This SECTION applies to the following models:

4H15S or SN	4H137S or SN	4H167S or SN	30A12
4H16S or SN	4H145S or SN	30B15S or SN	30A13
4H17S or SN	4H146S or SN	30B16S or SN	30A14
4H18S or SN	4H147S or SN	30B17S or SN	30A15
4H19S or SN	4H155S or SN	30C15S or SN	30A16
4H115S or SN	4H156S or SN	30C16S or SN	8C11
4H116S or SN	4H157S or SN	30C17S or SN	8C12
4H117S or SN	4H165S or SN	30A14SA	8C13
4H126S or SN	4H166S or SN	30A15SA	

NOTE: Some models (not listed above) in the "4H," "30B" and "30C" series use other chassis numbers. See stamping on chassis and refer to manual for that chassis.

SECTION 1
REVISED

Schematics, Parts List, Additional Trouble Shooting Data, Production Changes, Voltage Charts, and Circuit Description

TUBE LOCATIONS

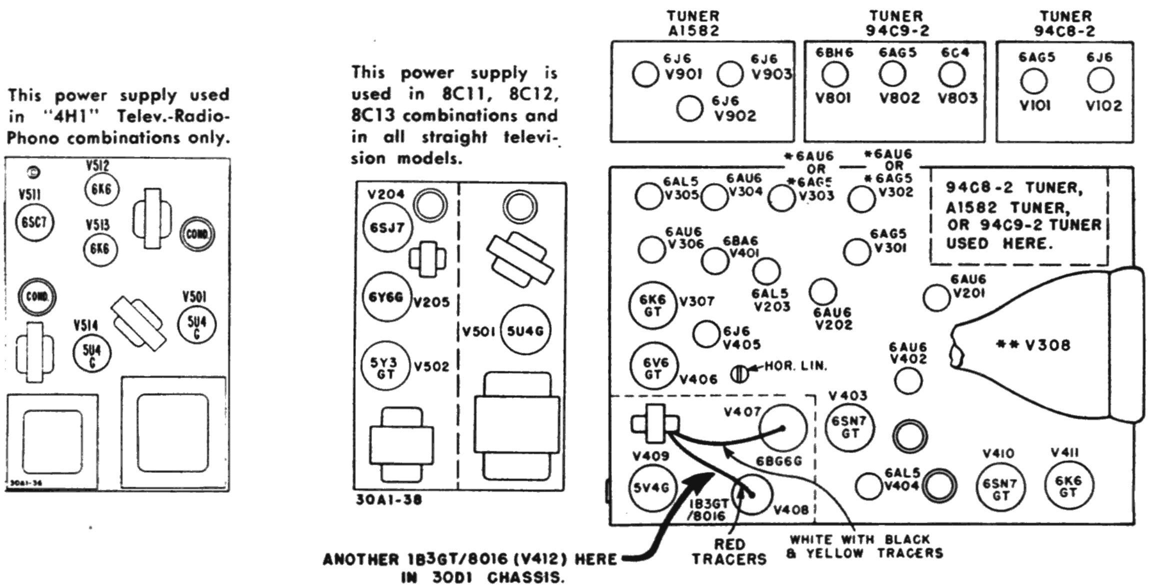


Figure 1-1. Tube Locations, Top View.

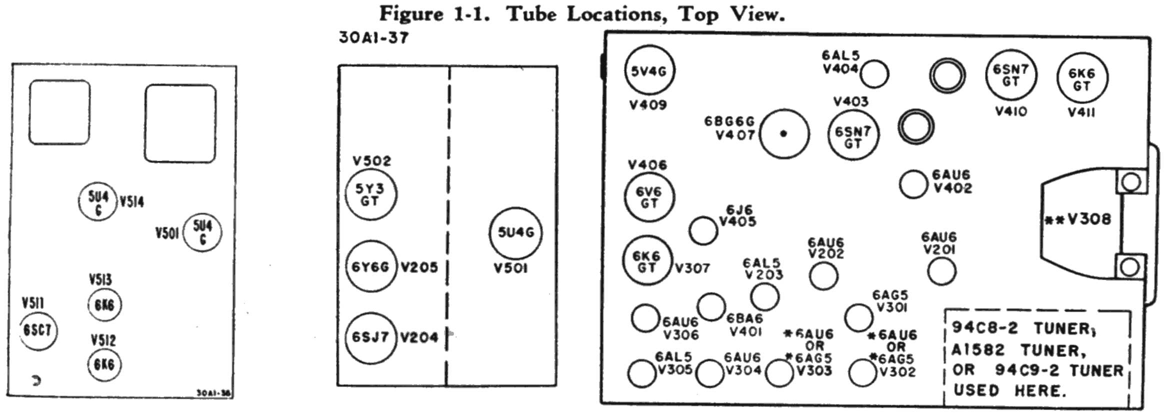


Figure 1-2. Tube Locations, Bottom View.

* 30D1 chassis uses 6AG5 only. 30A1, 30B1, 30C1 chassis uses 6AG5 or 6AU6. Tubes not directly interchangeable; see "Production Changes", paragraph 15,

** 16" picture tube not mounted on chassis; mounted in separate assembly. Different 12" pictures tubes used in 30C1 chassis.

ADDITIONAL TROUBLE-SHOOTING DATA

FREQUENCY DRIFT IN 94C8-2 TUNERS

High ambient temperatures encountered under certain operating conditions may result in excessive oscillator frequency drift in some 94C8-2 tuners. Under such conditions, frequent readjustment of the Sharp Tuning Control may be necessary. In some cases, oscillator drift may even go beyond the normal tuning range of the Sharp Tuning Control.

This condition is most probable in 30D1 (16") chassis due to higher operating temperatures in this model.

When excessive oscillator frequency drift is encountered in a 94C8-2 tuner, the following part change will usually correct this condition:

Replace old part, C109 (10 mmfd., —300 temp. coef., ceramic) with new part C109, #65B6-33 (10 mmfd., —750 temp. coef., ceramic).

In some sets, condenser C109 is accessible by removing the cover plate located on the side of the chassis pan, next to the tuner. Condenser C109 is connected between terminal #2 on the turret contact block and ground. Refer to figure 1-12.

Replacement of C109 will require realignment of Overall Oscillator Adjustment (A18) and then individual channel oscillator adjustments.

NOISY TV TUNERS

Noise is generally caused by dirty contacts, loose or intermittent connections and microphonic tubes.

Dirty contacts can be cleaned with carbon tetrachloride or other commercial contact cleaner. A small atomizer filled with carbon tetrachloride can be used to spray the switch contacts.

With 94C8-2 tuner, remove several sets of coils from turret and rotate turret to position making contact points of contact plate accessible for cleaning. Using a small, stiff brush and carbon tetrachloride, clean contact surfaces and shafts of stationary contacts. Remove accumulated dust or grease from contact plate with a light canvas cloth dampened with carbon tetrachloride. Clean contact surfaces of rotating coils in same manner.

Loose and intermittent connections can be found by tapping the components or rotating the channel selector and watching the pattern on the oscilloscope. A visual inspection or a continuity check will also be helpful.

Microphonic tubes can be located by tapping the tube. See microphonics discussion on this page.

For 94C8-2 (Turret Type) Tuners: Noise with rotation of the Sharp Tuning Control is often caused by poor contact of the tuner shaft with the metal bearing plate (#15A247-1). This noise can be eliminated by securing better shaft contact through use of (new part) tuner shaft contact spring #19A55. This spring is similar to the front turret shaft spring used on the tuner and is assembled to metal bearing plate (#15A-247-1) in the same manner.

MICROPHONICS IN 30A1 CHASSIS

Microphonics have been a source of trouble in some early 30A1 television receivers using the 94C8-2 tuner (turret type). Listed below are suggestions for eliminating this microphonic condition. In general, this information will also be helpful in sets with other type television tuners.

(1) Check for microphonic oscillator mixer tube, V101 (6J6). It is recommended that several tubes be tried, in order to select a tube which will be least microphonic and at the same time, causes a minimum of oscillator frequency shift, as noted with rotation of Sharp Tuning Control. In some cases, replacement of the oscillator mixer tube, may necessitate readjustment of the Overall Oscillator Adjustment (A18) and then individual channel oscillator adjustments.

(2) Spot-solder the tube socket saddles and oscillator mixer tube shield bracket to the tuner chassis.

(3) Loosen the chassis mounting screws, in order to float the chassis on the rubber mounts placed under the chassis mounting lugs. If the chassis does not have the rubber mounts, they can be made from one inch rubber tubing, cut to ¼" lengths. Slip the rubber tubing underneath each chassis mounting lug. Rubber tubing shockmounts can be ordered from the Admiral distributor under part #12A6-7.

(4) Check control shafts and knobs (particularly on the Sharp Tuning Control) making sure that they clear the escutcheon or front panel of the cabinet.

(5) Microphonics can sometimes be eliminated by shock-mounting the speaker with rubber grommets, (part number 12A2-6) and grommet spacer (part number 29A2-5-71). Ream the speaker mounting holes sufficiently to allow insertion of a rubber grommet and spacer, and remount the speaker with the grommets in place.

(6) In early production 94C8-2 tuners, microphonics can be caused by vibration of the rotating dielectric disc of the oscillator Sharp Tuning Control. In order to avoid vibration with resulting microphonics, the rotating dielectric disc should be made to contact the grounded stator plate of the oscillator Sharp Tuning Control. Information on the adjustment of the Sharp Tuning Control, will be found under the heading "Sharp Tuning Control".

Important: Use extreme caution when making adjustment of the stator plates of the oscillator Sharp Tuning Control. If tightening of the stator plate mounting screw is required, extreme care should be exercised in order to avoid stripping of the screw thread. A major repair job may result from breakage of the rotor disc or plastic contact strip. If the threads in the plastic insulating block become stripped, tap the hole for a larger screw.

(7) Microphonics can result from oscillation or vibration of components in the audio IF system. This can often be cured, by pressing condensers close to the chassis, re-dressing wires and shortening leads wherever possible. Moving of wiring in critical circuits may necessitate audio IF and ratio detector realignment.

(8) Check trimmer adjustments on the top side of the tuner for loose locknuts.

ADDITIONAL TROUBLE-SHOOTING DATA (Cont'd)

LOSS OF HORIZONTAL SYNC
(In Early Production 30A1 only)

Loss of horizontal sync in early 30A1 receivers has in many cases been due to dielectric leakage or breakdown of coupling condensers V407 or V408 (100 mmfd.), used in V403A plate and cathode circuits.

Early sets used a 100 mmfd. ceramic condenser, which was replaced in later production by a 100 mmfd., 10%, mica condenser, part #65B5-17, to correct this trouble.

INSUFFICIENT WIDTH, Early 30D1 Chassis

See paragraph 21.

AUDIO BUZZ (Chassis 30B1, 30C1 or 30D1 only)

In some localities audio or station buzz may be apparent on some channels.

Early production 30B1, 30C1 or 30D1 chassis have the 6.3 volt heater lead from the TV tuner (94C8-2) connected to pin 4 of V401 (6BA6). Changing the TV tuner heater connection to pin 7 of V411 (6K6GT) will eliminate this trouble in most cases.

PULLING AT TOP OF PICTURE

In some television receivers, pulling shows up across the top of the picture or pattern and extends approximately one inch down from the top. Vertical lines in the picture or pattern will pull to the right or left.

This trouble is caused by vertical synchronizing pulses "riding through" the horizontal sync discriminator circuit and momentarily upsetting the horizontal oscillator. Since vertical sync pulses occur at the frame frequency (during the vertical blanking period), the pulling exists immediately after the vertical blanking period and shows up only in the top portion of the picture.

The low frequency response of the horizontal sync discriminator can be reduced to overcome this problem. It is recommended that resistors R413 and R414 be changed from 470,000 ohms each to 180,000 ohms each (180,000 ohms, ½ watt, part number 60B8-184).

CAUTION: With R413 and R414 reduced in value, the circuit becomes critical to tolerance variations. **Tolerance on R413 and R414 must be within 5 per cent of each other.** This tolerance limit can be met by selecting a matched pair from stock resistors.

After changing the resistor values of R413 and R414, the horizontal oscillator must be readjusted as described on Section 5 of this manual.

CLOUDING PICTURE TUBE WINDOW

details on servicing.

PRODUCTION CHANGES IN 30A1 ONLY

(Also see paragraphs 14 through 17,

Many production changes usually take place during a long production run. These changes are necessary to facilitate purchasing of component parts, to improve manufacturing techniques, and to incorporate current circuit refinements. Several such changes were made during the 30A1 production run. The following paragraphs describe these changes.

1. FUSE PROTECTION AND HORIZONTAL CENTERING

In early production models, 6BG6G horizontal output tube (V407) failure sometimes results in damage to circuit components. (such as horizontal output transformer T402). This original circuit is shown in Figure 1-6. The new circuit (see Figure 1-20) results in improved horizontal centering as well as fuse protection.

This new circuit refinement should always be wired into an early production model television receiver when major repairs make it necessary to remove the chassis from the cabinet. Parts required for adding this modification are listed below. Parts may be ordered individually or in a complete kit from the Admiral distributor.

Fuse Protection Conversion Kit 98A50-8 contains the following parts and material:

C426 .5 mfd., 200 volts, paper	64B 6-27
M402 Fuse, 0.25A/250V.	84A 4-2
Fuse Holder	84A 5-1
Screw, Self-tapping, #6x½"	1A 51-6-2
Spaghetti tubing, 1¼"	96A 2-5
Hook-up wire, 7"	95B10-20-20-92

Line drawings showing the bottom of the television receiver chassis before and after modification are shown in Figures 1-3 and 1-4. The fuse holder mounting details are shown in Figure 1-5. The circuit modifications are made as follows:

a. Remove C426 (50 mfd., 25 volts, electrolytic) and R436 (10 ohm, 1 watt) resistor; see figure 1-3.

b. Clip out jumper wire between terminals 1 and 2 on tie-strip "A".

c. Remove lead on R432 from terminal 3 of tie-strip "B" and reconnect to terminal 2 of tie-strip "A".

d. Disconnect red wire from terminal 1 of tie-strip "A" and reconnect to terminal 3 of tie-strip "B".

e. Disconnect deflection yoke lead (yellow) from terminal 5 and reconnect to terminal 1 on tie-strip "A". Do not disconnect yellow lead from focus coil (this lead must remain connected to terminal 5).

f. Insulate one lead of a 0.5 mfd. 200 volt condenser (new C426, part number 64B6-27) with a 1¼" length of spaghetti tubing (96A2-5). Solder condenser mounting strap to chassis next to terminal 3 of tie-strip "A". Connect condenser between terminals 1 and 2 of tie-strip "A", attaching the insulated lead to terminal 2.

g. Connect a 7" length of wire (95B10-20-20-92, white with red tracer) to terminal 1 of tie-strip "C". Insert free end through nearest hole at rear of chassis (for connection to fuse holder in 9 KV rectifier compartment).

h. Use a #36 drill bit to drill a hole 1⅛" from rear of chassis and 2¼" from left side of chassis (see

PRODUCTION CHANGES IN 30A1 ONLY (Cont'd)

figure 1-5). Since there isn't too much room to work in the 9 KV rectifier compartment, it is convenient to dismount R435 and remove V409 from its socket while drilling the hole as described above. This hole permits mounting the fuse holder (84A5-1) with a #6 self-tapping screw (1A51-6-2).

i. Cut lead (white with yellow tracer) 2¾″ from terminal #5 on horizontal output transformer T402. Skin back the two ends ½″ and tin. Solder both wires to the fuse holder terminal nearest rear of chassis.

j. Connect white wire with red tracer (see step g) to other terminal of fuse holder.

k. Press 0.25 ampere fuse (84A4-2) into the fuse holder clips. Check lead dress to avoid possible shorts before placing receiver chassis in operation.

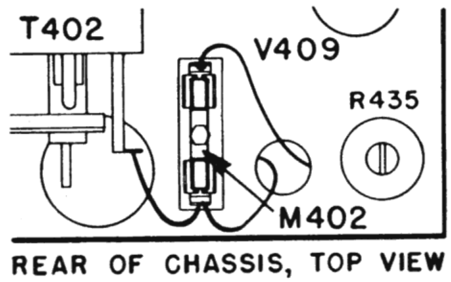


Fig. 1-5. Fuse Location

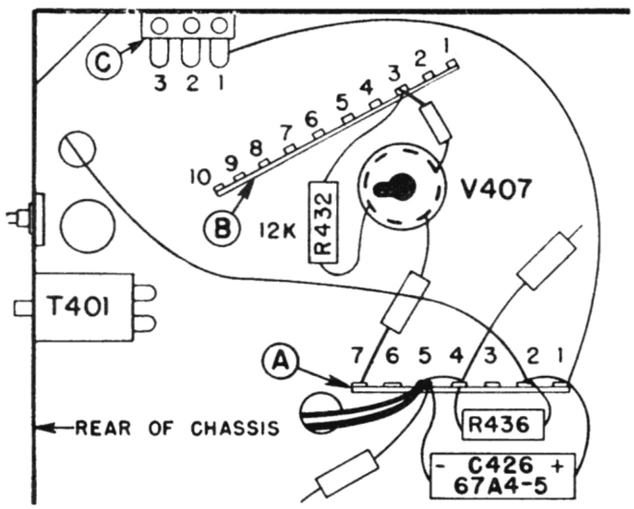


Figure 1-3. Original Circuit, Before Fusing.

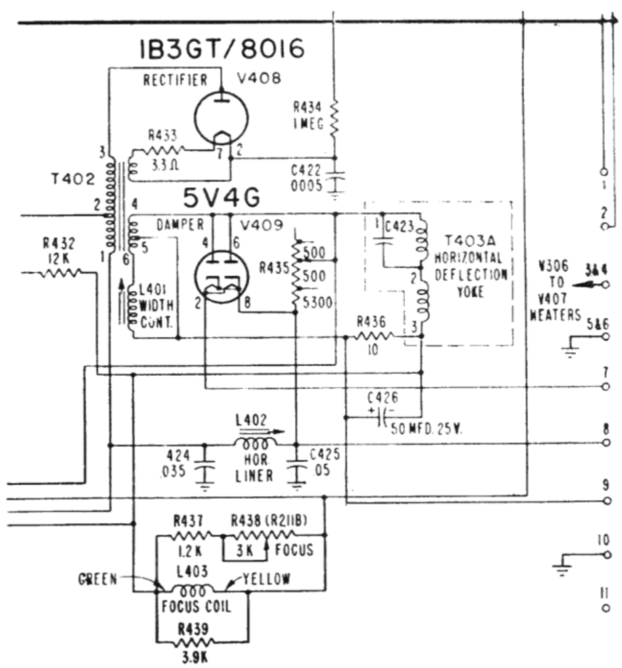


Fig. 1-6. Circuit Before Adding Fuse

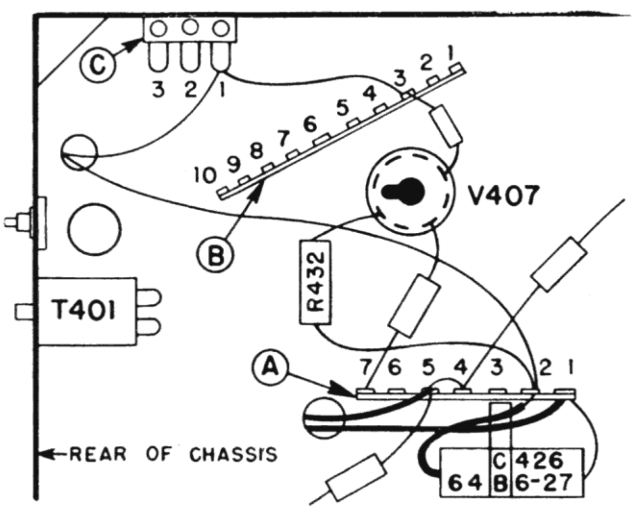


Fig. 1-4. Modified Circuit, After Fusing.

2. FUSED CIRCUIT CHASSIS CONNECTION MODIFICATION

When the fuse change discussed in paragraph 1 was first incorporated in the horizontal output circuit, a small number of the 30A1 chassis were not wired according to the schematic, figure 1-20. This incorrect chassis wiring is shown in figure 1-7.

If a fuse burns out in a chassis wired as shown in figure 1-7, excessive voltage appears across condenser C426. Subsequent failure of C426 may result in damage to other circuit components. Therefore, chassis wired as shown in figure 1-7 must be modified when brought in to the shop. The modified chassis connections are shown in figure 1-8. The necessary modifi-

PRODUCTION CHANGES IN 30A1 ONLY (Cont'd)

cation in chassis wiring can best be accomplished as follows:

*a. Unsolder the lead of R330 from terminal 1 of tie strip "D" and clip off the other lead on R330 as close to the ground lug as possible. See figure 1-7.

*b. Connect R330 between the two terminals of tie strip "E". See figure 1-8.

*c. Unsolder the lead from terminal 1 of tie strip "D" and clip the other end of this lead off terminal 3 of tie strip "C". See figure 1-7.

*d. Transfer the connections from terminal 1 of tie strip "A" to terminal 1 of tie strip "D."

e. Transfer condenser lead of C426 and deflection yoke lead (white or yellow, depending on the production run) from terminal 2 to terminal 1 on tie strip "A".

f. Clip off the other lead of condenser C426 from terminal 5 (figure 1-7) and reconnect the terminal 2 of tie strip "A" (figure 1-8). It will be necessary to splice a length of tinned copper wire to this lead.

g. Connect an insulated lead between terminal 2 of tie strip "A" and terminal 5 of tie strip "B".

h. Check wiring per figure 1-8 and figure 1-20 before operating receiver.

*Due to the substitution of a four-terminal tie strip at "F" in later production, some chassis will not appear exactly the same as shown in figure 1-7. The additional terminal on tie strip "F" was used for the tuner plate decoupling filter in place of terminal 1 of tie strip "A". Since such a chassis connection leaves terminal 1 of tie strip "A" open, steps "a" through "d" of the above modification procedure do not apply. A chassis having the four-terminal tie strip at "F" must be modified by following steps "e" through "h" only.

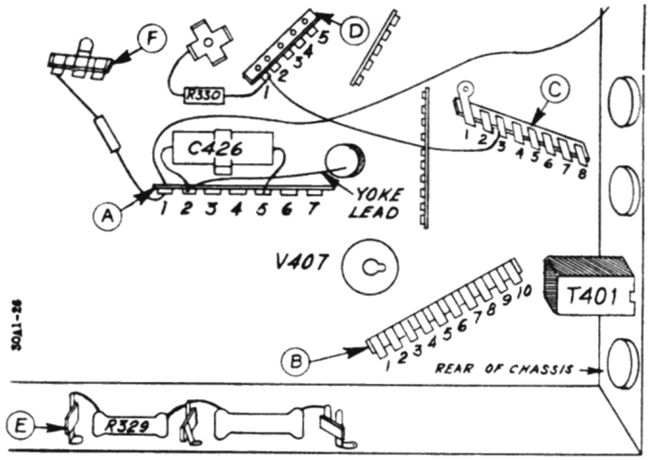


Figure 1-7. Original "Fused Chassis" Connections (Before Wiring Modification).

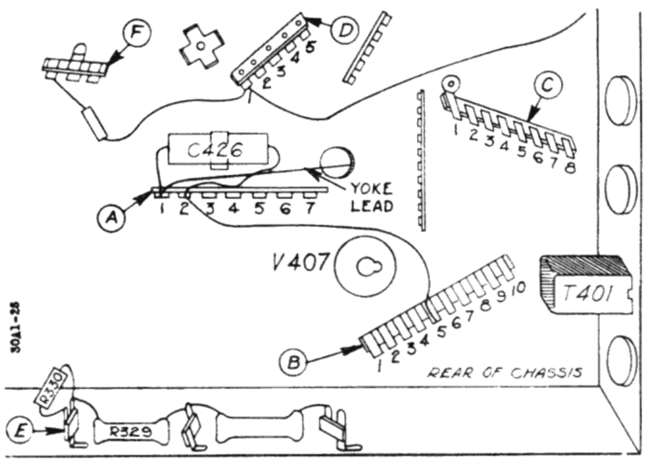


Figure 1-8. Modified "Fused Chassis" Connections. (After Wiring Modification).

3. POWER SUPPLIES

Early production 30A1 sets used two separate power supply chassis. After a small number of sets were run, the two separate power supply chassis were combined into one unit.

When the power supplies were on separate chassis, upright transformers were used for T501 and T502. When both power supplies were put on the same chassis, these transformers were changed to half-shell mounting. See parts list.

When both power supplies were combined on one chassis, a 39-ohm isolating resistor was deleted.

Some of the double-cable power supplies had a 270,000 ohm, ½ watt (bleeder) resistor connected across C503C in the low voltage power supply, and a 270,000 ohm, 1 watt (bleeder) resistor connected across C501B in the high voltage power supply. These resistors were deleted when a single cable was substituted for the double-cable arrangement.

Later production chassis are connected to the power supply through a single cable, instead of two connecting cables as used in earlier production sets. Order replacement cables, sockets or plugs from the description given in the parts list, under heading "Sockets and Plugs". Refer to symbols M203 for cables or connectors attached to the chassis and symbol M513 for cables or connectors attached to the power supply.

4. CONTRAST CONTROL BIAS

Several changes have been made in the contrast control bias circuit. Condenser C301 was originally a 4 mfd. electrolytic condenser. This condenser is now a 50 mfd., 25 volt electrolytic (67A4-7). Part number 67A4-7 is recommended for replacement of C301 in all cases.

The value of R304 has been changed in later production to provide a greater contrast control range. This change should prove helpful in areas of unusually high video signal strength. The value has been changed from 27,000 ohms, ½ watt to 15,000 ohms, ½ watt (60B8-153). Replacements should be made with new part, 60B8-153.

In early production sets (first 500 units), an RC filter was used in the selenium bias rectifier circuit M405. This filter is a PI circuit consisting of a 180 ohm resistor, and two 50 mfd., electrolytic condensers. In later sets, the 180 ohm resistor and one 50 mfd., electrolytic condenser have been removed from the circuit. The remaining 50 mfd., electrolytic condenser is used in the circuit and corresponds to C440 in the

PRODUCTION CHANGES IN 30A1 ONLY (Cont'd)

present schematic, figure 1-20. In the event that service is required for sets using the early PI filter circuit, the 180 ohm resistor and one 50 mfd. electrolytic condenser should be removed; the remaining electrolytic condenser should be connected as shown in the schematic. IMPORTANT: the 180 ohm resistor and 50 mfd. electrolytic condenser (as used in the older circuit) should not be removed unless circuit connection of M405 (50 mfd., 25 volts condenser, 67A4-7) has been changed as well.

A contrast control bias decoupling filter consisting of a 12,000 ohm resistor and a 1500 mfd. ceramic condenser, was deleted in later production (after 500 units). This decoupling filter was first used in the grid circuit of the V302 (6AG5), but was found unnecessary.

5. ALTERNATE TRANSFORMER T201 (1st AUDIO IF)

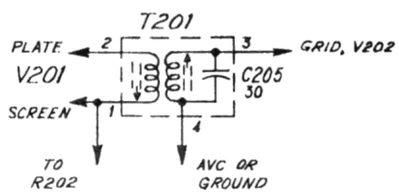


Figure 1-9. Wiring Above is for 72B58 IF Transformer. (Schematic, Fig. 1-20 shows 72B44 IF Transformer).

Production used 72B58 as an alternate for 72B44 (T201) for a short period of time. Alternate transformer 72B58 has a different terminal numbering arrangement than transformer 72B44. The terminal connections shown in the schematic (figure 1-20) are those of transformer 72B44. The terminal connections for transformer 72B58 are shown in figure 1-9.

Due to the tendency for transformer 72B58 to detune in shipment, the slugs were sealed with glyptal. In the event that alignment adjustment is necessary, a few drops of solvent must be applied to the glyptal around each slug. The solvent will free the slug in a short time. Alignment adjustment can then be made in the usual manner.

Lacquer thinner or amyl acetate (banana oil) are commonly used thinners which can be used on glyptal.

Replacements for T201 should always be ordered by part number 72B44 even though part number 72B58 was originally used in the chassis.

6. DELETED HEATER DECOUPLING FILTER

Heater decoupling filter choke and 1500 mmfd. ceramic condenser were deleted after 500 units.

7. DELETED V201 BYPASS CONDENSER

V201 plate circuit and screen bypass (.05 mfd) was deleted in later production. C203, 1500 mmfd., proved adequate in itself.

8. C407 and C408 CHANGED TO MICA

Ceramic condensers were used for C407 and C408 in the horizontal sync discriminator circuit (V404). These condensers were replaced in later production by two 100 mfd., 10%, mica condensers (65B5-17). The new part number 65B5-17 should be used for service replacements for C407 and C408. This change was made to avoid horizontal sync difficulties, caused by dielectric leakage or breakdown of the ceramic type condensers.

9. WATTAGE RATING INCREASE, R415

R415 was a 150,000 ohm, ½ watt resistor. In later production, R415 was changed to a 150,000 ohm, **1 watt** resistor (60B28-14). Part number 60B28-14 should be used for service replacements.

10. WATTAGE RATING INCREASE, R416

R416 was a 82,000 ohm, ½ watt resistor. In later production, R416 was changed to a 82,000 ohm, **1 watt** resistor (60B28-15). New part number 60B28-15 should be used for service replacements.

11. FM INTERFERENCE TRAP, TUNER A1582

An FM interference trap (98A44-28) consisting of parts L984, L985, C921 and C922 was added to tuner A1582 in later production. In the event that FM interference is encountered on an early production receiver using tuner A1582 (see figure 1-18), an FM interference trap assembly can be obtained under service part number 98A44-28.

12. AVC CIRCUIT IN SOME SETS

Some early production sets were wired with AVC action, controlling the 2nd audio IF stage, V202.

AVC voltage is developed across a 180,000 ohm resistor and a 470.000 ohm resistor in series, connected between point "Y" (in early ratio detector V203 circuit) and chassis. The 470,000 ohm resistor connects to chassis.

Terminal #1 (AVC lead) of T201 audio IF transformer is connected to junction of the 180,000 ohm resistor, 470,000 ohm resistor, and a .005 mfd. min. ceramic bypass condenser (other end of .005 mfd. condenser is connected to chassis).

13. R205 LOCATED INSIDE RATIO DETECTOR TRANSFORMER T202

Resistance value of R205 in early sets was 47 ohms, and in later sets was changed to 150 ohms. In early sets, R205 was located inside the ratio detector can T202 (72B45). In the event that T202 (72B45) must be replaced in a chassis that included R218 inside transformer T202, resistor R205, 150 ohms, ½ watt (60B8-151) will be required in addition to replacement transformer 72B45. Connect R205 under the chassis after replacing transformer T202 (72B45).

PRODUCTION CHANGES IN 30A1, 30B1, 30C1, 30D1

14. C109 CHANGE IN TV TUNER 94C8-2 (Chassis 30A1, 30B1, 30C1 and 30D1)

In later production 94C8-2 TV tuners, ceramic condenser C109 has been changed from 10 mmfd., negative 300 temperature coefficient to 10 mmfd., 5%, negative 750 temperature coefficient (part 65B6-33). This change was made to improve frequency stability of the oscillator and mixer stage V102 (6J6) with conditions encountered under high ambient temperatures.

For replacement details, see paragraph "Frequency Drift in 94C8-2 Tuners"

15. DIFFERENT TUBES USED FOR 2nd and 3rd VIDEO IF, V302 and V303 (Chassis 30A1, 30B1, 30C1 only)

Type 6AG5 and 6AU6 tubes have been used for V302, and also for V303. Due to differences in tube characteristics, corresponding video IF transformers T301, T302 must be used with the different tubes.

When type 6AG5 tubes are used, T301 and T302 are part numbers 72B40-1 and 72B41-1, respectively. When type 6AU6 tubes are used, T301 and T302 are part numbers 72B81 and 72B82, respectively.

16. DIFFERENT 2nd and 3rd VIDEO IF TRANSFORMERS, T301 and T302 (Chassis 30A1, 30B1, 30C1 only)

See discussion in paragraph 15 directly above.

17. ALTERNATE DEFLECTION YOKE (Chassis 30A1, 30B1, 30C1, 30D1)

Two alternate deflection yokes are currently being used, part number 94B2-1 and 94B2-2. Condenser C423 which is part of the yoke assembly has to be a different value when used with the two alternate yokes. Condenser C423 should be 56 mmfd., 5%, mica (6B1-54) when used with 94B2-1. Condenser C423 should be 39 mmfd., 5%, mica (65B1-55) when included in 94B2-2. The two yokes are interchangeable when complete with the proper resistors, condenser and wire leads. Yoke 94B2-2 (correct parts and leads included) is supplied for service replacement.

18. CHANGE IN TV TUNER FILAMENT CONNECTION (Chassis 30B1, 30C1 and 30D1 Only)

In later production 30B1, 30C1 and 30D1 chassis, the 6.3 volt filament connection to the TV tuner has been changed from pin 4 of V401 (6BA6) to pin 7 of V411 (6K6GT). This change was made to avoid possible audio or station buzz noticeable on certain channels.

19. DIFFERENT 12" PICTURE TUBES USED (Chassis 30C1 Only)

Different 12" picture tubes (types 12BP4, 12LP4, 12TP4, 12KP4 or 12QP4) have been used in the 30C1 models. The various tube types require different chassis wiring and ion traps.

Data on circuit requirements for the different tubes is tabulated ------ and also shown on schematics, figures 1-20 and 1-21.

Important: When replacing a 12" picture tube with another type, be sure to check existing chassis wiring and if required, make the necessary changes as tabulated for that tube in chart.

20. CHANGE IN INTERLOCK CONNECTORS AND WIRING TO DEFLECTION YOKE AND FOCUS COIL (Chassis 30D1 Only)

An interlock circuit is wired into the plugs connnecting the deflection yoke and focusing coil to the 30D1 chassis.

In some early production sets, the interlocking circuit in the chassis had been incorrectly wired, whereby the 110 volt AC circuit was not opened when plug M407 connection to the deflection yoke, or plug M408 connection to the focus coil, are removed from the chassis. Correct wiring for the interlocking connectors (plugs M407 and M408, sockets M406 and M409) is shown in schematics figures 1-22 ,1-26 and 1-27, and wiring illustrations figures 1-23, 1-24 and 1-25

Note figure 1-23 shows pin arrangement of plug M407 or socket M406 used in earlier sets. Figure 1-24 shows pin arrangement of plug M407 or socket M406 used in later sets. Only later type plugs and matching sockets are supplied for replacements, see parts list,

21. INSUFFICIENT WIDTH, Early 30D1 Chassis

This trouble can in most cases be corrected by adjustment of width control L404 or by replacement of tubes V403 (6SN7GT) or V407 (6BG6G). If this will not correct the condition, shunt a 68,000 ohm, 1 watt resistor across R465 (15,000 ohm, 2 watt, V407 screen dropping resistor), or replace R465 with a 12,000 ohm, 2 watt resistor, part number 60B20-123. Readjust L404 after changing value of R465 resistor. Note: In later production sets, R465 was changed to 12,000 ohms, 2 watt.

CIRCUIT DESCRIPTION

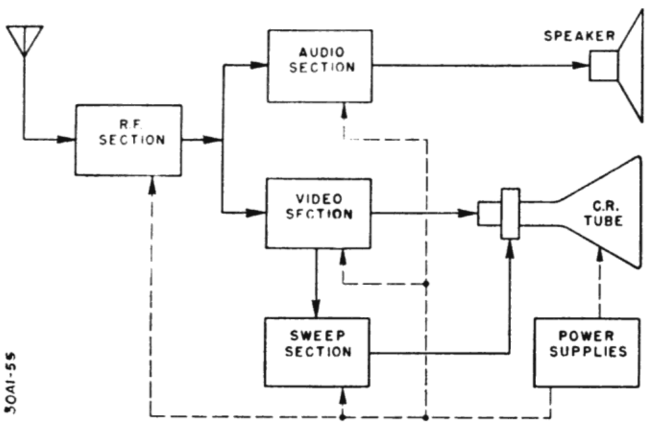


Figure 1-10. Sectional Block Diagram.

The circuits of the 30A1, 30B1, 30C1 and 30D1 are practically identical; the major difference between the 30D1 and the other models is in the picture tube second anode power supply. The circuit discussion which follows applies mainly to the 30A1, 30B1, 30C1 chassis, except where the 30D1 is mentioned in the text.

SECTIONAL CIRCUIT FUNCTION

A block diagram of the five major sections in this television receiver circuit is shown in Figure 1-10. The RF section amplifies the Audio and Video carriers and converts them to their respective intermediate frequencies. The audio section consists of a conventional IF amplifier, FM ratio detector and audio amplifier circuit. The video sections consists of a stagger-tuned broadband IF amplifier, video detector and video amplifier circuit. The sweep section contains the horizontal and vertical sweep generators and the sync circuits. The power supply section supplies the necessary voltages for operation of the various tubes and circuits in the other sections of the receiver. A functional block diagram, indicating the various stages, is shown in Figure 1-11.

RF SECTION, 94C8-2 TUNER
(Other TV tuners also used)

RF Amplifier (V101, 6AG5). Balanced 300 ohm and unbalanced 75 ohm (coaxial line) input impedances are provided by center-tapped primary winding L101A. (See schematic, Figure 1-20). Secondary winding L101B is tuned by V101 input capacity in series with the parallel combination of C101 and C102. Trimmer C102 is used for alignment. Loading of secondary L101B by R101 provides the required bandpass in this first tuned circuit.

Primary coil L102A is the plate load of RF amplifier V101. Trimmer C104 and tube output capacity tune L102A. C104 is an alignment adjustment. Damping resistor R103 provides the required bandpass.

Channel selection is accomplished by rotation of the turret assembly, a different set of coils (L101 and L102) being switched in for each channel.

Mixer, Late Circuit (½ V102, 6J6). Secondary coil L102B feeds the RF and oscillator injection voltages to the grid of the mixer stage, one triode section of V102. Secondary L102B is tuned by tube input capacity and trimmer C107. Trimmer C107 is also used for alignment adjustment. C106, R105 and R106 develop grid-leak bias for the mixer stage. The two resistors are used in this circuit in order that their junction can be brought out as an alignment test point. An oscilloscope can be connected to this test point "W" without materially affecting the operation of the circuit.

The mixer plate is bypassed by C114 in order to control regenerative effects (such effects being quite common in VHF mixer circuits). Primary coil L107 is the untuned mixer plate load. Coil L105 and condenser C116 are series-resonant in the video IF passband and provide coupling between the mixer plate and the first video IF amplifier grid. Slug-tuning of L105 provides an alignment adjustment.

Condenser C115 tunes secondary coil L106 to the audio IF carrier frequency. A tap on L106 provides direct coupling to the first audio IF amplifier grid. This tuned circuit functions as an audio absorption trap in the video IF amplifier circuit as well as coupling the mixer to the audio IF system. The slug in L106 is an alignment adjustment.

H. F. Oscillator (½ V102, 6J6). Oscillator coil L102C is inductively coupled to mixer grid coil L102B for oscillator injection to the mixer. Condenser C109 is in series with the parallel combination of C110 and C111 to form the split-condenser of a Colpitts oscillator. Trimmer C110 is an alignment adjustment. Variable-dielectric type condenser C111 is the Sharp Tuning control. Grid-leak bias for the oscillator is developed by R107 and C108. The oscillator plate is shunt-fed by means of R108.

AUDIO SECTION

Audio IF Amplifiers V201 and V202, (6AU6). The broad-band IF stages of conventional circuit design are used ahead of FM detector V203 (6AL5). Since no AVC voltage is applied and maximum gain is desired per stage, high Mu, sharp-cut-off pentode tubes are used.

F. M. Detector, Late Circuit (V203, 6AL5). A ratio detector is used for FM sound detection. The network between point "Z" and ground (de-emphasis filter and volume control circuit) is the AF output load circuit. Condenser C221 is an IF bypass.

Ratio detector limiter action is provided by the filtering action of condenser C212. Condenser C212 is effectively connected across the tuned secondary of T202 through the two diode sections of V203. This tends to hold the IF signal amplitude at its average value and results in limiter action.

Since C212 charges to a value proportional to average IF signal amplitude and then limits at that level, the circuit will adjust itself to any signal level. As a result, limiter action is effective on weak as well as strong signals.

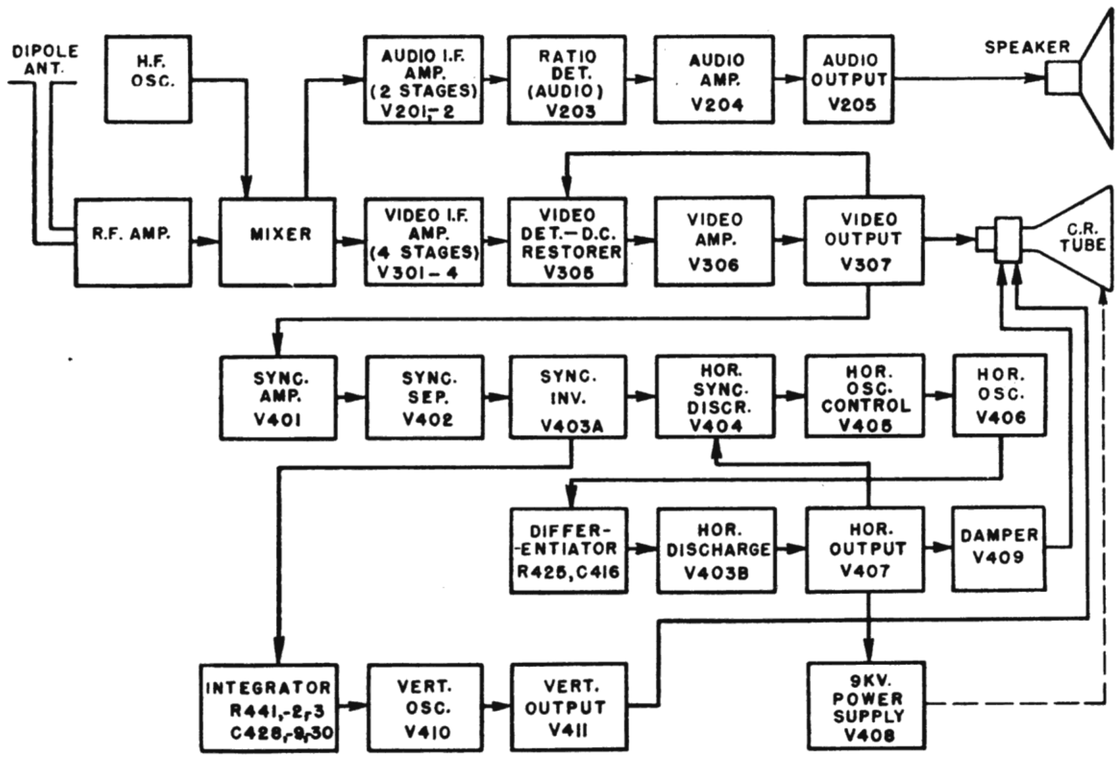


Figure 1-11. Functional Block Diagram.

Audio Amplifiers, For Straight Television models V204 (6SJ7), V205 (6Y6G). The television (only) audio amplifier system consists of voltage amplifier V204 (6SJ7) and power amplifier V205 (6Y6G). These two stages provide the necessary audio power to drive the speaker. The circuit is conventional.

Audio Amplifiers, For Radio-Phono-Television models V511 (6SC7), V512, V513 (6K6GT). Television combination models use a push-pull audio system in place of the single-ended system used in the straight television models. The functions of voltage amplifier and phase inverter are combined in V511, a 6SC7 dual triode tube. The grid of the phase inverter (pin No. 3 of V511) is fed from the voltage across R514. The circuit is of the self-balancing or "floating paraphase" type.

A pair of 6K6GT tubes (V512 and V513) are used in a cathode biased push-pull power amplifier stage.

VIDEO SECTION

Video IF Amplifiers V301 (6AG5), V302, V303 (6AG5 or 6AU6) and V304 (6AU6). Four stages of stagger-tuned video IF amplification are used. Self-resonant, slug-tuned coils are used in the impedance coupling networks between stages. Parallel-resonant traps are inductively coupled to these coils in the second, third and fourth video IF stages (T301 to T303). These traps provide rejection of the sound carrier and adjacent channel sound and video carriers, respectively.

The contrast control bias on the RF stage V101 (6J6) is adjustable from approximately -1 to -8 volts. This is obtained from the arm of R306A. Contrast control bias is supplied to the first three video IF stages (V301, V302, V303) through a voltage divider (R304 and R305). Contrast bias on these stages is adjustable from approximately -1 to -6 volts.

Video Detector V305 (6AL5). The video detector diode (one diode section of V305) connections are reversed from those commonly used in broadcast receiver circuits in order to obtain positive picture phase across the load circuit. The two phase inversions that take place in the video amplifier result in a positive picture phase to the grid of picture tube V308.

A "constant K filter (L306, L307, R321 and R322)" is used as a load for the video detector. The resistive and inductive elements of this load circuit are so chosen that a flat frequency response characteristic is obtained over the entire video frequency range. The upper limit is approximately 4 megacycles. Condenser C318 serves as the usual RF bypass and removes the video IF carrier from the detected video signal.

DC Restorer V305 (6AL5). Since the video amplifier is capacitively coupled, the DC component of the television signal is lost. The function of the second diode section of V305 is to restore the DC component, which provides proper background illumination for the picture.

Video Amplifier V306 (6AU6). The video amplifier is a pentode voltage amplifier with a constant K filter for a plate load. The fixed bias voltage is obtained from a voltage divider (R324 and R325) across the —8 volt bias supply. Sufficient bias is used to provide noise limiter action in this stage.

Video Output V307 (6K6GT). A pentode power amplifier is used in the video output stage. Fixed bias is obtained from the -8 volt bias supply. Cathode bias is also used and the cathode bypass condenser is omitted to introduce inverse feedback. A constant K type of filter is also used as a plate load for this stage. The coupling between this plate load circuit and the grid of the picture tube V308 is a modification of the usual circuit. This is due to the DC restorer diode (one section of V305) and the circuit for sync pulse output to the sync and sweep circuits of the receiver. The sync is taken from R334. R335 is used to isolate the coupling circuit as well as to attenuate the higher video frequencies. The picture tube (V308) grid return circuit consists of R336, R337 and R338.

The DC restorer diode (one section of V305) is across R337. The video signal appearing across R338 contains an accentuated sync pulse due to the action of the DC restorer diode. This provides the input signal for the sync amplifier.

Second Anode Supply for 30A1, 30B1, 30C1. Horizontal output amplifier V407 (6BG6G) is the source of power for the second anode supply. The plate voltage for rectifier V408 (1B3GT/8016) is obtained from horizontal output transformer T402 by auto-transformer action. A separate secondary winding supplies filament power to the rectifier tube (V408).

Due to the high-frequency power source and the relatively light load, an RC filter is sufficient for filtering the second anode supply. The external coating of the picture tube V308 serves as the output filter capacitor. Some 12" picture tubes do not have the external coating.

Second Anode Supply for 30D1. The horizontal output amplifier V407 (6BG6G) is the source of pulsed voltage for the second anode voltage rectifiers V408 and V412 (1B3GT/8016). This voltage is increased by auto-transformer action in T405 and rectified by a cascade rectifier arrangement (V408 and V412) having an output of 12,000 volts. The positive half-cycle of the T405 primary voltage is a short duration pulse of very high amplitude. The negative half-cycle has relatively low amplitude and is of longer duration. During the first positive half-cycle, V408 conducts, charging capacitor C446 to the peak value of the full T405 primary voltage pulse. V412 does not conduct during this period. During the negative half-cycle, neither rectifier conducts and the sum of T405 primary voltage plus the charge on C446 (acquired during the first positive half-cycle) charges C445 through R468. The next positive half-cycle causes both V408 and V412 to conduct. V412 conducts by virtue of the charge on C445 adding to the positive pulse of the primary of T405. Conduction through V408 recharges C446 to the peak value of the positive pulse. Conduction through V412 charges C447 through the T405 primary circuit to approximately half the potential of C445. The potential of C446 plus that of C447 produces a total of 12,000 volts.

Vertical Oscillator V410 (6SN7GT). A cathode-coupled multivibrator is used as a vertical oscillator. The vertical hold control R421B is a variable resistor in the grid circuit of the discharge section of the multivibrator. Resistors R449 and R450 form a voltage divider circuit. Resistor R449 is a potentiometer and permits plate voltage adjustment on the discharge section of the multivibrator. Resistor R449 serves as a height control adjustment.

Vertical Output V411 (6K6GT). A triode-connected pentode tube is used as a vertical output amplifier. Variable resistor R455 is in the cathode circuit and serves as a vertical linearity control. The plate of this stage (V411) is transformer-coupled to the vertical coils of deflection yoke T403. Damping resistors R457 and R458 are connected across the vertical coils (T403B) in the deflection yoke.

