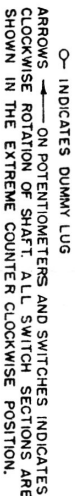
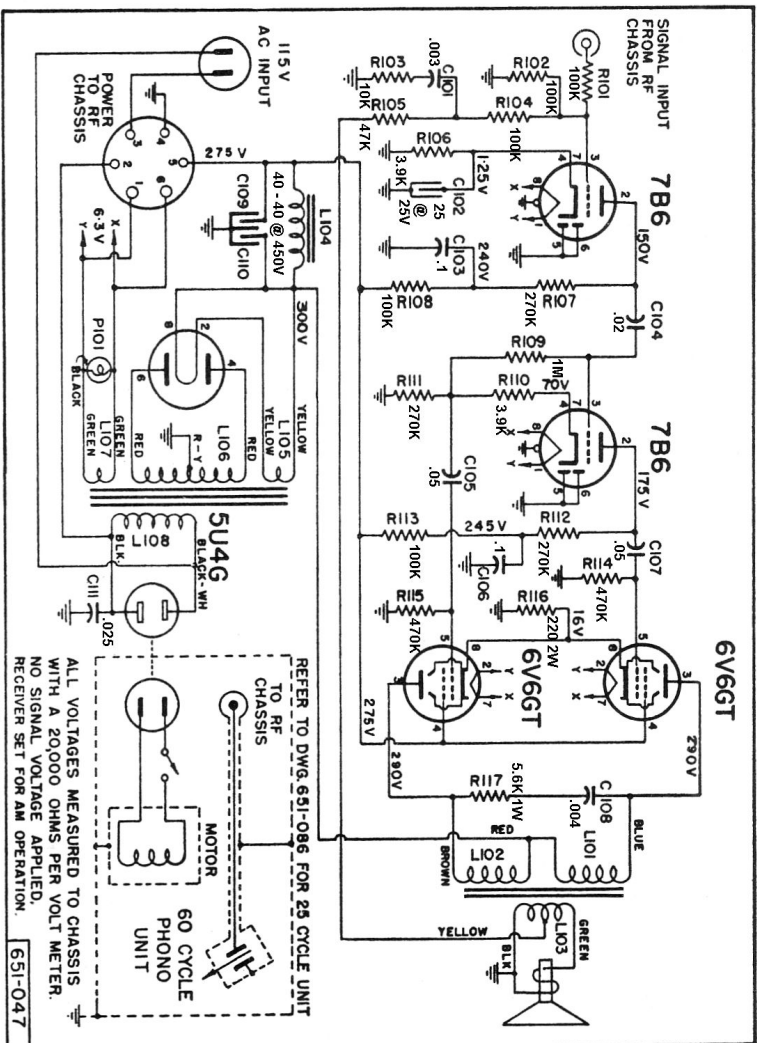
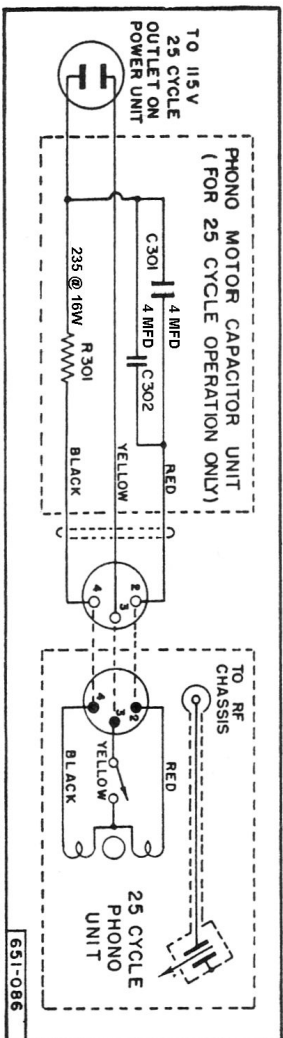


