Most - Often - Needed

1951

VOLUME TV-5

Television

Servicing Information

Compiled by
M. N. BEITMAN

VOLUME TV-5
PRICE $3

SUPREME PUBLICATIONS

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CHICAGO

PREFACE AND INTRODUCTION

This new 1951 Television Servicing Information manual is the fifth in the SUPREME PUBLICATIONS Television Series and has a familiar appearance to those who have used the earlier volumes. Material on more models of all important makes is included in this volume. An attempt has been made to make this material serve as a quick guide to easier repairs, and explanations and theory have been cut to a very minimum. The television receivers of this period have been made under a constant part shortage and circuits have been altered in production to take advantage of available parts. Such changes, or those due to engineering revisions, are included where this is practical to aid you further.

The Table of Contents is given pages 3 and 4. Refer to this table to find material needed.

We extend our sincere thanks and appreciation for fine cooperation to all television set manufacturers whose products are described in this manual.

M. N. Beitman

March 1, 1951
Chicago.

MOST-OFTEN-NEEDED **1951 TELEVISION SERVICING INFORMATION**

Table of Contents

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

Admiral SERVICE for models using

24D1, 24E1, 24F1, 24G1, 24H1, and 5B2, 5D2 CHASSIS

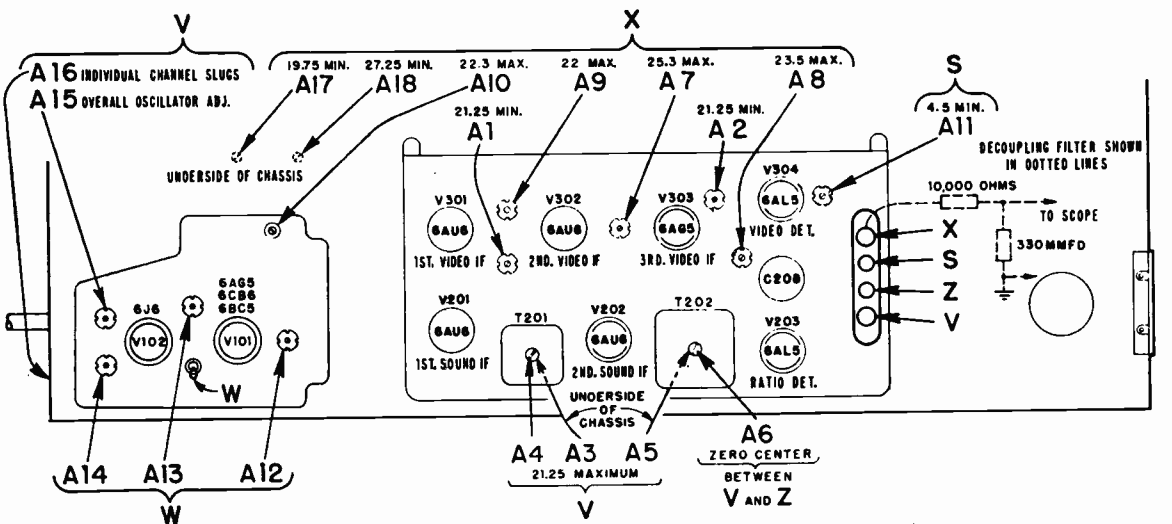
MODEL IDENTIFICATION CHART

Model Numbers Model numbers may have suffix letter "N"	Tube Size	TV Chassis	TV Tuner	Record Changer	Radio (AM-FM)
26X35, 26X36, 26X37	16" round	24D1	94C18-3	.....	...
36X35, 36X36, 36X37	16" round	24E1	"	RC500 or RC550	5B2
36X35A, 36X36A, 36X37A	16" round	24E1	"	RC500 or RC550	5D2
29X15, 29X16, 29X17, 29X25, 29X26, 29X27	19" round	24F1	"	.....	...
39X16, 39X16A, 39X17A	19" round	24G1	"	RC500 or RC550	5B2
39X16B, 39X17B	19" round	24G1	"	RC500 or RC550	5D2
39X25, 39X26	19" round	24G1	"	RC550	5D2
26R25, 26R26, 26R35, 26R36, 26R37, 26X45, 26X46	16" rect.	24H1	"	.....	...
26X55, 26X56, 26X57, 26X65, 26X66, 26X67, 26X75, 26X76	16" round	24D1	"	.....	...

This manual does not apply to models in this group having the suffix letter "A" or "AN", but it does apply if the model number has the suffix letter "N".

Since the circuit of the chassis listed above is similar to Chassis 21A1, covered in the 1950 Television manual, the brief alignment information given below plus the detailed material on alignment in the 1950 Television manual should be used together.

Adj.	Symbol	Frequency	Function
A1	L201	21.25 MC	1st Sound Trap
A2	T303	21.25 MC	2nd Sound Trap
A3	T201	21.25 MC	Primary, 1st Sound IF Transformer
A4	T201	21.25 MC	Secondary, 1st Sound IF Transformer
A5	T202	21.25 MC	Primary of Ratio Detector Transformer
A6	T202	21.25 MC	Secondary of Ratio Detector Transformer
A7	T302	25.3 MC	2nd Video IF Transformer
A8	T304	23.5 MC	3rd Video IF Transformer
A9	T301	22.0 MC	1st Video IF Transformer
A10	L106	22.3 MC	Mixer Plate Coil
A11	L303	4.5 MC	4.5 MC Beat Trap
A12	C102		RF Input Trimmer
A13	C104		RF Output Trimmer
A14	C107		Mixer Trimmer
A15	C110		HF Oscillator Trimmer
A16	L102		Slug, HF Oscillator Coils
A17	L310	19.75 MC	Adjacent Channel Trap
A18	L309	27.25 MC	Adjacent Channel Trap



Top View of Chassis Showing Alignment Adjustment Locations.

Admiral Corporation 24D1, 24E1, 24F1, 24G1, 24H1, 5B2, 5D2

PRODUCTION CHANGES

At the start of production, chassis were not stamped with a run number.

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.

Note that numerical symbols ①, ②, ③, etc., on the schematic indicate run numbers (production changes) for chassis with round picture tubes. Numerical symbols [1], [2], [3], etc., indicate run numbers (production changes) for chassis with rectangular picture tubes.

RUN 1 in 24D1, 24E1, 24F1, 24G1

Voltage rating of C214 increased. Condenser C214 was changed from .0022 mfd, 600 volts to a .0022 mfd, 1000 volts (part number 64A2-11) to prevent breakdown.

RUN 1 in 24H1 and RUN 2 in 24D1, 24E1, 24F1, 24G1

Alignment point "S" changed. Test jack connector for injection of the 4.5 MC signal as explained in step 8 in the "IF Amplifier and Trap Alignment" was changed from junction of L302 and L303, to plate (pin 7) of the video detector V304. This resulted in a more definite dip at 4.5 MC when aligning the 4.5 MC trap (L303 and C307).

RUN 2 in 24H1

R322 decreased in value to increase brightness control range. Picture tube brightness range was increased by changing resistor R322 from 100,000 ohms, ½ watt to 33,000 ohms, ½ watt (part number 60B8-333). With this change, the Brightness control will completely cut off the picture tube beam current when the Picture control is advanced all the way.

RUN 3 in 24D1, 24E1, 24F1, 24G1

Current limiting resistor (R328) deleted to improve focus. Due to variations in tube characteristics of short-neck picture tubes, it was necessary to add R328 (22,000 ohms, 2 watt) to some receivers produced before RUN 3. Other receivers did not have this resistor. In a few sets, a compromise resistor of 15,000 ohms was used.

If difficulty in focus is encountered in any chassis (either earlier or later than Run 3), determine if resistor R328 is necessary by checking as follows:

a. Picture will focus only with focus control all the way to the right (clockwise). Add R328 (22,000 ohms, 5 watt, part number 60B20-223).

b. Picture will focus with focus control all the way to the left (counterclockwise). Remove R328.

If adding or removing R328 does not help, try changing the 6V6GT audio output tube (V205).

RUN 3 in 24H1

Interlock bracket changed. The 2nd anode housing was changed so that the line cord will pull away from the plug interlock and break the primary circuit of the power transformer when the 2nd anode housing cover is opened, thus preventing possibility of shock.

RUN 4 in 24D1, 24E1, 24F1, 24G1

Audio amplifier circuit changed. The 6SQ7 audio amplifier previously used (as shown under "Audio Amplifier Circuit in Early Sets" at right of schematic) in the 24D1, 24E1, 24F1, 24G1 chassis was deleted and replaced by a 6AU6 tube and circuit as shown on schematic.

R322 decreased in value to increase brightness control range. Picture tube brightness range was increased by changing resistor R322 from 100,000 ohms, ½ watt to 33,000 ohms, ½ watt (part number 60B8-333). With this change, the Brightness control can be made to completely cut off the picture tube beam current when the Picture control is advanced all the way.

RUN 4 in 24H1 and RUN 5 in 24D1, 24E1, 24F1, 24G1

Resistor R448 added to 6CD6 screen grid to reduce parasitics. A 100 ohm, ½ watt resistor R448 (part number 60B8-101) was added to the 6CD6 screen grid as shown in schematic to reduce parasitic oscillations in this circuit. These oscillations will generally cause a double image with a "wavy" effect.

RUN 5 in 24H1

R503 added to prevent static charge on chassis. A 270,000 ohm, ½ watt resistor R503 (part number 60B8-274) was added from one side of the 117 volt AC line to ground to provide a DC return for any static charge that might build up on the chassis.

RUN 6 in 24D1, 24E1, 24F1, 24G1

Interlock bracket changed. The 2nd anode housing was changed so that the line cord will pull away from the plug interlock and break the primary circuit of the power transformer when the 2nd anode housing cover is opened thus preventing possibility of shock.

RUN 7 in 24D1, 24E1

Picture tube and focus coil mounting bracket changed to improve picture centering. The picture tube and focus coil mounting brackets (top and bottom) were changed to improve picture centering. Early mounting brackets had a tendency to tilt backward slightly, making it difficult to bring the raster down enough to fill the picture window.

RUN 7 in 24F1, 24G1

High voltage compartment changed. The high voltage compartment was changed so that the cover could be removed easily without removing the chassis. This change was only necessary on these chassis due to their mounting arrangement in the cabinet.

RUN 8 in 24E1, 24G1

Jumper wire added to socket M504 to accommodate 5D2 radio. A jumper wire was added between pins "M" and "N" of socket M504 to supply plate voltage to the extra lead on the 5D2 radio. The 5B2 radio connecting cable has 8 leads, and the 5D2 radio has 9.

RUN 8 in 24D1, 24F1

R503 added to prevent static charge on chassis. A 270,000 ohm, ½ watt resistor R503 (part number 60B8-274) was added from one side of the 117 volt AC line to ground to provide a DC return for any static charge that might build up on the chassis.

RUN 9 in 24E1, 24G1

R503 added to prevent static charge on chassis. A 270,000 ohm, ½ watt resistor R503 (part number 60B8-274 was added from one side of the 117 volt AC line to ground to provide a DC return for any static charge that might build up on the chassis.

R504 added to limit jewel light current. A 3.3 ohm, ½ watt resistor (part number 60B28-10) was added in series with jewel light M508 to limit current.

RUN 9 in 24F1 and RUN 10 in 24G1

Picture tube and focus coil mounting bracket changed to improve picture centering. The picture tube and focus coil mounting brackets (top and bottom) were changed to improve picture centering. Early mounting brackets have a tendency to tilt backward slightly, making it difficult to bring the raster down enough to fill the picture window.

RUN 6 in 24H1 RUN 9 in 24D1 RUN 10 in 24E1, 24F1 RUN 11 in 24G1

Traps added to eliminate possibility of adjacent channel interference. Two adjacent channel traps L309 (27.25 MC) and L310 (19.75 MC) were added between the output of the TV tuner and the input of the 1st Video IF amplifier V301 (6AU6). This was done to eliminate the possibility of interference from the video carrier of the adjacent channel above and the sound carrier of the adjacent channel below.

This interference might be evident if two stations are operating on adjacent channels in the same locality, especially when the wanted station is weaker than the interfering station.

Adjacent channel interference may take either of these two forms:

Adjacent Channel Video Interference. The picture has an interference pattern produced by the video carrier of the adjacent **higher** channel. Sometimes the interference will appear as a superimposed picture (stationary or moving slowly); at other times it may appear as a number of diagonal lines or as a vertical moving bar.

Adjacent Channel Sound Interference. The picture has a herringbone interference pattern produced by the sound carrier of the adjacent **lower** channel. Close examination will often reveal that the fine lines of the herringbone pattern vary in accordance with the speech or music on the adjacent lower channel. This can be checked by quickly turning the channel selector to this station.

Since these types of interference effects can also be produced by other sources of interference, and also by misalignment of the video IF's and traps, trouble from these sources should be checked before deciding traps are required.

The 19.75 MC trap will remove adjacent channel video interference, and the 27.25 MC trap will remove adjacent channel sound interference.

A complete Adjacent Channel Trap Assembly (includes L309, L310, C313, C314 and mounting bracket) is supplied under part number A3320.

COPPER BAND (PAINTED BLACK) ADDED TO POWER TRANSFORMER TO ELIMINATE PICTURE RIPPLE

To reduce 60 cycle pickup, which produced a continual very slowly moving "wiggle" or ripple in the picture, a 2-inch copper band (painted black) was added to each side of the power transformer T501. This condition is only possible in areas where the power source for the station is different than for the receiver. If this difficulty is encountered, try a similar shield on these early transformers, or if necessary, replace with new transformer. All service replacement transformers will have the 2-inch copper band on each side.

Note that the power transformer is mounted on top of the chassis in early production sets, and is mounted underneath on later production sets.

CHASSIS MOUNTING BOLT SHORT CIRCUITING WIDTH CONTROL T405 in 24D1, 24F1 CHASSIS

In early production "television only" models, the chassis is mounted on a mounting board with 1¼" mounting bolts. The mounting bolt near the "Horiz. Width" control might short circuit the width control, resulting in insufficient width, horizontal non-linearity, and loss of picture brightness, or no raster at all.

To correct, pull the mounting board four or five inches out of the cabinet to remove the mounting bolt, then place four or five washers under the bolt head. Late production sets use a shorter bolt.

When installing chassis, do not use a sharp pointed tool for locating this mounting hole, as the width control winding might be damaged.

24D1, 24E1, 24F1, 24G1, 24H1, 5B2, 5D2

SERVICE HINTS

The circuits in the 24D1, 24E1, 24F1, 24G1, 24H1 chassis are very similar to those in the late production 20A1, 20B1, 21A1 chassis. Most service techniques applicable to the 20A1, 20B1, 21A1 chassis can be used when servicing the 24D1, 24E1, 24F1, 24G1, 24H1 chassis.

AUTOMATIC GAIN CONTROL CIRCUIT

A "triggered" type AGC circuit is employed to develop a rapidly changing bias which is applied to the RF Amplifier and the 1st and 2nd video IF amplifiers with any sudden change in the sync level input to the receiver. Since the sound IF signal is taken from the output of the 1st video IF amplifier, failure of the AGC circuit will also affect the sound. If the video amplifier V306 (6AC7) becomes defective, the AGC system will develop enough negative bias to cut-off the AGC controlled tubes. This results in loss of both sound and picture. If the AGC becomes completely inoperative, such as a defective AGC tube, the sound level will increase due to loss of control bias on the 1st IF amplifier. Also, this condition will generally result in loss of picture since the detected voltage developed across resistor R314 is large enough to cut off the video amplifier V306.

The most positive way to check for proper operation of the AGC circuit is to observe the control grid and plate voltage waveforms. See TP3 and TP4 under "Waveform Analysis".

INSUFFICIENT WIDTH AND HEIGHT

Since the plate voltage on the vertical oscillator and vertical output tubes is received from the boosted B+ supply (boot strap), any failure in the horizontal oscillator or horizontal output stages (such as a bad 6CD6 tube) will also affect picture height and vertical linearity.

CLEANING PICTURE WINDOW and REMOVING FINE SCRATCHES or MARS ON PLASTIC PARTS

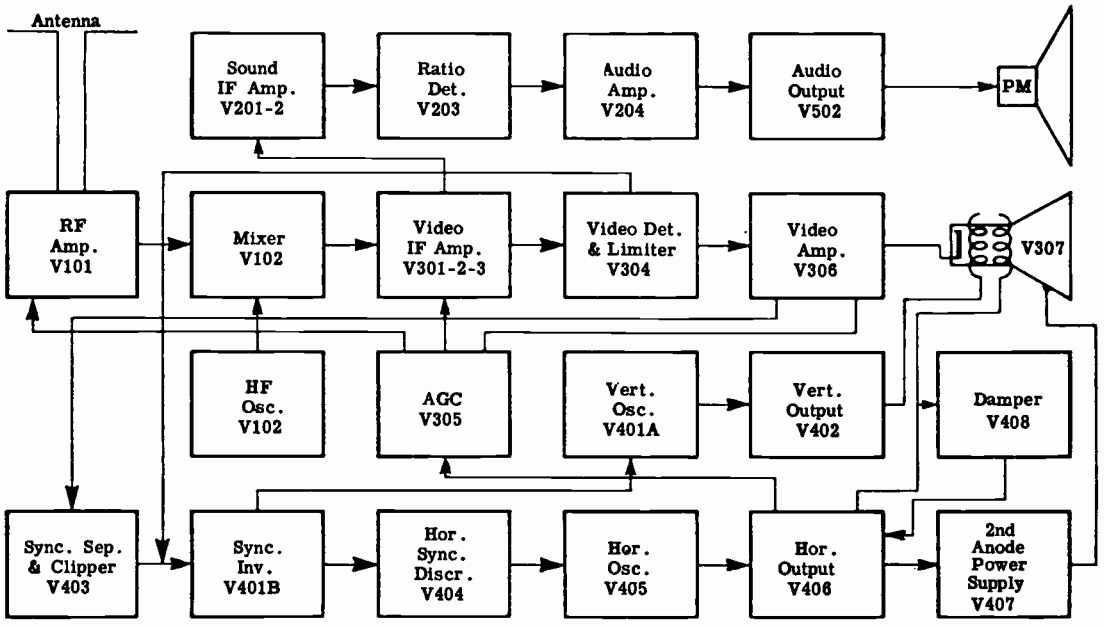
For best results, wash the window with luke warm soapy water, rinse with clear water, and dry with a soft, lint-free cloth with as little rubbing as possible.

If necessary, use Dust-Ded (part number 98A11-2; ½ oz. bottle), or commercially available "Glim", as a plastic cleaner and dust repellent.

Caution: Do not use other cleaners or solvents. Cleaners and solvents such as kerosene, carbon tetrachloride and most of the kitchen-type cleaners may be injurious.

Most scratches on plastic parts can be removed satisfactorily. If the scratch or mar is slight, follow steps 3, 4, 5 below. If scratch is deep, follow all steps below.

1. Sand the scratch with wet #400 (wet or dry type) sandpaper. Use plenty of water. Rub with free, easy, straight strokes and finish with light featherlike strokes.
2. Clean sanded area thoroughly by swabbing with wet cotton or a very soft cotton cloth and then dry thoroughly.
3. Apply a commercial household polishing agent to the plastic parts. Although many commercial polishing agents may be satisfactory, Parka-Polish, Simoniz Kleener, Johnson's Carnu and Wright's Silver Cream have been tried on Admiral plastic parts and found suitable. Rub in with rapid, vigorous, straight strokes. It may take several minutes of this rubbing to produce satisfactory results.
4. Remove all trace of polishing agent by swabbing with damp cotton. Inspect results carefully.
5. Dry completely, and buff entire escutcheon with clean, dry cotton.



Functional Block Diagram.

Admiral

24D1, 24E1, 24F1, 24G1, 24H1, 5B2, 5D2

WAVEFORM ANALYSIS

SERVICING BY WAVEFORM ANALYSIS

After a circuit defect has been localized to the video or sweep sections of a television receiver (see trouble-shooting chart), localization to a single stage can be accomplished by use of the waveforms shown. Voltage or resistance measurements can then be used to locate the defective part in a conventional manner.

Two separate waveforms are shown for TP1, TP2, TP5, TP6, TP7. TP8 and TP9. Two different oscilloscope sweep frequencies are used in order to show up the vertical and horizontal pulses at each test point (both cannot be locked in at the same sweep frequency due to the great difference in, and non-integral relationship of, the vertical and horizontal pulse frequencies). The oscilloscope sweep is adjusted for one half of the frequency of the vertical frequency (60 cycles) or the horizontal frequency (15.75 KC) in order that two pulses will appear on the screen.

The peak-to-peak (PP) voltages indicated for the various waveforms can be used to determine the voltage gain per stage. For example: the peak-to-peak voltage reading at TP1 (input to video amplifier) is 1.5 volts. The peak-to-peak voltage reading at TP2 (output of video amplifier) is 45 volts. A voltage gain of 30 can be determined by dividing the output voltage by the input voltage.

If a peak-to-peak meter is not available for these measurements, the oscilloscope can be calibrated with a known voltage and used as a reference for comparison. If the known voltage is a sine wave, multiply the RMS value by 2.83 to find the peak value obtained on scope.

Turn Picture control fully to the right. Varying this control will produce corresponding variations in peak-to-peak voltages in TP1, TP2, TP3 and TP5 through TP10.

A change in waveform may be noticed at the first two test points when the receiver is switched to a different television station. This is true since some variations in the transmitted waveform are tolerated at the television transmitter. All waveforms and peak-to-peak voltage readings are subject to modification due to the response of the oscilloscope used for test. Due to parts and manufacturing tolerances, variations in peak-to-peak voltages between television receivers are a normal condition. Hence, when using waveforms and peak-to-peak voltage readings for quick trouble shooting, these variations should be kept in mind to avoid erroneous conclusions.

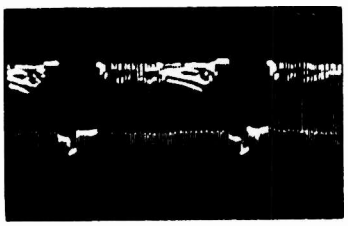
WARNING

Waveform analysis of high voltage sections of the receiver is not recommended, extreme care should be taken to avoid contact with these circuits. Care should be exercised when taking measurements on the horizontal output stage. No connections should be made to the plate cap of the V406 (6CD6G) or to any connections on the rectifier tube (1B3GT/8016) as the high voltages at these points are dangerous.

CONTROL SETTINGS AND CONNECTIONS

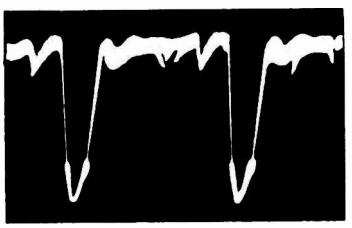
- Picture control set fully to the right.
- Antenna connected for TP1, TP2, TP3, and TP5 thru TP10.
- On some test points it may be necessary to connect an isolating resistor (approx. 100,000 ohms) in series with probe lead of scope.

VIDEO AMPLIFIER and AGC WAVEFORMS

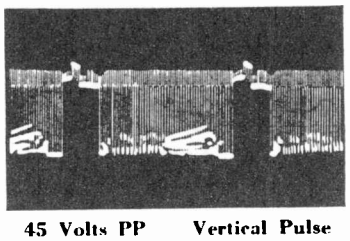


1.5 Volts PP Vertical Pulse

***TP1**
Grid of Video Amplifier
Pin 4 of V306 (6AC7)

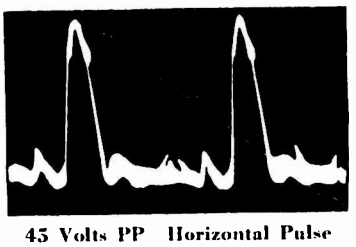


1.5 Volts PP Horizontal Pulse



45 Volts PP Vertical Pulse

***TP2**
Output of Video Amplifier
Junction of L304 and L305



45 Volts PP Horizontal Pulse

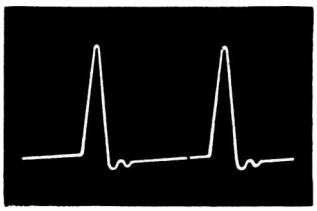
*** Waveforms obtained only with transmitted picture signal input.**

24D1, 24E1, 24F1, 24G1, 24H1, 5B2, 5D2

SYNC CIRCUIT WAVEFORMS

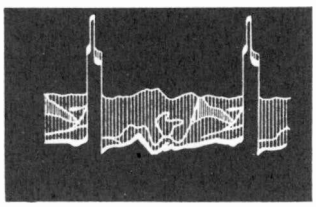
45 Volts PP Horizontal Pulse

***TP3**
Grid of AGC
Pin 1 of V305 (6AU6)



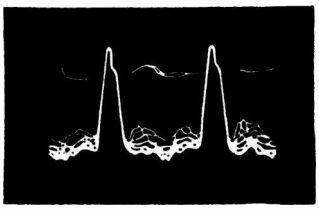
350 Volts PP Horizontal Pulse

TP4
Plate of AGC
Pin 5 of V305 (6AU6)

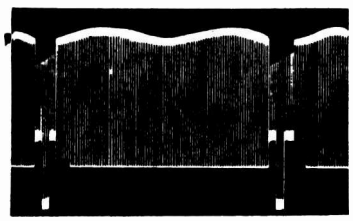


45 Volts PP Vertical Pulse

***TP5**
Grid of Sync Separator
Pin 2 of V403 (12AU7)

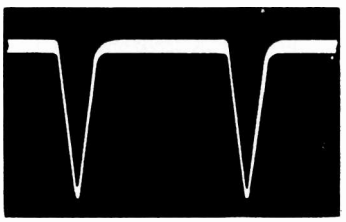


45 Volts PP Horizontal Pulse

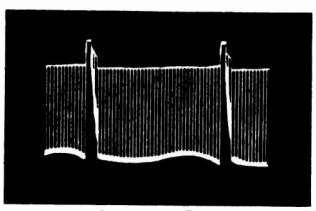


45 Volts PP Vertical Pulse

***TP6**
Plate of Sync Separator
Pin 1 of V403 (12AU7)

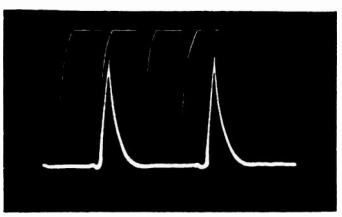


30 Volts PP Horizontal Pulse

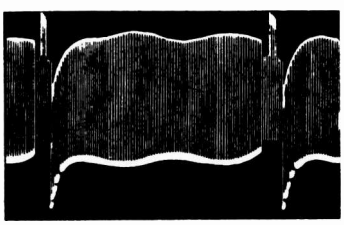


Vertical Pulse
115 Volts PP (TP7)
65 Volts PP (TP8)

***TP7**
Plate of Clipper
Pin 6 of V403 (12AU7)
and
***TP8**
Grid of Svnc Inverter
Pin 4 of V401B (6SN7GT)

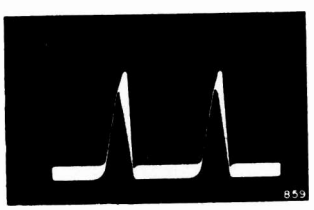


Horizontal Pulse
115 Volts PP (TP7)
65 Volts PP (TP8)

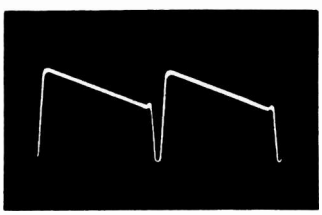


15 Volts PP Vertical Pulse

***TP9**
Cathode of Sync Inverter
Pin 6 of V401B (6SN7GT)
Waveform on plate (pin 5)
is identical, but reversed
180 degrees.

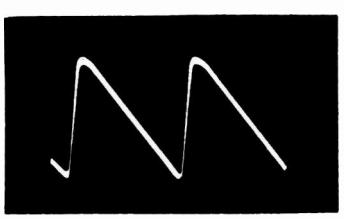


15 Volts PP Horizontal Pulse



10 Volts PP

***TP10**
Cathode of Hor. Sync Disc.
Pin 1 of V404 (6AL5)

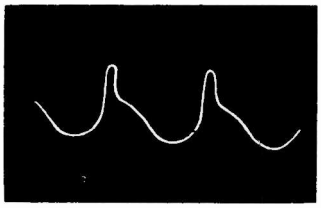


12 Volts PP

TP11
Plate of Hor. Sync Disc.
Pins 5 and 7 of V404 (6AL5)

* Waveforms obtained only with transmitted picture signal input.

HORIZONTAL OSCILLATOR and OUTPUT WAVEFORMS



50 Volts PP

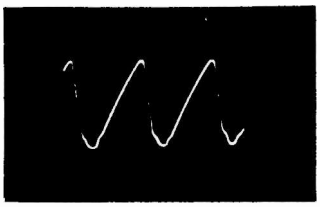
TP12

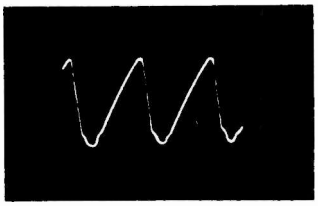
Plate of Hor. Osc.
Pin 2 of V405
(6SN7GT)

100 Volts PP

TP13

Plate of Hor. Osc.
Pin 5 of V405
(6SN7GT)





85 Volts PP

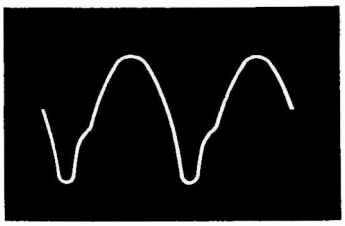
TP14

Grid of Hor. Output
Pin 5 of V406
(6CD6G)

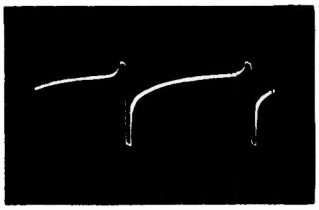
25 Volts PP

TP15

Cathode of Damper
Pin 3 of V408
(6W4GT)



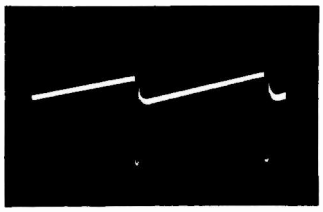
VERTICAL OSCILLATOR and OUTPUT WAVEFORMS



75 Volts PP

TP16

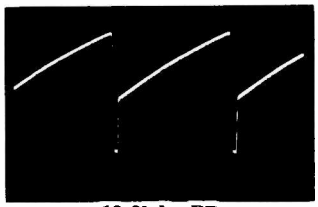
Grid of Vertical Osc.
Pin 1 of V401A (6SN7GT)



75 Volts PP

TP17

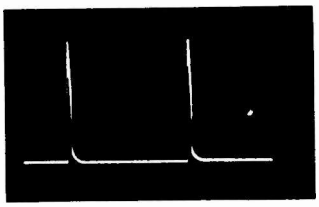
Plate of Vertical Osc.
Pin 2 of V401A (6SN7GT)



60 Volts PP

TP18

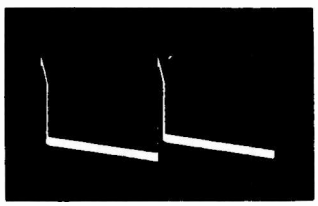
Grid of Vertical Output
Pin 6 of V402 (6S4)



900 Volts PP

TP19

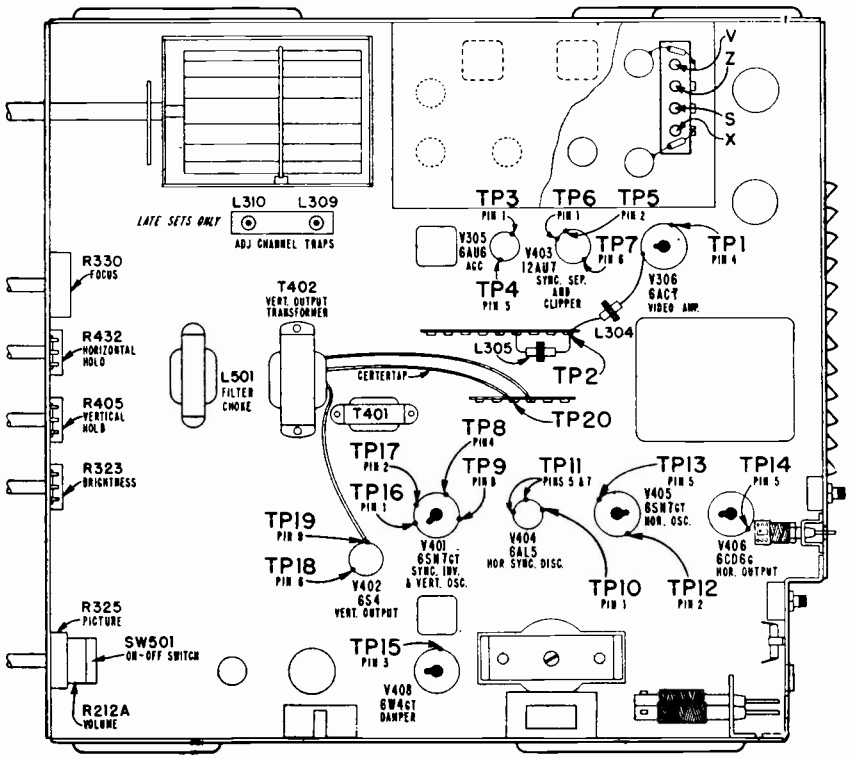
Plate of Vertical Output
Pin 9 of V402 (6S4)



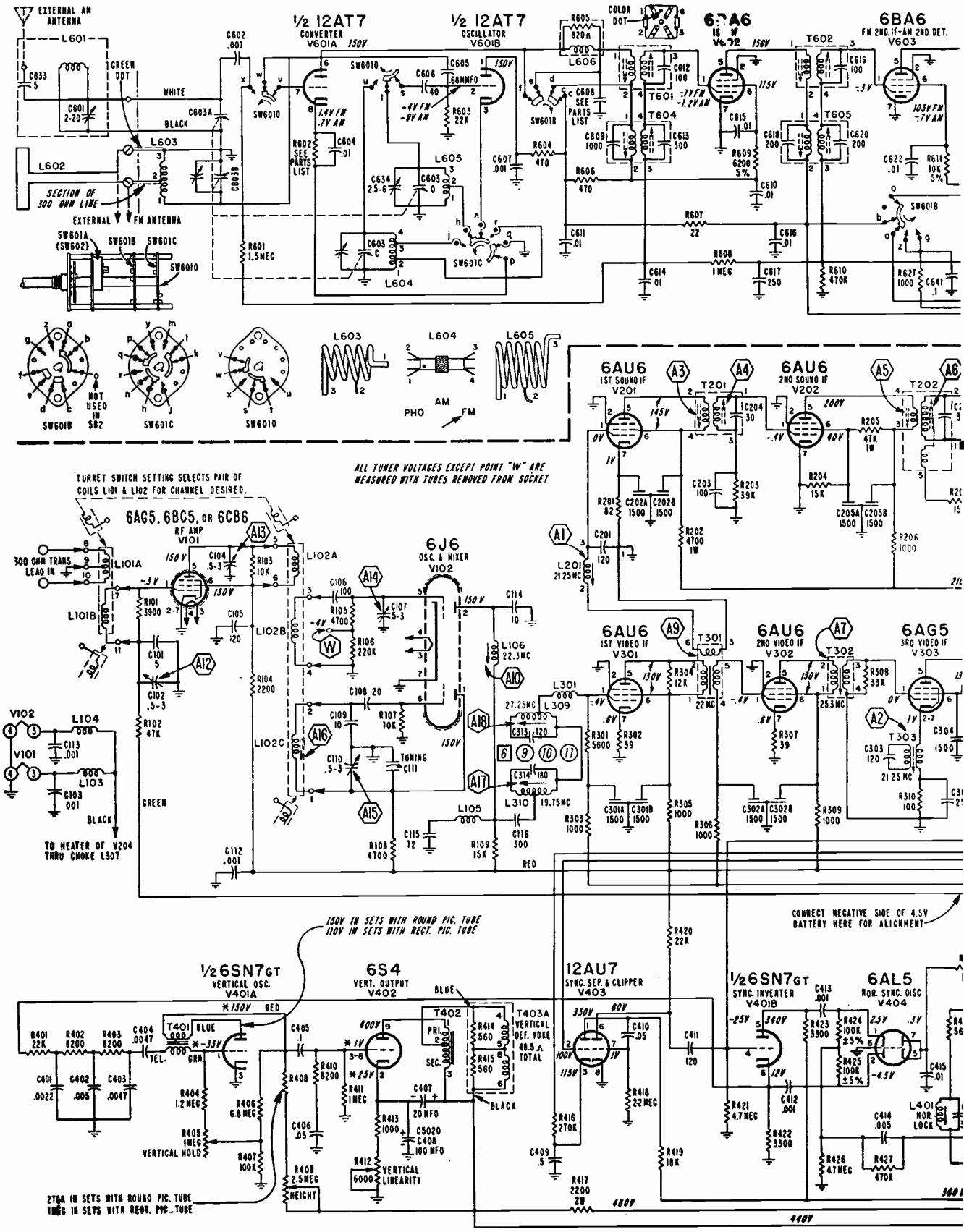
115 Volts PP

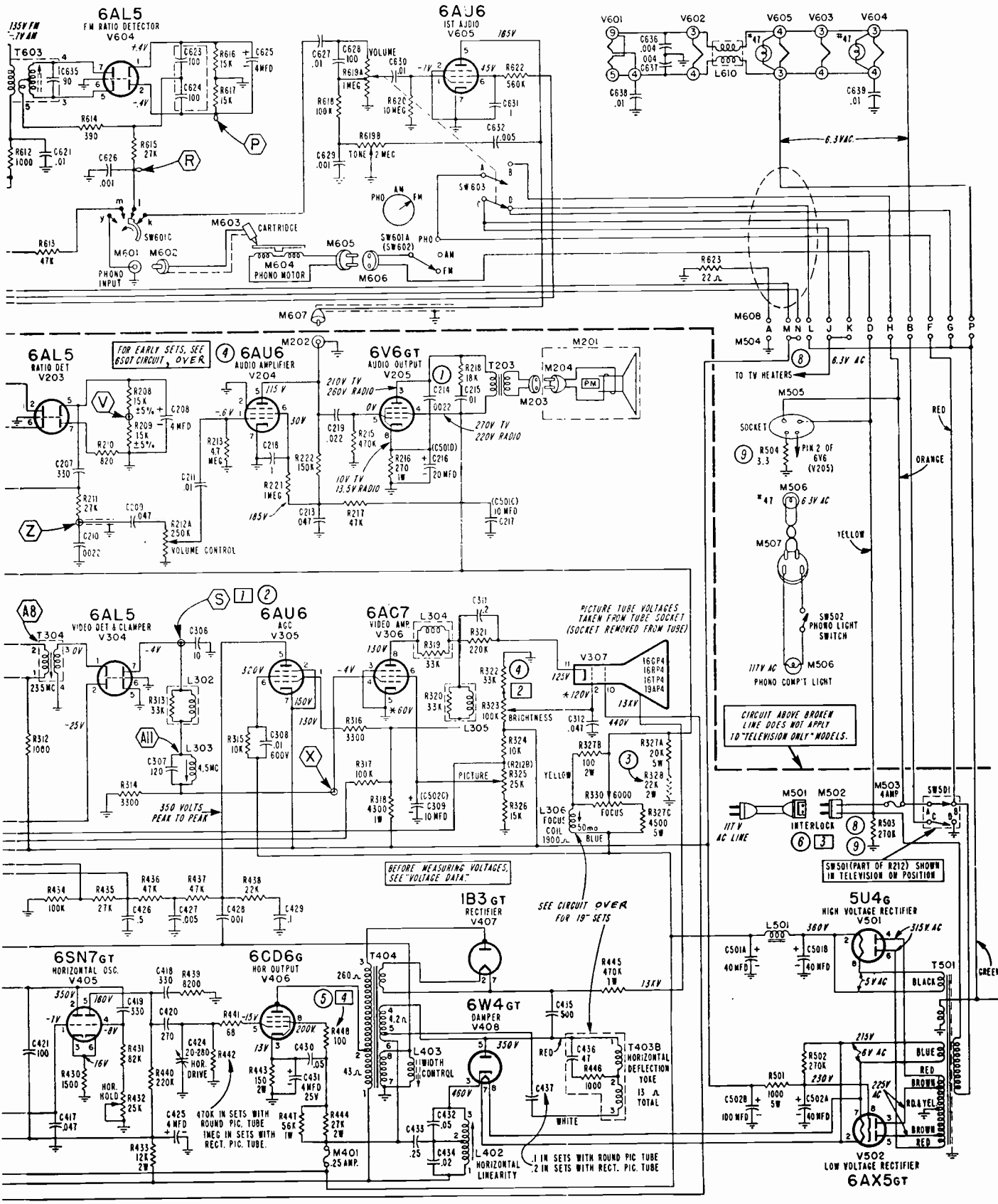
TP20

Vertical Output
Centertap of T402



Bottom View of Chassis Showing TP Locations.

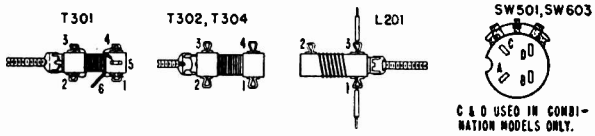

½ 12AT7
CONVERTER
V601A
½ 12AT7
OSCILLATOR
V601B
6BA6
IF AMP
V602
6BA6
FM 2ND. IF-AM 2ND. DET.
V603
6AU6
1ST SOUND IF
V201
6AU6
2ND SOUND IF
V202
6AU6
1ST VIDEO IF
V301
6AU6
2ND VIDEO IF
V302
6AG5
3RD VIDEO IF
V303
6AG5, 6BC5, OR 6CB6
RF AMP
V101
6J6
OSC. & MIXER
V102
½ 26SN7GT
VERTICAL OSC.
V401A
6S4
VERT. OUTPUT
V402
12AU7
SYNC. SEP. & CLIPPER
V403
½ 26SN7GT
SYNC. INVERTER
V401B
6AL5
HOR. SYNC. DISC
V404
EXTERNAL AM ANTENNA
L601
L602
L603
L604
L605
SECTION OF 300 OHM LINE
EXTERNAL FM ANTENNA
SW601A (SW602)
SW601B
SW601C
SW6010
SW6018
TURRET SWITCH SETTING SELECTS PAIR OF COILS L101 & L102 FOR CHANNEL DESIRED.
ALL TUNER VOLTAGES EXCEPT POINT "W" ARE MEASURED WITH TUBES REMOVED FROM SOCKET
300 OHM TRANS LEAD IN
TO HEATER OF V204 THRU CHOKE L307
CONNECT NEGATIVE SIDE OF 4.5V BATTERY HERE FOR ALIGNMENT
150V IN SETS WITH ROUND PIC. TUBE
110V IN SETS WITH RECT. PIC. TUBE
2700 IN SETS WITH ROUND PIC. TUBE
1800 IN SETS WITH RECT. PIC. TUBE
VERTICAL HOLD
VERTICAL LINEARITY
HEIGHT
PHO
AM
FM
NOT USED IN SB2

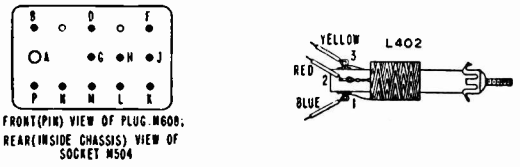


nd connections also shown. The 5B2 radio circuit (used in early sets) is not shown.

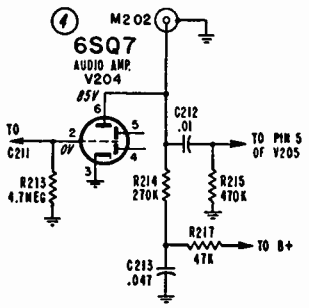
MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

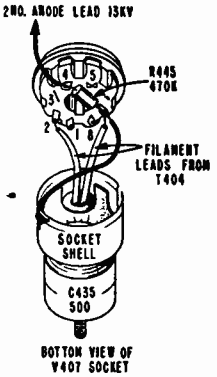
24D1, 24E1, 24F1, 24G1, 24H1, 5B2, 5D2



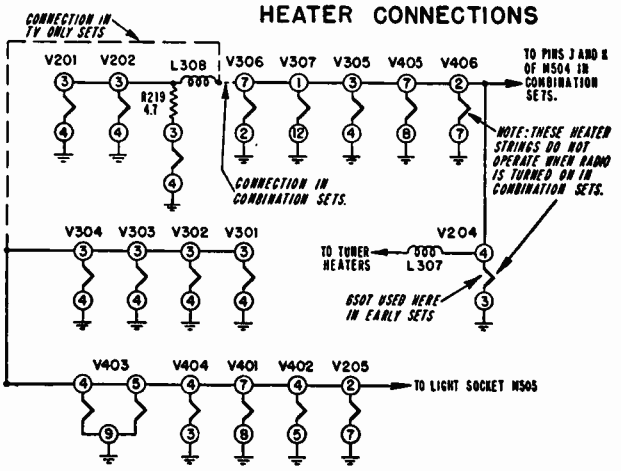


AUDIO AMP. CIRCUIT IN EARLY SETS

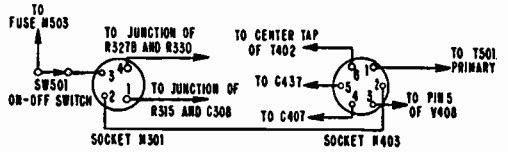


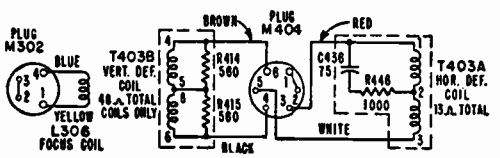


HEATER CONNECTIONS



FOCUS COIL AND DEFLECTION YOKE SOCKETS AND PLUGS USED ONLY IN 19" SETS.





SCHEMATIC NOTES

Run numbers are rubber stamped at rear of chassis and are discussed.

①, ②, ③, etc. indicate run numbers in 24D1, 24E1, 24F1, 24G1 chassis (round picture tube).

1, 2, 3 etc. indicate run numbers in 24H1 chassis (rectangular picture tube).

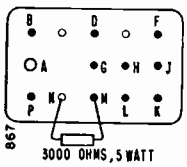
A1, A2,.....Y, Z, etc. indicate alignment points and alignment connections.

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 M504. See schematic.

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. The 2PA1 can be used directly with the 5B2 radio. To operate the 5D2 radio, connect a 3,000 ohm, 5 watt resistor (part 61A1-15) from pin "M" to "N" on power supply socket.



Socket, Rear View (Inside Chassis).

TV VOLTAGE DATA
(Voltages given on schematic)

- Picture control turned fully clockwise. CHANNEL control set on an unused channel. Other front controls and 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.
- 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; terminals shorted.
- Under operating conditions, AGC (Automatic Gain Control) voltage developed at pin 1 of V301 (6AU6) should measure approximately —4 volts. This voltage depends on signal strength and Picture control setting.

CAUTION

Pulsed high voltages are present on the cap of the 6CD6 tube, and on the filament terminals and cap of the 1B3/8016 tube. NO ATTEMPT SHOULD BE MADE TO TAKE MEASUREMENTS FROM THESE POINTS UNLESS SUITABLE EQUIPMENT IS AVAILABLE.

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 13 KV. Proper filament voltage check of the 1B3/8016 tube may be made by observing filament brilliancy as compared with that obtained with a 1.5 volt dry cell battery.

RADIO VOLTAGE DATA
(Voltages given on schematic)

- Line voltage 117 volts AC.
- Voltages measured with a vacuum tube voltmeter, between tube terminals and chassis.
- Voltages measured with band switch on FM position, unless otherwise indicated; an AM reading is given where difference is significant.
- Volume control set at minimum.
- Dial turned to low frequency end.
- Antennas disconnected.

Admiral SERVICE for models using 21B1, 21C1, 21D1, 21H1, 21J1 and 5D2, 3C1 CHASSIS

MODEL IDENTIFICATION CHART

*Model Numbers Model numbers may have suffix letter "N"	Tube Size	TV Chassis	TV Tuner	Record Changer	Radio
16R12, 26R12, 26R25A, 26R26A, 26R35A, 26R36A, 26R37A	16" rect.	21B1	94C18-4	.....	.....
36R37, 36R45, 36R46	16" rect.	21C1	94C18-4	RC500 or RC550	5D2 (AM-FM)
26X55A, 26X56A, 26X57A, 26X65A, 26X66A, 26X67A, 26X75A, 26X76A	16" round	21D1	94C18-4	.....	.....
29X25A, 29X26A	19" round	21H1	94C18-4	.....	.....
39X17C, 39X25A, 39X26A	19" round	21J1	94C18-4	RC550	5D2 (AM-FM)
39X35, 39X36	19" round	21J1	94C18-4	RC550	3C1 (AM only)
320R17, 320R25, 320R26	20",20CP4	21J1	94C18-4	RC550	5D2 (AM-FM)

* Important: This manual does not apply to models 26R25, 26R26, 26R35, 26R36, 26R37, 26X55, 26X56, 26X57, 26X65, 26X66, 26X67, 26X75, 26X76, 29X25, 29X26, 39X25, 39X26 **(without the suffix letter "A").**

The schematic diagram on the next two pages covers 21B1, 21C1, (16" rect.) 21H1, 21J1 (19" round) Chassis as used with 5D2 (AM-FM radio). The 3C1 AM radio used with 21J1 chassis is not shown, but it connects to the television chassis through the same type of cable and employes only three tubes. Chassis 21D1 is for television reception only, and its circuit is almost identical to the television section of the models shown on the next two pages.

The IF and AGC circuits of these television sets are similar to the circuits of the 20X1, 20Y1, described on pages 17 to 22 of the 1950 Television manual. The material in this earlier volume may be used to help you with the alignment. The sweep circuits are similar to the circuits of the 24D1 series covered in this manual beginning with page 5.

Admiral Television Chassis 20T1, and 20V1, are similar in many ways to the sets described here. You will find that this material can be used as a guide in servicing these additional models.

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).

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 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.

DIFFERENT IF TUBES (V301, V302, V303)

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

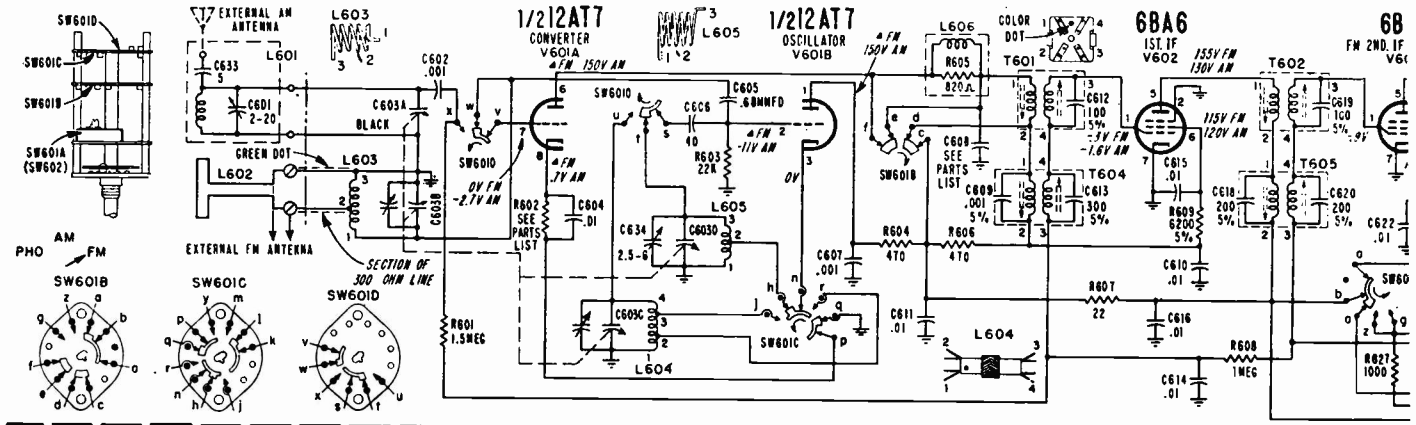
In later sets, a 6AG5 tube is used as an alternate for the 6AU6 tube in the 3rd IF stage, in the 2nd and 3rd IF stages, or in the 1st, 2nd and 3rd IF stages. The 6AU6 and 6AG5 tubes are not directly interchangeable. When the 6AG5 tube is used, tube socket terminal 2 is unused (not grounded) as pins 2 and 7 of this tube are connected internally. A tube shield is used with 6AG5 tube in 3rd IF stage (and in the 1st IF stage if all 3 stages use the 6AG5 tube).

Note that when the 3rd IF stage uses a 6AG5. an 18,000 ohm grid resistor R330 is used in that stage.

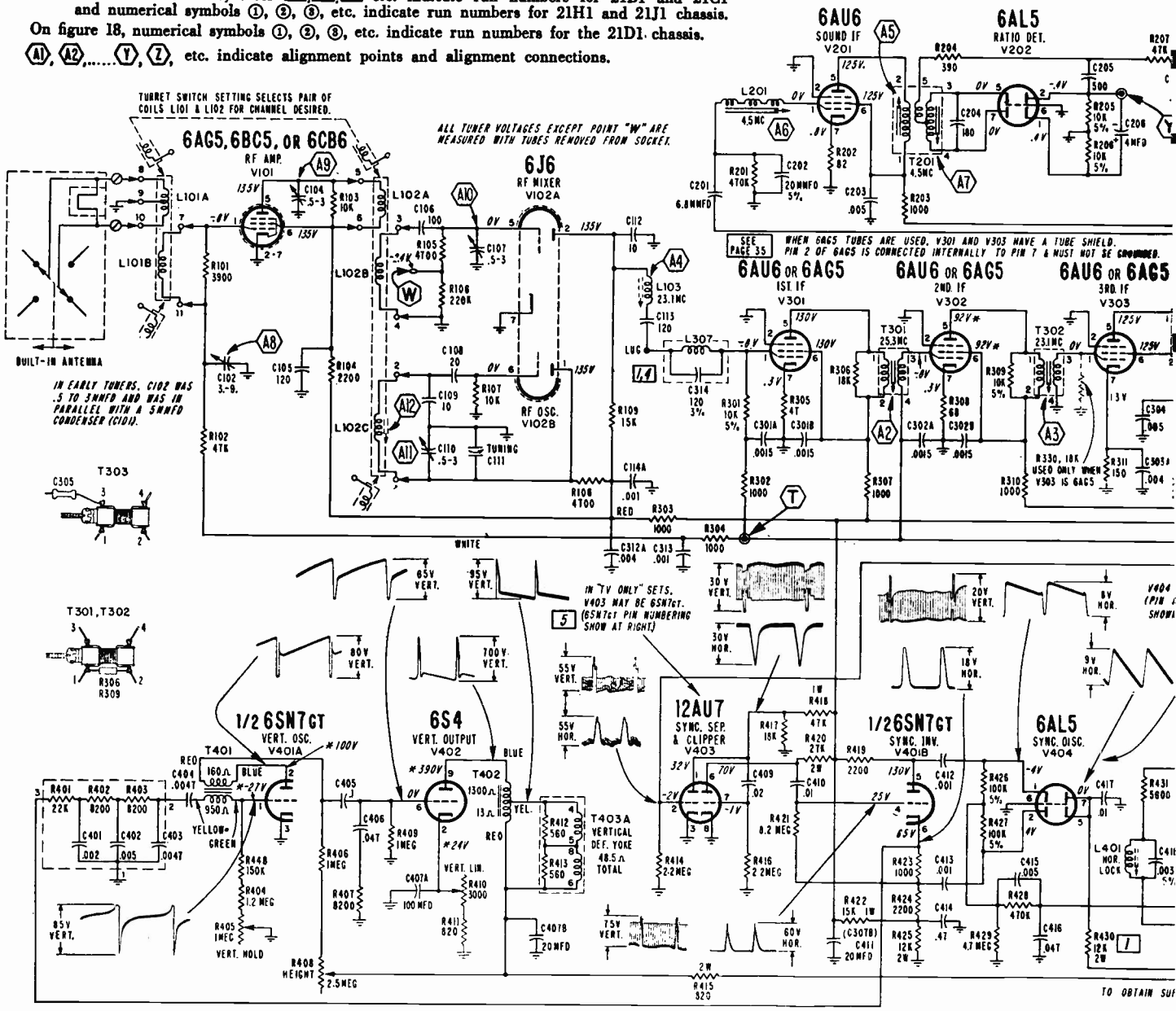
Align IF stages after any tube replacement.

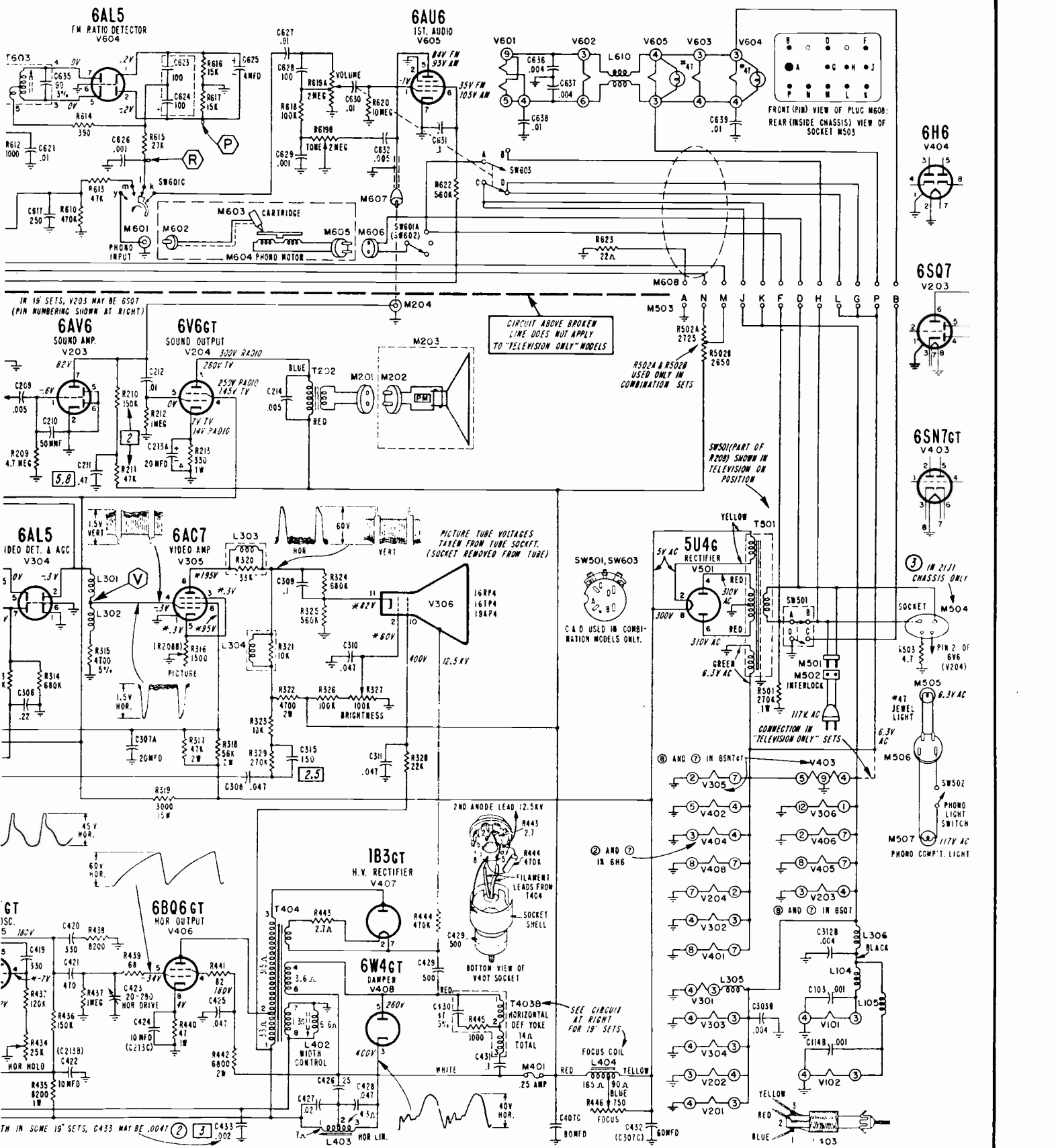
‡ This change was incorporated at beginning of production of all other chassis.

* The 21B1 chassis is being 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.



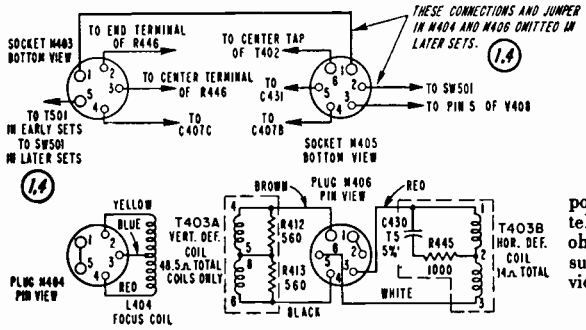
Numerical symbols [1], [2], [3] etc. indicate run numbers for 21B1 and 21C1 and numerical symbols ①, ②, ③, etc. indicate run numbers for 21H1 and 21J1 chassis. On figure 18, numerical symbols ①, ②, ③, etc. indicate run numbers for the 21D1 chassis. Ⓐ1, Ⓐ2,.....Ⓨ, Ⓩ, etc. indicate alignment points and alignment connections.




6AL5
FM RATIO DETECTOR
V604
6AU6
1ST. AUDIO
V605
V601
V602
V605
V603
V604
L610
FRONT (PIN) VIEW OF PLUG M608;
REAR (INSIDE CHASSIS) VIEW OF
SOCKET M503
6H6
V404
6SQ7
V203
M601
PHONO
INPUT
M602
M603 CARTRIDGE
M604 PHONO MOTOR
M605
M606
M607
M608
SW603
SW601A (SW602)
SW601C
R623
22Ω
IN 19" SETS, V203 MAY BE 6SQ7
(PIN NUMBERING SHOWN AT RIGHT)
6AV6
SOUND AMP.
V203
6V6GT
SOUND OUTPUT
V204
M204
M203
M201
M202
T202
CIRCUIT ABOVE BROKEN
LINE DOES NOT APPLY
TO "TELEVISION ONLY" MODELS
M503
R502A
2725
R502B
2650
R502A & R502B
USED ONLY IN
COMBINATION SETS
6SN7GT
V403
SW501(PART OF
R208) SHOWN IN
TELEVISION ON
POSITION
6AL5
VIDEO DET. & AGC
V304
6AC7
VIDEO AMP
V305
L303
L301
L302
L304
PICTURE TUBE VOLTAGES
TAKEN FROM TUBE SOCKET.
(SOCKET REMOVED FROM TUBE)
V306
16RP4
16TP4
19AP4
SW501, SW603
C & D USED IN COMBI-
NATION MODELS ONLY.
5U4G
RECTIFIER
V501
T501
YELLOW
RED
GREEN
6.3V AC
310V AC
300V
SW501
SOCKET
M504
M501
M502
INTERLOCK
117V AC
M505
#47
JEWEL
LIGHT
M506
SW502
PHONO
LIGHT
SWITCH
M507
117V AC
PHONO COMPT. LIGHT
CONNECTION IN
"TELEVISION ONLY" SETS
8 AND 7 IN 6SN7GT
V403
V305
V402
V404
V408
V204
V302
V401
V306
V406
V405
V203
8 AND 7 IN 6SQ7
2 AND 7
IN 6H6
1B3GT
H.V. RECTIFIER
V407
2ND ANODE LEAD 12.5KV
FILAMENT
LEADS FROM
T404
SOCKET
SHELL
BOTTOM VIEW OF
V407 SOCKET
6BQ6GT
HOR. OUTPUT
V406
6W4GT
DAMPER
V408
T404
T4038
HORIZONTAL
DEF. YOKE
14Ω
TOTAL
SEE CIRCUIT
AT RIGHT
FOR 19" SETS
L402
WIDTH
CONTROL
L403
HOR. LIN.
FOCUS COIL
L404
FOCUS
M401
.25 AMP
WHITE
RED
YELLOW
BLUE
L306
BLACK
L104
L105
L305
V301
V303
V304
V202
V201
V101
V102
L103
TH IN SOME 19" SETS, C433 MAY BE .0047
C433
.002

t also shown.

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

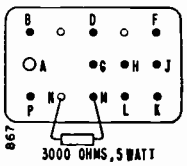


FOCUS COIL and DEFLECTION YOKE CONNECTORS USED in 19" SETS

Admiral Corporation

21B1, 21C1, 21D1, 21H1, 21J1, 5D2, 3C1

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 as shown in the adjacent illustration of the rear (inside) view of the socket.

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 on the TV chassis. See schematic.

TV VOLTAGE DATA
(Voltages given on schematic diagram)

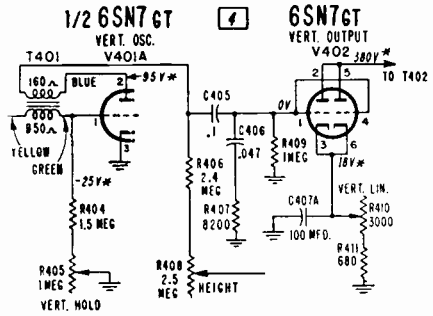
- PICTURE control turned fully clockwise. CHANNEL control set on an unused channel. Other front controls set at approximately half rotation. Vert. Lin. and Height set at approximately half rotation.
- Voltages marked with an asterisk * will vary widely with control setting.
  In combination models, B+ 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.
- Under operating conditions, AGC (Automatic Gain Control) voltage developed at pin 1 of V301 should measure approximately —3 volts. This voltage depends on picture signal strength.

CAUTION

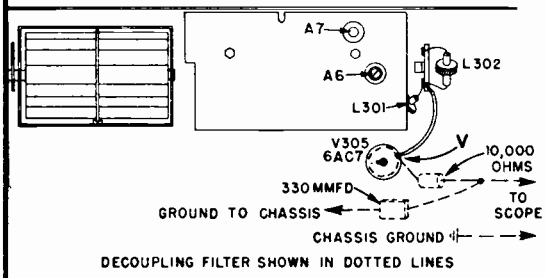
Pulsed high voltages are present on the cap of V406, and on the filament terminals and cap of the 1B3GT tube. NO ATTEMPT SHOULD BE MADE TO TAKE MEASUREMENTS FROM THESE POINTS UNLESS SUITABLE TEST EQUIPMENT IS AVAILABLE.

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.

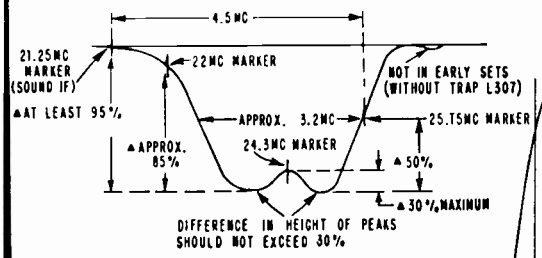
ALTERNATE CIRCUIT WHEN V402 IS 6SN7GT



ALIGNMENT



Bottom View Showing Test Point Connections.

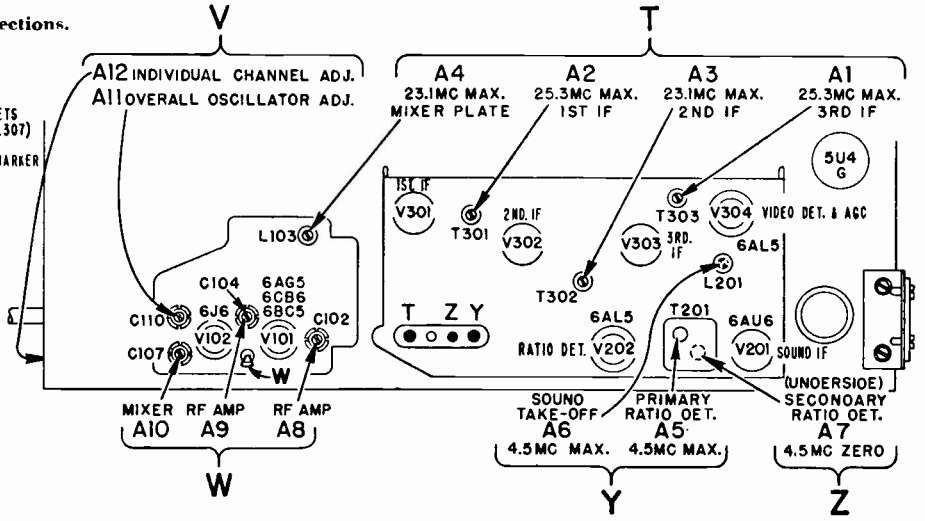


IF Response Curve.

RADIO VOLTAGE DATA

- Line voltage 117 volts AC.
- Voltages measured with a vacuum tube voltmeter, between tube terminals and chassis.
- Volume control set at minimum.
- Dial turned to low frequency end.
- FM antenna disconnected; AM antenna connected.
- In AM-FM sets, voltages measured with band switch on FM position, unless otherwise indicated; an AM reading is given where difference is significant.

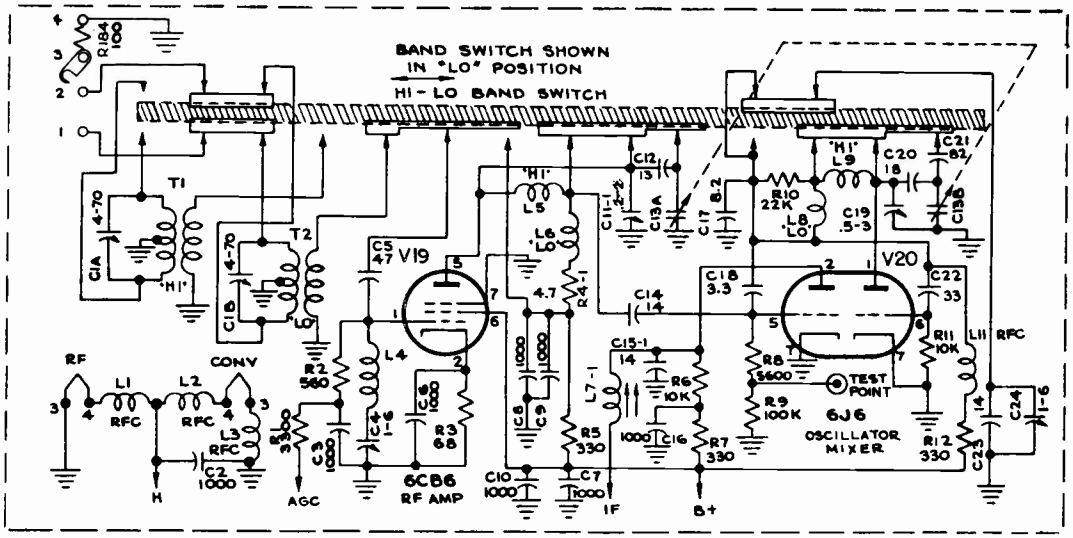
▲ When R602 is 240 ohms, voltage on pin 1 of V601 is 152 volts, pin 2 is —.5 volts, pin 6 is 152 volts and pin 8 is 1.9 volts.
When R602 is 1500 ohms, voltage on pin 1 of V601 is 160 volts, pin 2 is —3 volts, pin 6 is 160 volts and pin 8 is 3 volts.



Top View of Chassis Showing Alignment Data.

ARVIN TELEVISION

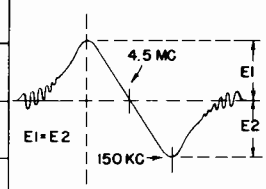
Chassis TE 290, Models 2160, 2161, 2162, and 2164



TUNER UNIT N 23054-3

SOUND I.F ALIGNMENT TABLE

STEP	EQUIPMENT	CONNECT TO	FREQUENCY	ADJUST	DISCRIMINATOR CURVE
1.	OSCILLOSCOPE (EXTERNAL HORIZONTAL SWEEP FROM SWEEP GENERATOR)	JUNCTION C110 AND R106			
2.	SIGNAL GENERATOR	PIN 4, V9	4.5 MC (AM MODULATED)	TOP OF T101 FOR MINIMUM EDGE RIPPLE ON SCOPE	
3.	SIGNAL GENERATOR	PIN 4, V9	4.5 MC ±300 KC	L101 AND BOTTOM T101 FOR MAXIMUM AND EQUAL CURVE PEAKS.	
4.	DISCONNECT ALL TEST EQUIPMENT; TUNE IN TRANSMITTED SIGNAL; ADJUST CONTRAST, VOLUME, AND TUNING FOR LOW AUDIABLE SYNC BUZZ; ADJUST TOP OF T101 FOR MINIMUM BUZZ.				



VIDEO I.F. AND TRAP ALIGNMENT

1. ALLOW ABOUT 15 MINUTES FOR RECEIVER AND TEST EQUIPMENT TO WARM UP.
2. PULL THE R.F TUBE, V19 OUT -- IF SPURIOUS RESPONSES SHOW ON THE CURVE, KILL THE OSCILLATOR BY GROUNDING THE STATOR SECTION OF THE OSCILLATOR GANG.
3. CONNECT A BIAS BATTERY (-3V) TO THE AGC POINT -- JUNCTION C134 AND R135 -- POSITIVE TERMINAL OF BATTERY 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. L109 ADJUSTS SOUND PORCH AMPLITUDE -- SHOULD BE 20 TO 30 TIMES DOWN FROM TOP OF CURVE.

STEP	EQUIPMENT	CONNECT TO	FREQUENCIES	ADJUST	INSTRUCTIONS
1.	VTVM	JUNCTION L105 & L106 (IN64 DETECTOR LOAD)			USE LOW SCALE AND 27K ISOLATING RESISTOR
2	R.F. SIGNAL GENERATOR	TUNER TEST POINT	41.4 MC	BOTTOM T103 FOR MIN VTVM DEFLECTION (DIP)	INCREASE OUTPUT SO THAT DIP IS ON VTVM LOW SCALE
3.	SAME	SAME	47.25 MC	BOTTOM T104 FOR MIN VTVM DEFLECTION (DIP)	SAME
4.	SAME	SAME	42.5 MC	TOP T103 FOR MAX. VTVM DEFLECTION (PEAK)	REDUCE OUTPUT SO VTVM IS LESS THAN 2V
5.	SAME	SAME	45.75 MC	TOP T104 FOR MAX. VTVM DEFLECTION	SAME
6.	SAME	SAME	42.9 MC	L7 (TUNER) AND L109 FOR MAX. VTVM DEF.	SAME
7	SAME	SAME	45.0 MC	L108 FOR MAX. VTVM DEFLECTION	SAME
8	OSCILLOSCOPE	JUNCTION L105 & L106 (IN64 DETECTOR LOAD)			USE 27K ISOLATING RESISTOR AND 250 MMF BY PASS TO GROUND USE EXTERNAL HORIZONTAL SWEEP VOLTAGE FROM SWEEP GENERATOR
9	SWEEP GENERATOR	TUNER TEST POINT	40 TO 50 MC	TOP T103, T104, L7, L108, L109 - (TOP T103 FLATTENS SOUND PORCH)	"TOUCH-UP" FOR CURVE & MARKERS OF I.F RESPONSE. WITH SWEEP OUTPUT LOW & SCOPE GAIN HIGH MARKERS WILL SHOW BETTER

NOTE INCREASE SCOPE GAIN TO SEE "SOUND-PORCH" CLEARLY -- ADJUST TOP T103 SO PORCH IS MOST FLAT FOR 41.25 MC

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

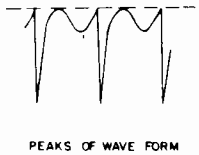
HORIZONTAL OSCILLATOR ADJUSTMENT (COMPLETE)

ARVIN INDUSTRIES, INC.

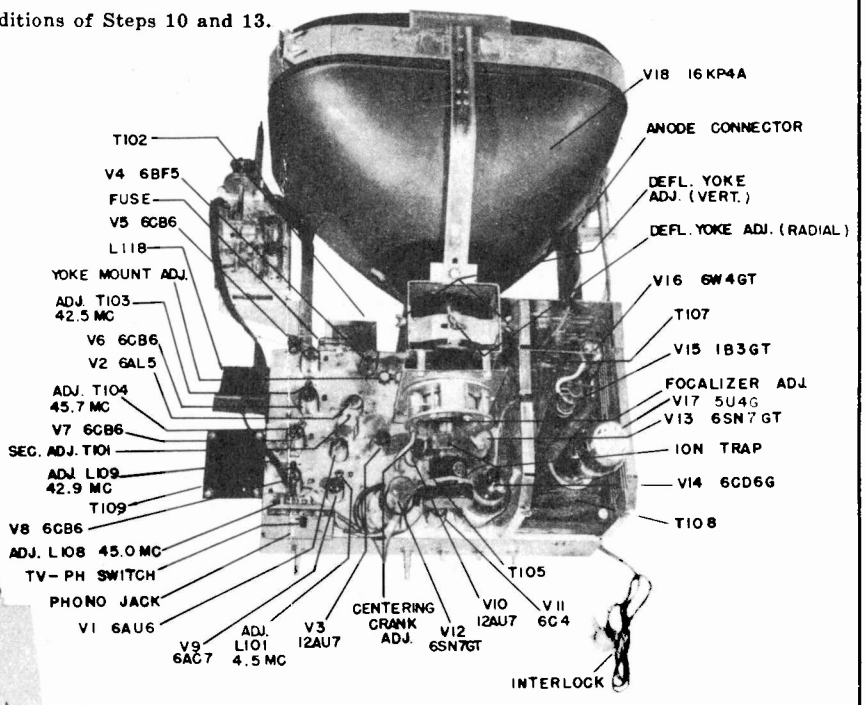
Television Chassis TE 290

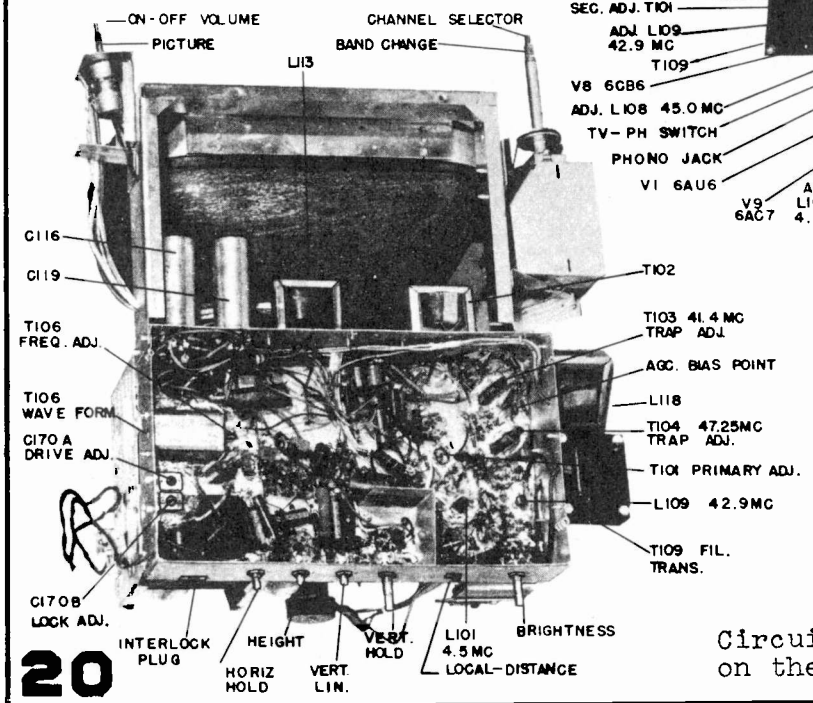
Models 2160, 2161, 2162, and 2164.

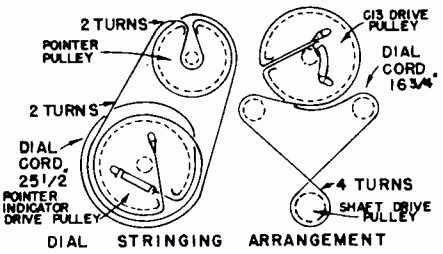
1. Tune in an available station.
2. Set the Horizontal Hold Control mid-range.
3. Set the Horizontal Lock Adjustment one turn from tight.
4. Connect the oscilloscope to Terminal "C" of T106.
5. Turn the T106 Blocking Waveform Adjustment maximum counter-clockwise and then 3 turns clockwise.
6. Turn the T106 Frequency Adjustment until only a ½" or less of the screw protrudes.
7. Turn the T106 Frequency Adjustment counter-clockwise until the picture is in sync.
8. Adjust the T106 Blocking Waveform Adjustment until the waveform is correct as in illustration. (Picture must be in sync when adjusting waveform — keep in sync with Frequency Adjustment.)
9. Turn Horizontal Hold Control maximum counter-clockwise.
10. Adjust the T106 Frequency Adjustment so that the picture just breaks sync (the ideal is to have a wide vertical blank bar representing horizontal blanking showing somewhere in the picture).
11. Turn the Horizontal Hold maximum clockwise. If picture doesn't break sync, momentarily short the antenna terminals. Picture will now be out-of-sync.
12. Turn the Horizontal Hold Control slowly counter-clockwise and count the diagonal bars just before "pull-in".
13. There should be 2 bars—adjust Horizontal Locking Range until only 2 bars are present before "pull-in".
14. Repeat steps 9 thru 13 if necessary to obtain conditions of Steps 10 and 13.



PEAKS OF WAVE FORM MUST BE AT SAME AMPLITUDE LEVEL ACROSS THE TOP





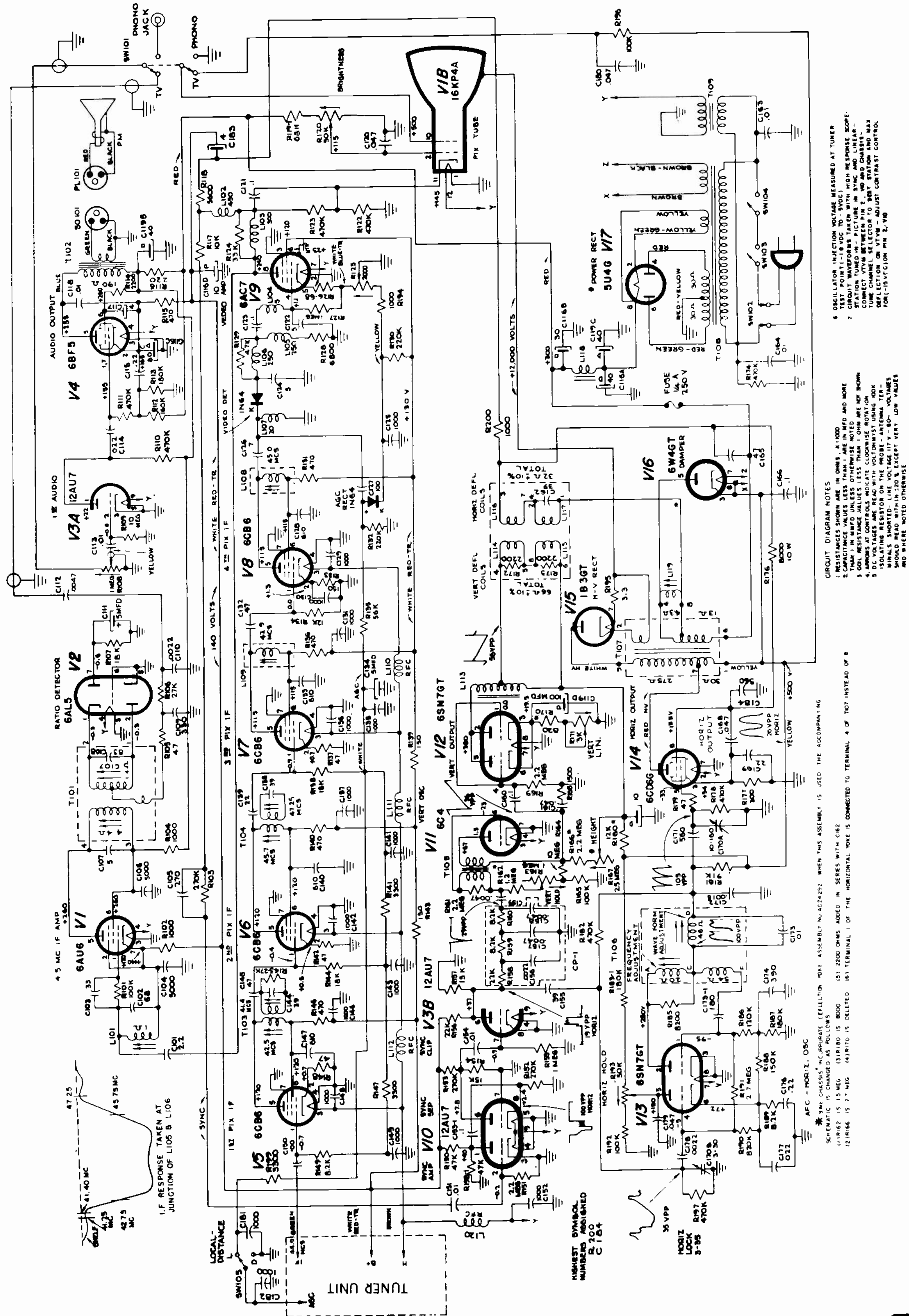


DIAL STRINGING ARRANGEMENT

Circuit diagram is on the next page.

ARVIN TELEVISION

Chassis TE 290 Models 2160, 2161, 2162, 2164



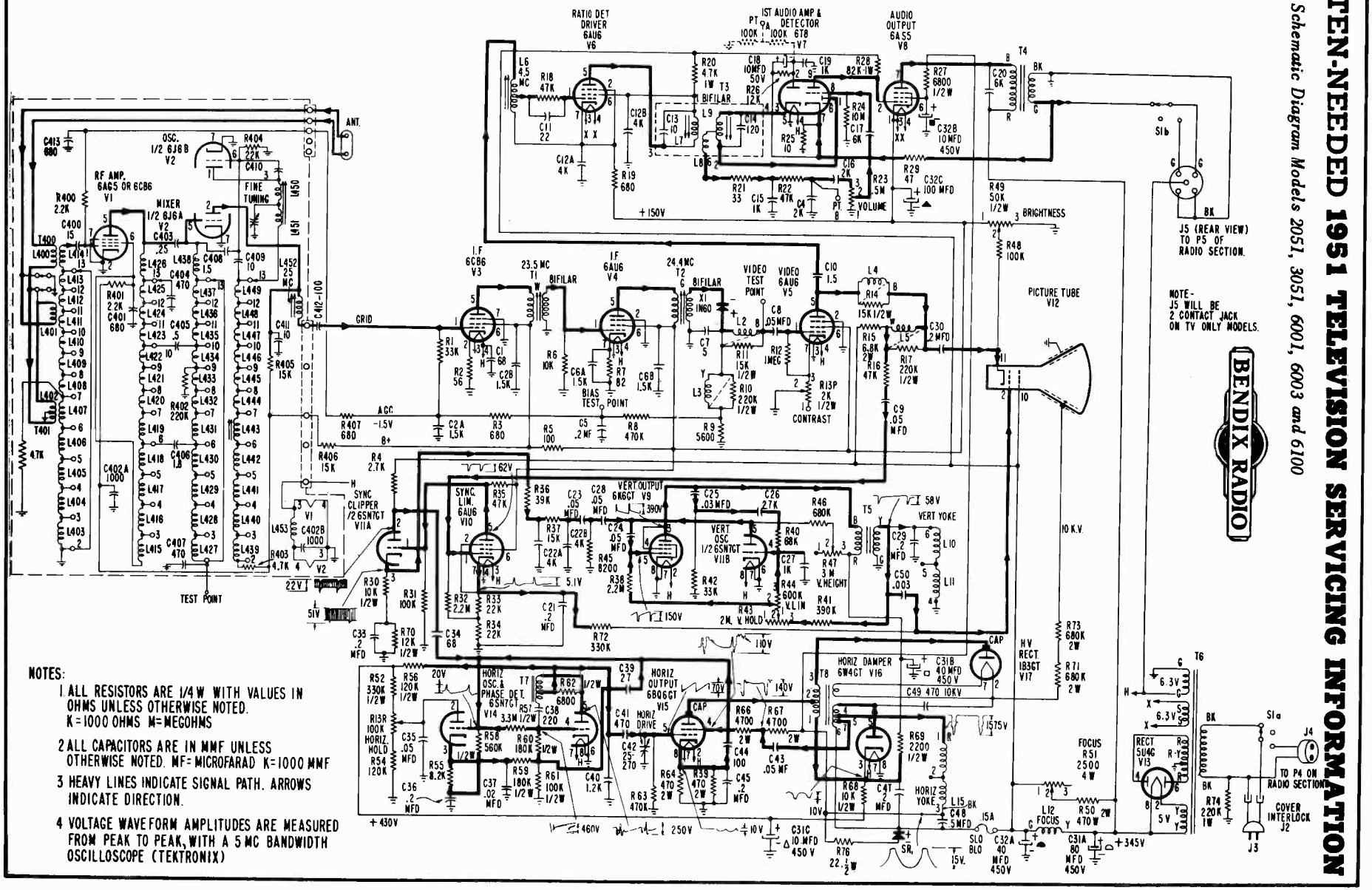
Bendix Radio

AND TELEVISION

2051, 3051, 6001, 6003 AND 6100
14 INCH AND 16 INCH
TELEVISION RECEIVERS

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

Schematic Diagram Models 2051, 3051, 6001, 6003 and 6100



NOTES:

1. ALL RESISTORS ARE 1/4 W WITH VALUES IN OHMS UNLESS OTHERWISE NOTED. K = 1000 OHMS M = MEGOHMS
2. ALL CAPACITORS ARE IN MMF UNLESS OTHERWISE NOTED. MF = MICROFARAD K = 1000 MMF
3. HEAVY LINES INDICATE SIGNAL PATH. ARROWS INDICATE DIRECTION.
4. VOLTAGE WAVEFORM AMPLITUDES ARE MEASURED FROM PEAK TO PEAK, WITH A 5 MC BANDWIDTH OSCILLOSCOPE (TEKTRONIX)

CAPEHART-FARNSWORTH CORPORATION

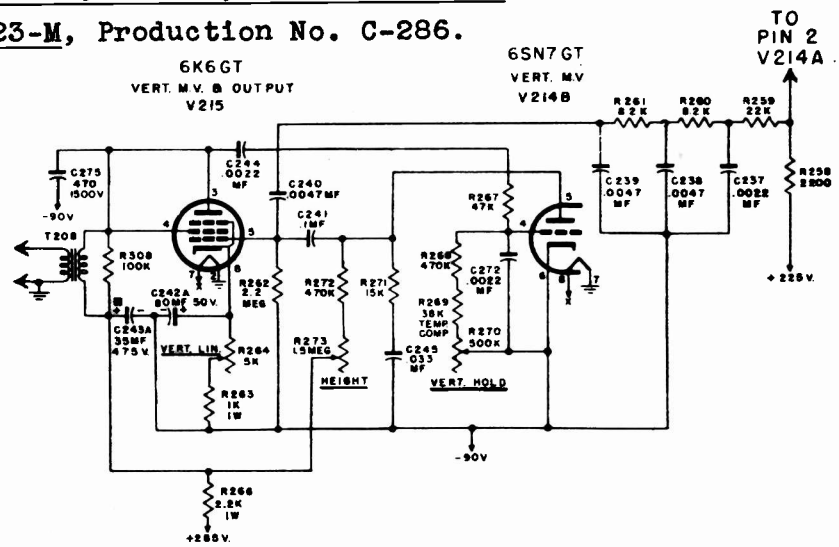
An IT&T Associate

FORT WAYNE, INDIANA

Chassis CX-33, used in Models 3011-M, 3011-B, 3012-M, 3012-B, Production C-281,
Chassis CX-33F, used in Model 323-M, Production No. C-286.

The following differences exist between the chassis used in early production of Models 3011 and 3012, and the schematic diagram shown on the next page:

1. The junction of R254 and R253 is connected to ground.
2. R255 is 22K, 2W resistor.
3. R286 is 150K resistor.
4. R242 is 47K resistor.
5. Terminal "B" on T209 is connected directly to +235 v.
6. R314, C278, and C283 are not used.
7. The Vertical M.V. and Output Stage is shown directly above.

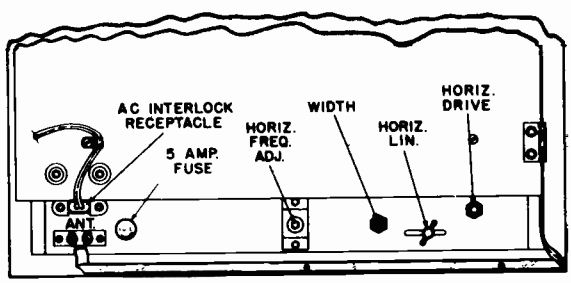


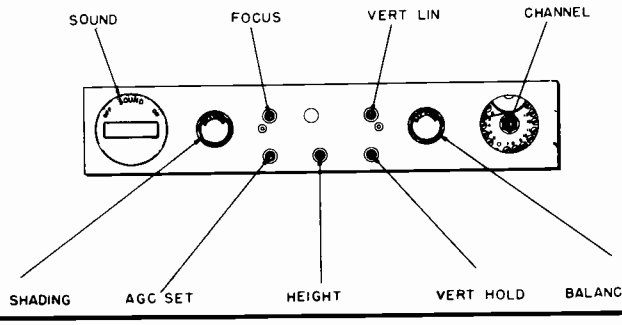
The following differences exist in the CX-33 Chassis, coded with a "-2" and CX-33F Chassis (which employs a 16-inch Round metal picture tube):

1. R286 is a 150K resistor; 2. R267 is a 22K resistor; 3. R262 is a 2.2 Megohm;
4. R266 is connected to plus 295 volts; 5. C283 is not used.

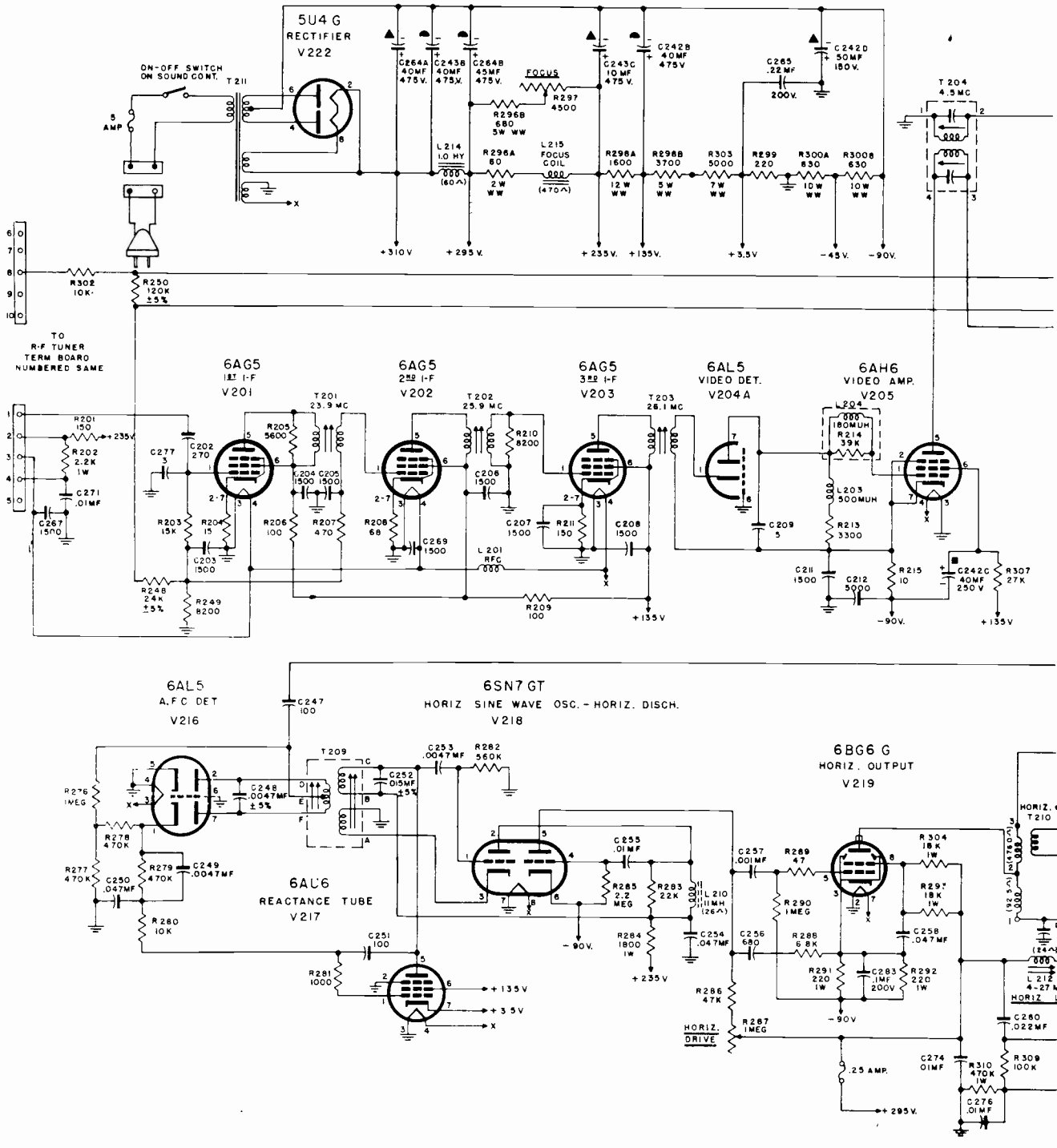
The chassis and models listed below are of similar design. The material presented on these pages can be used as an aid in servicing these sets. Some of these sets are combinations and are used with A.M. radio, AM-FM, and phono pre-amplifier. Standard Coil tuner (Capehart Part Number 850103A) is used in the CX-33 and CX-33F Chassis starting with the series "-3" production run. The CX-33A, CX-33M, CX-33K, and CX-33L Chassis employ this tuner exclusively.

Chassis CX-33, used in Models 321-B, 321-M, 322-M, 324-M, 325-F, Production No. C-281, Series "-3",
Chassis CX-33A, used in Model 327-M, Production No. C-285,
Chassis CX-33F, used in Models 332-B, 332-M, 334-M, Production C-286, Ser."-3",
Chassis CX-33L, used in Models 320-M, 326-M, Production No. C-289,
Chassis CX-33K, used in Model 337-M, Production No. C-292,
Chassis CX-33M, used in Model 328-M, Production No. C-290.





CAPEHART "CX-33" CHASSIS



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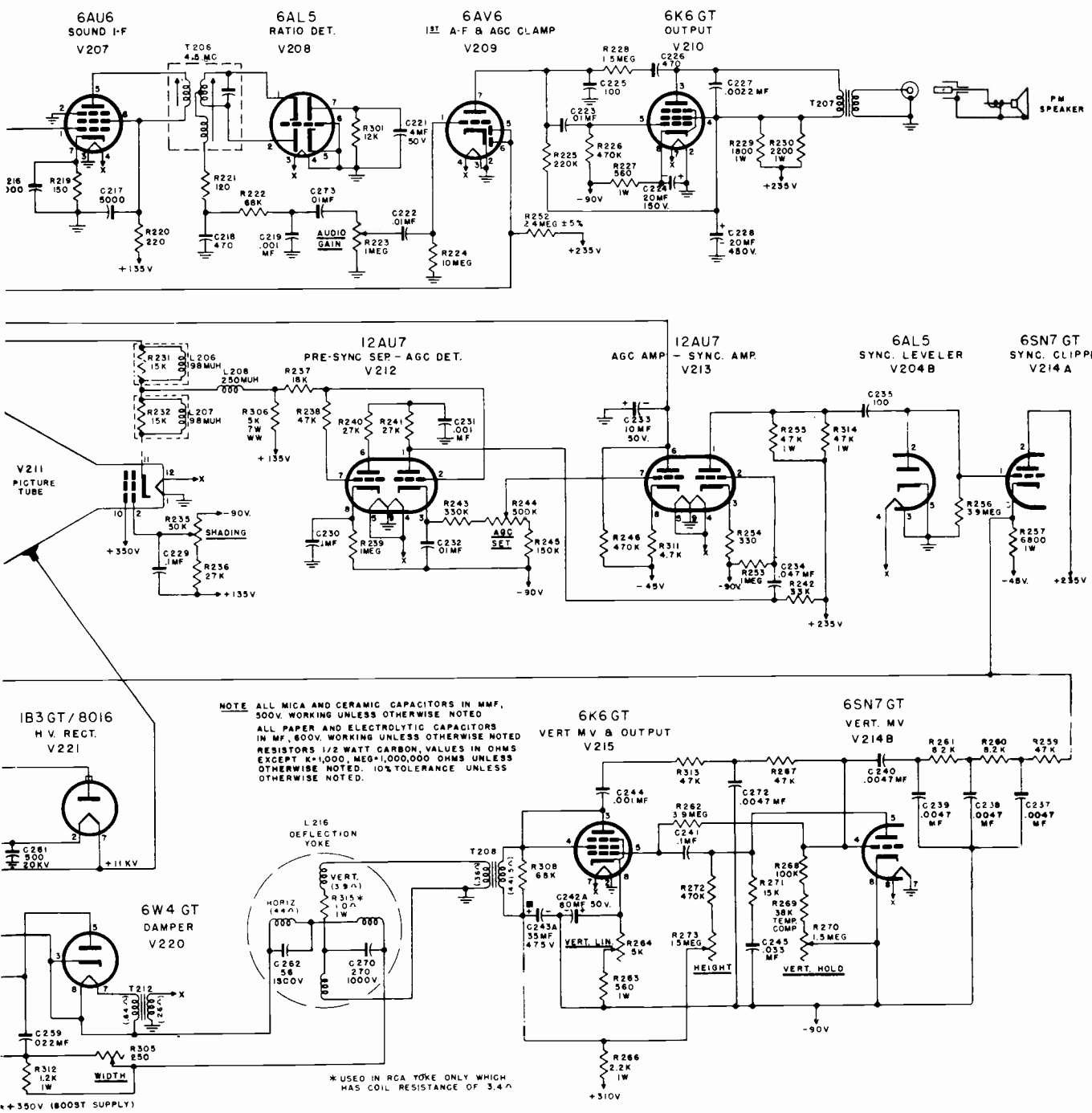
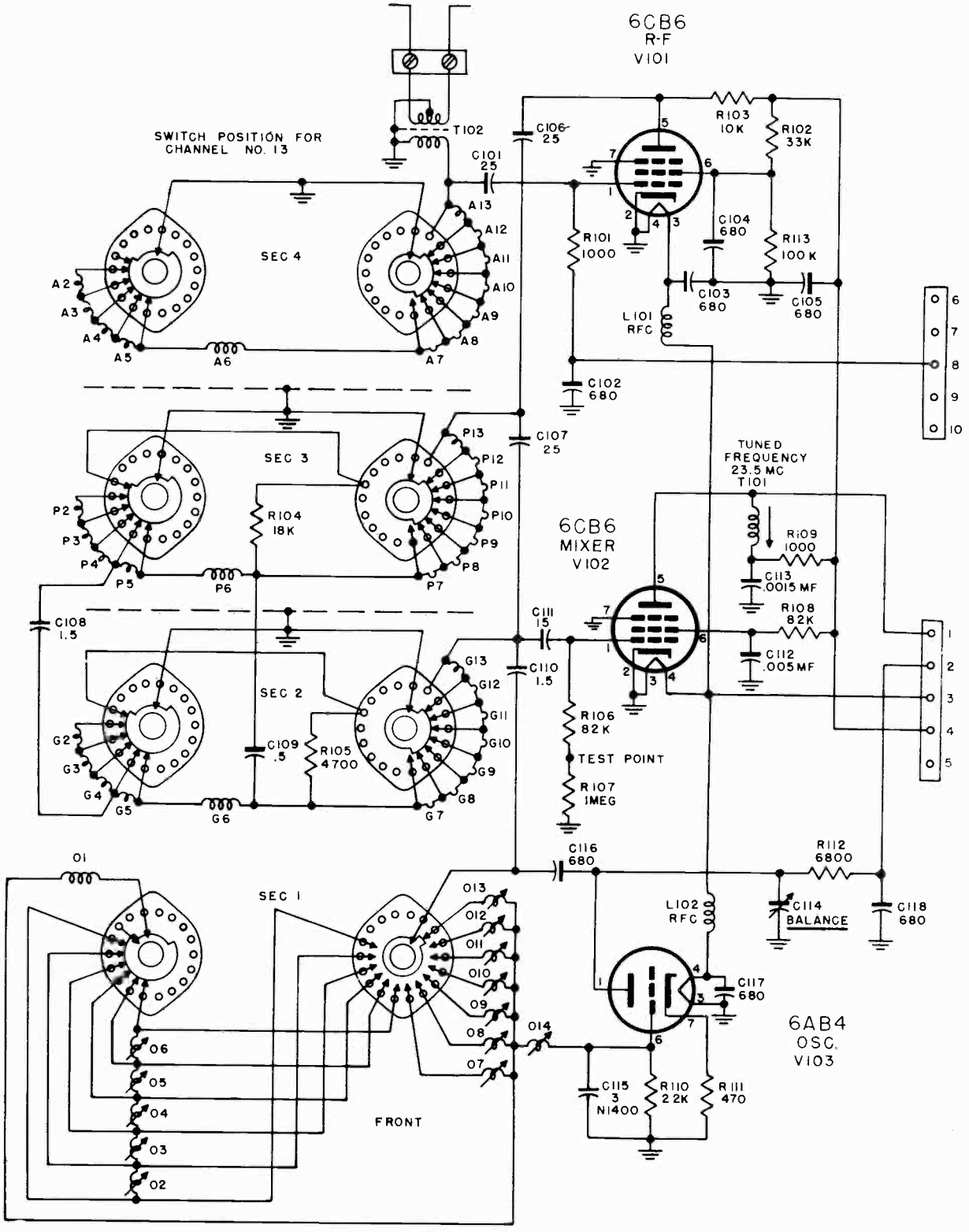
CAPEHART-FARNSWORTH

THIS SCHEMATIC CORRECT FOR THE FOLLOWING CHASSIS:

CHASSIS NO.	PICTURE TUBE	PRODUCTION NO.	SERIES
CX-33	FARNSWORTH "160-AR"	C-281	-2
CX-33F	16GP4	C-286	



Capehart-Farnsworth "CX-33" Television Chassis, Tuner Schematic Diagram



R-F Tuner (Part No. 850078D-1) Schematic

Capehart-Farnsworth "CX-33" Television Chassis, Waveform Analysis

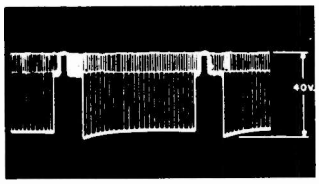
The following waveforms were obtained from a production run CX-33, Series "-2" receiver, with a standard transmitted picture signal connected to the input of the receiver.

The waveforms shown here have been sized for purposes of reproduction and they are not intended to show relative amplitudes. Approximate peak-to-peak voltages are shown on each waveform. These voltages were obtained by calibrating the oscilloscope used to observe the waveforms. The approximate values of peak-to-peak voltage are those that may be expected to be obtained with the AGC Set and Shading controls adjusted for optimum picture contrast and all other controls adjusted for normal operation.

