

MODELS 6W11,
6W12; ch. 6W1

FM SERVICE

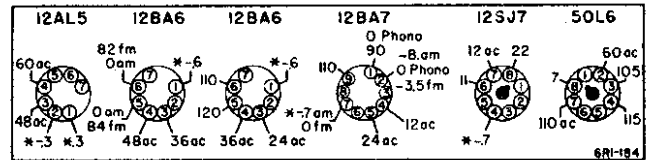
Much of FM service is similar to the usual service necessary for AM receivers such as voltage analysis, parts replacement, etc. The chief differences arise because of the considerably higher frequencies used in FM operation, and because of the different type of second detector needed in FM.

For a complete discussion of the FM Ratio Detector circuit used in this chassis, see Page 2 of the 9A1 Service Manual.

The higher frequencies involved means that more care must be exercised in location and length of leads. Leads tend to act as small inductances or capacities at high frequency and hence may appreciably alter the electrical characteristics of a circuit. For this reason, ground connections should always be maintained as originally made in the set. Also note that in certain circuits, the type by-pass condenser used is critical at the high FM frequencies. When replacing condensers it is important that they be replaced with condensers of identical capacity values, tolerances, temperature coefficients and construction. For example: C19

is a 100 mmfd \pm 5%, - .00075 temperature coefficient, ceramic capacitor. If defective it should be replaced with a 100 mmfd \pm 5%, - .00075 temperature coefficient, ceramic capacitor.

VOLTAGE DATA



- * If taken with a 1000 ohm-per-volt meter, readings will be lower or zero.
- Voltages read between socket terminals and B minus (terminal of Off-On switch).
- Band switch in FM position unless otherwise indicated in chart.
- Measured on 117 Volt AC line.
- Volume control minimum; dial turned to low frequency end.
- Voltages measured with Vacuum Tube Voltmeter. Readings taken with a 100 ohm-per-volt meter will be approximately the same except for those marked with an asterisk * in the voltage chart; these readings will either be lower or zero.

| Symbol | Description | Part No. |
|--------|--|------------|
| R1 | 470,000 Ohms, 1/4 Watt | 60B 2-474 |
| R2 | 1,000 Ohms, 1/4 Watt | 60B 2-102 |
| R3 | 22,000 Ohms, 1/4 Watt | 60B 2-223 |
| R4 | 470 Ohms, 1/4 Watt | 60B 2-471 |
| R5 | 470,000 Ohms, 1/4 Watt | 60B 2-474 |
| R6 | 1,000 Ohms, 1/4 Watt | 60B 2-102 |
| R7 | 47,000 Ohms, 1/4 Watt | 60B 2-224 |
| R8 | 220,000 Ohms, 1/4 Watt | 60B 2-224 |
| R9 | 1,000 Ohms, 1/4 Watt | 60B 2-102 |
| R10 | 390 Ohms, 1/4 Watt | 60B 2-391 |
| R11 | 27,000 Ohms, 1/4 Watt | 60B 2-273 |
| R12 | 6,800 Ohms, 1/4 Watt, 5% | 60B 1-682 |
| R13 | 6,800 Ohms, 1/4 Watt, 5% | 60B 1-682 |
| R15 | 33 Ohms, 1 Watt | 60B 14-330 |
| R16 | 47 Ohms, 1 Watt | 60B 14-470 |
| R17 | 27,000 Ohms, 1/4 Watt | 60B 2-273 |
| R18 | 2 Megohms Tone Control and ON-OFF Switch SW1 | 75B 1-12 |
| R19 | 1 Megohm Volume Control (Tapped at 500,000 Ohms) | 75B 2-12 |
| R20 | 4.7 Megohms, 1/4 Watt | 60B 3-475 |
| R21 | 1.8 Megohms, 1/4 Watt | 60B 3-185 |
| R22 | 470,000 Ohms, 1/4 Watt | 60B 2-474 |
| R23 | 47,000 Ohms, 1/4 Watt | 60B 2-473 |
| R24 | 470,000 Ohms, 1/4 Watt | 60B 2-474 |
| R25 | 150 Ohms, 1/2 Watt | 60B 8-151 |
| R26 | 150,000 Ohms, 1/2 Watt | 60B 2-154 |
| R27 | 10 Ohms, 1/4 Watt | 60B 2-100 |

