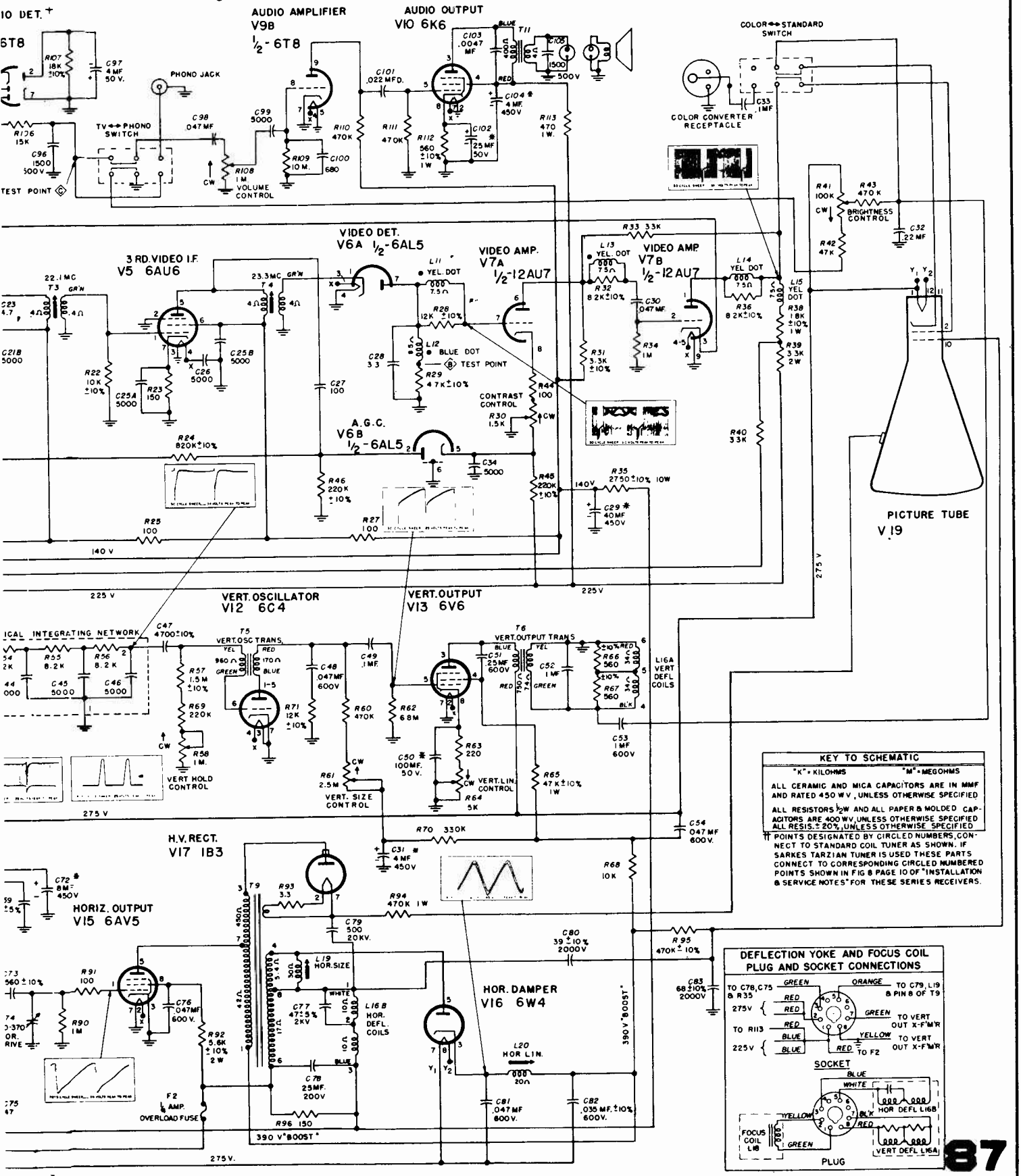
CIRCUIT SCHEMATIC DIAGRAM

SERIES 106 - 17" RECT TUBE	
MODEL	DESCRIPTION
70	TABLE MODEL LEATHERETTE
72 73	TABLE MODEL MAHOGANY BLONDE
700 701	CONSOLETTE MAHOGANY BLONDE
712	CONSOLETTE MAHOGANY
715	CONSOLE FRUITWOOD
717	CONSOLE BLONDE
718	CONSOLE MAHOGANY
719	CONSOLE BLONDE
17C62	CONSOLETTE MAHOGANY
17UT	TABLE MODEL MAHOGANY
17L	TABLE MODEL 2TONE LEATH

SERIES 106A - 17" RECT TUBE	
MODEL	DESCRIPTION
17FA	TABLE MODEL MAHOGANY
17JA	CONSOLETTE MAHOGANY
17X	TABLE MODEL LEATHERETTE
A-70	TABLE MODEL LEATHERETTE
A-712	CONSOLETTE MAHOGANY
SERIES 108 - 20" RECT TUBE	
800 801	CONSOLETTE MAHOGANY BLONDE
802 803	CONSOLE MAHOGANY BLONDE
804	CONSOLE MAHOGANY

SERIES 108 - 20" RECT. TUBE	
MODEL	DESCRIPTION
20T82 20T83	TABLE MODEL MAHOGANY LIMED OAK
20C82 20C83	CONSOLETTE MAHOGANY LIMED OAK
20L	TABLE MODEL 2TONE LEATH.
20KA	CONSOLETTE MAHOGANY
20UC	CONSOLETTE MAHOGANY
20UT	TABLE MODEL MAHOGANY
SERIES 108A - 20" RECT. TUBE	
20LA	CONSOLE MAHOGANY
SERIES 108B - 20" RECT. TUBE	
MODEL	DESCRIPTION
20UAT	TABLE MODEL LEATHERETTE
20X	TABLE MODEL LEATHERETTE
SERIES 108C - 20" RECT. TUBE	
20K	TABLE MODEL LEATHERETTE

Majestic (Garod) Series 106 and 108 Television Receivers.



KEY TO SCHEMATIC

"K" = KILOHMS "M" = MEGOHMS

ALL CERAMIC AND MICA CAPACITORS ARE IN MMF AND RATED 450 W V, UNLESS OTHERWISE SPECIFIED

ALL RESISTORS ½W AND ALL PAPER & MOLDED CAPACITORS ARE 400 W V, UNLESS OTHERWISE SPECIFIED
ALL RESIS. ± 20%, UNLESS OTHERWISE SPECIFIED

‡‡ POINTS DESIGNATED BY CIRCLED NUMBERS, CONNECT TO STANDARD COIL TUNER AS SHOWN. IF SARKES TARZIAN TUNER IS USED THESE PARTS CONNECT TO CORRESPONDING CIRCLED NUMBERED POINTS SHOWN IN FIG 8 PAGE 10 OF "INSTALLATION & SERVICE NOTES" FOR THESE SERIES RECEIVERS.

DEFLECTION YOKE AND FOCUS COIL PLUG AND SOCKET CONNECTIONS

Majestic (Garod) Series 106 and 108 Television Receivers.
(Continued from previous pages)

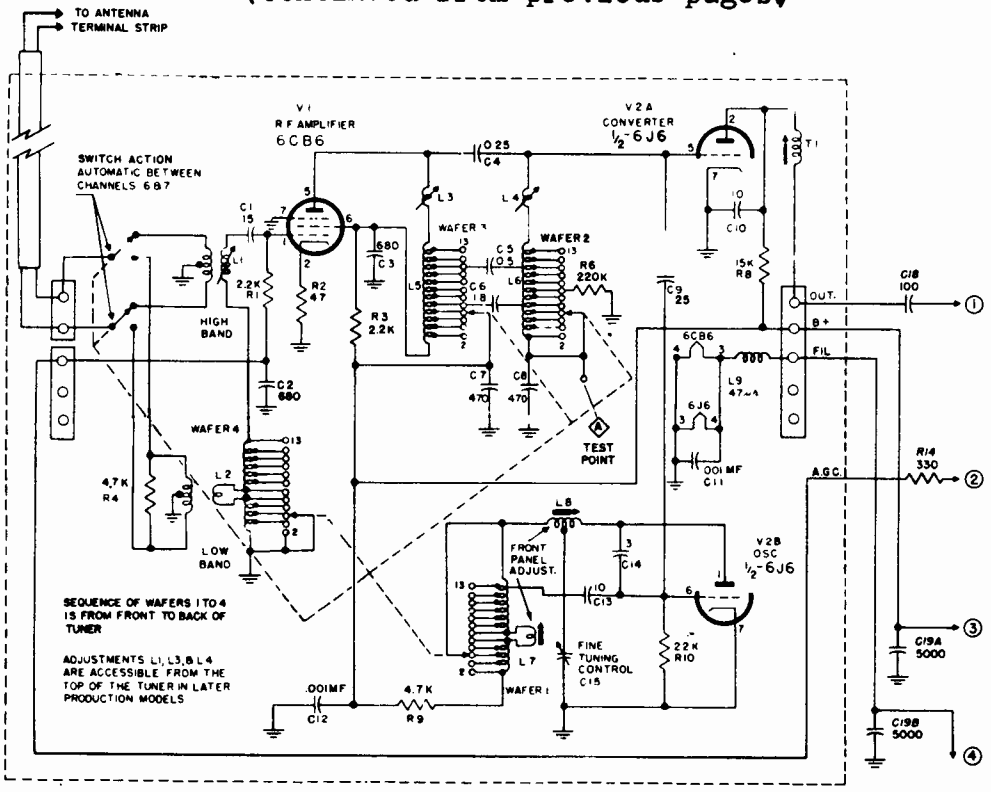


FIG. 8. SARKES TARZIAN TUNER — USED IN SOME MODELS.
CIRCLED NUMBERED POINTS CONNECT AT CORRESPONDING NUMBERS ON MAIN SCHEMATIC.

TUBE COMPLEMENT AND VOLTAGE CHART (SERIES 106 and 108)

SYMBOL	FUNCTION	TUBE TYPE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V1	RF AMPLIFIER	6AG5/6BC5/6CB6	—.5	0	6.3AC	0	90	90	0	—	—
V2	OSCILLATOR-MIXER	6J6	90	70	6.3AC	0	—3 to —4.5	—4 to —9	0	—	—
V3	1ST VIDEO IF	6CB6	—.7	.4	0	6.3AC	100	100	0	—	—
V4	2ND VIDEO IF	6CB6	—.7	.4	0	6.3AC	101	101	0	—	—
V5	3RD VIDEO IF	6AU6	0	0	0	6.3AC	102	102	1.0	—	—
V6	AGC AND VIDEO DETECTOR	6AL5	0	—.2	6.3AC	0	1.5	0	—.6	—	—
V7	VIDEO AMPLIFIER	12AU7	142	—1.2	0	6.3AC	6.3AC	90	—.6	.9	0
V8	SOUND IF AMPLIFIER	6AU6	—.2	0	0	6.3AC	220	80	.2	—	—
V9	RATIO DETECT. AND AUDIO AMP.	6T8	—.45	—1.2	—.6	6.3AC	0	0	0	—1.0	45
V9	RATIO DETECTOR	6AL5	0	—1.2	6.3AC	0	—.5	0	—.5	—	—
Alternate	AUDIO AMPLIFIER	6AT6/6AV6	—1.2	0	6.3AC	0	0	0	42	—	—
V10	AUDIO OUTPUT	6K6	NC	0	225	230	0	45	6.3AC	15	—
V11	SYNC. AMPLIFIER	6SN7	0	22	2.7	22	82	22	6.3AC	0	—
V12	VERTICAL OSCILLATOR	6C4	180	0	0	6.3AC	180	—58	0	—	—
V13	VERTICAL OUTPUT	6V6	NC	6.3AC	250	275	—24	0	0	3.9	—
V14	HORIZONTAL OSCILLATOR	6SN7	—3 to +4	180	11	—55 to —85	180	0	0	6.3AC	—
V15	HORIZONTAL OUTPUT	6AV5	—20 to —32	6.3AC	0	—	410	—	0	140	—
V16	HORIZONTAL DAMPER	6W4	190	NC	390	NC	175	265	265	265 ∴6.3AC	—
V17	HIGH VOLTAGE RECTIFIER	*1B3	11.5KV	11.5KV	11.5KV	—	11.5KV	—	11.5KV	11.5KV	—
V18	LOW VOLTAGE RECTIFIER	5U4	NC	220 5.0AC**	NC	270AC	270 ∴6.3AC	270AC	270	220	—
V19	PICTURE TUBE		265	142		PIN 10 375		PIN 11 150		PIN 12 265 ∴6.3AC	
	YOKE AND FOCUS SOCKET		220	265	225	—	195	—	0	0	—

NOTES

1. Tune receiver to unused channel — no signal applied.
2. All front panel controls at maximum clockwise positions.
3. Maintain line voltage at 117 Volts A.C.
4. All voltages measured with V.T.V.M. unless otherwise specified.
5. Values shown are D.C. voltages, measured from socket to ground, unless otherwise specified.
6. NC designates no connection on pins, thus denoted.
7. Dashed lines designate the non-existence of the pin, thus denoted, on this tube type.

* Use high voltage insulated probe only.

∴ Top value is D.C. voltage to ground. Bottom value, negative lead of meter connected to pin 7 of 5U4.

** Top value is D.C. voltage to ground. Bottom value, negative lead of meter connected to pin 8 of 5U4.

John Meck Industries, Inc.

9021 - 9024 CHASSIS

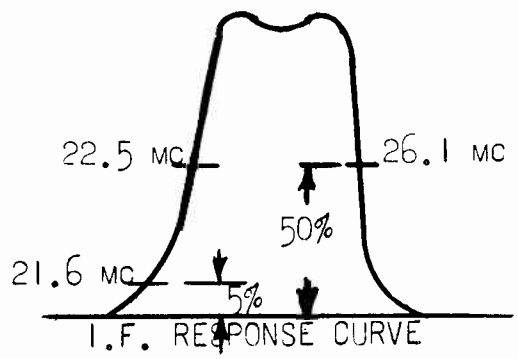
The circuit shown on page 91 is exact for Chassis 9021. The other chassis numbers listed above cover slight variations of the 9021. For instance, the 9022 uses a three tube I.F. strip and is being used in 14" models. Chassis 9023 and 9024 are changed to supply higher voltage to operate 20" picture tubes. These chassis are used in Models XSC, 614T, 717C, 717T, 720C, 720T, and other models. Chassis 9026 is similar to 9021, being a slightly revised circuit of these earlier sets. This Chassis 9026 is used in the JM-700 series covering sets such as JM-717C, JM-717T, JM-720C, JM-720T.

IF ALIGNMENT PROCEDURES

The I.F. amplifier contains five tuned circuits and five different alignment frequencies are used. The video carrier is passed through the I.F. amplifier at a frequency of 26.1 MC. and the sound carrier at 21.6 MC. Extreme care must be taken in alignment to assure that the sound carrier be attenuated substantially below the video carrier. This is necessary as further insurance against the possibility that the A.M. modulation on the sound I.F. carrier due to picture modulation will be sufficiently low to be removed by the detector, and not produce spurious phase modulation of the sound I.F. See figure below. A bandwidth of 3.6 MC. is attained (6 DB. down) with a stage gain of 12 to 15 times.

An I.F. alignment signal is best introduced in the 9021 chassis by means of a suitable cup or tube shield floated over the mixer tube to produce capacity coupling of the signal to the plate circuit. It may be desirable to disable the local oscillator, to prevent R.F. harmonics from distorting the trace on the 'scope screen. (A dummy 6J6 may be substituted for the mixer tube, with the #1 pin removed, or pin #2 when a 12AT7 is used, to acoomplish alignment.) Contrast control is set at 80% of full on. Metering may be done on the AGC line, keeping input attenuated to produce no more than a 2.5 to 3 volt reading.

PEAK	AT	
1st I.F.	25.9 MC.	Unmodulated
2nd I.F.	25.6 MC.	"
3rd I.F.	23.1 MC.	"
4th I.F.	22.9 MC.	"
5th I.F.	24.4 MC.	"



I.F. RESPONSE CURVE

Alignment continued on page 90.

John Meck Industries, Chassis 9021, 9022, 9023, and 9024, continued.

SOUND ALIGNMENT

1. Connect 4.5MC generator to the grid of the video amplifier tube (here again, low signal level is important, so that limiting action does not occur. Metering may be accomplished at the sound take-off point of the ratio detector (at the juncture of the 15,000 ohm resistor and the 3900 mmf capacitor) with meter ground connected to pin No. 8 of 6V6GT tube.

2. Adjust the slug on the sound transformer for maximum negative meter indication.

3. Adjust primary of ratio detector (top slug) for maximum negative reading.

4. Move meter ground to the juncture of the two 6900 ohm resistors in the sound detector circuit, and adjust bottom slug on ratio detector to Zero voltage. Other meter lead remains connected as in step 1.

SOUND TRAP ALIGNMENT

1. With 4.5 megacycle generator connected as above, switch on modulation, and increase the generator output control until modulation bars are observed on the C.R.T. screen.

2. Adjust trap core for minimum indication on C.R.T. screen.

NOTE—For this adjustment, over 50% AM modulation is desirable. If generator modulation is fixed, full R.F. output may be required to produced readable modulation on C.R.T. screen.

PICTURE ADJUSTMENT - CENTERING

This receiver was shipped from the factory with all the picture adjustments set and locked at the time of shipment. However, due to the weigh of some of the components, and in cases of picture tube replacement, some re-adjustment may be necessary.

(1) The deflection yoke should be placed in position closet to the "bell of the picture tube, as far forward as possible. The focus coil should be positioned approximately one-quarter inch from the rear of the yoke - concentric to, and at right angles with the tube neck. The four wing nuts on the side of the bracket should now be tightened.

(2) With the set turned on, the brilliance control at 80% of maximum and the contrast at minimum, the ion trap may be Reduce the brilliance control to slightly more than normal brilliance and adjust the focus control for sharpest horizontal sweep lines. The ion trap may now be adjusted for brightest response.

(3) Connect the antenna and tune in a station Should centering be necessary, the 3 centering spring bolts on the rear of the focus coil may be adjusted. In extreme cases of poor centering, loosen the 4 screws mounting the bracket to the chassis and point yoke and focus coil slightly off 90°.

P.M. FOCUS COIL ADJUSTMENT

On some models a permanent magnet type focus unit is used. This unit provides an easy method for both focusing and centering adjustments.

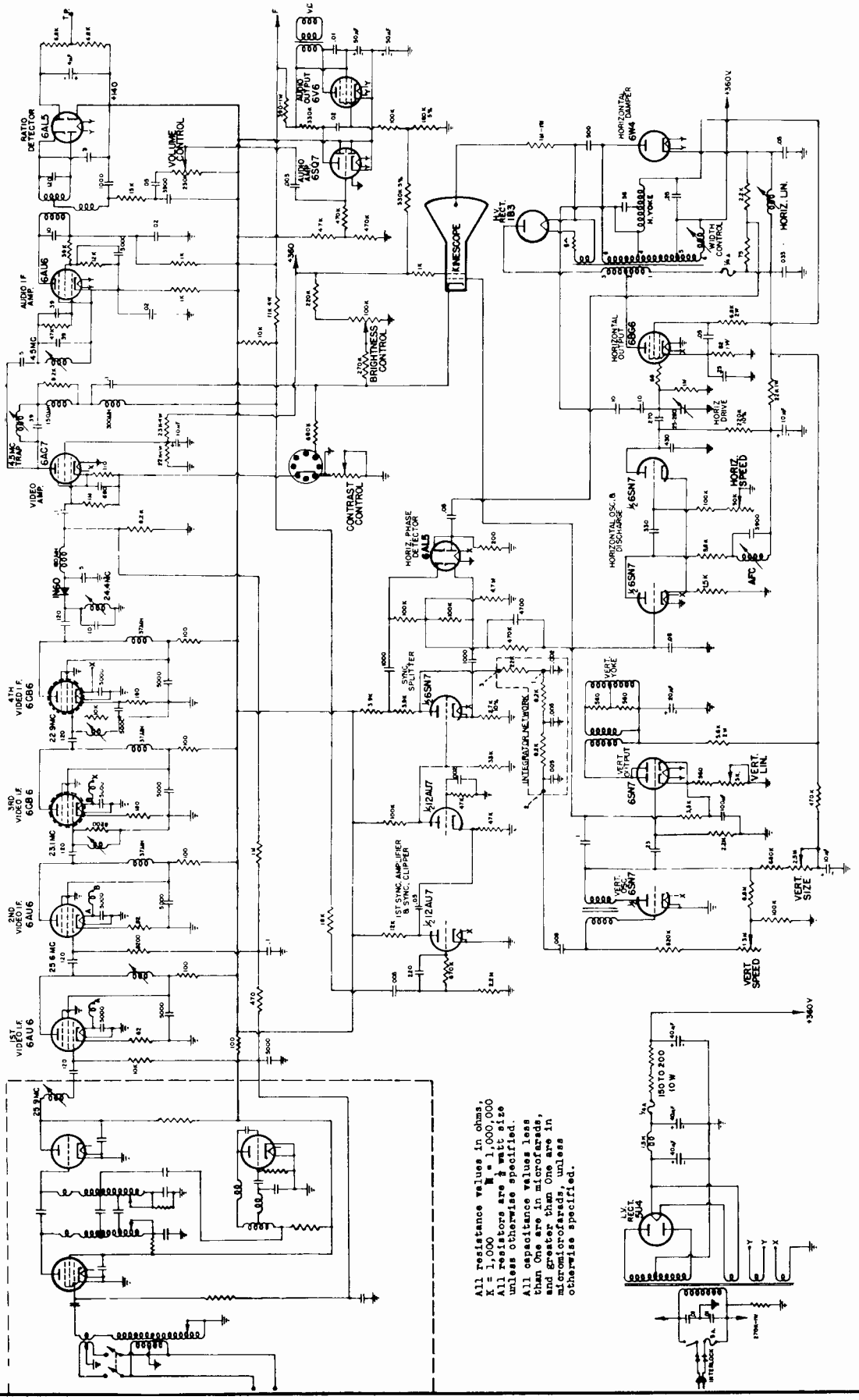
The unit is spring mounted for ease of positioning. A brass, screw driver slotted rod, is located to the right of the CR Tube Socket at the rear of the set, and may be adjusted for best focus. If the focusing ring (outer ring) is drawn completely to the rear and a focus is approached, but not attained, the entire assembly should be moved to the rear. This may be accomplished by loosening all 3 wing nuts on the spring mtg. assembly. Conversly, if focus is approached with the focus ring completely forward, tighten the 3 wing nuts. The raster may be centered by movement of the positioning ring (inside of the focusing ring) with the "Wobble Stick" which is taped to an eletrolytic condenser on the top of the chassis.

PICTURE TUBE DAMAGE RESULTING FROM INCORRECT ION TRAP MAGNET ALIGNMENT

Of major importance in the installation of a television set, is the proper adjustment of the ion trap magnet on the neck of the cathode ray picture tube. Improper positioning of the magnet may result in circular areas of discoloration developing on the face of the bulb.

CHASSIS 9021

John Meck Industries, Inc.



All resistance values in ohms, K = 1,000, M = 1,000,000
All resistors are ½ watt size unless otherwise specified.
All capacitance values less than One are in microfarads, and greater than One are in micromicrofarads, unless otherwise specified.

NO SIGNAL VOLTAGE MEASUREMENTS

1. Where readings may vary according to control settings, min. and max. readings are given.
2. Measurements are from socket pin to chassis, unless otherwise stated.
3. All measurements taken with line voltage maintained at 117 A.C.

TUBE	APPLICATION	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
6AU6	1st. I.F. AMP.	− .1	0	0	6.3 AC	+ 140	+ 140	+ .75	.....	.....
6AU6	2nd I.F. AMP.	− .1	0	0	6.3 AC	+ 140	+ 140	+ .75	.....	.....
6CB6	3rd I.F. AMP.	0	+ 2.2	0	6.3 AC	+ 140	+ 140	0	.....	.....
6CB6	4th I.F. AMP.	0	+ 2.5	0	6.3 AC	+ 140	+ 140	0	.....	.....
6AC7	VIDEO AMP.	SHELL	0	+ 2 to + 12	0 to + 8	+2 to + 12	+ 150	6.3 AC	+ 200	.....
*6AU6	SOUND I.F. AMP.	+ 7	+ 7.5	0	0	+ 220	+ 55	+ 7.5	.....	.....
*6AL5	RATIO DETECTOR	− 2.5	− 2.5	0	0	0	NC	+ 4	.....	.....
12AU7	SYNC. AMP.—CLIPPER	+ 24	0 to −5	+ 5 to + 11	6.3 AC	6.3 AC	100	−3	0	0
6AL5	HORIZ. PHASE DET.	+ 9 to + 15	− 10	6.3 AC	0	0	NC	0	.....	.....
6SN7	HORIZ. OSC.	+ 1.6	+ 330	+ 12	− 8 to − 13	+ 120	+ 12	0	6.3 AC	.....
6BG6	HORIZ. OUT.	NC	0	+ 8 to + 10	NC	− 10 to − 20	NC	6.3 AC	+ 280	CAP Do not measure
6W4	DAMPER	NC	NC	+ 500 to + 575	NC	+ 360	NC	+ 140	+ 140	.....
6SN7	VERT. OSC. & SYN. SPLIT.	+ 24	+ 85	+ 23	− 7 to − 60	+ 60 to + 200	0	6.3 AC	0	.....
6SN7	VERT. OUT.	+ .2	+ 390 to + 500	+ 4 to + 9	+ .2	+ 390 to + 500	+4 to + 9	6.3 AC	0	.....
*6SQ7	AUDIO AMP.	SHELL	− 1.6	0	0	0	+ 140	0	0	.....
*6V6	AUDIO OUT.	NC	0	190	200	− 4	NC	0	0	.....
5U4	L.V. RECT.	NC	+ 400	NC	360 AC	NC	360 AC	NC	+ 400	.....
1B3	H.V. RECT.	DO NOT MEASURE								

*Readings Taken From Pin Socket With + 140 As Common Negative Reference.

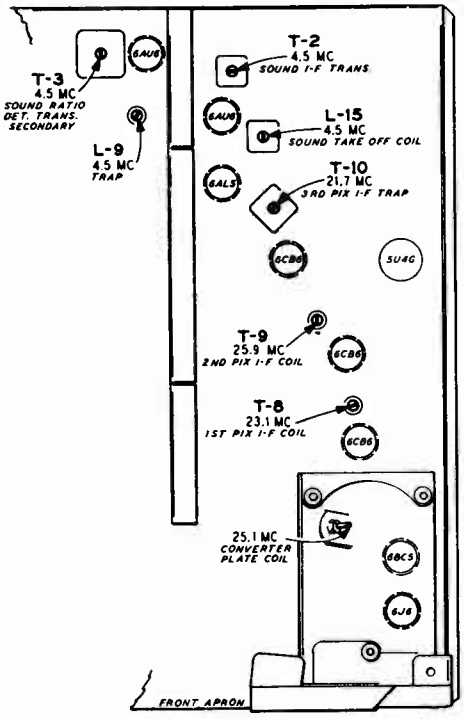
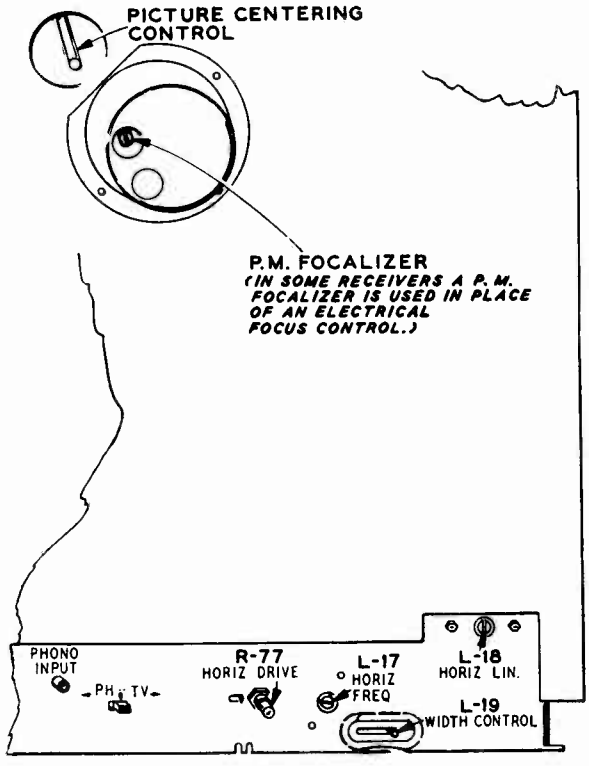


Fig. 11 — Top Chassis Video and Audic I-F Adjustments

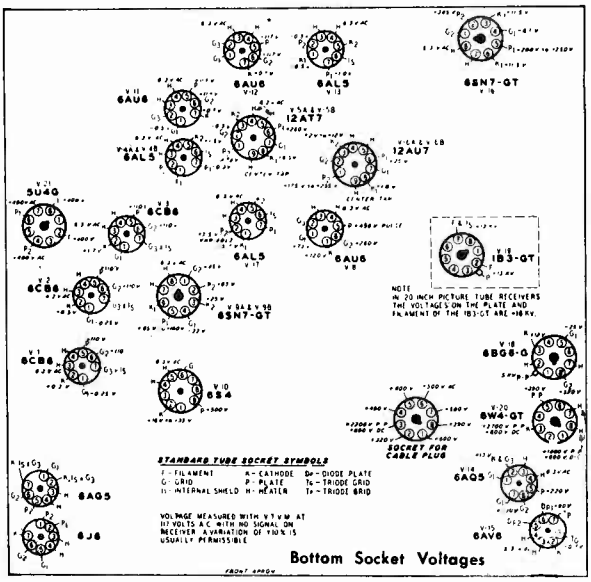


Adjustments Rear of Chassis

Models 15WG-3046C and 15WG-3051C

These models with a "B" suffix differ mainly in mechanical items from the "C" series. Sets with suffix "A" are of earlier production with slightly different I.F. section and vertical oscillator circuit.

Models 15WG-3049A and 15WG-3050A & B use essentially the same circuit as shown on the next two pages, and this material may be used in servicing these additional receivers.



Bottom Socket Voltages

SERVICE PRECAUTIONS — To service the receiver remove the chassis from the cabinet. To do so, remove the knobs, the cabinet back, disconnect the leads from the speaker, remove the antenna terminal board at rear of cabinet and then the 5 chassis mounting bolts.

ALIGNMENT PROCEDURE

PIX I-F

A. Unmodulated R-F signal into Converter Grid by means of tube shield insulated from base. VTVM with filter in lead of 10 K ohms and 5000 mmf connected to pic. det. load resistor, (R-18) 5600 ohms, in series with peaking coil (L-6) from Pin 7 of 6AL5. Input signal level should be such that output is less than 2 volts DC. Apply -3.0V battery Bias on AGC line.

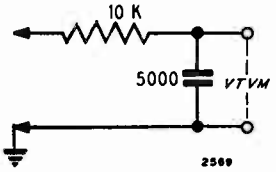


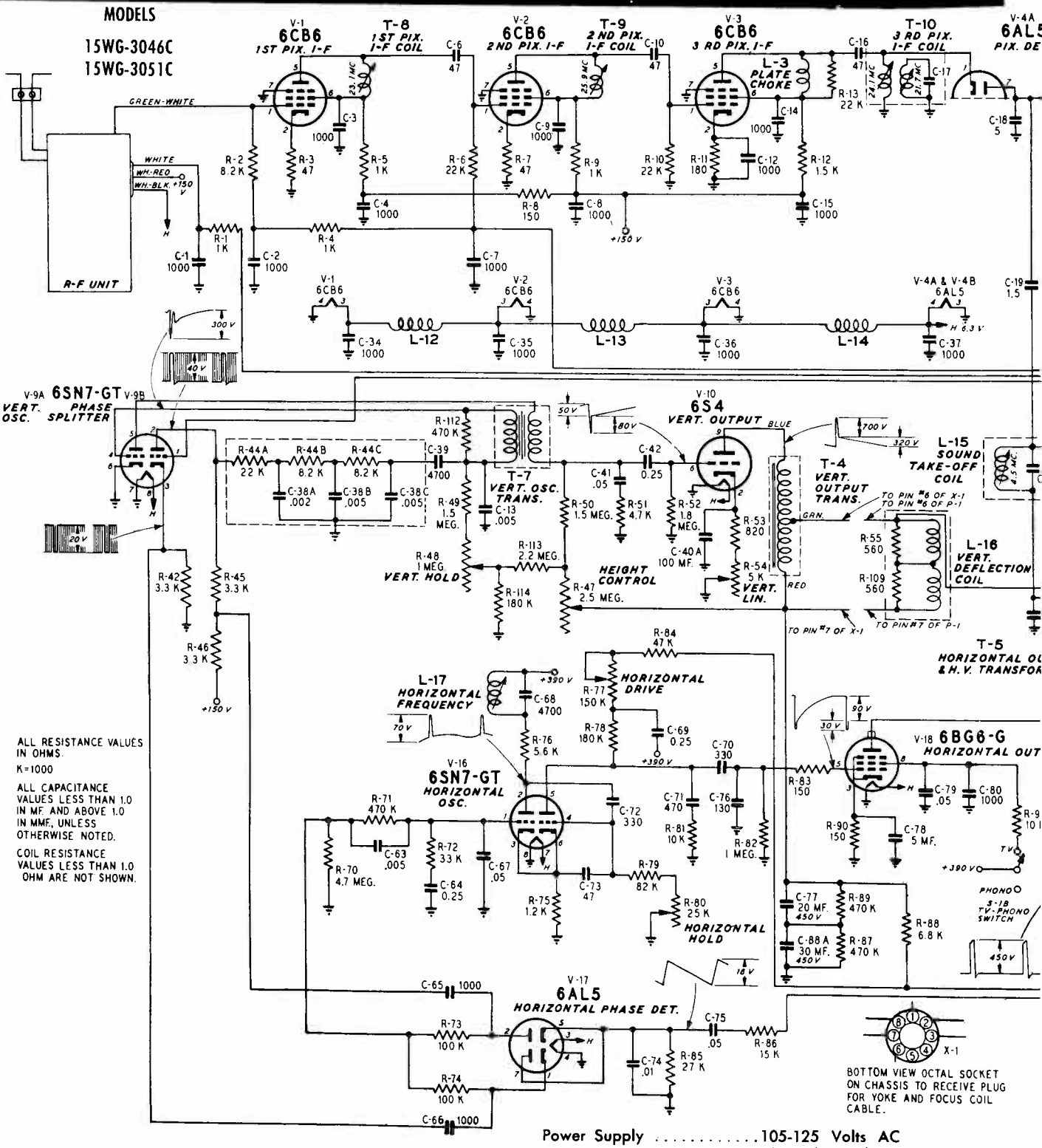
Fig. 13 — VTVM Connections

Continued on page after diagram.

MONTGOMERY WARD

MODELS

15WG-3046C
15WG-3051C



ALL RESISTANCE VALUES IN OHMS.

K=1000

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.

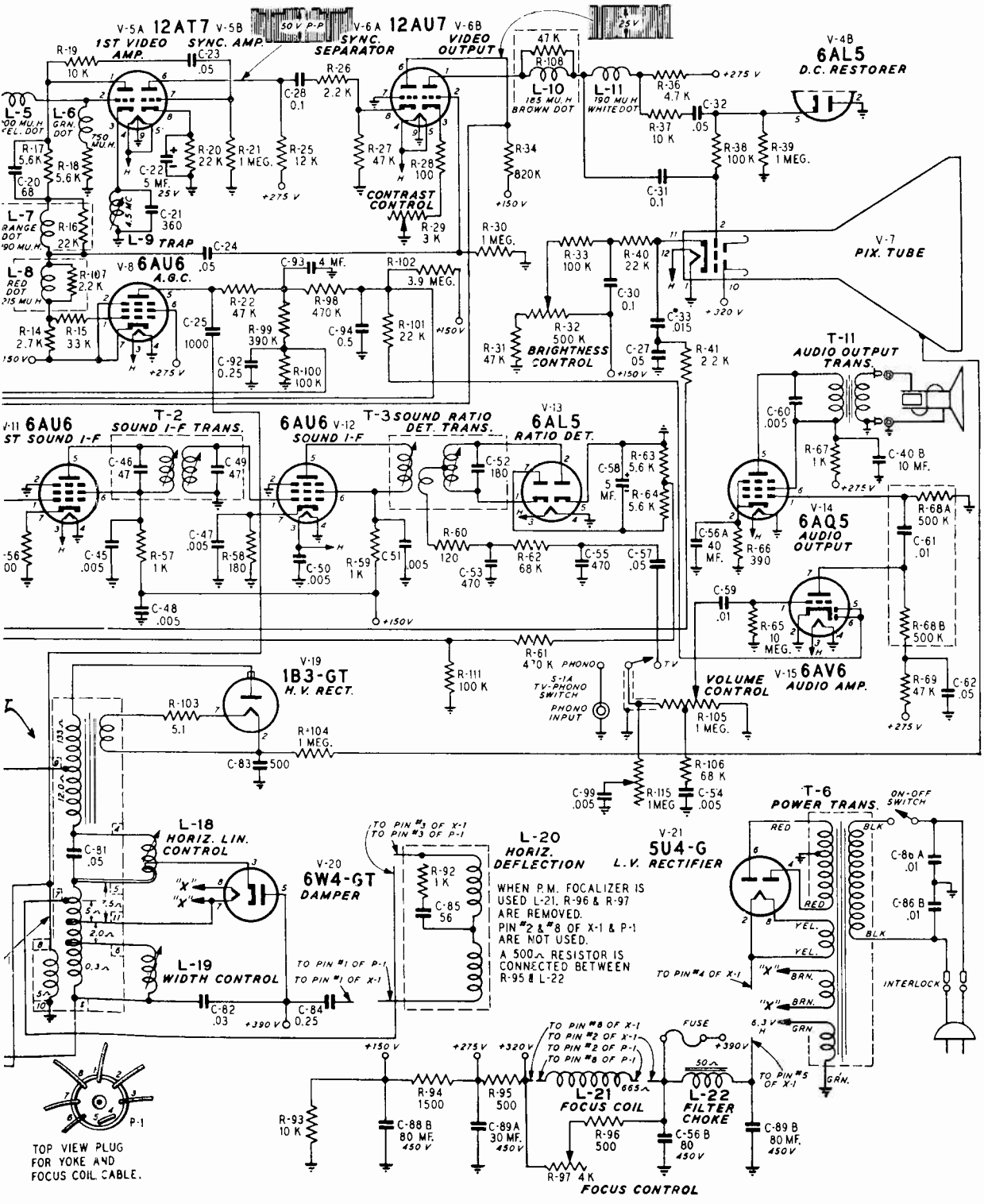
BOTTOM VIEW OCTAL SOCKET ON CHASSIS TO RECEIVE PLUG FOR YOKE AND FOCUS COIL CABLE.

Power Supply .....105-125 Volts AC
60 Cycles Only

Power Consumption .....220 Watts

Power Output .....2.4 Watts (Max.)
1.8 Watts (10% Distortion)

Models 15WG-3046C and 15WG-3051C



In some receivers C-99 and R-115 are not used.

Montgomery Ward Models 15WG-3046C and 15WG-3051C.

ALIGNMENT PROCEDURE (continued)

	FREQUENCY	ADJUST
1.	25.1 MC	Converter plate coil (on top of tuner) for maximum dc at picture detector.
2.	23.1 MC	1st picture I-F coil (T-8 above chassis) for maximum dc at picture detector.
3.	25.9 MC	2nd picture I-F coil (T-9 above chassis) for maximum dc at picture detector.

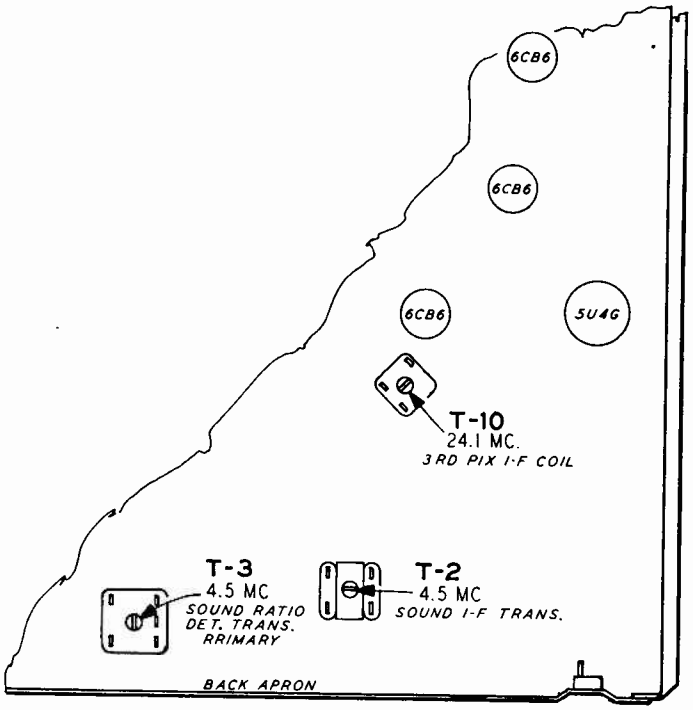


Fig. 12 — Bottom Chassis Video and Audio I-F Adjustments

	FREQUENCY	ADJUST
4.	24.1 MC	3rd picture I-F coil (T-10 below chassis) for maximum dc at picture detector.
5.	21.7 MC	3rd picture I-F trap (T-10 in can above chassis) for minimum dc at picture detector.

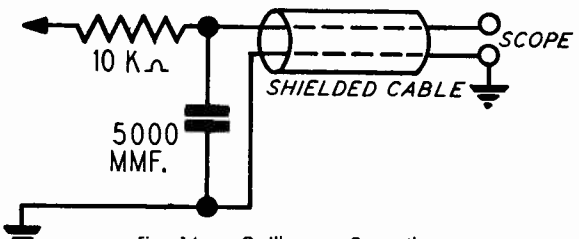


Fig. 14 — Oscilloscope Connection

8. I-F Sweep Generator into converter grid by means of tube shield insulated from base.
Connect oscilloscope across R-18 (in place of VTVM).
Apply -3.0V bias (DC) to AGC line (battery).
Tuner should be switched to dead channel so as not to cause interference.

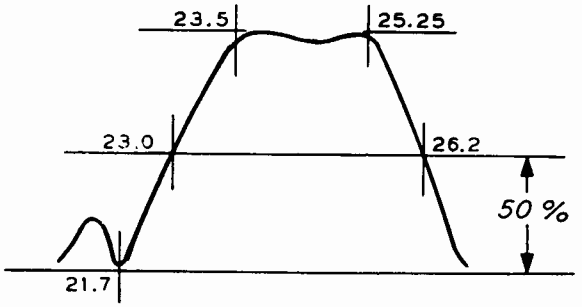


Fig. 15 — Overall Response Curve

Observe overall I-F response, which should be as shown above: A slight touch-up may be required. At no time should the trap coil be re-adjusted, nor should it be necessary to turn any of the picture I-F coils more than 1/2 turn of the slug. The following comments are suggestions only:

1. The height of the 26.2 MC marker is controlled by the 25.1 MC (Converter Plate Coil on tuner) and the 25.9 MC (2nd P.I.F.) coils.
2. The uniformity of response (flatness across top and position of 23.5 MC) marker is controlled for the most part by the 24.1 MC third picture I-F coil.
3. The 23.0 MC marker position is controlled by the first picture I-F (23.1 MC coil). However, it is NOT advisable to change the setting of the coil, due to its effect on sound rejection. Its adjustment should be avoidea unless believed to be absolutely necessary.

VIDEO

With 4.5 MC unmodulated signal from a high impedance source, (10,000 ohms in series with generator), into plate of pix det. tube (Pin 7 of 6AL5 second detector) and VTVM on picture tube grid, tune 4.5 MC trap L-9 (top of chassis) for minimum response. VTVM on 0-10V AC scale.

AUDIO I-F

Ground sound AGC (bottom of sound take-off coil) With signal generator set to 4.5 MC and dc V.T.V.M. connected to ratio detector (6AL5 Pin No. 7) adjust sound take-off coil (L-15), sound I-F primary and secondary (T-2), and ratio detector primary (T-3 bottom) for max. voltage. Select output levels on signal generator which will maintain d-c voltage about 10 volts.

With same setup as above except dc V.T.V.M. is connected as follows: Ground side of V.T.V.M. is connected to junction of 5600 ohm resistors (R-63 & R-64) across pins 5 and 7 of 6AL5 ratio detector and high side of V.T.V.M. is connected to ratio detector audio output at junction of 68,000 ohm resistor (R-62) and 470 mmf condenser (C-55).

Align ratio detector secondary (T-7 Top) for crossover (0 voltage) as read on V.T.V.M. lowest scale (3 V.).

Motorola Television

CHASSIS
TS-236
MODELS

17K8
17K8B
17K11
17K11B
17K11C
17T5D
17T6C
17T6D
17T6BD

The description of Chassis TS-236, used in the models listed at right, appears below and on the next seven pages. Chassis TS-196, used in Models 17T3, 17K11D, is the same, but uses a 17" glass picture tube. Chassis TS-214, Model 17T5A, is the same, but uses a 17" glass electrostatically focused picture tube. Chassis TS-228, used in Models 17T5C, 17T6F, 17T6BF, 17K8A, 17K8BA, 17K9A, 17K9BA, 17K10, 17K10M, 17K11A, 17K11BA, is the same, but uses a 17" metal electrostatically focused picture tube. Chassis TS-307, used in Models 20T2A, 20T2BA, 20T3, 20T3B, 20K6, 20K6B, is the same, but uses a 20" glass picture tube.

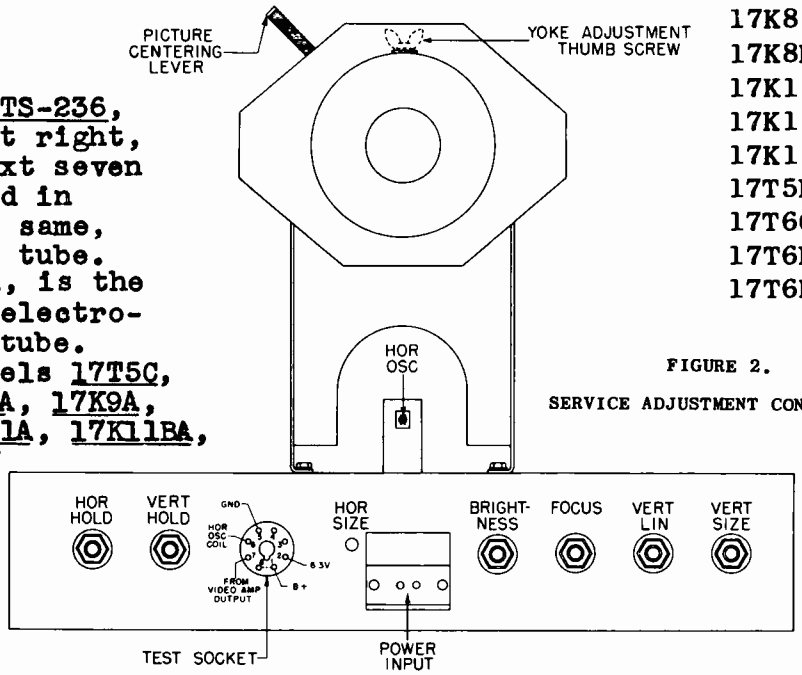


FIGURE 2.

SERVICE ADJUSTMENT CONTROLS

An octal socket on the rear of the chassis (see Figure 2) provides the following test points:

Pins #1 and #6, from the horizontal oscillator coil, should be shorted when making the horizontal oscillator adjustment.
Pins #1 and #8 are connected to B+
Pin #2 is connected to the 6.3V filament line.
Pin #7 is wired to the output of the video amplifier stage.

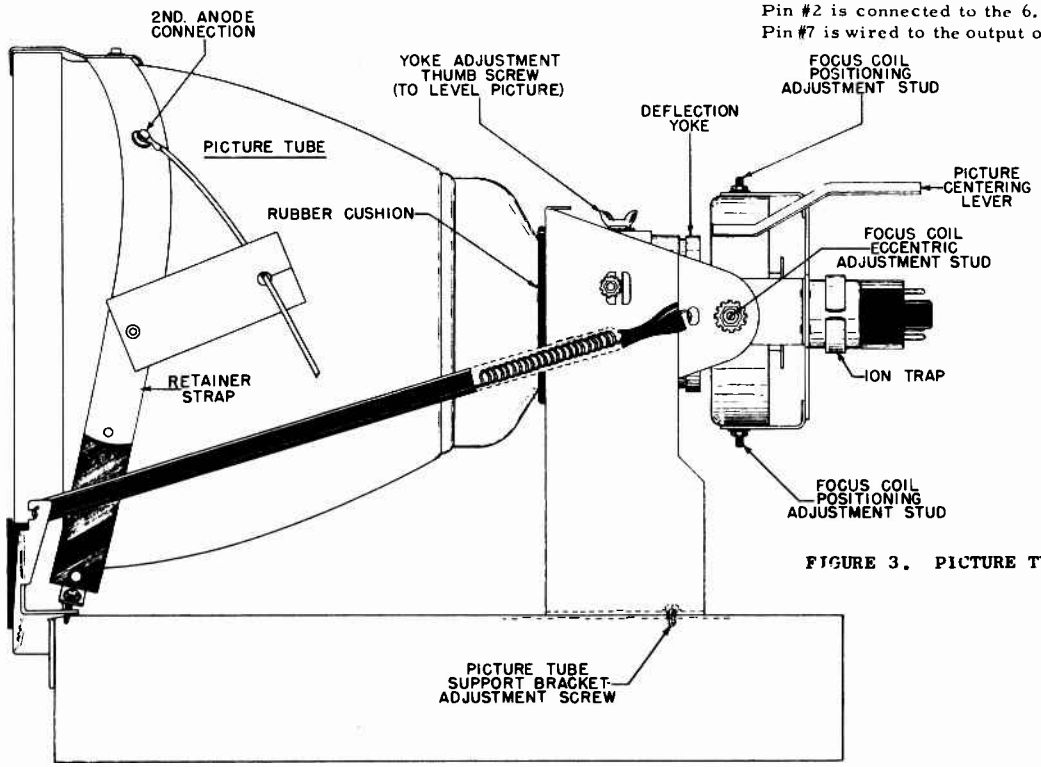
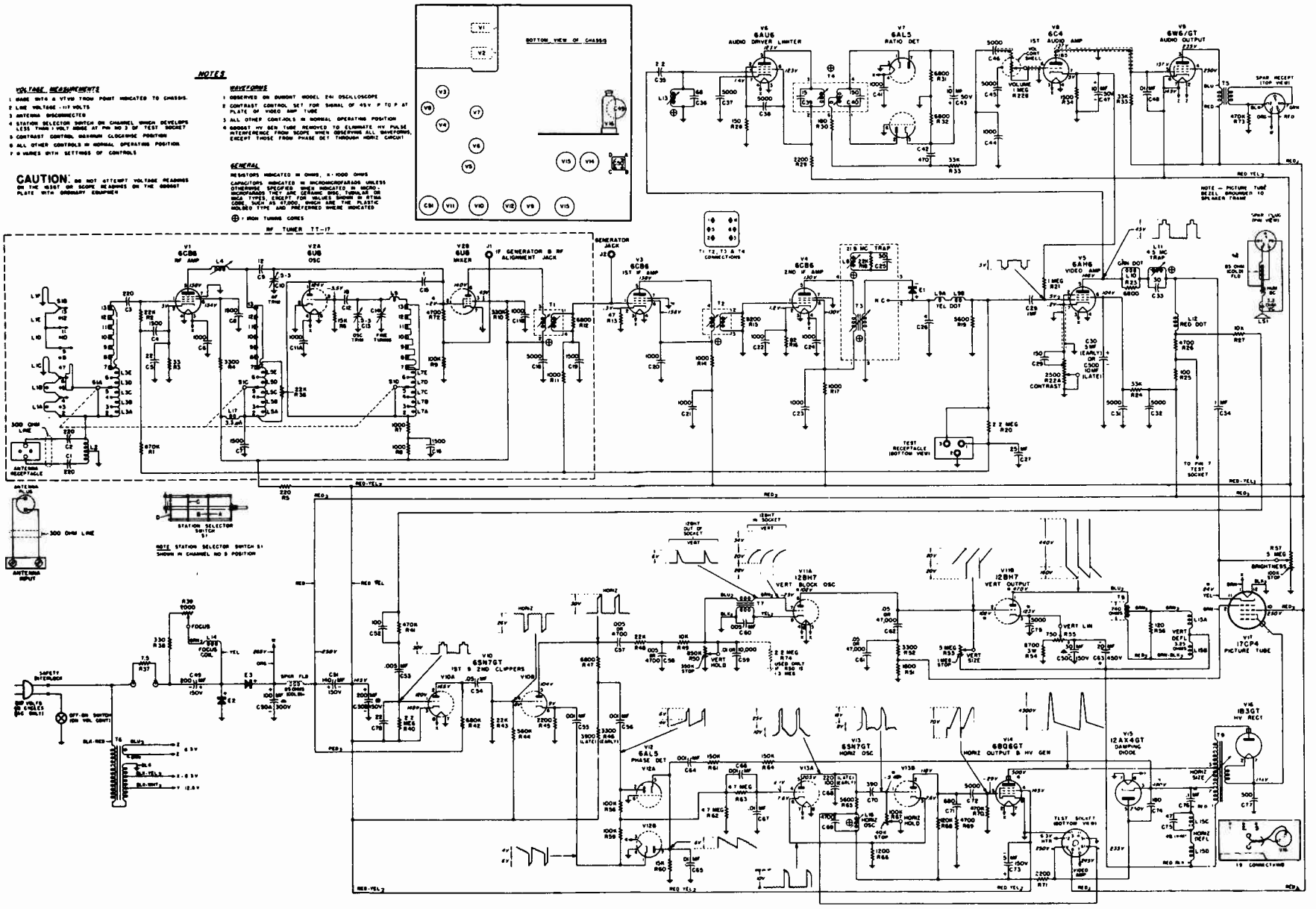


FIGURE 3. PICTURE TUBE ADJUSTMENT LOCATIONS

Motorola Television

Diagram of Chassis TS-236



Motorola Chassis TS-236, Models 17K8, 17K11, 17T5D, 17T6C, etc., continued.

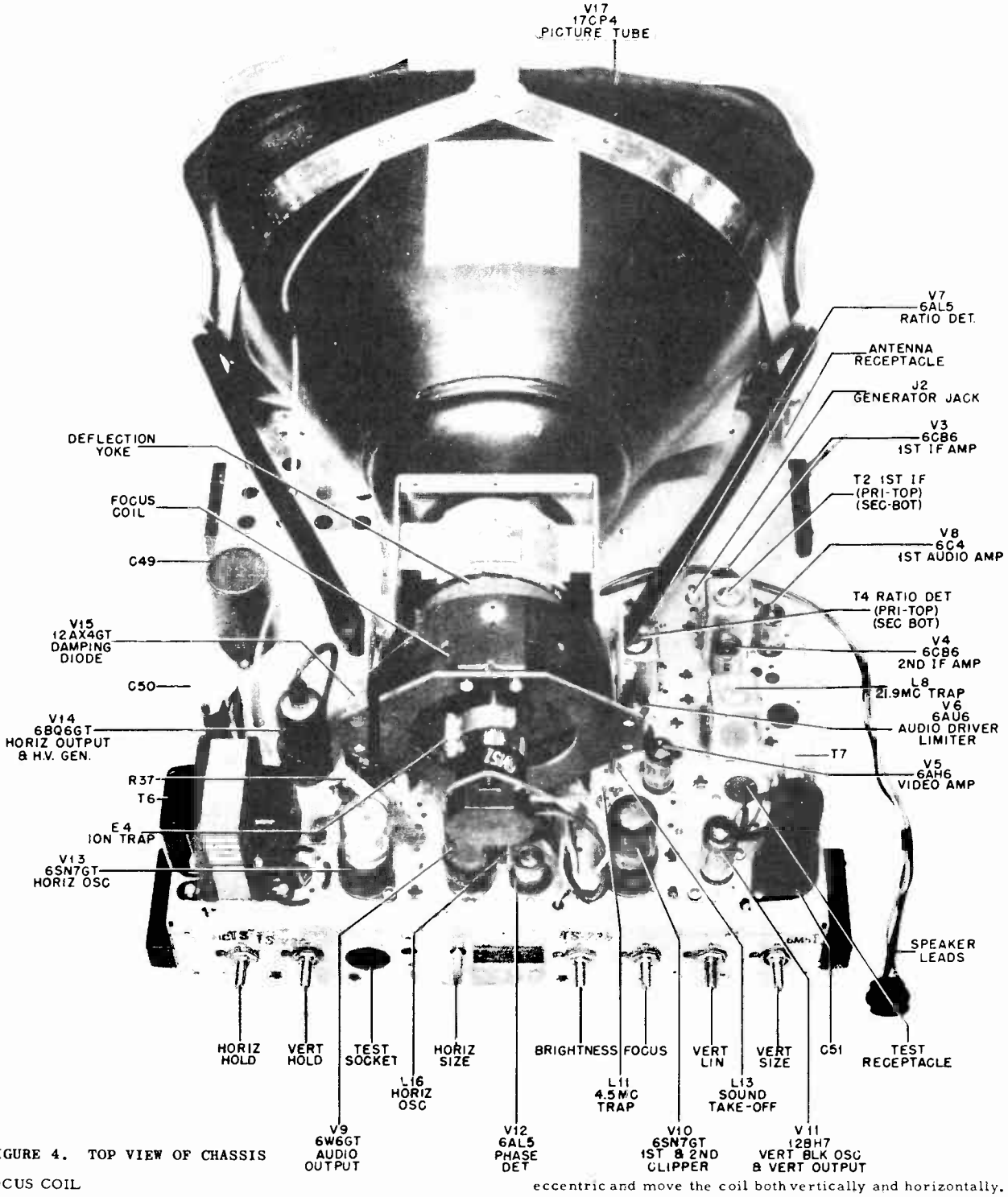


FIGURE 4. TOP VIEW OF CHASSIS

FOCUS COIL

The focus coil should be spaced 1/4" from the deflection yoke when it is parallel with the yoke, with its opening concentric with the neck of the tube. The position of the focus coil is changed by loosening the nuts on the top and bottom of the coil and sliding it forward or backward in the slotted brackets on the coil mounting plate. See Figure 3. The opening in the focus coil can be made concentric with the neck of the tube by loosening the nuts on the studs which support the focus coil mounting plate and turning the studs with a screwdriver in the slots provided. The studs are eccentric and move the coil both vertically and horizontally. They should be used only to center the neck of the tube in the opening of the coil.

TEST RECEPTACLE

A three-pin receptacle, accessible from the top of the chassis (see Figure 4), is provided for checking sensitivity and AGC voltage. The video detector load resistor is connected to pin #3, the AGC line is brought out to pin #1, and pin #2 is grounded.

Motorola Chassis TS-236, Models 17K8, 17K11, 17T5D, 17T6C, etc., continued.

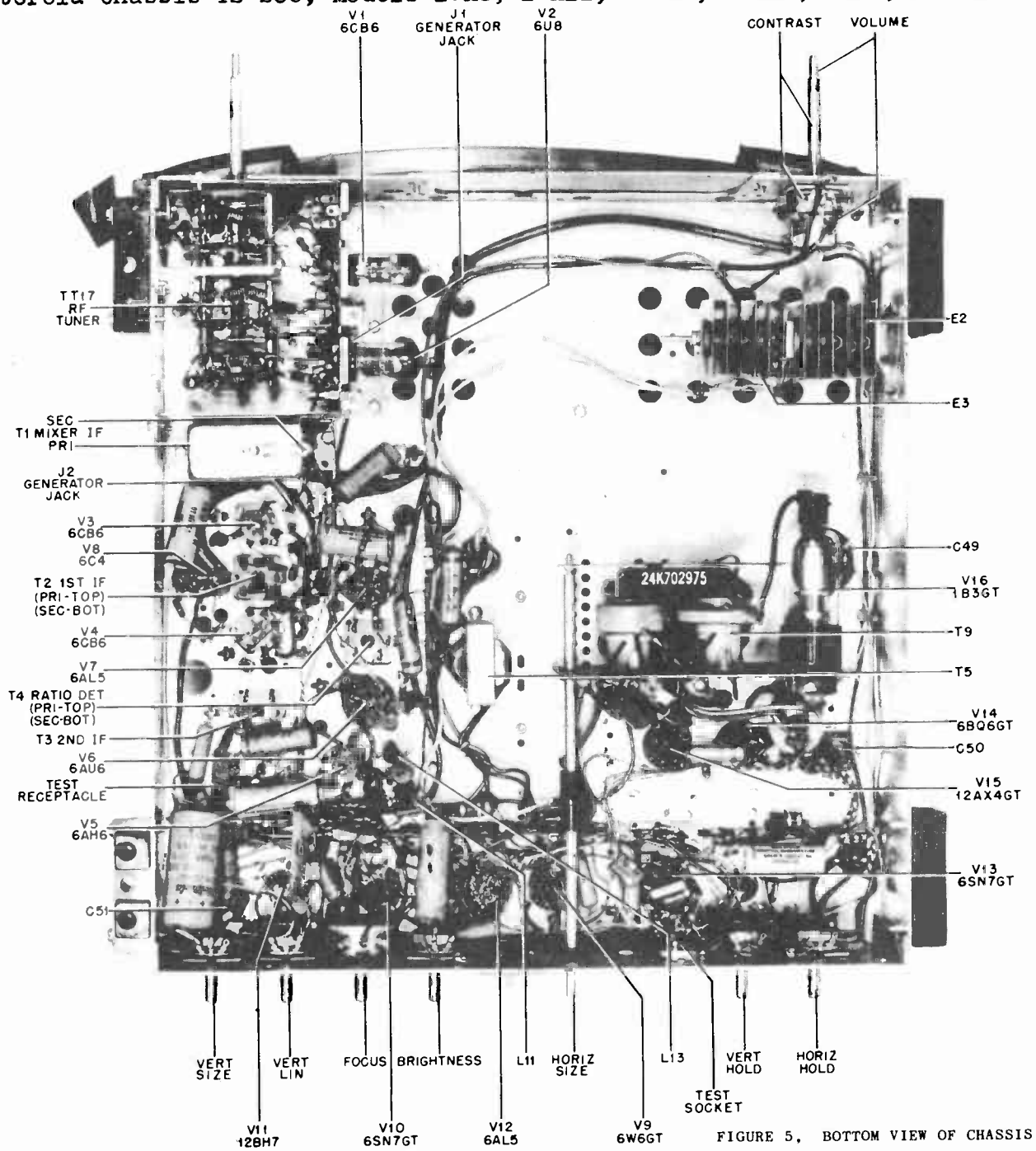


FIGURE 5, BOTTOM VIEW OF CHASSIS

ALIGNMENT

GENERAL

The chassis should be mounted on angle iron brackets (Motorola Part No. 7X700210) so that all connections and adjustments may be made easily.

Since the power cord circuit is broken by the interlock when the cabinet back is removed, it will be necessary to obtain an extra power cord with the female interlock receptacle in order to make a power connection to the receiver. Order Motorola Part No. 30B470756.

As one side of the power line is connected directly to the chassis, it is important that an isolation transformer be used between the receiver and the line when any test equipment is attached to the chassis. This precaution is especially important if grounded test equipment is used. NEVER GROUND THE RECEIVER CHASSIS DURING TESTING OPERATIONS OR INSTALLATION UNLESS AN ISOLATION TRANSFORMER IS USED.

Motorola Chassis TS-236, Models 17K8, 17K11, 17T5D, 17T6C, etc., continued.

ORDER OF ALIGNMENT

1. Audio Take-Off & Ratio Detector
2. 4.5 Mc Trap
3. IF & Mixer Transformers
4. Oscillator & RF Sections

AUDIO TAKE-OFF & RATIO DETECTOR ALIGNMENT

Equipment Required:

AM Signal Generator: (Optional)	Accurately calibrated at 4.5 mc Adjustable output
DC Meter:	Low range electronic voltmeter

Refer to Figures 3 & 4 for location of adjustments.

1. If possible, it is desirable to align the audio section from an actual station signal, since the 4.5 mc alignment frequency will be exact. To permit operation below the limiting level of the audio driver tube, for sharp alignment, the fine tuning trimmer should be turned off the station slightly.

2. If a signal generator is used, tune it accurately to 4.5 mc, and adjust the output to approximately 10,000 microvolts. Connect the high side of the signal generator through a 1000 mmf capacitor to the grid (pin 1) of the video amplifier tube V-5, and the low side to chassis. The following steps apply whether the station signal or signal generator is used.

3. From either side of electrolytic capacitor C-43 (10 mf) through a 10K ohm decoupling resistor, connect an electronic voltmeter to chassis.

4. Set CONTRAST control for maximum gain (fully clockwise).

5. Peak audio take-off coil L-13 for maximum reading on meter.

NOTE: As adjustments are brought to resonance, it is advisable to reduce the signal generator output to prevent overloading.

6. Peak ratio detector (T-4) primary (top core) for maximum reading on meter.

NOTE: Both the primary and secondary of the ratio detector transformer have two tuning points. Only one, with the cores at the outer end of the windings, is the proper point.

