MOTOROLA

Professional Radio

GM300 Series

Basic Service Manual

68P64115B51

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SAFETY INFORMATION

Read this information before using your radio.

SAFE AND EFFICIENT OPERATION OF MOTOROLA TWO-WAY RADIOS

This document provides information and instructions for the safe and efficient operation of Motorola Portable and Mobile Two-Way Radios. The information provided in this document supersedes the general safety information contained in user guides published prior to 1 January 1998.

For information regarding radio use in hazardous areas, please refer to the Factory Mutual (FM) approval manual supplement.

EXPOSURE TO RADIO FREQUENCY ENERGY

Your Motorola Two-Way Radio, which generates and radiates radio frequency (RF) electromagnetic energy (EME), is designed to comply with the following National and International Standards and Guidelines regarding exposure of human beings to radio frequency electromagnetic energy:

- Federal Communications Commission Report and Order No. FCC 96-326 (August 1996)
- American National Standards Institute (C95.1 - 1992)
- National Council on Radiation Protection and Measurements (NCRP-1986)
- International Commission on Non-Ionizing Radiation Protection (ICNRP- 1986)
- European Committee for Electrotechnical Standardization (CENELEC):

ENV 50166-1 1995 E	Human exposure to electromagnetic fields Low frequency (0 Hz to 10 kHz)
- ENV 50166-2 1995 E	Human exposure to electromagnetic fields High frequency (10 kHz to 300 GHz)
- Proceedings of SC211/B 1996	"Safety Considerations for Human Exposure to EMFs from Mobile Telecommunication Equipment (MTE) in the Frequency Range 30MHz - 6 GHz." (EMF - Electro-Magnetic Fields)

To assure optimal radio performance and to ensure that your exposure to radio frequency electromagnetic energy is within the guidelines in the above standards, always adhere to the following procedures:

ELECTROMAGNETIC INTERFERENCE/COMPATIBILITY

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

- To avoid electromagnetic interference and/or compatibility conflicts, turn off your radio in any facility where posted notices instruct you to do so. Hospital or health facilities may be using equipment that is sensitive to external RF energy.
- When instructed to do so, turn off your radio when on board an aircraft. Any use of a radio must be in accordance with airline regulations or crew instructions.

Mobile Radio Operation and EME Exposure

To assure optimal radio performance and that human exposure to radio frequency electromagnetic energy is within the guidelines referenced in this document, transmit *only* when people inside and outside the vehicle are at least the minimum distance away from a properly installed, externally-mounted antenna.

The table below lists the minimum distance for several different ranges of rated radio power.

Table 1 Rated Power and Distance

Rated Power of Vehicle-Installed Mobile Two-Way Radio	Minimum Distance from Transmitting Antenna
7 to 15 Watts	30.5 cm (1 Foot)
16 to 50 Watts	61 cm (2 Feet)
More than 50 Watts	91.5 cm (3 Feet)

Mobile Antenna Installation

Install the vehicle antenna *external* to the vehicle and in accordance with:

a. The requirements of the antenna manufacturer/supplier

b. Instructions in the radio installation manual.

Control Station Operation

When radio equipment is used to operate as a control station, it is important that the antenna be installed outside the building and away from places where people may be in close proximity.

NOTE **Refer to Table 1 for rated power and minimum distance values for transmitting antennas.**

OPERATIONAL WARNINGS

Potentially explosive atmospheres

WARNING: Turn off your Two-Way radio when you are in any area with a potentially explosive atmosphere, unless it is a radio type especially qualified for use in such areas. Sparks in a potentially explosive atmosphere can cause an explosion or fire resulting in bodily injury or even death.

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.

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; and any other area where you would normally be advised to turn off your vehicle engine. Areas with potentially explosive atmospheres are often but not always posted.**

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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:	06 60 75 41	Italy:	16 78 77 387
Belgium:	08 00 72 471	Luxemburg:	08 00 23 27
Denmark:	80 01 55 72	Netherlands:	60 22 45 13
Finland:	08 00 11 49 10	Norway:	80 01 11 15
France:	05 90 30 90	Portugal:	05 05 49 35 70
Germany:	01 30 18 75 24	Spain:	90 09 84 902
Greece:	00 80 04 91 29 020	Sweden:	02 07 94 307
UK :	08 00 96 90 95	Switzerland:	1 55 30 82
Ireland:	18 00 55 50 21	Iceland:	80 08 147

Or dial Customer Care Centre:

Tel: +49 6128 70 2164

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
European Parts Department
65232 Taunusstein
Germany.

2.5   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

Northern Europe - Bjorn Rambert
Telephone: +46 8 735 9282
Fax: +46 8 735 9280
Email: TCW275X@email.mot.com

Germany
Telephone: +49 (0) 6128 70 2266
Fax: +49 (0) 6128 95 1685
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 - Ralph Schubert
Telephone: +33 (0)4 4230 5887
Fax: +33 (0)4 4230 4784
Email: ralph.schubert@Motorola.com

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 portable radio model number and its specific characteristics.

Table 1-1 Radio Model Number (Example: MDM25KHC9AN1AE)

	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	**M** **M** = Mobile	**25**	**K** VHF (136-174MHz)	**H** 1-25W	**C** GM140 GM340 GM640	**9** Program-mable	**AA** Conventional MDC	**1** GM140 GM340 GM640	**A**	**E**
			R UHF1 (403-470MHz)	**K** 40-60W	**F** GM160 GM360 GM660		**AN** 5 Tone	**5** GM160 GM360 GM660.		
			B LB1 (29.7-36.0MHz)		**N** GM380 GM1280		**CK** MPT	**8** GM380 GM1280		
			C LB2 (36.0-42.0MHz)							
			D LB3 (42.0-50.0 MHz)							

MODEL CHART AND TEST SPECIFICATION

1.0   Model Chart (UHF 403-470 MHz)

GM Series UHF 403-470 MHz				
Model				Description
MDM25RHC9AN1_E				GM340, 403-470 MHz, 1-25W, 6 Ch
	MDM25RHF9AN5_E			GM360, 403-470 MHz, 1-25W, 255 Ch
		MDM25RHN9AN8_E		GM380, 403-470 MHz, 1-25W, 255 Ch
			Item	Description
X			GCN6112_	Control Head GM340
	X		GCN6120_	Control Head GM360
		X	GCN6121_	Control Head GM380
X			IMUE6015_	Tanapa GM340
	X		IMUE6015_	Tanapa GM360
		X	IMUE6038_	Tanapa GM380
X	X	X	ENBN4056_	Packaging, Waris Mobile
X	X	X	GLN7324_	Low Profile Mounting Trunion
X	X	X	HKN4137_	12V Power Cable 1-25W
X	X	X	MDRMN4025_	Enhanced Compact Microphone
X			6864110B80	User Guide, GM340
	X		6864110B81	User Guide, GM360
		X	6864110B82	User Guide, GM380

X = Indicates one of each is required

2.0   Model Chart (VHF 136-174 MHz)

GM Series VHF 136-174 MHz				
Model				**Description**
MDM25KHC9AN1_E				GM340, 136-174 MHz, 1-25W, 6 Ch
	MDM25KHF9AN5_E			GM360, 136-174 MHz, 1-25W, 255 Ch
		MDM25KHN9AN8_E		GM380, 136-174 MHz, 1-25W, 255 Ch
			Item	**Description**
X			GCN6112_	Control Head GM340
	X		GCN6120_	Control Head GM360
		X	GCN6121_	Control Head GM380
X			IMUD6013_	Tanapa GM340
	X		IMUD6013_	Tanapa GM360
		X	IMUD6024_	Tanapa GM380
X	X	X	ENBN4056_	Packaging, Waris Mobile
X	X	X	GLN7324_	Low Profile Mounting Trunion
X	X	X	HKN4137_	12V Power Cable 1-25W
X	X	X	MDRMN4025_	Enhanced Compact Microphone
X			6864110B80	User Guide, GM340
	X		6864110B81	User Guide, GM360
		X	6864110B82	User Guide, GM380

X = Indicates one of each is required

3.0 Model Chart (Low Band 29-50 MHz)

GM Series Low Band 29-50 MHz				
Model				**Description**
MDM25BKF9AN5_E				GM360 LB1, 29.0-36.0 MHz, 40-60W, 255 Ch
	MDM25CKF9AN5_E			GM360 LB2, 36.0-42.0 MHz, 40-60W, 255 Ch
		MDM25DKF9AN5_E		GM360 LB3, 42.0-50.0 MHz, 40-60W, 255 Ch
			Item	**Description**
X	X	X	GCN6120_	Control Head, GM360
X			IMUB6003_	Tanapa GM360, LB1
	X		IMUB6004_	Tanapa GM360, LB2
		X	IMUB6005_	Tanapa GM360, LB3
X	X	X	ENBN4056_	Packaging, Waris Mobile
X	X	X	HKN9402_	12V Power Cable
X	X	X	MDRMN4025_	Enhanced Compact Microphone
X	X	X	RLN4774_	3 Point Mount
X	X	X	6864110B81_	User Guide, GM360

