Service Manual
THE FISHER

120™
125™
CHASSIS SERIAL NUMBERS BEGINNING 10001
PRICE $1.00

FISHER RADIO CORPORATION • 11-40 45th ROAD • LONG ISLAND CITY, N.Y. 11101
CAUTION: This is a FISHER precision high-fidelity instrument. It should be serviced only by qualified personnel trained in the repair of transistor equipment and printed circuitry.

TEST EQUIPMENT REQUIRED
The following are needed to completely test and align modern high-fidelity instruments such as amplifiers, tuners and receivers.

- Vacuum-Tube Voltmeter (100-mv DC scale)
- Audio Vacuum-Tube Voltmeter (10-mv AC scale)
- Oscilloscope (Flat to 100 kHz Minimum)
- Audio (Sine-Wave) Generator
- Intermodulation Distortion Analyzer
- Harmonic Distortion Analyzer
- AM/FM Signal Generator
- Multiplex Generator (preferably with RF output – FISHER Model 500 or equal)
- 10.7-MHz Sweep Generator
- 455-kHz Sweep Generator
- Line Voltage Autotransformer or Voltage Regulator
- 2 - Load Resistors, 4 or 8 Ohm, 50 Watt
- 2 - Foil Range Speakers for Listening Tests
- Stereo Source – Turntable or Tape Recorder for Listening Tests
- Soldering Iron with Small Tip
- Fully Insulated from Power Line
- Suction Desoldering Tool

PRECAUTIONS

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

Soldering—A well-tinned, hot, clean soldering iron tip will make it easier to solder without damage to the printed-circuit board or the many circuit components mounted on it. It is not the wave length of the iron that counts—it is the heat available at the tip. Some 50-watt iron tips reach temperatures of 1,000°F—others will barely melt solder. Small-diameter tips should be used for small solder connections—larger pyramid and chisel tips are needed for larger areas.

- When removing defective resistors, capacitors, etc., the leads should be cut as close to the body of the circuit component as possible. (If the part is not being returned for in-warranty factory replacement it may be cut in half—with diagonal-cutting pliers—to make removal easier.)

- Special de-soldering tips are made for unsoldering multiple-terminal units like IF transformers and electrolytic capacitors. By unsoldering all terminals at the same time the part can be removed with little chance of breaking the printed-circuit board.

- Always disconnect the chassis from the power line when soldering. Turning the power switch OFF is not enough. Power-line leakage paths, through the heating element, can destroy transistors.

Transistors—Never attempt to do any work on the transistor amplifiers without first disconnecting the AC line cord and waiting until the power supply filter-capacitors have discharged.

- Guard against shorts—it takes only an instant for a base-to-collector short to destroy that transistor and possibly others directly-coupled to it. If the time it takes for a dropped machine screw, washer or even the screwdriver, to glance off a pair of socket terminals (or between a terminal and the chassis) a transistor can be ruined.

- DO NOT bias the base of any transistor to, or near, the same voltage applied to its collector.

- DO NOT use an ohmmeter for testing transistors. The voltage applied through the test probes may be higher than the base-emitter breakdown voltage of the transistor.

Output Stage and Driver—Replacements for output and driver transistors, if necessary, must be made from the same beta group as the original type. The beta group is indicated by a colored dot on the mounting flange of the transistor. Be sure to include this information, when ordering replacement transistors.

- If one output transistor burns out (open or shorts), always remove ALL output transistors in that channel and check the bias adjustment, the control and other parts in the network with an ohmmeter before replacing a new transistor. All output transistors in one channel will be destroyed if the base-biasing circuit is open on the emitter end.

- When mounting a replacement power transistor be sure the bottom of the flange, the mica insulator and the surface of the heat sink are free of foreign matter. Dust and grit can prevent perfect contact reducing heat transfer to the heat sink. Metallic particles can puncture the insulator and cause shorts—ruining 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 conduction. (Use Dow-Corning DC-5 or C2001/4 or equivalent compounds made for power transistor heat conduction.)