Two separate waveforms are shown at those points where it is intended to show both the vertical and horizontal pulses. For viewing the vertical sync pulse or waveforms in the vertical sweep circuits, the oscilloscope sweep is adjusted to one-half of the vertical sweep rate (30 c.p.s.). For viewing the horizontal sync pulse or waveforms in the horizontal sweep circuits, the oscilloscope sweep is adjusted to one-half the horizontal sweep rate (7875 c.p.s.).

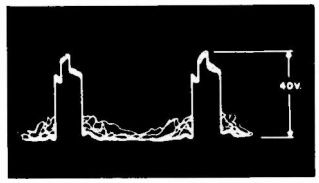
Slight variations in waveform may be noticed in the sync circuits when the receiver is switched to different TV stations. This is due to the slight variation which is tolerated in the transmitted waveform at the station. Some variation in waveform and in peak-to-peak voltage may also be expected due to the response of the particular oscilloscope used to observe the waveforms. When using the waveforms in trouble shooting, these factors should be taken into consideration to avoid possible incorrect conclusions. CAUTION - No waveforms are shown for points in the Horizontal Output Stage other than the control grid and cathode due to the high pulse voltages which exists in the output of this stage. DO NOT attempt to observe waveforms in the horizontal deflection yoke, Horizontal Damper or H. V. Rectifier circuits.

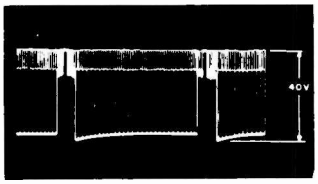
SYNC CIRCUITS



Picture Tube Cathode
(Pin 11 of V211)

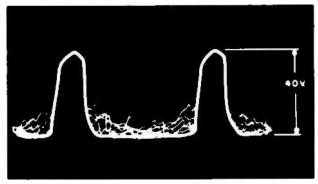
Vertical ← → Horizontal

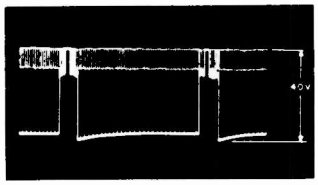




Input to Pre-Sync Separator
(Pin 7 of V212, ½12AU7)

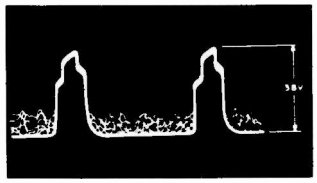
Vertical ← → Horizontal

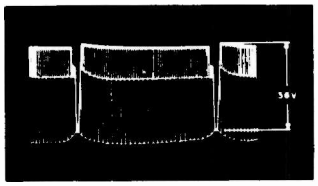




Input to AGC Detector
(Pin 2 of V212, ½12AU7)

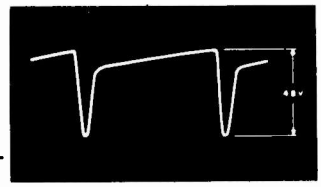
Vertical ← → Horizontal





Input to Sync Amplifier
(Pin 2 of V213, ½12AU7)

Vertical ← → Horizontal



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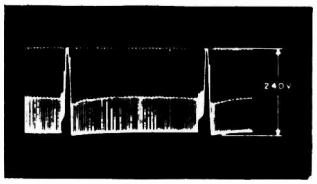
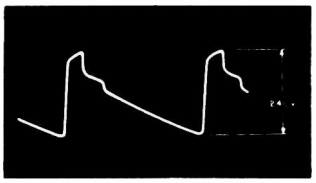
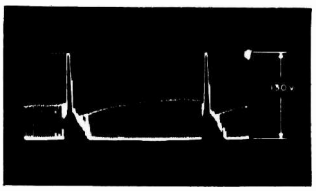
Capehart-Farnsworth "CX-33" Television Chassis, Waveform Analysis, continued



Output of Sync Amplifier
(Pin 1 of V213, ½12AU7)

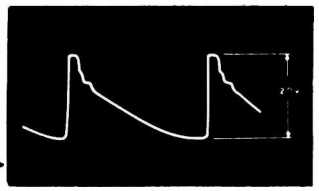
Vertical ← → Horizontal

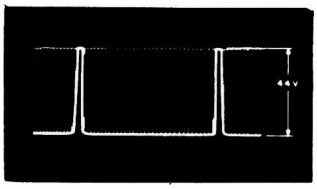




Input to Sync Clipper
(Pin 1 of V214A, ½ 6SN7)

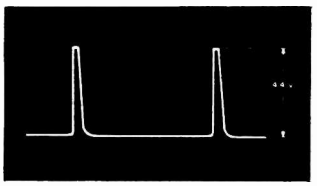
Vertical ← → Horizontal



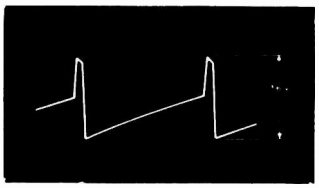


Cathode of Sync Clipper
(Pin 3 of V214A, ½6SN7)

Vertical ← → Horizontal



HORIZONTAL SCAN CIRCUITS



Input to AFC Detector
(Terminal E of T209)

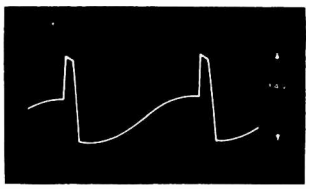


Plate of AFC Detector
(Terminal D of T209)

VERT. SCAN CIRCUITS

Grid of Vertical M. V.
(Pin 4 of V214B, ½6SN7)

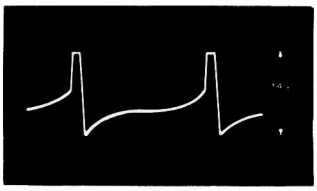
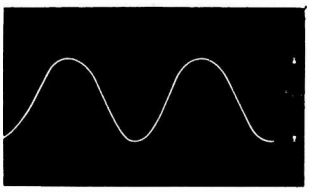
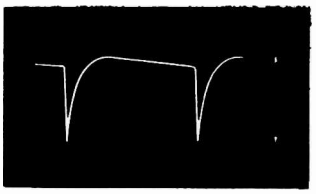


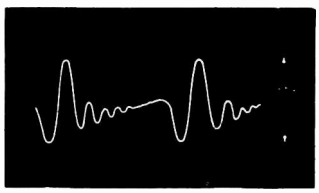
Plate of AFC Detector
(Terminal F of T209)



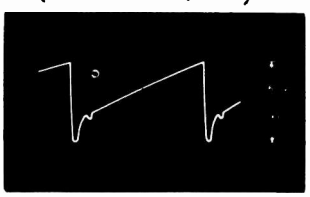
Grid of Horiz. Oscillator
(Pin 1 of V218)



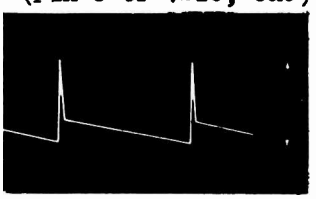
Grid of Vert. M.V. & Output
(Pin 5 of V215, 6K6)



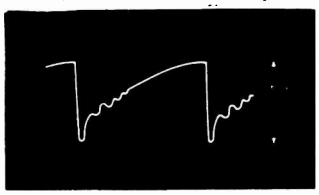
Grid of Horiz. Discharge
(Pin 4 of V218)



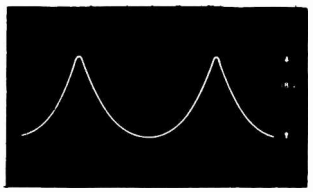
Output of Horiz. Discharge
(Pin 5 of V218)



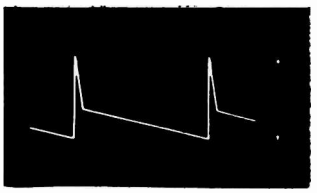
Output of Vert. M.V. & Output
(Pin 3 of V215, 6K6)



Input to Horiz. Output
(Pin 5 of V219)



Cathode of Horiz. Output
(Pin 3 of V219)



Input to Vert. Defl. Coils
(Green lead of L216)

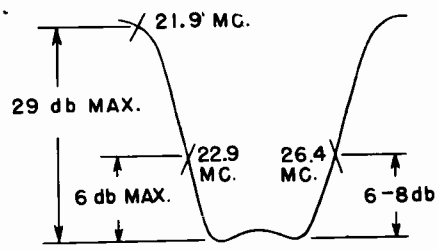
CROSLEY

MODEL 10-421MU

In case you are called upon to service Crosley Model 10-401, you will find that model similar to the set described here, but using but one 5U4G rectifier and having other minor differences. This set uses a 10-inch picture tube. Model 10-430 BU is also similar to the set 10-421 MU described here, but it uses a 12-inch tube. Model 10-428 MU is a 14-inch set and is also similar to the model covered on the next four pages.

I-F ALIGNMENT

1. Connect a short clip lead from B- (-4 volts) to AGC terminal (white-black lead near V102) of the I-F stages.
2. Connect an electronic voltmeter across R118.
3. Connect "hot" lead of signal generator to grid (pin #1) of V101.
*4. Set signal generator to 25.65 mc. and adjust L107 and L103 for maximum meter deflection.
*5. Reset signal generator to 23.7 mc. and adjust L105 and L102 for maximum meter deflection.
6. Disconnect the electronic voltmeter and signal generator from grid of V101. Connect a scope to the CRT grid. Keep scope leads as far away as possible from the IF stages. Connect a video sweep signal to the adjusting screw (top of chassis on tuner) of C3. Ground lead of sweep signal should be connected to main chassis as close as possible to the hot lead. Remove the oscillator tube V3. Tuner should be approximately 1-1/2 turns counter-clockwise from the high end (Channel #13). Contrast control should be set as low as possible and still obtain reasonable deflection on the scope.



7. Adjust L101 for 26.4 mc. to fall 6 db down from the peak with as flat a curve as possible across the bottom.
8. Disconnect sweep signal and clip lead from B- to AGC terminal.

* NOTE: In steps 4 and 5 limit DC meter deflection to 3.5 volts maximum by adjusting attenuator of signal input.

SOUND ALIGNMENT

1. Connect "hot" lead of signal generator to grid (pin #1) of V106. Set signal generator to 4.5 mc. with 400 c.p.s. amplitude modulated 30% or greater.
2. Connect scope to CRT grid through a detector probe.
3. Connect two 100 K ohm resistors (matched within 1%) in series across R139 (pin 2 and 7 of V110A) Connect common lead of electronic voltmeter to junction of the matched 100K ohm resistors and the DC lead to + 150 volt point at junction of C128 (pin #4 of V110).
4. Using a high level signal input and with the contrast control set at maximum, tune the sound takeoff transformer (T101) primary adjustment (bottom of chassis) for minimum deflection on the scope.
5. Reduce signal input to below limiting in V107 and adjust sound take-off transformer (T101) secondary (top of chassis), and ratio detector transformer (T102) primary (top of chassis) for peak meter reading.
6. Repeat steps 4 and 5.
7. Transfer DC lead only of electronic voltmeter to junction of R140 and C131.
8. Return to high level signal input for limiting in V107 and adjust ratio detector transformer (T102) secondary (bottom of chassis) for minimum buzz, corresponding with undistorted output.
9. Remove the two 100 K ohm resistors, and all test equipment from the receiver.

AGC ADJUSTMENT

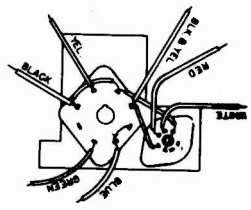
Connect scope (direct) to detector load resistor R118. Tune in a station with a strong signal and adjust the Automatic Gain Control on the rear apron of the chassis for 5 volts + 1/2 volt peak to peak (white to sync tip) detector output.

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

CROSLEY
MODEL 10-421 MU

V113 & V114 SOCKET CONNECTIONS TO WIRING JUNCTION SOCKET

WJ SOCKET LUG	WIRE COLOR	FROM PIN	TUBE ABOVE CHASSIS	TUBE ELEMENT
1	WHITE	8	6C4	GRID
2	RED	5	6C4	PLATE
3	—	—	—	—
4	GREEN	5	6V6GT	GRID
5	BLUE	3 & 4	6V6GT	PLATE & SCREEN
6	YELLOW	8	6V6GT	CATHODE
7	BLK-YEL	2	6V6GT	HEATER
8	BLACK GREEN	7 7 & 3	6V6GT 6C4	HEATER CATHODE & HEATER



CROSLEY TELEVISION
MODEL 10-421MU

NOTES:

1A. SOCKET VOLTAGES MEASURED WITH AN ELECTRONIC VOLTMETER CONNECTED FROM SOCKET LUG TO CHASSIS.

B. SUPPLY VOLTAGE 117V. 60 CYCLE AC.

C. VOLTAGE MEASURED WITH CONTROLS SET TO OBTAIN A NORMAL PICTURE AND + 13 VOLTS DC. ON GRID PIN 2 OF THE PICTURE TUBE.

D. VOLTAGES MAY VARY DEPENDING UPON THE SETTING OF THE VARIOUS CONTROLS.

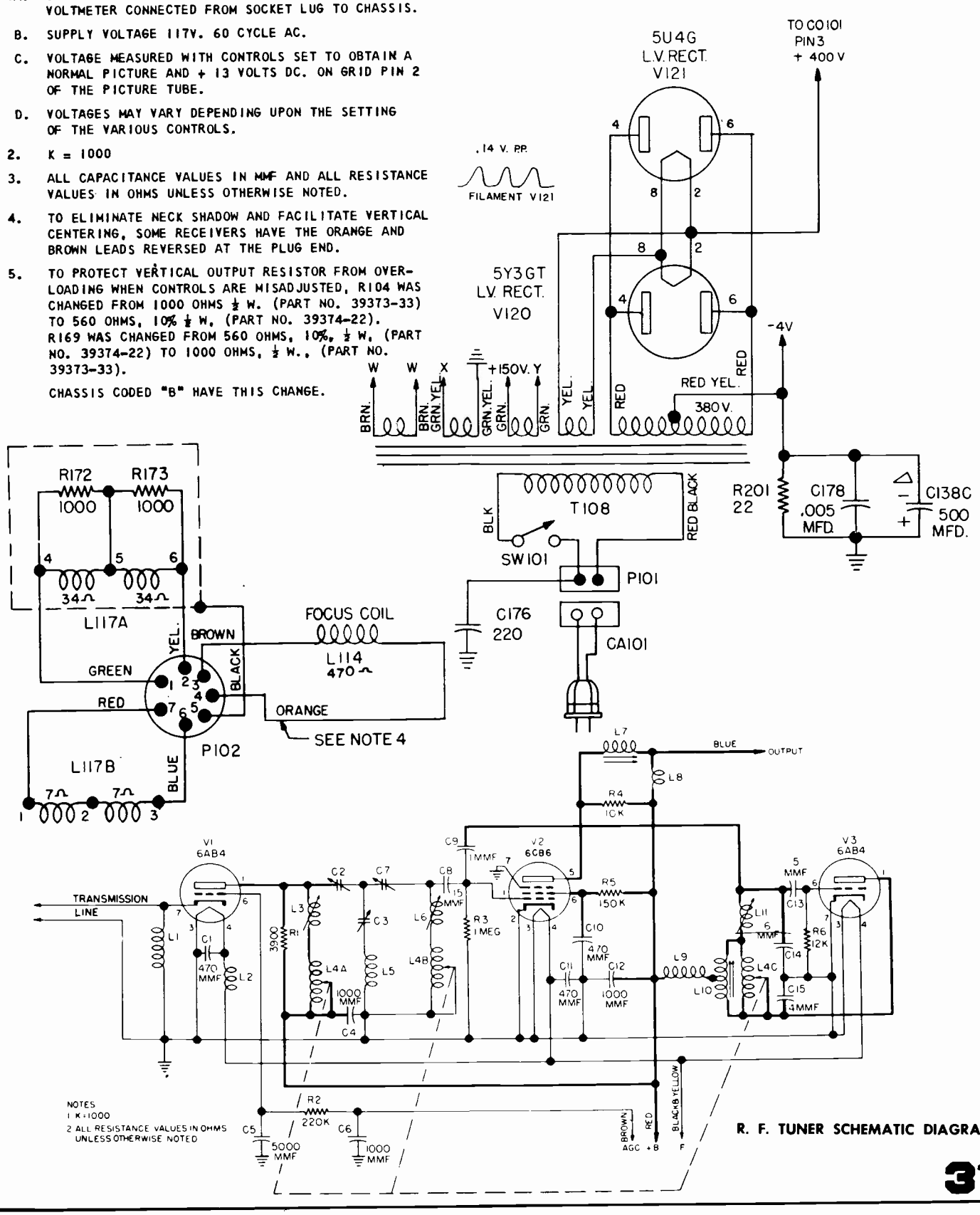
2. K = 1000

3. ALL CAPACITANCE VALUES IN MMF AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE NOTED.

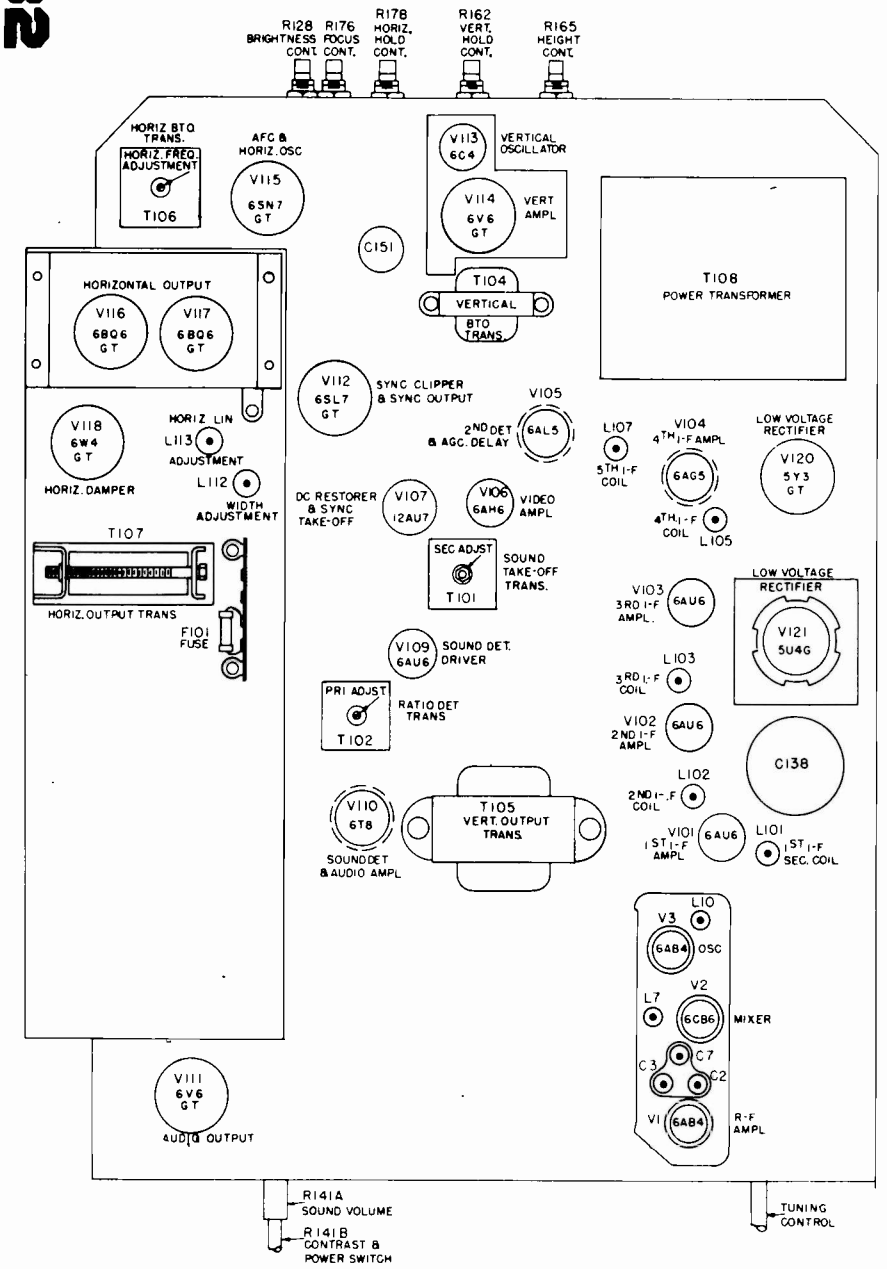
4. TO ELIMINATE NECK SHADOW AND FACILITATE VERTICAL CENTERING, SOME RECEIVERS HAVE THE ORANGE AND BROWN LEADS REVERSED AT THE PLUG END.

5. TO PROTECT VERTICAL OUTPUT RESISTOR FROM OVERLOADING WHEN CONTROLS ARE MISADJUSTED, R104 WAS CHANGED FROM 1000 OHMS ½ W. (PART NO. 39373-33) TO 560 OHMS, 10% ½ W. (PART NO. 39374-22). R169 WAS CHANGED FROM 560 OHMS, 10%, ½ W. (PART NO. 39374-22) TO 1000 OHMS, ½ W., (PART NO. 39373-33).

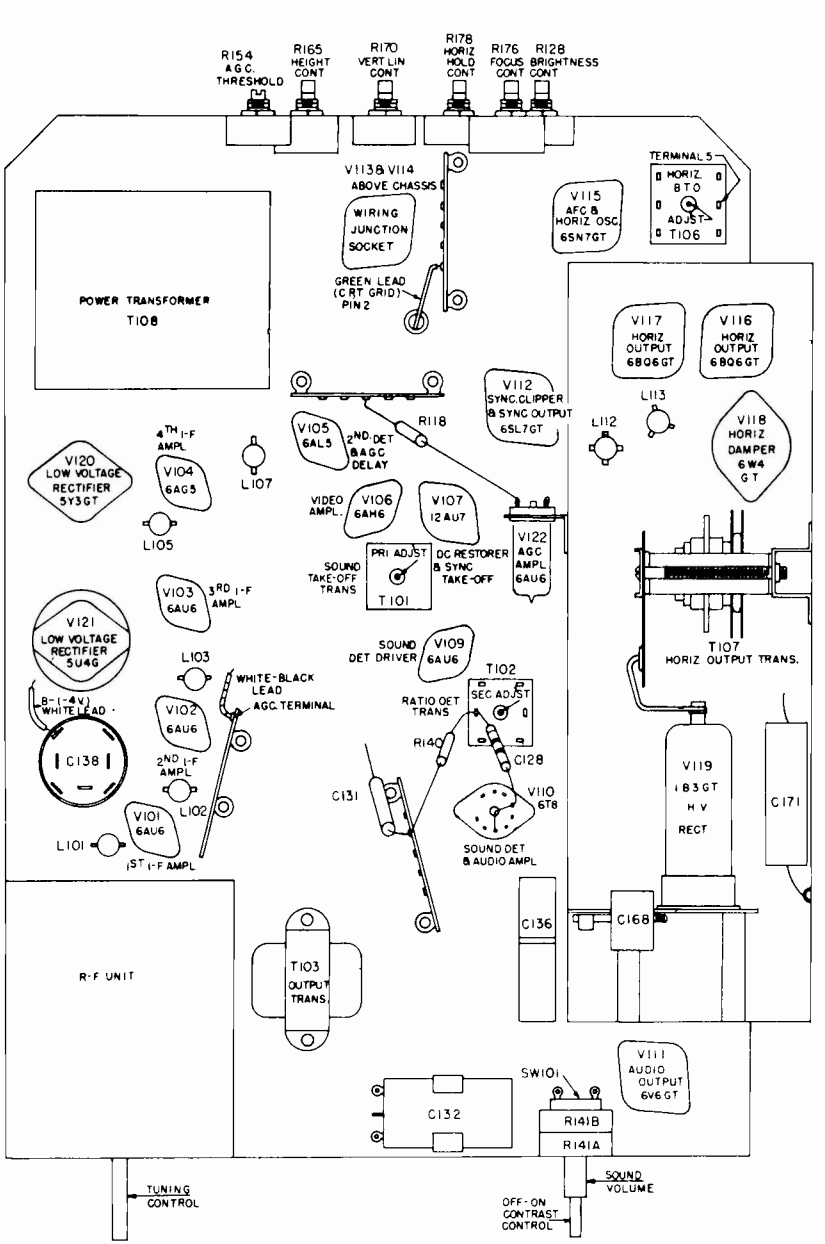
CHASSIS CODED "B" HAVE THIS CHANGE.



R. F. TUNER SCHEMATIC DIAGRAM



Chassis Top View Showing Tube and Alignment Locations



Chassis Bottom View Showing Tube Socket and Alignment Locations

CROSLEY

TELEVISION SERVICE INFORMATION

MODELS: 11-442MIU, 11-444MU, 11-453MU, 11-460MU, 11-470BU, 11-472BIU, 11-474BU, 11-483BU
(Chassis 331)

The material on the next six pages covers service information on the Chassis 331 used in models listed above. Several other chassis used in many additional models are very similar to Chassis 331, and therefore this material may be used as an aid in servicing these additional sets. These similar sets may use larger or smaller picture tubes, may have similar type but different number tubes in some of the circuits, and may differ in other respects. In the main, however, these service notes will be applicable to:

Chassis 320, Models 11-441 MU, 11-461 WU, 11-471 BU,

Chassis 321, 321-1, 321-2, Models 11-445MU, 11-447MU, 11-459MU, 11-459MIU, 11-465WU, 11-475BU, 11-477BU,

Chassis 323, Models 11-443MU, and 11-473BU,

Chassis 325, Models 11-446MU, and 11-476BU.

SOCKET VOLTAGE TABLE

The following voltages are measured with an electronic voltmeter from socket lugs to ground (chassis) while the set is operating on a 117 volt, 60 cycle A. C. current. Controls are set to obtain a normal picture with +15 volts D. C. on grid (Pin 2) of the picture tube. Some A. C. voltages measured between socket lugs as noted.

Voltages may vary depending upon the setting of the various controls.

Symbol	Tube Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6CB6	-0.1	0.9	Gnd.	*6.3	120	115	Gnd.	....	....
V2	12AT7	140	-2.7	Gnd.	Gnd.	Gnd.	110	-5	Gnd.	*6.3
V101	6AU6	-3.2	Gnd.	*6.3	Gnd.	140	140	-2	....	....
V102	6AU6	-3.2	Gnd.	*6.3	Gnd.	140	140	<0.1	....	....
V103	6AU6	0	Gnd.	*6.3	Gnd.	135	135	0.9	....	....
V104	6AG5 or 6BC5	0	N. C.	Gnd.	*6.3	135	135	0.8	....	....
V105	6AL5	Gnd.	-4.8	*6.3	Gnd.	▲2.3	Gnd.	▲-2.4	....	....
V106	6AH6	▲2.3	Gnd.	*6.3	Gnd.	220	240	2.2	....	....
V107	12AU7	6.5	Gnd.	16	*6.3	*6.3	N. C.	▲2.3	4.8	Gnd.
V108	17BP4	Gnd.	15	....	....	....	(Pin 10) 350	(Pin 11) 45	(Pin 12) *6.3	Anode 12.3KV
V109	6AU6	0	Gnd.	*6.3	Gnd.	54	58	1	....	....
V110	6T8	-5.2	-7.6	-5.2	Gnd.	*6.3	Gnd.	Gnd.	-1	110
V111	6V6GT	N. C.	2 to 7 *6.3	350	360	135	W. J.	7 to 2 *6.3	175	....
V112	6AU6	-2.2	Gnd.	*6.3	Gnd.	-42	130	4.8	....	....
V113	6SL7GT	120	320	155	100	420	160	7 to 8 *6.3	8 to 7 *6.3	....
V114	6C4	N. C.	N. C.	*6.3	Gnd.	160	-36	Gnd.	....	....
V115	6V6GT	N. C.	*6.3	360	360	0.1	W. J.	Gnd.	33	....
V116	6SN7GT	-80	270	Gnd.	-25	140	-5	*6.3	Gnd.	....
V117	6BQ6GT	N. C.	*6.3	N. C.	120	-19	W. J.	Gnd.	Gnd.	....
V118	6BQ6GT	N. C.	*6.3	W. J.	120	-19	W. J.	Gnd.	Gnd.	....
V119	1B3GT	....	....	....	....	....	....	....	....	....
V120	6W4GT	N. C.	W. J.	515	N. C.	350	N. C.	7 to 8 *6.3	7 to 8 *6.3	....
V121	5U4G	N. C.	400	W. J.	*360	N. C.	*360	W. J.	400	....
V122	5U4G	N. C.	400	W. J.	*360	N. C.	*360	W. J.	400	....

All voltages plus volts unless otherwise noted.

The following symbols denote:

*=A. C. voltage

N. C.=No connection

W. J.=Wiring junction

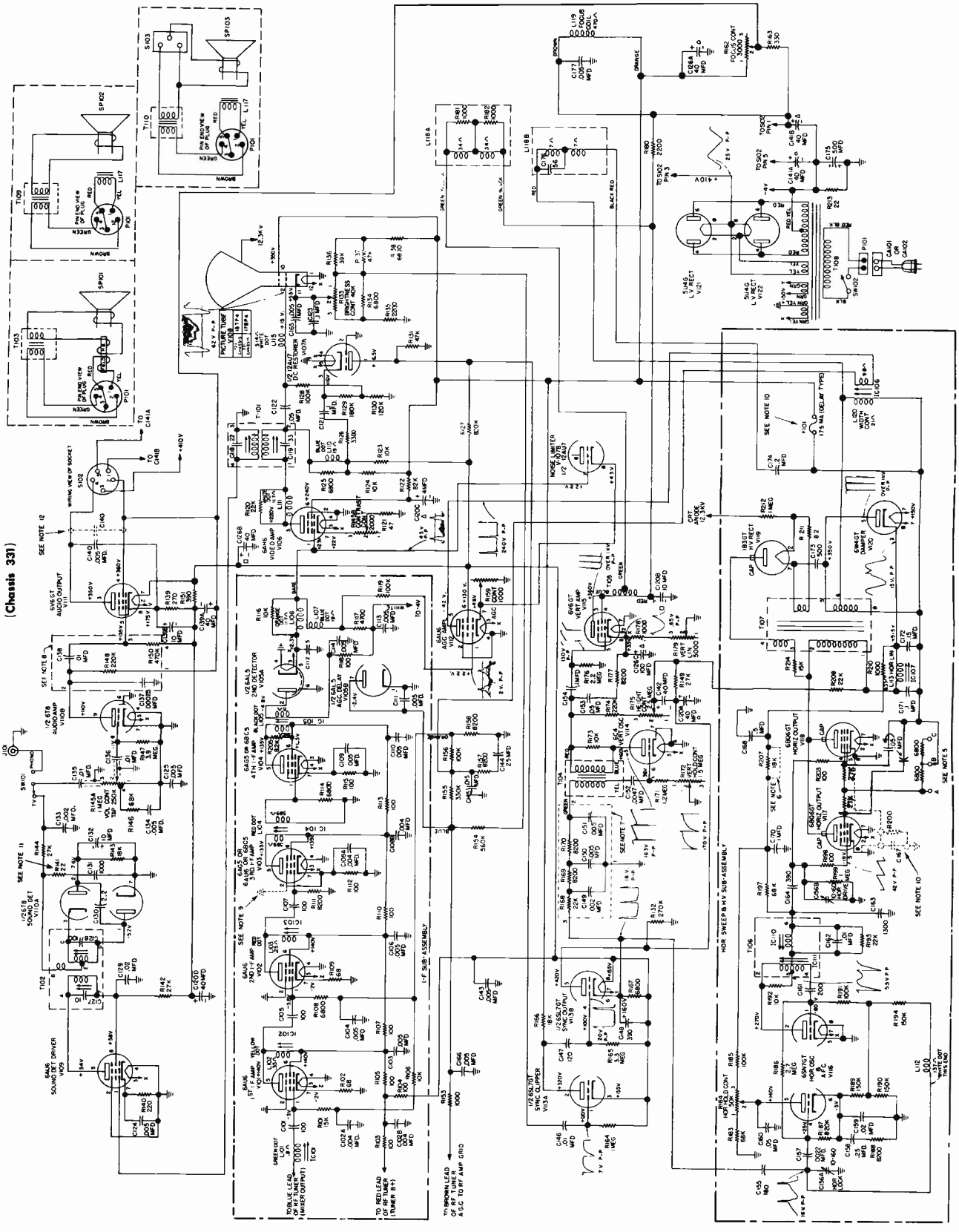
<=less than

▲=A.G.C. voltage (variable with signal strength)

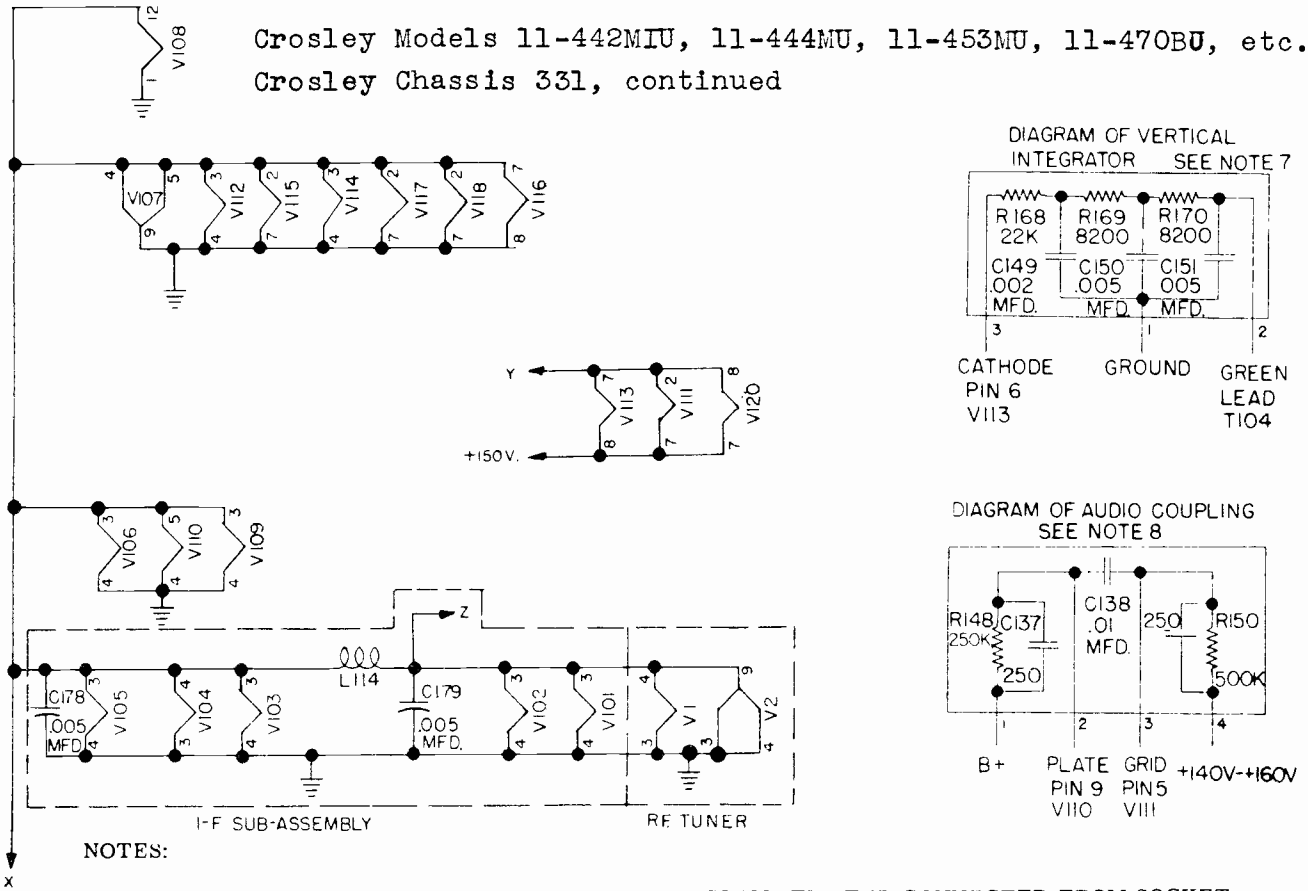
CROSLEY

MODELS 11-442MIU, 11-444MU, 11-453MU, 11-460MU, 11-470BU, 11-472BIU, 11-474BU, 11-483BU

(Chassis 331)



Crosley Models 11-442MIU, 11-444MU, 11-453MU, 11-470BU, etc.
Crosley Chassis 331, continued

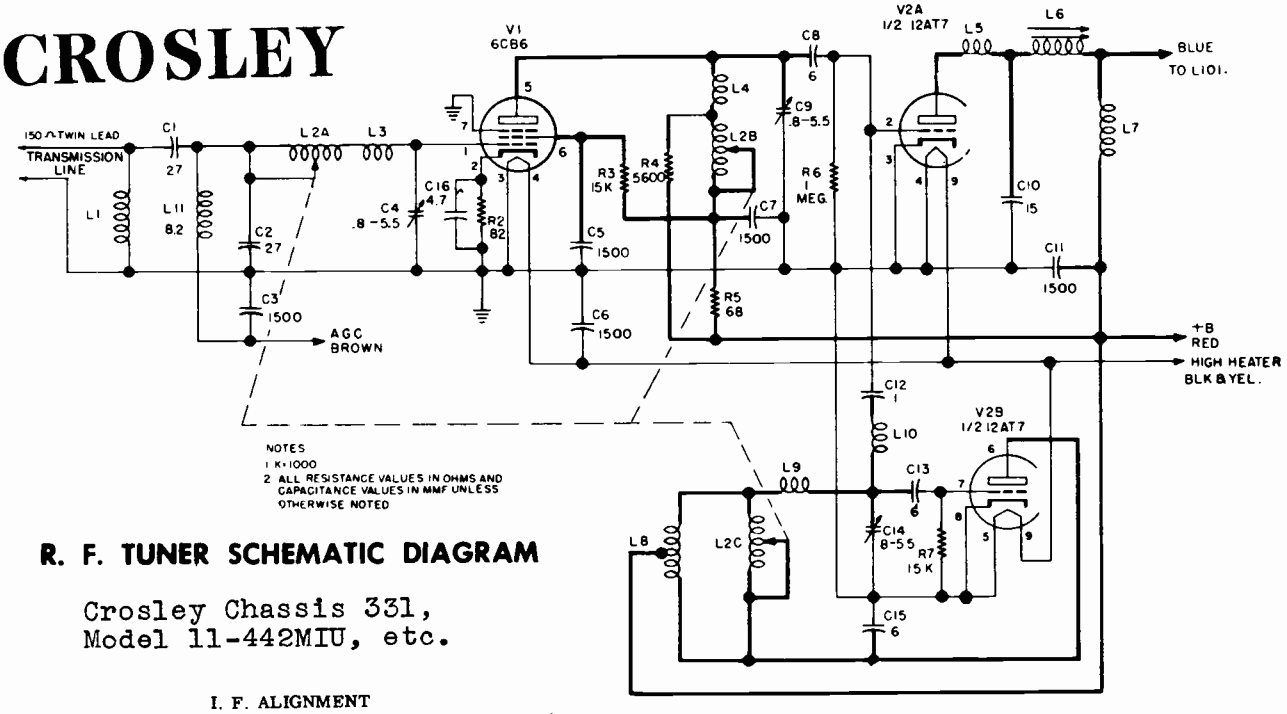


NOTES:

1. ALL VOLTAGES MEASURED WITH AN ELECTRONIC VOLTMETER CONNECTED FROM SOCKET LUG TO CHASSIS.
2. SUPPLY VOLTAGE 117V., 60 CYCLE AC.
3. K = 1000
4. ALL CAPACITANCE VALUES IN MMF. & ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE NOTED.
5. SCREEN VOLTAGE ADJUSTMENT FOR V117 & V118

   NOMINAL — TERMINAL B
   HIGH — TERMINAL A
   LOW — TERMINAL C
6. SOME SETS ARE EQUIPPED WITH A BARE WIRE SHUNTING R207. IF HORIZONTAL DRIVE IS EXCESSIVE, REMOVE THE BARE WIRE ACROSS R207.
7. IN SOME RECEIVERS, C149, C150, C151, R168, R169, AND R170 ARE A RESISTOR-CAPACITOR UNIT, (PART NO. W-149878). SEE DIAGRAM ABOVE.
8. IN SOME RECEIVERS C137, C138, R148 AND R150 ARE A RESISTOR-CAPACITOR UNIT (PART NO. W-149881). SEE DIAGRAM ABOVE.
9. ON SOME SETS LUG 2 OF V103 IS CONNECTED TO GROUND AND NOT TO LUG 7. THESE SETS ARE EQUIPPED WITH A 6AU6 TUBE. BY CONNECTING LUG 2 TO LUG 7 AS SHOWN BY THE SOLID LINES IN SCHEMATIC, EITHER A 6AG5, 6AU6, OR 6BC5 TUBE MAY BE USED IN THE V103 SOCKET. WHEN REPLACING THIS TUBE, RE-ALIGN THE 3rd. I.F. STAGE.
10. ON SETS LABELED TO USE A 175 M.A. DELAY TYPE FUSE (PART NO. W-150065), C167 AND R200 ARE DELETED; THE CATHODES OF V117 AND V118 ARE THEN GROUNDED. IN THE FIELD, IT IS NOT NECESSARY TO REMOVE C167 AND R200 AND TO GROUND THE CATHODES WHEN REPLACING THE FUSE WITH A DELAY TYPE FUSE.
11. SOME SETS ARE EQUIPPED WITH A 68 OHM, 10%, 1/2 WATT RESISTOR (PART NO. 39374-11).
12. IN EARLY PRODUCTION RECEIVERS, C140 IS CONNECTED AS SHOWN BY DOTTED LINES. IN LATER PRODUCTION SETS, C140 IS CONNECTED AS SHOWN BY SOLID LINES TO PREVENT PARASITIC OSCILLATION IN THE AUDIO OUTPUT TUBE.

CROSLEY



R. F. TUNER SCHEMATIC DIAGRAM

Crosley Chassis 331,
Model 11-442MIU, etc.

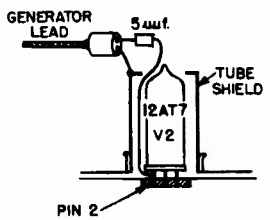
I. F. ALIGNMENT

1. To check I. F. alignment on oscilloscope:

   a. Connect a short clip lead from B- (-6.3 volts, white wire on C141) on the AGC terminal (orange lead) on the terminal board mounted on the I. F. strip close to L102.

   b. Connect high side of scope to the bare lead on pin 1 of the Video Amplifier V106, and the low side to ground (chassis).

   c. Connect sweep signal generator to the grid (pin 2) of the Mixer tube V2 (see illustration below) making sure that the leads are as short and direct as possible, connecting ground terminal of generator to the tube shield and the "hot" terminal through a 5 mmf. capacitor to the grid pin.

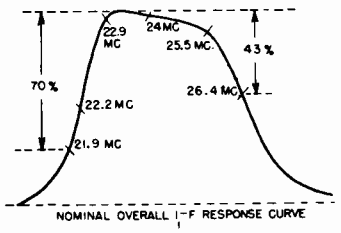


   d. Set generator to sweep from 20 mc. to 30 mc. and adjust output to provide a 2 volt peak to peak signal on the scope.

   e. Set tuner near the low frequency end of the range approximately 4 to 5 turns clockwise at a point where there are no spurious responses.

   f. 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.

   g. Observe curve and position of markers (see nominal response curve in column two), 21.9 mc. should be approximately 70% down from the peak and 26.4 approximately 43% down. Slight deviation in shape from the nominal response curve is permissible, but if any great variation 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 and regeneration.



   h. Disconnect the generators, scope and the clip lead from B- to AGC terminal.

2. Connect a short clip lead from B- (-6.3 volts, white wire on C141) to the AGC terminal (orange lead) on the terminal board mounted on the I. F. strip close to L102.

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

4. Connect signal generator as in (c) of "I. F. Alignment Check."

5. Set tuner near low frequency end of range approximately 4 to 5 turns clockwise at a point where there are no spurious responses.

6. 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.

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

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

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

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

11. Repeat steps 6, 7, 8, 9, and 10.

12. Disconnect signal generator, electronic voltmeter and clip lead from B- to the AGC terminal.

Crosley Chassis 331, Models 11-442MIU, 11-444MU, 11-453MU, 11-460MU, etc.

SOUND ALIGNMENT

1. Connect "hot" lead of signal generator to grid (pin #1) of V106. Set signal generator to 4.5 mc. with 400 cps. amplitude modulated signal modulated 30% or greater.
2. Connect scope to picture tube grid (pin #2) through detector probe.
3. Connect two 100 K ohm resistors (matched to within 1%) in series across ratio detector load resistor R143 (pin 2 of V110 to chassis). Connect common lead of the electronic voltmeter to the junction of the matched 100 K ohm resistors and the D.C. lead of the voltmeter to ground (chassis).
4. Using a high level signal input and with the Contrast control set at maximum, tune the Sound Take-off Transformer (T101) primary adjustment (bottom of chassis) for minimum deflection on the scope.
5. Reduce signal input to below limiting in V109 and adjust the Sound Take-off Transformer (T101) Secondary (Top of Chassis), and the Ratio Detector Transformer (T102) *primary for peak meter reading.
6. Repeat Steps 4 and 5.
7. Remove detector probe and scope from the picture tube grid.
8. Transfer D.C. lead only of the electronic voltmeter to junction of R144 and C133. (lower of T.V. phono switch terminal toward speaker socket.)
9. Return to high level signal input for limiting V109 and adjust the Ratio Detector Transformer (T102) *secondary for zero meter reading.
10. Remove the two 100 K 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. When using two driver tubes in parallel operation, this setting becomes more critical than in single tube circuits. 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 up this 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 tubes, they will draw excessive current which will seriously shorten their life. This condition corresponds to the drive trimmer being adjusted too far in the clockwise direction.

When it becomes necessary to replace one of the horizontal output tubes, two new tubes, matched to draw equal plate current should be chosen and both the driver tubes should be replaced.

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 tubes 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.

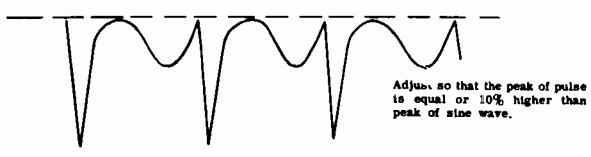
NOTE: In rare cases where low B_+ voltage is encountered, it may be necessary to change the screen resistor connection of V117 and V118 to obtain sufficient width (see note 5 on schematic). Do not overdrive the tubes, make this change only if the width of the raster is not sufficient to cover face of the CRT.

A.G.C. ADJUSTMENT

Tune in a station with a weak signal and adjust the A.G.C. threshold control on the rear apron of 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 BTO Transformer (T106) and adjust the HORIZONTAL BTO 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.



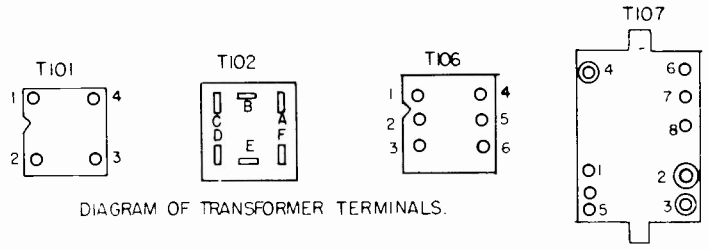
4. Turn the HORIZONTAL HOLD control fully clockwise. Adjust the HORIZONTAL FREQUENCY control (top of T106) by turning out until the raster is just out of sync, and then turning the FREQUENCY control slowly in until the raster is just ready to fall into sync (indicated by a wide black vertical or diagonal 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 retune 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 effects the horizontal frequency, the adjustments 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 pull-in range. Pull-in range should be 120^0 minimum and 220^0 maximum.
6. The final setting of the horizontal hold control should be made with a very weak picture.

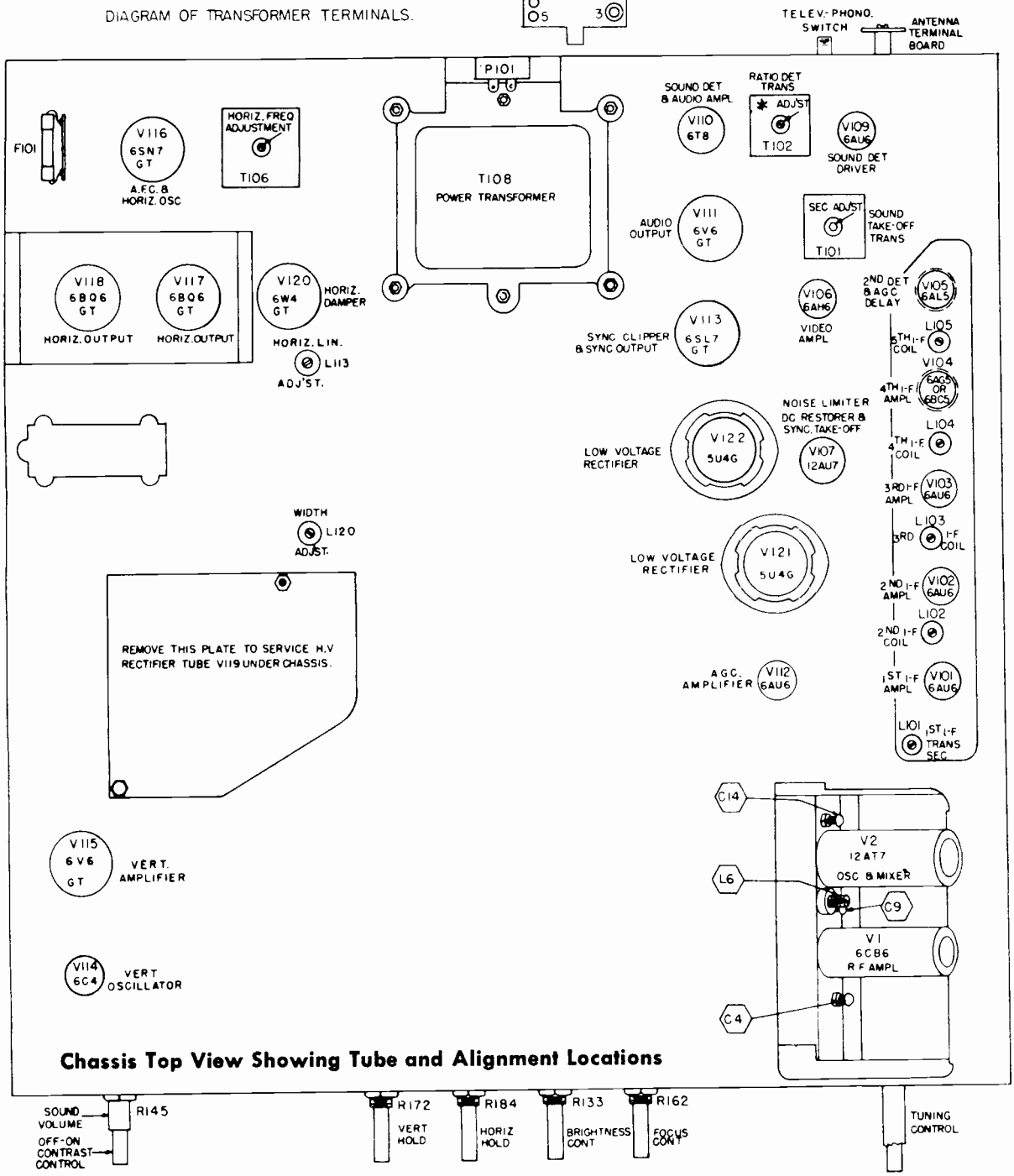
   Rotate the dial on and off the station and set the horizontal hold control so that the picture returns completely in sync.

The most important points in the Horizontal Oscillator and the AFC Alignment for most stable operation are: (1) that the raster just falls in sync at the clockwise end of the HORIZONTAL HOLD control, and (2) that the pull-in range is between 120^0 and 220^0.

*Transformers (T102) with a red or green color code have the primary adjustment on bottom and the secondary adjustment on top. Transformers without a color code have the primary adjustment on top and the secondary adjustment on bottom.

Crosley Chassis 331, Models 11-442MIU, 11-444MU, 11-453MU, 11-460MU, 11-470BU, 11-472BIU, 11-474BU, 11-483BU, (continued)





Chassis Top View Showing Tube and Alignment Locations

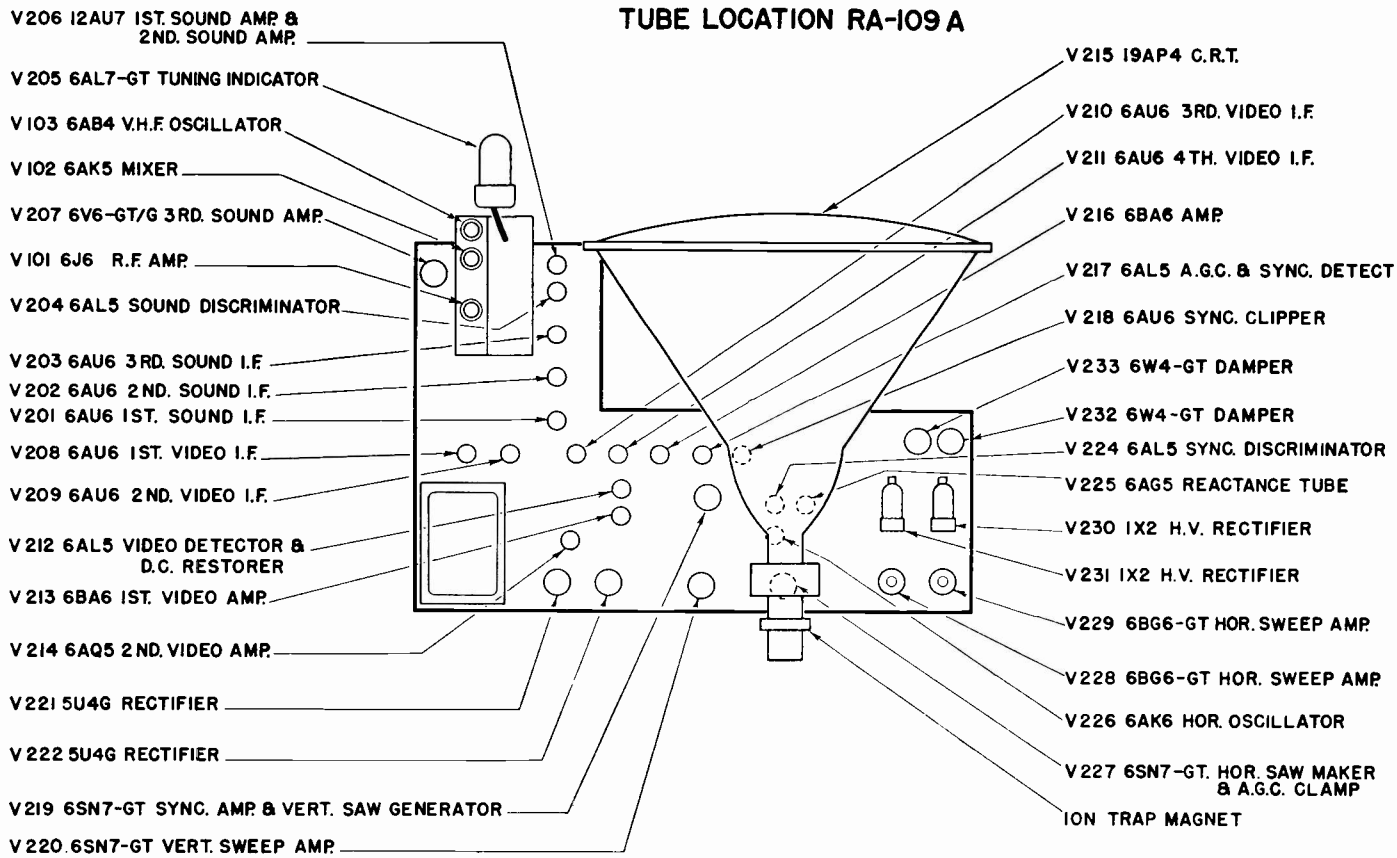
*Transformers (T102) with a red or green color code have the primary adjustment on bottom and the secondary adjustment on top. Transformers without a color code have the primary adjustment on top and the secondary adjustment on bottom.

DUMONT

RA-109A

Winslow Hanover Sherbrooke

TUBE LOCATION RA-109A



NOTES:

1. The fourth video IF tube (V211) was changed from a 6AU6 to a 6BC5 starting with chassis #0925688.
2. The cathode-ray tube (V215) was changed from a 19AP4 to a 19AP4A. ("A" type indicates use of gray filter faceplate.)
3. The reactance tube (V225) was changed from a 6AG5 to a 6BC5 starting with chassis #0925688.

RESISTANCE READINGS OF COILS

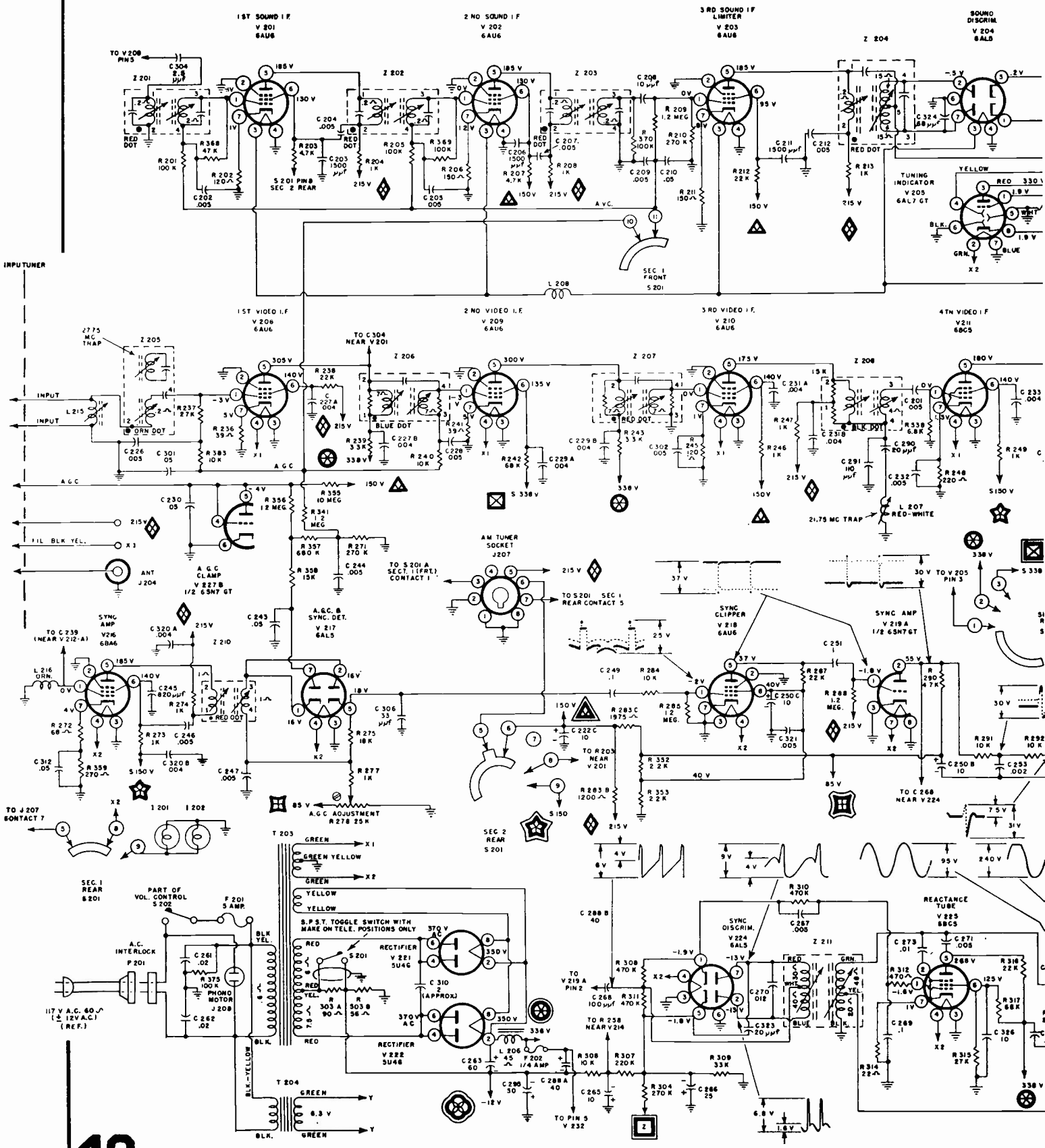
(All readings in ohms)

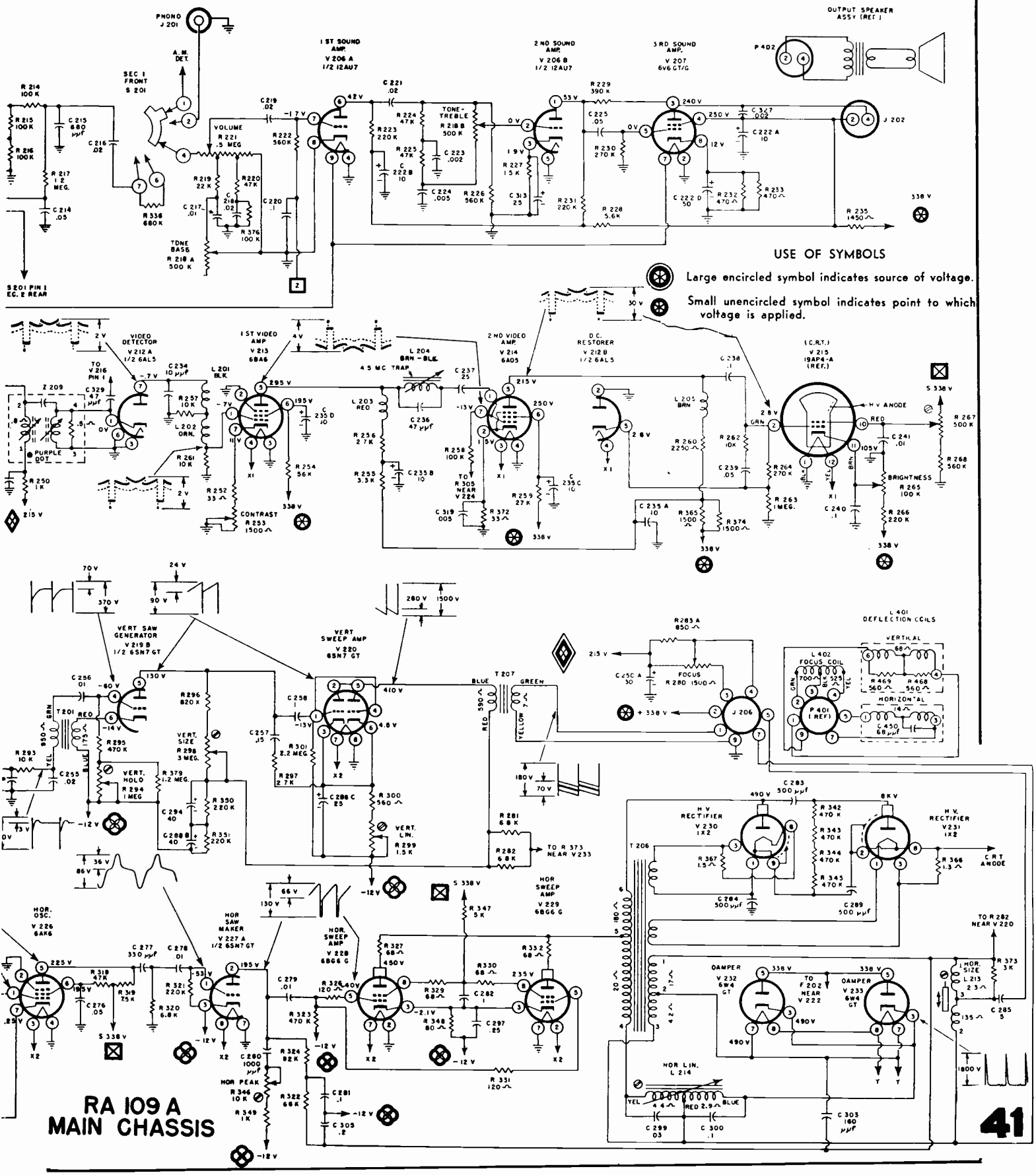
All coil readings shown were taken with coils disconnected.

Symbol	Reading
L201	1.8
L202	7.2
L203	7.5
L204	2.5
L205	3.6
L207	.1
L208	.02
L216	1.8

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

ALLEN B. DU MONT LABORATORIES, INC.

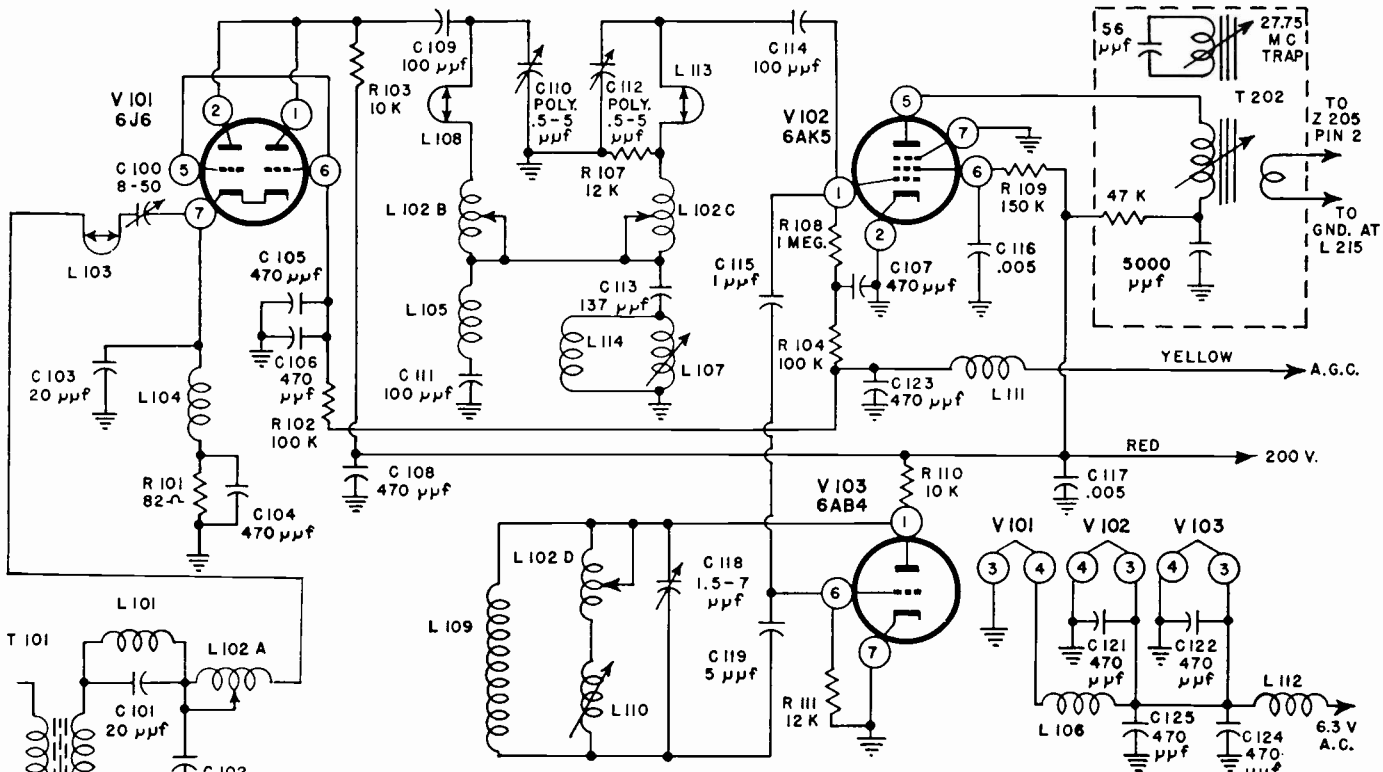




RA 109 A
MAIN CHASSIS

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

ALLEN B. DU MONT LABORATORIES, INC.



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

1. Issue 1, June 3, 1950.
2. Unless otherwise specified, all capacitors are ceramic.

RESISTANCE MEASUREMENTS — ALL READINGS TO GROUND
RA-109A CHASSIS

TUBE	1	2	3	4	5	6	7	8
V201	1.7M	0	.1	0	7.4K	10K	120	
V202	1.7M	0	.1	0	7.4K	10K	150	
V203	270K	0	.1	0	7.4K	28K	150	
V204	0	100K	.1	0	200K	0	100K	
V205	3.3K	.1	7.5K	1.5M	0	0	0	3.3K
*V206	150K	130K	1.5K	0	0	260K	850K	0
V207	0	0	9K	8.5K	270K	.1	.1	235
V208	1.5M	0	0	.05	10.5K	28K	39	
V209	1.5M	0	0	.05	11K	75K	39	
V210	.7	0	0	.05	9K	6.5K	120	
V211	6.8K	220	0	.05	7.3K	6.3K	220	
V212	.5	0	0	.05	1M	0	5.2K	
V213	5.2K	0	0	.05	13.5K	70K	33—1.5K	
V214	110K	33	.05	0	10.5K	36K	110K	
**V215	0	1.3M						
V216	.5	0	0	.1	7.3K	6.4K	338	
V217	5.2K	5.2K	0	.1	24K	0	1M	
V218	1.2M	0	0	.1	24.2K	2.2K	0	
V219	1.2M	8.4K	0	470K—1M	1.2M—5.5M	220	.05	0
V220	2.2M	430K	1K—2.5K	2.2M	430K	1K—2.5K	.05	0
V221	N.C.	7.5K	N.C.	64	N.C.	64	N.C.	7.5K
V222	N.C.	7.5K	N.C.	64	N.C.	64	N.C.	7.5K
V224	1M	500K	0	.05	33K	0	500K	
V225	1.5M	22	0	.05	33K	27K	22	
V226	220K	0	.05	0	15K	55K	20	
V227	220K	550K	56	1.8M	1.8M	0	0	.05
°V228	N.C.	0	140	500K	500K	N.C.	.05	12.5K
°°V229	N.C.	.05	140	12.5K	500K	500K	0	12.5K
†V230	INF.	N.C.	INF.	N.C.	N.C.	N.C.	N.C.	INF.
††V231	INF.	INF.	INF.	N.C.	N.C.	N.C.	N.C.	INF.
V232	N.C.	N.C.	450K	N.C.	7.4K	N.C.	450K	450K
V233	N.C.	N.C.	450K	N.C.	7.4K	N.C.	450K	450K

	10	11	12		*V206	†V230	††V231
**V215	8K-240K	70K	.1	Pin #9	.1	INF.	N.C.

	°V228	°°V229	†V230	††V231
Cap	400K	400K	450K	INF.

Selector switch in 'Television light on' 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.

NOTES

1. Issue No. 19 through P-124.
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, lights on.
   d. All coil readings were taken with coils disconnected.
   e. Video waveforms measured with contrast set for 30 volts p—p at grid of CRT.
3. Switch sections viewed from front end of switch. Rotor in extreme CCW (AM) position. Switch positions: 1. A.M. 2. Phono. 3. F.M. 4. TV, light on. 5. TV, light off.

Emerson Radio

MODELS 662B AND 663B
CHASSIS MODEL 120127-B
120128-B

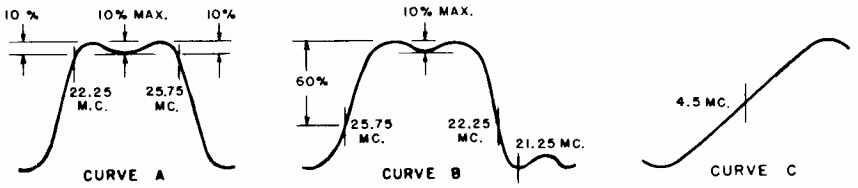


FIGURE 1 - I.F. RESPONSE CURVES

Circuit modifications found in sets coded with a triangle:

Sets coded with Triangle 1, R-90, and C-68 omitted;

Triangle 2, use a 6CB6 in place of a 6AC7 (V-5 video amplifier). These tubes are electrically the same, but require a different socket. R-47 (10 ohms) is replaced with a jumper when a 6CB6 is used;

Triangle 3, use a 6AG5 in place of a 6AU6 for V-2, also the following changes are made in the circuit: C-5 and R-8 are removed, jumper wire between pin 2 and center pin shield has been removed, a 100 ohm, $\frac{1}{2}$ w. resistor is added between pins 2 and 3 of V-2 (6AG5).

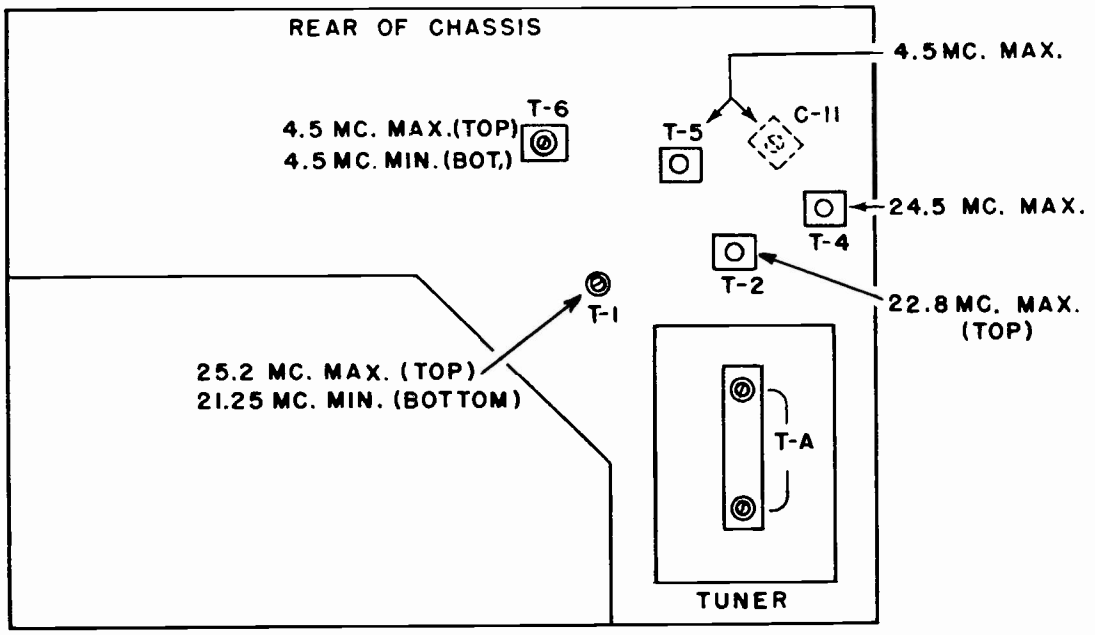
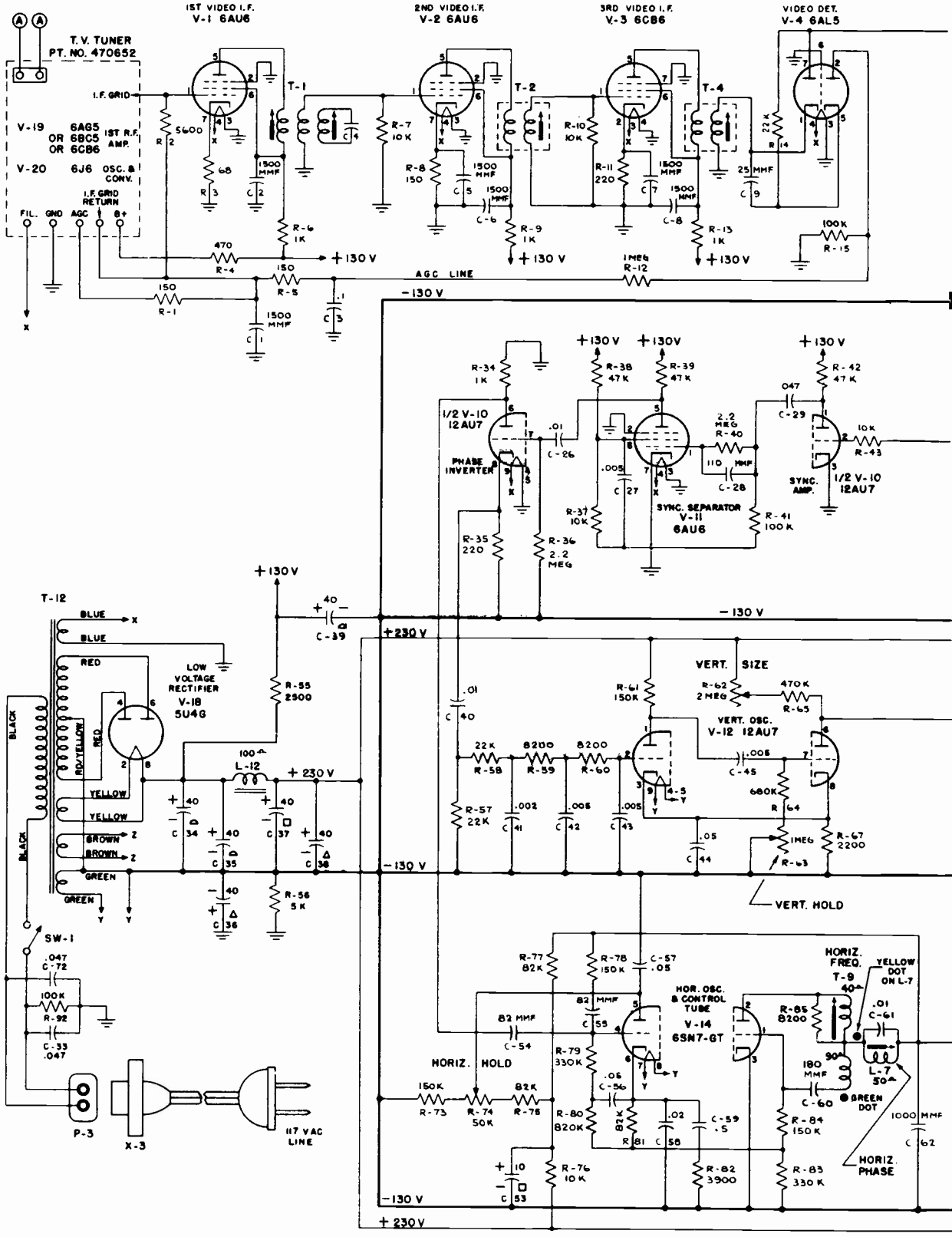
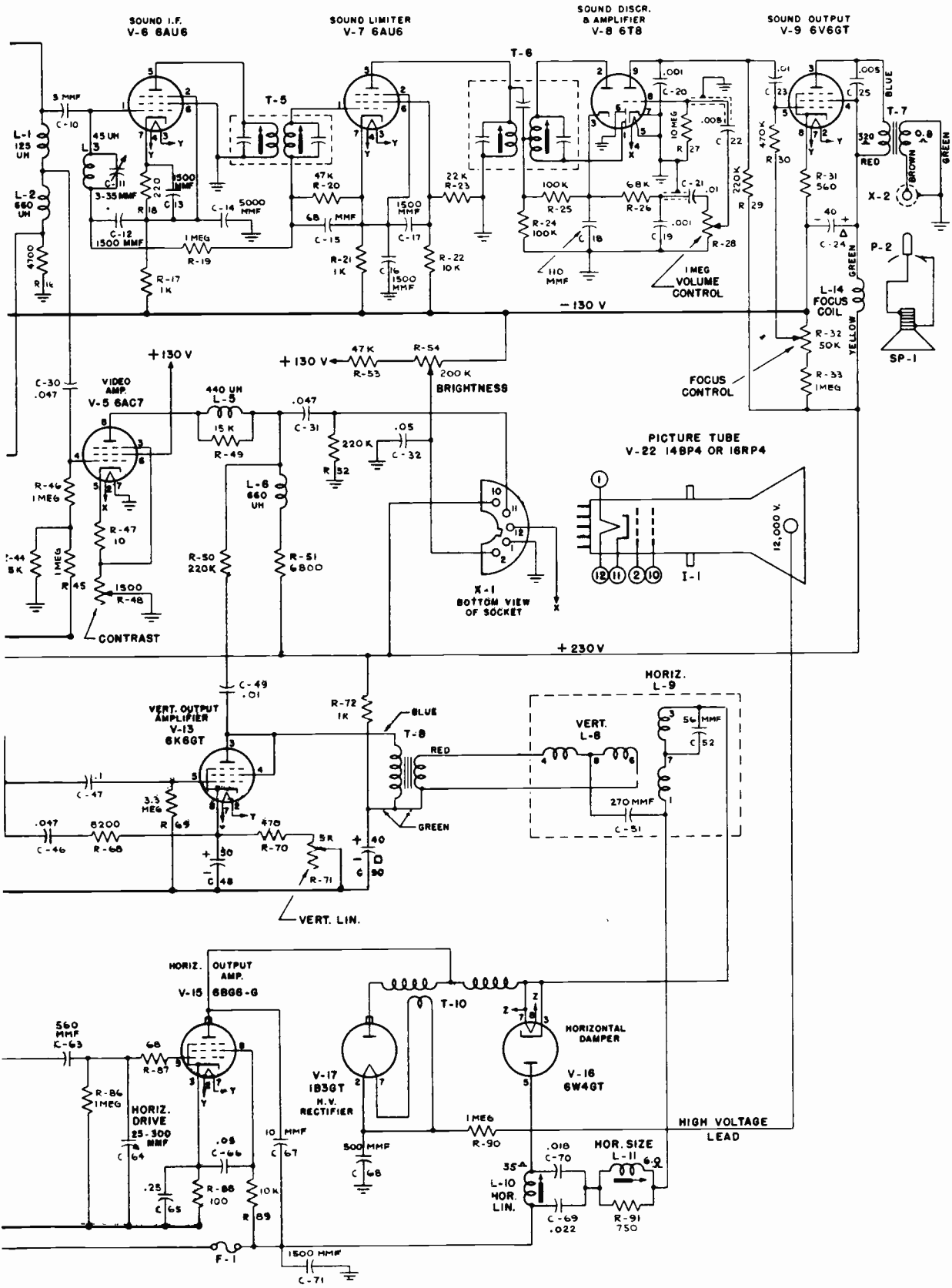


FIGURE 2 - LOCATION OF ALIGNMENT POINTS (TOP VIEW)

Emerson Radio, Models 662B and 663B, Chassis 120127-B and 120128-B



Emerson Radio, Models 662B and 663B, Chassis 120127-B and 120128-B



MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

Emerson Radio -- Voltage and Resistance Measurements, Models 662B & 663B

CONDITIONS FOR TAKING VOLTAGE AND RESISTANCE READINGS:

1. Antenna disconnected and antenna terminals shorted.
2. Line voltage 117 volts.
3. All controls in position for normal picture.
4. All measurements taken with a vacuum tube voltmeter and ohmeter.
5. All readings listed in tables were taken between points shown and chassis.
6. Resistance readings are given in ohms unless otherwise noted.
7. N.C. denotes no connection.

VOLTAGE READINGS

SYMBOL	TUBE PIN NO											
	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	-0.7	0	0	6.3 A.C.	140	140	0					
V-2	0	0	0	6.3 A.C.	135	135	1.2					
V-3	0	2.2	6.3 A.C.	0	135	135	0					
V-4	0	-1.1	0	6.3 A.C.	-0.4	0	0.7					
V-5	0	0	1.0	-1.5	1.0	150	6.3 A.C.					
V-6	-120	-135	-135	-135	0	0	-130					
V-7	-130	-130	-130	-130	0	-95	-130					
V-8	-9.2	-6.4	2.2	6.3 A.C.	0	0	0	-0.7	75			
V-9	N.C.	-130	90	100	-110	50	-130	-110				
V-10	31	-0.6	0	0	0	-12	-130	-130	6.3 A.C.			
V-11	-7	0	0	6.3 A.C.	120	23	0					
V-12	-29	-135	-130	-135	-135	-34	-170	-130	-135			
V-13	N.C.	-135	200	200	-115	-100	-135	-95				
V-14	-200	47	-135	-120	60	-135	-135	-135				
V-15	N.C.	-135	-125	-150	-150	-135	-135	110				
V-16	DO NOT MEASURE											
V-17	DO NOT MEASURE											
V-18	N.C.	235	N.C.	350 A.C.	N.C.	350 A.C.	N.C.	235				
V-22	0	50								215	58	6.3 A.C.

RESISTANCE READINGS

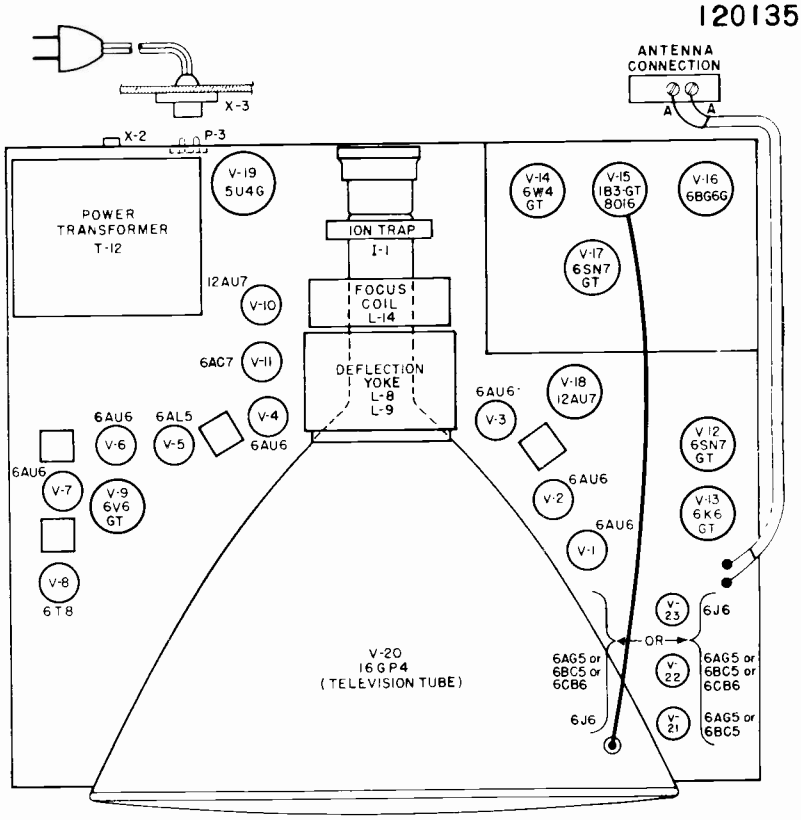
SYMBOL	PIN NUMBER											
	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9	PIN 10	PIN 11	PIN 12
V-1	1M	0	0	0	35K	35K	62					
V-2	0.2	0	0	0	35K	35K	140					
V-3	1.5	200	0	0	35K	35K	0					
V-4	1.0	100K	0	0	25K	0	4.5K					
V-5	0	0	5	1M	15	35K	0	35K				
V-6	1M	5K	4K	4K	2	0	5K					
V-7	45K	5K	4K	4K	2	8K	5K					
V-8	90K	90K	200K	0	0	0	0	9M	220K			
V-9	N.C.	4K	30K	30K	500K	300K	4K	4.5K				
V-10	70K	15K	0	0	0	1K	2M	4K	0			
V-11	2M	0	0	0	70K	10K	0					
V-12	150K	60K	6K	4K	4K	1M	1M	6K	4K			
V-13	N.C.	4K	30K	30K	3M	6K	4K	6.5K				
V-14	500K	100K	4K	1.5M	70K	400K	4K	4K				
V-15	N.C.	4K	4K	1M	1M	4K	4K	40K				
V-16	N.C.	N.C.	INF.	N.C.	30K	N.C.	INF.	INF.				
V-17	INFINITY											
V-18	N.C.	35K	N.C.	4K	N.C.	4K	N.C.	35K				
V-22	0	60K								45K	200K	0

N.C. denotes "No Connection"
INF. denotes "Infinity"

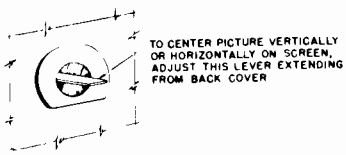
MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

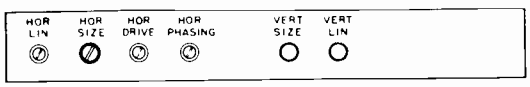
EMERSON RADIO AND PHONOGRAPH CORPORATION

MODEL 666-B
CHASSIS MODEL 120132-B (RADIO)
120135-B (TELEVISION)

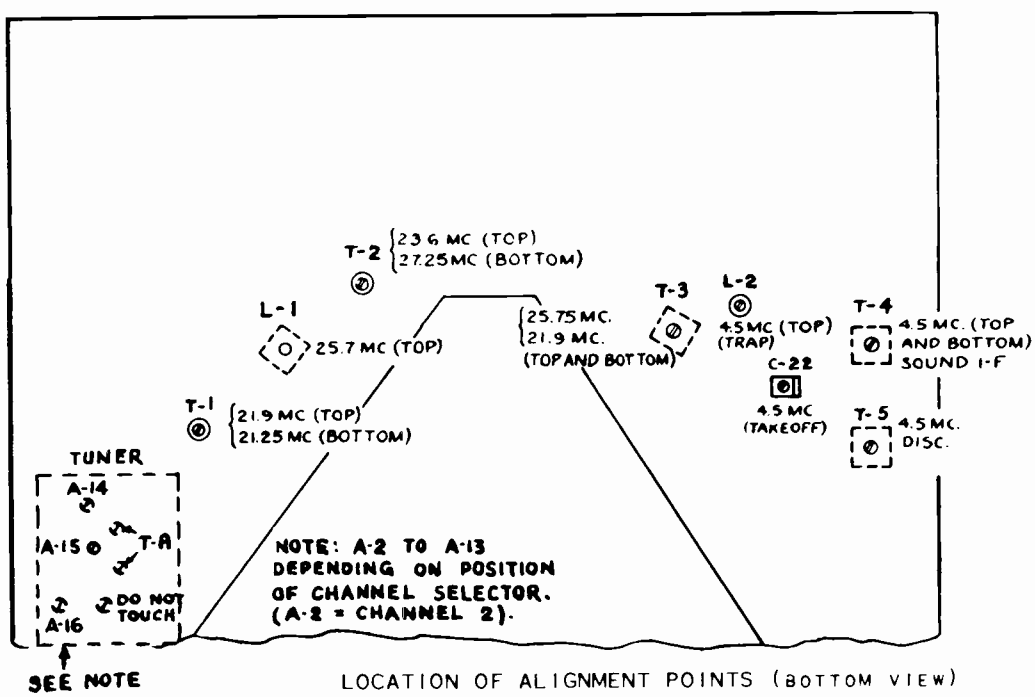


TUBE LOCATIONS DIAGRAM FOR CHASSIS 120135-B





REAR CONTROLS



LOCATION OF ALIGNMENT POINTS (BOTTOM VIEW)
CHASSIS 120135-B

Emerson Radio, Television Chassis 120135-B, used in Model 666-B

Circuit Modifications

Sets coded Triangle 5, have the following modifications to improve synch stability in fringe areas:

1. R-37 changed from 10K ohms to 47K ohms.
2. R-56 is removed.
3. C-55, R-55, and C-56 are removed.
4. A 2.2 megohm resistor in parallel with a 110 mmfd. condenser are added between pin 7 of V-10 and R-54 (old junction of C-55 and R-55).
5. A .05 mfd. 400 v. condenser is added between pin 1 of V-10 and R-54 (10K ohms).
6. A 100K ohm ½ w. resistor is added from pin 9 of V-10 to junction of R-54 and the 110 mmfd. condenser added.

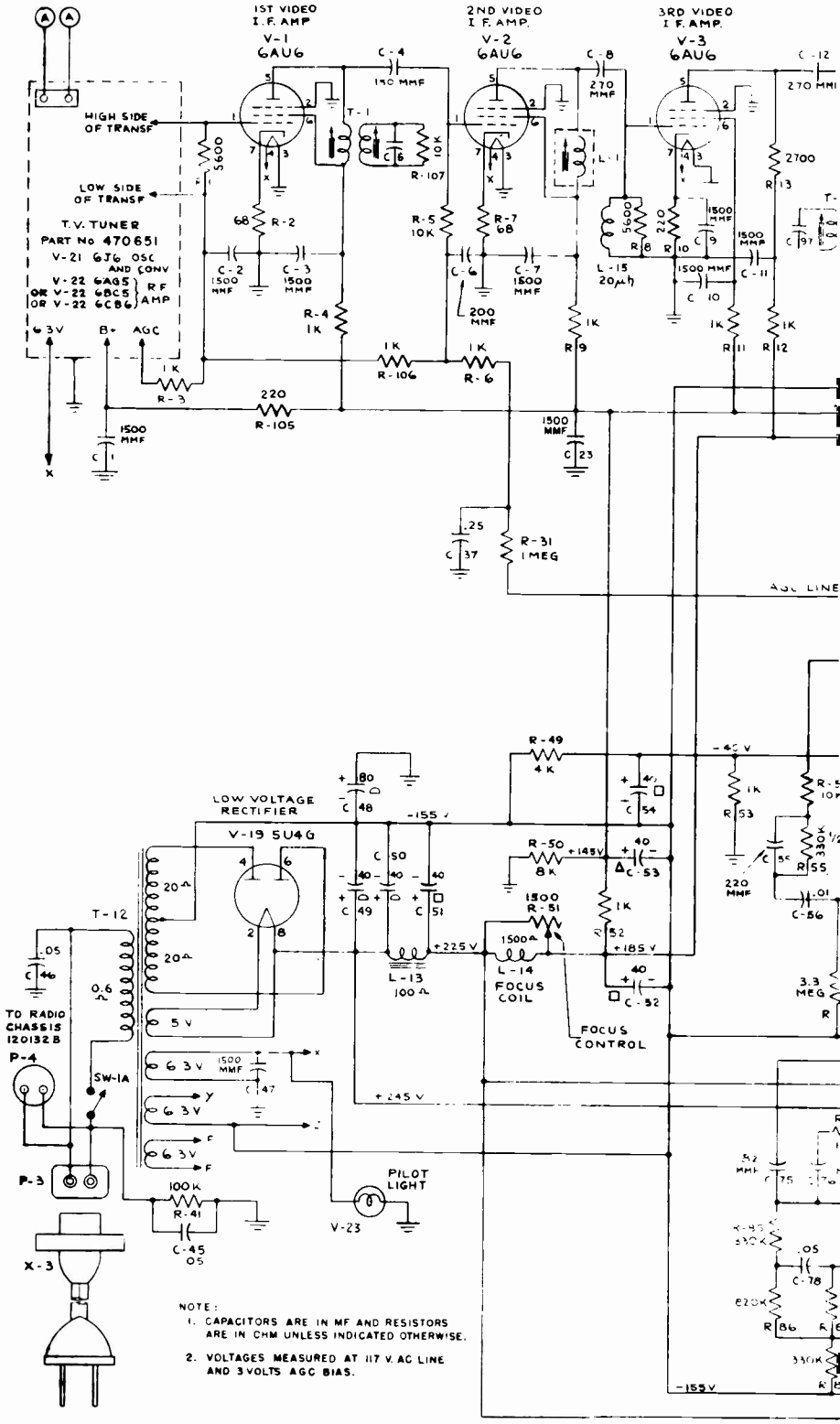
Sets coded Triangle 6 have the contrast control wired differently.

Sets coded Triangle 7 use a 6AL5 and 6AV6 instead of a 6T8 for the discriminator and 1st audio ampl.

Sets coded Triangle 8 use a 6SN7 instead of a 12AU7 (V-18).

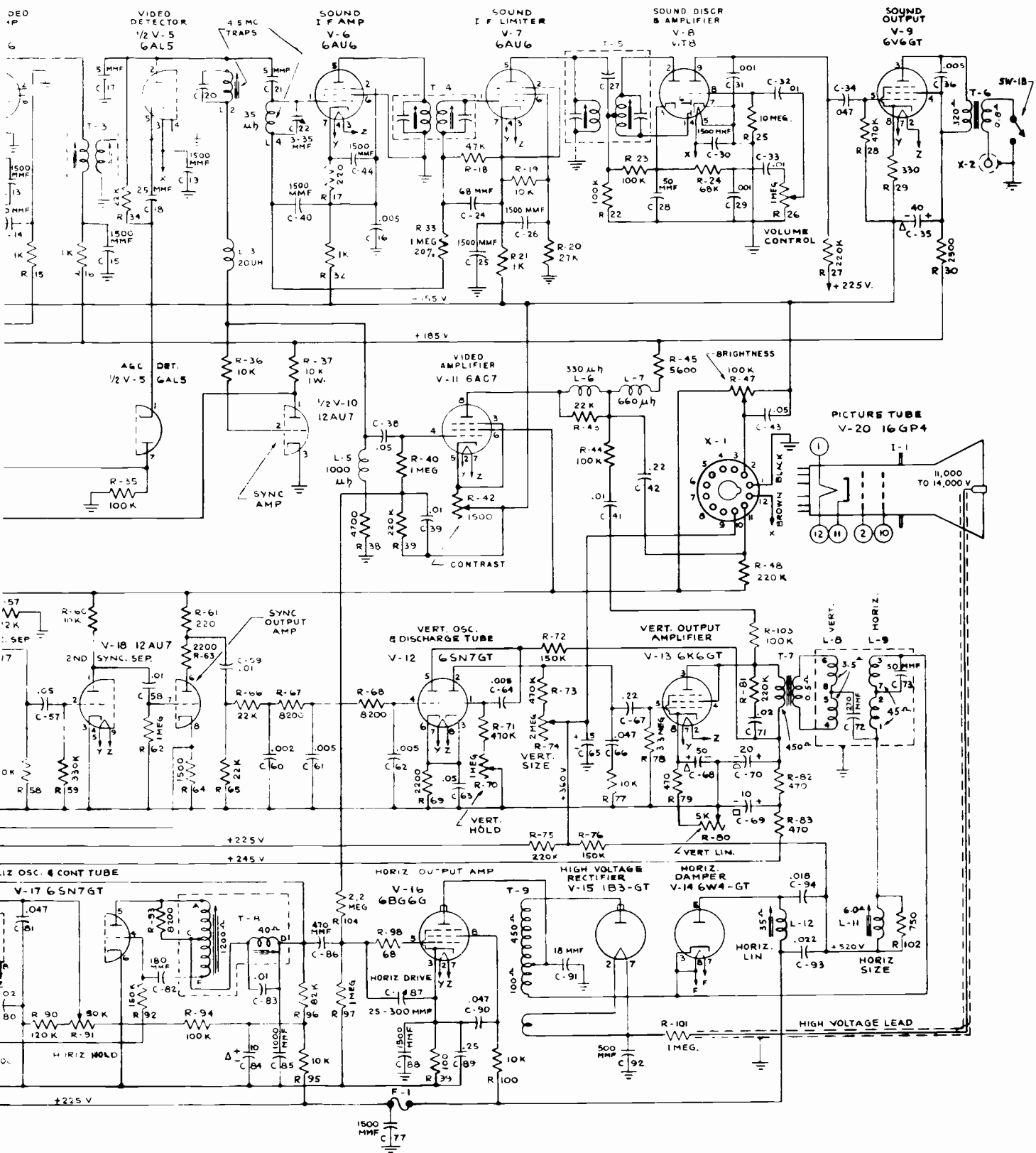
TV. RECEIVER CHARACTERISTICS

ITEM	DESCRIPTION
Voltage Rating	115V - 60 Cycles A.C.
Power Consumption	195 Watts
Frequency Range	54-88 mc; 174-216 mc
Intermediate Frequencies	Video - 25.75 mc. Audio - 4.5 mc.
Antenna Input Impedance	300 Ohms, balanced
Channel Selection	Twelve position rotary
Chassis Model	120135-B 666-B



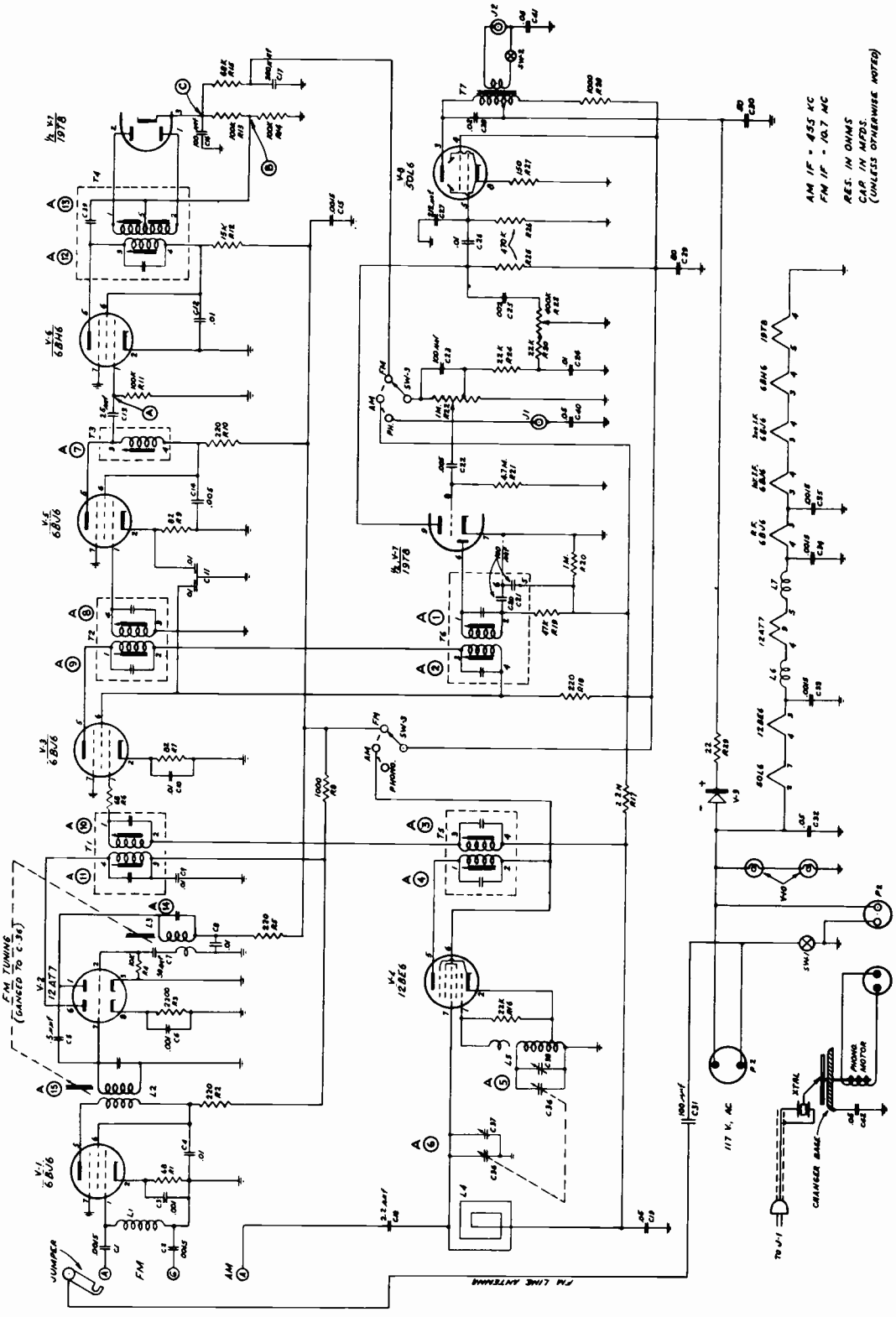
SCHEMATIC DIAGRAM (CHASSIS 120135-B)

Emerson Radio, Television Chassis 120135-B, used in Model 666-B



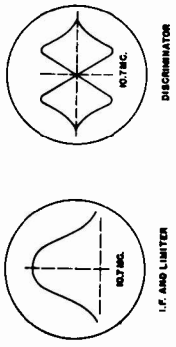
Emerson Radio, Chassis 120132-B Radio used in Model 666-B Television

(Television Chassis 120135-B is on pages 48 and 49)

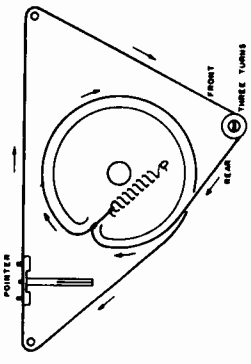


RADIO RECEIVER CHARACTERISTICS

ITEM	DESCRIPTION
Voltage Rating	115v - A.C. - D.C.
Power Consumption	35 Watts - Radio 30 Watts - Phono.
Freq. Range	(AM)-540 to 1620 kC (FM) - 88 to 108 MEG.
Chassis	120132-B
Model	666-B



ALIGNMENT CURVES (FM)



DIAL CORD DRIVE

EMERSON RADIO AND PHONOGRAPH CORPORATION

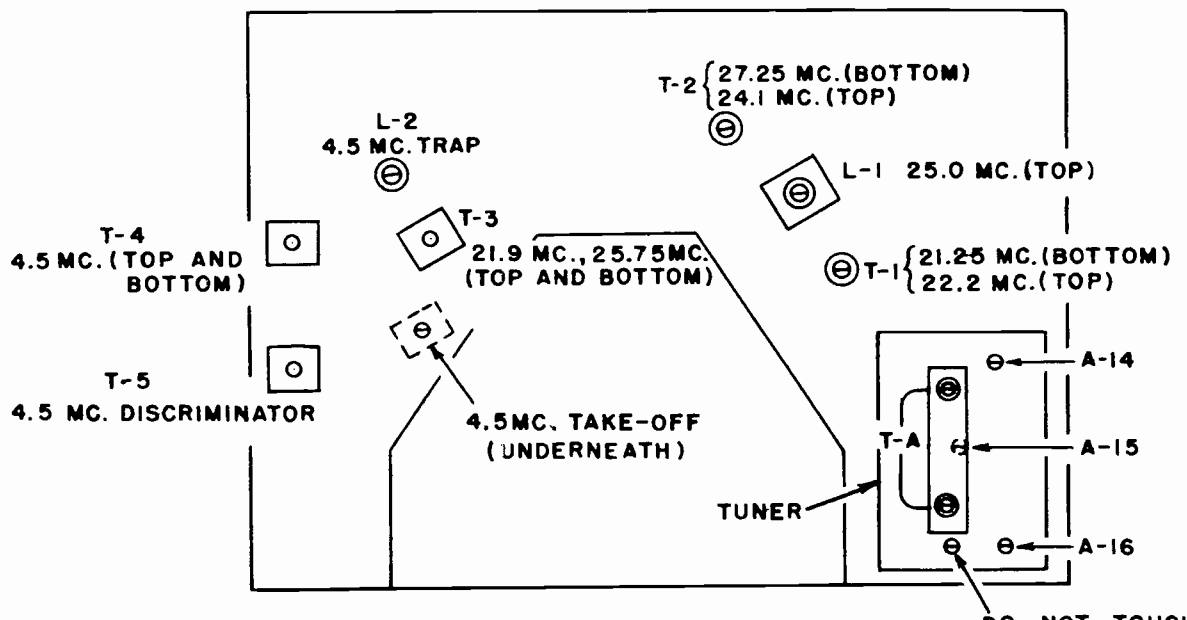
CHASSIS MODEL 120129-B **MODELS 669B AND 675B** 688B, 689B AND 690B

(Chassis 120129-D used in MODELS — 692B, 693B, 694B is similar.)

Information for I.F. and Sound Alignment is given below and on page 54. Using suitable equipment, follow instructions in Table 1, on page 54, for I.F. alignment, and in Table 2, below, for Sound alignment. Alignment points shown in figure below. Set receiver to Channel 3, connect 3 volt bias battery from junction of R31 and C37 (negative terminal) to ground (positive terminal), follow instructions. Figures 1 and 2 are on page 52, over.

