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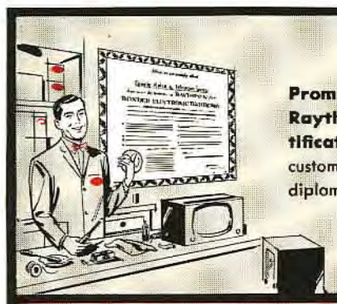

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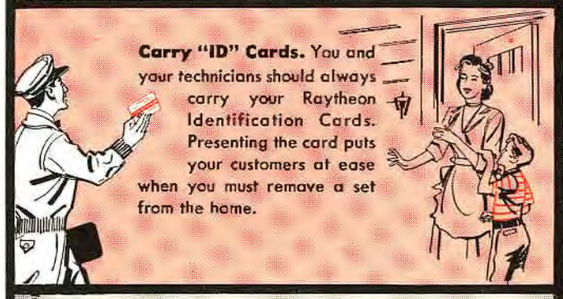

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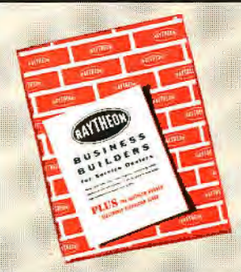

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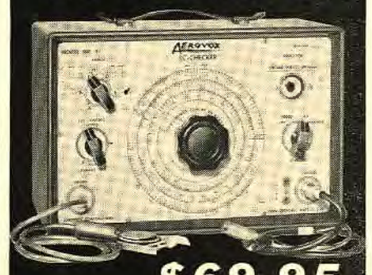

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Looking for Trouble?

by Cyrus Glickstein*

Second of a series presenting useful and practical service information in an entertaining manner. Can you solve the problem?

Try your hand at fixing TV sets by remote control simply by answering the questions in this TV trouble-shooting quiz. A defective receiver is being serviced on the bench and the quiz follows the usual servicing procedures. To make the quiz more interesting, it is suggested that each question be answered before going on to the next and all questions answered before referring to the answers. If there is more than one correct answer to a question give all the correct answers. The answers, discussion and trouble-shooting hints follow after the questions.

Receiver: Spartan, Chassis 23U214, transformer-type low voltage power supply.
Complaint: Blank screen, sound output present.

Questions:

1. The set, which is tuned to an active channel, is turned on. The screen is blank but sound is heard. Turning up the brightness and contrast controls have no effect on bringing in a picture or raster.

A blank screen with sound present can be caused by a defect in the:

☐ a. High voltage power supply;
☐ b. Low voltage power supply;
☐ c. Horizontal sweep circuit (horizontal oscillator, horizontal output, damper);
☐ d. Video section (video *if* stages, video detector, video amplifier, *crt*);
☐ e. *age* circuit (*age* stage or stages).

Control Action

2. To clarify which section is probably defective on the basis of the observed symptoms, the most important control(s) to check next is (are):

☐ a. Horizontal drive;
☐ b. Channel selector and fine tuning;
☐ c. Width;
☐ d. *age* (performance) control;
☐ e. Vertical hold.

3. The volume seems normal but there is a 60-cycle buzz in the sound. As the fine tuning control is varied on the channel to which the set is tuned, small streaks of light flash on the screen. When the channel selector is turned to an inactive channel, a normal raster fills the screen and the normal background rushing noise can be heard, with no buzz or hum.

On other active channels, which normally produce strong signals, the same symptoms as described above are noted—blank screen with sound output containing a buzz. On a weaker channel, a dark, over-contrasty picture is visible and the sound has the usual buzz.

The brightness control has the normal range of control on inactive channels but has no effect on unblanking the screen on active channels. Varying the contrast and *age* (performance) controls on active channels had no effect on unblanking the screen. On a weaker channel with the over-contrasty picture, rotating the *age* control had no effect on picture or sound, while turning the contrast control to minimum blanked out the screen but had no effect on the sound.

The symptoms point to trouble in:

☐ a. Video section;
☐ b. Front end (*rf* amplifier, *rf* oscillator, mixer);
☐ c. *age* circuit;
☐ d. Horizontal sweep circuit;
☐ e. High voltage power supply.

4. The following tubes were changed: *rf* amplifier, 1st and 2nd common *if* amplifiers, keyed *age* and 1st audio. The symptoms remained unchanged. An oscilloscope applied to the video detector load, video amplifier plate, and to the plate and control grid of the *age* keyer tube showed the waveforms in *Fig. 1*.

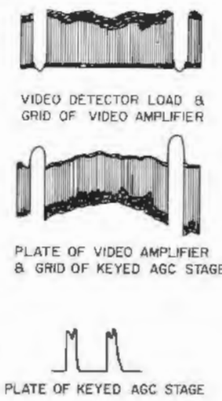

Fig. 1—Waveforms as seen in the video amplifier and agc stage.

Voltage Analysis

Voltage readings around V7, the *age*

[*Continued on page 6*]

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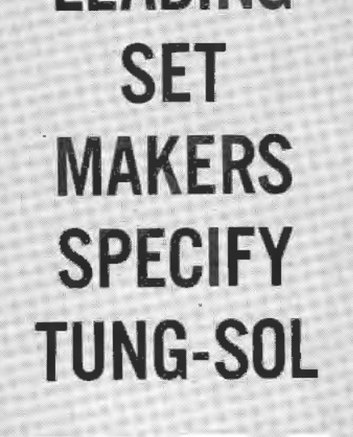

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ANSWERMAN

Answerman
Dear Sir:

My problem is in the picture of a new receiver. The presentation contains something which is in appearance similar to "snow" as is commonly seen when the signal strength is weak. However, my trouble is not exactly of that nature because the signal I am receiving is quite strong and the same effect does not appear on other receivers I have in my shop. In fact, I have noticed that this so called "snow" disappears when the picture modulation is removed as during a program change or when a commercial is about to be switched on. That is, a blank screen does not exhibit the "snow." If the trouble was being caused by a weak signal the "snow" would remain with the removal of the picture information. On this basis I believe the trouble is in the receiver, but I am at a complete loss to know what to do about it. The receiver uses the RCA KCS113 chassis.

C. O.
Houston, Texas

As you point out the problem is not that of a snowy picture as could be caused by a weak *rf* tube, improper *age* bias or an open antenna line. What you evidently are experiencing is termed "picture agitation" and is frequently also called graininess or background noise. Picture agitation is the result of a noise voltage being prevalent along with the video voltage and is frequently seen in some closed circuit TV systems. On TV receivers with narrow *if* and video bandpass circuits the noise is not visible because the high frequency information is not presented in the picture and thus the snow is not presented as a grainy background. On the other hand it can be seen on high resolution receivers that have the ability to present a broad band of video frequencies.

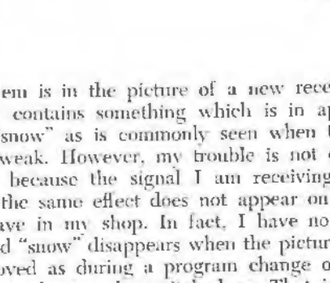

Fig. 1—Partial schematic of RCA KCS 113 video amplifier

Since the background noise is transmitted as modulation along with the video signals the receiver cannot be considered to be at fault. However, since the noise is presented because of the receivers' ability to present all of the transmitted video it is possible to modify the receiver, to reduce the bandpass and thus block the presentation of the high frequency noise. The changes necessary are shown in *Fig. 1* and involve two components, *L401* and *C106*. Inductance L401 should be changed to 120 microhenries and condenser *C106* should be changed to 330 *uuf*.

Dear Mr. Answerman:

I have a condition in a TV receiver that is causing me considerable difficulty. The picture is poor with a small amount of smear and the receiver performs as though the *age* circuit wasn't functioning, in that the picture is overdriven with full contrast. I know there is trouble in the *age* circuitry and that the *age* voltage is insufficient because I am able to compare it with an identical properly functioning model I have along side this one on my repair bench. Unfortunately, I can't determine whether the trouble is occurring in the *if* strip or not. In addition, the sync action is somewhat disturbed by video. Some of the voltages in the video amplifier and *age* circuit differ a small amount from the properly operating receiver. It is difficult to determine whether I have one common trouble or two separate ones. The receiver is a Motorola chassis TS-542.

B. T.
Miami, Fla.

Although the possibility exists that two different circuit failures are causing the improper operation of the receiver it is not likely. Rather, one component failure is most probably causing the entire problem. The circuit where the component failure is probably occuring is the video plate load resistor, *R126* shown in *Fig. 2*. Tht resistance increased in the video amplifier, the smear or loss of high frequency components of the video signal would result with an accompanying larger sync signal to disrupt the sync action. In addition, the *age* amplifier would be affected by the reduced voltage applied to the suppressor, again the result of a resistance increase in the

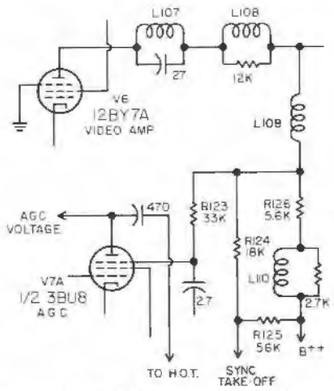

Fig. 2—Motorola TS542 *age* and video amplifier circuit

video plate load resistor, *R126* shown in *Fig. 2*. The reduced suppressor voltage would lessen tube conduction and cause the circuit to develop less *age* voltage. On the basis of this analysis the resistors in the involved circuit are *R124*, *R125*, *R126* and the parallel combination of inductance *L130* and the *2.7K* resistor. If either *R124* or *R125* had changed value the above mentioned symptoms would not be produced. An increase in their resistance would affect the sync voltage but not the video signal and the *age* voltage. On the other hand, if resistor *R126* shown in *Fig. 2* should increase or become open the symptoms described would develop. It is suggested that resistor *R126*, a *5.6 K* resistor be checked.

[*Continued on page 30*]

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LOOKING FOR TROUBLE?

[*from page 3*]

stage (*Fig. 2*) taken while the set was tuned to an incoming signal showed the following:

Measured Voltages—V7
(With Signal)

Cathode (pin 7)	146 v
Control grid (pin 1)	146 v
Screen grid (pin 6)	465 v
Plate (pin 5)	0.6 v

On the basis of the above, the general location of the trouble seems to be in the:

- ☐ a. input line from the horizontal output transformer to the plate of the *agc* keyer tube;
- ☐ b. video amplifier line connecting to the grid of the *agc* stage or elsewhere in the video section;
- ☐ c. cathode circuit of the *agc* stage;
- ☐ d. *agc* bus;
- ☐ e. +150-volt line of the low voltage power supply.

5. To narrow down further the possible location of the trouble, the following resistance readings were taken around the *agc* stage (normal resistance of 150-volt line to ground approximately 30K):

V7 Resistance Readings
(*To Ground*)

Cathode (pin 7)	32K
Control grid (pin 1)	90K
Screen grid (pin 6)	360K
Plate (pin 5)	176K

A further resistance check at test point 7 (across capacitor *C48*) gave a reading of 2.9K.

On the basis of the above readings, the most likely cause of trouble is:

- ☐ a. Shorted *C49*;
- ☐ b. Shorted *C48*;
- ☐ c. Short across *R34*;
- ☐ d. Open *R35*;
- ☐ e. Open *C46* (grid circuit of V5).

Answers and Discussion

1. a, c, d, e

A blank screen with sound present can result from a fault in several sections of the TV set. A defective high voltage power supply can cause a blank screen with sound remaining normal by not supplying the necessary high voltage to the *crt*. The blank screen would be present on all channels—active and inactive.

A faulty low voltage power supply usually affects the sound, picture and raster.

A fault in the horizontal sweep circuit causes a blank screen when the horizontal sawtooth signal is lost or distorted and either insufficient or no high voltage is developed. Usually, sound output is normal. But a fault in the horizontal circuit may also cause a loss of sound on active channels where the set uses keyed *agc* and the sound takeoff is in the plate of the video amplifier. In such cases, the symptoms of blank screen and no sound may be somewhat confusing. The reason for the loss of sound is exactly the same as outlined above in the description of *agc* faults. A keyed *agc* stage receives its keyer pulse from the horizontal sweep circuit. Loss of this pulse causes a complete loss of *agc* bias. With no *agc* bias, there is excessive video amplification, and the large signal at the video detector cuts off the video amplifier. Since the screen is blank anyhow, this has no effect as far as the video signal is concerned. However, if the sound takeoff is at the video amplifier plate, there is also a loss of sound.

Video Amp Faults

Two video section troubles can cause a blank screen with normal sound—a faulty video amplifier stage and a defective *crt* (or circuit associated with the *crt*). A defect in the video amplifier stage of certain sets (a fault such as an open filament, open coil in the 4.5 *mc* trap in the plate, etc.) can produce a blank screen on all channels. If the video amplifier plate is direct-coupled to the *crt* cathode, the loss of video amplifier plate current causes a more positive voltage at the junction of the plate circuit and the *crt* cathode circuit, raising the voltage at the *crt* cathode and thereby possibly causing the picture tube to cut off (see *Fig. 2*). In addition to the blank screen, there is a loss of sound on all channels if the sound takeoff circuit is in the plate of the video amplifier stage. However, if the sound takeoff coil is in the video detector circuit, the symptoms would be a blank screen with normal sound.

