MOTOROLA

Commercial Series

CP140/CP160/CP180 Portable Radios

Service Maintainability

Issue: December 2003

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SAFETY INFORMATION

Read this information before using the radio.

PRODUCT SAFETY AND RF EXPOSURE FOR PORTABLE TWO-WAY RADIOS.

This document provides information and instructions for the safe and efficient operation of Motorola Portable Two-Way Radios. The information provided in this document supersedes information contained in user guides published prior to **February 2002.**

COMPLIANCE WITH RF ENERGY EXPOSURE STANDARDS

Note: This Radio is intended for use in occupational/controlled applications, where users have been made aware of the potential for exposure and can exercise control over their exposure. This radio device is NOT authorized for general population, consumer or similar use.

This document includes useful information about RF exposure and helpful instructions on how to control RF exposures.

Motorola radios are designed and tested to comply with a number of national and international standards and guidelines regarding human exposure to radio frequency electromagnetic energy. **This radio complies with IEEE and ICNIRP exposure limits for occupational/controlled RF** exposure environments at usage factors of up to 50% talk–50% listen. In terms of measuring RF energy for compliance with the IEEE/ICNIRP exposure guidelines, the radio radiates measurable RF energy only while it is transmitting (during talking), not when it is receiving (listening) or in standby mode.

NOTE: The approved batteries, supplied with this radio, are rated for a 5-5-90 duty cycle (5% talk–5% listen–90% standby), even though this radio complies with IEEE/ICNIRP occupational exposure limits at usage factors of up to 50% talk.

PORTABLE RADIO OPERATION AND EME EXPOSURE

Your Motorola two-way radio complies with the following RF energy exposure standards and guidelines:

- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- United States Federal Communications Commission, Code of Federal Regulations; 47 CFR part 2 sub-part J
- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95. 1-1992
- Ministry of Health (Canada) Safety Code 6. Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz, 1999
- Australian Communications Authority Radiocommunications (Electromagnetic Radiation - Human Exposure) Standard 2001
- ANATEL, Brasil Regulatory Authority, Resolution 256 (April 11, 2001) “additional requirements for SMR, cellular and PCS product certification.”

COMPLIANCE AND CONTROL GUIDELINES AND OPERATING INSTRUCTIONS FOR PORTABLE TWO-WAY RADIOS

To control your exposure and ensure compliance with the occupational/controlled environment exposure limits, always adhere to the following procedures:

- Transmit no more than 50% of the time. To transmit (talk), push the Push-To-Talk (PTT) button. To receive calls, release the PTT button. Transmitting 50% of the time or less is important since the radio generates measurable RF energy exposure only when transmitting (in terms of measuring standards compliance).
- Hold the radio in a vertical position in front of the face with the microphone (and other parts of the radio including the antenna) at least 2.5 to 5 centimeters (one to two inches) away from the lips. Keeping the radio at a proper distance is important since RF exposures decrease with distance from the antenna.
- For body-worn operation, always place the radio in a Motorola approved clip, holder, holster, case, or body harness for this product. Using Motorola non-approved accessories may result in exposure levels which exceed the IEEE/ICNIRP occupational /controlled environment RF exposure limits.
- If you are not using a body-worn accessory and are not using the radio in the intended use position in front of the face, then ensure the antenna and the radio are kept 2.5 cm (one inch) from the body when transmitting. Keeping the radio at a proper distance is important because of RF exposures decrease with distance from the antenna.

Use only Motorola-approved supplied or replacement antennas, batteries, and accessories. Use of non-Motorola approved antennas, batteries and accessories may exceed IEEE/ICNIRP RF exposure guidelines.
For a list of Motorola-approved antennas, batteries, and other accessories, visit the following web site which lists approved accessories:

http://moleurope.comm.mot.com/member/commerce

For additional information on exposure requirements or other training information, visit http://www.motorola.com/rfhealth.

ELECTROMAGNETIC INTERFERENCE/COMPATIBILITY

NOTE: Nearly every electronic device is susceptible to electromagnetic interference (EMI) if inadequately shielded, designed or otherwise configured for electromagnetic compatibility.

