SERVICE NOTES AND INSTRUCTIONS FOR
G.I. TELEVISION TUNER

TYPE TVA - WIDE NOTCH DETENT - UNSHIELDED
Mechanical Vernier

TYPE TVB - "V" NOTCH DETENT - UNSHIELDED
Vernier producing correct sound tuning at two points

TYPE TVC - "V" NOTCH DETENT - SHIELDED
Vernier producing correct sound tuning at two points
with reduced range

Procedure for Alignment of Tuner in Television Receiver

DO NOT ATTEMPT TO ALIGN TUNER UNLESS PROPER EQUIPMENT IS USED

Equipment:

1. Sweep generator, similar to RCA Type WR59A, covering frequencies of 54 to 88 Mc and 174 to 216 Mc with a minimum sweep of 10 Mc and output of at least .1 volts.
2. Signal generator or a crystal marker, similar to Megamarker, capable of establishing a marker at the video and audio frequencies as listed below:

Channel No.	Video Carrier	Audio Carrier
2	55.25	59.75
3	61.25	65.75
4	67.25	71.75
5	77.25	81.75
6	83.25	87.75
7	175.25	179.75
8	181.25	185.75
9	187.25	191.75
10	193.25	197.75
11	199.25	203.75
12	205.25	209.75
13	211.25	215.75

3. An oscilloscope equivalent to DuMont Type 208B.
4. Electronic volt meter similar to the "Voltohmyst" type.

Oscillator Alignment:

The tuner oscillator may be aligned by feeding a signal into the receiver at the RF sound carrier frequency and adjusting the oscillator for zero output from the sound discriminator. The sound discriminator must be aligned to the exact frequency. Rotate the receiver channel switch to 7, adjust the signal generator to 179.75 Mc. With the oscillator slug (Figure 6) in the maximum counterclockwise position, slowly rotate the slug in a clockwise direction. After completing one revolution, adjust the fine tuning control until zero voltage is had at the sound discriminator. This is measured by connecting a volt meter to the output of the discriminator as shown in the Service Manuals of the receiver manufacturers. If zero voltage is not obtained, continue to rotate the slug in a clockwise direction and adjust the fine tuning control after each revolution of the slug until zero voltage is obtained. Switch the receiver to Channel 8, set the generator to the proper sound frequency, as listed on Page 1, and adjust the fine tuning control for zero voltage. If no zero voltage is obtained, continue to rotate the oscillator slug in clockwise direction and adjust the fine tuning control for each adjustment of the slug until zero voltage is obtained. Recheck Channel 7 to make sure that the fine tuning still produces a zero voltage. Check Channels 9, 10, 11, 12 and 13 by switching the receiver and the signal generator to each channel and repeat the same procedure given for Channels 7 and 8. Whenever the oscillator slug is adjusted always recheck all channels. Switch receiver to Channel 2, set the generator to the proper frequency and with low frequency oscillator slug (Figure 6) in the maximum counterclockwise position, slowly rotate the slug in the clockwise position. Adjust the fine tuning control until zero voltage is obtained at the sound discriminator and repeat as in the high band adjustment. After the oscillator screws are adjusted, touch the screw with a hot soldering iron so that the wax reseals the screw to prevent frequency shift. If condenser plates have not been knocked out of alignment, no difficulty should be encountered.

If, with the above procedure, it is still impossible to obtain oscillator tracking on all channels, it is then necessary to adjust the oscillator rotor plates to be within range of the fine tuning control. The procedure for alignment of plates is given under "Pass Band Plate Adjustment".

Equipment Setup for Pass Band Alignment:

As shown in Figure 1, the 12 channel RF sweep generator is connected to the antenna terminals of the television receiver. The marker is coupled to the sweep generator and receiver at the antenna, and the oscilloscope, protected by 20,000 ohms, is then connected to the solder joints of the stators as shown in Figure 3a. To look at the high band (Channels 7 to 13) it is necessary to connect the oscilloscope to the low band stator and when looking at the low band (Channels 2 to 6) the oscilloscope is connected to the high band stator. It is then necessary to remove the first video IF tube to prevent coupling back from the receiver as well as connect a 1000 ohm resistor across the first video IF grid resistor. This setup permits observation of the RF pass band of the tuner.