A defective *crt* (open filament, etc.) can cause a blank screen and normal sound, as can a defect in the circuits associated with the *crt*. Faulty brightness control circuit, incorrect ion trap placement are some other possibilities.

AGC Faults

A defect in the *agc* circuit which causes a complete loss of *agc* voltage may result in extreme amplification in the video channel, since no *agc* bias

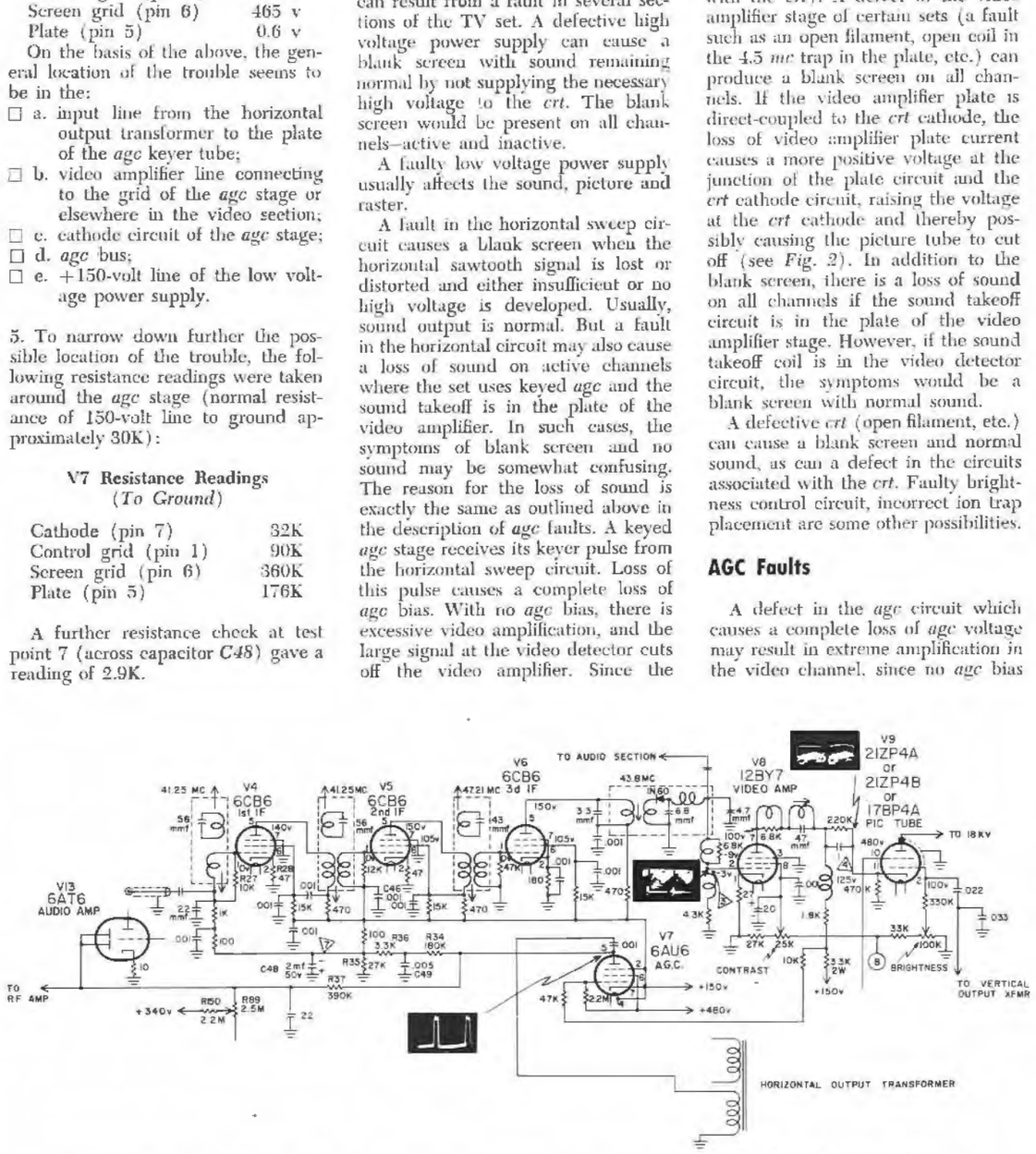

Fig. 2—Partial schematic of the Spartan chassis 23U214 showing the video and the keyed agc stages.

is applied to the controlled *rf-if* stages. An extra-large video signal appears at the video detector (*Fig. 3*) and is direct-coupled to the control grid of the video amplifier stage. Since this detected video signal is a pulsating negative *dc* voltage, it provides bias as well as a signal to the video amplifier grid. Because of the large negative voltage, the video amplifier stage may be almost or completely cut off, thus causing the loss of video. In addition, the higher voltage at the plate due to the drop in plate current is, in many sets, direct-coupled to the *crt* cathode, cutting off the *crt* and causing a blank screen on active channels. Of course, when the set is tuned to an inactive channel, a normal raster is visible. Furthermore, if the sound takeoff coil is at the video amplifier plate, there is a loss of sound as well. If the sound takeoff coil is in the video detector circuit, sound is present on active channels but usually with a noticeable buzz because of the large amplitude of the 60-cycle sync pulses in the detected video signal.

In some receivers, the detected video signal may not be large enough to cut off the video amplifier stage. In such cases, either a weak picture is seen if the video amplifier is biased close to cutoff or an over-contrasty picture is seen if the bias is not large enough to reduce the amplification of the stage substantially. In either case, sound is usually heard, approximately at normal volume but possibly distorted and generally with a pronounced 60-cycle buzz.

Blank Screen

The methods for localizing the faulty section when sound is present but the screen is blank are discussed in the following answers.

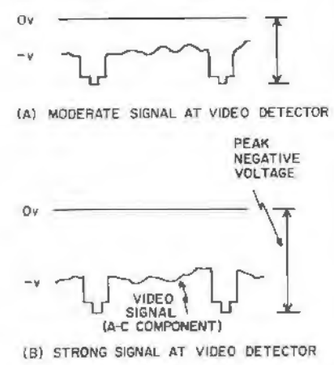

Fig. 3—Peak voltages with normal and excessive video signals.

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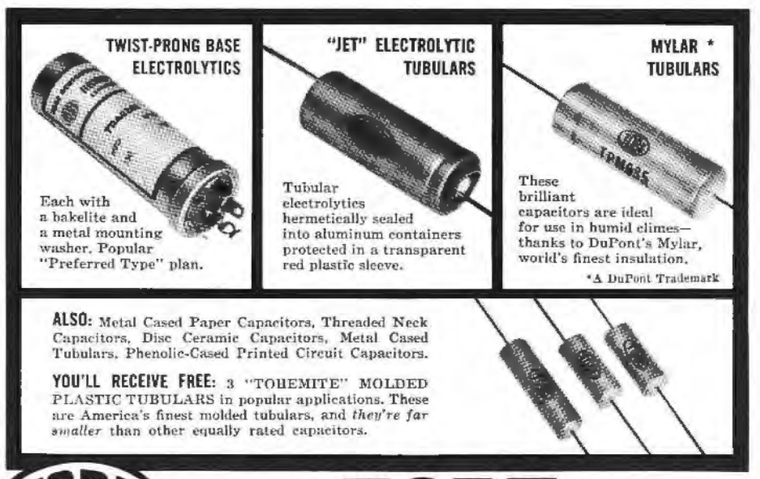

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2. b

To determine which of the four circuits mentioned above is probably faulty, the set is turned on and the initial symptoms noted. The most important checks in the order named are:

1) Turning up the brightness and contrast controls to check if a picture or raster can be brought in. The volume control is varied to determine if sound is approximately at the normal level.

2) Rotating the channel selector and fine tuning to check the situation on both active and inactive channels. If sound is normal but there is no picture or raster on any channel, the trouble is probably in the high-voltage power supply, the horizontal sweep circuit, video amplifier stage, *crt* or circuit associated with the *crt*. A faulty *age* circuit is indicated if there is a normal raster and normal background sound on inactive channels but a blank screen with normal sound (or sound with a buzz or no sound) on active channels.

3) If a weak or over-contrasty picture is found on any active channel, the contrast and *age* controls are rotated through their range to note the effect on the picture. If varying the respective control does not have the usual effect, this points to possible trouble in the associated circuit.

The horizontal drive control is rotated usually to check faults such as low brightness, overdrive line(s) on raster, non-linearity, etc. Rotating the vertical hold control is important only when a picture is visible and a check is being made on the hold-in range. The width control also is checked mainly when there is insufficient width or a horizontal sweep trouble is evident in the picture and raster.

3. c

The symptoms point to trouble in the *age* circuit. As noted above, an over-contrasty picture on some active channels and a blank screen on others is caused by an excessive signal applied to the grid of the video amplifier stage. In sets where the plate of the video amplifier is not directly coupled to the cathode of the *crt* (*rc* coupling used), the symptoms may be no picture, normal raster on an active channel to a strong signal area. A complete loss of sound may also occur if the sound takeoff coil is in the plate of the video amplifier. When the sound takeoff is in the video detector circuit, sound is present on all channels but usually with a buzz.

Oscilloscope Checks

4. d

A number of precautions are advisable in making checks on *age* circuits.

In the first place, it is important to keep in mind that oscilloscope checks may be misleading if they are not carefully analyzed. For example, a correct waveshape is found at the plate of the keyer tube while the video signal at the control grid is obviously distorted (*Fig. 1*). This may seem to indicate that the trouble is in the video line connected to the grid of the keyer stage or in the preceding video section. However, the fact that a correct waveform appears at the plate of the keyer tube does not necessarily mean that there is no fault in the *age* bus. Many faults in the *age* bus do not affect the plate waveform but cause a loss of *age* bias. This loss of bias results in excessive video amplification which, in turn, causes a distorted video signal (or no video signal) to be applied to the grid of the keyer stage. In such cases, the defective video signal applied to the *age* tube grid is an *effect* of the basic trouble, not the *cause*.

This does not mean that oscilloscope checks are misleading for *age* troubles. They simply must be interpreted correctly. In this case, the scope definitely helped localize the trouble. It established the fact that the keyer pulse at the plate is normal while the video signal at the grid is abnormal, thereby ruling out the possibility that the trouble is caused by a fault in the horizontal keyer pulse input to the *age* stage. The checks therefore pointed to possible trouble in the *age* bus.

Pix Bend

In cases of picture bend or video pickup (lines in the picture, etc.), it is advisable to apply the oscilloscope to the *age* bus to check for the presence of hum, poor filtering of the *age* bias voltage, etc. Any *ac* component in the *age* line points to a defect in the *age* filter circuit or in components connected to this line.

AGC Voltage Analysis

In taking voltage checks around the *age* stage, an additional precaution should be kept in mind. Age voltage readings are most helpful when taken with a signal coming in; that is, with the set connected to an antenna and tuned to an active channel, even if the screen is blank and there is distorted or no sound output. A defective keyed *age* stage may have almost the same voltage readings as a normal stage with no signal coming in (set

[*Continued on page 27*]

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Contest is open to all service-men over 21 years of age residing in the continental United States. Employees of the TOBE DEUTSCHMANN CORPORATION and their advertising agency are excluded. All entries become the property of TOBE DEUTSCHMANN CORPORATION. Decisions of the judges are final. In case of ties, duplicate prizes will be awarded. Contest closes June 30, 1958. Winners will be announced July 31st.

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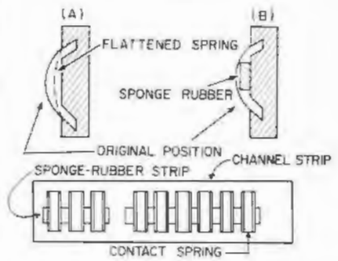
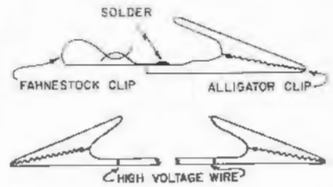
Shop Hints and Short Cuts

We would welcome hints and short cuts from our readers. ES will pay $5 for each hint used. Sorry, but we cannot be responsible for unaccepted material. In case of duplication, first received will be accepted.



After use, the contact springs in the Neutrode Tuner flatten out and are pushed into the upper groove, as shown in (A). The bottom part of spring is rivetted to the channel strip and connections. After the contact spring is brought back to the original position, a sponge-rubber strip, shown in (B), is placed under the contact springs. When the drum is revolved, the sponge-rubber is soft enough to allow a good wiping contact, and firm enough to push out the thin contact spring, between channels. Two pieces of sponge rubber are required. Each is ¾" wide, and ¼" thick.