X = Indicates one of each is required

2.4   Specifications

General			
Specification	**VHF**	**UHF**	**LB1, LB2, LB3**
Frequency Range:	136-174 MHz	403-470 MHz	29.7-36.0 MHz 36.0-42.0 MHz 42.0-50.0 MHz
Frequency Stability (-30°C to +60°C, 25°C Ref.)	±2.5 PPM	±2 PPM	±5.0 PPM
Channel Capacity:	GM340 - 6 GM360 - 255 GM380 - 255		
Channel Spacing:	12.5/20/25 kHz		
Power Output:	1-25W	1-25W	40-60W
Power Supply:	13.2Vdc (10.8 - 15.6 Vdc) negative vehicle ground		
Dimensions (L X W X H) **UHF/VHF 1-25W** GM340 GM360 GM380 **Low Band 40-60W** GM360	 177mm X 176mm X 56mm (add 8mm for Volume Knob) (6.97" X 6.93" X 2.2" - add 0.3" for Volume Knob) 186mm X 179mm X 59mm (add 9mm for Volume Knob) (7.32" X 7.05" X 2.34" - add 0.35" for Volume Knob) 188mm X 185mm X 72mm (add 7mm for Volume Knob) (7.4" X 7.28" X 2.83" - add 0.27" for Volume Knob) 250mm X 179mm X 59mm (add 9mm for Volume Knob) (9.8" X 7.05" X 2.34" - add 0.35" for Volume Knob)		

Weight:
  Low power (1-25W)
  High power (40-60W)
	1400 g (3.15 lbs)
	2064 g (4.3 lbs)		

Operating Temperature	-30 to 60 ^{o} C		
Sealing	Passes rain testing to IP54		
Shock and Vibration	Meets MIL-STD 810-C,D&E and TIA/EIA 603		
Dust	Meets MIL-STD 810-C,D&E and TIA/EIA 603		
Humidity	Meets MIL-STD 810-C,D&E and TIA/EIA 603		

Transmitter			
Specification	**VHF**	**UHF**	**LB1, LB2, LB3**
Modulation Limiting:	±2.5 kHz @ 12.5 kHz ±4.0 kHz @ 20 kHz ±5.0 kHz @ 20/25 kHz		
FM Hum and Noise:	-40 dB@12.5 kHz -45 dB@ 20/25 kHz		
Conducted/Radiated Emissions:	-36 dBm < 1 GHz -30 dBm > 1 GHz		-26 dBm
Adjacent Channel Power	-60dB @12.5, -70dB @ 20/25kHz		
Audio Response: (300 to 3000Hz)	+1, -3dB		
Audio Distortion: @ 1000 Hz, 60% Rated Maximum Deviation:	3% Typical		

Receiver			
Specification	**VHF**	**UHF**	**LB1, LB2, LB3**
Sensitivity (12dBSINAD): (ETS)	0.30µV (0.22 µV Typical)		
Intermodulation : (ETS)	>65 dB; >70 dB in Base Mode		>65 dB
Adjacent Channel Selectivity: (ETS)	80 dB @ 25 kHz 75 dB @ 20 kHz 65 dB @ 12.5 kHz	75 dB @ 25 kHz 70 dB @ 20 kHz 65 dB @ 12.5 kHz	80 dB @ 25 kHz 75 dB @ 20 kHz 65 dB @ 12.5 kHz
Spurious Rejection: (ETS)	80 dB @ 20/25 kHz 75 dB @ 12.5 kHz	75 dB @ 20/25 kHz 70 dB @ 12.5 kHz	80 dB @ 20/25 kHz 75 dB @ 12.5 kHz
Rated Audio: (ETS)	3W Internal (GM340/GM360) 13W External		
Audio Distortion @ Rated Audio:	3% Typical		
Hum and Noise:	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz		
Audio Response: (300 to 3000Hz)	+1, -3dB		
Conducted Spurious Emission per FCC Part 15:	-57 dBm <1 GHz -47 dBm >1 GHz		

Chapter 3

MAINTENANCE

1.0   Introduction

This chapter provides details about the following:

- ❑   Preventive maintenance (inspection and cleaning).
- ❑   Safe handling of CMOS and LDMOS devices.
- ❑   Disassembly and reassembly of the radio.
- ❑   Repair procedures and techniques.
- ❑   Installation of Option Boards.

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 Procedures

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 service 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. Avoid using aerosol sprays, tuner cleaners, and other chemicals.**

Cleaning External Plastic Surfaces

Apply the 0.5% detergent-water solution sparingly with a stiff, non-metallic, short-bristled brush to work all loose dirt away from the radio. Use a soft, absorbent, lintless cloth or tissue to remove the solution and dry the radio. Make sure that no water remains entrapped near the connectors, cracks, or crevices.

Cleaning Internal Circuit Boards and Components

Isopropyl alcohol (70%) 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. After completing 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 Devices

Complementary metal-oxide semiconductor (CMOS) devices are used in this family of radios, and are 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 following CAUTION statement.

CAUTION: This radio contains static-sensitive devices. Do not open the radio unless you are properly grounded. Take the following precautions when working on this unit:

❑ Store and transport all CMOS devices in conductive material so that all exposed leads are shorted together. Do not insert CMOS devices into conventional plastic "snow" trays used for storage and transportation of other semiconductor devices.

❑ Ground the working surface of the service bench to protect the CMOS device. We recommend using the Motorola Static Protection Assembly (part number 0180386A82), which includes a wrist strap, two ground cords, a table mat, and a floor mat.

❑ Wear a conductive wrist strap in series with a 100k resistor to ground. (Replacement wrist straps that connect to the bench top covering are Motorola part number RSX4015_.)

❑ Do not wear nylon clothing while handling CMOS devices.

❑ Do not insert or remove CMOS devices with power applied. Check all power supplies used for testing CMOS devices to be certain that there are no voltage transients present.

❑ When straightening CMOS pins, provide ground straps for the apparatus used.

❑ When soldering, use a grounded soldering iron.

❑ If at all possible, handle CMOS devices by the package and not by the leads. Prior to touching the unit, touch an electrical ground to remove any static charge that you may have accumulated. The package and substrate may be electrically common. If so, the reaction of a discharge to the case would cause the same damage as touching the leads.

4.0 Repair Procedures and Techniques — General

Parts Replacement and Substitution

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

Rigid Circuit Boards

This 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 printed-through holes may interconnect multiple layers of the printed circuit. Therefore, exercise care to avoid pulling the plated circuit out of the hole.

When soldering near the 20-pin and 40-pin connectors:

❑   Avoid accidentally getting solder in the connector.

❑   Be careful not to form solder bridges between the connector pins.

❑   Examine your work closely for shorts due to solder bridges.

5.0 Disassembling and Reassembling the Radio — General

Since these radios may be disassembled and reassembled with the use of only four (board to casting) screws, it is important to pay particular attention to the snaps and tabs, and how parts align with each other.

The following tools are required for disassembling the radio:

❑   Small flat blade screwdriver

❑   Dismantling Tool (Motorola Part No. 6686119B01)

❑   TORX™ T20 screwdriver

If a unit requires more complete testing or service than is customarily performed at the basic level, send this unit to a Motorola Authorized Service Center. (See Chapter 1 for a list of authorized service centers.)

The following disassembly procedures should be performed only if necessary:

6.0   Radio Disassembly - Detailed

The procedure to remove and replace a Control Head, Top Cover or Transceiver Board is similar for all models of radio. A typical procedure is therefore shown followed by specific disassembly procedures for Control Heads on radio models without a display and radio models fitted with a display.
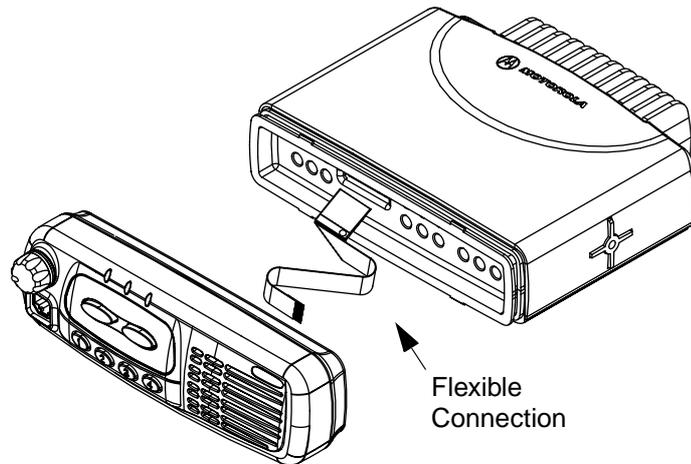
6.1   Control Head Removal

1.   Insert the dismantling tool in the groove between the control head and the radio assembly as shown in Figure 3-1.

2.   Press on the dismantling tool until the snap connectors on the side of the control head release from the radio assembly.

