



### BROADCAST BAND —“AM”—ALIGNMENT PROCEDURE

1. Disconnect leads from FM-AM antenna terminal strip (labeled FM-FM-AM-AM) at back of chassis; also disconnect speaker leads and phono plugs. Remove chassis and speaker. If desired, allow speaker to remain in cabinet and connect to receiver by extension leads.
2. Stand chassis on one edge so that all trimmers are accessible.
3. Loop antenna leads (on cabinet) do not have to be connected to terminal strip on chassis while I. F. stages are being aligned. Before starting alignment of Ant., R.F., and Osc. stages, reconnect all antenna leads to chassis—do not attempt to use extension leads; place chassis as close as required to cabinet so that connections may be made direct to antenna terminal strip at back.
4. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 55 on the dial. If it is set incorrectly, hold tuning shaft steady and reposition pointer.
5. Connect on output meter across speaker voice coil, or from plate of 6V6GT tube to chassis through a 0.1 Mfd. condenser.
6. Connect ground lead of signal generator to the receiver chassis.
7. Set volume control of maximum volume position and use a weak signal from the signal generator.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
.1 MFD. Condenser	Lug on trimmer No. 6 at top of gang (see figure below for location of trimmer).	455 KC	AM Broadcast (Middle)	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
					3-4	1st I.F.	
260 MMFD. Mica Condenser	External Antenna Clip on Cabinet	1500 KC	AM Broadcast (Middle)	1500 KC	5	Broadcast Oscillator	Adjust for maximum output.
260 MMFD. Mica Condenser	External Antenna Clip on Cabinet	1500 KC	AM Broadcast (Middle)	Tune to 1500 Kc. generator signal.	6	Broadcast R.F.	Adjust for maximum output.
					7	Broadcast Antenna	Adjust for maximum output.
260 MMFD. Mica Condenser	External Antenna Clip on Cabinet	600 KC	AM Broadcast (Middle)	Tune to 600 Kc. generator signal.	8	Adjustable core of Broadcast R.F. Coil.	Adjust for maximum output.
					9	Adjustable core of Broadcast Antenna Coil.	Adjust for maximum output.

Repeat adjustment of trimmers 6 & 7 and slugs 8 & 9 until one no longer detunes the other.

NOTE: It is preferable to check the alignment of the I.F. stages in the FM channel after completing AM alignment.

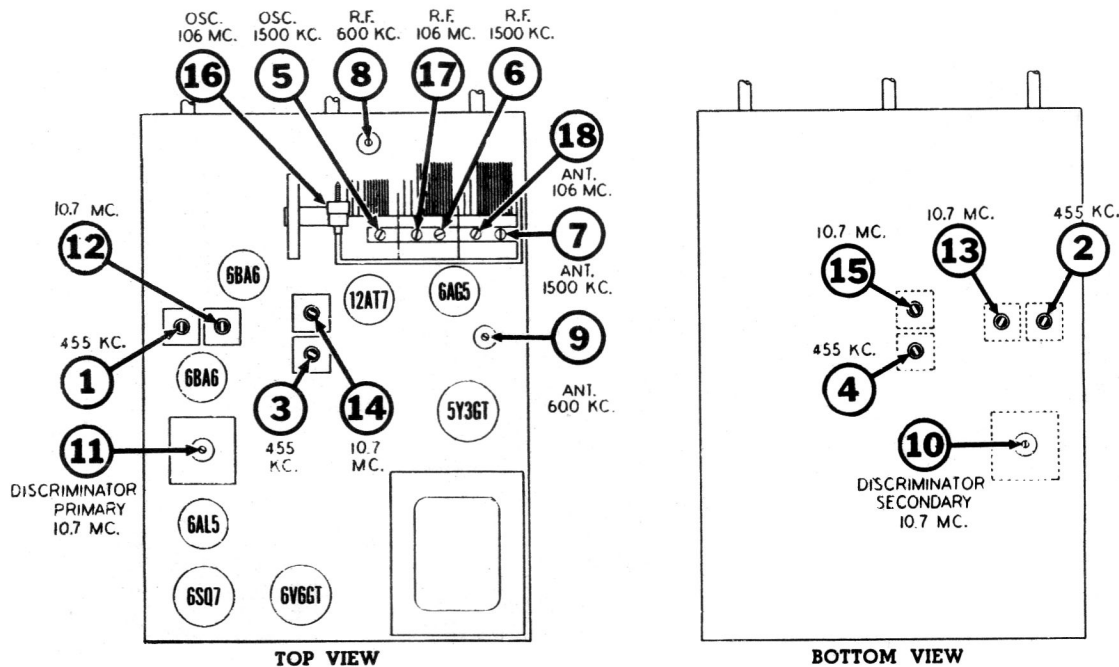
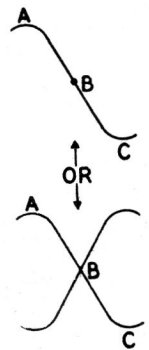


