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1959

VOLUME TV-16

Television

Servicing Information

THEORY

PRACTICE EXPERIENCE

Compiled by

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VOLUME TV-16

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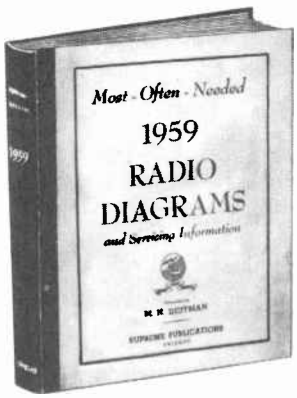

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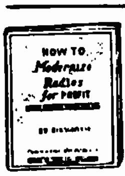

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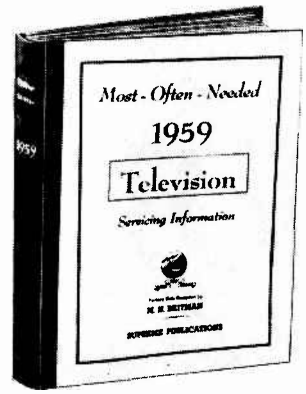

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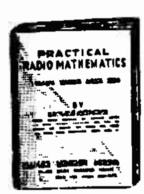

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CONTENTS

(Continued on page 4)

Table of Contents, Continued

This manual is made up of factory prepared service material. Editorial changes and selections were made to conform with the objectives of this manual. Our sincere thanks and appreciation is extended to every manufacturer whose products are covered by the material in this manual and who aided us in the preparation of this book.
M. N. Beitman, Chief Editor of the Engineering Staff, Supreme Publications.

Admiral

CHASSIS 16R1C, 16R1CB, 16AR1C, 16S1C, 16S1CB, 16AS1C

MODEL IDENTIFICATION CHART

MODEL NUMBER	TV CHASSIS	MODEL NAME	CHASSIS SERIES	VHF TUNER	UHF TUNER	LOCATION OF TUNING CONTROLS	TONE CONTROL (S)
T21E20E T21E20F	16R1C 16R1CB	Asbury	Imperial 330	94E144-13 94D151-1 or -5		Front	Single
TA21E20E	16AR1C	Asbury	Imperial 330	94E144-30	94D112-5 or 94D155-3	Front	Single
T21E21E T21E21F	16R1C 16R1CB	Asbury	Imperial 330	94E144-13 94D151-1 or -5		Front	
T21E22E T21E22F	16R1C 16R1CB	Asbury	Imperial 330	94E144-13 94D151-1 or -5		Front	
TA21E22E	16AR1C	Asbury	Imperial 330	94E144-9	94D112-5 or 94D155-3	Front	
T21E23E	16R1C 16R1CB	Asbury	Imperial 330	94E144-13 94D151-1 or -5		Front	
TA21E23E	16AR1C	Asbury	Imperial 330	94E144-9	94D112-5 or 94D155-3	Front	
C21E11E C21E11F	16S1C 16S1CB	Windsor	Imperial 330	94E144-24 94D151-2 or -6		Front	
CA21E11E	16AS1C	Windsor	Imperial 330	94E144-22	94D112-5 or 94D155-3	Front	
C21E12E C21E12F	16S1C 16S1CB	Windsor	Imperial 330	94E144-24 94D151-2 or -6		Front	
CA21E12E	16AS1C	Windsor	Imperial 330	94E144-22	94D112-5 or 94D155-3	Front	
C21E13E C21E13F	16S1C 16S1CB	Windsor	Imperial 330	94E144-24 94D151-2 or -6		Front	
CA21E13E	16AS1C	Windsor	Imperial 330	94E144-22	94D112-5 or 94D155-3	Front	
L21E22E L21E22F L21E23E L21E23F	16S1C 16S1CB 16S1C 16S1CB	Princeton	Imperial 330	94E144-24 94D151-2 or -6		Front	Single

This group of sets is similar to chassis covered on pages 29 through 34, in TV-15, EARLY 1959 Television Servicing Information manual. The alignment information given in this previous volume is applicable. Circuit diagram of Chassis 16R1CB, 16S1CB, is printed on pages 10-11 of this ADDITIONAL 1959 TV manual. Chassis with these numbers but without suffix letter "B" use a different, disc type VHF tuner employing a cascode RF amplifier. For a circuit diagram of this tuner (94E144-13, etc.) see page 32 of TV-15. Chassis 16AR1C, 16AS1C, are practically identical to types mentioned except that a combination VHF-UHF tuner is used. The material for all of these sets is printed on pages 5 through 12.

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

ADMIRAL Chassis 16R1C, 16AR1C, 16S1C, 16AS1C Service Information, Continued

VHF CHANNEL ADJUSTMENT FOR FOR 16R1CB AND 16S1CB CHASSIS

VHF Channel adjustment of each station should be checked upon installation and at every service call. If adjustment is properly made, it is possible to tune from one station to another by merely turning the Channel Selector knob.

To adjust VHF Channel Slugs, proceed as follows:

1. Turn the set on and allow 15 minutes to warm up.
2. Set **VHF Channel Selector** for a station; set other controls for normal picture and sound.
3. Set **Fine Tuning** control at center of its range by rotating it approximately half-way.
4. For table models, remove Channel Selector and Fine Tuning knobs. For console models, remove escutcheon plate above Channel Selector knob after removing mounting screw at center of plate. Note: Later console models may use snap-in plate without mounting screw. To remove snap-in plate, insert blade end of a screwdriver against left side of channel window. With slight pressure, pull left side of plate away from cabinet.
5. Insert a 1/8" blade, flexible non-metallic tool (Part No. 98A30-19) through the hole adjustment to Channel Selector shaft. For each channel in operation, carefully adjust the channel slug for best picture. (Note that this is not the point at which the sound is loudest.)

   Caution: Only slight rotation of the slug will be required; turning the slug out too far will cause it to fall out of coil.

AUDIO HUM

Persistent audio hum (with or without TV signal) can be caused by high resistance leakage of coupling capacitor C203 (.001 mf, 500 volts, ceramic). Coupling capacitor C203 is connected from pin 3 of sound IF amplifier V304B to terminal of sound detector coil L201.

GEAR TOOTHED RASTER

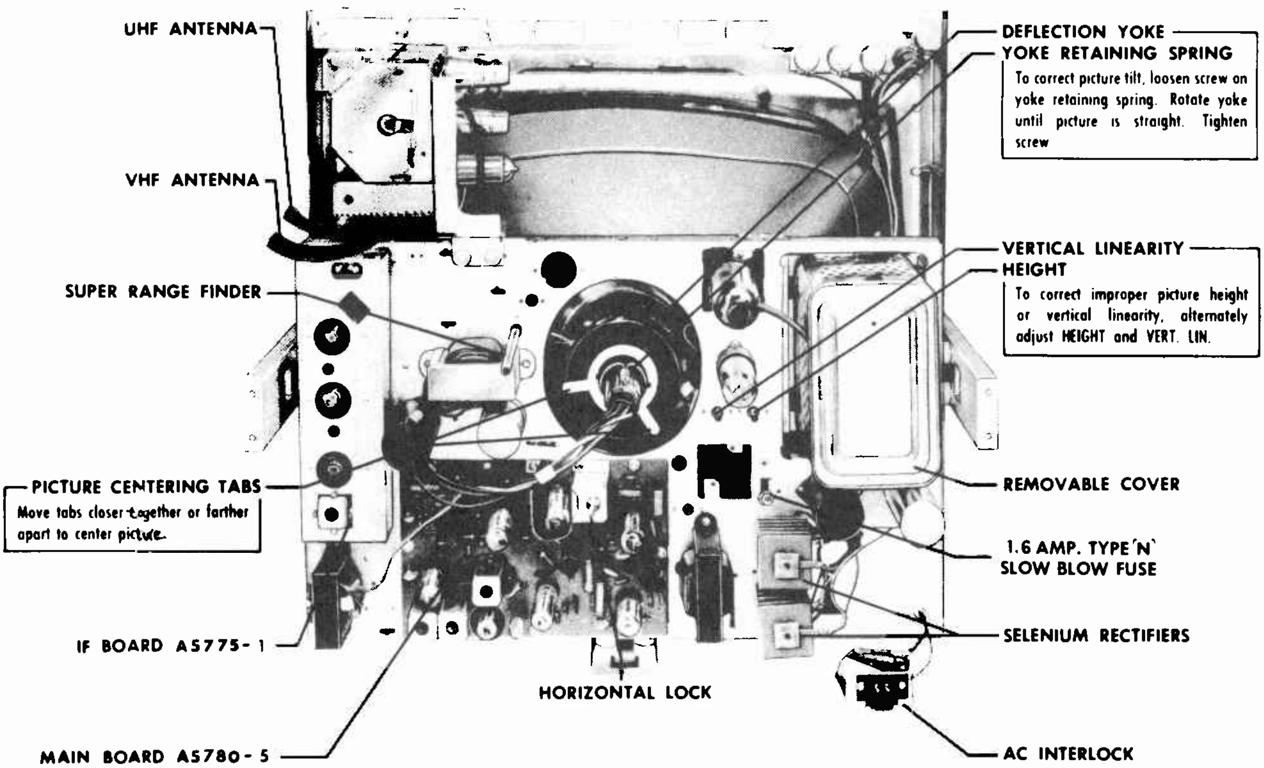
Distortion at right side of raster, with dark vertical line having a "gear toothed" pattern may be due to a faulty horizontal lock coil, L401.

Other symptoms occurring with above trouble may be a great change in horizontal oscillator frequency when set is switched off-channel and a few seconds delay for the oscillator to lock-in when set is turned back to an operating channel.

INSTALLING UHF CHANNEL STRIPS IN VHF TUNERS 94D151-1, -2, -5 OR -6

Receivers using VHF tuners 94D151-1, -2, -5 or -6 can be easily adapted for UHF operation by insertion of a UHF channel coil strip in the vacant channel position of the tuner turret drum (between channels 13 and 2).

If more than one UHF channel can be received, additional UHF channel coil strips can be inserted in the tuner turret drum after removing unused VHF channel coil strips.



Rear View of 16R1C, 16AR1C, 16S1C and 16AS1C Chassis Showing Adjustment Locations. Note: Super Range Finder control not in chassis stamped Run 29. UHF Antenna Terminals in VHF-UHF sets only.

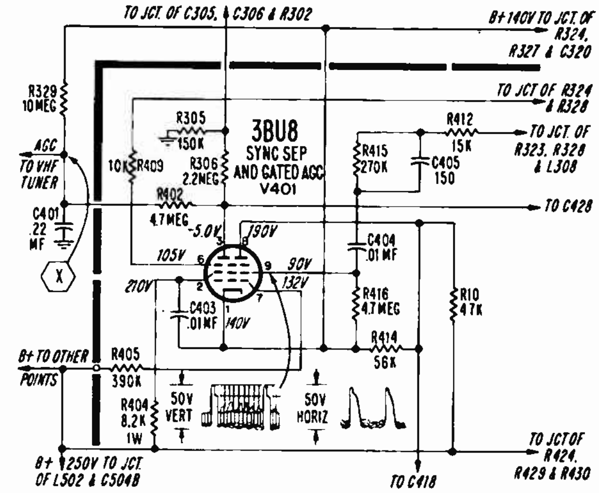
ADMIRAL Chassis 16R1C, 16AR1C, 16S1C, 16AS1C, Service Information, Continued

SERVICING PRINTED WIRING

A major portion of the circuitry in these receivers is contained in two printed wiring boards. The smaller printed circuit board at side of chassis contains tubes and components in the video IF and video detector circuits. The larger printed circuit board at bottom of chassis contains tubes and components in the sound IF, sound detector, sound output, sync, AGC, video amplifier, vertical and horizontal sweep circuits.

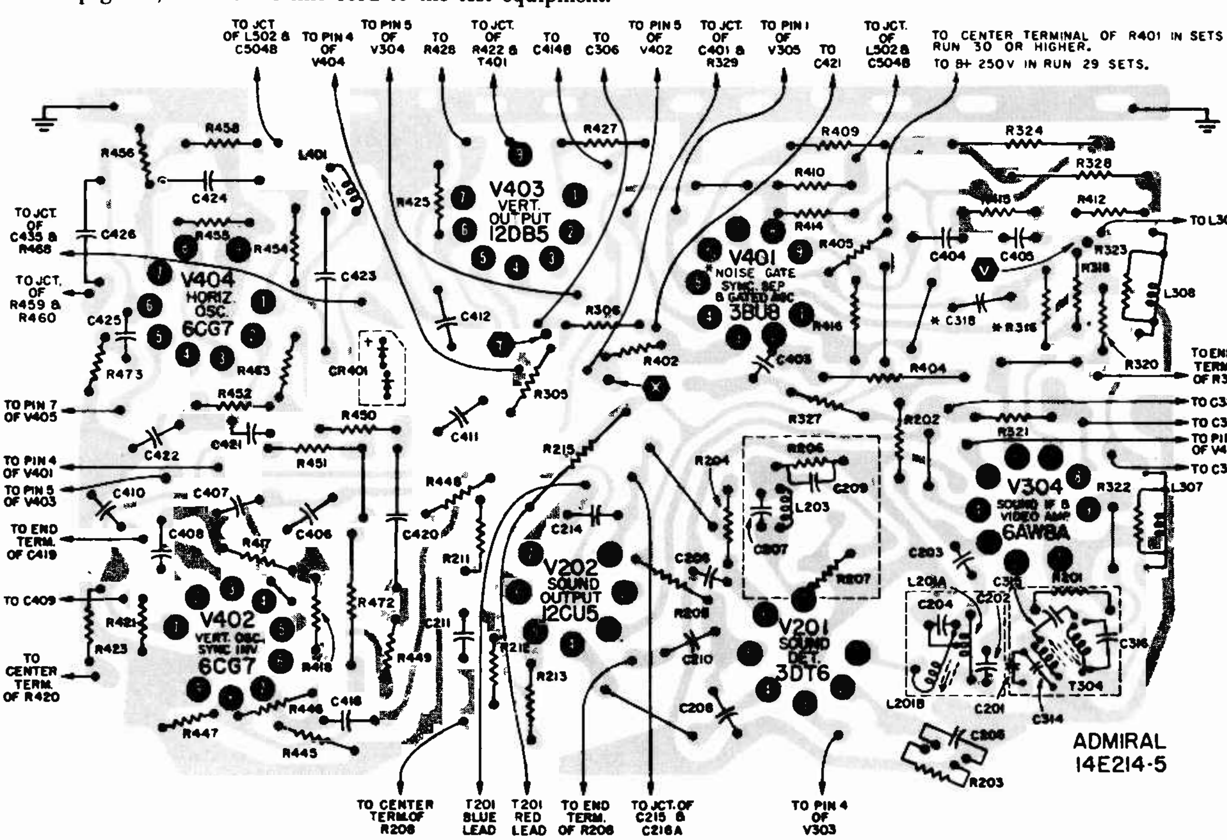
Trouble shooting of printed circuit wiring is similar to that of conventionally wired sets.

Note: In these illustrations, components are shown schematically instead of pictorially. This illustrates what would be seen if it were possible to look through the printed circuit wiring board and actually see the various components on the board.



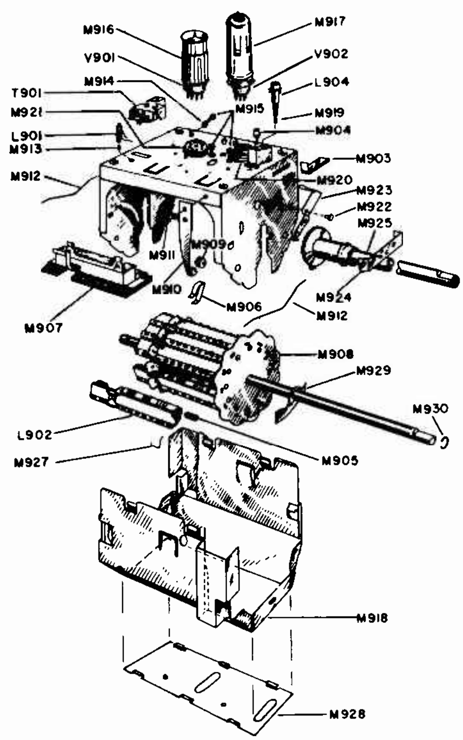
Sync Separator and Gated AGC Circuit Used in 16R1, 16AR1, 16S1 and 16AS1 Chassis Stamped Run 29.

Do not ground chassis or connect test equipment directly to it, unless an isolation transformer is used. If an isolation transformer is not available, a neon lamp can be used to determine if the chassis is "hot". Connect an electrician's neon tester (General Cement's "Ne-o-lite" or equivalent) between the receiver chassis (not control shafts) and some grounded point, such as electrical conduit, water pipe, etc. If the neon lamp glows, the chassis is "hot" and the line cord plug should be reversed. Make the same check with the neon lamp connected between ground and the ground terminal of the test equipment. If the lamp glows, reverse the line cord to the test equipment.

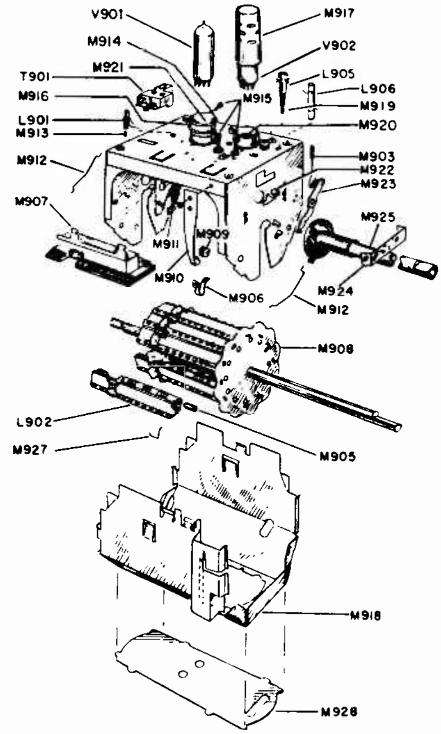


View of Printed Wiring Board A5780-5 used in 16R1, 16AR1, 16S1, 16AS1 Chassis. Note: Noise Gate Circuit in Chassis Stamped Run 30 or Higher. Gray Area Represents Printed Wiring; Black Symbols and Lines Represent Components and Connections on Opposite Side.

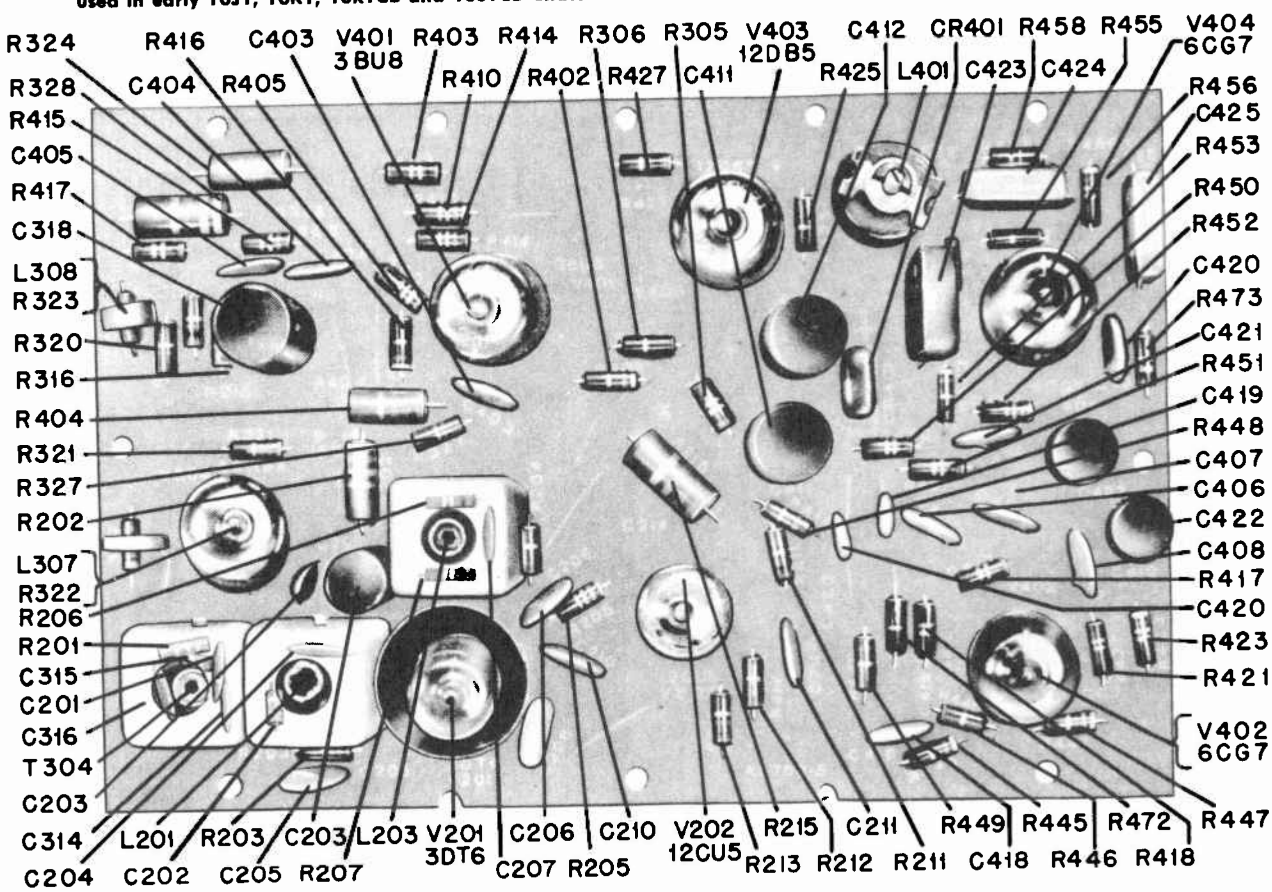
ADMIRAL Chassis 16R1C, 16AR1C, 16S1C, 16AS1C, Service Information, Continued



Exploded View of VHF Tuners 94D151-1 and -2 used in early 16J1, 16K1, 16R1CB and 16S1CB Chassis.



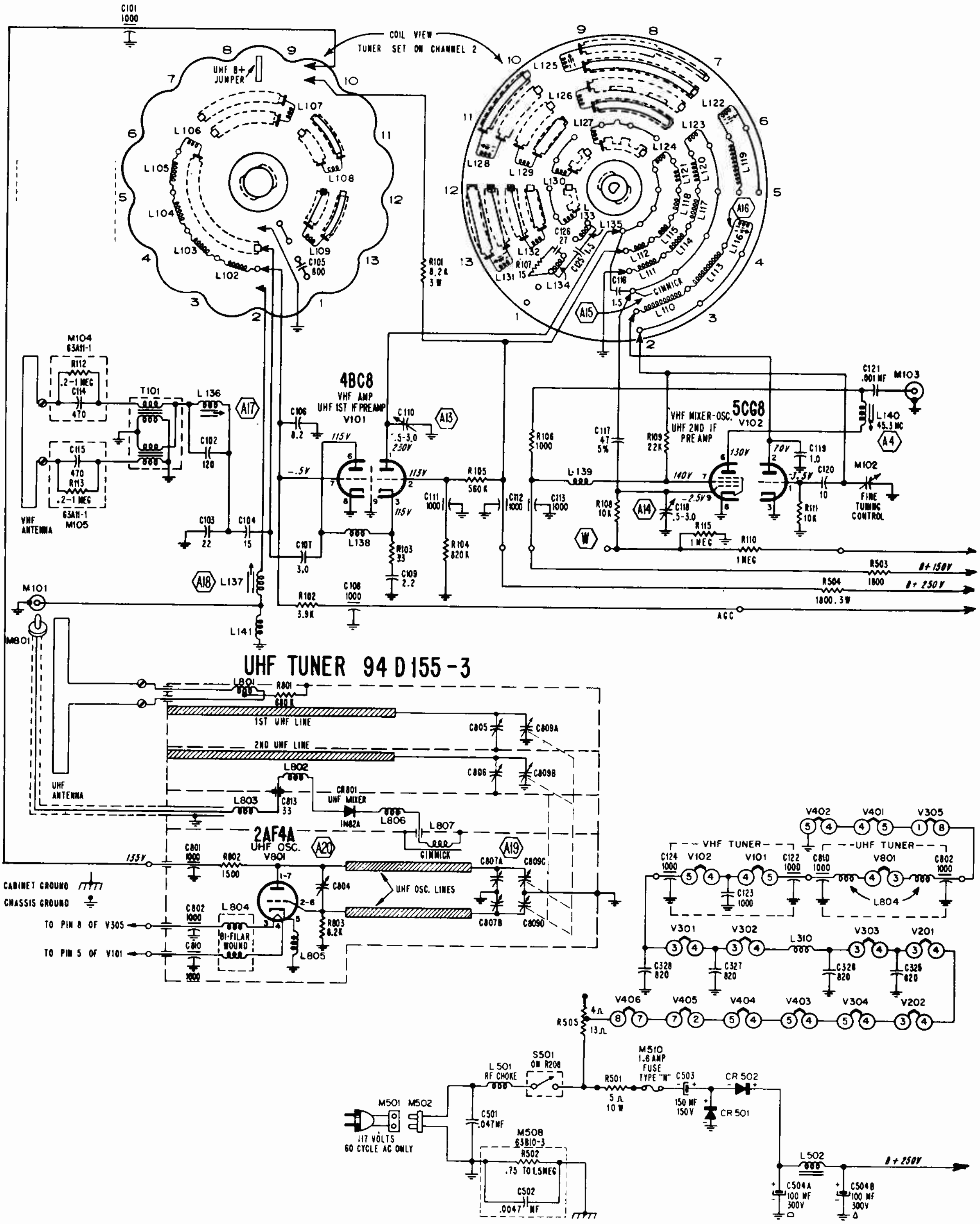
Exploded View of VHF Tuners 94D151-5 and -6 Used in Later 16J1, 16K1, 16R1CB and 16S1CB Chassis.



View of Component Side of Printed Wiring Board A5780-5 used in 16R1C, 16AR1C, 16S1C and 16AS1C Chassis.

ADMIRAL Service Information on Tuner of Chassis 16AS1C, Continued

VHF TUNERS 94E144 IN 16AR1C, 94E144-22 IN 16AS1C



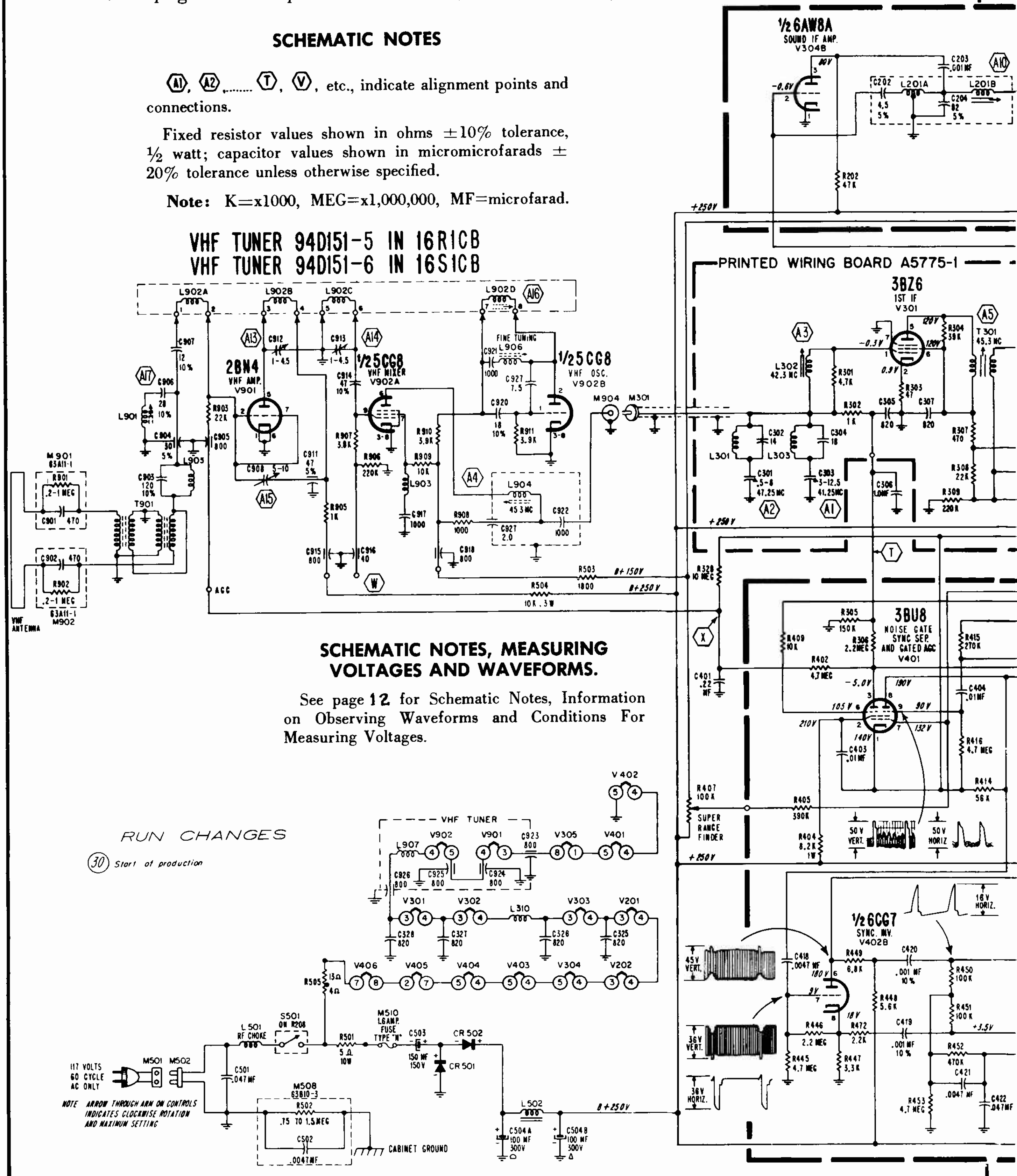
ADMIRAL Chassis 16R1CB, 16S1CB, Schematic Diagram
(See page 5 for explanation of chassis differences)

SCHEMATIC NOTES

A1, A2,........ T, V, etc., indicate alignment points and connections.

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

Note: K=x1000, MEG=x1,000,000, MF=microfarad.



SCHEMATIC NOTES, MEASURING VOLTAGES AND WAVEFORMS.

See page 12 for Schematic Notes, Information on Observing Waveforms and Conditions For Measuring Voltages.

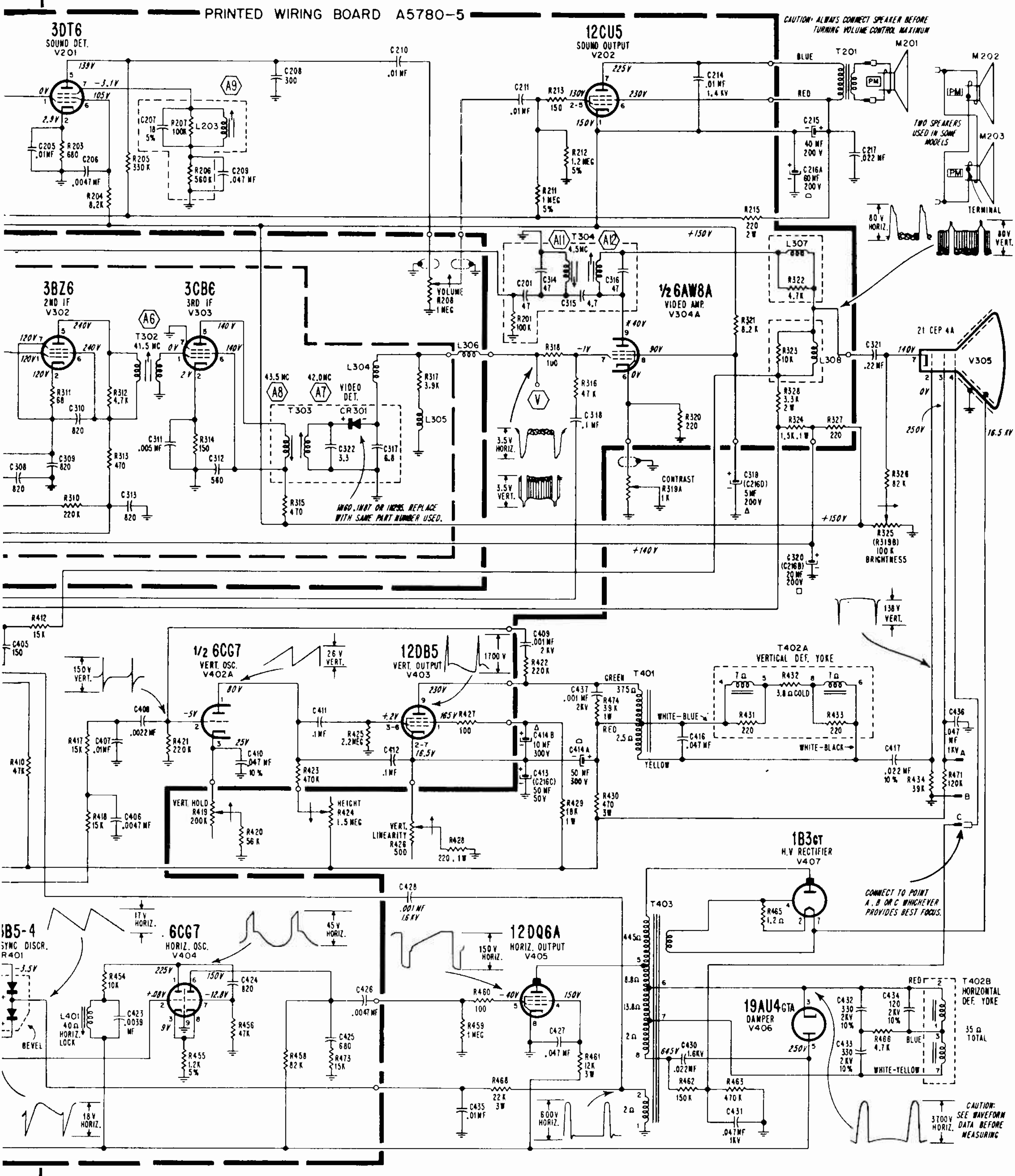
RUN CHANGES

(30) *Start of production*

NOTE ARROW THROUGH ARM ON CONTROLS INDICATES CLOCKWISE ROTATION AND MAXIMUM SETTING

ADMIRAL

Schematic for 16R1CB and 16S1CB Television Chassis Stamped Run 30.



VOLTAGE WARNING

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

Do not ground chassis or connect test equipment directly to it, unless an isolation transformer is used. If an isolation transformer is not available, a neon lamp can be used to determine if the chassis is "hot". Connect an electrician's neon tester (General Cement's "Ne-o-lite" or equivalent) between the receiver chassis (not control shafts) and some grounded point, such as electrical conduit, water pipe, etc. If the neon lamp glows, the chassis is "hot" and the line cord plug should be reversed. Make the same check with the neon lamp connected between ground and the ground terminal of the test equipment. If the lamp glows, reverse the line cord to the test equipment.

PICTURE TUBE HANDLING PRECAUTION

The newly developed picture tube used in these sets must be handled with much greater care because of its short, thin neck and wafer type base. ALWAYS lift picture tube by grasping firmly around face plate; NEVER LIFT TUBE BY ITS NECK. Use care when inserting socket to prevent bending pins. Before handling picture tube, remove static charge from it by shorting 2nd anode well to chassis ground with an insulated wire or screwdriver. WHEN TUBE IS REMOVED, ALWAYS PLACE IT FACE DOWN.

CONDITIONS FOR MEASURING VOLTAGES

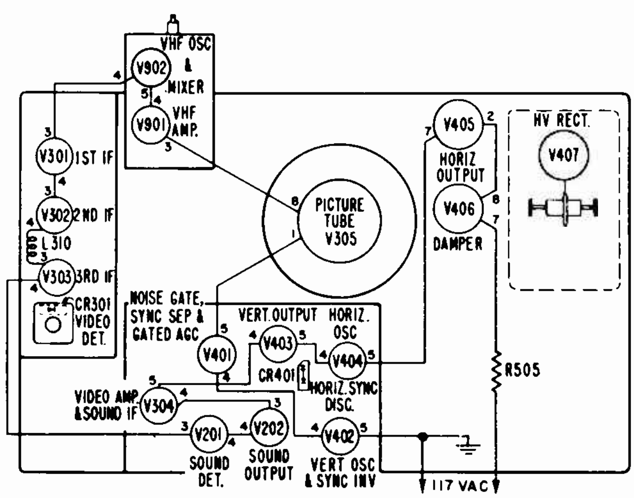
Caution: Pulsed high voltages are present on the caps of V405 and V407, and at pin 3 of V406. DO NOT attempt to measure voltages at these points without suitable test equipment. A VTVM with a high voltage probe may be used when measuring picture tube 2nd anode voltage.

- Set the CHANNEL SELECTOR on an unused channel. CONTRAST and SUPER RANGE FINDER controls fully clockwise. All other controls counterclockwise. Do not disturb HORIZONTAL DRIVE or HORIZONTAL HOLD adjustments.
- Antenna disconnected and terminals shorted together.
- Line voltage: 117 volt AC.
- DC voltages measured with a VTVM between tube socket terminals and chassis, unless otherwise indicated.
- Voltages measured with tubes in socket.
- Voltages marked (*) will vary widely with control settings.

CONDITIONS FOR OBSERVING WAVEFORMS

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

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



TUBE LOCATIONS AND HEATER CIRCUIT

TUBE COMPLEMENT

V901—2BN4	V303—3CB6	V401—3BU8
V902—5CG8	CR301—1N60, 1N87 or 1N295	V402—6CG7
V201—3DT6	V304—6AW8A	V403—12DB5
V202—12CU5	V305—21CEP4A	V404—6CG7
V301—3BZ6	CR401—Dual Selenium Diode 93B5-4	V405—12DQ6A
V302—3BZ6		V406—19AU4GTA
		V407—1B3GT

Admiral

15A2, 15B2, and 15B3 TV CHASSIS
4G3 and 4H3 Remote Control Amplifier
Son-r Tuners S11A and S21A

MODEL IDENTIFICATION CHART

MODEL NUMBER	TV CHASSIS	MODEL NAME	VHF TUNER	SON-R TUNER	REMOTE CONTROL AMPLIFIER	POWER TOWER ANTENNA	DIAL LIGHT
P17F1	15A2	Rockwell	94E163-1	—	—	NO	NO
P17F2	15A2	Rockwell	94E163-1	—	—	YES	NO
P17F3	15A2	Rockwell	94E163-1	—	—	YES	NO
PS17F12	15B2	Lexington	94E164-3	S11A	4H3	YES	YES
PS17F13	15B2	Lexington	94E164-3	S11A	4H3	YES	YES
PS17F22	15B3	Kent	94E164-3	S21A	4G3	YES	YES
PS17F23	15B3	Kent	94E164-3	S21A	4G3	YES	YES

INDEXING POWER TUNING MECHANISM TO STOP ONLY ON OPERATING CHANNELS (Chassis 15B2 and 15B3)

1. Turn set on. On 15B3 chassis, set Son-r **Off-On** switch at rear of set to "OFF" position.
2. Press **Push Bar** tuning control (front of set) until a non-operating channel number appears in channel indicator opening at front of set.
3. Grasp Channel Preset knob (on upper left hand corner of cabinet back when set is viewed from rear), press inward and rotate clockwise until Channel Preset shaft engages the slot in the nylon indexing adjustment. Very slowly turn the knob one half turn to right (clockwise) until a stop is felt. Repeat steps 2 and 3 for each non-operating channel.
4. If tuner skips an operating (desired) channel, remove cabinet back and place a 3/16″ wide screwdriver blade into hollow slotted collar on rear of tuner shaft. Turn screwdriver until a desired channel number appears in opening at front of set.
5. Check to see that AC line cord is disconnected and replace the cabinet back. Grasp Channel Preset knob, press inward and rotate counterclockwise until Channel Preset shaft engages the slot in the nylon indexing adjustment. Very slowly turn knob one half turn to left (counterclockwise) until a stop is felt. Repeat steps 4 and 5 for all operating (desired) channels.

   Do not attempt to adjust Channel Preset knob on 15B2 chassis when TV tuner is positioned between channels 13 and 2 (dot on indicator disc appears in window on front of receiver).
6. After completing adjustments, set Son-r **Off-On** switch to "ON". Check operation on all channels.

PRESETTING MAXIMUM VOLUME LEVEL (Chassis 15B3)

When TV receiver is operated by Son-r hand-held unit, three settings of sound volume are obtained (low, medium and loud).

Before operating by remote control, the loudest required sound level must be preset. With Son-r **Off-On** switch set to "OFF" position for manual tuning, tune in a channel for

(Continued on pages 14 through 23)

normal sound and picture. Adjust **Volume** control for loudest sound volume desired.

Set Son-r **Off-On** switch to "ON" position. By pressing **OFF-ON-VOL** button on the Son-r tuner, the receiver can be turned off and on and three sound levels can be selected in recurring order. Press the **OFF-ON-VOL** button to check the preset sound levels. Do not disturb the manual **Volume** control setting on the front of the set when proper maximum sound level is set.

If, when the set is operated manually, the **Volume** control setting is changed, it will be necessary to reset maximum volume level for remote tuning.

HORIZONTAL LOCK ADJUSTMENT

Make adjustment if picture "slips sideways" or "tears" when switching channels. Adjustment is made by rotating flexible shaft extending from rear of set. Adjust as follows:

1. Allow a few minutes for set to warm up. Tune in weakest station, set **Brightness** and **Contrast** controls for normal picture. Important: Before proceeding, be sure that **AGC** control has been adjusted according to instructions in this manual.
2. Reduce **Contrast** to minimum. Very slowly turn **Horizontal Lock** adjustment to the right or left until picture is in sync. Interrupt the television signal by switching to next channel. With **Push Bar** switch or **Channel Selector** knob, reselect weakest channel. Picture should remain in sync. If picture bends or loses sync, adjust the **Horizontal Lock** so that picture remains in sync and bending of vertical lines does not appear at top of picture. Check adjustment on all channels; if necessary, repeat procedure.

AGC CONTROL ADJUSTMENT

Improper **AGC** control adjustment may result in an overloaded picture. Picture overload can be recognized by bending and/or tearing of the picture or buzz in the sound output. Also, loss of the picture or a weak washed-out picture can result from improper **AGC** adjustment. However, these same conditions can be caused by other troubles in the set.

If adjustment is required, it should be performed exactly as described below:

1. Turn set on and allow 15 minutes to warm up.
2. Select strongest station in the area.
3. Set **Contrast** control for normal picture and **Brightness** control to maximum (fully to right).
4. Set **AGC** control (at rear of chassis) to minimum fully to left.
5. If picture has disappeared when **AGC** control is set to left, turn **AGC** to right until a weak picture is obtained. Adjust **Horizontal Lock** (at rear of set) and **Vertical Hold** (at front of set) for a steady picture without bending of vertical lines at top of picture.
6. Very slowly turn **AGC** control to right until picture just begins to bend, tear, shift or until buzz is heard in sound. Then, slowly turn **AGC** control to left to a point at which overload of picture and/or buzz in sound is removed. Turn **AGC** control an additional 10 degrees (approx.) to left.
7. Check picture at maximum contrast on all channels. Picture should not overload and should reappear immediately after changing channels.

IMPORTANT: **AGC** adjustment should always be made on strongest TV station received.

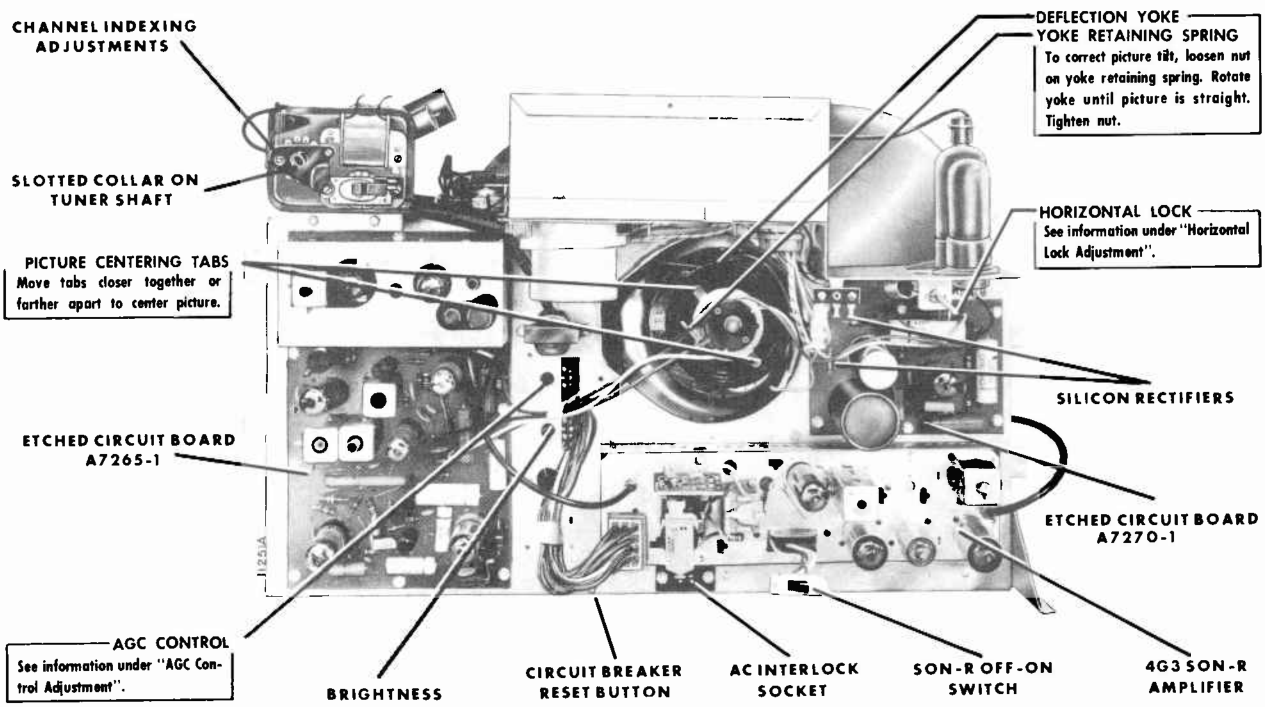
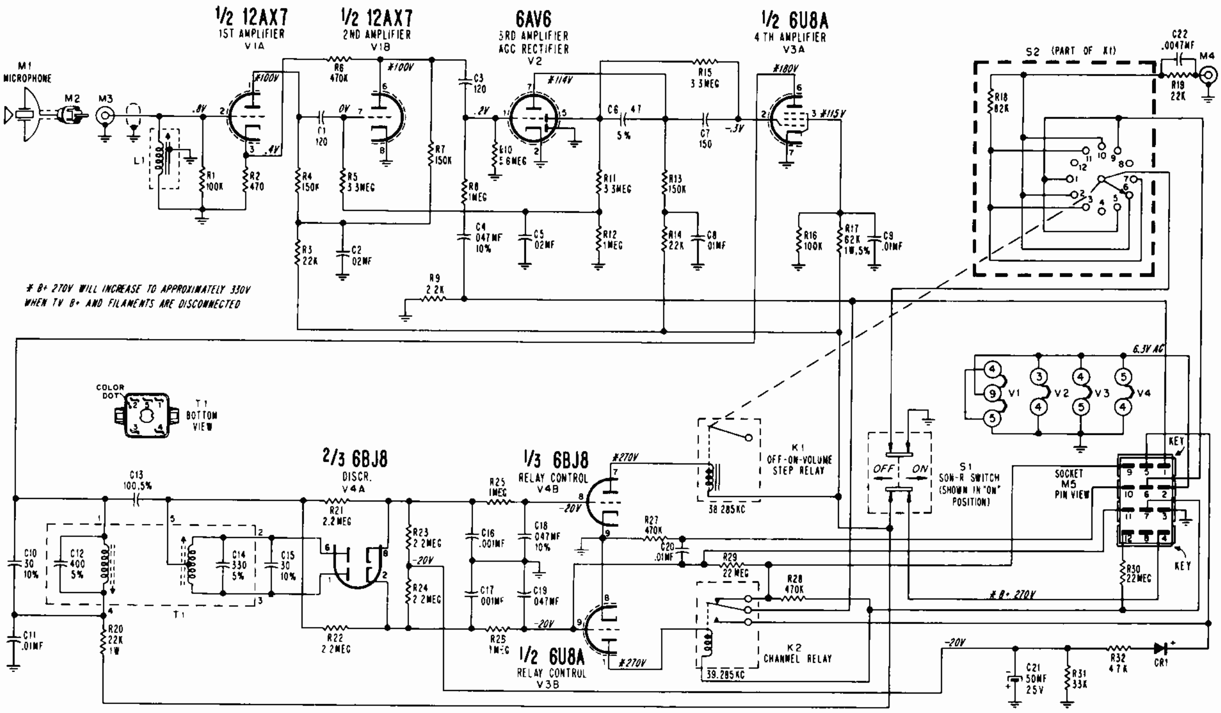
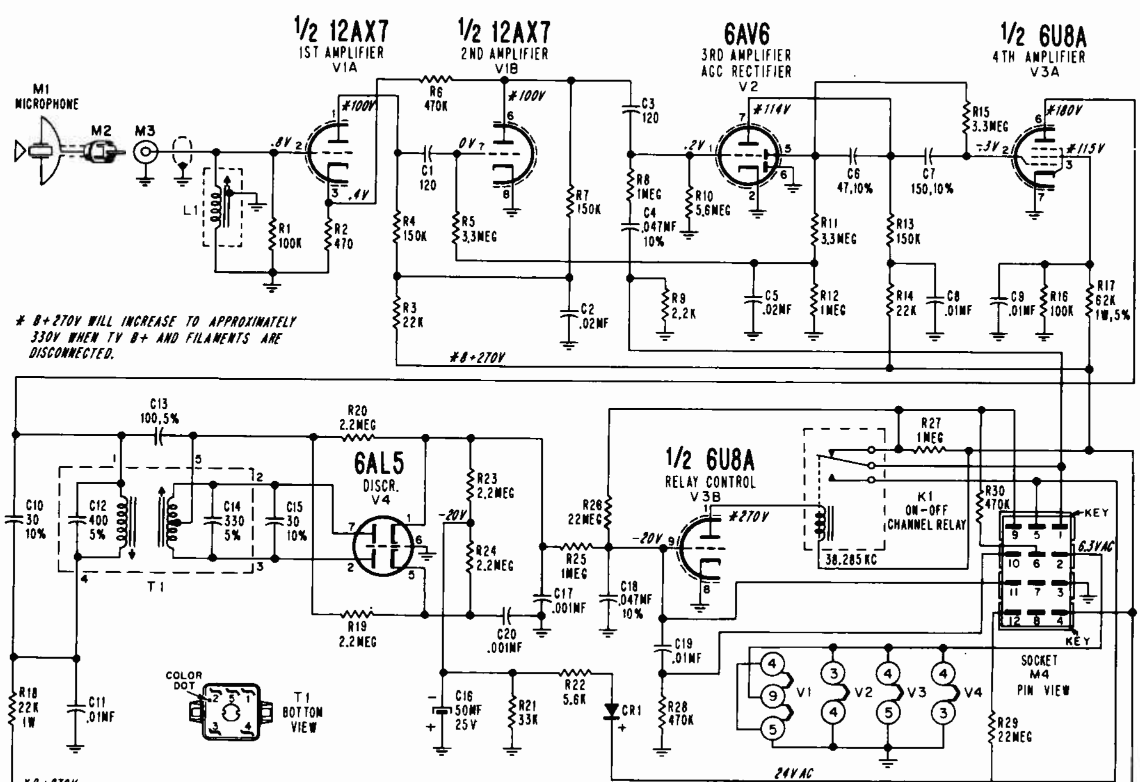


Figure 3. Rear View of 15B3 Chassis Showing Adjustment Locations. Adjustment locations are the same for chassis 15B2.

ADMIRAL Remote Control Amplifiers 4G3 and 4H3, used with 15A2, 15B2, 15B3, Continued



Schematic for 4G3 Remote Control Amplifier Chassis.
NOTE: Chassis 4G3 used with Television Chassis 15B3.



Schematic for 4H3 Remote Control Amplifier Chassis.
NOTE: Chassis 4H3 used with Television Chassis 15B2.

CHASSIS DIFFERENCES

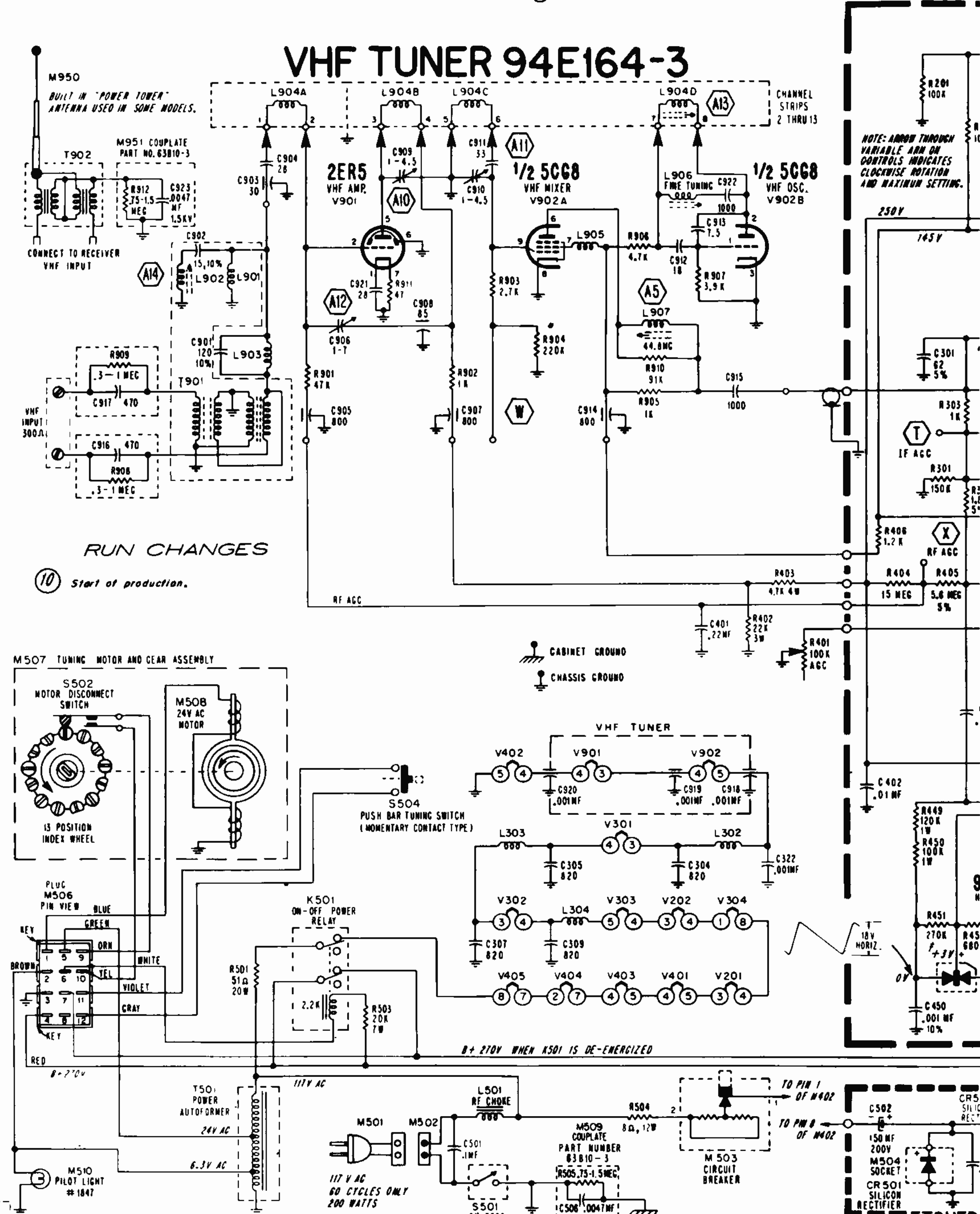
All chassis use a 17" rectangular picture tube. Chassis 15A2 uses VHF tuner 94E163-1. 15B2 and 15B3 use VHF tuner 94E164-3. Chassis 15B2 operates in conjunction with 4H3 Son-r Remote Amplifier and S11A Son-r Remote Tuner. Chassis 15B3 operates with 4G3 Son-r Remote Amplifier and S21A Son-r Remote Tuner.

All TV chassis (15A2, 15B2 and 15B3) use two silicon rectifiers in a voltage doubler power supply circuit.

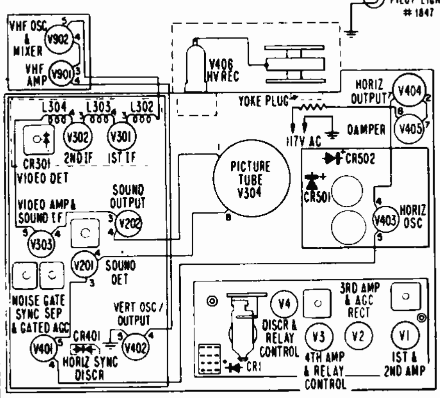
PICTURE TUBE HANDLING PRECAUTION

WARNING: Picture tube must be handled with care. ALWAYS lift picture tube by grasping firmly around face plate; NEVER LIFT TUBE BY ITS NECK. Use care when inserting socket to prevent bending pins. WHEN TUBE IS REMOVED, ALWAYS PLACE IT FACE DOWN.

ADMIRAL Chassis 15B3 Schematic Diagram



TUBE LOCATIONS



TUBE COMPLEMENT

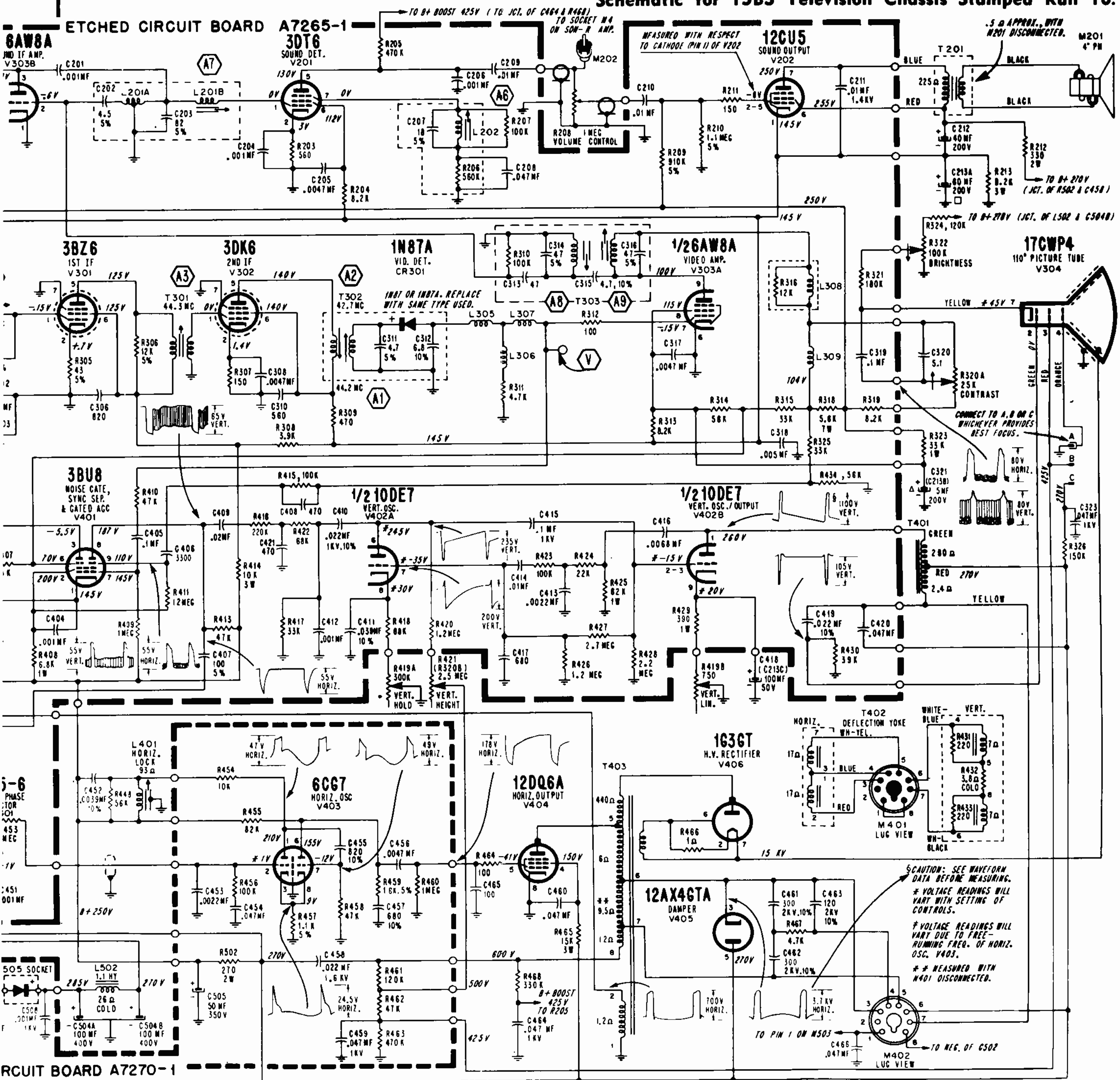
V1 —12AX7	V403—6CG7
V2 —6AV6	V404—12DQ6A
V3 —6U8A	V405—12AX4GTA
V4 —6BJ8	V406—1G3GT
V201—3DT6	V901—2ER5
V202—12CU5	V902—5CG8
V301—3BZ6	CR1 —93A15-1
V302—3DK6	CR301—1N87 or 1N87A
V303—6AW8A	CR401—93B5-6
V304—17CWP4	CR501—93B12
V401—3BU8	CR502—93B12
V402—10DE7	

CIRCUIT BREAKER

A circuit breaker with manual reset is used in the receiver power supply for protection against current overload. If circuit breaker continues to open when "RESET" button is pushed, troubleshooting will be necessary to find the source of excess current.

WARNING: Portions of the chassis are connected directly to one side of the 117 volt, 60 cycle power line. Depending upon the position of the line

Schematic for 15B3 Television Chassis Stamped Run 10.



cord plug in the wall outlet, the total AC line voltage may exist between the chassis and any grounded object. When installing or servicing, do not touch the chassis unless adequate safety precautions are taken. Never touch the chassis and a ground (radiators, pipes, etc.) at the same time.

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

VOLTAGES AND WAVEFORMS

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

Warning: Pulsed high voltages are present at caps of V404 and V406, and pin 3 of V405. Use suitable test equipment at these points.

SCHEMATIC NOTES

Numbers and letters inside hexagons indicate alignment points.

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

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

REMOTE AMPLIFIER ADJUSTMENTS AND SERVICING

The 4H3 and 4G3 Remote Control Amplifiers are 4 tube subchassis and are mounted at the lower rear side of the television chassis.

The 4H3 amplifier and S11A Son-r Tuner, used with 15B2 TV, operate to turn the TV on and off. Also, they control the selection of channels.

The 4G3 amplifier and S21A Son-r Tuner, used with 15B3 TV, control the selection of TV channels during remote operation. Also, the TV is turned on and off and three levels of sound volume can be selected.

B+ and filament voltages are supplied to the remote chassis through a twelve pin socket on the television set.

To insure uniform operation with smooth tuning for both manual and Son-r remote tuning, it is especially important to make VHF Channel Slug Adjustment, Indexing Power Tuning Mechanism and Pre-Setting Maximum Volume Level.

OPERATIONAL DESCRIPTION OF SON-R TUNER S21A AND REMOTE CONTROL AMPLIFIER 4G3

Figure 4 shows a function diagram of the Son-r Tuner S21A and 4G3 Remote Control Amplifier.

The Son-r tuner contains two metal bars of slightly different length and mechanical resonant frequency. When a button on the Son-r tuner is pushed, a hammer strikes one of the resonator bars. The bar that is struck vibrates at a definite ultra-sonic frequency. A microphone, mounted at the front of the television set, picks up the ultra-sonic vibrations, converts them to electrical signals (damped waves) and feeds them to the amplifier. The **CHANNEL** and **ON-OFF-VOL** bars resonate at 39.285KC and 38.285KC respectively.

Input signals are amplified by V1A (½ 12AX7), V1B (½ 12AX7), V2 (triode section of 6AV6) and V3A (pentode section of 6U8A). Signals are then fed to a discriminator stage V4A (⅔ 6BJ8).

The DC output voltage, which is dependent upon input signal, is applied to the grids of the relay control tubes V3B (triode section of 6U8A) and V4B (triode section of 6BJ8).

Depending upon which button on the Son-r tuner is pressed, the discriminator output voltage will swing positive and overcome the bias on the proper relay control tube (V3B or V4B) energizing the associated relay.

Operation of OFF-ON-VOLUME relay K1 actuates the ratchet on rotary switch S2 (step type volume control). This switch advances one step for each time the **OFF-ON-VOL** button on the Son-r tuner is pressed. This switch gives the Off-On function and three steps of volume level.

When the **CHANNEL** button on the remote tuner is pressed, actuating the Channel Relay K2, a switch on the TV chassis allows Tuning Motor M508 to position tuner at next operating channel.

OPERATIONAL DESCRIPTION OF SON-R TUNER S11A AND REMOTE CONTROL AMPLIFIER 4H3

The Son-r tuner contains a metal bar that resonates at 38.285KC. Input signals are amplified by V1, V2 and V3 and fed to V4 (6AL5). When the Son-r tuner is operated, the discriminator output voltage swings positive to overcome the bias on V3B. V3B conducts and the plate circuit relay K1 is actuated.

When the **ON-OFF CHANNEL** button on the remote tuner is pressed, actuating relay K1, a switch on the TV chassis allows Tuning Motor M508 to position tuner at next operating channel. When tuner stops at position between channels 2 and 13, a cam mounted on the tuner shaft turns the TV receiver off. By operating the remote tuner again, the TV receiver turns on and the TV tuner is positioned at the lowest numbered operating channel.

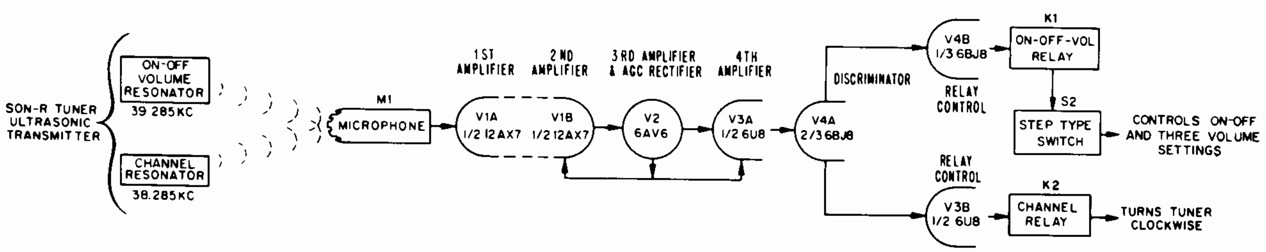


Figure 4. Functional Diagram of S21A Son-r Tuner and 4G3 Remote Control Amplifier.

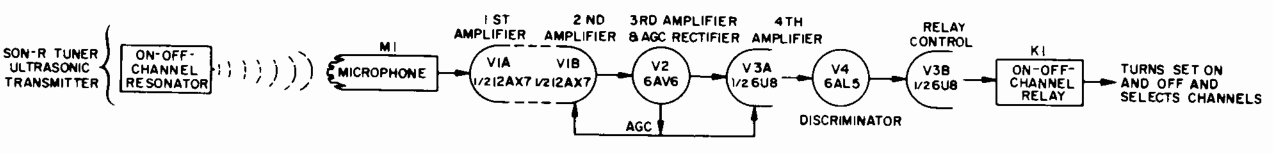


Figure 5. Functional Diagram of S11A Son-r Tuner and 4H3 Remote Control Amplifier.

ADMIRAL Chassis 15A2, 15B2, 15B3, Service Information, Continued

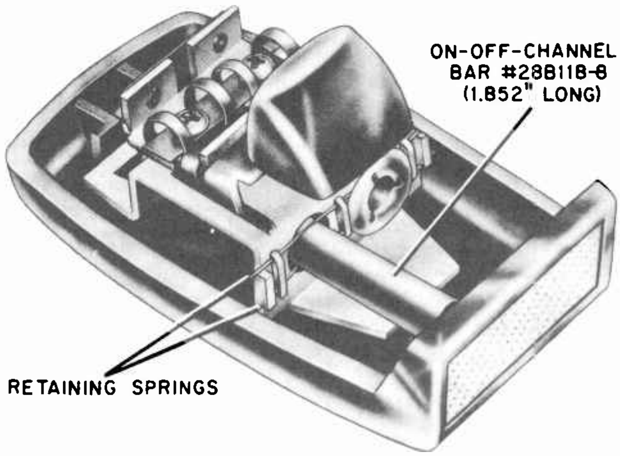


Figure 6. Top Inside View of S11A Son-r Tuner. Location of Retaining Springs and Resonator Bar Shown.

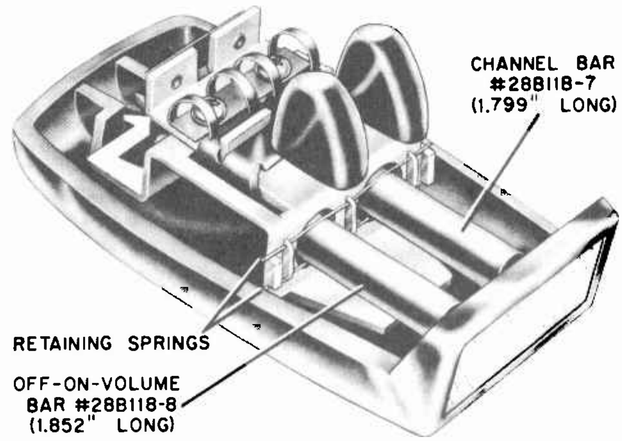


Figure 7. Top Inside View of S21A Son-r Tuner. Location of Retaining Springs and Resonator Bars Shown.

SERVICING SON-R TUNERS S11A AND S21A

The hand-held Son-r tuner is a mechanical device (no tubes, transistors, etc.). With normal handling the Son-r tuner should seldom if ever require service attention. Handle the tuner with moderate care and do not subject it to sharp impact by dropping or striking it.

If the Son-r tuner is dropped on a solid surface or given rough handling, the resonator bars may slip from their proper position. This may cause intermittent tuning or inoperation. Figures 6 and 7 show the correct mounted position of each resonator bar. IMPORTANT: Retaining springs on the tuner must fit into grooves on resonator bars.

If Son-r tuner is dropped, remove top section of the tuner and check to see that resonator bar(s) have not slipped. Retaining springs must be seated in grooves at center of bar(s).

SERVICING 4H3 AND 4G3 REMOTE CONTROL AMPLIFIERS

All tubes and relays are located at top of chassis for ease of servicing. B+ and filament voltages for remote amplifier operation are supplied by the TV chassis.

To expose components under the chassis for servicing, remove screws that hold the remote chassis to TV chassis. When servicing either remote chassis, do not allow it to come in contact with the television chassis pan. A removable shield covers the relays K1 and K2 on the remote amplifier chassis 4G3.

When the remote chassis is removed from the TV chassis, voltages can be measured on the component side of the chassis.

SERVICE HINTS

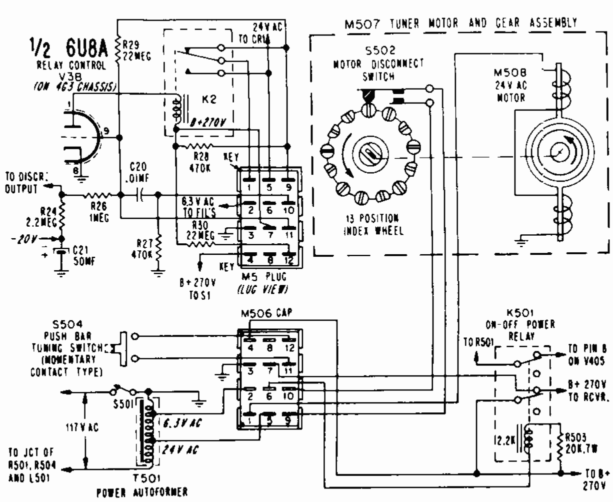


Figure 8. Simplified Diagram of AC Circuitry in Television Chassis 15B3. In Chassis 15B2, K501 is replaced by switch S505 and is operated by a cam gear on the tuner shaft.

POWER SWITCHING FOR TUNING MOTOR M508

As an aid to circuit tracing, refer to figure 8. Figure 8 shows relay control stage V3B and switching circuitry on TV chassis 15B3. The following explanation applies to TV chassis 15B2 also. The symbol numbers of some components involved in this explanation will change for TV chassis 15B2, but the connection and values remain constant for both chassis.

Line voltage (117V AC) is applied to T501 when switch S501 is turned "ON". From the secondary of T501, 6.3VAC and 24VAC are applied to the remote chassis.

Push Bar tuning switch S504 is connected in series with a 22 megohm resistor through the 12 pin plug and socket (pins 11 and 12). On the remote chassis, this series network is connected between B+ 270V and pin 9 (grid) of V3B.

With S501 turned "ON", the tuning motor can be operated by actuating **Push Bar** switch S504 on front of set or by:

ADMIRAL Chassis 15A2, 15B2, 15B3, Service Information, Continued

1. Pressing **CHANNEL** button on Son-r Tuner S21A to actuate channel relay K2 on 4G3 remote chassis and operate the tuning motor on TV chassis 15B3.
2. Pressing **ON-OFF CHANNEL** button on Son-r Tuner S11A to actuate **ON-OFF CHANNEL** relay K1 on 4H3 remote chassis and operate the tuning motor on TV chassis 15B2.

When S504 is actuated, the grid of V3B is placed at a near ground potential. V3B conducts, energizing the plate circuit relay. 24VAC, normally applied to the remote chassis, is switched by the plate circuit relay and applied to Tuning Motor M508 through pin 1 on plug and socket. M508 turns and allows contacts on S502 to close. With S502 closed, the .01MF capacitor charges, negative on the grid side, through contacts on S502.

When S502 contacts open by mechanical detent action, the capacitor discharges through the 1 megohm and 2.2 megohm resistors in the grid circuit, the negative bias supply and the 470K ohm resistor connected in series with the capacitor. When S502 opens, the grid of V3B is driven negative and the negative bias supply (-20V) cuts V3B off. The plate circuit relay deenergizes, stopping the tuning motor. The negative bias supply holds V3B cut off until the tuning cycle is initiated again.

When the **CHANNEL** button on Son-r Tuner S21A or **ON-OFF CHANNEL** button on Son-r Tuner S11A is operated, the output of the discriminator stage (on remote chassis) triggers V3B, starting the cycle of tuning motor action.

TV SET OPERATION WITH SON-R AMPLIFIER CHASSIS DISCONNECTED

TV chassis 15B2 or 15B3 may be operated when the 12 pin plug and socket are disconnected. By connecting one jumper wire between pins 1, 10 and 11 on M506 and connecting a second jumper wire between pins 5, 9 and 12 on M506, the television chassis may be operated with the **Push Bar** tuning switch S504.

SERVICING HORIZONTAL PHASE DETECTOR (DUAL SELENIUM DIODE CR401)

A plug-in type dual selenium diode is used as the horizontal phase detector CR401. The diodes have a common cathode. See schematic diagrams (at rear of manual) for circuit connection of CR401.

A faulty diode or poor contact between diode leads and socket can result in no raster, intermittent horizontal sync or loss of horizontal sync. To insure good contact between CR401 leads and socket, scrape all three leads to remove oxidation or corrosion.

Important: When inserting diode in socket, be sure to observe polarity indication. The beveled edge of the diode case must line up with the beveled corner on the diode socket.

Checking dual selenium diode CR401

A quick and simple check of CR401 is made by using the R X 100 and R X 1,000,000 scales on an ohmmeter.

Remove CR401 from socket and connect negative lead of ohmmeter to center lead of CR401. With the positive probe of the ohmmeter, measure the resistance to each end lead. The resistance should be from 2,000 to 5,000 ohms in each case.

Now, connect the positive probe of the ohmmeter to the center lead on CR401. Measure the resistance to each end lead with the negative lead. On the R X 100 range, no indication will normally be seen. The resistance readings will be quite high (100 megohms or higher).

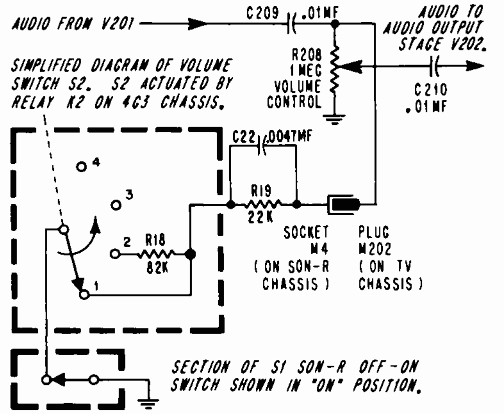


Figure 9. Simplified Diagram of Volume Level Control Circuitry on Chassis 15B3 TV and 4G3 Son-r Remote Control Amplifier.

Set the ohmmeter to R X 1,000,000 range and make the same measurements as in the preceding paragraph. A slight deflection from the infinite resistance point on the scale should be seen. This is a check for an open diode. An open diode will give no indication on the R X 1,000,000 scale.

THREE STEP VOLUME LEVEL CONTROL CHASSIS 15B3 AND 4G3

Figure 9 shows a simplified diagram of volume level selection during Son-r remote control tuning. To control volume level, the high side of **Volume** control R208 (jct. of C209 and R208) is shunted, in steps, by:

1. 22,000 ohms to give "LOW" volume level.
2. 82,000 ohms and 22,000 ohms (series connected) to give "MEDIUM" volume level.
3. R208 is unshunted to give "HIGH" volume level.

When the set is operated by Son-r remote control and the **ON-OFF-VOL** button on the Son-r tuner is pushed, relay K2 on 4G3 chassis causes step type switch S1 to move to the next position. When set is "ON", 1, 2 and 3 (see above) are selected in order. The set is turned "OFF" in position 4. Because of the "step-type" action of S2, the sequence of selection is repeated. IMPORTANT: Maximum necessary volume level must be preset before operating the set by Son-r.

SERVICING VIDEO DETECTOR (CR301)

In these receivers, a germanium diode (1N87 or 1N87A) is used as the video detector CR301. The detector diode is connected across the top terminals of the 2nd IF transformer T302. The detector diode is accessible for checking or replacement after removing the snap-on cover shield from the 2nd IF transformer.

Note: The germanium diode functions with excellent stability, has long life expectancy and ability to withstand severe mechanical shock without damage. However, the diode may be permanently damaged by application of high current or excessive heat to the connecting leads.

ADMIRAL Chassis 15A2, 15B2, 15B3, Service Information, Continued

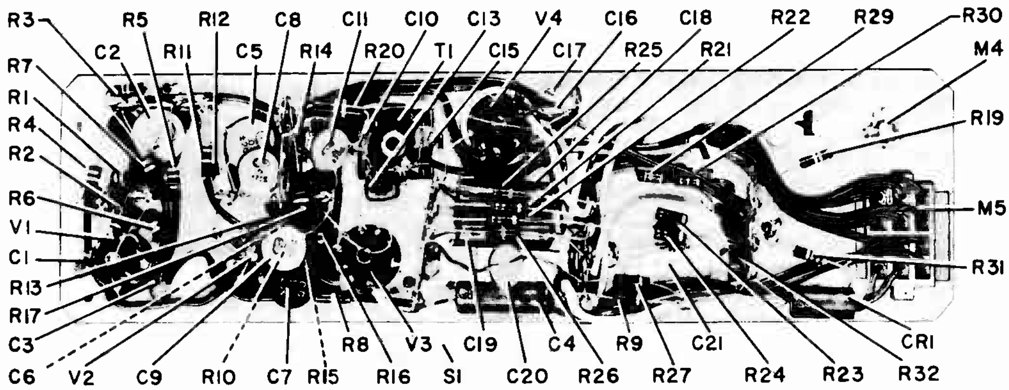


Figure 11. Bottom View of Remote Amplifier Chassis 4G3. Component locations shown.

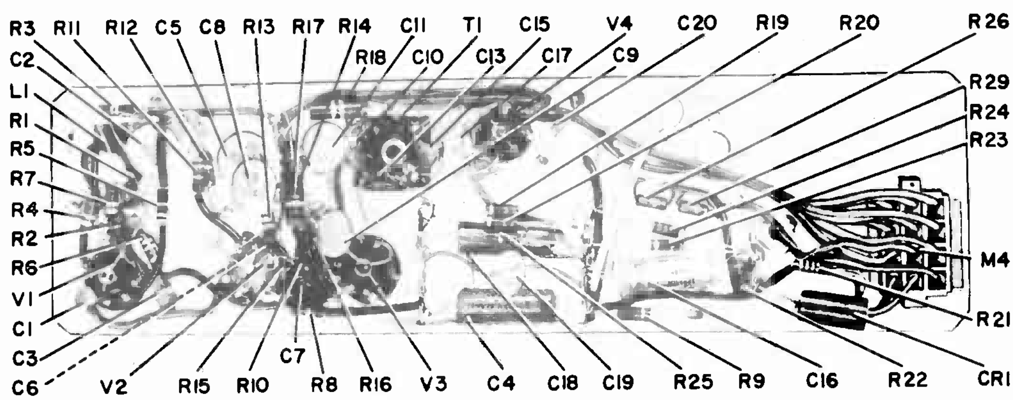


Figure 13. Bottom View of Remote Amplifier Chassis 4H3. Component locations shown.

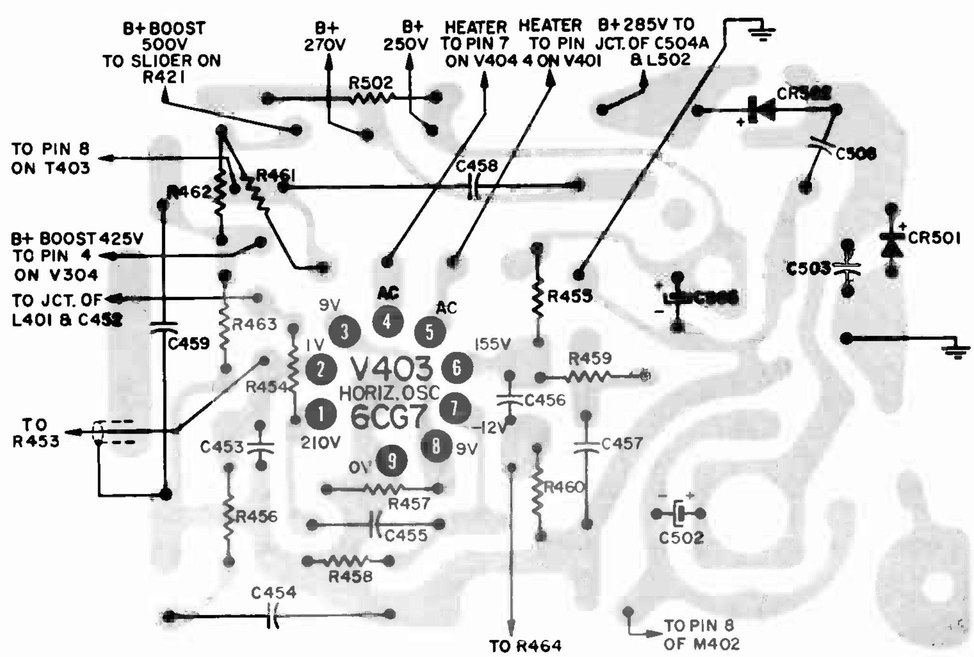


Figure 15. View of Wiring Side of Etched Circuit Board A7270-1. Gray Area Represents Etched Wiring; Black Symbols and Lines Represent Components and Connections on Opposite Side.

ADMIRAL Chassis 15A2, 15B2, 15B3, Service Information, Continued

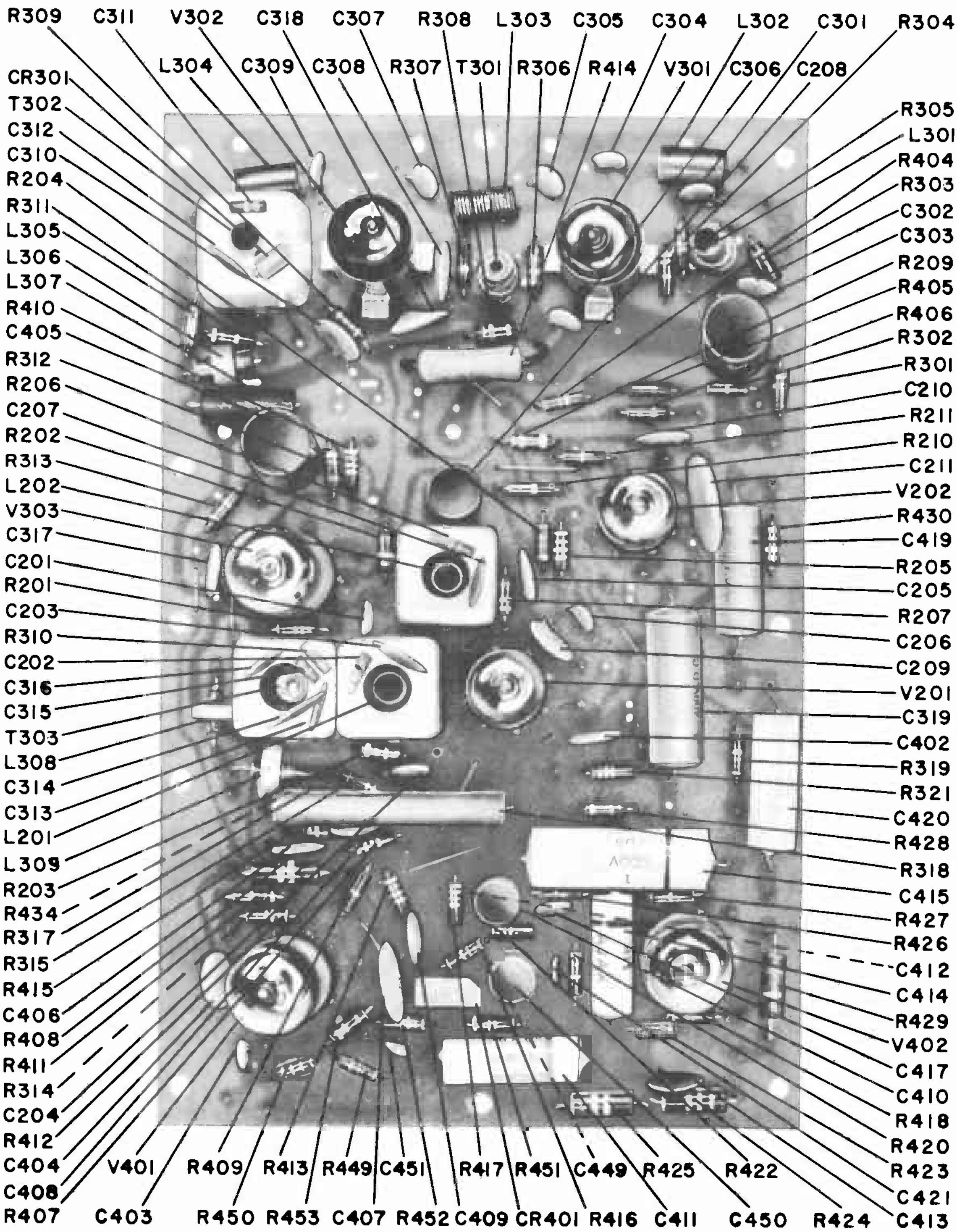


Figure 16. View of Components Side of Etched Circuit Board A7265-1. Location of Components Shown.

ADMIRAL Chassis 15A2, 15B2, 15B3, Service Information, Continued

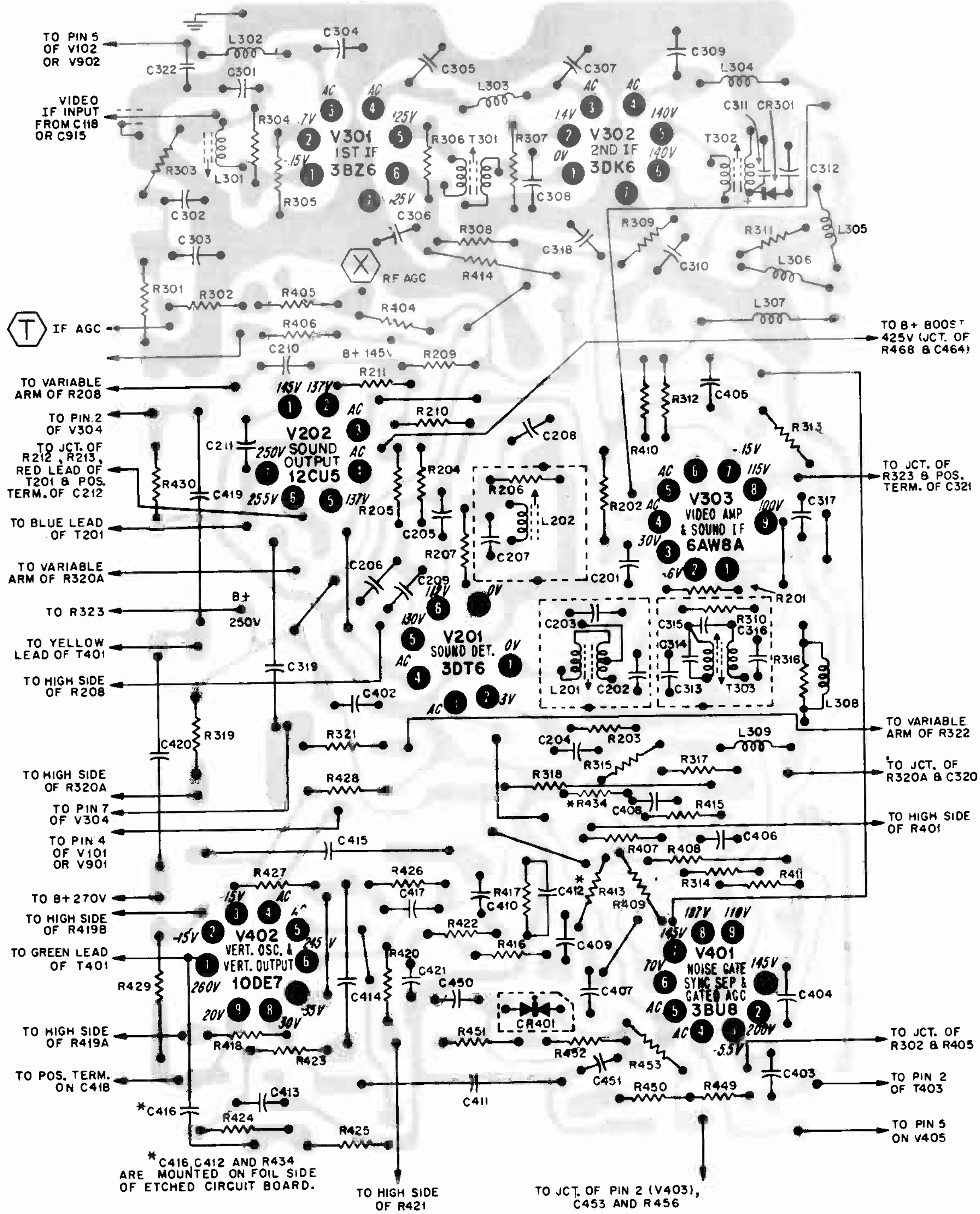
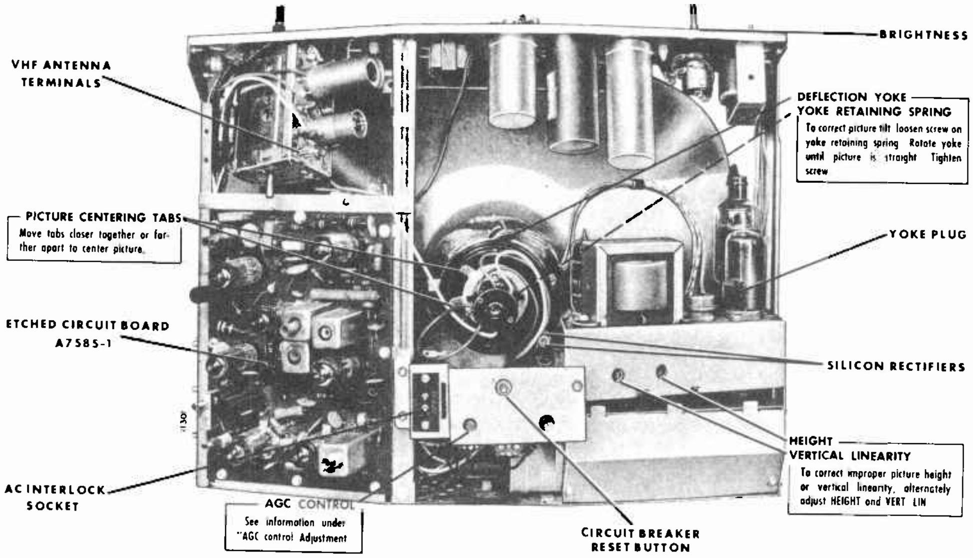


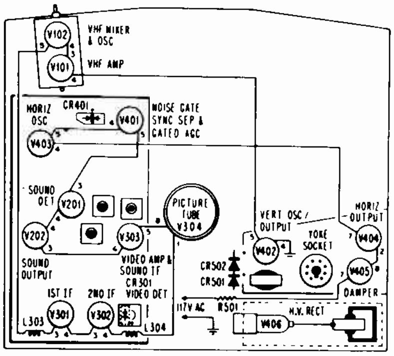
Figure 17. View of Wiring Side of Etched Circuit Board A7265-1. Gray Area Represents Etched Wiring; Black Symbols and Lines Represent Components and Connections on Opposite Side.

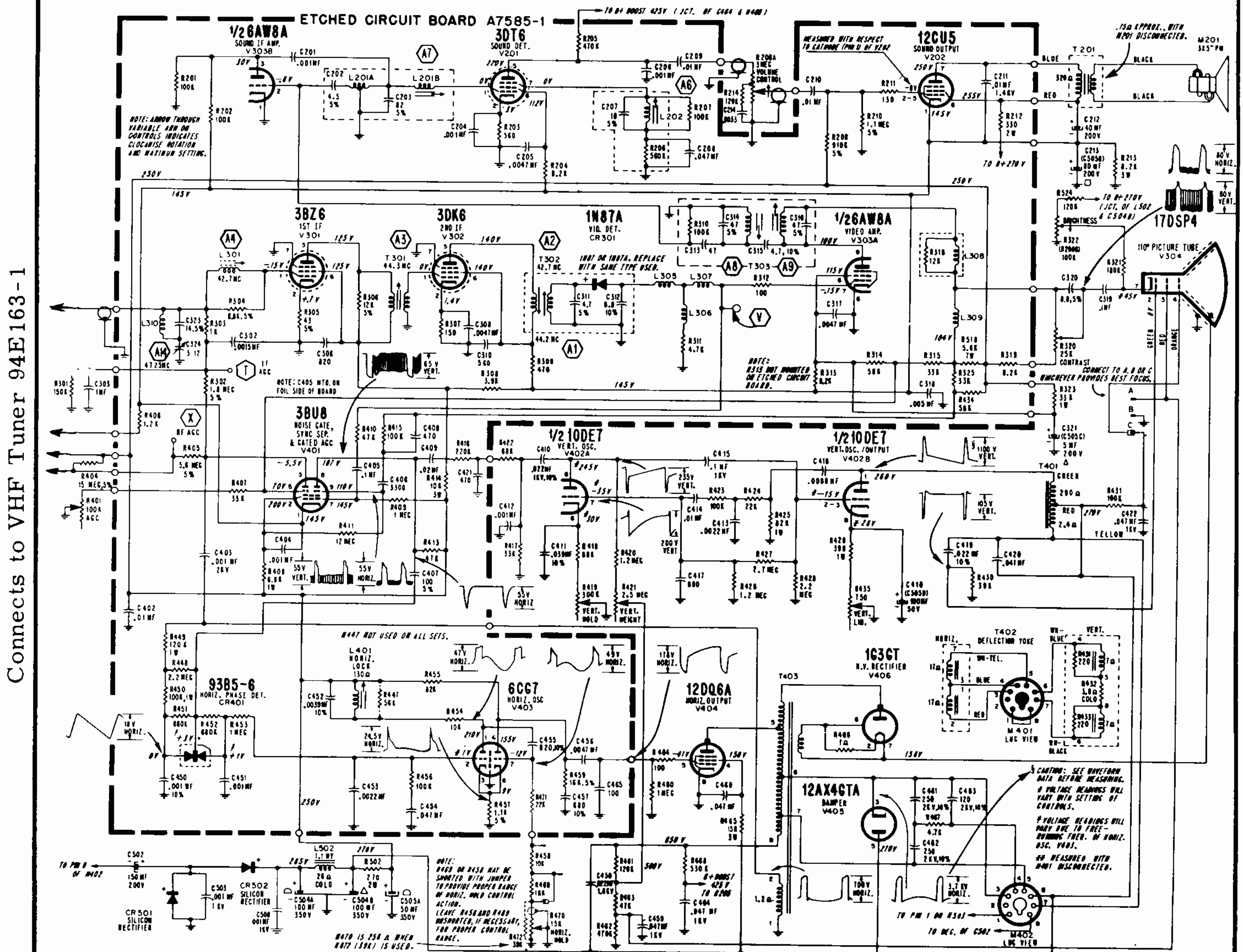
ADMIRAL Chassis 15D1B (Essential information which differs from 15A2)

Models:
PL17F31B, PL17F32B, PL17F33B, PL17F41B, PL17F42B, PL17F43B.



TUBE LOCATIONS





(For Schematic Notes see Page 17)

Emerson Television

MODELS USING CHASSIS: 120451 HC(H), 120452 MC(M)

(Service material on pages 25 through 30)

TYPE	STYLE	MODEL NO.	TV CHASSIS	KINESCOPE	TUNER
VHF RECEIVERS	PORTABLE TABLE MODEL	1500	120451 HC(H)	17AVP4A	471113
		1502	120451 H		
		1504	120451 HC		
	TABLE MODEL	1506	120451 H		
UHF-VHF RECEIVERS	PORTABLE TABLE MODEL	1503	120452 M		471141
		1505	120452 MC(M)		

DISASSEMBLY INSTRUCTIONS

To Remove Mask and Lens:

1. Remove the two screws on bottom of mask.
2. Lift bottom of mask out and upward releasing the assembly.

To Remove Picture Tube:

1. Remove mask and lens assembly from front of set. (Instructions above.)
2. Disconnect two antenna leads. Remove masonite back.
3. Remove picture tube socket, ion trap, yoke bracket, and high voltage lead. (Be sure to discharge high voltage.)
4. Remove two screws on picture tube support bracket.
5. Remove picture tube from front of cabinet, guiding the yoke as the neck moves forward.

To reassemble, reverse above procedure.

To Remove Chassis from Cabinet:

1. Remove all knobs, disconnect antenna leads, and remove masonite back.
2. Take off speaker leads, picture tube socket, ion trap, yoke bracket, and high voltage lead. (Be sure to discharge high voltage.)
3. Remove four chassis-mounting screws from bottom of cabinet.
4. Remove one screw from the VHF tuner brace on upper left of cabinet at the rear and one screw on side near knobs.
5. Pull chassis toward rear, being careful to guide and support the deflection yoke as it slides off the picture tube neck.

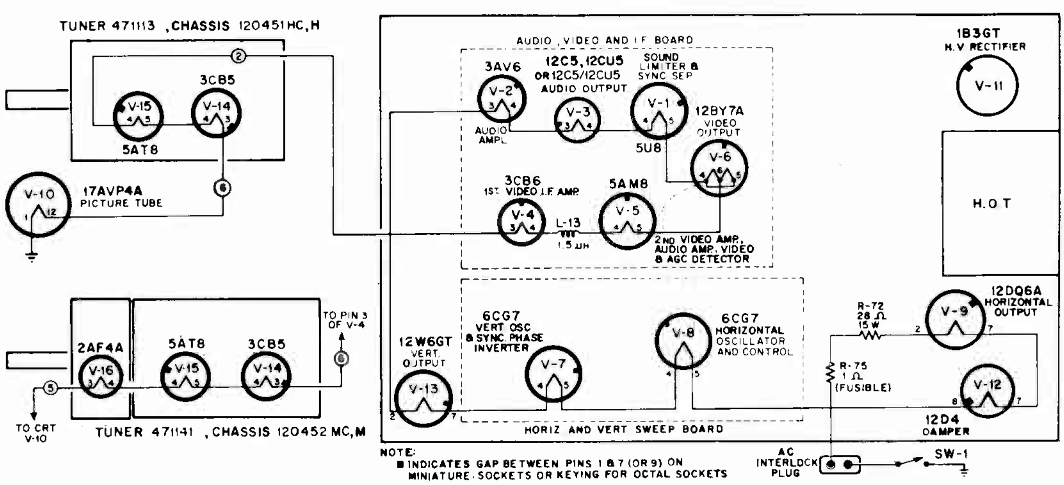
To reassemble, reverse above procedure.

REPAIR OF COUPLATES

Whenever possible, couplates should be repaired instead of replaced. This practice could easily become a time-saving factor.

Example No. 1: Couplate Part #923151, Resistor R-51 open.
Clip off pin 6 from couplate. This removes R-51 from circuit. Insert a regular 47K resistor from pin 5 of couplate to junction of C-18 and R-78.

Example No. 2: Couplate Part #923055.
Capacitor C-27 shorted.
Clip off pin 4 of couplate. This takes C-27 and R-50 out of circuit.
Insert regular 330K resistor and an 82 mmfd. from pin 3 of couplate to pin 5 of couplate Part #923151.



TUBE LOCATION DIAGRAM

EMERSON Chassis 120451H, -HC, -HC(H), 120452M, -MC(M), Alignment Information

VIDEO I.F. ALIGNMENT

1. Connect 3 volts bias to AGC line. Negative terminal to junction of R13 and R15, positive terminal to chassis.
2. Connect IF marker generator to floating shield of tuner mixer tube (See Note) and VTVM to junction L-8 and R-34.
3. Adjust C-T (tuner) for maximum capacity.
4. Adjust marker to 45.5 MC and peak T-4 for maximum. (Keep signal generator output as low as possible).
5. Adjust marker to 43.25 MC and peak T-3, L-2 and T-8 (tuner I.F.) for maximum. (Keep signal generator output as low as possible).
6. Connect oscilloscope through 20,000 ohm isolation resistor in place of the VTVM and connect a sweep generator to "Floating" mixer tube shield along with marker generator. Adjust output of sweep to produce about 2 volts peak to peak at oscilloscope and reduce marker signal so response curve is not distorted.
7. Adjust marker to 45.75 MC. This marker should appear 60% down with respect to related peak of response curve. If not 60%, adjust C.T. Limits of response curve are 30% tilt and 20% peak-to-valley ratio.

NOTE: Part of the procedure calls for use of a "floating" shield over the mixer tube of the tuner. The tube shields now used in the tuner cannot be removed from their mounts. Instead of a "floating" shield, the following method is recommended:

Take a thin piece of copper on brass foil, ½" by 2", and paste on to a thin piece of onion skin insulation. The insulation should extend about 1/8" beyond the two long sides and one short side while the foil should extend beyond the insulation on the other short side.

The shim assembly is then slipped in lengthwise to fit between the mixer tube and its shield with the metal foil facing the tube. The short side with extended insulation is placed toward the chassis, while the side with the foil extending beyond the insulation is connected to the sweep generator. The shim may now be rotated for maximum coupling as observed on the oscilloscope.

SOUND I.F. ALIGNMENT:

1. With antenna loosely coupled to set, adjust receiver to a weak signal channel.
2. Place a VTVM (negative scale) to junction L-1 and R-1, and adjust T-9 and L-4 for maximum limiter voltage on V.T.V.M. Amount of input signal should be such that a sharp maximum reading can be obtained.
3. Connect V.T.V.M. to junction R-5 and C-4, (Negative Scale) and detune discriminator (T-1) secondary to produce a maximum negative reading. (Looking at top of chassis secondary slug is closer to you).
4. Adjust primary of T-1 for maximum negative reading.
5. Re-adjust secondary of discriminator T-1 towards original slug position for minimum reading on V.T.V.M. Check audio, and if distorted, repeat steps No. 1-5.

ALIGNMENT OF MIRACLE PICTURE LOCK (Horizontal Oscillator and AFC)

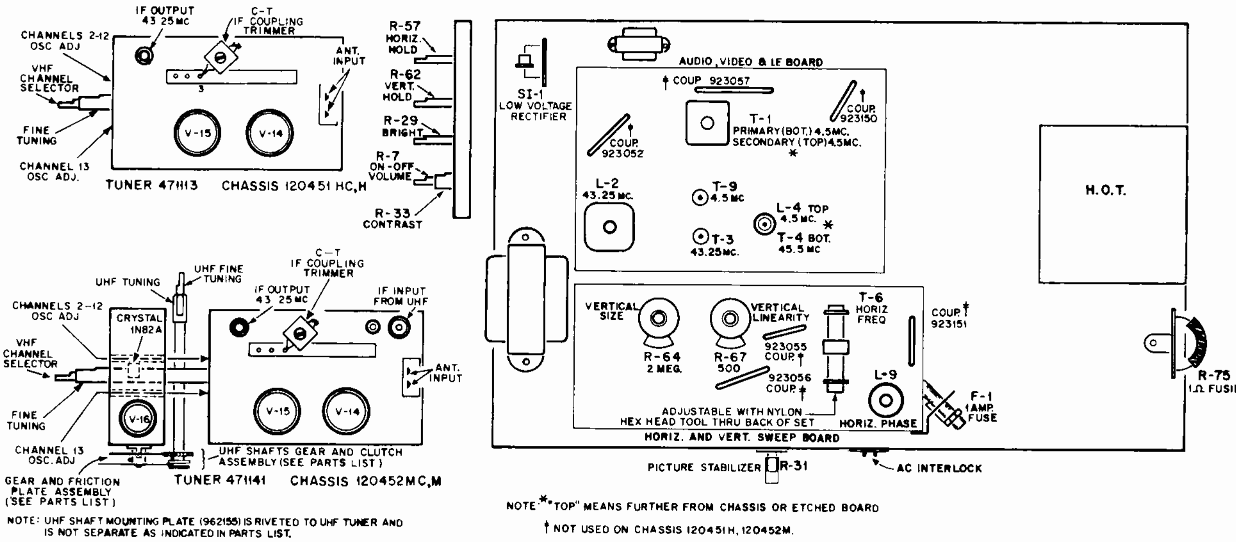
Tune set to a known good channel and turn picture stabilizer (R-31, 100K) located on the rear chassis apron fully clockwise (minimum resistance). Short phasing coil (L-9) by means of a jumper wire across C-32, .01 mfd, accessible on circuit board. Rotate horizontal hold control (R-57, 500K) 2/3 of its total travel in the clockwise direction. Starting with the horizontal frequency slug of T-6, (the coil mounted horizontally on board) all the way "out" (towards back of set), rotate "in" until picture locks into sync. Remove short from phase coil and adjust phase coil (L-9) slug until picture holds. Adjust horizontal hold control R-57 to full clockwise position. At this point picture should fall out of horizontal sync. (4 bars slanted to the right as you are facing picture). Readjust phase coil for these 4 bars if necessary. Picture will now fall out of sync at both sides of the 2/3 point (clockwise) of the horizontal hold control.

NOTE: T-6 and L-9 must be adjusted with a hex-head adjustment tool and not a screwdriver.

ADJUSTMENT OF PICTURE STABILIZER (R-31)

For local signals, this control should be set to its extreme clockwise position (minimum resistance).

If sync improvement is required in electrically noisy areas, the picture stabilizer control (R-31) is turned in a counterclockwise direction until the best sync stability is obtained. Be sure to check all channels for sync instability, since a compromise setting of R-31 might be necessary.



ALIGNMENT POINT DIAGRAM

EMERSON Chassis 120451H, -HC, -HC(H), 120452M, -MC(M), Service Information

TUNER INFORMATION

VHF tuner 471113 is a 12 position, series filament, incremental inductance-type tuner. Switching is accomplished by means of 4-ganged wafer sections in a removable turret with two circular rows of contacts on one side of each section. A single stationary spring contact is used for each circular row of contacts.

Ordinarily, the only adjustments required in the field are those necessary to compensate for variations in oscillator tube replacements. This can usually be accomplished with the channel #13 oscillator adjustment. If individual channel adjustments are necessary, proceed as follows:

(Since this tuner is of the incremental inductance type, all oscillator adjustments should be made commencing with the higher channel and then proceeding to the lower channel).

1. Set channel selector to channel #13. Set fine tuning control to electrical center of its range.
2. Adjust Channel #13 oscillator adjustment (See figure #1) for best picture and sound. (Use a non-metallic screwdriver).
3. Channels #2, #4, and #6 have slug adjustments and should always be adjusted starting with the higher channel. (See figure #1.) It is recommended that channels #13, #6, #4, and #2 slugs, only, be adjusted in the field in that order when necessary.
4. Channels #12 through #7, can be adjusted when required by bending the hairpin inductonces through the hole provided.
5. Channels #3 and #5 split-coil windings should not have to be compressed or separated ordinarily.

UHF-VHF Tuner 471141 – This tuner incorporates a 13 position, incremental inductance-type VHF tuner, plus a 70 channel UHF tuner. Separate VHF and UHF antenna inputs are provided. A 2AF4 is used as the UHF oscillator and a 1N82A as the UHF mixer crystal. The 13th position on the VHF tuner corresponds to the UHF position and converts the VHF tuner to two additional stages of IF amplification.

Dissassembly of VHF Tuner 471113, VHF Section Tuner 471141

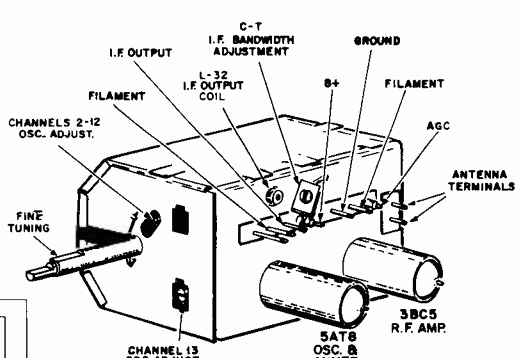
1. Remove one screw from edge of cover away from the shaft. This releases the cover and most servicing can be accomplished without further disassembly.
2. If further disassembly is needed, disengage 2 retaining wire springs and 2 grounding wire springs.
3. Hold tuner so that shaft is up. In this position the ball bearing that engages the detent ring will not be lost as the turret is disengaged.

Reverse procedure to reassemble.

Disassembly of UHF Section, UHF-VHF Tuner 471141

1. Unsolder three leads from UHF section and unplug the UHF input cable.
2. Remove the screw from the linkage bar (located beneath the crossed shafts) that locks the tuners together. The screw forces the prongs apart causing pressure contact.
3. Remove two screws from top UHF bracket.
4. To reach UHF components, straighten tabs in the front cover plate.

Reverse procedure to reassemble.

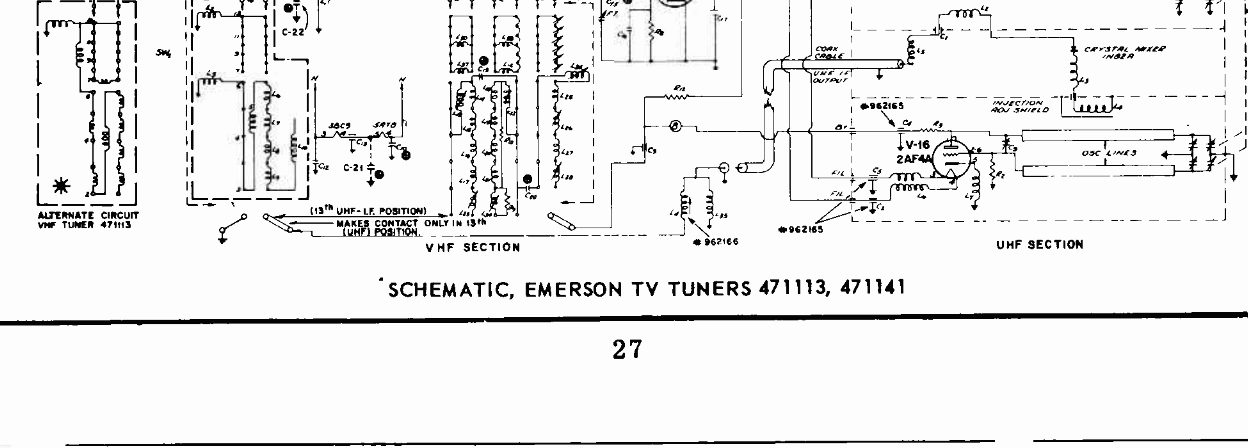


TV TUNER, 471113

NOTE:
✳ USED ON TUNER 471113 ONLY.
MECHANICAL PARTS SHOULD BE ORDERED BY TUNER PART NUMBER AND PART FUNCTION.
"96" NUMBERS ARE EMERSON PART NUMBERS.
● REFER TO VHF TUNER PARTS LIST, NO. 471113, VHF SECTION NO 471141.

CHASSIS PARTS LIST, UHF SECTION, TUNER 471141

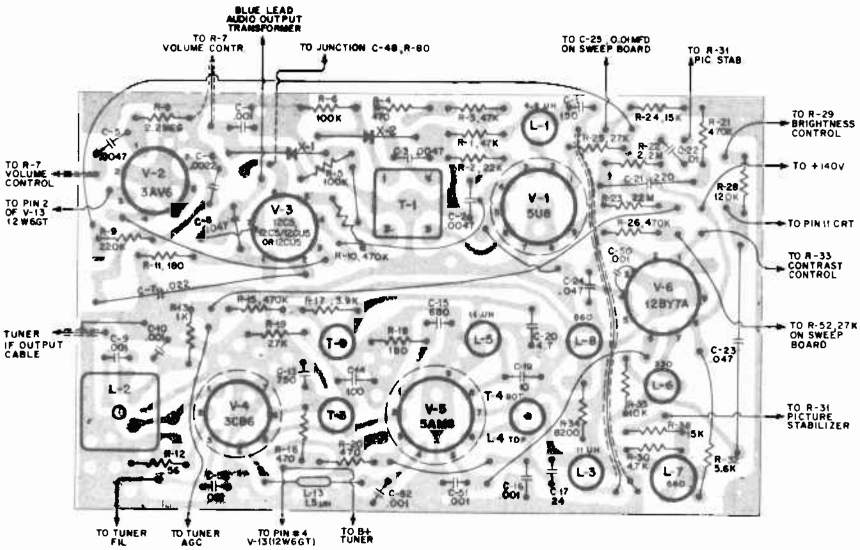
SYM.	DESCRIPTION	SYM.	DESCRIPTION	SYM.	DESCRIPTION
R-1	680K Ω 1/2 W.	C-3	OSC. LOW END TRIMMER	L-3	OSC. COUPLING LOOP
R-2	6.8K Ω 1/2 W.	C-4	1000 MMF FEED THRU	L-4	OSC. COUPLING LOOP
R-3	1.5K Ω 1/2 W.	C-5	1000 MMF FEED THRU	L-5	40 MC OUTPUT COIL
C-1	33 MMF FEED THRU	L-1	ANT. LOOP	L-6	FILAMENT COIL
C-2	1000 MMF FEED THRU	L-2	R.F. COUPLING LOOP	L-7	CATHODE COIL



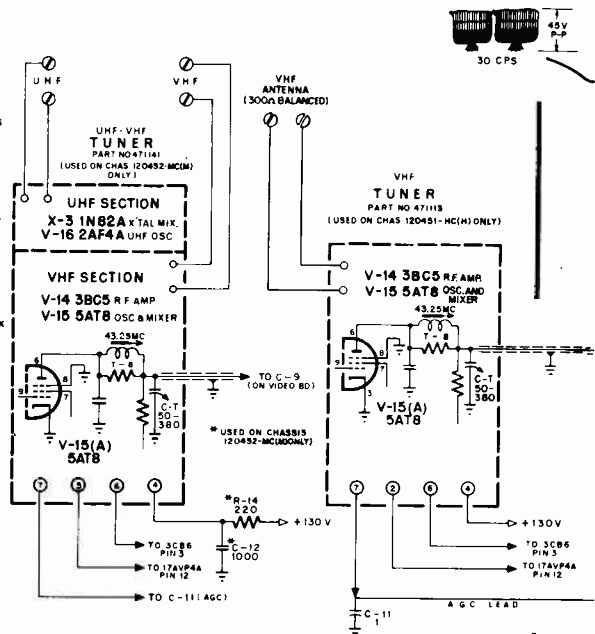
SCHEMATIC, EMERSON TV TUNERS 471113, 471141

EMERSON Chassis 120451H, -HC, -HC(H), 120452M, -MC(M), Continued

NOTE:
THE LETTER "C", FOLLOWING THE CHASSIS NUMBER, INDICATES USE OF COUPLATES. (120451-HC)
ON NON-COUPLATE CHASSIS, INDIVIDUALLY MOUNTED COMPONENTS OF THE SAME VALUES ARE USED, EXCEPT WHERE (✱) INDICATED.



AUDIO, VIDEO AND I.F. PRINTED CIRCUIT BOARD (TOP VIEW)



CONDITIONS FOR TAKING VOLTAGE AND RESISTANCE (Static Conditions) READINGS

The voltage and resistance readings were taken on chassis 120451HC.

Due to component variations, voltage and resistance readings may vary slightly from those given here. Slight variations may also be noticed if chassis is not coded as mentioned above.

The picture tube, deflection yoke and high voltage circuits were connected to take the following readings and waveshapes. If picture tube is not connected to chassis, insert test picture tube or short pins 1 and 12 in picture tube socket to complete filament circuit.

1. Antenna disconnected and antenna terminals shorted on tuner and connected to chassis (use short leads).
2. Line voltage 117 volts (Disconnect power for resistance readings).
3. 3 volt bias battery connected to A.G.C. circuit, positive terminal to chassis, negative terminal to junction of R13 and R15, BIAS BATTERY USED FOR VOLTAGE READINGS ONLY.
4. All controls in position for normal picture. (Varied when it directly affects reading).
5. All measurements taken with a vacuum tube voltmeter and ohmmeter.
6. All readings listed in tables were taken between points shown and chassis.
7. Resistance readings are given in ohms unless otherwise noted.
8. N.C. denotes no connection.

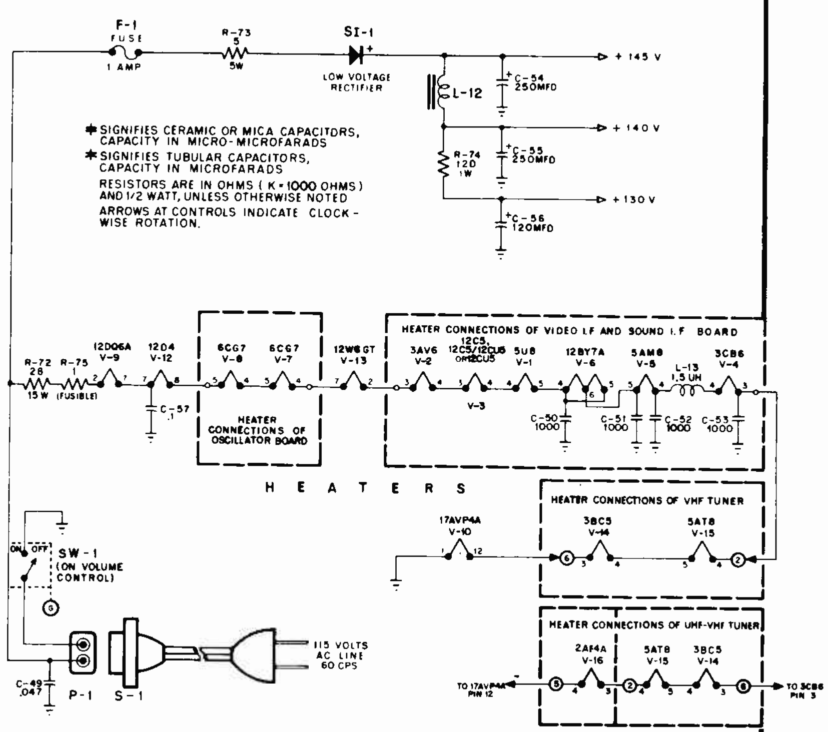
WAVE SHAPE ANALYSIS CHART

The wave shapes shown on the schematic were taken on chassis 120451HC:

Slight peak-to-peak voltage differences may be noticed on chassis of later triangle codes.
The peak-to-peak voltages given may also vary slightly depending on signal strength and component variations.