7. Move the meter and decoupling resistor from C-43 to the junction of R-33 (33K) and C-44 (1000 mmf).

8. Adjust T-4 secondary (bottom core) for zero response on the lowest scale of the meter. This corresponds to the cross-over point of the FM detector curve. If desired, the symmetry of the curve may be checked by tuning the signal generator 25 kc above and below 4.5 mc and noting the plus and minus voltage produced, reversing the meter connections, as necessary. For proper balance of the ratio detector system, the voltages in each direction should be approximately equal. If not, check the tuning of L-13 and both the primary and secondary of T-4, the ratio detector transformer. If necessary, replace the ratio detector tube V-7.

AUDIO SENSITIVITY MEASUREMENT

1. Connect the signal generator to the grid (pin 1) of V-5, the video amplifier tube, through a 1000 mmf capacitor.

2. Turn CONTRAST control fully clockwise.

3. Connect the electronic voltmeter from either side of electrolytic capacitor C-43, through a 10K ohm decoupling resistor, to chassis.

4. Set the generator at 4.5 mc.

5. With a 10,000 microvolt signal, the AVC voltage read on the meter should be greater than 5 volts.

4.5 MC TRAP ALIGNMENT

1. Connect the signal generator, through a 1000 mmf capacitor, to the grid (pin 1) of V-5, the video amplifier tube.

2. Connect the voltmeter and the germanium crystal detector, as shown in Figure 6, between the cathode of the picture tube (yellow lead) and chassis.

3. With the signal generator accurately set at 4.5 mc and maximum output, adjust trap L-11 for minimum reading on the lowest voltage scale of the meter.

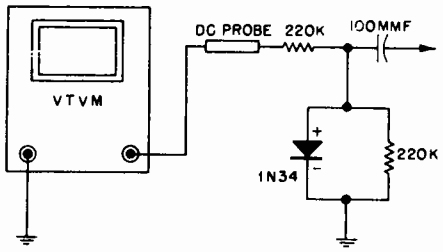


FIGURE 6. ELECTRONIC VOLTMETER CONNECTIONS

IF AMPLIFIER ALIGNMENT

Equipment Required:

IF Sweep Generator meeting the following requirements:

1. 18 to 30 mc, approximately 12 mc sweep width
2. Output constant and adjustable to at least 0.1 volt maximum.
3. Accurately calibrated, adjustable markers

Cathode Ray Oscilloscope - preferably one with a calibrated attenuator

NOTE: If there is no built-in marker in the sweep generator, loosely couple the output of an accurately calibrated AM signal generator to the IF strip. At all times, keep the marker output low enough to prevent the marker from distorting the response curve.

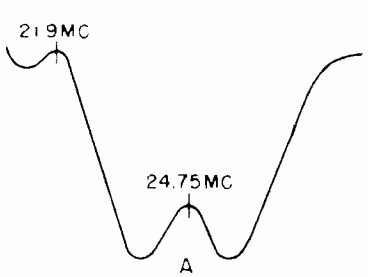
If a wide band scope is used, the marker will be more distinct if a capacitor of 100 to 1000 mmf is placed across the scope input. Use the smallest size possible, since too large a value will affect the shape of the curve.

Procedure:

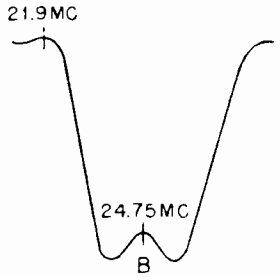
1. Replace the high voltage generator tube V-14 with an 80 ohm, 10W resistor connected between terminals 2 and 7 of the socket, to eliminate RF interference in the oscilloscope. The tube may also be replaced with a similar type which has all pins clipped off except the heaters.

2. By means of an external battery, apply a negative 3 volt bias, through a decoupling resistor of 47K ohms, to the AGC line, which is connected to pin #1 of the test receptacle. See Figure 4 for receptacle location.

Motorola Chassis TS-236, Models 17K8, 17K11, 17T5D, 17T6C, etc., continued.

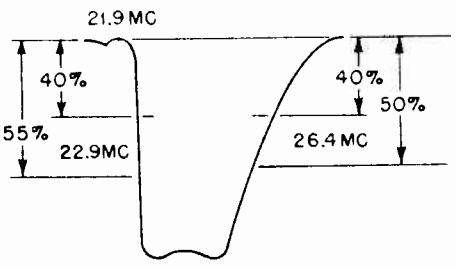


IF RESPONSE CURVE (DAMPED)



OVERALL RESPONSE CURVE FROM MIXER (DAMPED)

FIGURE 7. IF AND MIXER RESPONSE CURVES (DAMPED)



MARKERS TO FALL IN RANGES INDICATED.

FIGURE 8. OVERALL RESPONSE CURVES FROM MIXER

3. Connect an 820 ohm damping resistor across the primary winding of the 2nd IF transformer T-3 (across terminals 1 & 4 of the transformer).

4. Through a 47K ohm decoupling resistor, connect the oscilloscope across the video detector load resistor R-19 (5600), which may be reached from pin #3 of test receptacle. If a stronger output is required, connect the scope between picture tube cathode (yellow lead) and chassis. The curve seen at this position will be the reverse of the polarity shown in Figure 7.

5. Using leads as short as possible, connect the sweep generator, through a 1000 mmf capacitor, to jack J-2, feeding into the grid of the 1st IF tube V-3. See Figure 4. (Do not use the loose or "spraying" method of coupling). Set the generator center frequency to 24.6 mc, with a sweep deviation of 10 mc.

6. Tune the primary and secondary of the 1st IF transformer T-2 to a center frequency of 24.75 mc. See Figures 4 & 5 for core locations and Figure 7A for response curve.

NOTE: If a distorted or unstable curve is seen on the scope during alignment, it may be necessary to stop the oscillator by placing a shunt wire across the oscillator inductance (from position 2 to position 13 on the band switch).

CAUTION: A. Keep the signal input low, to prevent flattening the top of the curve, due to limiting in the video or scope amplifiers.

B. The dressing of plate and grid components in the IF circuit affects tuning. Do not move indiscriminately.

C. The resonance point of the IF transformers and trap will be found at two settings of the core. The correct setting is the one with the core at the outer end of the winding.

7. Tune trap L-8 for maximum attenuation on the curve at 21.9 mc, as in Figure 7A.

8. Move the generator to jack J-1, connected to the grid (pin 2) of the mixer tube V-2B. See Figure 5.

9. Tune the primary and secondary of the mixer IF transformer T-1 to a center frequency of 24.75 mc. See Figure 7B for response curve.

10. Remove the 820 ohm damping resistor from the 2nd IF transformer T-3. Adjust the core in T-3 until the response curve of Figure 8 is obtained.

BANDWIDTH

The IF bandwidth may be checked with an AM signal generator, if desired. Connect the generator, through a 1000 mmf capacitor, to jack J-1 in the grid circuit of the mixer tube V-2B, and an electronic voltmeter across the video detector load resistor R-19 (5600). Set the generator frequency to 24.6 mc, and adjust its output for a 1 volt reading on the meter. Double the output of the generator. Tune to both sides of 24.6 mc and note the frequencies at which the meter again reads 1 volt. These frequencies indicate the 6 db bandwidth points and should be 22.9 mc and 26.4 mc. By watching the meter while tuning slowly through the band, any serious peaks or holes in the response curve can be detected.

REGENERATION

After the mixer and IF stages have been aligned, a check for regeneration in the IF strip should be made as follows:

1. Remove the battery bias and observe the response curve on the scope as taken between the picture tube cathode (yellow lead) and chassis. The bandwidth may change with the bias removed, but should not change more than 0.2 mc.

If the bandwidth does change more than 0.2 mc, check the cathode resistors or change tubes.

2. Set the contrast control at maximum gain (fully clockwise).

3. Decrease the generator input until the output signal shows a marked decrease.

4. Any regeneration present will be indicated by sharp peaks on the overall response curve.

NOTE: The oscillator should be stopped, as described above, during this procedure.

MIXER & IF SENSITIVITY MEASUREMENTS

1. Connect an AM signal generator, set at 24.6 mc, to the grid (pin 2) of the mixer tube V-2B through a capacitor of 1000 mmf

2. Remove the battery bias from the AGC line.

3. Put the oscillator back into the circuit.

4. Connect the electronic voltmeter, through a decoupling resistor of 100K ohms, across the video detector load resistor R-19 (5600).

5. Turn the station selector switch to the low channel position which gives the lowest noise reading on the meter.

6. The signal required to produce 1 volt on the voltmeter should be less than 250 microvolts.

Motorola Chassis TS-236, Models 17K8, 17K11, 17T5D, 17T6C, etc., continued.

ANTENNA, RF, & OSCILLATOR COIL ALIGNMENT

NOTE: The IF circuits must be aligned before the oscillator section can be properly phased.

Equipment Required:

Sweep Generator having:

1. Frequency range 40-220 mc
2. 10 mf sweep width
3. Output constant and adjustable
4. Adjustable markers (markers should be calibrated occasionally by checking against an accurate signal generator).

Oscilloscope: Preferably one with a calibrated input attenuator.

AM Signal Generator having:

1. Frequency range 40-220 mc
2. Accurate frequency and attenuator calibration
3. 400 cycle, AM modulation

FREQUENCY CHART

Chan	Frequency	Picture	Sound	Oscillator
2	54-60	55.25	59.75	81.65
3	60-66	61.25	65.75	87.65
4	66-72	67.25	71.75	93.65
5	76-82	77.25	81.75	103.65
6	82-88	83.25	87.75	109.65
7	174-180	175.25	179.75	201.65
8	180-186	181.25	185.75	207.65
9	186-192	187.25	191.75	213.65
10	192-198	193.25	197.75	219.65
11	198-204	199.25	203.75	225.65
12	204-210	205.25	209.75	231.65
13	210-216	211.25	215.75	237.65

ANTENNA & RF ALIGNMENT PROCEDURE

1. Remove the high voltage generator tube V-14, to eliminate RF interference in the oscilloscope.

2. Remove the antenna lead-in from the chassis, and connect the sweep generator to the antenna receptacle. Keep the leads from the generator to the socket short. Use internal markers or an accurately calibrated external signal generator for markers.

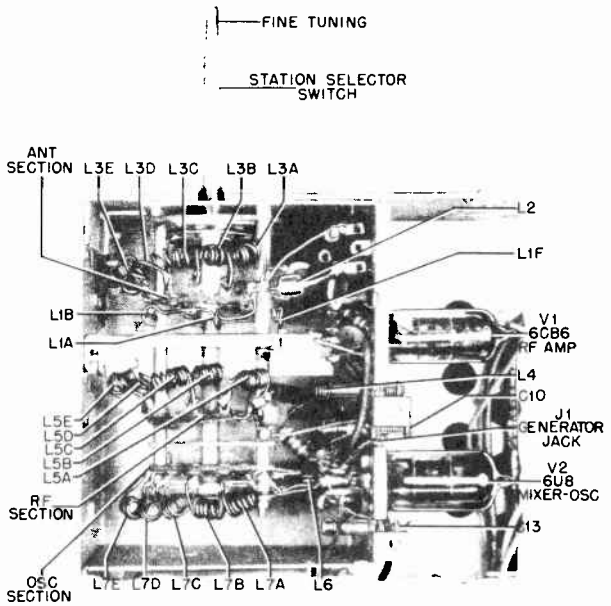


FIGURE 9. ANTENNA, RF, AND OSCILLATOR COIL LOCATIONS

3. Connect the oscilloscope, through a decoupling resistor of 47K ohms, to jack J-1, in the grid circuit of the mixer tube V-2B. See Figure 9.

4. Short the AGC line to chassis (ground pin #1 of test receptacle).

5. Stop the oscillator by placing a shunt wire across the oscillator inductance (from position 2 to position 13 on the band switch).

6. Refer to Figure 9 for the location of the trimmers and coils. The chart listed above gives the picture and sound carrier frequencies.

7. The antenna coils are tuned to the video carrier frequency and the RF coils are tuned to the sound carriers. Figure 10 shows the shape of the curve which should appear on the oscilloscope.

8. Set the screw, in channel 13 RF coil L-4, midway in the coil.

9. Turn the station selector switch to channel 7. Set the center frequency of the sweep generator to the center frequency of channel 7 (177 mc).

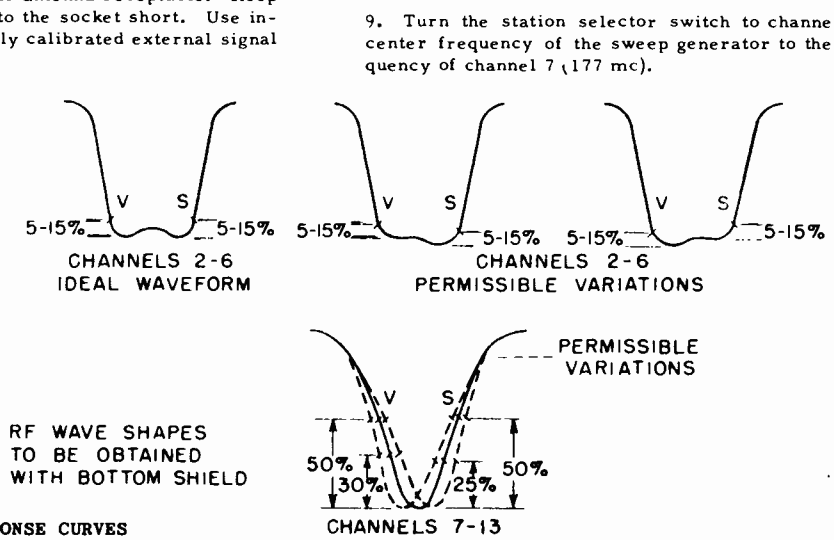


FIGURE 10. RF RESPONSE CURVES

Motorola Chassis TS-236, Models 17K8, 17K11, 17T5D, 17T6C, etc., continued.

10. Adjust ceramic trimmer C-10, so that the video and sound markers appear on the response curve within the limits shown in Figure 10.

11. Move the station selector switch to channel 13, and set the generator to the center frequency of the channel (213 mc). Adjust the screw in coil L-4 for the proper response on channel 13 (see Figure 10).

12. Recheck channel 7 for proper response. Readjust trimmer C-10, if necessary.

13. Check channels 13 through 7 and compare with curves in Figure 10. The peak of the curves may be sharpened or broadened by changing the position of the grounded end of the high frequency matching bus L-1F. It should be approximately 3/16" from the switch shield. For minor adjustments, bend the bus to increase or decrease the amount of wire extending through the switch shield. Note the response curve.

NOTE: If the response is checked with the cover on the tuner, the picture marker will move up the left side of the curve a short distance, but the markers should be within tolerance.

14. Move the station selector switch to channel 6 and set the generator to the center frequency of the channel (85 mc).

15. Compress or spread the channel 6 antenna coil L-1C and RF coil L-5E to obtain the proper response. See Figure 9 for coil locations and Figure 10 for response curve. The antenna coil affects the video carrier and the RF coil affects the sound carrier.

16. Align channels 5 through 2, in that order, in the same manner as channel 6. As the coils are in series, the proper phasing of channel 6 will simplify the alignment of the lower channels.

CAUTION: Make certain the bandswitch is on the correct channel before checking bandpass.

OSCILLATOR ADJUSTMENT

1. Put the oscillator back into the circuit.

2. Connect the oscilloscope, through a 47K ohm resistor, across the video detector load resistor R-19 (5600), which may be reached from pin #3 of the test receptacle.

3. Ground the AGC line.

4. Refer to Figure 9 for the locations of the trimmers and coils. The sound carrier frequencies may be obtained from the chart above.

5. Set the fine tuning trimmer to mid-capacity.

6. Turn the station selector switch to channel 10.

7. Set the sweep generator to channel 10, with a center frequency of 195 mc. Keep the output low enough to show no evidence of limiting in the overall response curve.

NOTE: The curve should be substantially that of the mixer, as in Figure 8. Any consistent tilting of the response curve indicates that the mixer and IF stages are not properly aligned.

8. Introduce a marker corresponding to the sound carrier of channel 10 (197.75 mc). Keep marker signal as low as possible.

9. Adjust the oscillator trimmer C-13 to place the sound marker slightly higher in frequency than the 21.9 mc trap dip. This allowance must be made for the shift caused by the bottom shield being off. When the shield is replaced, the sound marker will move down into the trap dip. The picture marker will then be approximately one-fourth to one-half down from the base line on the opposite side of the curve.

10. Check channels 7 through 13, noting whether the sound marker falls just above the trap dip, with the fine tuning trimmer within 30 degrees of mid-capacity. (Each number on the station selector switch knob represents 30 degrees).

11. If more than a 30 degree change in the fine tuning trimmer was needed in step 10, adjust the channel 13 oscillator coil L-6 by spreading or compressing the turns. If L-6 is is adjusted, it may be necessary to readjust trimmer C-13 on channel 10. Coil L-6 has more effect on channels 10 to 13 than on channels 7 to 9.

12. Turn the station selector switch to channel 6, and set the sweep generator center frequency to 85 mc.

13. Set the fine tuning trimmer to mid-capacity.

14. Introduce a marker corresponding to the sound carrier of channel 6 (87.75 mc).

15. Compress or spread the channel 6 oscillator coil L-7E until the sound marker is placed just above the dip in the 21.9 mc trap.

16. Align channels 5 through 2, in that order, in the same manner as channel 6, so that the sound marker falls just above the trap dip, with the fine tuning trimmer within 15 degrees of mid-capacity.

NOTE: Since the oscillator coils are in series, it is necessary to adjust the high channel coils first, before proceeding to a lower channel.

OVERALL SENSITIVITY MEASUREMENTS

An overall measurement of sensitivity is made as follows:

1. Connect an AM signal generator to the antenna receptacle on the receiver chassis, matching the generator to the receiver with a resistor network. In the case of a generator with a 50 ohm output impedance, insert a 100 ohm resistor in series with the output terminal, and a 150 ohm resistor in series with the ground terminal.

2. From the cathode of the picture tube (yellow lead) to chassis, connect a calibrated oscilloscope. NOTE: To calibrate scope, connect it across the 6.3 volt filament supply. The peak-to-peak amplitude on the screen will then be approximately 18V (6.3 x 2.8).

3. Short out the AGC line to chassis (ground pin #1 of the test receptacle).

4. Set the contrast control for maximum sensitivity (fully clockwise).

5. Set the signal generator for 30% modulation at 400 cycles, tune it to the mid-carrier frequency of the channel being checked, and rotate the fine tuning trimmer for maximum output.

6. The generator signal necessary to produce 20 volts peak-to-peak on the scope should be less than:

a) 35 microvolts for channels 2 through 6
b) 100 microvolts for channels 7 through 13

Motorola Television

CHASSIS
TS-216
MODELS
14T4
14T4B

The circuit diagram of Chassis TS-216, used in Models 14T4 and 14T4B, is shown on the next page. Chassis TS-314, used in Models 17T5E, 17T6G, and 17K10E, is the same as TS-216, but uses a 17" picture tube. Chassis TS-314A is the same as TS-314, but has an additional I.F. stage. Chassis TS-315, table Model 17T5F, is the same, but uses a 17" metal picture tube. Model 14P1B is a portable using Chassis TS-216. For carrying out alignment work on any of these sets, you may refer to the full alignment information presented under Chassis TS-236, in the previous Motorola section. The procedure is exactly the same.

SERVICE ADJUSTMENTS

FOCUS CONTROL

Adjust FOCUS control until the fine horizontal line structure of the raster is visible over the picture area. The control should be turned through the correct point several times until optimum focus is obtained.

CENTERING

Center the picture in its mask in the following manner:

1. Place the two arms, on the magnetic centering device, together.

2. Center the picture horizontally with the HORIZONTAL CENTERING control, on the back of the chassis. If the control comes within 1/4 rotation of either end of its range, move both arms of the centering device simultaneously until the picture is centered horizontally and the range of the control is adequate. It will be helpful, during centering, if the picture size is reduced until all four edges are visible. CAUTION: Do not center the raster - use a picture on the screen only.

3. Separate the two arms until the picture is centered vertically. NOTE: The two magnets interact, and adjusting one may necessitate readjusting the other.

4. Make a final adjustment of horizontal centering with the HORIZONTAL CENTERING control.

VERTICAL SIZE AND VERTICAL LINEARITY

Adjust the VERTICAL SIZE control until the picture fills the mask vertically. Adjust the VERTICAL LINEARITY control for best overall vertical linearity. Adjustment of the VERTICAL SIZE control will require a readjustment of the VERTICAL LINEARITY control and possibly of the VERTICAL HOLD control.

HORIZONTAL SIZE

Adjust the HORIZONTAL SIZE control until the picture fills the mask horizontally. As this control also affects vertical size, it may be necessary to readjust the VERTICAL SIZE control.

HORIZONTAL HOLD ADJUSTMENT

The HORIZONTAL HOLD control should have a sync range of approximately 180°. If the control is too critical, adjust as follows:

1. Short out HORIZONTAL OSCILLATOR coil L-16. This may be done with the chassis in the cabinet by shorting pins 1 and 6 of the test socket on the rear edge of the chassis.

2. With HORIZONTAL CENTERING control, move the picture to the left so that the right edge of the raster can be seen. Adjust the HORIZONTAL HOLD control to about the middle of its range and note the width of the blanking pulse. (The blanking pulse appears as a gray bar at the right edge of the raster).

3. Remove short from HORIZONTAL OSCILLATOR coil.

4. Adjust HORIZONTAL OSCILLATOR coil until the same amount of blanking pulse can be seen as was noted in step 2.

VERTICAL HOLD

Adjust the VERTICAL HOLD control for the center of the vertical sync lock-in range.

BRIGHTNESS

Adjust the BRIGHTNESS control, in combination with the CONTRAST control, for the most pleasing picture. Keep the brilliance as low as possible, to protect the fluorescent screen of the picture tube and to prevent poor picture detail.

ADJUSTMENT OF THE ION TRAP

Under conditions of rough shipment, it is possible for the ion trap to become misaligned. To prevent serious damage to the picture tube, the following method of adjustment should be used.

Place the magnet on the neck of the tube so that it is positioned over the internal pole pieces on the gun structure. With the BRIGHTNESS control at low intensity, move the magnet a short distance forward and backward, at the same time rotating it, to obtain the brightest raster. If, in obtaining the brightest raster, the ion trap magnet has to be moved more than 1/4" from the gun pole pieces, the magnet is probably weak and should be replaced. Never correct for a shadowed raster with the ion trap magnet if such correction results in decreased brightness. The ion trap is always adjusted for maximum brightness and, if shadows occur at this setting, they should be eliminated by adjusting the magnetic centering device on the neck of the tube.

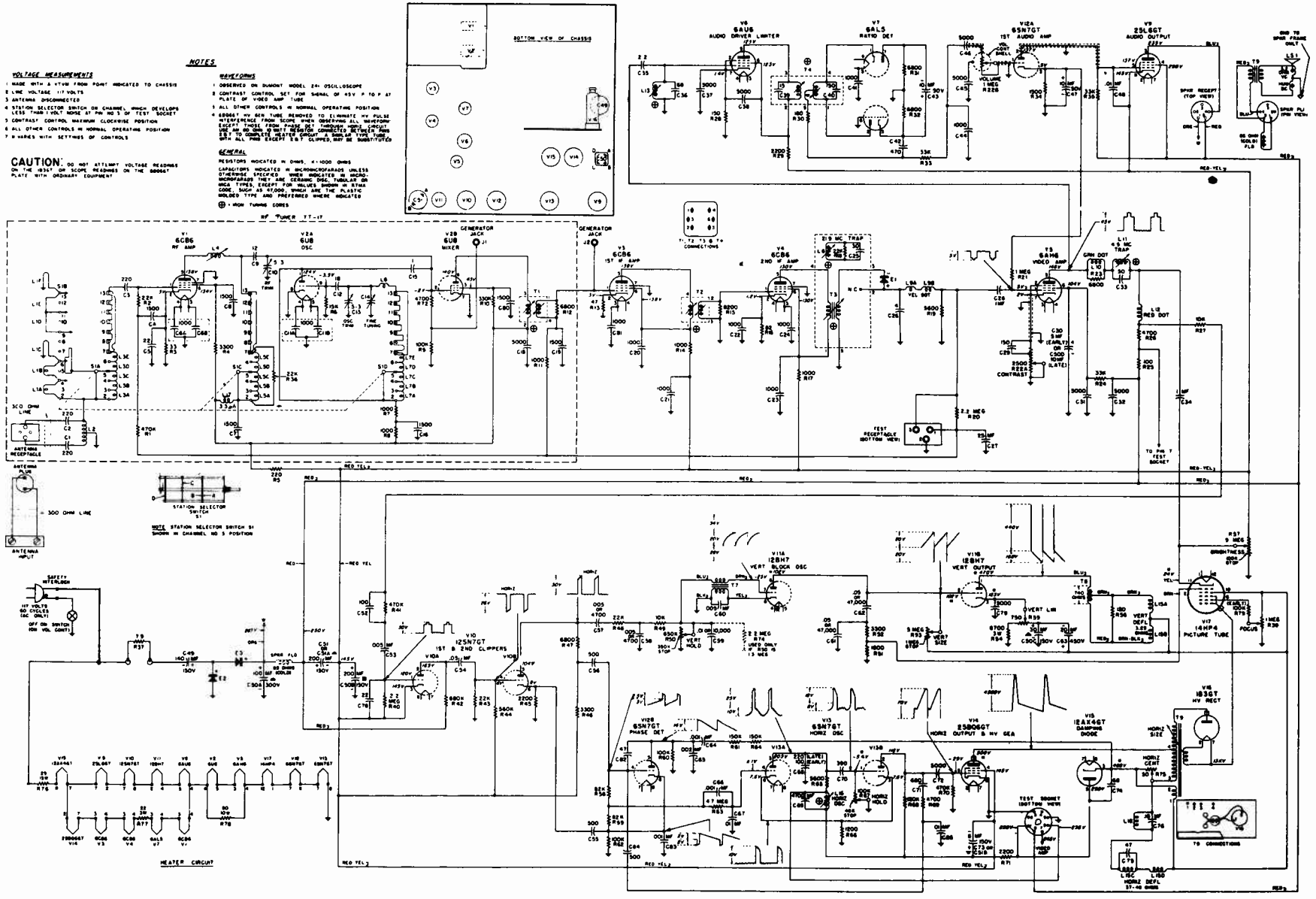
CAUTION: Keep the brightness control at low intensity until the ion trap is properly set.

DEFLECTION YOKE ADJUSTMENT

If the deflection yoke shifts, the picture will be tilted. To correct, loosen the thumbscrew on top of the deflection yoke and rotate yoke until the picture is straight. Before tightening the thumbscrew, make certain that the deflection yoke is as far forward as possible.

Motorola Television

Diagram of Chassis TS-216

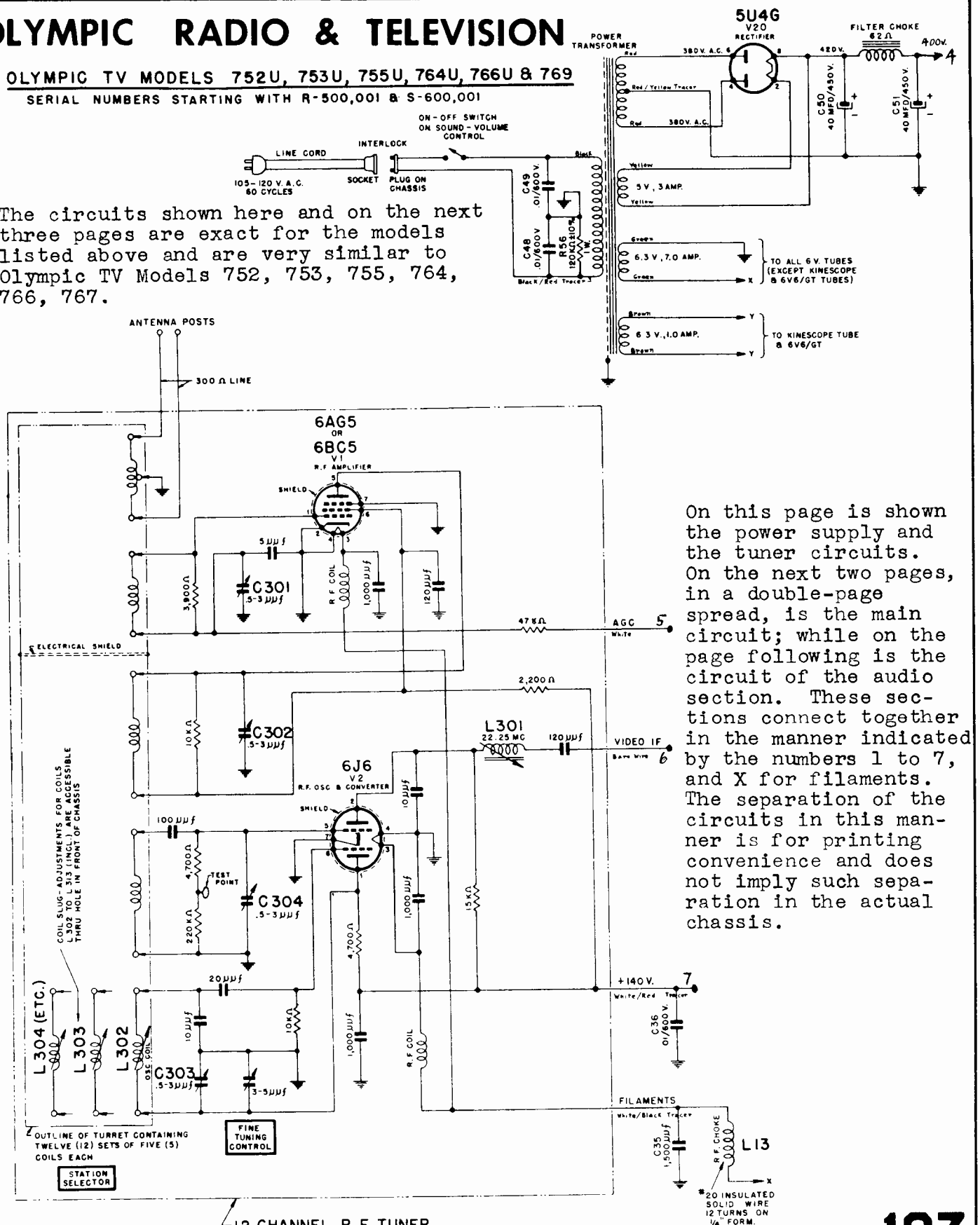


OLYMPIC RADIO & TELEVISION

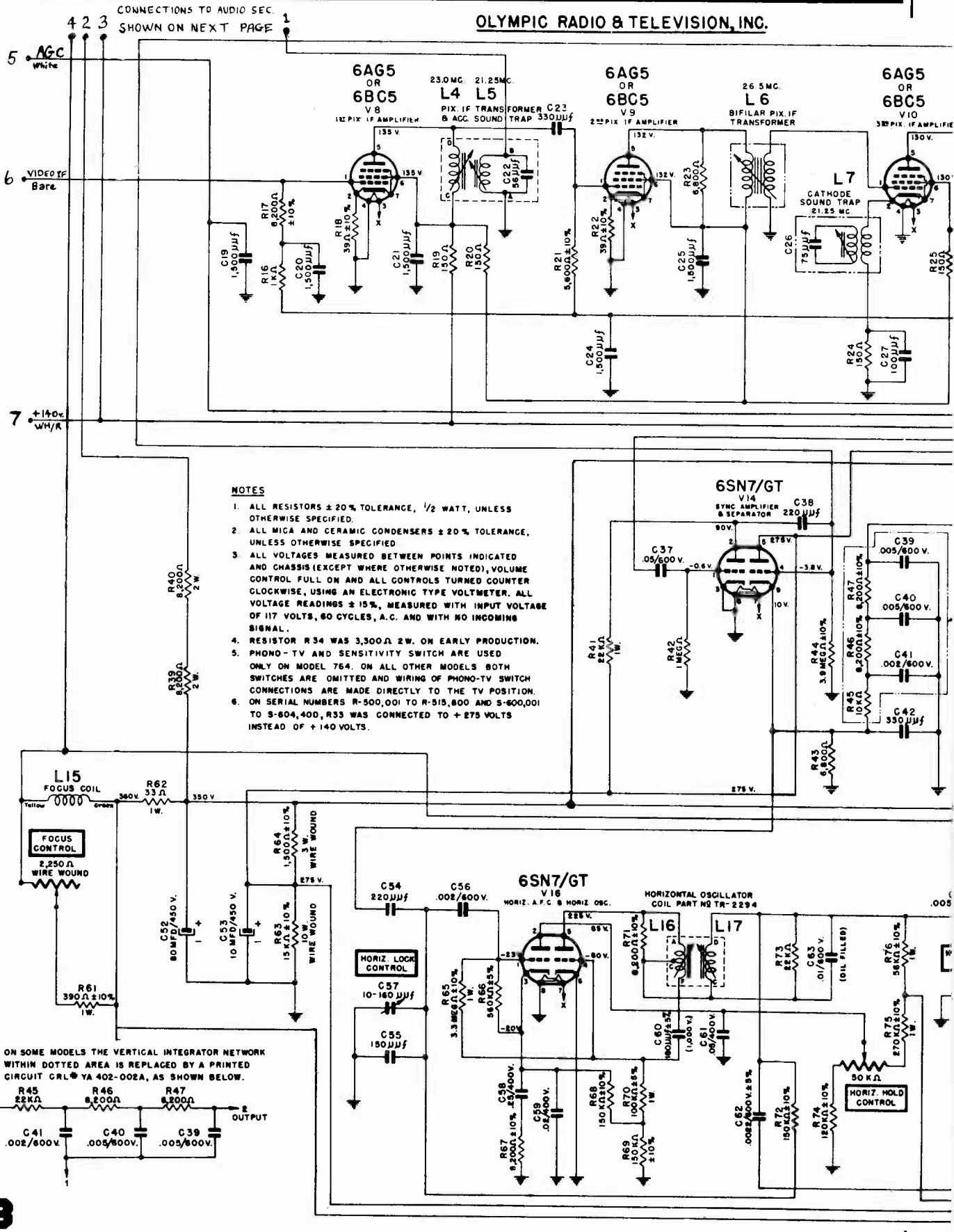
OLYMPIC TV MODELS 752U, 753U, 755U, 764U, 766U & 769

SERIAL NUMBERS STARTING WITH R-500,001 & S-600,001

The circuits shown here and on the next three pages are exact for the models listed above and are very similar to Olympic TV Models 752, 753, 755, 764, 766, 767.

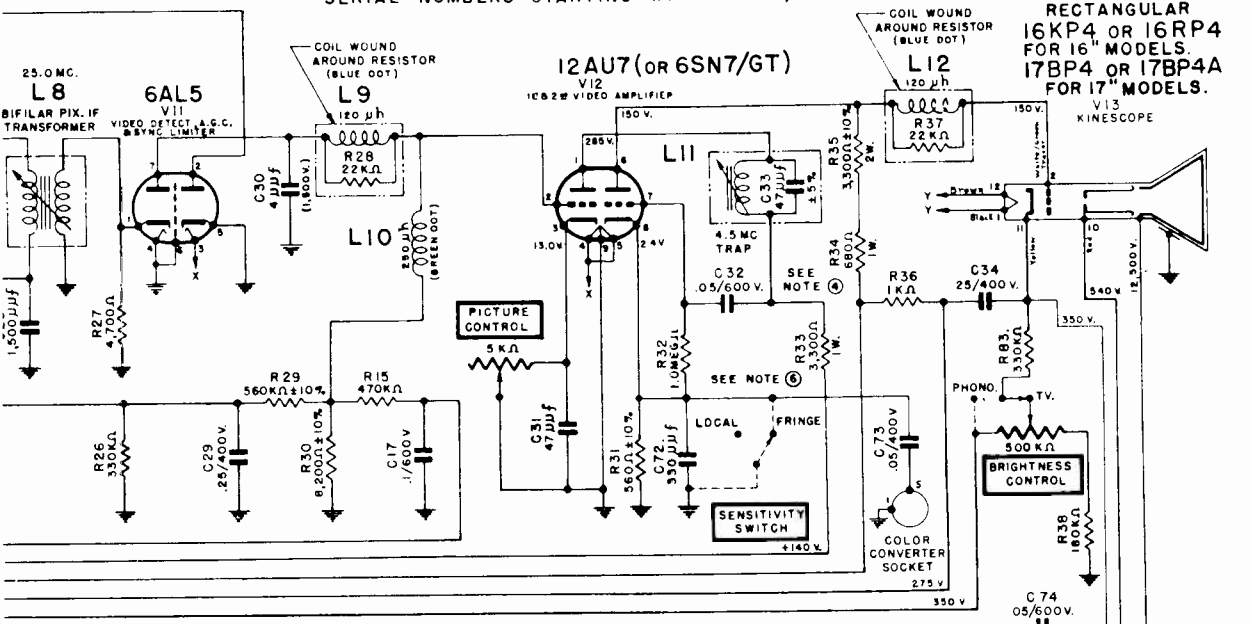


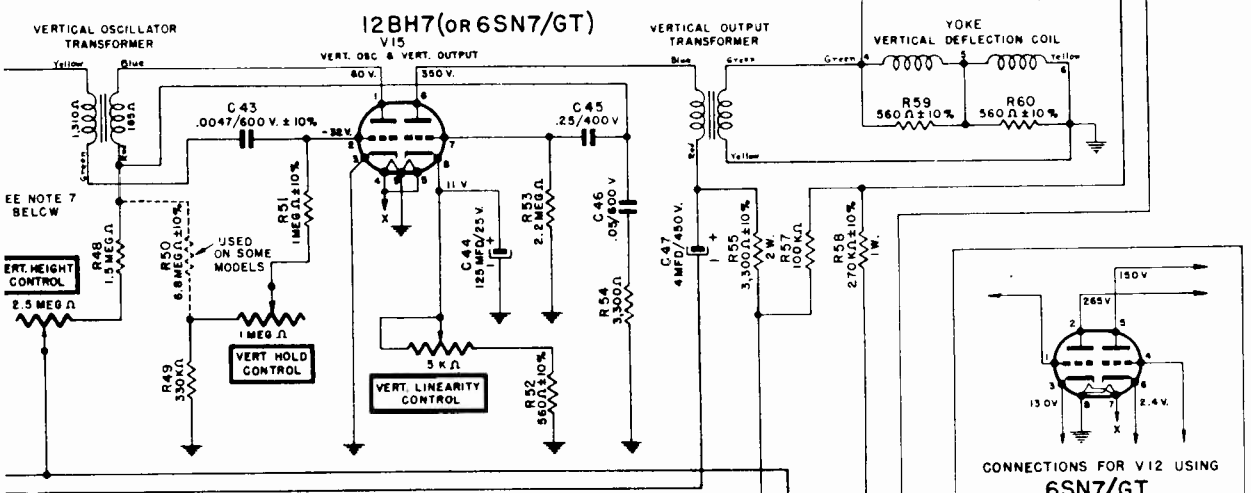
On this page is shown the power supply and the tuner circuits. On the next two pages, in a double-page spread, is the main circuit; while on the page following is the circuit of the audio section. These sections connect together in the manner indicated by the numbers 1 to 7, and X for filaments. The separation of the circuits in this manner is for printing convenience and does not imply such separation in the actual chassis.

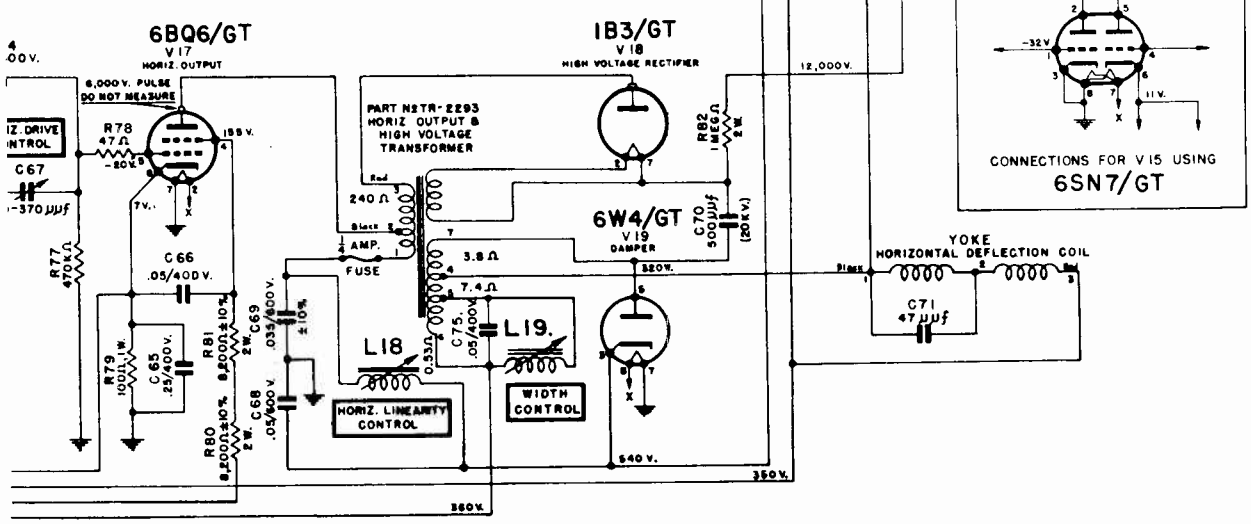

OLYMPIC RADIO & TELEVISION, INC.
CONNECTIONS TO AUDIO SEC. SHOWN ON NEXT PAGE
4 2 3 1
5 AGC White
6 VIDEO IF Bare
7 +140v WH/R
6AG5 OR 6BC5 V8 1ST PIX. IF AMPLIFIER
23.0 MC. 21.25 MC. L4 L5 PIX. IF TRANSFORMER & AGC. SOUND TRAP
C23 330 µµf
6AG5 OR 6BC5 V9 2ND PIX. IF AMPLIFIER
26.5 MC. L6 BIFILAR PIX. IF TRANSFORMER
6AG5 OR 6BC5 V10 3RD PIX. IF AMPLIFIER
L7 CATHODE SOUND TRAP 21.25 MC.
C19 1,500 µµf
R16 1KΩ
R17 8,200Ω ±10%
C20 1,500 µµf
R18 39Ω ±10%
C21 1,500 µµf
R19 150Ω
R20 150Ω
C22 56 µµf
R21 5,600Ω ±10%
C24 1,500 µµf
R22 39Ω ±10%
R23 6,800Ω
C25 1,800 µµf
C26 75 µµf
R24 150Ω
C27 100 µµf
R25 150Ω
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 (EXCEPT WHERE OTHERWISE NOTED), VOLUME CONTROL FULL ON AND ALL CONTROLS TURNED COUNTER CLOCKWISE, USING AN ELECTRONIC TYPE VOLTMETER. ALL VOLTAGE READINGS ± 15%, MEASURED WITH INPUT VOLTAGE OF 117 VOLTS, 60 CYCLES, A.C. AND WITH NO INCOMING SIGNAL.
4. RESISTOR R 34 WAS 3,300 Ω 2W. ON EARLY PRODUCTION.
5. PHONO-TV AND SENSITIVITY SWITCH ARE USED ONLY ON MODEL 764. ON ALL OTHER MODELS BOTH SWITCHES ARE OMITTED AND WIRING OF PHONO-TV SWITCH CONNECTIONS ARE MADE DIRECTLY TO THE TV POSITION.
6. ON SERIAL NUMBERS R-500,001 TO R-515,800 AND S-600,001 TO S-604,400, R33 WAS CONNECTED TO + 275 VOLTS INSTEAD OF + 140 VOLTS.
6SN7/GT V14 SYNC AMPLIFIER & SEPARATOR
C38 220 µµf
C37 .05/600 V.
R40 8,200Ω 2W.
R39 8,200Ω 2W.
R41 22 KΩ 1W.
R42 1 MEGΩ
R44 3.9 MEGΩ ±10%
C39 .005/600 V.
R47 8,200Ω ±10%
C40 .005/600 V.
R46 8,200Ω ±10%
C41 .002/600 V.
R45 10 KΩ
C42 330 µµf
R43 6,800Ω
L15 FOCUS COIL
R62 33Ω 1W.
FOCUS CONTROL 2,250Ω WIRE WOUND
R64 1,500Ω ±10% 3W WIRE WOUND
C52 80 MFD/450 V.
C53 10 MFD/450 V.
R63 15 KΩ ±10% 10W WIRE WOUND
R61 390Ω ±10% 1W.
C54 220 µµf
C56 .002/600 V.
6SN7/GT V16 HORIZ. A.F.C. & HORIZ. OSC.
HORIZONTAL OSCILLATOR COIL PART Nº TR-2294
L16 L17
HORIZ. LOCK CONTROL
C57 10-160 µµf
C55 150 µµf
R65 3.3 MEGΩ ±10% 1W
R66 560KΩ ±5%
R71 8,200Ω ±10%
R73 22 KΩ
C63 .01/600 V. (OIL FILLED)
R76 56 KΩ ±10% 1W.
C60 400 µµf ±5% (1,000 V.)
C61 .05/400 V.
R75 270 KΩ ±10% 1W.
50 KΩ HORIZ. HOLD CONTROL
C58 .05/400 V.
C59 .02/400 V.
R68 130 KΩ ±10%
R70 100 KΩ ±5% 1W.
R67 8,200Ω ±10%
R69 130 KΩ ±10%
C62 .002/400 V. ±5%
R72 150 KΩ ±10%
R74 120 KΩ ±10%
NOTE 7: ON SOME MODELS THE VERTICAL INTEGRATOR NETWORK WITHIN DOTTED AREA IS REPLACED BY A PRINTED CIRCUIT CRL® YA 402-002A, AS SHOWN BELOW.
3 INPUT
R45 22 KΩ
R46 8,200Ω
R47 8,200Ω
2 OUTPUT
C41 .002/600 V.
C40 .005/600 V.
C39 .005/600 V.
1

OLYMPIC TV MODELS 752U, 753U, 755U, 764U, 766U & 769

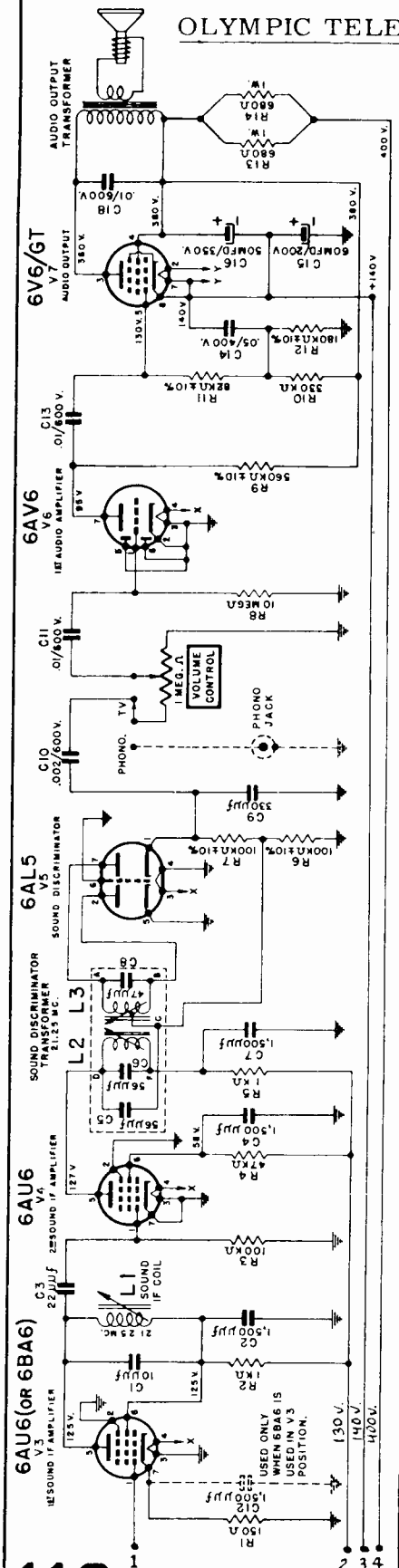
SERIAL NUMBERS STARTING WITH R-500,001 & S-600,001

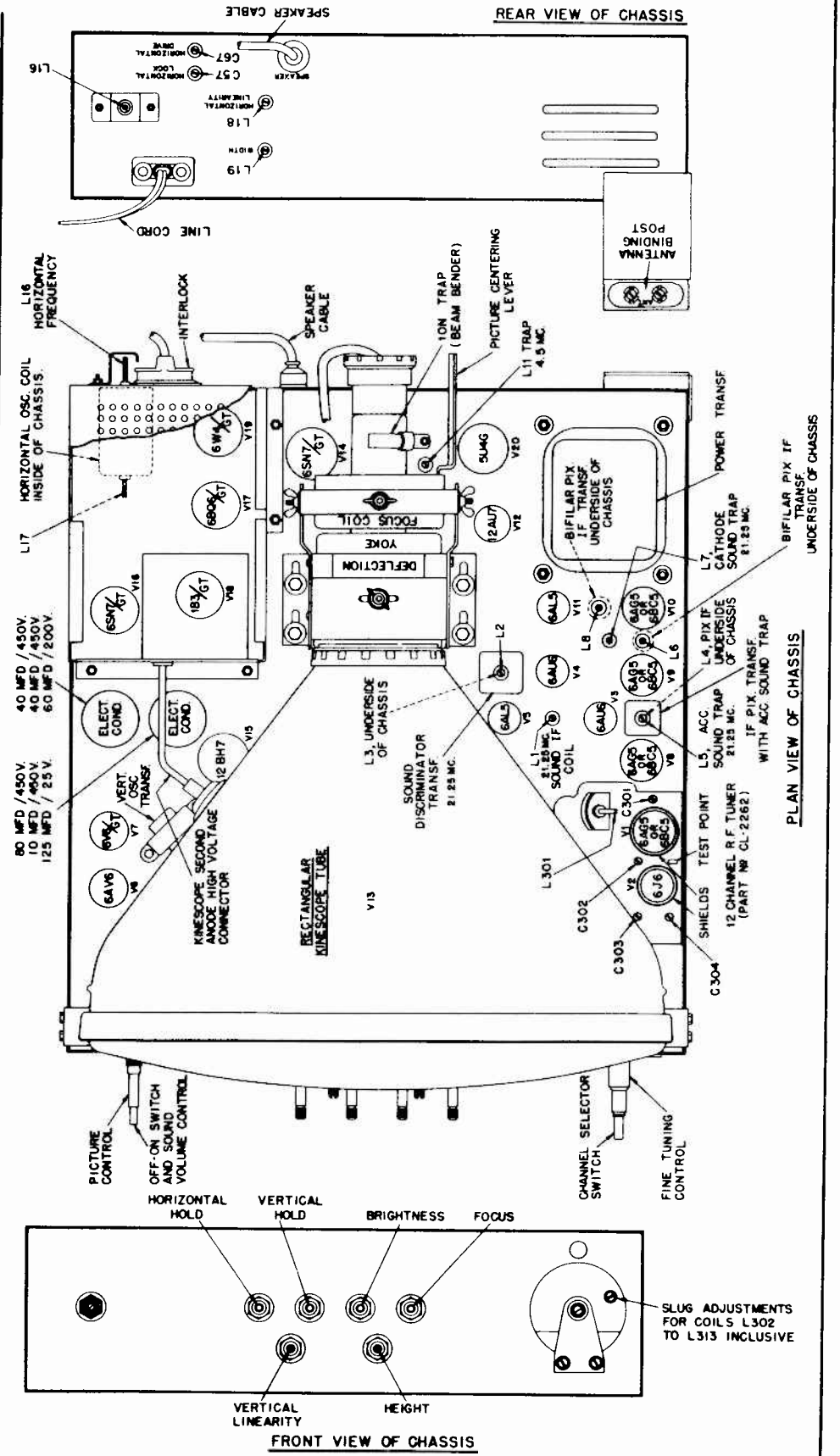






OLYMPIC TELEVISION RECEIVERS MODELS 752, 753, 755, 764, 766, 767 & 769





PHILCO CORPORATION

Various Philco models of this period were made in the form of dual chassis. The Deflection Chassis employed contained power and sync. circuits, while the R.F. Chassis contained the balance of circuits. Some models were changed from one type of chassis to another during production and are so listed in the table below.

To find the service material you need, first look up below the model number of the set you are servicing, and find out what R.F. and Deflection Chassis are used.

Philco Model No.	R.F. Chassis	Deflection Chassis
52-T1610, 52-T1612	33 or 32	C1
52-T1802, 52-T1804, 52-T1808, 52-T1831, 52-T1839, 52-T1840, 52-T1841	33	C2
52-T1810, 52-T1812, 52-T1842, 52-T1844	33 or 37	C2
52-T1882	35 or 38	CP1
52-T2106, 52-T2108, 52-T2144	41	D1
52-T2110	41, 35, or 38	D1 or F2
52-T2140	41	D4
52-T2142	35 or 38	F2
52-T2145, 52-T2182, 52-T2245, 52-T2282	44	D4

After having looked up what R.F. and Deflection Chassis are used, see the list below for reference to pages in this manual where this information is presented.

R.F. Chassis

32 -- Similar to 33, pages 112-113, uses Standard Tuner, 76-5411
33 -- See pages 112-113, Figure 14, uses Tuner Part No. 76-5747
35 -- Similar to 33, pp. 112-113, main diff. in tuner, uses 76-6440-1
37 -- " " " " " " " " " " 76-6777-2
38 -- " " " " " " " " " " 76-6777-2
41 -- See pages 116-117, Figure 37, uses Tuner Part No. 76-7070
44 -- Same as 41, pages 116-117, except for power audio output.

Deflection Chassis

C1 -- Similar to C2, page 115, diff. pwr. sect.
C2 -- See page 115, Figure 15.
CP1 -- Similar to C2, page 115, has AM radio pn
D1 -- See page 114, Figure 38.
D4 -- Same as D1, except for AM radio provision
F2 -- Similar to C2, page 115, uses two 1X2.

Tuners

76-5411 Standard Tuner
76-5747 See page 112
76-6440-1 See page 118
76-6777-2
76-7070 See page 116.

Alignment information given on pages 118 to 120 is correct for all these sets. The specific Tuner Alignment is exact for Tuner Part No. 76-7070, but is very similar for other tuners used in these models. The Philco material in this manual is reproduced through the courtesy of the Philco Corporation.

Tuner Part No. 76-5747

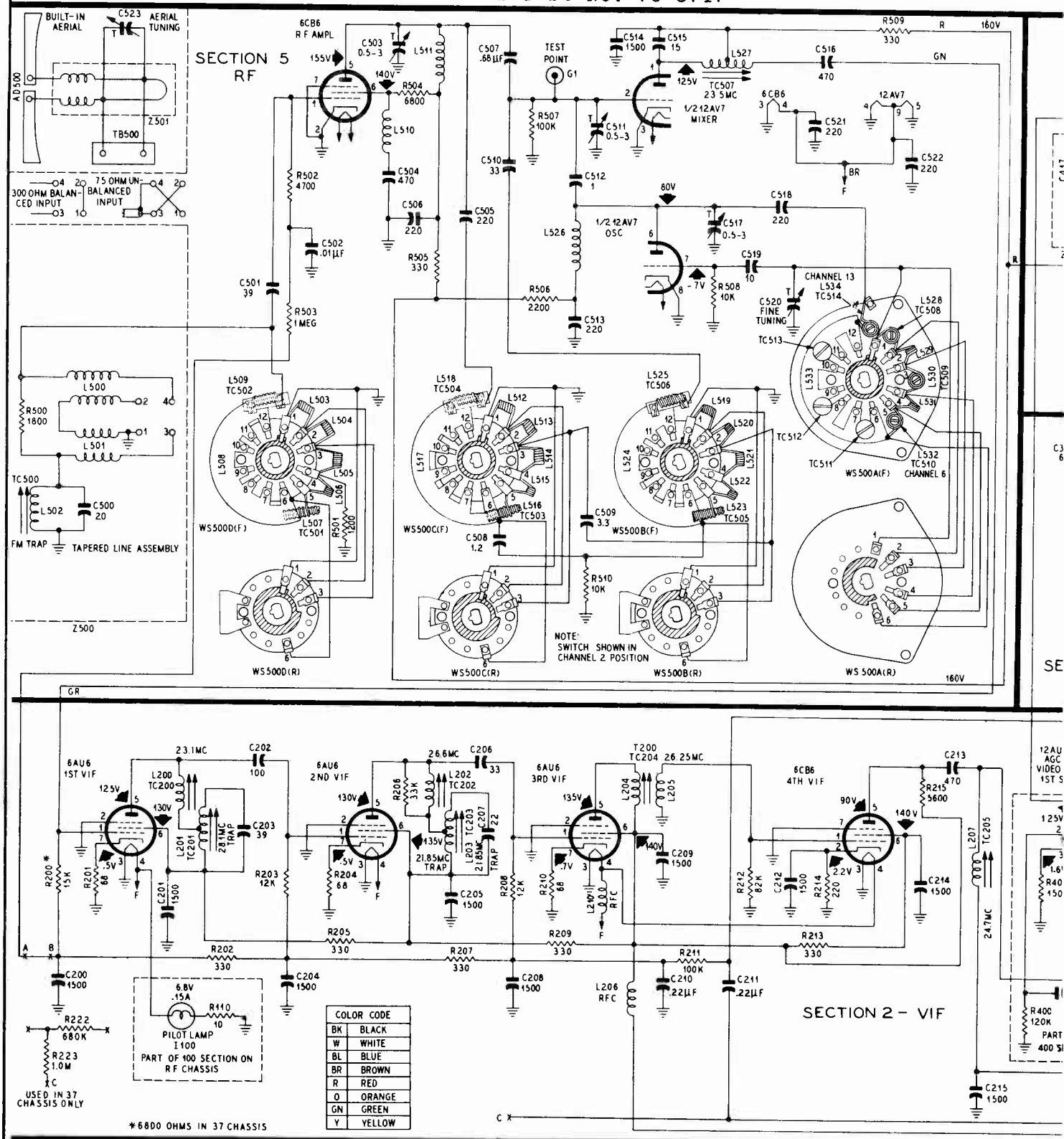
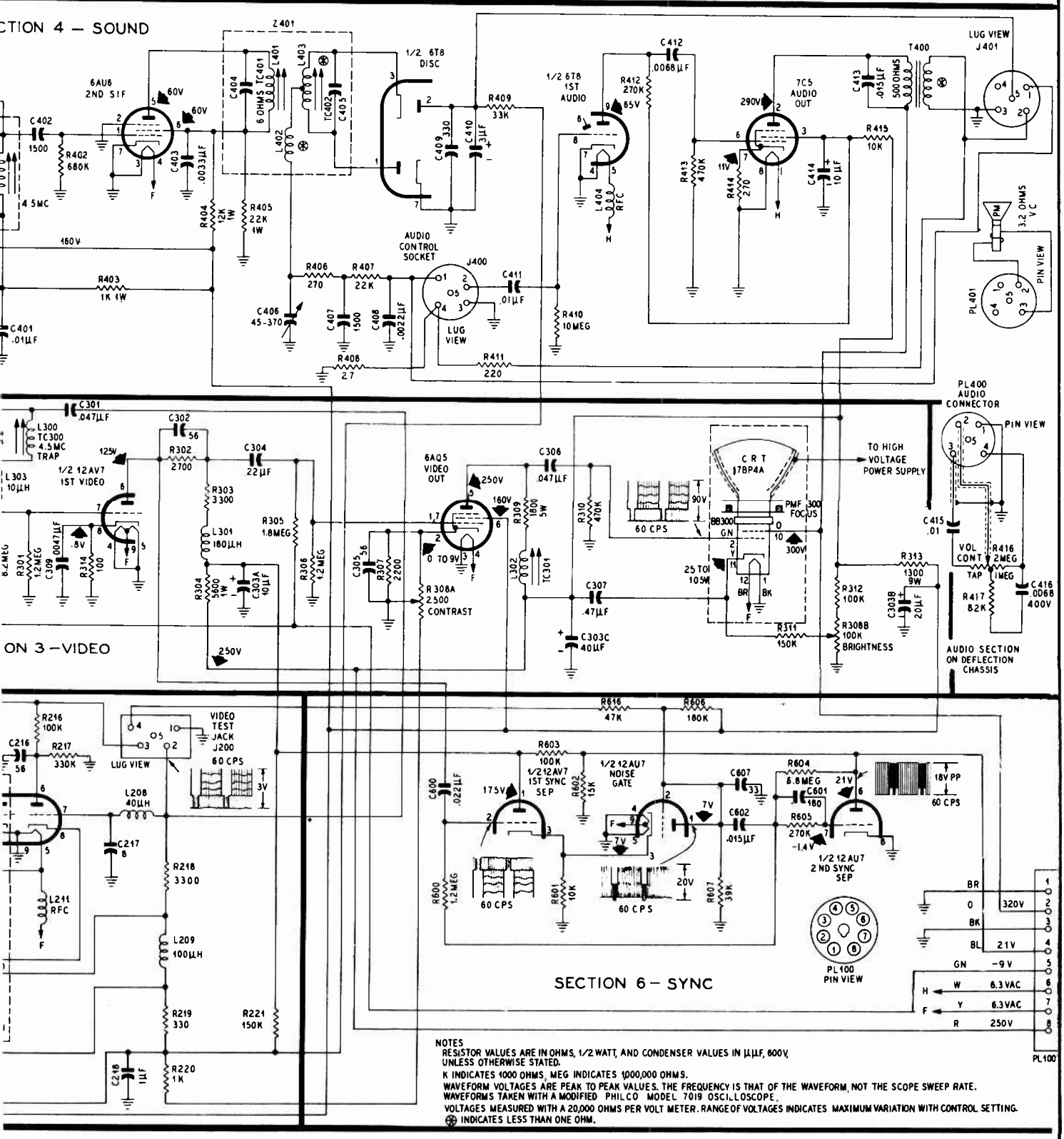


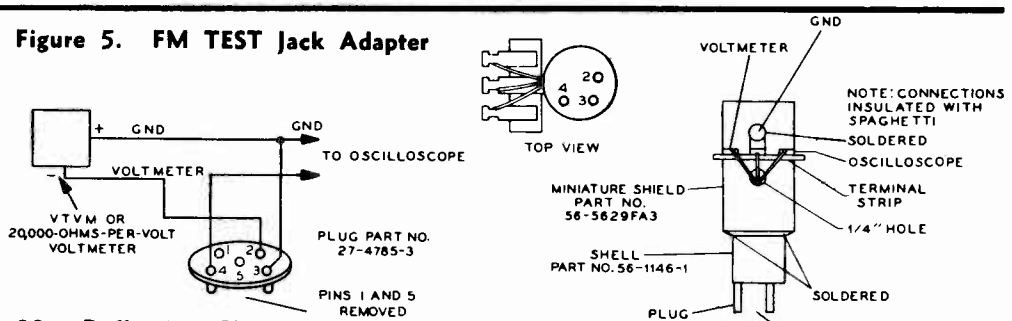
Figure 14. Schematic Dia

Philco R.F. Chassis 33



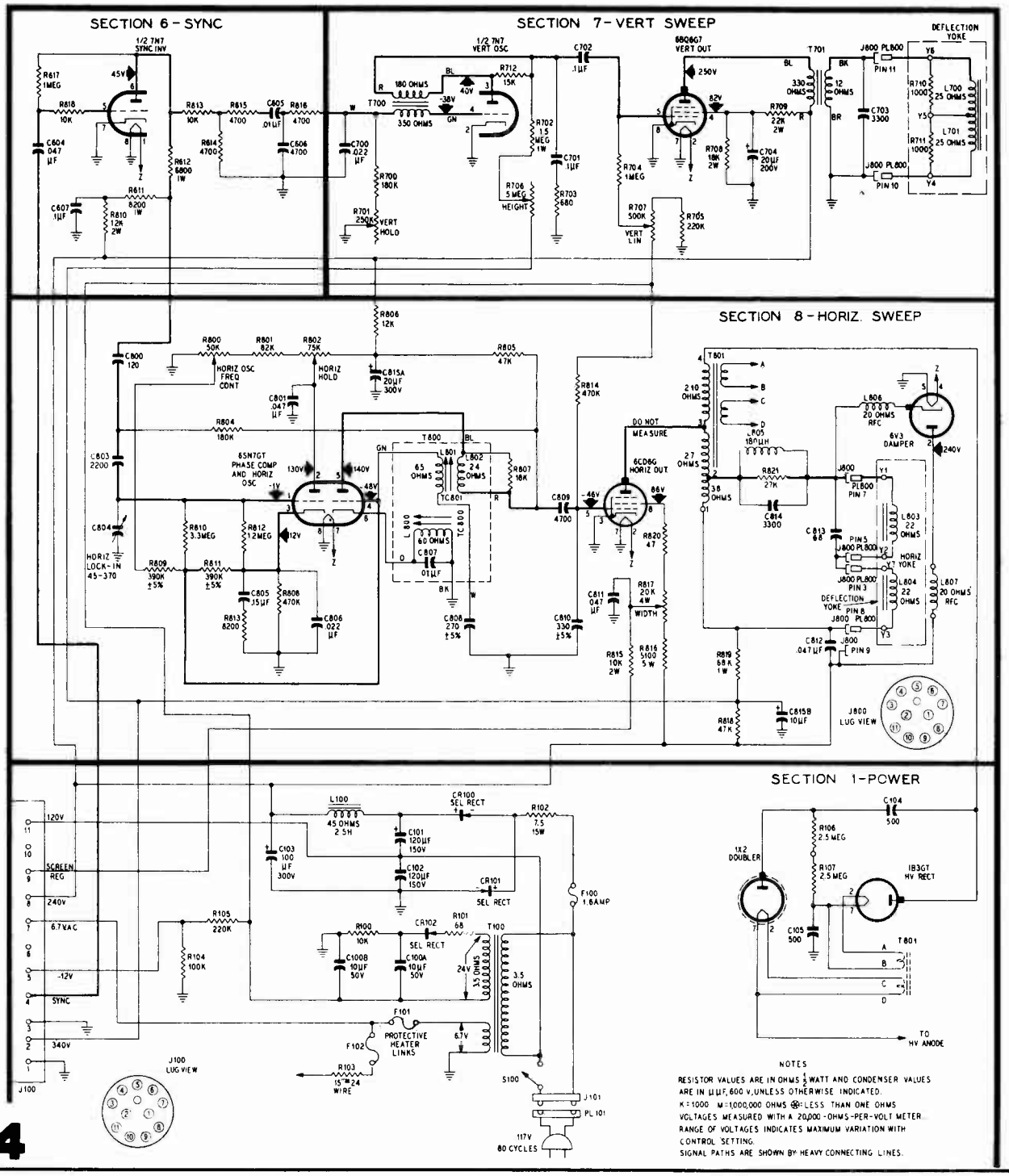
NOTES
RESISTOR VALUES ARE IN OHMS, 1/2 WATT, AND CONDENSER VALUES IN μμF, 600V, UNLESS OTHERWISE STATED.
K INDICATES 1000 OHMS, MEG INDICATES 1,000,000 OHMS.
WAVEFORM VOLTAGES ARE PEAK TO PEAK VALUES. THE FREQUENCY IS THAT OF THE WAVEFORM, NOT THE SCOPE SWEEP RATE.
WAVEFORMS TAKEN WITH A MODIFIED PHILCO MODEL 7019 OSCILLOSCOPE.
VOLTAGES MEASURED WITH A 20,000 OHMS PER VOLT METER. RANGE OF VOLTAGES INDICATES MAXIMUM VARIATION WITH CONTROL SETTING.
⊛ INDICATES LESS THAN ONE OHM.

