The Fisher
701

Four-Channel Stereophonic
AM/FM Receiver

WORLD LEADER IN HIGH QUALITY STEREO
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-timed, 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 iron reach temperatures of 1,000°F, while others will hardly melt solder. Small-diameter tips should be used for single solder connections, pyramid 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 elements of the iron, may destroy transistors.

PARTS REMOVAL: If a part is not being returned for warranty factory replacement, it may be cut in half (with diagonal cutting pliers) to make removal easier. Multiple terminal parts, such as IF transformers, or electrolytic capacitors, should be removed using special desoldering 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 cleaning working area, free of metal particles, screws, etc., is an important preventive 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 screw, washer, or screwdriver, to contact a pair of terminals (or terminal and 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 trouble 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. Solver and unsolder each lead separately using a pin 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 checker should be used to determine the condition of a transistor or diode. Ohmmeter checks do not provide conclusive data, and many even destroy the junction(s) 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 (lopes or shorts), 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, check bias 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. Include this information when ordering replacements.

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 tied to prevent frayed wire ends. Current in the speakers and output circuitry is quite high — poor contacts, or small wire, can cause significant power loss. 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 ± 20%. DC voltages are measured to wands 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.
**DIAL STRINGING TEST**

**AUTOSCAN BOARD**

1. Remove dress panel.
2. Remove the dress securing top cover to chassis.
3. Remove cover.
4. Remove the dress securing connector board.
5. Remove connector board.
6. Replace and connect the connector board.

**DIAL STRINGING TECHNOLOGY**

1. Remove the dress covering the top cover to chassis.
2. Rotate turn capacitor fully CW. Loosen screw in center of dial and remove dial card.
3. Tie end of new card to end of old spring. Faster spring to bottom right ear inside drum. See illustration.
4. Run card through rim slot into underside of drum.
7. Rotate drum fully CW, allowing card to wind onto drum.
8. Guide card over drum into groove F, through rim slot, and under water. See illustration.
10. Rotate drum CW and CW to distribute tensioning
11. Repeat (8) and (9) until spring is tensioned.
12. Place card over tab on pointer. Rotate turning shaft CW. Slide pointer to 5ohl holding turning shaft fully CW.
13. Check dial calibration. Refer to TUNER ALIGNMENT.

**CONTROL AMPLIFIER BOARD**

1. Remove audio filter board.
2. Remove hex nuts that secure extension plates of TPE MONITOR, SELECTOR, and SPEAKER switches to chassis from front panel. Remove couplings to secure extension shafts to switches. Pull extension shafts out towards the rear.
3. Disconnect leads from pins 36, 40, and 41 and label for reference.
4. Carefully remove (pull up) red slide-connection on 12-pin printed circuit board connector interconnecting audio input board. Slide connector to chassis that shields pins on the control amplifier board.
5. Remove hex nuts securing BALANCE and MODE switches to chassis from front panel.
6. Remove screws securing the control amplifier board to its nylon mounts. Lift up rear of board to clear shafts and remove board.
7. Replace in reverse order.

**AUDIO INPUT BOARD**

1. Remove dress panel.
2. Remove the dress securing bottom cover to chassis.
3. Remove cover.
4. Remove hex nuts that secure the extension plates of TPE MONITOR, SELECTOR, and SPEAKER switches to chassis from front panel. Remove coupling holding extension shafts.
5. Carefully remove (pull up) red slide-connections on 8-pin and 12-pin printed circuit board connectors. Slide connector to the side that disconnects pins to the audio input covers.
6. Remove three screw holding input/output jack connector board on the rear.
7. Remove eight screws securing the audio input board to its nylon mounts. Remove rear with input/output jacks from chassis.
8. Replace in reverse order.

**POWER SUPPLY BOARD**

1. Remove dress panel.
2. Remove screws securing bottom cover to chassis and remove control board.
3. Remove hex nuts securing extension shaft of SPEAKER switch to chassis from front panel. Remove coupling holding extension shaft at other end.
4. Disconnect leads from pins 3 on power supply board and leads from board to SPEAKERS terminals on rear panel.
5. Label all wires for reference.
6. Carefully remove (pull up) red slide-connection on 6-pin printed circuit board connector. Slide connector to the side that disconnects pins on power supply board.
7. Remove four screws securing rear panel to chassis. Bend back rear panel.
8. Remove driven screws securing supply power board to chassis mounts and remove board.
9. Replace in reverse order.