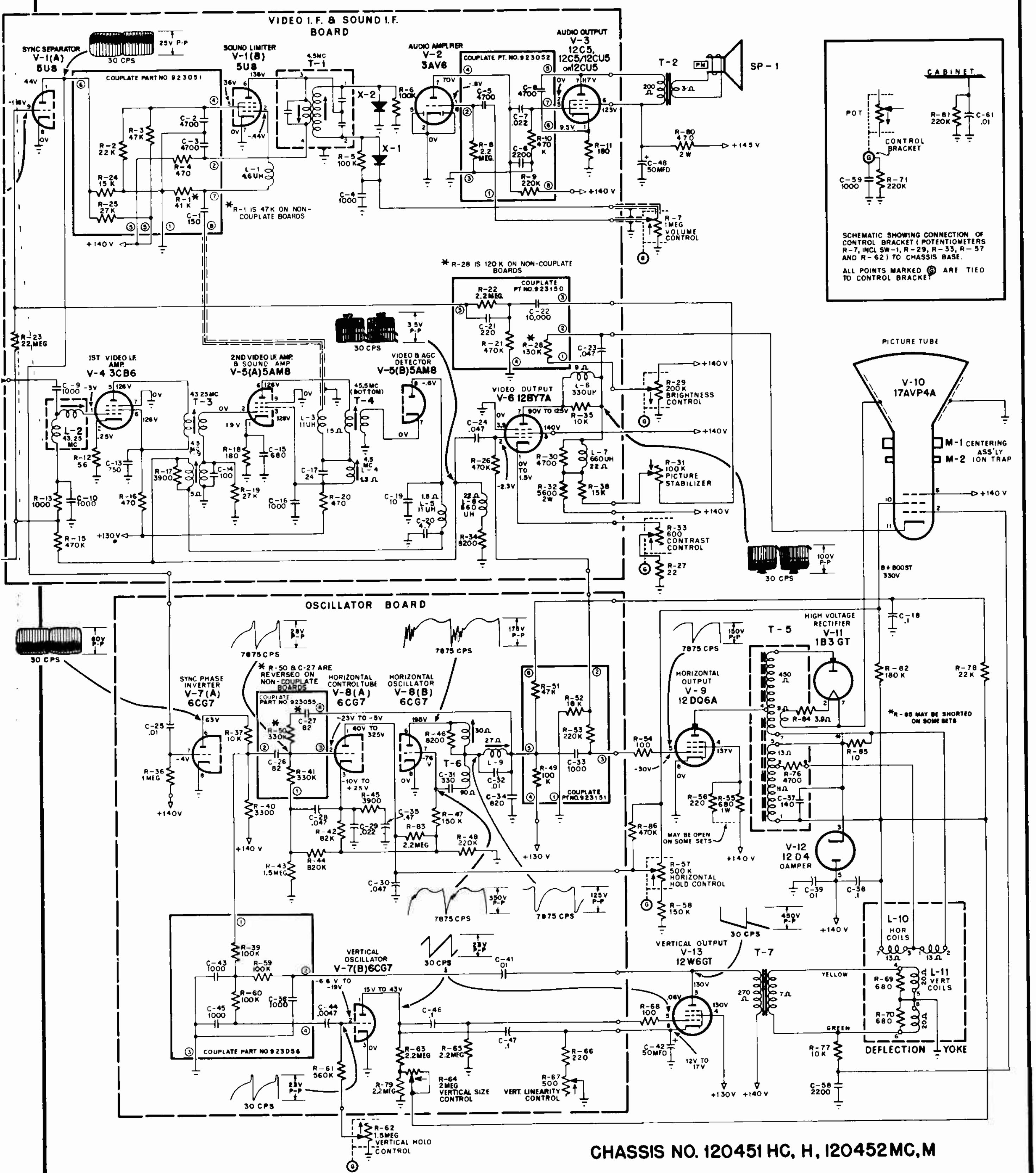
To accurately observe the wave shapes, the relatively high input capacity of an oscilloscope must be reduced so as not to change the operating characteristics of the television set. Failure to do this will result in wrong wave shape readings. This is accomplished by using an Emerson low-capacity probe

1. Connect antenna and tune receiver to channel where best reception has been obtained in the past.
2. Low end of the probe is connected to CHASSIS and the contrast control is set for MAXIMUM UNDISTORTED CONTRAST.
3. The 30 and 7875 C.P.S. oscilloscope sweep settings are used so as to permit observation of two cycles of the wave shape.
NOTE: A wave shape seen on your oscilloscope may be upside down from same wave shape shown here. This will depend on the number of stages of amplification in the oscilloscope used.



✱SIGNIFIES CERAMIC OR MICA CAPACITORS, CAPACITY IN MICRO-MICROFARADS
✱SIGNIFIES TUBULAR CAPACITORS, CAPACITY IN MICROFARADS
RESISTORS ARE IN OHMS (K = 1000 OHMS) AND 1/2 WATT, UNLESS OTHERWISE NOTED
ARROWS AT CONTROLS INDICATE CLOCKWISE ROTATION.

EMERSON Chassis 120451H, -HC, -HC(H), 120452M, -MC(M), Schematic Diagram

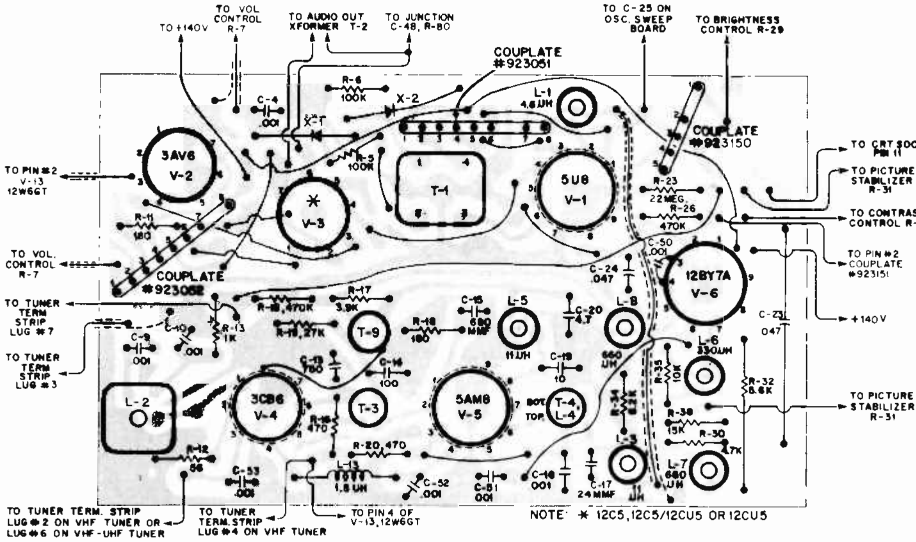


EMERSON Chassis 120451H, -HC, -HC(H), 120452M, -MC(M), Continued

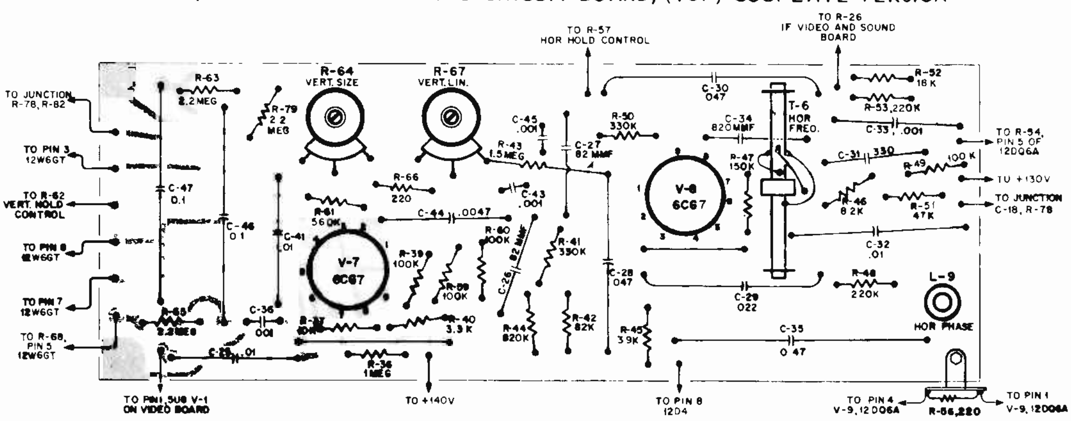
SERVICING OF PRINTED BOARDS

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

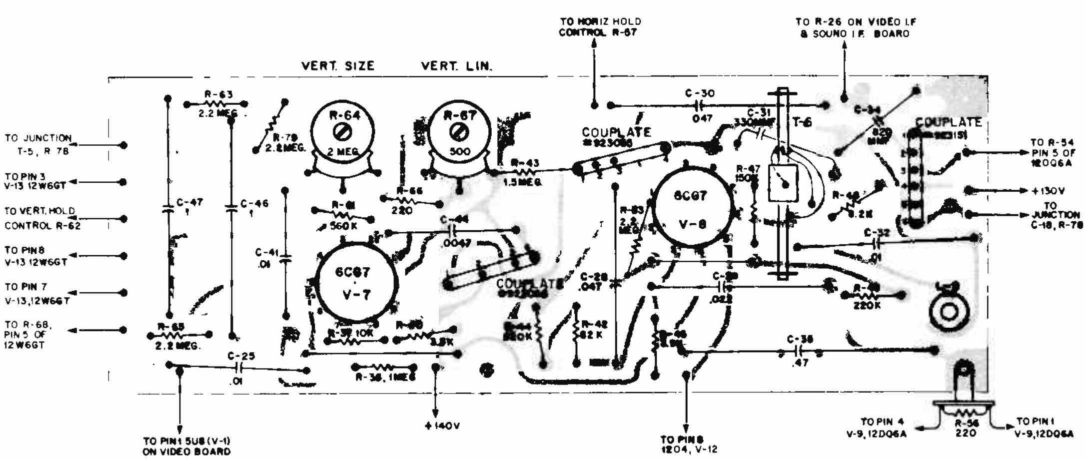
Use a low wattage (20 to 30 watts) soldering iron. Be careful not to apply excessive heat since this may cause the printed foil to loosen. Broken foil leads may be repaired by soldering a hookup wire across the break.



AUDIO, VIDEO AND I.F. PRINTED CIRCUIT BOARD, (TOP) COUPLATE VERSION



HORIZONTAL AND VERTICAL SWEEP PRINTED CIRCUIT BOARD (TOP VIEW)



HORIZONTAL AND VERTICAL SWEEP PRINTED CIRCUIT BOARD (TOP VIEW) (COUPLATE VERSION)

Series M5,

GENERAL ELECTRIC

(Service material on pages 31 through 38)

COVERS MODELS
17T3304
17T3305
17T3306
17T3310
17T3311
17T3315
17T3316
17T3317
17T3318
17T3320
17T3321
17T3331U
21T3417
21T3418
21T3419
21T3420
21T3421
21T3425
21T3429
21T3430
21T3431
21T3432
21T3435
21T3436
21C3439
21C3440
21C3441
21C3442
21C3443
21C3445
21C3446
21C3450
21C3451
21L3455
21L3456
21C3458
21C3459
21C3460
21C3461
21C3478
21C3479
21C3482
21C3483
WITH OR WITHOUT UHF

HEIGHT AND VERTICAL LINEARITY - These controls, R204 and R208, should be adjusted simultaneously to give proper vertical size consistent with good vertical linearity. Final adjustment should be made to allow the picture to extend approximately 1/8 inch beyond the top and bottom edges of the mask.

HORIZONTAL HOLD -

1. Remove the cabinet back as described below.
2. Tune the receiver to a weak signal and adjust the controls for normal operation.
3. Short Test Point VI to the chassis with a jumper wire.
4. Connect a 1000 ohm resistor from Test Point VIII to Test Point IX (in parallel with L251.)
5. Adjust horizontal hold potentiometer, R257, until picture just "Floats" back and forth across the screen. Leave R257 set in this position.
6. Remove the 1000 ohm resistor from Test Point VIII and Test Point IX. Adjust L251 stabilizer coil so that the picture again just "Floats" across the screen. Leave L251 set in this position.
7. Remove the jumper from Test Point VI and the chassis.

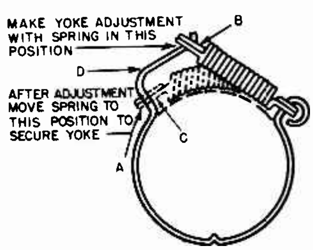


FIG. 1. YOKE CLAMP

PICTURE TUBE ADJUSTMENTS

YOKE POSITION - The yoke is secured to the neck of the picture tube by a "U" shaped clamp and spring, Figure 1. To adjust the yoke for picture tilt, loosen the clamp by squeezing points C and D with long nose pliers until the eye of the spring slides over the bend in the clamp. The yoke can now be adjusted for correct picture tilt. To secure the yoke, the pliers are used in the same manner between points A and B until the spring eye slides over the bend to its clamping position.

PICTURE CENTERING- The picture centering device is located on the rear of the yoke assembly. The centering device consists of two rings each of which may be rotated separately. Each ring has two tabs with holes punched. The holes are provided so that an insulated alignment tool may be inserted in them to provide an easy means of rotating the rings. Rotate the rings so that the tabs move towards or away from each other to center the picture on the face of the tube.

FOCUS - The proper focus potential for the tube was chosen at the time the set was manufactured. If it becomes necessary to install a new picture tube or change the focus potential, any one of five potentials may be chosen for best focus. The five connection points for focus potential are located on the small printed board behind the vertical linearity potentiometer. The lead from R219 in the picture tube socket may be connected to the proper point for best focus as follows:

1. Connect to Pin "B+1" near RC-304.
2. Connect to Pin "B+3" behind the vertical linearity control.
3. Connect to Pin "B+4" behind the vertical linearity control.
4. Connect to Pin with ground symbol near Y251A/Y25lB phase detector.
5. Connect to pin at the junction of R216, R217, and spark gap SG201.

TO REMOVE THE CHASSIS FROM THE CABINET

Remove the knobs from the shafts on the front of the cabinet. Disconnect any antenna connected to the antenna terminal board. Remove the cabinet back by taking out the screws securing the back to the cabinet, the interlock bracket, and the antenna bracket. Remove the speaker leads from the speaker (the speaker network terminal board on some models.) On some models it will be necessary to unsolder the speaker leads to remove them from the speaker. Connect one end of a lead to the chassis and touch the other end to the anode of the picture tube to discharge it. Remove the anode lead from the picture tube by squeezing the anode clip and withdrawing it from the tube. Remove the screws from the bottom of the cabinet which hold the chassis. Remove the picture tube socket. Loosen the yoke clamp and slide the yoke back over the neck of the picture tube. Remove the chassis from the cabinet.

TO REMOVE THE 21 INCH PICTURE TUBE

The chassis must be removed from the cabinet as previously described before the picture tube can be removed.

After removing the chassis remove four screws which go through the bottom of the cabinet into the tube strap brackets. Remove the top left hand nut holding the tube bracket to the top front of the cabinet. Hold the neck of the tube in the left hand and remove the top right hand nut. Carefully remove the tube from the cabinet.

To replace the picture tube, lay the tube face down on a clean cloth so that the tube face does not become scratched. Loosen the nut on the spade bolt securing the picture tube in the tube strap. Remove tube strap from the tube. Place the strap on the new tube so that when facing the back of the tube the anode button is to the right with the tube strap ears at the top. Position the tape between the tube strap and the picture tube. Tighten the nut on the spade bolt to secure the strap to the tube. Replace the tube assembly in the cabinet and observe if the tube aligns properly with the mask. If it does not, remove the tube from the cabinet and reposition the strap as necessary to effect proper alignment of the picture tube with the mask. Re-assemble picture tube into the cabinet by reversing the disassembly procedure.

GENERAL ELECTRIC Series M5 Service Material, Continued

TO REMOVE THE 17 INCH PICTURE TUBE

Remove the chassis from the cabinet as described above. After removing the chassis, position the cabinet face down on a soft clean cloth. Loosen the two self tapping screws at the top and bottom of the picture tube sling. Disengage the sling from the four hooks and remove the picture tube.

To reassemble the picture tube, reverse the above procedure making sure that the picture tube anode button is located at that end of the cabinet farthest from the control panel.

CLEANING THE CURVED PLASTIC SAFETY WINDOW AND PICTURE TUBE FACE

Remove the chassis and picture tube assembly as previously described. The inside of the safety window and the picture tube face may now be cleaned. A solution of pure soap and water and a soft cloth is recommended for cleaning. Most other cleaning agents, sprays, detergents, or solvents are harmful to the safety window and should not be applied.

VIDEO I-F SYSTEM

INTRODUCTION:

The video I-F system must be in alignment in order to align most other sections of the receiver; therefore it is treated first. A list of the frequencies of the tuned coils is given and may be used for pre - peaking these coils, but over-all sweep alignment is necessary to correctly align the I-F system.

AM PRE-PEAKING AND TRAP FREQUENCIES

L135-45.75 MC	T152-45.30 MC
L151-42.50 MC	T153-44.15 MC
T151-43.00 MC	L150-47.25 MC

General Notes:

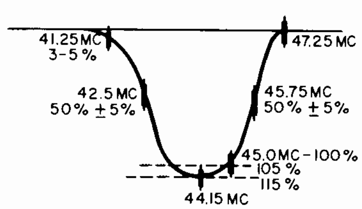
1. Allow receiver and alignment equipment at least 20 minutes of warm-up time before proceeding.
2. Turn the volume control fully counter clockwise and the contrast control fully clockwise. Set the channel selector to Channel 9 or some other high band channel where oscillator influence is not noted as the fine tuning control is turned.
3. Short the antenna terminals together with a jumper wire.
4. Connect oscilloscope to Test Point III thru a 22,000 ohm resistor not more than 2.5 inches away from Test Point III.
5. Connect -4 volts bias between Test Point II and the chassis with the negative side of the bias voltage on Test Point II.
6. Inject signals from a properly terminated AM signal generator or sweep generator through the network in Figure 4 to the I-F injection jack*. General Electric test equipment, if used, need not be terminated as the termination is in the attenuator.

Align the receiver to produce the response curve in Figure 2 under "Remarks".

*NOTE: The I-F injection jack is not a phono type receptacle. The connection is made by the end of the phono plug touching the contact inside the injection jack. The outside shell of the plug grips the injection jack firmly. Press plug firmly into place without excess pressure. See Figure 3 for plug construction.

Proceed as follows:

VIDEO I-F ALIGNMENT CHART

STEP	SIGNAL FREQUENCY	ADJUST	REMARKS
1.	47.25 MC AM	Adjust L150 for minimum scope deflection	Use maximum scope sensitivity and smallest possible signal for the 47.25 MC AM adjustments.
2.	38-48 MC sweep generator, scope calibrated 3 volts peak to peak for 2 inch deflection.	L135 (converter plate) for maximum deflection of the 45.75 MC marker.	Do not retouch this adjustment.
3.	SAME	L151 (1st I-F grid) for maximum deflection of the 42.5 MC marker.	 FIGURE 2. I-F RESPONSE CURVE
4.	SAME	L153 (Video Detector) for maximum deflection of the 44.15 MC marker.	
5.	SAME	T152 (2nd I-F Plate) to place 45.75 MC marker properly on the curve.	
6.	SAME	T151 (1st I-F Plate) to place 42.5 MC Marker properly on the curve.	Repeat 5, 6 and 7 if necessary. Symmetry of the nose is important. No portion of the nose should be out of symmetry by more than 3%.
7.	SAME	L153 if necessary to shape the nose.	

GENERAL ELECTRIC Series M5 Alignment Information, Continued

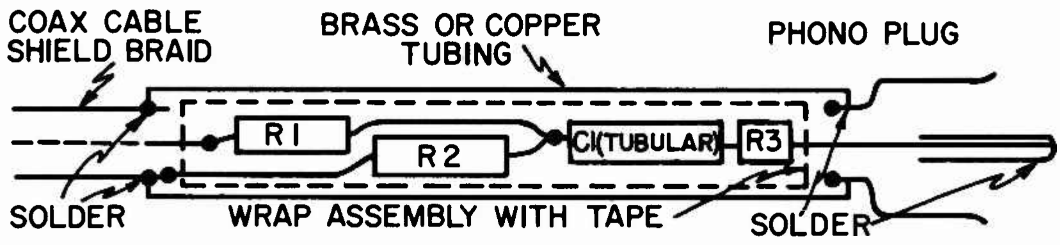


FIG. 3 I-F INJECTION PLUG CONSTRUCTION

4.5 MC TRAP ALIGNMENT

1. Connect a -7.5V bias between Test Point II and chassis.
2. Turn contrast control fully clockwise.
3. Connect detector network (Figure 5) to Test Point IV. Connect an AC VTVM to the network.
4. Connect oscilloscope to speaker terminals.
5. Apply an accurate 4.5 MC AM signal through .001 MF to Test Point III.

NOTE: The top core of T154 has two positions showing minimum. The bottom core has two positions showing maximum. The correct position for each core is the position nearest the respective end of the coil.

6. Tune the top core of T154 for minimum deflection on the VTVM.
7. Turn up volume control. Tune the bottom core of T154 for maximum deflection on the oscilloscope.
8. Retouch the top core for minimum reading on the VTVM.

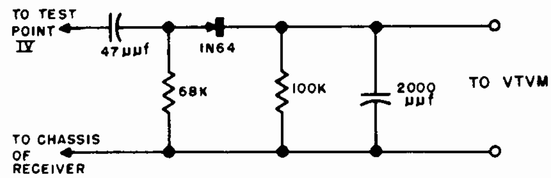


FIG. 5 DETECTOR NETWORK

AUDIO I-F ALIGNMENT

1. Connect an antenna to the receiver and tune in a weak television signal. This will provide a 4.5 MC FM signal source for audio I-F alignment. Keep the volume control turned down unless the speaker is connected.
2. Connect two matched 100,000 ohm resistors in series between Pin No. 2 of V8 (6FM8) and chassis.
3. Follow instructions in Audio Alignment chart.

AUDIO ALIGNMENT CHART

STEP	CONNECT VTVM OR 20,000 OHMS/VOLTMETER	ADJUST	METER INDICATION	REMARKS
1	Between Pin No. 2 of V8 and chassis.	Bottom core T154	Adjust for maximum deflection.	Repeat steps 1, 2 and 3 to assure proper adjustments.
2		T301 primary (Top)	Adjust for maximum deflection.	Each core has two positions. Select position for each core nearest respective end of the coil.
3	Between terminal 2 of RC-304 and the center of the two 100,000 ohm resistor.	T301 secondary (Bottom)	Adjust for zero volts d-c output.	

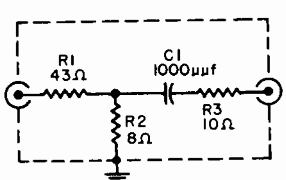
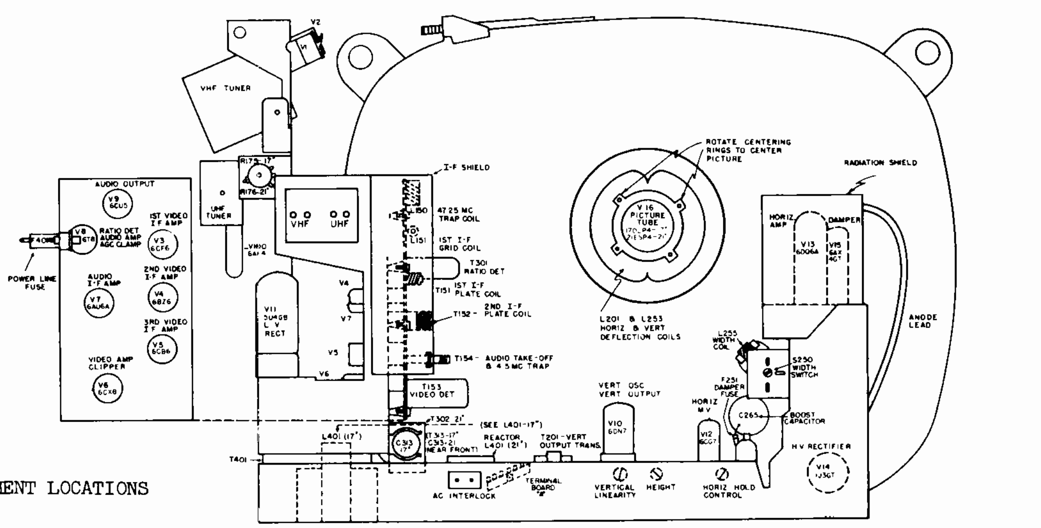
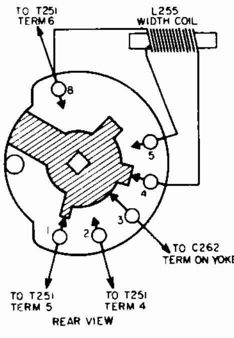


FIG. 4 I-F INJECTION NETWORK

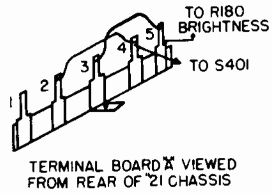


TUBE AND ADJUSTMENT LOCATIONS

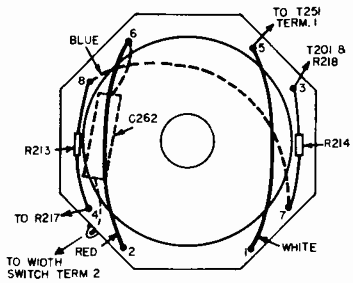
GENERAL ELECTRIC Series M5 Service Information, Continued



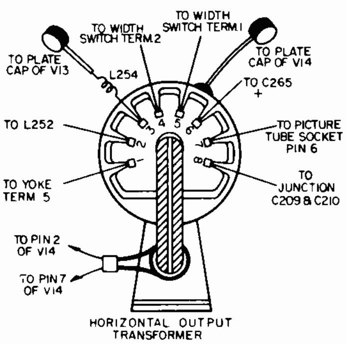
WIDTH SWITCH



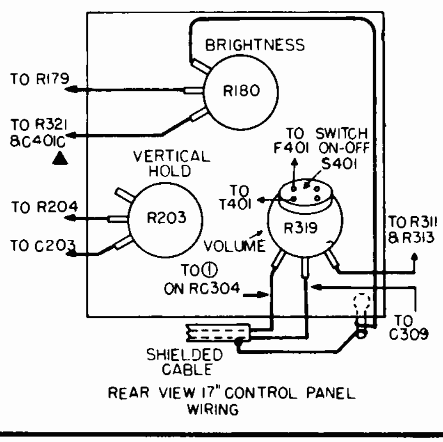
TERMINAL BOARD "A"



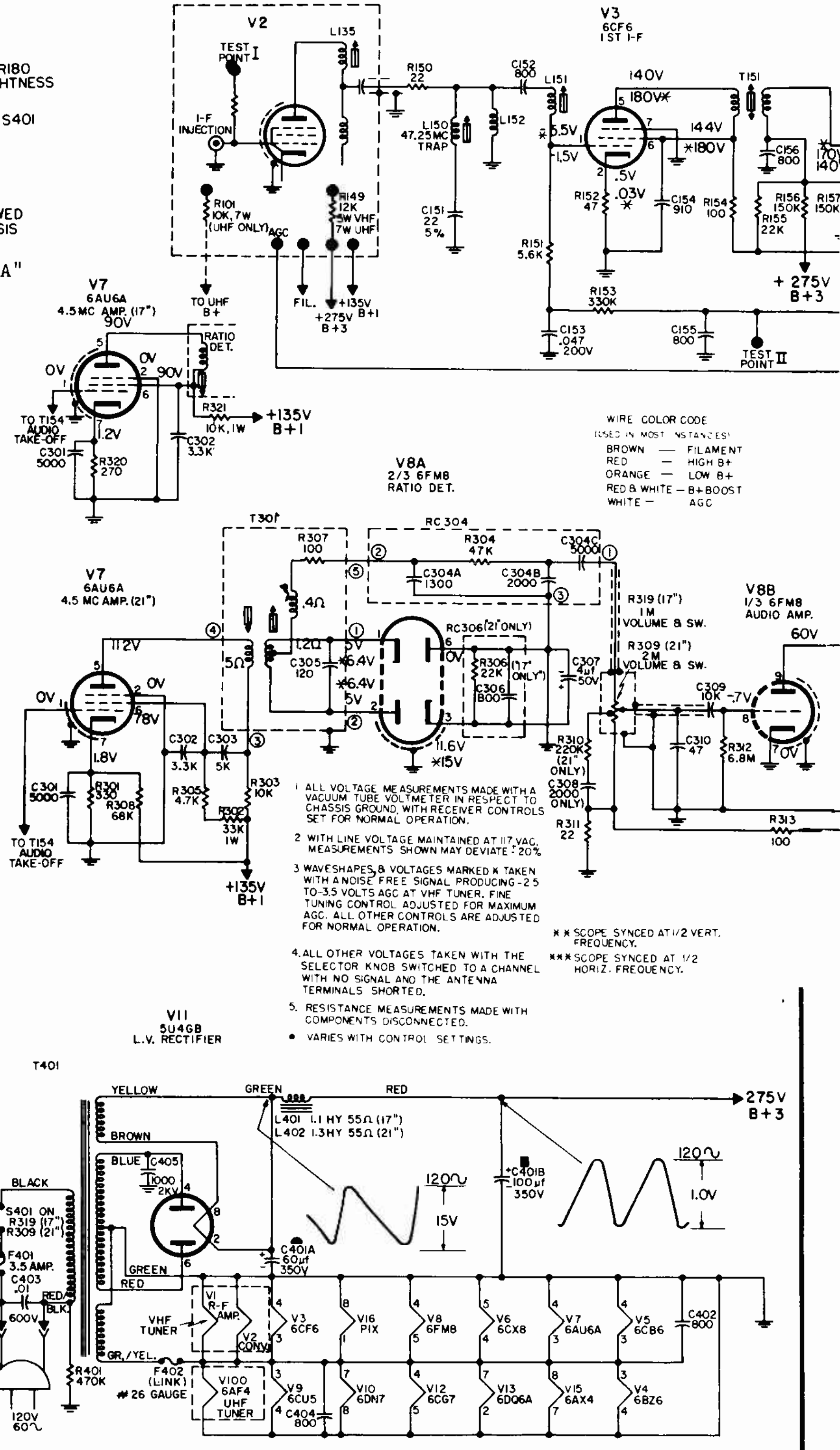
YOKE WIRING



HIGH VOLTAGE TRANSFORMER WIRING



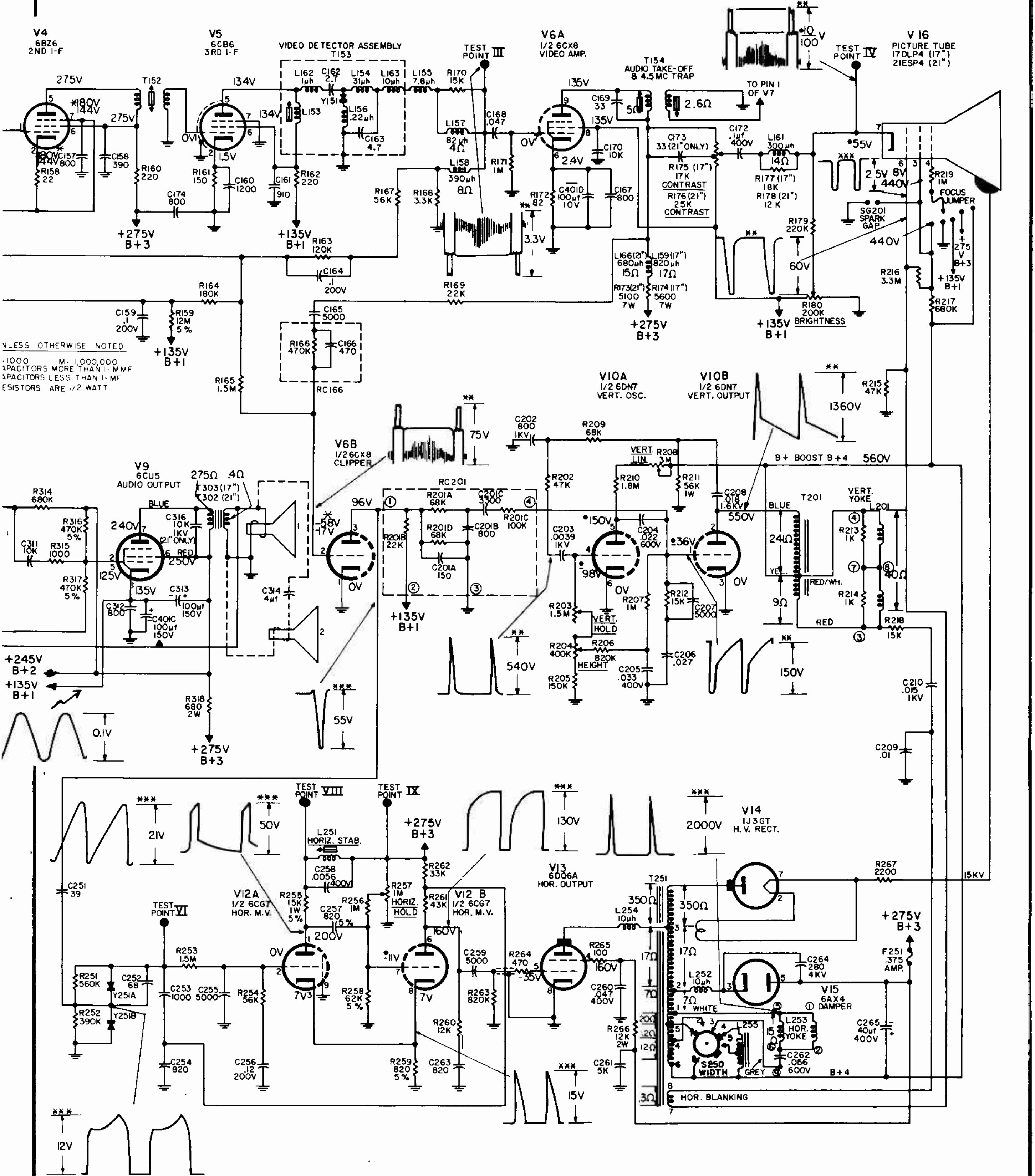
REAR VIEW 17" CONTROL PANEL WIRING



Models 21T3435, 21T3436, 21C3445, 21C3446, 21C3450, 21C3451, 21L3455, 21L3456, 21C3482 and 21C3483 have an audio circuit with a phono input jack permitting its use as an audio amplifier for an external phono pickup.

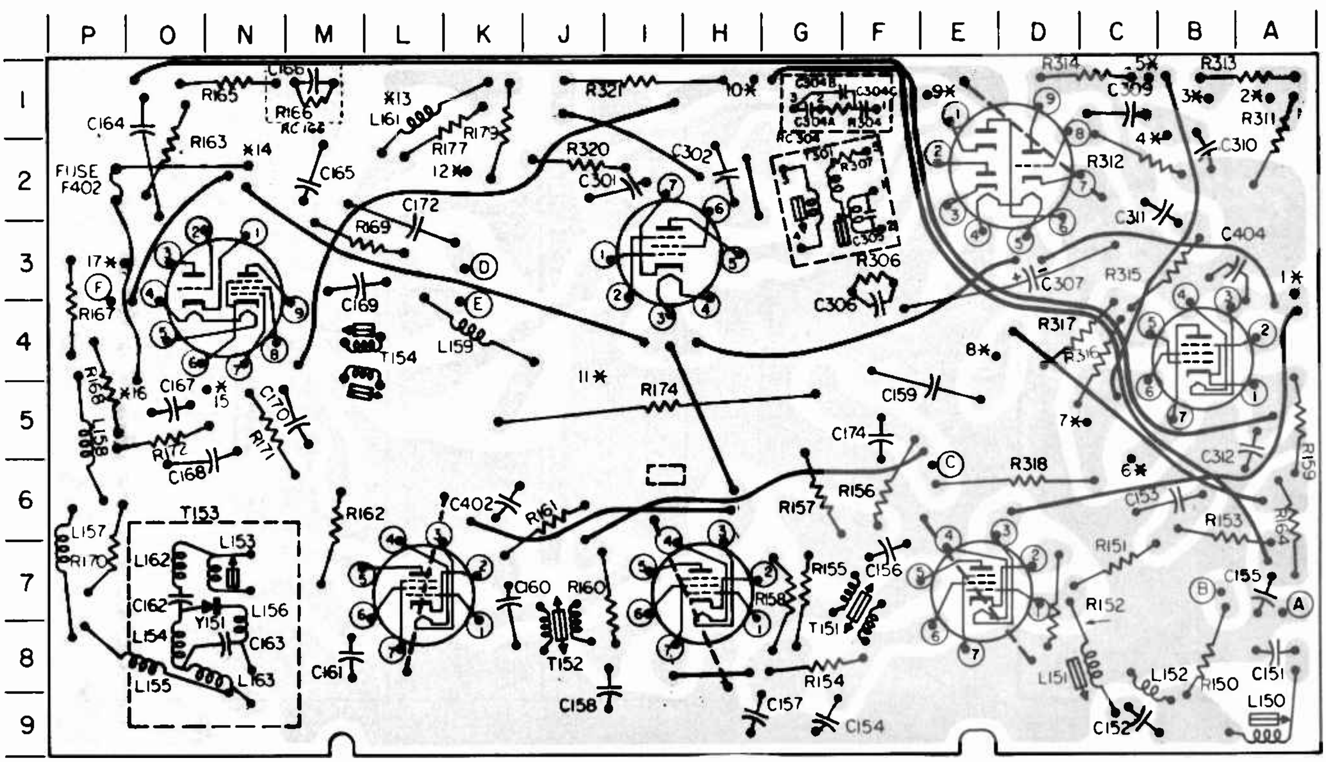
Models 21C3458, 21C3459, 21C3460 and 21C3461 feature power tuning and wireless remote control operation of the on-off switch, volume control and channel selector.

GENERAL ELECTRIC Series M5 Schematic Diagram (Continued)



SCHEMATIC DIAGRAM, MAIN CHASSIS, WITH VOLTAGES AND WAVESHAPES.

GENERAL ELECTRIC Series M5 Service Information, Continued



17" I-F BOARD COMPONENT LOCATIONS AS VIEWED FROM CONDUCTOR SIDE

ASTERISKED (✱) NUMBERS

DENOTE WIRE WRAP TERMINALS MOUNTED ON COMPONENT BOARD TO CONNECT WIRES FROM OTHER COMPONENTS

- ✱ 1. TO VHF TUNER FILAMENTS
- ✱ 2. TO R319 VOLUME CONTROL
- ✱ 3. TO CONTRAST CONTROL TERMINAL BOARD, TERMINAL I
- ✱ 4 TO R319 VOLUME CONTROL
- ✱ 5. TO C313
- ✱ 6. TO T303
- ✱ 7. FOR TESTING B+2 VOLTAGE
- ✱ 8. TO VHF TUNER, AGC TERMINAL
- ✱ 9. TO R319 VOLUME CONTROL
- ✱ 10. TO C313 GROUND TERMINAL, C401C▲, AND R180 BRIGHTNESS CONTROL
- ✱ 11. TO GREEN LEAD ON POWER TRANSFORMER
- ✱ 12. TO R180 BRIGHTNESS CONTROL
- ✱ 13 TO PICTURE TUBE SOCKET-PIN 7
- ✱ 14 CONNECT TO ✱16 WITH FILAMENT FUSE WIRE, #26 GUAGE
- ✱ 15. TO C401D—
- ✱ 16. CONNECT TO ✱14 WITH FILAMENT FUSE WIRE #26 GUAGE TO GREEN & WHITE LEAD ON POWER TRANFORMER
- ✱ 17 TO ✱8 ON SWEEP BOARD (I) ON RC-201)

CIRCLED (A) LETTERS

REPRESENT INTER-CONNECTING WIRES SOLDERED INTO BOARD

- (A) TO SHIELD OF (B)
- (B) TO VHF TUNER- I-F OUTPUT SHIELD
- (C) TO C401B■
- (D) TO R175 CONTRAST CONTROL
- (E) TO R175 CONTRAST CONTROL
- (F) TO ✱9 ON SWEEP BOARD (V10, PIN 7)

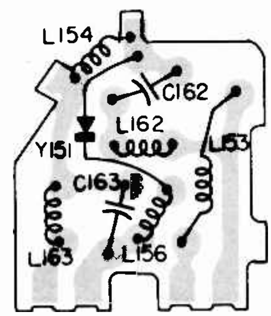
BY SYMBOL

RESISTORS		
R150	-	B8
R151	-	C7
R152	-	D7
R153	-	B7
R154	-	G8
R155	-	G7
R156	-	F6
R157	-	G6
R158	-	G7
R159	-	A5
R160	-	I7
R161	-	J6
R162	-	M6
R163	-	O2
R164	-	A6
R165	-	N1
R167	-	P3
R168	-	P4
R169	-	L3
R170	-	P7
R171	-	R5
R172	-	O5
R174	-	I5
R177	-	K1
R179	-	K1
R306	-	F3
R307	-	.F2
R311	-	A2
R312	-	C2
R313	-	A1
R314	-	C1
R315	-	B3
R316	-	C4
R317	-	D4
R318	-	D6
R320	-	J2

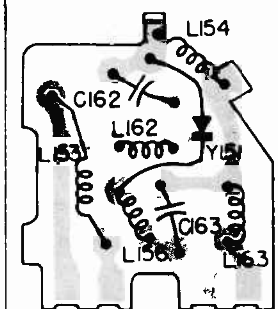
CAPACITORS		
C151	-	A8
C152	-	C9
C153	-	B6
C154	-	G9
C155	-	A7
C156	-	F7
C157	-	H9
C158	-	I9
C159	-	E5
C160	-	K7
C161	-	M8
C162	-	O7
C163	-	N8
C164	-	O2
C165	-	M2
C167	-	O5
C168	-	N6
C169	-	L3
C170	-	M5
C172	-	L3
C174	-	F5
C301	-	I2
C302	-	H2
C305	-	F2
C306	-	F3
C307	-	D3
C309	-	C1
C310	-	B2
C311	-	B3
C312	-	A5
C402	-	K6
C404	-	B3
COILS & TRANSFORMERS		
L150	-	A9

L151	-	C8
L152	-	C8
L153	-	N7
L154	-	O8
L155	-	O8
L156	-	N8
L157	-	P7
L158	-	P5
L159	-	K4
L161	-	L1
L162	-	O7
L163	-	N8
T151	-	F7
T152	-	J8
T154	-	L4
T301	-	G2
RC NETWORKS		
RC166	-	M1
RC304	-	G1
TUBES		
V3(6CF6)	-	E7
V4(6BZ6)	-	H8
V5(6CB6)	-	L7
V6(6CX8)	-	N3
V7(6AU6)	-	I3
V8(6FM8)	-	D2
V9(6CU5)	-	B4
DIODE		
Y151	-	N7
FUSE		
F402	-	P2

TEST POINTS								
II	-	P1	III	-	P6	IV	-	L1



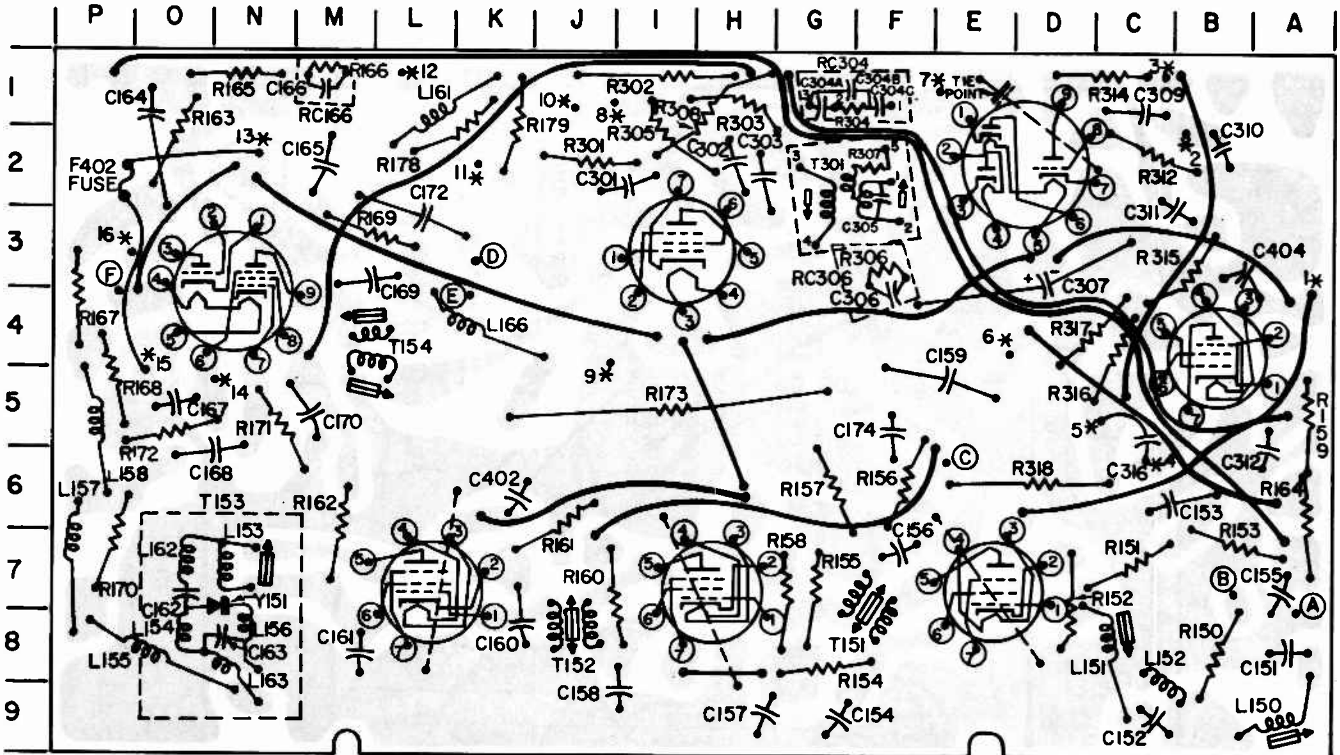
VIDEO DETECTOR BD. COMPONENT LOCATION AS VIEWED FROM COMPONENT SIDE.
PLUG INTO I-F BOARD WITH COMPONENTS FACING L155



VIDEO DETECTOR BD. COMPONENT LOCATION AS VIEWED FROM CONDUCTOR SIDE.

DETECTOR BOARD - BOTH SIDES

GENERAL ELECTRIC Series M5 Service Information, Continued

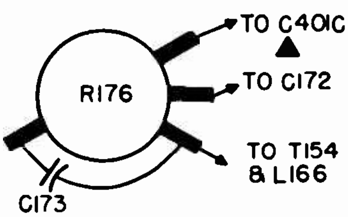


21" I-F BOARD COMPONENT LOCATIONS AS VIEWED FROM CONDUCTOR SIDE

CIRCLED (A) LETTERS

REPRESENT INTERCONNECTING WIRES SOLDERED INTO BOARD.

- (A) TO SHIELD OF (B)
- (B) TO VHF TUNER- I-F OUTPUT TERMINAL
- (C) TO C401B■
- (D) TO R176, CONTRAST
- (E) TO R176, CONTRAST
- (F) TO *9 ON SWEEP BOARD (V10,-PIN 7)



21" CONTRAST CONTROL WIRING- REAR VIEW

ASTERISKED (*) NUMBERS

DENOTE WIREWRAP TERMINALS MOUNTED ON COMPONENT BOARD TO CONNECT WIRES FROM OTHER COMPONENTS.

- *1. TO VHF TUNER FILAMENTS
- *2. TO R309, VOLUME CONTROL
- *3. TO C313
- *4. TO T302
- *5. FOR TESTING B+2 VOLTAGE
- *6. TO VHF TUNER, AGC TERMINAL
- *7. TO TIEPOINT ON 6FM8 SHIELD
- *8. CONNECT TO *10
- *9. TO GREEN LEAD ON POWER TRANSFORMER
- *10. CONNECT TO *8
- *11. TO R180, BRIGHTNESS CONTROL
- *12. TO PIX TUBE SOCKET,-PIN 7
- *13. CONNECT TO *15 WITH FILAMENT FUSE WIRE, #26 GAUGE
- *14. TO C401D
- *15. CONNECT TO *13 WITH FILAMENT FUSE WIRE, #26 GAUGE TO GREEN & WHITE LEAD ON POWER TRANSF
- *16. TO *8 ON SWEEP BOARD (① OF RC201 ON SWEEP BOARD)

BY SYMBOL

RESISTORS	
R150	B8
R151	C7
R152	D7
R153	B7
R154	G8
R155	G7
R156	F6
R157	G6
R158	G7
R159	A5
R160	I7
R161	J6
R162	M6
R163	O2
R164	A6
R165	N1
R167	P3
R168	P4
R169	L3
R170	P7
R171	N5
R172	O5
R173	I5
R178	K2
R179	K1
R301	J2
R302	I1
R303	H1
R305	I1
R307	F2
R308	H1
R312	C2
R314	C1
R315	B3
R316	C4
R317	D4
R318	D6

CAPACITORS	
C151	A8
C152	C9
C153	B6
C154	G9
C155	A7
C156	F7
C157	H9
C158	I9
C159	E5
C160	K7
C161	M8
C162	O7
C163	N8
C164	O2
C165	M2
C167	O5
C168	N6
C169	L3
C170	M5
C172	L3
C174	F5
C301	I2
C302	H2
C303	H2
C305	F2
C307	D3
C309	C1
C310	B2
C311	B3
C312	A5
C316	C5
C402	K6
C404	B3

COILS & TRANSFORMERS	
L150	A9
L151	C8
L152	C8
L153	N7
L154	O8
L155	O8
L156	N8
L157	P7
L158	P5
L161	L1
L162	O7
L163	N8
L166	K4
T151	F7
T152	J8
T154	L4
T301	G2

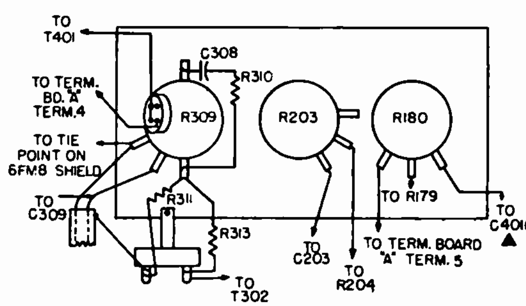
RC NETWORKS	
RC-166	M1
RC-304	G1
RC-306	F3

TUBES	
V3(6CF6)	E7
V4(6BZ6)	H8
V5(6CB6)	L7
V6(6CX8)	N3
V7(6AU6)	I3
V8(6FM8)	D2
V9(6CU5)	B4

DIODE	
Y151	N7

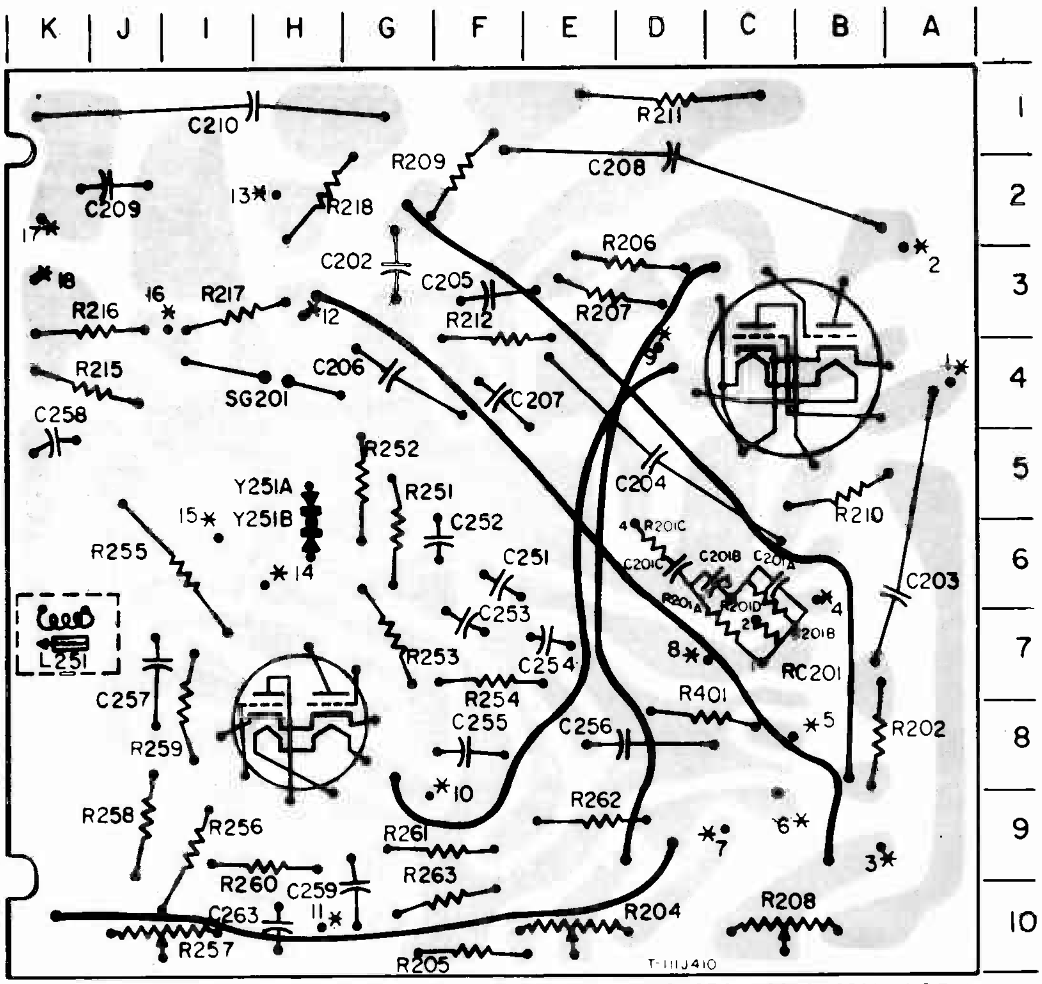
FUSE	
R402	P2

TEST POINTS	
II	P1
III	P6
IV	L1



REAR VIEW 21" CONTROL PANEL WIRING

GENERAL ELECTRIC Series M5 Service Information, Continued



SWEEP BOARD COMPONENT LOCATIONS AS VIEWED FROM CONDUCTOR SIDE

ASTERISKED (*) NUMBERS

DENOTE WIREWRAP TERMINALS MOUNTED ON COMPONENT BOARD TO CONNECT WIRES FROM OTHER COMPONENTS.

- *1. TO R203, VERT. HOLD CONTROL
- *2. TO T201 (BLUE LEAD)
- *3. TO T201 (YELLOW LEAD)
- *4. TO C401C (+135V B+1)
- *5. TO T401 (RED/BLACK LEAD), TO AC INTERLOCK
- *6. TO C401B (+275V B+3)
- *7. TO R203, VERT. HOLD CONTROL (CENTER TERM.)
- *8. TO *17 ON I-F BOARD
- *9. TO Ⓕ ON I-F BOARD
- *10. TO V16, PIN 1 TO V13, PIN 7
- *11. TO R264
- *12. TO TERM 4 OF YOKE, TO C265
- *13. TO T201 (RED LEAD), TO TERM. 3 OF YOKE
- *14. GROUND TERM. FOR FOCUS JUMPER
- *15. +275V B+3 TERM. FOR FOCUS JUMPER
- *16. TO V16, PIN 3
- *17. TO TERM. 7 ON T251
- *18. TO TERM. 8 ON T251 TO V16, PIN 6

BY SYMBOL	
RESISTORS	
R202	B8
R204	E10
R205	F10
R206	D3
R207	D3
R208	B10
R209	F2
R210	B5
R211	D1
R212	F3
R215	J4
R216	J4
R217	I3
R218	H2
R251	G6
R252	G5
R253	G7
R254	F7
R255	I6
R256	I9
R257	I10
R258	J9
R259	I8
R260	H9
R261	F9
R262	E9
R263	F9
R401	C8
CAPACITORS	
C202	G3
C203	A6
C204	D5
C205	F3
C206	G4
C207	F4
C208	D2
C209	J2
C210	I1
C251	F6
C252	F5
C253	F7
C254	E7
C255	F8
C256	D8
C257	J7
C258	K5
C259	G10
C263	H10
COILS & TRANSFORMERS	
L251	K7
RC NETWORKS	
RC201	C7
DIODES	
Y251A	H5
Y251B	H6
SPARK GAP	
SG201	H4
TEST POINTS	
VI	G6
VIII	I6
IV	C9

Hoffman

CHASSIS 335 and 336, MARK 7

See page 40 for list of models, diagram pages 40-41, additional material page 42.

SOUND IF ALIGNMENT.

Inject a 4.5 mc, FM modulated signal, into the grid of the 6AW8A Video Amplifier at TV-2. Then connect an oscilloscope to the top of the volume control.

a. Turn slug out several turns in the take off coil (L101), interstage coil (T101) and quadrature coil (L102).

b. With the signal generator set to maximum output, turn the slug in the quadrature coil in past the first definite peak (as indicated on scope) and then tune for maximum output on the second peak. If generator has insufficient 4.5 mc output, rough-tune the take off coil (L101) until signal is strong enough to accurately tune the second peak to maximum.

c. Reduce signal generator output to a setting where scope sine wave scrambles, and then tune interstage coil (T101) until sine wave is proper. Repeat above until lowest generator output resulting in proper sine wave is achieved.

d. Duplicate step c. while tuning the take off coil L101.

e. Increase signal level output over a wide range. Sine wave amplitude should remain relatively uniform over a wide range of input signal amplitude.

f. Connect a detector probe and meter (or scope) to the cathode of the picture tube. Adjust the 4.5 mc trap (L204) for minimum output. See Fig. 1 for circuit of suitable detector probe.

VIDEO IF ALIGNMENT

a. Connect a DC voltmeter to the grid of the 6AW8A (TV-2), using an isolation network as shown in Fig. 2.

b. Apply -3VDC to the IF AGC bus at TV-5 (top of AGC bus at TV-5 (top of AGC control).

c. Connect the signal generator to the RF test point on the tuner, with a .005 mfd capacitor in series with the generator.

d. Set the Contrast Control to MINIMUM, and the tuner off channel (between channels).

e. Remove yoke plug to cut high voltage.

f. Set tuner fine tuner knob full clockwise.

g. Adjust 3RD IF transformer (T203) to maximum meter deflection using an unmodulated RF signal at 44 mc. Hold meter reading around 2 volts during alignment.

h. Adjust the 2ND IF transformer (T202) to maximum at 45.4 mc.

i. Adjust the 1ST IF transformer (T201) to maximum at 43.25 mc.

j. Adjust the tuner converter plate coil (L7) in a couple of turns.

k. Adjust the IF input coil (L201) to maximum at 43 mc.

l. Adjust the tuner converter plate coil (L7) out to a maximum at 45 mc.

VIDEO IF SWEEP ALIGNMENT

a. Connect an oscilloscope to the grid of the 6AW8A (TV-2) using the same isolation network (Fig. 2) as for the voltmeter.

b. Leave -3VDC bias on AGC bus.

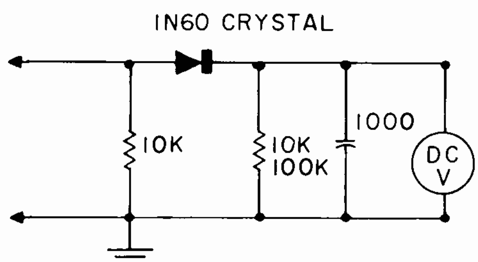
c. Apply a sweep generator IF signal to test point on tuner through .005 mfd capacitor.

d. With Contrast Control still set to full clockwise and tuner between channels, tune sweep generator to 43 mc. and set generator sweep control to 10 or 12 mc sweep.

e. Observe IF response on scope after adjusting generator sweep output to just below the overload point. Overload is indicated by a flattening of the top of the response curve.

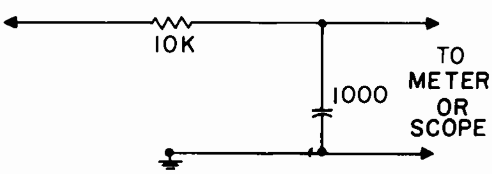
f. Turn on MARKERS and check at 42.75 mc. and 45.75 mc. These markers should fall at about the 50% point on the slopes as shown in Fig. 3. Slight readjustment of individual IF coils may be necessary to duplicate the IF response curve of Fig. 3. Do not readjust the last IF stage (T203) to compensate as this state should be exactly 44 mc.

FIG I



DETECTOR NETWORK

FIG 2



ISOLATION NETWORK

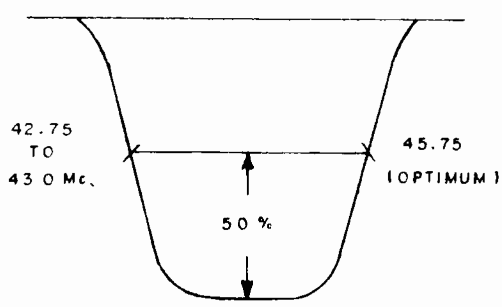


FIG 3 – IF ALIGNMENT CURVE

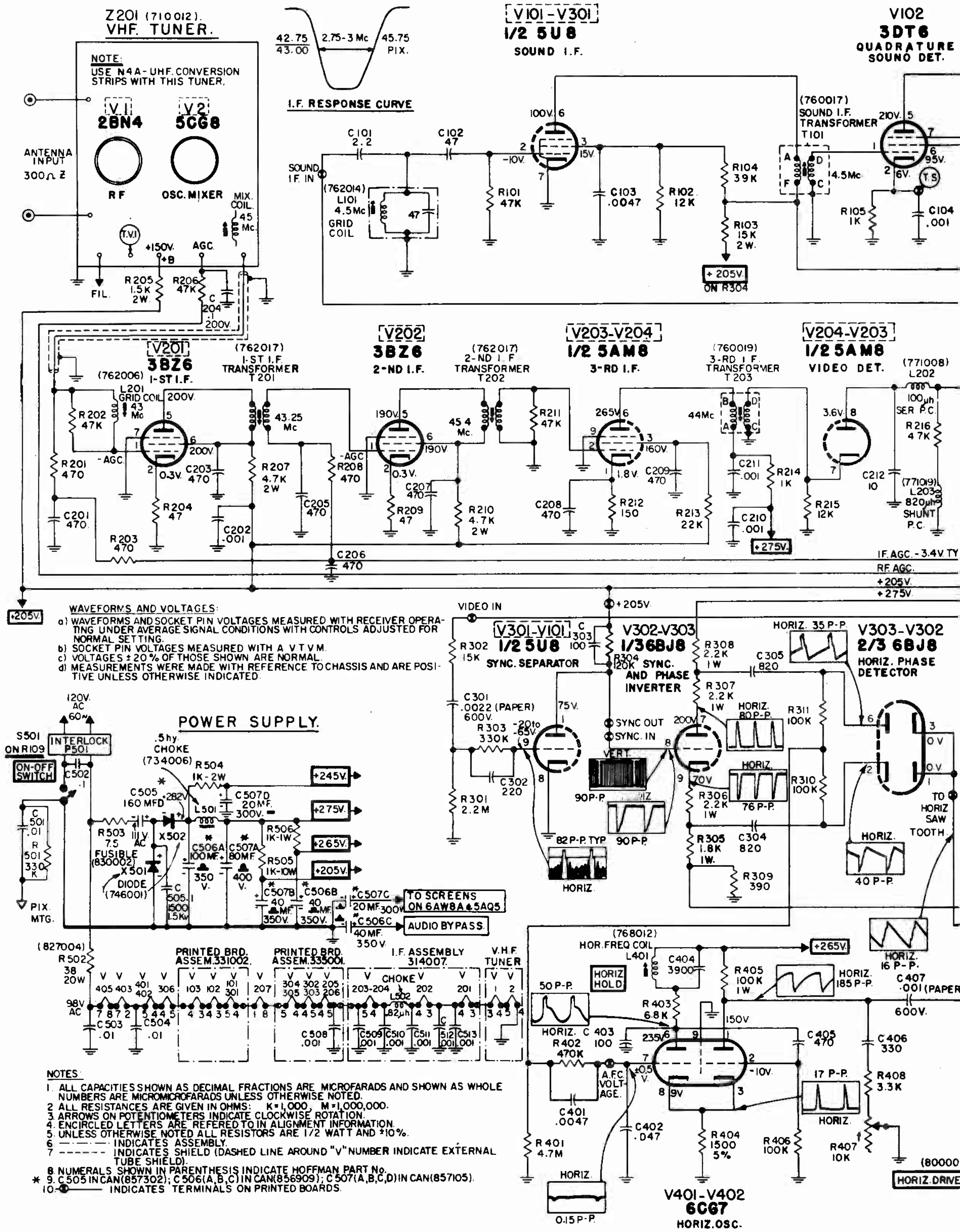
HOFFMAN MARK 7, CHASSIS 335, 336, Schematic Diagram

Models using Chassis 335

B1277
K1277
M1277
P1277
W1277

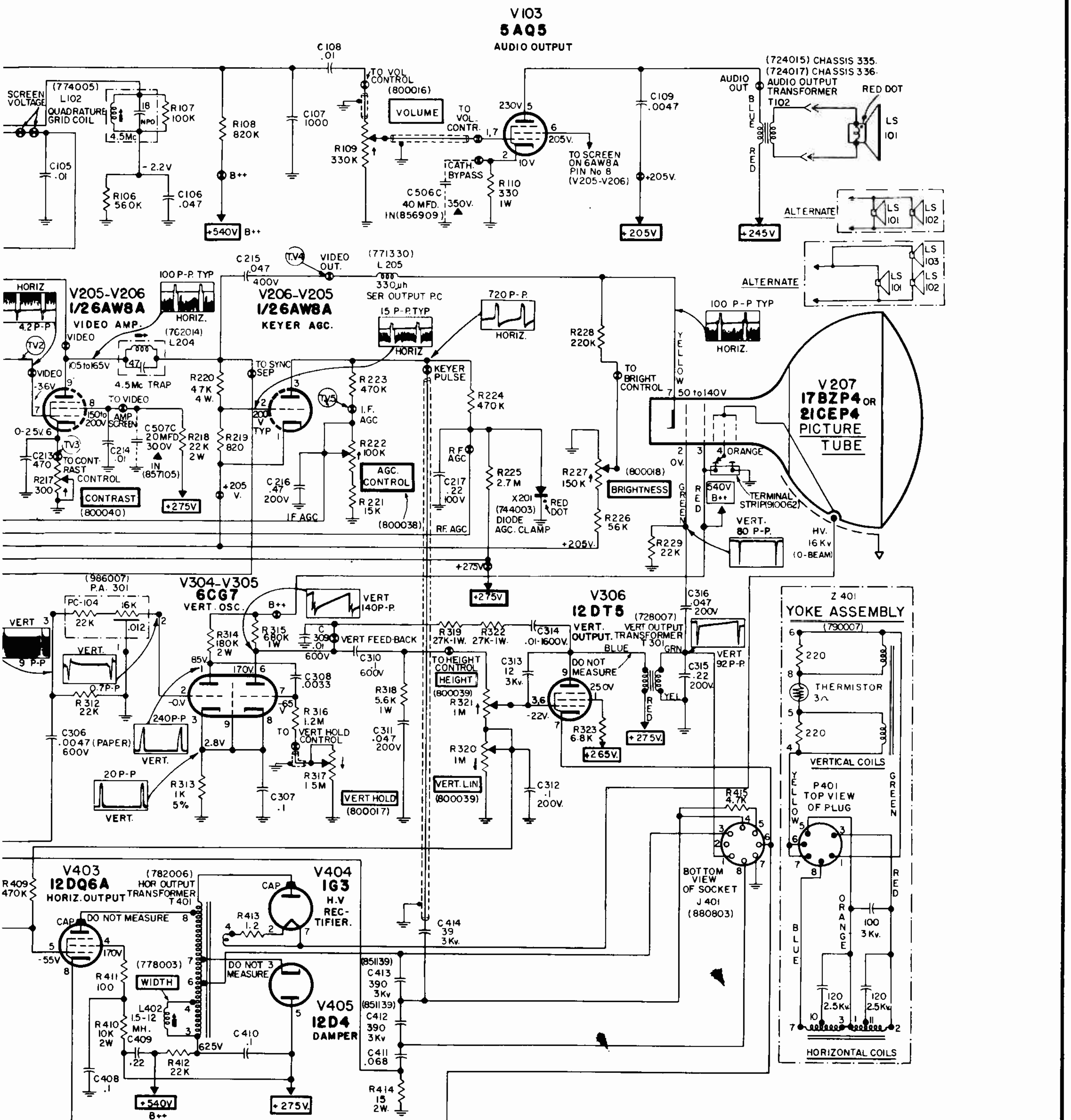
Models using Chassis 336

B1291
K1291
M1291
SP1291
W1291
B3411
M3411
SP3411
W3411
B3421
M3421
SP3421
W3421



SCHEMATIC DIAGRAM FOR

HOFFMAN MARK 7, CHASSIS 335, 336, Schematic Diagram

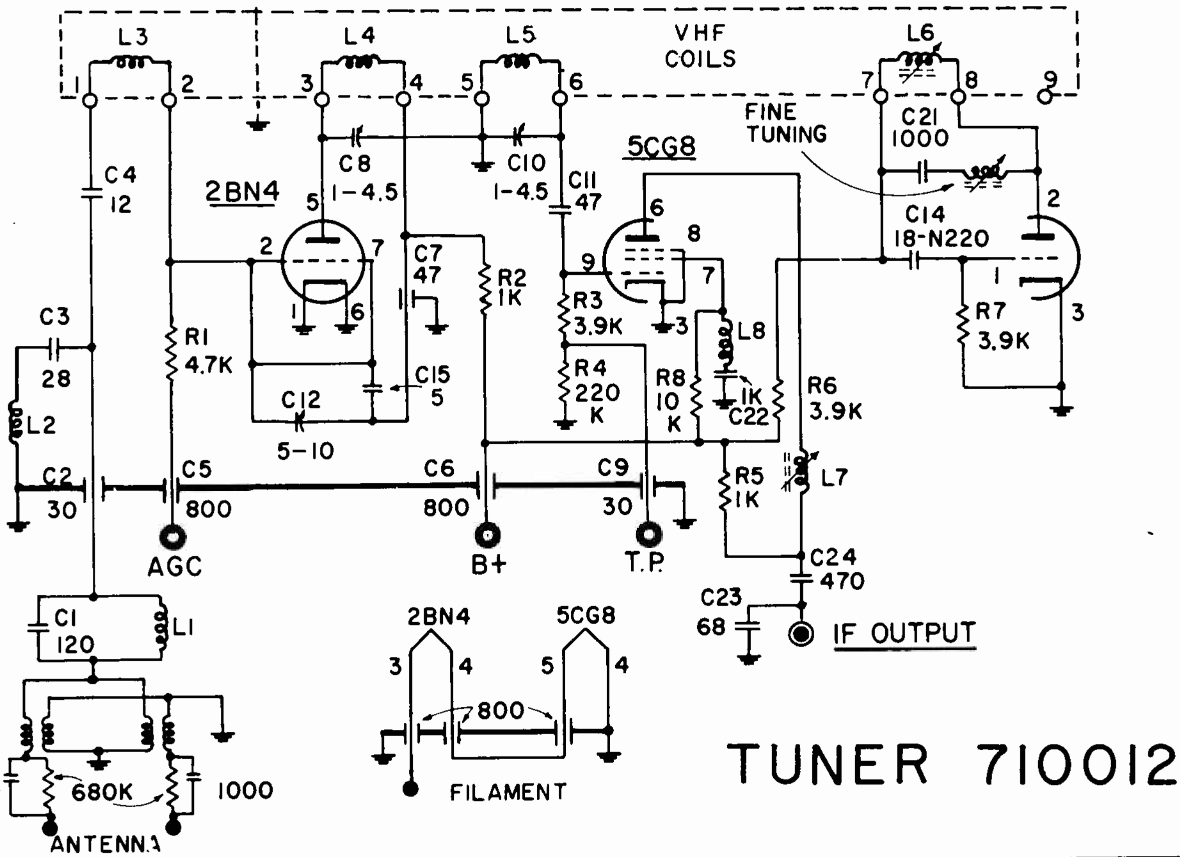


HOFFMAN MARK 7 CHASSIS 335,336

HOFFMAN MARK 7, CHASSIS 335, 336, Service Information, Continued

CAPACITORS

SYMBOL	PART NO.	DESCRIPTION
C101	854035	2.2mmf Composition
C102	854051	47mmf Composition
C103	851140	.0047mfd, 500V Ceramic
C104	851141	.001 mfd, 500V Ceramic
C105	851015	.01 mfd, 500V Ceramic
C106	871221	.047 mfd, 200V Tubular
C107	851003	1000mmf, 500V Ceramic
C108	851015	.01 mfd, 500V Ceramic
C109	851140	.0047 mfd, 500V Ceramic
C201	851122	470mmf Ceramic
C202	866301	.001mfd, 600V Tubular
C203	851122	470mmf Ceramic
C204	866125	.1mfd, 200V Tubular
C205	851122	470mmf Ceramic
C206	851122	470mmf Ceramic
C207	851122	470mmf Ceramic
C208	851122	470mmf Ceramic
C209	851122	470mmf Ceramic
C210	866301	.001mfd, 600V Tubular
C211	866301	.001mfd, 600V Tubular
C212	854043	10mmf Composition
C213	851122	470mmf Ceramic
C214	851015	.01 mfd, 500V Ceramic
C215	871421	.047 mfd, 400V Tubular
C216	866129	.47mfd, 200V Tubular
C217	866129	.22mfd, 200V Tubular
C301	871605	.0022 mfd, 600V Tubular
C302	851114	220mmf Ceramic
C303	851128	100mmf Ceramic
C304	851117	820mmf Ceramic
C305	851117	820mmf Ceramic
C306	871609	.0047 mfd, 600V Tubular
C307	871225	.1 mfd, 200V Tubular
C308	871657	.0033mfd, 600V Tubular
C309	851015	.01 mfd, 500V Ceramic
C310	871625	.1 mfd, 600V Tubular
C311	866121	.047mfd, 200V Tubular
C312	866125	.1mfd, 200V Tubular
C313	850105	12mmf, 3KV Ceramic
C314	867913	.01mfd, 1600V Tubular
C315	866129	.22mfd, 200V Tubular
C316	866121	.047mfd, 200V Tubular
C401	871609	.0047 mfd, 600V Tubular
C402	866121	.047mfd, 200V Tubular
C403	851128	100mmf Ceramic
C404	862102	3900mmf Mica
C405	862101	470mmf Mica
C406	862103	330mmf Mica
C407	866301	.001mfd, 600V Tubular
C408	866325	.1mfd, 600V Tubular
C409	866329	.22mfd, 600V Tubular
C410	866325	.1mfd, 600V Tubular
C411	866323	.068mfd, 600V Tubular
C412	850301	390mmf, 3KV Ceramic
C413	850301	390mmf, 3KV Ceramic
C414	850107	39mmf, 3KV Ceramic
C501	870213	.01mfd, 600V Tubular
C502	870225	.1mfd, 600V Tubular
C503	851119	.01mfd, 500V Ceramic
C504	851119	.01mfd, 500V Ceramic
C505	856909	160mfd, 150V Filter
C506A		100mfd, 350V Filter
C506B	856906	40mfd, 350V Filter
C506C		40mfd, 350V Filter
C507A		80mfd, 400V Filter
C507B	857105	40mfd, 350V Filter
C507C		20mfd, 300V Filter
C507D		20mfd, 300V Filter
C508	851013	.001mfd, 500V Ceramic



TUNER 710012

MONTGOMERY WARD

MODEL WG-4204A, SERIAL 85X (Material on pages 43 through 46)

DEFLECTION YOKE ADJUSTMENT—The deflection yoke should be positioned as far forward on the neck of the tube as the bell will allow. Then, if the lines of the raster are not horizontal or squared with the picture mask, rotate the deflection yoke until this condition is obtained. Upon completion of this adjustment, tighten the clamp at the rear of the deflection yoke.

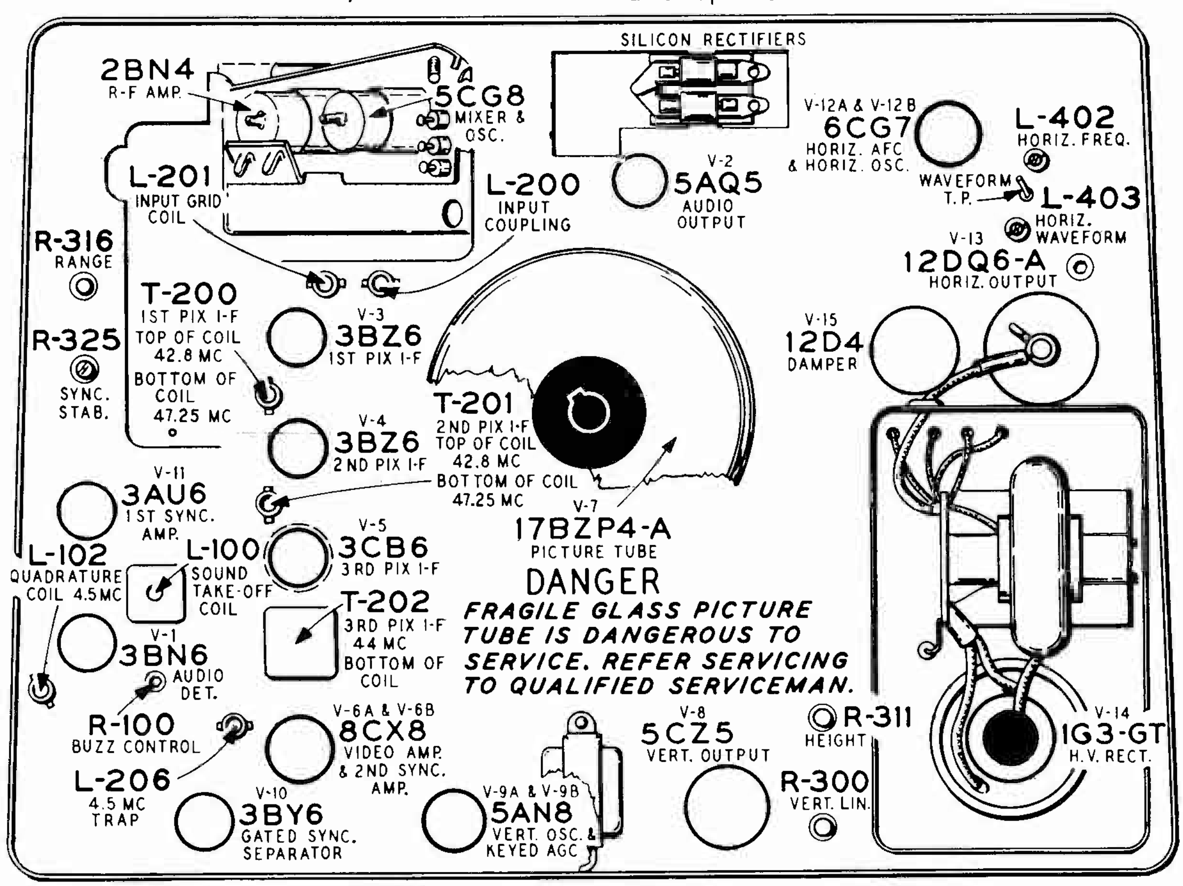
CENTERING ADJUSTMENT — If horizontal or vertical centering is required, adjust each ring in the centering device until proper centering is obtained. If a clamp type centering device is used, rotate the device to the left or right and turn the knob located at the top of the device until the picture is centered correctly.

ADJUSTMENT OF RANGE CONTROL—Tune the receiver to the strongest station in the area in which the receiver will be used. While observing the picture and listening to the sound, turn the control clockwise until signs of overloading (buzz in sound washed-out picture, sync instability) appear. Then turn the control a few degrees counter-clockwise from the point at which overloading occurs. (The stronger the signal input, the more counter-clockwise this setting will be.) In areas where the strongest signal does not exceed 1000 MV the setting will usually be maximum clockwise. With the control set correctly, the AGC will automatically adjust the bias on the R-F and I-F amplifiers so that the best possible signal to noise ratio (minimum snow) will be obtained for any signal input to the receiver.

HORIZONTAL FREQUENCY ADJUSTMENT — Turn the horizontal hold control to the extreme clockwise position. Tune in a station and adjust the horizontal frequency control until the picture is just about to tear out of sync as seen at the top of the picture.

HORIZONTAL DRIVE ADJUSTMENT—While receiving a signal from a station (with picture locked in sync) turn contrast control fully counter-clockwise, turn the brightness control up so that the picture appears washed out. Turn the horizontal drive control clockwise until white bars appear in the left center portion of the raster, then turn counter-clockwise until the white bars just disappear. This adjustment will allow the horizontal system to operate at maximum efficiency.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENT — Adjust the height control until the picture fills the mask vertically. Adjust the vertical linearity control until the picture is symmetrical from top to bottom. Adjust the picture centering device to align picture with the mask. Adjustment of any control will require a re-adjustment of the other control.



Chassis Tube Layout and Trimmers

MONTGOMERY WARD Model WG-4204A, Serial 85X

Schematic Diagram

CONTROLS TOP OF CHASSIS

Horizontal Hold R-424
Brightness R-219
Vertical Hold R-310
Off-On Volume R-104
Contrast R-222

CONTROLS REAR OF CHASSIS

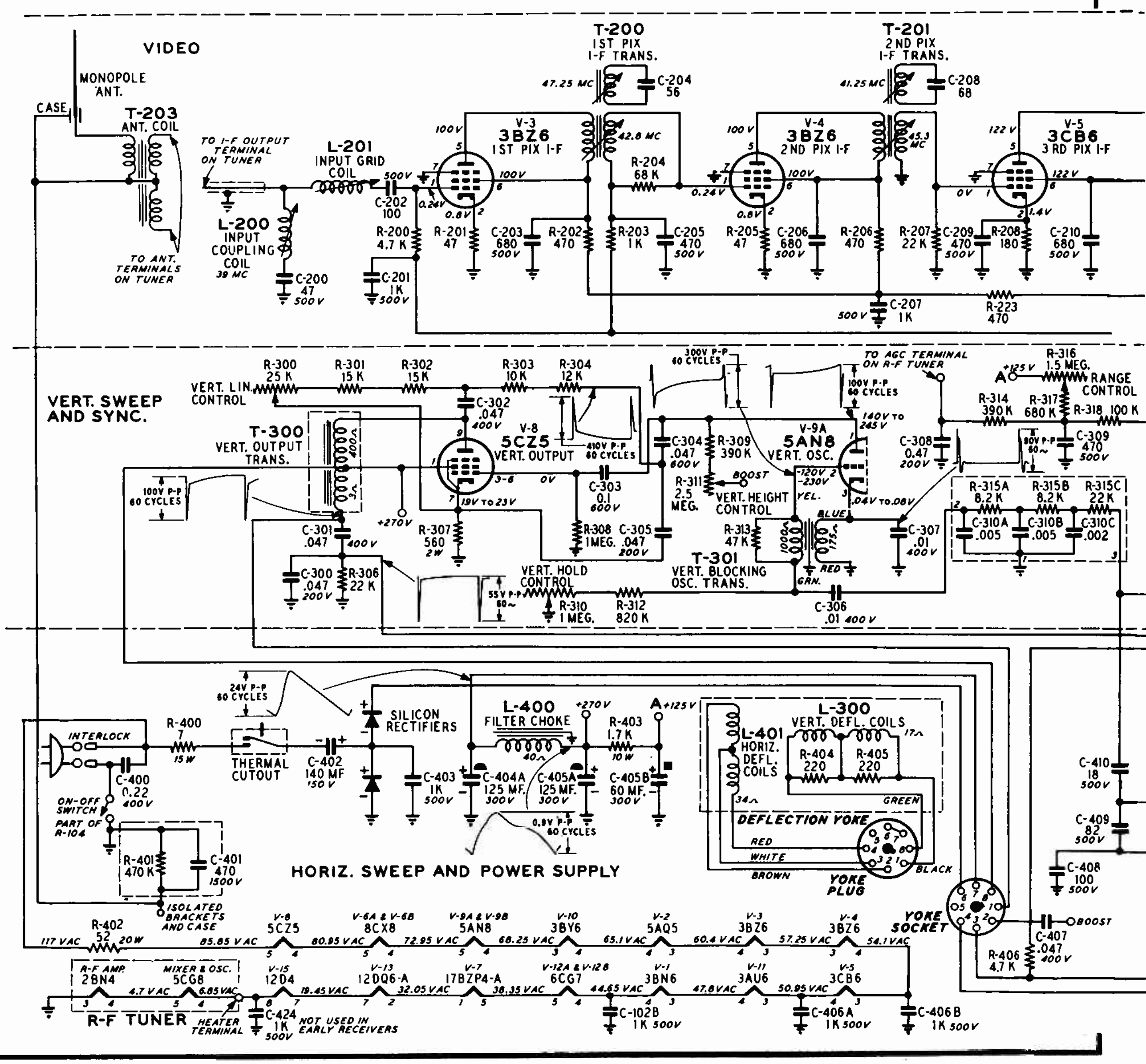
Horizontal Centering ......} Centering
Vertical Centering ....} Device
Horizontal Drive C-417
Vertical Linearity R-300
Height R-311
Horizontal Wave Form L-403
Horizontal Frequency L-402
Buzz R-100
Range R-316

OSCILLOSCOPE WAVEFORM PATTERNS

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

DC SOCKET VOLTAGES

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



MONTGOMERY WARD Model WG-4204A

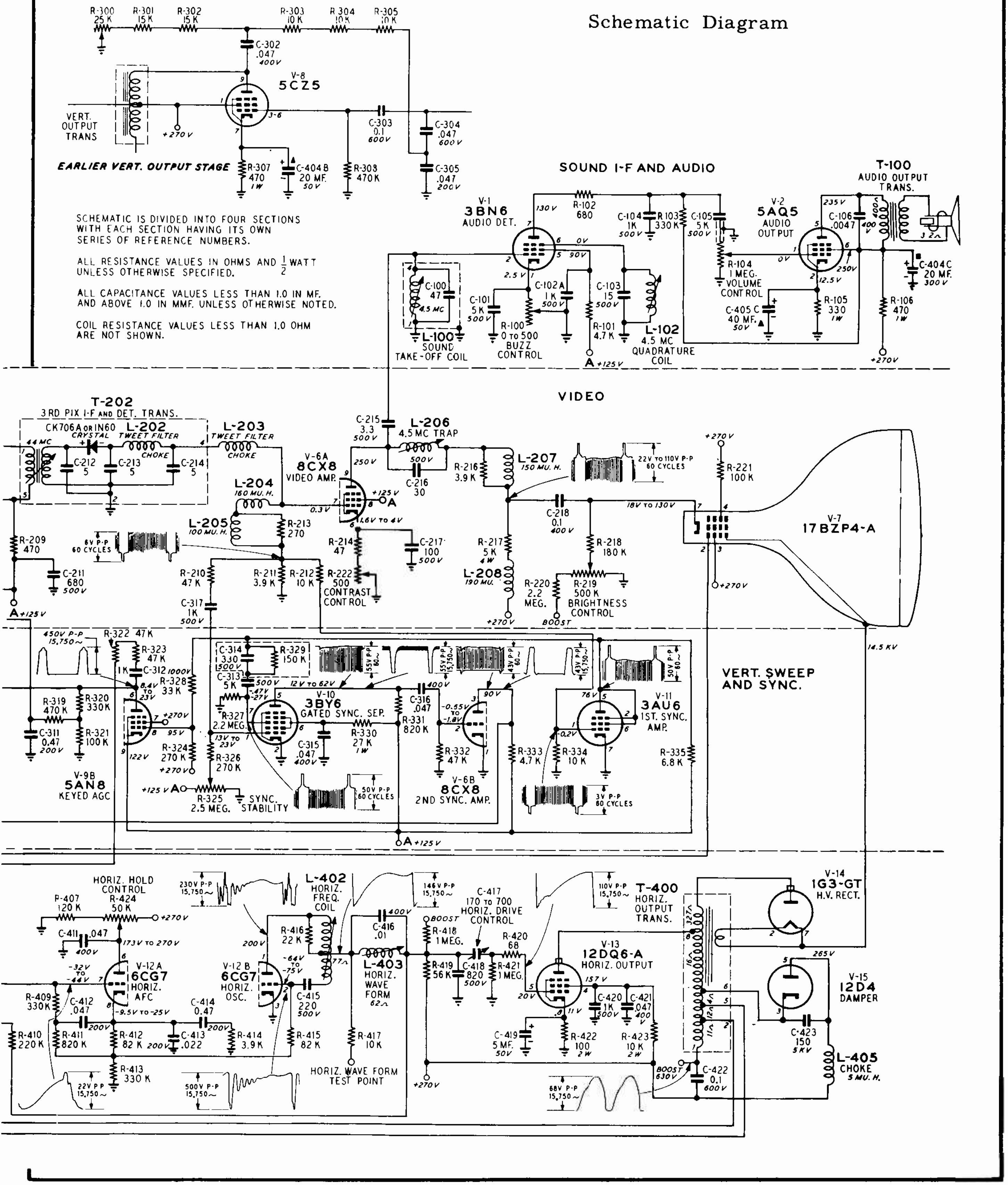
Schematic Diagram

SCHEMATIC IS DIVIDED INTO FOUR SECTIONS WITH EACH SECTION HAVING ITS OWN SERIES OF REFERENCE NUMBERS.

ALL RESISTANCE VALUES IN OHMS AND $\frac{1}{2}$ WATT UNLESS OTHERWISE SPECIFIED.

ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF. AND ABOVE 1.0 IN MMF. UNLESS OTHERWISE NOTED.

COIL RESISTANCE VALUES LESS THAN 1.0 OHM ARE NOT SHOWN.



MONTGOMERY WARD Model WG-4204A, Serial 85X, Service Information, Continued

ALIGNMENT PROCEDURE

40 MC I-F ALIGNMENT — With tuner set in UHF (blank position) connect sweeper with very short leads through a 10K mmf disc. ceramic capacitor to mixer grid. (Lead of a 10K ohm resistor which is accessible through a hole at top of tuner.) With short leads, connect crystal diode detector (Fig. 3) to plate of 1st I-F tube. Connect −4-5V to I-F AGC line (Junction of C-201 and R-200). Connect oscilloscope to detector output. Adjust sweep output to give adequate deflection.

A. FREQUENCY	ADJUST
1. 47.25 Mc	1st Pix I-F Coil (T-200 Bottom of Coil) to center notch over 47.25 Mc marker.
2.	Converter Plate Coil L-9 (Top of Tuner) Input Grid Coil (L-201) and Input Coupling Coil (L-200) to give the response shown in figure 4.

The converter plate and input grid coils control the shape of the top. The input coupling coil controls the position of the 41.25 marker. This adjustment must be made accurately or the sound rejection will not be correct (41.25 Mc 31 to 36 db down from top of overall P.I.F. response). 45.75 Mc marker must be set exactly on peak or the position of the 44.5 Mc marker in the overall response curve will not be correct.

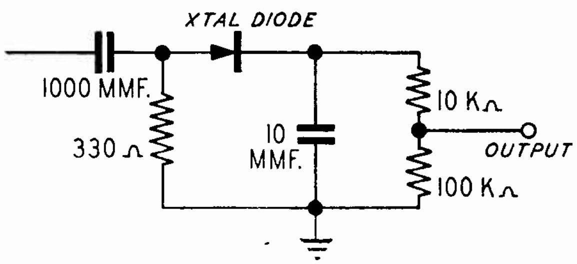


Fig. 3—Crystal Diode Detector

B. When the input circuit is aligned place −4.5V bias on the I-F AGC line. (Junction of C-201 & R-200). Remove the crystal detector and connect oscilloscope and VTVM to the 2nd pix detector load resistor R-211. Adjust sweep output to give 2.0 VDC at detector.

FREQUENCY	ADJUST
1. 42.8 Mc	1st Pix I-F Coil (T-200, Top of Coil) for maximum height of 42.8 Mc marker.
2. 41.25 Mc	2nd Pix I-F Coil (T-201, Bottom of Coil) for minimum height of 41.25 Mc marker.
3. 45.3 Mc	2nd Pix I-F Coil (T-201, Top of Coil) for maximum height of 45.3 Mc marker.
4. 44.0 Mc	3rd Pix I-F Coil (T-202, Bottom of Coil) for maximum height of the 44.0 Mc marker.

These adjustments may be made with a single frequency generator if it is more convenient to do so.

C. After these adjustments have been made recheck the peak to peak output on the oscilloscope. If the shape of the curve is not as shown in figure 5, it will be necessary to retouch the adjustments. A small fraction of a turn is all that is necessary if the strip is operating correctly. The position of the 44.5 Mc marker is critical (98%). The 44.0 Mc transformer (3rd I-F) controls the symmetry of the top. The 45.3 Mc transformer (2nd I-F) controls the height of the 45.75 Mc marker. The 42.8 Mc transformer (1st I-F) controls the height of the 42.4 Mc marker. This adjustment will very seldom need retouching.

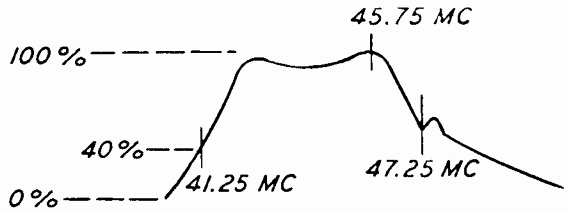


Fig. 4—Input Circuit Response

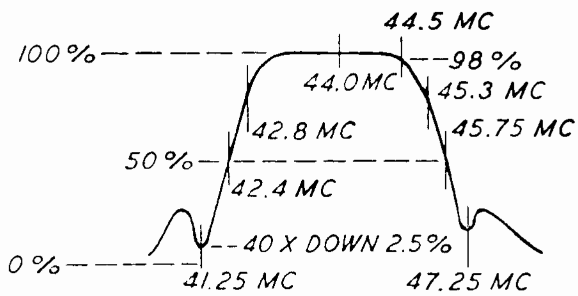


Fig. 5—Overall Response Curve

DO NOT RETOUCH the converter plate coil or the input grid coil. These coils MUST be adjusted correctly with the diode detector. Recheck position of 41.25 Mc and 47.25 Mc markers. Reset if necessary.

VIDEO

With 4.5 Mc unmodulated signal into grid of the video amplifier tube and VTVM on picture tube cathode, tune 4.5 Mc trap for minimum response. VTVM on 0-10 V AC scale. This adjustment can also be made while observing a picture from a station. Tune trap for least 4.5 Mc beat (grainy appearance) in picture.

AUDIO

1. Tune in a TV station and reduce signal strength at antenna terminals by use of an attenuator or similar device until a "hiss" accompanies the sound.
2. Adjust sound take-off coil (L-100), quadrature coil (L-102) and buzz control (R-100) for maximum undistorted sound and minimum buzz.
3. If "hiss" disappears during step 2, further reduce signal strength.

MONTGOMERY WARD

MODELS WG-5062A, WG-5067A, WG-5072A, WG-5077A, WG-5162A, WG-5172A

(Material on pages 47 through 50)

SERVICE ADJUSTMENTS

MAGNET ADJUSTMENT—The picture tube used on these receivers is of the electrostatic type, and occasionally, to bring about best focus, it is necessary to use a beam aligner. The beam aligner fits on the neck of the picture tube and appears to be an ion trap. In many cases, the beam aligner is not needed to properly focus the tube and therefore is not mounted on the tube. However, if a replacement picture tube is ever needed, it may be necessary to purchase a beam aligner to bring about satisfactory focusing adjustment.

DEFLECTION YOKE ADJUSTMENT—The deflection yoke should be positioned as far forward on the neck of the tube as the bell will allow. Then, if the lines of the raster are not horizontal or squared with the picture mask, rotate the deflection yoke until this condition is obtained. Upon completion of this adjustment, tighten the clamp at the rear of the deflection yoke.

CENTERING ADJUSTMENT — If horizontal or vertical centering is required, adjust each ring in the centering device until proper centering is obtained. If a clamp type centering device is used, rotate the device to the left or right and turn the knob located at the top of the device until the picture is centered correctly.

CHASSIS ASSEMBLY REMOVAL

1. Remove knobs from the front of the cabinet.
2. Remove cabinet back.
3. Disconnect the antenna leads. Disconnect speaker leads on consoles only.
4. Remove speaker (table models only).
5. Remove screws holding chassis brackets to top of cabinet.
6. Remove only 4 screws (2 at each side) from the bottom side of the shelf.
7. Gently pull the chassis assembly out from the cabinet.

   CAUTION — DO NOT LOOSEN OR REMOVE ANY OTHER SHELF SCREWS INSIDE CHASSIS COMPARTMENT.
8. Place entire assembly face down on a cushioned surface which should be thick enough to allow for clearance of control shaft. Disconnect the yoke plug, picture tube socket, anode lead and remove the beam aligner magnet and deflection yoke.

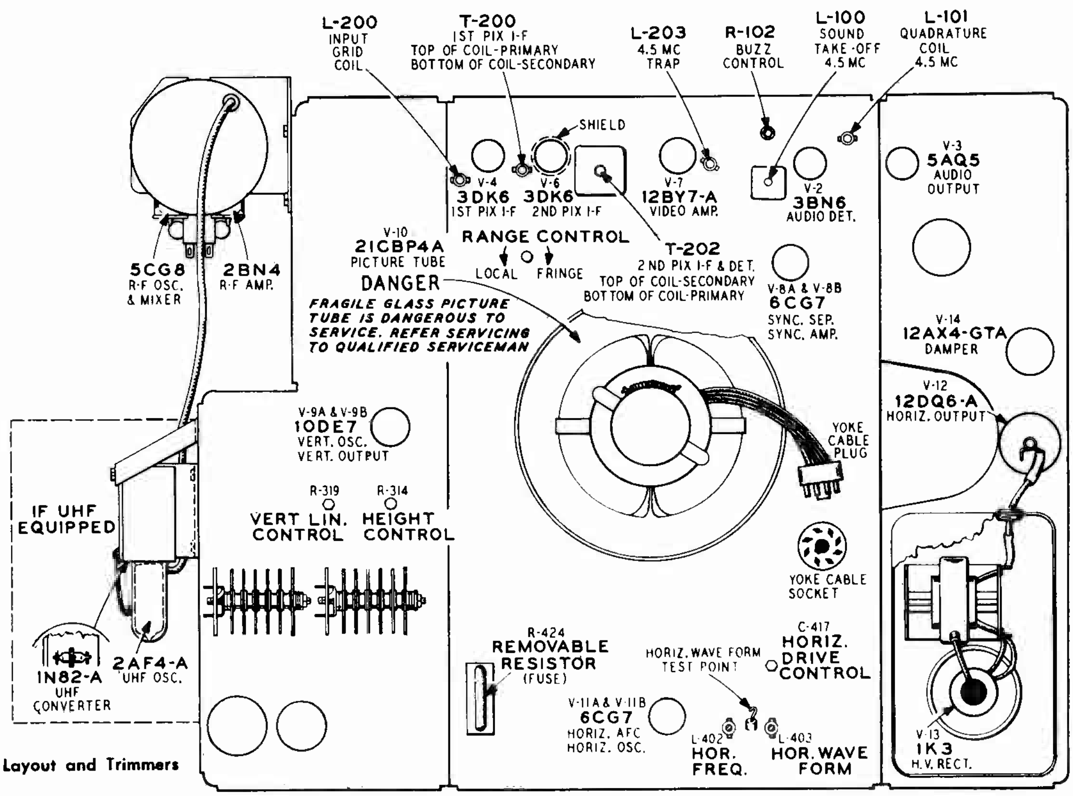
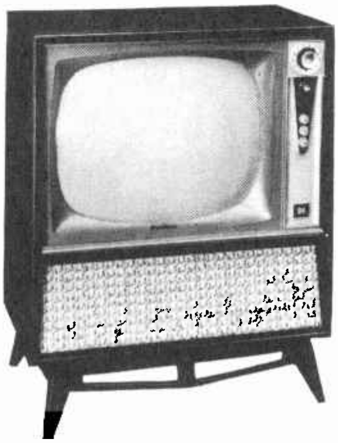


Fig. 1—Chassis Tube Layout and Trimmers

MONTGOMERY WARD Models WG-5062A, WG-5067A, WG-5072A, WG-5077A, WG-5162A, WG-5172A, Schematic Diagram, Continued

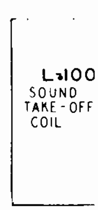


OSCILLOSCOPE WAVEFORM PATTERNS

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

DC SOCKET VOLTAGES

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



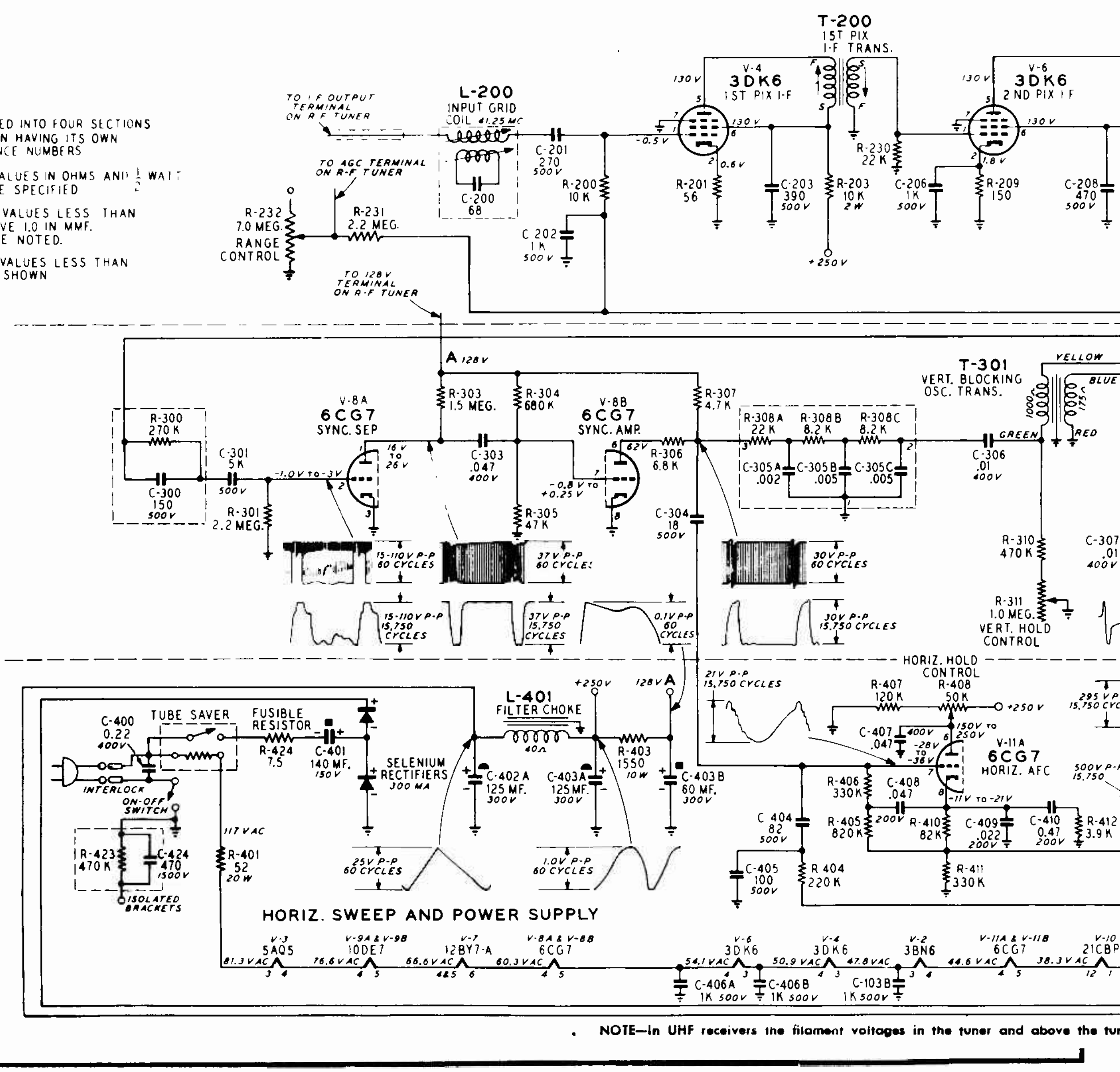
SCHEMATIC IS DIVIDED INTO FOUR SECTIONS WITH EACH SECTION HAVING ITS OWN SERIES OF REFERENCE NUMBERS

ALL RESISTANCE VALUES IN OHMS AND ½ WATT UNLESS OTHERWISE SPECIFIED

ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF. AND ABOVE 1.0 IN MMF. UNLESS OTHERWISE NOTED.

COIL RESISTANCE VALUES LESS THAN 1.0 OHM ARE NOT SHOWN

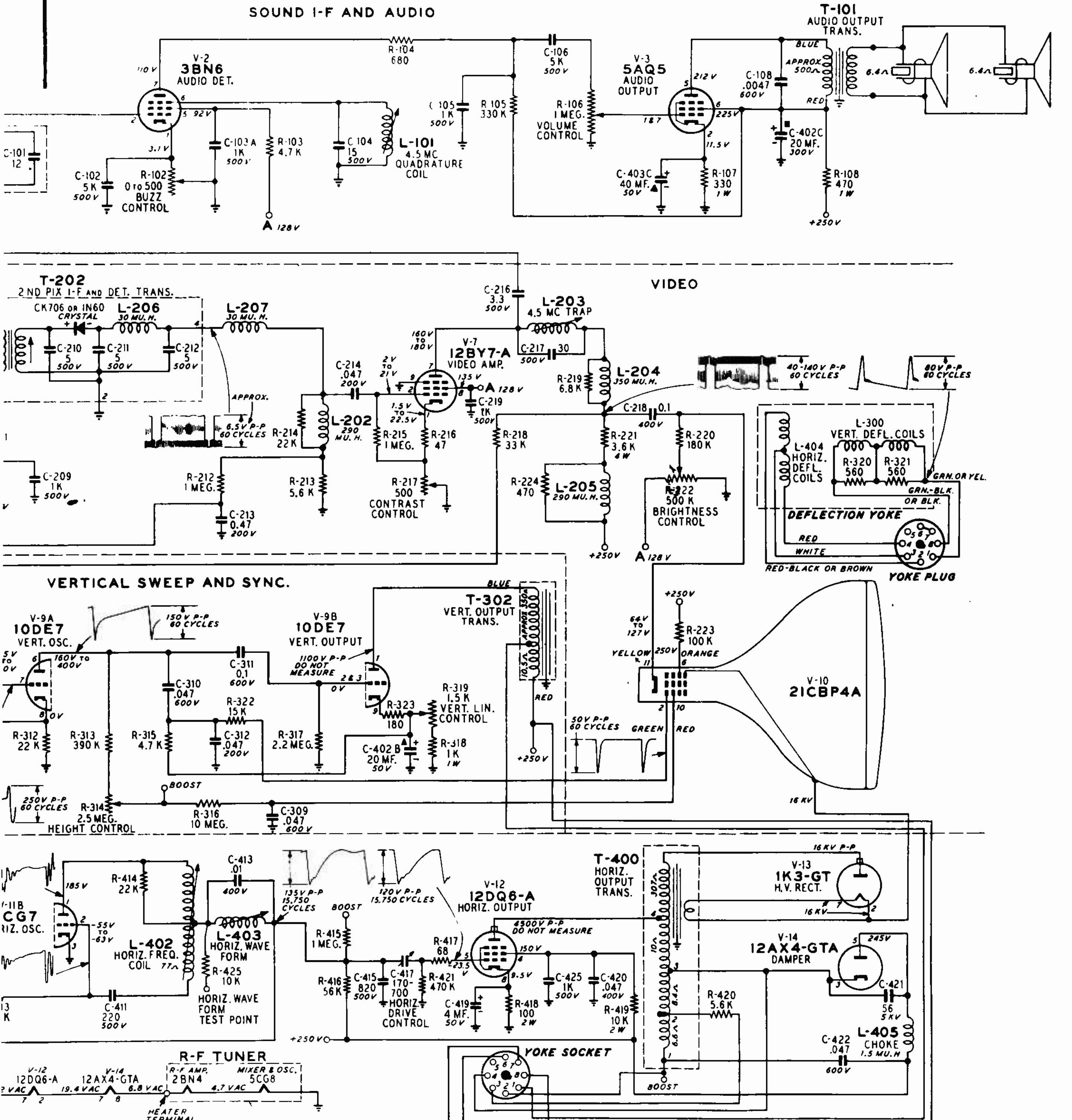
K=1000



NOTE—In UHF receivers the filament voltages in the tuner and above the tun

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 and then back. Normally the picture may be out of sync. Turn the control slowly clockwise. The number of diagonal bars will be gradually reduced and when only 2 to 3 bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional clockwise rotation of the control.

At the extreme clockwise position, the picture should be just starting to pull out of sync.



...the heater string will be slightly greater because of the filament voltages of the tuner tubes

MONTGOMERY WARD, Continued
Models WG-5062A, WG-5067A, etc.

SERVICE SUGGESTIONS

BUZZ IN SOUND

1. Check buzz control setting.
2. Check sound I-F alignment.
3. V-2 defective.

BENDING OR S-ING

1. Check capacitors C-402A & C-403A.
2. V-12 or V-11B tubes defective.
   circuits.
3. Check V-8A, V-8B and V-7 tubes.

ALIGNMENT PROCEDURE

1. Connect sweep output to 2nd I-F grid (pin #1-V6), oscilloscope to diode load resistor (R-213). Set output of sweeper so that some output is indicated on oscilloscope. Adjust 2nd PIF transformer (T-202) primary (bottom) and secondary (top) simultaneously for maximum output and symmetry. Readjust sweeper output for 4.0V P-P on oscilloscope. Touch-up to give the waveform shown in figure 4.

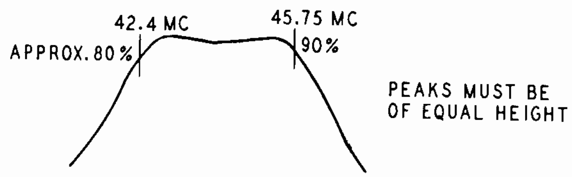


Fig. 4—2nd Pix I-F Response

2. With approximately —7.0V bias on AGC line (junction of R-212 and C-213) connect sweeper to 1st I-F grid (Pin #1-V4). Reduce sweeper output to compensate for additional gain of 1st stage (4.0V. P-P on oscilloscope). Adjust 1st I-F transformer primary (top) and secondary (bottom) for maximum gain and symmetry with 45.75 mc marker. (See Figure 5.)

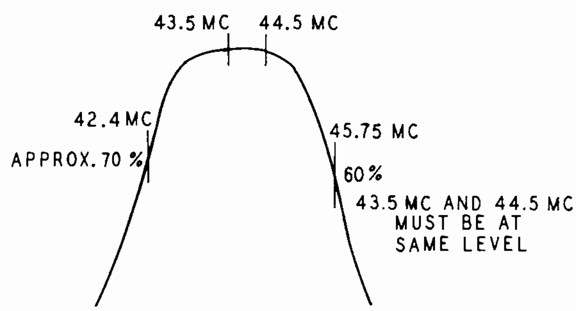


Fig. 5—Pix I-F Response From 1st Pix I-F Grid

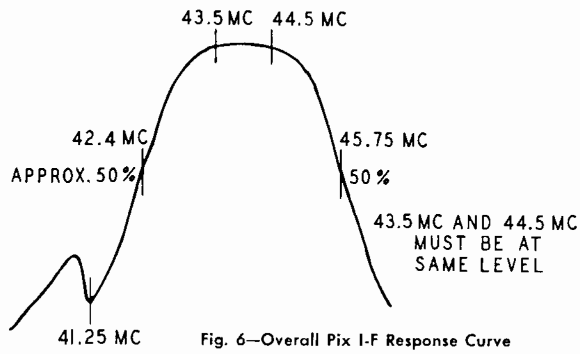


Fig. 6—Overall Pix I-F Response Curve

3. Set channel selector to Channel 13. Connect sweeper with very short leads through a 10 K mmf disc ceramic capacitor to mixer grid (lead of a 10 K resistor which is accessible through a hole located on front of the tuner). Readjust sweep output for 4.0V P-P, adjust 41.25 mc trap (bottom of L-200) so that notch is at marker, adjust mixer plate coil (L-9 primary) and input grid coil (top of L-200) for maximum gain and symmetry with 45.75 mc marker at 50%. (Figure 6.)

In all positions, final touch up should be made with 4.0V. P-P amplitude on oscilloscope. Once a stage has been adjusted, do not readjust with the sweeper connected to another stage. For instance, after adjusting the output stage and moving the sweeper to the 1st grid to adjust 1st I-F transformer, do not move the slugs in the output stage, etc.

In general, the position of the 45.75 mc marker should be set with the primary and the symmetry adjusted with the secondary. An approximate setting of the input grid coil may be obtained by adjusting for maximum amplitude of the 45.75 marker. This amplifier **cannot** be adjusted for bandwidth. It must be adjusted for maximum gain, symmetry and position of 45.75 marker.

VIDEO

With 4.5 Mc unmodulated signal into grid of the video amplifier tube and VTVM on picture tube cathode, tune 4.5 Mc trap for minimum response. VTVM on O-10 V AC scale. This adjustment can also be made while observing a picture from a station. Tune trap for least 4.5 Mc beat (grainy appearance) in picture.

AUDIO

1. Tune in a TV station and reduce signal strength at antenna terminals by use of an attenuator or similar device until a "hiss" accompanies the sound.
2. Adjust sound take-off coil (L-100) quadrature coil (L-101) and buzz control (R-102) for maximum undistorted sound and minimum buzz.
3. If "hiss" disappears during step 2, further reduce signal strength.

MOTOROLA

CHASSIS TS-430, LTS-430, QTS-430

MODEL BREAKDOWN CHART

Model	Type	TV Chassis	VHF Tuner	UHF Tuner
17T32BZ	Table	TS-430	TT-104	-
Y17T32BZ	Table	TS-430Y	TT-104Y	VTT-89
17T33B	Table	LTS-430	LTT-104	-
17T33M	Table	LTS-430	LTT-104	-
17P5-1	Portable	TS-430	TT-104	-
Y17P5-1	Portable	TS-430Y	TT-104Y	VTT-89
17P5-2	Portable	TS-430	TT-104	-
Y17P5-2	Portable	TS-430Y	TT-104Y	VTT-89

ADDENDA TO MODEL BREAKDOWN CHART

Model	TV Chassis	VHF Tuner	UHF Tuner	Antenna
17P5-2C	TS-430	TT-104	-	Monopole
Y17P5-2C	TS-430Y	TT-104Y	VTT-89	Monopole
17P5-3A	QTS-430	QCMTT-102	-	Monopole
Y17P5-3F	TS-430Y	TT-104Y	VTT-89	Monopole
17P5-4A	QTS-430	QCMTT-102	-	Monopole
Y17P5-4F	TS-430Y	TT-104Y	VTT-89	Monopole
17P5-5A	QTS-430	QCMTT-102	-	Monopole
Y17P5-5F	TS-430Y	TT-104Y	VTT-89	Monopole
17T32WH	TS-430	TT-104	-	None

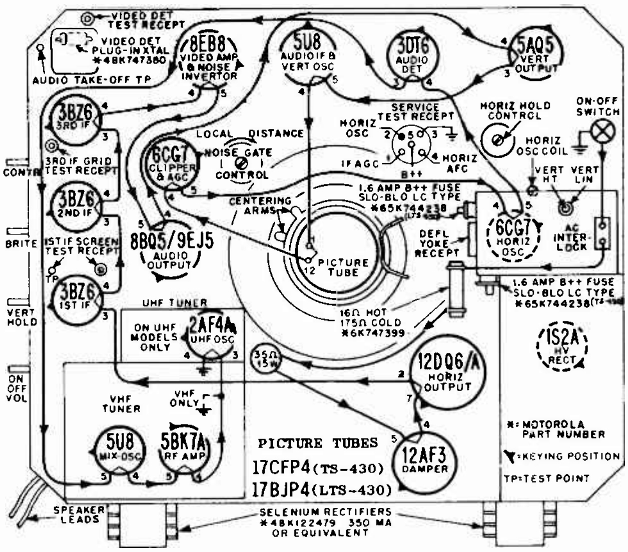


FIGURE 1. TUBE LOCATIONS & FILAMENT WIRING

DEFLECTION YOKE ADJUSTMENT

If the deflection yoke is not correctly positioned rotationally, the picture will be tilted. If the deflection yoke is not tight against the flare of the picture tube, the picture may be de-focused, have non-linear distortions and neck shadow.

To adjust the yoke; loosen the metal clamp, push the yoke as far forward as possible, then rotate until the picture is straight. Loosen clamp and push tight against rear of yoke; tighten metal clamp.

PICTURE CENTERING

Picture centering is accomplished magnetically by means of the centering device located on the picture tube neck. Use the following procedure:

1. Starting with the magnetic centering device arms together (for minimum field strength) and positioned in the horizontal plane.

2. Separate the arms of the centering device to center the picture vertically.

3. Adjust horizontal centering by rotating the magnetic centering device, as a unit, one way or the other. Readjust vertical centering by slightly rotating the relative position of the arms.

REAR PANEL ACCESSORIES AND CONTROLS

These models are provided with conventional antenna terminals for connection of an outside or portable-indoor antenna of any type. The 17T32 & 17P5 models (chassis TS-430) are equipped for use with a custom-designed single-mast type antenna called the Monopole. The Monopole antenna requires a "counterpoise" which is provided by the cabinet; required connection from the antenna to the cabinet is provided by a female receptacle pre-wired into the receiver's back cover. The Monopole antenna is provided with a male plug and when the antenna is plugged into the back cover, the cabinet counterpoise is automatically connected. The conventional twin-lead from the Monopole antenna must still be connected to the conventional antenna terminals. Should the back cover be removed, make certain the ground counterpoise wire is secured to a cabinet screw when cover is replaced.

Model 17T33 is provided with a "built-in" antenna. The leads for the built-in antenna protrude through the back cover, near the conventional antenna terminals. To use built-in, connect lead-in wires to antenna terminals. Do not use both an external antenna and built-in antenna.

Receivers equipped for VHF and UHF reception are provided with externally connected, 150 ohm resistors, between the VHF and UHF antenna terminals. Such connection allows VHF and UHF reception from a single antenna. When a single antenna is used as a combination VHF/UHF antenna, reception should be checked with the antenna connected to the VHF terminals first and then to the UHF terminals. Since the 150 ohm coupling resistors can cause a loss of signal strength, it is necessary to determine which tuner input must be fed directly from the antenna and which tuner will be least affected by the loss. Keep in mind that the 150 ohm resistor jumpers are only used when VHF and UHF reception is obtained from a single antenna. In fringe areas, and cases where individual VHF and UHF antennas are required...the resistor jumpers are removed and the appropriate antenna connected to the appropriate input terminals.

The Monopole antenna is not recommended for UHF operation and a special UHF loop antenna (TK-86) is available. However, the Monopole will often give satisfactory results as a combination VHF/UHF antenna in certain areas. In such case, the Monopole lead-in should be tried in both the VHF and UHF position to the group of stations that will be least affected by the loss of signal strength due to the resistors.

FOCUS ADJUSTMENT

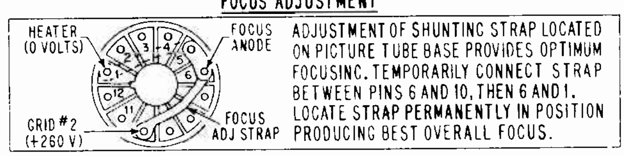


FIGURE 2. FOCUS STRAP ILLUSTRATION

MOTOROLA Chassis TS-430, LTS-430, QTS-430, Service Information, Continued

NOISE GATE CONTROL (Local-Distance) ADJUSTMENT

This control sets the receiver for the signal strength in the area in which it is to operate. To adjust: tune in a channel that receives a satisfactory picture; turn the noise gate control clockwise until picture becomes unstable (sync or otherwise). Then turn the noise gate control counterclockwise until picture is again satisfactory. Check this setting on all available channels. If any channel is unstable, continue turning noise gate control counterclockwise until it clears up. Once set in this manner, the control should not require further adjustment unless some condition occurs that would change the signal strength to the receiver...this might include changing the receiver's position in the room, changing the antenna type or location, etc.

HORIZONTAL OSCILLATOR ADJUSTMENT

The HORIZONTAL HOLD control should have a sync range of approximately 30 degrees. If the control is too critical, adjust by the following procedure. (It should be possible to adjust the horizontal oscillator coil with the receiver in the cabinet by using the appropriate pins of the SERVICE TEST RECEPTACLE.)

1. Set all controls for a normal picture.

2. Use a piece of wire, short the pin labeled "HORIZ AFC" to ground.

3. Connect a .1 mfd 400 volt capacitor in parallel with the HORIZONTAL OSCILLATOR COIL (L-501). Use pins #2 and #5 of the SERVICE TEST RECEPTACLE.

