Service Manual
THE FISHER

250-T™ 400-T™
CHASSIS SERIAL NUMBERS BEGINNING 10001
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PRICE $1.00

FISHER RADIO CORPORATION • 11-40 45TH ROAD • LONG ISLAND CITY, N.Y. 11101
REQUIRED TEST EQUIPMENT

The following equipment is required to completely test and align modern high-fidelity amplifiers, tuners, and receivers:

- Line Voltage Autotransformer or Voltage Regulator
- DC Vacuum Tube Voltmeter
- Accurately Calibrated AC Vacuum Tube Voltmeter
- Oscilloscope (10MHz to 100 kHz Minimum)
- Low-Distortion Audio Line Wavemeter Generator
- Intermodulation Distortion Analyzer
- Harmonic Distortion Analyzer
- 2 - Load resistors, 8-Ohms, 100 Watt (Minimum Rating)
- AM/FM Signal Generator
- 10.7 MHz Sweep Generator
- Multiple Generator (preferably with RF output – FISHER 2000)
- 455 kHz Sweep Generator
- Ferrite Test Loop Stick
- 2 - Full Range Speakers for Listening Tests
- Stereo Source – Turntable, Tape Recorder, etc.
- Soldering Iron with Small Tip, Fully Insulated from AC Line
- Suction Desoldering Tool

CAUTION: This precision high-fidelity instrument should be serviced only by qualified personnel, trained in the repair of transistor equipment and printed circuitry.

Many of these items are included only as a reminder—they are normal procedures for experienced technicians. Shortcuts may be taken, but these often cause additional damage to transistors, circuit components, or printed circuit boards.

SOLDERING: A well-tinned, hot, clean soldering iron tip will make soldering easier, without causing damage to the printed circuit board or the components mounted on it. Regular use of a sponge cleaner will maintain a clean soldering surface. The heat available at the tip, not the wattage of the iron, is important. Some 50-watt irons reach temperatures of 1,000°F, while others will hardly melt solder. Small-diameter tips should be used for single solder connections, pyramidal and chisel tips for large areas. Always disconnect the AC power cord from the line when soldering. Turning the power switch OFF is not sufficient. Power-line leakage paths, through the heating element of the iron, may destroy transistors.

PARTS REMOVAL: If a part is not being returned for warranty factory replacement, it may be cut out with diagonal cutting pliers to make removal easier. Multiple terminal parts, such as IF transformers, or electrolytic capacitors, should be removed using special de-soldering tips made especially for this purpose. Removing solder from terminals reduces the possibility of breaking the printed circuit board when the part is removed.

ACCIDENTAL SHORTS: A clean working area, free of metal particles, screws, etc., is an important preventative in avoiding servicing problems. Screws, removed from the chassis during servicing, should be stored in a box until needed. While a set is operating, it takes only an instant for a base-to-collector short to destroy a transistor (and others direct-coupled to it). In the time it takes for a dropped machine screw, washer, or screwdriver, to contact a pair of socket terminals (or terminal chassis), a transistor can be ruined.

SOLID-STATE DEVICES: Integrated Circuits contain the equivalent of many circuit parts, including transistors, diodes, resistors, and capacitors. The preferred troubleshooting procedure requires isolating the troubles to one stage using AC signal tracing methods. Once the suspected stage is located, the DC voltages at the input and output leads are measured to give an accurate indication of the operating conditions of the IC. DO NOT use an ohmmeter to check continuity with the IC mounted on the printed circuit board. Forward biasing the internal junctions within the IC may burn out the transistors. Do not replace a defective IC until all external resistors, capacitors, and transformers are checked first, to prevent the replacement IC from failing immediately due to a defect in the connecting components. Solder and unsolder each lead separately using a pliers or other heat sink on the lead to prevent damage from excessive heat. Check that the leads are connected to the correct locations on the printed circuit board before turning the set on.

Whenever possible, a transistor tester should be used to determine the condition of a transistor or diode. Ohmmeter checks do not provide conclusive data, and may even destroy the junctional within the device. Never attempt to repair a transistor power amplifier module until the power supply filter-capacitors are fully discharged.