| Symbol | Description | Part No. | Symbol | Description | Part No. |
|--------|--|----------|--------|--|----------|
| C18a | .004 mfd. min. | 65A 17-1 | C18b | .004 mfd. min. | 65A 17-1 |
| C19 | 100 mmfd. 5%, - .00075 Temp. Coeff., Ceramic | 65B 6-7 | C20 | 100 mmfd. 5%, - .00075 Temp. Coeff., Ceramic | 65B 6-7 |
| C21 | 4 mfd., 50 Volts, Elect. | 67A 4-8 | C22 | .002 mfd., 600 Volts, Paper | 64B 1-14 |
| C23 | .001 mfd., Ceramic | 85B 9-31 | C25 | .005 mfd., 600 Volts, Paper | 64B 1-12 |
| C26 | .002 mfd., 600 Volts, Paper | 64B 1-14 | C27 | .01 mfd., 400 Volts, Paper | 64B 1-25 |
| C28 | 50 mmfd., Ceramic | 65B 6-4 | C29 | .1 mfd., 200 Volts, Paper | 64B 1-30 |
| C30 | .1 mfd., 200 Volts, Paper | 64B 1-30 | C31 | .01 mfd., 400 Volts, Paper | 64B 1-25 |
| C32 | .01 mfd., 400 Volts, Paper | 64B 1-25 | C33 | .0015 mfd. min., Ceramic | 65A 14-2 |
| C34 | .0015 mfd. min., Ceramic | 65A 14-2 | C35 | .01 mfd., 400 Volts, Paper | 64B 1-25 |
| C37 | .05 mfd., 200 Volts, Paper | 64B 1-32 | C38a | 70 mfd., 150 Volts | 67C 6-40 |
| C38b | 30 mfd., 150 Volts | 67C 6-40 | C39 | .1 mfd., 200 Volts, Paper | 64B 1-30 |
| C40 | .01 mfd. min., Ceramic | 65A 10-3 | C41 | .0015 mfd. min., Ceramic | 65A 14-2 |

| Part No. | Description | Part No. |
|----------|------------------------------|-------------|
| SW1 | Switch, On-Off | Part of R18 |
| SW2 | Switch, Band (FM, AM, Phono) | 77B 22 |
| | Diode Filter | 63A3-1 |
| | Rectifier, Selenium | 93A 1-2 |

PHONOGRAPH PARTS

NOTE: Check Record Changer model number and see proper service manual for complete parts list.

- M5 Cartridge (includes needles) 409A 11
- Needle, Phonograph (Long Play) 98A 15-6
- Needle, Phonograph (Standard 78 RPM) 98A 15-7
- M6 Shielded Cable & Plug, Pickup 413A 11-1
- M7 Plug, Pickup Shielded Cable 88A 2-3
- SW3 Switch, Phono Motor On-Off 408A 1

(See caution in Changer Manual)

- Centerpost, for 10" and 12" records G400B 311
- Centerpost, for 7" records G400B 310