FM-AM
ANTENNA





SCHEMATIC DIAGRAM OF AUDIO/POWER CHASSIS



SCHEMATIC DIAGRAM OF 25 CYCLE CONDENSER AND PHONO MOTOR UNITS

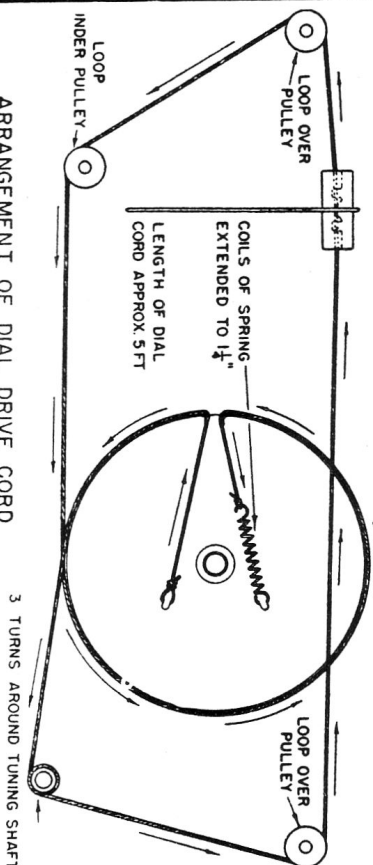
1. Set the output meter on the 1 watt scale.
2. Apply a 400 cycle, 30% modulated, 38 Mc. signal of approx. 30 microvolts.
3. Tune the receiver for maximum output and adjust the volume control for a 1 watt output meter reading.
4. Remove the modulation.
5. Set the output meter to the 50 milliwatts scale.
6. Check to see that the receiver is tuned to the minimum noise output.
7. If the RF input is of the proper value, the output reading will be 1 mW. (The ratio of 1 watt to 1 mW is equal to 30 db.)
8. When the minimum noise output is not 1 mW, increase or decrease the signal as required, and repeat the test until a value of RF input is found that results in a 30 db. difference in the outputs resulting from modulated and unmodulated input signals.
9. The value of RF input that produces a 30 db. output signal ratio is the quieting sensitivity.
10. The quieting sensitivity for the receiver should be below 30 uV.
11. If the quieting sensitivity is above 30 uV, check for faulty tubes, etc., especially the 6BE6 mixer tube.

TUBES:

- | | |
|------------------------------|---|
| 6BA6 RF Amplifier (FM) | 7C7 Pentagrid Converter (AM) |
| 6BE6 Mixer (FM) | 7E7 IF Amplifier, AVC and 2nd Detector (AM) |
| 6C4 H.F. Oscillator (FM) | 7B6 1st AF Amplifier |
| 7W7 1st IF Amplifier (FM) | 7B6 2nd AF Amplifier |
| 7W7 2nd IF Amplifier (FM) | 7B6 Phase Inverter |
| 7C7 1st Limiter (FM) | 6V6GT Push Pull Audio Output |
| 7C7 AVC and 2nd Limiter (FM) | 6V6GT Rectifier |
| 7A6 Discriminator (FM) | 5U4G Tuning Indicator |
| 6E5 | |

DIAL DRUMS IN POSITION SHOWN

POINTER AT LOW FREQUENCY END OF DIAL GANG CAPACITORS AT MAXIMUM CAPACITY (CLOSED)



3 TURNS AROUND TUNING SHAFT

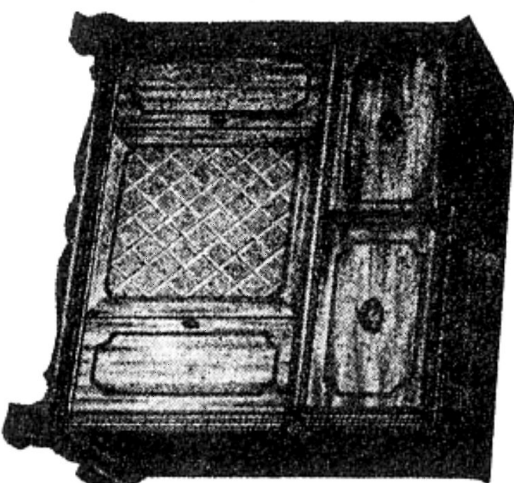
LOOP CORD AROUND HUB AND SECURE WITH A KNOT.