- Use care when making connections to speakers and output terminals. Any frayed wire ends can cause shorts that may burn out the output transistors—they are directly-coupled to the speakers. To reduce the possibility of shorts at the speakers, lugs should be used on the exposed ends or at least on the ends of the stranded wires should be trimmed to prevent frayed wire ends. The current in the speakers and output circuitry is quite high. Poor contacts or small size wire can cause power losses in the speaker system. Use 14 or 16 AWG for long runs of speaker wiring.

Voltage Measurements—Voltage measurements are made with the line voltage adjusted to 117 volts and all readings are ±10%. All voltages are DC, measured with a VTVM to ground, with no signal input unless otherwise noted. 1-kHz indicates 1-kHz audio voltages, measured with an audio AC VTVM to ground at various points from the phone input to the power amplifier output.

Alignment Procedures—Replacement of transistors and components in the front end, IF amplifier and multiplex decoder will normally not require realignment of these circuits. Realignment of those circuits, unless absolutely necessary, is not recommended. Do not attempt a 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 MOTORBOARD

To gain access to the chassis for servicing, remove the motorboard using the following procedure:
(1) Disconnect AC power cord.
(2) Unscrew the two shipping screws (near the left rear and right-front corners of the turntable baseplate) fully out to lock the chassis to the motorboard.
(3) Remove the four screws in the motorboard (two on each side) holding the board to the wood enclosure. Lift the motorboard at the front, and unplug the two audio cables and power plug from the underside of the changer.
(4) Remove the motorboard from the top of the chassis.
(5) To reinstall the motorboard, reverse the procedure. Be sure to reconnect the audio cable with the red plug to the changer phono jack labeled Right.

REPLACING DIAL LAMPS

(1) Disconnect AC power cord.
(2) Remove dress panel. Refer to REMOVING DRESS PANEL procedure.
(3) Replace the defective lamp (with its metal shade) from its bayonet base by pressing the lamp in, and rotating 1/8 turn CCW. Slide the metal shade off the lamp. Install the replacement lamp by pressing in, and turning CW 1/8 turn. Slide the shade onto the lamp and adjust it to direct the light towards the edge of the dial glass.
(4) Reinstall the dress panel.

REPLACING STEREO BEACON LAMP

(1) Disconnect AC power cord.
(2) Remove motorboard. Refer to REMOVING MOTORBOARD procedure.
(3) Unscrew the two leads from the terminals on the rear of the STEREO BEACON lamp assembly.
WARNING: Damage to the nylon lamp holder assembly may result from excessive heating of the terminals. Use a pair of pliers (as a heat sink) to hold each terminal when soldering or unsoldering leads.
(4) Gently pry off the nylon lamp holder assembly. Press the replacement assembly into the mount and reinsert the leads removed previously.
(5) Reinstall the motorboard.

REPLACING METER LAMP

(1) Disconnect AC power cord.
(2) Remove motorboard. Refer to REMOVING METER procedure.
(3) Replace the meter lamp (with its metal shade) from its bayonet base by pressing the lamp in, and rotating 1/8 turn CCW. Slide the shade off the lamp. Install the replacement lamp by pressing in, and turning CW 1/8 turn. Slide the shade onto the lamp and adjust it to direct the light towards the back of the housing.
(4) Reinstall the motorboard.

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 (lugging pillars), and lift each corner of the board. To remount the board, align the mounting holes over the clips, and press firmly.
POWER AMPLIFIER CENTER VOLTAGE TEST

1. Connect 0-50mV load resistor across the LEFT SPKR MAIN terminals and an 8-ohm load resistor across the RIGHT SPKR MAIN terminals.
2. Connect 2N 15k ohms resistors in series across capacitor C662 (1500 uF). Connect the common lead of a DC volt meter to the junction of the two resistors.
3. Connect the common lead of the DC volt meter to the Terminal B3 of the test point SB98 (junction of RB66 and RB36) on right channel of dual-channel power amplifier module. Meter should read 5V (±0.5 volt).
4. Disconnect both the two 10k resistors.