Dismantling
Tool
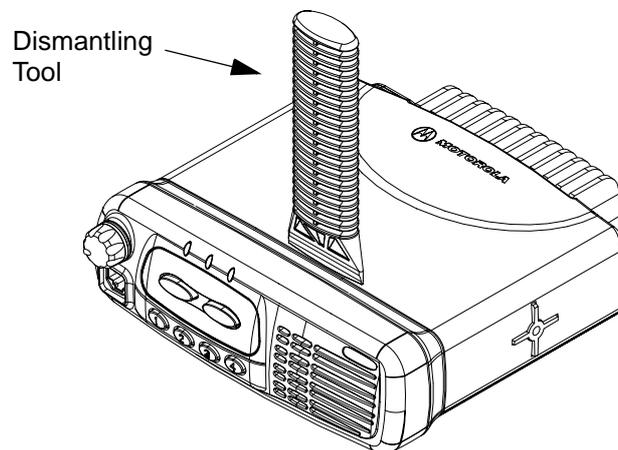
ZWG0130209-O

Figure 3-1 Typical Control Head Removal.

3.   Pull the control head away from the radio assembly as shown in Figure 3-2.
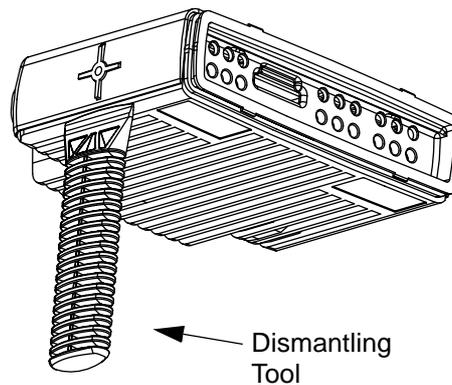
ZWG0130210-O

Figure 3-2 Flexible Connection Removal

4.   Remove the flexible connection from the socket on the control head board.

6.2   Top Cover Removal

1.   Insert the dismantling tool in the middle of the radio assembly side groove as shown in Figure 3-3.

2.   Press on the dismantling tool until the snap connectors on the side of the cover release from the radio chassis.
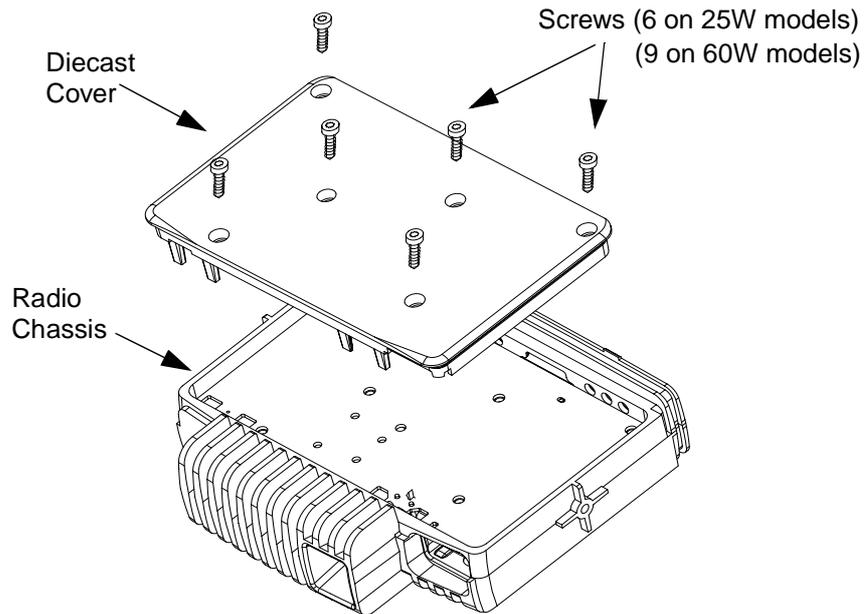
3.   Lift the top cover from the chassis.

ZWG0130211-O

Figure 3-3 Top Cover Removal.

6.3   Transceiver Board Removal

1. Remove the screws securing the diecast cover to the chassis, using the T20 TORX™ driver as shown in Figure 3-4.

2. Lift the cover from the chassis.

ZWG0130212-O

Figure 3-4 Diecast Cover Removal.

3. Slowly lift the transceiver board on the edge at the front of the radio (the edge that mates with the control head) and pull gently toward the front of the radio as shown in Figure 3-5. Take care to slide the antenna connector and power connector out of the chassis towards the front.

CAUTION: The thermal grease or pads can act as an adhesive and cause the leads of the heat dissipating devices to be over stressed if the board is lifted too quickly.
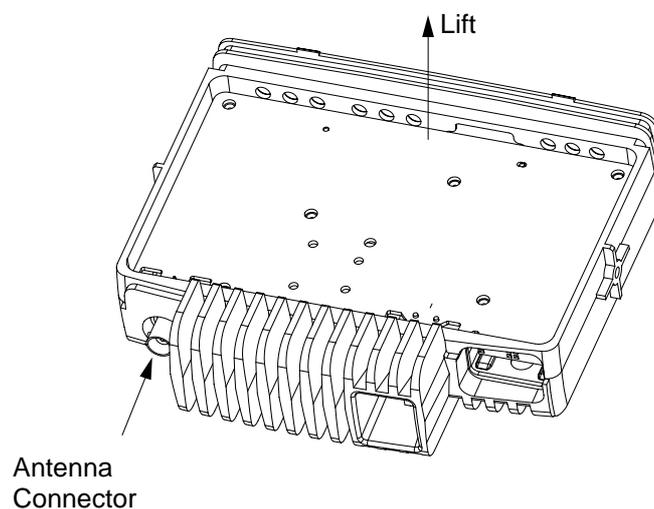
ZWG0130213-O

Figure 3-5 Transceiver Board Removal

6.4   Disassembly of Control Head - GM340 (without display)

1. To dismount the control head housing from the back housing, insert the dismantling tool in the groove between the two housings as shown in Figure 3-6.
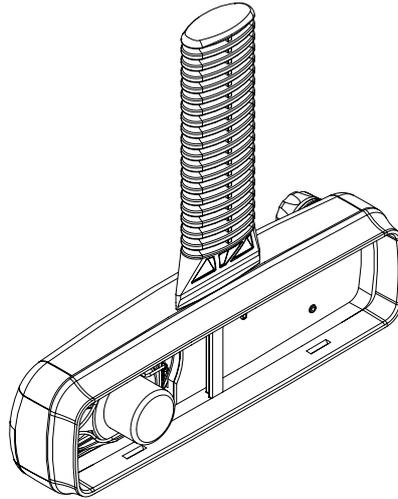
ZWG0130214-O

Figure 3-6 Control Head Back Housing Removal

2. Press the dismantling tool until the snap connectors on the side of the back housing release from the control head.

3. Disconnect the speaker socket.
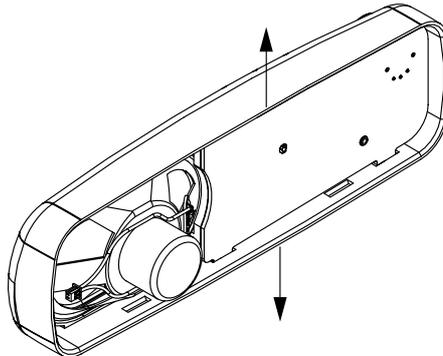
ZWG0130215-O

Figure 3-7 Control Head Board Removal

4. Remove the board from the control head housing by stretching the control head housing and pulling up on the board as shown in Figure 3-7 and 3-8.

5. Remove the keypad from the control head housing by lifting up the rubber keypad.

NOTE   Care should be taken not to touch or contaminate the conductive pads on the under side of the keypad or the conductive contacts on the printed circuit board.
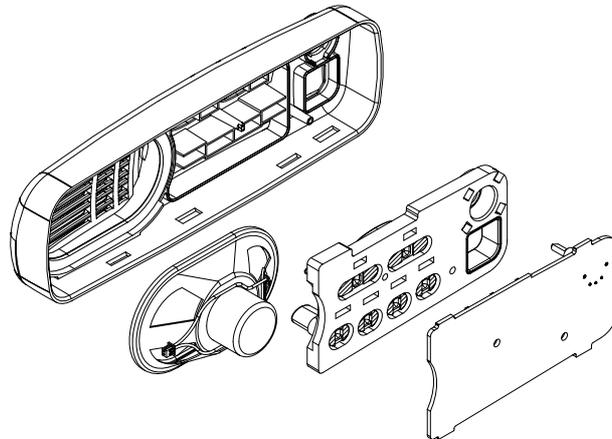
ZWG0130216-O

Figure 3-8 Board, Keypad and Speaker Removal

6.   Remove the speaker from the control head housing.

6.5   Disassembly of Control Heads - GM360 and GM380 (with display)

1.   Dismount the control head housing from the back housing as described for control heads without displays, Figure 3-6 and 3-7.