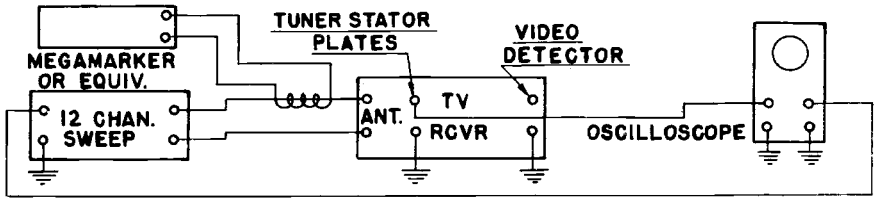


FIGURE NO. 1

Check RF pass band starting with Channel 13 and observe characteristics in conformance with Figure 2. If pass bands are not in accordance with the acceptable pass band, shown in Figure 2, then realign as follows:

Set channel selector on Channel 13 (make sure the oscilloscope connection is to the low band stator) and readjust the high band trimmers. These are the four trimmers, two RF and two mixer trimmers, with are closest to the coils (See Figure 3b). Maximum response will be had when each set of two trimmers is adjusted for balance of the push-pull circuits and so adjusted that the sound and video markers appear at the peak of the response curve. Recheck pass bands for all high channels. If any of the channels are then off (Channels 12 to 7) it will be necessary to realign the high band rotor plates. These are the four small aluminum plates in the RF and mixer circuits which mesh with the single stator plates. Extreme care must be taken so that these plates are bent at the correct channel, starting with Channel 12 and ending with Channel 7. Figure 4 shows the location or point of bending for each channel of the high band. The direction of bending may be determined by touching the stator lug with the metal tip of an insulated alignment tool. If the capacity induced by the alignment tool improves the pass band then the rotor plate must be pushed closer to the stator plate. If the tool capacity does not improve the condition but makes it worse, then the rotor plate is pushed away from the stator. There is B+ voltage on the RF and oscillator plates so care must be taken that these plates are not shorted for any length of time as the B+ dropping resistor can be burned out. CAUTION! By bending, it is meant a very slight pressure obtained by flicking the finger nail on the edge of the plate. Excess bending will only damage the condenser and should not be attempted.

After realignment of the high band the same procedure is followed for the low band. Set the channel selector at Channel 6, connect the oscilloscope to the high band stator and adjust trimmers. The low band trimmers are the four trimmers farthest from the coils (See Figure 3b). Recheck all channels for alignment after adjustment of trimmers. If lower channels (Channels 5 to 2) need adjustment, the low frequency RF and mixer stators (double copper plates) should be squeezed together or spread apart starting with Channel 5 and ending with Channel 2. Channel 5 is the end of the stator closest to the coils and Channel 2 is the other and closest to the bottom of the tuner (See Figure 5). The same precautions should be observed in the bending of the low band stator plates as in the high band rotor plates.

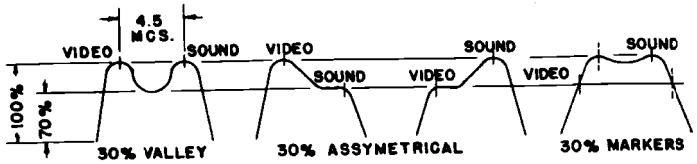
After pass band is adjusted replace first IF tube and disconnect the 1000 ohm resistor. Connect oscilloscope to second detector so that overall pass band may be observed. If there is still misalignment of pass band, it is now necessary to realign the IF in accordance with the procedure outlined in the Manual distributed by the manufacturer of the television receiver.