HARMONIC DISTORTION TEST

Set BALANCE, BASS, and TREBLE controls to their center positions. Set SELECTOR switch to AUX. Set LOUDNESS switch to OFF and MODE switch to STEREO1 (on push-button model MONO MODE and LOUDNESS pushbutton switches should be released to the out position). Set SPEAKERS switch to MAIN (on pushbutton models, depress MAIN SPKRS switch). Unplug AC power cord.
1. Connect 8-ohm, 500mV resistor across the LEFT SPKR MAIN terminals. In parallel with the load resistor, connect the input leads of an HD analyzer and the input leads of an accurately calibrated AC volt meter. (Connect a low-distortion audio sine-wave generator, set for 1,000 Hz, to the Left channel AUX input. Connect AC power cord and rotate VOLUME control to maximum. Increase audio generator level for 14 watts output (10 V RMS across 8-ohm load). HD meter should read 0.5% or less. Repeat preceding steps for right channel.

POWER AMPLIFIER IDLING CURRENT ADJUSTMENT

NOTE: Power amplifier center voltage test should be performed before starting the following procedure.

Turn VOLUME control to minimum.
1. Connect DC volt meter across resistor RB36 (10.0 ohm) on left channel of dual-channel power amplifier module. Meter should read between 10 mV and 28 mV. Meter should read 10 mV on RB25 (OUTPUT BIAS ADJUST) pot on predriver/driver board for readings between 10 mV and 35 mV on DC volt meter. Optimum amplifier performance will be achieved with 15 mV reading.
2. Connect DC volt meter across resistor RB83 on right channel of dual-channel power amplifier module. Meter should read between 10 mV and 25 mV. (If necessary, adjust RB25 pot on predriver/driver board for reading between 10 mV and 35 mV on DC volt meter.

INTERMODULATION DISTORTION TEST

Set BALANCE, BASS and TREBLE controls to their center positions. Set SELECTOR switch to AUX. Set LOUDNESS switch to OFF and MODE switch to STEREO1 (on pushbutton model MONO MODE and LOUDNESS pushbutton switches should be released to the out position). Set SPEAKERS switch to MAIN (on pushbutton models, depress MAIN SPKRS switch). Unplug AC power cord.
1. Connect an 8-ohm, 500mV resistor across the LEFT SPKR MAIN terminals. In parallel with the load resistor, connect the input leads of an IM distortion analyzer and the input leads of an accurately calibrated AC volt meter. (Connect IM analyzer generator output to the left channel AUX input. Set IM analyzer generator frequency for 300 mV output. Connect AC power cord and adjust VOLUME control for 12 watts output (7.95 V RMS across 8-ohm load). AFTER ONE FULL MINUTE OF WARM-UP, PROCEED TO NEXT STEP.
2. IM meter reading should be 0.5% or less.
3. Repeat preceding steps for right channel.

NOTE: If any of the preceding instructions differ from those in the IM analyzer instruction manual, it is best to follow those in the manual. If a load resistor of 500mV rating is built into the IM analyzer, a separate load resistor is not required.