If an output or driver transistor becomes defective (open or shorted), always check ALL direct-coupled transistors and diodes in that channel. In addition, check the bias pot, and other parts in the bias network, before installing replacement transistors. All output and driver transistors in one channel may be destroyed if the bias network is defective. After parts replacement, always check the bias adjustment for specified idling current.

In some applications, replacement of transistors must be made from the same beta group as the original type. The beta group is indicated by a colored marking on the transistor. Be sure to include this information when ordering replacement transistors.

When mounting a replacement power transistor, be sure the bottom of the flange, mica insulator, and the surface of the heat sink, are free of foreign matter. Dust and grit will prevent flat contact, reducing heat transfer to the heat sink. Metallic particles can puncture the insulator, cause a short, and destroy the transistor.

Silicone grease must be used between the transistor and the mica insulator, and between the mica and the heat sink, for best heat transfer. Use Dow-Corning DC-3, or an equivalent compound made for power transistor heat conduction.

Use care when making connections to speakers and output terminals. To reduce the possibility of shorts, lugs should be used on the exposed ends, or stranded wire should be tinned to prevent frayed wire ends. Current in the speakers and output circuitry is quite high — poor contacts, or small sized wire, can cause significant power losses in the system. For wire lengths greater than 30 feet, 16 AWG, or heavier, should be used.

VOLTAGE MEASUREMENTS: All voltages are measured with the line voltage adjusted to 120 volts. All measured voltages are ±10%. DC voltages are measured to ground with a VTM, with no signal input unless otherwise noted. AC signal voltages are measured under the conditions specified on the schematic.

ALIGNMENT PROCEDURES: DO NOT attempt realignment unless the required test equipment is available, and the alignment procedure is thoroughly understood.

BECAUSE ITS PRODUCTS ARE SUBJECT TO CONTINUOUS IMPROVEMENT, FISHER RADIO CORPORATION RESERVES THE RIGHT TO MODIFY ANY DESIGN OR SPECIFICATION WITHOUT NOTICE AND WITHOUT INCURRING ANY OBLIGATION.
REMOVING DRESS PANEL
(1) Disconnect AC power cord.
(2) Remove the screws which hold the top and bottom covers to the chassis. (On 260-1, 24H chassis, also remove screws holding top cover to heat link.) Remove the covers.
(3) Gently pull the eight leads off the terminal pins behind the TUNE-MATIC dial assembly. These push-on terminal leads connect the panel-mounted dial assembly to the chassis circuitry and must be disconnected in order to remove the dress panel. Label each lead with its associated pin location to make replacement easier later.
(4) Gently pull all knobs off the front dress panel control shafts. Remove the hex nuts from the shafts and remove panel by pulling forward over the shafts. (Reverse procedure for reassembly.)

REPLACING DIAL LAMPS
(1) Remove dress panel. Refer to REMOVING DRESS PANEL procedure.
(2) Snap out the defective lamp from the spring clip. Place the new lamp in the socket making sure the unsoldered side of the lamp faces the edge of the dial glass.
(3) Replace the front dress panel and secure with the hex nuts removed previously. Replace the knobs on the control shafts.
(4) Reconnect the terminal leads (removed previously) to their respective terminal pins behind the TUNE-MATIC assembly.

REMOVING DIAL GLASS ASSEMBLY
(1) Remove dress panel. Refer to REMOVING DRESS PANEL procedure.
(2) Gently pull the four leads from the terminal pins on the top rear of the meter and label each lead with its associated pin location for easy replacement later.
(3) Gently pull the two pairs of dial lamp leads from the terminal pins on the rear panel.
(4) Gently pull the pair of meter leads from the terminal pins on the rear panel.

NOTE: These ten push-on terminal leads which connect the dial glass assembly to the chassis must be disconnected in order to remove the dial glass panel.
(5) Remove the screws holding the dial glass panel. Remove the panel with the dial glass, pilot lamps, and meter attached by tilting out the bottom of the panel and sliding downward. Be careful to avoid deforming dial pointer.
(6) Reverse the procedure for reassembly.