Facilities

To avoid electromagnetic interference and/or compatibility conflicts, turn off your radio in any facility where posted notices instruct you to do so. Hospitals or health care facilities may be using equipment that is sensitive to external RF energy.

Aircraft

When instructed to do so, turn off your radio when on board an aircraft. Any use of a radio must be in accordance with applicable regulations per airline crew instructions.

Medical Devices

Pacemakers

The Advanced Medical Technology Association (AdvaMed) recommends that a minimum separation of 15 cms (6 inches) be maintained between a handheld wireless radio and a pacemaker.These recommendations are consistent with those of the U.S. Food and Drug Administration.

Persons with pacemakers should:

- ALWAYS keep the radio more than 15 cms from their pacemaker when the radio is turned ON.
- Not carry the radio in the breast pocket.
- Use the ear opposite the pacemaker to minimize the potential for interference.
- Turn the radio OFF immediately if you have any reason to suspect that interference is taking place.

Hearing Aids

Some digital wireless radios may interfere with some hearing aids. In the event of such interference, you may want to consult your hearing aid manufacturer to discuss alternatives.

Other Medical Devices

If you use any other personal medical device, consult the manufacturer of your device to determine if it is adequately shielded from RF energy. Your physician may be able to assist you in obtaining this information.

Driver Safety

Check the laws and regulations on the use of radios in the area where you drive. Always obey them.
When using your radio while driving, please:

- Give full attention to driving and to the road.
- Use hands-free operation, if available.
- Pull off the road and park before making or answering a call if driving conditions so require.

OPERATIONAL WARNINGS

Vehicles with an air bag

WARNING: Do not place a portable radio in the area over an air bag or in the air bag deployment area. Air bags inflate with great force. If a portable radio is placed in the air bag deployment area and the air bag inflates, the radio may be propelled with great force and cause serious injury to occupants of the vehicle.

Potentially explosive atmospheres

WARNING: Turn off your radio prior to entering any area with a potentially explosive atmosphere, unless it is a radio type especially qualified for use in such areas as "Intrinsically Safe" (for example, Factory Mutual, CSA, UL or CENELEC Approved). Do not remove, install, or charge batteries in such areas. Sparks in a potentially explosive atmosphere can cause an explosion or fire resulting in bodily injury or even death.

NOTE The areas with potentially explosive atmospheres referred to above include fuelling areas such as below decks on boats, fuel or chemical transfer or storage facilities, areas where the air contains chemicals or particles, such as grain, dust or metal powders. Areas with potentially explosive atmospheres are often but not always posted.

Blasting caps and areas

WARNING: To avoid possible interference with blasting operations, turn off your radio when you are near electrical blasting caps, in a blasting area, or in areas posted: "Turn off two-way radio". Obey all signs and instructions.

OPERATIONAL CAUTIONS

Damaged antennas

CAUTION: Do not use any portable radio that has a damaged antenna. If a damaged antenna comes into contact with your skin, a minor burn can result.

Batteries

CAUTION: All batteries can cause property damage and/or bodily injury such as burns if a conductive material such as jewellery, keys, or beaded chains touch exposed terminals. The conductive material may complete an electrical circuit (short circuit) and become quite hot. Exercise care in handling any charged battery, particularly when placing it inside a pocket, purse, or other container with metal objects.

Table of Contents

Chapter 1 INTRODUCTION

Chapter 2 MAINTENANCE

Chapter 3 SERVICE AIDS

Chapter 1
INTRODUCTION

1.0 Scope of Manual

This manual is intended for use by service technicians familiar with similar types of equipment. It contains service information required for the equipment described and is current as of the printing date. Changes which occur after the printing date may be incorporated by a complete Manual revision or alternatively as additions.

NOTE Before operating or testing these units, please read the Safety Information Section in the front of this manual.