FM IF AND DETECTOR ALIGNMENT

Select SET/CONT roll to FM. Turn VOLUME control to minimum.
1. Connect the jumper lead from FM Test Point 301 (pin 3N on AM/FM IF, MPX board) and connect vertical input of scope to Test Point 301. Connect ground lead of scope to nearest chassis ground. (Connect an 8k resistor across scope input and scope set input for AC. Adjust scope vertical sensitivity to approximately 100 mV per division. Connect 10.7 MHz sweep generator to Test Point 501 (pin 8F on FM RF board). Adjust ground lead of scope to pin 5G. Adjust generator level and sweep to observe IF response curve.
2. Adjust top and bottom cores of C203, C204, and C203 (on AM/FM IF, MPX board) for symmetry and maximum gain.
3. Adjust top and bottom cores of C205 (on FM RF board) for maximum gain and symmetry. Repeat alignment until maximum gain and symmetry are obtained (see figure 2).
4. Increase generator level to full output (approximately 100,000 V/m), if necessary, slightly readjust top core of C205 to center 10.7 MHz generator line (see figure 3).
5. Reconnect the jumper lead to FM Test Point 301 (pin 3N on AM/FM IF, MPX board) removed previously. Disconnect the 8k resistor across scope input connected previously.
6. Reduce generator sweep to zero (sweep off). Adjust FM METER ADJ, pot. R32B (on AM/FM IF, MPX board) for front panel tuning meter to zero when the 10.7 MHz generator is centered. (Connect vertical input of scope to Test Point 301 (on AM/FM IF, MPX board). Use same scope sensitivity setting (100 V/mV).) Adjust generator level and sweep to observe detector "I" curve. Adjust bottom core of C206 first, then top core for maximum gain and symmetry. (See figure 4).
7. Connect CVT DC voltage to Test Point 301. Use 1.50 volts DC meter scale or lower. (Readjust top core of C206 for zero beading (within ±0.2 volt on DC volt meter.

FM FRONT END ALIGNMENT

NOTE: FM IF alignment must be performed after starting this procedure.
Select SET/CONT roll to FM. Turn VOLUME control to minimum. Select MODE switch to MONO (on pushbutton models), then MODE switch. MONO MODE pushbutton switch.
1. Set TUNING dial pointer to 1010 MHz calibration mark on the logging scale. If the dial pointer is not centered on the 0 at the extreme end of the knob rotation, repoint the pointer assembly on the dial cord and center the pointer in place to prevent slipage. Allow converter to cementorily.
2. Repointing the dial pointer may result in realignment of AM RF board (on Model 125 only) for correct AM station calibration.
3. Connect an AM generator to the AM ANTenna terminals. Use a 1200-turn composition resistor in series with each lead from the generator (see figure 5).
4. Connect a scope and an 83 V/dcc to either Left or Right RCDR DUT jack.
5. Set FM generator frequency and TUNING dial pointer to 90 MHz. Modulate generator with 400 Hz, 75 kHz deviation. Set generator level as low as possible.
6. Align (coaxial coil) L101, the same wire coil L603 and L605 for maximum reading on AC volt meter and tuning meter, and maximum waveform amplitude and symmetry.
7. Set generator frequency and TUNING dial pointer to 106 MHz.
8. Align (coaxial trimmer) C612 first, then (trimmer) C611 and (trimmer) C602 for maximum reading on AC volt meter and tuning meter, and maximum waveform amplitude and symmetry.
9. Repeat alignment several times until accurate dial calibra- tion and maximum gain are obtained. Keep the generator out- put as low as possible during all adjustments.
Figure 5. Connections To Provide 300-ohm Gen-
enerator Output Impedance, Matching Resistors Reduce
Generator Voltage By Half Antenna Terminals.

TUNING METER CALIBRATION

NOTE: Meter calibration should be performed after FM IF and RF alignment.

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

1. Connect an FM generator to the FM ANTenna terminals.
   Use a 120-ohm composition resistor in series with each lead
e from the generator (see Figure 5).

2. Set generator frequency to some frequency as receiver.
   Set generator RF output level to full output (approximately
   100,000 at full audio modulation off).

3. Adjust generator frequency for peak tuning meter read-
ing.

4. Adjust FM METER ADJ. pot, R328 (on AM/FM IF, MPX
   board) for tuning meter reading of 4.5.

MULTIPLEX ALIGNMENT

Two methods of aligning the multiplex decoder are given.