H. H.
Brooklyn, N. Y.

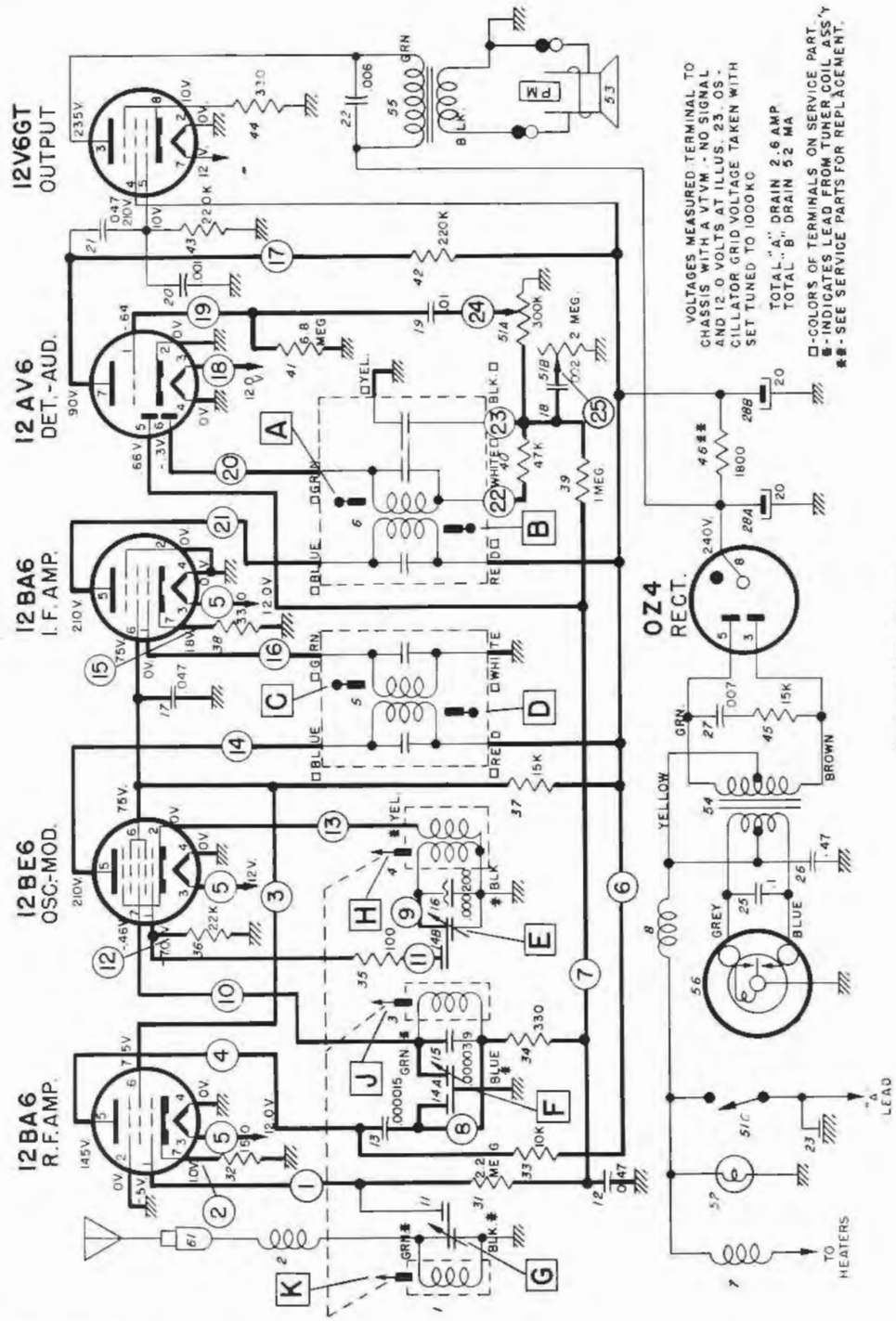


I frequently find it necessary to insert parts in a TV or radio chassis, temporarily, for test purposes. Soldering the part in is time consuming, but wrapping the pigtails is unreliable.

[*Continued on page 28*]

1958 STUDEBAKER MODEL AC-2905
1958 STUDEBAKER-PACKARD MODEL AC-2906
1958 STUDEBAKER-PACKARD MODEL AC-2907

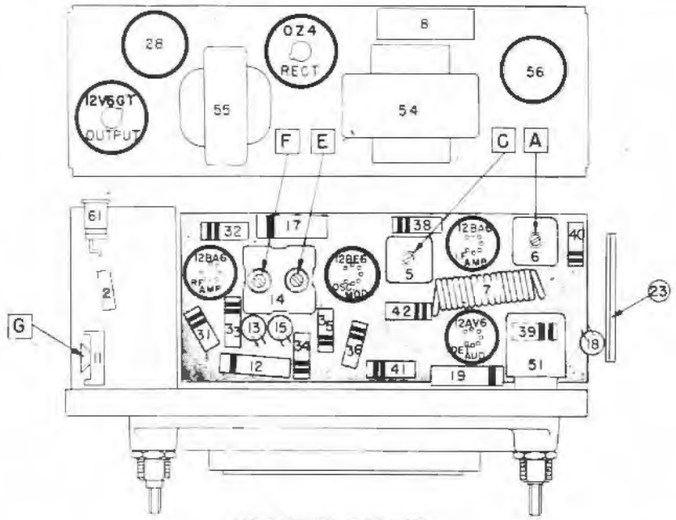
STUDEBAKER



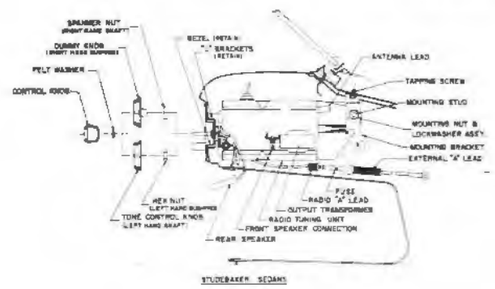
STUDEBAKER AC-2905

STUDEBAKER

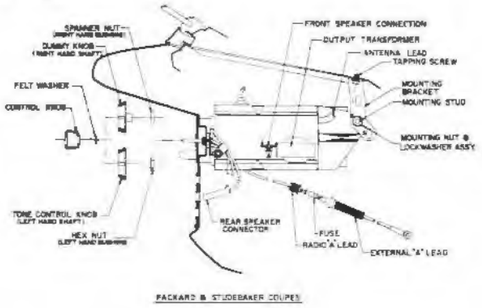
1958 STUDEBAKER MODEL AC-2905
1958 STUDEBAKER-PACKARD MODEL AC-2906
1958 STUDEBAKER-PACKARD MODEL AC-2907



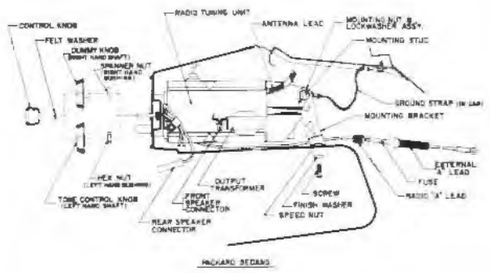
PARTS LAYOUT—TUBE VIEW



STUDEBAKER SEDANS



PACKARD & STUDEBAKER COUPES



PACKARD SEDANS

Suppression Equipment—

Generator capacitor (Part #1925118)
Voltage regulator capacitor (Part #1931648)
Ignition coil capacitor (Part #1931648)
Fuse, 7½ amperes (Part #455640)

Mounting—

These models are one unit sets with a separate speaker. The receiver unit is held in place by a mounting bracket at the rear of the set and the two control bushing nuts.

The speaker is held in place by four studs on the back of the instrument panel and four nuts and lockwashers.

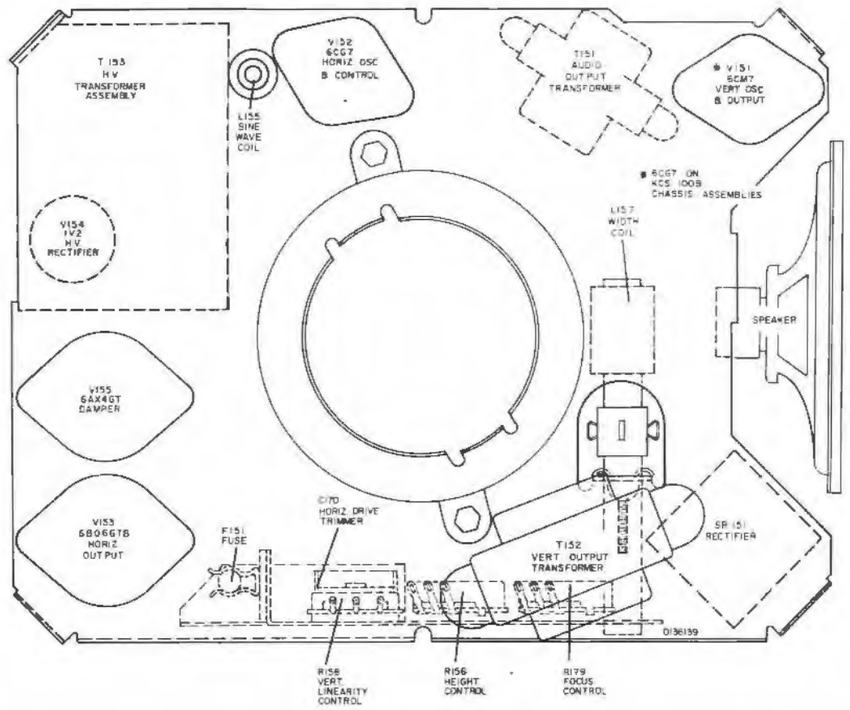
In removing the receiver, the glove box must be removed except on the cars which have the Fiberglass instrument panel, the speaker lead must be disconnected from the connector on the output transformer, and the "A" lead must be removed from the external "A" lead connector. Also disconnect the antenna lead-in from the connector next to the mounting bracket at the rear of the set.

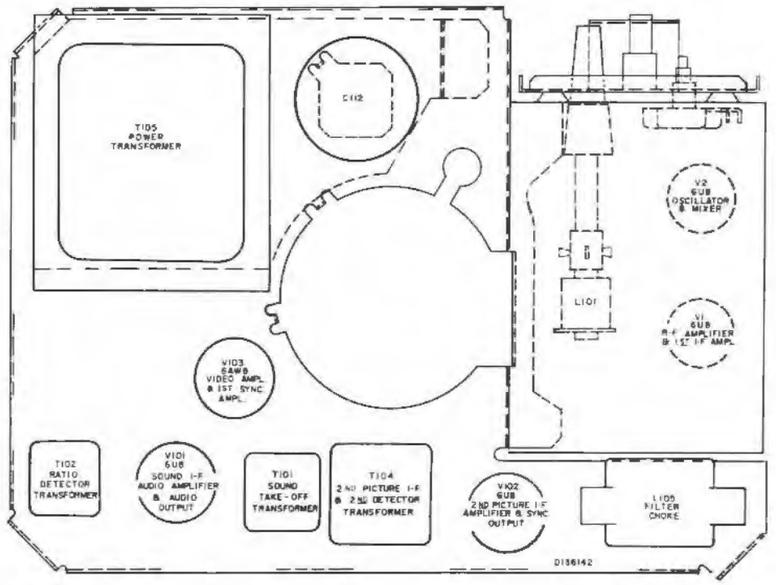
The antenna trimmer is located on the bottom of the receiver and may be adjusted through the hole in the top of the glove compartment.