CABINET PARTS

| | |
|--|-----------|
| Bracket, Dial Scale Mtg | 15A 169 |
| Cabinet, Plastic | |
| Bottom, less Lid (Ebony 6W11) | 34D 11-14 |
| Bottom, less Lid (Mahog. 6W12) | 34D 11-12 |
| Lid only (Ebony 6W11) | 34D 11-15 |
| Lid only (Mahog. 6W12) | 34D 11-13 |
| Dial Scale, Glass | 21B 51 |
| Escutcheon Overlay | 23C 23-2 |
| Grille Cloth and Baffle | A1688 |
| Hinge | 37A 8-1 |
| Hinge Stud | 27A 17-1 |
| Knobs, Radio | |
| "Volume" and "Tone" (Ebony 6W11) | 33A 21-8 |
| "Volume" and "Tone" (Mahog. 6W12) | 33A 21-7 |
| "Tuning" (Ebony 6W11) | 33B 34-8 |
| "Tuning" (Mahog. 6W12) | 33B 34-6 |
| "Radio-Phono" (Ebony 6W11) | 33B 34-7 |
| "Radio-Phono" (Mahog. 6W12) | 33B 34-5 |
| Rubber Bumper (for cabinet lid) | 12A 3-2 |
| Rubber Strip, Dial Scale Mtg. (8 1/2") | 12A 9-3 |
| Spring Clip, FM Antenna Mtg. | 19A 44 |
| Stay Arm, Lid | 37A 9-1 |

MISCELLANEOUS

| | |
|------------------------------------|----------|
| Background, Dial | 22B 9-2 |
| Bracket, Tuning Sleeve | 15A 289 |
| Bracket, Dial Light | 15A 369 |
| Carton and Fillers | 44B 112 |
| Cover Plate, Chassis | 15B 154 |
| Dial Cord | 50A 1-3 |
| Pilot Light, Mazda No. 10C7 | 81A 2-2 |
| Pilot Light, Socket and Leads | 82A 9-1 |
| Pointer, Dial | 25A 21-1 |
| Sleeve, Tuning (Brass) | 27A 61 |
| Spring, Dial Drum Tension | 19B 1-3 |
| Washer, Felt ("Volume" and "Tone") | 5A 4-8 |
| Washer, Felt (Center Knob) | 5A 4-9 |

CONDENSERS

| | | |
|-----|---|----------|
| C1 | 200 mmfd., Ceramic | 65B 9-15 |
| C2 | .0015 mfd., Ceramic | 65B 9-63 |
| C3 | .005 mfd. min., Ceramic | 65A 10-1 |
| C4a | 15 mmfd. (max.) FM RF | |
| C4b | 485.8 mmfd. (max.) AM RF | A1814 |
| C4c | 15 mmfd. (max.) FM Osc. | |
| C4d | 142.6 mmfd. (max.) AM Osc. (Drum spot welded to gang) | Gang |
| C5 | .01 mfd., 400 Volts, Paper | 64B 1-25 |
| C6 | 3-12 mmfd. Trimmer, Ceramic | 66A 19-2 |
| C7 | 50 mmfd., Ceramic | 65B 6-4 |
| C8 | .005 mfd. min., Ceramic | 65A 10-1 |
| C9 | 35 mmfd., 10% Zero Temp. Coeff., Ceramic | 65B 6-57 |
| C10 | .005 mfd. min., Ceramic | 65A 10-1 |
| C11 | .005 mfd. min., Ceramic | 65A 10-1 |
| C12 | .005 mfd. min., Ceramic | 65A 10-1 |
| C13 | .005 mfd. min., Ceramic | 65A 10-1 |
| C14 | .01 mfd. min., Ceramic | 65A 10-3 |
| C15 | .005 mfd. min., Ceramic | 65A 10-1 |
| C16 | 100 mmfd., Ceramic | |
| C17 | 100 mmfd., Ceramic | |

† Part of encased Diode Filter Unit 63A3-1. This unit consists of R7, C16, C17 (see schematic). If a section of the unit becomes defective, it may be replaced with a component of proper value.

‡ Used only in sets with model numbers ending in "UL".