**VOLUME CONTROL BOARD**

1. When the volume control front panel contains both left and right volume controls and must be replaced as a unit.
2. Remove dress panel.
3. Remove the dress securing connector board to dial board. Disconnect connector board.
4. Remove the four securing screw volume control board to dial board. Remove board.
5. Replace and connect in reverse order.

**TUNER BOARD**

1. Disconnect wiring and label for reference.
2. Remove the dress securing connector board.
3. Remove cover.
4. Replace in reverse order.

**REPLACING STEREO BEACON, 2-CH, 4-CH, AND MONO LAMPS**

Note: The indicator assembly above the meter contains all four lamps and must be replaced as a unit.
1. Remove the dress securing top cover to chassis. Remove cover.
2. Disconnect three lamp leads from pins 56, 16, and 30 on turn-on board and leads from pins 36, 40 on turn-off control amplifier board. Label each wire for reference.
3. Remove two nuts securing indicator assembly to dial bracket and remove assembly.
4. Remove new indicator assembly and connect leads to the tuner and control amplifier boards as labeled. Replace.

**REPLACING MEETER LAMPS**

**NOTE:** The lamp holder assembly at the rear of the meter contains both the analog and motor lamps, and must be replaced as a unit.
1. Remove the dress securing top cover to chassis.
2. Remove lamp assembly leads from pins 56 and 51.
3. Snap out defective lamp assembly from the rear of bracket. Insert a new lamp assembly and connect leads to pins 56 and 51. Tape wires against metal bracket as noted in step 2.
4. Replace dress panel.

**REPLACING DIAL POINTERS**

1. Remove the dress securing top cover to chassis. Remove cover.
2. Remove the dress securing connector board to dial board. Disconnect connector board.
3. Remove the four securing screw volume control board to dial board. Remove board.
4. Replace and connect in reverse order.

**REMOVING PCBs**

To remove most boards, disconnect leads and remove securing screw boards to its nylon mounts. Label all wires for reference. Some boards have guide pins or front panel controls and require additional removal procedures as follows:

**VOLUME CONTROL BOARD**

**NOTE:** The volume control front panel contains both left and right volume controls and must be replaced as a unit.
1. Remove dress panel.
2. Remove the dress securing connector board to dial board. Disconnect connector board.
3. Remove the four securing screw volume control board to dial board. Remove board.
4. Replace and connect in reverse order.

**TUNER BOARD**

1. Disconnect wiring and label for reference.
2. Remove the dress securing connector board.
3. Remove cover.
4. Replace in reverse order.

**REMOVING DRESS PANEL**

1. Remove screws securing top cover to chassis. Remove cover.
2. Gently pull TAPe MONITOR, SELECTOR, MODE, BASS, TREBLE, BALANCE, SPEAKERS, TUNING, and VOLUME knobs from their control shafts. Remove two nuts from shafts.
3. Unscrew transverse screws (2) at top and left top of dial bracket. Remove dress panel.
4. Replace procedure for assembly.

**REPLACING DIAL GLASS**

1. Remove dress panel.
2. Remove left bottom glass dial retainers and remove dial glass.
3. Replace all new dial glass by reversing procedure.

**REPLACING DIAL LAMPS**

1. Remove the dress securing top cover to chassis. Remove cover.
2. Mask the area around the glass lamps to protect the metal bracket.
3. Snap out defective lamp assembly from the rear of bracket. Insert a new lamp assembly and connect leads to pins 56 and 51. Tape wires against metal bracket as noted in step 2.
4. Replace dress panel.

**REPLACING DIAL STRINGING TEST**

1. Remove the dress securing top cover to chassis. Remove cover.
2. Remove the dress securing connector board.
3. Remove the dress securing autoscanning board to nylon mounts and remove board.
4. Replace in reverse order.