ARRANGEMENT OF DIAL DRIVE CORD



ARRANGEMENT OF FM TUNER DRIVE CORD

LENGTH OF CORD APPROX 2 FT.



Philips CM100A

WAVE RANGE SWITCH POSITIONS

PH Position—Phonograph operation.
AM Position—Standard broadcast range from 540 kc. to 1730 kc.
31m Position—Shortwave Range from 9.5 to 9.8 Mc.
25m Position—Shortwave Range from 11.5 to 12.1 Mc.
FM Position—FM Range from 88 Mc. to 108.5 Mc.

INTERMEDIATE FREQUENCY: AM = 455 kc.
FM = 10.7 Mc.

AUDIO OUTPUT: 8 watts undistorted
13 watts maximum

CURRENT DRAIN: 1.5 ampere maximum.

SPEAKER

12½" permanent magnet dynamic. DC voice coil resistance = 5 ohms. Impedance at 400 cycles = 6 ohms.

SPECIAL FEATURES

BUILT-IN ANTENNA

The built-in antenna consists of a folded di-pole type, fastened to the rear of the cabinet. For best results an external FM antenna should be mounted on a mast above the roof or any other suitable high place. Connect a 300 ohm line between the FM external antenna and terminals A1-A2 on the receiver. The recommended maximum length of the line is 100 feet. Disconnect the built-in antenna when an external antenna is used.

The use of an outside FM antenna of the folded di-pole type cannot be too strongly recommended. It is imperative if reception from distant FM stations is desired. The external FM antenna and transmission line act as an aerial for AM reception, so that only the FM antenna installation is necessary for receiving both FM and AM signals.

TONE CONTROL SWITCH

As the switch is turned from left to right the seven positions of the switch vary the tonal response as follows:

- Position 1—Normal bass response with a large reduction in treble response.
- Position 2—Normal bass response with a small reduction in treble response.
- Position 3—Normal high fidelity reproduction.
- Position 4—Fidelity reproduction with a slight accentuation of bass response.
- Position 5—Fidelity reproduction with a greater emphasis of bass response.
- Position 6—Accentuated bass response with a small reduction in treble response.
- Position 7—Accentuated bass response with a large reduction in treble response.

RECORD CHANGER

The Record changer unit is a Webster Model 356 capable of operating at 33½, 45 and 78 R.P.M. The turntable is driven by a 117 volt motor of a suitable frequency for the cycle rating of the version.

The Tilt-o-matic tone arm incorporates a Webster V42 crystal cartridge with a Tandem Tip nylon needle. The needle has a .001" tip for microgroove records and a .003" tip for standard groove records. For further data on the record changer refer to the Webster 356 Service Manual.

HOW TO REMOVE THE CHASSIS

1. Remove the four control knobs.
2. Disconnect the antenna and ground leads.
3. Disconnect the phono, signal and power cables.
4. Remove the three nuts and washers located along the lower edge of the rear of the RF chassis.
5. Slide the RF chassis out of the cabinet.
6. Unsolder the speaker leads.
7. Reach under the center of the front skirting of the cabinet and slide the indicator light off the mounting bracket. Pull the light and socket up through the hole in the lower shelf.
8. Remove the four mounting screws located on the flanges of the power chassis and lift the chassis out of the cabinet.