Sync Amplifier V401 (6BA6). The sync amplifier is an RC coupled circuit with fixed bias supplied by the selenium bias rectifier M405. An RC plate decoupling filter consisting of R405 and C403 provides low-frequency boost. High-frequency attenuation results from plate bypass condenser C402. Low-frequency boost and high-frequency attenuation in the sync amplifier (V401) plate circuit removes some of the unwanted video and noise from the sync pulses. Further noise limiting occurs in the grid circuit of V401 (6BA6).

Sync Separator V402 (6AU6). An RC coupled circuit is used in the sync separator. Fixed bias is supplied by the selenium bias rectifier M405. The use of a sharp cutoff pentode tube, low plate voltage and a rather high bias voltage results in plate clipping of the negative (video) portions of the input cycle. All traces of the video signal are removed from the sync pulses by this stage.

Sync Inverter V403A (½ 6SN7GT). A triode sync inverter circuit is used to obtain a push-pull feed for the horizontal sync discriminator.

A tap on the cathode load of the sync inverter V403A provides a feed to the integrator for vertical synchronization. The vertical integrator consists of a three-section, RC filter network (R441, R442, R443, C428, C429, C430).

Horizontal Sync Discriminator V404 (6AL5). The sync discriminator is also an RC coupled circuit. A push-pull, sync signal input is supplied by the sync inverter, as previously mentioned. An RC voltage divider circuit (R415, R416, C409) is used to supply a portion of the horizontal sweep output voltage to the horizontal sync discriminator V404 (6AL5). Condenser C409 is necessary in the divider circuit for DC blocking purposes.

The discriminator (V404) delivers a DC output voltage that is proportional to the phase difference between the sync pulse and horizontal sweep voltage inputs. When the frequency and phase relationship between these two voltages is correct, the discriminator circuit develops its normal output voltage. This voltage, combined with cathode bias voltage, is equal to the normal operating bias of the horizontal oscillator control tube V405 (6J6). When the horizontal sweep circuit in the receiver is not locked in with the transmitter, the frequency or phase relationship between the sync pulses and the horizontal sweep voltage is abnormal. The DC output of the horizontal sync discriminator V404 (6AL5) changes accordingly.

The DC output of the horizontal sync discriminator is fed to the grid of the horizontal oscillator control tube V405 (6J6) through an RC filter network. The filter is necessary to keep sync pulses and noise from reaching the grid of the horizontal oscillator control tube (V405).

Horizontal Oscillator Control V405 (6J6). A triode reactance modulator circuit is used for horizontal oscillator control. The horizontal oscillator tank condenser C413 is returned to the cathode of the oscillator control tube. This control tube input voltage is out of phase with and leads the oscillator tank voltage by approximately 90 degrees. Due to the inverted input circircuit, the signal on the plate of the control tube also leads the oscillator tank voltage by the same amount. Coupling this amplified leading voltage back to the oscillator tank makes the horizontal oscillator control tube V405 appear as a shunt inductance across the oscillator tank. The oscillator tank is made to resonate at the correct sweep frequency with this shunt inductance effect.

The DC output of the horizontal sync discriminator V404 (6AL5) supplies a portion of the bias for the horizontal oscillator control tube V405 (6J6); the other source of bias being cathode resistor R419. Any shift in phase difference between the transmitter sync pulses and the horizontal sweep voltage in the receiver causes the sync discriminator (V404) DC output to change. This changes the bias on the horizontal oscillator control tube V405 (6J6) and changes the amplitude of the reactive voltage appearing in the plate circuit. The effective shunt inductance across the horizontal oscillator tank then changes. This, in turn, shifts the horizontal oscillator (V406) phase sufficiently to correct for the original phase shift. The horizontal hold circuit in this television receiver is actually an automatic frequency-control circuit.

SWEEP AND SYNC SECTION

Horizontal Oscillator V406 (6V6GT). A beam tetrode tube is used as an electron-coupled horizontal oscillator. Horizontal oscillation transformer T401 is slug-tuned. This slug adjustment is the horizontal lock control. The horizontal hold control R421A (on the front of the set) is in the oscillator grid-leak circuit.

The plate current of V406 (6V6GT) is driven to cutoff and saturation giving a "squared" output waveform. This squared output is fed to a differentiator made up of R425 and C416. The differentiator delivers a peaked waveform.

Horizontal Discharge V403B (½ 6SN7GT). The peaked waveform from the differentiator is used to trigger discharge tube V403B. Horizontal drive control R429 and resistor R428 are connected in series with discharge tube condenser C419 in order to give a large negative grid swing during the retrace interval.

Horizontal Output V407 (6BG6G). A beam tetrode is used in the horizontal output amplifier in order to obtain the required driving power for the horizontal deflection coils and the second anode supply. The circuit is conventional with the exception of the plate load circuit.

The output of the horizontal amplifier is transformer-coupled (by T402) to horizontal deflector coils T403A. Width control L401 shunts a portion of the output transformer (T402) secondary, making the inductance variable for width control.

The Damper V409 (5V4G) is connected in such a way as to give an effective increase in the plate voltage of the horizontal output amplifier V407 (6BG6G) The plate current of V407 flows through V409 for the major portion of the trace. Condensers C424 and C425 are fully charged during this period and supply V407 (6BG6G) current during the time when V409 (5V4G) is not conducting. An average voltage due to damper tube (V409) current is developed across the network C424, L402 (horizontal linearity adjustment) and C425. This voltage gives approximately 60 volts boost to the V407 plate voltage. The network (C424, C425, L402) provides linearity control by adjusting the cathode waveform (bias) of the V409 damper tube. R435 in conjunction with C425 gives some RC damping in the output circuit. It may be necessary to change the tap on R435 if it is not possible to effect satisfactory linearity with R429 (horizontal drive) and L402.

Blocking condenser C426 prevents DC flow through deflection yoke T403.

The linearity control circuit appears in a different form in the 30D1 chassis. However, its basic function is identical to the older circuit types (the new circuit allows a greater parts tolerance and adjustment range).

POWER SUPPLY SECTION

Second Anode Supply V408 (1B3GT/8016). Since this supply is an integral part of the horizontal output amplifier circuit, a circuit description of this supply is given in the paragraph following the horizontal output circuit description.

High Voltage Power Supply V501 (5U4G). A full-wave rectifier and pi-type LC filter are used in this power supply to obtain the plate and screen voltages required by the tubes in sections 3 and 4 of the receiver. A separate winding on the power transformer T501 in this power supply furnishes heater power to the tubes in these sections. A separate heater winding is necessary for the damper tube V409 (5V4G) due to the presence of the DC supply voltage on the damper tube heater circuit

Low Voltage Power Supply V502 (5Y3GT). Aside from the fact that the low voltage power supply delivers a lower DC output voltage and current, it is of the same general type as the one described in the preceding paragraph. The speaker field serves as a filter choke in some models.

The low voltage power supply rectifier V514 in combinations using the 4H1 Radio Tuner is a Type 5V4G tube. The circuit function remains the same.

Bias Supply. The heater winding on the low voltage power transformer supplies the input power for the selenium bias rectifier M405. A single filter condenser C440 provides adequate filtering due to the light load. The 8 volt output provides sufficient bias for contrast control and normal operating bias on the various stages in the receiver.

RC decoupling filters are used in the plate and screen supply leads of various stages in the receiver in order to isolate them from a common power supply. LC decoupling filters are also used for isolating purposes in the heater circuit. The use of two separate power supplies also provides isolation between sections or stages of the receiver.

DIFFERENT TV TUNERS USED IN 30A1 CHASSIS

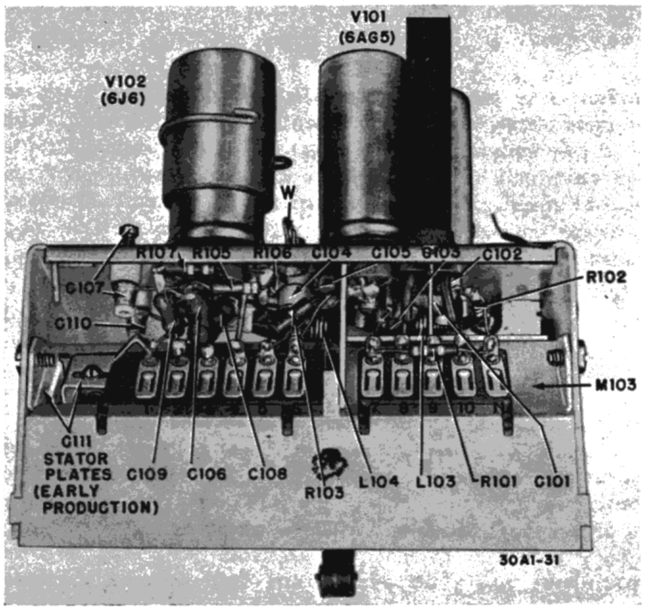


Figure 1-12. TV Tuner 94C8-2 (94A8-2), Right Side.

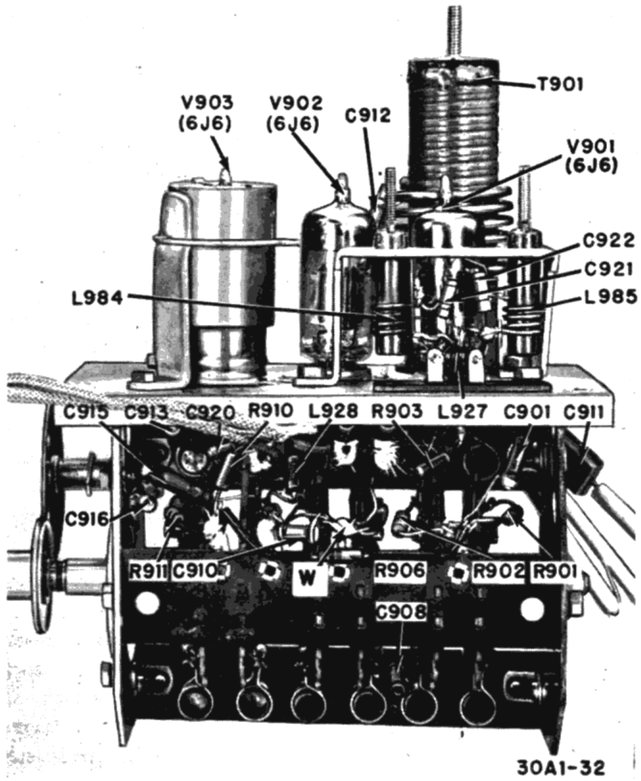


Figure 1-13. TV Tuner A1582, Right Side.

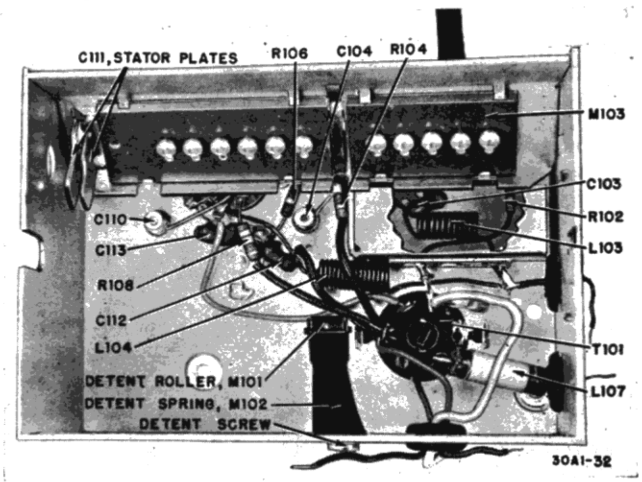


Figure 1-14. Early Production 94C8-2 Television Tuner with Turret Removed. Later Production 94C8-2 Tuners are the same, except for wiring and parts differences such as T701 mixer transformer, L701 plate coupling coil, and Sharp Tuning control (C111 stator plates). See schematic for wiring differences. See Section 2 for additional identifying illustrations. For mechanical parts descriptions (dimensions, etc.)

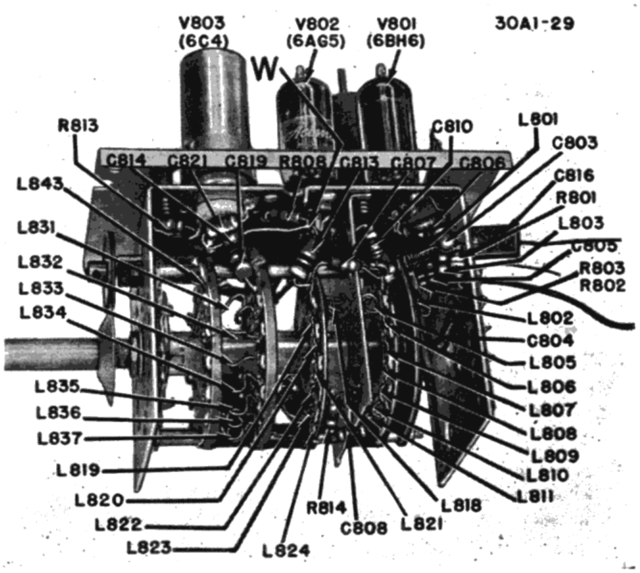


Figure 1-15. TV Tuner 94C9-2, Right Side.

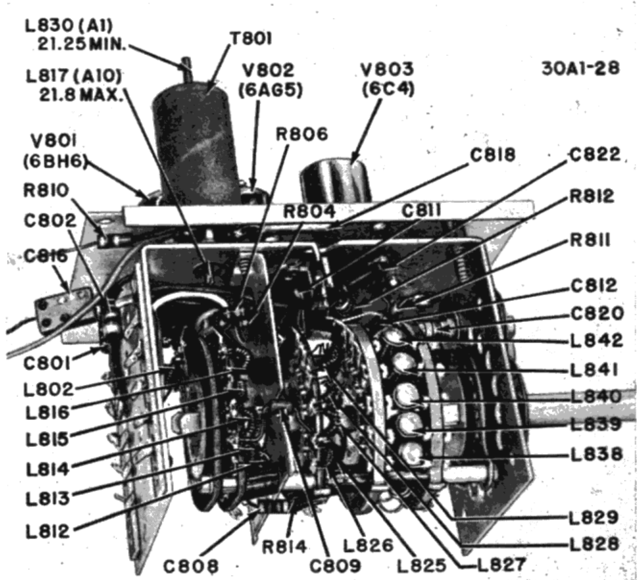


Figure 1-16. TV Tuner 94C9-2, Left Side.

PARTS LIST

Electrical components have symbol numbers assigned according to "section" location on the main schematics (Figures 1-20 and 1-21). For example: R101 is in the 94C8-2 tuner, C204 is in the Audio Section, V303 is in the Video Section, T402 is in the Sweep Section, etc. Parts in the "800" and "900" series are in the alternate TV tuners (Figures 1-18 and 1-19).

COMBINED 30A1, 30B1, 30C1, 30D1, 4H1 CHASSIS PARTS

RESISTORS

Sym.	Ohms	Part No.	
††R101	3,900 Ohms, ¼ W.	98A 45-16	
R102	47,000 Ohms, ¼ W.	98A 45-17	
R103	10,000 Ohms, ¼ W.	98A 45-18	
R104	2,200 Ohms, ½ W.	98A 45-19	
††R105	4,700 Ohms, ½ W.	98A 45-20	
R106	220,000 Ohms, ¼ W.	98A 45-21	
R107	10,000 Ohms, ¼ W.	98A 45-18	
††R108	4,700 Ohms, ½ W.	98A 45-20	
R201	39, ½W.	60B 8-390	V201 cathode bias
R202	1,000, ½W.	60B 8-102	V201 decoupling
R203	68, ½W.	60B 8-680	V202 cathode bias
R204	1,000, ½W.	60B 8-102	V202 decoupling
R205	150, ½W. (See "Production Changes" paragraph 13.)	60B 8-151	V203 diode return
R206	4.7, ½W.	60B 28-11	V203 filament dropping
R207	27,000, ½W.	60B 8-273	V203 load
R208	27,000, ½W.	60B 8-273	V203 load
R209	1,000, ½W.	60B 8-102	V203 balancing
R210	27,000, ½W.	60B 8-273	V203 de-emphasis filter
R211A	1 Meg. Pot. and Switch S201 — See note directly below.		Off volume control
R211B	See R438 — See note directly below.		Focus control
	for 30A1 (with SPST SW)	75B 12-1	
	for 30B1, 30C1 30D1 (with DPST SW)	75B 12-2	
R212	1 Meg, ½W.	60B 8-105	V204 grid bias
R213	2.2 Megs, ½W.	60B 8-225	V204 screen dropping
R214	470,000, ½W.	60B 8-474	V204 plate load
R215	47,000, ½W.	60B 8-473	V204 decoupling
R216	470,000, ½W.	60B 8-474	V205 grid return
R217	270, 1W.	60B 14-271	V205 cathode bias
R219	15,000, ½W., 5%	60B 7-153	V203 load
R220	15,000, ½W., 5%	60B 7-153	V203 load
R221	560, ½W.	60B 8-561	V203 balancing
R225	180, ½W. (R225 used only when chassis has 94C8-2 or 94C9-2 telev. tuner.)	60B 8-181	Decoupling
R301	15,000, ½W., 5%	60B 7-153	V301 grid return
R302	39, ½W.	60B 8-390	V301 cathode bias
R303	12,000, ½W.	60B 8-123	V301 decoupling
R304	15,000, ½W. (R304 was 27,000 ohms in early 30A1 production.)	60B 8-153	Video IF contrast bleeder
R305	47,000, ½W.	60B 8-473	Video IF dropping
R306A	25,000 — Dual Pot.	75B 11-2	Contrast control
R306B	100,000 — Dual Pot.	75B 11-2	Brightness control
R307	3,900, ½W.	60B 8-392	Contrast bias bleeder
R308	1,000, ½W.	60B 8-102	V301 decoupling
R309	2,400, ½W., 5% (R309 is 5600 ohms, ½W., part number 60B7-562 in sets with 94C9-2 telev. tuner.)	60B 7-242	V302 grid return
R311	39, ½W.	60B 8-390	V302 cathode bias
R312	1,000, ½W.	60B 8-102	V302 decoupling
R313	12,000, ½W.	60B 8-123	V302 decoupling
R314	2,700, ½W., 5%	60B 7-272	V303 grid return
R315	39, ½W.	60B 8-390	V303 cathode bias
R316	6,800, 1W., 5%	60B 13-682	V303 plate load

RESISTORS

Sym.	Ohms	Part No.	Function
R317	1,000, ½W.	60B 8-102	V303 decoupling
R318	150, ½W.	60B 8-151	V304 cathode bias
R319	5,600, 1W., 5%	60B 13-562	V304 plate load
R320	1,000, ½W.	60B 8-102	V304 decoupling
R321	39,000, ½W.	Part of L306	V305 plate load damping
R322	3,900, ½W.	60B 8-392	V305 plate load
R323	470,000, ½W.	60B 8-474	V306 grid return
R324	39,000, ½W.	60B 8-393	V306 bias bleeder
R325	*100,000, ½W. / §150,000, ½W.	60B 8-104 / 60B 8-154	V306 decoupling
R326	22,000, ½W.	Part of L308	V306 plate load damping
R327	3,300, 1W.	60B 14-332	V306 plate load
R328	6,800, 2W.	60B 20-682	V306 plate decoupling
R329	*3,000, WW, 15W. / §2,000, WW, 7.5W.	61A 1-9 / 61A 1-12	Plate dropping
R330	15,000, 2W.	60B 20-153	Plate supply bleeder
R331	820,000, ½W.	60B 8-824	V307 grid return
R332	150, ½W. (R332 was 330 ohms in early 30A1 production.)	60B 8-151	V307 cathode bias
R333	22,000, ½ W.	Part of L310	V307 plate load damping
R334	3,300, 1W.	60B 14-332	V307 plate load
R335	10,000, ½W.	60B 8-103	V307 phase correction
R336	100,000, ½W.	60B 8-104	V308 grid return
R337	1 Meg, ½W.	60B 8-105	DC restorer (V305) load
R338	47,000, ½W.	60B 8-473	DC restorer (V305) load
R339	220,000, ½W.	60B 8-224	V308 cathode bias bleeder
R341	22,000, ½W.	60B 8-223	V308 cathode bias
R342	12,000, 2W.	60B 20-123	Plate dropping
R401	2.2 Megs, ½W.	60B 8-225	V401 bias dropping
R402	2.2 Megs, ½W.	60B 8-225	V401 grid return
R403	10,000, ½W.	60B 8-103	V401 screen dropping
R404	4,700, 1W.	60B 14-472	V401 plate load
R405	4,700, 1W.	60B 14-472	V401 plate decoupling
R406	2.2 Megs, ½W.	60B 8-225	V402 bias dropping
R407	1.8 Megs, ½W.	60B 8-185	V402 grid return
R408	5,600, ½W.	60B 8-562	V402 plate load
R409	470,000, ½W.	60B 8-474	V403A grid return
R410	*3,300, ½W. / §2,700, ½W.	60B 8-332 / 60B 8-272	V403A cathode load
R411	*270, ½W. / §470, ½W.	60B 8-271 / 60B 8-471	V403A cathode load
R412	3,300, ½W.	60B 8-332	V403A plate load
R413	470,000, ½W. (See "Pulling At Top of Picture")	60B 8-474	V404 plate return
R414	470,000, ½W. (See "Pulling At Top of Picture")	60B 8-474	V404 cathode return
R415	150,000, 1W. (½ Watt in early production. See "Production Changes" paragraph 9.)	60B 28-14	V404 input return
R416	82,000, 1W. (½ Watt in early production. See "Production Changes" paragraph 10.)	60B 28-15	V404 input dropping
R417	470,000, ½W.	60B 8-474	V404 output filter
R418	1,000, ½W.	60B 8-102	V405 input filter

† Order exact replacement part from Admiral distributor or use IRC metalized resistor only, to secure proper high frequency characteristics.

* Used in 30A1, 30B1 and 30C1 chassis.
§ Used in 30D1 chassis.

COMBINED 30A1, 30B1, 30C1, 30D1, 4H1 CHASSIS PARTS (Cont'd)

RESISTORS

Sym.	Ohms	Part No.	Function
R419	33, ½W.	60B 8-330	V405 cathode return
R420	33,000, 2W.	60B 20-333	V405 plate load
R421A	100,000 } Dual Pot.	75B 11-1	Horizontal control
R421B	1 Meg. } Dual Pot.	75B 11-1	Vertical control
R422	39,000, ½W.	60B 8-393	V406 grid bias
R423	33,000, 1W.	60B 14-333	V406 screen dropping
R424	5,000, 5W.	61A 1-8	V406 plate load
R425	8,200, ½W.	60B 8-822	Differentiator (V406)
R426	270,000, ½W.	60B 8-274	V403B grid bias
R427	680,000, ½W., 5%	60B 7-684	V403B plate load
R428	8,200, ½W.	60B 8-822	V403B lin. correction
R429	25,000, Pot.	75A 13-2	Hor. drive control
R430	470,000, ½W.	60B 8-474	V407 grid bias
R431	100, 2W.	60B 20-101	V407 cathode bias
R432	12,000, 2W.	60B 20-123	V407 screen dropping
R433	3.3, ½W.	60B 28-10	V408 filament dropping
R434	1 Meg, 1W.	60B 28-33	V408 filter
R435	6,300, 50W.	61A 8	Hor. damping (V409)
	R435 is 7500, 25 W (#61A12-2) in 30C1-SB chassis only.		
R437	1,200, 5W.	61A 1-10	Focus coil shunt
R438	3,000 Pot. (Part of R211)		Focus control
R439	3,900, 2W.	60B 20-392	Focus coil shunt
**R440	22,000, ½W.	60B 8-223	V410 grid return
**R441	22,000, ½W.	60B 8-223	Integrator filter (V410)
**R442	8,200, ½W.	60B 8-822	Integrator filter (V410)
**R443	8,200, ½W.	60B 8-822	Integrator filter (V410)
R444	2,200, ½W.	60B 8-222	V410 cathode bias
R446	470,000, ½W.	60B 8-474	V410 grid return
R447	150,000, ½W.	60B 8-154	V410 plate load
R448	1.2 Megs, ½W.	60B 8-125	V410 plate load
R449	2 Megs, Pot.	75A 13-3	Height control
R450	470,000, ½W.	60B 8-474	V410 bleeder
R451	*56,000, ½W.	60B 8-563	V410 decoupling filter
	§27,000, ½W.	60B 8-273	
R452	8,200, ½W.	60B 8-822	V410 lin. correction
R453	2.2 Megs, ½W.	60B 8-225	V411 grid return
R454	*2,700, 1W.	60B 14-272	V411 cathode bias
	§1,500, 1W.	60B 14-152	
R455	5,000, Pot.	75A 13-1	Vertical lin. control
R456	*10,000, 1W.	60B 14-103	V411 decoupling
	§ 4,700, 1W.	60B 14-472	
R457	560, ½W.	60B 8-561	Vert. damping (T403B)
R458	560, ½W.	60B 8-561	Vert. damping (T403B)
R460	6,800, 2W.	60B 20-682	Plate dropping
	(R460 used only when chassis has 94C9-2 telev. tuner.)		
R461	6,800, 2W.	60B 20-682	Focus coil shunt
	(R461 used only when chassis has 94C9-2 telev. tuner.)		
R464	4,700, ½W.	60B 8-472	V403B lin. correction
R465	12,000, 2W.	60B 20-123	V407 screen dropping
	(R465 was 15,000 ohms in early production. See "Production Changes" paragraph 21.)		
R466	4.7, ½W.	60B 28-11	V408 fil. dropping
R467	4.7, ½W.	60B 28-11	V412 fil. dropping
R468	1 Meg., 2W.	60B 28-42	V412 coupling
R469	1 Meg., 2W.	60B 28-42	V412 coupling
R470	2,700, 2W.	60B 20-272	Focus control shunt
R471	2,700, 2W.	60B 20-272	Focus control shunt
R472	2,700, WW, 7.5W.	61A 1-11	Focus coil shunt
R473	470,000, 1W.	60B 14-474	Current limiter
R501	18 ohms, 1 Watt	60B 14-180	

RESISTORS

Sym.	Ohms	Part No.	Function
R502	39 ohms, ½ Watt	60B 8-390	
	(See "Production Changes" paragraph 3.)		
R503	3,300 ohms, 2 Watts	60B 20-332	
R511	2,500 ohms, 5 Watts, Candohm	61A 3-8	
R512	4.7 Megohms, ½ Watt	60B 8-475	
R513	4.7 Megohms, ½ Watt	60B 8-475	
R514	470,000 ohms, ½ Watt	60B 8-474	
R515	470,000 ohms, ½ Watt	60B 8-474	
R516	47,000 ohms, ½ Watt	60B 8-473	
R517	470,000 ohms, ½ Watt	60B 8-474	
R518	470,000 ohms, ½ Watt	60B 8-474	
R519	18 ohms, 1 Watt	60B 14-180	
R520	270 ohms, 2 Watt	60B 20-271	
R521	470,000 ohms, ½ Watt	60B 8-474	
R601	1.5 Megohms, ½ Watt	60B 8-155	
R602	390 ohms, ½ Watt	60B 8-391	
R603	22,000 ohms, ½ Watt	60B 8-223	
R604	1,000 ohms, ½ Watt	60B 8-102	
R605	1,000 ohms, ½ Watt	60B 8-102	
R606	27,000 ohms, 1 Watt	60B 14-273	
R607	1 Megohm, ½ Watt	60B 8-105	
R609	220,000 ohms, ½ Watt	60B 8-224	
R610	47,000 ohms, ½ Watt	60B 8-473	
R611	27,000 ohms, 1 Watt	60B 14-273	
R612	1,000 ohms, ½ Watt	60B 8-102	
R613	390 ohms, ½ Watt	60B 8-391	
R614	27,000 ohms, ½ Watt	60B 8-273	
R615	6,800 ohms, ½ Watt, 5%	60B 7-682	
R616	6,800 ohms, ½ Watt, 5%	60B 7-682	
R617a	1 Megohm, Volume Control }	75B 11-3	
R617b	2 Megohms, Tone Control }	75B 11-3	
	(Includes SW603; DPST switch.)		
R618	47,000 ohms, ½ Watt	60B 8-473	
R620	150,000 ohms, ½ Watt	60B 8-154	
R621	22 ohms, 1 Watt	60B 14-220	
R801	1,000, ½W.	60B 9-102	
R802	1 Meg, ½W.	60B 9-105	
R803	150, ½W.	60B 9-151	
R804	10,000, ½W.	60B 9-103	
R806	100, ½W.	60B 9-101	
	(R806 was 150 ohms, ½W. in early production.)		
R808	1 Meg, ½W.	60B 9-105	
R809	47,000, ½W.	60B 9-473	
R810	1,000, ½W.	60B 9-102	
R811	22,000, ½W.	60B 9-223	
R812	6,800, 1W.	60B 15-682	
R813	470, ½W.	60B 9-471	
R814	6,800, 2W.	60B 20-682	
R901	4,700, ½W.	60B 8-472	V901 plate decoupling
R902	4,700, ½W.	60B 8-472	V901 plate decoupling
R903	150, ½W.	60B 8-151	V901 grid return
R904	150, ½W.	60B 8-151	V901 grid return
R905	1,000, ½W.	60B 8-102	V901 decoupling
R906	1,000, ½W.	60B 8-102	V901 plate decoupling
R907	1 Meg. ½W.	60B 8-105	V902 grid bias
R908	10,000, ½W.	60B 8-103	V902 grid loading
R909	1,000, ½W.	60B 8-102	V902 plate decoupling
R910	150, ½W.	60B 8-151	Tuner plate decoupling
R911	4,700, ½W.	60B 8-472	V903 plate decoupling
R912	47, ½W.	60B 8-470	V903 cathode bias
R913	100,000, ½W.	60B 8-104	V903 grid bias
R914	100,000, ½W.	60B 8-104	V903 grid bias

COMBINED 30A1, 30B1, 30C1 , 30D1, 4H1 CHASSIS PARTS (Cont'd)

CONDENSERS

Sym.	Mmfd.	Part No.	Function
C101	5 mmfd., ±.5 mmfd., Zero Temp. Coeff.	98A 45-22	
C102	.5 to 3 mmfd., Ceramic Trimmer	98A 45-23	
C103	.001 mfd. min., Ceramic, Hi K.	98A 45-24	
C104	.5 to 3 mmfd., Ceramic Trimmer	98A 45-23	
C105	120 mmfd., Cer., —750 Temp. Coeff.	98A 45-25	
C106	100 mmfd., Cer., —750 Temp. Coeff.	98A 45-26	
C107	.5 to 3 mmfd., Ceramic Trimmer	98A 45-23	
C108	20 mmfd., Cer., Zero Temp. Coeff.	98A 45-27	
C109	10 mmfd., Cer., —750 Temp. Coeff. 5%	65B6-33	
	(See "Production Changes" paragraph 14.)		
C110	.5 to 3 mmfd., Ceramic Trimmer	98A 45-23	
C111	3 to 5 mmfd., Sharp Tuning	Part of M104	
C112	.001 mfd. min., Ceramic, Hi K.	98A 45-24	
C113	.001 mfd. min., Ceramic, Hi K.	98A 45-24	
C114	10 mmfd. ±.5 mmfd., Ceramic, Zero Temp. Coeff.	98A 45-59	
C115	68 mmfd., 5%, Ceramic, Zero Temp. Coeff.	98A 45-47	
C116	120 mmfd., Ceramic, —750 Temp. Coeff.	98A 45-25	
C201	1,500, Ceramic	65A 12-2	V201 cathode bypass
C202	1,500, Ceramic	65A 12-2	V201 filament bypass
C203	1,500, Ceramic	65A 12-2	V201 screen bypass
C205	30	Part of 72B 44	Transformer (T201) tank
C206	1,500, Ceramic	65A 12-2	V202 cathode bypass
C207	1,500, Ceramic	65A 12-2	V202 filament bypass
C208	1,500, Ceramic	65A 12-2	V202 screen bypass
C209	35, Cer, 2%	65B 6-14	Transformer (T202) tank
C210	300, Mica, 5%	65B 4-23	V203 output coupling
C211	300, Mica, 5%	65B 4-23	V203 output coupling
C212	4 mfd, 50v, Elec.	67A 4-4	V203 DC filter
C213	350, Mica, 10%	65B 5-24	V203 output filter
C214	.002 mfd, 600 v.	64B 5-14	V203 de-emphasis filter
C216	.005 mfd, 600 v.	64B 5-12	V204 coupling
C217	.1 mfd, 400 v.	64B 5-20	V204 screen bypass
C218	.1 mfd, 400 v.	64B 5-20	V204 decoupling
C219	.005 mfd, 600 v.	64B 5-12	V204 coupling
C220	.01 mfd, 600 v.	64B 5-10	V205 output frequency compensation
C221	350, Mica, 10%	65B 5-24	V203 output filter
C222	.005 mfd., 600 v.	64B 5-12	V203 audio coupling
C225	.1 mfd., 400 v.	64B 5-20	By-pass
	(C225 used only when chassis has 94C8-2 or 94C9-2 telev. tuner.)		
C301	50 mfd., 25v, Elect.	67A 4-7	Bias filter (V301)
	(C301 was 4 mfd. in early 30A1 production. See "Production Changes" paragraph 4.)		
C302	1,500, Ceramic	65A 12-2	V301 decoupling
C303	1,500, Ceramic	65A 12-2	Bias decoupling (V303)
C304	1,500, Ceramic	65A 12-2	V301 screen bypass
C305	300, Ceramic	65A 12-1	V301 coupling
C308	1,500, Ceramic	65A 12-2	V302 screen bypass
C309	300, Ceramic	65A 12-1	V302 coupling
C310	1,500, Ceramic	65A 12-2	Bias decoupling (V303)
C311	1,500, Ceramic	65A 12-2	V303 filament bypass
C312	1,500, Ceramic	65A 12-2	V303 screen bypass
C313	300, Ceramic	65A 12-1	V303 coupling (T302)
C314	1,500 Ceramic	65A 12-2	V304 cathode bypass
C315	1,500, Ceramic	65A 12-2	V305 filament bypass
C316	1,500, Ceramic	65A 12-2	V304 screen bypass
C317	300, Ceramic	65A 12-1	V304 coupling (T303)
C318	10, 5%, Zero Temp., Coeff., Cer.	65B 6-69	V305 load bypass
C319	.05 mfd. 400 v.	64B 5-22	V305 coupling
C320	.1 mfd., 200 v.	64B 5-30	V306 bypass
C321	.05 mfd. 600 v.	64B 5-7	V306 coupling
C322A	10 mfd., 450 v. DC.	Elect. 67C 15-3	V306 plate decoupling
C322B	20 mfd., 450 v. DC.	Elect. 67C 15-3	V308 plate supply filter
C322C	See C435	Elect. 67C 15-3	See C435
C323	.05 mfd., 400 v.	64B 5-22	V307 coupling
C324	.05 mfd., 400 v.	64B 5-22	V307 coupling

CONDENSERS

Sym.	Mmfd.	Part No.	Function
C325	.5 mfd., 200 v.	64B 5-27	V308 cathode bypass
C326	90, 3%, Zero Temp. Coeff., Cer.	65B 6-37	Video IF sound trap tank
C327	95, 3%, Zero Temp. Coeff., Cer.	65B 6-38	Video IF adj. channel audio trap tank
C328	105, 3%, Zero Temp. Coeff., Cer.	65B 6-39	Video IF adj. channel Video trap tank
C401	.05 mfd., 400 v.	64B 5-22	V401 coupling
C402	200, Mica, 10%	65B 5-21	V401 plate bypass
C403	.1 mfd., 400 v.	64B 5-20	V401 plate decoupling
C404	350, Mica, 10%	65B 5-24	V401 coupling
C405A	60 mfd., 350v. D.C	Elect. 67C 15-4	Plate supply filter
C405B	20 mfd., 450v. D.C	Elect. 67C 15-4	Plate decoupling
C405C	20 mfd., 450v. D.C	Elect. 67C 15-4	Plate decoupling
C406	.05 mfd. 400 v.	64B 5-22	V402 coupling
C407	100, Mica, 10%	65B 5-17	V403A coupling
	(C407 was ceramic in early 30A1 Production. See "Production Changes", paragraph 8.)		
C408	100, Mica, 10%	65B 5-17	V403A coupling
	(C408 was ceramic in early 30A1 Production. See "Production Changes", paragraph 8.)		
C409	.001 mfd., 600 v.	64B 5-15	V404 coupling
C410	.01 mfd., 600 v.	64B 5-10	V404 output filter
C411	.05 mfd., 400 v.	64B 5-22	V404 output filter
C412	.02 mfd., 600 v.	64B 5-9	V405 coupling
C413	.015 mfd., 600 v.	65A 13-1	V406 tank
C414	.005 mfd., 600 v.	64B 5-12	V406 coupling
C415	.05 mfd., 600 v.	64B 5-7	V406 screen bypass
C416	350, Mica, 10%	65B 5-24	Differentiator (V403B)
C417	.01 mfd., 600 v.	64B 5-10	V403B coupling
C418	.001 mfd., 600 v.	64B 5-15	V403B coupling
C419	680, Mica, 5%	65B 1-53	V403B waveforming
C420	.05 mfd., 600 v.	64B 5-7	V407 screen bypass
C421	.1 mfd., 400 v.	64B 5-20	V407 cathode bypass
C422	500, 10,000 v.	65A 11-1	V408 filter
C423	56, Mica, 1000v. 5%. (for 94B2-1 Yoke)	65B 1-54	Bypass
	39, Mica, 1000v, 5%. (for 94B2-2 Yoke)	65B 1-55	Bypass
	(See "Production Changes", paragraph 17.)		
C424	.035 mfd., 600 v. Oil Impreg.	64A 2-5	Hor. linearity control filter (V407)
C425	.05 mfd., 600 v. Oil Impreg.	64A 2-4	Hor. linearity control filter (V407)
C426	.5 mfd., 200 v.	64B 6-27	T403A or T406A coupl'g
	(C426 was 50 mfd. used before fuse circuit change. See "Production Changes" paragraph 1.)		
**C427	.01 mfd., 600 v.	64B 5-10	V410 sync coupling
**C428	.002 mfd., 600 v.	64B 5-14	Integrator filter (V410)
**C429	.005 mfd., 600 v.	64B 5-12	Integrator filter (V410)
**C430	.005 mfd., 600 v.	64B 5-12	Integrator filter (V410)
C431	.05 mfd., 400 v.	64B 5-22	V410 cathode bypass
C432	.005 mfd., 600 v.	64B 5-12	V410 coupling
C433	.05 mfd., 400 v.	64B 5-22	V410 waveforming
C434	.1 mfd., 400 v.	64B 5-20	V410 coupling
C435	50 mfd., (Part of C322)	67C 15-3	V411 cathode bypass
C440	50 mfd., 25v. Elect.	67A 4-7	Bias rectifier filter
C441	470, Mica, 5%	65B 1-57	V403B waveforming
C442	.25 mfd., 600 v.	64B 5-3	V407 plate supply filter
C443	.1 mfd., 200 v.	64B 5-30	Hor. lin. control filter (V407)
C444	.2 mfd., 200 v.	64B 5-29	Hor. lin. control filter (V407)
C445	500, 10,000 V. (with slot and stud mounting)	65B 18-2	V412 coupling
C446	500, 10,000 V. (with slot and stud mounting)	65B 18-2	V408 filter

**Component may be part of couplate unit, part #63A6-1. Replace with exact duplicate or individual components.

COMBINED 30A1, 30B1, 30C1, 30D1, 4H1 CHASSIS PARTS (Cont'd)

CONDENSERS

Sym.	Mmfd.	Part No.	Function
C447	500, 10,000 V. (with rod mounting)	65B 18-1	V412 filter
C448	500, 10,000 V.	65A 11-1	V408 filter
C501A	40 mfd., 450 v. DC. Elect.	67C 15-1	HV power supply filter
C501B	40 mfd., 450 v. DC.	67C 15-1	HV power supply filter
C503A	40 mfd., 300 v. DC. Elect.	67C 15-2	Plate supply filter
C503B	60 mfd., 300 v. DC. Elect.	67C 15-2	Plate supply filter
C503C	20 mfd., 300 v. DC. Elect.	67C 15-2	Plate supply filter
C503D	50 mfd., 25 v. DC. Elect.	67C 15-2	V205 cathode bypass
C511	.01 mfd., 400 Volts, Paper	64B 5-25	
C512	.1 mfd., 400 Volts, Paper	64B 5-20	
C513	.01 mfd., 400 Volts, Paper	64B 5-25	
C514	.01 mfd., 400 Volts, Paper	64B 5-25	
C515	.01 mfd., 400 Volts, Paper	64B 5-25	
C516	.002 mfd., 600 Volts, Paper	64B 5-14	
C517a	60 mfd., 350 Volts, Electrolytic	67C 15-5	
C517b	40 mfd., 350 Volts, Electrolytic	67C 15-5	
C517c	20 mfd., 350 Volts, Electrolytic	67C 15-5	
C518a	40 mfd., 450 Volts, Electrolytic	67C 15-1	
C518b	40 mfd., 450 Volts, Electrolytic	67C 15-1	
C601	5 mmfd., Ceramic (External AM antenna coupling condenser)	65B 6-61	
C602	2 to 20 mmfd., Trimmer	Part of L601	
C603	.001 mfd. min., Ceramic	65B 6-41	
C604a	486 mmfd. (max) AM RF, Gang	68B 24	
C604b	15 mmfd. (max) FM RF, Gang	68B 24	
C604c	114 mmfd. (max) AM Osc., Gang	68B 24	
C604d	15 mmfd. (max) FM Osc., Gang	68B 24	
C605	.01 mfd. min., Ceramic	65A 10-3	
C606	2.5 to 6 mmfd., Trimmer	66A 28-1	
C607	40 mmfd.,—.00075 Temp. Coeff., Ceramic	65B 6-67	
C608	.68 mmfd., Ceramic	65A 16-1	
C609	.001 mfd. min., Ceramic	65B 6-41	
C610	.01 mfd. min., Ceramic	65A 10-3	
C611	300 mmfd., Silver Mica, 5%	Part of T604	
C612	300 mmfd., Silver Mica, 5%	Part of T604	
C613	100 mmfd., Silver Mica, 5%	Part of T601	
C614	.01 mfd. min. Ceramic	65A 10-3	
C615	.005 mfd. min., Ceramic	65A 10-1	
C616	.01 mfd., min., Ceramic	65A 10-3	
C617	200 mmfd., Silver Mica, 5%	Part of T605	
C618	100 mmfd., Silver Mica, 5%	Part of T602	
C619	200 mmfd., Silver Mica, 5%	Part of T605	
C620	250 mmfd., Ceramic	65B 6-5	
C621	.01 mfd. min., Ceramic	65A 10-3	
C622	.005 mfd. min., Ceramic	65A 10-1	
C623	90 mmfd., Silver Mica, 3%	Part of T603	
C624	.001 mfd. min., Ceramic	65B 6-41	
C625	100 mmfd., 5%, —.00075 Temp. Coeff., Cer.	65B 6-7	
C626	100 mmfd., 5%, —.00075 Temp. Coeff., Cer.	65B 6-7	
C627	4 mfd., 150 Volts, Electrolytic	67A 4-2	
C628	.005 mfd. min., Ceramic	65A 10-1	
C629	.005 mfd. min., Ceramic	65A 10-1	
C630	250 mmfd., Ceramic	65B 6-5	
C631	.005 mfd. min., Ceramic	65A 10-1	
C632	.005 mfd. min., Ceramic	65A 10-1	
C714	130 mmfd., Silver Mica, Zero Temp. Coeff.	98A 45-56	
C715	10 mmfd., Silver Mica, ± .5 mmfd., Zero Temp. Coeff.	98A 45-59	
C716	85 mmfd., Silver Mica, 3%, Zero Temp. Coeff.	98A 45-57	
C801	680 mmfd. min., Ceramic, Hi-K.	98A 46-10	
C802	680 mmfd. min., Ceramic, Hi-K.	98A 46-10	
C803	680 mmfd. min., Ceramic, Hi-K.	98A 46-10	
C804	680 mmfd. min., Ceramic, Hi-K.	98A 46-10	
C805	500 mmfd. min., Ceramic, Hi-K.	98A 46-11	
C806	680 mmfd. min., Ceramic, Hi-K.	98A 46-10	
C807	.68 mmfd., Ceramic, ± 10%	98A 46-12	
C808	.47 mmfd., Ceramic, ± 10%	98A 46-13	
C809	1.5 mmfd., Ceramic, ± 10%	98A 46-14	
C810	680 mmfd. min., Ceramic, Hi-K.	98A 46-10	
C811	680 mmfd. min., Ceramic, Hi-K.	98A 46-10	

CONDENSERS

Sym.	Mmfd.	Part No.
C812	680 mmfd. min., Ceramic, Hi-K.	98A 46-10
C813	25 mmfd., Ceramic, ±10%, Zero Temp. Coeff.	98A 46-15
C814	1.5 mmfd., Ceramic, ± 10%	98A 46-14
C815	.005 mfd., Ceramic, Hi-K.	98A 46-16
C816	270 mmfd., Mica, 10%	98A 44-11
C817	56 mmfd., Ceramic	Part of T801
C818	.0015 mfd., Ceramic, Hi-K.	98A 46-17
C819	680 mmfd. min., Ceramic, Hi-K.	98A 46-10
C820	Sharp Tuning (Special)	98A 46-18
C821	3 mmfd., Ceramic, ± 10%, 750 Temp. Coeff.	98A 46-19
C822	680 mmfd. min., Ceramic, Hi-K.	98A 46-10

Sym.	Mmfd.	Part No.	Function
C901	1,500, Ceramic	98A 44-12	V901 plate decoupling
C902	1.5, Cer, 10%	98A 44-6	V901 neutralizing
C903	1.5, Cer, 10%	98A 44-6	V901 neutralizing
C904	270, Cer, 10%	98A 44-10	V901 grid coupling
C905	1,500, Cer, 10%	98A 44-12	V901 decoupling
C906	270, Cer, 10%	98A 44-10	V901 grid coupling
C907	2.2, Cer, 10%	98A 44-7	V902 grid coupling
C908	4.7, Cer, 10%	98A 44-8	V902 grid coupling
C909	.68, Cer, 10%	98A 44-5	V902 grid coupling
C910	22, 10%, —.00075 Temp. Coeff., Cer.	98A 44-9	V902 grid IF trap
C911	270, Mica, 10%	98A 44-11	V902 plate coupling
C912	68, 5%, Zero Temp. Coeff., Cer.	98A 44-4	Converter IF transformer tank (T901)
C913	1,500, Ceramic	98A 44-12	Tuner heater decoupling
C914	1,500, Ceramic	98A 44-12	V902 plate decoupling
C915	1,500, Ceramic	98A 44-12	Tuner plate decoupling
C916	10, 5%,—.00075 Temp. Coeff., Cer.	65B 6-33	V903 plate decoupling
C917A	Stator	98A 44-29	Sharp tuning control
C917B	Rotor	98A 44-30	Sharp tuning control
C919	4.7, 10%,—.00075 Temp. Coeff., Cer.	98A 44-8	V903 feedback
C920	4.7, 10%,—.00075 Temp. Coeff., Cer.	98A 44-8	V903 feedback
C921	10, Ceramic, 5% (See "Production Changes"	65B 6-33	F.M. interference trap paragraph 11.)
C922	10, Ceramic, 5% (See "Production Changes"	65B 6-33	F.M. interference trap paragraph 11.)

COILS AND TRANSFORMERS

Sym.	Description	Part No.
L101	Antenna Coil	
	for Channel #2	98A 58-2
	for Channel #3	98A 58-3
	for Channel #4	98A 58-4
	for Channel #5	98A 58-5
	for Channel #6	98A 58-6
	for Channel #7	98A 58-7
	for Channel #8	98A 58-8
	for Channel #9	98A 58-9
	for Channel #10	98A 58-10
	for Channel #11	98A 58-11
	for Channel #12	98A 58-12
	for Channel #13	98A 58-13
L102	Mixer—Oscillator Coil	
	for Channel #2	98A 59-2
	for Channel #3	98A 59-3
	for Channel #4	98A 59-4
	for Channel #5	98A 59-5
	for Channel #6	98A 59-6
	for Channel #7	98A 59-7
	for Channel #8	98A 59-8
	for Channel #9	98A 59-9
	for Channel #10	98A 59-10
	for Channel #11	98A 59-11
	for Channel #12	98A 59-12
	for Channel #13	98A 59-13

Before inserting replacement coil (L101 or L102) in turret, check to see that teeth at inner end of coils fit together when fitted in detent plate at center of turret. If necessary, file teeth slightly.