REPLACING DIAL ASSEMBLY
(1) Remove dress panel. Refer to REMOVING DRESS PANEL procedure.
(2) Remove dial glass assembly. Refer to REMOVING DIAL GLASS ASSEMBLY procedure.
(3) Gently pry the meter off the dial glass panel, and scrape the residual adhesive off the panel.
(4) Peel the backing from one side of the replacement adhesive mounting panel (FRC Part No. 921A2081), and affix it to the replacement meter. Feel the backing film that remaining side of the adhesive, align the meter face over the dial panel contour, and firmly press the meter to the back of the glass panel.
(5) Remove the dial glass assembly.
(6) Reinstall the dress panel. Reconnect all leads (removed previously) to their respective terminal pins.
(7) Check meter calibration. Refer to TUNING METER CALIBRATION procedure.
(8) Remount top and bottom covers removed previously.

REPLACING METER
(6) Run the dial cord through the slot in the rim of the drive-drums and set in the underside of groove 3.
(7) Pull dial cord last and wrap 2 turns of COW around turning shaft. See Figure 2.
(8) Guide the dial cord under and around pulley "A", across to the left side, down and around pulleys "B" and "C". Keep the dial cord taut during this procedure.
(9) Rotate the drive-drum to its maximum CW position, allowing the cord to wind onto the drive-drum. Keep the dial cord taut during this procedure.
(10) Guide the dial cord under the drive-drum and into groove S. Bring the dial cord around groove S and into the slot in the drive-drum. See Figure 3.
(11) With the machine screws loosened, place the cord under the braded washer, pull the dial cord taut, and tighten the screws.
(12) Turn the tuning shaft to rotate the drive-drum fully CW and fully CW to disengage tensioning along the dial cord.
(13) Repeat steps (11) and (12) until dial spring is tensioned.
(14) Remount dial glass panel assembly using the four mounting screws removed previously.
(15) Reconnect the ten leads (removed previously) to their respective terminal pins.
(16) Place the dial cord over and under the tabs on the rear of the dial pointer (see detail), and place the pointer on the top of the dial glass panel rail.
(17) Turn the tuning shaft fully CW. Slide the dial pointer to zero (0) calibration mark on the logging scale while holding turning shaft fully CW. Cement dial pointer to dial cord to prevent slippage. Allow cement to thoroughly dry.
(18) Reinstall the dials panel and knobs. Reconnect the leads (removed previously) to their respective terminal pins behind the TUNE-MATIC assembly.
(19) Check dial calibration. Refer to FM FRONT END ALIGNMENT and AM RF ALIGNMENT.
(20) Remount top and bottom covers removed previously.

CLEANING FRONT PANEL
WARNING: Use only plain lukewarm water for moistening a freshly laundered, soft lint-free cloth to clean the front control panel.

REPLACING STEREO BEACON AND METER LAMPS
NOTE: The compartmented lamp assembly (FRC Part No. M2151604-2), mounted on the rear of the meter, contains the meter lamp and the STEREO BEACON lamp, and must be replaced as a complete unit.
(1) Disconnect AC power cord.
(2) Remove the screws which hold the top cover to the chassis. (On 260-1, 24H chassis, also remove screws holding top cover to heat link.) Remove the cover.
(3) Gently pull the four wires off the terminal pins on the top rear of the meter. Label each wire with its associated pin location to make replacement easier later.
(4) Gently unnap the compartmented lamp assembly from the top rear of the meter.
(5) Relocate the lamp assembly between the plastic flanges and press firmly into place.
(6) Reconnect the four wires to the associated terminal pins on the replacement lamp assembly.
(7) Replace the top cover on the chassis and secure with the screws removed previously.

DIAL STRINGING
(1) Remove dress panel. Refer to REMOVING DRESS PANEL procedure.
(2) Remove dial pointer.
(3) Remove dial glass assembly. Refer to REMOVING DIAL GLASS ASSEMBLY procedure.
(4) Rotate the tuning capacitor drive-drum to its maximum CW position. Loosen the machine screws along the center of the drive-drum and remove the old dial cord.
(5) Tie end of new dial cord to one end of dial spring. Fasten spring to bottom right ear inside drive-drum. See Figure 5.

CLEANING FRONT PANEL
WARNING: Use only plain lukewarm water for moistening a freshly laundered, soft lint-free cloth to clean the front control panel.

