



SABER™ R, SECURENET™ SABER™ R, and
SECURENET™ Systems SABER™ R
Handie-Talkie® Portable Radios

H499 Ruggedized Option Supplement to Service Manuals
68P81045C70, 68P81045C75, 68P81063C30,
68P81066C95, 68P81067C10, 68P81043C90,
and 68P81043C95

Service Manual



Manual Scan

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Thank you,

Bryan Fields, W9CR
bryan@bryanfields.net

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SABER™ R, SECURENET™ SABER™ R, and SECURENET™ Systems SABER™ R Handie-Talkie® Portable Radios

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I. INTRODUCTION

The SABER™ R, SECURENET™ SABER™ R, and SECURENET™ Systems SABER™ R Handie-Talkie® portable radios are “ruggedized” versions of the Clear SABER™, SECURENET™ SABER™, and SECURENET™ Systems SABER™ radios. These radios are designed to withstand adverse conditions and still perform according to specifications. They meet or exceed U.S. Military Specifications 810C, D, and E for

shock, abrasion, physical abuse, and corrosion resulting from exposure to salt sprays, fuels, and chemicals.

This manual supplements the standard SABER and Systems SABER service manuals, and contains information on the differences between the “ruggedized” version radios and the standard radios. These differences include submersibility, and changed housing, base plate, and battery design.

MODEL CONFIGURATION

FACTORY ID (SEE NOTE)	RADIO TYPE	POWER LEVEL	FREQ.	SECURE CAPABLE/CLEAR	KEYPAD	DISPLAY
H33QXN7139CN	SABER	1W-2.5W	146-174MHz	SECURE CAPABLE	NONE	NONE
H43QXN7139CN	SABER	2.5W-6W	136-174MHz	SECURE CAPABLE	NONE	NONE
H33QXJ7139CN	SABER	1W-2.5W	146-174MHz	SECURE CAPABLE	3X1	LCD
H43QXJ7139CN	SABER	2.5W-6W	136-174MHz	SECURE CAPABLE	3X1	LCD
H34QXN7139CN	SABER	1W-2.5W	438-470MHz	SECURE CAPABLE	NONE	NONE
H44QXN7139CN	SABER	2.5W-6W	403-512MHz	SECURE CAPABLE	NONE	NONE
H34QXJ7139CN	SABER	1W-2.5W	438-470MHz	SECURE CAPABLE	3X1	LCD
H44QXJ7139CN	SABER	2.5W-6W	403-512MHz	SECURE CAPABLE	3X1	LCD
H42QXN7139CN	SABER	1W-6W	68-88MHz	SECURE CAPABLE	NONE	NONE
H42QXJ7139CN	SABER	1W-6W	68-88MHz	SECURE CAPABLE	3X1	LCD
H33TUN5170CN	Systems SABER	1W-2.5W	146-174MHz	SECURE CAPABLE	NONE	NONE
H43TUN5170CN	Systems SABER	2.5W-6W	136-174MHz	SECURE CAPABLE	NONE	NONE
H34TUN5170CN	Systems SABER	1W-2W	403-512MHz	SECURE CAPABLE	NONE	NONE
H44TUN5170CN	Systems SABER	2W-5W	403-512MHz	SECURE CAPABLE	NONE	NONE
H33SAN7139CN	SABER	1W-2.5W	136-174MHz	CLEAR	NONE	NONE
H43SAN7139CN	SABER	2W-6W	136-174MHz	CLEAR	NONE	NONE
H34SAN7139CN	SABER	1W-2W	403-512MHz	CLEAR	NONE	NONE
H44SAN7139CN	SABER	2W-5W	403-512MHz	CLEAR	NONE	NONE
H33SAJ7139CN	SABER	1W-2.5W	136-174MHz	CLEAR	3X1	LCD
H43SAJ7139CN	SABER	2.5W-6W	136-174MHz	CLEAR	3X1	LCD
H34SAJ7139CN	SABER	1W-2W	403-512MHz	CLEAR	3X1	LCD
H44SAJ7139CN	SABER	2W-5W	403-512MHz	CLEAR	3X1	LCD

NOTE: All radios equipped with H499 option.
Clear and SECURENET SABER R Radios: (With the Ultra High Capacity Battery)

Dimensions: 8.37" x 3.06" x 1.56" (212.6mm x 77.72mm x 39.62mm)

Weight: 31.23 oz. (885 g)

Specifications are Subject to Change Without Notice

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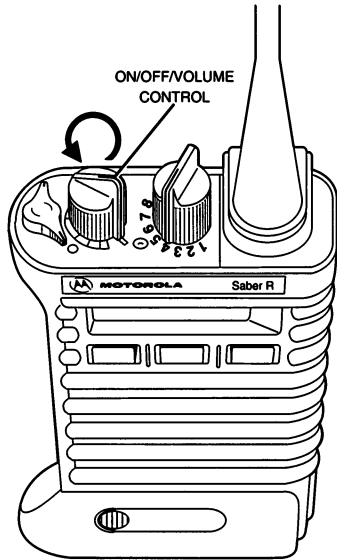
SPECIALIZED TOOLS AND TEST EQUIPMENT

SERVICE AIDS	
RPX-4665A	Field Modification Kit/RTX4005A
RSX-4043A	Rotatorq Tool
RTK-4203A	Program/Test Cable
RTL-4208A	RF Coaxial Probe
RTL-4224A	Battery Eliminator
RTL-4225A	Housing Eliminator
RTL-4238A	SABER RF Cable
RTX-4005B	Portable Products Test Set
0180370B85 thru B86	Ungar Table Fixtures
0180386A81	Micro-Tip Soldering Iron
0180386A82	Static Protection Kit
5880348B33	SMA to BNC Adapter (for probe)
6680321B79	Phillips-Head Rotatorq Bit
6680334B48 thru B52	Ungar Service Heads
6680370B88	Frequency and On/Off Switch Spanner Nut Rotatorq Bit
6680370B89	Baseplate Spanner Nut Rotatorq Bit
6680371B34	Antenna Bushing Spanner Nut Rotatorq Bit
6680385A11	Module Extractor
6680387A59	Leadless Component Extractor
6680387A64	Heat Controller With Safety Stand
8407668M01	Display Extender Cable
TEST EQUIPMENT	
R-1053A	Dual-Trace Oscilloscope
R-2001D	Communications System Analyzer
S-1339A	RF Millivoltmeter
S-1347D	Power Supply
RTL-4223A	Charger Tester
RTL-4237A	Battery Tester
FIELD PROGRAMMING EQUIPMENT	
RVN-4002A	Field Programmer Software on 5 1/4-inch Disk
RVN-4003A	Field Programmer Software on 3 1/2-inch Disk
0180353A74	Radio Interface Box (RIB)
0180357A57	RIB Wall-Mounted Power Supply
3080369B71	Computer Interface Cable (PC-XT)
3080369B72	Computer Interface Cable (PC-AT)

DISASSEMBLY/REASSEMBLY PROCEDURES

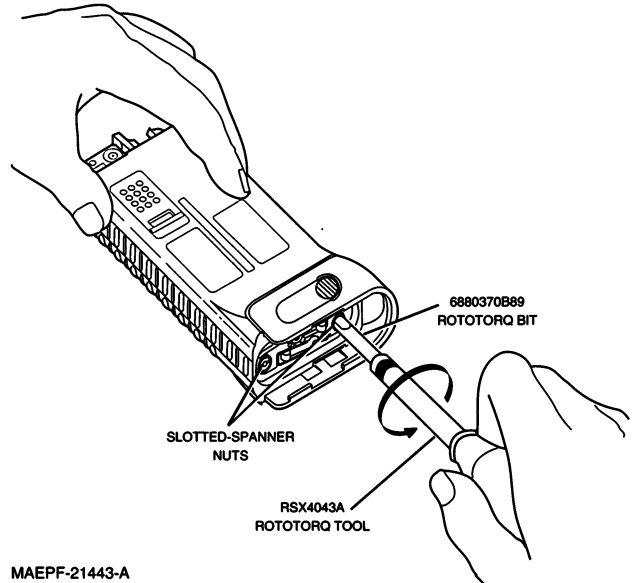
I. DISASSEMBLY

A. Turn off the radio by rotating the on/off/volume control knob fully counterclockwise until you hear a click. Remove the universal connector cover or any accessory connected to the radio before beginning disassembly.



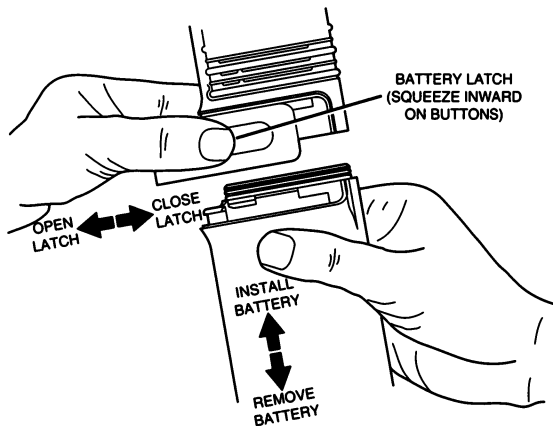
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C. Loosen the two slotted-spanner nuts on the bottom of the radio using Rotatorq tool bit No. 6680370B89. When loosened, the captive slotted-spanner nuts will spin freely without separating from the baseplate.



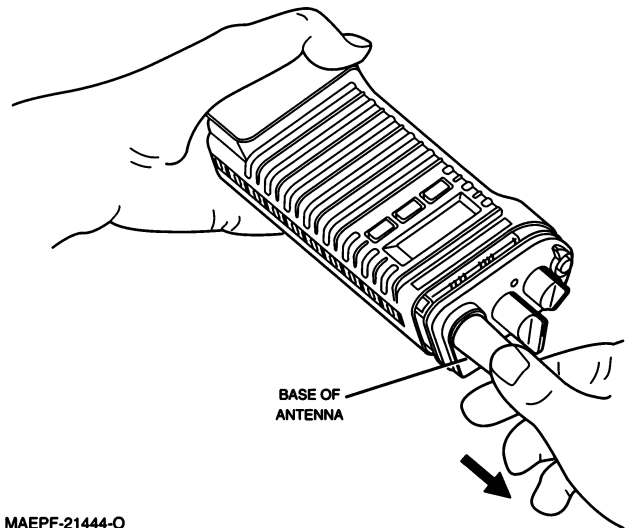
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B. Remove the battery from the baseplate on the bottom of the radio housing by simultaneously squeezing inward on the spring-loaded battery latch buttons, and sliding the U-shaped battery latch slide away from the radio as far as it will go (about 1/2 inch). Then, pull the battery down and away from the radio.



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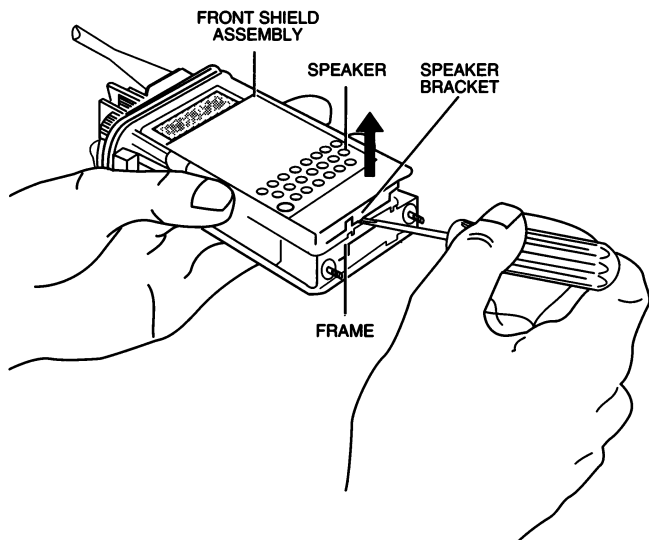
D. Remove the frame assembly from the radio housing by grasping the antenna at its base and pulling it gently upward. Do not depress the PTT switch during removal and do not push on the slotted-spanner nuts to lift the frame assembly.



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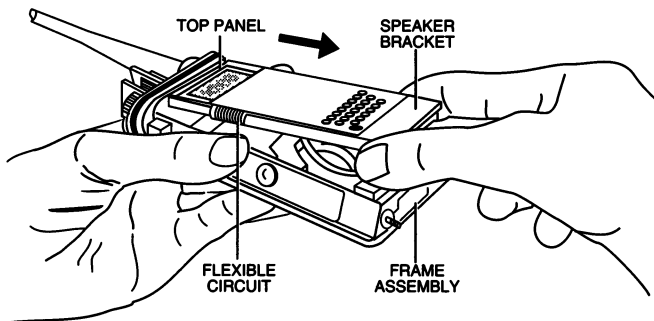
CAUTION
 Ensure that all static electricity safeguards are in place.

E. With the speaker facing upward, **remove the speaker bracket assembly** by inserting a thin screwdriver blade between the frame and the bottom of the speaker bracket, and prying gently upward on the speaker bracket until it is disengaged from the frame.



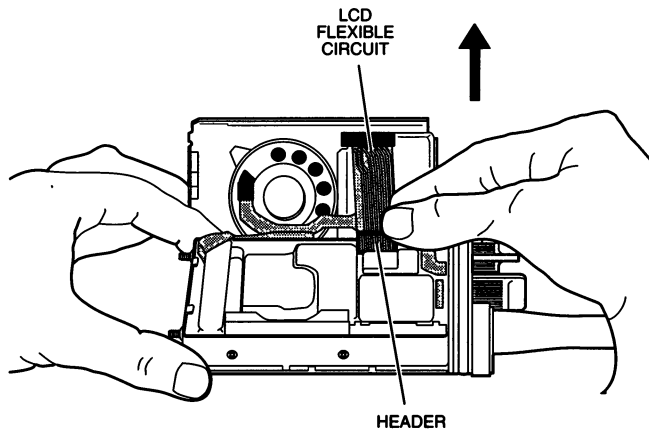
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F. **Lift the speaker bracket assembly** away from the bottom of the frame assembly, then pull it out from under the plastic top panel. Be careful not to pull against the flexible circuits connecting the speaker bracket to the frame assembly.