FRONT CHASSIS WIRING VIEW

Chassis No. KCS100B, KCS100D or KCS100K

RCA

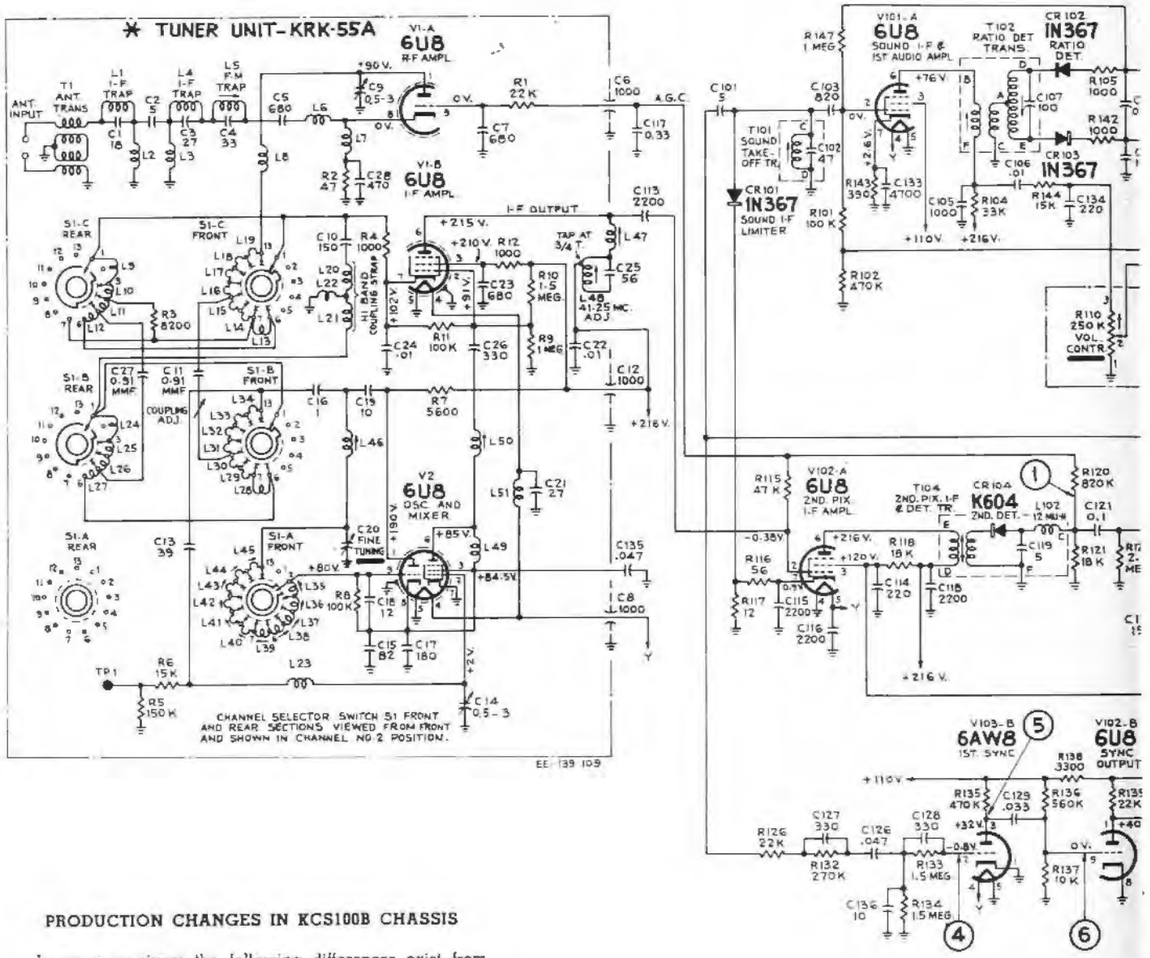




Rear Chassis (Tube side)

RCA

Chassis No. KCS100B, KCS100D or KCS100K



PRODUCTION CHANGES IN KCS100B CHASSIS

In some receivers the following differences exist from the latest schematic shown above:

C160 . . . connected to the junction of the Horizontal Yoke Coils L153 and L154 . . . was 68 mmf.

C175 . . . at terminal F of L157 Width Coil . . . was .033 mf.

R154 . . . at pin 6 of V151A Vertical Oscillator . . . was 1 megahm.

R157 . . . at the junction of C132 and C155 in kinescope screen circuit . . . was 15,000 ohms.

R165 . . . connected between L157 Width Coil and the red lead on T152 Vertical Output Transformer . . . was 8200 ohms.

Balloons ① ② etc., shown on schematic above, and on Figure 48, indicate points of observation of the waveforms

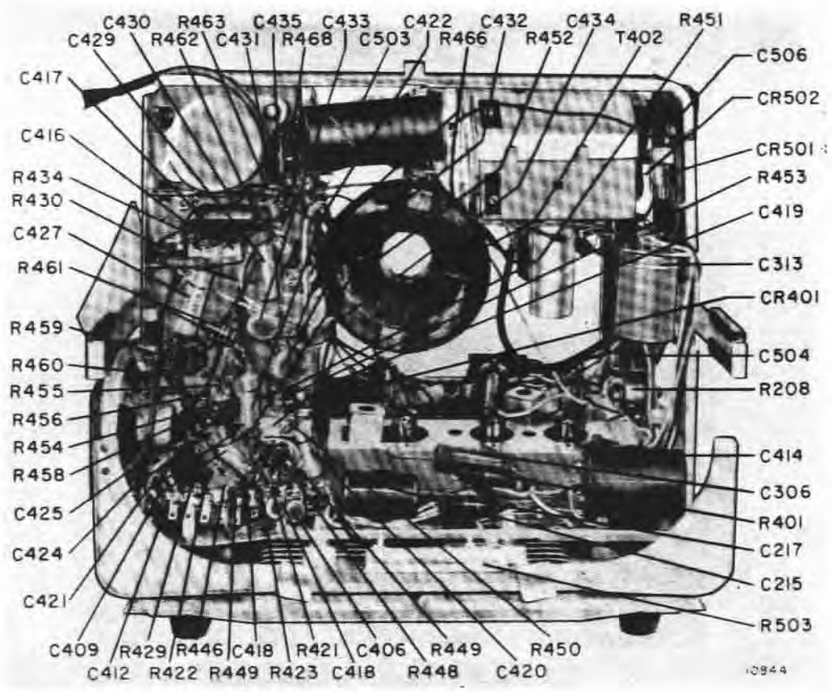
The schematic is shown in the latest condition at the time of printing.

All resistance value in ohms. K = 1000.

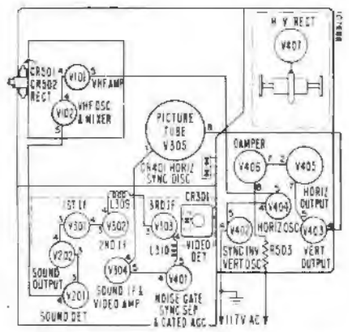
All capacitance values MF and above 1 in MMF noted

CHASSIS 16H1

ADMIRAL



Wiring Side of 14" Picture Tube Chassis.



TUBE LOCATIONS AND HEATER CIRCUIT

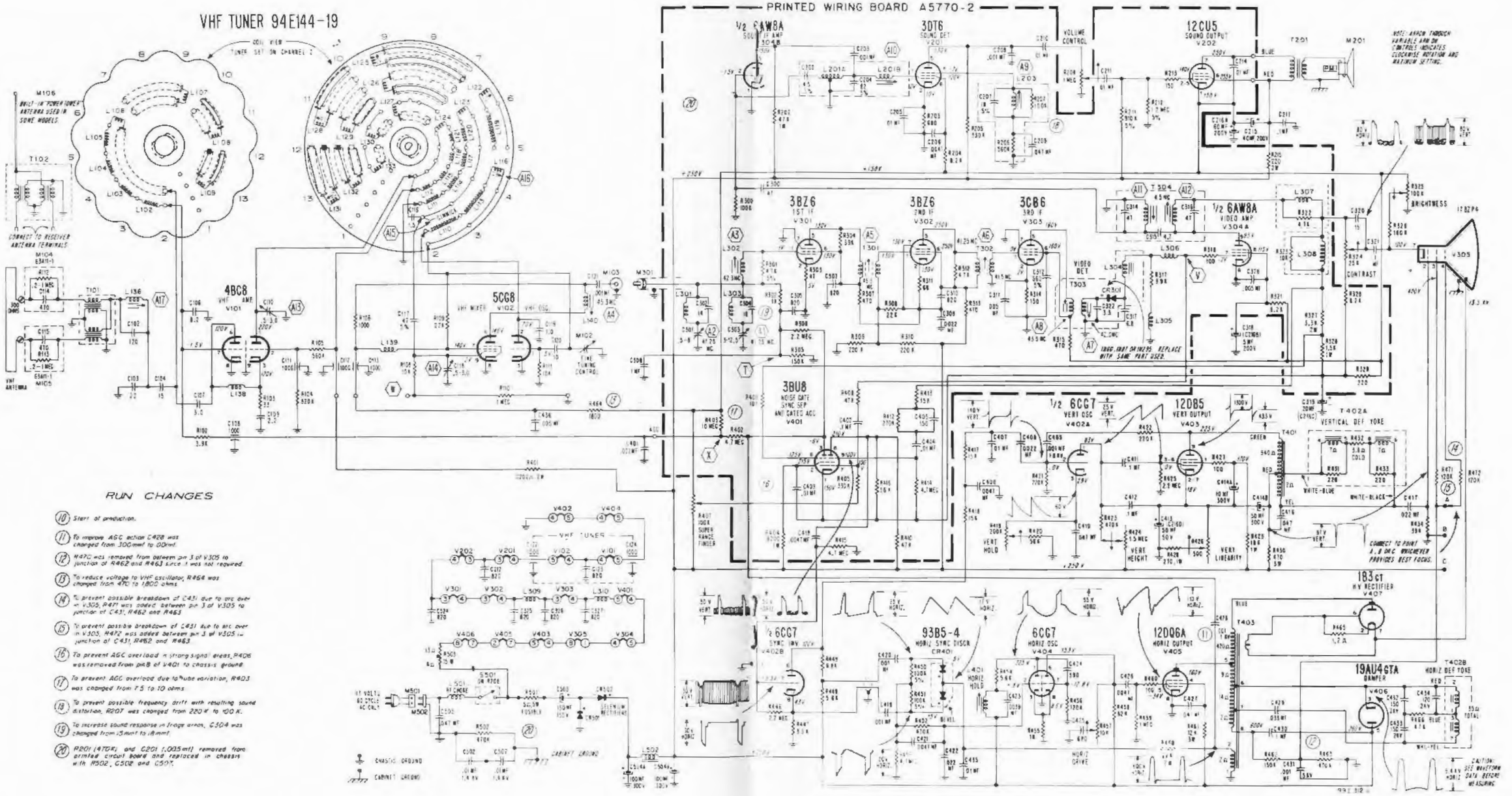
V101—4BC8
V102—5CG8
V201—3DT6
V202—12CU5
V301—3BZ6
V302—3BZ6
V303—3CB6
CR301—1N60, 1N87 or 1N295
V304—6AW8A
V305—14ASP4 or 14AVP4
CR401—Dual Selenium Diode 93B5-4
V401—3BU8
V402—6CG7
V403—12DB5
V404—6CG7
V405—12DQ6A
V406—12AX4GTA
V407—1B3GT

REMOVING CHASSIS FROM CABINET

The cabinet enclosure of these receivers consists of a cabinet wrap-around (shell) bottom plate, front bezel and masonite back. The chassis, speaker and picture are mounted as a complete assembly to the bottom plate of the cabinet.

To remove the chassis from the cabinet, proceed as follows:

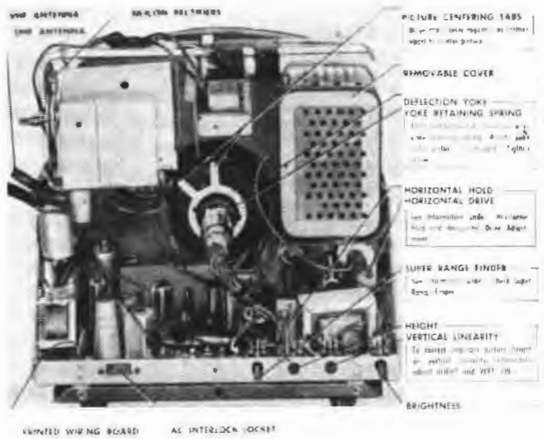
1. Remove tuning knobs at side of cabinet.
2. Remove cabinet back, using care so as not to damage interlock socket or plastic shaft of **Horizontal Lock** control.
3. Remove picture window and bezel after removing screws at sides and bottom of bezel. Pull bottom of bezel away from cabinet. Lift up to free top of bezel from cabinet.
4. Remove top cabinet mounting screw located below carrying handle.
5. Remove reinforcing brackets at top corners of cabinet.
6. Disconnect antenna connector leads from plug-in terminal at top of tuner.
7. Remove cabinet wrap-around after removing screws which mount it to the bottom plate of cabinet.
8. To remove bottom plate from chassis, remove screws which mount it to chassis bottom. **Caution:** Do not allow bottom surface of chassis (printed wiring) to come in contact with metal bench, tools or metal chips which may be lying on surface of bench.
9. To reassemble chassis in cabinet, follow above procedure in reverse order.



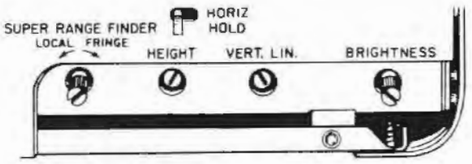
Schematic for 16H1 Television Chassis Stamped Run 10 through 20.

ELECTRONIC SERVICING COMPLETE MANUFACTURERS SCHEMATICS. A service of Cowan Publishing Corp.