4. Adjust the HORIZONTAL HOLD control to the point where the picture almost remains stationary...as far as horizontal sync is concerned. Also, make sure that the picture is synced vertically.

5. Remove the .1 mfd capacitor shunting the HORIZ COIL and without turning the HORIZONTAL HOLD control, adjust the HORIZ COIL slug to the center of the range in which the picture almost remains in sync horizontally. The slug of the coil is located in the upper right-hand corner of the chassis.

6. Remove the wire shorting the HORIZ AFC to ground and adjust the HORIZONTAL HOLD control so that no fold-over appears on either side of the raster.

TO REMOVE THE TS-430 (17T32 & 17P5) CHASSIS FROM THE CABINET;

1. Remove all knobs from the side of the cabinet.

2. Unplug the tuner lead-in wires from the antenna terminals.

3. Remove the three screws from the back cover and remove the back cover by lifting up and out of the bottom retaining channel, then straight back from the cabinet.

4. Remove the two self-tapping screws exposed by back cover removal and located at the top edge of the cabinet. These screws hold the brackets retaining the top of the chassis.

5. Remove the two screws from underneath the cabinet that hold the bottom chassis bracket.

6. Tilt chassis so that left-hand side of chassis moves as close to the left-hand side of the cabinet as possible: tilt the top of the chassis outward from the cabinet. Now, disconnect the speaker leads, the high voltage picture tube anode lead, the picture tube socket and the yoke socket.

7. The chassis can be removed from the cabinet by tilting the top out first.

TO REPLACE THE TS-430 CHASSIS

1. Insert chassis with top tilted outward from cabinet and the left-hand side inward so the tuner shaft may be inserted through opening in side of cabinet. Before proceeding further, replace speaker leads and the picture tube high voltage anode lead.

2. Continue placing chassis into cabinet with top leaning outward.

3. Replace yoke and picture tube sockets.

4. Replace two screws holding top chassis brackets.

5. Replace two screws underneath cabinet holding chassis bracket.

6. Insert back cover into bottom well of cabinet, position flexible shafts so they will extend out openings in back cover, then close cover making sure power interlock makes proper connection. Replace the three screws in back cover making sure Monopole grounding lug is placed underneath the right-hand top (as viewed from rear) screw.

7. Insert tuner leads into proper antenna terminals.

8. Check operation of receiver as well as making a check to make certain the cabinet is not in any way making contact with wiring, creating a shock hazard.

TO REMOVE THE LTS-430 CHASSIS FROM THE CABINET

1. Remove all knobs from the side of the cabinet.

2. Unplug the tuner lead-in wires from the antenna terminals.

3. Remove the back cover of the cabinet.

4. Remove the two screws exposed by back cover removal and located at the top edge of the cabinet. These screws hold the brackets retaining the top of the chassis.

5. Remove the two screws from underneath the cabinet that hold the bottom chassis bracket.

6. Shift chassis to required position and disconnect the speaker leads, the high voltage picture tube anode lead, the picture tube socket and the yoke socket. Remove chassis.

TO REPLACE LTS-430 CHASSIS: Use preceding instructions in reverse order.

After replacement, check operation of receiver as well as making a check to make certain the cabinet is not in any way making contact with wiring...creating a shock hazard.

TO REMOVE THE SAFETY SHIELD FOR CLEANING

MODELS: 17T32 and 17P5

1. Position cabinet so the screws underneath the cabinet front (bezel) may be removed.

NOTE: Special "holt head" screws were used on some cabinets. A special tool, Motorola Part No. 66T742501, will be required to remove these screws in order to remove the safety shield.

2. Pull lower portion of cabinet front outward, away from cabinet.

3. Lift cabinet front upward until it is released from the upper edge of the cabinet.

MODEL: 17T33

1. Remove the safety shield by removing the screws located in the metal retainer strip at the top of the safety shield. Remove the metal strip and allow the top of the shield to move outward from the cabinet.

2. Grasp safety shield at right and left-hand sides and lift up and out of the bottom retainer.

PRECAUTIONS IN CLEANING PLASTIC-TYPE SAFETY SHIELD (Models: 17T32 & 17P5)

Clean the safety shield with water, mild soap and a clean soft cloth. Dry the surface with a clean, damp chamois. Never try to clean the safety shield by hard rubbing with a dry cloth. This will only tend to scratch the surface and produces an electrostatic charge on the plastic which will attract more dust from the air.

MOTOROLA Chassis TS-430, LTS-430, QTS-430, Alignment Information, Continued

ALIGNMENT

SERVICING THE IF SECTION

Before alignment of the video IF section is attempted, it is advisable to thoroughly check the system. If alignment is started on an IF section in which a faulty component exists, successful alignment will probably be impossible and the entire procedure will have to be repeated when the real cause of the trouble is corrected. Preliminary tests of the system should include voltage and resistance measurements, routine checks for bad soldering connections, and visual inspection of the circuits for overheated components as well as for obvious wiring defects.

VIDEO IF & MIXER ALIGNMENT PROCEDURE

Pre-Alignment Steps

1. Maintain line voltage at 122 volts with variac.

2. Remove the deflection yoke plug to eliminate RF interference radiation.

3. Disable oscillator by shorting point "L" located near oscillator tube V-2 to chassis.

4. Apply the negative lead of a 6 volt bias supply to pin #1 (IF AGC) of the SERVICE TEST RECEPTACLE and the positive lead to pin #3 (chassis ground).

5. All coil core tuning positions, in relation to chassis, are given in the procedure chart and in the illustration of Figure 6.

6. Set channel selector on channel #13 and connect a 1500 ohm 50 watt voltage normalizing resistor from B++ to chassis (use pins #5 (B++) and #3 (ground) of the SERVICE TEST RECEPTACLE.

7. Short across the tuner input terminals.

8. Set the noise gate control to maximum counterclockwise position (as viewed from rear of chassis).

9. Maintain 2 to 5 volts peak-to-peak at the diode load (Det. T.P.) except when specific values are given in the procedure chart.

10. Refer to Video IF & Mixer Alignment Detail for component and test point locations (Figure 7).

VIDEO IF & MIXER ALIGNMENT PROCEDURE

STEP	SWEEP GENERATOR	INDICATOR	ADJUST	ADJUST FOR AND/OR REMARKS
1.	To 3rd IF grid test recept thru a .001 mf capacitor Set sweep approx to 44 Mc markers as required	Scope thru a 47K ohm resistor to video det test recept	Both cores of 3rd IF coil (T-103)	Equal peaks and 45.75 Mc marker as shown in curve #1. NOTE: Core at crystal det end can be reached by inserting tool through unobstructed slug. Tune both cores near the ends of their respective coils. See detail Fig. 6.
2.	To mixer grid thru .001 mf capacitor. Use opening adjacent to mixer, point "M". Set sweep to approximately 44 Mc.	Scope connection same as step #1		NOTE: Temporary removal of bias or increased generator input may be required to see traps.
	a. Set marker to 47.25 Mc		a. Both 47.25 Mc traps (L-101 & L-105)	a. Minimum response (tune cores at end of coils away from chassis).
	b. Set marker to 41.25 Mc		b. 41.25 Mc trap (L-102A)	b. Minimum response (tune core at end of coil toward chassis).
	c. Set marker to 39.75 Mc		c. 39.75 Mc trap (L-103)	c. Minimum response (tune core at end of coil away from chassis).
3.	Generator connection same as step #2, except set output for 3V P-P on scope	Scope to "1st IF screen test recept" or "test point".	Mixer trans, located on tuner (T-2) 1st IF grid coil (L-102B)	See curve #2 for above responses. Tune both mixer trans (T-2) and grid coil (L-102B) for curve shown in curve #3. T-2 affects the center peak and L-102B affects the two outside peaks. If a suck-out (trap effect) occurs, detune 1st IF transformer (T-101) to remove. Tune both coil cores at end of coil away from chassis.
4.	Generator connection same as step #2. Reset for 2-5V P-P on scope	Scope thru a 47K ohm resistor to video det test recept	1st IF trans (T-101) 2nd IF trans (T-102)	Proper 42.25 Mc marker placement (tune core at end of coil toward chassis) Proper 45.75 Mc marker placement (tune core at end of coil toward chassis. See curve #4)
5.	Same as step 4.	Same as step #4.		If a tilt occurs, readjust the mixer trans coil (T-2, on tuner) and if necessary, touch up the 1st & 2nd IF trans (T-101 & T-102) for the response shown in curve #4.

MOTOROLA Chassis TS-430, LTS-430, QTS-430, Alignment Information, Continued

4.5 MC TRAP ADJUSTMENT

1. Carefully tune receiver to local station and advance contrast control.

2. Adjust local oscillator (with fine tuning control to bring the 4.5 Mc interference strongly into the picture.

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

SOUND ALIGNMENT
(Station Signal Method)

The sound system used in the TS-430 receiver consists of an audio IF amplifier stage, a quadrature grid detector and an output stage. Since this type of sound system is extremely sensitive, relatively small input signal voltage will cause grid current to flow in both the IF amplifier and the detector stages. Grid current through the tuned coils will load them down making the adjustment extremely broad and alignment impossible. For this reason, it is necessary to use a very weak signal when aligning the driver and the detector input coils. Actually, the signal should be well down into the noise level for proper tuning action.

Preliminary Steps

1. Tune in a strong TV station.

2. Adjust all controls for normal picture and sound.

3. Refer to Video IF & Mixer Alignment Detail for coil and test point locations (Figure 7).

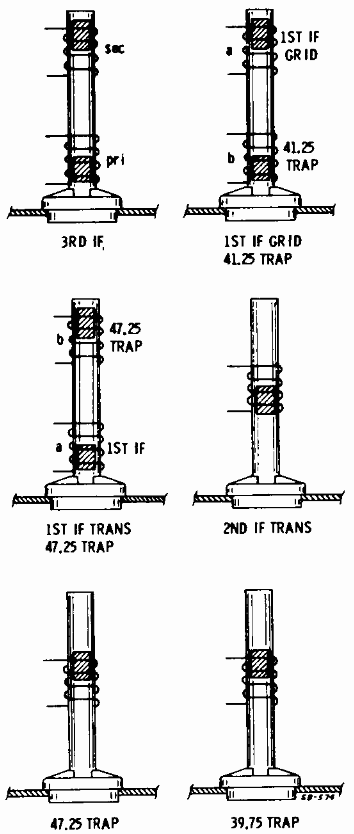


FIGURE 6. COIL CORE POSITIONS

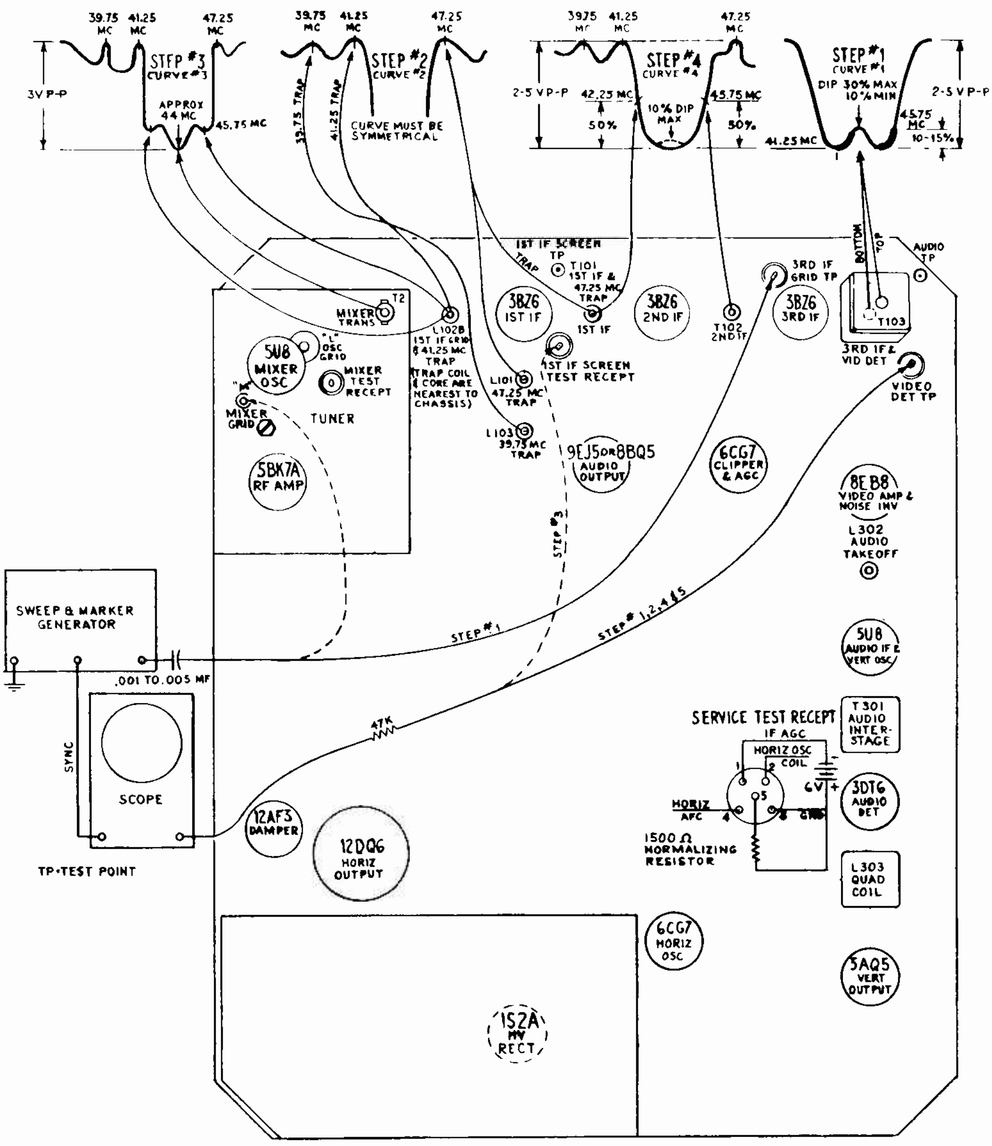


FIGURE 7. VIDEO IF & MIXER ALIGNMENT PROCEDURE

MOTOROLA Chassis TS-430, LTS-430, QTS-430, Alignment Information, Continued

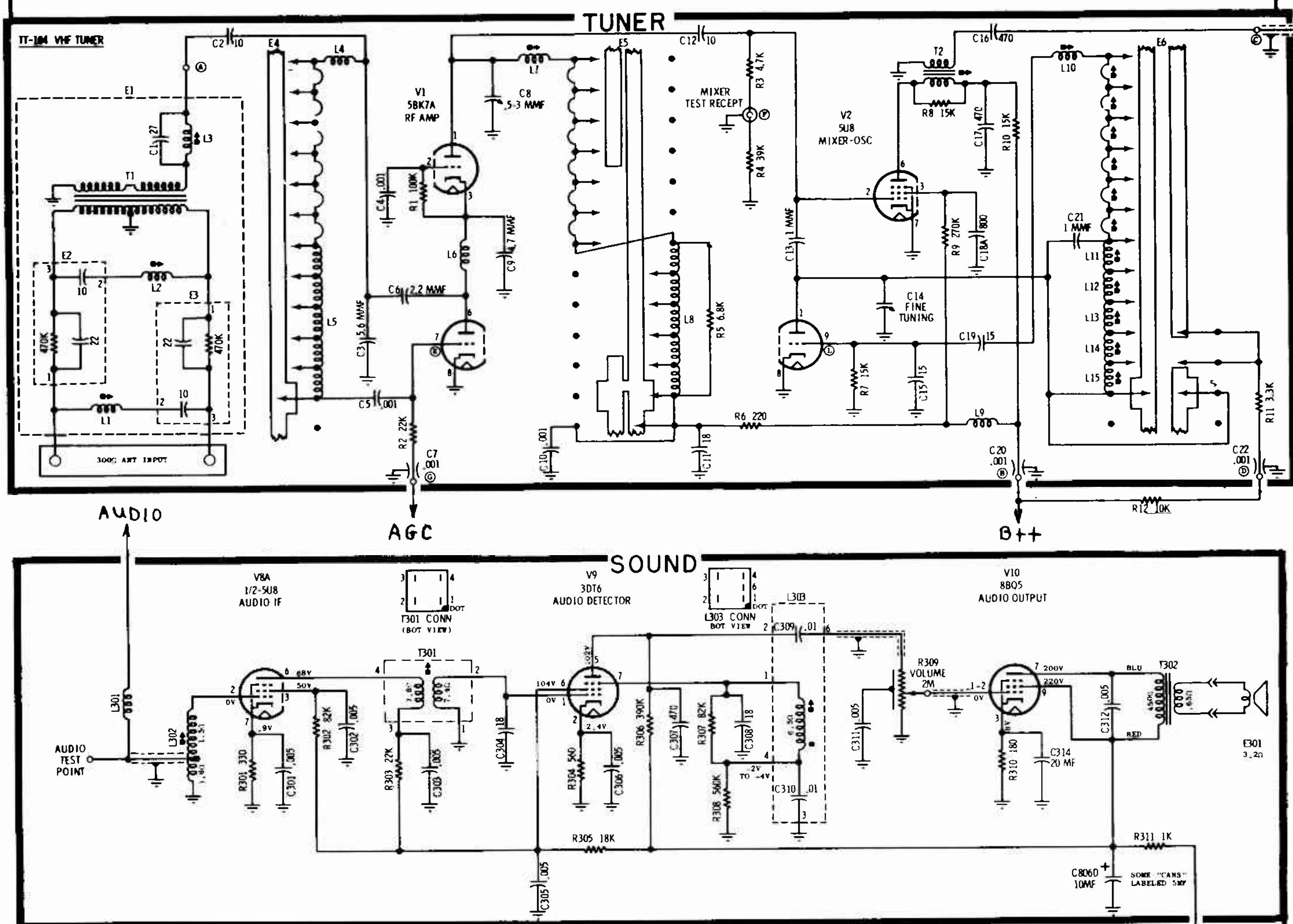
SOUND ALIGNMENT PROCEDURE

STEP	STATION	INDICATOR	ADJUST	REMARKS
1.	Strong signal	VTVM to lug #4 of quad coil (L-303) (see base detail on schematic). This point is jct of R-307 (82K) & R-308 (560K)	L-303 quad coil	Maximum deflection (coarse adj). Of two possible maximum tuning points, use that giving the largest voltage reading (DC). NOTE: Core located away from chassis should remain fixed**
2.	"	Listening test	"	Maximum sound with minimum distortion (fine adj)
3.	Weak signal*	"	T-301 interstage	Maximum sound with minimum distortion (maintain hiss level)
4.	"	"	L-301 take-off	Maximum sound with minimum distortion

If sound is not clear at this point, repeat above procedure as necessary.

*NOTE: The signal must be weakened considerably either by disconnecting one side of the antenna lead, or connecting low value resistors across the antenna terminals until a pronounced hiss appears in the sound. This hiss level must be maintained for proper alignment.

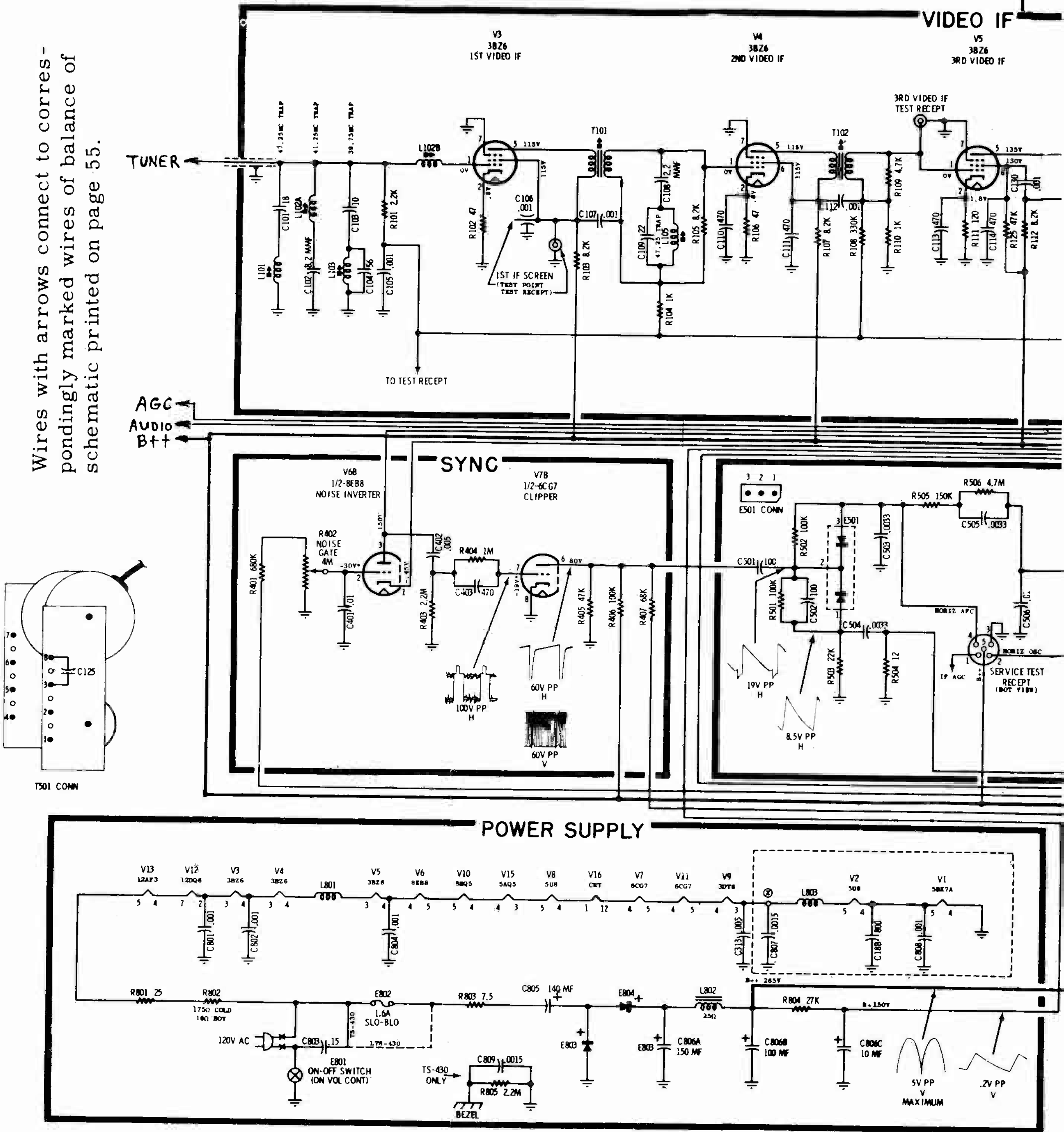
**Second core is merely to increase inductance: if misadjusted by previous service work, merely set near end of coil and proceed as stated.



Wires with arrows connect to correspondingly marked wires of main schematic printed on pages 56-57, over. B++

MOTOROLA Chassis TS-430, LTS-430, QTS-430, Schematic Diagram

Wires with arrows connect to correspondingly marked wires of balance of schematic printed on page 55.

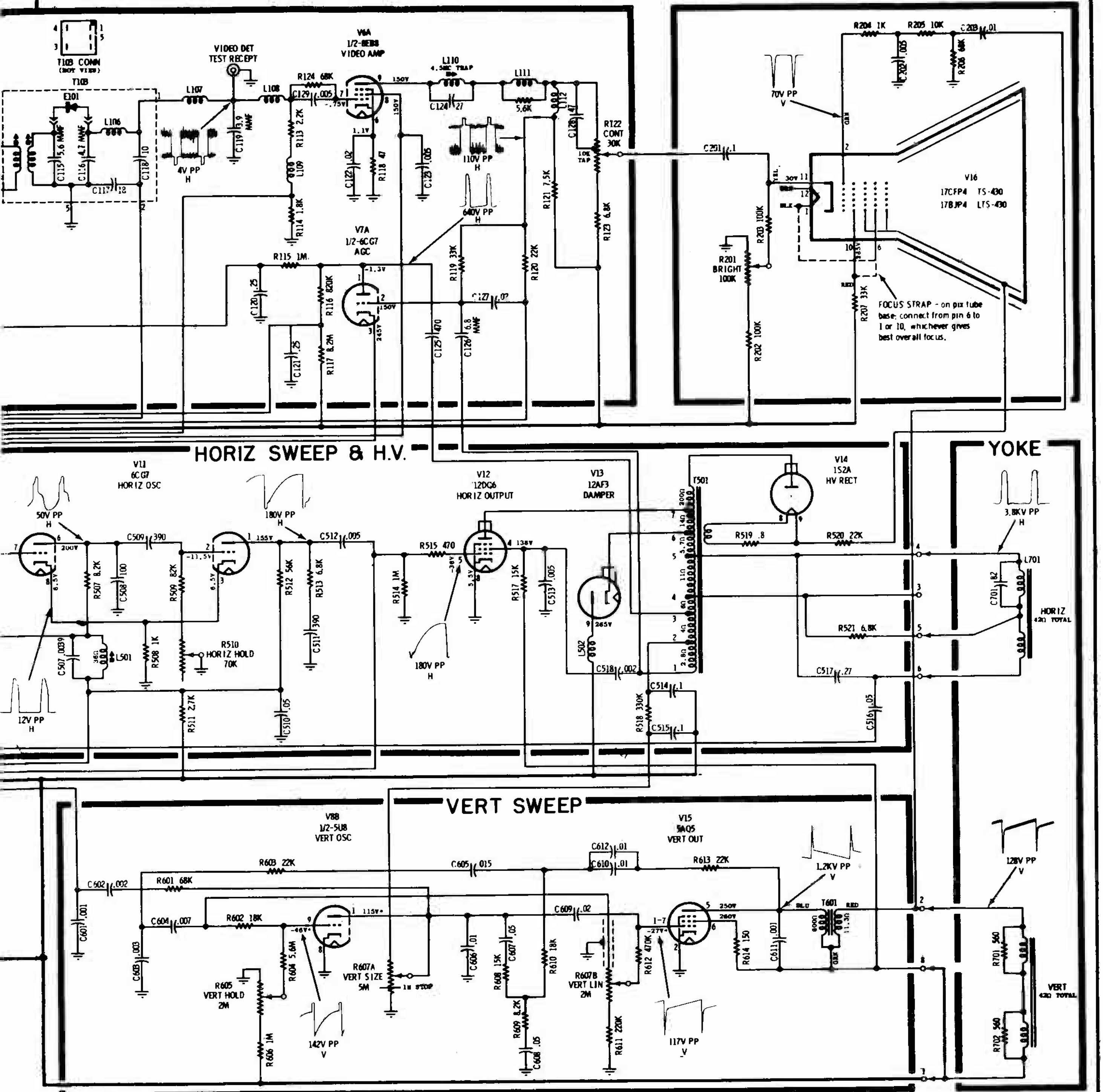


SUPPLEMENTARY PRODUCTION CHANGES

Chassis Coding	Changes
A-07	TO REDUCE VERTICAL SIZE FLUCTUATION WITH CHANGES IN TEMPERATURE: C-610 (.02 mf) changed to .01 mf; C-612 (.01 mf) added in parallel with C-610.
No coding change	DESIGN CHANGE: R-121 (7500) wattage rating changed from 4 watts to 3 watts.

Chassis Coding	Changes
A-08	TO INCREASE AUDIO OUTPUT: C-314 (20 mf) added between pin #3 of V-10 (8BQ5 or 9EJ5 - Audio Output) and ground.
A-09	CRYSTAL PROTECTION CIRCUIT ADDED: C-129 (.005 mf) and R-124 (68K) placed in parallel and added between pin #7 of V-6A (8EB8 - Video Amp) and junction of L-108 & R-113

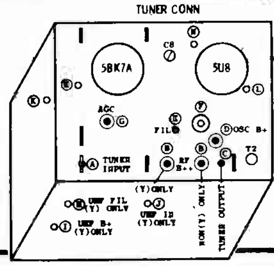
MOTOROLA Chassis TS-430, LTS-430, QTS-430, (B-00 version) Schematic Diagram



(2.2K). NOTE: E-102 (.0047 mf & 68K), a 51K744975 Res-Cap is used in place of C-129 and R-124 on some chassis.

A-10 THIRD IF LIMITING CHANGE: R-112 (8.2K) relocated; R-125 (47K) added; C-130 (.001 mf) added. See TS-430B-00 schematic diagram for electrical application.

TUNER CONN



NOTES:

VOLTAGE MEASUREMENTS
1. Taken from point indicated to chassis with a VTVM, ±10%.
2. Line voltage maintained at 120V AC.
3. Voltages indicated by an asterisk will vary with associated control settings.
4. Taken with contrast control at minimum and all other controls in normal operating position with no signal input.
5. Tuner on channel 13 or channel of least noise with antenna terminals shorted.

WAVEFORM MEASUREMENTS
1. Taken from point indicated to chassis with a wide-band oscilloscope.
2. Oscilloscope synced near sweep rate indicated.
3. Taken with strong signal; contrast control at maximum; all other controls in normal operating position.

MOTOROLA Chassis TS-430, LTS-430, QTS-430, Service Information, Continued

TO REPLACE PICTURE TUBE
TS-430 Only (Models 17T32 & 17P5)

1. Remove chassis from cabinet (see chassis removal instructions).

2. Remove the safety glass (see "To remove the safety glass for cleaning").

3. Loosen picture tube mounting bolts at upper right and left-hand corners of cabinet.

4. Carefully remove picture tube out front of cabinet and place on dirt-free surface.

5. Remove the centering device and deflection yoke. The deflection yoke is held in place by the yoke retainer clamp ....remove the clamp by means of the screw.

6. Working with the new replacement picture tube, place cloth tape at same points and of approximately the same size as those on the original picture tube, then place two pieces of gummed paper on picture tube to prevent yoke from slipping about. The gummed paper, preferably gummed on both sides, is placed on opposite sides of the tube neck...at the flare.

7. Clean picture tube and safety glass (see note on cleaning plastic surfaces in the "To remove the safety glass for cleaning" section).

8. Replace deflection yoke and centering device.

9. Replace picture tube into correct position in front of cabinet: tighten mounting bolts at upper right and left hand sides.

10. Insert chassis into cabinet and position so that the voltage anode lead may be connected to the picture tube.

11. Re-connect the speaker leads and plug in the picture tube socket.

12. Secure the chassis into position, apply power with service line cord and check receiver operation. Adjust the yoke position and centering device (see applicable sections in INSTALLATION ADJUSTMENTS).

13. After receiver has been adjusted for proper operation, replace the front and rear covers.

TO REPLACE PICTURE TUBE
LTS-430 (Model 17T33)

1. Remove chassis from cabinet (see chassis removal instructions for the LTS-430 chassis).

2. Remove two bolts from underneath cabinet holding picture tube bottom bracket.

3. Remove the two nuts at upper left and right-hand corners of cabinet securing top picture tube brackets.

4. Remove complete picture tube and mounting assembly from cabinet.

5. Remove the centering device and deflection yoke. The deflection yoke is held in place by means of a wedge clamp: To remove, compress both ends of the wedge clamp spring.

6. Working with the new replacement picture tube, place cloth tape at same points and of approximately the same size as those on the original picture tube, then place two pieces of gummed paper on picture tube to prevent yoke from slipping about. The gummed paper, preferably gummed on both sides, is placed on opposite sides of the tube neck.. at the flare.

7. Replace mounting assembly, deflection yoke and center-

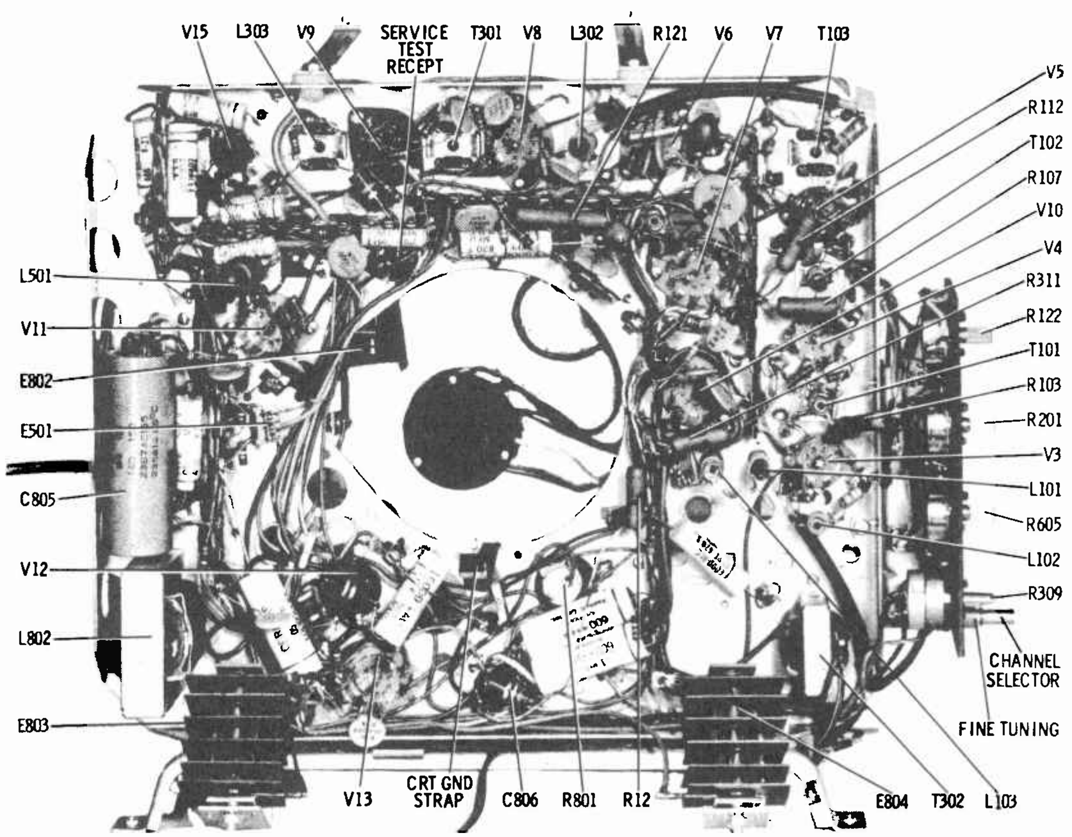


FIGURE 10. CHASSIS TS & LTS-430A-00 PARTS LOCATIONS

MOTOROLA

CHASSIS TS-434, MODEL 14P14-1

(Service material on pages 59 through 66)

The 14P14 receivers are provided with conventional antenna terminals for connection of an outside or portable-indoor antenna of any type. These models are equipped for use with a custom-designed single-mast type antenna called the Magic Mast. The Magic Mast antenna requires a "counterpoise" which is provided by the cabinet; required connection from the antenna to the cabinet is provided by a female receptacle pre-wired into the receiver's back cover. The Magic Mast antenna is provided with a male plug and when the antenna is plugged into the back cover, the cabinet counterpoise is automatically connected. The conventional twin-lead from the Monopole antenna must still be connected to the conventional antenna terminals. Should the back cover be removed, make certain the ground counterpoise wire is secured to a cabinet screw when cover is replaced.

AGC CONTROL (Local-Distance) ADJUSTMENT

This control sets the receiver for the signal strength in the area in which it is to operate by adjusting the average value of the AGC voltage developed. Rotating the local-distance control counterclockwise increases the AGC voltage to the receiver and will reduce the picture contrast. Rotating the local-distance control clockwise decreases the AGC voltage to the receiver and increases the picture signal. Too great a reduction of the AGC voltage (by clockwise rotation) can create a condition of overdrive in the video amplifier with attendant sync compression and sync instability.

VERTICAL SIZE AND LINEARITY ADJUSTMENT

Vertical Size and Lin are concentric controls located at the rear of the chassis. The inner control is Vert Size (HT) while the outer control is Vert Lin. To adjust, proceed as follows:

1. Center the picture and adjust vertical size until lower portion of picture is normal.

2. Adjust vertical linearity to normalize upper portion.

3. Readjust controls, if necessary, to obtain best balance with minimum stretch or compression of picture.
NOTE: Re-setting of the Vertical Hold control may be necessary during the adjustments.

PICTURE CENTERING

Picture centering is accomplished magnetically by means of the centering device located on the picture tube neck. Use the following procedure:

1. Starting with the magnetic centering device arms together (for minimum field strength) and positioned in the horizontal plane.

2. Separate the arms of the centering device to center the picture vertically.

3. Adjust horizontal centering by rotating the magnetic centering device, as a unit, one way or the other. Readjust vertical centering by slightly rotating the relative position of the arms.

DEFLECTION YOKE ADJUSTMENT

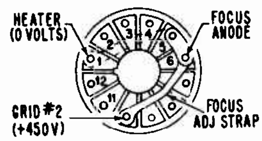
If the deflection yoke is not correctly positioned, the picture will be tilted. If the deflection yoke is not tight against the flare of the picture tube, the picture may be defocused, have non-linear distortions or neck shadow.

To adjust the yoke, compress the ends of the yoke wedge clamp and move clamp and rubber retainer away from deflection yoke. Position yoke as far forward as possible and rotate until picture is straight. When satisfactory, replace retainer and clamp so yoke cannot be moved in any direction.

FOCUS

Adjust the centering device as required, then position the shunting strap (located under the picture tube socket) for optimum focus.

FOCUS ADJUSTMENT



ADJUSTMENT OF SHUNTING STRAP LOCATED ON PICTURE TUBE BASE PROVIDES OPTIMUM FOCUSING. TEMPORARILY CONNECT STRAP BETWEEN PINS 6 AND 10, THEN 6 AND 1. LOCATE STRAP PERMANENTLY IN POSITION PRODUCING BEST OVERALL FOCUS.

FOCUS STRAP ILLUSTRATION

In some cases, focus may be improved by rotating the magnetic centering device 180 degrees and repeating the entire procedure. Never position the focus strap in any manner other than that specified: other connections can cause damage to the receiver.

HORIZONTAL OSCILLATOR ADJUSTMENT

The HORIZONTAL HOLD should have a sync range of approximately 30 degrees. If the control is too critical, adjust as follows:

1. Set all controls for a normal picture.

2. Using a piece of wire, short SERVICE TEST RECEPTACLE pin #4, labeled "HORIZ AFC" to ground.

3. Connect a .1 mfd 400 volt capacitor in parallel with the HORIZONTAL OSCILLATOR COIL (L-501). Use pins #2 and #3 of the SERVICE TEST RECEPTACLE.

4. Adjust the HORIZONTAL HOLD control to the point where the picture almost remains stationary... as far as horizontal sync is concerned. Picture must be in vertical sync during this adjustment.

5. Remove the .1 mfd capacitor shunting the HORIZ OSC. COIL and without turning the HORIZONTAL HOLD control, adjust the HORIZ OSC. COIL slug to the center of the range in which the picture almost remains in sync horizontally. The coil adjustment slug is located just to the left of the high voltage cage (receiver viewed from rear).

6. Remove the wire shorting the HORIZ AFC to ground and adjust the HORIZONTAL HOLD control so that no fold-over appears on either side of the raster.

SAFETY SHIELD REMOVAL

1. Position cabinet so the screws underneath the cabinet front (bezel) may be removed.

NOTE: Special "holt head" screws were used on some cabinets. A special tool, Motorola Part No. 66T742501, will be required to remove these screws in order to remove the safety shield.

2. Pull lower portion of cabinet front outward, away from cabinet.

3. Lift cabinet front upward until it is released from the upper edge of the cabinet.

CHASSIS REMOVAL

1. Remove all knobs from the side of the cabinet.

2. Unplug the tuner lead-in wires from the antenna terminals.

3. Remove the screws from the back cover and remove the back cover by lifting up and out of the bottom retaining channel, then straight back from the cabinet.

MOTOROLA Chassis TS-434, Model 14P14-1, Service Information, Continued

4. Remove the two chassis retaining screws located underneath the cabinet.

5. Remove the bolt securing the top of the chassis to the cabinet handle bracket. The bolt is located between the Service Test Receptacle and the Local Distance (AGC) control.

6. Tilt chassis so that left-hand side of chassis moves as close to the left-hand side of the cabinet as possible: tilt the top of the chassis outward from the cabinet. Now, disconnect the speaker leads, the high voltage picture tube anode lead, the picture tube socket and the yoke socket.

7. The chassis can be removed from the cabinet by tilting the top out first.

CHASSIS INSTALLATION

1. Insert chassis with top tilted outward from cabinet and the left-hand side inward so the tuner shaft may be inserted through opening in side of cabinet. Before proceeding further, replace speaker leads and the picture tube high voltage anode lead.

2. Replace two screws underneath cabinet holding chassis bracket and chassis retaining bolt.

3. Replace yoke and picture tube sockets.

4. Insert back cover into bottom well of cabinet, position flexible shafts so they will extend out openings in back cover, then close cover making sure power interlock makes proper connection. Replace the screws in back cover making sure Monopole grounding lug is placed underneath the left-hand top (as viewed from rear) screw.

5. Insert tuner leads into proper antenna terminals.

6. Check operation of receiver as well as making a check to make certain the cabinet is not in any way making contact with wiring, creating a shock hazard.

PICTURE TUBE REMOVAL

1. Remove chassis from cabinet (see "Chassis Removal" instructions).

2. Remove the safety shield (see "Safety Shield Removal" instructions).

3. Loosen picture tube mounting bolts at upper right and left-hand corners of cabinet.

4. Carefully remove picture tube out front of cabinet and place on dirt-free surface.

5. Remove the centering device and deflection yoke. The deflection yoke is held in place by the yoke retainer clamp ...see "Deflection Yoke Removal" instructions.

6. Working with the new replacement picture tube, place cloth tape at same points and of approximately the same size as those on the original picture tube, then place two pieces of gummed paper on picture tube to prevent yoke from slipping about. The gummed paper, gummed preferably on both sides, is placed on opposite sides of the tube neck, at the flare.

7. Clean picture tube and safety glass.

8. Replace deflection yoke and centering device.

9. Replace picture tube into correct position in front of cabinet: tighten mounting bolts at upper right and left-hand sides.

10. Insert chassis into cabinet and position so that the voltage anode lead may be connected to the picture tube.

11. Re-connect the speaker leads, plug in the picture tube socket and deflection yoke plug.

12. Secure the chassis into position, apply power with service line cord and check receiver operation. Adjust the yoke position and centering device.

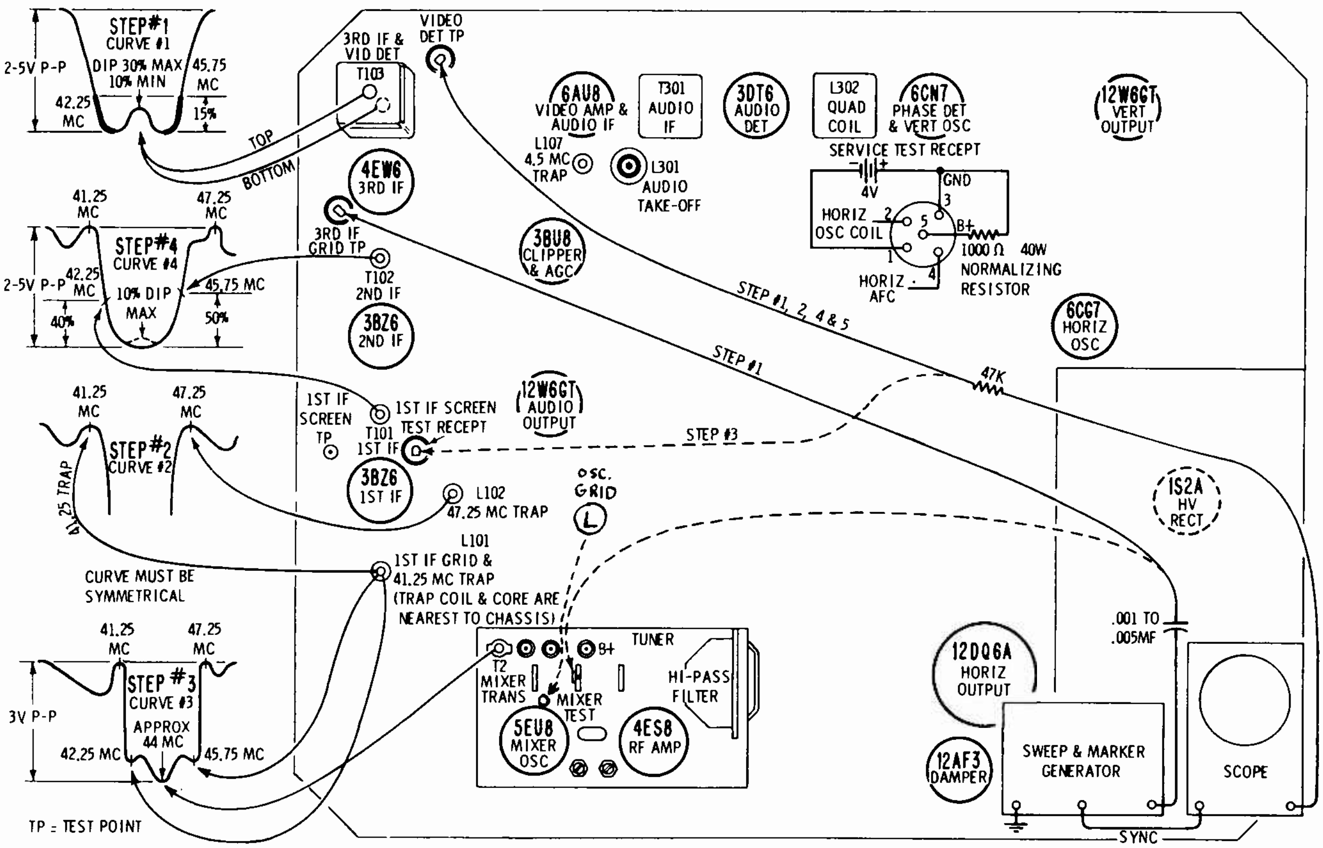


FIGURE 5. VIDEO & SOUND IF ALIGNMENT DETAIL

MOTOROLA Chassis TS-434, Model 14P14-1, Alignment Information, Continued

HIGH VOLTAGE AND PICTURE TUBE HANDLING PRECAUTIONS

OPERATION OF THIS RECEIVER WITH THE CHASSIS ACCESSIBLE INVOLVES A SHOCK HAZARD AND NO WORK SHOULD BE DONE BY ANYONE NOT FAMILIAR WITH THESE HAZARDS.

EXTREME CARE MUST BE USED IN HANDLING THE PICTURE TUBE, AS ROUGH HANDLING MAY CAUSE IT TO IMPLODE DUE TO ATMOSPHERIC PRESSURE. DO NOT NICK OR SCRATCH GLASS, OR SUBJECT IT TO ANY UNDUE PRESSURE IN INSTALLATION. WHEN HANDLING, USE GOGGLES AND HEAVY GLOVES FOR PROTECTION. DISCHARGE PICTURE TUBE BY SHORTING THE ANODE CONNECTION TO CHASSIS GROUND (NOT CABINET OR OTHER MOUNTING PARTS). WHEN DISCHARGING...BE SURE TO USE A WELL INSULATED PIECE OF WIRE.

VIDEO & SOUND ALIGNMENT

PRE-ALIGNMENT INSTRUCTIONS

Before alignment of the video IF section is attempted, it is advisable to thoroughly check the system. If alignment is started on an IF section in which a faulty component exists, successful alignment will probably be impossible and the entire procedure will have to be repeated when the real cause of the trouble is corrected. Preliminary tests of the system should include voltage and resistance measurements, routine checks for bad soldering connections, and visual inspection of the circuits for overheated components as well as for obvious wiring defects.

VIDEO IF & MIXER ALIGNMENT

Pre-Alignment Steps

1. Maintain line voltage at 120 with variac.

2. Remove the deflection yoke plug to eliminate RF interference radiation.

3. Disable oscillator by shorting point "L" located near oscillator tube V-2, to chassis See Figure 5.

4. Apply the negative lead of a 4 volt bias supply to pin #1 (IF AGC) of the SERVICE TEST RECEPTACLE and the positive lead to pin #3 (chassis ground).

5. All coil slug tuning positions, in relation to chassis, are given in the procedure chart and in the separate detail of Figure 6.

6. Set channel selector on channel #13 and connect a 1000 ohm 40W voltage normalizing resistor from B+ to chassis (use pins #5 (B+) and #3 (ground) of the SERVICE TEST RECEPTACLE.

7. Set the contrast control at minimum (extreme counterclockwise position).

8. Short across tuner input terminal.

9. Maintain 2 to 5 volts peak-to-peak at the diode load (Det TP) except when specific values are given in the procedure chart.

10. Refer to Video & Sound IF Alignment Detail for component and test point locations (Figure 5).

VIDEO IF & MIXER ALIGNMENT PROCEDURE

STEP	SWEEP GEN AND MARKER	INDICATOR	ADJUST	ADJUST FOR AND/OR REMARKS
1.	To 3rd IF grid test recept thru a .001 mf capacitor. Set sweep approx. to 44 Mc: markers as required.	Scope thru a 47K ohm resistor to Video Det test recept	Both slugs of 3rd IF coil (T-103)	Equal peaks and 45.75 Mc marker as shown on curve #1. Note: Slug at crystal end can be reached by inserting tool through unobstructed slug. Tune both slugs near the ends of their respective coils. See detail for slug position
2.	To mixer T.P. thru .001 mf capacitor. (Use opening adjacent to mixer. See Figure 5). Set sweep to approx. 44 Mc	Scope connection same as step #1		Note: Temporary removal of bias or increased generator input may be required to see traps.
	a. Set marker to 47.25 Mc		a. 47.25 Mc trap (L-102)	a. Minimum response (tune slug at end of coil away from chassis)
	b. Set marker to 41.25 Mc		b. 41.25 Mc trap (L-101B)	b. Minimum response (tune slug at end of coil toward chassis) See curve #2 for above responses.
3.	Generator connection same as step #2, except set output for 3V P-P on scope	Scope to "1st IF screen test recept or test point." Pin #6 of tube	a. Mixer trans, located on tuner (T-2)	Tune both T-2 & L-101A for curve shown in curve #3. The pri affects the center peak and the sec affects the two outside peaks.
			b. 1st IF grid coil (L-101A) slug located away from chassis	If a suck-out (trap effect) occurs, detune 1st IF transformer (T-101). Tune both coil slugs at end of coil away from chassis
4.	Generator connection same as step #2. Reset for 2-5V P-P on scope	Scope thru a 47K ohm resistor to Video Det test recept	1st IF trans (T-101)	Proper 42.25 Mc marker placement (tune slug at end of coil toward chassis)
			2nd IF trans (T-102)	Proper 45.75 Mc marker placement (tune slug at end of coil toward chassis). See curve #4.
5.	Same as step #4	Same as step #4		If a tilt occurs, readjust the mixer pri coil (T-2 on tuner) and if necessary touch-up the 1st and 2nd IF trans (T-101 & T-102) for response shown in curve #4.

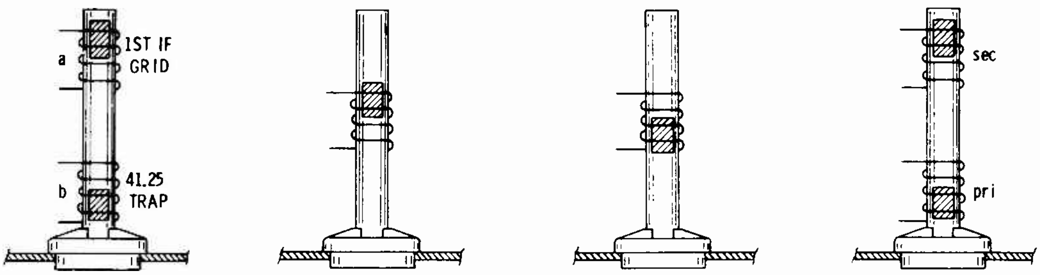
MOTOROLA Chassis TS-434, Model 14P14-1, Alignment Information, Continued

4.5 MC TRAP ADJUSTMENT

1. Carefully tune receiver to local station and advance contrast control.

2. Adjust local oscillator (with fine tuning control) to bring 4.5 Mc interference strongly into the picture.

3. ADJUST... sound trap (L-107) to find the two points of adjustment at which the sound beat is just noticeable on the picture tube screen. Rotate the core toward center of the two points. Use minimum amount of inductance (core out of coil) that will result in no apparent beat interference.



1ST IF GRID 41.25 TRAP — 47.25 TRAP — 1ST & 2ND IF TRANS — 3RD IF TRANS

FIGURE 6. COIL CORE POSITIONS

SOUND ALIGNMENT (Station Signal Method)

The sound system used in the TS-434 receiver consists of an audio IF amplifier stage, a quadrature grid detector and an output stage. Since this type of sound system is extremely sensitive, relatively small input signal voltage will cause grid current to flow in both the IF amplifier and the detector stages. Grid current through the tuned coils will load them down making the adjustment extremely broad and alignment impossible. For this reason, it is necessary to use a very weak signal when aligning the driver and the detector input coils. Actually, the signal should be well down into the noise level for proper tuning action.

Preliminary Steps

1. Tune in a strong TV station.

2. Adjust all controls for normal picture and sound.

3. Refer to Video IF & Mixer Alignment Detail for coil and test point locations (Figure 5).

SOUND ALIGNMENT PROCEDURE

STEP	STATION	INDICATOR	ADJUST	REMARKS
1.	Strong signal	VTVM to jct of R-306 (82K) and R-307 (560K) located on L-302 (under chassis).	L-302 (quad coil)	Maximum deflection (coarse adj.). Of two possible maximum tuning points, use that giving the largest voltage reading. **
2.	"	Listening test	"	Maximum sound with minimum distortion (fine adj.).
3.	Weak signal*	"	T-301 (interstage)	Maximum sound with minimum distortion (maintain hiss level). **
4.	"	"	L-301 (take-off)	Maximum sound with minimum distortion.

If sound is not clear at this point, repeat the above procedure as necessary.

*The signal must be weakened considerably either by disconnecting one side of the antenna lead, or connecting low value resistors across the antenna terminals until a pronounced hiss appears in the sound. The hiss level must be maintained for proper alignment.

**The purpose of the top pre-set core is to enable the adjustable core to make the tuning range required while reducing the physical length. If the pre-set core should be misadjusted by previous service work, merely re-set near top end of coil and tune for maximum.

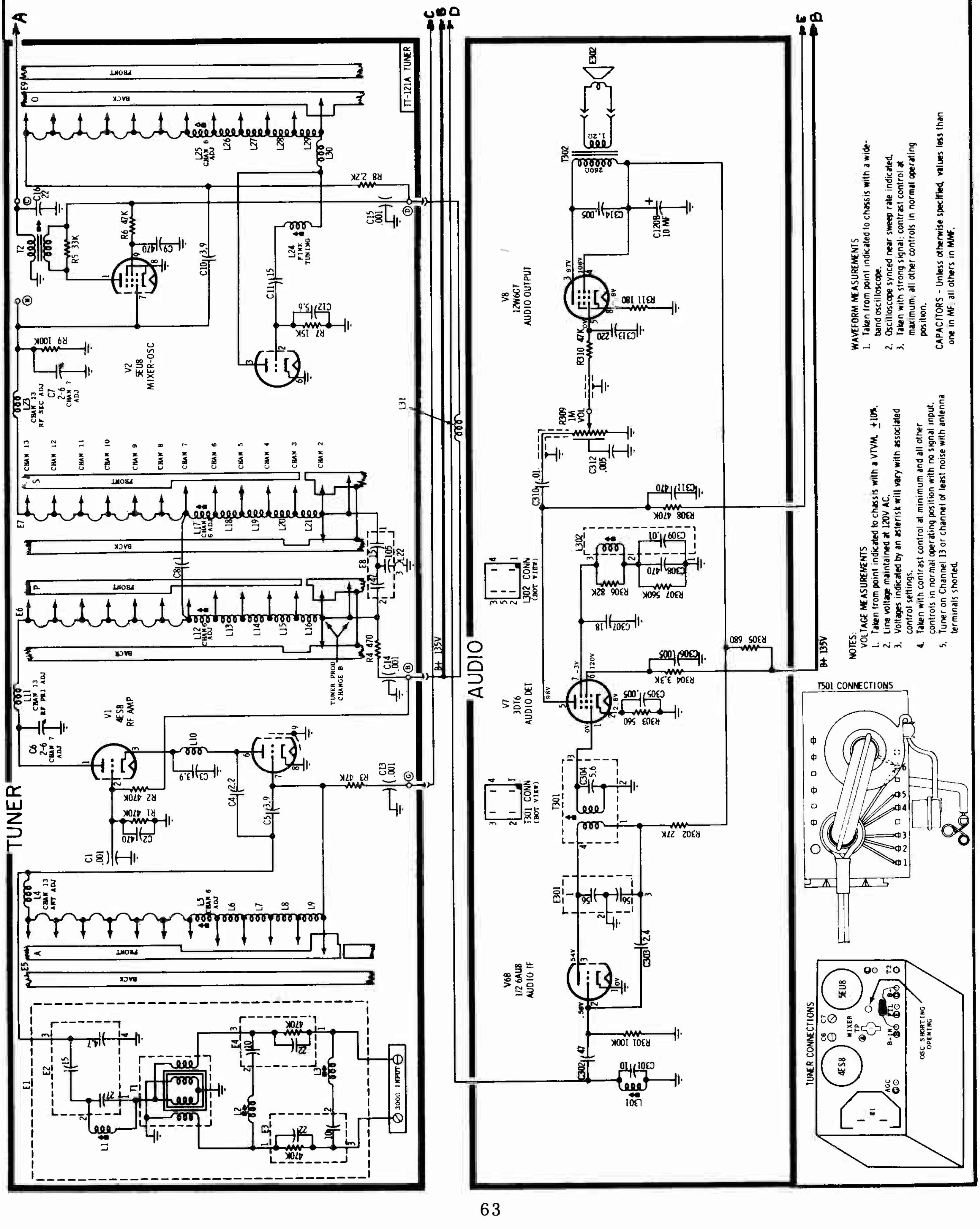
CHASSIS PRODUCTION CHANGES
TS-434A-00 thru A-02

Chassis Coding	Changes
A-01	TO IMPROVE VERTICAL SYNC STABILITY: R-502 (100K) moved from ground to pin #1 of V-10 (6CN7 -Horiz Phase Det). DESIGN CHANGE: C-125 (470 mmf) removed. The plate of V-9A (3BU8) is now connected to junction of C-513 (150) and C-514 (.001).
A-02	TO REDUCE NOISE LEVEL: R-121 (390K) changed to 470K.

TUNER PRODUCTION CHANGES
B thru C

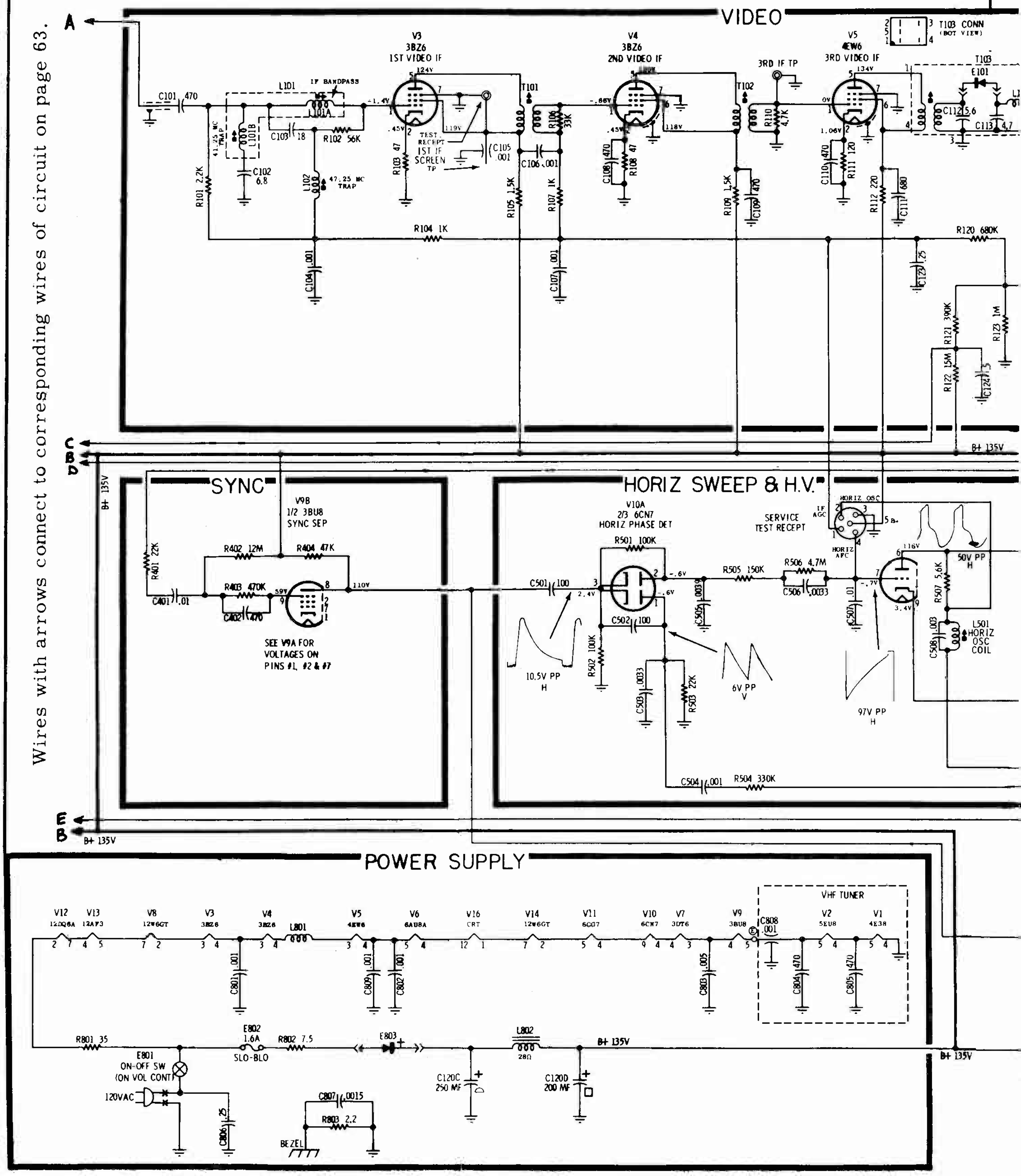
Tuner Coding	Changes
TT-121B	TO MAINTAIN B+ ON RF PRI TRIMMER: A buss lead is added to RF pri wafer. See Tuner Schematic.
TT-121C	TO MINIMIZE RESPONSE CURVE TILT ON CHANNEL 5: C-2 (470) changed to .0022 mf. This change reduces parasitic oscillation creating the tilt.

MOTOROLA Chassis TS-434, Part of Schematic, Continued on Page 64



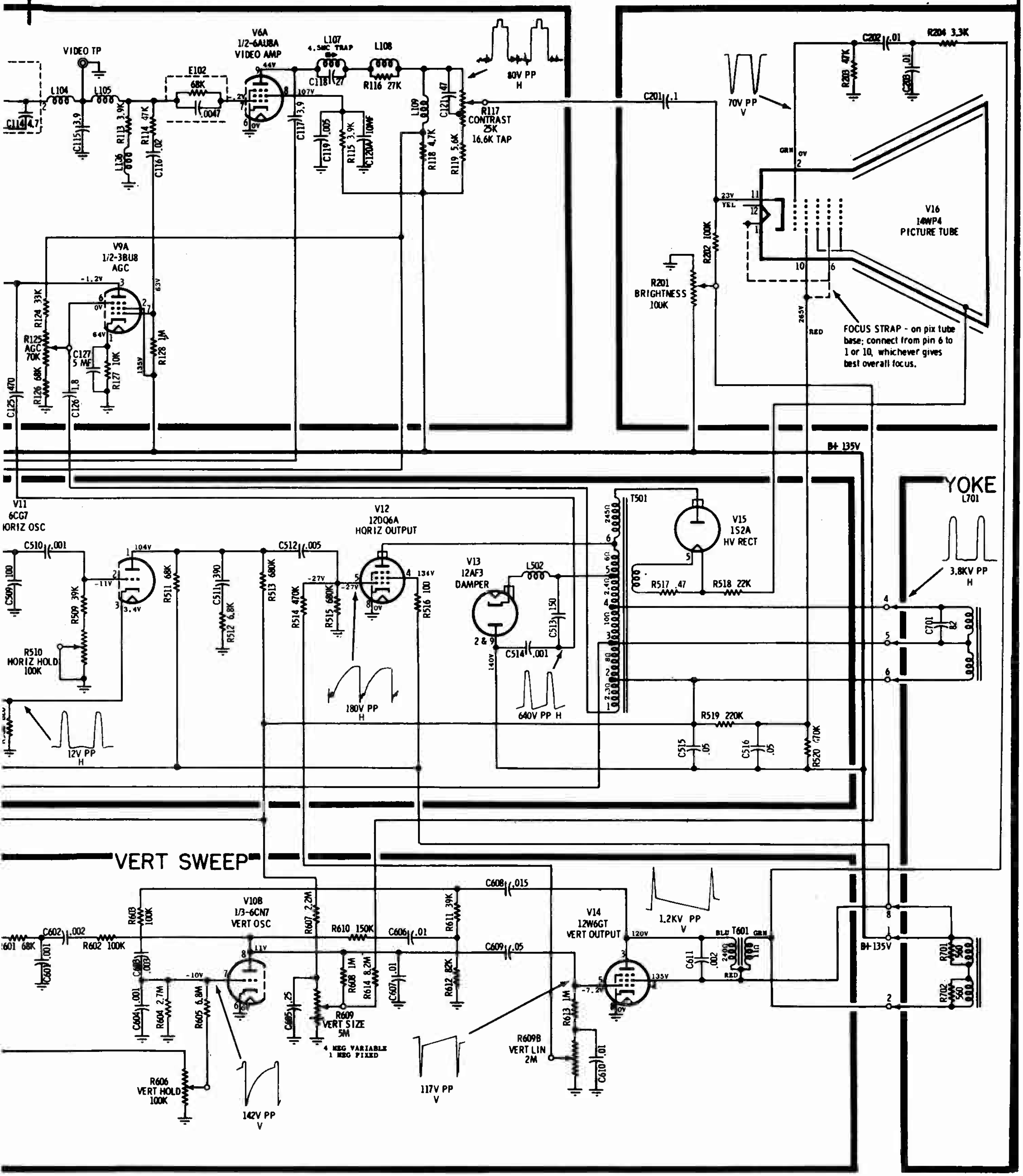
MOTOROLA Chassis TS-434, Model 14P14-1, Schematic Diagram, Continued

Wires with arrows connect to corresponding wires of circuit on page 63.



MOTOROLA Schematic Diagram

TELEVISION CHASSIS TS-434A-00



MOTOROLA Chassis TS-434, Model 14P14-1

Service Information (Continued)

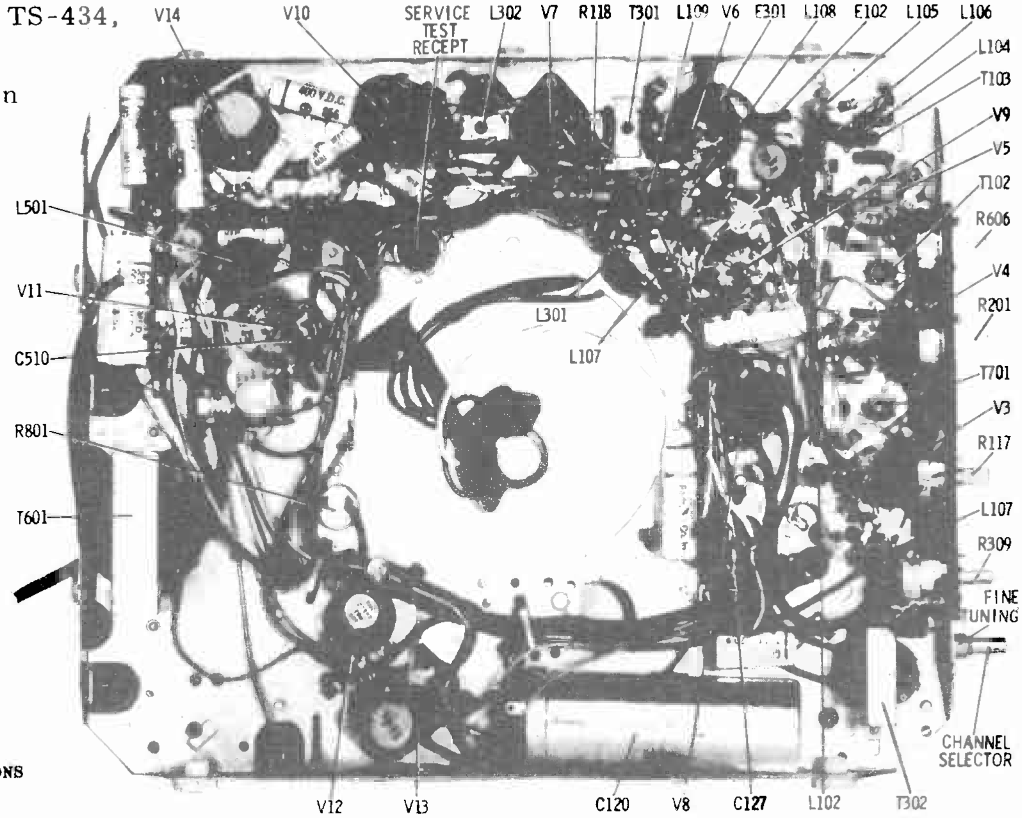
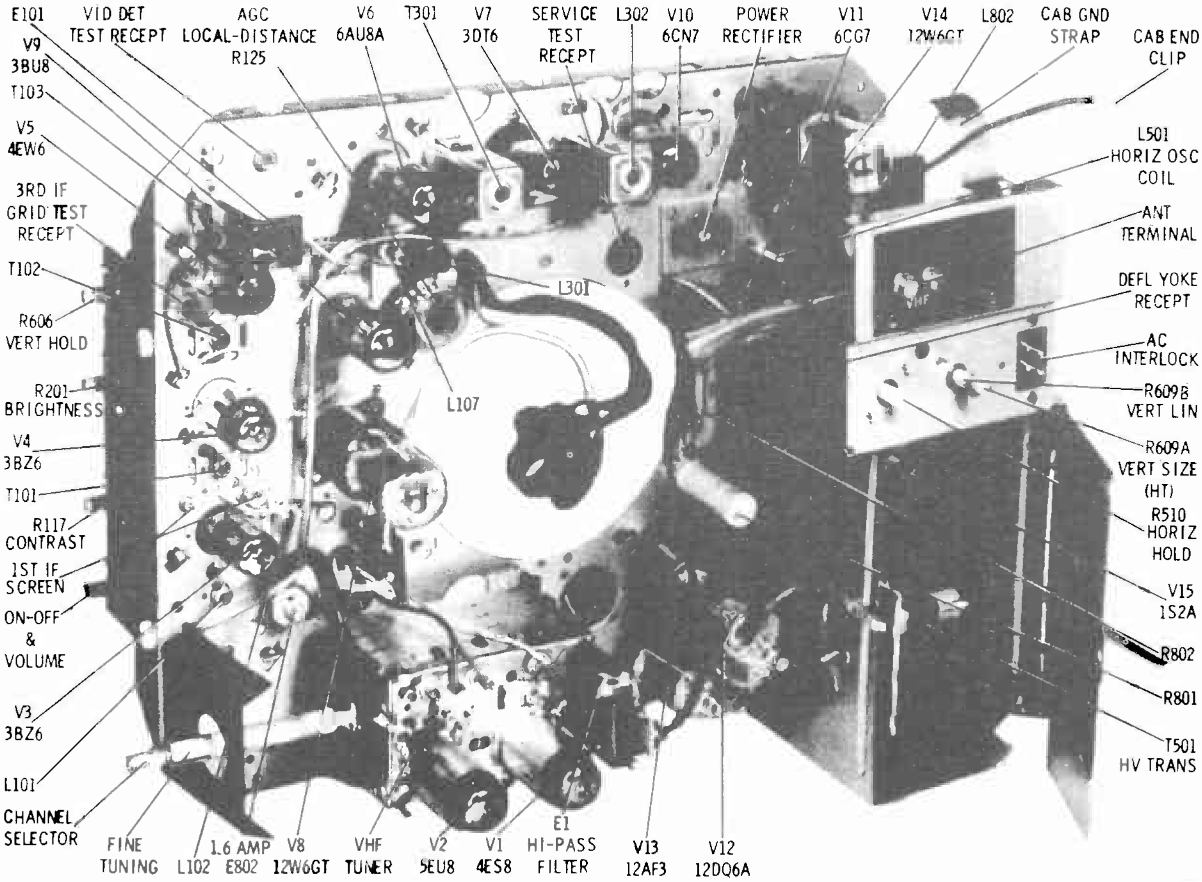


FIGURE 9. PARTS LOCATIONS



MOTOROLA

INSTALLATION & SERVICE ADJUSTMENTS

VERTICAL SIZE AND LINEARITY ADJUSTMENT

1. Center the picture and adjust vertical size until lower portion of picture is normal.

2. Adjust vertical linearity to normalize upper portion.

3. Readjust controls, if necessary, to obtain best balance with minimum stretch or compression of picture.

NOTE: Re-setting of the Vertical Hold control may be necessary during the adjustments.

DEFLECTION YOKE ADJUSTMENT

If the deflection yoke is not correctly positioned, the picture will be tilted. If the deflection yoke is not tight against the flare of the picture tube, the picture may be defocused, have non-linear distortions or neck shadow. To adjust the yoke, loosen the yoke retainer clamp screw until the yoke is movable. Push the yoke as far forward as possible, then rotate until the picture is straight. Recheck Horizontal Size device; if satisfactory, retighten yoke retainer clamp screw.

PICTURE CENTERING

Picture centering is accomplished magnetically by means of the centering device located on rear of yoke cover. Use the following procedure:

1. Starting with the magnetic centering device arms together (for minimum field strength) and positioned in the horizontal plane.

2. Separate the arms of the centering device to center the picture vertically. Keep arms as close together as possible commensurate with proper centering; excessive separation may result in de-focusing.

3. Adjust horizontal centering by rotating the magnetic centering device, as a unit, one way or the other. Readjust vertical centering by slightly rotating the relative position of the arms.

RASTER CORRECTOR MAGNETS(NOT ON ALL MODELS)

Raster corrector (pin cushion) magnets, found on each side of the deflection yoke, are used to straighten the sides of the raster. They are correctly set at the factory but, if moved in shipping, or if the yoke has been replaced, they may require readjustment. Adjust in the following manner:

1. Reduce raster size so that its sides are just visible.

2. Loosen screws holding magnet mountings.

3. Move corrector magnets forward, backward or tilt until raster distortion is eliminated.

4. Re-tighten screws holding magnet mountings.

FUSE REPLACEMENT

FUSE - B++: 1.6 amp "Slo-blo, LC" type (E-802) located on top of chassis just above vertical linearity control.

SURGE PROTECTION RESISTOR - Thermal type unit, R-801, located in filament string. Rating: 200 ohms cold, 6 ohms hot.

MODEL BREAKDOWN CHART

Model	Type	TV Chassis	VHF Tuner	UHF Tuner	Remote Control
A21K106B	Console	WTS-553	TT-107	-	TR-3
A21K106M	Console	WTS-553	TT-107	-	TR-3
A21T60BG	Table	WTS-553	TT-107	-	TR-3
A21T60CH	Table	WTS-553	TT-107	-	TR-3
A21T60MG	Table	WTS-553	TT-107	-	TR-3

CHASSIS DESCRIPTION

WTS-553 SERIES — These chassis are horizontally mounted types containing 16 tubes plus a 21CBP4A picture tube, dual selenium phase detector, and a germanium video detector. Features: cascode tuner, gated AGC, quadrature-grid sound detector and Tube Sentry System.

All receivers have projection-type channel-selector knobs (non-concentric).

All models using the WTS-553 chassis have a motorized, automatic tuning system in conjunction with a remote control unit.

RECEIVER MODEL BREAKDOWN CHART

Model	Type	TV Chassis	VHF Tuner	UHF Tuner
21K107B	Console	TS-553	TT-106	-
Y21K107B	Console	TS-553Y	TT-106Y	VTT-89
21K107M	Console	TS-553	TT-106	-
Y21K107M	Console	TS-553Y	TT-106Y	VTT-89

TS-553 - Electrically identical to the WTS-553 chassis with the exception of tuner type and the addition of tone compensating control. All these chassis have separate fine tuning and channel selector knobs. All receivers using the TS-553 chassis have manually operated tuners only.

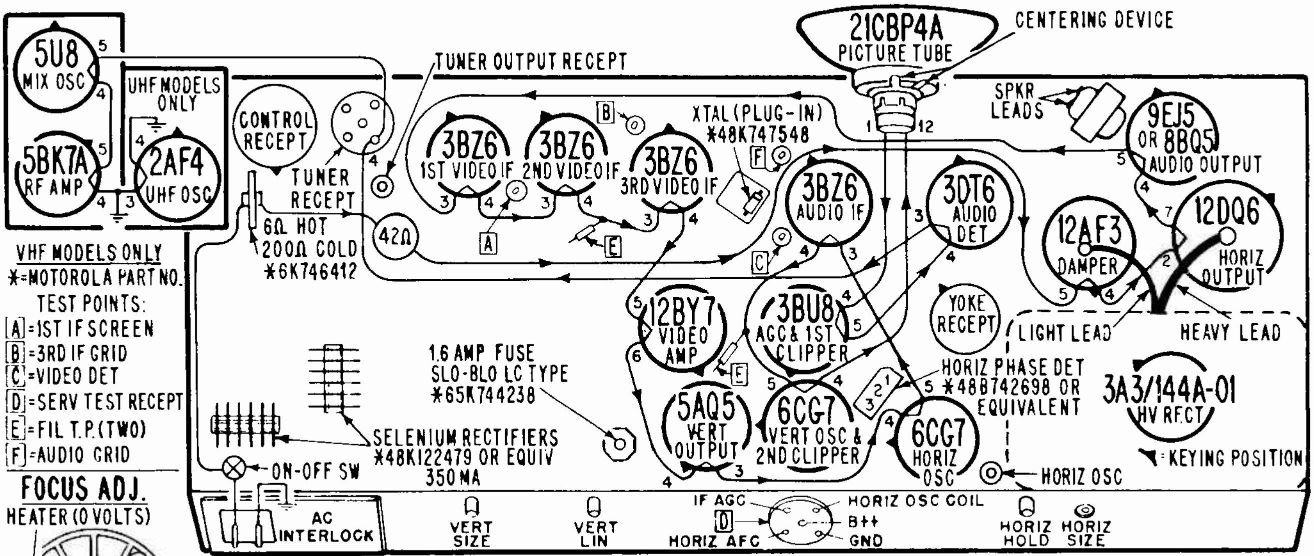
Chassis TS-552 and TS-552Y are practically identical to TS-553, except for power supply, audio section, and type of tuner employed.

MODEL BREAKDOWN CHART

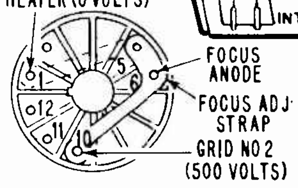
Model	Type	TV Chassis	VHF Tuner	UHF Tuner
21K104B	Console	TS-552	TT-108	-
Y21K104B	Console	TS-552Y	TT-108Y	TT-89
21K104M	Console	TS-552	TT-108	-
Y21K104M	Console	TS-552Y	TT-108Y	TT-89
21K104W	Console	TS-552	TT-108	-
Y21K104W	Console	TS-552Y	TT-108Y	TT-89
21K105B	Console	TS-552	TT-108	-
21K105MC	Console	TS-552	TT-108	-
21K105W	Console	TS-552	TT-108	-
21K108W	Console	TS-552	TT-108	-
21K109M	Console	TS-552	TT-108	-
21K110W	Console	TS-552	TT-108	-

(Material on these models continued on pages 68 through 78)

MOTOROLA Chassis TS-553, -Y, WTS-553, Service Information, Continued



FOCUS ADJ.



FOCUS

ADJUST THE CENTERING DEVICE AS REQUIRED, THEN POSITION THE SHUNTING STRAP (LOCATED UNDER THE PICTURE TUBE SOCKET) FOR OPTIMUM FOCUS. THE SHUNTING STRAP IS DESIGNED SO ONE CONNECTION ALWAYS REMAINS ON PIN #6 (FOCUS ANODE)...THE STRAP MAY THEN BE PHYSICALLY POSITIONED SO THE OTHER CONNECTION IS ON PIN #1 (CHASSIS GROUND) OR PIN #10 (BOOTSTRAP VOLTAGE). IN SOME CASES, FOCUS MAY BE IMPROVED BY ROTATING THE MAGNETIC CENTERING DEVICE 180 DEGREES AND REPEATING THE ENTIRE PROCEDURE.

FIGURE 1. TUBE LOCATION, FUSE GUIDE, FOCUS INFORMATION & FILAMENT WIRING

HORIZONTAL OSCILLATOR ADJUSTMENT

The HORIZONTAL HOLD should have a sync range of approximately 30 degrees. If the control is too critical, adjust as follows:

1. Set all controls for a normal picture.

2. Using a piece of wire, short SERVICE TEST RECEPTACLE S-4 pin #4 labeled "HORIZ AFC" to ground. See Figure 2.

3. Connect a .1 mfd 400 volt capacitor in parallel with the HORIZONTAL OSCILLATOR COIL (L-501). Use pins #2 and #3 of the SERVICE TEST RECEPTACLE.

4. Adjust the HORIZONTAL HOLD control to the point where the picture almost remains stationary...as far as horizontal sync is concerned. Picture must be in vertical sync during this adjustment.

5. Remove the .1 mfd capacitor shunting the HORIZ COIL and without turning the HORIZONTAL HOLD control, adjust the HORIZ COIL slug to the center of the range in which the picture almost remains in sync horizontally. The coil adjustment slug is located just to the left of the high voltage cage (receiver viewed from rear).

6. Remove the wire shorting the HORIZ AFC to ground and adjust the HORIZONTAL HOLD control so that no fold-over appears on either side of the raster.

LOCAL TUNER OSCILLATOR ADJUSTMENTS

The local oscillator slugs of the tuner are physically located at the shaft end of the tuner and positioned toward the front of the receiver allowing adjustment from the front of the cabinet without chassis removal. An insulated alignment tool of sufficient length is required to reach the oscillator slugs which are located approximately six inches behind the front panel.

Items To Be Removed (part of osc adj)

The oscillator adjustments may be reached on manually tuned models by removal of the channel selector knob and, in some cases, the circular metal insert hidden by the selector knob.

On automatic tuning models (INSTA-MATIC) it is necessary to remove the INSTA-MATIC pushbutton by clockwise rotation, then the two screws holding the switch in place. Move the switch plate to the most convenient position.

On models having channel projection lights, it may be necessary to temporarily change the projection light position to reach the slugs.

On UHF models, the plastic rocker arm may be repositioned by turning the fine tuning shaft past either end-stop and then returning it so the fine tuner is at mid-range as explained in the following instructions.

Preliminary Checks (part of osc adj)

After receiver has had a few minutes of warm-up time, check all available stations and observe sound and picture: if sound and picture are not properly received within the range of the fine tuning control on manually tuned receivers, it may be necessary to adjust the local oscillator. On automatic tuning receivers, the indexed stations should be received without the necessity of changing the fine tuning control due to automatic re-centering of the control each time the station is changed. If this does not occur, the oscillator slugs should be adjusted with the fine tuner at the center of the range so reception will be correct.

TO ADJUST TUNER OSCILLATOR SLUGS

1. Remove channel selector knob. See "items to be removed" for specific disassembly.

2. Tune to the highest numbered channel that is giving trouble.

3. Set the fine tuner to mid-position. This position is correct when channel number holes #2 and #13 are open as viewed through cabinet opening. On automatic tuning receivers this position will automatically be correct if the tuner is switched off channel and then returned to the desired channel.

NOTES:

To eliminate false tuning, use a non-metallic tool.

MOTOROLA Chassis TS-553, -Y, WTS-553, Service Information, Continued

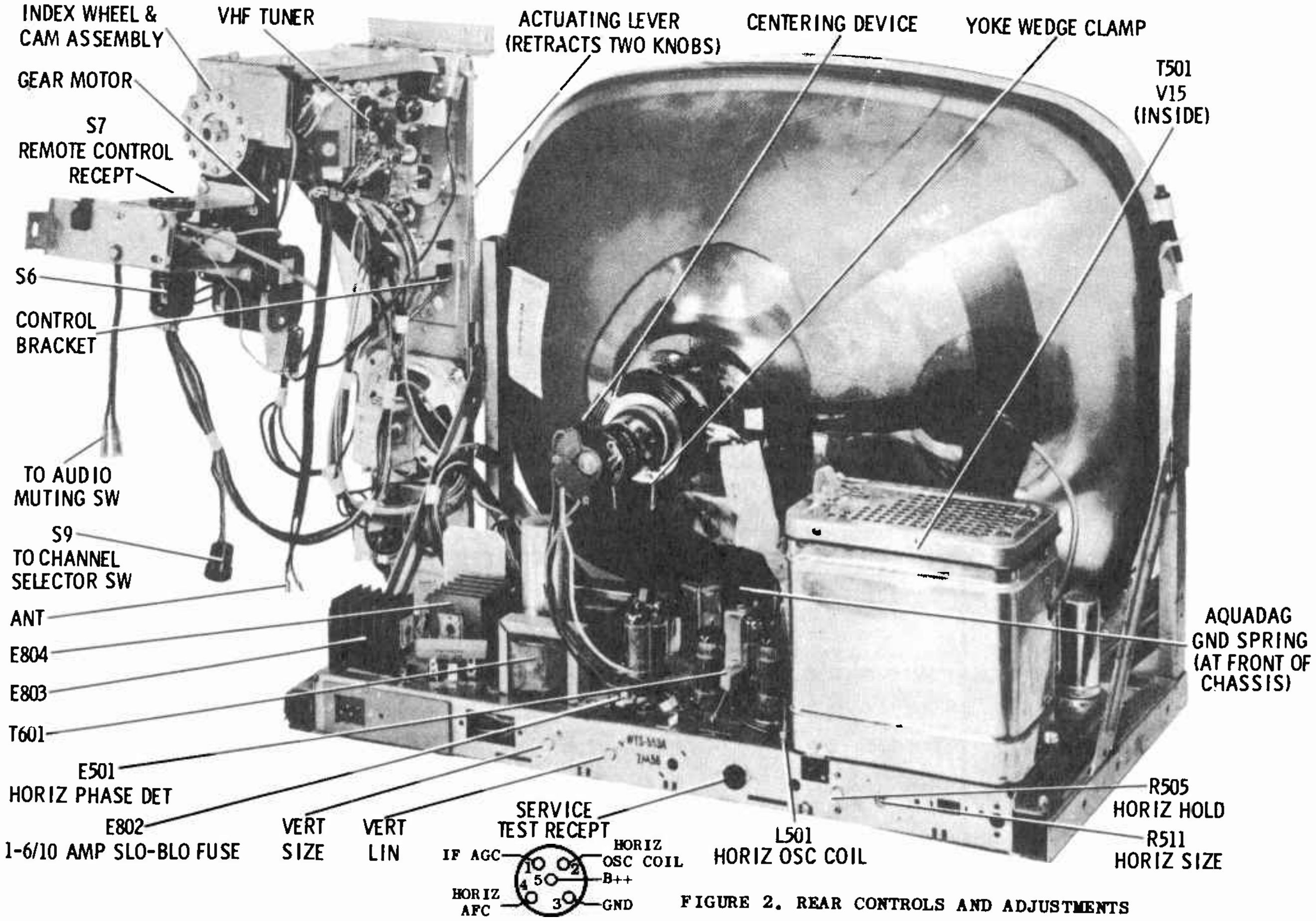


FIGURE 2. REAR CONTROLS AND ADJUSTMENTS

Do not turn oscillator screw counterclockwise to the extent of disengagement from tuner. To insure that the screw is within the range of its threads... tighten the screw (clockwise) until it stops, then turn counterclockwise until the station appears. The maximum number of safe counterclockwise turns from the stop are:

7-turns for channels:	5-turns for channels:
13	12
6	11
5	10
4	9
3	8
2	7

4. Switch tuner to the next lower channel number available in your area. If station is not properly received, adjust appropriate oscillator slug using the outline given in step 3.

5. Repeat step #4 for the remainder of the channels. Always adjust channels in descending order, otherwise tuner will be severely misaligned.

TO REMOVE THE CHASSIS (MODELS HAVING CHANNEL WINDOW)

The chassis is mounted independently to the framework holding the picture tube, and the entire picture tube and chassis assembly are mounted independently of the tuner and auxiliary front panel controls. The chassis uses plug and receptacles for connections to the tuner and auxiliary controls and thus may easily be separated from these components.

1. Remove the back cover of the cabinet. If model is equipped with a "STEREO RECEPTACLE" on the back cover, it is advisable to remove the two screws holding the receptacle to the cover and leave the receptacle with the cabinet. If receiver is equipped with a Monopole antenna receptacle (metal cabinets only), there will be a counterpoise antenna connection to the cabinet. Remember this connection, so it will be correctly replaced when the back cover is replaced. Remove tuner lead-in from back cover receptacle by unplugging.

2. Remove all cables running from the control panel to the chassis, including those of the tuner. Remove the yoke plug, picture tube socket, high voltage anode lead and speaker leads. Remove the four screws holding the chassis to the horizontal metal mounting member (these screws are accessible from inside cabinet). Remove the chassis.

TO REMOVE THE VHF AND/OR UHF TUNER

To remove the VHF tuner, it is necessary to remove the complete control bracket assembly to which the tuner is mounted. Removal of the control bracket is necessitated by the projection dial disc channel indicator (mounted to the tuner channel selector shaft) on the inside of the bracket.

1. Remove all front panel knobs except the supplementary controls: brightness, vertical hold and tone controls.

2. Unplug all cables running from tuner, and control bracket from TV chassis.

3. Visually locate actuating lever mounted to control bracket. This lever is approximately one-fourth of the way down from the top of the bracket, and on the right-hand edge. This lever, when pushed upward, will retract the small supplementary controls of the front panel (brightness and vertical hold), so that they will clear the decorative front panel. Push lever and make sure knobs retract properly. Lever will operate easier if pressure is applied to push lever towards left, as well as upward.

MOTOROLA Chassis TS-553, -Y, WTS-553, TS-552, -Y, Alignment, Continued

4. Remove the three mounting screws of the control bracket: two at the bottom and one at the upper right-hand corner.

5. Carefully pull bottom (repeat, bottom) end of control bracket toward rear of cabinet until tone control(s) is clear of opening. When sufficiently clear, the control bracket may be moved toward the right-hand side of cabinet, so as to clear the cabinet flange retaining the top left-hand of the control bracket. The control bracket and tuner assembly may now be removed from the cabinet.

6. Remove the projection-dial-disc from channel selector shaft of tuner by removing retaining spring. Unsolder lead to dial light. Remove the four screws holding the VHF tuner to the control bracket: remove tuner.

ALIGNMENT

Before alignment of the video IF section is attempted, it is advisable to thoroughly check the system. If alignment is started on an IF section in which a faulty component exists, successful alignment will probably be impossible and the entire procedure will have to be repeated when the real cause of the trouble is corrected. Preliminary tests of the system should include voltage and resistance measurements, routine checks for bad soldering connections, and visual inspection of the circuits.

VIDEO IF & MIXER ALIGNMENT

Pre-Alignment Steps

1. Maintain line voltage at 120 with variac.

2. Remove the deflection yoke plug to eliminate RF interference radiation.

3. Disable oscillator by shorting point "K" located near oscillator tube V-2, to chassis.

4. Apply the negative lead of a 6 volt bias supply to pin #1 (IF AGC) of the SERVICE TEST RECEPTACLE and the positive lead to pin #3 (chassis ground).

5. All coil slug tuning positions, in relation to chassis, are given in the procedure chart and in the separate detail of fig. 7.

6. Set channel selector on channel #13 and connect a 1500 ohm 50W voltage normalizing resistor from B++ to chassis (use pins #5 (B++) and #3 (ground) of the SERVICE TEST RECEPTACLE.

7. Set the contrast control at minimum (maximum resistance).

8. Maintain 2 to 5 volts peak-to-peak at the diode load (Det TP) except when specific values are given in the procedure chart.

VIDEO IF & MIXER ALIGNMENT PROCEDURE

STEP	SWEEP GEN AND MARKER	INDICATOR	ADJUST	ADJUST FOR AND/OR REMARKS
1.	To 3rd-IF-grid test-recept thru a .001 mf capacitor. Set sweep approx, to 44Mc: markers as required.	Scope thru a 47K ohm resistor to Video Det test recept	Both slugs of 3rd IF coil (T-103)	Equal peaks and 45.75 Mc marker as as shown on curve #1. Note: Slug at crystal end can be reached by inserting tool through unobstructed slug. Tune both slugs near the ends of their respective coils. See detail for slug position.
2.	To mixer grid thru .001 mf capacitor. (Use opening adjacent to mixer, point "N"). Set sweep to approx 44 a. Set marker to 47.25 Mc b. Set marker to 41.25 Mc c. Set marker to 39.75 Mc	Scope connection same as step #1	a. Both 47.25 Mc traps (L-101 & L-104) b. 41.25 trap (L-102B) c. 39.75 trap (L-103)	Note: temporary removal of bias or increased generator input may be required to see traps. a. Minimum response (tune slugs at end of coils away from chassis). b. Minimum response (tune slugs at end of coil toward chassis). c. Minimum response (tune slugs at end of coil away from chassis). See curve #2 for above responses
3.	Generator connection same as step #2, except set output for 3V P-P on scope.	Scope to "1st IF screen test recept or test point." Pin #6 of tube.	Mixer trans, located on tuner (T-2) 1st IF grid coil (L-102A) slug located away from chassis.	Tune both T-2 & L-102A for curve shown in curve #3. The "pri" affects the center peak and the "sec" affects the two outside peaks. If a "suck-out" (trap effect) occurs, detune 1st IF transformer (T-101) to remove. Tune both coil slugs at end of coil away from chassis
4.	Gen connection same as step #2. Reset for 2-5V P-P on scope	Scope thru a 47K ohm resistor to Video Det test recept.	1st IF trans (T-101) 2nd IF trans (T-102)	Proper 42.25 Mc marker placement (tune slug at end of coil toward chassis) Proper 45.75 Mc marker placement (tune slug at end of coil toward chassis). See curve #4.
5.	Same as step #4	Same as step #4	→	If a tilt occurs, readjust the mixer pri coil (T-2 on tuner) and if necessary touch-up the 1st and 2nd IF trans (T-101 & T-102) for response shown in curve #4.

SOUND ALIGNMENT
(Station Signal Method)

The sound system used in the WTS-553 receiver consists of an audio IF amplifier stage, a quadrature grid detector and an output stage. Since this type of sound system is extremely sensitive, relatively small input signal voltage will cause grid current to flow in both the IF amplifier and the detector stages. Grid current through the tuned coils will load them down making the adjustment extremely broad and alignment impossible. For this reason, it is necessary to use a very weak signal when aligning the driver and the detector input coils. Actually, the signal should be well down into the noise level for proper tuning action.

Preliminary Steps

1. Tune in a strong TV station.

2. Adjust all controls for normal picture and sound.

3. Refer to Video IF & Mixer Alignment Detail for coil and test point locations (Figure 6).

MOTOROLA Chassis TS-553, -Y, WTS-553, TS-552, -Y, Alignment, Continued

SOUND ALIGNMENT PROCEDURE

STEP	STATION	INDICATOR	ADJUST	REMARKS
1.	Strong signal	VTVM to jct. of R-309 (82K) and R-310 (560K) located on L-303 (under chassis).	L-303 (quad coil)	Maximum deflection (coarse adj.). Of two possible maximum tuning points, use that giving the largest voltage reading. Do not change top pre-set core**
2.	"	Listening test	"	Maximum sound with minimum distortion (fine adj.).
3.	Weak signal*	"	T-301	Maximum sound with minimum distortion (maintain hiss level).*
4.	"	"	L-302 (take-off)	Maximum sound with minimum distortion.

If sound is not clear at this point, repeat the above procedure as necessary.

*The signal must be weakened considerably either by disconnecting one side of the antenna lead, or connecting low value resistors across the antenna terminals until a pronounced hiss appears in the sound. The hiss level must be maintained for proper alignment.

**The purpose of the top pre-set core is to enable the adjustable core to make the tuning range required while reducing the physical length. If the pre-set core should be misadjusted by previous service work, merely re-set near top end of coil and tune for maximum.

4.5 MC TRAP ADJUSTMENT

1. Carefully tune receiver to local station and advance contrast control.

2. Adjust local oscillator (with fine tuning control) to bring 4.5 Mc interference strongly into the picture.

3. ADJUST... sound trap (L-109) to find the two points of adjustment at which the sound beat is just noticeable on the picture tube screen. Rotate the core toward center of the two points. Use minimum amount of inductance (core out of coil) that will result in no apparent beat interference.

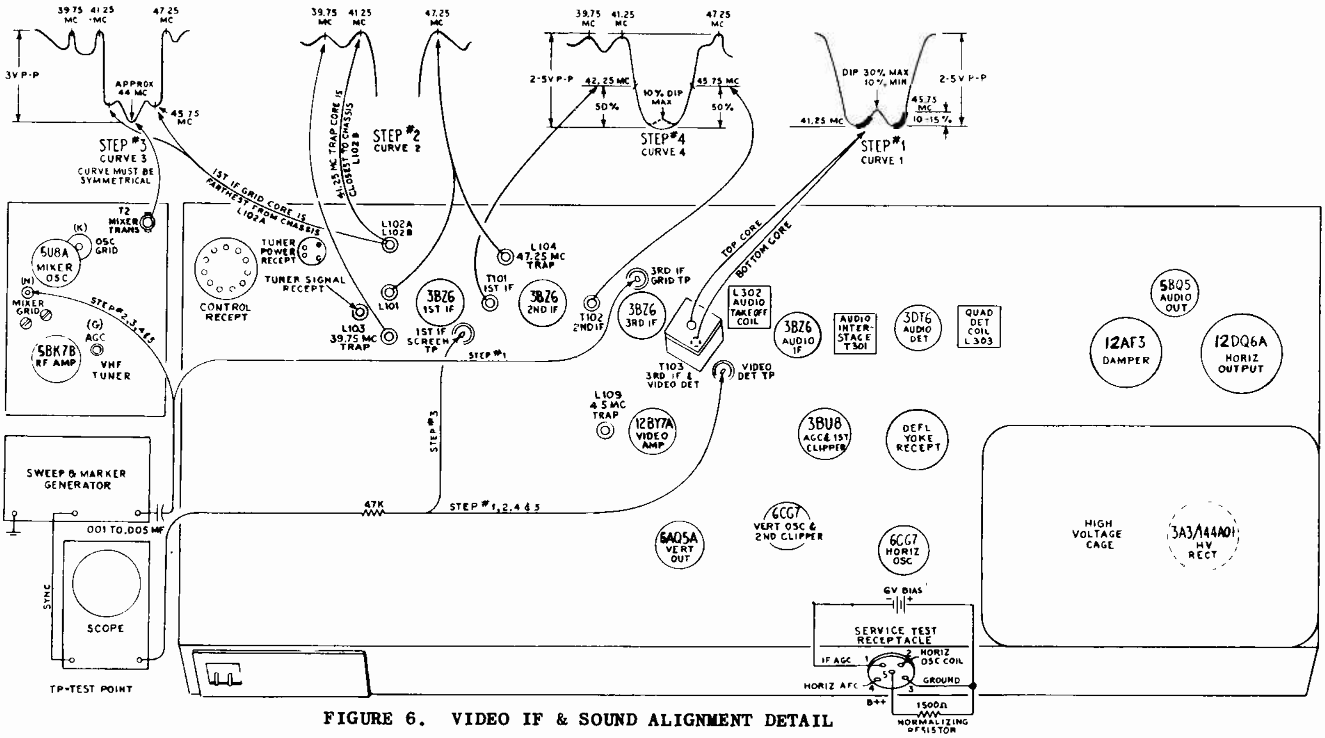


FIGURE 6. VIDEO IF & SOUND ALIGNMENT DETAIL

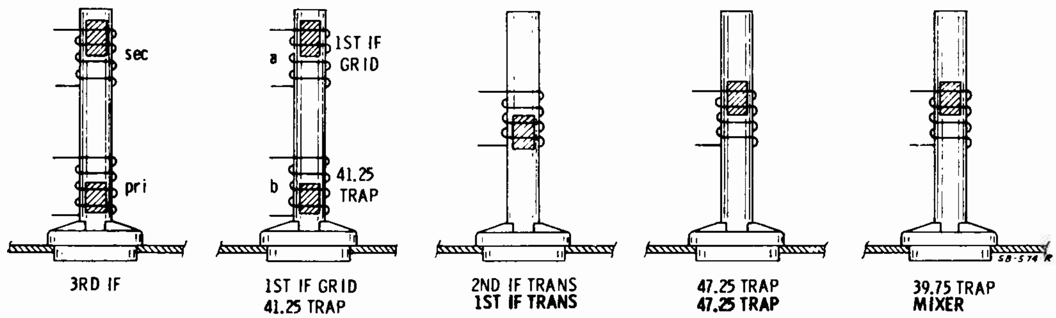


FIGURE 7. COIL SLUG POSITIONS FOR ALIGNMENT

MOTOROLA Chassis TS-553, -Y, WTS-553, Service Information, Continued

TO REMOVE THE PICTURE TUBE

1. Remove the back cover of the cabinet. If model is equipped with a "STEREO RECEPTACLE" on the back cover, remove the two screws holding the receptacle and leave receptacle with cabinet. If receiver is equipped with a Monopole antenna receptacle (metal cabinets only), notice the counterpoise antenna connection to the cabinet so it may be correctly replaced when the cover is replaced. Remove the tuner lead-in from the antenna receptacle by unplugging.

2. Unplug all cables running between the control bracket, the tuner and the TV chassis. Disconnect speaker leads.

3. Remove four bolts from underneath cabinet holding picture tube and chassis framework assembly to the cabinet. Slide entire assembly out rear of cabinet.

4. Remove yoke plug, picture tube socket and high voltage anode lead. Loosen the two strap clamp screws at the left and right-hand sides of the picture tube. Remove picture tube from the framework.

TO REPLACE PICTURE TUBE

5. Place any insulating or other type tape found on the original picture tube on the replacement picture tube and insert into framework.

6. Replace leads, plugs and components in reverse order to disassembly instructions.

TO REPLACE THE PICTURE TUBE MASK

1. Remove the entire picture tube and chassis assembly (see "how to remove the picture tube").

2. Remove the entire control bracket assembly and the tuner (see "how to remove the tuner and control bracket").

3. Remove the safety glass by removing the retainer strip located at the top edge of the safety glass. The strip is secured to cabinet by screws having the heads downward. Hold glass so it does not fall out. Allow top of glass to move outward. Grasp at left and right-hand sides and lift up and out of bottom glass retaining channel.

4. Remove the circular push-on type retainers holding the plastic projections of the mask to the top and bottom rails of the cabinet (remove the retainers from the inside of the cabinet).

5. Let top of mask move outward from cabinet until it is clear, then lift up and out of the bottom channel.

SAFETY GLASS REMOVAL

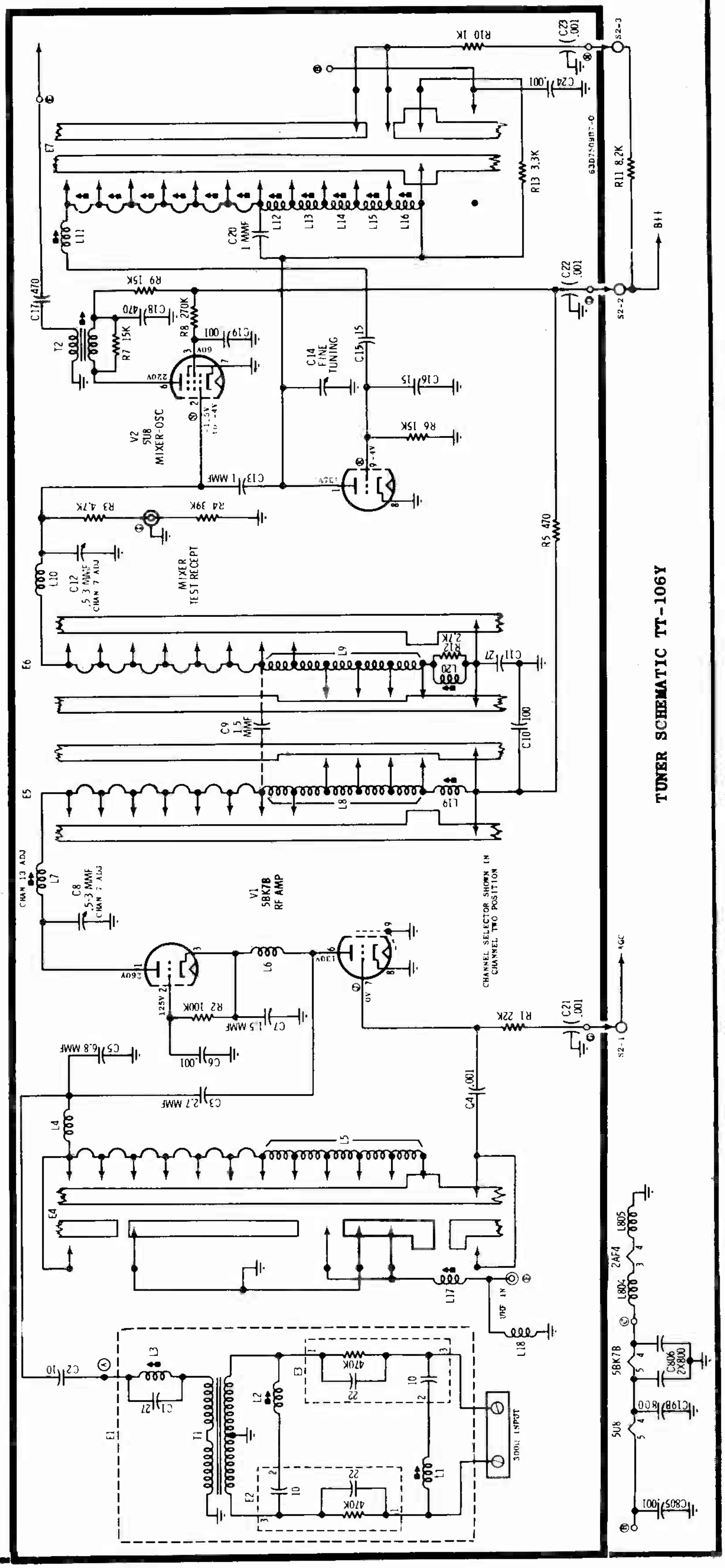
1. Turn power off.

2. Remove the screws holding metal trim or glass retainer (depending on model) at the top of the safety glass and remove the metal trim or retainer. Hold glass so it does not fall out.

3. Allow glass to move outward at the top: Grasp glass at left and right-hand sides and lift upward until glass is out of lower retainer channel. Place glass in a safe place.

When replacing glass, make sure protective channel is on glass before installation.

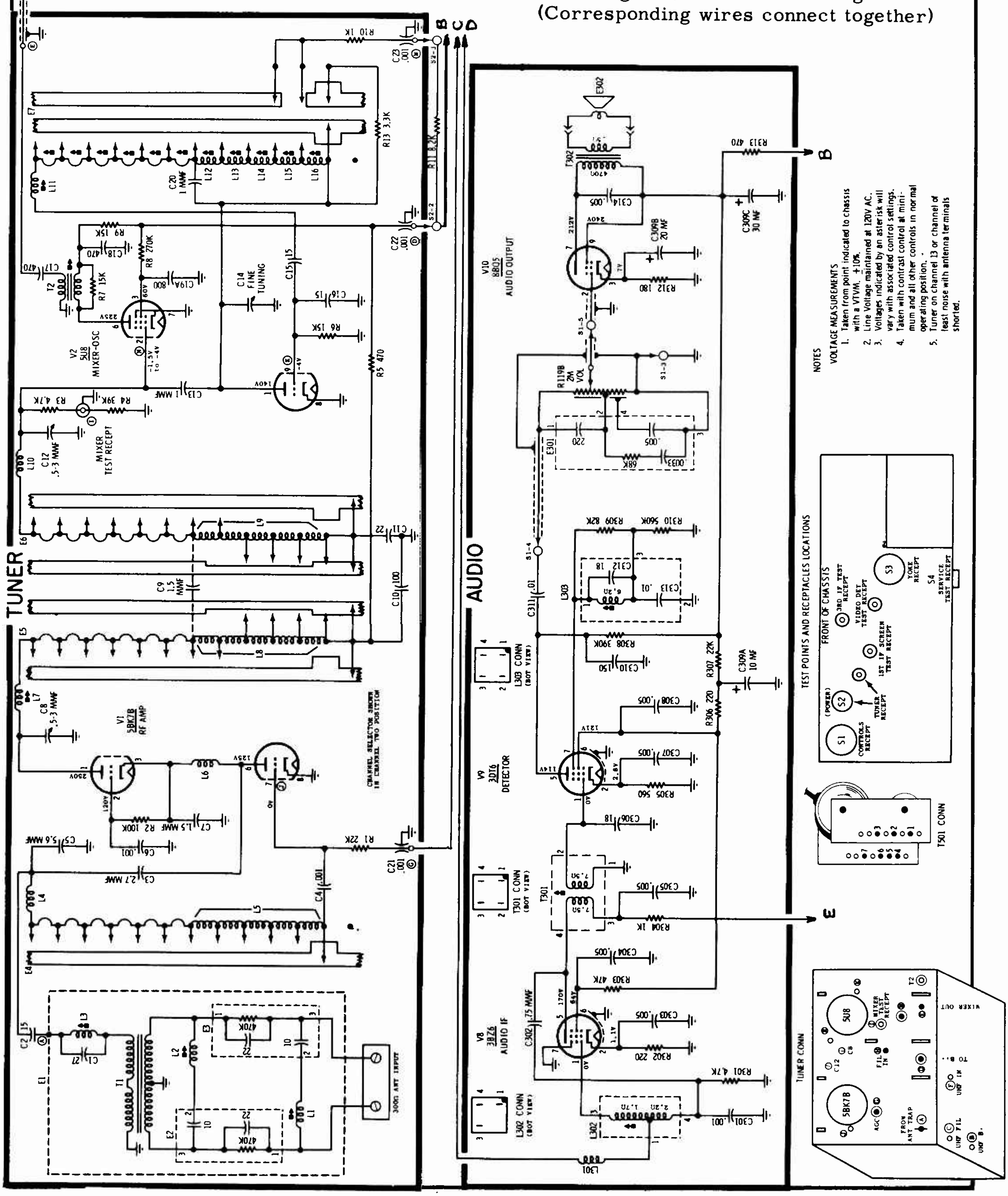
CAUTION: Do not attempt to change the tuner to the next lower channel by manually turning the index wheel: motor will be energized and begin automatic channel selection. When aligning the tuner, it is recommended that you change stations with the INSTA-MATIC station selector button, making as many complete revolutions as required to reach the desired channel number.



TUNER SCHEMATIC TT-106Y

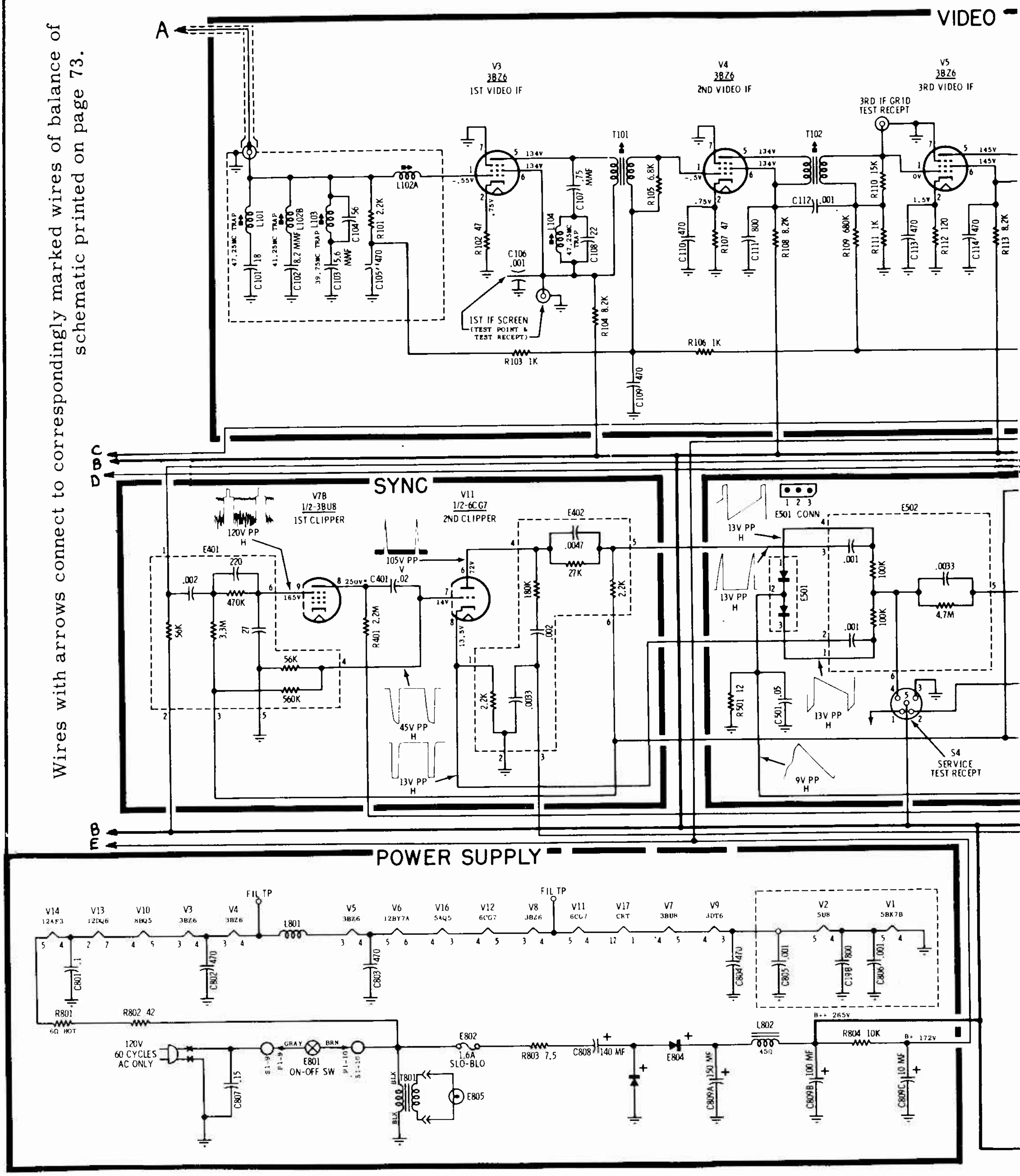
MOTOROLA Chassis WTS-553, Part of Schematic Diagram, Continued on Page 74

(Corresponding wires connect together)



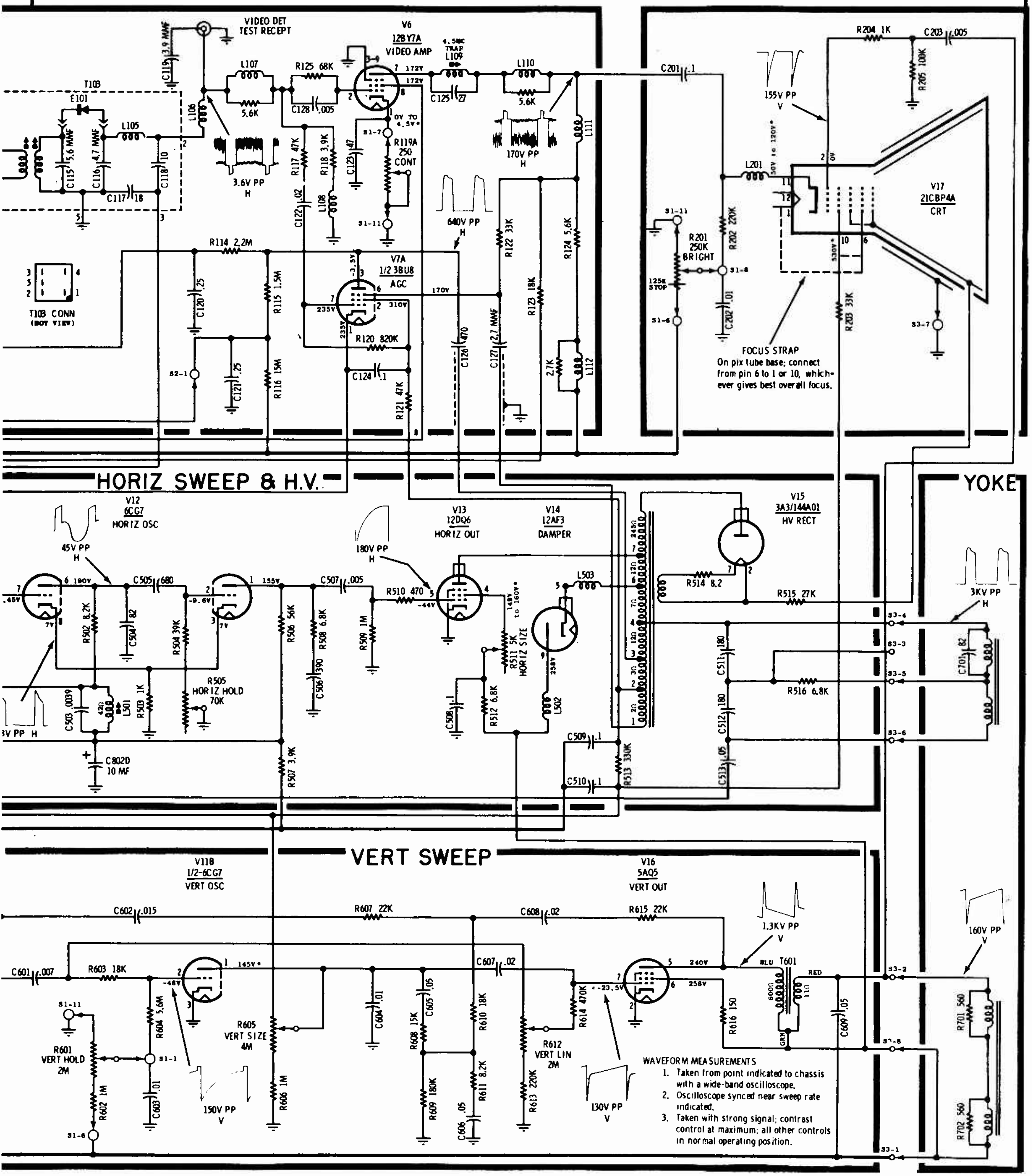
MOTOROLA Chassis WTS-553 Schematic Diagram, Continued

Wires with arrows connect to correspondingly marked wires of balance of schematic printed on page 73.



MOTOROLA Schematic Diagram

TELEVISION CHASSIS WTS-553A-00



MOTOROLA Chassis WTS-553, Automatic Tuner Information, Continued

AUTOMATIC TUNER SECTION

MOTOR TUNER SYSTEM OPERATION

The tuner is powered by a fractional horsepower, 120 volt shaded pole AC motor, coupled through a 3200 to 24 RPM step-down gear box, utilizing nylon gears. When not energized, the driving motor is out of gear with the tuner driving mechanism. The disengagement is accomplished mechanically by a coil spring located on the rotor shaft between the armature and gear box. This spring suspends the armature partially out of the field when the motor is de-energized. When the motor is energized, the magnetic field pulls the armature into the center of the motor housing. This action actuates the gear train which drives the tuner and also the shaft and cam switches. The shaft switch has four circuits whose individual functions are: blanking of the picture, removal of sound, removal of channel window illumination and motor power retention. The cam switch performs the function of allowing the tuner to operate until it is actuated by cams on the index wheel, stopping the tuner at pre-set channels. Once the tuner motor is energized by the front panel Insta-Matic pushbutton or remote control unit, it will continue to change channels until stopped by the indexing mechanism at the next pre-set channel.

FINE TUNING MECHANISM

The fine tuning capacitor is driven by means of a rubber drive wheel and semi-circular drive plate. When the tuner is switched from channel to channel, a corrugated detent washer forces the drive wheel away from the plate. This effectively disengages the drive wheel from the fine tuner. The fine tuner is then returned to the center range by the action of a "hair pin" spring. This system provides the greatest versatility, since it allows complete manual control of fine tuning on all channels for purposes of interference-free pictures, while retaining the automatic fine tuning re-set feature when switching channels. The latter action is especially important in the case of remote control operation of the receiver. Of course, the tuner oscillator must be in correct alignment for satisfactory operation of the automatic fine tuner. However, with the provisions for front panel, individual channel oscillator adjustment screws, the matter is somewhat simplified.