REMOVING P.C. BOARDS
To remove a board from its nylon mounts, squeeze the loop of each mounting clip (using pliers), and lift each corner of the board. To remount the board, align the mounting holes over the clips, and press firmly.

SERVICING INTEGRATED CIRCUITS
Integrated Circuits are used in this unit to approach the theoretical maximum of AM superheterodyne noise limiting. These ICs contain the equivalent of many circuit parts, including transistors, diodes, resistors, and capacitors. These integrated circuits are high-reliability devices, requiring minimum servicing. In the unlikely event that an IC requires servicing, it should be serviced in the same way as a transistor.

The preferred troubleshooting procedure requires isolating the trouble to one stage using AC signal tracing methods. Once the suspect stage is located, the integrated circuit can be checked by measuring the DC voltages at the input and output leads of the IC using a DC Voltmeter. These DC voltage measurements give the most accurate indications of the operating conditions of the integrated circuit.

WARNING: Do not use an oscilloscope to check continuity with the IC mounted on the printed circuit board. Forward biasing the internal junctions within the IC may burn out the transistors.
POWER OUTPUT MEASUREMENT

The output amplifier of this unit is designed to deliver its full-rated power with program material (0.03% total harmonic distortion) into 8 ohms loudspeaker for an indefinite period of time. When a constant audio tone is used as a signal to measure the maximum continuous RMS power output, the following precautions must be taken:

1. Measure the power output of one channel at a time.
2. Limit the measurement period to 10 minutes with a load resistance of 8 ohms.
3. 2A-250-T-24R: Use a load resistor with a power rating of at least 50 watts.
4. 2A-400-T: Use a load resistor with a power rating of at least 100 watts.

WARNING: If the power output of both channels is measured simultaneously, use a load 8 ohms per channel and limit measurements to a period not longer than 5 minutes.

NOTE: The 400-T uses a high-temperature output switch to protect the amplifier against damage resulting from overheating. The switch disables the amplifier by eliminating drive signal in the audio control amplifier. When the amplifier cools to normal operating temperature, the cutout switch automatically resets.

HARMONIC DISTORTION TEST

Set BALANCE, BASS, and TREBLE controls to their center positions. Set SELECTOR switch to AUX. Depress MAIN SPIKES pushbutton switch; release all other pushbutton switches to off position.

(1) Connect an 8-ohm, 100-watt resistor across the LEFT SPEAKERS MAIN terminals. Parallel the load resistor, connect the input leads of an HD analyzer and the input leads of an accurately calibrated AC VTVM.

(2) Connect a low-distortion audio drive generator, set for 1,000 Hz, to the LEFT channel AUX IN jack.

NOTE: Allow at least a 10-minute warm-up time before making measurements.

(3) Press the VOLUME control to maximum. (44A) 2050-T-24R: Increase audio generator level for 30 watts output (15.6 V RMS across 8-ohm load); HD meter should read 0.5% or less.

(4) 400-T: Increase audio generator level for 50 watts output (20.0 V RMS across 8-ohm load); HD meter should read 0.5% or less.

(5) Repeat preceding steps for right channel.

POWER AMPLIFIER CENTER VOLTAGE TEST

NOTE: Allow set to warm up at least 10 minutes before making measurements. Power amplifier center voltage test should be performed after preceding this procedure.

Turn VOLUME control to minimum. Depress MAIN SPIKES pushbutton switch; release all other pushbutton switches to off position.

(1) Connect DC VTVM across the LEFT SPEAKERS MAIN terminals. Meter should read 0 volts DC (±100 mV).

(2) Connect DC VTVM across the RIGHT SPEAKERS MAIN terminals. Meter should read 0 volts DC (±100 mV).

POWER AMPLIFIER IDLING CURRENT ADJUSTMENT

NOTE: Allow set to warm up at least 10 minutes before making measurements or adjustments. Power amplifier center voltage test should be performed before starting this procedure.

Turn VOLUME control to minimum. (1) Connect ground lead of DC VTVM to pin 2B on left channel of predriver/driver board, Connect probe of DC VTVM to pin 8Z on predriver/driver board. (2A) 250-T-24R, Adjust pot. R185 (OUTPUT BIAS ADJUST) for DC VTVM reading of 15 mV.