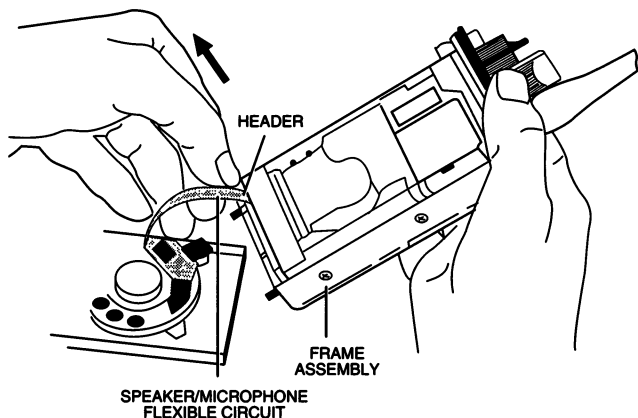
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G. **ON SABER II AND Systems SABER RADIOS ONLY:** **Disconnect the LCD interconnect flexible circuit** from the frame assembly by pulling the header straight out and away from the main printed circuit board.



MAEPF-20614-O

H. **Disconnect the speaker/microphone flexible circuit** from the frame assembly by pulling the connector straight out and away from the main printed circuit board.



MAEPF-20615-A

CAUTION
 Refer to "SERVICING MAJOR SUBASSEMBLIES" (Section 2) and the appropriate exploded view diagrams at the back of this manual before attempting further disassembly or repair.

II. SERVICING MAJOR SUBASSEMBLIES

A. Baseplate

- All repairs to the baseplate assembly can (and should) be made with the radio chassis inside the radio
- After the slotted-spanner nuts are loosened, the baseplate is held in place by a screw.
- The retainers holding the slotted-spanner nuts in place are not reusable. Replacement of the retainers requires special insertion procedures; refer to the instruction sheet provided with the slotted-spanner nut kit.
- The o-ring over the white vacuum port seal must be fully seated in its recess before the baseplate is reassembled.

B. Housing Assembly

- The housing assembly includes many parts that are not replaceable or repairable.
- The insulator on the universal connector can, and should, be replaced if the old insulator has been torn. When replacing the insulator take care to keep it out of the main seal o-ring's seating area.
- The PTT lever can be replaced by prying out the old part with a soft plastic tool. The plastic housing around the lever may be damaged if a harder tool is used.

C. Control Top Panel

- The control top panel is fastened to the frame by the on/off/volume and frequency switches, and two self-tapping screws; it should be removed from the frame only if absolutely necessary. If repair is required, always start the screws into the control top panel by hand before tightening them with a torque wrench; this will help avoid cross-threading and stripping of the plastic panel.
- The on/off/volume and frequency knobs are 2-part kits; each kit consists of a knob and an insert. Once an insert is removed, it cannot be used again; therefore, remove an insert only if the on/off/volume control or frequency switch must be replaced, or if the control top must be removed from the frame.
- The number of frequency switch positions can be changed by removing the frequency knob and insert, and aligning the top tab on the detent washer with the number on the escutcheon that is equal to the desired number of frequency positions minus three. For example, a 12-position frequency switch would have the top tab aligned with the "9" on the escutcheon. A new frequency knob and insert must be used each time this change is made.

NOTE

There are different detent washers for even or odd numbers of switch positions; see the appropriate exploded view parts list.

D. LCD/Speaker Bracket Assembly

- The LCD assembly can be replaced on SABER II radio PC board assemblies, but the instructions on the replacement kit's instruction sheet must be strictly followed.
- The microphone boot must be properly oriented and seated in the speaker bracket **before** the microphone is pressed into place.

E. Backshield Assembly

- Before removing the backshield, ensure that all static electricity safeguards are in place.
- For best results, loosen/tighten all four screws lightly before loosening/tightening any single screw completely.
- The backshield screws are held captive in the shield after being loosened.

F. Circuit Boards and Modules

- All modules plug into sockets on the main circuit board.
- Some modules are fastened to the main board and frame with screws; remove these screws before attempting to unplug a module. **Never** substitute any screw.
- Several of the modules are designed to be removed with a standard DIP extractor tool (OK-1 or equivalent). Always use the extractor tool when removing these modules to avoid damaging their leads.
- Some modules have guide pins to assist in insertion or removal. Pressure may be applied to these guide pins to aid removal of a module if, and only if, it is distributed evenly over all guide pins on the module. *Applying all the force to a single guide pin will cause severe damage to the module.*
- Before reinserting any module, always check its leads for damage. Gently straighten any leads that may be bent; replace any modules with severely damaged leads.
- Before reinserting reference oscillator module U301 into the main circuit board, be certain that its squared (pin 1) corner is correctly oriented per the main circuit board component layout diagram.
- When electrically testing and/or probing the main circuit board with the back shield removed, always use the three finger screws on the SABER housing eliminator service aid to provide grounding to the VCO synthesizer module U300 (two places), and the rf ground clip (one place).

- When removing the main circuit board from the frame assembly, do the following:
 1. Remove the back shield assembly.
 2. Unplug the PTT/controls flexible circuit.
 3. Remove the two power amplifier module (U202) screws from the frame.
 4. Remove module SECURENET U900.
 5. Remove the two main compression connector screws.
 6. Lift the board at the bottom and pull out from under the control top panel.
- The rf and ground contacts at the top of the main circuit board are exposed when the board is removed from the frame. Special care must be taken to avoid accidental damage to these contacts.

G. Frame Assembly

- The tapped tabs on the frame can be stripped if excessive screw tightening torques are used (see Torque Specifications table). The frame is not repairable.
- If the PTT/controls flex circuit must be lifted or removed for any reason, it must not be readhered to the frame; the flex must be replaced.

H. Dual-Function Switch (S801) and Actuator Assembly

- Before removing the switch, remove the knob by gently separating the two arms of the switch bracket (located between the switch and the main o-ring seal) and pulling upward on the knob.
- Before reinserting the knob, ensure that the slot in the switch is properly aligned with the blade on the knob's shaft.
- When the knob is properly inserted, the arms of the switch bracket will snap into position (approximately 0.2 inches apart), the knob will not be loose in the switch bracket, and the bracket will hold the switch firmly against the inside of the top control panel. If this is not the case, replace the switch bracket.

III. REASSEMBLY

Reassemble the radio in the reverse order of disassembly, referring to "SERVICING MAJOR SUBASSEMBLIES" (Section 2) and making certain:

- that the speaker/microphone connector (and the LCD interconnect header on SABER II radios) is correctly aligned so that no twisting or pinching of the flexible circuit occurs when the speaker bracket is reattached to the frame assembly.
- that the two extended tabs at the top of the speaker bracket are properly inserted into the slots between the frame and the control top panel.
- *that the PTT switch and monitor button are not depressed while the frame is being inserted into the housing.*
- to tighten all hardware loosened or removed during disassembly per the torque specifications listed in the Torque Specifications table. Use recommended torque driver (Motorola RSX4043A Rotatorq Tool or equivalent).
- that there is no foreign material on the main o-ring or stud seals.



- to properly orient the completed frame assembly before inserting it into the radio housing.

ENSURING RADIO SUBMERSIBILITY

I. INTRODUCTION

SABER R radio models meet twice the stringent requirements of U. S. MIL-STD-810C, Method 512.1, Procedure I, MIL-STD-810D, Method 512.2, Procedure I, and MIL-STD-810E, Method 512.3, Procedure 1, which require the radio to maintain watertight integrity when immersed in six feet of water for two hours. Radios shipped from the Motorola factory have passed the water immersion test and should not be disassembled. If disassembly is necessary, refer to qualified service personnel and service shops capable of restoring the watertight integrity of the radio.

CAUTION

It is strongly recommended that maintenance of the radio be deferred to qualified service personnel and service shops. This is of paramount importance as irreparable damage to the radio can result from service by unauthorized persons. If disassembly is necessary, unauthorized attempts to repair the radio may void any existing warranties or extended performance agreements with Motorola. It is also recommended that submersibility be checked annually by qualified service personnel.

If the radio is accidentally dropped in water, shake the radio to remove the excess water from the speaker grille area before operating; otherwise, the sound may be distorted until the water has evaporated from this area.

II. GENERAL INFORMATION

To ensure that the radio is truly a watertight unit, special testing, test procedures, and specialized test equipment are required. The special testing involves a vacuum check of the radio and pressure testing (troubleshooting) for water leaks if the vacuum check fails. The specialized test equipment is needed to perform the vacuum check and pressure testing, if required.

NOTE

When ordering replacement batteries for a radio, NTN7058A (Ni-Cd, FM approved, Ultra-High-Capacity) should be ordered.

III. SPECIALIZED TEST EQUIPMENT

A. Vacuum Pump Kit, NLN9839

The vacuum pump kit includes a vacuum pump with gauge, and a vacuum hose. An adapter with gasket (NTN4264), which must be ordered separately, connects the vacuum hose to the radio's baseplate. The vacuum pump kit and adapter are also used on Motorola Expo™ and SABER radios.

B. Pressure Pump Kit, NTN4265

The pressure pump kit includes a pressure pump with gauge, and a pressure hose; the pressure pump kit is also used on Motorola Expo and SABER radios. As with the vacuum pump kit above, the NTN4264 adapter connects the pressure hose to the radio's baseplate.

C. Miscellaneous Hardware

Other items needed for testing the submersible radio include:

- Large water container.
- Fresh water
- A supply of replacement seals, o-rings, and gaskets (refer to the exploded view parts lists in the applicable service manual for Motorola part numbers).

IV. DISASSEMBLY AND REASSEMBLY

If disassembly and reassembly of the radio is required, refer to the "DISASSEMBLY/REASSEMBLY PROCEDURES" in the applicable service manual.

A. Disassembly

Disassemble the radio according to the "DISASSEMBLY" section of this manual; refer also to the "SERVICING MAJOR SUBASSEMBLIES" section.

B. Reassembly

Reassemble the radio according to the "REASSEMBLY" section of this manual; refer also to the "SERVICING MAJOR SUBASSEMBLIES" section. Tighten all hardware which was loosened or removed per the Torque Specifications table. **DO NOT REASSEMBLE THE RADIO WITHOUT FIRST PERFORMING THE FOLLOWING PRELIMINARY INSPECTION PROCEDURE:**

1. Remove the main seal o-ring from the control top panel.
2. Inspect the seal area around the control top panel for foreign material that might prevent the main seal o-ring from sealing properly.
3. Install a new main seal o-ring; discard the old o-ring.
4. Check to ensure that both frame stud seals are in place and are not damaged in any way. Replace both frame stud seals if any damage or foreign material is visible.

CAUTION

The main seal o-ring should not be visible when looking at the top side of the radio. If the seal is visible, it is improperly installed.

NOTE

When seating the main seal o-ring in the radio housing, use hand pressure to press the radio into the housing. Make sure that the baseplate slotted-spanner nuts are properly aligned before tightening them.

V. VACUUM TEST

Refer to the exploded view diagrams and parts lists in this manual.

A. General

The vacuum test uses a vacuum pump and gauge. The pump creates a vacuum condition inside the radio, and the gauge monitors the radio for a stable vacuum reading; that is, checking for a properly sealed, watertight unit. Before starting the vacuum test:

- Remove the battery and check the battery contact mounting screws for correct torque.
- Check the two baseplate slotted-spanner nuts for correct torque.
- Check the antenna bushing spanner nut for correct torque.
- Remove the universal connector cover to expose the universal connector.

B. Conducting the Test

1. Attach the vacuum hose to the vacuum pump. Check the pump and hose for leaks by blocking off the open end of the hose and operating the pump a few times. The actual reading of the gauge at this point is not important; it is important that the gauge pointer remains steady, indicating no vacuum leaks in the pump.
2. Ensure that a rubber gasket is attached to the hose-to-baseplate adapter. Screw the adapter into the tapped hole in the baseplate.
3. Orient the radio so that the housing is rightside-up and the PTT button is on the left. Place several drops of fresh water in the small hole on the right side of the second speaker grille slot from the bottom (opposite from the microphone). This will seal off the grille.
4. Attach the open end of the hose to the adapter.
5. Operate the pump a few times until the gauge indicates 5 in. Hg; *do not pull more than 10 in. Hg of vacuum on the radio*. The gauge should indicate a leaking-down and should stabilize at some lower value. The leak-down is normal and important; it indicates that the pressure is equalizing across the vacuum port seal.

NOTE

If this leak-down phenomenon does not occur, the port seal is probably missing, damaged, or wet. In this manual, refer to the "Vacuum Port Seal" paragraph of the "PRESSURE TEST" section.

Operate the pump again until the gauge indicates 5 in. Hg. Some additional leak-down will occur. After repeating this action several more times, the gauge should stabilize at 5 in. Hg.

6. Observe the gauge for approximately two minutes.
 - If the needle falls 2 in. Hg or less (for example, from 5 in. Hg to 3 in. Hg), then the radio has passed the vacuum test and is approved for submersibility. No additional testing will be required.
 - If the needle falls more than 2 in. Hg (for example, from 5 in. Hg to less than 3 in. Hg), then the radio has failed the vacuum test and the radio might leak if submersed. Additional troubleshooting of the radio will be required; complete this procedure, then go to the "PRESSURE TEST" section of this manual.
7. Remove the vacuum hose and adapter from the radio.

VI. PRESSURE TEST

Refer to the exploded view diagrams and parts lists in this manual.