UHF CHANNEL SECTION

The UHF tuner is of the continuous tuning type and, therefore, cannot be indexed for automatic selection of stations except in cases where only one UHF station is available or desired. Once the motorized VHF tuner has been switched to the UHF position (channel #1) all UHF tuning must be made manually. During UHF operation, the VHF fine tuner knob becomes the UHF tuning control. When only one UHF station is available, tuning may be semi-automatic by pre-setting the UHF tuner exactly on the station and then refraining from changing the position of the UHF tuning control. Thus, the UHF tuner will remain tuned to the selected station and when the VHF tuner is switched to the UHF position, the UHF station will automatically be received. This is quite feasible since it should be unnecessary to change the fine tuner setting during normal VHF station reception.

SERVICE NOTES

CAUTION: Line voltage (120 volts) appears throughout the intercabling as well as at pins of the male and female connectors. Do not permit power application unless all connections are complete.

When servicing "hot" chassis, always use an isolation transformer (not autoformer or other non-isolating type) in the power line.

Before returning receiver to set owner, make certain no shock hazard exists on any metal parts that can be contacted by the set owner. When making such shock hazard tests, make sure all sections of receiver are operating (motor, remote control unit, etc.).

WARNING: IF TUNER IS SWITCHED FROM CHANNEL OR ROCKED TO EXTENT OF OPENING CAM SWITCH, TUNER MOTOR WILL BEGIN OPERATION.

TV receiver cannot be supplied with line power (turned "on") unless remote control is plugged in, or a jumper wire placed across pins #7 & #8 of receptacle S-3. (Warning: Observe all "hot chassis" and "power" precautions.)

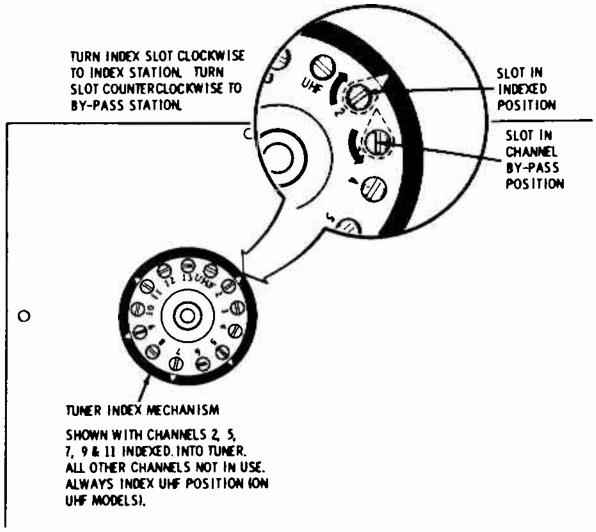


FIGURE 10. TUNER INDEX DETAIL.

TUNER INDEXING

The indexing mechanism is accessible from the rear of the receiver after removing the back cover and consists of a circular disc containing numbered, screw slots for each channel. Each slot is limited to a quarter-turn rotation and the position of the slot indicates indexing... slots pointing toward center of wheel have indexed channels; slots at right angles to wheel radius have bypassed channels.

TO INDEX... Turn set off and turn each desired channel's screw slot to point toward center of wheel-and-each undesired channel's screw slot at right angles to radius of wheel. Apply power to receiver and check reception of all indexed stations. If any station is not properly received without fine tuner adjustment, it may be necessary to touch-up the local oscillator.

NOTES:

Should the condition occur in which all channel numbers have been removed from the index system, the tuner will run continuously when the INSTA-MATIC station-selector-button is pressed. To stop tuner motor, turn set "off" with ON-OFF pushbutton or remove the power plug, then index any one channel.

To insure proper reception on each channel, regardless of the fine tuning adjustment of the previous channel, the fine tuner is automatically re-set to its nominal (center) position each time a new channel number is selected. The tuner local oscillator is provided with individual channel adjustment screws that allow precision-setting of each channel during the initial installation... and eliminates the necessity of readjusting the fine tuning control from channel to channel.

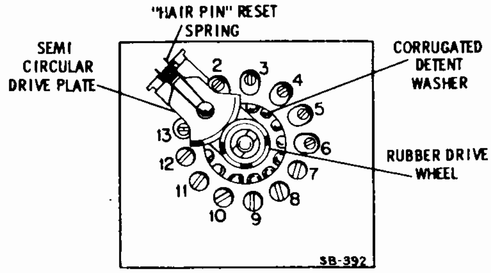


FIGURE 11. TUNER OSCILLATOR CHANNEL ADJUSTMENTS.

MOTOROLA Chassis WTS-553, Automatic Tuner Information, Continued

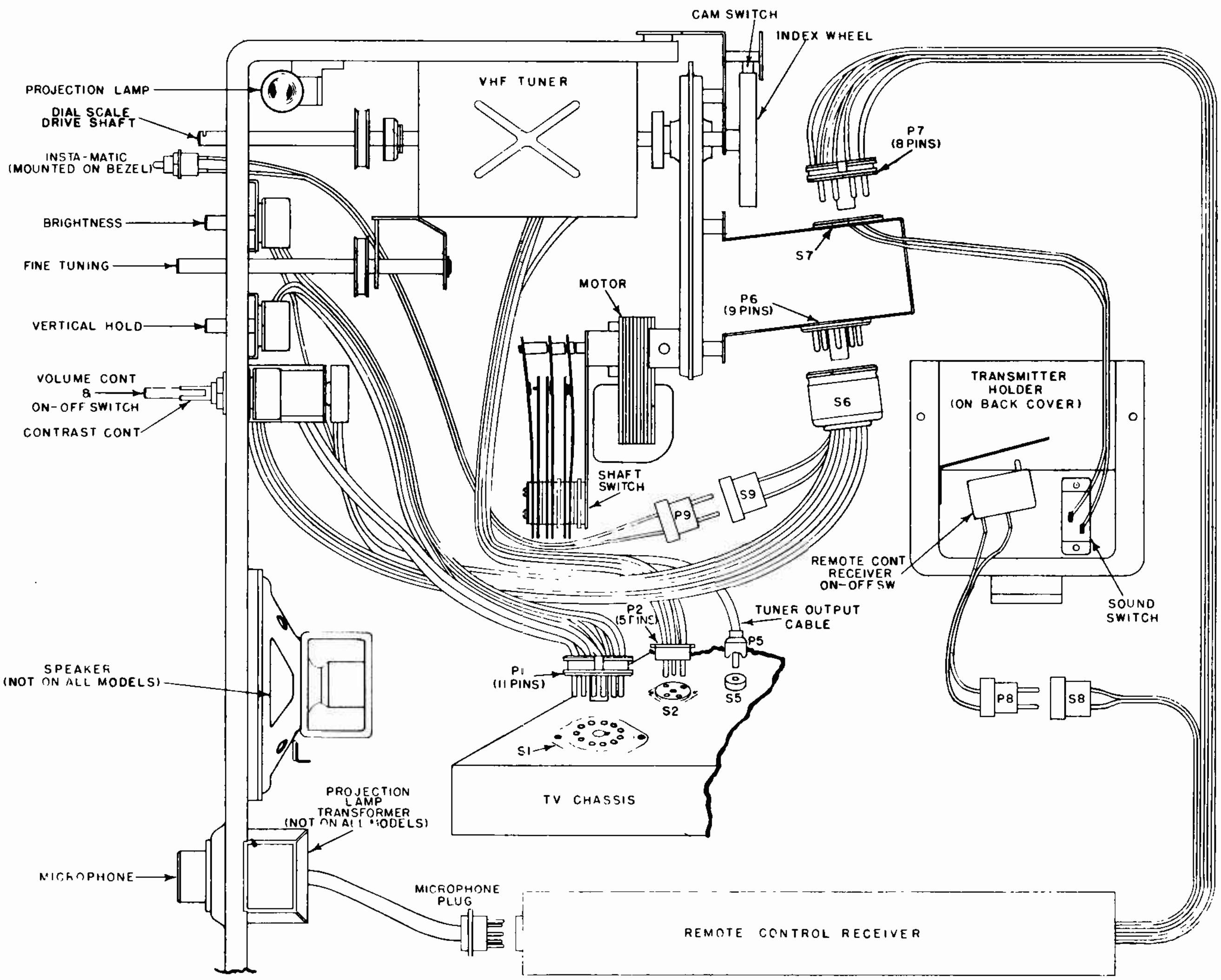


FIGURE 12. INTERCABLING & PLUG DESIGNATION DETAIL.

TO REMOVE POWER FROM REMOTE CONTROL CHASSIS

The on-off button on the remote control transmitter unit removes power from the television chassis, however, this button does not remove power from the remote control chassis. Power to the remote control chassis is removed by depressing the transmitter holder switch inside the holder (back cover). It is recommended that the transmitter be returned to the transmitter holder whenever it is not in use, in order to conserve power. In the event the transmitter is not available, place an object of similar weight and size into the transmitter holder or disconnect the plug and socket connection between the transmitter holder and the remote control chassis.

TO RESTORE SOUND WHEN RECEIVER IS IN MUTE POSITION

An auxiliary sound switch is located on the back cover of the TV receiver. The purpose of this switch, which is mounted to the transmitter holder, is to restore sound to normal in the event sound should lock in in the mute position. Push switch to MANUAL position to restore sound to normal.

REMOVING TUNER-MOTOR ASSEMBLY AS A UNIT

1. Remove cabinet back cover: note connections of wires and plugs running to the manual/mute switch and to the switch located inside the remote control transmitter holster. Tuner leads must be unplugged from the receptacles on the back cover.

2. Disconnect all plugs between the remote control receiver and the TV chassis. Remove screws holding remote control receiver to cabinet (remove from underneath cabinet). Position remote receiver so that microphone cable at front of unit may be disconnected. Microphone must remain seated in control bracket due to a retainer on inside of bracket. To remove or replace microphone, control bracket must be removed (see step 4).

3. After remote control receiver chassis is out of cabinet, remove all plugs and leads between the control panel and the TV chassis. Remove the TV chassis and the picture tube as a unit by removing the four screws from underneath the cabinet.

4. The complete control bracket containing the tuner and all controls may now be removed as an assembly by following the instructions outlined on page 6 for "Removing the VHF and/or the UHF tuner". One additional screw must be removed at the rear of the tuner/control bracket which secures the bracket to the left-hand side of the cabinet.

MOTOR REMOVAL

Although it is impossible to remove the VHF tuner from the cabinet without removing the entire control bracket assembly to which the tuner is mounted due to the fact that the channel indicator dial is inaccessible on the inner side of the control bracket...it is possible to remove the motor from the rear of the tuner without the necessity of removing the tuner.

MOTOROLA Chassis WTS-553, Automatic Tuner Information, Continued

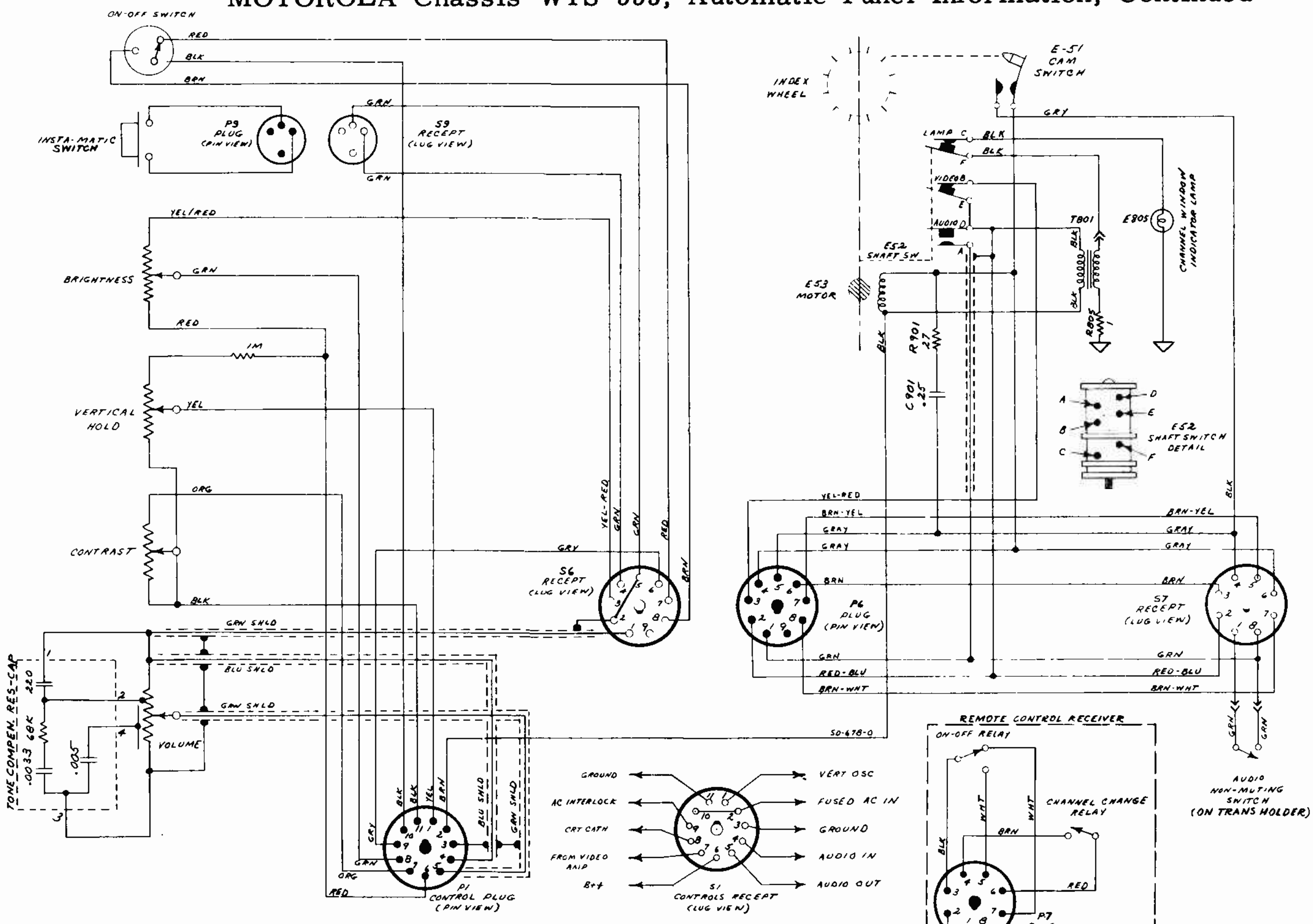


FIGURE 13. CABLING CONNECTIONS (A21K106 & A21T60).

MOTOR REMOVAL PROCEDURE

1. Remove the two cam switch shield mounting screws at the rear of the index wheel.

2. Remove the index wheel setscrew located inside the shaft opening and remove the index wheel.

3. Remove the rear bracket extending out from the gear motor assembly by removing the four screws.

4. Remove the three screws projecting through the metal bracket and securing the gear motor. Sufficient room should now be available to disengage the driving member of the motor from the rear clutch of the tuner shaft.

5. With the motor assembly removed from the receiver and placed in a convenient position, remove the wires from the original motor and attach them to the replacement motor.

INDEX WHEEL REMOVAL

1. Switch tuner to a local channel.

2. Remove the two cam switch shield mounting screws at the rear of the index wheel.

3. Remove the index wheel setscrew located inside the shaft opening and remove the index wheel.

INDEX WHEEL REPLACEMENT

Note that the index wheel can be replaced on the shaft in two positions, one of which will be mis-rotated 180 degrees from the correct position.

1. Set tuner to channel selected in step #1 of "Index Wheel Removal".

2. Position index wheel on shaft so that its number at the cam switch corresponds to the channel number tuned in.

3. Replace setscrew inside the shaft opening and tighten.

   a. See Cam Actuating Switch section for adjustment.

   b. Refer to Calibration section.

INDEX CAM ACTUATING SWITCH (Replacement or Adjustment)

When replacing this switch, adjustment will be necessary before tightening mounting screws.

To Replace Switch

1. Remove the back cover.

2. Remove the two cam switch shield screws

3. Remove two switch mounting screws and switch.

4. Replace switch

Adjust cam switch so it breaks contact on the side of the cam moving into the switch. When set to the desired position, the cam should stop with the contact arm riding on the top of the cam; tuner should be solidly in its detent position at completion of operation. Check operation of tuner on all indexed channels until adjustment is satisfactory.

MOTOROLA

MODEL BREAKDOWN CHART

Model	Type	TV Chassis	VHF Tuner	UHF Tuner
21K97B	Console	WTS-551	WTT-104	-
Y21K97B	Console	WTS-551Y	WTT-104Y	VTT-89
21K97M	Console	WTS-551	WTT-104	-
Y21K97M	Console	WTS-551Y	WTT-104Y	VTT-89
21K99B	Console	TS-551	VTT-104	-
Y21K99B	Console	TS-551Y	VTT-104Y	VTT-89
21K99M	Console	TS-551	VTT-104	-
Y21K99M	Console	TS-551Y	VTT-104Y	VTT-89
21T57BG	Table	TS-551	VTT-104	-
Y21T57BG	Table	TS-551Y	VTT-104Y	VTT-89
21T57CH	Table	TS-551	VTT-104	-
Y21T57CH	Table	TS-551Y	VTT-104Y	VTT-89
21T57MG	Table	TS-551	VTT-104	-
Y21T57MG	Table	TS-551Y	VTT-104Y	VTT-89

ADDENDA TO MODEL BREAKDOWN CHART

Model	Type	TV Chassis	VHF Tuner	UHF Tuner
21K99W	Console	TS-551	VTT-104	-
Y21K99B	Console	TS-551Y	VTT-104Y	VTT-89
Y21K99M	Console	TS-551Y	VTT-104Y	VTT-89
Y21K115BA	Console	WTS-551Y	WTT-104Y	VTT-89
Y21K115MA	Console	WTS-551Y	WTT-104Y	VTT-89
Y21K115WA	Console	WTS-551Y	WTT-104Y	VTT-89
Y21K116BA	Console	WTS-551Y	WTT-104Y	VTT-89
Y21K116MA	Console	WTS-551Y	WTT-104Y	VTT-89
Y21K116MCA	Console	WTS-551Y	WTT-104Y	VTT-89
Y21K116WA	Console	WTS-551Y	WTT-104Y	VTT-89
21T57MO	Table	TS-551	VTT-104	-
21T62MA	Table	TS-551	VTT-104	-
Y21T62MA	Table	TS-551Y	VTT-104Y	VTT-89
Y21T63BA	Table	WTS-551Y	WTT-104Y	VTT-89
Y21T63MA	Table	WTS-551Y	WTT-104Y	VTT-89
Y21T63WA	Table	WTS-551Y	WTT-104Y	VTT-89

Model	Description	TV Chassis
21C9B	Consolette, blonde oak: masonite	TS-551
Y21C9B	Consolette, blonde oak: masonite	TS-551Y
21C9M	Consolette, mahogany: masonite	TS-551
Y21C9M	Consolette, mahogany: masonite	TS-551Y

CHASSIS TS-551 and WTS-551

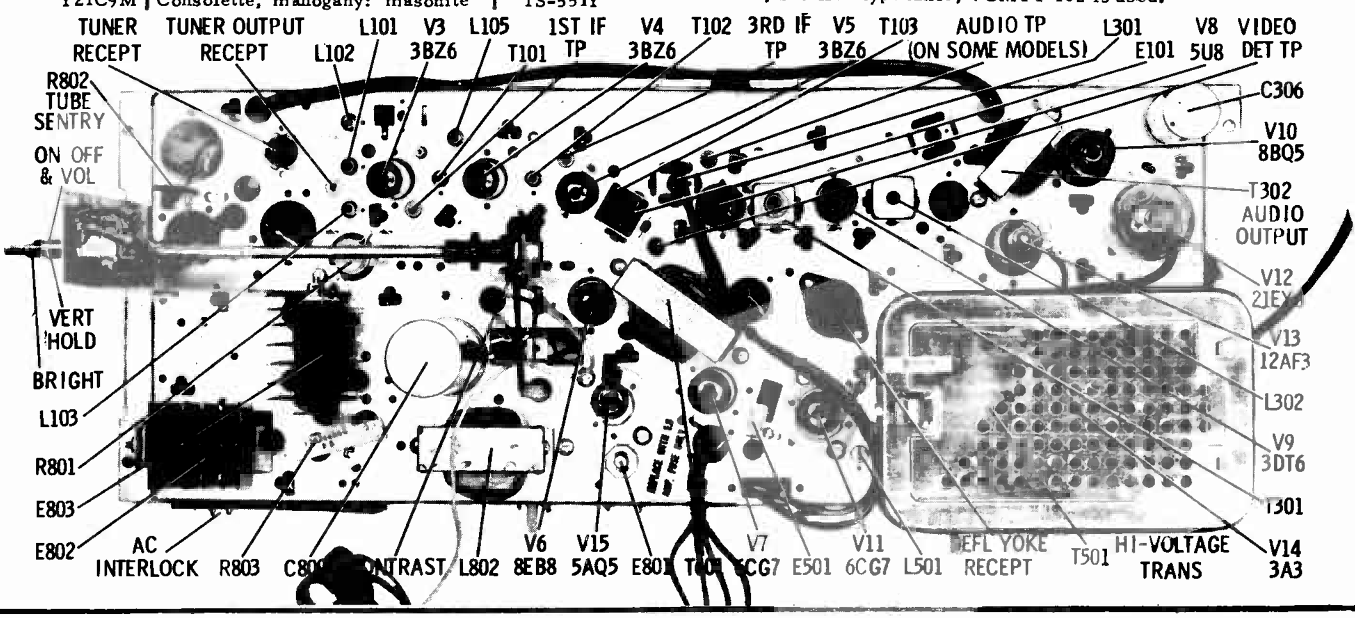
A list of models using these chassis is at left. Schematic diagram is printed on pages 80-81 and 82. Much of the service material for these sets is the same as for TS-553 described in the preceding section beginning with page 67. The tuner diagram on page 82 is applicable to TS-551, while Chassis WTS-551 uses WTT-104 type.

ADDENDA TO MODEL BREAKDOWN CHART

Model	Type	TV Chassis	VHF Tuner	UHF Tuner
21C9BD	Consolette	MTS-551	CMTT-102	-
21C9MD	Consolette	MTS-551	CMTT-102	-
21K99BD	Console	MTS-551	CMTT-102	-
21K99MD	Console	MTS-551	CMTT-102	-
21K99WD	Console	MTS-551	CMTT-102	-
21K115B	Console	VTS-551	VCMTT-102	-
21K115M	Console	VTS-551	VCMTT-102	-
21K115W	Console	VTS-551	VCMTT-102	-
21K116B	Console	VTS-551	VCMTT-102	-
21K116M	Console	VTS-551	VCMTT-102	-
21K116MC	Console	VTS-551	VCMTT-102	-
21K116W	Console	VTS-551	VCMTT-102	-
21T57BGD	Table	MTS-551	CMTT-102	-
21T57CHD	Table	MTS-551	CMTT-102	-
Y21T57CHD	Table	MTS-551Y	CMTT-102Y	VTT-111
21T57MGD	Table	MTS-551	CMTT-102	-
21T62M	Table	MTS-551	CMTT-102	-
21T63B	Table	VTS-551	VCMTT-102	-
21T63M	Table	VTS-551	VCMTT-102	-
21T63W	Table	VTS-551	VCMTT-102	-

MTS-551...Same as the TS-551 chassis except that the new, smaller type tuner, CMTT-102 is used.

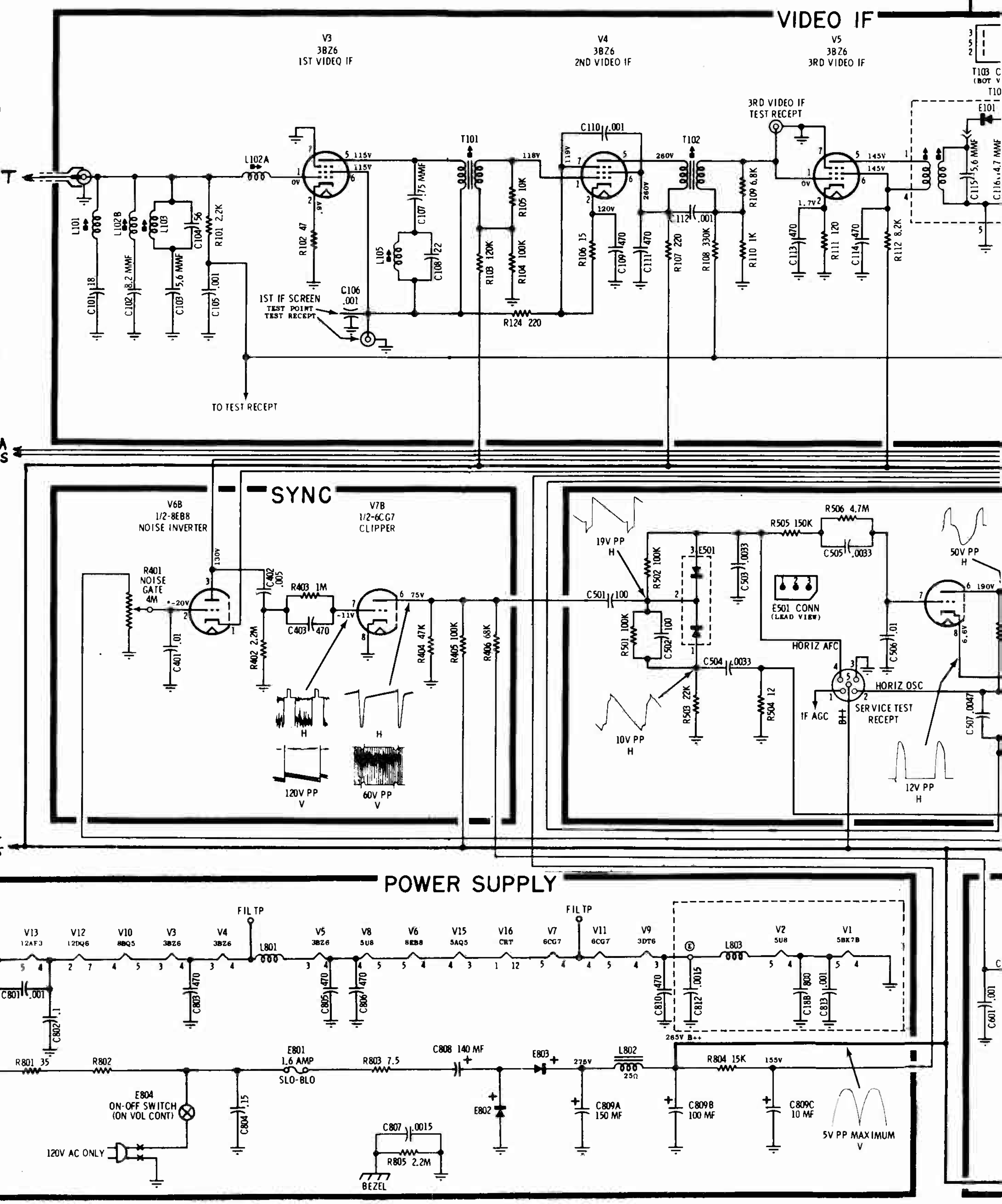
VTS-551...Same as the WTS-551 chassis except that the new, smaller type tuner, VCMTT-102 is used.



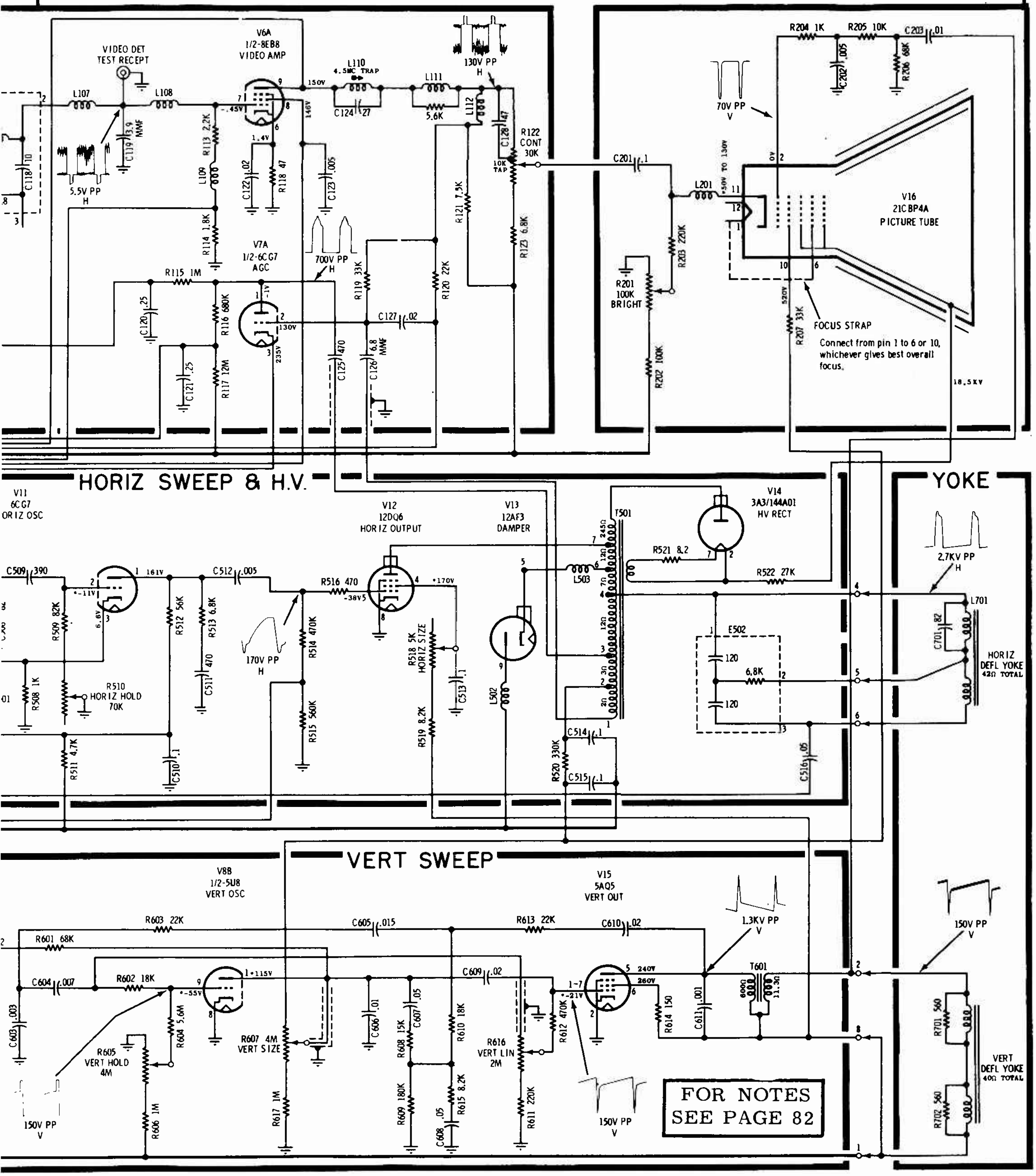
CHASSIS TS-551A-00 PARTS LOCATION (TOP)

MOTOROLA Chassis TS-551 and WTS-551 Schematic Diagram, Continued

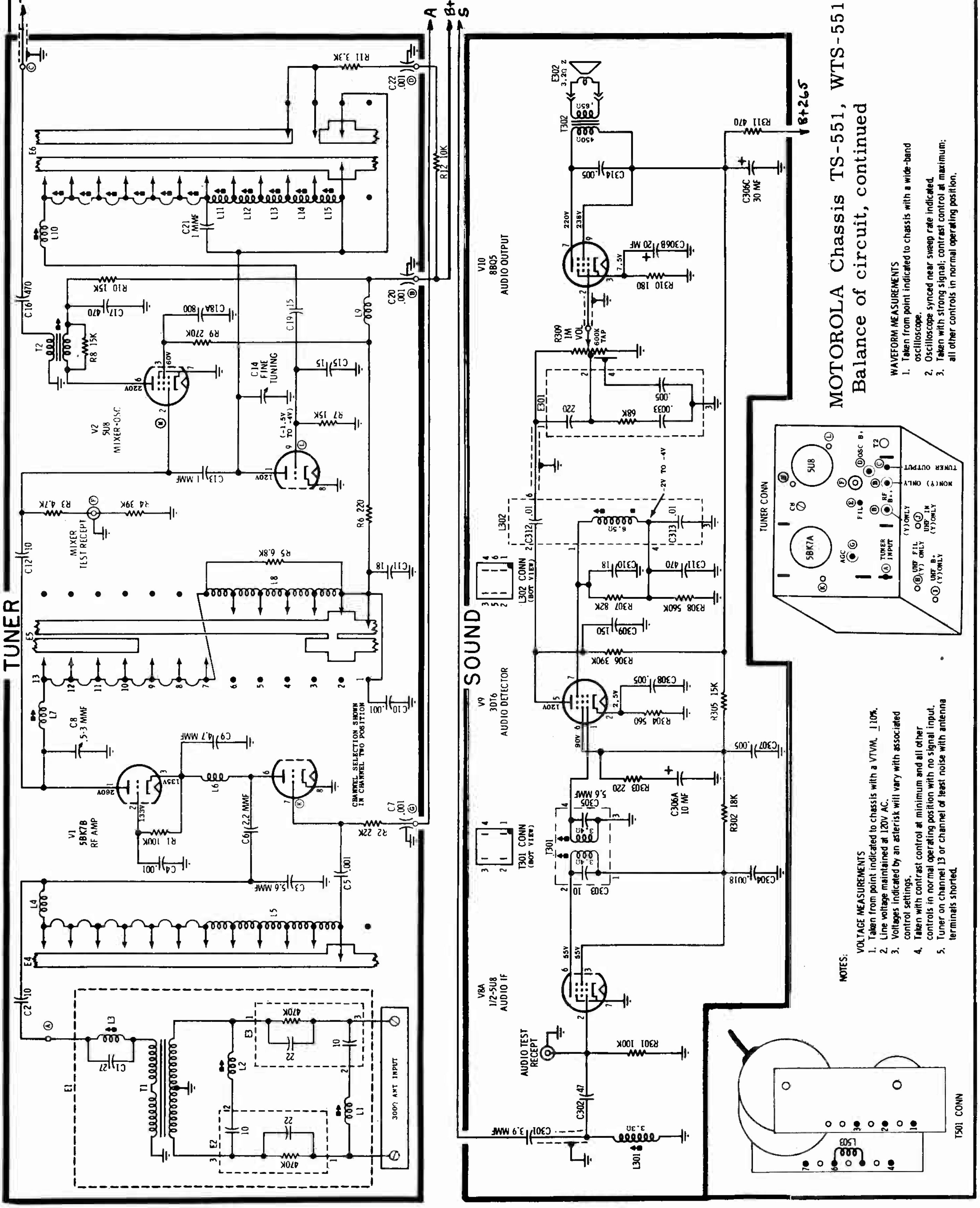
Wires with arrows connect to corresponding wires of circuit on page 82.



MOTOROLA Schematic Diagram **TELEVISION CHASSIS TS & WTS-551A-00 SERIES**



MOTOROLA Chassis TS-551, WTS-551 Circuit continued from pages 80-81



MOTOROLA

CHASSIS TS-556 and TS-556Y

(Material on pages 83 through 88)

MODEL BREAKDOWN CHART

Model	Type	TV Chassis	VHF Tuner	UHF Tuner
21T64B	Table	TS-556	LCMTT-102	-
Y21T64B	Table	TS-556Y	LCMTT-102Y	VTT-111
21T64M	Table	TS-556	LCMTT-102	-
Y21T64M	Table	TS-556Y	LCMTT-102Y	VTT-111

PICTURE CENTERING

Picture centering is accomplished magnetically by means of the centering device located on the picture tube neck. Use the following procedure:

1. Starting with the magnetic centering device arms together (for minimum field strength) and positioned in the horizontal plane, proceed as follows:

2. Separate the arms of the centering device to center the picture vertically.

3. Adjust horizontal centering by rotating the magnetic centering device, as a unit, one way or the other. Readjust vertical centering by slightly rotating the relative position of the arms.

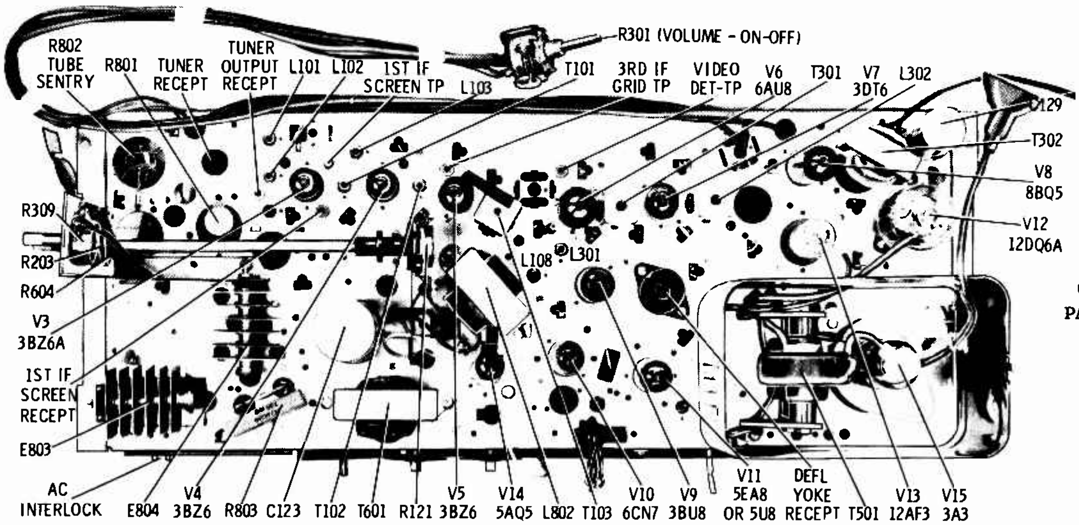
DEFLECTION YOKE ADJUSTMENT

If the deflection yoke is not correctly positioned, the picture will be tilted. If the deflection yoke is not tight against the flare of the picture tube, the picture may be defocused, have non-linear distortions or neck shadow.

To adjust the yoke, compress the ends of the yoke wedge clamp and move clamp and rubber retainer away from deflection yoke. Position yoke as far forward as possible and rotate until picture is straight. When satisfactory, replace retainer and clamp so yoke cannot be moved in any direction.

HORIZONTAL OSCILLATOR ADJUSTMENT

No special adjustment is needed for the horizontal oscillator coil (L-501) as the coil is used for horizontal hold lock-in purposes. Merely set for most stable horizontal sync conditions.



CHASSIS TS-556A-00 PARTS LOCATIONS (TOP)

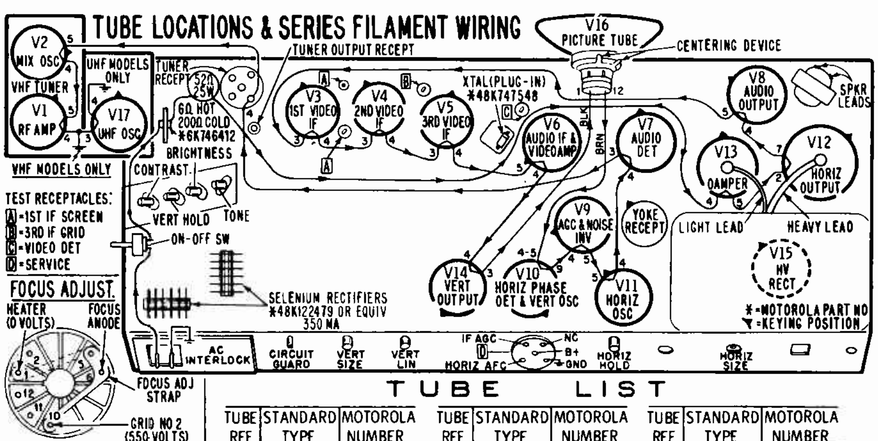
PROTECTIVE DEVICES

CIRCUIT GUARD

The Circuit Guard is a protective device intended to prevent damage to the receiver in event of B+ or power line overload. Its prime purpose is to act as a 1.6 amp overloading fuse. In event of an overload, the Circuit Guard will automatically turn the receiver "OFF", thereby removing any possibility of damage to the chassis.

Power may again be restored by momentarily depressing the red (Circuit Guard) button toward the chassis and then releasing button. If depressing the Circuit Guard does not restore the set to normal operation, the receiver should then be checked for shorts or other sources of trouble.

TUBE LOCATIONS & SERIES FILAMENT WIRING



ADJUSTMENT OF SHUNTING STRAP LOCATED ON PICTURE TUBE BASE PROVIDES OPTIMUM FOCUSING. TEMPORARILY CONNECT STRAP BETWEEN PINS 6 AND 10, THEN 6 AND 1. LOCATE STRAP PERMANENTLY IN POSITION PRODUCING BEST OVERALL FOCUS.

TUBE LIST

TUBE REF	STANDARD TYPE	MOTOROLA NUMBER	TUBE REF	STANDARD TYPE	MOTOROLA NUMBER	TUBE REF	STANDARD TYPE	MOTOROLA NUMBER
V1	5BK7A	177A02	V7	3DT6	148A01	V12	12DQ6A	162A02
V2	5EU8	269A01	V8	8BQ5	247A01	V13	12AF3	264A02
V3	3BZ6A	146A03	V9	3BU8	145A01	V14	5AQ5	101A04
V4	3BZ6	146A01	V10	6CN7	273A01	V15	3A3	144A01
V5	3BZ6	146A01	V11	5EA8 or 5U8	270A01 150A01	V16	21CBP4A	196T105A01
V6	6AU8	153A01				V17	2AF4A	142A01

MOTOROLA Chassis TS-556 and TS-556Y Alignment Information, Continued

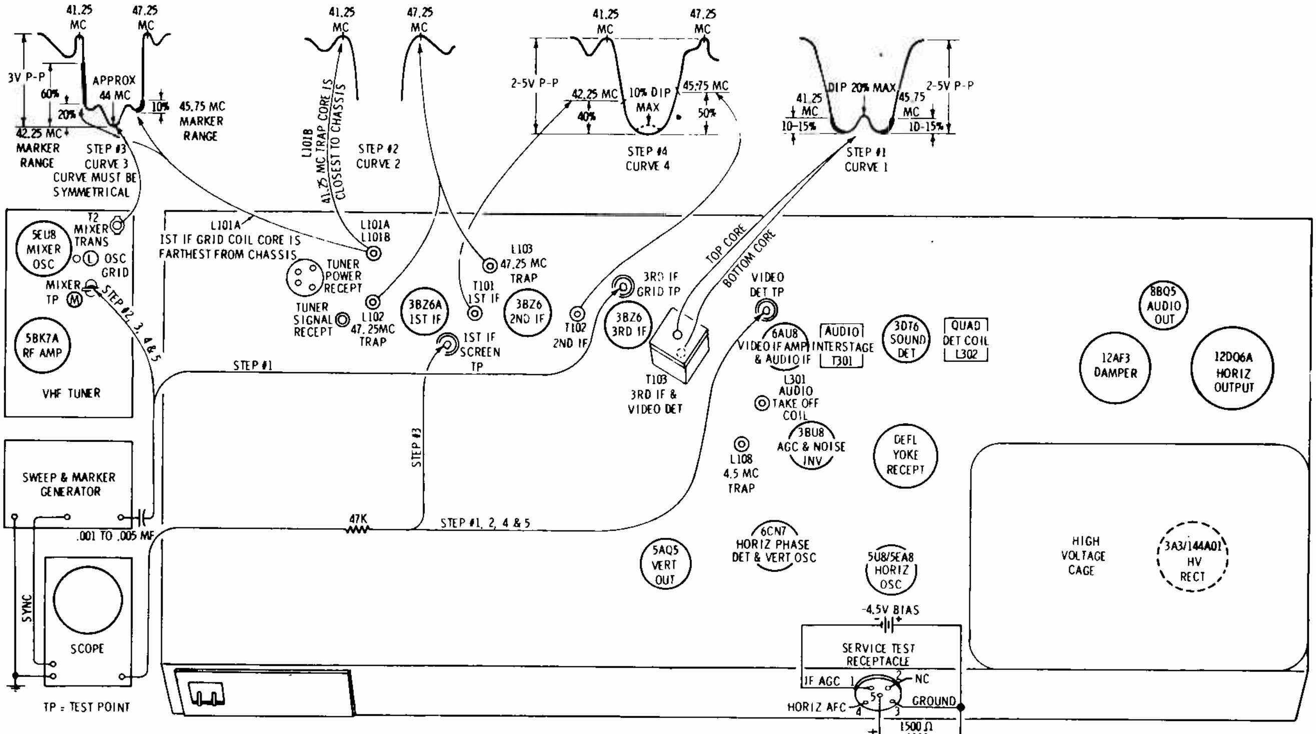


FIGURE 6. VIDEO IF & SOUND ALIGNMENT DETAIL

ALIGNMENT

VIDEO IF & SOUND ALIGNMENT

PRE-ALIGNMENT INSTRUCTIONS

Before alignment of the video IF section is attempted, it is advisable to thoroughly check the system. If alignment is started on an IF section in which a faulty component exists, successful alignment will probably be impossible and the entire procedure will have to be repeated when the real cause of the trouble is corrected. Preliminary tests of the system should include voltage and resistance measurements, routine checks for bad soldering connections, and visual inspection of the circuits for overheated components as well as for obvious wiring defects.

VIDEO IF & MIXER ALIGNMENT

Pre-Alignment Steps

1. Maintain line voltage at 120 with variac.
2. Remove the deflection yoke plug to eliminate RF interference radiation.
3. Disable oscillator by shorting point "L" located near oscillator tube V-2, to chassis. See Figure 6.
4. Apply the negative lead of a 4.5 volt bias supply to pin #1 (IF AGC) of the SERVICE TEST RECEPTACLE and the positive lead to pin #3 (chassis ground).
5. All coil slug tuning positions, in relation to chassis, are given in the procedure chart and in the separate detail of Figure 7.
6. Set channel selector on channel #13 and connect a 1500 ohm 50W voltage normalizing resistor from B+ to chassis (use pins #5 (B+) and #3 (ground) of the SERVICE TEST RECEPTACLE.
7. Set the contrast control at minimum (extreme counter-clockwise position).
8. Short across tuner input terminals.
9. Maintain 2 to 5 volts peak-to-peak at the diode load (Det TP) except when specific values are given in the procedure chart.
10. Refer to Video IF & Sound Alignment Detail for component and test point locations (Figure 6).

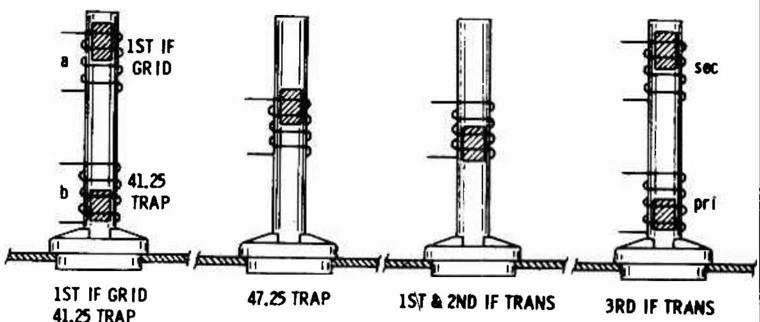


FIGURE 7. COIL CORE POSITIONS

VIDEO IF & MIXER ALIGNMENT PROCEDURE

STEP	SWEEP GEN AND MARKER	INDICATOR	ADJUST	ADJUST FOR AND/OR REMARKS
1.	To 3rd IF grid test recept thru a .001 mmf capacitor. Set sweep approx. to 44 Mc: markers as required	Scope thru a 47K ohm resistor to Video Det test recept	Both slugs of 3rd IF coil (T-103)	Equal peaks and 45.75 Mc marker as shown on curve #1. Note: Slug at crystal end can be reached by inserting tool through unobstructed slug. Tune both slugs near the ends of their respective coils. See detail for slug position

MOTOROLA Chassis TS-556 and TS-556Y Alignment Information, Continued

VIDEO IF & MIXER ALIGNMENT PROCEDURE (CONT'D)

STEP	SWEEP GEN AND MARKER	INDICATOR	ADJUST	ADJUST FOR AND/OR REMARKS
2.	To mixer TP thru .001 mf capacitor. (Terminal adjacent to mixer. See Figure 6). Set sweep to approx. 44 Mc.	Scope connection same as step #1		
	a. Set marker to 47.25 Mc b. Set marker to 41.25 Mc		a. 47.25 Mc trap (L-102) b. 41.25 Mc trap (L-101B)	a. Minimum response (tune slug at end of coil away from chassis) b. Minimum response (tune slug at end of coil toward chassis) See curve #2 for above responses.
3.	Generator connection same as step #2, except set output for 3V P-P on scope	Scope to "1st IF screen test recept or test point." Pin #6 of tube	a. Mixer trans, located on tuner (T-2)	Tune both T-2 & L-101A for curve shown in curve #3, step #3 of Figure 6.. The pri affects the center peak and the sec affects the two outside peaks.
			b. 1st IF grid coil (L-101A) slug located away from chassis	If a suck-out (trap effect) occurs, detune 1st IF transformer (T-101). Tune both coil slugs at end of coil away from chassis.
4.	Generator connection same as step #2. Reset for 2-5V P-P on scope.	Scope thru a 47K ohm resistor to Video Det test recept	1st IF trans (T-101)	Proper 42.25 Mc marker placement (tune slug at end of coil toward chassis)
			2nd IF trans (T-102)	Proper 45.75 Mc marker placement (tune slug at end of coil toward chassis) See curve #4 of Figure 6.
5.	Same as step #4.	Same as step #4.		If a tilt occurs, readjust the mixer pri coil (T-2 on tuner) and if necessary touch-up the 1st and 2nd IF trans (T-101 & T-102) for response shown in curve #4.

SOUND ALIGNMENT (Station Signal Method)

The sound system used in the TS-556 receiver consists of an audio IF amplifier stage, a quadrature grid detector and an output stage. Since this type of sound system is extremely sensitive, relatively small input signal voltage will cause grid current to flow in both the IF amplifier and the detector stages. Grid current through the tuned coils will load them down making the adjustment extremely broad and alignment impossible. For this reason, it is necessary to use a very weak signal when aligning the driver and the detector input coils. Actually, the signal should be well down into the noise level for proper tuning action.

Preliminary Steps

1. Tune in a strong TV station.
2. Adjust all controls for normal picture and sound.
3. Refer to Video IF & Mixer Alignment Detail for coil and test point locations (Figure 6).

SOUND ALIGNMENT PROCEDURE

STEP	STATION	INDICATOR	ADJUST	REMARKS
1.	Strong signal	VTVM to jct of R-306 (680K) and C-308 (.01) located on L-302 (under chassis).	L-302 (quad coil)	Maximum deflection (coarse adj.). Of two possible maximum tuning points, use that giving the largest voltage reading. **
2.	"	Listening test	"	Maximum sound with minimum distortion (fine adj.).
3.	Weak signal*	"	T-301 (interstage)	Maximum sound with minimum distortion (maintain hiss level). **
4.	"	"	L-301 (take-off)	Maximum sound with minimum distortion.

If sound is not clear at this point, repeat the above procedure as necessary.

*The signal must be weakened considerably either by disconnecting one side of the antenna lead, or connecting low value resistors across the antenna terminals until a pronounced hiss appears in the sound. The hiss level must be maintained for proper alignment.

**The purpose of the top pre-set core is to enable the adjustable core to make the tuning range required while reducing the physical length. If the pre-set core should be misadjusted by previous service work, merely re-set near top end of coil and tune for maximum.

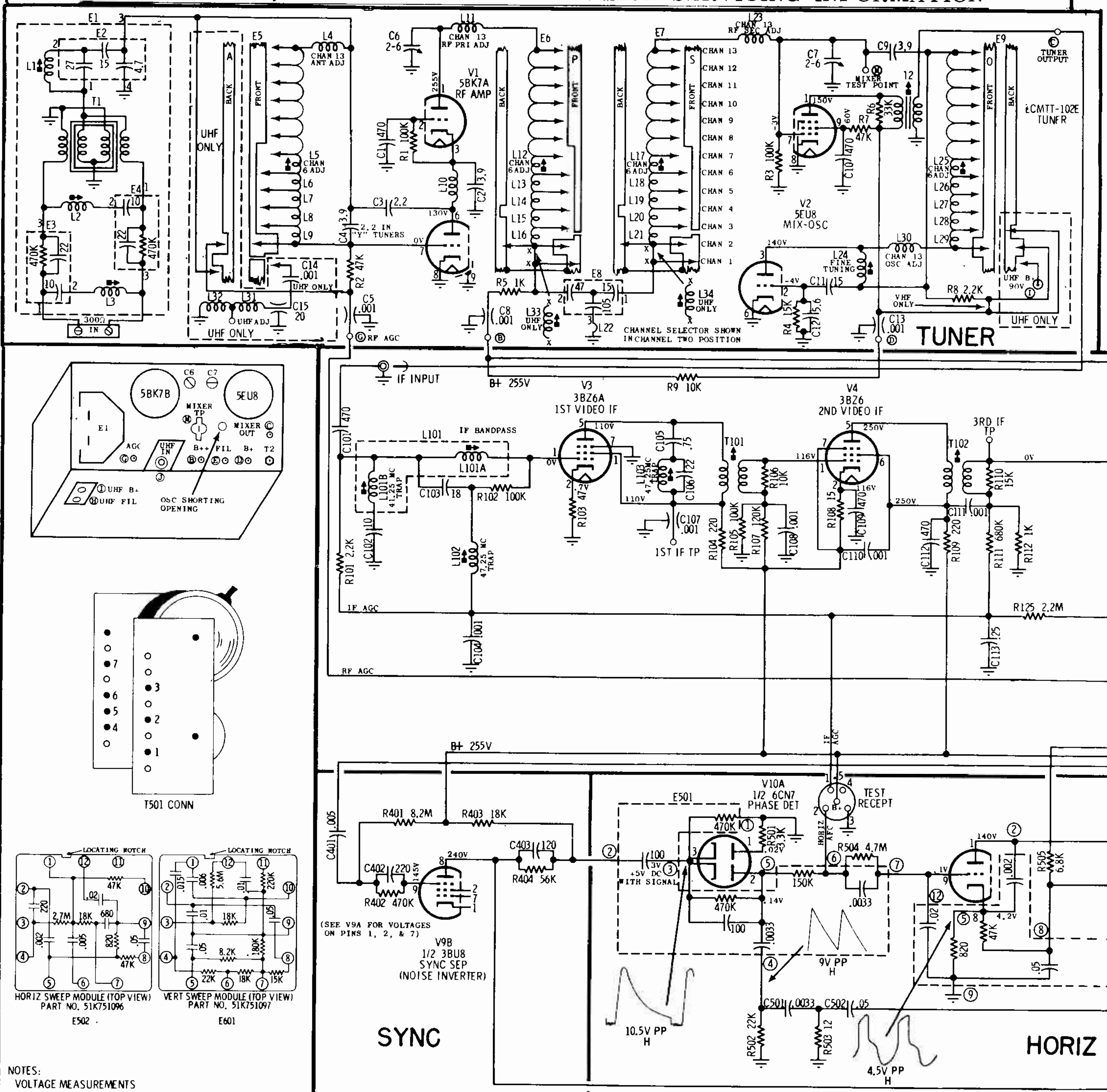
4.5 MC TRAP ADJUSTMENT

1. Carefully tune receiver to local station and advance contrast control.

2. Adjust local oscillator (with fine tuning control) to bring 4.5 Mc interference strongly into the picture.

3. ADJUST... sound trap (L-108) to find the two points of adjustment at which the sound beat is just noticeable on the picture tube screen. Rotate the core toward center of the two points. Use minimum amount of inductance (core out of coil) that will result in no apparent beat interference.

MOTOROLA Chassis TS-556 and TS-556Y Schematic Diagram



NOTES:

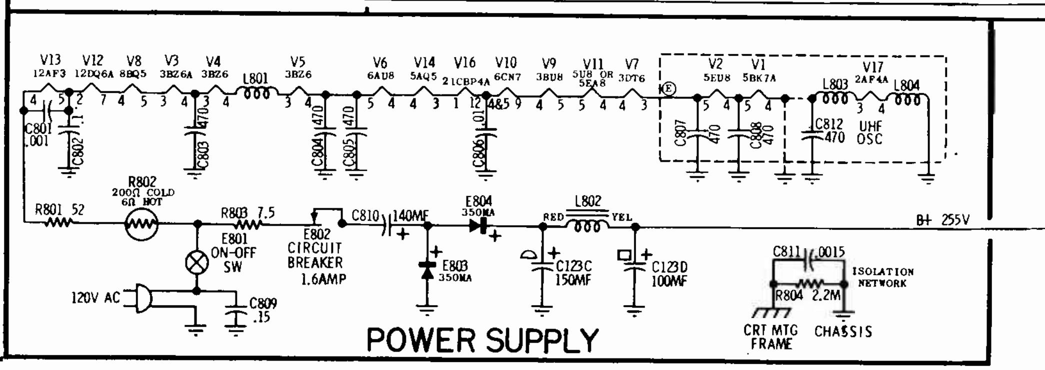
VOLTAGE MEASUREMENTS

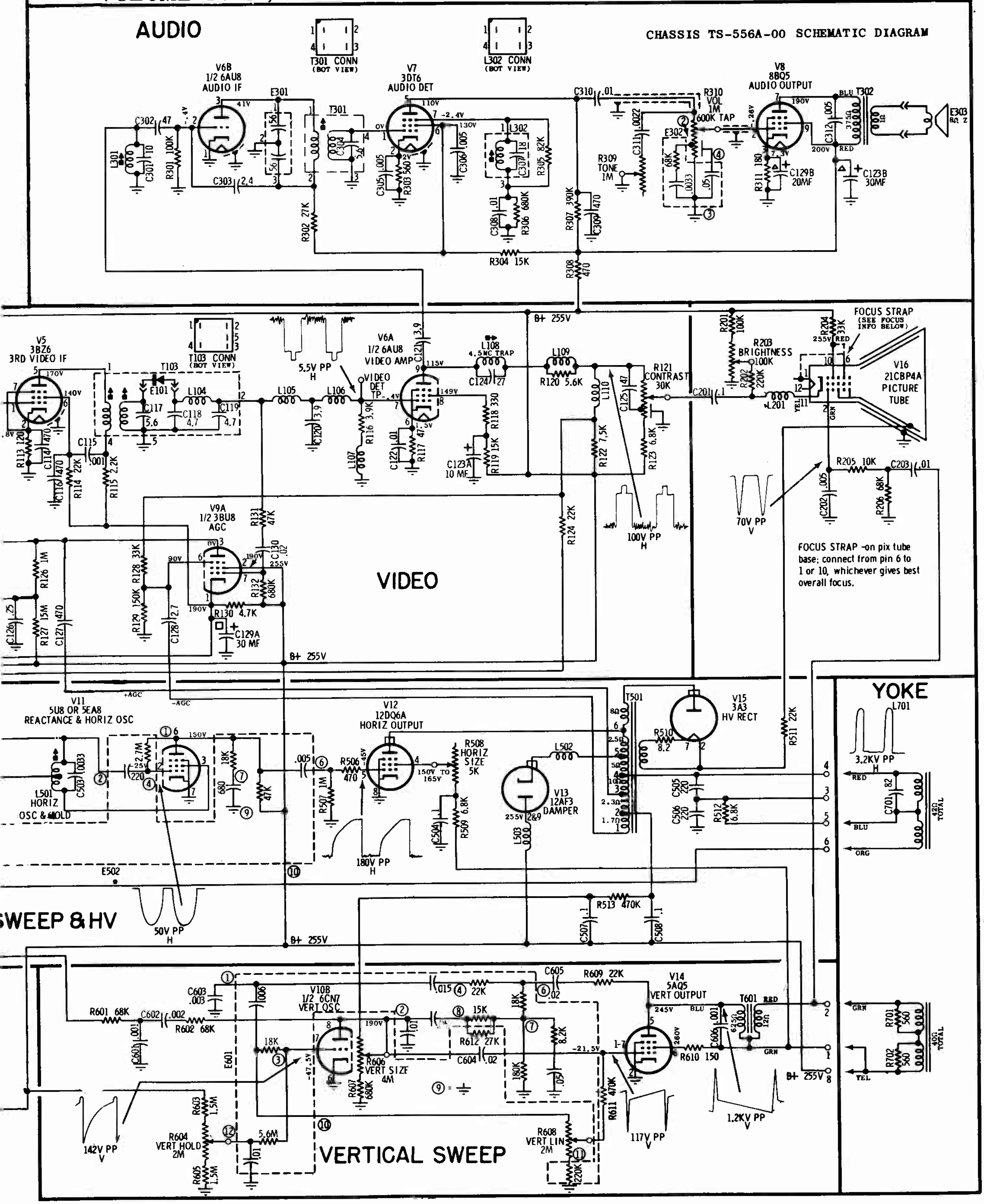
1. Taken from point indicated to chassis with a VTVM, ±10%.
2. Line voltage maintained at 120V AC.
3. Voltages indicated by an asterisk will vary with associated control settings.
4. Taken with contrast control at minimum and all other controls in normal operating position with no signal input.
5. Tuner on Channel 13 or channel of least noise with antenna terminals shorted.

WAVEFORM MEASUREMENTS

1. Taken from point indicated to chassis with a wide-band oscilloscope.
2. Oscilloscope synced near sweep rate indicated.
3. Taken with strong signal; contrast control at maximum; all other controls in normal operating position.

CAPACITORS - Unless otherwise specified, values less than one in MF; all others in MMF.




AUDIO
CHASSIS TS-556A-00 SCHEMATIC DIAGRAM
T301 CONN (BOT VIEW)
L302 CONN (BOT VIEW)
V6B 1/2 6AU8 AUDIO IF
V7 3DT6 AUDIO DET
V8 8BQ5 AUDIO OUTPUT
R310 VOL 1M 600K TAP
R309 TONE 1M
C129B 20MF
C123B 30MF
E303 8Ω Z
R304 15K
V5 3BZ6 3RD VIDEO IF
T103 CONN (BOT VIEW)
5.5V PP H
V6A 1/2 6AU8 VIDEO AMP
VIDEO DET TP
L108 4.5MC TRAP
R120 5.6K
R121 CONTRAST 30K
R203 BRIGHTNESS 100K
FOCUS STRAP (SEE FOCUS INFO BELOW)
V16 21CBP4A PICTURE TUBE
C123A 10 MF
100V PP H
70V PP V
FOCUS STRAP -on pix tube base; connect from pin 6 to 1 or 10, whichever gives best overall focus.
V9A 1/2 3BU8 AGC
VIDEO
C129A 30 MF
B+ 255V
V11 5U8 OR 5EA8 REACTANCE & HORIZ OSC
L501 HORIZ OSC & HOLD
V12 12DQ6A HORIZ OUTPUT
R508 HORIZ SIZE 5K
V15 3A3 HV RECT
V13 12AF3 DAMPER
180V PP H
YOKE
L701
3.2KV PP H
E502
SWEEP & HV
50V PP H
R513 470K
V10B 1/2 6CN7 VERT OSC
V14 5AQ5 VERT OUTPUT
R606 VERT SIZE 4M
R604 VERT HOLD 2M
R608 VERT LIN 2M
142V PP V
117V PP V
1.2KV PP V
VERTICAL SWEEP

MOTOROLA Chassis TS-556 and TS-556Y Service Information, Continued

SERVICING CHASSIS IN CABINET is easy, since entire bottom panel comes off by removal of nine (9) retaining screws in bottom panel. Voltages and waveforms can be taken, and all chassis components are accessible. Observe all electrical safety precautions when working on the exposed chassis. For tuner servicing, remove entire cabinet, as explained in following steps. (See Figure 3A.)

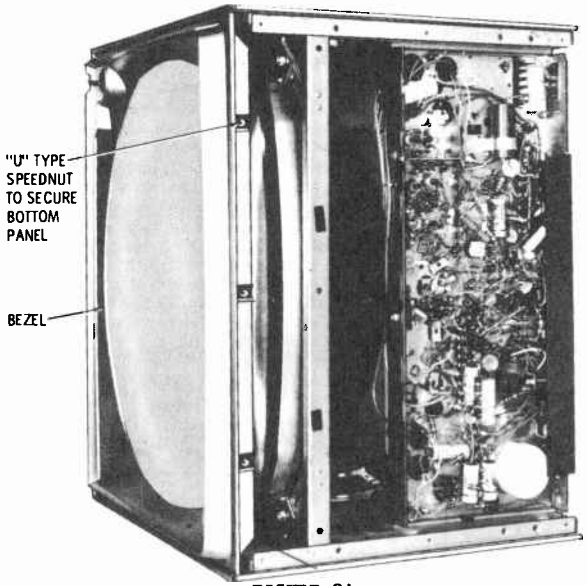


FIGURE 3A.

CLEANING OF PICTURE TUBE SCREEN and safety glass is accomplished by removal of front bezel. Screw in upper right-hand corner of cabinet locks bezel in place; After locking screw is out and the three (3) retaining screws in bottom panel removed (or the entire bottom panel removed, if desired), pull off the front knobs; then remove the bezel by pulling bottom of bezel out from cabinet and dropping bezel downward to disengage top retainers. WARNING: When bezel is replaced during re-assembly, inside locking screw must be replaced so untrained personnel cannot gain access to front of set. (See Figures 3A and 3B.)

DISASSEMBLY OF CABINET WRAPAROUND is continued by removing the two (2) screws at upper left-hand corner which holds tuner bracket to side panel. Speaker leads should be unplugged at this time. (See Figure 3B.)

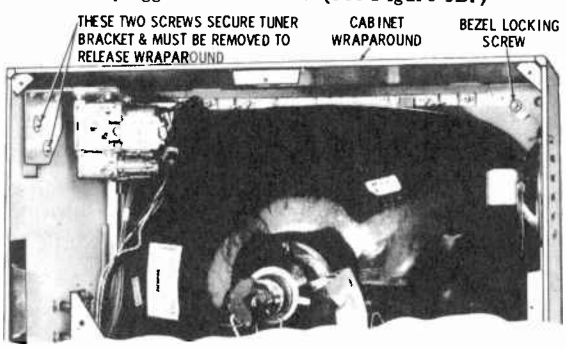


FIGURE 3B.

CABINET WRAPAROUND REMOVAL is completed by pulling off the side knobs and unscrewing eight (8) screws: three on each side of the cabinet side panels, and two at bottom of cabinet-front-frame. (When removing screws, avoid twisting cabinet, since this will bind screws making removal difficult). The cabinet wraparound can now be slipped up and off of the complete chassis assembly. (See Figure 3C.)

ASSEMBLY OF CABINET WRAPAROUND illustrates how the cabinet side-panels are held to the cabinet top-panel by five (5) screws in each inside corner channel: These screws

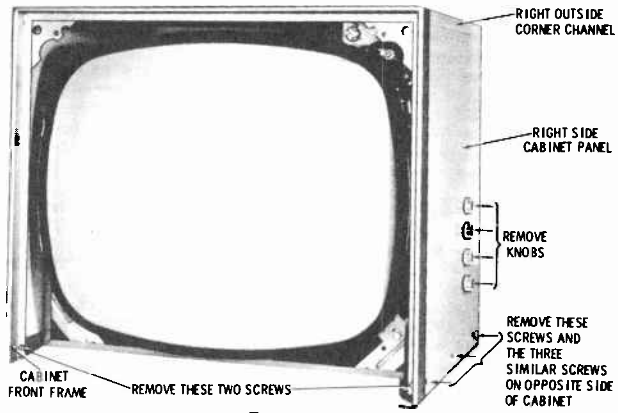


FIGURE 3C.

tighten into the outside corner channels shown in Figure 3C, which match the cabinet color. The cabinet-front-frame is secured to the corner channels by four (4) screws: two in each corner channel. (See Figure 3D.)

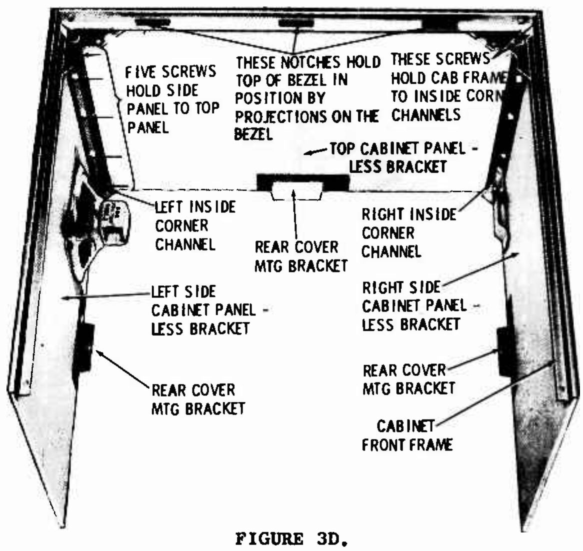


FIGURE 3D.

PICTURE TUBE REPLACEMENT

1. Remove entire cabinet wraparound, as illustrated in Figures 3A, 3B, and 3C, then disconnect and remove the deflection yoke, second anode connector, and the picture tube socket. Loosen the picture tube mounting bolts at upper right and left-hand corners of the mounting strap, and carefully remove the picture tube.

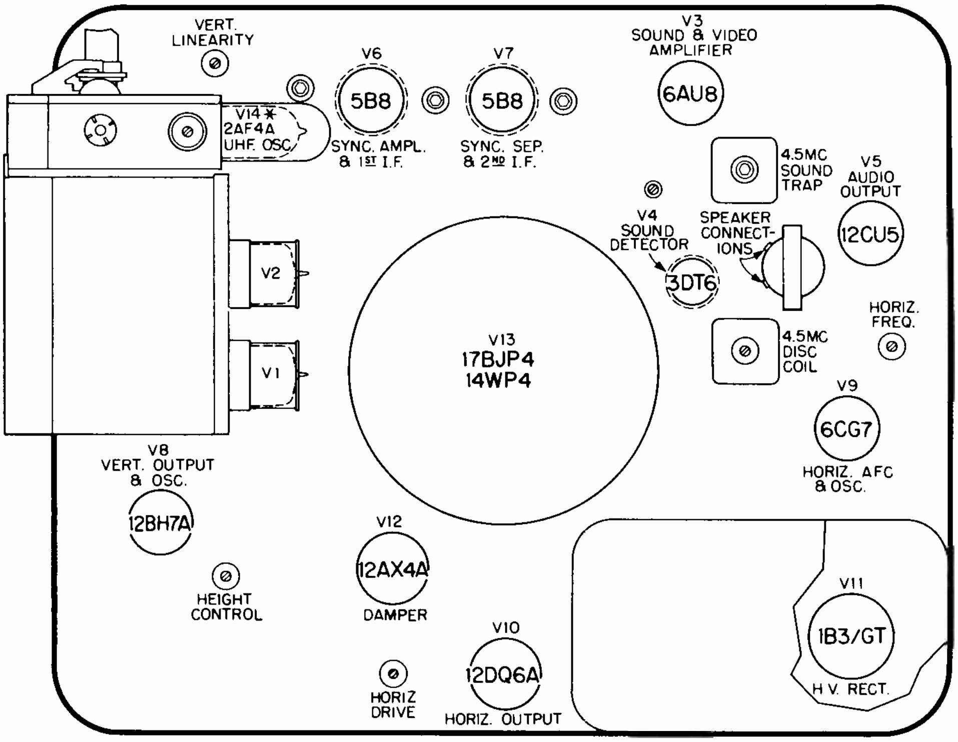
2. Working with the new replacement picture tube, place cloth tape (Motorola Part No. 11M121682), of approximately the same size, and at the same points as that on the original picture tube. Stick two pieces of gummed paper (preferably gummed on both sides), on the new picture tube neck, at the flare, to keep the yoke from slipping about.

3. Replace picture tube into correct position: Tighten mounting bolts; replace the deflection yoke, picture tube socket, and the second-anode connector. Connect the deflection yoke to the chassis receptacle.

4. Apply power with service line cord, and check receiver operation. Adjust the yoke position for proper operation, and adjust the centering device.

Before returning a serviced receiver (of any type) to the owner, the service technician must thoroughly test the unit to be certain that it is completely safe to operate without danger of electrical shock.

OLYMPIC RADIO & TELEVISION



CHASSIS	TUNER	V1	FUNCTION	V2	FUNTION
GT,GU	VHF	2CY5	R.F.	5AT8	MIXER
GTU,GUU	VHF/UHF	5U8	MIXER	5BK7A	R.F.

*USED IN VHF/UHF TUNER ONLY.

TUBE LAYOUT

MODELS

GT CHASSIS
14TT91
14TT92

GTU CHASSIS
14TT91U
14TT92U

GU CHASSIS
17TU93
17TU94
17KU98

GUU CHASSIS
17TU93U
17TU94U
17KU98U

DEFLECTION YOKE ADJUSTMENT

If the lines of the raster are not horizontal, loosen clamp on collar of yoke and rotate the deflection yoke until the condition is corrected. If neck shadow is evident or the corners of the raster are dark, move the deflection yoke forward as far as possible and retighten the wing screw.

ADJUSTMENT OF HORIZONTAL OSCILLATOR

(1) Allow set to warm-up for two minutes.
(2) Select channel with suitable picture.
(3) Short sync to ground at junction of C24 and C25.
(4) Short the terminals of the oscillator coil L12.
(5) Vary the Horizontal Hold Control R69 until the picture is in frequency.
(6) Remove short from oscillator coil L12 and adjust coil until the picture is in frequency.
(7) Remove short from sync.

Caution: It is important that the picture be centered in the mask properly with the Horizontal Hold Control in the approximate mid-position, otherwise the set user may attempt to center the picture by means of the hold control which may then be on "edge" and impulse noise or change of camera will cause the picture to fall out of synchronization. Excessive drift of the horizontal oscillator circuit may be caused by a weak or defective 6CG7 tube. Some manufacturers types of 6CG7 may perform better than others in the horizontal oscillator socket.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENTS

For best results height and vertical linearity adjustments should be made on a transmitted test pattern, although satisfactory results can be obtained from an active picture.

Both controls affect height AND linearity of the picture and must therefore be adjusted simultaneously. The Vertical Height Control has a tendency to affect the bottom of the picture more than the top and the Vertical Linearity Control has the opposite tendency.

Note: It is advisable that both height and width of the picture be adjusted to a size slightly larger than the mask opening, so that during periods of low-line voltage adequate picture size is maintained.

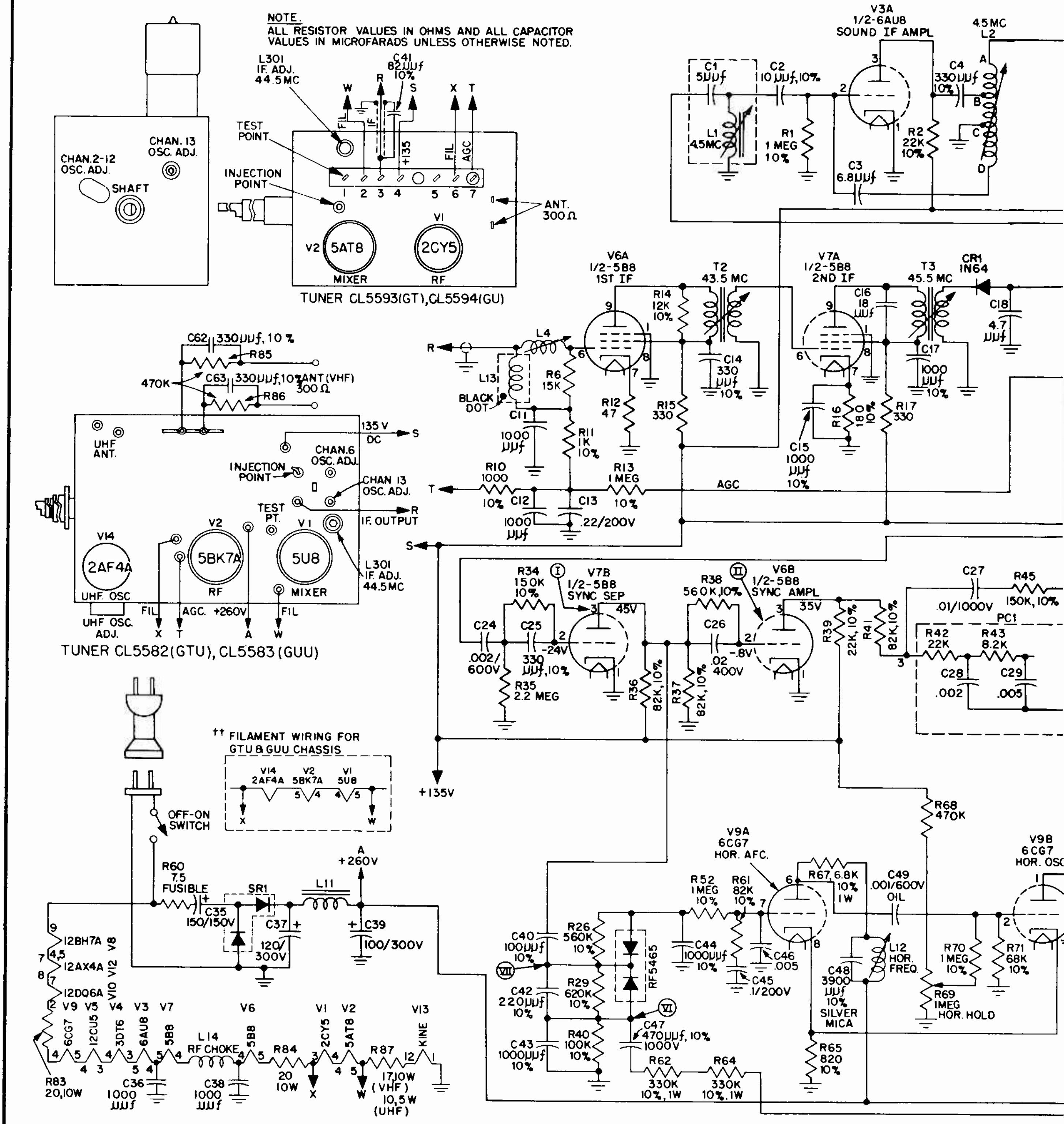
HORIZONTAL DRIVE (WIDTH) ADJUSTMENT

The horizontal drive trimmer C53 should be screwed in tight (clockwise) and then backed off (counter-clockwise) until horizontal drive bars appear. Then turn the trimmer clockwise again, until the drive bars just disappear.

Note: In some sets horizontal drive bars will not appear regardless of horizontal drive trimmer adjustment. In these sets the trimmer should be set for proper width.

Important: The horizontal oscillator frequency must be checked for proper range of horizontal control after every adjustment of the horizontal drive C53. Adjustment of C53 usually requires resetting of the horizontal frequency adjustment coil L12.

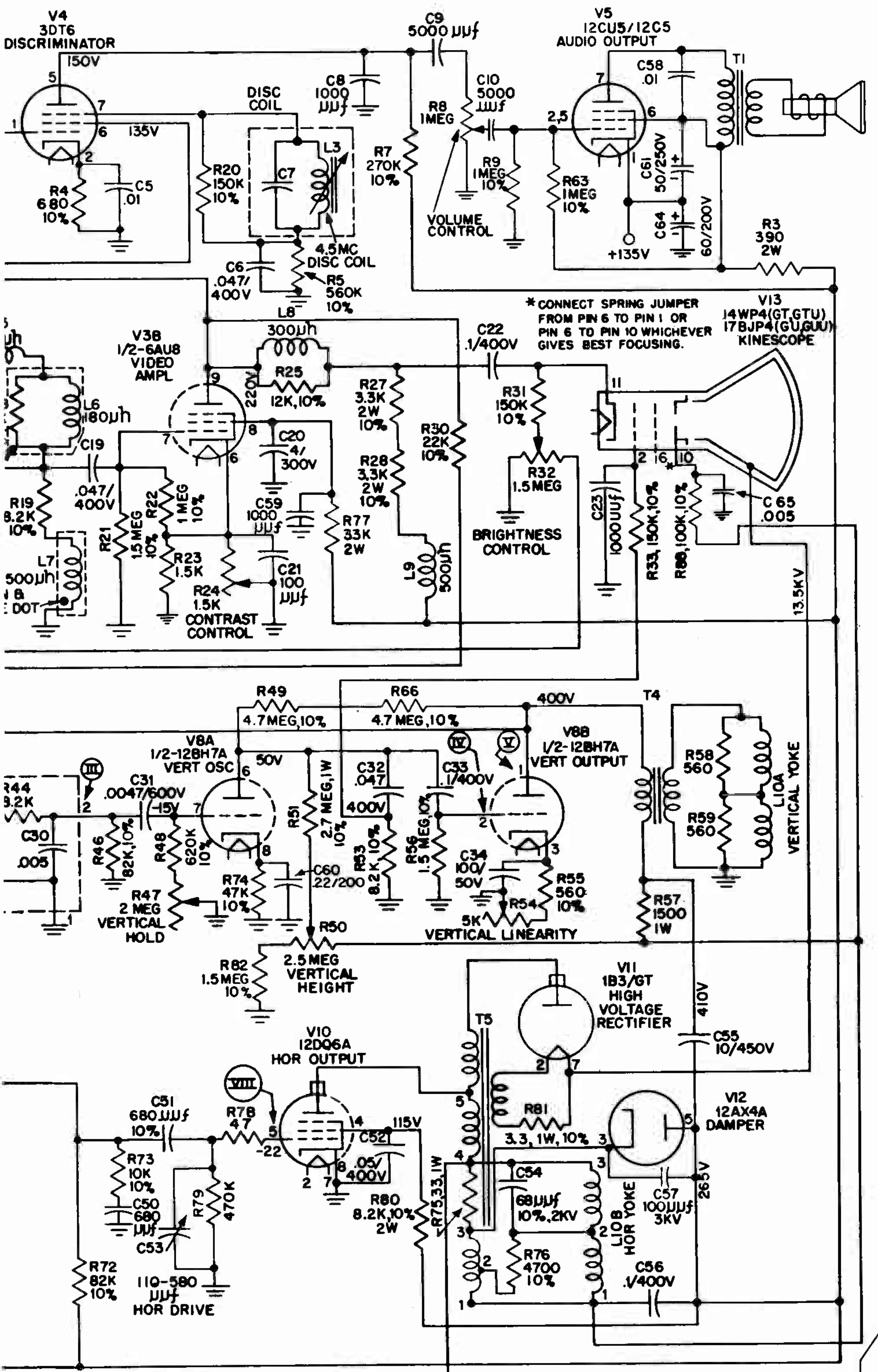
OLYMPIC GT, GU (VHF) & GTU, GUU (VHF/UHF) CHASSIS

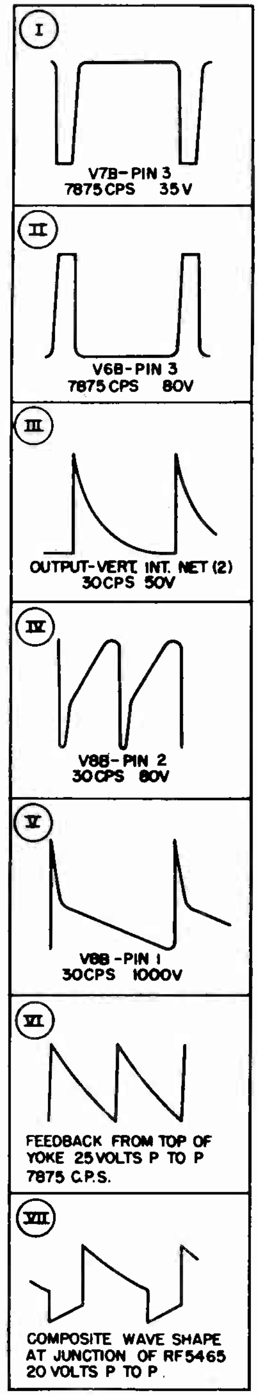


CENTERING ADJUSTMENT

The centering magnets are mounted on the back cover of the deflection yoke. (See Figure 5.) Each ring has a small tab and adjustment is accomplished by rotating these tabs. The tab which extends horizontally will affect the vertical position of the picture and the tab which extends vertically will affect the horizontal position of the picture. The two magnetic rings have their maximum effect when they are farthest apart but, to avoid neck shadow, should never be more than 45° apart.

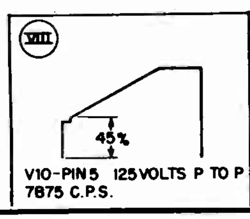
OLYMPIC GT, GTU, GU, GUU Chassis Schematic Diagram, Continued





"B" VOLTAGE POWER SUPPLY

The "B" voltage in these chassis is provided by a half wave selenium rectifier doubler circuit. The B+ voltage is 260 volts. The tube filaments are series connected. If the filament of any one tube opens, the entire filament string will be open; hence, all tubes will be inoperative.



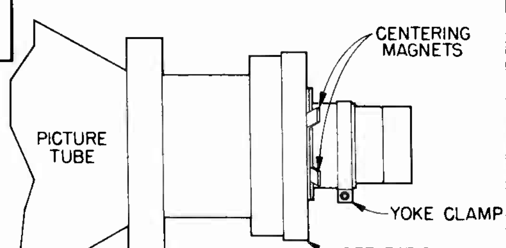
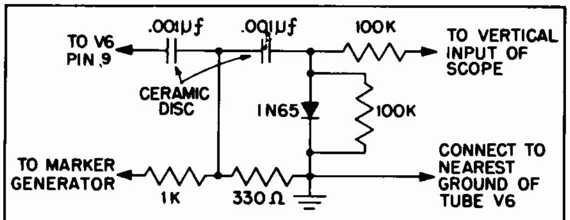


FIG. 5

OLYMPIC GT, GTU, GU, GUU Chassis, Alignment Information, Continued

BUILT-IN ANTENNA

The "rabbit ear" antenna is normally connected to the antenna posts and must be disconnected when attaching the outside aerial. When set is operating with "rabbit ear" antenna, reception can sometimes be improved by rotating the antenna.



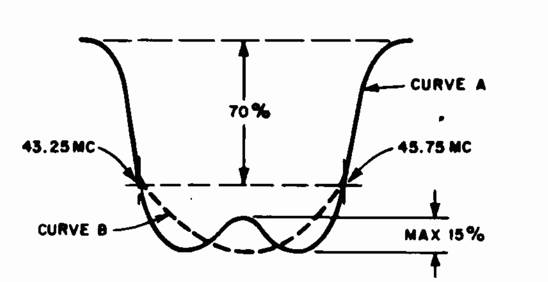
CRYSTAL DETECTOR

FIG. 6

TO REMOVE CHASSIS FROM CABINET

(1) Disconnect antenna from antenna terminals at rear of cabinet.
(2) Remove cabinet masonite back.
(3) Remove both leads from audio output transformer.
(4) Remove two mounting bolts from underside of cabinet and one from the top of the handle.

CURVE MAY APPEAR AS SHOWN IN CURVE A OR CURVE B



OVERCOUPLED CURVE

FIG. 7

PIX IF COIL AND TRANSFORMER ADJUSTMENT

Set the tuner to Channel 12 when not operated by a local station; if 12 is a local station, use Channel 11 or 13. Turn on power switch and proceed as follows:

Insert a 100,000 ohm ½ watt resistor in series with the "hot lead" of the electronic voltmeter and connect it to the junction of L6 and C19. Set meter switch to the lowest negative scale. Connect the ground lead of meter to chassis.

Connect hot lead of the RF signal generator to injection point of tuner (see circuit diagram) through a 10 uuf condenser.

Adjust the following slugs for maximum output as indicated on the meter at frequencies and sequence indicated below:

L301	44.5 MC
L4	44.5 MC
T2	43.5 MC
T3	45.5 MC

Remove hot lead of RF signal generator leaving the 10 uuf condenser and the 100K resistor in place.

Set the sweep generator to approximately 45 MC. Set the Band Width to the proper setting.

Inject output of sweep generator at the injection point on tuner through the 10 uuf condenser.

Connect crystal circuit as shown in Figure 6 to pin 9 of V6. Connect a 3 volt bias battery into position with plus side to ground and minus side to junction of R11 and C11 (this point is AGC bias voltage) for all alignment procedures. Connect the marker generator to point illustrated in Figure 6 and set it to frequencies of 43.25 MC and 45.75 MC and connect the scope as shown in Figure 6.

Curve shown on scope should be similar to response curve shown in Figure 7.

If markers do not appear as shown in Figure 7, adjust coils L301 and L4 for correct positioning of markers ±10%. (Set tuner to channel that gives best response curve without interference from a station.)

After completion of preceding procedure, remove crystal circuit. The sweep generator still remains at injection point with the 10 uuf condenser. Connect a scope to the 100,000 ohm resistor which was connected at L6 and C19.

Inject the following marker frequencies into the tuner by coupling the marker generator to the half shield of the mixer tube.

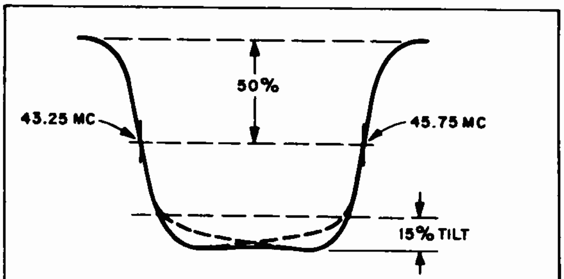
43.25 MC	Marker
45.75 MC	Picture Carrier Marker

After alignment, if the wave shape is not the same as shown in Figure 8, allowing 15% tilt, retouch coils L301, L4, T2 and T3.

SOUND DISCRIMINATOR (4.5 MC) ADJUSTMENT

Because the transmitted sound signal from a TV station is probably the most accurate available for frequency, it is recommended that a working signal be used for sound alignment. The set should be turned on, allowed to warm up for five to ten minutes and then tuned to an extremely weak signal. A vacuum tube voltmeter should be connected to pin 3 of V3A through a crystal detector probe and the meter set to the —3-volt scale. The Video Trap L1 and Sound IF L2 should be tuned for maximum deflection of the meter (not to exceed 1 volt).

The discriminator coil L3 should be adjusted for maximum audio output, using the transmitted signal from a TV station. Use an output meter connected to the voice coil terminals, or adjust by ear since the coil slug must be set carefully to eliminate buzz. L3 must be adjusted for maximum audio output and elimination of buzz.



STANDARD RESPONSE

FIG. 8

Olympic

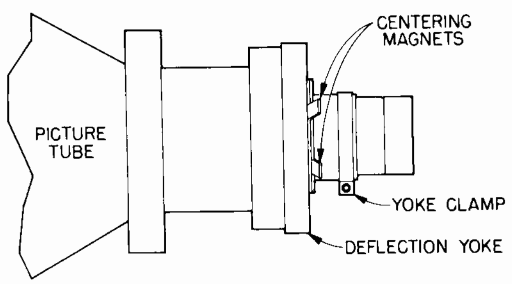
MODELS

GD CHASSIS	GDU CHASSIS	GH CHASSIS
TD102	TD102U	CH402
CD108	CD108U	KH406
CD109	CD109U	KH407
CD110	CD110U	
KD118	KD118U	
KD119	KD119U	**GHU CHASSIS**
KD120	KD120U	CH402U
KD188	KD188U	KH406U
PKD118	PKD118U	KH407U
PKD119	PKD119U	

TO REMOVE CHASSIS FROM CABINET

Remove:
(1) Line cord from power outlet.
(2) Antenna lead-in from terminal posts.
(3) Masonite back.
(4) Speaker plug from rear of chassis.
(5) Knobs from front of cabinet.
(6) Deflection yoke plug from socket.
(7) High voltage lead from picture tube.
(8) Three mounting screws from bottom and one from upper rear side of chassis.

In sliding chassis out of cabinet, be careful that it does not strike against the kinescope tube.



ADJUSTMENT OF HORIZONTAL OSCILLATOR

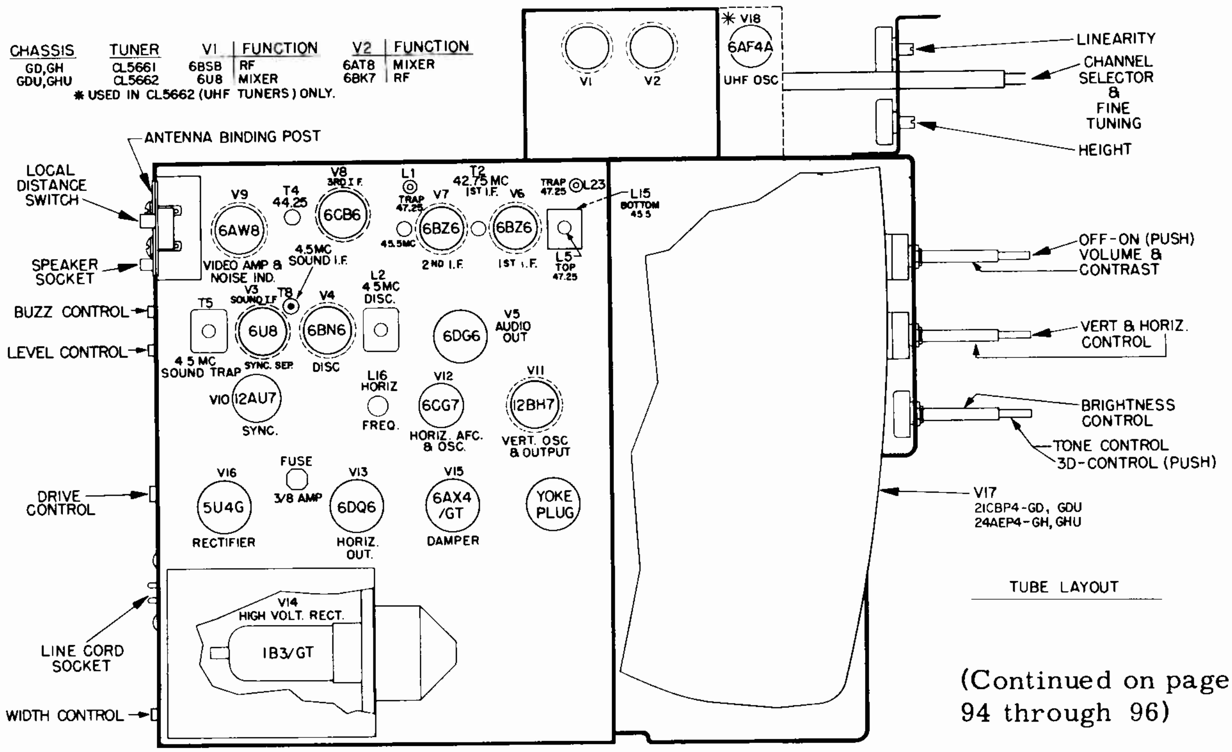
(1) Allow set to warm-up for 2 minutes.
(2) Select channel with suitable picture.
(3) Short sync to ground at junction of C50 and C53.
(4) Short the terminals of the oscillator coil L16.
(5) Vary the Horizontal Hold Control R83 until the picture is in frequency.
(6) Remove short from oscillator coil L16 and adjust coil until the picture is in frequency.
(7) Remove short from C50 and C53.

HORIZONTAL DRIVE ADJUSTMENT

The Horizontal Drive Trimmer C67 should be screwed in tight (clockwise) and then backed off (counterclockwise) until horizontal drive bars appear. Then turn the trimmer clockwise again until the drive bars just disappear.

Note: In some sets horizontal drive bars will not appear, regardless of horizontal drive trimmer adjustment. In these sets, the trimmer should be set for proper width.

Important: The horizontal oscillator frequency must be checked for proper range of horizontal control after every adjustment of the horizontal drive (C67).



TUBE LAYOUT

(Continued on pages 94 through 96)

OLYMPIC GD, GDU, GH, GHU Chassis, Service Information, Continued

PIX IF TRANSFORMER & ADJACENT SOUND TRAP ALIGNMENT

Insert a 100,000 ohm ½ watt resistor in series with the "Hot Lead" of the electronic voltmeter and connect it to the junction of L7 and C26. Set meter switch to the lowest negative scale. Connect the ground lead of meter to chassis.

Connect an RF signal generator through a 10 uuf condenser to the injection point of the tuner. (See circuit diagram.) Before aligning, adjust slugs in coils L5 and L15 so that they are at their maximum counterclockwise position, at the top and bottom of the can, respectively.

Adjust the following coils for maximum output: L301, L15, T2, T3 and T4. Adjust L1, L5 and L23 for minimum dip, but feed in a strong enough signal so that a definite dip is indicated.

Remove the signal generator and VTVM.

Connect the sweep generator through a 10 uuf condenser to the injection point on the tuner. Set the sweep generator for IF/VF output, with IF/Video Control at approximately 45 MC and the Band Width at the proper setting.

Connect a battery in place with its positive terminal to chassis and the negative terminal to the junction of R20 and L4 (this is AGC bias).

Connect a crystal detector circuit as illustrated in Figure 6 to the plate, pin 5, of the 1st IF Amplifier V6, a 6BZ6 tube, and then connect the scope and marker generator to the points illustrated in Figure 6.

All coil slugs requiring alignment are available from the underside of the chassis, except for L5 and L23 which are on the top side.

Set the Level Control to its maximum counterclockwise (off) position.

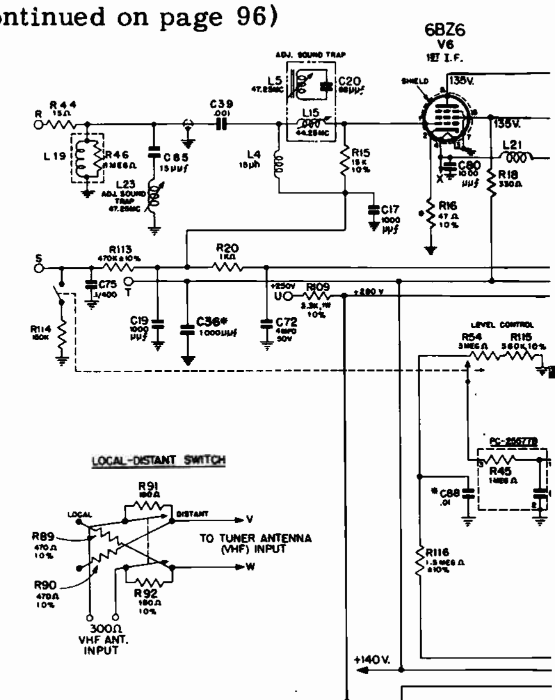
Observe the waveshape on the scope. Inject markers of 47.25 MC (adjacent sound trap), 42.5 MC (marker) and 45.75 MC (picture carrier marker). They should appear as illustrated on waveshape shown in Figure 7. If they do not, readjust coils L301 and L15 until markers fall into approximate position. The tuner should be set to a channel which does not give interference from a station.

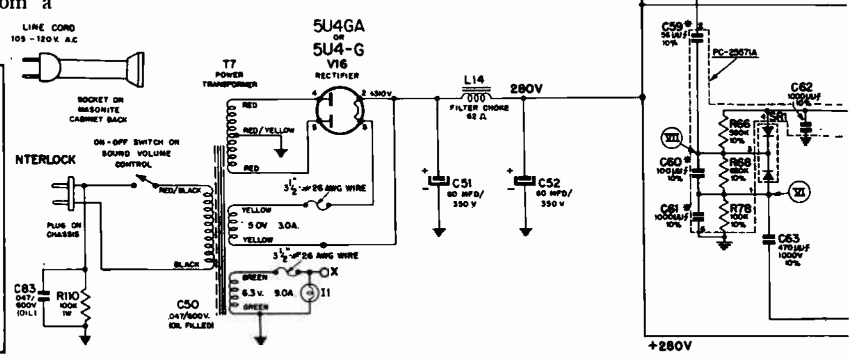
After disconnecting the test equipment and crystal detector circuit, connect the scope through a 100K resistor to the junction of L7 nd C26. Inject the following markers into the set by connecting the output of the marker generator a half shield of the mixer tube on the tuner:

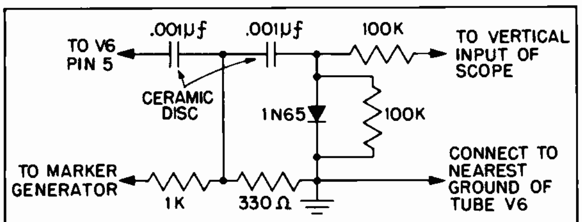
42.5 MC..............Marker
45.75 MC..............Picture carrier marker
47.25 MC..............Adjacent sound traps L1, L5, L23

If after alignment the waveshape does not appear as in Figure 8, within the limits of curves A and B, retouch coils T2, T3 and T4, if necessary. (Do not retouch

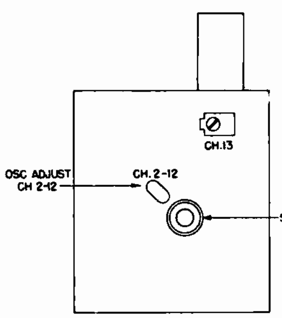
(Continued on page 96)



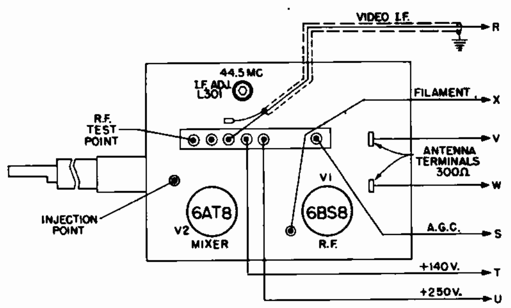




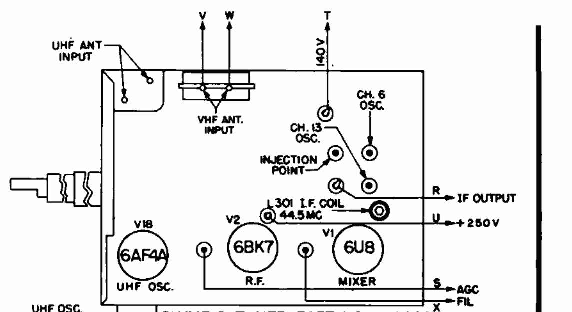
CRYSTAL DETECTOR
FIG. 6



FRONT VIEW OF TUNER

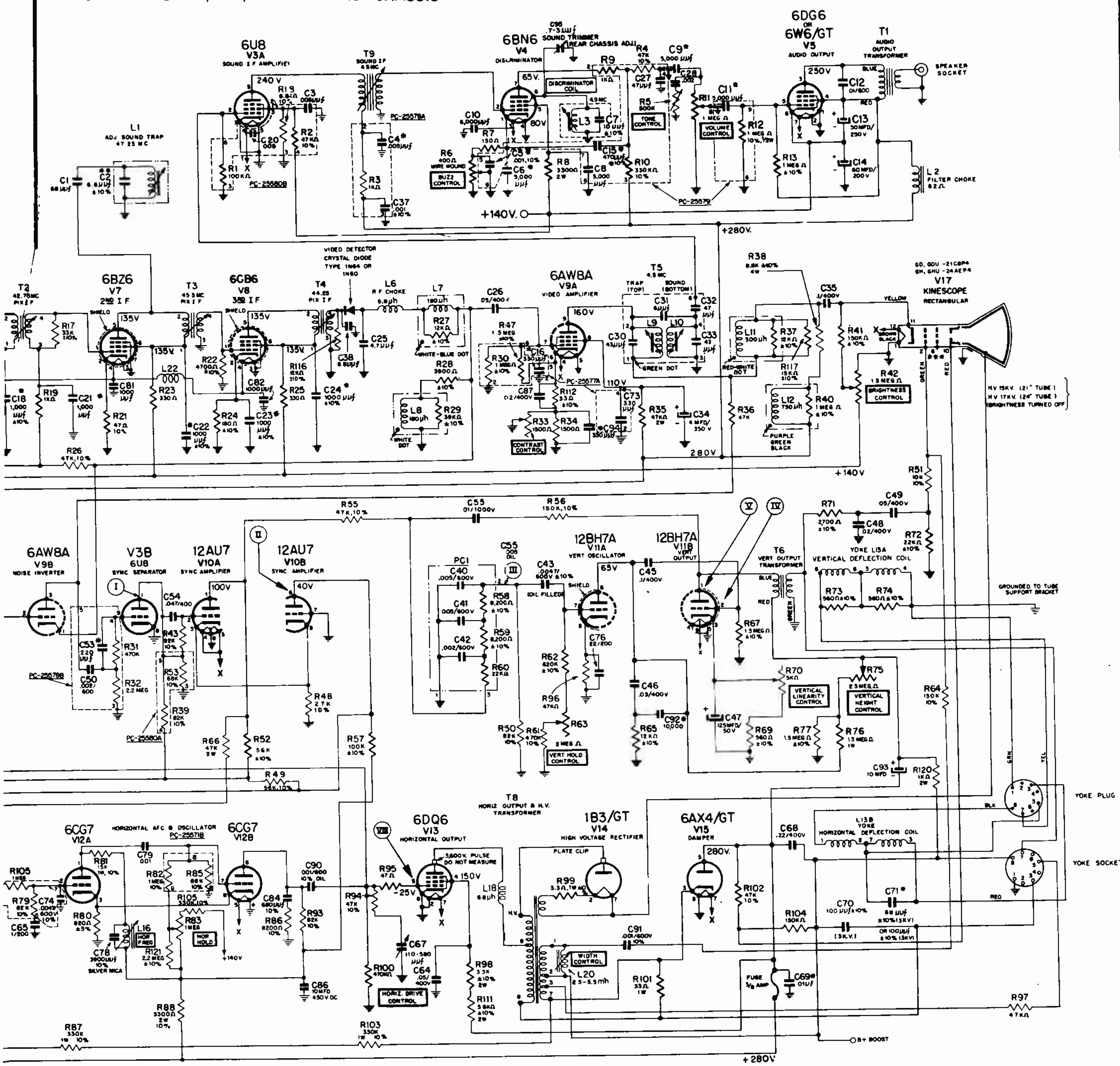


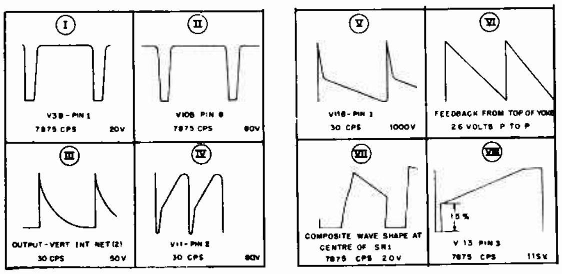
OLYMPIC TUNER PART NO. CL 5661

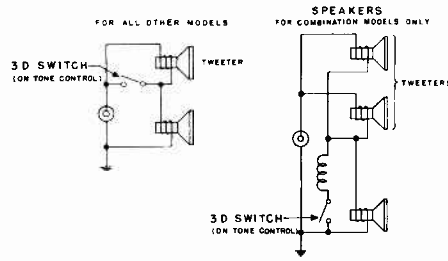


OLYMPIC TUNER PART NO. CL5662

OLYMPIC GD, GH, GDU & GHU CHASSIS







NOTES.

1. ALL RESISTORS ±20% TOLERANCE, 1/2 WATT UNLESS OTHERWISE SPECIFIED
2. ALL MICA AND CERAMIC CONDENSERS ±20% TOLERANCE, UNLESS OTHERWISE SPECIFIED
3. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND CHASSIS, USING AN ELECTRONIC VOLTMETER. ALL VOLTAGE READINGS ±15%, MEASURED WITH AN INPUT VOLTAGE OF 117 VOLTS, 60 CYCLES, A C WITH INCOMING SIGNAL AND WITH CONTRAST CONTROL SET TO PRODUCE 50 VOLTS PEAK TO PEAK AT KINESCOPE
4. VOLTAGE MEASUREMENTS FOR THE CG, CH CHASSIS ARE APPROXIMATELY 10% HIGHER THAN SHOWN ON THE SCHEMATIC DIAGRAM, EXCEPT FOR THE +140 VOLT SUPPLY

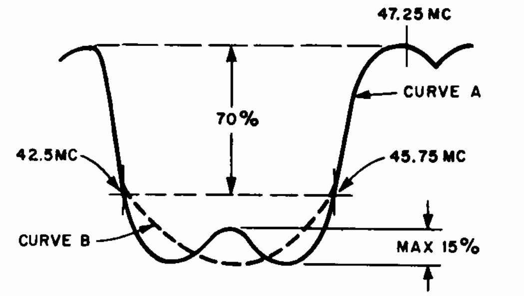
* 5 CERAMIC CONDENSERS, DISC TYPE

** 6 THE VALUES OF THESE CAPACITORS (C2, C20) IN SOME INSTANCES MAY BE 33μμf, 47μμf, OR 68μμf. REPLACE WITH IDENTICAL PART

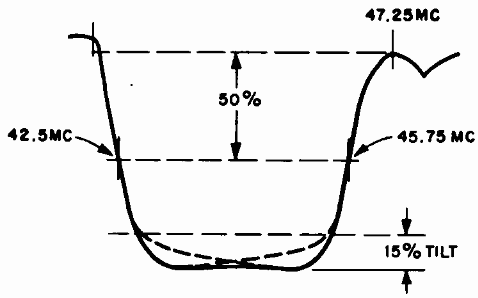
7. LEVEL-SWITCH CONTROL SHOWN IN LOCAL POSITION

**** 8. KINESCOPE FOCUSING: CONNECT SPRING JUMPER FROM PIN 6 TO PIN 1 OR FROM PIN 6 TO PIN 10, WHICHEVER GIVES BEST FOCUS.

OLYMPIC GD, GDU, GH, GHU Chassis, Alignment Information, Continued



OVERCOUPLED CURVE
FIG. 7



STANDARD RESPONSE
FIG. 8

L301, L1, L5, L15 and L23 after they have been aligned.)

The 6DQ6 (V13) and 6CG7 (V12) tubes should be removed when aligning the set.

4.5 MC TRAP ALIGNMENT

Connect voltmeter lead to the diode crystal rectifier as shown in Figure 9. Connect diode crystal rectifier between Cathode Ray tube cathode lead (yellow wire) and chassis ground. Signal generator is connected at junction of L7 and C26. Set the contrast Picture Control at maximum and voltmeter to 3-volt scale (negative). Remove the 6CB6 tube (V8) from socket. Use maximum output of generator at 4.5 MC. Adjust video trap L9 for minimum reading on meter.

When it is necessary to retouch this trap in the field, proper adjustment can be made by using the local station signal and turning the Fine Tuning Control to bring fine herringbone sound beat into the picture. The 4.5 MC trap (L9) should then be adjusted to minimize this beat interference.

SOUND IF AND DISCRIMINATOR (4.5 MC) ADJUSTMENT

Because the transmitted sound signal from a TV station is probably the most accurate available for frequency, it is recommended that a working signal be used for sound alignment. The set should be connected to an antenna, turned on, allowed to warm up for about five to ten minutes and then tuned for the best picture. A vacuum tube voltmeter should be connected to pin 2 of V3A through a 1 megohm isolating resistor and the meter set to the —30-volt scale. The bottom of the 4.5 MC sound IF transformer (L10) should be tuned for maximum deflection of the meter.

The discriminator coil (L3) should be adjusted for maximum audio output, with the Buzz Control set to

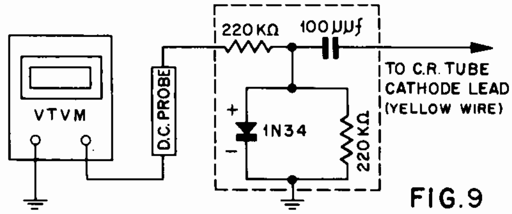


FIG. 9

VOLTMETER AND CRYSTAL DIODE CONNECTIONS

mid-range, using the transmitted signal from a TV station. Use an output meter connected to the voice coil terminals, or adjust by ear since the coil slug must be set carefully to eliminate Buzz. Both the Buzz Control R6 and L3 coil must be adjusted for maximum audio output and elimination of Buzz.

TUNER ALIGNMENT

Note: Before making a complete tuner adjustment, it is essential that all the IF and sound discriminator circuits be aligned to their proper frequencies as described in the preceding paragraphs. WHEN CHANGING THE CONVERTER TUBE IT IS NECESSARY TO REALIGN THE OSCILLATOR ADJUSTMENT ON ALL CHANNELS WITH THE MIXER TUBE SHIELD IN PLACE.

This tuner has been carefully checked and aligned at the factory to give best possible performance. Do not tamper with adjustments.

The following instructions are given for your information or in the event that adjustment may be necessary after tubes or parts are changed.

A. Oscillator Alignment Check.
   (1) Turn station selector to Channel 13.
   (2) Connect signal generator (adjusted to correct Channel 13 oscillator frequency of 237.5 MC) to the antenna terminals.
   (3) Connect oscilloscope to r-f test point through 10,000 ohms.
   (4) Set the Fine Tuning Control in center of its range. Check Channel 13 for zero beat on scope.
   (5) Repeat steps (1) through (4) using Channel 6 with a frequency of 103.5 MC.

B. Oscillator Alignment.
   If necessary to make oscillator adjustments, perform the following steps:
   (1) Align high channels for correct frequency with the Channel 13 oscillator screw. A nonmetallic screwdriver should be used.
   (2) Align low channels for correct frequency with the Channel 6 oscillator screw.
   (3) Alignment of Channel 13 and Channel 6 oscillators adjusts all the channels. Do not back up the screws more than eight turns from tight. At this point the electrical effect has ceased. Further back-up will cause the screws to drop out.

Note: Cover and tube shields should be on. Have rated supply voltages fed to tuner. Allow a three minute warm-up. Clockwise rotation of screws increases frequency.

Rated Voltages:	"B" supply	+140 volts
	Heater supply	6.3 volts
	Grid bias	—3.0 volts
(When necessary)	B++	+250 volts

Olympic

MODELS

GA CHASSIS	GB CHASSIS	GF CHASSIS
TA100	TB101	CF400
CA105	CB106	CF401
KA115	CB107	KF405
PKA115	KB116	
ICA96	PKB116	
	ICB97	

GAU CHASSIS	GBU CHASSIS	GFU CHASSIS
TA100U	TB101U	CF400U
CA105U	CB106U	CF401U
KA115U	CB107U	KF405U
PKA115U	KB116U	
ICA96U	PKB116U	
	ICB97U	

ADJUSTMENT OF HORIZONTAL OSCILLATOR

(1) Allow set to warm-up for 2 minutes.
(2) Select channel with suitable picture.
(3) Short sync to ground at junction of C27 and C28.
(4) Short the terminals of the oscillator coil L16.
(5) Vary the Horizontal Hold Control R76 until the picture is in frequency.
(6) Remove short from oscillator coil L16 and adjust coil until the picture is in frequency.
(7) Remove short from C27 and C28.

Caution: It is important that the picture be centered in the mask properly with the Horizontal Hold Control approximately in the mid-position; otherwise, the set user may attempt to center the picture by means of the hold control, which may then be on "edge" and impulse noise or change of camera will cause the picture to fall out of synchronization. Excessive drift of the horizontal oscillator circuit may be caused by a weak or defective 6CG7 tube. Some manufacturers types of 6CG7 may perform better than others in the horizontal oscillator socket.

VERTICAL HEIGHT AND LINEARITY ADJUSTMENT

For best results, height and vertical linearity adjustments should be made on a transmitted test pattern, although satisfactory results can be obtained from an active picture.

Both controls affect height AND linearity of the picture and must therefore be adjusted simultaneously. The Vertical Height Control has a tendency to affect the bottom of the picture more than the top and the Vertical Linearity Control has the opposite tendency.

HORIZONTAL DRIVE (WIDTH) ADJUSTMENT

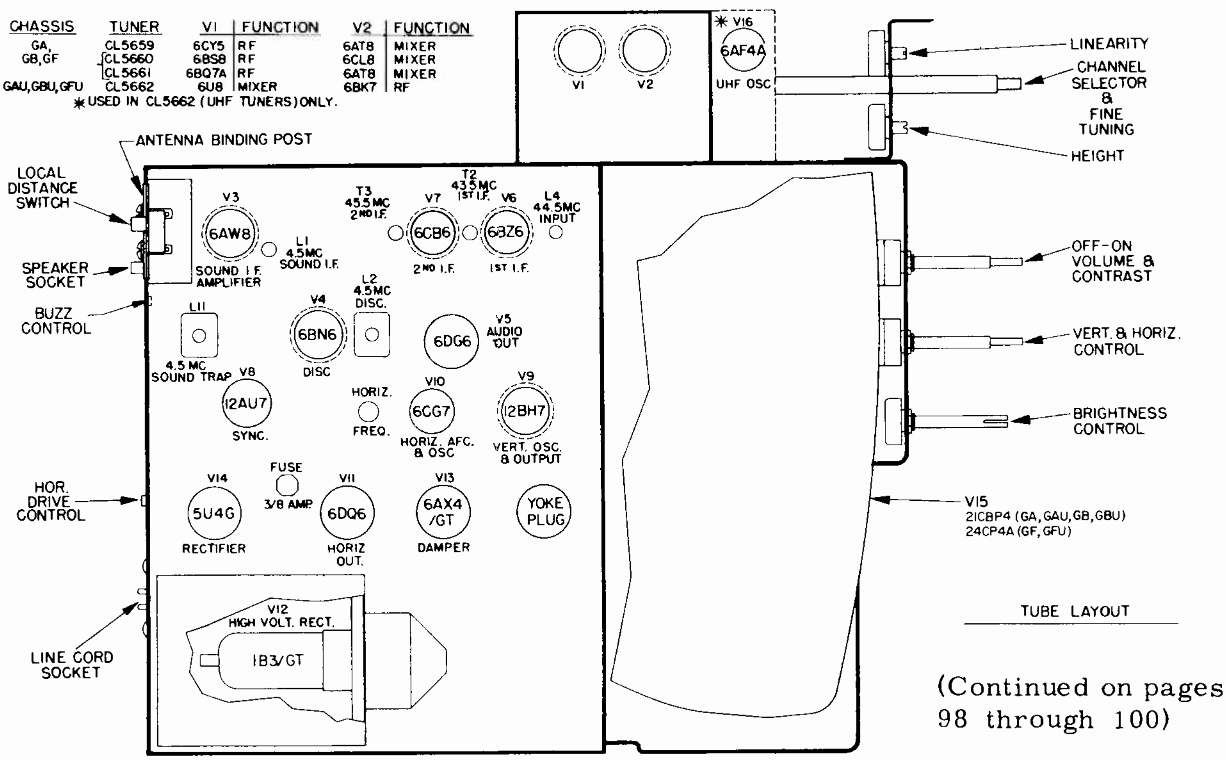
The horizontal drive trimmer C75 should be screwed in tight (clockwise) and then backed off (counterclockwise) until horizontal drive bars appear. Then turn the trimmer clockwise again until the drive bars just disappear.

Note: In some sets horizontal drive bars will not appear regardless of trimmer adjustment. In these sets, adjust the trimmer for proper width.

Important: The horizontal oscillator frequency must be checked for proper range of horizontal control after every adjustment of the horizontal drive trimmer C75.

CHASSIS	TUNER	V1	FUNCTION	V2	FUNCTION
GA,	CL5659	6CY5	RF	6AT8	MIXER
GB, GF	CL5660	6BS8	RF	6CL8	MIXER
	CL5661	6BQ7A	RF	6AT8	MIXER
GAU, GBU, GFU	CL5662	6U8	MIXER	6BK7	RF

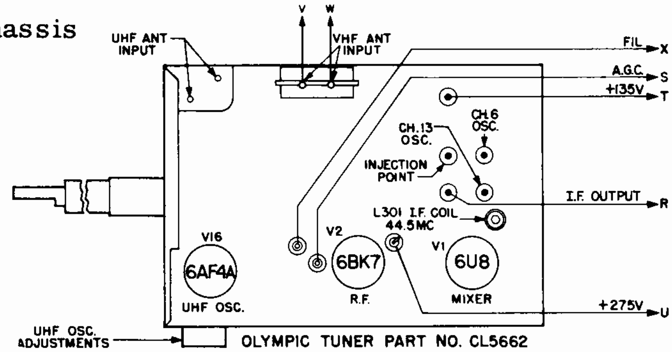
* USED IN CL5662 (UHF TUNERS) ONLY.