**AUDIO FILTER BOARD**

1. Remove the dress securing bottom cover to chassis. Remove cover.
2. Remove the dress securing securing autoscanning board to nylon mounts and remove board.
3. Replace in reverse order.

**CONTROL AMPLIFIER BOARD**

1. Remove audio filter board.
2. Remove hex nuts that secure extension shafts of TAPe MONITOR, SELECTOR, and SPEAKER switches to chassis from front panel. Remove couplings to secure extension shafts to switches. Pull extension shafts out towards the rear.
3. Disconnect leads from pins 36, 40, and 41 and label for reference.
4. Carefully remove (pull up) red slide-connection on 12-pin printed circuit board connector interconnecting audio input board. Slide connector to chassis that shields pins on the control amplifier board.
5. Remove hex nuts securing BALANCE and MODE switches to chassis from front panel.
6. Remove screws securing the control amplifier board to its nylon mounts. Lift up rear of board to clear shafts and remove board.
7. Replace in reverse order.

**AUDIO INPUT BOARD**

1. Remove dress panel.
2. Remove the dress securing bottom cover to chassis. Remove cover.
3. Remove hex nuts that secure the extension shafts of TAPe MONITOR, SELECTOR, and SPEAKER switches to chassis from front panel. Remove coupling holding extension shafts.
4. Carefully remove (pull up) red slide-connections on 8-pin and 12-pin printed circuit board connectors. Slide connector to the side that disconnects pins to the audio input covers.
5. Remove three screw holding input/output jack connector board on the rear.
6. Remove eight screws securing the audio input board to its nylon mounts. Replace rear with input/output jacks from chassis.
7. Replace in reverse order.

**POWER SUPPLY BOARD**

1. Remove dress panel.
2. Remove screws securing bottom cover to chassis and remove control board.
3. Remove hex nuts securing extension shaft of SPEAKER switch to chassis from front panel. Remove coupling holding extension shaft at other end.
4. Disconnect leads from pins 3 on power supply board and leads from board to SPEAKERS terminals on rear panel. Label all wires for reference.
5. Carefully remove (pull up) red slide-connection on 6-pin printed circuit board connector. Slide connector to the side that disconnects pins on power supply board.
6. Remove four screws securing rear panel to chassis. Bend back rear panel.
7. Remove driven screws securing supply power board to chassis mounts and remove board.
8. Replace in reverse order.

**VOLUME CONTROL BOARD**

**NOTE:** The volume control front panel contains both left and right volume controls and must be replaced as a unit.
1. Remove dress panel.
2. Remove the dress securing connector board to dial board. Disconnect connector board.
3. Remove the four securing screw volume control board to dial board. Remove board.
4. Replace and connect in reverse order.

**TUNER BOARD**

1. Disconnect wiring and label for reference.
2. Remove the dress securing connector board.
3. Remove dial card.
4. Remove eight screw securing board to its nylon mounts and lift board straight up.
5. Reverse procedure to replace.
6. Replacing dial card. Refer to DIAL STRINGING procedure.

**HARMONIC DISTORTION TEST**

**CAUTION:**

1. Test one channel at a time.
2. Leave leads to 10 minutes.
3. Use a load with a minimum power rating of 100 watts.
4. Unplug AC power cord. Release all pushbuttons. Slide FRONT and REAR VOLUME to 0. Slide BASS, TREBLE, and BALANCE to their center positions. Slide TAPE MONITOR to OFF, SELECTOR to AUX 1, MODE to 4-COLUMN, and SPEAKERS to MAIN.
5. Connect a low-impedance sine-wave generator to the AUX 1 IN-FRONT L jack. Set generator frequency to 0 and remove generator from the system.
6. Connect B-B (front) load resistor between MAIN SPEAKERS FRONT L and COMMON terminals. Connect a harmonic distortion analyzer and an AC VTM across the load.
7. Connect AC power cord and slide FRONT TO 150V and REAR TO 100V.
8. Increase generator output for 50 watts RMS (20V with 8 Booth load) per channel. Do not overload the analyzer.
9. Repeat preceding steps for FRONT R, REAR L, and REAR R channels.
CHASSIS LAYOUT
FM ALIGNMENT

Except as noted, maintain generator output level as low as possible during alignment.