A. General

Pressure testing the radio is necessary only if the radio has failed the vacuum test. Do not perform the pressure test until the vacuum test has been completed. Pressure testing involves creating a pressure condition inside the radio, submersing the radio in water, and observing the radio for a stream of bubbles (leak). Since all areas of the radio are being checked, observe the entire unit carefully for the possibility of multiple leaks before completing this test.

B. Conducting the Test

1. Screw the adapter (with gasket) into the tapped hole in the baseplate.
2. Attach one end of the pressure hose to the adapter and the other end to the pressure pump.
3. Operate the pump until the gauge reads approximately 1 psig. Some leak-down is normal as the pressure equalizes across the vacuum port seal.

CAUTION

Pressure any greater than 1 psig may push air around the main seal and may damage the grille area.

4. Maintain the pressure at 1 psig and submerge the radio into a water-filled container.
5. Watch for any continuous series of bubbles. A stream of bubbles may occur emanating from the grille port hole (refer to step V.B.3.), or the keypad area, if applicable. These phenomena are normal. A stream of bubbles occurring anywhere else, including other areas of the grille, indicates a sign of leakage.

NOTE

Some air entrapment may cause the accumulation of bubbles, especially in the grille area, but the bubbles should not be continuous.

6. Note all of the seal areas that show signs of leakage. Pinpoint the problem(s) to one (or more) of the following areas:

(a) housing	(e) rf connector
(b) vacuum port seal	(f) frame stud seals
(c) antenna bushing seal or lightpipe seal	(g) main seal
(d) frequency switch and on/off/volume control	(h) battery contact seal
7. Remove the radio from the water container and dry it thoroughly. Be especially careful to dry the area around the main seal to prevent contamination of the internal electronics while the unit is open. Also, to keep the area around the port seal dry, make sure that there is no water around the baseplate vacuum port.
8. Remove the adapter and pressure hose added in steps (1) and (2).

C. Troubleshooting Leak Areas

Before repairing any leak, read all applicable area repair paragraphs. This will help to eliminate unnecessary disassembly and reassembly of a radio with multiple leaks. Troubleshoot only the faulty seal areas listed in the "PRESSURE TEST" section, and, when multiple leaks exist, in the order listed.

NOTE

Before reassembling the radio, always install a new main seal o-ring, and new seals in the defective area.

1. Housing

If a leak occurs in any portion of the housing assembly (monitor or push-to-talk switches, speaker grille, or universal connector), replace the housing.

2. Vacuum Port Seal

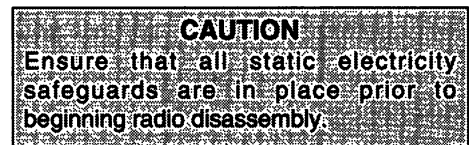
- a. This seal can, and should, be repaired without removing the radio chassis from the housing assembly. Remove the baseplate by loosening the slotted-spanner nuts and removing the screw that does not hold down a battery contact.
- b. Inspect the elastomer seal for damage or foreign material; replace or clean as necessary. Remove the old vacuum port seal, and inspect

the sealing surfaces of the housing and baseplate for damage; replace any faulty items, and install a new vacuum port seal.

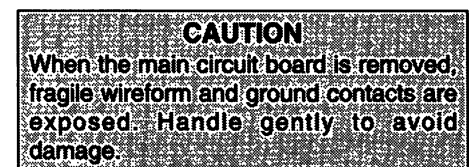
3. Antenna Bushing Seal or Lightpipe Seal

- a. Check the antenna bushing spanner nut for correct torque. If the nut is loose, tighten it to the correct value and run the pressure test again. If the nut is not loose, the antenna bushing must be replaced. This will require the removal of the main circuit board from the frame assembly according to the following procedure:

- (1) Referring to the "DISASSEMBLY" section in the applicable service manual, disassemble the radio until the speaker bracket assembly is disconnected and removed from the frame assembly.



- (2) Read the precautions outlined in the "SERVICING MAJOR SUBASSEMBLIES" section of the service manual before performing steps 3 through 8, below.
- (3) Disconnect the PTT/controls flexible circuit from the radio circuit board.
- (4) Remove the back shield.
- (5) Remove the two bottom connector screws securing the main circuit board, and the two power amplifier module (U202) screws through the frame.
- (6) Gently remove the ground clip. If the clip is bent during removal, replace it.
- (7) Remove the SECURENET module (U900).
- (8) Grasping the main circuit board at the bottom connector end, lift the board and carefully slide it out from under the control top panel.



- b. The control top panel must now be removed from the frame assembly. Remove the two screws that hold the panel to the side of the radio frame.
- c. Remove the on/off/volume control and frequency switch knobs by grasping the tip of each knob with pliers and pulling the knob off the shaft of the switch. Open the insert by inserting a screwdriver blade into the insert's slot, then pull the insert off the shaft.

- d. Remove the detent washer from around the frequency switch, noting the orientation of the washer, relative to the switch, prior to removal. Remove the torque washer from the on/off volume control switch. Then, remove the spanner nut from each switch.
- e. Noting the location of the lightpipe, which will be loose, lift the control top panel off the frame.
- f. Remove the antenna bushing spanner nut and the antenna bushing from the control top panel. Inspect the sealing surfaces on the control top panel and bushing; replace faulty items as required. Remove and discard the old antenna bushing o-ring, and install a new one.
- g. Before reassembling the radio, inspect the o-rings on the lightpipe, on/off/volume control, and frequency switch for damage and foreign material. Also, ensure that the lightpipe and the antenna bushing's hex head are properly seated in the control top panel.
- h. Reassemble the radio in reverse order of disassembly, using new frequency switch and on/off/volume control knobs and inserts.

4. Frequency Switch and On/Off/Volume Control

- a. Remove the suspect knob by grasping it with pliers and pulling it off the shaft of the switch. Then, grasp the insert with the pliers and pull it off the shaft. If you are working on the frequency switch, remove the detent washer from around the switch as well, noting the orientation of the washer, relative to the switch, prior to removal. If you are working on the on/off volume control, remove the torque washer.
- b. Check the switch's spanner nut for correct torque. If the nut is loose, tighten it to the correct value and rerun the pressure test. If the nut is not loose, determine if the leak is internal (from within the switch) or external (from around the switch) by pressurizing the radio to 1 psig, submersing the unit in water, and observing the flow of bubbles.
- c. Following the procedures detailed in "(3) Antenna Bushing Seal or Lightpipe Seal," above, disassemble the radio until the control top panel is removed from the frame assembly.
- d. If the leak is from the internal switch seal, replace the switch; follow the unsoldering and replacement instructions contained in the new switch's instruction sheet. If the leak is from the external switch seal, replace the switch's o-ring.
- e. Before reassembling the radio, inspect the light pipe seal and both switch seals for damage and foreign material. Repair or clean as necessary.
- f. Reassemble the radio in reverse order of disassembly, using new frequency switch and on/off/volume control knobs and inserts.

5. RF Connector

- a. To replace the rf connector seal, disassemble the radio until the main circuit board is removed from the frame assembly, following the procedures detailed in "(3) Antenna Bushing Seal or Lightpipe Seal," above.
- b. While applying light pressure on the rf connector, pull and disconnect the rf ground clip. If the bubbles in the pressure test come through the rf connector (as opposed to around the connector), then replace the connector. Lift out the rf connector and replace the o-ring. Inspect the rf connector hole in the control top panel for foreign material, and clean as required.
- c. Reassemble the rf connector, snapping the rf ground clip in place while applying pressure to the connector. Ensure that the ground clip is fully seated within the groove in the connector.
- d. Reassemble the radio in reverse order of disassembly.

6. Dual-Function Switch and Actuator Assembly

- a. Remove the knob assembly by gently separating the two arms of the switch bracket (located between the switch and the main o-ring seal) and pulling the knob up and away from the control top.
- b. Remove the o-ring from the knob's shaft and replace it with a new, prelubricated o-ring.

NOTE

The switch bracket should hold the switch firmly against the inside of the control top panel. If this is not the case, replace the switch bracket.

- c. Before reinserting the knob into the switch bracket, ensure that the slot in the switch is properly aligned with the blade on the knob's shaft.
- d. Reinsert the knob into the switch bracket; the arms of the switch bracket will snap into position (approximately 0.2 inches apart).

NOTE

The knob should not be loose in the switch bracket; if the knob is loose, replace the switch bracket.

7. Frame Stud Seals

- a. Remove the seals by pulling them off the frame studs.
- b. Inspect sealing areas on the radio housing for foreign material, scratches, and nicks. Clean off foreign material as required; replace the housing assembly if it is damaged in any way.
- c. Install the new seals, ensuring that they are fully seated against the radio frame before reassembling the radio.

8. Main Seal

- a. Remove and discard the old main seal o-ring around the control top panel. Inspect the sealing surfaces on the housing and control top panel, replacing faulty items and cleaning off any foreign material.
- b. Inspect the speaker bracket assembly to ensure that the two tabs protruding from the top of the speaker bracket are properly seated *between* the frame and the control top panel. An improperly located speaker bracket will distort the housing in the seal area, causing leakage.
- c. Remove the antenna before installing a new main seal o-ring. Install the main seal o-ring by first placing it in the groove on the antenna side of the radio, then by slowly stretching the o-ring around and over the frequency switch and on/off/volume control, and finally by dropping it into the groove on the push-to-talk switch side of the radio.
- d. Inspect again for proper seating of the main seal all around the control top panel, and for foreign

material. Observe carefully to ensure that the main seal o-ring is not pinched between the radio housing and the control top panel during insertion of the radio chassis into the housing assembly. Pinched main seal o-rings are one of the most common causes of vacuum test failures.

9. Battery Contact Seal

- a. Remove the B+ contact and screw, and the screw which does not retain a contact.
- b. With the chassis removed from the radio, gently pull the universal connector flex from the bottom of the radio housing. Both contact bushings should have red o-rings. If an o-ring is missing, place a replacement o-ring on the bushing and slide it all the way up to the base of the flex.
- c. When both o-rings are in place, check for damage to the bushing and the housing's holes. If there is any damage, replace the housing.
- d. Carefully replace the flex, then seat the bushings in the holes.

TORQUE SPECIFICATIONS

APPLICATION	TORQUE (IN. LBS.)	TORQUE (N•m)	TORQUE BIT NO.
Antenna Bushing Spanner Nut	20	2.27	6680371B34
Back Shield to Frame Screws	2.5	0.28	6680321B79
Bottom Connector to Frame Screws	2.5	0.28	6680321B79
Frequency Switch Spanner Nut	8	0.91	6680370B88
All Module Screws	2.5	0.28	6680321B79
Power Contact Screws	2.5	0.28	6680321B79
Slotted-Spanner Nut (Baseplate)	6	0.68	6680321B79
Top Panel to Frame Screws	2	0.23	6680321B79
Volume Pot Spanner Nut	8	0.91	6680370B88

SABER VHF Electrical Parts List
(For Clear SABER R Models Only)