Figure 5. FM TEST Jack Adapter



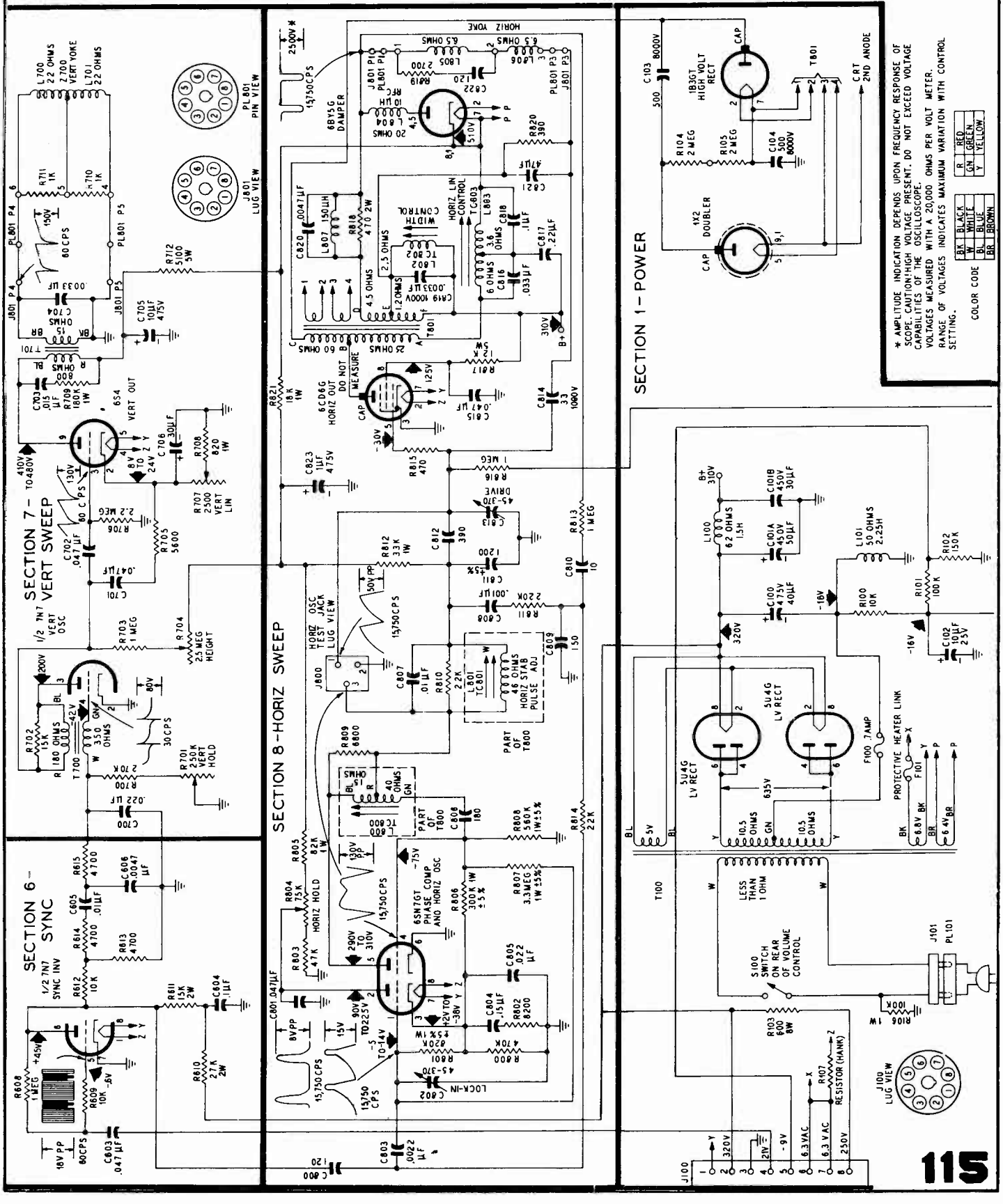
PHILCO

Figure 38. Deflection Chassis D-1, Schematic Diagram



Philco

Figure 15. Schematic Diagram, C2 Deflection Chassis



Philco

Tuner Part No. 76-7070

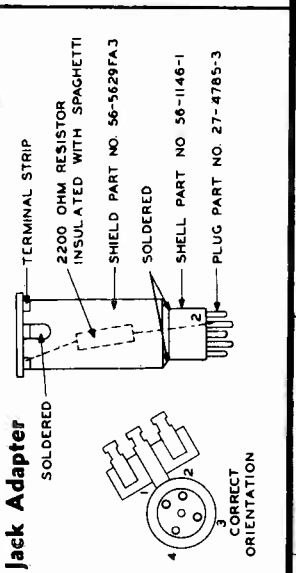
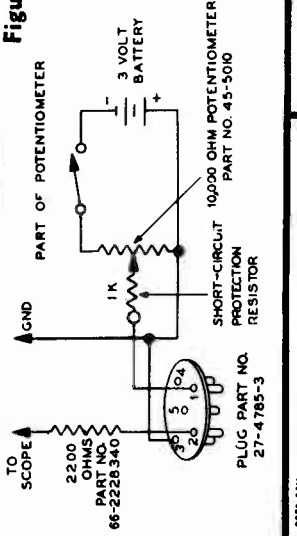
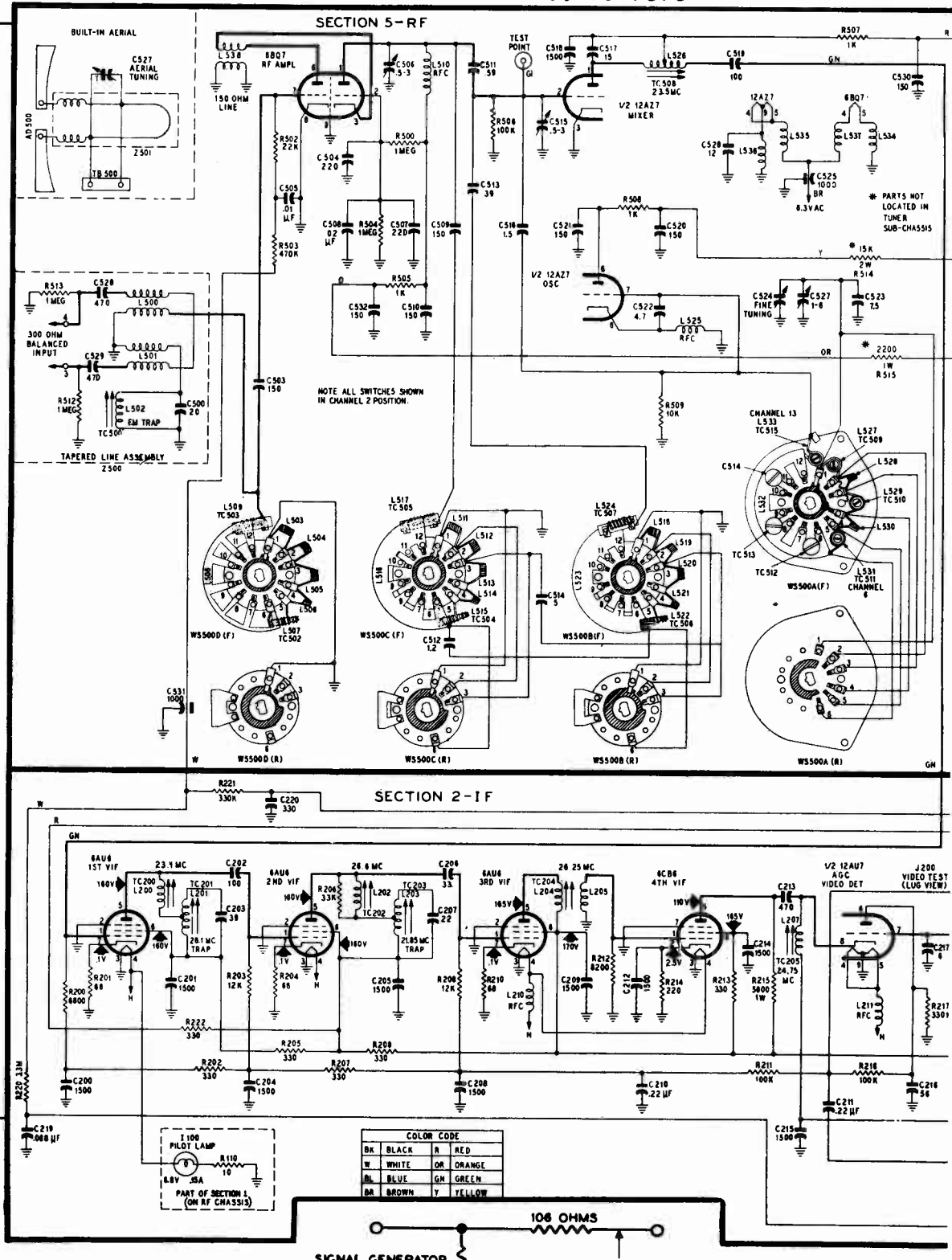


Figure 4. ALIGN TEST Jack Adapter





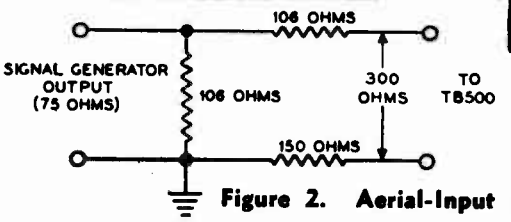
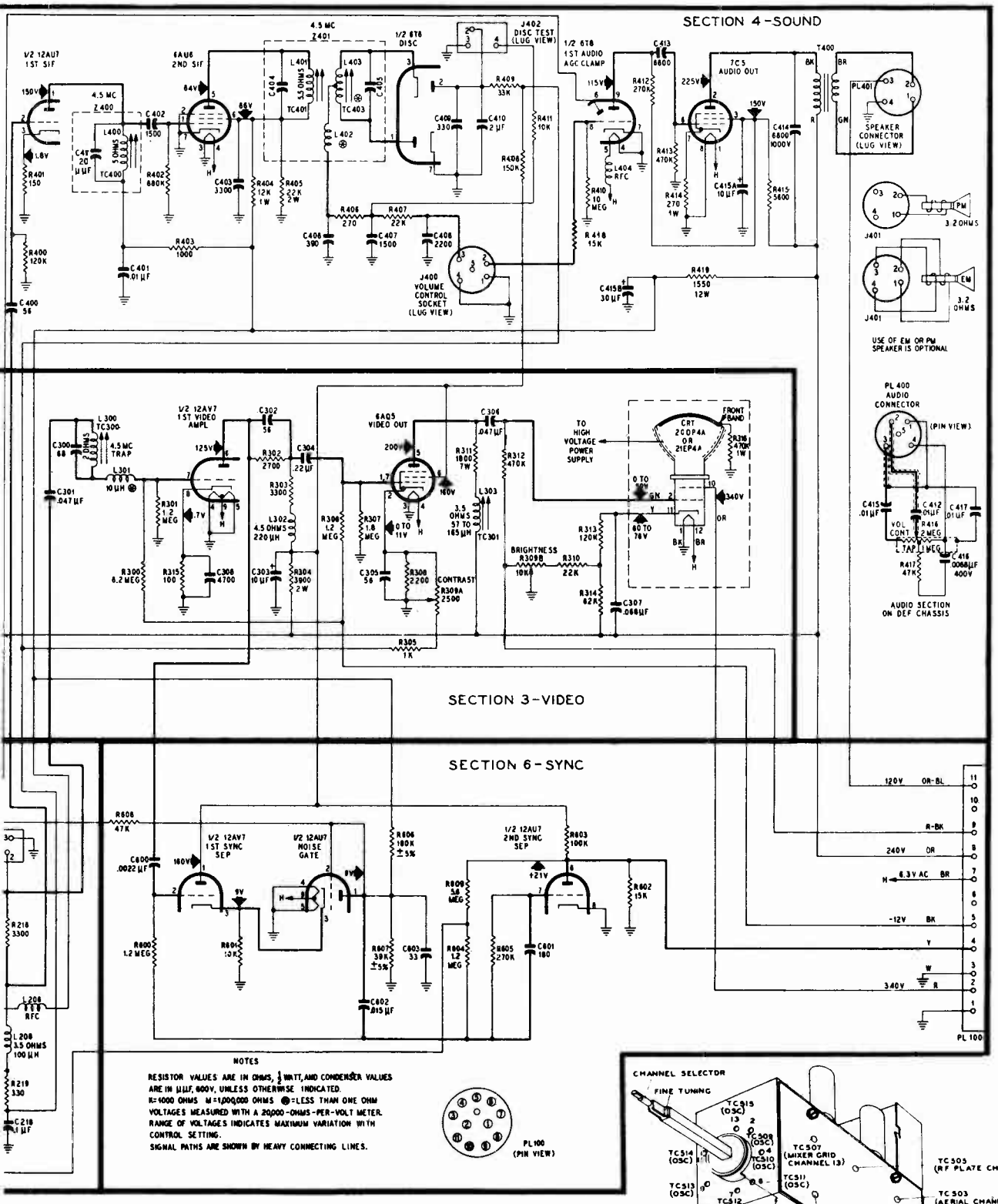


Figure 2. Aerial-Input Matching Network

Figure 37. R-F Chassis 41, Schematic Diagram



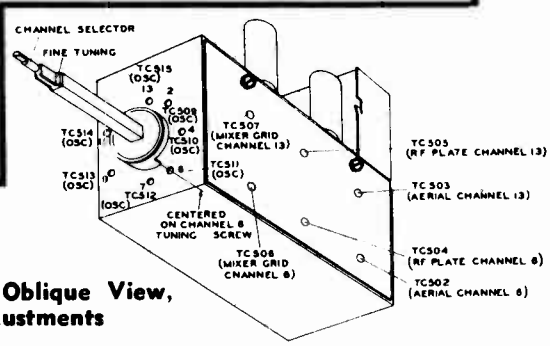
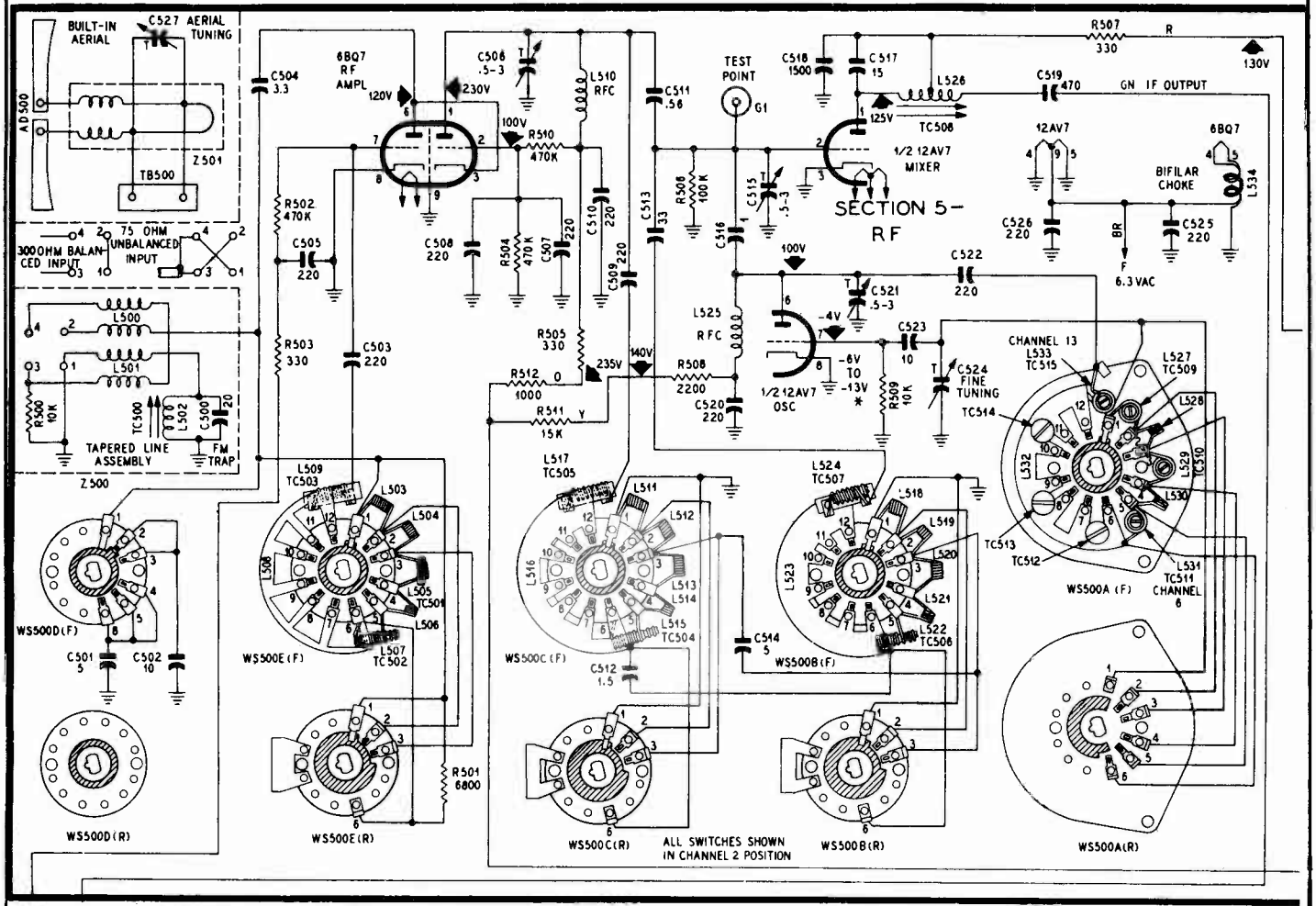


Figure 6. Television Tuner, Oblique View, Showing Location of Adjustments

Philco Schematic Tuner Part No. 76-6440-1



TELEVISION TUNER ALIGNMENT

The following simplified procedure may be used to align the oscillator when the television i-f alignment is satisfactory and a station signal is available.

1. Mechanically preset the fine-tuning cam to the center of its range (see figure 6).

2. Tune in the highest-frequency channel to be received.

3. Adjust the tuning core for that channel, or the next highest, for the best picture; that is, starting with sound in the picture, turn the tuning core until the sound disappears. Repeat for each channel received in the area.

BAND-PASS ALIGNMENT

A 330-ohm resistor is shunted across the 1st i-f coil, to eliminate the absorption effect of this coil on the response curve.

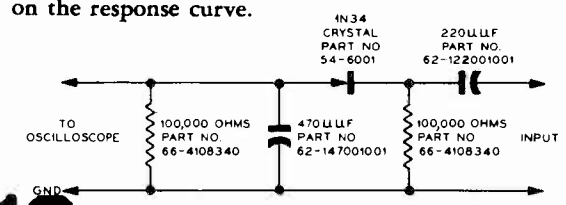


Figure 3. Wiring Diagram of Crystal Detector

1. Disconnect the white (a-g-c) lead from the tuner, and connect it to the negative terminal of a 1.5-volt battery. Ground the positive terminal.

2. Connect a 3300-ohm resistor in series with the red lead from the tuner. Connect the "hot" lead of the oscilloscope to the junction of the red lead and the 3300-ohm resistor.

3. Connect a 330-ohm resistor from the green lead to ground.

4. Connect the FM (sweep) generator to the 300-ohm aerial input through an aerial-input matching network. See figure 2.

PROCEDURE

1. Set the CHANNEL SELECTOR and FM (sweep) generator to Channel 12 (213 mc.). Adjust the generator for sufficient sweep to show the complete response curve.

2. Establish the channel limits (see figure 7) by using the marker (AM r-f) signal generator to produce marker pips on the response curve; set the generator first to 210 mc., then to 216 mc.

3. Adjust TC505 and TC507 (figure 6) for a symmetrical, approximately centered pass band. Set

marker generator to 213 mc. Detune TC507 counterclockwise until a single peak appears. Adjust TC505 until the peak falls on the 213-mc. marker. It may be necessary to increase the output of the generator during this adjustment. Then adjust TC503 for maximum curve height and symmetry of the single peak. The aerial circuit is now tuned for the high channels.

4. Readjust TC505 and TC507 for a symmetrical response, centered about 213 mc.

5. Set the CHANNEL SELECTOR and FM generator to Channel 7 (177 mc.).

6. Establish the channel limits by using the marker signal generator to produce marker pips on the response curve; set the generator first to 174 mc., then to 180 mc.

7. Note the response curve, with respect to tilt and center frequency. The curve should be centered in the pass band, and should be symmetrical. If not, it will be necessary to make the adjustments given in step 8. However, when making these adjustments, the effect of Channel 13 adjustments on Channel 7 must be taken into consideration. This is done by over-compensating with the trimmers, so that, when Channel 13 is adjusted, Channel 7 is nearly correct.

8. Adjust C506 and C515 (see figure. 36) to obtain a response curve which is the mirror image (tilt in the opposite direction) of the original. This is the overcompensation mentioned in step 7.

9. Set the CHANNEL SELECTOR to Channel 13, and retune the generators. Readjust TC505 and TC507 for a symmetrical and centered band pass.

10. Set the CHANNEL SELECTOR and generators to Channel 7, and check the response for center frequency and symmetry. Repeat steps 8 and 9 as many times as necessary to obtain the most symmetrical and centered response curves on Channels 13 and 7. Channels 8 through 12 are now correctly aligned.

11. Set the CHANNEL SELECTOR and sweep generator to Channel 6 (85 mc.).

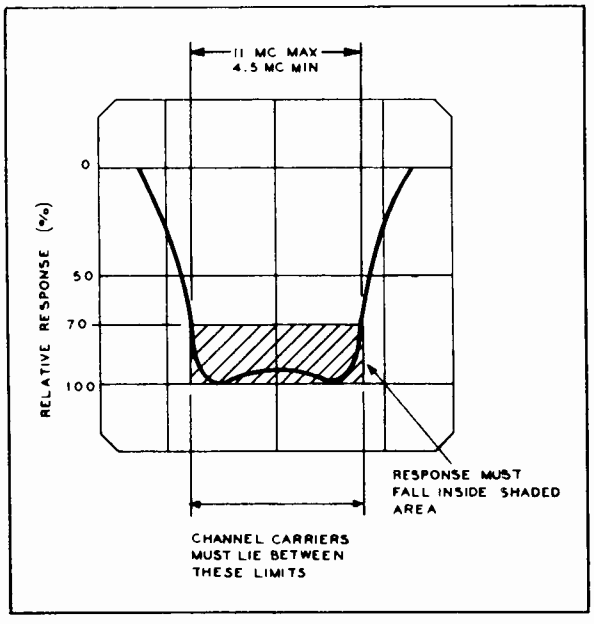


Figure 7. Television-Tuner Response Curve, Showing Band-Pass Limits

12. Establish the channel limits, using the marker generator to produce marker pips on the response curve; set the generator first to 82 mc., then to 88 mc.

13. Adjust TC504 and TC506 for a symmetrical, approximately centered pass band. Set the marker generator to 85 mc. Detune TC506 counterclockwise until a single peak appears.

Adjust TC504 until the peak falls on the 85-mc. marker. It may be necessary to increase the output of the generator during this adjustment. Then adjust TC502 for maximum curve height and symmetry of the single peak. The aerial circuit is now tuned for Channels 5 and 6.

14. Readjust TC504 and TC506 for a symmetrical response, centered about 85 mc.

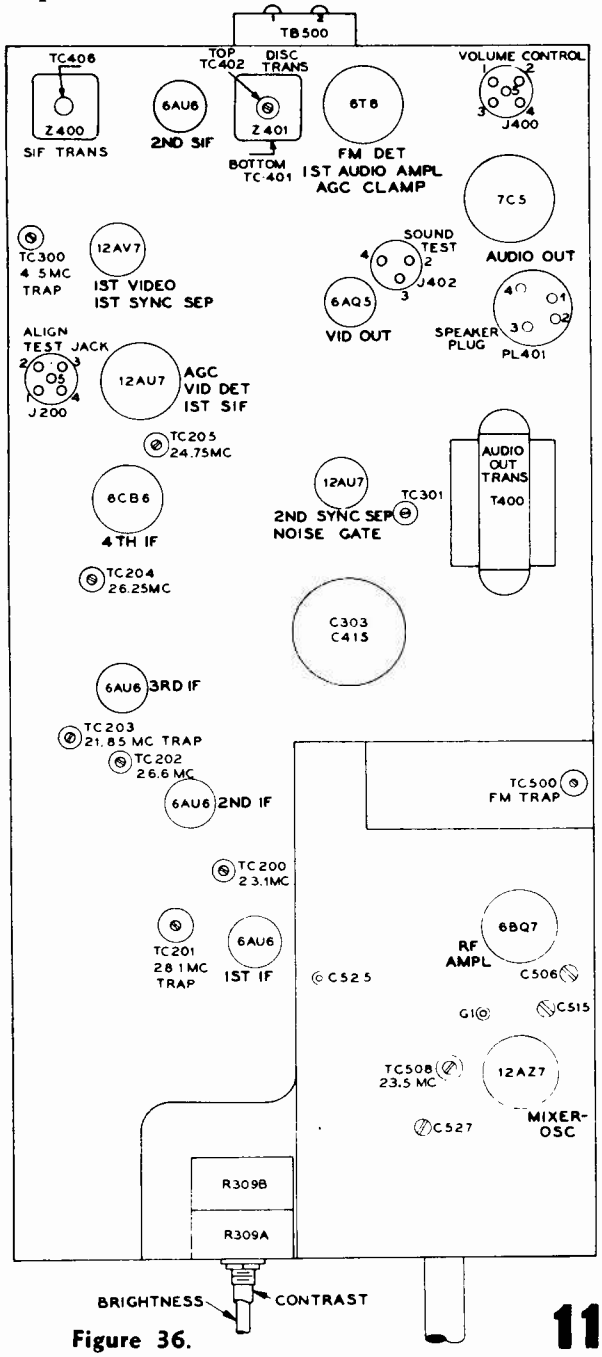


Figure 36.

Philco TELEVISION I-F ALIGNMENT

Before proceeding with the i-f alignment or making an alignment check, observe the following preliminary instructions:

1. Connect the oscilloscope to the 2200-ohm resistor from the ALIGN TEST jack adapter.

2. If additional attenuation of the marker signal is required when using Visual Alignment Generator Model 7008, insert a 10,000-ohm resistor in series with the output lead, or use a 2nd harmonic of Band A, which will give a marker of lower amplitude.

3. Preset the television controls as follows:
   a. CONTRAST control fully counterclockwise.
   b. BRIGHTNESS control to give a dim raster.
   c. Function switch to TV position.

4. Insert the FM TEST jack adapter into J402.

5. Insert the ALIGN TEST jack adapter into J200.

I-F ALIGNMENT PROCEDURE

1. Preset TC201 and TC203 fully counterclockwise. See figure 36. Preset TC200 and TC202 to the center of their ranges.

2. Connect the oscilloscope to J200, pin 2, through the 2200-ohm resistor from the ALIGN TEST jack adapter, and connect the AM generator to G1 (mixer grid on tuner).

3. Feed in a 28.1-mc. AM signal, and tune TC201 for minimum output (use first minimum). Use zero bias during this adjustment.

4. Feed in a 21.85-mc. AM signal, and tune TC203 for minimum output (use first minimum). Use zero bias during this adjustment.

5. Tune TC205, TC204, TC202, TC200, and TC507 for maximum output at the frequencies indicated in figure 36. Use 3 volts of bias, and attenuate the generator to keep the output below 2 volts, peak to peak.

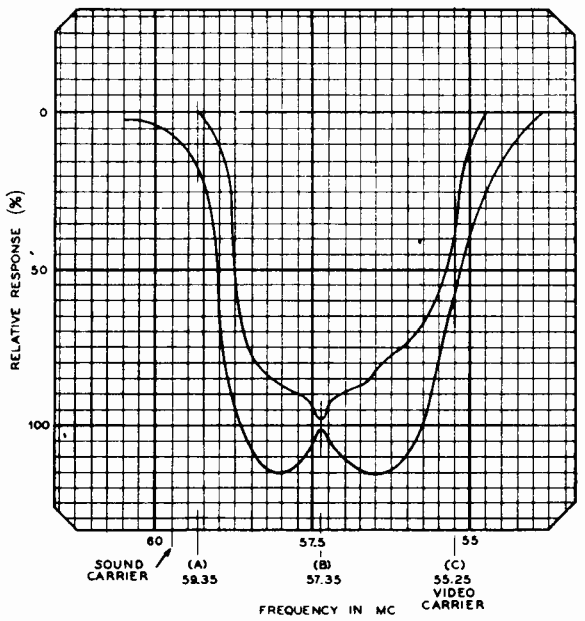


Figure 9. Over-all R-F, I-F Response Curve, Showing Tolerance Limits for Channel 2.

6. Feed in sweep and marker signals to Channel 2 through the aerial-input terminals. The tuner pass band should be checked, and the tuner aligned, if necessary. Touch up TC205, TC204, TC202, TC200, and TC507. See NOTE below.

IMPORTANT: Do not turn any of the i-f tuning cores excessively after they have been set to the approximate position by the use of the AM signal generators; to do so may cause poor transient or phase response, resulting in trailing whites or smear. If a response within the limits shown cannot be obtained by a slight adjustment, carefully repeat the AM adjustments, and, if necessary, trouble-shoot the i-f system. It is preferable to get a response curve within the tolerance range WITHOUT touching the adjustments made with the AM signals at the specified frequencies.

NOTE: TC205 rocks top of curve.
TC202 controls level of carrier.
TC204 controls dip or peak on carrier side.
TC200 controls bandwidth (sound side).
TC507 controls dip or peak on sound side.

S-I-F ALIGNMENT PROCEDURE

1. Remove the first i-f tube, and connect a v.t.v.m. or a 20,000-ohms-per volt voltmeter to the FM TEST jack adapter. Adjust the VOLUME control for moderate speaker output.

2. Feed in an accurately calibrated 4.5-mc. AM signal through the 2200-ohm resistor in the ALIGN TEST jack adapter to pin 2 of J200.

3. Tune TC400 and TC402 for maximum indications on the meter. The point of maximum meter indication for TC402 should also be the point of minimum speaker output.

4. Tune TC402 for minimum speaker output.

5. Connect an r-f probe or crystal detector to the grid (pin 2) of the picture tube. See NOTE below.

6. Tune TC300 for minimum indication on oscilloscope. If a crystal detector is not available, TC300 may be adjusted for minimum beat pattern, observed on the picture tube, with a station picture present.

7. Replace the 1st i-f tube. Tune in a station and use the speaker output as an indication.

8. Turn the FINE TUNING control clockwise to obtain a slightly fuzzy picture.

9. Tune TC402 for minimum AM (noise) output. NOTE: The r-f probe, Part No. 76-3595, is used as a detector of the 4.5-mc. signal, and the oscilloscope as an indicating device. An alternate crystal detector may be made up.

RCA VICTOR

CHASSIS DESIGNATIONS

KCS47B ..... In Models 7T103 and 7T104
KCS47F ..... In Models 7T103B and 7T104B
KCS47C ..... In Models 7T112, 7T122, 7T123 and 7T124
KCS47G ..... In Models 7T112B, 7T122B, 7T123B and 7T125B
KCS47D ..... In Model 7T132

MODELS 7T103, 7T103B, 7T104, 7T104B, 7T112, 7T112B, 7T122, 7T122B, 7T123, 7T123B, 7T124, 7T125B, 7T132

Chassis Nos. KCS47B, KCS47F, KCS47C, KCS47G or KCS47D

The models listed above using the chassis as stated are covered by this service material including the main and supplementary schematics. In addition Model 7T143, using television Chassis KCS-48A, uses the same circuit except that the audio section of the radio section is employed. Model 9T147, using Chassis KCS-60A, has this same difference, but uses a 19" picture tube. Model 7T111B, using Chassis KCS-47GF-2, is similar to the "B" series sets such as 7T103B, and this material plus the supplementary circuit will be of aid in case you are called on to service this additional receiver. Models 9T105, 9T126, 9T128, using Chassis KCS-49B or KCS-49C, are also similar to the "B" series sets except that some of the parts differ and a 19" picture tube is used.

ALIGNMENT TABLE

STEP No.	CONNECT SIGNAL GENERATOR TO	SIGNAL GEN. FREQ. MC.	CONNECT SWEEP GENERATOR TO	SWEEP GEN. FREQ. MC.	CONNECT OSCILLOSCOPE TO	CONNECT "VOLTOHMYST" TO	MISCELLANEOUS CONNECTIONS AND INSTRUCTIONS	ADJUST	REFER TO
	DISCRIMINATOR AND SOUND I-F ALIGNMENT								
1	2nd sound i-f grid (pin 1, V116)	21.00 .1 volt output	Not used		Not used	In series with 1 meg. to pin 7 of V117	Meter on 3 volt scale	Detune T112 (bot.) Adjust T112 (top) for max. on meter	Fig. 12 Fig. 9 Fig. 8
2	"	"	"		"	Junction of R192 & S103	Meter on 3 volt scale	T112 (bottom) for zero on meter	Fig. 12 Fig. 9
3	"	"	2nd sound i-f grid (pin 1, V116)	21.00 center .1 v. out	Junction of R192 & S103	Not used	Check for symmetrical response waveform (positive & negative). If not equal adjust T112 (top) until they are equal.		Fig. 12 Fig. 9
4	1st sound i-f grid (pin 1, V115)	21.00	1st sound i-f grid (pin 1, V115)	21.00 reduced output	Terminal "A" of T111 in series with 33K.	"	Sweep output reduced to provide 0.3 volt p-to-p on scope	T111 (top and bot.) for max. gain at 21.00 mc.	Fig. 13 Fig. 10 Fig. 9
	PICTURE I-F AND TRAP ADJUSTMENT								
5	Not used		Not used	—	Not used	Junction of R102 & R201	Connect bias box to junction of R102 & R201 and to ground	Adjust potentiometer for −3.0 volts on meter	Fig. 10
6	Terminal D of T101	21.00	"	—	"	Pin 2 of V106 and to ground	Meter on 3v scale. Rec. between 2 & 13	T103 (top) for min. on meter	Fig. 10 Fig. 8
7	"	21.00	"	—	"	"	"	T105 (top) for min.	Fig. 8
8	"	27.00	"	—	"	"	"	T102 (top) for min.	"
9	"	27.00	"	—	"	"	"	T104 (top) for min.	"
10	"	19.50	"	—	"	"	"	T101 (top) for min.	"
11	"	*24.35	"	—	"	"	"	L103 (top) for max.	"
12	"	*22.5	"	—	"	"	"	T104 (bot.) for max.	Fig. 9
13	"	*21.75	"	—	"	"	"	T103 (bot.) for max.	"
14	"	*25.3	"	—	"	"	"	T102 (bot.) for max.	"

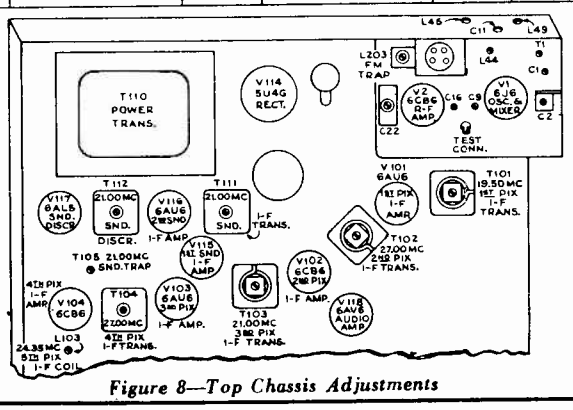


Figure 8—Top Chassis Adjustments

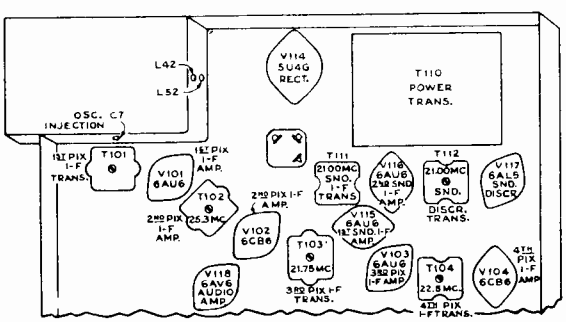
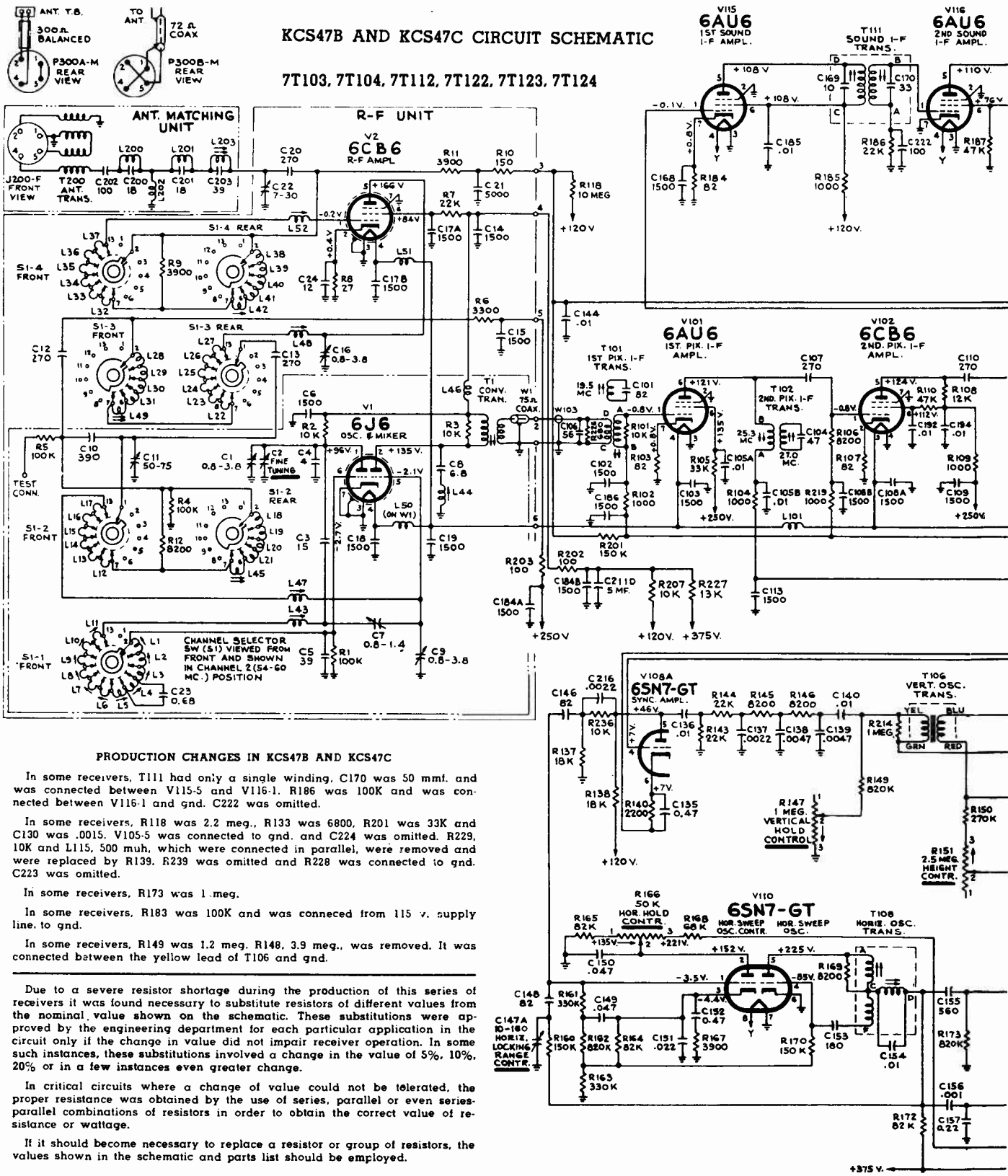


Figure 9—Bottom Chassis Adjustments

KCS47B AND KCS47C CIRCUIT SCHEMATIC

7T103, 7T104, 7T112, 7T122, 7T123, 7T124



PRODUCTION CHANGES IN KCS47B AND KCS47C

In some receivers, T111 had only a single winding, C170 was 50 mmf. and was connected between V115-5 and V116-1. R186 was 100K and was connected between V116-1 and gnd. C222 was omitted.

In some receivers, R118 was 2.2 meg., R133 was 6800, R201 was 33K and C130 was .0015. V105-5 was connected to gnd. and C224 was omitted. R229, 10K and L115, 500 muh, which were connected in parallel, were removed and were replaced by R139. R239 was omitted and R228 was connected to gnd. C223 was omitted.

In some receivers, R173 was 1 meg.

In some receivers, R183 was 100K and was conneced from 115 v. supply line, to gnd.

In some receivers, R149 was 1.2 meg. R148, 3.9 meg., was removed. It was connected between the yellow lead of T106 and gnd.

Due to a severe resistor shortage during the production of this series of receivers it was found necessary to substitute resistors of different values from the nominal value shown on the schematic. These substitutions were approved by the engineering department for each particular application in the circuit only if the change in value did not impair receiver operation. In some such instances, these substitutions involved a change in the value of 5%, 10%, 20% or in a few instances even greater change.

In critical circuits where a change of value could not be tolerated, the proper resistance was obtained by the use of series, parallel or even series-parallel combinations of resistors in order to obtain the correct value of resistance or wattage.

If it should become necessary to replace a resistor or group of resistors, the values shown in the schematic and parts list should be employed.

Chassis KCS-47B and KCS-47C.

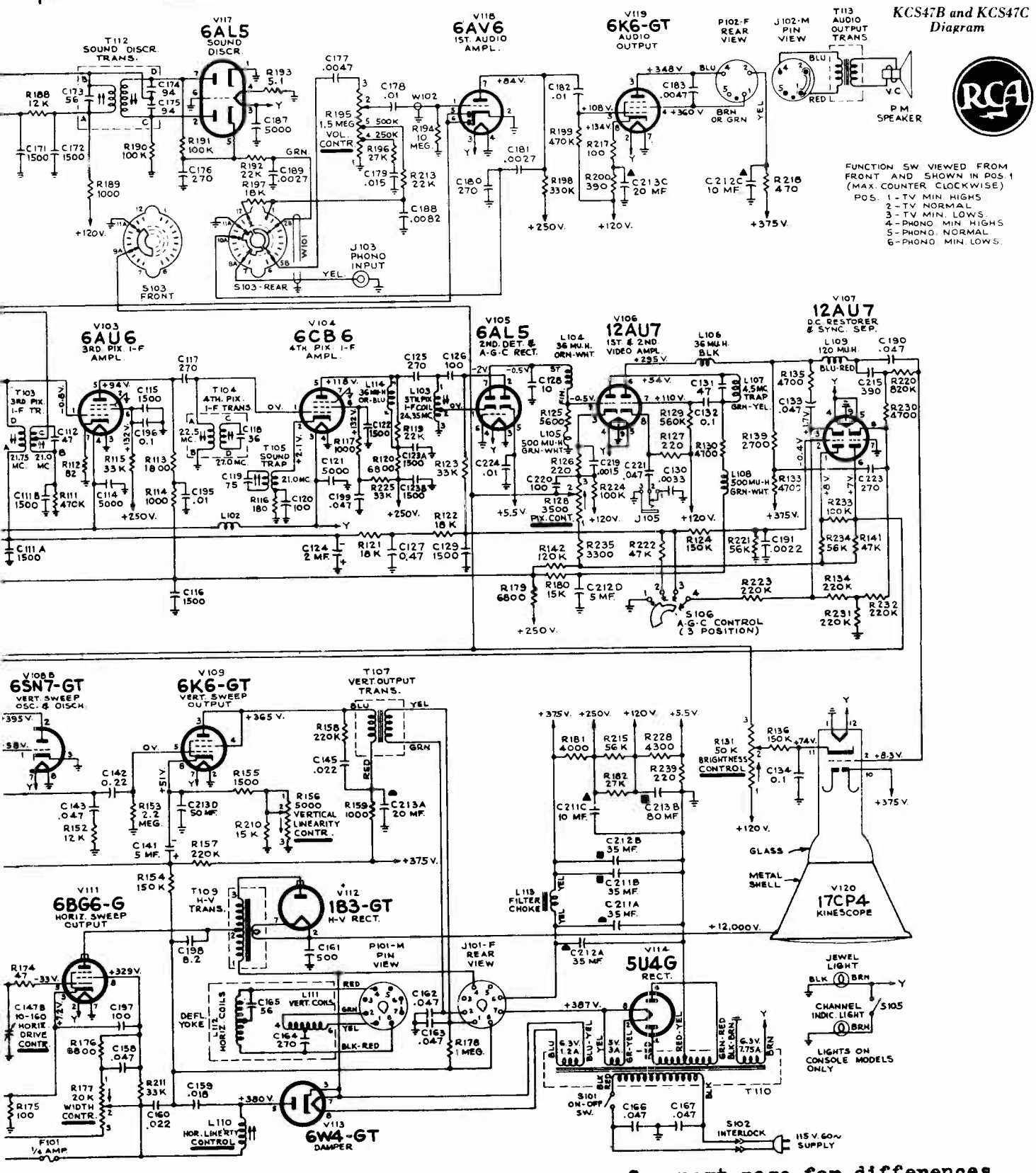
All resistance values in ohms. K = 1000.

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

Coil resistance values less than 1 ohm are not shown.

Direction of arrows at controls indicates clockwise rotation.

KCS47B and KCS47C Diagram



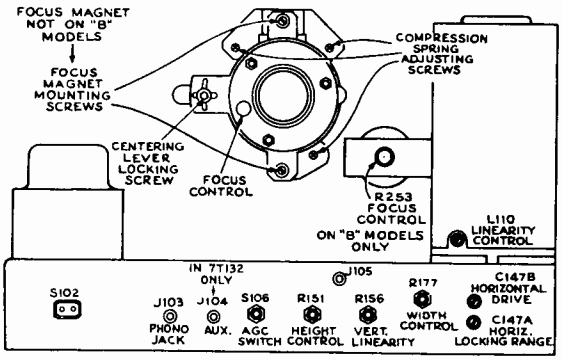
In some receivers, substitutions have caused changes in component lead color codes, in electrolytic capacitor values and their lug identification markings.

All voltages measured with "Volt-Ohmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

See next page for differences in KCS-47D, KCS-47F, KCS-47G, and the circuit shown here.

MOST-OFTEN-NEEDED 1952 TELEVISION SERVICING INFORMATION

7T103, 7T103B, 7T104, 7T104B, 7T112, 7T112B, 7T122, 7T122B, 7T123, 7T123B, 7T124, 7T125B, 7T132



Rear Chassis Adjustments

Figure 12 Discriminator Response

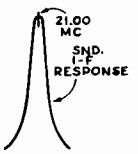


Figure 13 Sound I-F Response

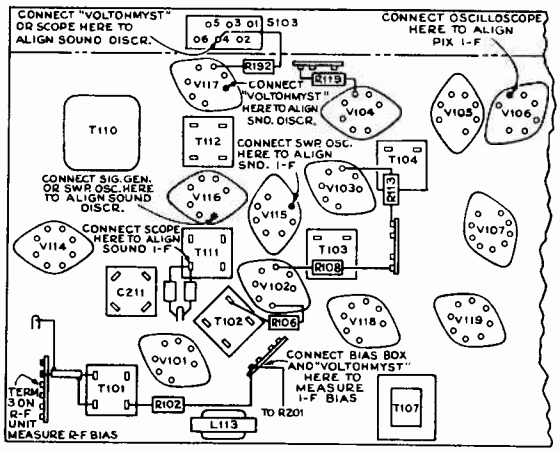
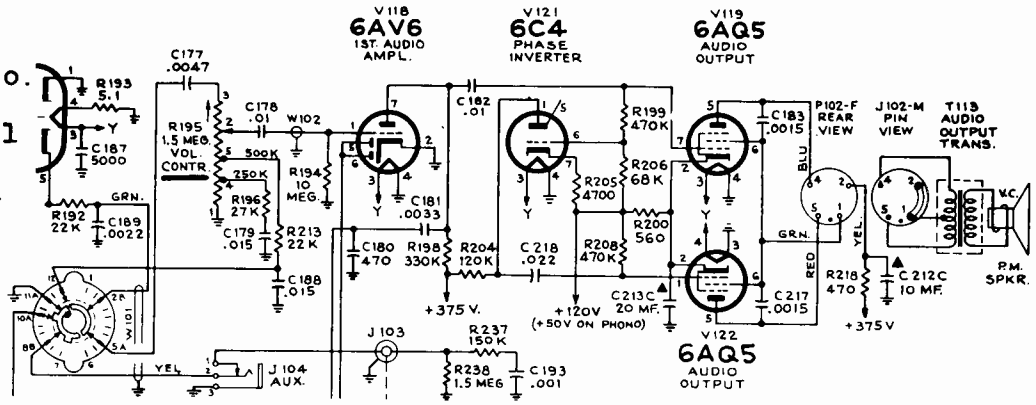
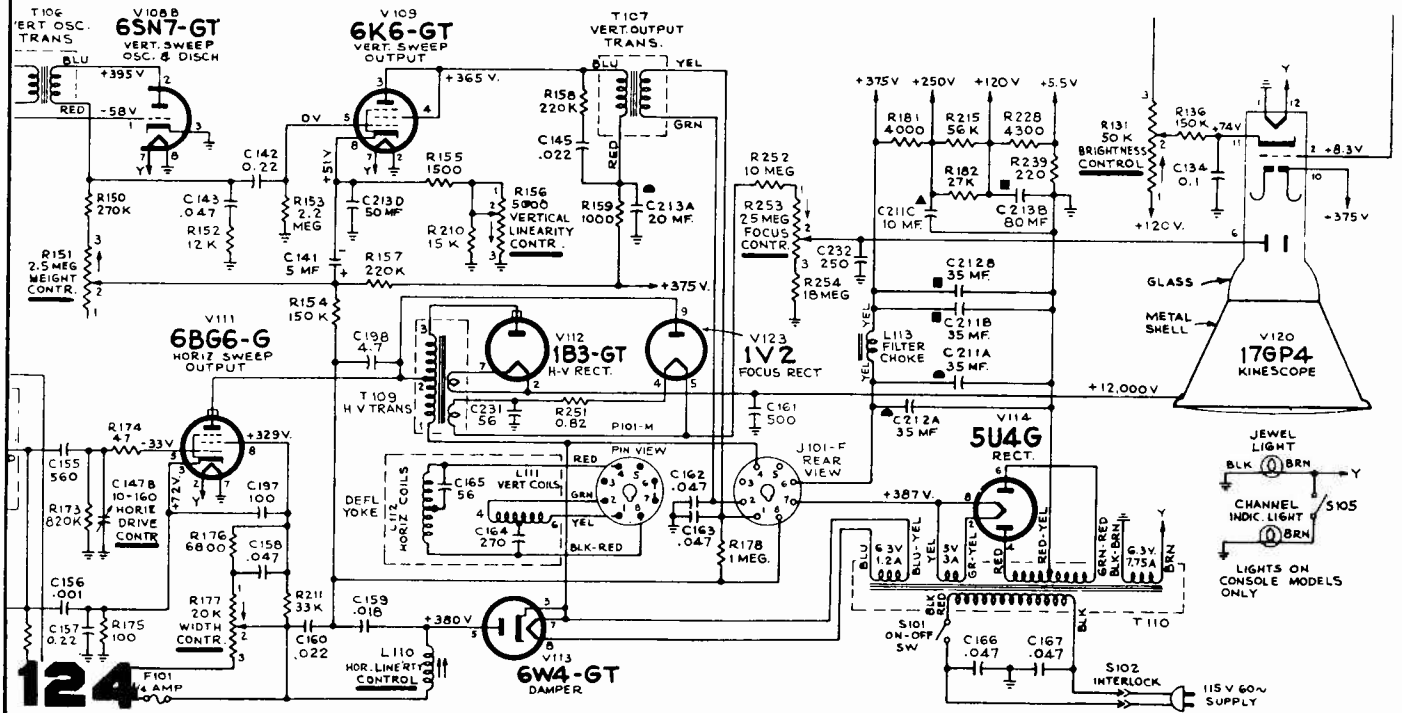


Figure 10—Test Connection Points

Circuit showing audio section of Chassis KCS-47D used in Model 7T132, as being different from the main schematic shown on previous page. In other ways Chassis KCS-47D and KCS-47B are the same.



Circuit of power supply used in Chassis KCS-47F and KCS-47G of Models 7T103B, 7T104B, 7T112B, 7T122B, 7T123B, and 7T125B. Balance of circuit is the same as shown on previous page for Chassis KCS-47B.



RCA VICTOR

MODEL 4T101

Chassis No. 61

Service material on Model 4T101, using Chassis 61, appears below and on the next five pages. You will find that Model 4T141, using television Chassis KCS-62, uses exactly the same circuit except the audio section of the radio unit is used and 6AQ5 is omitted and 6AV6 is used for bias only.

ALIGNMENT TABLE

STEP No.	CONNECT SIGNAL GENERATOR TO	SIGNAL GEN. FREQ. MC.	CONNECT SWEEP GENERATOR TO	SWEEP GEN. FREQ. MC.	CONNECT OSCILLOSCOPE TO	CONNECT "VOLTOHMYST" TO	MISCELLANEOUS CONNECTIONS AND INSTRUCTIONS	ADJUST	REFER TO
	DISCRIMINATOR AND SOUND I-F ALIGNMENT								
1	2nd sound i-f grid (pin 1, V116)	21.00 .1 volt output	Not used	—	Not used.	In series with 1 meg. to pin 7 of V117	Meter on 3 volt scale	Detune T111 (bot.) Adjust T111 (top) for max. on meter	Fig. 12 Fig. 9 Fig. 8
2	"	"	"	—	"	Junction of R192 & S103	Meter on 3 volt scale	T111 (bottom) for zero on meter	Fig. 12 Fig. 9
3	"	"	2nd sound i-f grid (pin 1, V116)	21.00 center .1 v. out	Junction of R192 & S103	Not used	Check for symmetrical response waveform (positive & negative). If not equal adjust T111 (top) until they are equal		Fig. 12 Fig. 9
4	1st sound i-f grid (pin, 1, V115)	21.00 reduced output	1st sound i-f grid (pin 1, V115)	21.00 reduced output	Terminal A of T110 in series with 33K	"	Sweep output reduced to provide 0.3 volt p-to-p on scope	T110 (top and bot.) for max. gain and symmetry of 21.00 mc.	Fig. 13 Fig. 10 Fig. 8
	PICTURE I-F AND TRAP ADJUSTMENT								
5	Not used		Not used	—	Not used	Junction of R102 & R103	Connect bias box to junction of R102 & R103 and to ground	Adjust potentiometer for −3.0 volts on meter	Fig. 10
6	Terminal D of T101	21.00	"	—	"	Pin 2 of V106 and to ground	Meter on 3 v. scale. Rec. between 2 & 13	T103 (top) for min. on meter	Fig. 10 Fig. 8
7	"	21.00	"	—	"	"	"	T105 (top) for min.	Fig. 8
8	"	27.00	"	—	"	"	"	T102 (top) for min.	"
9	"	27.00	"	—	"	"	"	T104 (top) for min.	"
10	"	19.50	"	—	"	"	"	T101 (top) for min.	"
11	"	24.35	"	—	"	"	"	L102 (top) for max.	"
12	"	22.5	"	—	"	"	"	T104 (bot.) for max.	Fig. 9
13	"	21.75	"	—	"	"	"	T103 (bot.) for max.	"
14	"	25.3	"	—	"	"	"	T102 (bot.) for max.	"
	R-F UNIT ALIGNMENT								
15	Disconnect the co-ax link from terminal 2 of the r-f unit terminal board and connect a 39 ohm composition resistor between lugs 1 and 2. If the receiver oscillator is adjusted by feeding in the r-f sound carrier signal, couple the link loosely to lug 2 of the r-f unit terminal board so as to permit measurement at sound discriminator. In early production units in which L44 is adjustable, back the L44 core all the way out. Detune T1 by backing the core all the way out of the coil. In order to align the r-f tuner, it will first be necessary to set the channel 13 oscillator to frequency. The shield over the bottom of the r-f unit must be in place when making any adjustments.								
16	Antenna terminals	215.75 MC.	Not used		Loosely coupled to r-f oscillator	236.75 MC.	Junction of R192 & S103 for signal gen. method only	Fine tuning centered. Receiver on channel 13. Het. freq. meter coupled to osc. if used.	C1 for zero on meter or beat on het. freq. meter	Fig. 10 Fig. 8
17			"				Connect "Volt-Ohmyst" to terminal 3 of the r-f unit terminal board	Turn AGC control counter-clockwise. Connect bias box to terminal 3 of r-f unit term. board	Adjust the bias box potentiometer for −3.5 volts.	Fig. 10
18	Antenna terminal (loosely)	181.25 185.75	Antenna terminals (see text for precaution)	Sweeping channel 8	Not used	—	Not used	Rec. on chan. 8. Connect oscilloscope to test connection at R5 on top the r-f unit. Adjust C9, C11, C16 and C22. Correct curve shape, frequency, and band width. C22 is adjusted to give max. amplitude between markers. C9 primarily affects tilt and C16 primarily affects the frequency of response. C11 affects the response band width.		Fig. 16 (8)
19	"	87.75	"	Not used	Loosely coupled to r-f oscillator	108.75	Junction of R192 & S103 for signal gen. method only	Rec. on channel 6	L5 for zero on meter or beat on het. freq. meter	Fig. 8 Fig. 10 Fig. 11
20	"	83.25 87.75	"	Channel 6	Not used	—		Rec. on chan. 6. Adjust L42, L45 and L49 for proper response. L42 is adjusted to give max. amplitude between markers. L45 primarily affects tilt and L49 primarily affects freq. of response. If necessary, retouch C11 for proper width.		Fig. 16 (6)

RCA Victor

ALIGNMENT TABLE (Continued)

4T101

STEP No.	CONNECT SIGNAL GENERATOR TO	SIGNAL GEN. FREQ. MC.	CONNECT SWEEP GENERATOR TO	SWEEP GEN. FREQ. MC.	CONNECT HETERODYNE FREQ. METER	HET. FREQ. METER MC.	CONNECT "VOLTOHMYST" TO	MISCELLLANEOUS CONNECTIONS AND INSTRUCTIONS	ADJUST	REFER TO
21	Not used	—	Not used	—	Not used	—	Connect "Volt-Ohmyst" to r-f unit test point R5	Rec. on channel 6	Adjust C7 for −3.0 volts at the test point	Fig. 8 Fig. 9
22	Repeat steps 19. 20 and 21 until the specified conditions are obtained.									
23	Antenna terminal (loosely)	185.75	Not used	—	Loosely coupled to r-f oscillator	206.75	Junction of R192 & S103 for sig. gen. method only	Rec. on chan. 8	C1 for zero on meter or beat on het. freq. meter	Fig. 8 Fig. 10
24	Antenna terminal (loosely)	181.25 185.75	Antenna terminals (see text for precaution)	Sweeping channel 8	Not used	—	Not used	Rec. on chan. 8. Readjust C9, C16 and C22 for correct curve shape, frequency and band width. Readjust C11 only if necessary.		Fig. 8 Fig. 9 Fig. 16 (8)
25	"	211.25 215.75	"	Sweeping channel 13	Not used	—	Not used	Rec. on chan. 13. Adjust L52 for max. amplitude between markers and then overshoot a little more than the amount of turning required to reach max. response. Adjust C22 to regain max. amplitude of response.		Fig. 9 Fig. 16 (13)
26	"	215.75	Not used	—	Loosely coupled to r-f oscillator	236.75	Junction of R192 & S103 for signal gen. method only	Fine tuning centered. Receiver on chan. 13. Adjust L43 for correct channel 13 osc. freq. then overshoot. Reset the osc. to proper freq. by adjustment of C1.		Fig. 10 Fig. 11
27	"	205.25 209.75	Antenna terminals (see text for precaution)	channel 12	Not used	—	Connect "Volt-Ohmyst" to r-f unit test point at R5	Rec. on chan. 12	Check to see that response is correct and −3.0 volts of osc. injection is present	Fig. 8 Fig. 16
28	"	199.25 203.75		channel 11	"	—	"	Rec. on chan. 11	"	Fig. 16 (11)
29	"	193.25 197.75	"	channel 10	"	—	"	Rec. on chan. 10	"	Fig. 16 (10)
30	"	187.25 191.75	"	channel 9	"	—	"	Rec. on chan. 9	"	Fig. 16 (9)
31	"	181.25 185.75	"	channel 8	"	—	"	Rec. on chan. 8	"	Fig. 16 (8)
32	"	175.25 179.75	"	channel 7	"	—	"	Rec. on chan. 7	"	Fig. 16 (7)
33	If the response of any channel (steps 27 through 32) is below 80% at either marker, repeat step 24 and adjust C9, C11, C16 and C22 as necessary to pull response up on the low channel yet maintain correct response on channel 8. If C22 required adjustment, the adjustment should be overshot a small amount and corrected by adjustment of L52 to give maximum amplitude of response between the sound and picture carrier markers.									
34	Repeat step 23. If the oscillator is off frequency overshoot the adjustment of C1 and correct by adjusting L43.									
35	Repeat steps 27 through 34 until all requirements are obtained.									
36	Antenna terminals (loosely)	87.75	Not used	—	Loosely coupled to r-f oscillator	108.75	Junction of R192 & S103 for sig. gen. method only	Rec. on chan. 6	L5 for zero on meter or beat on het. freq. meter	Fig. 10 Fig. 11
37	"	83.25 87.75	Ant. terminals (see text for precaution)	Sweeping channel 6	Not used	—	Not used	Observe response. If necessary readjust L42, L45 and L49. It should not be necessary to touch C11.		Fig. 8 Fig. 9 Fig. 16
38	Not used	—	Not used	—	Not used	—	Connect "Volt-Ohmyst" to the r-f unit test point at R5	Check osc. injection. If necessary adjust C7 to give −3 volts. If C7 is adjusted, switch to channel 8, and readjust C9 for proper response then repeat step. 37.		Fig. 9 Fig. 10
39	Antenna terminals (loosely)	77.25 81.75	Ant. terminals (see text for precaution)	channel 5	"	—	"	Rec. on chan. 5	Check to see that response is correct and −3.0 volts of osc. injection is present	Fig. 16 (5)
40	"	67.25 71.75	"	channel 4	"	—	"	Rec. on chan. 4		Fig. 16 (9)
41	"	61.25 65.75	"	channel 3	"	—	"	Rec. on chan. 3	"	Fig. 16 (3)
42	"	55.25 59.75	"	channel 2	"	—	"	Rec. on chan. 2	"	Fig. 16 (2)
43	Likewise check channels 7 through 13, as outlined in steps 32 back through 27, stopping on channel 13 for next step.									
44	Antenna terminals	215.75	Not used	—	Loosely coupled to r-f oscillator	236.75	Junction of R192 & S103 for sig. gen. method only	Fine tuning centered. Receiver on channel 13	C1 for zero on meter or beat on het. freq. meter	Fig. 8 Fig. 10
45	"	209.75	"	—	"	230.75	"	Rec. on chan. 12	L11 as above	Fig. 11
46	"	203.75	"	—	"	224.75	"	Rec. on chan. 11	L10 as above	Fig. 11
47	"	197.75	"	—	"	218.75	"	Rec. on chan. 10	L9 as above	Fig. 11
48	"	191.75	"	—	"	212.75	"	Rec. on chan. 9	L8 as above	Fig. 11
49	"	185.75	"	—	"	206.75	"	Rec. on chan. 8	L7 as above	Fig. 11
50	"	179.75	"	—	"	200.75	"	Rec. on chan. 7	L6 as above	Fig. 11
51	"	87.75	"	—	"	108.75	"	Rec. on chan. 6	L5 as above	Fig. 11
52	"	81.75	"	—	"	102.75	"	Rec. on chan. 5	L4 as above	Fig. 11
53	"	71.75	"	—	"	92.75	"	Rec. on chan. 4	L3 as above	Fig. 11
54	"	65.75	"	—	"	86.75	"	Rec. on chan. 3	L2 as above	Fig. 11
55	"	59.75	"	—	"	80.75	"	Rec. on chan. 2	L1 as above	Fig. 11
56	Repeat steps 44 through 55 as a check.									
	Antenna terminals	181.25 185.75	Antenna terminals	Sweeping channel 8	Not used	—		Rec. on chan. 8. Oscilloscope at R5 test point.		Fig. 16 (8)