COMBINED 30A1, 30B1, 30C1, 30D1, 4H1 CHASSIS PARTS (Cont'd)

COILS AND TRANSFORMERS

Sym.	Description	Part No.	
L103	Choke, Filament RF	98A 45-13	
L104	Choke, Filament Oscillator	98A 45-14	
L105	Coil, 1st IF	98A 45-48	
L106	Trap Coil		
	with solder lug mtg.	98A 45-49	
	with spade lug mtg.	98A 45-53	
L107	Coupling Coil	Part of L106	
L201	RF Fil. Choke	73A 2	V201 heater decoupling
L301	1st Video IF Coil	69A 32	V301 plate load
L302	RF Fil. Choke	73A 2	Heater decoup. (V301)
L304	RF Fil. Choke	73A 2	Heater decoup. (V303)
L305	RF Fil. Choke	73A 2	Heater decoup. (V304)
L306	180 microhenrys (wound on R321)	AA139-1	Detector (V305) peaking coil
L307	250 microhenrys	AA139-2	Detector (V305) peaking coil
L308	120 microhenrys (wound on R326)	AA139-3	V306 peaking coil
L309	93 microhenrys	AA139-4	V306 peaking coil
L310	120 microhenrys (wound on R333)	AA139-3	V307 peaking coil
L311	93 microhenrys	AA139-4	V307 peaking coil
L401	Slug-Adj. Coil	94A 4	Width control
L402	Slug-Adj. Coil	94A 3	Horizontal lin. control
L403	Coil	69B 35-1	Focus coil
L404	Coil, Adjustable	94A 12	Width control
L405	Coil, Adjustable	94A 11	Horiz. lin. control
L406	Coil (with plug and leads)	69B 94-1	Focus coil
L501	Filter Choke 2hy	74A 12	V501 filter choke
L511	Filter choke 2.8hy.	74A 13	V514 filter choke
L512	Filter choke 2hy	74A 12	V501 filter choke
	Filter choke (speaker adapter for 8C11, 8C12, 8C13)	74A 14-1	
L601	Antenna, AM Loop	69 C84-1	
L602	Antenna, FM (internal folded dipole)	AB195	
	(Early production used two 28" lengths of #20 wire.)		
L603	Coil, Antenna (FM)	69A 85	
L604	Coil, Oscillator (AM)	69A 86	
L605	Coil, Oscillator (FM)	69A 87	
L606	Choke, Filament RF	73A 2-4	
L705	Coil, Mixer Plate	Part of T701	
L706	Coil, Mixer Trap	Part of T701	
L707	Coil, Plate Coupling	98A 45-15	
L801	Coil, Antenna (9 turns #22 wire)		
L802	Coil, Antenna (9 turns #22 wire)		
L803	Coil, Antenna (center-tapped)	98A 46-23	
L804	Choke, Heater RF	98A 46-24	
L805	Coil, RF Plate (2½ turns #20 wire) Channel 13		
L806	Jumper, RF Plate (#20 wire) Channel 12		
L807	Jumper, RF Plate (#20 wire) Channel 11		
L808	Jumper, RF Plate (#20 wire) Channel 10		
L809	Jumper, RF Plate (#20 wire) Channel 9		
L810	Jumper, RF Plate (#20 wire) Channel 8		
L811	Jumper, RF Plate (#20 wire) Channel 7		
L812	Coil, RF Plate (8½ turns #22 wire) Channel 6		
L813	Coil, RF Plate (6½ turns #24 wire) Channel 5		
L814	Coil, RF Plate (12½ turns #24 wire) Channel 4		
L815	Coil, RF Plate (9½ turns #24 wire) Channel 3		
L816	Coil, RF Plate (12½ turns #24 wire) Channel 2		
L817	Coil, Mixer Plate	Part of T801	
L818	Coil, Mixer Grid (2½ turns #20 wire) Channel 13		
L819	Jumper, Mixer Grid (#20 wire) Channel 12		
L820	Jumper, Mixer Grid (#20 wire) Channel 11		
L821	Jumper, Mixer Grid (#20 wire) Channel 10		
L822	Jumper, Mixer Grid (#20 wire) Channel 9		

COILS AND TRANSFORMERS

Sym.	Description	Part No.	
L823	Jumper, Mixer Grid (#20 wire) Channel 8		
L824	Jumper, Mixer Grid (#20 wire) Channel 7		
L825	Coil, Mixer Grid (8½ turns #22 wire) Channel 6		
L826	Coil, Mixer Grid (6½ turns #24 wire) Channel 5		
L827	Coil, Mixer Grid (12½ turns #24 wire) Channel 4		
L828	Coil, Mixer Grid (9½ turns #24 wire) Channel 3		
L829	Coil, Mixer Grid (12½ turns #24 wire) Channel 2		
L830	Coil, Sound Trap	Part of T801	
L831	Coil, Osc. (1½ turns #20 wire) Channel 13		
L832	Coil, Osc. (S-formed #20 wire) Channel 12		
L833	Coil, Osc. (S-formed #20 wire) Channel 11		
L834	Coil, Osc. (S-formed #20 wire) Channel 10		
L835	Coil Osc. (S-formed #20 wire) Channel 9		
L836	Coil, Osc. (1½ turns #20 wire) Channel 8		
L837	Coil, Osc. (1½ turns #20 wire) Channel 7		
L838	Coil, Osc. (6 turns #21 wire) Channel 6	98A 46-25	
L839	Coil, Osc. (7 turns #21 wire) Channel 5	98A 46-26	
L840	Coil, Osc. (9 turns #21 wire) Channel 4	98A 46-27	
L841	Coil, Osc. (10 turns #21 wire) Channel 3	98A 46-28	
L842	Coil, Osc. (10 turns #21 wire) Channel 2	98A 46-29	
L843	Jumper Osc. series (#20 wire)		
L901	Channel #1 Coil	98A 44-13	V901 plate coil
L902	Channel #1 Coil	98A 44-13	V901 plate coil
L903	Channel #2 Coil	98A 44-14	V901 plate coil
L904	Channel #2 Coil	98A 44-14	V901 plate coil
L905	Channel #3 Coil	98A 44-17	V901 plate coil
L906	Channel #3 Coil	98A 44-17	V901 plate coil
L907	Channel #4 Coil	98A 44-15	V901 plate coil
L908	Channel #4 Coil	98A 44-15	V901 plate coil
L909	Channel #5 Coil	98A 44-16	V901 plate coil
L910	Channel #5 Coil	98A 44-16	V901 plate coil
L927	Antenna Coil	98A 44-3	High pass filter
L929	Channel #1 Coil	98A 44-13	V902 grid coil
L930	Channel #1 Coil	98A 44-13	V902 grid coil
L931	Channel #2 Coil	98A 44-14	V902 grid coil
L932	Channel #2 Coil	98A 44-14	V902 grid coil
L933	Channel #3 Coil	98A 44-17	V902 grid coil
L934	Channel #3 Coil	98A 44-17	V902 grid coil
L935	Channel #4 Coil	98A 44-14	V902 grid coil
L936	Channel #4 Coil	98A 44-14	V902 grid coil
L937	Channel #5 Coil	98A 44-16	V902 grid coil
L938	Channel #5 Coil	98A 44-16	V902 grid coil
L984, L985	Trap (includes C921, C922)	98A 44-28	FM interference trap
	(See "Production Changes" paragraph 11.)		
T201	1st Audio IF Trans.	72B 44	Transformer (V201)
	(Late production 30A1 used 72B 58. See "Production Changes" paragraph 5.)		
T202	FM Detector Trans.	72B 45	Transformer (V203)
	(See "Production Changes" paragraph 13.)		
T203	Audio Out. Trans.	79A 8	Transformer (V205)
T301	2nd Vid. IF Trans.		
	for 6AG5	72B 40-1	Trans. & audio trap
	for 6AU6	72B 81	Trans. & audio trap
	(See "Production Changes" paragraph 16.)		
T302	3rd Vid. IF Trans.		
	for 6AG5	72B 41-1	Trans. & audio trap
	for 6AU6	72B 82	Trans. & audio trap
	(See "Production Changes" paragraph 16.)		
T303	4th Vid. IF Trans.	72B 42	Trans. & video trap
T401	Hor. Osc. Trans.	72B 43	Transformer-Horizontal lock control (V406)
T402	Hor. Output Trans.		
	for 30A1, 30B1	79B 7	Transformer (V407)
	for 30C1	79C 19-1	Transformer (V407)
	for 30C1-SB only	79C 23-2	Transformer (V407)
T403a, T403b	Deflection Yoke	94B 2-2	V308 Horiz.-Vert. Deflection
	(See "Production Changes" paragraph 17.)		

COMBINED 30A1, 30B1, 30C1, 30D1, 4H1 CHASSIS PARTS (Cont'd

COILS AND TRANSFORMERS

Sym.	Description	Part No.	Function
T404	Vert. Out. Trans.	79B 6	Transformer (V411)
T405	Hor. Out. Trans. for 30D1 only	79C 17-1	Transformer (V407)
T406A, T406B	Deflection Yoke	94B 2-2	V308 Horiz.-Vert. Deflection
	(See "Production Changes" paragraph 17.)		
T501	HV Power Trans. Upright Mtg.	80B 7	Transformer (V501)
	(Used in double chassis power supply. See "Production Changes" paragraph 3.)		
	Half-shell Mtg.	80B 11	Transformer (V501)
	(Used in single chassis power supply. See "Production Changes" paragraph 3.)		
T502	LV Power Trans. Upright Mtg.	80B 8	Transformer (V502)
	(Used in double chassis power supply. See "Production Changes" paragraph 3.)		
	Half-shell Mtg.	80 B12	Transformer (V502)
	(Used in single chassis power supply. See "Production Changes" paragraph 3.)		
T511	Transformer, Output	79A 16	
T512	Transformer, Low Voltage Power	80B 16	
T513	Transformer, High Voltage Power	80B 15	
T601	Transformer, 1st IF (FM)	72B 75	
T602	Transformer, 2nd IF (FM)	72B 76	
T603	Transformer, Ratio Detector	72B 39	
T604	Transformer, 1st IF (AM)	72B 73	
T605	Transformer, 2nd IF (AM)	72B 74	
T701	Mixer Trans. (Early Production)	98A 45-1	
	Slug, Hollow Core (for T701)	98A 45-35	
	Slug, Solid Core (for T701)	98A 45-38	
T801	Mixer Transformer	72B 61	
T901	Mixer Transformer	98A 44-27	

PICTURE TUBES

Sym.	Description	Part No.
V308	10″ Picture tube (30A1, 30B1)	10BP4
V308	12″ Picture tube (30C1)	12BP4
V308	12″ Picture tube (30C1)	12KP4
V308	12″ Picture tube (30C1)	12LP4
V308	12″ Picture tube (30C1)	12QP4
V308	12″ Picture tube (30C1)	12TP4
V308	16″ Picture tube (30D1)	16AP4

Important

Alternate 12″ picture tubes used in 30C1 chassis. Replace with identical tube (see "WIRED FOR—" stamp on rear of chassis); or when substituting

SOCKETS AND PLUGS

Sym.	Description	Part No.
M201	Plug, Audio Input	88A 2-1
M202	Socket, Audio Input	88A 1
M203	Socket, Wafer (14 contact rectangular) for all single cable chassis	88A 20-2
M203	Socket and Cable (11 contact, round); connects to LV power supply in two-cable chassis (early production 30A1 only)	A1581
M203	Socket and Cable (11 contact, round); connects to HV power supply in two-cable chassis (early 30A1) only)	A1580
M203	Socket (11 contact, round)	87A 19-1
M203	Cover and Insulator for 87A19-1 Socket	88A 17

SOCKETS AND PLUGS

Sym.	Description	Part No.
M204	Socket, Speaker (4 contact)	87A 6-1
M205	Plug, Speaker (4 pin)	88A 4-4
M206	Socket, AC Power Outlet	87A 21-1
M207	Plug, AC Input (interlock)	89A 22-2
M208	Line Cord, with plug & interlock socket	89A 22-1
§§M406	Socket, Deflection Yoke (6 contact)	87B 30-2
§§M407	Plug, Deflection Yoke (6 pin)	88A 9-1
	Cover and Insulator for plug 88A9-1	88A 17
M408	Plug, Focus Coil (4 pin)	88B 22-1
	Cover and Insulator for plug 88B22-1	88B 22-3
M409	Socket, Focus Coil (4 contact)	87A 6-3
M511	Socket, Audio Input	88A 1
M512	Socket, Cable Connector (8 contact rect.)	88A 20-5
	Plug, Cable Connector (8 pin rect.)	88A 20-7
	Cable, including 88A20-5 socket	AB184
	Cable, including 88A20-5 socket and 88A20-7 plug	AB189
	Cover and Insulator for 88A20-5 socket and 88A20-7 plug	88A 20-6
M513	Plug, Cable Connector (14 pin rect.)	88A 20-1
	Cable, (12 wire) including 88A20-1 plug for 4 tube single chassis power supply	AB150
	Cable, (13 wire) including 88A20-1 plug for 5 tube single chassis power supply	AB186
	Cover and Insulator (for 88A20-1 plug)	88A 20-3
	Plug and Cable (11 contact, round) for Low Voltage Power Supply	A1596
	Plug and Cable (11 contact, round) for High Voltage Power Supply	A1598
	Plug and Retaining Ring (11 contact, round)	88A 18-2
M514	Socket and Leads, Phono Motor	89A 6-10
M515	Socket and Leads, Pilot Light	82A 11-6
M601	Socket, Phono Input	88A 1
M602	Plug, Chassis Connector (8 pin rect.)	88A 20-4
M603	Plug and Shielded Cable	89A 29-6
M604	Socket and Shielded Cable	89A 26-26
	Plug, Adapter (For alignment or service, with 4H1 television combinations. Used for operating television chassis, without 4H1 radio tuner connected)	98A 30-4
	Socket, Adapter (For alignment or service, with 4H1 television combinations. Used for operating 4H1 radio tuner without television chassis connected)	98A 30-5
	Socket, Tube for 10″ or 12″ Picture Tube	87A 18
	for 16″ Picture Tube	87A 18-1
	for Octal Tube (Standard)	87A 5-1
	for Octal Tube (Ring mounting)	87A 20
	for Miniature Tube (7 pin)	87A 3-7
	for Miniature Tube (9 pin)	87A 25-2
	Connector, Male (for 2nd anode of picture tubes 10BP4, 12BP4, 12LP4, 12TP4 and 12KP4)	88A 16-1
	Connector, Female (for 2nd anode of picture tube 12QP4)	88A 16-3
	Connector, Male (for 2nd anode of picture tube 16AP4)	88A 16-2

§§ Early production (30D1) used a molded plug (with a rubber cap) for M407 and a socket with matching pin arrangement for M406. When replacement of an early production type plug or socket is necessary, replace both the plug and socket with late production type parts M407 and M406 (88A9-1 and 87B30-2 respectively).

MISCELLANEOUS PARTS FOR TELEVISION CHASSIS

NOTE

Picture tube mounting parts listed below are for 10" and 12" picture tubes. See separate heading on this page for 16" picture tube mounting parts.

Sym.	Description	Part No.
M208	Line Cord, Plug and Interlock Socket	89A 22-1
M304	Ion Trap	
	for 10BP4, 12BP4, 12LP4 and 12TP4 Picture Tubes	94B 6
	for 12QP4 Picture Tube	94A 15-2
	for 16AP4 Picture Tube	94A 15-1
M402	Fuse, Cartridge (.25 Amp.—250 volts)	84A 4-2
	Fuse Holder, for fuse 84A4-2	84A 5-1
M405	Bias Rectifier, Selenium	93A 2
M516	Speaker	
	for 4H15, 4H16, 4H17, 4H145, 4H146, 4H147 (10" PM)	78B 41
	for 4H115, 4H116, 4H117 (12" PM)	78B 44-1
	for 4H18, 4H19, 4H126, 4H137, 4H155, 4H156, 4H157, 4H165, 4H166, 4H167 (12" PM)	78B 44-2
	for 8C11, 8C12 and 8C13 (10" PM)	78B 41
	for 30A12, 30A13, 30A14, 30A15, 30A-16, 30B15, 30B16, 30B17, 30C15, 30C16, 30C17 (6" dyn. 750 ohm)	78B 36-1
S201	On-Off Switch (AC power switch)	Part of R211
SW601	Switch, AM-FM Band	76B 17
SW602	Switch, Telev-Radio-Phono	76B 16
SW603	Switch, AC Power (DPST)	Part of R617
	Bracket, 10" or 12" Picture Tube Support	
	Right side (facing tube)	15C 259-2
	Left side (facing tube)	15C 259-1
	Bracket, Deflection Yoke Mounting (10" or 12" picture tube)	15A 252
	Bracket, Tube and Focus Coil Mounting	
	for 10" Picture Tube	15C 240
	for 12" Picture Tube	15C 403
	Bumper Plate, Picture Tube	
	with 11/32" offset	15A 404
	with 3/32" offset	15A 292
	Bumper, Rubber (10" & 12" picture tube mtg.)	12A 16
	Cable, Shielded Audio (4 ft.)	89A 24-2
	Channel, Rubber 8⅝" long (for 10" and 12" picture tube bracket)	12A 9-5
	Clamp (for 10" & 12" picture tube mtg. strap)	15A 245
	Clip, 1B3GT or 6BG6G Plate Cap	19A 54
	Collar, Rubber (inside focus coil)	12A 14
	Connector, Male (for 2nd anode of picture tubes 10BP4, 12BP4, 12LP4, 12TP4 and 12KP4)	88A 16-1
	Connector, Female (for anode of picture tube 12QP4)	88A 16-3
	Connector, Male (for 2nd anode of picture tube 16AP4)	88A 16-2
	**Couplate (multiple unit) (Consists of R440, R441, R442, R443, and C427, C428, C429, C430).	63A 6
	Insulator, Ceramic Stand-Off	
	½"x1½", 8-32 Thread	29A 8
	½"x1½", 6-32 Thread	29A 8-1
	½"x½", 6-32 Thread	29A 8-2
	Insulator, Fibre (for deflection yoke)	32A 75
	Insulator, Fibre (2nd anode lead support)	32A 74

Description	Part No.
Plate, Channel Selector Shaft Bearing (Metal)	
with ½" hole, for chassis using A1582 television tuner	15A 247
with ⅜" hole, for chassis using 94C8-2 (94A8-2), 94C9-2 television tuner	15A 247-1
(If used for replacement of obsolete fibre bearing plate, use with 19A55 tuner shaft contact spring.)	
Plate, 1B3GT Tube Mtg. (30A1, 30B1, 30C1 chassis)	A1591
Plate, 5V4GT and 1B3GT Tube Mounting (30D1 chassis)	A1949
Ring, Corona (30A1, 30B1 and 30C1 chassis)	19A 24
Ring, Corona (30D1 chassis)	19A 52
Rubber Strip (3/16"x⅜"x2"; for picture tube bumper plate)	12A 5-6
Screw, Deflection Yoke Adjustment (8/32x⅜", wing)	1A 101-1-21
Screw, Focus Coil Adjustment (10/32x1½")	100-1500-F2-21
Shield, Removable HV (includes line cord)	A1967
Shield Plate, IF	A1779
Spring, Focus Coil Mounting	19A 22
Spring, Grounding (Picture tube to chassis)	19A 23
Spring, Tube (5U4G) Retaining	87A 22-2
Spring, Tuner Shaft Contact (used with metal Bearing Plate 15A247-1)	19A 55
Terminal Board, Antenna	10A 6-2
Tubing, Plastic (11½" length, 2nd anode lead in 30D1 chassis)	96B 19-5-6-2
Webbing, 10" Picture Tube Mtg. Strap (30" length)	50A 3-1
Webbing, 12" Picture Tube Mtg. Strap (36" length)	50A 3-3

PARTS FOR MOUNTING 16" PICTURE TUBE

Description	Part No.
Band, Tube front insulating (Plastic)	33A 47
Band, Tube Retaining (Metal)	28A 40-1
Base Assembly, Deflection Yoke (includes insulator)	A1941
Bracket, Deflection Yoke Adjusting	15A 433
Bracket, Tube Mounting (Front)	
Left hand—(from front)	15B 468-2
Right hand—(from front)	15B 468-1
Cover, Protective Cardboard (for picture tube)	43B 76
Deflection Yoke Mtg. (Upper Section)	15C 428
HV Lead and Lug (2nd anode)	A1938
Insulator, Deflection Yoke (Fibre)	32A 104
Insulator, Tube Band (Plastic Sheet 3"x5½")	32A 103-1
Ion Trap	94A 15-1
Mounting Board, Picture Tube	98A 48-50
Nut (8-32 Hex, for Tube band)	2A 1-15-71
Nut (10-32 tee-nut for tube mtg. board)	2A 17-2
Plate, Focus Coil Mounting (U shaped)	15B 432
Rubber Channel (11 13/16" for tube rear support)	12A 9-7
Rubber Collar inside focus coil	12A 14
Screw, Bracket Mounting (8-32x⅜" RH MS)	380-375-C2-71
Screw, Focus Coil Mtg. (10-32x1½" RH MS)	3100-1500-F2-71
Screw, Wing (for deflection yoke)	1A 101-1-71
Spring, Focus Coil Mounting	19A 22
Spring, HV Contact at front of tube	18A 37
Tube, 16" Picture	16AP4
Tube Support Bakelite (in front of Deflection Yoke)	32B 99

**Component may be part of couplate unit, part #63A6-1. Replace with exact duplicate or individual components.

MISCELLANEOUS PARTS FOR TELEVISION TUNERS

MISCELLANEOUS 94C8-2 TUNER PARTS

Sym.	Description	Part No.
†	Turret and Shaft Assembly (less coils)	
	Early prod. (3/8" detent depression)	98A 45-42
	Late prod. (1/8" detent depression)	98A 45-51
†M101	Roller, Detent	
	1/4" diameter (early prod.)	98A 45-32
	3/8" diameter (late prod.)	98A 45-50
†M102	Spring, Detent	
	2 5/8" long (early prod.)	98A 45-37
	1 13/16" long (late prod.)	98A 45-45
M103	Contact Plate and Bracket Assy.	98A 45-30
†M104	Shaft Shell & Rotor Assembly (Sharp Tuning)	
	Early prod. (with 4 5/8" long brass shaft shell)	98A 45-34
	Late prod. (with 4 3/8" long brass shaft shell)	98A 45-54
†M105	Spring, Sharp Tuning Rotor Contact	
	Early prod. (Wire 5/8" long)	98A 45-41
	Late prod. (Flat Bronze 7/8"x1/2")	98A 45-60
†	Spring, Front Turret Shaft	
	Early prod. (Wire 1/2" long)	98A 45-40
	Late prod. (Wire 2 3/4" long)	98A 45-44
	Bracket, Sharp Tuning Rotor Retaining (Used in late prod. tuners only)	98A 45-61
	Nut, Locking Spring (for trimmers)	98A 45-31
	Screw, Bracket Mounting (6-32x1/4")	98A 45-62
	Screw, Trimmer (#4-36x5/8")	98A 45-33
	Shield, Leaded Tube	98A 44-23
	Shield, Plain Tube	98A 45-36
	Slug, Tuning, for L106 (includes Locknut and Bushing)	98A 45-58
	Spring, Tube Shield Clamping	98A 44-26
†	Spring, Rear Turret Shaft	
	Early prod. (Wire 1 1/4" long)	98A 45-39
	Late prod. (Wire 2 3/4" long)	98A 45-44
	Spring, Slug Retaining (osc. coil)	98A 45-52
	Washer, Fibre Spacer (1/4" IDx1/2" OD) (Used in late prod. tuners only)	98A 45-63

MISCELLANEOUS 94C9-2 TUNER PARTS

Description	Part No.
Disc Assembly, Sharp Tuning	98A 46-30
Jumper, Switch Wafer	98A 46-31
Plate, Detent	98A 46-32
Screw, Set (for Sharp Tuning Disc), 4-40x1/8" Bristol Head	98A 46-33
Shaft Shell, Sharp Tuning	98A 46-34
Shaft Assembly, Selector	98A 46-35
Shield, Tube	87A 7-4
Socket, Tube (Ceramic)	98A 46-36
Socket, Tube (Black Bakelite)	87A 3-7
Switch Assembly, Wafer (Osc. Ceramic)	98A 46-37
Switch Assembly, Wafer (Antenna section)	98A 46-38
Switch Assembly, Wafer (RF & Mixer section)	98A 46-39
Spring, Shaft Ring (for Selector Shaft)	98A 46-40
Terminal Board, 5 lug	98A 46-41
Washer, C (for Selector Shaft)	98A 46-42
Wrench, Bristol #4	1A 46-1

MISCELLANEOUS A1582 TUNER PARTS

Description	Part No.
Condenser C917 Rotor Assembly (for Sharp Tuning Control)	98A 44-30
Condenser C917 Stator Assembly (for Sharp Tuning Control)	98A 44-29
Core — Channel #13, front and rear oscillator coil (L980 and L981)	98A 44-18
Core — Channel #6 and #13, front and rear converter grid coils or front and rear RF amplifier plate coils (L911, L912, L925, L926, L939, L940, L953, and L954)	98A 44-19
Core — Channel #6, front and rear oscillator coils (L966 and L967)	98A 44-20
Screw tuning-adj. — #4.40x15/32", (for coils L957, L959, L961, L963, and L965)	98A 44-21
Screw tuning-adj. — #4.40x1/4", (for coils L969, L971, L973, L975, L977, and L979)	98A 44-22
Shaft Assembly, Vernier	AA138
Shield, Tube (for V903)	87A 7-4
Shield Cover, Lead (for V903)	98A 44-23
Spring, for retaining vernier shaft shell to selector switch shaft	19A 21-1
Spring, Clamping (for Tube Shield of V903)	98A 44-26
Spring, Retaining (for Slug-Adj. Screws)	98A 44-25
Spring, Snap (for sharp tuning shaft)	98A 44-24
Trap, F.M. Interference	98A 44-28
Vernier Detent and Shaft (for Selector Switch S901)	76B 14
Vernier Shell and Detent (for Selector Switch)	AB142

† When ordering parts, be sure to check complete description including physical size. Parts used in early and late production runs are not interchangeable. For illustration, see figures 2-8, 2-9 and 2-10 in Section 2.

MISCELLANEOUS PARTS FOR 4H1 FM-AM RADIO TUNER CHASSIS

Sym.	Description	Part No.
M601	Socket, Phono Input	88A 1
M602	Plug, Power Supply (8 pin)	88A 20-4
M603	Plug and Shielded Cable	89A 5-6
M604	Socket and Shielded Cable	89A 5-26
SW601	Switch, AM-FM Band	76B 17
SW602	Switch, Telev-Radio-Phono	76B 16
SW603	Switch, AC Power	Part of R617
	Adapter Socket (for alignment and service)	98A 30-5
	Bracket, Dual Control	15A 385
	Bracket, Tuning Sleeve	15A 394
	Cover Assembly, Chassis	A1880
	Dial Back and Bracket Assembly	A1881
	Dial Cord	50A 1-3
	Dial Scale	22B 19-1

Description	Part No.
Escutcheon, Radio	23D 39-1
Grommet, Rubber (Gang mounting)	12A 1-4
Pilot Light, Mazda No. 47	81A 1-8
Pilot Light, Socket and 12" Lead	82A 8-6
Pointer, Dial	25A 33
Pulley, Dial	17A 1-3
Spring, Dial Cord	19B 1-3
Spring, Tube retaining (for 12AT7)	19A 56-1
Snap Button (Dial mounting)	13A 1-1-21
Spacer Sleeve (for gang mounting)	29A 2-10-71
Tube Socket (7-pin miniature)	87A 3-7
Tube Socket (9-pin miniature)	87A 25-2
Tuner Sleeve	27A 61

PHONOGRAPH PARTS

‡ Supplied only if old part cannot be repaired. When ordering, describe condition of old part in detail.

NOTE: Parts listed below are used in "4H" combination models. See either the RC210, RC211, RC212 Record Changer Service Manual or the RC221, RC222 Record Changer Service Manual for complete parts list for Record Changers used in the "4H" models.

See either the RC180, RC181 Record Changer Service Manual or the RC182 Record Changer Service Manual for a complete parts list for Record Changers used in models 8C11, 8C12, 8C13.

Description	Part No.
Belt, Rubber Drive	406A 20
Cable, Shielded Pickup (includes plug)	413A 11-1
Cartridge, Dual Needle (includes needles)	409A 11
Centerpost, Record (for 10″ and 12″ records)	G400B 311
Centerpost, Record (for 7″ record)	G400B 310
Idler Wheel Assembly (includes tire)	G400A 279
Motor (2 speed)	407B 15
Motor (3 speed)	407B 17
Needle, Phonograph (Long Play)	98A 15-6
Needle, Phonograph (Standard 78 RPM)	98A 15-7
Needle Retaining Nut	98A 54-2
Plug, Motor (Male)	88A 8-1
Shoulder Eye Bolt (for adjusting phono tilt-out spring)	1A 87-1
Spindle Mounting Assembly (for holding extra centerpost and spindle)	A2002
Spindle, Record (for 45 RPM)	G400B 329
Hinge Assembly, Tilt-out	
for Left side (facing front)	AC183-1
for Right side (facing front)	AC183-2
Tilt-Out Spring (2⅛″ long)	19A 15-1
Tilt-Out Tie Bar (13⅞″ long)	15B 126-1
Tilt-Out Tie Rod (13⅞″ long)	28A 22-1
Touch-up Paint (Coppertone Hammer)	98A 54-3

CABINET PARTS

CABINET PARTS for 30A12, 30A13, 30A14, 30A15, 30A16, 8C11, 8C12 and 8C13

For 30A14SA, 30A15SA parts, see next page.

For data on TV tuner identification, refer to page 2-1 of Section 2.

For additional cabinet parts for 8C11, 8C12, 8C13, refer to 8C1 Service Manual, form No. S195.

Description	Part No.
Back, Cabinet (30A14, 30A15, 30A16)	43B 50
Back, Cabinet (30A12 and 30A13)	43B 53
Bracket, Safety glass mounting	15A 244
Bracket, Picture tube bumper	15A 243
Cabinet	
for sets with 94C8-2 (94A8-2) Television Tuner	
Walnut (30A12S or SN)	35E 85-5
Mahogany (30A13S or SN)	35E 85-6
Walnut (30A14S or SN)	35E 77-7
Mahogany (30A15S or SN)	35E 77-8
Blond (30A16S or SN)	35E 77-9
for sets with A1582 Television Tuner	
Walnut (30A12N or UL)	35E 85-1
Mahogany (30A13N or UL)	35E 85-2
Walnut (30A14N or UL)	35E 77-1
Mahogany (30A15N or UL)	35E 77-2
Blond (30A16N or UL)	35E 77-3
for sets with 94C9-2 Television Tuner	
Walnut (30A12T or TN)	35E 85-7
Mahogany (30A13T or TN)	35E 85-8
Walnut (30A14T or TN)	35E 77-10
Mahogany (30A15T or TN)	35E 77-11
Blond (30A16T or TN)	35E 77-12
Carton and Fillers	
for 30A14, 30A15 and 30A16	44C 106
for 30A12 and 30A13	44B 122
for 8C11, 8C12, 8C13	44B 115
Crate, Shipping (for 8C11, 8C12, 8C13)	44B 117
Clamp, Cable	11A 2-6
Decal, Cabinet Lettering	98A 15-1
Escutcheon, Plastic (for 8C11, 8C12, 8C13 models). See "Replacement of Plastic Escutcheons"	
Escutcheon, Wood	
for sets with 94C8-2 (94A8-2) Television Tuner	
Walnut (8C11S or SN)	23D 36-7
Mahogany (8C12S or SN)	23D 36-8
Blond (8C13S or SN)	23D 36-9
for sets with A1582 Television Tuner	
Walnut (8C11N or UL)	23D 36-1
Mahogany (8C12N or UL)	23D 36-2
Blond (8C13N or UL)	23D 36-3
for sets with 94C9-2 Television Tuner	
Walnut (8C11T or TN)	23D 36-10
Mahogany (8C12T or TN)	23D 36-11
Blond (8C13T or TN)	23D 36-12

CABINET PARTS for 30A12, 30A13, 30A14 30A15, 30A16, 8C11, 8C12 and 8C13 (Cont'd)

For 30A14SA, 30A15SA parts, see next page.

Description	Part No.
Felt Mask (for picture tube window)	38B 2
Glass Window (Picture tube)	21B 49
(To install glass window,	
Grille Cloth	
for Walnut and Mahogany Cabinets	98A 41-13
for Blond Cabinet	98A 41-14
Grommet, Speaker Mounting	12A 2-6
Knobs, Tuning	
'Channel' (inner knob)	33C 28-9
'Horizontal,' 'Contrast' and 'Off-Volume' (inner knob)	33C 28-10
'Sharp Tuning' (outer knob)	33C 28-11
'Vertical,' 'Brightness' and 'Focus' (outer knob)	33C 28-12
Medallion Block (for grille)	
for Walnut Cabinets	98A 38-14
for Mahogany Cabinets	98A 38-15
for Blond Cabinets	98A 38-16
Ring, Channel Knob Compression	18A 5-3
Rubber Grommet (for shock mounting speaker, use with spacer sleeve 29A 2-5-71)	12A 2-6
Rubber Strip, Sponge (⅛″x¾″x¾″ for safety glass mtg. bracket)	12A 5-4
Screen, Perforated Metal (8″x11″)	16A 2-1-70
Screw, Plastic Escutcheon Mtg. (#3x⅝″ F.H.M.S.)	1A 11-7-58
Screw, Telev. Chassis Mtg. (¼x20x1¼″)	1A 67-44-21
Screw, Wood Escutcheon Mtg. (#3x½″ O.H.W.S.)	1A 15-6-58
Shock Mount, Chassis (Rubber tubing 1″ dia. x ¼″)	12A 6-7
Spacer, Fibre Cabinet Leveler (Kit of six)	98A 44-47
Spacer, Grommet (Metal)	29A 2-5-71
Speaker, 6″ Dynamic; 750 ohm field (30A12 to 30A16)	78B 36-1
Speaker, 10″ PM (for 8C11, 8C12, 8C13 models)	78B 41
Spring, Tuning Knob	
for 'Channel,' 'Horizontal,' 'Contrast,' 'On-Off Volume' (inner knobs)	98A 44-1
for 'Sharp Tuning' (outer knob)	98A 44-2
Washer, Felt	
for 'Horizontal-Vertical,' 'Contrast-Brightness,' 'Off-Volume-Focus' knobs	5A 4-6
for 'Channel-Sharp Tuning' knobs	5A 4-5

CABINET PARTS (Cont'd)

CABINET PARTS for 30A14SA, 30A15SA, 30B15, 30B16, 30B17, 30C15, 30C16, 30C17

(All the above model numbers contain the letter "S" or "SN".)

Parts below are for sets with rectangular picture tube window. See manual covering 20B1 chassis for parts used with sets having rounded-end picture tube window.

Description	Part No.
Back, Cabinet (30A14A, 30A15A, 30B15, 30B16, 30B17)	43B 50
Back, Cabinet (30C15, 30C16, 30C17)	16D 7
Bottom, Metal Cabinet	16A 2-1-70
Bracket, Plug Lock	15A 365
‡Cabinet, Wood	
Walnut (30A14A)	35E 77-7
Mahogany (30A15A)	35E 77-8
Walnut (30B15)	35E 90-1
Mahogany (30B16)	35E 90-2
Blond (30B17)	35E 90-3
Walnut (30C15)	35E 93-1
Mahogany (30C16)	35E 93-2
Blond (30C17)	35E 93-3
Carton and Fillers	
for 30A14A, 30A15A, 30B15, 30B16 and 30B17	44C 106
for 30C15, 30C16 and 30C17	44B 126
Clamp, Cable	11A 2-6
Decal, Cabinet Lettering	98A 15-1
Escutcheon, Overlay (Channel)	23B 43
Escutcheon, Window (10" Television)	23C 40
Escutcheon, Window (12" Television)	23B 41
Grille Cloth	
for Walnut and Mahogany Cabinets	98A 38-7
for Blond Cabinet	98A 38-8
Grommets, Speaker Mounting	12A 2-6
Knobs, Tuning	
for 30A14A, 30A15A, 30B15, 30B16, 30C15 and 30C16	
'Sharp Tuning' (Gold outer knob)	33C 28-15
'Vertical,' 'Brightness,' 'Focus' (Gold outer knob)	33C 28-16
'Channel' (Maroon inner knob)	33C 28-19
'Horizontal,' 'Contrast,' 'On-Off-Volume' (Maroon inner knob)	33C 28-20
for 30B17 and 30C17	
'Sharp Tuning' (Gold outer knob)	33C 28-15
'Vertical,' 'Brightness,' 'Focus' (Gold outer knob)	33C 28-16
'Channel' (Gold inner knob)	33C 28-17
'Horizontal,' 'Contrast,' 'On-Off Volume' (Gold inner knob)	33C 28-18
Mask, Sponge Rubber (for 10" picture tube)	12A 32-1
Mask, Sponge Rubber (for 12" picture tube)	12A 32-2
Medallion Block (for grille)	
for Walnut Cabinets	98A 49-4
for Mahogany Cabinets	98A 49-5
for Blond Cabinets	98A 49-6
Medallion Plug	20A 6-1
Ring, Channel Knob Compression	18A 5-3
Rubber Grommet (for shock mounting speaker, use with spacer sleeve 29A 2-5-71)	12A 2-6
Screw, Escutcheon Mtg. (#6x½ Phillips W.S.)	1A 7-24-59
Shockmount, Chassis	
Rubber tubing (1"x¼")	12A 6-7
Rubber block vulcanized to chassis mtg. bracket	AA190
Spacer, Fibre Cabinet Level (Kit of six)	98A 44-47
Spacer, Grommet (Metal)	29A 2-5-71
Speaker, 6" Dynamic (750 ohm field)	78B 36-1
Spring Clip, Channel Escutcheon	19A 48

CABINET PARTS for 30A14SA, 30A15SA, 30B15, 30B16, 30B17, 30C15, 30C16, 30C17 (Cont'd)

(All the above model numbers contain the letter "S" or "SN".)

Description	Part No.
Spring, Tuning Knob	
for 'Channel,' 'Horizontal,' 'Contrast,' 'On-Off Volume' (inner knobs)	98A 44-1
for 'Sharp Tuning' (outer knob)	98A 44-2
Washer, Felt (Television)	
for 'Horizontal—Vertical,' 'Contrast—Brightness,' 'Off-Volume Focus' knobs	5A 4-6
for 'Channel—Sharp Tuning' knobs	5A 4-5
Washer, Fibre (used between inner and outer television knobs)	5A 1-30

CABINET PARTS for 4H15, 4H16, 4H17

(All the above model numbers contain the letter "S" or "SN".)

Description	Part No.
Back, Cabinet (Radio-Phono compartment)	43B 64-1
Back, Cabinet (Telev. compt. 15½"x11")	16D 6
Bracket, Plug Lock	15A 365
‡Cabinet	
for sets with rectangular picture tube window	
Walnut (4H15)	35E 89-1
Mahogany (4H16)	35E 89-2
Blond (4H17)	35E 89-3
Carton and Fillers (for 4H15, 4H16, 4H17)	44B 124
Clamp Cable	11A 2-6
Cushion Plate, Fibre (Channel Escutcheon mtg)	32A 78
‡Door, Television and Radio-Phono	
pair for Walnut (4H15)	98A 48-16
pair for Mahogany (4H16)	98A 48-17
pair for Blond (4H17)	98A 48-18
‡Door, Record Compartment Complete	
for Walnut (4H15)	98A 48-19
for Mahogany (4H16)	98A 48-20
for Blond (4H17)	98A 48-21
Door Bumper, Sponge Rubber ($\frac{1}{16}$"x¼"x1")	12A 5-6
Door Catch and Strike Plate, Bullet	98A 48-26
Escutcheon, Radio	23D 39-1
Escutcheon, Television Channel	23B 44-1
Escutcheon, Frame (Television, for 23D30-6)	23D 30-5
Escutcheon Window (rectangular)	23D 30-6
Eye Bolt (for Tilt-Out Spring)	1A 87-1
Grille Cloth (2 pieces)	
for Walnut (4H15) and Mahogany (4H16)	98A 48-22
for Blond (4H17)	98A 48-23
Hinge Assembly, Tilt-Out	
Left side (facing front)	AC183-1
Right side (facing front)	AC183-2
Hinge, Knife Door	
pair for Walnut (4H15); Mahogany (4H16)	98A 48-24
pair for Blond (4H17)	98A 48-25
Jewel, Pilot Light	82A 10-8
Knob, Door (Telev. and Radio Phono (Compt.)	33A 41-1
Knob Door (Record Compartment)	33A 41-2
Knob, Radio Tuning	
'Telev-Phono-Radio' (Maroon and gold, single knob)	33C 40-6
'Tuning' (Maroon outer knob)	33C 40-7
'AM-FM' (Gold inner knob)	33C 40-8
'Tone' (Maroon outer knob)	33C 40-9
'Off-Volume' (Gold inner knob)	33C 40-10
Knob, Television	
'Channel' (Gold inner knob)	33C 28-17
'Horizontal', 'Contrast', and 'Off-Volume' (Gold inner knob)	33C 28-18
'Sharp Tuning' (Maroon outer knob)	33C 28-21
'Vertical', 'Brightness' and 'Focus' (Maroon outer knob)	33C 28-22

‡ Supplied only if old part cannot be repaired. When ordering, describe condition of old part in detail.

CABINET PARTS for 4H15, 4H16, 4H17 (Cont'd)

(All the above model numbers contain the letter "S" or "SN".)

Description	Part No.
Mask, Sponge Rubber (for television escutcheon)	12A 32-2
Nut, Hex (#4-40 for Tilt-Out Tie Bar)	2A 1-6-71
Ring, Knob Compression	18A 5-3
Screen, Perforated (8"x11")	16A 2-1-70
Screw, Telev. Chassis Mtg. (#¼-20x1¼")	1A 67-44-71
Screw, Escutcheon Mtg. (#3x⅝" O.H.W.S.)	1A 15-7-58
Screw, TV Window Mtg. (#4x½" F.H.W.S.)	1A 10-8-59
Screw, Tilt-Out Tie Rod Mtg. (#6-32x¼" Bd H.M.S.)	365-250-C2-58
Screw, Tilt-Out Spring Mtg. (#8-32x¼" Bd H.M.S.)	85-250-C2-21
Screw, Tilt-Out Tie Bar Mtg. (#4-40x$\frac{7}{16}$" R.H.M.S.)	40-437-C2-71
Speaker, 10" PM	78B 41
Spindle Mounting Assembly (for holding extra centerpost and spindle)	A2002
Speed Nut (Radio escutcheon mounting)	2B 10-24-59
Speed Nut (Picture Tube escutcheon mtg.)	2B 10-5-68
Speed Nut (#8-22 Speaker mounting)	2B 10-8-59
Spring, Channel Escutcheon Retaining	18A 27
Spring, Tilt-Out Coil	19A 15-1
Tie Bar, Tilt-Out	15B 126-1
Tie Rod, Tilt-Out	28A 22-1
Washer, Felt (Radio Knobs)	5A 4-11
Washer, Felt (Television)	
for 'Horizontal—Vertical', 'Contrast—Brightness, Off-Volume Focus' knobs	5A 4-6
for 'Channel-Sharp Tuning' knobs	5A 4-5

CABINET PARTS for 4H18, 4H19 and 4H165, 4H166, 4H167

(All the above model numbers contain the letter "S" or "SN")

Back, Cabinet (Radio-Phono Compartment)	
for 4H18, 4H19	43B 64-2
for 4H165, 4H166, 4H167	43B 64-1
Back, Cabinet (Television compartment)	16D 5-1
Bracket, Plug Lock	15A 365
‡Cabinet	
For sets with rectangular picture tube window	
Ebony (4H18)	35E 91-1
Jade Green (4H19)	35E 91-2
Walnut (4H165)	35E 91-8
Mahogany (4H166)	35E 91-9
Blond (4H167)	35E 91-10
Clamp, Cable	11A 2-6
Crate, Shipping	44B 125
Crate Fillers, Cardboard	43C 67
‡Doors, Matched	
pair for Ebony (4H18)	98A 48-31
pair for Jade Green (4H19)	98A 48-32
pair for Walnut (4H165)	98A 48-54
pair for Mahogany (4H166)	98A 48-55
pair for Blond (4H167)	98A 48-56
Door Catch and Strike Plate, Bullet	98A 48-34
Door Handle	98A 48-37
Escutcheon, Radio	23D 39-1
Escutcheon, Picture Tube	23D 41
Escutcheon, Television Channel	23B 43
Grille Cloth	
for Ebony (4H18) and Jade Green (4H19)	98A 48-35
for Walnut (4H165) and Mahogany (4H166)	98A 48-57
for Blond (4H167)	98A 48-58

CABINET PARTS for 4H18, 4H19 and 4H165, 4H166, 4H167 (Cont'd)

(All the above model numbers contain the letter "S" or "SN".)

Description	Part No.
Hinge, Knife Door (Pair)	98A 48-33
Jewel, Pilot Light	82A 10-8
Knobs, Radio Tuning	
'Telev-Phono-Radio' (Gold with maroon rim)	33C 40-6
'Tuning' (Maroon outer knob)	33C 40-7
'AM-FM' (Gold inner knob)	33C 40-8
'Tone' (Maroon outer knob)	33C 40-9
'Off-Volume' (Gold inner knob)	33C 40-10
Knobs, Television Tuning	
for Ebony (4H18) and Jade Green (4H19)	
'Channel' (Ebony inner knob)	33C 28-29
'Sharp Tuning' (Gold outer knob)	33C 28-23
'Horizontal', 'Contrast' and 'Off-Volume' (Ebony inner knob)	33C 28-30
'Vertical', 'Brightness' and 'Focus' (Gold outer knob)	33C 28-24
for Walnut (4H165) and Mahogany (4H166)	
'Sharp Tuning' (Gold outer knob)	33C 28-15
'Vertical', 'Brightness' and 'Focus' (Gold outer knob)	33C 28-16
'Channel' (Maroon inner knob)	33C 28-19
'Horizontal', 'Contrast' and 'Off-Volume' (Maroon inner knob)	33C 28-20
for Blond (4H167)	
'Sharp Tuning' (Gold outer knob)	33C 28-15
'Vertical', 'Brightness' and 'Focus' (Gold outer knob)	33C 28-16
'Channel' (Gold inner knob)	33C 28-17
'Horizontal', 'Contrast' and 'Off-Volume (Gold inner knob)	33C 28-18
Mask, Sponge Rubber (Picture Tube)	12A 32-2
Nut, Hex (#4-40 for Tilt-Out Tie Bar)	2A 1-6-71
Pilot Light #47	81A 1-8
Plaque, Cabinet Door	
matched set for Ebony (4H18)	98A 48-52
matched set for Jade Green (4H19)	98A 48-53
Ring, Compression (for channel knob)	18A 5-3
Screen, Perforated Metal (8"x11")	16A 2-1-70
Screw, Escutcheon Mtg. (#6x½" R.H.W.S.)	1A 7-24-59
Screw, Slide Mtg. (#8-32x1⅝" Bd Hd M.S.)	85-1625-C2-21
Screw, Telev. Chassis Mtg. (¼x20x1¼")	1A 67-44-21
Shelf, Slide Drawer	
for Ebony (4H18)	98A 48-36
for Jade Green (4H19)	98A 48-38
for Walnut (4H165)	98A 48-59
for Mahogany (4H166)	98A 48-60
for Blond (4H167)	98A 48-61
Speaker (12" PM)	78B 44-2
Speed Nut (Radio Escutcheon mounting)	2B 10-24-59
Speed Nut (Picture Tube Escutcheon mtg.)	2B 10-5-68
Speed Nut (#8-22 Speaker mounting)	2B 10-8-59
Spindle Mounting (for holding extra centerpost and spindle)	A2002
Spring, Knob Tension (for telev. inner knobs)	98A 44-1
Spring, Knob Tension (for telev. Sharp Tuning knob)	98A 44-2
Washer, Felt (Radio Knob)	5A 4-11
Washer, Felt (Television)	
for 'Horizontal—Vertical', 'Contrast—Brightness', 'Off-Volume—Focus' knobs	5A 4-6
for 'Channel—Sharp Tuning' knob	5A 4-5
Washer, Fibre (used between inner and outer television knobs)	5A 1-30

CABINET PARTS for 4H115, 4H116, 4H117, 4H145, 4H146, 4H147 and 4H155, 4H156, 4H157

(All the above model numbers contain the letter "S" or "SN".)