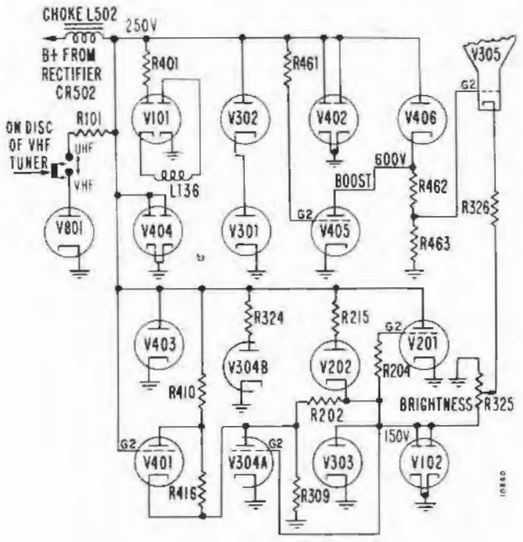
ADMIRAL CHASSIS 16H1



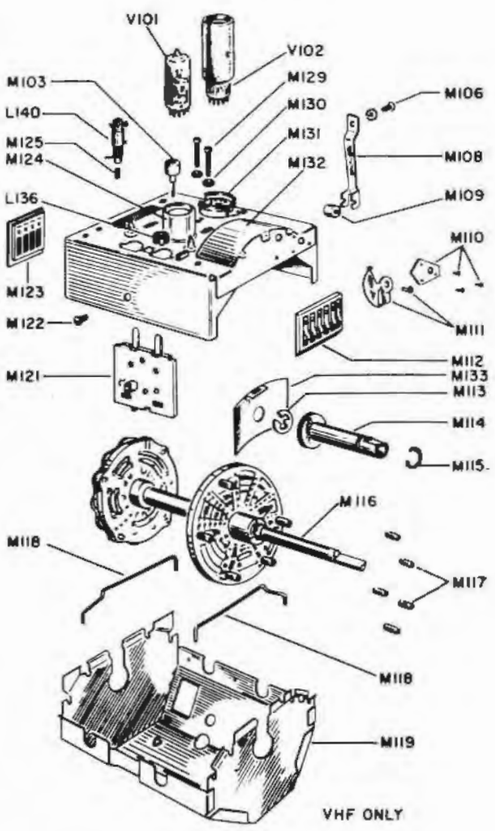
Rear View of 14" Picture Tube Sets Showing Adjustment Locations. UHF Antenna Terminals in VHF-UHF Sets Only.



Auxiliary Controls at Rear of 14" Picture Tube Sets.



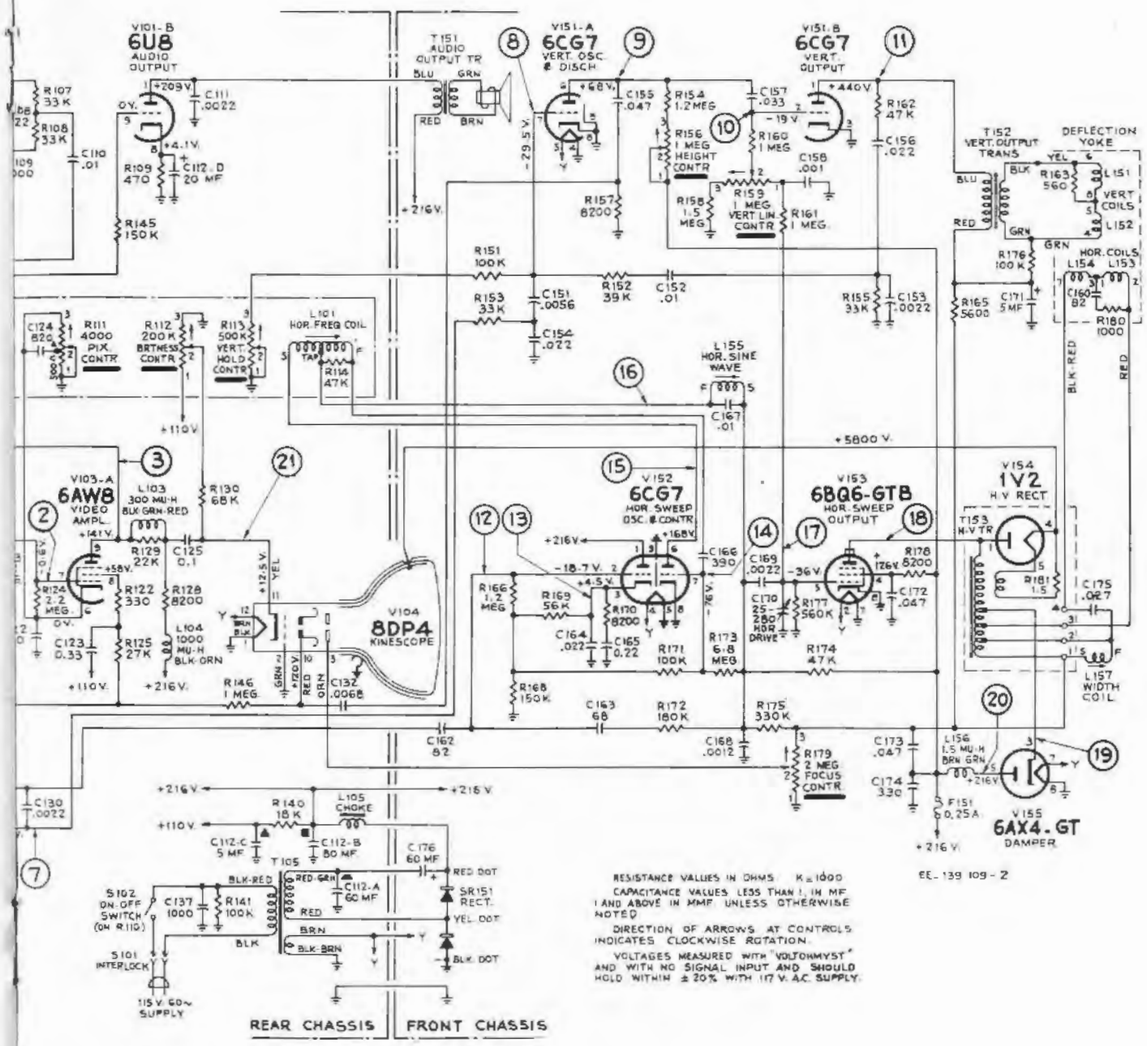
Simplified B+ Distribution Diagram for VHF-UHF Receivers.



Exploded View of VHF Tuner 94E144-19.

To replace a picture tube, proceed as follows:

1. Remove cabinet back, front bezel and cabinet wrap-around as instructed under separate heading on "Removing Chassis From Cabinet".
2. Remove static charge from picture tube by discharging second anode well to chassis ground with an insulated wire lead or screwdriver.
3. Disconnect the second anode lead and picture tube socket.
4. Loosen mounting clamp at rear of deflection yoke cap by loosening screw or nut on clamping band.



CIRCUIT SCHEMATIC DIAGRAM KCS 100B

less than 1 in unless otherwise

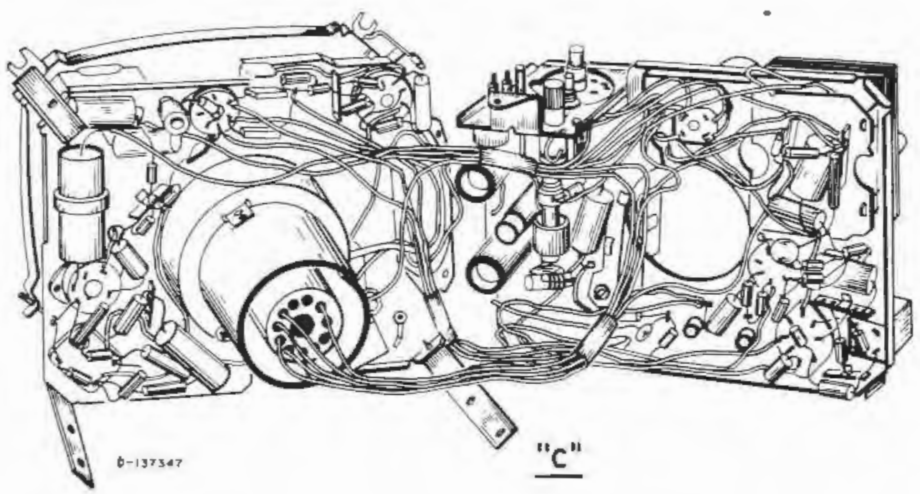
Direction of arrows at controls indicates clockwise rotation

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

ELECTRONIC SERVICING COMPLETE MANUFACTURERS SCHEMATICS A service of Cowan Publishing Corp.

RCA

Chassis No. KCS100B, KCS100D or KCS100K



Chassis Removal

CHASSIS REMOVAL.—The chassis must be removed from the cabinet to replace tubes or the kinescope and to perform certain adjustments as explained above.

Models With Attached Stand

Take the receiver off its stand and completely remove the two knurled screws at the sides of the cabinet. Never attempt to remove the chassis unless these two screws are completely removed, as their projection inside the cabinet may result in internal damage as the chassis is pulled from the case. See Figure 2A.

All Models

Remove the knobs on the controls located in the cover and case assembly and take out the three screws holding the assembly to the cabinet. Their location is indicated at "A" in Figure 2A. Lift the control case and cover directly upward to remove.

Take off the carrying handle by removing the two screws at the ends of the handle. Also, remove the screw at the bottom front edge of the receiver case. These three screws are indicated at "B" in Figure 2A.

The antenna lead must be internally disconnected on the following models before removing the chassis from the cabinet: Models 8-PT-7010, 8-PT-7011, 8-PT-7012 and 8-PT-7014.

Remove the plate to which the antenna terminal board is fastened. Pull the clips at the end of the antenna lead off the terminals on the rear of the antenna or terminal board assembly.

On all models not listed above, the antenna will automatically disengage as the receiver chassis is removed from the cabinet.

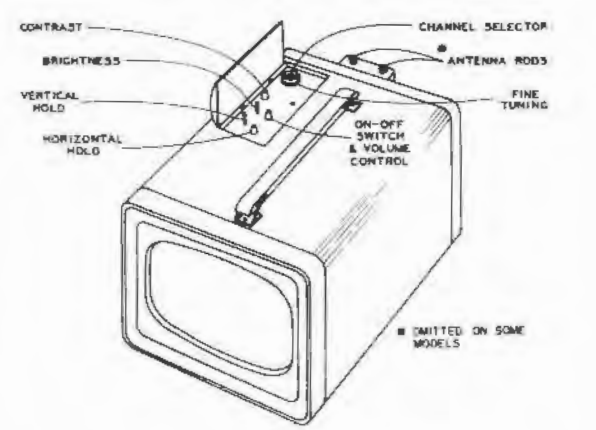
Slide the chassis assembly, which includes the front frame and kinescope, out of the receiver cabinet. The A.C. interlock will automatically disengage as the chassis is removed.

CHASSIS SERVICING.—Adjustment of the yoke position, centering magnets and the ion trap magnet may be made with the chassis completely assembled. The location of these adjustments is shown in Figure 4.

Replacement of the tubes in the tuner section requires removal of the speaker. To remove the speaker, loosen the speaker clamp screw shown in Figure 4 and slide the speaker out of its clamp. This will allow room to make tube replacement in the tuner unit.

Service which requires circuit tracing or voltage measurements must be performed with the front and rear chassis sections separated. To do this, remove the six (6) self-tapping screws holding the front and rear chassis sections together. See Figure 2B. The positions of the insulating boards should be noted for replacement when reassembling the chassis.

Unplug the kinescope socket and slide the rear chassis section off the end of the kinescope neck. Turn the chassis around making the bottom wiring side visible. Slip the kinescope socket leads out of the hole in the chassis, through which they are normally dressed, and pass the socket through the large opening in the chassis and reconnect to the kinescope. With the chassis in this position, which is shown in Figure 2C and Figure 3, all points will be accessible for servicing. Greater separation of the two chassis sections may be accomplished by the use of a short extension cable for the kinescope leads if desired.