The preferred procedure uses a multimeter generator with RF
and 19 kHz outputs and with 1 kHz modulation, such as
the FISHER 200 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 pro-
cedure 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, and VOLUME control to
minimum. Set MODE switch to STEREO (on phasemeter
models, release MONO MODE phasemeter switch to out
position).

1. Connect RF output of multiplex generator to the FM
   ANTenna terminals. Use a 120-ohm composition resistor
   in series with each lead from RF output (see Figure 5). Set
   MPX generator for external modulation with 19 kHz pilot
carrier at 2.5 VDC (10% pilot, no audio). Tune receiv-
er to RF frequency of MPX generator.

2. Connect DC Voltmeter to Test Point 403 (pin 4 on AM/FM
   IF, MPX board). Adjust voltages of 2403 and 2402 (on AM/FM IF, MPX
   board) for maximum read-out on DC Voltmeter (2.5 to 4 VDC).

3. 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 2.0 volts peak-to-peak. Composite MPX input (100
   milliamp, 90% audio). See Figure 8. Module right channel only.

4. Proceed with steps 1 through 110 of PREFERRED ALIGN-
MENT PROCEDURE.

5. Reconnect the jumper lead going to pin 4A (on AM/FM
   IF, MPX board) removed previously.

6. Connect generator ground to pin 7C.

7. Connect vertical input ofoscope to Test Point 302 (pin
   4C on AM/FM IF, MPX board). Connect scope ground to
   pin 3G. Set scope vertical input sensitivity to approximately
   200 mV/cm.

8. Adjust generator level and sweep to observe IF frequency
   response curve. Set generator output as low as possible.

9. Adjust top and bottom edges of 2301, 2300 (on AM/FM
   IF, MPX board), and 2701 (on MPX board) for maximum
   gain and symmetry. Repeat alignment until maximum gain
   and symmetry are obtained (see Figure 9).

SERVICE PROCEDURES

Figure 7. Waveform At Test Point 402.

Figure 8. Composite Input To Multiplex Decoder.

Figure 9. 4kHz AM 1F Alignment

Figure 10. 4kHz AM RF Alignment

Figure 6. Voltage Divider Probe.

1. Connect generator ground to pin 7C.

2. Connect vertical input ofoscope to Test Point 302 (pin
   4C on AM/FM IF, MPX board). Connect scope ground to
   pin 3G. Set scope vertical input sensitivity to approximately
   200 mV/cm.

3. Adjust generator level and sweep to observe IF frequency
   response curve. Set generator output as low as possible.

4. Adjust top and bottom edges of 2301, 2300 (on AM/FM
   IF, MPX board), and 2701 (on MPX board) for maximum
   gain and symmetry. Repeat alignment until maximum gain
   and symmetry are obtained (see Figure 9).

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

NOTE: Set SELECTOR switch to AMI, and VOLUME control to
minimum.

1. Set SELECTOR to either Left or Right RCDR OUT jack.

2. Connect Scope through visual divider probe (see Figure 6) to Test
   Point 402 (pin 4C on AM/FM IF, MPX board).

3. Turn R107 SEPARATION CONTROL (on phasemeter board) until
   maximum response setting. Adjust core of
   2403 (on AM/FM IF, MPX board) for maximum gain and
   as straight a baseline as possible (see Figure 7). AC
   VTM should read minimum.

4. Connect AC VTM to Left RCDR OUT jack. Connect scope
   through visual divider probe (see Figure 6) to Test
   Point 402 (pin 4C on AM/FM IF, MPX board).

5. Turn R107 SEPARATION CONTROL (on phasemeter board) for
   minimum reading on AC VTM; at least 30 db below reading
   recorded in step (7). Read record.

6. Connect AC VTM to Left RCDR OUT jack. Same read-
ing.2 as recorded in step (7).

7. Set FM METER to multiplex right channel only. Same reading
   as recorded in step (8).

NOTE: If equal readings cannot be obtained in steps (8) and
(10), adjust Z042 slightly (on AM/FM IF, MPX board) and
repeat steps (7) through (10).