2.0 Warranty and Service Support

Motorola offers long term support for its products. This support includes full exchange and/or repair of the product during the warranty period, and service/ repair or spare parts support out of warranty. Any "return for exchange" or "return for repair" by an authorised Motorola Dealer must be accompanied by a Warranty Claim Form. Warranty Claim Forms are obtained by contacting an Authorised Motorola Dealer.

2.1 Warranty Period and Return Instructions

The terms and conditions of warranty are defined fully in the Motorola Dealer or Distributor or Reseller contract. These conditions may change from time to time and the following notes are for guidance purposes only.

In instances where the product is covered under a "return for replacement" or "return for repair" warranty, a check of the product should be performed prior to shipping the unit back to Motorola. This is to ensure that the product has been correctly programmed or has not been subjected to damage outside the terms of the warranty.

Prior to shipping any radio back to the appropriate Motorola warranty depot, please contact Customer Resources (Please see page 2 and page 3 in this Chapter). All returns must be accompanied by a Warranty Claim Form, available from your Customer Services representative. Products should be shipped back in the original packaging, or correctly packaged to ensure no damage occurs in transit.

2.2 After Warranty Period

After the Warranty period, Motorola continues to support its products in two ways.

1. Motorola's Radio Aftermarket and Accessory Division (AAD) offers a repair service to both end users and dealers at competitive prices.
2. AAD supplies individual parts and modules that can be purchased by dealers who are technically capable of performing fault analysis and repair.

2.3 European Radio Support Centre (ERSC)

The ERSC Customer Information Desk is available through the following service numbers:

Austria:	08 00 29 75 41	Italy:	80 08 77 387
Belgium:	08 00 72 471	Luxemburg:	08 00 23 27
Denmark:	80 88 05 72	Netherlands:	08 00 22 45 13
Finland:	08 00 11 49 910	Norway:	80 01 11 15
France:	08 00 90 30 90	Portugal:	08 00 84 95 70
Germany:	08 00 18 75 240	Spain:	90 09 84 902
Greece:	00 80 04 91 29 020	Sweden:	02 07 94 307
UK :	08 00 96 90 95	Switzerland:	08 00 55 30 82
Ireland:	18 00 55 50 21	Iceland:	80 08 147

Or dial the European Repair and Service Centre:

Tel: +49 30 6686 1555

Please use these numbers for repair enquiries only.

2.4 Piece Parts

Some replacement parts, spare parts, and/or product information can be ordered directly. If a complete Motorola part number is assigned to the part, it is available from Motorola Radio Aftermarket and Accessory Division (AAD). If no part number is assigned, the part is not normally available from Motorola. If the part number is appended with an asterisk, the part is serviceable by Motorola Depot only. If a parts list is not included, this generally means that no user-serviceable parts are available for that kit or assembly.

All part orders should be directed to :

Motorola GmbH
Customer Care
AM Borsigturm 130
13507 Berlin
Germany.

2.5 EMEA Test Equipment Support

Information related to support and service of Motorola Test Equipment is available via Motorola Online (Extranet), through the Customer Care organisation of Motorola’s local area representation or by calling the the European Repair and Service Centre: Tel: +49 30 6686 1555

2.6 Technical Support

Motorola Product Services is available to assist the dealer/distributors in resolving any malfunctions which may be encountered.

UK/Ireland - Richard Russell
Telephone: +44 (0) 1256 488 082
Fax: +44 01256 488 080
Email: BRR001@email.mot.com

Central/East Europe - Siggy Punzenberger
Telephone: +49 (0) 6128 70 2342
Fax: +49 (0) 6128 95 1096
Email: TFG003@email.mot.com

Scandinavia
Telephone: +46 8 735 9282
Fax: +46 8 735 9280
Email: C14749@email.mot.com

Germany -Customer Connect Team
Telephone: +49 (0) 30 6686 1539
Fax: +49 (0) 30 6686 1916
Email: cgiss.emea@europe.mot.com

France - Lionel Lhermitte
Telephone: +33 1 6929 5722
Fax: +33 1 6929 5904
Email: TXE037@email.mot.com

Italy - Ugo Gentile
Telephone: +39 0 2822 0325
Fax: +39 0 2822 0334
Email: C13864@email.mot.com

Africa & Middle East - Armand Roy
Telephone: +33 1 6929 5715
Fax: +33 1 6929 5778
Email: armand.roy@Motorola.com

2.7 Related Documents

The following documents are directly related to the use and maintainability of this product.

