



# **Professional Radio**

## **GP300 Series**

Basic Service Manual

68P64115B18C

Issue: Nov 2001

## **Computer Software Copyrights**

The Motorola products described in this manual may include copyrighted Motorola computer programs stored in semiconductor memories or other media. Laws in the United States and other countries preserve for Motorola certain exclusive rights for copyrighted computer programs, including the exclusive right to copy or reproduce in any form, the copyrighted computer program. Accordingly, any copyrighted Motorola computer programs contained in the Motorola products described in this manual may not be copied or reproduced in any manner without the express written permission of Motorola. Furthermore, the purchase of Motorola products shall not be deemed to grant, either directly or by implication, estoppel or otherwise, any license under the copyrights, patents or patent applications of Motorola, except for the normal non-exclusive royalty-free license to use that arises by operation of law in the sale of a product.

---

## **SAFETY INFORMATION**

Read this information before using your radio.

### **SAFE AND EFFICIENT OPERATION OF MOTOROLA TWO-WAY RADIOS**

The information provided in this document supersedes the general safety information contained in user guides published prior to July 2000. For information regarding radio use in a hazardous atmosphere please refer to the Factory Mutual (FM) Approval Manual Supplement or Instruction Card, which is included with radio models that offer this capability.

### **RADIO FREQUENCY (RF) OPERATIONAL CHARACTERISTICS**

To transmit (talk) you must push the Push-To-Talk button; to receive (listen) you must release the Push-To-Talk button. When the radio is transmitting, it generates radio frequency (RF) energy; when it is receiving, or when it is off, it does not generate RF energy.

### **PORTABLE RADIO OPERATION AND EME EXPOSURE**

Your Motorola radio is designed to comply with the following national and international standards and guidelines regarding exposure of human beings to radio frequency electromagnetic energy:

- 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
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition
- National Council on Radiation Protection and Measurements (NCRP) of the United States, Report 86, 1986
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- 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 1999 (applicable to wireless phones only):

To assure optimal radio performance and make sure human exposure to radio frequency electromagnetic energy is within the guidelines set forth in the above standards, always adhere to the following procedures:

#### **Phone operation**

When placing or receiving a phone call, hold your phone as you would a wireline telephone. Speak directly into the microphone.

#### **Two-way radio operation**

When using your radio hold the radio in a vertical position with the microphone 2.5 to 5 cm away from the lips.

#### **Body-worn operation**

To maintain compliance with ICNIRP RF exposure guidelines, if you wear a radio on your body when transmitting, always place the radio in a Motorola approved clip, holder, holster, case, or body harness for this product. Use of non-Motorola-approved body worn accessories may exceed ICNIRP RF exposure guidelines. If you do not use a Motorola approved body-worn accessory and are not using the radio in the intended use positions along side of the head in the phone mode or in front of the face in the two-way radio mode, then ensure the antenna and radio is kept the following minimum distances from the body when transmitting:

- Phone or Two-way radio mode: 2.5 cm (one inch).
- Data operation using any data feature with or without an accessory cable: 2.5 cm (one inch).

#### **Antenna Care**

Use only the supplied or an approved replacement antenna. Unauthorized antennas, modifications, or attachments could damage the radio and may violate ICNIRP regulations.

DO NOT hold the antenna when the radio is "IN USE". Holding the antenna affects call quality and may cause the radio to operate at a higher power level than needed.

## Approved Accessories

For a list of approved Motorola accessories please contact your dealer, or local Motorola representative.

## ELECTROMAGNETIC INTERFERENCE/COMPATIBILITY

**NOTE** Nearly every electronic device is susceptible to electromagnetic interference (EMI) if inadequately shielded, designed, or alternately 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 Health Industry Manufacturers Association 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.

## SAFETY AND GENERAL

### Use While Driving

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 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, 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.

### 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 jewelry, 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

1.0	Scope of Manual.....	1-1
2.0	Warranty and Service Support .....	1-1
2.1	Warranty Period and Return Instructions .....	1-1
2.2	After Warranty Period.....	1-1
2.3	European Radio Support Centre (ERSC) .....	1-2
2.4	Piece Parts.....	1-2
2.5	Technical Support .....	1-3
3.0	Radio Model Information .....	1-4

## Chapter 2 INTRINSICALLY SAFE RADIO INFORMATION

1.0	FMRC Approved Equipment.....	2-1
2.0	Repair of FMRC Approved Products .....	2-2
2.1	Repair.....	2-2
2.2	Relabelling .....	2-2
2.3	Do Not Substitute Options or Accessories .....	2-3

## Chapter 3 MAINTENANCE

1.0	Introduction.....	3-1
2.0	Preventive Maintenance .....	3-1
2.1	Inspection.....	3-1
2.2	Cleaning Procedures.....	3-1
3.0	Safe Handling of CMOS and LDMOS Devices.....	3-2
4.0	Repair Procedures and Techniques — General.....	3-3
5.0	Disassembling and Reassembling the Radio — General.....	3-3
6.0	Radio Disassembly — Detailed .....	3-4
6.1	Front Cover from Chassis Disassembly .....	3-4
6.2	Chassis Assembly Disassembly .....	3-6
6.3	Keypad, Display, and Keypad/Option Board Disassembly .....	3-7
6.4	Speaker, Microphone, and Universal Connector Flex Disassembly .....	3-8
6.5	PTT Disassembly .....	3-9
6.6	Controller Board Disassembly (GP344/GP388).....	3-10
6.7	Control Top Disassembly .....	3-10
7.0	Radio Reassembly — Detailed.....	3-10
7.1	Control Top Reassembly.....	3-10
7.2	Controller Board Reassembly (GP344/GP388) .....	3-10
7.3	PTT Reassembly.....	3-11
7.4	Speaker, Microphone, and Universal Connector Flex Reassembly.....	3-11
7.5	Keypad, Display, and Keypad Option Board Reassembly .....	3-11

