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 in-warranty factory replacement, it may be cut out 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 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 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 fast-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 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 transistors 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 (opens 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 networks, 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 twisted to prevent frayed wire ends. Current in the speakers and output circuits is quite high — sever contacts, or small area wire, can cause significant power losses in the system. For wire lengths greater than 30 feet, 18 AWG, or heavier, should be used.

VOLTAGE MEASUREMENTS: All voltages are measured with the low voltage applied to 100 volts. All measured voltages are ±10%. AC voltages are measured ground with a VTVM, 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.
REMOVING MOTORBOARD

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

REMOVING DRESS PANEL

1. Unplug AC power cord.
2. Gently pull the VOLUME, BASS, TREBLE SELECTOR, and TUNING knobs from the control shafts. Remove the hex nuts from the shafts and remove panel by pulling forward over the shafts.
3. Reverse procedure for reassembly.

REPLACING DIAL GLASS

1. Remove dress panel. Refer to REMOVING DRESS PANEL procedure.
2. Carefully remove the foam strips at the ends of the dial glass. Strips may be reused with the replacement glass.
3. Slide the retaining clips from the flanges by gently twisting a flat-blade screwdriver in each slot.

REPLACING DIAL LAMPS

NOTE: Dial lamps are replaceable only as molded assemblies (IFR No. AS21410-3).
1. Unplug AC power cord.
2. Remove motorboard. Refer to REMOVING MOTORBOARD procedure.
3. Remove dress panel. Refer to REMOVING DRESS PANEL procedure.
4. Squeeze the sides of the assembly together at the back and press through the panel.

REPLACING STEREOE BEACON AND METER LAMPS

NOTE: The compartmented lamp assembly (IFR No. LM21008-2), 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. Unplug AC power cord.
2. Remove motorboard. Refer to REMOVING MOTORBOARD procedure.
3. Gently pull the four wires near 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 unsnap the lamp compartment from the top rear of the meter.
5. Center the replacement lamp assembly between the plastic flanges and press firmly into place.
DIAL STRINGING

1. Unplug AC power cord.
2. Remove motorboard. Refer to REMOVING MOTORBOARD procedure.
3. Remove drum panel. Refer to REMOVING DRUM PANEL procedure.
4. Remove dial pointer from old dial cord.
5. Prop unit on left side, remove right wood side-panel by removing two slotted screws near feet on right side.
6. Rotate tuning capacitor fully CW. Loosen screws in the drum and remove old dial cord.
7. Tie cord to spring. Fasten spring to START screw.
8. Run cord through slot in arm and wrap it turn CW around drum. Guide cord around pulley "A", and wrap 2 turns (CCW viewed from back) around tuning shaft.
10. Rotate drum CW, allowing cord to wind on drum.
11. Run cord over top of drum, around other side, into the arm slot. Tie a half-knot around FINISH screw.
12. Pull cord taut and tighten screw.
13. Rotate drum fully CW and CCW to distribute tensioning along cord. Repeat (12) and (13) to tension spring.
14. Place pointer on arm and slip cord over and under tabs.
15. Rotate drum fully CCW. Slide pointer to (5) mark on logging scale while holding tuning shaft fully CCW. Cement pointer to cord. Check dial calibration.

HARMONIC DISTORTION TEST

CAUTION:
(A) Measure the power of one channel at a time.
(B) Limit measurements to 10 minutes.
(C) Use a load resistor with a minimum rating of 50 watts.