2.   On the GM360, disconnect the speaker socket and pull out the speaker (with speaker tube) by stretching the control head housing, Figure 3-9.

NOTE   The speaker and speaker tube are glued together to form one unit. (GM360 only)
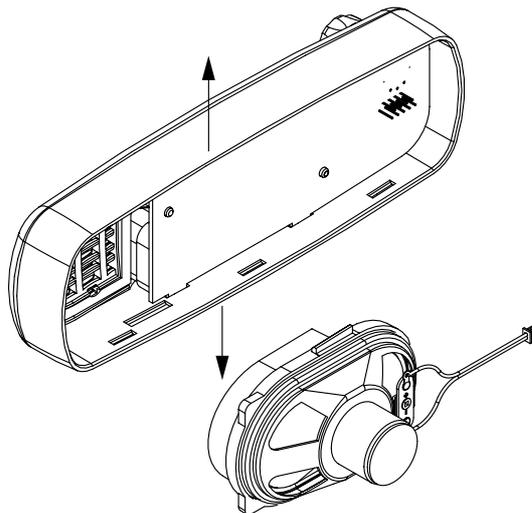
ZWG0130218-O

Figure 3-9 Speaker and Speaker Tube Removal

3.   Remove the board from the control head housing by stretching the control head housing and pulling up on the board.

4.   Remove the keypad from the control head housing by lifting up the rubber keypad.

5. Remove the display and the top and bottom elastomeric connectors from the control head housing (GM360 only).

NOTE Care should be taken not to touch or contaminate the conductive pads on the under side of the keypad, the elastomeric connectors or the conductive contacts on the printed circuit board .

7.0 Radio Assembly

7.1 Control Head - GM340

1. Locate the speaker in the control head and press it into place as shown in Figure 3-8.
2. Insert the keypad into the control head ensuring that the keypad keys and connector cut-out fit correctly.

NOTE Care should be taken not to touch or contaminate the conductive pads on the underside of the keypad.

3. On the board, rotate the on/off control spindle fully counter-clockwise.
4. Also, rotate the volume knob on the housing fully counter-clockwise
5. Align the board with the control head and insert the on/off control spindle through the hole in the keypad.
6. Locate the two snap tags on the board in the grooves in the control head and press the board into place until all of the tags snap into place.
7. Connect the speaker connector to the connector on the board.

7.2 Control Heads - GM360 and GM380

1. On the GM360 only, locate the display in the control head ensuring that the two cut-outs in the display are aligned with their corresponding indentations, then press the display into place. Insert the top and bottom elastomeric connector strips into the spaces above and below the display respectively.

NOTE Care should be taken not to touch or contaminate the conductive pads on the underside of the display and the elastomeric connectors (GM360 only).

2. Fit the rubber keypad onto the board ensuring that the on/off control and microphone connector on the board locate correctly with the cut-outs in the keypad.
3. On the board, rotate the on/off control spindle fully counter-clockwise.
4. Also, rotate the volume knob on the front housing fully counter-clockwise.
5. Align the board with the control head, inserting the on/off control spindle and microphone connector through the holes in the control head.
6. Ensure that the keypad, on/off control spindle and microphone connector are aligned with the control head then press the board into place until it clicks.
7. On the GM360, insert the speaker tube and speaker into the control head and press it in until it clicks.Connect the speaker connector to the board.

7.3   Radio Chassis and Transceiver Board

1.   Inspect the transceiver board chassis and if required reapply thermal grease to the heatsink area on the chassis and heat dissipating devices. You may have to remove damaged thermal pads from the chassis and devices prior to applying the grease.

2.   Insert the transceiver board at an angle (approximately 30°) into the chassis taking care to slide the antenna connector and accessory connector into their cut-outs in the chassis.

3.   Lower the transceiver board onto the chassis and align the two locating holes in the board with the locating pins in the chassis.

4.   Secure the cover to the chassis with the six screws previously removed.

5.   Torque the six screws to 1.9 NM (17 in lbs) using the T20 TORX™ driver. Begin with the two screws located in the middle of the chassis followed by the four outer screws. Since the screws usually take a set, torque the screws a second time (1.9 NM) in the same order.

6.   Refit the top cover over the assembled radio chassis. Press the cover down until it snaps into place.

7.4   Control Head Fitting

1.   Align the "0" mark on the flex with the "0" mark on the chassis to the socket on the radio assembly as shown in Figure 3-2.

2.   Check that the back housing o-ring seal is undamaged and fitted in the groove. Replace the seal if it is damaged (refer to the exploded view diagrams and parts list).

3.   Fit the back housing to the control head. Ensure that the tags on the back housing align with the snap catch grooves on the control head. Press the back housing into place until it snaps into place.

4.   Check that the radio chassis o-ring seal is undamaged and fitted in the groove on the chassis assembly. Replace the seal if it is damaged.

8.0   Radio Exploded Mechanical Views and Parts Lists

8.1   Radio Assembly - 25W Models
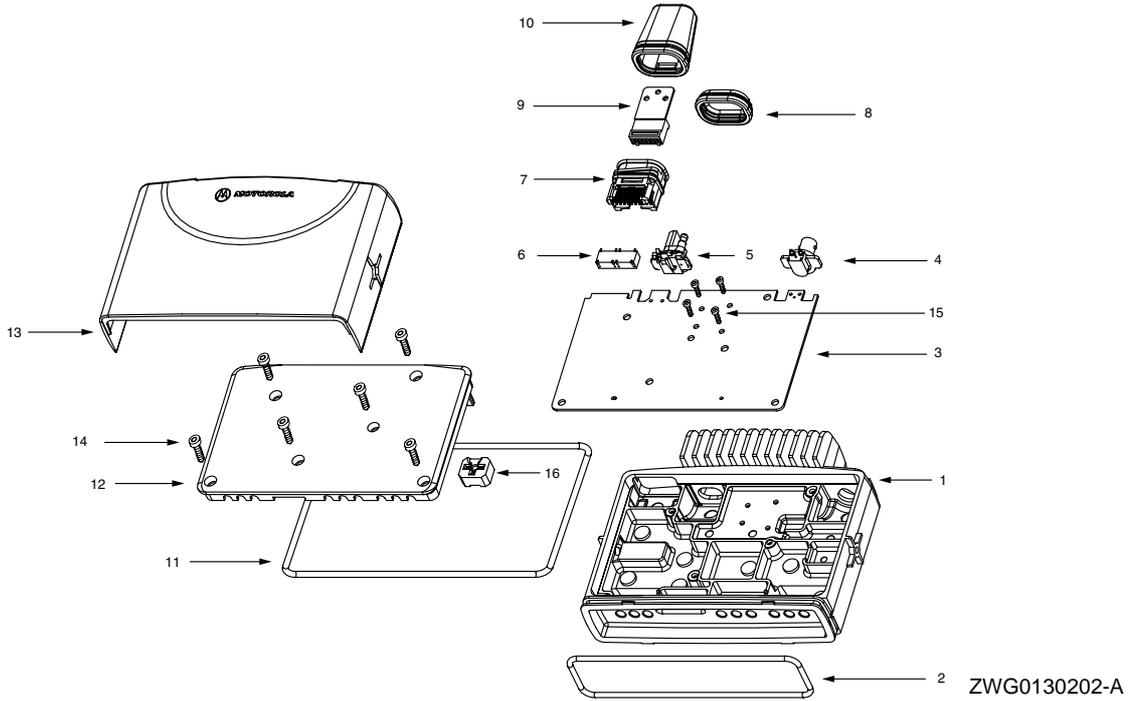
Figure 3-10 Radio Assembly - 25W Models

Table 3-1   Radio Assembly Parts List - 25W Models

Item No.	Description	Part Number
1	Chassis 25W	2786082B02
2	Gasket, Controlhead	3202620Y01
3	Main PCB (items 4 to 10 included)	
4	Antenna Connector with Gasket, BNC	0986166B01
5	Power Connector	0986165B01
6	Connector 20 PIN	0986105B01
7	Connector Assembly	2886122B02
8	Gasket Cover	3202607Y01
9	Connector	1580922V01
10	Gasket Accessory Connector	3202606Y01
11	Gasket Cover 25W	3286086B01
12	Cover 25W	1586084B01
13	Cover, Plastic 25W	1586083B01
14	Screw T20, 6x (M4)	0310911A30
15	Screw T8 Power Device Fastner (some models only)	0310911A12
16	Silicon Pressurepad, Power devices (25W cover only)	7586187B01