Set SELECTOR to FM and release AUTOSCAN MODE switch for manual tuning. Set SELECTOR switch to DB and depress MUTING OFF switch. Release all pushbuttons. Set dial pointer to position of non-interference near 88 MHz. Slide FRONT and REAR VOLUME controls to 0.

IF
(1) Connect vertical dc input of scope to pin 90, scope ground to pin 5X. Use a direct probe.
(2) Connect 10.7 MHz sweep generator to pin 63, generator ground to pin 5Y.
(3) Adjust top and bottom cores of 2402 and 2452 and trimmer C446 for maximum gain and symmetry. See FM IF illustration.
(4) Increase generator level to full output. If necessary readjust top and bottom cores of 2452 for maximum gain and symmetry. See FM IF illustration.
(5) Reduce generator output and readjust top and bottom cores of 2402 for maximum gain and symmetry. See FM IF illustration.

DETECTOR
(6) Connect DC VTM and vertical input of scope to detector output pin 5B, meter and scope grounds to pin SW.
(7) Keep generator output as low as possible and adjust top and bottom cores of 2853 for maximum gain and symmetry. See FM DETECTOR illustration.
(8) Reduce sweep to zero (10.5 MHz output only). Set DC VTM to most sensitive scale. Readjust top core of Z453 for zero VDC at pin 5B.

AFC
(9) Connect DC VTM to pin 59, meter ground to pin 5X. Set AFC ADJUST 4R470 for zero VDC at pin 59. Disconnect VTM.

METER
(10) Set generator output as low as possible and sweep to zero (10.5 MHz only).
(11) Connect DC VTM to pin 57, ground to pin 5W. Adjust L701 for maximum gain. Disconnect VTM.

NOTE: If no signal is present at pin 57, verify that MUTING THRESHOLD ADJUST R703 is not turned fully counterclockwise.

DIAL CALIBRATION
(12) Tune MANUAL TUNING knob fully CCW. If pointer is not centered on 0, repetition it and cement pointer.
(13) Connect DC VTM to pin 31 (tip of R490). Set dial pointer to center of 108 MHz calibration bar (underneath number 108). Adjust R490 FM DIAL CAL H13 for exactly 24.5 VDC.
(14) Set dial pointer to center of 88 MHz calibration bar. Adjust R4043A FM DIAL CAL-L LOW for exactly 4.4 VDC.
(15) Repeat steps (13) and (14) until correct voltages are obtained.

FRONT END NOTE: This procedure uses 120-ohm composition resistors. Series with each lead from the RF generator to match 50-ohm output to 300-ohm input impedance. These matching resistors reduce generator voltage to one-half at the antenna terminals. RF signal voltages specified in this procedure indicate output levels, not antenna terminal voltages.

(16) Connect FM signal generator to FM ANTenna terminals through 120-ohm composition resistors. Modulator generator with 400 Hz, 22.5 kHz (or 25 kHz) deviation. Connect AC VTM to ROR OUT FRONT L jack.
(17) Set generator frequency and dial pointer accurately to 90 MHz. Adjust generator output for a front panel meter indication between 2 and 3. Adjust cores of L405, L404, L403, and X401 for maximum indication on AC VTM. Reduce generator output as necessary to keep panel meter reading between 2 and 3.
(18) Set generator frequency and dial pointer accurately to 100 MHz. Adjust trimmers C418, C416, C411, and C402 for maximum indication on AC VTM. Reduce generator output to maintain panel meter between 2 and 3.
(19) Repeat steps (17) and (18) until accurate dial calibration and maximum as signal is obtained.

METER FULL SCALE
(20) Set generator output to 100 mV and reduce sweep to zero. Set FULL SCALE METER DEFLECTION ADJUST R705 for a panel meter indication of 4.5V.