RCA Victor — ALIGNMENT TABLE (Continued) — 4T101

STEP No.	CONNECT SIGNAL GENERATOR TO	SIGNAL GEN. FREQ. MC.	CONNECT SWEEP GENERATOR TO	SWEEP GEN. FREQ. MC.	CONNECT OSCILLOSCOPE TO	CONNECT "VOLTOHMYST" TO	MISCELLANEOUS CONNECTIONS AND INSTRUCTIONS	ADJUST	REFER TO
58	Switch through all channels and observe response, oscillator injection and r-f oscillator frequency. Minor touch-ups of adjustments may be made at this time. However, if C7 or C9 are changed appreciably, then a recheck of the oscillator frequency on all channels should be made.								
59	Remove 39 ohm resistor and reconnect link from T101 to terminal 2 of r-f unit terminal board. Proceed with sweep alignment of Pix I-F.								
	SWEEP ALIGNMENT OF PICTURE I-F AMPLIFIER								
60	Loosely coupled to i-f amplifier	22.3 25.4	Antenna terminals	Sweeping selected channel	Terminal 2 of V106 socket	Junction of R102 and R103	Select channel known to have good r-f response. Clip 330 ohm resistors across R107, R110, R115, R119. Connect bias box to junction R102, R103.	Adjust bias box for −1.0 v. Set sweep to give 0.5 v. p-p on oscilloscope. Adjust T1 and T101 for correct response.	Fig. 8 Fig. 9 Fig. 10 Fig. 14
61	"	21.85 24.75 25.50 26.25	"	"	"	"	Remove 330 ohm resistors. Set bias box for −4.5 v.	Set sweep to give 3.0 v. p-p on oscilloscope. Adjust T1, T101 bot., T102 bot., T103 bot., T104 bot. and L102 for desired response	Fig. 15

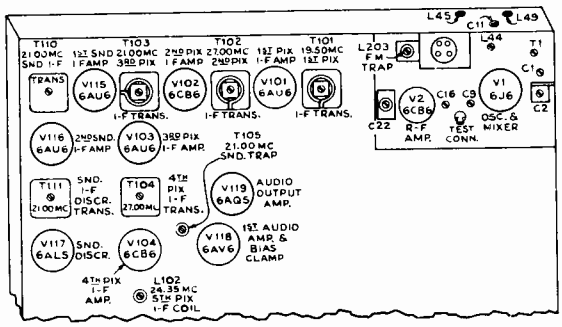


Figure 8—Top Chassis Adjustments

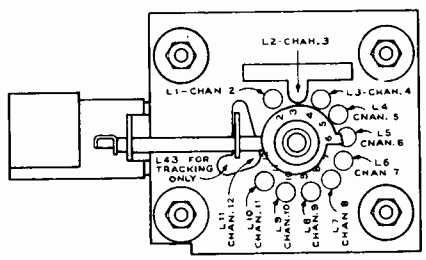


Figure 11—R-F Oscillator Adjustments

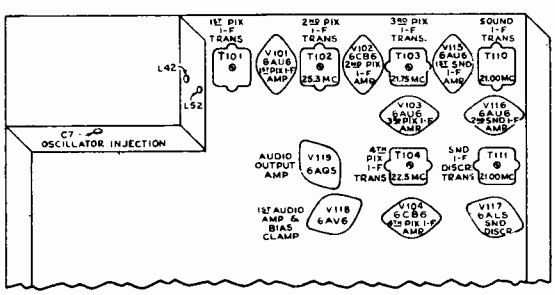


Figure 9—Bottom Chassis Adjustments

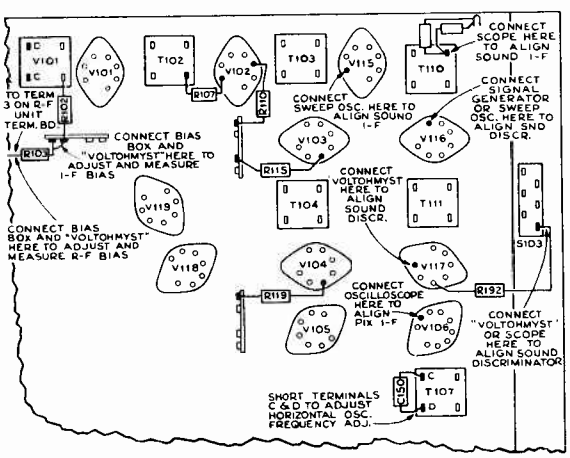


Figure 10—Test Connection Points

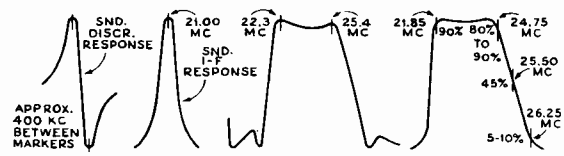


Figure 12 Discriminator Response — *Figure 13 Sound I-F Response* — *Figure 14 T1 and T101 Response* — *Figure 15 Overall I-F R-F Response*

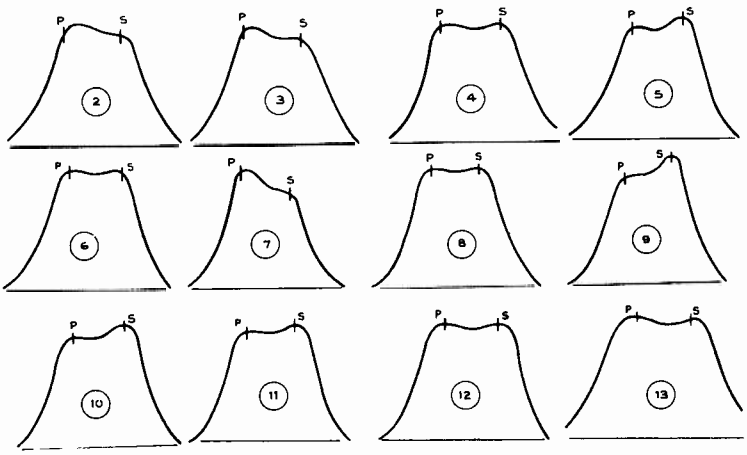


Figure 16 R-F Response

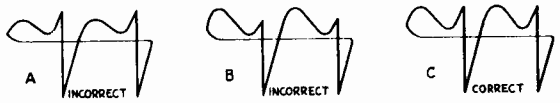
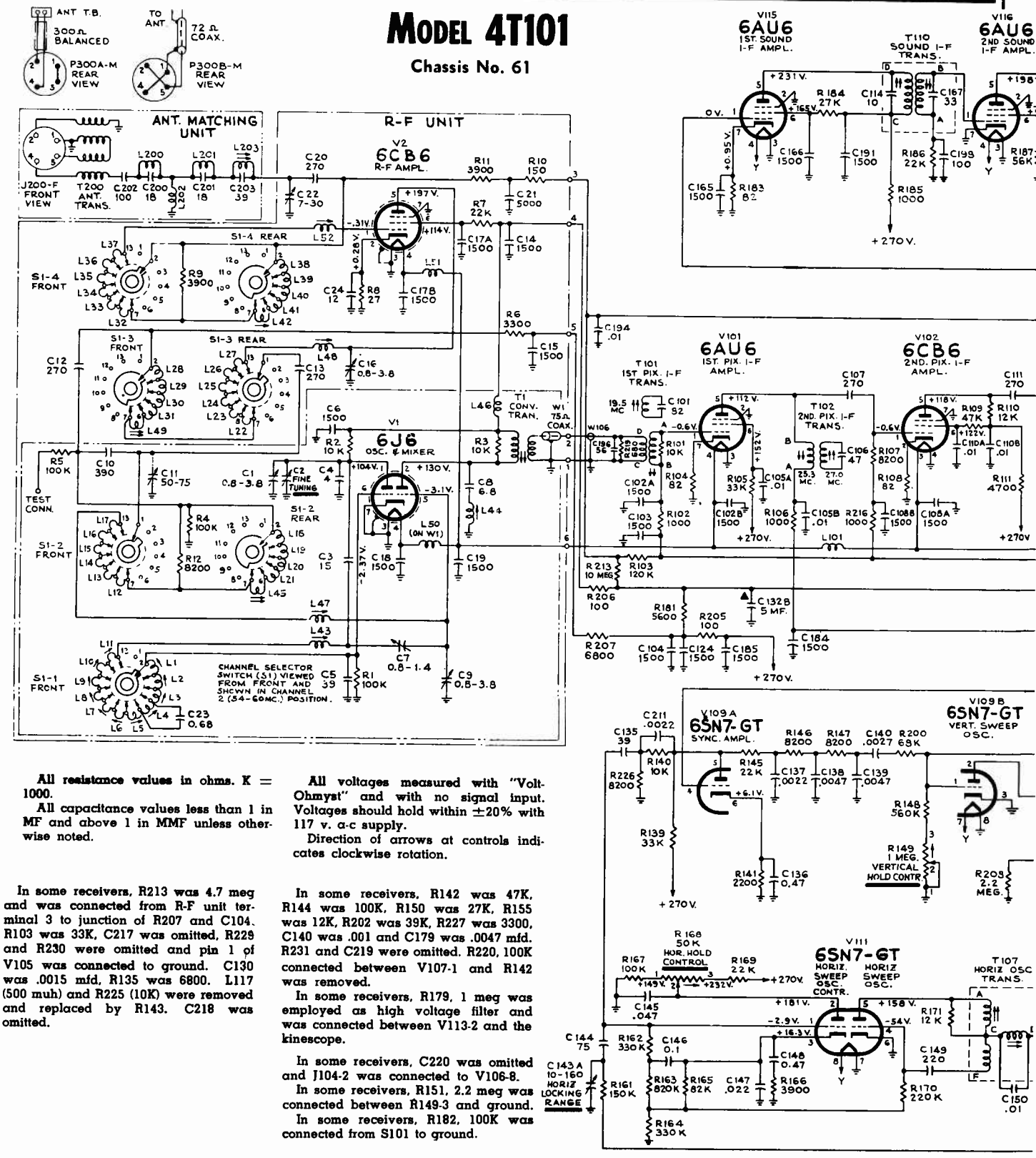


Figure 17—Horizontal Oscillator Waveforms

MODEL 4T101

Chassis No. 61



All resistance values 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 hold within ±20% with 117 v. a-c supply.

Direction of arrows at controls indicates clockwise rotation.

In some receivers, R213 was 4.7 meg and was connected from R-F unit terminal 3 to junction of R207 and C104. R103 was 33K, C217 was omitted, R229 and R230 were omitted and pin 1 of V105 was connected to ground. C130 was .0015 mfd, R135 was 6800. L117 (500 muh) and R225 (10K) were removed and replaced by R143. C218 was omitted.

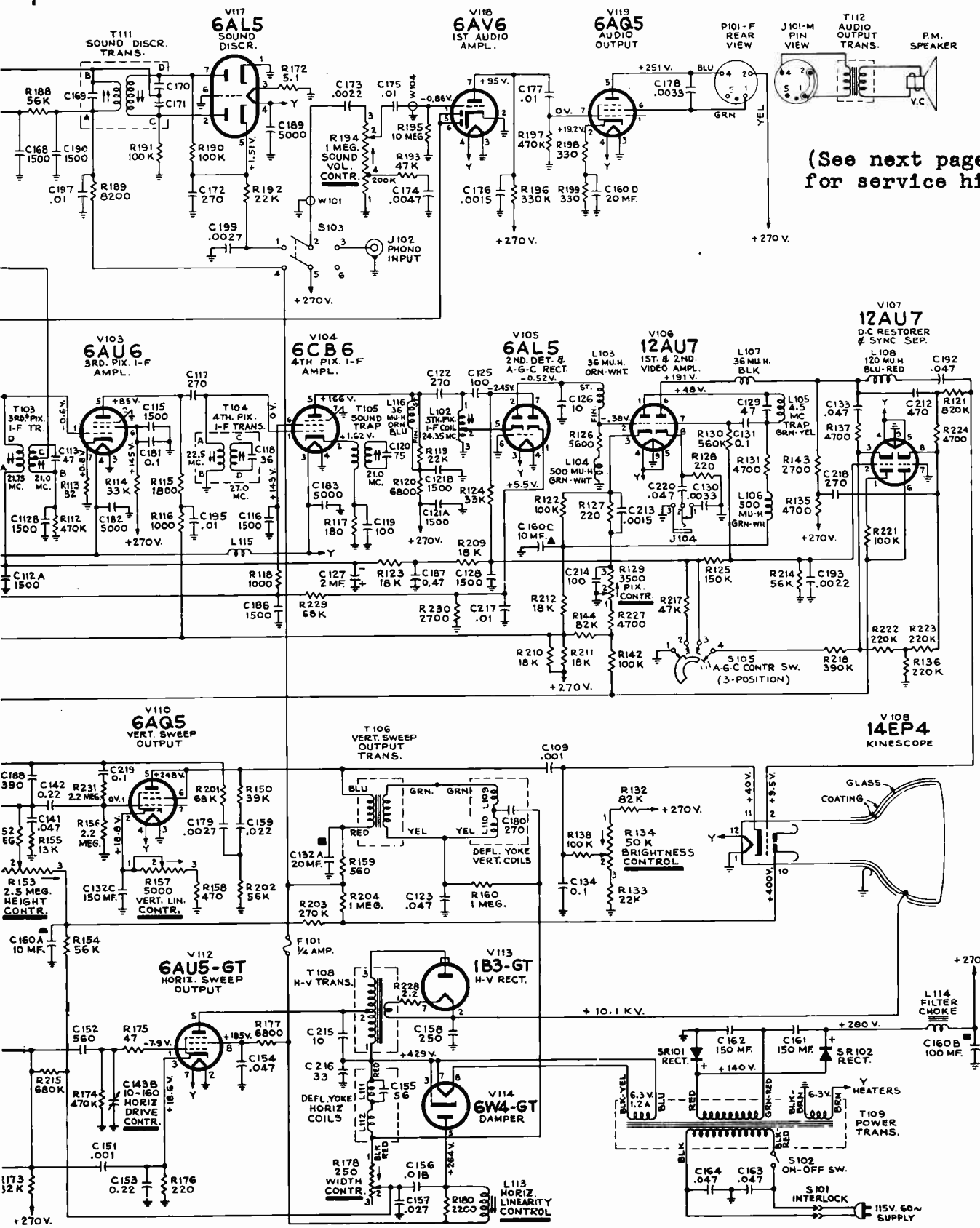
In some receivers, R142 was 47K, R144 was 100K, R150 was 27K, R155 was 12K, R202 was 39K, R227 was 3300, C140 was .001 and C179 was .0047 mfd. R231 and C219 were omitted. R220, 100K connected between V107-1 and R142 was removed.

In some receivers, R179, 1 meg was employed as high voltage filter and was connected between V113-2 and the kinescope.

In some receivers, C220 was omitted and J104-2 was connected to V106-8.

In some receivers, R151, 2.2 meg was connected between R149-3 and ground.

In some receivers, R182, 100K was connected from S101 to ground.



CIRCUIT SCHEMATIC DIAGRAM 4T101

TELEVISION SERVICE SUGGESTIONS

4T101

Following is a list of symptoms of possible failures and an indication of some of the possible faults:

NO RASTER ON KINESCOPE:

(1) Incorrect adjustment of ion trap magnet. Magnet reversed either front to back or top to bottom.

(2) V112 or V113 inoperative. Check waveforms on grids and plates.

(3) No high voltage — if horizontal deflection is operating as evidenced by the correct waveform on terminal 1 of high voltage transformer, the trouble can be isolated to the 1B3GT circuit. Either the T108 high voltage winding is open, the 1B3GT tube is defective, its filament circuit is open, C158 is shorted, or R179 is open.

(4) V111 circuit inoperative—refer to schematic and waveform chart.

(5) Damper tube (V114) inoperative.

(6) Defective kinescope.

(7) R134 open.

(8) No receiver plate voltage—filter capacitor shorted—or filter choke open.

NO VERTICAL DEFLECTION:

(1) V109 or V110 inoperative. Check voltage and waveforms on grids and plates.

(2) T106 open.

(3) Vertical deflection coils open.

SMALL RASTER:

(1) Low Plus B or low line voltage.

(2) V112 defective.

POOR VERTICAL LINEARITY:

(1) If adjustments cannot correct, change V110.

(2) Vertical output transformer T106 defective.

(3) V109 defective—check voltage and waveforms on grid and plate.

(4) C141, R155, C132A or C132C defective.

(5) Low plate voltage—check rectifiers and capacitors in supply circuits.

(6) If height is insufficient, try changing V109.

POOR HORIZONTAL LINEARITY:

(1) If adjustments do not correct, change V112 or V114.

(2) T108 or L113 defective.

(3) C156 or C157 defective.

WRINKLES ON LEFT SIDE OF RASTER:

(1) C155, R160 or C123 defective.

(2) Defective yoke.

PICTURE OUT OF SYNC HORIZONTALLY:

(1) T107 incorrectly tuned.

(2) R167, R168 or R169 defective.

TRAPEZOIDAL OR NON SYMMETRICAL RASTER:

(1) Improper adjustment of focus magnet or ion trap magnet.

(2) Defective yoke.

RASTER AND SIGNAL ON KINESCOPE BUT NO SOUND:

(1) R-F oscillator off frequency.

(2) Sound i-f, discriminator or audio amplifier inoperative—check V115, V116, V117 and their socket voltages.

(3) T112 or C178 defective.

(4) Speaker defective.

SIGNAL AT KINESCOPE GRID BUT NO SYNC:

(1) AGC control switch S105 misadjusted.

(2) V107B inoperative. Check voltage and waveforms at its grid and plate.

SIGNAL ON KINESCOPE GRID BUT NO VERTICAL SYNC:

(1) Check V109 and associated circuit—C140, R200, etc.

(2) Integrating network inoperative—check.

(3) R148, R149, R150, R151, R152, R153, R154, R201, R202, C159 or C179 defective.

(4) Gas current, grid emission or grid cathode leakage in V109—replace.

(5) If C188 is small or missing, interlace will be poor.

SIGNAL ON KINESCOPE GRID BUT NO HORIZONTAL SYNC:

(1) T107 misadjusted—readjust as instructed on page 11.

(2) V111 inoperative—check socket voltages and waveforms.

(3) T107 defective.

(4) C144, C143A, C145, C146, C147, C148 or C150 defective.

(5) If horizontal speed is completely off and cannot be adjusted check R167, R168, R169, R170, R171, R173 and R215.

SOUND AND RASTER BUT NO PICTURE OR SYNC:

(1) Picture i-f, detector or video amplifier inoperative—check V103, V104, V105 and V106—check socket voltages.

(2) Bad contact to kinescope grid.

PICTURE STABLE BUT POOR RESOLUTION:

(1) V105 or V106 defective.

(2) Peaking coils defective—check for specified resistance.

(3) Make sure that the focus control operates on both sides of proper focus.

(4) R-F and I-F circuits misaligned.

PICTURE SMEAR:

(1) R-F or I-F circuits misaligned.

(2) Open peaking coil.

(3) This trouble can originate at the transmitter—check on another station.

PICTURE JITTER:

(1) AGC control switch S105 misadjusted.

(2) If regular sections at the left picture are displaced change V112.

(3) Vertical instability may be due to loose connections or noise.

(4) Horizontal instability may be due to unstable transmitted sync.

RASTER BUT NO SOUND, PICTURE OR SYNC:

(1) Defective antenna or transmission line.

(2) R-F oscillator off frequency.

(3) R-F unit inoperative—check V1, V2.

DARK VERTICAL LINE ON LEFT OF PICTURE:

(1) Reduce horizontal drive and readjust width and horizontal linearity.

(2) Replace V112.

LIGHT VERTICAL LINE ON LEFT OF PICTURE:

(1) C155 defective.

(2) V114 defective.

RCA VICTOR

MODELS 17T153, 17T155, 17T160, 17T174

Chassis Nos. KCS66 or KCS66A

ALIGNMENT PROCEDURE

TEST EQUIPMENT.—To properly service the television chassis of this receiver, it is recommended that the following test equipment be available:

R-F Sweep Generator meeting the following requirements:

(a) Frequency Ranges
35 to 90 mc., 1 mc. to 12 mc. sweep width
170 to 225 mc., 12 mc. sweep width

(b) Output adjustable with at least .1 volt maximum.

(c) Output constant on all ranges.

(d) "Flat" output on all attenuator positions.

Cathode-Ray Oscilloscope.—For alignment purposes, the oscilloscope employed must have excellent low frequency and phase response, and should be capable of passing a 60-cycle square wave without appreciable distortion

Signal Generator to provide the following frequencies with crystal accuracy.

(a) Intermediate frequencies
4.5 mc. sound i-f transformer
39.75 mc. adjacent channel picture trap
41.25 mc. sound trap
45.75 mc. picture carrier
47.25 mc. adjacent channel sound trap

(b) Radio frequencies

Channel Number	Picture Carrier Freq. Mc.	Sound Carrier Freq. Mc.	Receiver R-F Osc. Freq. Mc.
2	55.25	59.75	101
3	61.25	65.75	107
4	67.25	71.75	113
5	77.25	81.75	123
6	83.25	87.75	129
7	175.25	179.75	221
8	181.25	185.75	227
9	187.25	191.75	233
10	193.25	197.75	239
11	199.25	203.75	245
12	205.25	209.75	251
13	211.25	215.75	257

(c) Output of these ranges should be adjustable and at least .1 volt maximum.

Heterodyne Frequency Meter with crystal calibrator if the signal generator is not crystal controlled.

Electronic Voltmeter of Junior or Senior "VoltOhmyst" type and a high voltage multiplier probe for use with this meter to permit measurements up to 20 kv.

CAUTION: Do not short the kinescope second anode lead. Its short circuit current presents a considerable overload on the high voltage rectifier V119.

ORDER OF ALIGNMENT.—When a complete receiver alignment is necessary, it can be most conveniently performed in the following order:

(1) Ant. Matching Unit
(2) R-F Unit
(3) Ratio Detector
(4) Sound I-F Trans.
(5) Sound Take-Off Trans.
(6) Picture I-F Traps
(7) Picture I-F Trans.
(8) Sweep Alignment of I-F
(9) Horizontal Oscillator
(10) Sensitivity Check

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 realigned.

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 L58 to the channel selector switch S5. Connect an oscilloscope low capacity crystal probe from L58 to ground. The sensitivity of the oscilloscope should be at least 0.02 volts per inch. Set the oscilloscope gain to maximum.

Connect a signal generator to the antenna input terminals of the matching unit. Modulate the signal generator 30% with a 400 cycle sine wave. Adjust for maximum r-f output of at least 1.0 volt.

Tune the signal generator to 45.75 mc. and adjust L59 in the antenna matching unit for minimum 400 cycle indication on the oscilloscope.

Tune the signal generator to 41.25 mc. and adjust L60 for minimum 400 cycle indication on the oscilloscope.

Connect the r-f sweep oscillator 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 10 shows three different resistance pads for use with sweep generators with 50 ohm coax output, 72 ohm coax 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.

Connect a 300 ohm ½ watt composition resistor from L58 to ground keeping the leads as short as possible. Leave the oscilloscope diode probe connected from L58 to ground.

Set the sweep generator to sweep from 45 mc. to 55 mc.

Adjust L61 and L62 to obtain the response shown in Figure 11. L61 is most effective in locating the position of the shoulder of the curve at 52 mc. and L62 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.

It is very important that the unit be aligned to the response as shown in Figure 11 if maximum sensitivity and good r-f tracking of the r-f unit is to be obtained.

Remove the 300 ohm resistor and diode probe connections. Restore the connection between L58 and S5.

R-F UNIT ALIGNMENT.—An r-f 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 all adjustments to the approximate center of their range with the following exceptions: Set C18 so that the screw head is approximately three-eighths of an inch above chassis. Set the T1 core for maximum inductance (core turned counter-clockwise). Set C11 near maximum capacity (one-quarter turn from tight). Do not change any of the adjustments in the antenna matching unit.

Disconnect the link from terminals "A" and "B" of T104 and terminate the link with a 39 ohm composition resistor.

The r-f unit is aligned with zero AGC bias. To insure that the bias will remain constant, take a clip lead and short circuit the r-f unit power terminal board terminal 3 to ground.

Connect the oscilloscope to the test point TP1 on top of the r-f unit. Set the oscilloscope gain to maximum.

Turn the receiver channel selector switch to channel 2.

Connect the output of the signal generator to the grid of the r-f amplifier, V2. To do this, remove the tube from the socket and fashion a clip by twisting one end of a small piece of wire around pin number 7. Replace the tube in the socket leaving the end of the wire protruding from under the tube. Connect the signal generator to this wire through a 1,500 mmf capacitor.

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 L65 on top of the r-f unit 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 adjust it so as to reduce sensitivity on channel 2.

Remove the wire clip from pin 7 of V2 and replace the tube and tube shield.

Set the channel selector switch to channel 8.

Turn the fine tuning control 30 degrees clockwise from the center of its mechanical range now and at all times when adjusting the oscillator frequency.

Adjust C1 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 r-f unit through the hole provided for the adjustment for C11. Be careful that the wire does not touch any of the tuned circuits as it may cause the frequency of the r-f unit oscillator to shift. Connect the other end of the wire to the "r-f in" terminal of the signal generator. Adjust C1 to obtain an audio beat with the signal generator.

Connect the sweep generator through a suitable attenuator as shown in Figure 10 to the input terminals of the antenna matching unit.

Connect the signal generator loosely to the antenna terminals.

Set the sweep oscillator to cover channel 8.

Set the oscilloscope to maximum gain and use the minimum input signal which will produce a useable pattern on the oscilloscope. Excessive input can change oscillator induction 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 C9, C11, C15 and C18 for approximately correct curve shape, frequency, and band width as shown in Figure 12.

The correct adjustment of C18 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. C9 tunes the mixer grid circuit and affects the tilt of the curve most noticeably (assuming that C22 has been properly adjusted). C11 is the coupling adjustment and hence primarily affects the response band width.

Set the receiver channel switch to channel 6.

Adjust the signal generator to the channel 6 oscillator frequency 129 mc.

Turn the fine tuning control 30 degrees clockwise from the center of its mechanical range.

Adjust L5 for an audible beat with the signal generator as before.

Set the sweep generator to channel 6.

From the signal generator, insert channel 6 sound and picture carrier markers, 83.25 mc. and 87.75 mc.

Adjust L48, L50 and L53 for proper response as shown in Figure 12.

L50 tunes the r-f amplifier plate circuit and primarily affects the frequency of the pass band. L53 tunes the r-f amplifier grid and is adjusted to give maximum amplitude of the curve between the markers. L48 affects the tilt of the curve but not quite the same as C9 adjustment. When the circuits are correctly adjusted and L48 is rocked on either side of its proper setting, the high frequency (sound carrier) end of the curve appears to remain nearly fixed in amplitude while the picture carrier end tilts above or below this point.

Turn off the sweep and signal generators.

Connect the "VoltOhmyst" to the r-f unit test point TP1.

Adjust the oscillator injection trimmer C8 for –3.5 volts or at maximum if –3.5 volts cannot be reached. This voltage should fall between –2.5 and –5.5 volts on all channels when the alignment of all circuits is completed.

Turn the sweep oscillator and signal generator back on and recheck channel 6 response. Readjust L48, L50 and L53 if necessary.

Set the receiver channel selector switch to channel 8 and readjust C1 for proper oscillator frequency, 227 mc.

Set the sweep oscillator and signal generator to channel 8.

Readjust C9, C11, C15 and C18 for correct curve shape, frequency and band width.

Turn off the sweep and signal generators, switch back to channel 6 and check the oscillator injection voltage at TP1 if C9 was adjusted in the recheck of channel 8 response.

If the initial setting of oscillator injection trimmer C8 was far off, it may be necessary to adjust the oscillator frequency and response on channel 8, adjust the oscillator injection on channel 6 and repeat the procedure several times before the proper setting is obtained.

Turn off the sweep generator and switch the receiver to channel 13.

Adjust the signal generator to the channel 13 oscillator frequency 257 mc.

Set the fine tuning control 30 degrees clockwise from the center of its mechanical range.

Adjust L46 to obtain an audible beat. Slightly overshoot the adjustment of L46 by turning the slug a little more in the same direction from the original setting, then reset the oscillator to proper frequency by adjusting C1 to again obtain the beat.

Check the response of channels 7 through 13 by switching the receiver channel switch, sweep oscillator and marker oscillator to each of these channels and observing the response and oscillator injection obtained. See Figure 12 for typical response curves. It should be found that all these channels have the proper shaped response with the markers above 80% response.

If the markers do not fall within this requirement, switch to channel 8 and readjust C9, C11, C15 and C18 as necessary.

Turn off the sweep generator and check the channel 8 oscillator frequency. If C1 has to be readjusted for channel 8, the principle of overshooting the adjustment and then correcting by adjusting L46 should be followed in order to establish the L/C ratio for the desired oscillator tracking.

Turn the receiver channel selector switch to channel 6. Adjust L5 for correct oscillator frequency, 129 mc.

Turn the sweep oscillator on and to channel 6 and observe the response curve. If necessary readjust L48, L50 and L53.

Switch the receiver through channel 6 down through channel 2 and check for normal response curve shapes and oscillator injection voltage.

If excessive tilt in the same direction occurs on channels 2, 3 and 4, adjust C18 on channel 2 to overshoot the correction of this tilt, then switch to channel 6 and adjust L53 for maximum amplitude of curve between markers. This adjustment should produce "flat" response on the low channels if the other adjustments especially L48 are correct.

Likewise check channels 7 through 13, stopping on 13 for the next step.

With the receiver on channel 13, check the receiver oscillator frequency. Correct by adjustment of C1 if necessary.

Adjust the oscillator to frequency on all channels by switching the receiver and the frequency standard to each channel and adjusting the appropriate oscillator trimmer to obtain the audible beat. It should be possible to adjust the oscillator to the correct frequency on all channels with the fine tuning control in the middle third of its range.

17T153, 17T155, 17T160, 17T174

ALIGNMENT PROCEDURE (Continued)

RCA Victor

Channel Number	Picture Carrier Freq. Mc.	Sound Carrier Freq. Mc.	Receiver R-F Osc. Freq. Mc.	Channel Oscillator Adjustment
2	55.25	59.75	101	L1
3	61.25	65.75	107	L2
4	67.25	71.75	113	L3
5	77.25	81.75	123	L4
6	83.25	87.75	129	L5
7	175.25	179.75	221	L6
8	181.25	185.75	227	L7
9	187.25	191.75	233	L8
10	193.25	197.75	239	L9
11	199.25	203.75	245	L10
12	205.25	209.75	251	L11
13	211.25	215.75	257	C1

Remove the 39 ohm resistor from the link and reconnect the link to terminals "A" and "B" of T104.

RATIO DETECTOR ALIGNMENT.— Set the signal generator at 4.5 mc. and connect it to the second sound i-f grid, pin 1 of V102. Set the generator for 30% 400 cycle modulation. As an alternate source of signal, the RCA WR39B or WR39C calibrator may be employed. If used, connect its output cable to the grid of the 4th pix i-f amplifier, pin 1 of V109.

Set the frequency of the calibrator to 45.75 (pix carrier) and modulate with 4.5 mc. crystal. The 4.5 mc. signal will be picked off at T110A and amplified through the sound i-f amplifier.

Connect the "VoltOhmyst" to the junction of R110 and R114.

Connect the oscilloscope across the speaker voice coil and turn the volume control for maximum output.

Set the trimmer C226 (on the bottom of the V103 socket) for minimum capacity.

Tune the ratio detector primary, T102 top core for maximum DC output on the "VoltOhmyst." Adjust the signal level from the signal generator for 10 volts on the "VoltOhmyst" when finally peaked. This is approximately the operating level of the ratio detector for average signals.

Tune the ratio detector secondary T102 bottom core for minimum AM output on the oscilloscope.

Repeat adjustments of T102 top for maximum DC and T102 bottom for minimum output on the oscilloscope making final adjustment with the 4.5 mc. input level adjusted to produce 10 volts d-c on the "VoltOhmyst."

Connect the "VoltOhmyst" to the junction of R112 and C113 and note the amount of d-c present. If this voltage exceeds ±1.5 volts, adjust C226 by turning the core in until zero d-c is obtained. Readjust the T102 bottom core for minimum output on the oscilloscope. Repeat the adjustments of C226 and T102 bottom core until the voltage at R112 and C113 is less than ±1.5 volts when T102 bottom core is set for minimum indication on the oscilloscope.

Connect the "VoltOhmyst" to the junction of R110 and R114 and repeat the T102 top core for maximum d-c on the meter and again reset the generator output so that the meter reads minus 10 volts.

Repeat the adjustments in the above two paragraphs until the voltage at R112 and C113 is less than ±1.5 volts when the T102 top core is set for maximum d-c at the junction of R110 and R114 and the T102 bottom core is set for minimum indication on the oscilloscope.

SOUND I-F ALIGNMENT. — Connect the sweep generator to the first sound i-f amplifier grid, pin 1 of V101. Adjust the generator for a sweep width of 1 mc. at a center frequency of 4.5 mc.

Insert a 4.5 mc. marker signal from the signal generator into the first sound i-f grid.

Connect the oscilloscope in series with a 10,000 ohm resistor to terminal A of T101.

Adjust T101 top and bottom cores for maximum gain and symmetry about the 4.5 mc. marker on the i-f response. The pattern obtained should be similar to that shown in Figure 13.

The output level from the sweep should be set to produce approximately 2.0 volt peak-to-peak at terminal A of T101 when the final touches on the above adjustment are made. It is necessary that the sweep output voltage should not exceed the specified values otherwise the response curve will be broadened, permitting slight misadjustment to pass unnoticed and possibly causing distortion on weak signals.

Connect the oscilloscope to the Junction of R112 and C113 and check the linearity of the response. The pattern obtained should be similar to that shown in Figure 14.

SOUND TAKE-OFF ALIGNMENT.—Connect the 4.5 mc. generator in series with a 1000 ohm resistor to terminal "C" of T110. The input signal should be approximately 0.5 volts.

Short the fourth pix i-f grid to ground, pin 1 V109, to prevent noise from masking the output indication.

As an alternate source of signal the RCA WR39B or WR39C calibrator may be used. In such a case, disregard the above two paragraphs. Connect calibrator across link circuit, T104 A, B, and modulate 45.75 carrier with 4.5 mc. crystal.

Connect the crystal diode probe of a "VoltOhmyst" to the plate of the video amplifier, pin 8 of V110.

Adjust the core of T110 for minimum output on the meter.

Remove the short from pin 1 V109 to ground, if used.

PICTURE I-F TRAP ADJUSTMENT.—Connect the i-f signal generator across the link circuit on terminals A and B of T104.

Connect the "VoltOhmyst" to test point TP101.

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 of R143 and R144.

Set the bias pot to produce approximately −1.0 volt of bias at test point TP101.

Connect the "VoltOhmyst" to test point TP102 at the picture detector.

Set the signal generator to each of the following frequencies and adjust the corresponding circuit for minimum d-c output at TP102. Use sufficient signal input to produce 1.0 volt of d-c on the meter when the final adjustment is made.

39.75 mc.	T104 top core
41.25 mc.	T105 bottom core
47.25 mc.	T106 bottom core

PICTURE I-F TRANSFORMER ADJUSTMENTS.—Set the 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 1.0 volt of d-c at test point TP102 with −1.0 volt of i-f bias at test point TP101.

43.7 mc.	T109
45.5 mc.	T108
41.8 mc.	T107

To align T105 and T106, connect the sweep generator to the first picture i-f grid, pin 1 of V106. Shunt R141, R149 and terminals "A" and "F" of T109 with 330 ohm composition resistors. Set the i-f bias to −1.0 volt at test terminal TP101.

Adjust T105 and T106 top cores for maximum gain and curve shape as shown in Figure 15. For final adjustments set the output of the sweep generator to produce 0.5 volts peak-to-peak at the oscilloscope terminals.

To align T1 and T104, connect the sweep generator to the mixer grid test point TP2. Use the shortest leads possible, with not more than one inch of unshielded lead at the end of the sweep cable.

Set the channel selector switch to channel 4.

Connect a 180 ohm composition resistor from terminal B of T105 to the junction of R135 and C132. Connect the oscilloscope diode probe to terminal B of T105 and to ground.

Couple the signal generator loosely to the diode probe in order to obtain markers.

Adjust the T1 (top) and T104 (bottom) core for maximum gain and the response as shown in Figure 16.

Disconnect the diode probe, the 180 ohm and three 330 ohm resistors.

SWEEP ALIGNMENT OF PIX I-F.—Connect the oscilloscope to the test point TP102.

Adjust the bias potentiometer to obtain -6.0 volts of bias as measured by a "VoltOhmyst" at test point TP101.

Leave the sweep generator connected to the mixer grid test point TP2 with the shortest leads possible and with not more than one inch of unshielded lead at the end of the sweep cable. If these precautions are not observed, the receiver may be unstable and the response curves obtained may be unreliable.

Adjust the output of the sweep generator to obtain 3.0 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 T108 and T109 to obtain the response shown in Figure 17. Do not adjust T107 unless absolutely necessary. If T107 is adjusted too low in frequency it will raise the level of the 41.25 mc. sound i-f carrier and may create interference in the picture. It will also cause poor adjacent channel picture rejection. If T107 is tuned too high in frequency, the level of the 41.25 mc. sound i-f carrier will be too low and may produce noisy sound in weak signal areas.

Remove the oscilloscope, sweep and signal generator connections.

Remove the bias box employed to provide bias for alignment.

HORIZONTAL OSCILLATOR ADJUSTMENT.—Normally the adjustment of the horizontal oscillator is not considered to be a part of the alignment procedure, but since the oscillator waveform adjustment may require the use of an oscilloscope, it can not be done conveniently in the field. The waveform adjustment is made at the factory and normally should not require readjustment in the field. However, the waveform adjustment should be checked whenever the receiver is aligned or whenever the horizontal oscillator operation is improper.

Horizontal Frequency Adjustment.—Tune in a station and sync the picture. If the picture cannot be synchronized with the horizontal hold control R201B, then adjust the T113 frequency core on the rear apron until the picture will synchronize. If the picture still will not sync, turn the T113 waveform adjustment core (under the chassis) out of the coil several turns from its original position and readjust the T113 frequency core until the picture is synchronized.

Examine the width and linearity of the picture. If picture width or linearity is incorrect, adjust the horizontal drive control C181B, the width control L106 and the linearity control L107 until the picture is correct.

Horizontal Oscillator Waveform Adjustment. — The horizontal oscillator waveform may be adjusted by either of two methods. The method outlined in paragraph A below may be employed in the field when an oscilloscope is not available. The service shop method outlined in paragraph B below requires the use of an oscilloscope.

A.—Turn the horizontal hold control completely clockwise. Place adjustment tools on both cores of T113 and be prepared to make simultaneous adjustments while watching the picture on the screen. First, turn the T113 frequency core (on the rear apron) until the picture falls out of sync and one diagonal black bar sloping down to the right appears on the screen. Then, turn the waveform adjustment core (under the chassis) into the coil while at the same time adjusting the frequency core so as to maintain one diagonal black bar on the screen. Continue this procedure until the oscillator begins to motorboat, then turn the wavefrom adjustment core out until the motorboating just stops. As a check, turn the T113 frequency core until the picture is synchronized then reverse the direction of rotation of the core until the picture begins to fall out of sync with the diagonal bar sloping down to the right. Continue to turn the frequency core in the same direction. Additional bars should not appear on the screen. Instead, the horizontal oscillator should begin to motorboat. Retouch the adjustment of the T113 waveform adjustment core if necessary until this condition is obtained.

B.—Connect the low capacity probe of an oscilloscope to terminal C of T113. Turn the horizontal hold control one-quarter turn from the clockwise position so that the picture is in sync. The pattern on the oscilloscope should be as shown in Figure 18. Adjust the waveform adjustment core of T113 until the two peaks are at the same height. During this adjustment, the picture must be kept in sync by readjusting the hold control if necessary.

This adjustment is very important for correct operation of the circuit. If the broad peak of the wave on the oscilloscope is lower than the sharp peak, the noise immunity becomes poorer, the stabilizing effect of the tuned circuit is reduced and drift of the oscillator becomes more serious. On the other hand, if the broad peak is higher than the sharp peak, the oscillator is overstabilized, the pull-in range becomes inadequate and the broad peak can cause double triggering of the oscillator when the hold control approaches the clockwise position.

Remove the oscilloscope upon completion of this adjustment.

Horizontal Locking Range Adjustment. — Set the horizontal hold control to the full counter-clockwise position. Momentarily remove the signal by switching off channel then back. The picture may remain in sync. If so turn the T113 frequency core slightly and momentarily switch off channel. Repeat until the picture falls out of sync with the diagonal lines sloping down to the left. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.

If more than 3 bars are present just before the picture pulls into sync, adjust the horizontal locking range trimmer C181A slightly clockwise. If less than 2 bars are present, adjust C181A slightly counter-clockwise. Turn the horizontal hold control counter-clockwise, momentarily remove the signal and recheck the number of bars present at the pull-in point. Repeat this procedure until 2 or 3 bars are present.

Turn the horizontal hold control to the maximum clockwise position. Adjust the T113 frequency core so that the diagonal bar sloping down to the right appears on the screen and then reverse the direction of adjustment so that bar just moves off the screen leaving the picture in synchronization.

SENSITIVITY CHECK.—A comparative sensitivity check can be made by operating the receiver on a weak signal from a television station and comparing the picture and sound obtained to that obtained on other receivers under the same conditions.

This weak signal can be obtained by connecting the shop antenna to the receiver through a ladder type attenuator pad. The number of stages in the pad depends upon the signal strength available at the antenna. A sufficient number of stages should be inserted so that a somewhat less than normal contrast picture is obtained when the picture control is at the maximum clockwise position. Only carbon type resistors should be used to construct the pad.

RESPONSE CURVES.—The response curves shown on page 12 and referred to throughout the alignment procedure were taken from a production set. Although these curves are typical, some variations can be expected.

The response curves are shown in the classical manner of presentation, that is with "response up" and low frequency to the left. The manner in which they will be seen in a given test set-up will depend upon the characteristics of the oscilloscope and the sweep generator. The curves may be seen inverted and/or switched from left to right depending on the deflection polarity of the oscilloscope and the phasing of the sweep generator.

NOTES ON R-F UNIT ALIGNMENT.—Because of the frequency spectrum involved and the nature of the device, many of the r-f unit leads and components are critical in some respects. Even the power supply leads form loops which couple to the tuned circuits, and if resonant at any of the frequencies involved in the performance of the tuner, may cause serious departures from the desired characteristics. In the design of the receiver these undesirable resonant loops have been shifted far enough away in frequency to allow reasonable latitude in their components and physical arrangement without being troublesome. When the r-f unit is aligned in the receiver, no trouble from resonant loops should be experienced. However, if the unit is aligned in a jig separate from the receiver, attention should be paid to insure that unwanted resonances do not exist which might present a faulty representation of r-f unit alignment.

A resonant circuit exists between the r-f tuner chassis and the outer shield box, which couples into the antenna and r-f plate circuits. The frequency of this resonance depends on the physical structure of the shield box, and the capacitance between the tuner chassis and the front plate. In the KRK11 units, this resonance should fall above channel 13 and is controlled in the design by using insulating washers of proper thickness in the front plate to tuner chassis mounting. The performance of the tuner will be impaired if the proper washers are not used. Obviously then, if the r-f unit is removed for service, the washers should be replaced in the correct order when the unit is replaced.

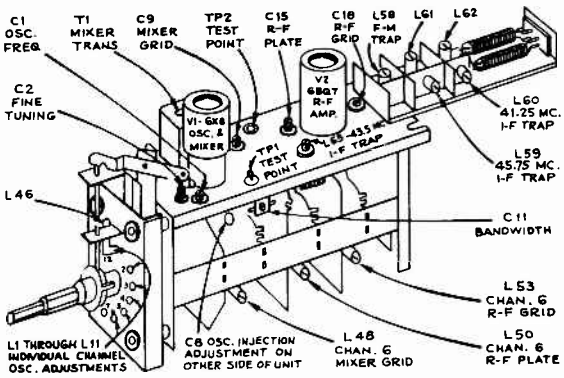


Figure 6—R-F Unit Adjustments

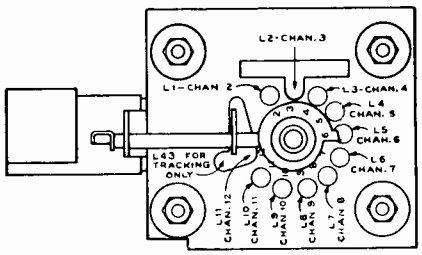


Figure 7—R-F Oscillator Adjustments

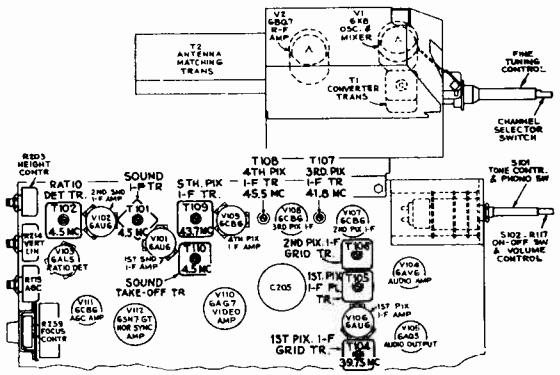


Figure 8—Top Chassis Adjustments

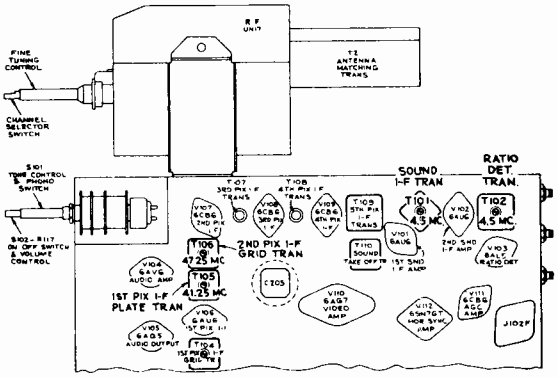


Figure 9—Bottom Chassis Adjustments

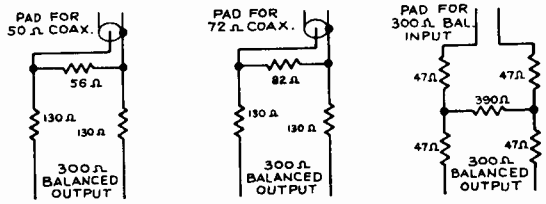


Figure 10—Sweep Attenuator Pads

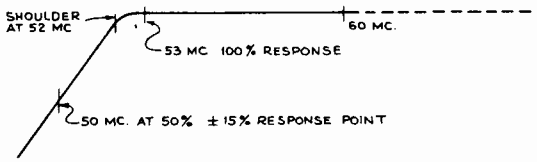


Figure 11—Antenna Matching Unit Response

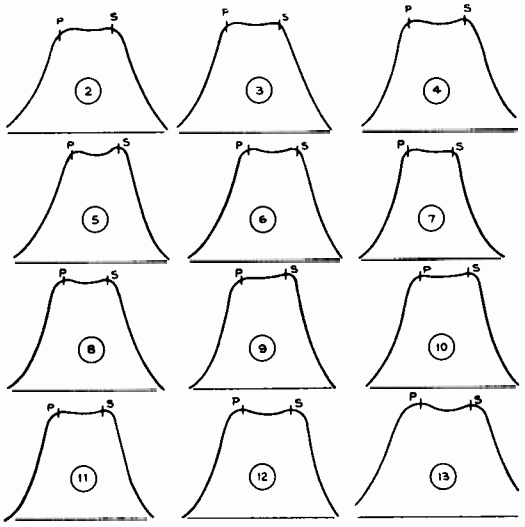


Figure 12—R-F Response

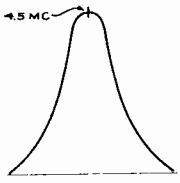


Figure 13 Sound I-F Response

Figure 14 Ratio Det. Response

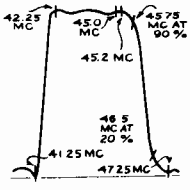


Figure 15 T105 and T106 Response

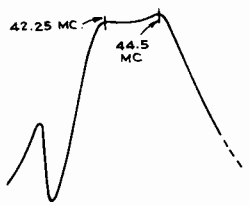


Figure 16 T1 and T104 Response

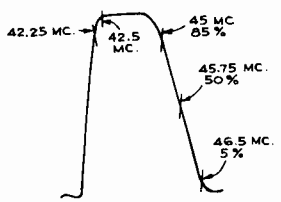


Figure 17 Over-all I-F Response

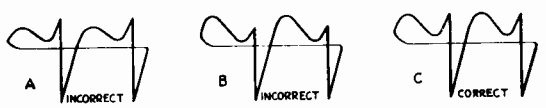
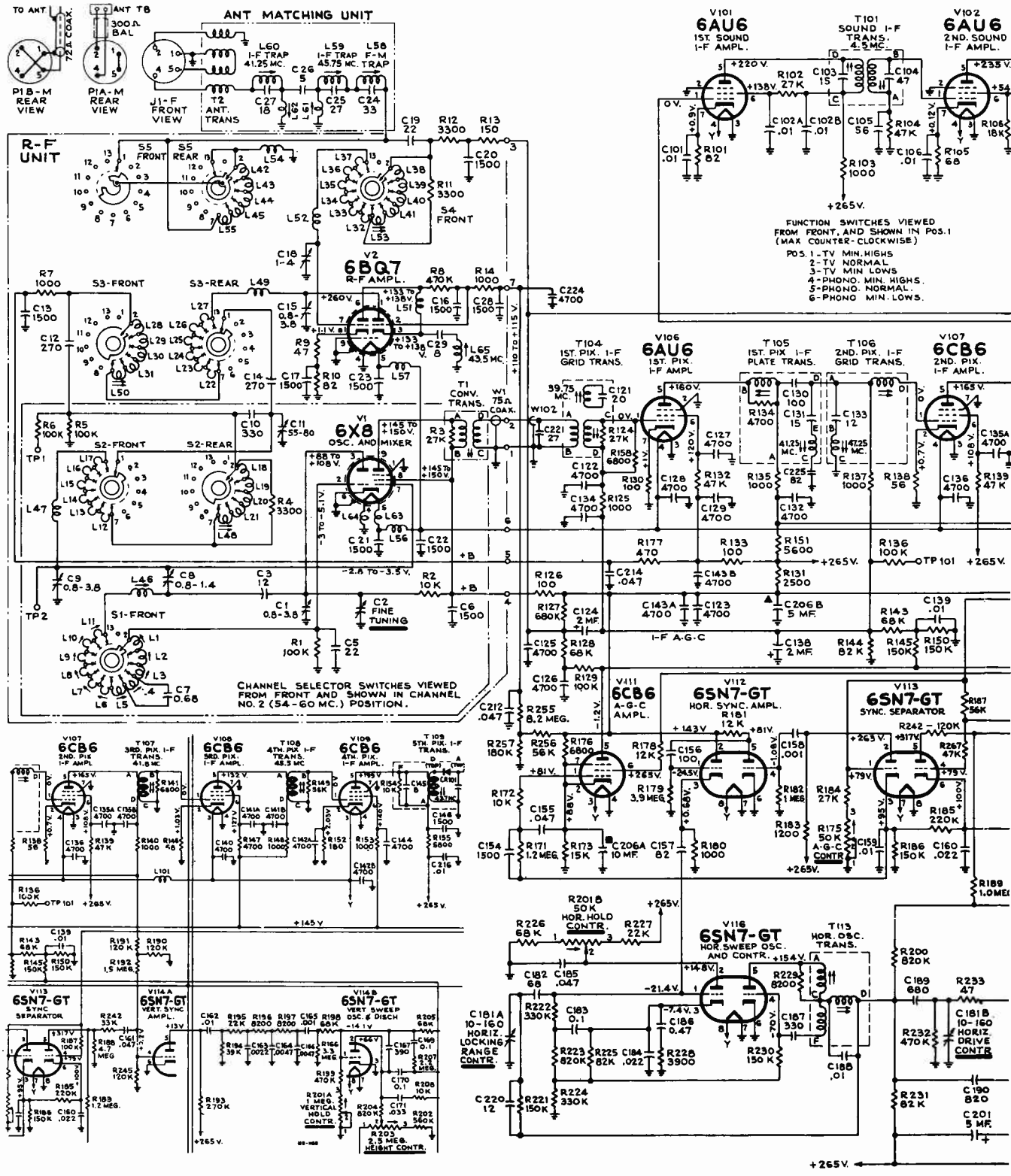


Figure 18—Horizontal Oscillator Waveforms

See the next two pages for a complete circuit diagram.

RCA Victor Models 17T153, 17T155, 17T160, 17T174, Chassis KCS-66 or KCS-66A



In a few early production receivers the V113 sync separator circuit was wired as shown in the above partial schematic diagram. R265, R268, R269, R270 and C223 were omitted and R153 was connected to the +145 volt bus.

In some receivers, focus bleeder resistors R238 was 12 meg and R240 was 15 meg. In some receivers, R238 and R240 are combined into one 18 meg resistor.

In some receivers, R264 (in video amp at sync take-off) was 220 k.

In some receivers, r-f unit terminal 7 by-pass capacitor C224 was omitted.

In some receivers, terminal C of I-F trans. T105 was connected to ground and C225 was omitted.

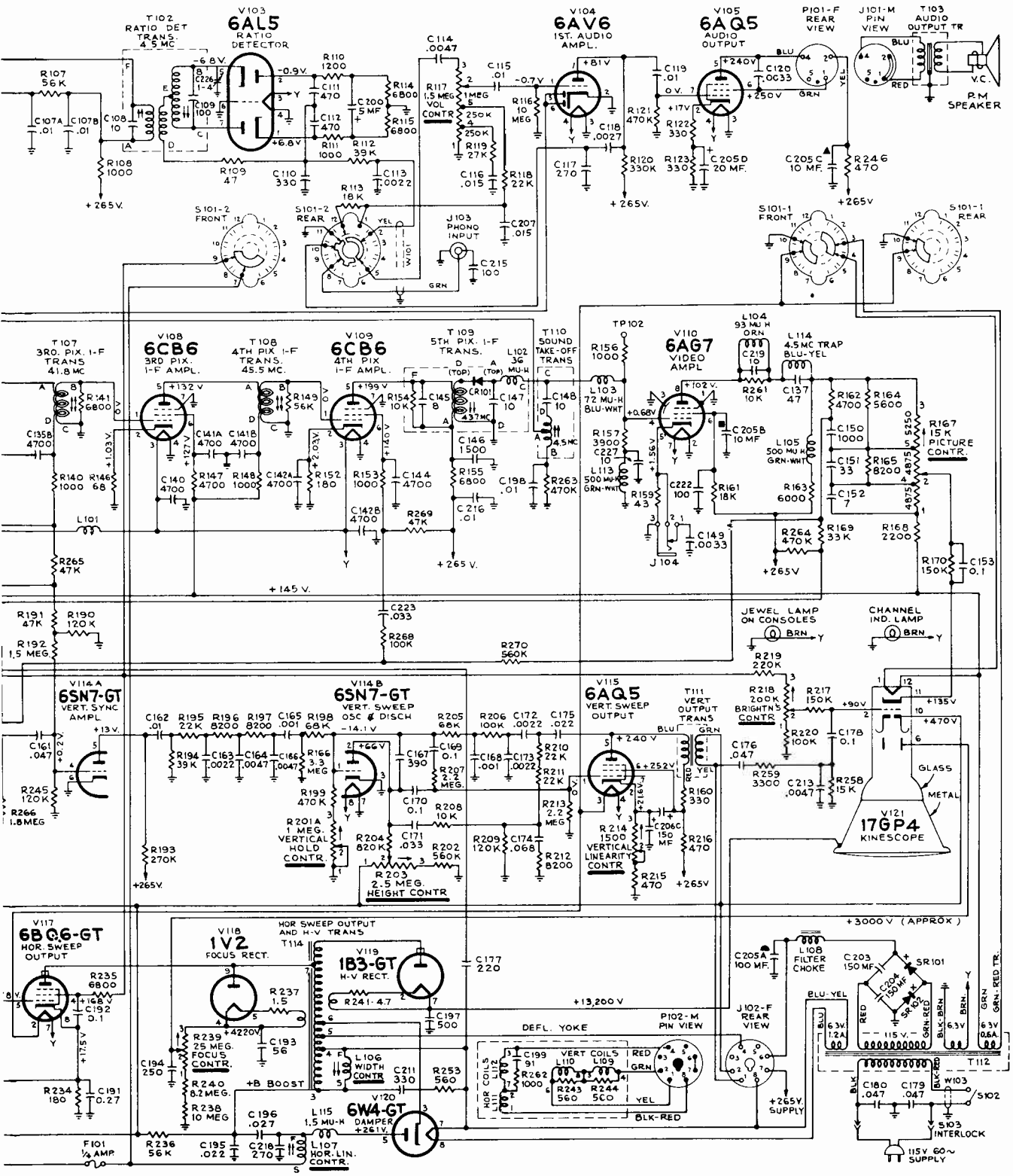
In some receivers ratio detector trimmer C226 was omitted.

In some receivers, C193 was connected from V118-5 to ground.

In some receivers a 22 k resistor, R142 was connected from V110-8 to junction of L105, L114.

In some receivers, C227 (at video amp) was omitted.

RCA Victor Models 17T153, 17T155, 17T160, 17T174, Chassis KCS-66 or KCS-66A



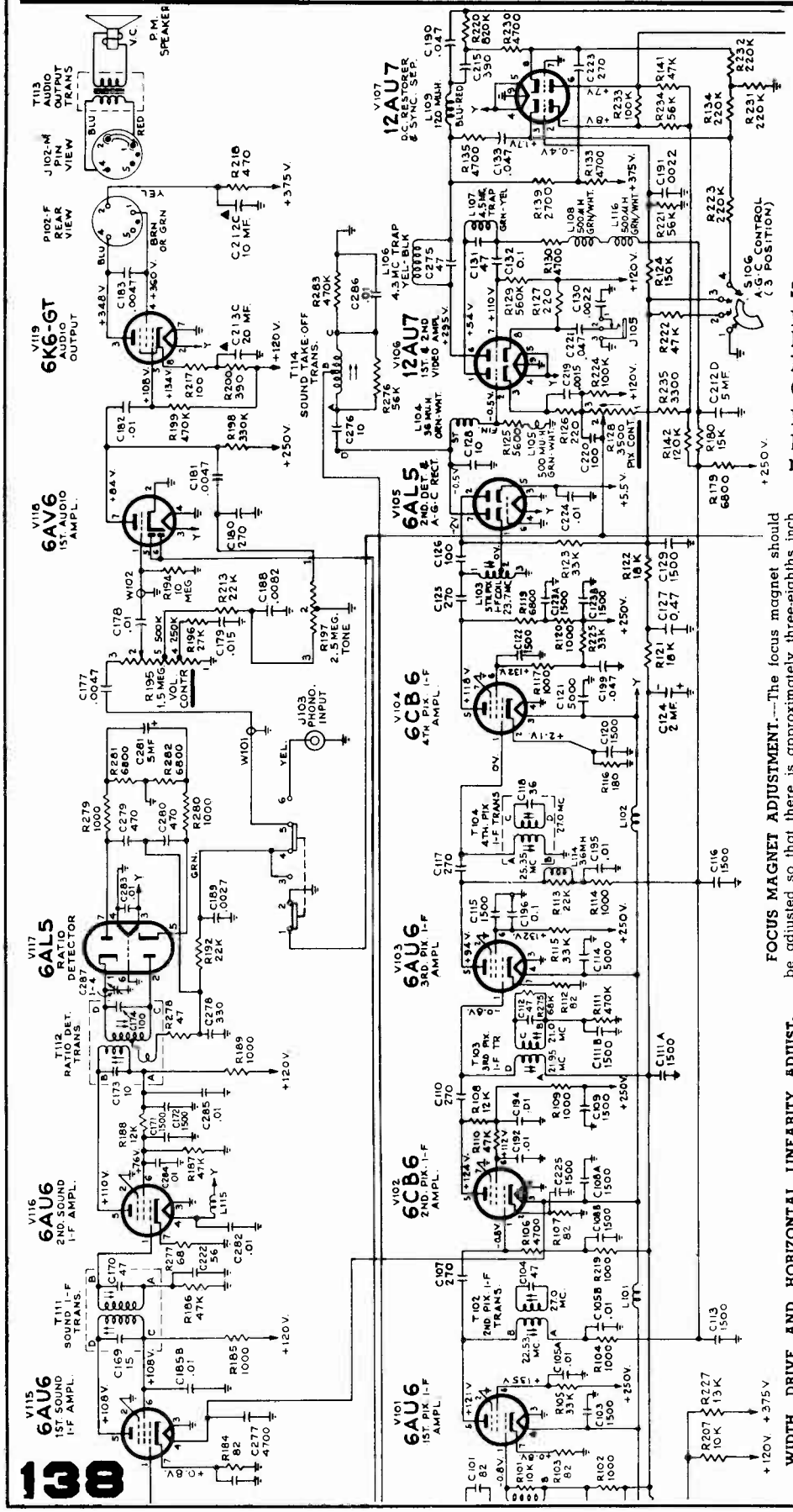
Coil resistance values less than 1 ohm are not shown.

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.

All resistance values in ohms. K = 1000.

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.



RCA VICTOR

TELEVISION RECEIVER MODEL 16T152

Chassis No. KCS47E

Shown on this page is that part of the schematic of Model 16T152, using Chassis KCS-47E, which differs from Chassis KCS-47B circuit on pages 122-123. Use this portion-schematic with the main schematic of KCS-47B.

WIDTH, DRIVE AND HORIZONTAL LINEARITY ADJUSTMENTS.—Adjustment of the horizontal drive control affects the high voltage applied to the kinescope. In order to obtain the highest possible voltage hence the brightest and best focused picture, adjust horizontal drive counter-clockwise as far as possible without stretching the left side of the picture. As a first adjustment, set the horizontal drive trimmer C147B one-half turn out from maximum capacity.

Turn the horizontal linearity coil out until appreciable loss in width occurs, then in until nearly maximum width and the best linearity is obtained.

Adjust the width control R177 to obtain correct picture width.

AGC CONTROL.—The AGC control switch is provided as an installation adjustment. The normal position for strong signal areas is with the switch in the number 1 or counter-clockwise position. If impulse type of interference is experienced, turn the switch to the number 2 or center position. In very weak signal areas in which impulse type interference is experienced, turn the switch to position number 3 or fully clockwise. In this position, all AGC is removed and the receiver will overload if the input signal exceeds 200 microvolts. However, for signals under 200 microvolts, this position of the AGC control switch gives best noise immunity of sync.

FOCUS MAGNET ADJUSTMENT.—The focus magnet should be adjusted so that there is approximately three-eighths inch of space between the rear cardboard shell of the yoke and the flat of the front face of the focus magnet. This spacing gives best average focus over the face of the tube.

The axis of the hole through the magnet should be parallel with the axis of the kinescope neck with the kinescope neck through the center of the opening.

CENTERING ADJUSTMENT.—No electrical centering controls are provided. Centering is accomplished by means of a separate plate on the focus magnet. Some centering plates include a locking screw which must be loosened before centering, and others are held in adjustment by friction. Up and down adjustment of the plate moves the picture side to side and sidewise adjustment moves the picture up and down.

If a corner of the raster is shadowed, check the position of the ion trap magnet. Reposition the magnet within the range of maximum raster brightness to eliminate the shadow and recenter the picture by adjustment of the focus magnet plate. In no case should the magnet be adjusted to cause any loss of brightness since such operation may cause immediate or eventual damage to the tube. In some cases it may be necessary to shift the position of the focus magnet in order to eliminate a corner shadow.