COILS, TRANSFORMERS, ETC.

| | | |
|-----|---|----------|
| L1 | Antenna, Loop (AM) | 69B 73 |
| L2 | Coil, RF (FM) | 69A 68 |
| L3 | Coil, Oscillator (FM) | 69A 69 |
| L4 | Coil, Oscillator (AM) | 69A 20-3 |
| L5 | Choke, Cathode RF | AA139-5 |
| L6 | Choke, Heater RF | 73A 2-3 |
| L7 | Choke, Heater RF | 73A 2-3 |
| L8 | Choke, Filter | 74A 15-2 |
| L9 | Coil, IF Trap | |
| | Approx. 5 turns (18") of solid No. 22 hook-up wire wound on C39. Solder one end to inside foil lead of C39. | |
| L10 | Antenna, Built in FM | AB155 |
| T1 | Transformer, 1st IF (FM) | 72B 64 |
| T2 | Transformer, 2nd IF (FM) | 72B 65 |
| T3 | Transformer, Ratio Detector | 72B 39 |
| T4 | Transformer, 1st IF (AM) | 72B 66 |
| T5 | Transformer, 2nd IF (AM) | 72B 66 |
| T6 | Transformer, Output | 79A 14-2 |
| M1 | Speaker 5" P.M. Dynamic | 78B 39-1 |
| M2 | Socket and Leads, Phono-Motor | 89A 6-1 |
| M8 | Socket, Phono input | 88A1 |

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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 1 and 2)

Voltage reading in Step 4a is + 1.5 volts.

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 2.

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

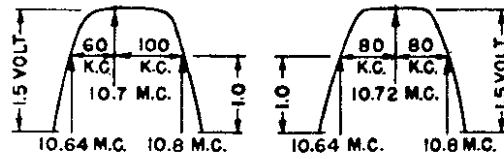


Fig. 1

Fig. 2

TYPICAL SELECTIVITY CURVES

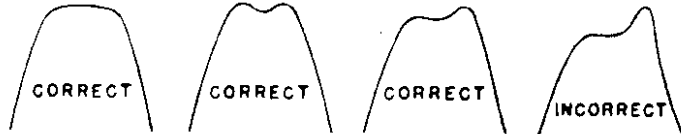


Fig. 3

Fig. 4

Fig. 5

Fig. 6

FM RF ALIGNMENT PROCEDURE

| | Connect Signal Generator | Generator Frequency | Receiver Dial Setting | Output Indicator and Connections | Adjust as Follows |
|---|---|------------------------|-----------------------|--|---|
| 6 | Thru 270 ohm carbon resistor to high side FM antenna terminal | 109 MC† (unmodulated). | Tuning gang wide open | Connect VTVM (DC probe) from point "W" to B minus ("Y"). See Fig. 7. | *G (osc.) for maximum VTVM reading. |
| 7 | | 102 MC† (unmodulated). | 102 MC | " | *Tune in generator signal on receiver. Adj. H (ant.) for max. VTVM reading. |

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

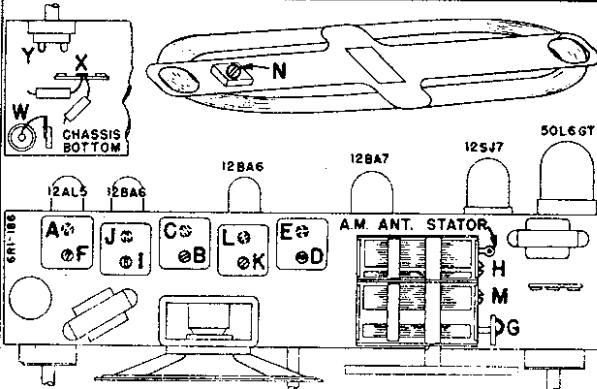
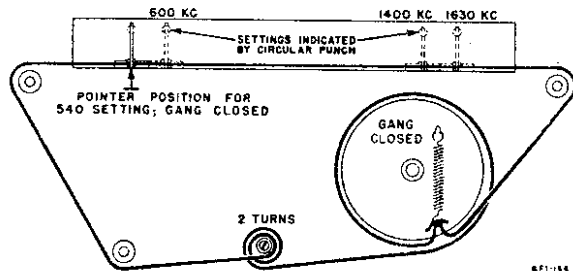


Fig. 7. Trimmer Location



With the gang fully closed, the tip of the pointer clip should be in line with the 1/16" circular punch at the extreme left end of the dial background.