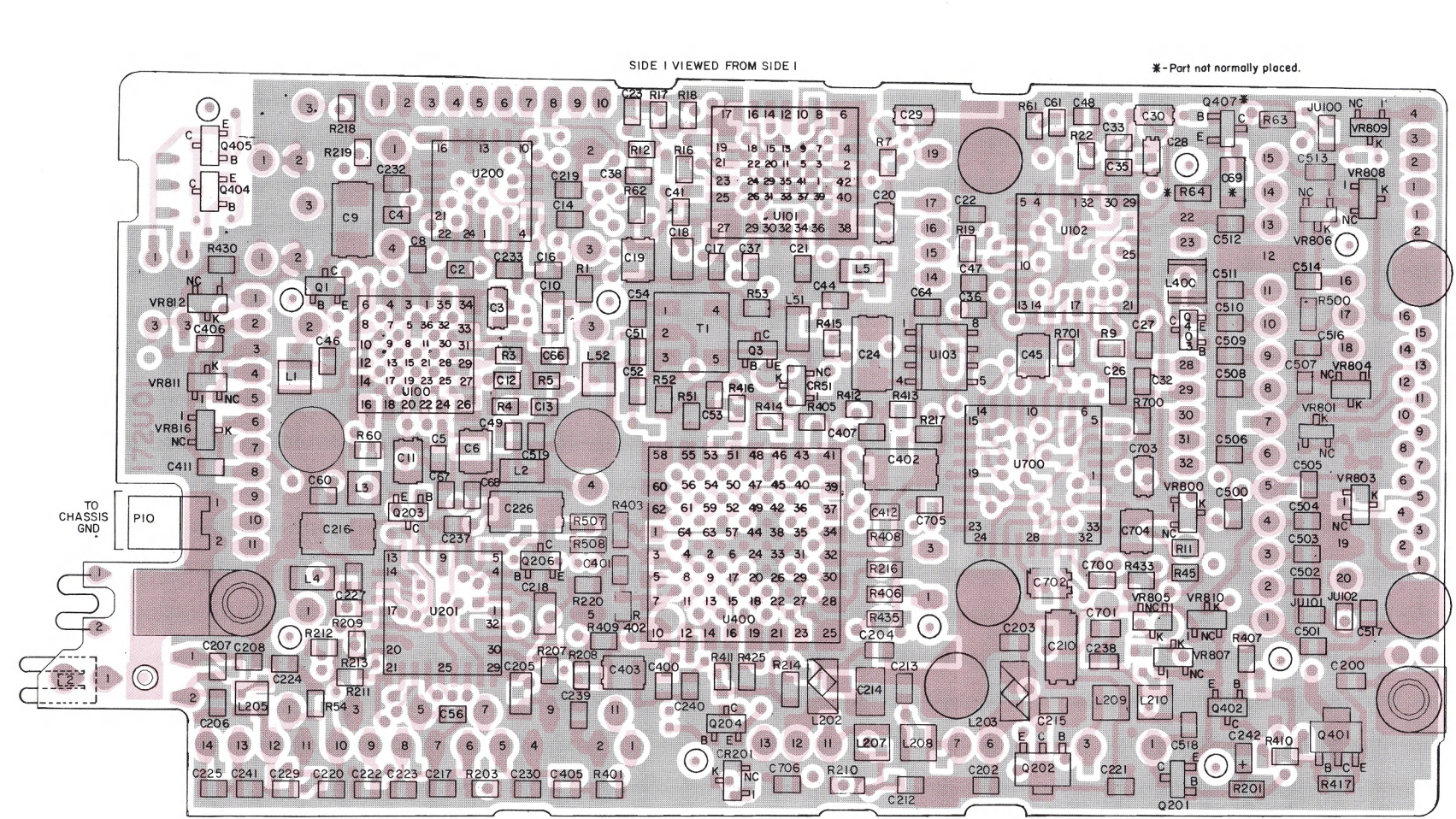
TPLF-4077-0

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, Fixed: uF±20%; 25V unless stated
C1	-----	Not Used
C2	2113741A25	1500pF±5%
C3	2311049A07	1 ±10%; 16V
C4, 5	2160521G37	0.1+80-20%
C6	2311049J12	4.7; 10V
C7	-----	Not Used
C8	2160521G37	0.1+80-20%
C9	2311049J26	10; 16V
C10	2311049A02	0.15 +80%-20%
C11	2311049J04	2.2; 20V
C12	2113741A21	1000pF ±5%
C13	2113741A45	.01±5%
C14	2160521G37	0.1+80-20%
C15	-----	Not Used
C16	2113740A48	51pF±5%
C17	2160521G37	0.1+80-20%
C18	2160521H41	0.22+80-20%
C19	2311049J07	3.3±10%; 16V
C20	2311049A37	1; 16V
C21	2113741A21	1000pF±5%
C22	2160521G37	0.1+80-20%
C23	2113741A33	3300pF±5%
C24	2311049J14	4.7; 20V
C25	-----	Not Used
C26	2113741A37	4700pF±5%
C27	2113741A59	.039±5%
C28 thru 30	2311049A37	1; 16V
C31	-----	Not Used
C32	2113741A59	.039±5%
C33	2160521G37	0.1+80-20%
C34	-----	Not Used
C35 thru 37	2160521G37	0.1+80-20%
C38	2113740A55	100pF ±5% NPO
C39,40	-----	Not Used
C41	2113740A55	100pF±5%; NPO
C42,43	-----	Not Used
C44	2160521G37	0.1+80-20%
C45	2311049J07	3.3±10%; 16V
C46	2113741A51	0.18
C47	2113740A75	680
C48	2113741A53	.022±5%
C49	2113740A23	6.2pF±.25pF; NPO
C50	-----	Not Used
C51 thru 53	2113741A51	.018
C54	2113740A55	100pF±5%; NPO
C55	-----	Not Used
C56	2113741A51	.018
C57 thru 60	-----	Not Used
C61	2113741A53	.022±5%
C62, 63	-----	Not Used
C64	2113741A51	.018
C65, 66	-----	Not Used
C67	2160521G37	0.1+80-20%
C68	2113740A63	220pF
C69	-----	Not Normally Placed
C200	2113740A44	43
C201	-----	Not Used
C202	2113740A50	62
C203	2113740A49	56pF±0.25pF; NPO
C204	2113740A55	100pF±5%; NPO
C205	2160521H41	0.22+80-20%
C206	2113740A33	15pF±5%; 50V; NPO
C207	2113740A11	2.2pF±0.25pF; NPO
C208	2113740A33	15pF±5%; 50V; NPO
C209	-----	Not Used
C210	2311049J14	4.7; 20V
C211	-----	Not Used
C212, 213	2113741A51	.018
C214	2311049J07	3.3±10%; 16V
C215	2113740A75	680pF
C216	2311049J26	10; 16V
C217	2113741A51	.018
C218	2113741B61	.047
C219	2113741A13	470pF±10%
C220	2113740A55	100pF±5%; NPO
C221 thru 223	2113741A51	.018
C224	2160521G37	0.1+80-20%
C225	2113741A51	.018
C226	2311049J26	10; 16V
C227	2113741A51	.018
C228	-----	Not Used

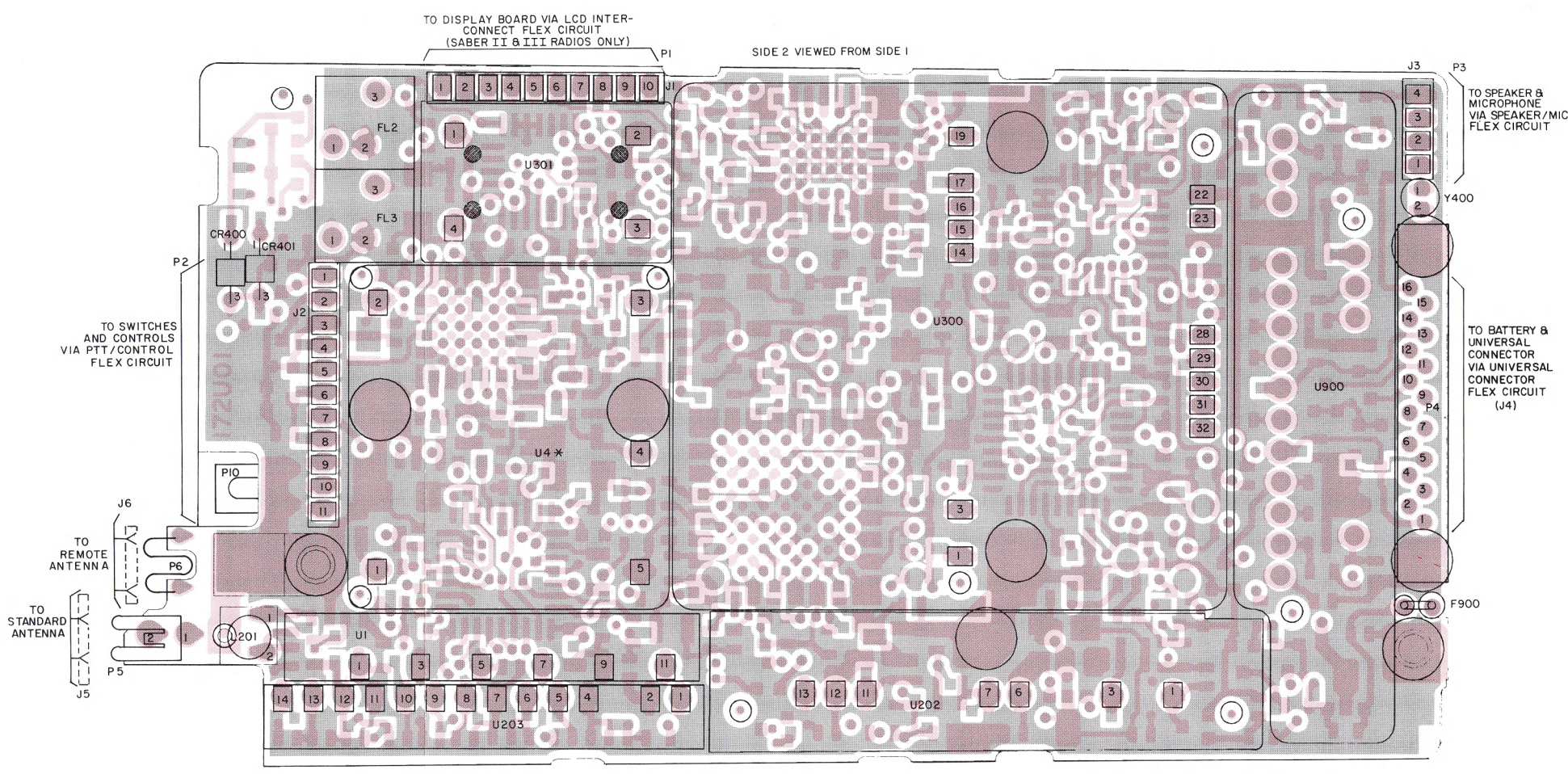
C229, 230	2113741A51	.018
C231	-----	Not Used
C232	2113741A13	470pF±10%
C233	2113741A51	.018
C234 thru 236	-----	Not Used
C237	2113741A51	.018
C238	2113741A33	3300pF±5%
C239 thru 240	2113741A13	470pF±10%
C241	2113740A17	3.9pF±.25pF
C242	2113741A51	.018
C400	2113740A27	8.2pF
C401	2113740A46	47pF
C402	2311049J26	10; 16V
C403	2311049J12	4.7; 10V
C404	-----	Not Used
C405	2113741A45	.01±5%
C406, 407	2160521G37	0.1+80-20%
C408 thru 410	-----	Not Used
C411, 412	2160521G37	0.1+80-20%
C500 thru C514	2113740A55	100pF±5%; NPO
C515	-----	Not Used
C516, C517	2113740A55	100pF±5%; NPO
C518	2113741A13	470pF±10%
C700, 701	2160521G37	0.1+80-20%
C702	2311049J07	3.3±10%; 16V
C703	2311049A05	0.47±10%
C704	2311049J12	4.7; 10V
C705	2160521G37	0.1+80-20%
C706	2113740A51	68pF
CR1 thru 50	-----	DIODE: See Note I Not Used
CR51	4805119G18	SOT-23
CR200	-----	Not Used
CR201	4805129M05	SOT-23
CR400	4805729G34	LED, Red
F900	0105955P27	FUSE: ASSEMBLY, 5 Amp
FL1	-----	FILTER: Not Used
FL2	9105685Q11	Ceramic; 450kHz; 20kHz BW
FL3	9105685Q12	Ceramic; 450kHz; 15kHz BW
J1	0905287C07	JACK: Socket, Printed Circuit (LCD Interconnect)(10 req'd)
J2	0905287C07	Socket, Printed Circuit (PTT Controls Flex)(11 req'd)
J3	0905287C07	Socket, Printed Circuit (Speaker/Mic Connector)(4 req'd)
JU100 thru 102	-----	JUMPER
L1	2462587P15	COIL, RF: unless stated 1800nH±5%
L2	2462575A03	820nH±5%
L3	2405452C09	50nH±5%
L4, 5	2462575A08	5.6uH±6%
L6 thru 50	-----	Not Used
L51	2462575A08	5.6uH±6%
L52	2405452C38	65nH±5%
L200	-----	Not Used
L201	2405855Q01	50nH
L202, L203	2484657R01	Bead
L204	-----	Not Used
L205	2405452C62	1200nH±5%
L206	-----	Not Used
L207 thru 209	2405452C62	1200nH±5%
L210	2405452C47	92nH
L400	2462585A40	33uH
LS1	-----	SPEAKER: 28Ω±1% (part of Speaker/ Microphone Flex Assembly)
MK1	-----	MICROPHONE: (part of Speaker/Microphone Flex Assembly)
P1 thru 3	-----	PLUG: Not Used
P4	3905445Q03	Connector
P5	REX-4166A	Contact, Antenna
P6	3905446Q03	Contact, RF Wireform
P7 thru 9	-----	Not Used
P10	3905889R01	Contact, PCB Ground

Q1	4805128M16	TRANSISTOR: See Note I PNP; SOT-23; MMBT3906
Q2	-----	Not Used
Q3	4805128N03	Bipolar; SOT-23; MMBR901
Q200	-----	Not Used
Q201	4805128M23	NPN; SOT-23
Q202	4805128M27	PNP; SOT-89
Q203, 204	4805128M16	PNP; SOT-23; MMBT3906
Q205	-----	Not Used
Q206	4805128M16	PNP; SOT-23; MMBT3906
Q400	-----	Not Used
Q401	4805128M27	PNP; SOT-89
Q402	4805128M12	NPN; SOT-23
Q403	4805218N50	NPN; SOT-23
Q404	-----	Not Used
Q405	4805128M12	NPN; SOT-23
Q407	-----	Not Normally Placed
R1	0660079K02	RESISTOR, Fixed: Ω±5%; 1/8W unless stated 75k±1%
R2	-----	Not Used
R3	0660076E76	13k±1%
R4	0660078T24	91k
R5	0660078T01	10k
R6	-----	Not Used
R7	0660078J80	49.9k±1%
R8	-----	Not Used
R9	0660078G33	2k±1%
R10	-----	Not Used
R11	0660078G33	2k±1%
R12	0660076A49	1k
R13 thru 15	-----	Not Used
R16	0660078L01	100k±1%
R17	0660076A67	5.6k±1%
R18	0660076E89	47k±1%
R19	0660076A89	47k
R20,21	-----	Not Used
R22	0660076A92	62k±5%
R23 thru 44	-----	Not Used
R45	0660076A29	150
R46 thru 50	-----	Not Used
R51, 52	0660076A85	33k
R53	0660076A41	470
R54	0660076E73	10k
R55 thru 59	-----	Not Used
R60	0660076A29	150
R61	0660076A77	15k±5%
R62	0660076B01	100k
R63	0605021K01	0
R64	-----	Not Normally Placed
R200	-----	Not Used
R201	0660076A89	47k
R202	-----	Not Used
R203	0660078G33	2k±1%
R204 thru 206	-----	Not Used
R207	0660078J18	14.7k±1%
R208	-----	Not Normally Placed
R209	0660076A48	910
R210	0660078J80	49.9k±1%
R211, 212	0660078G33	2k±1%
R213	0660078J23	16.2k±1%
R214	0660076B01	100k
R215	-----	Not Used
R216,217	0660076E73	10k
R218	0660076B01	100k
R219	0660076B05	150k
R220	0660076A49	1k
R400	-----	Not Used
R401	0660076A65	4.7k
R402	0660076B25	1M
R403	0660076B01	100k
R404	-----	Not Used
R405	0660076B01	100k
R406	0660076E73	10k
R407	0660076A65	4.7k
R408	0660076B01	100k
R409	0660076A29	150
R410	0660076a41	470
R411	0660079J33	20k
R412,413	0660078L01	100k±1%
R414 thru 416	0660076B01	100k
R417	0660076B01	100k
R418 thru 424	-----	Not Used
R425	0660076E73	10k
R426 thru 429	-----	Not Used
R430	0660076A29	150
R431,432	-----	Not Used
R433	0660076A21	68
R434	-----	Not Used