Fig. 1  
TRIMMER LOCATION CHART

This single "S" curve pattern results when scope uses properly phased "sine wave" horizontal deflection voltage.



This double "S" curve pattern results when scope uses properly phased "Sawtooth" horizontal deflection voltage whose frequency is twice the modulation frequency of signal generator.

FIG. 2

### FREQUENCY MODULATION—"FM"—ALIGNMENT PROCEDURE (USING A VACUUM TUBE VOLTMETER AND AM SIGNAL GENERATOR)

**INSTRUMENTS:** Although it is preferable to use on FM generator and an oscilloscope, reasonably accurate alignment is obtainable when using a conventional AM generator and vacuum tube voltmeter providing proper care is exercised in adjusting the discriminator circuit trimmer.

**IMPORTANT:** When using an AM signal generator, it should be capable of producing fundamental frequencies of 10.7 MC and 88 to 108 MC — avoid using an AM generator which produces signals in the 88 to 108 MC range by using harmonics higher than the second. Generators which are dependent upon third, fourth or fifth harmonics for output frequencies of 88 to 108 MC will generally produce undesirable spurious beat signals with the local oscillator in the receiver and alignment will be exceedingly difficult.

1. If alignment of both AM and FM channels is required it is necessary to align the AM channel first, then align the FM channel as instructed in chart below (AM alignment procedure is given on the preceding page).

2. Disconnect leads from FM-AM aerial terminal strip (labelled FM-FM-AM-AM) at back of chassis; also disconnect speaker leads and phono plugs. Remove chassis and speaker. If desired, allow speaker to remain in cabinet and connect to receiver by extension leads.
3. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 88 on the dial. If it is set incorrectly, hold tuning shaft steady and reposition pointer.
4. A specific setting of the receiver volume control is not required. However, it will be found convenient to leave it in the maximum volume position so that alignment signals will be audible even though the output indication is obtained by a V-T voltmeter connected to points in the discriminator circuit.
5. Dress FM circuit leads as short and straight as possible, particularly those in the oscillator circuit. I.F. plate and grid leads should also be kept short and straight.
6. Set band switch to the FM (extreme counter-clockwise) position.