Fig. 8. Dial Stringing and Pointer Setting

AM ALIGNMENT PROCEDURE

- Use regular output meter connected across speaker voice coil.
- Turn receiver Volume Control full on; Tone Control fully clockwise.
- AM loop antenna must be connected and placed in the same relative position to the chassis as when in cabinet.
- Use lowest output setting of signal generator that gives a satisfactory reading on meter.

| | Connect Signal Generator | Dummy Antenna Between Radio and Signal Generator | Signal Generator Frequency | Receiver Dial Setting | Adj. Trimmers in Following Order to Max. |
|--|--|--|----------------------------|-----------------------|--|
| Set Band Switch to Broadcast Position (center) and be sure to follow instructions under heading "Important Preliminary Alignment Steps." Loop antenna must be connected. | | | | | |
| 1 | Gang condenser antenna stator | .1 MFD | 455 KC | Tuning gang wide open | I, J (2nd IF) K, L (1st IF) |
| 2 | AM Antenna Stator | Direct connection | 1620 KC | Tuning gang wide open | M (oscillator) |
| Install chassis and AM loop in cabinet. | | | | | |
| 3 | Place generator lead close to loop of set to obtain adequate signal. No actual connection (signal by radiation). | | 1400 KC | Tune in signal | N (antenna) |

Note: Trimmer adjustments J and L made from underside of chassis.

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IMPORTANT PRELIMINARY ALIGNMENT STEPS

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.

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.

If complete alignment is necessary, it is essential that proper sequence be followed as tabulated in the alignment chart. However, if only the AM band or a portion

of the FM circuit are to be aligned, proceed from that point on the chart being sure to follow all remaining steps.

Adjustments made to FM-IF's at 10.7 MC, will require realignment of AM-IF slug adjustments.

Check pointer position. With tuning gang closed, the tip of the pointer clip should be over the 1/16" circular punch at the extreme left end of the dial background (see stringing diagram).

Use an isolation transformer if available, otherwise connect a .1 mfd. condenser in series with low side of signal generator and attach to B minus of chassis.

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

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 (fully to the left).
- While peaking IF's, keep reducing signal generator output so VTVM reading is approximately +1.5 volts DC with exception of Step #5.
- To avoid splitting the slotted head of iron core tuning slugs in the IF transformers, use a non-metallic alignment tool with a 1/8" wide screwdriver blade. Do not exert undue pressure as threads of slugs may strip.
- Speaker must be connected during alignment.
- FM antenna disconnected during alignment.