R435	0660076A49	1k
R500	0660076E73	10k
R507	0660076B01	100k
R508	0605021K01	0
R700	0660078J80	49.9k±1%
R701	0660076A49	1k
R800	RPX4690A	Potentiometer, Kit, On/Off/Volume (includes S800)
R801	0660076B08	200k (part of PTT/Controls Flex, RPX4700A or RPX4701A)
R802	0660076A93	68k (part of PTT/Controls Flex, RPX4700A or RPX4701A)
R803	-----	Not Used
R804	0660076A85	33k (part of PTT/Controls Flex, RPX4700A or RPX4701A)
R805	0660076A49	1k (part of PTT/Controls Flex, RPX4700A or RPX4701A)
S800	RPX4690A	SWITCH: Kit, On/Off/Volume (includes R800)
S801/S804	4005221R01	Dual-Function, Clear/Code (S804) (Standard) and Emergency (S801) (Optional)
S802	-----	Not Used
S803	RPX4694A	Kit, Contact Snapdome, PTT
S805 thru 807	RPX4694A	Kit, Contact Snapdome, Monitor
S808 thru 822	-----	Not Used
S823	RPX4689A	Kit, Frequency
T1	2405548Q03	TRANSFORMER: Ferrite
U1	NFD6111A	CIRCUIT MODULE: See Note I Filter, 2-Pole (136-150.8MHz)
U2	NFD6112A	Filter, 2-Pole (146-174MHz)
U2 or	NFD6091A	Filter, 5-Pole (136-150.8MHz)
U4	NFD6092A	Filter, 5-Pole (146-174MHz)
U100	NLD8180A	Receiver Front End (136-174MHz IC, I-F
U101	0105958P76	IC, Audio Filter, CMOS
U102	0105958P73	IC, Audio, Bipolar
U103	5105469E65	IC, Regulator
U200	0105953M67	IC, Digital/Analog Converter, CMOS
U201	0105955P29	IC, Transmit Automatic Level Control
U202	NLD8121A	Power Amplifier, High-Power (136-150.8MHz)
or	NLD8773A	Power Amplifier, High-Power (146-162MHz)
U203	NFD6131A	Power Amplifier, High-Power (157-174MHz)
or	NFD6132A	Filter/Detector/Switch (136-150.8MHz)
U204	-----	Not Used
U205	NLD8133A	Filter/Detector/Switch (146-174MHz)
U300	NLD8201A	Power Amplifier, Low-Power (146-174MHz)
or	NLD8210A	Synthesizer/VCO (136-150.8MHz)
U301	NXN6269A	Synthesizer/VCO (146-174MHz)
U400	0105958R05	Oscillator, Reference; 16.8MHz
U700	0105954S43	Microcomputer, MC68HC11; Binary Signal Filter, Phase 1, CMOS
U900	NTN4720A	SECURENET Bypass Module
VR800	4805129M35	DIODE: See Note I Zener, 5.6V
VR801	4805129M49	Zener
VR802	-----	Not Used
VR803 thru 812	4805129M35	Zener, 5.6V
VR813 thru 815	-----</	

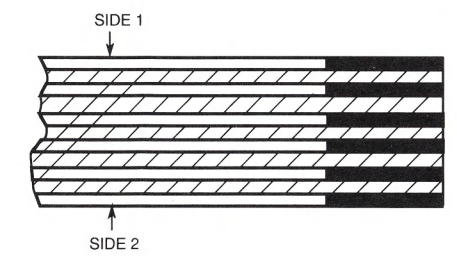


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 L6-CEPF-21264-0
 OL-CEPF-21265-A



L1-CEPF-21263-0
 L6-CEPF-21264-0
 OL-CEPF-21266-0

6-LAYER CIRCUIT BOARD COPPER DETAIL VIEWING COPPER STEPS AT EDGE OF BOARD IN PROPER LAYER SEQUENCE.



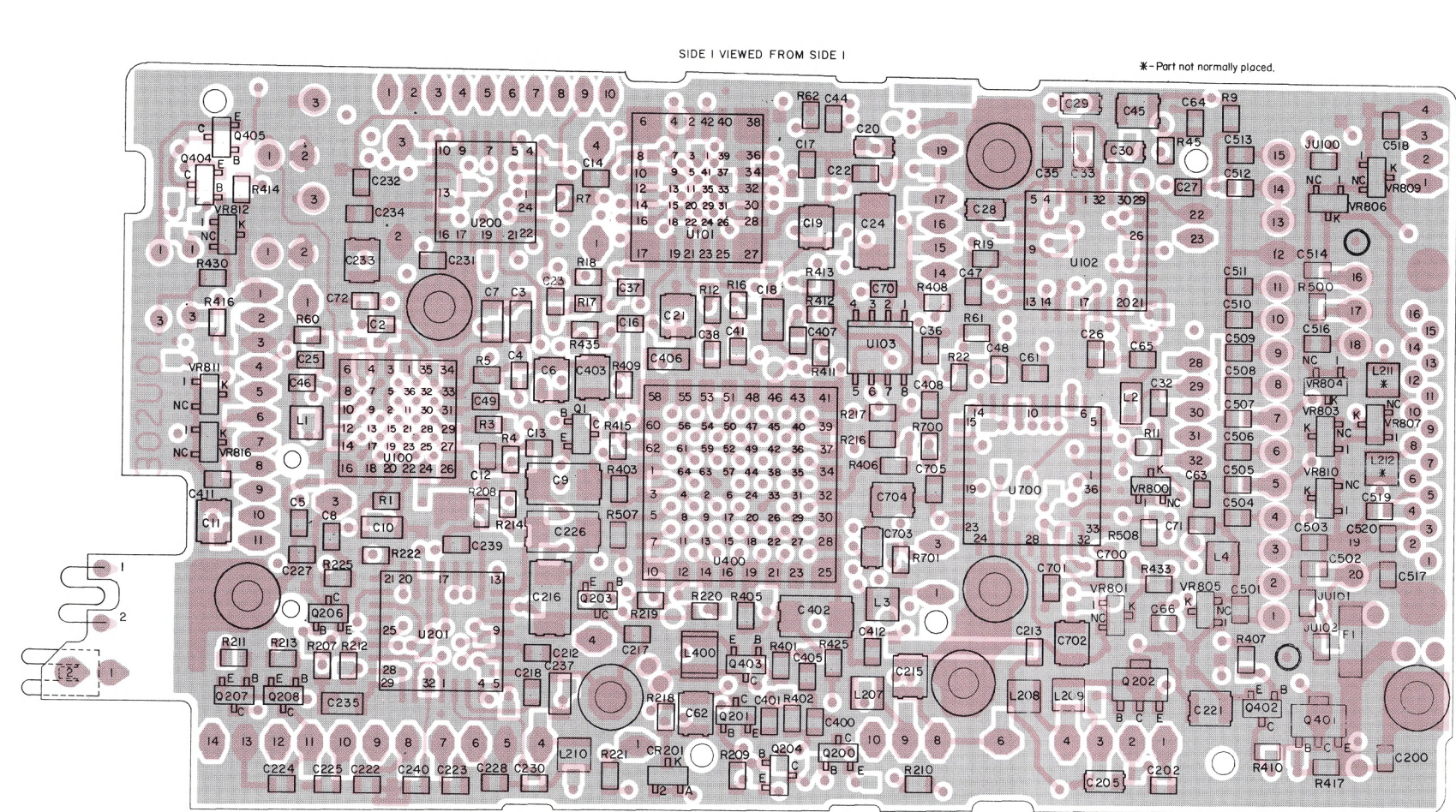
LAYER 1 (L1)
 LAYER 2 (L2)
 LAYER 3 (L3)
 LAYER 4 (L4)
 LAYER 5 (L5)
 LAYER 6 (L6)

INNER LAYERS

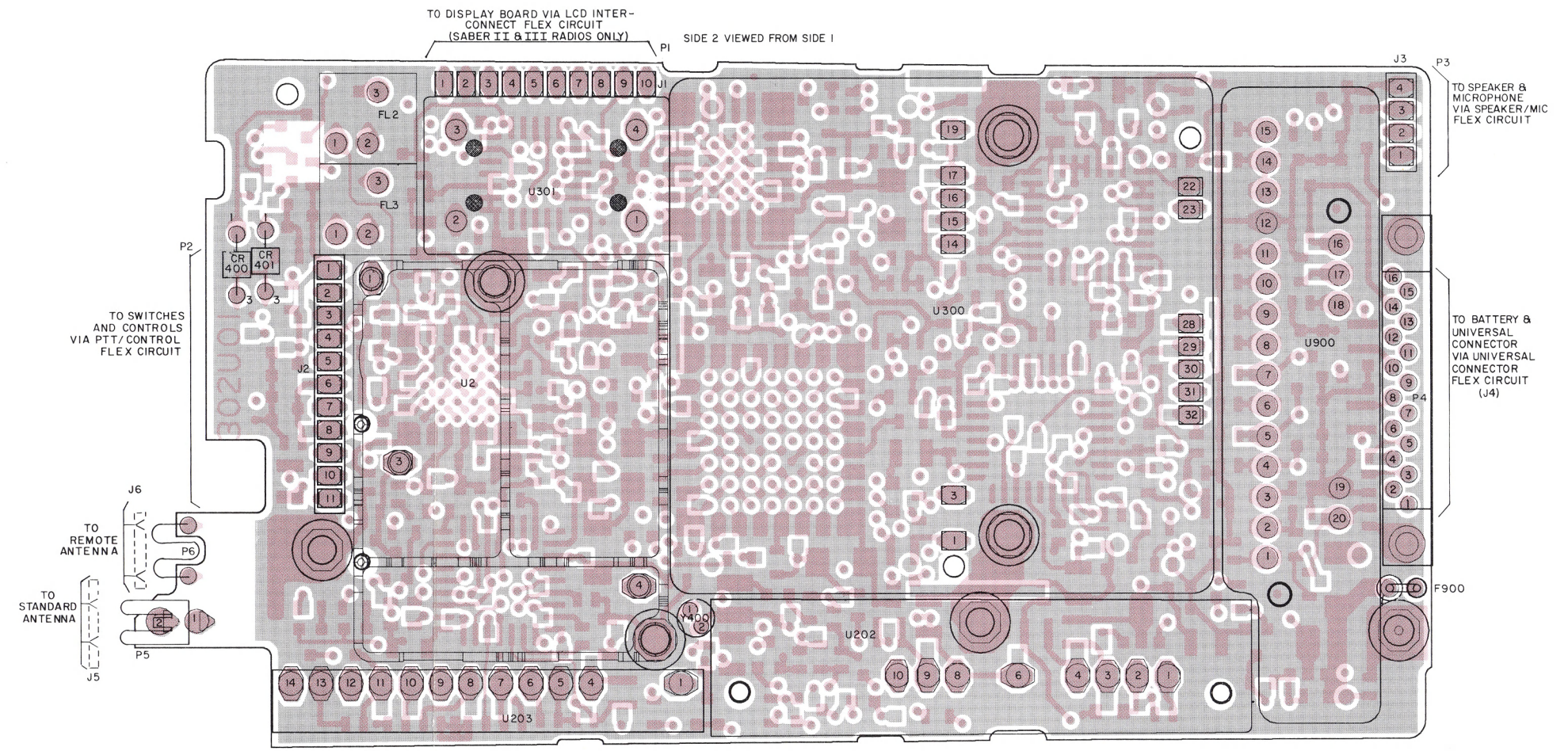
MAEPF-18100-0

SCHEMATIC AND CIRCUIT BOARD NOTES

1. Unless otherwise stated, resistances are in ohms (k = 1000), capacitances less than 1 are in microfarads, and capacitances 1 or greater are in picofarads.