SIGNAL GENERATOR CONNECTIONS	FREQUENCY & TYPE OF MODULATION	VACUUM TUBE VOLTMETER CONNECTIONS	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
Connect high side in series with an .01 Mfd condenser to lug on trimmer No. 17 at top of gang (see illustration on page 8 for location of trimmer). Connect ground lead to receiver chassis in vicinity of 12AT7 tube.	10.7 MC AM signal may be 400 cycle modulated.	Connect common (or ground) terminal of meter to receiver chassis. D.C. probe lead of meter is then connected to pin No. 7 of the 6AL5 tube.	Any position where it does not affect the signal.	11	Discriminator Primary	Adjust these trimmers for maximum meter reading—the output voltage will be of negative polarity.
				12 and 13	2nd I.F.	
				14 and 15	1st I.F.	
Same as above	Same as above	Connect common (or ground) terminal of V-T voltmeter to the junction of resistors 87 and 88 in the discriminator circuit. D.C. probe lead of meter is then connected to junction of resistor No. 67 (18,000 ohms) and condenser No. 70 (.003 MFD.) which are in the discriminator output circuit.  Set meter for operation on its lowest D.C. voltage range.	Same as above	10	Discriminator Secondary	Note that as trimmer No. 10 is rotated a point will be found where voltmeter will swing from a positive to a negative reading or vice versa. Correct setting of trimmer No. 10 is obtained when meter reads zero as trimmer is moved through this point. The adjustment is somewhat critical and considerable care must be exercised to set the trimmer for a zero meter indication.
Recheck adjustment of trimmers No. 10 and No. 11 to be sure that both are set as accurately as possible to obtain the specified output indication.						
Connect generator "high" side in series with a 300 ohm carbon resistor to end terminal marked "FM" on strip at back of chassis. Generator ground lead must connect to next terminal marked "GND".	106 MC AM signal may be 400 cycle modulated.	Connect common (or ground) terminal of meter to receiver chassis. D.C. probe lead of meter is then connected to Pin No. 7 of the 6AL5 tube.	106 MC	16	Oscillator Trimmer	Set trimmer No. 16 to receive 106 MC. signal as indicated by maximum meter reading. <b>IMPORTANT:</b> It will be noted that there are two different settings of trimmer No. 16 at which the 106 MC. signal will be received—always select the trimmer setting which is nearest to the low capacity end of its range.
Same as above	Same as above	Same as above	Tune to 106 MC. generator signal.	17	R.F. Trimmer	Adjust trimmer No. 17 for maximum meter reading.
				18	Antenna Trimmer	Adjust trimmer No. 18 for maximum meter reading.
				14 and 15	1st I.F.	Recheck adjustment of these trimmers for maximum meter reading.
<p>Check calibration and tracking of receiver with input signals of 90 and 98 MC. If difference between dial pointer setting and 90 or 98 MC. calibration mark does not exceed <math>\pm 0.3</math> MC. and antenna and R.F. circuits are tracking properly, then alignment may be considered satisfactory and no further adjustment is necessary. Where the calibration error is greater than <math>\pm 0.3</math> MC. it is advisable to make the following adjustments:</p> <ol style="list-style-type: none"> <li>1. If pointer falls above the 90 MC. calibration point, it will be necessary to slightly spread the windings of the FM oscillator coil. Then repeat the two preceding adjustments of trimmers 16, 17 and 18 at 106 MC. Should it be found impossible to obtain the 106 MC. signal at the proper point on the dial by adjustment of the trimmers it will then be necessary to adjust the spacing of the gang condenser plates.</li> <li>2. If pointer falls below the 90 MC. calibration point, it will be necessary to push the windings together on the FM oscillator coil. Then repeat the two preceding adjustments of trimmers 16, 17 and 18 at 106 MC. Should it be found impossible to obtain the 106 MC. signal at the proper point on the dial by adjustment of the trimmers it will then be necessary to adjust the spacing of the gang condenser plates.</li> <li>3. Correction for mistracking of antenna and R.F. may be accomplished by adjusting coil turns and gang plate spacing in the same manner as outlined above for the oscillator stage.</li> </ol>						

### FREQUENCY MODULATION—"FM"—ALIGNMENT PROCEDURE

(USING AN OSCILLOSCOPE AND FM "SWEEP" GENERATOR)

**INSTRUMENTS:** Alignment of the FM circuits in this receiver can be most conveniently accomplished with an FM signal generator. When using this type generator, the output indicator must be an oscilloscope.

1. If alignment of both AM and FM channels is required it is necessary to align the AM channel first, then align the FM channel as instructed in chart below (AM alignment procedure is given on page 8).
2. Disconnect leads from FM-AM aerial terminal strip (labelled FM-FM-AM-AM) at back of chassis; also disconnect speaker leads and phono plugs. Remove chassis and speaker. (If desired, allow speaker to remain in cabinet and connect to receiver by extension leads.)
3. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 88 on the dial.

If it is set incorrectly, hold tuning shaft steady and reposition pointer.

4. A specific setting of the receiver volume control is not required, however, it will be found convenient to leave it in the maximum volume position so that alignment signals will be audible even though the output indication is obtained by an oscilloscope connected to points in the discriminator circuit.
5. Dress FM circuit leads as short and straight as possible, particularly those in the oscillator circuit. I.F. plate and grid leads should also be kept short and straight.
6. Set band switch to the FM (extreme counter-clockwise) position.
7. Set tone control to fully counter-clockwise position.