8.2   Radio Assembly - 60W Models
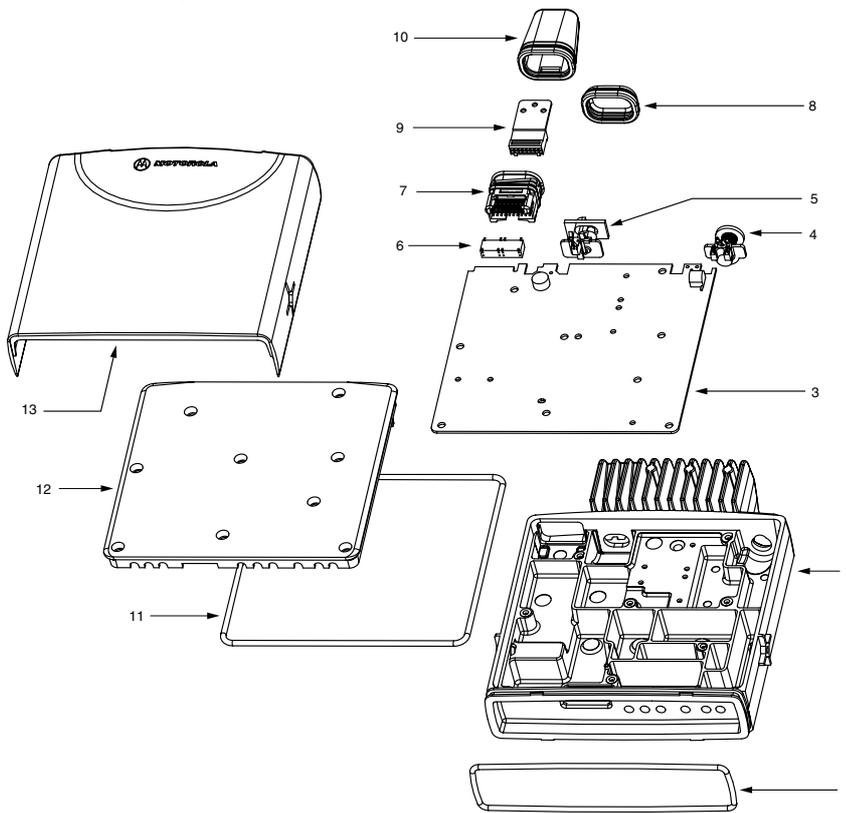
Figure 3-11 Radio Assembly 60W Models

Table 3-2   Radio Assembly Parts List - 60W Models

Item No.	Description	Part Number
1	Chassis 60W	2786149B01
2	Gasket, Controlhead	3202620Y01
3	Main PCB (items 4, 5 and 8 included)	
4	Antenna Connector, Mini UHF	0986166B02
5	Power Connector	0986165B01
6	Connector 20 PIN	0986105B01
7	Connector Assembly	2886122B01
8	Gasket Cover, Connector	3202607Y01
9	Connector	1580922V01
10	Gasket Accessory Connector	3202606Y01
11	Gasket Cover 60W	3286152B01
12	Cover 60W	1586150B01
13	Cover, Plastic 60W	1586151B01
	Screw T20, 9x (not shown)	0310911A30

8.3   Control Head - GM340
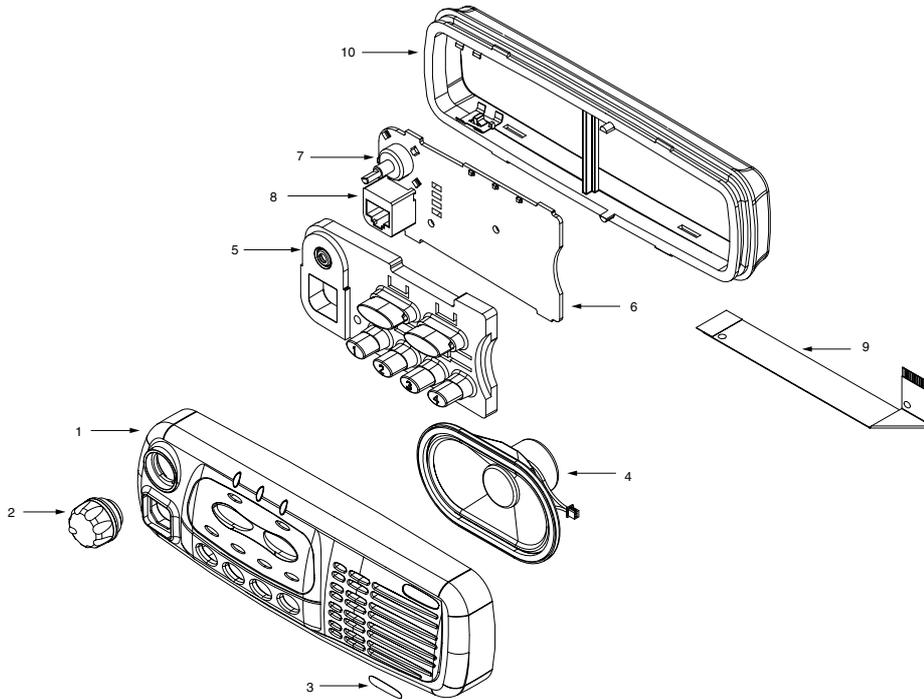
ZWG0130198-A

Figure 3-12 Control Head GM340

Table 3-3   Control Head GM340 Parts List

Item no	Description	Part No
1	Housing Front, including: Gasket, Lens, Lightguide	1586086B01
2	Knob, Volume	3686098B02
3	Label	1364279B13
4	Speaker	5086126B01
5	Keypad, including Keypad Button	7586089B01 3886133B--
6	PCB Kit	GLN7350_
7	Potentiometer	1805911V02
8	10 PIN Microphone Jack	2864287B01
9	Flex 12 Position Connector (Controlhead to Radio)	8486127B01
10	Backhousing, including: Back Housing O-ring Back Housing ,Grounding Clip	1586092B02 3286094B01 3286217B01

8.4   Control Head - GM360
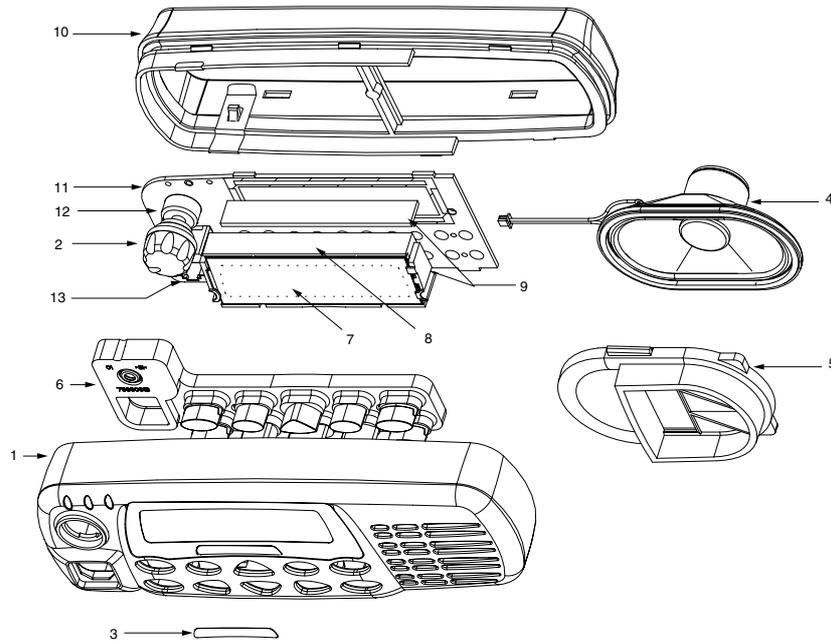
ZWG0130200-A

Figure 3-13 Control head - GM360

Table 3-4   Control Head GM360 Parts List

Item no	Description	Part No.
1	Housing Front Gasket, Lens, Lightguide	1586088B01
2	Knob, Volume	3686098B02
3	Label	1364279B14
4	Speaker	5086126B01
5	Tube, Speaker with Gasket	3786107B01
6	Keypad, including: Keypad Button	7586091B02 3886134B--
7	LCD Glass	7286104B01
8	Frame LCD	0786099B01
9	Conn. Elastomeric (Top and Bottom)	2886130B01 2886130B02
10	Back Housing, including: Back Housing, O-ring Back Housing, Grounding Clip	1586093B02 3286094B01 3986218B01
11	PCB Kit	GLN7353_
12	Potentiometer	1805911V02
13	10 PIN Micphone Jack	2864287B01
(not shown)	Flex, 12 Position Connector (Controlhead to Radio)	8486127B01