TUBE SOCKET VOLTAGES

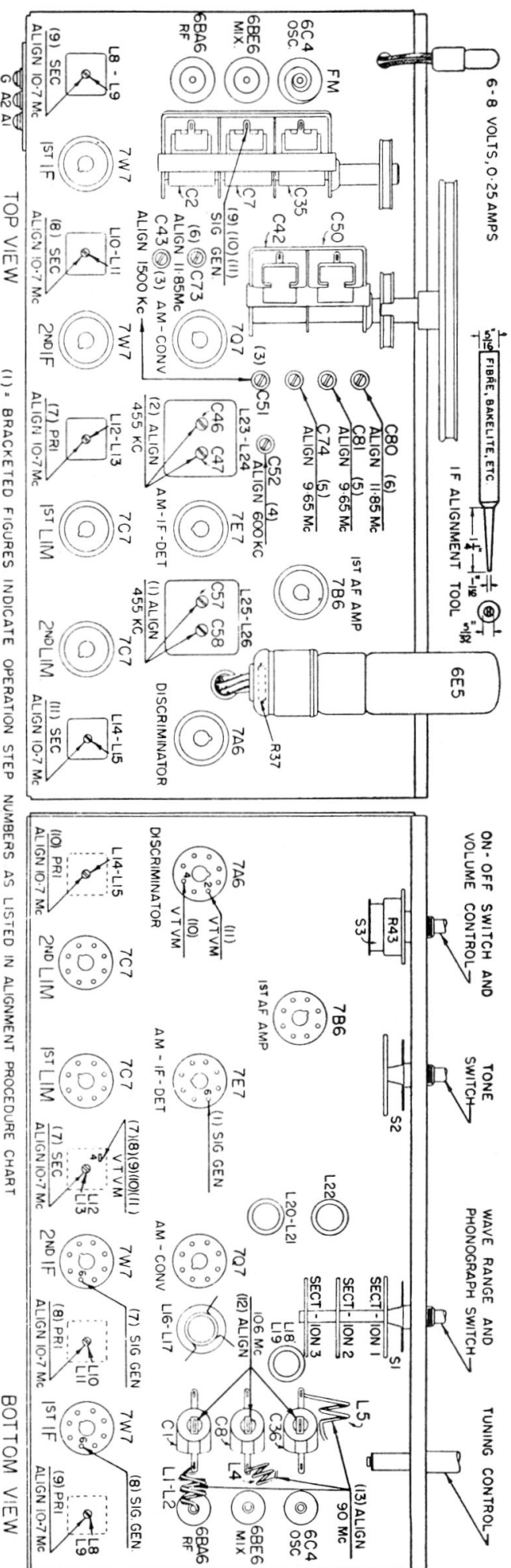
Pin No.	6BA6 H.F.	6BE6 Mix.	6C4 Osc.	7W7 1st IF	7W7 2nd IF	7C7 1st Lim.	7C7 2nd Lim.	7A6 Disc.	7Q7 Con.	7E7 IF & Det.	7B6 1st AF	7B6 2nd AF	7B6 Inv.	(2) 6V6GT PP Out	5U4G Rect.	6E5 Eye
1	—	—	—	6.3 ac	6.3 ac	0	0	0	0	0	0	0	0	0	—	6.3 ac
2	0	0	0	255	260	240	190	—	275	275	185	150	175	0	300	—
3	0	0	0	160	145	60	60	—	105	—	—	—	—	290	—	—
4	6.3 ac	6.3 ac	6.3 ac	2.3	3.8	0	0	—	—	—	—	1.25	70	275	300 ac	275
5	270	255	170*	0	0	0	0	0	0	80	0	0	0	—	—	0
6	85	75	—	—	—	—	—	—	—	—	0	0	0	—	300 ac	0
7	0	—	0	2.3	3.8	0	0	0	0	0	1.45	1.25	70	6.3 ac	—	—
8	—	—	—	0	0	6.3 ac	6.3 ac	6.3 ac	6.3 ac	6.3 ac	6.3 ac	6.3 ac	6.3 ac	16	300	—

*Plate voltage of 6C4 Oscillator Tube to be measured at the junction of R29, C39 and the R.F. Choke.

All voltages are measured to the chassis and are D.C. positive except where noted. Readings may vary plus or minus 10% due to line voltage fluctuations. All tubes must be in their sockets during test. Tests made at 117 volts 25/60 cycles, with a 20,000 ohms per volt meter. Receiver set for AM reception for AM and audio readings. Receiver set for FM for FM readings. No input signal applied.

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EQUIPMENT REQUIRED

Signal Generator: A signal generator or generators capable of supplying AM signals from 450 kc. to 1800 kc. and 10.7Mc, also FM signals from 87 to 109 Mc.

If the FM signal generator is not available, the antenna, oscillator and RF interstage circuits can readily be aligned with an AM signal generator having output frequencies of from 87 to 109 Mc.

Output Meter: A power output meter, or a high resistance AC volt meter.