SIGNAL GENERATOR CONNECTIONS	FREQUENCY & TYPE OF MODULATION	OSCILLOSCOPE CONNECTIONS	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
Connect high side in series with an .01 Mfd condenser to lug on trimmer No. 17 at top of gang (see illustration on page 8 for location of trimmer). Connect ground lead to receiver chassis in vicinity of 12AT7 tube.	<b>10.7 MC</b> FM signal should preferably be modulated $\pm 400$ KC.	Connect vertical amplifier "high" lead to junction of resistor No. 67 (18000 ohms) and condenser No. 70 (.003 Mfd.) which are in discriminator output circuit. Connect scope ground lead to receiver chassis.  Set vertical amplifier of scope for maximum amplification. Where FM signal generator provides an output voltage for synchronization, connect this voltage to "sync" terminals of the scope.	Any position where it does not affect the signal.	10	Discriminator Secondary	Before attempting to adjust trimmer No. 10, set trimmers No. 11, 12, 13, 14 and No. 15 for approximately maximum sound output from the speaker (output meter not required). This is done to obtain sufficient signal for an oscilloscope pattern of desirable amplitude when making the following discriminator trimmer adjustment.  Adjust setting of trimmer No. 10 until a pattern similar to that shown in Fig. 2 appears on the screen. If pattern does not remain stationary operate sweep frequency control on 'scope and also "sync" control until desired result is obtained. Correct setting of trimmer No. 10 is obtained when crossover point "B" (Fig. 2) is centrally located in both the horizontal and vertical directions; in addition that portion of the curve between "A" and "C" should be as linear (straight) as possible.
				11	Discriminator Primary	
				12 and 13	2nd I.F.	
				14 and 15	1st I.F.	
Same as above	Same as above	Same as above	Same as above	Recheck adjustments of trimmers No. 10 and No. 11 to be sure that both are set as accurately as possible to obtain correct cross-over point or symmetry of pattern.		
Connect generator "high" side in series with a 300 ohm carbon resistor to end terminal marked "FM" on strip at back of chassis. Generator ground lead must connect to next terminal marked "GND"	<b>106 MC</b> FM signal should preferably be modulated $\pm 400$ KC.	Same as above	106 MC	16	Oscillator Trimmer	Adjust trimmer No. 16 to obtain the symmetrical pattern shown in Fig. 2. Correct setting of trimmer No. 16 is obtained when cross-over point in pattern is centrally located.  <b>IMPORTANT:</b> It will be noted that there are two different settings of trimmer No. 16 at which the desired 'scope pattern can be obtained—always select the trimmer setting which is nearest to the low capacity end of its range.
				17	R.F. Trimmer	
				18	Antenna Trimmer	
				14 and 15	1st I.F.	
Same as above	Same as above	Same as above	Tune to 106 MC. generator signal.	Recheck adjustment of these trimmers for maximum amplitude of pattern.		

Check calibration and tracking of receiver with input signals of 90 and 98 MC. If difference between dial pointer setting and 90 or 98 MC. calibration mark does not exceed  $\pm 0.3$  MC. and antenna and R.F. circuits are tracking properly, then alignment may be considered satisfactory and no further adjustment is necessary.

Where the calibration error is greater than  $\pm 0.3$  MC. it is advisable to make the following adjustments:

1. If pointer falls above the 90 MC. calibration point, it will be necessary to slightly spread the windings of the FM oscillator coil. Then repeat the two preceding adjustments of trimmers 16, 17 and 18 at 106 MC. Should it be found impossible to obtain the 106 MC. signal at the proper point on the dial by adjustment

of the trimmers it will then be necessary to adjust the spacing of the gang condenser plates.

2. If pointer falls below the 90 MC. calibration point, it will be necessary to push the windings together on the FM oscillator coil. Then repeat the two preceding adjustments of trimmers 16, 17 and 18 at 106 MC. Should it be found impossible to obtain the 106 MC. signal at the proper point on the dial by adjustment of the trimmers it will then be necessary to adjust the spacing of the gang condenser plates.
3. Correction for mistracking of antenna and R.F. may be accomplished by adjusting coil turns and gang plate spacing in the same manner.