(2B) 400-T: Adjust pot. R185 (OUTPUT BIAS ADJUST) for DC VTVM reading of 15 mV.

(3) Connect ground lead of DC VTVM to pin 8B on right channel of predriver/driver board. Connect probe of DC VTVM to pin 8D on predriver/driver board. (4A) 250-T-24R, Adjust pot. R186 for DC VTVM reading of 15 mV.

(4B) 400-T: Adjust pot. R186 for DC VTVM reading of 15 mV.

INTERMODULATION DISTORTION TEST

NOTE: Bypass C20 and C21 with direct connections for IM test on 24R connectors. Bypass C17 and C18 on 25R.

Set BALANCE, BASS, and TREBLE controls to their center positions. Set SELECTOR switch to AUX. Depress MAIN SPIKES pushbutton switch; release all other pushbutton switches to off position.

(1) Connect an 8-ohm, 100-watt resistor across the LEFT SPEAKERS MAIN terminals. Parallel the load resistor, connect the input leads of an IM analyzer and the input leads of an accurately calibrated AC VTVM.

(2) Connect IM-analyzer generator output to the LEFT channel AUX IN jack.

FM IF AND DETECTOR ALIGNMENT

Set SELECTOR switch to FM, and AFC switch to OFF. Turn VOLUME control to minimum. Depress MUTING OFF pushbutton switch.

(1) Disconnect and remove lead from Test Point 301 (pin 3N on AM/FM IF, MXF board) and connect vertical AC input of scope to FM Test Point 301. Connect ground lead of scope to ground of scope to 30.

(2) Connect an RF inductor across input scope and set scope vertical sensitivity to 0.1 volt/mv.

(3) Connect 10.7 MHz sweep generator to Test Point 501 (pin 5N on RF IF board). Connect ground lead of generator to pin 5H, Adjust generator level and sweep to observe IF response curve.

(4) Adjust top and bottom cores of L305, C304, and C302 (pin 1A on AM/FM IF, MXF board) for symmetry and maximum gain.

(5) Adjust top and bottom cores of L506 (on FM RF board) for maximum gain and symmetry. Repeat alignment until maximum gain and symmetry are obtained (see Figure 4).

(6) Increase generator level to full output (approximately 100,000,000) if necessary, slightly reduce top core of L305 to center 10.7 MHz marker (see Figure 5).

(7) Reconnect the jumper lead to FM Test Point 301 (pin 3N on AM/FM IF board). Disconnect the B2K resistor across input scope connected previously.

(8) Reduce generator sweep to zero (sweep off). Adjust FM METER ADJ. pot. R328 (on AM/FM IF, MXF board) for front panel tuning meter reading of 4.5.

(9) Connect a 100K resistor in series with the vertical input of the scope and connect to FM Test Point 405 (pin 4A on AM/FM IF, MXF board). Use same AC scope sensitivity setting (100 mV/mV).

(10) Adjust generator level and sweep to observe detector "S" curve. Adjust bottom core of C300 first, then top core for maximum gain and symmetry (see Figure 6).

(11) Connect DC VTVM to Test Point 405 (pin 4A on AM/FM IF, MXF board). Use sensitive meter scale setting.

(12) Readjust top core of C300 for zero (0) reading with 50 mV DC VTVM.

FM FRONT END ALIGNMENT

NOTE: FM IF alignment should be performed before starting this procedure.

Set SELECTOR switch to FM, and AFC switch to OFF. Turn VOLUME control to minimum. Depress MUTING OFF, and MONO MODE pushbutton switches. Depress MANUAL pushbutton on TUNE-O-MATIC dial assembly.

(1) Set TUNING dial to point to zero (0) calibration mark on the logging scale. If the dial pointer is not centered on the zero line at the extreme end of the knob rotation, repoint the pointer assembly on the dial cord and cement the pointer in place to prevent slippage. Allow cement to thoroughly dry.

NOTE: Repointing the dial pointer may require realignment of AM RF board for correct AM station calibration.

(2) Connect an accurately calibrated DC VTVM to Test Point 9B (on TUNE-O-MATIC circuit board). DO NOT USE DC VOM.

(3) Rotate TUNING knob to center dial pointer on 88 MHz calibration mark on dial glass.