Vacuum Tube Voltmeter: A vacuum tube voltmeter capable of reading ± 3 , ± 10 and ± 30 volts.

Alignment Tools: To adjust the core slugs of the FM discriminator and IF transformers in alignment operation steps 7 to 11 inclusive, it is imperative that the proper IF alignment tool be used. A description of the IF alignment tools is given on the alignment points diagram. The FM-RF trimmers of operation step 9 must be adjusted with a non-metallic screw driver, which can be made from a $\frac{3}{16}$ " plastic rod. The tools are easily made by turning the material to size on a lathe and using a file to complete the flat surfaces. Never use alignment tools having any metal in their construction.

ALIGNMENT PROCEDURE AND EQUIPMENT CONNECTIONS

SIGNAL GENERATOR (or generators)

Allow a sufficient length of time for the signal generator and receiver to become thermally stable before making any tests. Connect the common lead of the signal generator to the chassis base as close as possible to the input signal connection for all operations except the FM-RF alignment. Always be sure to use the specified capacitance or resistance in series with the output lead of the generator as indicated in the alignment chart. Series components are to be connected as close as possible to the receiver.

OUTPUT METER (for AM output indication)

If a power output meter is used, adjust it for 6 ohms impedance and connect it in place of the speaker voice coil. Do not exceed a 500 milliwatt reading. If an AC voltmeter is used it should be connected across the voice coil, and the output kept below 1.75 volts during alignment. Regulate the signal generator attenuator to keep the output below the above limit.

VACUUM TUBE VOLTMETER (for FM alignment)

Connect the common lead of the VTVM to the receiver chassis. The zero adjustment of the VTVM must be checked regularly. Do not exceed 1.5 volts AVC voltage during RF and IF alignment. This is to be controlled by regulating the signal generator's output.

RECEIVER

Set the tone switch to the third position (full response position). Adjust the dial pointer to correspond to the alignment mark on the dial, when the gang tuning capacitor is fully meshed. The alignment mark is the end of the horizontal lines at the 550 kc. end of the dial scale. Set the volume control to the maximum adjustment for all AM alignment. On FM alignment the volume control is normally set so that the alignment signal may be heard, when using an FM signal generator.

ALIGNMENT PROCEDURE CHART

Operation Steps	SIGNAL GENERATOR				METER			RECEIVER				
	Series Component	Connection To Receiver	Frequency	Modulation	Type	Connection To Receiver	Scale	Range Switch	Tuning Capacitor	See Notes	Adjust in Stated Order	Adjust For
1	.05 mf.	7E7 Pin No. 6	455 kc.	400c AM at 30%	Output	In place of voice coil	6 ohms	AM	Min. Cap.	A	C58-C57	Max. Output
2	.05 mf.	Stator of C42	455 kc.	400c AM at 30%	Output	In place of voice coil	6 ohms	AM	Min. Cap.		C47-C46	Max. Output
3	100 mmf.*	Antenna Terminal A1	1500 kc.	400c AM at 30%	Output	In place of voice coil	6 ohms	AM	1500 kc.		C51, C43	Max. Output
4	100 mmf.*	Antenna Terminal A1	600 kc.	400c AM at 30%	Output	In place of voice coil	6 ohms	AM	600 kc.	B	C52	Max. Output
5	100 mmf.*	Antenna Terminal A1	9.65 Mc.	400c AM at 30%	Output	In place of voice coil	6 ohms	31M	9.65 Mc.		C81-C74	Max. Output
6	100 mmf.*	Antenna Terminal A1	11.85 Mc.	400c AM at 30%	Output	In place of voice coil	6 ohms	25M	11.85 Mc.		C80-C73	Max. Output
7	200 mmf.	2nd IF, 7W7, Pin 6	10.7 Mc.	None	VTVM	Pin 4 of L13	—3 V	FM	Max. Cap.	C	L13 Secondary L12 Primary	Max. A.V.C. Voltage
8	200 mmf.	1st IF, 7W7, Pin 6	10.7 Mc.	None	VTVM	Pin 4 of L13	—3 V	FM	Max. Cap.	D	L11 Secondary L10 Primary	Max. A.V.C. Voltage
9	None	Stator Lug of C7	10.7 Mc.	None	VTVM	Pin 4 of L13	—3 V	FM	Max. Cap.	D	L9 Secondary L8 Primary	Max. A.V.C. Voltage
10	None	Stator Lug of C7	10.7 Mc.	None	VTVM	Pin 4 of 7A6	—30 V	FM	Max. Cap.	E	L14 Primary	Max. Discrim. Voltage
11	None	Stator Lug of C7	10.7 Mc.	None	VTVM	Pin 2 of 7A6	—3 V	FM	Max. Cap.	F	L15 Secondary	Zero Voltage
12	150 ohm resistor in each lead	Antenna Terminals A1-A2	106 Mc.	400c FM at 30%	VTVM	Pin 4 of L13	—3 V	FM	106 Mc.	G-H	C36, C8, C1	Max. A.V.C. Voltage
13	150 ohm resistor in each lead	Antenna Terminals A1-A2	90 Mc.	400c FM at 30%	VTVM	Pin 4 of L13	—3 V	FM	90 Mc.	I	L5, L4, L2	Max. A.V.C. Voltage