TABLE II - SOUND ALIGNMENT

STEP	SIGNAL GENERATOR INPUT		MEASURING INSTRUMENT	ADJUST	PROCEDURE
	CONNECTION	FREQUENCY			
1	Marker generator through .001 mfd. to pin 5 of V5. Low side to chassis.	Marker—4.5 MC. (400 cycle mod.)	Connect v.t.v.m. through R.F. det. probe to junction of C-42, R-48. Low side to B-(155V.)	L2	Adjust for minimum output, with contrast control set at maximum.
2	"	Marker—4.5 MC. (400 cycle mod.)	Connect v.t.v.m. to junction of T-4 and R-18. Low side to B-(165V.)	C22	Peak for maximum response. Adjust generator input to produce one volt at grid of V7.
3	"	Marker—4.5 MC. (400 cycle Mod.)	"	T4 (Top and bottom)	"
4	Connect sweep generator in parallel with marker gen.	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 R24 and C29. Low side to chassis.	T5 (Secondary)	Position 4.5 MC. marker at center of S-curve, by adjusting secondary. Trans. #708031 (Sickles); secondary is at bottom of chassis; trans. #708031B (Automatic); secondary is at top of chassis. Curve F.
5	"	"	"	T5 (Primary)	Peak primary for maximum amplitude and linearity. Repeat step 4. Curve F.



LOCATION OF ALIGNMENT POINTS (TOP VIEW)

Emerson Radio, Chassis 120129-B Television Schematic Diagram

Circuit shown is code Triangle 1; Triangle 2 sets have the following modifications:
R-37 changed to 47K, R-55, R-56, C-55, C-56 have been removed, A 2.2 meg. resistor in parallel with 110 mmfd. added between pin 7 of V-10 and R-54, A .05 mfd. 400 v. cond. added from pin 1 of V-10 to R-54, also a 100K resistor added from pin 9 to junction of R-54, 2.2 meg. resistor, and 110 mmfd. condenser.

In Triangle 3 sets, R-50 and R-46 are removed, R-20 changed to 39K, 2 w., and has one end connected to chassis instead of to R-108-C-36, a 2K, 4 w. connected in parallel with R-52, R-49 changed to 9K, 4 w., R-53 to 1.7K, 4 w.

Sets coded Triangle 4, use 6AL5 and 6AV6 instead of 6T8 (V-8).

Sets coded Triangle 5, use a 6SN7 instead of a 12AU7, (V18).

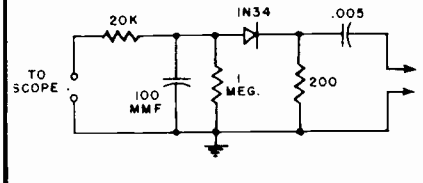


FIGURE 1 - SCOPE DETECTOR

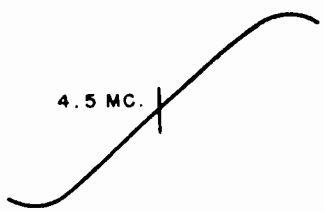


FIGURE 2 - CURVE F

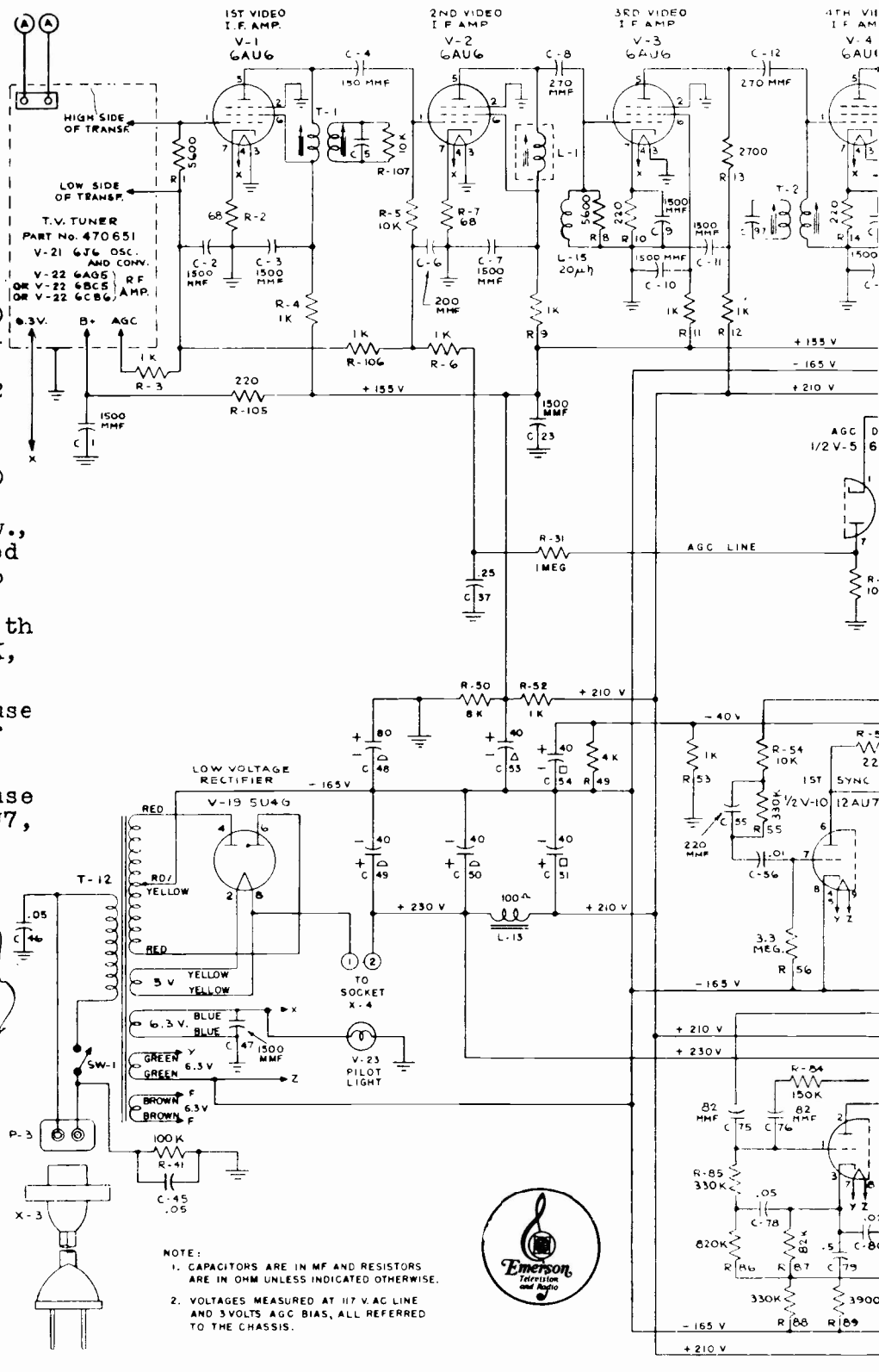
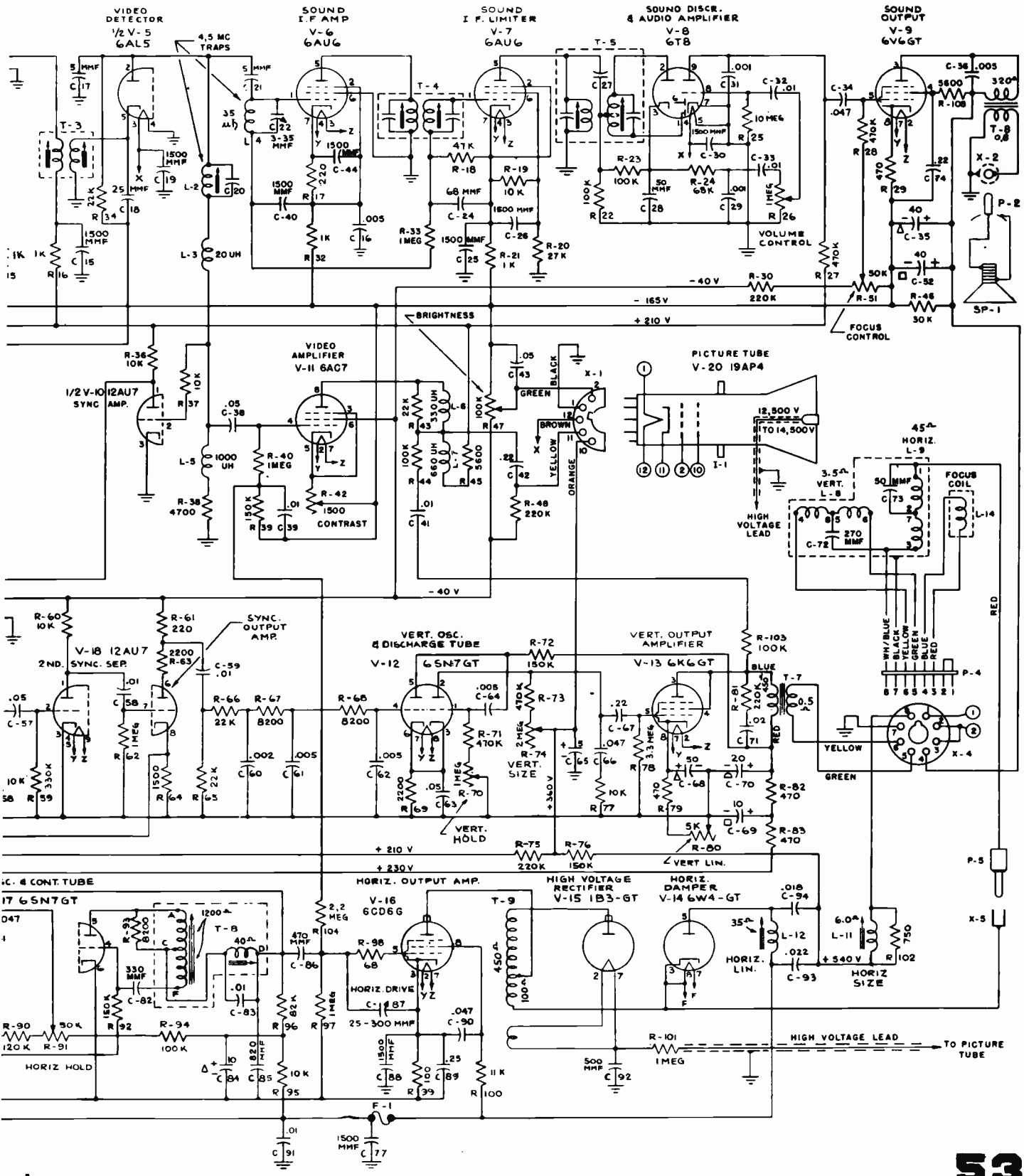


DIAGRAM (CHASSIS 120129-B)

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

Emerson Radio, Chassis 120129B, used in Models 669B, 675B, 688B, 689B, 690B



I.F. Alignment Information

(See page 51 for further information and alignment points)

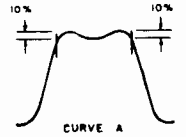
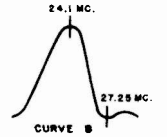
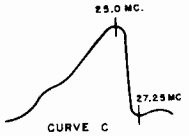
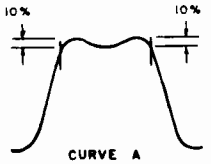
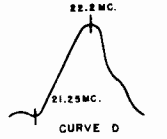
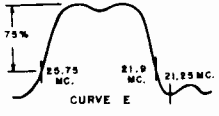
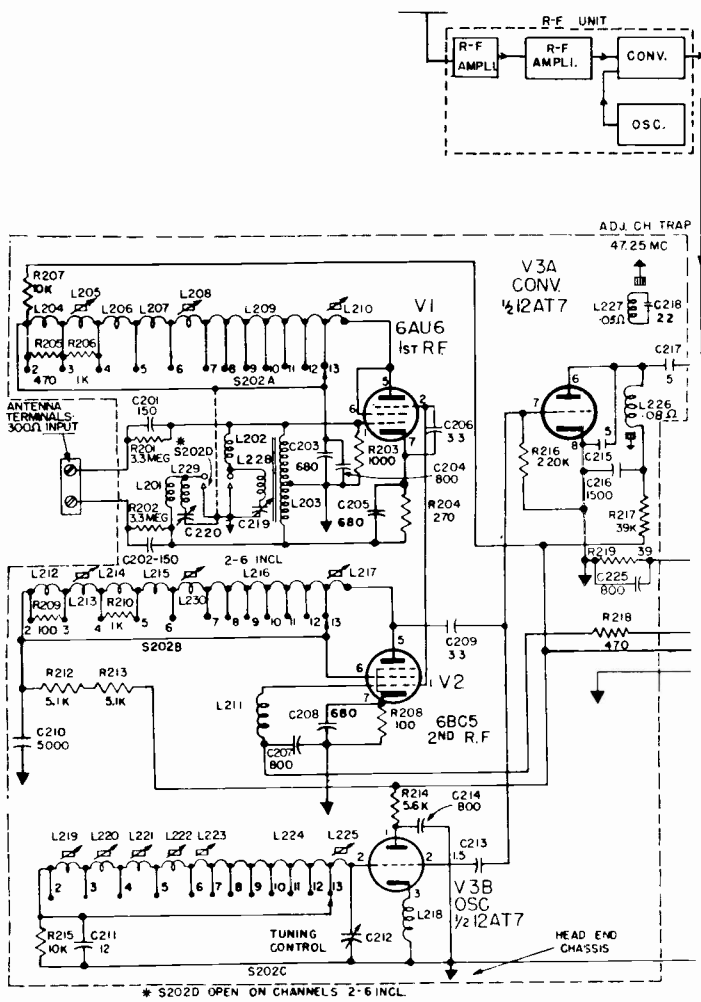
STEP	SIGNAL GENERATOR INPUT		MEASURING INSTRUMENT	ADJUST	PROCEDURE	
	CONNECTION	FREQUENCY				
1	Couple sweep generator to pin 1 (grid) of V-4. Lightly couple marker to same point. Low side to chassis.	Sweep 23.5 MC. (10 MC. sweep) Markers 25.75 MC and 21.9 Mc.	Connect vertical input of scope through 10K resistor to junction of L-5 and R-37. Grid return of oscilloscope to be connected to chassis.	T-3 (Top and (bottom)	Set markers as shown on response curve A. Adjust sweep generator input to produce one volt at junction of L-5 and R-37. Markers should be 10% down on curve. Peak-to-valley ratio should not exceed 10%.	
2	Couple sweep generator to pin 1 (grid) of V-3. Lightly couple marker to same point. Low side to chassis.	Markers 24.1 MC. and 27.25 MC.	"	T-2 (Top 24.1 MC) (Bottom 27.25 MC)	Adjust to conform with curve B.	
3	Couple sweep generator through .001 mfd. to pin 1 of V-2. Lightly couple marker to same point. Low side to chassis.	Marker 25.0 MC.	"	L-1 (Top)	Adjust to conform with curve C.	
4	Connect sweep generator through .001 mfd. to tuner (through hole in side of chassis) at third lug from front. Lightly couple marker generator to same point. Low side to chassis.	Markers 27.75 MC. and 21.25 MC.	Connect scope and scope detector (Fig. 1) between pin 1, V-2 and chassis.	Adjust T-A	Adjust to conform with curve A.	
5	"	Markers 21.25 MC. and 22.2 MC.	Connect scope and scope detector (Fig. 1) between pin 1, V-3 and chassis.	Adjust T-1 (Top 22.2 MC.) (Bottom 22.25 MC.)	Adjust to conform with curve D.	
6	"	Markers 21.25 MC., 21.9 MC. and 27.75 MC.	Same as Step 1.	Adjust T-1 T-2 T-3	Adjust for overall response as shown on curve E. Adjust L-1 to position 25.75 MC. marker accurately. Adjust T1 (Top) to position 21.9 MC. marker. Do not readjust trap. Equalize peaks of response curve B within 10% by adjusting T2 (Top).	

TABLE I - I.F. ALIGNMENT

GENERAL ELECTRIC

MODELS 12T3, 12T4, 12C107, 12C108, AND 12C109 (B-VERSION) TELEVISION RECEIVERS

The earlier production runs of the models listed above (not the B-version) are identical to these later models (B-version) except for the front-end circuit. The early version front-end section schematic is shown below to permit comparison to the main schematic diagram which covers the B-version of Models 12T3, 12T4, 12C107, 12C108, and 12C109. Should you be called upon to service Model 12T7, you will find it almost identical in circuit to the B-version models covered on these pages. The 12-inch Models 12T1, 12C101, 12C102, and 12C105, as well as the 10-inch Models 10T1, 10T4, 10T5, 10T6, 10C101, and 10C102, have circuits that correspond closely to the earlier version of the sets described. Model 12K1 is also similar to these "earlier" Models 12T3, etc., but this set incorporates a radio tuner and phonograph, and therefore has a different audio circuit and uses a type 25L6 tube as a separate focus control. Some of these earlier models also may differ in a small degree in their filament circuits.



Schematic of the front-end circuit used in early-version models described above.

Block Diagram, Models 12T3, 12T4, 12C107, 12C108 & 12C109

The video i-f is stagger tuned to pass the video i-f of 45.75 mc and the sound i-f of 41.25 mc. As this receiver uses intercarrier sound i-f, the video signal is detected at Y1 as well as a 4.5 mc FM television sound signal which is the beat frequency between the 45.75 mc video i-f and the 41.25 mc sound i-f.

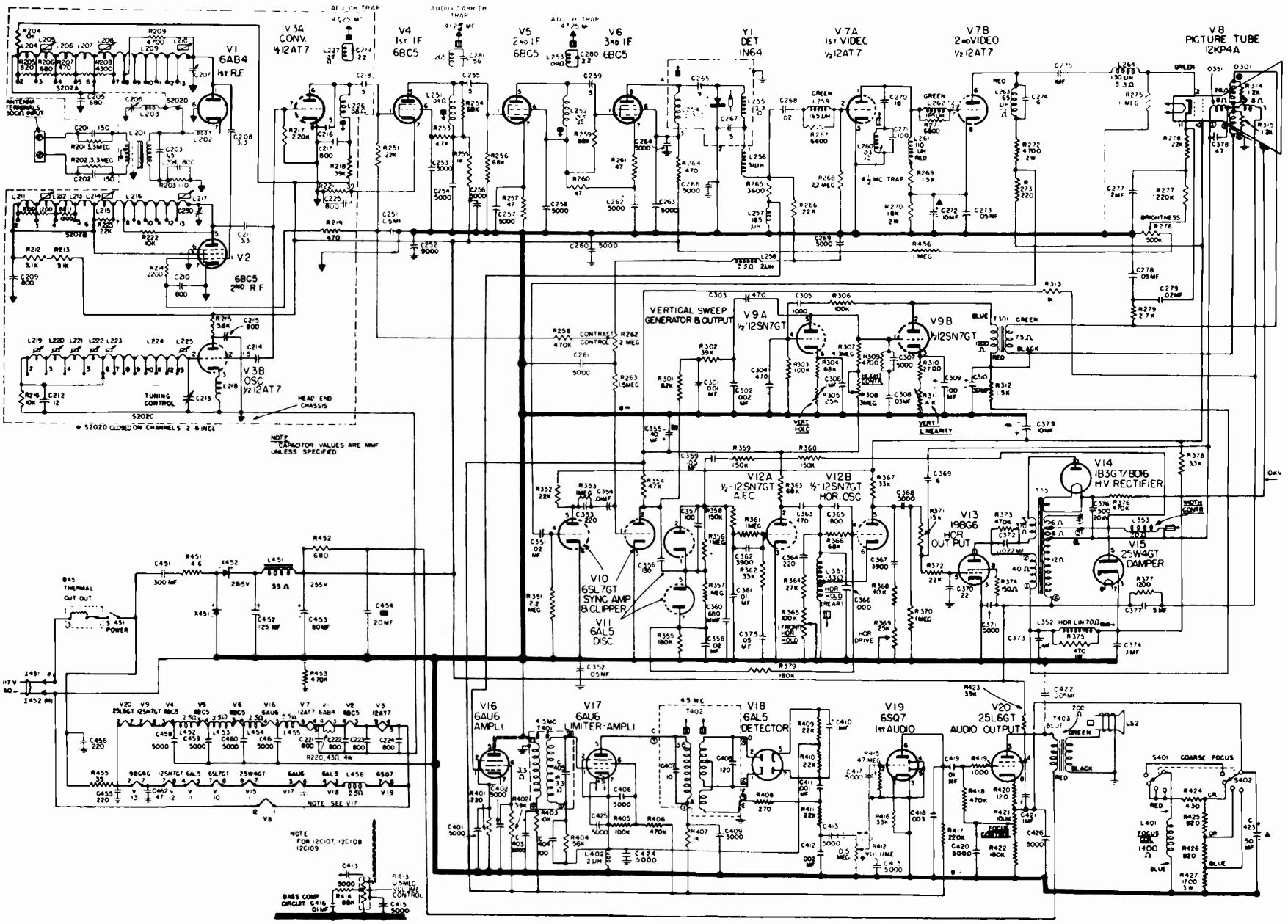
Horizontal and vertical sync signals are tapped off on the plate load of V7B and fed into the sync amplifier and clipper, V10. The vertical sweep generator and output is a 12SN7 connected as a multivibrator. The horizontal sync circuit contains a 6AL5 (V11) tube which is the automatic frequency control discriminator. V12A is a reactance tube which is one section of a 12SN7 tube. Tube V12B operates as a sine-wave oscillator and saw-tooth generator. V13 is a 19BG6 tube and serves as the horizontal sweep output tube. V15 (25W4GT) is a damper tube in the horizontal sweep output circuit. V14 (1B3GT/8016) is a rectifier tube to supply high voltage d-c from the kick voltage during the retrace period of the horizontal sweep developed at the horizontal output transformer, T351.

The 4.5 mc FM sound signal is taken from the diode load of Y1 and is fed into tube V16 (6AU6) which is a sound i-f amplifier.

Tube V16 is coupled by a transformer T401 to the tube V17 (6AU6) which is a limiter amplifier. Tube V17 is coupled to tube V18 (6AL5) ratio detector by the ratio detector transformer T402. The television audio is then amplified by V19 tube (6SQ7) and coupled to the audio output tube V20, (25L6GT) which delivers its power to the loudspeaker coupled by the output transformer.

GENERAL ELECTRIC

MODELS 12T3, 12T4, 12C107, 12C108 AND 12C109



General Electric Models 12T3, 12T4, 12C107, etc. (Continued)

VIDEO I-F ALIGNMENT

1. Connect a bias battery from junction of C261, R263 and the contrast control to B—. Connect positive of battery to B—. Adjust contrast control to give a —4 volts bias at the grid pin 1 of V4 measured with a VTVM. Disconnect VTVM leads during alignment.

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. Before attempting to align the receiver, obtain an i-f curve on the scope. If suitable amplification of the scope is applied, the trap L265* will cause a dip in the i-f curve. Turn the slug of the trap, L265, in such a way that the dip will move towards the low frequency end of the curve and leave the slug at a resonance point of approximately 40 mc.

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.

8. The slug of the sound trap L265 is adjusted for minimum amplitude of the 41.25 mc marker.

9. After adjustment of the three sound traps, readjust the i-f curve to obtain the proper curve and marker as illustrated.

10. Adjust the signal input to give a video response curve of ¾ volt, as shown in Figure 21.

VIDEO I-F ALIGNMENT CHART

Step	Marker Generator Frequency	Sweep Generator Frequency	Signal Input Points Between	Connect Oscilloscope Between	Adjust	See Note No.
1	40.00 MC	40 to 50 MC	Junction L230 and L216 on second r-f switch wafer thru .01 mf. and B— on head-end shield.	Junction L256, R265, C268 thru 10K ohms and B— on V7 socket.	Detune L227 and L253 by turning cores out of coil, and tune L265* to approximately 40 mc.	3
2	44.50 MC		V6 grid (pin 1) thru .01 mf. cap. and B— on head-end shield. Pins 5-6 shorted on V5.		Core of L254 for curve of Fig. 21-A.	1, 2, 5, 6, 10
3	45.75 MC		V5 grid (pin 1) thru .01 mf. cap. and B— on head-end shield. Short L251. Remove short on V5.		Core of L252 for curve of Fig. 21-B.	
4	42.50 MC 45.75 MC		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		Junction L230 and L216 on second r-f switch wafer thru 0.1 mf. cap. and B— on head-end shield.		Core of L226 for curve of Fig. 21-D.	
6	47.25 MC, 41.25 MC				Cores of L227 and C253 for min. output at 47.25 MC (Fig. 21-E). Core of L265* for min. output at 41.25 MC. Increase scope gain (Fig. 21-F).	1, 2, 4, 5, 8, 10
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, or Fig. 21-F if L265 is incorporated.	1, 2, 4, 5, 6, 7, 9, 10

*A number of receivers do not contain this trap.

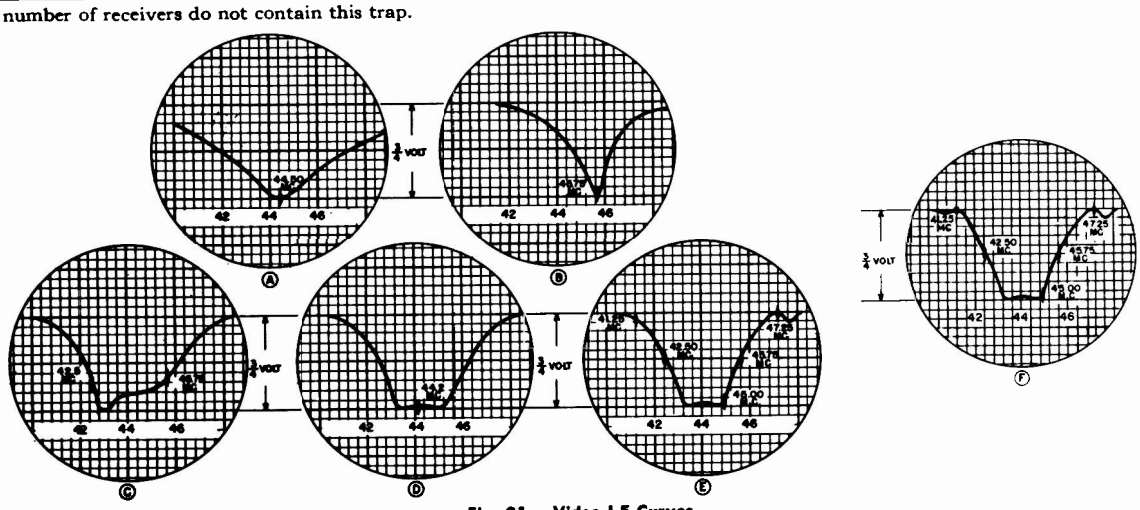


Fig. 21. Video I-F Curves

General Electric Models 12T3, 12T4, 12C107, 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. The primary and secondary of T402 should be aligned to give equal amplitude of the positive and negative peaks of the response curve with as straight a trace as possible connecting the peaks. The 4.5 mc marker zero beat point should be placed at the cross-over point of the base line and the curve.

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 ouput. 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 4.5 mc marker as shown in Fig. 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 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.

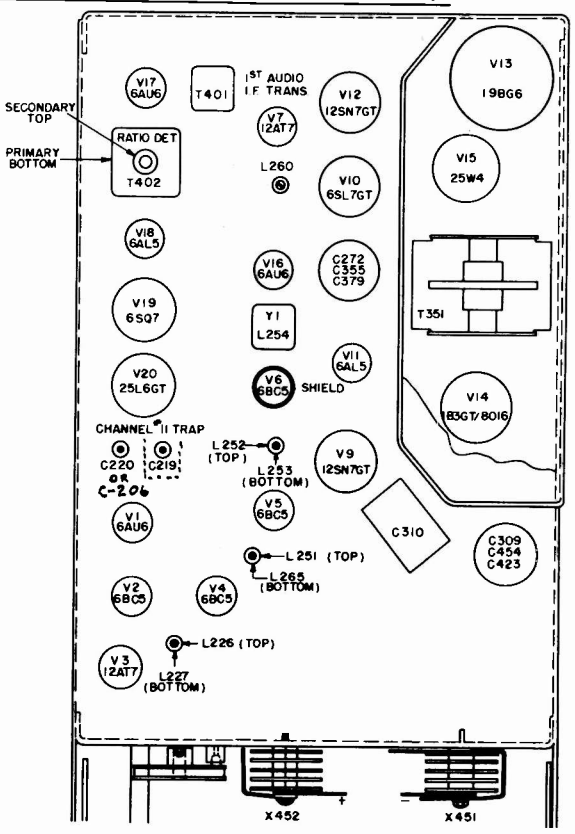


Fig. 22. Tube and Trimmer Location

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.	Pin 1 of V16 through .01 mfd. cap. and B−.	Junction of R404 and C404 & sec. of T401 through 10K and B−.	Primary and secondary of T401 for max. amplitude and symmetry of curve. See Figure 23-A.	1, 3
9			Pin 1 of V17 through 0.1 mfd. cap. and B−.	Junction of R408, C411 and R411 through 10K and B−.	Secondary of T402 to place zero beat of 4.5 mc marker and sweep at the cross-over of the curve and base line.	
10					Primary of T402 for equal amplitude of the positive and negative peaks with a straight line connecting these peaks. See Figure 23-B.	1, 3, 4, 5
11					Secondary of T402 to place zero beat of 4.5 mc marker at cross-over and sweep point of curve and the base line. See Figure 23-B.	
12	Recheck alignment of step 11 on operating station as in note 2.					

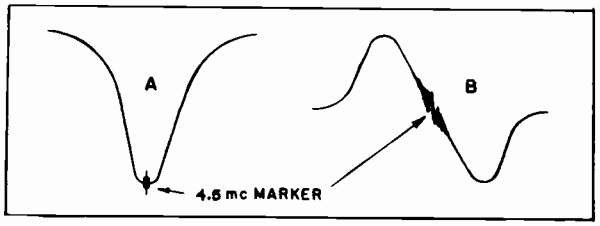


Fig. 23. Audio I-F Curve

GENERAL ELECTRIC

MODELS 16T3, 16T4, 16C113 AND 16C116

You will find that Models 16T1, 16T2, 16C110, 16C111, and 16C115, are almost identical to the models listed above and described in these pages. However, these earlier sets used an electro-magnetic focus coil and associated circuits. Models 14T2, 14T3, 14C102, and 14C103 are also almost identical to the models described on these pages, but use a 14-inch picture tube. Models 16K1 and 16K2 are similar to Models 16T3, etc., described on these pages, but since these sets have a radio tuner, there are the following main differences: 1) for TV audio output stage that section of the radio chassis is used, 2) there is a separate 25L6 tube used as the focus control. For alignment help refer to the previous few pages where such material on other General Electric sets is presented. This material is not intended for other sets, but can be employed as a guide. Models 17C101 and 17C102 resemble 16T3 described.

TROUBLE SHOOTING

This trouble shooting chart is divided into sections for quick trouble shooting. In most cases a trouble may be localized by noting the condition of the picture or test pattern and the presence or absence of sound.

In general, the tubes in the defective circuit should be checked first since they are fairly easy to check. When substituting tubes in the RF or video IF circuits, the original tube should be replaced in the socket if it is found not to be defective. When a tube is replaced in the video IF or RF circuits, alignment should be checked.

Defects of the R-F and I-F Circuits

A. NO PICTURE, NO SOUND, RASTER NORMAL.

1. Check the R-F head end circuits of V1 and V2.
2. Check to see that local oscillator, V3B, is operating properly.
3. Check Video I-F amplifier circuits of V4, V5 and V6.
4. Check crystal detector, Y1.
5. Check channel switch.

B. SNOW IN PICTURE.

1. Open input circuit in C278, C279 or L201.
2. Defective antenna installation or transmission line.
3. Antenna orientation.

C. LACK OF PICTURE DETAIL (FOCUS SATISFACTORY).

1. Misalignment of Video I-F.
2. Misalignment of R-F amplifier.
3. Mismatch of input impedances at antenna input terminals of receiver.
4. Overloading of r-f stages.

D. MOTORBOAT OR FLUTTER IN PICTURE AND AUDIO.

1. Open by-pass, C251.
2. Open filament by-passes C222, and C458.
3. Misalignment of video I-F and R-F amplifiers.

E. WIGGLES IN PICTURE BACKGROUND, TRAILING WHITES ON PICTURE, SOUND NORMAL.

1. Misalignment of R-F and I-F amplifier.
2. Improper tuning of receiver.

F. SOUND BARS IN PICTURE (BLACK HORIZONTAL BARS).

1. Microphonic tubes, V3, V4, V7 or picture tube V8.
2. Misalignment of adjacent channel sound traps, L253, L227.

Defects of the Video Amplifier

A. NO PICTURE, SOUND SATISFACTORY, RASTER SATISFACTORY.

1. Open chokes L263, L261, L264.
2. Shorted capacitor C270, C272, C273.
3. Open capacitor, C268.
4. Open resistors R269, R272.
5. Short from pin 2 to pin 11 of V8 picture tube.

B. POOR LOW FREQUENCY RESPONSE (TRAILING WHITES AFTER BLACK).

1. Low value of resistors R269, R272, R265.
2. Low capacity or open capacitor C272.
3. Low capacity of C268, C275.

C. LACK OF PICTURE DETAIL, FOCUS SATISFACTORY (SMEARING OF VERTICAL WEDGES OF TEST PATTERN).

1. Shorted chokes L259, L261, L262.
2. Open chokes L259, L262.
3. High resistance of R272, R269, R265.

D. BRIGHT PICTURE WITH BLACK LINES.

A shorted capacitor C275 will give a very bright picture with black lines across the picture. The picture control will have no effect.

E. PICTURE DISTORTED AT HIGH SETTINGS OF PICTURE CONTROL.

Check for high resistance of R273.

Defects of the Sync Section

A. NO VERTICAL SYNC, HORIZONTAL SYNC SATISFACTORY.

1. Check waveform of sinc input, V9 pin 5.
2. Check C303, R301, R302, C301 for leakage or shorted.
3. Check components C306, R304, R305.
4. Check for leakage of C305.

B. WEAK VERTICAL SYNC, HORIZONTAL SYNC AND PICTURE NORMAL.

1. Leakage or low value of capacitor of C303.
2. Leakage of C301, C302 or incorrect values.
3. Check frequency determining components C306, R304, R305 for value or defective.

C. WEAK OR NO VERTICAL AND HORIZONTAL SYNC, PICTURE INFORMATION PRESENT AND SOUND NORMAL.

1. Check waveform at pin 4 of V11 for proper waveform from video amplifier.
2. Improper B+ voltage on V11.
3. Incorrect value of R354.
4. Open or low capacity of C351.
5. Defective coupling capacitor C353, C354.

D. WEAK OR NO HORIZONTAL SYNC, VERTICAL SYNC SATISFACTORY.

1. Check waveform at pin 2 of V12.
2. Check sweep frequency determining components L351, C366, C364, R365, R364.
3. Check for leakage in V12 components, C356, C357, C360, C358.
4. Check for proper value of resistors R356, R357, R358, R361.
5. Check C359, R359 and R360 in the feedback circuit.
6. Check coupling between V13A and V13B (C363, C365, R366).

Defects of the Vertical Sweep

A. KEYSTONING (PICTURE NARROWS AT TOP OR BOTTOM).

1. Defective vertical deflection coil, D301.
2. Check R314, R315.

B. NO VERTICAL DEFLECTION (SINGLE WHITE HORIZONTAL LINE ON SCREEN).

1. Open deflection coil, D301.
2. Defective sweep output transformer, T301.
3. Multivibrator V9 and V10 defective, no B+ to V10, open R312 or shorted C310.

(Continued on page 62)

General Electric Models 16T3, 16T4, 16C113, and 16C116.

PRODUCTION CHANGES

1. TO CORRECT BENDING AT TOP OF PICTURE.

In early production receivers R273, R274 and the sync voltage take-off capacitor C351 was connected as shown in Figure 28.

In late production R274 was deleted. R273 was changed to 220 ohms and is reconnected in series with R272. C351, the sync coupling capacitor, is now connected at the junction of R272 and R273 as shown in the schematic diagram.

2. ELIMINATION OF VERTICAL LINES AT LEFT SIDE OF PICTURE (ADDITION OF C371).

Capacitor C371, .05 mfd., 600 volts, was added to later production receivers, to by-pass transient voltages developed by the horizontal sweep circuit at the B+ supply. These voltages would produce the effect of vertical, light and dark bars in the left part of the picture.

The capacitor, C371, is connected from the B+ terminal of the terminal strip adjacent to the damper tube, V16, on the chassis side apron and to the B− bus connection of C374.

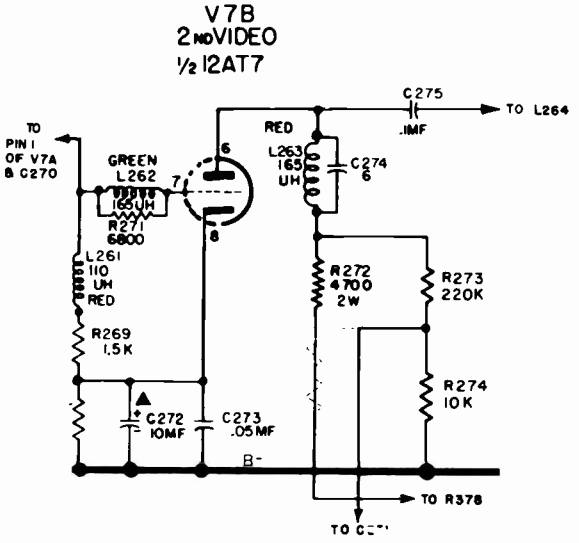
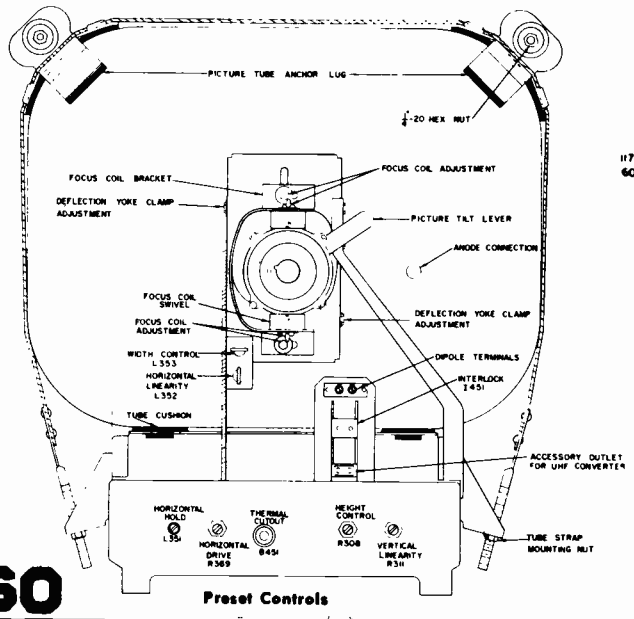
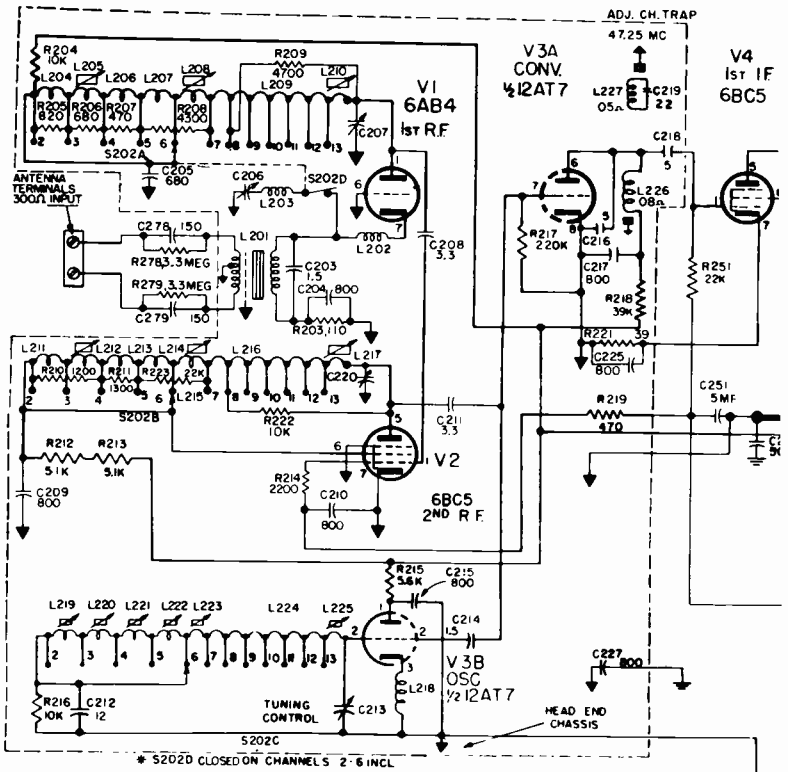


Fig. 28. C351, R273, R274 Connections



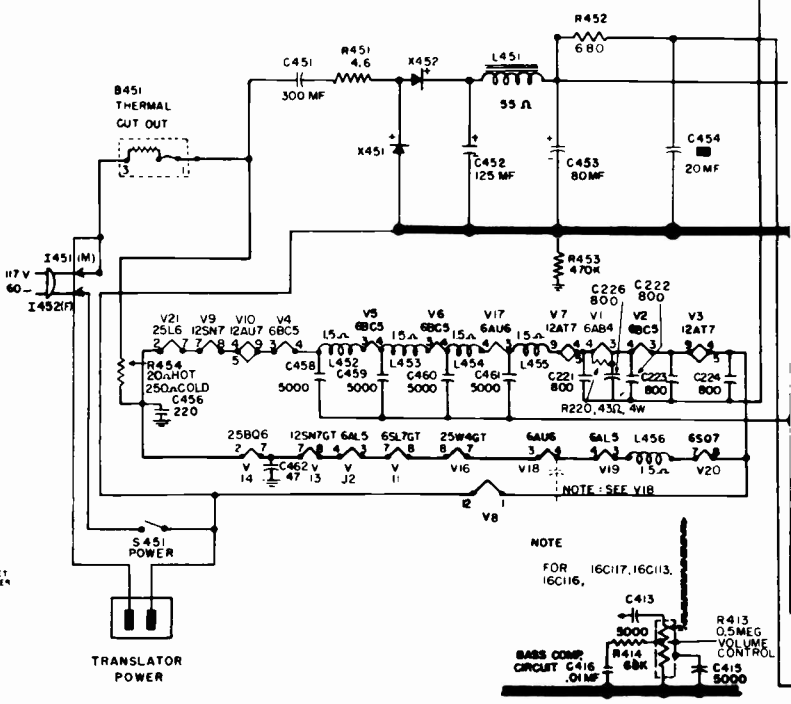
Preset Controls



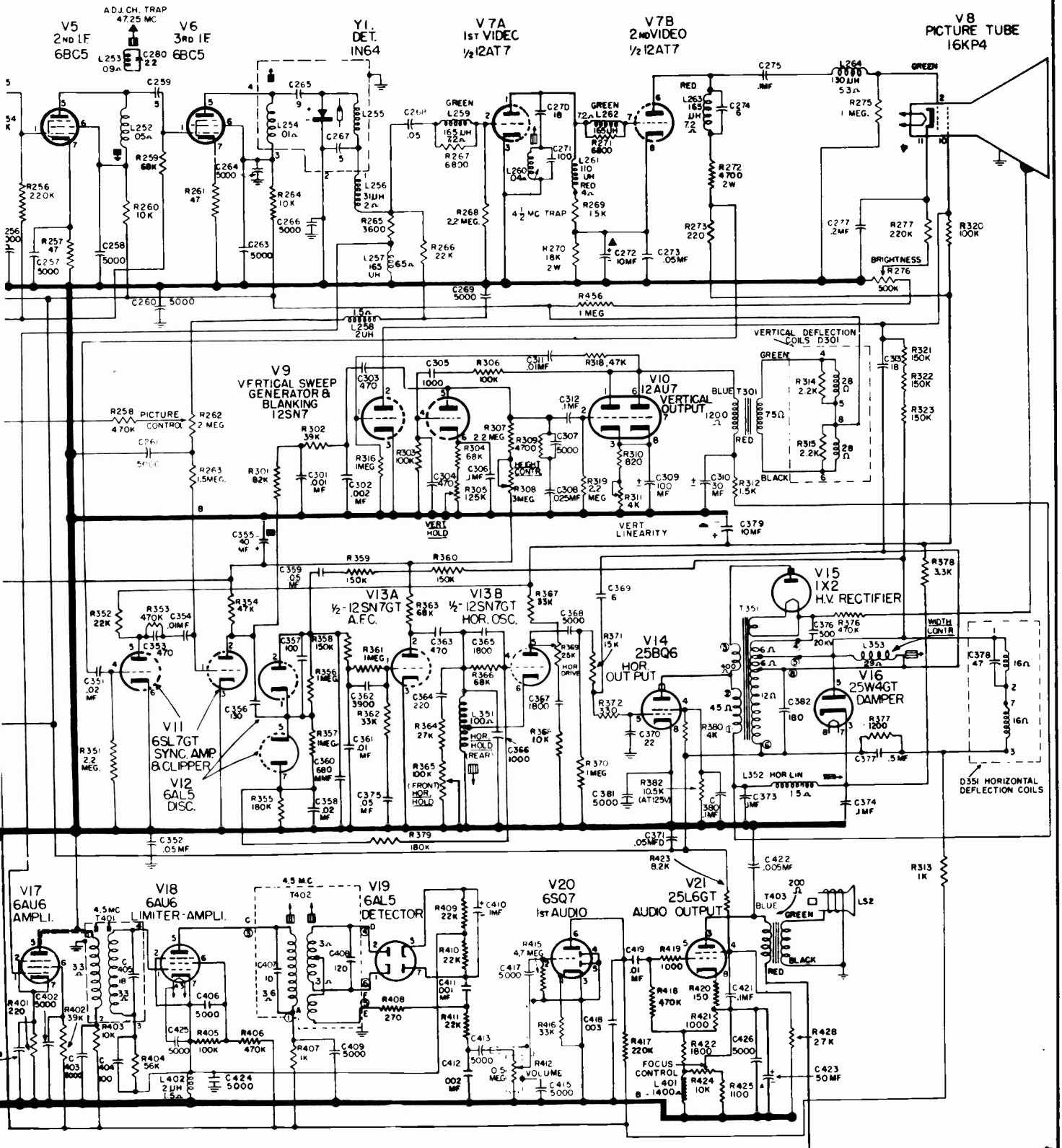
NOTE
CAPACITOR VALUES ARE MMF UNLESS SPECIFIED

C272-10MF 150V ▲
C355-40MF 300V ■
C379-10MF 450V ▲

C454-20MF 300V ■
C423-50MF 100V ▲
C309 100MF 75V



General Electric Models 16T3, 16T4, 16C113, and 16C116.



General Electric Models 16T3, 16T4, 16C113, and 16C116, continued.

C. INSUFFICIENT HEIGHT.

1. Open C310.
2. High resistance of R307.
3. Excessive leakage of C308.
4. Defective T301.
5. Incorrect voltage values on V10.
6. Low capacity of C309 (this also results in poor vertical linearity).

D. POOR VERTICAL LINEARITY, SIZE NORMAL.

1. Leaky or improper value of C309.
2. Check B+ to V10 (leaky capacitor C310).
3. Check C303 for leakage.

E. POOR VERTICAL LINEARITY, INSUFFICIENT HEIGHT.

1. Defective output tube, V10.
2. Inadequate drive voltage from V9. Check waveform at pin 5 of V9.
3. Low plate voltage to V9 or V10.
4. Open or low capacity of C309.

F. EXCESSIVE VERTICAL SIZE, SYNC SATISFACTORY.

1. Low value of R307 or defective size control R308.
2. Open or low capacity of C308.
3. Low picture tube anode voltage.
4. Open R309.

G. NO VERTICAL SYNC, VERTICAL HOLD HAS NO EFFECT, INSUFFICIENT HEIGHT.

1. Shorted capacitor C306.
2. Shorted R305.

H. POOR VERTICAL LINEARITY, FOLD-OVER AT BOTTOM OF PICTURE, TOO MUCH HEIGHT.

1. Shorted or high leakage of C303.
2. Low capacity of C308.

I. CURTAIN RAISING EFFECT (PICTURE ROLLS UP FROM BOTTOM AS VERTICAL HOLD IS ADVANCED).

1. Leaky capacitor, C304.
2. Low resistance of R303.

DEFECTS OF THE HORIZONTAL SWEEP

A. Inadequate Sweep Width.

1. Low B+ boost to plate of V14 or low B+ to screen of V14.
2. Shorted turns of width control, L353.
3. Shorted turns or arc-over in T351.
4. Parasitic oscillations in V14 (open filament by-pass C462, or defective V14).

B. Too Great Sweep Width.

1. Open width control, L353.
2. Low value of picture tube anode voltage.
3. Check voltages of V14.
4. High value of C382.

C. Poor Horizontal Linearity.

1. Check for short, or shorted turns of L352.
2. Leaky capacitor C370 in grid of V14.
3. Check screen by-pass capacitor C380.
4. Defective transformer T351.

D. Single White Vertical Line on Screen.

1. Open deflection coil, D351.

E. Black Beady Vertical Line or Lines (Barkhausen Oscillation).

1. Check sweep output tube, V14.
2. Check for open C382.

F. Keystoning (Picture Narrows at Top or Bottom).

1. Check for shorted capacitor, C378.
2. Shorted turns of Horizontal Deflection coil D351.

G. No Horizontal Sync, Bright Vertical Bar or Bars in Picture.

1. Shorted, open or leaky C365.
2. Shorted R366.

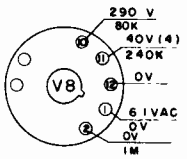
VOLTAGE MEASUREMENTS

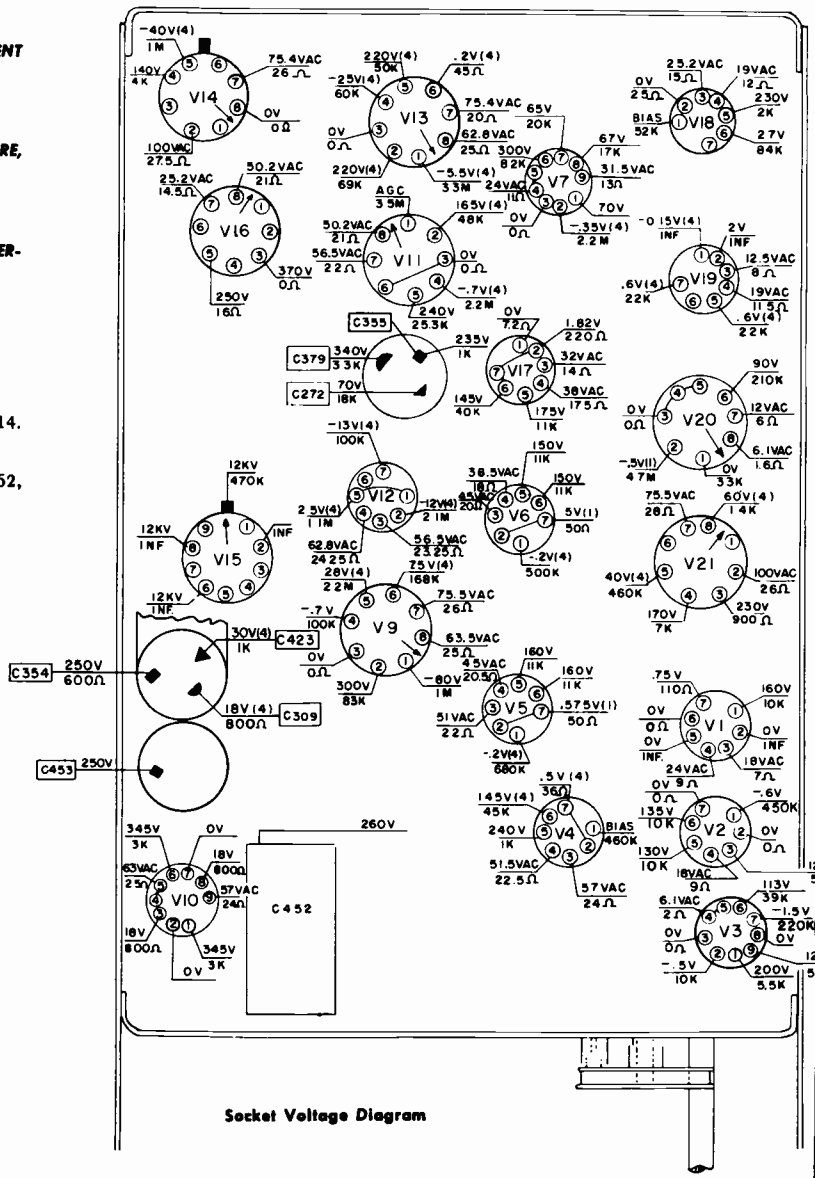
INPUT 117V, 60
ALL CONTROLS SET FOR NORMAL SWEEPS, FOCUS AND BRIGHTNESS
MEASUREMENTS ARE IN RESPECT TO B-
WITH A 20,000Ω/VOLT METER

(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
BRIGHTNESS
VERTICAL HOLD
VERTICAL SIZE
VERTICAL LINEARITY
VALUES LISTED MAY HAVE A TOLERANCE OF ± 20%

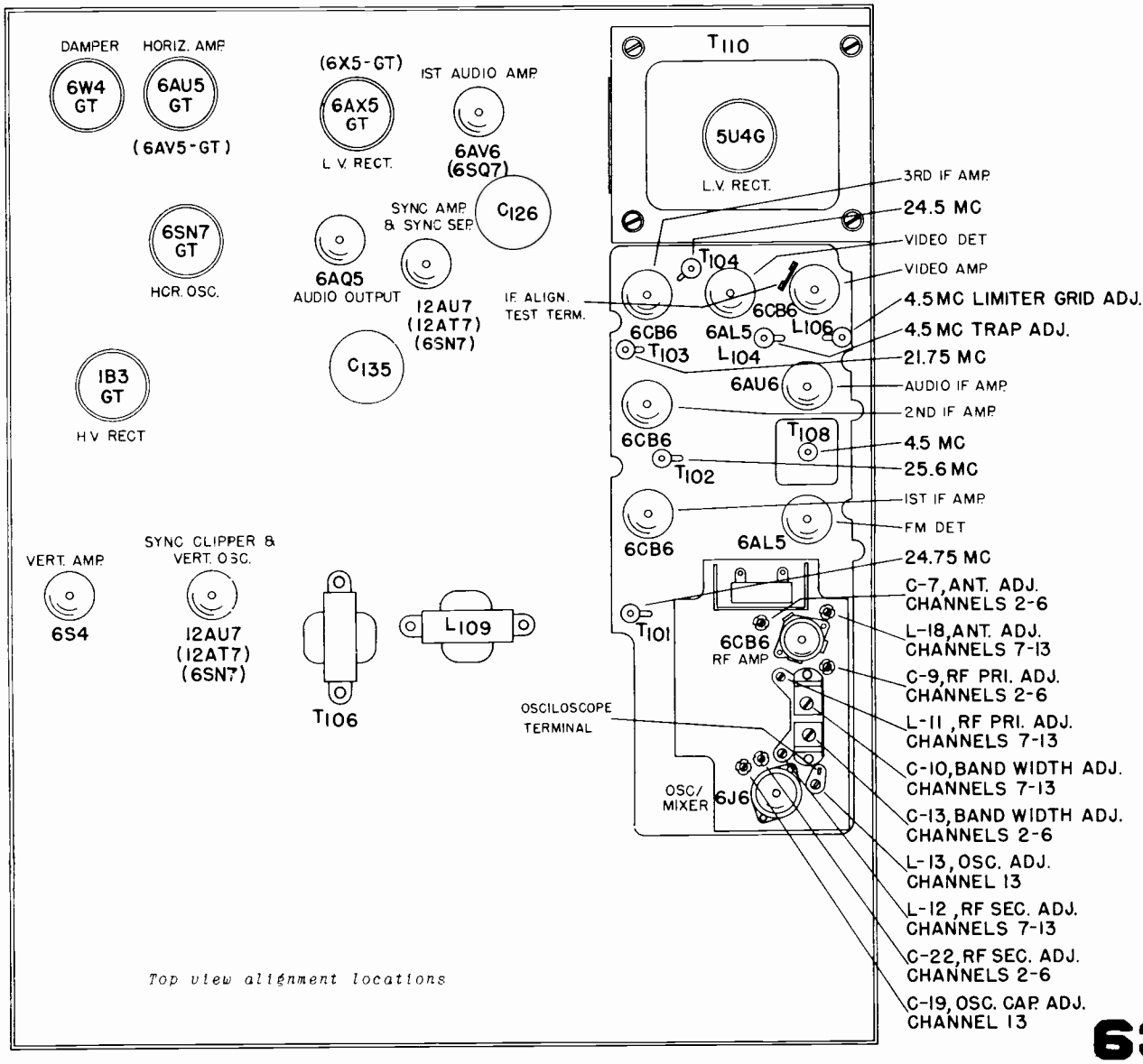




Socket Voltage Diagram

the hallicrafters co.

The circuit on the next two pages is exact for Models 810A and 815. Models 822, 870, 871, and 880 are practically identical. All of these models are for television reception only. Models 811, 818, 820, and 821 incorporate a three-tube A.M. radio tuner with a switch system for using audio stages of the television set. The television section of these sets are almost identical to the ones described. Models 860, 861, 890, 890S, and 894 also have an A.M. radio tuner and phonograph, and are similar to the sets described here.

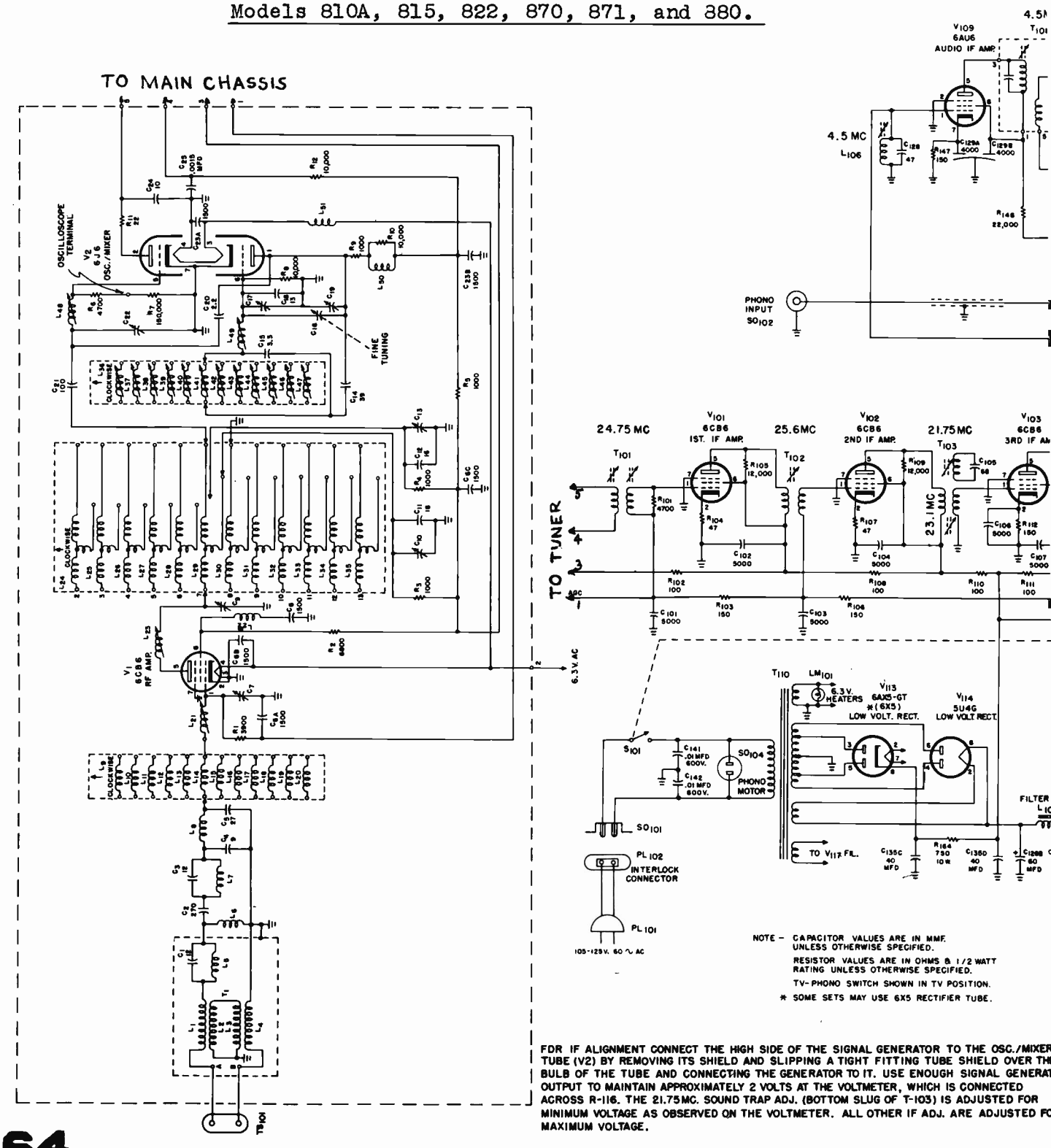


Top view alignment locations

the hallicrafters co.

MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 24, U. S. A.

Models 810A, 815, 822, 870, 871, and 880.



NOTE – CAPACITOR VALUES ARE IN MMF. UNLESS OTHERWISE SPECIFIED.

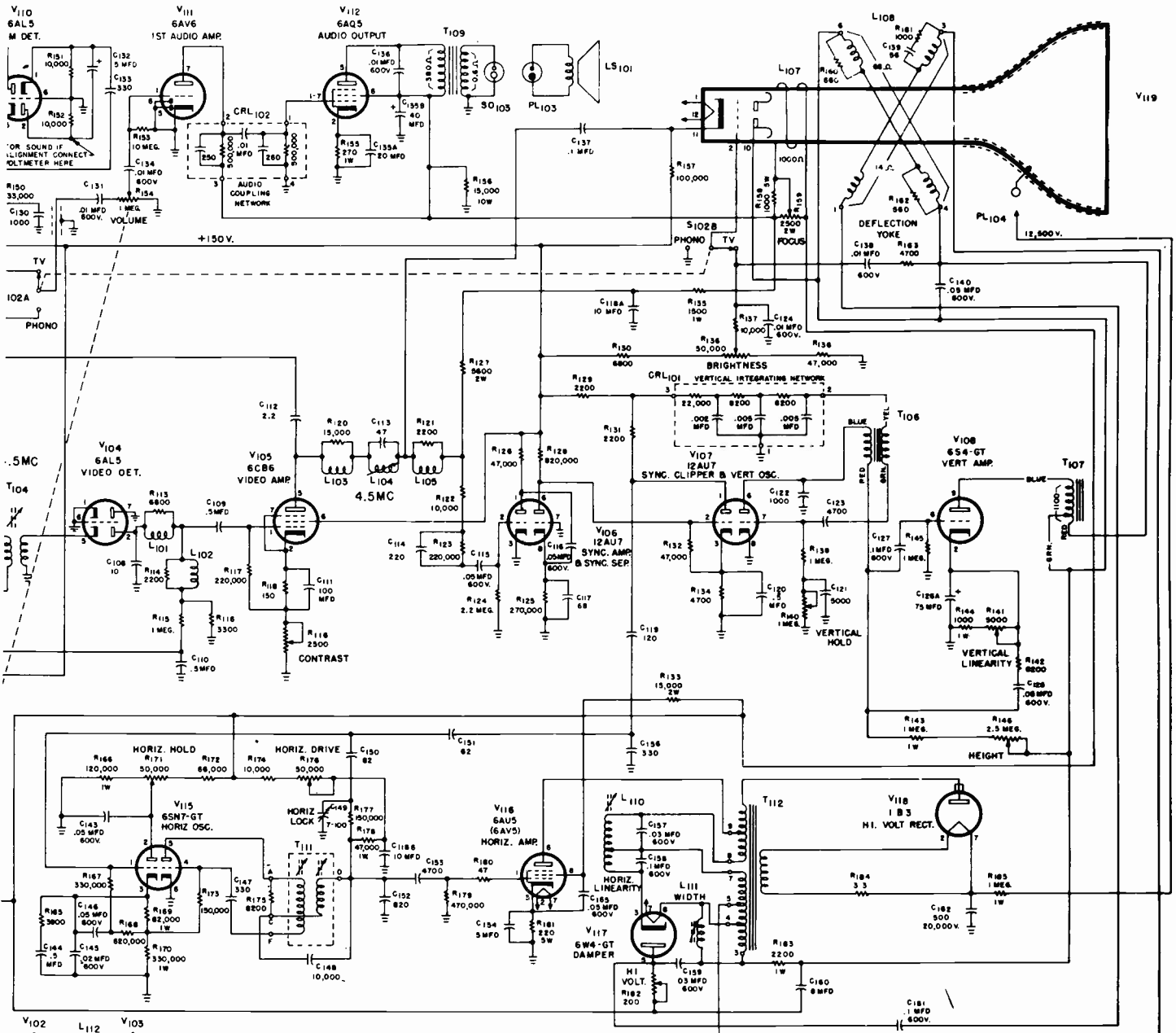
RESISTOR VALUES ARE IN OHMS & 1/2 WATT RATING UNLESS OTHERWISE SPECIFIED.

TV-PHONO SWITCH SHOWN IN TV POSITION.

* SOME SETS MAY USE 6X5 RECTIFIER TUBE.

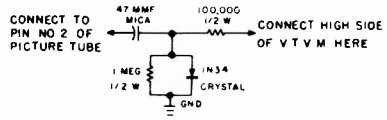
FOR IF ALIGNMENT CONNECT THE HIGH SIDE OF THE SIGNAL GENERATOR TO THE OSC./MIXER TUBE (V2) BY REMOVING ITS SHIELD AND SLIPPING A TIGHT FITTING TUBE SHIELD OVER THE BULB OF THE TUBE AND CONNECTING THE GENERATOR TO IT. USE ENOUGH SIGNAL GENERATOR OUTPUT TO MAINTAIN APPROXIMATELY 2 VOLTS AT THE VOLTMETER, WHICH IS CONNECTED ACROSS R-116. THE 21.75MC. SOUND TRAP ADJ. (BOTTOM SLUG OF T-103) IS ADJUSTED FOR MINIMUM VOLTAGE AS OBSERVED ON THE VOLTMETER. ALL OTHER IF ADJ. ARE ADJUSTED FOR MAXIMUM VOLTAGE.

the hallicrafters co.



** FOR SOUND IF ALIGNMENT THE SIGNAL GENERATOR IS CONNECTED ACROSS R-116 THROUGH A .005 MFD. CAPACITOR WITH ENOUGH SIGNAL OUTPUT TO MAINTAIN APPROX. 1 VOLT AT THE VOLTMETER. CONNECT THE CIRCUIT AS SHOWN BELOW. ADJUST THE 4.5MC TRAP ADJ. WHICH IS LOCATED ON THE UNDER SIDE OF THE CHASSIS FOR MINIMUM VOLTAGE AS INDICATED ON THE VOLTMETER. DISCONNECT THE TEST CIRCUIT AND CONNECT THE VOLTMETER TO PIN NO. 2 OF V-110. ALIGN THE LIMITER GRID ADJ. (L-106) AND THE PRIMARY OF T-108 FOR MAXIMUM INDICATION ON THE VOLTMETER.

* FOR SECONDARY ADJ. OF T-108 CONNECT THE VOLTMETER ACROSS C-130 (1000 MMF.) AND ADJUST FOR THE NULL.

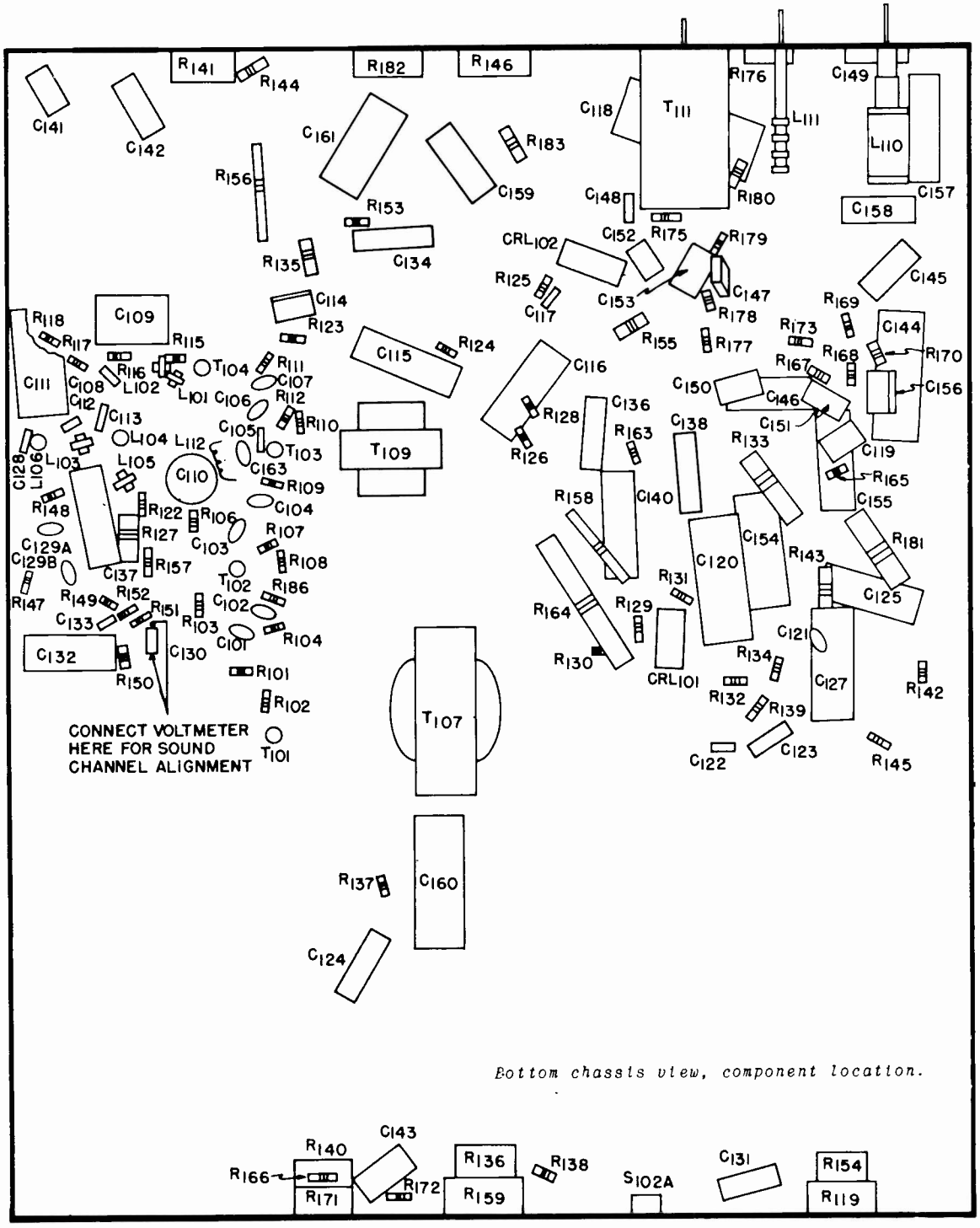


MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

The Hallicrafters Co. Models 810A, 815, 822, 871, and 880.

Chassis in which minor changes or substitutions were made during production may be identified as follows:

	CHASSIS STAMP	CHANGE OR SUBSTITUTIONS
1.	A.	Fuse added to the circuit
2.	1	Tube type 6SQ7 substituted for type 6AV6
3.	2	Tube type 12AT7 substituted for type 12AU7
4.	3	Both of the above tube substitutions
5.	4	Tube type 6SN7 substituted for type 12AU7



Bottom chassis view, component location.

Hoffman
SERVICE DATA

TELEVISION CHASSIS
170, 171, 173, 175

CHASSIS 170 FOR MODELS 630, 631, 870, 871, 872

CHASSIS 171 FOR MODELS 632, 633, 876, 877, 878

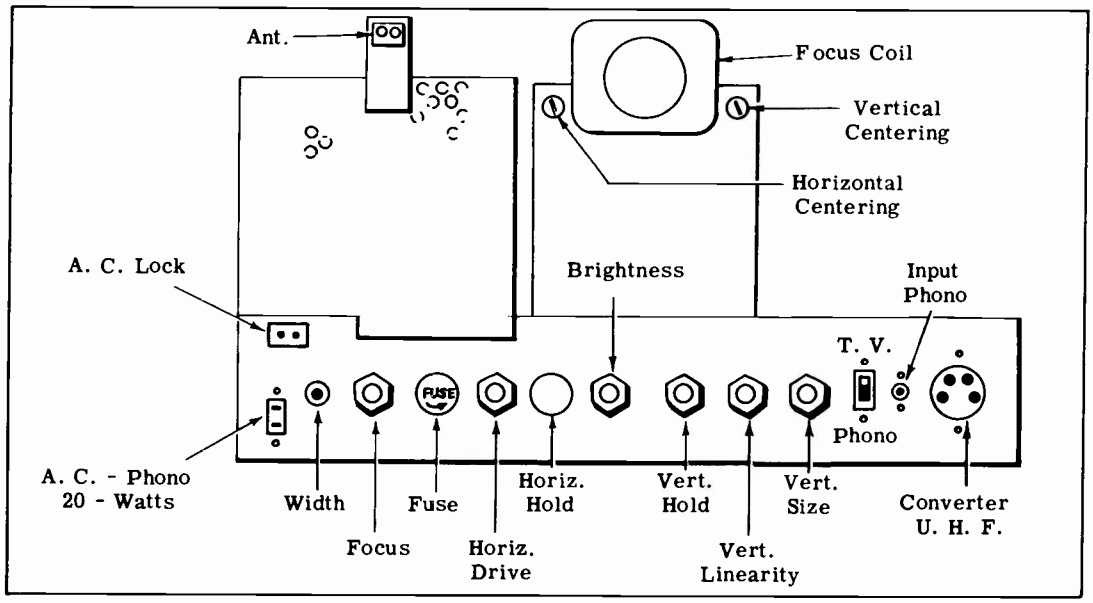
CHASSIS 173 FOR MODELS 866, 867, 868

CHASSIS 175 FOR MODELS 890, 891, 892

The Chassis 170, 171, 173, and 175, used in models listed above, are identical except for the picture tube size, mounting, and a couple of resistor changes in horizontal deflection system. Since these sets were originally released minor changes have been made to produce improvements or because of procurement difficulties. The circuit on the next page includes revisions, but at times other vacuum tubes may have been used and minor changes may have been required in this matter.

Two types of tuners have been used with these chassis. These are the RF6 turret type, and the Hoffman continuous type. These tuners require adjustment or service only on rare occasions.

Hoffman Chassis 172 used in Models 950, 951, and 952,
Chassis 174 used in Models 950A, 951A, and 952A,
Chassis 176 used in Models 960, 961, and 962,
are similar to the chassis described on these pages. The Chassis 172 and 174 are combination TV and radio receivers with provisions for connecting an automatic record player. A selector switch is wired with some changes so that TV, radio, or phono operation may be obtained. Chassis 176 is identical to Chassis 175 (TV only), but also having the selector switch circuit changes and instead of TV audio a separate audio section is added on a small separate chassis.

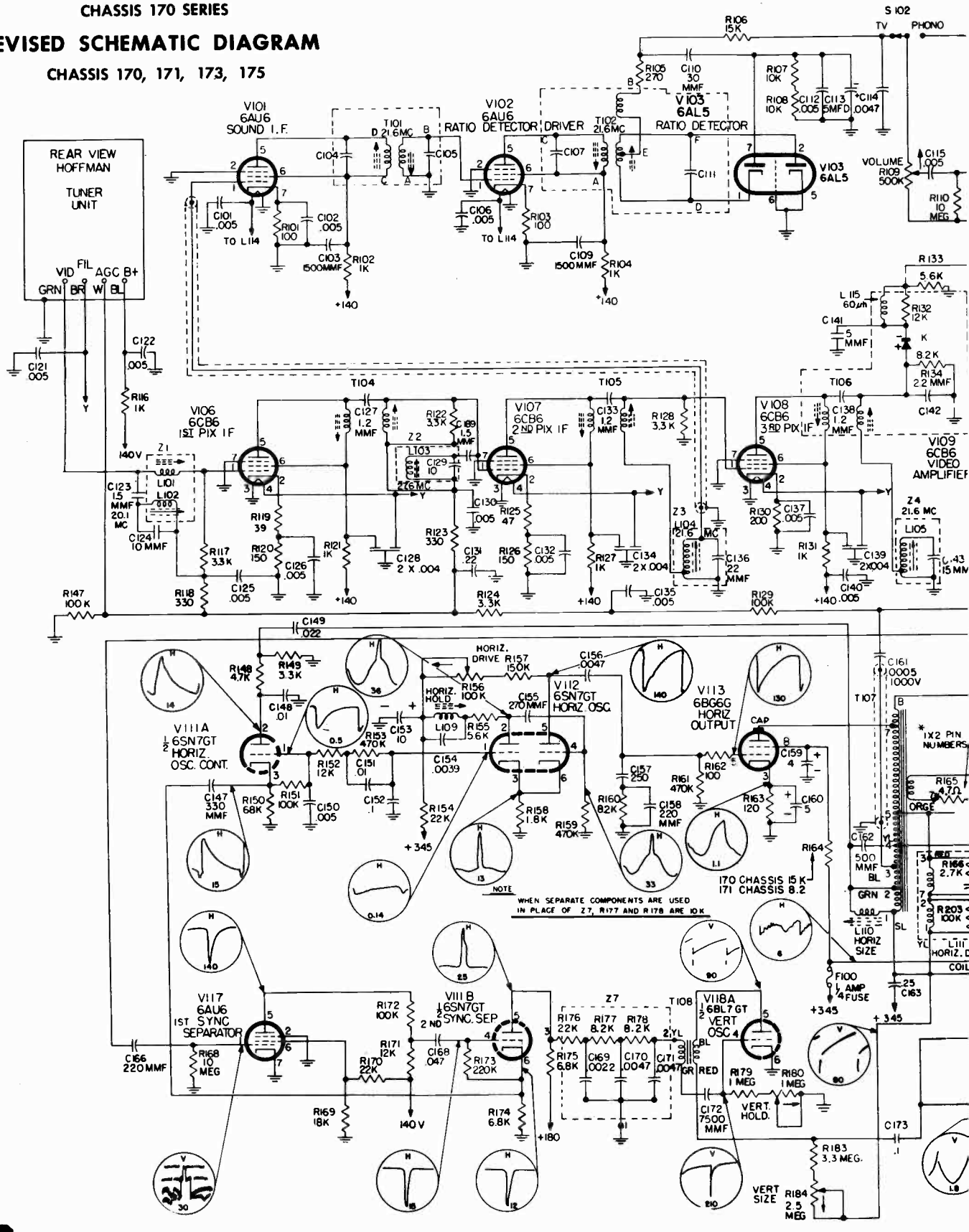


Rear Chassis Controls

CHASSIS 170 SERIES

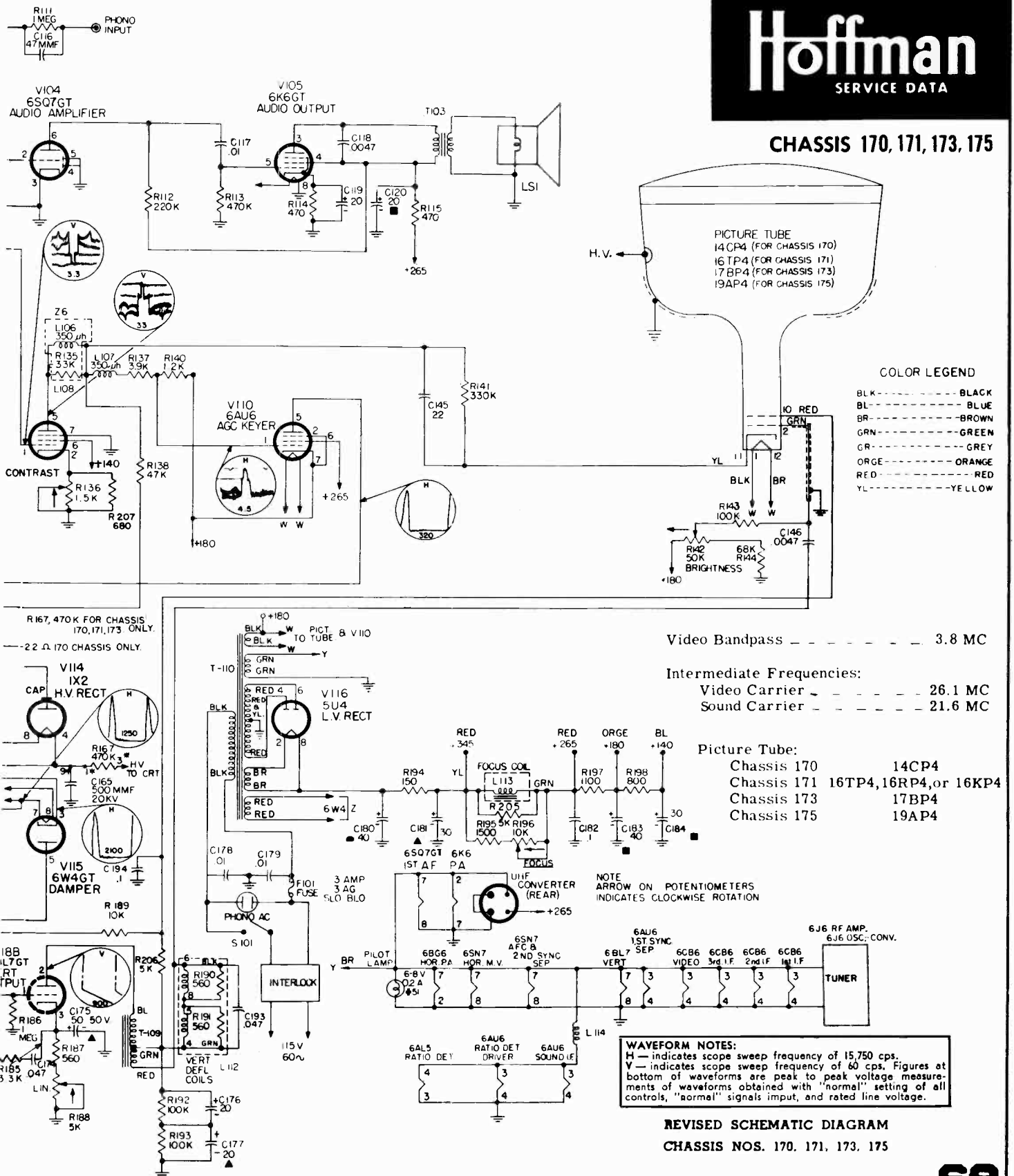
REVISED SCHEMATIC DIAGRAM

CHASSIS 170, 171, 173, 175



Hoffman SERVICE DATA

CHASSIS 170, 171, 173, 175



Video Bandpass _ _ _ _ _ _ _ _ 3.8 MC

Intermediate Frequencies:

Video Carrier _ _ _ _ _ _ _ 26.1 MC

Sound Carrier _ _ _ _ _ _ _ 21.6 MC

Picture Tube:

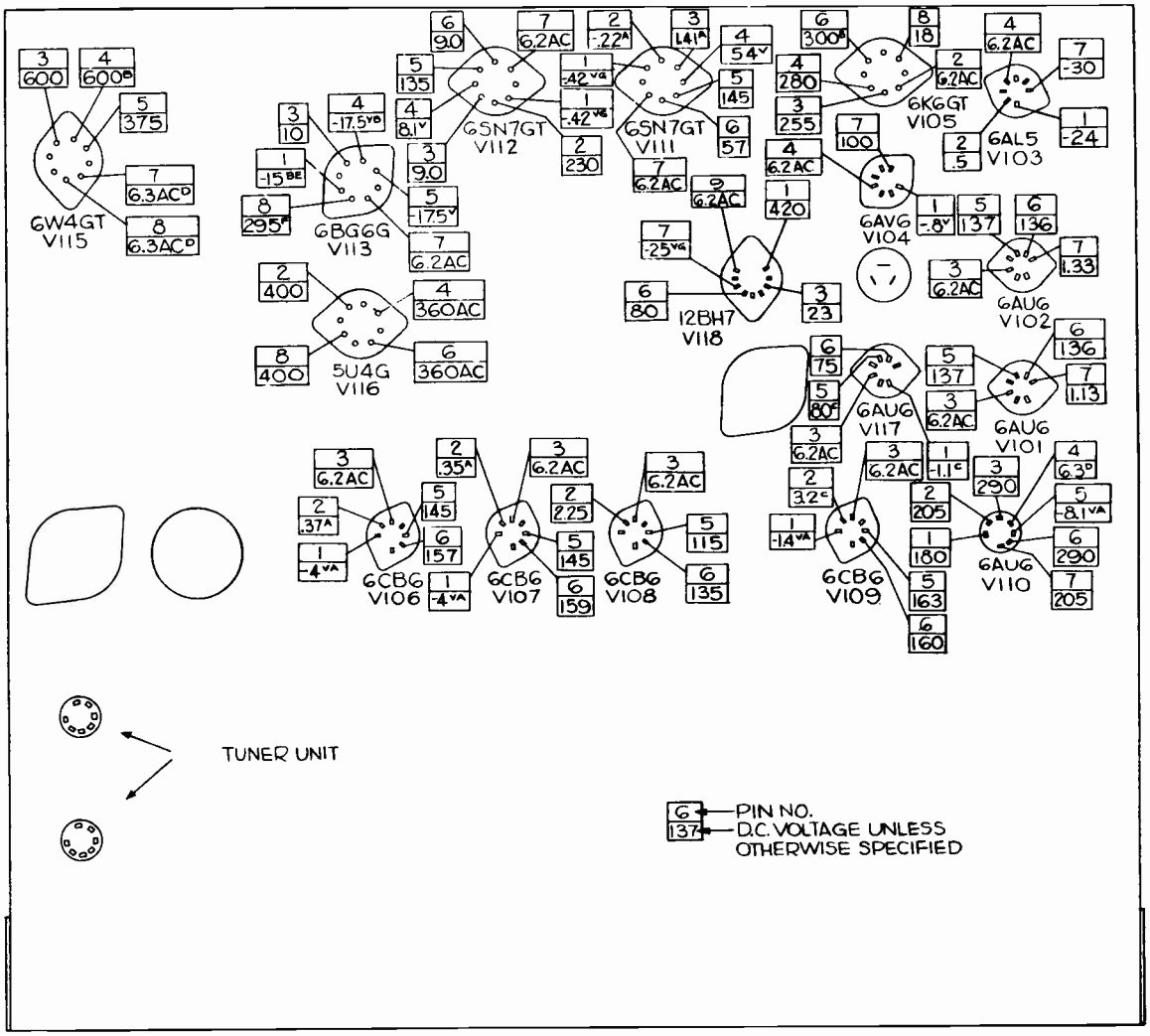
Chassis 170	14CP4
Chassis 171	16TP4, 16RP4, or 16KP4
Chassis 173	17BP4
Chassis 175	19AP4

WAVEFORM NOTES:
H — indicates scope sweep frequency of 15,750 cps.
V — indicates scope sweep frequency of 60 cps. Figures at bottom of waveforms are peak to peak voltage measurements of waveforms obtained with "normal" setting of all controls, "normal" signals imput, and rated line voltage.

REVISED SCHEMATIC DIAGRAM
CHASSIS NOS. 170, 171, 173, 175

Hoffman Television Chassis 170, 171, 173, and 175, Voltage Chart

BOTTOM VIEW TUBE LAYOUT
CHASSIS 170, 171, 173, 175



All voltages measured with set receiving picture and sound adjusted for normal operation, medium signal, medium volume and contrast level.

Line Voltage = 115V AC

All bus voltages run about 10 to 20 volts higher than shown on circuit schematic.

Slight variations in voltage values are to be expected due to variations in line voltage and variations from component nominal values.

A - Varies with signal level.

B - Pin used as tie point only.

C - Contrast set at minimum.

D - Measured to other heater pin.

E - No connection on chassis 175.

F - About 40V. less on chassis 170.

G - Depends upon setting of hold control.

V - Measured with V.T.V.M.

MAJESTIC RADIO & TELEVISION, INC. (Formerly Garod)

101 and 102 SERIES

Television

The material on the next six pages presents service information on Majestic 101 and 102 series, models as listed at left. This material can be used in servicing Majestic 99 and 100 series which have a different tuner and somewhat different high voltage supply. The circuit of the tuner for the 99-100 series is shown on the last page of this section following the alignment information. Sets of series 101A, 101B, 101C, 101D, 103, 103A, and 105 are almost identical in most respects to the 101-102 series, but uses other sizes of picture tubes and has some differences in the high voltage supply.

Series 101, Models 160, 160B, 162, 1600, & 1600B.
Series 102, Models 1605, 1605B, 1610, and 1610B.
Series 99, Models 120, 121, 121B.
Series 100, Models 141, 141B, 1400, 1400B, 142, 142B.
Series 101A, Models 7P1, 7P2, 7P3, 7P10, 7P11, & 1710.
Series 101B, Model 141C.
Series 101C, Models 7PR12, 7PR13.
Series 101D, Models 17DA, 17GA, 17HA.
Series 103, Models 902, 903, 910, 911, 9P4, 9P5.
Series 103A, Models 9PR8, 9PR9.
Series 105, Model 1401.

TUBE COMPLEMENT AND VOLTAGE READINGS—SERIES 101 AND 102

Item No.	Function	Tube Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	R.F. AMPLIFIER	6AG5/6BC5	—0.7	0	6.3 AC	0	115	115	0	—	—
V2	OSCILLATOR-CONVERTER	6J6	103	75	6.3 AC	0	−3 to −4.5	−4 to −9	0	—	—
V3	AUDIO OUTPUT	6K6	N.C.	0	263	275	0	N.C.	6.3 A.C.	19	—
V4	RATIO DET.—AUDIO AMP.	6T8	−0.3	−1.5	−0.8	6.3 A.C.	0	−0.8	0	−0.7	53
V5	RATIO DETECTOR DRIVER	6AU6	−0.1	0	0	6.3 A.C.	265	85	−0.6	—	—
V6	1st VIDEO I.F.	6BC5	−0.5	N.C.	0	6.3 A.C.	130	130	0.7	—	—
V7	2nd VIDEO I.F.	6BC5	−1	N.C.	0	6.3 A.C.	130	130	0.7	—	—
V8	3rd VIDEO I.F.	6AU6	0	0	0	6.3 A.C.	130	130	1.1	—	—
V9	VIDEO AMPLIFIER	12AU7	100	−0.7	0.2	6.3 A.C.	6.3 A.C.	150	−1	0	0
V10	SYNC. AMPLIFIER	12AU7	135	0	3.8	6.3 A.C.	6.3 A.C.	285	−23	4	0
V11	A.G.C.—SYNC. LEVELER	6AL5	2.6	−23	0	6.3 A.C.	0	—	−0.2	—	—
V12	VERT. OSCILLATOR	6C4	105	0	0	6.3 A.C.	105	−29	0	—	—
V13	VERT. OUTPUT	6V6/6W6	N.C.	0	270	270	0	270	6.3 A.C.	33	—
V14	HOR. OSCILLATOR	6SN7	−6	175	10	−65	170	0	0	6.3 A.C.	—
V15	HOR. OUTPUT	6AV5	5.8	6.3 A.C.	28	—	360	—	0	175	—
V16	HOR. DAMPER	6W4	230	N.C.	365	285	230	365	270 / * 6.3 A.C.	270	—
V17	H.V. RECTIFIER	† 1 X 2	11KV	11KV	—	11KV	11KV	11KV	—	11KV	11KV
V18	POWER RECTIFIER	5U4G	N.C.	290	N.C.	295 A.C.	270	295 A.C.	270	290	—
V19	PICTURE TUBE	See Diagram	270 / * 6.3 A.C.	150	Pin 10: 320			Pin 11: 175		Pin 12:	270 / * 6.3 A.C.

NOTES

1. Tune receiver to unused channel—no signal applied.
2. All front panel controls set at maximum clockwise positions.
3. Maintain line voltage at 117 volts A.C.
4. Values shown are D-C voltages, measured from socket pin to ground, unless otherwise stated.
5. D-C voltages measured with V.T.V.M. unless otherwise stated.

† Use high voltage insulated probe.

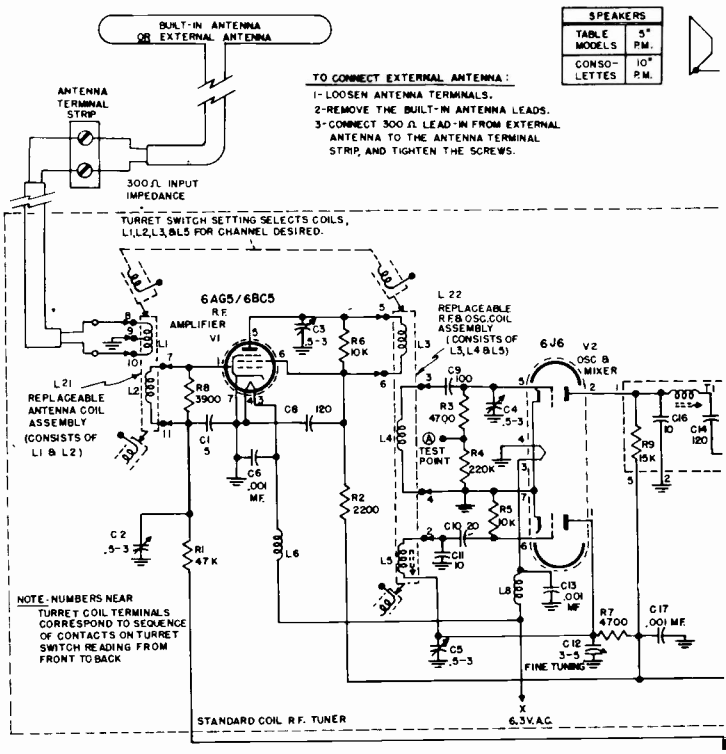
* Top value is D-C voltage to ground; bottom value measured across filament (Y-Y).

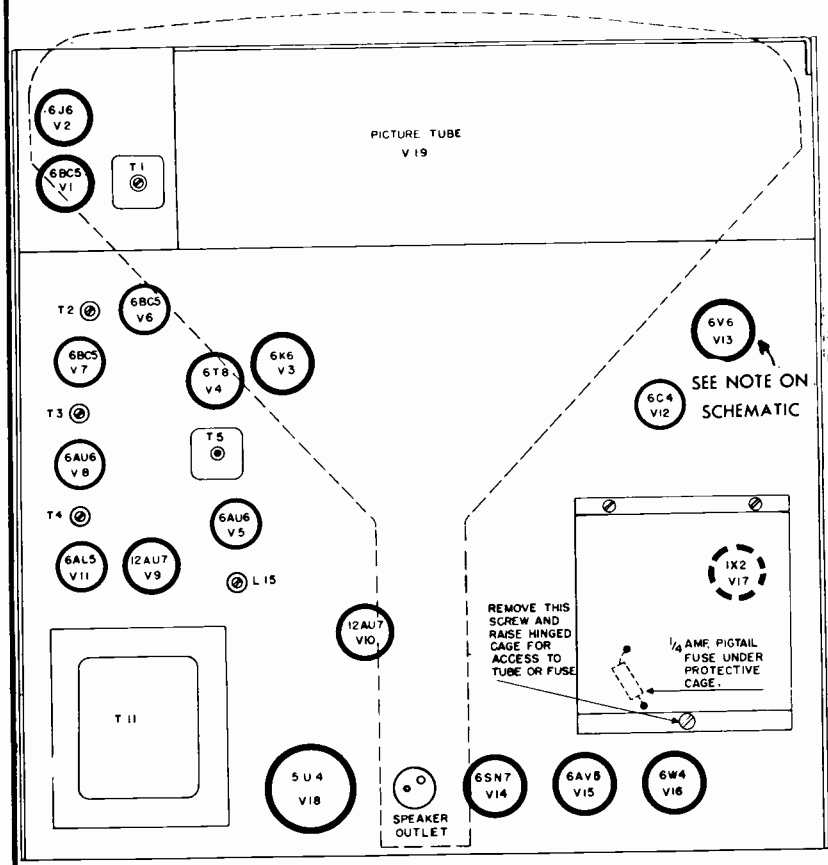
MAJESTIC RADIO & TELEVISION, INC.

101 and 102 SERIES Television Receivers

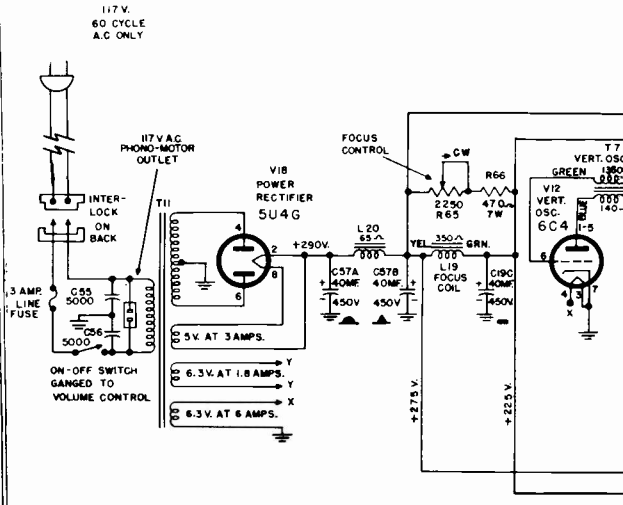
ELECTRICAL SPECIFICATIONS

Power Supply	117 Volts A.C. 60 Cycles Only
Power Consumption	175 Watts
Antenna Input Impedance	300 Ohms, Balanced
Tuning Range	Channels 2 to 13
I.F. System	Intercarrier
I.F. Frequencies	Picture—24.75 Mc Sound—20.25 Mc
	Sound I.F. Aligned at 4.5 Mc
Loud Speaker	5" P.M. or 10" P.M.
Voice Coil Impedance	3.2 Ohms @ 400 c.p.s.





TUBE LOCATION DIAGRAM – TOP VIEW

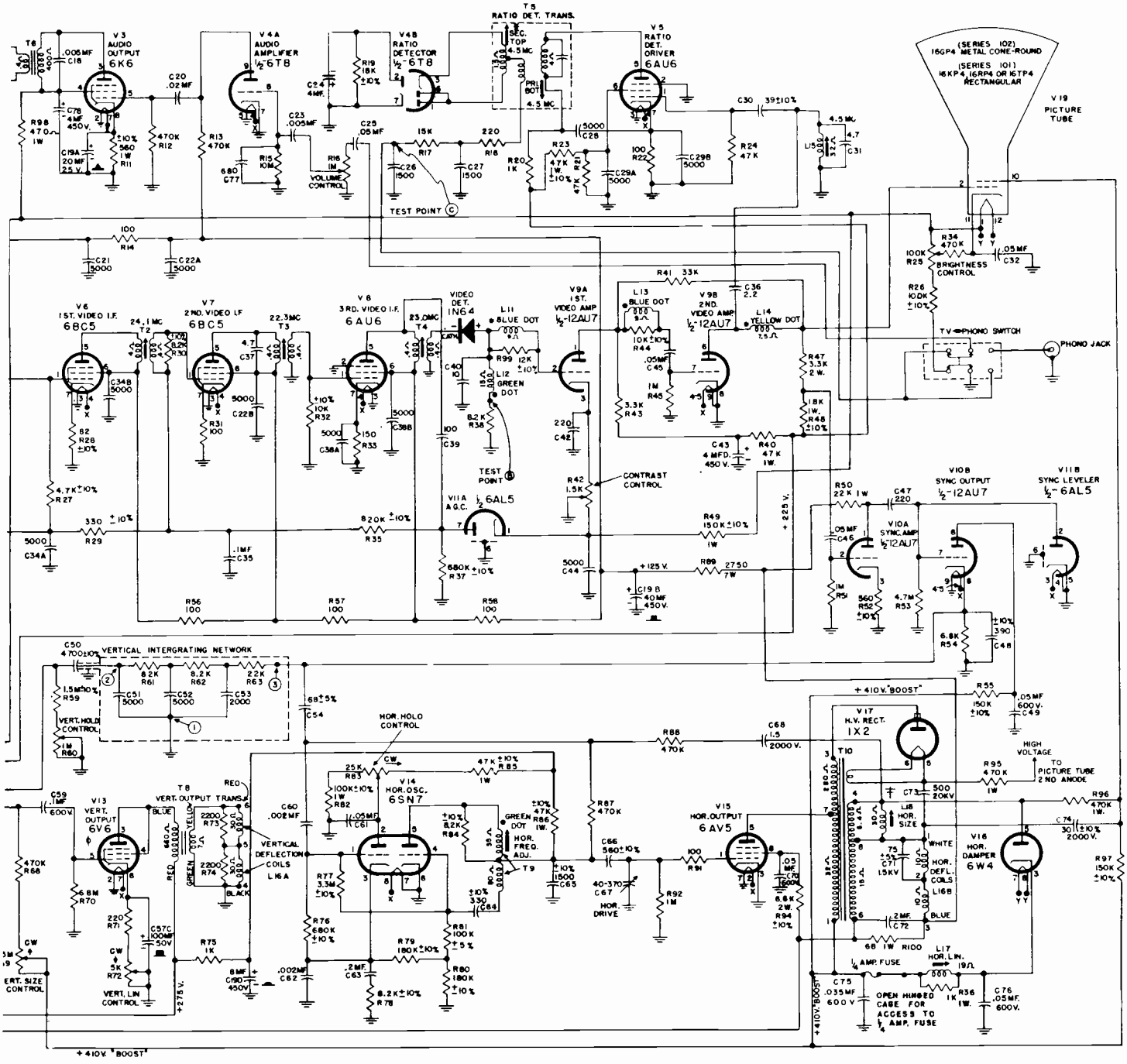


CIRCUIT SCHEMATIC DIAGRAM

101 SERIES 16"RECTANGULAR TUBE		102 SERIES 16"ROUND TUBE	
MODEL	CABINET	MODEL	CABINET
160	TABLE MODEL, MAHOGANY	1605	CONSOLETTE, MAHOGANY
1608	TABLE MODEL, BLEACHED	1605 B	CONSOLETTE, BLEACHED
162	TABLE MODEL, LEATHERETTE	1610	CONSOLE, MAHOGANY
1600	CONSOLETTE, MAHOGANY	1610 B	CONSOLE, BLEACHED
1600B	CONSOLETTE, BLEACHED		

MAJESTIC RADIO & TELEVISION
(Formerly GAROD)

MAJESTIC RADIO & TELEVISION, INC. Series 101 and 102.



I.F. ALIGNMENT DATA
T1 – 24.9 MC
T2 – 24.1 MC
T3 – 22.3 MC
T4 – 23.0 MC
VIDEO
L15 – 4.5 MC – SOUND TAKE-OFF
* T5 – 4.5 MC – RATIO DETECTOR

* TO ALIGN PRI. OR SEC. OF T5, OBTAIN TWO RESISTORS OF APPROXIMATELY 100,000 OHMS EACH, WHICH HAVE BEEN MATCHED ACCURATELY WITH OHMMETER. CONNECT THEM IN SERIES, ACROSS 18K RATIO DETECTOR RESISTOR (R19). USE JUNCTION OF MATCHED RESISTORS AS TEST POINT.

† C73 AS SHOWN, IN SERIES 101 RECEIVERS
C73 CONNECTED BETWEEN PIN 5 OF V17 AND GROUND IN SERIES 102 RECEIVERS

♦ 6V6 ON SERIES 101, 6W6 OR 6V6 ON SERIES 102

"K" = KILOHMS
"M" = MEGOHMS

ALL CERAMIC AND MICA CAPACITORS ARE IN MMFD. AND RATED 500 W.V., UNLESS OTHERWISE SPECIFIED.

ALL RESISTORS ARE ½ WATT AND ALL PAPER CAPACITORS ARE 400 W.V., UNLESS OTHERWISE SPECIFIED.

SERVICE ADJUSTMENTS

Below is given a description of the steps required in adjustment of the Beam Bender, Deflection Yoke, Focusing, Vertical and Horizontal Peaking and Horizontal A.F.C. However, it should be remembered that these adjustments are to be made only when picture quality is such that service adjustment is warranted. Use this description as a check-list and if a particular phase of quality is good, leave it alone and go on to the next operation. Refer to figure 1 for location of front panel controls, or to figure 2 for location of rear panel controls.

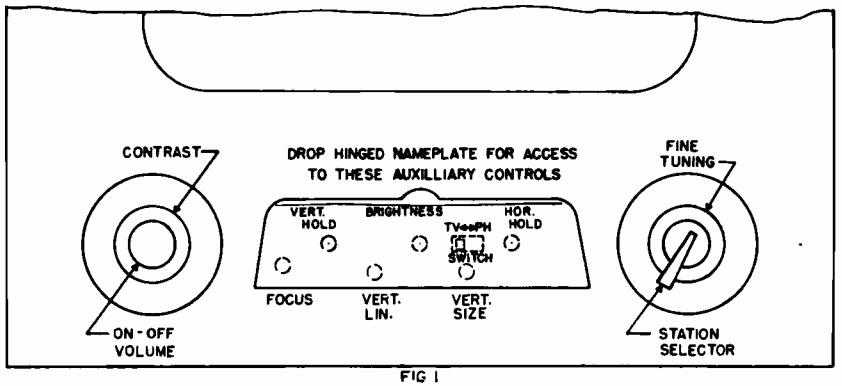


FIG. 1 — FRONT PANEL SERVICE ADJUSTMENTS

Before proceeding, tune in a station transmitting a test pattern.

A. BEAM BENDER (ION TRAP) ADJUSTMENT

1. Advance the BRIGHTNESS control almost fully clockwise.
2. Position the Beam Bender over the "flags" or kink in the gun structure. Starting from this position, adjust the Beam Bender by moving it forward or backward, and at the same time rotating it slightly around the neck of the tube until the brightest raster appears on the screen. If two maximum brightness positions are found, the one nearest the tube base is the correct setting. This adjustment should be done quickly to avoid damaging the gun structure.
3. Adjust the BRIGHTNESS control setting until the raster is slightly above average brilliance.
4. Re-adjust the Beam Bender carefully for maximum raster brilliance.

B. DEFLECTION YOKE ADJUSTMENT

1. Loosen the wing thumb screw located at the top of the deflection yoke frame.
2. Rotate the yoke until the raster-lines are squared with the picture mask.
3. Make sure the yoke presses firmly against the flare of the tube and tighten the wing screw.

C. FOCUSING ADJUSTMENTS

1. Adjust BRIGHTNESS and CONTRAST controls so that the raster brilliance corresponds to that of an average picture.
2. If the corner of the raster is shadowed, loosen the Focus Coil Wing Nuts and screws slightly, and carefully twist the focus coil in such a direction that the shadow is eliminated. The focus coil should be positioned close to, but not necessarily touching the back of the deflection yoke. Tighten the wing nuts and screws while the focus coil is held in this position. The Beam Bender may now require slight readjustment.
3. Adjust the focus control (see fig. 1) so that the lines of the raster are sharp and distinct over the greatest screen area.