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

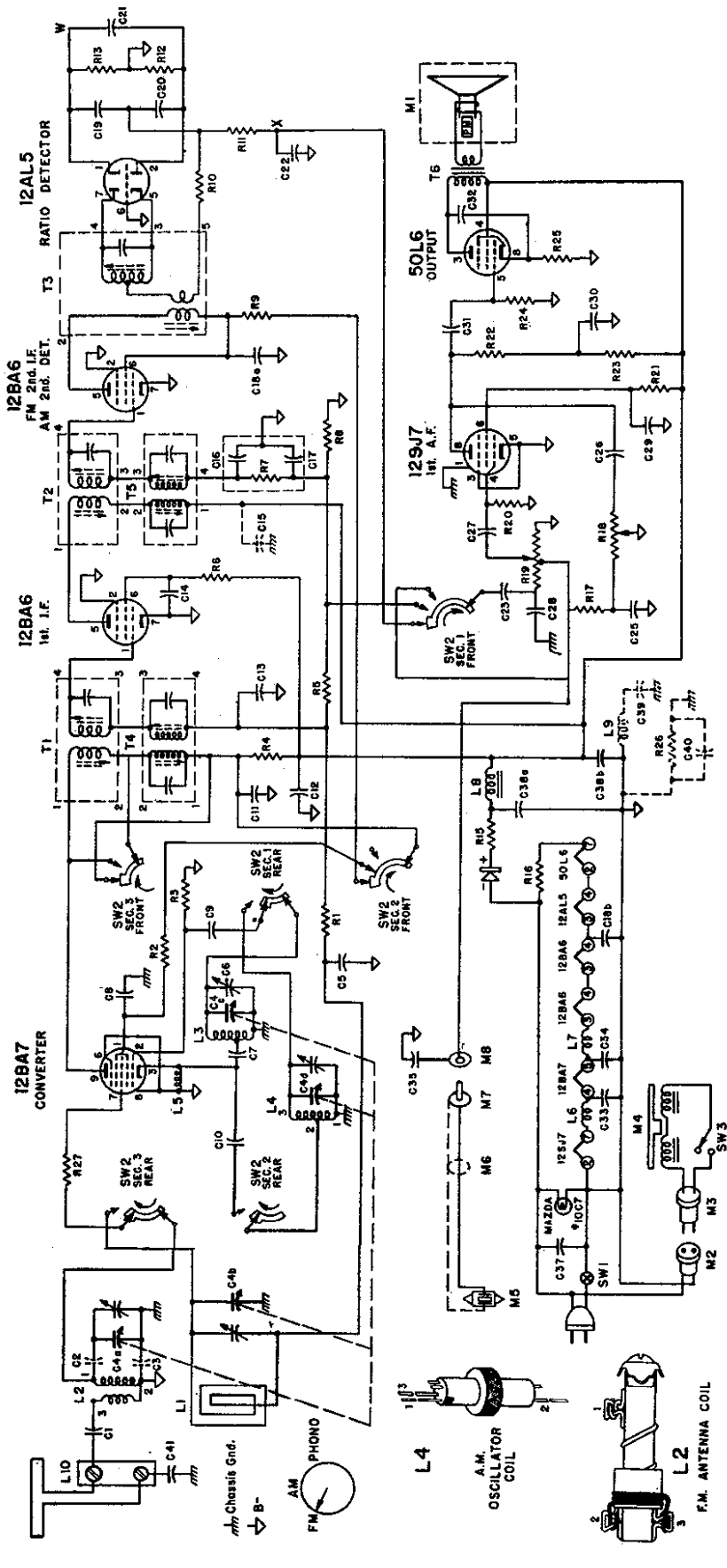
| | Connect Signal Generator | Generator Frequency | Receiver Dial Setting | Output Indicator and Special Connections | Adjust as Follows (very carefully) |
|---|---|--|-----------------------|--|---|
| 1 | Thru .001 cond. to 2nd IF grid (pin #1 of 12BA6 2nd IF) | 10.7 MC unmodulated. | Tuning gang wide open | Connect VTVM (DC probe) from point "W" to B minus ("Y"). (See Fig. 7.) | "A" (ratio detector primary) for maximum reading on VTVM. |
| 2 | **Thru .001 cond. to 1st IF grid (pin #1 of 12BA6 1st IF) | " | " | " " | Iron cores "B" and "C" (2nd IF trans.) for maximum reading on VTVM. |
| 3 | High side FM antenna terminal | " | " | " " | "D" and "E" (1st IF) for maximum on VTVM. Re-adjust A, B, C, D, E, 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 on next page. 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 5 or 6, 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 6. | | | |
| 5 | " | Center of IF selectivity curve per step 4d above. See "EXAM- PLE" on next page. | Tuning gang wide open | Connect VTVM (DC probe) from point "X" to B minus ("Y"). (See Fig. 7.) | Iron core "F" (ratio detector secondary) for zero voltage reading on VTVM. (The correct zero point is located between a positive and a negative maximum.) |

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.

Note: Trimmer adjustments A, C, and E made from underside of chassis.

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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 this merely set the signal generator dial as follows and align exactly as explained in the alignment instructions.

Where alignment chart specifies 109 MC., set signal generator to highest available frequency of the following:

- 109. MC
- 54.50 MC
- 36.33 MC

Where alignment chart specifies 102 MC., set signal generator to highest available frequency of the following:

- 102. MC
- 51. MC
- 34. MC

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

CAUTION

Do not connect a ground wire to this radio chassis.