Title	Language	Part Number
CP140/CP160/CP180 Product Manual	English	GMLN1092_
	French	GMLN1093_
	Russian	GMLN1094_

3.0 Radio Model Information

The model number and serial number are located on a label attached to the back of your radio. You can determine the RF output power, frequency band, protocols, and physical packages. The example below shows one mobile radio model number and its specific characteristics.

Table 1-1 Radio Model Number (Example: MDH65KDC9AA2_N)

	Type of Unit	Model Series	Freq. Band	Power Level	Physical Packages	Channel Spacing	Protocol	Feature Level	Model Revision	Model Package
MD ↑ MD = Motorola Internal Use	**H** ↑ H = Portable	**65**	**K** VHF (146-174 MHz) **Q** UHF1 (403-438 MHz) **R** UHF2 (438-470 MHz) **S** UHF3 (465-495 MHz)	**D** 4W or 5W	**C** Non Display **F** Limited Keypad **H** Full Keypad	**9** Program-mable	**AA** Conven-tional	**2** 16 channel **3** 32 channel **4** 64 channel	**A**	**N**

Chapter 2

MAINTENANCE

1.0 Introduction

This chapter of the manual describes:

- preventive maintenance
- safe handling of CMOS devices
- repair procedures and techniques

2.0 Preventive Maintenance

The radios do not require a scheduled preventive maintenance program; however, periodic visual inspection and cleaning is recommended.

2.1 Inspection

Check that the external surfaces of the radio are clean, and that all external controls and switches are functional. It is not recommended to inspect the interior electronic circuitry.

2.2 Cleaning

The following procedures describe the recommended cleaning agents and the methods to be used when cleaning the external and internal surfaces of the radio. External surfaces include the front cover, housing assembly, and battery case. These surfaces should be cleaned whenever a periodic visual inspection reveals the presence of smudges, grease, and/or grime.

NOTE Internal surfaces should be cleaned only when the radio is disassembled for servicing or repair.

The only recommended agent for cleaning the external radio surfaces is a 0.5% solution of a mild dishwashing detergent in water. The only factory recommended liquid for cleaning the printed circuit boards and their components is isopropyl alcohol (70% by volume).

CAUTION: The effects of certain chemicals and their vapors can have harmful results on certain plastics. Aerosol sprays, tuner cleaners, and other chemicals should be avoided.

1. Cleaning External Plastic Surfaces
   The detergent-water solution should be applied sparingly with a stiff, non-metallic, short-bristled brush to work all loose dirt away from the radio. A soft, absorbent, lintless cloth or tissue should be used to remove the solution and dry the radio. Make sure that no water remains entrapped near the connectors, cracks, or crevices.
2. Cleaning Internal Circuit Boards and Components
   Isopropyl alcohol may be applied with a stiff, non-metallic, short-bristled brush to dislodge embedded or caked materials located in hard-to-reach areas. The brush stroke should direct the dislodged material out and away from the inside of the radio. Make sure that controls or tunable components are not soaked with alcohol. Do not use high-pressure air to hasten the drying process since this could cause the liquid to collect in unwanted places. Upon completion of the cleaning process, use a soft, absorbent, lintless cloth to dry the area. Do not brush or apply any isopropyl alcohol to the frame, front cover, or back cover.

NOTE Always use a fresh supply of alcohol and a clean container to prevent contamination by dissolved material (from previous usage).

3.0 Safe Handling of CMOS and LDMOS

Complementary metal-oxide semiconductor (CMOS) devices are used in this family of radios. CMOS characteristics make them susceptible to damage by electrostatic or high voltage charges. Damage can be latent, resulting in failures occurring weeks or months later. Therefore, special precautions must be taken to prevent device damage during disassembly, troubleshooting, and repair.