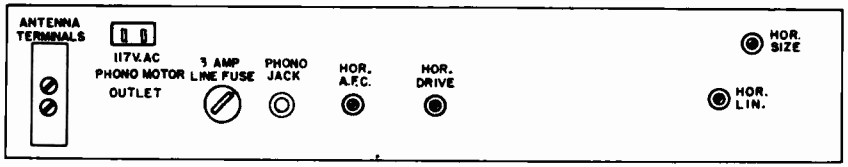


FIG. 2 — REAR PANEL ADJUSTMENTS

D. PICTURE CENTERING, SIZE, AND LINEARITY

1. Horizontal or Vertical Centering is accomplished mechanically. To center the picture, loosen the Focus Coil Wing Nuts sufficiently to twist the Focus Coil slightly about its horizontal or vertical axis. Make sure the corners of the rasters are not shadowed. See step C-2.
2. Adjust the VERTICAL SIZE and VERTICAL LINEARITY controls (see fig. 1) until the test pattern is vertically linear and symmetrical, and fills the mask. Adjustment of either control may require readjustment of the other. If vertical synchronization "falls out," re-adjust the VERTICAL HOLD control.
3. Adjust the HORIZONTAL SIZE control for correction of horizontal width.
4. Adjust the HORIZONTAL PEAKING control trimmer (see fig. 2) for a horizontally symmetrical pattern and for elimination of any existing vertical bars in left-center of picture.
5. Adjust the HORIZONTAL LINEARITY control (see fig. 2) for central alignment of the inner circles of the test pattern.

E. HORIZONTAL A.F.C. ADJUSTMENT

If difficulty is encountered in locking the picture horizontally, or if it locks-in only when the HORIZONTAL HOLD control is counterclockwise, adjust the HORIZONTAL A.F.C. control as follows:

1. Turn CONTRAST down about half way.
2. Turn HORIZONTAL HOLD control fully clockwise.
3. If the picture is not locked-in, turn the HORIZONTAL A.F.C. control till it does lock-in.
4. Turn the HORIZONTAL A.F.C. control counterclockwise till it just tends to fall out of sync. — This is the correct position of the HORIZONTAL A.F.C. control for optimum range of the HORIZONTAL HOLD control.

RECORD-PLAYER OR CHANGER OPERATION

A Phono-Jack and a 117V. A.C. outlet are provided at the rear of the chassis (See fig. 2) for connection of a record-player or changer. A TV-Phono transfer switch is concealed behind the trap door on the front of the cabinet (See fig. I).

To operate phonograph, switch should be thrown to "phono" position. Sound volume is regulated by means of volume control as in the case of TV operation. (See main schematic diagram for circuit details).

ALIGNMENT INSTRUCTIONS

I-F and Sound Alignment Procedure

TV I-F ALIGNMENT

1. Tune receiver to quiet portion of TV High Band.
2. Set contrast control fully counterclockwise.
3. Connect TV I-F Signal Generator through a 1500 MMF condenser to Test Point (A) of tuner unit; (See Fig. 3) low side to ground.
4. Connect negative lead of V.T.V.M. (or meter of 20,000 ohms-per-volt, or better) to 8.2K diode load resister TEST POINT (B); positive lead to ground. See schematic diagram.
5. Feed 23.0 MC (±.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.*
6. Feed 22.3 MC (±.05 MC) from Signal Generator, and adjust T3 as above.
7. Feed 24.1 MC (±.05 MC) from Signal Generator, and adjust T2 as above.
8. Feed 24.9 MC (±.05 MC) from Signal Generator, and adjust T1 as above.
9. Replace the meter with the vertical input of an Oscilloscope; low side to ground.
10. Replace Signal Generator with a video I-F Sweep Generator.
11. Loosely couple high side of a TV I-F Marker Generator to the high Sweep Generator Lead; low side to ground.
12. Feed I-F Sweep, and observe response on 'scope.
13. If response does not approximate that shown in Fig. 5, repeat steps 3 to 8, making sure that frequencies are precise, and that the Signal Generator output voltage is kept low. Continue with steps 9 to 12. A slight touch-up of individual slugs may be required to approximate the recommended curve of Fig. 5.

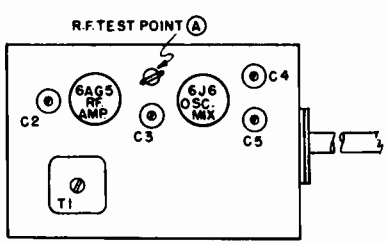


FIG. 3 — TOP VIEW

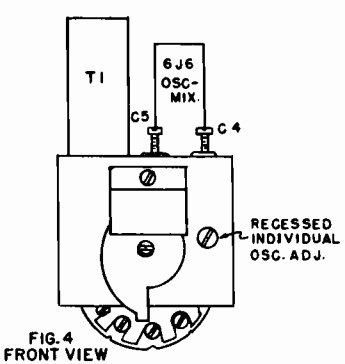


FIG. 4 FRONT VIEW

R.F. TUNER ADJUSTMENT POINTS

TABLE I - 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.

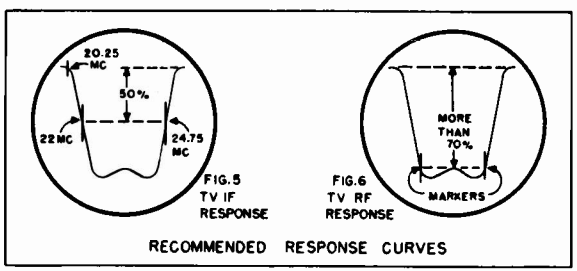


FIG. 5 TV IF RESPONSE

FIG. 6 TV RF RESPONSE

RECOMMENDED RESPONSE CURVES

SOUND ALIGNMENT

1. Connect a 4.5 MC Signal Generator (±.01 MC) through a 1500 MMF condenser to the 8.2K video diode load resistor—TEST POINT (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 (R19) at the 6T8 tube socket (V4).
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 L15 and bottom slug of T5 for maximum deflection on V.T.V.M.
5. Connect positive lead of V.T.V.M. to junction of C25, C26, and R17—TEST POINT (C), leaving negative lead of V.T.V.M. connected as in step 4. See schematic diagram for TEST POINT (C).
6. Adjust top of T5 for zero output on V.T.V.M., between two opposite polarity peaks.

(Continued on the next page, over)

MAJESTIC Series 101 and 102 Television
(Alignment continued from previous page)

R.F. AND OSCILLATOR ALIGNMENT PROCEDURE

R.F. ALIGNMENT

1. Connect TV Sweep Generator to Antenna Terminals.
2. Connect R.F. Marker Generator loosely to Antenna Terminals.
3. Connect vertical amplifier of Oscilloscope through a 10,000 ohm ½w. resistor to Test Point (A) fig. 3.
4. Short A.G.C. Bus to ground on TV chassis (across C34A 5000 MMF Discap condenser).
5. Set Station Selector switch to Channel 12.
6. Feed 207 mc at 10 mc sweep from Sweep Generator, and 205.25 mc & 209.75 mc fixed frequencies from R.F. Marker Generator.
7. Observe response curve on Scope. If necessary adjust C2, C3, or C4 (See fig. 3) so that response curve corresponds approximately to that shown in fig. 6 and has maximum gain.
8. Check markers on response curve of all remaining channels, setting Sweep and Marker Generators at corresponding frequencies for each channel. See Table I for convenient tabulation of proper frequencies. If the R.F. Markers do not fall in automatically in their proper places on all channels, a compromise must be made by slight readjustment of C2, C3, or C4.

OSCILLATOR ALIGNMENT

1. Connect TV Sweep Generator to Antenna Terminals.
2. Couple R.F. Marker Generator loosely to Antenna Terminals.
3. Connect verticle amplifier of Oscilloscope across the video amplifier grid and ground (Pin 2 of 12AU7, V9).
4. Couple 24.75 mc video I.F. Marker Generator loosely to first I.F. grid (Pin 1 of 6BC5, V6).
5. Rotate Fine Tuning control to center of range.
6. Set Station Selector switch to Channel 12.
7. Set Sweep Generator to 207 mc at 10 mc sweep and Marker Generator to 205.25 mc (video carrier).
8. Observe response curve and adjust C5, (figs. 3 & 4) for Zero-beat with 24.75 mc marker.

NOTE: Quality of response curve does not affect accuracy of oscillator alignment, so long as a zero-beat is obtained.

9. Check for zero-beat on all channels in this manner, setting the Station Selector, Sweep Generator and Marker Generator at corresponding frequencies. (See Table I). It is not usually necessary to make any further adjustments. However, if the individual oscillator coils must be touched-up, the following procedure should be employed:

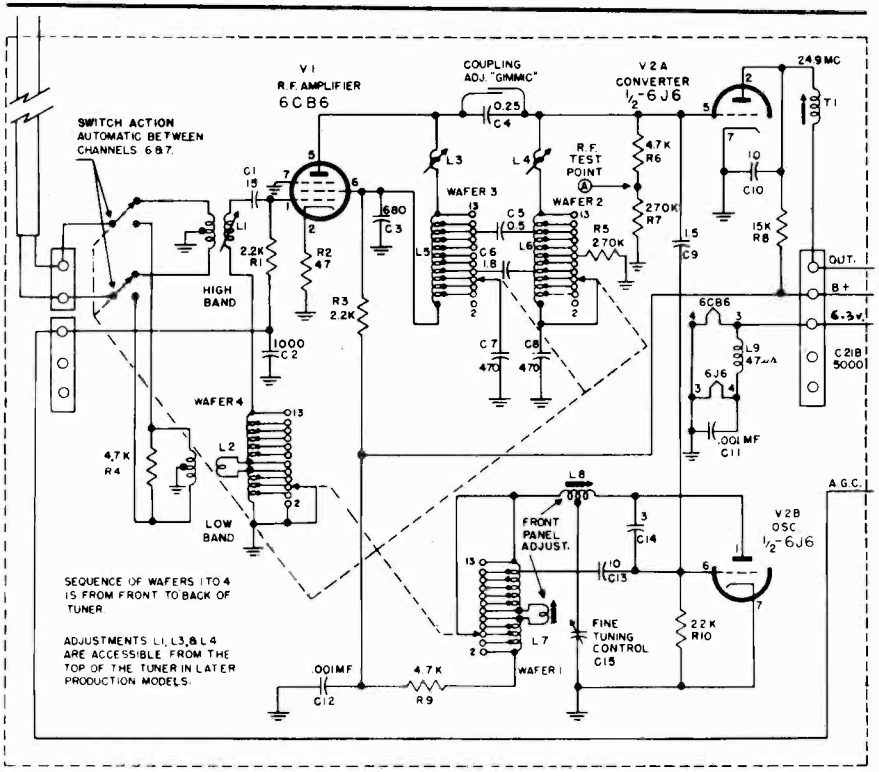
   a) Rotate Fine Tuning control to center of range.

   b) Set Station Selector to desired channel, Sweep Generator to its center frequency with 10 mc sweep, and Marker Generator to the corresponding video carrier frequency (See Table I).

   c) Place a non-metallic screwdriver through the opening marked 'Recessed Individual Osc. Adjustment', fig. 4, and adjust oscillator coil zero-beat with 24.75 mc marker on response curve.

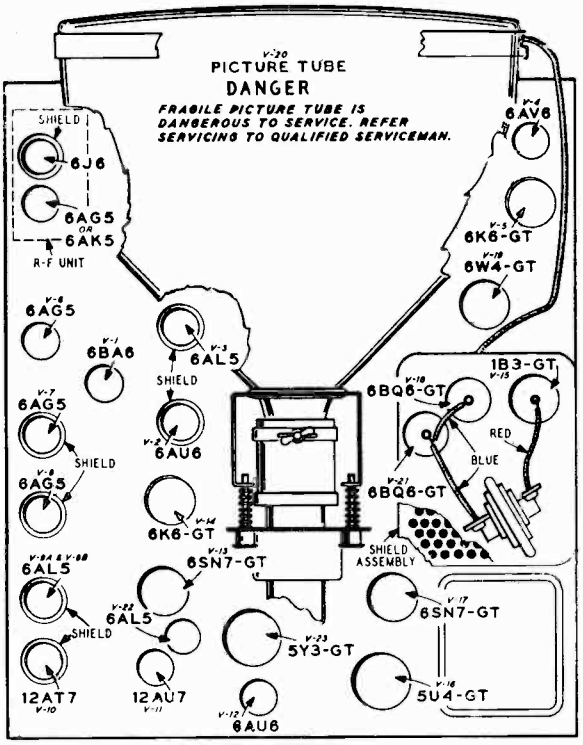
   d) This adjustment can be repeated on any single channel, or, if necessary, on all channels.

   e) If difficulty is encountered in tuning any particular channel well within limits of Fine Tuning control after these adjustments are made, readjust C5 slightly (as in Step 8) shifting the whole range of frequencies in the desired direction.



Tuner used on Series 99 and 100 sets.

M O N T G O M E R Y W A R D

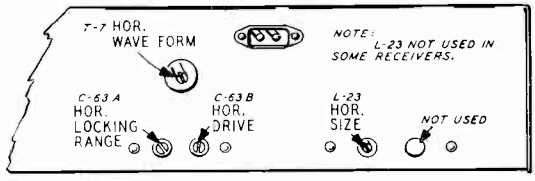


Tube Layout—16" Pix Tube Receivers

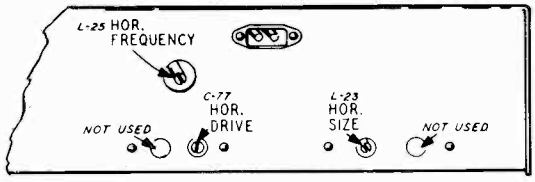
16" TELEVISION RECEIVER

MODEL NOS.
05WG-3030C
05WG-3036A&B
05WG-3039A&B

Models 05WG-3030A and 05WG-3030B, using 16" round picture tubes, Models 05WG-3031A and 05WG-3031B, using 12½" round picture tubes, and Model 05WG-3032A, using a 16" square picture tube, are all very similar to the television receivers described on the next six pages. The alignment information given will apply exactly, while the circuit diagram on pages 80 and 81, is very close to these additional models.



Rear Chassis Adjustments
(12½" Pix Tube Receivers)



Rear Chassis Adjustments
(16" Pix Tube Receivers)

ALIGNMENT PROCEDURE

TEST EQUIPMENT—To service this receiver properly, it is recommended that the following test equipment be available:

R-F SWEEP GENERATOR meeting the following requirements:
(a) Frequency ranges:
18 to 30 mc, 10 mc sweep width
40 to 90 mc, 10 mc sweep width
170 to 225 mc, 10 mc sweep width
(b) Output adjustable with at least .1 volt maximum.
(c) Output constant on all ranges.
(d) Flat output in all attenuator positions.

CATHODE-RAY OSCILLOSCOPE preferably one with a wide band vertical deflection and an input calibrating source.

SIGNAL GENERATOR to provide the following frequencies:
(Output on these ranges should be adjustable and at least .1 volt maximum.)
(a) Intermediate alignment frequencies:
*17.0 mc adjacent picture trap
20.2 mc adjacent picture trap
22.7 mc first picture I-F coil
**24.1 mc third picture I-F coil
25.7 mc second picture I-F coil
27.7 mc adjacent sound trap
21.7 mc sound trap (takeoff)
4.5 mc video trap

* This frequency is not used in receivers with the turret type tuner.

** If turret type tuner is used the frequency will be 23.7 mc.

ALIGNMENT PROCEDURE (continued)

(b) Radio frequencies:

Channel Number	Picture Carrier Freq. Mc.	Sound Carrier Freq. Mc.
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

HETERODYNE FREQUENCY METER with crystal calibrator if the signal generator is not crystal controlled.

ELECTRONIC VOLTMETER and a high voltage probe for use with this meter to permit measurements up to 20 kilovolts.

A. CW Carrier into Converter Grid.

VTVM with filter in lead of 10 K ohms and 5000 uuf connected to pic. det. load resistor, (R-31) 4700 ohms, in series with peaking coil (L-9) from Pin 7 of 6AL5. Input level should be such that output is less than 2 volts DC.

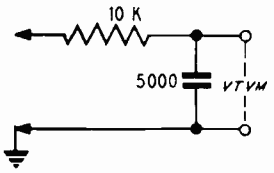


Fig. 18—VTVM Connections

	FREQUENCY	ADJUST
1.	20.2	Adjacent pix trap (T-4) — (3rd P-IF Cathode Coil) (above chassis) for minimum dc at picture detector.
2.	22.7	1st pix IF (L-5) (Sound Take-off Coil) primary (below chassis) for maximum dc at picture detector.
3.	25.7	2nd pix IF (L-24) (top of chassis) for maximum dc at picture det.
4.	24.1 (Switch Type Tuner) 23.7 (Turret Type Tuner)	3rd pix IF (L-7) (below chassis) for maximum dc at picture detector.
5.	27.7	2nd pix IF (L-24) transformer (below chassis) for minimum dc at picture detector.
6.	21.7	Sound Take-off Coil (L-5) (1st picture IF) (top of coil) For minimum dc at picture detector.

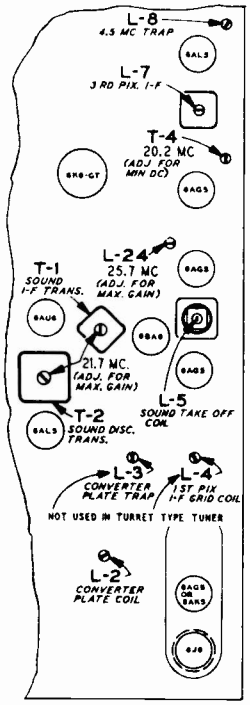


Fig. 16. Top Chassis
Video and Audio I-F Adjustments

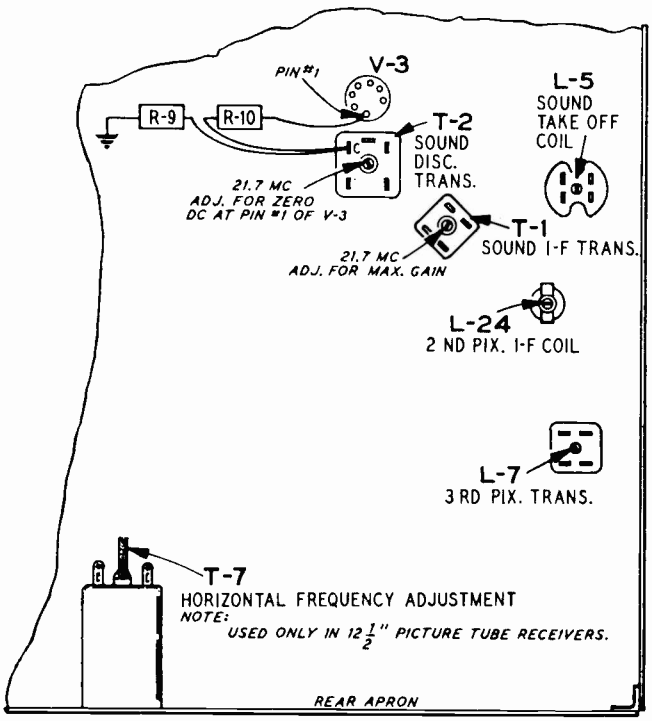


Fig. 17—Bottom Chassis
Video and Audio I-F Adjustments

ALIGNMENT PROCEDURE (continued)

7.	21.7	3rd pix IF (L-7) (top of can) adjust for minimum dc at picture detector.
*8.	17 MC (2 volts required)	Converter plate trap coil (L-3) for minimum dc at pic. detector.

*Step 8 omitted in Receivers with turret type tuner.

B. I-F Sweep Generator into converter grid (through tube shield insulated from chassis) with markers at 21.7 MC, and 26.2 MC.

Connect oscilloscope probe to plate of 1st I-F tube V-6 (Pin 5 of 6AG5).

Ground A-G-C Line.

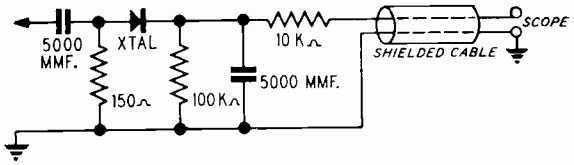


Fig. 19—Oscilloscope Connection

SWITCH TYPE TUNERS

Adjust converter plate coil (L-2) and 1st Pic. I-F grid coil (L-4) (top of chassis) to give the response shown below in figure 20.

A slight re-adjustment of L-3 converter plate trap may be necessary.

TURRET TYPE TUNERS

Adjust converter plate coil (L-2) to give response shown in dotted line in figure 20.

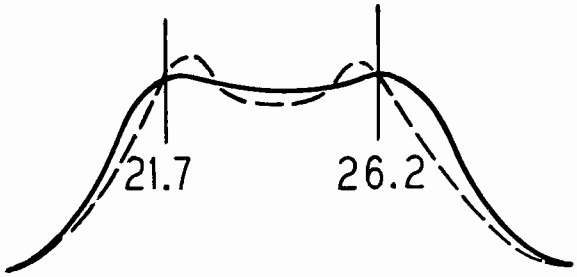


Fig. 20—Response Curve

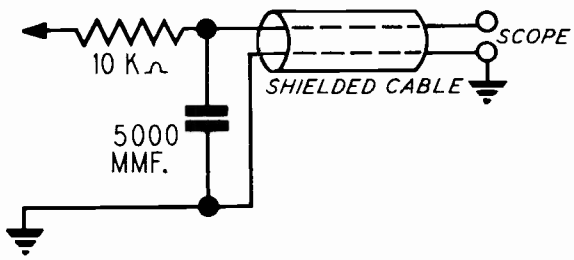


Fig. 21—Oscilloscope Connection

C. With same I-F sweep input, connect scope probe to second detector (junction of peaking coil (L-9) and 4700 ohm resistor (R-31) off Pin 7, 6AL5). Input should be adjusted to give 2 volt P to P output.

Apply 3 V, bias (dc) to AGC line. (battery).

Observe overall I-F response, which should be as shown in Figure 22. Slight touch-up may be required.

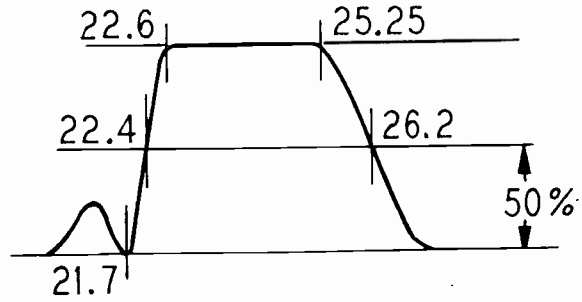


Fig. 22—Overall Response Curve

D. Sweep generator with balanced 300 ohm output into antenna for each channel. Adjust fine tuning to receive sound and observe overall response at second detector as in C. above.

If 26.2 marker is not at 50% point, a slight touch-up of 2nd Pix-IF transformer (L-24 on top of chassis) is required.

If there is a noticeable peak near 23 MC, a slight touch-up of 1st Pix-IF transformer (L-5 sound take-off coil on bottom of chassis) is required.

If the top of the curve is tilted, a slight re-adjustment of the 3rd Pix-IF transformer L-7 (bottom of chassis) may be necessary.

AUDIO I-F

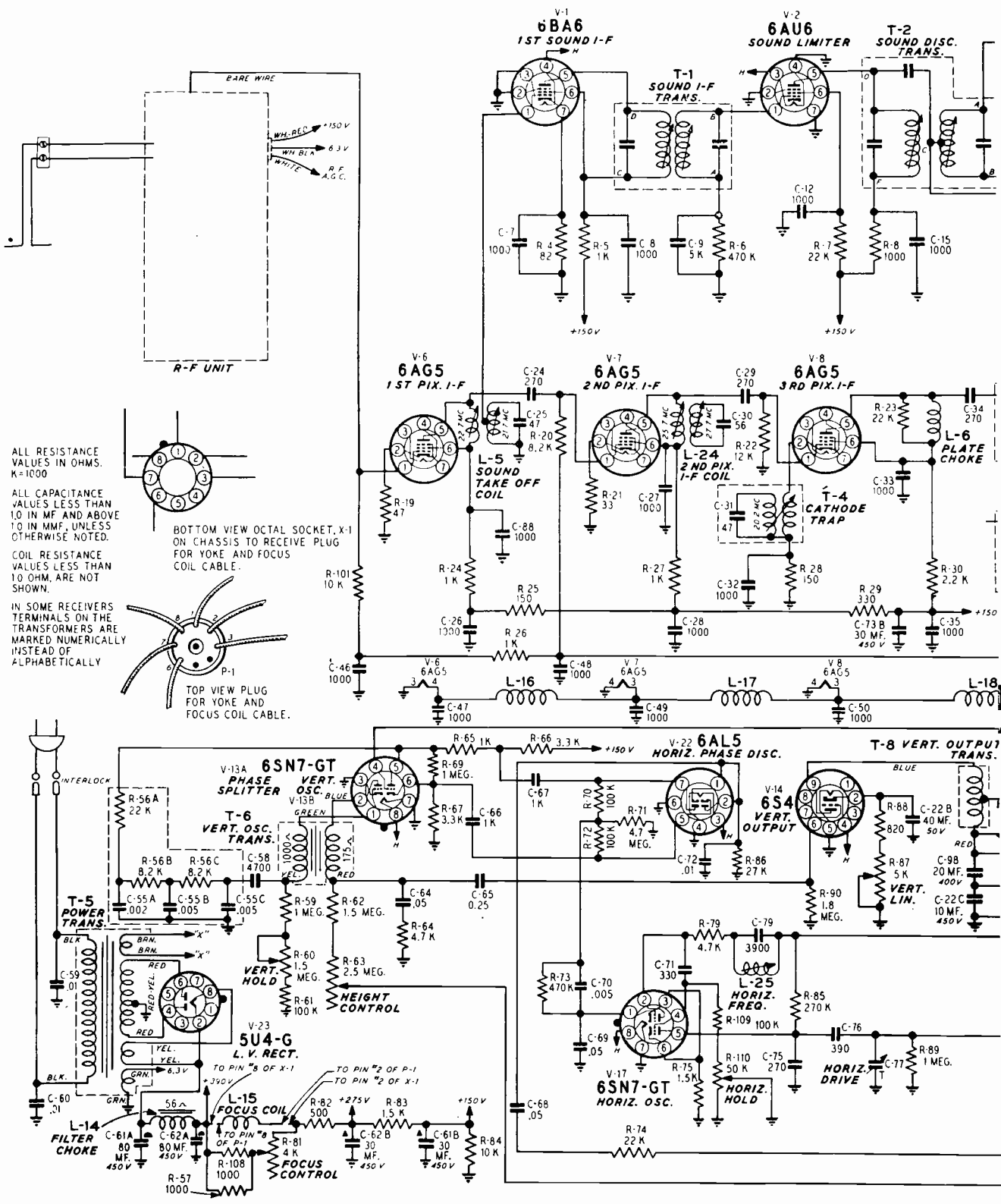
With 21.7 CW Carrier into converter grid as in A., and VTVM connected to terminal "C" of sound discriminator transformer, adjust sound I-F transformer (T-1) pri. and sec., and pri. (top of can) of discriminator (T-2) for max. dc. Input should be adjusted for 2 volts out.

Connect VTVM to Pin 1 of 6AL5 discriminator and adjust secondary of discriminator (T-2) (bottom of can) for cross-over. (Zero voltage).

VIDEO

With 4.5 MC CW Carrier from a high impedance source, (10,000 ohms in series with generator), into grid of 1st video tube (Pin 7 of 6AL5 second detector) and VTVM on picture tube grid, tune 4.5 MC trap L-8 (top of chassis) for minimum response.

M O N T G O M E R Y W A R D

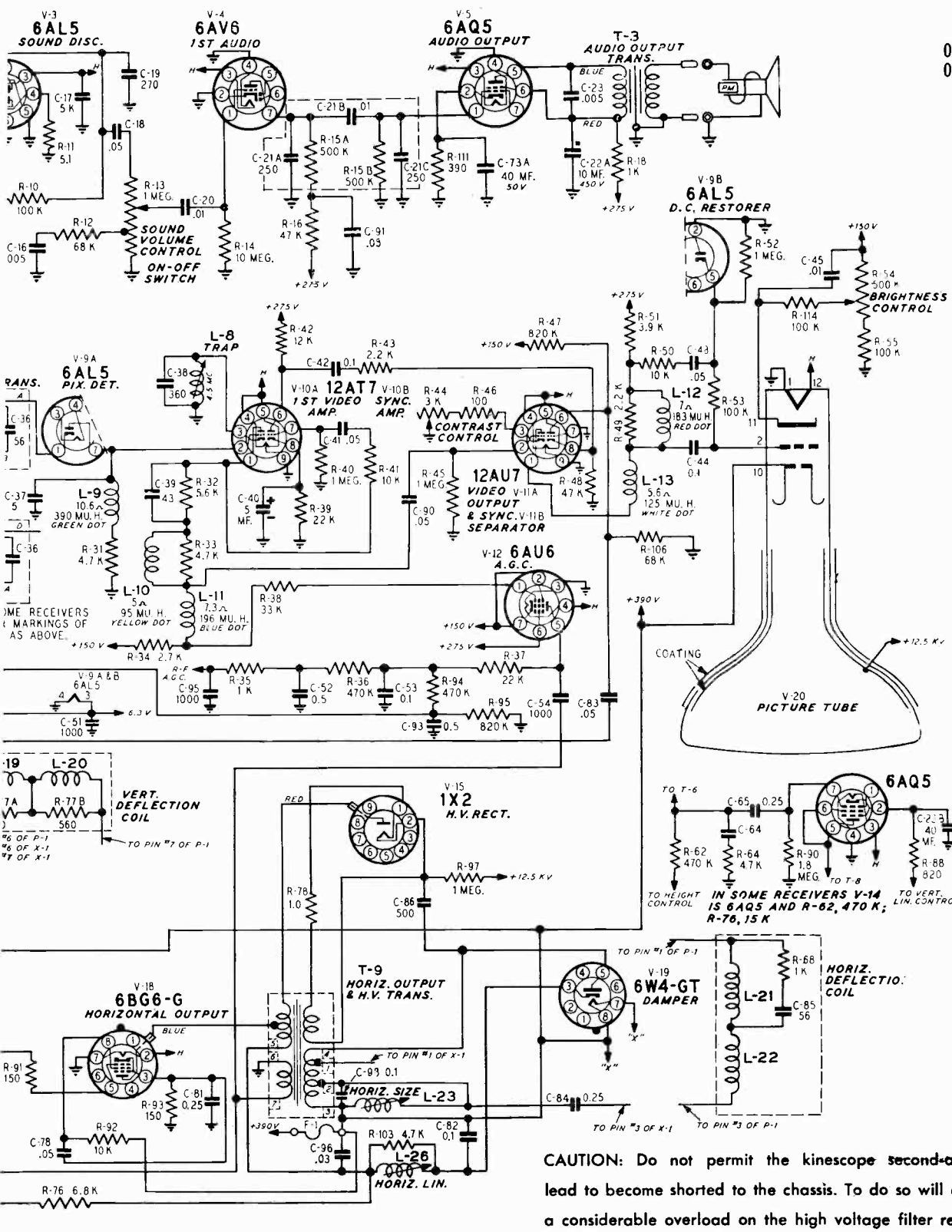


NOTE—In later production R-78 is 3.3 ohms.

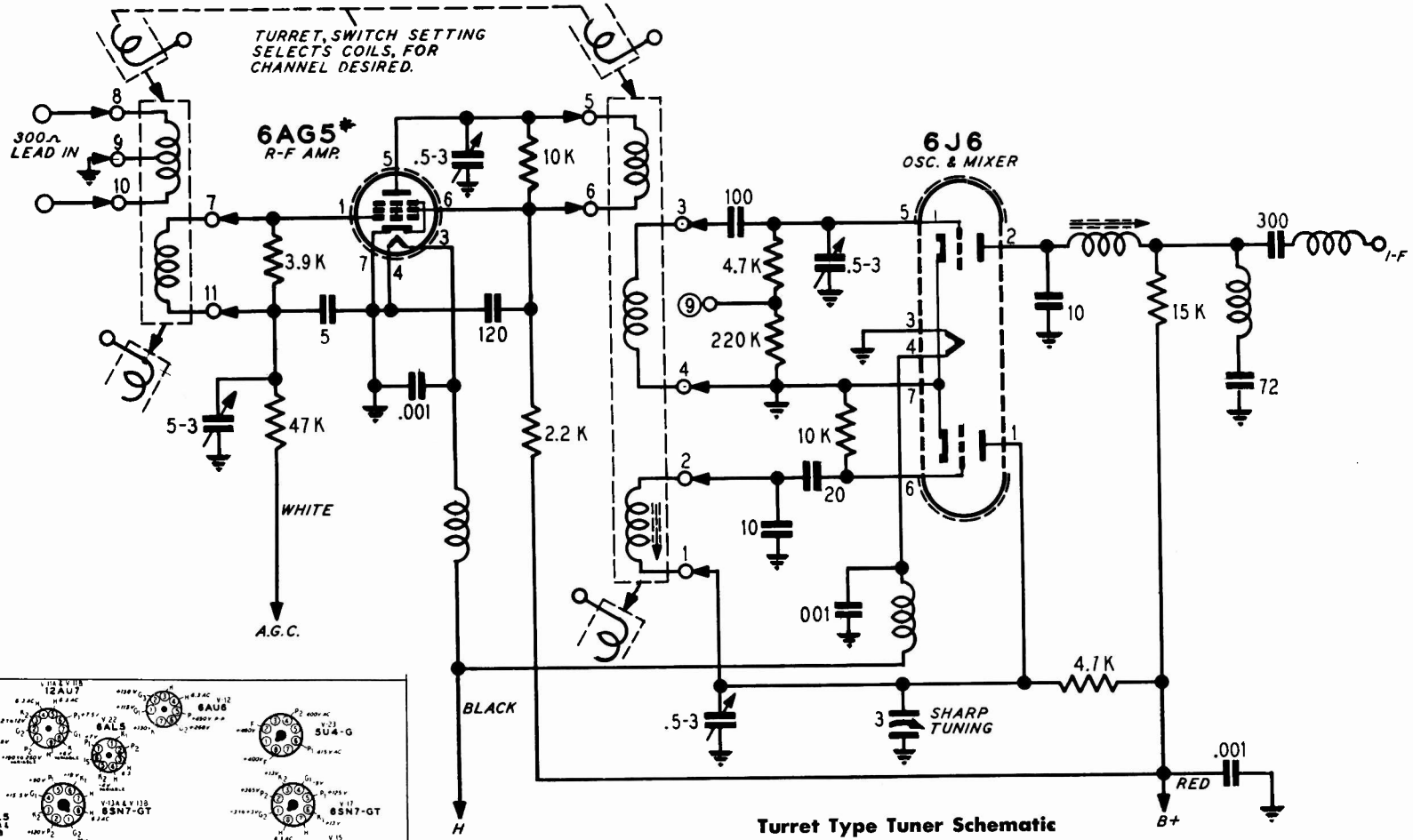
16" ROUND PIX TUBE

16" TELEVISION RECEIVER

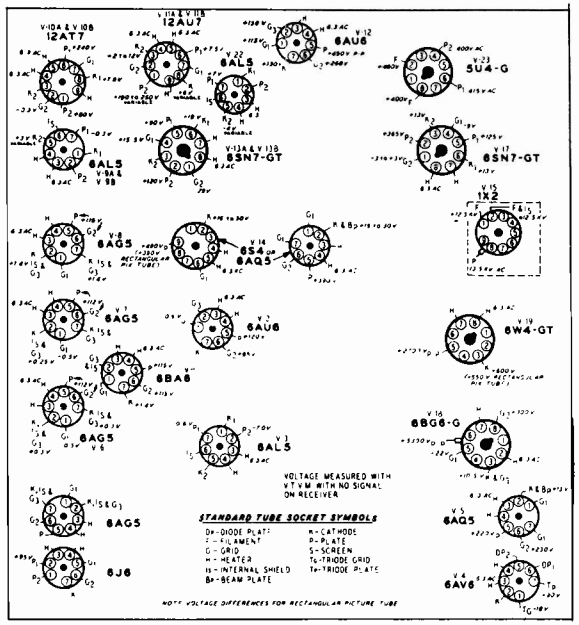
MODEL NOS.
05WG-3030C
05WG-3036A&B
05WG-3039A&B

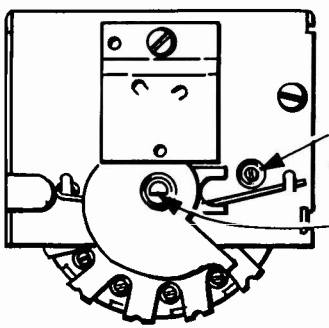


CAUTION: Do not permit the kinescope second-anode lead to become shorted to the chassis. To do so will cause a considerable overload on the high voltage filter resistor R-79 on 12½" receivers or R-97 on 16" receivers.



Turret Type Tuner Schematic





Turret Type Tuner Adjustment

*In some receivers the R-F amplifier tube may be a 6BC5 or 6CB6. These 3 tubes are interchangeable and may be replaced without any circuit changes.

Motorola Television

CHASSIS
TS-14
TS-23
TS-52

Chassis TS-14 is used in Models 10VT10, 10VT10B, 10VT10R, 10VK12, 10VK12R, 10VK22R, 10VT24R; while 10T2 uses TS-14B.

Chassis TS-23 is used in Models 12VK11, 12VK11R, 12VK11B, 12VT13, 12VT13B, -R

Chassis TS-23B is used in Models 12T1, 12T1B, 12K1, 12K1B, 12K2, 12K2B.

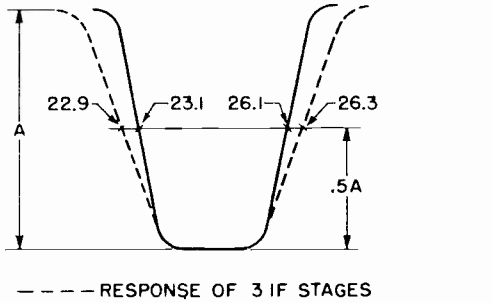
Chassis TS-23 and TS-23A are used in Models 12VF4B, 12VF4R, 12VF4R-c.

Chassis TS-23A and TS-23B are used in Models 12VF26B, 12VF26R, and with -C.

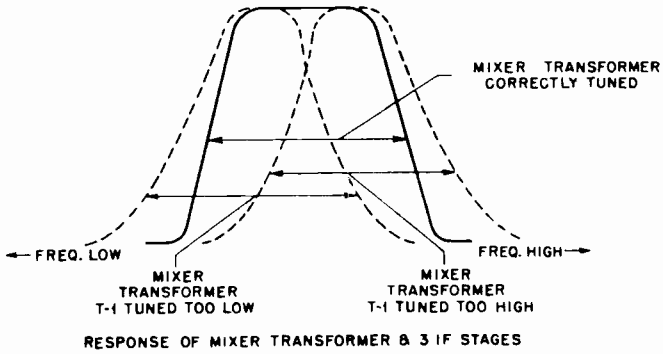
Chassis TS-52 is used in Models 16VK1B, 16VK1R, 16K2L, and 16K2LB.

Explanation of Chassis Differences

Chassis TS-14, for which a schematic is provided, uses 18 tubes, plus a type 10BP4 picture tube. All the circuits are contained on a single chassis. The chassis TS-23 differs from the TS-14 in that it uses a 12LP4 picture tube and a different high voltage transformer. In the TS-14A and TS-23A, the 3rd I.F. tube (V-5, 6AU6) was replaced by a 6AG5 tube and a bi-filar I.F. transformer replaced coil L-13. In the TS-14B and TS-23B, the video amplifier (V-6, 6AU6) was replaced by a 6AH6 tube and additional compensation was added to the contrast control. The TS-52 chassis is basically the same as the TS-14B and TS-23B with the exception of an extra 6BQ6GT horizontal output and high voltage generator tube, a 25L6GT for the vertical output tube, and a 16AP4 picture tube.

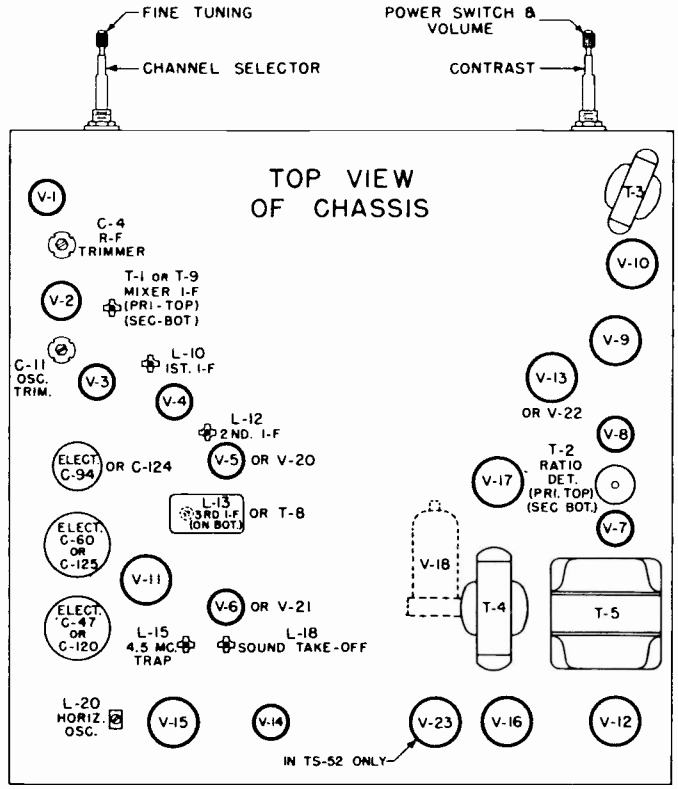


IF & MIXER RESPONSE CURVES



RESPONSE OF MIXER TRANSFORMER & 3 IF STAGES

MIXER TRANSFORMER TUNING CURVE



TUBE AND ALIGNMENT ADJUSTMENT LOCATIONS

See page 85 for diagram of TS-14, TS-23, and page 86 for diagram of TS-52.

MOTOROLA CHASSIS TS-14, TS-23, TS-52

ANTENNA

2 RF AMP. MIXER & RF OSC. 2-TUBES V-1 & V-2

3 IF AMPS & DET. 3-TUBES V-3, V-4, V-5 & 1N34 DET.

4 VIDEO AMPLIFIER 1-TUBE V-6

5 AUDIO DRIVER-LIMITER & RATIO DET. 2-TUBES V-7 & V-8

6 AUDIO AMPLIFIER 2-TUBES V-9 & V-10

LOUD SPEAKER

7 PICTURE TUBE V-16

FUNCTIONAL BLOCK DIAGRAM

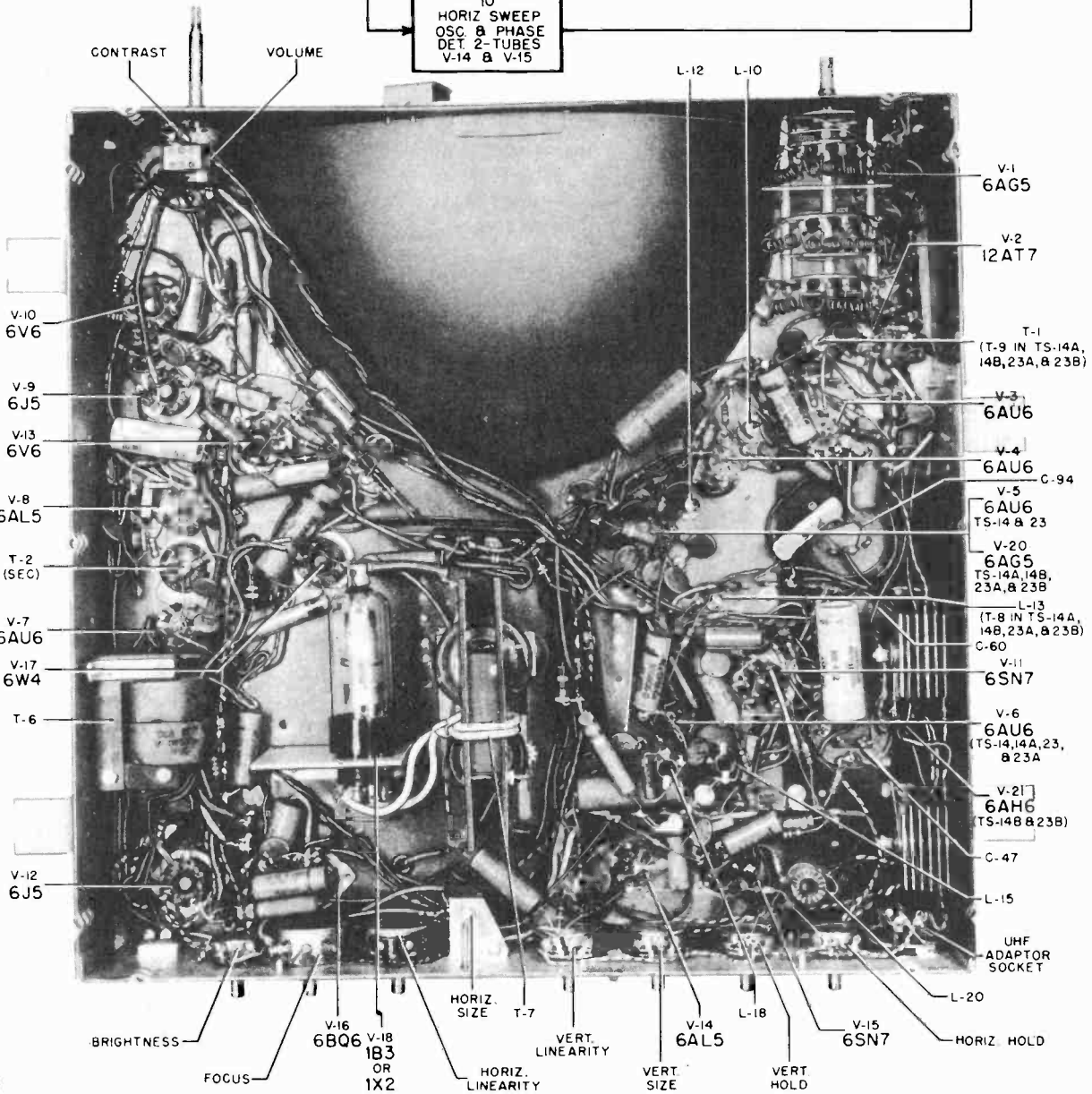
8 1ST & 2ND CLIPPER 2-1/2 TUBES V-11

11 HORIZ. OUTPUT, HV RECT. & DAMPING DIODE 3-TUBES V-16, V-17 & V-18

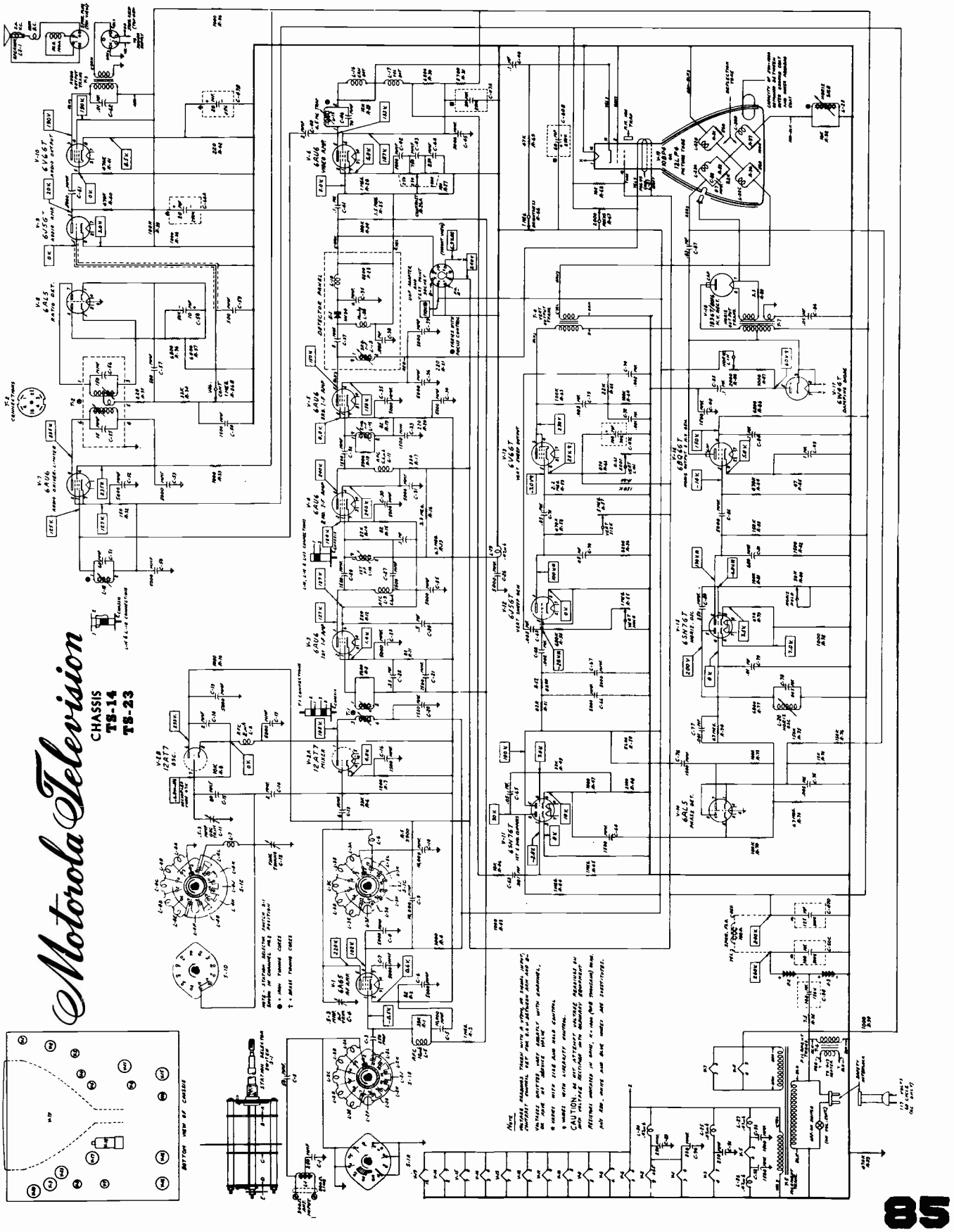
1 LOW VOLTAGE POWER SUPPLY & SELENIUM RECTIFIERS

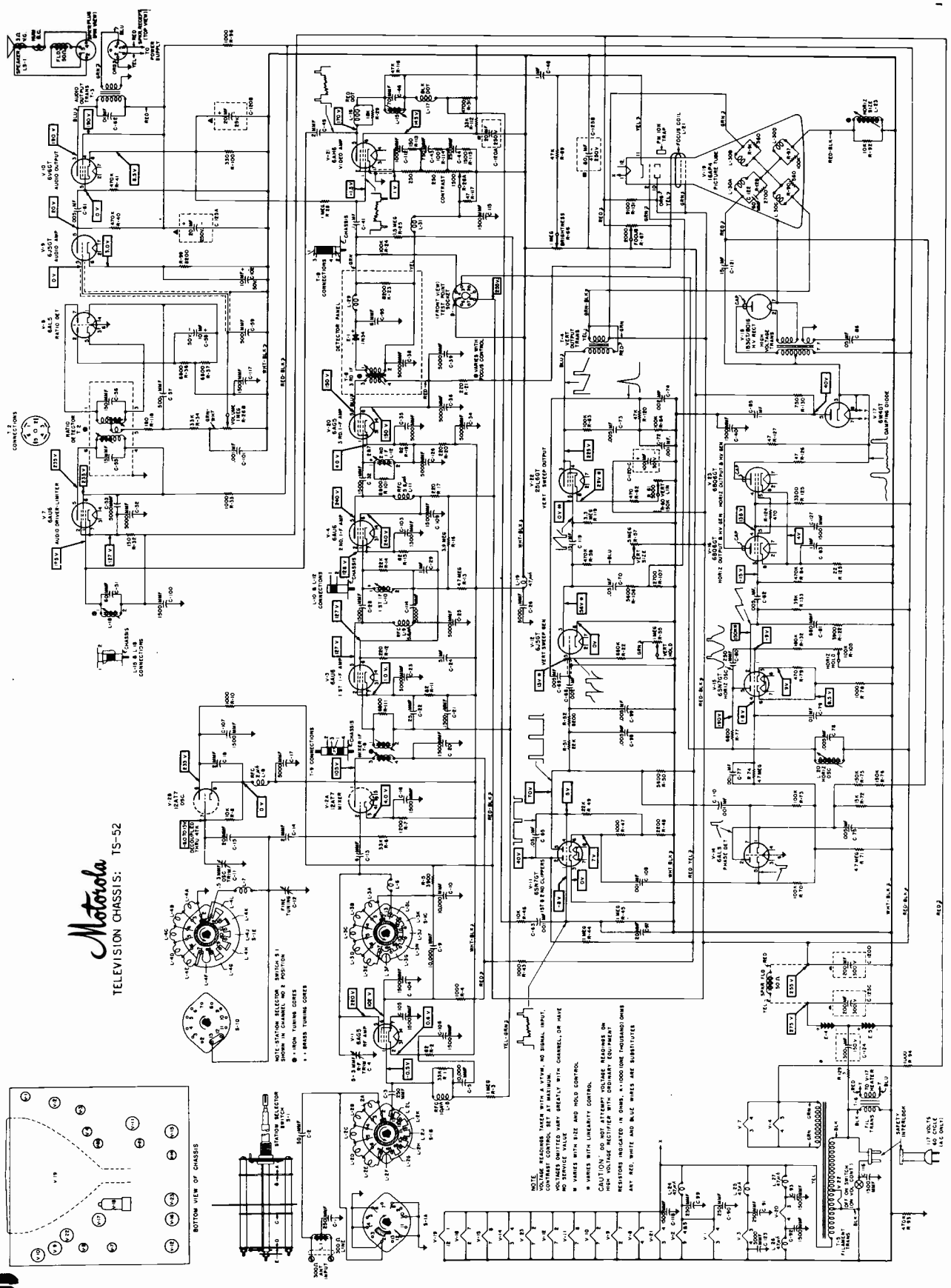
9 VERT. SWEEP GEN. & OUTPUT 2-TUBES V-12 & V-13

10 HORIZ SWEEP OSC. & PHASE DET. 2-TUBES V-14 & V-15



TS-14, TS-14A & TS-14B CHASSIS BOTTOM VIEW MAJOR PARTS LOCATION


Motorola Television
CHASSIS
TS-14
TS-23
CAUTION: AS SET ATTAINS VOLTAGE REGULATION ON VOLTAGE REGULATOR TUBE, ADJUST BRIGHTNESS CONTROL FOR NORMAL BRIGHTNESS OF RASTER.
BOTTOM VIEW OF CHASSIS


Motorola
TELEVISION CHASSIS: TS-52
BOTTOM VIEW OF CHASSIS
NOTE
VOLTAGES OMITTED VARY GREATLY WITH CHANNEL, OR HAVE NO SERVICE VALUE
CAUTION: DO NOT ATTEMPT VOLTAGE READINGS ON HIGH VOLTAGE RECTIFIER WITH ORDINARY EQUIPMENT
RESISTORS INDICATED IN OHMS, K=1000 OHMS, MEG=1000K OHMS
ANT. RED, WHITE AND BLUE WIRES ARE SUBSTITUTES

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

Motorola Television

CHASSIS
TS-89
TS-94
TS-95

16K2H	16T1H	17F1A	17F5BA
16K2BH	16T1BH	17F1BA	17K3A
17K1A	17T1A	17F2WA	17K3BA
17K1BA	17T1BA	17F3BA	17K4A
16F1H	17T2A	17F4A	17T3A
16F1BH	17T2BA	17F5A	

PRODUCTION CIRCUIT REVISIONS

COMPENSATION CHANGE

An improvement in picture quality is achieved with a change in compensating coils. See Figure A. L-17 is changed from a red dot coil to a yellow dot coil; L-19 is changed from a red dot coil to a black dot coil, and L-21 is changed from a green-black dot coil to a green dot coil. With this change in compensation, the RC network on the tapped contrast control, R-31A, is eliminated.

VIDEO AMPLIFIER TUBE ALTERNATE

In some sets, a 6CB6 tube is used as a video amplifier (V-7) instead of a 6AH6. In this case, the screen dropping resistor, R-35, is changed from 33K ohms to 22K ohms. See Figure B.

VERTICAL SYNC STABILIZATION

The RC network, C-92 (100) and R-100 (470K), which has a short time constant, has been added in the grid input circuit of the 1st clipper. This short time constant keeps noise pulses, most of which have a much longer time duration, from reaching the clipper, resulting in more stable syncing of the vertical oscillator. The grid resistor, R-51, changes from 1 meg to 2.2 meg with the addition of this network. See Figure C. The addition of this network in noisy areas will also be advisable in existing sets.

VERTICAL OUTPUT TUBE ALTERNATE

In some sets, a 6AS5 tube is used in the vertical output stage (V-14) instead of a 6W6. No component changes, except the substitution of a miniature tube socket are made. The connections for the 6AS5 miniature socket are shown in Figure D.

ELIMINATION OF VERTICAL COLLAPSE

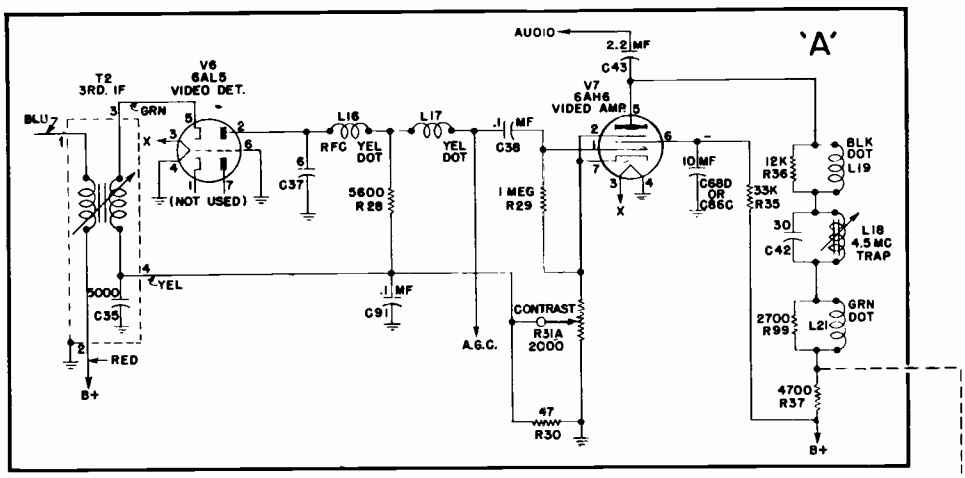
The addition of the 100 ohm screen isolation resistor, R-101, in the vertical output stage, V-14, prevents a tendency of some tubes to break into momentary oscillation. See Figure E. Where a momentary collapsing of the raster is troublesome, this resistor may be added in existing sets and will remedy this condition.

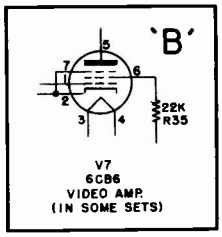
SPEAKER REVISION

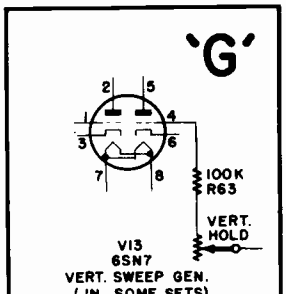
As the AM-FM chassis in the combination models require PM speakers, a filter choke is mounted on the speaker frame to serve the TV chassis. See parts list for correct speakers. See Figure F for speaker wiring.

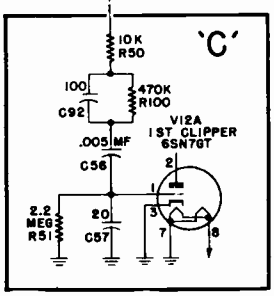
HORIZONTAL RADIATION REDUCTION

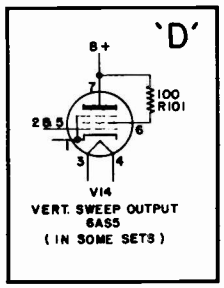
A 10,000 mmf ceramic disc type capacitor has been added from each side of the AC line to chassis. These capacitors are installed right on the power input receptacle. A paper-backed foil shield to cover the upper half of the picture tube has also been added. These changes help to minimize horizontal oscillator interference in broadcast receivers and may be added to existing sets where this condition is troublesome.

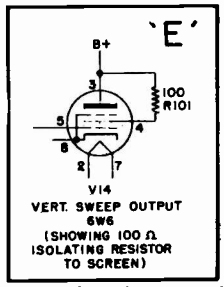


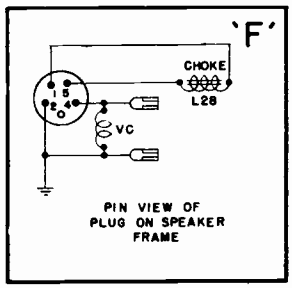


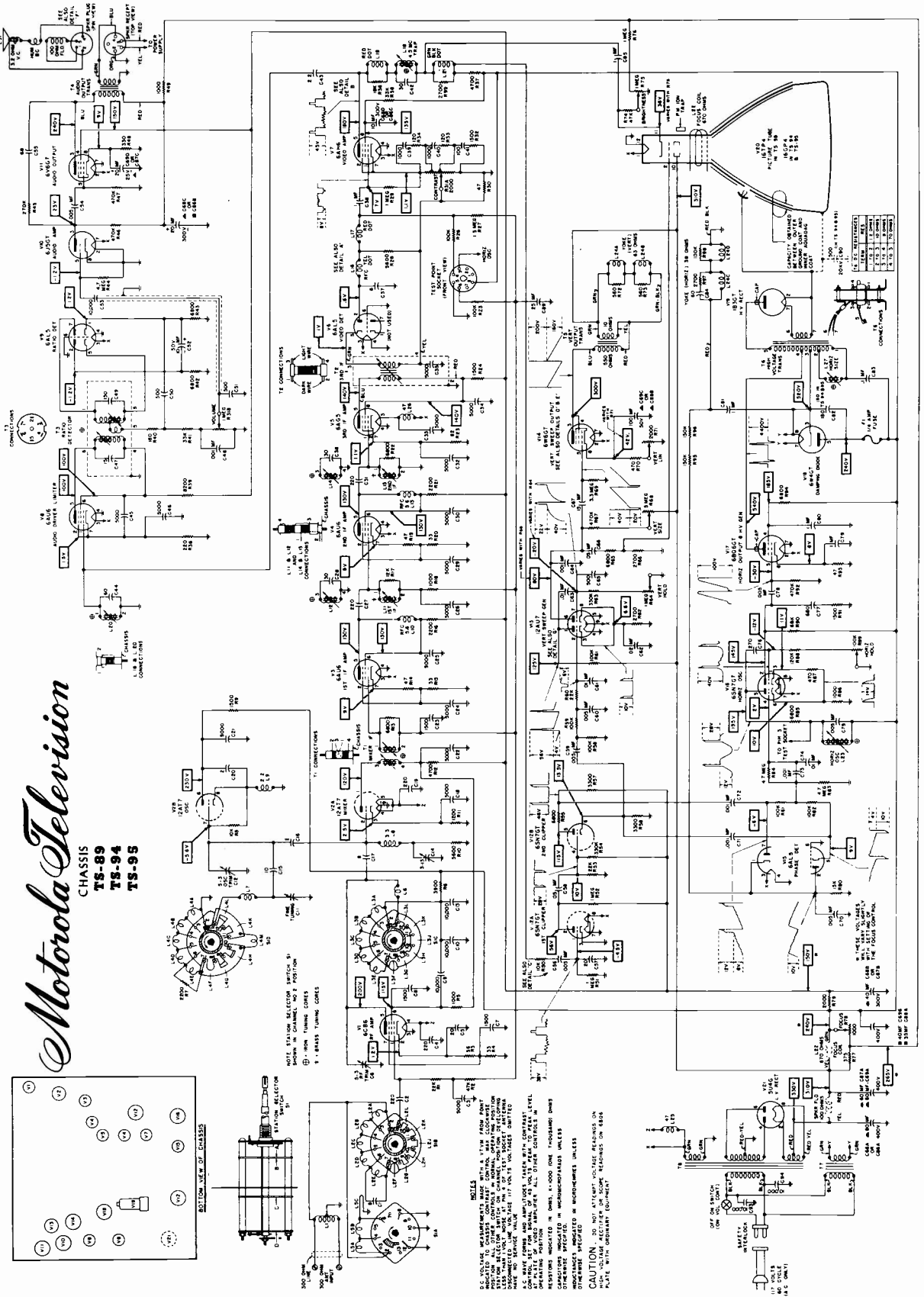











Motorola Television
CHASSIS
TS-89
TS-94
TS-95
BOTTOM VIEW OF CHASSIS
NOTES
CAUTION: DO NOT ATTEMPT VOLTAGE READINGS ON HIGH VOLTAGE RECTIFIER OR SCOPE READINGS ON 6BQ6 PLATE WITH OSCILLATOR COUPLING

Motorola Television

CHASSIS **TS-101**

MODELS **19K2, 19K2B, 19K3, 19K4, 19K4B**

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.

ORDER OF ALIGNMENT

1. Audio Take-Off & Ratio Detector
2. 4.5 Mc Trap
3. IF Coils & Mixer Transformer
4. Osc & RF Sections

Diagram on page 94.

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

If a signal generator is used, the following instructions should be followed:

STEP	SIGNAL GENERATOR CONNECTION	OUTPUT INDICATOR CONNECTION	SIGNAL GENERATOR SETTING	SPECIAL INSTRUCTIONS	ADJUST (See Figure 3)
1.	Pin 7 of 12AU7 1st audio IF, and chassis	Either side of C-47 (10 mfd) to chassis	4.5 mc crystal-controlled	Generator output set at 10,000 microvolts.	L-21 for max.
2.	"	"	"	"	*Primary of T-4 for max. (top)
3.	"	Junction of R-37 (33K) & volume control and chassis	"	"	**Secondary of T-4 for zero output (bottom)

* The primary of the ratio detector transformer has two points of resonance. The correct setting is the one which is found with the greater part of the adjusting screw out of the coil can.

** If desired, the symmetry of the curve may be checked by tuning the generator ± 25 kc from 4.5 mc and noting the voltage produced, reversing the meter connections as necessary. For proper balance of the ratio detector system, the voltage in each direction should be approximately equal. If not, recheck alignment. If necessary replace ratio detector tube V-9 (6AL5).

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. The fine tuning trimmer should be tuned off the station slightly, to prevent overloading the ratio detector. The same connections are made for the output indicator and the same trimmers are adjusted as above. The signal should preferably be the single tone transmitted with a test pattern although a regular picture transmission can be used.

AUDIO SENSITIVITY MEASUREMENT

1. Connect the signal generator to the plate, pins 1 or 2, of the video detector tube V-6A (12AU7). Set the focus control at mid-range.
2. Connect the electronic voltmeter, through a 1 meg resistor, between either side of C-47 (10 mf) and chassis.
3. Set the generator at 4.5 mc.
4. A generator output of not more than 10,000 microvolts should give a meter reading of 5 volts above the contact potential.

4.5 MC TRAP ALIGNMENT

STEP	SIGNAL GENERATOR CONNECTION	OUTPUT INDICATOR CONNECTION	SIGNAL GENERATOR SETTING	SPECIAL INSTRUCTIONS	ADJUST (See Figure 3)
1.	Pin 1 of 6AH6 video amp decoupled by 1000 mmf, maximum output.	Germanium crystal det. with voltmeter (lowest scale) from cathode (yellow lead) of CRT and chassis.	4.5 mc crystal controlled.	Connect the VTVM as shown in Figure 4.	L-1 for maximum attenuation.

Motorola Television Chassis TS-101, Models 19K2, 19K3, etc. (continued)

IF ALIGNMENT

Equipment Required:

IF Sweep Generator meeting the following requirements:

18 to 30 mc approximately 12 mc sweep width. Output constant and adjustable to at least 0.1 volt maximum with accurately calibrated adjustable markers.

Cathode Ray Oscilloscope: Preferably one with a calibrated input attenuator. Bias battery (-3 volts).

STEP	SIGNAL GENERATOR CONNECTION	OUTPUT INDICATOR CONNECTION	SIGNAL GENERATOR SETTING	SPECIAL INSTRUCTIONS	ADJUST (See Figure 3)
1.	Pin 1 of V-3 (6CB6) 1st IF amp & grd	Scope connected to pin 4 of test socket	*Sweep gen 18-30 mc approx. 12 mc sweep width to chassis	Remove V-17 (6BQ6) and insert a 2500 ohm 25 watt dummy load from pin 8 of test socket to chassis. Apply a -3 volts bias from AGC line to chassis. Open R-7 (1000) or use a 12AT7 tube with pin 6 removed to disable oscillator. Set contrast control at minimum and focus control at center position.	T-1 for proper placement of 26.4 mc marker. See Figure 5.
2.	"	"	"	"	T-2 for proper placement of 22.9 mc marker. See Figure 5.
3.	"	"	"	"	T-3 for a flat top or symmetrical response curve. See Figure 5.
4.	Pin 2 of 12AT7 converter and chassis.	"	"	Same as 1 and also increase sweep gen. output so trap setting can be observed on low side.	L-9 for max attenuation at 21.9 (32-40 db down). See Figure 6.
5.	"	"	"	Same as 1 and 4.	L-13 for max attenuation at 20.4 mc. See Figure 7.
6.	Same as 1.	"	"	Same as 1. Return sweep gen output to normal.	L-10 & 12 simultaneously for flat response & proper placement of 22.9 & 26.4 mc markers. Care should be taken to place the 26.4 mc marker 6 db down. A slight variation in placement of the 22.9 mc marker is permitted.
7.	Recheck traps after L-10 & L-12 alignment				

* If there is no marker built in the sweep generator, loosely couple the output of an accurately calibrated AM signal generator to the IF strip.

CAUTION:

1. 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 size will affect the shape of the curve.
2. Do not reduce the scope gain and increase signal input so that the top of the curve is flattened, due to limiting in the IF or scope amplifiers.
3. On the IF coils and on the traps, the resonance point will be found at two settings of the slug. The correct setting is the one which is found with the greater part of the adjusting screw out of the coil.

BANDWIDTH

The bandwidth may be determined by connecting an AM generator to the mixer grid. Apply a -3V bias from AGC bus to chassis. With the generator frequency at 24.6 mc, adjust the output for 1 volt reading on a VTVM connected at pin 4 of the test socket and chassis. Double the output of the generator. Now by tuning either side of 24.6 mc and noting the frequencies at which the VTVM again reads 1 volt the 6 db bandwidth points are indicated.

REGENERATION CHECK

After the above IF and mixer transformer alignment has been made, a check for regeneration in the IF amplifier should be made. This is done by removing the battery bias and observing the output response curve on the oscilloscope, as taken between the picture tube cathode and chassis. The

Motorola Television Chassis TS-101, (continued)

Models 19K2, 19K2B, 19K3, 19K4, and 19K4B.

Alignment Information Continued

NO.	TYPE	FUNCTION
V1	6CB6	RF AMP.
V2	12AT7	MIXER-OSC.
V3	6CB6	1ST. IF AMP.
V4	6CB6	2ND. IF AMP.
V5	6CB6	3RD. IF AMP.
V6	12AU7	VIDEO DET. & 1ST. AUDIO IF
V7	6AN6	VIDEO AMP.
V8	6AU6	2ND. AUDIO IF
V9	6AL5	RATIO DET.
V10	6J5/6T	1ST. AUDIO AMP.
V11	6V6/6T	AUDIO OUTPUT
V12	6SN7GT	1ST. & 2ND. CLIPPERS
V13	6SN7GT	3RD. CLIPPER & VERT. BLOCKING OSC.
V14	6W6GT	VERT. OUTPUT
V15	6AL5	PHASE DET.
V16	6SN7GT	HORIZ. OSC.
V17	6BQ6GT	HORIZ. OUTPUT & H.V. GEN.
V18	6W4GT	DAMPING DIODE
V19	1B3GT	H.V. RECT.
V20	5U4G	L.V. RECT.

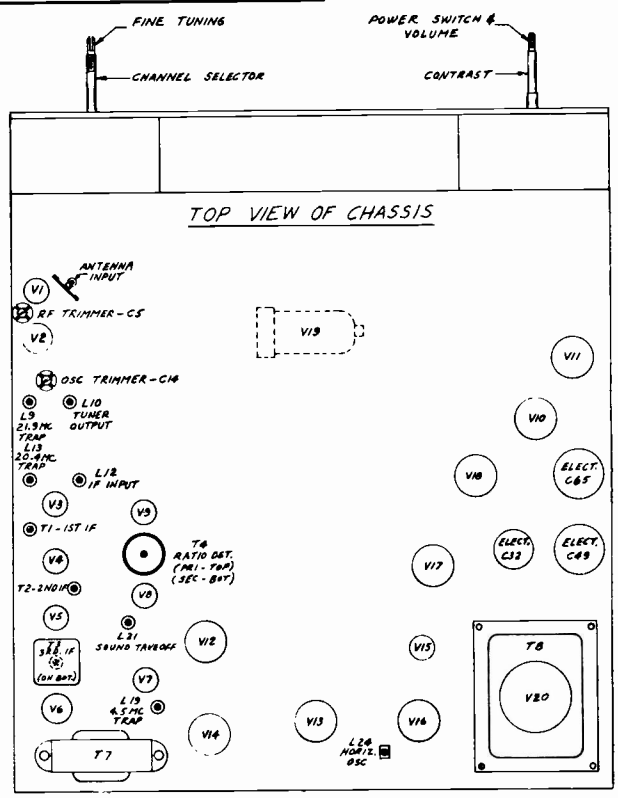


FIGURE 3. TUBE AND ALIGNMENT ADJUSTMENT LOCATIONS

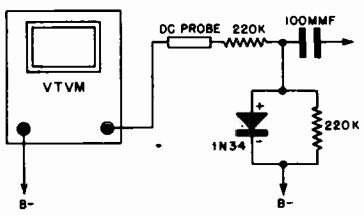


FIGURE 4. ELECTRONIC VOLTMETER CONNECTIONS

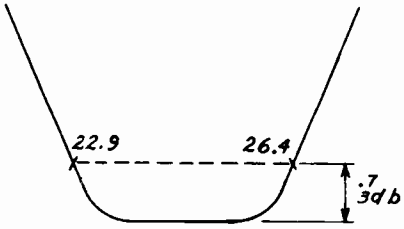


FIGURE 5. IF RESPONSE CURVE

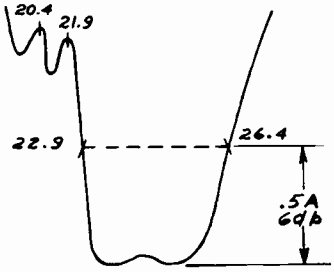


FIGURE 6. OVERALL RESPONSE CURVE FROM MIXER

bandwidth may change with the bias removed but should not change more than 0.2 mc. Set the contrast control to maximum gain. Decrease the input until the output signal shows a marked decrease. Any regeneration present will be indicated by sharp peaks on the overall response curve. The oscillator should be stopped, as described above, during this procedure.

IF SENSITIVITY MEASUREMENTS

IF Stages Only

1. Remove the battery bias from 1st IF tube grid.
2. Connect an AM signal generator, set at 24.6 mc, through a blocking capacitor of 5000 mmf, between the grid (pin 1) of the 1st IF tube V-3 (6CB6) and chassis.
3. Connect an electronic voltmeter between pin 4 of test socket and chassis.
4. Stop the oscillator tube by disconnecting resistor R-7 (1000) from the plate (pin 6) of the tube V-2B (12AT7) or by substituting another tube with pin 6 removed.
5. The signal required to produce 1 volt (negative) above contact potential on the meter should be less than 600 microvolts.

Mixer & IF Stages

The preliminary preparations are the same as for checking the sensitivity of the IF stages except:

1. Connect the AM signal generator, set at 24.6 mc

Motorola Television Chassis TS-101, Alignment Information continued,

through a 500 mmf capacitor, between the grid (pin 2) of the mixer tube V-2A (12AT7) and chassis.

2. The signal required to produce 1 volt (negative) above contact potential on the meter should be less than 60 microvolts.

OSCILLATOR, ANTENNA AND RF ALIGNMENT

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

Equipment Required:

Sweep Generator: Frequency range 40-220 mc; 10 mc sweep width.
Output constant and adjustable
Adjustable markers (markers should be calibrated occasionally by checking against an accurate signal generator)

Oscilloscope: Preferably one with a calibrated input attenuator.

Signal Generator: Frequency range 40 to 220 mc
Accurately calibrated
AM modulated, 400 cycle

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

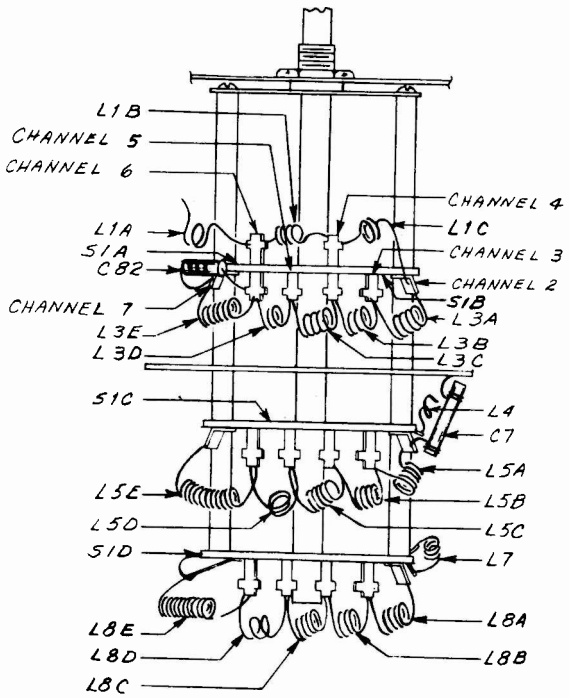


FIGURE 7. ANTENNA, RF & OSC COIL LOCATIONS

ANTENNA AND RF ALIGNMENT

STEP	SIGNAL GENERATOR CONNECTION	OUTPUT INDICATOR CONNECTION	SIGNAL GENERATOR SETTING	SPECIAL INSTRUCTIONS	ADJUST (See Figs 3 & 7)
1.	Across ant term strip on chassis with short ant lead-in removed & couple marker in.	Oscilloscope connected at junction of R-5 (22K) and R-6 (22K) and chassis decoupled by 150K resistor.	Channel 10	Remove 6BQ6 and insert a 2500 dummy load from pin 8 of test socket to chassis. Open R-7 (1000) or use a 12AT7 tube with pin 6 removed.	C-5 for proper bandpass for channel 10 -also adjust *L-4 if necessary. See Figure 9.
2.	"	"	Channel 13	"	Position C-1 (220) for max gain. See Figure 9.
3.	"	"	Channels 6, 5, 4, 3, 2, in this order.	"	Compress or spread the RF and antenna coils to obtain proper response. See Figure 8.

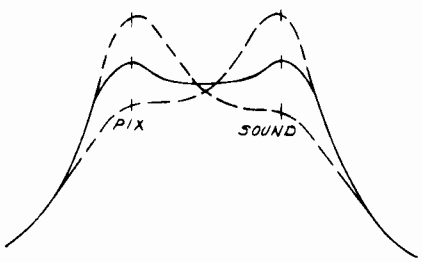
See Figure 7 for coil locations.

* Check channels 7 to 13 for response and, if necessary, adjust L-4. This will have more effect on channels 10 to 13 than 7 to 9. If this is done, it is necessary to readjust the plate trimmer, C-5, and recheck the high channels.

The antenna coils are tuned on the picture side and the RF coils are tuned on the sound side of the response on low channels (2-6).

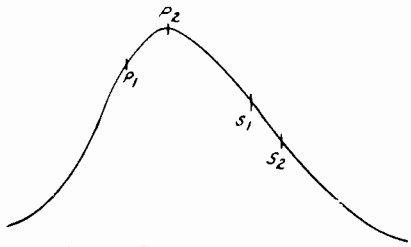
Motorola Television Chassis TS-101, Models 19K2, 19K3, 19K4

Alignment Information, continued,



LOW CHANNEL RESPONSE WITH LIMITS

FIGURE 8. RF RESPONSE CURVES, CHANNELS 2-6



HIGH CHANNEL RESPONSE WITH LIMITS

FIGURE 9. RF RESPONSE CURVES, CHANNELS 7-13

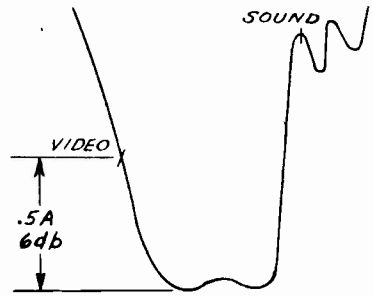


FIGURE 10. OVERALL RECEIVER RESPONSE

OSCILLATOR ADJUSTMENT

1. Remove 6BQ6 and insert a 2500 ohm 25 watt dummy load from pin 8 of test socket to chassis.
2. Put oscillator back in the circuit.
3. For each channel, the marker generator is tuned to that channel's sound carrier frequency. When the oscillator is properly aligned, the marker pip should fall into the 21.9 mc trap dip on the overall response curve. The shield over the tuner must be removed but the side plate on the chassis should be left in place. Removal of the shield lowers the oscillator frequency and to compensate for this, C-15, the fine tuning control, should be tuned about 15° off mid-capacity point toward minimum capacity. The shield detuning effect is more marked on the low channels and these coils should be dressed as far from the shield as possible to minimize the detuning effect.

STEP	SIGNAL GENERATOR CONNECTION	OUTPUT INDICATOR CONNECTION	SIGNAL GENERATOR SETTING	ADJUST (See Figs 3 & 7)
1.	Across ant term strip, on chassis with short lead-in disconnected.	Oscilloscope pin 4 of test socket and chassis.	Channel 10	*C-14 until sound marker falls in trap dip.
2.	"	"	Channel 13	L-7 by spreading or compressing until sound marker falls in trap dip.
3.	"	"	Channel 10	Repeat 1 & 2 until no improvement results and then check each high channel in turn.
4.	"	"	Channels 6, 5, 4, 3, 2 in this order.	Set osc coils by spreading or compressing so that audio marker is in the trap dip. See Figure 10.

* C-14 is adjusted on channel 10 since this is mid-channel of channels 7-13. All high channels must be checked to be sure that they fine tune within plus or minus 30 degrees of the setting of the fine tuning capacitor as explained above.

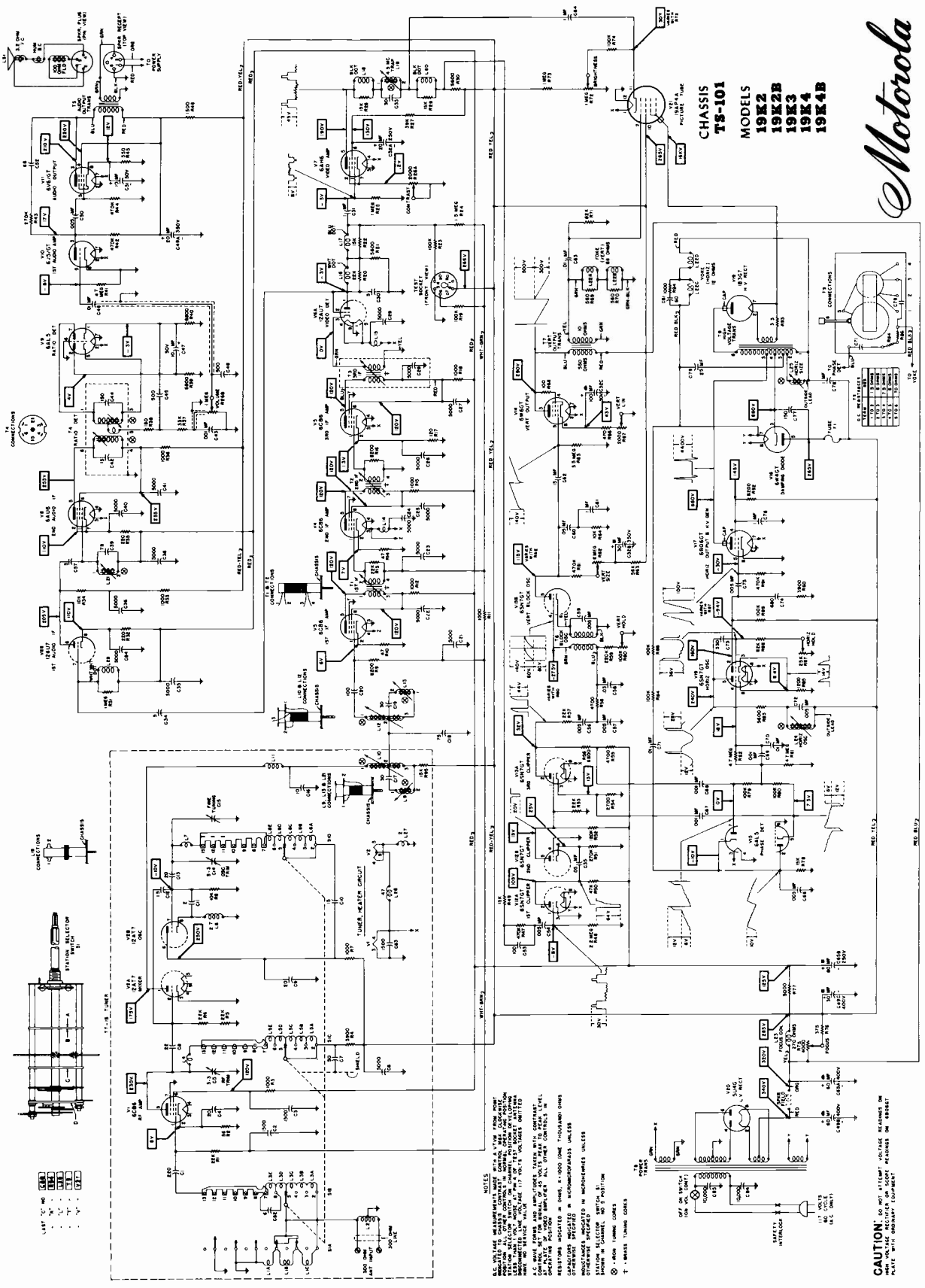
OVERALL RECEIVER SENSITIVITY MEASUREMENT

An overall measurement of sensitivity is made as follows:

1. Connect an AM signal generator to the input terminals of the receiver chassis after removing the short 300 ohm lead which connects to the antenna input strip on the back of the cabinet. To match the generator to the receiver input, a resistor matching network should be used. In the case of a generator with a 50 ohm output impedance, for example, place a 100 ohm resistor in series with the output terminal of the generator and a 150 ohm resistor in series with the ground terminal.
2. From cathode of picture tube to chassis, connect a calibrated oscilloscope.

NOTE: To calibrate scope, connect it across 6.3 volt filament supply. The peak-to-peak amplitude on the screen will then be approximately 18V (6.3 x 2.8).

3. Set contrast control for maximum sensitivity (fully clockwise).
4. Tune signal generator to the video carrier frequency of the channel being checked. Generator signal should be 30% modulated at 400 cycles. The signal from the generator to produce 20 volts peak-to-peak at picture tube cathode should be less than 50 microvolts on all channels.
5. If sensitivity is down on high channels, reverse generator and matching resistor network and recheck.


Motorola
CHASSIS
TS-101
MODELS
19K2
19K2B
19K3
19K4
19K4B
CAUTION!

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

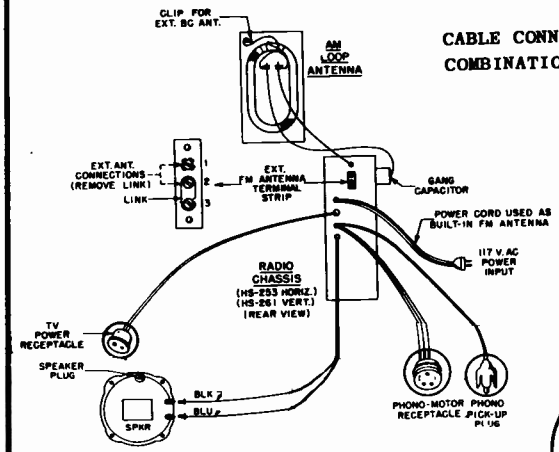
Motorola Television

CHASSIS TS-118

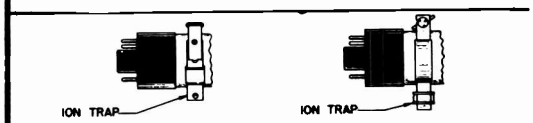
MODELS See Chart Below

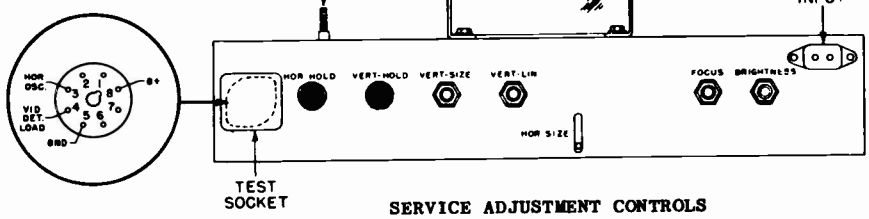
The models in which Chassis TS-118 is used are listed at right. The schematic and a page showing circuit changes follow this page. Chassis TS-115, used in Model 14K1H, is almost identical, but uses a 14-inch picture tube and has other minor differences such as variations in focus coil circuit. Chassis TS-114, used in Model 14T3, is also similar, but here other differences are, V-13 is 6SN7GT, R-63 is 100K, chassis layout is somewhat different.

Model	Type of Receiver	AM-FM Chassis Used	Record Changer Used
17F1	Combination, red-brn mahogany	HS-253	RC-36A
17F1B	Combination, limed oak	HS-253	RC-36A
17F2W	Combination, walnut	HS-253	RC-36A
17F3B	Combination, limed oak	HS-253	RC-36A
17F4	Combination, red-brn mahogany	HS-253	RC-36A
17F5	Combination, red-brn mahogany	HS-261	RC-36A
17F5B	Combination, limed oak	HS-261	RC-36A
17K3	Console, red-brn mahogany	-	-
17K3B	Console, limed oak	-	-
17T1	Table, red-brn mahogany	-	-
17T1B	Table, limed oak	-	-
17T2	Table, red-brn mahogany	-	-
17T2B	Table, limed oak	-	-
17T3	Table, molded plastic	-	-

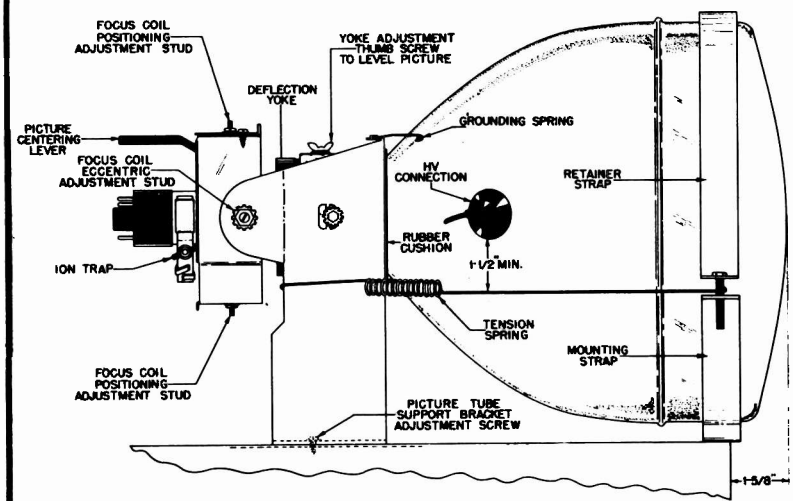


CABLE CONNECTIONS ON COMBINATION MODELS





SERVICE ADJUSTMENT CONTROLS



PICTURE TUBE ADJUSTMENT LOCATIONS

HORIZONTAL OSCILLATOR ADJUSTMENT

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

1. Short out HORIZONTAL OSCILLATOR coil L-23. This may be done with the chassis in the cabinet by shorting pins 3 & 8 of the test socket on chassis rear.

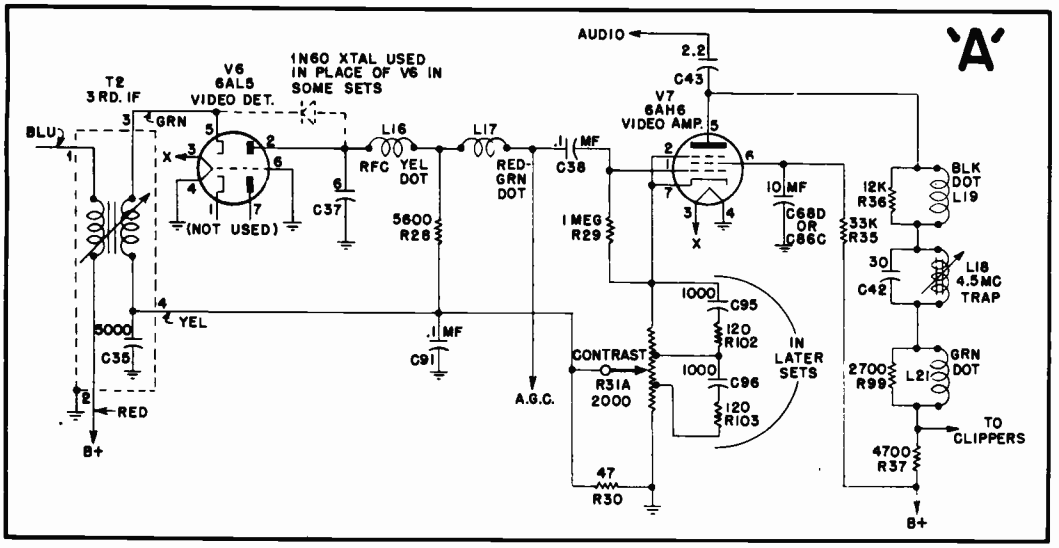
2. With the centering lever, move the picture to the left so that the right edge of the raster can be seen. Adjust the HORIZONTAL HOLD control to about the middle of its range and note the width of the blanking pulse. (The blanking pulse appears as a gray bar at the right edge of the picture).

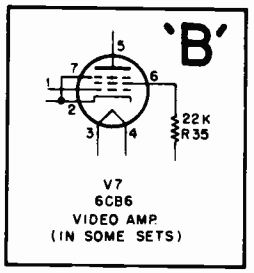
3. Remove short from HORIZONTAL OSCILLATOR coil.

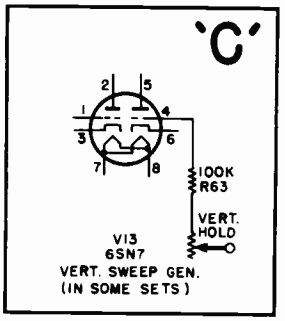
4. Adjust HORIZONTAL OSCILLATOR coil until the same amount of blanking pulse can be seen as was noted in step 2.

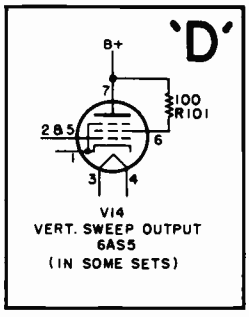
MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

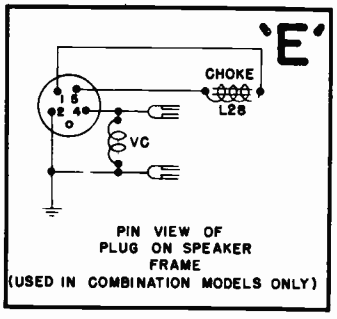
Motorola Television Chassis TS-118

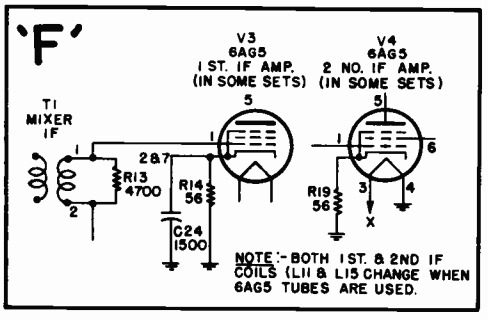


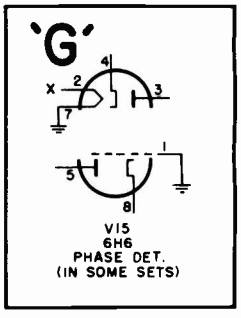


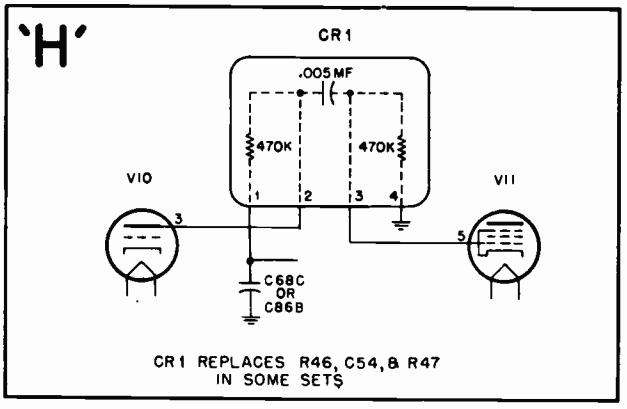


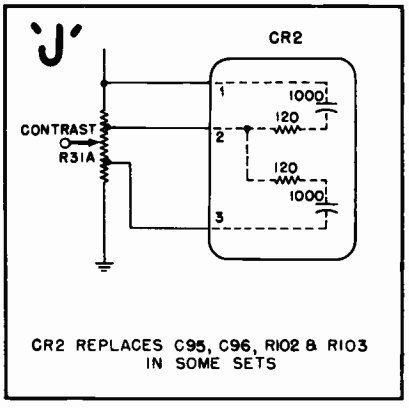


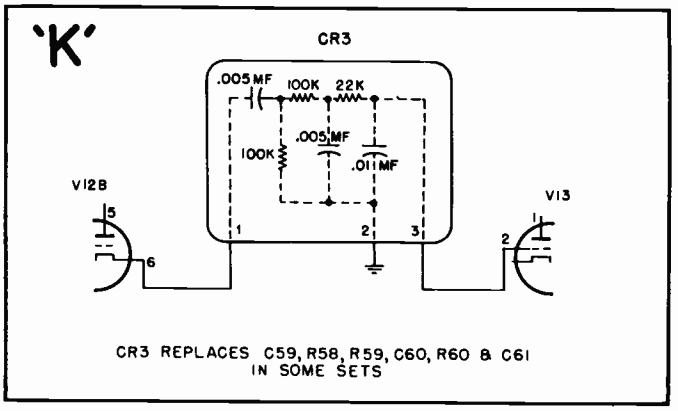


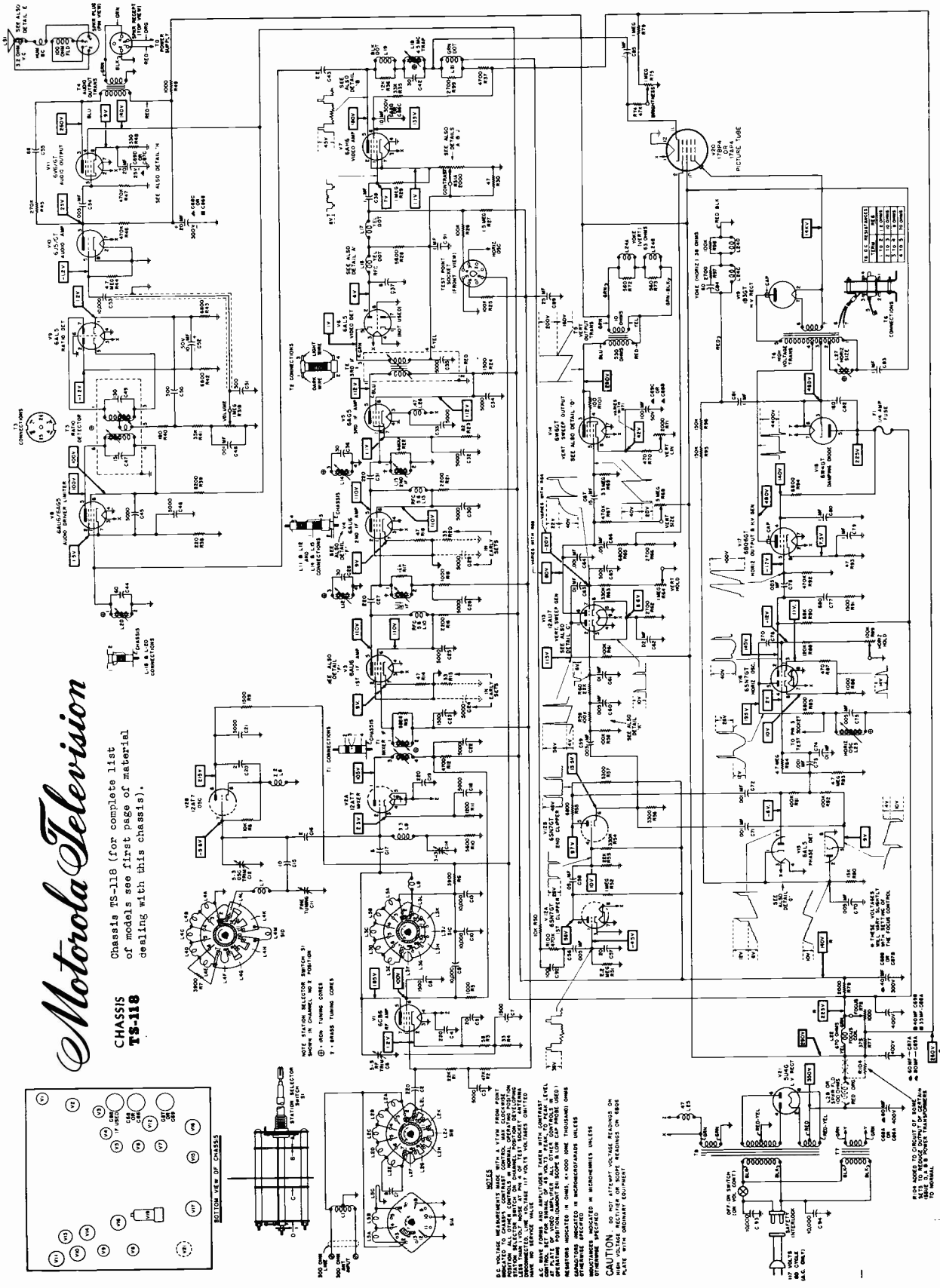











Motorola Television
CHASSIS TS-118
Chassis TS-118 (for complete list of models see first page of material dealing with this chassis).
NOTES
CAUTION: DO NOT ATTEMPT VOLTAGE READINGS ON HIGH VOLTAGE RECTIFIER OR SCORE READINGS ON 1B3GT PLATE WITH ORDINARY EQUIPMENT
BOTTOM VIEW OF CHASSIS

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

Motorola Television Chassis TS-118, I.F. Alignment Information

1. Remove the high voltage generator tube V-17 (6BQ6GT) from its socket to eliminate horizontal pick-up in the oscilloscope. Replace 6BQ6 with dummy load of 2500 ohm 25 watts connected from B plus side of fuse to chassis.

2. By means of an external battery, apply a negative 3.0 volt bias from the bottom of the 1st IF tube grid coil damping resistor, R-13, to chassis.

3. Using leads as short as possible, connect the hot side of the sweep generator to the grid (pin 1) of the 1st IF tube V-3 (6AU6) through a 5000 mmf capacitor (do not use the loose or "spraying" method of coupling). The low side is connected to chassis. Set the center frequency of the sweep to about 24.6 mc and adjust initially for a sweep deviation of approximately 12 mc. However, a sweep of from 8 to 10 mc may be found better for overall alignment.

4. Using R-26 (100K) as a decoupling resistor, connect the scope to pin 4 of test socket and chassis. If a stronger output is required, connect the scope between the picture tube cathode and chassis. The curve seen at this position will be the reverse of the polarity shown in Figure 6.

5. Set the contrast control at minimum.

NOTE: If a distorted or unstable picture is seen on the oscilloscope during alignment, it may be necessary to stop the oscillator by disconnecting resistor R-9 (1500) from the plate (pin 6) of the oscillator tube V-2B (12AT7), or by substituting another tube with pin 6 removed.

NOTE: The 1st & 2nd IF traps are tuned from bottom of chassis while IF cores are adjusted from the top.

6. Tune the low frequency trap L-14 located on the 2nd IF coil for maximum attenuation on the curve at 21.9 mc.

7. Tune the high frequency trap L-12 located on the 1st IF coil for maximum attenuation on the curve at 27.3 mc.

8. Adjust the 1st IF coil, L-11, to place a 26.6 mc marker on the high side of the response curve 60% down from maximum response. See Figure 6.

9. Adjust the 2nd IF coil, L-15, to place a 22.7 mc marker on the low side of the response curve 60% down from maximum response.

10. Adjust the 3rd IF plate transformer T-2 to provide a flat top or symmetrical response curve.

11. Reset the traps (steps 6 and 7) and again check the IF for proper response.

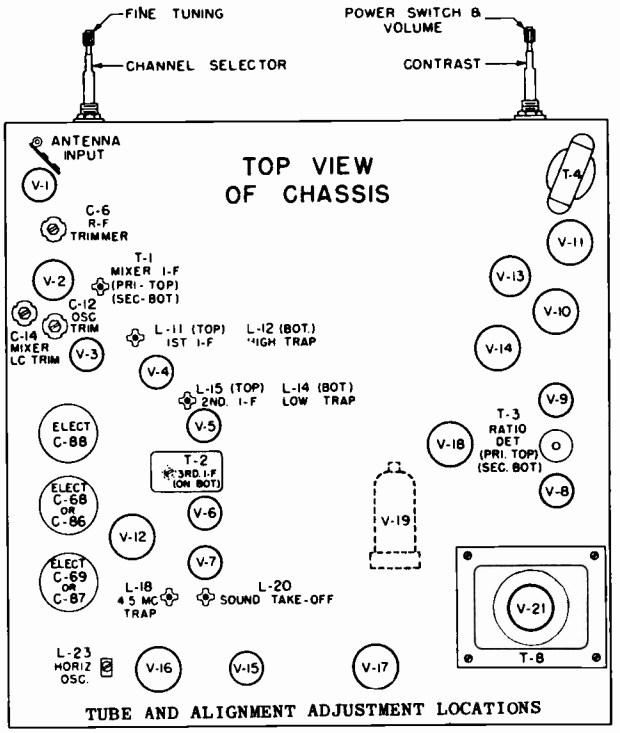
NOTE: It is suggested that the bias be removed for accurate setting of the traps.

12. With bias applied, connect the sweep between the grid (pin 2) of the mixer tube V-2A (12AT7) and chassis.

13. Disconnect the trimmer, C-14, in LC circuit in the grid of the mixer tube, or short the trimmer thru a 10,000 mmf ceramic disc type to chassis.

14. Bring both cores of the mixer transformer, T-1, simultaneously from the outside towards the center. The half-way markers should be 26.4 mc and 22.9 mc.

NOTE: In aligning the three IF coils, each coil is adjusted individually, but when adjusting the primary and secondary of the mixer transformer, the adjustments should be made simultaneously. The important point to keep in mind is to obtain a flat response curve with as much gain as possible. The sides of the curve should be straight and as steep as possible. Simultaneous adjusting of the primary and secondary is the easiest way to obtain this result. The transformer by itself is, in effect, tuned for the same pass band as the three staggered circuits. See Figure 7. The only difference in the overall waveform should be that the sides of the overall wave are steeper. Constant use of the 50% markers (22.9 mc and 26.4 mc) should be resorted to, since it is absolutely necessary to obtain the proper curve. A slight dip (not exceeding 10%) is permissible in the mixer transformer response curve.