Receiver Operating Controls

DU MONT

RA-378/379 AMPLIFIER SCHEMATIC
RA-379 AM RADIO SCHEMATIC

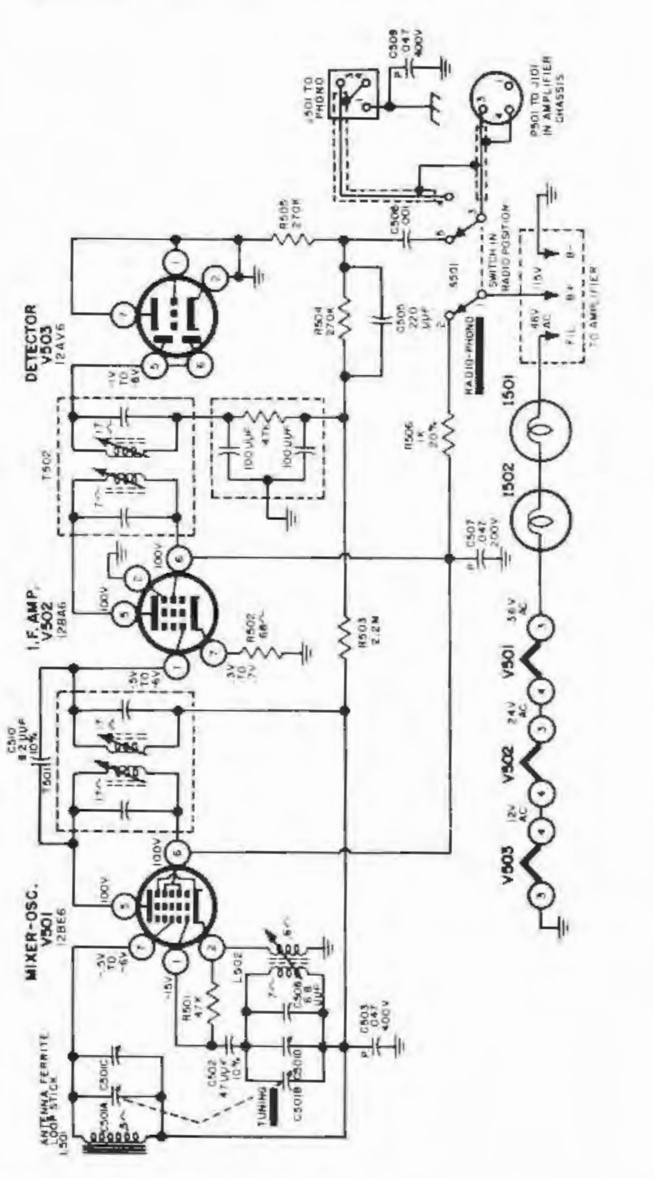
Resistance Measurements

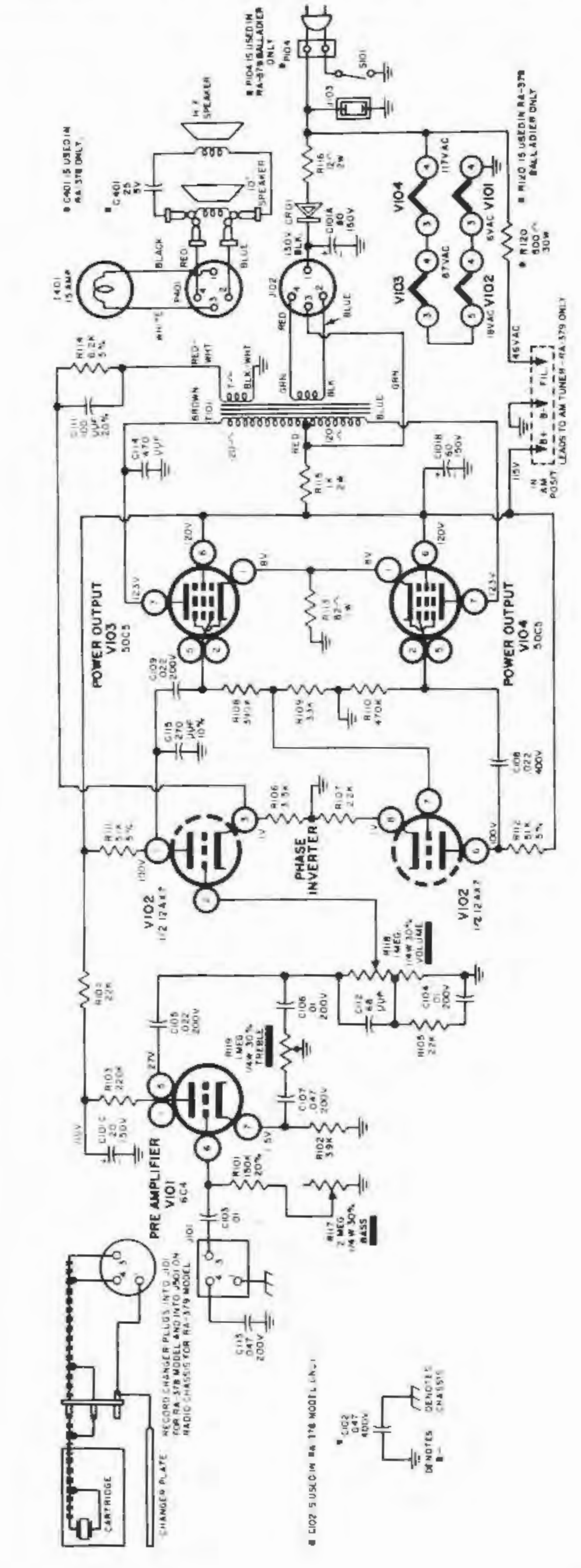
All Readings to B—

	1	2	3	4	5	6	7	8	9
V101	INF	INF	8	0	INF	150K 2.2M	3.9K		
V102	INF	0.1M	2.2K	8	20	INF	33K	2.2K	NC
V103	82	420K	20	65	470K	INF	INF		
V104	82	470K	65	110	470K	INF	INF		
V501	47K	8	35	25	INF	INF	2.7M		
V502	2.7M	0	25	13	INF	INF	68		
V503	0	0	0	13	580K	580K	0		

The above resistance readings were taken with an RCA model WV97A VTVM. All readings are in ohms, K = 1000, M = 1 million

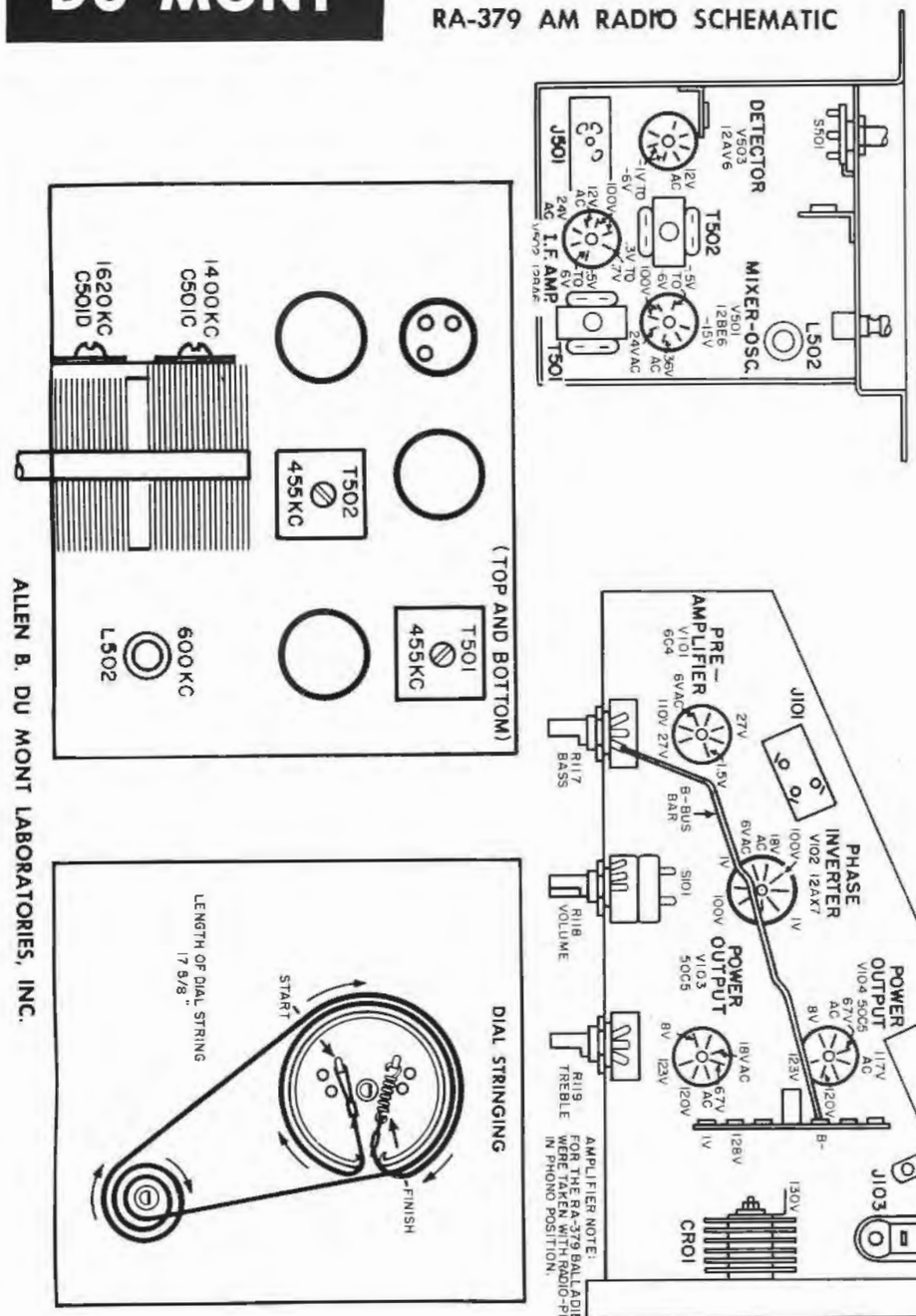
NOTE: RA-379 measurements of V101 to V104 were taken with the Radio-Phono switch in the Phono position. V501 to V503 were measured with the switch in the Radio position.





DU MONT

RA-378/379 AMPLIFIER SCHEMATIC
RA-379 AM RADIO SCHEMATIC



ALLEN B. DU MONT LABORATORIES, INC.

Mfr: Motorola Chassis No. TS422

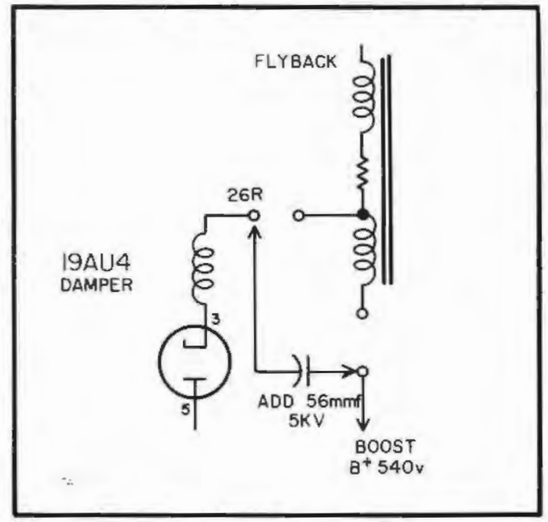
Card No: MO-422-1

Section Affected: Raster

Symptoms: Insufficient width.

Reason For Change: To increase width.

What To Do: Connect a *56 mmf 5KV* condenser across lugs 26R and 27R of the fly back transformer.



Mfr: Motorola Chassis No. TS422

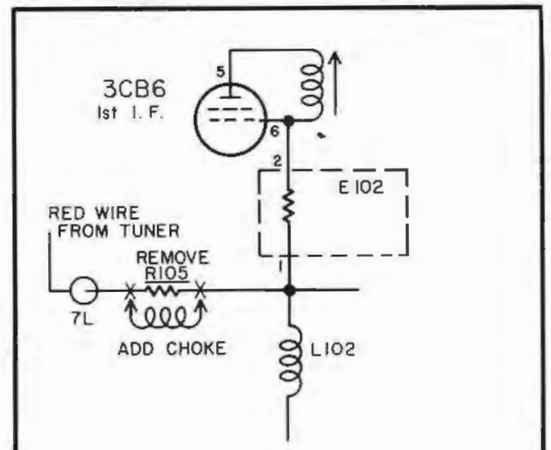
Card No: MO-422-2

Section Affected: Pix

Symptoms: Poor sensitivity

Reason For Change: To improve sensitivity by increasing voltage at tuner.

What To Do: Change *R105, 1K*, to a .52 microhenry choke, part #24K730391.



Mfr: Motorola Chassis No. TS422

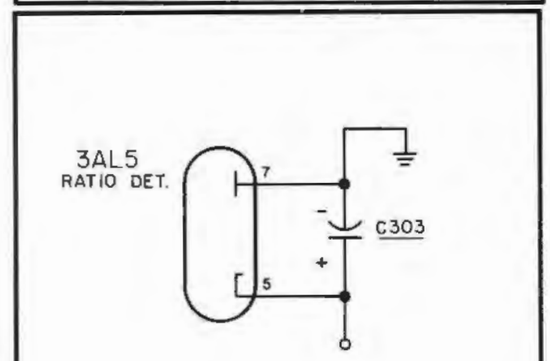
Card No: MO-422-3

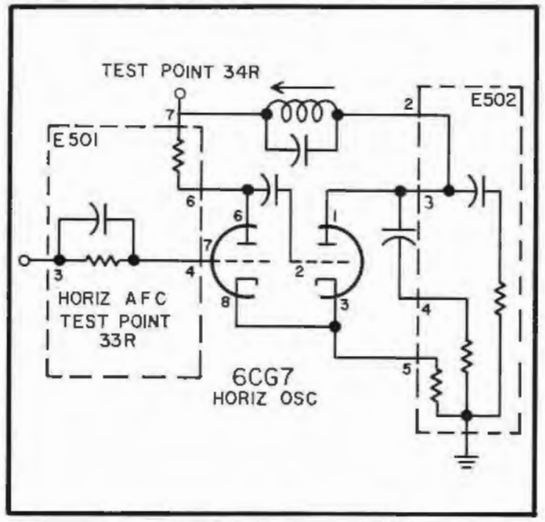
Section Affected: Sound

Symptoms: Distortion, weak sound.

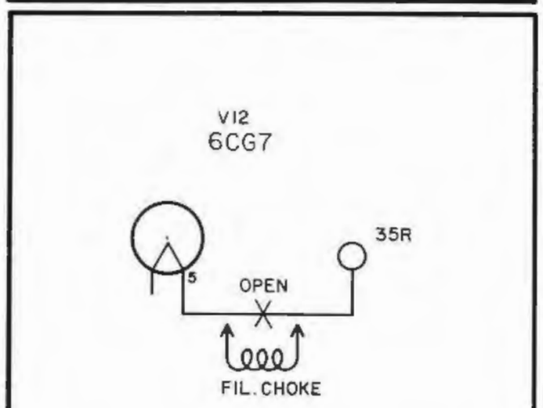
Cause: Open filter condenser, *C303*, in ratio detector.