Description	Part No.
Back, Cabinet	
Radio-Phono Compartment	43B 64-1
Telev. Compartment for 4H115, 4H116, 4H117	16D 6
Telev. Compartment (perforated metal) for 4H145, 4H146, 4H147, 4H155, 4H156, 4H157	16D 5-1
Bracket, Plug Lock	15A 365
‡Cabinet, with rectangular picture tube window	
Walnut (4H115)	35E 92-1
Mahogany (4H116)	35E 92-2
Blond (4H117)	35E 92-3
Walnut (4H145)	35E 98-1
Mahogany (4H146)	35E 98-2
Blond (4H147)	35E 98-3
Walnut (4H155)	35E 92-7
Mahogany (4H156)	35E 92-8
Blond (4H157)	35E 92-9
‡Cabinet Leg	
for Walnut (4H115, 4H145, 4H155)	98A 48-6
for Mahogany (4H116, 4H146, 4H156)	98A 48-7
for Blond (4H117, 4H147, 4H157)	98A 48-8
Clamp, Cable	11A 2-6
Carton and Fillers, for 4H145, 4H146, 4H147	44B 142
Crate, Shipping	
for 4H115, 4H116, 4H117	44B 127
for 4H155, 4H156, 4H157	44B 138
Crate Filler, Cardboard	
for 4H115, 4H116, 4H117	43C 65
for 4H155, 4H156, 4H157	43C 78
Cushion Plate, Fibre (23B44-1 Channel escutcheon mounting)	32A 78
‡Door, Television and Radio-Phono	
pair for Walnut (4H115, 4H145, 4H155)	98A 48-1
pair for Mahogany (4H116, 4H146, 4H156)	98A 48-2
pair for Blond (4H117, 4H147, 4H157)	98A 48-3
‡Door, Record Compartment (Complete)	
for Walnut (4H145)	98A 57-1
for Mahogany (4H146)	98A 57-2
for Blond (4H147)	98A 57-3
Door Catch and Strike Plate, Bullet	
for 4H115, 4H116, 4H117, 4H155, 4H156, 4H157	98A 48-11
for 4H145, 4H146, 4H147	98A 48-26
Escutcheon, Radio	23D 39-1
Escutcheon, Television Channel	
for 4H115, 4H116, 4H117	23B 44-1
for 4H145, 4H146, 4H147, 4H155, 4H156, 4H157	23B 43
Escutcheon Frame, Picture Tube (4H115, 4H116, 4H117)	23D 30-5
Escutcheon Window, Picture Tube (4H115, 4H116, 4H117)	23D 30-6
Escutcheon, Picture Tube Window and Frame (4H145, 4H146, 4H147, 4H155, 4H156, 4H157)	23D 41
Eye Bolt (for Tilt-Out Spring)	1A 87-1
Grille, Metal Cabinet	
for 4H115, 4H116, 4H117, 4H155, 4H156, 4H157	36C 11-1
for 4H145, 4H146, 4H147	36B 12-2
Grille Cloth	
for Walnut (4H115, 4H155) and Mahogany (4H116, 4H156)	98A 48-4
for Blond (4H117, 4H157)	98A 48-5
for Walnut (4H145) and Mahogany (4H146) 2 pieces	98A 57-4
for Blond (4H147), 2 pieces	98A 57-5

CABINET PARTS for 4H115, 4H116, 4H117, 4H145, 4H146, 4H147, Etc. (Cont'd)

(All the above model numbers contain the letter "S" or "SN".)

Description	Part No.
Hinge Assembly, Tilt-Out	
Right side (facing front)	AC183-2
Left side (facing front)	AC183-1
Hinge, Knife Door	
pair for Walnut (4H115, 4H145, 4H155) and Mahogany (4H116, 4H146, 4H156)	98A 48-9
pair for Blond (4H117, 4H147, 4H157)	98A 48-10
Jewel, Pilot Light	82A 10-8
Knob, Door (Television and Radio-Phono)	
for Walnut (4H115, 4H145, 4H155) and Mahogany (4H116, 4H146, 4H156)	98A 48-12
for Blond (4H117, 4H147, 4H157)	98A 48-13
Knob, Radio Tuning	
'Telev-Phono-Radio' (Maroon and gold, single knob)	33C 40-6
'Tuning' (Maroon outer knob)	33C 40-7
'AM-FM' (Gold inner knob)	33C 40-8
'Tone' (Maroon outer knob)	33C 40-9
'Off-Volume' (Gold inner knob)	33C 40-10
Knob, Television Tuning	
for 4H115, 4H116, 4H117	
'Channel' (Gold inner knob)	33C 28-17
'Horizontal', 'Contrast', and 'Off-Volume' (Gold inner knob)	33C 28-18
'Sharp Tuning' (Maroon outer knob)	33C 28-21
'Vertical', 'Brightness' and 'Focus' (Maroon outer knob)	33C 28-22
for Walnut (4H145, 4H155) and Mahogany (4H146, 4H156)	
'Sharp Tuning' (Gold outer knob)	33C 28-15
'Channel Selector' (Maroon inner knob)	33C 28-19
'Focus', 'Brightness' and 'Vertical' (Gold outer knob)	33C 28-16
'Contrast', 'Off-Volume' and 'Horizontal' (Maroon inner knob)	33C 28-20
for Blond (4H147, 4H157)	
'Sharp Tuning' (Gold outer knob)	33C 28-15
'Channel' (Gold inner knob)	33C 28-17
'Focus', 'Brightness' and 'Vertical' (Gold outer knob)	33C 28-16
'Contrast', 'Off-Volume' and 'Horizontal' (Gold inner knob)	33C 28-18
Mask, Sponge Rubber (for television escutcheon)	12A 32-2
Nut, Hex (#4-40 for Tilt-Out Tie Bar)	2A 1-6-71
Ring, Knob Compression	18A 5-3
Screen, Perforated Metal (8"x11")	16A 2-1-70
Screw, Telev. Chassis Mtg. (#¼-20x1¼")	1A 67-44-71
Screw, Escutcheon Mtg. (#3x⅝" O.H.W.S.)	1A 15-7-58
Screw, TV Window Mtg. (#4x½" F.H.W.S.)	1A 10-8-59
Screw, Tilt-Out Tie Rod Mtg. (#6-32x¼" Bd H.M.S.)	365-250-C2-58
Screw, Tilt-Out Spring Mtg. (#8-32x¼" Bd H.M.S.)	85-250-C2-21
Screw, Tilt-Out Tie Bar Mtg. (#4-40x$\frac{7}{16}$" R.H.M.S.)	40-437-C2-71
Speaker, 12" PM	
for 4H115, 4H116, 4 .H155, 4H156, 4H157	78B 44-1
Speaker, 10" PM (4H145, 4H146, 4H147)	78B 41
Speed Nut (Radio Escutcheon mounting)	2B 10-24-59
Speed Nut (Picture Tube Escutcheon mtg.)	2B 10-5-68
Speed Nut (#8-22 Speaker mounting)	2B 10-8-59

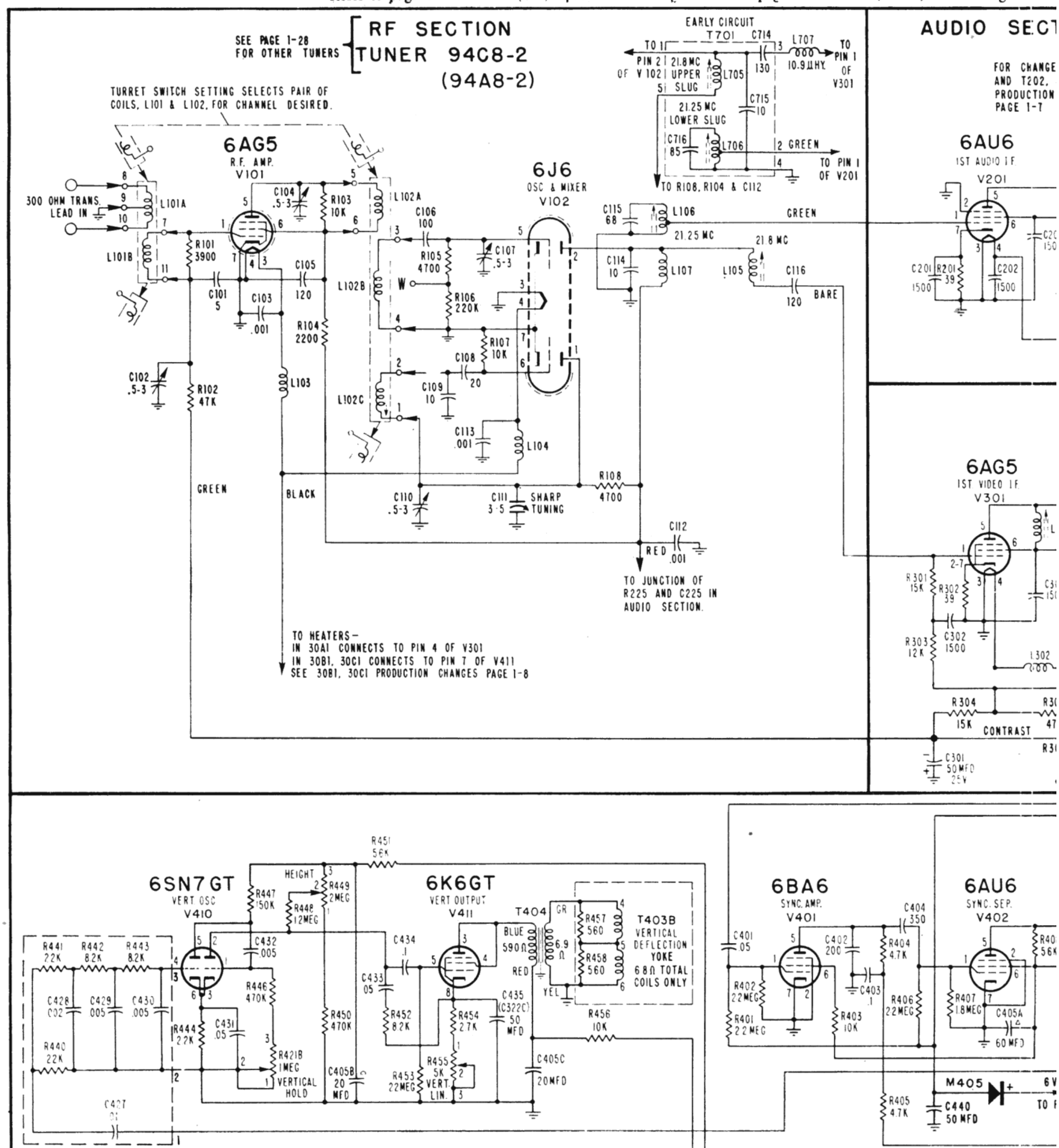
‡ Supplied only if old part cannot be repaired. When ordering, describe condition of old part in detail.

Figure 1-20. Schematic Diagram for 30A1, 30B1, or 30C1 Chassis, using 94C8-2 T
with 10" and 12" picture tubes, and for 8C11, 8C12, 8C13 combina

For schematic diagram of "4H" combinations with 10", 12" and 16" picture tubes, see reverse page. Figure 1-2

Circuit changes necessary for different 12" picture tubes are tabulated on page 1-31.

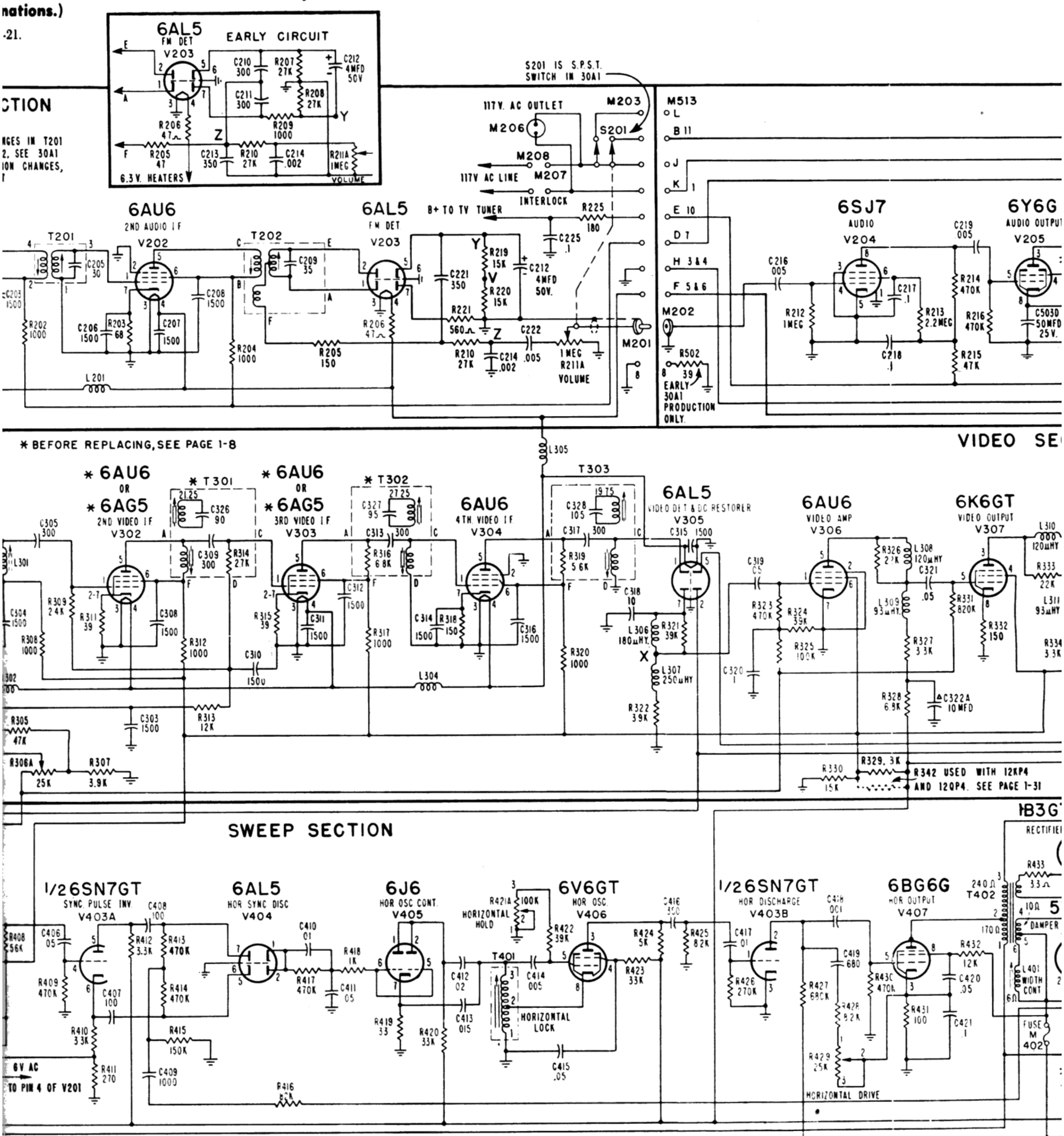
Refer to page 1-4 for 30A1 (only) production changes: refer to page 1-8 for 30A1, 30B1, 30C1 changes.



33 TUNER A1582 300 OHM TRANSMISSION **If parts**

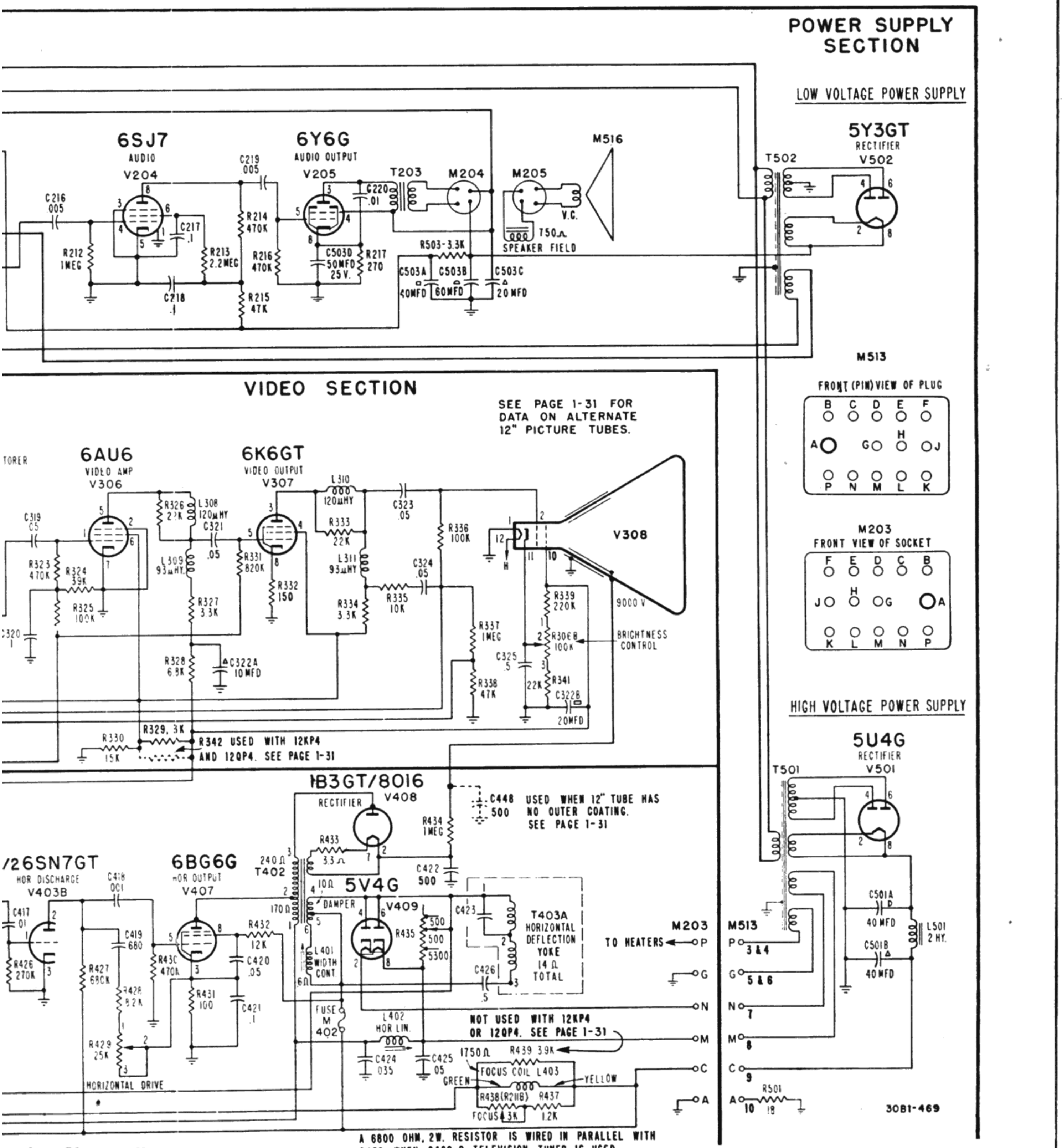
: Telev. Tuner. (For all Television (only) sets
nations.)

-21.



rts not shown here or different circuit arrangements are found in a chassis, see "Production Changes",

CHASSIS 30A1, 30B1, 30C1, 30D1; RADIO CHASSIS 4H1



uction Changes",

If parts not shown here or different circuit c

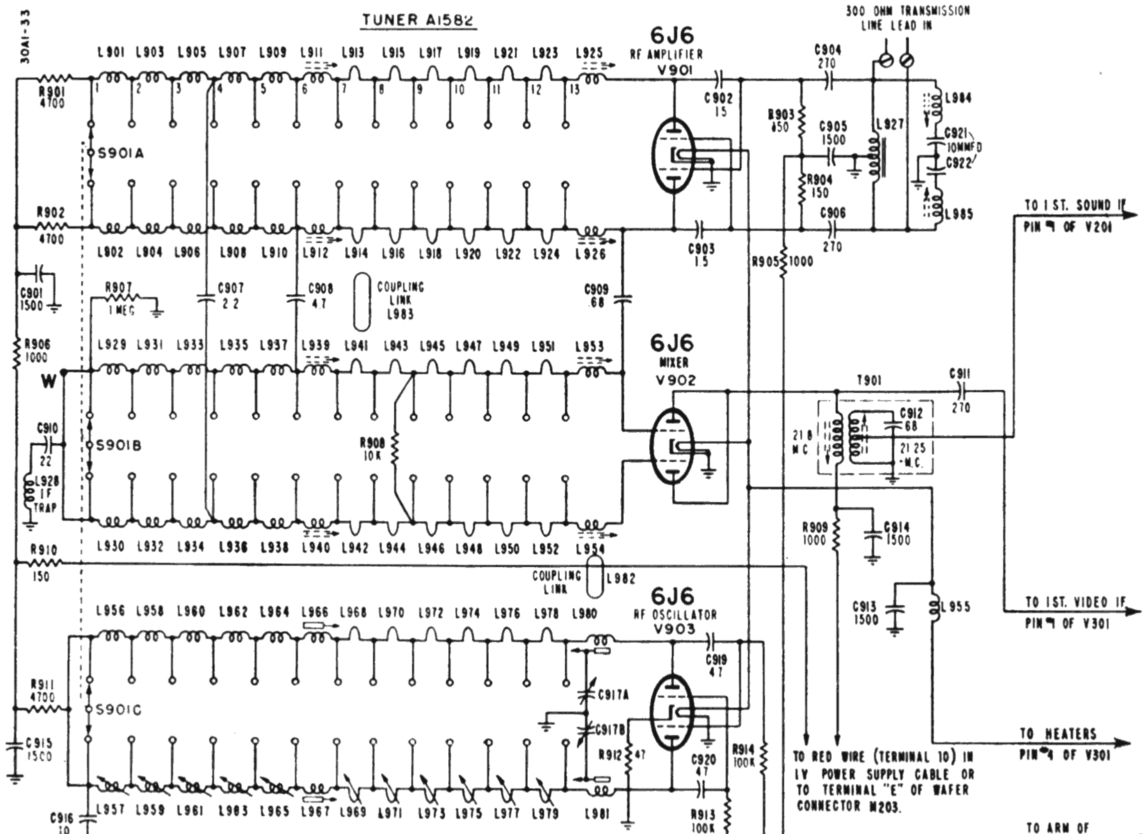
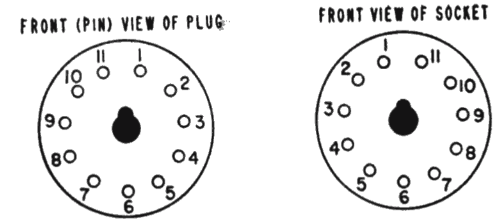


Figure 1-18. Schematic, TV Tuner A1582.



ALTERNATE TV TUN

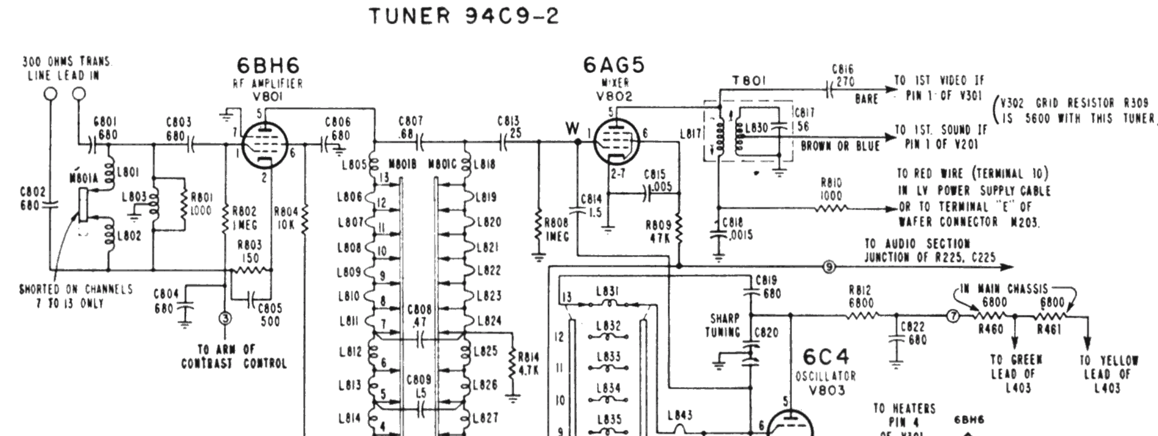
(See Figure 1-20 f

The adjoining illustrations show round connectors used in early production power supplies. The numerals shown are stamped on the connector and correspond to those shown at M203, M513 in the schematic

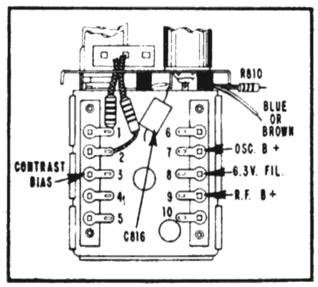
NERS USED IN 30A1 CHASSIS

0 for 94C8-2 television tuner.)

TUNER 94C9-2



30A1-34



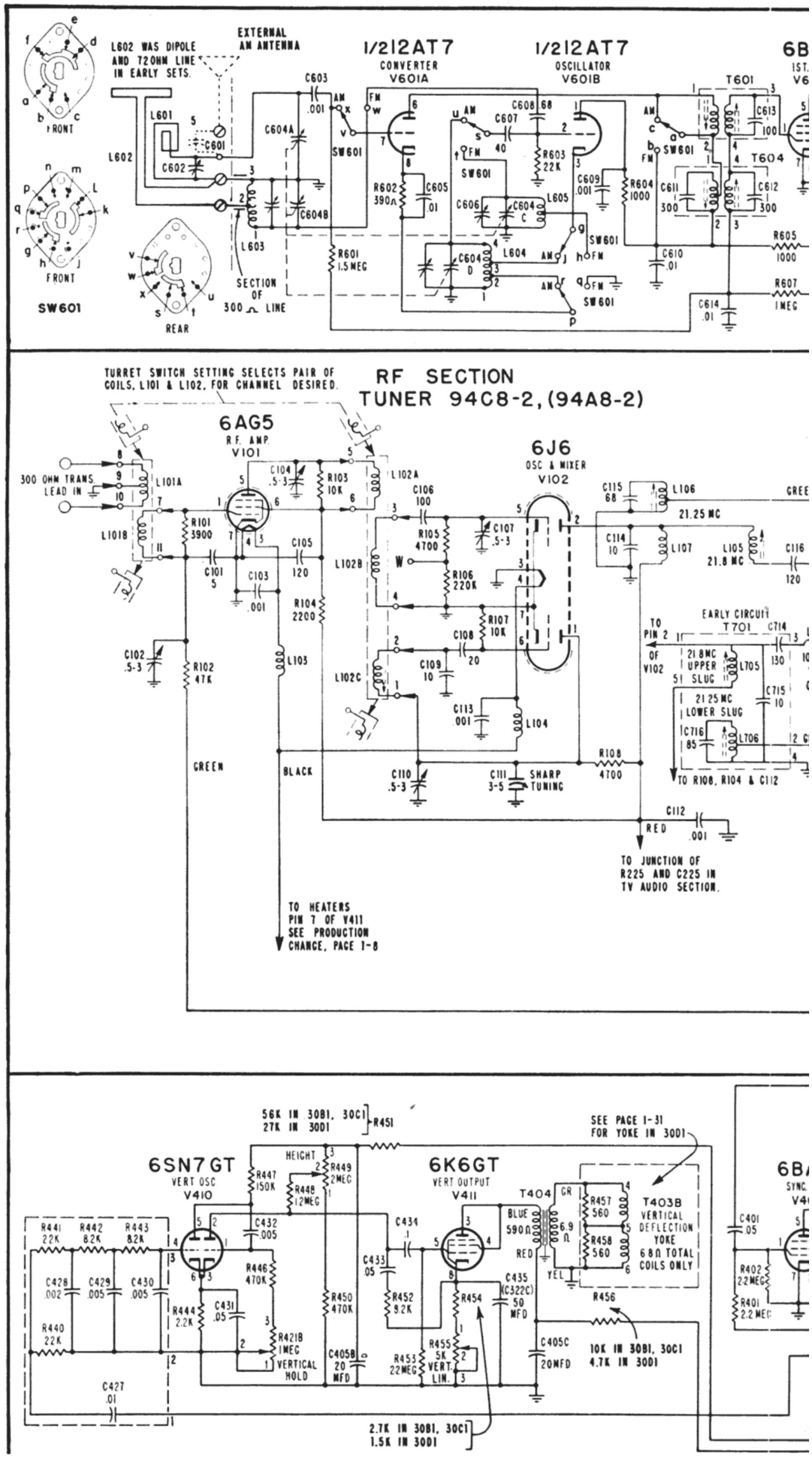
SWITCH SECTIONS SHOWN IN CHANNEL 13 POSITION

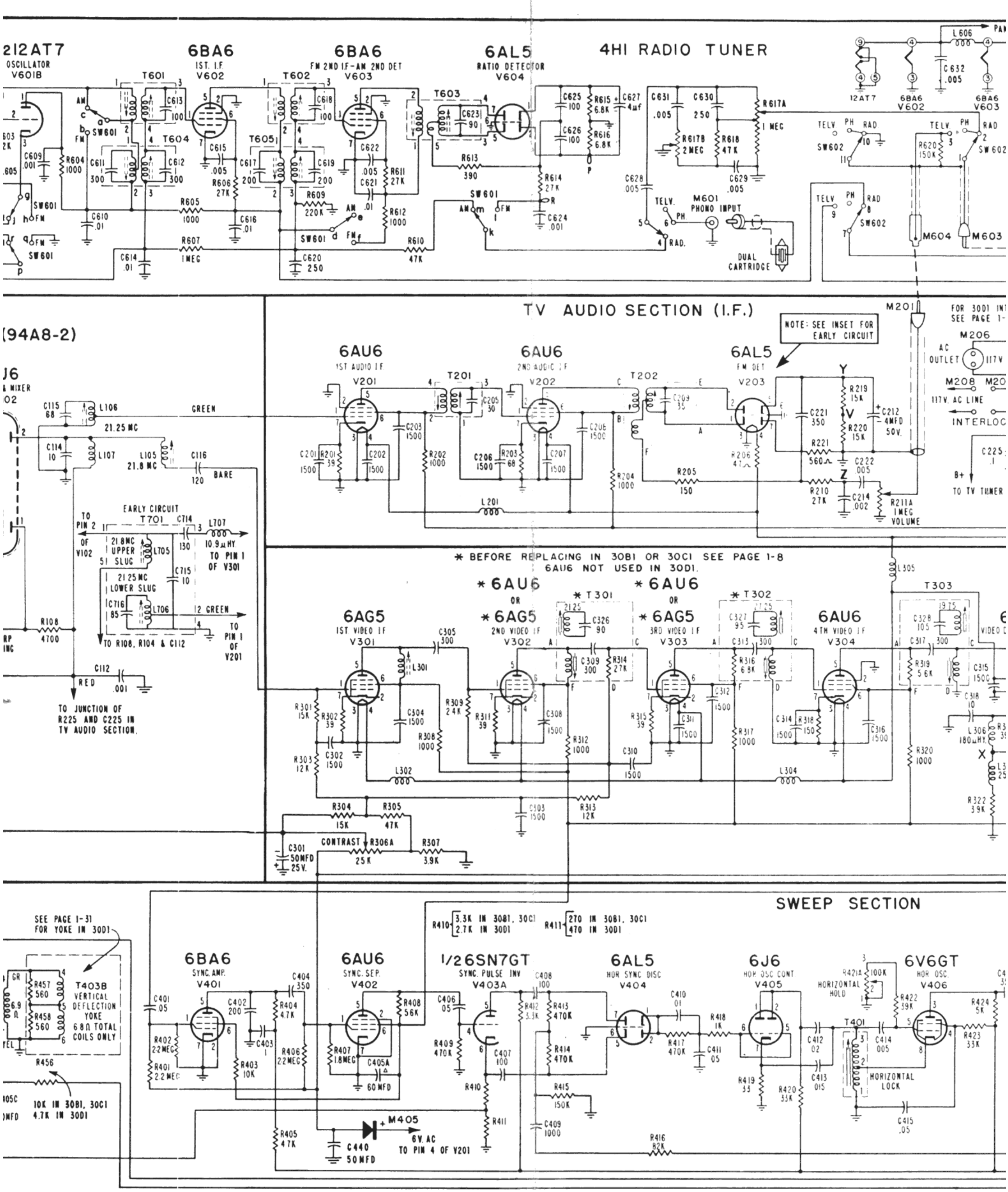
Figure 1-19. Schematic, TV Tuner 94C9-2.

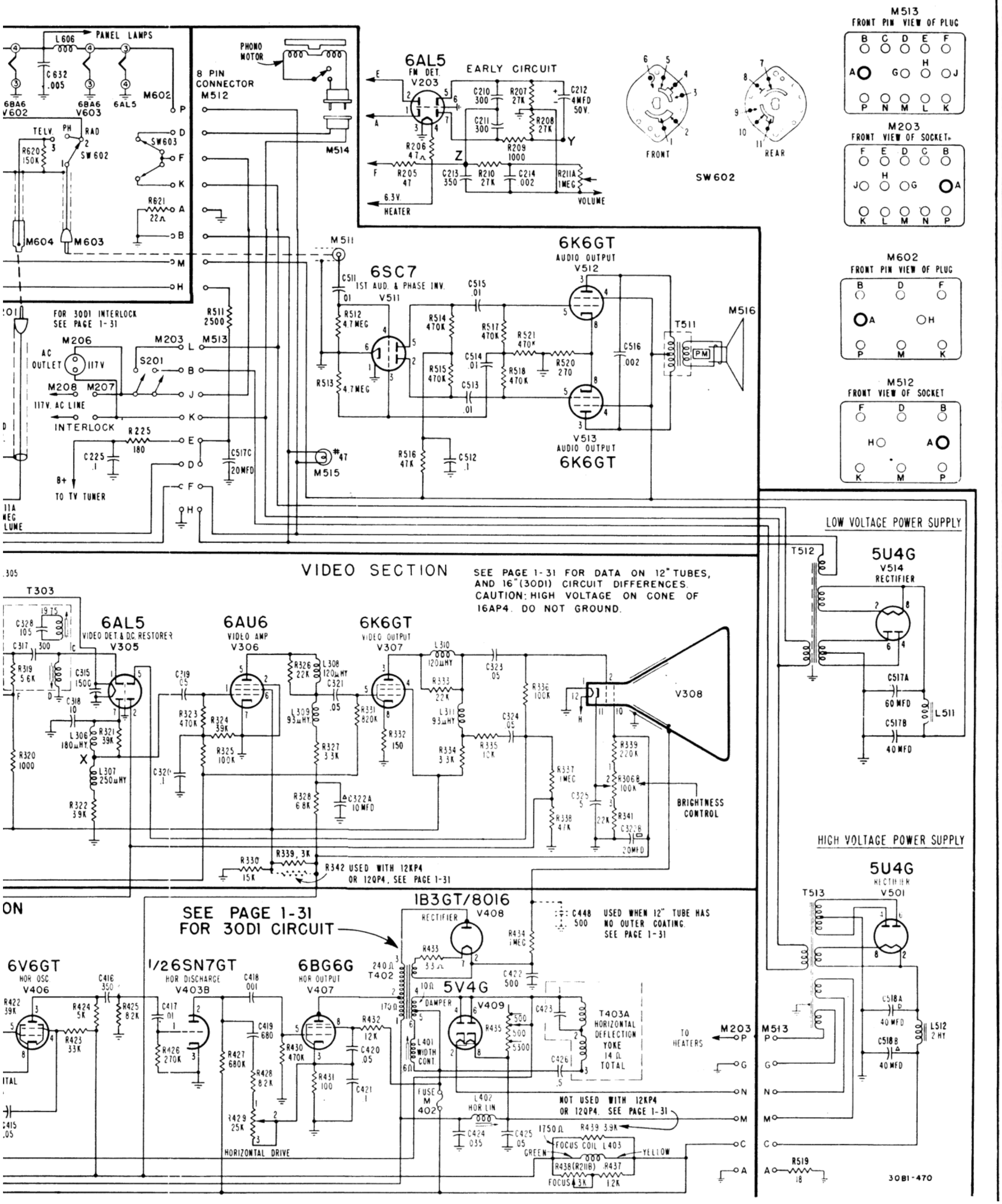
Figure 1-21. Schematic Diagram for 4H1 Radio Tuner Chassis, and 30B1, 30C1, or 30D1 Television Chassis. (For all "4H" Radio-Phono-Television combinations with 10", 12" and 16" picture tubes.)

For schematic of Television (only) sets, and 8C11, 8C12, 8C13 combinations, see Figure 1-20. Refer for 30B1, 30C1, and 30D1 production changes.

Circuit changes necessary for different 12" picture tubes are tabulated Circuit differences for 30D1 chassis (16" picture tube)




4HI RADIO TUNER
12AT7 OSCILLATOR V601B
6BA6 1ST. I.F. V602
6BA6 FM 2ND I.F.-AM 2ND DET V603
6AL5 RATIO DETECTOR V604
M601 PHONO INPUT
DUAL CARTRIDGE
(94A8-2)
TV AUDIO SECTION (I.F.)
NOTE: SEE INSET FOR EARLY CIRCUIT
6AU6 1ST AUDIO I.F. V201
6AU6 2ND AUDIO I.F. V202
6AL5 FM DET V203
R211A 1MEG VOLUME
TO TV TUNER
EARLY CIRCUIT
TO JUNCTION OF R225 AND C225 IN TV AUDIO SECTION.
* BEFORE REPLACING IN 30B1 OR 30C1 SEE PAGE 1-8
6AU6 NOT USED IN 30D1.
6AG5 1ST VIDEO I.F. V301
*6AU6 OR *6AG5 2ND VIDEO I.F. V302
*6AU6 OR *6AG5 3RD VIDEO I.F. V303
6AU6 4TH VIDEO I.F. V304
CONTRAST R306A 25K
SWEEP SECTION
SEE PAGE 1-31 FOR YOKE IN 30D1
T403B VERTICAL DEFLECTION YOKE 6.8Ω TOTAL COILS ONLY
R456 10K IN 30B1, 30C1 4.7K IN 30D1
R410 3.3K IN 30B1, 30C1 2.7K IN 30D1
R411 270 IN 30B1, 30C1 470 IN 30D1
6BA6 SYNC. AMP. V401
6AU6 SYNC. SEP. V402
1/2 6SN7GT SYNC. PULSE INV V403A
6AL5 HOR SYNC DISC V404
6J6 HOR OSC CONT V405
6V6GT HOR OSC V406
HORIZONTAL HOLD
HORIZONTAL LOCK
M405 6V. AC TO PIN 4 OF V201



EARLY CIRCUIT
6AL5 FM DET. V203
6SC7 1ST AUD. & PHASE INV. V511
6K6GT AUDIO OUTPUT V512
6K6GT AUDIO OUTPUT V513
8 PIN CONNECTOR M512
PHONO MOTOR
PANEL LAMPS
FOR 30D1 INTERLOCK SEE PAGE 1-31
AC OUTLET 117V
117V. AC LINE
INTERLOCK
B+ TO TV TUNER
VOLUME
6.3V. HEATER
SW602
FRONT
REAR
M513 FRONT PIN VIEW OF PLUG
M203 FRONT VIEW OF SOCKET
M602 FRONT PIN VIEW OF PLUG
M512 FRONT VIEW OF SOCKET
LOW VOLTAGE POWER SUPPLY
5U4G V514 RECTIFIER
VIDEO SECTION
SEE PAGE 1-31 FOR DATA ON 12" TUBES, AND 16" (30D1) CIRCUIT DIFFERENCES.
CAUTION: HIGH VOLTAGE ON CONE OF 16AP4. DO NOT GROUND.
6AL5 VIDEO DET. & D.C. RESTORER V305
6AU6 VIDEO AMP V306
6K6GT VIDEO OUTPUT V307
V308
BRIGHTNESS CONTROL
R342 USED WITH 12KP4 OR 12QP4. SEE PAGE 1-31
HIGH VOLTAGE POWER SUPPLY
5U4G RECTIFIER V501
SEE PAGE 1-31 FOR 30D1 CIRCUIT
1B3GT/8016 RECTIFIER V408
C448 500 USED WHEN 12" TUBE HAS NO OUTER COATING. SEE PAGE 1-31
6V6GT HOR. OSC. V406
1/2 6SN7GT HOR DISCHARGE V403B
6BG6G HOR OUTPUT V407
5V4G DAMPER V409
T403A HORIZONTAL DEFLECTION YOKE 14 Ω TOTAL
WIDTH CONT.
HORIZONTAL DRIVE
HOR LIN
FUSE M402
NOT USED WITH 12KP4 OR 12QP4. SEE PAGE 1-31
FOCUS COIL L403
GREEN
YELLOW
FOCUS
TO HEATERS
30B1-470

DIFFERENT 12" PICTURE TUBES USED IN 30C1 CHASSIS

Different 12" picture tubes (listed below) have been used in the 30C1 chassis. The tube used in a particular chassis is indicated by the "WIRED FOR —— " stamp on the rear of the chassis. (In some chassis, this stamp was not applied.) The various tube types used require different chassis wiring and ion traps. Data on circuit requirements for the different tubes is tabulated below and shown in figures 1-20 and 1-21.

IMPORTANT: When replacing a 12" picture tube with another type, be sure to check existing chassis wiring and if required, make the necessary changes as listed in the tabulation below. Also, mark rear of chassis accordingly if a different picture tube is used.

NOTE: All brands of 12LP4 and 12BP4 tubes can be used without circuit change in sets wired for 12TP4.

Tube	Ion Trap	*R439 is	R329 is	C448 is	2nd Anode Connector
12BP4	Dual Type 94B6	*3900 ohm, 2 W. (60B20-392)	3000 ohm, 15 W. Wire wound (61A1-9)	Not used	Use male connector, 88A16-1
**12LP4	Same as above	Same as above	Same as above	See note ** below	Same as above
12TP4	Same as above	Same as above	Same as above	See note † below	Same as above
12KP4	Not used	Not used. Remove from chassis.	See note § below	Not used	Use male connector, 88A16-1
12QP4	Single Type 94A15-2	Not used. Remove from chassis.	See note § below	See note † below	Use female connector, 88A16-3

*R439 resistor is connected across the yellow and green leads from the focus coil L403.

Some brands of type 12LP4 tubes do not have the outer conductive coating which functions as a second anode supply filter condenser. Type 12LP4 tubes **WHICH DO NOT HAVE the outer conductive coating require the addition of C448 (500 mmfd., 10,000 volt; part number 65A11-1) to the second anode power supply filter circuit, same as for type 12TP4 tube. To add C448, see note † below; also see schematic for circuit location of C448. Type 12LP4 tubes **WHICH HAVE** the outer conductive coating are directly interchangeable with the 12BP4 tube. Chassis wired for 12LP4 tube without the outer conductive coating are stamped at rear of chassis "Wired for 12LP4-IC". Chassis wired for 12LP4 with coating are stamped "Wired for 12LP4-OC".

†Add condenser C448 (500 mmfd., 10,000 volt) to the second anode supply filter circuit. See schematic.

Locate C448 inside the second anode supply housing. Mount it on the perforated side, between the 1B3/8016 and 6BG6 tubes. Connect a wire lead from the remaining ungrounded end of C448 to the tie point connecting the second anode lead to the corona ring under the 1B3/8016 tube socket.

§Add R342 (12,000 ohm, 2 W; part number 60B20-123) in parallel with R329. R329 (3000 ohm, 15 watt) is the front wire wound resistor on the under side of the chassis pan.

CIRCUIT DIFFERENCES BETWEE

(Use illustrations

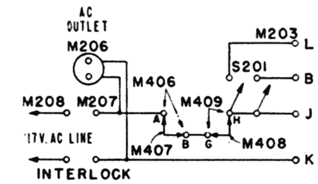


Figure 1-22. 117V, AC Interlock Circuit (30D1).

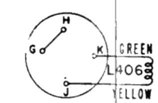


Figure 1-25. Focus Coil Connector. Pin View M408, Bottom View M409.

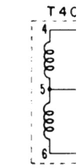


Figure
Conn
Vie

...ES BETWEEN 30D1 CHASSIS and 30B1, 30C1 CHASSIS

...se illustrations below with Figure 1-21.)

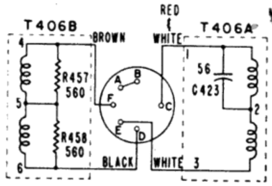


Figure 1-23. Deflection Yoke Connector (early type). Pin View M407, Bottom View M406.

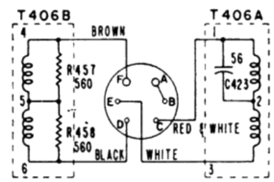
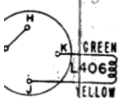


Figure 1-24. Deflection Yoke Connector (late type). Pin View M407, Bottom View M406.



...1-25. Focus Coil ...r. Pin View M408, ...om View M409.

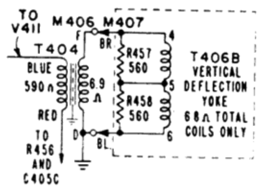


Figure 1-26. Vertical Deflection Yoke Circuit (30D1).

NOTE: R465 is 12,000 ohms in later sets. See paragraph 21, page 1-8.

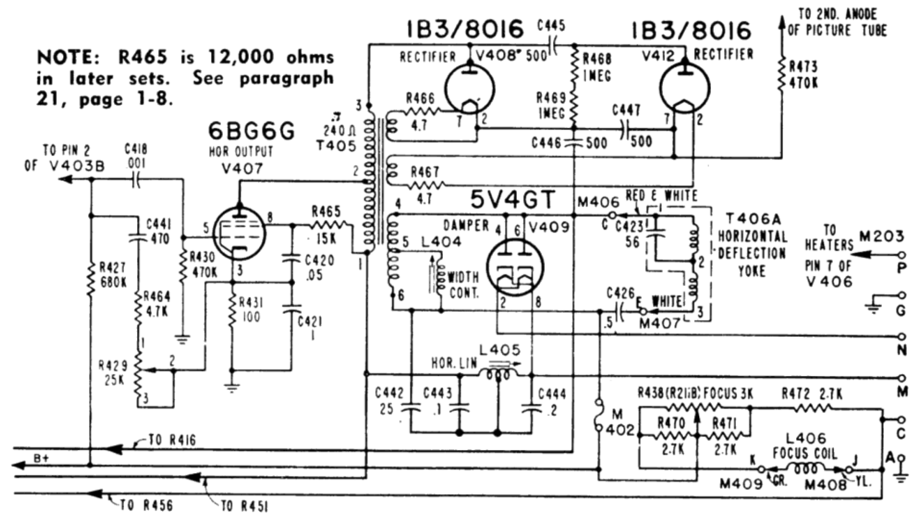


Figure 1-27. 2nd Anode Supply Circuit for 30D1; use with Figure 1-21.

CABINET PARTS for 4H115, 4H116, 4H117, 4H145, 4H146, 4H147, Etc. (Cont'd)

(All the above model numbers contain the letter "S" or "SN".)