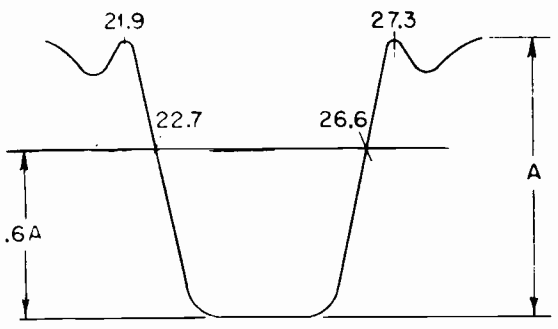


FIGURE 6. IF RESPONSE CURVE

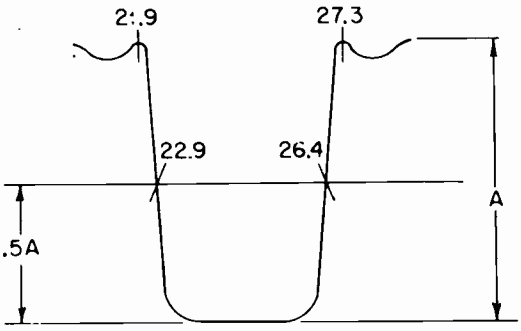
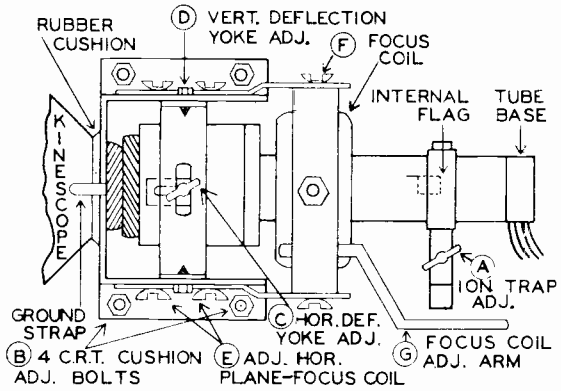


FIGURE 7. OVERALL RESPONSE CURVE FROM MIXER

Muntz TV INC

Chassis	Models	Kinescope
17A2	M31, M32	16" Rect.
17A3	M31R, M32R	16" Round
17A3A	M41, M42	17" Rect.
17A4	M33, M34	19" Round
17A7	M46, M49	20" Rect.

VIEW OF C.R.T. - PICTURE TUBE ADJUSTMENTS



NOTE: The 4 nuts "E" on Fig. No. 1 are welded positions on the 19" model and not adjustable.

FIG. NO. 1

REAR VIEW OF CHASSIS

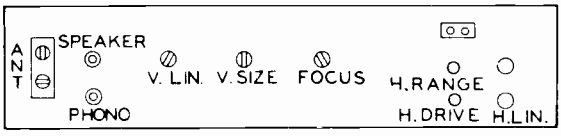
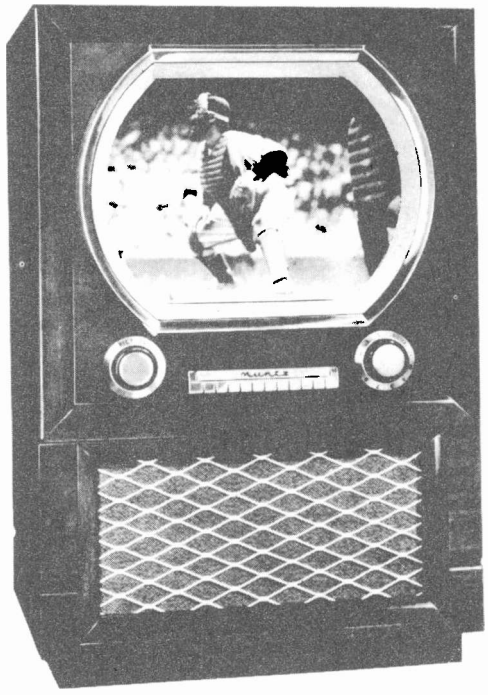
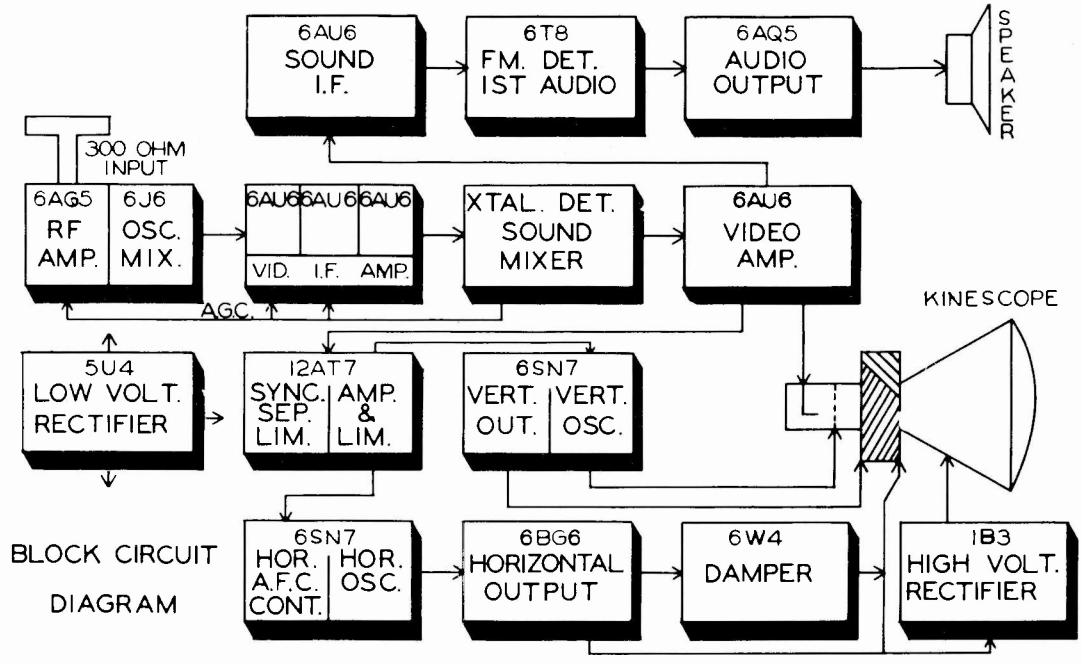


FIG. NO. 3

M33





BLOCK CIRCUIT DIAGRAM

Muntz TV INC

This circuit applies to the following chassis:

No. 17A2 above serial 71440
No. 17A3 above serial 85800
No. 17A4 above serial 57629
and all Nos. 17A3A & 17A7.

Modifications:

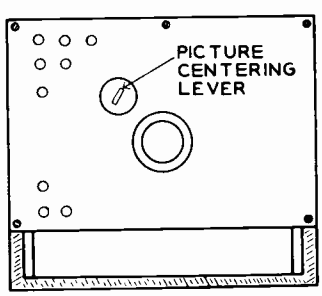
Resistor R12, 820 ohms, in the low voltage power supply, is shunted in aprallel with an additional 820-ohm 2 watt resistor in Chassis 17A4 and 17A7 which use 19 and 20 inch picture tubes.

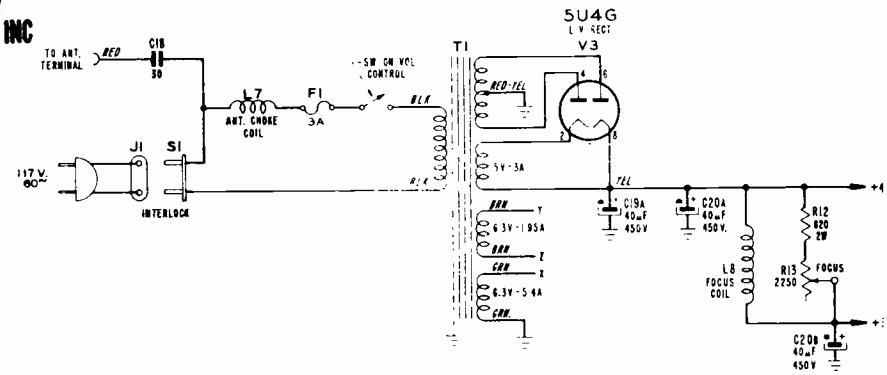
In some sets type 6BC5 or 6AG5 tube is used instead of 6AU6 shown as the 1st I.F. amplifier (V7). When these tubes are used, pin 2 is not grounded, but is connected back to pin 7.

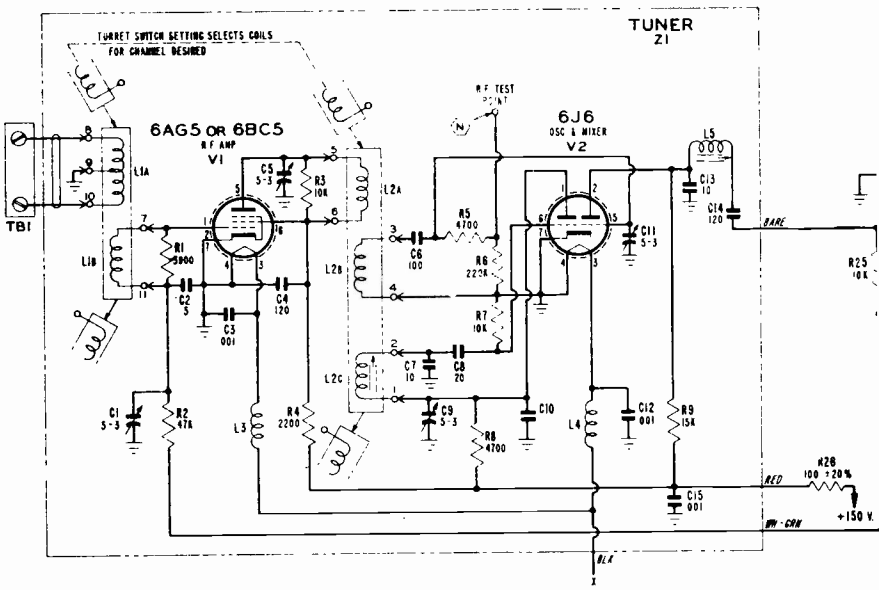
Besides the kinescope tube types stated under V17, 17" and 20" types are used on some of the chassis.

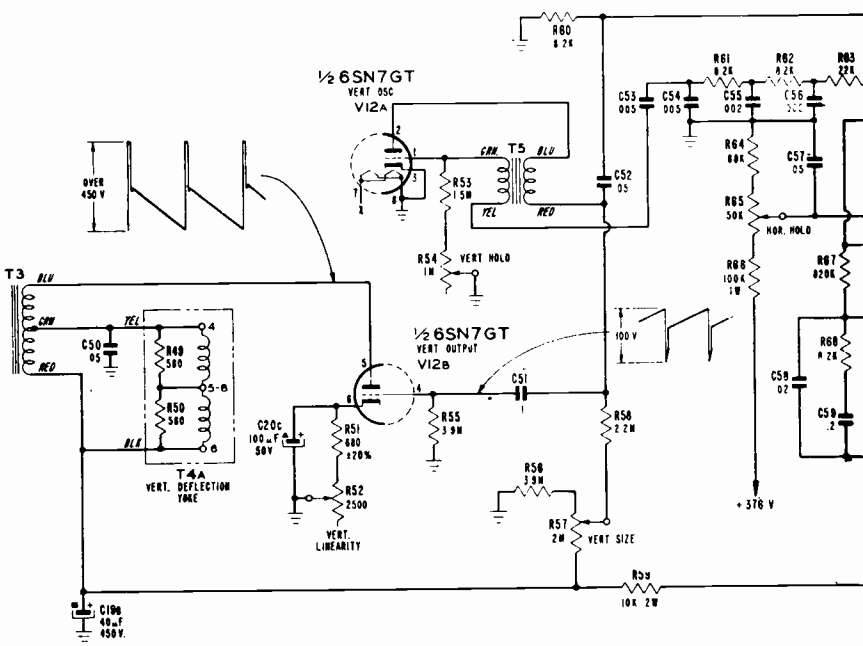
Please note that C71 is .04 mfd. for use with type 16DP4-A only; when other picture tubes are used this condenser is .1 mfd.

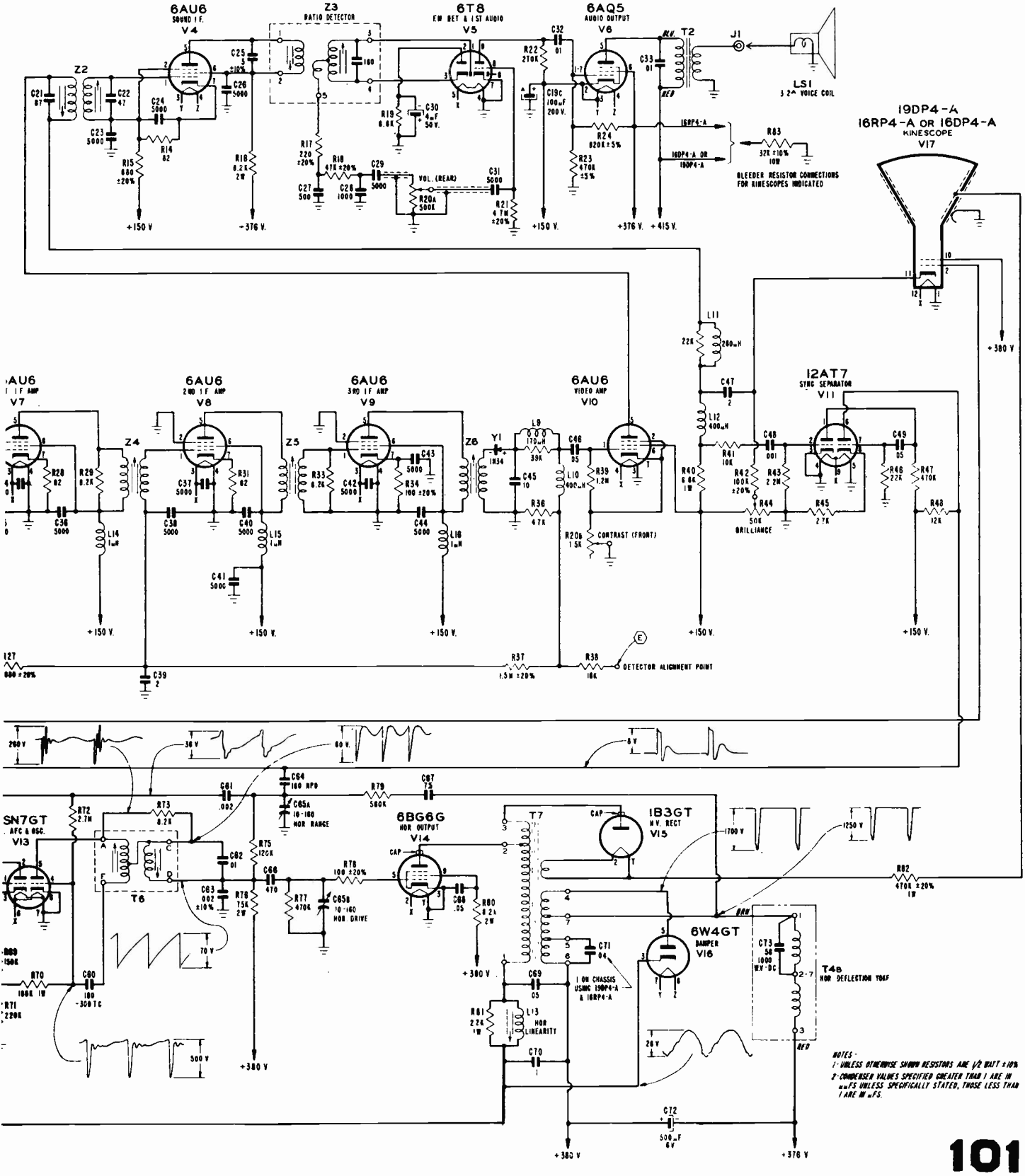
BACK OF CABINET











NOTES -
1 - UNLESS OTHERWISE SHOWN RESISTORS ARE 1/2 WATT ±10%
2 - CONDENSER VALUES SPECIFIED GREATER THAN 1 ARE IN mmFS UNLESS SPECIFICALLY STATED, THOSE LESS THAN 1 ARE IN mFS.

Alignment Instructions for Muntz TV 17A2, 17A3, 17A3A, 17A4, 17A7

A 22,000 ohm isolation resistor, for scope or VT meter, is provided beneath the chassis at point "E" Figure No. 5.

VIDEO I.F. ALIGNMENT CHART

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT V.T.V.M.	FIG. NO. 5 ADJUST	REMARKS
#1	.001	Pin #1 of V8	25.7 MC	2	DC probe to Test Point "E"	D (Z6)	Short antenna connections. To avoid distortion in the response curve which may be caused by AGC action, keep the attenuator of the signal generator to a minimum, below 2 volts on the vacuum tube voltmeter. Adjust for maximum reading.
#2	.001	Pin #1 of V8	24.7 MC	2	DC probe to Test Point "E"	C (Z5)	
#3	.001	High side to ungrounded tube shield floating over converter tube (V2). Low side to chassis.	22.7 MC	2	DC probe to Test Point "E"	B (Z4)	
#4	.001	High side to ungrounded tube shield floating over converter tube (V2). Low side to chassis.	21.8 MC	2	DC probe to Test Point "E"	A (L5)	
#5	Repeat above operations until no further improvement can be made.						

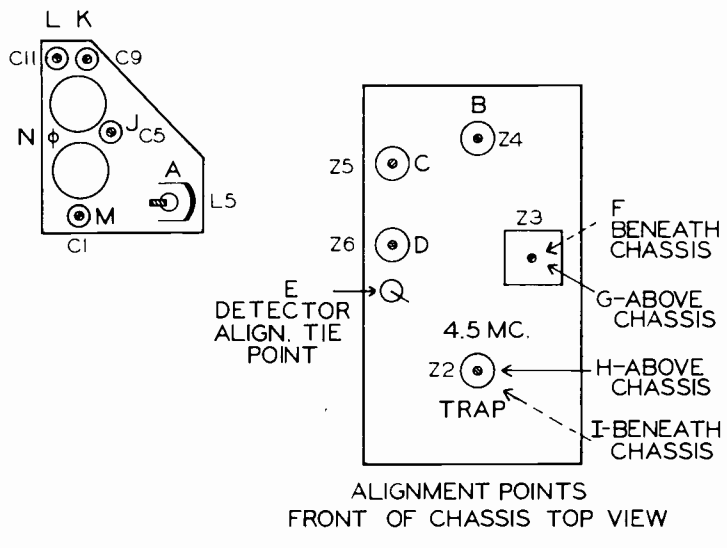
OVERALL VIDEO I.F. RESPONSE EMPLOYING I.F. CURVE

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GEN. FREQ.	CHANNEL	CONNECT SCOPE	FIG. NO. 5 TOUCH-UP	REMARKS
#6	.001	High side to ungrounded tube shield floating over converter tube (V2). Low side to chassis.	24 MC 10 MC Sweep	20.6 MC 22.6 MC 24.3 MC 25.1 MC	2	Point "E"	A B C D	Short antenna connections. Check response curve to Fig. No. 6 and touch up where necessary.

DISCRIMINATOR AND SOUND I.F. ALIGNMENT

Connect two matched 100K ohm resistors in series from Pin #2 of the 6T8 to chassis ground. Fig. No. 7.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT V.T.V.M.	FIG. NO. 5 ADJUST	REMARKS
#7	.001	Pin #1 of 6AU6 V10	4.5 MC (unmod.)	2	Pin #2 of 6T8 and Chassis Ground (Fig. No. 7)	F, H, I	Turn picture control (contrast) all the way counterclockwise. Maximum reading. Use non-metallic screwdriver.
#8	.001	Pin #1 of 6AU6 V10	4.5 MC (unmod.)	2	Move to Point S and T, Fig. No. 7	G	The correct setting is when the VTVM pointer is at zero "cross over point." Use non-metallic screwdriver.



ALIGNMENT POINTS
FRONT OF CHASSIS TOP VIEW

FIG. NO. 5

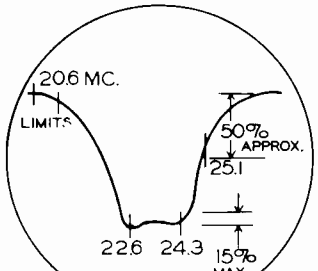


FIG. NO. 6

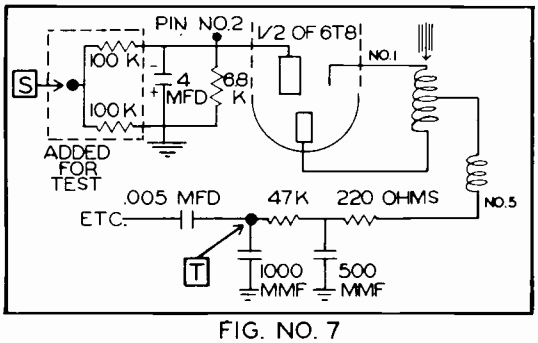
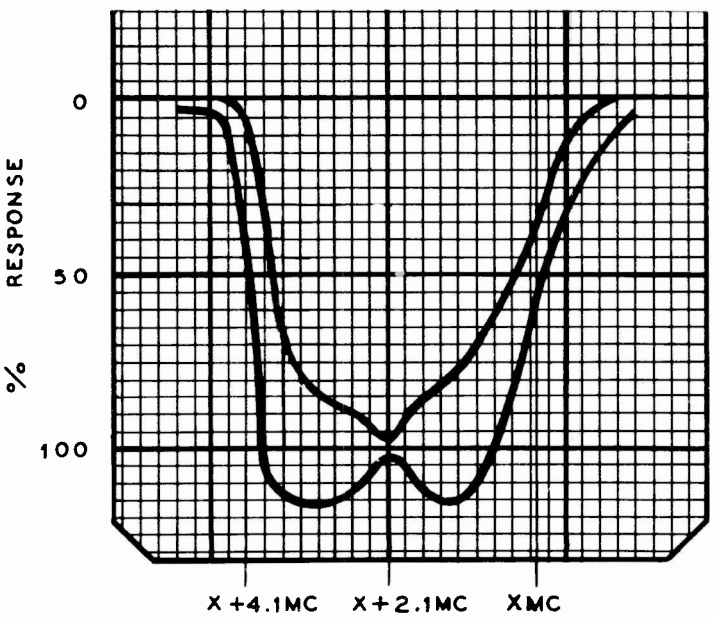


FIG. NO. 7

PHILCO TELEVISION RECEIVER MODELS 50-T1600, 50-T1632, AND 50-T1633

The circuit diagram on the next two pages is exact for the above listed models made under Code 122. The same models made under Code 121 are very similar and the differences are explained on page 104. Other Philco models which are the same or very similar to these models are listed below, with a brief explanation of correspondence.

51-T1606, Code 131, same as 50-T1600, Code 121.
51-T1606, Code 132, same as 50-T1600, Code 122.
51-T1604, 51-T1606, 51-T1634, Code 122, same as 50-T1600, Code 122, + pilot.
51-T1604, 51-T1606, 51-T1634, Code 125, same as 50-T1600, Code 122, plus pilot lamp, and 7N7 replaces 6SN7.
51-T1604, 51-T1606 in some cases uses #76-5747 tuner instead of #76-5411.



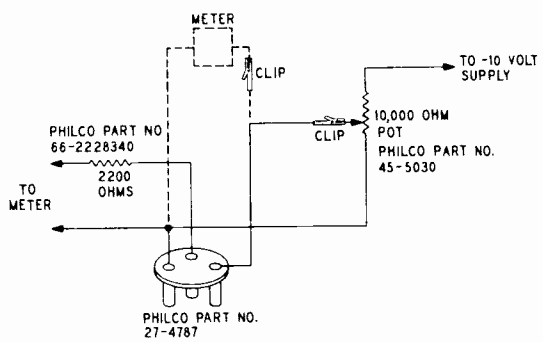
Over-all Response Curve

VIDEO SYNC AND SWEEP VOLTAGE MEASUREMENTS

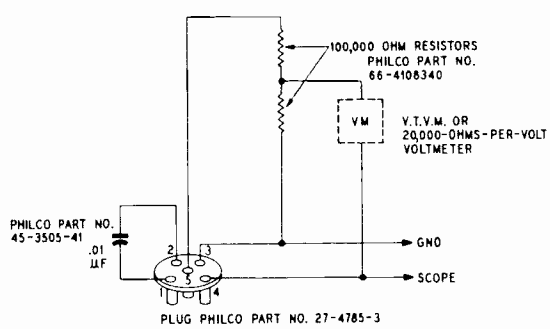
Since the actual value of peak-to-peak voltage in the video amplifier depends upon the strength of the signal being received, no value is given on the schematic. However, the relative gain of the stages is given, to serve as a standard for comparison. The gain is calculated by measuring the input and output voltages, and dividing the output voltage by the input voltage. The 1st sync separator, which is a cathode follower, has a gain of ½.

The combined output from the horizontal and vertical sync separators is approximately 18 volts, peak-to-peak. If either separator is inoperative, the output drops to one-half, or 9 volts, peak-to-peak. The output at the sync inverter plate should be approximately 30 volts, with either 9 or 18 volts input.

Below each wave form shown on the schematic, the frequency for synchronizing the test oscilloscope is given.



ALIGN TEST Jack Adapter



FM TEST Jack Adapter

PHILCO TELEVISION RECEIVER MODELS 50-T1600, 50-T1632, AND 50-T1633

ALL CODE 122

Philco Television Receiver Models 50-T1600, 50-T1632, and 50-T1633, all Code 122, are similar to Code 121, first production of these models. The main differences are as follows:

1. The dual sync separator was changed to a single separator with a series noise gate.

2. The 6AL5 video detector and a-g-c rectifier was changed to a 12AU7, which is used as a video detector, a-g-c rectifier and 1st sound-i-f (intercarrier) amplifier.

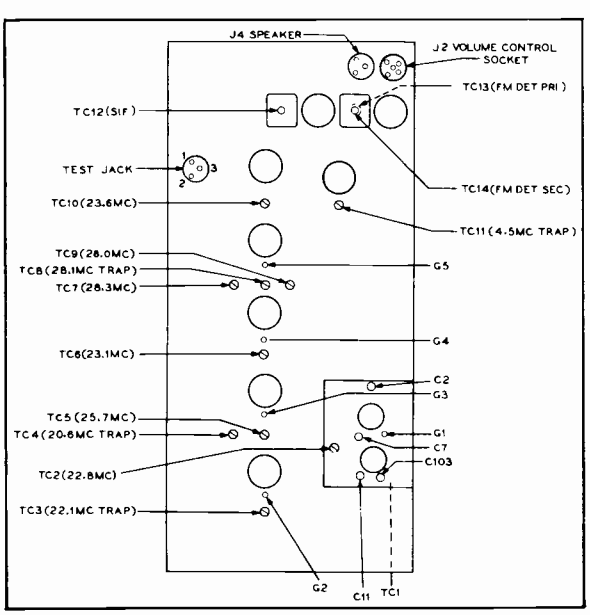
3. The 4.5-mc. trap was moved from the plate of the video-output tube to the output of the video detector.

4. The intercarrier sound take-off point was moved from the plate of the first video amplifier to the output of the video detector.

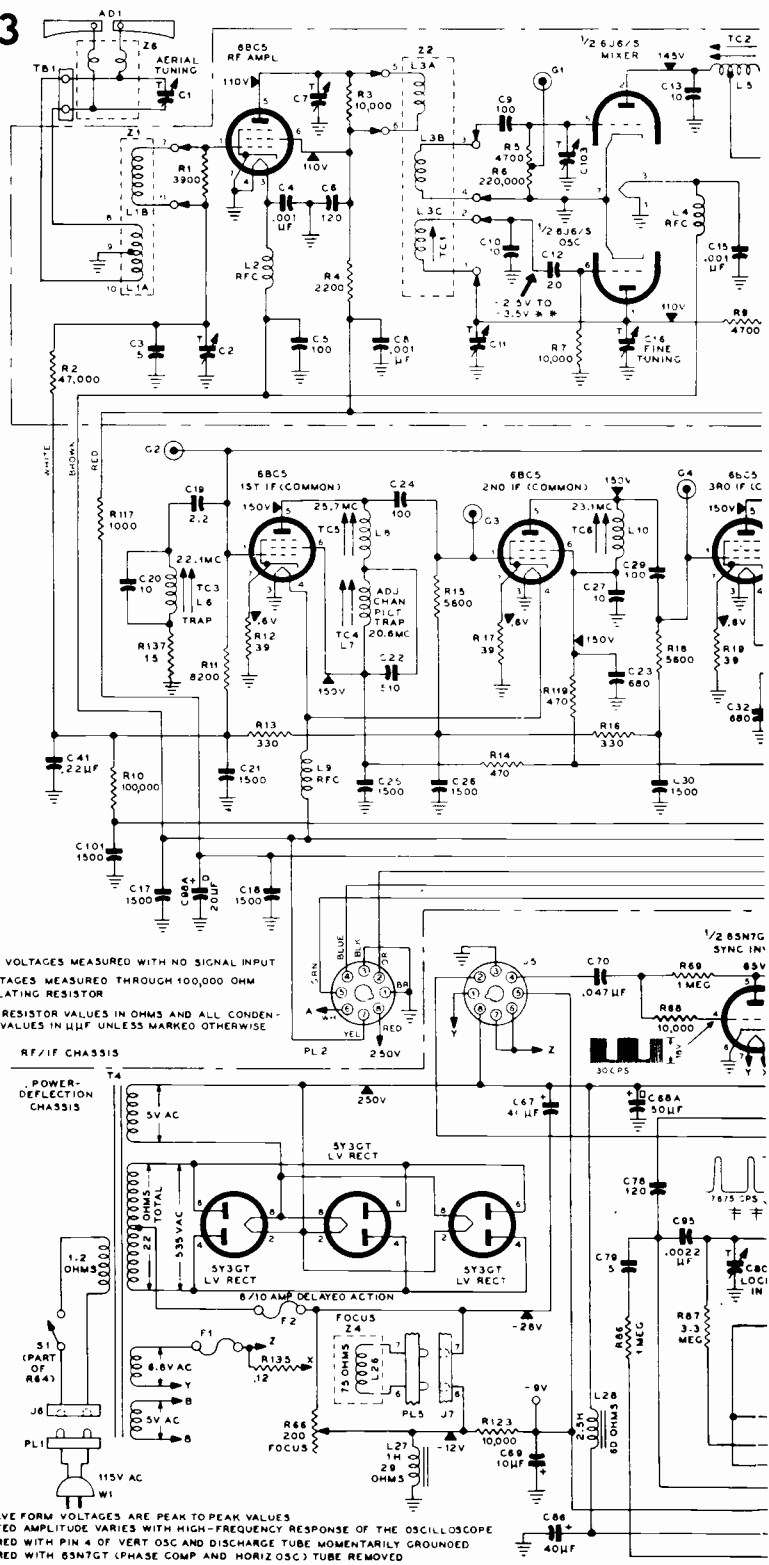
5. The a-g-c clamper was removed, and the a-g-c system was changed to variable-delay a.g.c. with sound a-g-c boost.

6. The 6/10-ampere delayed-action fuse was moved from inside the high-voltage cage to a point between the high-voltage cage and the chassis power deflection socket, J5.

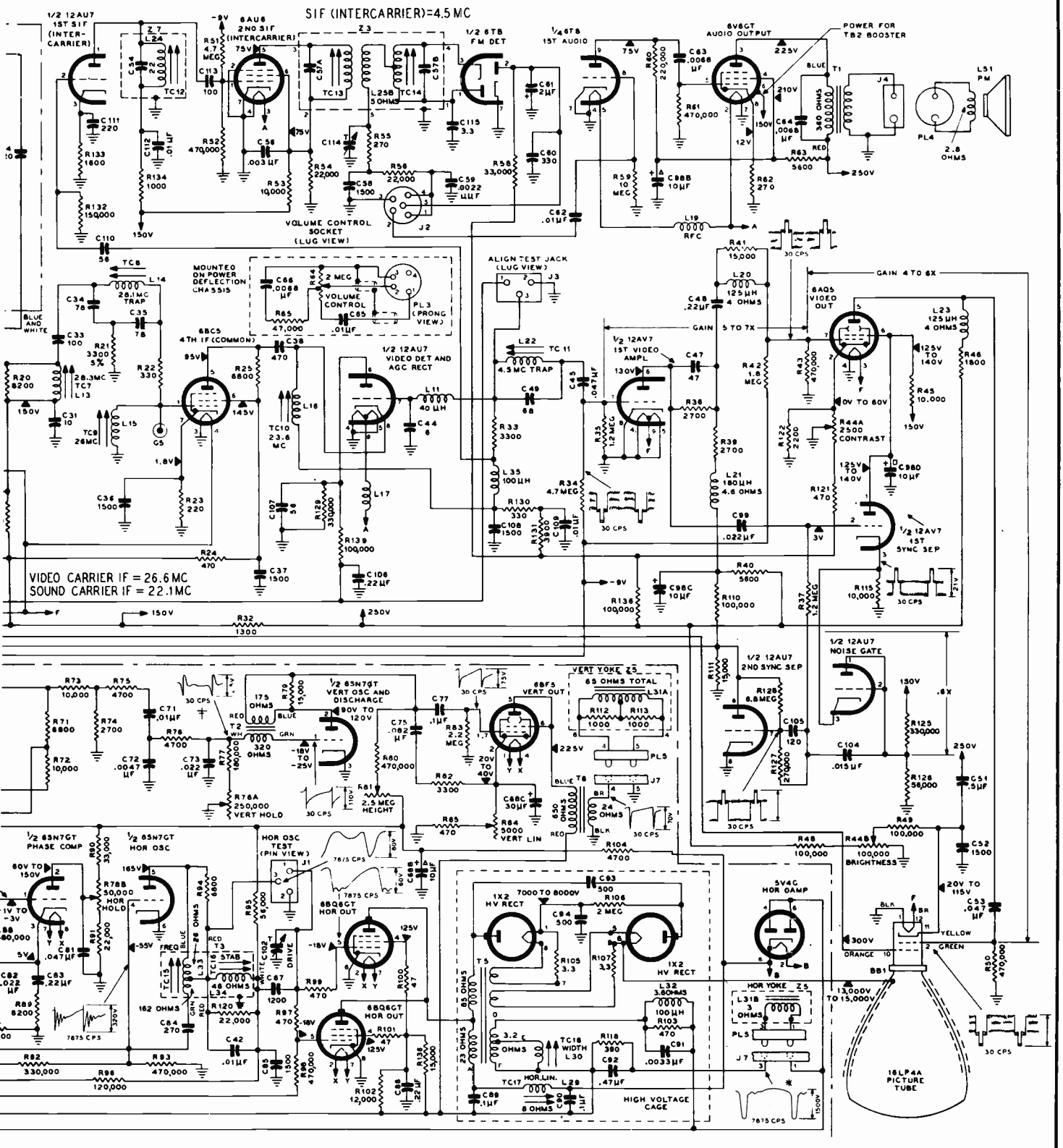
7. A balancing condenser was added to the FM detector circuit.



R-F/I-F Chassis, Showing Locations of Adjustments



MODELS 50-T1600, 50-T1632 and 50-T1633



I-F ALIGNMENT CHART

STEP	SIGNAL-GENERATOR CONNECTION	OUTPUT-INDICATOR CONNECTION	SIGNAL-GENERATOR SETTING	ADJUSTMENT INSTRUCTIONS
1	Connect output of AM generator to G2.	Connect v.t.v.m. or 20,000 ohms-per-volt voltmeter through ALIGN TEST jack adapter to the ALIGN TEST jack. Disconnect bias source.	23.6 mc. See Note 3.	Tune TC10 for maximum output. See Note 4.
2	Same as step 1.	Same as step 1.	28.1 mc. See Note 3.	Tune TC8 for minimum indication. See Note 4.
3	Same as step 1.	Same as step 1.	28.3 mc. See Note 3.	Tune TC7 for maximum output. See Note 4.
4	Same as step 1.	Same as step 1.	26.0 mc. See Note 3.	Tune TC9 for maximum output. See Note 4.
5	Same as step 1.	Same as step 1.	23.1 mc. See Note 3.	Tune TC6 for maximum output. See Note 4.
6	Same as step 1.	Same as step 1.	20.6 mc. See Note 3.	Tune TC4 for minimum output. See Note 4.
7	Same as step 1.	Same as step 1.	25.7 mc. See Note 3.	Tune TC5 for maximum output. See Note 4.
8	Connect output of AM generator to G1.	Same as step 1.	22.1 mc. See Note 3.	Tune TC3 for minimum output. See Note 4.
9	Same as step 8.	Same as step 1.	22.8 mc. See Note 3.	Tune TC2 for maximum output. See Notes 4 and 5.
10	Repeat step 1 of PRELIMINARY ALIGNMENT CHECK CHART			
11	Connect output of AM generator to pin 3 of J3.	Connect v.t.v.m. or 20,000 ohms-per-volt voltmeter through FM TEST jack adapter to volume-control socket. Connect vertical input of oscilloscope to same adapter.	4.5 mc. (modulated).	Tune TC12 and TC13 for maximum indication on oscilloscope. Tune TC14 for zero volts on voltmeter.
12	Same as step 11.	Connect r-f probe (crystal detector) to grid (pin 2) of picture tube. See Note 6.	Same as step 11.	Tune TC11 for minimum indication on oscilloscope.

NOTE 1: Attenuate the signal-generator output to keep the output at the ALIGN TEST jack below 2 volts, peak-to-peak.

NOTE 2: The following information should be used to find the adjustment required:
TC5 Adjusts the position of the video carrier on the curve.
TC6 Sags or bulges the top of the curve.
TC10 Tilts the top of the curve.

NOTE 3: The generator output should be adjusted to maintain between 2 and 3 volts of a-g-c voltage, as read at the VIDEO TEST jack.

NOTE 4: When making this adjustment, the core should be rocked, and the meter indication observed very carefully.

NOTE 5: Two peaks may be obtained while tuning TC2. Starting with TC2 at maximum counterclockwise, the correct peak is the second larger one obtained while turning the core clockwise.

NOTE 6: The r-f probe, Philco Part No. 76-3595, is used as a detector, and the oscilloscope as an indicating device.

PHILCO TELEVISION MODELS 51-T1443B, 51-T1443M, 51-T1443L, 51-T1443X, AND 51-T1443XL

The models listed above employ a new type dual chassis. Although the circuit is similar to 50-1600 Code 122, covered on the preceding four pages, there are sufficient differences to warrant a special treatment of this material. There are a number of additional television models which are similar to the 51-T1443 sets which are described on the next four pages, and information on the similarity of these models is given below:

51-T1443PM, 51-T1443PL, 51-T1443PW use the same "1443" chassis plus a phono-tuner connections to form combination sets.

51-T1601, -02, Code 121, 51-T1607, 51-T1634, Code 123, differ slightly from "1443" in that the RF chassis has a 7C5 in place of 6V6GT, and two 1X2 tubes as a doubler are used instead of a single 1B3GT, two 5U4G tubes replace two 5AX4GT, and an improved horizontal linearity circuit.

51-T1634, Code 124, same as above, but #76-5411 tuner instead of #76-5747.

51-T1832, 51-T1835, differ slightly from the "1601" series; rearrangement of of the B+ circuit is the main change; less horizontal sweep voltage is needed by the 17", 65° deflection, rectangular tube.

51-T1870 uses RF chassis as in "1443P" and power chassis as in 51-T1832 except for the phono and tuner provisions.

51-T1872, 51-T1874 as 51-T1870 plus the RT-4 tuner to provide AM radio.

51-T1875 same as above, but uses RT-2 AM-FM tuner instead.

HORIZONTAL SWEEP ADJUSTMENTS

The range of the horizontal hold control is sufficient to compensate for normal variations in the frequency of the horizontal oscillator, and no other adjustments are ordinarily required. However, if the tube or any of the components are replaced in the horizontal-oscillator circuit, it may be necessary to make the following adjustments to maintain proper synchronism and deflection.

1. Preset the adjustments as follows:
   a. Lock-in trimmer, C612, one turn counterclockwise from the maximum clockwise position.

(Continued on page 110)

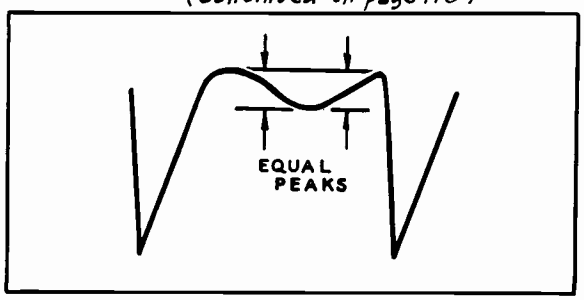


Figure 1. Horizontal Sweep—Horizontal Stabilizing Core Properly Adjusted

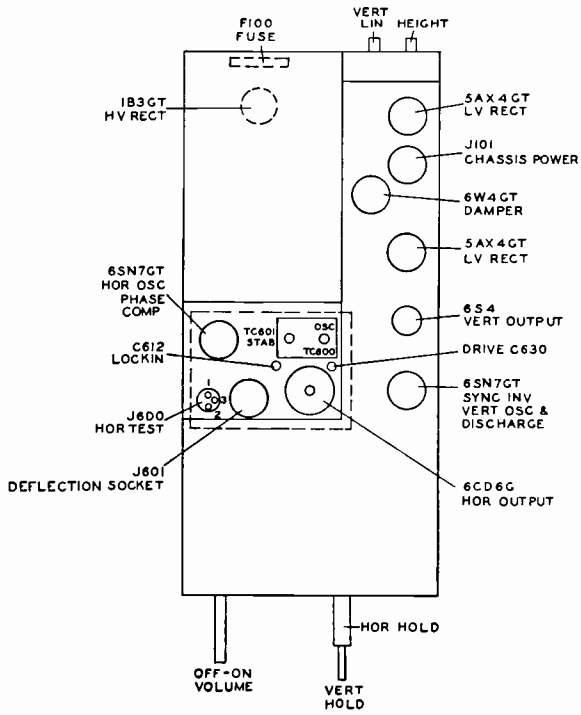
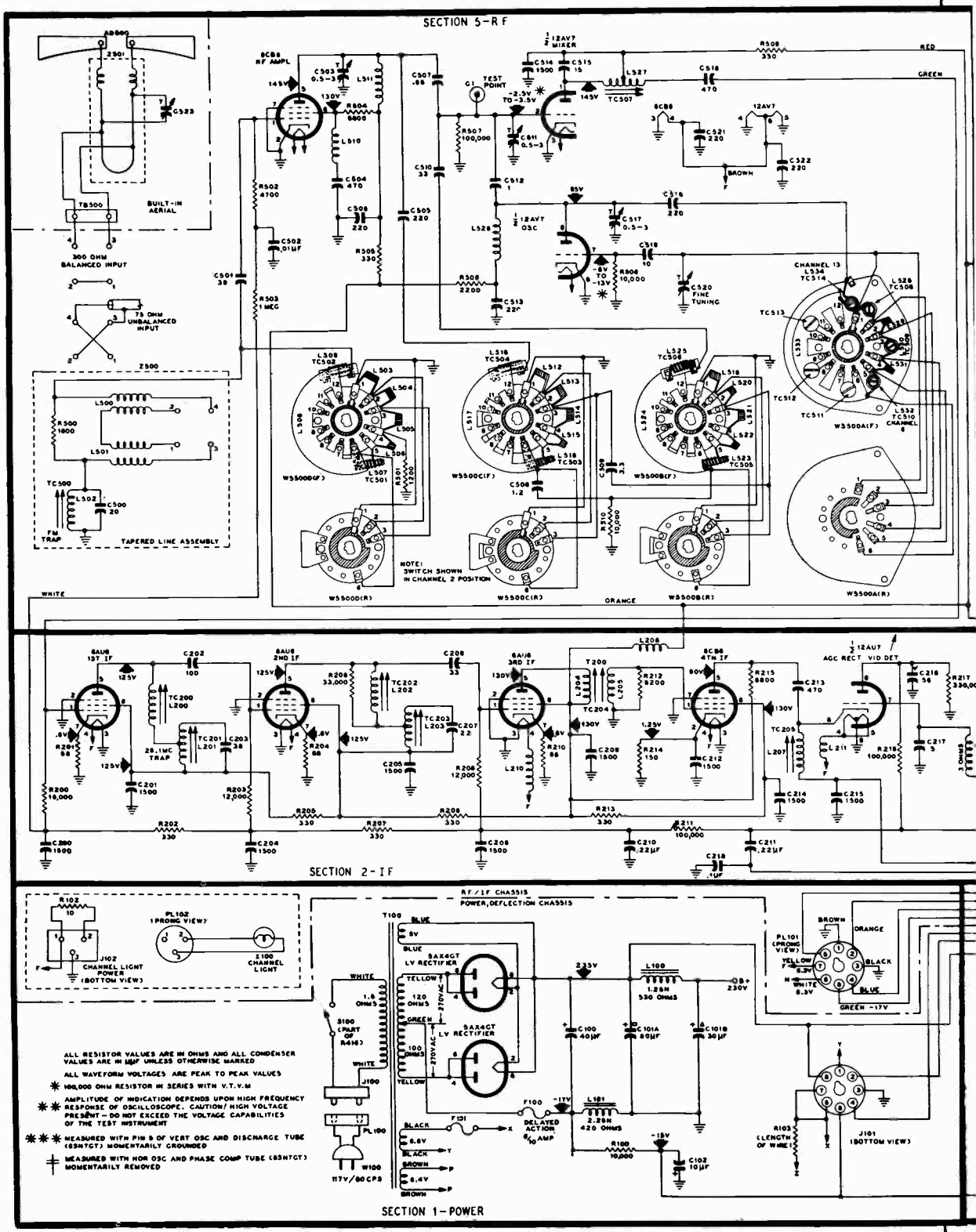
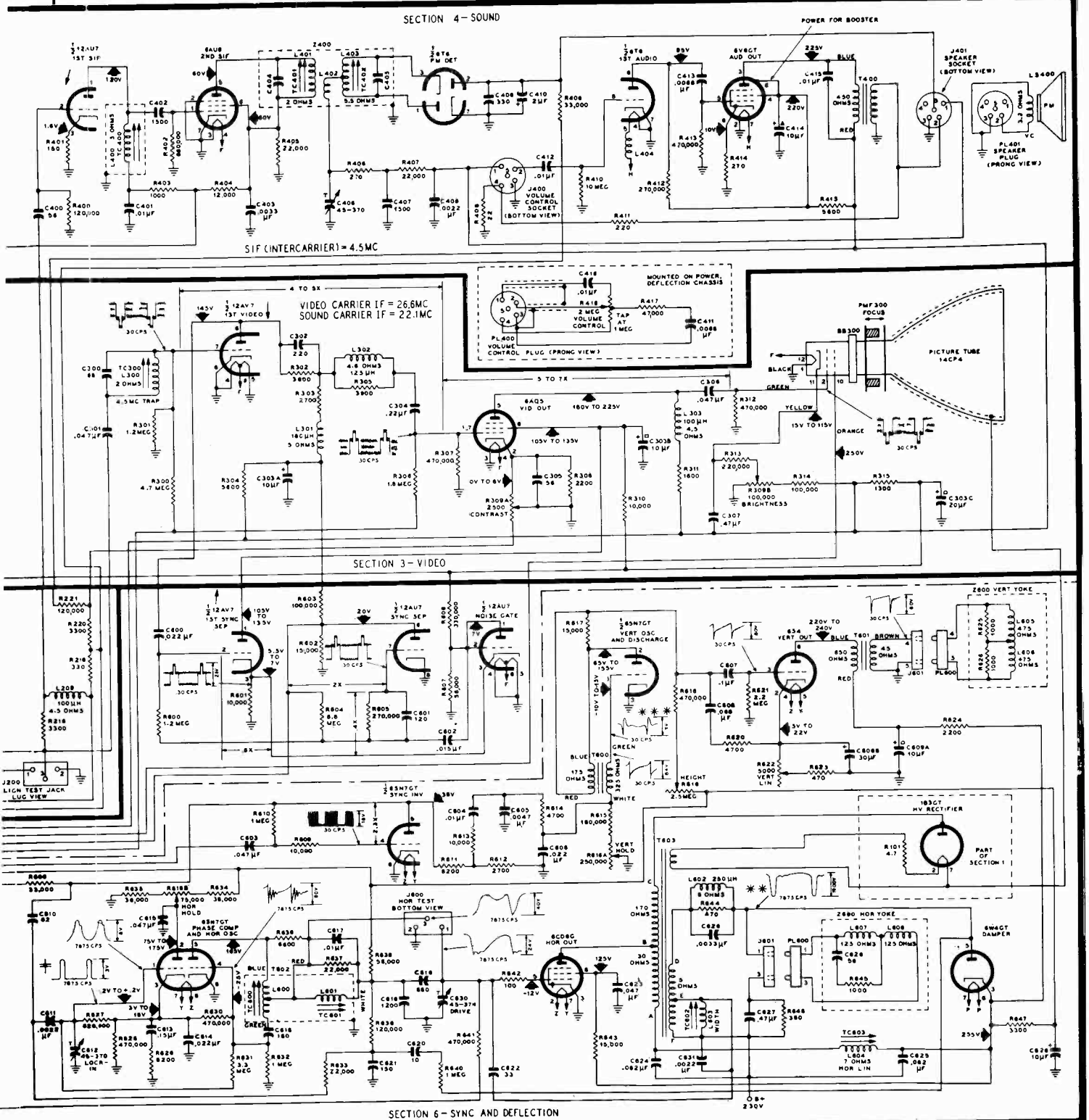


Figure 2. Power, Deflection Chassis, Top View

MODELS 51-T1443B, 51-T1443M, 51-T1443L, 51-T1443X, AND 51-T1443XL



PHILCO TELEVISION



b. Stabilizing core, TC601, extending 5/8-inch above coil mount.

c. Drive trimmer, C630, 1 turn counterclockwise from the maximum clockwise position.

d. HORIZ. HOLD control, center of its range.

2. Tune in a station, and adjust TC600 (see figure 2) so that the picture is brought into sync.

3. Connect an oscilloscope to pin 3 of J600, and adjust the scope sweep so that two complete cycles of the pattern are stationary.

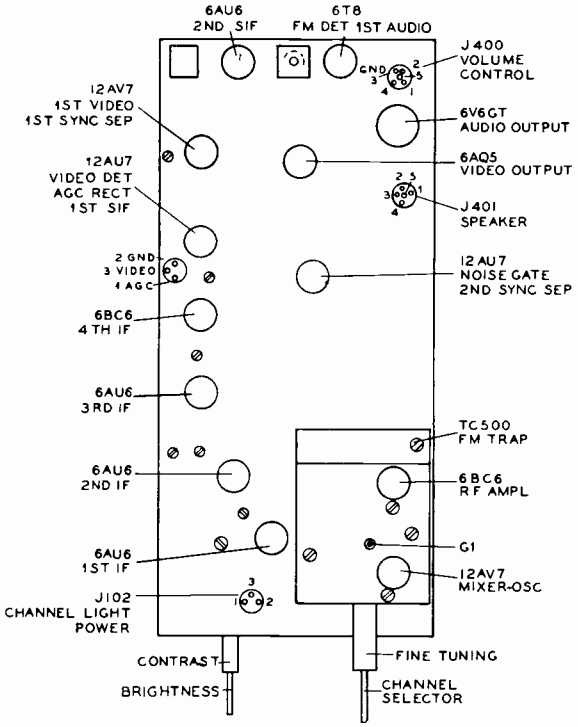


Figure 3. R-F, I-F Chassis, Top View

4. Adjust the stabilizing core, TC601, so that the two peaks (see figure 1) are of equal amplitude, re-adjusting TC600, if necessary, to keep the picture in sync.

5. Turn the HORIZ. HOLD control maximum clockwise. Adjust TC600 so that there are from 3 to 5 blanking bars sloping down to the right.

6. Turn the HORIZ. HOLD control counterclockwise until the picture comes in, then goes out of sync. Then turn the HORIZ. HOLD control slowly clockwise again, counting the number of black (blanking) bars, sloping down to the left, just before the picture pulls into sync. If there are more than 3-1/2 bars, turn the lock-in trimmer, C612, slightly clockwise; if there are less than 2-1/2 bars, turn C612 slightly counterclockwise. If the Receiver does not lose sync when the HORIZ. HOLD control is maximum counterclockwise, then remove the signal momentarily, and proceed with the next step.

7. Repeat steps 5 and 6 until the picture pulls in after 2-1/2 to 3-1/2 bars, down to the left.

8. Turn the HORIZ. HOLD control maximum clockwise. Adjust TC600 to obtain 4 to 6 bars, sloping down to the right.

9. Turn the HORIZ. HOLD control slowly counterclockwise, and note whether the picture goes in and out of sync again. Now turn the HORIZ. HOLD control slowly clockwise until the picture comes into sync. If this sequence is not obtained. repeat steps 5, 6, 7, and 8.

HORIZONTAL DRIVE ADJUSTMENT

The horizontal-drive condenser, C630, controls the amount of drive applied to the horizontal-output tube (6CD6G), and hence, the picture-tube second-anode voltage, picture width, and horizontal linearity. Turning C630 counterclockwise increases the drive; turning clockwise decreases the drive.

The drive should be as high as possible, consistent with good linearity, proper width, and the absence of black line due to Barkhausen oscillation.

In no case should the drive be adjusted below the point where the second anode is below 8600 volts (as measured with a Philco Electronic Circuit Master, Model 7001, or an equivalent instrument which has 100-meg-ohm input resistance). This measurement is made with the second anode of the picture tube connected, and zero beam current (BRIGHTNESS control maximum counterclockwise).

FM TRAP ADJUSTMENT

The FM trap is adjusted at the factory to resonate at 100 mc., and normally requires no further adjustment unless an FM station with a frequency other than 100 mc. causes interference. In such cases, the interference may be reduced by tuning in the television station on which the interference occurs, and adjusting TC500 for minimum interference.

If the FM station is not on the air, the FM trap may be adjusted as follows:

1. Connect the output of the AM signal generator through the aerial-input-matching network (figure 5) to TB500. Wire the tuner for 300-ohm input.

FUSE REPLACEMENT

The B supply protective fuse is located in the high-voltage cage, and is made accessible by removing the back cover of the cage. Use a 6/10-ampere delayed-action fuse, Part No. 45-2656-18.

The filament protective fuse consists of a length of No. 26 copper wire. This fuse is in series with one of the filament supply wires (black) from the power transformer, and is connected between pin 3 of the 5AX4GT tube socket and pin 6 of the chassis power socket, J101. It is important to use No. 26 copper wire when replacing this fuse.

PHILCO TELEVISION RECEIVER MODELS 51-T1836, CODE 123, 51-T1836L, CODE 123, 51-T1838, CODE 124, 51-T2134, CODE 124, 51-T2136, CODE 124, AND 51-T2138, CODE 124

PHILCO TELEVISION-RADIO-PHONOGRAPH MODELS 51-T1876, CODE 124, 51-T2175, CODE 124, AND 51-T2176, CODE 124

The diagram on the next two pages is for Models 51-T1836, -L. Models 51-T1800, 51-T1830, 51-T1832, and 51-T1871 are similar. All these sets have tuner and phono connections. The other models listed above and the more recent Models 51-T2102, 51-T2130, 51-T2132, 51-T2133, and 51-T2170 (these are similar to 51-T2134) use the same dual chassis, but have higher picture tube voltage in sets which use 20" rectangular tubes instead of the 17" size, may include tuners and record changers, and may use Philco remote control.

HORIZONTAL DRIVE ADJUSTMENT

The horizontal drive condenser, C630 (see figure 1), controls the amount of drive applied to the horizontal-output tube (6CD6G), and hence, the picture-tube second-anode voltage, picture width, and horizontal linearity. However, with the new horizontal linearity circuit, the effect of drive on linearity in most cases is negligible, and need not be taken into consideration in making the drive adjustment. The drive is increased by turning C630 counterclockwise, and is decreased by turning clockwise.

The drive should be as high as possible, consistent with the proper width, the absence of black line due to Barkhausen oscillation, and the ability of the horizontal oscillator to start with low line voltage.

In no case should the drive be adjusted below the point where the second anode is below 13,500 volts for the 17-inch tube or 16,500 volts for the 20-inch tube

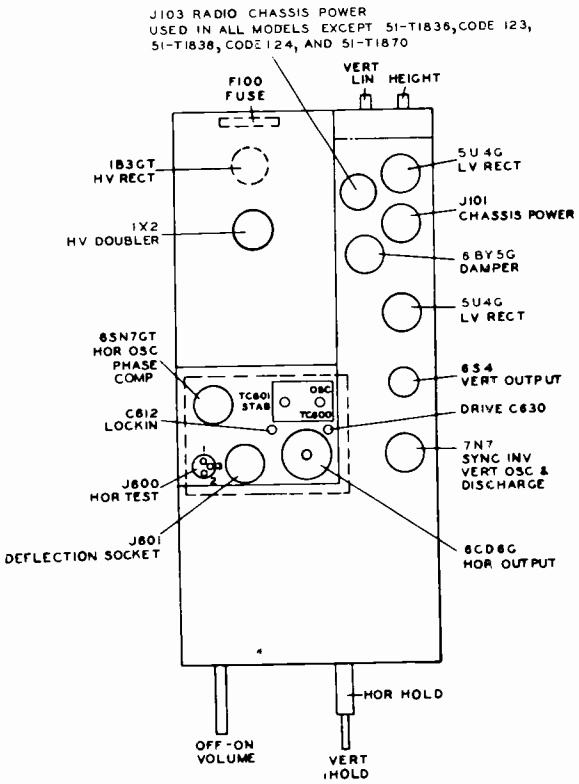


Figure 1. Power, Deflection Chassis, Top View, Showing Locations of Tubes and Adjustments

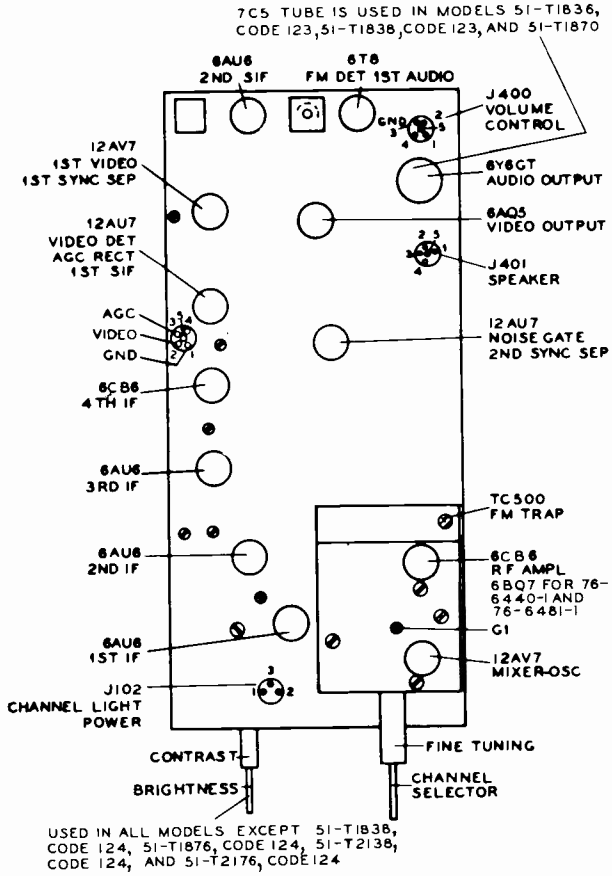
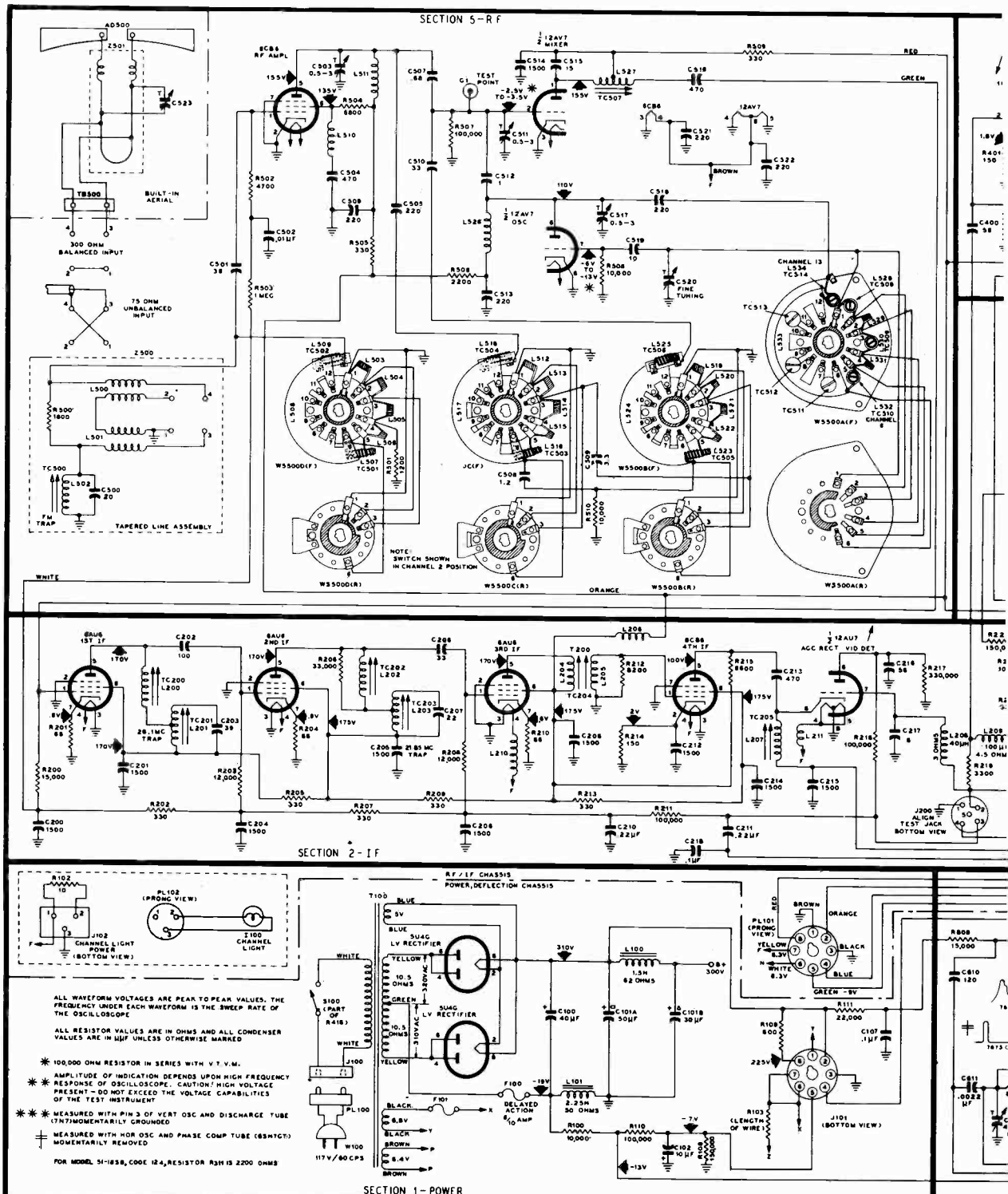
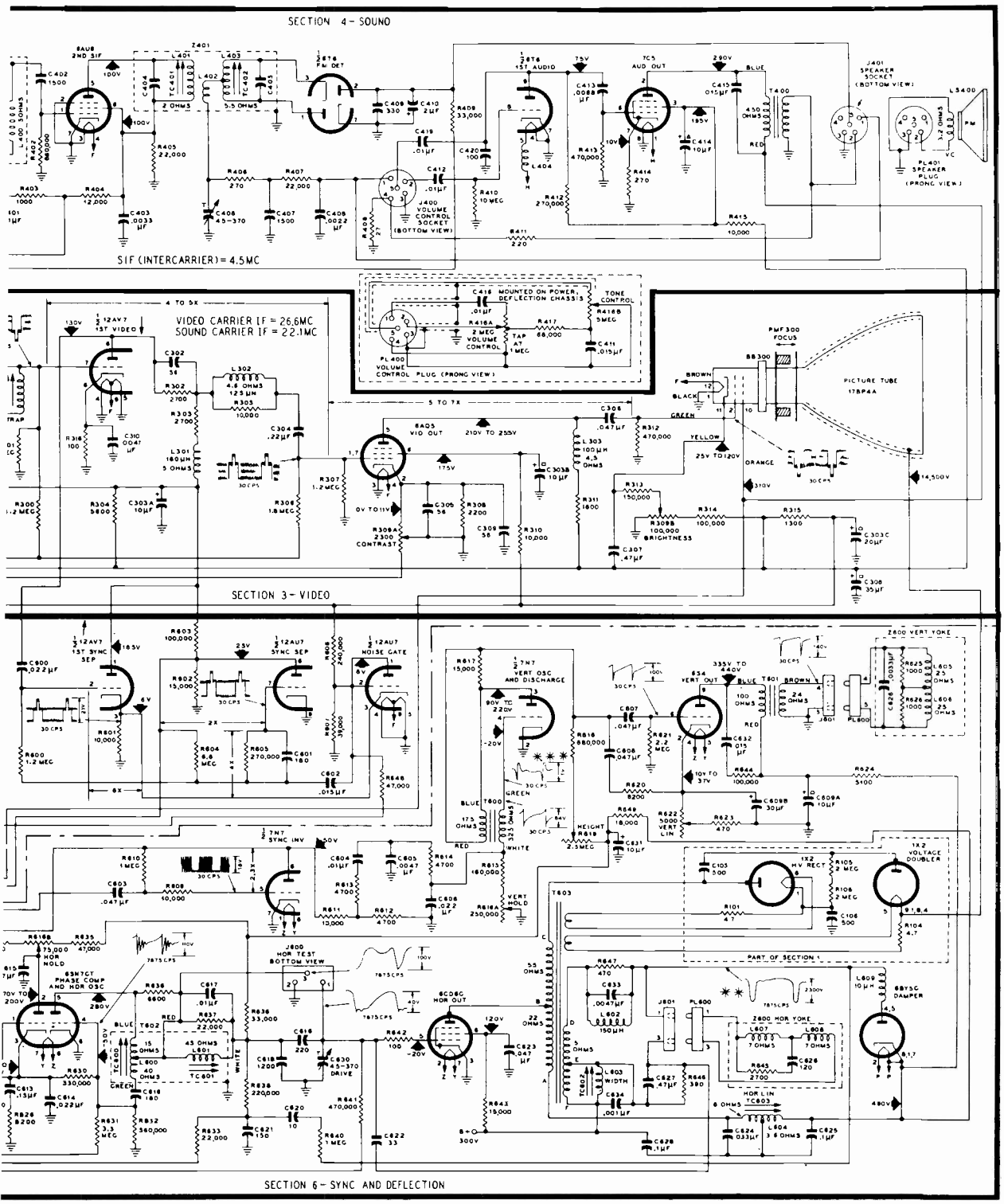


Figure 3. R-F, I-F Chassis, Top View, Showing Locations of Tubes and Jacks

Philco Television Models 51-T1836, 51-T1836L



Philco Television Models 51-T1836, 51-T1836L



Television Schematic Diagram, Models 51-T1836, Code 123 and 51-T1836L, Code 123

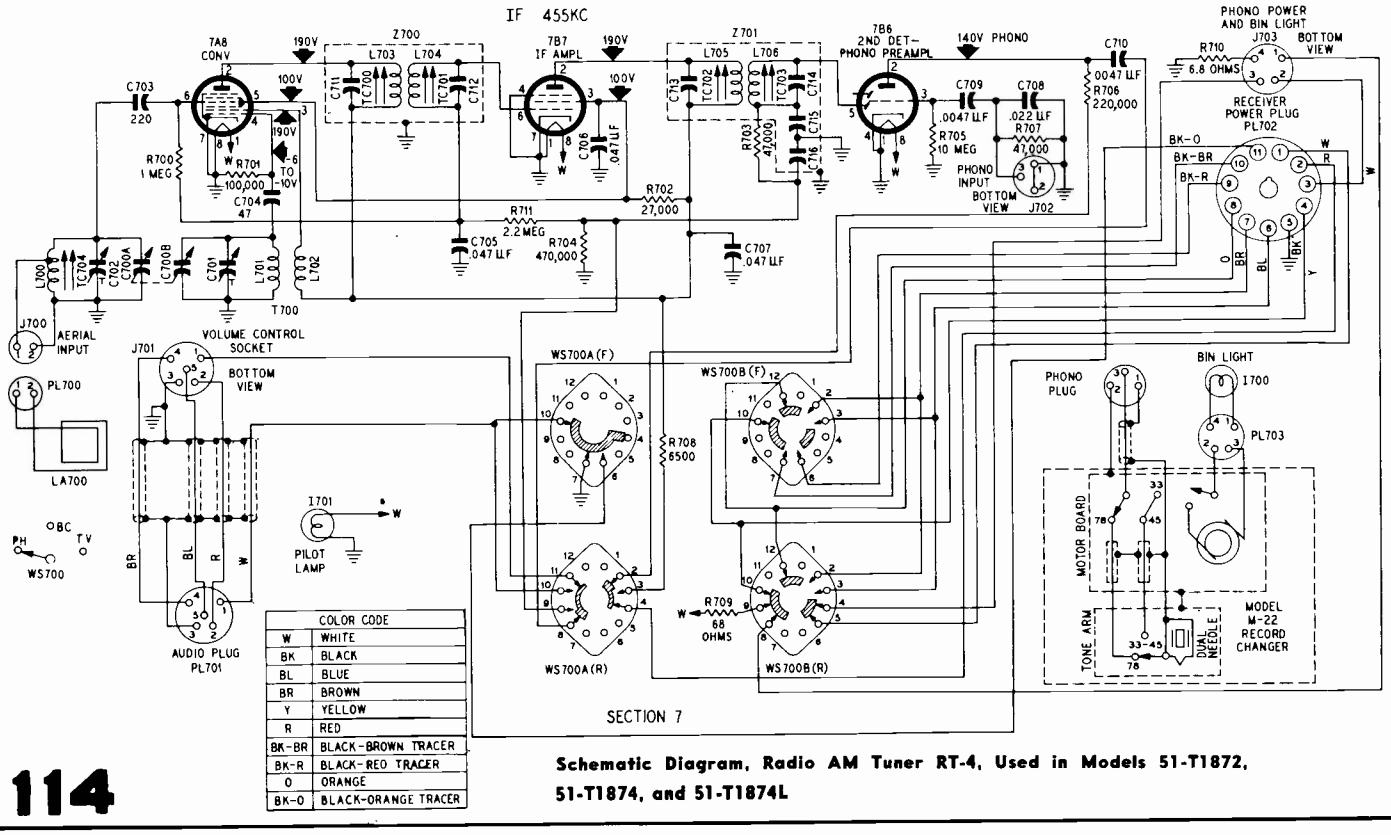
Philco AM Radio Tuner RT-4 used in Television Models 51-T1872, 51-T1874

AM RADIO ALIGNMENT CHART (TUNER RT-4)

STEP	SIGNAL-GENERATOR CONNECTION	OUTPUT-INDICATOR CONNECTION	SIGNAL-GENERATOR SETTING	RADIO-DIAL SETTING	ADJUSTMENT INSTRUCTIONS
1	Connect signal generator through .1-μf. condenser to grid (pin 6) of converter tube.	Connect vertical input of oscilloscope (or meter leads) to pins 2 and 3 of speaker socket, J401.	Set signal generator (modulated) to 455 kc.	Condensers fully meshed.	Adjust TC700, TC701, TC702, and TC703 for maximum output indication.
2	Connect signal generator through .1-μf. condenser to pin 1 of antenna socket, J700.	Same as step 1.	Set signal generator (modulated) to 1620 kc.	1620 kc. (see figure 19).	Adjust C701 for maximum output indication.
3	Same as step 2. (See NOTE below.)	Same as step 1.	Set signal generator (modulated) to 1500 kc.	Tune receiver to generator signal (1500 kc.).	Adjust C702 for maximum output indication.
Steps 4 and 5 should be performed only if it becomes necessary to replace the antenna coil, L700.					
4	Same as step 2.	Same as step 1.	580 kc.	Tune receiver to generator signal.	Adjust TC704 for maximum output indication. Rock tuning gang.
5	Repeat steps 3 and 4 until maximum output is obtained on the high and low ends of the band.				

RADIO ANTENNA COIL (L700) REPLACEMENT—If it should ever become necessary to replace the antenna coil, L700, the adjustment given in steps 4 and 5 of the RADIO ALIGNMENT CHART above should be made.

NOTE: The final adjustment of C702 should be made with the chassis in the cabinet and the loop aerial connected. The signal generator should be coupled to the Receiver by means of a radiating loop. This loop should be made up of six to eight turns of insulated wire in a 6-inch-diameter loop. Connect the signal generator to the radiating loop, and place the radiating loop near the loop aerial of the Receiver.



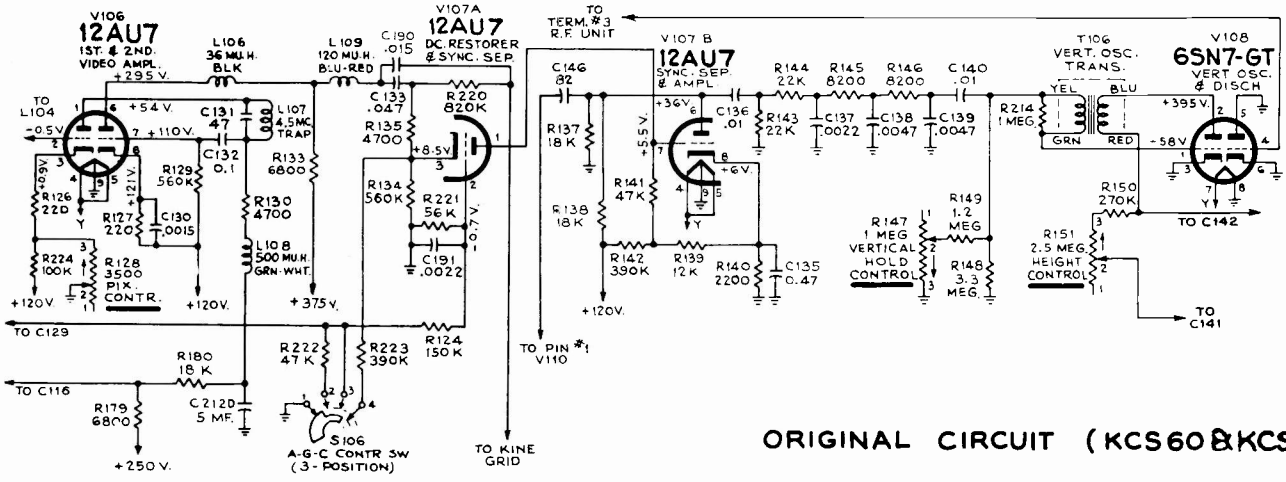
COLOR CODE	
W	WHITE
BK	BLACK
BL	BLUE
BR	BROWN
Y	YELLOW
R	RED
BK-BR	BLACK-BROWN TRACER
BK-R	BLACK-RED TRACER
O	ORANGE
BK-O	BLACK-ORANGE TRACER

Schematic Diagram, Radio AM Tuner RT-4, Used in Models 51-T1872, 51-T1874, and 51-T1874L

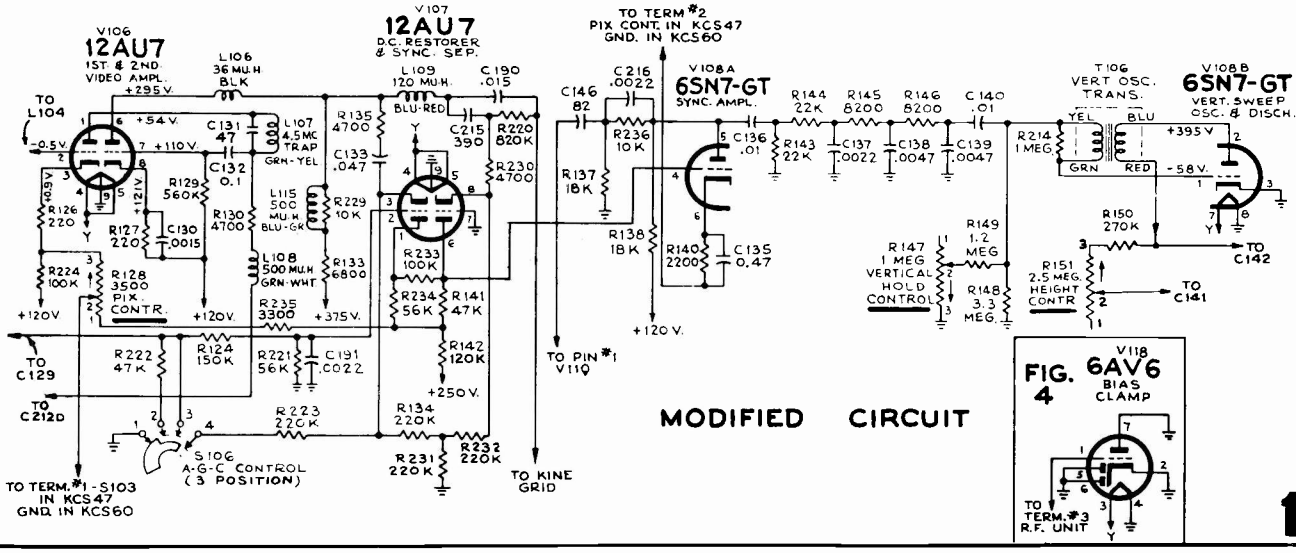
RCA VICTOR

MODELS 6T53, 6T54, 6T64, 6T65, 6T71, 6T74, 6T75, 6T76

The above listed models use Chassis Nos. KCS47 and KCS47A. Same chassis numbers with letter "T" suffix are also used and this is explained later in this paragraph. Models 9T57, 9T77, 9T79, using Chassis Nos. KCS49 and KCS49A, employing 19" picture tubes, are almost identical to chassis described here. Combination 16" and 19" Models 2T81, 6T84, 6T86, 6T87, using TV Chassis KCS48, and Model 9T89, using TV Chassis KCS60, are very similar to chassis covered in the following eight pages, and you may use this material as an aid in servicing any of these sets. The circuits of the sync separator, D.C. restorer, sync amplifier, and vertical oscillator for the KCS48 and KCS60 is shown directly below. The same circuits for KCS47 and KCS49 may be observed by referring to the main schematic of these sets on pages 118-119. The "Modified Circuit" of the same stages as shown at the bottom of this page, is used in the "T" versions of all of these chassis; that is, every chassis number mentioned in this paragraph and followed with a letter "T." For example, KCS47T, KCS47AT, KCS60T, etc. The alignment information given, beginning on page 121, applies equally well to all chassis mentioned here.



ORIGINAL CIRCUIT (KCS60 & KCS48)



MODIFIED CIRCUIT

RCA Victor
Models 6T53, 6T54
6T64, 6T65, etc.

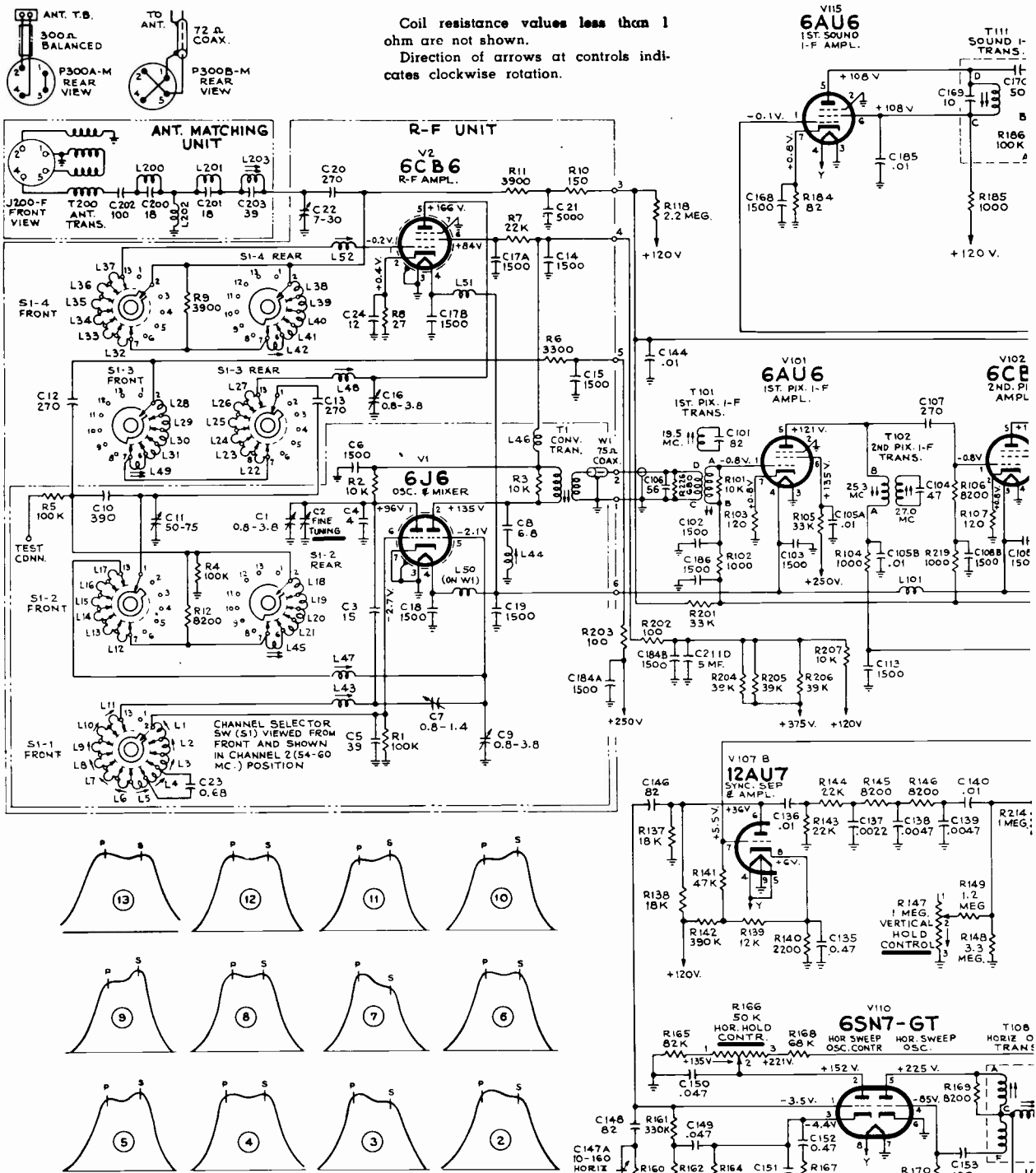


Figure 13 R-F Response

PRODUCTION CHANGES IN KCS47 AND KCS47A

In some receivers C160 was .022, C161 was 250, C105A and C105B were 1,500, R129 was 390 k, R180 was 22 k, R176 was 8,200, C141 was connected between R151, R154 and plus 120 volts. C144 and R226 were omitted.

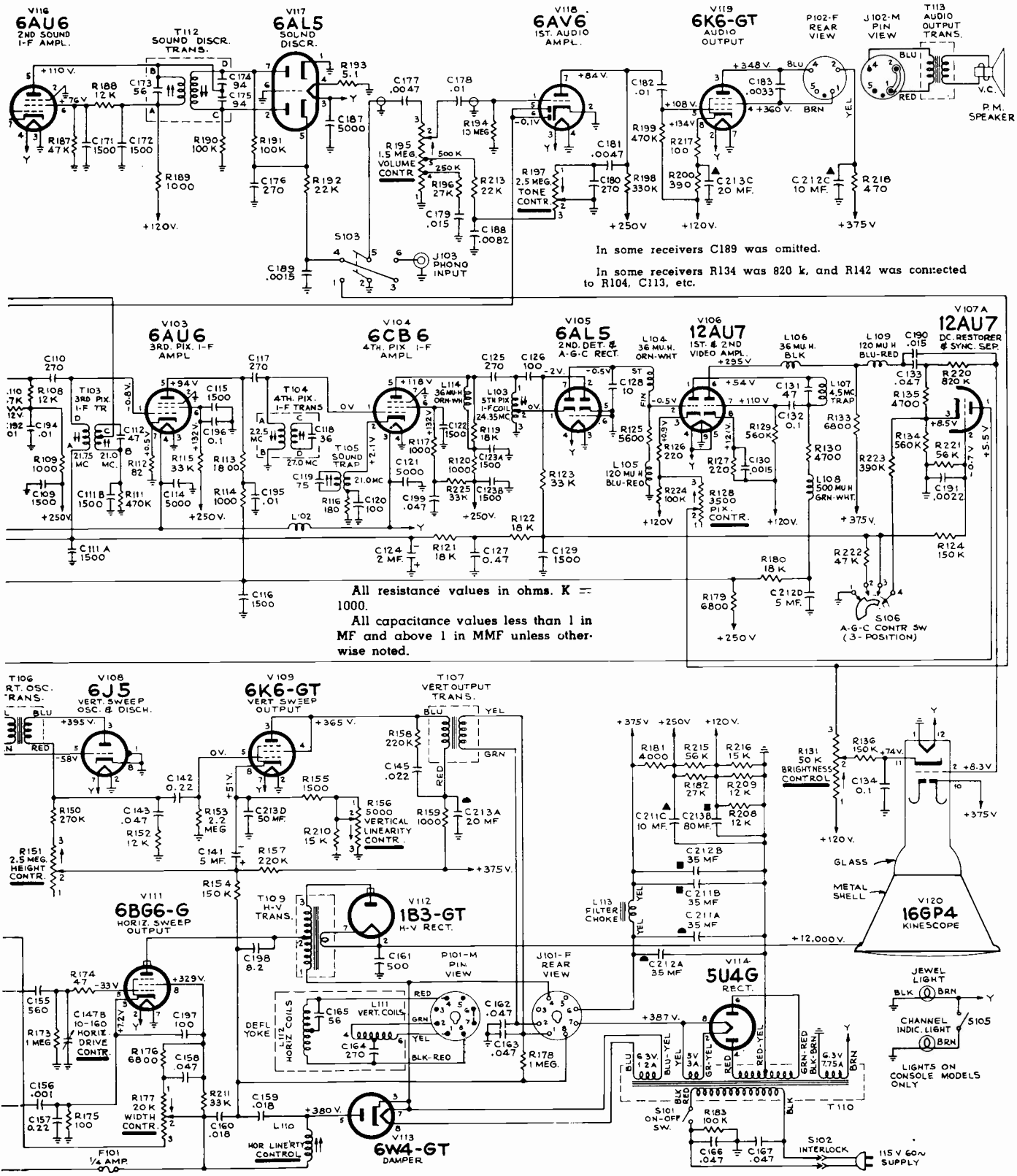
In some receivers the connections to terminals 1 and 3 of R177 were reversed.

In some receivers R142 was 1.2 meg and was connected to plus 250 volts.

In some receivers C198 was 4.7, R134 was 470 k, C190 was connected at R135.

In some receivers R113 was 3900, R119 was 8,200, and L114 was omitted, T104 bottom was tuned to 24.35MC and L103 was tuned to 22.5MC.

Figure 14 —Horizontal Oscillator Waveforms



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.

Figure 16 — Circuit Schematic Diagram KCS47 and KCS47A

RCA Victor

Models 6T53, 6T54, 6T64, 6T65, 6T71, 6T74, 6T75, 6T76.

Chassis KCS47, -A.

CHASSIS TOP VIEW

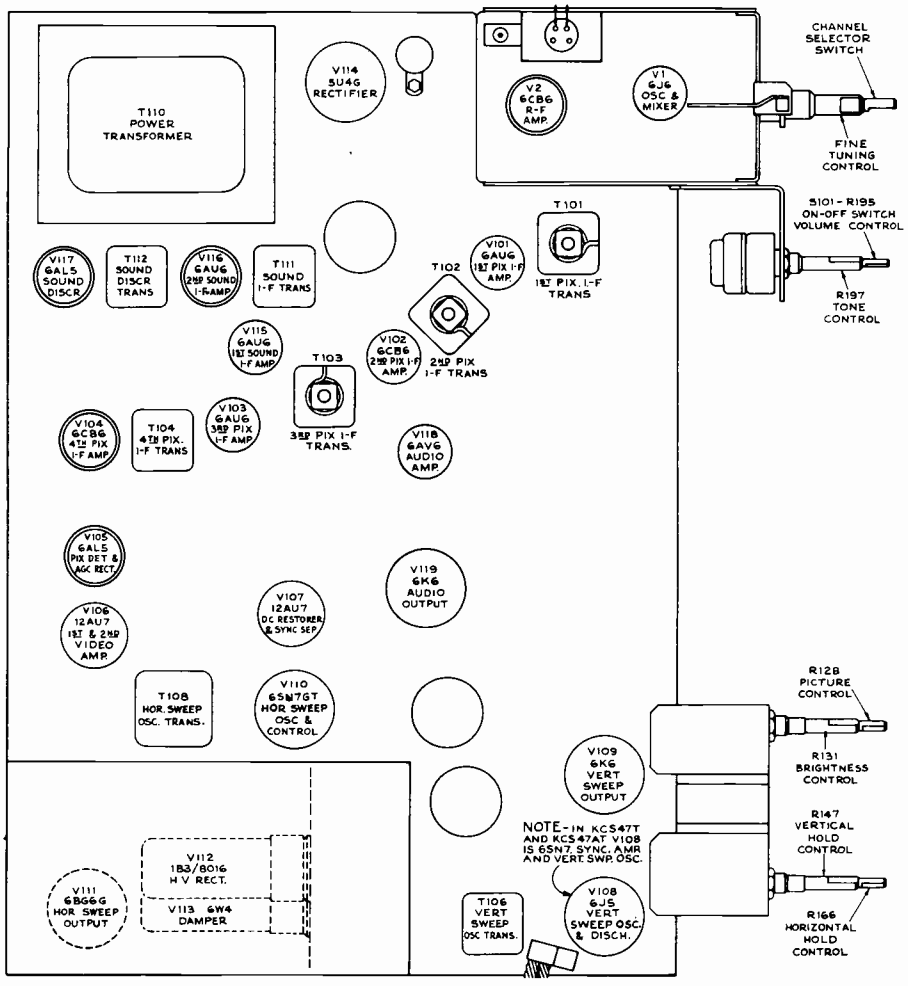


Figure 5—Chassis Top View

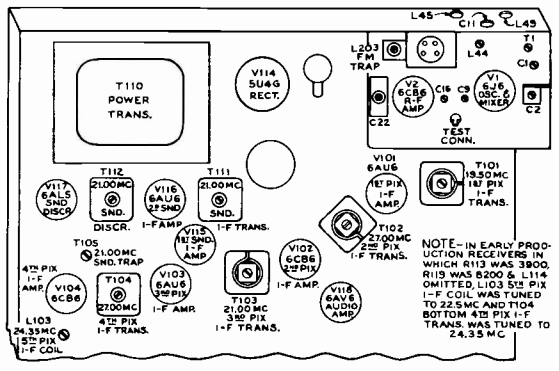


Figure 6—Top Chassis Adjustments

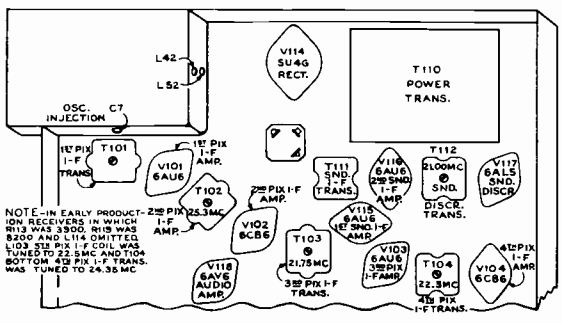


Figure 7—Bottom Chassis Adjustments

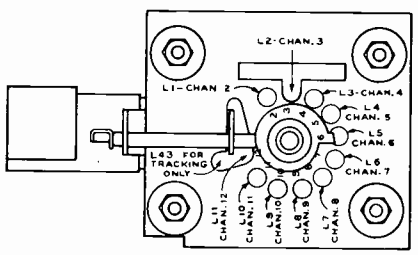


Figure 8—R-F Oscillator Adjustments

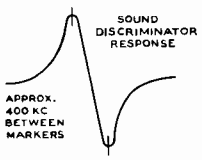


Figure 9—Discriminator Response

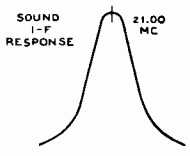


Figure 10—Sound I-F Response

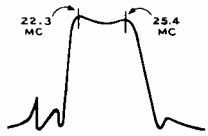


Figure 11 T1 and T101 Response

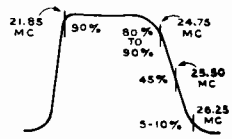


Figure 12 Overall I-F R-F Response

RCA Victor Models 6T53, 6T54, 6T64, 6T65, 6T71, etc., continued

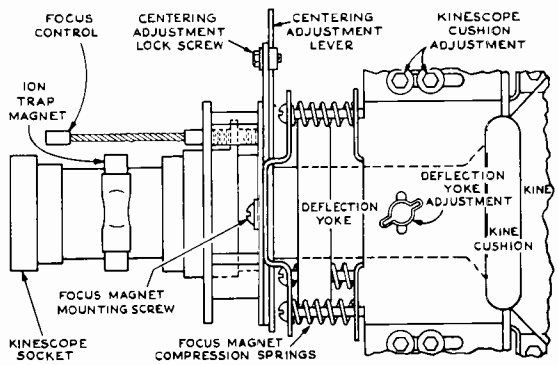


Figure 1—Yoke and Focus Magnet Adjustments

CHECK OF HORIZONTAL OSCILLATOR ALIGNMENT. — Turn the horizontal hold control to the extreme counter-clockwise position. The picture should remain in horizontal sync. Momentarily remove the signal by switching off channel then back. Normally the picture will be out of sync. Turn the control clockwise slowly. The number of diagonal black bars will be gradually reduced and when only 2 bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional clockwise rotation of the control. Pull-in should occur when the control is approximately 90 degrees from the extreme counter-clockwise position. The picture should remain in sync for approximately 90 degrees of additional clockwise rotation of the control. At the extreme clockwise position, the picture should be out of sync and should show 1 vertical or diagonal black bar in the raster.

ALIGNMENT OF HORIZONTAL OSCILLATOR. — If in the above check the receiver failed to hold sync with the hold control at the extreme counter-clockwise position or failed to hold sync over 90 degrees of clockwise rotation of the control from the pull-in point, it will be necessary to make the following adjustments.

Horizontal Frequency Adjustment. — Turn the horizontal hold control to the extreme clockwise position. Tune in a television station and adjust the T108 horizontal frequency adjustment on top of the chassis until the picture is just out of sync and the horizontal blanking appears as a vertical or diagonal black bar in the raster.

Horizontal Lock in 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 T108 top 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.

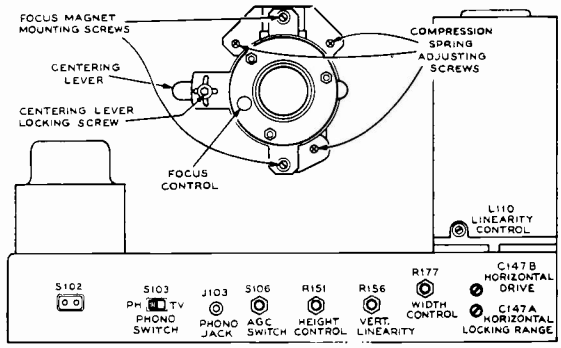


Figure 2—Rear Chassis Adjustments

If more than 2 bars are present just before the picture pulls into sync, adjust the horizontal locking range trimmer C147A slightly clockwise. If less than 2 bars are present, adjust C147A slightly counter-clockwise. Turn the picture control counter-clockwise, momentarily remove the signal and recheck the number of bars present at the pull-in point. Repeat this procedure until 2 bars are present.

Repeat the adjustments under "Horizontal Frequency Adjustment" and "Horizontal Locking Range Adjustment" until the conditions specified under each are fulfilled. When the horizontal hold operates as outlined under "Check of Horizontal Oscillator Alignment" the oscillator is properly adjusted.

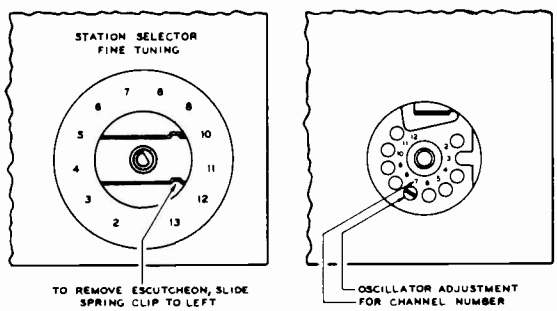


Figure 3—R-F Oscillator Adjustments

CHECK OF R-F OSCILLATOR ADJUSTMENTS. — Tune in all available stations to see if the receiver r-f oscillator is adjusted to the proper frequency on all channels. If adjustments are required, these should be made by the method outlined in the alignment procedure on page 4. The adjustments for channels 2 through 12 are available from the front of the cabinet by removing the station selector escutcheon as shown in Figure 3. Adjustment for channel 13 is on top of the chassis.

ALIGNMENT PROCEDURE

SOUND DISCRIMINATOR ALIGNMENT.—Set the signal generator for approximately .1 volt output at 21.00 mc. and connect it to the second sound i-f grid, pin 1 of V116.

Detune T112 secondary (bottom) to the extreme counter-clockwise position.

Set the "VoltOhmyst" on the 3-volt scale.

Connect the meter, in series with a one-megohm resistor, to pin 7 of V117.

Adjust the primary of T112 (top) for maximum output on the meter.

Connect the "VoltOhmyst" to the junction of R192 and S103. Adjust T112 secondary (bottom). It will be found that it is possible to produce a positive or negative voltage on the meter dependent upon this adjustment. Obviously to pass from a positive to a negative voltage, the voltage must go through zero. T112 (bottom) should be adjusted so that the meter indicates zero output as the voltage swings from positive to negative. This point will be called discriminator zero output.

Connect the sweep oscillator to the grid of the second sound i-f amplifier, pin 1 of V116.

Adjust the sweep band width to approximately 1 mc. with, the center frequency at approximately 21.00 mc. and with an output of approximately .1 volt.

Connect the oscilloscope to the junction of R192 and S103. The pattern obtained should be similar to that shown in Figure 9. If it is not, adjust T112 (top) until the wave form is symmetrical.

The peak-to-peak band width of the discriminator should be approximately 400 kc. and the trace should be linear from 20.925 mc. to 21.075 mc.

RCA Victor 6T53, etc. ALIGNMENT PROCEDURE (Continued)

Note. — The bottom core and stud in the discriminator transformer are at plus B potential.

SOUND I-F ALIGNMENT. — Connect the sweep oscillator to the first sound i-f amplifier grid, pin 1 of V115.

Insert a 21.00 mc. marker signal from the signal generator into the first sound i-f grid.

With the oscilloscope connected as above, adjust T111 for maximum gain and symmetry about the 21.00 mc. marker on the discriminator pattern. The pattern obtained should be similar to that shown in Figure 9.

The output level from the sweep should be set to produce approximately 1 volt peak-to-peak at the junction of R192 and S103. 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.

The band width at 70% response from the first sound i-f grid to the second i-f grid should be approximately 530 kc.

PICTURE I-F TRAP ADJUSTMENT. — Connect the "VoltOhmyst" to the junction of R102 and R201.

Obtain a 4.5 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 R102 and R201. Adjust the potentiometer for –3.0 volts indication on the "VoltOhmyst."

Set the channel switch to the blank position between channels number 2 and 13.

Connect the "VoltOhmyst" to pin 2 of V106 and to ground.

Connect the output of the signal generator to terminal D of T101.

Set the generator to each of the following frequencies and with a thin fiber screwdriver tune the specified adjustment for minimum indication on the "VoltOhmyst." In each instance the generator should be checked against a crystal calibrator to insure that the generator is exactly on frequency.

(1) 21.00 mc.—T103 (top)
(2) 21.00 mc.—T105 (top)
(3) 27.00 mc.—T102 (top)
(4) 27.00 mc.—T104 (top)
(5) 19.50 mc.—T101 (top)

In the above transformers using threaded cores, it is possible to run the cores completely through the coils and secure two peaks or nulls. The correct position is with the cores in the outside ends of the coils. If the cores are not in the correct position, the coupling will be incorrect and it will be impossible to secure the correct response.

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 to prevent overloading.

*24.35 mc.—L103
*22.5 mc.—T104 (bottom)
21.75 mc.—T103 (bottom)
25.3 mc.—T102 (bottom)

*See note on Figures 6 and 7.

R-F UNIT ALIGNMENT. — 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.

Detune T1 by backing the core all the way out of the coil.

In early production units in which L44 is adjustable, back the L44 core all the way out.

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.

The oscillator may be aligned by adjusting it to beat with a crystal-calibrated heterodyne frequency meter, or by feeding a signal into the receiver at the r-f sound carrier frequency and adjusting the oscillator for zero output from the sound discriminator. In this latter case the sound discriminator must first have been aligned to exact frequency. Either method of adjustment will produce the same results. The method used will depend upon the type of test equipment available. Regardless of which method of oscillator alignment is used, the frequency standard must be crystal controlled or calibrated.

If the receiver oscillator is to be adjusted by the heterodyne frequency meter method, couple the meter probe loosely to the receiver oscillator.

If the receiver oscillator is adjusted by feeding in the r-f sound carrier signal, connect the signal generator to the receiver antenna terminals. Connect the "VoltOhmyst" to the sound discriminator output (junction of R192 and S103). Also couple the link loosely to lug 2 of the r-f unit terminal board so as to permit measurement at sound discriminator.

Set the channel selector switch to 13.

Adjust the frequency standard to the correct frequency (236.75 mc. for heterodyne frequency meter or 215.75 mc. for the signal generator).

Set the fine tuning control to the middle of its range.

Adjust C1 for an audible beat on the heterodyne frequency meter or zero voltage from sound discriminator.

Now that the channel-13 oscillator is set to frequency, we may proceed with the r-f alignment.

Turn the AGC control to the counter-clockwise position.

Connect the bias box to terminal 3 of the r-f unit terminal board and adjust the bias box potentiometer for –3.5 volts.

Connect the oscilloscope to the test connection at R5 on top of the r-f unit.

Connect the r-f sweep oscillator to the receiver antenna terminals. The method of connection depends upon the output impedance of the sweep. The P300 connections for 300-ohm balanced or 72-ohm single-ended input are shown in the circuit diagram. If the sweep oscillator has a 50-ohm single-ended output, 300-ohm balanced output can be obtained by connecting as shown in Figure 4.

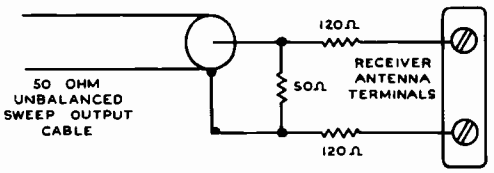


Figure 4—Unbalanced Sweep Cable Termination

Connect the signal generator loosely to the receiver antenna terminals.

Set the receiver channel switch to channel 8.

Set the sweep oscillator to cover channel 8.

Insert markers of channel 8 picture carrier and sound carrier, 181.25 mc. and 185.75 mc.

Adjust C9, C11, C16 and C22 for approximately correct curve shape, frequency, and band width as shown in Figure 13.

The correct adjustment of C22 is indicated by maximum amplitude of the curve midway between the markers. C16 tunes the r-f amplifier plate circuit and affects the frequency of the curve most noticeably. C9 tunes the converter 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 frequency standard to the correct frequency (108.75 mc. for heterodyne frequency meter or 87.75 mc. for the signal generator).

Set the fine tuning control to the middle of its range.

Adjust L5 for an audible beat on the heterodyne frequency meter or zero voltage from sound discriminator.

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 L42, L45 and L49 for proper response as shown in Figure 13.

L42 is adjusted to give maximum amplitude of the curve between the markers. L45 primarily affects the tilt of the curve. L49 primarily affects the frequency of response.

RCA Victor 6T53, etc. ALIGNMENT PROCEDURE (Continued)

Connect the "VoltOhmyst" to the r-f unit test point at R5.

Adjust C7 for −3.0 volts at the test point.

Retouch L42, L45 and L49 for proper response if necessary. If necessary, retouch C11 for proper band width on channel 6. Continue these retouching adjustments until proper response is obtained and −3.0 volts of oscillator injection is present at the test point.

Set the receiver channel selector switch to channel 8 and readjust C1 for proper oscillator frequency.

Set the sweep oscillator and signal generator to channel 8.

Readjust C9, C16 and C22 for correct curve shape, frequency and band width. Readjust C11 only if necessary.

Switch the receiver, the sweep oscillator and signal generator to channel 13.

Adjust L52 for maximum amplitude of the curve midway between markers and then overshoot the adjustment by turning the slug in the same direction from the initial setting a little more than the amount of turning required to reach maximum amplitude of response.

Adjust C22 for maximum amplitude of response.

Turn off the sweep generator. Adjust the L43 core for correct channel 13 oscillator frequency, then overshoot the adjustment by turning the slug a little more in the same direction from the initial setting. Reset the oscillator to proper frequency by adjustment of C1.

Turn the sweep oscillator back on.

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 13 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, C16 and C22 as necessary. 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. The antenna circuit (L52, C22) is broad so that tracking is not particularly critical.

If the valley in the top of the selectivity curves for the high channels is deeper than normal, the curve can be flattened somewhat by decreasing the inductance of L44 by turning the core stud in. Be sure to check for undesirable resonant suck-outs on channels 7 and 8 if this is done. In later production units, L44 may be fixed and not require adjustment.

Turn the sweep oscillator off and check the receiver r-f oscillator frequency. If the oscillator is off frequency overshoot the adjustment of C1 and correct by adjusting L43.

Turn the receiver channel selector switch to channel 6. Adjust L5 for correct oscillator frequency.

Turn the sweep oscillator on and to channel 6 and observe the response curve. If necessary readjust L42, L45 and L49. It should not be necessary to touch C11.

Check the oscillator injection voltage at the test point. If necessary adjust C7 to give −3 volts injection. If C7 is adjusted, switch to channel 8, and readjust C9 for proper curve shape, then recheck channel 6.

Switch the receiver through channel 6 down through channel 2 and check for normal response curve shapes and oscillator injection voltage.

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 for the specified indication. 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.

Channel Number	Picture Carrier Freq. Mc.	Sound Carrier Freq. Mc.	Receiver R-F Osc. Freq. Mc.	Channel Oscillator Adjustment
2	55.25	59.75	80.750	L1
3	61.25	65.75	86.750	L2
4	67.25	71.75	92.750	L3
5	77.25	81.75	102.750	L4
6	83.25	87.75	108.750	L5
7	175.25	179.75	200.750	L6
8	181.25	185.75	206.750	L7
9	187.25	191.75	212.750	L8
10	193.25	197.75	218.750	L9
11	199.25	203.75	224.750	L10
12	205.25	209.75	230.750	L11
13	211.25	215.75	236.750	C1

Switch to channel 8 and observe the response.

Adjust T1 clockwise while watching the change in response. When T1 is properly adjusted, the selectivity curve will be slightly wider with a slightly deeper valley in its top.