Oscillator plate bending is accomplished in the same manner as the RF and converter plates (described above). Here, however, the use of a pair of long nose pliers is required for bending because of the heavy copper rotor plates. In using the pliers care must be exercized not to leave burrs on the plates.

Balance or maximum response should be maintained. This is best done if, when more capacity is desired, the appropriate high or low band oscillator rotor plates farthest from the front of the tuner are squeezed. If less capacity is required, the appropriate high or low band rotor plates closest to the front of the tuner are spread.

NOTE: FM trap, mounted on bracket and connected to antenna terminals of tuner, should be disconnected so that the true response of Channels 5 and 6 may be seen.

Pass Band (Band Pass) Alignment: (Figure 2)



ACCEPTABLE RF PASS BANDS
FIGURE NO. 2

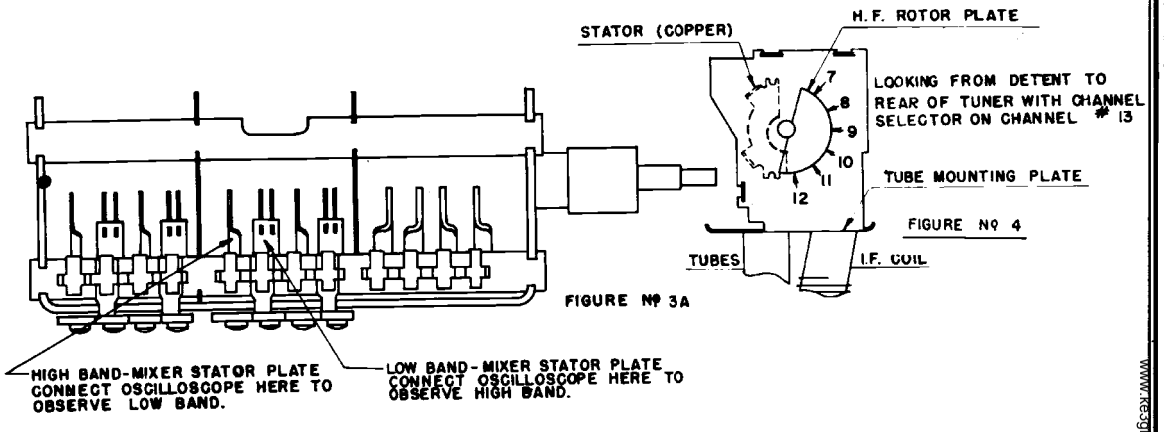


FIGURE Nº 3A

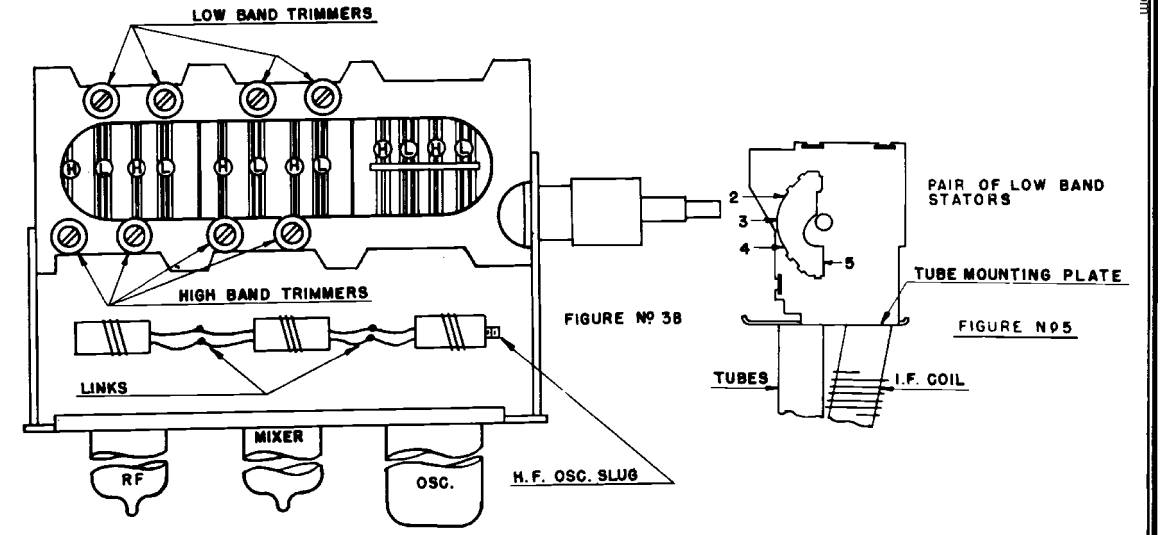


FIGURE Nº 3B

SERVICE NOTES

Station Selector Knob Adjustment:

In some cases the station selector knob may indicate the wrong channel. This is due to the slipping of the brass bushing which is secured to the selector shaft by two Allen head set screws. To correct this condition, set unit on Channel 2, remove the selector knob, loosen the Allen set screws on the brass bushing and replace selector knob loosely on loosened bushing and rotate until the knob marker indicates Channel 2. Remove knob carefully and tighten two Allen set screws. The selector knob will now be oriented properly with the shaft.

High-Low Band Switch Adjustment:

A switch is incorporated in the tuner to transfer both the coils and the variable gang tuning condenser from low to high channels. This switch functions with the rotation of the selector knob in either direction, clockwise or counterclockwise. The switch is actuated by the cam of the detent plate. The displacement is so designed as to make the switch action positive, however, due to the complexity of the assembly, some switches may be improperly adjusted. This condition is corrected by setting the selector knob to Channel 7, loosening the two screws shown on Figure 6 marked "Adjustment for Maximum Switch Throw", slide the bar slightly left or right. It will be necessary to watch the switch contacts to assure correct position. Tighten the screws and check for operation, that is, switch from 7 to 6 and back. Also check at 13 and 2.

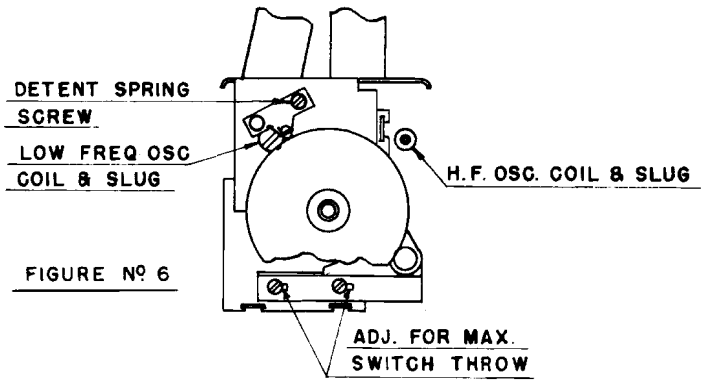


FIGURE Nº 6

Injection Voltage:

The injection voltage is specified as 1.8 to 5 volts and is measured from the grid of the converter (stator plate) to ground. In the event of failure to meet these specifications it is necessary to replace either the oscillator or converter tubes.

NOTE: If a tube is changed it may be necessary to realign to compensate for differences of tube characteristics. Low injection voltage will reduce conversion gain and in weak signal areas this is very important for optimum results.

Aluminum Rings on High Band Coils:

On some models aluminum shorting rings are used on the high band coils for the adjustment of inductance. These rings are adjusted on Channel 13 in conjunction with the trimmers for optimum pass band. Moving the rings to the extreme ends of the coils produces highest inductance (requires less capacity in the trimmer) and moving the rings towards the center of the coils produces decreased inductance (requires more capacity in trimmer). The best practice is to keep the rings as far to the end of the coil as possible. After adjustment of the rings, if necessary, reseal with wax.