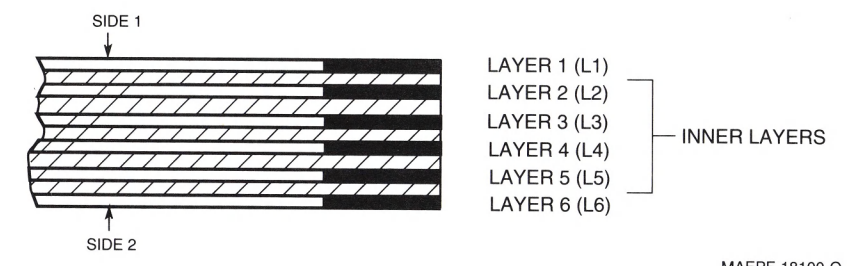


L1-CEPF-21267-0
 L6-CEPF-21268-0
 OL-CEPF-21270-A



L1-CEPF-21267-0
 L6-CEPF-21268-0
 OL-CEPF-21269-0

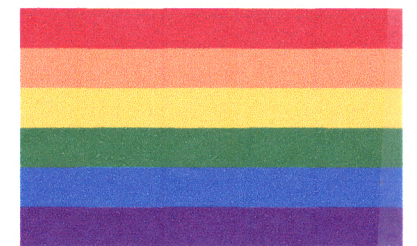
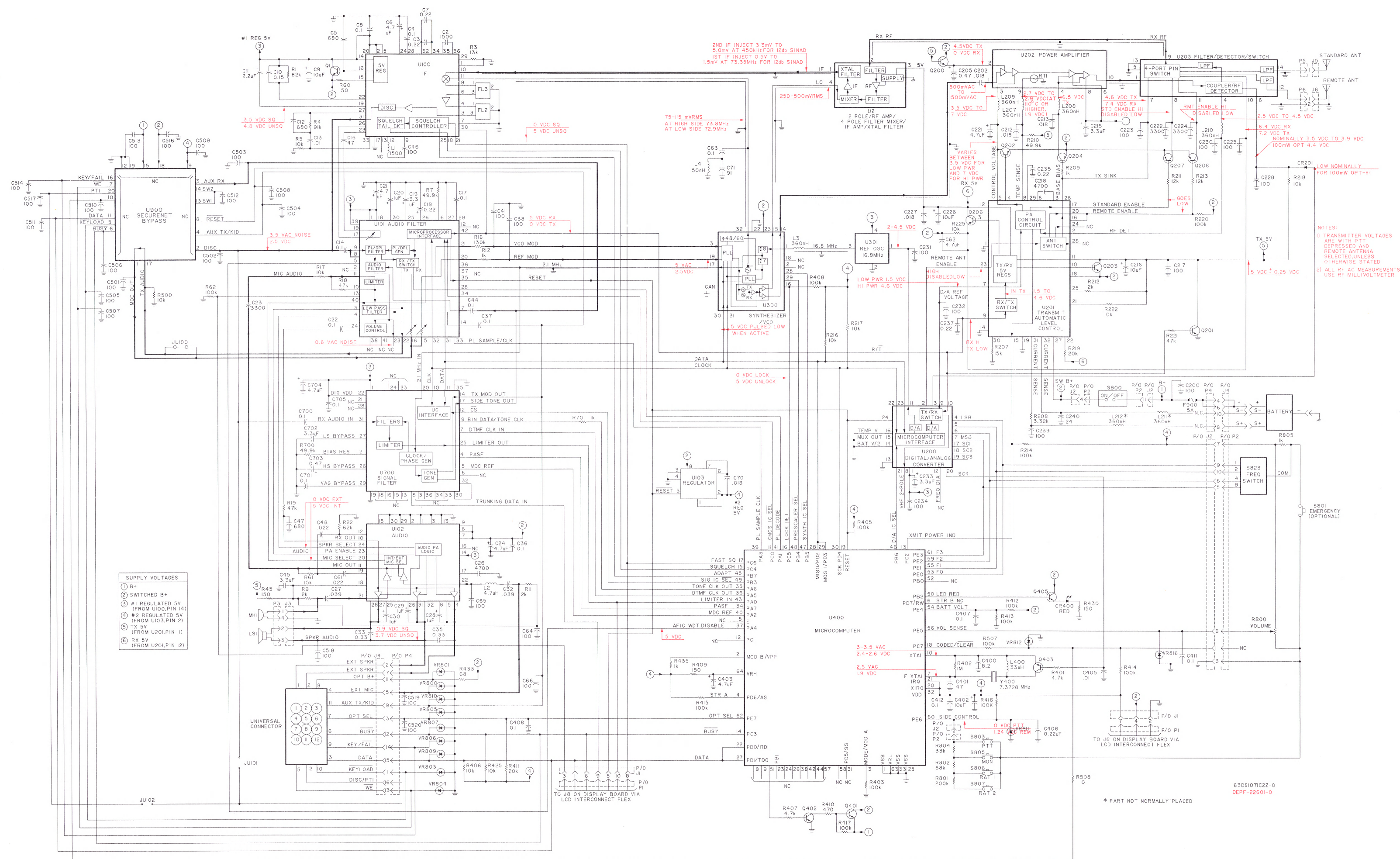
6-LAYER CIRCUIT BOARD COPPER DETAIL VIEWING COPPER STEPS AT EDGE OF BOARD IN PROPER LAYER SEQUENCE.



MAEPF-18100-0

SCHEMATIC AND CIRCUIT BOARD NOTES

1. Unless otherwise stated, resistances are in ohms (k = 1000), capacitances less than 1 are in microfarads, and capacitances 1 or greater are in picofarads.



SABER UHF Electrical Parts List
(For Clear SABER R Models Only)

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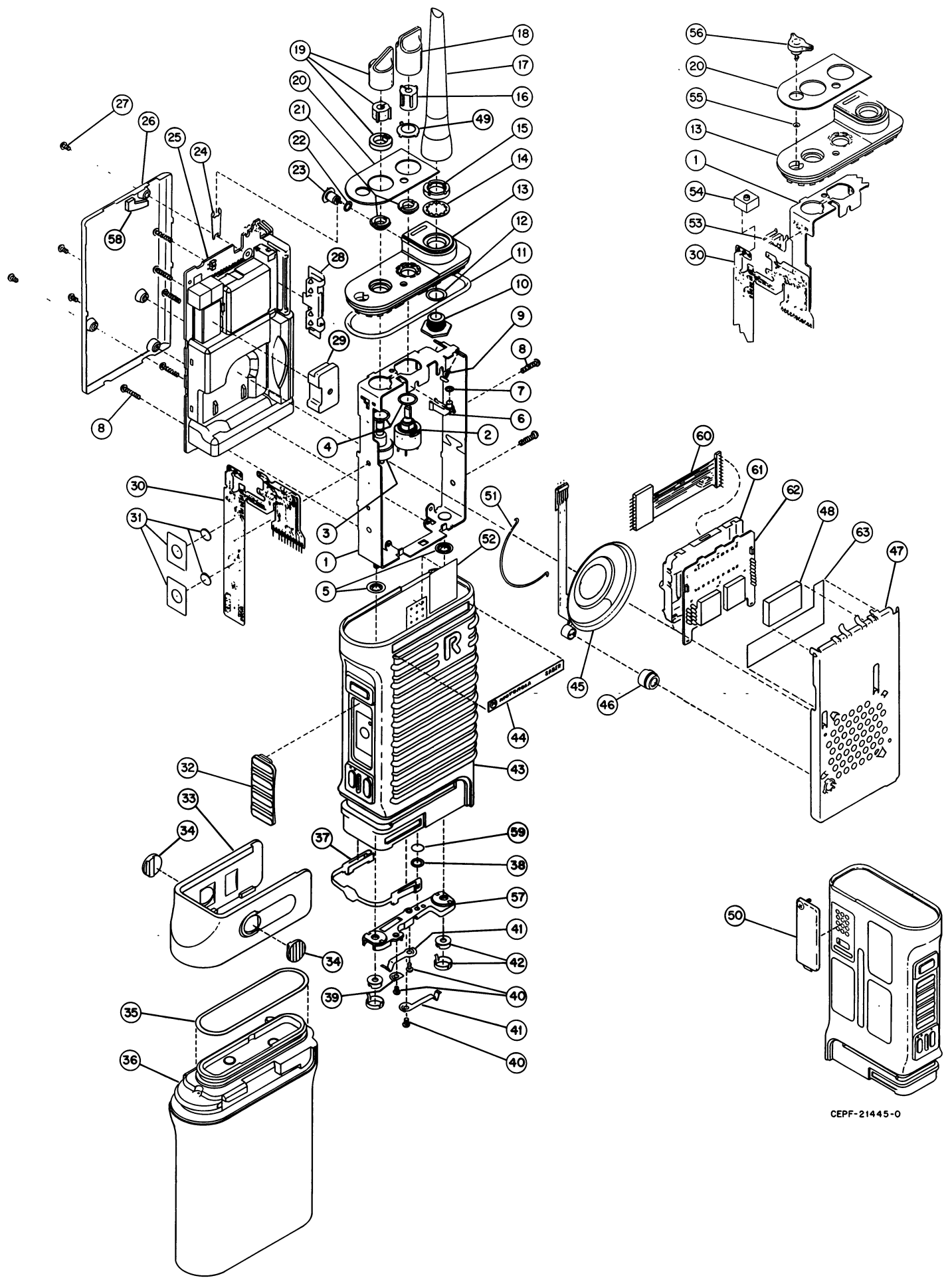
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, Fixed: uF±20%; 25V
		unless stated
		Not Used
C1	-----	Not Used
C2	2113741A25	1500pF±5%
C3	2160521H41	0.22+80-20%
C4	2160521G37	0.1+80-20%
C5	2113741A17	680pF
C6	2311049J12	4.7
C7	2160521H41	0.22+80-20%
C8	2160521G37	0.1+80-20%
C9	2311049J26	10; 16V
C10	2311049A02	0.15 +80%-20%
C11	2311049J04	2.2; 20V
C12	2113741A17	680pF ±5%
C13	2113741A45	.01
C14	2160521G37	0.1+80-20%
C15	-----	Not Used
C16	2113740A46	47pF±5%
C17	2160521G37	0.1+80-20%
C18	2160521H41	0.22+80-20%
C19	2311049J07	3.3±10%; 16V
C20	2311049A37	1; 16V
C21	2311049J12	4.7
C22	2160521G37	0.1+80-20%
C23	2113741A33	3300pF±5%
C24	2311049J14	4.7; 20V
C25	-----	Not Used
C26	2113741A37	4700pF±5%
C27	2113741A59	.039±5%
C28 thru 30	2311049A37	1; 16V
C31	-----	Not Used
C32	2113741A59	.039±5%
C33	2160521H43	0.33+80-20%
C34	-----	Not Used
C35	2160521H43	0.33+80-20%
C36,37	2160521G37	0.1+80-20%
C38	2113740A55	100pF ±5%
C39,40	-----	Not Used
C41	2113740A55	100pF±5%
C42,43	-----	Not Used
C44	2160521G37	0.1+80-20%
C45	2311049J07	3.3±10%; 16V
C46	2113740A55	100pF±5%
C47	2113740A75	680pF±30%
C48	2113741A53	.022±5%
C49 thru 60	-----	Not Used
C61	2113741A53	.022±5%
C62	2311049J12	4.7
C63	2160521G37	0.1+80-20%
C64 thru 66	2113740A55	100pF±5%
C67 thru 69	-----	Not Used
C70	2113741A51	.018
C71	2113740A54	91pF±25%; NPO
C200	2113740A55	100pF±5%
C201	-----	Not Used
C202	2113741A51	.018
C203,204	-----	Not Used
C205	2311049A05	0.47±10%
C206 thru 211	-----	Not Used
C212,213	2113741A51	.018
C214	-----	Not Used
C215	2311049J07	3.3±10%; 16V
C216	2311049J26	10; 16V
C217	2113740A55	100pF±5%
C218	2113741A37	4700pF±10%
C219,220	-----	Not Used
C221	2311049J12	4.7
C222	2113741A33	3300pF±5%
C223	2113740A55	100pF±5%
C224	2113741A33	3300pF±5%
C225	2113740A55	100pF±5%
C226	2311049J26	10; 16V
C227	2113741A51	.018
C228	2113740A55	100pF±5%
C229	-----	Not Used
C230 thru 232	2113740A55	100pF±5%
C233	2311049J07	3.3±10%; 16V
C234	2113740A55	100pF±5%
C235	2160521H41	0.22+80-20%
C236	-----	Not Used
C237	2160521H41	0.22+80-20%
C238	-----	Not Used

C239	2113740A55	100pF±5%
C240	2113740A38	24pF±5%; 50V; NPO
C400	2113740A27	8.2pF
C401	2113740A46	47pF
C402	2311049J26	10; 16V
C403	2311049J12	4.7; 10V
C404	-----	Not Used
C405	2113741A45	.01
C406	2160521H41	0.22+80-20%
C407, 408	2160521G37	0.1+80-20%
C409, 410	-----	Not Used
C411, 412	2160521G37	0.1+80-20%
C500	-----	Not Used
C501 thru 514	2113740A55	100pF±5%
C515	-----	Not Used
C516 thru 520	2113740A55	100pF±5%
C700, 701	2160521G37	0.1+80-20%
C702	2311049J07	3.3±10%; 16V
C703	2311049A05	0.47±10%
C704	2311049J12	4.7
C705	2160521G37	0.1+80-20%
CR200	-----	DIODE: See Note 1
CR201	4805129M05	Not Used
CR400	4805729G34	SOT LED, Red
F900	0105955P27	FUSE: ASSEMBLY, 5 Amp
FL1	-----	FILTER: Not Used
FL2	9105685Q11	Ceramic; 450kHz; 20kHz BW
FL3	9105685Q12	Ceramic; 450kHz; 15kHz BW
J1	0905287C05	JACK: Socket, Printed Circuit (LCD Interconnect)(10 req'd)
J2	0905287C05	Socket, Printed Circuit (PTT Controls Flex)(11 req'd)
J3	0905287C05	Socket, Printed Circuit (Speaker/Mic Connector)(4 req'd)
JU100 thru 102	-----	JUMPER
L1	2405452C64	COIL, RF: unless stated 150nH±5%
L2	2462575A05	Choke; 4.7uH
L3	2405452C49	360nH±5%
L4	2405452C09	50nH±5%
L200 thru 206	-----	Not Used
L207 thru 210	2405452C49	360nH±5%
L211, 212	-----	Not Normally Placed
L400	2462585A40	33uH
LS1	-----	SPEAKER: 28Ω±1% (part of Speaker/ Microphone Flex Assembly)
MK1	-----	MICROPHONE: (part of Speaker/Microphone Flex Assembly)
P1 thru 3	-----	PLUG: Not Used
P4	3905445Q03	Connector
P5	REX-4166A	Contact, Antenna
P6	3905445Q03	Contact, RF Wireform
P7 thru 9	-----	Not Used
Q1	4805128M16	TRANSISTOR: See Note 1 PNP; SOT-23
Q2	-----	Not Used
Q200,201	4805128M12	NPN; SOT-23
Q202	4805128M27	PNP; SOT-89
Q203	4805128M16	PNP; SOT-23
Q204	4805218N13	PNP; SOT
Q205	-----	Not Used
Q206	4805128M16	PNP; SOT-23
Q207,208	4805128M29	PNP; SOT-23
Q400	-----	Not Used
Q401	4805128M27	PNP; SOT-89
Q402	4805128M12	NPN; SOT-23
Q403	4805218N03	NPN; SOT-23
Q404	-----	Not Used
Q405	4805128M12	NPN; SOT-23