8.5 Control Head - GM380
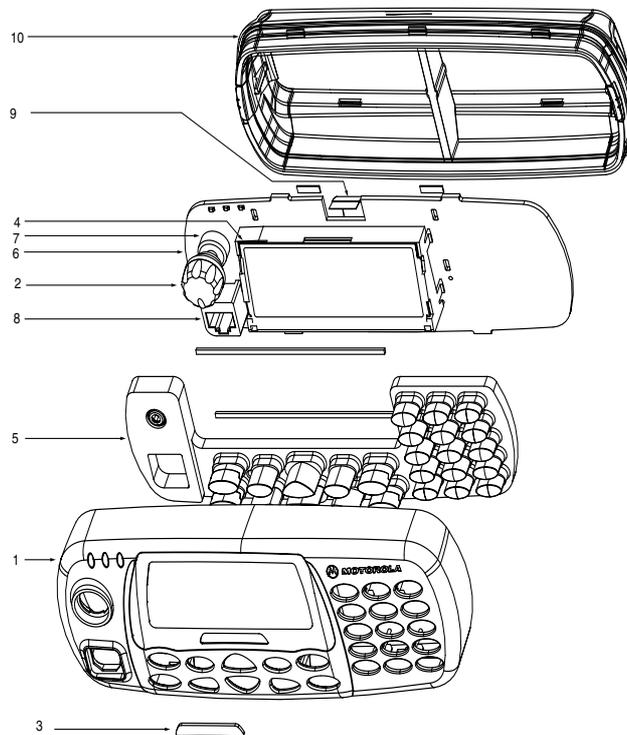
ZWG0130201-A

Figure 3-14 Control Head - GM380

Table 3-5 Control Head GM380 Parts List

Item No	Description	Part No
1	Housing Front, including: Gasket, Lens, Lightguide	1564304B01
2	Knob, Volume	3686098B02
3	Label	1364279B15
4	LCD Module	5164313B01
5	Keypad, including: Keypad Button	7564314B01 3886134B--
6	PCB Kit	GLN7361_
7	Potentiometer	1805911V02
8	10 PIN Microphone Jack	2864287B01
9	Flex, 24 Position connector	8464346B02
10	Backhousing, including: Back housing O-ring Grounding Clip, left Grounding Clip, right	1564305B01 3286094B01 3908450X02 3908451X02
(not shown)	Flex, 12 Position Connector (Controlhead to Radio)	8486127B01

9.0   Service Aids

Table 3-6 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 3-6   Service Aids

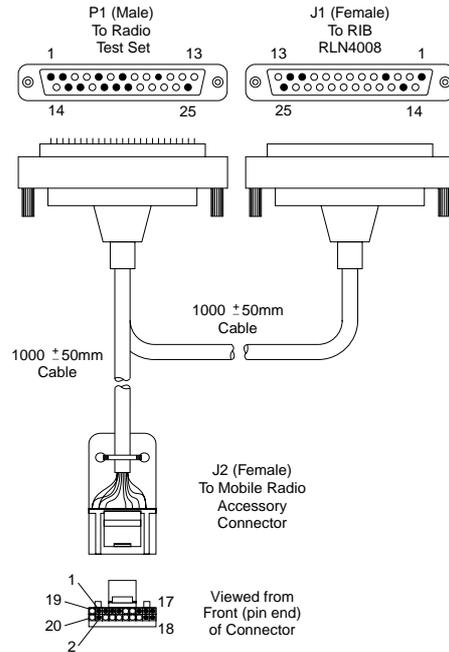| Motorola Part No.	Description	Application
RLN4460_	Portable Test Set	Enables connection to audio/accessory jack. Allows switching for radio testing.
RKN4081_	Programming Cable with Internal RIB	Includes radio interface box (RIB) capability.
RLN4853_	10 to 20 Pin Adapter	Connects RKN4081_ to the radio accessory connector.
RKN4083_	Mobile Programming/Test Cable	Connects radio to RIB (RLN4008_).
GTF374_	Program Cable	Connects RIB to Radio microphone input
RLN4008_	Radio Interface Box	Enables communications between radio and computer's serial communications adapter.
HLN8027_	Mini UHF to BNC Adaptor	Adapts radio antenna port to BNC cabling of test equipment.
GPN6133_	Power Supply	Provides the radio with power when bench testing.
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)
8180384J59	Housing Eliminator (short)	Test Fixture used to bench test the radio pcb
8180384J60	Housing Eliminator (medium)	Test Fixture used to bench test the radio pcb
8180384J61	Housing Eliminator (long)	Test Fixture used to bench test the radio pcb
3080369B71	Computer Interface Cable	Connects the RIB to the Computer (25-pin)
3080369B72	Computer Interface Cable	Connects the RIB to the Computer (9-pin) (Use for IBM PC AT - other IBM models use the B71 cable above)
6686119B01	Removal Tool	Assists in the removal of radio control head.

10.0   Test Equipment

Table 3-7 lists test equipment required to service the radio and other two-way radios.

Table 3-7   Recommended Test Equipment

Motorola Part No.	Description	Characteristics	Application
R2600_NT	Comms System Analyzer (non MPT)	This monitor will substitute for items with an asterisk *	Frequency/deviation meter and signal generator for wide-range troubleshooting and alignment
R2680_NT	Comms System Analyzer (MPT1327) to be ordered with RLN1022_ (H/W) RLN1023_ (S/W)	This monitor will substitute for items with an asterisk *	Frequency/deviation meter and signal generator for wide-range troubleshooting and alignment
*R1072_	Digital Multimeter		AC/DC voltage and current measurements
*R1377_	AC Voltmeter	100 µV to 300 V, 5Hz-1MHz, 10 Megohm input impedance	Audio voltage measurements
WADN4133	Delay Oscilloscope	2 Channel 40 MHz bandwidth, 5 mV/cm - 20 V/cm	Waveform measurements
R1440_ 0180305F17 0180305F31 0180305F40 RLN4610_ T1013_	Wattmeter, Plug-in Elements Plug-in Elements Plug-in Elements Carry case RF Dummy Load	Thruline 50-Ohm, ±5% accuracy 10W, 25 - 60 MHz 10W, 100 - 250 MHz 10W, 200 - 500 MHz Wattmeter and 6 elements	Transmitter power output measurements
S1339_	RF Millivolt Meter	100mV to 3 VRF, 10 kHz to 1.2 GHz	RF level measurements
R1011_/220V	220V Power Supply	0-40V, 0-40A	Programmable

11.0 Programming/Test Cable - RKN4083_

P1 (Male)
To Radio
Test Set

J1 (Female)
To RIB
RLN4008

1   13   13   1

14   25   25   14

1000 ±50mm
Cable

1000 ±50mm
Cable

J2 (Female)
To Mobile Radio
Accessory
Connector

1   17
19
20   18
2

Viewed from
Front (pin end)
of Connector

FLO830308-0

Figure 3-15 Programming/Test Cable

J2 Mobile Radio Accessory Connector		P1 To Radio Test Set RLN4460	
SPEAKER -	1	1	AUDIO +
EXTERNAL MIC	2	2	AUDIO -
DIGITAL IN 1 (EXT. PTT)	3	5	AUDIO +
DIGITAL OUT 2 (EXT. ALARM)	4	7	AUDIO -
FLAT TX AUDIO SENSITIVITY	5	10	MIC AUDIO
DIGITAL IN 3/MPT MAP 27 RX	6	15	MIC AUDIO
GND	7	16	GND
DIGITAL IN/OUT 4/MPT MAP 27 TX	8	18	VOL CTRL
DIGITAL IN 5 w WAKEUP (EMG)	9	19	DISC
IGNITION	10	20	PTT
FLAT/FILTERED RX AUDIO	11	25	BOOT CTRL
DIGITAL IN/OUT 7	12		
SWITCHED BATTERY VOLTAGE	13		
DIGITAL IN/OUT 8	14		J1 To RIB RLN4008
RSSI	15		
SPEAKER +	16	1	GND
BUS + (FOR CPS AND FLASHING)	17	4	BIAS
BOOT CONTROL	18	11	BUS -
N/C	19	12	SW B +
N/C	20	15	BUS +
		25	BOOT CTRL

FLO830307-0

Figure 3-16 Pin Configuration of the Side Connector

Chapter 4

TRANSCEIVER PERFORMANCE TESTING

1.0 General

These radios meet published specifications through their manufacturing process by utilizing high-accuracy laboratory-quality test equipment. The recommended field service equipment approaches the accuracy of the manufacturing equipment with few exceptions. This accuracy must be maintained in compliance with the manufacturer's recommended calibration schedule.

2.0 Setup

Supply voltage is provided using a 13.2Vdc power supply. The equipment required for alignment procedures is connected as shown in the Radio Tuning Test Setup Diagram, Chapter 5, Figure 5-4.

Initial equipment control settings should be as indicated in Table 4-1. The remaining tables in this chapter contain the following related technical data:

Table Number	Title
4-2	Test Environments
4-3	Test Channel Spacing
4-4	Test Frequencies
4-5	Transmitter Performance Checks
4-6	Receiver Performance Checks

Table 4-1 Initial Equipment Control Settings

Service Monitor	Test Set	Power Supply
Monitor Mode: Power Monitor	Spkr set: A	Voltage: 13.2Vdc
RF Attn: -70	Spkr/load: Speaker	DC On/Standby: Standby
AM, CW, FM: FM	PTT: OFF	Volt Range: 20V
Oscilloscope Source: Mod Oscilloscope Horiz: 10mSec/Div Oscilloscope Vert: 2.5kHz/Div Oscilloscope Trig: Auto Monitor Image: Hi Monitor BW: Nar Monitor Squelch: mid CW Monitor Vol: 1/4 CW		Current: 20A

3.0   RF Test Mode

When the radio is operating in its normal environment, the radio's microcontroller controls the RF channel selection, transmitter key-up, and receiver muting. However, when the unit is on the bench for testing, alignment, or repair, it is removed from its normal environment and cannot receive commands from its system. Therefore, the internal microcontroller does not key the transmitter or unmute the receiver. This prevents the use of a normal tuning procedure. To solve this problem, a special "test mode" is incorporated into the radio.