Handling precautions are mandatory for CMOS circuits and are especially important in low humidity conditions. DO NOT attempt to disassemble the radio without first referring to the CMOS CAUTION paragraph in the Disassembly and Reassembly section of the manual.

4.0 General Repair Procedures and Techniques

IC Pre-Baking

No pre-baking of components is required in the repair of this product.

Parts Replacement and Substitution

When damaged parts are replaced, identical parts should be used. If the identical replacement component is not locally available, check the parts list for the proper Motorola part number and order the component from the nearest Motorola Communications parts center listed in the “Piece Parts” section of this manual.

Rigid Circuit Boards

The family of radios uses bonded, multi-layer, printed circuit boards. Since the inner layers are not accessible, some special considerations are required when soldering and unsoldering components. The through-plated holes may interconnect multiple layers of the printed circuit. Therefore, care should be exercised to avoid pulling the plated circuit out of the hole.

When soldering near the 18-pin and 40-pin connectors:

- avoid accidentally getting solder in the connector.
- be careful not to form solder bridges between the connector pins
- closely examine your work for shorts due to solder bridges.

Chip Components

Use either the RLN4062 Hot-Air Repair Station or the Motorola 0180381B45 Repair Station for chip component replacement. When using the 0180381B45 Repair Station, select the TJ-65 mini-thermojet hand piece. On either unit, adjust the temperature control to 370 °C (700 °F), and adjust the airflow to a minimum setting. Airflow can vary due to component density.

- **To remove a chip component**:
  1. Use a hot-air hand piece and position the nozzle of the hand piece approximately 0.3 cm (1/8") above the component to be removed.
  2. Begin applying the hot air. Once the solder reflows, remove the component using a pair of tweezers.
  3. Using a solder wick and a soldering iron or a power desoldering station, remove the excess solder from the pads.
- **To replace a chip component using a soldering iron**:
  1. Select the appropriate micro-tipped soldering iron and apply fresh solder to one of the solder pads.
  2. Using a pair of tweezers, position the new chip component in place while heating the fresh solder.
  3. Once solder wicks onto the new component, remove the heat from the solder.
  4. Heat the remaining pad with the soldering iron and apply solder until it wicks to the component. If necessary, touch up the first side. All solder joints should be smooth and shiny.
- **To replace a chip component using hot air**:
  1. Use the hot-air hand piece and reflow the solder on the solder pads to smooth it.
  2. Apply a drop of solder paste flux to each pad.
  3. Using a pair of tweezers, position the new component in place.
  4. Position the hot-air hand piece approximately 0.3 cm (1/8”) above the component and begin applying heat.
  5. Once the solder wicks to the component, remove the heat and inspect the repair. All joints should be smooth and shiny.

Shields

Removing and replacing shields will be done with the R1070 station with the temperature control set to approximately 215°C (415°F) [230°C (445°F) maximum].

■ **To remove the shield**:

1. Place the circuit board in the R1070 circuit board holder.
2. Select the proper heat focus head and attach it to the heater chimney.
3. Add solder paste flux around the base of the shield.
4. Position the shield under the heat-focus head.
5. Lower the vacuum tip and attach it to the shield by turning on the vacuum pump.
6. Lower the focus head until it is approximately 0.3 cm (1/8”) above the shield.
7. Turn on the heater and wait until the shield lifts off the circuit board.
8. Once the shield is off, turn off the heat, grab the part with a pair of tweezers, and turn off the vacuum pump.
9. Remove the circuit board from the R1070 circuit board holder.

■ **To replace the shield:**

1. Add solder to the shield if necessary, using a micro-tipped soldering iron.
2. Next, rub the soldering iron tip along the edge of the shield to smooth out any excess solder. Use solder wick and a soldering iron to remove excess solder from the solder pads on the circuit board.
3. Place the circuit board back in the R1070 circuit board holder.
4. Place the shield on the circuit board using a pair of tweezers.
5. Position the heat-focus head over the shield and lower it to approximately 0.3 cm (1/8”) above the shield.
6. Turn on the heater and wait for the solder to reflow.
7. Once complete, turn off the heat, raise the heat-focus head and wait approximately one minute for the part to cool.
8. Remove the circuit board and inspect the repair. No cleaning should be necessary.