(4) Using a small screwdriver, adjust R28, FM ALIGNMENT POT, for DC VTVM reading of exactly 4.3 volts Disconnect the alignment.

(5) Connect an FM generator to the FM ANTENNA terminals. Use a 120-ohm compensation wire with each end connected to your generator (see Figure 7).

(6) Connect a scope and an AC VTVM to either LEFT or RIGHT RCOR output jack.

(7) Set FM generator frequency to receiver frequency, 90 MHz, modulated with 400 Hz, 375 kHz deviation. Set generator output level to low as possible.

(8) Align (oscillator trimmer) C216 first, then mixer (mixer trimmer) C211, and (RF trimmer) C205 for maximum reading on AC VTVM and tuning meter, and maximum waveform amplitude and symmetry.

(9) Set generator frequency and TUNING dial pointer to 108 MHz. Align (oscillator trimmer) C216 first, then (mixer trimmer) L505, and (RF trimmer) C205 for maximum reading on AC VTVM and tuning meter, and maximum waveform amplitude and symmetry.

(10) Repeat alignment several times until accurate dial calibration and maximum gain are obtained. Keep generator output at low as possible during all adjustments.
TUNING METER CALIBRATION

NOTE: If the FM IF DETECTOR ALIGNMENT procedure (including calibration of tuning meter) has been completed, omit the following procedure. Use the following procedure to calibrate the tuning meter without IF alignment; i.e., after meter replacement.

Set SELECTOR switch to FM. Turn VOLUME control to minimum.

1. Connect an FM generator to the FM ANTenna terminals. Turn a 120-ohm composition resistor in series with each lead from the generator (See Figure 7).
2. Set generator frequency to same frequency as receiver. Set generator RF output to full output (approximately 1000V) with audio modulation.
3. Adjust generator frequency for peak tuning meter reading.
4. Adjust FM METER ADJ. pot. R328 (on AM/FM IF, MPX board) for tuning meter reading of 4.5.

MULTIPLE ALIGNMENT

Two methods of aligning the multiplex decoder are given. The preferred procedure uses a multiplex generator with RF and IF kHz outputs and with 1 kHz modulation, such as the FISHER 300 Multiplex Generator. This is the better method of alignment because the front end and IF stages are also checked through the use of this procedure. An alternate procedure for use with multiplex generators not having an RF output is also given.

PREFERRED ALIGNMENT PROCEDURE

NOTE: Check the alignment of the IF amplifier before aligning the multiplex decoder. Poor IF alignment can make proper MPX alignment impossible.

Set SELECTOR switch to FM. Turn VOLUME control to minimum. Depress MUTING OFF pushbutton switch. Depress MANUAL pushbutton on TUNE-O-MATIC dial assembly.

1. Connect RF output of multiplex generator to the FM ANTenna terminals. Use a 120-ohm composition resistor in series with each lead from the RF output (see Figure 7). Set MPX generator for external modulation with 19 kHz pilot carrier (570 kHz deviation 110% pilot, 2050 Hz audio). Tune receiver to RF frequency of MPX generator.
2. Connect DC VTVM to Test Point 403 (pin 4B on AM/FM IF, MPX board) for maximum reading on DC VTVM (2.5 to 4 VDC). Connect output of audio generator, set for 1 kHz, to the external modulation input of MPX generator and to the external sync input of an oscilloscope. Adjust audio generator level for 1.2 volts peak-to-peak composite MPX input110% pilot, 930 Hz audio. See Figure 8. Module right channel only. Proceed with steps (3) through (10) of PREFERRED ALIGNMENT PROCEDURE.
3. Repeat the junction lead going to pin 4A (on AM/FM IF, MPX board) removed previously.

SERVICES PROCEDURES

Figure 7. Connections To Provide 300-ohm Generator Output Impedance. Matching Resistors Reduce Generator Voltage By Half At Antenna Terminals.

AM IF ALIGNMENT

Set SELECTOR switch to AM, and VOLUME control to minimum.

1. Connect 455 kHz sweep generator to pin 7A (on AM RF board). Use a 0.1 uF capacitor in series with the generator lead. Connect generator ground to pin 7C.

Figure 8. Voltage Divider Probe.

NOTE: AM IF alignment should be performed before starting this procedure.