Description	Part No.
Spindle Mounting Assembly (for holding extra centerpost and spindle)	A2002
Spring, Channel Escutcheon Retaining	
Flat bronze; for 23B44-1 Escutcheon	18A 27
Spring steel; for 23B43 Escutcheon	19A 48
Spring, Tilt-Out Coil	19A 15-1
Tie Bar, Tilt-Out	15B 126-1
Tie Rod, Tilt-Out	28A 22-1
Washer, Felt (Radio Knobs)	5A 4-11
Washer, Felt (Television)	
for 'Horizontal—Vertical', 'Contrast—Brightness', 'Off-Volume—Focus' knobs	5A 4-6
for 'Channel—Sharp Tuning' knobs	5A 4-5
Washer, Fibre (used between inner and outer television knobs)	5A 1-30
Washer, Insulating (for mtg. plastic escutcheon)	5A 1-21

CABINET PARTS for 4H126 and 4H137

Description	Part No.
Back, Cabinet	
for Radio-Phono Compartment	43C 66
for Television Compartment (4H126)	A1914
for Television Compartment (4H137)	A2000
Bracket, Plug Lock	15A 365
‡Cabinet	
Mahogany (4H126)	35E 95-2
Blond (4H137)	35E 96-3
Crate, Fibre Board	44B 130
Crate Fillers, Coardboard	43C 72
Clamp, Cable	11A 2-6
Cover, Loop Antenna	43C 77
‡Door, Cabinet (Radio-Phono and Television Tube Compartment)	
Matched pair for Mahogany (4H126)	98A 48-41
Matched pair for Blond (4H137)	98A 56-4
‡Door, Cabinet (Record Compartment)	
Complete Door for Mahogany (4H126)	98A 48-43
Complete Door for Blond (4H137)	98A 56-3
‡Door, Cabinet (Television Tuning Compt.)	
for Mahogany (4H126)	98A 48-51
for Blond (4H137)	98A 56-2
Door Catch and Strike Plate, Bullet	98A 48-45
Escutcheon, Channel	23B 43-1
Escutcheon, Picture Tube	23D 42
Escutcheon, Radio	23D 39-1
Eye Bolt (for Tilt-Out Spring)	1A 87-1
Grille Cloth	
2 pieces for Mahogany (4H126)	98A 48-44
2 pieces for Blond (4H137)	98A 56-5
Hinge, Knife	
for TV Tuning, Radio-Phono and Record Compartment	
Mahogany (4H126)	98A 48-48
Blond (4H137)	98A 56-7
for TV Tube Compartment	
Mahogany (4H126)	98A 48-47
Blond (4H137)	98A 56-2
Hinge Assembly, Tilt-Out	
Left Side (facing front)	AC183-1
Right Side (facing front)	AC183-2
Jewel, Pilot Light	82A 10-8
Knob, Door (for Mahogany 4H126)	98A 48-46

CABINET PARTS for 4H126 and 4H137 (Cont'd)

Description	Part No.
Knobs, Radio Tuning	
'Telev-Phono-Radio' (Maroon and gold single knob)	33C 40-6
'Tuning' (Maroon and gold outer knob)	33C 40-7
'AM-FM' (Gold inner knob)	33C 40-8
'Tone' (Maroon outer knob)	33C 40-9
'Off-Volume' (Gold inner knob)	33C 40-10
Knobs, Television Tuning	
for Mahogany (4H126)	
'Sharp Tuning' (Gold outer knob)	33C 28-15
'Vertical', 'Brightness' and 'Focus' (Gold outer knob)	33C 28-16
'Channel' (Maroon inner knob)	33C 28-19
'Horizontal', 'Contrast' and 'Off-Volume' (Maroon inner knob)	33C 28-20
for Blond (4H137)	
'Sharp Tuning' (Gold outer knob)	33C 28-15
'Vertical', 'Brightness' and 'Focus' (Gold outer knob)	33C 28-16
'Channel' (Gold inner knob)	33C 28-17
'Horizontal', 'Contrast' and 'Off-Volume' (Gold inner knob)	33C 28-18
Nut, Hex (#4-40 for Tilt-Out Tie Bar)	2A 1-6-71
Ring, Compression (for Channel knob)	18A 5-3
Rubber Channel; 3¾" long (for Telev. back)	12A 9-6
Rubber Strip, Sponge; ⅛"x⅝"x42¼" (for picture tube escutcheon)	12A 5-13
Rubber Strip, Sponge; ⅛"x$\frac{9}{16}$"x2" (for television chassis support blocks)	12A 5-14
Screen, Perforated Metal (2"x17⅝")	16A 9-1-70
Screw, Tilt-Out Tie Bar mtg. (#4-40x$\frac{1}{16}$" M.S.)	40-437-C2-71
Screw, Tilt-Out Spring mtg. (#8-32x¼" M.S.)	85-250-C2-71
Screw, Tie Rod mtg. (#6-32x¼" Bd. H.M.S.)	365-250-C2-58
Screw, Picture Tube Board mtg. (¼"-20x1¾" R.H.M.S.)	1A 3-12-71
Screw, Telev. Chassis mtg. (¼"-20x1¼")	1A 67-44-71
Screw, Escutcheon mtg. (#3x⅝" O.H.W.S.)	1A 15-7-58
Shelf, Picture Tube Mounting	93A 48-50
Speaker (12" PM)	78B 44-2
Speed Nut (Radio Escutcheon mounting)	2B 10-24-59
Speed Nut (Picture Tube Escutcheon mtg.)	2B 10-5-68
Speed Nut (#8-22 Speaker mounting)	2B 10-8-59
Spindle Mounting (holding extra centerpost or spindle)	A2002
Spring, Knob Tension (for telev. inner knobs)	98A 44-1
Spring, Knob Tension (for 'Sharp Tuning')	98A 44-2
Spring, Mounting (for channel escutcheon)	19A 48
Spring, Tilt-Out Coil	19A 15-1
Tie Bar, Tilt-Out	15B 126-1
Tie Rod, Tilt-Out	28A 22-1
Washer, Felt (Radio Knobs)	5A 4-11
Washer, Felt (Television)	
for 'Horizontal—Vertical', 'Contrast—Brightness', 'Off-Volume—Focus' knobs	5A 4-6
for 'Channel—Sharp Tuning' knob	5A 4-5
Washer, Fibre (used between inner and outer television knobs)	5A 1-30

Parts For Phono Compartment Light

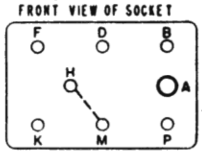
(Used in some sets only)

Description	Part No.
Bracket, Switch	15B 502
Bulb, Light (7 watt Mazda #7C7)	81A 2-4
Light Assembly, Complete (less bulb)	AB196
Plug (2 pin round)	33A 8-1
Shield, Light	[illegible]A 13
Socket and Leads	82A 12-1
Switch, Light	77A 29

‡Supplied only if old part cannot be repaired. When ordering, describe condition of old part in detail.

VOLTAGE DATA

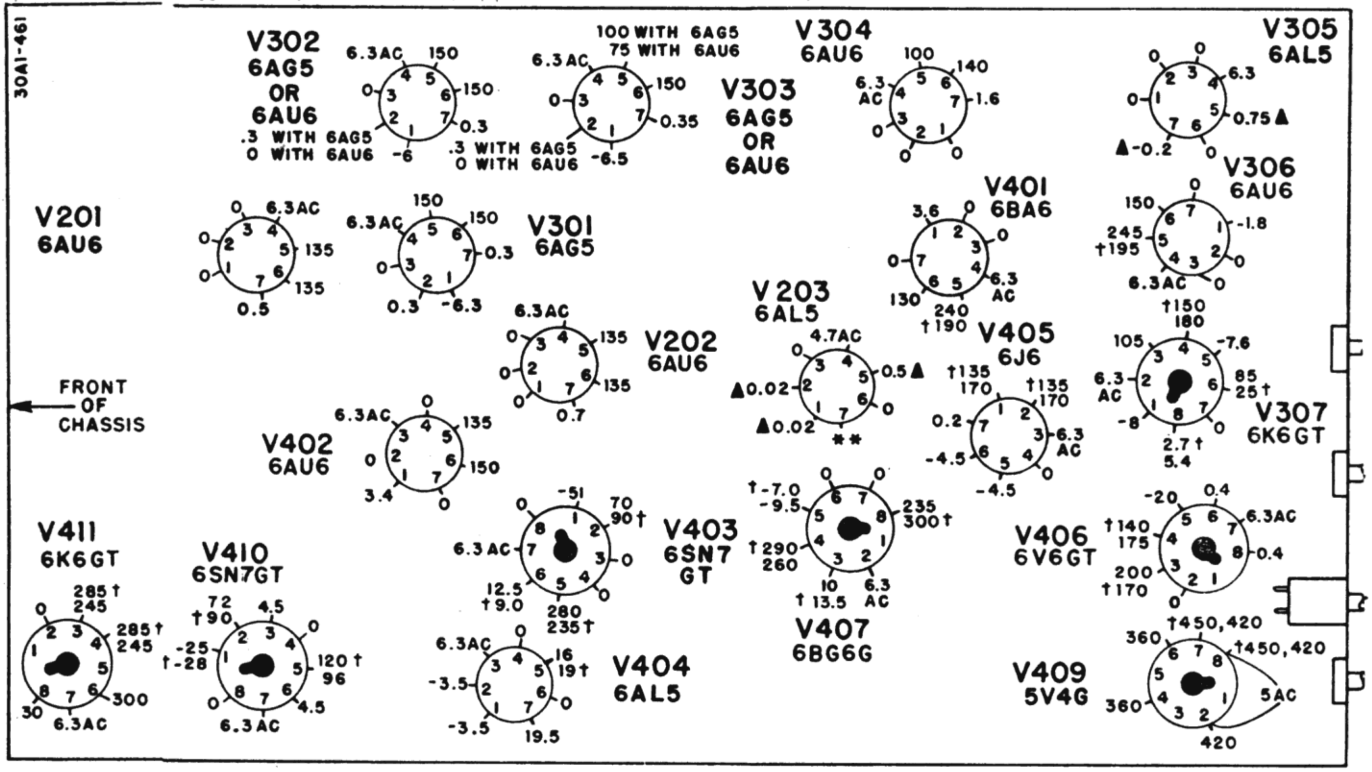
- For combination models, 4H1 Radio Tuner must be connected to power supply unless a jumper or adapter plug (part number 98A-30-4) is inserted in the radio tuner power supply socket M512 to complete the B+ circuit. See adjoining illustration.
- Line voltage, 117 Volts, AC.
- Voltages measured with a vacuum tube voltmeter, between tube socket terminals and chassis, unless otherwise indicated.
- Antenna disconnected from television receiver.
- All front controls except Contrast set at approximately half rotation; Contrast set at minimum (all the way to the left).
- All rear panel controls, except HOR. LOCK, HOR. LIN., and WIDTH, set at approximately half rotation. (Do not disturb HOR. LOCK, HOR. LIN., and WIDTH settings.)



- Channel selector on channel 2. (Channel 1 for sets with A1582 Tuner, Figure 1-13).

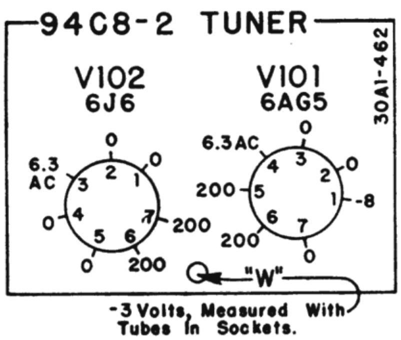
CAUTION: Pulsed high voltages are present on the cap of V407 (6BG6G) tube, and on the filament terminals and cap of V408 (or V412 in 30D1) 1B3/8016 tube. NO ATTEMPT SHOULD BE MADE TO TAKE MEASUREMENTS FROM THESE POINTS.

Picture tube 2nd anode voltage can be measured at the high voltage cap of picture tube (V308) and should be taken only with a high voltage instrument such as a kilovoltmeter. Voltage for 2nd anode of 10" or 12" tube is approximately 9KV, for 16" tubes, 12KV. Proper filament voltage check of V408 (and V412) 1B3/8016 tube may be made by observing filament brilliancy as compared with that obtained with a 1.5 volt dry cell battery.

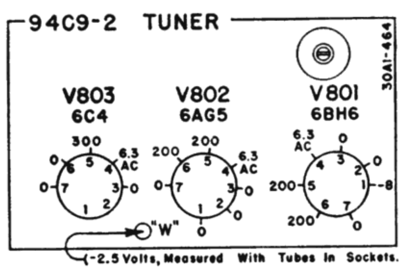


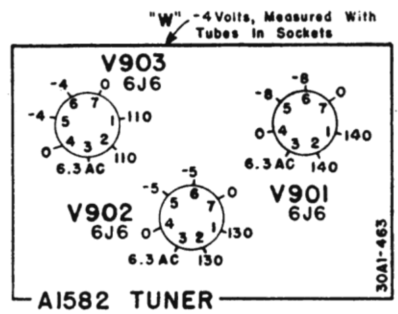
▲ Indicates contact potential which may vary widely.
† Indicates 30D1 voltages.

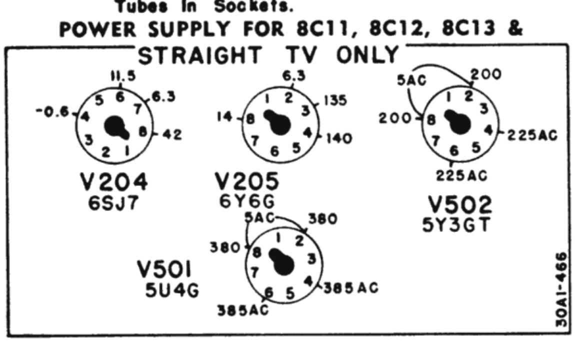
** Zero volts in chassis with late V203 circuit. —0.5 volts (contact potential) in chassis, with early ratio detector V203.

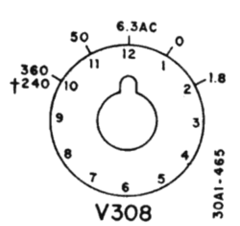


Voltages taken from top, tubes removed.









† Indicates 30D1 voltage.

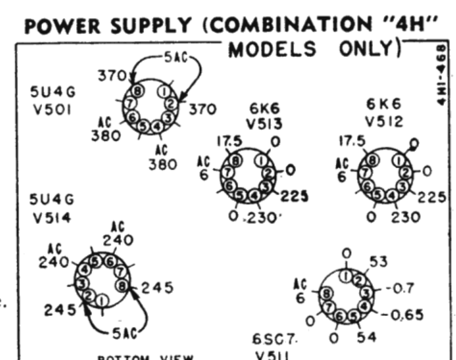


Figure 1-17. Voltage Charts.

REPLACEMENT OF PLASTIC ESCUTCHEONS FOR 8C11, 8C12 and 8C13 Models

Wood escutcheons are supplied as replacements for original plastic escutcheons used in some 8C11, 8C12 or 8C13 models.

When ordering a wood escutcheon to replace a plastic escutcheon, it will be necessary to order one 98A50-9 Safety Glass Kit and also one 98A15-5 Escutcheon Hardware Kit. These kits consists of the following:

Safety Glass Kit No. 98A 50-9

	Part No.	Description
1	21B49	Safety Glass
1	38B2	Felt Mask
4	12A5-4	Rubber Strips (for corner of glass)

Escutcheon Hardware Kit No. 98A 15-5

4	15A244	Brackets (holds safety glass in place)
8	1A7-23-59	Wood Screws #6x3/8 RH
1	15A243	Picture Tube Bumper Bracket
4	1A15-7-58	Wood Screws #3x5/8 Brass OH

When replacing a plastic escutcheon with a wood escutcheon, proceed as follows:

1. The picture tube must be moved toward the rear of the chassis to allow room for the safety glass and mask. Proceed as follows:
   - (a) Remove picture tube bumper bracket #15A292.
   - (b) Loosen the webbed strap holding the front of the picture tube.
   - (c) Slide picture tube toward rear of chassis.
   - (d) Install picture tube bumper bracket #15A243 (included in kit #98A15-5).
   - (e) Slide picture tube up against bracket and tighten webbed strap.
2. Assemble and install the escutcheon, glass and mask as outlined below in steps 1 to 9 under "Installing Safety Glass and Mask on Models 8C11, 8C12, 8C13". Use the four wood screws provided in the kit and the seven screws which mounted the plastic escutcheon.

INSTALLING SAFETY GLASS AND MASK ON MODELS 8C11, 8C12, 8C13

There may be slight variation in the location of the four wood strips on the back of the wood escutcheon which make up the frame for the safety glass. This variation may cause one edge of the felt mask to show through the escutcheon opening, when the felt mask is centered perfectly on the safety glass.

Therefore, when installing the safety glass, it will be necessary to position the felt mask on the safety glass so that the glass and mask assembly will fit in the escutcheon opening without any of the edges of the mask showing. For best results we suggest that you proceed as follows:

1. Place the wood escutcheon, with the back side up, on a bench or table.
2. Keeping the safety glass as clean as possible, place it in the frame *so it rests on the bottom strip.*
3. Place the felt mask on the glass so it frames the opening in the escutcheon perfectly and note the position of the felt mask. (Perhaps it would be well to mark the outline of the mask on the escutcheon.)
4. Apply an ambroid cement liberally to one side of the mask, avoiding the inner edge. We have found Paisley #2012 Adhesive to be the best type for this particular application. However, a high quality speaker cement, radio cement or glue may be used.
5. Carefully place the mask on the safety glass and escutcheon. Try to get it in the correct position with a minimum of sliding or moving. Allow the cement to dry.
6. Remove the cloth back from the four sponge rubber strips and stick one strip on each corner of the safety glass outside of the mask.
7. Install one #15A244 bracket over the sponge rubber strips and across each of the four corners.
8. Carefully clean the safety glass, making certain that no spots or specks of lint or dirt remain.
9. Install the wood escutcheon which you have assembled.

INSTALLING SAFETY GLASS AND MASK ON MODELS 30A12 TO 30A16

When replacing the safety glass in models 30A12, 30A13, 30A14, 30A15 and 30A16, use kit #98A50-9 and proceed as follows:

1. Remove television main chassis and old or broken safety glass from cabinet.
2. Place the new safety glass in the frame and hold it in place with two of the brackets or with one hand.
3. Mark the outline of the panel opening on the glass from the front of the cabinet. Use chalk, grease pencil or material which can be removed easily.
4. Remove the safety glass and carefully glue the mask in place, using the chalk or pencil outline as a guide. Use an ambroid, speaker or radio cement.

NOTE: An alternate method would be to permanently install the new safety glass, four rubber corner strips and the brackets. Then cement the mask in position from the rear of the cabinet.

5. Clean and install the safety glass and mask assembly in the cabinet. Make certain that no spots or specks of lint or dirt remain on the glass.
6. Install the main chassis in the cabinet.

CLEANING PLASTIC PICTURE TUBE WINDOW

The picture tube window should be cleaned only with a dampened chamois or a soft lint-free cloth, with as little rubbing as possible. If necessary, use part #98A-11-2 (1/2 oz. bottle) Dust-Ded as a plastic cleaner and dust repellent. Caution: Do not use other cleaners or solvents, Cleaners and solvents such as kerosene, carbon tetrachloride and most of the kitchen-type cleaners may be injurious.

CLOUDING OF PICTURE TUBE WINDOW

Fogging or clouding can be avoided by sealing off the interior of the picture tube window from collecting dust, moisture or smoke.

In models with glass picture tube windows, check to see that the face of the picture tube fully contacts the surface of the felt mask.

For models with plastic picture tube windows, clean the plastic window (see discussion above) and make sure that the face of the picture tube fully contacts the sponge rubber mask.

Some early production sets (with plastic picture tube windows) did not have the sponge rubber mask. The sponge rubber mask can be obtained under part number 12A32-1 (for 10" picture tube) or 12A32-2 (for 12" picture tube). The mask can also be made from 3/8" wide adhesive sponge rubber strip, obtainable from hardware or ten cent stores. Apply the mask to the inside of the cabinet or outer edges of the picture tube window frame, using artists rubber cement. Caution: Do not use any other cement or glue, as damage may result.

This SECTION applies to the following models:

4H15S or SN	4H117S or SN	30C16S or SN	30A16S or SN
4H16S or SN	4H126S or SN	30C17S or SN	30A14SA
4H17S or SN	4H137S or SN	30A12S or SN	30A15SA
4H18S or SN	30B15S or SN	30A13S or SN	8C11S or SN
4H19S or SN	30B16S or SN	30A14S or SN	8C12S or SN
4H115S or SN	30B17S or SN	30A15S or SN	8C13S or SN
4H116S or SN	30C15S or SN		

NOTE: Some models (not listed above) in the "4H," "30B" and "30C" series use other chassis numbers. See stamping on chassis.

SECTION 2

TV Alignment and Tuner Service Data for *all* 30B1, 30C1, 30D1 Chassis and also for 30A1 Chassis containing the letter "S".

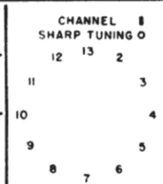
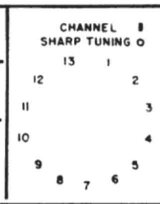
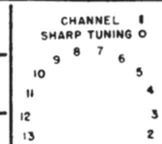
(See Identification Chart Below.)

SECTION 2. TELEVISION ALIGNMENT PROCEDURE AND TELEVISION TUNER SERVICE DATA

For all Models using Turret Type Tuner, 94C8-2 (94A8-2)

IMPORTANT For alignment and service data for 4H1 AM-FM Radio Tuner, see Section 4. For alignment of 30A1 Chassis with alternate TV tuners, use Section 2 or Section 3 as indicated in Chart below.

30A1 CHASSIS USE 3 TYPES OF TV TUNERS AS IDENTIFIED BELOW

	Use Section 2 for these Tuners		Use Section 3 for these Tuners			
TUNER TYPE	94C8-2 (94A8-2)		A1582		94C9-2	
TUBES USED	6AG5, 6J6		6J6, 6J6, 6J6		6BH6, 6AG5, 6C4	
CHASSIS OR MODEL NUMBER CODE	containing letter "S"		All numbers without letter "S" or "T"		containing letter "T"	

TELEVISION ALIGNMENT PROCEDURE

GENERAL

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

a. IF Amplifier and Trap Alignment (Video and Sound IF).
b. Tuner RF and Mixer Alignment.
c. Tuner High Frequency Oscillator Alignment.

Under normal use or operating conditions, tuner misalignment with age will be slight. The RF and mixer stage components as well as coil assemblies have been designed for stable band-pass operation and under normal conditions will seldom require realignment. The HF oscillator however, may require some slight readjustment, if the oscillator-mixer tube or individual channel snap-in coils have been replaced. See discussion under "94C8-2 Tuner Service".

Do not attempt alignment until all possible causes of trouble have first been investigated. Do not attempt alignment unless suitable test equipment is available.

HIGH VOLTAGE WARNING

Operating or servicing television receivers with cabinet removed involves shock hazard. Exercise all normal High Voltage precautions.

Picture tube, including all cables, must be connected to television chassis for 30D1 models during alignment. Anode voltage for 16" picture tubes is approximately 12 KV.

ALIGNMENT TOOL KIT (#98A30-3)

An Alignment Tool Kit consisting of 2 screwdrivers is available. Order part #98A30-3 from Admiral Distributor.

TEST EQUIPMENT

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

RF Sweep Generator

18 to 30 MC range: 10 MC sweep width.
50 to 90 MC range: 10 MC sweep width.
170 to 225 MC range: 10 MC sweep width.
Output: adjustable; one-tenth volt minimum.
Output impedance: 300 ohms balanced to ground for RF ranges.

Marker Generator

18 to 30 MC frequency range.
50 to 90 MC frequency range.
170 to 225 MC frequency range.
Must be extremely accurate or have built-in crystal calibrator for checking accuracy of calibration.

Crystal Calibrator

Check points from 18 to 225 MC. Not required if marker or sweep generators have built-in calibration crystals.

Signal Generator

Accurate signal generator, range 18 to 225 MC, with low impedance output and calibrated output attenuator.

Oscilloscope

Standard oscilloscope, preferably with a wide band vertical deflection, vertical sensitivity at least .5 volt peak-to-peak per inch, and input calibrator.

Vacuum-Tube Voltmeter

Vacuum-tube voltmeter or 20,000 ohms per volt DC meter. Preferably one with low range (3 volt) DC zero center scale.

ALIGNMENT ADJUSTMENT IDENTIFICATION

For sets with 94C8-2 (turret type) tuner only. See Section 3 for alignment of sets with other type tuners.

Adj.	Symbol	Function
A1	L106 / §L706	21.25 MC Trap Coil
A2	T301	21.25 MC Trap (IF Trans.)
A3	T201	1st IF Transformer (Sound)
A4	T201	1st IF Transformer (Sound)
A5	T202	Ratio Detector Transformer
A6	T202	Ratio Detector Transformer
A7	T302	27.25 MC Trap (IF Trans.)
A8	T303	19.75 MC Trap (IF Trans.)
A9	L301	1st IF Coil (Video)
A10	L105	Mixer Coupling Coil (late circuit)
	§L705	Mixer Plate Coil (early circuit)
A11	T301	2nd IF Transformer (Video)
A12	T302	3rd IF Transformer (Video)
A13	T303	4th IF Transformer (Video)
A14	C102	Trimmer Condenser (RF amp.)
A15	C104	Trimmer Condenser (RF amp.)
A16	C107	Trimmer Condenser (Mixer)
A17	L102	HF Osc. Coils (all channels)
A18	C110	Trimmer Condenser (Oscillator)

§Part of T701, early circuit.

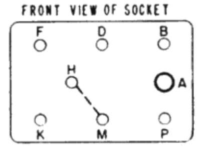
CONNECTIONS FOR 4H1 MODELS

Set "Tel-Phono-Radio" switch on 4H1 radio tuner for television operation.

The 4H1 radio tuner must be connected to power supply during alignment unless a jumper or adapter plug is inserted in the radio tuner power supply socket M512 to complete the B+ circuit. See adjoining illustration. Order adapter plug (#98A30-4) from Admiral Distr.

For 4H1 model with 16" picture tube (30D1 television chassis), remove the complete picture tube and mounting board assembly. The picture tube including all connecting cables must be connected to the television chassis during alignment.

M512
FRONT VIEW OF SOCKET



IF AMPLIFIER AND TRAP ALIGNMENT

For sets with 94C8-2 (turret type) tuner only. See Section 3 for alignment of sets with other type tuners.

- Allow about 15 minutes for receiver and test equipment to warm up.
- Disconnect antenna from receiver.
- Set Channel Selector to channel 13 or other unassigned high channel (to prevent signal interference during IF alignment).
- Connnect RC filter of 10,000 ohm resistor and 330 mmfd. condenser in series from point "X" to chassis. See figure 2-2. Leave connected for all steps in this alignment.
- Connect signal generator high side to tube shield of 6J6 oscillator-mixer tube. Be sure to insulate tube shield from chassis. Connect signal generator low side to chassis close to 6J6 tube base.
- Set Contrast control for —3 volts (read at arm of control). Retain this setting for all IF and trap adjustments.
- Use VTVM on lowest scale. (3 volts DC preferred.) Note: A 20,000 ohm-per-volt meter can also be used.
- Use a NON-METALLIC alignment screwdriver.
- Refer to figure 2-1 and 2-2 for alignment adjustment and test point locations.

Step	Signal Gen. Frequency (MC)	Connect VTVM to	Test Connections and Instructions	Adjust
1	*21.25	High side to junction of resistor and condenser of RC filter connected to "X" (video detector V305 circuit); common to chassis. See figure 2-2.	Use lowest signal generator output for adequate meter indication, then gradually increase generator output as VTVM reading decreases.	**A1 and A2 for minimum.
2	*21.25	† High side to "Y", common to chassis.	While peaking, keep reducing signal generator output so VTVM reading is approx. 1.5 volts.	A3, A4 and A5 for maximum.
3	*21.25	High side to "Z" (ratio detector V203 circuit). Common to "V" in late ratio detector V203 circuit; common to chassis in early V203 circuit.	Use 3 volt zero center scale if available.	A6 for zero reading between a positive and negative peak.
4	*27.25	High side to junction of resistor and condenser of RC filter connected to "X" (video detector V305 circuit); common to chassis. See figure 2-2.	Use lowest signal generator output for adequate meter indication, then gradually increase generator output as VTVM reading decreases.	A7 for minimum.
5	*19.75	"	"	A8 for minimum.
6	25.0	"	While peaking, keep reducing signal generator output so VTVM reading is approximately 1 volt.	A9 for maximum.
7	21.8	"	"	**A10 for maximum.
8	22.3	"	"	A11 for maximum.
9	25.25	"	"	A12 for maximum.
10	23.5	"	"	A13 for maximum.

† Test Point "Y" is positive side of electrolytic C212 in late detector (V203) circuit; "Y" is negative side in early detector circuit. See Fig. 2-1.

* Before proceeding, be sure to check the signal generator used in alignment against a crystal calibrator or other frequency standard for absolute frequency calibration required for this operation.

** See Figures 2-6 and 2-7 for alternate locations of A1 and A10.

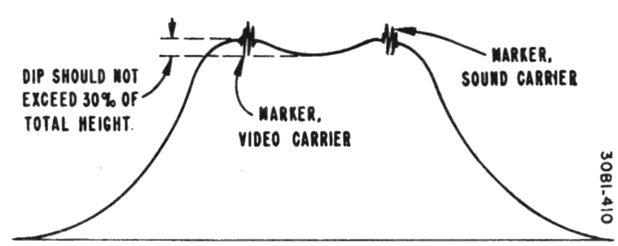
RF AND MIXER ALIGNMENT

For sets with 94C8-2 (turret type) tuner only. See Section 3 for alignment of sets with other type tuners.

- See "Connections for 4H1 Models"
- Disconnect antenna from receiver.
- Before starting alignment, allow about 15 minutes for receiver and test equipment to warm up.
- Connect sweep generator to antenna terminals.
- Loosely couple marker generator to antenna terminal (to obtain marker pips of video and sound RF carriers). To avoid distortion of the response curve, keep marker generator output at a minimum, marker pips just barely visible.
- Connect oscilloscope through 10,000 ohm resistor to point "W" (Figure 2-6). Keep oscilloscope leads away from chassis.
- Set Contrast control to —1.5 volts (read at arm of control).

Step	Marker Gen. Freq. (MC)	Sweep Gen. Frequency	Adjust
1	*205.25 **209.75	Sweeping Channel 12	Check for curve resembling RF response curve shown in figure 2-5. If necessary, adjust A14, A15 and A16 (Figure 2-6) as required. Consistent with proper band width and correct marker location, response curve should have maximum amplitude and flat top appearance.
2	211.25 215.75	13	Check each channel for curve resembling RF response curve shown in figure 2-5. In general, the adjustment performed in step 1 is sufficient to give satisfactory response curves on all channels. However, if reasonable alignment is not obtained on a particular channel, (a) check to see that coils have not been intermixed, or (b) try replacing the pair of coils for that particular channel, or (c) repeat step 1 for the weak channel as a compromise adjustment to favor this particular channel. If a compromise adjustment is made, other channels should be checked to make certain that they have not been appreciably affected.
3	199.25 203.75	11	
4	193.25 197.75	10	
5	187.25 191.75	9	
6	181.25 185.75	8	
7	175.25 179.75	7	
8	83.25 87.75	6	
9	77.25 81.75	5	
10	67.25 71.75	4	
11	61.25 65.75	3	
12	55.25 59.75	2	

* Picture Carrier Frequency (MC)　　** Sound Carrier Frequency (MC)



Full skirt of curve will not be visible unless generator sweep width extends beyond 10 MC.

Figure 2-5. RF Response Curve.

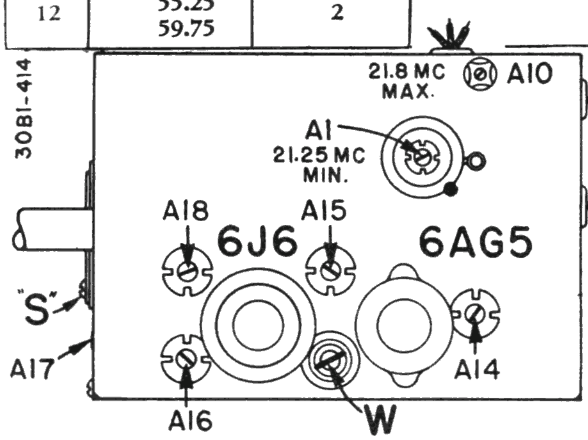


Figure 2-6. Top View of 94C8-2 Tuner.

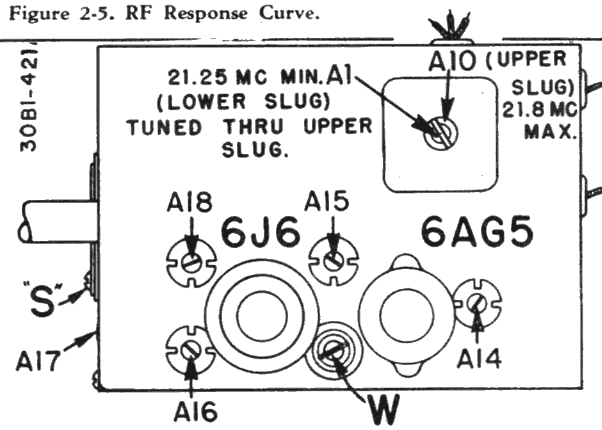


Figure 2-7. Top View of 94C8-2 Tuner, showing Alternate A1 and A10 Arrangement.

OVER-ALL VIDEO IF RESPONSE CURVE CHECK

(Using sweep generator and Oscilloscope)

1. Disconnect signal generator and VTVM (if used in previous alignment).
2. Connect oscilloscope between point "X" and chassis ground through a decoupling filter (see figure 2-2). Keep leads away from receiver.
3. Connect sweep generator high side to point "W" on tuner, low side to chassis ground. Set sweep generator to sweep the video IF pass band (19 to 29 MC).
4. Loosely couple marker generator high side to the sweep generator lead connected to point "W" on tuner, low side to chassis ground.

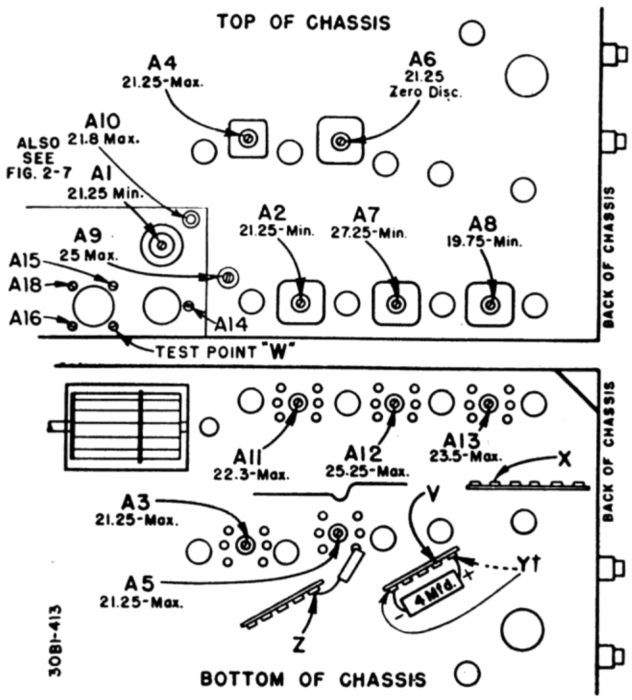
Important

To avoid distortion of the response curve, keep the sweep generator and marker generator outputs at a very minimum. Marker pip (25.75 MC) should be just kept barely visible. Setting sweep generator output for VTVM reading from .5 to 1 volt DC (measured from decoupling network at point "X" and chassis, figure 2-2) will avoid distortion of response curve.

5. Check curve obtained against the ideal over-all video IF amplifier response curve shown in figure 2-3, also check trap and video IF carrier points by means of marker generator. It is important that Marker pips be in the proper location on the response curve as shown in figure 2-3. Correct location of 25.75 MC marker, should be 6db below peak (50% point on slope of curve). With correct trap adjustments, markers at 27.25 MC, 21.25 MC and 19.75 MC points should not be visible generally. Consistent with proper band-width and correct location of markers, the response curve should have maximum amplitude and flat top appearance.

If necessary to correct band-width and flat top appearance, retouch (stagger tune) A10, A11, A12 and/or A13 as required.

For retouching traps A1, A2, A7 and/or A8, it will be necessary to use signal generator and VTVM, and repeat steps under "IF Amplifier and Trap Alignment".



†Test point "Y" is positive side (broken line connection) of electrolytic C212 in late V203 circuit; "Y" is negative side (solid line connection) in early detector circuit.

Figure 2-1. Trimmer Locations

AUDIO IF ALIGNMENT CHECK

(Using sweep generator and oscilloscope)

1. Disconnect signal generator and VTVM; if used in previous alignment.
2. Connect oscilloscope between point "Z" and chassis ground (see figure 2-1). Keeps leads away from receiver.
3. Connect sweep generator high side to point "W" on tuner, low side to chassis ground. Set sweep generator to sweep the audio IF pass band (20.25 to 22.25 MC). NOTE: If sweep generator does not have sufficient output for oscilloscope trace, connect between grid No. 1 of V201 to chassis, thru 200 mmfd. condenser.
4. Loosely couple marker generator high side to the sweep generator high side, low side to chassis ground.

Important

To avoid distortion of the response curve, keep sweep generator and marker generator outputs at a very minimum. Marker pips should be kept just barely visible.

5. Observe ratio detector response (figure 2-4). Since the sweep signal is fed through the entire audio IF system for this check, mis-alignment of the audio IF's will affect this curve. This provides an over-all audio IF response check. The shape of the curve should be such as to provide a minimum vertical voltage slope of 50 KC to each side of the 21.25 MC marker (cross over point). Maximum size and linearity of the straight portion of the curve is ideal. The non-symmetrical form of the ratio detector response curve at the high frequency end is normal with the type of ratio detector circuit used in later production. Note that the ratio detector circuit used in early production gives a symmetrical "S" pattern (dotted line in Figure 2-4). Check for linearity between the markers indicated on the curve. The response curves obtained may appear inverted and/or reversed (end for end) depending on the sweep generator and oscilloscope used.
6. If correct response is not obtained, repeat alignment steps for slugs A3, A4, A5 and A6 under "IF Amplifier and Trap Alignment". Re-check response curve.

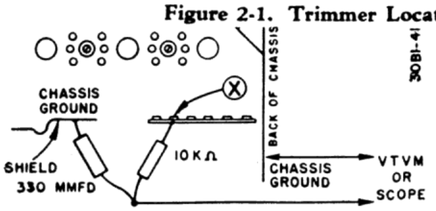


Figure 2-2. VTVM or Scope Connections.

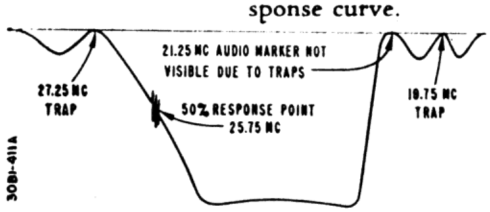


Figure 2-3. Overall Video IF Response Curve.

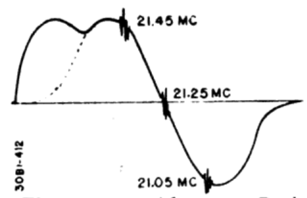


Figure 2-4. Alternate Ratio Detector Response Curves. See discussion above.

HF OSCILLATOR ALIGNMENT

For sets with 94C8-2 (turret type) tuner only. See Section 3 for alignment of sets with other type tuners.

Need for alignment on individual channels can be checked by noting if rotation of the Sharp Tuning control will tune in the sound carrier of the television signal at or reasonably close to the middle of its range.

If mis-alignment is evident on a major number of channels, an over-all HF oscillator adjustment (A18) can also be performed.

INDIVIDUAL CHANNEL ADJUSTMENTS USING SIGNAL GENERATOR & VTVM

a. Allow about 15 minutes for receiver and test equipment to warm up. Disconnect antenna from receiver.

b. Connect signal generator high side to one antenna terminal, ground to chassis.

c. See Figure 2-1. Connect VTVM high side to "Z" (ratio detector V203 circuit). Common to "V" in late ratio detector V203 circuit; common to chassis in early V203 circuit. Use VTVM 3 volt zero center scale if available. A 20,000 ohm-per-volt meter can be used as an alternate.

d. Set Sharp Tuning control at electrical center:

For tuners with sharp tuning rotor assembled **inside** of tuner chassis (see figure 2-8), rotate Sharp Tuning control counter-clockwise until rotor engages stop screw "S" and oscillator slug (A17) can be reached through cutout "H" in tuner chassis. In some tuners it will be necessary to back screw "S" out a few turns to slightly increase rotation of rotor until oscillator slug can be reached.

For tuners with sharp tuning rotor assembled **outside** of tuner chassis (see figure 2-9), rotate Sharp Tuning control approximately 150° or half rotation as shown in Figure 2-9.

e. Use a NON-METALLIC alignment screwdriver with a 1/8 inch blade.

f. For more accurate oscillator alignment, it is advisable to first check sound IF amplifier alignment (A3, A4, A5 and A6) before aligning HF oscillator. IF's and ratio detector must be accurately aligned to correct IF frequency. Retouch IF and ratio detector adjustments if necessary.

g. Adjust as follows:

Channel	Generator Freq. (MC)	Adjust
13	215.75	A17 (Figure 2-8) for zero VTVM reading between a positive and a negative peak with Sharp Tuning control at electrical center. Do this carefully as only a slight rotation of slug may be required.
12	209.75	
11	203.75	
10	197.75	
9	191.75	
8	185.75	
7	179.75	
6	87.75	Note that if mis-alignment is evident on a major number of channels, an over-all HF oscillator adjustment (A18) can be made.
5	81.75	
4	71.75	
3	65.75	
2	59.75	

HF oscillator alignment can be performed with the use of a television signal, or with a signal generator and VTVM. The alternate methods are given below. Note that individual channel adjustment A17 can be performed, in sets with removable channel escutcheon, without removing chassis from cabinet.

See "Connections for 4H1 Models"

INDIVIDUAL CHANNEL ADJUSTMENT USING TELEVISION SIGNAL

(Can be performed in some sets without removal of chassis from cabinet)

a. Allow 15 minutes for set to warm up. Remove Channel and Sharp Tuning knobs. Remove channel-indicating escutcheon if set has removable escutcheon, otherwise remove chassis to reach oscillator slugs. With slight pressure, pull escutcheon away from cabinet and slide the escutcheon and spring to the left or to the top, and pry the right side away from the cabinet.

b. Set channel switch on station with test pattern or program with sound. Set Contrast control for normal picture.

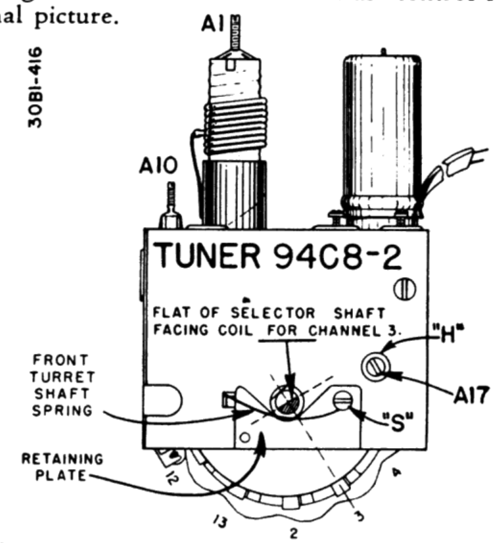


Figure 2-8. Front View of 94C8-2 Tuner With Sharp Tuning Rotor Inside Chassis.

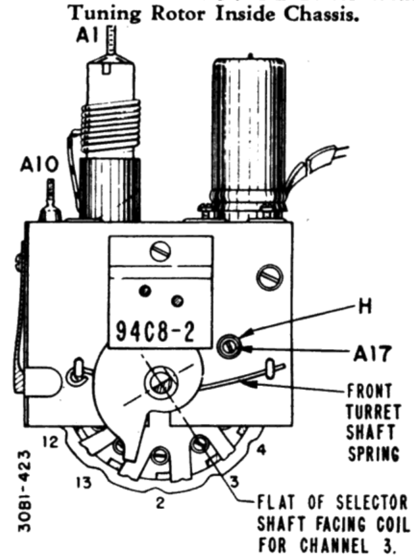


Figure 2-9. Front View of 94C8-2 Tuner With Sharp Tuning Rotor Outside Chassis.

c. Set Sharp Tuning control at electrical center:

For tuners with sharp tuning rotor assembled **inside** of tuner chassis (see figure 2-8), rotate Sharp Tuning control counter-clockwise until rotor engages stop screw "S" and oscillator slug (A17) can be reached through cut-out "H" in tuner front. In some tuners it will be necessary to back screw "S" out a few turns to slightly increase rotation of rotor until oscillator slug is accessible.

For tuners with sharp tuning rotor assembled **outside** of tuner chassis (see figure 2-9), rotate Sharp Tuning control approximately 150° or half rotation as shown in Figure 2-9.

d. Insert NON-METALLIC screwdriver (1/8" blade) in the 3/8" hole ("H") in tuner at right of Sharp Tuning control. Tune oscillator slug for best sound. Do this carefully as only a slight rotation of slug may be required.

OVER-ALL OSCILLATOR ADJUSTMENT (A18)

Over-all oscillator adjustment should only be necessary when tubes or other components in the oscillator circuit have been replaced. (When replacing the oscillator-mixer tube (6J6), it is recommended that several tubes be tried to select one which causes least frequency shift.)

This over-all adjustment can be made using a VTVM and signal generator, or using a television signal.

a. Remove chassis from cabinet.

b. Set selector to channel 13 or other high channel.

c. **When using a signal generator,** follow steps (a), (b), (c), (d) under "Individual Channel Adjustments Using Signal Generator and VTVM", then adjust A18 (Figure 2-6) for zero VTVM reading between a positive and a negative peak.

OR

c. **When using a television signal,** follow steps (b) and (c) under "Individual Channel Adjustment Using Television Signal", then adjust A18 (Figure 2-6) for best sound and clearly defined picture.

d. Recheck adjustment of individual channels and touch-up (A17) if necessary.

94C8-2 TELEVISION TUNER SERVICE

94A8-2 and 94C8-2 Tuners are Identical.

GENERAL

The 94C8-2 Tuner is a sub-chassis consisting of an RF Amplifier (6AG5) and a Mixer-Oscillator (6J6) dual triode.

Channel selection is accomplished by rotation of the tuner turret assembly, which has a separate set of two coils for each of the 12 television channels. Each set consists of an antenna coil in one assembly, and a mixer-oscillator coil in another. Coils are the snap-in type. Coils can be identified as to channel number by RMA color code, or by the number stamped on the outside of the coil assembly. A Sharp Tuning control, having a tuning range of plus or minus 1.5 MC for low channels, and plus or minus 3 MC for high channels, permits fine adjustment of oscillator frequency.

The high frequencies used in television make it necessary that extreme care be exercised in handling or servicing tuners.

Location and lead dress of components and wiring are usually very critical. At high frequencies, wiring leads tend to act as small inductances or capacities and consequently may appreciably alter electrical characteristics of critical circuits.

Parts location and ground connections should be as originally made. When replacing components, **it is important that they be replaced with parts of identical electrical characteristics and physical size.** Refer to parts list for temperature coefficients, tolerances, and other essential description.

Note resemblance between some ceramic condensers and resistors. If in doubt, check Schematic and Parts List in Section 1.

Also note that replacement of tubes (especially 6J6 oscillator-mixer tube) may cause some slight detuning of tuner circuits. This is due to the inherent differences of interelectrode capacitances. When replacing 6J6 tube, it is recommended that several tubes be tried in order to select a tube which will cause least oscillator frequency shift. This is easily checked by noting whether the oscillator Sharp Tuning control will tune in the sound carrier of the television signal at, or reasonably close to, the middle of its range.

Channel snap-in coils must be handled with care. Do not disturb coil windings. Also be sure the coils are properly paired for the indicated channel number, and that coils follow proper sequence when reassembled in the turret drum. For proper reference of tuner shaft in relation to coil position, refer to figure 2-8.

TUNER REPLACEMENT

Replacement of the complete tuner should generally never become necessary since all electrical and mechanical parts are easily replaceable.

Service data covering parts replacement and tuner alignment are given in this manual. Minor adjustments can easily be made in the field.

SHARP TUNING CONTROL

The normal tuning range of the Sharp Tuning control for high channels is plus or minus 3 MC, for low channels plus or minus 1.5 MC.

For Tuner with Sharp Tuning Rotor Inside of Tuner Chassis (figure 2-8). Decreasing the spacing between the two stationary metal stator plates will increase the range of frequency. To move the stator plates closer together or further apart, loosen the mounting screw (J, figure 2-11). Unsolder the metal strap K. (This strap was V-shaped in some sets, straight in others.) Reposition stator plate. Resolder strap and tighten screw.

Slight rubbing of the rotating dielectric disc against the grounded stator plate is intentional, in order to avoid vibration with resulting microphonics. However, the rotating dielectric disc should not be allowed to rub or contact the ungrounded plate attached to terminal No. 1 of the contact plate.

For Tuner with Sharp Tuning Rotor Outside of Tuner Chassis (figure 2-9). The Sharp Tuning control is permanently set at the factory and cannot be readjusted for frequency tuning range.

REMOVING CHANNEL COILS

Insert a screwdriver blade between the coil retainer spring and the turret end plate. Twist the blade away from the turret and lift the end of the coil upward and remove.

CLEANING CONTACT POINTS

Remove several sets of coils from turret and rotate turret to position making contact points of contact plate accessible for cleaning.

Using a small, stiff brush and carbon tetrachloride, clean contact surfaces and shafts of stationary contacts.

Remove accumulated dust or grease from contact plate with a light canvas cloth dampened with carbon tetrachloride.

Clean contact surfaces of rotating coils in same manner.

OSCILLATOR SLUGS IN TOO FAR

If HF oscillator slugs "fall into" coil form, remove the channel coil, move the slug retaining spring aside, and tap the coil assembly until the slug slips forward. Set the coil retaining spring into position; it should rest firmly against the slug. See figure 2-10.

REMOVING TUNER TURRET ASSEMBLY

For Tuners with Sharp Tuning Rotor Inside of Tuner Chassis (figure 2-8).

a. Remove stop screw "S", the spring, and the retaining plate at the front of the tuner. See figure 2-8.
b. Remove the shaft retaining spring at the rear of the tuner by spreading it over the end of the shaft.
c. Using a screwdriver blade at the side of the tuner, press the detent spring M102 and roller M101 away from the turret detent plate.
d. Grasp tuner shaft and slip out of end plate bearings.
e. Reassemble in reverse order.