Set BASS and TREBLE controls to NORMAL. Set SELECTOR switch to AUX. Depress MAIN SPKRS switch. Unplug AC power cord.
1. Connect a low-distortion sine-wave generator to the LEFT AUX IN jack. Set generator frequency to 1,000 Hz, and output level to minimum.
2. Connect an 8-ohm load resistor between the LEFT SPKRS MAIN and COMMON terminals. In parallel with the load resistor, connect the input leads of an HD analyzer and the input leads of an accurately calibrated AC VTM.
3. Connect AC power cord and rotate VOLUME control to maximum.
4. Increase generator level for 14 watts output (110.6 V RMS across 8-ohm load). HD meter should read 0.5% or less.
5. Repeat preceding steps for right channel.
5) Set generator frequency and dial pointer accurately to 900kHz. Modulate generator with 400Hz, ±75kHz deviation. Bend oscillator coil L3 for maximum amplitude at P5.
6) Set generator frequency and dial pointer accurately to 108MHz. Adjust oscillator trimmer T3C for maximum amplitude at P5.
7) Repeat steps (5) and (6) for accurate dial calibration.
8) Reconnect DC VTMV to P5. Set generator level to 1 mV. Tune receiver to generator frequency (108MHz) for 0 VDC at P5.
9) Connect AC VTMV and scope to RIGHT RCDR OUT jack. Connect MPX generator output (left) to FM generator EXTERNAL MODULATION input. Modulate left and right channels with 400Hz, ±75kHz deviation and 1kHz pilot (±7.5kHz deviation).
10) Adjust top cores of L17 and L18 for maximum audio. Note audio level.
11) Modulate right channel only. AC VTMV should read ±20 dB below level noted in step 10.
12) Disconnect MPX generator. Set generator output to 20 mV, and modulate with 400Hz, ±75kHz deviation.
13) Connect jumper between P3 and P4 to turn AFC on. DC VTMV should read ±20 dB below level noted in step 10.
14) Connect jumper between P3 and P4. Disable generator frequency for -0.5 VDC at P5. Disconnect jumper between P3 and P4 to turn AFC on. DC VTMV should read ±20 dB below level noted in step 10.
15) Disconnect jumper between P3 and P4. Disable generator frequency for -0.5 VDC at P5. Remove jumper. Meter should read between -0.5 and 0 VDC. Disconnect test equipment.

AM ALIGNMENT

1) Set SELECTOR switch to AM. Turn VOLUME control to minimum.
2) Connect 45kHz sweep generator through 0.1uF to P19. Connect scope through 220kΩ to P1. Adjust cores of L14, L13, L11 and L10 for maximum gain and symmetry.
3) Disconnect sweep generator. Connect AM audio generator through 220kΩ to P19. Connect scope to AC VTMV to RIGHT RCDR OUT jack.
4) Disconnect jumper between P21 and chassis. Adjust oscillator coil L12 for maximum amplitude.
5) Set generator frequency and dial pointer accurately to 1400kHz. Adjust oscillator trimmer T3C for maximum amplitude.
6) Repeat steps (5) and (6) for accurate dial calibration and maximum gain.
7) Disconnect jumper between P21 and chassis. Reconnect AM audio generator to AM ANTENNA terminal.
8) Tune receiver to generator frequency at 600kHz. Modulate generator with 400kHz, ±30kHz modulation.
9) Set the wax holding the coil to the ferrite antenna. Shift the coil for maximum audio indication. To secure coil in position, remelt wax.
10) Tune receiver to generator frequency at 1400kHz. Adjust antenna trimmer TC4 for maximum audio.

FM ALIGNMENT

1) Set SELECTOR switch to FM. Turn VOLUME control to minimum.
2) Connect 10kHz sweep generator to 1pF to P19. Connect scope through 220kΩ to P1. Adjust cores of L14, L13, L11 and L10 for maximum gain and symmetry.
3) Disconnect sweep generator. Connect AM audio generator through 220kΩ to P19. Connect scope to AC VTMV to RIGHT RCDR OUT jack.
4) Disconnect jumper between P21 and chassis. Adjust oscillator coil L12 for maximum amplitude.
5) Set generator frequency and dial pointer accurately to 1400kHz. Adjust oscillator trimmer T3C for maximum amplitude.
6) Repeat steps (5) and (6) for accurate dial calibration and maximum gain.
7) Disconnect jumper between P21 and chassis. Reconnect AM audio generator to AM ANTENNA terminal.
8) Tune receiver to generator frequency at 600kHz. Modulate generator with 400kHz, ±30kHz modulation.
9) Shift the wax holding the coil to the ferrite antenna. Shift the coil for maximum audio indication. To secure coil in position, remelt wax.
10) Tune receiver to generator frequency at 1400kHz. Adjust antenna trimmer TC4 for maximum audio.