RCA VICTOR

MODELS 21T176, 21T177, 21T178, 21T179

Chassis Nos. KCS68C

Alignment information given for Chassis KCS-66, preceding this section, can be used as a guide in carrying out alignment on the models described. Voltage chart which begins on this page, continues on the page after the double-page circuit diagram.

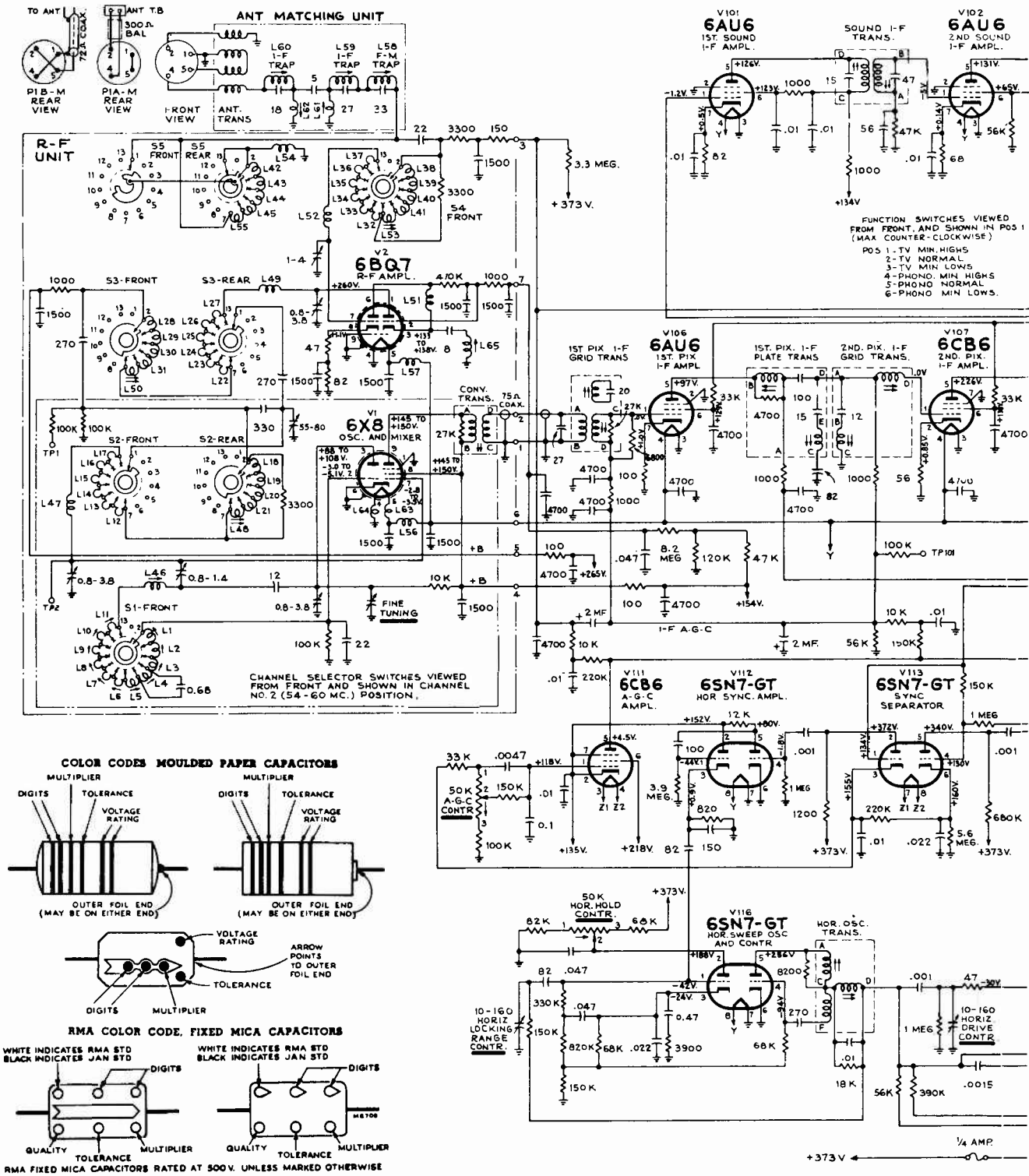
VOLTAGE CHART

The following measurements represent two sets of conditions. In the first condition, a 5000 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		E. Screen		E. Cathode		E. Grid		I Plate (ma.)	I Screen (ma.)	Notes on Measurements
				Pin No.	Volts	Pin No.	Volts	Pin No.	Volts	Pin No.	Volts			
V1	6X8	Mixer	5000 Mu. V. Signal	9	—	8	—	6	0	7	—	—	—	
			No Signal	9	145 to 150	8	145 to 150	6	0	7	−2.8 to −3.5	—	—	Depending on channel
V1	6X8	R-F Oscillator	5000 Mu. V. Signal	3	—	—	—	6	0	2	—	—	—	
			No Signal	3	88 to 108	—	—	6	0	2	−3.0 to −5.1	—	—	Depending on channel
V2	6BQ7	R-F Amplifier	5000 Mu. V. Signal	6	—	—	—	8	—	7	—	—	—	
			No Signal	6	133 to 138	—	—	8	1.1	7	—	—	—	Depending on channel
V2	6BQ7	R-F Amplifier	5000 Mu. V. Signal	1	—	—	—	3	—	2	—	—	—	
			No Signal	1	260	—	—	3	133 to 138	2	—	—	—	Depending on channel
V101	6AU6	1st Sound I-F Amp.	5000 Mu. V. Signal	5	127	6	124	7	0.7	1	−0.4	6.0	3.0	
			No Signal	5	126	6	123	7	0.5	1	−1.2	5.0	3.0	
V102	6AU6	2d Sound I-F Amp.	5000 Mu. V. Signal	5	132	6	60	7	0.14	1	−10	2.8	1.2	
			No Signal	5	131	6	65	7	0.14	1	−5	2.0	1.0	
V103	6AL5	Ratio Detector	5000 Mu. V. Signal	7	1.0	—	—	1	9.2	—	—	—	—	
			No Signal	7	0	—	—	1	8.0	—	—	—	—	
V104	6AV6	1st Audio Amplifier	5000 Mu. V. Signal	7	90	—	—	2	0	1	−0.7	0.45	—	At min. volume
			No Signal	7	86	—	—	2	0	1	−0.7	0.45	—	
V105	6AQ5	Audio Output	5000 Mu. V. Signal	5	350	6	360	2	150	7	116	30.0	2.0	At min. volume
			No Signal	5	346	6	356	2	145	7	114	30.0	2.0	
V106	6AU6	1st Pix. I-F Amplifier	5000 Mu. V. Signal	5	180	6	230	7	0.15	1	−6.5	1.5	0.3	
			No Signal	5	97	6	129	7	1.0	1	0	7.0	3.0	
V107	6CB6	2nd Pix. I-F Amplifier	5000 Mu. V. Signal	5	236	6	233	2	0.1	1	−6.5	1.5	0.14	
			No Signal	5	226	6	138	2	0.85	1	0	12.0	3.0	
V108	6CB6	3d Pix. I-F Amplifier	5000 Mu. V. Signal	5	149	6	144	2	0.9	1	0	11.0	3.0	
			No Signal	5	129	6	133	2	0.8	1	0	10.0	2.0	

MODELS 21T176, 21T177, 21T178, 21T179

Chassis Nos. KCS68C



COLOR CODES MOULDED PAPER CAPACITORS

RMA COLOR CODE, FIXED MICA CAPACITORS

RMA FIXED MICA CAPACITORS RATED AT 500 V. UNLESS MARKED OTHERWISE

All resistance values in ohms. K = 1000.

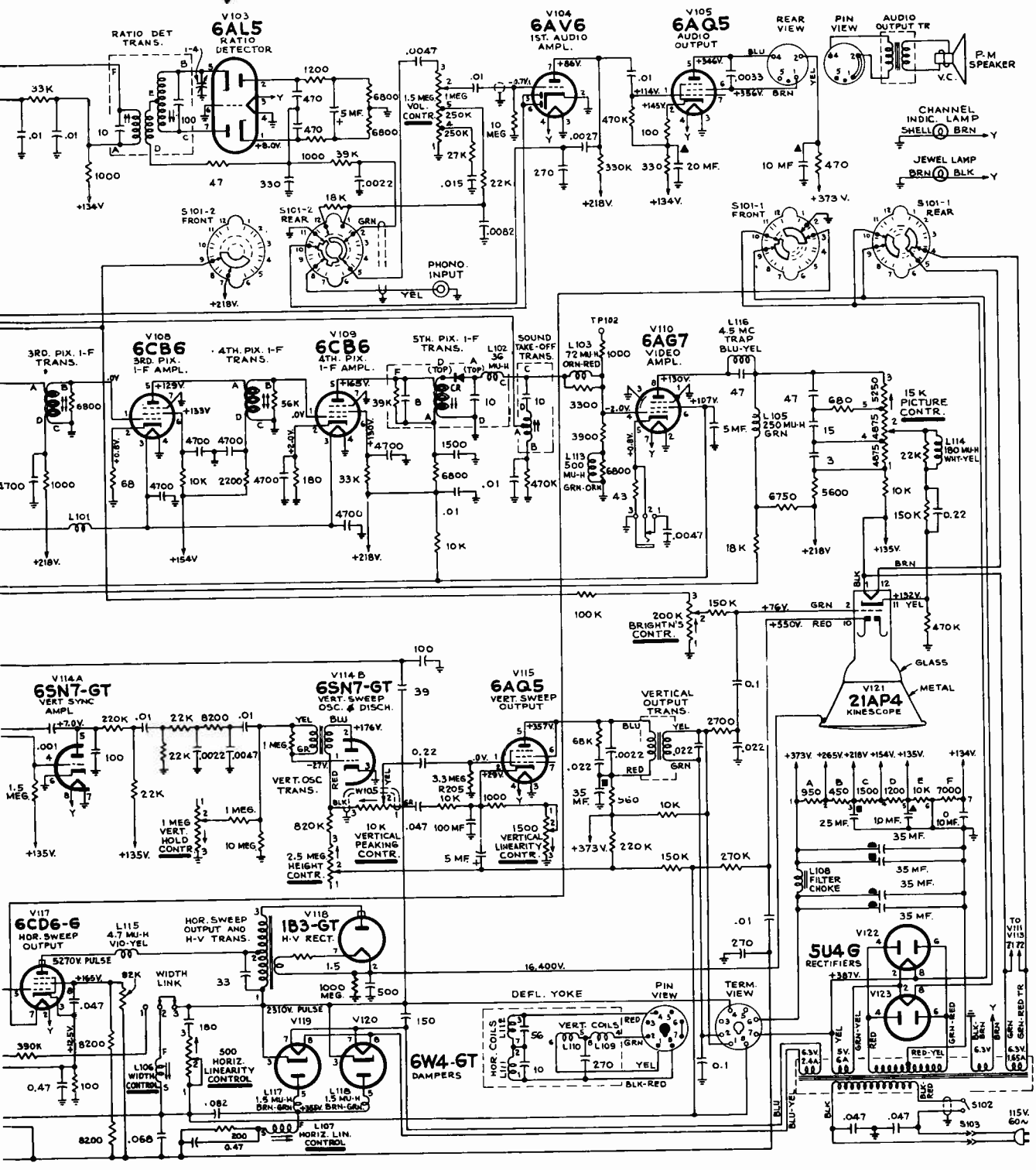
All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

Coil resistance values less than 1 ohm are not shown.

Direction of arrows at controls indicates clockwise rotation.

RCA VICTOR

21T176, 21T177
21T178, 21T179



In some receivers, substitutions have caused changes in component lead color codes, in electrolytic capacitor values and their lug identification markings.

All voltages measured with "Volt-Ohmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

RCA Victor

VOLTAGE CHART (Continued)

21T176, 21T177
21T178, 21T179

Tube No.	Tube Type	Function	Operating Condition	E. Plate		E. Screen		E. Cathode		E. Grid		I Plate (ma.)	I Screen (ma.)	Notes on Measurements
				Pin No.	Volts	Pin No.	Volts	Pin No.	Volts	Pin No.	Volts			
V109	6CB6	4th Pix. I-F Amplifier	5000 Mu. V. Signal	5	178	6	163	2	2.2	1	0	8.9	2.1	
			No Signal	5	165	6	150	2	2.0	1	0	7.9	2.1	
V110	6AG7	Video Amplifier	5000 Mu. V. Signal	8	130	6	172	5	1.2	4	-5.0	22.5	5.5	
			No Signal	8	130	6	107	5	0.8	4	-2.0	15.0	4.0	
V111	6CB6	AGC Amplifier	5000 Mu. V. Signal	5	-27	6	238	2	152	1	155	0.1	3.4	AGC control set for normal operation
			No Signal	5	4.5	6	218	2	135	1	118	0	0	
V112	6SN7GT	Hor. Sync Amplifier	5000 Mu. V. Signal	2	152	—	—	3	0.9	1	-44	1.1	—	
			No Signal	2	135	—	—	3	0.4	1	-30	0.5	—	
			5000 Mu. V. Signal	5	86	—	—	6	0	4	-2.0	5.5	—	
			No Signal	5	80	—	—	6	0	4	-1.8	4.6	—	
V113	6SN7GT	Hor. Sync Separator	5000 Mu. V. Signal	2	374	—	—	3	216	1	155	1.2	—	
			No Signal	2	372	—	—	3	155	1	134	0.8	—	
V113	6SN7GT	Vert. Sync Separator	5000 Mu. V. Signal	5	345	—	—	6	205	4	135	<0.1	—	
			No Signal	5	340	—	—	6	160	4	130	<0.1	—	
V114A	6SN7GT	Vert. Sync Amplifier	5000 Mu. V. Signal	5	7.0	—	—	6	0	4	-0.2	0.6	—	
			No Signal	5	7.0	—	—	6	0	4	0	0.5	—	
V114B	6SN7GT	Vertical Oscillator	5000 Mu. V. Signal	2	176	—	—	3	0	1	-27	0.2	—	
			No Signal	2	176	—	—	3	0	1	-27	0.2	—	
V115	6AQ5	Vertical Output	5000 Mu. V. Signal	5	359	6	359	2	30	1	0	17.3	1.2	
			No Signal	5	357	6	357	2	29	1	0	17.3	1.2	
V116	6SN7GT	Horizontal Osc. Control	No Signal	2	188	—	—	3	-24	1	-42	0.37	—	
			5000 Mu. V. Signal	2	145	—	—	3	-18	1	-42	0.4	—	Hor. hold counter-clockwise
			5000 Mu. V. Signal	2	230	—	—	3	-18	1	-42	0.4	—	Hor. hold clockwise
V116	6SN7GT	Horizontal Oscillator	5000 Mu. V. Signal *	5	258	—	—	6	0	4	-91	2.0	—	
V117	6CD6G	Horizontal Output	5000 Mu. V. Signal *	Cap	*	8	165	3	12.5	5	-30	110	15.0	*High Voltage Pulse Present
V118	1B3GT /8016	H. V. Rectifier	5000 Mu. V. Signal *	Cap	*	—	—	2 & 7	16,000	—	—	0.2	—	
V119 V120	6W4GT	Dampers	5000 Mu. V. Signal *	5	355	—	—	3	*	—	—	57	—	
V121	21AP4	Kinescope	5000 Mu. V. Signal	Cone	16,000	10	555	11	140	2	82	0.2	—	At average Brightness
			No Signal	Cone	16,400	10	550	11	132	2	76	0.2	—	
V122 V123	5U4G	Rectifiers	5000 Mu. V. Signal	4 & 6	388	—	—	2 & 8	389	—	—	*139	—	Per Tube
			No Signal	4 & 6	386	—	—	2 & 8	387	—	—	*145	—	

*Same voltage values are obtained under "No Signal" condition.

Raytheon

Chassis 20AY21, used in Models C-2001A, C-2002A, RC-2005A, and C-2006A, is covered by the circuit on the next two pages. Models M-2007A and M-2008A use this chassis with the 12AT7 video amplifier tube changed to 6AB4, code numbered 124115 and up. Some of these sets have a different type of L-19 and 1-26 coils.

The following changes went into effect in the process of production.

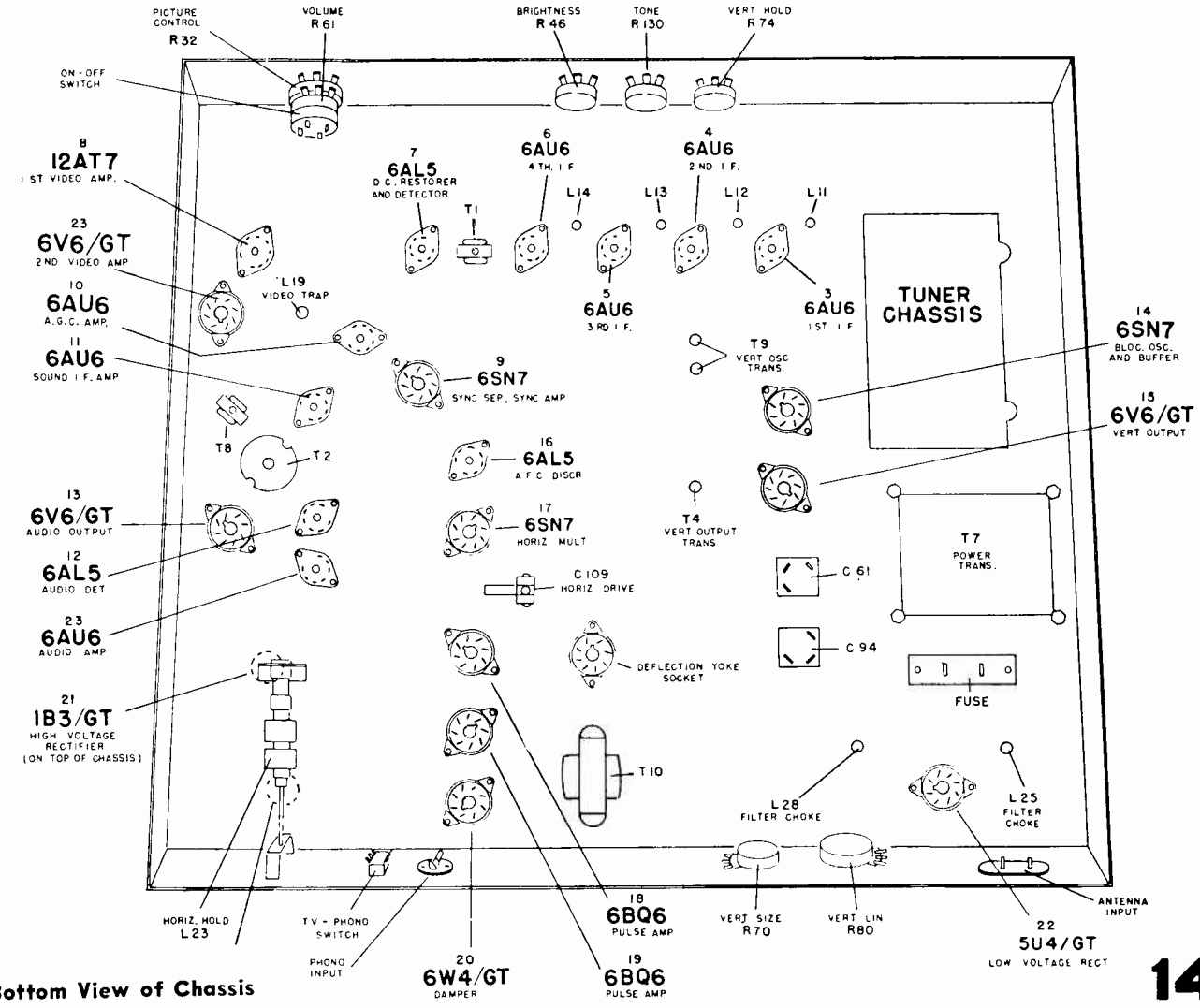
1. Resistor R79 was changed to 1000 ohms to increase vertical scan reserve. This change was incorporated in chassis stamped with RMA date code numbers 124106 and up.

2. Resistor R87 was changed to 1 megohm to balance the AFC output at no signal. This change was incorporated in chassis stamped 124107 and up.

3. Resistor R47 was changed to 22K ohms to accommodate picture tubes requiring greater cut-off bias. This was incorporated in chassis stamped 124108 and up.

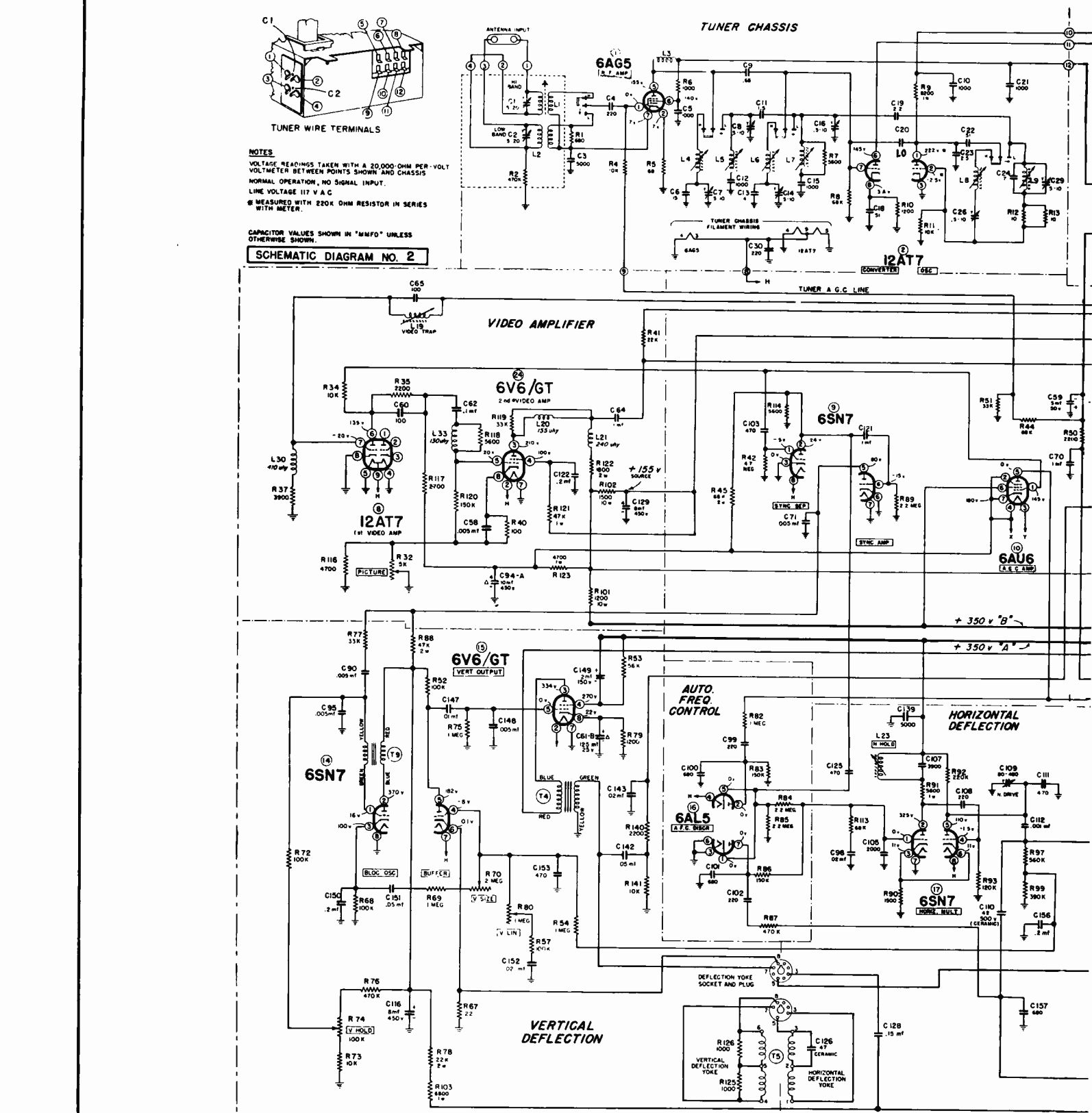
4. Resistors R73 and R76 were changed to 18K ohms and 390K ohms to center the range of the vertical hold control. This was incorporated in chassis stamped 124110 and up.

5. Capacitor C142 (.05 mfd x 200 volts) was changed to .05 mfd x 400 volts, to prevent breakdown in the field. This change was incorporated in chassis stamped 124110 and up.



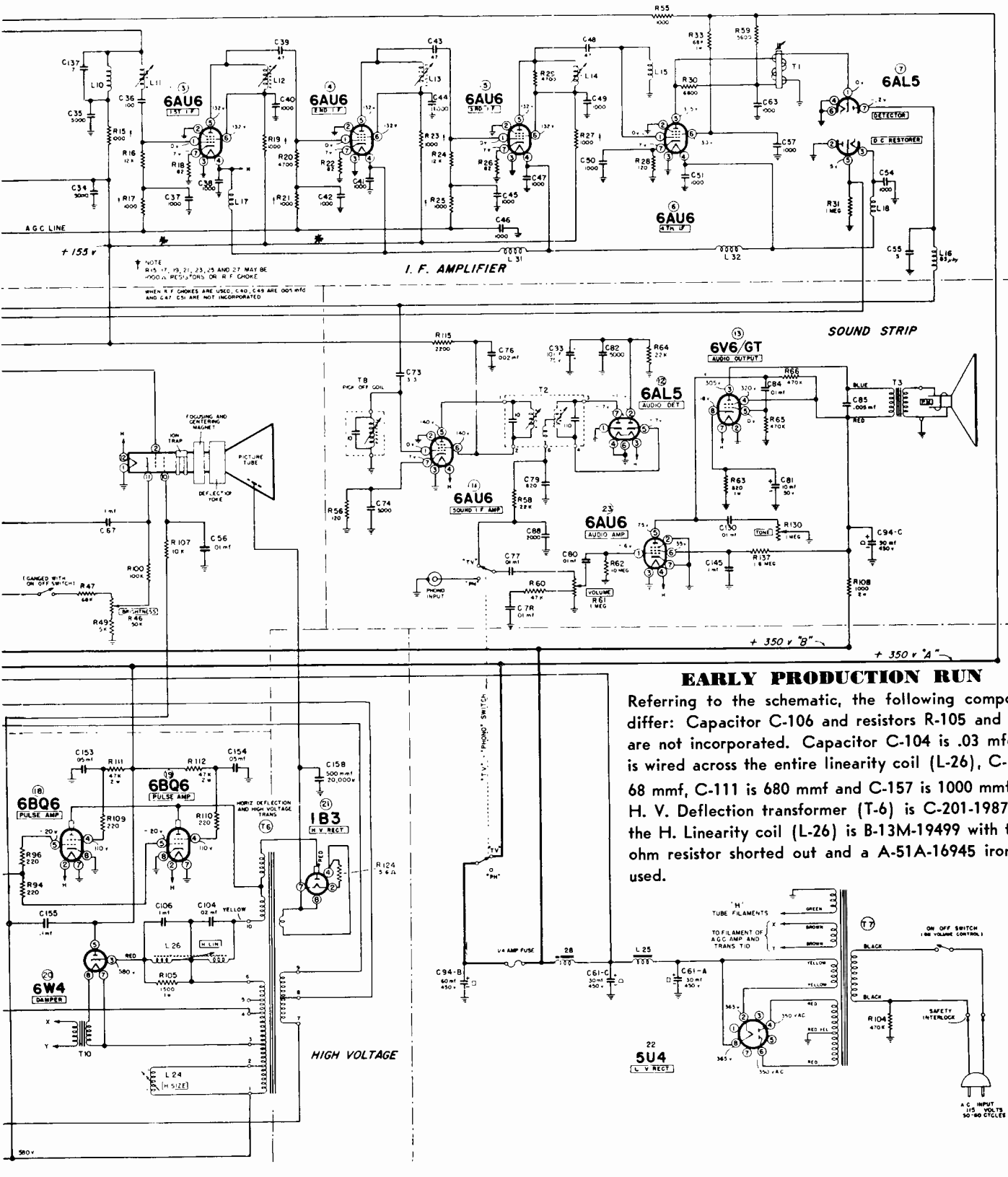
Bottom View of Chassis

Raytheon Television Chassis 20AY21



Alignment facts on the next page.

20AY21 SCHEMATIC DIAGRAM



EARLY PRODUCTION RUN

Referring to the schematic, the following components differ: Capacitor C-106 and resistors R-105 and R-124 are not incorporated. Capacitor C-104 is .03 mfd and is wired across the entire linearity coil (L-26), C-110 is 68 mmf, C-111 is 680 mmf and C-157 is 1000 mmf. The H. V. Deflection transformer (T-6) is C-201-19874 and the H. Linearity coil (L-26) is B-13M-19499 with the 10 ohm resistor shorted out and a A-51A-16945 iron core used.

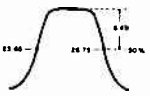
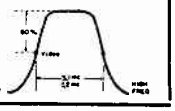
*Choke coils are connected in series with the 155 volt B+ leads in the I.F. Amplifier strip between R-15 and R-19 and between R-19 and R-23 (Part No. A-16A-18676).

Raytheon Television Chassis 20AY21 Alignment (Continued)

PRE-ALIGNMENT PRECAUTIONS

1. If sweep generator does not have a balanced output, connect a 150 ohm resistor in series with the ground lead and 150 ohms minus the internal resistance of the generator in series with the hot lead.
2. Connect a 1000 mmf capacitor across scope terminals and a 10K ohm resistor in series with hot scope lead.
3. Connect signal generator thru a 1000 mmf capacitor.
4. Set Picture control to maximum.
5. When aligning the I.F. Amplifier be sure the tuner is tuned to a high band channel (any channel).

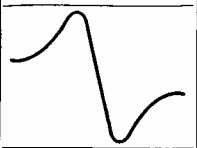
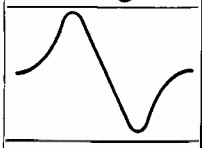
VIDEO I-F ALIGNMENT

Step No.	Signal Generator Freq. (mc.)	Sweep Generator Freq. (mc.)	Signal Input Point	Output Point	Adjust	Remarks	Response
1	26.25	———	Converter Grid	VTVM at pin 7 of tube 8	L-11 L-13	Adjust generator for output of approx. 1 volt	Maximum Reading
2	23.9	———	Converter Grid	VTVM at pin 7 of tube 8	L-12 L-14	Adjust generator for output of approx. 1 volt	Maximum Reading
3	25.1	———	Converter Grid	VTVM at pin 7 of tube 8	T-1	Adjust generator for output of approx. 1 volt	Maximum Reading
4	25.5	———	Converter Grid	VTVM at pin 7 of tube 8	———	SENSITIVITY Generator output should be less than 150 microvolts (If not, repeat alignment)	1 volt VTVM Reading (above noise)
5	26.75 23.65	25.0	Converter Grid	Scope at pin 7 of tube 8	T1 for proper ratio as in #6 below	SELECTIVITY Marker should be as shown in response column. (If not, repeat alignment).	
6	Connect scope and sweep generator as in step 5 and VTVM as in step 4. Adjust marker generator until marker reaches shoulder. Record marker frequency (F-1) and VTVM reading (V-1). Keeping generator output constant, adjust marker generator until marker reaches other shoulder. Record marker frequency (F-2) and VTVM reading (V-2). The response curve should be flat from shoulder to shoulder and V-1 should equal V-2. The difference between F-1 and F-2 should be 1.9 Mc. If not, repeat steps 1 to 5.						
7	———	Channels 2-4 6-7-10-12	Antenna Terminals	Scope at pin 7 of tube 8	———	Check channels for band width (2.9 mc to 3.3 mc)	

Picture I.F. frequency 26.75 mc — Sound I.F. frequency 22.25 mc.

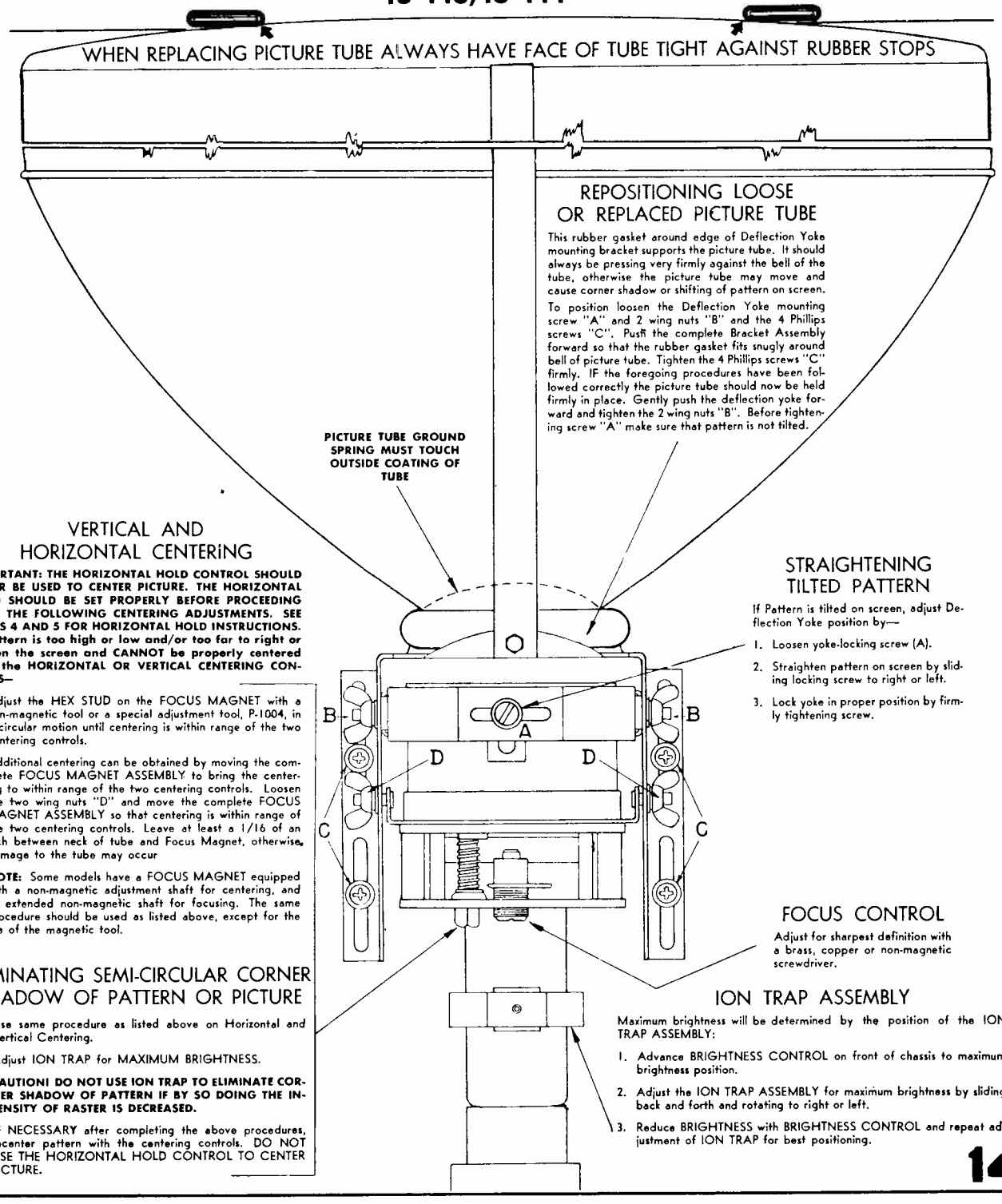
SOUND I-F ALIGNMENT

Short antenna to ground and connect generator thru a 1000 mmf capacitor.

1	4.5	———	Pin 1 of Tube 11	VTVM junction of R-58 and C-88	T-8 and T-2 primary (bottom of can)	———	Maximum Reading
2	———	4.5	Pin 1 of Tube 11	Scope junction of R-58 and C-88	T-2 secondary (top of can)	Sweep approx. ±100 kc. Adjust for max. linearity	
3	———	4.5	Pin 1 of Tube 11	Scope junction of R-58 and C-88	T-2 primary (bottom of can)	Sweep approx. ±100 kc. Adjust for symmetry of peaks	
4	4.5	———	Pin 1 of Tube 11	VTVM across speaker voice coil	———	Generator output should be less than .025 volts with Sweep of ± 25 KC and sweep freq. of 400 cycles	Approx. 1.25 volts

Sentinel Television

MODELS 438, 439, 440, 441, 443, 444, IU-438, IU-439, IU-440, IU-441, IU-443, IU-444



REPOSITIONING LOOSE OR REPLACED PICTURE TUBE

This rubber gasket around edge of Deflection Yoke mounting bracket supports the picture tube. It should always be pressing very firmly against the bell of the tube, otherwise the picture tube may move and cause corner shadow or shifting of pattern on screen.

To position loosen the Deflection Yoke mounting screw "A" and 2 wing nuts "B" and the 4 Phillips screws "C". Pusfi the complete Bracket Assembly forward so that the rubber gasket fits snugly around bell of picture tube. Tighten the 4 Phillips screws "C" firmly. IF the foregoing procedures have been followed correctly the picture tube should now be held firmly in place. Gently push the deflection yoke forward and tighten the 2 wing nuts "B". Before tightening screw "A" make sure that pattern is not tilted.

VERTICAL AND HORIZONTAL CENTERING

IMPORTANT: THE HORIZONTAL HOLD CONTROL SHOULD NEVER BE USED TO CENTER PICTURE. THE HORIZONTAL HOLD SHOULD BE SET PROPERLY BEFORE PROCEEDING WITH THE FOLLOWING CENTERING ADJUSTMENTS. SEE PAGES 4 AND 5 FOR HORIZONTAL HOLD INSTRUCTIONS. IF pattern is too high or low and/or too far to right or left on the screen and CANNOT be properly centered with the HORIZONTAL OR VERTICAL CENTERING CONTROLS—

1. Adjust the HEX STUD on the FOCUS MAGNET with a non-magnetic tool or a special adjustment tool, P-1004, in a circular motion until centering is within range of the two centering controls.
2. Additional centering can be obtained by moving the complete FOCUS MAGNET ASSEMBLY to bring the centering to within range of the two centering controls. Loosen the two wing nuts "D" and move the complete FOCUS MAGNET ASSEMBLY so that centering is within range of the two centering controls. Leave at least a 1/16 of an inch between neck of tube and Focus Magnet, otherwise, damage to the tube may occur

NOTE: Some models have a FOCUS MAGNET equipped with a non-magnetic adjustment shaft for centering, and an extended non-magnetic shaft for focusing. The same procedure should be used as listed above, except for the use of the magnetic tool.

ELIMINATING SEMI-CIRCULAR CORNER SHADOW OF PATTERN OR PICTURE

1. Use same procedure as listed above on Horizontal and Vertical Centering.
2. Adjust ION TRAP for MAXIMUM BRIGHTNESS.

CAUTION! DO NOT USE ION TRAP TO ELIMINATE CORNER SHADOW OF PATTERN IF BY SO DOING THE INTENSITY OF RASTER IS DECREASED.

IF NECESSARY after completing the above procedures, recenter pattern with the centering controls. DO NOT USE THE HORIZONTAL HOLD CONTROL TO CENTER PICTURE.

STRAIGHTENING TILTED PATTERN

If Pattern is tilted on screen, adjust Deflection Yoke position by—

1. Loosen yoke-locking screw (A).
2. Straighten pattern on screen by sliding locking screw to right or left.
3. Lock yoke in proper position by firmly tightening screw.

FOCUS CONTROL

Adjust for sharpest definition with a brass, copper or non-magnetic screwdriver.

ION TRAP ASSEMBLY

Maximum brightness will be determined by the position of the ION TRAP ASSEMBLY:

1. Advance BRIGHTNESS CONTROL on front of chassis to maximum brightness position.
2. Adjust the ION TRAP ASSEMBLY for maximum brightness by sliding back and forth and rotating to right or left.
3. Reduce BRIGHTNESS with BRIGHTNESS CONTROL and repeat adjustment of ION TRAP for best positioning.

Sentinel Models 438, 439, 440, 441, 443, 444 (and with prefix IU-), continued.

Required equipment:

VACUUM TUBE VOLTMETER having a 5 volt and a 10 volt range.

SIGNAL GENERATOR supplying 4.5 M.C. (within .25%), 20 to 30 M.C. and 50 to 216 M.C. (within 1%) signals.

MODULATOR TUBE ADAPTER (Part No. AD6AG5) using 1½ volt battery as shown in Figure 7.

SWEEP GENERATOR capable of covering 20 to 30 M.C. and 50 to 216 M.C. with a 10 M.C. sweep.

3 VOLT "A" BATTERY to provide fixed bias during video I.F. alignment.

DISCRIMINATOR AND SOUND I-F ALIGNMENT

Step No.	Connect Signal Generator to	Signal Gen. Freq. MC	Connect Sweep Generator to	Sweep Gen. Freq. MC	Connect Oscilloscope to	Connect Voltmeter to	Miscellaneous Connections and Instructions	Adjust
1	In series with .01 Mfd. Cond. to Grid, Pin 1 of Video Amplifier. See Fig. 2	4.5	Not used	Not used	Not used	In series with 47K Ohm Resistor and Across the 10 MFD. Cond. C-28. See Fig. 2	Meter on 5 volt scale and maintain 3 volt reading	T-7 (top) and T-8 (bottom) for max. on meter. See Figs. 1 and 2
2	In series with .01 Mfd. Cond. to Grid, Pin 1 of Video Amplifier. See Fig. 2	4.5	Not used	Not used	Not used	In series with 47K Ohm Resistor Connect to Junction of 39K and .002 MFD. Cond. C-42. See Fig. 2	Meter on 10 volt scale	T-8 (top) for zero on meter. See Fig. 1

NOTE 1: For **minimum buzz** always adjust T-8 adjustment screw with the sound carrier of a TV station.

PICTURE I-F ALIGNMENT

Step No.	Connect Signal Generator to	Signal Gen. Freq. MC	Connect Sweep Generator to	Sweep Gen. Channel	Connect Oscilloscope to	Connect Voltmeter to	Miscellaneous Connections and Instructions	Adjust
3	Adapter and connect adapter to pin #1 on Mod. Tube. See Fig. 7	25.3	Not used	Not used	Not used	In series with 47K Ohm Resistor and Across R-57, a 5600 Ohm Resistor. See Fig. 2.	Connect a 3 volt battery, positive side to ground, across C-56. Meter on 5 volt scale and maintain 1 volt reading.	T-6 for maximum reading. See Fig. 1
4	Adapter and connect adapter to pin #1 on Mod. Tube. See Fig. 7	22.9	Not used	Not used	Not used	In series with 47K Ohm Resistor and Across R-57, a 5600 Ohm Resistor. See Fig. 2.	Connect a 3 volt battery, positive side to ground, across C-56. Meter on 5 volt scale and maintain 1 volt reading.	T-5 for maximum reading. See Fig. 1
5	Adapter and connect adapter to pin #1 on Mod. Tube. See Fig. 7	25.5	Not used	Not used	Not used	In series with 47K Ohm Resistor and Across R-57, a 5600 Ohm Resistor. See Fig. 2.	Connect a 3 volt battery, positive side to ground, across C-56. Meter on 5 volt scale and maintain 1 volt reading.	T-4 for maximum reading. See Fig. 1
6	Adapter and connect adapter to pin #1 on Mod. Tube. See Fig. 7	22.9	Not used	Not used	Not used	In series with 47K Ohm Resistor and Across R-57, a 5600 Ohm Resistor. See Fig. 2.	Connect a 3 volt battery, positive side to ground, across C-56. Meter on 5 volt scale and maintain 1 volt reading.	T-3 for maximum reading. See Fig. 1
7	Adapter and connect adapter to pin #1 on Mod. Tube. See Fig. 7	24.1	Not used	Not used	Not used	In series with 47K Ohm Resistor and Across R-57, a 5600 Ohm Resistor. See Fig. 2.	Connect a 3 volt battery, positive side to ground, across C-56. Meter on 5 volt scale and maintain 1 volt reading.	T-2 for maximum reading. See Fig. 1

NOTE 2: For visual check of I.F. curve (see fig. 6) connect Sweep Generator to adapter and Oscilloscope across R-57.

PICTURE R-F OSCILLATOR ADJUSTMENT — VISUAL

Step No.	Connect Signal Generator to	Signal Gen. Freq. MC	Connect Sweep Generator to	Sweep Gen. Channel	Connect Oscilloscope to	Connect Voltmeter to	Miscellaneous Connections and Instructions	Adjust
8	Loosely couple to Sweep Gen. leads	55.25 see fig. 4	300 ohm ant. terminals	2	Across R-57 diode load. See Fig. 2	Not used	Channel switch on channel 2 Adjust Sig. Gen. output for min. distortion of sweep curve	#2 trimmer (fig. 3) so that marker pip is 6 DB (50%)down from top of curve. See Fig. 5
9	Loosely couple to Sweep Gen. leads	59.75 see fig. 4	300 ohm ant. terminals	2	Across R-57 diode load. See Fig. 2	Not used	Check pip. Should be 26DB (95%) down on opposite side of curve. See Fig. 5	Repeat steps 4 and 6 if pip position is not correct.
10	Repeat Steps 8 and 9 to Align Channels 3 to 13 Using Correct Frequency (See Fig. 4) and Oscillator Trimmer for Each Channel Being Aligned							

NOTE 3: This trimmer (see fig. 3) is to be used only in case there is not enough range to any oscillator screw from channels 7 to 13. If this screw is touched, then all channels 7 to 13 will have to be rechecked. If insufficient range is still encountered, proceed as outlined in Note 4.

NOTE 4: Oscillator Padder adjustment screw (see fig. 3) should be used when there is not enough range to any one oscillator trimmer. Adjusting the Padder will necessitate the realignment of all the Oscillator Trimmers.

PICTURE R-F OSCILLATOR ADJUSTMENT — ALTERNATE (USING T.V. STATION TEST PATTERN)

Step No.	Connect Signal Generator to	Signal Gen. Freq. MC	Connect Sweep Generator to	Sweep Gen. Freq. MC	Connect Oscilloscope to	Connect Voltmeter to	Miscellaneous Connections and Instructions	Adjust
11	Not used		Not used		Not used	Not used	Turn channel switch to channel needing alignment	Proper osc. trimmer clockwise until sound bars appear on pattern; then back-off trimmer until sound bars disappear and best resolution is obtained. See Fig. 3.
12	REPEAT STEP 9 FOR ANY OTHER CHANNELS NEEDING ALIGNMENT							

TRIMMER LOCATION AND ALIGNMENT EQUIPMENT CONNECTION POINTS

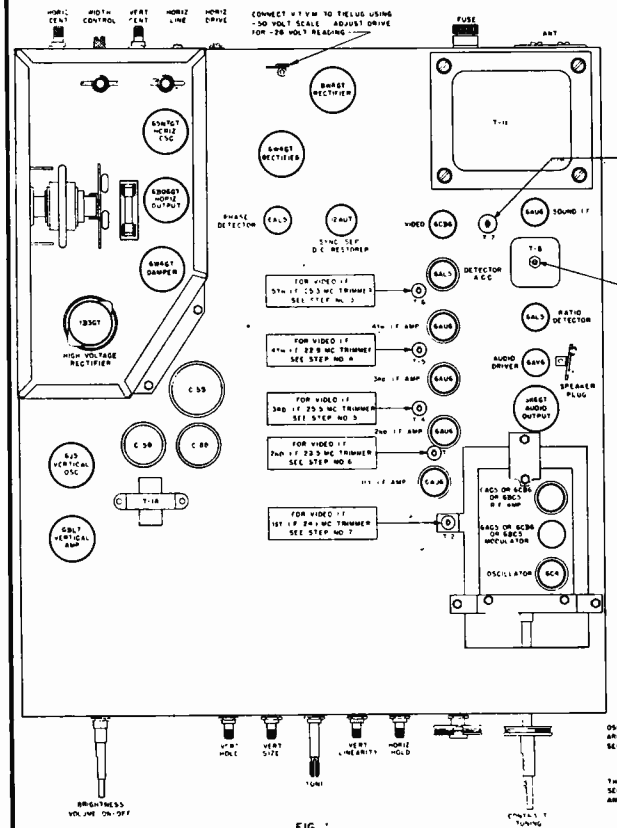


FIG. 1

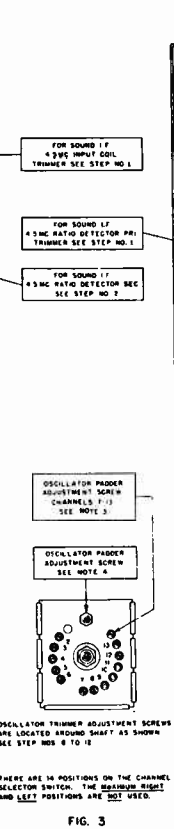


FIG. 3

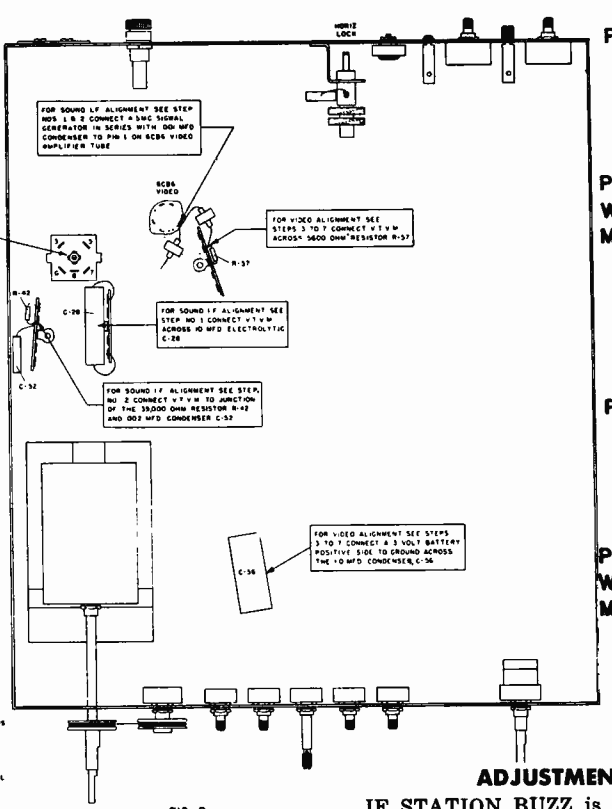
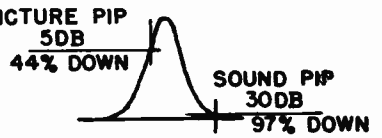


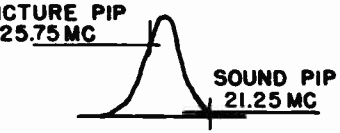
FIG. 2

ALIGNMENT CURVES



PICTURE OVERALL RESPONSE CURVE WITH PICTURE AND SOUND CARRIER MARKER PIPS.

FIG. 5



PICTURE I.F. RESPONSE CURVE WITH PICTURE AND SOUND CARRIER MARKER PIPS.

FIG. 6

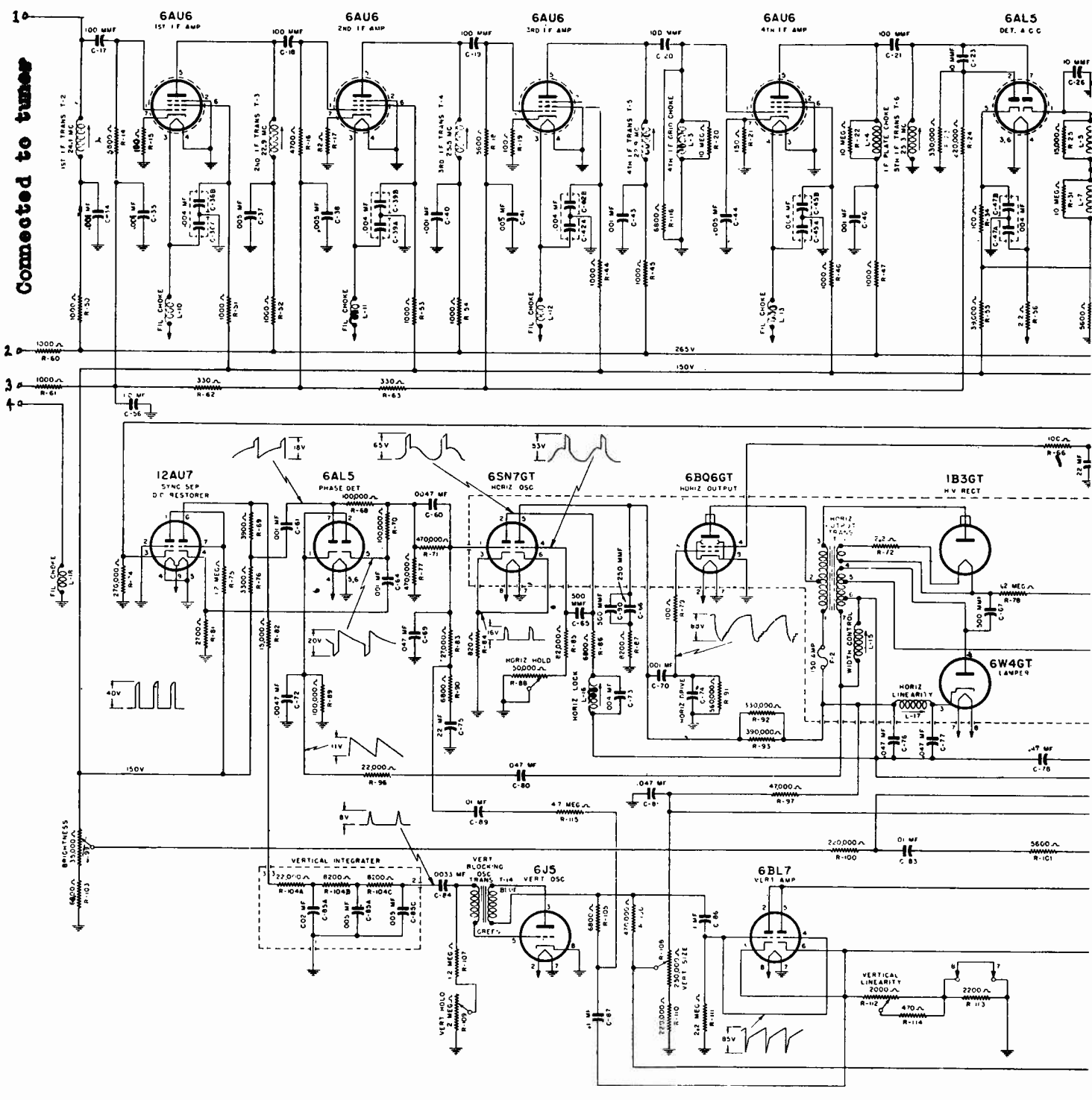
FRINGE AREA ADJUSTMENT

TURN Receiver Channel Selector Switch to Channel on which TV station is transmitting. ADJUST CONTRAST CONTROL TO MAXIMUM contrast position. TURN THE PROPER OSCILLATOR TRIMMER ADJUSTMENT SCREW COUNTER CLOCKWISE TO THE POINT WHERE BEST PICTURE IS OBTAINED WITH SATISFACTORY SOUND.

ADJUSTMENT FOR STATION BUZZ

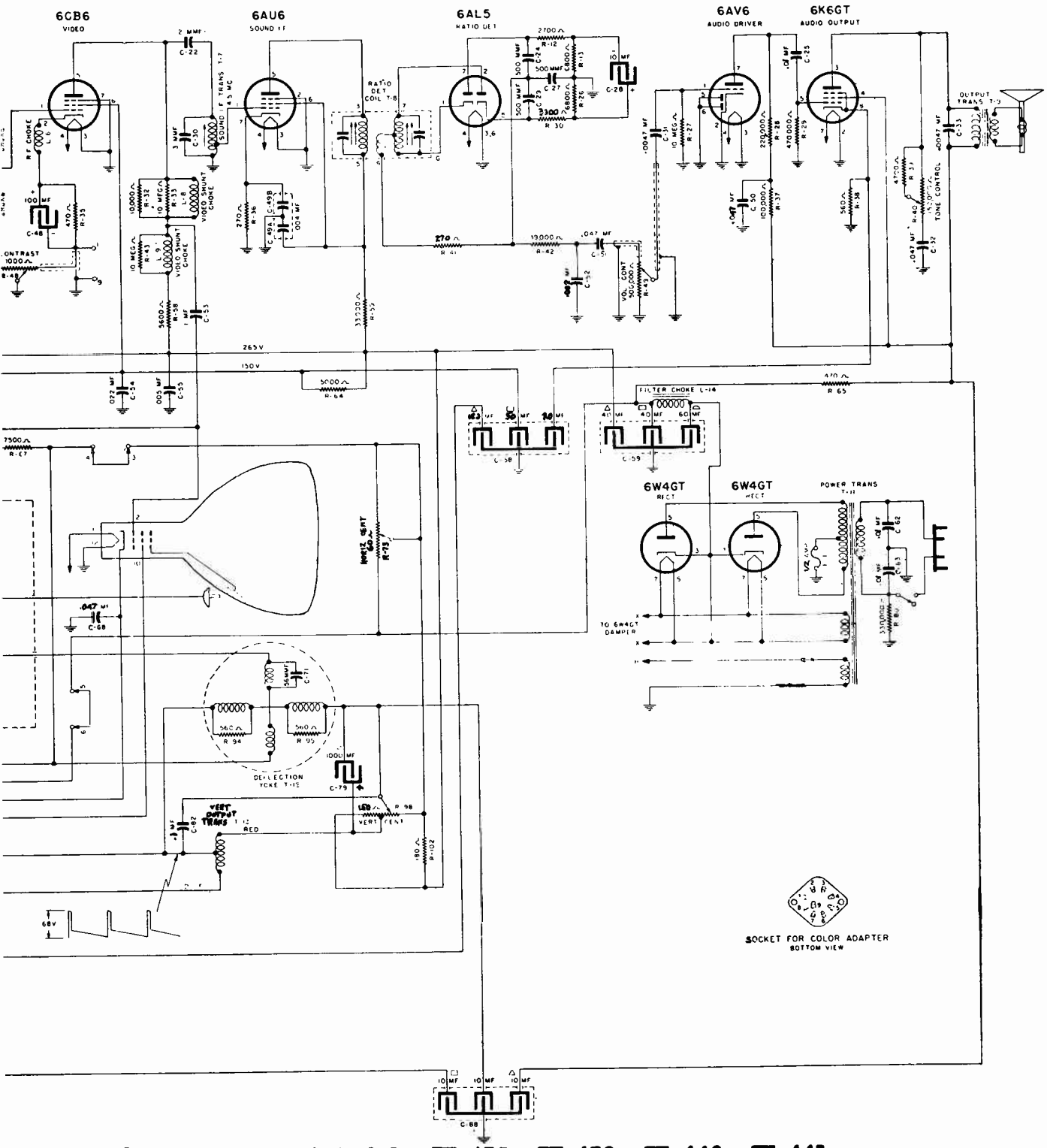
IF STATION BUZZ is excessive and is NOT DUE to "Contrast" control being too far advanced in clockwise direction, adjust Discriminator Secondary adjustment screw for MINIMUM buzz. MAKE SURE THAT THIS POSITION IS BETWEEN the two MAXIMUM buzz peaks that will be noticed when adjusting screw is turned to the right and left of the MINIMUM buzz position. This screw is located on top of the Discriminator Coil Shield Can which is mounted between 6AL5 Sound Detector tube and 6AU6 Sound I.F. Amplifier tube.

SENTINEL RADIO CORPORATION — EVANSTON, ILLINOIS



Sentinel Television

MODELS 438, 439, 440, 441, 443, 444, IU-438, IU-439, IU-440, IU-441, IU-443, IU-444

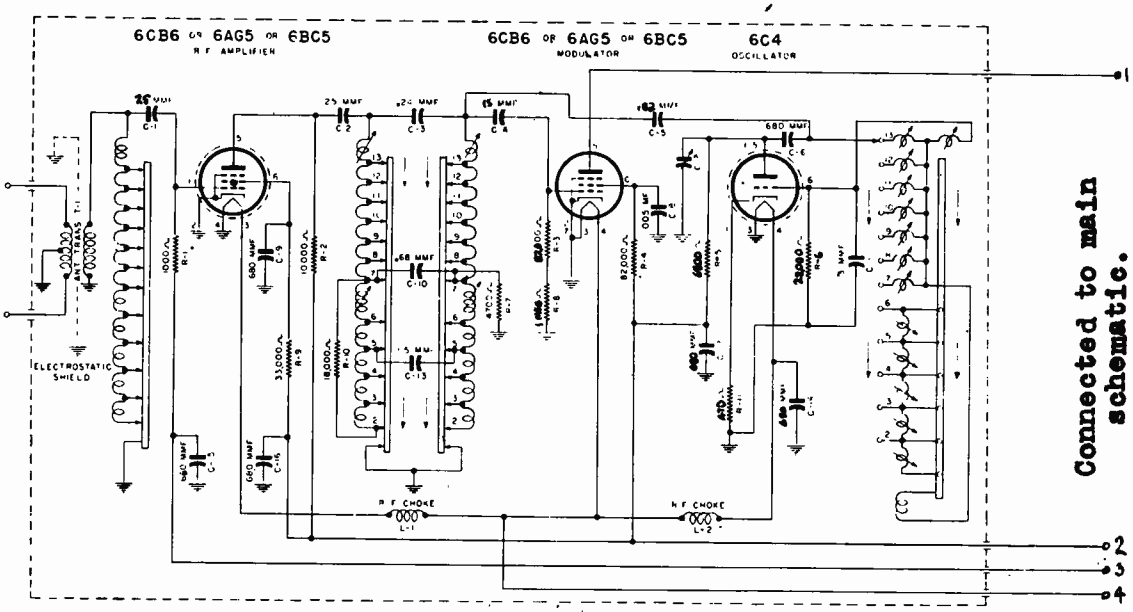


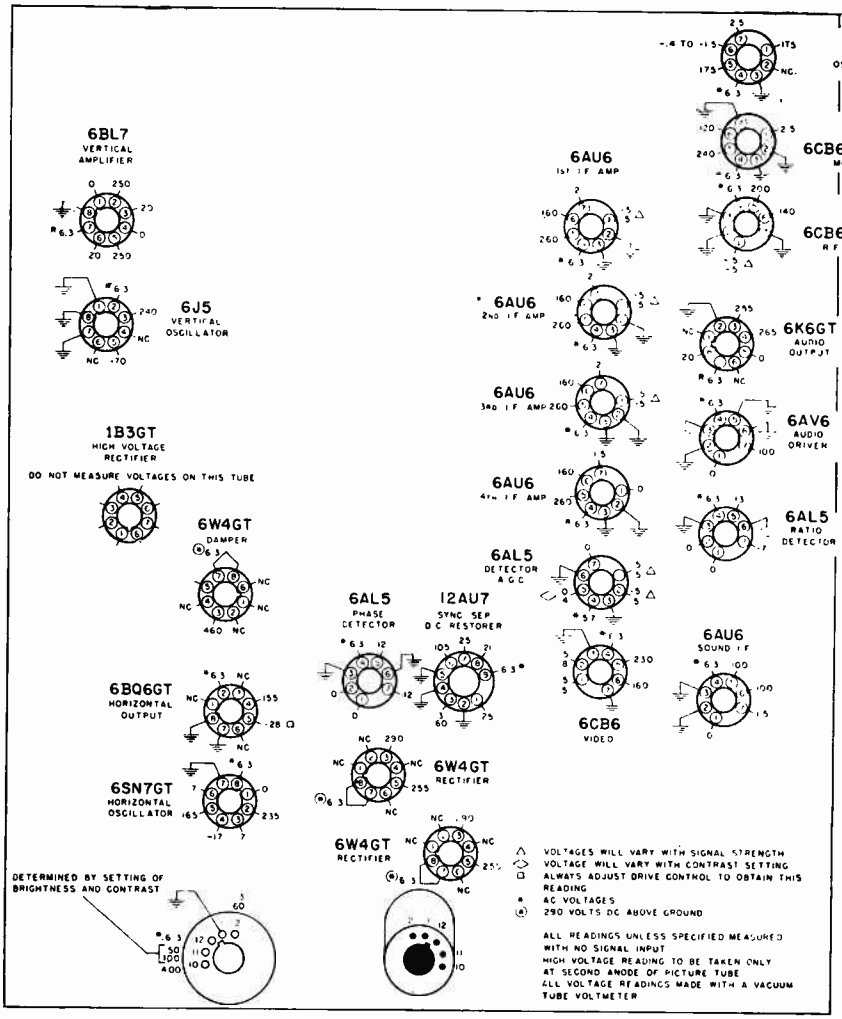
Please note that Models IU-438, IU-439, IU-440, IU-441, IU-443, IU-444, marked with "SERIES XD" ink stamped on the chassis are similar to, but different in many respects to the models here described. Those marked 2XD may use a 17" electrostatic picture tube, 17HP4A.

Sentinel Models 438, 439, 440, 441, 443, 444 (and with prefix IU-), continued.

NOTE:

A 6CB6 or 6AG5 or 6BC5 is used in the R.F. amplifier and modulator tube sockets. Always use the same type tube for replacement. Intermixing these tubes may result in loss in sensitivity caused by the differences in tube capacities detuning the circuits and making it necessary to realign the R.F. amplifier and modulator stages by spreading or squeezing turns on the coils.