For Tuners with Sharp Tuning Rotor Outside of Tuner Chassis (figure 2-9).

a. Remove retaining bracket in front of the tuner. See figure 2-9.
b. Remove rotor shaft assembly, rotor contact spring and fibre washer. For reassembly, note order of parts removal.
c. Remove front and rear turret retaining springs by depressing straight end of spring from tab on chassis.
d. Using a screwdriver blade at the side of the tuner, press the detent spring M102 and roller M101 away from the turret detent plate.
e. Grasp tuner shaft and slip out of end plate bearings.

REMOVING CONTACT PLATE ASSEMBLY M103

a. Remove turret as indicated under "Removing Tuner Turret Assembly".
b. Remove the mounting screws at the front and rear of Contact Plate and Bracket Assembly M103. See fig. 2-11.
c. Press outward the front and rear tuner chassis end plates.
d. To free M103, release the contact plate tabs by pushing them away from the slots in the end plates.
e. Unsolder all connections to contact plate. Unsolder the solder joint (L) holding contact plate to the center partition of the tuner chassis.
f. Reassemble in the same manner.

NOTE

When reassembling Contact Plate and Bracket Assembly M103, it will be necessary to reposition M103 as indicated in the next paragraph; it will also be necessary to reset the Detent Spring M102 as indicated under "Resetting The Detent Spring".

REPOSITIONING CONTACT PLATE ASSEMBLY M103

a. Loosen the contact plate mounting screws.
b. With thumb pressure of right and left hands, press the upper end of the contact plate toward the turret.
c. The contacts on the contact plate should clear the plastic surface of turret coils by about 1/64 of an inch. Clearance can be observed by removing several sets of coils from the turret and slowly rotating turret.
d. After setting the contact plate for proper clearance, tighten the contact plate mounting screws.
e. Resolder wiring connections and solder joint (L). See figure 2-11.

RESETTING DETENT SPRING M102

When servicing the Detent Spring M102, the Detent Roller M101, or when replacing the Contact Plate and Bracket Assembly M103, the detent spring should be reset as follows:

a. Loosen the detent spring mounting screw.
b. Observing the contacts on the contact plate, grasp the turret and the roller end of the detent spring. Rotate the drum slightly in one direction and then the other, until a point is reached where the contacts appear to have the greatest rise.
c. Check to see that the detent roller is set in the center of the depression on the edge of the turret detent plate. If setting is correct, tighten the detent spring mounting screw.
d. Rotate the turret, checking contacts on all channels.

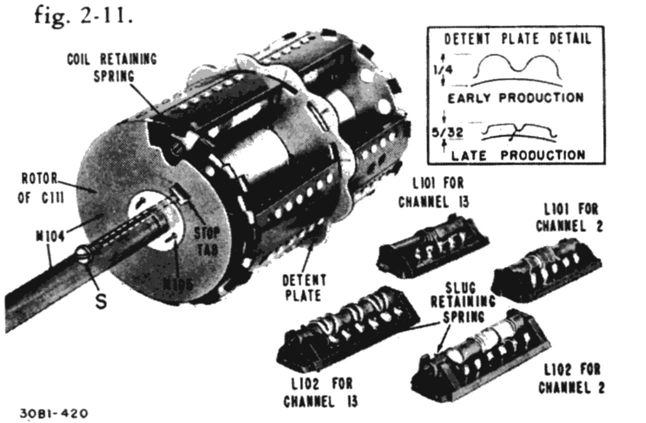


Figure 2-10. 94C8-2. Tuner Turret, Showing Snap-in Coils.

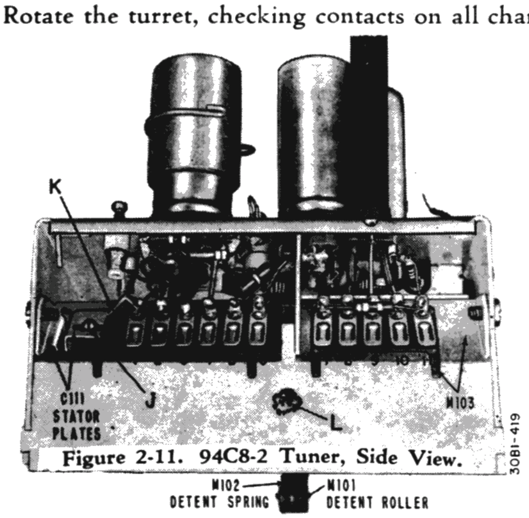


Figure 2-11. 94C8-2 Tuner, Side View.

This SECTION applies to the following models:

30A12N or UL	30A16N or UL	30A15T or TN	8C13N or UL
30A13N or UL	30A12T or TN	30A16T or TN	8C11T or TN
30A14N or UL	30A13T or TN	8C11N or UL	8C12T or TN
30A15N or UL	30A14T or TN	8C12N or UL	8C13T or TN

SECTION 3

Television Alignment Procedure for all 30A1 Chassis without the letter "S".

(See Identification Chart Below.)

SECTION 3. TELEVISION ALIGNMENT PROCEDURE

for all 30A1 Chassis without the letter "S"

GENERAL

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

a. IF Amplifier and Trap Alignment (Video and Sound IF).
b. Tuner RF and Mixer Alignment.
c. Tuner High Frequency Oscillator Alignment.

Under normal use or operating conditions, tuner misalignment with age will be slight. The RF and mixer stage components have been designed for stable bandpass operation and under normal conditions will seldom require realignment. The HF oscillator however, may require some slight readjustment, if the oscillator tube or individual channel coils have been replaced.

Important

Do not attempt alignment until all possible causes of trouble have first been investigated. Do not attempt alignment unless suitable test equipment listed below is available.

HIGH VOLTAGE WARNING

Operating or servicing television receivers with cabinet removed involves shock hazard. Exercise all normal High Voltage precautions.

TEST EQUIPMENT

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

RF Sweep Generator

18 to 30 MC range: 10 MC sweep width.
50 to 90 MC range: 10 MC sweep width.
170 to 225 MC range: 10 MC sweep width.
Output: One-tenth volt minimum Adjustable.
Output impedance: 300 ohms balanced to ground for RF ranges.

Marker Generator

18 to 30 MC frequency range.
50 to 90 MC frequency range.
170 to 225 MC frequency range.
Must be extremely accurate or have built-in crystal calibrator for checking accuracy of calibration.

Crystal Calibrator

Check points from 18 to 225 MC. Not required if marker generator has built-in crystal calibrator.

Signal Generator

Accurate signal generator, range 18 to 225 MC, with low impedance output and calibrated output attenuator.

Oscilloscope

Standard oscilloscope, preferably with a wide band vertical deflection, vertical sensitivity at least .5 volt peak-to-peak per inch, and input calibrator.

Vacuum-Tube Voltmeter

Vacuum-tube voltmeter or 20,000 ohms per volt DC meter. Preferably one with low range (3 volt) DC zero center scale.

TELEVISION ALIGNMENT PROCEDURE FOR CHASSIS WITH A1582 TUNER

Alignment Adjustment Identification

(For sets with A1582 tuner only; see figure 3-6.)

Adj.	Symbol	Function	Adj.	Symbol	Function	Adj.	Symbol	Function	Adj.	Symbol	Function
A1	T901	21.25 MC Trap	A10	T901	Mixer (Plate)	A19	L912	Chan. 6 RF	A28	L971	Chan. 8 Osc.
A2	T301	21.25 MC Trap	A11	T301	2nd IF (Video)	A20	L939	Chan. 6 Mixer	A29	L969	Chan. 7 Osc.
A3	T201	1st IF (Sound)	A12	T302	3rd IF (Video)	A21	L940	Chan. 6 Mixer	A30	L966	Chan. 6 Osc.
A4	T201	1st IF (Sound)	A13	T303	4th IF (Video)	A22	L980	Chan. 13 Osc.	A31	L967	Chan. 6 Osc.
A5	T202	Ratio Detector	A14	L925	Chan. 13 RF	A23	L981	Chan. 13 Osc.	A32	L965	Chan. 5 Osc.
A6	T202	Ratio Detector	A15	L926	Chan. 13 RF	A24	L979	Chan. 12 Osc.	A33	L963	Chan. 4 Osc.
A7	T302	27.25 MC Trap	A16	L953	Chan. 13 Mixer	A25	L977	Chan. 11 Osc.	A34	L961	Chan. 3 Osc.
A8	T303	19.75 MC Trap	A17	L954	Chan. 13 Mixer	A26	L975	Chan. 10 Osc.	A35	L959	Chan. 2 Osc.
A9	L301	1st IF (Video)	A18	L911	Chan. 6 RF	A27	L973	Chan. 9 Osc.	A36	L957	Chan. 1 Osc.

A37 L984 FM Interference (Trap) A38 L985 FM Interference (Trap)

IF AMPLIFIER AND TRAP ALIGNMENT

(For sets with A1582 tuner only; see figure 3-6.)

- Allow about 15 minutes for receiver and test equipment to warm up.
- Disconnect antenna from receiver.
- Set Channel Selector to channel 13 or other unassigned high channel (to prevent signal interference during IF alignment).
- Connect RC filter of 10,000 ohm resistor and 330 mmfd. condenser in series from point "X" to chassis. See figure 3-2. Leave connected for all steps in this alignment.
- Connect signal generator high side to tube shield of 6J6 mixer tube. Be sure to insulate tube shield from chassis. Connect signal generator low side to chassis close to 6J6 tube base.
- Set Contrast control for —3 volts (read at arm of control). Retain this setting for all IF and trap adjustments.
- Use VTVM on lowest scale. (3 volts DC preferred.) Note: 20,000 ohm-per-volt meter can also be used.
- Use a NON-METALLIC alignment screwdriver.
- Refer to figure 3-1 and 3-2 for alignment adjustment and test point locations.

Step	Signal Gen. Frequency (MC)	Connect VTVM to	Test Connections and Instructions	Adjust
1.	*21.25	High side to junction of resistor and condenser of RC filter connected to "X" (video detector V305 circuit); common to chassis. See figure 3-2.	Use lowest signal generator output for adequate meter indication, then gradually increase generator output as VTVM reading decreases.	Adjust A1 for Minimum. Detune A1 by shorting a couple turns of the coil with your finger or a clip lead. Adjust A2 for minimum. Remove the short on the coil associated with A1.
2.	*21.25	Point "Y", negative side of electrolytic condenser in ratio detector.	While peaking, keep reducing signal generator output so VTVM reading is approx. 1.5 volts.	Slugs A3, A4 and A5 for maximum reading on meter.
3.	*21.25	Point "Z", junction of R205 and R210 in ratio detector.	Use zero center VTVM for this reading.	Slug A6 to zero on VTVM between maximum positive and maximum negative voltages found nearest fully withdrawn slug position.
4.	*27.25	Same as step 1.	Same as Step 1.	Slug A7 for Minimum
5.	*19.75	"	"	Slug A8 for Minimum
6.	25.0	"	Reduce signal generator output so VTVM reading is approx. 1 volt.	Video Slug A9 for maximum
7.	21.8	"	"	Video Slug A10 for Maximum
8.	22.3	"	"	Video Slug A11 for Maximum
9.	25.25	"	"	Video Slug A12 for Maximum
10.	23.5	"	"	Video Slug A13 for Maximum

To insure proper alignment, make Overall Video IF and Audio IF checks as indicated on next page.

* Before proceeding, be sure to check the signal generator used in alignment against a crystal calibrator or other frequency standard for absolute frequency calibration required for this operation.

OVER-ALL VIDEO IF RESPONSE CURVE CHECK

(Using sweep generator and oscilloscope)

1. Disconnect signal generator and VTVM (if used in previous alignment).
2. Connect oscilloscope between point "X" and chassis ground through a decoupling filter (see figure 3-2). Keep leads away from receiver.
3. Connect sweep generator high side to point "W" on tuner, low side to chassis ground. Set sweep generator to sweep the video IF pass band (19 to 29 MC).
4. Loosely couple marker generator high side to the sweep generator lead connected to point "W" on tuner, low side to chassis ground.

Important

To avoid distortion of the response curve, keep the sweep generator and marker generator outputs at a very minimum. Marker pip (25.75 MC) should be just kept barely visible. Setting sweep generator output for VTVM reading from .5 to 1 volt DC (measured from decoupling network at point "X" and chassis, figure 3-2) will avoid distortion of response curve.

5. Check curve obtained against the ideal over-all video IF amplifier response curve shown in figure 3-3, also check trap and video IF carrier points by means of marker generator. It is important that marker pips be in the proper location on the re-

sponse curve as shown in figure 3-3. Correct location of 25.75 MC marker, should be 6db below peak (50% point on slope of curve). With correct trap adjustments, markers at 27.25 MC, 21.25 MC and 19.75 MC points should not be visible generally. Consistent with proper band-width and correct location of markers, the response curve should have maximum amplitude and flat top appearance.

If necessary to correct band-width and flat top appearance, retouch (stagger tune) A10, A11, A12 and/or A13 as required.

For retouching traps A1, A2, A7 and/or A8, it will be necessary to use signal generator and VTVM, and repeat steps under "IF Amplifier and Trap Alignment".

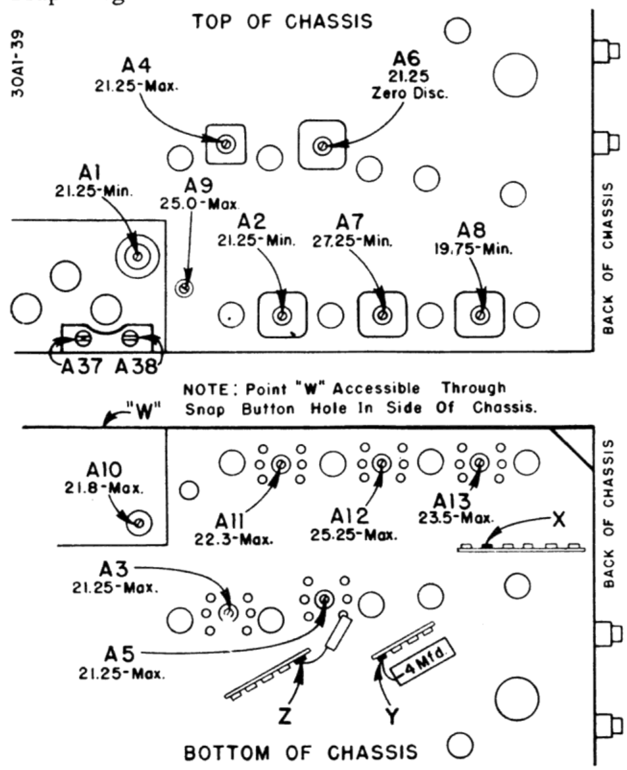


Figure 3-1. Trimmer Locations.

AUDIO IF ALIGNMENT CHECK

(Using sweep generator and oscilloscope)

1. Disconnect signal generator and VTVM; if used in previous alignment.
2. Connect oscilloscope between point "Z" and chassis ground (see figure 3-1). Keep leads away from receiver.
3. Connect sweep generator high side to point "W" on tuner, low side to chassis ground. Set sweep generator to sweep the audio IF pass band (20.25 to 22.25 MC). NOTE: If sweep generator does not have sufficient output for oscilloscope trace, connect between grid (pin 1) of V201 to chassis, thru 200 mmfd. condenser.
4. Loosely couple marker generator high side to the sweep generator high side, low side to chassis ground.

Important

To avoid distortion of the response curve, keep the sweep generator and marker generator outputs at a very minimum. Marker pips should be kept just barely visible.

5. Observe ratio detector response (figure 3-4). Since the sweep signal is fed through the entire audio IF system for this check, mis-alignment of the audio IF's will affect this curve. This provides an overall audio IF response check. The shape of the curve should be such as to provide a minimum vertical voltage slope of 50 KC to each side of the 21.25 MC marker (cross over point). Maximum size and linearity of the straight portion of the curve is ideal. Note that the ratio detector circuit used gives a symmetrical "S" pattern. Check for linearity between the markers indicated on the curve. The response curves obtained may appear inverted and/or reversed (end for end) depending on the sweep generator and oscilloscope used.
6. If correct response is not obtained, repeat alignment steps for slugs A3, A4, A5 and A6 under "IF Amplifier and Trap Alignment". Re-check response curve.

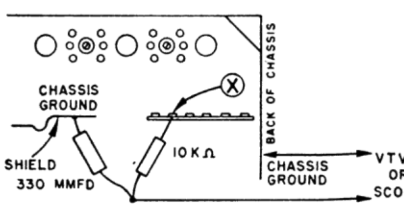


Figure 3-2. VTVM or Scope Connections.

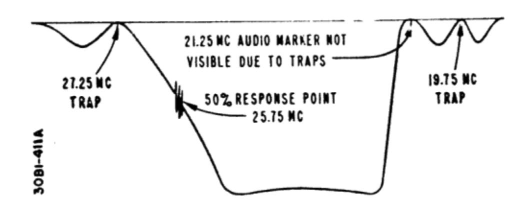


Figure 3-3. Overall Video IF Response Curve.

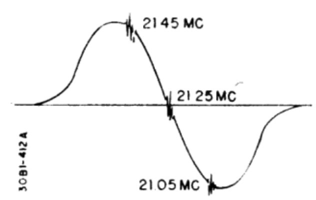


Figure 3-4. Ratio Detector Response Curve.

RF AND MIXER ALIGNMENT

(For sets with A1582 tuner only; see figure 3-6.)

The push-pull plate circuit of the RF stage (6J6) and push-pull grid circuit of the mixer stage (6J6) are individual series inductances, arranged to form a parallel tuned line, tuning successively from channel 13 to channel 1. The "tuned line" in the RF plate and mixer grid circuits each have one pair of adjustments for channels 13 to 7 and one pair for channels 6 to 1. In order that the lines be balanced, the two adjustment in each pair should be turned in or out equally during alignment. The highest frequency channel should be aligned first, as any change to a higher frequency channel will affect all lower channels. Check all lower channels and if necessary repeat adjustment.

- Disconnect antenna from receiver.
- Before starting alignment, allow about 15 minutes for receiver and test equipment to warm up.
- Connect sweep generator to antenna terminals.
- Loosely couple marker generator to antenna terminal (to obtain marker pips of video and sound RF carriers). To avoid distortion of the response curve, keep marker generator output at a minimum, marker pips just barely visible.
- Connect oscilloscope through 10,000 ohm resistor to point "W" (Figure 3-7). Keep oscilloscope leads away from chassis.
- See figure 3-6 for location of RF and Mixer adjustments.

Step	Marker Gen. Frequency (MC)	Sweep Gen. Frequency	Connect Oscilloscope to	Test Connections and Instructions	Adjust
1.	211.25 215.75	Sweeping Channel 13	Through 10,000 ohms to point W (See Figures 3-7 and 3-1) Junction of R907 and C910.	Set contrast control to —1.5 volts (read at arm of control).	A14, A15, A16, A17 as indicated under "RF Response Curve Check" below.
2.	205.25 209.75	12	"	"	Check response per step 1 above.
3.	199.25 203.75	11	"	"	"
4.	193.25 197.75	10	"	"	"
5.	187.25 191.75	9	"	"	"
6.	181.25 185.75	8	"	"	"
7.	175.25 179.75	7	"	"	"
8.	83.25 87.75	6	"	"	A18, 19, 20 and 21 per step 1.
9.	77.25 81.75	5	"	"	Check response per step 1.
10.	67.25 71.75	4	"	"	"
11.	61.25 65.75	3	"	"	"
12.	55.25 59.75	2	"	"	"
13.	45.25 49.75	1	"	"	"

RF RESPONSE CURVE CHECK

Check each channel for curve resembling RF response curve shown in figure 3-5. Consistent with proper band width and correct marker location, response curve should have maximum amplitude and flat top appearance. In general, the adjustment performed in steps 1 and 8 are sufficient to give satisfactory response curves on all channels. However, if reasonable alignment is not obtained on a particular channel, repeat steps 1 and/or 8 for the weak channel as a compromise adjustment to favor this particular channel. If a compromise adjustment is made, other channels should be checked to make certain that they have not been appreciably affected.

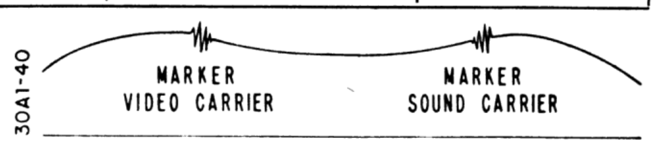


Fig. 3-5. RF Response Curve.

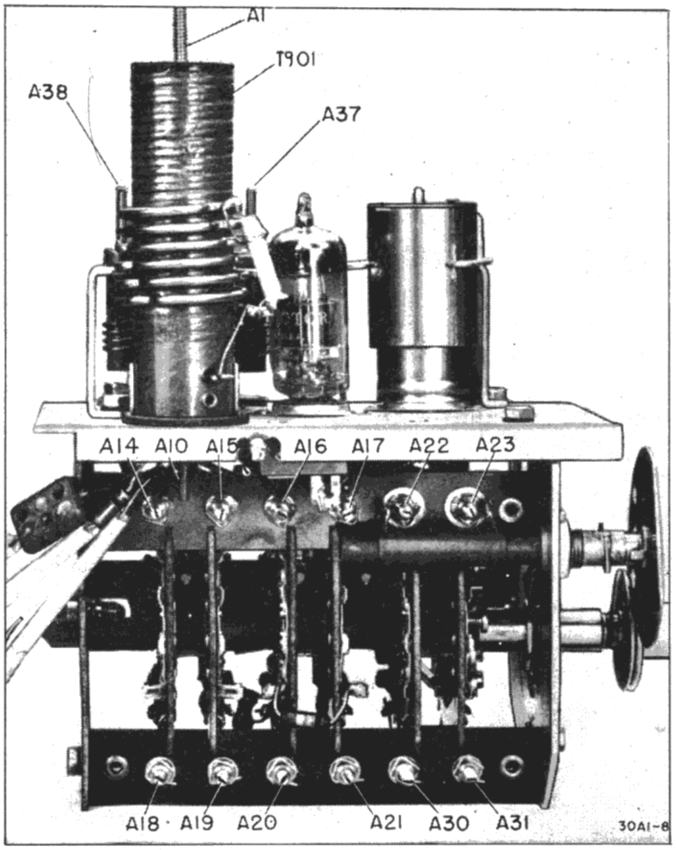


Fig. 3-6. TV Tuner A1582, Left Side.

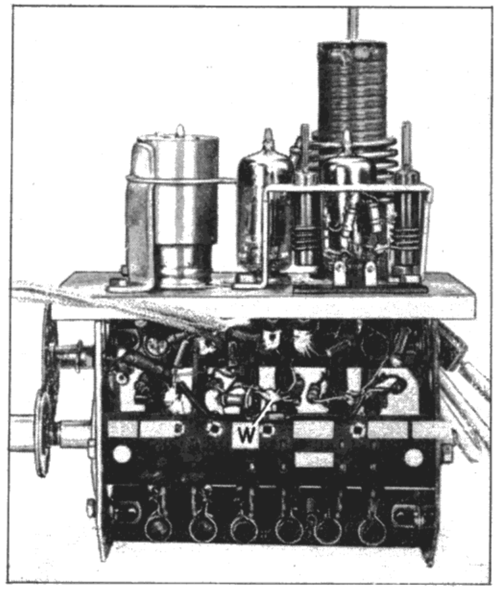


Fig. 3-7. TV Tuner A1582, Right Side.

INTERFERENCE TRAP ADJUSTMENT

Due to the prevalence of FM interference on some television channels, an interference rejection trap is mounted on top of RF tuner A1582 as shown in figures 3-6 and 3-7. It covers the frequency range from 93 to 109 MC.

Inter-channel interference may result from a dual-conversion effect that results from oscillator voltage feeding through to the grid of the RF amplifier. Channel 10 interference on channel 6 is an example of this condition. The local oscillator frequency for channel 6 reception is 109 MC. 193.25 and 197.75 MC are the picture and audio carrier frequencies for channel 10. Combining these with the 109 MC oscillator signal results in a conversion to 84.25 and 88.75 MC, respectively. These frequencies are close enough to the 83.25 and 87.75 MC carrier frequencies of channel 6 to cause serious interference. The 93 to 109 MC interference trap can also be used to eliminate inter-channel interference of the above type by trapping out the oscillator voltage on the grid of the RF amplifier.

In the event that FM interference; or inter-channel interference of the type described above, is experienced; set the television receiver for reception of the station that is being interfered with. Adjust trap adjustments A37 and A38 (Figures 3-6, 3-1) for minimum interference.

HF OSCILLATOR ALIGNMENT

(For chassis with type A1582 RF tuner only; see Figure 3-6.)

The tank circuit of the HF oscillator (6J6) consists of individual series inductances, arranged to form a parallel tuned line, tuning successively from channel 13 to channel 1. Both sections of line for channel 13 and channel 6 are aligned with a pair of slug adjustments, requiring equal setting. Channels 12 through 7 and channels 5 through 1 are each aligned only by a single adjustment for one side of the line.

The highest frequency channel should be aligned first, as any change to a higher frequency channel will affect all lower channels. Check all lower channels and if necessary repeat adjustment.

Need for alignment of individual channels can be checked by noting if rotation of the Sharp Tuning Control will tune in the sound carrier of the Television Signal at/or reasonably close to the middle of its range.

OVER-ALL HF OSCILLATOR ADJUSTMENT

If mis-alignment is evident on a major number of channels, an overall HF Oscillator adjustment of a limited range may be made by adjustment of the "Alignment Gimmick". This gimmick consists of a half inch length of wire connected to pin 2 (plate) of the oscillator tube socket. Bending the wire gimmick toward or away from the chassis varies wiring capacity of the oscillator circuit. This adjustment compensates for variation in tube capacity with replacement of the oscillator tube. Overall Oscillator Adjustment can be made using a signal generator and VTVM, or using a television signal as outlined

Make this adjustment preferably on channel 13 or other high channel, since this adjustment affects all channels. The Sharp Tuning control must be at center of rotation during this adjustment. **IMPORTANT:** When replacing the oscillator tube, try several tubes, in order to select a tube which will cause least frequency shift. In this way, need for oscillator alignment can sometimes be avoided.

INDIVIDUAL CHANNEL HF OSCILLATOR ALIGNMENT USING SIGNAL GENERATOR AND VTVM

(For sets with A1582 tuner only; see figure 3-6).

- Be sure to read paragraph on "Overall HF Oscillator Adjustment"
- Allow about 15 minutes for receiver and test equipment to warm up. Disconnect antenna from receiver.
- Connect signal generator high side to one antenna terminal, ground to chassis.
- Set contrast control for —1.5 Volts, (read at arm of control).
- Connect VTVM high side to "Z" (ratio detector V203 circuit). Common to chassis. Use VTVM with 3 volt zero center scale if available. A 20,000 ohm-per-volt meter can be used as an alternate.
- Set sharp tuning control at center of rotation. Retain this setting during entire oscillator alignment.
- Use a NON-METALLIC alignment screw driver with a 1/8 inch blade.
- For more accurate oscillator alignment, it is advisable to first check "Sound IF amplifier alignment" (A3, A4, A5 and A6). Before aligning HF Oscillator, IF's and ratio detector must be accurately aligned to correct IF frequency. Retouch IF and ratio detector adjustments if necessary.
- See Figures 3-6 and 3-8 for location of adjustments.

Step	Channel	Generator Frequency (MC)	Adjust
1.	13	215.75	**A22 and A23 for zero VTVM reading between a positive and a negative peak with sharp tuning control centered.
2.	12	209.75	A24 as described above.
3.	11	203.75	A25 as described above.
4.	10	197.75	A26 as described above.
5.	9	191.75	A27 as described above.
6.	8	185.75	A28 as described above.
7.	7	179.75	A29 as described above.
8.	6	87.75	**A30 and A31 as described above.
9.	5	81.75	A32 as described above.
10.	4	71.75	A33 as described above.
11.	3	65.75	A34 as described above.
12.	2	59.75	A35 as described above.
13.	1	49.75	A36 as described above.

**These slug adjustment screws should protrude approximately the same distance out of the coil forms.

INDIVIDUAL CHANNEL ADJUSTMENT USING TELEVISION SIGNAL

(For sets with A1582 tuner only; see fig. 3-6)

Be sure to read paragraph on "Overall Oscillator Adjustment"

a. Allow about 15 minutes for set to warm up.
b. Set channel switch on station with test pattern or program with sound. Set Contrast control for normal picture.
c. Set Sharp Tuning control at center of rotation.
d. Using a NON-METALLIC screwdriver (with 1/8" blade), tune slugs or screw adjustments for best sound. Refer to tabulation above and illustration figures 3-6 and 3-8 for adjustment data and location of adjustments.
e. The highest frequency channel should be aligned first, as any change to a higher frequency channel will affect all lower channels. Check all lower channels and if necessary repeat adjustment.

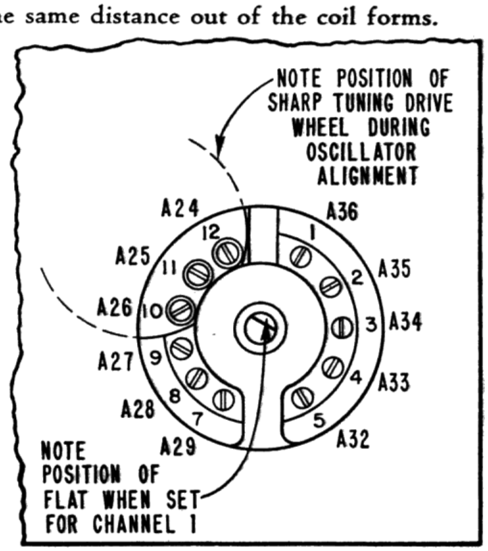


Fig. 3-8. Channel Switch Detail.

TELEVISION ALIGNMENT PROCEDURE FOR CHASSIS WITH 94C9-2 TUNER

(For sets with A1582 TV Tuner, see page of this section.)

TUNER SHIELD

Some 94C9-2 tuners have bottom shields. If the tuner has a shield, RF, Mixer, and Oscillator alignment can be made using a dummy shield with cutouts where the coils can be reached. Otherwise, make adjustments with shield removed, and repeat checks with shield replaced. If set does not have a shield, do not use one.

Caution: The tuner shield must be securely mounted, with all sides making good electrical contact, otherwise noise will result.

IF AMPLIFIER AND TRAP ALIGNMENT

(For sets with 94C9-2 tuner only; see figure 3-13.)

- Allow about 15 minutes for receiver and test equipment to warm up.
- Disconnect antenna from receiver.
- Set Channel Selector to channel 13 or other unassigned high channel (to prevent signal interference during IF alignment).
- Connect RC filter of 10,000 ohm resistor and 330 mmfd. condenser in series from point "X" to chassis. See figure 3-11. Leave connected for all steps in this alignment.
- Connect signal generator high side to tube shield of 6AG5 mixer tube. Be sure to insulate tube shield from chassis. Connect signal generator low side to chassis close to 6AG5 tube base.
- Set Contrast control for —3 volts (read at arm of control). Retain this setting for all IF and trap adjustments.
- Use VTVM on lowest scale. (3 volts DC preferred.) Note: A 20,000 ohm-per-volt meter can also be used.
- Use a NON-METALLIC alignment screwdriver.
- Refer to figure 3-9, 3-10 and 3-11 for alignment adjustment and test point locations.

Step	Signal Gen. Frequency (MC)	Connect VTVM to	Test Connections and Instructions	Adjust
1	*21.25	High side to junction of resistor and condenser of RC filter connected to "X" (video detector V305 circuit); common to chassis. See figure 3-11.	Use lowest signal generator output for adequate meter indication, then gradually increase generator output as VTVM reading decreases.	A1 for minimum.
2	*21.25	"	Connect pin 1 of V201 to ground for this step only.	A2 for minimum.
3	*21.25	High side to "Y", common to chassis.	While peaking, keep reducing signal generator output so VTVM reading is approx. 1.5 volts.	A3, A4, and A5 for maximum.
4	*21.25	High side to "Z" (ratio detector V203 circuit). Common to chassis.	Use 3 volt zero center scale if available.	A6 for zero reading between a positive and negative peak.
5	*27.25	High side to junction of resistor and condenser of RC filter connected to "X" (video detector V305 circuit); common to chassis. See figure 3-11.	Use lowest signal generator output for adequate meter indication, then gradually increase generator output as VTVM reading decreases.	A7 for minimum.
6	*19.75	"	"	A8 for minimum.
7	25.0	"	While peaking, keep reducing signal generator output so VTVM reading is approximately 1 volt.	A9 for maximum.
8	21.8	"	"	A10 for maximum.
9	22.3	"	"	A11 for maximum.
10	25.25	"	"	A12 for maximum.
11	23.5	"	"	A13 for maximum.

To insure proper alignment, make Overall Video IF and Audio IF checks as indicated

* Before proceeding, be sure to check the signal generator used in alignment against a crystal calibrator or other frequency standard for absolute frequency calibration required for this operation.

ALIGNMENT ADJUSTMENT IDENTIFICATION

(For sets with 94C9-2 tuner only; see figure 3-13.)

Adj.	Symbol	Function
A1	L830	21.25 MC Trap
A2	T301	21.25 MC Trap
A3	T201	1st IF Trans. (Sound)
A4	T201	1st IF Trans. (Sound)
A5	T202	Ratio Detector, Trans.
A6	T202	Ratio Detector, Trans.
A7	T302	27.25 MC Trap
A8	T303	19.75 MC Trap
A9	L301	1st IF Coil, Video
A10	L817	Mixer Plate Coil
A11	T301	2nd IF Trans. (Video)
A12	T302	3rd IF Trans. (Video)
A13	T303	4th IF Trans. (Video)

Symbol	Function
*L805	Chan. 13 RF
L818	Chan. 13 Mixer
L806	Chan. 12 RF
L819	Chan. 12 Mixer
L807	Chan. 11 RF
L820	Chan. 11 Mixer
L808	Chan. 10 RF
L821	Chan. 10 Mixer
L809	Chan. 9 RF
L822	Chan. 9 Mixer
L810	Chan. 8 RF
L823	Chan. 8 Mixer
L811	Chan. 7 RF
L824	Chan. 7 Mixer

Symbol	Function
L812	Chan. 6 RF
L825	Chan. 6 Mixer
L813	Chan. 5 RF
L826	Chan. 5 Mixer
L814	Chan. 4 RF
L827	Chan. 4 Mixer
L815	Chan. 3 RF
L828	Chan. 3 Mixer
L816	Chan. 2 RF
L829	Chan. 2 Mixer
L831 to L842	Osc. Chan. 13 to 2
L843	Overall Osc. Adj. (affects all channels)

* RF and Mixer adjustments L805 to L829 are seldom necessary.

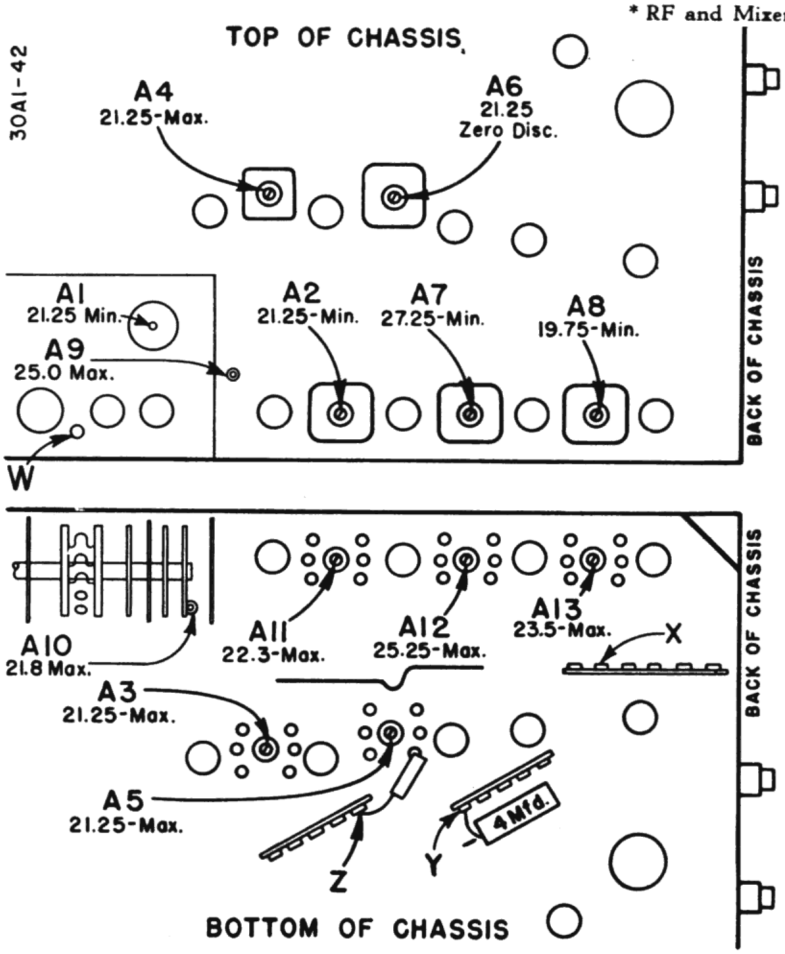


Fig. 3-9. Trimmer Locations (Sets using 94C9-2 Tuner).

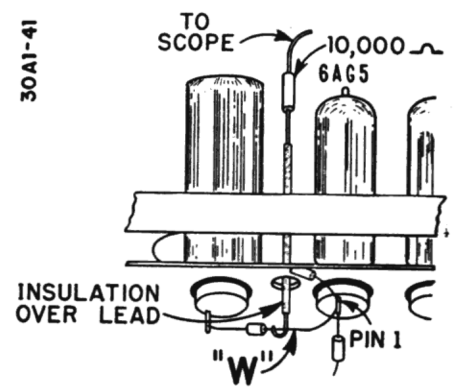


Fig. 3-10. Connecting Test Equipment to Point "W".

Point "W" is accessible through hole in top of chassis. Use hook-shaped wire on 10,000 ohm resistor.

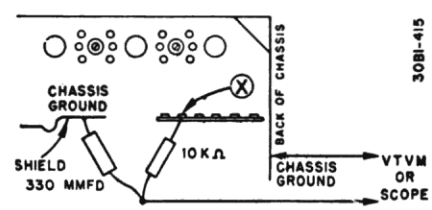


Fig. 3-11. VTVM or Scope Connections.

RF AND MIXER ALIGNMENT

(For sets with 94C9-2 tuner only; see figure 3-13.)

The plate circuit of the RF stage (6BH6) and grid circuit of the mixer stage (6AG5) are individually tuned series inductances, tuning successively from channel 13 to channel 2. RF plate and mixer grid circuits will seldom require realignment. However, if adjustment is required, adjustment of the wire loops or coils for the particular channel is made by spreading or squeezing turns, in order that a satisfactory response curve be obtained without great loss of amplitude. The highest frequency coil inductances must be aligned first. Any change to a higher frequency channel will affect all lower channels and it may be necessary to check or repeat adjustments on the lower channels.

Note: This tuner has a 14 position channel switch for the twelve channels (13 to 2). The first and last switch positions are not used.

- Disconnect antenna from receiver.
- Before starting alignment, allow about 15 minutes for receiver and test equipment to warm up.
- Connect sweep generator to antenna terminals.
- Loosely couple marker generator to antenna terminal (to obtain marker pips of video and sound RF carriers). To avoid distortion of the response curve, keep marker generator output at a minimum, marker pips just barely visible.
- Connect oscilloscope through 10,000 ohm resistor to point "W" (Figure 3-10). Keep oscilloscope leads away from chassis.
- Set Contrast control to —1.5 volts (read at arm of control).
- See paragraph on "Tuner Shield"

Step	Marker Gen. Freq. (MC)	Sweep Gen. Frequency	Adjust
1	*211.25 **215.75	Sweeping Channel 13	L805 L818
2	205.25 209.75	12	L806 L819
3	199.25 203.75	11	L807 L820
4	193.25 197.75	10	L808 L821
5	187.25 191.75	9	L809 L822
6	181.25 185.75	8	L810 L823
7	175.25 179.75	7	L811 L824
8	83.25 87.75	6	L812 L825
9	77.25 81.75	5	L813 L826
10	67.25 71.75	4	L814 L827
11	61.25 65.75	3	L815 L828
12	55.25 59.75	2	L816 L829

NOTES

Check for response curve resembling figure 3-12. Consistent with proper band width and correct marker location, response curve must have maximum amplitude and flat top appearance.

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

Adjustment is made by spreading or squeezing turns or loops of coils (for a particular channel) until a satisfactory response curve is obtained.

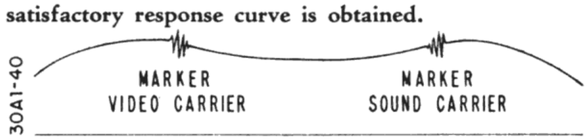


Figure 3-12. RF Response Curve

*** Picture Carrier Frequency (MC)**

**** Sound Carrier Frequency (MC)**

OVERALL OSCILLATOR ADJUSTMENT

If mis-alignment is evident on a major number of channels, an over-all HF oscillator adjustment of a limited range may be made by adjustment of the oscillator series coil L843. This is done by unsoldering one end of the coil L843 and lengthening or shortening the loop through the contact lug in the wafer switch. Make this adjustment preferably on channel 13 or other high channel, since this adjustment affects all channels. The Sharp Tuning Control must be at center of rotation during alignment. Overall Oscillator Adjustment can be made using a signal generator and VTVM as outlined - - - - - - - or using a television signal as outlined in paragraph "Individual Channel Adjustment Using Television Signal" below.

NOTE: Adjustment of L843 compensates for variation in tube capacity with replacement of the oscillator tube. When replacing the oscillator tube, try several tubes, in order to select a tube which will cause least frequency shift. In this way, need for oscillator alignment can sometimes be avoided.

INDIVIDUAL CHANNEL ADJUSTMENT USING TELEVISION SIGNAL

(For sets with 94C9-2 tuner only; see figure 3-13.)

Be sure to read paragraph on "Overall Oscillator Adjustment" on this page.

a. Allow about 15 minutes for set to warm up.
b. Set channel switch on station with test pattern or program with sound.
c. Set Contrast control for normal picture.
d. See paragraph on "Tuner Shield"
e. Check oscillator alignment on each channel, by noting whether rotation of the Sharp Tuning control will tune in the sound carrier of the TV signal reasonably close to middle of its range.

If sound can only be obtained with Sharp Tuning control rotated fully counter-clockwise, set Sharp Tuning control at center of rotation and carefully squeeze the turns of the oscillator coil (channels 13 to 7) or adjust oscillator tuning slug (channels 6 to 2) for maximum sound. Repeat check.

If sound can only be obtained with Sharp Tuning control rotated fully clockwise, set Sharp Tuning control at center of rotation and carefully spread the turns of the oscillator coil (channels 13 to 7) or adjust oscillator tuning slug (channels 6 to 2) for maximum sound. Repeat check.

Before adjusting oscillator slugs (channels 6 to 2), carefully melt wax with a heated screwdriver, being careful not to melt the coil form.

Individual oscillator channel adjustments can be made without affecting other channels. Refer to tabulation and figures 3-13 and 3-14 for adjustment data and location.

HF OSCILLATOR ALIGNMENT

(For sets with 94C9-2 tuner only; see figure 3-13.)

The tank circuit of HF oscillator (6C4) consists of individual inductances for each of the 12 channels.

Adjustment for channels 13 through 7 is made by varying inductance of coils by spreading or squeezing coils. Adjustment for channels 6 through 2 is made by tuning brass slugs in coils. Individual oscillator channel adjustment can be made on one channel without affecting other channels.

Need for alignment of individual channels can be checked by noting if rotation of the Sharp Tuning Control will tune in the sound carrier of the Television Signal at or reasonably close to the middle of its range.

Note: This tuner has a 14 position channel switch for the twelve channels (13 to 2). The first and last switch positions are not used.

INDIVIDUAL CHANNEL ADJUSTMENTS USING SIGNAL GENERATOR & VTVM

- Be sure to read "Overall Oscillator Adjustment",
- Allow about 15 minutes for receiver and test equipment to warm up. Disconnect antenna from receiver.
- Connect signal generator high side to one antenna terminal, ground to chassis.
- Set contrast control for −1.5 volts (read at arm of control).
- See Figure 3-9. Connect VTVM high side to "Z" (ratio detector V203 circuit); common to chassis. Use VTVM 3 volt zero center scale if available.
- Set Sharp Tuning control at center of rotation. Retain this setting during entire oscillator alignment.
- Use a NON-METALLIC alignment screwdriver with a 1/8 inch blade.
- For more accurate oscillator alignment, it is advisable to first check sound IF amplifier alignment (A3, A4, A5 and A6) before aligning HF oscillator. IF's and ratio detector must be accurately aligned to correct IF frequency. Retouch IF and ratio detector adjustments if necessary.
- See paragraph on "Tuner Shield"

Step	Channel	Generator Freq. (MC)	Adjust
1	13	215.75	L831 Turns
2	12	209.75	L832 Turns
3	11	203.75	L833 Turns
4	10	197.75	L834 Turns
5	9	191.75	L835 Turns
6	8	185.75	L836 Turns
7	7	179.75	L837 Turns
8	6	87.75	L838 Slug
9	5	81.75	L839 Slug
10	4	71.75	L840 Slug
11	3	65.75	L841 Slug
12	2	59.75	L842 Slug

NOTES

Check oscillator alignment on each channel, by noting whether rotation of the Sharp Tuning control will tune through zero center VTVM reading between a positive and negative peak.

If VTVM zero can only be obtained with Sharp Tuning control rotated fully counter-clockwise, set Sharp Tuning control at center of rotation and carefully squeeze the turns of the oscillator coil (channels 13 to 7) or adjust oscillator tuning slug (channels 6 to 2) for VTVM zero. Repeat check.

If VTVM zero can only be obtained with Sharp Tuning control rotated fully clockwise, set Sharp Tuning control at center of rotation and carefully spread the turns of the oscillator coil (channels 13 to 7) or adjust oscillator tuning slug (channels 6 to 2) for VTVM zero. Repeat check.

Before adjusting oscillator slugs (channels 6 to 2), carefully melt wax with a heated screwdriver, being careful not to melt the coil form.

Individual oscillator channel adjustments can be made without affecting other channels. See figures 3-13 and 3-14 for adjustment locations.

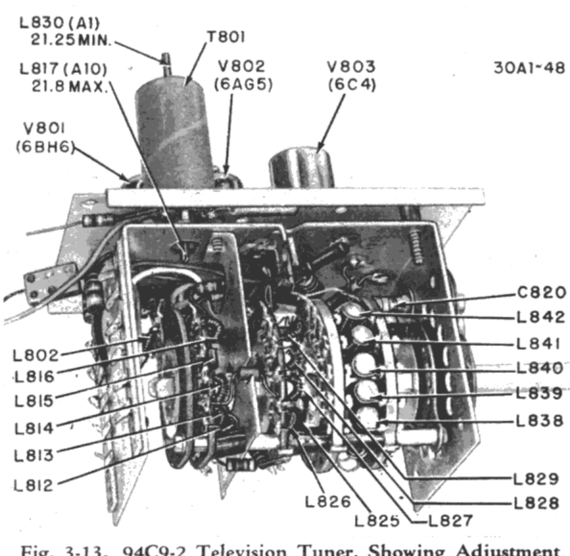


Fig. 3-13. 94C9-2 Television Tuner, Showing Adjustment Locations for Low Frequency Channels.

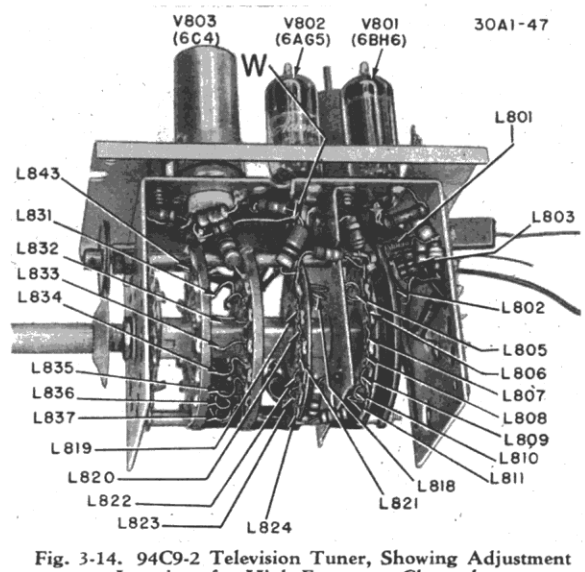


Fig. 3-14. 94C9-2 Television Tuner, Showing Adjustment Locations for High Frequency Channels.