TUBE LAYOUT

(Continued on pages 98 through 100)

OLYMPIC GA, GB, GF, GAU, GBU, GFU Chassis



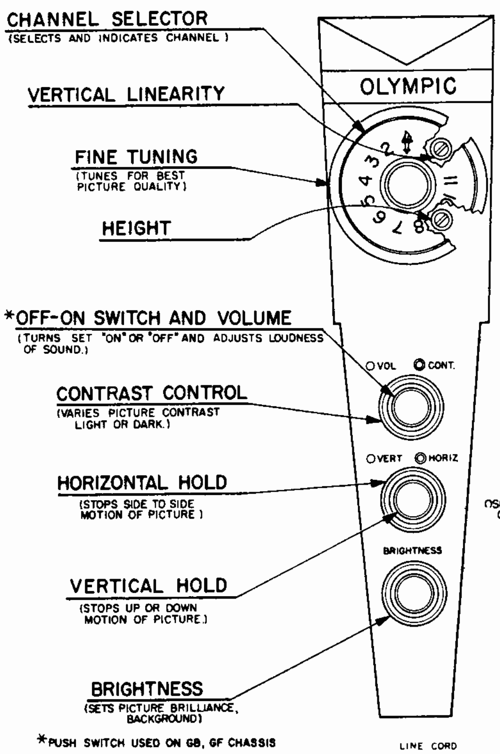
OLYMPIC TUNER PART NO. CL5662 (GAU, GBU, GFU)

TO REMOVE CHASSIS FROM CABINET

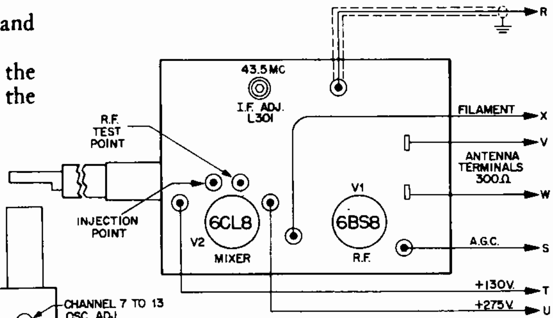
Remove: (1) Line cord from power outlet.
(2) Antenna lead-in from terminal posts.
(3) Masonite back.
(4) Speaker plug from rear of chassis.
(5) Knobs from front of cabinet.
(6) Deflection yoke plug from socket.
(7) High voltage lead from picture tube.
(8) Three mounting screws from bottom and one from upper rear side of chassis.

In sliding chassis out of cabinet, be careful that the chassis and any of its parts do not strike against the kinescope tube.

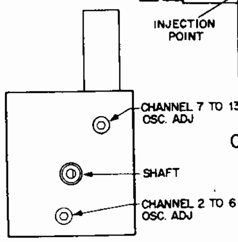
VHF-GA



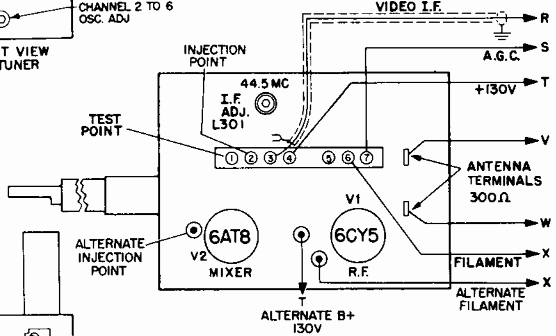
*PUSH SWITCH USED ON GB, GF CHASSIS



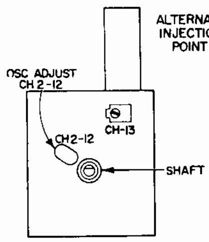
OLYMPIC TUNER PART NO. CL5660



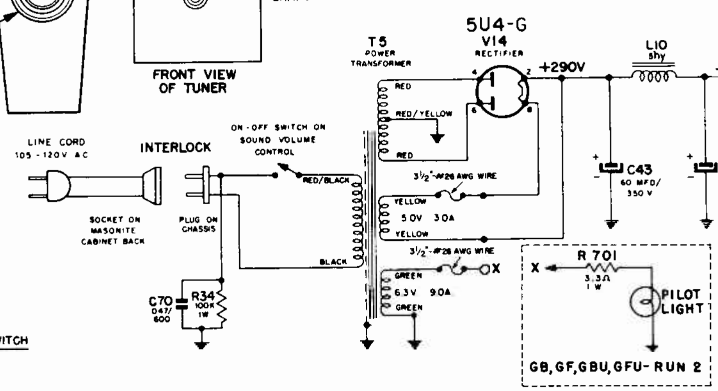
FRONT VIEW OF TUNER

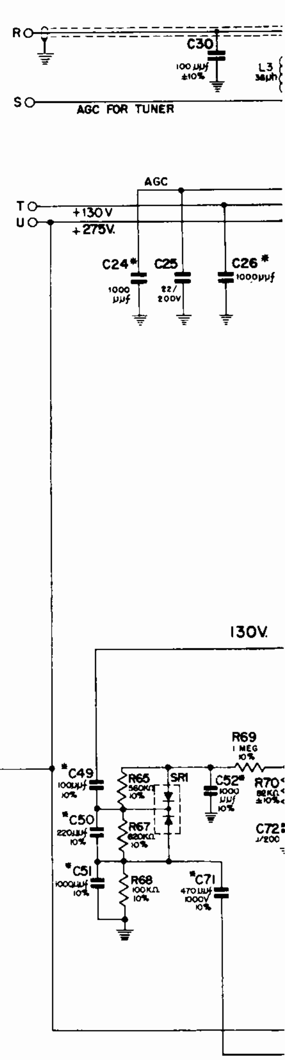


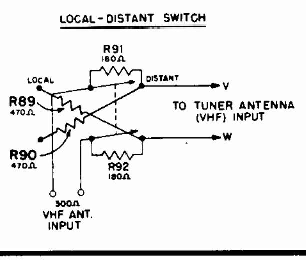
OLYMPIC TUNER PART NO. CL5659 (GA)



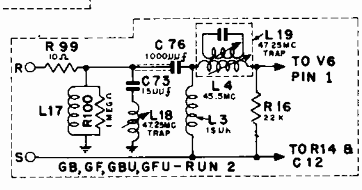
FRONT VIEW OF TUNER



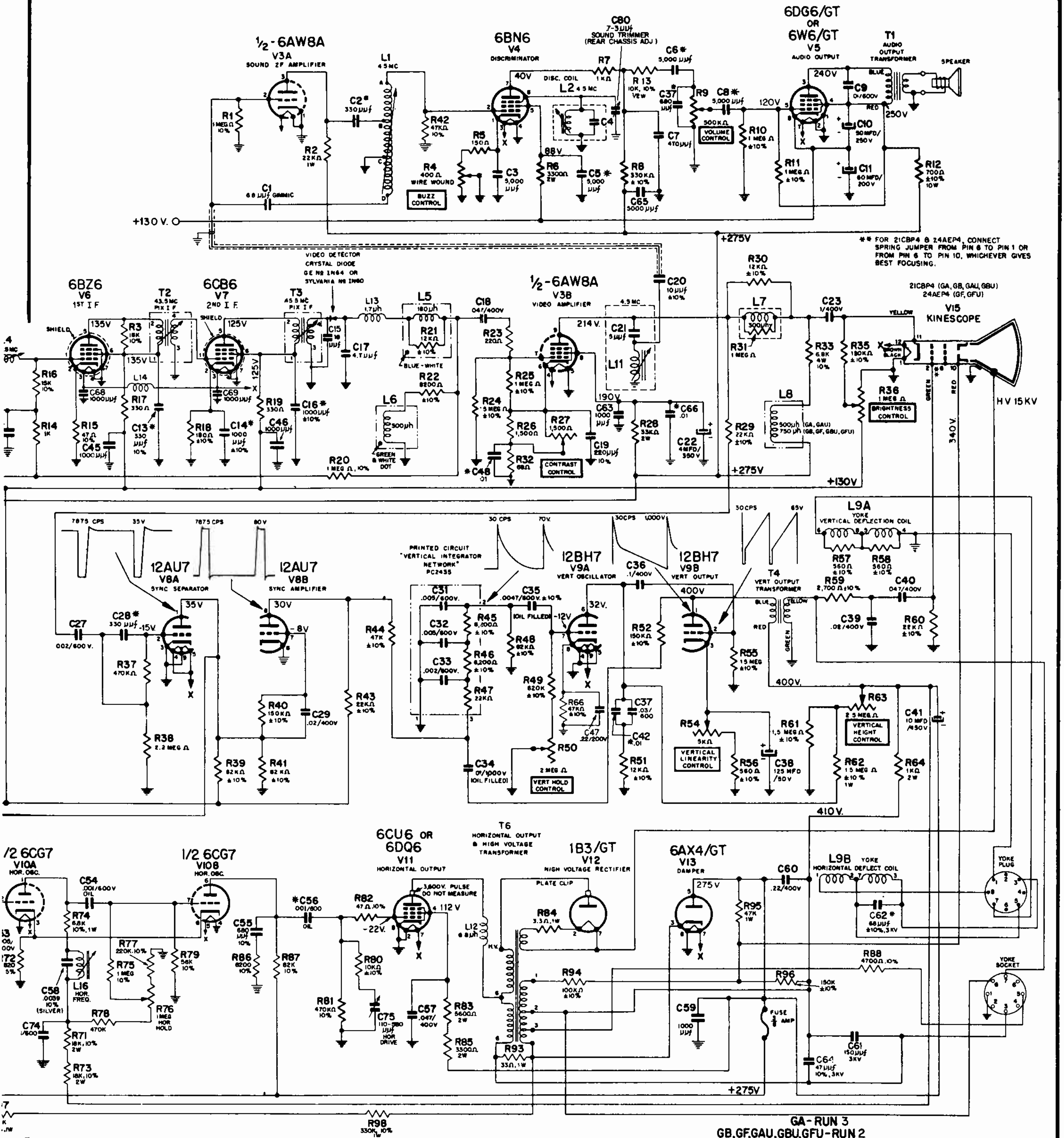




NOTES:
1. ALL RESISTORS ±20% TOLERANCE, 1/2 WATT UNLESS OTHERWISE SPECIFIED
2. ALL MICA AND CERAMIC CONDENSERS ±20% TOLERANCE, UNLESS OTHERWISE SPECIFIED.
3. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND CHASSIS, USING AN ELECTRONIC VOLTMETER ALL VOLTAGE READINGS ± 15%, MEASURED WITH AN INPUT VOLTAGE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



OLYMPIC GA, GB, GF & GAU, GBU, GFU CHASSIS



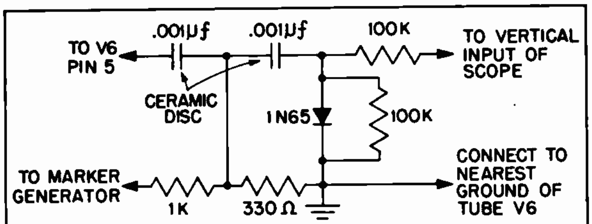
The GA, GB and GF models are equipped with a built-in antenna and the GAU, GBU and GFU models are equipped with two built-in antennas for VHF and UHF reception. These antennas provide satisfactory reception in many locations. In areas of weak reception an outside antenna will substantially improve the performance of the receiver.

If the lines of the raster are not horizontal, loosen clamp on collar of yoke and rotate the deflection yoke until condition is corrected. The clamp will then hold the yoke in place. If neck shadow is evident or the corners of the raster are dark, the deflection yoke must be moved forward as far as possible.

OLYMPIC GA, GB, GF, GAU, GBU, GFU Chassis, Alignment Information, Continued

ALIGNMENT

Set the tuner to Channel 12 when not operated by a local station; if 12 is a local station, use Channel 11 or 13. Turn on power switch and proceed as follows:



CRYSTAL DETECTOR

FIG. 6

PIX IF COIL ADJUSTMENT

Insert a 100,000 ohm ½ watt resistor in series with the "hot lead" of the electronic voltmeter and connect it to the junction of L5 and C18. Set the meter switch to the lowest negative scale. Connect the ground lead of meter to chassis.

Connect hot lead of the RF signal generator to injection point of tuner (see circuit diagram) through a 10 uuf condenser.

Adjust the following slugs for maximum output as indicated on the meter at frequencies and sequence indicated below:

	GA, GAU	GB, GF, GBU, GFU
L301	44.5 MC	43.5 MC
L4	44.5 MC	45.5 MC
T2	43.5 MC	43.5 MC
T3	45.5 MC	45.5 MC

Adjust the following slugs (on the GB, GF, GBU and GFU chassis) for minimum output as indicated on the meter at frequencies and sequence indicated below:

L19..........47.25 MC
L18..........47.25 MC

Remove hot lead of RF signal generator leaving the 10 uuf condenser and the 100K resistor in place.

Set the sweep generator to approximately 45 MC. Set the Band Width to the proper setting.

Inject output of sweep generator at the injection point on tuner through the 10 uuf condenser.

Connect crystal circuit as shown in Figure 6 to pin 5 of V6. Connect a 3 volt bias battery into position with plus side to ground and minus side to junction of R14 and L3 (this point is AGC bias voltage) for all alignment procedures. Connect the marker generator to point illustrated in Figure 6 and set it to frequencies of 43.25 MC and 45.75 MC and connect the scope as shown in Figure 6. Alignment is done from the underside of chassis.

Curve shown on scope should be similar to response curve shown in Figure 7.

If markers do not appear as shown in Figure 7, adjust coils L301 and L4 for correct positioning of markers ± 10%. (Set tuner to channel that gives best response curve without interference from a station.)

After completion of preceding procedure, remove crystal circuit. The sweep generator still remains at injection point with the 10 uuf condenser. Connect a scope to the 100,000 ohm resistor which was connected at L5 and C18.

Inject the following marker frequencies into the tuner by coupling the marker generator to the half shield of the mixer tube.

43.25 MC..........Marker
45.75 MC..........Picture Carrier Marker
47.25 MC..........Channel Trap Marker (GB, GF, GBU, GFU)

After alignment, if the wave shape is not the same as shown in Figure 8, allowing 15% tilt, retouch coils L301, L4, T2 and T3.

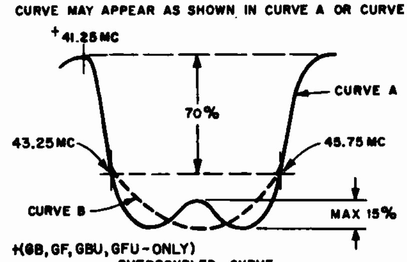
Note: It is advisable to remove the type 6DQ6 and 6CG7 tubes when aligning the set. If the curve does not appear as illustrated, because of a local station or other interference, or if multiple markers appear, remove the RF Amplifier tube from tuner.

SOUND DISCRIMINATOR (4.5 MC) ADJUSTMENT

Because the transmitted sound signal from a TV station is probably the most accurate available for frequency, it is recommended that a working signal be used for sound alignment. Turn the set on, allow a five to ten minute warm-up and then tune the set to an extremely weak signal. Connect a vacuum tube voltmeter to pin 3 of V3A through a crystal detector probe and set the meter to the —3-volt scale. Tune the video trap L11 and L1 for maximum deflection of the meter (not to exceed 1-volt).

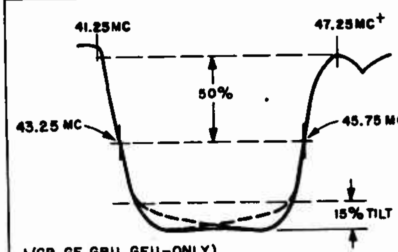
Adjust the discriminator coil L2 for maximum audio output using the transmitted signal from a TV station. This is done with the Buzz Control (R4) set to midrange. An output meter connected to the voice coil terminals may be used for this adjustment, or it may be done by ear since the coil slug must be set carefully for elimination of buzz. Adjust both the Buzz Control and L2 for maximum audio output and elimination of buzz.

CURVE MAY APPEAR AS SHOWN IN CURVE A OR CURVE B



OVERCOUPLED CURVE

FIG. 7



STANDARD RESPONSE

FIG. 8

PACKARD BELL

Models 17VT3, 17VT4, 17VC1, 17VT8, 17VT9, & 21VT4
CHASSIS V8-2 (REVISED)

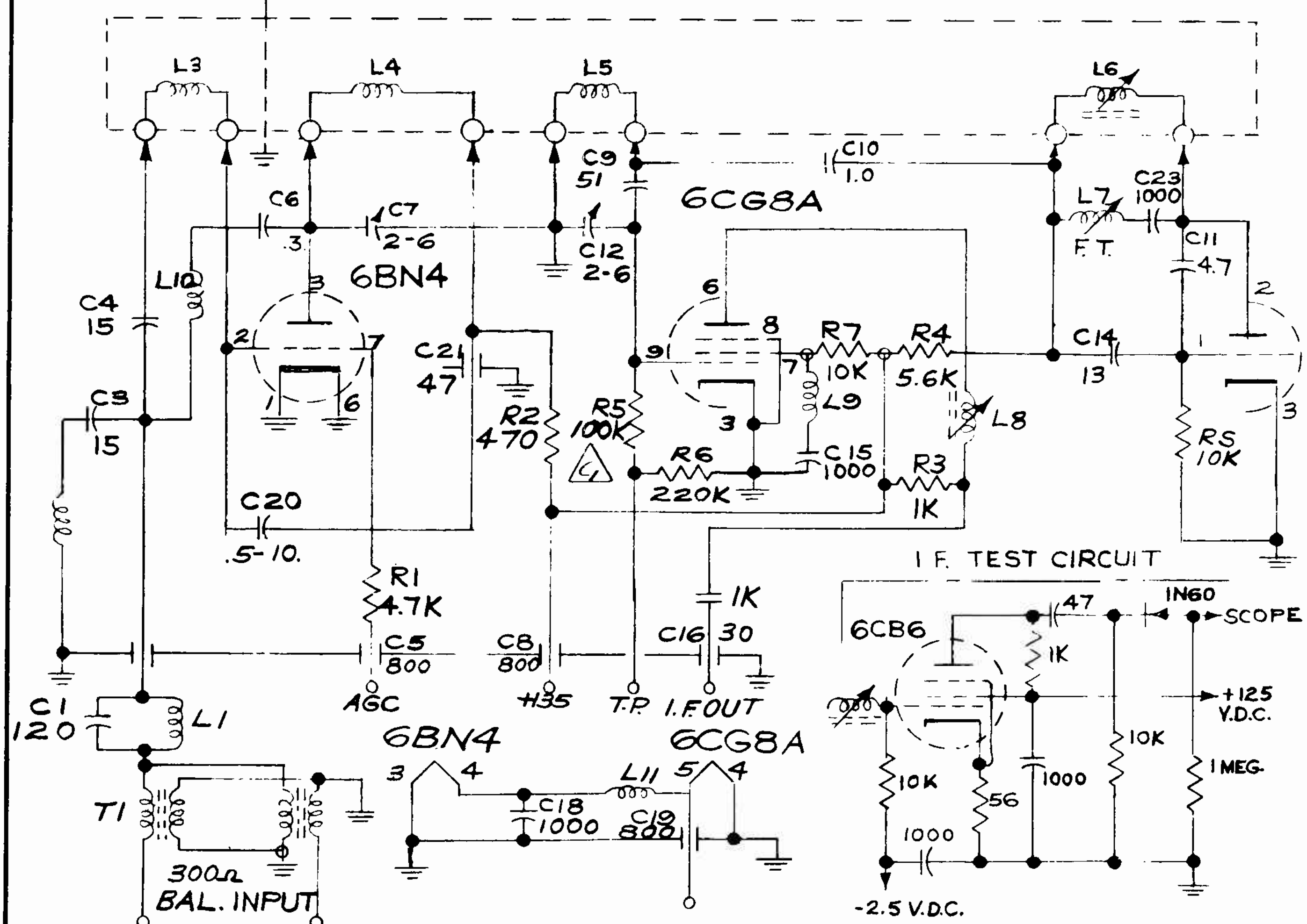
(Service material on pages 101 through 104)

CHANGES REQUIRED FOR 21-INCH MODEL 21VT4:

The values of certain components change for the 21-inch model. Other components are used ONLY in the 21-inch set.

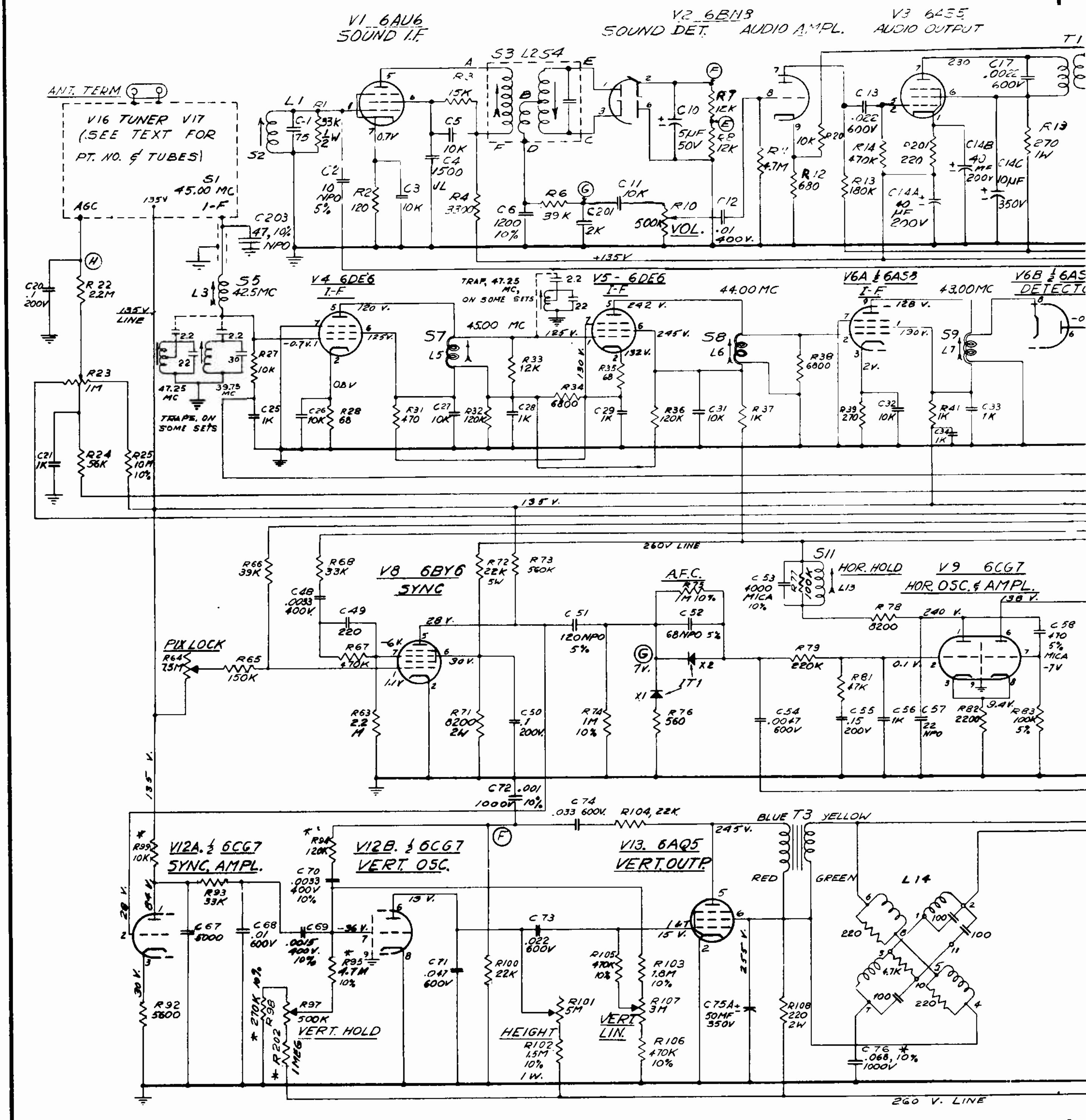
Complete list of these components:

C-76 (.068 mfd/1000 v) goes to .033 mfd/1000 v on 21VT4 **23074**
C-81 (150 mmf/2500 v) goes to 56 mmf/2500 v on 21VT4 **23646**
C-85 (.01 mfd/600 v) goes to .022 mfd/600 v on 21VT4 **23141**
C-202 (.022 mfd/600 v) is used only on 21VT4 **23141**
R-88 (15K, 2 watts) goes to 12K, 2 watts on 21VT4 **73438**
R-94 (120K) goes to 82K on 21VT4 **73048**
R-95 (4.7 meg) goes to 3.9 meg on 21VT4 **73068**
R-98 (270K) goes to 150K on 21VT4 **73051**
R-99 (10K) goes to 22K/2 watts on 21VT4; also it connects to the 260 volt line instead of the 135 volt line **73441**
R-202 (1 meg) goes to 820K on the 21VT4 **73060**
R-203 (39K) is used only on 21VT4 **73044**



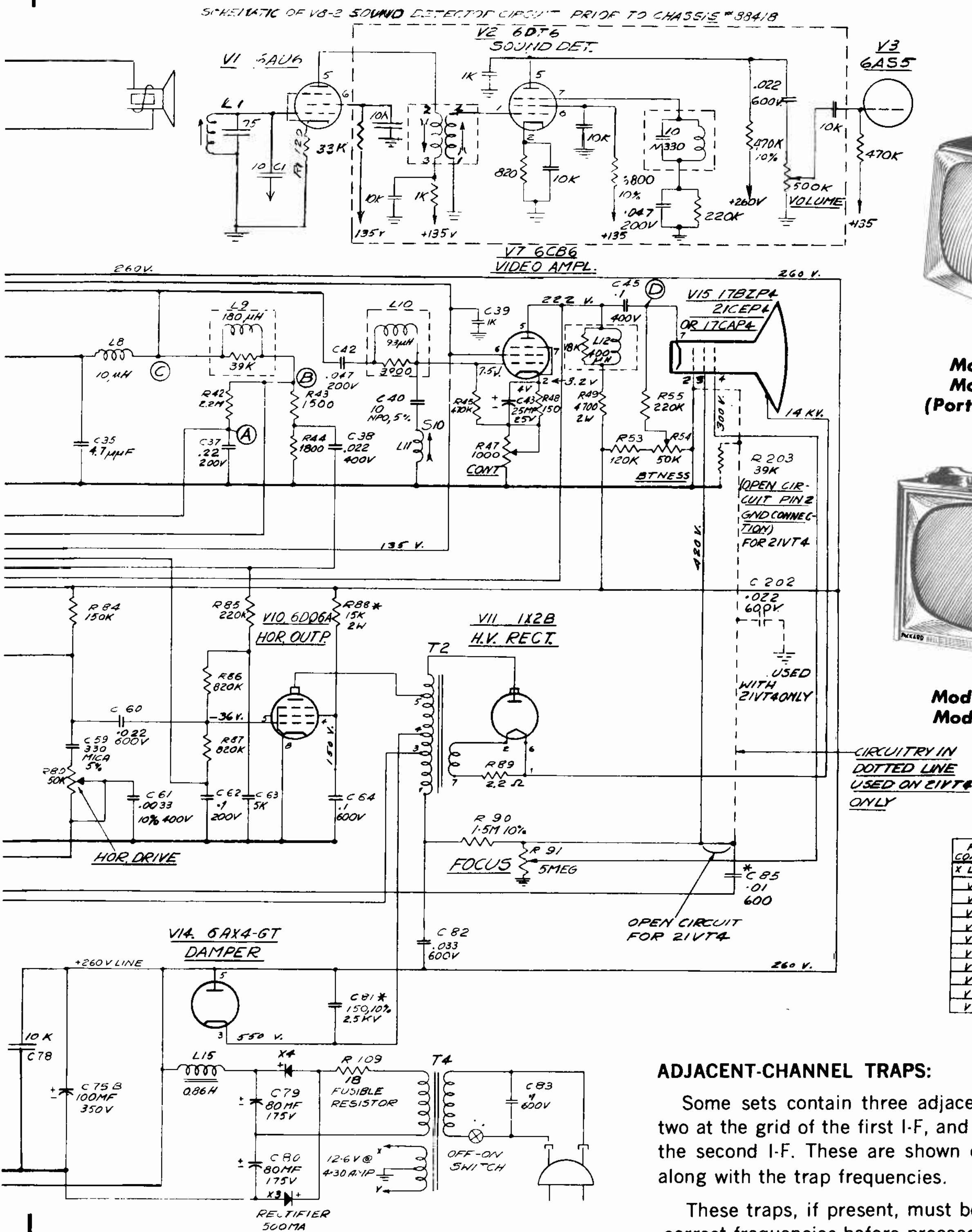
Schematic, Standard Coil "Fireball" Tuner

PACKARD BELL Models 17VC1, 17VT3, 17VT4, 17VT8, 17VT9, 21VT4, Chassis V8-2 (Revised) Schematic Diagram



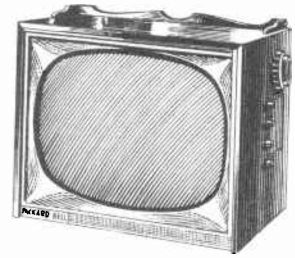
- ✶ C76 = .033, 1000 V. ON 21VT4
- ✶ C81 = 56 μμFD 10% 2.5 KV. ON 21VT4
- ✶ C85 = .022, 600 V 10% ON 21VT4
- ✶ C202 ON 21VT4 ONLY
- ✶ R88 = 12K, 2W ON 21VT4
- ✶ R94 = 82K ON 21VT4
- ✶ R95 = 3.9 MEG ON 21VT4
- ✶ R98 = 150 K " "
- ✶ R99 = 22K, 2W ON 21VT4; TO 260 V. ON 21VT4
- ✶ R202 = 820 K, ON 21VT4
- ✶ R203 ON 21VT4 ONLY.

PACKARD BELL Models 17VC1, 17VT3, 17VT4, 17VT8, 17VT9, 21VT4, Chassis V8-2 (Revised) Schematic Diagram



Schematic Diagram, V8-2 (revised)

Model 17VT3
Model 17VT8
(Porta-Bell Model)



Model 17VT4
Model 17VT9

HEATER CONNECTIONS:	
X LINE	Y LINE
V1	V6
V2	V8
V3	V9
V4	V10
V5	V12
V7	V14
V13	
V15	
V16	
V17	

ADJACENT-CHANNEL TRAPS:

Some sets contain three adjacent channel traps, two at the grid of the first I-F, and one at the grid of the second I-F. These are shown on the schematic, along with the trap frequencies.

These traps, if present, must be adjusted to their correct frequencies before proceeding with the alignment below.

(Alignment on page 104)

PACKARD BELL Chassis V8-2, Continued

ALIGNMENT

The PIX-LOCK control is normally almost completely counterclockwise. In fringe areas, if noise affects the sync stability, the control should be set as far clockwise as possible without pulling or tearing the picture.

PROCEDURE:

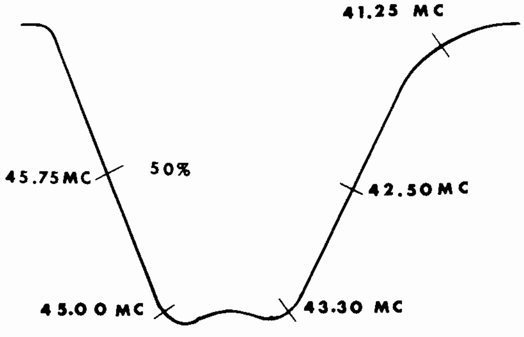
Connect VTVM to point "A".

Lift tube shield on mixer tube in tuner (6CG8A or 6AT8). Connect signal generator between shield and ground, keeping leads shorter than 1½ in. Set generator output to produce from minus 1½ to minus 2 volts of AGC bias as indicated by the VTVM. NOTE ON TUNER I-F ADJUSTMENT: S-1 must be adjusted through hole in tuner.

Step	Signal Gen Connection	Frequency Signal Gen	VTVM Connection	Adjust	For
1.	Mixer tube in tuner	45.00 mc	Point "A"	S-1	MAX
2.	ditto	42.50 mc	ditto	S-5	MAX
3.	ditto	45.00 mc	ditto	S-7	MAX
4.	ditto	44.00 mc	ditto	S-8	MAX
5.	ditto	43.00 mc	ditto	S-9	MAX

REPEAT STEPS 1 THRU 5

6. Connect scope to point "B" thru a 22,000 ohm isolating resistor.
7. Connect capacitor, 5 mfd, 50 volts, between point "A" and ground, the negative lead going to point "A". (Leave VTVM connected.)
8. Connect sweep generator to antenna terminal thru the impedance matching network.
9. Rotate tuner to channel 3, and set sweep generator to center frequency of channel (63 mc). With a sweep width of 8 mc, adjust generator output to develop about −2 volts of AGC bias at point "H".
10. Adjust AGC control at rear of set so that voltages at points "H" and "A" are equal. Then, if necessary, readjust generator so that AGC voltage is again −2 volts.



Response Curve

11. Replace tube shield on mixer tube in tuner but leave signal generator connected between shield and chassis. (Reason: removal of shield alters response curve, hence signal must be injected with shield in place.)
12. Adjust generator output to provide the markers shown on the curve. Check position of markers one at a time. A slight touching-up of the I-F adjustments may be needed to make the curve correspond to the illustration.
13. The adjustments have the following effects:

    S-1 moves the 45.75 mc marker up or down the curve (should be 50%).

    S-5 controls the overall band width, and with S-9, controls the 41.25 mc position.

    S-7 controls the position of the 45.00 mc marker, which should be at a maximum of 97% response. S-8 controls tilt of bottom portion of response curve.

    S-9 controls the 41.25 mc position which should be between 3% and 12% response.

IMPORTANT: The 45.00 mc marker must not exceed 97% response on channel three or picture may smear on higher channels.

TRAP ALIGNMENT (4.5 mc)

1. Connect signal generator between point "C" and ground thru a .001 mfd isolating capacitor.
2. Turn contrast control to maximum.
3. Connect RF probe of VTVM to point "D".
4. Set signal generator to 4.50 mc, with output at one volt or more.
5. Adjust trap, S-10, for minimum VTVM reading.

NOTE: If generator is not capable of a one volt output, the trap may be adjusted visually while receiving a TV signal. If no 4.5 mc beat is present in the picture, then S-10 requires no adjustment. If a beat appears, detune signal to exaggerate the beat and then adjust S-10 for minimum beat.

SOUND I-F AND RATIO DETECTOR ALIGNMENT:

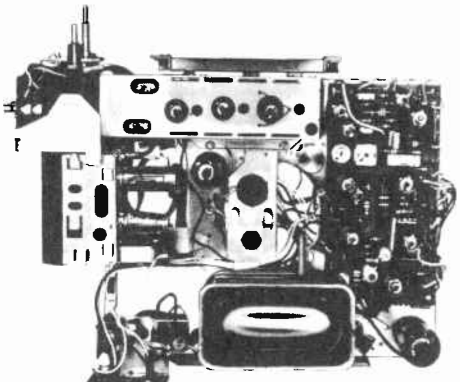
1. Connect signal generator between point "B" and ground.
2. Connect VTVM between point "F" and ground.
3. With generator frequency at 4.50 mc, adjust S-2 and S-3 for MAXIMUM VTVM reading.
4. Connect VTVM between "E" and "G".
5. Adjust ratio detector secondary, S-4, for zero between positive and negative peaks.
6. Repeat steps 2 thru 5.

Model No.	Chassis	Model No.	Chassis
G-4242M	9L37	G-4710M	9L38
G-4242L	9L37	G-4710L	9L38
UG-4242M	9L37U	UG-4710M	9L38U
UG-4242L	9L37U	UG-4710L	9L38U
G-4654M	9L37	G-4720M	9L38A
G-4654W	9L37	UG-4720M	9L38AU
UG-4654M	9L37U	G-4720L	9L38A
UG-4654W	9L37U	UG-4720L	9L38AU

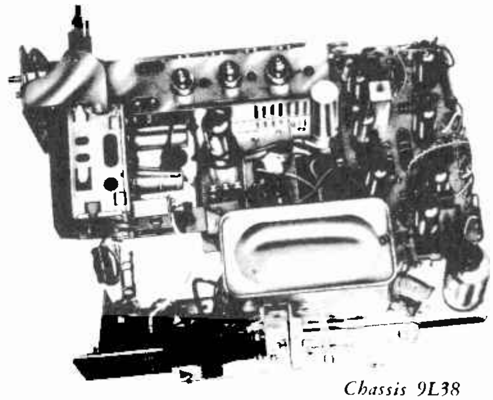
PHILCO

9L37 and 9L37U, 9L38 and 9L38U CHASSIS

Schematic diagrams and certain other service information on these sets are presented on the next ten pages. Since these chassis are similar to 9L35, -U, for the following information refer to Volume TV-15, Early 1959 TV Manual: horizontal oscillator adjustment, page 124; alignment, page 121; video IF printed wiring panel, page 123.



Chassis 9L37



Chassis 9L38

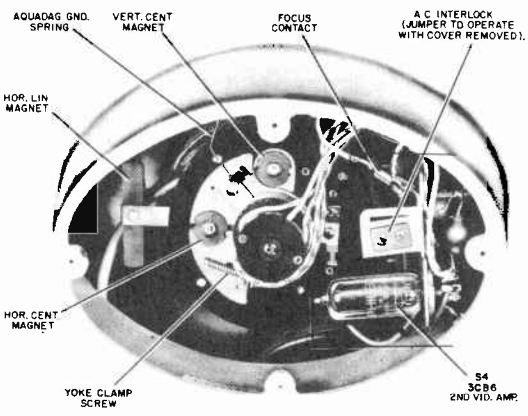


Figure 1. Adjustment Access Cover Removed — 9L38

DISASSEMBLY OF CRT HOUSING— CRT REMOVAL PROCEDURE

NOTE: The illustrations and procedure refer to the 9L37 — the 9L38 is similar.

Access to the yoke and its associated parts is obtained by removing the small cover on the rear of the CRT shell. This cover is secured by four screws. Removal of the cover exposes the neck of the CRT and the yoke assembly thus permitting adjustment of the yoke without removal of the complete rear shell assembly. Removal of the cover also exposes the vertical and horizontal centering magnets and the horizontal linearity adjustment. In the 9L38, the interlock must be jumped when the CRT rear cover is removed. The 2nd video amplifier, a 3CB6, and the focus connector are also accessible. See figure 1.

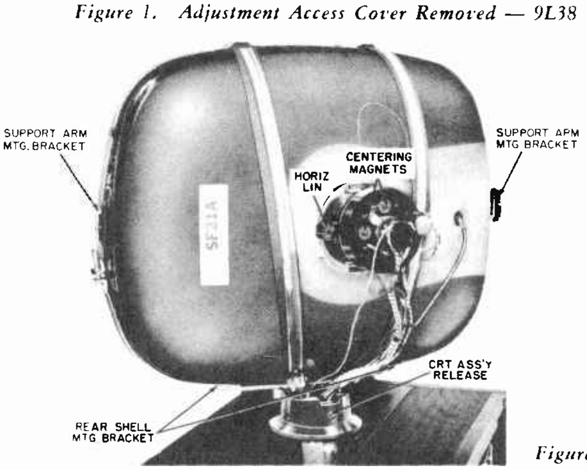


Figure 2B

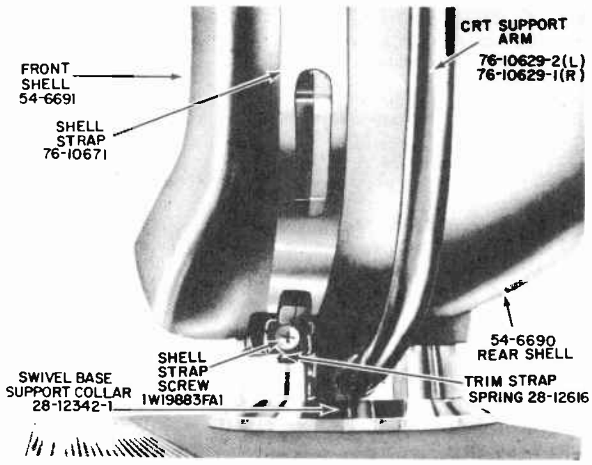


Figure 2A

PHILCO Chassis 9L37, -U, 9L38, -U, Service Information, Continued

To disassemble the CRT assembly, remove the small ornamental trim piece under the picture tube by removing the two small screws from the lower front. Remove the plastic trim around the CRT shell. This plastic trim is held in place with a spring at the bottom of the assembly. Remove the two screws at the bottom of the shell strap, remove the strap and the front mask. Remove the end caps on the side support arms and then remove the self-tapping screws which fasten the support arms and the rear shell to the picture tube frame. The base of the support arms, which are keyed, are inserted into sockets in the pivot assembly under the CRT. To remove the support arms, move each arm so that the arm key lines up with the slot in the socket and then pull the arm out of the socket. The picture tube is still secured by the pivot assembly to the cabinet.

Remove the two mounting screws at the bottom of the CRT which hold the rear shell, then remove the rear shell. Figure 2B shows the assembly with the rear shell removed. Now the CRT can be removed by loosening the bolts, one on either side of the picture tube front frame, near the support arm mounting brackets. In the 9L37 chassis the yoke and CRT cables plug into receptacles in the center of the chassis. The anode lead plugs into a jack at the top front of the 1G3GT socket.

The pivot or swivel assembly can also be removed by removing the single screw at the rear and then lifting the assembly off the cabinet or base.

CHASSIS REMOVAL PROCEDURE

To remove the chassis from the cabinet remove all control knobs, pull the monopole antenna part-way out so that the base section does not interfere with the chassis removal. Remove the two lower chassis mounting screws and the two screws holding the vertical support bracket. This bracket is a shipping brace and need not be replaced in the 9L37. In the 9L38, remove the top bracket to cabinet screw only. The bracket must be retained as it is part of the chassis assembly. Remove the chassis by pulling it straight back.

The front of the chassis contains two plastic seats into which are inserted two prongs or guides mounted on the cabinet and which hold the chassis in proper position. When installing the chassis in the cabinet these guides must be properly engaged by the plastic seats before the chassis can be fully inserted.

CRITICAL LEAD DRESS INFORMATION

A. *To Prevent Lead Burning*
(1) All leads must be dressed clear of WR1, WR2, WR3, WR4, WR5, 2 watt width divider resistor and filament thermistor.
(2) Brown filament lead from L3C to V.O.S. panel must be dressed away from 12D4 and WR5.
(3) R7, filament thermistor, must dress away from wiring panel, clear of all lugs by at least 1/2". Body of thermistor must be dressed over tuner cut-out in chassis. No leads to be run between panel and thermistor.
(4) All leads must be dressed clear of S1-3, yoke socket, or tie lugs carrying yoke or damper leads.
(5) WR3, filament dropping resistor, must dress along B5 wiring panel on tuner cut-out side at approximately 45° angle with panel. No leads to be run between WR3 and B5.

B. *To Prevent Pinched Leads*
(1) All leads must dress between end of E1 and side of chassis. No leads to be dressed under E1.

C. *To Prevent Breakdown*
(1) 3KV disk condenser must be dressed at least 1/4" away from all wires, lugs, components and chassis.

D. *To Prevent Corona*
(1) S3 socket must be kept free of points or sharp edges due to wiring and soldering.
(2) Rotate S3 cap to absorb any excess lead. Lead must be at least 3/4" from metal of high voltage cage.
(3) 9L38 only — Radiating fins on H.O.T. must be dressed away from transformer winding and against side of H.V. cage.
(4) All unused lugs of S3 socket must be bent down toward center of socket.

E. *To Prevent Regeneration*
(1) All leads connecting to the I-F panel must be as short as possible and any slack pulled from under the I-F shield.

F. *To Prevent Depadding*
(1) All leads must be dressed clear of the quadrature coil.

G. *To Prevent Unstable Sync*
(1) The white AGC lead from the tuner cable, J1, must dress under wiring panel at end of E2, between E2 and E1 and chassis, to B1-1.

H. *To Reduce Vertical and Horizontal Drift*
(1) The following components on the V.O.S. panel must be dressed perpendicular to the panel: N1, N2, N3, N4, N5 and C5U (C4N of 9L38).

I. *Underwriters Requirements*
(1) Aquadag grounding spring must dress between C.R.T. straps and must not touch either strap.
(2) The UHF tuner link cable must dress under lug on UHF tuner.
(3) The VHF pilot lamp cable must dress as follows: 9L37, on tuner side of S1 socket and along with tuner power cable, J1, around B4 panel and under dress lug mounted on rear of VHF tuner bracket; 9L38, between S1 socket and B5 panel, around B2 panel and under CL11.

J. *To Prevent Lead Burning and Pick-Up*
(1) VHF tuner filament lead and UHF pilot lamp leads must dress between the antenna taper line assy. and the 4BC8 R-F tube.
(2) Speaker leads must dress under dress lug mounted on right hand (facing rear of cab.) speaker mounting stud and be stapled approximately in center of bottom, side cabinet rail. These leads connect to lugs L9U and L10U in the 9L37 and to L7N and L8N in the 9L38.

CHASSIS 9L37 & 9L37U

K. *To Prevent Pickup*
(1) CRT and yoke cable (less CRT cathode lead) must dress under long dress lug on left tube strap (facing rear of tube).
(2) CRT cathode lead must dress under lug on right tube strap.
(3) Fishpaper separator must be inserted in the support collar of tube assy. to keep the CRT cathode lead separated from all other leads.
(4) CRT and yoke cable (less CRT cathode lead) must dress directly back from spindle to clamp mounted on top rear cabinet rail. All slack to be pulled through clamp.
(5) CRT cathode lead must dress directly from spindle to dress lug mounted on top, side cabinet rail, to L3U. Excess lead to be hanked under the dress lug.

CHASSIS 9L38 & 9L38U

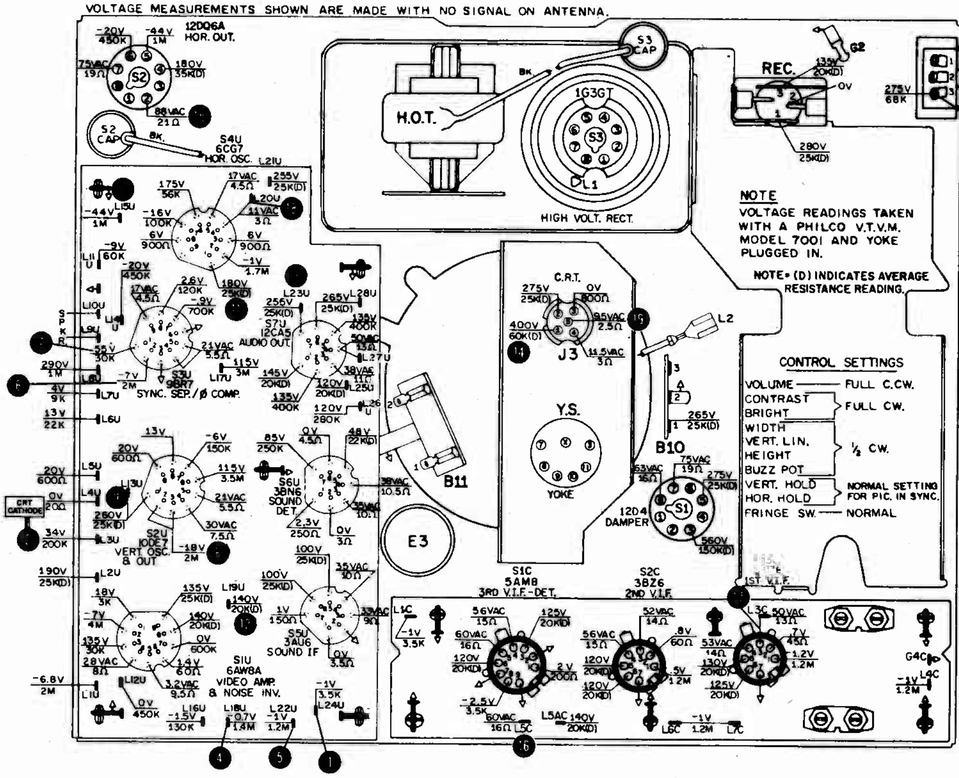
L. *To Prevent Parasitic Oscillation*
(1) Vertical output cathode lead from L3N to E3-3, must dress under V.O.S. panel between panel and chassis, through hole in chassis, under E1 to E3-3. The lead must be kept as short as possible.

M. *To Prevent Component Damage*
(1) X3, on 2nd video amp. assy., must be dressed down toward chassis but must be kept at least 1/4" away from chassis; to prevent damage to coil when plastic housing is assembled.

N. *Underwriters Requirements*
(1) VHF tuner I-F link must dress under lug mounted on top, front of VHF tuner.
(2) Tuner power cable, J1, must dress under CL13, around B3 panel on side away from R7, and between S1 socket and B5 panel.

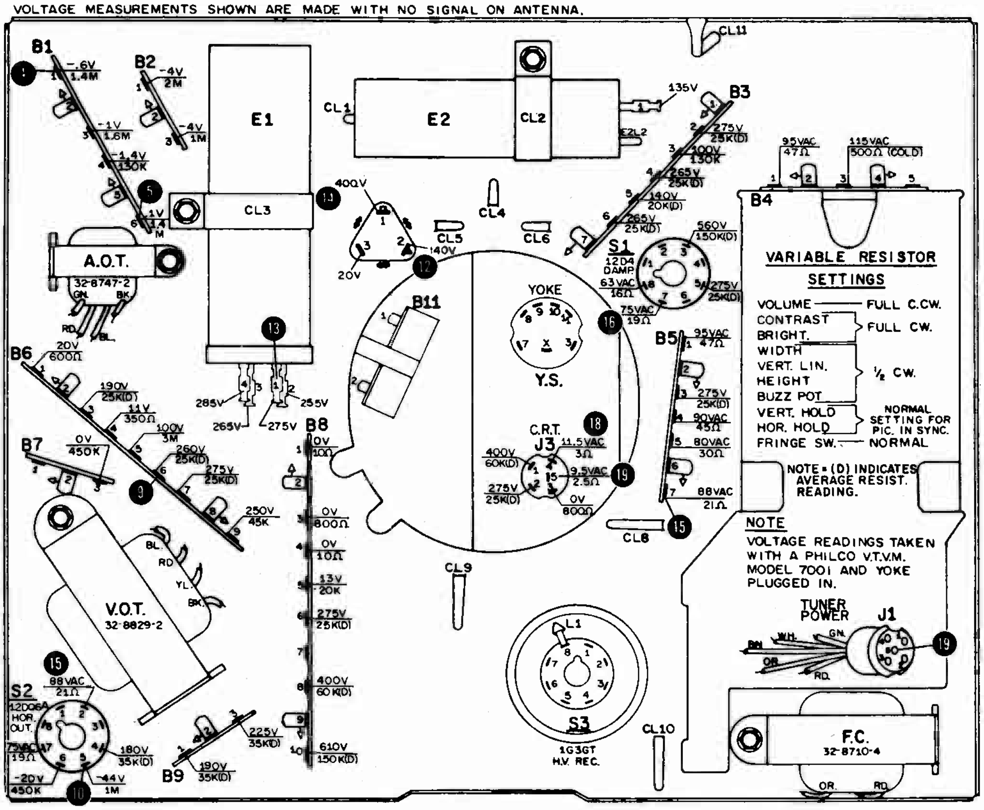
PHILCO Chassis 9L37 Service Information, Continued

VOLTAGE MEASUREMENTS SHOWN ARE MADE WITH NO SIGNAL ON ANTENNA.



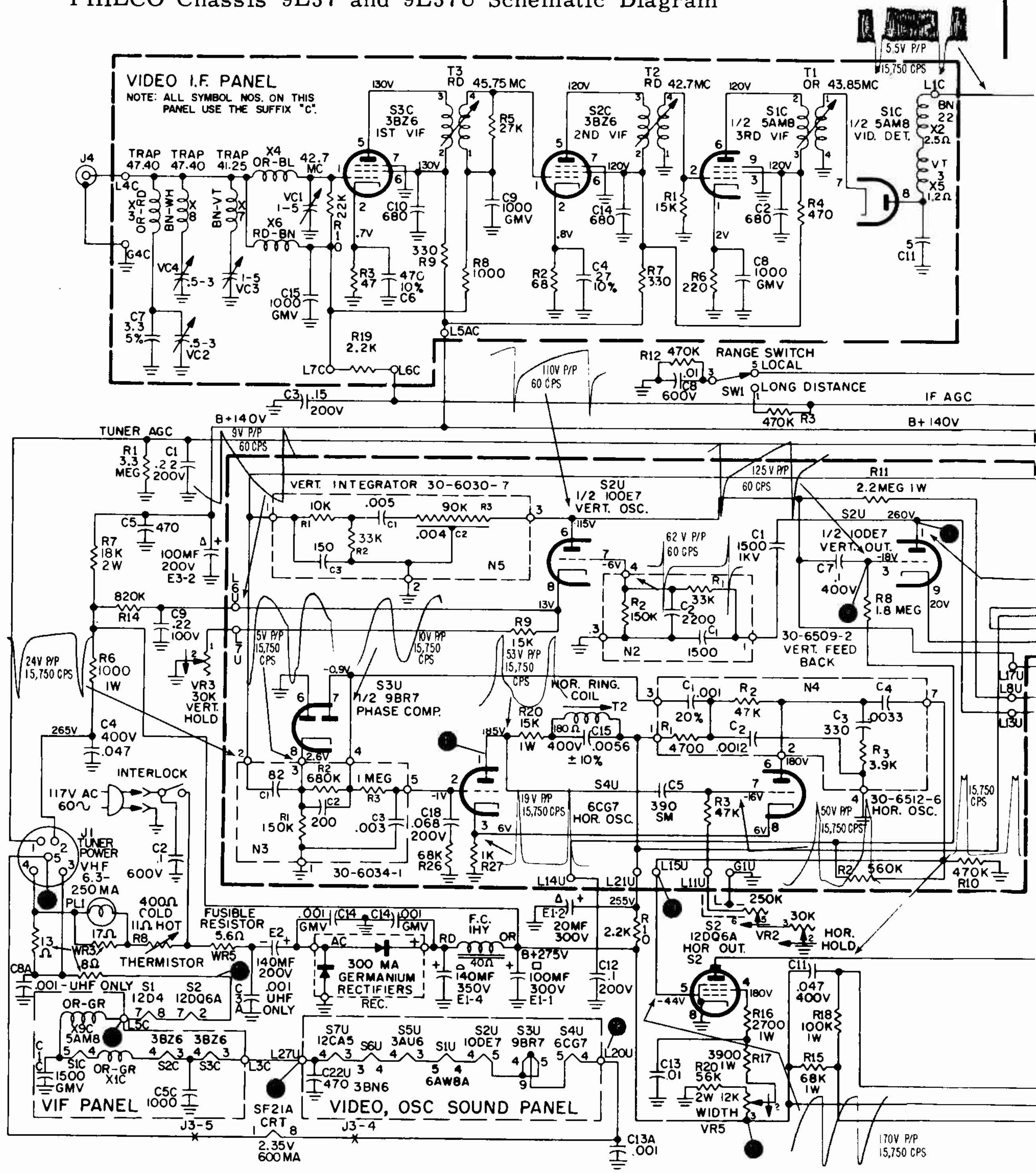
9L37 Voltage-Resistance Readings—Top View

VOLTAGE MEASUREMENTS SHOWN ARE MADE WITH NO SIGNAL ON ANTENNA.



9L37 Voltage-Resistance Readings—Bottom View

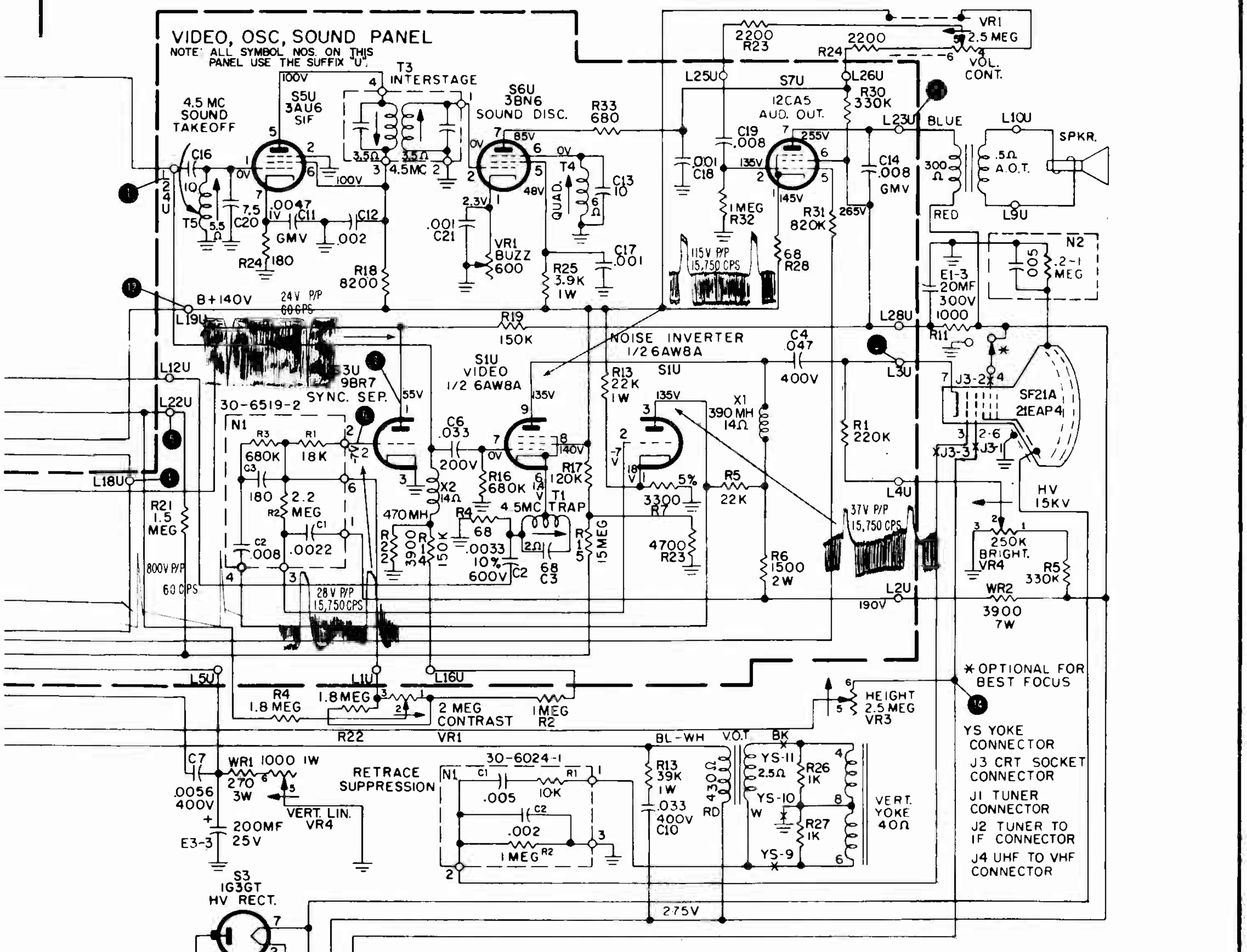
PHILCO Chassis 9L37 and 9L37U Schematic Diagram

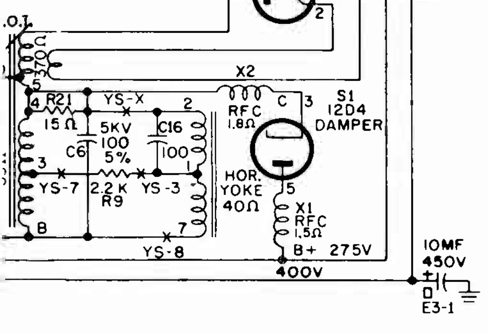


RECEIVER SET-UP CONTROL LOCATIONS

1. Vertical Linearity—Adjust with a thin screwdriver through the hollow brightness shaft.
2. Height—Adjust with a thin screwdriver through the hollow vertical hold shaft.
3. Horizontal Hold Centering—Adjust with a thin screwdriver through the hollow horizontal hold control shaft.
4. Width—Remove back. Width control is at the side in front of Range Switch.
5. Fusible B+ resistor—Remove back. Resistor is a plug-in at left center of chassis, in front of high voltage cage.
6. Tubes—All tubes (except CRT) are accessible after removing back and partly removing chassis. IG3GT, high voltage rectifier is in cage. 9L38 only—3CB6, 2nd video Amp., is mounted with CRT; remove CRT rear access cover.

PHILCO Chassis 9L37 and 9L37U Schematic Diagram





Schematic Diagram for Chassis 9L37 and 9L37U

NOTES: All capacitor values greater than 1 are in MMF unless otherwise noted.
All capacitor values less than 1 are in MFD unless otherwise noted.
All resistors are ½ watt, 10%, carbon unless otherwise noted.
Arrow through control indicates clockwise rotation.
Voltages are DC from point shown to chassis unless otherwise noted.
Voltages were read using a V.T.V.M. Voltages were taken with no signal. The receiver was adjusted for a good quality picture; i.e., normal contrast, brightness, width, height, vertical lin. and sound, picture in sync, then removed signal.
* Focus voltage optional for best focus.
Coil resistances read with coil in circuit.
• Indicates a coil resistance of less than 1 ohm.

UHF CROSSOVER NETWORK

A UHF-VHF antenna crossover network is available for use with the 9L37U & 9L38U chassis sets. This network should be ordered through our Accessory Division by part no. 426-3034.

This UHF-VHF crossover kit is complete with mounting hardware and installation instructions.

CAUTION: Use an isolation transformer for "on the bench" servicing as one side of the line is connected to the chassis.

INSTRUCTIONS FOR CLEANING WINDOW

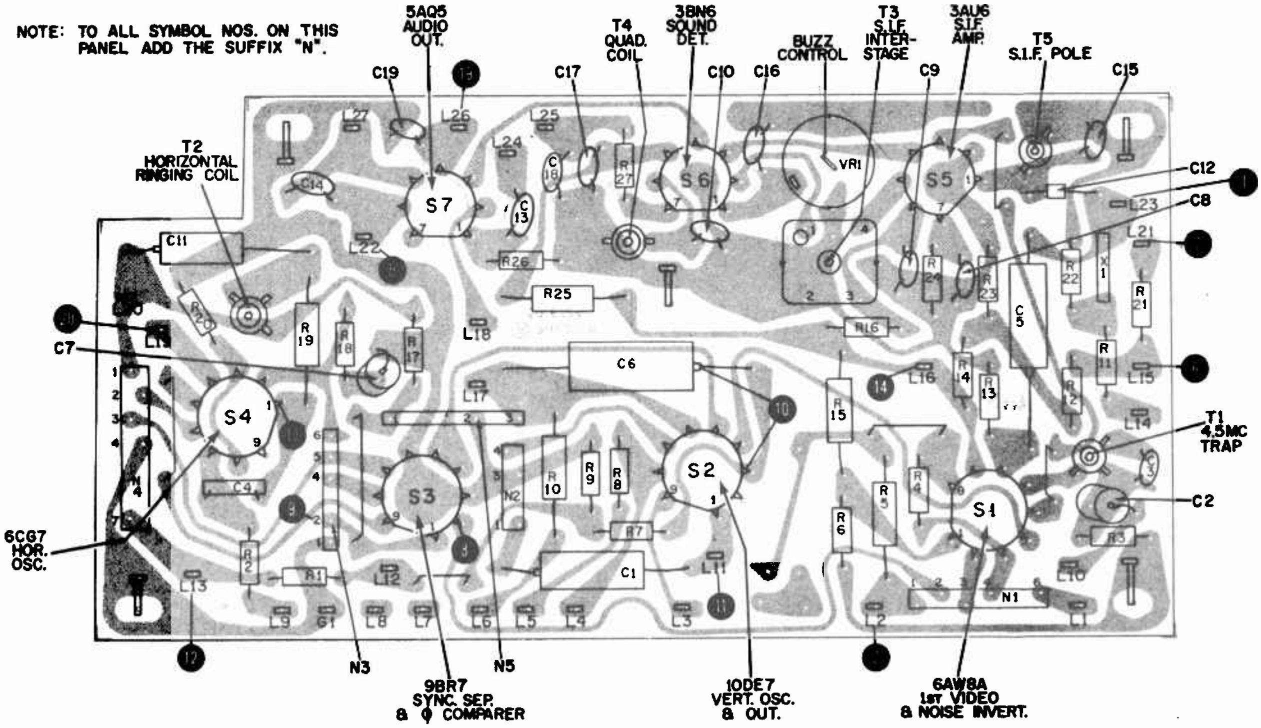
If the transparent window in the front of the picture tube occasionally needs cleaning, use only mild soap and water on a damp cloth. Rinse, then dry with a soft flannel cloth.

DO NOT ATTEMPT TO CLEAN WITH ABRASIVES OR CLEANING FLUIDS.

For the 9L38 the interconnecting cable may be cleaned the same as the window.

PHILCO Chassis 9L37, -U, 9L38, -U, Service Information, Continued

NOTE: TO ALL SYMBOL NOS. ON THIS PANEL ADD THE SUFFIX "N".



9L38 video-oscillator-sound perma-circuit panel

RUN CHANGE INFORMATION

9L37 and 9L37U Chassis

Main Chassis

Run 1—First Production (used Run 5 of V.I.F. panel)

Run 2—Use of Run 6 V.I.F. panel to eliminate channel 8 beat

Run 3—Use of Run 2 V.O.S. panel to reduce stretch.
Y. S. (yoke socket) rotated 45° CCW. S1 socket (damper tube) rotated 45° CW. C6 moved from yoke socket (Y.S.) and wired across damper socket S1-3 to S1-5. Damper socket lug S1-4 must be bent toward center or inside of socket. C4 moved from B3-4 and B3-7 to B3-4 and B3-1.
A two lug wiring panel (B4A) was added near E3. The orange lead from J3-1 was changed from B8-8 to the new panel B4A-1. A 47,000 ohms, 1/2 W resistor, R8A was added from B4A-1 to E3-1. This places a 47,000 resistor in series with the CRT screen between the screen and 400V boost to prevent CRT damage by arcing.
Red lead from B10-1 (B+ focus connection) changed from B3-6 (275V) to J3-1.
A dress lug was added between B3-7 and S1. The tuner cable leads and pilot lamp lead must dress between B5 wiring panel and S1 socket and under added dress lug.

Run 4—Use of Run 3 V.O.S. panel. VR-3 height control changed to 3.4 megohms, part number 33-5592-28. To improve centering of height control.

Run 5—Use of Run 4 V.O.S. panel to prevent blocking of noise inverter stage.

Run 6—R10, 2200 ohm hor. osc. de-coupling resistor, is removed from E1-1 and E1-2. C4, .047 ufd tuner B+ de-coupling condenser, is removed from B3-1 and B3-4. B7, the three lug wiring panel is removed. An orange wire is added from E1-2 to B3-4. This makes E1-2 the de-coupling filter condenser for tuner B+ and hor. osc. B+. The following wiring points were changed with no change in circuitry. R12 changed from B7-2 and B7-3 to B4-4 and B4-5. C8 changed from B7-3 and B6-8 to B4-2 and B4-5. The black lead from SW1-3 changes from B7-3 to B4-5.

Run 7—VR1, contrast/vol./on-off control, changed to 33-5592-42. This changes the contrast section from 2 megohms to 1 megohm and removes R22 from across the contrast control.

V.I.F. Panel

Run 5—Green dot, first production 9L37 chassis.

Run 6—Blue Dot. Special lead dress of filament choke X9C to eliminate channel 8 beat. X9C was raised up from panel to give greater spacing between choke and copper foil; thus radiation from foil to choke was reduced.

V.O.S. Panel

Run 3—Orange Dot. R11U, vertical osc. plate load resistor, changed in value to 2.7 megohms, 1 watt, part number 66-5274340. To improve centering of height control.

Run 4—Yellow Dot. R7U, noise inverter cathode resistor, changed in value to 3600 ohms, 5%, part number 66-2368240. To prevent blocking.

9L38 and 9L38U Chassis

Main Chassis

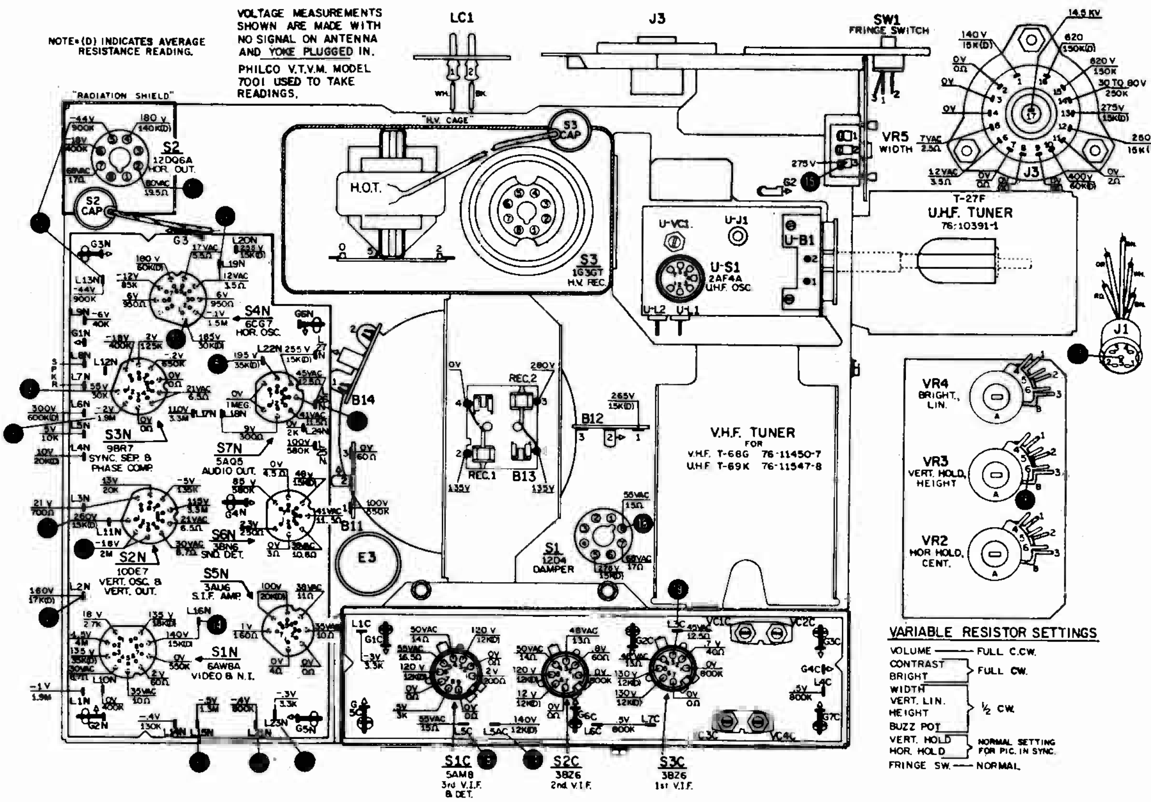
Run 2—A two lug wiring panel, B4A, was added next to and parallel to E5 on the chassis bottom. C5 was moved to wire from B2-9 to B4A-2. The value of C5 was changed from 250 mmf, 3KV, ceramic disk to 320 mmf, 3KV, ceramic disk, part number 30-1246-24. A resistor, R6A, was added from B4A-2 to S1-3. R6A is 470 ohms, 2 watts, part number 66-1476340. To reduce horizontal ringing.

Run 3—Pilot lamp socket and cable assy. and tuner power socket and cable assy. lead lengths changed.
Two .01 ufd tubular condensers and a 10,000 ohm resistor removed and a resistor-condenser network, N1, added in their place for retrace suppression. Part number of N1 is 30-6037-1. N1 wires to B8-3, B8-2 and B8-1. At this time R15 changed wiring points from B4-5 and B4-6 to B4-6 to B8-2. The blue lead from J3-14 changed from B4-5 to B8-2. To improve wiring and to use retrace suppression network.

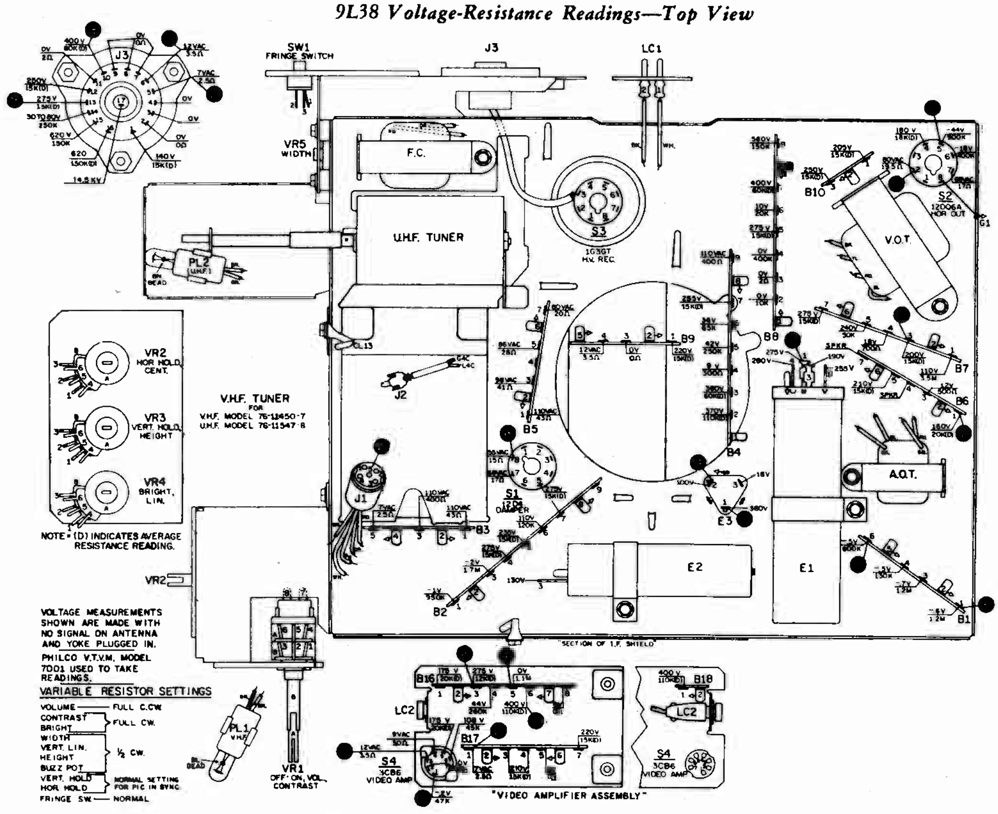
Run 4—R11, the 2200 ohm hor. osc. de-coupling resistor, is removed from E1-1 and E1-2. C4, .047 ufd tuner B+ de-coupling condenser, is removed from B2-2 and B2-5. An orange lead is added between E1-2 and B2-5.

Run 6—VR1, contrast/vol./on-off control changed to 33-5592-42. This changes the contrast section from 2 megohms to 1 megohm and removes R22 from across the contrast control.

PHILCO Chassis 9L38 Service Information, Continued

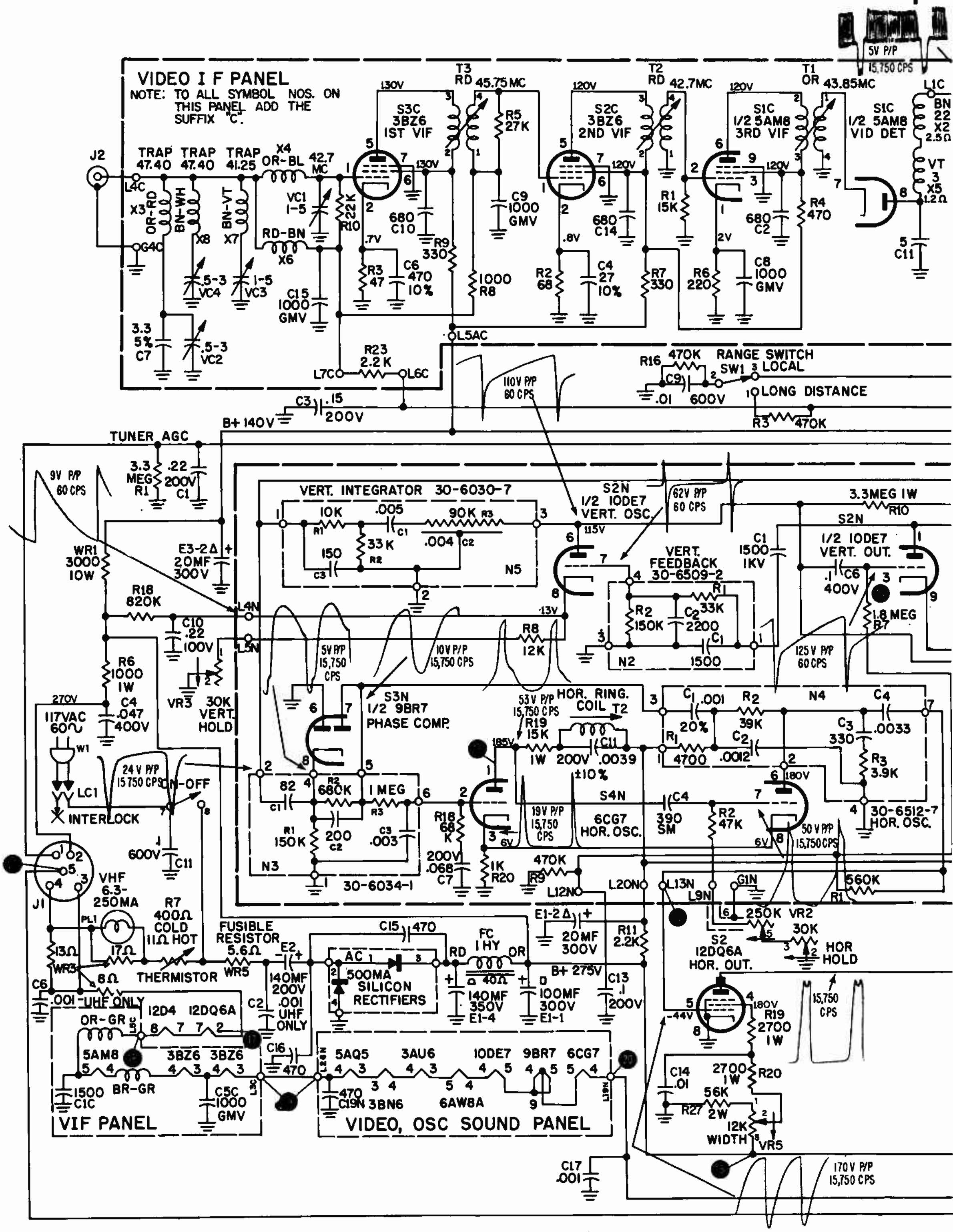


9L38 Voltage-Resistance Readings—Top View



9L38 Voltage-Resistance Readings—Bottom View

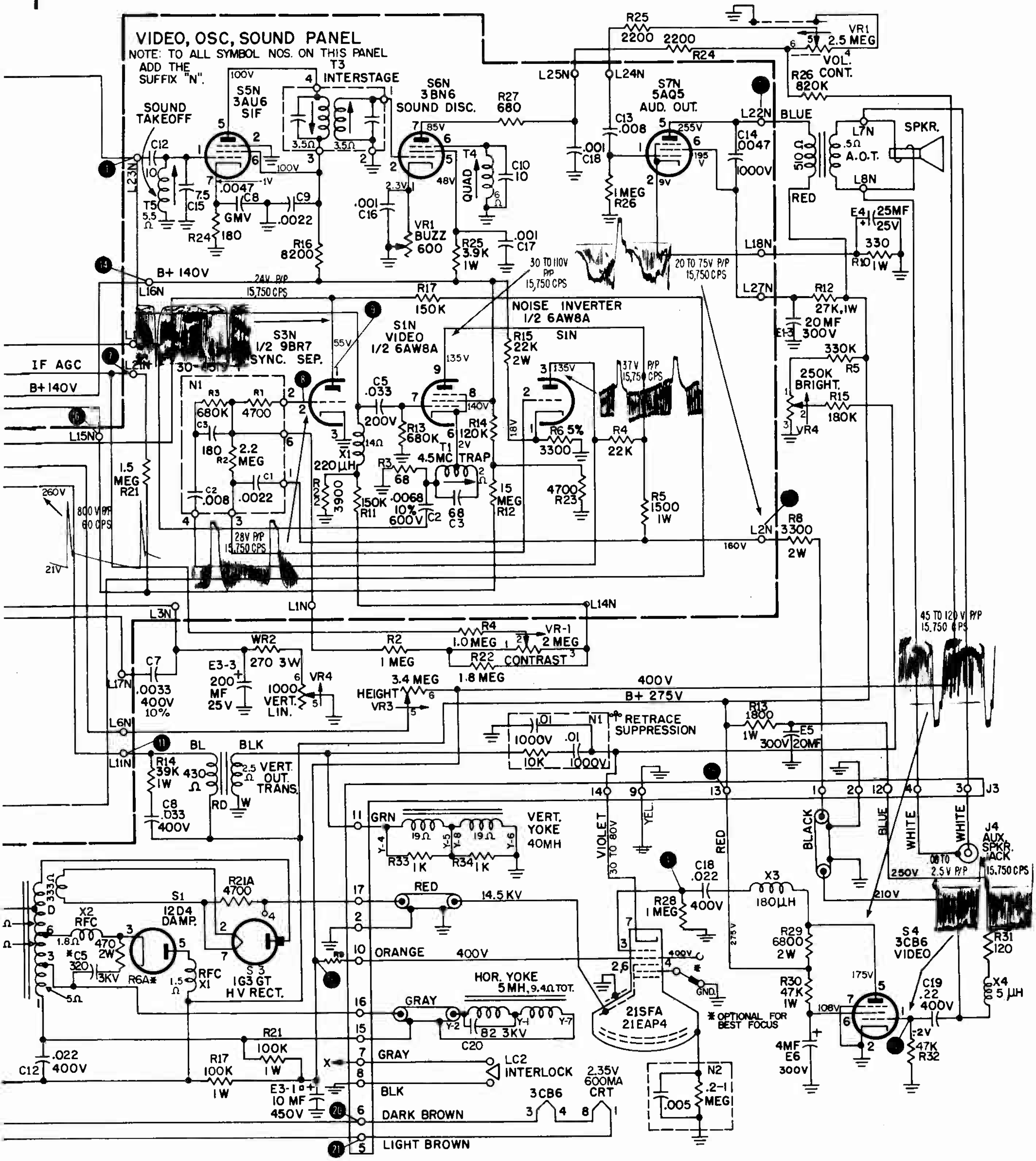
PHILCO Chassis 9L38 and 9L38U Schematic Diagram



Schematic Diagram for Chassis 9L38 and 9L38U, Run 3

NOTES: All capacitor values greater than 1 are in MMF unless otherwise noted.
All capacitor values less than 1 are in MFD unless otherwise noted.
All resistors are 1/2 watt, 10%, carbon unless otherwise noted.
Arrow through control indicates clockwise rotation.
Voltages are DC from point shown to chassis unless otherwise noted.
Voltages were read using a V.T.V.M. Voltages were taken with no signal.

PHILCO Chassis 9L38 and 9L38U Schematic Diagram



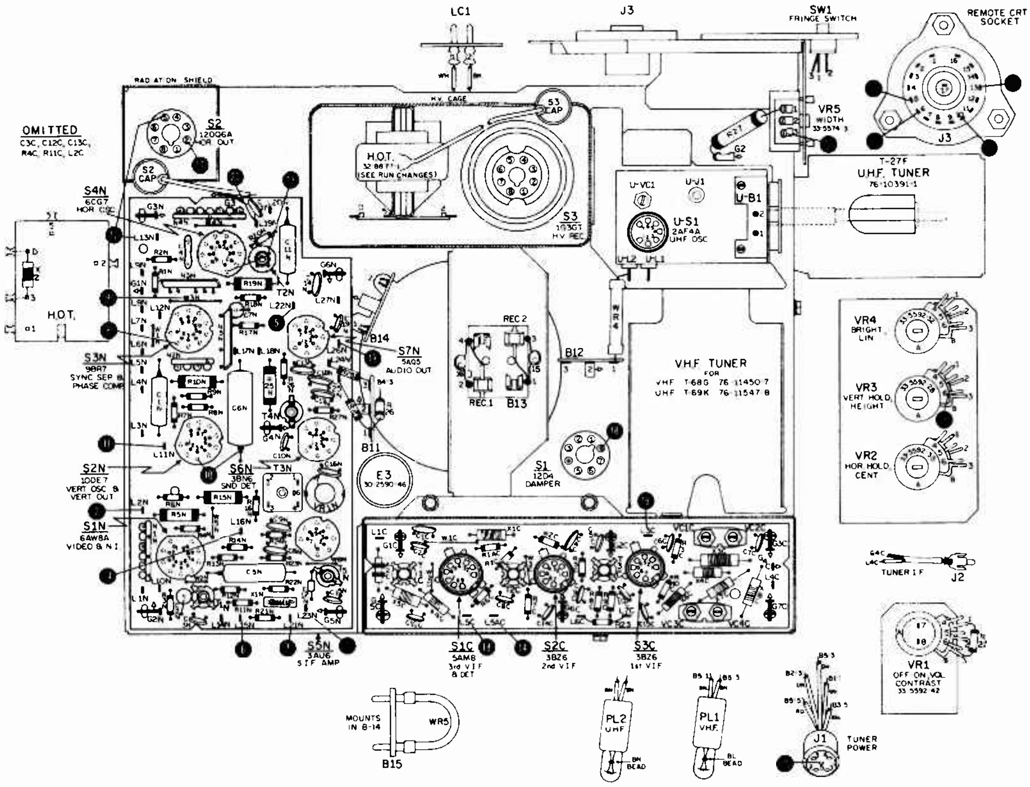
The receiver was adjusted for a good quality picture; i.e., normal contrast, brightness, width, height, vertical lin. and sound, picture in sync, then removed signal.

Coil resistances read with coil in circuit.

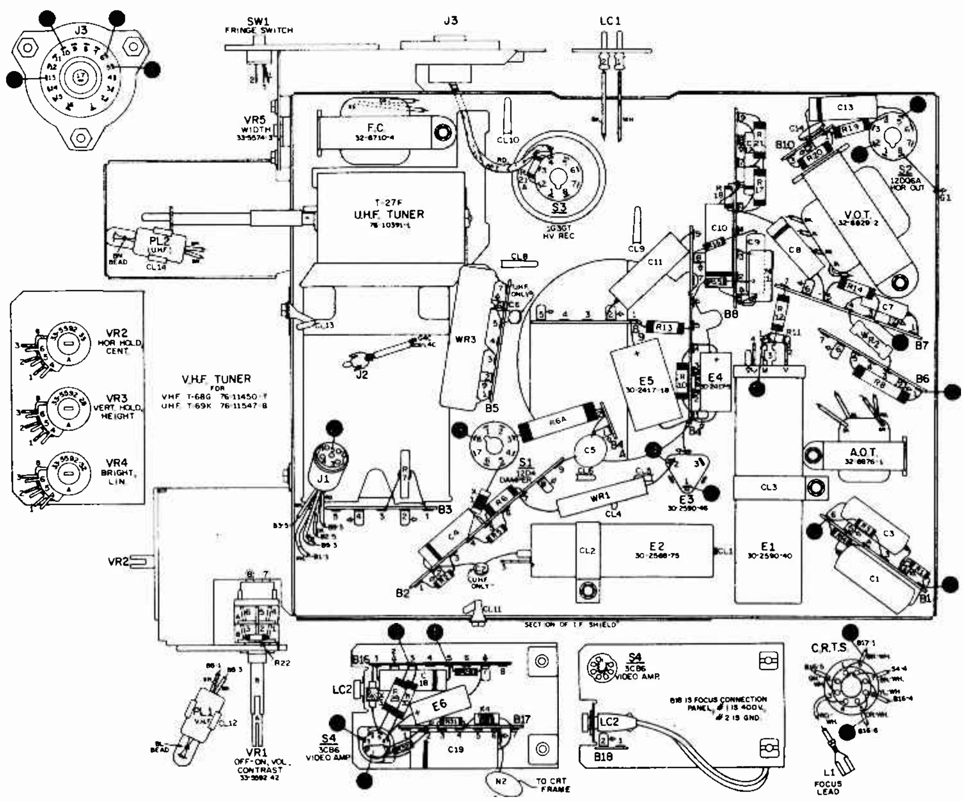
- Indicates a coil resistance of less than 1 ohm.

* Run 2 change } See Run Change Information.
† Run 3 change }

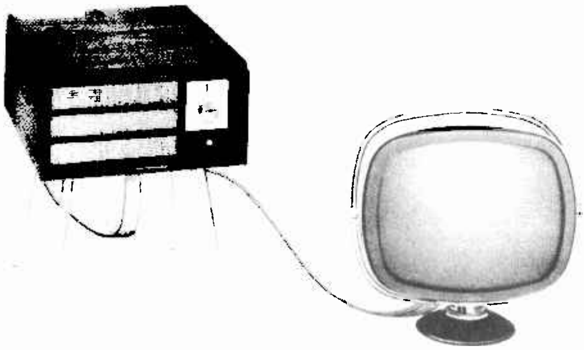
PHILCO Chassis 9L38 Service Information, Continued



9L38 Chassis Component Layout, Top View



9L38 Chassis Component Layout, Bottom View



PHILCO TELEVISION

PREDICTA TANDEM
TV MODEL G-4720
9L38A & AUDIO AMPLIFIER

DESCRIPTION

Models G-4720 and UG-4720 are Predicta Tandem TV featuring the separate picture tube and a 4 watt audio amplifier. These models match, and are intended to be used with, model G-1606-S, high fidelity phonograph consolette, for stereophonic reproduction.

The TV portion of model G-4720 uses a type 9L38A chassis. See page **116** for description.

The audio amplifier section uses a 6AU6 as first audio, a pair of 6AQ5's as audio output and a 6X4 rectifier. The function switch has three positions: center is "Off"; CCW is the "Phono" position which turns on the amplifier only; CW is the "TV" position which turns on both the amplifier and TV, selects the TV audio and completes the circuit from the amplifier output to the remote C.R.T. socket for the extension speaker jack. The speakers used are a 6" pm woofer and an "S" type electrostatic.

CHASSIS REMOVAL

To Remove Top—Remove amplifier knobs (4), remove the two top retaining screws at top rear. Slide cabinet top back (approx. 1") to disconnect the AC interlock and to free the guides at center top of each side. Lift top off and set aside. The line cord is held by two cable clamps.

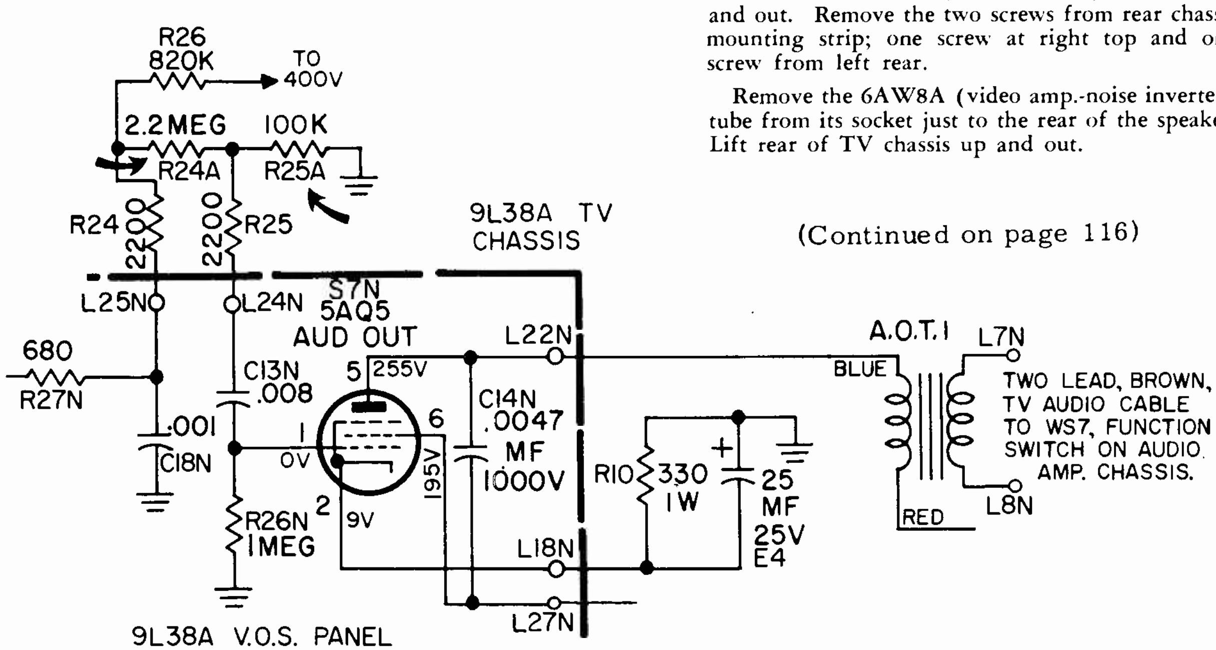
The entire TV and audio amplifier chassis are now exposed for service checks, tube replacement, etc.

To Remove Amplifier Chassis—Remove cabinet top. Remove the two screws from top edge of chassis. Disconnect the TV a.c., phono input and speaker leads. Pilot lamp removes from front clip. Unsolder the two leads from B21-1 and 2 that connect to the CRT remote socket (J3) and the TV audio leads connecting to TV V.O.S. panel lugs L7N & L8N. The amplifier is now free to lift out. The bottom lip of chassis fits in a groove of cabinet bottom.

To Remove TV Chassis—Remove cabinet top. Remove knobs. Disconnect TV a.c. and antenna leads and unsolder the two remote speaker leads from amp. chassis terminal panel B21-1 and 2 and the TV audio leads. Remove the two front chassis mounting screws from cabinet bottom. Remove the two screws from the top rear retaining plate. Remove left hand back section; three screws, lift back up and out. Remove the two screws from rear chassis mounting strip; one screw at right top and one screw from left rear.

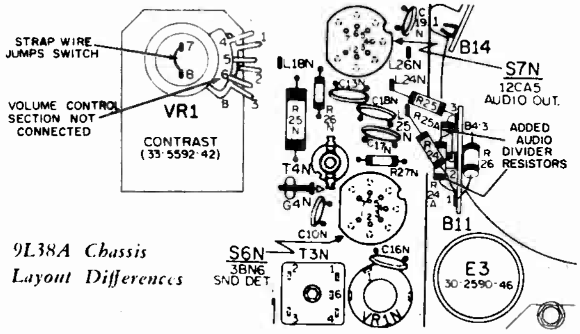
Remove the 6AW8A (video amp.-noise inverter) tube from its socket just to the rear of the speaker. Lift rear of TV chassis up and out.

(Continued on page 116)



9L38A Audio Circuit Showing Added Audio Divider Resistors

PHILCO TV MODEL G-4720, Continued



9L38A Chassis Layout Differences

9L38A TV CHASSIS

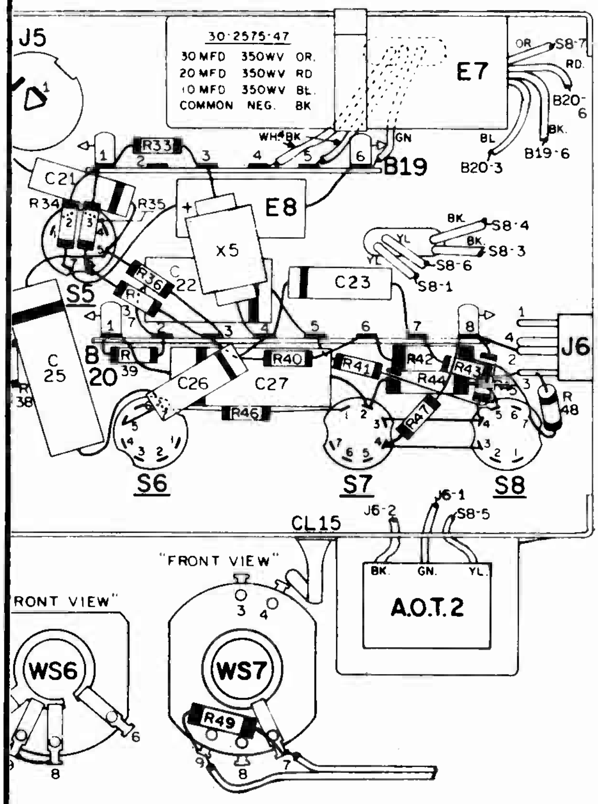
The 9L38A TV chassis is identical to the 9L38 chassis with the following exceptions.

The on-off switch is shorted by a jumper wire, the on-off action is accomplished by the function switch on the audio amplifier chassis.

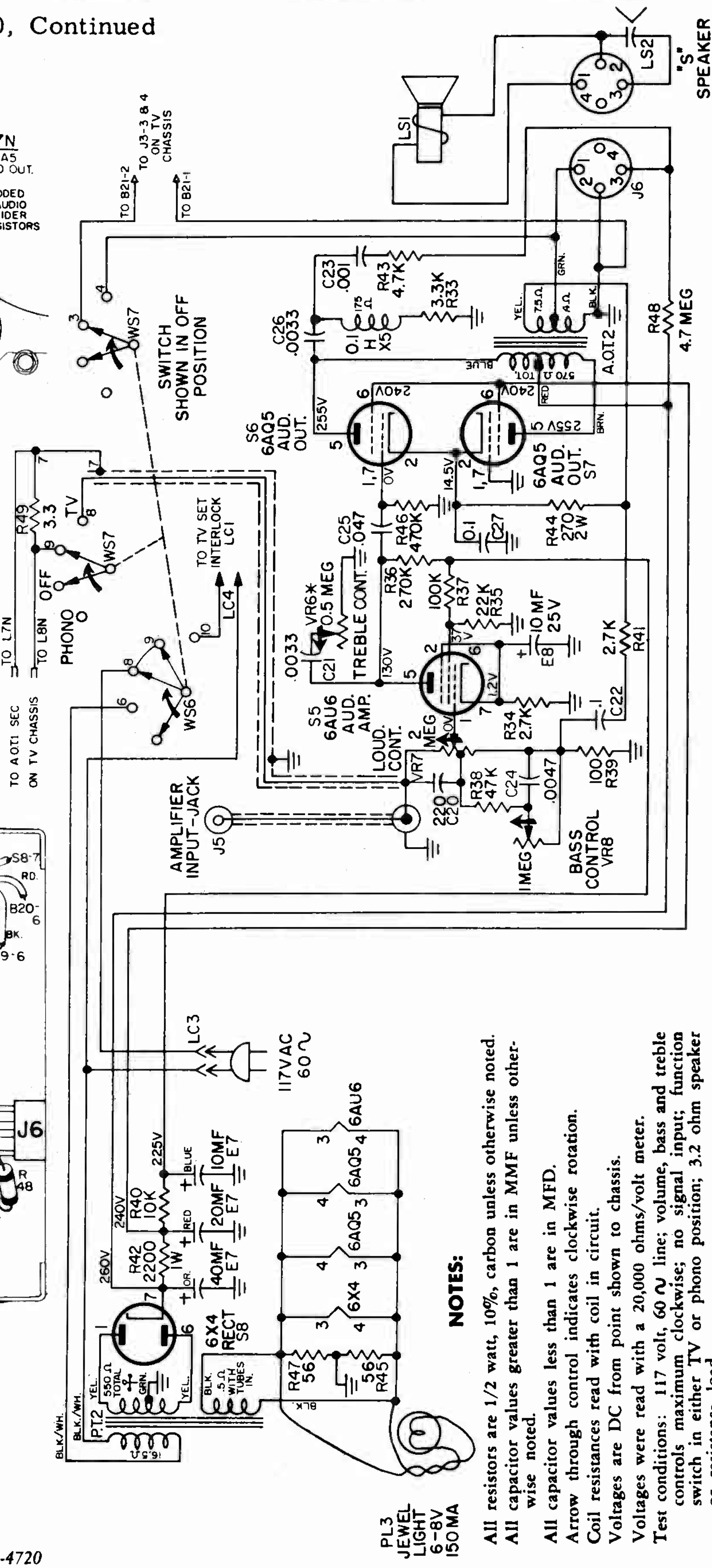
The TV volume control is present but not wired into the circuit. In place of the volume control two resistors (R24A and R25A) have been added as a fixed audio divider, see figures.

The secondary of the TV audio output transformer is wired over to the audio amplifier chassis where it is loaded by R49 and presented to the audio amplifier's volume control circuit. V.O.S. panel lugs L7N and L8N are the terminals for this two wire cable.

The remote speaker jack, provided on the C.R.T. base, is fed through the function switch and works only when the function switch is in "TV" position.



Component Layout, Audio Amplifier Section, Model G-4720



Schematic Diagram, Audio Amplifier Section, Model G-4720

NOTES:

All resistors are 1/2 watt, 10%, carbon unless otherwise noted.
All capacitor values greater than 1 are in MMF unless otherwise noted.
All capacitor values less than 1 are in MFD.
Arrow through control indicates clockwise rotation.
Coil resistances read with coil in circuit.
Voltages are DC from point shown to chassis.
Voltages were read with a 20,000 ohms/volt meter.
Test conditions: 117 volt, 60 ∿ line; volume, bass and treble controls maximum clockwise; no signal input; function switch in either TV or phono position; 3.2 ohm speaker or resistance load.
*VR6, first production value was 1 megohm.
P. T. 2 secondary voltage is 450V RMS, total.

PHILCO TELEVISION 9L60 and 9L60U CHASSIS

RECEIVER SET-UP CONTROL LOCATIONS

1. Vertical Linearity—Accessible from back of receiver. Left-hand control mounted on deflection PW panel.
2. Height—Accessible from back of receiver, left-hand side of dual potentiometer on deflection PW panel.
3. Horizontal Hold Centering—Right-hand control of dual potentiometers on deflection PW panel, accessable from back of receiver.
4. Width—Extreme right hand potentiometer on deflection PW panel, accessable from back of receiver.
5. .7 Ampere Fuse—Remove back. Fuse located in plug-in fuse holder on left side of chassis viewing from rear.
6. Tubes—All tubes (except CRT) are accessible after removing back. 1G3GT, high-voltage rectifier, is in cage.

TUNER, CHASSIS AND CRT REMOVAL

1. Remove channel selector, fine tuning, volume and contrast control knobs and cabinet back.
2. Disconnect speaker leads. Remove volume-contrast control and pilot lamp assembly by first removing drive screw located in well below knob.
3. Remove 2 screws mounting control sub assembly to cabinet top.
4. Remove tuner and chassis mounting bolts under cabinet and disconnect antenna leads.
5. Unplug tuner (IF link and power cable), yoke, CRT socket and anode lead.
6. Remove chassis from rear.
7. Remove tuner mounting screw on side of cabinet, and remove tuner. On UHF models remove UHF tuning knob before removing tuner.
8. Remove top, front trim strip, protective window and mask. All 24" sets and the 21" "Miss America" models have rear mounting CRT.
9. Remove 4 nuts and washers mounting CRT frame to cabinet.
10. Remove CRT assembly from front.

NOTE: CRT can be removed without chassis removal except in 21" "Miss America" and all 24" sets.

HORIZONTAL OSCILLATOR ADJUSTMENT

Allow set to warm up. Tune in a picture.

1. Short out the horizontal ringing coil, T1W, by placing a jumper across C1W.
2. Set the horizontal hold control, VR2 shaft, to the center of its range.
3. Adjust the horizontal hold centering control, VR2W screw driver adjustment, to set the oscillator to the correct horizontal line frequency (to stop the picture; it will not be stable). Bring picture into sync. from high frequency side (black bars sloping up to the left).
4. Remove the shorting jumper from across C1W and adjust the ringing coil (T1W) core for stable picture sync. Bring picture into sync. from high frequency side.

CRITICAL LEAD-DRESS INFORMATION

To Prevent Damage to Lead Insulation

(1) All leads from L15W, L16W, L18W, L13W must be dressed down toward deflection panel, between N1W and N2W, under dress lug CL7. Lead from L15W must be dressed between L18W and VR2W, L16W and VR2W, L14W and VR2W away from X2W and pin 6 of the damper tube.

(2) All leads from L7Y, L9Y, L4Y, L1Y, L2Y, L23Y must be dressed toward video panel, away from all tubes on panel.

(3) Leads from L10W and S3W cap to H.O.T. horizontal output transformer, must be dressed away from 5U4CB tube with excess dressed over end of chassis. Orient S3W cap to dress lead away from 6DQ6A.

(4) All leads must be dressed away from Hot Resistors WR1, WR2, WR3, WR4, WR1Y.

(5) Leads from L19W and L6W must be dressed along edge of deflection panel around G1W between 5U4GB heat shield and edge of panel away from 6AU4 and 5U4GB.

MODEL NO.	CHASSIS	MODEL NO.	CHASSIS
G-4240M	9L60	UG-4660SL	9L60U
G-4240L	9L60	G-4662M	9L60
UG-4240M	9L60U	G-4662P	9L60
UG-4240L	9L60U	G-4664P	9L41
G-4656SM	9L60	UG-4664P	9L41U
UG-4656SM	9L60	G-6628M	9L60
G-4658SM	9L60	G-6628L	9L60
G-4658SW	9L60	UG-6628M	9L60U
G-4658SL	9L60	UG-6628L	9L60U
UG-4658SM	9L60U	G-6632M	9L60
UG-4658SW	9L60U	G-6632L	9L60
UG-4658SL	9L60U	G-6632W	9L60
G-4660SM	9L60	UG-6632-M	9L60U
G-4660SL	9L60	UG-6632L	9L60U
UG-4660SM	9L60U	UG-6632W	9L60U

VIDEO I-F ALIGNMENT

AM ALIGNMENT

CHANNEL SELECTOR: On VHF models (T-100) set to channel 4; on UHF models (T-101) set to UHF position.

SIGNAL INJECTION: VHF models (T-100) to tuner feed-thru, L4, in mixer grid circuit. UHF models (T-101) to UHF input cable plug on tuner.

BIAS: —6.0 volts to I-F A.G.C., L6Y (on video-sound panel) and —2.5 volts to tuner A.G.C. L8Y (on video-sound panel).

RANGE SWITCH: Set to "NORMAL" position.

SCOPE: Connect to L3Y on video-sound panel, video second detector output.

OUTPUT LEVEL: Not to exceed 2 volts peak to peak during pole and sweep alignment. Not less than .2 volts peak to peak as null, during trap alignment, is approached.

(1) 45.85 MC adjust tuner pole T3 for maximum.

(2) 41.25 MC adjust VC-3Z trap for minimum.

NOTE: Bias may be reduced as trap minimum is approached.

(3) 47.40 MC adjust VC-2Z and VC-4Z traps for minimum.

(4) Repeat steps two and three.

(5) 42.70 MC adjust VC-1Z and T2Z for maximum.

(6) 45.0 MC adjust T3Z for maximum.

(7) 44.4 MC adjust T1Z for maximum.

SWEEP ALIGNMENT

CHANNEL SELECTOR: Set to channel 4.

SIGNAL INJECTION: To antenna terminals through an antenna matching network (generator to 300 ohms).

BIAS, SCOPE and OUTPUT LEVEL: Same as above under AM Alignment.

RANGE SWITCH: Set to "NORMAL" position.

(1) Inject 65.75 MC AM, 30% modulated, into antenna. Adjust fine tuning control for minimum output. Do Not Disturb fine tuning during balance of adjustments.

(2) Inject channel 4 sweep signal (69 MC with 6 MC sweep width) into antenna. If necessary, adjust the following cores to bring the curve within limits (see curve figure 2).

(a) Adjust 67.25 MC to fall at the 50% point with tuner core T1.

(b) Level curve with core T1Z.

(c) Position 70.5 MC at the 50% point with core T2Z.

DO NOT DISTURB T3Z AND VC-1Z

4.5 MC TRAP ALIGNMENT

(1) Inject 4.5 MC AM signal into L3Y or use station signal.

(2) Connect 4.5 MC detector (see circuit figure 1) to L17Y (pin 7 of CRT).

NOTE: Preliminary padding of 4.5 MC test detector—Connect detector to an accurate source of 4.5 MC signal and pad core of transformer for maximum DC output voltage.

NOTE: When using generator, calibrate by zero beating with sound I-F developed from station signal.

(3) Connect 20,000 ohms/volt meter, set to 2.5 volt range, to detector output.

(4) Turn contrast control fully clockwise (to maximum).

(5) Adjust 4.5 MC trap (top core of T2Y) for minimum indication.

PHILCO Chassis 9L60, -U, Continued

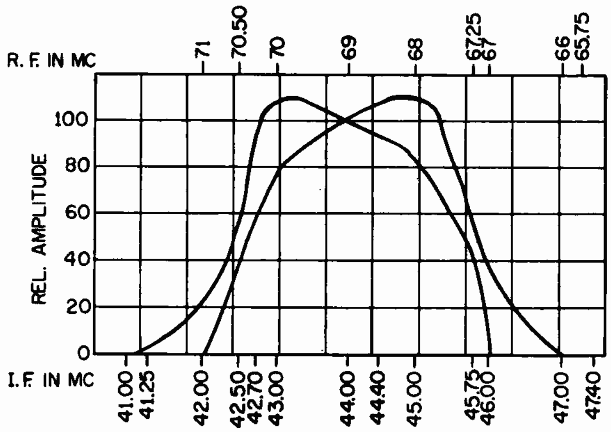


Fig. 2. Overall R-F I-F Response Curves

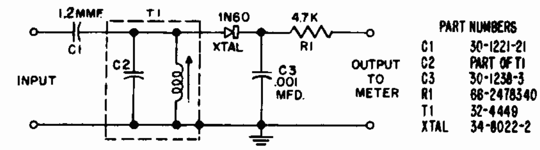


Fig. 1. 4.5 mc. Detector Tube

SOUND I-F ALIGNMENT

NOTE: The sound I-F alignment is based upon a properly aligned video I-F strip.

(1) With a weak station signal (antenna disconnected) tune receiver for best possible picture. Do not readjust fine tuning control during balance of procedure.

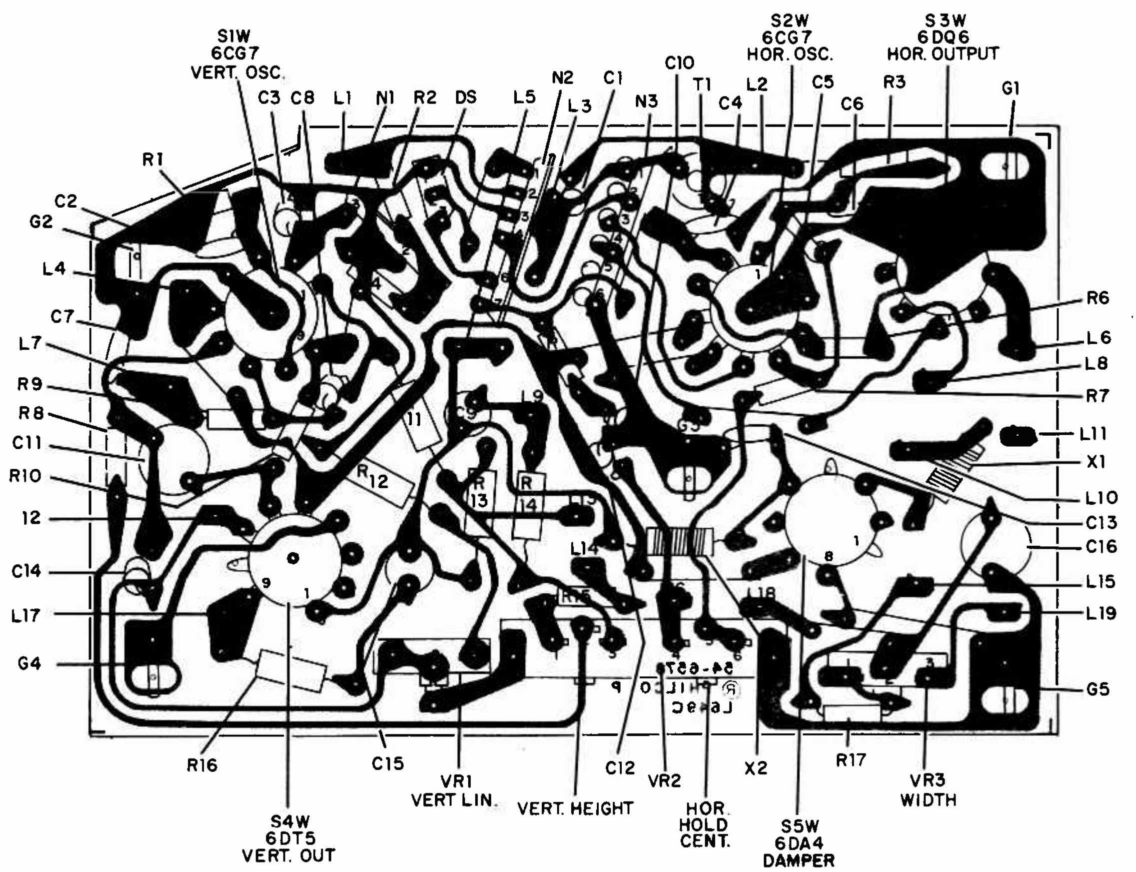
(2) With a strong signal (antenna connected) adjust the quadrature coil, T3Y, for maximum sound.

(3) Connect a VTVM to the audio test point, L14Y. Be sure voltmeter probe contains an isolation resistor. (If it is required to add a probe isolating resistor, use a value of 10,000 ohms or more.) Using a weak station signal (antenna disconnected), adjust the sound take-off coil (bottom core of T2Y) and the sound interstage transformer, T4Y (both pri. and sec. cores), for a maximum. The station signal employed should not be too weak for this adjustment.

(4) If any signs of intercarrier buzz or noise interference occur, a VERY SLIGHT adjustment of T4Y and/or the bottom core of T2Y may be made to minimize the noise. Neither core should be adjusted more than 1/4 turn.

TERMINAL LUG IDENTIFICATION — DEFLECTION PRINTED-WIRE PANEL

L1W	Sync input lead from L4Y on video-sound panel.
L2W	Horizontal stabilizing coil test point.
L3W	B+ lead (Hor. Osc.) from electrolytic E1, lug 2.
L4W	Filament lead input from filament transformer.
L5W	270V B+ input from electrolytic E1, lug 4.
L6W	Filament lead to chassis ground from 6DQ6A, pin 7.
L7W	Lead to vertical hold control VR1.
L8W	Lead to terminal L18W from horiz. output screen grid.
L9W	Lead to hor. output trans. (B+ boost).
L10W	Lead to hor. output trans. from 6DA4GT damper cathode.
L11W	Not used.
L12W	Vertical output 6DT5 cathode lead to electrolytic E2, lug 3.
L13W	Lead (B+ boost) to electrolytic E2, lug 2, CRT pin 6 and to L18Y terminal on video-sound panel.
L14W	Lead to L23Y terminal on video-sound panel and arm of brightness control VR3.
L15W	Lead to top of brightness control VR3.
L16W	Lead to top of horizontal hold control VR2.
L17W	Black and white to lead vertical output trans. primary.
L18W	Jumper wire connection from L8W to arm of width control VR3W.
L19W	B+ lead from width control VR3W to WR3 resistor.

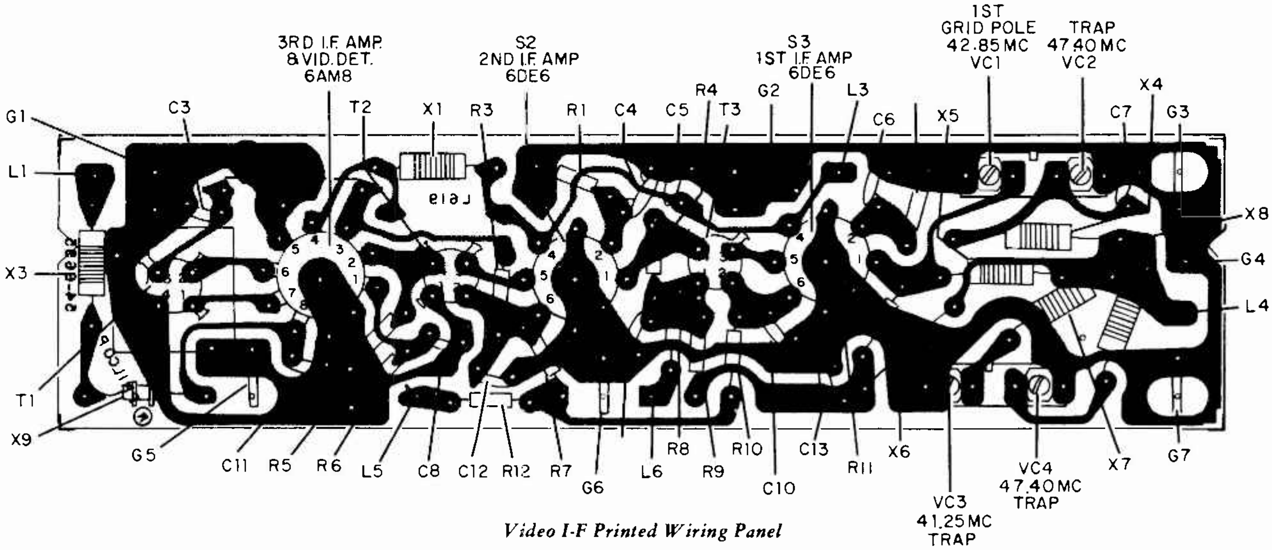


Deflection Printed Wiring Panel

PHILCO Chassis 9L60, 9L60U, Service Information, Continued

TERMINAL LUG IDENTIFICATION — VIDEO I-F PRINTED-WIRE PANEL

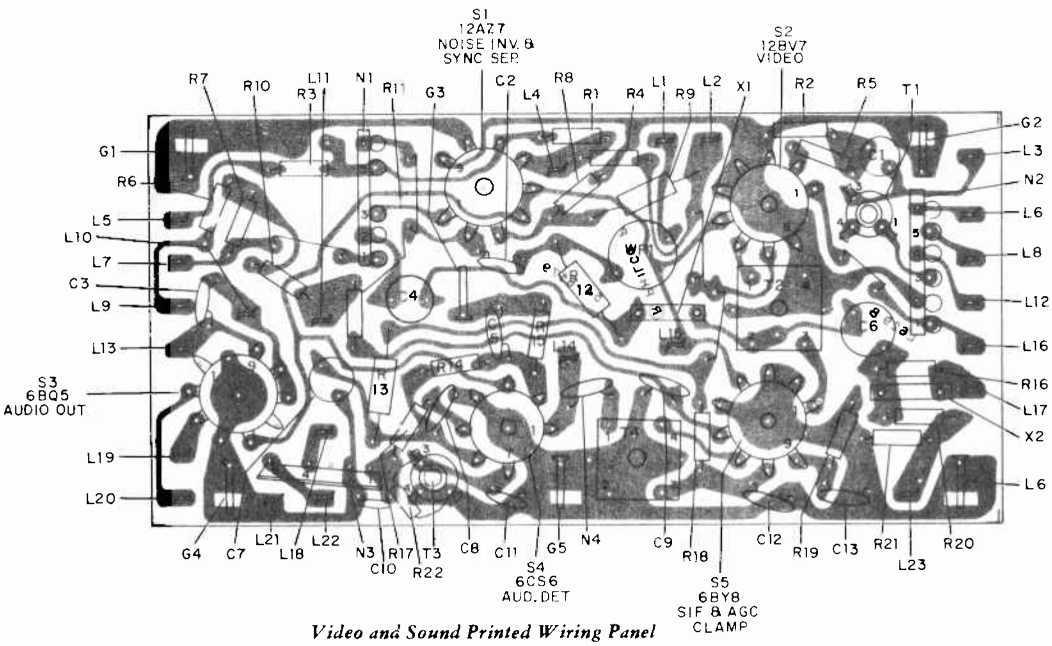
L1Z Video detector output to video-sound panel terminal L3Y.
L3Z Filament input lead from terminal L15Y on video-sound panel and CRT filament lead.
L4Z I-F input from tuner.
L5Z 140V B+ input.
L6Z I-F AGC lead from terminal L6Y on video-sound panel and No. 1 position of range switch.
G4Z Ground terminal for shield braid of i-f tuner cable.