RADIO FREQUENCY RANGES

Channel Number	Channel Freq. (Mc)	Picture Carrier Freq. (Mc)	Sound Carrier Freq. (Mc)
1	44-50	45.25	49.75
2	54-60	55.25	59.75
3	60-66	61.25	65.75
4	66-72	67.25	71.75
5	76-82	77.25	81.75
6	82-88	83.25	87.75
7	174-180	175.25	179.75
8	180-186	181.25	185.75
9	186-192	187.25	191.75
10	192-198	193.25	197.75
11	198-204	199.25	203.75
12	204-210	205.25	209.75
13	210-216	211.25	215.75

FIG. 4

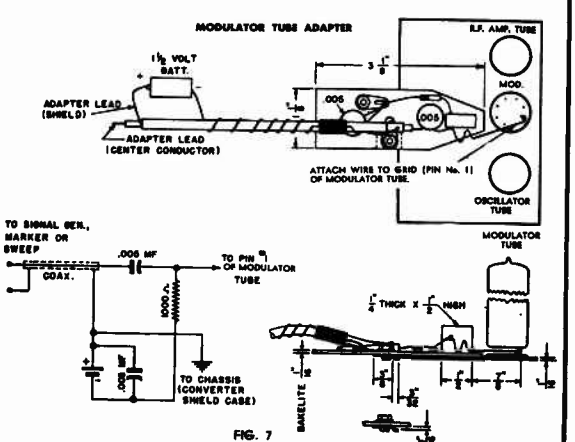


FIG. 7

THE SPARKS-WITHINGTON COMPANY - JACKSON, MICHIGAN

SPARTON TELEVISION RECEIVERS

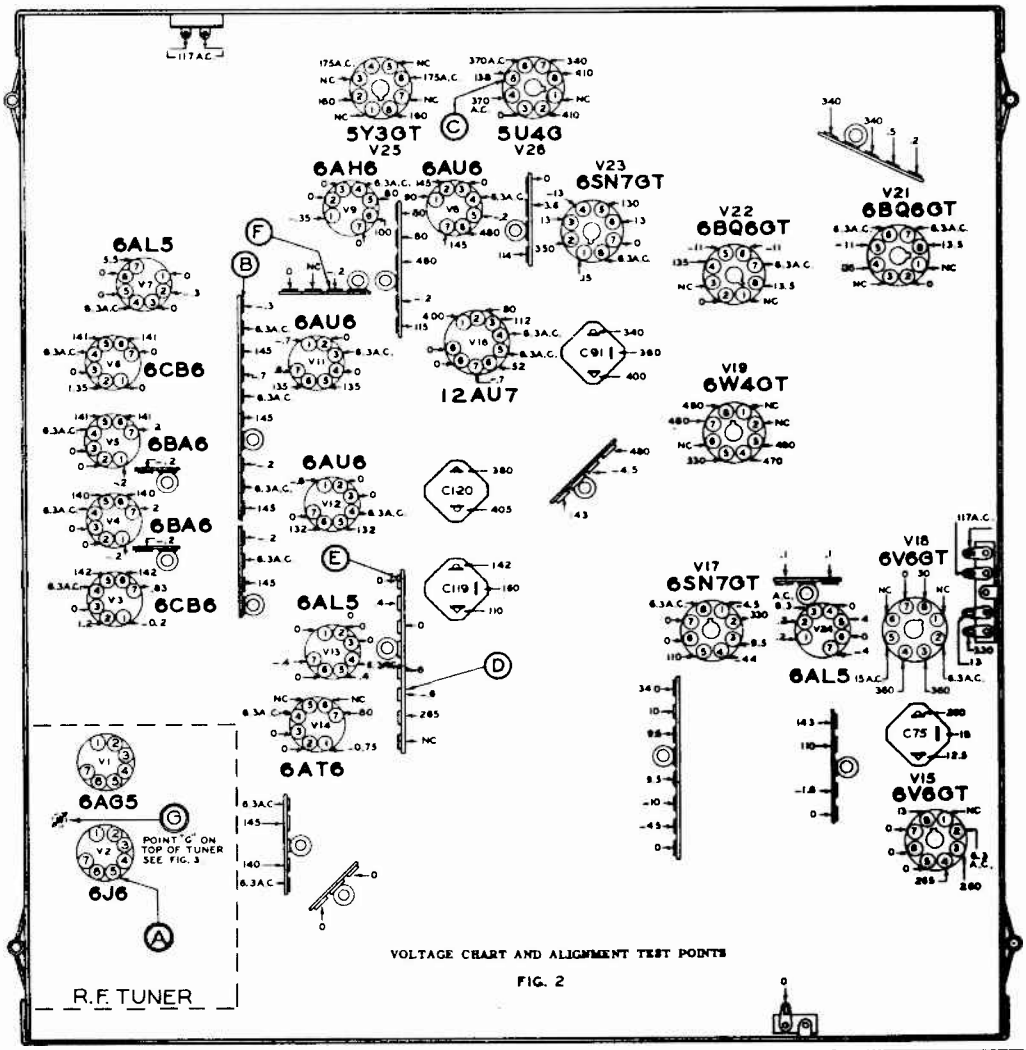
CHASSIS TYPE 26SS171 & 26SS171A

MODELS 5107X, 5162X & 5163X.

The material below and on the next five pages is almost exact in all respects for the following additional recent Sparton models:

Chassis 25S172, Model 5207A
Chassis 25SD201A (power supply 2SD201), Models 5191, 5192
Chassis 26SS170D, Models 5107, 5108
Chassis 26SD171, Models 5165X, 5166X, 5175X, 5178X
Chassis 26SD172, 26SD172A, Models 5265, 5267, 5268
Chassis 26SS172, 26SS172A, Models 5207, 5208, 5262, 5263.

Some of the differences are in the use of a 12AT7 (V16) in place of 12AU7, a horizontal width coil instead of a control, additional linearity coil, dual damper tubes in sets with larger size picture tubes, and a built-in dipole. In general, all this material can be used as an aid in repairing these additional sets.



VOLTAGE CHART AND ALIGNMENT TEST POINTS

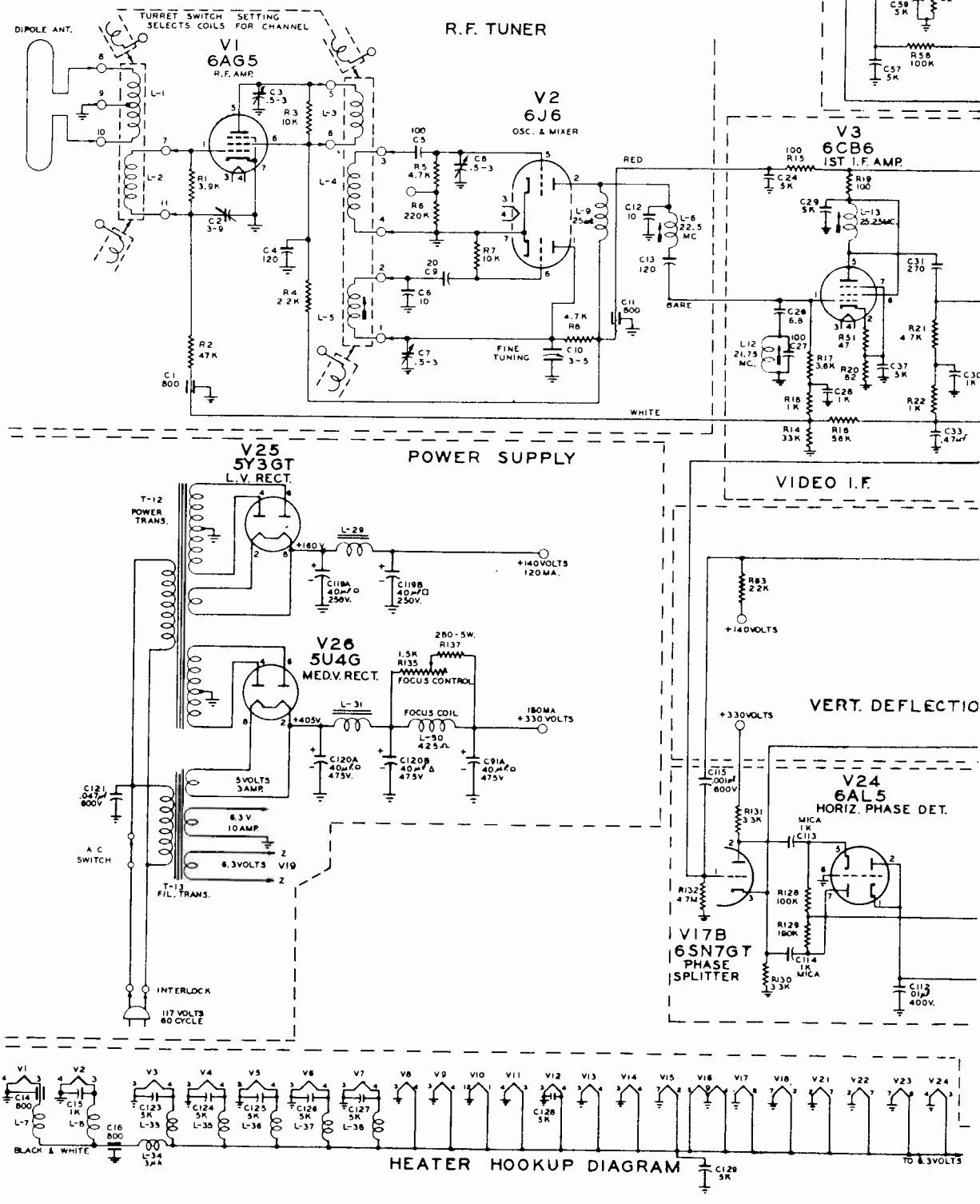
FIG. 2

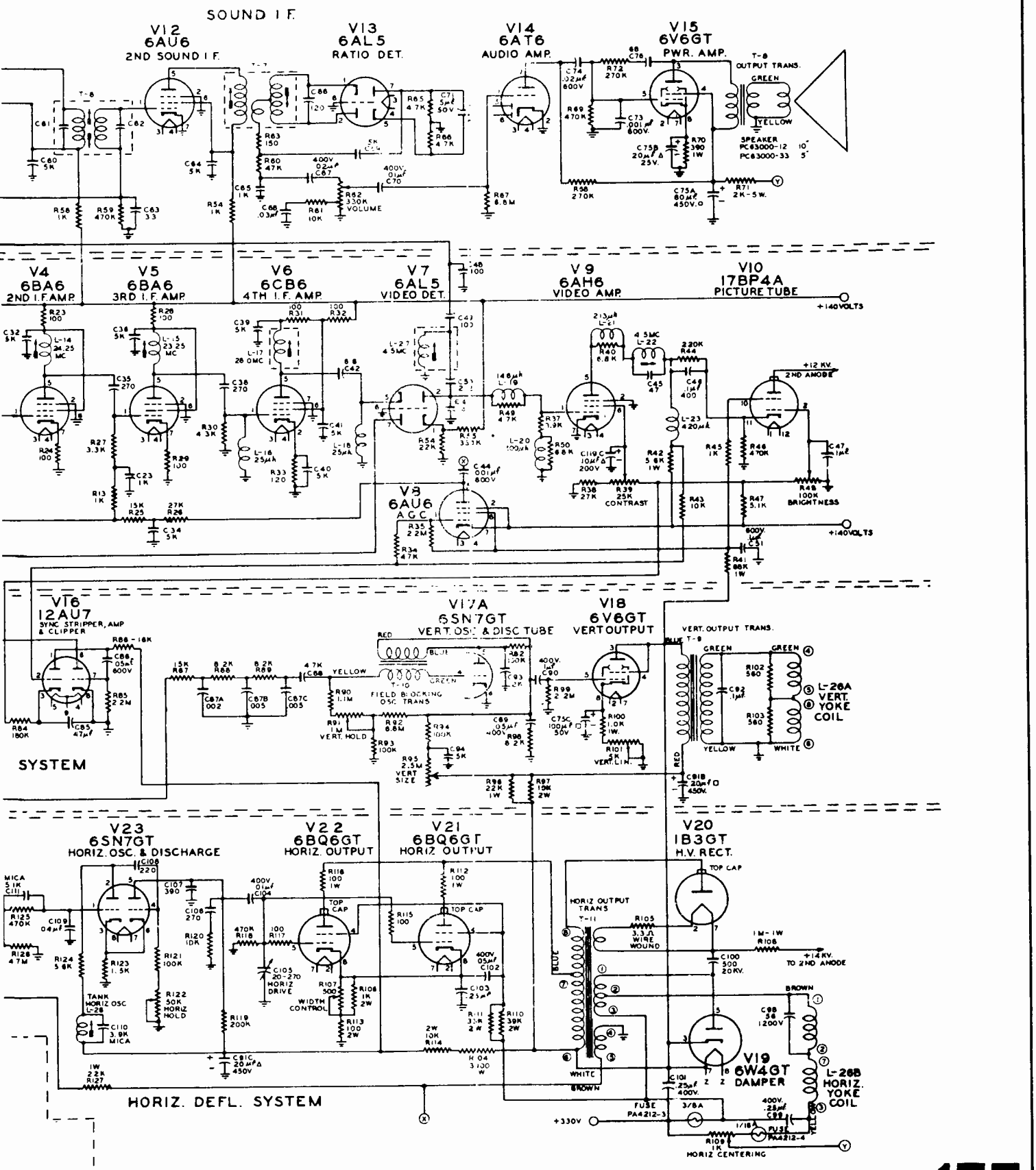
Line voltage at 117 v. A.C. Set on Channel #2.
Ajust the following controls for maximum: brightness, contrast, hor. width, vert. size; these for proper operation: Hor. hold, vert. hold, focus, vert. linearity. Volume and tone controls to maximum counter-clockwise. No signal to set. Measurements in respect to chassis ground using a VTVM.

SPARTON TELEVISION SCHEMATIC DIAGRAM

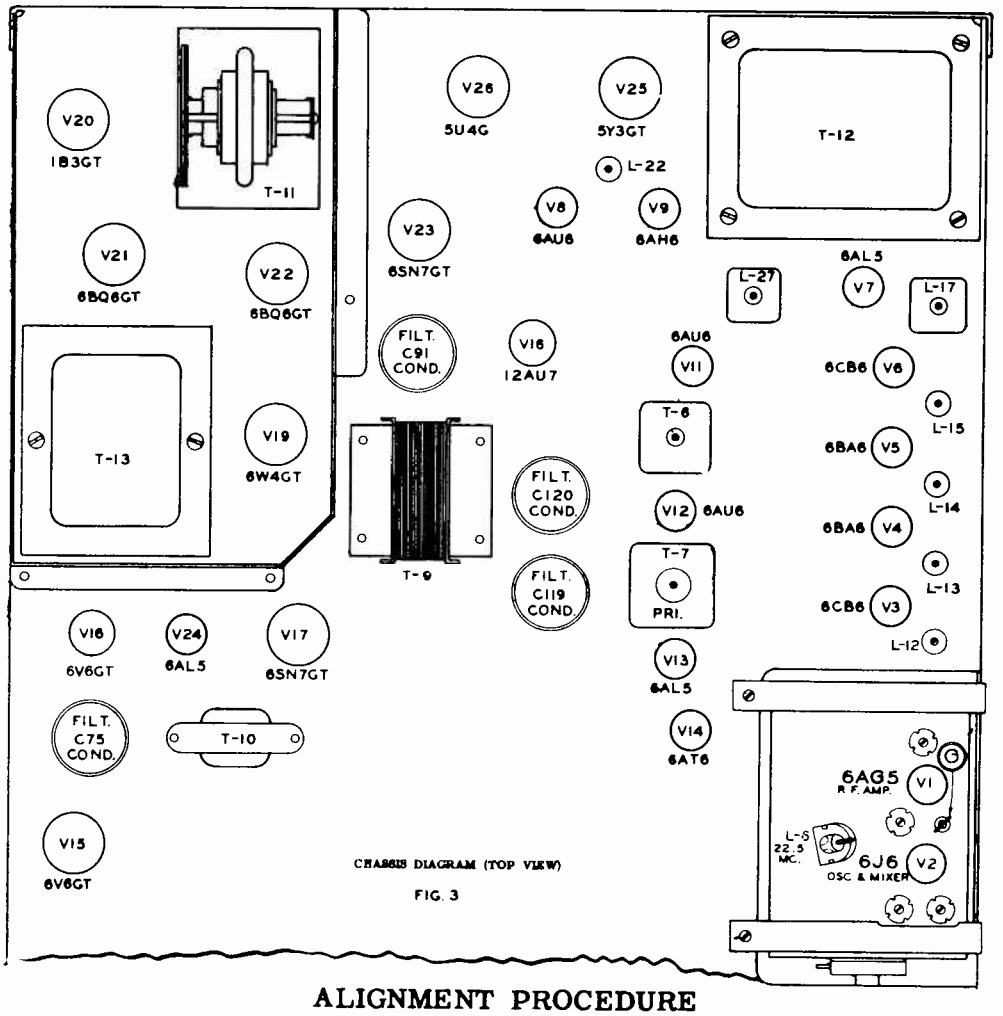
CHASSIS TYPE 26SS171 & 26SS171A STANDARD

USED IN MODELS 5107X, 5162X & 5163X.




SOUND I.F.
V12
6AU6
2ND SOUND I.F.
V13
6AL5
RATIO DET.
V14
6AT6
AUDIO AMP.
V15
6V6GT
PWR. AMP.
T-8
OUTPUT TRANS.
GREEN
YELLOW
SPEAKER
PC63000-12 10"
PC63000-33 5"
V4
6BA6
2ND I.F. AMP.
V5
6BA6
3RD I.F. AMP.
V6
6CB6
4TH I.F. AMP.
V7
6AL5
VIDEO DET.
V9
6AH6
VIDEO AMP.
V10
17BP4A
PICTURE TUBE
+140 VOLTS
+12 KV.
2ND ANODE
V8
6AU6
AGC
CONTRAST
BRIGHTNESS
V16
12AU7
SYNC. STRIPPER, AMP & CLIPPER
V17A
6SN7GT
VERT. OSC. & DISC TUBE
V18
6V6GT
VERT OUTPUT
VERT. OUTPUT TRANS.
FIELD BLOCKING OSC. TRANS
VERT. HOLD
VERT. SIZE
VERT. LIN.
L-26A
VERT. YOKE COIL
SYSTEM
V23
6SN7GT
HORIZ. OSC. & DISCHARGE
V22
6BQ6GT
HORIZ. OUTPUT
V21
6BQ6GT
HORIZ OUTPUT
V20
1B3GT
H.V. RECT.
TOP CAP
HORIZ OUTPUT TRANS
TANK HORIZ OSC L-28
HORIZ DRIVE
WIDTH CONTROL
HORIZ HOLD
TO 2ND ANODE
V19
6W4GT
DAMPER
L-26B
HORIZ. YOKE COIL
FUSE PA4212-3
+330V
HORIZ CENTERING
HORIZ. DEFL. SYSTEM

SPARTON TELEVISION RECEIVERS CHASSIS TYPE 26SS171 & 26SS171A, Continued



CHASSIS DIAGRAM (TOP VIEW)

FIG. 3

ALIGNMENT PROCEDURE

TEST EQUIPMENT SET UP: A certain amount of experimentation must be employed to secure a stable test set up before alignment or service of the receiver is attempted. It is recommended that the top of the test bench be covered with a sheet of aluminum to insure good grounds between the various pieces of test equipment and the receiver chassis. In general all test signal input leads should be kept away from output leads as much as possible.

SOUND TRAP ALIGNMENT: FIRST, Connect the R.F. signal generator to the grid of V-2 by means of the I.F. input adapter as shown in Figure 6.

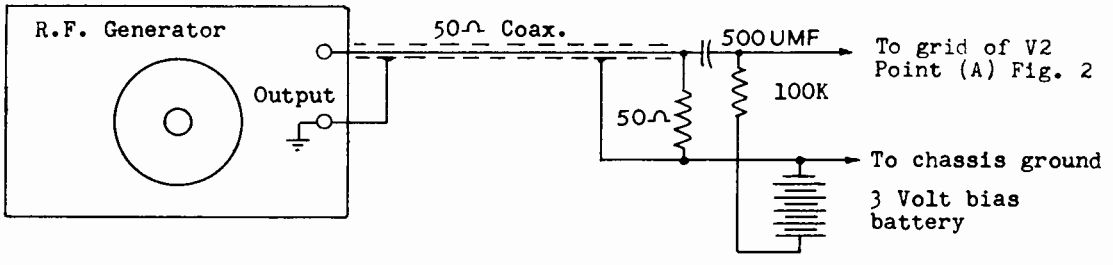


Figure 6 I.F. Input Adapter

SECOND: Set the R.F. tuner to Channel #13.

THIRD: Connect a 4.5 volt bias battery between the A.G.C. buss (Point F. Fig. 2) and chassis ground so that the voltage on the A.G.C. buss is -4.5 volts in respect to the chassis.

SPARTON TELEVISION RECEIVERS CHASSIS TYPE 26SS171 & 26SS171A

ALIGNMENT PROCEDURE (CONT'D)

FOURTH: Connect the electronic voltmeter across the picture detector load resistor R37, Point B, Fig. 2 and set the voltmeter on the low D.C. volt scale.

FIFTH: Set the R.F. signal generator to the frequency shown below and tune the specified adjustment for minimum indication on the voltmeter. It is advisable to check the output of the generator with the crystal calibrator to make certain that it is exactly on frequency.

21.75 Mc. L12 (Top of chassis as shown in Figure 3)

PICTURE I.F. ALIGNMENT: FIRST: Connect the R.F. Signal generator, voltmeter and bias battery to the receiver as described in steps 1, 2, 3 and 4 of the sound trap alignment instructions.

SECOND: Set the signal generator to each of the following frequencies and peak the specified adjustments for maximum indication of the voltmeter.

22.5 Mc.	L6	(Top of tuner as shown in Fig. 3)
25.25 Mc.	L13	(Top of chassis as shown in Fig. 3)
24.25 Mc.	L14	(Top of chassis as shown in Fig. 3)
23.25 Mc.	L15	(Top of chassis as shown in Fig. 3)
26.0 Mc.	L17	(Top of Chassis as shown in Fig. 3)

SOUND I.F. ALIGNMENT: FIRST: Connect the R.F. signal generator to Point B, Fig. 2

SECOND: Set the signal generator accurately to 4.5 Mc. This is very important because the picture and sound carriers sent out from the television stations are exactly 4.5 Mc. apart.

THIRD: Connect the electronic voltmeter across C71 from Point D to ground as shown in Fig. 2
Set the voltmeter on the 10 volt scale.

FOURTH: Peak the following coils for maximum reading on the voltmeter.

L 27 Top of chassis as shown in Fig. 3.
T 6 Top of chassis as shown in Fig. 3.
T 7 (Pri. Ratio Det)Top of chassis as shown in Fig. 3.

RATIO DETECTOR TRANSFORMER ALIGNMENT: FIRST: Connect the R.F. signal generator to the receiver as described in Step 1 of the Sound I.F. Alignment instructions.

SECOND: Connect the electronic voltmeter from Point E, Fig. 2 to ground.
Set the voltmeter on the lowest DC scale.

THIRD: Set the signal generator output to 4.5 Mc. Adjust the secondary of T7. Notice that it is possible to produce a positive or negative voltage indication on the meter by varying this adjustment. As the voltage swings from positive to negative, adjust T7 for zero output as indicated by the voltmeter. This point is called zero ratio detector output and indicates correct alignment of T7 transformer. If the secondary of T7 is found to be way out of alignment it will be necessary to re-peak the primary as described in the preceeding section on sound I.F. alignment.

4.5 MC. TRAP ALIGNMENT FIRST: Connect the R.F. signal generator as described in Step 1 of the sound I.F. alignment.

SECOND: Connect the electronic voltmeter from the cathode of the picture tube to ground (Point C Fig. 2)
The voltmeter must be capable of giving a reading at 4.5 Mc. at approximately 1 to 2 volts.

THIRD: Peak L22 (Top of chassis as shown in Fig. 3) for minimum output on the voltmeter.

PICTURE I.F. TOUCH UP: Connect the R.F. Sweep generator output to the grid of V-2 by means of the I.F. input adapter shown in Figure 6.

SECOND: Apply bias to A.G.C. line as described in Step 3 of sound trap alignment. Set R.F. selector to Channel #13.

SPARTON TELEVISION RECEIVERS CHASSIS TYPE 26SS171 & 26SS171A

ALIGNMENT PROCEDURE (CONT'D)

THIRD: Connect the oscilloscope across the picture detector load resistor R37 (Point B Fig. 2) by means of the shielded cable and the filter system shown in Figure 7.

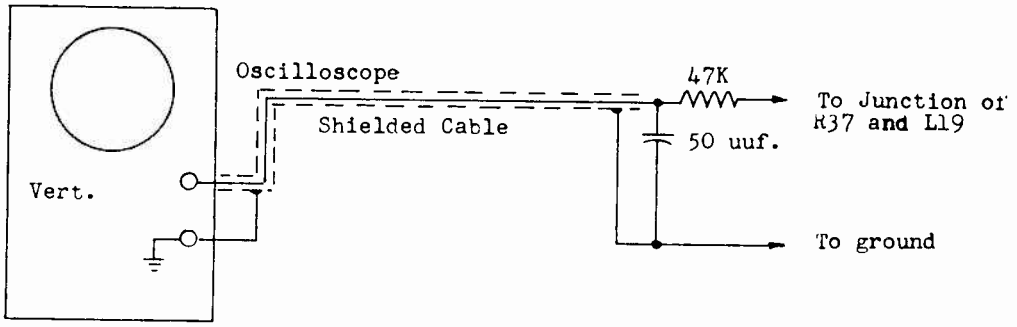


Figure 7 FILTER SYSTEM FOR SCOPE CONNECTION

FOURTH: Set the R.F. sweep generator so that it sweeps from approximately 20 to 30 Mc.

FIFTH: Adjust the oscilloscope so that the swept I.F. response is visible on the cathode-ray tube screen.

SIXTH: Loosely couple the output of the R.F. signal generator to the grid of V-2 so that the marker signals of proper frequency can be mixed in with the R.F. sweep signal.

SEVENTH: Observe the band width, relative position of the picture carrier, and flatness of the overall I.F. response curve. If necessary slightly vary the tuning of the picture I.F. coils L6, L13, L14, L15, L17 until the picture I.F. response shown in Figure 8 is obtained. The solid curve in Figure 8 depicts the ideal I.F. response while the dotted curves shown permissable variations.

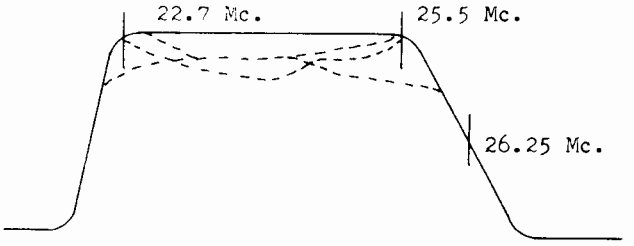


Figure 8 IDEAL I.F. RESPONSE WITH PERMISSABLE VARIATIONS

The picture I.F. carrier should appear approximately half way down the I.F. response curve as shown in Figure 8. Variation in the pix carrier position should not exceed ± 10% from the half way point.

PICTURE I.F. SENSITIVITY CHECK: FIRST: Connect the R.F. signal generator to the receiver as specified in Steps 1 and 2 of the sound trap alignment instructions. (When making sensitivity checks no bias battery is connected to the A.G.C. buss.)

SECOND: Connect the electronic voltmeter across the picture detector load resistor R37 Point A, Fig. 2 and set the meter on the low D.C. volts scale.

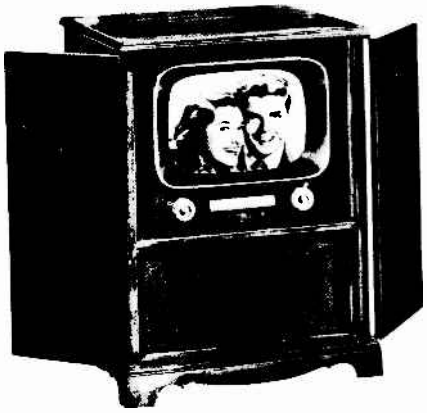
THIRD: Set the generator output frequency at approximately 23 Mc. Adjust the generator output until the voltmeter reads approximately 1.0 volt. Record the R.F. signal input in microvolts. Repeat the procedure with the generator output frequency set at 24.2 and 25.4 Mc. In all cases the I.F. input voltage should be 100 Microvolts or less. The sensitivity at the I.F. picture carrier 26.25 Mc. should be approximately half of the I.F. Sensitivity between 24.2 Mc. (Maximum of 100 microvolts.)
If the generator output is not calibrated in microvolts, comparative sensitivity measurements can be made by using another receiver that is known to be in good operating condition as a standard. This applies to all sensitivity measurements and good results can be obtained if sufficient care is used.

STEWART-WARNER

MODELS 9202-C, 9202-DA, 9202-DB, 9202-DD, 9202-E & 9202-F

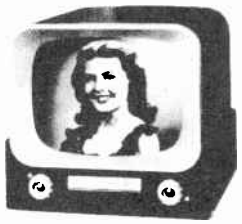
The service material below and on the next seven pages is exact for the Stewart-Warner models listed above. Models 9200-A and 9200-FA are basically the same as these models and represent early versions of this series. Model 9203-A is a combination model, but the TV section is almost identical to the sets covered in this manual. Model 9204-A is a straight TV set using a 20" picture tube, with its circuit practically identical to the models covered in these notes. This set has an additional 500 mmfd. condenser in the HV supply and use an electro-magnetic instead of PM focus assembly.

Information on alignment of the sound and I.F. channels is presented on pages 160-162. For convenience of printing, the circuit diagram and related information are divided into sections and are printed on pages 163 to 166. Such separation is not to be taken to mean that the actual circuits are divided physically in this manner.



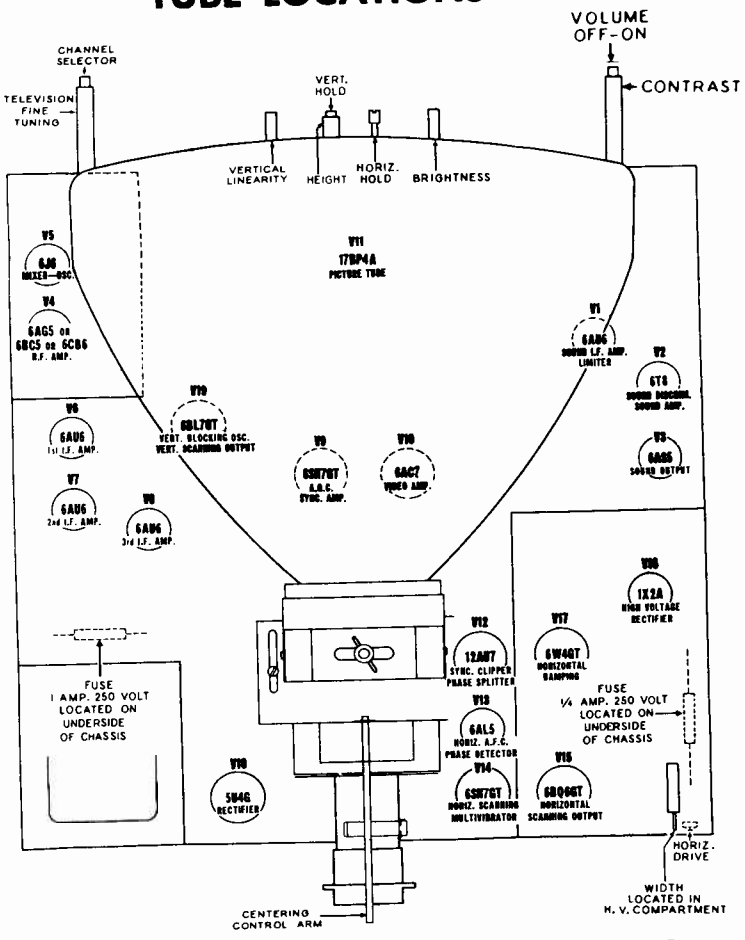
Model 9202-E

Model 9202-C
(Mahogany)
Model 9202-F
(Blonde)



Model 9202-DA
(Mahogany Base—Green Top)
Model 9202-DB
(Blonde Base—Beige Top)
Model 9202-DD
(Mahogany)

TUBE LOCATIONS



Stewart-Warner Models 9202-C, 9202-DA, etc., continued

SOUND CHANNEL ALIGNMENT PROCEDURE

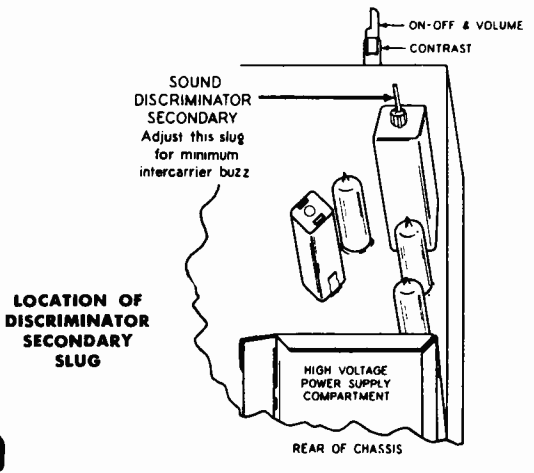
1. Short antenna terminals together with a jumper wire.
2. Set receiver Channel Selector to any inactive television channel and contrast control to its maximum counter-clockwise position; other controls may be left at any desired setting.
3. No special aligning tool is required to adjust the cores in the Sound IF and discriminator transformers. The blade of a small screwdriver will fit the slot in these cores, however, the screwdriver should be of a non-metallic or insulated type to prevent detuning when inserted in the transformer can.

STANDARD SIGNAL GENERATOR		VTVM CONNECTIONS	MISCELLANEOUS INSTRUCTIONS	TRIMMER OR SLUG	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
CONNECTIONS	FREQUENCY				
Connect as shown in Fig. 1.	**4.5 MC.** unmodulated IMPORTANT This signal must be accurate within ¼ of 1% of 4.5 Mc. Check generator calibration against a crystal controlled signal source by "zero beating" (heterodyning) with harmonics of the crystal frequency.	Connect as shown in Fig. 2.	1. Set Contrast control to its maximum clockwise position. 2. A special detector must be utilized when aligning the 4.5 Mc. Sound Trap Coil. This unit can be constructed in accordance with the information contained in the circuit shown below. If a VTVM contoining a high frequency A.C. probe is available, this probe can be utilized in place of the crystal detector shown in Fig. 2. 3. During this adjustment only, remove one of the three 6AU6 IF amplifier tubes (V6, V7 or V8). This will prevent noise in the RF stages from effecting the voltage reading while adjusting the sound trap.	**#1** 4.5 MC Sound Trap	Adjust for minimum reading on VTVM.
		Connect as shown in Fig. 3.	A "swishing" sound may be heard in the speaker during Sound Channel Alignment. This spurious oscillation is caused by horizontal sweep voltage being picked up in the audio system thru stray coupling of instrument leads; it should be disregarded as it will have no effect on alignment of the sound channel.	**#2** Discriminator Secondary	Adjust for maximum reading on VTVM.
				#3 Discriminator Primary	Adjust for maximum reading on VTVM.
				#4 Sound IF Transformer	Adjust for maximum reading on VTVM.
Same as above.	Same as above.	Connect as shown in Fig. 4.	To obtain zero balance of the discriminator circuit, two 68,000 ohm resistors will be required. These resistors must be matched so that their respective resistances do not differ by more than 1%—the accuracy of the total resistance is not critical. Connect the two resistors in series from pin 2 of the 6T8 tube to chassis ground as shown in Fig. 4.	**#2** Discriminator Secondary	Note that as slug #2 is rotated, a point will be found where the voltmeter will swing rather sharply from a positive to a negative reading or vice versa. The correct setting of slug #2 is obtained when the meter reads zero as the slug is moved thru this point.

REDUCTION OF INTERCARRIER BUZZ

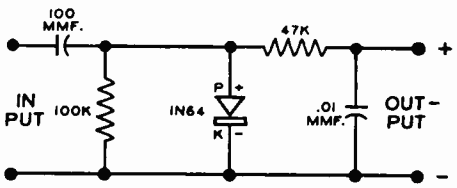
Slight "dynamic" unbalance of the discriminator secondary can emphasize intercarrier buzz due to incomplete amplitude modulation rejection. Therefore it is vitally important to obtain an accurate setting of the discriminator secondary slug under actual reception conditions.

Disconnect all instruments (be sure that I.F. tube removed for the adjustment of Sound Trap has been replaced) and then connect an antenna to the receiver to obtain program reception from a local station. If intercarrier buzz is prominent, a slight readjustment of the discriminator secondary slug (#2) should be made to obtain the "dip" point for the buzzing sound. Note that program sound will be clear and free from distortion at this point. Buzz should now be at an acceptable minimum if station transmission is not at fault.



LOCATION OF DISCRIMINATOR SECONDARY SLUG

CIRCUIT DIAGRAM FOR CRYSTAL DETECTOR



INSTRUMENT CONNECTIONS FOR SOUND CHANNEL ALIGNMENT

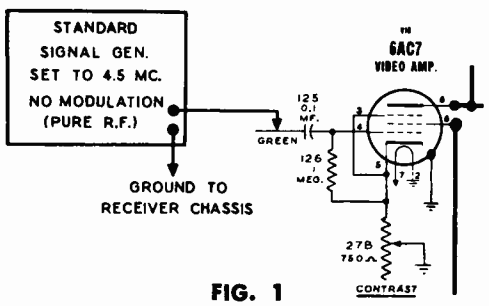


FIG. 1
Generator Connections for Sound Channel and 4.5 Mc. Sound Trap Alignment

Stewart-Warner Models 9202-C, etc. (Continued)

INSTRUMENT CONNECTIONS FOR SOUND CHANNEL ALIGNMENT

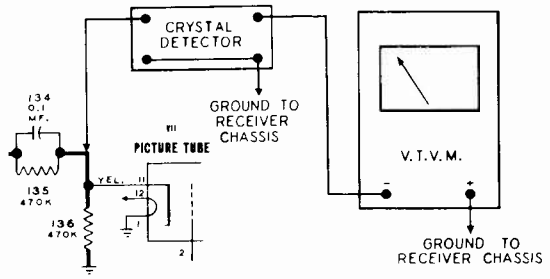


FIG. 2
Crystal Detector and VTVM Connections for 4.5 Mc. Sound Trap Alignment

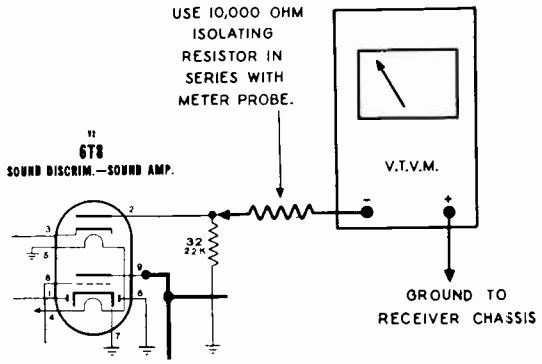


FIG. 3
VTVM Connections for Sound IF Alignment

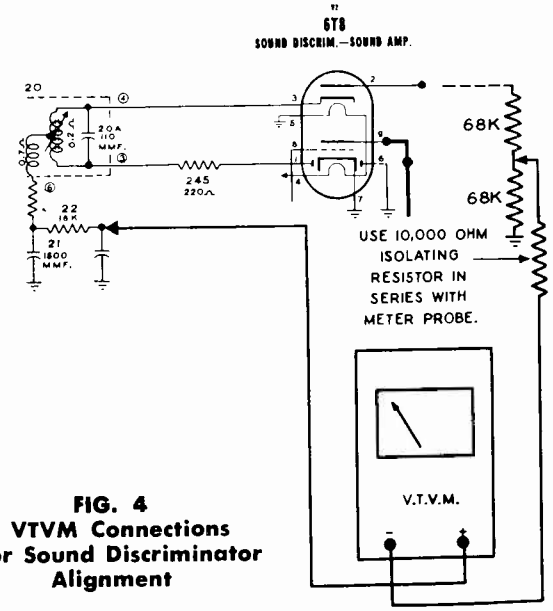


FIG. 4
VTVM Connections for Sound Discriminator Alignment

INSTRUMENT CONNECTIONS FOR IF CHANNEL ALIGNMENT

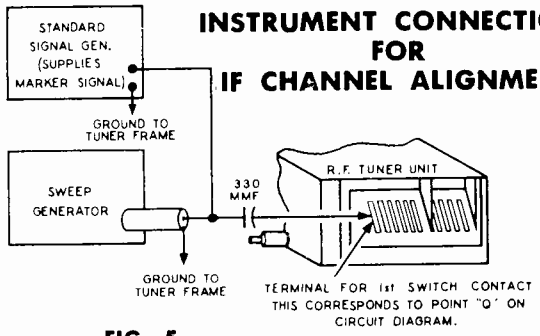


FIG. 5
Generator Connections for IF Channel Alignment

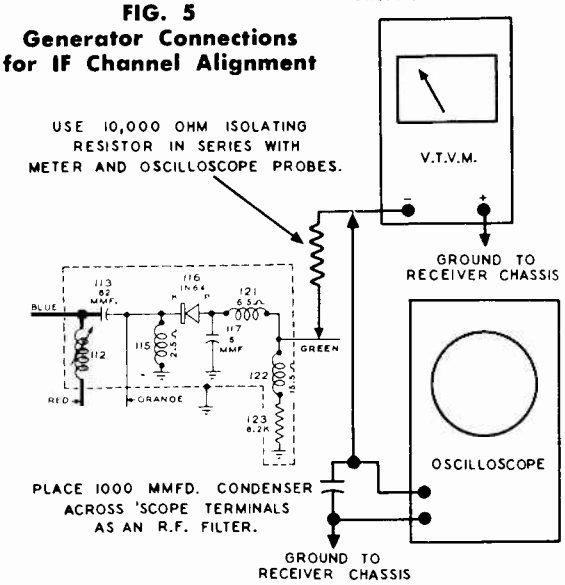


FIG. 6
VTVM and Oscilloscope Connections for IF Channel Alignment

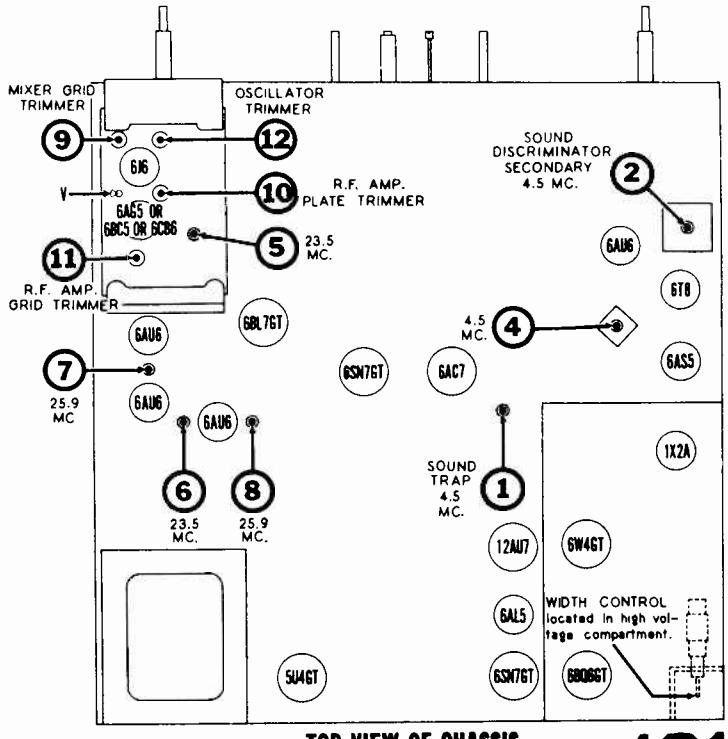


FIG. 14

Stewart-Warner Models 9202-C, 9202-DA, etc., continued

IF CHANNEL ALIGNMENT PROCEDURE

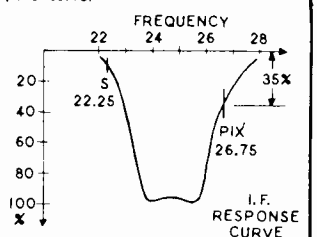
1. A special aligning tool designed to fit the stems on adjustable cores of the IF and Trap coils (see points 5, 6, 7 and 8 in Fig. 14) is available and may be obtained from Stewart-Warner by requesting IF Alignment Tool #507479.

2. Turn receiver Channel Selector to television channel #12 and short antenna terminals together with a jumper wire.

3. Connect a 3 volt battery to the receiver AGC system so that negative terminal of battery connects to the AGC line and positive terminal of battery connects to receiver chassis.

4. If the IF channel is badly misaligned and two or more immediately adjoining IF stages are tuned to the same frequency, oscillation may occur. Such oscillation shows up as an excessive voltage across the video detector load, symbol 122, and is indicated by the VTVM that is connected to this point during alignment. It should be noted that voltage due to IF oscillation is unaffected by strength of signal from the generator.

Where IF oscillation is encountered, it is generally possible to correct the condition by detuning the IF coils in different directions. If that does not have the desired effect, increase fixed bias on AGC line by using a 4½ volt battery instead of the 3 volt battery referred to in instruction #3 After stopping the oscillation in this manner it will then be possible to align all IF stages using the following procedure, however, the AGC bias battery must be changed back to 3 volts when using the oscilloscope to observe band pass characteristics. Once all stages have been aligned using the 4½ volt bias, the IF channel should be stable with reduced bias.

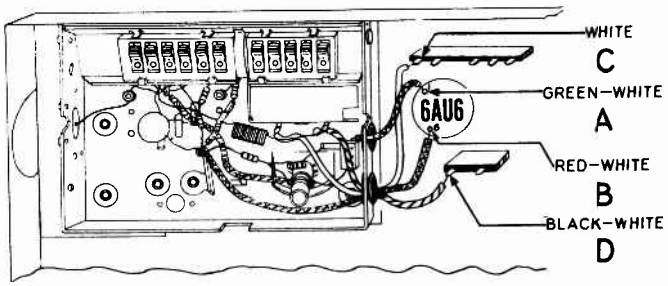
STANDARD SIGNAL GENERATOR		SWEEP GENERATOR		VTVM CONNECTIONS	OSCILLOSCOPE CONNECTIONS	MISCELLANEOUS INSTRUCTIONS	TRIMMER OR SLUG	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
CONNECTIONS	FREQUENCY	CONNECTIONS	FREQ.					
Connect as shown in Fig. 5.	**23.5 MC.**	Use a 330 Mmf. isolating condenser and connect as shown in Fig. 5 but keep power switch turned off during this step.	———	Connect as shown in Fig. 6.	Not used.	———	**#5** Converter plate coil	Adjust for maximum reading on VTVM.
							#6 2nd I.F.	Adjust for maximum reading on VTVM.
Same as above.	**25.9 MC.**	Same as above.	———	Same as above.	Not used.	———	**#7** 1st I.F.	Adjust for maximum reading on VTVM.
							#8 3rd I.F.	Adjust for maximum reading on VTVM.
Same as above.	**26.75 MC.**	With connections made as shown in Fig. 5, turn on this generator and set controls for operation as specified in next column.	**25 MC.** Sweeping ± 5 Mc.	Same as above.	Connect as shown in Fig. 6	IMPORTANT: 1. Adjust output attenuator on sweep generator so that reading on VTVM is approximately one-half volt. 2. Set attenuator on standard signal generator so that marker signal does not distort the pattern on the oscilloscope. 3. Be sure that a 3 volt battery is connected to AGC line as specified in instruction #3 at the head of this chart. Do not use a battery of any other voltage.		The IF band pass characteristic now displayed on the 'scope should be compared with the curve shown in Fig. 7. If top of curve is not properly shaped, make a slight readjustment of slug #6. Should that adjustment fail to yield the desired result, then note whether the curve has a peak on the high or low frequency side. Slugs #7 and #8 control high frequency response (25.9 Mc.) and slugs #5 and #6 affect the low frequency response (23.5 Mc.); by making a small change in the settings of the high or low frequency slugs, it will be possible to obtain correct band pass curve.  **FIG. 7** The 26.75 Mc. picture IF carrier marker should now appear at the 35% amplitude position on side of the band pass characteristic (see Fig. 7). If position of the marker appears too high or too low, slight readjustment of slugs #7 and/or 8 is required.
Same as above.	**22.25 MC.**	Same as above.	Same as above.	Same as above.	Same as above.	Same as above.		Adjust the vertical gain control on the 'scope in order to magnify the sound portion of the response curve. The 22.25 Mc sound IF carrier marker should appear at the position indicated in Fig. 7. If the position of the sound marker is incorrect, readjustment of slugs #5 and/or 6 is required.

Stewart-Warner Models 9202-C, etc. (Continued)

Receivers incorporating production changes explained at right, are identified by coding stamped on rear surface of chassis. Coding consists of the word SERIES and letter A or B.

The tuner assembly diagram is shown on this page, and it connects to the main circuit shown on the double page spread 164-165, and continued on page 166.

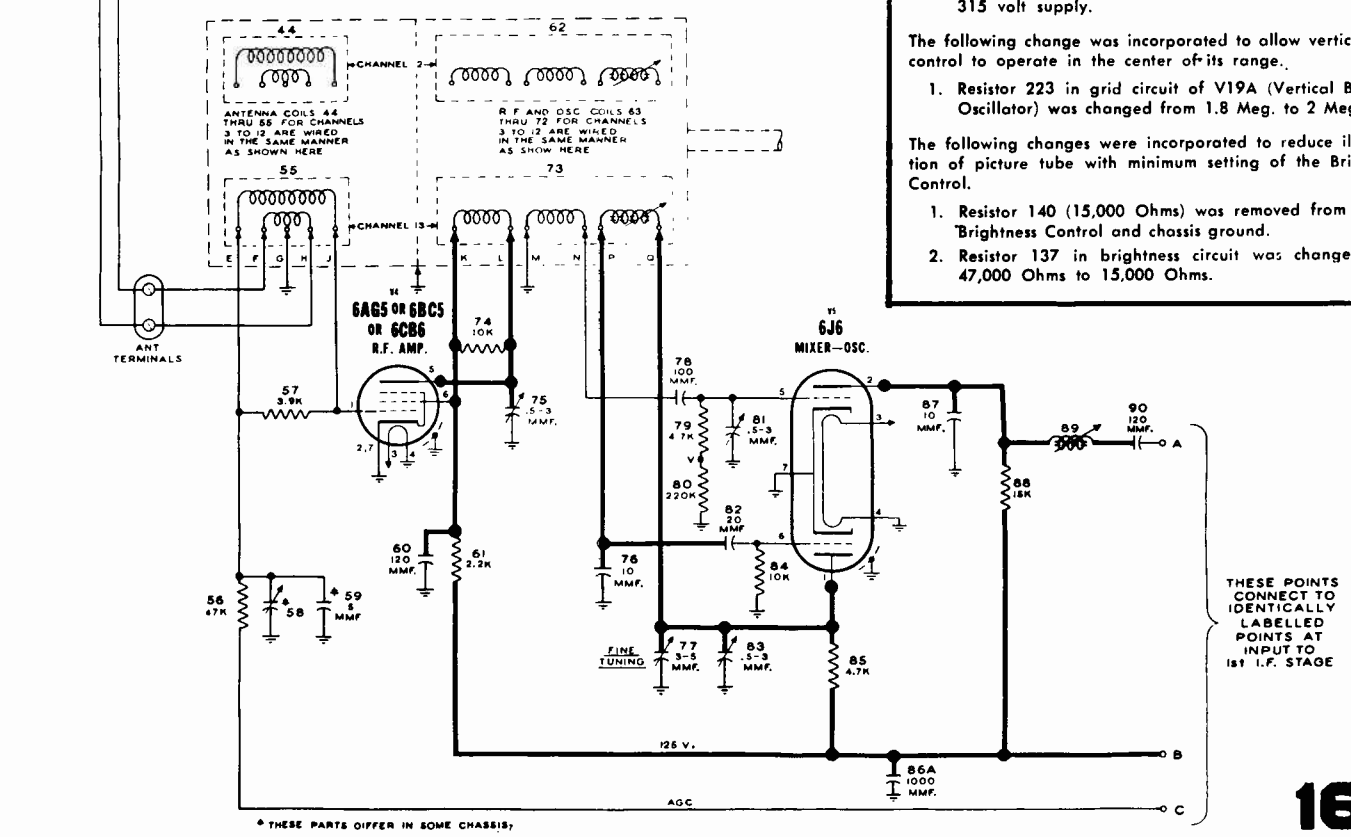
LETTER INCLUDED IN DESIGNATION FOLLOWING THE WORD "SERIES"	CHANGE INCORPORATED IN CHASSIS
UNCODED	INITIAL PRODUCTION
"A"	The following changes were incorporated to provide for a new TV sound discriminator transformer which improves AM rejection. 1. Sound Discriminator Transformer 20 was changed from 507321 to 509706. Terminal connections are the same for both transformers. 2. Condenser 18 (8 Mmfd.) was removed. It formerly was wired externally from pin 1 to pin 2 of Sound Discriminator Transformer 20, part 507321. 3. Condenser 208 (10 Mmfd.) was added. It is an integral part of Sound Discriminator Transformer 20, part 509706 and replaces Condenser 8, removed in step 2. 4. Condenser 20A across secondary of Sound Discriminator Transformer 20 was changed from 110 Mmfd. to 95 Mmfd. 5. Condenser 35 in plate circuit of tube V2 (Sound Discriminator) was changed from 4 Mfd. to 10 Mfd.
"B"	The following changes were incorporated to improve operation of horizontal multivibrator and to reduce the possibility of fuse 191 blowing out during the warm-up period. 1. Condenser 174 in plate circuit of tube V14 (Horizontal Scanning Multivibrator) was changed from 470 Mmfd. to 390 Mmfd. 2. Resistor 177 in plate circuit of tube V14 (Horizontal Scanning Multivibrator) was changed from 330,000 Ohms to 680,000 Ohms. 3. Resistor 235 in plate circuit of tube V14 (Horizontal Scanning Multivibrator) was changed from 3900 Ohms to 3300 Ohms. 4. Resistor 248 (270,000 Ohms) was added between pin 5 of tube V14 (Horizontal Scanning Multivibrator) and 315 volt supply. The following change was incorporated to allow vertical hold control to operate in the center of its range. 1. Resistor 223 in grid circuit of V19A (Vertical Blocking Oscillator) was changed from 1.8 Meg. to 2 Meg. The following changes were incorporated to reduce illumination of picture tube with minimum setting of the Brightness Control. 1. Resistor 140 (15,000 Ohms) was removed from end of Brightness Control and chassis ground. 2. Resistor 137 in brightness circuit was changed from 47,000 Ohms to 15,000 Ohms.



BOTTOM VIEW OF CHASSIS SHOWING CONNECTIONS TO RF TUNER UNIT

Lettered terminals in illustrations correspond to similarly lettered terminals on the circuit diagram.

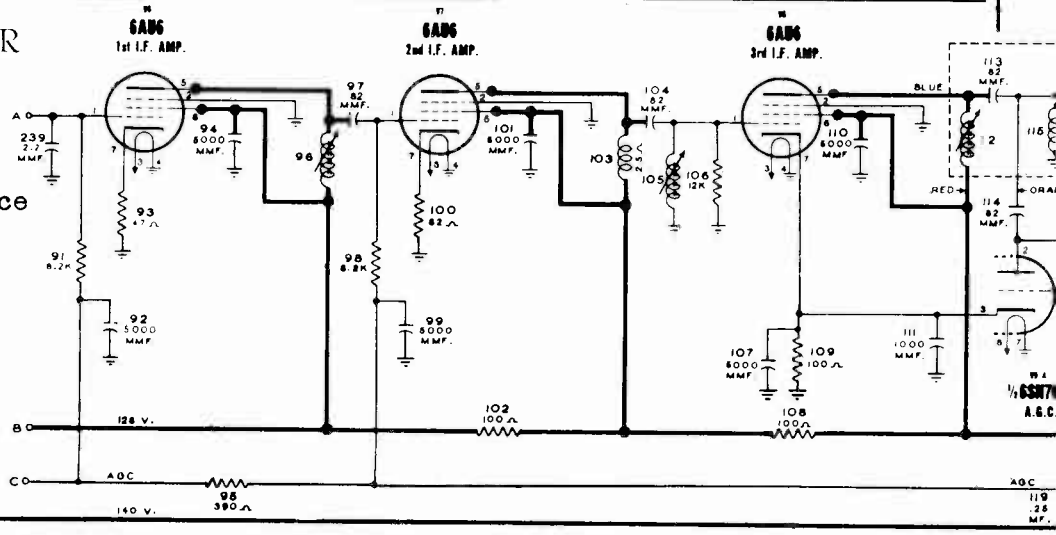
508890 R.F. TUNER ASSEMBLY

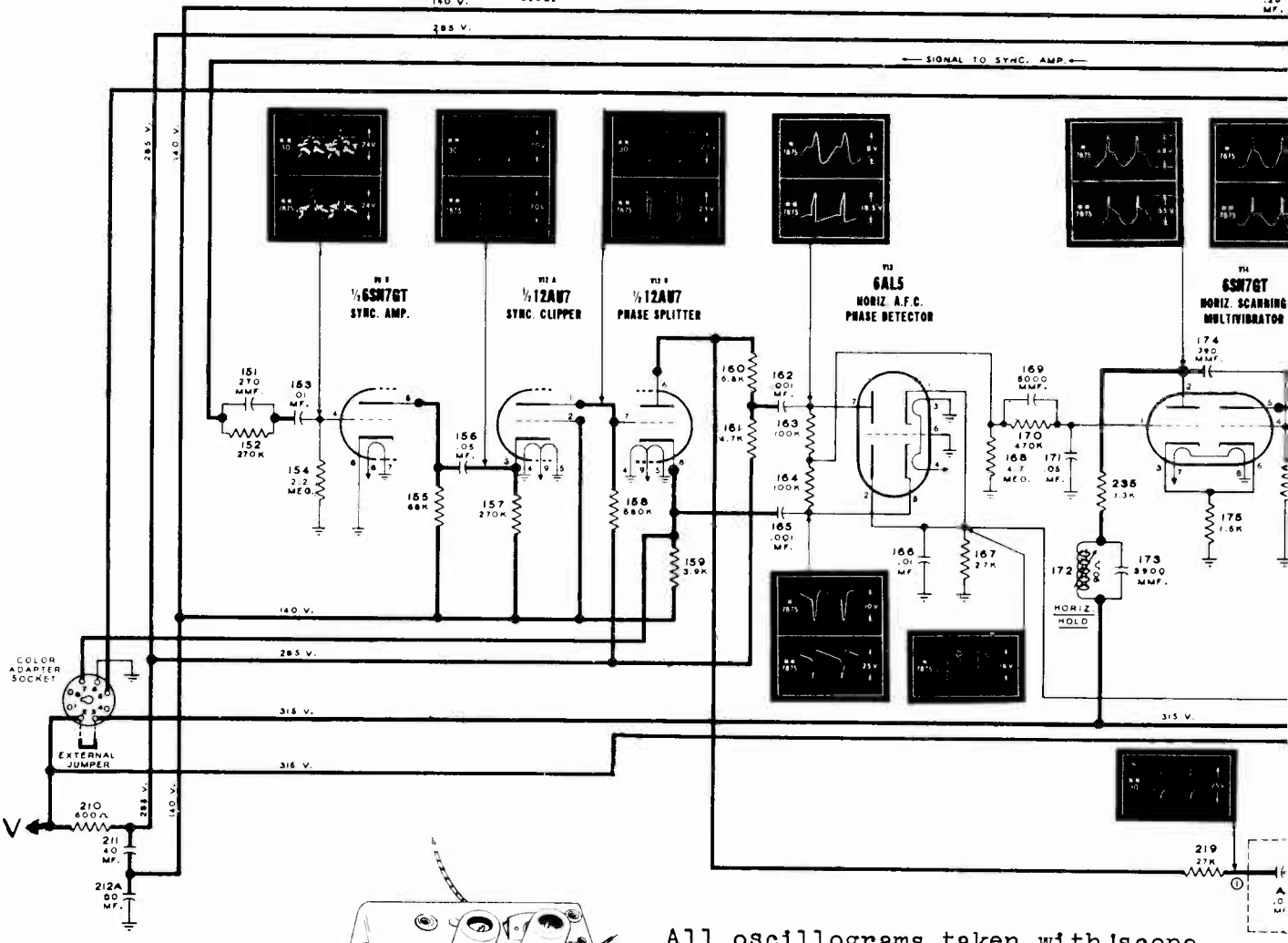


STEWART-WARNER

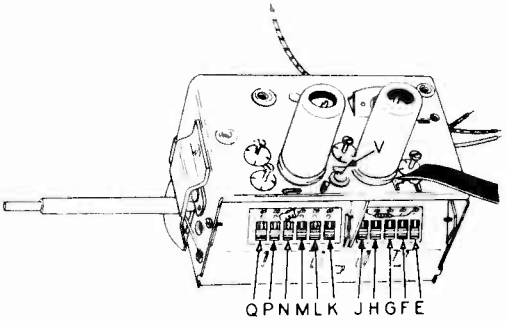
Stewart-Warner
Models 9202-C, etc.

For printing convenience parts of this circuit are shown on page 163 and page 166. Wires marked A, B, and C, connect to tuner on page 163; while wires V, X, Y, and Z, connect to sound section and power supply shown on page 166.



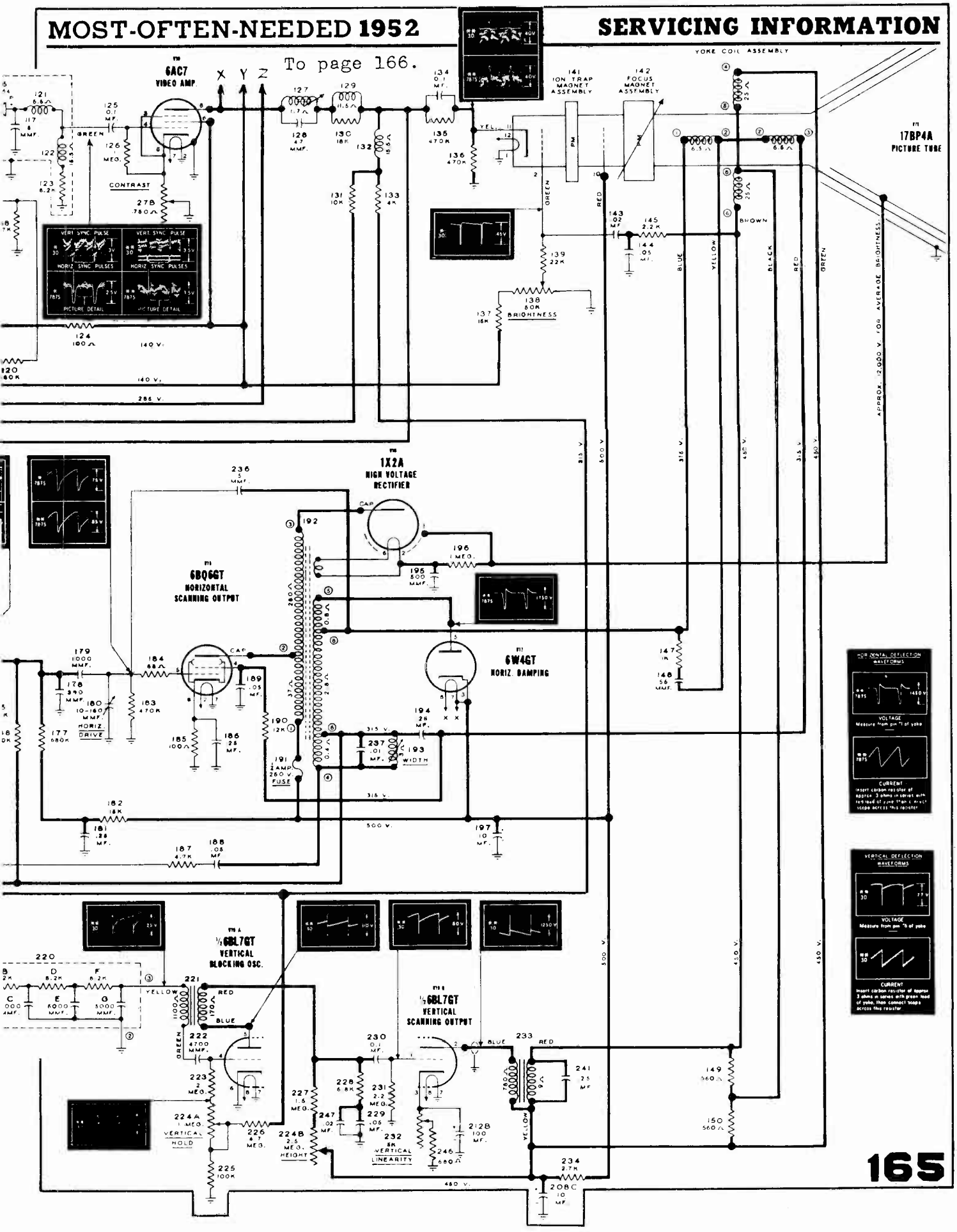


V - Connected to point V of power supply circuit, page 166.