This SECTION applies to models:

4H15S or SN	4H115S or SN	4H145S or SN	4H157S or SN
4H16S or SN	4H116S or SN	4H146S or SN	4H165S or SN
4H17S or SN	4H117S or SN	4H147S or SN	4H166S or SN
4H18S or SN	4H126S or SN	4H155S or SN	4H167S or SN
4H19S or SN	4H137S or SN	4H156S or SN	

SECTION 4
Service Data
For 4H1 FM-AM Radio
Tuner Chassis

NOTE: Some models (not listed above) in the "4H" series use other chassis numbers. See stamping on chassis and refer to manual for that chassis.

SECTION 4. SERVICE DATA for 4H1 FM-AM RADIO TUNER CHASSIS

FM ALIGNMENT EQUIPMENT

This chassis should be aligned only with an AM signal generator and a vacuum tube voltmeter. Any standard brand vacuum tube voltmeter with a DC scale of not over 5 volts is suitable. A 3-volt zero center scale is desirable. A signal generator with a frequency range up to 110 MC is desirable. It is possible however, to align the receiver with a signal generator going to 20 or 30 megacycles, by using the harmonics of these lower frequencies. To do do this merely set the signal generator dial as follows and align exactly as explained in the alignment instructions.

Where alignment chart specifies 109 MC, 106 MC, 90 MC or 87 MC, set generator to the highest available frequency shown in column under that frequency.

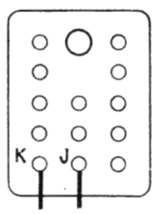
109. MC	106. MC	90. MC	87. MC
54.50MC	53. MC	45. MC	43.5 MC
36.33MC	35.33MC	30. MC	29. MC
27.25MC	26.5 MC	22.5 MC	21.75MC
21.80MC	21.2 MC	18. MC	17.4 MC
18.17MC	17.66MC	15. MC	14.5 MC

Generators which do not tune to 110MC or whose harmonics are not strong enough, cannot be used for FM alignment.

IMPORTANT PRELIMINARY ALIGNMENT STEPS

Before attempting to remove the 4H1 chassis for alignment or service, read the discussion under "Removing 4H1 Radio Tuner Chassis for Service and Complete Alignment."

Under normal operating conditions or use, misalignment of RF or IF circuits with age will be slight. Lack of sensitivity and poor tone quality may be due to causes other than alignment. Do not attempt to realign the receiver until all other possible causes have first been thoroughly investigated.



Television chassis must be connected to power supply during alignment unless a 117-volt line cord is wired to pins of plug M513 to supply AC power; diagram shows pin view of plug M513. An adapter socket and line cord for this purpose, part number (98A30-5) is available from Admiral Distributor.

In FM alignment, it is essential that every step be followed. Especially important is picking the center of the IF curve (step 4 in the FM-IF alignment instructions). During this portion of the alignment it is necessary to tune the signal generator very carefully; it may necessitate having to estimate the dial readings to a tenth of a division.

When completely aligning the FM circuit, it is essential to follow the sequence of steps in the chart. If only a portion of the FM circuit is being aligned, be sure to follow all the remaining steps. AM and FM alignment may be made independently of each other.

For alignment of IF slug adjustments, it will be necessary to disassemble the radio chassis from the escutcheon and housing and also remove the chassis cover and dial scale assembly. See figure 4-9.

NOTE: AM and FM oscillator and antenna trimmers are accessible from top of chassis. Disassembly of chassis cover and dial scale will generally not be required for alignment of these trimmers.

Disconnect FM antenna from twin lead cable. Stretch twin lead cable to full length during FM RF alignment.

To avoid splitting the slotted head of iron core tuning slugs in the IF transformers, use an insulated alignment tool with a 1/8" wide screwdriver blade. Do not exert undue pressure as threads of slugs may strip.

Be sure both the set and the signal generator are thoroughly warmed up before starting alignment.

AM ALIGNMENT PROCEDURE

- Connect output meter across speaker voice coil.
- Turn receiver Volume control fully on; Tone control fully clockwise.
- Band switch in AM position.
- "TEL-PHONO-RADIO" switch in Radio Position.
- AM loop antenna must be connected and placed in the same relative position to the chassis as when in the cabinet.
- Use lowest output setting of signal generator that gives a satisfactory reading on meter.

Step	Connect Signal Generator	Dummy Antenna Between Radio and Signal Generator	Signal Generator Frequency	Receiver Dial Setting	Adj. Trimmers in Following Order to Max.
Be sure to follow instructions under heading "Important Preliminary Alignment Steps".					
1	Gang condenser antenna stator	.1 MFD	455 KC	Tuning gang wide open	A-B (2nd IF) C-D (1st IF)
2	Lug on AM Antenna Stator	.1 MFD	1620 KC	Tuning gang wide open	E (oscillator)
3	Place generator lead close to loop of set to obtain adequate signal. No actual connection (signal by radiation).		1400 KC	Tune in signal	F (antenna)

NOTE: Trimmer adjustments A and C made from underside of chassis.
AM antenna trimmer adjustment "F" in step 3 should be repeated after set and antenna have been installed in cabinet.
Important: AM antenna trimmer may not peak if antenna leads are not routed or separated as originally made.

FM I.F. AND RATIO DETECTOR ALIGNMENT

- Keep output indicator leads well separated from signal generator leads and chassis wiring.
- Band switch in FM position.
- "TEL-PHONO-RADIO" switch in Radio position.
- While peaking IF's, keep reducing signal generator output so VTVM reading is approximately —1.5 volts DC with exception of Step #5.
- FM antenna disconnected during alignment.

Before proceeding, be sure to follow all steps listed under "Important Preliminary Alignment Steps."

Step	Connect Signal Generator	Generator Frequency	Receiver Dial Setting	Output Indicator and Special Connections	(Adj. as Follows very carefully)
1	Thru .001 cond. to pin #1 of 6BA6 2nd IF. (Ground to chassis, close to tube).	10.7 MC unmodulated	Tuning gang wide open	Connect VTVM (DC probe) from point "P" to chassis. (See Fig. 4-8.)	"G" (ratio detector Primary) for maximum reading on VTVM
2	**Thru .001 cond. to pin #1 of 6BA6 1st IF. (Ground to chassis, close to tube).	"	"	"	"H" and "I" (2nd IF trans.) for maximum reading on VTVM.
3	Across ends of FM antenna twin lead	"	"	"	"J" and "K" (1st IF trans.) for maximum on VTVM. Readjust G, H, I, J, K, for maximum. ((Keep reducing generator output to keep VTVM at 1.5 volts)
4	"	a. Reduce output of signal generator until VTVM reads EXACTLY —1.5 volts DC. b. Tune generator frequency above 10.7 MC until VTVM reads EXACTLY —1.0 volt. Note EXACT generator frequency. Extreme care in reading this is essential. c. Tune generator frequency below 10.7 MC until VTVM reads EXACTLY —1.0 volt. Note EXACT generator frequency. Extreme care in reading this is essential. d. Add generator frequency in step c to generator frequency in step b and divide by 2. The result is the center frequency of the IF curve to be used in step 5. See example under heading "Setting Signal Generator to Center of I.F. Selectivity Curve". e. Tune generator frequency above and below 10.7 MC and note voltage reading on VTVM at different frequency points until you have a good impression of the shape of the selectivity curve. If you have two peaks as in Figures 4-4 or 4-5, note readings (voltage) of both peaks. If one peak is over 20% higher than the other one, it will be necessary to realign IF's. A selectivity curve that would require realignment is illustrated by Figure 4-6.			
5	"	Center of IF selectivity curve per step 4d above.	Tuning gang wide open	Connect VTVM (DC probe) from point "R" to chassis. (See Fig. 4-8.)	"L" (ratio detector secondary) for zero voltage reading on VTVM (The correct zero point is located between a positive and a negative maximum.)

Note: Trimmer adjustments "G," "H" and "J" made from underside of chassis.

If any adjustments were very far off, it is desirable to repeat steps 3, 4 and 5.

**Do not feed I.F. signal into converter grid as this will cause mis-alignment.

SETTING SIGNAL GENERATOR TO CENTER OF I.F. SELECTIVITY CURVE

CAUTION: Due to the difficulty of setting a signal generator to the accuracy required by this operation, extreme care must be exercised in making each setting. Otherwise, improper alignment of the ratio detector and consequent audio distortion will result.

EXAMPLE: (See Figures 4-1 and 4-2)
Voltage reading in Step 4a is —1.5 volt.

Generator frequency on low side of 10.7 MC for a reading of —1 volt DC =10.640 MC.

Generator frequency on high side of 10.7 MC for a reading of —1 volt DC =10.800 MC.

Center frequency is obtained by adding 10.640 and 10.800, then dividing by 2. For these readings it will be 10.72 MC.

Set generator frequency to 10.72 MC as this is center of selectivity curve as shown in Figure 4-2.

Note: Numerical vernier dial readings may be used instead of MC.

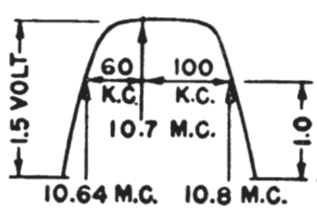


Fig. 4-1

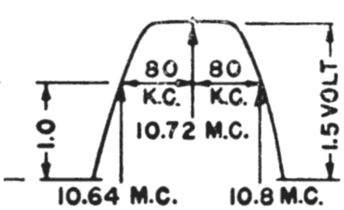


Fig. 4-2

TYPICAL SELECTIVITY CURVES

Fig. 4-3

Fig. 4-4

Fig. 4-5

Fig. 4-6

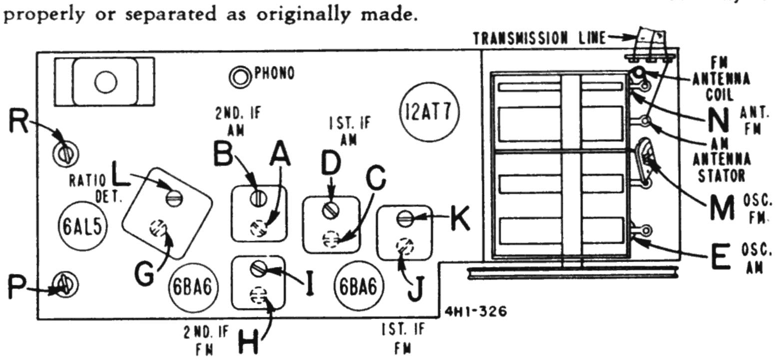
FM RF ALIGNMENT PROCEDURE

Step	Connect Generator	Generator Frequency	Receiver Gang or Dial Setting	Output Connections	Adjust as follows (very carefully)
1	To ends of FM antenna twin lead thru 120 ohm carbon resistors in series with each generator lead.	†109 MC (unmodulated)	Gang fully open	Connect VTVM (DC probe) from point "P" to chassis	*M (oscillator) and N (antenna) for maximum
2		87 MC (unmodulated)	Tune in Signal. (Gang should be closed or almost closed.)	"	If signals in steps 1 and 2 will not tune in at gang tuning extreme (±0.5 MC, it will be necessary to spread or squeeze oscillator coil turns and then repeat steps 1 and 2 until correct results are obtained.
3		106 MC (unmodulated)	Tune in Signal	"	Readjust N for maximum VTVM reading, while rocking gang. If trimmer does not peak, it will be necessary to squeeze or spread turns of FM antenna coil. Check tracking. Also check calibration at 90 MC if dial scale assembly is in place. Calibration error should not exceed ±0.5 MC. If necessary, repeat steps 1, 2, 3 until correct results are obtained.

* It is advisable to adjust generator output so VTVM readings do not exceed approximately —1.5 V. DC while peaking.
† If your signal generator does not reach this frequency, use harmonics as described in "FM Alignment Equipment".

After completing alignment, assemble chassis cover and dial scale to chassis. Set dial pointer travel and recheck dial calibration for AM and FM tuning. AM-FM oscillator and antenna trimmer adjustments may be repeated for more accurate calibration and tracking.

AM antenna trimmer adjustment "F" in step 3 of "AM Alignment Procedure" should be repeated after receiver and antenna have been installed in cabinet. Note: AM antenna trimmer may not peak properly if antenna leads are not routed properly or separated as originally made.



Trimmer adjustments A, C, G, H, J, made from underside of chassis.

Figure 4-8. Trimmer Locations.

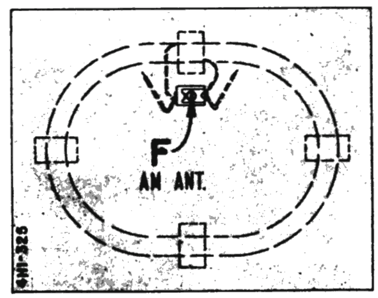


Figure 4-7. AM Antenna Trimmer Location.

REMOVING 4H1 RADIO TUNER AND CHANGER ASSEMBLY FROM CABINET

For models 4H15, 4H16, 4H17, 4H115, 4H116, 4H117, 4H126, 4H137, 4H145, 4H146, 4H147, 4H155, 4H156, 4H157, having the "Tilt-Out" Radio and Record Changer.

Disconnect all inter-connecting cables and remove the antenna lead-in wires from the terminal strip on the back of the cabinet. In early production sets, the power supply cable must be disconnected at the radio tuner. In later production sets, the power supply cable can be disconnected at the power supply.

Release one end of the tie-bar and one end of the tie-rod on underside of the unit. Hold the radio-phono unit with one hand and spring each of the four tilt-out hinge arms away from the sides of the unit. As this is done, the four pivot studs will come out of their sockets and free the unit from the cabinet.

To reinstall the radio-phono unit, place it back in the cabinet. Spring the tilt-out arms so that the changer will drop down between them. Guide the studs back into their sockets. Replace the tie-bar, tie-rod, and all inter-connecting cables and antennae lead-in wires.

For models 4H18, 4H19, 4H165, 4H166, 4H167, having the "Slide-Out" Radio and Record Changer.

Disconnect all inter-connecting cables and remove the antenna lead-in wires from the terminal strip on the back of the cabinet. In early production sets, the power supply cable must be disconnected at the radio tuner. In later production sets, the power supply cable can be disconnected at the power supply. Remove the four mounting screws which hold the unit to the "Slide-out" shelf assembly.

To reinstall the radio-phono unit, replace the four mounting screws and all inter-connecting cables and antennae lead-in wires.

REMOVING 4H1 RADIO TUNER CHASSIS FOR SERVICE AND COMPLETE ALIGNMENT

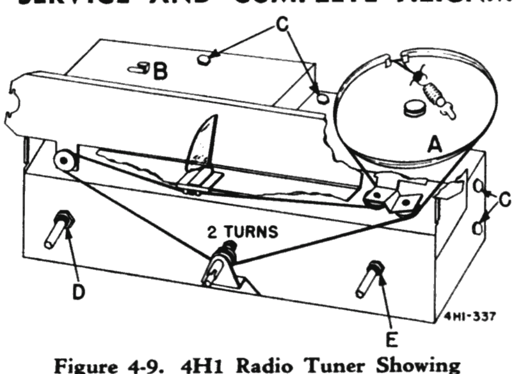


Figure 4-9. 4H1 Radio Tuner Showing Chassis Cover and Dial Assembly.

For service or alignment of models 4H15, 4H16, 4H17, 4H115, 4H116, 4H117, 4H126, 4H137, 4H145, 4H146, 4H147, 4H155, 4H156, 4H157, it is not necessary to remove the complete radio-phono unit from the cabinet. Remove radio tuner chassis only as per step 1 through 7 below.

For service or alignment of models 4H18, 4H19, 4H165, 4H166, 4H167, first remove the complete radio-phono unit as described under "Removing 4H1 Radio Tuner and Record Changer Assembly from Cabinet." Then follow steps 2 through 7 below.

1. Disconnect all inter-connecting cables and antenna leads. The cable which connects the 4H1 radio tuner and the

(Cont'd on next page.)

power supply can be disconnected by removing the power supply cable plug at the power supply.

Note: In early production models it will be necessary to free the power supply cable by reaching from the underside of the radio-phono unit and pulling the power supply plug from the radio tuner chassis.

2. Remove the two screws on each side and the screw(s) along the seam on the bottom which hold the radio chassis to the phono unit.
3. Pull radio chassis down and forward until you can reach in and unplug the shielded cable and phono motor leads. Then remove the radio tuner chassis.

IMPORTANT

After completing step 3, the oscillator and antenna trimmers are accessible for "touch-up" adjustment.

4. After removing the control knobs, remove the escutcheon and housing by removing the five screws at the bottom of the housing.
5. Position dial drum as shown in figure 4-9; unhook spring at "A" and, keeping tension on dial cord, hook it to tab "B".
6. Remove the six hex head screws "C" which hold chassis cover and dial scale to chassis.
7. After removing the pilot light brackets and hex nut "D" and "E", the chassis front can be pulled away from the chassis. All trimmers and parts are now accessible for adjustment or service.

4H1 FM-AM RADIO TUNER PARTS

RESISTORS

Sym.	Description	Part No.
R601	1.5 Megohms, ½ Watt	60B 8-155
R602	390 ohms, ½ Watt	60B 8-391
R603	22,000 ohms, ½ Watt	60B 8-223
R604	1,000 ohms, ½ Watt	60B 8-102
R605	1,000 ohms, ½ Watt	60B 8-102
R606	27,000 ohms, 1 Watt	60B 14-273
R607	1 Megohm, ½ Watt	60B 8-105
R609	220,000 ohms, ½ Watt	60B 8-224
R610	47,000 ohms, ½ Watt	60B 8-473
R611	27,000 ohms, 1 Watt	60B 14-273
R612	1,000 ohms, ½ Watt	60B 8-102
R613	390 ohms, ½ Watt	60B 8-391
R614	27,000 ohms, ½ Watt	60B 8-273
R615	6,800 ohms, ½ Watt, 5%	60B 7-682
R616	6,800 ohms, ½ Watt, 5%	60B 7-682
R617a	1 Megohm, Volume Control	75B 11-3
R617b	2 Megohms, Tone Control (On-Off Switch SW603, part of R617)	
R618	47,000 ohms, ½ Watt	60B 8-473
R620	150,000 ohms, ½ Watt	60B 8-154
R621	22 ohms, 1 Watt	60B 14-220

CONDENSERS

Sym.	Description	Part No.
C601	5 mmfd., Ceramic (External AM antenna coupling condenser)	65B 6-61
C602	2 to 20 mmfd., Trimmer	Part of L601
C603	.001 mfd. min., Ceramic	65B 6-41
C604a	486 mmfd. (max) AM RF	Gang 68B 24
C604b	15 mmfd. (max) FM RF	
C604c	114 mmfd. (max) AM Osc.	
C604d	15 mmfd. (max) FM Osc.	
C605	.01 mfd. min., Ceramic	65A 10-3
C606	2.5 to 6 mmfd., Trimmer	66A 28-1
C607	40 mmfd.,—.00075 Temp. Coeff., Ceramic	65B 6-67
C608	.68 mmfd., Ceramic	65A 16-1
C609	.001 mfd. min., Ceramic	65B 6-41
C610	.01 mfd. min., Ceramic	65A 10-3
C611	300 mmfd., Silver Mica, 5%	Part of T604
C612	300 mmfd., Silver Mica, 5%	Part of T604
C613	100 mmfd., Silver Mica, 5%	Part of T601
C614	.01 mfd. min. Ceramic	65A 10-3
C615	.005 mfd. min., Ceramic	65A 10-1
C616	.01 mfd., min., Ceramic	65A 10.3
C617	200 mmfd., Silver Mica, 5%	Part of T605
C618	100 mmfd., Silver Mica, 5%	Part of T602
C619	200 mmfd., Silver Mica, 5%	Part of T605
C620	250 mmfd., Ceramic	65B 6-5
C621	.01 mfd. min., Ceramic	65A 10-3
C622	.005 mfd. min., Ceramic	65A 10-1
C623	90 mmfd., Silver Mica, 3%	Part of T603
C624	.001 mfd. min., Ceramic	65B 6-41
C625	100 mmfd., 5%, —.00075 Temp. Coeff., Cer.	65B 6-7
C626	100 mmfd., 5%, —.00075 Temp. Coeff., Cer.	65B 6-7
C627	4 mfd., 150 Volts, Electrolytic	67A 4-2
C628	.005 mfd. min., Ceramic	65A 10-1
C629	.005 mfd. min., Ceramic	65A 10-1
C630	250 mmfd., Ceramic	65B 6-5
C631	.005 mfd. min., Ceramic	65A 10-1
C632	.005 mfd. min., Ceramic	65A 10-1

COILS, TRANSFORMERS, ETC.

Sym.	Description	Part No.
L601	Antenna, AM Loop	69 C84-1
L602	Antenna, FM (internal dipole) (Early production used two 28" lengths of #20 wire)	AB195
L603	Coil, Antenna (FM)	69A 85
L604	Coil, Oscillator (AM)	69A 86
L605	Coil, Oscillator (FM)	69A 87
L606	Choke, Filament RF	73A 2-4
T601	Transformer, 1st IF (FM)	72B 75
T602	Transformer, 2nd IF (FM)	72B 76
T603	Transformer, Ratio Detector	72B 39
T604	Transformer, 1st IF (AM)	72B 73
T605	Transformer, 2nd IF (AM)	72B 74
SW601	Switch, AM-FM Band	76B 17
SW602	Switch, Telev-Radio-Phono	76B 16
SW603	Switch, AC Power	Part of R617
T511	Transformer, Speaker Output	79A 16
M516	Speaker	
	for 4H15, 4H16, 4H17 (10" PM)	78B 41
	for 4H115, 4H116, 4H117 (12" PM)	78B 44-1
	for 4H18, 4H19, 4H126, 4H137, 4H145, 4H-146, 4H147, 4H155, 4H156, 4H157, 4H165, 4H166, 4H167 (12" PM)	78B 44-2

DIAL PARTS

Description	Part No.
Dial Back and Bracket Assembly	A1881
Dial Cord	50A 1-3
Dial Scale	22B 19-1
Pilot Light, Mazda No. 47	81A 1-8
Pilot Light, Socket and 12" Lead	82A 8-6
Pointer, Dial	25A 33
Pulley, Dial	17A 1-3
Spring, Dial Cord	19B 1-3
Tuner Sleeve	27A 61

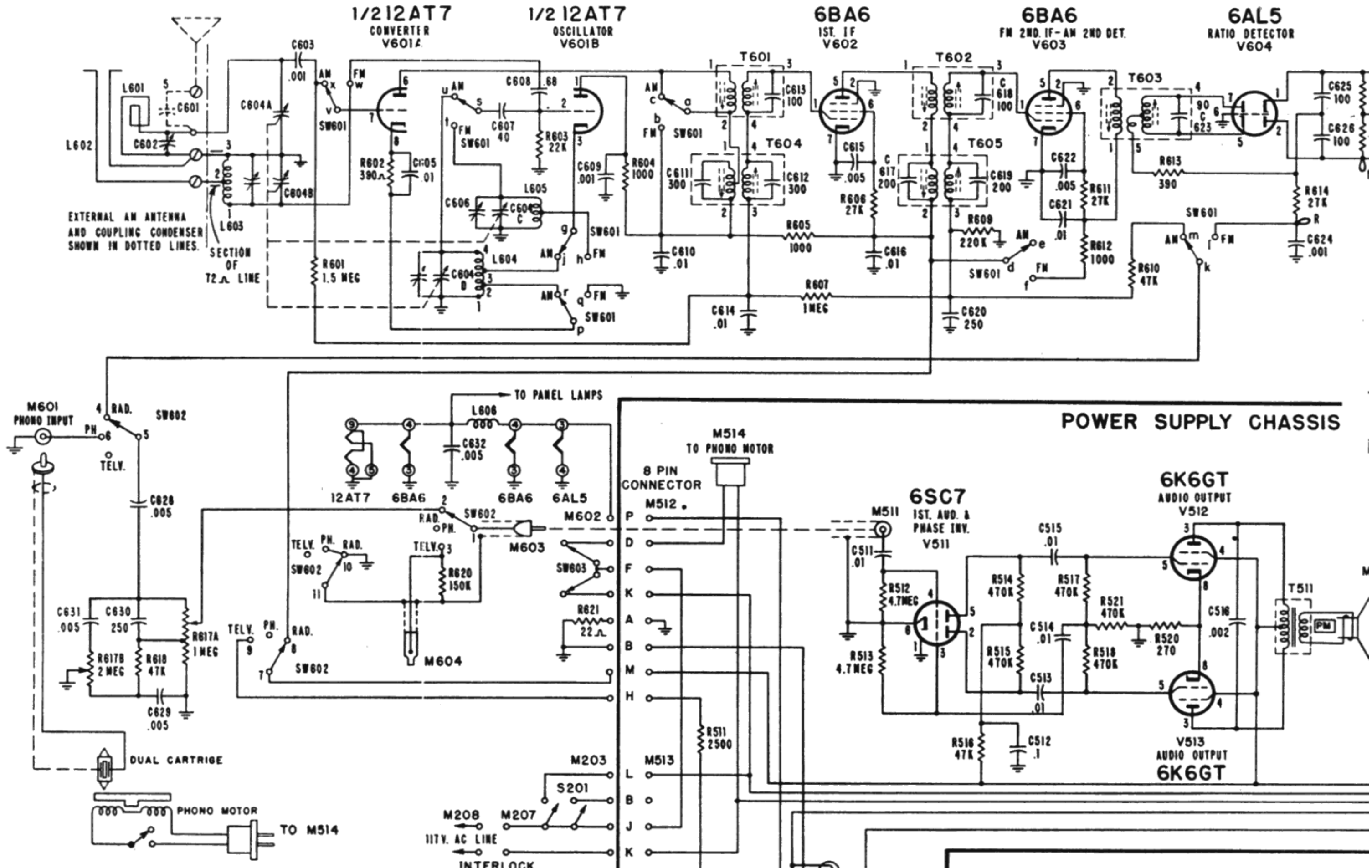
MISCELLANEOUS PARTS

Description	Part No.
M601 Socket, Phono Input	88A 1
M602 Plug, Power Supply (8 pin)	88A 20-4
M603 Plug and Shielded Cable	89A 5-6
M604 Socket and Shielded Cable	89A 5-26
Bracket, Dual Control	15A 385
Bracket, Tuning Sleeve	15A 394
Cover Assembly, Chassis	A1880
Grommet, Rubber (Gang mounting)	12A 1-4
Snap Button (Dial mounting)	13A 1-1-21
Spacer Sleeve (for gang mounting)	29A 2-10-71
Tube Socket (7-pin miniature)	87A 3-7
Tube Socket (9-pin miniature)	87A 25-2
Adapter Socket (for alignment and service)	98A 30-5

PHONOGRAPH PARTS

Note: See Record Changer Manual for complete parts list.

Description	Part No.
Belt, Rubber Drive	406A 20
Cable, Shielded Pickup (includes plug)	413A 11-1
Cartridge, Dual Needle (includes needles)	409A 11
Centerpost, Record (for 10" and 12" records)	G400B 311
Centerpost, Record (for 7" record)	G400B 310
Idler Wheel Assembly (includes tire)	G400A 279
Motor (2 speed)	407B 15
Motor (3 speed)	407B 17
Needle, Phonograph (Long Play)	98A 15-6
Needle, Phonograph (Standard 78 RPM)	98A 15-7
Needle retaining nut	98A 54-2
Plug, Motor (Male)	88A 8-1
Plug, Pickup Cable	88A 2-3
Spindle, Record (for 45 RPM)	G400B 329
Switch, Phono Motor On-Off (When replacing, see caution in Record Changer Manual)	408A 1



A1897 AND A1945 POWER SUPPLIES

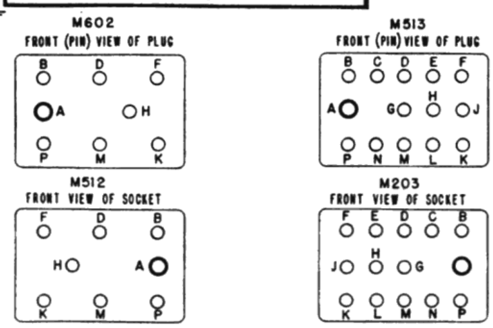
Double cable, 5 tube power supply chassis. Cables for A1897 Power Supply are not detachable. A1945 Power Supply has one non-detachable and one detachable cable.

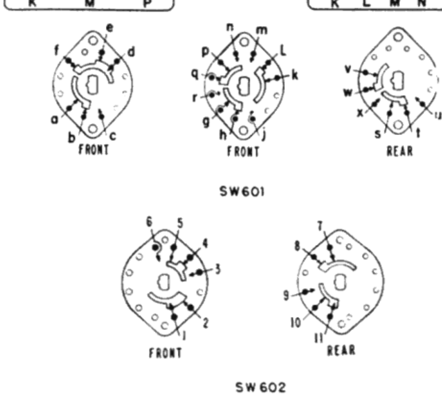
RESISTORS

Sym.	Description	Part No.
R511	2,500 ohms, 5 Watts, Candohm	61A 3-8
R512	4.7 Megohms, ½ Watt	60B 8-475
R513	4.7 Megohms, ½ Watt	60B 8-475
R514	470,000 ohms, ½ Watt	60B 8-474
R515	470,000 ohms, ½ Watt	60B 8-474
R516	47,000 ohms, ½ Watt	60B 8-473
R517	470,000 ohms, ½ Watt	60B 8-474
R518	470,000 ohms, ½ Watt	60B 8-474
†R519	18 ohms, 1 Watt	60B 14-180
R520	270 ohms, 2 Watt	60B 20-271
R521	470,000 ohms, ½ Watt	60B 8-474

CONDENSERS

Sym.	Description	Part No.
C511	.01 mfd., 400 Volts, Paper	64B 5-25
C512	.1 mfd., 400 Volts, Paper	64B 5-20
C513	.01 mfd., 400 Volts, Paper	64B 5-25
C514	.01 mfd., 400 Volts, Paper	64B 5-25
C515	.01 mfd., 400 Volts, Paper	64B 5-25
C516	.002 mfd., 600 Volts, Paper	64B 5-14
C517a	60 mfd., 350 Volts } Electrolytic	67C 15-5
C517b	40 mfd., 350 Volts }	
C517c	20 mfd., 350 Volts }	
†C518a	40 mfd., 450 Volts } Electrolytic	67C 15-1
†C518b	40 mfd., 450 Volts }	

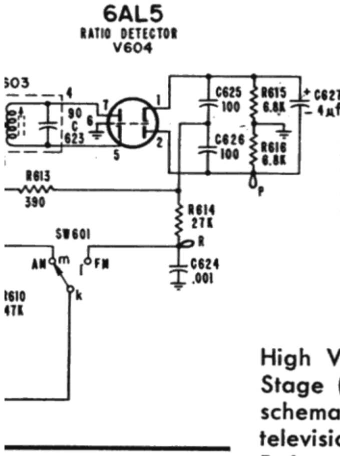




COILS, TRAN

Sym.	Description
L511	Choke, Filter (2.8 her
†L512	Choke, Filter (2 henr
T511	Transformer, Output
T512	Transformer, Low Vol
†T513	Transformer, High Vo
M516	Speaker for 4H15, 4H16, 4H1 for 4H115, 4H116, 4I for 4H18, 4H19, 4H1: 146, 4H147, 4H155, 4H166, 4H167 (12" I
	Spring, Tube Holder .

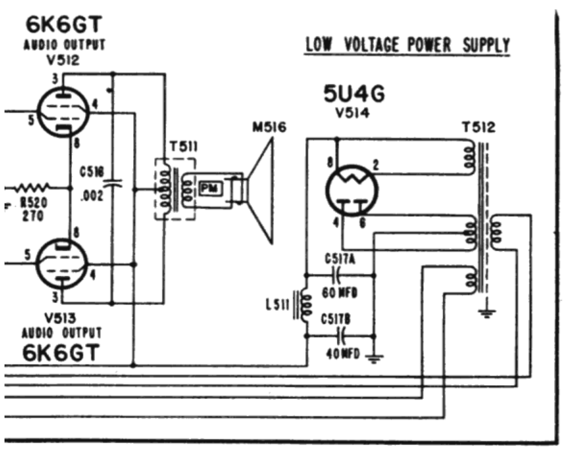
Sym.	Description SOCK
M511	Socket, Audio input.
M512	Socket, Cable (8-cont.
	Cover, Cable Socket
	*Cable and Socket As
	**Cable, Socket and Plug Assy
M513	Plug, Cable (14 pin)
	Cover, Cable Plug (fo
	Cable and Plug Assen
M514	Socket and Leads, Ph
M515	Pilot Light, Socket an
	Socket, Octal ....
	Cover, Connector (for 88A 2(
	**Plug, Cable (8-pin)........
	**Socket, Wafer (14-contact)..



Dipole (L602) and 72 ohm line are used in early sets only; later sets use folded dipole and 300 ohm line.

High Voltage power supply Stage (V501), not shown in schematic, is in circuit for television operation only. Refer to Section 1 for complete schematic.

SUPPLY CHASSIS



COILS, TRANSFORMERS, ETC

Description	Part No.
Choke, Filter (2.8 henrys)	74A 13
Choke, Filter (2 henrys)	74A 12
Transformer, Output	79A 16
Transformer, Low Voltage Power	80B 16
Transformer, High Voltage Power	80B 15
Speaker	
for 4H15, 4H16, 4H17 (10" PM)	78B 41
for 4H115, 4H116, 4H117 (12" PM)	78B 44-1
for 4H18, 4H19, 4H126, 4H137, 4H145, 4H146, 4H147, 4H155, 4H156, 4H157, 4H165, 4H166, 4H167 (12" PM)	78B 44-2
Spring, Tube Holder	87A 22-2

SOCKETS AND PLUGS

	Description	Part No.
11	Socket, Audio input	88A 1
12	Socket, Cable (8-contact)	88A 20-5
	Cover, Cable Socket (for M512)	88A 20-6
	*Cable and Socket Assembly (8 pin)	AB184
ble,	Socket and Plug Assy. (8-pin)	AB189
13	Plug, Cable (14 pin)	88A 20-1
	Cover, Cable Plug (for M513)	88A 20-3
	Cable and Plug Assembly (14 pin)	AB186
14	Socket and Leads, Phono Motor	89A 6-10
15	Pilot Light, Socket and Leads	82A 11-6
	Socket, Octal	87A 5-1
er,	Connector (for 88A 20-7 and 88A 20-5)	88A 20-6
g,	Cable (8-pin)	88A 20-7
ket,	Wafer (14-contact)	88A 20-2

TELEVISION CHASSIS AND CABINET PARTS

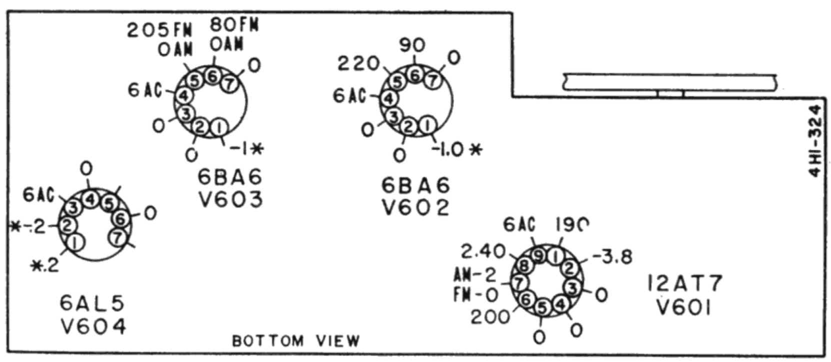
See Section 1, Schematics and Parts List for parts not listed below.

M203	Socket, Wafer (14 contact, rectangular)	88A 20-2
	Socket, AC Power Outlet	87A 21-1
M207	Plug, AC input (Chassis)	89A 22-2
M208	Line Cord (includes Female Plug)	89A 22-1
S201	On-Off Switch	Part of 75B 12-2

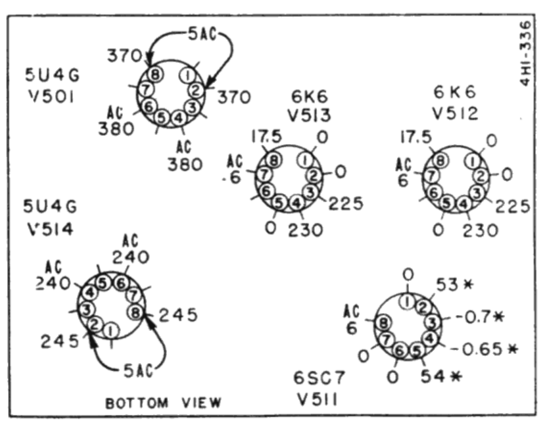
* A1897 Power supply only.
** A1945 power supply only.
† Part of High Voltage power supply, refer to Schematic in Section 1.

VOLTAGE DATA

- Line voltage 117 Volts AC.
- Voltages measured with a vacuum tube voltmeter, between tube socket terminals and chassis, unless otherwise indicated.
- "Tel-Phono-Rad" switch in "Rad" position.
- Voltages measured with band switch in FM position unless otherwise indicated.
- Volume control set at minimum.
- Dial turned to low frequency end.
- Antenna disconnected.
- Television chassis must be turned off, but remain connected to power supply, unless an AC line cord is wired to plug M513, see illustration or use adapter socket (98A30-5) available from Admiral Distributor.



* If taken with a 1000 ohm-per-volt meter, readings will be lower or zero.



* If taken with a 1000 ohm-per-volt meter, readings will be lower or zero.

This SECTION applies to the following models:

4H15S or SN	4H137S or SN	4H167S or SN	30A14S or SN
4H16S or SN	4H145S or SN	30B15S or SN	30A15S or SN
4H17S or SN	4H146S or SN	30B16S or SN	30A16S or SN
4H18S or SN	4H147S or SN	30B17S or SN	30A14SA
4H19S or SN	4H155S or SN	30C15S or SN	30A15SA
4H115S or SN	4H156S or SN	30C16S or SN	8C11S or SN
4H116S or SN	4H157S or SN	30C17S or SN	8C12S or SN
4H117S or SN	4H165S or SN	30A12S or SN	8C13S or SN
4H126S or SN	4H166S or SN	30A13S or SN	

NOTE: Some models (not listed above) in the "4H," "30B" and "30C" series use other chassis numbers. See stamping on chassis and refer to manual for that chassis.

SECTION 5

Specifications, Installation, Operation, Service Adjustments, Trouble-Shooting, and Wave Forms for *all* 30A1, 30B1, 30C1, 30D1 Chassis

Television Frequency Ranges

Channel Number	Channel Freq., MC	Wave Length Meters	Picture Carrier, MC	Sound Carrier, MC	Het. Osc. Freq., MC	Dipole Length	Folded Dipole Length	Reflector Length	Director Length	Channel Trap*
1	44- 50	6.82-6.0	45.25	49.75	71	...	...	...	...	...
2	54- 60	5.55-5.0	55.25	59.75	81	98″	96″	103″	95″	82″
3	60- 66	5.0 -4.55	61.25	65.75	87	90″	88″	94″	86″	73″
4	66- 72	4.55-4.17	67.25	71.75	93	82″	80″	86″	78″	66″
5	76- 82	3.95-3.66	77.25	81.75	103	71″	69″	74″	68″	58″
6	82 -88	3.66-3.41	83.25	87.75	109	66″	64″	69″	64″	54″
7	174-180	1.72-1.66	175.25	179.75	201	32″	30″	33″	30″	26″
8	180-186	1.66-1.61	181.25	185.75	207	31″	29″	32″	29½″	25″
9	186-192	1.61-1.56	187.25	191.75	213	30″	28″	31″	29″	24″
10	192-198	1.56-1.51	193.25	197.75	219	29″	27″	30″	28″	24″
11	198-204	1.51-1.47	199.25	203.75	225	28″	26″	29″	27″	23″
12	204-210	1.47-1.43	205.25	209.75	231	27″	25″	28″	26″	22″
13	210-216	1.43-1.39	211.25	215.75	237	26″	24″	27″	25″	22″

* Constructed of 300-ohm line.

Formula for cutting antennas to proper length to correspond to given frequency:

$$\frac{1}{4} \text{ wave length matching section in feet} = \frac{234 \text{ x velocity propagation}}{\text{Freq. (MC)}}$$

Velocity propagation 300 ohm line = 82%. 1.3db loss per 100 ft. at 50 Mc.

Velocity propagation 150 ohm twin line = 77%. 1.6db loss per 100 feet at 50 Mc.

Picture Presentation

Direct View Electromagnetic Cathode Ray Tube

Picture Area:

10 inch tube: 52 square inches.
12 inch tube: 72 square inches.
16 inch tube: 125 square inches.

Input Impedance

300-ohm Balanced.

Intermediate Frequencies

Video 25.75 MC Audio 21.25 MC

Power Supplies

Low Voltage. High Voltage.
Bias Voltage (—8 V.). Second Anode Voltage.

Operating Voltage

110-120 volts. 50-60 cycles.

Tube Complement

V101	6AG5	R. F. Amplifier	IN 94C8-2 Tuner
V102	6J6	Osc.-Mixer	IN 94C8-2 Tuner
V801	6BH6	R. F. Amplifier	In 94C9-2 Tuner
V802	6AG5	Mixer	In 94C9-2 Tuner
V803	6C4	Oscillator	In 94C9-2 Tuner
V901	6J6	R. F. Amplifier	In A1582 Tuner
V902	6J6	Mixer	In A1582 Tuner
V903	6J6	Oscillator	In A1582 Tuner
V201	6AU6	1st Audio I.F.	
V202	6AU6	2nd Audio I.F.	
V203	6AL5	FM Detector	
V204	6SJ7**	Audio Amplifier	
V205	6Y6G**	Audio Output	
V301	6AG5	1st Video I.F.	
V302	†6AG5 or 6AU6	2nd Video I.F.	
V303	†6AG5 or 6AU6	3rd Video I.F.	
V304	6AU6	4th Video I.F.	
V305	6AL5	Video Detector, D.C. Restorer	
V306	6AU6	Video Amplifier	
V307	6K6GT	Video Output	
V308	10BP4	Pic. Tube (30A1, 30B1 chassis)	
V308	12LP4*	Picture Tube (30C1 chassis)	
V308	16AP4	Picture Tube (30D1 chassis)	
V401	6BA6	Sync Amplifier	

V402	6AU6	Sync Separator
V403A	6SN7GT	Sync Inverter
V403B	6SN7GT	Horizontal Discharge
V404	6AL5	Horizontal Sync Discriminator
V405	6J6	Horizontal Oscillator Control
V406	6V6GT	Horizontal Oscillator
V407	6BG6G	Horizontal Output
V408	1B3GT/8016	Second Anode Rectifier
V409	5V4G	Damper
V410	6SN7GT	Vertical Oscillator
V411	6K6GT	Vertical Output
V412	1B3GT/8016	2nd Anode Rect. (30D1 only)
V501	5U4G	High Voltage Rectifier
V502	5Y3GT**	Low Voltage Rectifier
V511	6SC7***	1st Audio & Phase Inverter
V512	6K6***	Audio Output
V513	6K6***	Audio Output
V514	5U4G***	Low Voltage Rectifier

Tubes used in 4H1 FM-AM RADIO TUNER

V601A	12AT7	Converter
601B	12AT7	Oscillator
V602	6BA6	1st I.F. Amplifier
V603	6BA6	FM 2nd IF - AM 2nd Detector
V604	6AL5	Ratio Detector

** Used only in "television only" models. *** Used only in television-radio-phono combination models.
† Tubes not directly interchangeable. For servicing details, see Section 1, Revised. Use only 6AG5 in 30D1 chassis.
* Alternate tubes used. Replace with identical tube (see chassis stamp); or, when substituting, see Section 1, Revised.

INSTALLATION

CAUTION — PICTURE TUBE HANDLING

Due to the high vacuum and large surface area of the picture tubes, great care must be exercised when handling these tubes. The picture tube must not be scratched or subjected to excessive pressure as fracture of the glass will result in an explosion of considerable violence which may cause damage to property or person.

CAUTION — HIGH VOLTAGE

Extremely high voltages are used in the operation of this set. To avoid personal injury, extreme care should be exercised so that no contact is made with any components connected to the high voltage circuits.

RECEIVER LOCATION

The Television Receiver should be placed so that sunlight or light from lamps does not fall on the face of the cathode ray tube and cause glare or reflections. See figure 5-1.

Do not install the receiver in front of a window or any other source of light. Remember to place the receiver a small distance from the wall to allow adequate ventilation.

When selecting a location, be sure to bear in mind the necessity for access to an electrical outlet, and the need for an external antenna and transmission line.

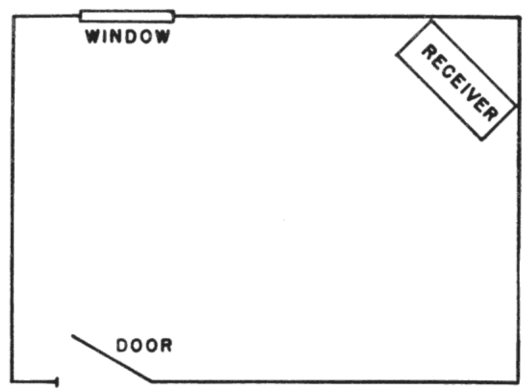


Fig. 5-1. Receiver Location

ANTENNA

The antenna and transmission line are the most important parts of the television receiver installation.

Television signals are transmitted on very high frequencies and unlike ordinary broadcast transmissions, the range of television transmission is restricted to line of sight.

Also the high frequencies used in television are subject to reflection from solid objects, thus a signal may be received over two or more paths, the signal direct from the transmitting antenna and one or more signals which have been reflected by objects such as buildings. Since there is a time difference in the arrival of the direct and reflected signals, multiple pictures or ghosts may appear on the cathode ray tube.

In order to prevent or lessen multi-path reception, special antennas are necessary, the most common type being a half-wave dipole consisting of two rods each a quarter wavelength long. Such an antenna will receive from two directions only. By fitting a reflector to the dipole, it can be made uni-directional. If multi-path reception or "ghosts" are still apparent, it will be necessary to sharpen the directivity of the antenna still further.

It is most important that the antenna be correctly oriented for a minimum of ghost signals.

The orientation or positioning of the antenna should be carried out by two persons equipped with telephones. One person should be stationed on the roof of the building to slowly orient the antenna, while the second person stationed alongside the television receiver can advise him when the most satisfactory picture is obtained.

The subject of antennas for television receivers is beyond the scope of this manual. However, a number of texts on the subject are available.

The following points should be closely observed with any type of antenna if clear pictures are to be obtained.

a. The antenna should be placed as high as possible and in line of sight of the transmitting station.

b. The antenna should be orientated for best picture with a minimum of ghost signals.

c. On weak signals, the antenna should be cut accurately for the required frequency.

TRANSMISSION LINES

The Admiral television receiver is intended for use with 300-ohm balanced transmission line*. This line must be held away from any walls, metal or the antenna mast by means of approved stand-off insulators. The line should be twisted about one turn each foot throughout its length to cancel out direct signal and/or noise pick-up by the transmission line. The transmission line should be firmly anchored to prevent a change in position during windy weather.

* Models using the 94C8-2 tuner will match 72-ohm coaxial cable by connecting the outer conductor to the chassis and the inner conductor to either antenna terminal.

OPERATION

OPERATING CONTROLS

The operating controls on this Admiral television receiver are located on the front panel of the receiver. Each control serves a dual function. Each control consists of a small inner knob **(I-shaped)** and a large outer knob or ring **(O-shaped).** The two knobs on each control work independently of each other. The controls and their function are as follows:

HORIZONTAL
Stops sideways motion of the picture.

VERTICAL
Stops up or down motion of the picture.

CONTRAST
Adjusts contrast between light and dark areas.

BRIGHTNESS
Adjusts the average brightness of the picture.

OFF VOLUME
Turns the set on and off. Adjusts sound volume.

FOCUS
Used to focus the picture for clear detail.

CHANNEL
Selects the proper channel for the station desired.

SHARP TUNING
A sharp or fine tuning adjustment for sound.

COMPLETE TUNING PROCEDURE Follow steps 1 through 7 in order. (In 4H1 models set function switch to Television position.)