What To Do: Replace *C303, 10 mfd, 50V*.





Mfr: Motorola **Chassis No.** TS422
Card No: MO-422-4
Section Affected: Horizontal sync.
Symptoms: Hold control effective for less than 50° of rotation.
Cause: Improperly adjusted horizontal *afc* circuit.
What To Do:
1. Set all controls for a normal picture.
2. Short out *afc* control voltage with jumper from test point 33R to ground.
3. Connect .1 condenser from test point 34R to ground.
4. Adjust front panel hold control for almost stationary picture.
5. Remove .1 cond. Adjust oscillator coil to center of range in which picture almost remains in hold.
6. Remove short from *afc* voltage at 33R and adjust front panel hold control so that there is no foldover on either side.



Mfr: Motorola **Chassis No:** TS422

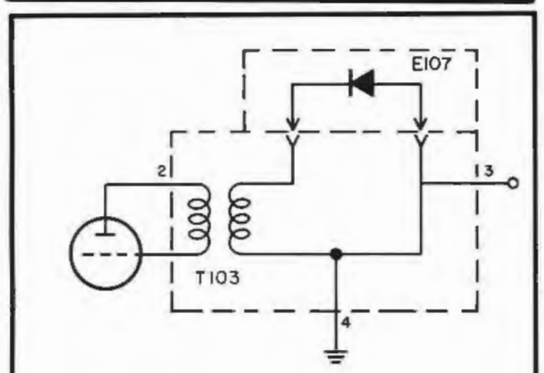
Card No: MO-422-5

Section Affected: Pix

Symptoms: Herringbone pattern.

Cause: *IF* interference.

What To Do: Add a filament choke, part #24K730391, between pin 5 of V12 6CG7 and 35R. This is effective only in sets with *uhf* tuner.



Mfr: Motorola **Chassis No:** TS422

Card No: MO-422-6

Section Affected: Pix

Symptoms: Negative pictnre. Unstable sync.

Cause: Defective crystal detector.

What To Do: Replace plug in crystal *E107* mounted on transformer *T103*.

Mfr: Westinghouse **Chassis No.** V2382

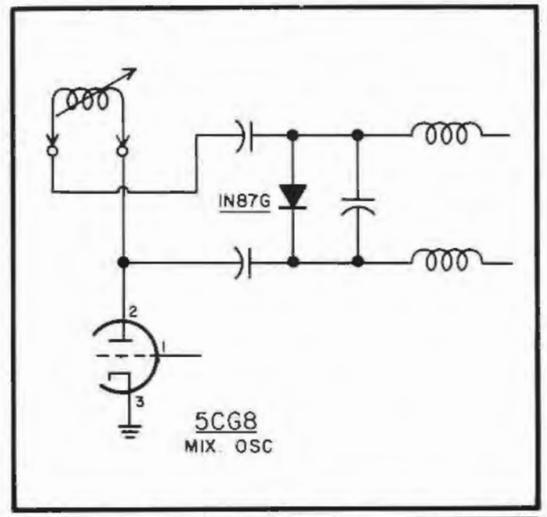
Card No: WE-V2382-1

Section Affected: Fine tuner.

Symptoms: Manual fine tuner inoperative.

Cause: Defective crystal *X100*.

What To Do: Replace crystal *X100* a 1N87G.



Mfr: Westinghouse **Chassis No.** V2382

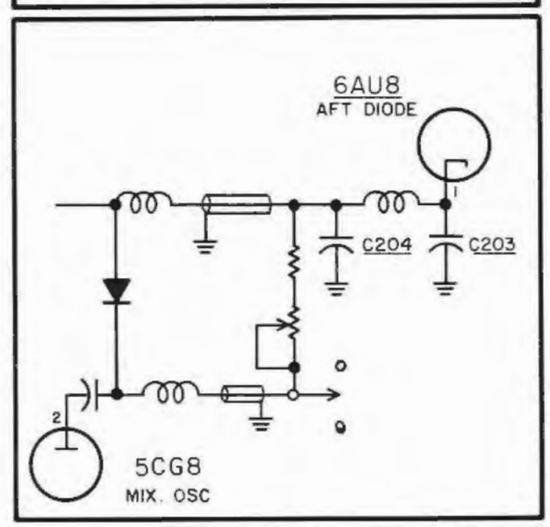
Card No: WE-V2382-2

Section Affected: Fine tuning.

Symptoms: No manual fine tuning. Replacement crystals are blown out.

Cause: Short on the anode side of *AFT* crystal may be *C118, C204*, or filament to cathode short in 6AU8.

What To Do: Check for filament to cathode leakage in 6AU8 AFT diode. Check *C118, 800 mmf.* feed through condenser on tuner and *C204, .001 mfd.*



Mfr: Westinghouse **Chassis No.** V2382

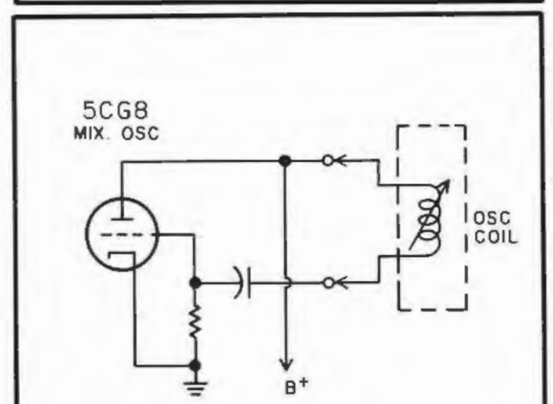
Card No: WE-V2382-3

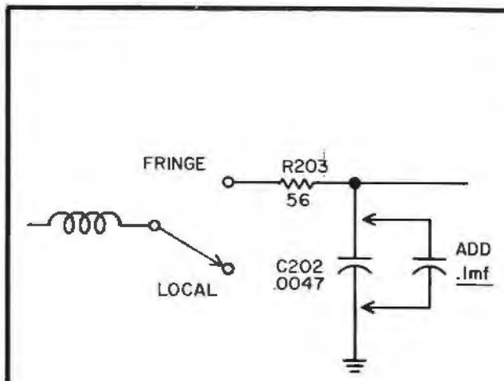
Section Affected: Automatic fine tuning.

Symptoms: *AFT* remains locked on same channel when the next channel is selected.

Cause: Tuner oscillator setting is improper.

What To Do: Readjust oscillator slug for desired channel.





Mfr: Westinghouse **Chassis No.** V2382

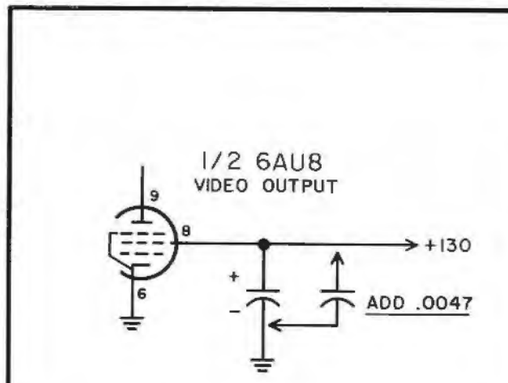
Card No.: WEV-2382-4

Section Affected: Pix

Symptoms: Streaking in picture.

Cause: Local—Fringe switch, on program wheel, in fringe position.

What To Do: Change Local—Fringe switch to local position if possible. If switch must be in fringe position add a *.1 mfd. 400V* condenser as indicated in diagram. Place the condenser on the terminal strip below the tuner.



Mfr: Westinghouse **Chassis No.** V2382

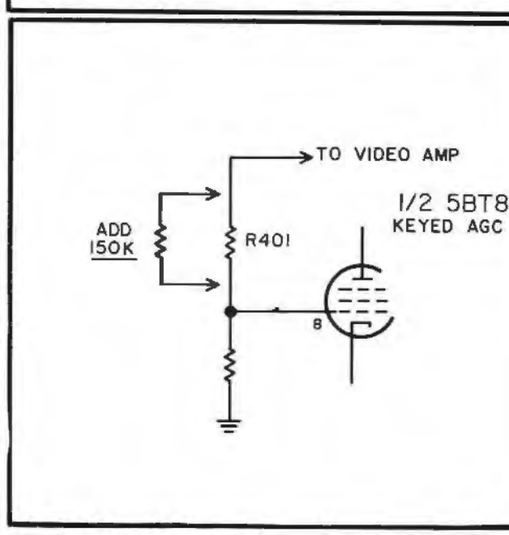
Card No: WE-V2382-5

Section Affected: Pix

Symptoms: Herringbone interference patterns generated internally. (Called tweets).

Reason For Change: To eliminate interference patterns.

What To Do: Add a *.0047 mfd. 400V* from the low B plus to B minus. The most effective point to place the condenser is at the screen of the video amplifier.



Mfr: Westinghouse **Chassis No.** V2382

Card No: WE-V2382-6

Section Affected: Pix

Symptoms: Negative pix, erratic sync and excessive contrast.

Cause: Local—Fringe switch in fringe position.

What To Do: Switch to local position (switch is on program wheel). If overload occurs in local position shunt a *150K* resistor across R401.

LOOKING FOR TROUBLE?

[*from page 9*]

tuned to an inactive channel). But with a signal coming in, the defective portion of the stage is usually much more obvious for many types of troubles. This is illustrated in the following figures for the keyed *age* stage with the given trouble in it compared to the normal readings.

V7 Voltage Readings (No Signal)

	Faulty Stage	*Normal Stage*
Plate	0.6 v	0.6 v
Screen	465 v	465 v
Control grid	122 v	122 v
Cathode	146 v	146 v

V7 Voltage Readings (With Signal)

	Faulty Stage	*Normal Stage*
Plate	0.6 v	–12 v
Screen	465 v	465 v
Control grid	146 v	128 v
Cathode	146 v	146 v

Obviously, on the basis of the voltage readings above, the most glaring discrepancies are in the plate and control grid circuits of the keyer stage. Trouble is indicated in the *age* keyer bus, which is connected to the plate circuit, since a normal keyer pulse was observed at the plate. Since the voltage checks with an incoming signal show a complete loss of *age* bias at the plate of the keyer tube, this would account for the higher than normal voltage at the control grid. Loss of *age* bias causes excessive video signal at the grid of the video amplifier stage which almost cuts off the tube and raises its plate voltage. This higher voltage is direct-coupled to the control grid of the keyer tube.

Where low negative voltage readings are measured at the plate of the keyer stage, further voltage readings are taken at various points along the *age* bus. This may localize the point in the bus where the trouble is located.

If a low positive voltage is measured on the *age* bus, this is usually caused not by a fault in the *age* circuit proper but in a component connected to the *age* bus—such as a defective *rf* or *if* amplifier tube (control grid to screen grid short, etc.), a leaky coupling capacitor (plate to control grid of a controlled stage) or similar trouble. This type of trouble can usually be tracked down by spot voltage checks along the *age* bus or, if necessary, by opening the *age* line at various points to find where the trouble is originating.

AGC Resistance Analysis

5. a

The resistance readings point definitely to a shorted capacitor *C49*. The reading at test point 7 is 2.9K because *R36* is effectively in parallel with *R35* since *C49* is shorted. To verify this, a further resistance check is made across *C49* with one end disconnected. The capacitor was found shorted.

A shorted *C48* would have caused a zero resistance reading at test point 7. The other choices listed would also have resulted in different resistance readings than those listed. A short across *R34* would have shown readings of 30K and 27K at the keyer plate and test point 7 respectively. An open *R35* would have resulted in very

[*Continued on page 32*]

Video Detector Voltage	AGC Bus Voltage	Possible Fault
Approx. –5 v	–3 to –7 v	Normal
Excessive°	Very low or zero	Fault in *age* bus (*age* filter network), age stage, or loss of horizontal keyer pulse input to keyed *age* stage
Excessive°	Positive voltage	Defective *rf* or *if* amplifier tube, leaky coupling capacitor connected to control grid of an *age*-controlled stage
Low or zero	Excessive°	Caused by loss of bias in keyed *age* stage itself: defective keyer tube; video amplifier fault causing too high a voltage applied to keyer tube control grid; defect in keyer tube cathode circuit

° *Negative voltage too high*

Table 1—Analysis of age troubles based on age-detector voltages.

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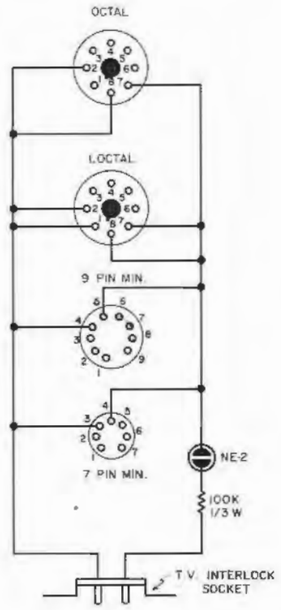
SHOP HINTS

[*from page 10*]

To solve this problem I keep a half dozen combined alligator and fahnestock clips on hand. These can be assembled simply by flattening the wire end of the alligator clip in a vise and soldering a fahnestock clip to the alligator clip.