508890 TUNER UNIT

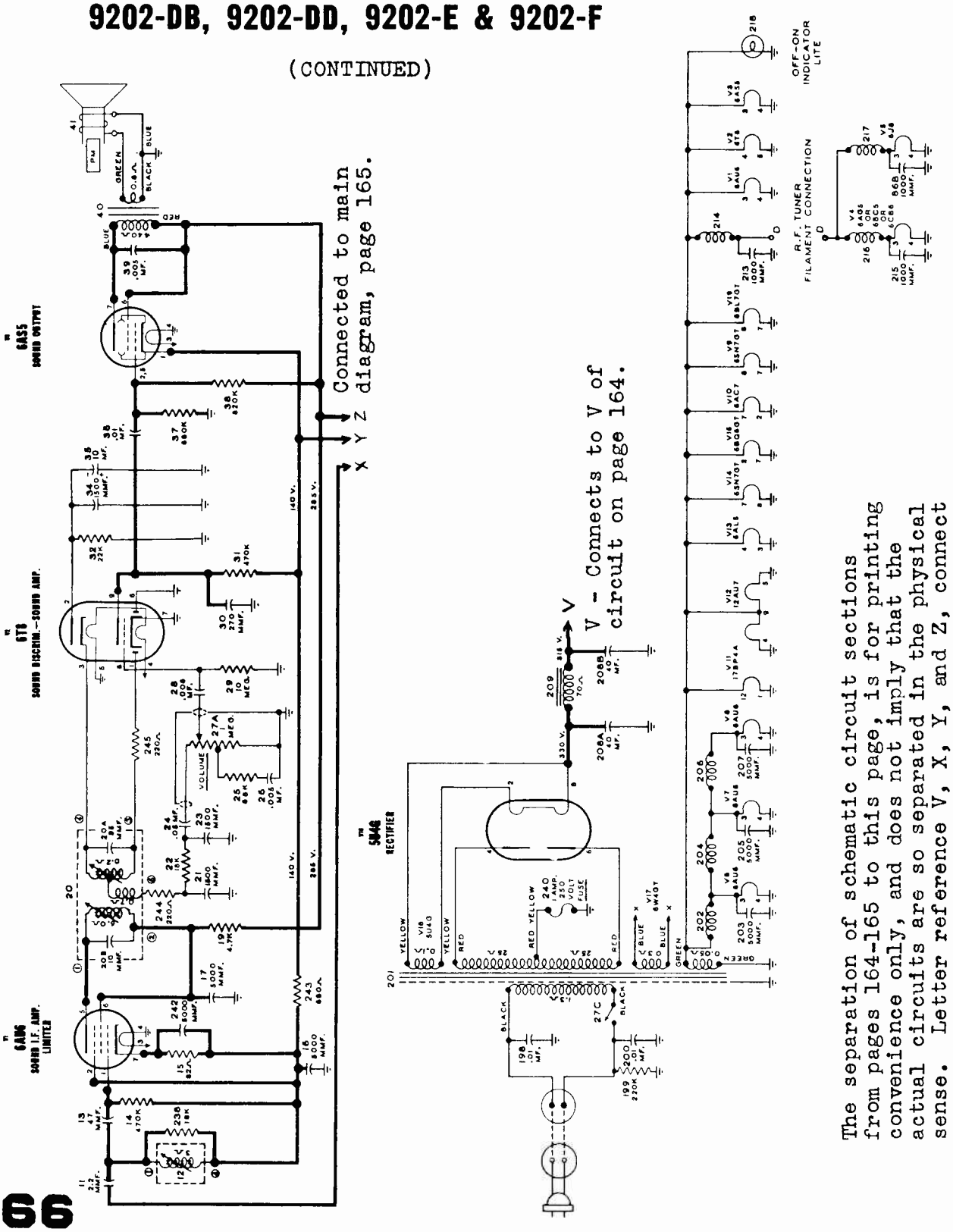
All oscillograms taken with 'scope ground to chassis; normal station reception. Number below * or ** specifies 'scope HOR. FREQ. setting. *-observed with 'scope of limited frequency response. **-observed with 'scope with vert. frequency response flat ±20% up to 2 MC.


To page 166.
V1 6AC7 VIDEO AMP.
X Y Z
YOKE COIL ASSEMBLY
141 ION TRAP MAGNET ASSEMBLY
142 FOCUS MAGNET ASSEMBLY
V11 17BP4A PICTURE TUBE
CONTRAST
138 BRIGHTNESS
140 V.
286 V.
APPROX. 12,000 V. FOR AVERAGE BRIGHTNESS
V8 1X2A HIGH VOLTAGE RECTIFIER
V9 6BQ6GT HORIZONTAL SCANNING OUTPUT
V10 6W4GT HORIZ. DAMPING
HORIZ. DRIVE
WIDTH
1 AMP 250 V. FUSE
315 V.
500 V.
V5A 1/2 6BL7GT VERTICAL BLOCKING OSC.
V5B 1/2 6BL7GT VERTICAL SCANNING OUTPUT
VERTICAL HOLD
VERTICAL HEIGHT
VERTICAL LINEARITY
480 V.
HORIZONTAL DEFLECTION WAVEFORMS
VOLTAGE
CURRENT
VERTICAL DEFLECTION WAVEFORMS
VOLTAGE
CURRENT

STEWART-WARNER

MODELS 9202-C, 9202-DA, 9202-DB, 9202-DD, 9202-E & 9202-F

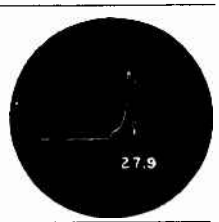
(CONTINUED)

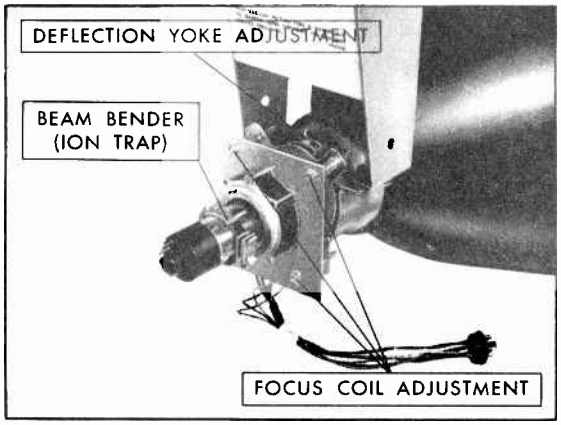


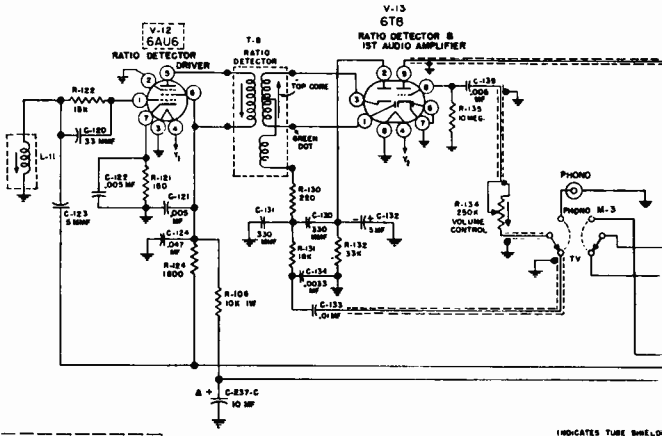
The separation of schematic circuit sections from pages 164-165 to this page, is for printing convenience only, and does not imply that the actual circuits are so separated in the physical sense. Letter reference V, X, Y, and Z, connect to corresponding letter-points shown in the schematic on pages 164-165.

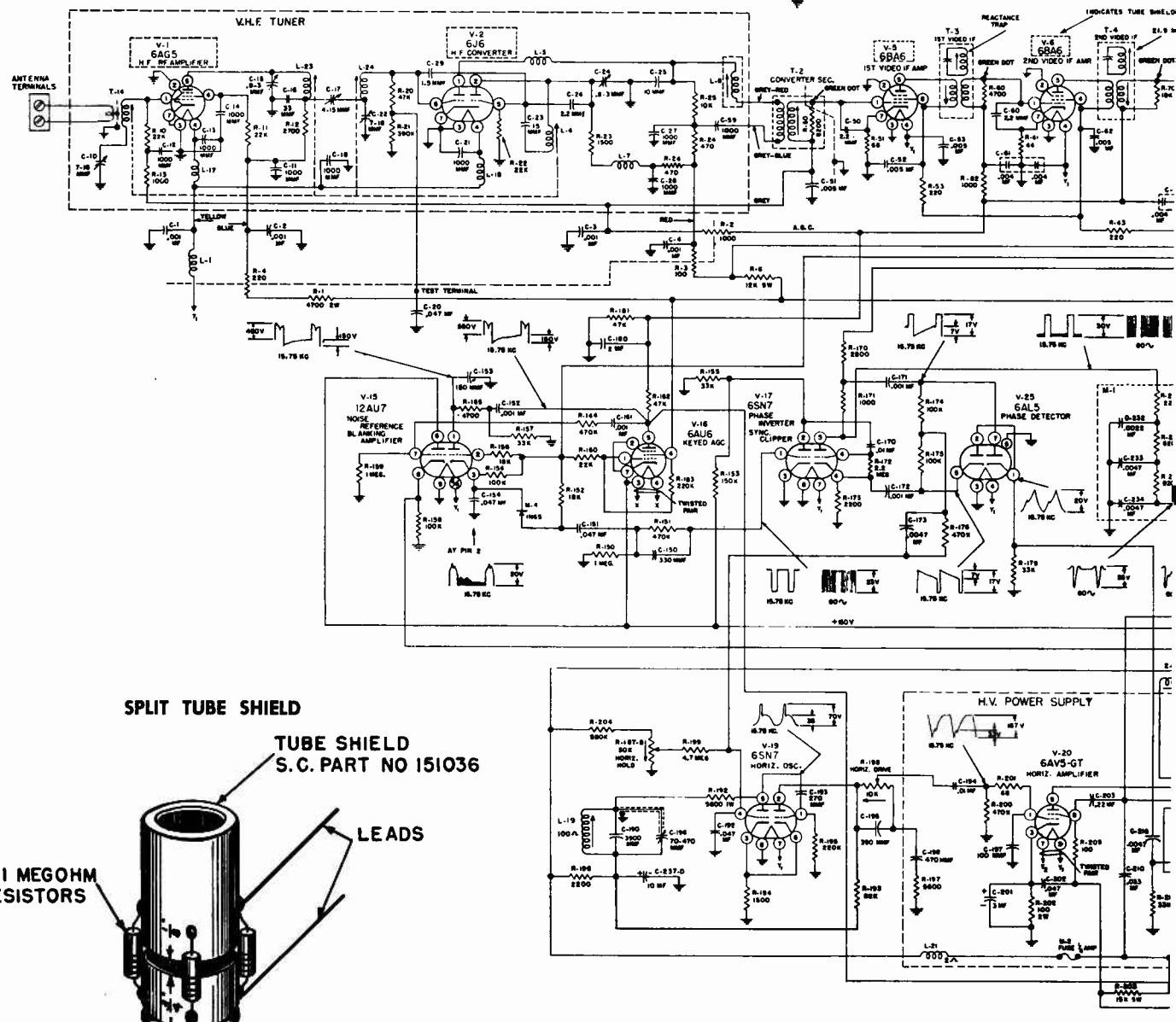
STROMBERG-CARLSON 321 SERIES

Alignment on sets of Series 321 is given below. The schematic diagram appears on the next two pages. The page after that has additional service material including illustrations of the trimmer positions. Should you be called upon to service sets of the 317 Series, you will find considerable similarity to the 321, and this material will prove of aid. The 317 Series use 17BP4 Kinescope, V-10 video amplifier is a type 6AG7, and V-20 horizontal amplifier is a type 6AU5-GT. There are other differences as well. The 317-RPM is a combination and includes AM radio and phono with additional circuits and selector switch.

	Signal Generator Connection	Oscilloscope or VTVM Connection	Adjustments and Notes	
1 Quadruple Alignment	Output of sweep generator to grid of 1st IF tube, pin 1 of V-5, 6BA6 thru 100 MMF isolating resistor.	Input of scope to grid of video amplifier, pin 2 of V-9, 12AU7 thru 47K ohm isolating resistor.	1. Adjust the bottom slug of T-3, 1st IF Transformer for low intermediate frequency. (23.7 mc. appox). 2. Adjust the bottom slug of T-4, 2nd IF Transformer for low frequency. (23.0 mc. approx). 3. Adjust the bottom slug of T-5, 3rd IF transformer for high frequency. (26.0 mc. appox). 4. Adjust the bottom slug of T-6, 4th IF transformer for high intermediate frequency. (25.3 mc. appox). 5. Maintaining the above relative frequency positions of the individual stages, adjust the slugs to produce a curve as shown with the 22.7 mc. and 26.4 mc. markers at 70% response.	
The output from the sweep generator should be such that with a DC bias of approximately —3.0 volts applied to the AGC line (across C-160) the output on the oscilloscope will be 2 volts peak to peak. This level of output 2 volts peak to peak from the video detector should be maintained throughout the alignment procedure by readjusting the bias and/or the input from the sweep generator, and leaving the gain of the oscilloscope fixed. The contrast control should be set at maximum contrast position.				
2 Sound Traps	Same as Step #1 Using 21.9 mc. marker.	Same as Step #1	1. Adjust the top slug of T-4 for minimum response at 21.9 mc. 2. Adjust the top slug of T-3 for curve shown.	
3 Adjacent Sound Trap	Same as Step #1 using 27.9 mc. marker.	Same as Step #1.	1. Adjust the top slug of T-5 for minimum response at 27.9 mc. 2. Repeat Step #1 (Quadruple alignment) to reproduce the curve as shown.	
4 Double-Tuned Stage Alignment	Couple the output of the sweep generator into the converter plate by means of the split tube shield.	Same as Step #1.	1. Adjust L-8 on tuner assembly and T-2 for curve as shown in Fig. 6 for maximum gain, maintaining the 22.7 mc. and 26.4 mc. markers at 50% response.	
5 Sound IF Alignment	Connect an unmodulated 4.5 mc. signal to the grid of the 1st sound IF amp. pin 4 of V-9, 12AU7.	Connect 2-100K resistors in series from plate of ratio detector pin 2 of V-13, 6T8 to ground. Connect VTVM from junction of the 2-100K resistors to ground.	1. Adjust L-10, L-11, and bottom slug of T-8 for maximum response.	
6 Ratio Detector Balance	Same as Step #5.	Reconnect the VTVM from the junction of the 2-100K resistors (see 5 above) to the junction of C-134 and R-131.	1. Adjust the secondary (top slug) of T-8 for zero volts between the positive and negative excursions.	


DEFLECTION YOKE ADJUSTMENT
BEAM BENDER (ION TRAP)
FOCUS COIL ADJUSTMENT


V-12 6AU6 RATIO DETECTOR DRIVER
T-8 RATIO DETECTOR
V-13 6T8 RATIO DETECTOR & 1ST AUDIO AMPLIFIER
PHONO
TV

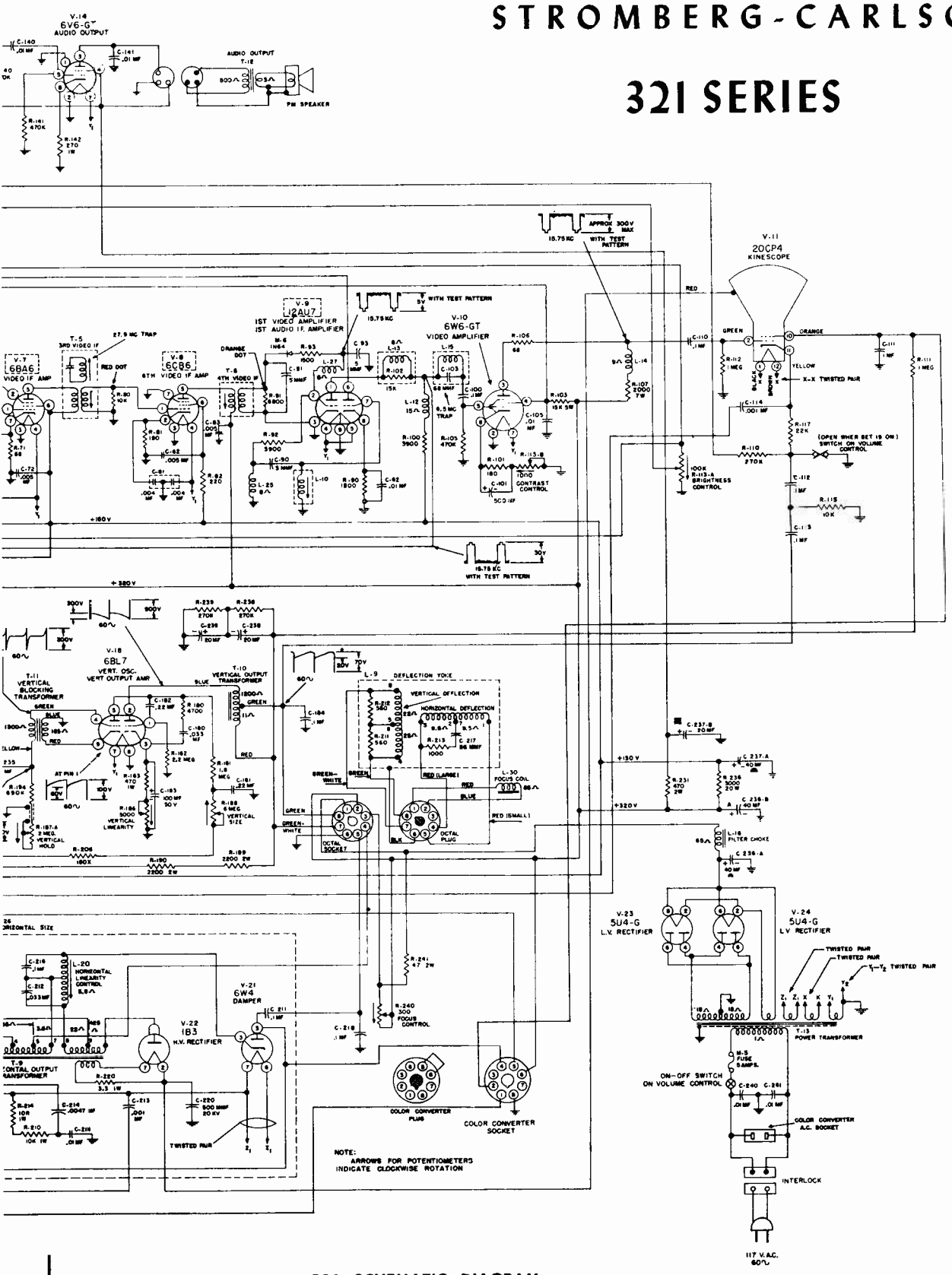

V.H.F. TUNER
V-1 6AG5 H.F. RF AMPLIFIER
V-2 6U6 H.F. CONVERTER
V-5 6BA6 1ST VIDEO IF AMP
V-6 6BA6 2ND VIDEO IF AMP
ANTENNA TERMINALS
REACTANCE TRAP
CONVERTER SEC.
TEST TERMINAL
V-15 12AU7 NOISE REFERENCE BLANKING AMPLIFIER
V-16 6AU6 KEYED AGC
V-17 6SN7 PHASE INVERTER SYNC. CLIPPER
V-25 6AL5 PHASE DETECTOR
+150V

H.V. POWER SUPPLY
V-19 6SN7 HORIZ. OSC.
V-20 6AV5-GT HORIZ. AMPLIFIER

SPLIT TUBE SHIELD
TUBE SHIELD S.C. PART NO 151036
LEADS
4-1 MEGOHM RESISTORS

STROMBERG-CARLSON

321 SERIES

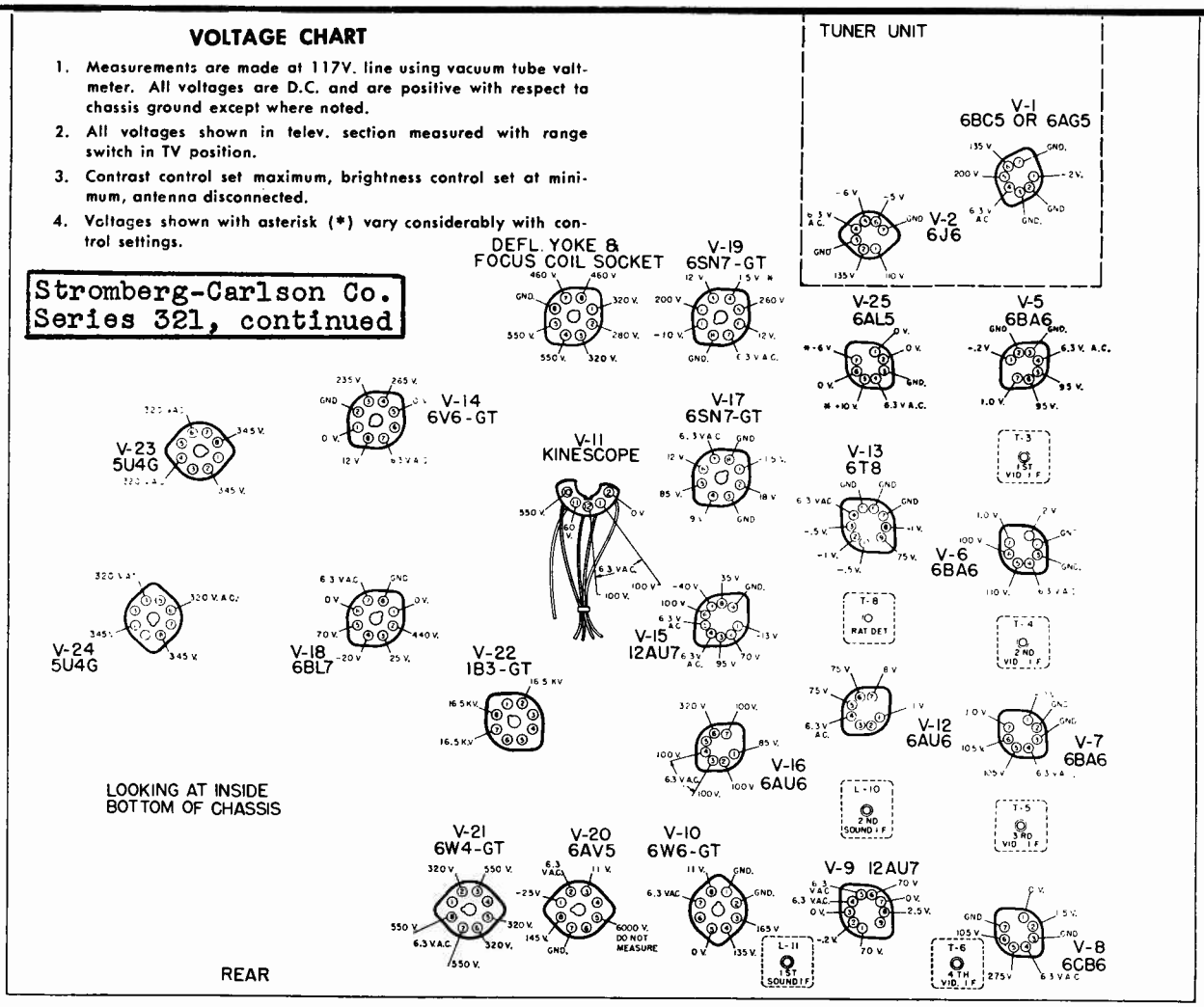


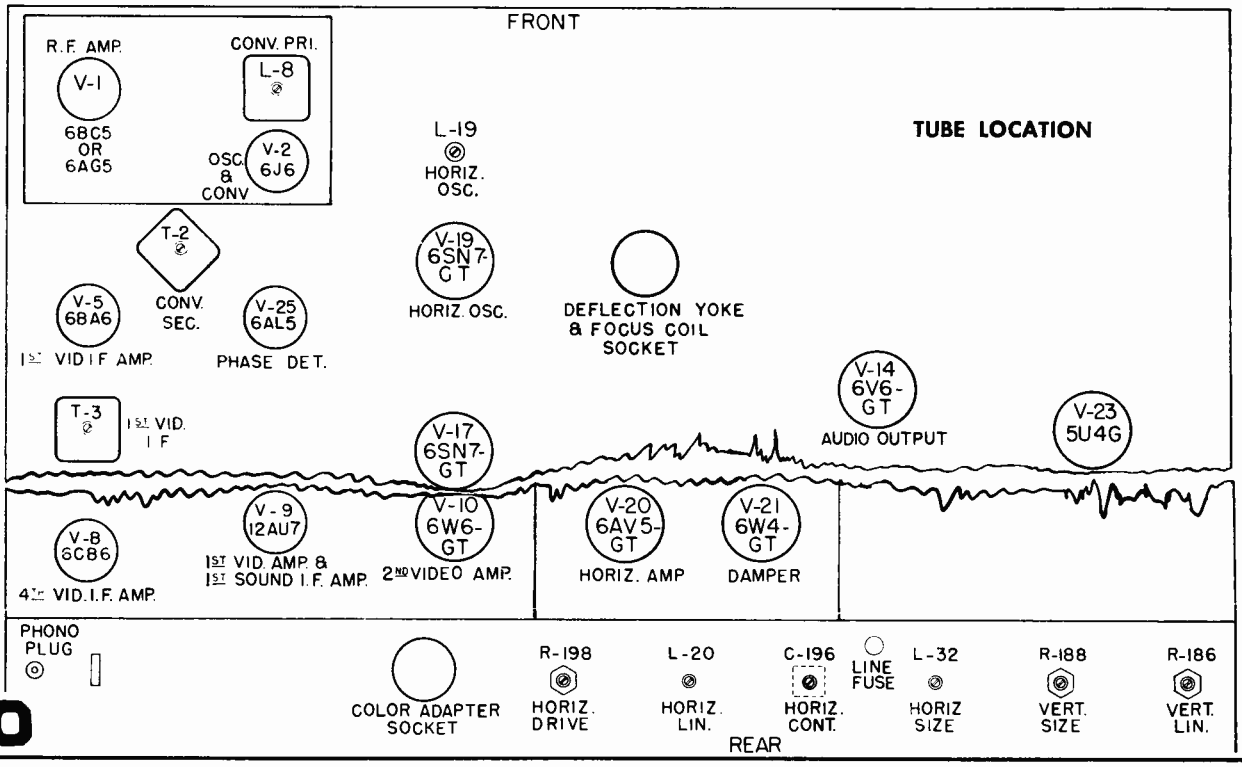
321 SCHEMATIC DIAGRAM

VOLTAGE CHART

1. Measurements are made at 117V. line using vacuum tube voltmeter. All voltages are D.C. and are positive with respect to chassis ground except where noted.
2. All voltages shown in telev. section measured with range switch in TV position.
3. Contrast control set maximum, brightness control set at minimum, antenna disconnected.
4. Voltages shown with asterisk (*) vary considerably with control settings.

Stromberg-Carlson Co.
Series 321, continued





SYLVANIA

Chassis 1-502-1
Models 71M-1, 72B-1, 72M-1

The service material on the next six pages is exact for Sylvania Chassis 1-502-1 used in Models 71M-1, 72B-1, and 72M-1. Chassis 1-502-2 used in Models 73M-1 and 73M-2, is the same except that a different tuner, using tubes 6CB6 and 6J6, is employed.

There are many other Sylvania television receivers which are very similar in circuit to the chassis covered on these pages. Besides minor circuit differences, some of these sets may use other tuners, different tubes in some of the stages, other stagger I.F. frequencies, 20" picture tubes, and some sets are combinations. The material presented on these pages will be helpful in servicing these additional receivers:

Chassis	1-356	Models	74B and 74M.
"	1-366	"	71M, 72B, 72M, 73B, 73M.
"	1-387	"	22M, 22M-1, 23B, 23M, 23M-1, 24M-1, 24M-3, 25M.
"	1-437-1	"	74B-1, 74M-1, 75B, and 75M.
"	1-441	"	71M (similar to 1-366 but different tuner).
"	1-462-1	"	24M.

Horizontal Hold Adjustment

A. Tune in a station and adjust the Channel Selector for best picture quality. Adjust the Picture Contrast and Brightness controls for normal picture.

B. Remove V15 - 6AL5 - Horizontal Discriminator tube.

C. Turn the Horizontal Hold Control until the picture moves back and forth across the screen with blanking bars vertical.

D. Replace the Horizontal Discriminator tube and repeat "A," "B," and "C" under "Check of Operation" above.

E. If the receiver will not pass these checks, it will be necessary to proceed with "Phase Adjustment".

ALIGNMENT PROCEDURE

VIDEO IF ALIGNMENT

1. Connect signal generator to the jig shield* on the Oscillator-Mixer tube. Allow generator and set to warm-up for fifteen minutes.

2. Connect the negative lead of a 3 volt battery to the AGC Line, positive lead to ground.

3. Connect an ungrounded D.C. VTVM across the diode load resistor R145 - 3,900 Ohm.

4. Tune generator to 27.9 Mc. and adjust trap coil L55 for minimum output. Keep voltmeter reading under 2 volts by reducing generator output as required.

*Jig Tube Shield - made by cutting off or insulating a tube shield such as used on V2 the 12AT7 Oscillator-Mixer tube on the tuner so that the shield does not ground when in place on the tube.

5. Adjust the cores of the Video IF Transformers in the following order. Reduce generator output to keep voltmeter reading between 1 and 2 volts.

Set Signal Generator At:	Adjust:
26.2 Mc.	Core on 2nd Video IF Transformer T57 for maximum output
24.1 Mc.	Core on 1st Video IF Transformer T56 for maximum output
25.3 Mc.	Core on Mixer Coil L8 for maximum output

Repeat adjustment of trap coil L55 as in step 4 above.

6. Disconnect signal generator and VTVM.

7. Connect sweep generator (frequency 25 Mc., sweeping 10 Mc.) using a .005 Mfd. capacitor to pin 1 of 3rd Video IF Amplifier - 6BC5.

Sylvania Chassis 1-502-1, Models 71M-1, 72B-1, 72M-1, continued.

8. Connect oscilloscope to junction of diode load resistor R145 - 3,900 Ohm and coil L58.

9. Adjust primary (top core) and then secondary (bottom core) of IF Bandpass T58 to obtain curve shown in Figure 8.

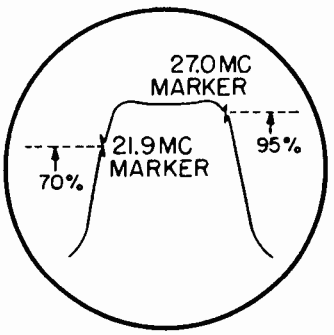


FIGURE 8 - IF BANDPASS RESPONSE

10. Disconnect Sweep Generator from 3rd IF Grid and connect it to the Jig Shield on V2, the Oscillator-Mixer tube. Loosely couple signal generator at this point for markers.

11. Observe IF response curve and, if necessary, adjust Video IF transformer cores slightly to obtain the response curve shown in Figure 9. Use low signal input and high enough scope gain so that the IF amplifier does not overload, resulting in distortion of the IF response curve.

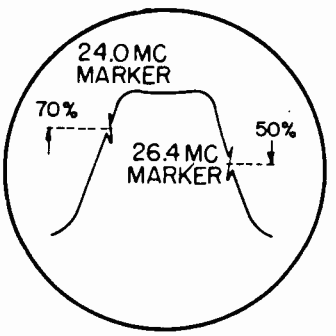


FIGURE 9 - OVERALL IF RESPONSE

SOUND TAKE-OFF & 4.5 MC. TRAP ALIGNMENT

1. Connect a 4.5 Mc. sweep generator having a 250 Kc. sweep through .005 Mfd. to pin 7 of video detector 6AL5. Loosely couple signal generator for use as markers.

2. Connect oscilloscope to limiter grid resistor R104 - 47M through a 270M isolating resistor. Adjust trap core L56 until 4.5 Mc. marker is centered at the peak of the response curve. See Figure 10.

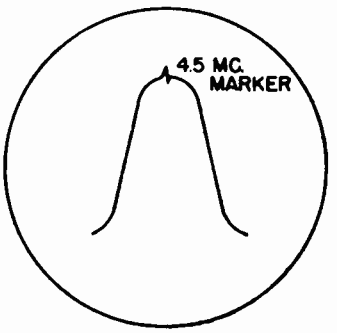


FIGURE 10 - SOUND IF RESPONSE

SOUND DISCRIMINATOR ALIGNMENT

1. Connect oscilloscope across the Volume Control.

2. Adjust the cores of the discriminator transformers T52 and T53 until the discriminator curve corresponds to that in Figure 11. Note especially that:

   (a) 4.5 Mc. marker is exactly in the center of the curve.

   (b) The curve is linear between the outside two markers.

   (c) The amplitude is the greatest obtainable.

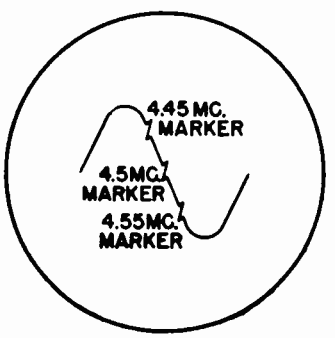


FIGURE 11 - SOUND DISCRIMINATOR RESPONSE

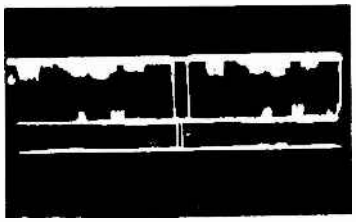
SYLVANIA

Chassis 1-502-1, continued,
Models 71M-1, 72B-1, 72M-1.

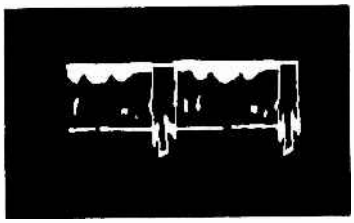
WAVEFORMS

Note 1: The terms "Horizontal," "Vertical," or "60 cps sine wave" refer to the oscilloscope sweep employed.
Note 2: All waveforms are taken with the oscilloscope horizontal sweep direction from left to right and with upward deflection corresponding to positive polarity.
Note 3: In some instances the waveforms obtained will not be identical with those shown, due to the electrical characteristics of the oscilloscope used.
Note 4: All waveforms are measured with respect to chassis unless otherwise indicated.
Note 5: Have Picture Contrast control at maximum.

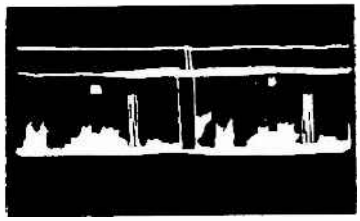
*The peak to peak (PP) voltages of these waveforms are dependent on the depth of modulation of the transmitted signal; voltages shown are obtained when modulation is approximately 90 percent.



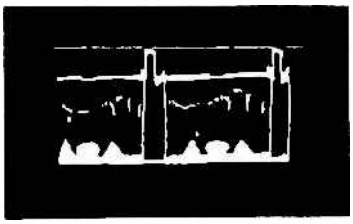
*6BF5 (V7) Video Amplifier Control Grid (Pins 1 and 7) 3.5 Volts PP Vertical



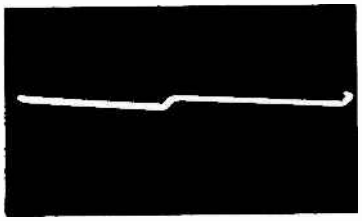
*6BF5 (V7) Video Amplifier Control Grid (Pins 1 and 7) 3.5 Volts PP Horizontal



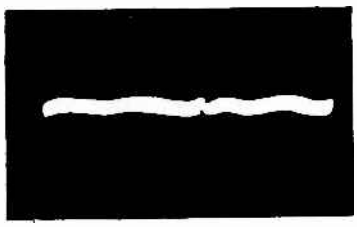
*6BF5 (V7) Video Amplifier Plate (Pin 5) 55 Volts PP Vertical



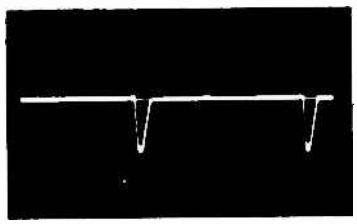
*6BF5 (V7) Video Amplifier Plate (Pin 5) 55 Volts PP Horizontal



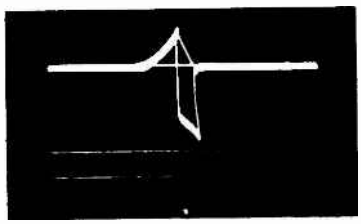
12AX7 (V13) Hor. Sync. Sep. and AGC Rectifier Cathode (Pin 8) 2.6 Volts PP Horizontal



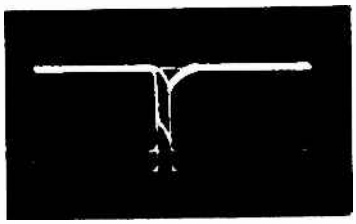
12AX7 (V13) Hor. Sync. Sep. and AGC Rectifier Cathode (Pin 8) 2.6 Volts PP Vertical



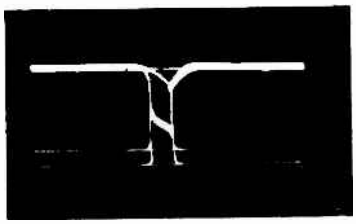
12AX7 (V13) Hor. Sync. Sep. Plate (Pin 6) 37 Volts PP Horizontal



12AX7 (V13) Hor. Sync. Sep. Plate (Pin 6) 37 Volts PP Vertical

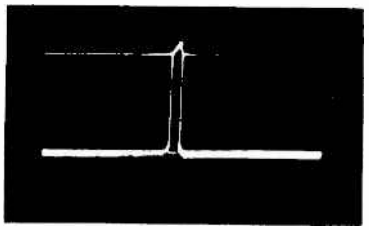


12AX7 (V13) Sync. Separator Plate (Pin 1) 25 Volts PP Vertical

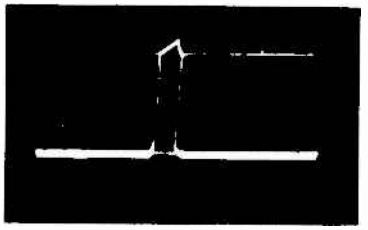


12AX7 (V13) Sync. Separator Plate (Pin 1) 25 Volts PP 60 cps sine wave

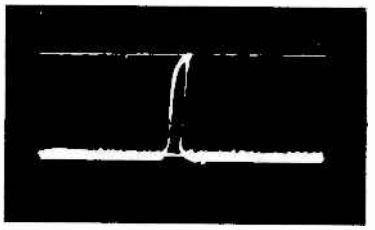
Sylvania Chassis 1-502-1, Models 71M-1, 72B-1, 72M-1, continued.



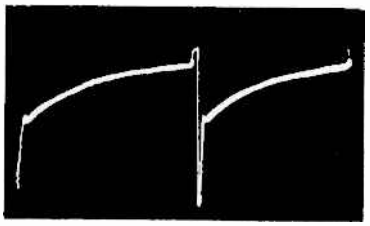
6SN7GT (V12) Sync. Amp. & Clipper Plate (Pin 2) 110 Volts PP Vertical



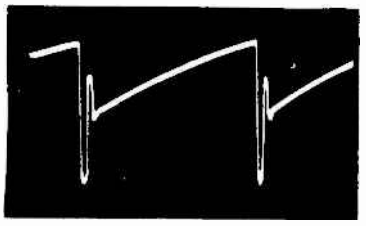
6SN7GT (V12) Sync. Amp. & Clipper Plate (Pin 2) 110 Volts PP 60 cps sine wave



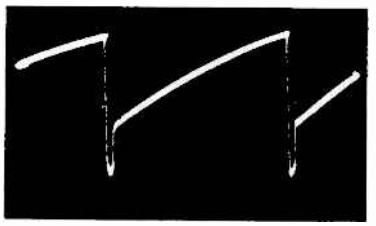
6SN7GT (V12) Sync. Amp. & Clipper Plate (Pin 2) 100 Volts PP Horizontal



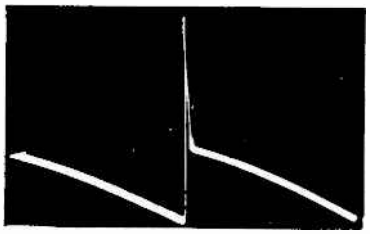
6BL7GT (V14) Vertical Oscillator Control Grid (Pin 1) 600 Volts PP Vertical



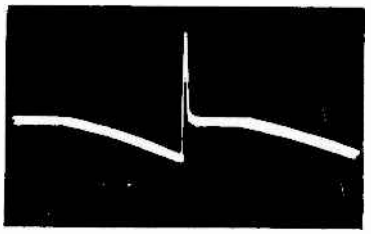
6BL7GT (V14) Vertical Oscillator Plate (Pin 2) 235 Volts PP Vertical



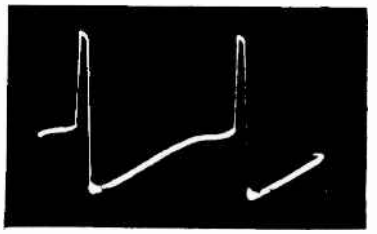
6BL7GT (V14) Vertical Output Control Grid (Pin 4) 95 Volts PP Vertical



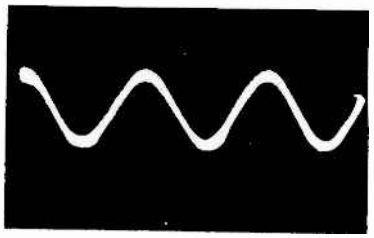
6BL7GT (V14) Vertical Output Plate (Pin 5) 830 Volts PP Vertical



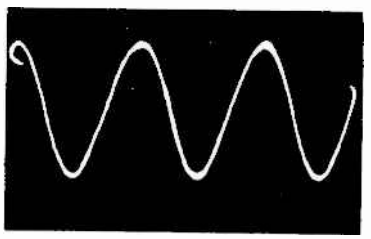
Vertical Deflection Coils (Test Point 1) 55 Volts PP Vertical



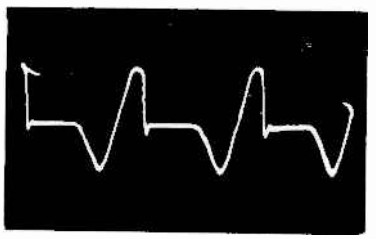
6AL5 (V15) Hor. Discriminator Plate (Pin 7) 70 Volts PP Horizontal



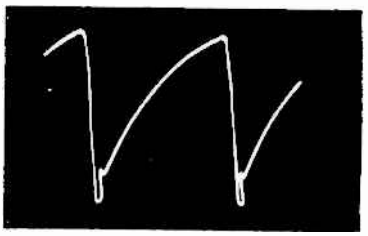
6AL5 (V15) Hor. Discriminator Plate to Plate (Pin 2 to Pin 7) Scope ground to pin 7 - 23 Volts PP Horizontal



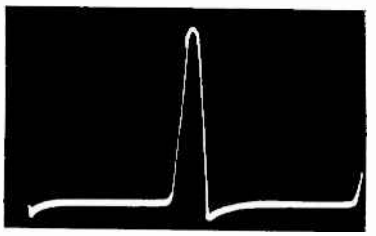
6AU6 (V16) Hor. Control Plate (Pin 5) 68 Volts PP Horizontal



6SN7GT (V17) Hor. Oscillator Plate (Pin 5) 95 Volts PP Horizontal

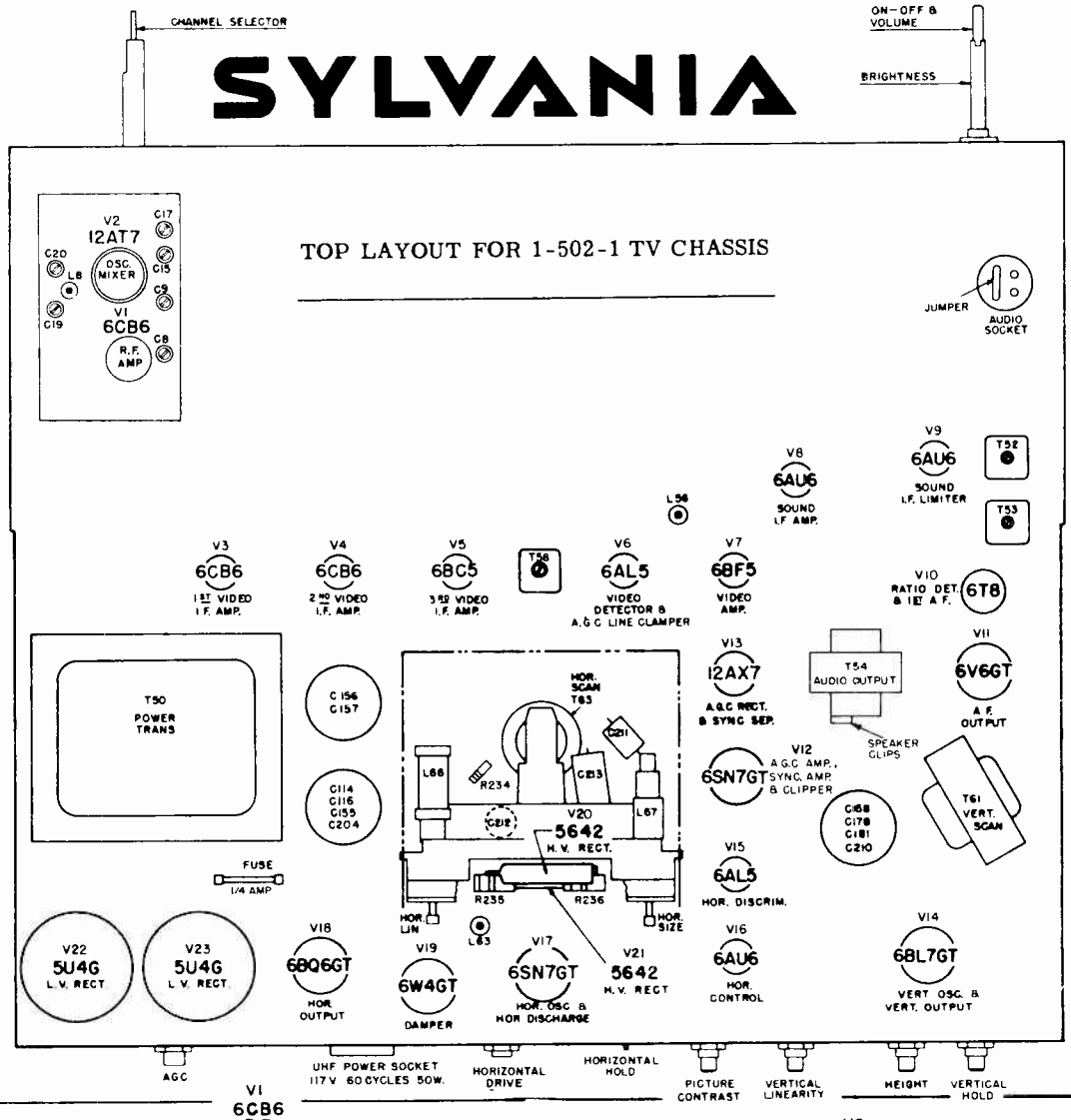


6SN7GT (V17) Hor. Discharge Plate (Pin 2) 105 Volts PP Horizontal

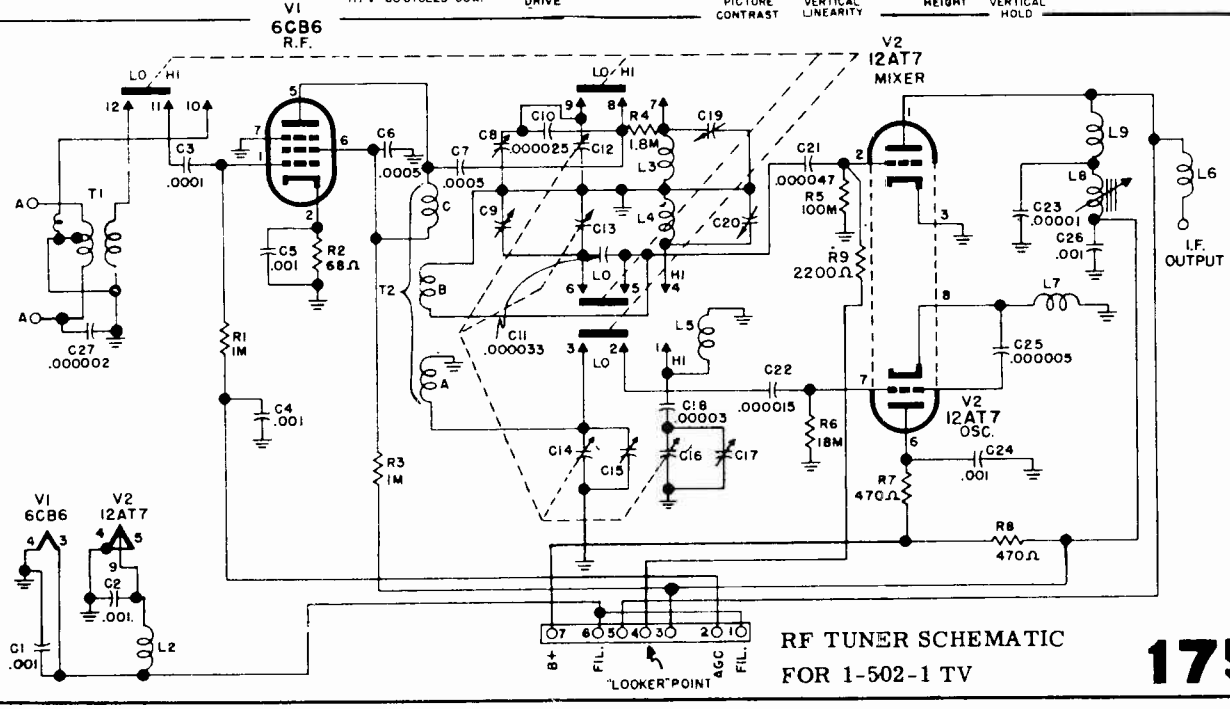


6W4GT (V19) Damper Cathode (Pin 3) 1000 Volts PP Horizontal

SYLVANIA



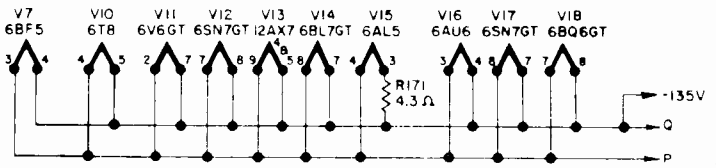
TOP LAYOUT FOR 1-502-1 TV CHASSIS



RF TUNER SCHEMATIC FOR 1-502-1 TV

SYLVANIA

Chassis 1-502-1
Models 71M-1, 72B-1, 72M-1



▣ USE HIGH VOLTAGE MULTIPLIER PROBE WITH SYLVANIA POLYMETER TYPE 221Z FOR ALL HIGH VOLTAGE MEASUREMENTS

Ⓐ CAUTION: VOLUME CONTROL SHIELDS ARE AT -135V. DO NOT CONNECT TO GROUND

* CONTRAST CONTROL AT MINIMUM

ϕ BRIGHTNESS CONTROL AT MAXIMUM

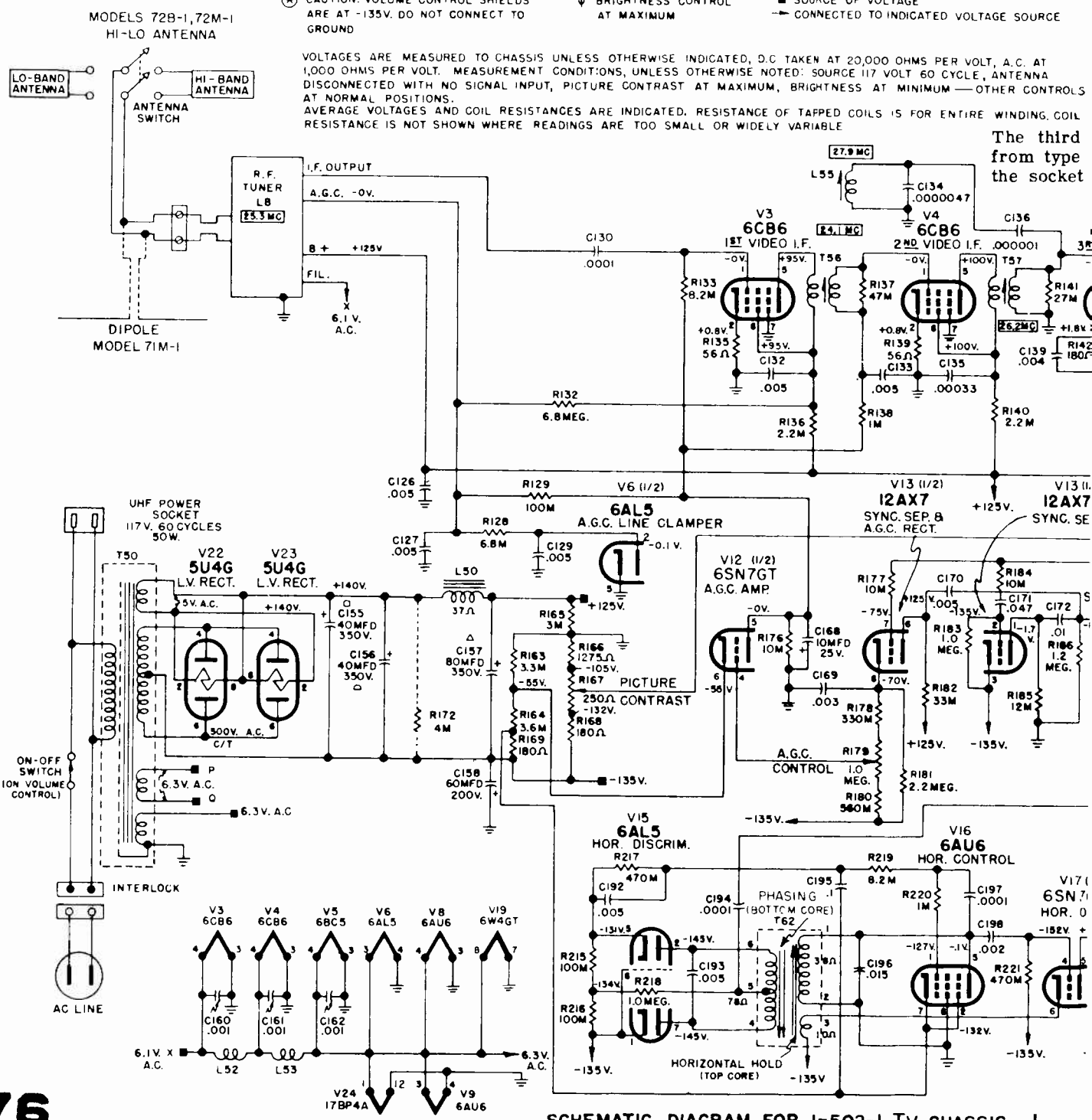
▲ HIGH PEAK VOLTAGE OF SHORT DURATION (APPROX. 2,000 V.) MAY DAMAGE METER USED FOR THIS MEASUREMENT

■ SOURCE OF VOLTAGE

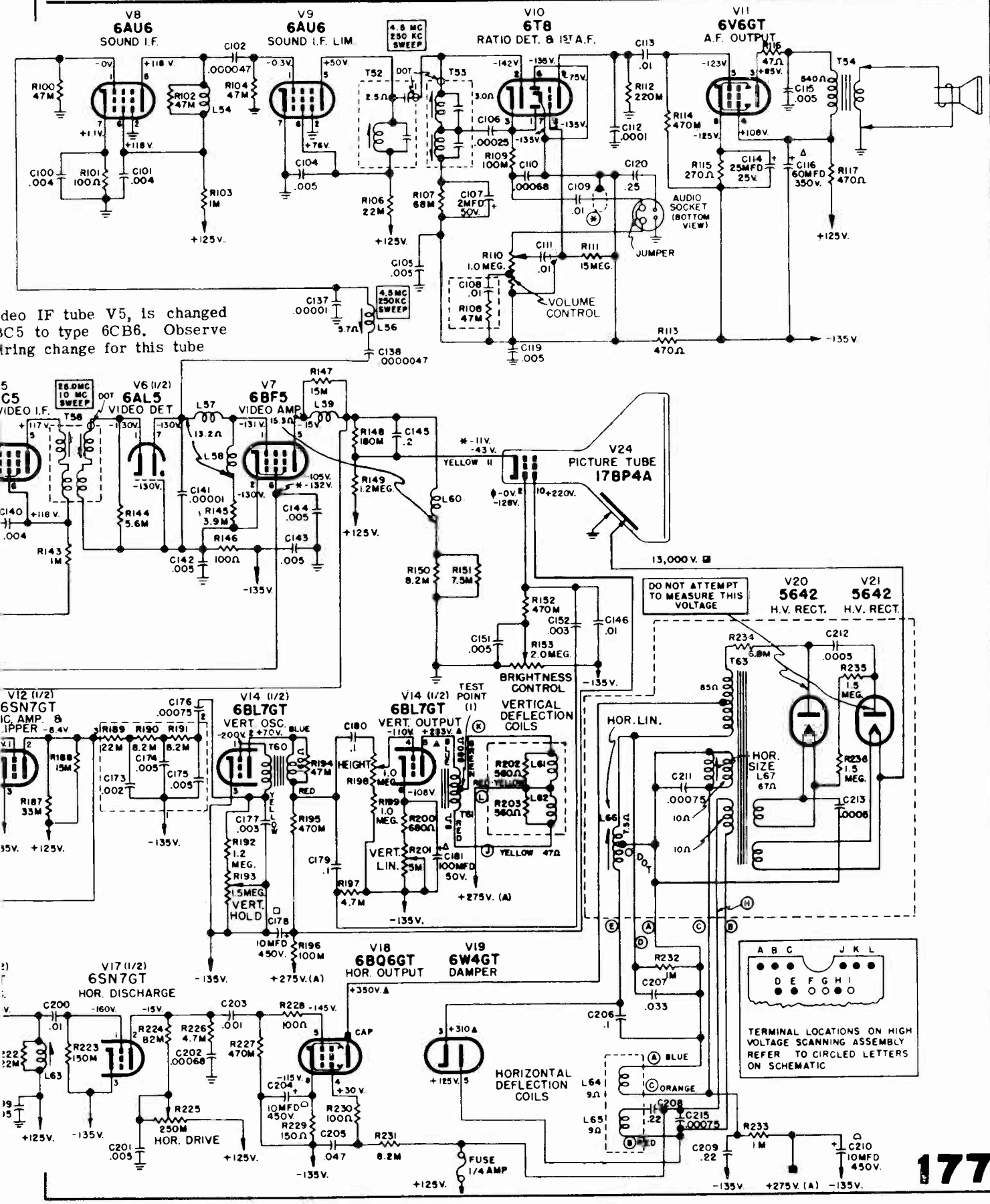
→ CONNECTED TO INDICATED VOLTAGE SOURCE

VOLTAGES ARE MEASURED TO CHASSIS UNLESS OTHERWISE INDICATED, D.C. TAKEN AT 20,000 OHMS PER VOLT, A.C. AT 1,000 OHMS PER VOLT. MEASUREMENT CONDITIONS, UNLESS OTHERWISE NOTED: SOURCE 117 VOLT 60 CYCLE, ANTENNA DISCONNECTED WITH NO SIGNAL INPUT, PICTURE CONTRAST AT MAXIMUM, BRIGHTNESS AT MINIMUM — OTHER CONTROLS AT NORMAL POSITIONS.
AVERAGE VOLTAGES AND COIL RESISTANCES ARE INDICATED. RESISTANCE OF TAPPED COILS IS FOR ENTIRE WINDING. COIL RESISTANCE IS NOT SHOWN WHERE READINGS ARE TOO SMALL OR WIDELY VARIABLE

The third
from type
the socket

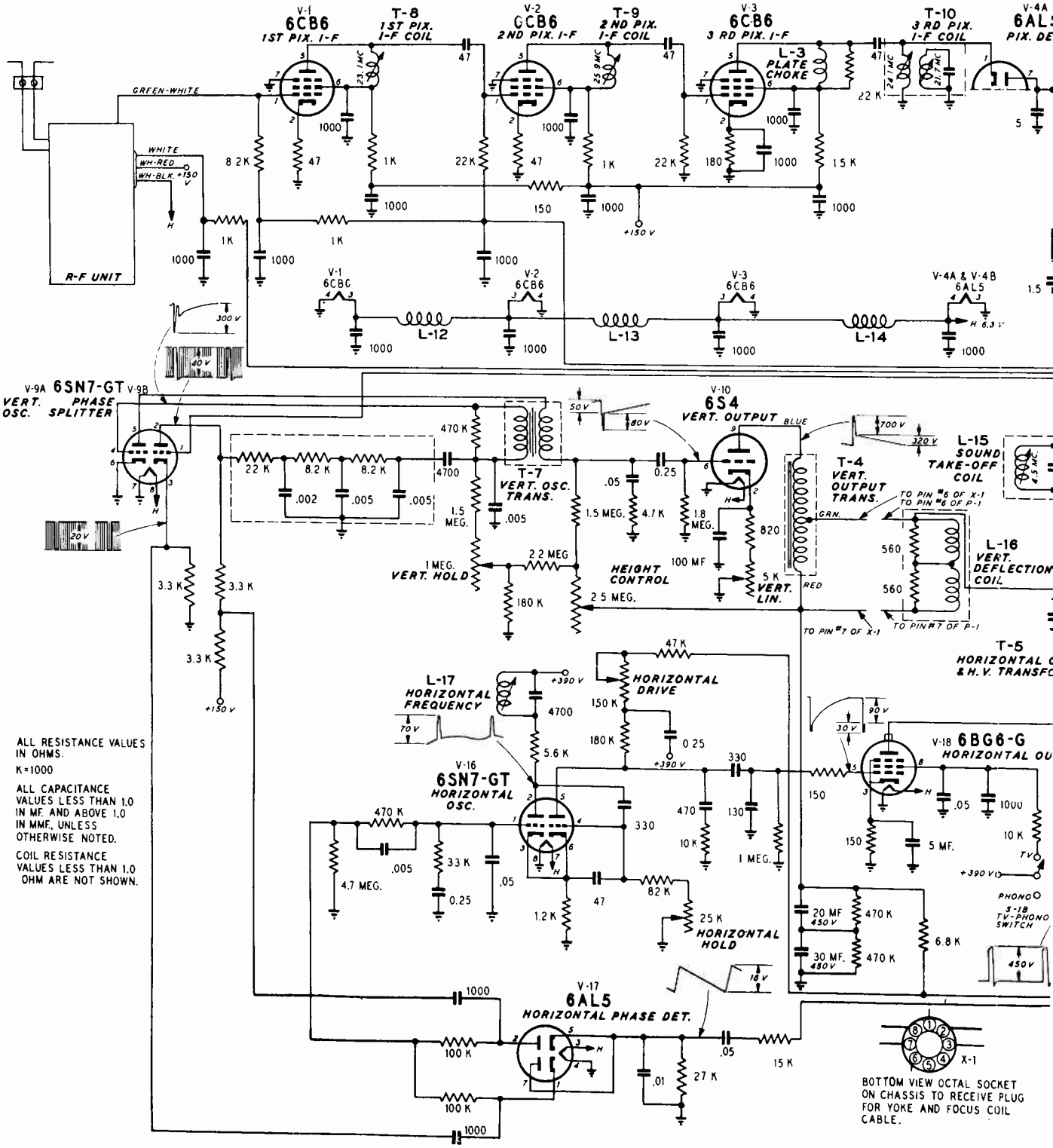


SCHEMATIC DIAGRAM FOR 1-502-1 TV CHASSIS


V8
6AU6
SOUND I.F.
V9
6AU6
SOUND I.F. LIM
4.8 MC 250 KC SWEEP
V10
6T8
RATIO DET. & 1ST A.F.
V11
6V6GT
A.F. OUTPUT
T52
T53
T54
L54
L56
R100 47M
R101 100Ω
R102 47M
R103 1M
R104 47M
R106 22M
R107 68M
R109 100M
R110 1.0 MEG.
R111 15MEG.
R112 220M
R113 470Ω
R114 470M
R115 270Ω
R116 47Ω
R117 470Ω
C100 .004
C101 .004
C102 .000047
C104 .005
C105 .005
C106 .00025
C107 2MFD 50V.
C108 .01
C109 .01
C110 .00068
C111 .01
C112 .0001
C113 .01
C114 25MFD 25V.
C115 .005
C116 60MFD 350V.
C119 .005
C120 .25
C137 .00001
C138 .0000047
+125V.
-135V.
VOLUME CONTROL
AUDIO SOCKET (BOTTOM VIEW)
JUMPER
deo IF tube V5, is changed
3C5 to type 6CB6. Observe
ring change for this tube
V6 (1/2)
6AL5
VIDEO DET.
V7
6BF5
VIDEO AMP.
T58
L57
L58
L59
L60
R140 .004
R141 .00001
R142 .005
R143 1M
R144 5.6M
R145 3.9M
R146 100Ω
R147 15M
R148 180M
R149 1.2MEG.
C140 .004
C141 .00001
C142 .005
C143 .005
C144 .005
C145 .2
V24
PICTURE TUBE
17BP4A
13,000 V.
R150 8.2M
R151 7.5M
R152 470M
R153 2.0MEG.
C146 .01
C151 .005
C152 .003
BRIGHTNESS CONTROL
DO NOT ATTEMPT TO MEASURE THIS VOLTAGE
V20
5642
H.V. RECT.
V21
5642
H.V. RECT.
R234 5.6M
R235 1.5 MEG.
R236 1.5 MEG.
C212 .0005
C213 .0006
HOR. SIZE L67 67Ω
HOR. LIN.
L66
C211 .00075
V12 (1/2)
6SN7GT
IC. AMP. & CLIPPER
V14 (1/2)
6BL7GT
VERT. OSC.
V14 (1/2)
6BL7GT
VERT. OUTPUT
TEST POINT (1)
VERTICAL DEFLECTION COILS
R187 33M
R188 15M
R189 22M
R190 8.2M
R191 8.2M
R192 1.2 MEG.
R193 1.5MEG. VERT. HOLD
R194 47M
R195 470M
R196 100M
R197 4.7M
R198 1.0 MEG. HEIGHT
R199 1.0 MEG.
R200 680Ω
R201 5M VERT. LIN.
R202 560Ω
R203 560Ω
C173 .002
C174 .005
C175 .005
C176 .00075
C177 .003
C178 10MFD 450V.
C179 .1
C180 .1
C181 100MFD 50V.
T60
T61
L61
L62
+275V. (A)
V17 (1/2)
6SN7GT
HOR. DISCHARGE
V18
6BQ6GT
HOR. OUTPUT
V19
6W4GT
DAMPER
R223 150M
R224 82M
R225 250M HOR. DRIVE
R226 4.7M
R227 470M
R228 100Ω
R229 150Ω
R230 100Ω
R231 8.2M
R232 1M
C200 .01
C201 .005
C202 .00068
C203 .001
C204 10MFD 450V.
C205 .047
C206 .1
C207 .033
C208 .22
C209 .22
C210 10MFD 450V.
C215 .00075
L63
L64 9Ω
L65 9Ω
+350V.
+310V.
HORIZONTAL DEFLECTION COILS
FUSE 1/4 AMP
TERMINAL LOCATIONS ON HIGH VOLTAGE SCANNING ASSEMBLY REFER TO CIRCLED LETTERS ON SCHEMATIC
A B C J K L
D E F G H I

Western Auto Supply Co. *** Television Receiver Model 2D1185B.