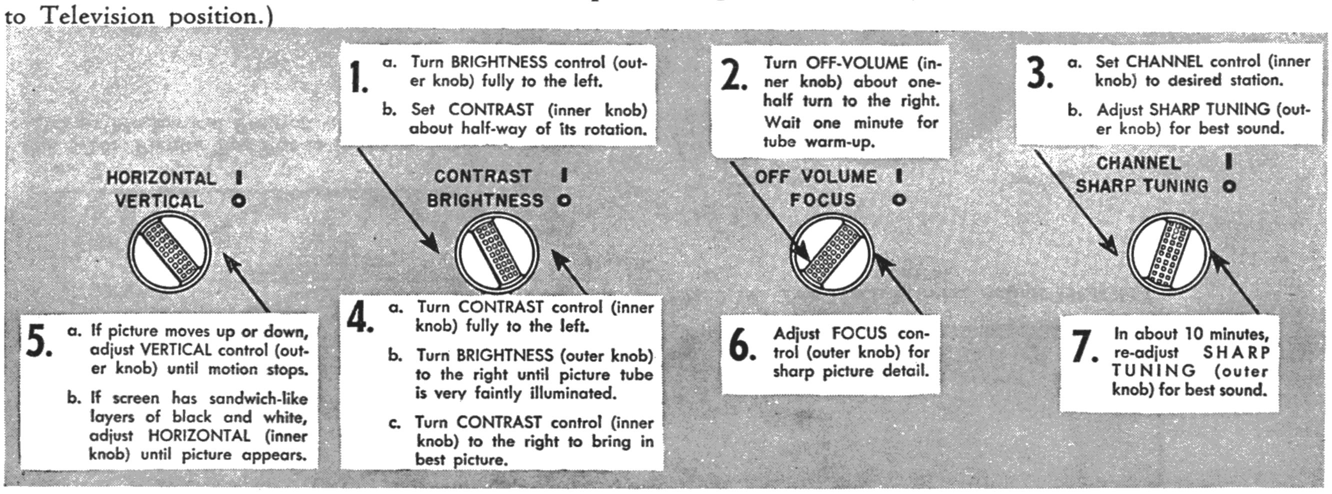


Figure 5-2.

IMPROVING PICTURE QUALITY

After you have tuned in the picture as described in the chart above (Fig. 5-2), it is sometimes possible to improve picture quality.

A. Be sure the SHARP TUNING control has been carefully set by tuning for best sound. Do not try to tune for brightest picture.

B. Try readjusting the FOCUS control to improve picture detail.

C. Better pictures may sometimes be obtained by changing the settings of the BRIGHTNESS and CONTRAST controls. See Figures 5-7 and 5-8. Set the BRIGHTNESS control at a slightly different position and then adjust the CONTRAST control for best reception. Try several such control settings to determine the ones giving the most satisfactory picture. Too high a setting of the CONTRAST control may result in distortion of the picture. See Figure 5-6.

Never reduce sound volume with the SHARP TUNING control.

SELECTING A DIFFERENT STATION

When correctly adjusted for reception of one television station, the receiver may be tuned to another station as follows:

A. Follow step 3 and when necessary, step 5 in the chart above (Fig. 5-2).

B. If necessary, adjust the CONTRAST control for best reception.

SIMPLIFIED TUNING PROCEDURE

If controls have not been disturbed since set was used last, proceed as follows:

A. Follow steps 2, 3, and if necessary, step 5 in the chart above (Figure 5-2).

B. Adjust CONTRAST control for best picture reception. Also see the paragraph on "Improving Picture Quality".

C. In about 10 minutes, re-adjust SHARP TUNING control for best sound.

TURNING RECEIVER OFF

Merely turn the OFF VOLUME control fully to the left until the switch "clicks." To simplify tuning when set is to be used again, **do not disturb other control settings.**

INSTALLATION AND SERVICE ADJUSTMENTS

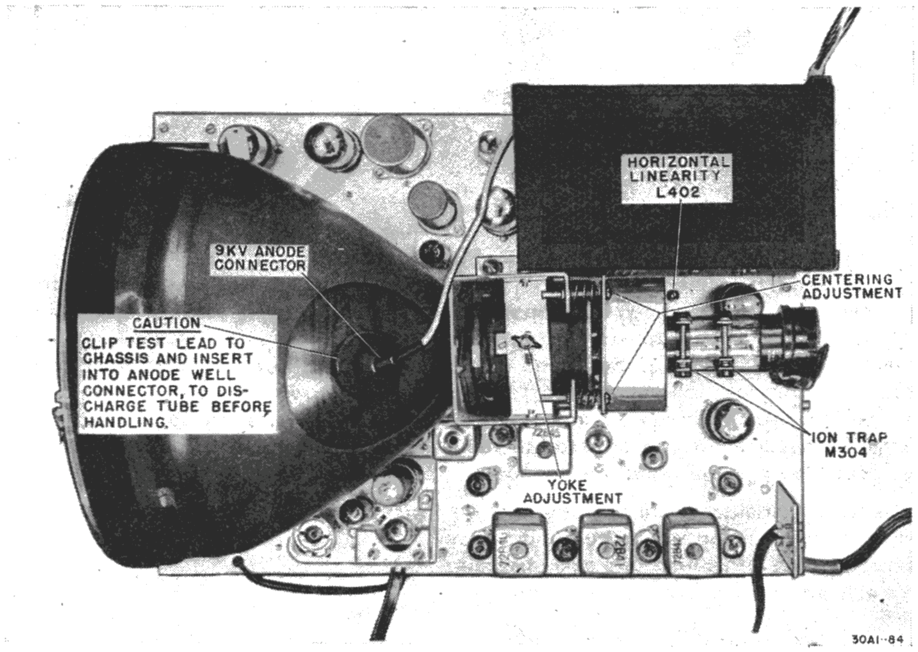


Fig. 5-14. Receiver Chassis, Top View Showing 10" or 12" Picture Tube

Models with 16" picture tube (30D1 chassis) have picture tube in separate assembly.

ION TRAP ADJUSTMENT

The double magnet ion trap (used with types 10BP4 and 12BP4 picture tubes) should be located with the black (sleeve) magnet toward the tube base.

Alternate 12" picture tubes use a single magnet ion trap, or no ion trap. The 16" picture tube also uses a single magnet ion trap. Refer to chart in Section 1, Revised. If no ion trap is required, do not use one. For tubes with the single magnet ion trap, the blue (sleeve) end of the magnet should be located at the left side of the tube, viewing back of the chassis. The ion trap is adjusted by viewing its effect on a picture, pattern or raster. Move the trap assembly back and forth with a slight rotary motion. Adjust for brightest raster on the screen. Reduce the brightness control until the raster is barely visible. Adjust the focus control for clearest trace lines and readjust the ion trap for maximum brightness. The final adjustment should be made with the brightness control at the maximum position at which good trace line focus can be maintained.

FOCUS COIL ADJUSTMENT

If the picture is not centered on the screen (Figures 5-15 and 5-16), it may be corrected by adjusting the screws holding the focus coil assembly (see Figure 5-14 or 5-20). Should the focus coil require excessive tilting to obtain proper centering, it may be necessary to slightly orient (reposition) the deflection yoke bracket.

WARNING

When carrying out this adjustment, extreme care should be exercised so that no abnormal pressure is exerted on the neck of the picture tube.

DEFLECTION YOKE ADJUSTMENT

If picture appears tilted (Figure 5-17), loosen adjustment on top of deflection yoke and turn the yoke for correct orientation and then tighten the adjustment.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENT

a. Adjust height (Figures 5-18 and 5-19) control R449 (Figure 5-20) to just fill picture tube mask.

b. Adjust vertical linearity (Figure 5-21) control R455 (Figure 5-20) for best vertical linearity. Distance AB should then equal DE; BC should equal CD (Figure 5-23).

c. Alternate readjustment of these controls may be necessary to obtain best vertical linearity. This is due to control interaction.

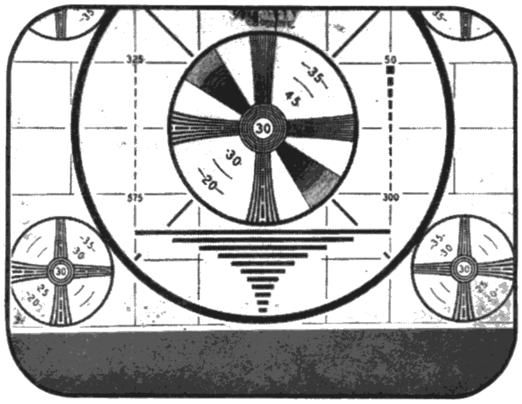


Fig. 5-15. Picture Too High or Too Low; Adjust Mechanical Position of Focus Coil

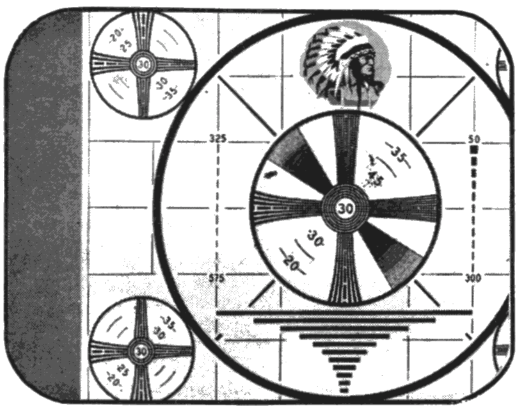


Fig. 5-16: Picture Too Far to Right or Left: Adjust Mechanical Position of Focus Coil

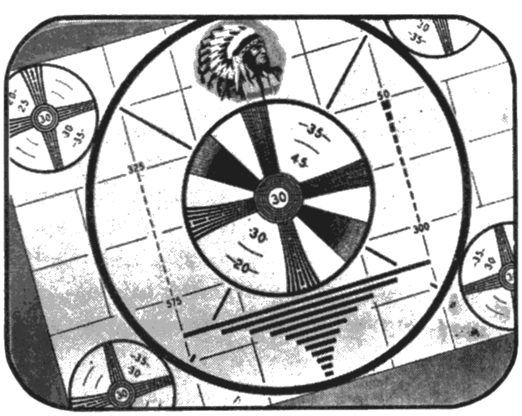


Fig. 5-17. Picture Tilted; Adjust Electromagnetic Deflection Coil

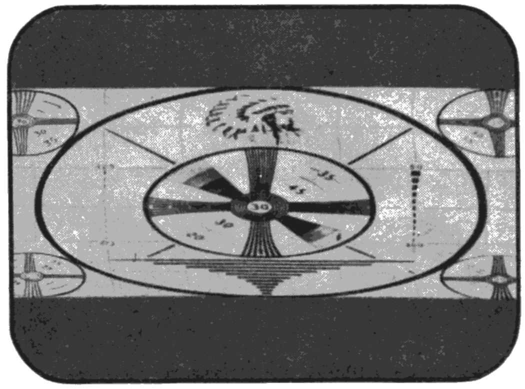


Fig. 5-18. Lack of Height; Adjust HEIGHT Control

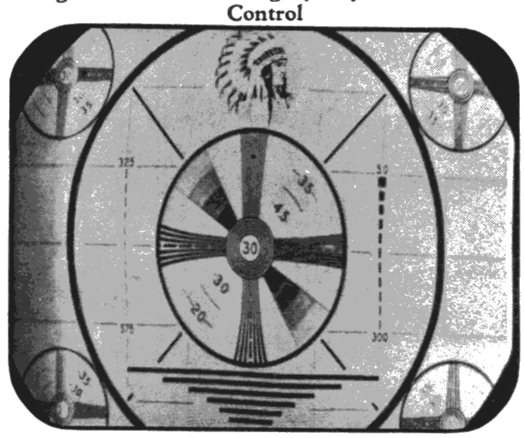


Fig. 5-19. Too Much Height; Adjust HEIGHT Control

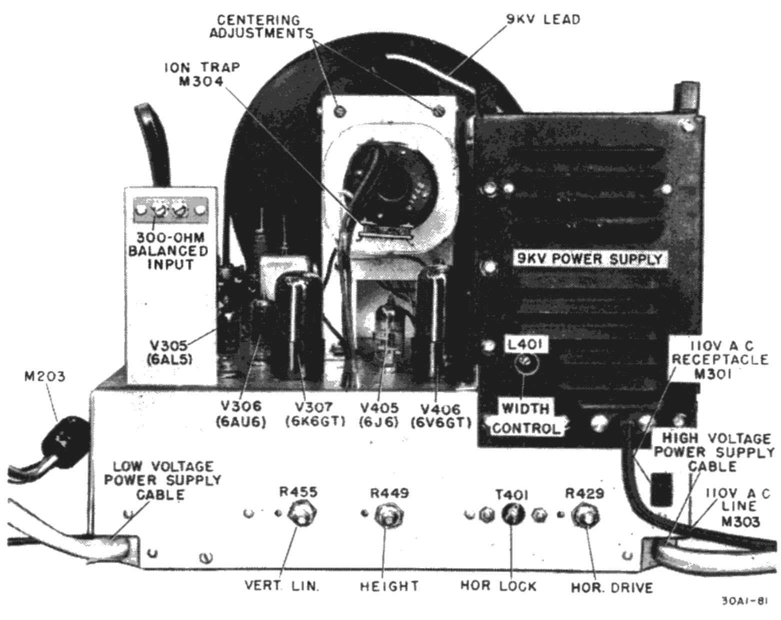


Fig. 5-20. Receiver Chassis Showing Rear Panel Adjustment Controls For All Sets.

NOTE: Picture tube mounting arrangement for 10″ and 12″ picture tubes only shown above. The 16″ picture tube is not mounted on chassis. Later production uses single cable arrangement for High and Low Voltage Power Supply connections.

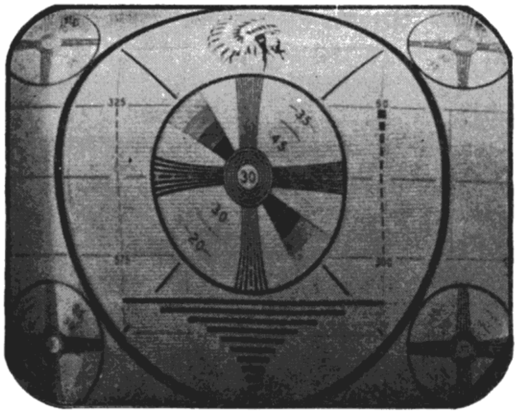


Fig. 5-21. Non-Linear Vertically; Adjust VERT. LIN. Control

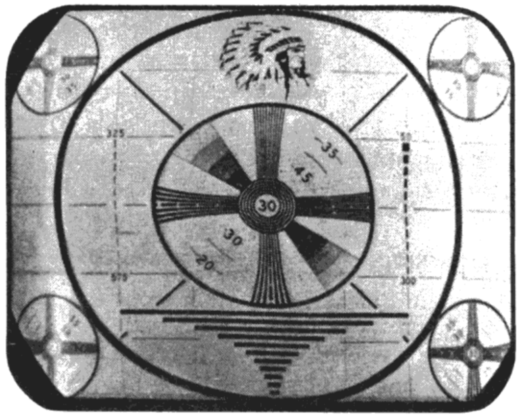


Fig. 5-22. Non-Linear Horizontally; Adjust HOR. DRIVE Control

WIDTH AND HORIZONTAL LINEARITY ADJUSTMENT

a. Adjust horizontal drive control R429 (Figure 5-20) for best linearity. Distances FG should then equal HK; GC should equal CH (Figure 5-23). Horizontal drive control R429 should be as far clockwise as possible, consistent with good linearity.

b. If horizontal non-linearity (Figure 5-22) cannot be corrected by horizontal drive control adjustment, further adjustment can be obtained by means of horizontal linearity control L402 (Figure 5-14). (L402 has the greatest effect on the center of the pattern.)

c. Alternate readjustment of these controls may be necessary to obtain best horizontal linearity. This is due to control interaction.

d. Adjust width (Figure 5-24a and 5-24b) control L401 (Figure 5-20) until the best pattern just fills the picture tube mask.

e. Center as per paragraph on "Focus Coil Adjustment".

With correct horizontal and vertical linearity and correct size adjustment, the circles in the test pattern should appear round. The test patterns used by different stations vary. For example, the outer circle may be cut off at A and E while points F and K are at the edges of the picture tube mask (Figure 5-23). The four small circles in the corners of the pattern illustrated are not always used.

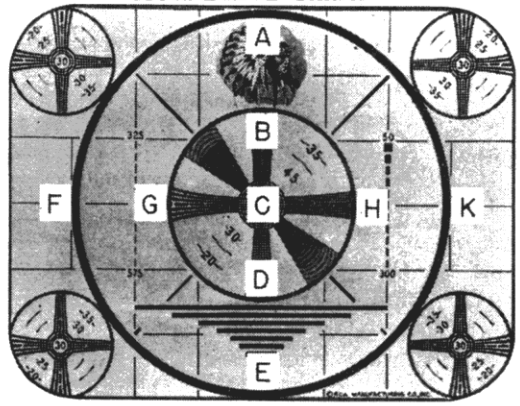


Fig. 5-23. Correct Width and Horizontal Linearity

If more than one station is on the air when making linearity, size and centering adjustments; check receiver adjustment on all stations. This is necessary since all TV stations are not perfectly linear at all times.

Tube aging may make horizontal linearity adjustment impossible. In some instances this difficulty may be overcome by changing the tap on damping resistor R435 (located inside the 2nd anode supply shield). After changing the tap on R435, readjust horizontal linearity, horizontal drive and width controls as per instructions. If correct horizontal linearity (and width) cannot be obtained, refer to the trouble-shooting chart.

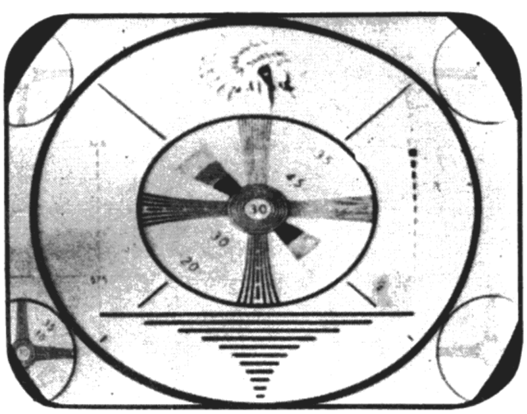


Fig. 5-24a. Too Much Width

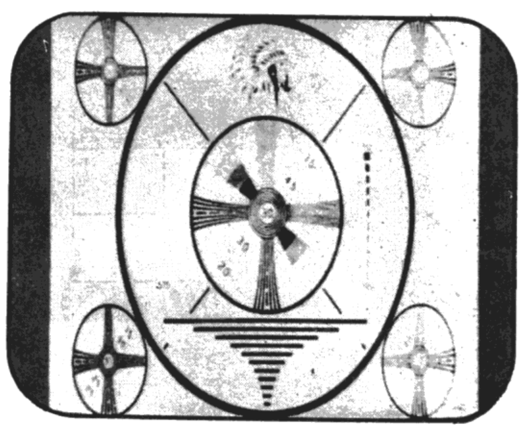


Fig. 5-24b. Insufficient Width

HORIZONTAL OSCILLATOR ADJUSTMENT

If it is difficult to hold the picture in horizontal sync (see Figure 5-5), proceed as follows:

a. Turn horizontal hold control R421A (Figure 5-2) on the front of the chassis to the extreme counter-clockwise position.

b. Turn the horizontal lock T401 (Figure 5-20) clockwise until the pattern falls out of synchronization.

c. Then turn the horizontal lock counter-clockwise until the pattern just falls back into synchronization.

d. Turn the horizontal hold control fully clockwise and turn the channel switch to the next **highest** channel, and then back to the original channel. The test pattern should return in synchronization. Should the pattern be broken up, slowly turn the horizontal hold control counter-clockwise until the picture just falls into synchronization. It should not be necessary to rotate this control more than 25% to obtain synchronization and if a greater percentage of rotation is necessary, refer to the trouble-shooting chart.

REPLACING 10" or 12" PICTURE TUBE

Remove the defective picture tube in the following manner:

CAUTION

Before handling the picture tube, remove the static charge on the second anode as follows: Connect an insulated test lead to the receiver chassis and insert the free end into the well connector of the picture tube and discharge.

a. Remove the high voltage lead from the connector on the top of the picture tube (see Fig. 5-14).

b. Remove the socket from base of picture tube.

c. Remove the ion trap.

d. Loosen webbing band holding the front of the picture tube.

e. Remove bumper plate from face of picture tube.

f. Withdraw the picture tube through the deflection yoke and focus coil towards the front of the chassis.

To install a new picture tube, the above procedure should be reversed, making sure that the picture tube is fitted closely against the deflection yoke housing and that the high voltage connector is on top of the picture tube.

REPLACING 16" PICTURE TUBE

WARNING — Extra precaution is necessary when handling this tube. The metal cone of the 16" picture tube is directly connected to the 12,000 volt supply and is dangerous unless correctly handled. An insulating cover is fitted around this tube for protection from the 12,000 volts.

In order to replace the picture tube (16AP4) in the 30D1 chassis, it is necessary to disconnect connecting cables and remove the wooden shelf from the cabinet. Proceed as follows:

a. Remove the second anode lead from the socket on the bracket supporting the tube. Contact chassis with connector on second anode lead to discharge high voltage capacitor.

b. Connect a lead from the socket mentioned above to the television chassis in order to discharge the second anode of the picture tube. Then remove the lead and check with a voltmeter between this socket and the chassis to be sure no charge remains on the tube.

c. Remove the two plugs connecting the focus coil and the deflection yoke to the chassis.

d. Remove the ground lead between the tube mounting bracket and the receiver chassis.

e. Remove the tube socket and the ion trap.

f. Remove the four screws holding the wooden shelf to the cabinet and withdraw the shelf and picture tube assembly.

g. Remove the insulating cover from the picture tube.

h. Remove the two nuts on the tube clamp at the front of the tube, and remove the clamp and plastic ring.

j. Withdraw the tube, being careful to handle the tube at the metal cone and neck only, or at the metal cone only.

Finger prints or dust on the surface of the insulating coating between the cone and the neck of the tube may cause electrical breakdown during humid weather.

To install a new picture tube, the above procedure should be reversed, making sure that the picture tube is fitted closely against the deflection yoke housing, and that the second anode lead is connected to the metal cone under the plastic ring.

TROUBLE SHOOTING

TELEVISION TROUBLE-SHOOTING CHART

Symptoms	Check	Remarks
Dead receiver.	AC Power line circuit.	
No sound or picture. Raster OK.	a. Tubes: Tuner; low voltage rectifier. b. Low voltage power supply. c. RF tuner. (1) RF amplifier circuit. (2) Mixer circuit. (3) Oscillator circuit. d. Contrast control circuit.	
No sound. Weak video (insufficient contrast).	a. RF tuner alignment.	Oscillator alignment most probable cause.

TELEVISION TROUBLE-SHOOTING CHART (Cont'd)

Symptoms	Check	Remarks
No sound. Picture OK.	a. Audio section tubes. b. Audio IF (V201 and V202). c. Ratio detector (V203). d. Audio amplifier. e. Audio plug and jack. f. Speaker.	
Weak sound. Picture OK.	a. Audio section tubes. b. Audio IF alignment. c. Audio IF's (V201 and V202). d. Ratio detector (V203). e. Audio amplifier.	
Noisy sound. Picture OK.	a. Audio section tubes. b. Ratio detector transformer alignment (T202). c. Audio IF's (V201 and V202). d. Ratio detector (V203). e. Audio amplifier. f. Speaker.	
Intermittent sound. Picture OK.	a. Audio section tubes. b. Audio IF's (V201 and V202). c. Ratio detector (V203). d. Audio amplifier. e. Speaker.	
No raster. Sound OK.	a. Tubes V308, V403, V406, V407, V409 and V501. b. Ion trap adjustment, if used. c. High voltage power supply (V501). d. Second Anode power supply. e. Horizontal Oscillator (V406). f. Differentiator. g. Horizontal discharge (V403B). h. Horizontal output (V407). i. Damper (V409). i. Focus coil circuit (open). k. Picture tube cathode circuit. l. Fuse M402.	Failure of horizontal oscillator (V-406), differentiator or horizontal discharge (V403B) will result in loss of drive to the horizontal output stage (V407), and the horizontal output tube (6BG6G) will show color due to excessive plate dissipation. If the receiver is fitted with a fuse (M402) excessive plate dissipation will not occur. Check waveforms at TP15 to TP18 (Figures 5-49 to 5-52).
Intermittent raster. Sound OK.	a. Tubes V308, V403, V406, V407, V409 and V501. b. High voltage power supply (V501). c. Second Anode power supply. d. Horizontal oscillator (V406). e. Differentiator. f. Horizontal discharge (V403B). g. Horizontal output (V407). h. Damper (V409). i. Focus coil circuit (intermittent open). j. Picture tube (V308) cathode circuit.	Check for arc-over or corona discharge in the second anode power supply. Check waveforms at TP15 to TP18 (Figures 5-49 to 5-52).
Insufficient raster brilliance.	a. Ion trap adjustment. b. Tubes V308 and second anode rectifier. c. Second anode power supply.	
Rounded corners on raster. Brilliance OK.	a. Deflection yoke (too far back on picture tube neck). b. Focus coil (too far back on picture tube neck). c. Ion trap adjustment.	

Symptoms	Check	Remarks
Rounded corners on raster. Insufficient brilliance.	a. Ion trap adjustment.	
Tilted raster.	a. Position adjustment of deflection yoke.	
Raster not centered.	a. Position adjustment of focus coil.	
Excessive raster size (too large a picture for the picture tube mask).	a. Height and width adjustments (R449 and L401 or L405 for 30D1 chassis). b. Second anode power supply. c. Horizontal drive control (R429) setting. See Installation and Service Adjustments.	Low second anode potential increases the deflection sensitivity of the picture tube (V308). Check 1B3/8016 tubes by substitution.
Trapezoidal or non-symmetrical raster.	a. Deflection yoke. b. Position adjustment of focus coil. c. Ion trap adjustment.	
Insufficient raster width.	a. Width adjustment (L401). b. Tubes V403 and V407. c. Horizontal discharge (V403B). d. Horizontal output (V407).	
Insufficient raster height.	a. Height adjustment (R449). b. Tubes V410 and V411. c. Vertical oscillator (V410). d. Vertical output (V411).	
Bright horizontal line. No vertical deflection, no raster.	a. Tubes V410 and V411. b. Vertical oscillator (V410). c. Vertical output (V411).	Check waveforms at TP11 and TP12 (Figures 5-45 and 5-46).
Bright vertical line. No horizontal deflection, no raster.	a. Fuse M402. b. Horizontal output transformer secondary circuit.	
Raster too small (insufficient height and width).	a. Height and width adjustments (R449 and L401 or L405 for 30D1 chassis). b. Tubes V308 and V501. c. High voltage power supply (V501). d. AC line voltage (low).	Gas content will decrease the deflection sensitivity of the picture tube V308 (improper focus will also result).
Excessive raster brilliance. Brightness control has no effect.	a. Picture tube (V308). b. Picture tube cathode circuit.	
Bunching of several trace lines appearing as a white band across raster.	a. Vertical amplifier tube (V411).	Replace tube (V411 and V307 can be switched to correct this difficulty.)
Vertical lines or "wrinkles" on left side of raster.	a. Spurious oscillations in horizontal output (V407). b. Deflection yoke. c. Horizontal drive (R429) setting.	If trouble is "a", replace tube V407.

SHOOTING CHART (Cont'd)

Light and dark vertical bars. Bad horizontal linearity.	a. Damper tube (V409).	Replace tube V409.
Two heavy black horizontal bars covering picture tube screen.	a. High voltage power supply (V501) for open filter (C501).	
No picture. Raster and sound OK.	a. Video section tubes (V301 to V307). b. Video IF's (V301 to V304). c. Video detector (V305). d. Video amplifier (V306 and V307).	Check waveforms at TP1 to TP5 (Figures 5-26 to 5-35).
Intermittent video. Sound and raster OK.	a. Video section tubes (V301 to V307). b. Video IF's (V301 to V304). c. Video detector (V305). d. Video amplifier (V306 and V307).	
Intermittent video and sound. Raster OK.	a. Tubes: Tuner; low voltage rectifier. b. RF tuner. (1) RF amplifier circuit. (2) Mixer circuit. (3) Oscillator circuit. c. Low voltage power supply. d. Contrast control circuit.	
Weak video (insufficient contrast). Sound and raster OK.	a. Video section tubes (V301 to V307). b. Video IF alignment. c. Video IF's (V301 to V304). d. Video detector (V305). e. Video amplifier (V306 and V307). f. Contrast control circuit.	Check waveforms at TP1 to TP5 (Figures 5-26 to 5-35).
"Snow" in picture background.	a. For weak signal input. b. Noisy tubes in RF tuner. c. Second anode power supply (V308) for corona discharge.	Weak signal from station, receiver antenna and/or transmission line difficulties.
No vertical sync. Horizontal sync. OK.	a. Integrator network.	Check waveforms at TP9 and TP10 (Figures 5-42 to 5-44).
Improper vertical sync. Split-framed picture.	a. Leaky sync inverter (V403A) coupling condensers (C407, C408). b. Sync inverter (V403A) coupling condensers (C407, C408) connections switched.	
No horizontal sync. Vertical sync OK.	a. Tubes V404 and V405. b. Horizontal sync discriminator circuit (V404). c. Horizontal oscillator control circuit (V405).	Check waveforms at TP8, TP13 and TP14 (Figures 5-40, 5-41, 5-47 and 5-48).
No horizontal or vertical sync.	a. Tubes V305, V401, V402 and V403. b. DC restorer (V305). c. Sync amplifier (V401). d. Sync separator (V402). e. Sync inverter (V403A).	Check waveforms at TP4 to TP8 (Figures 5-32 to 5-41).

TELEVISION TROUBLE-SHOOTING CHART (Cont'd)

Symptoms	Check	Remarks
Picture jitter.	a. Horizontal hold and/or lock adjustment. b. Change horizontal output V407) if regular sections of the picture are displaced. c. For noisy tube(s) in the RF, video and sweep sections of the receiver.	
Horizontal non-linearity.	a. Horizontal drive control setting (R429). b. Horizontal linearity control setting L402 (L405 for 30D1 chassis). c. Horizontal discharge (V403B). d. Horizontal output (V407). e. Damper (V409).	Check waveform at TP17 (Figure 5-51).
Vertical non-linearity.	a. Vertical linearity control setting (R455). b. Vertical oscillator (V410). c. Vertical output (V411).	Check waveforms at TP11 and TP12 (Figures 5-45 and 5-46).
Improper focus (best at extreme control position).	a. Focus coil. b. Focus control circuit. c. For circuit defect causing either excessive or low current drain from power supply.	
Improper focus (control has no effect).	a. Focus coil. b. Focus control circuit. c. Picture tube (V308).	If trouble is "a", check for open, shorted turns or incorrect position adjustment. If trouble is "c", picture tube (V308) may be gassy.
Engraved or bas-relief effect in picture.	a. Video output amplifier (V307). b. First video amplifier (V306). c. Video detector (V305). d. Peaking chokes.	Output load and coupling circuit is common source of this difficulty.
Smeared effect in picture (poor low frequency video response).	a. Video detector (V305). b. First video amplifier (V306). c. Video output amplifier (V307). d. Peaking chokes (open).	
Poor picture detail (poor definition).	a. RF and video IF band-pass. b. Video amplifier high-frequency response.	
Vertical bars on right side of picture.	a. Horizontal oscillator tube (V406).	
Sound bars in picture.	a. Alignment of video IF sound traps. b. Alignment of first 21.25 MC trap. c. Oscillator alignment. d. IF trap (L928 and C910) for type A1582 RF tuner only. e. Microphonic tubes.	
Herringbone pattern superimposed on picture.	a. FM, diathermy or other forms of RF interference.	
Brown or yellowish-brown spot on picture tube screen.	a. Picture tube (V308) by substitution.	Burned phosphor on picture tube screen. Replace tube if objectionable.

WAVEFORM ANALYSIS

SERVICING BY WAVEFORM ANALYSIS

After a circuit defect has been localized to the video or sweep sections of a television receiver (see trouble-shooting chart), localization to a single stage can be accomplished by use of the test points (figure 5-25) and waveforms shown in figures 5-26 to 5-52. Voltage or resistance measurements can then be used to locate the defective part in a conventional manner.

The waveforms shown for the first ten test points (figures 5-26 to 5-44) are obtained only with a video RF signal input to the receiver. Since the remainder of the waveforms shown are taken from the sweep circuits of the receiver, a video RF signal input is not necessary for these tests (TP11 to TP18).

Two separate waveforms are shown for the first nine test points. Two different oscilloscope sweep frequencies were used in order to show up the vertical and horizontal pulses at each test point (both cannot be locked in at the same sweep frequency due to the great difference in, and non-integral relationship of, the vertical and horizontal pulse frequencies).

The peak-to-peak voltages indicated for the various test points were measured by calibrating the oscilloscope used to observe the waveforms. Such peak-to-peak voltage measurements provide a check on the voltage gain per stage. For example: the peak-to-peak voltage readings at test points TP1 and TP2 are 1 and 9 volts, respectively. A voltage gain of 9 is indicated for the video amplifier stage V306 (6AU6).

The contrast control of the television receiver is set for a peak-to-peak reading of one volt at TP1 as a matter of convenience in measuring stage gain and providing a standard of comparison.

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

WARNING

Care should be exercised when taking measurements on the horizontal output stage. No connections should be made to the plate of the V407 (6BG6G) or to any connections on the rectifier tube (1B3GT/8016) as the high voltages at these points are dangerous.

TEST POINT LOCATIONS

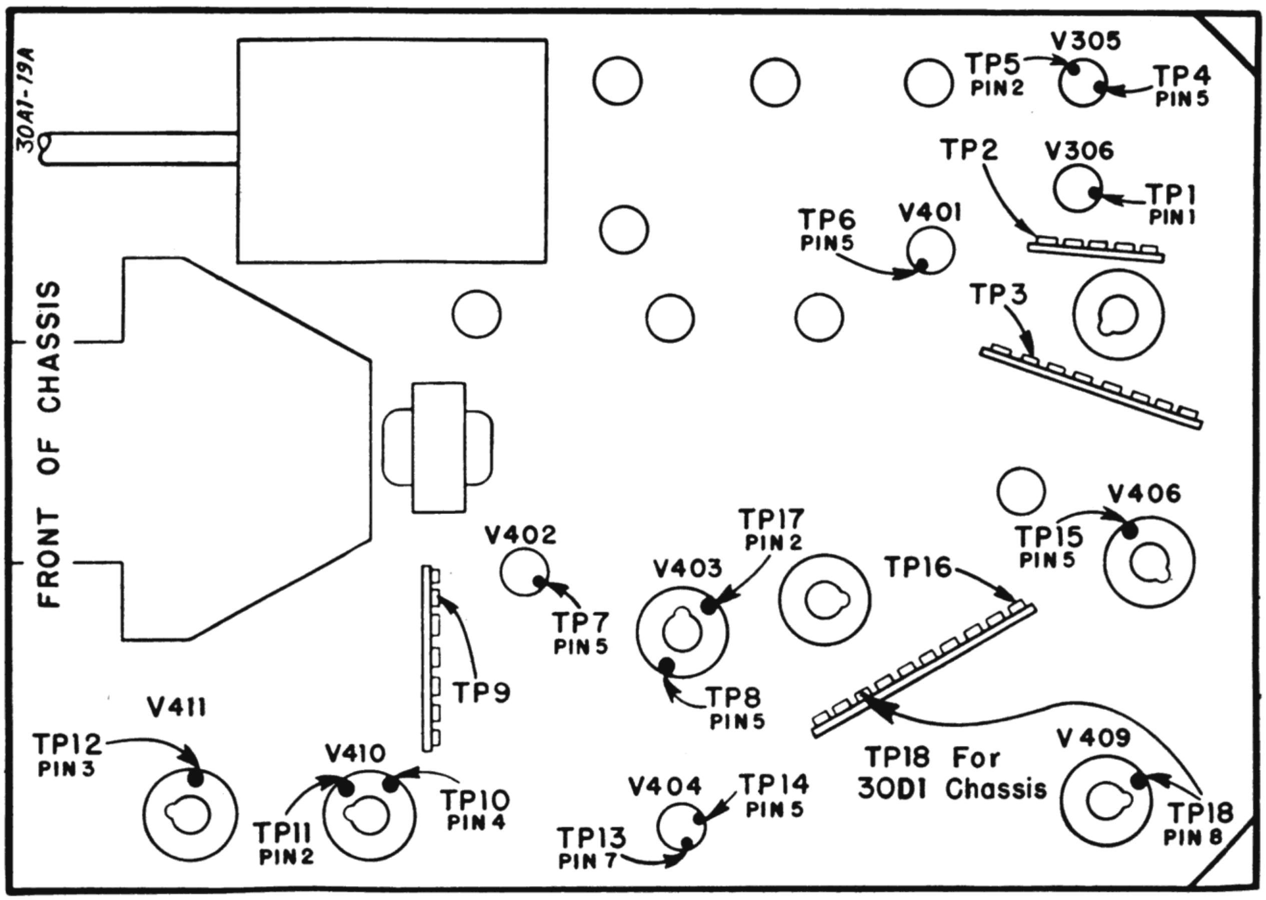


Fig. 5-25. Test Point Locations

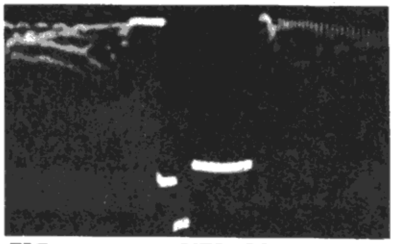


FIG. 5-26 VERTICAL PULSE
1 Volt PP

TP1

Input to Video Amplifier
Pin 1 of V306 (6AU6)

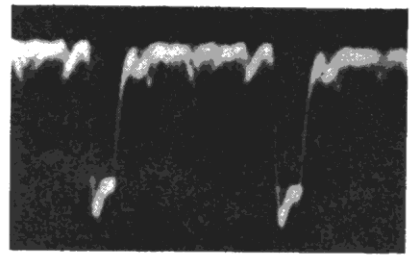


FIG. 5-27 HORIZONTAL PULSE
1 Volt PP

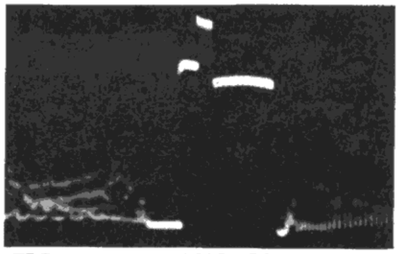


FIG. 5-28 VERTICAL PULSE
9 Volts PP

TP2

Output of Video Amplifier
Junction of L308 and L309

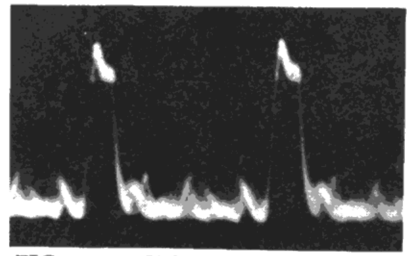


FIG. 5-29 HORIZONTAL PULSE
9 Volts PP

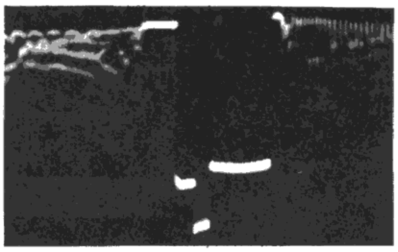


FIG. 5-30 VERTICAL PULSE
28 Volts PP

TP3

Output of Video Output
Junction of L310,
L311 and C323

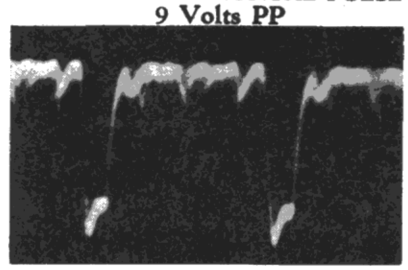


FIG. 5-31 HORIZONTAL PULSE
28 Volts PP

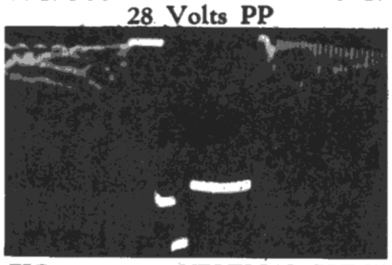


FIG. 5-32 VERTICAL PULSE
20 Volts PP

TP4

Cathode of D.C. Restorer
Pin 5 of V305 (6AL5)

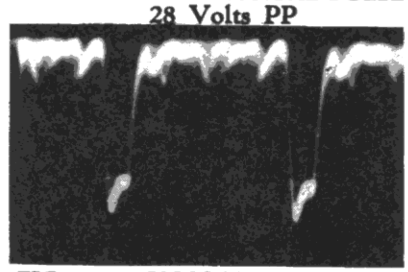


FIG. 5-33 HORIZONTAL PULSE
18 Volts PP

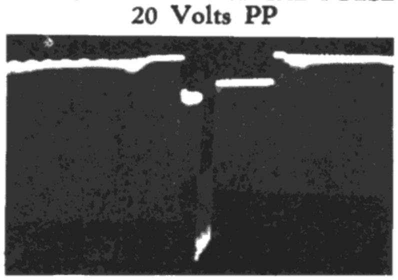


FIG. 5-34 VERTICAL PULSE
6.8 Volts PP

TP5

Plate of D.C. Restorer
Pin 2 of V305 (6AL5)

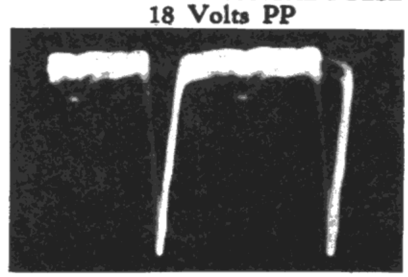


FIG. 5-35 HORIZONTAL PULSE
5 Volts PP

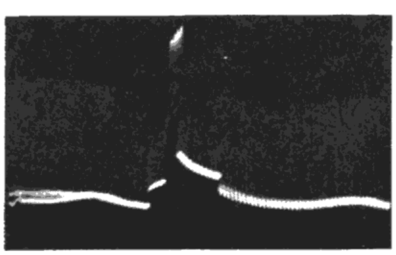


FIG. 5-36 VERTICAL PULSE
25 Volts PP

TP6

Output of Sync. Amplifier
Pin 5 of V401 (6BA6)

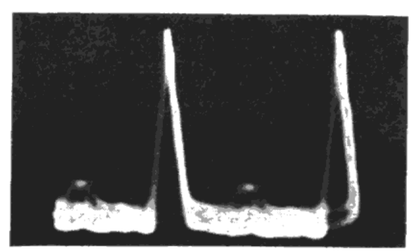


FIG. 5-37 HORIZONTAL PULSE
15 Volts PP

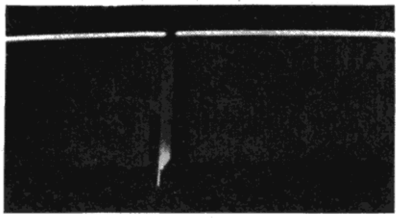


FIG. 5-38 VERTICAL PULSE
70 Volts PP

TP7
Output of Sync. Separator
Pin 5 of V402 (6AU6)

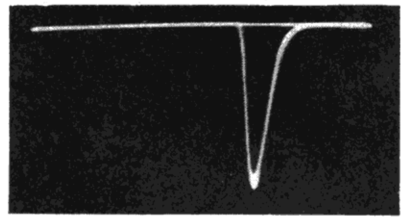


FIG. 5-39 HORIZONTAL PULSE
70 Volts PP

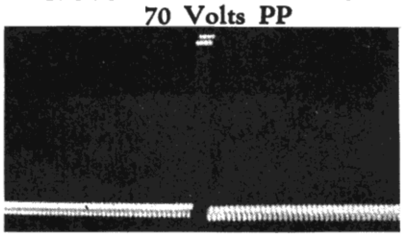


FIG. 5-40 VERTICAL PULSE
14 Volts PP

TP8
Output of Sync. Inverter
Pin 5 of V403A (6SN7GT)

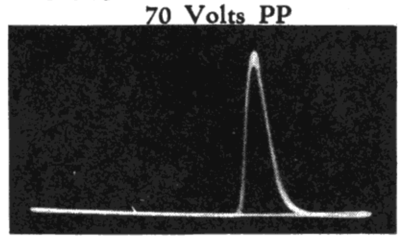


FIG. 5-41 HORIZONTAL PULSE
8 Volts PP

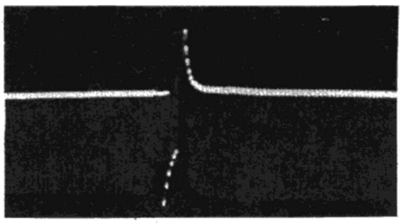


FIG. 5-42 VERTICAL PULSE
1.6 Volts PP

TP9
Input to Integrating Circuit
Junction of R440, R441, C427
If couplate is used for integrating circuit this test point is not accessible.

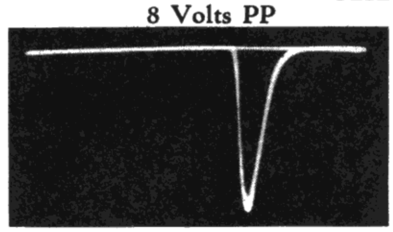
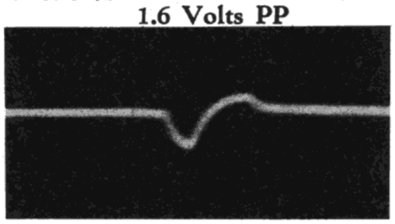
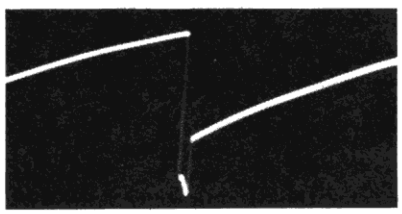


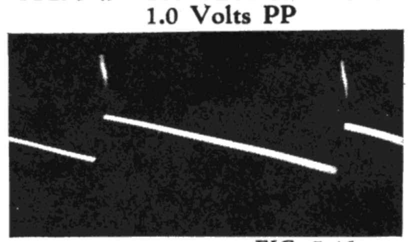
FIG. 5-43 HORIZONTAL PULSE
1.0 Volts PP



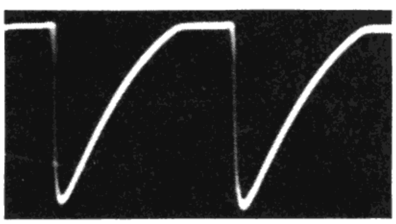
TP10 FIG. 5-44
.3 Volts PP
Input to Vertical Osc.
Pin 4 of V410 (6SN7GT)



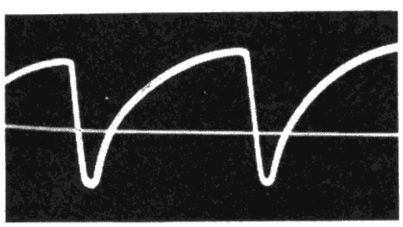
TP11 FIG. 5-45
60 Volts PP
Output of Vertical Osc.
Pin 2 of V410 (6SN7GT)



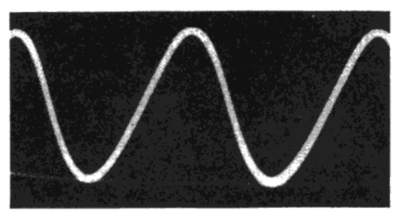
TP12 FIG. 5-46
340 Volts PP
Plate of Vertical Output
Pin 3 of V411 (6K6GT)



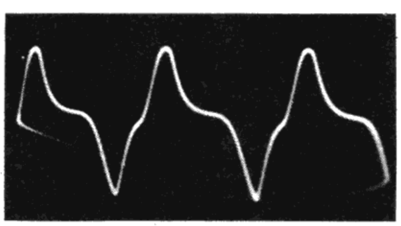
TP13 FIG. 5-47
30 Volts PP
Plate of Hor. Sync. Disc.
Pin 7 of V404 (6AL5)



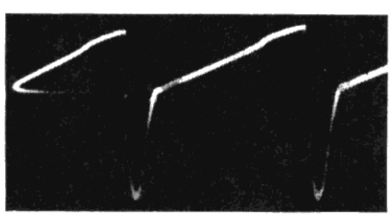
TP14 FIG. 5-48
20 Volts PP
Cathode of Hor. Sync. Disc.
Pin 5 of V404 (6AL5)



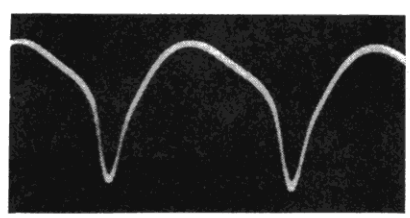
TP15 FIG. 5-49
52 Volts PP
Grid of Hor. Osc.
Pin 5 of V406 (6V6GT)



TP16 FIG. 5-50
80 Volts PP
Output of Differentiator
Junction of C416, R425, C417



TP17 FIG. 5-51
80 Volts PP
Plate of Hor. Discharge
Pin 2 of V403B (6SN7GT)
Amplitude and shape will vary with horizontal drive setting.



TP18 FIG. 5-52
52 Volts PP
Cathode of Damper
Pin 8 of V409 (5V4G)
On 30D1 chassis, TP18 is junction of L405 and C444; voltage is 15V.