Video I-F Printed Wiring Panel

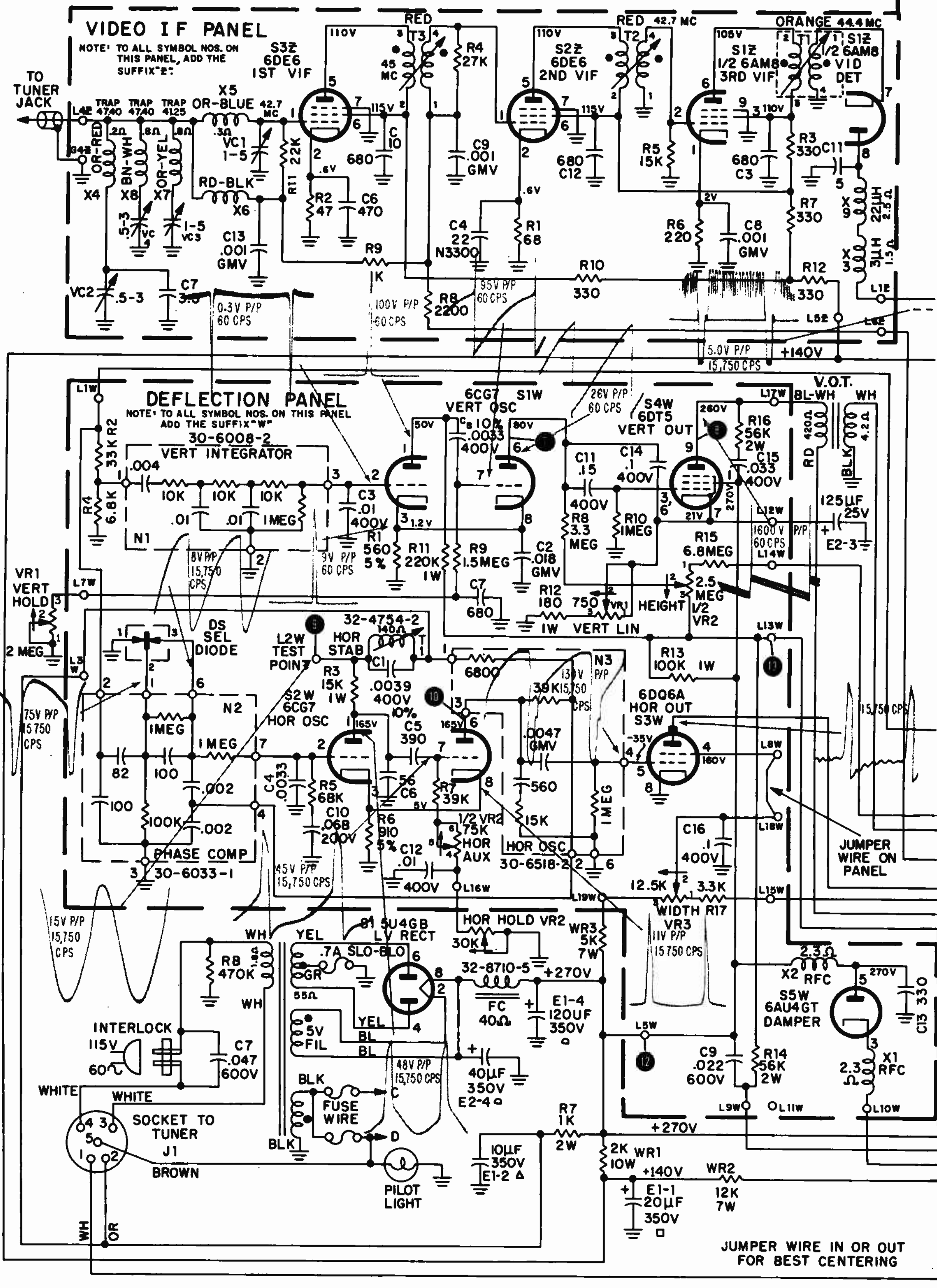
TERMINAL LUG IDENTIFICATION — VIDEO-SOUND PRINTED-WIRE PANEL

L1Y 270 B+ input to noise inverter, sync separator and video amplifier from L7Y terminal.
L2Y 140V B+ input lead from L5Z terminal on video i-f panel.
L3Y Lead from L1Z, video detector output on video i-f panel.
L4Y Sync separator output.
L5Y Sync separator grid lead to contrast control (agc).
L6Y Video i-f, agc lead to L6Z on video i-f panel and to No. 1 position on range switch.
L7Y 270V B+ supply to panel.
L8Y AGC lead to tuner and to junction of R1 and C6.
L9Y Lead to C2, R1A, C1 and No. 8 position on range switch.
L10Y Lead to audio output trans. primary and to C8 on tone control.
L11Y Lead to No. 5 position on range switch.
L12Y Lead to No. 4 position on range switch and to contrast control.
L13Y Lead to audio output transformer primary and electrolytic E2, lug 1.
L14Y Sound alignment test point.
L15Y Filament lead to L3Z on video i-f panel and to WR4, CRT filament resistor.
L16Y Video ampl. cathode lead to R5, C1 and WR2.
L17Y Video ampl. output lead to CRT cathode, pin 7.
L18Y 400V B+ lead to panel from electrolytic E2, lug 2.
L19Y Audio output cathode lead to electrolytic E1, lug 3 and R6.
L20Y Lead from audio output grid to volume control arm.
L22Y Lead to high side of volume control.
L23Y Lead to brightness control arm.



Video and Sound Printed Wiring Panel

PHILCO Chassis 9L60, 9L60U, Schematic Diagram



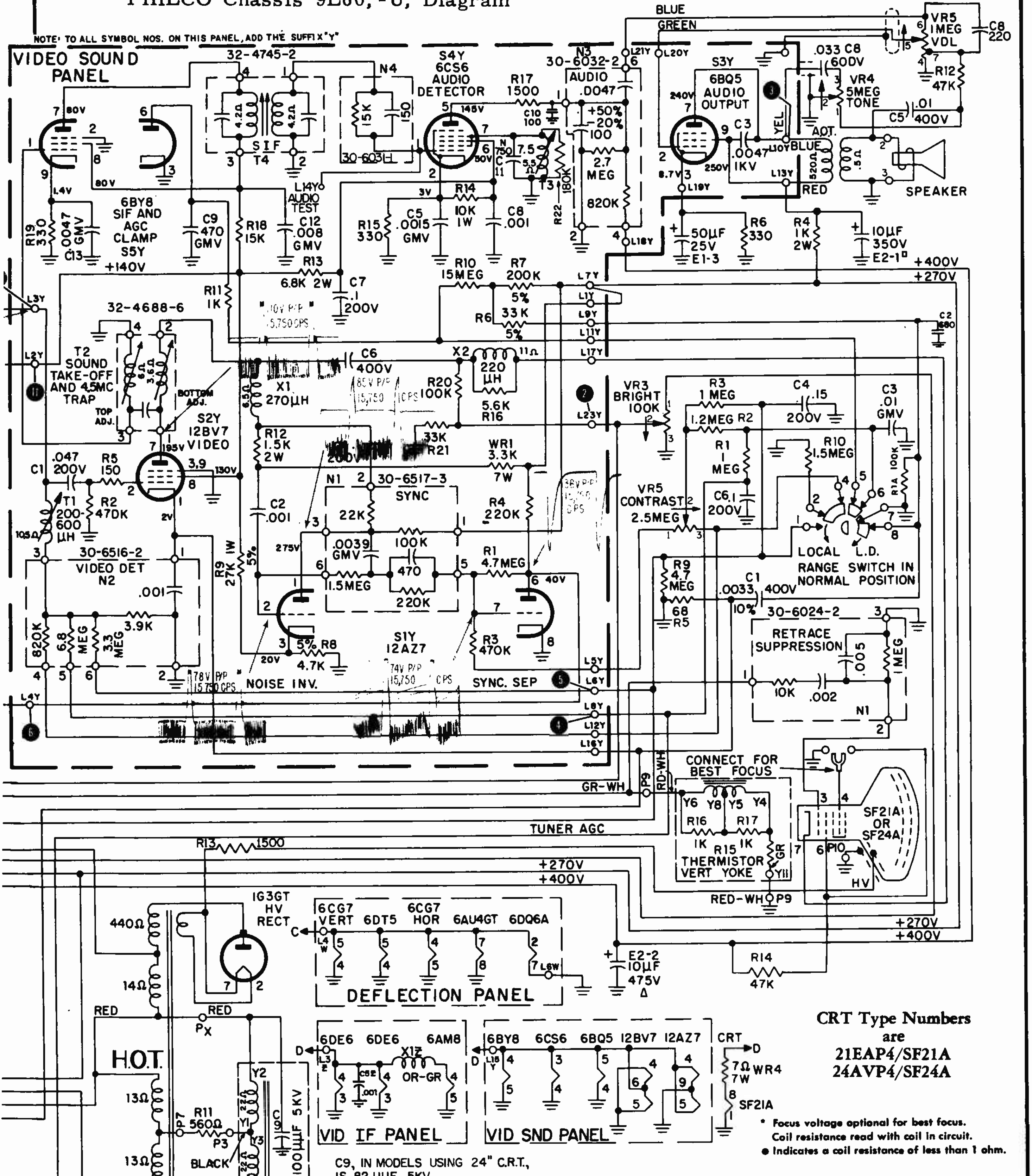
NOTES:

All resistors are 1/2 watt, 10%, carbon unless otherwise noted.
All capacitor values greater than 1 are in MMF unless otherwise noted.
All capacitor values less than 1 are in MFD.
Arrow through control indicates clockwise rotation.
Voltages are DC from point shown to chassis.
Voltages were read with a 20,000 ohms/volt meter.

CHECKING THE HORIZONTAL PHASE COMPARER SELENIUM DIODE (DS ON DEFLECTION PANEL)

A 20,000 ohm/volt meter is employed. On the 10K scale the forward resistance (meter connected in the same polarity as the diode) should be a maximum of 6000 ohms. The ratio of the forward resistances of the two diodes should be less than 2 to 1. On the 100K scale the back resistance (meter connecter in reverse polarity to the diode) should be a minimum of 2 megohms. The center conductor of the phase comparer unit is the common negative.

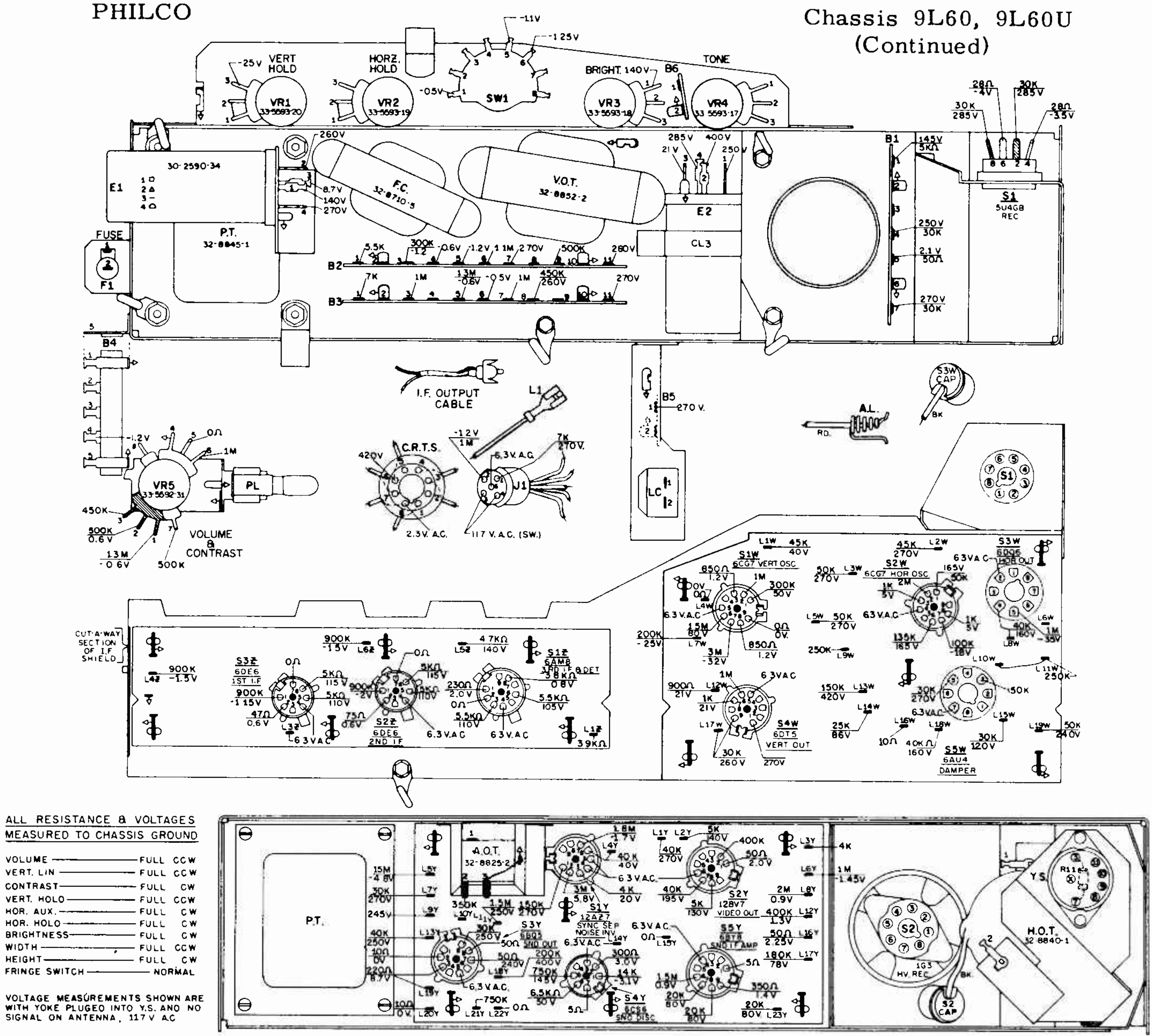
PHILCO Chassis 9L60, -U, Diagram



Schematic Diagram for Chassis 9L60 and 9L60U (Run 5)

PHILCO

Chassis 9L60, 9L60U
(Continued)



Chassis Layout Showing Voltage and Resistance Readings

RUN CHANGE INFORMATION

MAIN CHASSIS

Run 1Z First production.

Run 2 Video-Sound panel changed to Run 2 (red dot). To improve AGC action.

Run 3 Video-Sound panel changed to Run 3 (orange dot). To improve sound detector stability.

Run 4 Added a 47,000 ohm resistor, R14, from CRT screen to boost B+, see schematic. To improve CRT safety factor.

Run 5 Video-Sound panel changed to Run 4 (yellow dot). To improve sound detector stability.

DEFLECTION PANEL

Run 3 (orange dot) First production. Some early production panels may have a horizontal oscillator network (N3W) of part number 30-6518-1. Use the —2 when replacement is necessary.

VIDEO-SOUND PANEL

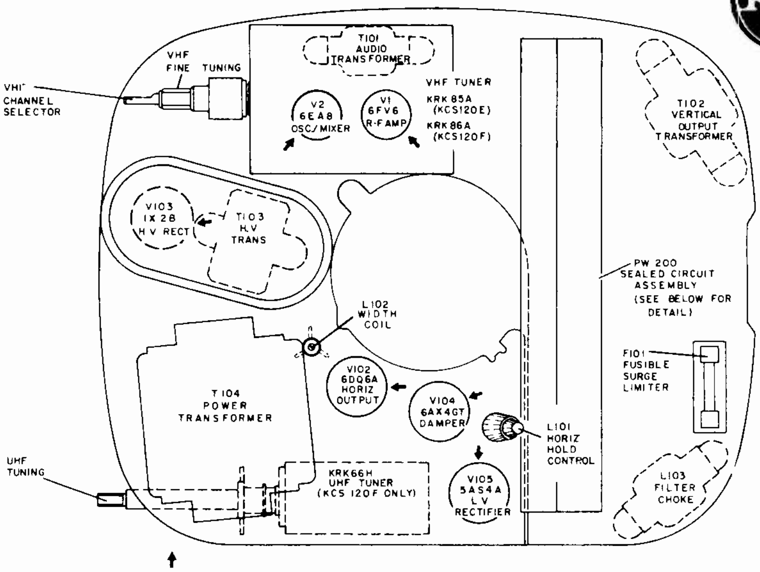
Run 1 First production.

Run 2 (red dot) N1Y, sync. sep-noise inverter network, changed to part number 30-6517-3. To improve AGC action.

Run 3 (orange dot) C11Y, sound detector quadrature tank condenser, changed in temperature coefficient to N330, part number 30-1263-39. To improve sound detector stability.

Run 4 (yellow dot) R14Y, sound detector cathode bias, changed from 1/2 watt to 1 watt, part number 66-3104340; R13Y, sound detector B+ de-coupling, changed from 10,000 ohms, 2 watts to 6,800 ohms, 2 watts, part number 66-2685340; C11Y, quadrature tank, changed in temperature coefficient to N750, part number 30-1263-44; and R22Y, quadrature coil damping resistor, 180,000 ohms, part number 66-4188340, added across the quadrature coil, T3Y.

CHASSIS REAR VIEW



DENOTES KEYWAY (OPEN PIN LOCATION FOR MINIATURE TUBES)

RCA VICTOR

PORTABLE TELEVISION RECEIVERS

MODELS

140-P-020, 140-P-020U
140-P-023, 140-P-023U
140-P-024, 140-P-024U

CHASSIS NOS.

KCS120E & KCS120F

(Material on pages 123 through 126)

ANTENNA INPUT IMPEDANCE .... 300 ohms balanced
FOCUS .... Electrostatic
PICTURE SIZE .. Approx. 108 sq. ins. on a 14WP4 Kinescope
POWER INPUT .... 117 Volts AC, 60~
POWER RATING .... 140 watts
SWEEP DEFLECTION .... Magnetic

ANTENNA INPUT

VHF Models

The KRK85A tuner unit is designed for VHF reception only with a 300 ohm antenna input provided. A rod-type VHF antenna is provided on all models. If reception from an external antenna is desired, the rod-type antenna leads should be disconnected from the terminal board and the lead-in from the external antenna should be connected to the antenna terminals.

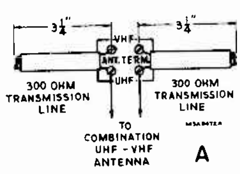
UHF/VHF Models

The KRK86A/66H tuner combination is designed for UHF/VHF reception with separate 300 ohm antenna inputs provided. A rod-type antenna is provided for VHF reception and a loop antenna for UHF reception on all models.

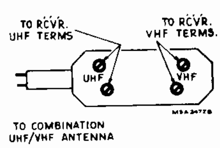
When reception from an external VHF antenna is desired, the leads of the rod-type antenna should be disconnected and the lead-in from the external antenna connected to the VHF antenna terminals.

When reception from an external UHF antenna is desired, the loop antenna leads should be disconnected and the lead-in from the external UHF antenna should be connected to the UHF antenna terminals.

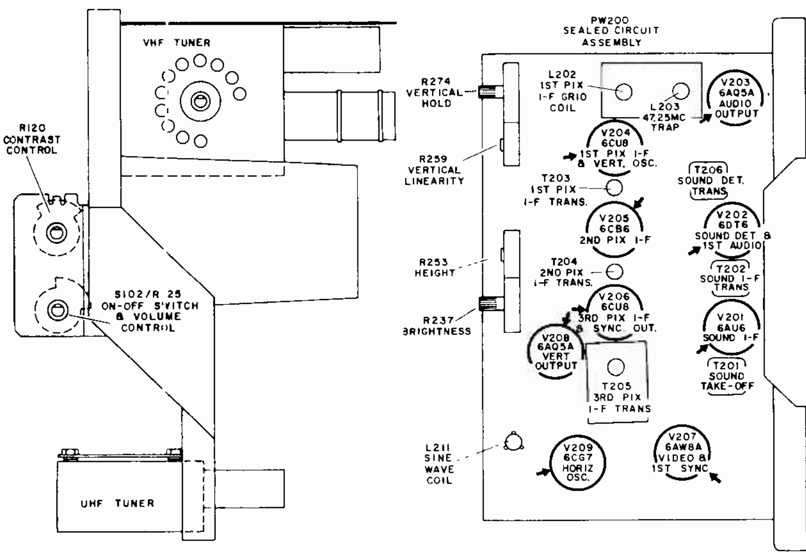
When a combination UHF/VHF antenna is to be used, having a single transmission line, a stub arrangement, such as shown in "A" of illustration below, or a crossover network (RCA Part #78444) as shown in "B", may be used to match the single transmission line to the two inputs.



A



B



CHASSIS REMOVAL AND REPLACEMENT

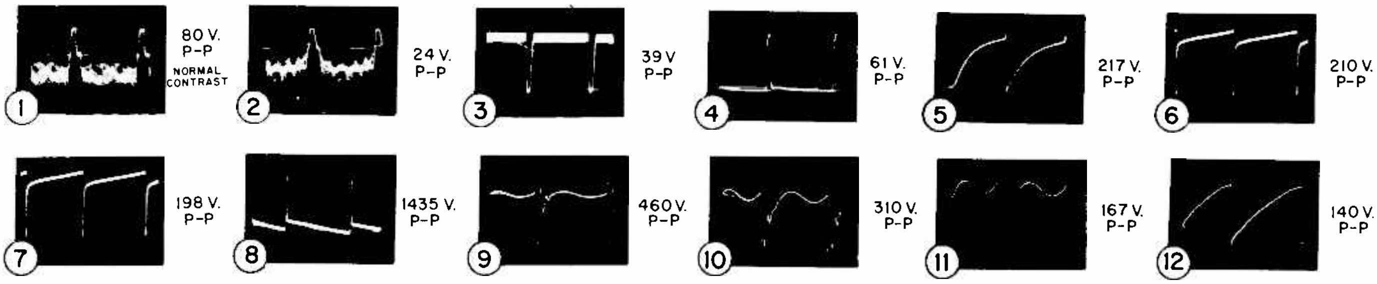
Take off the front safety window as outlined above. Remove the control knobs at the side of the cabinet by pulling the knobs outward off their shafts. On UHF Models remove the plastic guard behind the UHF tuning knob.

Take out the seven screws around the edge of the rear cover and the screw in rear of the cover at the power cord. Remove the rear cover, disconnecting the push-on antenna leads. Remove the screw at the top rear of the cabinet holding the cabinet to the cabinet channel.

Turn the receiver face downward on a protective cloth or pad and remove the eight screws from the bottom. Refer to illustration above. Spring the sides of the cabinet open just enough to slide the case upward off the chassis.

Reverse the above procedure to reassemble the chassis and kinescope in the cabinet.

RCA Victor Chassis Nos. KCS-120E and KCS-120F Service Material, Continued



Balloons ①② etc., shown on schematics indicate points of observation of the waveforms shown below the individual schematic.

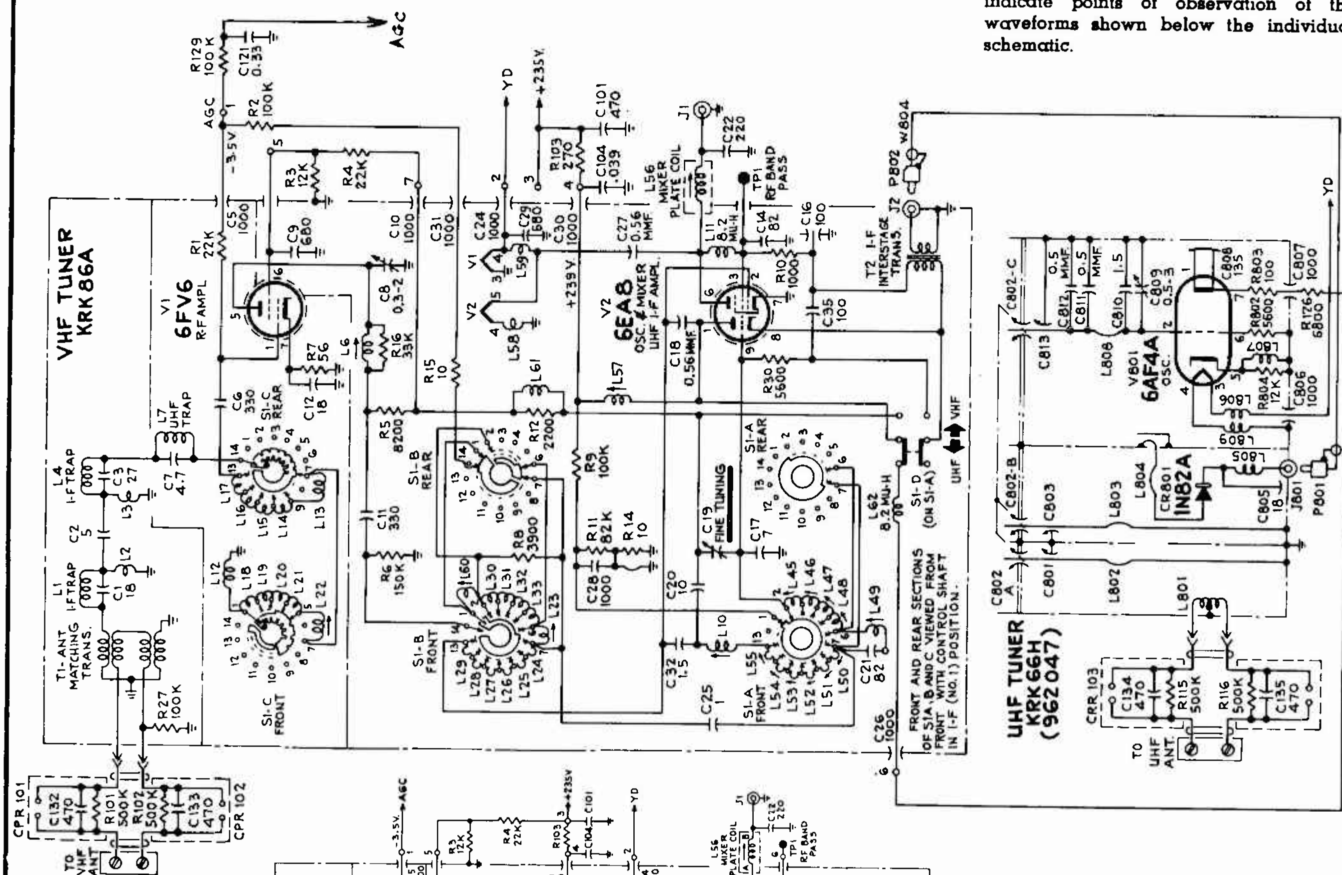
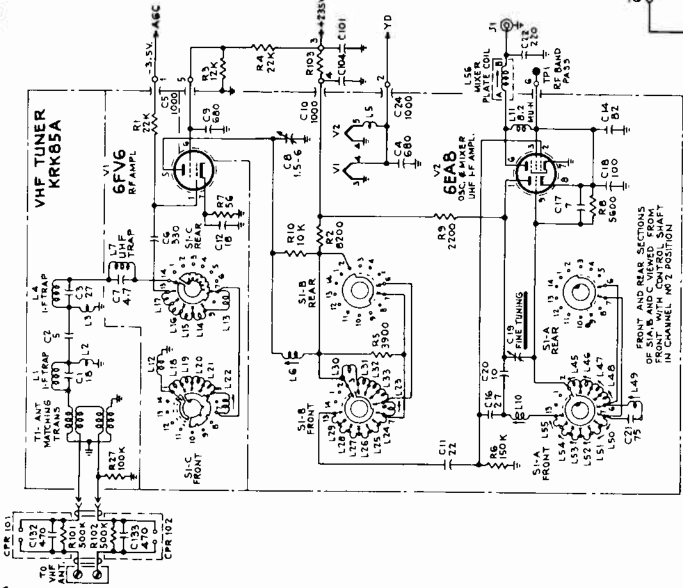


Diagram of Tuners KRK86A and KRK66H

CHASSIS DESIGNATIONS

CHASSIS	TUNER ASSEMBLY	MODELS
KCS120E	KRK85A	140-P-020, 140-P-023 140-P-024
KCS120F	KRK86A KRK66H	140-P-020U, 140-P-023U 140-P-024U



KRK85A VHF TUNER SCHEMATIC DIAGRAM

All schematics are shown in the latest condition at the time of printing.

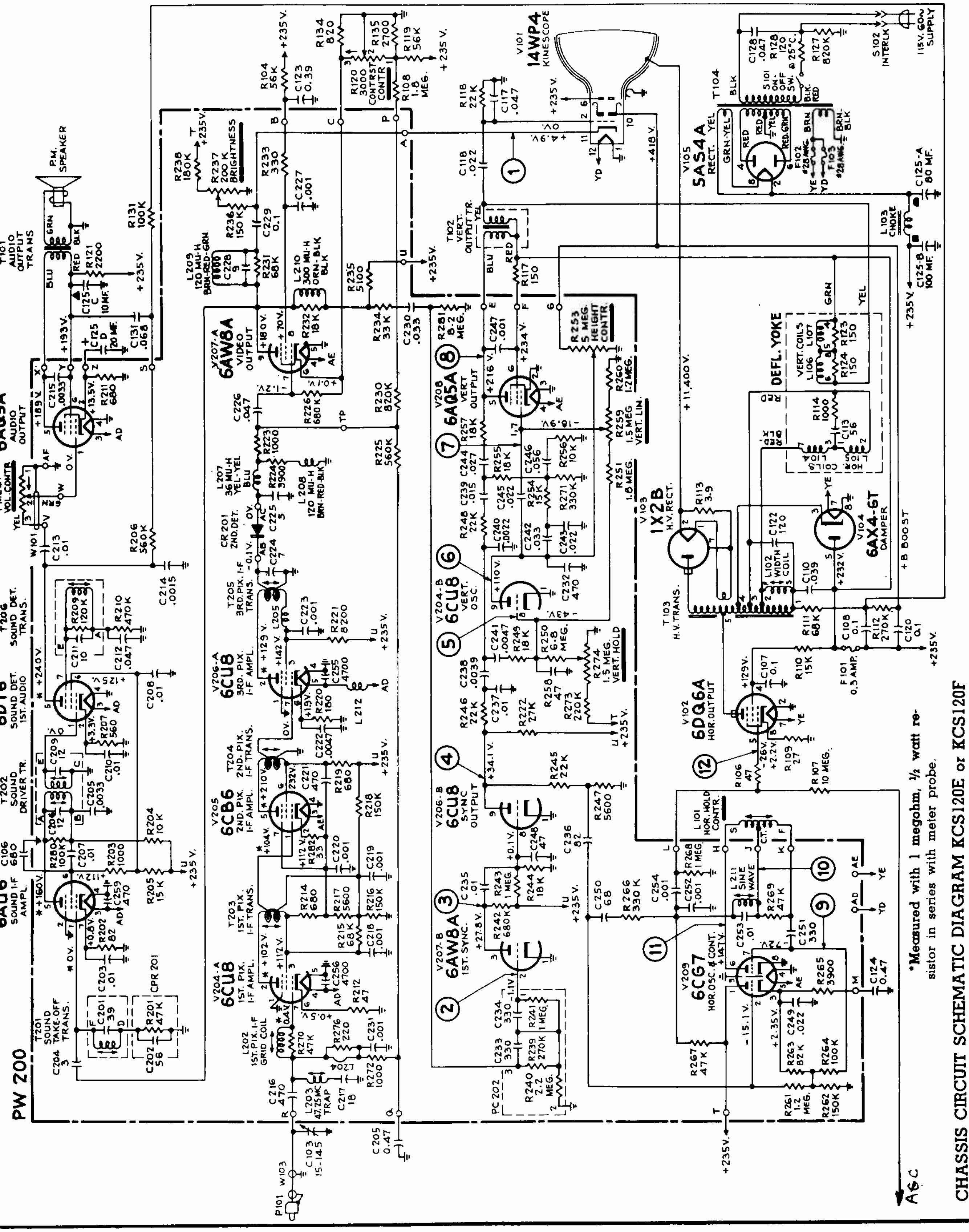
All resistance value in ohms. K = 1000.

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

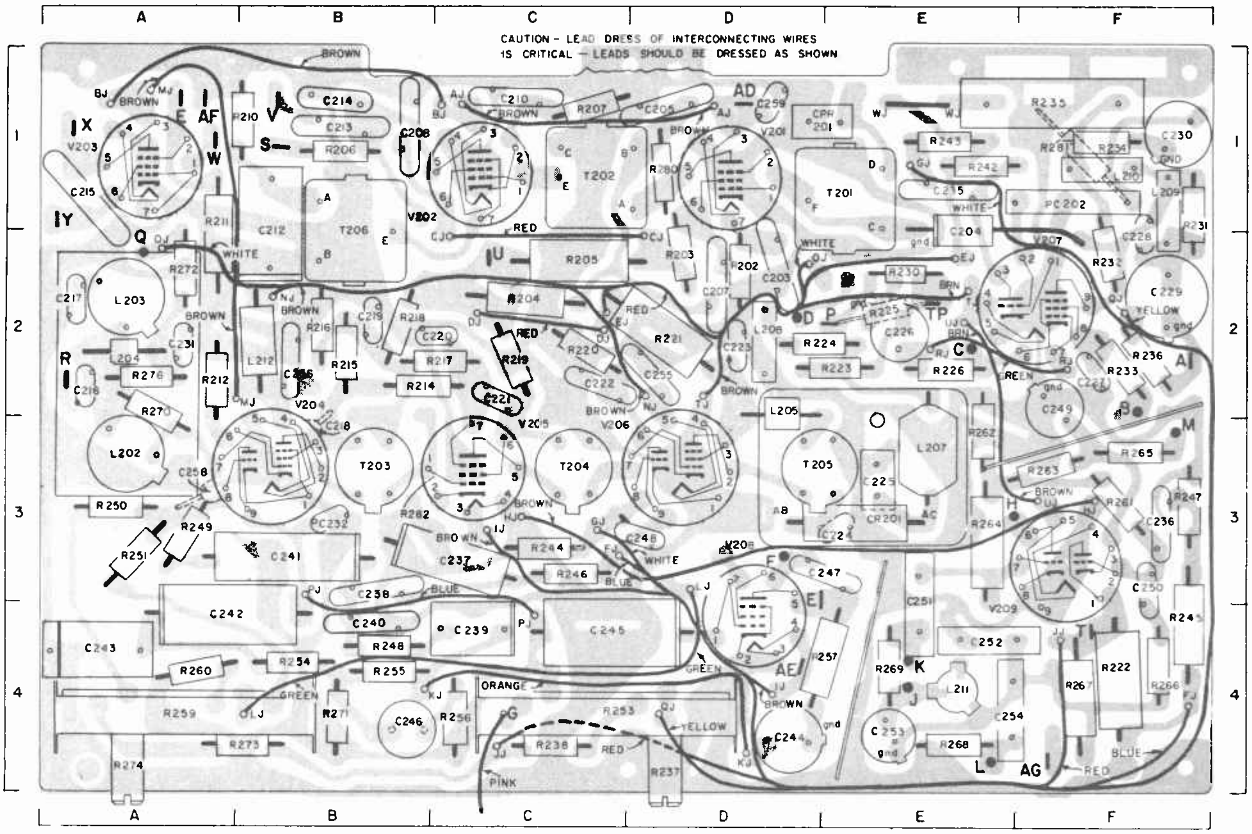
Direction of arrows at controls indicates clockwise rotation.

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

RCA Victor Chassis Nos. KCS-120E and KCS-120F Schematic Diagram

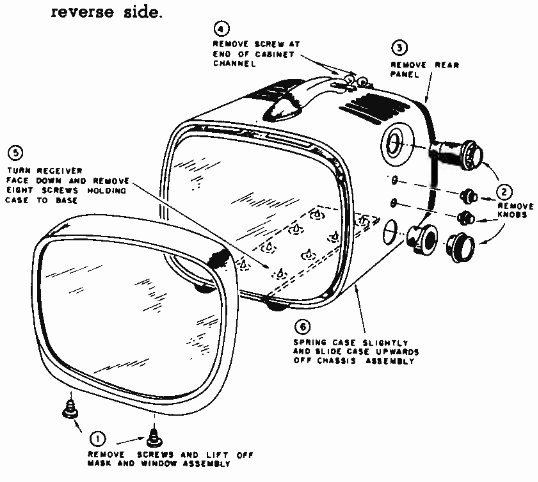


RCA Victor Chassis Nos. KCS-120E and KCS-120F Service Material, Continued



The printed wiring, on the reverse side of the circuit assembly, is presented in "phantom" view super-imposed on the component layout. This will enable circuit tracing without removing the assembly from the chassis to see the printed wiring on the reverse side.

The assembly represented above is viewed from the component side of the sealed circuit.



KINESCOPE AND SAFETY WINDOW CLEANING

The front safety window may be removed to allow for cleaning of the kinescope faceplate and the safety window if required.

To do this, remove two screws from under the front edge of the cabinet. Pull out at the bottom and lift off the kinescope mask assembly. Refer to step 1 in illustration above.

COMPONENT LOCATION GUIDE

C203 . . . D2	C244 . . . D4	R204 . . . C2	R249 . . . A3
C204 . . . E2	C245 . . . C4	R205 . . . C2	R250 . . . A3
C205 . . . D1	C246 . . . B4	R206 . . . B1	R251 . . . A3
C207 . . . D2	C247 . . . E3	R207 . . . C1	R254 . . . B4
C208 . . . B1	C248 . . . D3	R210 . . . B1	R255 . . . B4
C210 . . . C1	C249 . . . F2	R211 . . . A1	R256 . . . C4
C212 . . . B1	C250 . . . F3	R212 . . . A2	R257 . . . E4
C213 . . . B1	C251 . . . E4	R214 . . . B2	R259 . . . A4
C214 . . . B1	C252 . . . E4	R215 . . . B2	R260 . . . A4
C215 . . . A1	C253 . . . E4	R216 . . . B2	R261 . . . F3
C216 . . . A2	C254 . . . E4	R217 . . . C2	R262 . . . E3
C217 . . . A2	C255 . . . D2	R218 . . . B2	R263 . . . F3
C218 . . . B2	C256 . . . B2	R219 . . . C2	R264 . . . E3
C219 . . . B2	C258 . . . A3	R220 . . . C2	R265 . . . F3
C220 . . . C2	C259 . . . D1	R221 . . . D2	R266 . . . F4
C221 . . . C2		R222 . . . F4	R267 . . . F4
C222 . . . C2	CPR201 . E1	R223 . . . E2	R268 . . . E4
C223 . . . D2		R224 . . . D2	R269 . . . E4
C224 . . . E3	CR201 . . E3	R225 . . . E2	R270 . . . A2
C225 . . . E3		R226 . . . E2	R271 . . . B4
C226 . . . E2	L202 . . . A3	R230 . . . E2	R272 . . . A2
C227 . . . F2	L203 . . . A2	R231 . . . F1	R273 . . . B4
C228 . . . F2	L204 . . . A2	R232 . . . F2	R276 . . . A2
C229 . . . F2	L205 . . . D2	R233 . . . F2	R280 . . . D1
C230 . . . F1	L207 . . . E3	R234 . . . F1	R281 . . . F1
C231 . . . A2	L208 . . . D2	R235 . . . F1	R282 . . . C3
C232 . . . B3	L209 . . . F1	R236 . . . F2	
C235 . . . E1	L210 . . . F1	R237 . . . D4	
C236 . . . F3	L211 . . . E4	R238 . . . C4	
C237 . . . C3	L212 . . . B2	R242 . . . E1	
C238 . . . B3		R243 . . . E1	T201 . . . E1
C239 . . . C4	PC201 . . E2	R244 . . . C3	T202 . . . C1
C240 . . . B4	PC202 . . F1	R245 . . . F4	T203 . . . B3
C241 . . . B3		R246 . . . C3	T204 . . . C3
C242 . . . A4	R202 . . . D2	R247 . . . F3	T205 . . . D3
C243 . . . A4	R203 . . . D2	R248 . . . B4	T206 . . . B2

RCA VICTOR

TELEVISION RECEIVERS – MODELS

21-T-9122 & U, 21-T-9125 & U
21-T-9127 & U, 21-T-9265 & U
21-T-9266 & U, 21-T-9267 & U
21-T-9275 & U, 21-T-9276 & U
21-T-9277 & U, 21-T-9345 & U
21-T-9346 & U, 21-T-9347 & U

CHASSIS NOS.

KCS124C, D, E, F, H, J, K & L

(Material on pages 127 through 134)

CHASSIS DESIGNATIONS

CHASSIS	TUNER ASSEMBLY	TUNER Sub-assemblies	MODELS
KCS124C	KRK80E	KRK70D	21-T-9265 21-T-9266 21-T-9267
KCS124D	KRK80F	KRK71D KRK66J	21-T-9265U 21-T-9266U 21-T-9267U
KCS124E	KRK79T	KRK72L	21-T-9345 21-T-9346 21-T-9347
KCS124F	KRK79U	KRK73L KRK66A	21-T-9345U 21-T-9346U 21-T-9347U
KCS124H	KRK81H	KRK70D	21-T-9122 21-T-9125 21-T-9127
KCS124J	KRK81J	KRK71E KRK66P	21-T-9122U 21-T-9125U 21-T-9127U
KCS124K	KRK80H	KRK46AA	21-T-9275 21-T-9276 21-T-9277
KCS124L	KRK80J	KRK47AA KRK66J	21-T-9275U 21-T-9276U 21-T-9277U

FOCUS

An electrostatic focus type kinescope is employed in these receivers. The receivers operate with fixed focus, having a fixed voltage applied to the focusing electrode.

CHECK OF HORIZONTAL OSCILLATOR ADJUSTMENT

Turn the horizontal hold control to the extreme clockwise position. The picture should be out of sync, with a minimum of eight bars slanting downward to the left. Turn the control counter-clockwise slowly. The number of diagonal black bars will be gradually reduced and when only 1½ to 3 bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional counter-clockwise rotation of the control. The picture should remain in sync for approximately one quarter of a full turn of additional counter-clockwise rotation of the control. Continue counter-clockwise rotation until the picture falls out of sync. Rotation beyond fall out position should produce a minimum of 2 bars before end of rotation or a minimum of 7 bars before interrupted oscillation "motorboat" occurs.

When the receiver passes the above checks and the picture is normal and stable, the horizontal oscillator is properly aligned. Skip "Adjustment of Horizontal Oscillator" and proceed with "Centering Adjustment."

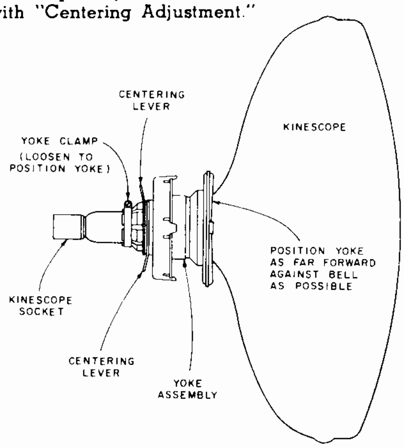


Figure 3—Yoke and Centering Magnet Adjustments

ADJUSTMENT OF HORIZONTAL OSCILLATOR

If in the above check the receiver failed to hold sync for one-quarter of a turn of counter-clockwise rotation of the control from the pull-in point, it will be necessary to make the following adjustments.

The width and drive adjustments should be properly set, as explained in the paragraph below, before adjusting the sine wave coil.

Connect a short jumper across the terminals of the sine wave coil L601 through the opening in the chassis. Also short the grid of the sync output tube, pin 2 of V501, to ground with a small screwdriver or jumper.

Adjust the horizontal hold to obtain a picture with the sides vertical (picture may drift slowly sideways). Remove the jumper on the sine wave coil L601 and adjust L601 to again obtain a picture with the sides straight. When the sine wave coil is properly adjusted, alternate shorting and no short should not cause a change in frequency, only a slight sideways shift should occur.

Remove the short on the grid of the sync output. The horizontal hold should now perform as outlined above under "CHECK OF HORIZONTAL OSCILLATOR ADJUSTMENT."

CENTERING ADJUSTMENT

Centering is accomplished by means of two levers on the back of the yoke. By alternately rotating one magnet with respect to the other, then rotating both simultaneously around the neck of the tube, proper centering of the picture can be obtained.

WIDTH AND DRIVE ADJUSTMENTS

Set the horizontal control at the "pull-in" point. Set the width coil maximum counter-clockwise and adjust horizontal drive trimmer counter-clockwise until a bright vertical line appears in the middle of the picture then clockwise until the bright line just disappears. If no line appears set the drive trimmer at maximum counter-clockwise position.

At normal brightness adjust the width coil L102 to obtain ¾" overscan at each side with normal line voltage.

Readjust the drive trimmer C109 as was done previously.

RCA Victor Chassis Nos. KCS-124C, -D, -E, -F, -H, -J, -K, -L, Service Data, Continued

VHF R-F OSCILLATOR ADJUSTMENTS

On all models except 21-T-9345-6-7 & U, adjustments for channels 2 through 12 are available through the holes on the front of the tuner. Adjustment for channel 13 is on top of the tuner chassis. Remove the channel selector and fine tuning knobs to make adjustments. Pull knobs outward off shaft. See "A" of Figure 4. Set Fine Tuning to mechanical center of its range.

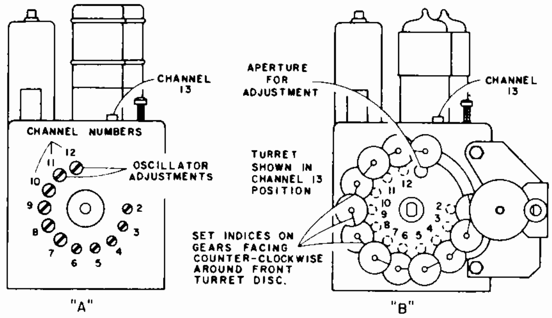


Figure 4—VHF Oscillator Adjustments

Models 21-T-9345-6-7 & U incorporate the "One-Set" fine tuning feature which requires the following procedure for oscillator adjustment.

Remove the channel selector knob by pulling the knob outward off its shaft. There are twelve gear and cam assemblies around the disc on the tuner face, one for each channel from 2 through 13.

Depress the fine tuning knob and set each gear with the index mark on the gear facing counter-clockwise around the outer edge of the disc as shown in Figure 4B. With the gears in this position, the fine tuning capacitor will automatically position to its mechanical center for each channel. On some models, the channel selector must be rotated to bring each gear into view through the opening in the tuner mounting plate.

Switch to channel 13 and, if necessary, adjust the channel 13 slug on top of the tuner. Progress counter-clockwise from channel 13 downward to channel 2, adjusting the oscillator slug, if required, on each channel. Do not change the setting of the fine tuning cams during adjustment of the oscillator slugs. The proper slug for each channel will become accessible through the opening in the front disc as the channel selector is switched to the desired channel.

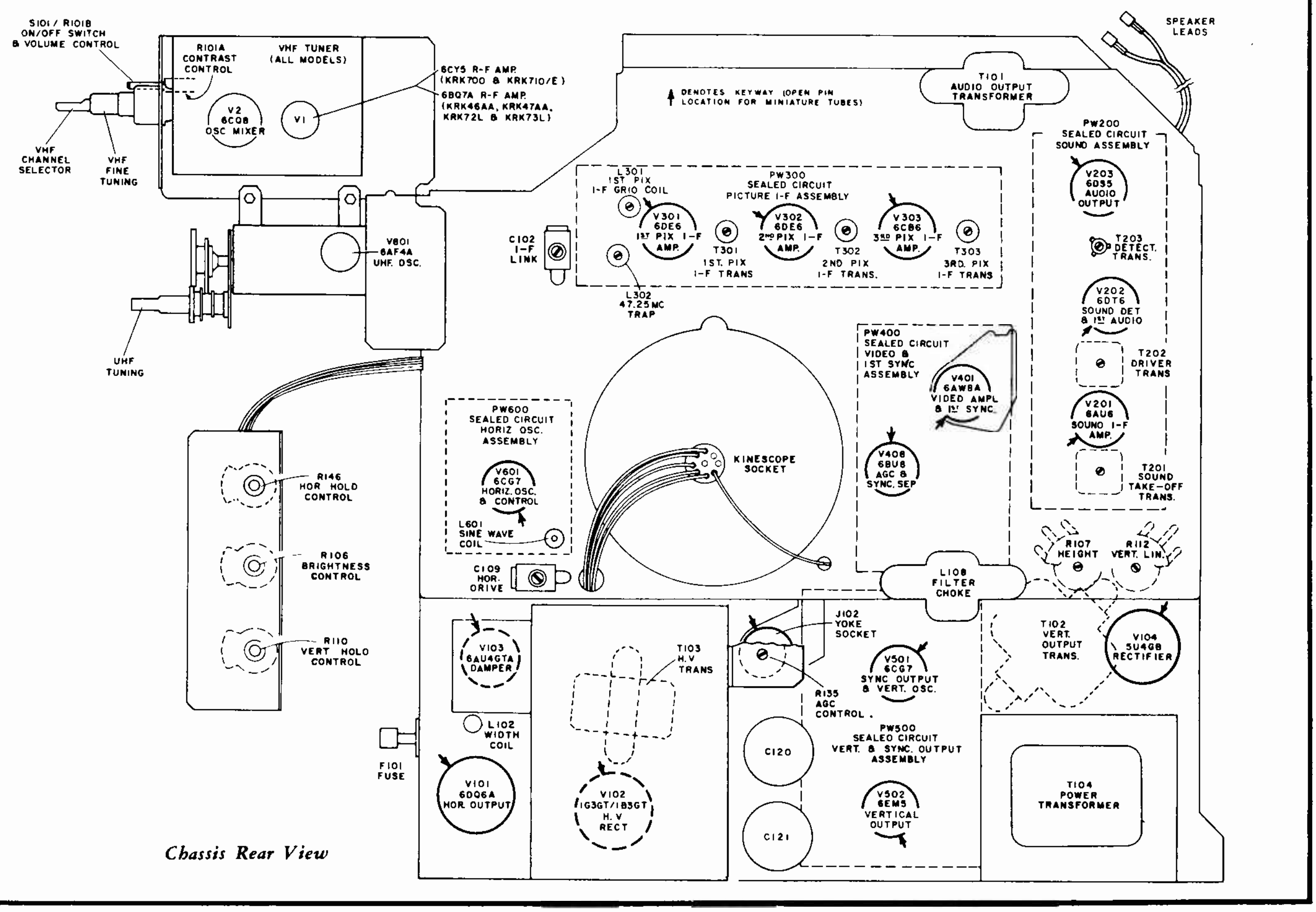
CHASSIS REMOVAL

To remove the chassis from the cabinet for repair, remove the channel selector, on/off volume, contrast and fine tuning knobs, remove the cabinet back, unplug the speaker cable, the antenna cable, the pilot lamp, the kinescope socket, and the yoke. On Models 21-T-9345-6-7 & U remove the "on-off" volume and contrast control knobs at the cabinet front and remove the screws holding the "on-off"/volume/contrast control mounting bracket.

Remove the knobs from the controls in the control case or at the receiver front on Models 21-T-9345-6-7 & U and remove the screws holding the control bracket. Unplug the I-F link cable and the tuner power plug on front tuning models.

Remove the two nuts at the top of the chassis and the two screws at the bottom. Move chassis out slightly to enable the H.V. lead to be disconnected from the kinescope. Clear all wires from lances and retaining springs. Remove chassis from cabinet.

If it is necessary to remove the tuner assembly on Models 21-T-9345-6-7 & U, remove the nuts holding the tuner mounting plate to the cabinet. The tuner and control brackets may be fastened to the chassis for transporting.



Chassis Rear View

RCA Victor Chassis Nos. KCS-124C, -D, -E, -F, -H, -J, -K, -L, Alignment, Continued

PICTURE I-F TRANSFORMER AND TRAP ADJUSTMENTS

TEST EQUIPMENT CONNECTIONS:

BIAS SUPPLY .... Apply —6 volts to I-F AGC bus at terminal "J" of PW300. Ground positive lead to chassis.
SIGNAL GENERATOR .... Connect to mixer grid at strap on S1B, in series with 1500 mmf. capacitor (see below).
VACUUM TUBE VOLTMETER.... Connect to 2nd Detector output at terminal "A" of PW400 using direct probe. Ground lead connected to chassis.

STEP		SIGNAL GENERATOR	ADJUST	REMARKS
1	Peak 3rd pix. I-F transformer	44.5 mc.	T303	Peak T303, T302 & T301 on frequency for maximum output on meter. Adjust generator output for 3 volts on meter when finally peaked.
2	Peak 2nd pix. I-F transformer	45.5 mc.	T302	
3	Peak 1st pix. I-F transformer	43.0 mc.	T301	
4	Adjust 47.25 mc. traps	47.25 mc.	L302 & T2 (L65) (top core)	Minimum output indication on meter.

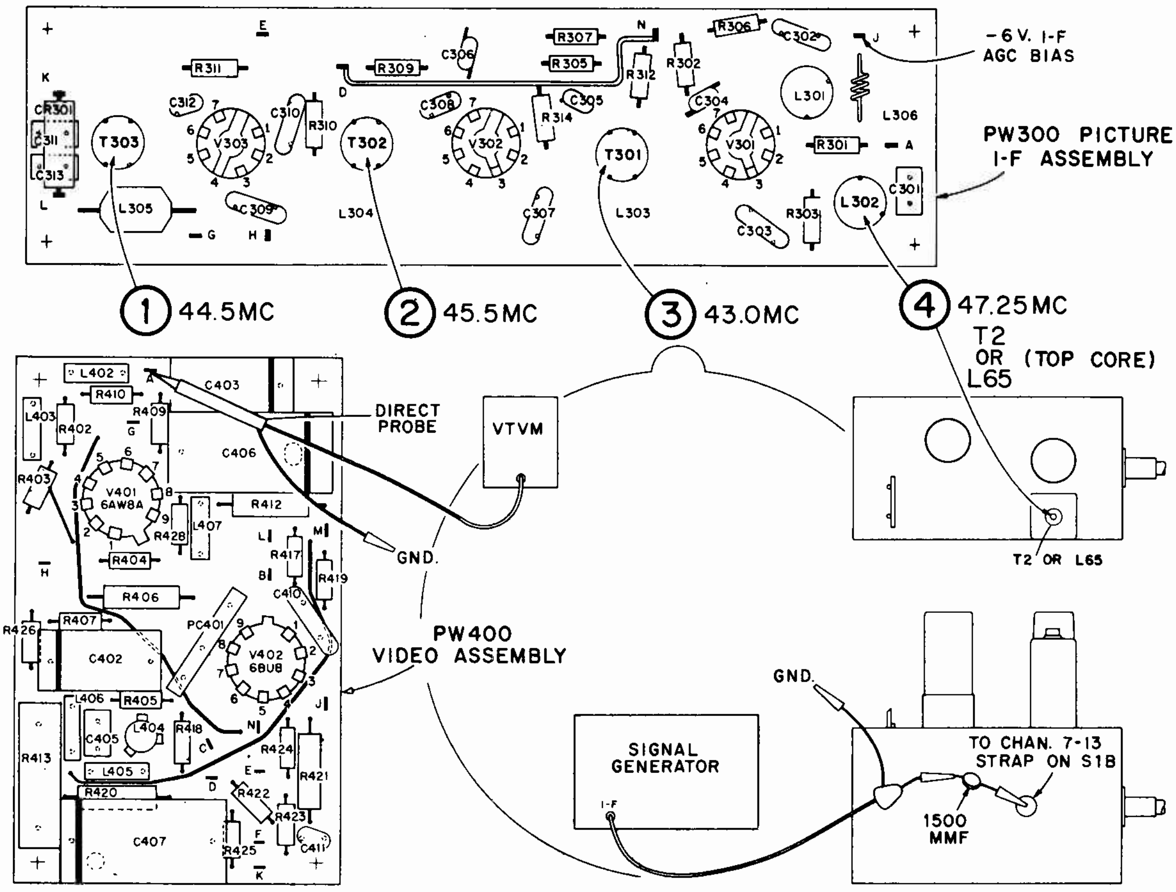


Figure 9—Picture I-F Transformer and Trap Adjustments

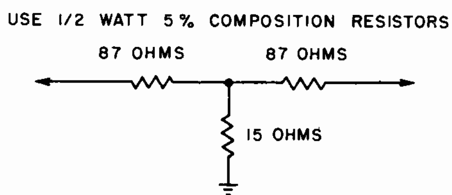


Figure 6—Sound Attenuation Pad

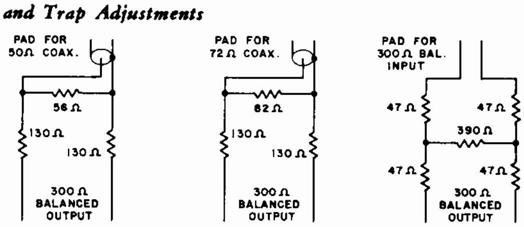


Figure 8—Sweep Attenuator Pads

RCA Victor Chassis Nos. KCS-124C, -D, -E, -F, -H, -J, -K, -L, Alignment, Continued

SWEEP ALIGNMENT OF PICTURE I-F

TEST EQUIPMENT CONNECTIONS:

BIAS SUPPLY .... Apply —6 volts to I-F AGC bus at terminal "J" of PW300, and —3.0 volts to tuner AGC terminal.
OSCILLOSCOPE .... Connect 180 ohm resistor across pins 5 and 6 of V301 1st pix. I-F amplifier. Connect oscilloscope to pin 5 of V301, using diode probe.
SWEEP GENERATOR .... Connect in series with 1500 mmf. to S1B at mixer grid. Use shortest leads possible.
SIGNAL GENERATOR .... Couple loosely to sweep output cable to provide markers.
VACUUM TUBE VOLTMETER.... Connect to 2nd Detector output at terminal "A" of PW400. Use DC probe.

STEP		SWEEP GENERATOR	SIGNAL GENERATOR	ADJUST	REMARKS
Set channel selector to channel 4.					
1	Adjust mixer plate transformer	40 - 50 mc. (I-F)	42.5 mc. 45.75 mc.	T2 or L56 (bottom core)	Sweep output set for 0.5 v. P-P on scope. Adjust for max. gain and response "A" below. Max. allow. tilt 20%.
2	Adjust I-F input	40 - 50 mc. (I-F)	42.5 mc. 45.75 mc.	L301 & C102	
Remove 180 ohm resistor and scope from V301. Connect scope to terminal "A" of PW400 using direct probe.					
3	Retouch I-F transformers	40 - 50 mc. (I-F)	42.5 mc. 45.0 mc. 45.75 mc.	T303 T302 T301	Adjust for response "B". Use 5 v. P-P on scope.
Remove sweep from mixer grid. Couple signal generator to mixer, in series with pad shown in Figure 6. Set generator to 45.75 mc. and adjust output for exactly one and one-half (1½) volts on the "VoltOhmyst". Remove the pad and connect generator direct to S1B. Do not change generator output in step 4.					
4	Set 41.25 mc. attenuation	—	41.25 mc.	T301 & T303	Adjust for 1.2 to 1.5 volts on VTVM maintaining response "B".
5	Connect sweep generator to antenna terminals using pad shown in Figure 8.				
	Check overall	Chans. 13 to 2	42.5 mc. 45.0 mc. 45.75 mc.	T302 & T303	Retouch slightly to correct any overall tilt. Maintain response "B".

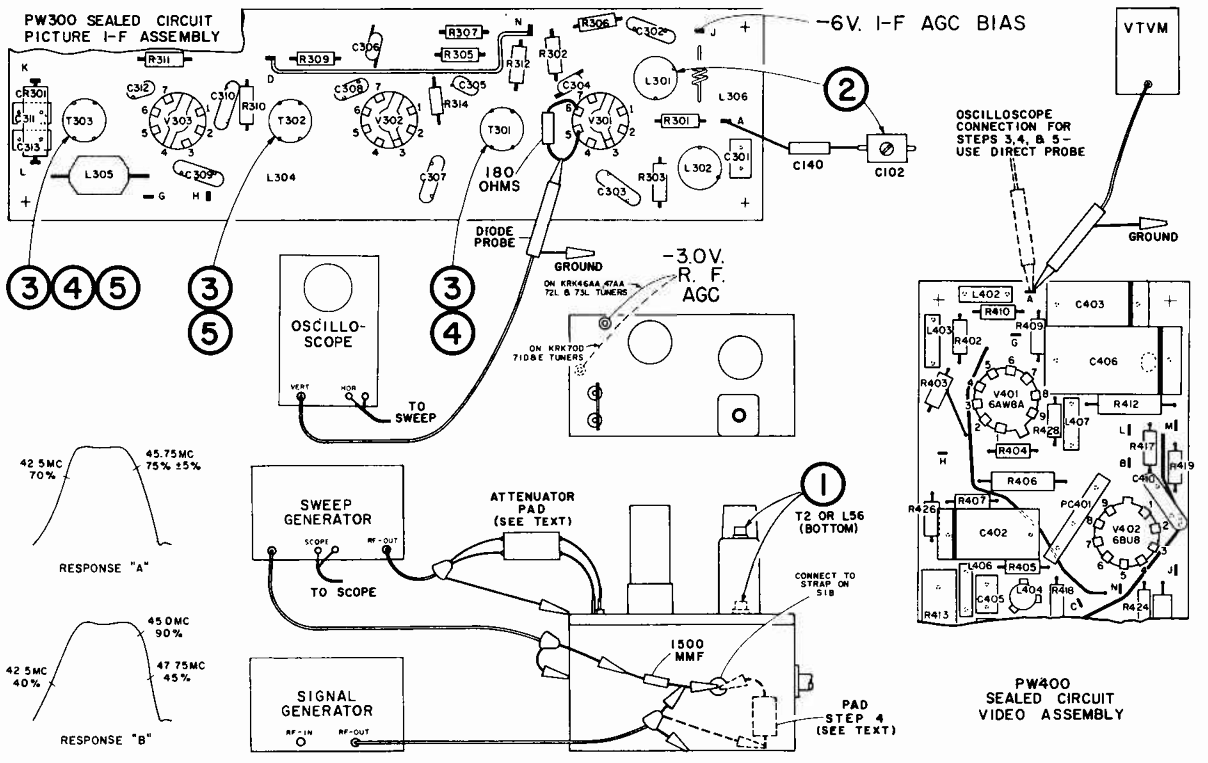


Figure 10—Sweep Alignment from Mixer Grid

SOUND I-F, SOUND DETECTOR AND 4.5 MC TRAP ALIGNMENT

TEST EQUIPMENT CONNECTIONS:

BIAS SUPPLY .... Apply —10 volts to the I-F AGC bus at terminal "J" on PW300.
OSCILLOSCOPE .... Connect across speaker voice coil.
SIGNAL GENERATOR .... Connect to terminal "A" on PW400.
VACUUM TUBE VOLTMETER.... Connect to output of diode detector shown below. Set meter for negative voltage readings.
MISCELLANEOUS .... Connect test diode detector, as shown below.

STEP		SIGNAL GENERATOR	ADJUST	REMARKS
Set contrast control maximum clockwise.				
1	Adjust Driver Transformer Primary and Secondary	4.5 mc.	T202 (top & bottom)	Adjust T202 top & bottom for maximum on meter. Set generator for 1.0 to 1.5 volts when peaked. Peak cores at open end of coils.
2	Adjust Sound Take-Off Trans.	4.5 mc.	T201	Adjust T201 for maximum negative DC on meter. Set generator for 1.0 to 1.5 volts on meter.
3	Disconnect the diode test detector. Turn off signal generator and tune in strongest signal in area adjusting volume control for normal volume (approx. ¼ turn from c.c.w.). Turn core of T203 flush with top of coil form.			
4	Adjust Sound Detector Trans.	Observing oscilloscope and listening to audio output adjust T203 clockwise to a peak. Continue clockwise to second louder peak and adjust for maximum on this peak.		
5	Adjust 4.5 mc. trap	4.5 mc., A-M Mod., 400 Cycles	L404	Adjust for minimum 400 cycle indication on oscilloscope.
Alternate Method Using Generators With F-M Modulation Provided.				
1	Same as step 1 above. Modulate 4.5 mc. signal with F-M 400 cycle signal with 7½ kc. deviation.			
2	Same as step 2 above. Modulate 4.5 mc. signal with F-M 400 cycle signal with 7½ kc. deviation.			
3	Adjust Sound Detector Trans.	4.5 mc., 400 cycle F-M Mod., 7½ kc. Dev.	T203	Adjust T203 for max. 400~ output on scope using max. amplitude peak. Set volume control for .70 v. p-p on scope when peaked. See response below.
4	Retouch Driver and Sound Take-Off. Trans. for breakout	4.5 mc., 400 cycle F-M Mod., 7½ kc. Dev.	T201 & T202	Decrease input to minimum usable signal. Retouch T201 & T202 for symmetrical breakout. Response below.
Move the oscilloscope to terminal "D" on PW400. Use the diode probe. Set the contrast control to maximum clockwise position.				
5	Adjust 4.5 mc. trap	Same as step 5 above. Adjust for minimum 400 cycle indication on oscilloscope.		

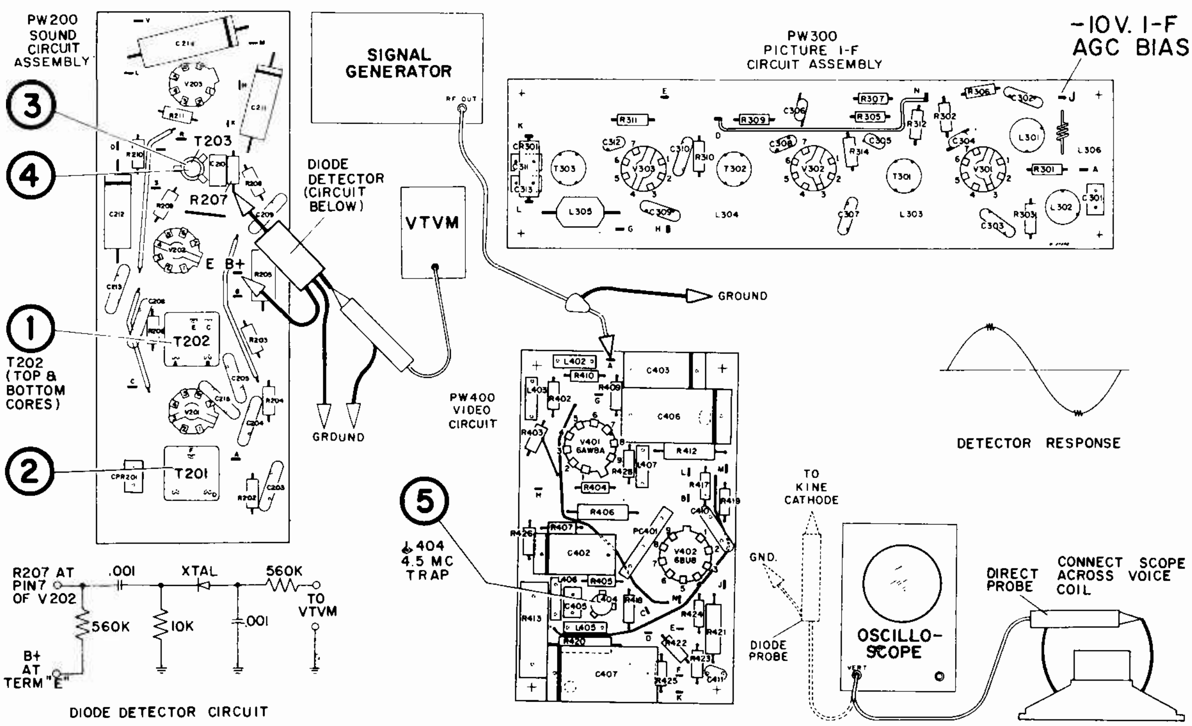


Figure 15—Sound I-F, Sound Detector and 4.5 mc. Trap Alignment

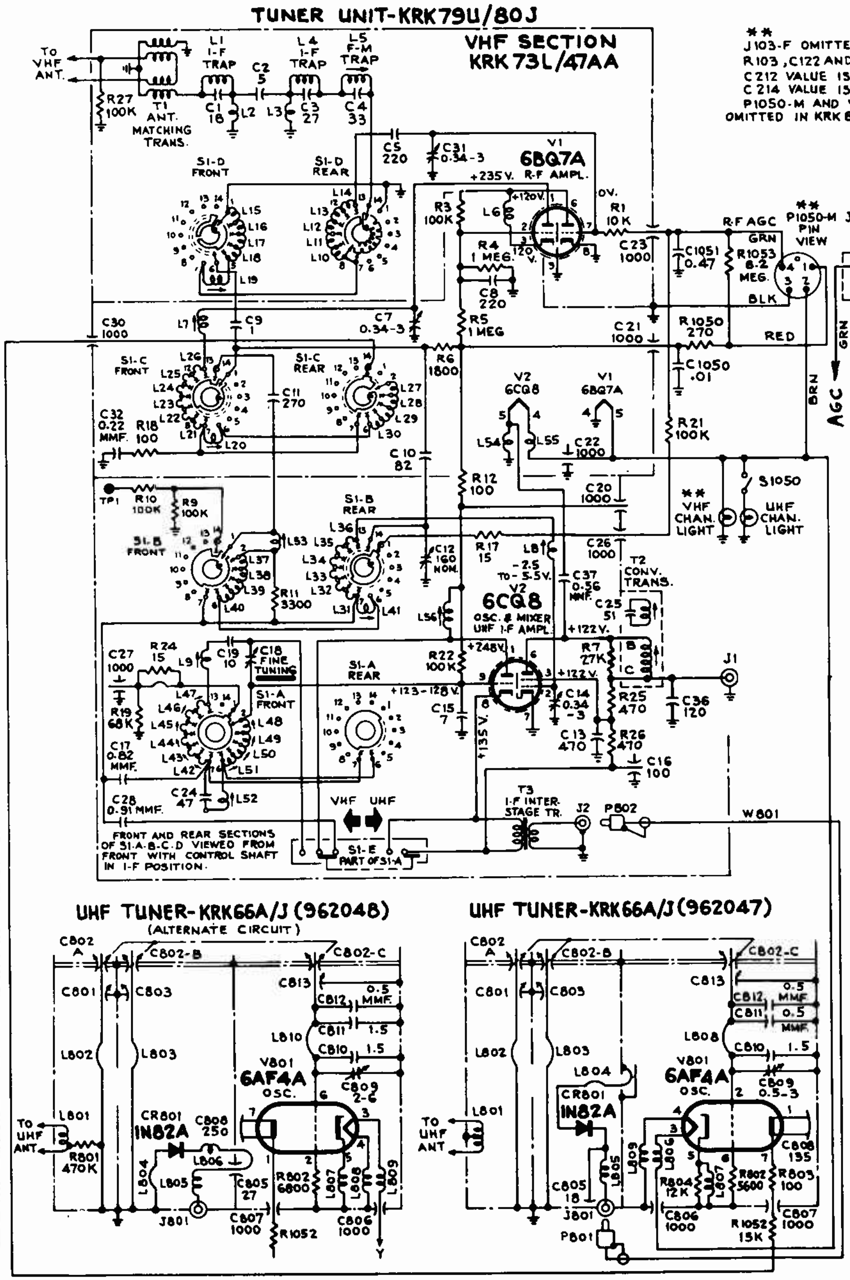
RCA Victor Chassis Nos. KCS-124C, -D, -E, -F, -H, -J, -K, -L, Circuit Diagrams

Diagrams of some of the tuners used with these chassis are printed on these pages. Reference to models and tuners is made in the table on page 127.

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

***Measured with 1 megohm, ½ watt resistor in series with meter probe.**

** J103-F OMITTED IN KCS 124C/D/H/J/K/L.
R103, C122 AND C141 OMITTED IN KCS 124H/J.
C212 VALUE IS .0022 IN KCS 124H/J.
C214 VALUE IS .0033 IN KCS 124H/J.
P1050-M AND VHF CHANNEL LIGHT OMITTED IN KRK 80J.



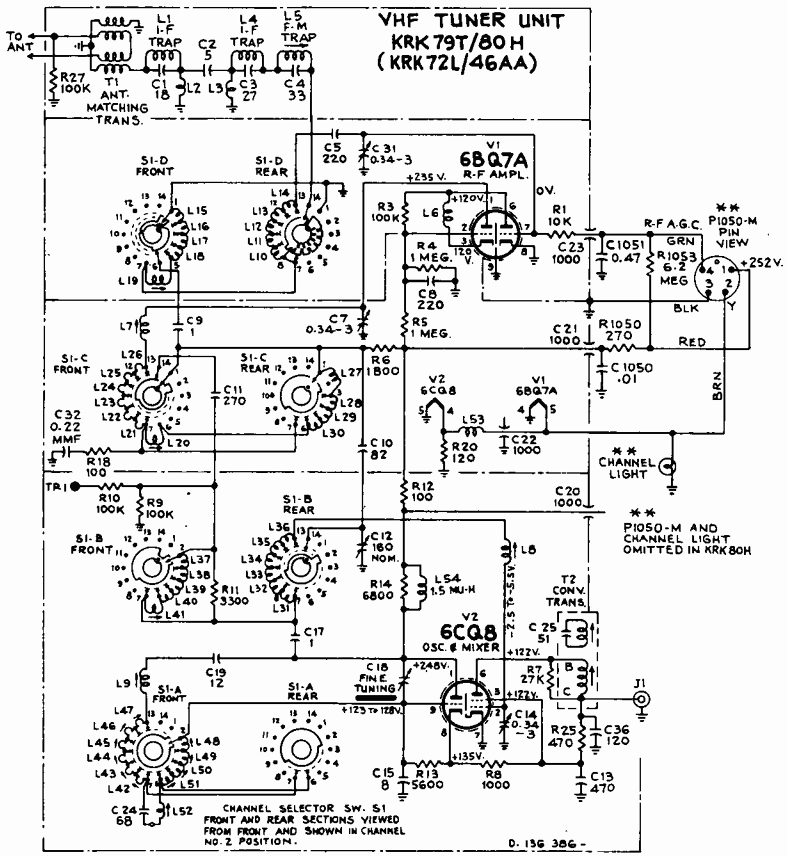
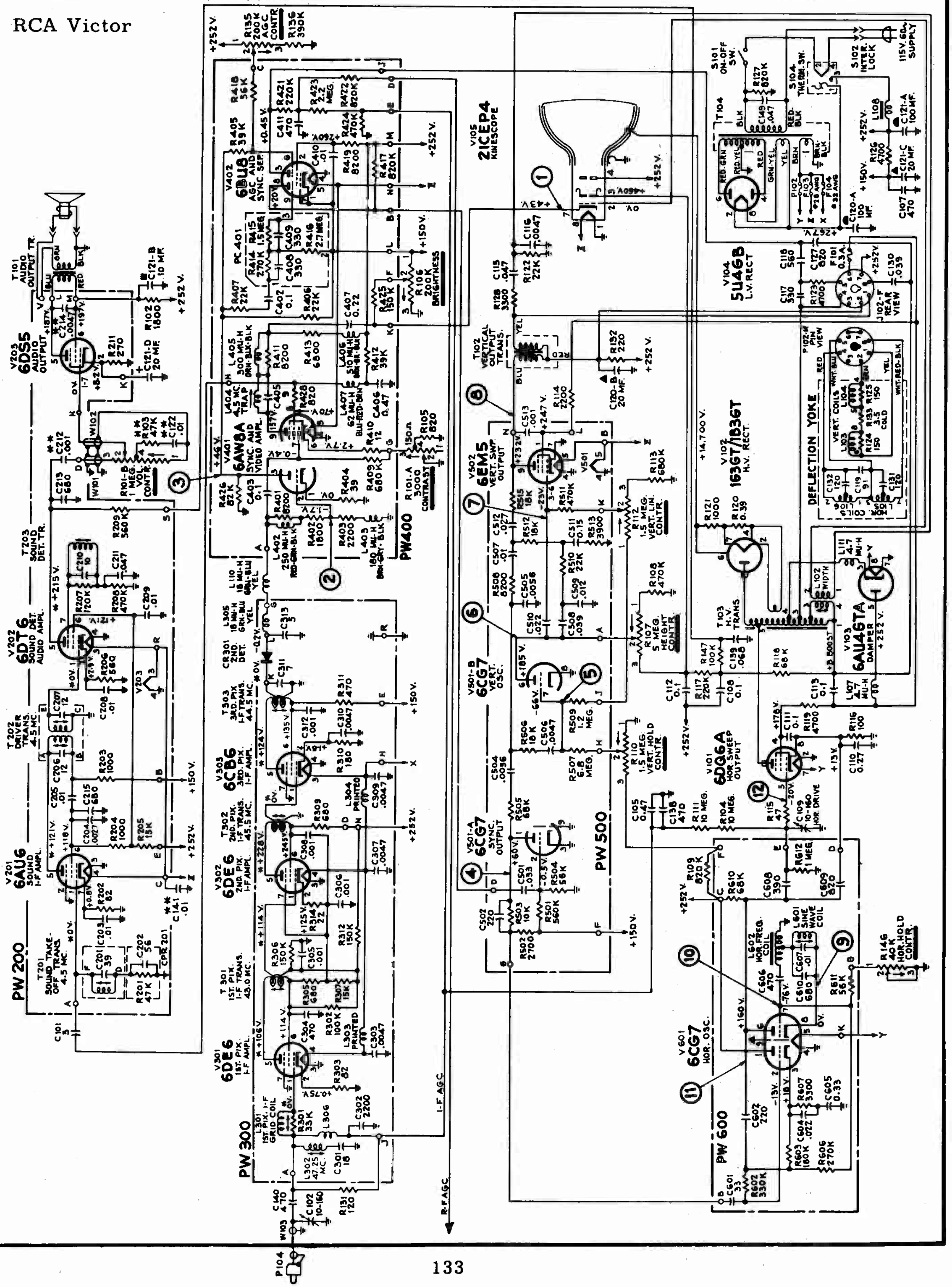


Figure 18—KRK79T & KRK80H VHF Tuner Circuit Schematic Diagram for Chassis KCS124E & KCS124K

RCA Victor

CIRCUIT SCHEMATIC DIAGRAM KCS124C, D, E, F, H, J, K & L CHASSIS



RCA Victor Chassis Nos. KCS-124C, -D, -E, -F, -H, -J, -K, -L, Service Data, Continued

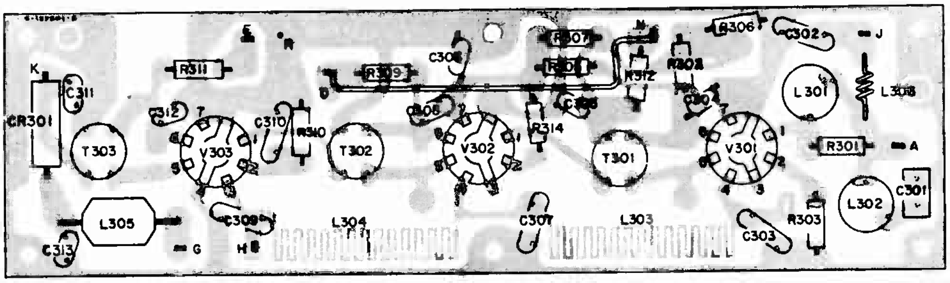


Figure 24—PW300 Picture I-F Circuit Layout

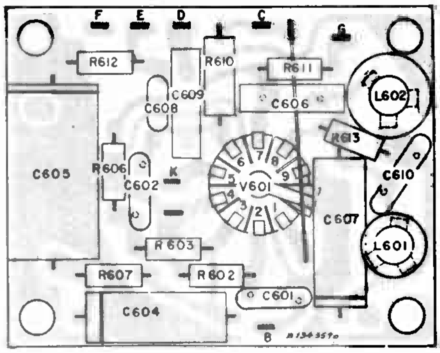


Figure 25—PW600 Horizontal Oscillator Circuit Layout

The assemblies represented above are viewed from the component side of the assemblies and are oriented as they will usually be viewed on the chassis.

The printed wiring, on the reverse side of the assemblies, is presented in "phantom" views superimposed on the component layouts. This will enable circuit tracing without removing the assemblies from the chassis to see the printed wiring on the reverse side.

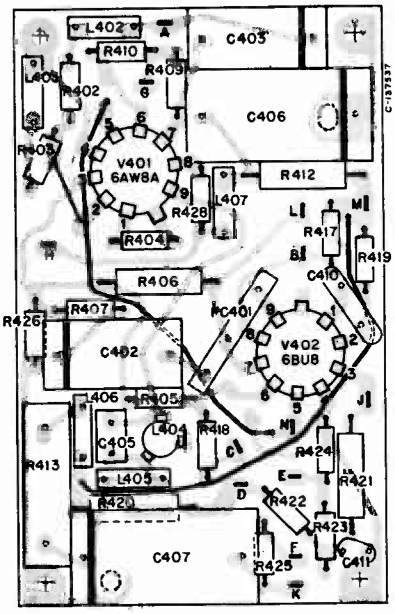


Figure 26—PW400 Video, Sync and AGC Circuit Layout

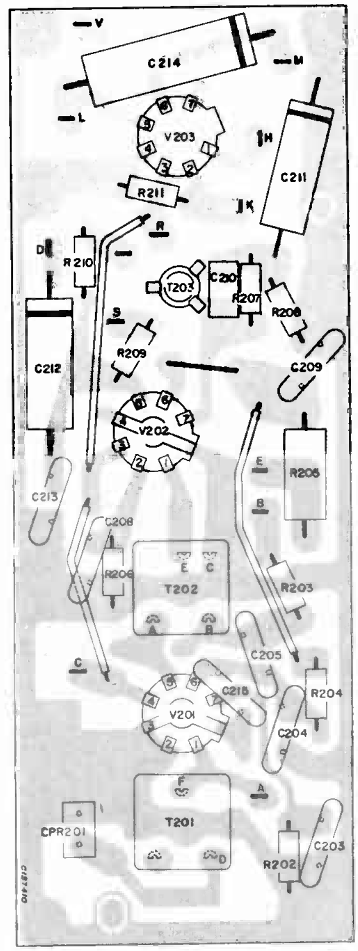


Figure 27—PW200 Sound I-F and Audio Circuit Layout

Balloons ①② etc., shown on schematics indicate points of observation of the waveforms shown below the individual schematic.

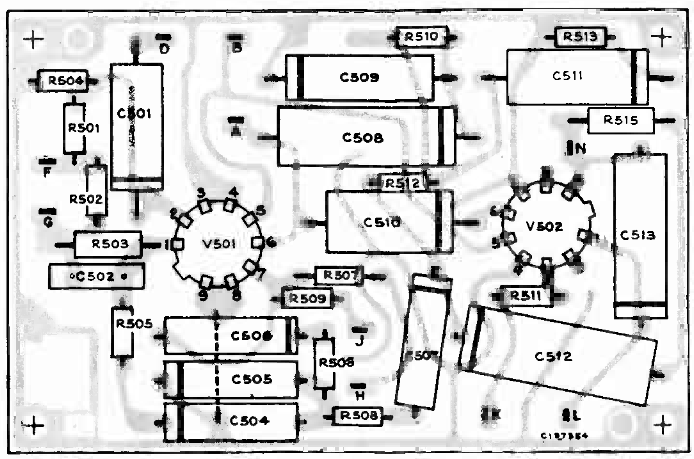
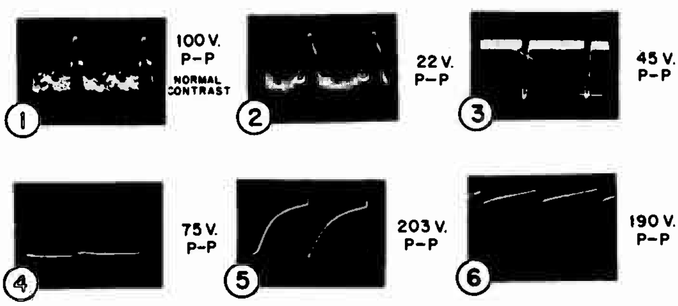
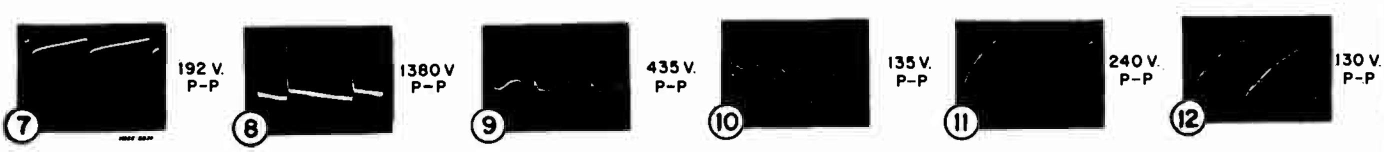


Figure 28—PW500 Vertical and Sync Output Circuit Layout





RCA VICTOR

PORTABLE TELEVISION RECEIVERS

MODELS

170-P-048, 170-P-048U
170-P-049, 170-P-049U
170-P-060, 170-P-060U
170-P-061, 170-P-061U
170-P-063, 170-P-063U
170-P-064, 170-P-064U

CHASSIS NOS.

KCS126A & B

CHASSIS DESIGNATIONS

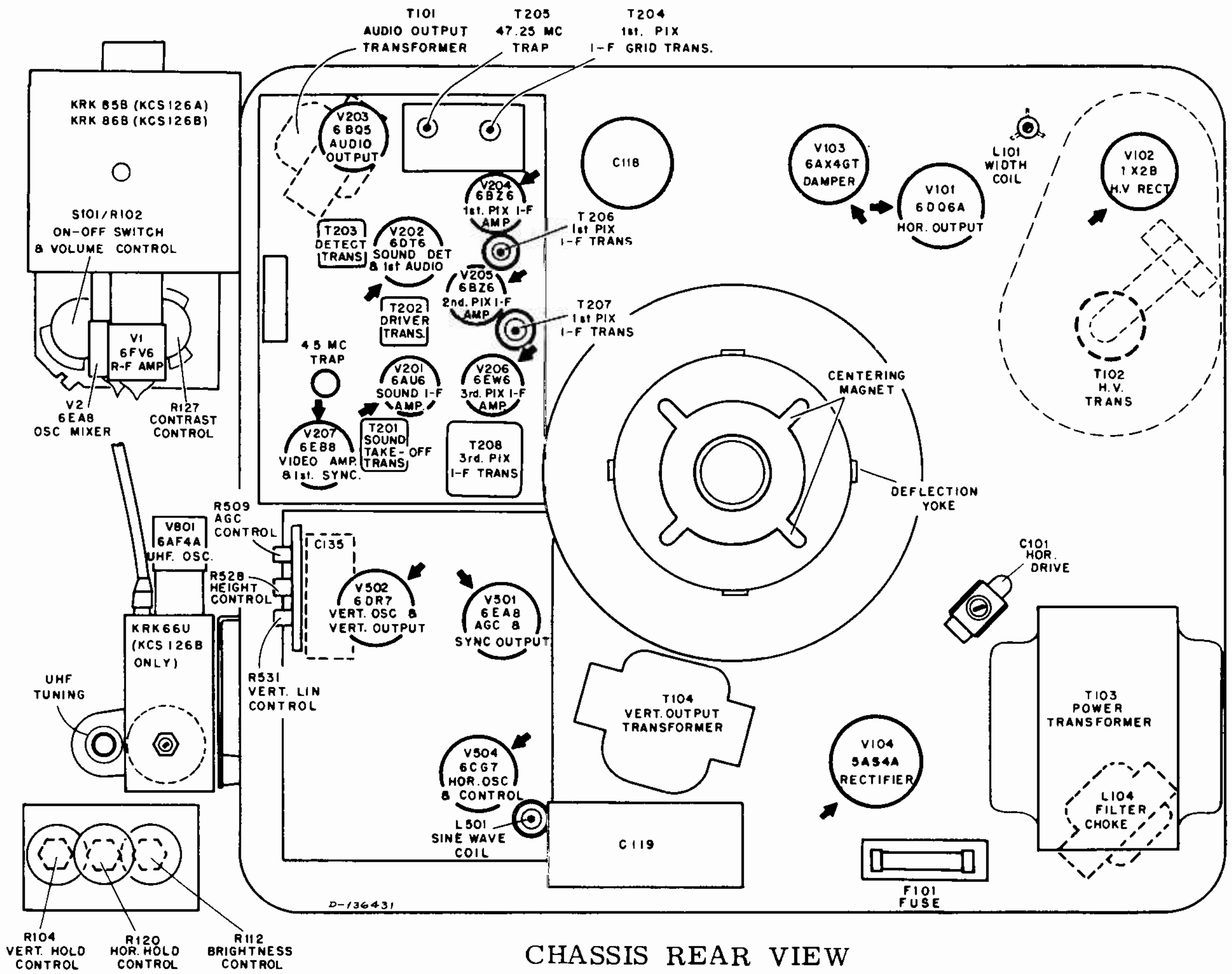
CHASSIS	TUNERS	MODEL NOS.
KCS126A	KRK85B	170-P-048, 170-P-049, 170-P-060, 170-P-061, 170-P-063, 170-P-064
KCS126B	KRK86B KRK66U	170-P-048U, 170-P-049U, 170-P-060U, 170-P-061U, 170-P-063U, 170-P-064U

CHASSIS REMOVAL

To remove the chassis from the cabinet, if necessary for repair, remove the front and rear panels of the receiver as proviously outlined. Remove the three screws holding the small control bracket to the bottom of the receiver case.

Take out the two nuts holding the top of the chassis to the top of the cabinet. Remove the two large chassis bolts under the bottom of the cabinet and remove the chassis and kinescope assembly from the cabinet rear.

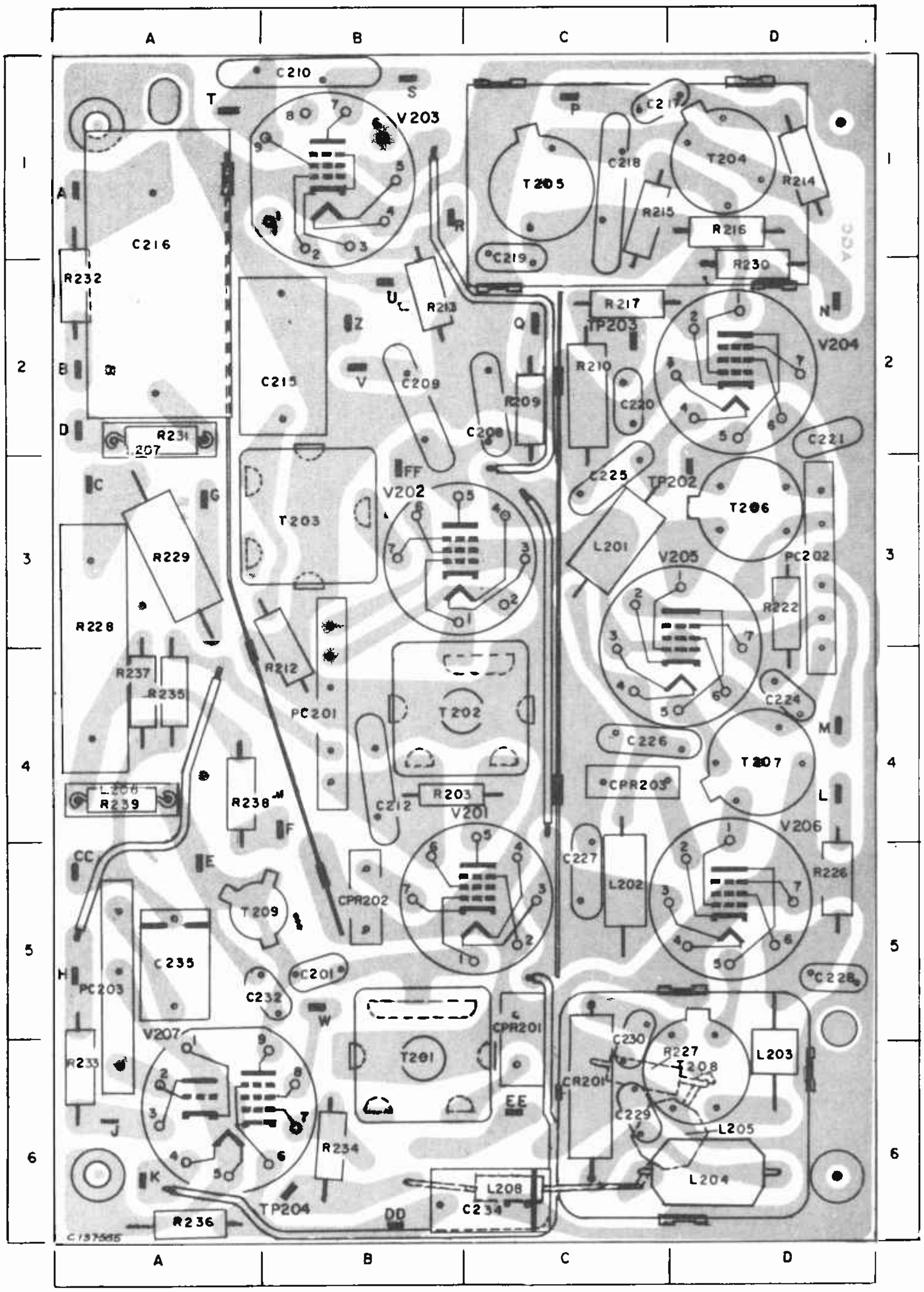
(Service material on pages 135 through 140)



CHASSIS REAR VIEW

RCA Victor Chassis Nos. KCS-126A and KCS-126B Service Material, Continued

PW200 SECURITY SEALED CIRCUIT ASSEMBLY

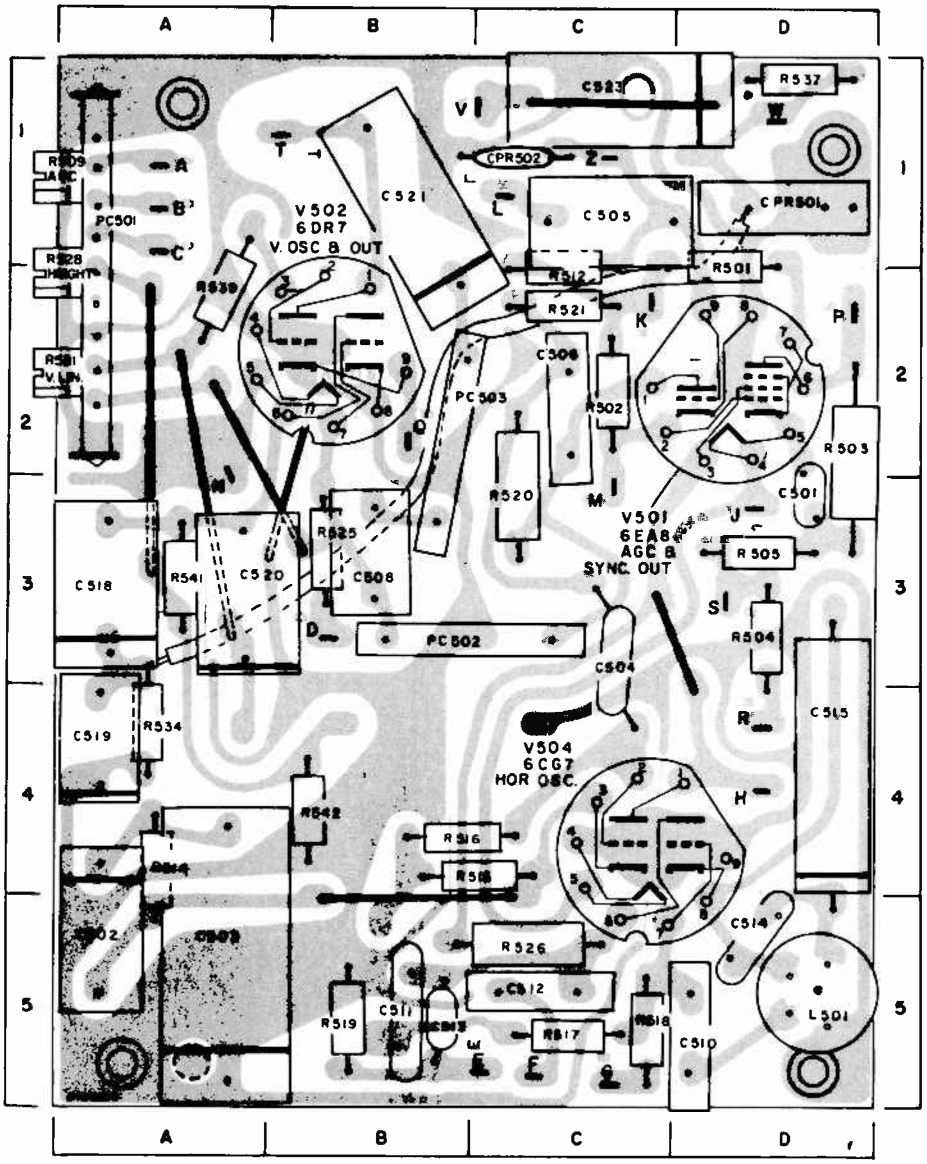


PW200 COMPONENT LOCATION GUIDE

C201 .... B5	C219 .... C1	C230 .....C5	L201 .. ..C3	PC201 ....B4	R214 .....D1	R230 .....D1	T201 .....B6
C208 .....C2	C220 .....C2	C232 .....B5	L202 .....C5	PC202 ...D3	R215 .....C1	R231 .....A2	T202 .....C4
C209 .....B2	C221 .....D2	C234 .....C6	L203 .....D6	PC203 ...A5	R216 .... D1	R232 .....A2	T203 .....B3
C210 .....B1	C224 .....D4	C235 .....A5	L204 .. ..D6		R217 .....C2	R233 .....A6	T204 .....D1
C212 .....B4	C225 .....C3		L205 . ...D6	R203 ....B4	R222 .....D3	R234 .....B6	T205 .....C1
C215 .....B2	C226 .....C4	CPR201 ..C5	L206 .....A4	R209 .....C2	R226 .....D5	R235 .....A4	T206 .....D3
C216 .....A1	C227 .....C5	CPR202 ..B5	L207 .... A2	R210 .....C2	R227 .....C6	R236 .....A6	T207 .....D4
C217 .....C1	C228 .....D5	CPR203 ..C4	L208 .....C6	R212 .....B3	R228 .....A4	R237, R238,	T208 .....D6
C218 .....C1	C229 .....C6	CR201 ....C6		R213 .....B2	R229 .....A3	R239 .....A4	T209 .....A5

RCA Victor Chassis Nos. KCS-126A and KCS-126B Service Material, Continued

PW500 SECURITY SEALED CIRCUIT ASSEMBLY



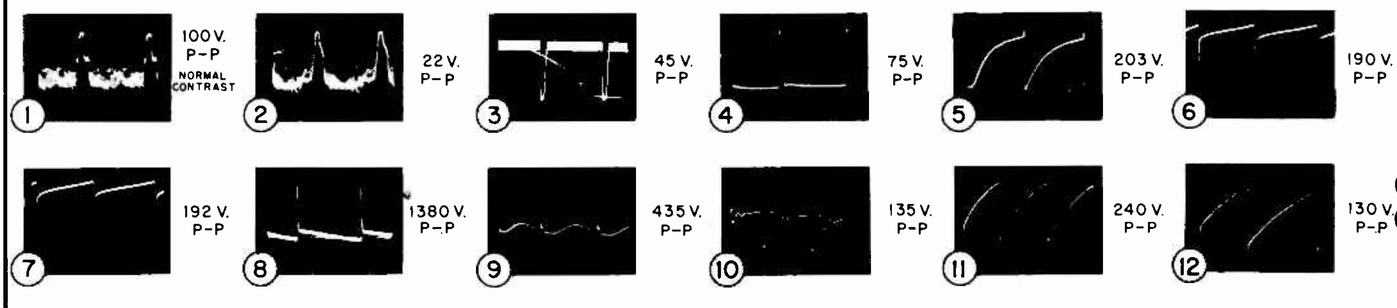
PW500 COMPONENT LOCATION GUIDE

C501 .....D3	C508 .....B3	C515 .....D4	CPR501 ..D1	PC502 ....C3	R504 .....D3	R517 .....C5	R526 .....C5
C502 .....A5	C510 .....D5	C518 .....A3	CPR502 ..C1	PC503 ....B2	R505 .....D3	R518 .... C5	R534 .....A4
C503 .....A5	C511 .....B5	C519 .....A4			R512 .....C2	R519 .....B5	R537 .....D1
C504 .....C3	C512 .....C5	C520 .....A3	L501 .....D5	R501 .... D2	R514 .... A4	R520 .....C3	R539 .....A2
C505 .....C1	C513 .....B5	C521 .....B1		R502 .....C2	R515 .....C4	R521 .....C2	R541 .....A3
C506 .....C2	C514 .....D5	C523 .....C1	PC501 ....A2	R503 .....D2	R516 .....B4	R525 .....B3	R542 .... B4

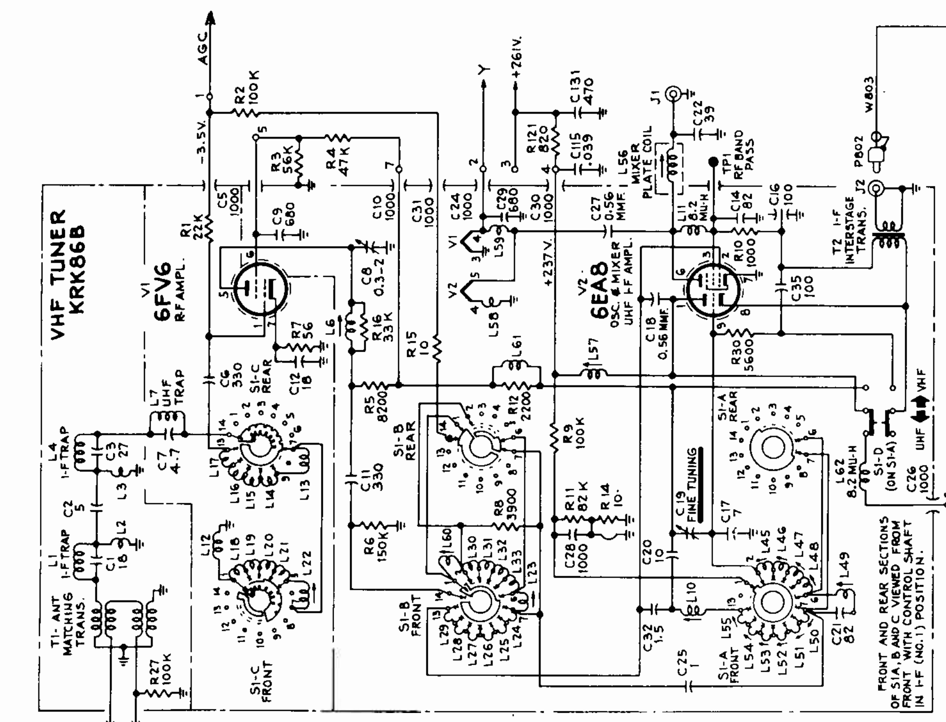
The assemblies represented above and at the left are viewed from the component side of the circuits and are oriented as they will usually be viewed on the chassis.

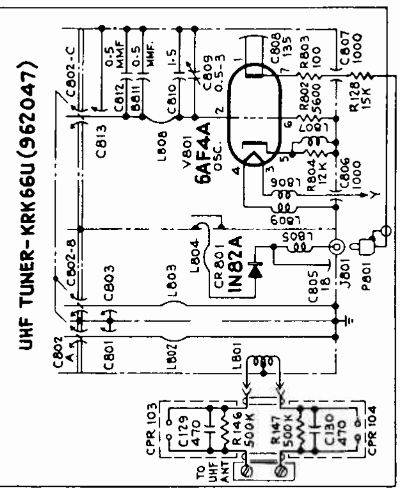
The printed wiring, on the reverse side of the circuits, is presented in "phantom" views superimposed on the component layouts. This will enable circuit tracing without removing the assemblies from the chassis to see the printed wiring on the reverse side.

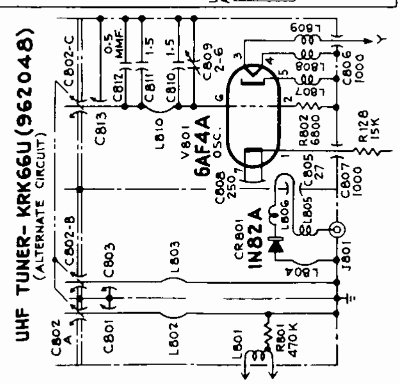
RCA Victor Chassis Nos. KCS-126A and KCS-126B Service Material, Continued

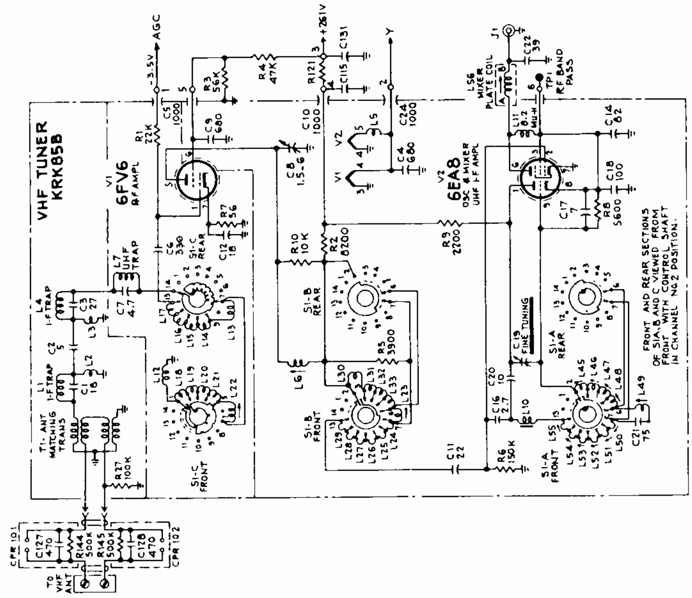


Balloons ① ② etc., shown on schematics indicate points of observation of the









KRK85B VHF TUNER SCHEMATIC FOR KCS126A CHASSIS

All schematics are shown in the latest condition at the time of printing.

All resistance value in ohms. K = 1000.

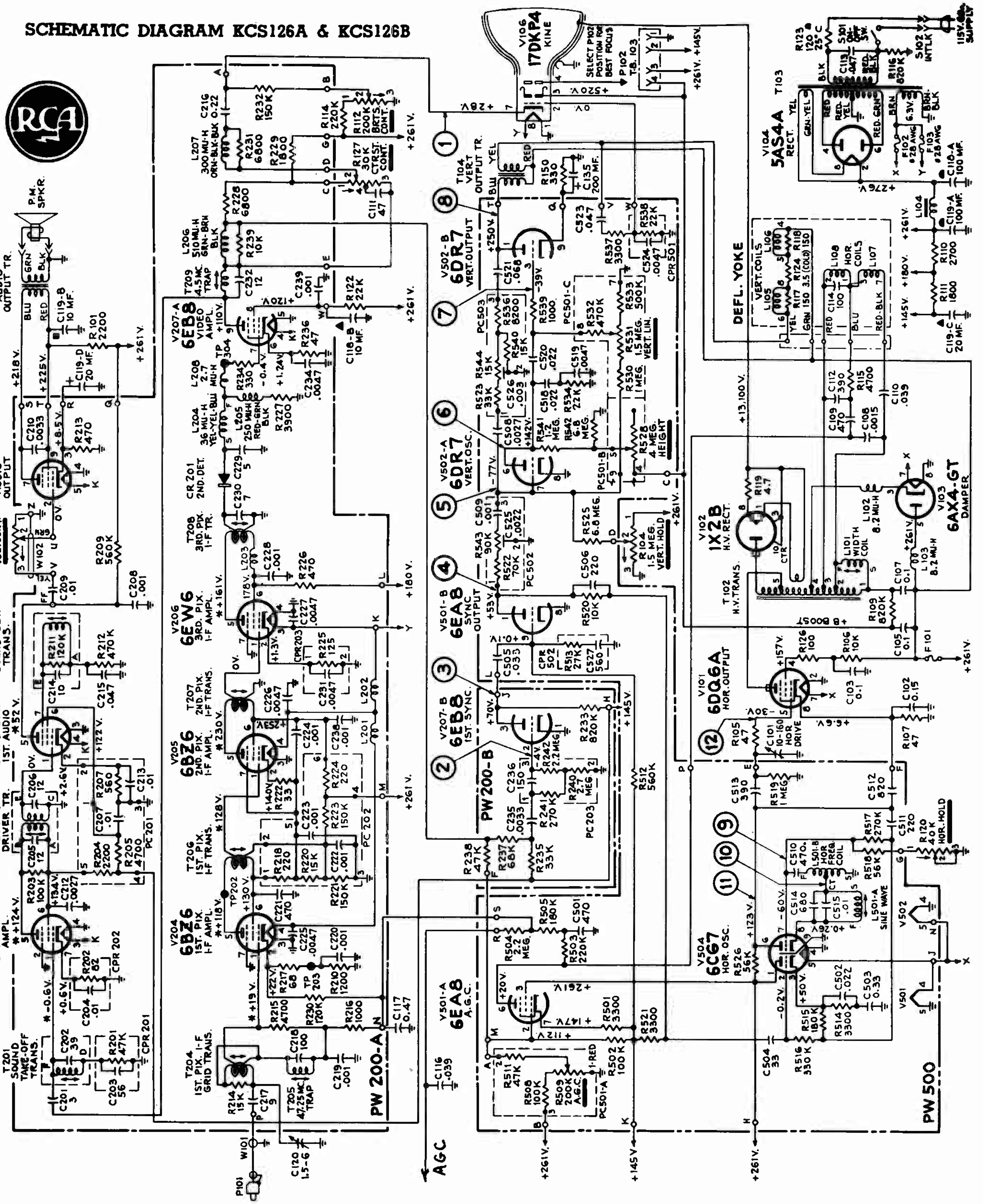
All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

Direction of arrows at controls indicates clockwise rotation.

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

*Measured with 1 megohm, ½ watt resistor in series with meter probe.

SCHEMATIC DIAGRAM KCS126A & KCS126B



RCA Victor Chassis Nos. KCS-126A and KCS-126B Schematic Diagram, for circuits of tuners used and service notes see page 138, adjacent at left.

RCA Victor Chassis Nos. KCS-126A and KCS-126B Service Material, Continued

DEFLECTION YOKE ADJUSTMENT

If the lines of the raster are not horizontal or squared with the picture mask, rotate the deflection yoke until this condition is obtained. The yoke clamp must be loosened to allow the yoke to be rotated. Make sure the yoke assembly is pushed forward against the kinescope bell.

CENTERING ADJUSTMENT

The electrostatic focus kinescope is provided with special centering magnets. These magnets are in the form of two discs mounted on the back of the deflection yoke. When the magnets are rotated so that the levers are together, maximum centering effect is produced. To shift the picture, rotate one of the magnets with respect to the other. To shift the picture in a desired direction rotate both magnets simultaneously in the same direction on the neck of the kinescope. By alternately rotating one magnet with respect to the other, then rotating both simultaneously around the neck of the tube, proper centering of the picture can be obtained.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENTS

Adjust the height control located on PC500 (remove rear panel) until the picture overscans approximately ⅝" at both top and bottom with normal line voltage of 117V. Adjust vertical linearity (located on PC500), until the test pattern is symmetrical from top to bottom. Adjustment of either control will require a readjustment of the other. Recheck centering of the picture within the mask.

WIDTH ADJUSTMENT

The width adjustment is located on the chassis rear. The rear panel must be removed to perform this adjustment.

The width of the picture should be adjusted to fill the mask with a line voltage of 105V. With normal voltage of 117V, the picture should overscan the tube at each side by approximately ¾ inch. The adjustment should be made with the Brightness control set at normal operating position.

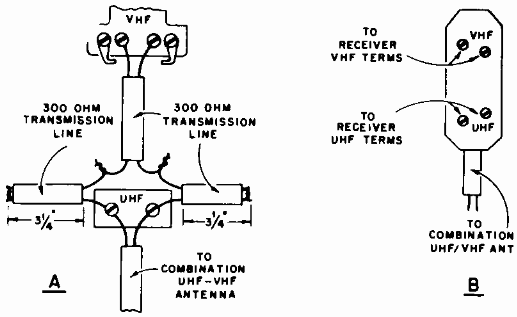
ANTENNA INPUT

VHF Models

The KRK85B tuner unit is designed for VHF reception only with a 300 ohm antenna input provided. A rod-type VHF antenna is provided on all models.

The antenna rods are connected when the straps on the VHF terminal board are connected between the outer and inner terminals.

If reception from an external antenna is desired, the rod-type antenna is disconnected by loosening the screws on the terminal board and swinging the straps back away from the inner terminals. The external antenna should then be connected to the inner terminals on the terminal board. Tighten the screws on the outer terminals to prevent the straps from shorting to the inner terminals. Push the rods all the way down when using the external antenna.



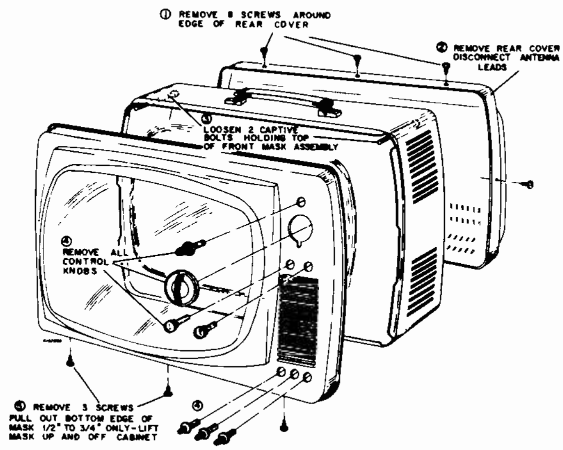
UHF/VHF Models

The KRK86B/66U tuner combination is designed for UHF/VHF reception with separate 300 ohm antenna inputs provided. A rod-type antenna is provided for VHF reception and a loop antenna for UHF reception on all models.

When reception from an external VHF antenna is desired, the rod-type antenna should be disconnected and the lead-in from the external antenna connected to the VHF antenna terminals, as explained above for VHF Models.

When reception from an external UHF antenna is desired, the loop antenna should be disconnected and the lead-in from the external UHF antenna should be connected to the UHF antenna terminals.

When a combination UHF/VHF antenna is to be used, having a single transmission line, a stub arrangement, such as is shown in A of the illustration above or a crossover network (RCA Part #78444) as shown in B of the illustration, may be used to match the single transmission line to the two inputs.



HIGH VOLTAGE WARNING

OPERATION OF THIS RECEIVER OUTSIDE THE CABINET OR WITH THE COVERS REMOVED, INVOLVES A SHOCK HAZARD FROM THE RECEIVER POWER SUPPLIES. WORK ON THE RECEIVER SHOULD NOT BE ATTEMPTED BY ANYONE WHO IS NOT THOROUGHLY FAMILIAR WITH THE PRECAUTIONS NECESSARY WHEN WORKING ON HIGH VOLTAGE EQUIPMENT. DO NOT OPERATE THE RECEIVER WITH THE HIGH VOLTAGE COMPARTMENT SHIELD REMOVED.

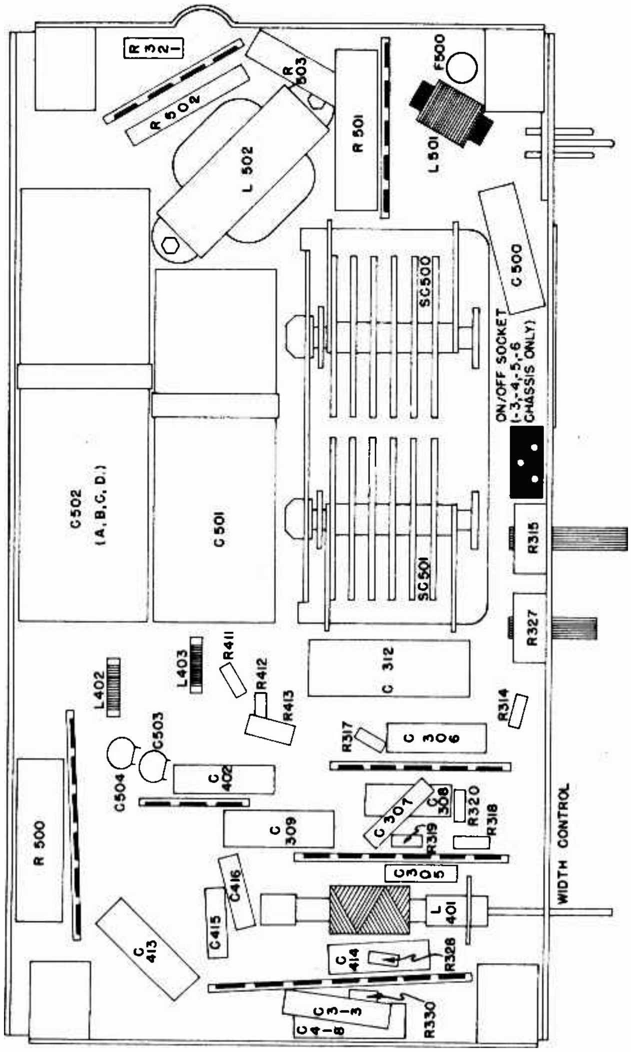
KINESCOPE HANDLING PRECAUTIONS

DO NOT INSTALL, REMOVE OR HANDLE THE KINESCOPE IN ANY MANNER UNLESS SHATTER-PROOF GOGGLES ARE WORN. PEOPLE NOT SO EQUIPPED SHOULD BE KEPT AWAY WHILE HANDLING KINESCOPES. KEEP THE KINESCOPE AWAY FROM THE BODY WHILE HANDLING.

Sylvania TV Chassis

1-542-1, -2, -3, -4, -5, -6, -7, -8

Models 21C414, 21C519, 21C524,
21C616, 21C621, 21T218, 21T305
(Material on pages 141 through 148)



BOTTOM PARTS LAYOUT (LOWER) CHASSIS

1-542-7,-8 CHASSIS

DESCRIPTION: Chassis 1-542-7,-8 is similar to the 1-542-5,-6 chassis except that the picture prompter assembly is not used.

MODELS 21C616, 21C621, 21T305

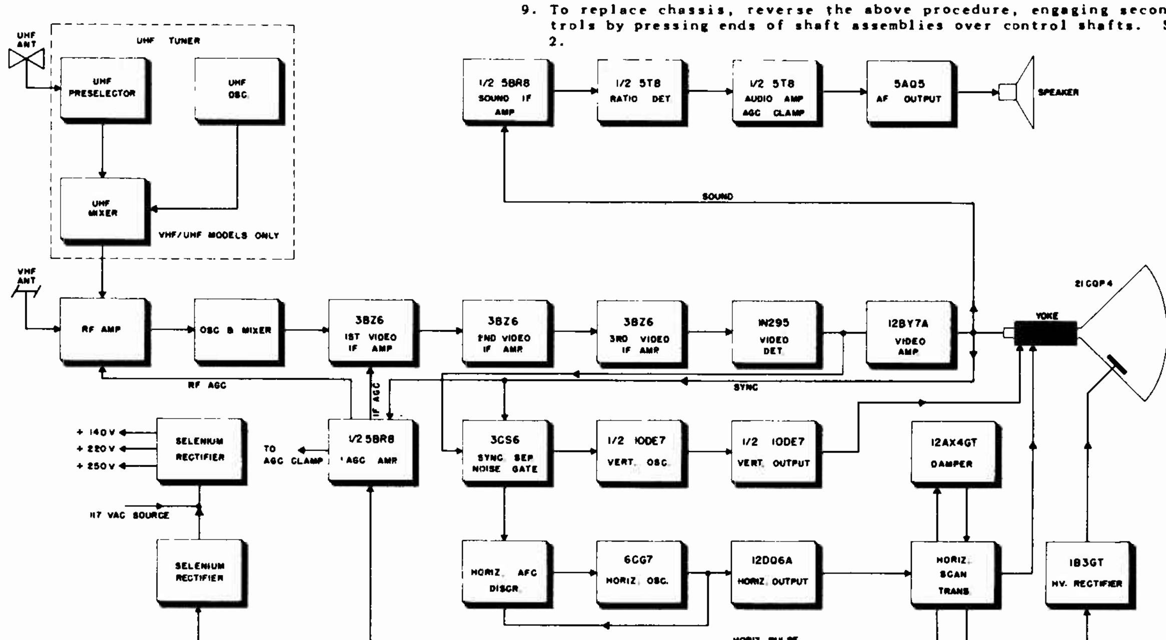
DESCRIPTION: Models 21C616, 21C621, 21T305 incorporating the 1-542 -5,-6 chassis are all similar.

KNOB REMOVAL

1. Channel Selector and On/Off Knobs
   A. Remove by pulling straight out.
2. Volume, Contrast, Brightness and HaloLight Knobs. See Figure 2.
   A. Remove Channel Selector and On/Off Knobs.
   B. Remove screws (2) securing escutcheon to cabinet. Remove escutcheon.
   C. Remove knobs by pulling straight out.

CHASSIS REMOVAL

1. Disconnect AC power cord and antenna connections. Remove interlock cover.
2. Remove screw securing vertical hold knob assembly to cabinet.
3. Remove screws (2) securing picture prompter knob assembly to cabinet.
4. ON UHF MODELS ONLY, compress sides of UHF coupling to disengage it from slots in arm on tuner. See Figure 3.
5. Disconnect speaker leads at speaker, high voltage anode lead, picture tube socket and ON/OFF plug. NOTE: To operate chassis with this plug removed, a jumper must be used. See Figure E on Sheet 2 of basic envelope assembly.
6. Remove deflection yoke retaining spring.
7. Remove two screws locking chassis feet and disengage feet from slots by sliding chassis to rear and up.
8. Remove chassis and deflection yoke from cabinet. NOTE: Secondary control shafts and VHF channel selector shaft will disengage when chassis is removed.
9. To replace chassis, reverse the above procedure, engaging secondary controls by pressing ends of shaft assemblies over control shafts. See Figure 2.