5.0 Notes For All Schematics and Circuit Boards

* Component is frequency sensitive. Refer to the Electrical Parts List for value and usage.

1. Unless otherwise stated, resistance values are in ohms (K = 1000), capacitance values are in picofarads (pF) or microfarads (µF), and inductance values are in nanohenries (nH) or microhenries (µH).
2. DC voltages are measured from point indicated to chassis ground using a Motorola DC multimeter or equivalent. If the board has been removed from the chassis, the transmitter module mounting screws may be used for ground connection. (*Note: The antenna nut bracket is not connected to ground.*) Operating mode dependent voltages are followed by (RX) for receive mode, (TX) for transmit mode, (UNSQ) for unsquelched mode, etc.
3. RF voltages on VHF models are measured with a Fluke model 85 RF probe. The indicated voltages expressed in mV (RF) are DC level readings which correspond approximately 1:1 to the RF voltage level in mV rms. RF voltages in the Receiver Front End and Receiver Back End circuits are measured with an on-channel 100 mV (-7 dBm) RF signal applied to the antenna jack J140.
4. RF voltages on UHF models are measured both with a high-impedance RF voltmeter having a bandwidth in excess of 500 MHz (levels are expressed in dBm) and with a Fluke model 85 RF probe [levels are expressed in mV (RF)]. These indicated voltages are DC level readings which correspond approximately 1:1 to the RF voltage level in mV rms, and are only approximate for UHF frequency measurements. RF voltages in the Receiver Front End and Receiver Back End circuits are measured with an on-channel 100 mV (-7 dBm) RF signal applied to the antenna jack J140.
5. Audio voltages are measured with a high-impedance AC rms voltmeter. The indicated voltages are expressed in mV rms. Receive mode voltages are followed by (RX) and are measured with an on-channel signal with 1 kHz modulation at 60% deviation (3 kHz for 25 kHz channels, or 1.5 kHz for 12.5 kHz channels). Transmit mode voltages are followed by (TX) and are measured with a 1 kHz, 10 mV rms signal present at the external microphone input (accessory connector J471 pin 4 hot and pin 7 ground).
6. Reference Designators are assigned in the following manner:

Ref. No. Series	Circuit Block
1-99	RF Front End
100-149	Transmitter RF Stages
150-200	Transmitter Power Control
201-250	Frequency Synthesizer
251-300	VCO
301-400	DC Regulation
401-450	Microprocessor
451-550	Audio

7. Circuit Block Interconnection Legend:

Name	Description
USWB+	Unswitched Battery Voltage (always on)
5V	5 volts (regulated)
5R	5 volts in RX mode only
5T	5 volts in TX mode only
RESET	Low-line reset signal from U320 to uP
D3_3V	Digital 3.3 volts (regulated)
3V	Analog 3 volts (regulated)
TX_ENA	Transmit enable signal from uP to transmitter
PWR_SET	DC voltage from ASFIC to TX power control
DEMOD	RX audio from backend to ASFIC
BW_SEL	Backend filter BW select from ASFIC
RSSI	RX signal strength indication from IFIC to uP
IF_IN/OUT	44.85 MHz from 1st mixer to high IF filter
RF_IN/OUT	RX signal from antenna switch to front end
MOD OUT/IN	TX modulation from ASFIC to synthesizer
16_8_MHZ	Ref osc signal from synthesizer to ASFIC
SYNTH_CS	Synthesizer chip select from uP
SPI_CLK	Serial clock from uP
SPI_DATA_OUT	Serial data from uP
LOCK	Lock detect indication from synth to uP
PRESC	VCO freq feedback from VCOBIC to synth
V_STEER	Steering line voltage from synth to VCO's
V_SF	Super-filtered 4.5 volts from synth to VCOBIC
VCO_MOD	TX modulation from ASFIC to synthesizer
TRB	TX/RX control from synth to VCOBIC
RX_INJ	Buffered RX VCO output to RX 1st mixer
TX_INJ	TX VCO output to transmitter input

Chapter 3

SERVICE AIDS

1.0 Recommended Test Tools

Table 3.1 lists the service aids recommended for working on the radio. While all of these items are available from Motorola, most are standard workshop equipment items, and any equivalent item capable of the same performance may be substituted for the item listed.