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.

Remove the 39 ohm resistor and reconnect the link from T101 to terminal 2 of the r-f unit terminal board.

Since T1 was adjusted during the r-f unit alignment it will be necessary to sweep the overall i-f response.

R-F UNIT TUBE CHANGES. — Since most of the circuits are low capacitance circuits the r-f unit may require readjustments when the tubes are changed.

If the 6CB6 r-f amplifier tube is changed, it may be necessary to readjust C16 and C22.

If the 6J6 oscillator and mixer tube is changed, then more extensive adjustments are required.

For good conversion efficiency, the oscillator injection to a triode mixer must be held reasonably close to the optimum value. Although there is some latitude in this level, it is nearly expended in the normal variation in injection from channel to channel. Consequently, the adjustment of C7 is limited primarily to establishing the conditions for good conversion. Since changes in oscillator injection affect conversion gain, it also affects the input capacity of the mixer, thus also affecting tracking of the mixer grid circuit. These tube variations with their consequent effect on circuit alignment thereby require readjustment of the r-f unit if maximum conversion efficiency is to be retained after the 6J6 tube is changed. It may be possible, however, to try several 6J6 tubes and select one which gives satisfactory performance without realignment.

SWEEP ALIGNMENT OF PIX I-F. — Set the r-f unit bias to −3.5 volts.

Connect a 47 ohm resistor across the link circuit at T101 terminals C and D.

Remove the second picture i-f amplifier tube, V102.

With the oscilloscope connected to the r-f unit test connection and the sweep oscillator connected to the antenna terminals, set the sweep output to give 0.1 volts peak-to-peak on the oscilloscope.

Switch through the channels and select one that is essentially flat and with the two carriers at 90% response or higher. Channel 6 is usually the most desirable for this test.

Remove the 47 ohm resistor and replace V102.

Connect the oscilloscope to terminal 2 of V106 socket.

Clip 330 ohm resistors across R106, R108, R113 and R119.

Connect the bias box to the junction of R102 and R201. Adjust the box for −1 volt.

Adjust the sweep oscillator output to give 0.5 volts peak-to-peak on the oscilloscope.

Connect the signal generator loosely to the i-f amplifier.

Adjust T1 and T101 bottom core to obtain the response curve shown in Figure 11.

RCA Victor 6T53, etc. ALIGNMENT PROCEDURE (continued)

Remove the 330 ohm resistors across R106, R108, R113 and R119.

Set the i-f bias to –4.5 volts.

Adjust the sweep output to give 3 volts peak-to-peak on the oscilloscope.

Retouch T1, T101 bottom, T102 bottom, T103 bottom, T104 bottom and L103 to obtain the response curve shown in Figure 12.

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 requires 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. — With a clip lead, short circuit the coil between terminals C and D of the horizontal oscillator transformer T108. Tune in a television station and sync the picture if possible.

A.—Turn the horizontal hold control R166 to the extreme clockwise position. Adjust the T108 Frequency Adjustment (atop the chassis) so that the picture is just out of sync and the horizontal blanking appears in the picture as a vertical bar. The position of the bar is unimportant.

B.— Turn the hold control approximately one quarter of a turn from the extreme clockwise position and examine the width and linearity of the picture. If picture width or linearity is incorrect, adjust the horizontal drive control C147B, the width control R177 and the linearity control L110 until the picture is correct. If C147B, R177 or L110 were adjusted, repeat step A above.

Horizontal Locking Range Adjustment. — Turn the horizontal hold control fully counter-clockwise. The picture may remain in sync. If so, turn the T108 top core slightly and momentarily switch off channel. Repeat until the picture falls out of sync with the diagonal lines sloping down to the left. Momentarily remove the signal by switching off channel then back. 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 9 bars are present just before the picture pulls into sync, adjust the horizontal locking range trimmer C147A slightly clockwise. If less than 7 bars are present, adjust C147A 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 7 to 9 bars are present.

Horizontal Oscillator Waveform Adjustment. — Remove the shorting clip from terminals C and D of T108. Turn the horizontal hold control to the extreme clockwise position. With a thin fibre screwdriver, adjust the Oscillator Waveform Adjustment Core of T108 (under the chassis) until the horizontal blanking bar appears in the raster.

A.—Connect the low capacity probe of an oscilloscope to terminal C of T108. 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 14. Adjust the Oscillator Waveform Adjustment Core of T108 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.

Check of Horizontal Oscillator Adjustments. — Set the horizontal hold control to the full counter-clockwise position. Momentarily remove the signal by switching off channel then back. 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 2 bars are present just before the picture pulls into sync, adjust the horizontal locking range trimmer C147A slightly clockwise. If less than 2 bars are present, adjust C147A 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 bars are present.

Turn the horizontal hold control to the maximum clockwise position. The picture should be just out of sync to the extent that the horizontal blanking bar appears as a single vertical or diagonal bar in the picture. Adjust the T108 Frequency Adjustment until this condition is fulfilled.

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 120 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 KRK8 units, this resonance should fall between 120 and 135 mc. and is controlled in the design by using insulating washers of different thicknesses (in the front plate to tuner chassis mounting) to compensate for differences in the shield boxes of different models of receivers. The performance of the tuner, particularly on channels 7 and 8 will be impaired if the proper washers for the particular shield box involved 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.

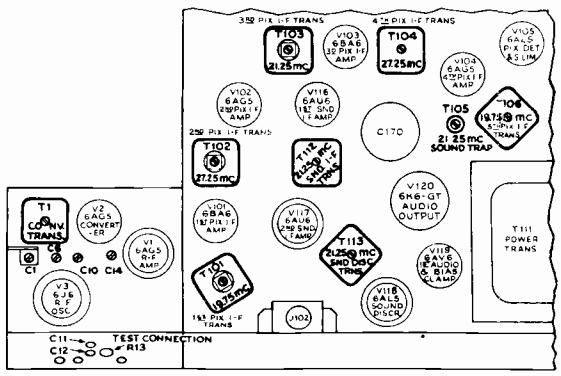
RCA VICTOR

MODELS TC124, TC125, TC127

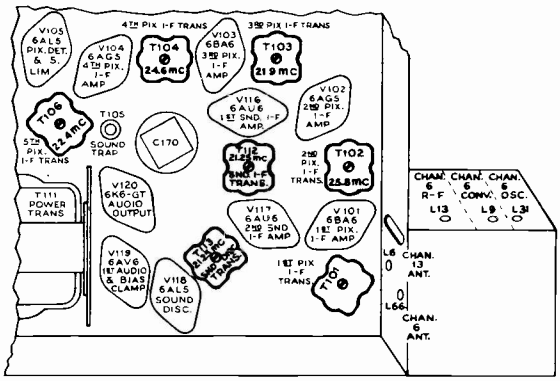
Chassis Nos. KCS 34B

The service material presented on the following six pages is exact for Chassis KCS34B used in the models listed above. Chassis KCS34C used in Models T120 and T121 differs from the chassis described in very minor detail. Chassis KCS40 and KCS40A are used in Models T164, TC165, TC166, TC167, and TC168, and a different Chassis KCS40B used in Model 6T72, are all very similar to the sets covered on these pages and this material will be of help to you in servicing these additional RCA Victor television models. Television Chassis KCS42A used in Model TA128, and TV Chassis KCS43 used in Model TA169, are combinations, but except for audio circuits, separate tuners, speakers, and switching arrangement, are similar to the television chassis described on these pages.

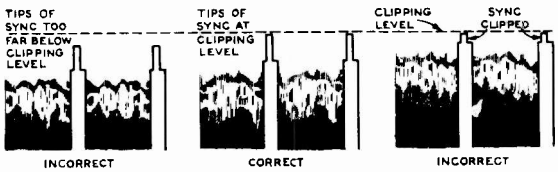
The following Models 9T256 (Chassis KCS38C, 10" table model), 9TW309 (TV Chassis KCS41, combination), and TA129 (TV Chassis KCS41A-1, combination) incorporate Electronic Magnifier deflection circuit by which the center portion of the picture may be enlarged to fill the screen. For the most parts, however, these sets are similar to the models described.



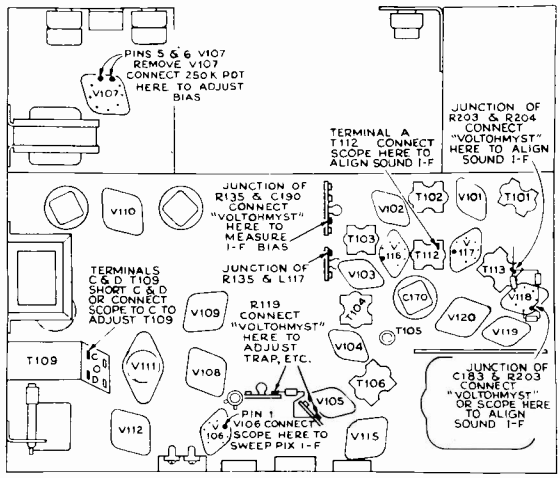
Top Chassis Adjustments



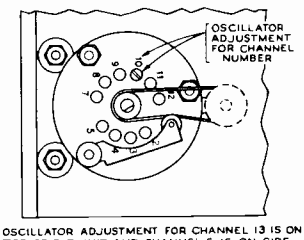
Bottom Chassis Adjustments



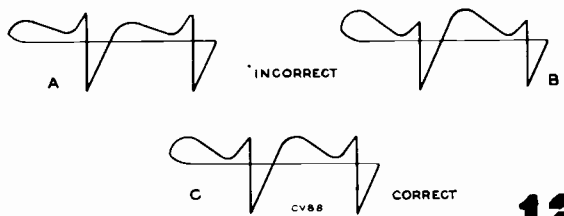
AGC Threshold Adjustment Waveforms



Test Connection Points

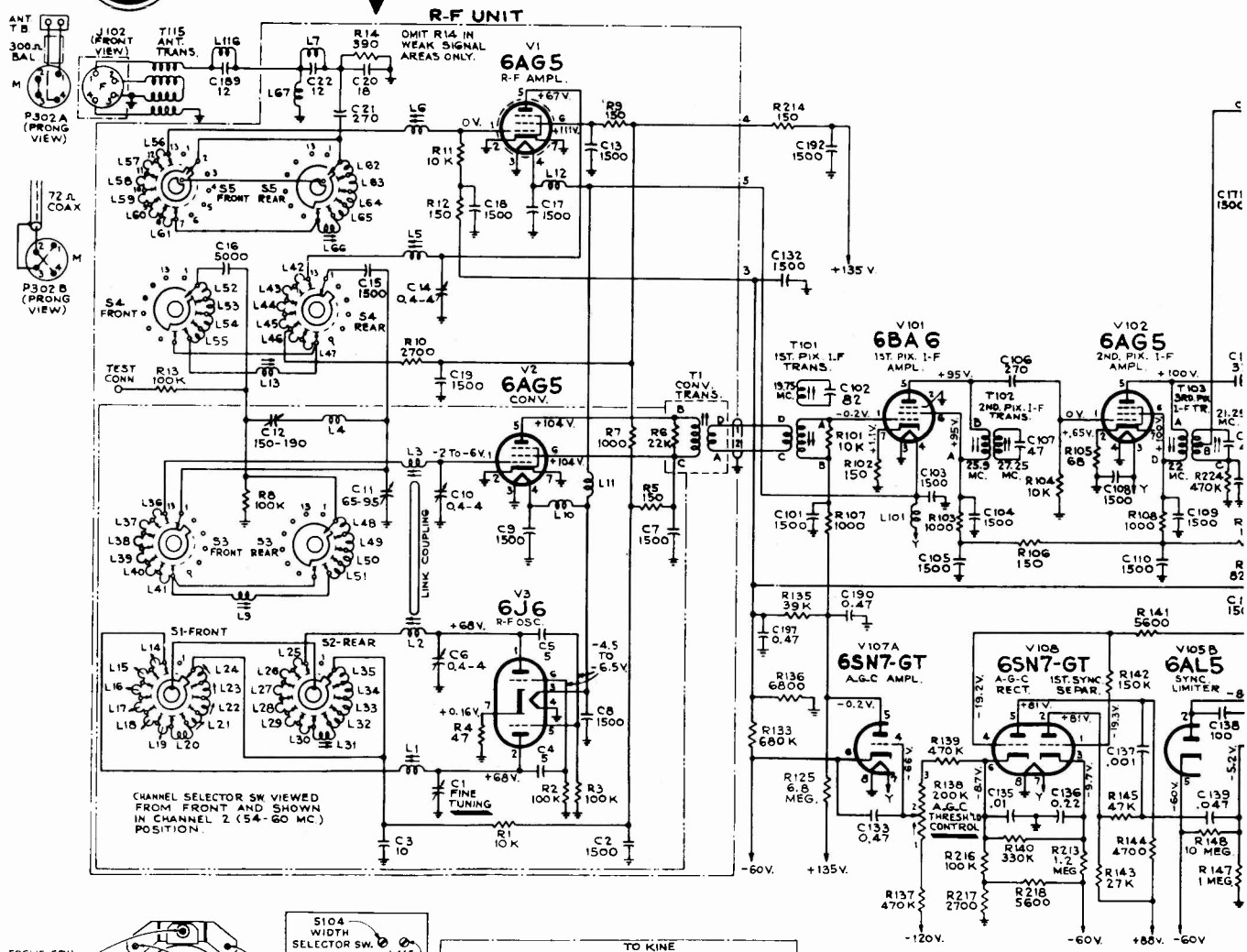


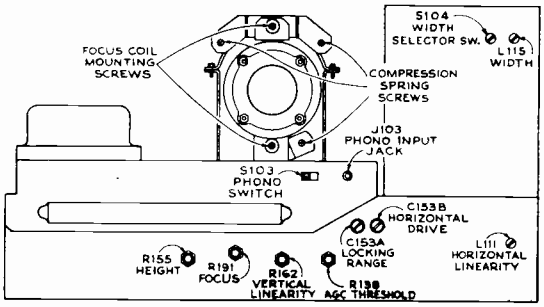
R-F Oscillator Adjustments



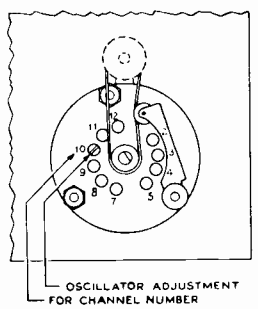
Horizontal Oscillator Waveforms

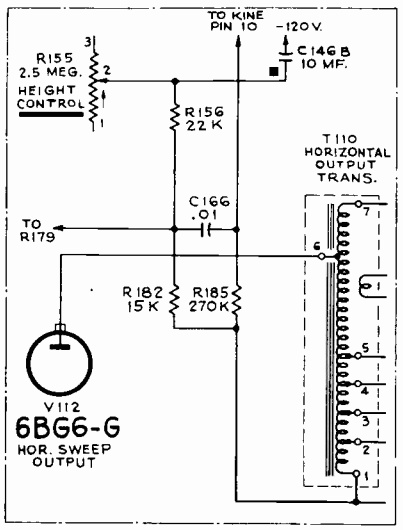
RCA VICTOR

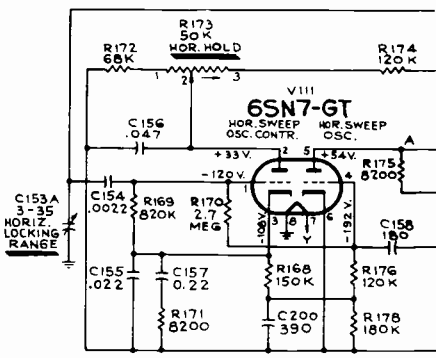




Rear Chassis Adjustments

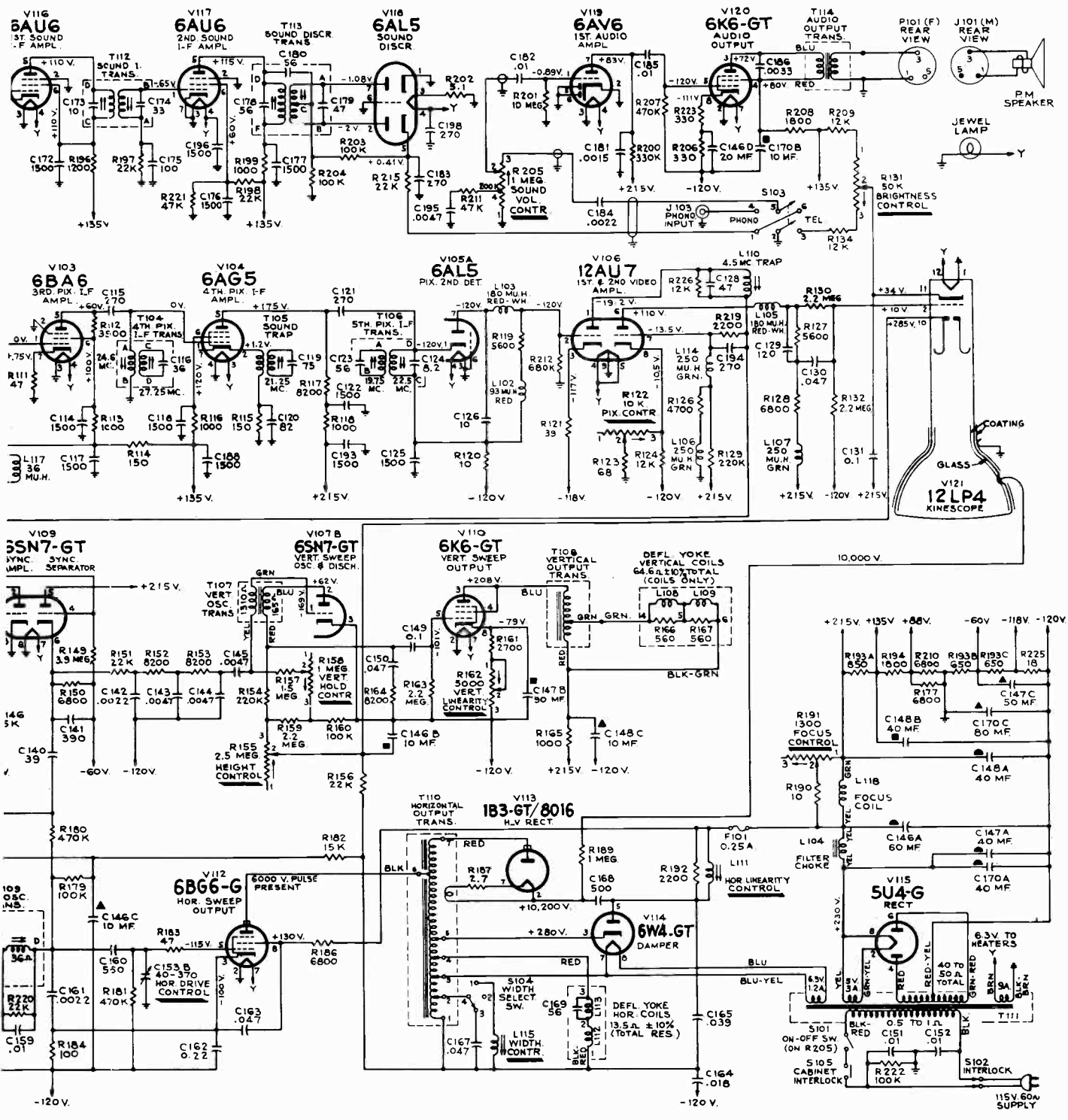






All resistance values in ohms. K = 1000.
All capacitance values less than 1 in MF and above 1 MMF unless otherwise noted.
Coil resistance values less than 1 ohm are not shown.

CIRCUIT SCHEMATIC DIAGRAM — TC124, TC125, TC127



Direction of arrows at controls indicates clockwise rotation.

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 "VoltOhmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

Some early receivers were connected as shown in the partial schematic.

The deflection circuits must be connected as shown above for powdered iron core yokes.

TC124, TC125, TC127 SERVICE SUGGESTIONS RCA Victor

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 4 of J106, the trouble can be isolated to the 8016 circuit. Either the T110 high voltage winding is open, the 8016 tube is defective, its filament circuit is open, or C168 is shorted.

(4) V111 circuit inoperative — Refer to schematic.

(5) Damper tube (V114) inoperative.

(6) Defective kinescope.

(7) R131 open.

(8) No receiver plate voltage—filter capacitor shorted—bleeder or filter choke open.

NO VERTICAL DEFLECTION:

(1) V107B or V110 inoperative. Check voltage and waveforms on grids and plates.

(2) T107 or T108 open.

(3) Vertical deflection coils open.

SMALL RASTER:

(1) Low Plus B or low line voltage.

(2) V112 defective.

(3) Defective yoke.

POOR VERTICAL LINEARITY:

(1) If adjustments cannot correct, change V110.

(2) T107 or T108 transformer defective.

(3) V107B defective — check voltage and waveforms on grid and plate.

(4) C150, R164, C146B, C147B C148-C

(5) Low bias or plate voltage — check rectifiers and capacitors in supply circuits.

POOR HORIZONTAL LINEARITY:

(1) If adjustments do not correct, change V112 or V114.

(2) T110 or L111 defective.

(3) C164 or C165 defective.

WRINKLES ON LEFT SIDE OF RASTER:

(1) C169 defective or incorrectly connected.

(2) C141 or C191 defective.

(3) Defective yoke.

PICTURE OUT OF SYNC HORIZONTALLY:

(1) T109 incorrectly tuned.

(2) R172, R173 or R174 defective.

TRAPEZOIDAL OR NON-SYMMETRICAL RASTER:

(1) Improper adjustment of focus coil 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 V116, V117, V118, V119, V120 and their socket voltages.

(3) T114 or C186 defective.

(4) Speaker defective.

SIGNAL AT KINESCOPE GRID BUT NO SYNC:

(1) AGC threshold control R138 misadjusted.

(2) V105B, V107A, V108 or V109 inoperative. Check voltage and waveforms at their grids and plates.

SIGNAL ON KINESCOPE GRID BUT NO VERTICAL SYNC:

(1) Check V107B and associated circuits—C145, T107, etc.

(2) Integrating network inoperative—Check.

(3) R154, R155, R157, R158 or R159 defective.

SIGNAL ON KINESCOPE GRID BUT NO HORIZONTAL SYNC:

(1) T109 misadjusted—readjust.

(2) V111 inoperative—check socket voltages and waveforms.

(3) T109 defective.

(4) C140, C153A, C154, C155, C157, C161 or C200 defective.

(5) If horizontal speed is completely off and cannot be adjusted check C158, C159, R172, R173, R174, R179 and R182.

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) V105A 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 threshold control R138 misadjusted.

(2) If regular sections at the left picture are displaced change V112.

TC124, TC125, TC127 — VOLTAGE CHART — RCA Victor

The following measurements represent two sets of conditions. In the first condition, a 2200 microvolt test pattern signal was fed into the receiver, the picture synced and the AGC threshold 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 "Jr. 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	6AG5	R-F Amplifier	2200 Mu. V. Signal	5	140	6	142	2 & 7	0	1	–4.2	.72	.33	
			No Signal	5	67	6	111	2 & 7	0	1	–.5	14.0	5.0	
V2	6AG5	Converter	2200 Mu. V. Signal	5	*130 to 140	6	*130 to 140	2 & 7	0	1	*–3.0 to –7.0	*7.1 to 7.7	*2.3 to 2.7	*Depending upon channel
			No Signal	5	*104 to 109	6	*104 to 109	2 & 7	0	1	*–2.0 to –6.0	*5.3 to 5.9	*.8 to 1.0	
V3	6J6	R-F Oscillator	2200 Mu. V. Signal	1 & 2	*88 to 95	—	—	7	.19	5 & 6	*–5.1 to –7.3	*1.9 to 2.7	—	*Depending upon channel
			No Signal	1 & 2	*68 to 81	—	—	7	.16	5 & 6	*–4.5 to –6.6	*1.8 to 2.1	—	
V101	6BA6	1st Pix. I-F Amplifier	2200 Mu. V. Signal	5	125	6	125	7	.4	1	–11	2.8	1.3	
			No Signal	5	95	6	95	7	1.1	1	0.0	7.5	3.5	
V102	6AG5	2d Pix. I-F Amplifier	2200 Mu. V. Signal	5	115	6	115	2 & 7	.75	1	0	8.2	2.5	
			No Signal	5	100	6	100	2 & 7	.65	1	0	6.8	2.1	
V103	6BA6	3d Pix. I-F Amplifier	2200 Mu. V. Signal	5	110	6	135	7	.25	1	–4.2	4.0	3.8	
			No Signal	5	60	6	100	7	.75	1	–.5	11.0	4.8	
V104	6AG5	4th Pix. I-F Amplifier	2200 Mu. V. Signal	5	170	6	135	2 & 7	1.35	1	0	6.5	2.0	
			No Signal	5	175	6	120	2 & 7	1.2	1	0	5.9	1.8	
V105 A	6AL5	Picture 2d Det.	2200 Mu. V. Signal	7	–113	—	—	1	–112	—	—	.48	—	
			No Signal	7	–120	—	—	1	–120	—	—	—	—	
V105 B	6AL5	Sync Limiter	2200 Mu. V. Signal	2	–107	—	—	5	–56	—	—	—	—	
			No Signal	2	–80	—	—	5	–60	—	—	—	—	
V106	12AU7	1st Video Amplifier	2200 Mu. V. Signal	1	–23.2	—	—	3	–111	2	–113	4.38	—	
			No Signal	1	–19.2	—	—	3	–117	2	–120	3.82	—	
V106	12AU7	2d Video Amplifier	2200 Mu. V. Signal	6	*166	—	—	8	*5.3	7	*–12.2	6.2	—	*At average contrast
			No Signal	6	*134	—	—	8	*–5.6	7	*10.3	6.9	—	
V107 A	6SN7 GT	AGC Amplifier	2200 Mu. V. Signal	5	–11.0	—	—	6	–55	4	–56	.9	—	
			No Signal	5	–.5	—	—	6	–60	4	–64	.3	—	
V107 B	6SN7 GT	Vertical Oscillator	2200 Mu. V. Signal	2	76	—	—	3	–111	1	–158	.2	—	
			No Signal	2	62	—	—	3	–120	1	–169	.2	—	
V108	6SN7 GT	AGC Rectifier	2200 Mu. V. Signal	5	97	—	—	6	–3.4	4	–19.3	.3	—	
			No Signal	5	81	—	—	6	–8.7	4	–19.3	.28	—	

RCA Victor

VOLTAGE CHART

TC124, TC125, TC127

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			
V108	6SN7 GT	1st Sync Separator	2200 Mu. V. Signal	2	96	—	—	3	−1.8	1	−19.5	.1	—	
			No Signal	2	81	—	—	3	−9.7	1	−19.3	.1	—	
V109	6SN7 GT	Sync Amplifier	2200 Mu. V. Signal	2	158	—	—	3	0	1	−4.7	5.25	—	
			No Signal	2	154	—	—	3	0	1	−5.2	3.75	—	
V109	6SN7 GT	Sync Separator	2200 Mu. V. Signal	5	230	—	—	6	−51	4	−106	.4	—	
			No Signal	5	215	—	—	6	−59	4	−80	.35	—	
V110	6K6-GT	Vertical Output	2200 Mu. V. Signal	3	223	4	223	8	−67	5	−91		*7.85	*Screen connected to plate
			No Signal	3	208	4	208	8	−79	5	−101		*7.7	
V111	6SN7 GT	Horizontal Osc. Control	2200 Mu. V. Signal	2	*48	—	—	3	−110	1	−92	.2	—	*Variation of hold gives −21.9 to +56 volts on plate
			No Signal	2	*33	—	—	3	−120	1	−108	.2	—	
V111	6SN7 GT	Horizontal Oscillator	2200 Mu. V. Signal	5	70	—	—	6	−111	4	−185	2.4	—	
			No Signal	5	54	—	—	6	−120	4	−192	2.4	—	
V112	6BG6G	Horizontal Output	2200 Mu. V. Signal	Cap	*	8	180	3	−90	5	−110	68	9.4	*6000 volt pulse present
			No Signal	Cap	Do Not Meas.	8	170	3	−100	5	−115	67	9.2	
V113	1B3GT /8016	H. V. Rectifier	Brightness Min.	Cap	*	—	—	2 & 7	10200	—	—	0	—	*9700 volt pulse present
			Brightness Average	Cap	Do Not Meas.	—	—	2 & 7	9700	—	—	1	—	
V114	6W4GT	Damper	2200 Mu. V. Signal	5	*	—	—	3	290	—	—	66	—	*1200 volt pulse present
			No Signal	5	Do Not Meas.	—	—	3	280	—	—	65	—	
V115	5U4G	Rectifier	2200 Mu. V. Signal	4 & 6	*335	—	—	2 & 8	250	—	—	210	—	*A-C measured from plate to trans. center tap
			No Signal	4 & 6	*335	—	—	2 & 8	245 230	—	—	215	—	
V116	6AU6	1st Sound I-F Amplifier	2200 Mu. V. Signal	5	134	6	134	7	.9	1	0	8.2	3.3	
			No Signal	5	110	6	110	7	.7	1	0	5.7	2.6	
V117	6AU6	2d Sound I-F Amplifier	2200 Mu. V. Signal	5	148	6	90	7	0	1	−9	1.6	.8	
			No Signal	5	115	6	60	7	0	1	−.65	3.35	1.15	
V118	6AL5	Sound Discrim.	2200 Mu. V. Signal	2 7	−8.4 −3.7	—	—	5 1	5.8 0	— —	— —	— —	— —	
			No Signal	2 7	−2.0 −1.08	—	—	5 1	.41 0	—	—	—	—	
V119	6AV6	1st Audio Amplifier	2200 Mu. V. Signal	7	85	—	—	2	0	1	−.89	.49	—	
			No Signal	7	83	—	—	2	0	1	−.89	.4	—	
V120	6K6-GT	Audio Output	2200 Mu. V. Signal	3	102	4	113	8	−99	5	−108	19.3	3.3	
			No Signal	3	72	4	80	8	−111	5	−120	18	3	
V121	12LP4	Kinescope	2200 Mu. V. Signal	Cap	*9700	10	339	11	51	2	20	.1	—	*Average Brightness
			No Signal	Cap	—	10	322	11	42 34	2	14	—	—	

RCA VICTOR

TELEVISION RECEIVERS
MODELS 2T51, 2T60
Chassis Nos. KCS45, or KCS45A

Combination Model 2T81 using Chassis KCS46 is similar to models described here except for the audio system.

CHASSIS REMOVAL.—To remove the chassis for repair or installation of a new kinescope, remove the cabinet back and the control knobs, unplug the speaker cable, and remove the four chassis bolts under the cabinet. Withdraw the chassis from the back of the cabinet. The kinescope is held on the chassis by means of a special strap, so that the chassis and the kinescope can be handled together, as a unit.

To remove the kinescope, remove the kinescope socket, the ion-trap magnet, and the second-anode connector. Loosen the cross-recessed head screw on the kinescope strap. Withdraw the kinescope toward the front of the chassis.

INSTALLATION OF KINESCOPE.—The kinescope second anode contact is a recessed metal well in the side of the bulb. The tube must be installed so that this contact is up but rotated approximately 30 degrees toward the high-voltage compartment.

Insert the neck of the kinescope through the deflection yoke and focus magnet. If the tube sticks, or fails to slip into place smoothly, investigate and remove the cause of the trouble. Do not force the tube.

Slide the kinescope cushion toward the rear of the chassis. Loosen the deflection yoke adjustment, slide the yoke toward the rear of the chassis and tighten.

Slip the ion trap magnet assembly over the neck of the kinescope.

Connect the kinescope socket to the tube base.

Connect the high voltage lead to the kinescope second anode socket.

Wipe the kinescope screen surface and front panel safety glass clean of all dust and finger marks.

To replace the chassis in the cabinet, first tighten the cross-recessed head screw on the kinescope strap. Slide the chassis into the cabinet, then insert and tighten the four chassis bolts. Loosen the kinescope strap from the rear of the cabinet. Push the kinescope forward until the face of the tube is against the mask. Push the yoke cushion forward against the kinescope flare, then tighten the cushion adjusting screws. Tighten the kinescope strap. Then replace the knobs, and the cabinet back.

FOCUS MAGNET ADJUSTMENT.—The focus coil 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 middle.

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 center shadow.

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 C143B 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 R178 to obtain correct picture width.

A slight readjustment of these three controls may be necessary to obtain the best linearity.

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.

FM TRAP ADJUSTMENT.—In some instances interference may be encountered from a strong FM station signal. A trap is provided to eliminate this type of interference. To adjust the trap tune in the station on which the interference is observed and adjust the L203 core on top of the r-f unit for minimum interference in the picture.

CAUTION: In some receivers, the FM trap L203 will tune down into channel 6 or even into channel 5. Needless to say, such an adjustment will cause greatly reduced sensitivity on these channels. If channels 5 or 6 are to be received, check L203 to make sure that it does not affect sensitivity on these two channels.

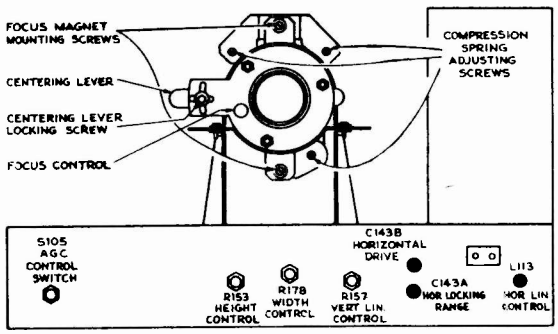


Figure 3—Rear Chassis Adjustments

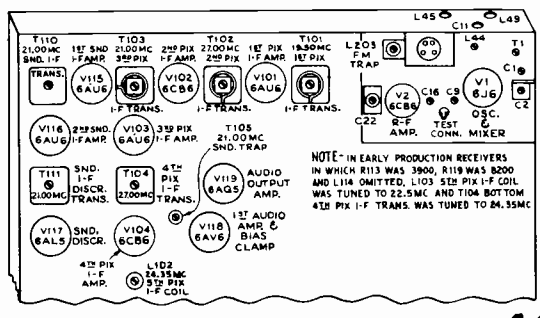
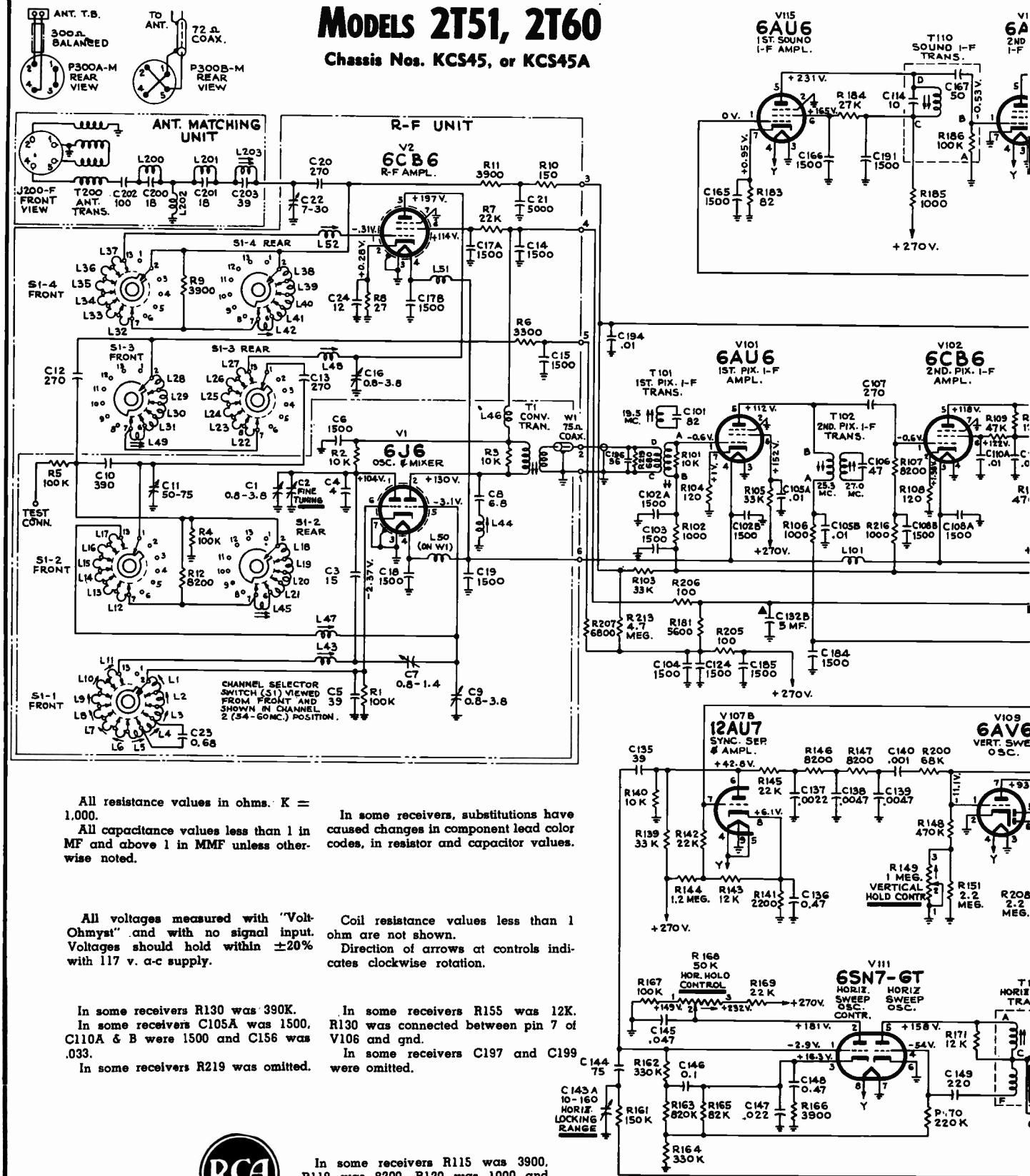


Figure 8—Top Chassis Adjustments

MODELS 2T51, 2T60

Chassis Nos. KCS45, or KCS45A



All resistance values in ohms. K = 1,000.

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.

In some receivers R130 was 390K.

In some receivers C105A was 1500, C110A & B were 1500 and C156 was .033.

In some receivers R219 was omitted.

In some receivers, substitutions have caused changes in component lead color codes, in resistor and capacitor values.

Coil resistance values less than 1 ohm are not shown.

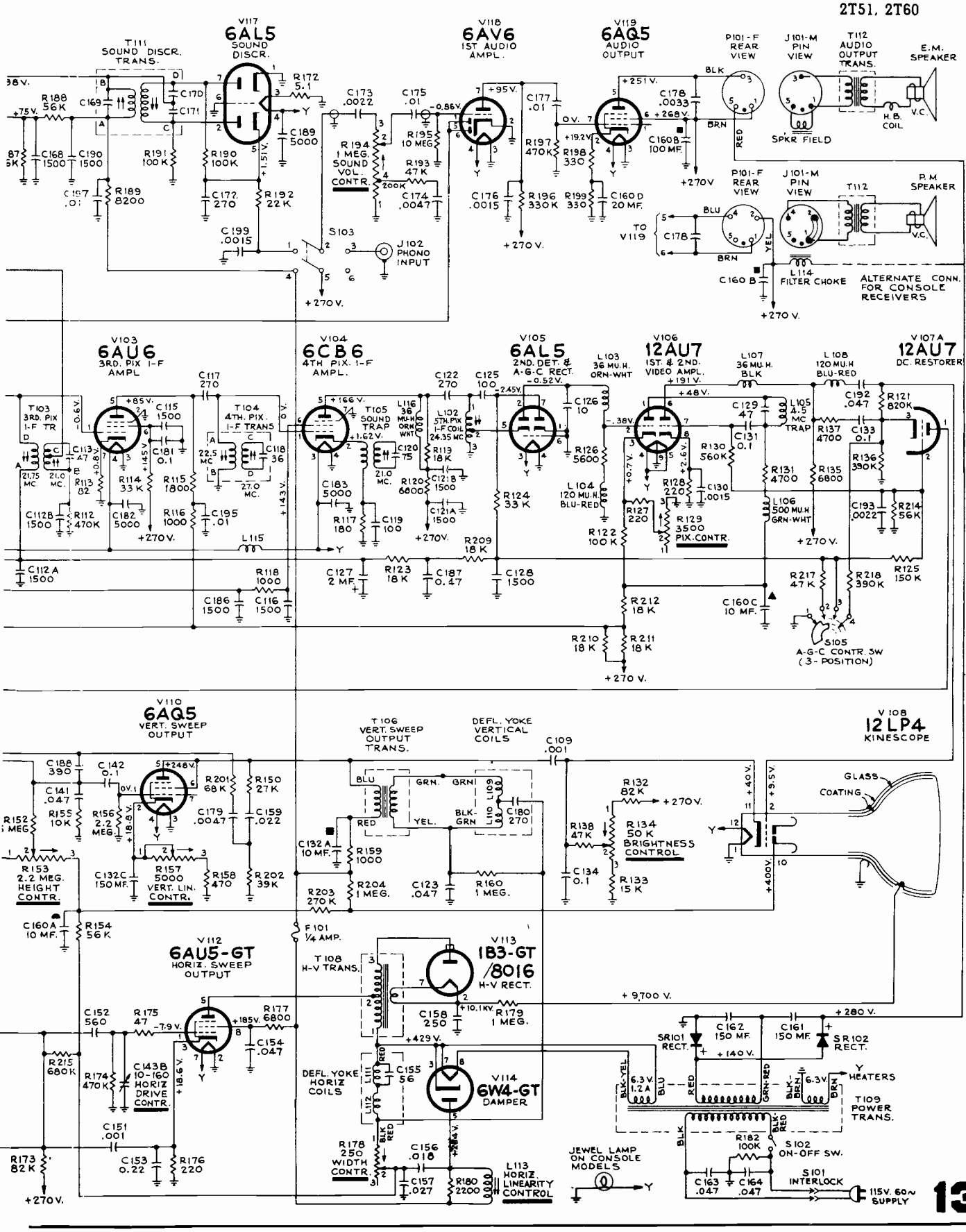
Direction of arrows at controls indicates clockwise rotation.

In some receivers R155 was 12K. R130 was connected between pin 7 of V106 and gnd.

In some receivers C197 and C199 were omitted.

In some receivers R115 was 3900, R119 was 8200, R120 was 1000 and L116 was omitted. T104 bottom was tuned to 24.35 mc. and L102 was tuned to 22.5 mc.

2T51, 2T60


V117 6AL5 SOUND DISCR.
T111 SOUND DISCR. TRANS.
V118 6AV6 1ST AUDIO AMPL.
V119 6AQ5 AUDIO OUTPUT
P101-F REAR VIEW
J101-M PIN VIEW
T112 AUDIO OUTPUT TRANS.
E.M. SPEAKER
SPKR FIELD
H.B. COIL
V.C.
P.M. SPEAKER
L114 FILTER CHOKE
ALTERNATE CONN. FOR CONSOLE RECEIVERS
V103 6AU6 3RD. PIX I-F AMPL.
V104 6CB6 4TH. PIX. I-F AMPL.
V105 6AL5 2ND. DET. & A-G-C RECT.
V106 12AU7 1ST. & 2ND. VIDEO AMPL.
V107A 12AU7 DC. RESTORER
T103 3RD. PIX I-F TR
T104 4TH. PIX. I-F TRANS
T105 SOUND TRAP
L103 36 MU.H. ORN-WHT
L104 120 MU.H. BLU-RED
L105 4.5 MC TRAP
L106 500 MU.H GRN-WHT
L107 36 MU.H. BLK
L108 120 MU.H BLU-RED
S105 A-G-C CONTR. SW (3-POSITION)
V110 6AQ5 VERT. SWEEP OUTPUT
T106 VERT. SWEEP OUTPUT TRANS.
DEFL. YOKE VERTICAL COILS
V108 12LP4 KINESCOPE
GLASS
COATING
R153 2.2 MEG. HEIGHT CONTR.
R157 5000 VERT. LIN. CONTR.
R134 50K BRIGHTNESS CONTROL
V112 6AU5-GT HORIZ. SWEEP OUTPUT
T108 H-V TRANS.
V113 1B3-GT /8016 H-V RECT.
F101 1/4 AMP.
C143B 10-160 HORIZ DRIVE CONTR.
DEFL. YOKE HORIZ COILS
V114 6W4-GT DAMPER
L113 HORIZ. LINEARITY CONTROL
R178 250 WIDTH CONTR
JEWEL LAMP ON CONSOLE MODELS
SR101 RECT.
SR102 RECT.
HEATERS
T109 POWER TRANS.
S102 ON-OFF SW.
S101 INTERLOCK
115V. 60~ SUPPLY
+270 V.
+9,700 V.
+280 V.

2T51, 2T60 — ALIGNMENT TABLE — RCA Victor

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, VII6)	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 mc. wide .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, VII5)	21.00 reduced output	1st sound i-f grid (pin 1, V115)	21.00 reduced output	"	"	Sweep output reduced to provide 1.0 volt p-to-p on scope	T110 for max. gain and symmetry at 21.25 mc.	Fig. 12 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 volt scale. Receiver 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.	"

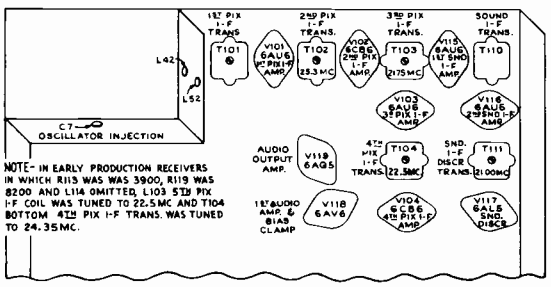


Figure 9—Bottom Chassis Adjustments

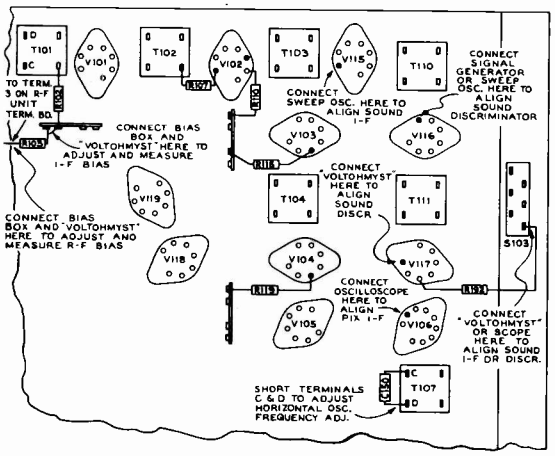


Figure 10—Test Connection Points

Figure 12 Discriminator Response

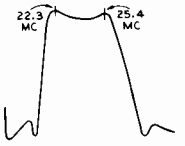


Figure 13 T1 and T101 Response

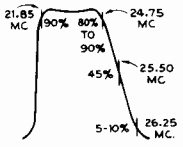


Figure 14 Overall I-F R-F Response

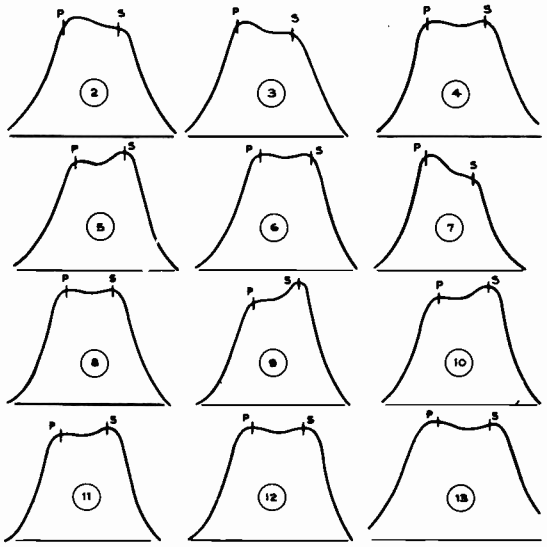


Figure 15—R-F Response

2T51, 2T60

WAVEFORM PHOTOGRAPHS

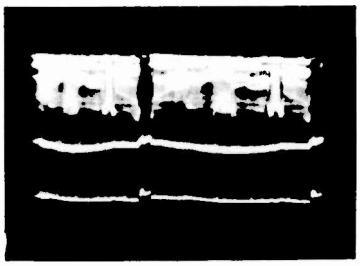
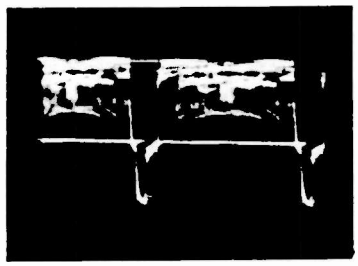
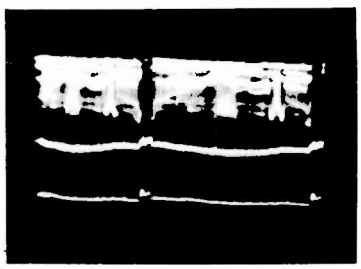


Plate of Picture Detector (Pin 2 of V105) (6AL5)

Figure 34—Vertical (Oscilloscope Synced to ½ of Vertical Sweep Rate) (5.5 Volts PP)

Figure 35—Horizontal (Oscilloscope Synced to ½ of Horizontal Sweep Rate) (5.5 Volts PP)

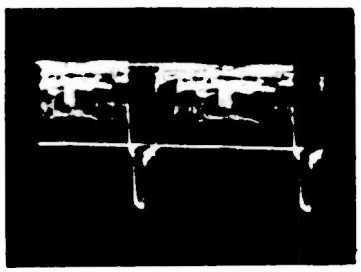




Grid of 1st Video Amplifier (Pin 2 of V106) (12AU7)

Figure 36—Vertical (5.3 Volts PP)

Figure 37—Horizontal (5.3 Volts PP)



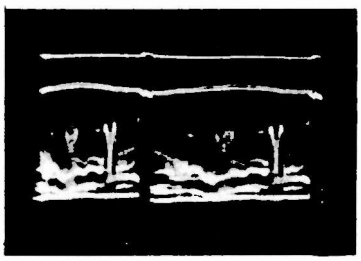
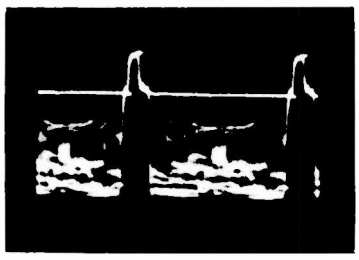


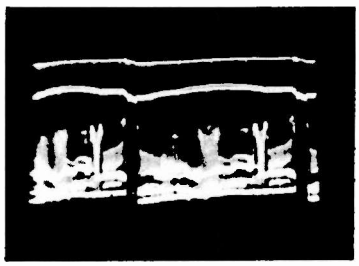
Plate of 1st Video Amplifier (Pin 1 of V106) (12AU7)

Voltages depend on setting of Pix control

Figure 38—Vertical (2-18 Volts PP)

Figure 39—Horizontal (2-18 Volts PP)



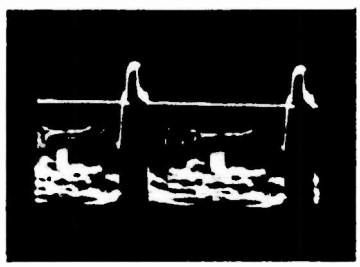


Grid of 2nd Video Amplifier (Pin 7 of V106) (12AU7)

Voltages depend on setting of Pix control

Figure 40—Vertical (2-18 Volts PP)

Figure 41—Horizontal (2-18 Volts PP)



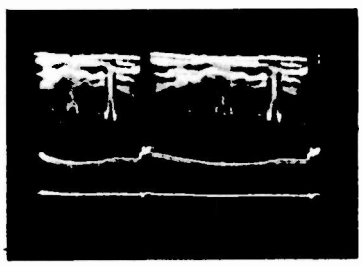
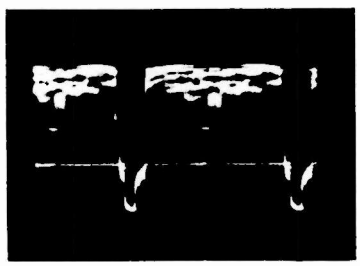


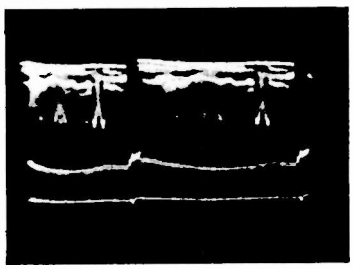
Plate of 2nd Video Amplifier (Picture Max.) (Pin 6 of V106) (12AU7)

Voltages depend on setting of Pix control

Figure 42—Vertical (15-90 Volts PP)

Figure 43—Horizontal (15-90 Volts PP)



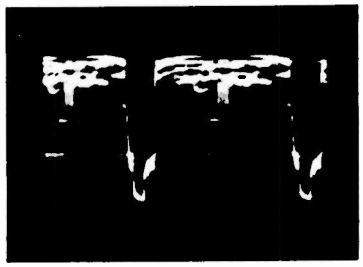


Input to Kinescope (Junction of R121 and C192) (Picture Max.)

Voltages depend on setting of Pix control

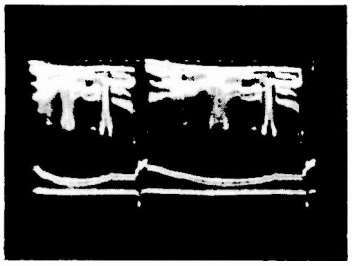
Figure 44—Vertical (15-90 Volts PP)

Figure 45—Horizontal (15-90 Volts PP)



2T51, 2T60

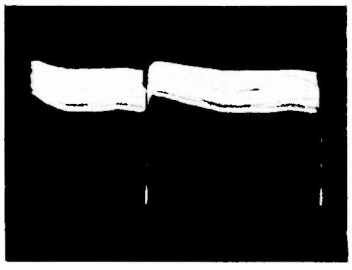
WAVEFORM PHOTOGRAPHS



Cathode of D-C Restorer (Pin 3 of V107A) (12AU7)
Voltages depend on setting of Pix control

Figure 46—Vertical (11-80 Volts PP)

Figure 47—Horizontal (11-80 Volts PP)



Grid of D-C Restorer (Pin 2 of V107A) (12AU7)
Voltages depend on setting of Pix control

Figure 48—Vertical (0.4-7.5 Volts PP)

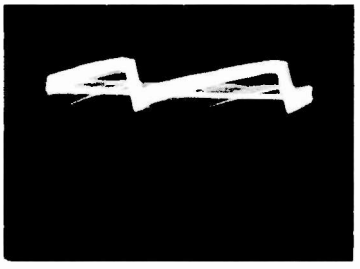
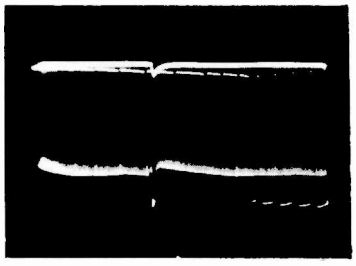


Figure 49—Horizontal (0.4-7.5 Volts PP)



Grid of Sync Separator (Pin 7 of V107B) (12AU7)
Voltages depend on setting of Pix control

Figure 50—Vertical (2.5-16 Volts PP)

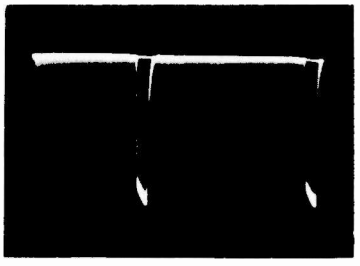


Figure 51—Horizontal (2.5-16 Volts PP)

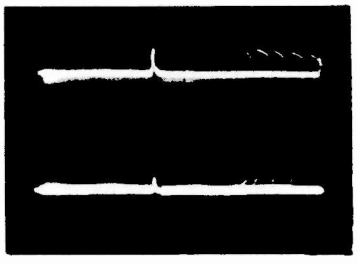


Plate of Sync Separator (Pin 6 of V107B) (12AU7)
Voltages depend on setting of Pix control

Figure 52—Vertical (18-22 Volts PP)

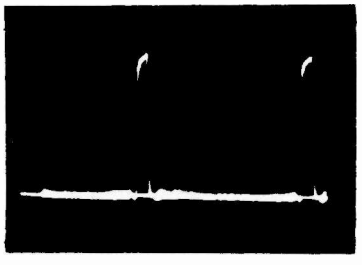


Figure 53—Horizontal (18-22 Volts PP)

Figure 58—Grid of Vertical Output (90 Volts PP) (Pin 1 of V110) (6AQ5)

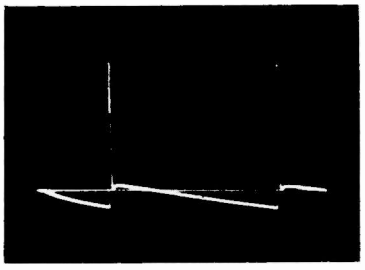


Figure 59—Plate of Vertical Output (600 Volts PP) (Pin 5 of V110) (6AQ5)

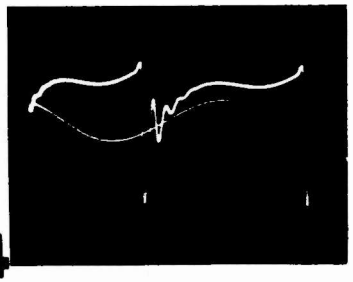


Figure 64—Junction of R163, R164 and R170 (70 Volts PP)

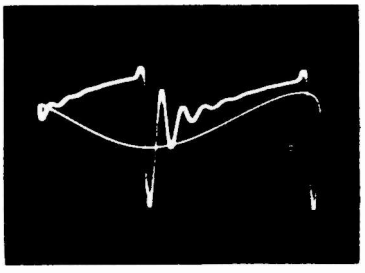


Figure 65—Grid of Horizontal Oscillator (290 Volts PP) (Pin 4 of V111) (6SN7GT)

RAYTHEON TELEVISION

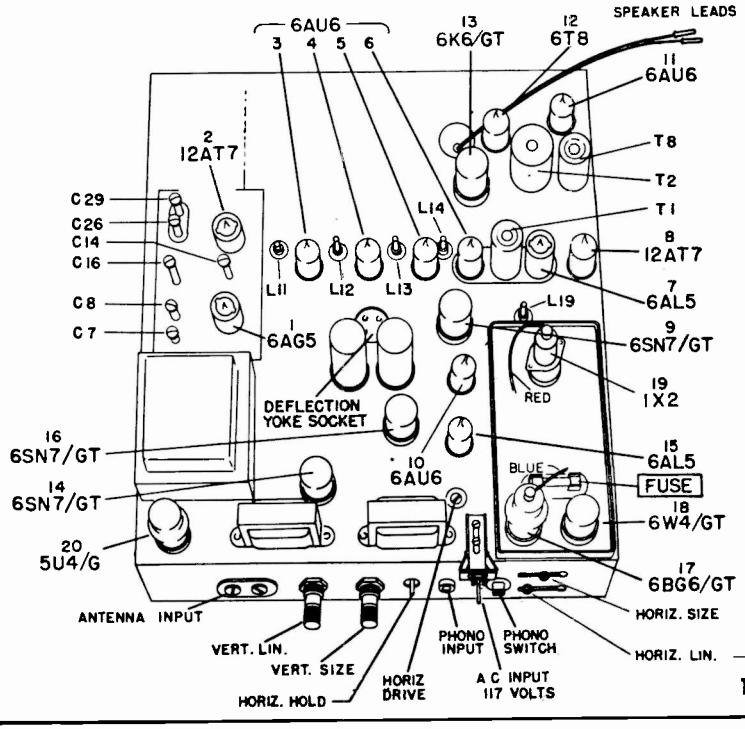
16AY211 CHASSIS	M-1611A, M-1612A, M-1613A, C-1614A C-1615A, C-1616A, RC-1618A, RC-1619A
17AY24 CHASSIS	M-1711A, M-1712A, M-1713A, C-1714A C-1715A, C-1716A, RC-1718A, RC-1719A

The 16AY211 and 17AY24 chassis are identical except for the cathode-ray tube and mounting hardware.

Eacn of these chassis is used in models listed above, to the right of the corresponding chassis. Models having the prefix "RC" designate a television, radio-phono combination receiver.

The two chassis listed below and used in models enumerated adjacent to them, are very similar to the chassis described in this manual. There are certain differences of part placement, values, and circuits, but much of the service material presented here will be of help in servicing these additional sets. If two models have an identical number except for the suffix "A" or "B", they will appear the same, but of course will use different chassis as catalogued.

16AY28 CHASSIS	M-1611B, M-1612B, M-1613B, C-1614B C-1615B, C-1616B, RC-1618B, RC-1619B
17AY21 CHASSIS	M-1711B, M-1712B, M-1713B, C-1714B C-1715B, C-1716B, RC-1718B, RC-1719B



16AY211 and 17AY24 Tube Layout

TUBE COMPLEMENT

1	6AG5, RF Amplifier
2	12AT7, Converter, Oscillator
3-4-5-6	6AU6, IF Amplifier
7	6AL5, Detector, D.C. Restorer
8	12AT7, Video Amplifier
9	6SN7, Sync Amp.-Sync Sep.
10	6AU6, AGC Amplifier
11	6AU6, Sound IF Amplifier
12	6T8, Audio Detector - Audio Amplifier
13	6K6, Audio Output
14	6SN7, Blocking Osc. Pulse Amp.
15	6AL5, AFC Discriminator
16	6SN7, Horizontal Multivibrator
17	6BG6, Pulse Amplifier
18	6W4, Damper
19	1X2, H. V. Rectifier
20	5U4, L. V. Rectifier
21	16" Rectangular Picture Tube 17" Rectangular Picture Tube

Raytheon Television Chassis 16AY211 and 17AY24, continued,

WAVE FORM ANALYSIS

The drawings in this section illustrate the wave shapes at various positions within the set. These wave shapes are not theoretical but exact copies of the oscilloscope wave shapes taken with a transmitted signal.

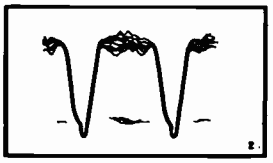
The peak-to-peak voltage indicated was measured by a calibrated oscilloscope under typical operating conditions. When analyzing a particular wave shape, the peak-to-peak voltage may vary somewhat depending upon the setting of the contrast control and the strength of the signal. The wave shapes may vary somewhat in video section depending on the picture being transmitted.

When checking these wave shapes connect the ground lead from the oscilloscope to the chassis and the hot lead to the position shown in the chart.

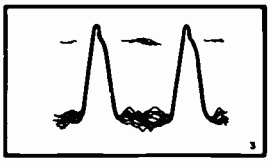
The chart below lists the test point, peak-to-peak voltage and the corresponding wave shape number. Under each drawing is the wave shape number, type of wave shape H-15,750 cycles and V-60 cycles and the position taken at.

Test Point	Schematic Reference	Taken At	Peak-to-peak Voltage	Wave Form Number
1	Pin 7 of Tube 7	Detector plate	8	1 and 2
2	Pin 7 of Tube 8	Grid of 1st Video Amp.	8	1 and 2
3	Pin 6 of Tube 8	Plate of 1st Video Amp.	42	3 and 4
4	Pin 2 of Tube 8	Grid of 2nd Video Amp.	12	3 and 5
5	Pin 1 of Tube 8	Plate of 2nd Video Amp.	32	1 and 2
6	Pin 4 of Tube 9	Grid of Sync Amp.	26	3 and 5
7	Pin 5 of Tube 9	Plate of Sync Amp.	11	6
8	Pin 1 of Tube 9	Grid of Sync Sep.	11	6
9	Pin 2 of Tube 9	Plate of Sync Sep.	40	7
10	Pin 5 of Tube 10	Plate of A.G.C. Amp.	410	20
11	Junction of R77 and C90	Vert. Intergrating Network	13	8
12	Junction of C90 and C95	Vert. Intergrating Network	27	9
13	Pin 1 of Tube 14	Grid of Bloc Osc.	40	10
14	Pin 2 of Tube 14	Plate of Bloc Osc.	76	11
15	Pin 4 of Tube 14	Grid of V. Pulse Amp.	28	12
16	Pin 5 of Tube 14	Plate of V. Pulse Amp.	650	13
17	Pin 5 of Yoke Socket	Vertical Yoke	42	13
18	Pin 1 of Tube 15	Cathode of AFC Discrim.	8	14
19	Pin 2 of Tube 15	Plate of AFC Discrim.	7	22
20	Pin 7 of Tube 15	Plate of AFC Discrim.	11	21
21	Pin 4 of Tube 16	Grid of H. Mult.	1	15
22	Pin 5 of Tube 16	Plate of H. Mult.	48	16
23	Pin 1 of Tube 16	Grid of H. Mult.	32	17
24	Pin 2 of Tube 16	Plate of H. Mult.	45	18
25	Pin 5 of Tube 17	Grid of Pulse Amp.	50	18
26	Pin 3 of Tube 18	Cathode of Damper	1500	19

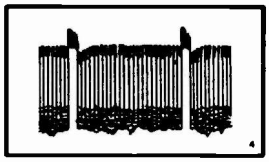
1-V—Detector plate, grid of 1st Video Amp., plate of 2nd Video Amp.



2-H—Detector plate, grid of 1st Video Amp., Plate of 2nd Video Amp.

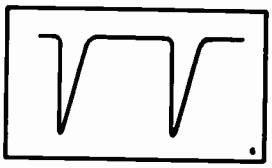


3-H—Plate of 1st Video Amp. Grid of 2nd Video Amp. Grid of Sync Amp.



4-V—Plate of 1st Video Amp.

5-V—Grid of 2nd Video Amp.

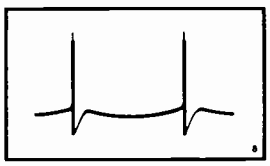


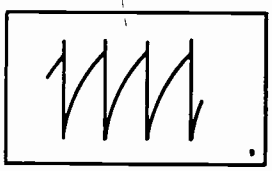
6-H—Plate of Sync Amp. Grid of Sync Sep.

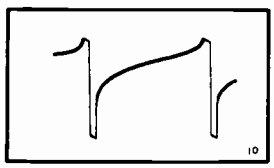
Raytheon Television Chassis 16AY211 and 17AY24, continued,

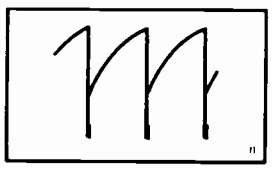
WAVE FORMS

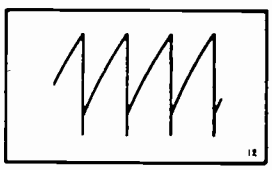

7-V—Plate of Sync Sep.

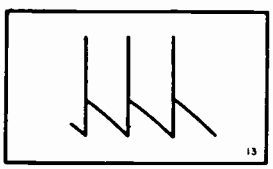

8-V—Vert. Intergrating Network

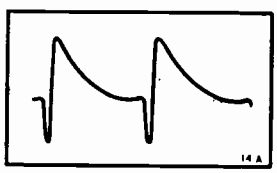

9-V—Vert. Intergrating Network

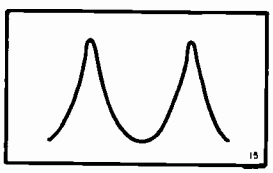

10-V—Grid of Bloc Osc.

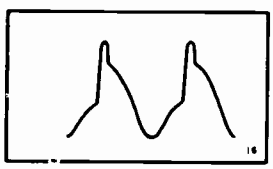

11-V—Plate of Bloc Osc.

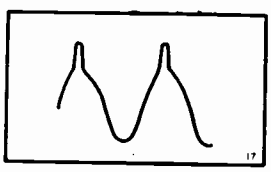

12-V—Grid of V Pulse Amp.

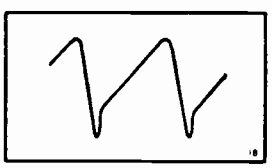

13-V—Plate of V. Pulse Amp. Vertical Yoke

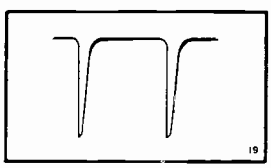

14-H—Cathode of AFC Discriminator

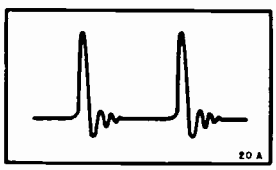

15-H—Grid of H. Mult.

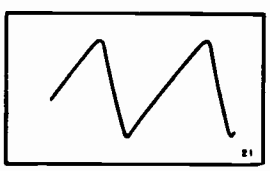

16-H—Plate of H. Mult.

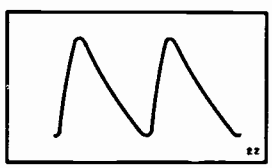

17-H—Grid of H. Mult.


18-H—Plate of H. Mult. Grid of Pulse Amp.


19-H—Cathode of Damper

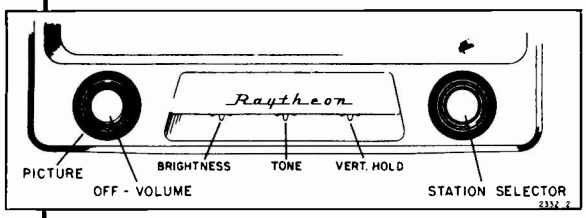

20-H—Plate of AGC Amp.


21-H—Plate of AFC Discriminator

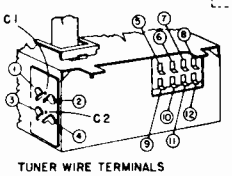

22-H—Plate of AFC Discriminator

RAYTHEON TELEVISION

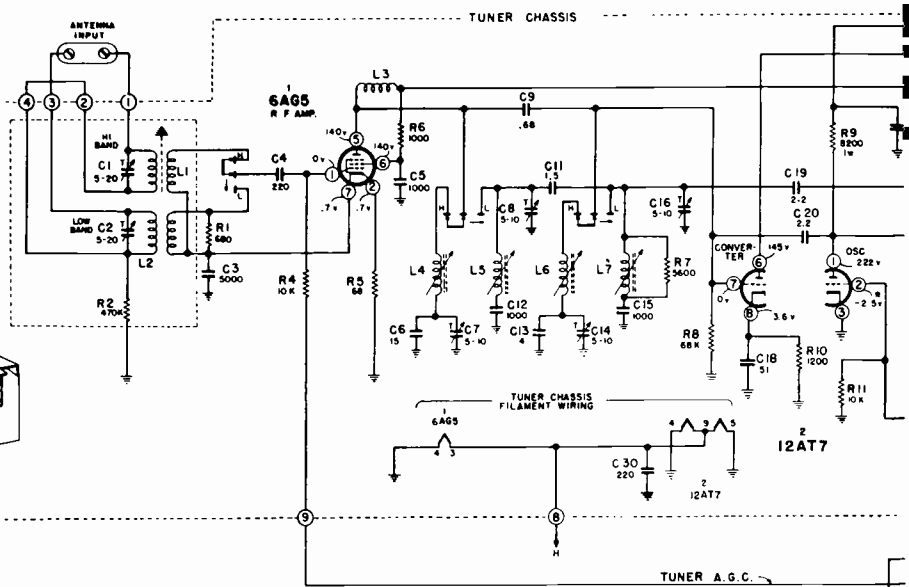
16AY211 AND 17AY24 SCHEMATIC DIAGRAM



Front Controls

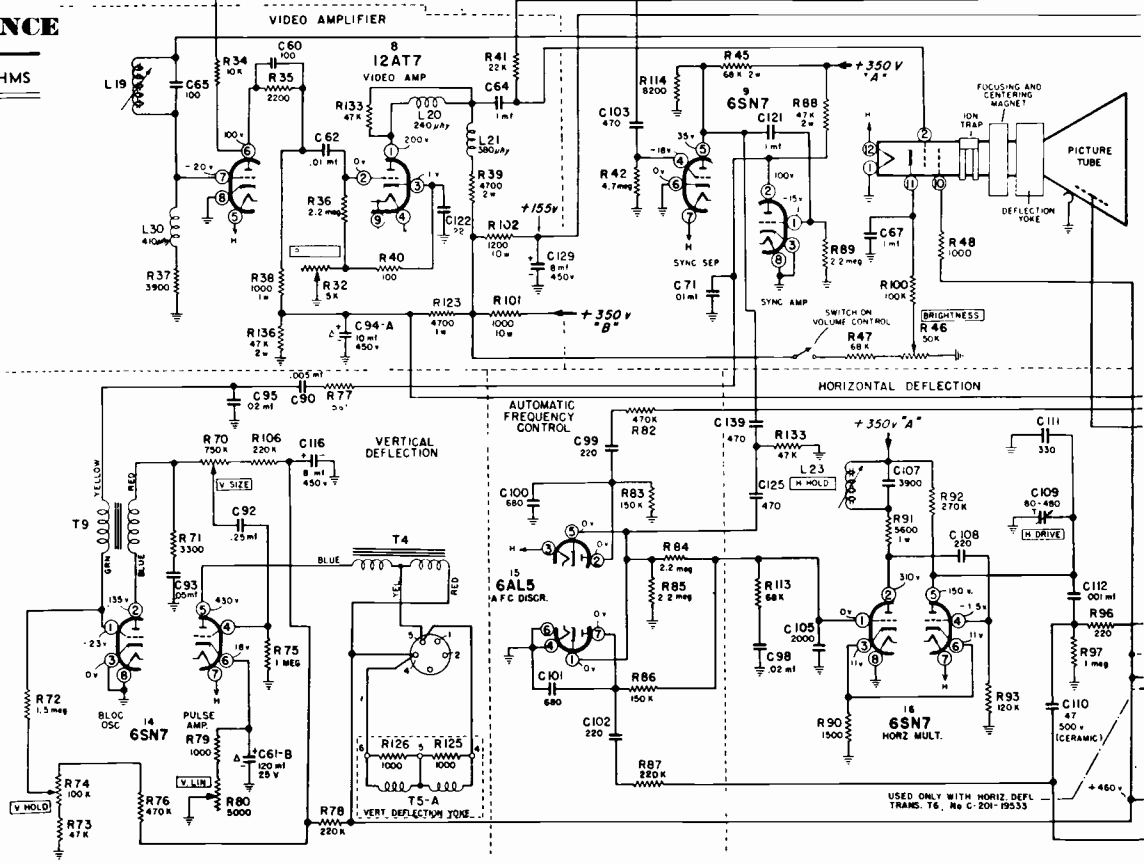


TUNER WIRE TERMINALS



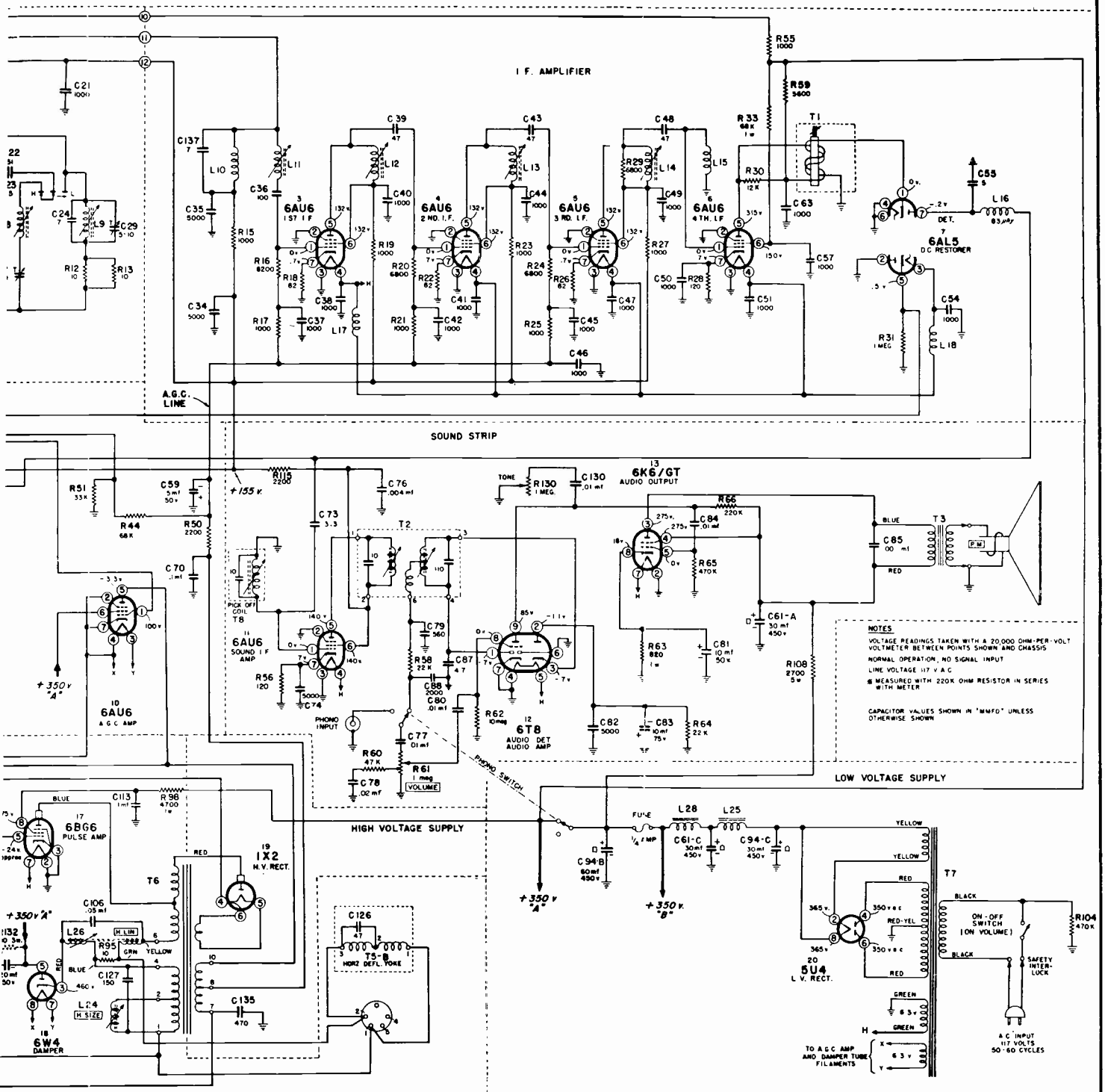
COIL DC RESISTANCE

COILS	RESISTANCE IN OHMS
L3	.8
L10	11
L11	.5
L12	.5
L13	.5
L14	.5
L15	2.5
L16	.5
L17*	.1
L18	.*1
L19	1.5
L20	8
L21	10
L26	13
L23	75
L24*	.2
L25	35
L28	35
L30	25
T1 Pri.	1
Sec.	1
T2 term 1 to 2	4.5
term 3 to 4	.1
term 3 to 6	.5
term 4 to 6	.5
T3 Pri.	500
Sec. (speaker out)	.4
T4 Pri.	750
Sec. (yoke plug out)	9
T5A (yoke plug out)	65
B (yoke plug out)	14
T6 (6BG6 to 1X2)	180
(6BG6 to term 6)	32
(term 6 to 4)	15
(term 1 to 4)	9
(term 7 to 10)	22
(term 7 to 8)	12
T7 Pri.	1
Sec.	65
T8	4
T9 Pri.	220
Sec.	1200



The DC resistance readings shown in the chart above have been taken with an ohmmeter directly across the coil being measured. Only a few of the coils were disconnected to obtain a correct reading and these are indicated by an asterisk after the coil reference number. All the coils not listed in the chart have a DC resistance reading of approximately zero ohms.

RAYTHEON TELEVISION CHASSIS 16AY211 AND 17AY24 SCHEMATIC DIAGRAM



T6 NOTE: The 16AY211 chassis may be equipped with either C-12M-19533 or C-12M-19407-2 T6 transformers. The C-201-19533 is wired as shown for 17AY24. On 16AY211, C-135 is not incorporated.

The C-12M-19407-2 is wired as shown with the following exceptions: R97 is 470,000 ohms; R132 is not used.

The following terminals of C-12M-19407-2 are wired 1 2 3 4 5 6 7

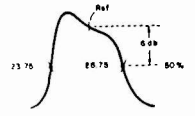
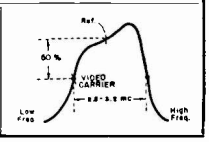
to the following schematic points numbered at T6 1 2 4 6 7 10 8

The wire connecting to Lug 5 of C-201-19533 is not used on C-12M-19407-2.

Raytheon Television Chassis 16AY211 and 17AY24, continued,

VIDEO IF ALIGNMENT

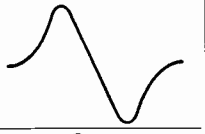
Turn to any high band channel. Connect the generator thru a 1000 mmf capacitor and set contrast to maximum.

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	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	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	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 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	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	———	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.

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-53 and C-77	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-77	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-77	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

Video Trap Coil (L-19) Adjustment

(a) Tune in a station.
(b) Adjust the tuner until sound bars just appear.
(c) Turn L-19 slug all the way out (counter-clockwise).
(d) Turn the slug in (clockwise) until the horizontal scanning lines are smooth and continuous.

Silvertone

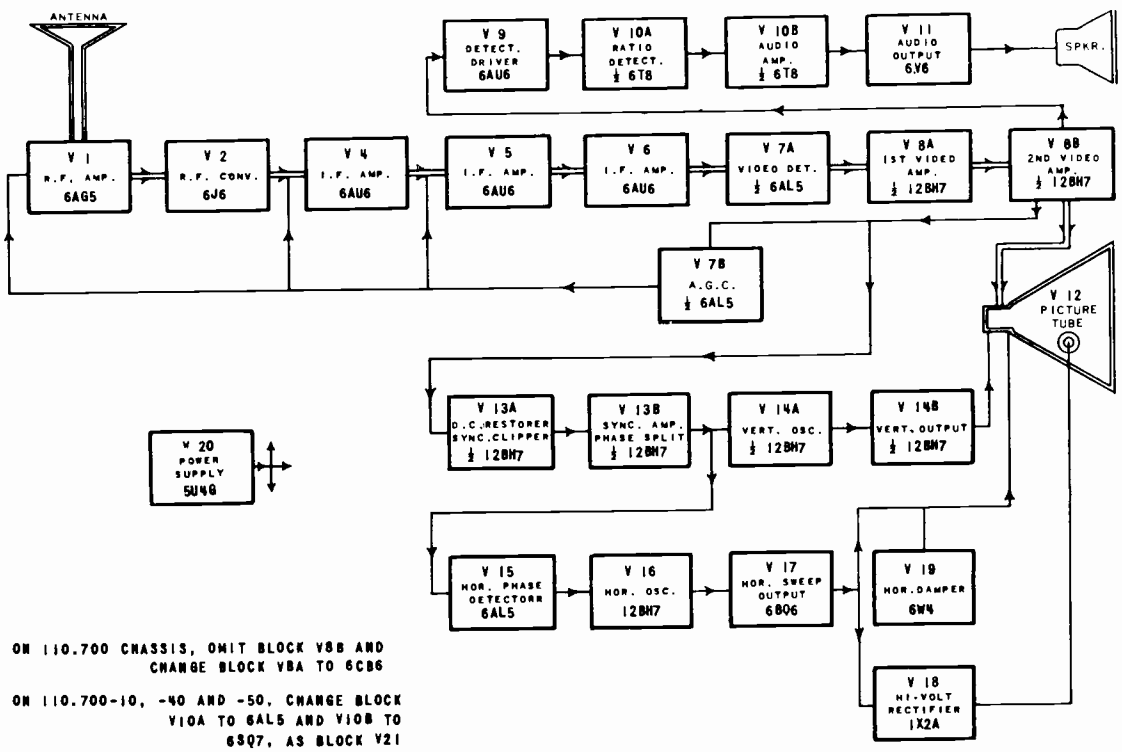
SEARS, ROEBUCK AND CO.

12½", 16" AND 19" DIRECT VIEW TELEVISION RECEIVERS, NINETEEN AND TWENTY TUBE TYPES IN TABLE, CONSOLETTE AND CONSOLE MODELS

CHASSIS NO.	DESCRIPTION
110.700	19 Tube Television Receiver chassis for 12½" round picture tube, including rectifiers.
110.700-1	19 Tube Television Receiver chassis for 16" rectangular picture tube, including rectifiers.
110.700-10	20 Tube Television Receiver chassis for 16" rectangular picture tube, including rectifiers.
110.700-2	19 Tube Television Receiver chassis for 16" rectangular tube with provision for connecting 507 AM/FM chassis and record changer, including rectifiers.
110.700-20	20 Tube Television Receiver chassis for 16" rectangular tube with provision for connecting 507 AM/FM chassis and record changer, including rectifiers.
110.700-40	20 Tube Television Receiver chassis for 19" round tube, including rectifiers.
110.700-50	20 Tube Television Receiver chassis for 16" rectangular tube with provision for connecting 703 AM/FM chassis and record changer, including rectifiers.

The chassis listed above were sold in various style cabinets under the following catalog numbers: 111, 113, 127-12, 116, 131, 134, 139, 140, 162-16, 173-16, 189-16, 191-16, 177-19. All these models have substantially the same circuit. In the 110.700 chassis there is only one pentode stage of video amplification, while all other models use two triode stages. The actual circuit diagram on pages 144 and 145, is for Chassis 110.700-10 and 110.700-40. Other chassis may have minor differences, connections for radio and phonograph, or may use a single 6T8 tube for sound detector and 1st audio (instead of 6AL5 and 6SQ7).

T.V. BLOCK DIAGRAM



ON 110.700 CHASSIS, OMIT BLOCK V8B AND CHANGE BLOCK V8A TO 6CB6

ON 110.700-10, -40 AND -50, CHANGE BLOCK V10A TO 6AL5 AND V10B TO 6SQ7, AS BLOCK V21

RATIO DETECTOR DRIVER AND RATIO DETECTOR ALIGNMENT

In aligning this section of the television receiver, the sound trap must be resonated at 4.5 mc. to separate the sound from the picture information, and the ratio detector transformer must be adjusted to complete balance in the secondary winding for maximum AM rejection. The sound trap is T1, located between the video amplifier (V8B) and the detector driver (V9). The discriminator transformer is T2, located between the detector driver (V9) and the ratio detector (V10A). A 4.5 mc. signal is fed into the final video amplifier, and the sound trap and ratio detector are adjusted in proper sequence to obtain VTVM readings across the detector plate load resistor R23, as specified in the step-by-step procedure below;

1 — Connect the VTVM across R23, with the positive lead from the meter to the chassis and the negative lead to the other side of R23. On those chassis utilizing a 6T8 tube as the detector V10, this latter connection will be at pin 2 of the 6T8. On those chassis utilizing a 6AL5 as the detector, this connection will be at pin 7 of the 6AL5.

2 — Connect the signal generator output through a .001 mfd mica capacitor to the junction of L5 and L6 in the mput to the first video amplifier, V8A. Ground the other side of the generator to the chassis.

3 — Set the signal generator to 4.5 mc. and adjust its output to provide about 10 volts reading on the VTVM.

4 — Adjust sound trap T1 for maximum reading on the VTVM. Two types of sound traps were used in the production of the models covered herein, i.e., a single-ended coil, and a double-ended coil. The single-ended coil is adjusted from the top, and the double-ended coil, from the bottom, since the top half of this coil is not used. Both of these coils can be peaked at two points, and the peak point selected should be the one closest to the full counter-clockwise position of the slug. This setting minimizes the possibility of intercarrier buzz.

5 — Adjust the top slug on the discriminator transformer T2 for maximum reading on the VTVM.

6 — Connect two 100k resistors across R23

7 — Reconnect the VTVM, running one lead to the junction point of these two 100k resistors, and the other lead to the tertiary winding lug (pin 6) of the discriminator transformer T2.
Adjust VTVM for zero center at 5 volts.

8 — Adjust bottom slug on T2. Note that during this adjustment, a point will be found where the VTVM will swing rather sharply from positive to negative, or vice versa. The correct setting of this adjustment is obtained when the VTVM pointer reads zero, setting as per (7) above, as the slug is passed through this point.

9 — Repeat steps 4, 5, 6, 7, and 8. This completes the ratio detector alignment.

I.F. ALIGNMENT:

The I.F. alignment of the models covered in this manual is based on peaking one set of I.F. coils at 23.0 mc. and the other set of I.F. coils at 25.4 mc. A signal generator feeds these frequencies to the I.F. strip, and a VTVM connected across the video detector load resistor R16 in proper polarity, serves as a measuring device for this peaking operation. The pair of 23.0 mc. coils are L401 on the tuner sub-chassis, and L2, located between the second and third I.F. stages. The 25.4 mc. coils are L1, located between the first and second I.F. stages, and L4, located between the third I.F. and the video detector. A recommended step-by-step procedure is given below;

1 — Set front panel "CONTRAST" control 1/4 turn clockwise.

2 — Connect the VTVM in proper polarity across the video detector (V7A) load resistor R16. One connection should be to the chassis, and the other to the junction of shunt peaking coil L6 and R16. See Figure 9B.

3 — Connect the signal generator through a .001 mfd capacitor to the test loop located between the two tubes on top of the tuner sub-chassis. See Figure 9A.

4 — Inject minus 3 volt bias to A.G.C. terminal on tuner, Figure 13C.

5 — Set the signal generator to 23.0 mc. and adjust its output so that the VTVM shows a reading of 2.5 volts maximum.

6 — Adjust L2 and L401 for maximum reading on the VTVM.

7 — Reset the signal generator to 25.4 mc. and adjust its output so that the VTVM shows a reading of 2.5 volts maximum.

8 — Adjust L1 and L4 for maximum VTVM reading.

9 — Repeat steps 4, 5, 6 and 7 in sequence to achieve further peak readings on the VTVM. If the VTVM pointer goes off scale, lower the signal generator output accordingly.

TEST INSTRUMENT CONNECTIONS FOR I.F. ALIGNMENT

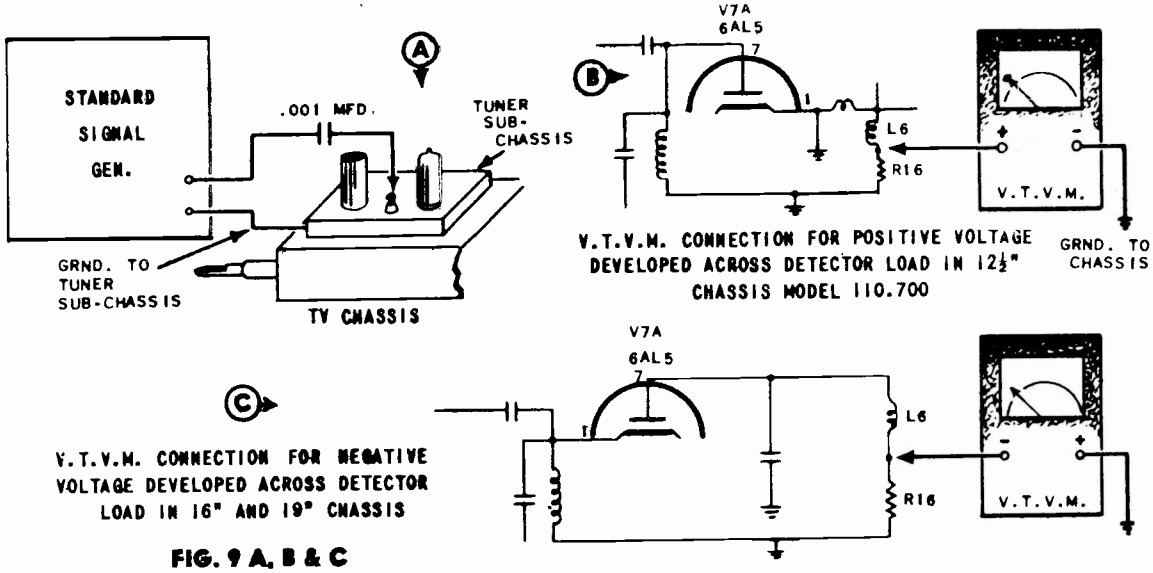
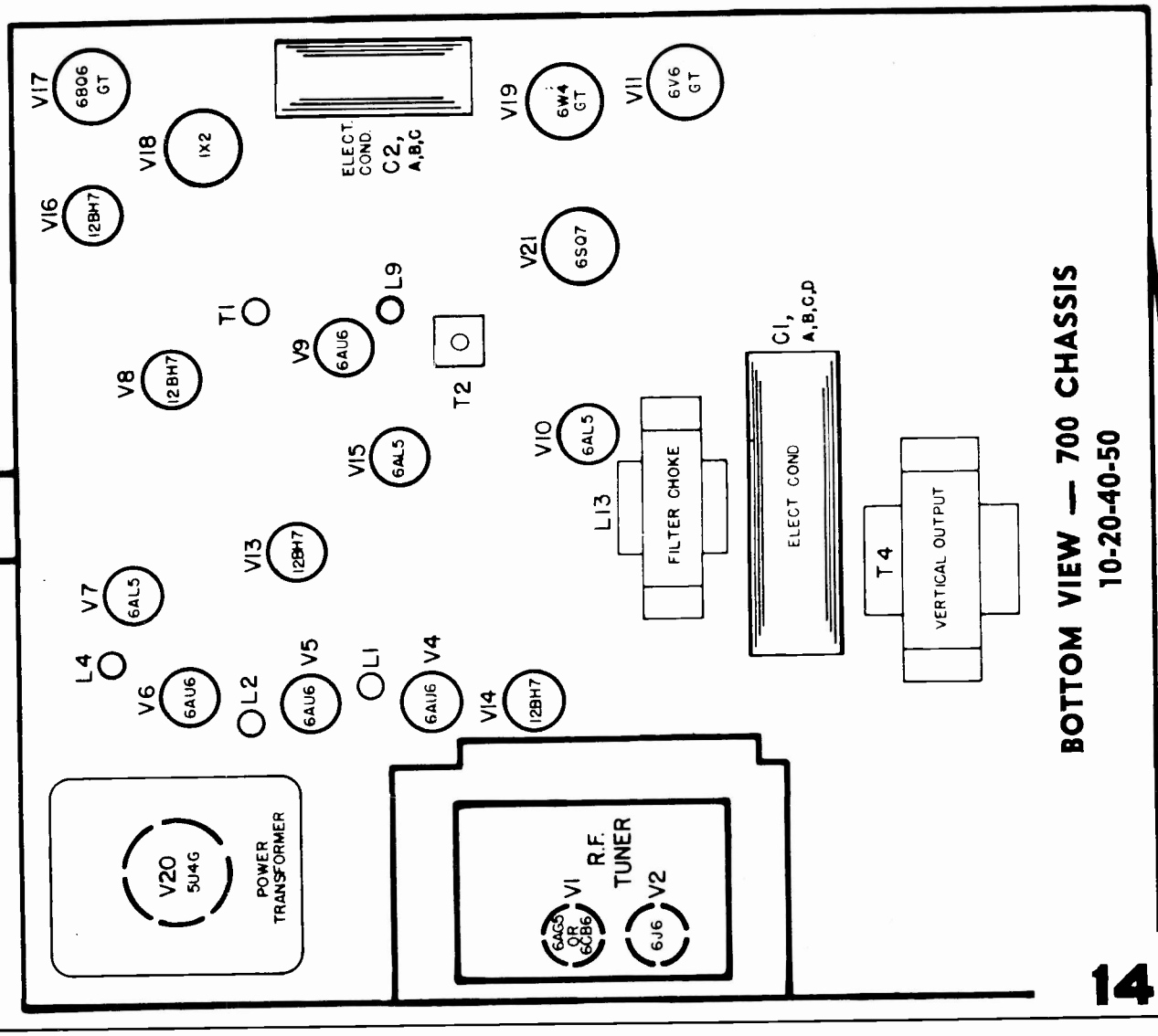
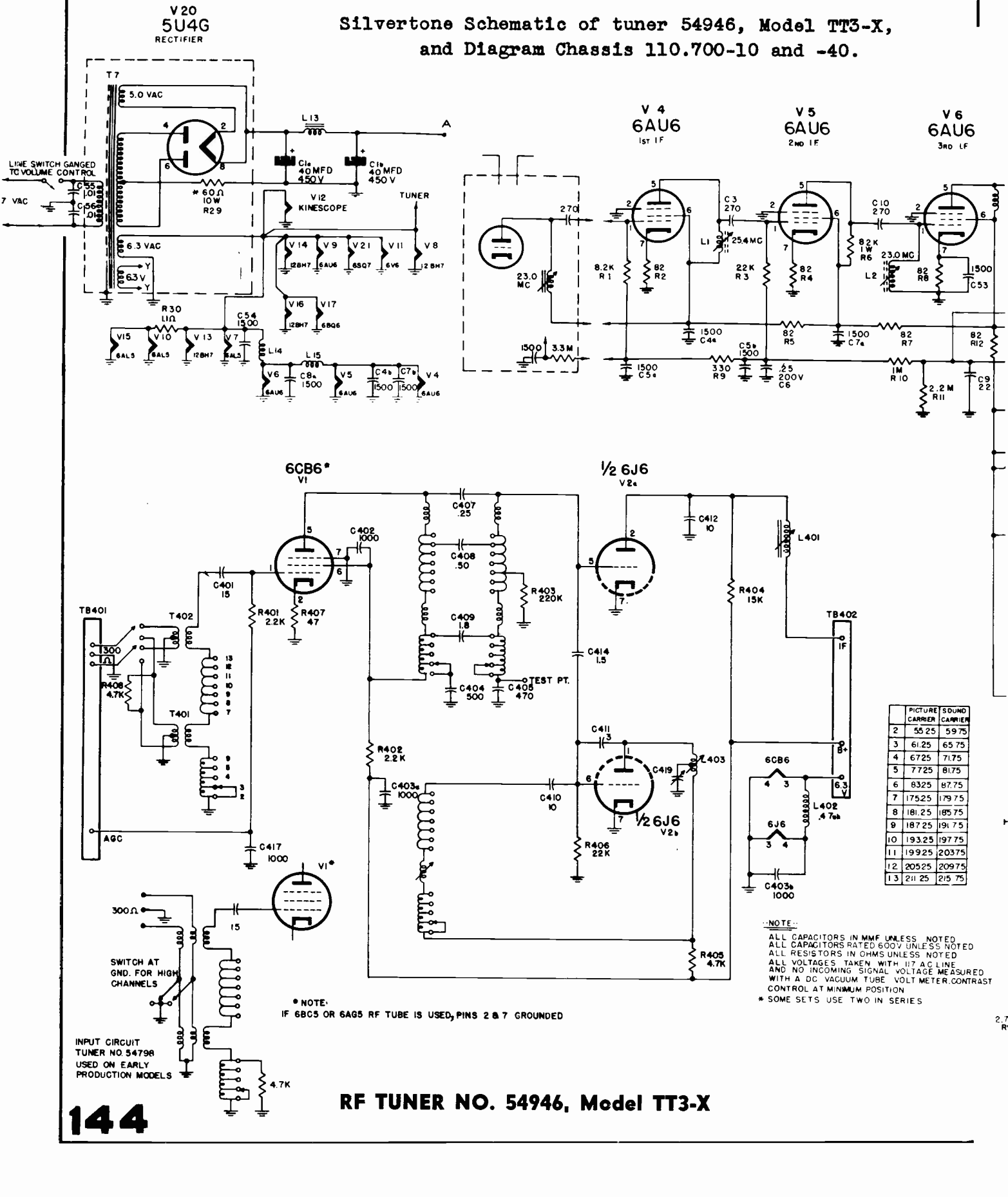


FIG. 9 A, B & C



Silvertone Schematic of tuner 54946, Model TT3-X, and Diagram Chassis 110.700-10 and -40.



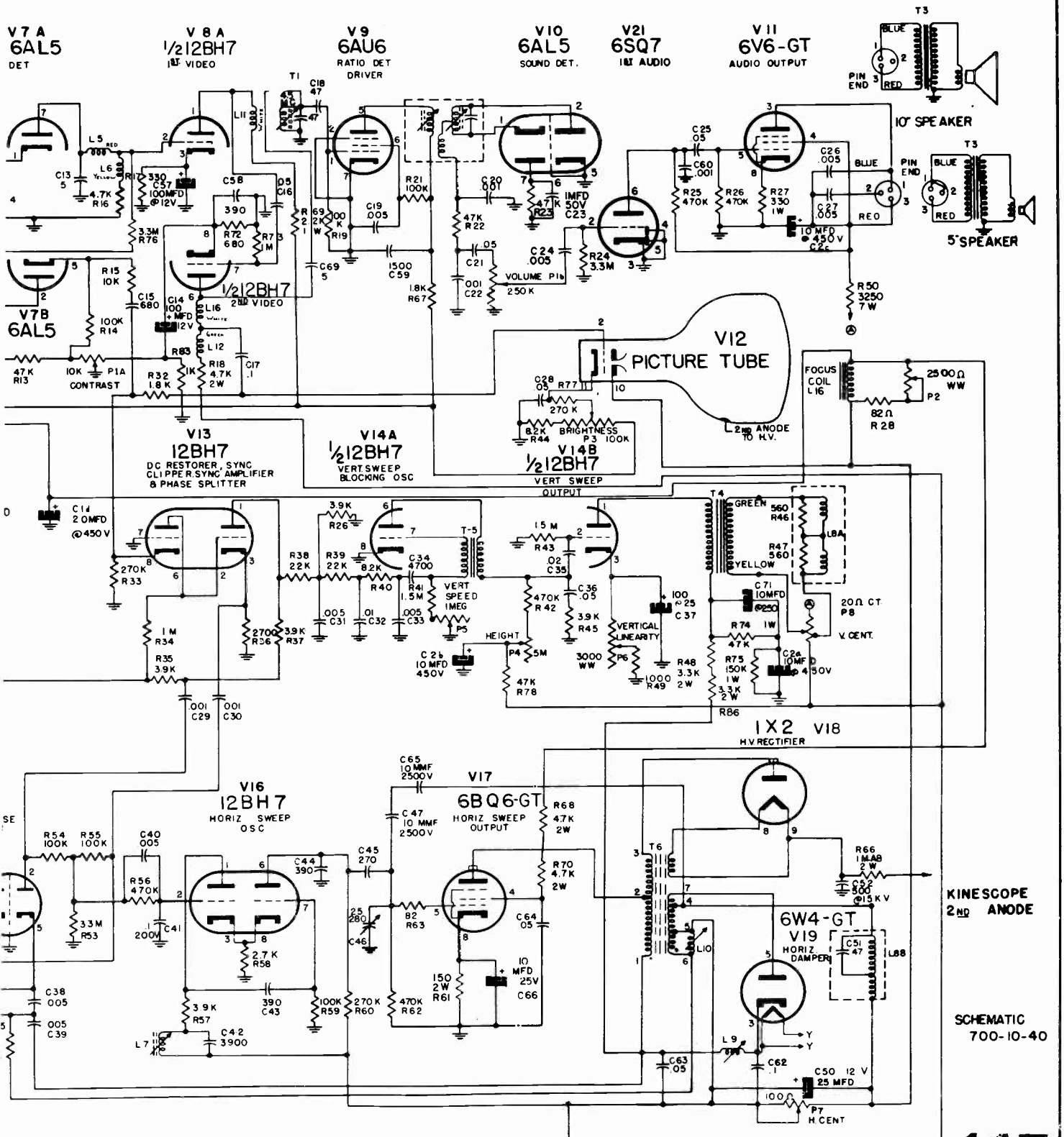
	PICTURE CARRIER	SOUND CARRIER
2	55.25	59.75
3	61.25	65.75
4	67.25	71.75
5	77.25	81.75
6	83.25	87.75
7	175.25	179.75
8	181.25	185.75
9	187.25	191.75
10	193.25	197.75
11	199.25	203.75
12	205.25	209.75
13	211.25	215.75

NOTE:
ALL CAPACITORS IN MMF UNLESS 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
* SOME SETS USE TWO IN SERIES

* NOTE:
IF 6BC5 OR 6AG5 RF TUBE IS USED, PINS 2 & 7 GROUNDED

RF TUNER NO. 54946, Model TT3-X

Sears, Roebuck and Co. Schematic Chassis 110.700-10 and 110-700-40.



Sears, Roebuck and Co. Chassis 110.700 continued.

TUBE SOCKET VOLTAGES AS INDICATED ON V.T.V.M.

Tube Location	Tube Type	PIN NUMBERS								
		1	2	3	4	5	6	7	8	9
*V1	6CB6	—0.7	0.4	5.4	0	95	100	0	—	—
V1	6AG5	—0.7	0	5.4	0	95	100	0	—	—
V2	6J6	80	75	0	5	—2.4	—4.4	0	—	—
V4	6AU6	0 TO ▲ —1.5	0	5	0	120	121	0.2	—	—
V5	6AU6	0 TO ▲ —1.5	0	5	0	120	121	0.2	—	—
V6	6AU6	0 TO ▲ —1.5	0	5.2	0	120	121	0.2	—	—
V7	6AL5	0	—1.0 TO ▲ —4.0	0	5.4	0 TO ▲ 22.0	0	—1.0 TO ▲ —4.0	—	—
V8	12BH7	110	0.2 TO ▲ 0.3	2.3	5.4	0	250	5.8	13	0
**V8	6CB6	—0.2	7	0	5.4	110	120	7	—	—
V9	6AU6	0.2 TO ▲ —0.2	0	0	5.4	220	210	0	—	—
V10	6T8	—4.0 TO ▲ —9.0	—10 TO ▲ —20	—3.5 TO ▲ —8.0	0	4.4	0	0	—10	60 TO ▲ 70
***V10A	6AL5	—10 TO ▲ —20	—10 TO ▲ —20	4	0	0	0	—10 TO ▲ —40	—	—
***V10B	6SQ7	0	—1	0	0	0	50	0	5.4	—
V11	6V6	0	5.4	220	220	0	0	0	10	—
V13	12BH7	90	20	24	0	0	24	0	10 TO ▲ 50	5.2
V14	12BH7	400	—0.4 TO ▲ +0.4	16 TO ▲ 29	5.2	5.2	95	—21	0	0
V15	6AL5	+15	—15	4.4	0	—0.2	0	—0.2	—	—
V16	12BH7	150	3.5	15	5	5	100	—6.0	15	0
V17	6BQ6	0	0	0	150	—8 TO ▲ —25	11.5	5.5	12	—
V19	6W4	—	—	450	—	275	—	—1	—	—

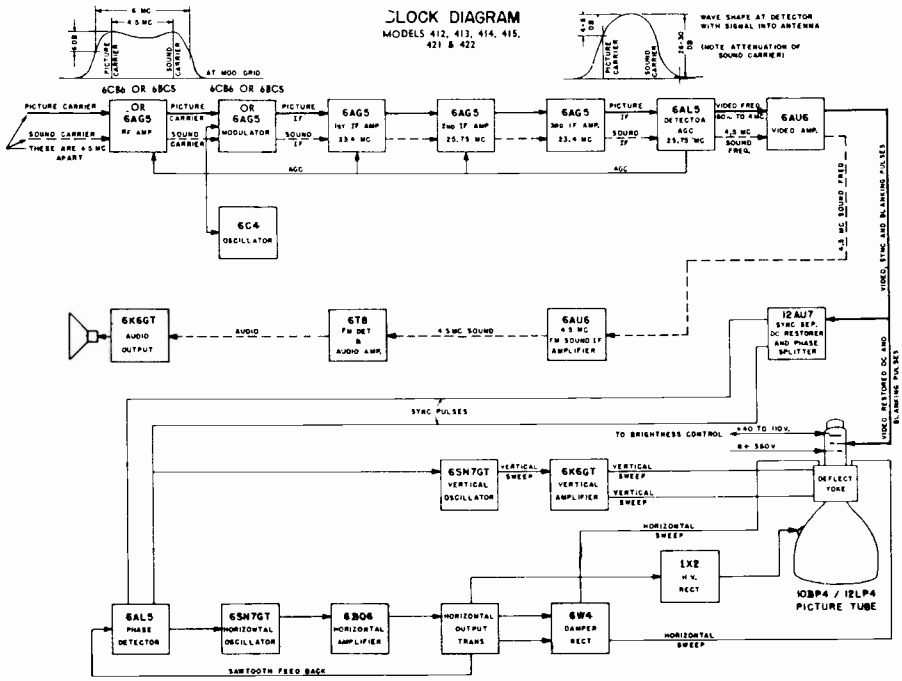
NOTES: ▲ NORMAL VOLTAGE RANGE INDICATED — VALUE DEPENDS UPON SETTING OF CONTROLS.
* 6CB6 USED AS R.F. AMPLIFIER INSTEAD OF 6AG5 ON SOME SETS.
** 6CB6 USED AS FIRST VIDEO AMPLIFIER ON 12½" CHASSIS 110.700 ONLY.
*** 6AL5 AND 6SQ7 SUBSTITUTED FOR 6T8 ON SOME 16" CHASSIS AND ALL 19" CHASSIS.