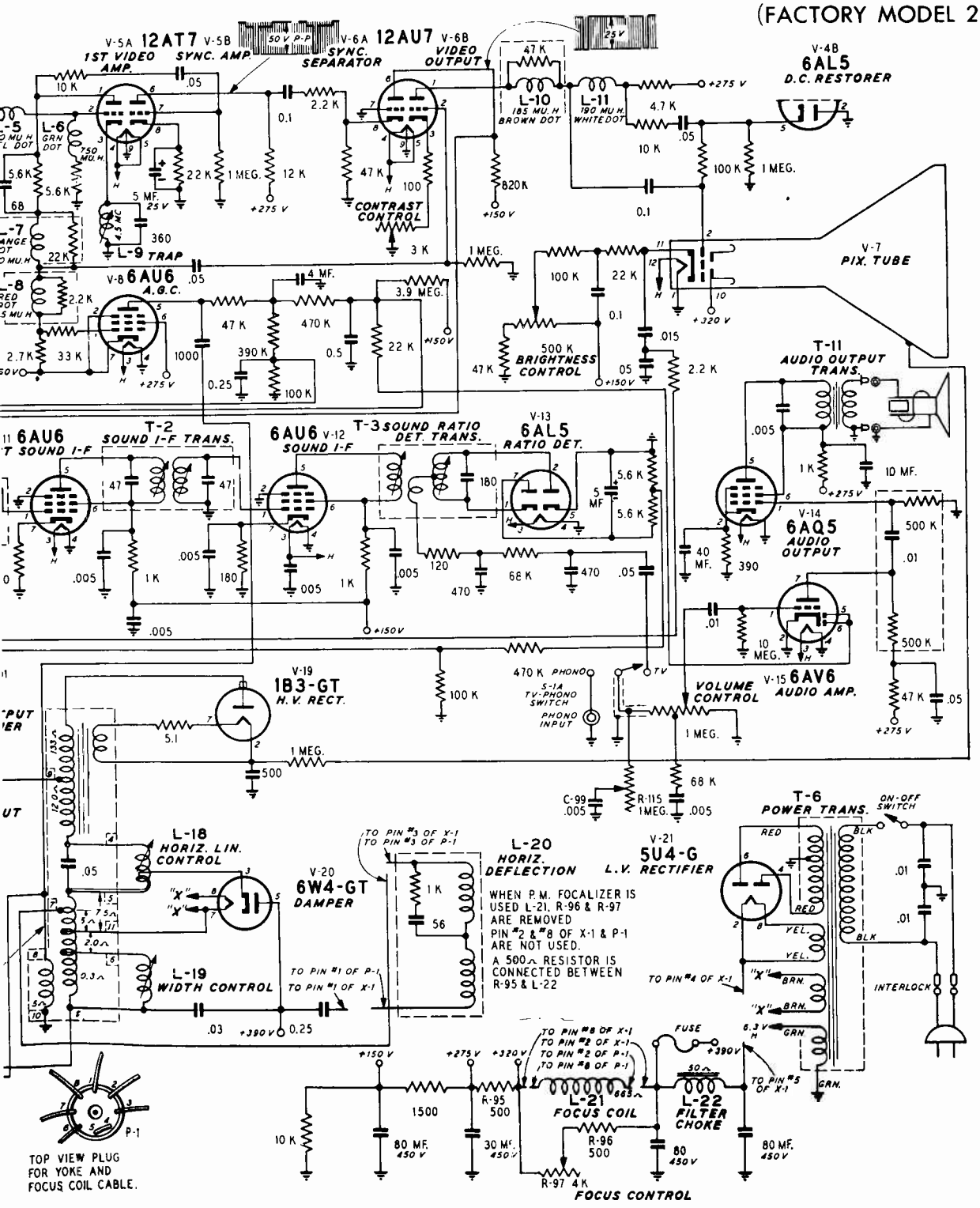
See below for list of similar models.



Model 2D1185A differs from 2D1185B mainly in a few minor mechanical changes. The circuit of this set is very similar to Models 2D2052, 2D1190 (with a 20" picture tube), and 2D1194 combination. Use this material as an aid in servicing all of these models.

Western Auto Supply Co MODEL 2D1185B

(FACTORY MODEL 229T26M-166-1)



In some receivers C-99 and R-115 are not used.

Additional service material on the next page.

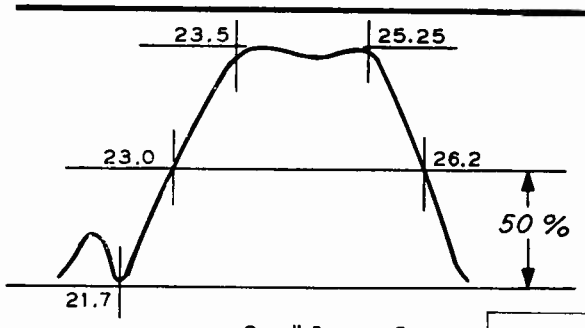
Western Auto Supply Co. (Continued).

MODEL 2D1185B

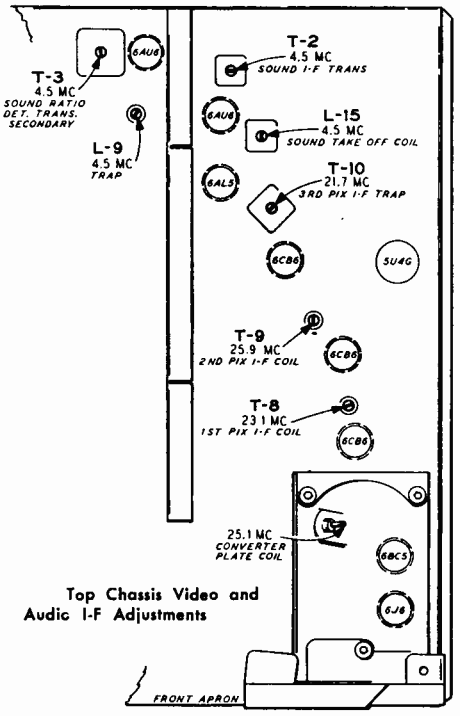
(FACTORY MODEL 229T26M-166-1)

TRUETONE TELEVISION RECEIVER

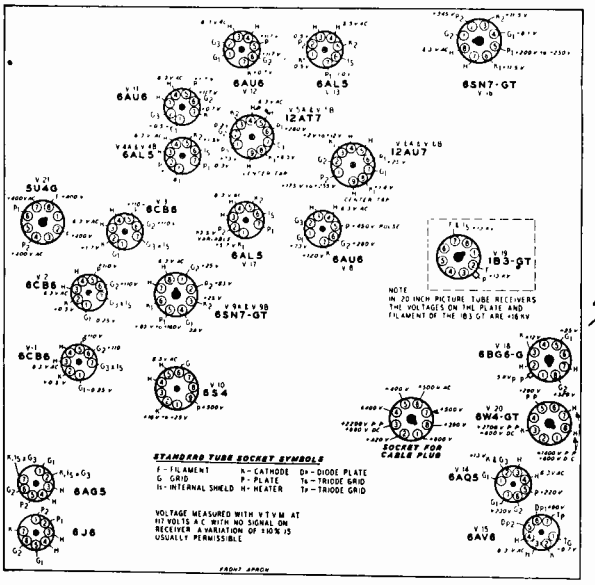
ALIGNMENT PROCEDURE



Overall Response Curve

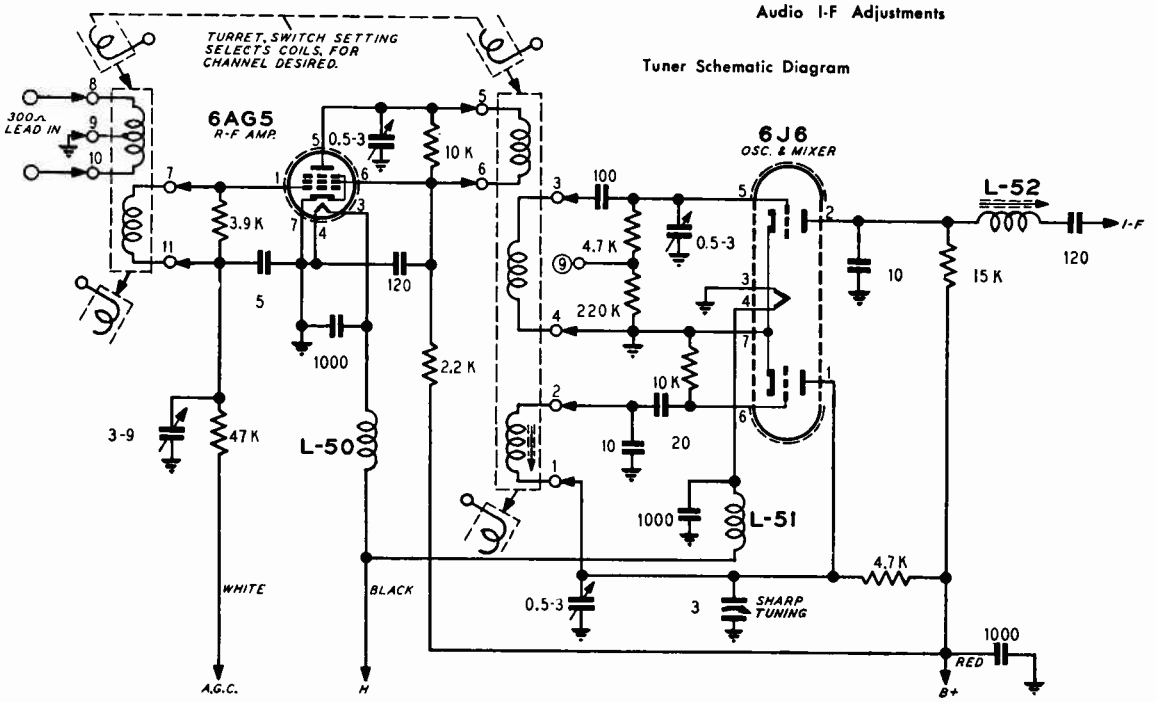


Top Chassis Video and Audio I-F Adjustments



Bottom Socket Voltages

Bottom Chassis Video and Audio I-F Adjustments



Tuner Schematic Diagram

Westinghouse Electric

Chassis V-2200-1 used in Models H-649T17, H-650T17, H-651K17, H-655K17, H-656K17, H-657K17, H-664K17;

and

Chassis V-2204-1 used in Models H-659T17, and H-663T17.

A list of chassis and models similar to the sets described is given on page 182.

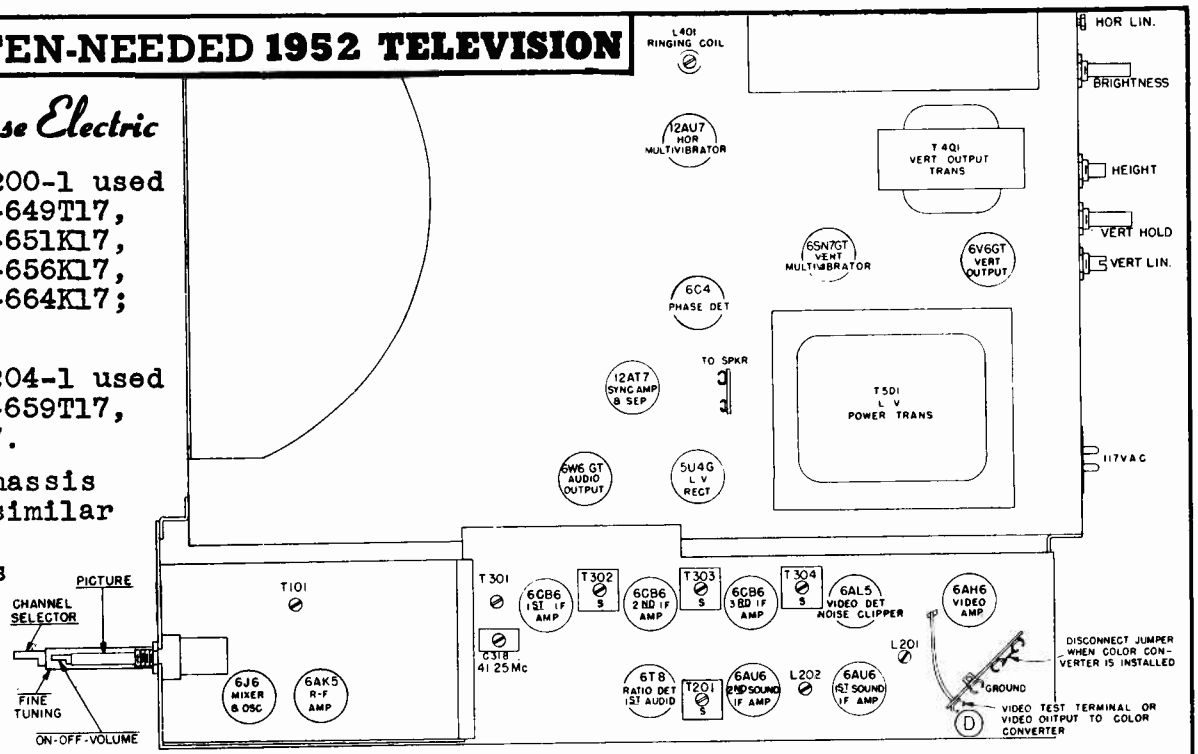


FIG. 4 TOP VIEW OF CHASSIS COMMON I-F SECTION

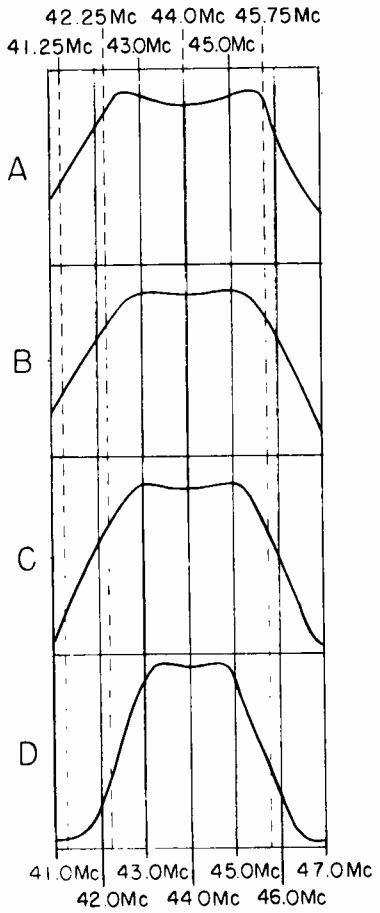


FIG. 5 — RESPONSE CURVES AT VARIOUS STAGES OF ALIGNMENT

Remove the 6AK5 RF amplifier tube from its socket, and turn the channel selector to channel 13.

Connect the oscilloscope to the video test terminal through the decoupling network shown in Fig. 2.

Connect a 3 volt bias battery to the AGC line.

Adjust the sweep generator for a center frequency of 44 mc. with a 10 mc. sweep deviation, and couple the marker generator to the sweep generator.

Step	*Connect Sweep and Marker Generators to —*	*Marker Use*	*Connect Detuning Clip to —*	*Adjust —*
1.	3rd I-F amp. grid	Check for equal response at 42.25 mc and 45.75 mc using weak signal. Also 43 mc and 45 mc.	2nd I-F amp. plate	Pri. of T304 for max. response and sec. of T304 for symmetrical curve shown in Fig. 5A.
2.	2nd I-F amp. grid	Same as step 1	1st I-F amp. plate	Pri. of T303 for max. response and sec. of T303 for symmetrical curve shown in Fig. 5B.
3.	1st I-F amp. grid	Same as step 1	Not used	Pri. of T302 for max. response and sec. of T302 for symmetrical curve shown in Fig. 5C.
4.	6J6 mixer through coupling device shown in Fig. 3.	Check at 44 mc Marker pip must be at center of flat region on curve.	Not used	Turn C318 adj. completely clockwise and adjust T101 for max. response. Adjust T301 for symmetrical top.
5.	Same as preceding step	Adjust to 41.25 mc. and increase output until pip is readily visible.	Not used	C318 to minimize amplitude of 41.25 mc. marker pip.
6.	Same as preceding step	Check curve at frequencies shown on Fig. 5.	Not used	Re-adjust T101 and T301 to obtain curve shown in Fig. 5D.

Westinghouse
RADIO TELEVISION

CHASSIS V-2200-1 V-2204-1

Models H-649T17, H-650T17, H-651K17, H-655K17, H-656K17, H-657K17, H-659T17, H-663T17, H-664K17.

There are many other Westinghouse television chassis which are very similar in circuit to the sets described on these pages. Each of these chassis may be used in several models, and at times the same model may have been issued with either of two chassis. For example, Model H-650T17 described here as using Chassis V-2200-1, also used Chassis V-2192-4 at an earlier date.

Some of the differences between these various chassis are outlined below, but in the main the differences are in minor circuit parts, picture tubes, high voltage transformers and yokes, and tuners.

Chassis V-2175-3, V-2175-4 used in Models H-646K17, H-647K17, H-654T17, differ from the sets described in tuner yokes used.

Chassis V-2178-1, V-2178-3 used in Model 642K20, differ in tuner, and in Horizontal sweep and AGC circuits.

Chassis Assemblies V-2192, and the same with suffix -1, -2, -3, -4, -5, and -6, have been used interchangeably to a degree in the following models and differ mainly in the type of tuner employed:

H-639T17, H-640T17, H-641K17, H-646K17, H-647K17, H-649T17, H-650T17, H-651K17, H-654T17, H-657K17, H-658T17, H-663T17.

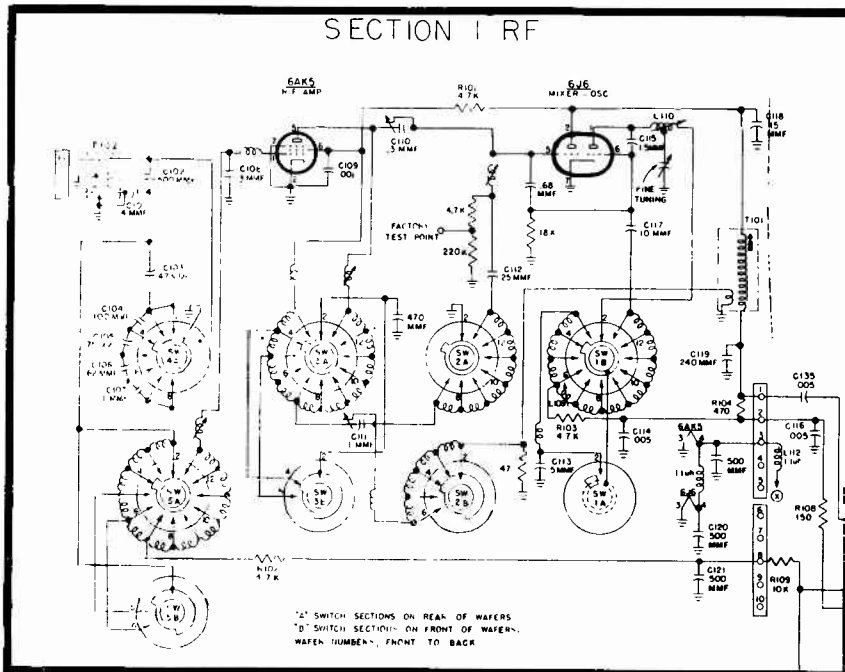
Chassis V-2194, V-2194-1, V-2194-2, V-2194-3, are used in Models H-642K20A, H-652K20.

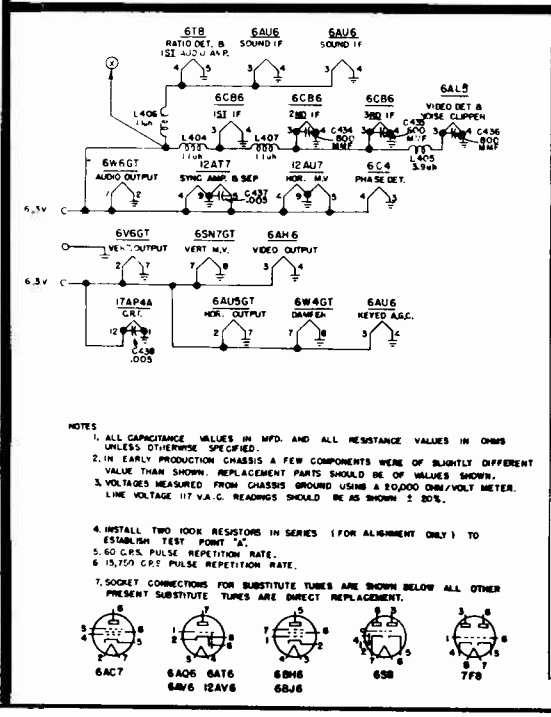
Chassis V-2201-1 used in Models H-648T20, H-652K20, H-662K20, uses a 20" picture tube and has minor circuit differences from the chassis described here.

Chassis V-2202-2 (with Chassis V-2210-1) used in Model H-653K24 has a 24" picture tube and a different high voltage circuit.

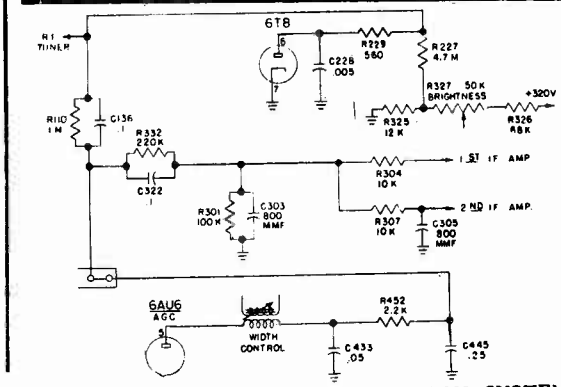
Chassis V-2203-1 is used in combination Models H-660C17, H-661C17

Chassis V-2206-1, Model H-665T16, is identical except that a 16KP4 tube is used.

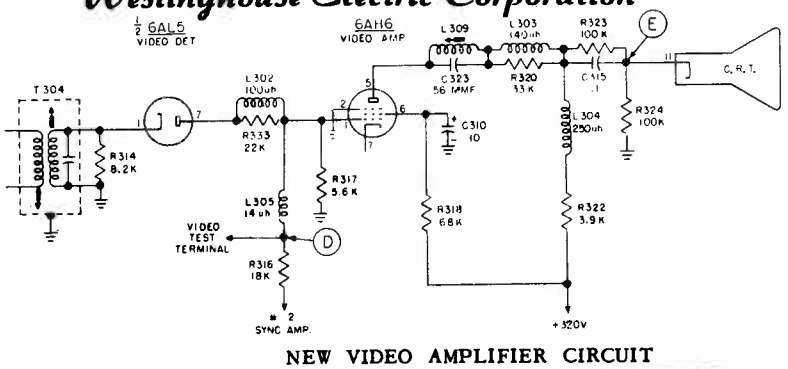




Westinghouse Electric Corporation



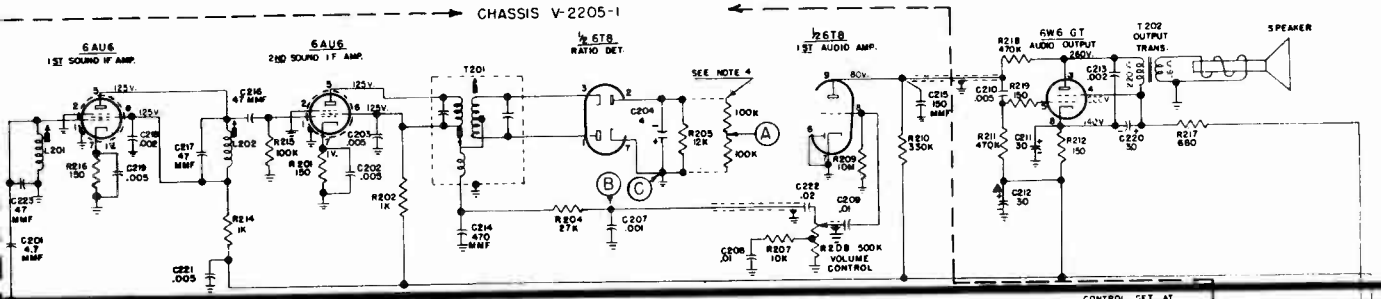
NEW AGC DISTRIBUTION SYSTEM

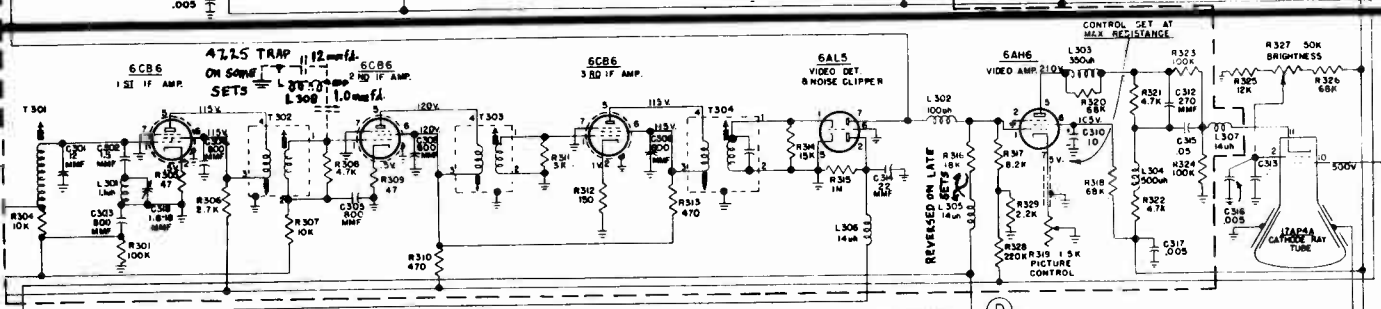


NEW VIDEO AMPLIFIER CIRCUIT

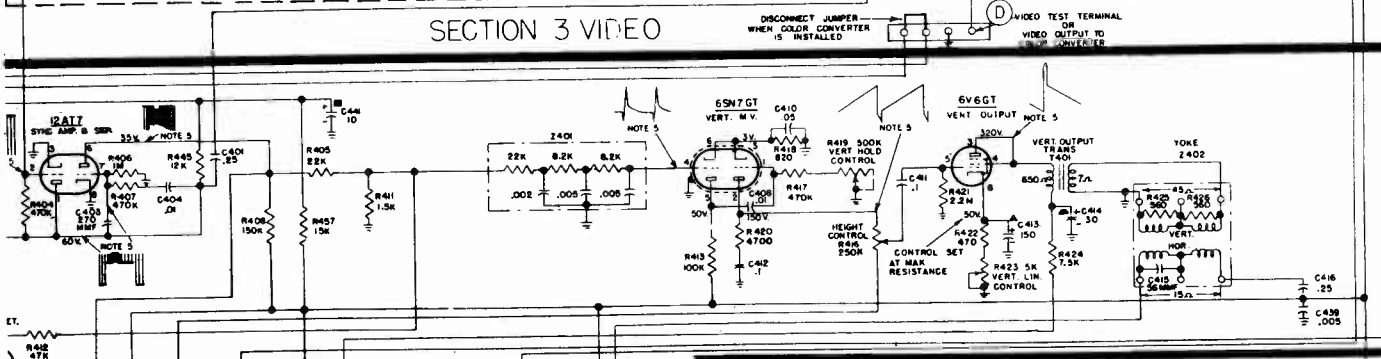
SECTION 2 SOUND IF AND AUDIO

CHASSIS V-2205-1



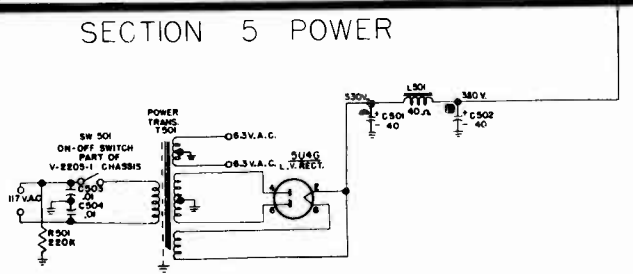


SECTION 3 VIDEO



SECTION 4 SWEEP

SECTION 5 POWER



CHASSIS NO. V-2200-1 & V-2204-1

FIG. 7 — SCHEMATIC DIAGRAM

Westinghouse Electric Chassis V-2200-1 and V-2204-1, continued.

SOUND I-F SECTION

Connect the signal generator to the video test terminal (point "D" on Fig. 4) through a .001 mfd capacitor.

Step	*Signal Gen. Frequency*	*VTVM Connections*	*Remarks*	*Adjust—*
1.	4.5 mc. unmodulated	Common lead to point "C" and high lead to point "A" as shown in Fig. 6.	Use 5 v. (-DC) scale on meter. Set sig. gen. output accordingly.	L201, L202 and pri. of T201 for max. voltage.
2.	4.5 mc. unmodulated	Common lead to point "A" and high lead to point "B" as shown in Fig. 6.	Use same sig. gen. output as in step 1.	Sec. of T201 for *zero* voltage.

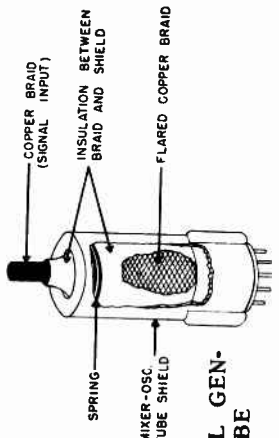


FIG. 3 — COUPLING SIGNAL GENERATOR TO MIXER TUBE

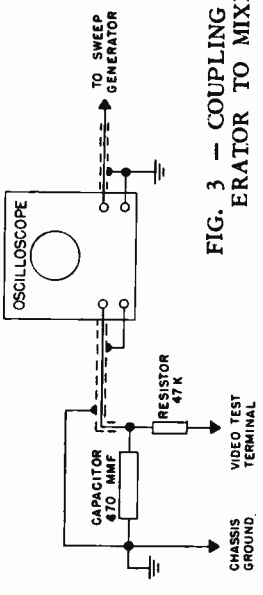


FIG. 2 — OSCILLOSCOPE CONNECTIONS

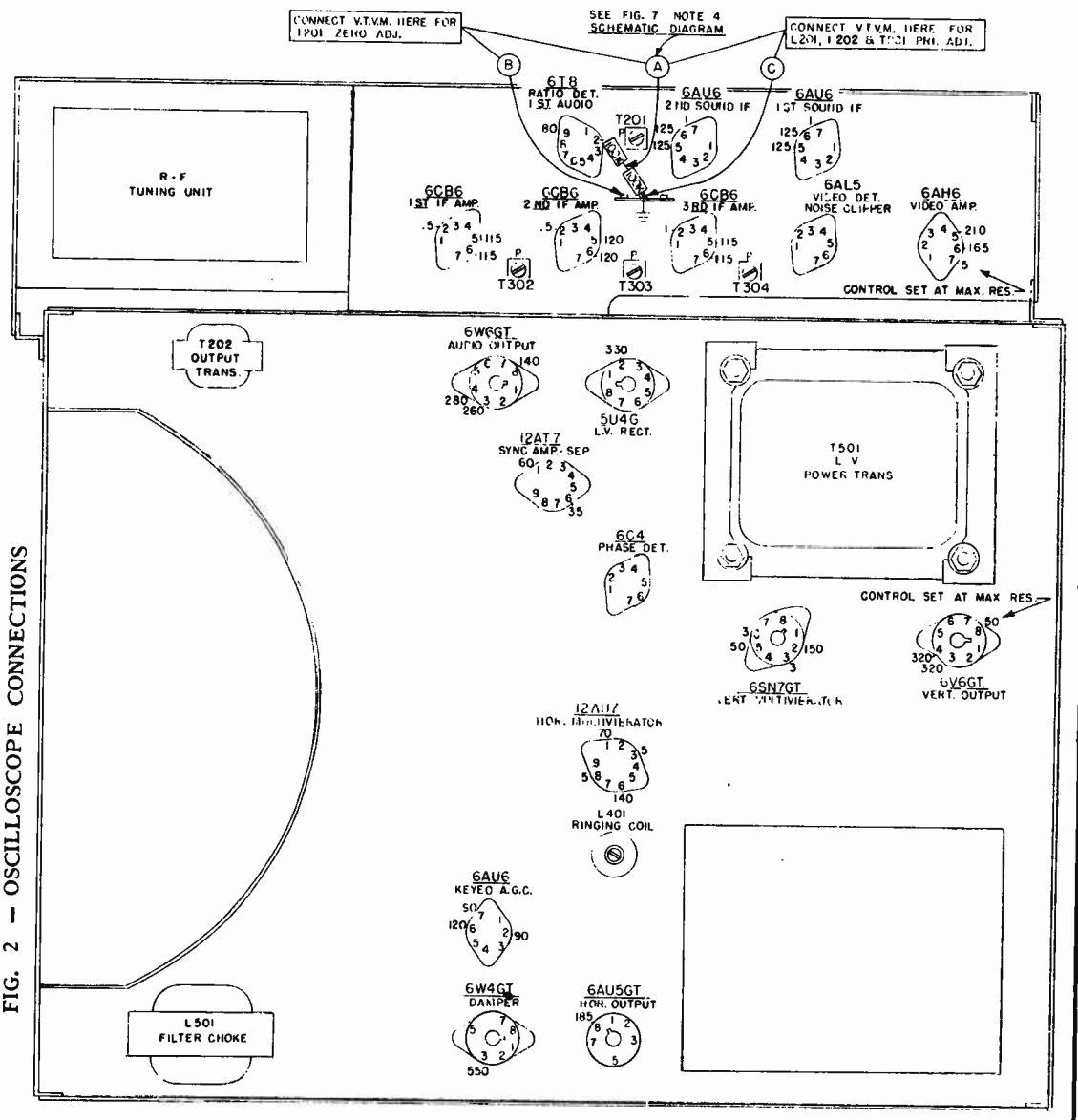


FIG. 6 — BOTTOM VIEW OF CHASSIS

ZENITH RADIO CORPORATION

CHASSIS 20J21-20J22-21J20-21J21

The 20J21, 20J22, 21J20 and 21J21 chassis described in this manual are basically alike. Alignment and adjustment procedures are identical. The slight differences that exist are in the size and types of picture tubes used. The 21J series receivers utilize the high voltage electrostatically focused picture tubes which obtain approximately 2200 volts from a 5642 rectifier for the focusing anode, while the 20J series receivers use the new low voltage focus picture tubes which obtain the 0 to 400 focusing anode voltage from the regular power supply of the receiver and do not require the 5642 rectifier.

Zenith Chassis 20H20 also used in models marked with (*) and in Models H2041R, H2052R, H2053E, H3074R, is similar to Chassis 20J21, but uses 17BP4 picture tube.

Models using the above chassis.

J2026R	J2051E	J2142R
J2027R	J2053R	J2143R
J2027E	J2054R	J2144E
J2029E	J2055R	J2144R
J2029R*	J2126R	J2151E
J2030E*	J2127E	J2153R
J2030R*	J2127R	J2154R
J2040E	J2129E	J2155R
J2042R	J2129R	J2868R
J2043R	J2130E	J2968R*
J2044E	J2130R	J3069E
J2044R	J2140E	J3169E

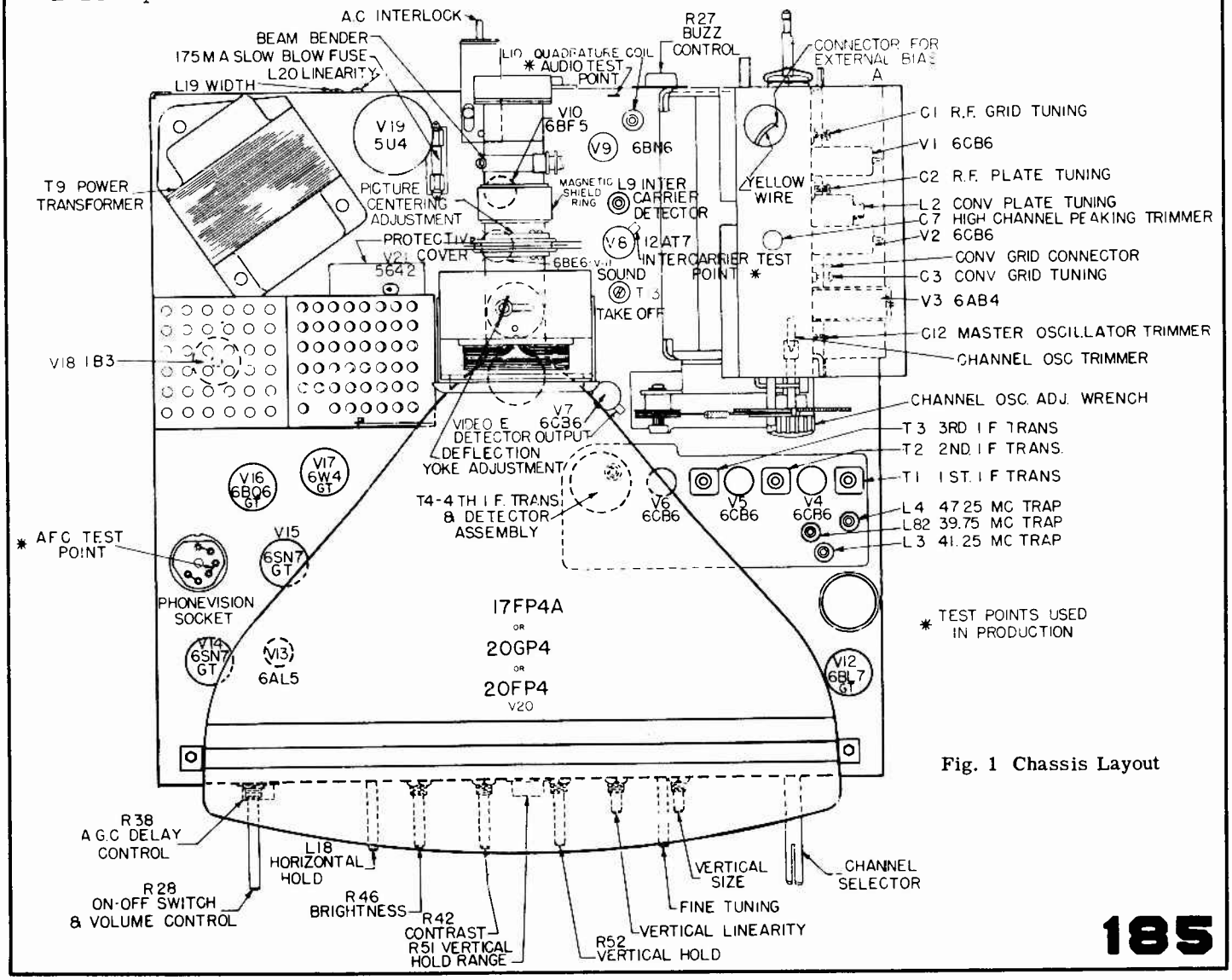


Fig. 1 Chassis Layout

Zenith Chassis 20J21, 20J22, 21J20, and 21J21, continued.

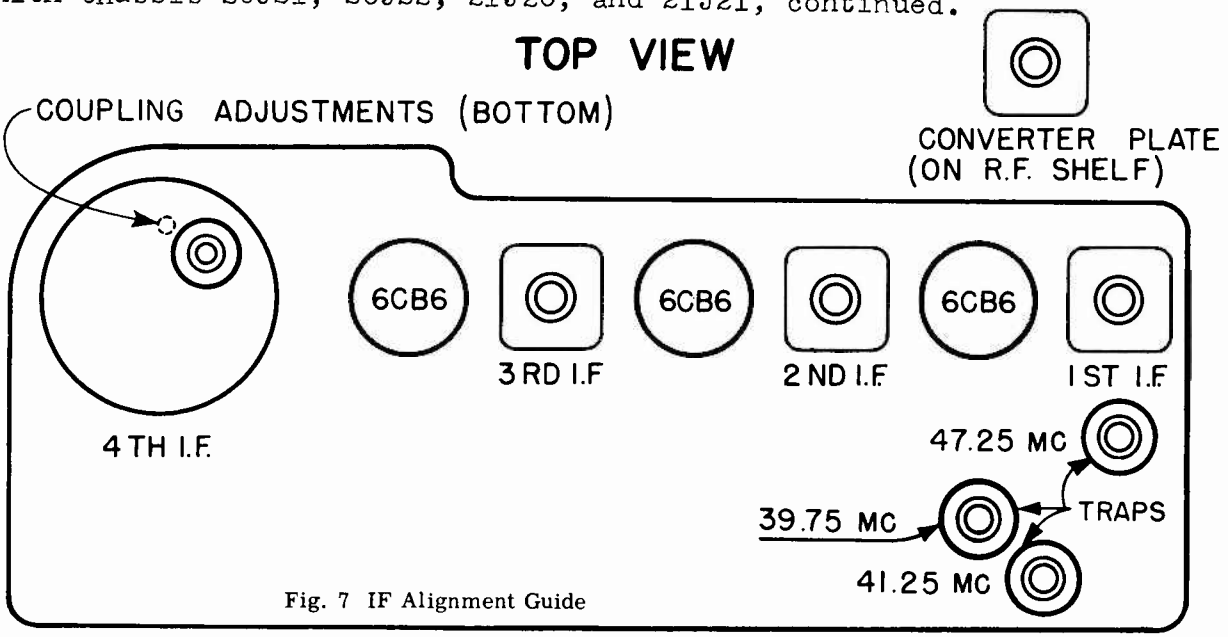


Fig. 7 IF Alignment Guide

AFC ADJUSTMENTS

The AFC adjustment can effectively be made by setting the horizontal hold control L18 to a position where it is virtually impossible to "throw" the receiver out of horizontal sync when switching from channel to channel.

AGC ADJUSTMENTS

The AGC delay control can be adjusted from the front of the cabinet by removing the volume control knob and reaching through the opening with a screwdriver.

Connect the calibrated oscilloscope through a 10K isolation resistor to terminal "E" (Fig. 1). Select the strongest TV signal and observe the deflection on the oscilloscope screen. Adjust the AGC delay control for 2 volt peak output.

Satisfactory adjustment can also be made by observing the picture and slowly turning the AGC delay control from its maximum clockwise position, counterclockwise until a point is reached where the picture distorts and buzz is heard in the sound. The control should then be turned slowly clockwise and set at a point comfortably below this level of intercarrier buzz, picture distortion and improper sync.

ALIGNMENT

A suitable sweep generator in conjunction with an accurate marker must be used for alignment work. When aligning the RF and IF stages of the receiver, it is necessary to measure detector peak output. This may be done with a calibrated oscilloscope. Any oscilloscope can be calibrated with a known DC voltage. To make the calibration, connect the ground lead of the vertical input cable to the negative side of a 3 volt battery supply. Turn the horizontal gain control fully counter clockwise. With the "hot" lead, make a momentary contact to the positive connection on the battery and observe the instantaneous spot deflection on the screen. Discharge the scope input capacitor by shorting out the leads and repeat the procedure, each time readjusting the scope vertical gain until the spot deflects 3 large divisions on the screen. Each division then represents 1 volt peak. The position of the vertical gain control should be marked for future reference.

VIDEO IF ALIGNMENT

1. Connect the negative lead of a 6 volt battery supply to terminal "A" (Fig. 1) and the positive lead to chassis. The bias supply can be made up from four small pen-light batteries. Keep the connecting leads as short as possible.

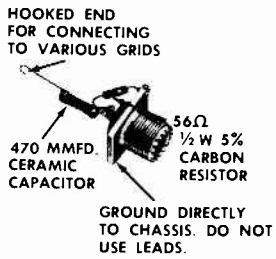


Fig. 6 IF Alignment Fixture

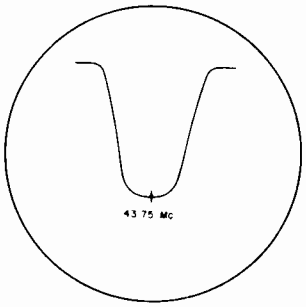


Fig. 8 4th IF Response

2. Connect the calibrated oscilloscope through a 10,000 ohm isolation resistor between terminal "E" and chassis. The sweep generator input to the receiver should be adjusted for 2 volts peak detector output. Do not exceed this output level during any of the adjustments.

3. Feed the output from the sweep generator through the special termination unit shown in Fig. 6 to point "D" (Pin 1 of 6CB6, 3rd IF). Adjust the generator until a pattern similar to Fig. 8 is obtained.

Zenith Radio Corp. Chassis 20J21, 20J22, 21J20, and 21J21, continued.

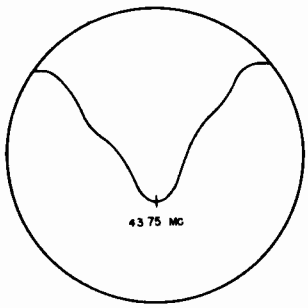


Fig. 9 3rd IF Response

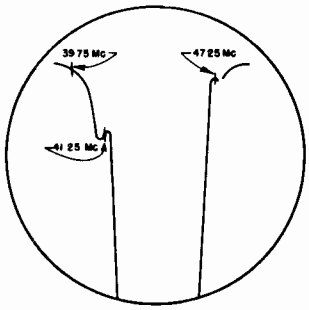


Fig. 10 Exploded View of Traps

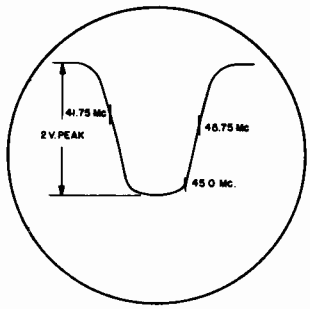


Fig. 11 Overall IF Response

4. Set the Marker Generator to 43.75 Mc and alternately adjust the top and bottom slugs and the coupling adjustment of the 4th IF transformer for maximum gain and symmetry with the 43.75 Mc Marker in the center of the response curve. The wire rod type of coupling adjustment utilizes an insulated sleeve by means of which coupling can be changed by turning the rod in or out.
If the correct response curve cannot be obtained in this step, check the position of the two slugs to see if they are entering their respective coils from the opposite ends of the coil form. The position of the slugs near the center of the coils may change the coefficient of coupling, making correct alignment difficult if not impossible.

5. Connect the sweep generator cable to point "C". Adjust the attenuator for a 2 volt peak detector output.

6. Alternately adjust the top and bottom slugs of the 3rd IF transformer until a pattern somewhat similar to Fig. 9 is obtained. It will be noted that the top slug affects the high frequency side and the bottom slug the low frequency side of the response curve. If the correct response curve cannot be obtained, check the position of the slugs as in Step 4.

7. Connect the sweep generator cable to terminal "B" (Converter Grid). In this step it may be necessary to disconnect the bias battery and temporarily ground the AGC in order to see the highly attenuated trap slots with the oscilloscope vertical gain near maximum.

8. Adjust the 47.15 Mc, 41.25 Mc and 39.75 Mc traps for minimum marker amplitude (See Fig.10). It can be seen that maximum oscilloscope gain has been used and as a result the top of the response curve has been "run off" the oscilloscope screen in order to see a "blow-up" of the trap slot.

9. Re-connect the bias battery and readjust the oscilloscope to the calibrated position. Adjust the sweep generator for a 2 volt peak output from the video detector. Bear in mind that only one tuning slug is used in each of the following stages to be aligned.

10. Adjust the slug in the second IF transformer until the 41.75 Mc marker is halfway down the slope of the response curve. Correct slug position is indicated when it is possible to move this marker above and below this 50% point.

11. With the test equipment set up as in Step 10, alternately adjust the 1st IF transformer and the converter plate coil until an overall response curve similar to Fig.11 is obtained. If the proper response curve cannot be obtained, it may be necessary to retouch the 4th IF coupling adjustment or make a slight readjustment of the other stages to obtain the correct overall response curve.

SOUND ALIGNMENT

Proper alignment of the 4.5 Mc intercarrier sound channel can only be obtained 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 S-17203 step attenuator be used for most satisfactory results. To prevent leakage, certain precautions must be taken when connections are made. Use as short a lead as possible between the attenuator and receiver antenna terminals and approximately 6 feet of 300 ohm shielded line between the antenna transmission line and the attenuator. The shield from the transmission line should be connected to the attenuator and the attenuator itself grounded to the TV chassis under test.

After the connections have been made, proceed as follows:

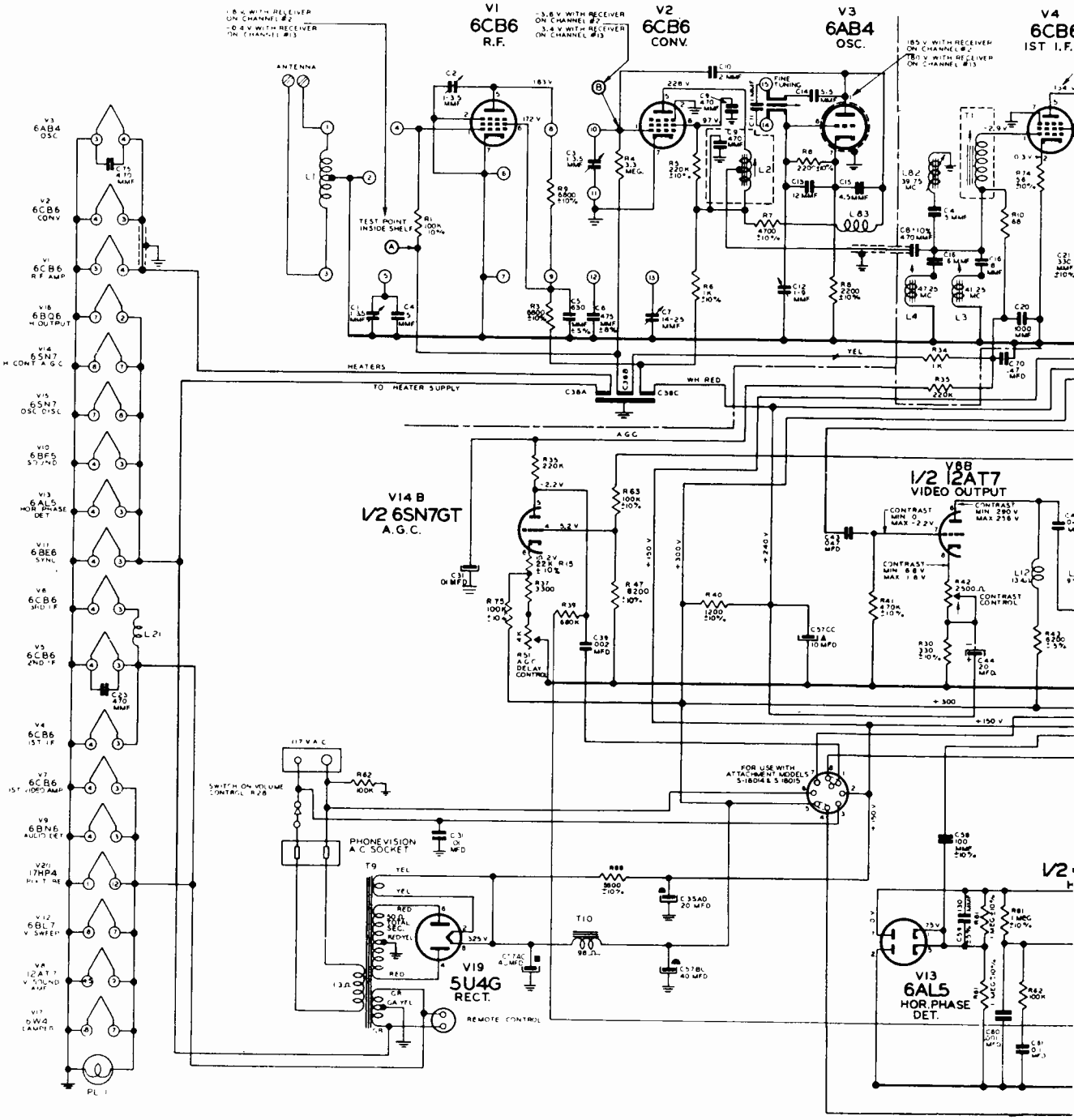
1. Tune in a tone modulated TV signal and adjust the step attenuator until the signal is reduced to a level where "hiss" is heard with the sound.

2. Adjust the sound take-off coil T13 (top and bottom slugs), input coil L9, quadrature coil L10 and buzz control R27 for the cleanest 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.

If intercarrier buzz is in evidence, after all normal sound adjustments have been made, the cause may be attributed to one or more of the following:

1. Improper adjustment of the AGC delay control.
2. Defective 12AT7 intercarrier sound amplifier.
3. Extremely high signal levels which require attenuation in the antenna circuit.
4. Transmitter overmodulation.

ZENITH Chassis 20J21, 20J22, 21J20, and 21J21



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 A VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.

ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT, AND WITH CHANNEL SELECTOR SET TO 2 UNLESS OTHERWISE SPECIFIED.

ALL CONDENSER VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

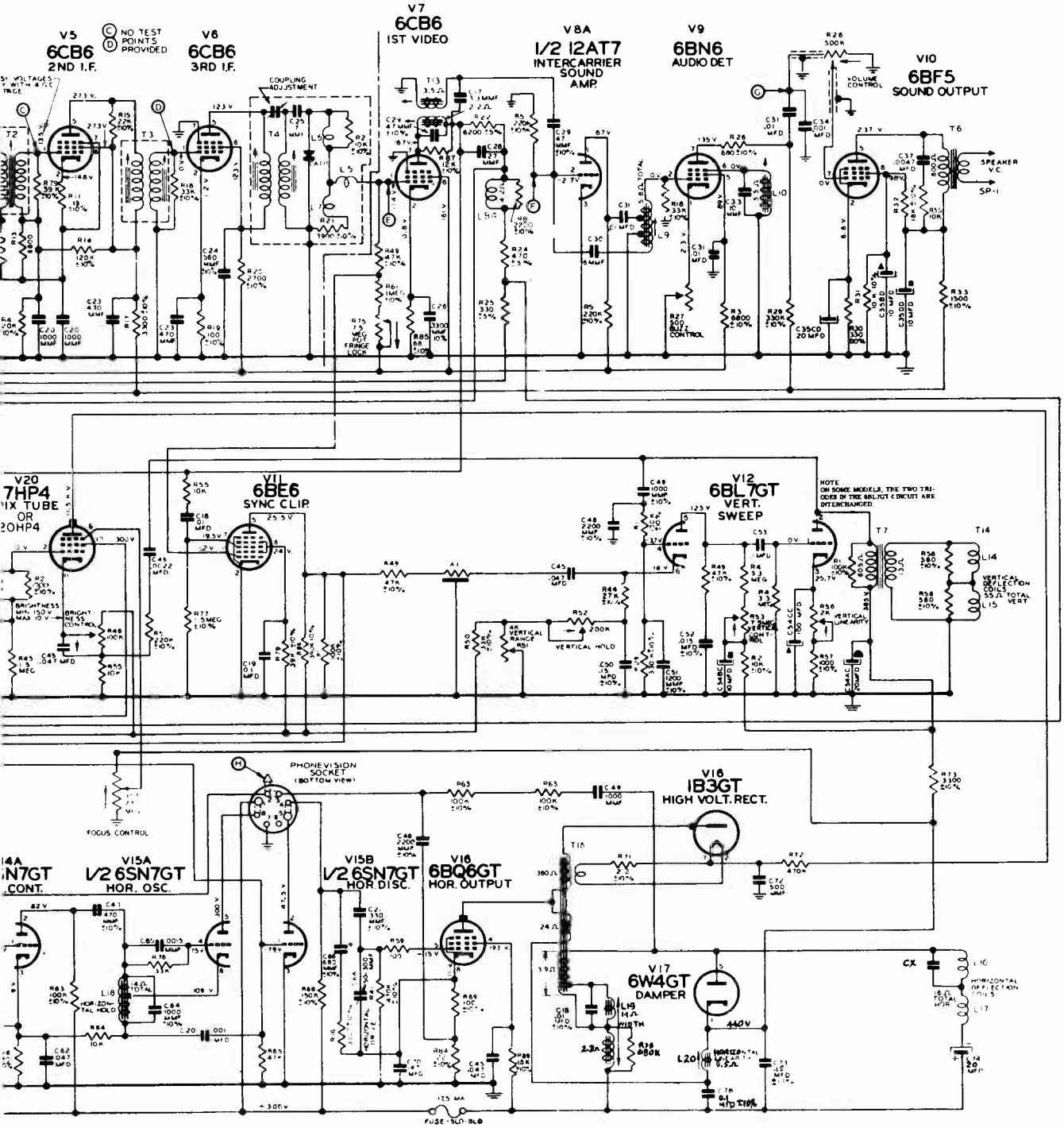
ALL RESISTORS ±20% TOLERANCE UNLESS OTHERWISE SPECIFIED.

RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT.

ALL CONDENSER CAPACITY TOLERANCE ±20% UNLESS OTHERWISE SPECIFIED.

CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 20K MIN. OHM PER VOLT, HIGH VOLTAGE METER.

ZENITH Chassis 20J21, 20J22, 21J20, and 21J21



Schematic Diagram 20J21 and 20J22 Chassis

(A) ALIGNMENT POINTS

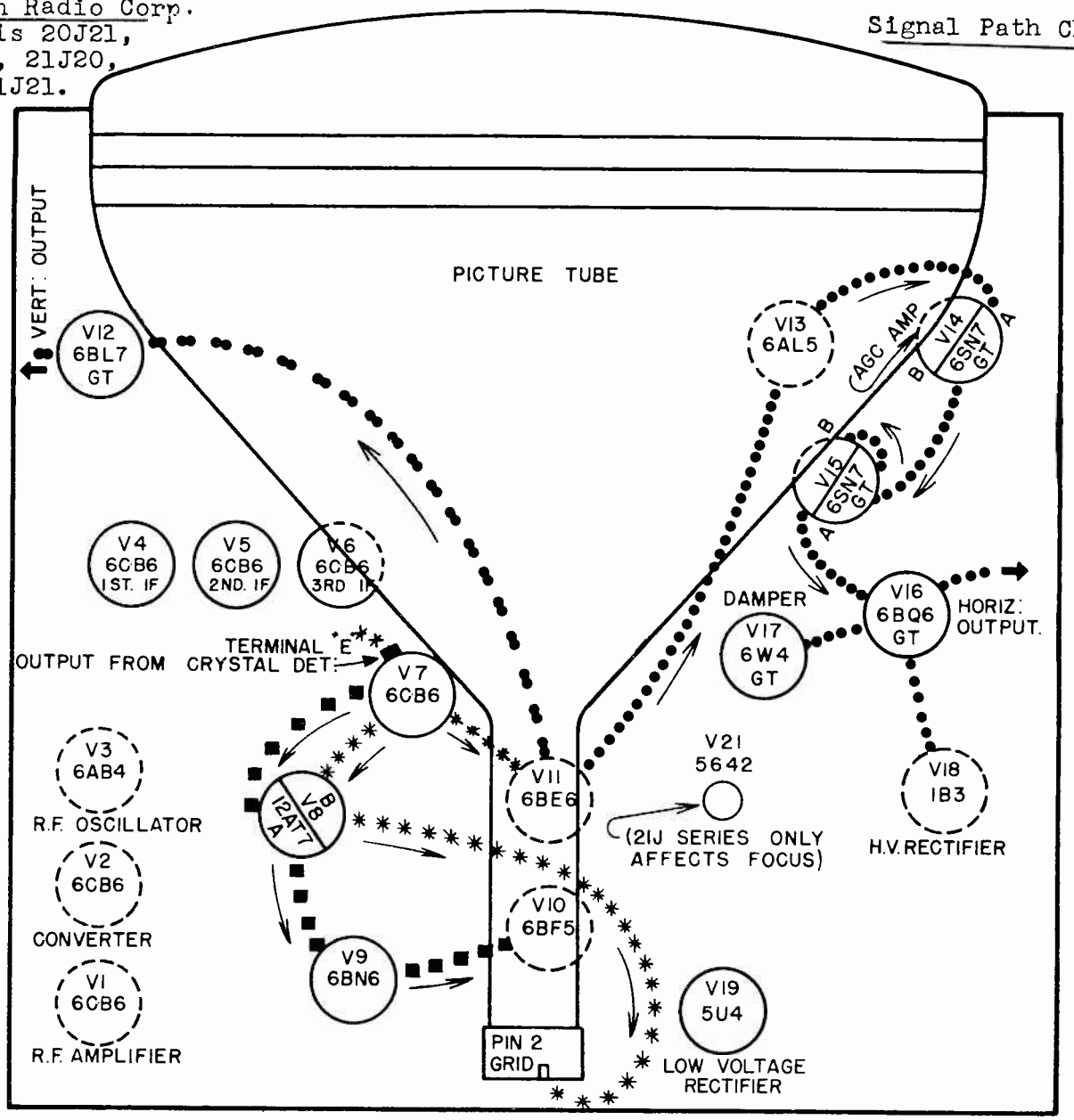
CIRCLED ALPHABETS INDICATE ALIGNMENT AND TEST POINTS.

DENOTES CHASSIS

The 21J20 and 21J21 series receivers employ high voltage electrostatically focused tubes using the variation of the high voltage circuit as shown on page 190, over. Outside of this difference, the circuits are alike.

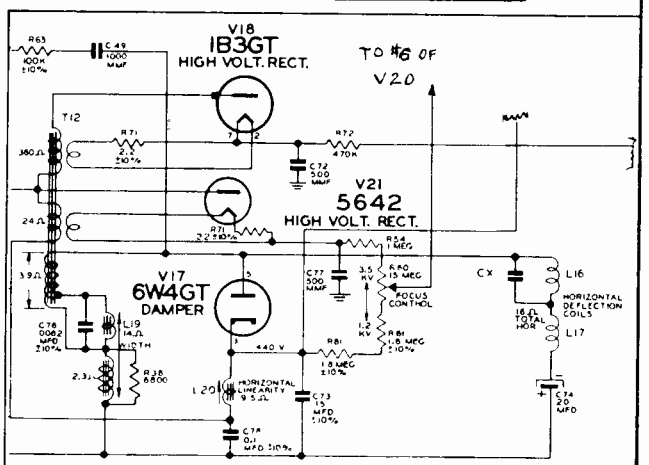
Zenith Radio Corp.
Chassis 20J21,
20J22, 21J20,
and 21J21.

Signal Path Chart.



VERTICAL CIRCUIT
HORIZONTAL CIRCUIT
SOUND CIRCUIT
COMPOSITE VIDEO

The signal path chart can be used for quickly isolating the particular section of the receiver where trouble is suspected. As an example, if the set under test has video but no sound, the chart will indicate that the sound begins at V7, and continues through V8A, V9, and V10, so the trouble is in one of these sections. The AGC tube (V14B) affects both picture and sound.



High voltage circuit of 21J20, 21J21

Index

Under each make, chassis or models are listed at left in numerical order. The corresponding page number at the right refers to the first page of each section dealing with such material. Under ADMIRAL only chassis not models are listed.

Another

Supreme Publications

Service Manual