Hand Capacity:

If the hand capacity has a detuning effect on the receiver, in the majority of instances this can be cured by shorting out the 47 ohm resistor in the cathode of the oscillator. As this detuning is caused by ground currents, the addition of a ground strap (braid) from the tuner to the chassis proper may be also a solution.

TROUBLE SHOOTING GUIDE

TROUBLE INDICATION	POSSIBLE CAUSES
1. No sound or picture but no B_f short	Bad mixer or oscillator tube, open filament, prongs on sockets shorted to each other, open cathode to ground, mixer rotor plates shorted to stators, open IF coil, oscillator or RF grids shorted to each other, open converter plates lead. Open A.G.C. lead.
2. No sound or picture with B_f short	Tube shorted internally, L.F. R.F. coil C.T. shorted to input coil, R.F. trimmer shorted, B_f bypass condenser shorted, IF bypass condenser shorted A.G.C., bypass condenser or lead shorted to R.F. plate at tube socket, converter plates to filament lead short, B_f lead to mounting screw short, oscillator or R.F. rotor plates shorted to stators.
3. One tube does not light	Bad tube, open filament return from socket to chassis.
4. All tubes do not light	Filament short at socket to chassis, FM trap mounting screw to filament lead short, open filament lead.
5. Picture O.K., no sound	(RCA coil) Sound trap turns shorted, trap not grounded, condenser across trap open, tap lead from trap open.
6. Sound O.K., no picture	Open IF coupling condenser.
7. One band works only	Open coil, open links, high resistance solder joints in links, shorted turns on coil, open strap from coil to variable condenser, open switch contact, switch making both bands, coil C.T. open, links shorted at tie points, open stator solder joint at comb, links shorted to coil.

TROUBLE SHOOTING GUIDE - cont'd

TROUBLE INDICATION	POSSIBLE CAUSES
8. Weak Signal	Open mixer C.T. bypass condenser, open input coil, bad R.F. tube, open R.F. neutralizing condenser, R.F. or mixer plates bent out of position, input lug shorted to chassis, open input coupling condenser, one converter tube plate open, open switch arm to socket prong, open mixer C.T. resistor.
9. Oscillator will not tune	Open lead from fine turner trimmer to stator on variable condenser, open oscillator coupling condenser, open switch contact in oscillator section, oscillator rotor plates not tracking properly, oscillator coil slugs not set correctly.
10. Interference on picture	Open input coil.
11. Interference - Channel 2 and 4	Unbalanced oscillator.
12. Intermittents	Socket pins not tight, bad solder joints, dirt between variable plates, switch contacts loose.

The Schematic Diagram shown represents a standard tuner. Since the great majority of receiver manufacturers have their own circuit designs, numerous variations from this standard schematic are necessary, especially with regard to the output circuit, as noted in Items 3, 4, and 5 below.

Following are deviations from the Schematic Diagram which will be found in some General Instrument Corporation Tuners:

1. A 47 ohm resistor from cathode to ground of oscillator tube. If used on tuner involved, it is not necessary to remove.
2. A 1000 ohm resistor (R5) between center taps of high and low frequency RF coils (L5 and L2) is omitted. If not used on tuner involved, it is not necessary to add.
3. First IF coil (L8) omitted. (In these instances the first IF coil is located in the receiver chassis proper.)
4. First IF coil may also have a secondary high Q coil on same form which is used for a sound trap. In these cases the video IF coil tuning slug is on underside of tuner while the sound trap tuning slug is on topside.
5. A transformer may be used in plate circuit of converter tube instead of IF coil L8.
6. A 1 megohm resistor and a 1500 mmf condenser may be used from the center tap of the converter coil (L3) to ground with no direct connection from the center tap of L3 to L6. Units without this additional resistor and condenser do not require their addition.
7. Resistor R6 color coded for 5500 ohms, resistors R8 and R9 color coded for 82,000 and 91,000 ohms but all resistors used were within tolerance permitted of correct values.