1. Connect vertical input of scope to Test Point 302 (pin 3Q on AM/FM IF, MPX board). Connect scope ground to pin 3G.
2. Set scope vertical input sensitivity to approximately 200 mV per cm.
3. Adjust generator level and sweep to observe IF response curve. Set generator output as low as possible.
4. Adjust top and bottom cores of Z200, Z201 (on AM/FM IF, MPX board), and Z202 (on AM RF board) for maximum gain and symmetry. Repeat step until maximum gain and symmetry are obtained (see Figure 11).

IN Correct FOR RIGHT CHANNEL MODULATION

ALTERNEATE ALIGNMENT PROCEDURE

Set SELECTOR switch to FM, and VOLUME control to minimum. Release all pushbutton switches to our position.

1. Disconnect the junction lead going to pin 4A (on AM/FM IF, MPX board) and connect the output of the multiplex generator through a 1k6 resistor to pin 4A.
2. Connect DC VTVM to Test Point 403 (on AM/FM IF, MPX board). Connect vertical input of the scope to pin 4A.
3. Set MPX generator for 19 kHz pilot carrier output only. Adjust pilot level for approximately 120 mV peak-to-peak input at pin 4A.
4. Adjust cores of Z201 and Z202 (on AM/FM IF, MPX board) for maximum reading on DC VTVM (2.5 to 4 VDC).
5. Connect output of audio generator, set for 1 kHz, to the external modulation input of MPX generator and to the external sync input of an oscilloscope. Adjust audio generator level for 1.2 volts peak-to-peak composite MPX input110% pilot, 930 Hz audio. See Figure 8. Module right channel only. Proceed with steps (3) through (10) of PREFERRED ALIGNMENT PROCEDURE.

NOTE: If equal readings cannot be obtained in steps (8) and (10), adjust Z202 slightly (on AM/FM IF, MPX board) and repeat steps (7) through (10).

Figure 9. Waveform At Test Point 402. Figure 10. Composite Input To Multiplex Decoder.

NOTE: Repositioning of the dial pointer may require realignment of FM RF board for correct FM station calibration.

2. Open the AM ANTenna SMD link at the antenna terminals. Connect an AM generator to the AM ANTenna and GND terminals.
3. Connect a scope on AC VTVM to either the LEFT or RIGHT RCOR OUT jack.
4. Set AM generator frequency and TUNING dial pointer to 600 kHz. Use 205 modulation (with 400 Hz). Set generator output as low as possible.
5. Align oscillator coil Z201 (on AM RF board) for maximum reading on AC VTVM and maximum waveform amplitude and symmetry.
6. Set AM generator frequency and TUNING dial pointer to 1400 kHz. Adjust oscillator trimmer C703 (on AM RF board) for maximum reading on AC VTVM and maximum waveform amplitude and symmetry.
7. Repeat alignment several times until accurate dial calibration and maximum gain are obtained. Keep the generator output at as low as possible during all adjustments.
8. Reset AM generator frequency and TUNING dial pointer to 600 kHz. Adjust the position of the small coil on the ferrite loop antenna for maximum reading on AC VTVM and maximum waveform amplitude and symmetry.
9. Note: To adjust the antenna coil, melt the wax holding the small coil to the end of the ferrite loop antenna. Shift the coil back and forth for maximum audio indication. Secure the coil in position, remelt the wax.

NOTE: Repositioning the dial pointer may require realignment of the antenna coil to the left or right of the RCOR OUT jack. Set AM generator frequency and TUNING dial pointer to 1400 kHz. Adjust oscillator trimmer C701 (on AM RF board) for maximum reading on AC VTVM and maximum waveform amplitude and symmetry.

10. Repeat steps (8) and (9) several times until maximum output is obtained. Keep generator output as low as possible during all adjustments.

11. Test for peak alignment by setting AM generator and TUNING dial pointer to 500 kHz. Adjust generator RF output level for tuning meter reading of 3. Generator RF output level should read between 500 uV and 1600 uV.
12. Set AM generator and TUNING dial pointer to 1400 kHz. Adjust generator RF output level for tuning meter reading of 3. Generator RF output level should read between 150 uV and 560 uV.

Figure 11. AM RF Alignment.