A piece of high voltage wire (from 4" to 15" long) with an alligator clip at each end is also a handy device for extending the high voltage lead when a set is on the bench. Insulated sleeves may be placed over the clips for greater safety.

B. T.
Brooklyn, N. Y.

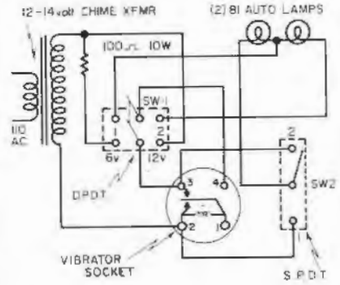


A tube filament and continuity tester that can be built from "junk box" parts is shown above. It can be assembled in a box as small as ⅜" x 5" x 2". If a pair of pin jacks are connected to pins 2 and 7 of the octal socket, the unit may also be used as a continuity tester.

R. P.
Plattsburg, N. Y.

A quick and easy way to locate noisy components, tubes and solder connections in a radio is to feed in an unmodulated *rf* signal from a signal generator. With the radio tuned to this signal, tap and probe the chassis with a non-metallic probe such as a plastic knitting needle. I have been using this system for many years and find it a real time saver.

L. C.
Newton, Miss.



Either 6 or 12 volt vibrators may be tested with the circuit, shown above. Switch SW-1 in position #1 is for 6 volts and in position #2, which uses the full secondary voltage, is for 12 volt vibrators. Switch SW-2 in position #1 will light the auto lamps using the transformer voltage. One bulb lights in the 6 volt position and both in the 12 volt position of SW-1. When SW-2 is in position #2 the lamps are lighted through the vibrator action. If the vibrator is in good condition the lamps will light with the same intensity as in position #1. A weak vibrator will cause a fluctuating light while a defective vibrator will prevent the lamps from lighting at all.

H. H.
N. Y. C.

When any tools become magnetized, they may be demagnetized with a soldering gun. Simply insert the tool through the loop of the soldering gun, pull the trigger and slowly withdraw the tool from the loop.

S. C.
E. Bradenton, Fla.

It says E equals I times R.

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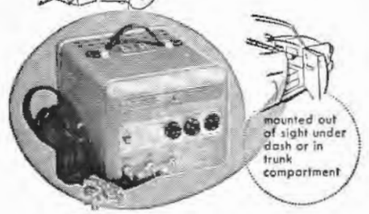

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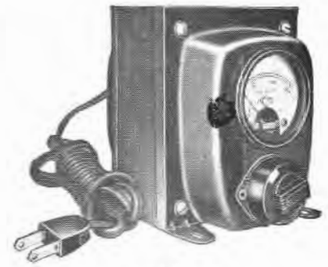

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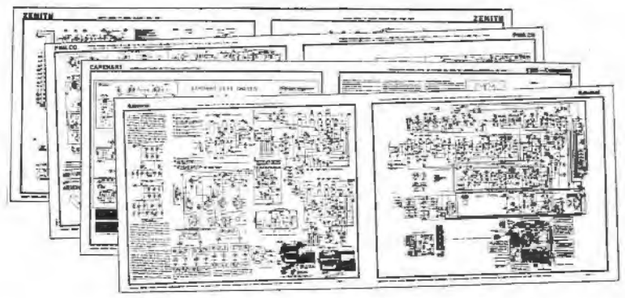

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ANSWERMAN

[*from page 5*]

Dear Sir:

I have an Admiral chassis 18XP4BZ which worked fine in the original location. When the customer uses it at his resort bungalow it develops a horizontal jitter. I appreciate that the receiver is being operated in a weak signal area and therefore may not work as well as in the city but he would like to use it at the bungalow and therefore wants to improve its weak signal performance. The noise in the area is high as he is just off a heavily traveled highway. The ignition noise seems to particularly affect

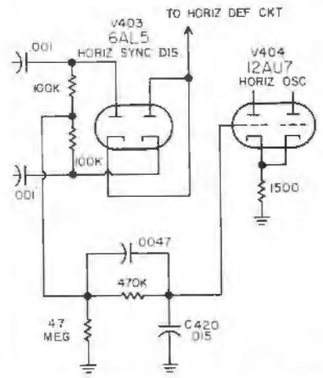

Fig. 3—Increased value of C120 improves noise immunity.

the horizontal lock-in of the picture making it quite unstable. What I would like to know is whether there is anything you can recommend for me to do to improve the horizontal sync action for operation in this weak signal area.

S. D.
Washington, D. C.

An improvement can be achieved in the horizontal sync action in the receiver by changing the filter condenser in the grid circuit of the multivibrator circuit shown in *Fig. 3*. This condenser, *C420*, for normal operation is *0.015 uf*. The value of the condenser can be increased from the original capacitance shown as *0.015* to *0.047 uf*. If an even further increase is desired the capacitance can further be increased to *0.1 uf* without causing a detrimental affect in its operation in weak signal areas. However, the condenser should not be increased in value if the receiver is to be used in strong signal areas as it may possibly produce bending in the picture.

Dear Sir:

I have an Emerson chassis 120380H which has a horizontal drive line that I can't remove. The receiver does not have a drive trimmer and works quite well on normal line voltage, but the customer has a very high line voltage which provides the horizontal oscillator and horizontal output stages with higher than normal B plus voltages. This most probably causes the drive line in the picture. I believe I can reduce the B plus voltage in some way but I thought I'd rather have your opinion first on how to remove the drive line before I made any changes.

E. M.
Philadelphia, Pa.

Although there are a number of methods from which you could choose to remove a horizontal drive line perhaps one of the best is to install a control which will permit adjusting the circuit for its elimination. This modification can easily be incorporated by

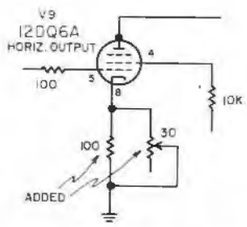

Fig. 4—Circuit modification to help eliminate drive lines.

installing a 30 ohm potentiometer in parallel with a 100 ohm, ½ watt resistor in the cathode circuit of the horizontal output 12DQ6A tube. The control permits positive adjustment of the stage and is usually adjusted to the position where the vertical bar is just removed from the picture tube presentation.

Dear Sir:

Is there anything I can do to reduce the accumulation of dust on the faces of picture tubes? In some locations picture tubes cloud up in a very short time. My customers rightly object to paying for a service call just to have the face of the picture tube cleaned. Is there a coating that can be used to help reduce this collection of dust on the picture tube face?

Pittsburgh, Pa.
S. P.

Some technicians have found that the spray they use for anti-static purposes on record players can also be helpful in such instances. Anti-static spray is usually available from electronic distributors. ■ ■

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LOOKING FOR TROUBLE?

[*from page 27*]

large resistance readings to ground (through *R37*, *R89*, *R150* and the electrolytic capacitors of the medium voltage power supply). An open *C46* would have had no effect on the normal resistance readings of the circuit.

AGC Servicing Hints:

1. When there is any doubt if the trouble is in the *agc* circuit, measure the *dc* voltage at the video detector load and on the *if agc* line (with the set tuned to an active channel). The reading at the video detector load should be approximately –5 volts and about –3 to –7 volts on the *agc* line. Incorrect voltages measured at these points indicate various kinds of trouble as outlined in Table 1.

2. A quick check to localize trouble in a keyed *agc* stage is to short the control grid to the cathode of the keyer tube just long enough to measure the negative *dc* voltage which is developed at the keyer tube plate. Shorting the two pins together allows the tube to conduct throughout the keyer pulse instead of only when the horizontal sync pulses of the composite video signal are applied to the control grid. In a normally-operating stage with this cathode-grid short, the negative voltage at the keyer tube plate should measure about –40 to –70 volts. If this voltage is present, the trouble is probably in the input video line connected to the grid of the keyer tube. If the negative voltage is too low or not present, the trouble is either a fault in the horizontal pulse input to the keyer tube, the keyer stage itself or the *agc* bus.

3. In checking tubes for *agc* troubles, don't overlook *agc* diodes which may be part of a multi-purpose tube and located in some other section of the chassis. The *agc* diode, when used, is often found in combination with the 1st audio amplifier.

4. In particularly difficult *agc* troubles, a bias box can be connected to the *agc* bus while the *agc* stage is disconnected from the circuit. If the set operates normally, the *agc* bus is probably good, and either the *agc* stage or one of the input lines to the *agc* stage is defective. If the set is still abnormal, the trouble is most likely in the *agc* bus. ■■

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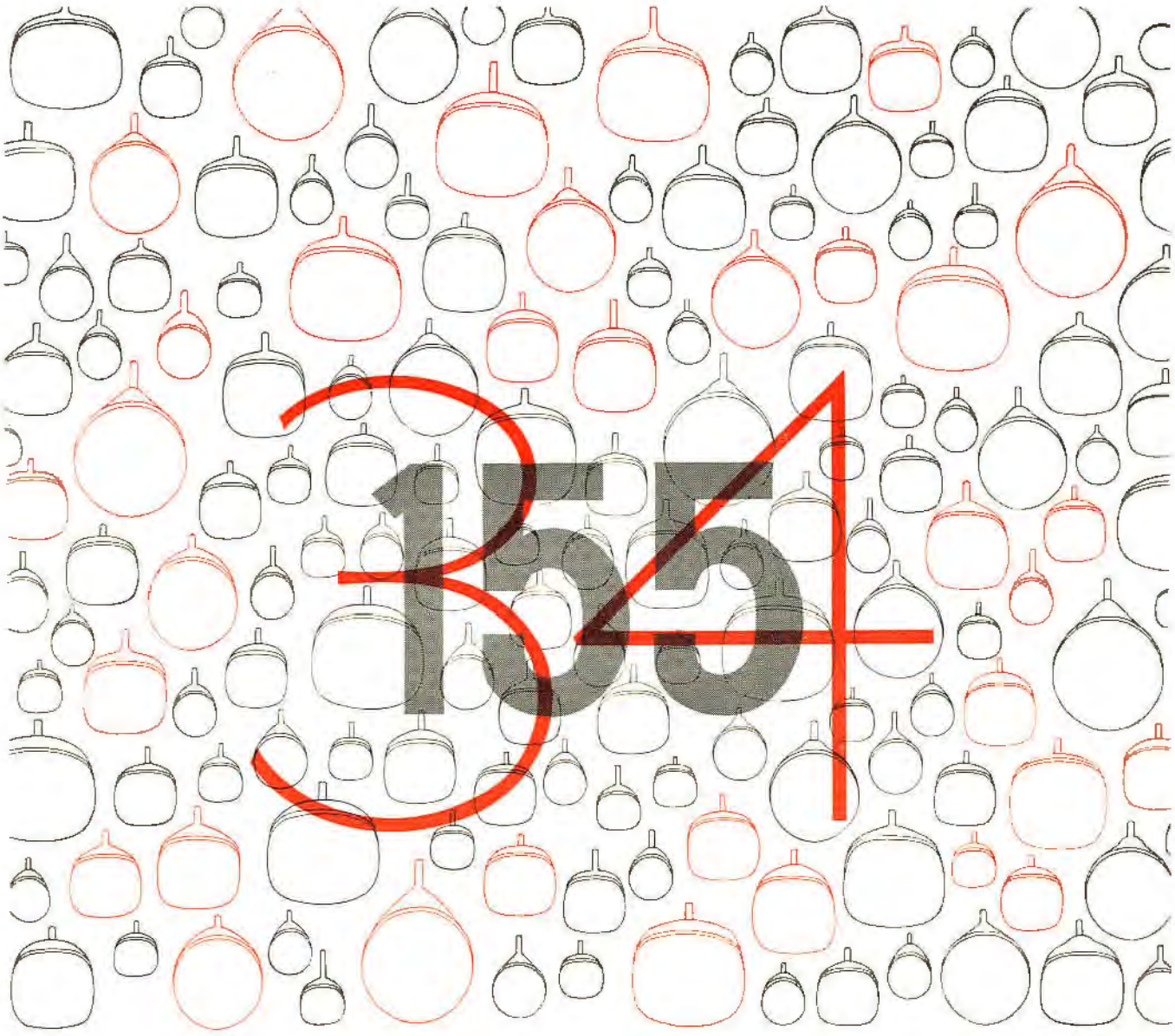

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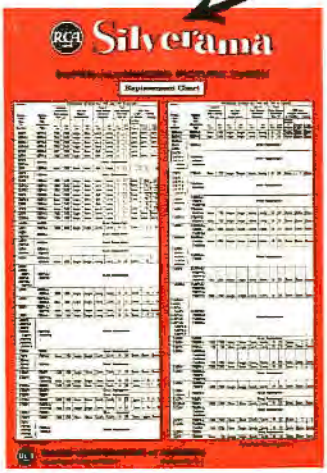

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