ALTERNATE ALIGNMENT PROCEDURE

Set SELECTOR switch to FM, and VOLUME control to
minimum. Set MODE switch to STEREO (on phasemeter
models, release MONO MODE phasemeter switch to out
position).

1. Disconnect the jumper lead going to pin 4A (on AM/FM
   IF, MPX board) and connect the output of the multiplex
   generator through a 15k resistor to pin 4A.

2. Connect DC Voltmeter to Test Point 402 (on AM/FM IF, MPX
   board). Connect vertical input ofoscope 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 2401 and 2402 (on AM/FM IF, MPX
   board) for maximum output on DC Voltmeter (2.5 to 4 VDC).

5. Connect output of audio generator, set for 1 kHz, to the
   external modulation input of MPX generator to the ex-
   ternal sync input of an oscilloscope. Adjust audio generator
   level for 2.0 volts peak-to-peak. Composite MPX input (100
   milliamp, 90% audio). See Figure 8. Module right channel only.

6. Proceed with steps 1 through 110 of PREFERRED ALIGN-
MENT PROCEDURE.

7. Reconnect the jumper lead going to pin 4A (on AM/FM
   IF, MPX board) removed previously.

8. Connect generator ground to pin 7C.

9. Connect vertical input ofoscope to Test Point 302 (pin
   4C on AM/FM IF, MPX board). Connect scope ground to
   pin 3G. Set scope vertical input sensitivity to approximately
   200 mV/cm.

10. Adjust generator level and sweep to observe IF frequency
   response curve. Set generator output as low as possible.

10. Adjust top and bottom edges of 2301, 2300 (on AM/FM
   IF, MPX board), and 2701 (on MPX board) for maximum
   gain and symmetry. Repeat alignment until maximum gain
   and symmetry are obtained (see Figure 9).

12. Set SELECTOR switch to AMF, and VOLUME control to
    minimum.

13. Set SELECTOR to either Left or Right RCDR OUT jack.

14. Set AM IF generator frequency and TUNING dial pointer to
    600 kHz. Use 30% modulation with 600 Hz. Set generator
    output as low as possible.

15. Adjust oscillator coil C701 (on AM RF board) for maxi-
    mum read-out on AC VTM and maximum waveform am-
    plitude and symmetry.

16. Set AM IF generator frequency and TUNING dial pointer to
    1400 kHz. Adjust oscillator trimmer C703 (on AM RF board)
    for maximum read-out on AC VTM and maximum wave-
    form amplitude and symmetry.

17. Repeat step 13 and (8) several times until maximum gain
    is obtained. Keep generator output as low as possible
during all adjustments.

NOTE: Repositioning the dial pointer may require align-
ment of all FM RF board for correct FM station calibration.

16. Open the AM ANTenna GND link at the antenna ter-
    minals. Connect an Aid generator to the AM ANTenna
    and GND terminals.

17. Connect an AM IF generator to either the Left or
    Right RCDR OUT jack.

18. Set AM IF generator frequency and TUNING dial pointer
    to 600 kHz. Use 30% modulation with 600 Hz. Set generator
    output as low as possible.

19. Adjust oscillator coil C701 (on AM RF board) for maxi-
    mum read-out on AC VTM and maximum waveform am-
    plitude and symmetry.

20. Set AM IF generator frequency and TUNING dial pointer to
    1400 kHz. Adjust oscillator trimmer C703 (on AM RF board)
    for maximum read-out on AC VTM and maximum wave-
    form amplitude and symmetry.

21. Repeat step 13 and (8) several times until maximum gain
    is obtained. Keep generator output as low as possible
during all adjustments.
2037-1 POWER SUPPLY

SCHEMATIC SHOWN ON MAIN CHASSIS DIAGRAM

BOARD VIEWED FROM COMPONENT SIDE

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