BLOCK DIAGRAM

SYLVANIA Chassis 1-542-1, -2, -3, -4, -5, -6, -7, -8

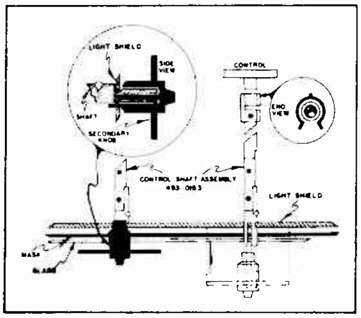


FIGURE 2

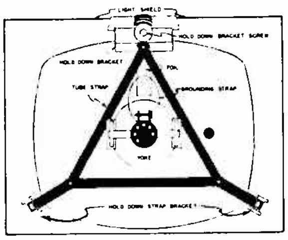


FIGURE 4

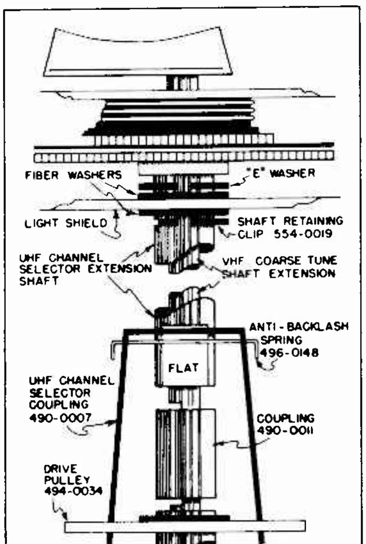
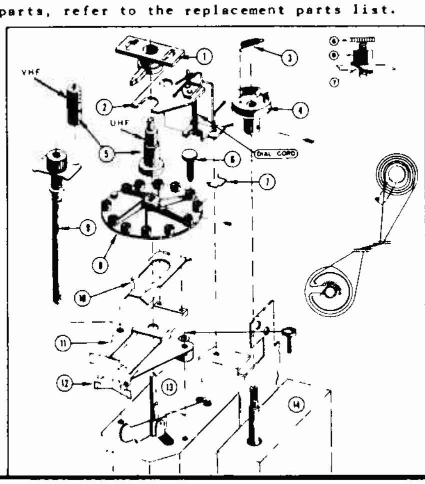


FIGURE 3

1-542-5, -6 CHASSIS

DESCRIPTION: Chassis 1-542-5, -6 is similar to the 1-542-3, -4 except for the addition of the picture prompter mechanism as as shown below. For all other data, refer to this page. For replacement parts, refer to the replacement parts list.



PICTURE TUBE REMOVAL

1. Remove chassis as outlined under "Chassis Removal"
2. Lay cabinet face down, supported so as not to damage knobs or cabinet front.
3. Remove hold down bracket screw located top center of picture tube. Unhook both lower hold down strap brackets from slots in light shield and remove straps. See Figure 4.
4. USING GOGGLES AND GLOVES, reach under face of tube and lift from cabinet. DO NOT GRASP NECK OF PICTURE TUBE AT ANY TIME.
5. To install picture tube, reverse the preceding steps. Exercise care not to scratch face of picture tube.

MODELS 21C525, 21C526, 21T310

DESCRIPTION: Models 21C525, 21C526, 21T310 incorporating the 1-542-7, -8 chassis are all similar. Data peculiar to these models is given below. For all other data refer to the remainder of this page.

KNOB REMOVAL

1. Channel Selector and On/Off Knobs
   A. Remove by pulling straight out.
2. Volume, Contrast, Brightness and HaloLight Knobs. See Figure 2.
   A. Remove Channel Selector and On/Off Knobs.
   B. Remove screws (2) securing escutcheon to cabinet. Remove escutcheon.
   C. Remove knobs by pulling straight out.

CHASSIS REMOVAL

1. Disconnect AC power cord and antenna connections. Remove interlock cover.
2. Remove screw securing vertical hold knob assembly to cabinet.
3. Remove clips securing rear chassis feet to support rail.
4. Compress sides of fine tune coupling to disengage it from slots in arm on tuner. See Figure 3.
5. Disconnect speaker leads at speaker, high voltage anode lead, picture tube socket and ON/OFF plug. NOTE: To operate chassis with this plug removed, a jumper must be used. See Figure E on the following page.
6. Remove deflection yoke retaining spring.
7. Remove chassis and deflection yoke from cabinet. NOTE: Secondary control shafts and VHF channel selector shaft will disengage when chassis is removed.
8. To replace chassis, reverse the above procedure, engaging secondary controls by pressing ends of shaft assemblies over control shafts.

GLASS AND MASK REMOVAL

1. Remove escutcheon and knobs as outlined under Knob Removal Procedure.
2. Remove two screws securing ratchet bracket to light shield. Remove bracket.
3. Loosen set screw securing wheel and dial assembly to shaft. Remove assembly and fine tune knob.
4. While supporting glass, remove screws (2) securing glass clamps to cabinet.
5. Pull glass and mask out slightly at top and then up. Remove trim strips before cleaning glass.
6. To replace glass and mask, reverse the preceding steps. Note that trim strips must be flush to cabinet with bevel facing front. Make certain top edge of escutcheon fits into groove in escutcheon trim.

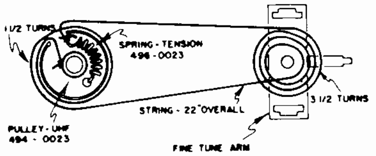
PICTURE TUBE REMOVAL

1. Remove chassis as outlined under "Chassis Removal".
2. Lay cabinet face down, supported so as not to damage knobs or cabinet front.
3. Remove hold down bracket screw located top center of picture tube. Unhook both lower hold down strap brackets from slots in light shield and remove straps. See Figure 4.
4. USING GOGGLES AND GLOVES, reach under face of tube and lift from cabinet. DO NOT GRASP NECK OF PICTURE TUBE AT ANY TIME.
5. To install picture tube, reverse the preceding steps. Exercise care not to scratch face of picture tube.

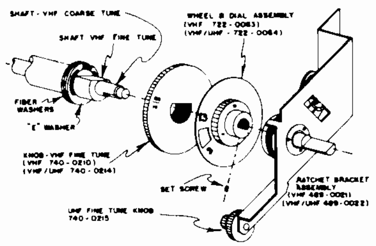
MODELS 21C415, 21T220

DESCRIPTION: Models 21C415 and 21T220 incorporating the 1-542-3, -4 chassis are similar to Models 21C524 and 21T218 respectively.

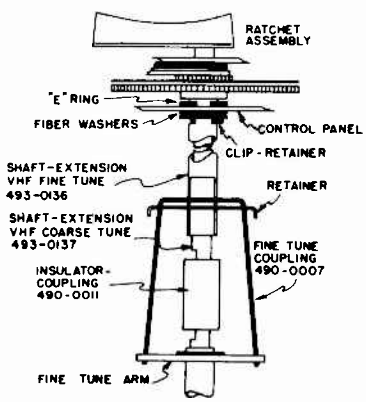
SYLVANIA Chassis 1-542-1, -2, -3, -4, -5, -6, -7, -8, (Continued)



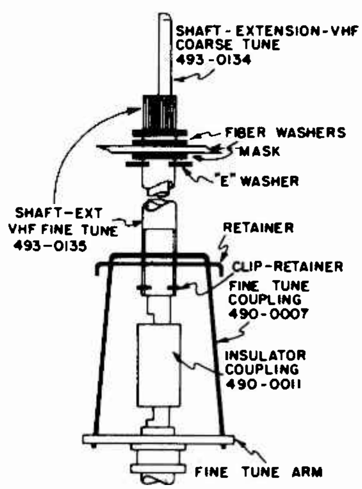
UHF DIAL STRINGING



RACKET AND BRACKET ASSEMBLY



TUNER SHAFTS ASSEMBLY
MODELS 21T218, 21C524

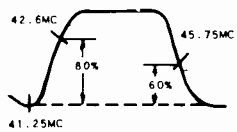
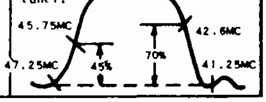


TUNER SHAFTS ASSEMBLY
MODELS 21T214, 21C414

VIDEO IF, SOUND IF AND 4.5MC TRAP ALIGNMENT PROCEDURES

1. Connect an isolation transformer between chassis and power line.
2. Use high scope gain and keep sweep generator output at lowest usable value, check, at intervals for possible sweep generator overloading by temporarily varying signal input level and noting any change (excluding amplitude) in response curve shape.
3. Keep marker generator coupling to a minimum to avoid distortion of response curve.
4. For optimum receiver alignment, power line voltage should be maintained at 117 volts.
5. Receiver and test equipment should warm up for approximately 15 minutes before alignment.

VIDEO IF ALIGNMENT

STEP	ALIGNMENT SETUP NOTES	TEST EQUIPMENT HOOKUP	ADJUST
1.	Set VHF tuner to a free channel. Connect -5 volts DC source (-) term to junction of R203 (100K) and R204 (100K) and (+) term. to chassis. Detune tuner converter plate coil by turning core fully counterclockwise.	SWEEP GENERATOR - through a .0047 Mfd DC blocking capacitor to pin 1 of L201. Set generator to 43.5 MC with 10 MC sweep. SIGNAL GENERATOR - loosely coupled as a marker to sweep generator lead. OSCILLOSCOPE - connected to junction of R219 and L205, through a 33K resistor.  FIGURE 1	a. Adjust sweep generator output to produce response curve of 3V. peak to peak. b. Adjust T200 (top core) for minimum 41.25 MC marker amplitude. c. Adjust L202 for maximum response at 44.0 MC. d. Adjust T201 for maximum response at 45.3 MC e. Adjust T200 (bottom core) for maximum response at 42.7 MC. f. Repeat steps C to E until 45.75 MC marker is at 60% and 42.6 MC marker is at 80%. Adjust L202 to remove tilt. Adjust T201 to position 45.75 marker. Adjust T200 (bottom core) to position 42.6 MC marker. (See Fig. 1).
2.	Same as step 1. NOTE: Tuner IF output lead may be disconnected at terminal 2 on board to increase response curve height for this step. Connect after adjusting traps.	SWEEP GENERATOR - through a .0047 Mfd DC blocking capacitor to VHF IF cable at chassis tie point (No. 1). SIGNAL GENERATOR - Same as step 1. OSCILLOSCOPE - Same as step 1.	Adjust L200 and L201 (top core for minimum 47.25 MC marker amplitude. For optimum results, repeat step 1.
3.	Leave -5 volt AGC voltage connected as in step 1. Set VHF tuner to a high band VHF channel which causes minimum distortion of response curve as fine tuning control is rotated.	SWEEP GENERATOR - to jig shield on mixer tube (V16). SIGNAL GENERATOR - same as step 1. OSCILLOSCOPE - same as step 1.	Adjust tuner converter plate and L201 to give response shown below. For optimum results, repeat steps 1 & 3 but do not detune tuner. 

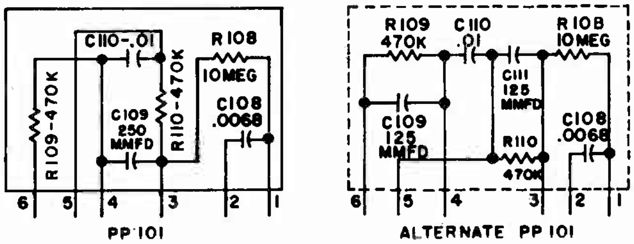
4.5MC TRAP, SOUND IF AND RATIO DETECTOR ALIGNMENT

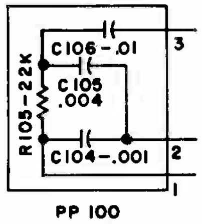
STEP	ALIGNMENT SETUP NOTES	TEST EQUIPMENT HOOKUP	ADJUST
1.	Set contrast control to maximum and brightness control to minimum. Connect -30 volts DC source (-) term. to junction of R203 (100K) & R204 (100K) and (+) term. to chassis. Connect a 4.5 MC series tuned circuit between yellow cathode lead of picture tube and ground.	VTVM - Ground or "common" lead to junction of two matched 100K resistors connected in series across R106 (27K). DC probe through 100K resistor to terminal 1 of de-emphasis plate (PP100). Isolate VTVM from ground. SIGNAL GENERATOR - connected to junction of R219 and L205. Set signal generator to 4.5 MC preferably crystal calibrated or controlled.	For MAXIMUM neg reading: T100 (Top core) T100 (Bottom core) T202 (Bottom core) T202 (Top core) Note: Use peak resulting in greatest separation of cores.
2.	Same as step 1.	VTVM - RF probe connected across coil of series tuned 4.5 MC circuit. SIGNAL GENERATOR - same as step 1.	For MINIMUM reading: T202 (Bottom core) Using lowest signal generator output level, repeat step 1 except T202 (bottom core).
3.	Same as step 1.	Same as step 1.	For zero reading: T100 (Top core) Set VTVM to zero reading using lowest meter scale. At correct setting for T100 (top core), a slight turn of core will give a reading either up or down the scale.

ALTERNATE 4.5MC TRAP ALIGNMENT

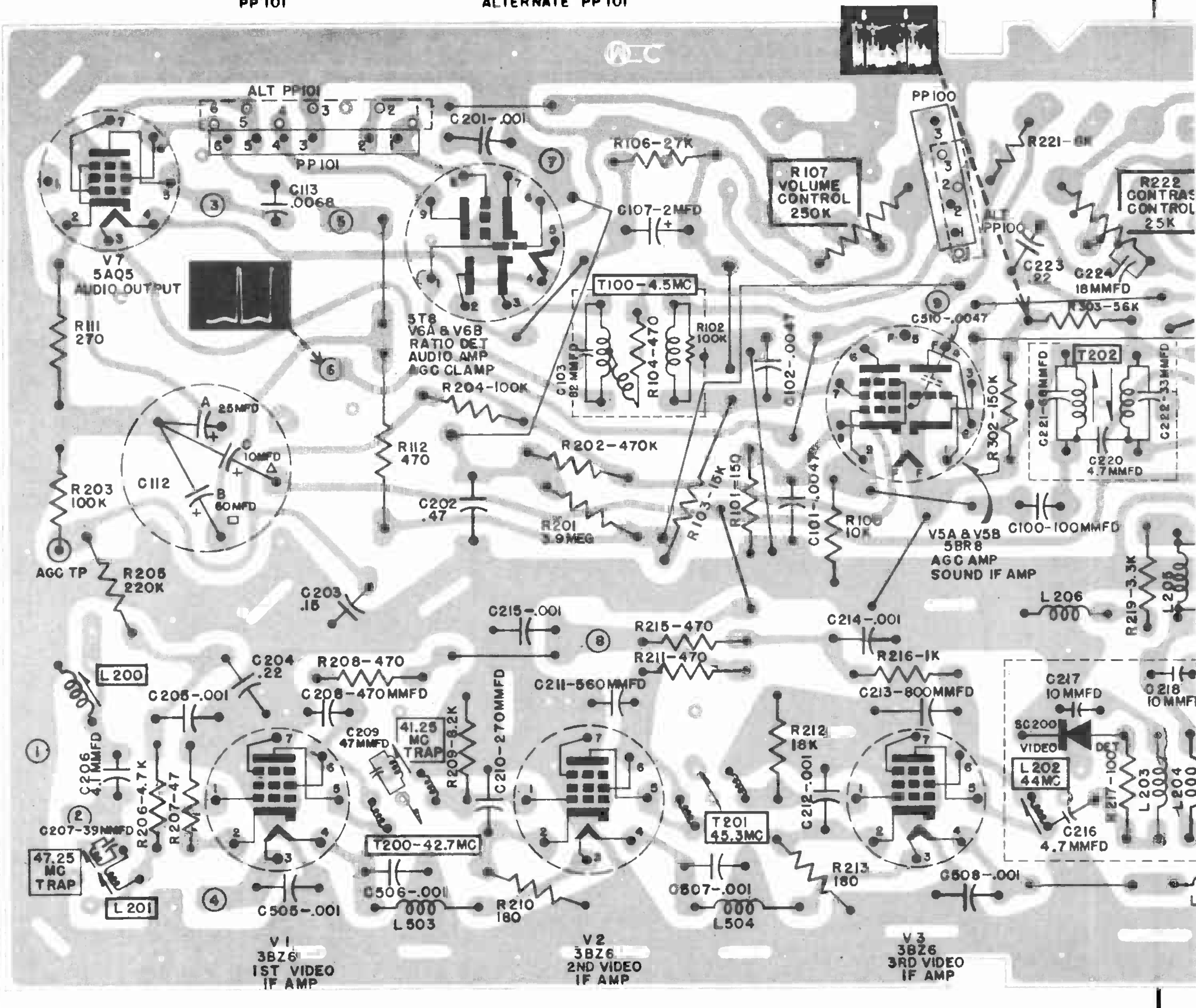
Connect a good antenna to the receiver and properly tune in a strong station. Adjust (T202 bottom core) for minimum 4.5 MC interference in the picture. This interference takes the form of a "grainy" appearance or a fine line pattern through the picture.

SYLVANIA Chassis 1-542-1, -2, -3, -4, -5, -6, -7, -8, Continued





ALTERNATE PP100
ALTERNATE PP100 IS ELECTRICALLY SAME AS PP100 EXCEPT FOR THE MOUNTING POSITION AS SHOWN.



TOP DECK - PRINTED BOARD ASSEMBLY

SUBJECT: C03 REVISIONS (SERIAL NO. 542103-, 542203-, 542303-, 542403-, 542503-, 542603-, 542703-, 542803-).

REASON: To increase life expectance of 10DE7 tube.

DESCRIPTION: Revisions have been made as follows:

1. R314, 1.2 Megohm, ½ watt resistor is changed to R314-1, 820,000 Ohm, ½ watt resistor. (Co-ordinates E-7).

2. R321, 150 Ohm, 2 watt resistor is changed to R321-1, 270 Ohm, 2 watt resistor. (Co-ordinates F-8).

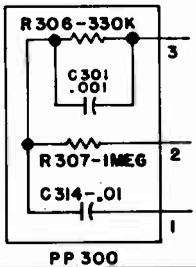
SUBJECT: C04 REVISION (SERIAL NO. 542104-, 542204-, 542304-, 542404-, 542504-, 542604-, 542704-, 542804-).

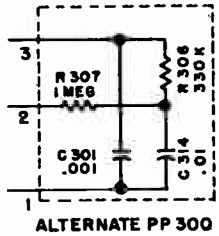
REASON: Frequency compensation at low contrast control settings.

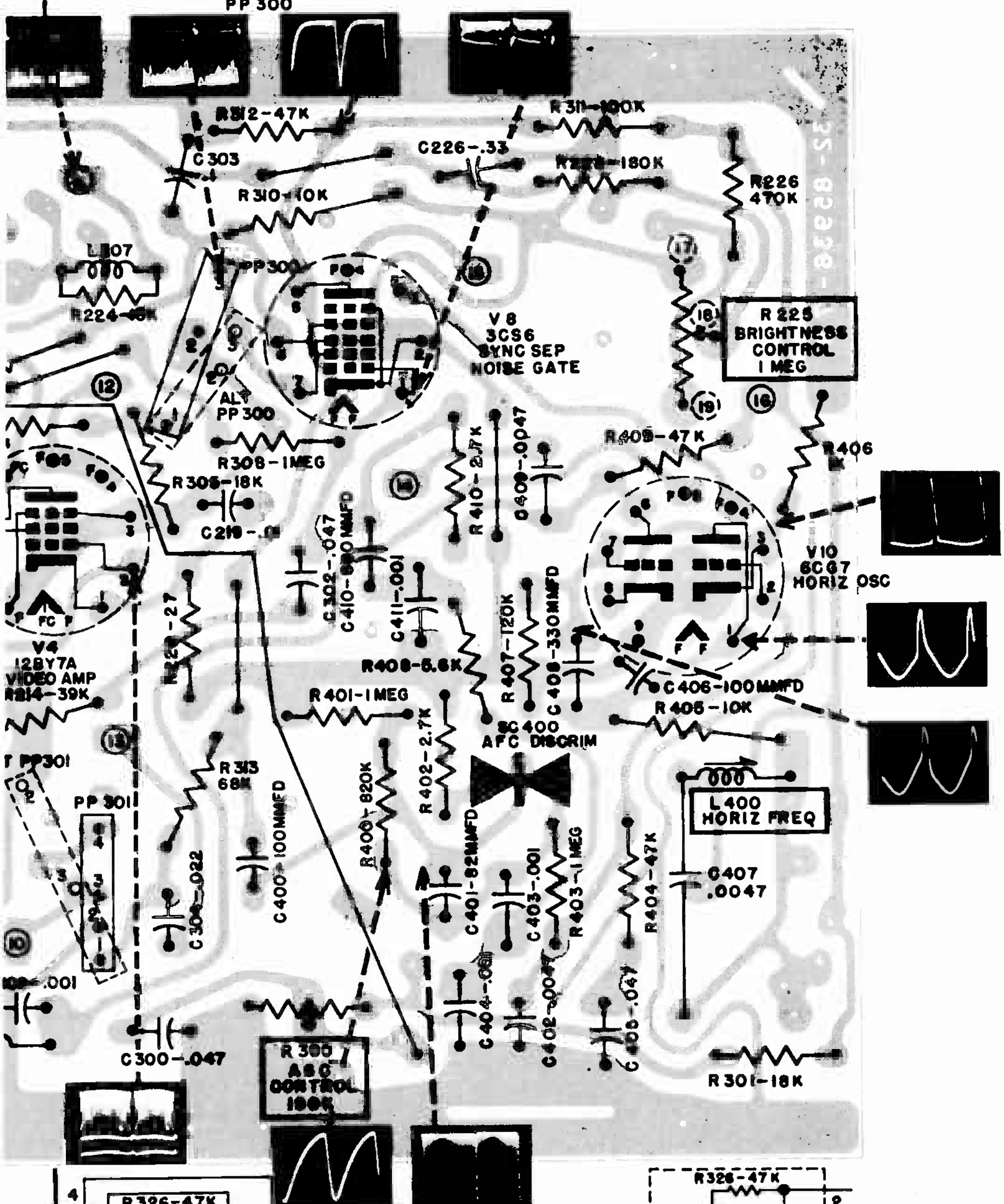
DESCRIPTION: The following revision has been made.

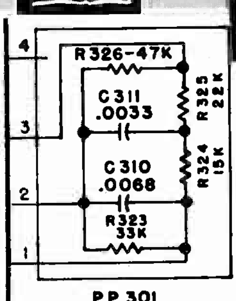
1. C225, 18 Mmfd. capacitor is added to the contrast circuit. One side connects to the junction of C223 and C224 and the other side connects to the wiper of R222, Contrast Control. (Co-ordinates C-9).

SYLVANIA
(Continued)

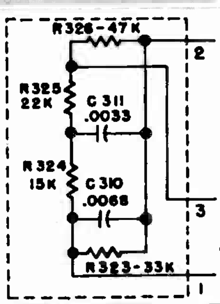








NOTE:
ON 1-542-1,-2 CHASSIS ONLY, R225-BRIGHTNESS CONTROL IS CABINET MOUNTED. EXTENSION LEADS CONNECT IT TO PRINTED BOARD TERMINALS AS SHOWN IN ILLUSTRATION ABOVE.



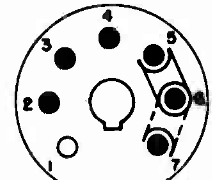
ALTERNATE PP301

FOCUS AND CENTERING ADJUSTMENT

1. Position deflection yoke as far forward as possible on the neck (against the flare) of the picture tube.

2. Rotate centering adjustment rings (located on yoke cover) individually or together until picture is centered. Turn brightness control to a low level and check that no corner cutting exists in the picture.

3. Focusing is accomplished by connecting the focus jumper between either pins 6 and 7 or between pins 6 and 5 on the picture tube, which ever gives the best focus.



AGC ADJUSTMENT

1. Set channel selector to strongest channel in area and adjust fine tuning control to correct tuning point.

2. Set contrast and brightness controls to maximum.

3. Rotate AGC control (R300) clockwise until picture "bends" or "jumps" sideways.

4. Reverse rotation of the AGC control (counterclockwise) until picture is horizontally and vertically stable.

5. Reduce contrast & brightness to normal setting, rotate fine tuning control to correct tuning point. Normal picture should be observed. If this condition cannot be met, rotate the AGC control a small amount further in the counterclockwise direction.

NOTE: For optimum performance, this adjustment should be made under actual operating conditions (in the owner's home).

HORIZONTAL AFC ADJUSTMENT

Before performing the following procedure, check AGC adjustment as described in "AGC Adjustment".

1. Set channel selector to strongest channel in area and adjust fine tuning control to correct tuning point.

2. Adjust vertical height, vertical linearity, and width control for normal picture.

3. Rotate horizontal frequency control (L400) in either direction until picture falls out of horizontal sync. (If picture is not out of sync at the end of the control range, momentarily switch tuner to "free" channel and then return to original).

4. Reverse rotation of frequency control slowly until picture falls into sync.

5. Rotate channel selector to a position on which no signal is received; then return to the original station. The picture should immediately fall into sync. If not, slightly readjust horizontal frequency control (L400) and repeat this step.

Sylvania TV Chassis 1-542-1, -2, -3, -4, -5, -6, -7, -8

VOLTAGE MEASUREMENT CONDITIONS UNLESS OTHERWISE SPECIFIED:

1. Voltage measured to chassis using Sylvania Polymeter (VTVM).
2. AC power source 117V. 60 cycle line.
3. Voltage readings in brackets taken with no signal input; channel selector set to free channel. Antenna disconnected. Antenna terminals shorted together and grounded to chassis.
4. Voltage readings not in brackets taken with a strong signal input: tuner set to strong local station developing approximately 11V. on IF AGC bus (junction of R-203 & R-205).
5. Contrast control set to maximum. Brightness control set to minimum.
6. Voltage values shown are average readings. Variations may be observed due to normal production tolerances.

SPECIAL VOLTAGE MEASUREMENT CONDITIONS:

Picture tube anode voltage measured with VTVM high voltage prove at line voltage of 117V. under conditions of normal signal. No brightness and correct scan size.

▲ High peak voltage of short duration may damage meter used for this measurement.

USE POWER LINE ISOLATION TRANSFORMER WHEN SERVICING THE CHASSIS.
PICTURE TUBE HIGH VOLTAGE ANODE LEAD MAY HAVE A POTENTIAL OF 16,000 VOLTS. OBSERVE ALL HIGH VOLTAGE PRECAUTIONS WHEN SERVICING THE CHASSIS. DO NOT OPERATE THE RECEIVER WITH THE HIGH VOLTAGE COVER REMOVED.

USE SAFETY GOGGLES AND GLOVES WHEN HANDLING THE PICTURE TUBE.

Shaded areas indicate code changes.

WAVEFORM MEASUREMENT CONDITIONS:

1. Channel selector set to strong channel.
2. Contrast control set for signal of 60V. PP at yellow lead of picture tube.
3. Waveforms measured with respect to chassis using Sylvania type 404 oscilloscope. (Other type oscilloscopes may alter waveform shapes or amplitudes).
4. The terms "30∿" or "7875∿" refer to scope sweep frequency used.

GENERAL SCHEMATIC NOTES

1. Voltage sources are indicated by encircled symbols: corresponding symbols without circles indicate voltage tie points.
2. Average resistances of coils and transformers are shown and are measured with component connected in circuit.
3. Encircled numbers on edge of printed circuit indicate tie points corresponding with those shown on parts layout of top board.
4. All capacitors are rated in microfarads unless otherwise specified.
5. Coil and transformer terminal views are shown as seen from botton.
6. Arrows on controls indicate direction of clockwise rotation.
7. Schematic coordinates are for reference in locating components, for example, R106 located in coordinates A-7.

PARTS CODING

Tuner Section	1-99
Sound Section	100-199
Video Section	200-299
Vert. & Sync Section	300-399
Horiz. & HV Section	400-499
L.V. Supply, Fil, Halo	500-599

CODE CHANGES

SUBJECT: C01 REVISIONS (Serial No. 542101-,542201-,542301-,542401-, 542501-,542601-)

DESCRIPTION: Revisions have been made as follows. See Figure 5.

1. R216, 1K, ½ Watt resistor is changed to R216-1, 470 Ohm, ½ Watt resistor. (Co-ordinates D-6).

2. R215, 470 Ohm, ½ Watt resistor is changed to R215-1, 2.2K, ½ Watt resistor. (Co-ordinates D-6).

3. R214, 39K resistor is removed. (Co-ordinates D-5).

4. C302, .047 Mfd. paper capacitor is changed to C302-1, .01 Mfd. paper capacitor. (Co-ordinates F-5).

5. The line which formerly connected R214 to R218 and L205 is now disconnected and C302-1 is now connected to the junction of R216-1 and R215-1 as shown in Figure 5.

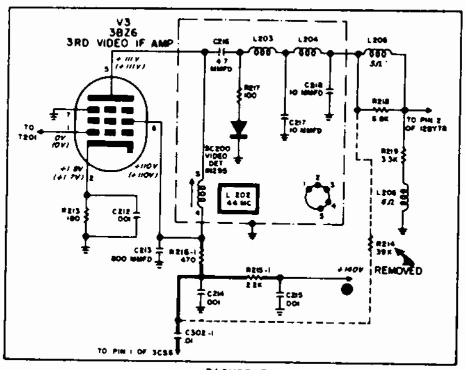
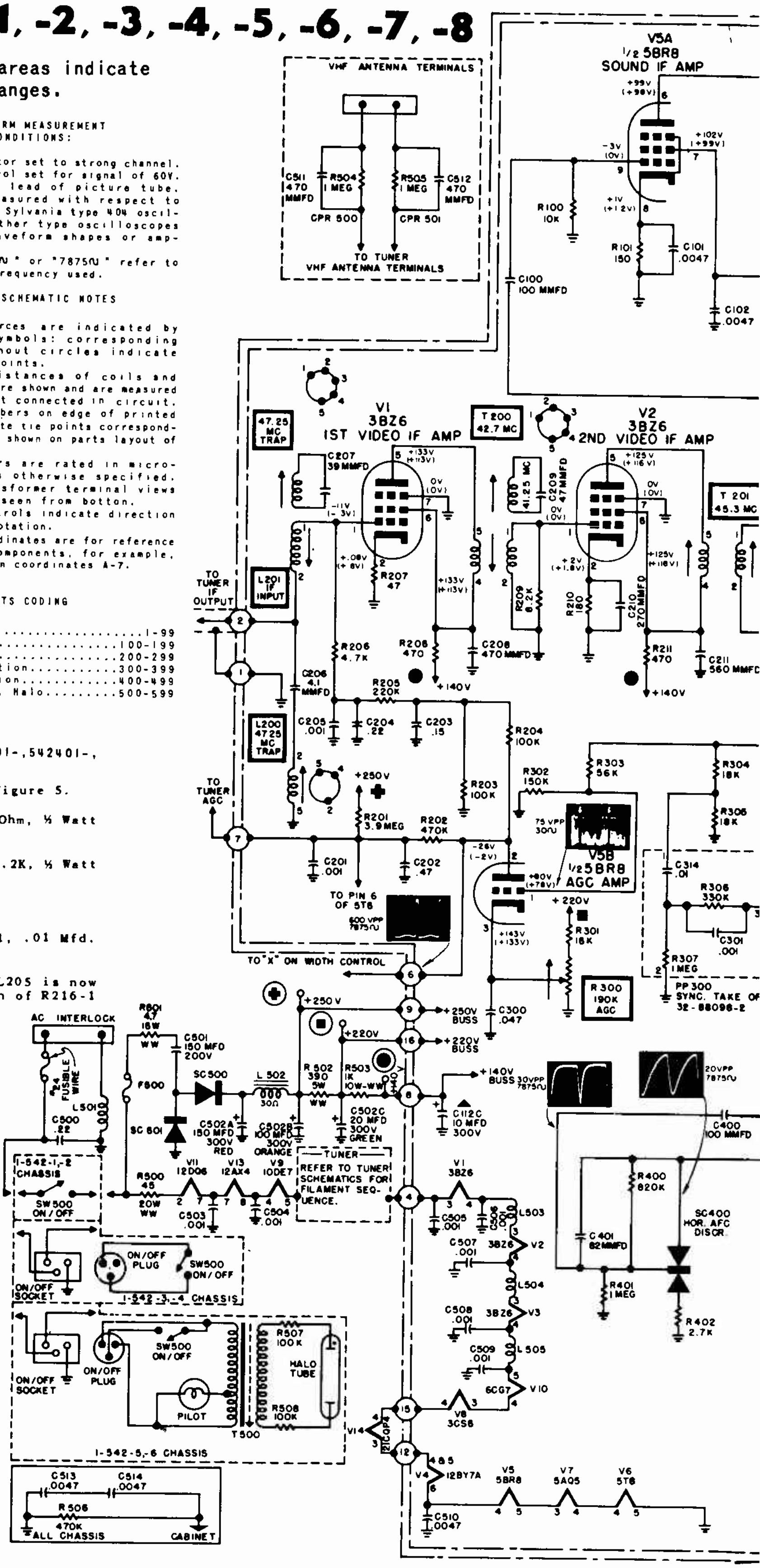
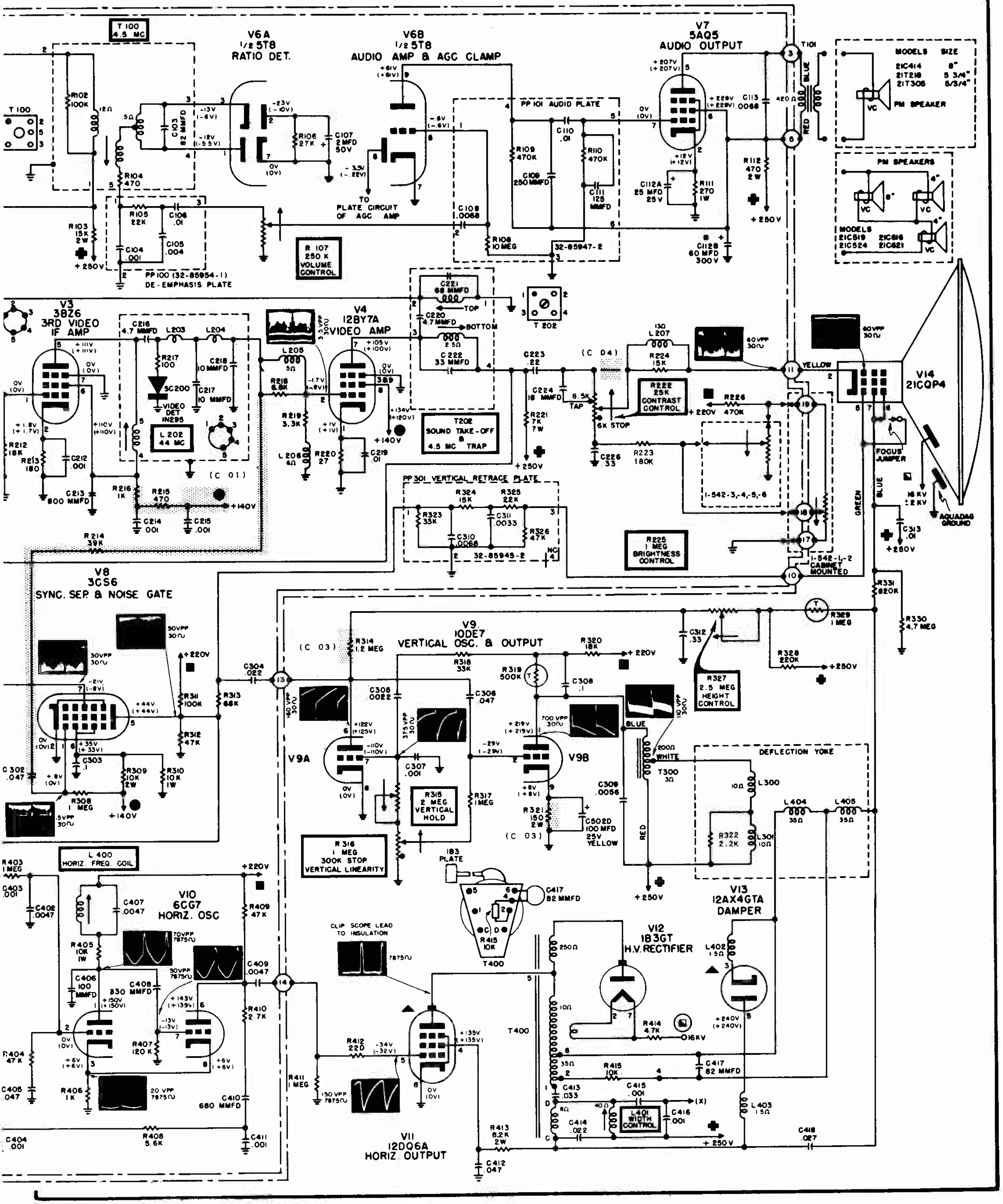


FIGURE 5

CAUTION: WHEN SERVICING CHASSIS OUT OF CABINET, DO NOT OPERATE RECEIVER WITH SPEAKER LEADS DISCONNECTED.





Sylvania TV Chassis 1-542-1, -2, -3, -4, -5, -6, -7, -8

MODELS 21T214, 21C414

KNOB REMOVAL

1. Channel Selector, Fine Tuning and On Off.
A. On UHF models, remove UHF fine tuning knob and shaft assembly by pulling straight out.
B. Remove channel selector, fine tuning and on/off knobs by pulling straight out. Make certain that fiber washer is replaced in well of fine tune knob when re-installing knobs.

2. Volume and Contrast. See Figure A.
A. Remove plastic coupling from control end of cable assembly by applying heat from a soldering iron to plastic crimp. APPLY ONLY ENOUGH HEAT TO LOOSEN PLASTIC COUPLING FROM CABLE ASSEMBLY TO PERMIT REUSE OF COUPLING. Remove tubing.
B. Remove retaining clip located behind mask, which secures knob and cable assembly to cabinet. Then remove knob and cable assembly through cabinet front.
C. To replace knob and cable assembly, reverse the preceding steps. Exercise care when applying heat to secure plastic coupling to cable assembly. APPLY ONLY ENOUGH HEAT TO CRIMP PLASTIC AROUND CABLE ASSEMBLY.

LENS REMOVAL

1. Remove nameplate located at bottom center of mask.
2. Remove screws (2) securing lens retaining clamp.
3. Remove lens by pulling out slightly at the bottom and then down.
4. To replace, reverse the preceding steps. Exercise care so as not to scratch lens surface. To clean lens, use a soft, lint free cloth, water and a mild liquid detergent.

CHASSIS REMOVAL

1. Disconnect AC power cord and antenna connections. Remove interlock cover.
2. Remove screw securing vertical hold knob assembly to cabinet.
3. Compress sides of fine tune coupling to disengage it from slots in arm on tuner. See Figure B.
4. Disconnect speaker leads at speaker, high voltage lead and picture tube socket.
5. Remove On/Off brightness knob. Remove hex nut securing On/Off brightness control to cabinet.
6. Remove two screws locking chassis feet and disengage feet from slots by sliding chassis to rear and up.
7. Remove deflection yoke retaining spring.
8. Remove chassis and deflection yoke from cabinet. NOTE: Secondary control shafts will disengage from controls when chassis is removed.
9. To replace chassis, reverse the above procedure, engaging secondary controls by inserting control shafts into plastic couplings.

PICTURE TUBE REMOVAL

1. Remove chassis as outlined under "Chassis Removal" procedure.
2. Lay cabinet face down, supported on the corners ONLY, so as not to damage or scratch the lens.
3. Loosen picture tube strap tightening screw. Remove screws (2) securing hold down straps at the upper corners of picture tube. Pass strap over neck of picture tube and stow in bottom of cabinet. See Figure C.
4. USING GOGGLES AND GLOVES, reach under face of tube and lift from cabinet. DO NOT GRASP NECK OF PICTURE TUBE AT ANY TIME.
5. To install picture tube, reverse the preceding steps. Exercise care not to scratch face of picture tube.

MODELS 21T218, 21C524

KNOB REMOVAL

1. Channel Selector
A. Remove channel selector knob by pulling straight out.

2. Brightness, Contrast, Volume
A. Disconnect AC power cord and remove backcover.
B. Remove channel selector knob.
C. Remove escutcheon by removing one (1) screw behind channel selector knob and one (1) screw inside right hand top corner of cabinet.
D. Remove knobs by pulling straight out. See Figure D.

LENS REMOVAL

1. Remove lens clamp cover located at bottom center of mask.
2. Remove screws (2) securing lens retaining clamp.
3. Remove lens by pulling out slightly at the bottom and then down.
4. To replace, reverse the preceding steps. Exercise caution so as not to scratch lens surface. To clean lens, use a soft, lint free cloth, water and a mild liquid detergent.

CHASSIS REMOVAL

1. Disconnect AC power cord and antenna connections. Remove interlock cover.
2. Remove screw securing vertical hold knob assembly to cabinet.
3. Compress sides of fine tune coupling to disengage it from slots in arm on tuner. See Figure B.
4. Disconnect speaker leads at speaker, high voltage lead, picture tube socket and on/off plug. NOTE: To operate chassis with this plug removed, a jumper must be used. See Figure E.
5. Remove two screws locking chassis feet and disengage feet from slots by sliding chassis to rear and up.
6. Remove deflection yoke retaining spring.
7. Remove chassis and deflection yoke from cabinet. NOTE: Secondary control shafts will disengage from controls when chassis is removed.
8. To replace chassis, reverse the above procedure, engaging secondary controls by pressing ends of shaft assembly over control. See Figure D.

PICTURE TUBE REMOVAL

Same as Models 21T214 and 21C414.

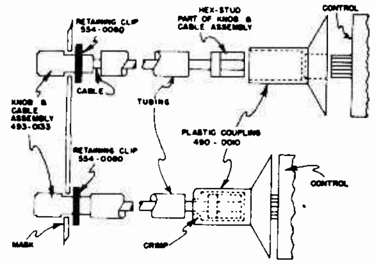


FIGURE A

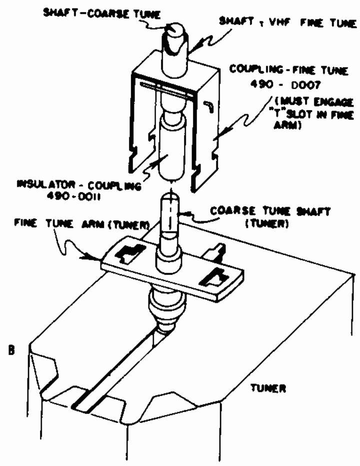


FIGURE B

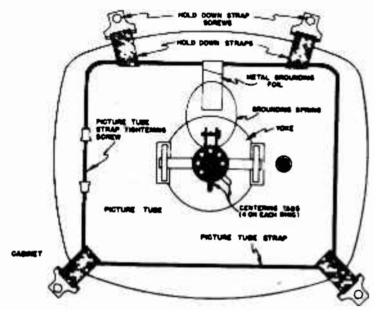


FIGURE C

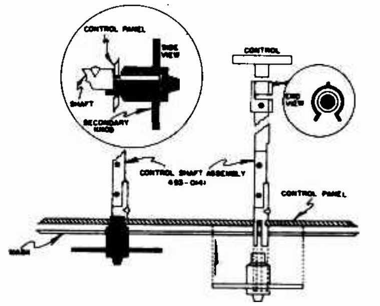


FIGURE D

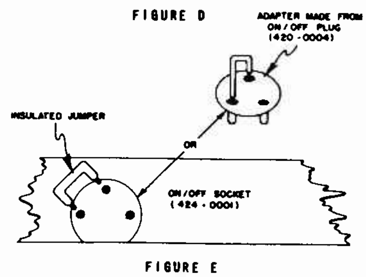
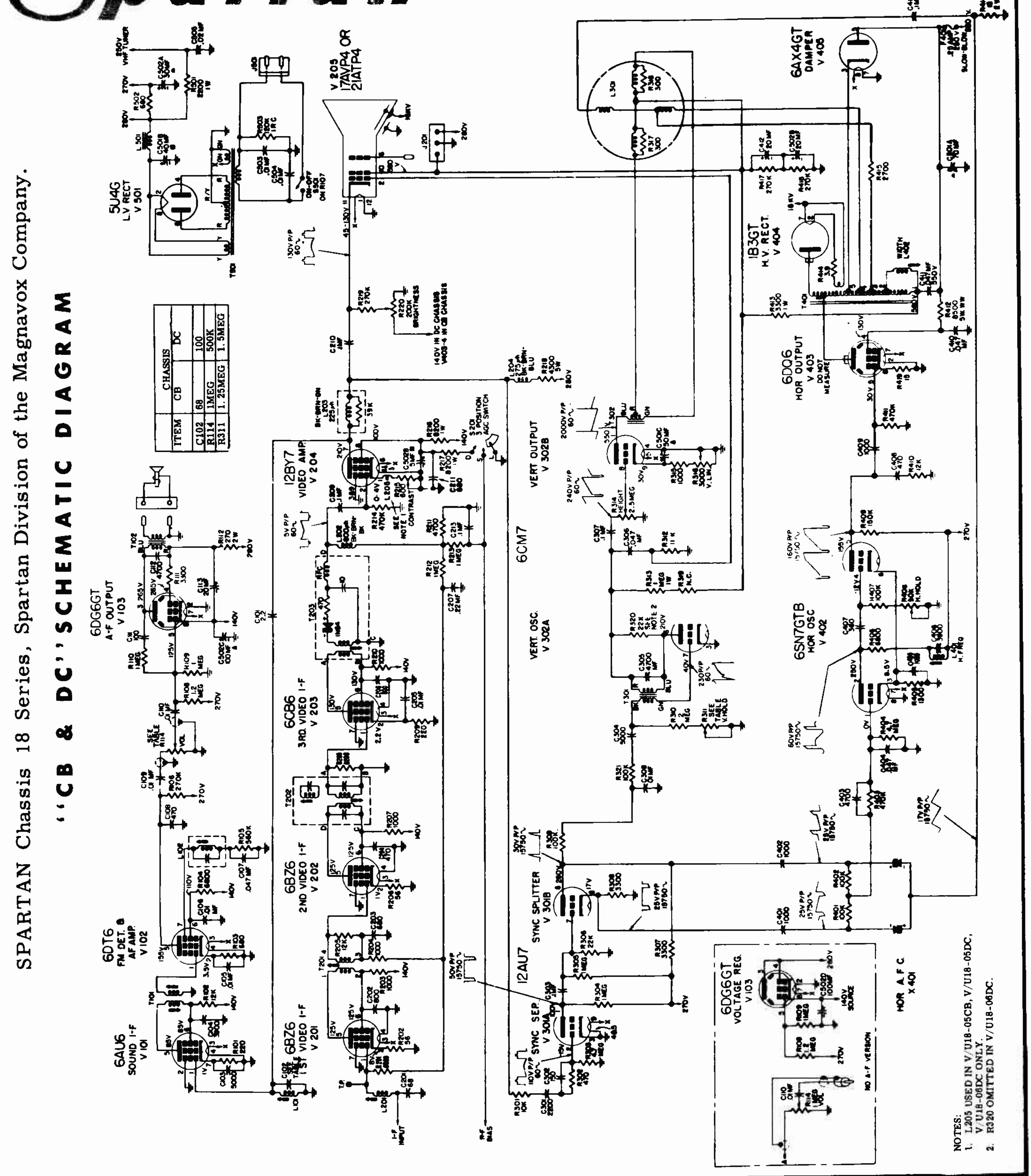


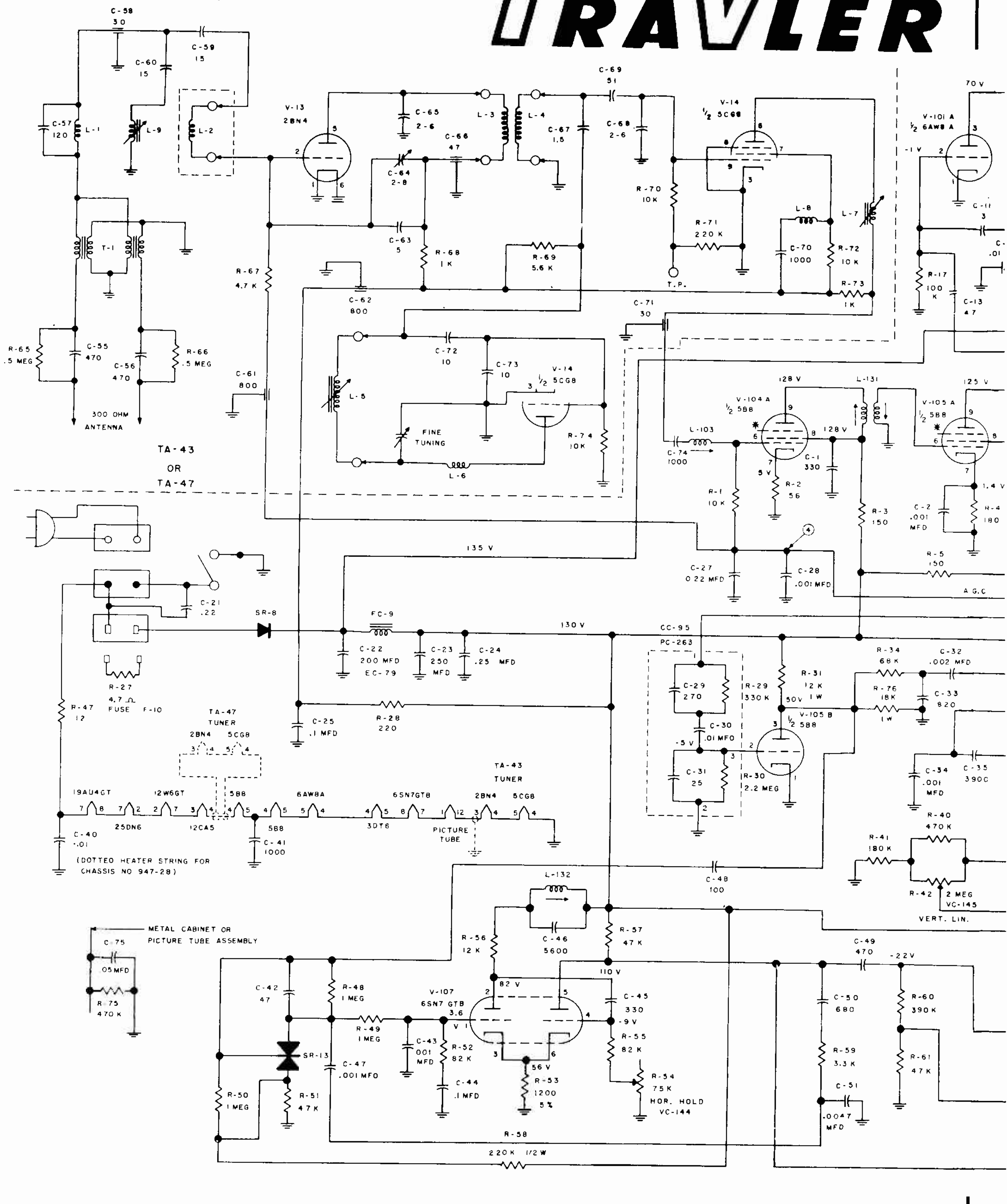
FIGURE E

Spartan CHASSIS 18 SERIES



Chassis No. 943-38, 947-28, 953-28, 975-48.

TRAVLER



TRAV-LER RADIO CORP. Chassis Nos. 943-38, 947-28, 953-28, 975-48

Schematic Diagram, Additional Information on page 152.

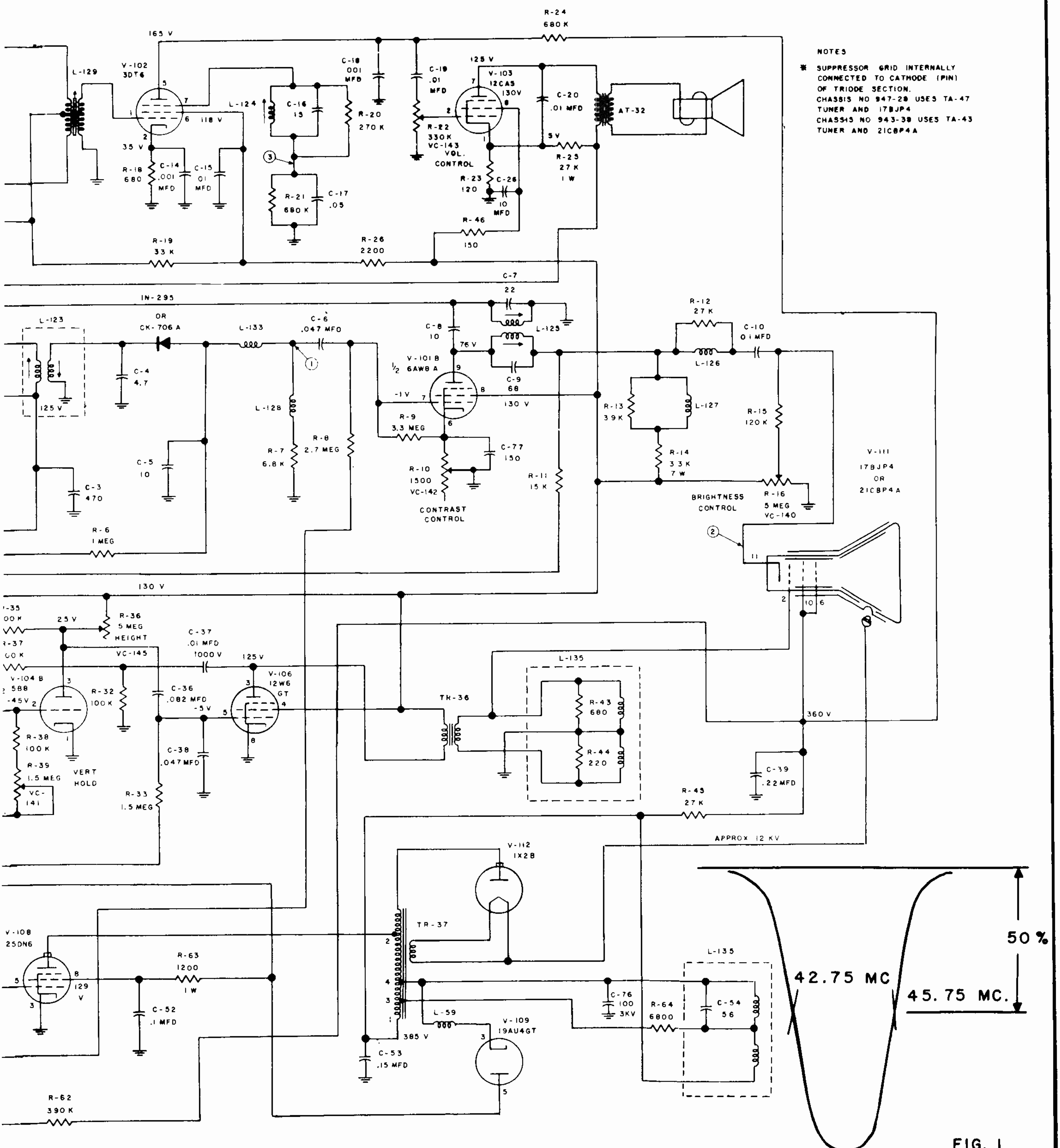


FIG. I

OVERALL I.F. RESPONSE CURVE

TRAV-LER Chassis Nos. 943-38, 947-28, 953-28, 975-48, Continued

INSTALLATION AND SERVICE INSTRUCTIONS

VIDEO I.F. ALIGNMENT

1. Tune receiver to channel 12 or 13, whichever is not assigned.
2. Set the contrast control to maximum clockwise position.
3. Connect the negative side of 3.0 volt battery to point (4); connect positive side to chassis.
4. Connect synchronized sweep voltage from sweep signal generator to horizontal input of oscilloscope for horizontal deflection.
5. Connect vertical input of oscilloscope to point (1); connect ground lead to chassis.
6. Loosely couple the sweep generator (40 to 48 m.c. to 5CG8 tube envelope.
7. Adjust slugs in coil No's L-7, L-103, L-131 and L-123 to obtain pattern shown in Fig. 1.

1. SOUND ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE:

a. Connect FM signal generator set at 4.5 Mc center frequency +−7.5 Kc deviation to point (1) shown on schematic.

b. Connect oscilloscope across voice coil of speaker.

c. Connect VTVM to point (3). Set meter to read at least - 10 V.D.C.

d. Adjust generator for a high level output approximately 200 millivolts or greater and set volume control of receiver for an audible level.

e. Adjust L-129 quadrature coil for maximum audio output on the oscilloscope. Note - during this adjustment, two peaks may occur. It is important to select the peak which gives the maximum voltage. This will normally measure approximately - 5 V.D.C.

f. Reduce the 4.5 Mc signal from 200 millivolts to a point where the output signal on the oscilloscope starts to break up.

g. Adjust L-125 (bottom) sound take-off coil and L-129 interstage coil for cleanest maximum audio output on the oscilloscope.

h. Further reduce the 4.5 Mc signal until the audio output signal breaks up again and reset L-125 and L-129 coils for cleanest maximum output. Final adjustment of these two coils should be made at that minimum signal level at which undistorted audio output signal is just obtainable.

2. ALTERNATE SOUND ALIGNMENT USING TELEVISION STATION SIGNAL AND OUTPUT METER:

a. Tune in strong air signal.

b. Connect output meter across voice coil of speaker and VTVM to point (3).

c. Adjust L-124 quadrature coil for maximum audio output. Note - during this adjustment, two peaks may occur. It is important to select the peak which gives the maximum voltage. This will normally measure approximately - 5 V.D.C.

d. Reduce the air signal by disconnecting antenna and/or detuning fine tuning control until audio distortion occurs.

e. Adjust L-125 sound take-off coil and L-129 interstage coil for maximum undistorted audio output.

f. Further reduce air signal level and reset L-125 and L-129 for maximum undistorted audio output. Final adjustment of these two coils should be made at that minimum air signal level at which undistorted audio output is just obtainable.

g. It may be advisable in some cases to repeat above steps to make certain that the alignment is accurate.

4.5 M.C. SOUND TRAP ADJUSTMENT

1. Connect a signal generator (4.5 M.C. unmodulated) to point (1) shown on schematic. Ground side to chassis.
2. Connect VTVM A.C. probe to point (2).
3. Adjust L-125 coil slug for minimum reading. The correct slug is furthest from the chassis.

CENTERING:

If the picture is not centered in the picture opening, it may be centered by removing the cabinet back and adjusting the centering device, on the neck of the tube, at the rear of the deflection yoke. Turn the whole device to the right or left. To increase the amount of picture shift, move the two tabs, which project from the device, farther apart. If the picture is tilted at an angle, it may be straightened by loosening the deflection yoke locking clamp and adjusting the deflection yoke.

VERTICAL SIZE AND LINEARITY CONTROLS:

Removal of the cabinet back cover is necessary in order to reach these controls. Refer to the tube layout drawing for correct location.

Adjust these controls so that the picture fills the picture opening from top to bottom. These two controls interact and are usually adjusted together to obtain good vertical symmetry and proper picture size.

Westinghouse

MODEL, CHASSIS AND TUNER INFORMATION

Models	*Chassis*	*Bands Covered*	*Tuners*	*Tuner Tubes*
H-17C287 – tutone H-17C288 – mahogany H-17C289 – walnut H-17C290 – limed oak H-17C291 – fruitwood	V-2365-11	VHF	VHF 470V057H01 & H02 or 470V059H02	V12-2CY5 V13-5AT8 V12-2BN4/2BN4A V13-5CG8
H-17CU287 – tutone H-17CU288 – mahogany H-17CU289 – walnut H-17CU290 – limed oak H-17CU291 – fruitwood	V-2365-12	VHF-UHF	VHF - 470V060H02 UHF - 472V034H01	V12-2BN4/2BN4A V13-5CG8 UHF Osc - 2AF4A

ADJUSTMENTS

DEFLECTION YOKE

Loosening the deflection yoke clamp allows back-and-forward and rotary movement of the deflection yoke with respect to the CRT. The deflection yoke should be as far forward as possible (touching the bell of the CRT). Rotation of the deflection yoke is used to level the raster with respect to the mask.

CENTERING

The two centering rings are located at the rear of the deflection yoke. The centering rings are provided with adjustment tabs. Centering the raster in the mask is accomplished by rotating the centering rings individually or together, as necessary.

HEIGHT AND VERTICAL LINEARITY

The HEIGHT control and V. LIN control are located at the rear of the receiver. The HEIGHT control is used to adjust the vertical size of the picture. The V. LIN control is used to remove vertically cramped or elongated areas from the picture. Alternate adjustment of these controls is necessary to obtain a picture of the proper height which has good vertical linearity throughout.

HORIZONTAL RINGING COIL

The horizontal ringing coil (L402) should be adjusted as follows:

1. Short out the ringing coil with a jumper wire.
2. Set the HORIZ hold control to the center of its range. Do not change this setting during the steps that follow.
3. Connect a VTVM to point F or to pin 7 of V2 (HMV). The VTVM is used to measure the DC voltage between this point and B–.
4. With the receiver tuned to a station of normal signal strength, adjust C417 for +.5 volts DC on the meter.
5. Remove the jumper connected across the ringing coil.
6. Adjust horizontal ringing coil L402 for +.5 volts DC on the meter. Check the adjustment by switching to another channel and back again. The receiver should pull into horizontal synchronization on all channels.

QUIETING

The QUIETING control is located at the rear of the receiver. This control determines the AM rejection characteristics of the sound system. It is adjusted as part of the procedure given under SOUND ALIGNMENT and will not ordinarily require further adjustment. In very weak signal areas, however, a reduction in noise or hiss in the sound may be obtained by slightly readjusting this control.

OSCILLATOR ADJUSTMENT

Oscillator adjustments may be necessary after replacement of the mixer-oscillator tube because of different tube inter-electrode capacitance.

The oscillator coils for channels 13 and 12 are in series and are tuned by a single slug. The same arrangement is used in the pairing of oscillator coils for channels 11 and 10, 9 and 8, 6 and 5, and 4 and 3. Channels 7 and 2 have individual oscillator coils, each with an adjustable slug.

By turning the channel selector to the channel to be adjusted the proper oscillator slug for adjustment of that channel will appear in the oscillator adjustment hole. This adjustment hole, located on the front of the tuner (Figure 15), is shaped so that the proper adjustment slug is available for each setting of the channel selector.

Oscillator adjustments can be made without removing the chassis from the cabinet. Remove only the channel selector and fine tuning knobs. Make adjustments with a non-metallic screwdriver. Be sure the screwdriver fits the slot properly to avoid damaging the coil or coil form.

Using an air signal, make the oscillator adjustment as follows:

1. Allow five minutes for receiver warm-up.
2. Set channel selector on channel to be adjusted.
3. Set the fine tuning control at the center of its range. This point must be estimated because of the 360 degree continuous fine tuning.
4. Adjust oscillator slug for best picture.

RF TRAP ADJUSTMENT

The RF trap, L1-C1, is normally factory set at 44 MC ±.5 MC. The trap may be adjusted to attenuate any interfering signal between 40 MC and 46 MC.

(Material continued on pages 154 through 160)

WESTINGHOUSE Chassis V-2365-11, V-2365-12, Service Material, Continued

WARNING –– PROTECTION OF PERSONNEL AND EQUIPMENT

1. Always use an isolation transformer between the power source and the receiver line input when servicing.
2. Discharge the high voltage lead to B- before working near high voltage.
3. When handling the cathode ray tube (CRT):
a) Completely discharge the CRT capacitance by means of a jumper between the high voltage cavity and B-.
b) Use protective shatterproof goggles and heavy gloves.
4. After receiver repair, check resistance between the B- side of the receiver line input and the chassis cold rail (line cord disconnected). A resistance of less than 300,000 ohms indicates a short circuit (or leakage) to metal parts which are accessible. Remove the cause of leakage before the set is released.

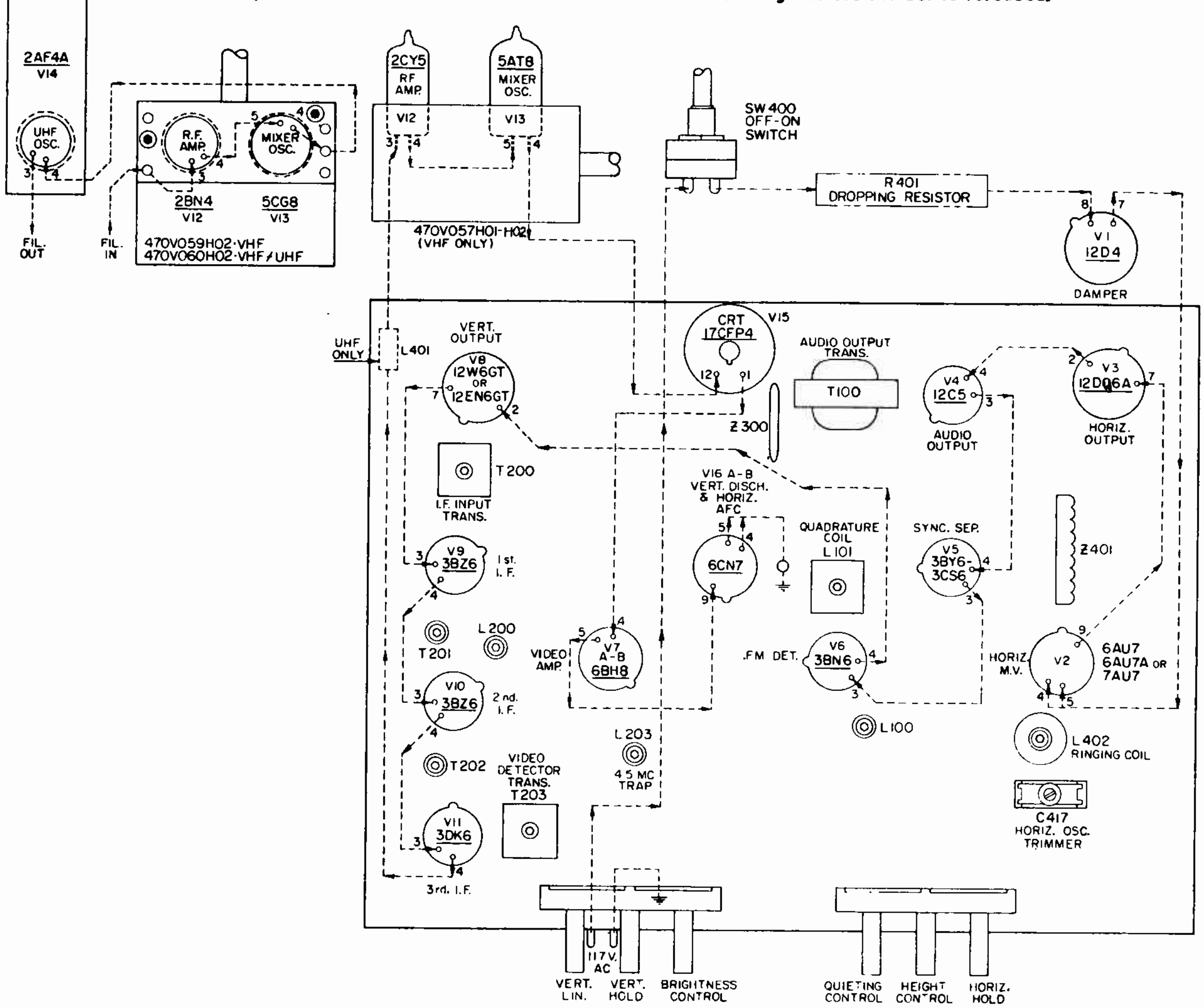


Figure 4. Top view of chassis. Tube location, heater string, and adjustments.

KEY TO BOTTOM VIEW OF PC BOARD

1. Shielded lead to tuner IF output
2. Brown wire to pin 7 of 12D4
3. Green wire to pin 2 of CRT
5. Brown wire to tuner (filament VHF/UHF receivers only)
6. Brown wire to tuner (filament VHF receivers only)
7. Blue wire to PICTURE control R219
8. Brown wire to pin 11 of CRT
9. Yellow wire to T300 secondary
10. Green wire to arm of PICTURE control R219
11. White wire to pin 6 of CRT (B+, 115V)
12. Gray wire to lug 3 of T400 (B+ +, 425V)
13. Red wire to pin 10 of CRT
14. Red/white wire to C410A (B+, 135V)
15. Yellow wire to lug 2 of T400
16. Green shielded lead to arm of VOLUME control R105
17. Orange wire to C412A (B+, 115V)
18. Black wire, filament return to ground
19. Black wire to pin 1 of CRT
20. Blue wire to T300 primary.
21. White wire to tuner AGC.
22. Orange/white wire to junction R402 and C411A (B+, 105V).
23. Blue shielded lead to top of VOLUME control R105.
24. Shield of green coax to lug 12 of TV-Phono switch.
25. Center conductor of green coax to lug 11 of TV-Phono switch.
26. Brown wire to lug 3 of TV-Phono switch.
27. Black wire to Phono base.
28. Blue wire to TONE control R108.
29. Yellow wire to C109.
30. Yellow wire to lug 2 of TV-Phono switch.
31. Red/yellow wire to lug 5 of TV-Phono switch.

WESTINGHOUSE
Chassis V-2365-11, V-2365-12,
Service Material, Continued

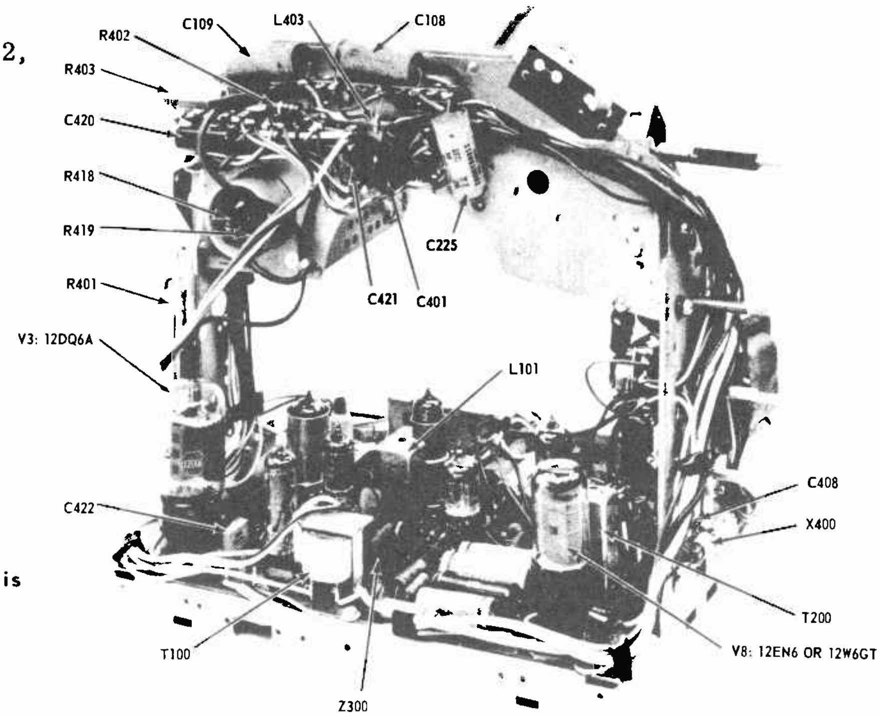


Figure 7 – Chassis removed from cabinet, front view.

ALIGNMENT

IF ALIGNMENT

EQUIPMENT:

1. **Sweep generator** – Output frequencies of 40 MC through 60 MC. Output voltage level should be adjustable.
2. **CW or marker generator** – Output frequencies of 4.5 MC, 41.25 MC, 43.1 MC, 42.5 MC, 47.25 MC, and 215.75 MC. Generator should be accurate and stable; crystal calibration preferred. Output voltage level should be adjustable.
3. **Oscilloscope** – Hickock 640 or equivalent.
4. **VTVM** – RCA Voltohmyst or equivalent.
5. **Bias supply** – A negative 3 volt bias.
6. **Alignment tool** – The alignment tool shown in Figure 8 should be used to adjust all slugs having a hexagonal bore.

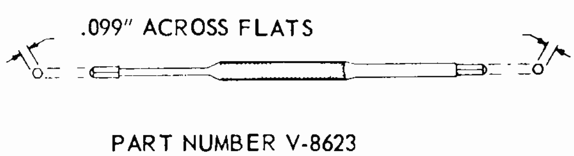
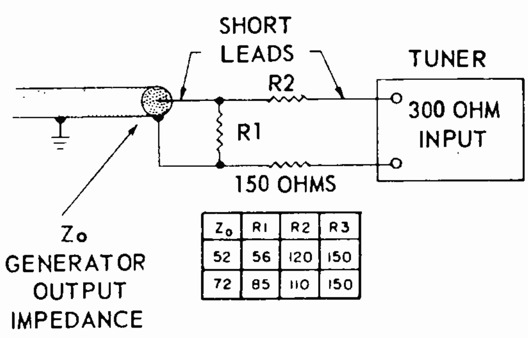


Figure 8. Alignment tool; .099" across flats.

TERMINATION OF EQUIPMENT:

1. **Generators** – Except where otherwise noted, all signal generating equipment should be terminated as shown in Figure 10
2. **Oscilloscope and VTVM** – Use direct probe terminated with decoupling network shown in Figure 11.



Z_o	R1	R2	R3
52	56	120	150
72	85	110	150

Figure 9. Impedance matching network.

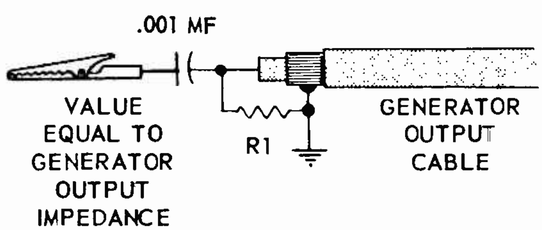


Figure 10. RF generator cable.

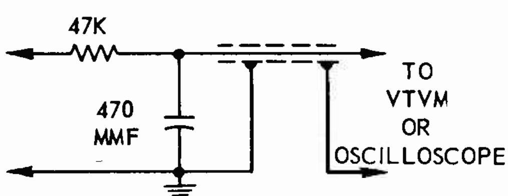


Figure 11. Decoupling network.

WESTINGHOUSE IF Alignment for Chassis V-2365-11, V-2365-12 (Continued)

Step	*Generator*	*Freq. (MC)*	*Generator Connection Point*	*Indicator and Connection Point*	*Adjustment*
1.					a) Connect a −3 volt bias to test point Ⓐ. b) Short out the receiver antenna terminals with a *short* jumper wire. c) L2 (tuner). Turn slug fully counterclockwise (all way out) to detune tuner output.
2.	Sweep	43.9	Connect sweep generator output to control grid (pin 1) of 3rd IF Amp.	Scope. Connect to test point Ⓑ. Calibrate for 2V PP.	T203. Bottom slug for maximum output at 43.9 MC; top slug to check that response will "rock" about 43.9 MC. If necessary, readjust bottom slug slightly until top slug will "rock" response about 43.9 MC. Finally, adjust top slug for flatest response.
3.					a) Remove generator connection from control grid (pin 1) of 3rd IF Amp. b) Remove scope connection from test point Ⓑ.
4.	CW	43.1	Connect CW generator output to test point Ⓓ.	VTVM. Connect to test point Ⓑ. Use range suitable for measuring −1.5V.	T202. Adjust for maximum negative voltage.
5.	CW	47.25	CW. Leave connected as in step 4.	VTVM. Leave connected as in step 4.	L200. Adjust for minimum negative voltage.
6.	CW	45.2	CW. Leave connected as in step 4.	VTVM. Leave connected as in step 4.	T201. Adjust for maximum negative voltage.
7.					a) Remove generator connection from test point Ⓓ. b) Remove VTVM connection from test point Ⓑ.
8.	Sweep	44	Connect sweep generator output to test point Ⓓ	Scope. Connect to test point Ⓑ. Calibrate for 2V PP.	Response curve should be as shown in Figure 13. Slight readjustment of T201 and T202 should be used, if necessary, to obtain the proper IF response curve.
9.					a) Remove generator connection from test point Ⓓ. b) Remove scope connection from test point Ⓑ.
10.	CW	41.25	Connect CW generator to Mixer grid point on tuner. (See Figure 15)	VTVM. Connect to test point Ⓑ. Use range suitable for measuring −1.5V.	T200. Top slug for minimum negative voltage. Increase generator output or reduce IF bias if necessary.
11.					a) Remove jumper wire shorting out antenna terminals. b) Set receiver channel selector to Ch. 13.
12.	Sweep	215.75	Connect sweep generator to antenna terminals through impedance matching network shown in Figure 9.	VTVM. Leave connected as in step 10.	Fine tuning. Adjust for lowest point in trap dip.
13.					a) Remove VTVM connection from test point Ⓑ.
14.	Sweep	Ch. 13 (210-216)	Connect sweep generator to antenna terminals through impedance matching network shown in Figure 9.	Scope. Connect to test point Ⓑ. Calibrate for 2V PP.	a) L2 (tuner). Adjust for maximum output. b) T200. Bottom slug to check that response will "rock" about Ch. 13 center frequency (213 MC). If necessary, readjust L2 slightly until bottom slug of T200 will "rock" response about 213 MC. Finally, adjust bottom slug of T200 for overall response curve Figure 12.
15.					a) Remove generator connection from antenna terminals. b) Remove scope connection from test point Ⓑ.
16.	CW	4.5	Connect CW generator to test point Ⓑ.	VTVM. Connect to point Ⓒ, low side to B−.	L203. Adjust for minimum positive voltage.

WESTINGHOUSE Alignment
Chassis V-2365-11, V-2365-12
(Continued)

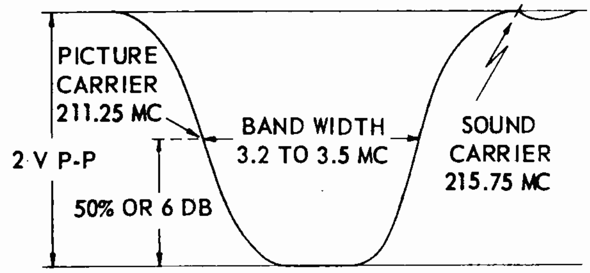


Figure 12. Overall response.

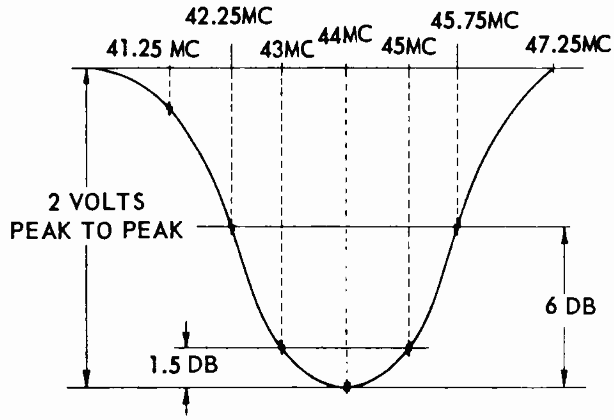


Figure 13. Video IF response curve.

SOUND ALIGNMENT

The sound section may be aligned using either a *locally generated signal* or an *air signal.*

4.5 MC DETECTOR PROBE

Construct probe from quadrature coil assembly (part no. 230V007H02) and 1N64 (part no. V-10916-3) or equivalent crystal diode. The crystal diode should have a back resistance of at least 500K ohms as measured by VTVM.

The probe should be adjusted for maximum response at 4.5 MC as follows:

1. Connect probe input lead, in series with a 2 mmf capacitor, to control grid (pin 2) of 3BN6 on properly operating receiver.
2. Tune quadrature coil slug for maximum indication on VTVM.

The use of this probe in the AIR SIGNAL ALIGNMENT procedure will insure exact tuning of the sound section. This is possible because the probe does not significantly load or detune the receiver circuits.

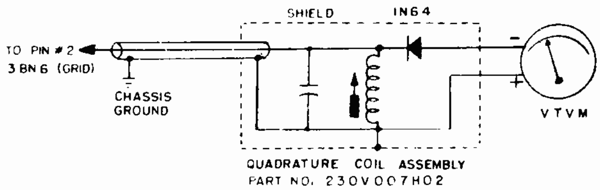


Figure 14. 4.5 MC detector probe.

LOCALLY GENERATED SIGNAL ALIGNMENT EQUIPMENT:

1. **FM generator** – Output frequency of 4.5 MC with approximately ±7.5 KC deviation.
2. **AM generator** – Output frequency of 4.5 MC, modulated approximately 30%.
3. **VTVM or oscilloscope** – Use with high impedance probe. Connect across VOLUME control as AC voltage indicator.

PROCEDURE:

1. Connect VTVM or scope across VOLUME control.
2. Set QUIETING control R100 to mid-range.
3. Apply strong 4.5 MC FM signal to test point (B)
4. Adjust quadrature coil L101 for maximum output.
5. Using lowest signal level that will produce an indication, adjust coil L100 for maximum output.
6. Apply medium strong 4.5 MC AM signal to test point (B)
7. Adjust QUIETING control for minimum AM output.
8. Repeat steps 3 through 7.

AIR SIGNAL ALIGNMENT EQUIPMENT:

1. **VTVM** – Use with special 4.5 MC detector probe.
2. **Detector probe, 4.5 MC** – This probe may be easily constructed from a quadrature coil assembly and a crystal diode. See Figure 14 for construction details.

PROCEDURE:

1. Connect detector probe (Figure 14) to control grid (pin 2) of 3BN6. Use VTVM range suitable for measuring small negative voltages.
2. Tune receiver to strongest of available channels.
3. Set the QUIETING control R100 to mid-range.
4. Using a low VOLUME control setting, adjust quadrature coil L101 for maximum speaker volume.
5. Reduce signal strength at the antenna. This may be done with an attenuator pad or by loose coupling.
6. Adjust coil L100 for maximum negative voltage on VTVM.
7. Reduce VOLUME control setting and further reduce signal strength at the antenna until −1 volt is measured on the VTVM.
8. Adjust quadrature coil L101 for maximum speaker volume.
9. Rotate fine tuning control away from "best picture" setting until a −1.5 volt VTVM measurement is obtained. If the −1.5 volt measurement cannot be obtained using the fine tuning, then adjust the tuner oscillator to obtain −1.5 volt.
10. Adjust the QUIETING control for minimum intercarrier noise (buzz).
11. If, in step 9, the tuner oscillator was adjusted, this oscillator should now be returned to its original adjustment condition.

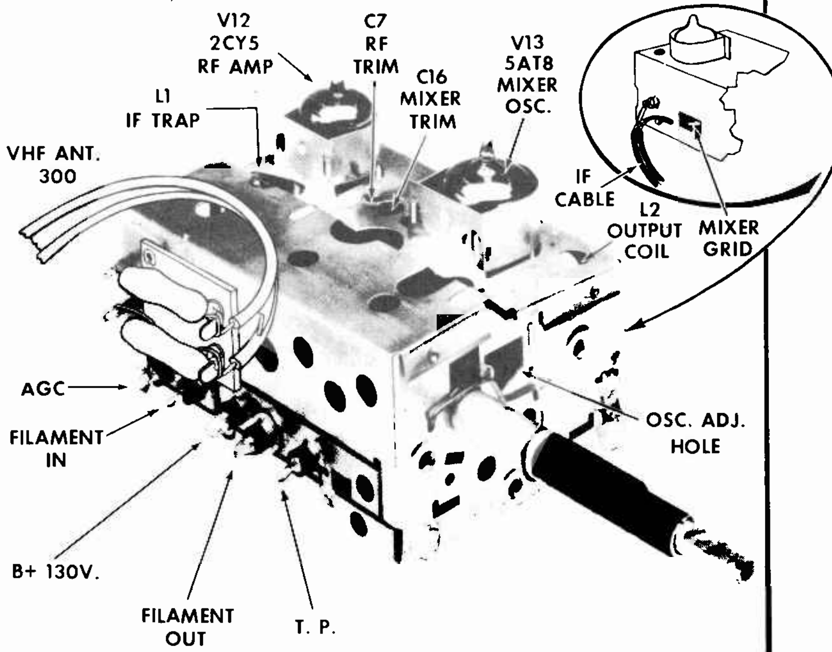
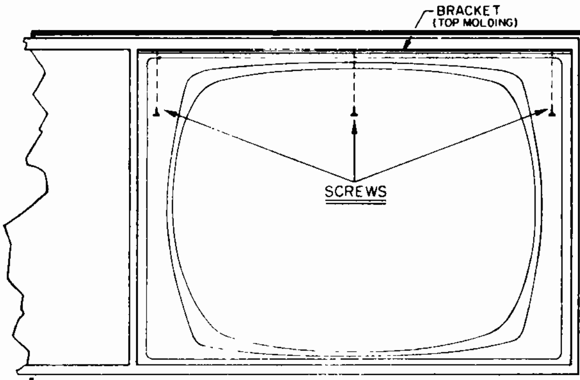


Figure 15 – VHF tuner 470V057H02 (Mark VI)

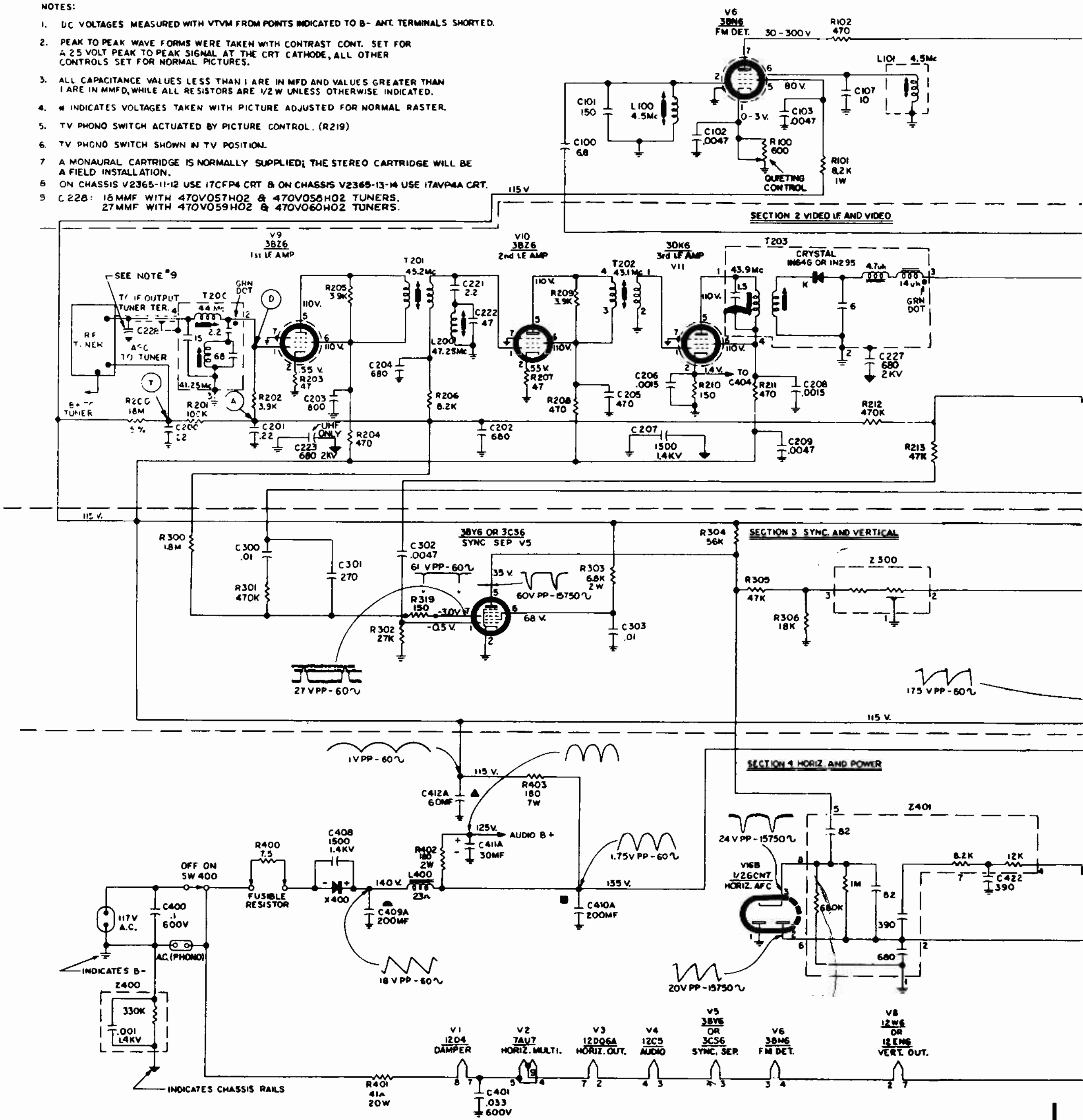


CHASSIS REMOVAL

1. Remove the external antenna leads, back cover, antenna terminal boards, control knobs, speaker leads and nut on speaker-holding clamp.
2. Disconnect the following: AC plug to phono (Amp-Lok); blue phono coaxial lead to terminal board under phono; black wire to terminal board under phono.
3. Remove six screws from the bottom of the cabinet (four 1/4" screws and two 5/16" screws).
4. Remove three screws located inside the cabinet (two above the CRT and one at the side of the chassis).

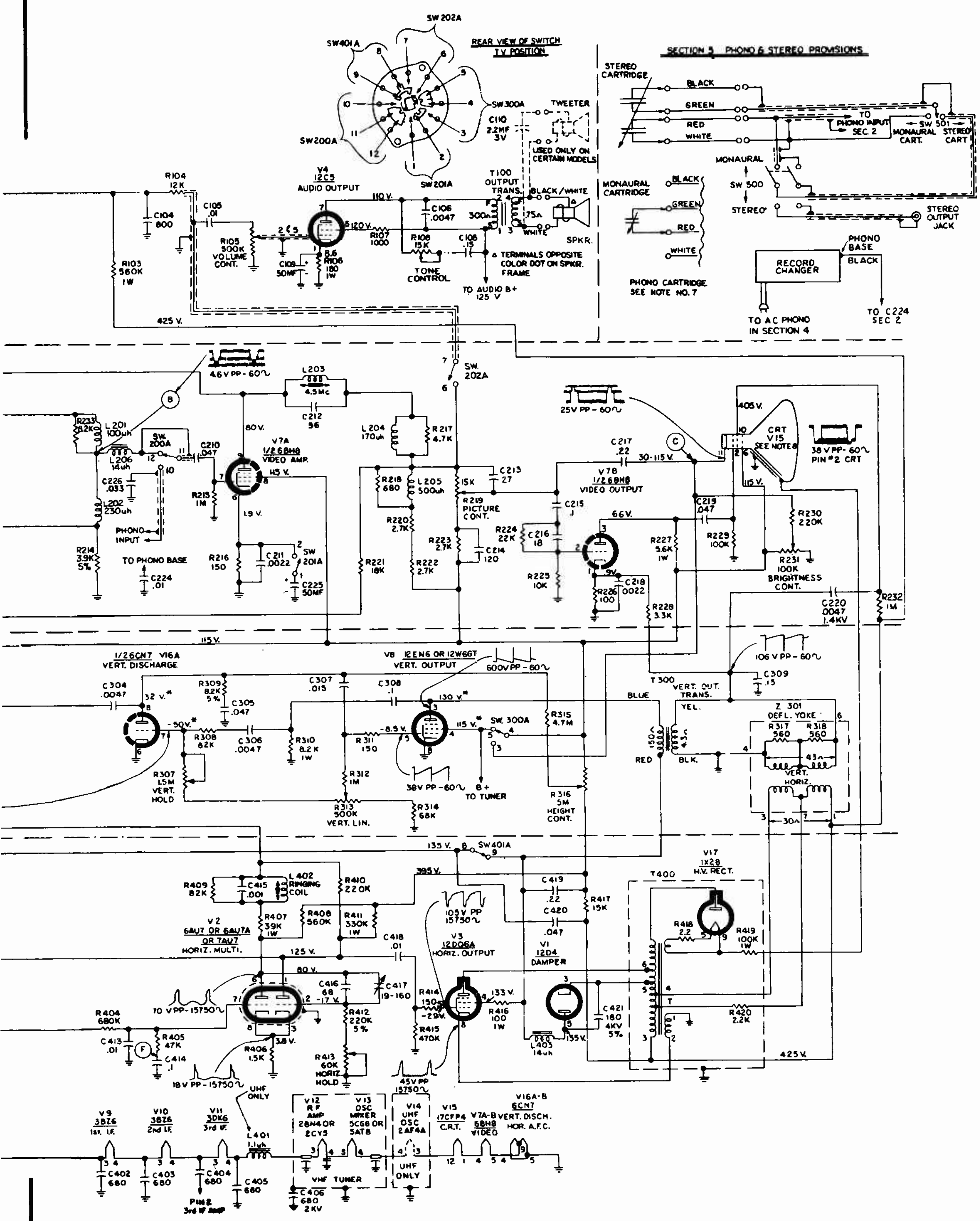
NOTES:

1. DC VOLTAGES MEASURED WITH VTVM FROM POINTS INDICATED TO B- ANT. TERMINALS SHORTED.
2. PEAK TO PEAK WAVE FORMS WERE TAKEN WITH CONTRAST CONT. SET FOR A 25 VOLT PEAK TO PEAK SIGNAL AT THE CRT CATHODE, ALL OTHER CONTROLS SET FOR NORMAL PICTURES.
3. ALL CAPACITANCE VALUES LESS THAN 1 ARE IN MFD AND VALUES GREATER THAN 1 ARE IN MMFD, WHILE ALL RESISTORS ARE 1/2 W UNLESS OTHERWISE INDICATED.
4. * INDICATES VOLTAGES TAKEN WITH PICTURE ADJUSTED FOR NORMAL RASTER.
5. TV PHONO SWITCH ACTUATED BY PICTURE CONTROL. (R219)
6. TV PHONO SWITCH SHOWN IN TV POSITION.
7. A MONAURAL CARTRIDGE IS NORMALLY SUPPLIED; THE STEREO CARTRIDGE WILL BE A FIELD INSTALLATION.
8. ON CHASSIS V2365-11-12 USE 17CFP4 CRT & ON CHASSIS V2365-13-14 USE 17AVP4A CRT.
9. C228: 18MMF WITH 470V057H02 & 470V058H02 TUNERS. 27MMF WITH 470V059H02 & 470V060H02 TUNERS.

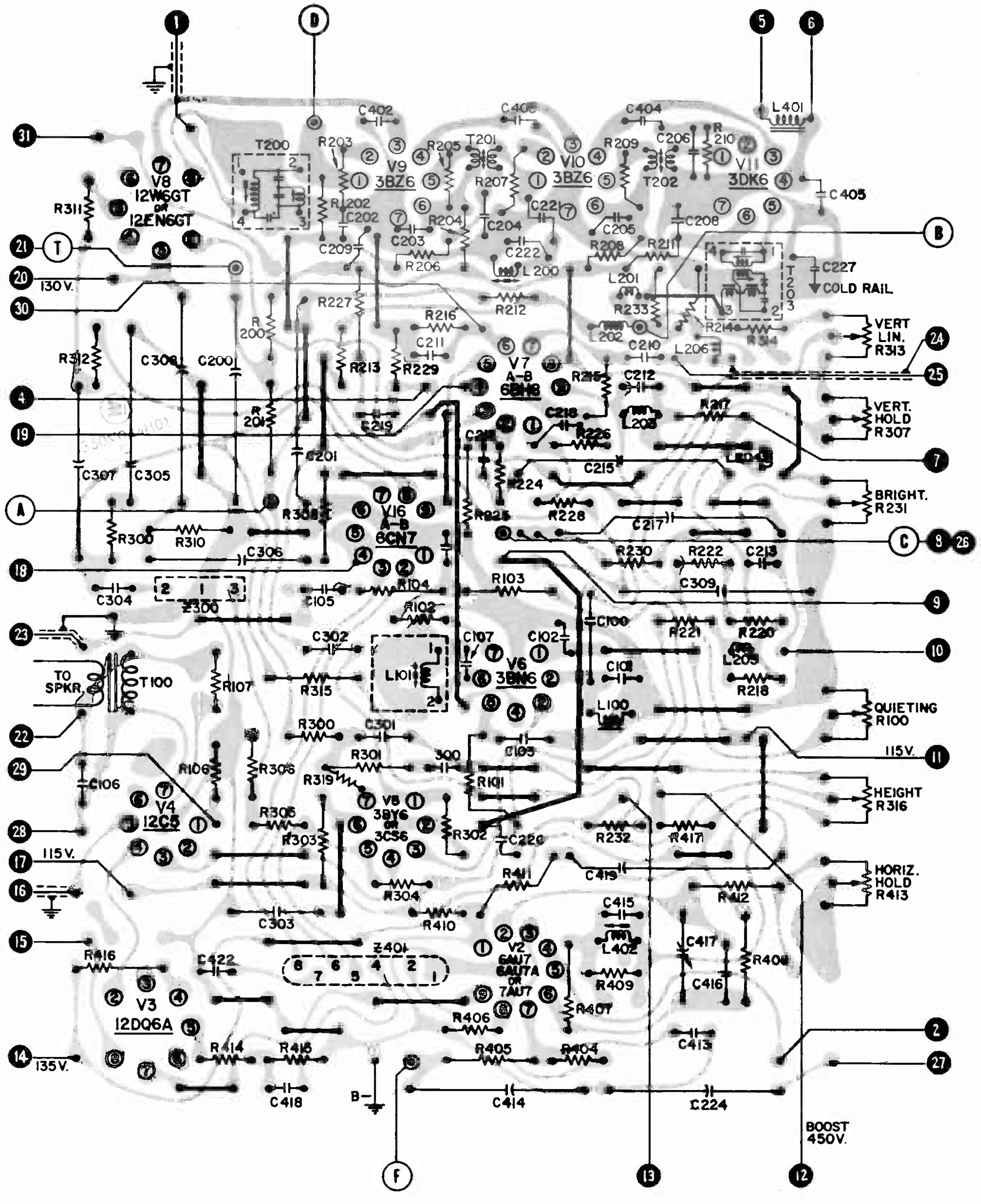


Schematic diagram; chassis V-2365-11 and V-2365-12

WESTINGHOUSE Chassis V-2365-11, V-2365-12, Schematic Diagram



WESTINGHOUSE Chassis V-2365-11, V-2365-12, Service Material, Continued



Bottom view of PC board showing top components as schematic symbols.

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MODEL AND CHASSIS CHART

Models	Chassis	Tuners Used	Tuner Tubes
H21T262 H21T267 H21T263 H21T268 H21T264 H21T269 H21T265 H21T270 H21T266 H21T271	V-2374-1	VHF: 470V057H02 or 470V059H02	RF Amp: 2CY5 Osc-Mix: 5AT8 RF Amp: 2BN4/2BN4A Osc-Mix: 5CG8
H21TU262 H21TU266 H21TU263 H21TU267 H21TU264 H21TU268 H21TU265 H21TU269	V-2374-2	VHF: 470V060H02 UHF: 472V024H01 472V024H03 472V034H01	RF Amp: 2BN4/2BN4A Osc-Mix: 5CG8 Osc: 2AF4A Xtal: 1N82A

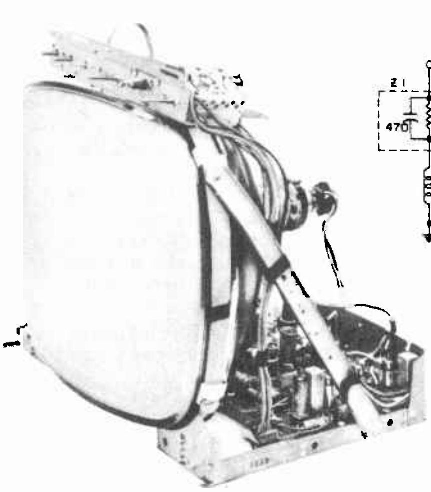
MODEL AND CHASSIS CHART

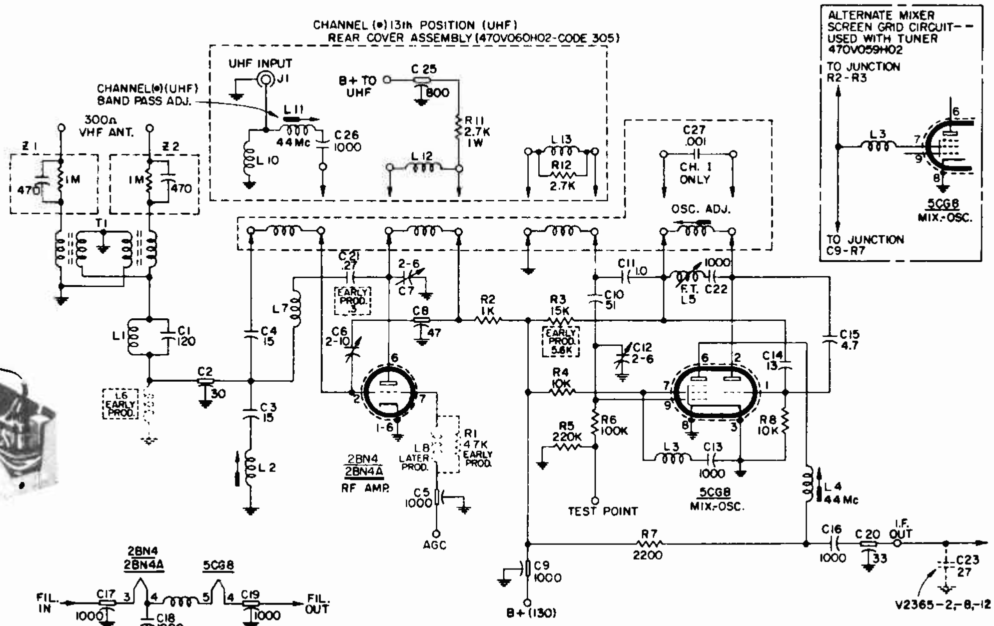
Models	Chassis	Tuners Used	Tuner Tubes
HT-3500 HT-3501 HT-3502	V-2377-1	VHF: 470V057H02 or 470V059H02	RF Amp: 2CY5 Osc-Mix: 5AT8 RF Amp: 2BN4A Osc-Mix: 5CG8
HT-3500U HT-3501U HT-3502U	V-2377-2	VHF: 470V060H02 UHF: 472V034H01	RF Amp: 2BN4A Osc-Mix: 5CG8 Osc: 2AF4A Xtal: 1N82A

Chassis V-2377-1 & 2 are identical to chassis V-2374-1 & 2 respectively, except for the items listed below.

Model	Chassis
H-21K270 – mahogany H-21K271 – limed oak	V-2374-1
H-21KU270 – mahogany H-21KU271 – limed oak	V-2374-2

Ref. No.	Part No.	Description
	754V035H01	Receptacle, AC cord, polarized
C420	R2CC61Z5Z681P	680 mmf (added between B- and point (15) on PC board)
R107 R221 SW400	270V069H01	Multiple control: Volume control, 500K ohms; Brightness control, 100K ohms; On-Off switch
R217	270V070H01	Contrast control, 15K ohms
R312 R409	270V069H02	Multiple control: Vertical hold, 2 megohms; Horizontal hold, 60K ohms





Schematic diagram for tuners 470V059H02 & 470V060H02.

WARNING -- PROTECTION OF PERSONNEL AND EQUIPMENT

1. *Always use an isolation transformer between the power source and the receiver line input when servicing.*
2. *Discharge the high voltage lead to B- before working near high voltage.*
3. *When handling the cathode ray tube (CRT):*
   a) Completely discharge the CRT capacitance by means of a jumper between the high voltage cavity and B-.
   b) Use protective shatterproof goggles and heavy gloves.
4. *After receiver repair, check resistance between the B- side of the receiver line input and the chassis cold rail (line cord disconnected). A resistance of less than 300,000 ohms indicates a short circuit (or leakage) to metal parts which are accessible. Remove the cause of leakage before the set is released.*

WESTINGHOUSE

Chassis V-2374-1, V-2374-2, V-2377-1, V-2377-2

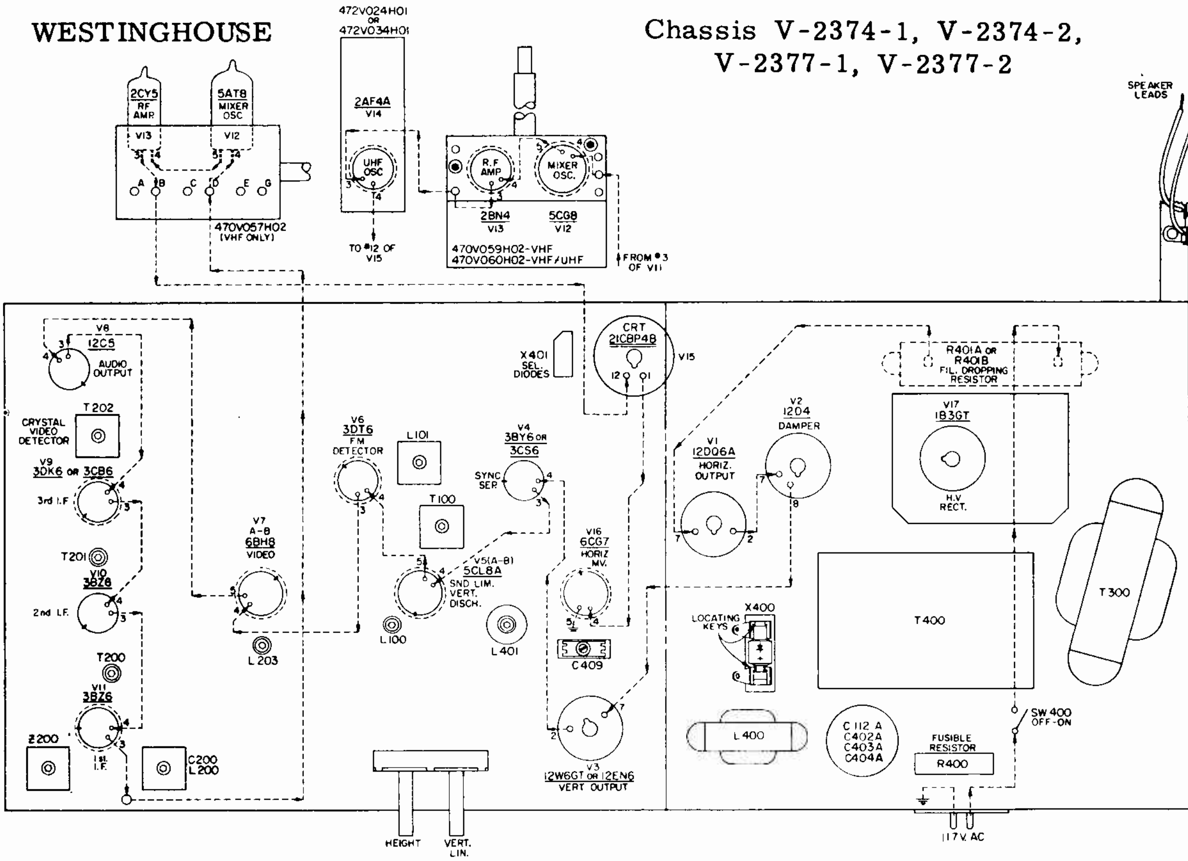


Figure 2. Top view of chassis showing tube locations, heater string, and adjustments.

SOUND ALIGNMENT

EQUIPMENT: VTVM

PROCEDURE:

1. Select the strongest station available (preferably with test pattern and test tone) and adjust the FINE TUNING for best reception. Adjust the VOLUME control so that the station sound is audible.
2. Adjust the quad coil (L101) for maximum sound from the speaker.
3. Use a jumper wire to short the control grid of the 3rd IF amplifier to B–.
4. Connect the VTVM to TP (S).
5. Adjust interstage transformer T100 for maximum negative voltage on the VTVM.
6. Remove the jumper wire used to short the control grid of the 3rd IF amplifier.
7. Disconnect the antenna input and place it close to the antenna terminals so that the signal is loosely coupled to the receiver and the picture is barely visible. A pronounced noisiness (hiss) should accompany the sound.
8. Adjust 4.5 MC trap L203 for maximum negative voltage on VTVM.
9. Adjust the limiter input coil (L100) for maximum negative voltage on the VTVM. If the VTVM indicates a broad response while making this adjustment, the receiver input signal is too strong. When the signal coupling described in step 7 is at the necessary low point, no limiting takes place and the VTVM will indicate a sharp response to the limiter input coil adjustment.

IF ALIGNMENT

EQUIPMENT

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

TERMINATION AND ADJUSTMENT OF EQUIPMENT

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

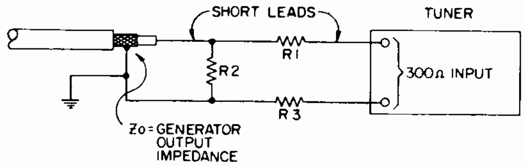
All test equipment cables and leads should be as short and direct as possible.

Oscilloscope and VTVM – Use a low-capacitance direct probe terminated with the decoupling network shown in Figure 10. Keep the oscilloscope calibrated for 2 volts peak to peak (P-P). Use a VTVM range suitable for measuring –1.5 volts.

Generators – Except where otherwise noted, all signal generating equipment should be terminated as shown in Figure 9. Connect the signal cable ground near the ground of the stage where the signal is injected.

Adjust the CW generator output so that: (1) When the VTVM is being used its reading remains near the –1 volt point. (2) When the oscilloscope is being used the marker frequencies do not distort the response curve.

WESTINGHOUSE (Continued)
Chassis V-2374-1, V-2374-2, V-2377-1, V-2377-2.



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

Figure 8. Impedance matching network.

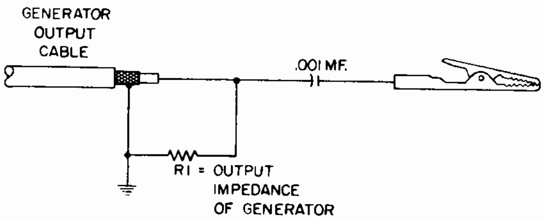


Figure 9. Generator cable termination.

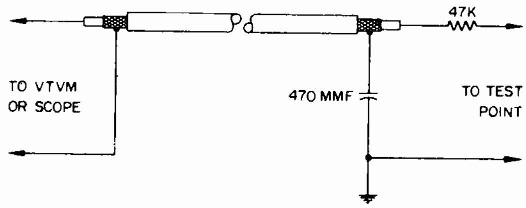
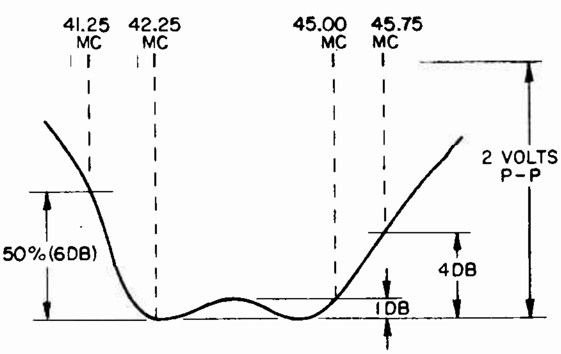


Figure 10. Decoupling network.

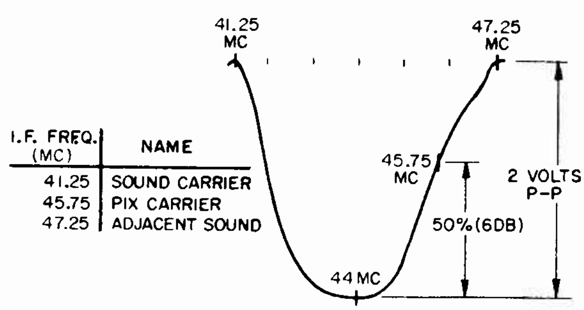
IF ALIGNMENT

	Test Equipment And Connections	*Adjustment*
1.	Connect a −4V bias to TP Ⓐ and a −2.5V bias to TP Ⓣ.	Z200: Detune top and bottom slugs. T202: Detune top slug only.
2.	Connect CW gen. (45.25 MC) to TP Ⓓ. Connect VTVM to TP Ⓑ.	T201: Adj. for max. neg. voltage.
3.	Same equipment and connections as step 2. Adj. gen. to 41.8 MC.	T200: Adj. for max. neg. voltage.
4.	Remove gen. and VTVM connections.	
5.	Connect sweep gen. (43 MC center) to TP Ⓓ. Loosely couple CW gen. (44 MC) to sweep gen. output cable. Connect scope to TP Ⓑ.	T202: Adj. bottom slug for max. peak at 44 MC.
6.	Same equipment and connections as step 5. Adj. CW gen. for 44.75 MC.	T202: Adj. top slug until the high frequency peak falls at 44.75 MC. Retouch bottom slug to obtain a symmetrical double-peaked response, as shown in Figure 11.
7.	Leave scope connected as in step 6. Connect sweep gen. (43 MC center) to "TEST INPUT" on tuner (see tuner picture). Loosely couple CW gen. (41.25 MC) to sweep gen. output cable.	L200: Detune in clockwise direction. L200: Adj. to place trap at 41.25 MC.
8.	Same equipment and connections as step 7. Adj. CW gen. first to 44 MC for adjustments, then to 45.75 MC to check that the Pix Carrier is at the 50% point on the curve.	Mixer Output coil: Adj. for max. amplitude of response curve at 44 MC. Z200: Adj. bottom slug (in conjunction with Mixer Output coil) to obtain a symmetrical response curve which "rocks" about 44 MC. 45.75 MC marker should be at the 50% (6DB) point on the curve. See Figure 12.
9.	Same equipment and connections as step 8. Adj. CW gen. to 47.25 MC.	Z200: Adj. top slug to place trap at 47.25 MC.
10.	Remove CW gen. connections. Leave scope connected as in step 9. Connect sweep gen. to antenna terminals through impedance matching network shown in Figure 8.	Ch. Selector: Check the overall response of each channel. These curves should be similar to Figure 12. If the alignment procedure has been followed closely, any major variations from the idealized response can be attributed to the RF portion of the tuner.



TYPICAL RESPONSE CURVE
Ist. I.F. AMP. GRID TO VIDEO DETECTOR

Figure 11. Video IF response curve.



TYPICAL RESPONSE CURVE
MIXER GRID TO VIDEO DETECTOR

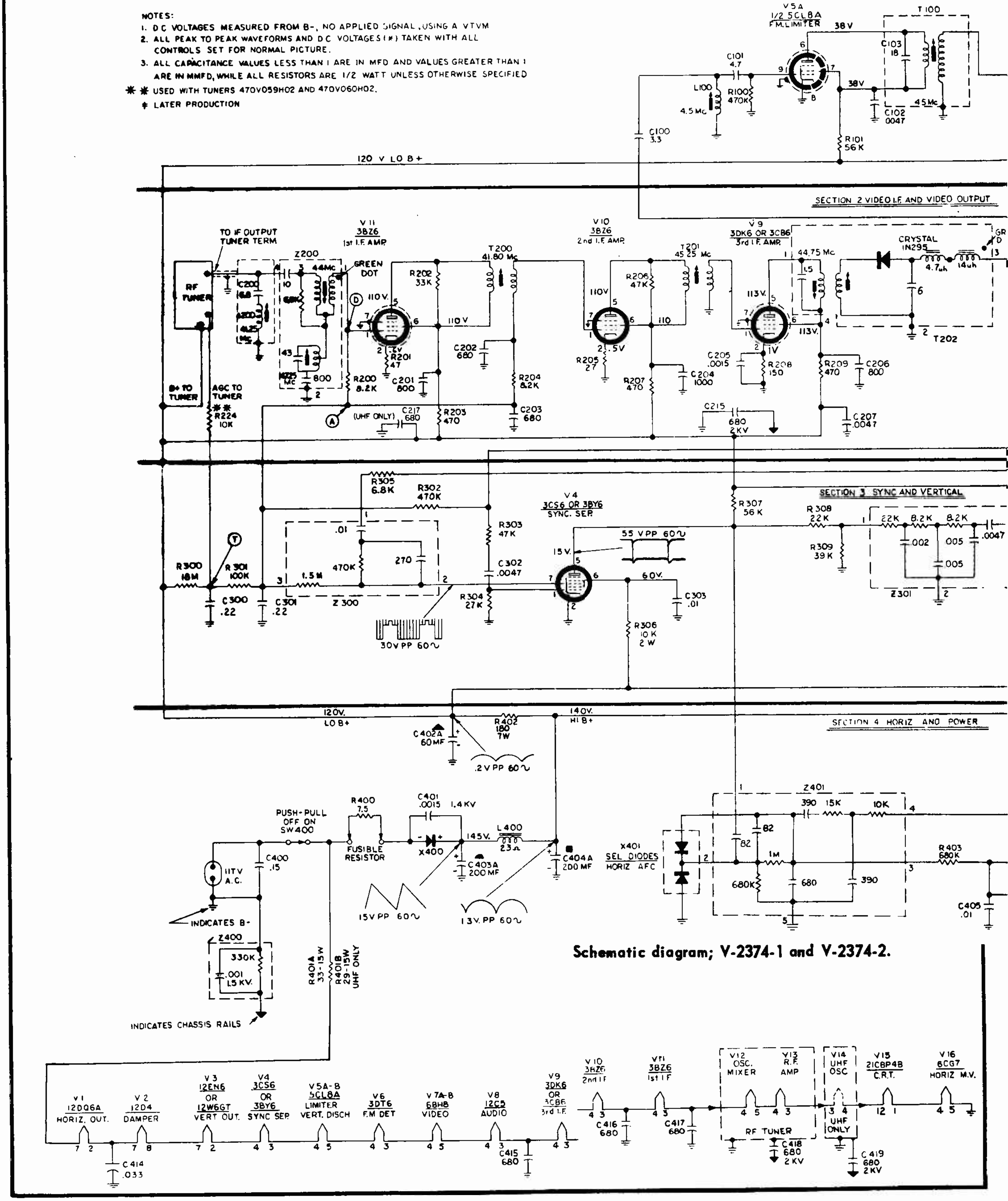
Figure 12. Overall response curve.

WESTINGHOUSE Schematic Diagram Chassis V-2374-1, -2

NOTES:
1. D C VOLTAGES MEASURED FROM B-, NO APPLIED SIGNAL, USING A VTVM
2. ALL PEAK TO PEAK WAVEFORMS AND D C VOLTAGES (*) TAKEN WITH ALL CONTROLS SET FOR NORMAL PICTURE.
3. ALL CAPACITANCE VALUES LESS THAN 1 ARE IN MFD AND VALUES GREATER THAN 1 ARE IN MMFD, WHILE ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED

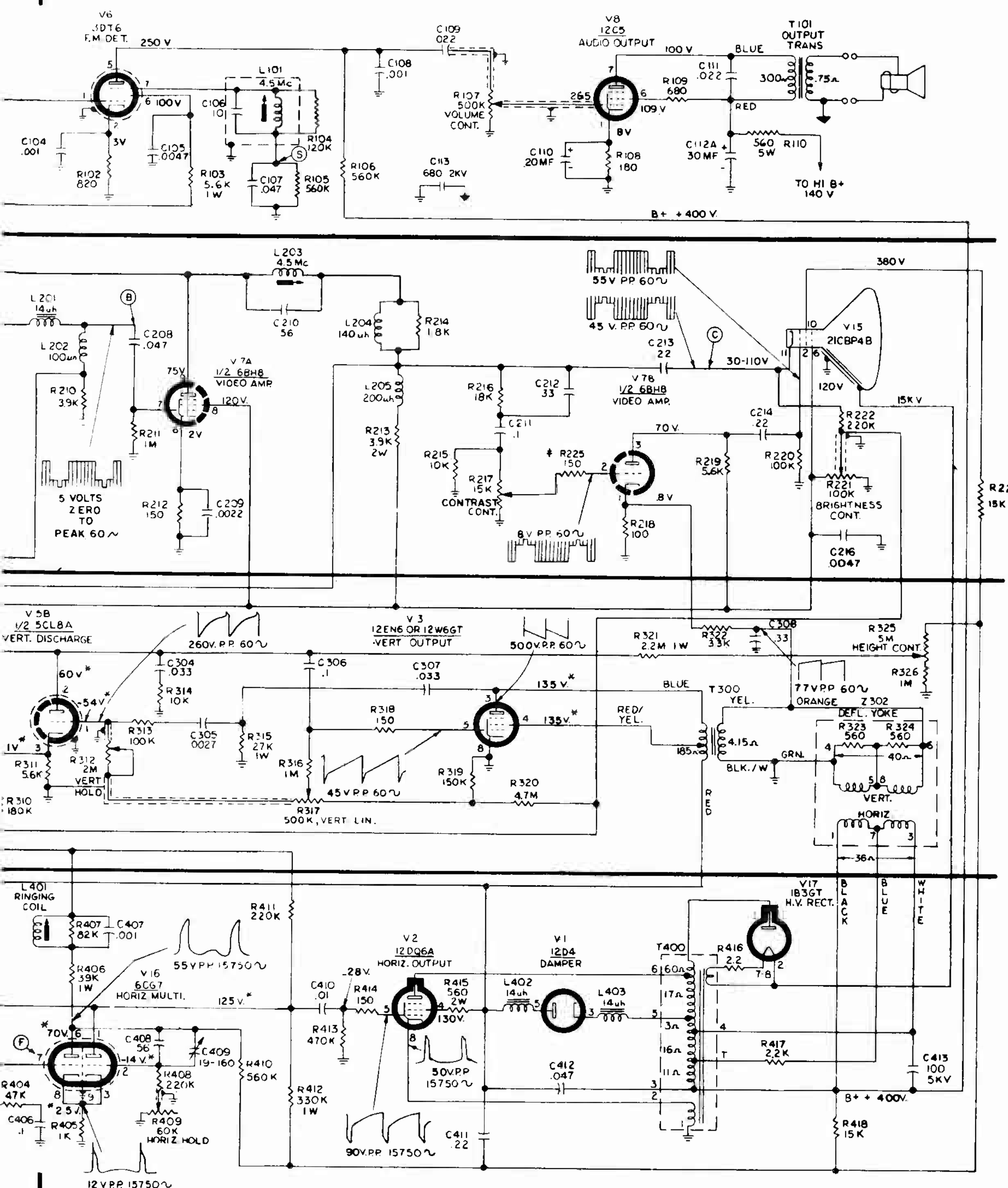
✱✱ USED WITH TUNERS 470V059H02 AND 470V060H02.