Sentinel Television

MODELS 412, 413, 414, 415, 1U412, 1U413, 1U414 & 1U415
MODELS 421, 422, 1U421 & 1U422

Many other Sentinel television models using 16" and 19" picture tubes are similar in circuit to the models covered on these pages. If you are called to service any of the models listed below, you will find this material of help.

Similar Sentinel Television Models: 416, 420, 420B, 423, 424, 1U416, 1U420, 1U420B, 1U423, and 1U424.



(NOTES—Continued from page **149**)

R-114 a 1,500 Ohm resistor added in series with the output side of the focus coil L-17 in "SERIES YE".

Focus Control R-101 rewired across Focus Coil L-17 and resistor R-114 starting with "SERIES YE".

R-102 was 2,000 Ohms in "SERIES YA thru YD". CHANGED to 1,000 Ohms with a 10,000 Ohm 10 Watt bleeder resistor connected across the 250 Volt line in "SERIES YE" chassis. The 10,000 Ohm bleeder resistor not used starting with "SERIES YF".

Focus Coil L-17 was 1,300 Ohms, part number 2E93, in "SERIES YA thru YE". CHANGED to 3,000 Ohms, part number 2E104 starting with "SERIES YF".

R-114 was 1,500 Ohms in "SERIES YE" only. CHANGED to 3,000 Ohms starting with "SERIES YF".

C-55 not used starting with "SERIES YG".

R-56 not used starting with "SERIES YG".

R-55 and R-59 were 100,000 Ohms in "SERIES YA thru YF". CHANGED to 470,000 Ohms starting with "SERIES YG".

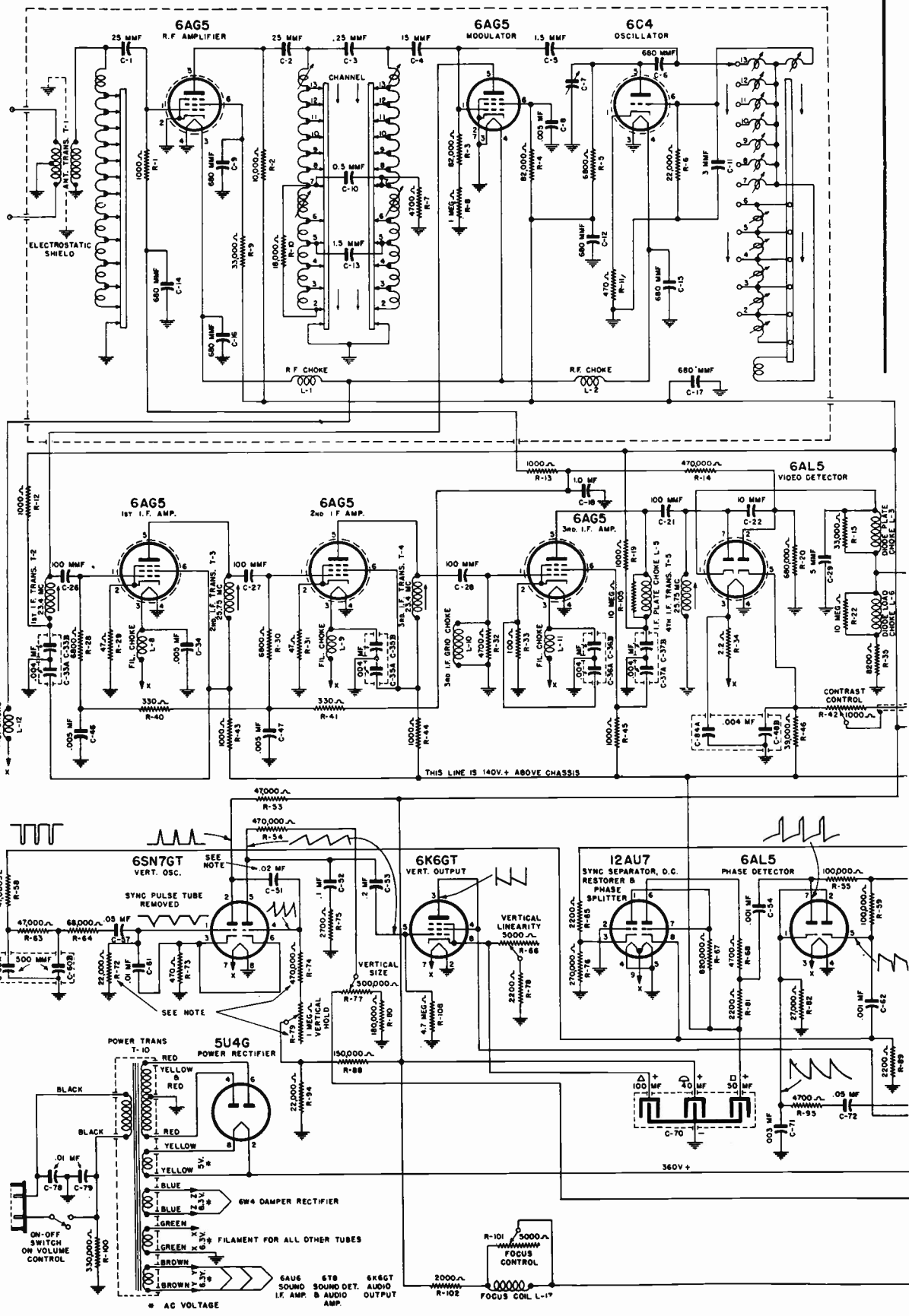
C-85 and C-86 added starting with "SERIES YG".

R-116 and R-117 added starting with "SERIES YG".

R-118 added in Models 421 & 422 only starting with "SERIES YA".

Pin No. 2 on 12AU7 socket removed from ground and connected to junction of R-106 and R-118 in Models 421 & 422 only starting with "SERIES YA".

R-89 removed from ground and connected to junction of R-106 and R-118 in Models 421 & 422 only starting with "SERIES YA"



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. The 6CB6 cannot be used in the video I.F. amplifier stages.

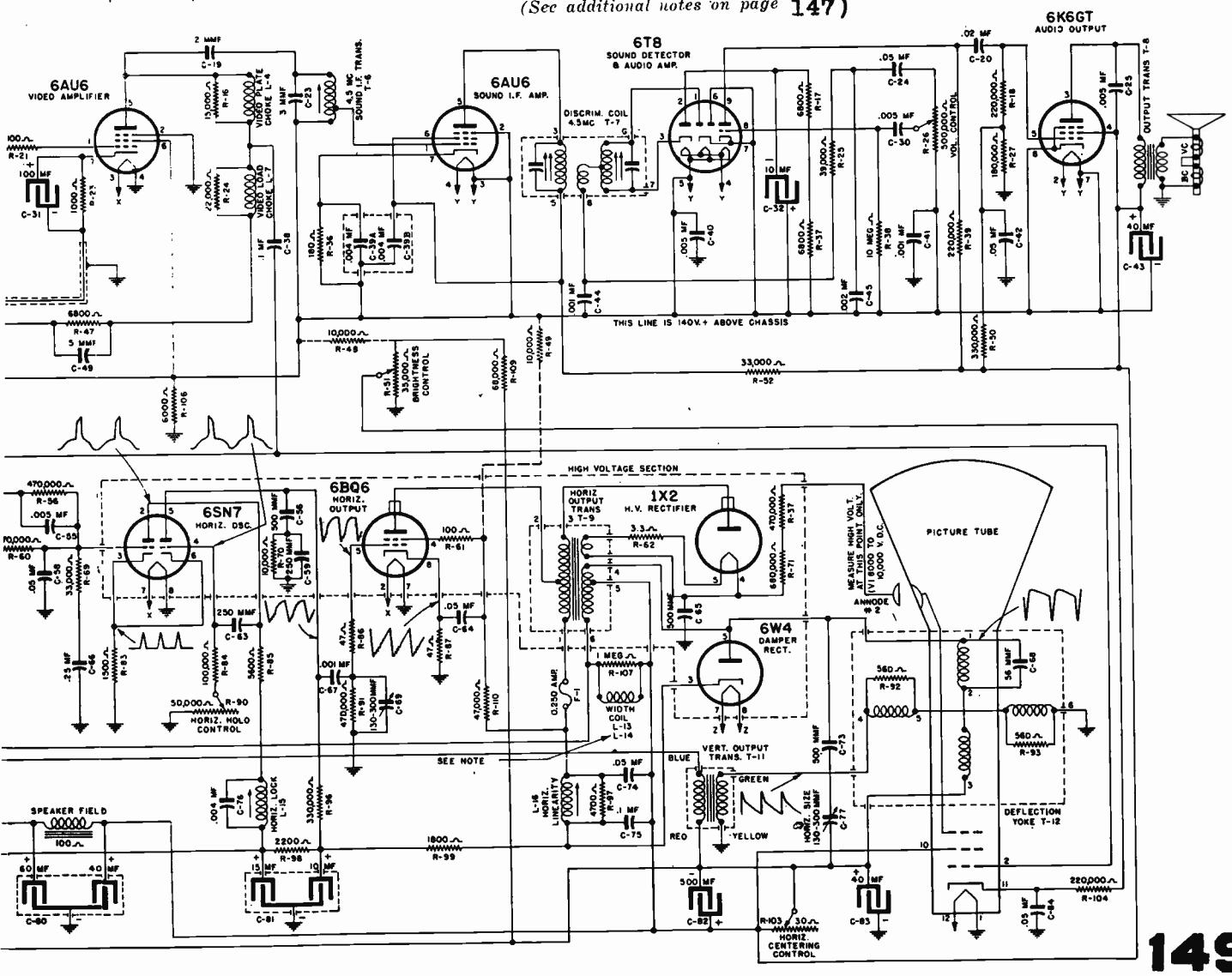
Sentinel *Television*

CIRCUIT USED ON MODELS 412, 413, 414, 415 "SERIES YA, YB, YC" INK STAMPED ON BACK OF CHASSIS

NOTES

C-51 was .02 in SERIES "YA". CHANGED to .1 Mfd starting with SERIES "YB".
R-72 was 22,000 Ohms in SERIES "YA". CHANGED to 10,000 Ohms starting with SERIES "YB".
R-74 was 470,000 Ohms in SERIES "YA". CHANGED to 220,000 Ohms starting with SERIES "YB".
R-79 was 1 Megohm in SERIES "YA". CHANGED to 500,000 Ohms starting with SERIES "YB".
L-13 or L-14 were used in both 10" and 12" models in SERIES "YA" & "YB".
C-82 500 Mfd not used in SERIES "YA" & "YB". Added in sets starting with SERIES "YC".
R-48 and R-49 connected as shown by dotted lines used in SERIES "YA" &"YB". CHANGED to R-109 and R-110 starting with SERIES "YC".
F-1, standard type fuse, in SERIES "YA" & "YB". CHANGED to Slo-Blo type in SERIES "YC". ALWAYS REPLACE WITH SLO-BLO TYPE.
C-45 used in "SERIES YA, YB, YC" only.
R-111 added across R-47 starting with "SERIES YD"
L-7 and R-24 replaced with 20E363-10 Video Load Choke Assembly starting with "SERIES YD"
R-29 was 47 Ohms in "SERIES YA, YB, YC". CHANGED to 10 Ohms starting with "SERIES YD". NOT USED in Models 421 & 422.
R-31 was 47 Ohms in "SERIES YA, YB, YC". CHANGED to 100 Ohms starting with "SERIES YD".
R-20 was 680,000 Ohms in "SERIES YA, YB, YC". CHANGED to 330,000 Ohms starting with "SERIES YD".
R-14 was 470,000 Ohms in "SERIES YA, YB, YC". CHANGED to 220,000 Ohms starting with "SERIES YD".
VIDEO I.F. Alignment frequencies changed starting with "SERIES YD".
R-106 was 6,000 Ohms in "SERIES YA thru YD". CHANGED to 5,000 Ohms starting with "SERIES YE".
R-36 was 180 Ohms in "SERIES YA thru YD". CHANGED to 270 Ohms starting with "SERIES YE".
R-103 was 30 Ohms in "SERIES YA thru YD". CHANGED to 60 Ohms starting with "SERIES YE".
C-82 was 500 MFD in "SERIES YC & YD". CHANGED to 1,000 MFD starting with "SERIES YE".
B+ take-off point for audio section moved to variable tap on horizontal centering control starting with "SERIES YE".

(See additional notes on page **147)**

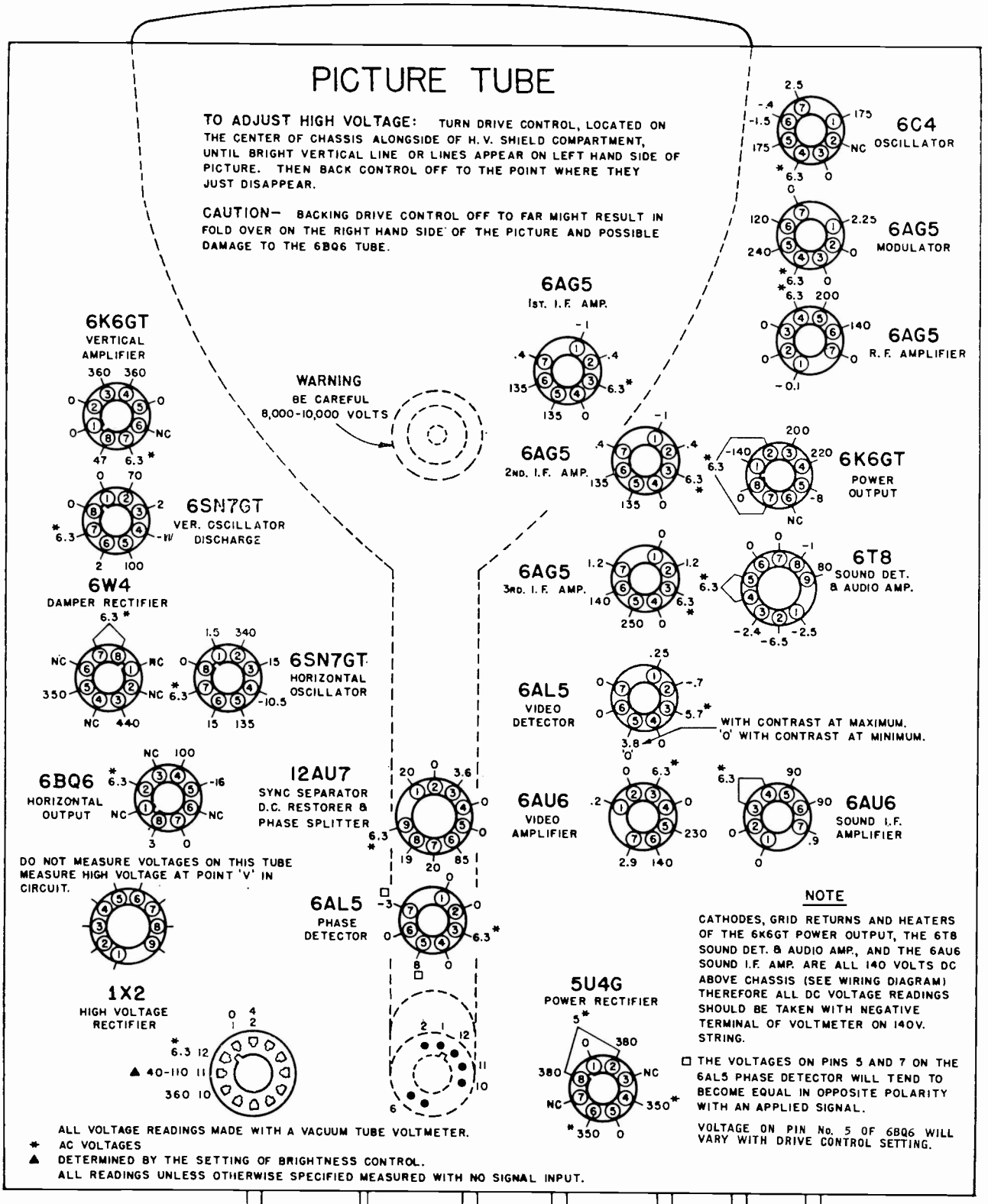


Sentinel Television, continued,

APPLIES TO ALL MODELS AND SERIES LETTERS

VOLTAGE TABLE

BOTTOM VIEW OF CHASSIS

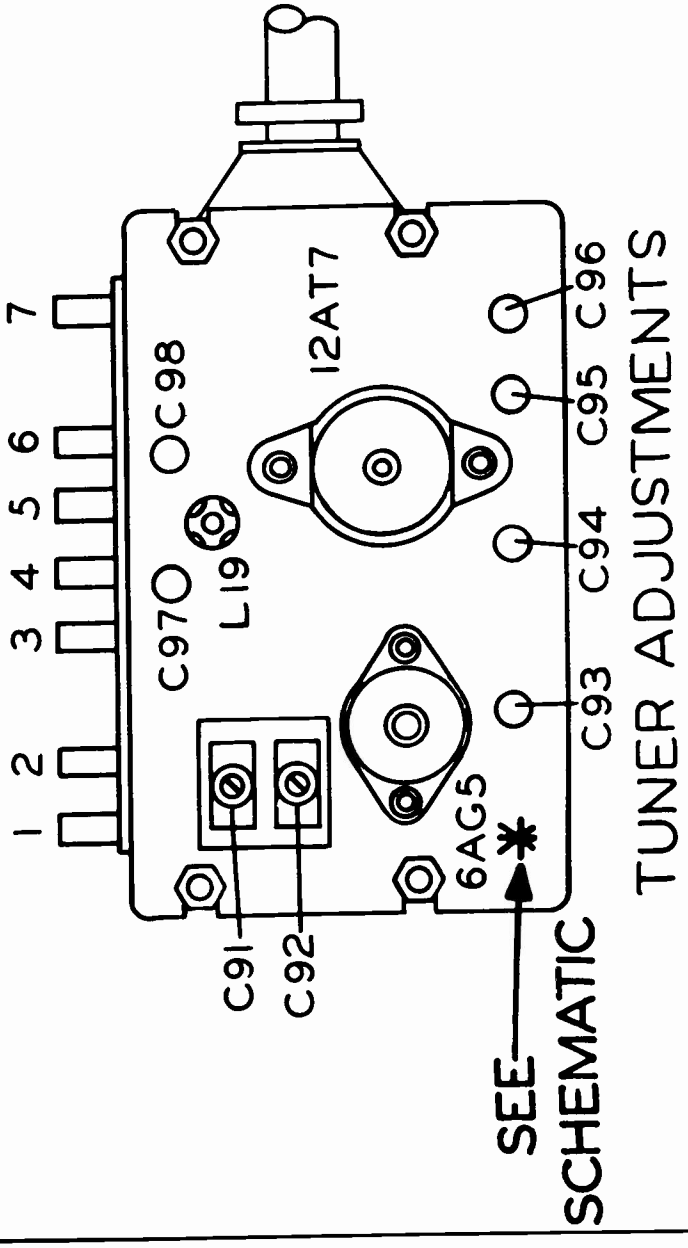


Sonora
Clear as a Bell

TELEVISION RECEIVERS
MODEL 302 - TABLE MODEL CABINET MODEL 303 - CONSOLETTE CABINET

VOLTAGE READINGS: The voltage readings to be obtained at various locations in the receiver have been indicated on the schematic diagram. These voltages will be very advantageous when "trouble shooting". Check voltages, tubes, and inspect for damaged or burned parts before attempting to re-align receiver. All voltages were taken with a 117.5 V. line and with no signal input. The contrast control set at its maximum clockwise position; the brightness control at 50% rotation and all other controls in normal operating position. The tuner set for Channel 2. All voltages are positive with respect to ground unless otherwise indicated.

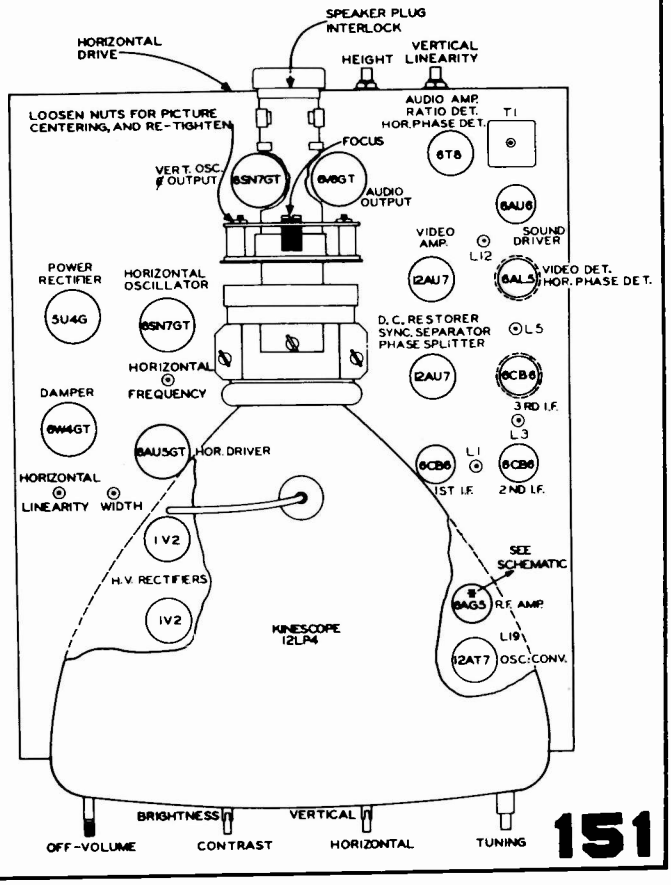
CENTERING OF PICTURE: The picture may be centered in relationship with the opening in the glass panel at the face of the receiver, by loosening the two hexagon nuts which fasten the focalizer to the plate. The focalizer may then be moved either sidewise or up and down until the picture is centered. After the picture is centered these nuts must be again secured to avoid shifting of the focalizer.



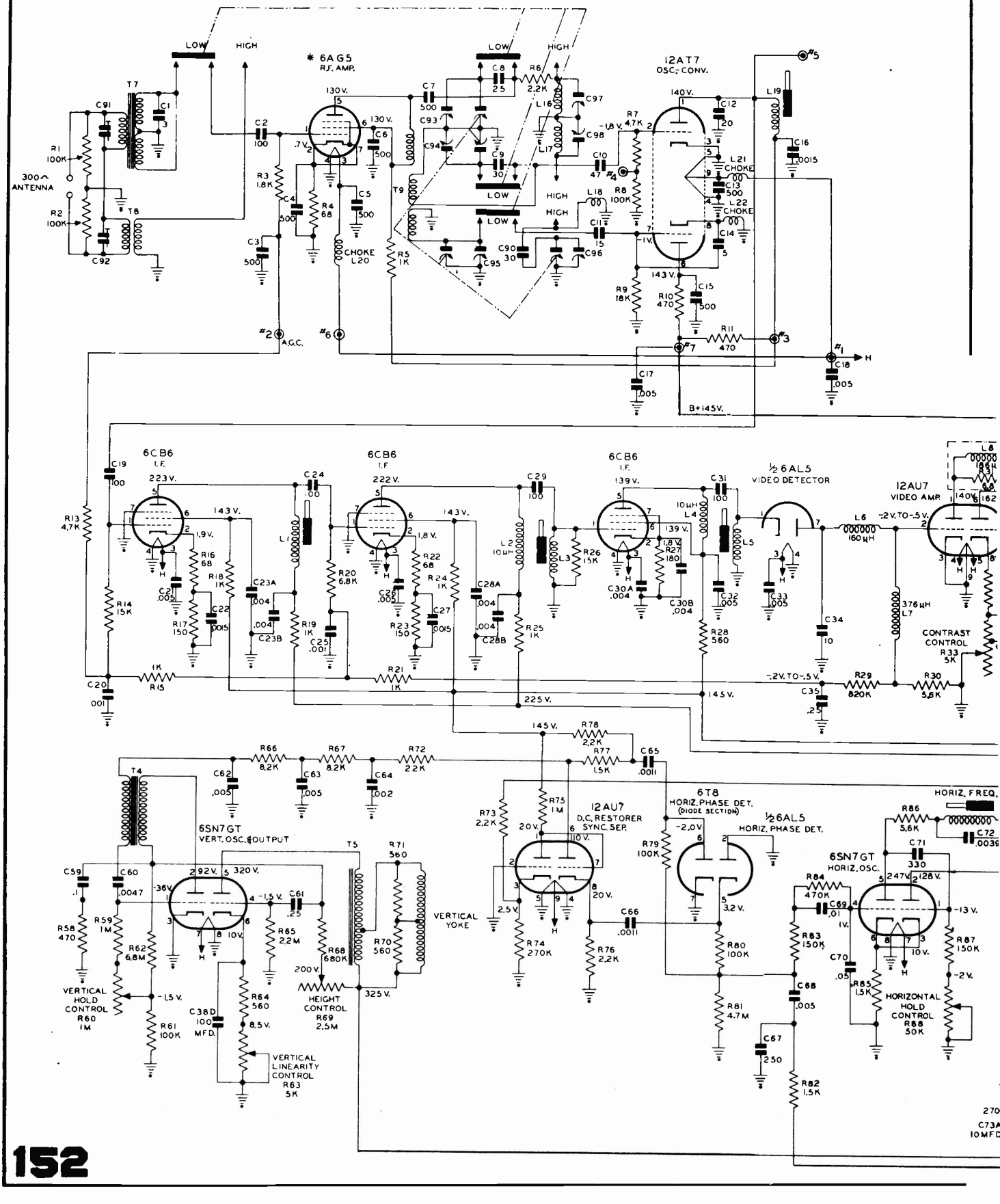
FREQUENCY CHART

CHANNEL NO.	CHANNEL FREQ.MC.	PICTURE CARRIER M.C.	SOUND CARRIER M.C.	RECEIVER RF. OSC. M.C.
2	54-60	55.25	59.75	81.35
3	60-66	61.25	65.75	87.35
4	66-72	67.25	71.75	93.35
5	76-82	77.25	81.75	103.35
6	82-88	83.25	87.75	109.35
7	174-180	175.25	179.75	201.35
8	180-186	181.25	185.75	207.35
9	186-192	187.25	191.75	213.35
10	192-198	193.25	197.75	219.35
11	198-204	199.25	203.75	225.35
12	204-210	205.25	209.75	231.35
13	210-216	211.25	215.75	237.35

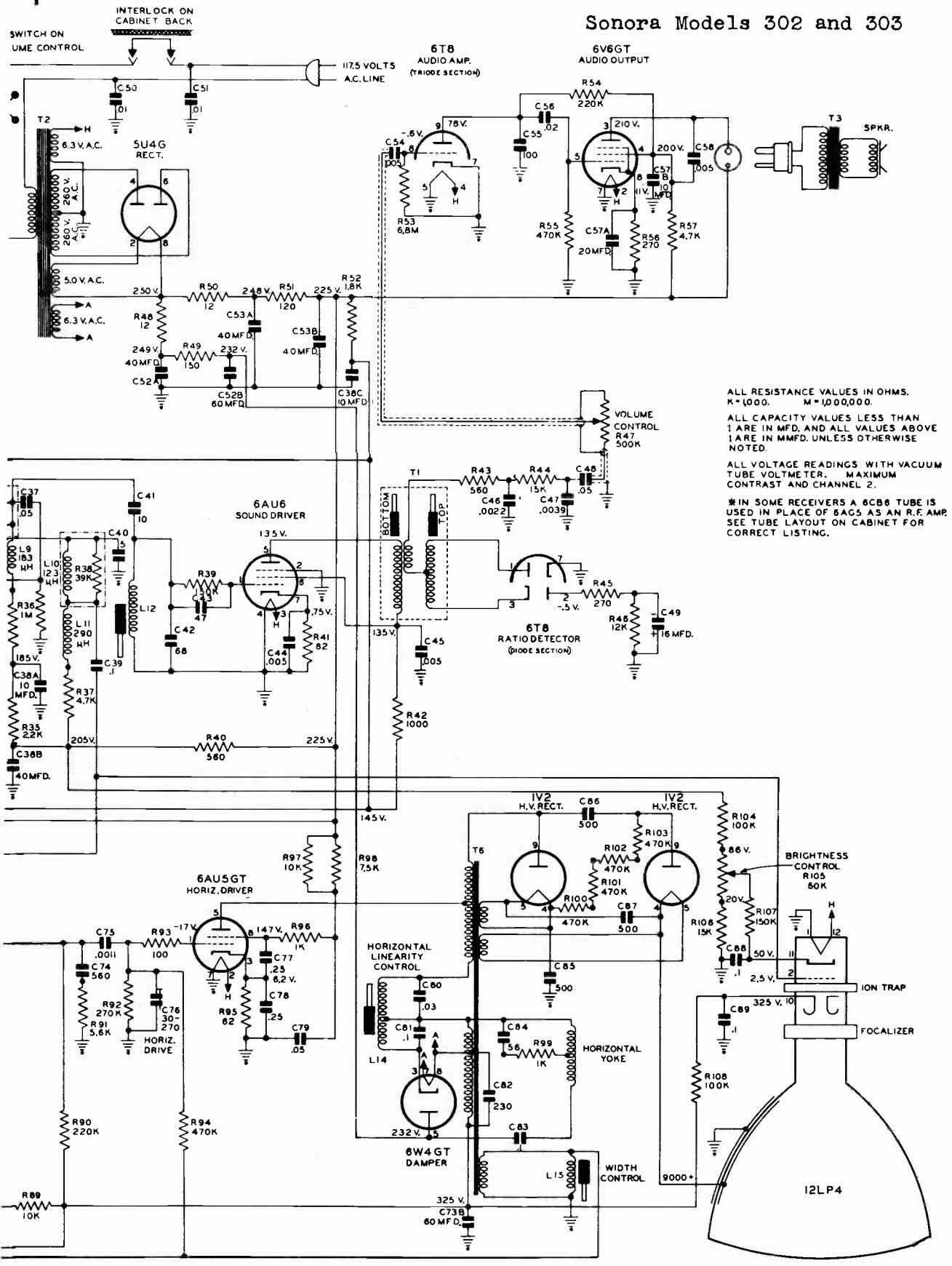
I.F. FREQ. M.C.	
PICTURE CARIER	26.1
SOUND CARRIER	21.6



Sonora Models 302 and 303



Sonora Models 302 and 303



ALL RESISTANCE VALUES IN OHMS. K = 1,000. M = 1,000,000.

ALL CAPACITY VALUES LESS THAN 1 ARE IN MFD. AND ALL VALUES ABOVE 1 ARE IN MMFD. UNLESS OTHERWISE NOTED.

ALL VOLTAGE READINGS WITH VACUUM TUBE VOLTMETER. MAXIMUM CONTRAST AND CHANNEL 2.

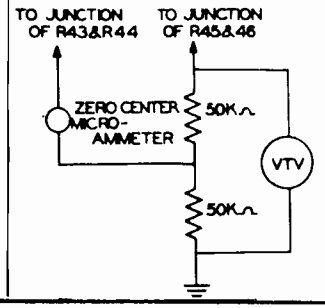
*IN SOME RECEIVERS A 6CB6 TUBE IS USED IN PLACE OF 6AG5 AS AN R.F. AMP. SEE TUBE LAYOUT ON CABINET FOR CORRECT LISTING.

Sonora Radio & Television Corp. Alignment, Models 302 and 303.

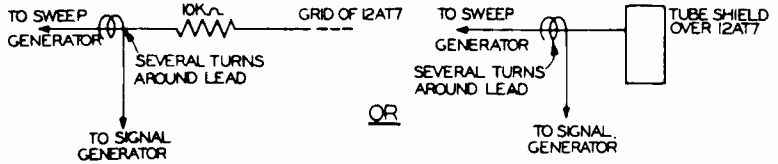
I.F. ALIGNMENT PROCEDURE

STEP NO.	Connect Signal Generator To	Signal Generator Frequency MC	Connect Sweep Generator To	Sweep Generator Frequency MC	Connect Oscilloscope To	REMARKS	ADJUSTMENTS (Use peak obtained when screw is farthest out of can or coil.)
1. AUDIO IF ALIGNMENT	Grid of 1st. Video Amp. (12AU7) pin #2. Contrast control at maximum.	4.5 MC. No Modulation. See Adjustments column.	NOT USED		NOT USED	Connect vacuum tube voltmeter and zero center microammeter as shown in note 1. (50,000 ohm resistors shown in note 1 must match within 5%)	Adjust L12 and T1 (Bottom) for maximum on Vacuum Tube Voltmeter. This adjustment should be made with voltage on Vacuum Tube Voltmeter under 12 volts. Adjust T1 (Top) for zero on Microammeter. If the receiver is receiving a signal, the above adjustments can be made off a weak station keeping the reading on the vacuum tube voltmeter under 12 volts.
2. PRELIMINARY VIDEO IF ALIGNMENT	Grid (Pin 2) of 12AT7 through 10,000 ohm resistor or a tube shield and slip over 12AT7. Do Not Ground Shield	25.5 MC. No Modulation	NOT USED		NOT USED	Connect vacuum tube voltmeter to A.G.C. point. Junction of R29 and R30.	Adjust 3rd and 4th I.F. coils for maximum (L5 & L3) on vacuum tube voltmeter. Adjust at approximately one volt.
3. PRELIMINARY VIDEO IF ALIGNMENT	Grid (Pin 2) of 12AT7 through 10,000 ohm resistor or a tube shield and slip over 12AT7. Do Not Ground Shield	23.0 MC. No Modulation	NOT USED		NOT USED	Connect vacuum tube voltmeter to A.G.C. point. Junction of R29 and R30.	Adjust 1st & 2nd I.F. coils (L1 and L19 in tuner) for maximum on vacuum tube voltmeter. Adjust at approximately one volt.
4. FINAL VIDEO IF ALIGNMENT	Signal Generator as shown in Note 2.	26.1 and 22.8 MC No Modulation. See Note 3.	Grid of 12AT7 through 10,000 ohm resistor, or a tube shield and slip over 12AT7. See Note 2.	24 Center Frequency at least 6 MC Wide.	A.G.C. point. Junction of R29 and R30.		With signal generator set at 26.1 MC adjust 3rd & 4th I.F. coils to give correct marker position as shown in note 3. Set signal generator at 22.8 MC and adjust 1st & 2nd I.F. coils for pattern shown in note 3. A slight readjustment of 3rd & 4th I.F. coils may be necessary. Curve shape should be between "A" and "C" of note 3 with maximum signal output for a low sweep input.

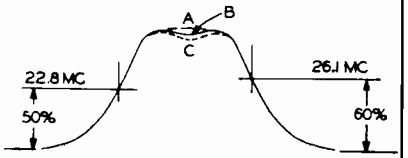
NOTE 1



NOTE 2



NOTE 3



SPARTON TELEVISION SERVICE

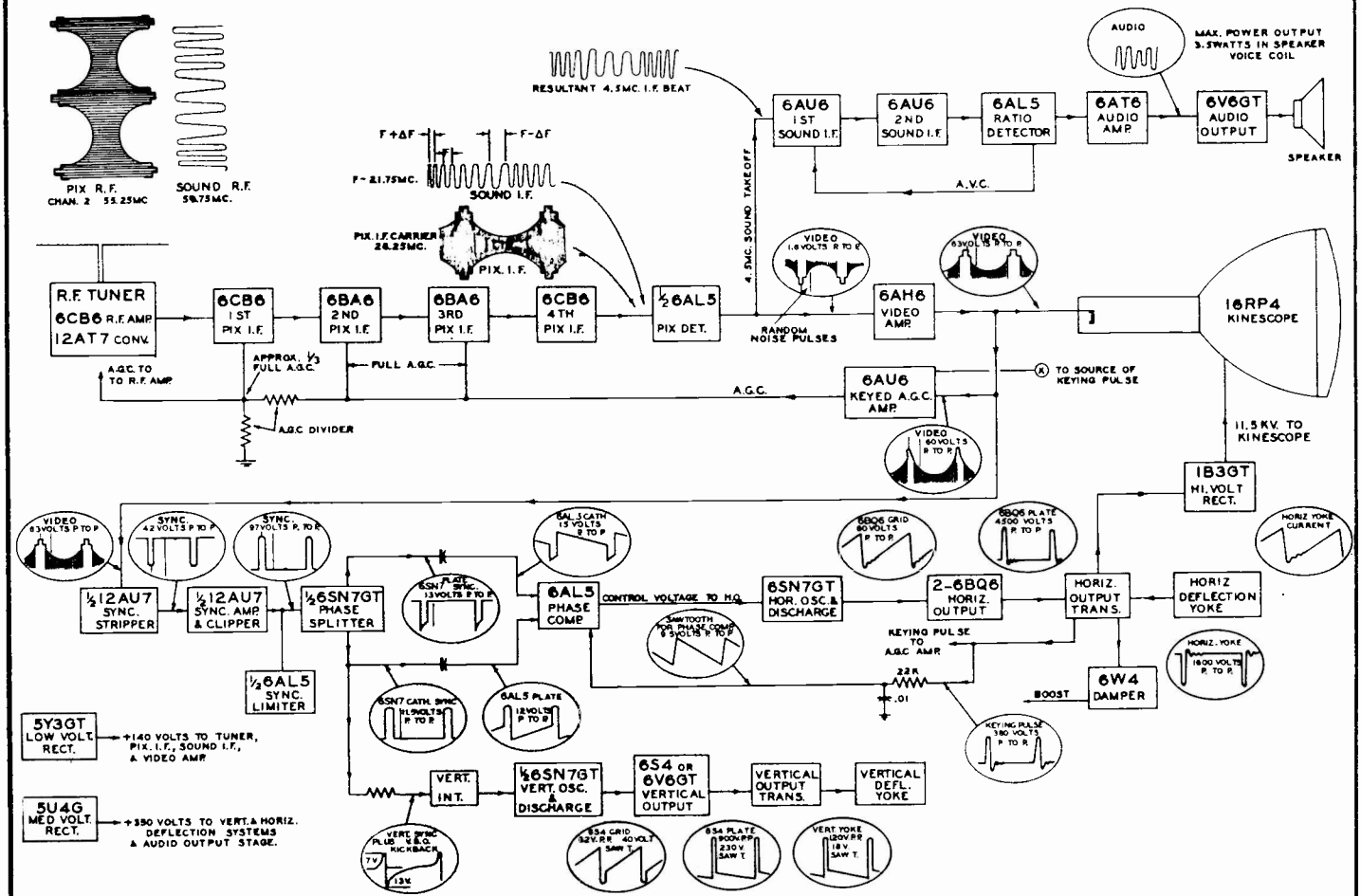
SPARTON TELEVISION RECEIVERS

CHASSIS TYPE 26SS160, 26SS160L, 26SS160B & 26SD160

MODELS

5025, 5026, 5029, 5030, 5035, 5036 & 5037 (TABLE)
5076, 5077, 5076BB, 5077BB, 5079 & 5080 (CONSOLES)
5082, 5083, 5088 & 5089 (COMBINATIONS)

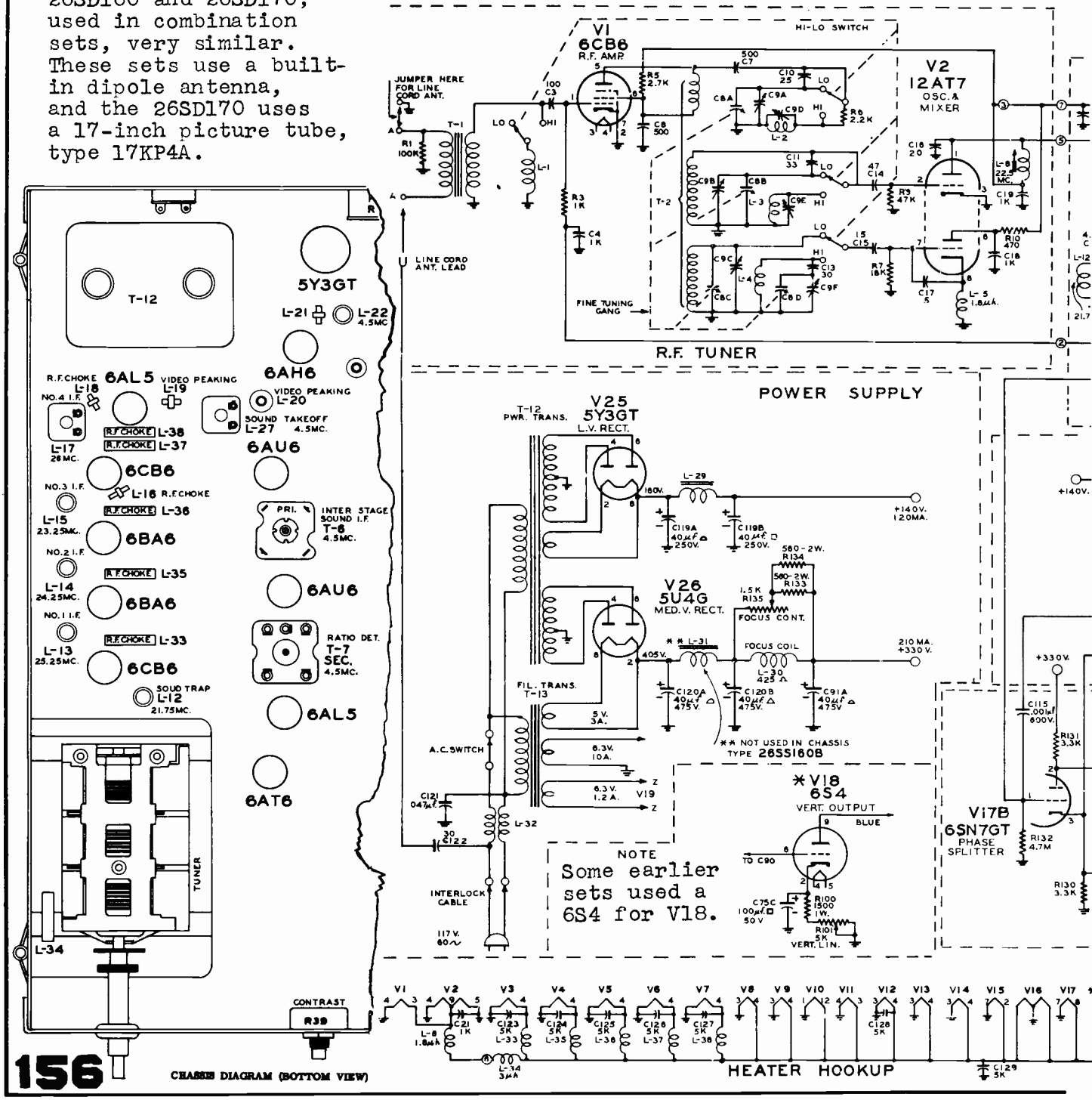
The circuit diagram covers the chassis with SS letters between the numbers. The Chassis 26SD160 (note SD) used in some table models and all of the combinations is almost identical; one of the differences being a built-in dipole antenna instead of a line cord antenna. Chassis 26SD170, used in Model 5090 and some of the models carrying numbers in the title, is also very similar. The combinations have a separate radio receiver, but use a common speaker for the television and radio receivers.



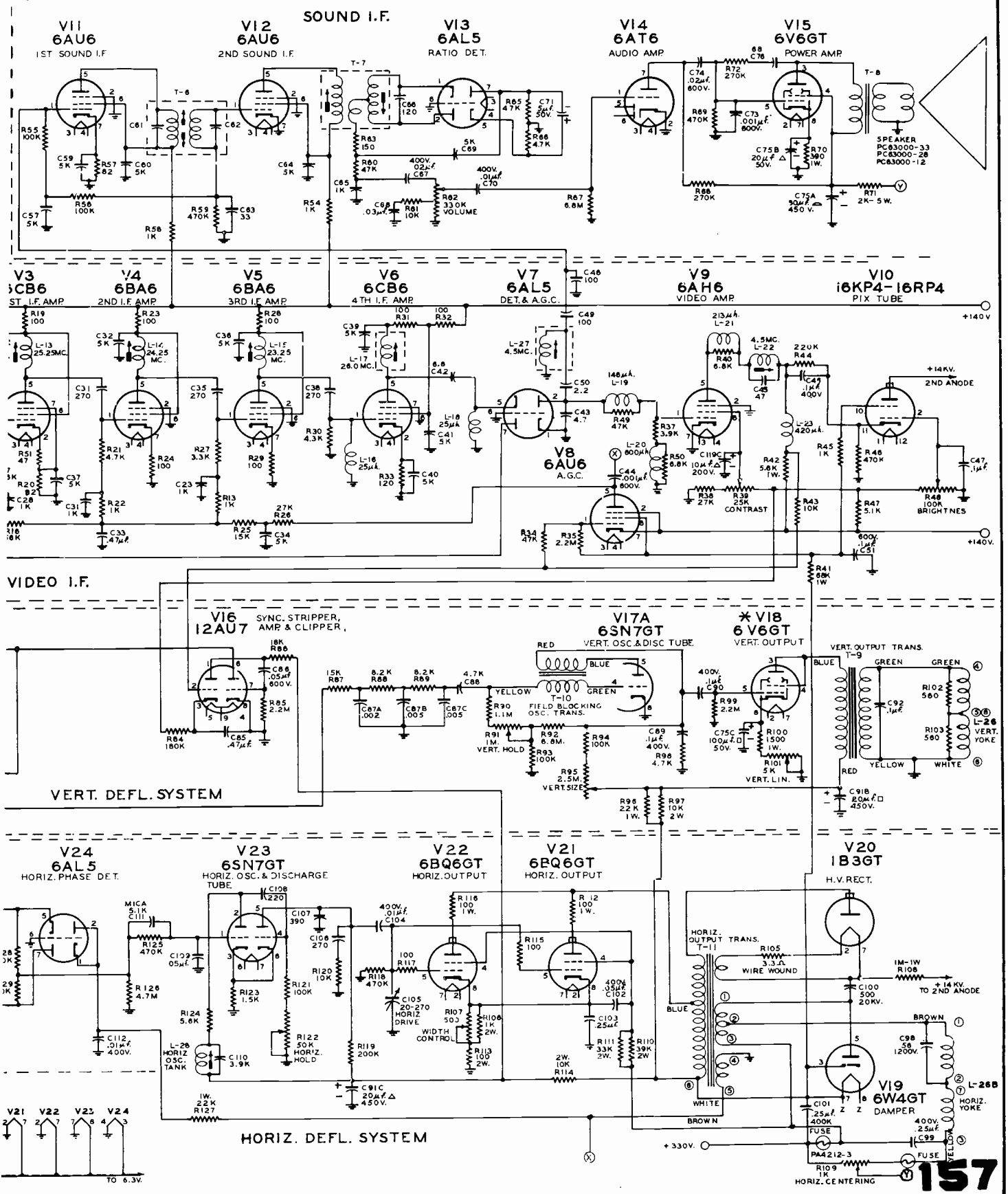
SPARTON TELEVISION SCHEMATIC DIAGRAM

CHASSIS TYPE 26SS160, 26SS160L & 26SS160B
USED IN MODELS 5025, 5026, 5076, 5077, 5029, 5030, 5035, 5036, 5037, 5076BB, 5077BB, 5079, 5080, 5082, 5083, 5088, 5089.

This circuit diagram covers the Chassis types stated above. You will find Chassis 26SD160 and 26SD170, used in combination sets, very similar. These sets use a built-in dipole antenna, and the 26SD170 uses a 17-inch picture tube, type 17KP4A.

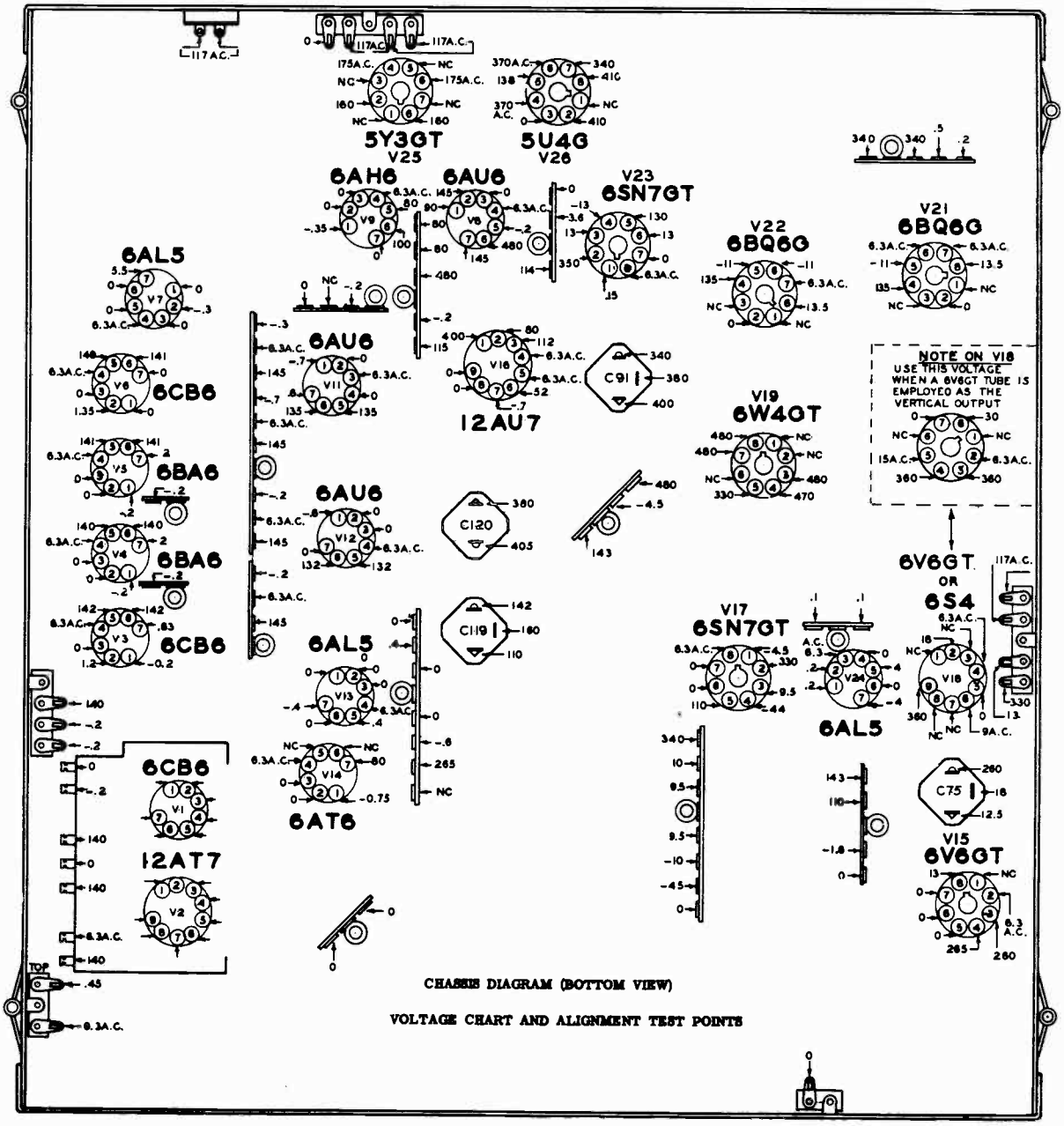


CHASSIS DIAGRAM (BOTTOM VIEW)


SOUND I.F.
V11 6AU6 1ST SOUND I.F.
V12 6AU6 2ND SOUND I.F.
V13 6AL5 RATIO DET.
V14 6AT6 AUDIO AMP
V15 6V6GT POWER AMP
SPEAKER PC83000-33 PC83000-28 PC83000-12
V3 6CB6 1ST I.F. AMP
V4 6BA6 2ND I.F. AMP
V5 6BA6 3RD I.F. AMP
V6 6CB6 4TH I.F. AMP
V7 6AL5 DET. & A.G.C.
V9 6AH6 VIDEO AMP
V10 16KP4-16RP4 PIX TUBE
+140V
+14KV. 2ND ANODE
V8 6AU6 A.G.C.
VIDEO I.F.
V16 12AU7 SYNC. STRIPPER, AMP & CLIPPER,
V17A 6SN7GT VERT. OSC. & DISC TUBE
*V18 6V6GT VERT. OUTPUT
VERT. OUTPUT TRANS. T-9
FIELD BLOCKING OSC. TRANS. T-10
VERT. HOLD
VERT. SIZE
VERT. LIN.
VERT. YOKE
VERT. DEFL. SYSTEM
V24 6AL5 HORIZ. PHASE DET.
V23 6SN7GT HORIZ. OSC. & DISCHARGE TUBE.
V22 6BQ6GT HORIZ. OUTPUT
V21 6BQ6GT HORIZ. OUTPUT
V20 1B3GT H.V. RECT.
HORIZ. OUTPUT TRANS. T-11
WIRE WOUND
+14 KV. TO 2ND ANODE
V19 6W4GT DAMPER
HORIZ. YOKE
HORIZ. OSC. TANK
HORIZ. HOLD
HORIZ. DRIVE
WIDTH CONTROL
HORIZ. CENTERING
+330V.
FUSE
TO 6.3V.
HORIZ. DEFL. SYSTEM

SPARTON TELEVISION RECEIVERS

CHASSIS TYPE 26SS160, 26SS160L, 26SS160B & 26SD160



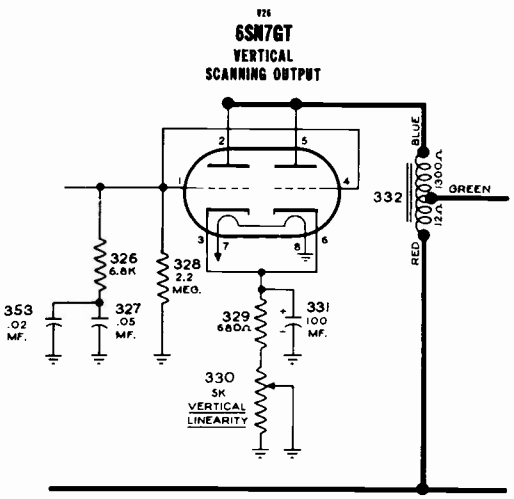
Unless otherwise indicated, the voltages shown in the above chassis diagram were measured in respect to chassis ground. The line voltage at 117 volts A.C. Set for no signal on Channel 2. Brightness and contrast set for maximum (clockwise). Volume and tone controls set at maximum counter-clockwise. Other controls set for proper operation. Measurements made with a vacuum tube voltmeter.

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

MODELS 9120-A, 9120-B, 9120-C, 9120-D, 9120-E & 9120-F

CHANGE INCORPORATED IN CHASSIS

"A"	There is no performance advantage to a chassis containing this change—circuit revisions are due to short supply of certain tubes. 1. Tube V12 (Video Amp.) was changed from a type 6AU6 to a type 6AG5. 2. Tube V16 (Keyer A.G.C.) was changed from a type 6AU6 to a type 6AG5. **In order for this receiver to operate properly, V12 and V16 must be the same type tube.**
"B"	There is no performance advantage to a chassis containing this change—circuit revisions are due to short supply of certain tubes. 1. Tube V1 (1st Sound I. F. Amp.) was changed from a type 6AU6 to a type 6BH6. 2. Connection point of resistor 70 (82 Ohms) was changed from pin 7 of tube V1 (1st Sound I.F. Amp.) to pin 2 of this tube. 3. Connection paint of blue lead from pin 2 of transformer 68 (1st Sound I.F. transformer) was changed from pin 2 of tube V1 (1st Sound I.F. Amp.) to pin 7 of this tube. 4. Tube V2 (2nd Sound I.F. Amp.-Limiter) was changed from a type 6AU6 to a type 6BH6. 5. Connection point of resistar 79 (82 Ohms) was changed from pin 7 of tube V2 (2nd Sound I.F. Amp.-Limiter) to pin 2 of this tube. 6. Connection point of blue lead from pin 2 of transformer 74 (2nd Sound I. F. transformer) was changed from pin 2 of tube V2 (2nd Sound I.F. Amp.-Limiter) to pin 7 of this tube. **In order for this receiver to operate properly, V1 and V2 must be the same type tube.**
"C"	There is no performance advantage to a chassis containing this change—circuit revisions are due to short supply of certain tubes. 1. Tube socket for V26 (Vertical Scanning Output) was changed from 7 pin miniature to octal base. 2. Tube V26 (Vertical Scanning Output) was changed from a type 6S4 to a type 6SN7GT. 3. Connections to tube socket of V26 (Vertical Scanning Output) were changed to those shown in schematic illustrated below. 4. Condenser 353 (.02 Mfd.) was added in parallel with condenser 327 (.05 Mfd.) as shown in schematic, illustrated below.



STEWART-WARNER

Models 9121-A & 9121-B incorporate a record changer and a section for AM-FM reception. Outside of the switching arrangement, the television section is similar to the models described here.

PRODUCTION CHANGES

The following tabulation furnishes complete details on changes which occurred during receiver production. The receivers incorporating these changes are identified by coding stamped on rear surface of chassis. This coding consists of one or more letters following the word SERIES, as SERIES B, SERIES AC, etc., and corresponds to similarly lettered changes shown below. Chassis incorporate only that change indicated by letter designation i.e., chassis stamped "SERIES BE" does not include changes "A" or "C" or "D".

The circuit shown on this page applies to "SERIES DEF" chassis.

"D"	This change was incorporated in the chassis to improve vertical and horizontal sync. stability. 1. Resistor 351 (1800 Ohms) was added in plate circuit of V17B (12AU7) Phase Splitter. The junction of resistor 246 (1800 Ohms) and condenser 247 (1000 Mmfd.) was formerly connected directly to pin 6 of this tube. 2. Resistor 258 in plate circuit of V19 (6SN7GT) Horizontal Scanning Multivibrator stage was changed from 5600 Ohms to 3900 Ohms. 3. Fuse 343 (1 Amp. 250 Volt) was added between red and yellow lead of power transformer 291 and chassis ground.
"E"	This change was incorporated to decrease tube noise level and improve picture quality. 1. Resistor 161 in the cathode circuit of V7 was changed from 82 Ohms to 270 Ohms. 2. Resistor 176 in grid circuit of V9 (6AU6) 3rd I.F. Amp. stage was changed from 4700 Ohms to 8200 Ohms. 3. Resistor 183 in plate circuit of V9 (6AU6) 3rd I.F. Amp. stage was changed from 8200 Ohms to 6800 Ohms. 4. Resistor 196 in plate circuit of V11A (6AL5) Detector stage was changed from 6800 Ohms to 4700 Ohms. In addition the alignment frequency of the Converter Plate coil and 2nd I.F. coil was changed from 26.3 Mc. to 26.1 Mc.
"F"	In order to reduce the "ringing effect" of the horizontal sweep transformer and defection yoke, which appears as white (or black) vertical lines on left side of picture screen, the following change was undertaken. 1. Trap coil 354 was added in series with yoke lead. 2. Condenser 355 (.003 mfd.) was placed in shunt across coil 354. 3. Resistor 356 (680 Ohms) was placed in shunt across coil 354. The following change was made to limit Picture tube beam current. 1. Connection to pin 10 of tube V15 (16TP4 or 16RP4) picture tube was changed from the 415 B+ Boost voltage bus to the 340 B+ bus.

STEWART-WARNER TELEVISION RECEIVER MODELS

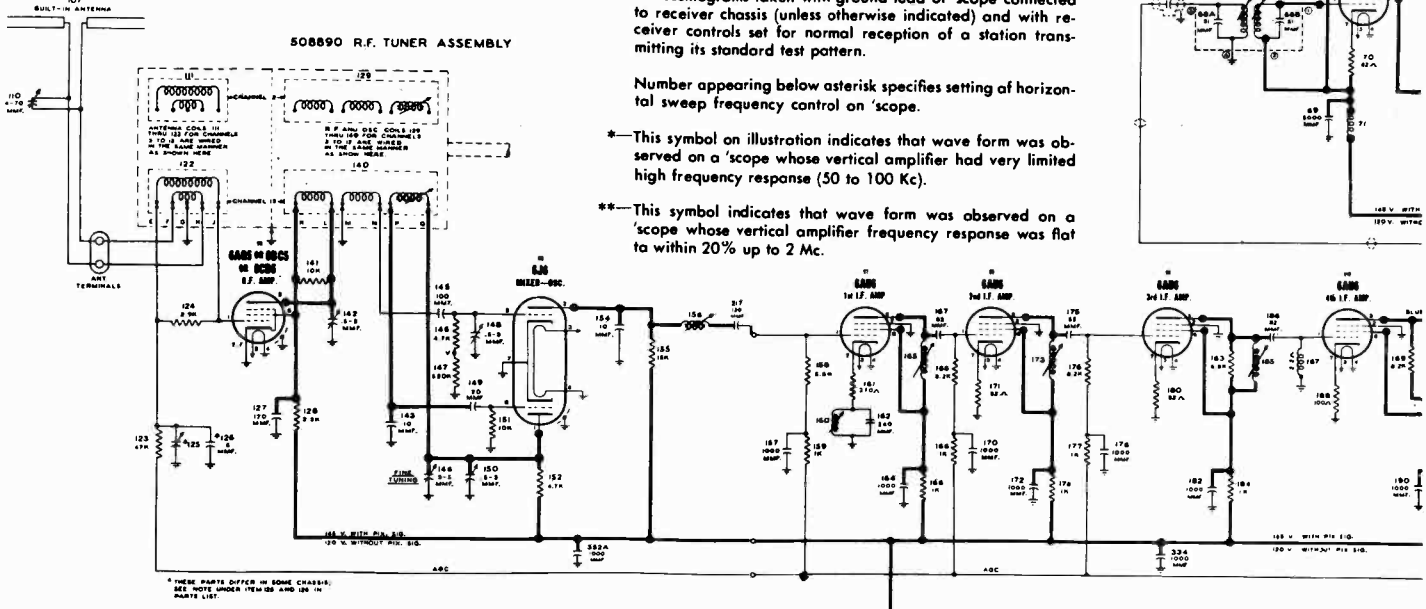
OSCILLOGRAMS

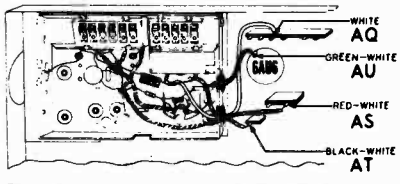
All oscillograms taken with ground lead of 'scope connected to receiver chassis (unless otherwise indicated) and with receiver controls set for normal reception of a station transmitting its standard test pattern.

Number appearing below asterisk specifies setting of horizontal sweep frequency control on 'scope.

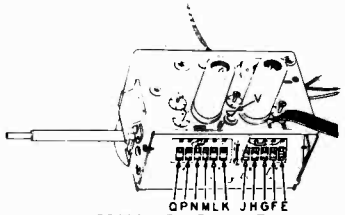
*—This symbol on illustration indicates that wave form was observed on a 'scope whose vertical amplifier had very limited high frequency response (50 to 100 Kc).

**—This symbol indicates that wave form was observed on a 'scope whose vertical amplifier frequency response was flat to within 20% up to 2 Mc.

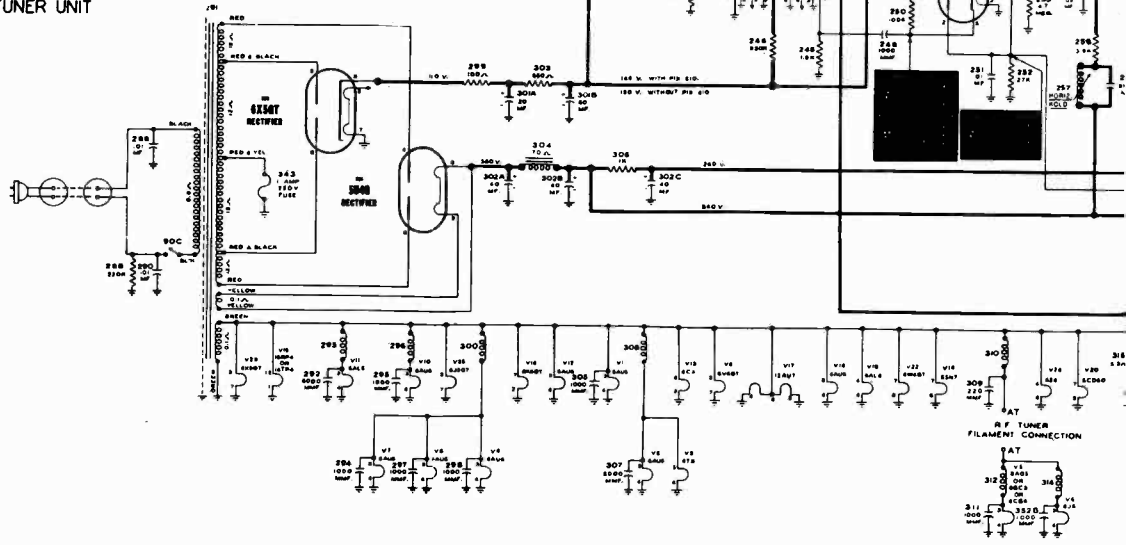




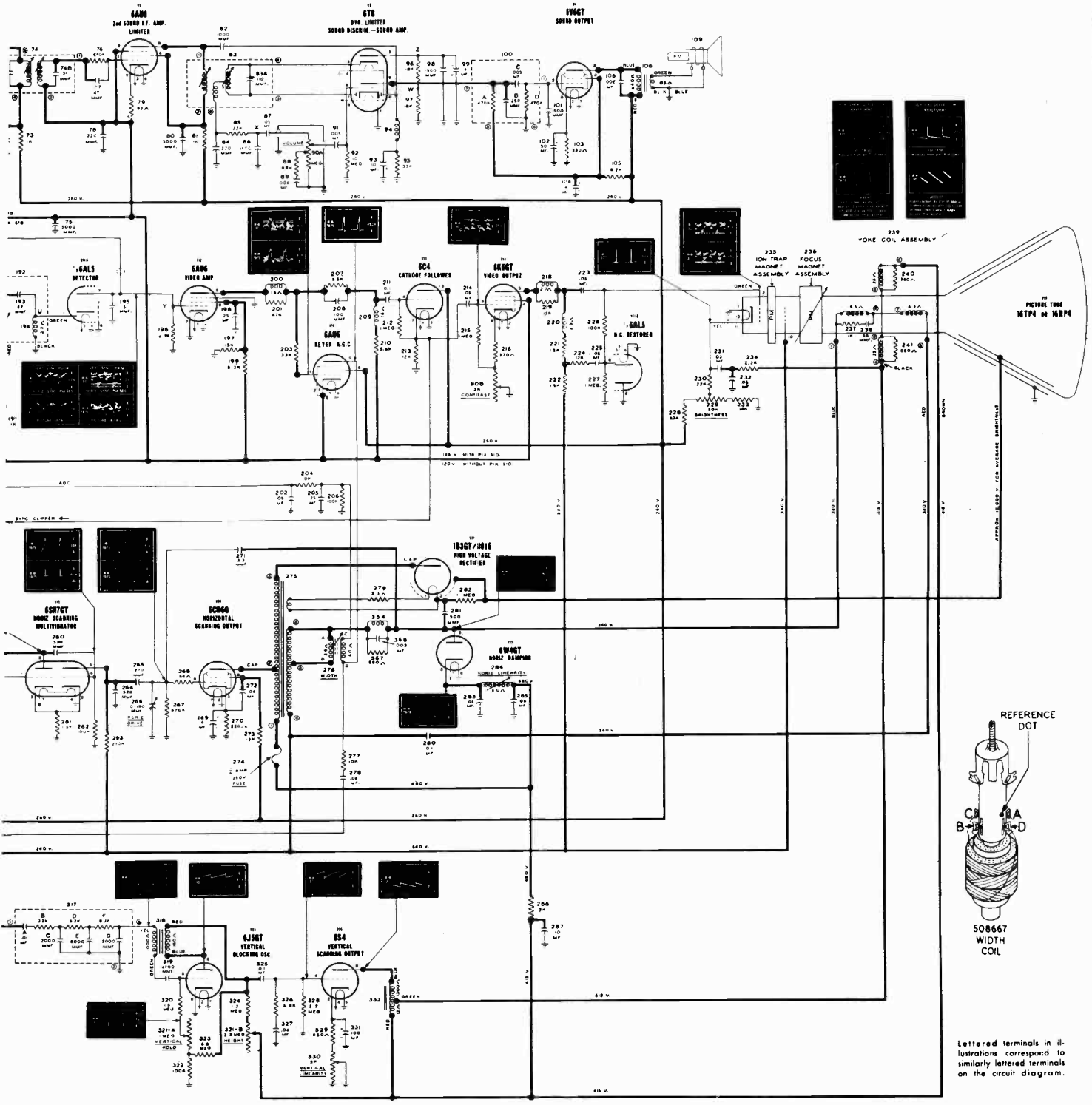
BOTTOM VIEW OF CHASSIS SHOWING CONNECTIONS TO RF TUNER UNIT



508890 TUNER UNIT



9120-A, 9120-B, 9120-C, 9120-D, 9120-E & 9120-F

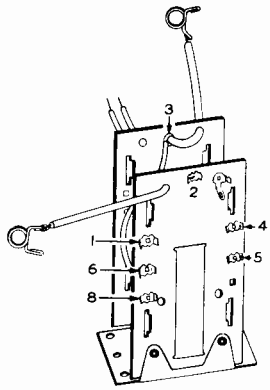


Lettered terminals in illustrations correspond to similarly lettered terminals on the circuit diagram.

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

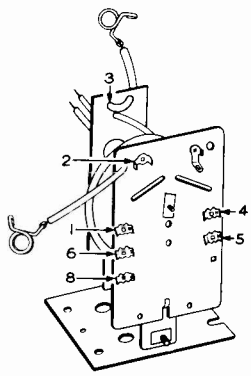
Stewart-Warner Models 9120-A, 9120-B, 9120-C, 9120-D, 9120-E, & 9120-F

Information on Alternate Types of Horizontal Sweep Transformers



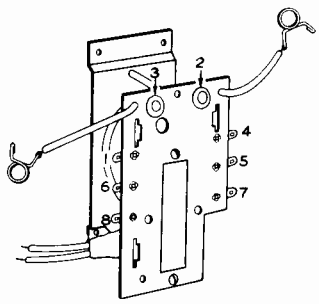
RESISTANCE MEASUREMENT
Between terminal 1 & 2— 40 Ohms
Between terminal 2 & 3—400 Ohms
Between terminal 5 & 8— 13 Ohms
Between terminal 6 & 8— 6.5 Ohms

508679



RESISTANCE MEASUREMENT
Between terminal 1 & 2— 40 Ohms
Between terminal 2 & 3—400 Ohms
Between terminal 5 & 8— 11 Ohms
Between terminal 6 & 8— 5.5 Ohms

508679

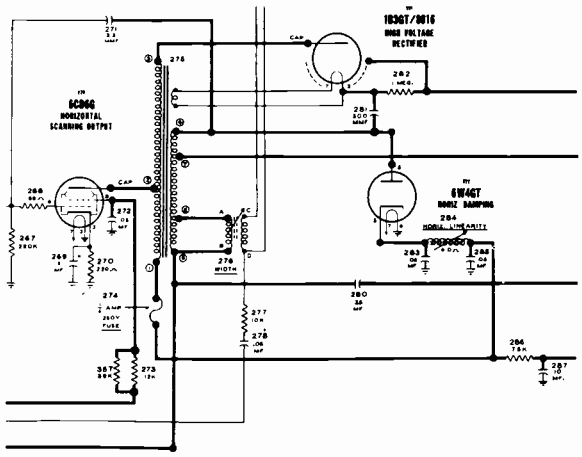


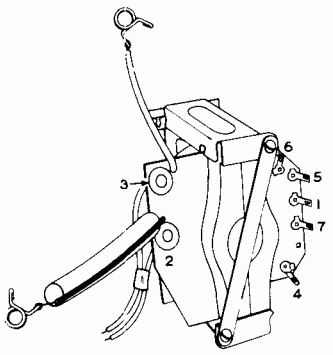
RESISTANCE MEASUREMENT
Between terminal 1 & 2— 40 Ohms
Between terminal 2 & 3—400 Ohms
Between terminal 5 & 8— 5 Ohms
Between terminal 6 & 8— 2.5 Ohms

508679

These three types of transformers all carry the same Part No. and are directly interchangeable.

Connection terminals are numbered to correspond to similarly numbered terminals shown in the complete circuit diagram





RESISTANCE MEASUREMENT
Between terminal 1 & 2—138 Ohms
Between terminal 2 & 3—420 Ohms
Between terminal 4 & 7— 2.2 Ohms
Between terminal 7 & 5— 7.3 Ohms
Between terminal 5 & 6— 3.8 Ohms

508971

When replacing a #508679 transformer with a #508971 transformer, or vice versa, the following circuit changes must be made in addition to noting differences in terminal connections.

This transformer was also used in some 9120 series chassis but is not directly interchangeable with the above illustrated units unless the sweep circuit is modified as indicated here.

ITEM	508679 HORIZONTAL SWEEP TRANSFORMER	508971 HORIZONTAL SWEEP TRANSFORMER
Resistor 267	—470,000 Ohms ±10% ½ watt	—220,000 Ohms ½ watt
Condenser 272	—Low potential side connected to cathode (pin 3) of V20 (6CD6G.)	—Low potential side connected to chassis ground.
Resistor 279	—3.3 Ohms	—Not used. Pin 7 (filament) of V21 1B3GT/8016 connects directly to filament winding of horizontal sweep transformer.
Condenser 280	—.1 Mfd. 200 volt	—.25 Mfd. 600 volt
Condenser 281	—Low potential side connected to plate (pin 5) of V22 (6W4GT).	—Low potential side connected to chassis ground.
Resistor 286	—3000 Ohms 2 watt	—7500 Ohms 5 watt
Coil 354	—Trap coil	—Not used
Condenser 355	—.003 Mfd. 600 volt	—Not used
Resistor 356	—680 Ohms ±10% ½ watt	—Not used
Resistor 357	—Not used	—39,000 Ohms ±10% 1 watt

Stewart-Warner Models 9120-A, 9120-B, 9120-C, 9120-D, 9120-E, & 9120-F

Connections for instruments for I.F. alignment, and trimmer location.

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 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 (#1) 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.

Detailed information in table form on I.F. alignment is given on the next page. Some pointers on sound, R.F., and oscillator alignment can be gathered from this page.

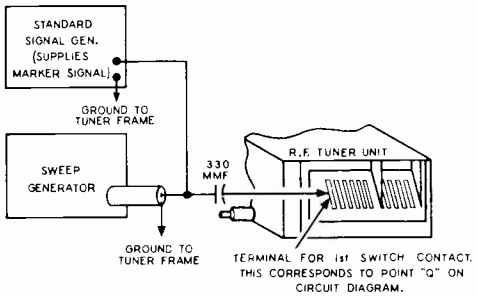


FIG. 4
Generator Connections
for IF Channel Alignment

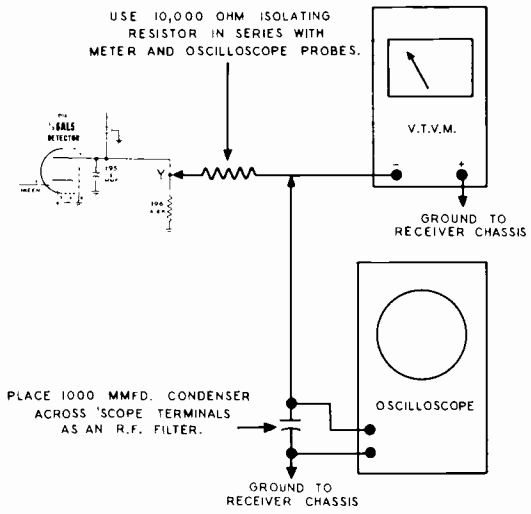
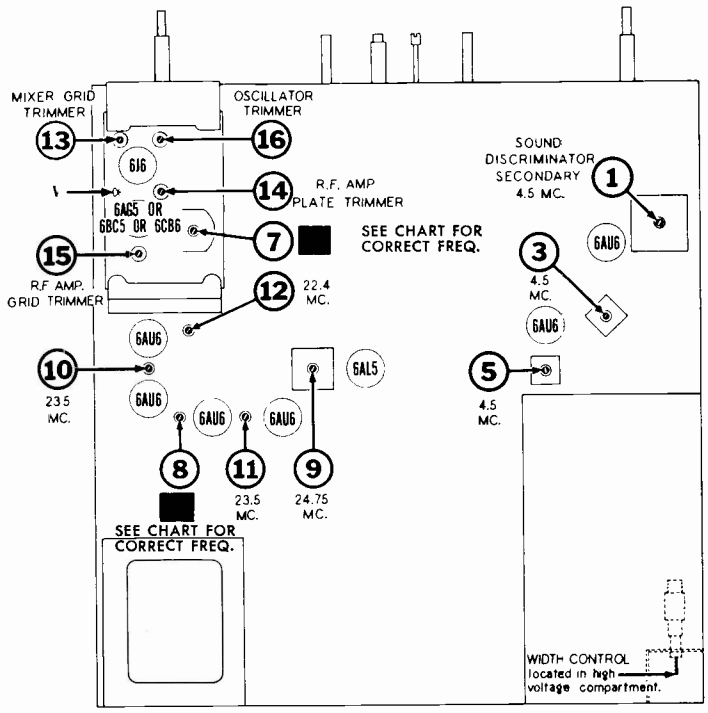
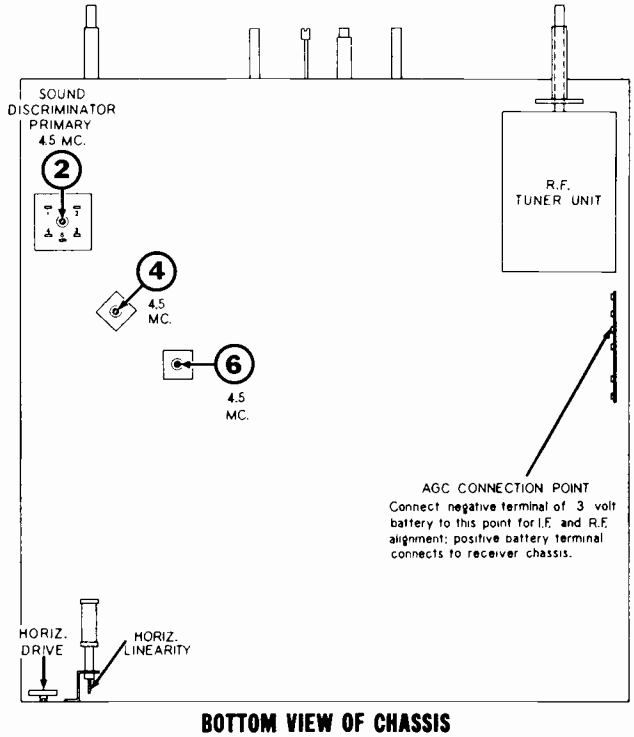


FIG. 5
VTVM and Oscilloscope Connections
for IF Channel Alignment



TOP VIEW OF CHASSIS

FIG. 13



BOTTOM VIEW OF CHASSIS

FIG. 14

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

Stewart-Warner Models 9120-A, 9120-B, 9120-C, 9120-D, 9120-E, 9120-F

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 8, 9, 10, 11 and 12 in Fig. 13) 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. See Fig. 14 for convenient point of connection.
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 a voltage across the video detector load resistor, symbol 196, 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 #4. 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. 4.	**26.3 MC.** or **26.1 MC. "E"**	Use a 330 Mmf. isolating condenser and connect as shown in Fig. 4 but keep power switch turned off during this step.	———	Connect as shown in Fig. 5.	Not used.	———	**#7** Converter plate coil	Adjust for maximum reading on VTVM.
							#8 2nd I.F.	Adjust for maximum reading on VTVM.
Same as above.	**24.75 MC.**	Same as above.	———	Same as above.	Not used.	———	**#9** 4th I.F.	Adjust for maximum reading on VTVM.
Same as above.	**23.5 MC.**	Same as above.	———	Same as above.	Not used.	———	**#10** 1st I.F.	Adjust for maximum reading on VTVM.
							#11 3rd I.F.	Adjust for maximum reading on VTVM.
Same as above.	**22.4 MC.**	Same as above.	———	Same as above.	Not used.	———	**#12** 1st IF Trap Coil	Adjust for minimum reading on VTVM.
Same as above.	**26.75 MC.**	With connections made as shown in Fig. 4, 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. 5.	**IMPORTANT:** 1. Adjust output attenuator on sweep generator so that reading on VTVM is approximately one 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. 6. If top of curve is not properly shaped, make a slight readjustment of slug #9. 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 (26.3 Mc.) and slugs #10 and #11 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.
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. 6. If the position of the sound marker is incorrect, readjust Trap Coil #12.

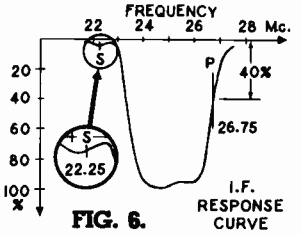


FIG. 6.

The 26.75 Mc. picture IF carrier marker should now appear at the 40% amplitude position on side of the band pass characteristic (see Fig. 6). If position of the marker appears too high or too low, slight readjustment of slugs #7, 8 and 9 is required.

STROMBERG-CARLSON

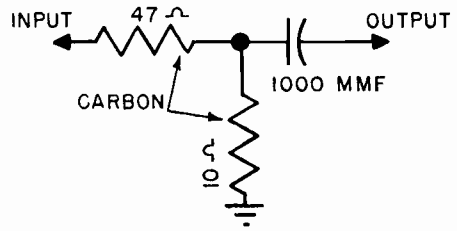
116 SERIES TELEVISION RECEIVER

116C 116T 116RP

The circuit diagram on pages 168 and 169 covers receivers 116C and 116T. The 116RP is almost identical to these except for the switch arrangement for a separate AM-FM radio and phono player. The 17-Series television receivers (17, 17RP, and 17RP2) are identical to the 116-Series, but use 17-inch picture tubes. Material on changes made in various production runs is included on page 170.

Alignment of the "Quadruple".

1. Set the contrast control at the maximum contrast position.
2. Apply an external of approximately —3V D.C. to the AGC line at the junction of R-119, 100 ohms, R-73, 27,000 ohms, and C-7, 10 MF.
3. Connect the oscilloscope to the grid of the video amplifier, pin 4 of V-8 (6AC7). The lead used for this connection should be a low capacity type shielded cable. A 47,000 ohm isolating resistor at the input end of the cable is advisable to minimize disturbances caused by I.F. energy pickup on the cable. Failure to observe this precaution may result in incorrect alignment of the receiver.
4. Connect the output of the sweep generator to the grid of the 1st I.F. amplifier V-12 (6BH6) thru the network shown below.



The 47 ohm and 10 ohm resistor network is recommended to give proper terminaton to the generator output cable and also to provide a low grid to ground impedance to minimize feedback from other receiver circuits.

5. Adjust the gain of the scope and the signal input to produce a 2 volt peak to peak output on the oscilloscope screen. This level of output should be maintained throughout the alignment procedure by re-adjusting the bias and/or the input.
6. Adjust the 21.9 mc. trap L-2 so that the 21.9 marker is coincident with the valley of the trap as shown in Fig. 1.
7. The 21 mc. L-5 trap may then be adjusted (without using a marker) to give the response curve the approximate shape as shown in Fig. 1. The response between the 21.9 mc. and 21 mc. should be kept at a minimum.
8. The tuning slugs are identified in accordance with their approximate frequency settings as follows:

   No. 1 — 1st I.F. Plate coil, T-9 hi-hi frequency.
   No. 2 — 2nd I.F. Plate coil, T-10 hi-lo frequency.
   No. 3 — 3rd I.F. Plate coil, T-11 lo-lo frequency.
   No. 4 — 4th I.F. Plate coil, T-12 lo-hi frequency.

   Maintaining these relative frequency positions, the slugs should be set to produce a curve approximately as shown below with 26.4 mc. and 22.7 mc. markers at the 70% response.

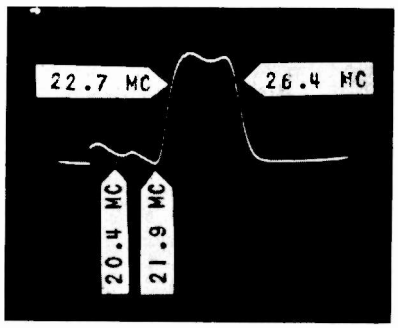
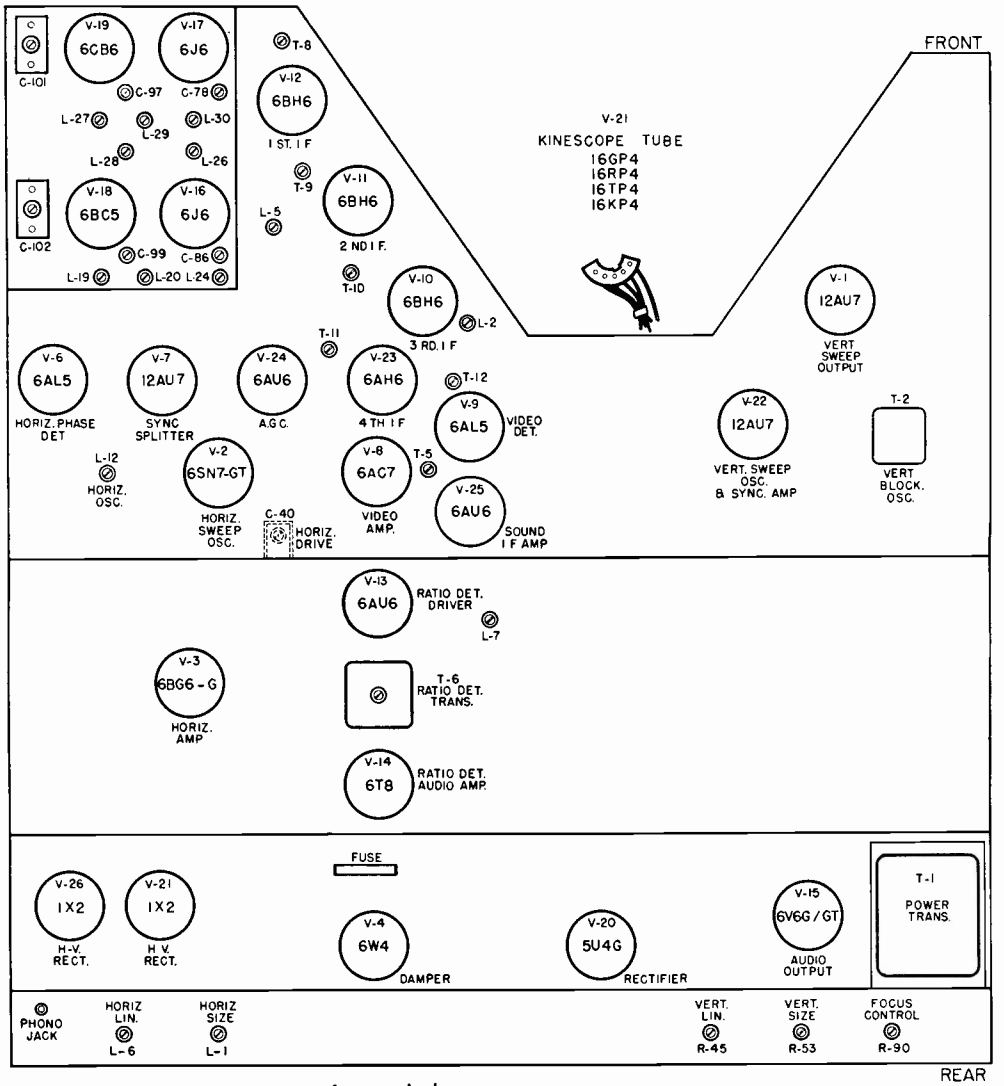


FIG. 1

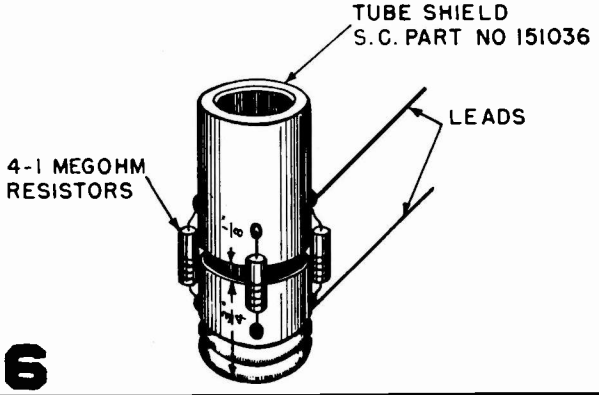
Alignment of the Double-Tuned Stage.

1. The band switch is turned to the Lo Band position and the external bias is still applied to the AGC bus.

116-SERIES TUBE LOCATION AND TRIMMER CHART



2. The output from the sweep generator is coupled into the plate of the Lo Band converter tube V-17, 6J6, by means of the special tube shield. This special shield is constructed by cutting tube shield SC No. 151036 in two, ¾" from the base. Separate the two pieces by ⅛" and secure by soldering 4-1 meg. ohm ½ watt carbon resistors to each part as shown below.



3. Adjust the primary L-26 and secondary T-8 of the double-tuned pair until the 26.4 mc. and 22.7 mc. markers are at 50% response as shown in Fig. 2.

4. It may be necessary to make slight adjustments on the "Quadruple" in order to achieve the desired response, but caution should be exercised to prevent complete mis-alignment.

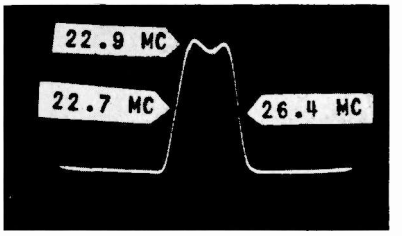
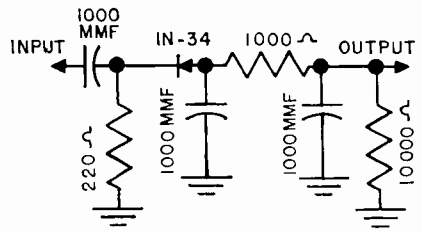


FIG. 2

Sound I.F. Alignment.

1. Apply an unmodulated 4.5 mc. signal to the grid of the video amplifier, pin 1 of V-9 (6AL5).



2. Adjust T-5, L-7, and the primary of the ratio detector transformer T-6 for maximum AGC voltage. This voltage is measured across the 5.0 MF electrolytic capacitor C-56 in the ratio detector diode circuit.
3. Adjust the secondary of the ratio detector transformer for zero voltage from the junction of R-79, 22K and R-80, 22K to the junction of C-58, .047 MF and R-78, 18K. This voltage in adjustment should pass thru zero between positive and negative swings on the VTVM.

The following photographs were taken from a Du Mont 208-B Oscilloscope, and were taken on a standard receiver, adjusted to give a normal picture.

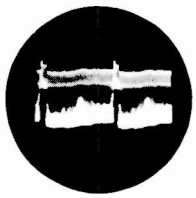


FIG. 3

Cathode of video detector (pin 1 of V-9-A, 6AL5) 50 volts peak-to-peak—60 cps.

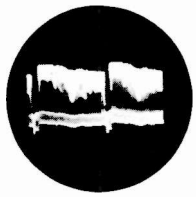


FIG. 4

Grid of Kinescope (pin 2 of V-5) 40 volts peak-to-peak—60 cps.

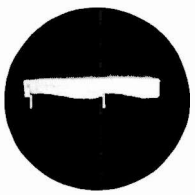


FIG. 5

Plate of sync clipper (pin 1 of V-7-B, 12AU7) 12 volts peak-to-peak—60 cps.

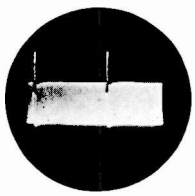


FIG. 6

Plate of sync amplifier (pin 6 of V-22-B, 12AU7) 20 volts peak-to-peak—60 cps.

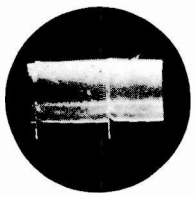


FIG. 7

Plate of sync splitter (pin 6 of V-7-A, 12AU7) 20 volts peak-to-peak—60 cps.

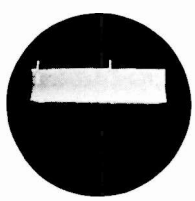


FIG. 8

Cathode of sync splitter (pin 8 of V-7-A, 12AU7) 20 volts peak-to-peak—60 cps.

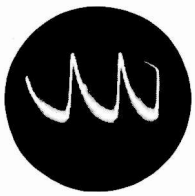


FIG. 9

Plate and cathode of horizontal phase detector (pin 1 or 2 of V-6, 6AL5) 13 volts peak-to-peak—15,750 cps.

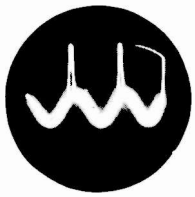


FIG. 10

Grid of horizontal sweep oscillator (pin 1 of V-2, 6SN7-GT) 43 volts peak-to-peak—15,750 cps.

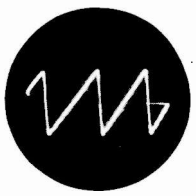


FIG. 11

Plate of horizontal sweep oscillator (pin 2 of V-2, 6SN7-GT) 80 volts peak-to-peak—15,750 cps.

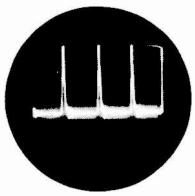


FIG. 12

Plate of AGC (pin 5 of V-24, 6AU6) 160 volts peak-to-peak—15,750 cps.

FIG. 13

Grid of vertical sweep oscillator (pin 2 of V-22-A, 12AU7) 150 volts peak-to-peak—60 cps.

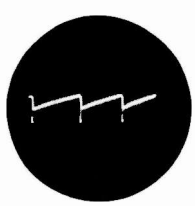
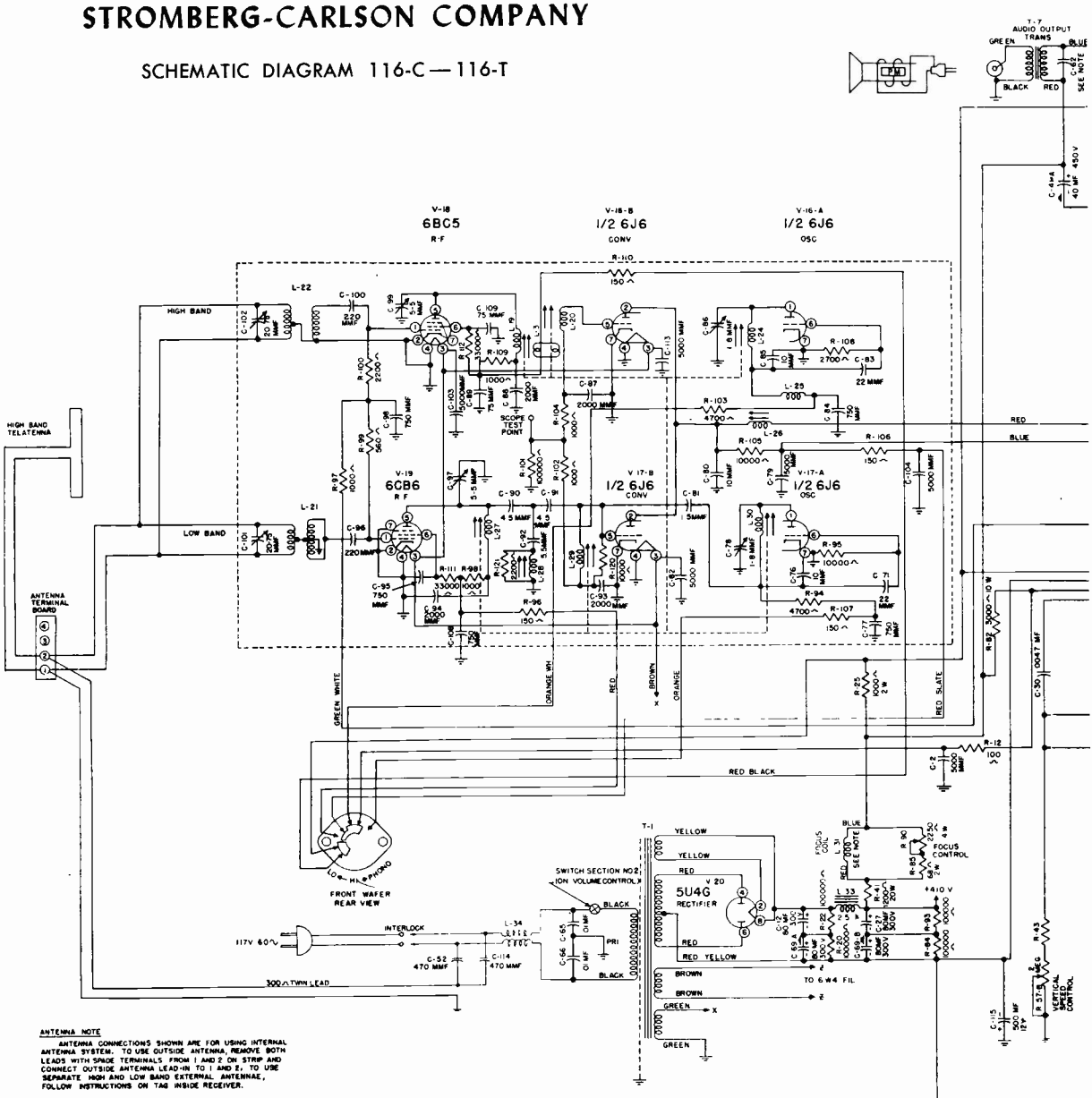


FIG. 14

Plate of vertical sweep oscillator (pin 1 of V-22-A, 12AU7) 85 volts peak-to-peak—60 cps.

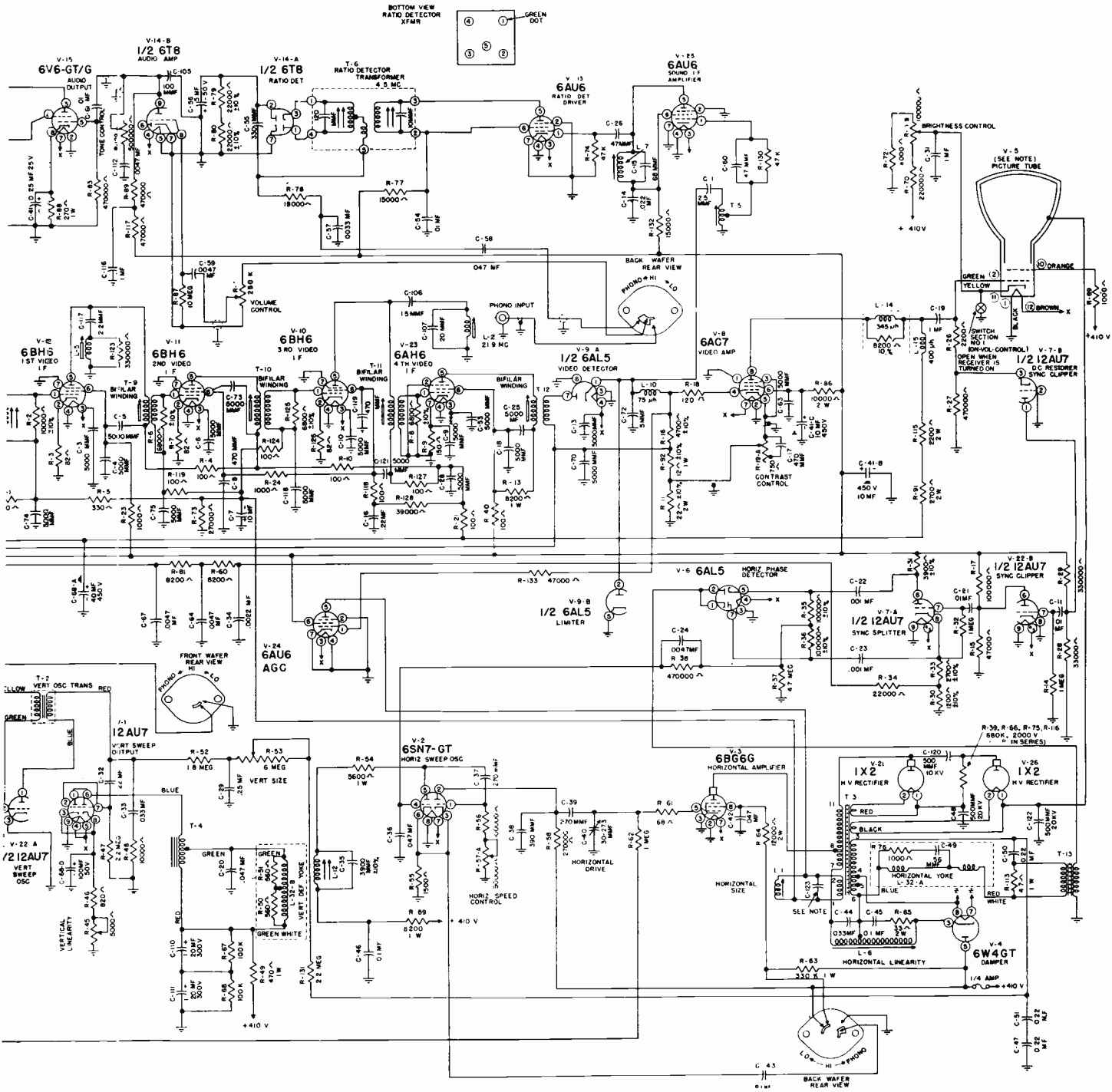
STROMBERG-CARLSON COMPANY

SCHEMATIC DIAGRAM 116-C — 116-T



Horizontal Phase Detector Circuit Modifications.

Coil T13 has been removed. R-113 is not used, and direct connection is made across. C50 has one side connected to Hor. Yoke that went to T13 before. C47 and C51 is series replaced by a single .068 mfd. capacitor. This capacitor connects to ground through a 33-ohm resistor. The feed connection to the No. 1 and 2 pins of 6AL5 Phase Detector now connects to the junction of the .068 mfd. capacitor and 33-ohm resistor.



NOTES:
1- C-62 IS .01 MF-600 V (110555) IN 116T (112110) AND .0047 MF-600 V (110553) IN 116C (112109) AND 17 (112116)
2- C-123 IS 7500 MMF-500 V (110287) IN 116C (112109) AND 3900 MMF-500 V (110272) IN 116T (112110) AND 17 (112116)
3- PICTURE TUBE IS 16GP4 (162089) IN 116C (112109) AND 16RP4, 16KP4 OR 16TP4 (162091) IN 116T (112110) AND 17AP4 (162097) IN 17 (112116)
4- FOCUS COIL IS 114683 OR 114687, DEPENDING ON PICTURE TUBE TYPE
5- RANGE SWITCH SHOWN IN MIDDLE (HIGH BAND) POSITION, WITH CONTROL TERMINALS TOWARD BOTTOM

MODEL 116 and 17 SERIES RECEIVERS — 6SN7GT Tube Type Substitutions for 12AU7 Type.

Chassis of recent production have been fitted with octal sockets to employ 6SN7GT tubes in the three positions where 12AU7 tubes were previously used.

Specifically, these three positions are the (1) V7-DC Restorer and Sync Clipper Stage, (2) the V22-Sync Clipper and Vertical Sweep Oscillator Stage, and (3) the V1-Vertical Sweep Output Stage. No circuit modifications were required to accommodate the 6SN7GT tubes in these positions except the necessary wiring revisions to the correct terminals of the octol sockets.

MODEL 17 SERIES RECEIVERS — Resistor Deletions.

The following resistors have been deleted in chassis of current production:

1. R37, the 4.7-megohm resistor in the V6, 6AL5, Horizontal Phase Detector Circuit has been removed.
2. R69, the 1000-ohm resistor in series with the screen supply to the kinescope tube has been removed.
3. R18, the 120-ohm resistor in the grid circuit of the V8, Video Amplifier, hos been removed.

MODEL 116 AND 17 SERIES RECEIVERS — Picture Blooming.

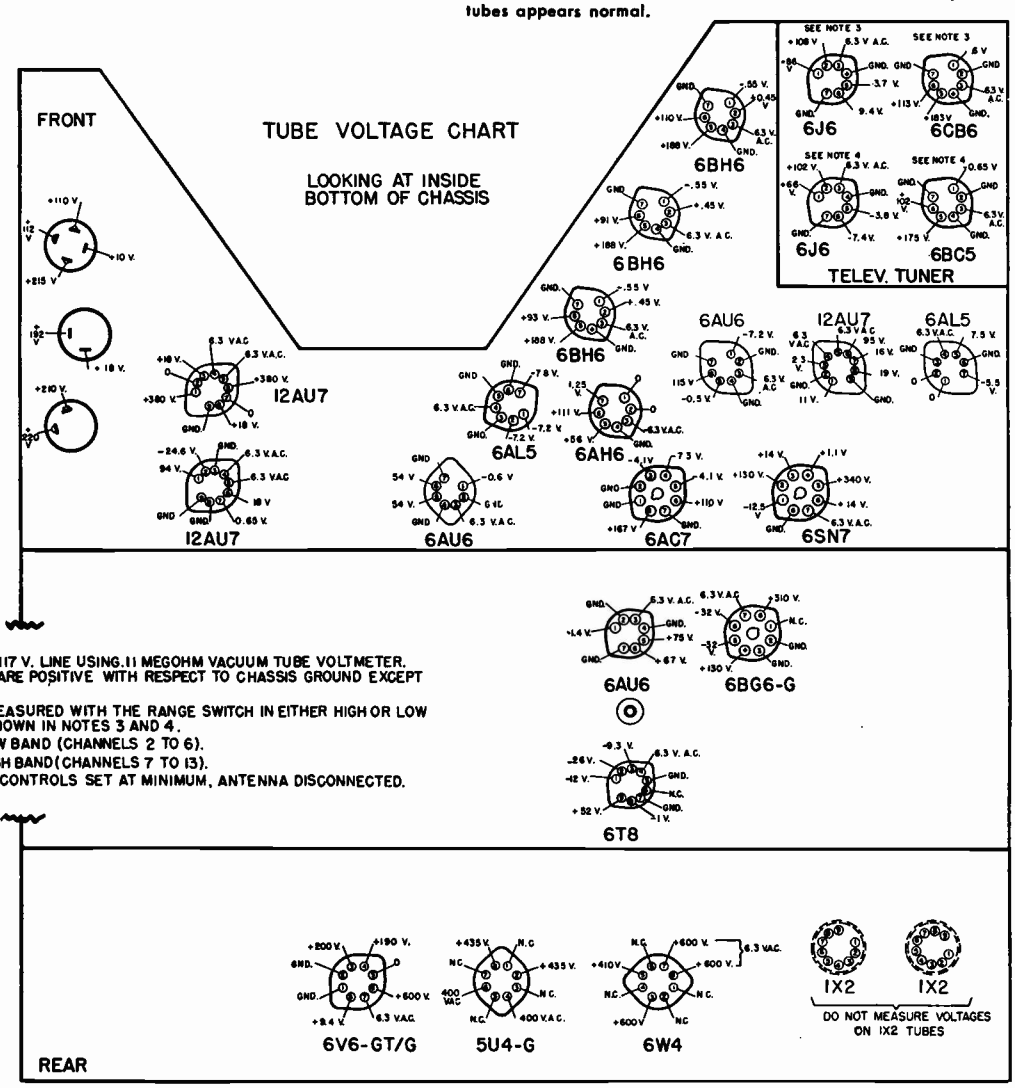
To reduce "picture blooming" when the brightness control is advanced, a 100,000-ohm, ½-watt resistor can be inserted in series with the picture tube cathode lead, at the tap arm of the brightness potentiometer R19-B. This modification is being made in current production of these receivers and the R72, 18,000-ohm resistor is being removed so that the end of the potentiometer now connects directly to ground.