To enter test mode (display radios):

1.   Turn the radio on.

2.   Within ten seconds after the self test is complete, press button P2, five times in succession.

3.   After "CSQ CHXX SP25" appears in the display, the radio is on channel XX, carrier squelch mode, 25 kHz channel spacing.

4.   Each additional press of P2 scrolls through to the next channel spacing and a corresponding set of tones are sounded.

5.   Pressing P1 scrolls through and accesses test environments as shown in Table 4-2.

6.   Pressing P2 for three seconds switches the radio to the control head test mode. '**LCD Test**' appears on the display.

7.   Pressing P1 causes the radio to turn on all the dots of the first character. Another P1 press turns on all the dots of the next character and so on until the last character.

8.   Pressing P1 at the end of the LCD test activates the 'Icon Test'. The next P1 press turns on the first icon.

9.   Pressing P1 at the end of the Icon test activates the button test. Pressing any button (except P1) or any keypad button during the LCD test or Icon test immediately activates this test.

10. Pressing P2 for 3 seconds in the control head test mode causes the radio to return to the RF test mode.

To enter test mode (non display radios):

1.   Turn the radio on.

2.   Within ten seconds after the self test is complete, press button P2, five times in succession.

3.   All LEDs turn on for a short period to indicate the entry of the test mode.

4.   Each additional press of P2 scrolls through to the next channel spacing and a corresponding set of tones are sounded.

5.   Pressing P1 scrolls through and accesses test environments as shown in Table 4-2.

6.   Pressing button 1 (up) or button 2 (down) scrolls through and accesses test channels as shown in Table 4-4. The LEDs above the buttons 1 to 4 indicate the channel number in binary form.

7.   Pressing P2 for three seconds activates the button test.

8.   Pressing P2 again for three seconds causes the radio to return to the RF test mode.

XX = channel number (01 - 14)

Table 4-2   Test Environments

No. of Beeps	Description	Function
1 (high pitch)	Carrier Squelch (CSQ)	RX: unsquelch if carrier detected TX: mic audio
11	CMP	RX: constant unsquelch TX: mic audio
12	LLE	RX: constant unsquelch TX: mic audio
5	Unsquelch (UNSQ)	RX: constant unsquelch TX: mic audio
2	Digital Private-Line (DPL)	RX: unsquelch if carrier and digital code (131) detected TX: mic audio + digital code (131)
1	Tone Private-Line (TPL)	RX: unsquelch if carrier and tone (192.8Hz) detected TX: mic audio + tone (192.8Hz)
3	Dual-Tone multiple frequency (DTMF)	RX: unsquelch if carrier detected TX: selected DTMF tone pair
9	MPT 0	RX: unsquelch if carrier detected TX: 1200 baud with data "0"
10	MPT 1	RX: unsquelch if carrier detected TX: 1200 baud with data "1"
4	MPT 3	RX: speaker muted, high tone sounds when below sequence detected TX: 1200 baud with bit pattern "aa aa c4 d7 d2 90 49 f1 f1 bb f5 c7"
6	Select 5 CCIR (SV-C)	RX: speaker muted, high tone sounds when below sequence detected TX: CCIR sequence 1124, 1275, 1446, 1640, 1860 Hz
7	Select 5 ZVEI (SV-Z)	RX: speaker muted, high tone sounds when below sequence detected TX: CCIR sequence 1060, 1270, 1530, 1830, 2200 Hz
8	Data Mode (EXT)	RX: unsquelch if carrier detected TX: flat TX audio
13	Base Station Mode (B-ST)	RX: constant unsquelch TX: mic audio

Table 4-3   Test Channel Spacing

Number of Beeps	Channel Spacing
1	25 kHz
2	12.5 kHz
3	20 kHz

Table 4-4   Test Frequencies

Test Mode	Test Channel Low Power	Test Channel High Power	VHF	UHF	LB1	LB2	LB3
TX	1	8	136.025	403.025	29.725	36.025	42.025
RX	1	8	136.050	403.050	29.750	36.050	42.050
TX	2	9	142.325	414.150	30.225	37.125	43.225
RX	2	9	142.350	414.175	30.325	37.225	43.125
TX	3	10	148.625	425.325	31.025	38.225	44.525
RX	3	10	148.650	425.350	31.125	38.325	44.425
TX	4	11	154.975	436.475	32.125	39.125	46.125
RX	4	11	155.025	436.525	32.225	39.225	46.025
TX	5	12	161.225	447.650	33.025	40.225	47.525
RX	5	12	161.250	447.675	33.125	40.325	47.425
TX	6	13	167.525	458.825	34.225	41.025	48.125
RX	6	13	167.550	458.850	34.325	41.125	48.025
TX	7	14	173.950	469.950	35.950	41.950	49.950
RX	7	14	173.975	469.975	35.975	41.975	49.975

Table 4-5   Transmitter Performance Checks

Test Name	Communications Analyzer	Radio	Test Set	Comment
Reference Frequency	Mode: PWR MON 4th channel test frequency* Monitor: Frequency error Input at RF In/Out	TEST MODE, Test Channel 4 carrier squelch	PTT to continuous (during the performance check)	Frequency error: ±150 Hz VHF, ±150 Hz UHF ±150 Hz LB
Power RF	As above	As above	As above	Low Power: 0.8-1.4W High Power: 25-30W (VHF 403-470MHz). Low Power: 40-47W High Power: 60-70W (LB)

Table 4-5 Transmitter Performance Checks (Continued)

Test Name	Communications Analyzer	Radio	Test Set	Comment
Voice Modulation	Mode: PWR MON 4th channel test frequency* atten to -70, input to RF In/ Out Monitor: DVM, AC Volts Set 1kHz Mod Out level for 800mVrms at test set, 800mVrms at AC/ DC test set jack	As above	As above, meter selector to mic	Deviation: 2.5 kHz Max. (12.5 kHz Ch. Sp). 4 kHz Max. (20 kHz Ch. Sp). 5 kHz Max. (25 kHz Ch. Sp).
Voice Modulation (internal)	Mode: PWR MON 4th channel test frequency* atten to -70, input to RF In/ Out	TEST MODE, Test Channel 4 carrier squelch output at antenna	Remove modulation input	Deviation: 2.5 kHz Max. (12.5 kHz Ch. Sp.). 4 kHz Max. (20 kHz Ch. Sp.). 5 kHz Max. (25 kHz Ch. Sp.).
DTMF Modulation	As above, 4th channel test frequency*	TEST MODE, Test Channel 4 DTMF output at antenna	As above	Deviation: 1.4-1.9 kHz (12.5 kHz Ch. Sp.). 2.3-3.0 kHz (20 kHz Ch. Sp.). 2.9-3.8 kHz (25 kHz Ch. Sp.).
PL/DPL Modulation	As above 4th channel test frequency* BW to narrow	TEST MODE, Test Channel 4 TPL DPL	As above	Deviation: 0.25-0.5 kHz (12.5 kHz Ch. Sp.). 0.4-0.8 kHz (20 kHz Ch. Sp.) 0.5-1.0 kHz (25 kHz Ch. Sp.).

* See Table 4-4

Table 4-6   Receiver Performance Checks

Test Name	Communications Analyzer	Radio	Test Set	Comment
Reference Frequency	Mode: PWR MON 4th channel test frequency* Monitor: Frequency error Input at RF In/Out	TEST MODE, Test Channel 4 carrier squelch output at antenna	PTT to continuous (during the performance check)	Frequency error to be ±150 Hz VHF ±150 Hz UHF ±150 Hz LB
Rated Audio	Mode: GEN Output level: 1.0mV RF 4th channel test frequency* Mod: 1kHz tone at 3kHz deviation Monitor: DVM: AC Volts	TEST MODE Test Channel 4 carrier squelch	PTT to OFF (center), meter selector to Audio PA	Set volume control to 8.12Vrms
Distortion	As above, except to distortion	As above	As above	Distortion <5.0%
Sensitivity (SINAD)	As above, except SINAD, lower the RF level for 12dB SINAD.	As above	PTT to OFF (center)	RF input to be <0.3µV
Noise Squelch Threshold (only radios with conventional system need to be tested)	RF level set to 1mV RF	As above	PTT to OFF (center), meter selection to Audio PA, spkr/ load to speaker	Set volume control to 3.16Vrms
	As above, except change frequency to a conventional system. Raise RF level from zero until radio unsquelches.	out of TEST MODE; select a conventional system	As above	Unsquelch to occur at <0.25µV. Preferred SINAD = 9-10dB

* See Table 4-4

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Chapter 5

RADIO TUNING AND PROGRAMMING

</div>

1.0   Introduction

This chapter provides an overview of the Customer Programming Software (CPS) and tuner program which are designed for use in a Windows 95/98 environment. These programs are available in separate kits as listed in the Table 5-1. An Installation instruction manual is also included with each kit.