*or a Standard Dummy Antenna with a 200 mmf. condenser in series.

ALIGNMENT NOTES

- After step 2 has been completed do not readjust C58 and C57.
 - Repeat operation 3 and 4 until no further improvement results.
 - Secondary is adjusted through the bottom of transformer, primary through the top.
 - Secondary is adjusted through the top of the transformer, primary through the bottom. After completing operation 9, increase the signal generator output until the A.V.C. voltage is —3 volts. Leave the signal generator at this increased setting for operation steps 10 and 11.
 - Primary is adjusted through the bottom of the transformer. Discriminator voltage should be approx. —10.5 volts.
 - Secondary is adjusted through the top of the transformer. After completing operation 11, repeat operation 10, then repeat operation 11. Continue this procedure until no further improvement results. Always perform operation 11 last. After the last repetition of operation 11, the discriminator should be checked by one of the following methods:
 - Method 1—If the calibrations of the signal generator used for IF and discriminator alignment are sufficiently accurate, swing the signal to 75 kc. higher and 75 kc. lower in frequency than the 10.7 Mc. intermediate frequency, and note the plus and minus discriminator voltages. If these voltage values are not approximately equal in magnitude (within 6%) repeat steps 10 and 11.
 - Method 2—This method is used if the signal generator calibration is not accurate enough for method 1. Connect the VTVM across the end of the de-emphasis network i.e., from junction of R27 and C33 to chassis) and tune the receiver to the signal of the local FM station until the VTVM reads zero. Then adjust the tuning of the receiver, to the left and right of the zero VTVM point, for maximum readings on the VTVM. If the voltage peaks are not approximately equal in magnitude (within 5%), the discriminator has not been properly aligned, thus requiring the realignment of steps 10 and 11.
 - A balanced output FM modulated signal generator is recommended for the RF alignment. Tune the receiver to the center response of the three audio responses. If a suitable FM signal generator is not available, the RF or "front-end" alignment can be done quite well with an AM signal generator capable of supplying frequencies from 87 to 109 Mc. The trimmers and coils are adjusted as in the alignment chart for maximum A.V.C. reading on the VTVM.
- The use of a signal generator for steps 12 and 13 is recommended only if the available generator is sufficiently accurate to insure correct frequency settings. Otherwise, an alternate procedure employing FM station signals in place of a signal generator is recommended. For adjustments at the high frequency end of the band, use the station nearest 105 Mc. For adjustments at the low frequency end of the band, use the station nearest 90 Mc. Make certain the frequency of the FM stations used in alignment, in order that the receiver may be logged correctly. If only one FM station is available in your community it will have to suffice for RF alignment.
 - Check all coil adjustments with a tuning wand. If inserting the brass end in or near the coil increases the A.V.C. reading, spread the coil turns. If the powdered-iron end increases the A.V.C. reading, compress the coil turns. If both ends of the tuning wand cause a decrease in the VTVM reading, the coil is correctly adjusted. Do not change the coils excessively as only a small adjustment is required at these frequencies.

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