R1	0660079V23	RESISTOR, Fixed: Ω±5%; 1/8W unless stated
R2	-----	82k
R3	0660076E76	Not Used
R4	0660078T24	13k
R5	0660076E73	91k
R6	-----	10k
R7	0660078J80	Not Used
R8	-----	49.9k±1%
R9	0660078G33	Not Used
R10	-----	2k±1%
R11	0660078G33	Not Used
R12	0660076A49	1k
R13 thru 15	-----	Not Used
R16	0660079V28	130k
R17	0660076E73	10k±1%
R18	0660076E89	47k±1%
R19	0660076A89	47k±5%
R20,21	-----	Not Used
R22	0660076A92	62k
R23 thru 44	-----	Not Used
R45	0660076A29	150
R46 thru 59	-----	Not Used
R60	0660076A29	150
R61	0660076A77	15k
R62	0660076B01	100k
R200 thru 206	-----	Not Used
R207	0660076E77	15k±1%
R208	0660076G58	3.32k
R209	0660076A49	1k
R210	0660078J80	49.9k±1%
R211	0660076A75	12k
R212	0660078G33	2k±1%
R213	0660076A75	12k
R214	0660076B01	100k
R215	-----	Not Used
R216 thru 218	0660076E73	10k
R219	0660079J33	20k
R220	0660076B01	100k
R221	0660076E89	47k±1%
R222	0660076E73	10k
R223,224	-----	Not Used
R225	0660076E73	10k
R400	-----	Not Used
R401	0660076A65	4.7k
R402	0660076B25	1M±5%
R403	0660076B01	100k
R404	-----	Not Used
R405	0660076B01	100k
R406	0660076E73	10k
R407	0660076A65	4.7k
R408	0660076B01	100k
R409	0660076A29	150
R410	-----	Not Used
R411	0660079J33	20k
R412,413	0660078L01	100k±1%
R414 thru 417	0660076B01	100k
R418 thru 424	-----	Not Used
R425	0660076E73	10k
R426 thru 429	-----	Not Used
R430	0660076A29	150
R431,432	-----	Not Used
R433	0660076A21	68
R434	-----	Not Used
R435	0660076A49	1k
R500	0660076E73	10k
R507	06600776B01	100k
R508	0605021K01	0
R700	0660078J80	49.9k±1%
R701	0660076A49	1k
R800	RPX4690A	Potentiometer, Kit, On/Off/Volume (includes S800)
R801	0660076B08	200k (part of PTT/Controls Flex, RPX4700A or RPX4701A)
R802	0660076A93	68k (part of PTT/Controls Flex, RPX4700A or RPX4701A)
R803	-----	Not Used
R804	0660076A85	33k (part of PTT/Controls Flex, RPX4700A or RPX4701A)
R805	0660076A49	1k (part of PTT/Controls Flex, RPX4700A or RPX4701A)

S800	RPX4690A	SWITCH: Kit, On/Off/Volume (includes R800)
S801/S804	4005221R01	Dual-Function, Clear/Code (S804)(Standard) and Emergency (S801)(Optional)
S802	-----	Not Used
S803	RPX4694A	Kit, Contact Snapdome, PTT
S805 thru 807	RPX4694A	Kit, Contact Snapdome, Monitor
S808 thru 822	-----	Not Used
S823	RPX4689A	Kit, Frequency
U1	-----	CIRCUIT MODULE: See Note 1
U2	NLE9431A	Not Used
U23	NLE9432A	Filter/Amp/Mixer (403-433 MHz)
U24	NLE9433A	Filter/Amp/Mixer (440-470 MHz)
U25	NLE9434A	Filter/Amp/Mixer (460-490 MHz)
U26	NLE9435A	Filter/Amp/Mixer (482-512 MHz)
U100	0105958P76	IC, I-F
U101	0105953R64	IC, Audio Filter, CMOS
U102	0105958P73	IC, Audio, Bipolar
U103	5105469E65	IC, Regulator
U200	0105953N05	IC, Digital/Analog Converter, CMOS
U201	0105959P66	Transmit Automatic Level Control
U202	NLE9471A	5W-Power Amplifier (403-433 MHz)
U203	NLE9472A	5W-Power Amplifier (440-470 MHz)
U204	NLE9473A	5W-Power Amplifier (460-490 MHz)
U205	NLE9474A	5W-Power Amplifier (482-512 MHz)
U206	NLE9483A	2W-Power Amplifier (440-470 MHz)
U207	NFE6061A	Filter/Detector/Switch (403-470 MHz)
U208	NFE6062A	Filter/Detector/Switch (460-512 MHz)
U300	NLE9461A	Synthesizer (403-433 MHz)
U301	NLE9462A	Synthesizer (440-470 MHz)
U302	NLE9463A	Synthesizer (460-490 MHz)
U303	NLE9464A	Synthesizer (482-512 MHz)
U304	NXN6269A	Oscillator, Reference; 16.8MHz
U400	0105958R05	Microcomputer, MC68HC11; Binary
U700	0105954S43	Signal Filter, Phase 1, CMOS
U900	NTN4720A	SECURENET Bypass Module
VR800	4805129M35	DIODE: See Note 1
VR801	4805129M49	Zener, 5.6V
VR802	-----	Zener, 16V
VR803 thru 807	-----	Not Used
VR808	4805129M35	Zener, 5.6V
VR809 thru 812	-----	Not Used
VR813 thru 815	4805129M35	Zener, 5.6V
VR816	-----	Not Used
Y400	4805664G32	CRYSTAL: 7.3728MHz
NONREFERENCED ITEMS		
	0905287C05	SOCKET, Printed Circuit (for all modules)(71 req'd)
	1405881R01	BOOT, Crystal (For Y400)
	7505934Q01	PAD, Oscillator (For U301)

NOTES:
1. For optimum performance, order replacement diodes, transistors, and circuit modules by Motorola part number only.



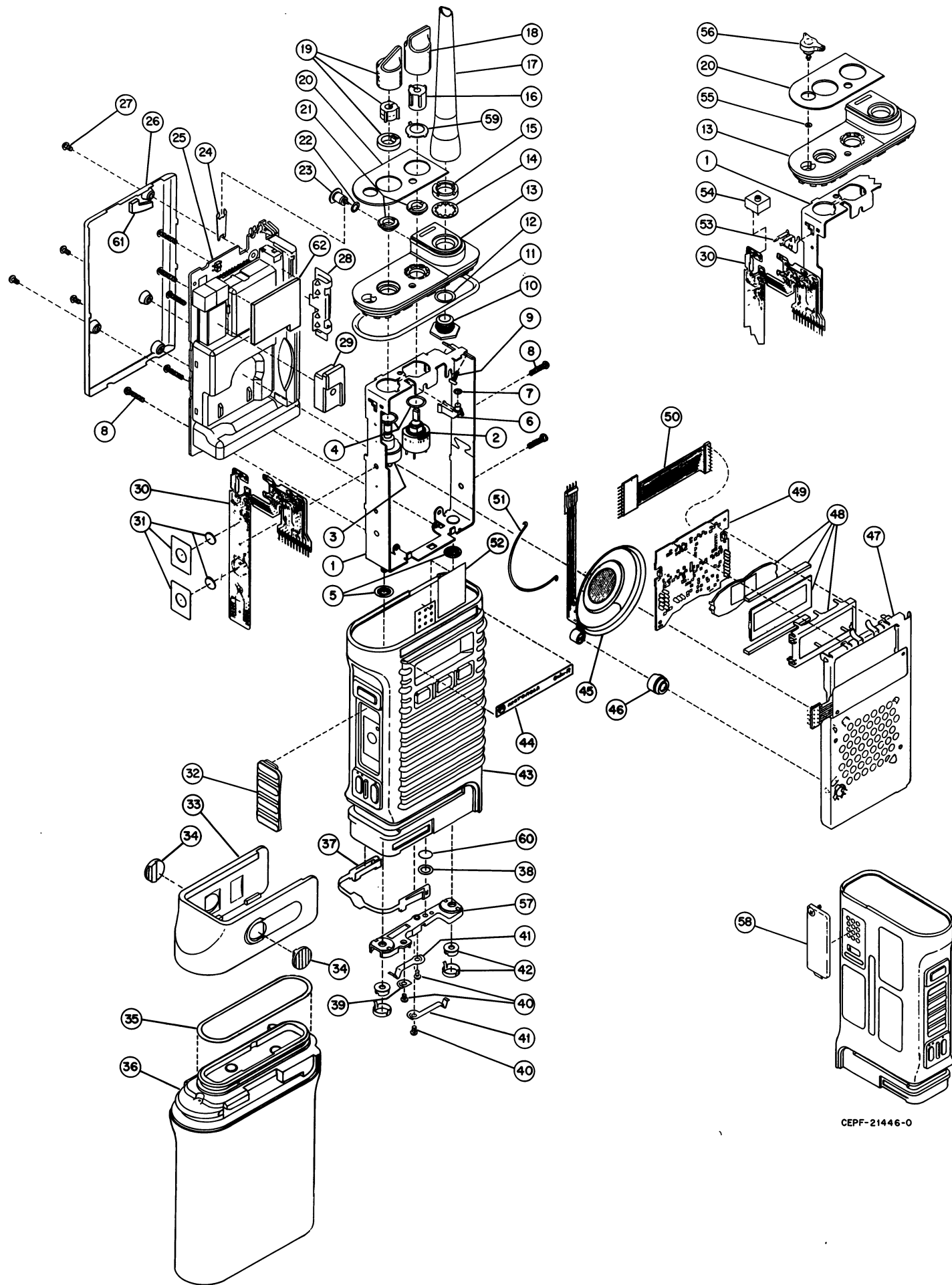
**SABER I R/Systems SABER I R
Exploded View Parts List**

TPLF-4003-A

ITEM NO.	MOTOROLA PART NO.	DESCRIPTION
1	RPX-4695A	KIT, Frame Stud (includes item 5)
2	RPX-4689A	KIT, Frequency Switch (S823) (includes item 4)
3	RPX-4690A	KIT, On/Off Switch (S800)/Volume Control (R800) (includes item 4)
4	3205082E62	GASKET, O-Ring (2 req'd) (part of items 2 and 3)
5	3205422Q01	SEAL, Stud (2 req'd) (part of item 1)
6	6105436Q01	LIGHTPIPE, LED
7	3205082E59	GASKET, O-Ring
8	0305714J10	SCREW, Module, Ph Pan Hd; 7-56x.400" (7 req'd)
9	0300140332	SCREW, Top Panel; 2-28x.187" (2 req'd)
10	RPX-4693A	KIT, Antenna Bushing (includes item 12)
11	3205082E80	GASKET, O-Ring (part of item 13)
12	3205082E58	GASKET, O-Ring (part of item 10)
13	RPX-4692A	KIT, Control Top Panel (includes item 11)
14	0400139731	LOCKWASHER, Internal Tooth
15	0205591R01	NUT, Antenna Bushing
16	-----	INSERT, Frequency Knob (part of item 18) (SABER only)
	or 4305141R03	INSERT, Frequency Knob (Systems SABER only)
17	NAD6471A	ANTENNA, VHF Helical (136 - 150.8 MHz)
	or NAD6472A	ANTENNA, VHF Helical (146 - 162 MHz)
	or NAD6473A	ANTENNA, VHF Helical (157 - 178 MHz)
	or NAE6440B	ANTENNA, UHF Whip (403 - 520 MHz)
	or NAC6052A	ANTENNA, MB Helical (74 - 88 MHz)
18	RPX-4699A	KIT, Frequency Knob (includes item 16) (SABER only)
	or REX-4017A	KIT, Frequency Knob, Low-Profile (includes item 16) (SABER only)
	or 3605526Q01	KNOB, Frequency (Systems SABER only)
19	RPX-4698A	KIT, On/Off/Volume Knob
	or REX-4016A	KIT, Volume Knob, Low Profile
20	1305622Q01	ESCUTCHEON, 12-Frequency
	or 1305622Q11	ESCUTCHEON, 12-Frequency Emergency
	or 1305622Q04	ESCUTCHEON, 12-Frequency, Submersible
	or 1305622Q03	ESCUTCHEON, 12-Frequency Emergency, Submersible
21	0205916P01	NUT, Spanner (2 req'd)
22	3205082E61	GASKET, O-Ring (part of item 23)
23	RPX-4691A	KIT, RF Connector (includes items 22,24)
24	4205852N01	CONTACT, Ground, RF (part of item 23)
25	NLD8750A	KIT, VHF SECURENET Main PC Board (SABER only)
	or NLE4150A	KIT, UHF SECURENET Main PC Board (SABER only)
	or NLC6370C	KIT, MB SECURENET Main PC Board (SABER only)
	or NLD8880A	KIT, VHF SECURENET Main PC Board (Systems SABER only)
	or NLE4200A	KIT, UHF SECURENET Main PC Board (Systems SABER only)
26	NTN4647A	ASSEMBLY, Back Shield (includes items 27,58)