MODEL 16 AND 116 RECEIVERS — Increased Frequency Stability of the Horizontal Sweep Oscillator.

The R59 Resistor in series with the B plus supply lead to the No. 5 pin of the 6SN7GT (V2) Horizontal Sweep Oscillator Tube has been increased from 2200-ohm, 1-watt value to 8200-ohm, 1-watt value (SC Part No. 37200). This increased value lowers the voltage on the No. 5 pin about 50-75 volts with increased stability of this oscillator section. Also, 8200-ohm, 2-watt resistors (SC Part No. 149054) or 10,000-ohm, 2-watt resistors (SC Part No. 149276) are permissible substitutions in this position.

MODEL 16, 117, and 17 SERIES RECEIVERS — Horizontal Picture Pulling or Kinking.

Recent field reports suggest that horizontal picture pulling, picture kinking, and critical action of the horizontol hold control can often be corrected by replacing the 6AH6 tube in the 4th I.F. stage. Other than these symptoms, the operation of the foulty 6AH6 tubes appears normal.

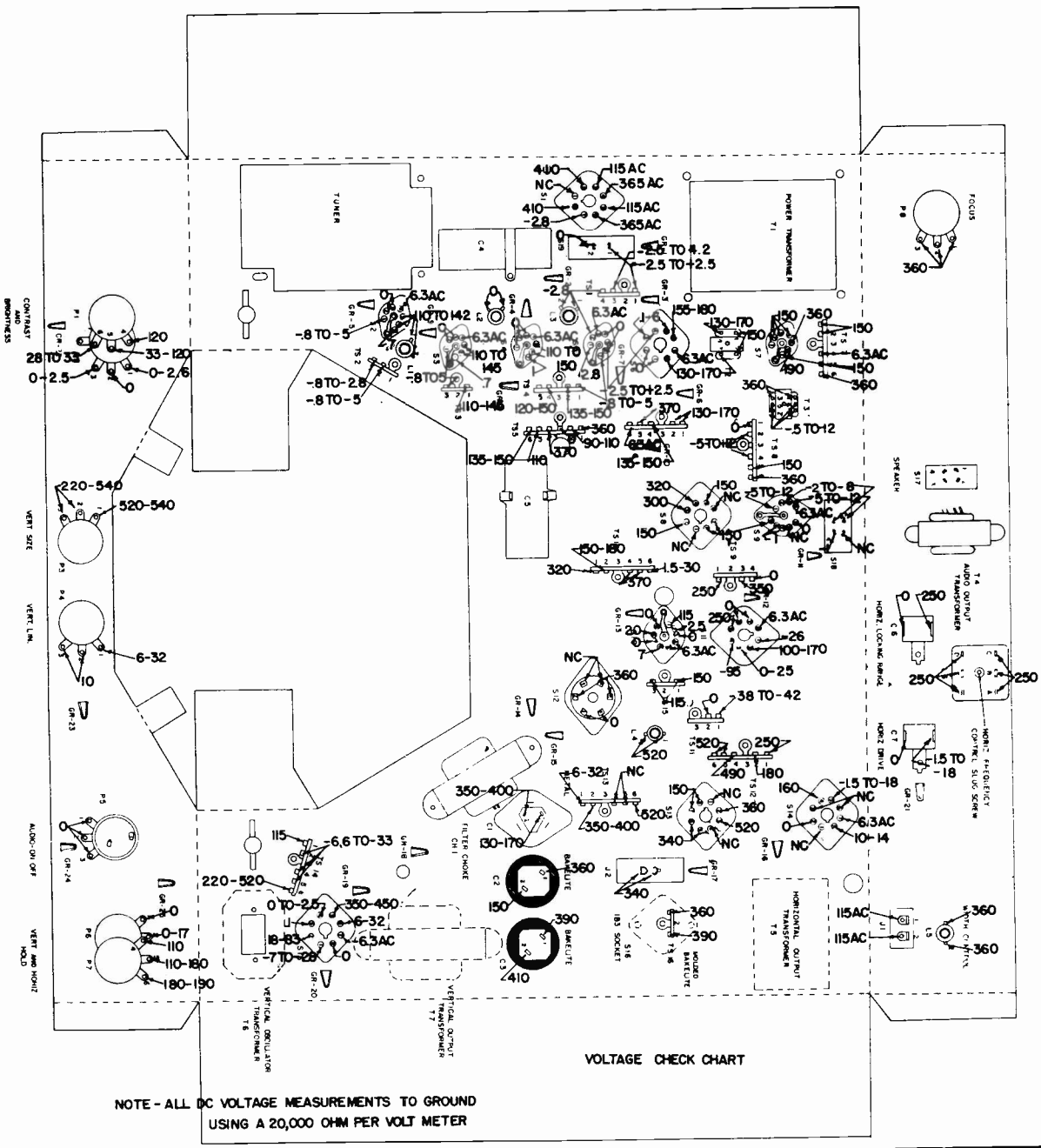


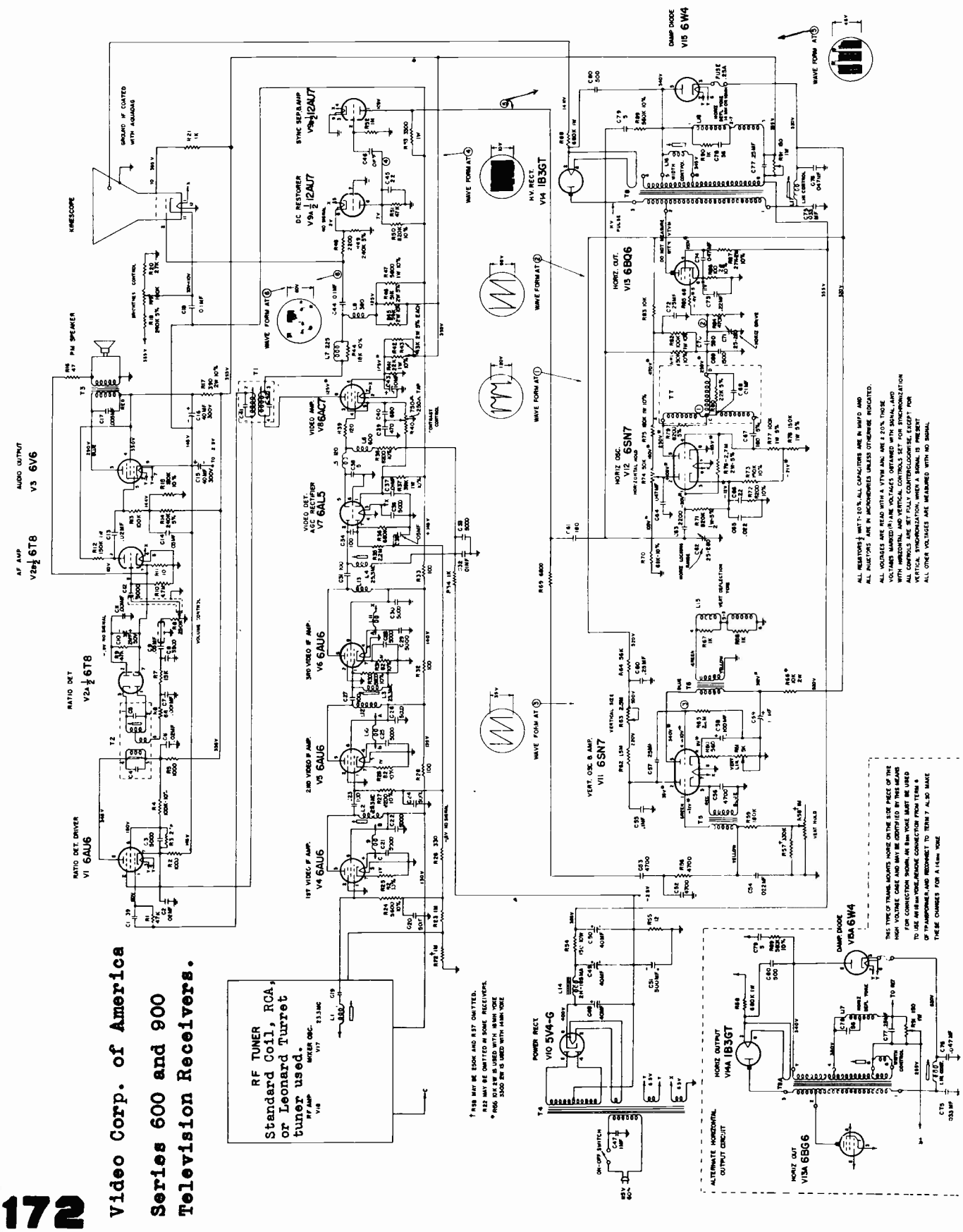
NOTES:
1- MEASUREMENTS ARE MADE AT 117 V. LINE USING 11 MEGOHM VACUUM TUBE VOLTMETER. ALL VOLTAGES ARE D.C. AND ARE POSITIVE WITH RESPECT TO CHASSIS GROUND EXCEPT WHERE NOTED.
2- ALL VOLTAGES, SHOWN, ARE MEASURED WITH THE RANGE SWITCH IN EITHER HIGH OR LOW BAND POSITION EXCEPT AS SHOWN IN NOTES 3 AND 4.
3- VOLTAGES SHOWN ARE FOR LOW BAND (CHANNELS 2 TO 6).
4- VOLTAGES SHOWN ARE FOR HIGH BAND (CHANNELS 7 TO 13).
5- CONTRAST AND BRIGHTNESS CONTROLS SET AT MINIMUM, ANTENNA DISCONNECTED.

Video Corporation of America

Series 600 & 900

Circuit diagram is on page 178. Several different tuners have been used with these sets. The circuits of these tuners may be found in the description of other sets.




Video Corp. of America
Series 600 and 900
Television Receivers.
RF TUNER
Standard Coil, RCA,
or Leonard Turret
tuner used.
KINESCOPE
AUDIO OUTPUT V3 6V6
AF AMP V2½ 6T8
RATIO DET V2½ 6T8
RATIO DET. DRIVER V1 6AU6
1ST VIDEO IF AMP. V4 6AU6
2ND VIDEO IF AMP. V5 6AU6
3RD VIDEO IF AMP. V6 6AU6
VIDEO DET. AGC RECTIFIER V7 6AL5
VIDEO AMP. V8 6AC7
DC RESTORER V9a ½ 12AU7
SYNC SEP. & AMP. V9b ½ 12AU7
H.V. RECT. V14 1B3GT
HORIZ. OUT. V13 6BQ6
HORIZ. OSC. V12 6SN7
VERT. OSC. & AMP. V11 6SN7
DAMP DIODE V15 6W4
POWER RECT. V10 5V4-G
HORIZ OUTPUT V14A 1B3GT
DAMP DIODE V15A 6W4
HORIZ OUT V13A 6BQ6
ALTERNATE HORIZONTAL OUTPUT CIRCUIT
WAVE FORM AT
ALL RESISTORS ½ WATT ± 20%, ALL CAPACITORS ARE IN MMFD AND ALL INDUCTORS ARE IN MICROHENRIES UNLESS OTHERWISE INDICATED.
ALL VOLTAGES ARE READ WITH A VTVM AND ARE ± 20% THOSE VOLTAGES MARKED (*) ARE VOLTAGES OBTAINED WITH SIGNAL AND WITH NORMAL CONTRAST AND BRIGHTNESS CONTROL ADJUSTMENT.
ALL CONTROLS ARE SET FULLY COUNTERCLOCKWISE, EXCEPT FOR VERTICAL SYNCHRONIZATION WHEN A SIGNAL IS PRESENT.
ALL OTHER VOLTAGES ARE MEASURED WITH NO SIGNAL.
THIS TYPE OF TRANS. MOUNTS HORIZ ON THE SIDE PIECE OF THE HIGH VOLTAGE CAGE AND MAY BE IDENTIFIED BY THIS MEANS
FOR CONNECTION SHOWN AT 8mm YOKE MUST BE USED
TO USE AN 18 mm YOKE, REMOVE CONNECTION FROM TERM 9 OF TRANSFORMER, AND RECONNECT TO TERM 7 ALSO MAKE THESE CHANGES FOR A 14mm YOKE

TRAV-LER RADIO CORPORATION

Models 12L50, 14B50, 14C50, 16G50, 16R50, 16R70, 16T50, and 19A50.

The alignment information presented applies to all of these models. The schematic diagram shows Models 16R50 and 16T50. Model 16R70 is exactly the same except it also has a A.M. tuner and phonograph. The other models may use other size picture tubes and differ only in the output sections to a minor degree. This material, therefore, may be used by the serviceman for all these models.

CHASSIS REMOVAL FOR SERVICE ADJUSTMENTS.

1. Disconnect the cabinet antenna or outside antenna leads from the cabinet antenna terminals.
2. Remove rear cabinet cover. Note that the line cord inter-lock connector is part of the rear cover and disconnects power to the chassis when this cover is removed. A substitute line cord must be provided if the set must be turned on for service adjustments.
3. Disconnect the five connectors supplying power to the deflection yoke, focus coil, picture tube base connector, second anode, and speaker.
4. Remove the wood screws holding the antenna terminal strip bracket to the cabinet.
5. Remove the two front panel control knobs.
6. Remove four chassis bolts holding chassis to cabinet and slide chassis out rear of cabinet.

Caution:—When reinstalling the chassis in the cabinet, remove the metal front trim panel first. Reinstall the panel and line up the chassis however, before replacing the chassis bolts.

ALIGNMENT INSTRUCTIONS

Check other possible causes carefully before considering realignment. The following adjustments rarely require attention and alignment should not be attempted unless the circuits are definitely known to be out of adjustment and suitable equipment is available to make these adjustments.

Refer to Fig 10. for location of alignment adjustments. Refer to Fig. 11. or the schematics for location of the test points indicated by the circled letters in the following chart.

PRESETTING IF AMP. COILS TO FREQUENCY

Connect the negative lead of a 3-volt battery at point (B) shown on the voltage chart or schematic diagram; connect the positive lead to the chassis. Couple the signal generator to the *1st* IF grid coil (L-13A) as shown in Fig. 4. Set the receiver for channel 10 to avoid local oscillator effects.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
Direct	To 1st IF grid coil (L-13A) See Fig. 4	22.9 Mc. (Unmod.)	10	DC probe to point (A). Common to chassis.	L-13A	Adjust for max. voltage. Set signal generator for approx. 2 V. DC at VTVM.
"	"	24.4 Mc	"	"	L-13B	"
"	"	26.4 Mc	"	"	L-13C	"
"	"	23 Mc	"	"	L-13D	"
"	"	25.9 Mc	"	"	L-13E	"

CAUTION—Setting the IF amplifier coils to frequency as described above does not completely align the IF amplifier stages. The overall response must be checked and adjusted as described below, to complete the alignment.

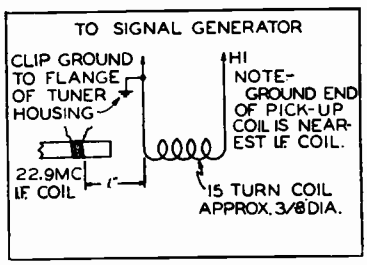


FIG. 4. Coupling Detail For IF Alignment

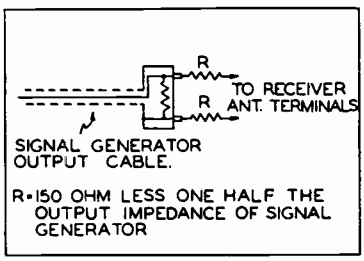


FIG. 5. Dummy Antenna Detail

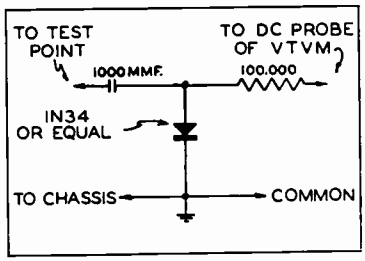


FIG. 6. Diode Detector Detail

Trav-ler Models 12L50, 14B50, 14C50, 16G50, 16R50, 16R70, 16T50, 19A50

OVERALL IF AMP. RESPONSE CHECK

Connect the synchronized sweep voltage from the sweep signal generator to the horizontal input of the oscilloscope for horizontal deflection.

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
Direct	To 1st IF grid coil (L-13A). See Fig. 4.	24 Mc (10 Mc sweep)	21.75 Mc 26.25 Mc	10	Vertical amplifier to point (A) Common to chassis.		Check for response curve similar to Fig. 7 with markers as shown. It is generally necessary to retouch settings of L-13A thru E for proper response. The dip or valley between peaks should not exceed 30%. Note that the adjustment of L-13A balances up the peaks of the curve while the remaining adjustments shape the skirts of the curve.

SOUND IF AMP ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
Direct	High side to point (A). Low side to chassis.	4.5 Mc (Unmod.)	Any channel unused locally.	DC probe to point (C). Common to chassis.	L-16A and top and bottom adjustments of L-17.	Adjust for max. voltage at VTVM.
"	"	"	"	DC probe to point (E). Common to chassis.	Adjust top slug of L-17.	Adjust for zero voltage. A positive and negative reading will be obtained on either side of the correct setting.

CHECK ON SOUND IF AMP ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
Direct	High side to point (A). Low side to chassis.	4.5 Mc (500 Kc sweep)	4.45 Mc 4.5 Mc 4.55 Mc	Any channel unused locally.	Vertical amplifier input to point (E). Common to chassis.	L-17	Touch up the adjustments of L-17 maintaining max. amplitude while adjusting for max. steepness and straightness of the slope. See Fig. 8. Note that the 4.5 Mc marker pip tends to disappear as the correct setting of the top adjustment of L-17 is reached.

4.5 MC TRAP ADJUSTMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
Direct	High side to point (A). Low side to chasis.	4.5 Mc (Unmod.)	Any channel unused locally.	AC probe to cathode of picture tube. (Pin 11.) Common to chassis.	L-16B	Adjust for minimum voltage. A crystal detector shown in Fig. 6 may be used with the VTVM in place of a commercial AC probe if desired.

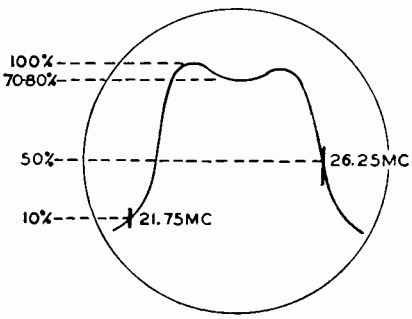


FIG. 7.

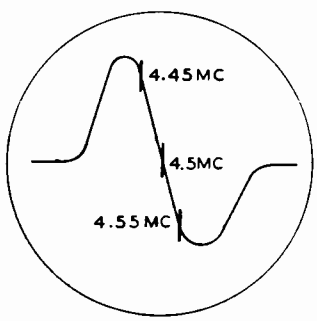
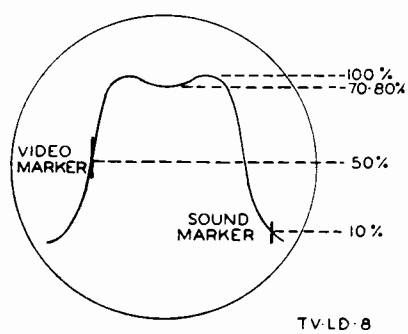


FIG. 8.

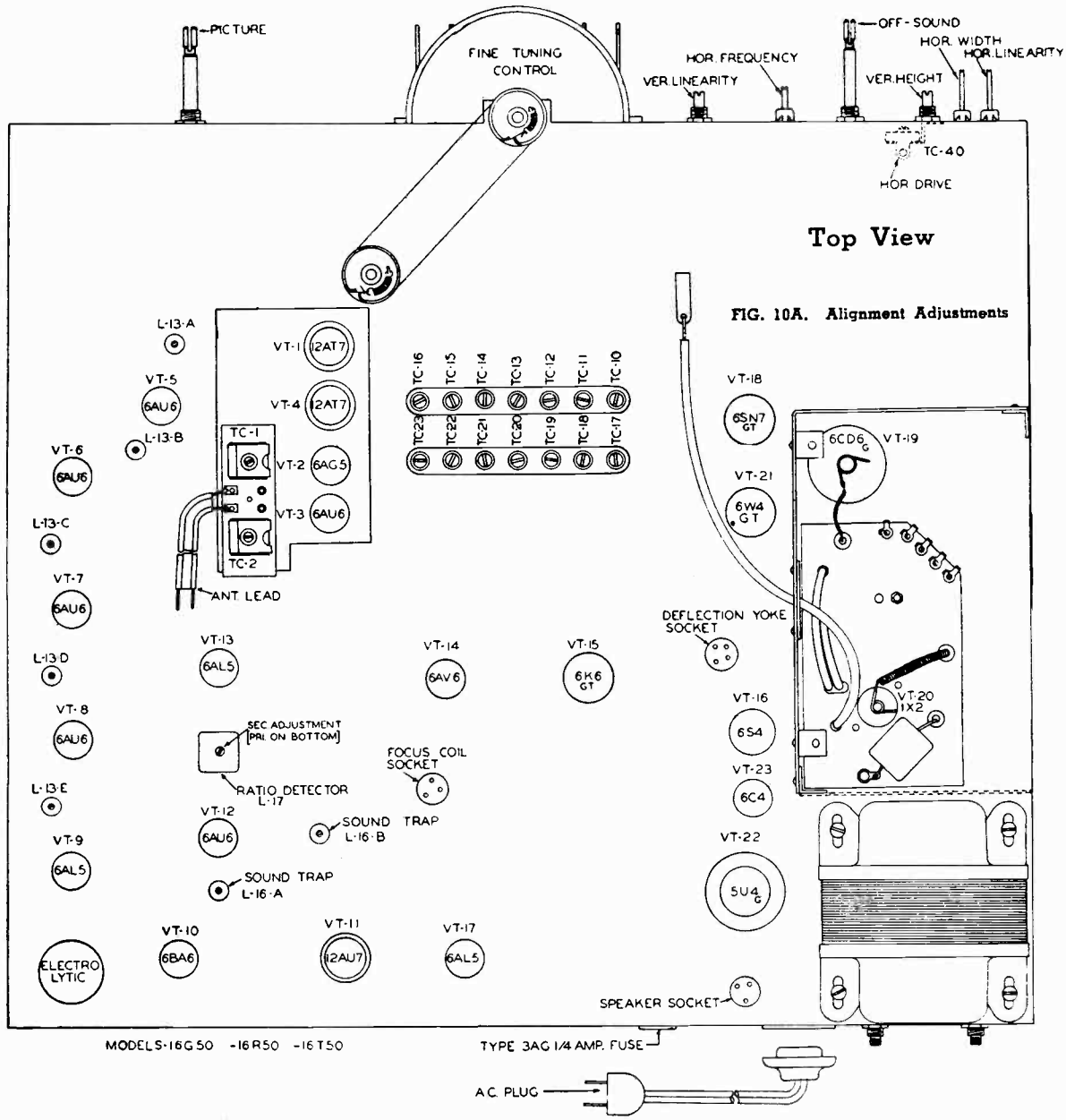


TV-LD-8

FIG. 9.

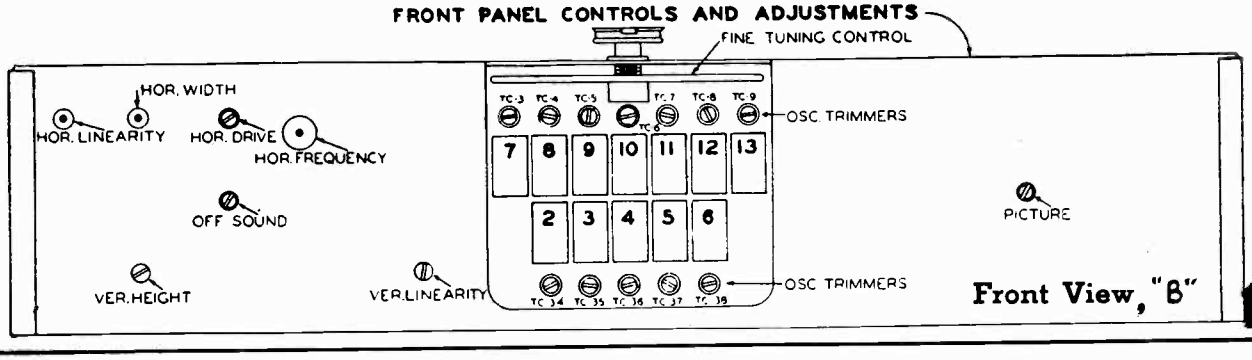
Trav-ler Models 12L50, 14B50, 14C50, 16G50, 16R50, 16R70, 16T50, 19A50

Alignment Information Continued



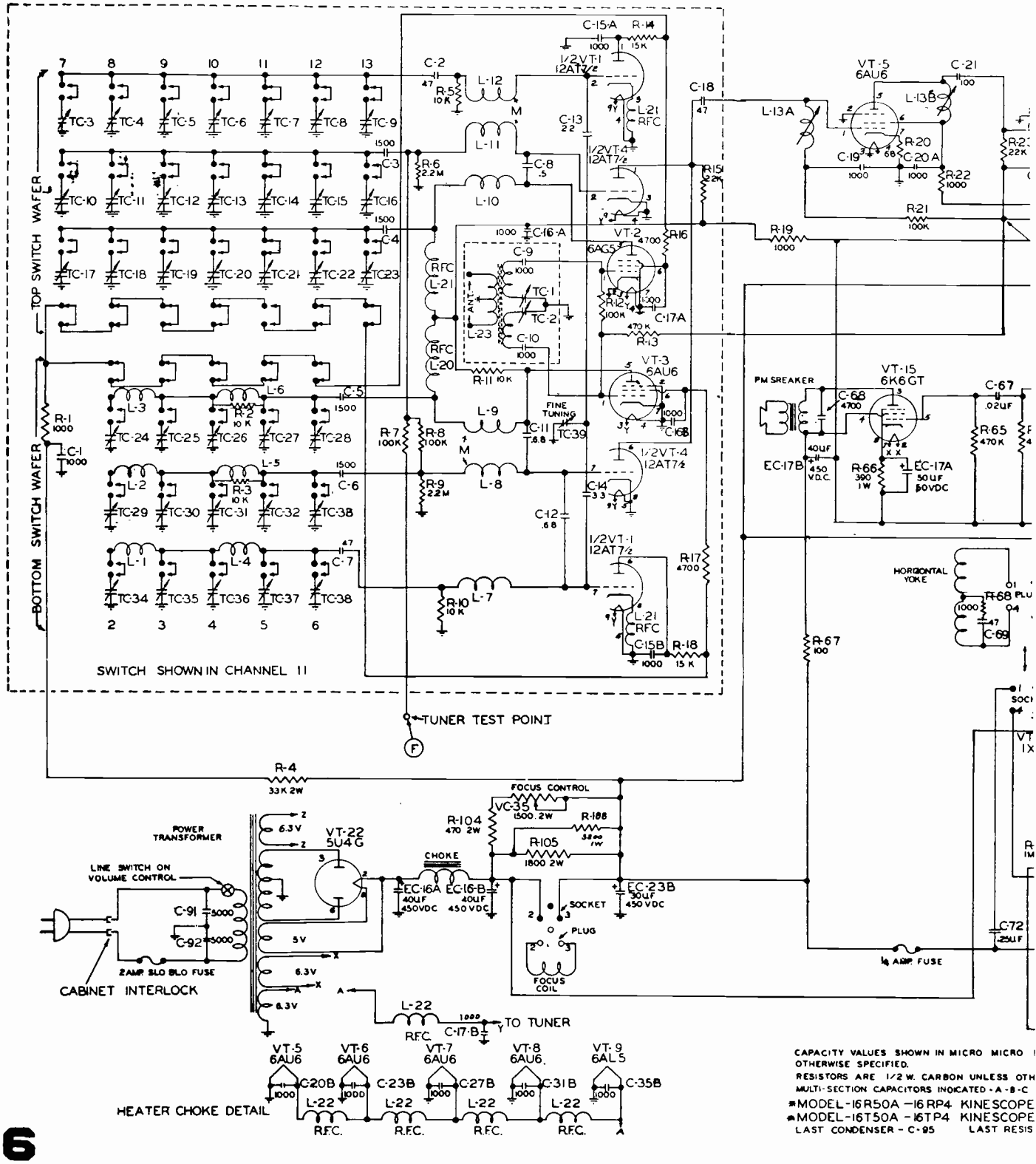
Top View

FIG. 10A. Alignment Adjustments



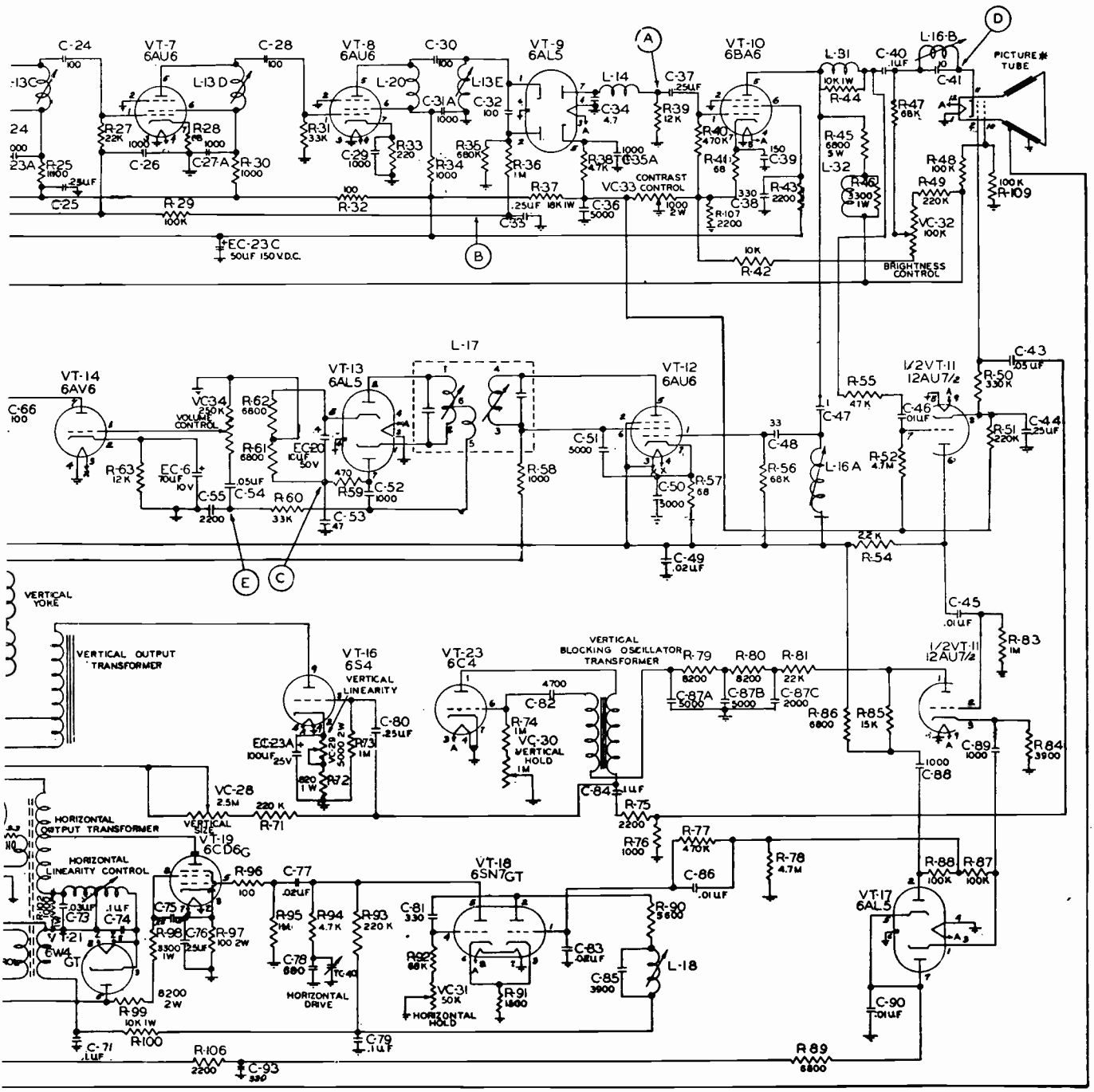
Front View, "B"

TRAV-LER TELEVISION SCHEMATIC DIAG



\M - MODELS 16R50 or 16T50

TRAV-LER



MODELS 16R50 OR 16T50
110-125V. 60 CYCLES A.C. ONLY

TRAV-LER RADIO CORP.
CHICAGO ILL. ORLEANS IND.

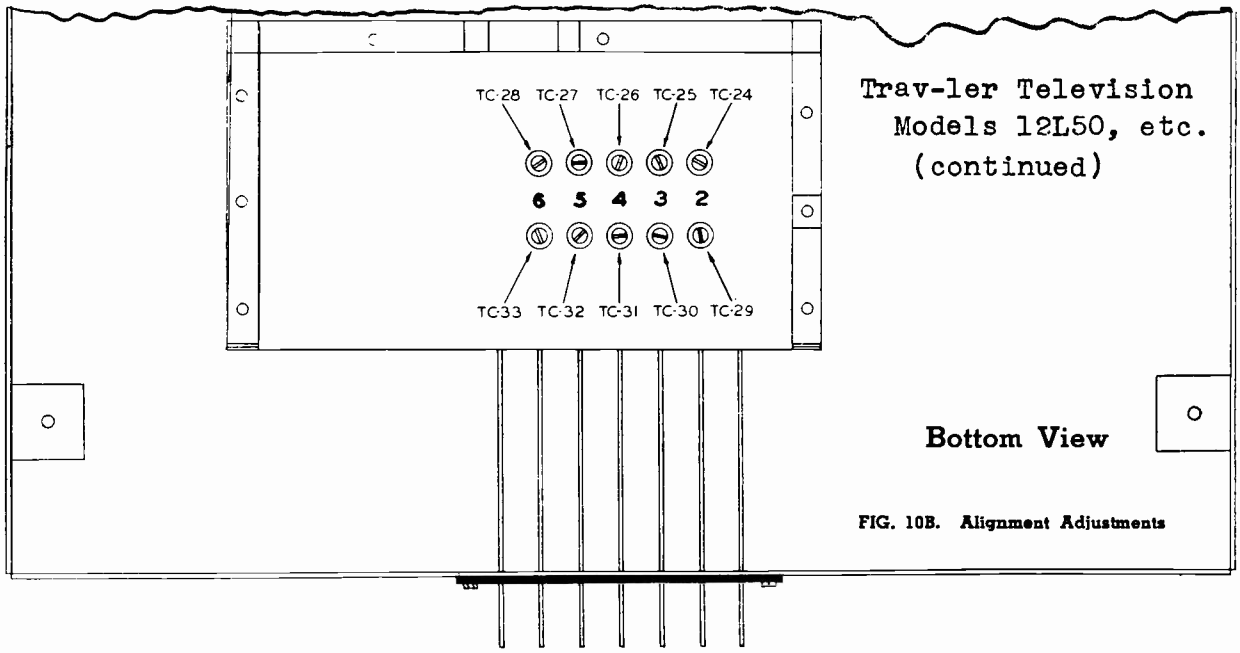


FIG. 10B. Alignment Adjustments

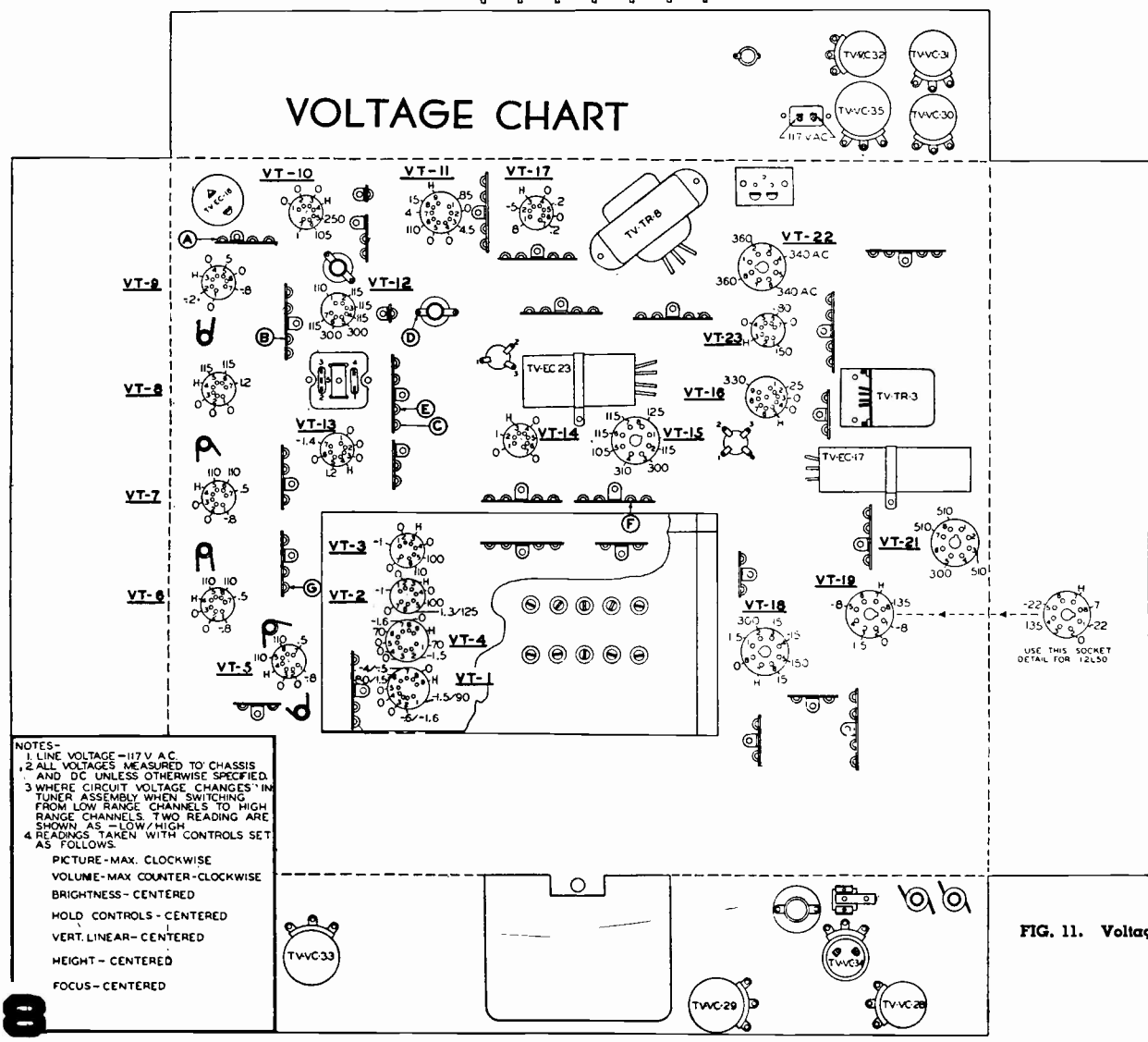


FIG. 11. Voltage Chart

Westinghouse Electric Corporation

MODELS H-633C17 (MAHOGANY) AND H-634C17 (BLOND)

CHASSIS ASSEMBLY V-2173:

V-2158-3A I-F CHASSIS
V-2162-4 SWEEP CHASSIS
V-2163 AM/FM TUNER CHASSIS

Model H-638K20 (Chassis Assembly V-2178) and Model H-643K16 (Chassis Assembly V-2179) are almost the same as the models covered by this material, but do not have AM/FM tuners.

Centering—Centering is accomplished by varying the position of the magnetic ring that is located between the plates of the focalizer. This adjustment is performed by moving the centering lever horizontally and vertically until the picture is centered and there are no "neck shadows" on the face of the CRT. If "neck shadows" are difficult to eliminate, make certain that the neck of the CRT is centered in the focalizer. To do this, remove the focalizer from the mounting bracket, and adjust the length of the stabilizer strap which extends from the CRT strap to the superstructure for true centering. Then replace the focalizer.

Focus—Focusing is accomplished by adjusting the threaded slug that is located in the upper right quadrant of the focalizer. A non-magnetic screwdriver is required for the adjustment.

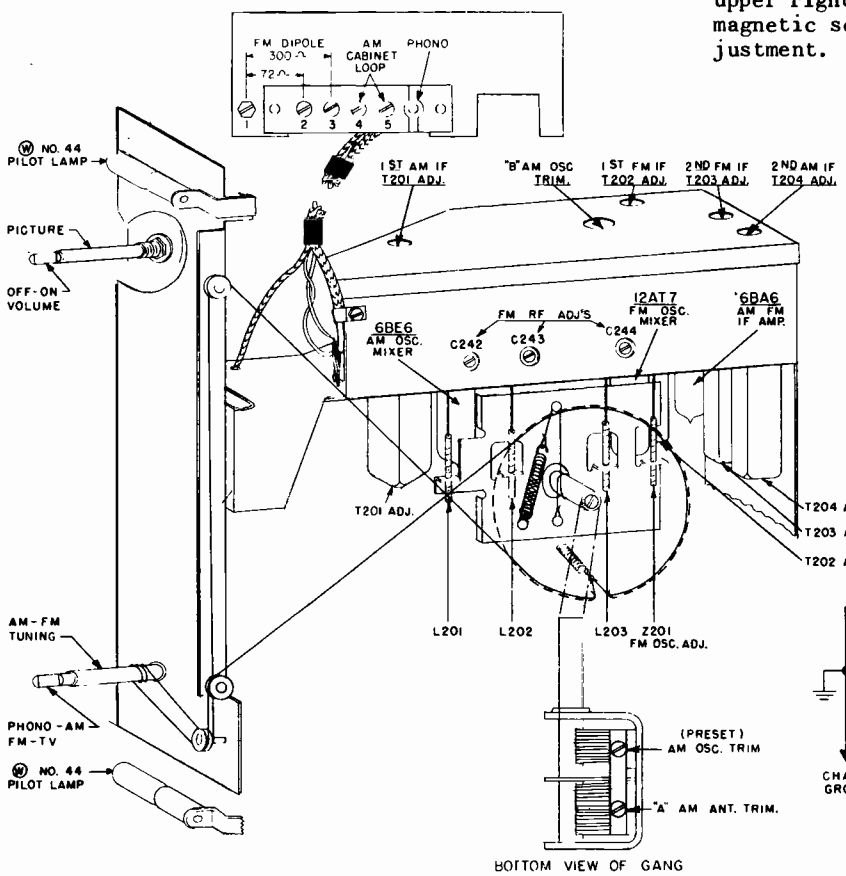


FIG. 4—V-2163-1 CHASSIS ADJUSTMENTS AND DRIVE STRINGING

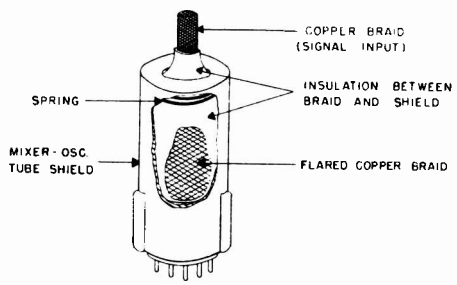


FIG. 2—COUPLING SIGNAL GENERATOR TO TV MIXER TUBE

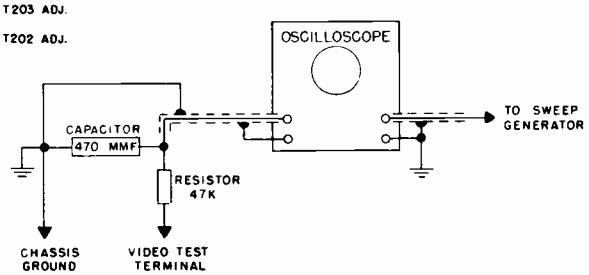


FIG. 3—OSCILLOSCOPE CONNECTIONS

Westinghouse Electric Models H-633C17 and H-634C17 Alignment Procedure

AM RADIO SECTION

Set the selector switch to the "AM" position.

Connect an output meter across the speaker voice coil.

While making the following adjustments, keep the volume control set for maximum output, the tone control set for maximum treble, and the signal generator output attenuated to avoid AVC action.

Step	*Connect Signal Generator to —*	*Sig. Gen. Freq.*	*Radio Dial Setting*	*Adjust for Max. Output —*
1.	Stator of AM ant. section (C239A) of tuning gang through a 0.1 mfd capacitor	455 kc. amplitude modulated	minimum capacity	Primary and secondary of T201 and T204
	Note: If the I-F transformers are badly mis-aligned, it may be necessary to connect the signal generator through a 0.1 mfd capacitor to the control grid of the 6BA6 I-F amp. and adjust the pri. and sec. of T204 for maximum output before attempting step 1.			
2.	Same as step 1	1615 kc. amplitude modulated	minimum capacity	AM osc. trimmer
3.	Radiated signal (no actual connection)	1400 kc. amplitude modulated	tune for maximum signal	AM ant. trimmer (rock-in adjustment)

FM RADIO SECTION

If AM adjustments are required, do not align the FM circuits until the AM adjustments have been completed.

Step	*Connect Signal Generator to —*	*Sig. Gen. Freq.*	*Radio Dial Setting*	*Adjust —*
1.	Set the selector switch to the "TV" position.			
2.	Connect a VTVM between points "A" and "C" (shown on Fig. 8).			
3.	Video test terminal	4.5 mc. unmodulated	------	L207 and pri. of T205 for max.
4.	Connect VTVM between points "A" and "B" (shown on Fig. 8) with common lead to point "B".			
5.	Same as step 3	4.5 mc. unmodulated	------	Sec. of T205 for *zero* voltage
6.	Set the selector switch to the "FM" position, and re-connect the VTVM between points "A" and "C".			
7.	Ungrounded tube shield placed on 12AT7 FM osc-mixer tube	4.5 mc. unmodulated	maximum inductance	Pri. and sec. of T202 and T203 for max. voltage
8.	Ant. terminal #3 through a 300 ohm non-inductive resistor	98 mc. unmodulated	98 mc.	FM osc. slug (Z201) for maximum voltage
9.	Same as step 8	90 mc. unmodulated	tune for max. sig.	C242, C243, and C244 for max. voltage (rock-in)
10.	Same as step 8	105 mc. unmodulated	tune for max. sig.	L201, L202, L203 for max. voltage (rock-in)

TV SOUND SECTION

The TV sound and ratio detector alignment are accomplished by performing steps 1 through 5 of the FM RADIO SECTION.

Westinghouse Electric Models H-633C17 and H-634C17 Alignment Continued

TV COMMON I-F SECTION

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. 3.

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	Short across link between T101 and T301	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. 2.	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.

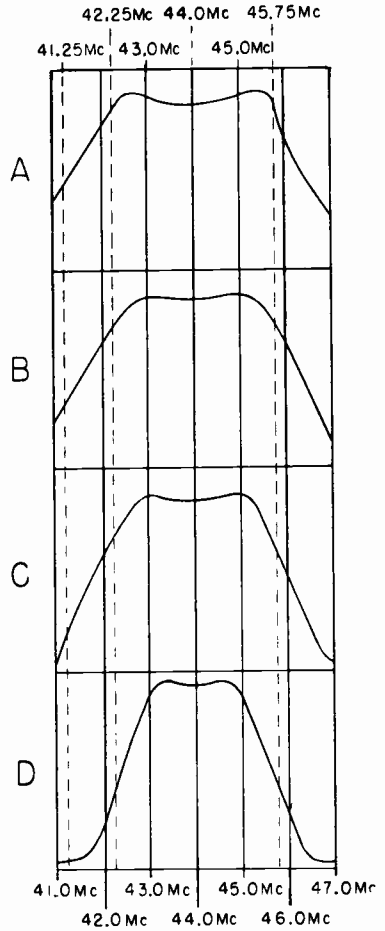


FIG. 5—RESPONSE CURVES AT VARIOUS STAGES OF ALIGNMENT

TV HIGH FREQUENCY OSCILLATOR

If the 6J6 oscillator tube is replaced, the different inter-electrode capacity of the new tube may change the oscillator frequency enough to necessitate realignment of the oscillator.

Alignment of the oscillator on the high band is accomplished by adjusting the brass slug located adjacent to the vernier drive wheel on the front of the tuner. Alignment of the oscillator on the low band is accomplished by adjusting the brass slug on the lower front of the tuner.

The oscillator alignment procedure is as follows:

1. Set the fine tuning control at the middle of its range, and leave it in this position during the following adjustments.

2. Set the selector switch to the highest of the low-band (channels 2 through 6) stations operating in your vicinity.

3. Peak the low band adjustment slug (L109) for the best picture detail.

4. Set the selector switch to the highest of the high-band (channels 7 through 13) stations operating in your vicinity.

5. Peak the high band adjustment slug (L110) for the best picture detail.

6. Check the previously made low band adjustment, and if the tuning has changed, repeat steps 2 and 3.

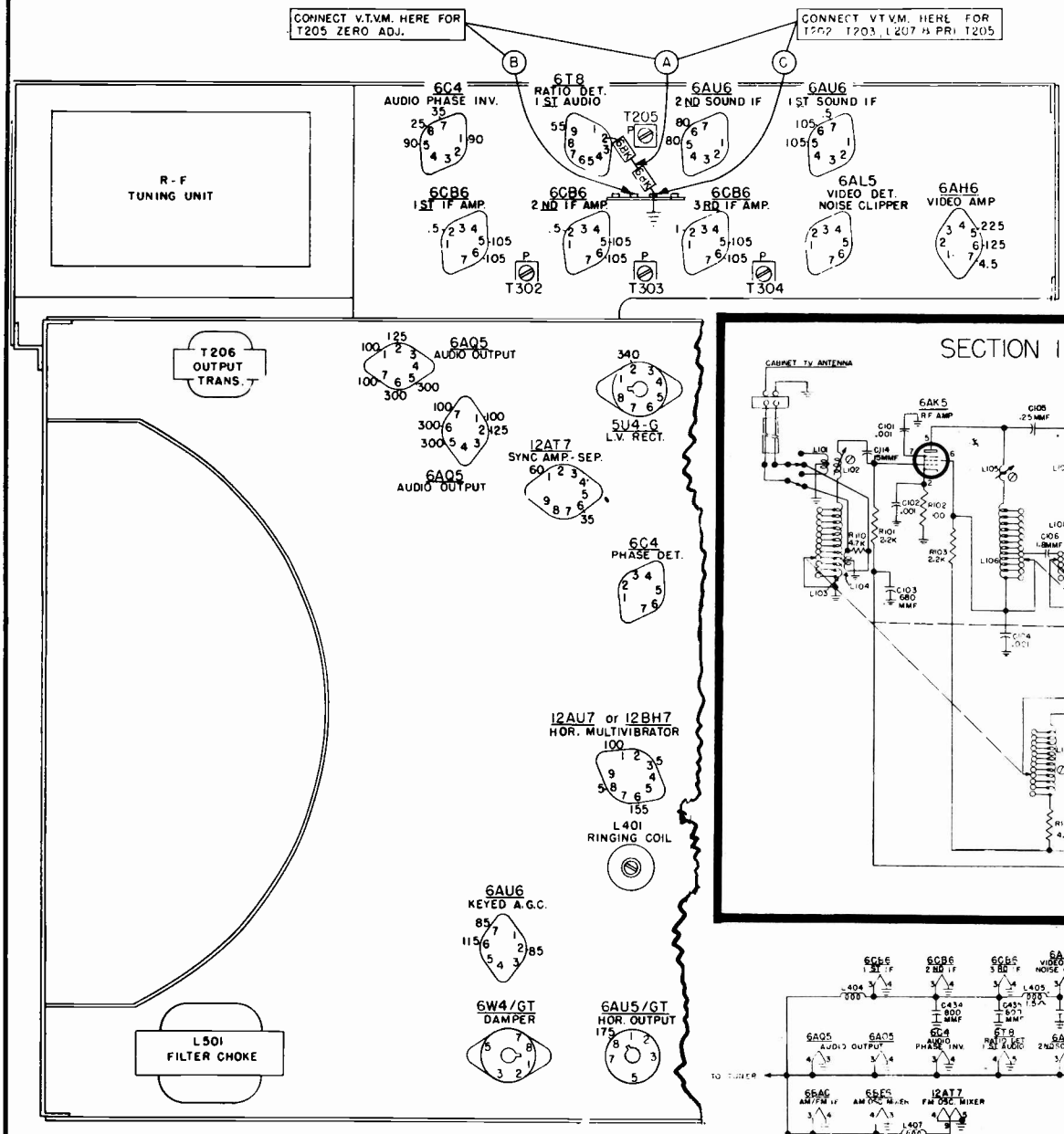


FIG. 8—BOTTOM VIEW OF MAIN CHASSIS

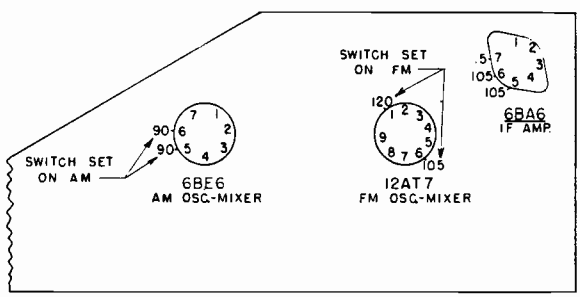
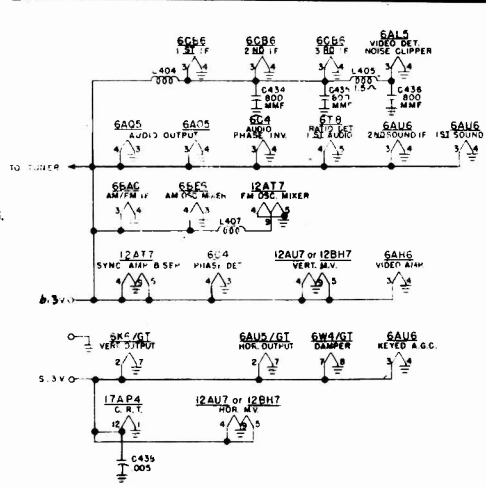


FIG. 7—BOTTOM VIEW OF V-2163 CHASSIS



NOTES:
1. VOLTAGES MEASURED FROM CHASSIS GROUND USING A 20,000 OHM/VOLT METER. LINE VOLTAGE 117 V.A.C. READINGS SHOULD BE AS SHOWN ± 20 PER CENT.
2. ALL CAPACITOR VALUES ARE SHOWN IN MFD UNLESS OTHERWISE SPECIFIED. ALL RESISTOR VALUES ARE SHOWN IN OHMS UNLESS OTHERWISE SPECIFIED.
3. IN EARLY PRODUCTION CHASSIS A FEW COMPONENTS WERE OF SLIGHTLY DIFFERENT VALUE THAN SHOWN. REPLACEMENT PARTS SHOULD BE OF VALUES SHOWN.
4. SOME CHASSIS ARE WIRED FOR 6SN7. INSERT SECTION SHOWS TUBE BASING
5. SELECTOR SWITCH SW201 IS SHOWN IN EXTREME COUNTER CLOCKWISE POSITION OR PHONO
   FIRST POSITION CLOCKWISE IS AM
   SECOND POSITION CLOCKWISE IS FM
   THIRD POSITION CLOCKWISE IS TV

Westinghouse Electric Corporation

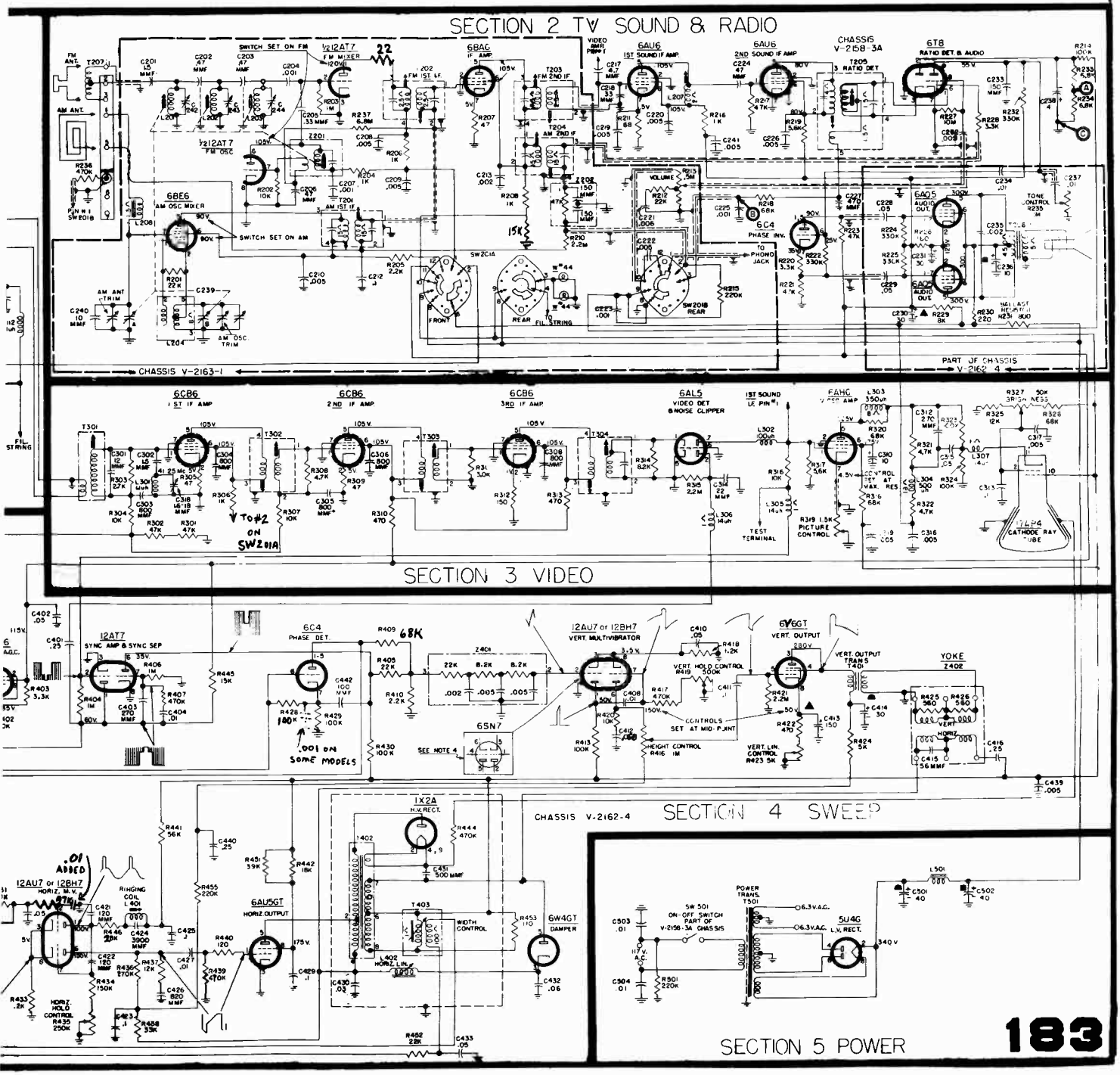
Models H-633C17 and H-634C17

Chassis Assembly V-2173

Leads which are susceptible to RF pickup with resulting interaction between stages must be dressed close to the chassis mounting plate. Leads in this category include heater, AGC, B plus, and the 125 volt bus leads. These leads must be long enough to permit dressing most of the path length close to the mounting plate. The heater wiring arrangement should not be altered.

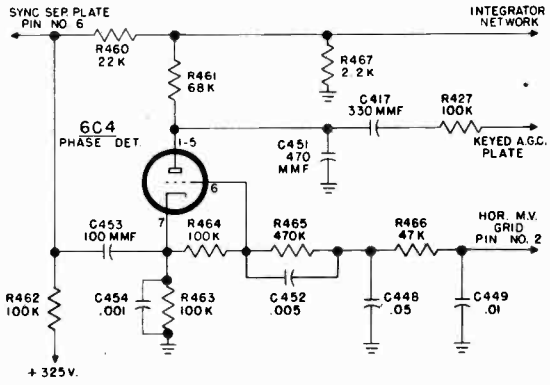
ALIGNMENT TOOL

To adjust the slugs in the common I-F and 4.5 mc. I-F transformers a special tool is required. This tool must fit into the .035" x .093" slot in the slug. *An incorrectly designed tool will cause chipping of the slug.* A suitable tool is stocked under Westinghouse part number V-8345.



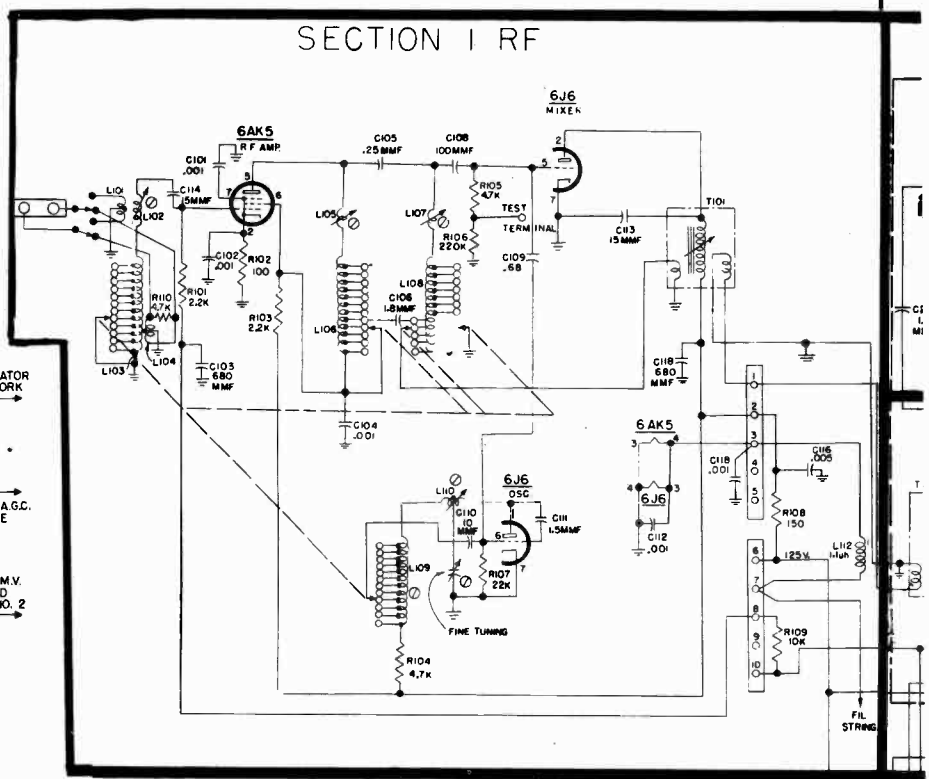
Westinghouse Electric Model H-626T16 using Chassis Assembly V-2172
and Model H-630T14 using Chassis Assembly V-2176

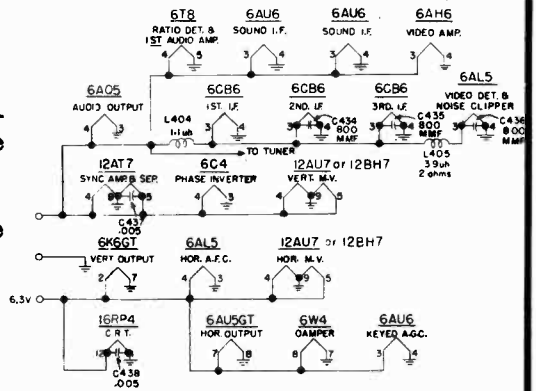
Model H-636T17 using Chassis Assembly V-2175, and Model H-637T14 using Chassis Assembly V-2177, are similar to the sets described on these pages, but may use a 17-inch picture tube and a different focalizer. Later production chassis had the 6C4 phase inverter and 6AL5 horizontal AFC replaced with a 6C4 phase detector circuit shown below.

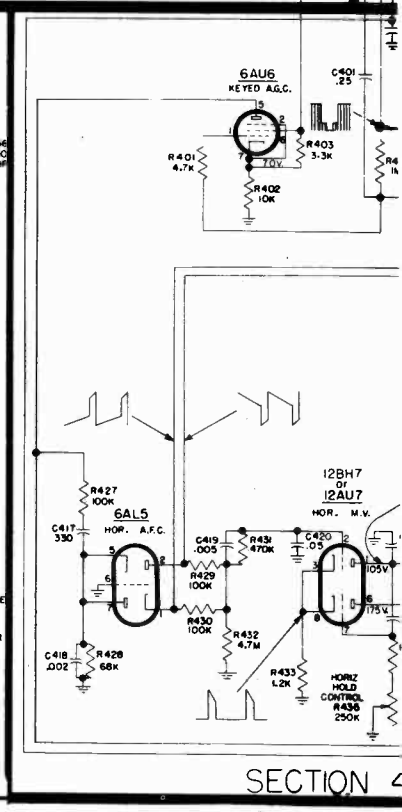


PHASE DETECTOR CIRCUIT

Models H-627K16, H-628K16, & H-629K16, using Chassis Assembly V-2171, are similar to the models covered by the circuit on this page. Here are main differences: Picture tube type 16JP4A is used, R414 is 560K, C430 is .06 mfd., C432 is 0.1 mfd., R424 is 470 ohms and it returns to junction of C416 and Z402, a 5600 ohm resistor is added in parallel with L402, L403 is omitted, R446 is 18K, C309 a 4.7 mmfd. condenser is omitted, add a 120 mmfd. capacitor in parallel with L201, R436 is changed to 270K ohms, 220K ohm resistor is connected in parallel with R434, a 120 mmfd. is connected in parallel with C422 between pins #1 and #7 of horizontal multivibrator.







VOLTAGES MEASURED FROM CHASSIS GROUND USING A 20,000 OHM/VOLT LINE VOLTAGE 117 V.A.C. READINGS SHOULD BE AS SHOWN ± 20 PER CENT. ALL CAPACITOR VALUES ARE SHOWN IN MFD UNLESS OTHERWISE SPECIFIED. ALL RESISTOR VALUES ARE SHOWN IN OHMS UNLESS OTHERWISE SPECIFIED. THE VIDEO AMP CATHODE VOLTAGE READING WAS OBTAINED WITH THE PICTURE CONTROL SET AT MAX RESISTANCE. THE B+ VOLTAGE WAS TAKEN WITH THE FOCUS CONTROL SET AT MID-POINT. IN EARLY PRODUCTION CHASSIS A FEW COMPONENTS WERE OF SLIGHTLY DIFFERENT VALUE THAN SHOWN. REPLACEMENT PARTS SHOULD BE OF VALUES SHOWN.

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

Westinghouse

Electric

H-626T16

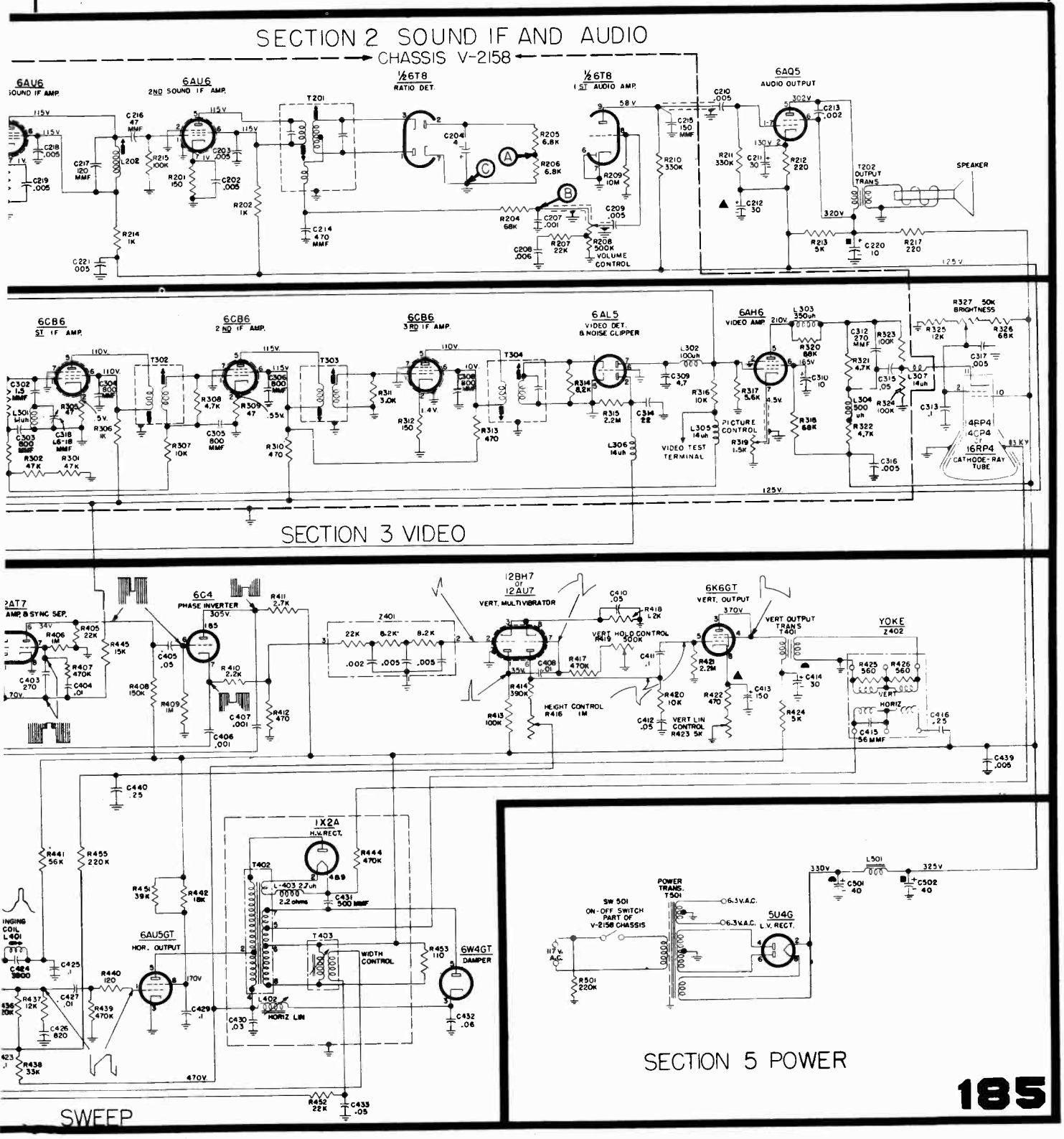
CHASSIS ASSEMBLY V-2172:

V-2158-1A I-F CHASSIS
V-2162-3 SWEEP CHASSIS

H-630T14

CHASSIS ASSEMBLY V-2176:

V-2158-1A I-F CHASSIS
V-2162-6 SWEEP CHASSIS



MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

WESTINGHOUSE TELEVISION MODELS

H-626T16 AND H-630T14 (Continued)

ALIGNMENT CHARTS

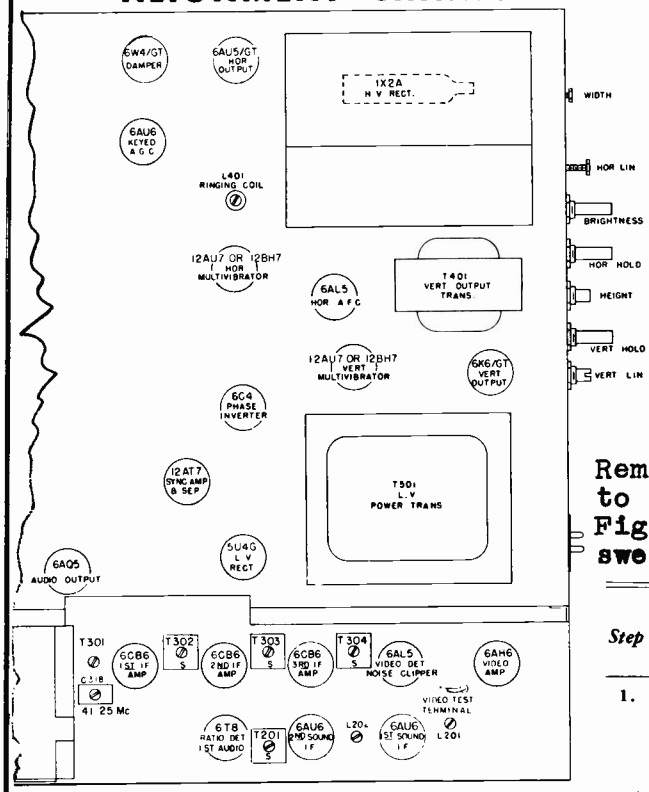


FIG. 6—TOP VIEW OF CHASSIS

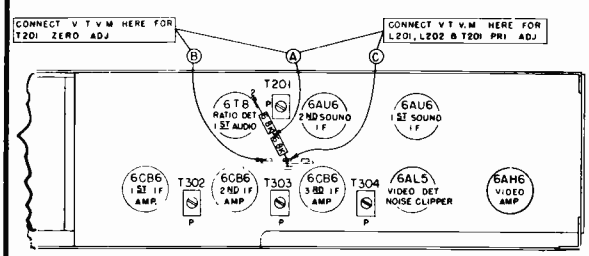


FIG. 7—BOTTOM VIEW OF CHASSIS

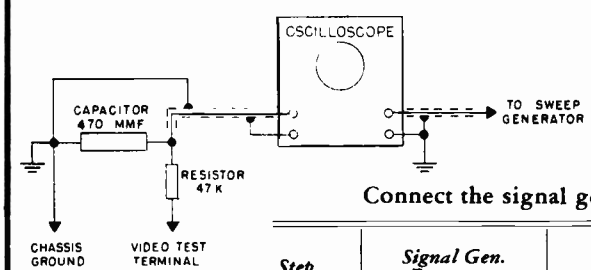
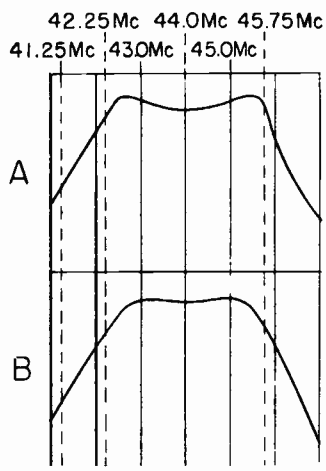


FIG. 3—
OSCILLOSCOPE
CONNECTIONS



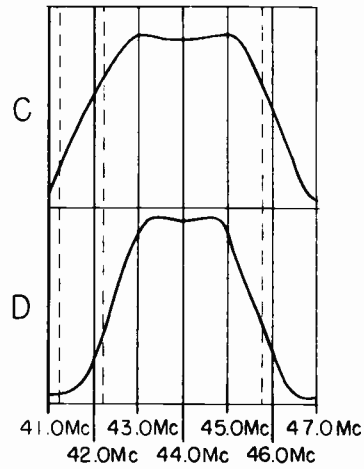


FIG. 5—RESPONSE CURVES AT VARIOUS STAGES OF ALIGNMENT

COMMON I-F SECTION

Remove 6AK5 RF amplifier tube. Turn selector to Channel 13. Connect oscilloscope as per Fig. 3. Sweep generator 44 mc. center, 10 mc. sweep, couple marker generator to sweep gen.

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	Short across link between T101 and T301	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. 4.	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.

SOUND I-F SECTION

Connect the signal generator to the video test terminal 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. 7.	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. 7.	Use same sig. gen. output as in step 1.	Sec. of T201 for *zero* voltage.

ZENITH RADIO CORPORATION

1951 TELEVISION RECEIVERS

CHASSIS 22H20 - 23H22 - 23H22Z - 24H20 - 24H21

The chassis listed above are used in a great many different models in various cabinet styles, using different size picture tubes, and some in combination styles using a separate radio chassis. All of these models have a number with a prefix "H", for example H227R. Space will not be used to list these model numbers since a serviceman will find the chassis number stamped on the chassis of the Zenith set he may be servicing.

The circuit diagram on pages 190 and 191, is exact for Chassis 22H20. Waveforms shown there are also representative for the other chassis. Chassis 23H22 differs in the fact that it uses a 17BP4 picture tube, and has two 6BQ6GT in the horizontal output circuit. Chassis 23H22Z uses a 16TP4 picture tube. V19, high voltage rectifier, in either of these two models may be 1X2 or 1B3GT.

Chassis 24H20 uses a 16GP4 picture tube, while Chassis 24H21 uses a 19AP4A. Both of these chassis are similar to the 22H20 covered in the circuit diagram, but these sets have a separate power supply and a circuit of this is shown on page 192.

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 S17203 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 are 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 L60, input coil L57, quadrature coil L58 and buzz control R19 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 is necessary so that the "hiss" never disappears during alignment.

IF ALIGNMENT

When aligning the 40 Mc IF, it is of utmost importance to keep the sweep generator connections as short as possible. (See Fig. 5). Clip the negative lead of a 4.5V battery to test point "A" and the positive lead to chassis. Connect the oscilloscope to the grid (Pin 7) of the 12AT7 limiter-inverter through a 10K isolation resistor. During alignment keep the output from the sweep generator at a level which develops approximately 3V peak output at the detector as viewed on the calibrated oscilloscope.

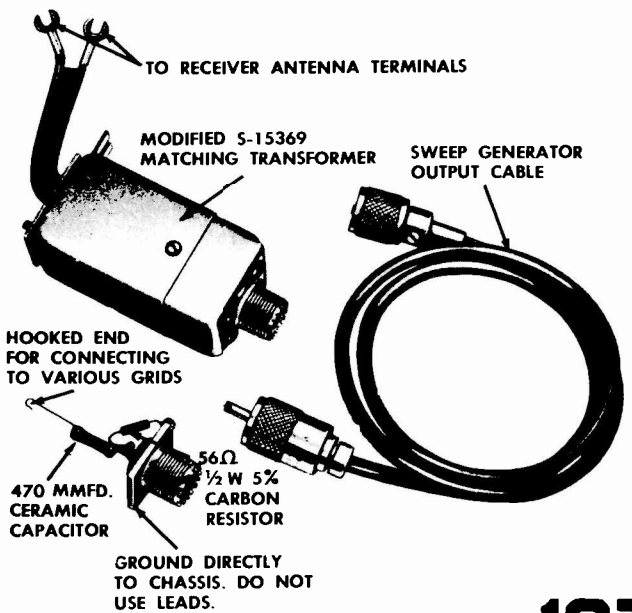


Fig. 5 IF - RF Alignment Fixtures.

Alignment Information, continued, for Zenith Chassis 22H20/23H22/24H20-21

After the bias and scope connections have been made and the receiver allowed a 15 minutes warm-up period, proceed as follows:

1. Feed the output from the sweep generator through a connector, as shown in Fig. 5, into the converter grid (terminal "F"). This terminal is immediately adjacent to the 6CB6 converter tube.

2. Remove oscillator tube V3 and switch channel selector to channel 12.

3. Adjust the IF transformers to obtain an overall pattern of maximum amplitude with linearity, similar to the illustration in Fig. 6. It will be noted that adjustment of L51, T1 and T3 will have maximum effect on the low frequency portion of the pattern (42.75 - 43.5 Mc) whereas adjustment of T2 and T4 will have maximum effect on the high frequency side (45.75 and 45 Mc.) T5 tilts the top and is adjusted to obtain best symmetry.

After the correct overall pattern is obtained, turn the channel selector to channel 2 and inject a 47.25 Mc marker into the sweep. Adjust the low channel adjacent sound trap L53 for minimum indication on the scope or on a VTVM connected to the video detector.

4. Feed a 4.5 Mc crystal calibrated signal to terminal "C" Fig. 20 and connect the RF probe of a VTVM to the cathode (Pin 11) of the picture tube. Advance the contrast control for approximately 1 volt indication on the meter and adjust trap L63 for minimum indication.

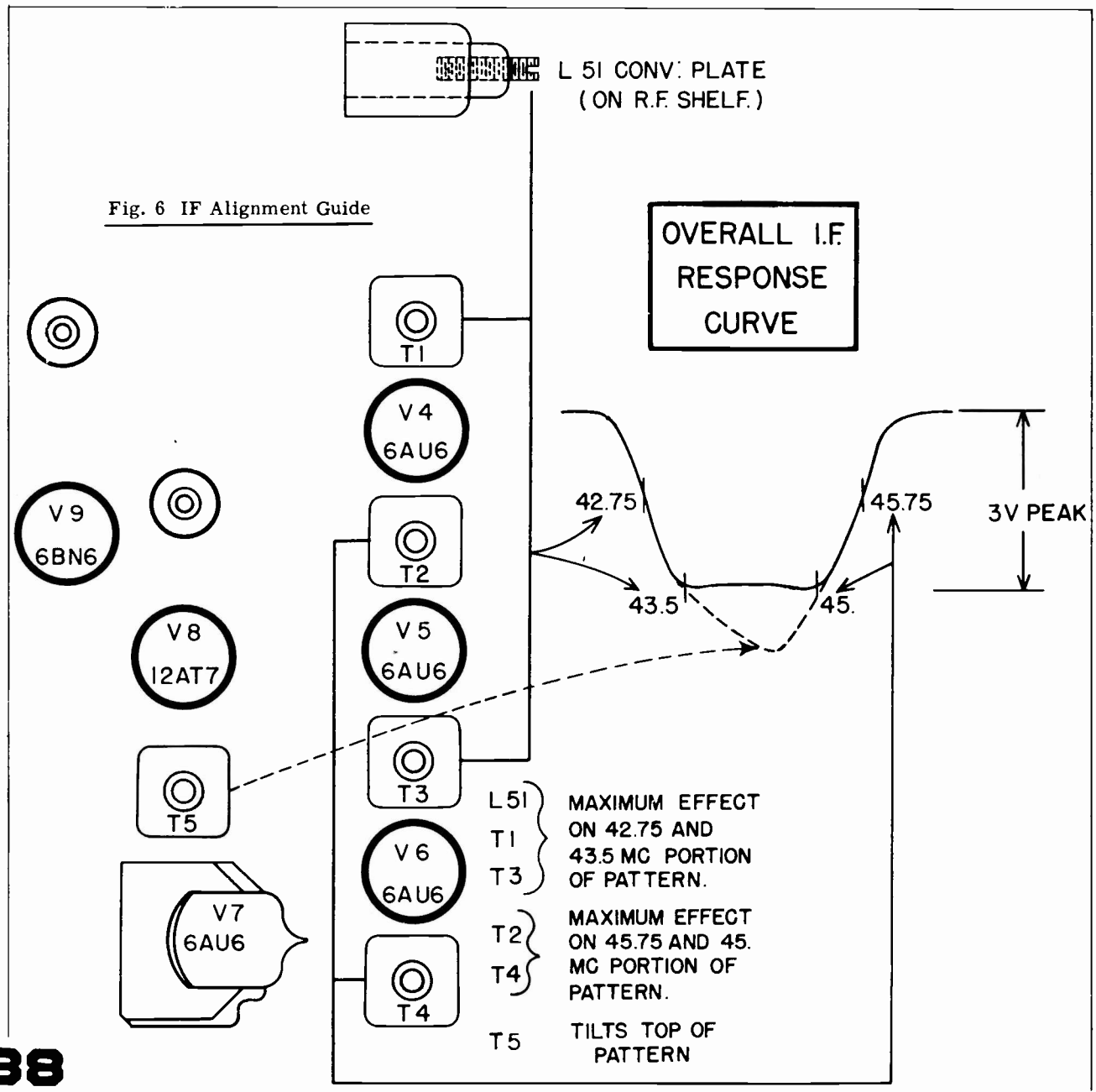
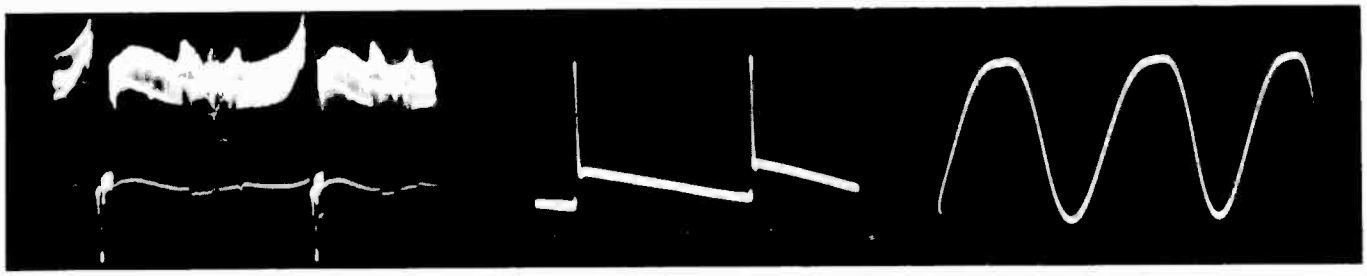


Fig. 6 IF Alignment Guide

MOST-OFTEN-NEEDED 1951 TELEVISION SERVICING INFORMATION

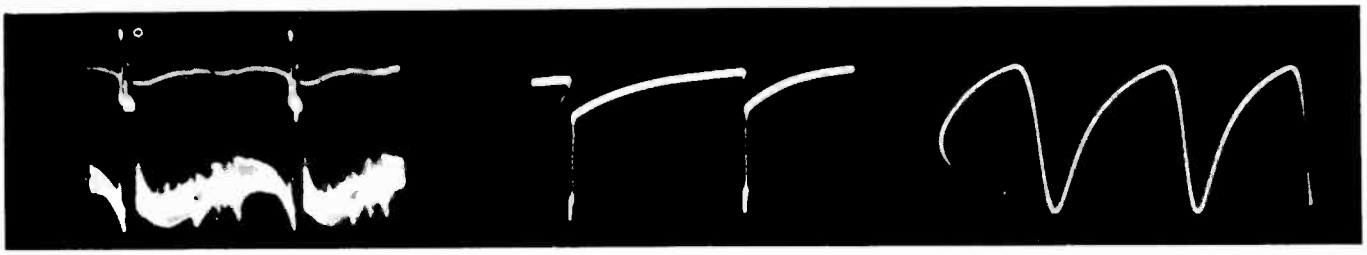
Wave Forms 22H20 Chassis. Also representative for 23H22Z and 24H20-21 Chassis.



Pins 7&8 V8A-Pin 6 V12A Pin 1 V11A (60 cps)

Pin 2 V14B (60 cps)

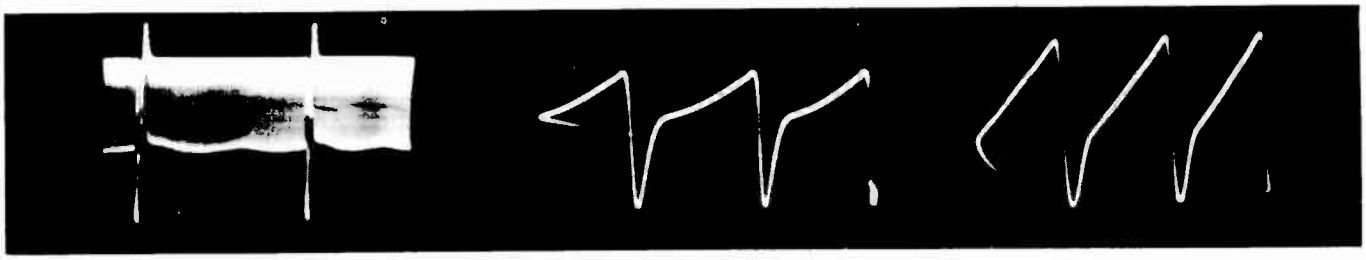
Pin 2 V12B (15.75 Kc)



Pin 6 V8A Pin 2 V11A Pin 6 V11B Pin 2 V13 Pin 11 V22

Pin 1 V14B (60 cps)

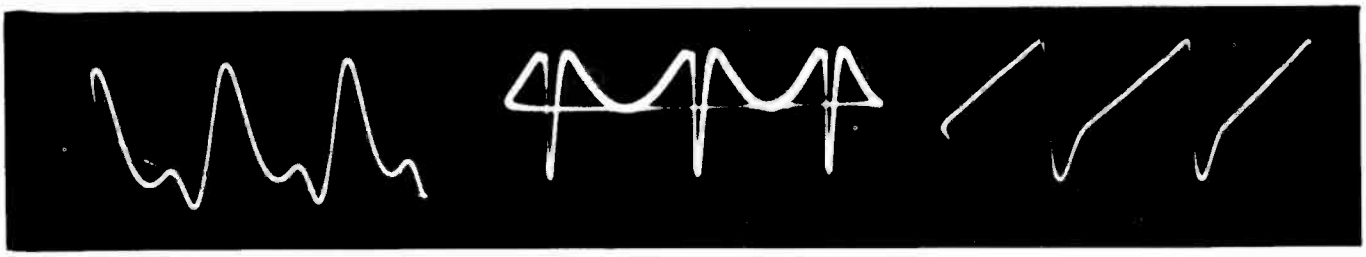
Pin 5 V16A (15.75 Kc)



Pin 7 V13 (60 cps)

Pin 1&5 V15 (15.75 Kc)

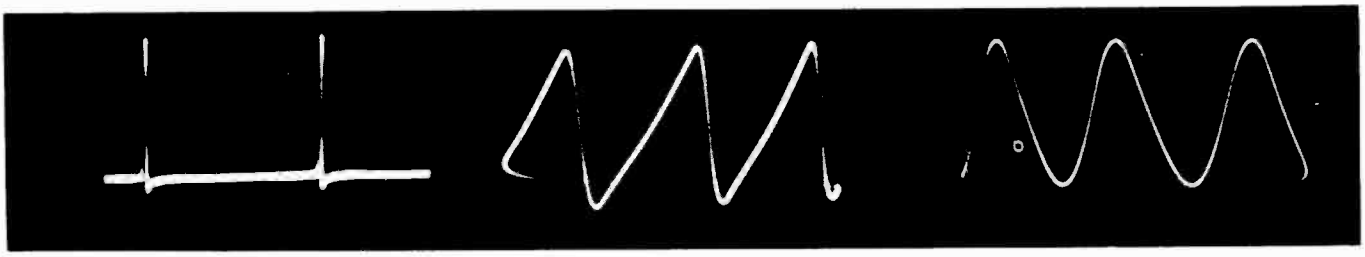
Pin 2 V16B (15.75 Kc)



Pin 5 V12A (15.75 Kc)

Pin 2 V15 (15.75 Kc)

Pin 5 V17 (15.75 Kc)

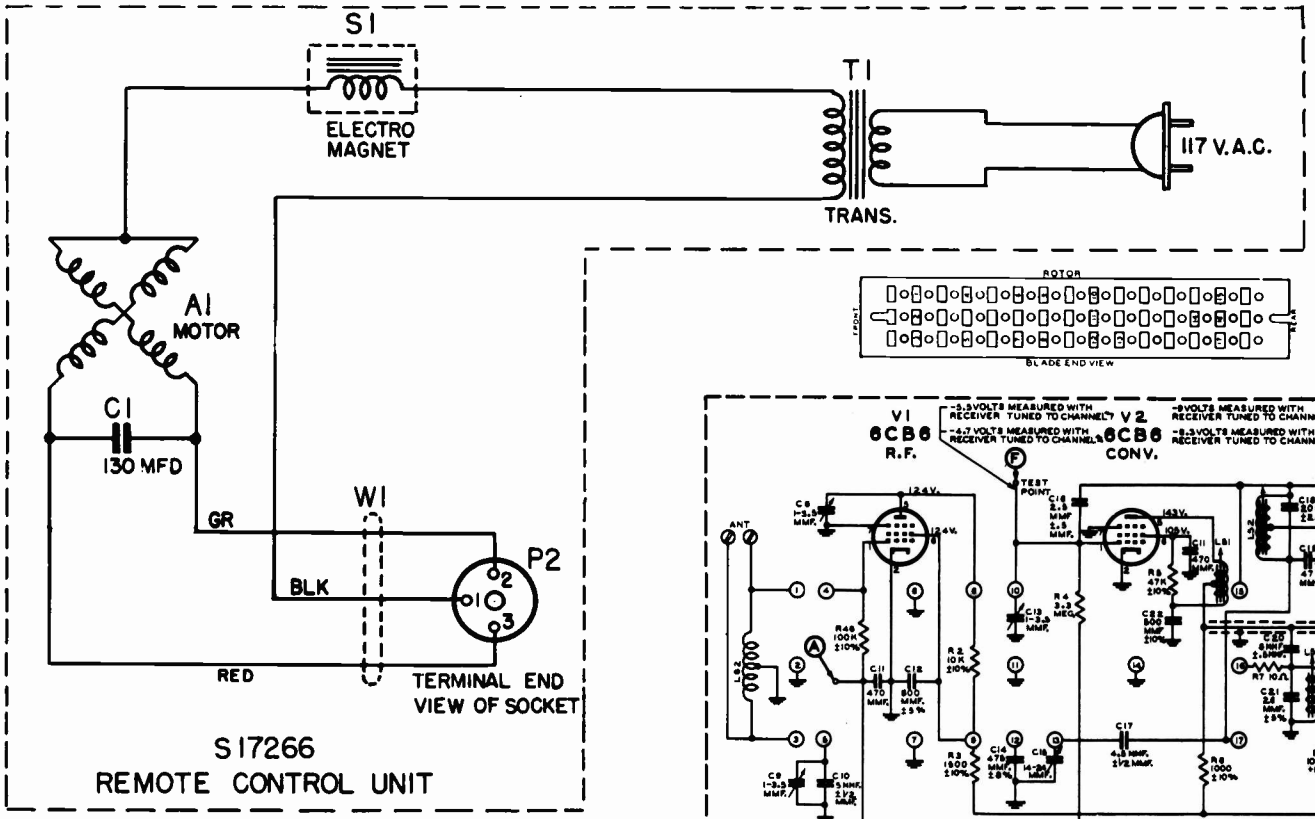


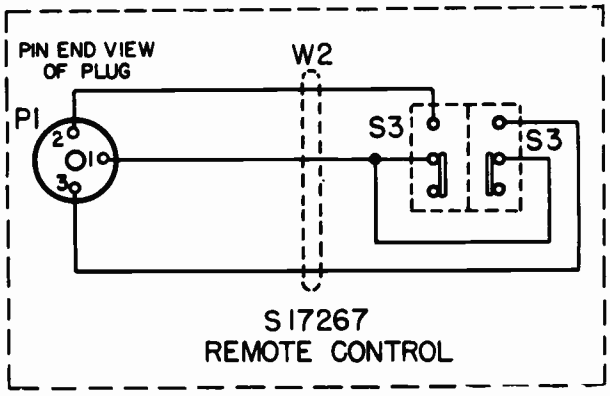
Pin 4 V14A (60 cps)

Pin 7 V15 (15.75 Kc)

Pin 8 V17 (15.75 Kc)

Schematic Diagram 22H20 Chassis (Wave Forms Shown Also Representative For 23H22Z, 24H20 and 24H21).

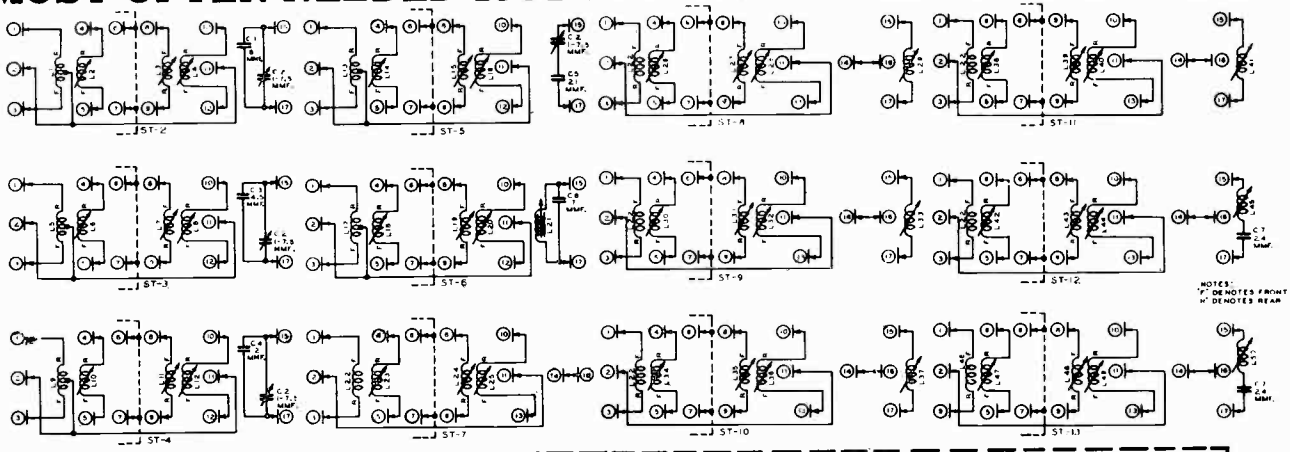


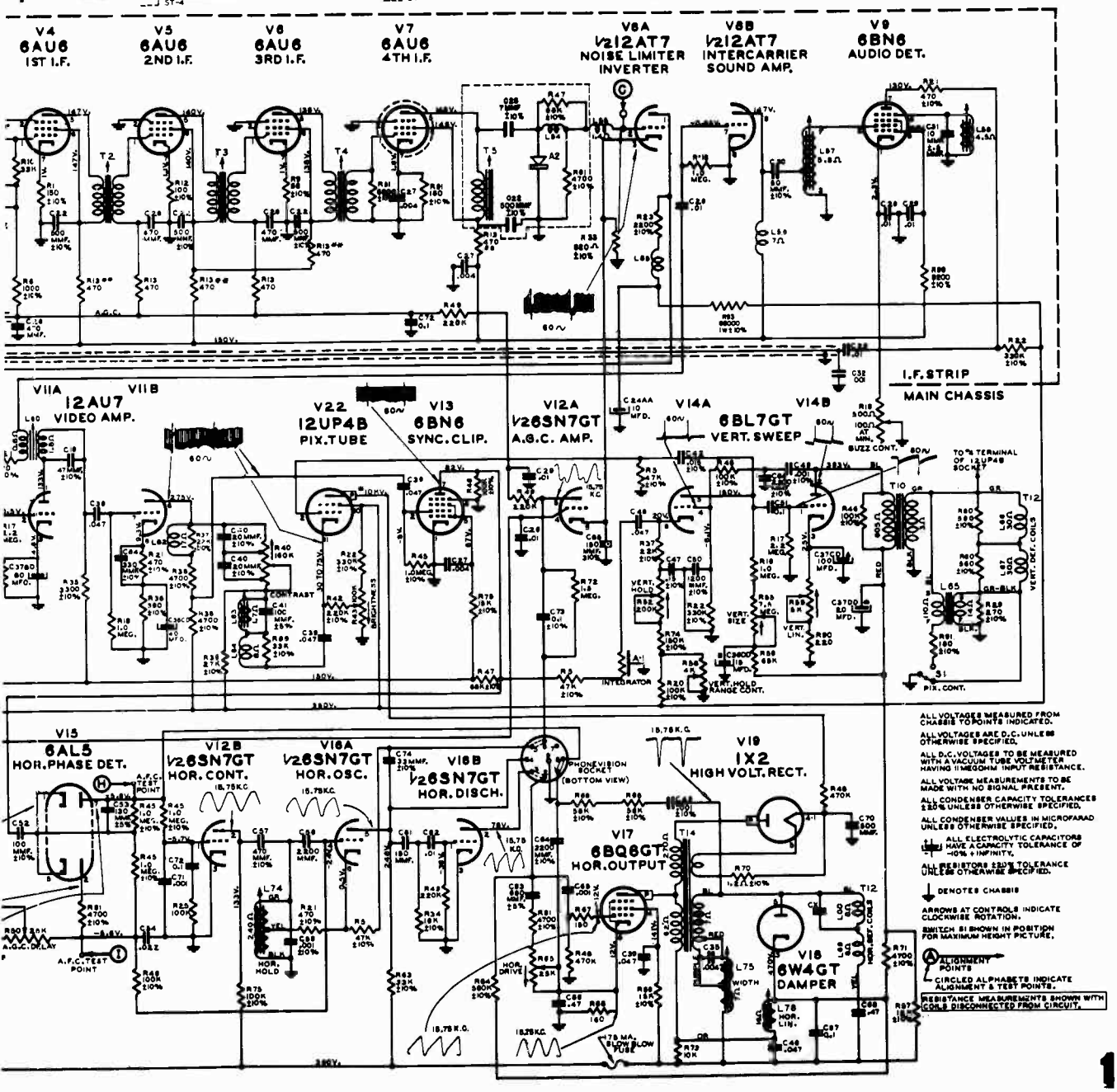


Schematic Diagram Remote Control Tuner.

ZENITH

Channel Strips S-17100 Turret Tuner





Service Hints for Zenith Television Chassis 22H20, 23H22, 24H20, 24H21

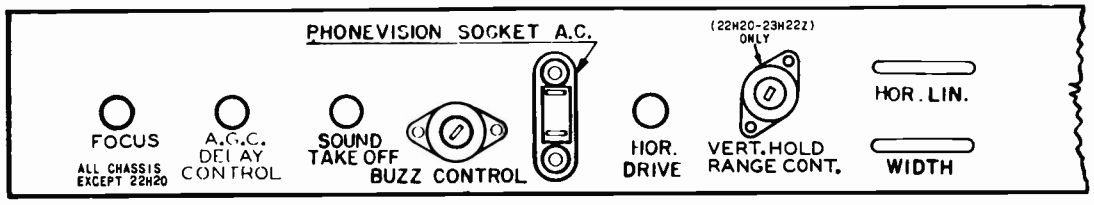
FRINGE RECEPTION - Vertical synchronization in weak signal areas may be improved by lowering the value of the resistor in the grid circuit of the sync clipper from its normal 1 Meg. value. Values as low as 10,000 ohms may be used, however, care must be exercised as too great a reduction of this resistance may introduce horizontal distortion into the picture on some signals.

POOR VERTICAL LINEARITY - (22H20 - 23H22Z) If this condition cannot be corrected by adjustment of the vertical linearity and height adjustments, the fault will probably lie in a defective 6BL7GT vertical sweep tube.

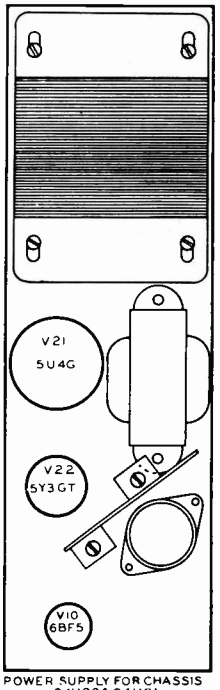
S-17268 REMOTE CONTROL UNIT - Locking of the manual control can be caused by failure of the worm drive gear to disengage. This condition can be the result of a weak solenoid armature actuating spring or misalignment of the magnet mounting bracket. It will be noted that the solenoid mounting bracket has slotted mounting holes which allows for horizontal as well as vertical alignment. Improper seating of the solenoid clapper plate on the magnet core will cause excessive buzz.

IMPORTANT: Any receiver equipped with the remote control unit must be perfectly "bulls eyed" to insure its most satisfactory operation with the remote control unit.

TESTING GERMANIUM CRYSTALS - If, after all normal adjustments have been made, the picture appears washed out, the cause may be low detector output due to a defective germanium crystal. The crystal may be disconnected and tested with an ohmmeter for front-to-back ratio. The resistance in one direction should be lower than 400 ohms and at least 25 times this resistance (10,000 ohms) or higher in the other direction. Any ratio less than 25 to 1 would indicate a below standard crystal.

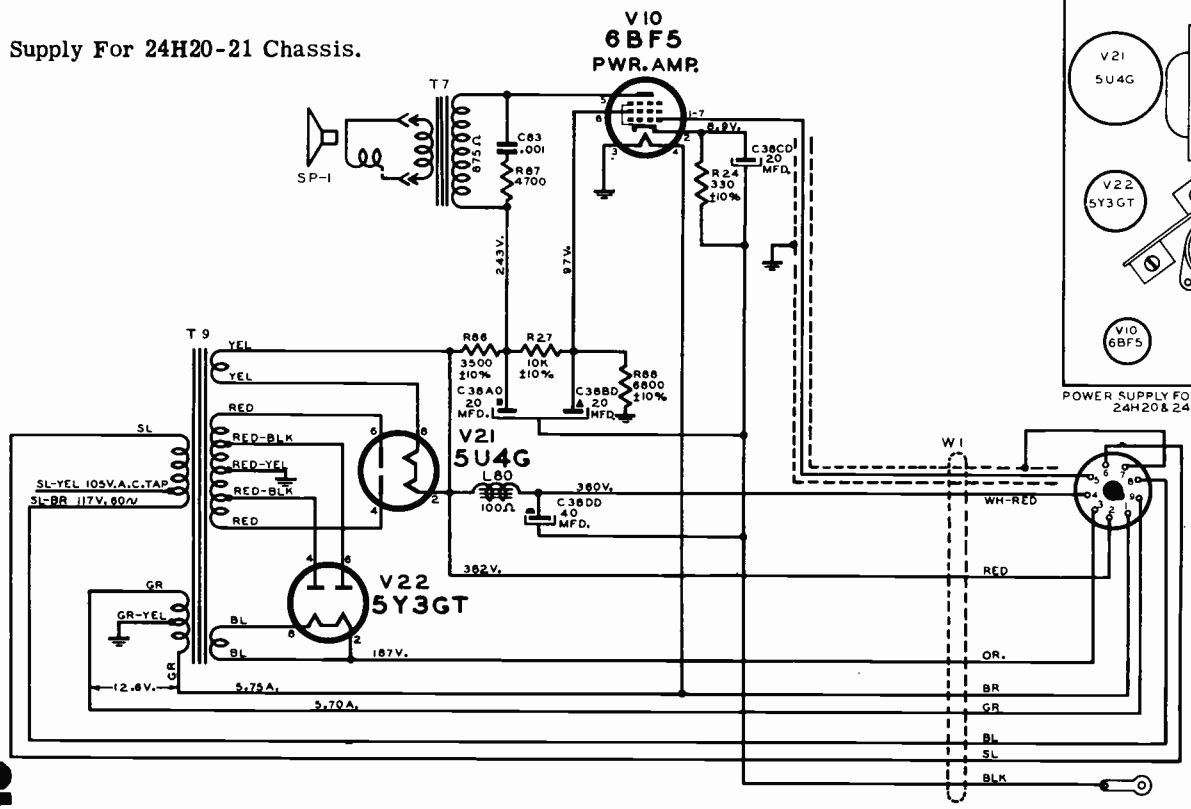


CONTROLS AT REAR OF CHASSIS



POWER SUPPLY FOR CHASSIS 24H20 & 24H21

Power Supply For 24H20-21 Chassis.



Another

Supreme Publications

Service Manual