**NOTE**   Refer to the appropriate program on-line help files for the programming procedures.

Table 5-1   Software Installation Kits Radio Tuning Setup

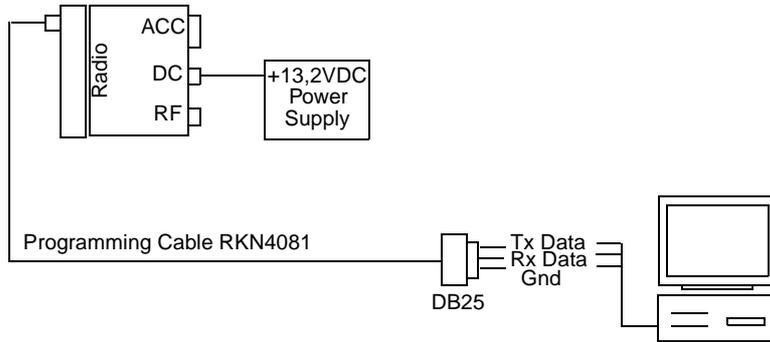| Description	Kit Number
EMEA CD	ENLN4115_
Software Installation Manual	68P64113B14_

2.0   CPS Programming Setup

The CPS programming setups, shown in Figures 5-1 through 5-3, are used to program the radio.

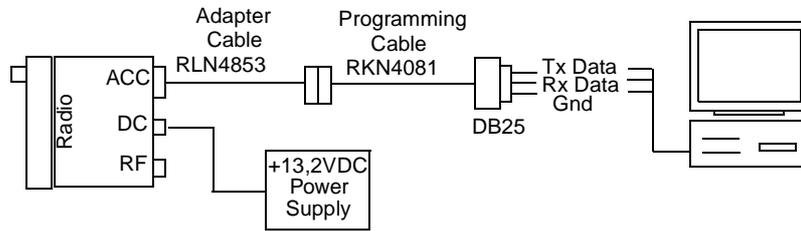**NOTE**   Refer to appropriate program on-line help files for the programming procedures.
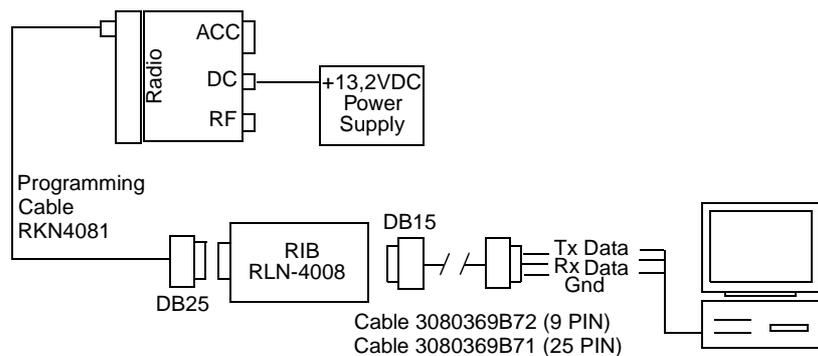
ZWG0130338-0

Figure 5-1 CPS Programming Setup with RIB

ZWG0130339-0

Figure 5-2 CPS Programming Setup Cable with Internal RIB
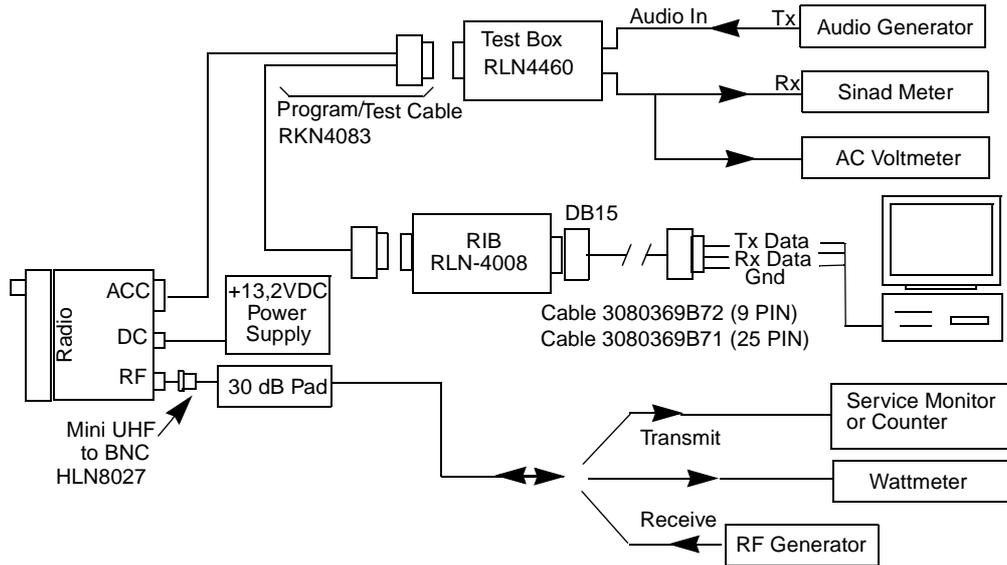

ZWG0130340-0

Figure 5-3 CPS Programming Setup Cable with Internal RIB and Rear Adapter Cable

3.0   Radio Tuning Setup

A personal computer (PC), Windows 95/98 and a tuner program are required to tune the radio. To perform the tuning procedures, the radio must be connected to the PC, radio interface box (RIB), and test equipment setup as shown in Figure 5-4.

Figure 5-4 Radio Tuning Test Equipment Setup with External RIB

3.1   Initial Test Equipment Control Settings

The initial test equipment control settings are listed in Table 5-2.

Table 5-2   Initial Equipment Control Settings

Service Monitor	Test Set	Power Supply
Monitor Mode: Power Monitor	Speaker set: A	Voltage: 13.2Vdc
RF Attenuation: -70	Speaker/load: Speaker	DC on/standby: Standby
AM, CW, FM: FM	PTT: OFF	Volt Range: 20V
Oscilloscope Source: Mod Oscilloscope Horizontal: 10mSec/Div Oscilloscope Vertical: 2.5 kHz/Div Oscilloscope Trigger: Auto Monitor Image: Hi Monitor BW: Nar Monitor Squelch: mid CW Monitor Volume: 1/4 CW		Current: 20A

POWER UP SELF-TEST

1.0   Error Codes

Turning on the radio starts a self-test routine that checks the radio functionality. If the checks are successful, the radio generates a high-pitched self-test pass tone. If the self-test is not successful, one low-pitched (300Hz) error tone is heard and the RED LED flashes several times to indicate the reason for the failure (see Table 6-1 below). After flashing the error code, the LED remains off for 5 seconds and then repeats the error code. The LED sequence and the error tone continue until the radio is switched off. Radios with displays are also able to display error codes. The meaning of the LED indication, the displayed error codes and the related corrections are listed in Table 6-1.

Table 6-1   Power-up Error Codes

If the error code displayed is…	The LED flashes...	then, there is a...	To correct the problem...
"Test 1 Failed"	Once	Hardware codeplug error, possibly codeplug structure mismatch or non-existant codeplug.	Reprogram codeplug. If message re-occurs, replace main board or return it to the nearest Motorola depot.
"Test 2 Failed"	Twice	Select 5 Application Vector corrupted.	Reprogram codeplug and retest the radio.
"Test 3 Failed"	Three times	Codeplug Checksum error.	Reprogram codeplug and retest the radio.
"Test 4 Failed"	Four times	Codeplug Version Error.	Reprogram codeplug using the correct version and retest the radio.
"Test 5 Failed"	Five times	ROM Checksum test failure.	Turn radio off then on again. If the message re-occurs replace the main board or return it to the nearest Motorola depot.
"Test 6 Failed"	Six times	RAM Checksum test failure.	Turn the radio off then on again. If the message re-occurs replace the main board or return it to the nearest Motorola depot.
"Test 7 Failed"	---	---	Reserved
"Test 8 Failed"	Eight times	Radio Model Number failure.	Reprogram codeplug for correct model.
No Display.		Display module is not connected. Display module faulty.	Check connection between main board and the display module Replace display module.
300Hz Tone and Flashing LED. (Radio with no display).		Radio failure or invalid codeplug as described above.	Turn the radio off then on again. Confirm that there is a 300Hz fail tone and count the number of flashes made by the LED. Make the relevant correction as described above