27	0305706Q01	SCREW, Captive (4 req'd) (part of item 26)
28	4205577Q01	CLIP, Ground
29	1405343S01	BOOT, Oscillator, (SABER I)
30	RPX-4700A	KIT, PTT/Controls Flex (includes item 31)
	or RPX-4701A	KIT, PTT/Controls Flex Assembly (includes items 2,3,31)
31	RPX-4694A	KIT, Contact Snapdome (S803, 805) (2 req'd) (part of item 30)
32	4505315V01	LEVER, PTT (part of item 43)
33	4205292V01	SLIDE (part of item 43)
34	3805294V01	BUTTON (2 req'd) (part of item 43)
35	3205082E84	O-RING, Battery (part of item 36)
36	NTN7058A	BATTERY, Submersible, 1500 mAh (includes item 35)
37	4105293V01	SPRING (part of item 43)
38	3205300V01	SEAL, Elastomer (part of item 43)
39	3905291V02	LOCKWASHER (part of item 43)
48	7505641N03	PAD, Speaker Bracket (part of item 47)
40	0305706Q02	SCREW, Baseplate Ph Pan Hd; 2-56x3/32" (3 req'd) (part of item 43)
41	3905291V01	CONTACT, Power (2 req'd) (part of item 43)
42	RPX-4696A	KIT, Slotted Spanner Nut (2 req'd) (part of item 43)
43	NHN6524A	ASSEMBLY, Housing, (SABER I) (includes items 32 thru 34, 37 thru 42, 57, and 59)
44	3305183R63	LABEL, Nameplate, (SABER I R)
	or 3305183R64	LABEL, Nameplate, (Systems SABER I)
45	0105958M34	ASSEMBLY, Speaker/ Microphone Flex, SABER I
46	1405490Q01	BOOT, Microphone
47	RPX-4697A	KIT, Speaker Bracket, (SABER I) (includes item 48)
48	7505641N03	PAD, Speaker Bracket (part of item 47)
49	0405781Q01	WASHER, Detent (even number of switch positions)
	or 0405781Q03	WASHER, Detent (odd number of switch positions)
50	NTN7061A	COVER, Universal Connector
51	4205872S01	RETAINER, Speaker
52	1405182M03	INSULATOR, Universal Connector
53	0705319R02	BRACKET, Switch (optional)
54	4005221R02	SWITCH, Dual-Function (S801) (optional)
55	3205082E83	GASKET, O-Ring (optional)
56	NTN5076A	KIT, Push-Only Knob (includes item 55)
	or NTN5068A	KIT, Push-and-Rotate Knob (includes item 55)
	or NTN5069A	KIT, Rotate-Only Knob (includes item 55)
	or 4305607S01	PLUG, Seal
57	6405296V01	BASEPLATE (part of item 43)
58	7505934Q05	PAD, Backshield (part of item 26)
59	3205472M03	SEAL, Vacuum Port (part of item 43)
60	8405681U01	FLEX CIRCUIT, LCD Interconnect (Systems SABER I R only)
61	2605682U01	SHIELD, LCD Board (Systems SABER I R only)
62	0105950S84	ASSEMBLY, Controller PC Board (Systems SABER I R only)
63	1405888Q03	INSULATOR, Front Shield (Systems SABER I R only)

CEPF-21445-0



**SABER II R
Exploded View Parts List**

TPLF-4004-A

ITEM NO.	MOTOROLA PART NO.	DESCRIPTION
1	RPX-4695A	KIT, Frame Stud (includes item 5)
2	RPX-4689A	KIT, Frequency Switch (S823) (includes item 4)
3	RPX-4690A	KIT, On/Off Switch (S800)/Volume Control (R800) (includes item 4)
4	3205082E62	GASKET, O-Ring (2 req'd) (part of items 2 and 3)
5	3205422Q01	SEAL, Stud (2 req'd) (part of item 1)
6	6105436Q01	LIGHTPIPE, LED
7	3205082E59	GASKET, O-Ring
8	0305714J10	SCREW, Module, Ph Pan Hd; 7-56x.400" (7 req'd)
9	0300140332	SCREW, Top Panel; 2-28x.187" (2 req'd)
10	RPX-4693A	KIT, Antenna Bushing (includes item 12)
11	3205082E80	GASKET, O-Ring (part of item 13)
12	3205082E58	GASKET, O-Ring (part of item 10)
13	RPX-4692A	KIT, Control Top Panel (includes item 11)
14	0400139731	LOCKWASHER, Internal Tooth
15	0205591R01	NUT, Antenna Bushing
16	-----	INSERT, Frequency Knob (part of item 18)
17	NAD6471A or NAD6472A or NAD6473A or NAE6440B or NAC6052A	ANTENNA, VHF Helical (136 - 150.8 MHz) ANTENNA, VHF Helical (146 - 162 MHz) ANTENNA, VHF Helical (157 - 178 MHz) ANTENNA, UHF Whip (403 - 520 MHz) ANTENNA, MB Helical (74 - 88 MHz)
18	RPX-4699A or REX-4017A	KIT, Frequency Knob (includes item 16) KIT, Frequency Knob, Low-Profile (includes item 16)
19	RPX-4698A or REX-4016A	KIT, On/Off/Volume Knob KIT, Volume Knob, Low Profile
20	1305622Q01 or 1305622Q11	ESCUTCHEON, 12-Frequency ESCUTCHEON, 12-Frequency Emergency
21	0205916P01	NUT, Spanner (2 req'd)
22	3205082E61	GASKET, O-Ring (part of item 23)
23	RPX-4691A	KIT, RF Connector (includes items 22,24)
24	4205852N01	CONTACT, Ground, RF (part of item 23)
25	NLD8750A or NLE4150A or NLC6370C or NTN4647A	KIT, VHF SECURENET Main PC Board KIT, UHF SECURENET Main PC Board KIT, MB SECURENET Main PC Board ASSEMBLY, Back Shield (includes item 27)
26	0305706Q01	SCREW, Captive (4 req'd) (part of item 26)
27	4205577Q01	CLIP, Ground
28	REX-4121A	BOOT, Reference Oscillator, SABER II
29	RPX-4700A or RPX-4701A	KIT, PTT/Controls Flex (includes item 31) KIT, PTT/Controls Flex Assembly (includes items 2,3,31)

31	RPX-4694A	KIT, Contact Snapdome (2 req'd) (part of item 30)
32	4505315V01	LEVER, PTT (part of item 43)
33	4205292V01	SLIDE (part of item 43)
34	3805294V01	BUTTON (2 req'd) (part of item 43)
35	3205082E84	O-RING, Battery (part of item 36)
36	NTN7058A	BATTERY, Submersible, 1500 mAh (includes item 35)
37	4105293V01	SPRING (part of item 43)
38	3205300V01	SEAL, Elastomer (part of item 43)
39	3905291V02	LOCKWASHER (part of item 43)
40	0305706Q02	SCREW, Baseplate Ph Pan Hd; 2-56x3/32" (3 req'd) (part of item 43)
41	3905291V01	CONTACT, Power (2 req'd) (part of item 43)
42	RPX-4696A	KIT, Slotted-Spanner Nut (2 req'd) (part of item 43)
43	NHN6525A	ASSEMBLY, Housing, SABER II (includes items 32 thru 34; 37 thru 42; 57, 60)
44	3305183R63	LABEL, Nameplate, SABER II R
45	8405711U01	ASSEMBLY, Speaker/Microphone Flex
46	1405490Q01	BOOT, Microphone
47	RPX-4702A	ASSEMBLY, LCD/Speaker Bracket
48	RPX-4703A	KIT, LCD Assembly (part of item 49)
49	8460999A58	ASSEMBLY, Display PC Board (VHF and UHF radios) (includes item 48)
	or 8460999A71	ASSEMBLY, Display PC Board (VHF and UHF radios) (includes item 48)
50	8405712U01	FLEX CIRCUIT, LCD Interconnect
51	4205872S01	RETAINER, Speaker
52	1405182M03	INSULATOR, Universal Connector
53	0705319R02	BRACKET, Switch (optional)
54	4005221R02	SWITCH, Dual-Function (S801) (optional)
55	3205082E68	GASKET, O-Ring (optional)
56	NTN5076A or NTN5068A	KIT, Push-Only Knob (includes item 55) KIT, Push-and-Rotate Knob (includes item 55)
	or NTN5069A or 4305607S01	KIT, Rotate-Only Knob (includes item 55) PLUG, Seal
57	6405296V01	BASEPLATE (part of item 43)
58	NTN7061A	COVER, Universal Connector
59	0405781Q01 or 0405781Q03	WASHER, Detent (even number of switch positions) WASHER, Detent (odd number of switch positions)
60	3205472M03	SEAL, Vacuum Port (part of item 43)
61	7505934Q05	PAD, Backshield (part of item 26)
62	7505934Q02	PAD, DVP

SERVICE MANUAL QUESTIONNAIRE



We believe that reports from users provide valuable information for producing quality manuals. By taking a few moments to answer the following questions as they relate to this specific manual, you can take an active role in the continuing effort to ensure that our manuals contain the most accurate and complete information of benefit to you. Thank you for your cooperation.

In reference to Manual Number: **68P81071C20-A**

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1. Please check all the appropriate boxes:

	Complete	Incomplete	Correct	Incorrect	Clear	Confusing	Size Adequate	Size Too Small	Not Covered in This Manual
Disassembly Procedures									
Alignment Procedures									
Exploded Views									
Schematic Diagrams									
Circuit Board Details									
Electrical Parts Lists									
Exploded View Parts List									

2. How would you rate the overall organization of this manual?

- excellent
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 good
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 poor

3. Did this Service manual provide you with the information necessary to service and maintain the specific equipment?

- very much so
 generally yes
 to some extent
 no

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 good
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 poor

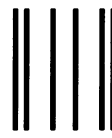
5. We would appreciate any corrections or recommendations for improving this manual. Please include the specific page number(s) of the diagram or procedure in question.

a. Disassembly Procedures: (Page No. _____)

b. Alignment Procedures: (Page No. _____)

c. Exploded Views: (Page No. _____)

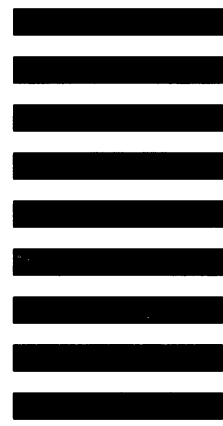
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Please specify the page number along with any corrections or recommendations for improvement.

- d. Schematic Diagrams: (Page No. _____)
- e. Component Location Details: (Page No. _____)
- f. Electrical Parts List: (Page No. _____)
- g. Exploded View Parts List: (Page No. _____)

6. General comments/suggestions:

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REPLACEMENT PARTS ORDERING

ORDERING INFORMATION

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Crystal and channel element orders should specify the crystal or channel element type number,

crystal and carrier frequency, and the model number in which the part is used.

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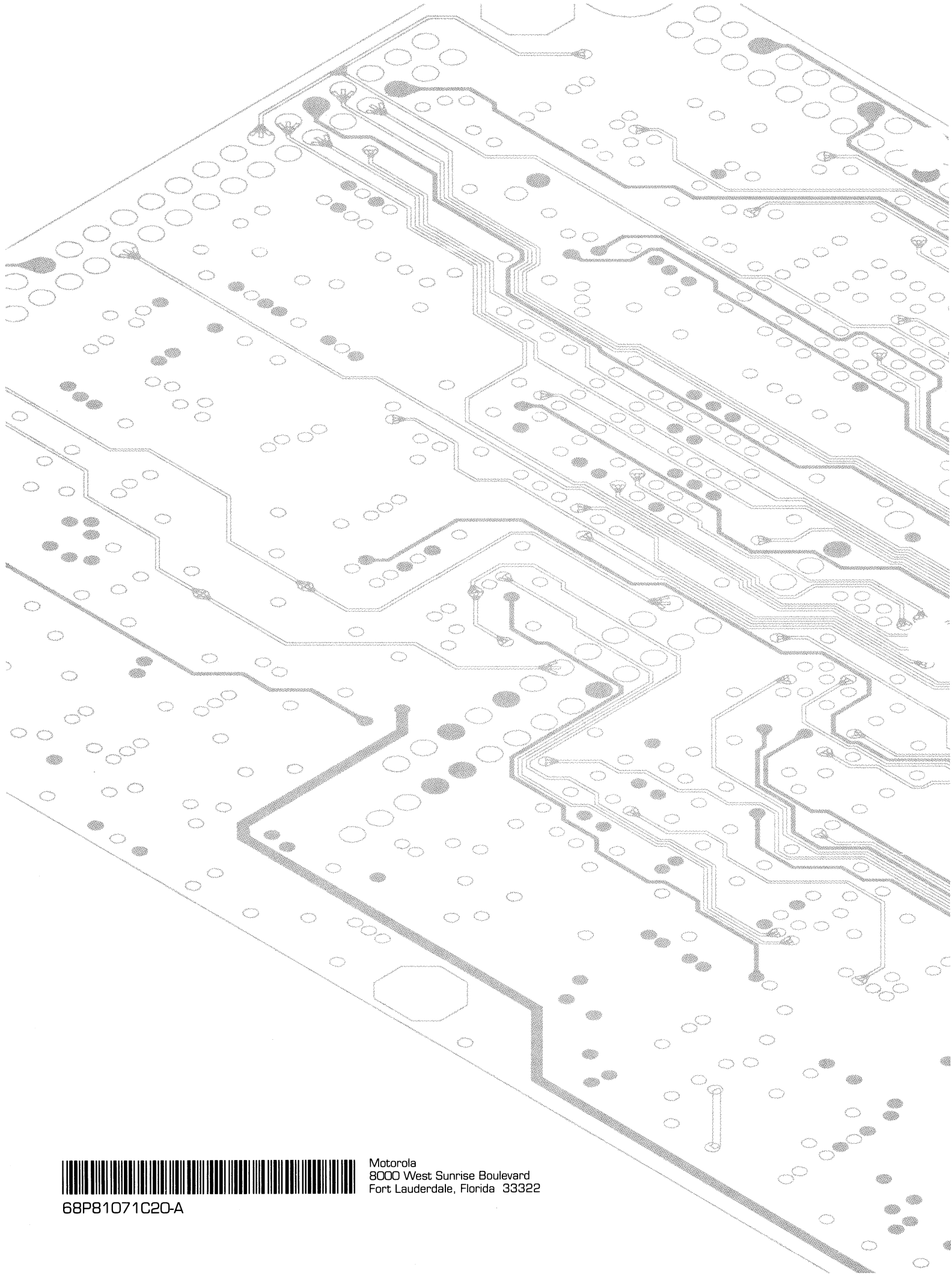
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