Table 3-1 Service Aids

Motorola Part No.	Description	Application
RLN4460	Portable Test Set	Enables connection to the audio/accessory jack. Allows switching for radio testing.
RLN4510	Battery Interface	Regulates DC current and voltage between radio and power supply.
RVN4191	Customer Programming Software and Global Tuner - Software on CD Rom	Program customer option and channel data.
PMKN4004	Programming Test Cable	Connects radio to RIB (PLN4008).
PMKN4003	Radio to Radio Cloning Cable	Allows a radio to be duplicated from a master radio by transferring programmed data from the master radio to the other.
RLN4008	Radio Interface Box	Enables communications between the radio and the computer's serial communications adapter.
5886564Z01	RF Adaptor	Adapts radio's antenna port to BNC cabling of test equipment.
0180305K08	Shop Battery Eliminator	Interconnects radio to power supply.
EPN4040	Wall-Mounted Power Supply	Used to supply power to the RIB (UK).
EPN4041	Wall-Mounted Power Supply	Used to supply power to the RIB (Euro).
3080369B71 or 3080369B72	Computer Interface Cable	Use B72 for the IBM PC AT or newer (9-pin serial port). Use B71 for older models (25-pin serial port). Connects the computer's serial communications adapter to the RIB (PLN4008).
6686533Z01	Knob Remover/Chassis Opener	Used to remove the front cover assembly.
HKN9216	IBM Computer Interface Cable	Connection from computer to RIB.
RSX4043A	TORX Screwdriver	Used to remove and tighten chassis screws.
6680387A	T6 TORX bit	Removable TORX screwdriver bit.
WADN4055A	Portable Soldering Station	Digitally controlled soldering iron.
6604008K01	0.4mm Replacement Tip	For WADN4055A Soldering iron.
6604008K01	0.8mm Replacement Tip	For WADN4055A Soldering iron.
0180386A82	Anti-static Grounding Kit	Used for all radio assembly/disassembly procedures.

Table 3-1 Service Aids

Motorola Part No.	Description	Application
6684253C72	Straight Prober	
6680384A98	Brush	
1010041A86	Solder (RMA type)	63/37, 0.5mm diameter, 1lb. spool.

2.0 Test Equipment

Table 3-2 lists test equipment required to service the radio and other two-way radios.

Table 3-2 Recommended Test Equipment

Motorola Part No.	Description	Characteristics	Application
R2600 series	System analyzer	This item will substitute for items with an asterisk (*)	Frequency/deviation meter and signal generator for wide-range troubleshooting and alignment
*R1074A	Fluke 87 digital multimeter	True RMS metering, 200 kHz frequency counter, 32-segment bargraph with backlit display	Digital voltmeter is recommended for AC/DC voltage and current measurements
	Fluke 85 RF probe	500 MHz, 30 VAC max	Use with Fluke 87 digital multimeter for RF voltage measurements.
*R1377A	AC voltmeter	1mV to 300mV, 10 megaohm input impedance	Audio voltage measurements
R1611A	Dual channel 100 MHz oscilloscope (Agillent)	Two-channel, 100 MHz bandwidth, 200M sample rate/sec, 2MB memory/channel	Waveform measurements
S1339A	RF millivolt meter	100µV to 3V RF, 10 kHz to 1 GHz frequency range	RF level measurements
*R1013B or *R1370A	SINAD meter or SINAD meter with RMS	Without RMS audio voltmeter or With RMS audio voltmeter	Receiver sensitivity measurements
S1348D	Programmable DC power supply	0-20V DC, 0-5 amps, current limited	Bench supply for 7.5 V DC