♦ LATER PRODUCTION



Schematic diagram; V-2374-1 and V-2374-2.

WESTINGHOUSE Schematic Diagram Chassis V-2374-1, V-2374-2



CENTERING

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

HEIGHT AND VERTICAL LINEARITY

The HEIGHT and VERT. LIN. controls, located at the rear of the receiver, should be adjusted alternately to obtain a picture of proper height which has good vertical linearity throughout.

DEFLECTION YOKE

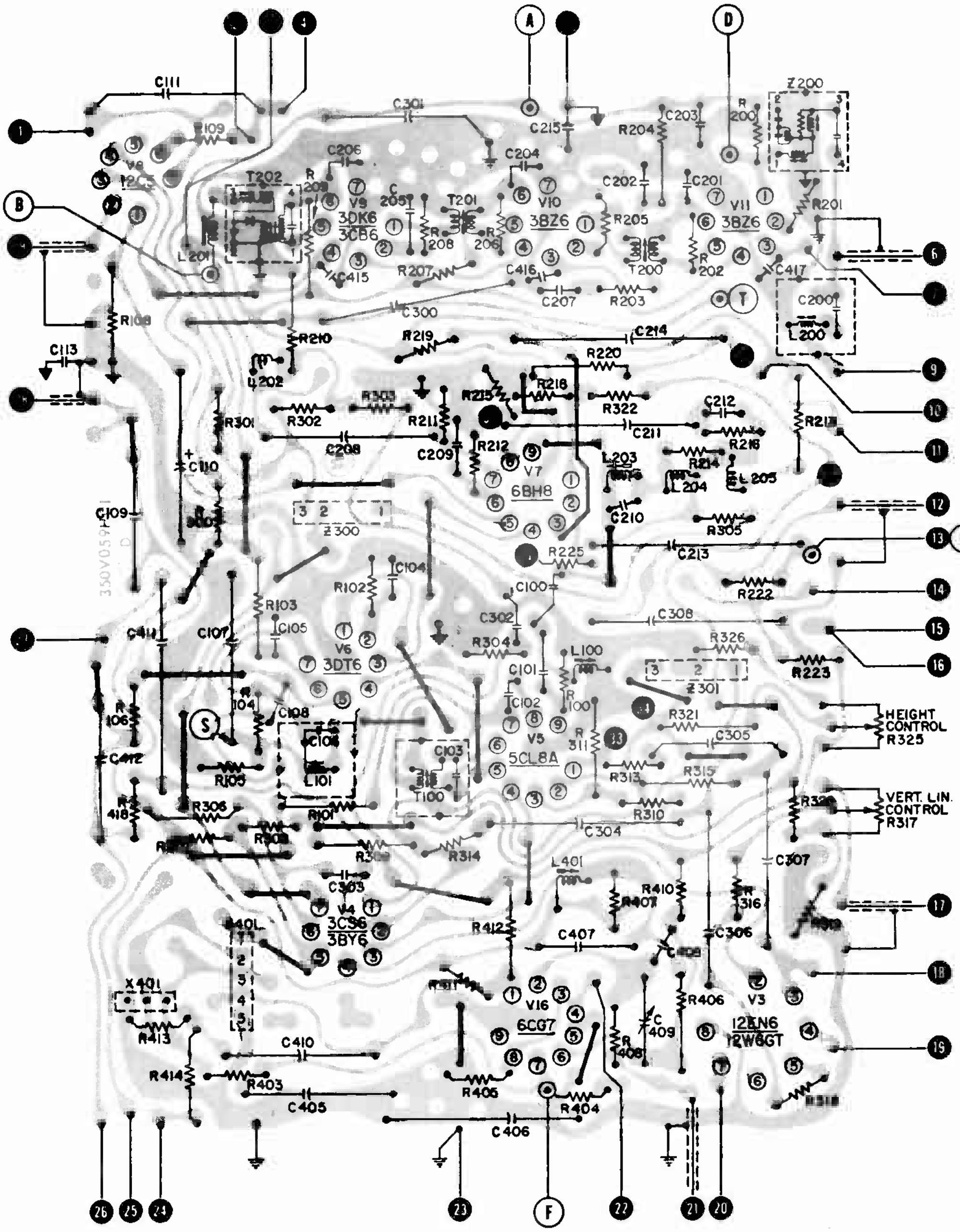
The deflection yoke should be as far forward as possible (touching the bell of the CRT). Rotation of the deflection yoke is used to level the raster.

HORIZONTAL RINGING COIL

The ringing coil (L401) should be adjusted as follows:

1. Short out the ringing coil with a jumper wire.
2. Set the horizontal hold control to the center of its range. Do not change this setting during the steps that follow.
3. Connect a VTVM to TP F for measuring the DC voltage between TP F and B–.
4. With the receiver tuned to a station of normal signal strength, adjust C409 for 0 volts DC on the meter.
5. Remove the jumper from the ringing coil.
6. Adjust the ringing coil for 0 volts DC on the meter. Check the adjustment by switching to another channel and back again. The receiver should pull into horizontal sync on all channels.

WESTINGHOUSE Chassis V-2374-1, V-2374-2, Service Material, Continued



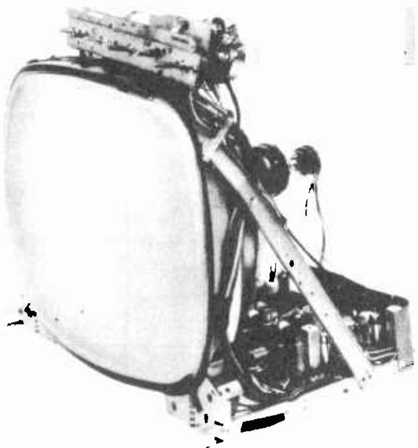
Bottom view of PC board showing top components as schematic symbols.

The leads identified by number in the above figure connect to the following points:

1. T101 primary
2. Junction C112A and R110
3. Tuner B+ point
4. T101 primary
5. Chassis rail
6. Tuner IF output point
7. Tuner "Heater In" point
8. Pin 2 of CRT
9. Low side of BRIGHTNESS control
10. Lo B+, 120V
11. Pin 6 of CRT
12. Arm of BRIGHTNESS control
13. Pin 11 of CRT
14. Pin 10 of CRT
15. Pin 12 of CRT
16. Tuner "Heater Out" point
17. Low side of VERTICAL hold control
18. T300 primary
19. T300 primary
20. Pin 7 of V3
21. Arm of HORIZONTAL hold control
22. Pin 1 of CRT
23. B–
24. Pin 5 of V2
25. Lo B+, 120V
26. Lug 3 of T400
27. Hi B+, 140V
28. High side of VOLUME control
29. Arm of VOLUME control
30. High side of CONTRAST control
31. Arm of CONTRAST control
32. T300 secondary
33. High side of VERTICAL hold control
34. B–

TEST POINTS:

- (A) AGC for IF
- (B) Video detector
- (C) CRT cathode
- (D) 1st IF input
- (F) Horiz. MV
- (S) FM detector
- (T) AGC for tuner



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V-2375-1: VHF ONLY
V-2375-2: VHF/UHF

MODEL AND CHASSIS CHART

Models	*Chassis*	*Tuners Used*	*Tuner Tubes*
H21K272 H21K273 H21K274 H21K275 H21K276	V-2375-1	VHF: 470V057H02 or 470V059H02	RF Amp: 3CY5 Osc-Mix: 5AT8 RF Amp: 2BN4/2BN4A Osc-Mix: 5CG8
H21KU272 H21KU273 H21KU274 H21KU275 H21KU276	V-2375-2	VHF: 470V060H02 UHF: 472V034H01	RF Amp: 2BN4/2BN4A Osc-Mix: 5CG8 Osc: 2AF4A Xtal: 1N82A

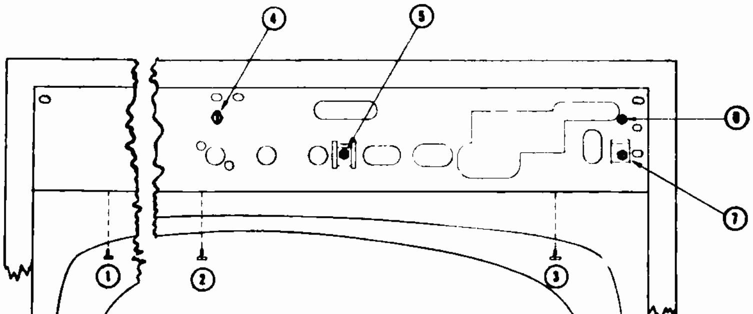


Figure 1. Location of screws.

CHASSIS REMOVAL

1. Remove control knobs, external antenna leads, back cover, antenna bracket, and speaker leads.
2. Remove front escutcheon. It is held by screws 1, 2, and 3 (Figure 1). Remove thumbwheel knobs.
3. Remove screws 4, 5, 6, and 7 (Figure 1) which hold the control panel to the front plate.
4. Remove the bolts, on the bottom of the cabinet, which hold the chassis.
5. On UHF models: Remove screw holding UHF tuner-support rod to cabinet. Remove screw holding UHF tuner-support strap to cabinet.

CRT REMOVAL

1. Remove chassis from cabinet.
2. Remove CRT socket, deflection yoke, and HV anode lead.
3. Loosen the CRT-strap bolt at the top of the CRT and remove the CRT. *Observe CRT handling precautions*

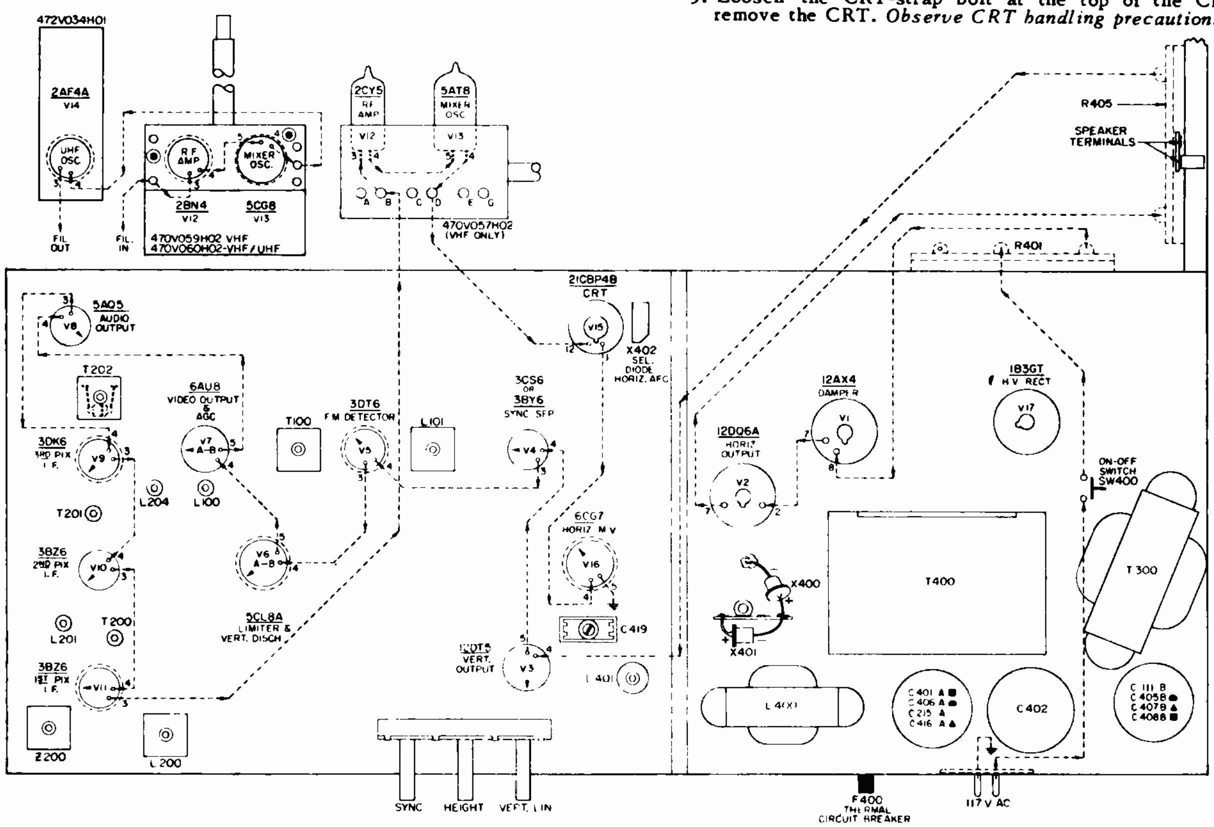


Figure 2. Top view of chassis showing tube locations, heater string, and adjustments.

WESTINGHOUSE Chassis V-2375-1, V-2375-2, Service Material, Continued

TUBE COMPLEMENT AND RESISTANCE MEASUREMENTS

	Tube Type	Tube Function	Resistance Measurements								
			Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX4	Damper	-	NC	Inf	-	21	-	40	42	-
V2	12DQ6A	Horiz Out	-	40	NC	17.5K*	470K	-	38	0	-
V3	12DT5	Vert Out	1K*	NC	1.2M* to 1.7M	15	13	1.2M* to 1.7M	220	NC	1.3K*
V4	3CS6/3BY6	Sync Sep	60K*	0	12.5	13.5	170K*	12K*	2.4M	-	-
V5	3DT6	FM Det	3.5	820	11.5	12.5	Inf	54K*	560K	-	-
V6	5CL8A	FM Lim & Vert Disch	670K to 2.6K	Inf	0	11.5	10.5	42K*	18K	0	470K
V7	6AU8	Video Out & Keyed AGC	46K	45K	670K	10.5	8.5	10	500 on (RX100)	22K* to 58K	5.4K*
V8	5AQ5	Audio Out	0 to 500K	330	7.5	8.5	1.6K*	1.1K*	0 to 500K	-	-
V9	3CB6/3DK6	3rd IF Amp	0	150	7	7.5	2.4K*	2.4K*	0	-	-
V10	3BZ6	2nd IF Amp	110K	27	6	7	2.4K*	2.4K*	0	-	-
V11	3BZ6	1st IF Amp	110K	47	4.8	5.6	2.4K*	2.4K*	0	-	-
V12	2CY5	RF Amp	2M	0	3.6	4.8	1.8K*	16K*	0	-	-
V13	5AT8	Osc-Mix	18K	6.8K*	0	3	3.6	5K*	3.4K*	0	100K
V15	21CBP4B	CRT	1.5	150K	-	-	-	1.8K*	PIN 10 Inf	PIN 11 180K to 230K*	PIN 12 3
V16	6CG7	Horiz MV	56K	180K to 240K	1K	1.5	0	48K*	2.2M	1K	0
V17	1B3GT	HV Rect	← INFINITE →								

Resistances from tube pin to B-(except*) in ohms unless otherwise noted. Controls set for normal picture.
*Resistances from tube pin to junction X401 & L400.

ALIGNMENT

SOUND ALIGNMENT

EQUIPMENT: VTVM

PROCEDURE:

1. Select the strongest station available (preferably with test pattern and test tone) and adjust the FINE TUNING for best reception. Adjust the VOLUME control so that the station sound is audible.
2. Adjust the quad coil (L101) for maximum sound from the speaker.
3. Use a jumper wire to short the control grid of the 3rd IF amplifier to B–.
4. Connect the VTVM to TP Ⓢ.
5. Adjust interstage transformer T100 for maximum negative voltage on the VTVM.
6. Remove the jumper wire used to short the control grid of the 3rd IF amplifier.
7. Disconnect the antenna input and place it close to the antenna terminals so that the signal is loosely coupled to the receiver and the picture is barely visible. A pronounced noisiness (hiss) should accompany the sound.
8. Adjust 4.5 MC trap L204 for maximum negative voltage on VTVM.
9. Adjust the limiter input coil (L100) for maximum negative voltage on the VTVM. If the VTVM indicates a broad response while making this adjustment, the receiver input signal is too strong. When the signal coupling described in step 7 is at the necessary low point, no limiting takes place and the VTVM will indicate a sharp response to the limiter input coil adjustment.

IF ALIGNMENT

EQUIPMENT

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

TERMINATION AND ADJUSTMENT OF EQUIPMENT

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

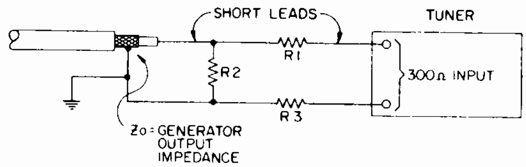
All test equipment cables and leads should be as short and direct as possible.

Oscilloscope and VTVM – Use a low-capacitance direct probe terminated with the decoupling network shown in Figure 11. Keep the oscilloscope calibrated for 2 volts peak to peak (P-P). Use a VTVM range suitable for measuring –1.5 volts.

Generators – Except where otherwise noted, all signal generating equipment should be terminated as shown in Figure 10. Connect the signal cable ground near the ground of the stage where the signal is injected.

Adjust the CW generator output so that: (1) When the VTVM is being used its reading remains near the –1 volt point. (2) When the oscilloscope is being used the marker frequencies do not distort the response curve.

WESTINGHOUSE (Continued)
Chassis V-2375-1, V-2375-2



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

Figure 9. Impedance matching network.

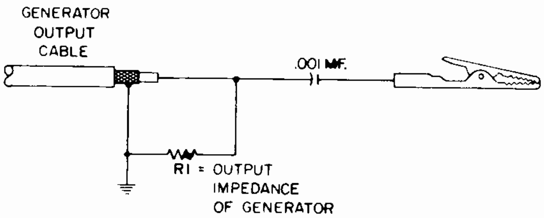


Figure 10. Generator cable termination.

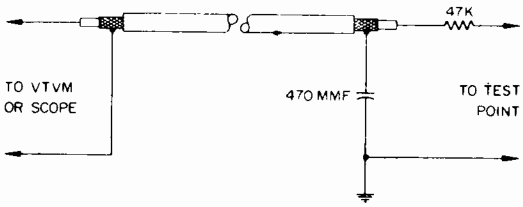
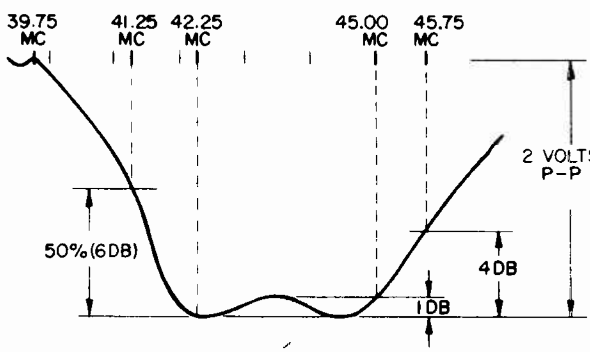


Figure 11. Decoupling network.

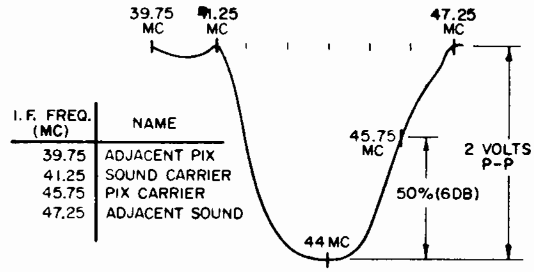
IF ALIGNMENT

	Test Equipment And Connections	*Adjustment*
1.	Connect a −4V bias to TP (A) and a −2.5V bias to TP (T).	Z200: Detune top and bottom slugs. T202: Detune top slug only.
2.	Connect CW gen. (45.25 MC) to TP (D). Connect VTVM to TP (B).	T201: Adj. for max. neg. voltage.
3.	Same equipment and connections as step 2. Adj. gen. to 39.75 MC; then to 41.8 MC.	L201: Adj. for min. neg. voltage at 39.75 MC. T200: Adj. for max. neg. voltage at 41.8 MC.
4.	Remove gen. and VTVM connections.	
5.	Connect sweep gen. (43 MC center) to TP (D). Loosely couple CW gen. (44 MC) to sweep gen. output cable. Connect scope to TP (B).	T202: Adj. bottom slug for max. peak at 44 MC.
6.	Same equipment and connections as step 5. Adj. CW gen. for 44.75 MC.	T202: Adj. top slug until the high frequency peak falls at 44.75 MC. Retouch bottom slug to obtain a symmetrical double-peaked response, as shown in Figure 12.
7.	Leave scope connected as in step 6. Connect sweep gen. (43 MC center) to "TEST INPUT" on tuner (see tuner picture). Loosely couple CW gen. (41.25 MC) to sweep gen. output cable.	L200: Detune in clockwise direction. L200: Adj. to place trap at 41.25 MC.
8.	Same equipment and connections as step 7. Adj. CW gen. first to 44 MC for adjustments, then to 45.75 MC to check that the Pix Carrier is at the 50% point on the curve.	Mixer Output coil: Adj. for max. amplitude of response curve at 44 MC. Z200: Adj. bottom slug (in conjunction with Mixer Output coil) to obtain a symmetrical response curve which "rocks" about 44 MC. 45.75 MC marker should be at the 50% (6DB) point on the curve. See Figure 13.
9.	Same equipment and connections as step 8. Adj. CW gen. to 47.25 MC.	Z200: Adj. top slug to place trap at 47.25 MC.
10.	Remove CW gen. connections. Leave scope connected as in step 9. Connect sweep gen. to antenna terminals through impedance matching network shown in Figure 9.	Ch. Selector: Check the overall response of each channel. These curves should be similar to Figure 13. If the alignment procedure has been followed closely, any major variations from the idealized response can be attributed to the RF portion of the tuner.



TYPICAL RESPONSE CURVE
1st. I.F. AMP. GRID TO VIDEO DETECTOR

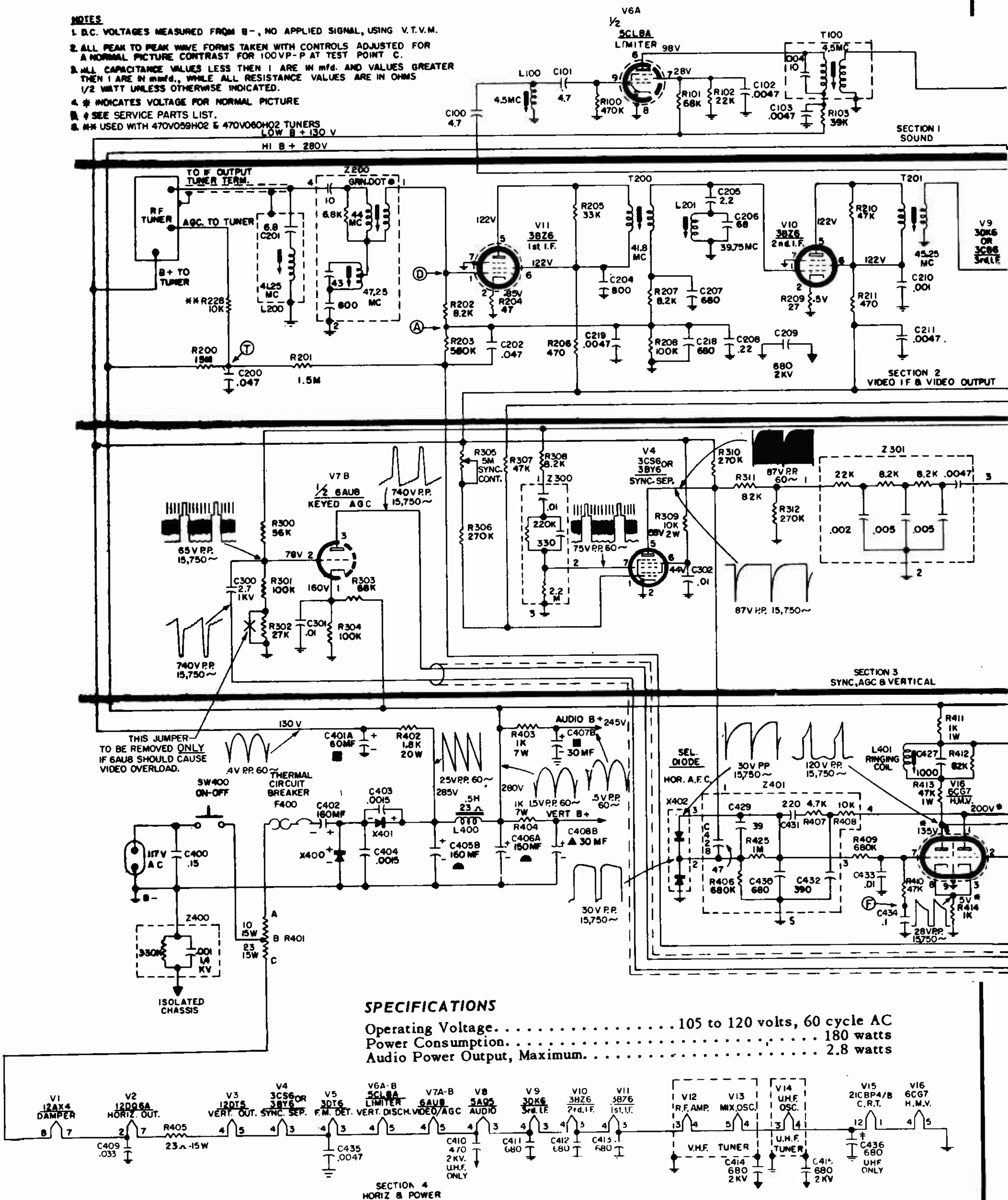
Figure 12. Video IF response curve.



TYPICAL RESPONSE CURVE
MIXER GRID TO VIDEO DETECTOR

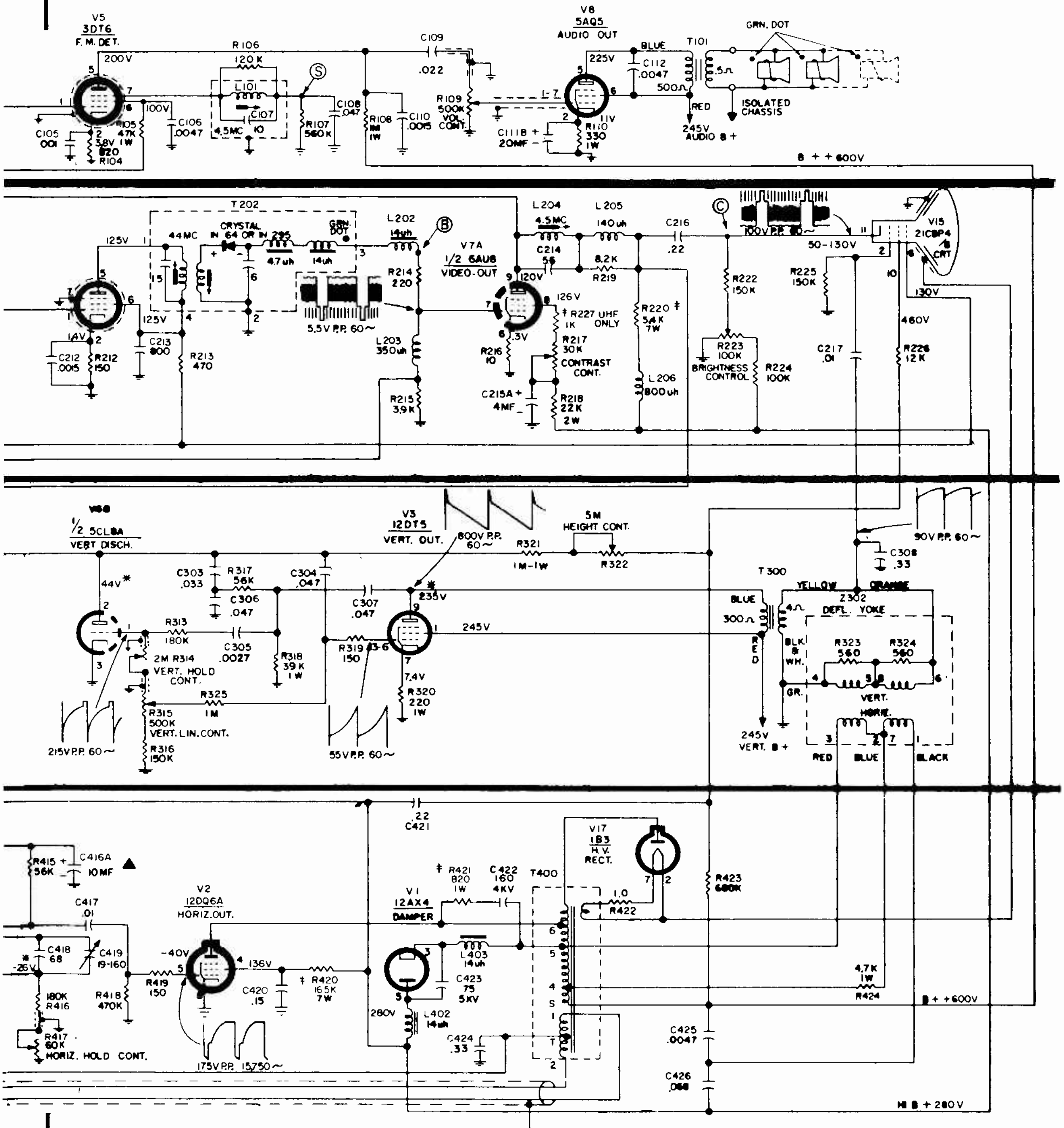
Figure 13. Overall response curve.

WESTINGHOUSE Chassis V-2375-1, V-2375-2, Schematic Diagram



Schematic Diagram; V-2375-1 and V-2375-2.

WESTINGHOUSE Chassis V-2375-1, V-2375-2, Schematic Diagram



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

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

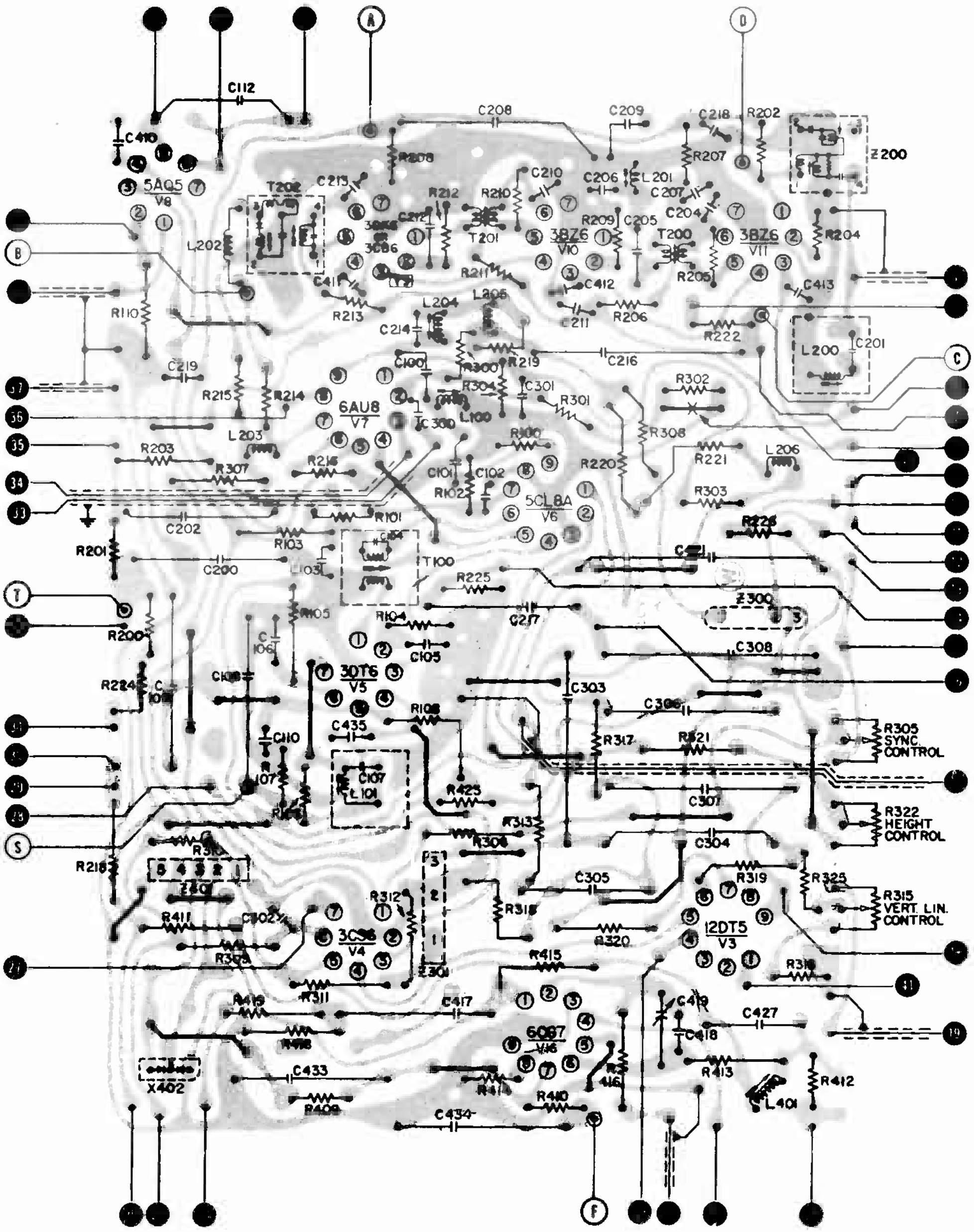
HORIZONTAL RINGING COIL
The ringing coil (L401) should be adjusted as follows:

1. Short out the ringing coil with a jumper wire.
2. Set the horizontal hold control to the center of its range. Do not change this setting during the steps that follow.
3. Connect a VTVM to TP F for measuring the DC voltage between TP F and B–.
4. With the receiver tuned to a station of normal signal strength, adjust C419 for 0 volts DC on the meter.
5. Remove the jumper from the ringing coil.
6. Adjust the ringing coil for 0 volts DC on the meter. Check the adjustment by switching to another channel and back again. The receiver should pull into horizontal sync on all channels.

CIRCUIT BREAKER RESET
The thermal circuit breaker will open the receiver AC input in event of an overload (short) and will remain open until reset. Push the button on the rear of the receiver to reset. Immediate reopening of the circuit breaker (button pops out) indicates a short. DO NOT HOLD THE BUTTON IN. *Component damage or fire may result.*

SYNC
In areas where the received signal is weak or there is noise interference, maximum picture stability will be obtained by adjusting the SYNC control as follows. With the receiver tuned to the weak signal, adjust the HORIZONTAL and VERTICAL hold controls for best stability. Turn the SYNC control toward the position marked NOISY AREA — *just far enough* to obtain maximum sync stability. Check the adjustment by switching to other channels. Picture should remain stable on all channels.

WESTINGHOUSE Chassis V-2375-1, V-2375-2, Service Material, Continued



Bottom view of PC board showing top components as schematic symbols.

The leads identified by letters and numbers in the above figure connect to the following points:

1. T101 primary
2. C407B (Audio B+, 245V)
3. T101 primary
4. Tuner IF output point
5. Arm of BRIGHTNESS control
6. Pin 3 of V11
7. Pin 11 of CRT
8. Tuner B+ point
9. Tuner "Heater Out" point
10. Pin 10 of CRT
11. Pin 12 of CRT
12. Jumper to 27
13. C401A (Lo B+, 130V)
14. Pin 2 of CRT
15. Pin 6 of CRT
16. T300 secondary
17. High side of VERTICAL hold control
18. T300 primary
19. Low side of VERTICAL hold control
20. C416A
21. Pin 1 of CRT
22. Arm of HORIZONTAL hold control
23. R405
24. Pin 5 of V2
25. Junction R402 and C401A
26. C406A (Hi B+, 280V)
27. Jumper to 12
28. C425 (B+ +, 600V)
29. C215A
30. Arm of CONTRAST control
31. High side of BRIGHTNESS control
32. Tuner AGC point
33. Lug 1 of T400
34. Lug 2 of T400
35. Lug "T" of T400
36. High side of CONTRAST control
37. High side of VOLUME control
38. Arm of VOLUME control
39. C111B
40. AGC overload jumper
41. T300 primary

TEST POINTS:

- A AGC for IF
- B Video detector
- C CRT cathode
- D 1st IF input
- F Horiz MV
- S FM detector
- T AGC for tuner

Westinghouse

CHASSIS V-2376-1, V-2376-2

MODEL AND CHASSIS CHART

Models	Chassis	Tuners Used	Tuner Tubes
H21T300 H21K308 H21T301 H21K309 H21T302 H21K310 H21K305 H21K311 H21K306 H21K312 H21K313	V-2376-1	VHF: 470V019H03,H04,H05	RF Amp: 2BN4 Osc-Mix: 5CG8 Crystal: 1N87G
		or 470V043H03	RF Amp: 2CY5 Osc-Mix: 5AT8 Crystal: 1N64G
H21TU302 H21KU305 H21KU306 H21KU308 H21KU309 H21KU310	V-2376-2	VHF: 470V021H03, H05	RF Amp: 2CY5 Osc-Mix: 5AT8 Crystal: 1N64G
		UHF: 472V024H01, H03	Osc: 2AF4A Crystal: 1N82A

(Material on pages 173 through 178)

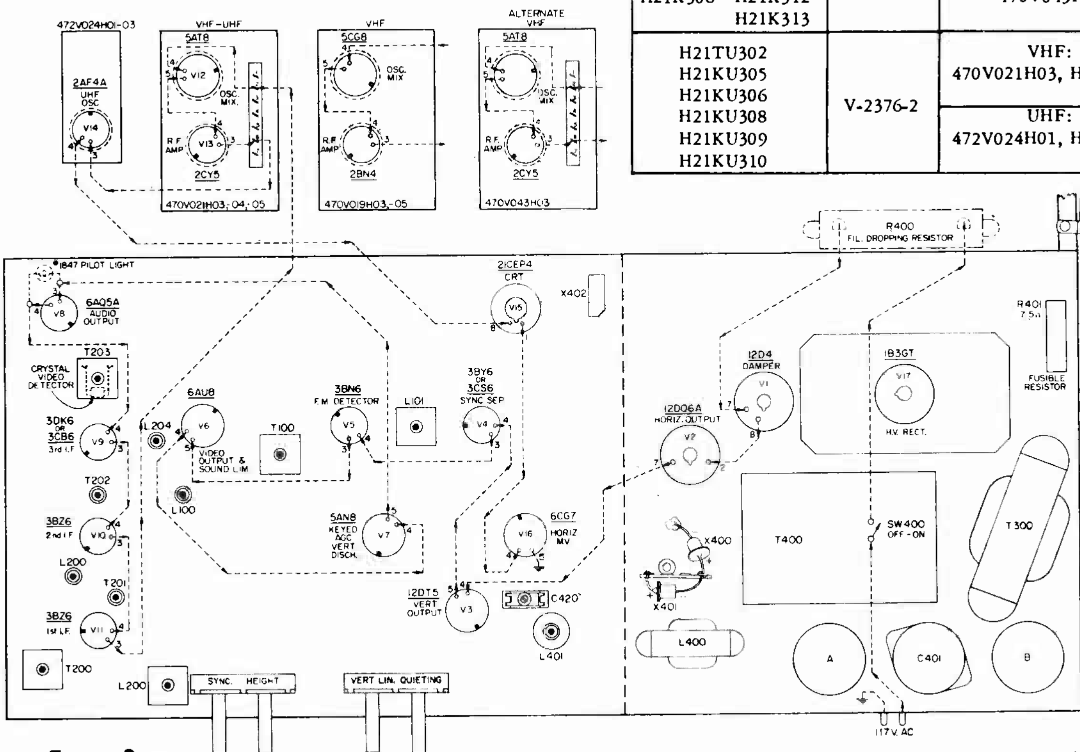
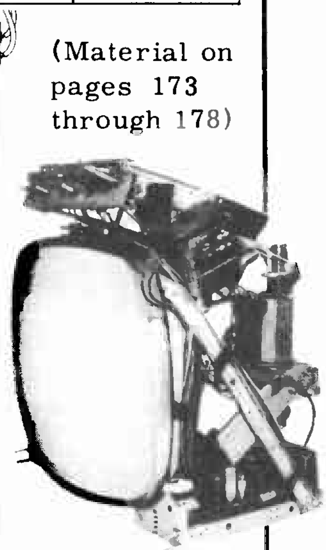


Figure 2 – Top view of chassis showing tube locations, heater string and adjustments.



TUBE COMPLEMENT AND RESISTANCE MEASUREMENTS

	Tube Type	Tube Function	Resistance Measurements								
			Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12D4	Damper	–	NC	4M*	–	23*	–	17	20	–
V2	12DQ6A	Horiz Out	–	20	20*	14K*	500K	–	22	0	Cap 3.8M*
V3	12DT5	Vert Out	29K	NC	1.4M	17	14	1.3M	47	NC	600*
V4	3CS6/3BY6	Sync Sep	58K	0	13	14	34K*	13K*	2.2M	–	–
V5	3BN6	FM Det	0-600	0	12	13	20K*	6.5	4.8M*	–	–
V6	6AU8	Video Out & FM Lim	0	100K	38K*	11	12	10	600 on (Rx100)	13.5K*	6K*
V7	5AN8	Vert Disch & Keyed AGC	4.5M*	1.5M	0	11	9.5	720K	20*	25K*	10K*
V8	6AQ5A	Audio Out	0-500K	330	9	7.5	1.5K*	900*	0-500K	–	–
V9	3DK6/3CB6	3rd IF Amp	0	150	6.7	7.5	2K*	2K*	0	–	–
V10	3BZ6	2nd IF Amp	125K	27	6	6.8	2K*	2K*	0	–	–
V11	3BZ6	1st IF Amp	125K	47	5	6	2K*	2K*	0	–	–
V12	5AT8	Osc-Mix	10K	4K*	0	5	4	2.5K*	2K*	0	110K
V13	2CY5	RF Amp	2M	0	3.5	4	3K*	20K*	0	–	–
V14	2AF4A	UHF Osc	NC	6K	3	4	0	6K	NC	–	–
V15	21CEP4	CRT	1.4	150K	4.4M*	1.6K*	–	NC	200K*	3	–
V16	6CG7	Horiz MV	68K*	180K to 240K	1K	1.4	0	50K*	2.6M	1K	0
V17	1B3GT	HV Rect	NC	INF	NC	–	NC	–	INF	INF	Cap 3.8M*

Resistances from tube pin to B- (except *) in ohms unless otherwise noted. Controls set for normal picture.
*Resistances from tube pin to junction of L400 & C405A.

WESTINGHOUSE Chassis V-2376-1, V-2376-2, Alignment Information (Continued)

ALIGNMENT

SOUND ALIGNMENT

ALIGNMENT WITH SIGNAL GENERATORS

Equipment: *FM generator* having output frequency of 4.5 MC with approximately ±7.5 KC deviation.
AM generator having output frequency of 4.5 MC modulated approximately 30%.
Indicator (VTVM or oscilloscope) with high impedance input.

Procedure:

1. Connect VTVM or scope across VOLUME control. Set QUIETING control to mid-range.
2. Apply strong 4.5 MC FM signal to TP (B). Adjust quad coil L101 for maximum output.
3. Using lowest signal level that will produce an indication, adjust L100 and T100 for maximum output.
4. Repeat steps 2 and 3.
5. Apply strong 4.5 MC AM signal to TP (B). Adjust QUIETING control for minimum AM output.

ALIGNMENT WITH AIR SIGNAL

Procedure:

1. Tune receiver to strongest of available channels. Set QUIETING control to mid-range. Adjust quad coil L101 for peak volume. If two peaks are noted, use the one with the slug further counterclockwise. If two peaks occur within a narrow range of adjustment, the QUIETING control is not set correctly — or the received signal is too weak.
2. Reduce the signal strength at the antenna (use attenuator or loose coupling) allowing noise to be heard. Adjust L100 and T100 for peak sound. If two peaks are noted, use the one with the slug further counterclockwise.

IF ALIGNMENT

EQUIPMENT

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

TERMINATION AND ADJUSTMENT OF EQUIPMENT

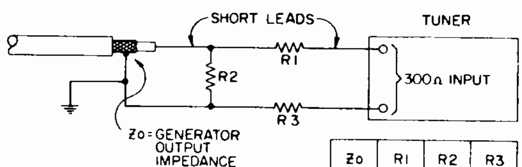
These instructions on termination and adjustment of equipment will apply throughout the IF Alignment procedure.

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

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

Generators — Except where otherwise noted, all signal generating equipment should be terminated as shown in Figure 12. Connect the signal cable ground near the ground of the stage where the signal is injected.

Adjust the CW generator output so that: (1) When the VTVM is being used its reading remains near the -1 volt point (except in step 2). (2) When the oscilloscope is being used the marker frequencies do not distort the response curve.



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

Figure 11 — Impedance matching network.

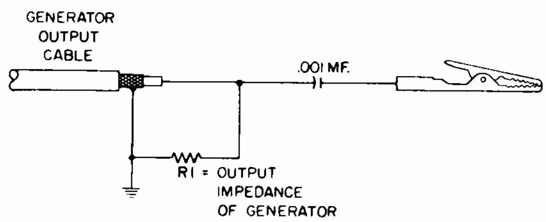


Figure 12 — Generator cable termination.

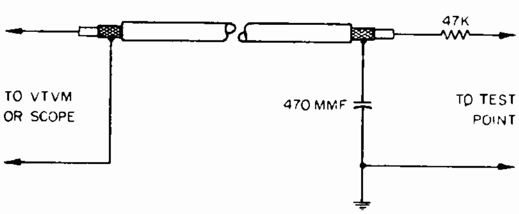


Figure 13 — Decoupling network.

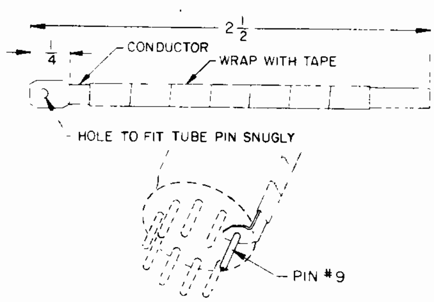
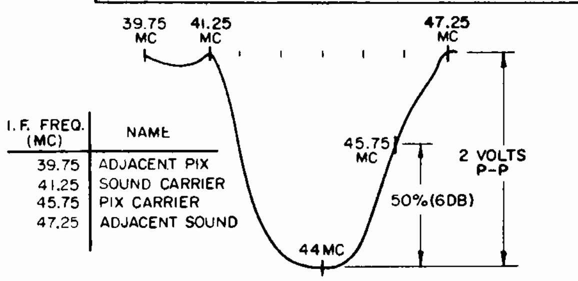


Figure 14 — Mixer coupling gimmick.

WESTINGHOUSE Chassis V-2376-1, V-2376-2, Alignment Information, Continued

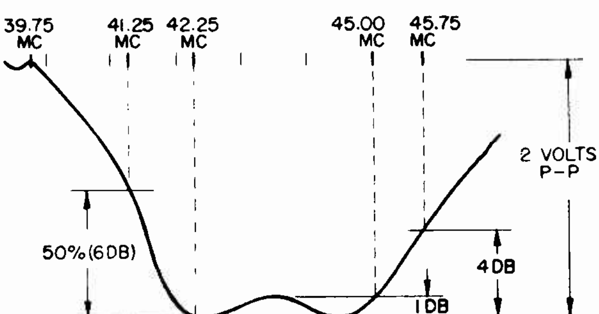
IF ALIGNMENT

	Test Equipment and Connections	*Adjustment*
1.	Connect a -4V bias to TP (A) and a -2.5V bias to TP (T).	T200: Detune top and bottom slugs. T203: Detune top slug only.
2.	Connect CW gen. (4.5 MC - strong signal) to TP (B). Connect VTVM to TP (C).	L204: Adj. for min. AC voltage (null).
3.	Connect CW gen. (45.25 MC) to TP (D). Connect VTVM to TP (B).	T202: Adj.for max. neg. voltage
4.	Same equipment and connections as step 3. Adj. gen. to 39.75 MC; then to 41 8 MC.	L201: Adj. for min. neg. voltage at 39.75 MC. T201: Adj. for max. neg. voltage at 41.8 MC.
5.	Remove gen. and VTVM connections.	
6.	Connect sweep gen. (43 MC center) to TP (D), Loosely couple CW gen. (44 MC) to sweep gen. output cable. Connect scope to TP (B).	T203: Adj. bottom slug for max. peak at 44 MC.
7.	Same equipment and connections as step 6. Adj. CW gen. for 44.75 MC.	T203: Adj. top slug until the high frequency peak falls at 44.75 MC. Retouch bottom slug to obtain a symmetrical double-peaked response, as shown in Figure 15. Slight retouching of T201 and T202 may be necessary in order to obtain best double-peaked response.
8.	Leave scope connected as in step 7. Connect sweep gen. (43 MC center) to mixer control grid (pin 9) of V12. Use coupling gimmick shown in Figure 14. Set Ch. selector on channel 10. Loosely couple CW gen. (41.25 MC) to sweep gen. output cable.	L200: Detune in clockwise direction. L200: Adj. to place trap at 41.25 MC.
9.	Same equipment and connections as step 8. Adj. CW gen. first to 44 MC for adjustments, then to 45.75 MC to check that the Pix Carrier is at the 50% point on the curve.	Fine Tuning control: Set to mid-range. Mixer Output coil: Adj. for max. amplitude of response curve at 44 MC. T200: Adj. bottom slug (in conjunction with Mixer Output coil) to obtain a symmetrical response curve which "rocks" about 44 MC. 45.75 MC marker should be at the 50% (6DB) point on the curve. See Figure 16. Slight retouching of the Mixer Output coil and T200 may be necessary in order to obtain best response curve.
10.	Same equipment and connections as step 9. Adj. CW gen. to 47.25 MC.	T200: Adj. top slug to place trap at 47.25 MC.
11.	Remove CW gen. connections. Remove coupling gimmick from V12 and connect sweep gen. to antenna terminals through impedance matching network shown in Figure 11. Leave scope connected as in step 10.	Ch. Selector: Check the overall response of each channel. These curves should be similar to Figure 16. If the alignment procedure has been followed closely, any major variations from the idealized response can be attributed to the RF portion of the tuner.



TYPICAL RESPONSE CURVE
MIXER GRID TO VIDEO DETECTOR

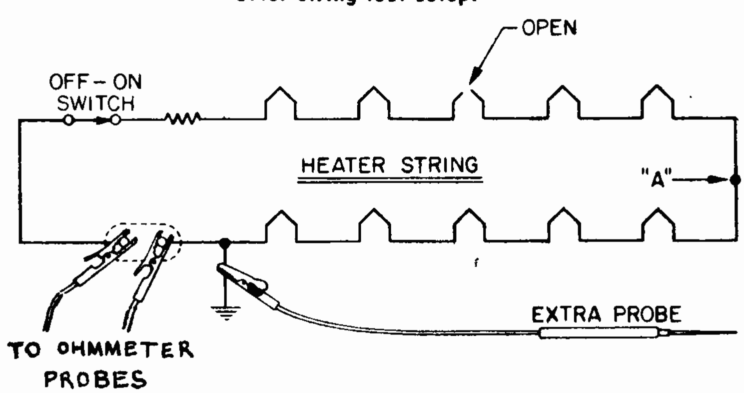
Figure 15 – Video IF response curve.



TYPICAL RESPONSE CURVE
1st. I.F. AMP. GRID TO VIDEO DETECTOR

Figure 16 – Overall response curve.

Heater string test setup.



TESTING SERIES HEATERS

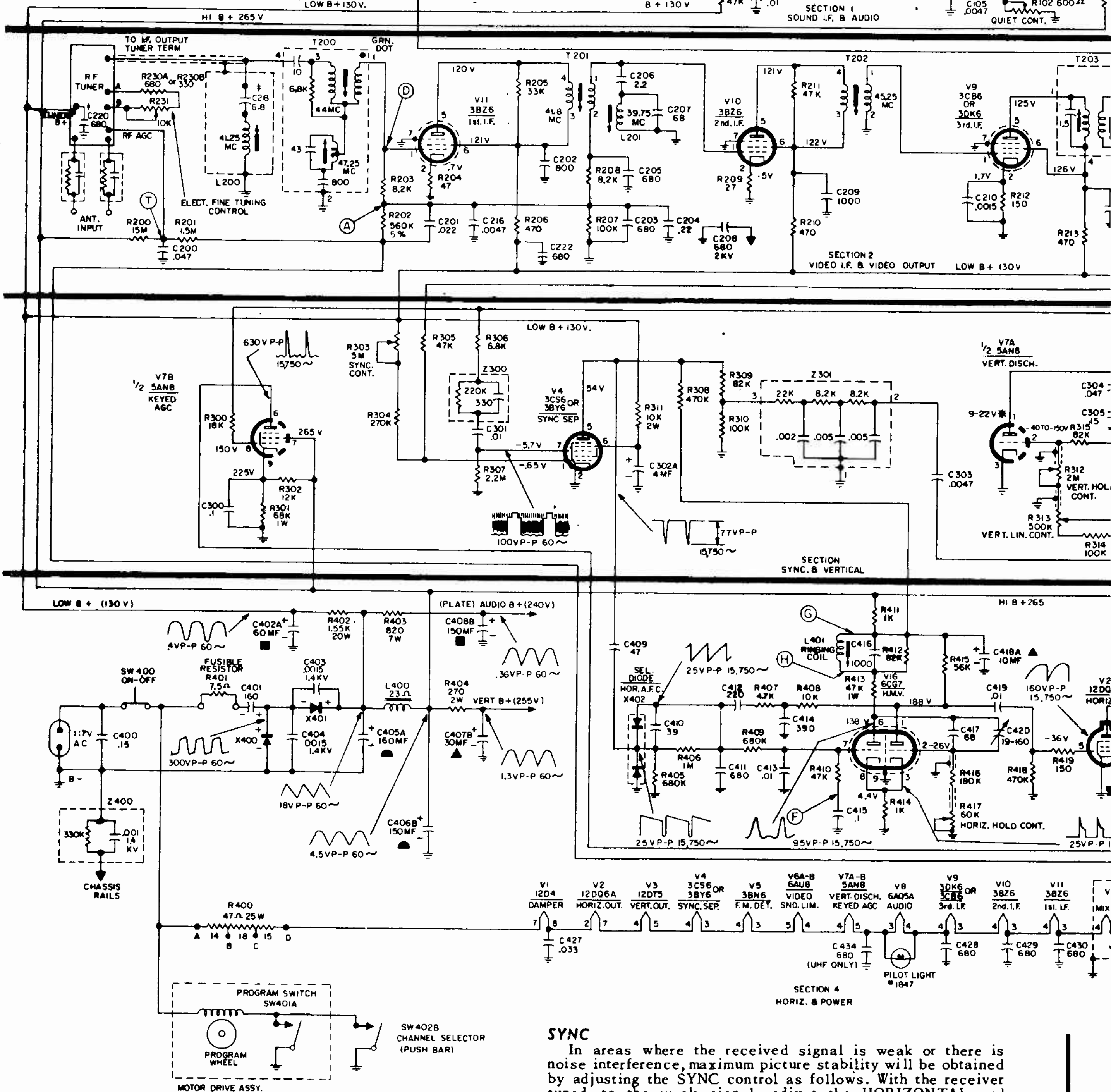
Use the extra probe to ground a point in the center of the heater string (A). No reading on the meter (infinity) indicates an open between point A and the high end of the string. If the meter shows contunity, the open is between point A and ground. Continue to split the defective half of the string and repeat the procedure. An open heater will be quickly located.

REMOVAL OF AUDIO TUBE V8 (6AQ5A)

The pilot lamp (upper-right corner of chassis, Figure 2) is in parallel with the filament of V8. Both the lamp and the tube should be in place before the receiver is turned on. *NOTE:* Removal of V8 while the receiver is on will force excessive current thru the pilot lamp, causing it to burn out.

WESTINGHOUSE Chassis V-2376-1, V-2376-2, Schematic Diagram

NOTES
1. D.C. VOLTAGES MEASURED FROM B−, NO APPLIED SIGNAL, USING V.T.V.M.
2. ALL PEAK TO PEAK WAVE FORMS TAKEN WITH CONTROLS ADJUSTED FOR A NORMAL PICTURE CONTRAST FOR 125VP-P AT TEST POINT C.
3. ALL CAPACITANCE VALUES LESS THAN 1 ARE IN mfd AND VALUES GREATER THAN 1 ARE IN mmfd, WHILE ALL RESISTANCE VALUES ARE IN OHMS 1/2 WATTS UNLESS OTHERWISE INDICATED.
4. # INDICATES VOLTAGE FOR NORMAL PICTURE.
5. ♦ SEE SERVICE PARTS LIST.
6. ALL SWITCHES SHOWN FOR NORMAL "ON CHANNEL" OPERATION.

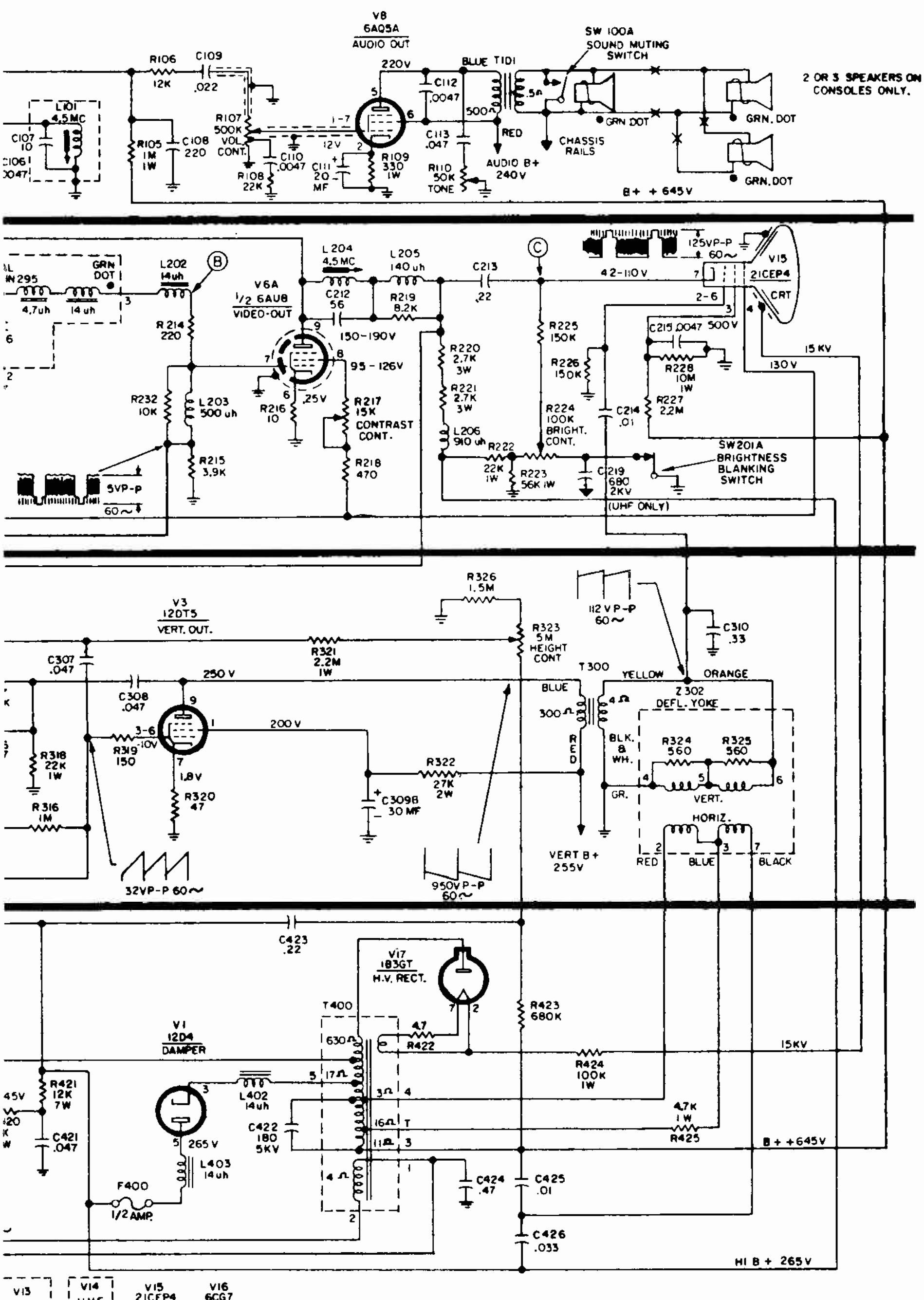


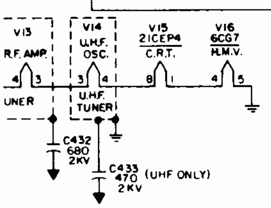
SYNC

In areas where the received signal is weak or there is noise interference, maximum picture stability will be obtained by adjusting the SYNC control as follows. With the receiver tuned to the weak signal, adjust the HORIZONTAL and VERTICAL hold controls for best stability. Turn the SYNC control toward the position marked NOISY AREA — *just far enough* to obtain maximum sync stability. Check the adjustment by switching to other channels. Picture should remain stable on all channels.

Schematic diagram; V-2376-1 and V-2376-2

WESTINGHOUSE Chassis V-2376-1, V-2376-2, Schematic Diagram





KEY TO FIGURE ON PAGE 178

Leads identified by letters and numbers connect to the following:

1. T101 primary
2. C408B (Audio B+, 240V)
3. T101 primary
4. Pin 4 of CRT
5. Arm of BRIGHTNESS control
6. Tuner heater "in"
7. Tuner IF output point
8. Pin 7 of CRT
9. Pin 3 of CRT
10. Pin 2 of CRT
11. Tuner B+ point
12. T300 secondary
13. Arm of VERTICAL hold control
14. High side of VERTICAL hold control
15. Pin 7 of V2
16. Pin 1 of CRT
17. T300 primary
18. C309B
19. C418A
20. High side of HORIZONTAL hold control
21. T101 secondary
22. Two-lug speaker terminal strip
23. SW100A
24. Pin 5 of V2
25. C302A
26. R402
27. F400
28. C425
29. High side of BRIGHTNESS control
30. High side of VOLUME control
31. Tuner AGC point
32. C424
33. High side of CONTRAST control
34. Low side of CONTRAST control
35. Pilot light (twisted pair)
36. C111
37. Arm of VOLUME control
38. High side of TONE control

HORIZONTAL RINGING COIL

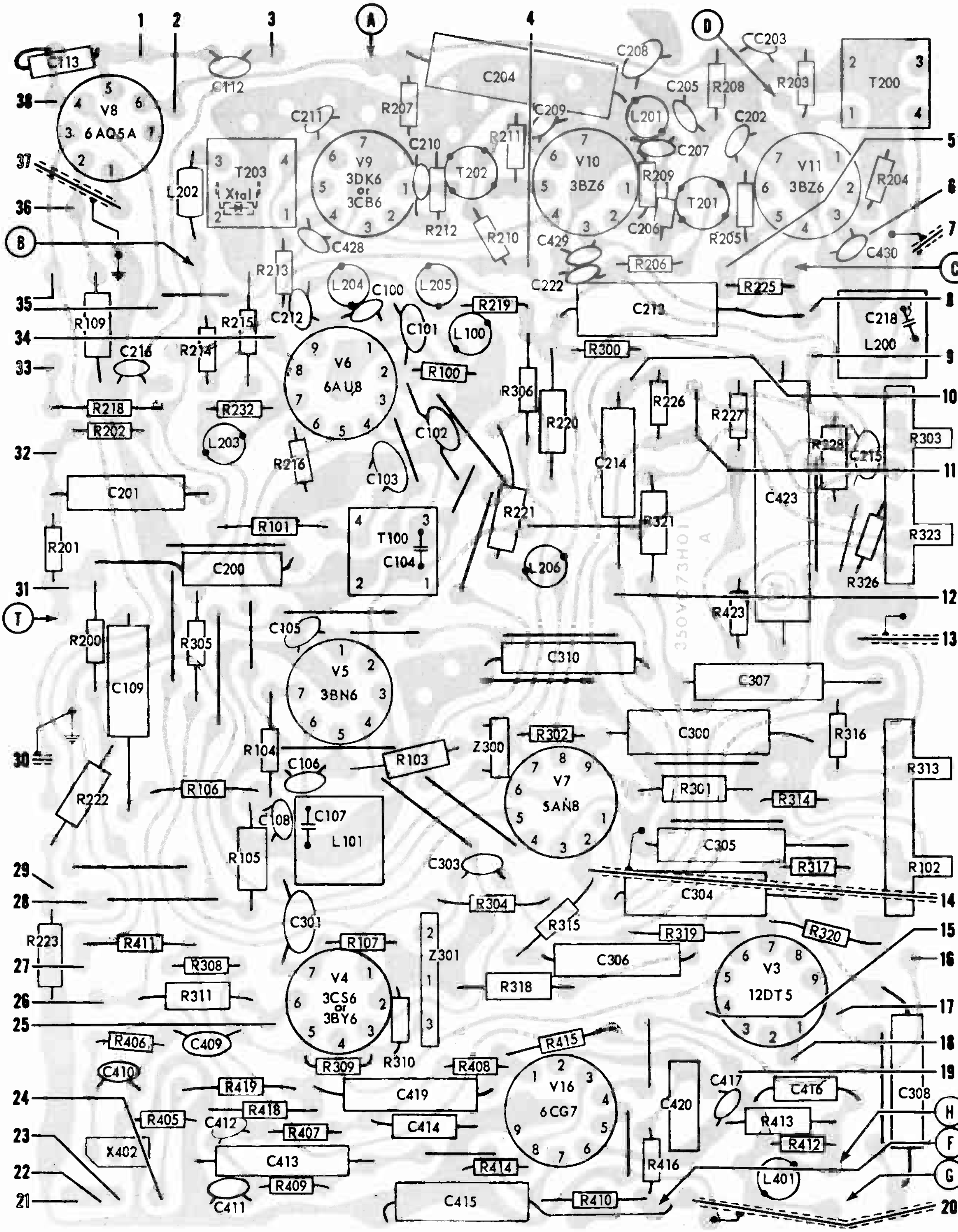
The ringing coil (L401) should be adjusted as follows:

1. Short out the ringing coil with a jumper wire. Use TP (G) & (H).
2. Set the HORIZONTAL hold control to the center of its range. Do not change this setting during the steps that follow.
3. Connect a VTVM to TP (F) for measuring the DC voltage between TP (F) and B-.
4. With the receiver tuned to a station of normal signal strength, adjust C420 for 0 volts DC on the meter.
5. Remove the jumper from the ringing coil.
6. Adjust the ringing coil for 0 volts DC on the meter. Check the adjustment by switching to another channel and back again. The receiver should pull into horizontal sync on all channels.

TEST POINTS

- (A) AGC for IF
- (B) Video detector
- (C) CRT cathode
- (D) 1st IF input
- (F) Horiz. MV
- (G), (H) Ringing coil
- (T) AGC for tuner

WESTINGHOUSE Chassis V-2376-1, V-2376-2, Service Material, Continued



Bottom view of PC board showing location of top components in solid outlines. Tube pin numbering is for bottom of socket.

ZENITH TELEVISION RECEIVERS

CHASSIS 16C20 - 16C20Q - 16C21 - 16C21Z - 16C21Q - 16C22Q - 16C23 - 16C24 - 18C20 - 18C20Q - 18C24Q

MODEL	CHASSIS	TUNER
C1415L	16C20	Bandswitch
C1416B	16C20	Bandswitch
C1417L	16C20	Bandswitch
C1715L	16C20	Bandswitch
C1716C	16C20	Bandswitch
C1717J	16C20	Target Turret
C1719P	16C20	Target Turret
C1720C	16C20	Target Turret
C2001L	16C20Q	Target Turret
C2221R & Y	16C21	Bandswitch
B2221RZ & YZ	16C21Z	Bandswitch
C2223E,R,Y	16C21	Target Turret
B2223EZ,RZ,YZ	16C21Z	Target Turret
C2225E,R,W	16C21	Target Turret
C2245E,R,W	16C21	Target Turret
B2245EZ1,RZ1,WZ1	16C21Z	Target Turret
C2246E,R,W	16C21	Target Turret
C2247E,R,W	16C21	Target Turret
C2249H,R,W	16C21	Target Turret
C2254E,H,R,W	16C21	Target Turret
C2282E,R,W	16C23/5B26	Target Turret
C2284H & R	16C21/5B28	Target Turret
C2330E & R	18C20	Bull's Eye Turret
C2358E,R,W	18C20	Bull's Eye Turret
C2359E & W	18C20	Bull's Eye Turret
C2360M & R	18C20	Bull's Eye Turret
C2673E,R,W	16C24	Target Turret
C3000E & R	16C22Q	Target Turret
C3001E,R,W	16C21Q	Target Turret
C3004E,R,W	16C22Q	Target Turret
C3006E,R,W	16C21Q	Target Turret
C3007E,R,W	16C21Q	Target Turret
C3008R	16C21Q	Target Turret
C3009E,W,Y	16C21Q	Target Turret
C3010E,H,R	18C20Q	Bull's Eye Turret
C3011E,W,Y	18C20Q	Bull's Eye Turret
C3012H & R	18C20Q	Bull's Eye Turret
C3013H	18C20Q	Bull's Eye Turret
C3014H & R	18C20Q	Bull's Eye Turret
C4007E & R	18C24Q	Bull's Eye Turret
C4012H & R	18C24Q	Bull's Eye Turret

ADJUSTMENTS

BANDSWITCH TUNER OSCILLATOR ADJUSTMENTS

To adjust the oscillator adjustment screws set the fine tuning control to a position where the index hole in the drive cam is directly over the small hole just below the channel 13 adjustment screw (see Fig. 1). Without further adjustment of the fine tuning control, insert a 68-24 alignment tool into the tuner and adjust each operating channel to resonance starting with the highest channel and following each lower channel in sequence. Be certain not to move the fine tuning shaft when switching channels. It will be noted that turning the oscillator screw to one side of resonance results in a faded, washed-out picture with the spacings between the wedge lines "fogged" and turning in the opposite direction causes the spaces between the lines to clear up, however, going beyond this point will cause the picture to take on a "wormy" appearance from sound getting into the picture. Correct adjustment is obtained by adjusting for a "wormy" picture and then back down the adjustment screw slightly until the picture clears up.

TARGET TUNER OSCILLATOR ADJUSTMENTS

1. Turn the fine tuning control to the approximate position shown in Fig. 2.

2. Without further adjustment of the control, insert a 68-29 alignment wrench (designed to prevent turning the adjustment screw too far into the core where it could disengage from its track) through the hole provided in the front of the tuner and adjust each operating channel to resonance. It will be noted that turning the adjustment screw to one side of resonance results in a faded, washed-out picture with the spacings between the wedge lines "fogged" and turning the screw in the opposite direction causes the spaces to clear up, however, going beyond this point will cause the picture to take on a "wormy" appearance from sound getting into the picture. Correct adjustment is obtained by adjusting for a "wormy" picture and then back down the adjustment screw slightly, until the picture clears up.

Suffix "Q" following the chassis number identifies a receiver equipped with Zenith's Space Command remote control.
Suffix "U" is added to the chassis and model number if the receiver is factory equipped with a UHF continuous tuner.

ZENITH Chassis 16C20, -Q, 16C21, -Q, -Z, 16C22Q, 16C23, 16C24, 18C20, -Q, 18C24Q

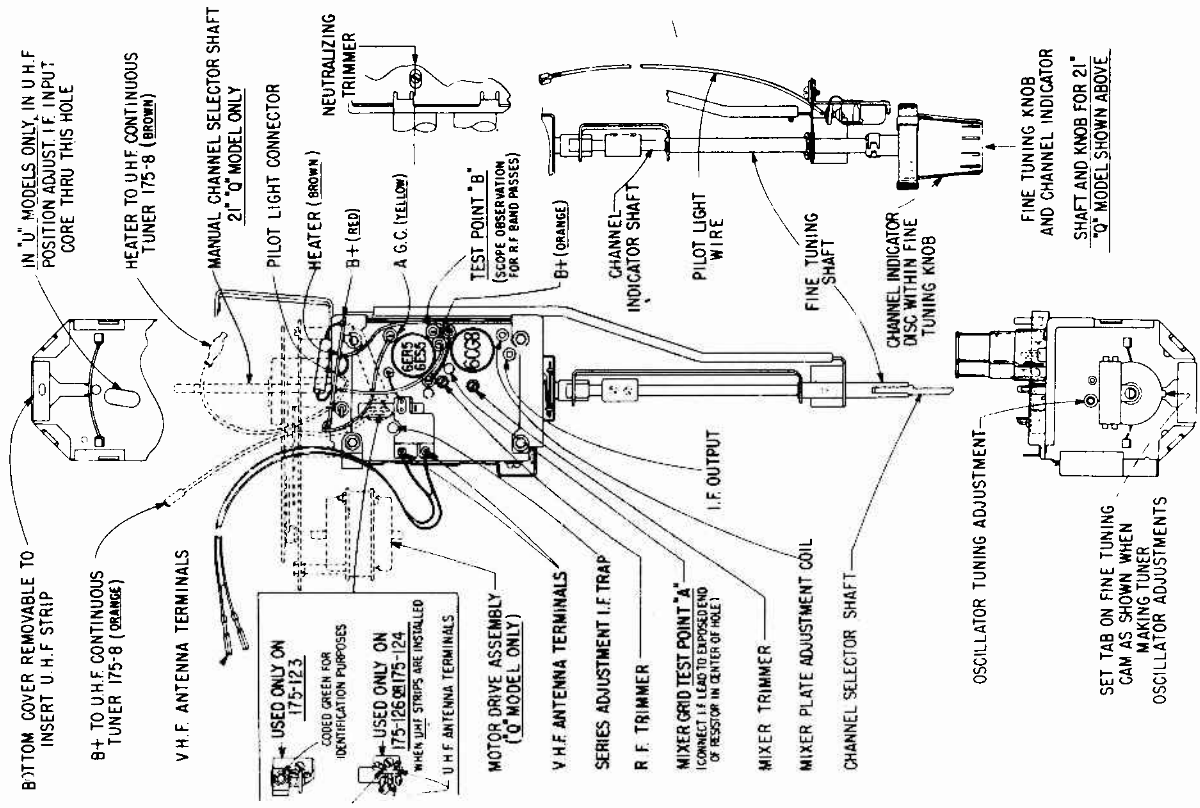


Fig. 2 Tube and Trimmer Layout, Target Tuner

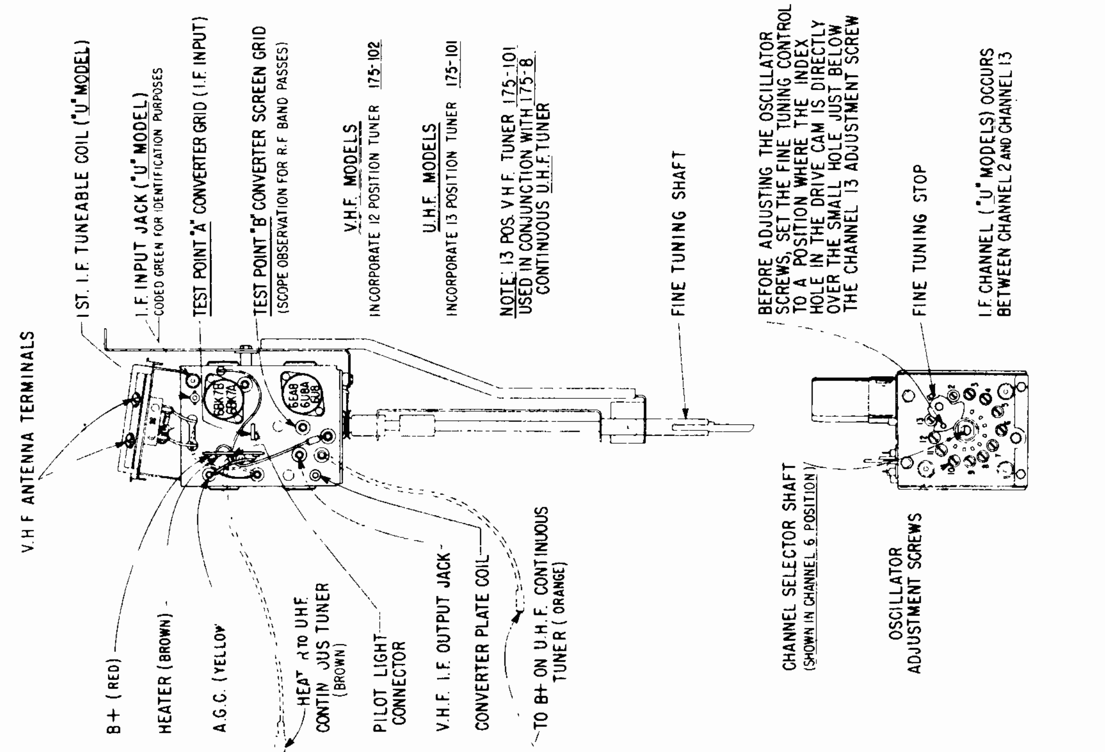


Fig. 1 Tube and Trimmer Layout, Bandswitch Tuner

BULLS EYE TUNER ADJUSTMENTS

To adjust the receiver for bull's eye tuning, set the fine tuning control to its approximate center position. Without further adjustment of this control insert a 68-31 alignment wrench through the hole provided at the rear of the tuner and adjust each operating channel to resonance. It will be noted that turning the adjustment screw to one side of resonance results in a faded, washed-out picture with the spacings between the wedge lines "fogged" and turning the screw in the opposite direction causes the spaces between the lines to clear up, however, going beyond this point will cause the picture to take on a "wormy" appearance from sound getting into the picture. Correct adjustment is obtained by adjusting for a "wormy" picture and then back down the adjustment screw slightly until the picture clears up.

AGC ADJUSTMENT

Tune in a strong TV signal and slowly turn the delay control until a point is reached where the picture distorts and buzz is heard in the sound. The control should then be backed down from this position and set at a point comfortably below the level of intercarrier buzz, picture distortion and improper sync. This setting will correspond to approximately 3 V. peak to peak output from the video detector.

CAUTION: Misadjustment of the AGC control can result in a washed-out picture, distorted picture, buzz in the sound or complete loss of picture and sound.

FRINGE LOCK ADJUSTMENT

The fringe lock adjustment is made to obtain best possible synchronization under weak and noisy signal conditions. To adjust, first check the AGC adjustment and proceed as follows:

1. Turn the fringe lock control fully clockwise and then back it off approximately 1/4 turn. Adjust the vertical and horizontal hold controls and check operation of the receiver to see that it syncs normally when the turret is switched from channel to channel.

2. If the picture jitters or shows evidence of delay, tearing, split phase, etc., back down the fringe lock control further, a few degrees at a time, each time readjusting the hold controls and switching from channel to channel until normal sync action is obtained. It will be found that under normal signal conditions, the correct adjustment will be near the counterclockwise position of the control.

3. In fringe and noisy areas, the best adjustment will be found at or near the maximum clockwise position of the control; however, do not automatically turn the fringe lock fully clockwise in fringe areas. Follow the procedure outlined. In areas where both local and fringe signals are received, a compromise setting should be made for best overall performance.

AFC ADJUSTMENT

The horizontal hold control is equipped with a stop which limits knob rotation to approximately 270 degrees. To adjust the AFC, remove the knob and turn the shaft to a position where it is virtually impossible to disrupt horizontal synchronization when switching from channel to channel. After adjustment, install the knob with its pointer centered between the stops.

WIDTH ADJUSTMENT

To obtain proper width, slide and turn the metal sleeve along the neck of the picture tube. A setting will be found which results in proper width and linearity.

ALIGNMENT

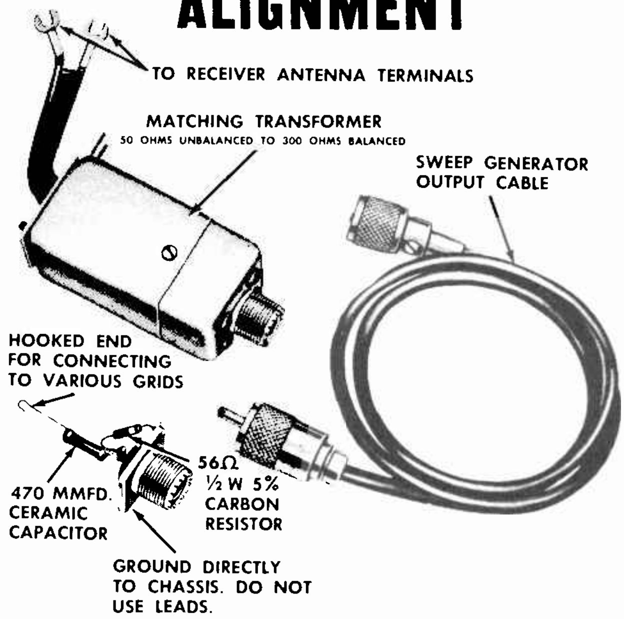


Fig. 4 IF-RF Alignment Fixtures

SOUND ALIGNMENT

Proper alignment of the 4.5 Mc intercarrier sound channel can only be made if the signal to the receiver antenna terminals is reduced to a level below the limiting point of the 6BN6 Gated Beam Detector. This level can be easily identified by the "hiss" which then accompanies the sound. Various methods may be used to reduce the signal level; however, a step attenuator is recommended for most satisfactory results.

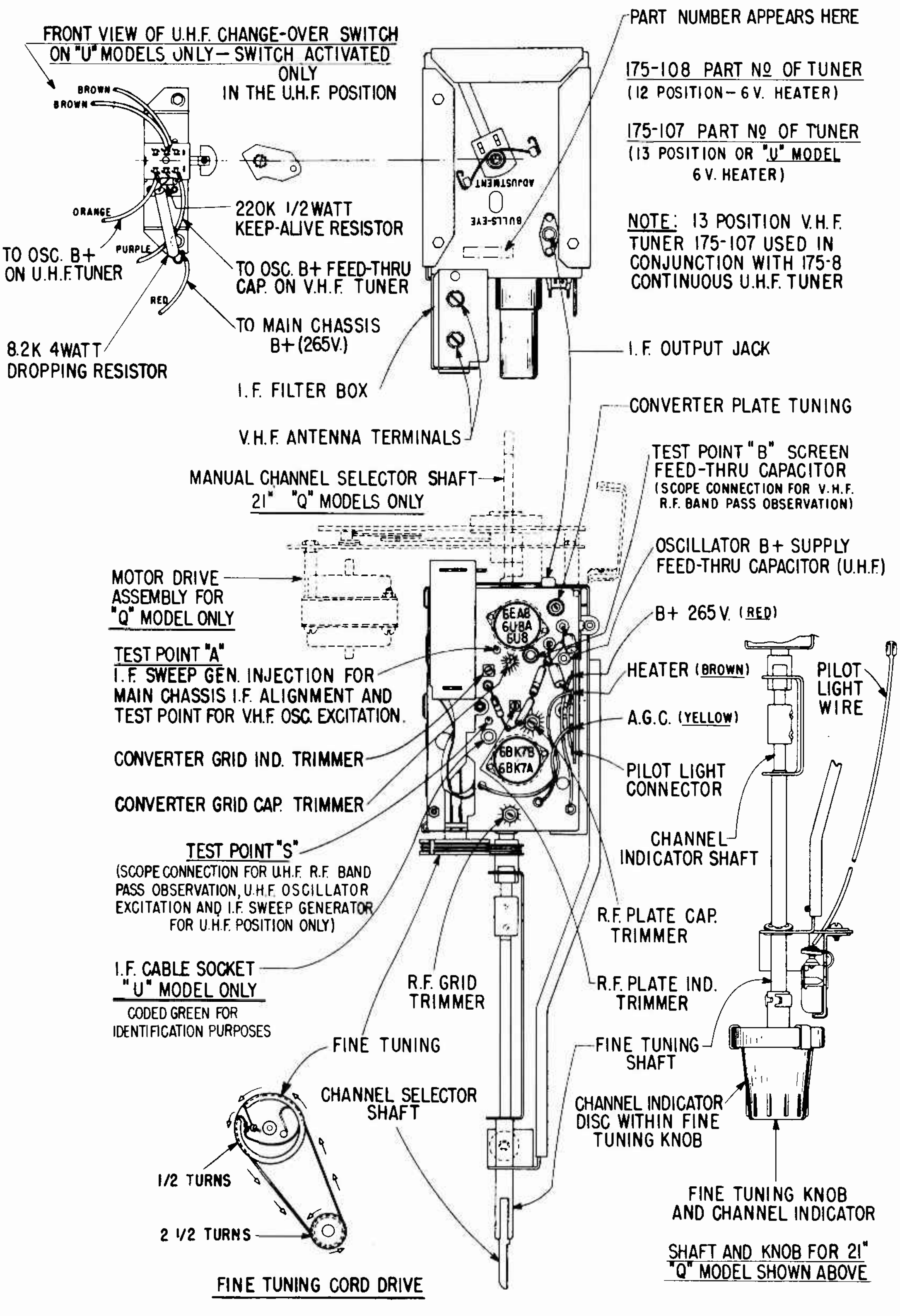


Fig. 3 Tube and Trimmer Layout, Bull's Eye Tuner

1. Connect the step attenuator between the antenna and the receiver antenna terminals.

2. Tune in a tone modulated TV signal. Adjust the step attenuator until the signal is reduced to a level where a "hiss" is heard in the sound.

3. Adjust the sound take-off coil (top and bottom cores), intercarrier transformer, quadrature coil and buzz control for the best quality sound and minimum buzz. It must be remembered that any of these adjustments may cause the "hiss" to disappear and further reduction of the signal will be necessary to prevent the "hiss" from disappearing during alignment.

VIDEO I F ALIGNMENT

1. Slowly turn the channel selector until the tuner rotor is made to rest between two channels. This will prevent an erroneous response.

2. Connect an oscilloscope through a 10,000 ohm isolation resistor to terminal "C" (detector). Connect the ground lead to chassis.

3. Feed the sweep generator through the special terminating network shown in Fig. 4 to point "G" (Pin 1 of the 3rd IF). Adjust generator to obtain a response similar to Fig. 5 with a detector output of 3 volts peak to peak. Do not exceed this level during any of the adjustments.

4. Set the marker generator to 45.75 Mc and alternately adjust the top and bottom cores of the 4th IF for maximum gain and symmetry with the 45.75 Mc marker positioned as shown in Fig. 5. The 39.75 Mc marker can fall within ± 0.5 Mc of the specified frequency. If the correct response cannot be obtained, check the position of the cores to see that they are not butted but are entering their respective windings from the opposite ends of the coils.

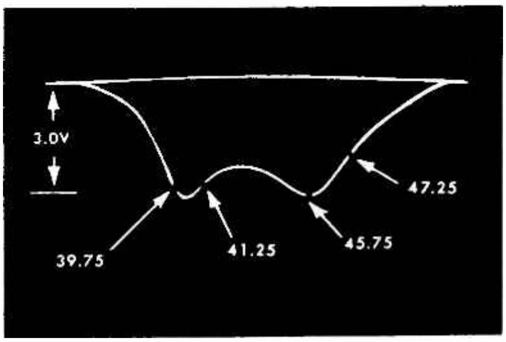


Fig. 5 4th IF Response

5. Connect the sweep generator to terminal "A" (mixer grid, see Fig. 1, 2 or 3, depending on tuner). Connect terminal "F" to chassis and connect a jumper between terminal "E" and the junction of the 56 (68 in 16C20) and 1500 ohm resistors in the cathode of the 1st IF. Adjust sweep to obtain a response similar to Fig. 8. Switch oscilloscope to 10 X gain to "blow up" the traps.

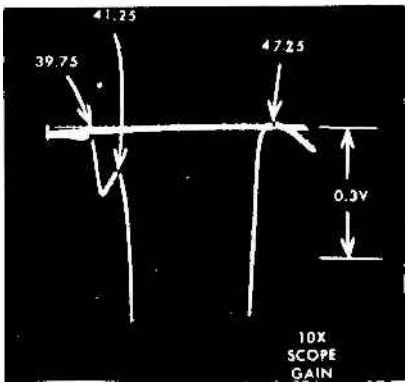


Fig. 6 Expanded View of Traps

6. Refer to Fig. 6 and 7 and adjust the 39.75 Mc 41.25 Mc, and the two 47.25 Mc traps for minimum marker amplitude.(16C20 chassis has one 47.25 Mc trap.) It can be seen that high oscilloscope gain must be used to "run" the response off the screen in order to view a "blow up" of the traps.

7. Disconnect the jumper between "E" and the 56 and 1500 ohm cathode resistors. Connect this jumper between "E" and chassis. Adjust sweep generator for 3 volts peak to peak output. Alternately adjust the 2nd, 3rd, 1st IF and the converter plate coil until an overall response similar to Fig. 8 (Fig. 9 for 16C20) is obtained. It will be found that the 2nd IF affects the low side (42.75 Mc) and the 3rd IF the high side of the response. If the receiver is equipped with a target tuner, adjust the IF trap L1 for minimum response at 45.5 Mc. After alignment remove all jumpers and check operation.

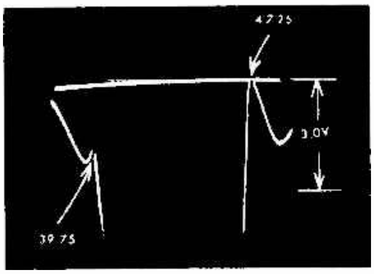


Fig. 7 Further Expansion of Fig. 6 for Detail View of the 39.75 and 47.25 Mc Traps.

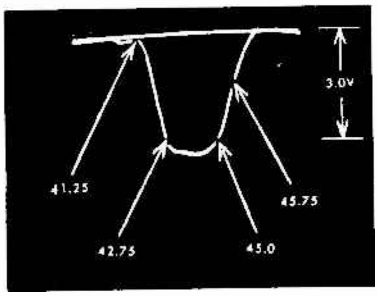


Fig. 8 Overall IF Response

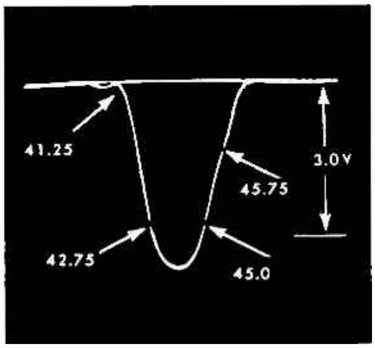
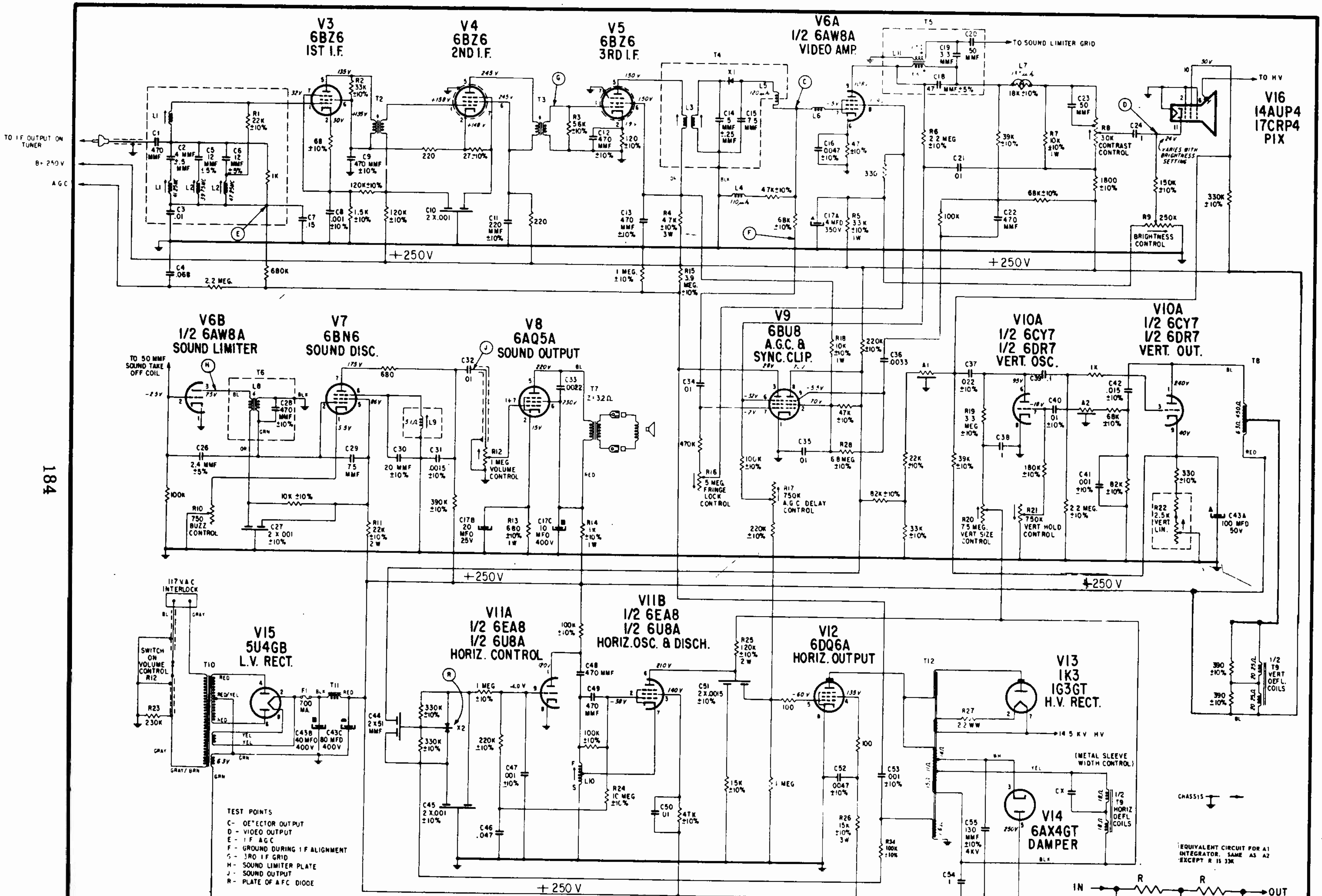


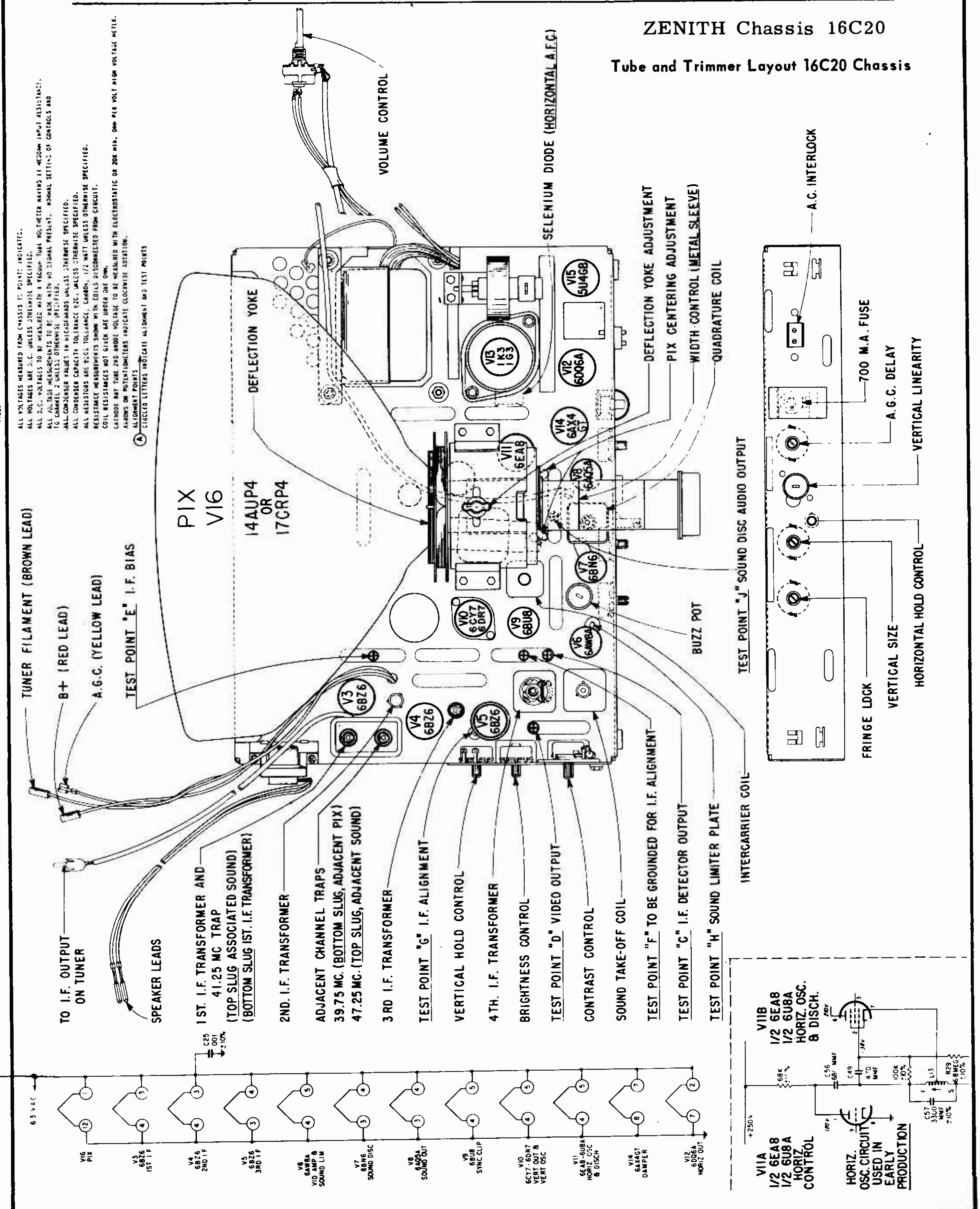
Fig. 9 Overall IF Response 16C20 Chassis Only

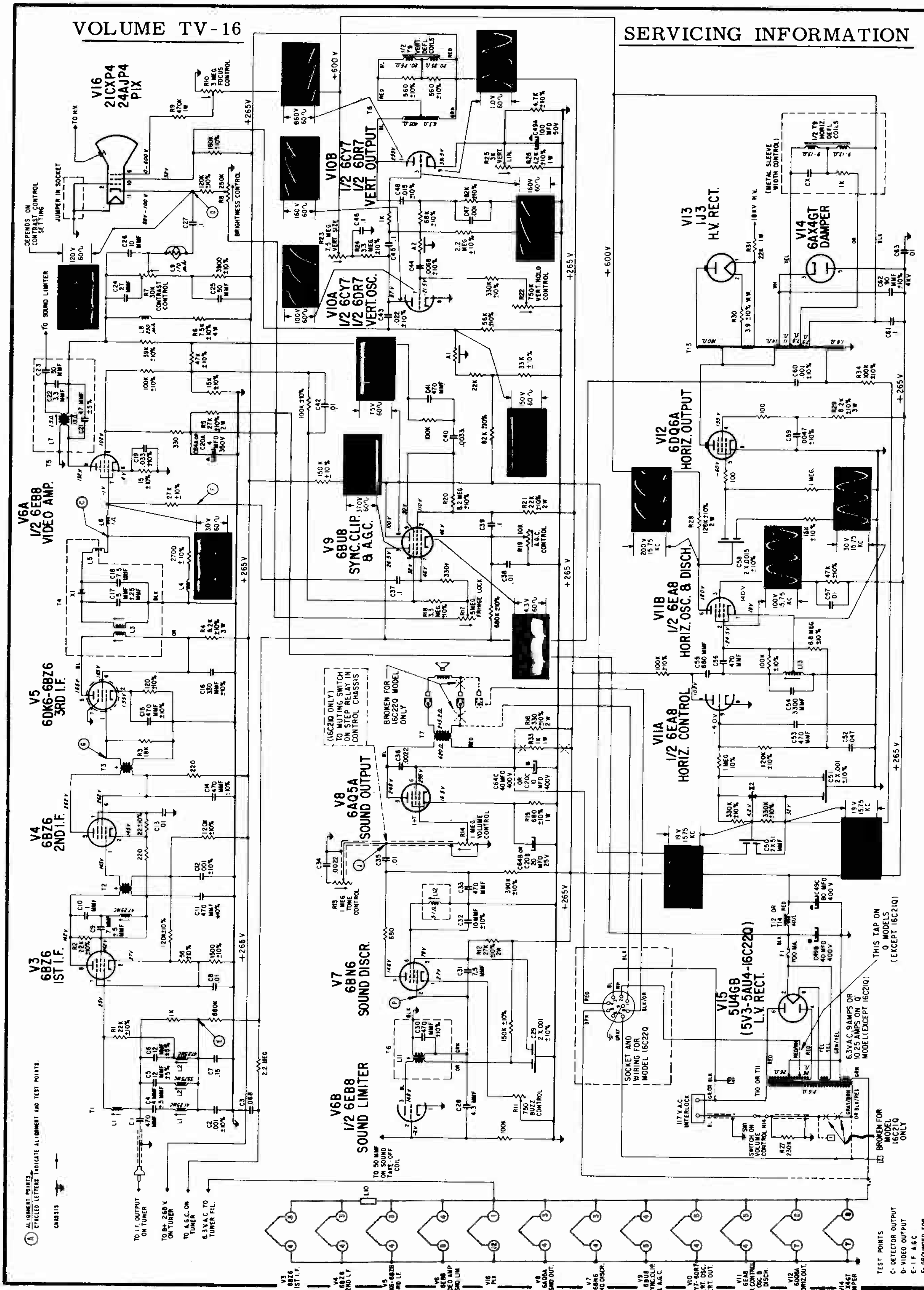


ZENITH Schematic Diagram 16C20. Chassis 16C20Q is similar but has changes in circuit to operate with Space Command unit.

ZENITH Chassis 16C20

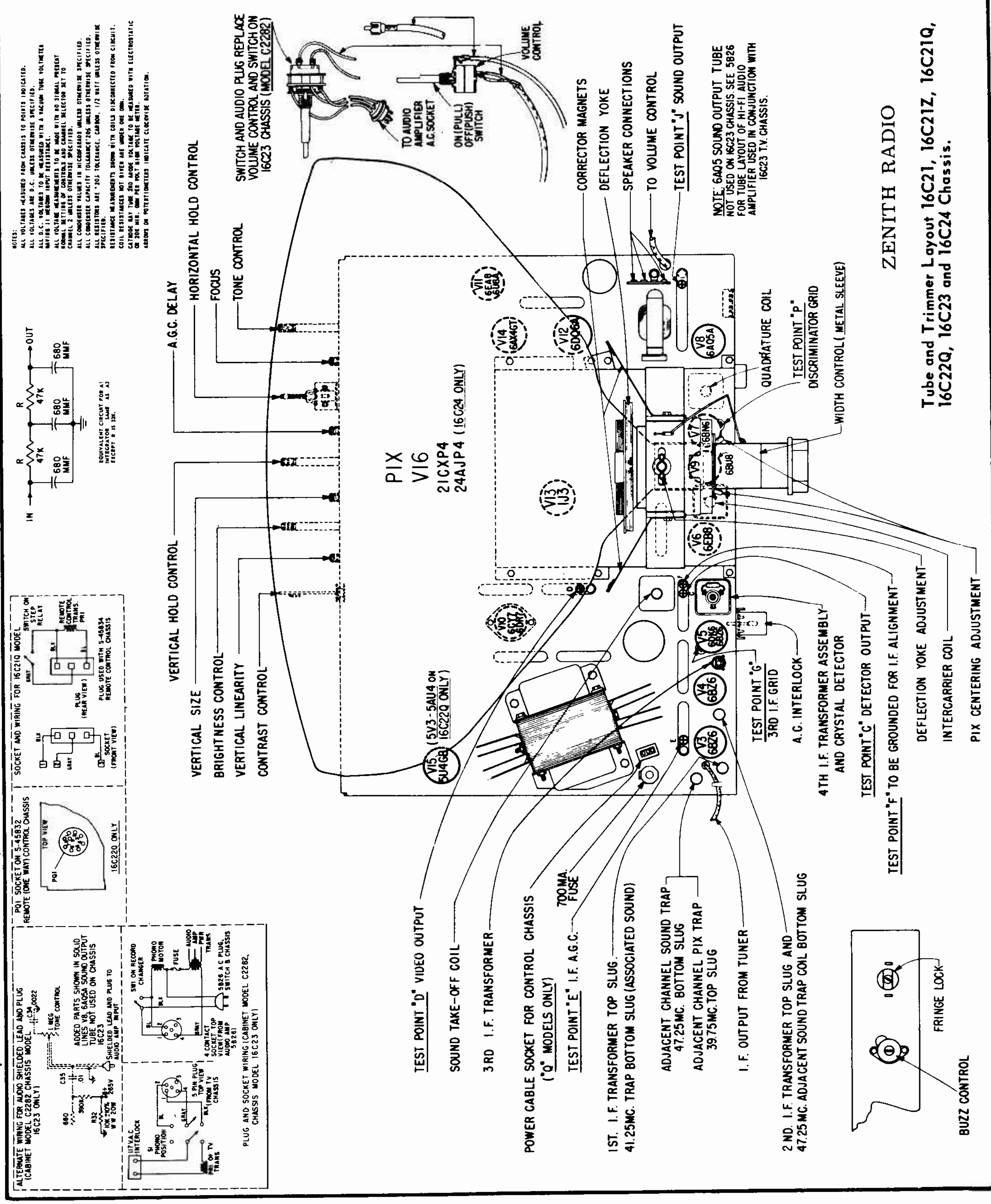
Tube and Trimmer Layout 16C20 Chassis

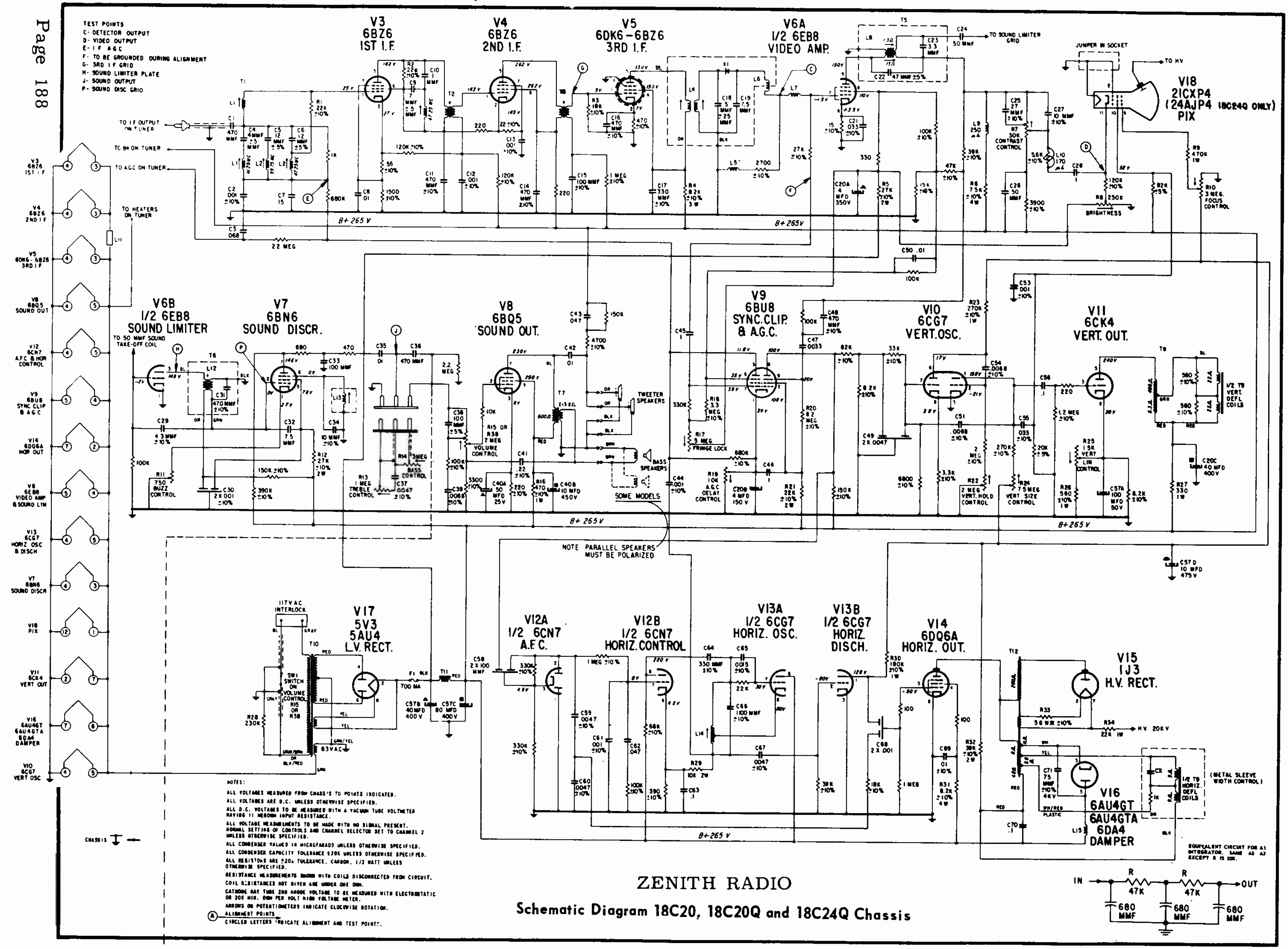




ZENITH Schematic Diagram 16C21, 16C21Z, 16C21Q, 16C22Q, 16C23 and 16C24 Chassis

ZENITH Chassis 16C21, 16C21Z, 16C21Q, 16C22Q, 16C23, 16C24

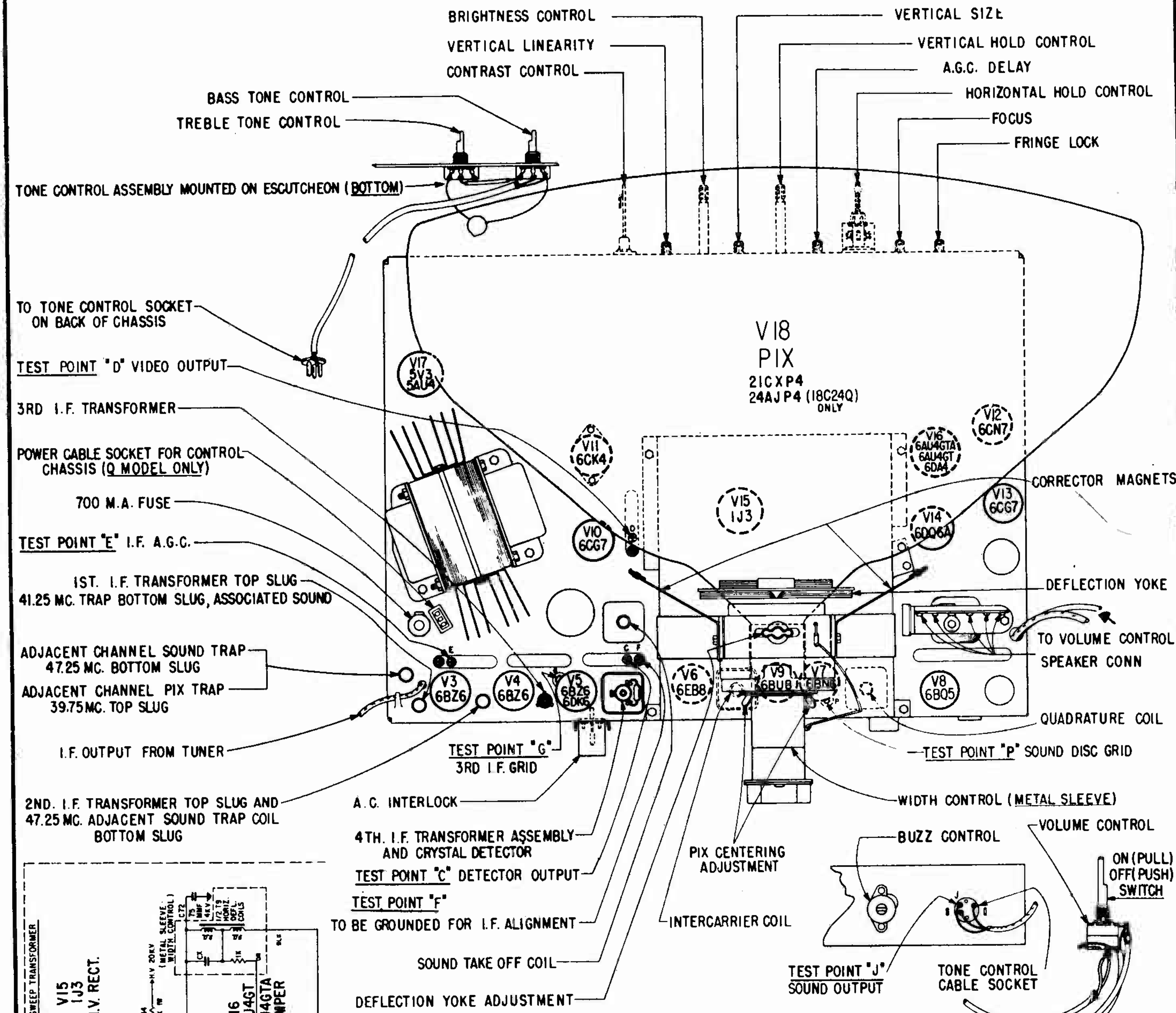




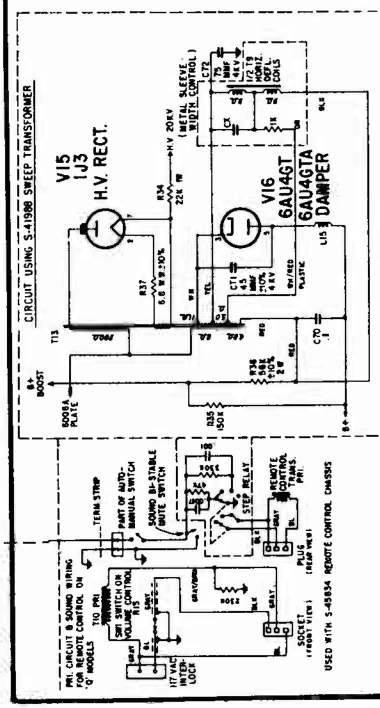
ZENITH RADIO

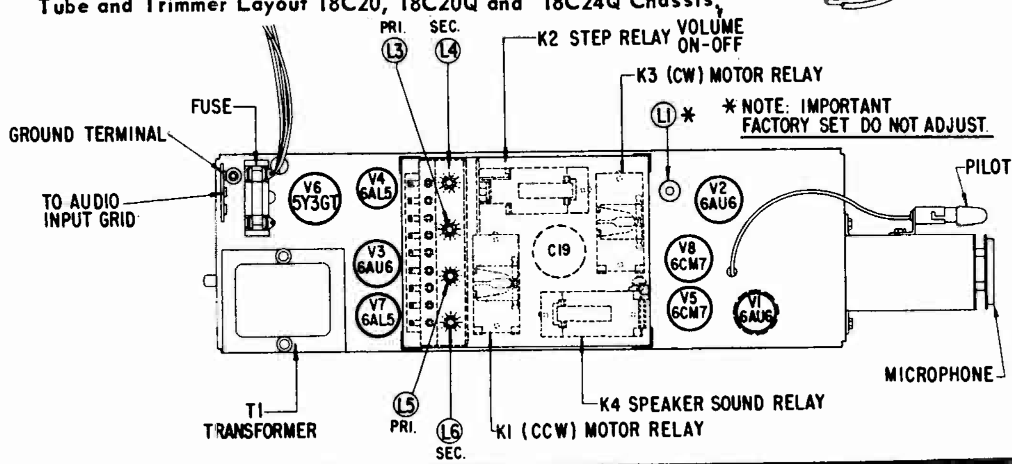
Schematic Diagram 18C20, 18C20Q and 18C24Q Chassis

ZENITH Chassis 18C20, 18C20Q, 18C24Q, Continued

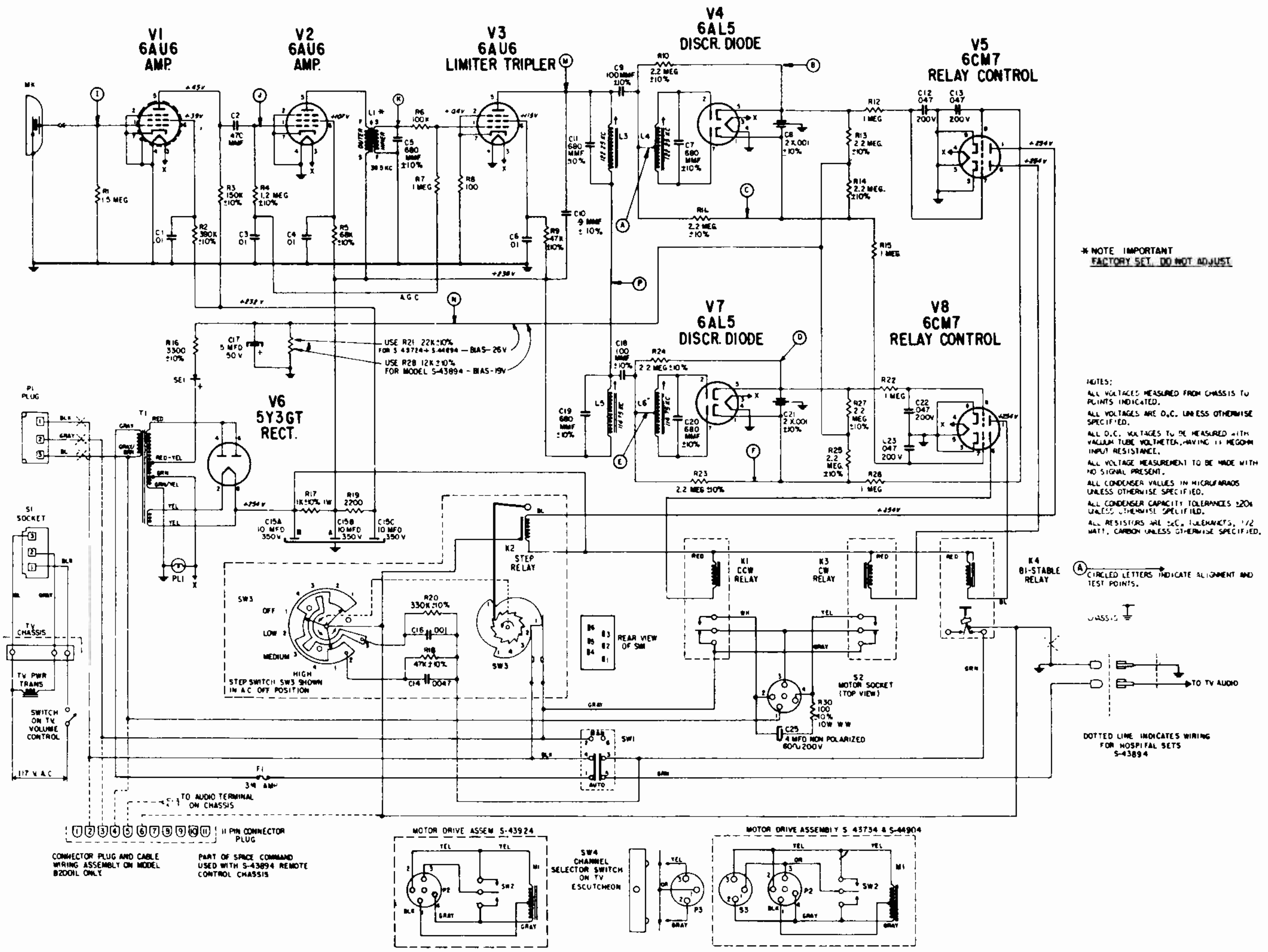


Tube and Trimmer Layout 18C20, 18C20Q and 18C24Q Chassis





Tube and Trimmer Layout S-45834 Space Command Control



Schematic Diagram S-45834 Space Command Control Chassis

CENTERING ADJUSTMENT

The centering assembly is built into the yoke housing. This assembly is made of two magnetic rings which can be rotated by means of tabs. Centering is accomplished by gradually rotating the tabs with respect to each other, then rotating both tabs simultaneously until the picture is centered.

CORRECTOR MAGNET ADJUSTMENT

Two corrector magnets are used to obtain straight, sharply focused sweep lines across the face of the picture tube. The magnets are mounted on the deflection coil mounting brackets and can be moved in and out or up and down by bending the flexible arms which support them. Adjustment has been made at the factory and should not require readjustment unless accidentally bent out of position. If this occurs, proceed as follows:

1. With the vertical and horizontal size controls, reduce the size of the picture to a point where the four corners and sides of the picture are visible. (In some receivers it may not be possible to reduce the picture size sufficiently to see all the sides and in this case it may be necessary to shift the picture with the centering control to view one side at a time.)

2. Bend the corrector magnet arms until the corners become right angles and the top of the raster is parallel with the bottom and the left side is parallel with the right side. After adjustment, the picture should be restored to normal size.

NOTE: Misadjustment of the corrector magnets may cause pincushioning, barreling, keystoning, poor linearity, etc.

INDEX

Under each manufacturer's name, at left there are listed that make chassis and models in numerical order. The corresponding page number at right of each listing refers to the first page of the section dealing with such material.

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Another

Supreme Publications

Service Manual