MUTING
(21) Set generator frequency and dial pointer to position of non-interference near 88 MHz. Modulator generator with 400 Hz, 22.5 kHz for ±25 kHz deviation. Reduce generator output until noise is visible on sine wave. Adjust generator frequency to center noise interference peaks and negative half-cycles. See SYMMETRICAL TUNING illustration.
(22) Release MUTING OFF switch, generator output output to 20uV. Turn R703 MUTING THRESHOLD adjustment clockwise until audio disappears on scope trace, then turn R703 clockwise slowly until audio reappears. Check adjustment by reducing generator output to 18uV. Audio should disappear.

AUTOSCANNING ADJUSTMENTS AND TEST
Adjustment of FM 1F and RP, MPX and Detector to be checked before attempting to adjust autoscann circuit.

(1) Connect FM signal generator to output terminals through 120-ohm composition resistors, one in series with each lead from the generator. Connect DC VTM to pin 34 on autoscann board, ground to pin 5P.
(2) Set SELECTOR to FM and MODE to 2-CH STEREO.
(3) Slide FRONT and REAR VOLUME controls to 0. Depress AUTOSCANN MODE pushbutton, release all other.
(4) Set generator frequency to 88 MHz. Modulator generator with 400 Hz, ±25 kHz deviation. Set generator output to 100 mV.
(5) Tune generator to frequency (±5 kHz) by pressing CONTINUOUS pushbutton, release when meter reaches high end of scale.
(6) Reduce generator output to 30 mV. Press and hold CONTINUOUS pushbutton until meter reaches high end of scale. Receiver should automatically tune to generator frequency at 88 MHz. After 5 seconds, DC VTM should indicate ±300 mV.
(7) Set generator frequency at 108 MHz. Tune receiver to generator frequency by pressing either CONTINUOUS or ONE STATION pushbutton. After 5 seconds, meter should indicate less than 200 mV.

AM ALIGNMENT
(1) Set SELECTOR to AM and slide FRONT and REAR VOLUME controls to 0.
(2) Connect 400 kHz sweep generator to pin 70, generator ground to pin 5V. Use a 0.1 uf capacitor in series with generator lead.
(3) Using a low capacitive probe, connect scope input to AC VTM pin 20 (RF/IF function of probes) and scope output to pin 5V. Detune bottom core of C253 (primary) by turning clockwise.
(4) Adjust core of C230 for maximum gain.
(5) Connect scope to pin 61, ground to pin 5V. Adjust top and bottom cores of Z301 for maximum display and symmetry. Note that the frequency at which maximum response is obtained may be ±2.5 kHz from center frequency. See AM IF illustration. Disconnect test equipment.

FRONT END

(6) Open EXT AM Antenna GND link. Connect AM signal generator to the EXT AM ANT and GND terminals. Use a 220 pF capacitor in series with generator lead. Connect AC VTVM to RCDR OUT FRONT L jack.

(7) Set generator frequency and dial pointer to center of 600 kHz calibration bar. Modulate generator with 400 Hz, 30% modulation. Adjust Z301 and Z302 for maximum audio.

(8) Set generator frequency and dial pointer to center of 1400 kHz calibration bar. Adjust C306 and C302 for maximum audio.

(9) Repeat steps (7) and (8) for maximum gain.
CENTER VOLTAGE TEST
Slide FRONT and REAR VOLUME controls to 0. Warm-up unit about 10 minutes.
Connect common lead of DC VTVM to chassis ground. Connect probe to each emitter terminal of Q811 and Q812 on rear and front amplifiers. Meter should indicate +3.5V (+3V) at each emitter. See illustration.

IDLING CURRENT ADJUSTMENT
Slide FRONT and REAR VOLUME controls to 0. Warm-up unit about 10 minutes. Set line voltage to 120 VAC.

REAR AMPLIFIERS
(1) Connect common lead of DC VTVM to emitter terminal of Q810 and probe to emitter terminal of Q811. See illustration. Set IDLING ADJUST R821 for indication of 20 to 40 mV.
(2) Connect DC VTVM between emitters of Q812 and Q814 and adjust R822 for indication of 20 to 40 mV.

FRONT AMPLIFIERS
Repeat steps (1) and (2).