---

7.6	Chassis Assembly Reassembly .....	3-12
7.7	Chassis and Front Cover Reassembly .....	3-13
8.0	Option Board Installation .....	3-14
9.0	Mechanical Views and Parts Lists .....	3-16
9.1	GP320/GP340 .....	3-16
9.2	GP360/GP380 .....	3-18
9.3	GP344 .....	3-20
9.4	GP388 .....	3-22
10.0	Service Aids .....	3-24
11.0	Test Equipment .....	3-25
12.0	Programming/Test Cable .....	3-26

## **Chapter 4 PERFORMANCE TESTING**

1.0	Introduction .....	4-1
2.0	Receiver Performance Tests .....	4-1
3.0	Transmitter Performance Tests .....	4-2

## **Chapter 5 RADIO TUNING AND PROGRAMMING**

1.0	Introduction .....	5-1
2.0	Global Radio Tuning Setup .....	5-1
2.1	Initial Test Equipment Setup .....	5-2
3.0	CPS Programming Setup .....	5-2

## **Chapter 6 MODEL CHART AND TEST SPECIFICATION**

1.0	Model Chart (UHF) .....	6-1
2.0	Model Chart (VHF) .....	6-3
3.0	Model Chart (LB) .....	6-4
4.0	Model Chart (300R1) .....	6-5
5.0	Specifications - Professional GP300 Series Radios .....	6-6
5.1	GP320/340/360/380 .....	6-6
5.2	GP344/388 .....	6-8

## **Chapter 7 POWER UP SELF-TEST**

1.0	Error Codes .....	7-1
-----	-------------------	-----



# 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:	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:	1 55 30 82
Ireland:	18 00 55 50 21	Iceland:	80 08 147

Or dial Customer Care Centre:

Tel: +49 6128 70 2618

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 enquiries 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** - Siggý 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: TCW275X@email.mot.com

**Germany** - Customer Connect Team  
Telephone: +49 (0) 6128 70 2248  
Fax: +49 (0) 6128 95 1082  
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: MDH25KDC9AA3AE)

	Type of Unit	Model Series	Freq. Band	Power Level	Physical Packages	Channel Spacing	Protocol	Feature Level	Model Revision	Model Package
<b>MD</b> ↑ MD = Motorola Internal Use	<b>H</b> ↑ H = Portable	<b>25</b> GP140 GP320 GP340 GP640 GP360 GP380 GP680 GP1280  <b>38</b> GP344 GP388	<b>K</b> VHF (136-174MHz)	<b>D</b> 4-5W	<b>C</b> GP140, GP320, GP340, GP344, GP640.	<b>9</b> Program- mable	<b>AA</b> Conventional MDC	<b>O</b> GP320	<b>A</b>	<b>E</b>
			<b>R</b> UHF1 (403-470MHz)	<b>E</b> 5-6W	<b>H</b> GP380, GP388, GP680	<b>AN</b> Conventional 5 Tone	<b>3</b> GP140, GP340, GP344, GP640.			
			<b>S</b> UHF2 (450-527 MHz)		<b>N</b> GP1280	<b>CK</b> MPT	<b>5</b> GP360			
			<b>B</b> LB1 29-42MHz		<b>F</b> GP360		<b>6</b> GP380, GP388, GP680			
			<b>C</b> LB2 35-50MHz				<b>8</b> GP1280			
			<b>E</b> 300R1 (300-350MHz)							

# INTRINSICALLY SAFE RADIO INFORMATION

## 1.0 FMRC Approved Equipment

Anyone intending to use a radio in a location where hazardous concentrations of flammable material exist (hazardous atmosphere) is advised to become familiar with the subject of intrinsic safety and with the National Electric Code NFPA 70 (National Fire Protection Association) Article 500 (hazardous [classified] locations).

An Approval Guide, issued by Factory Mutual Research Corporation (FMRC), lists manufacturers and the products approved by FMRC for use in such locations. FMRC has also issued a voluntary approval standard for repair service (“Class Number 3605”).

FMRC Approval labels are attached to the radio to identify the unit as being FM Approved for specified hazardous atmospheres. This label specifies the hazardous Class/Division/Group along with the part number of the battery that must be used. Depending on the design of the portable unit, this FM label can be found on the back of the radio housing or the bottom of the radio housing. Their Approval mark is shown above.



**WARNING: Do not operate radio communications equipment in a hazardous atmosphere unless it is a type especially qualified (e.g. FMRC Approved) for such use. An explosion or fire may result.**

**WARNING: Do not operate the FMRC Approved Product in a hazardous atmosphere if it has been physically damaged (e.g. cracked housing). An explosion or fire may result.**

**WARNING: Do not replace or charge batteries in a hazardous atmosphere. Contact sparking may occur while installing or removing batteries and cause an explosion or fire.**

**WARNING: Do not replace or change accessories in a hazardous atmosphere. Contact sparking may occur while installing or removing accessories and cause an explosion or fire.**

**WARNING: Do not operate the FMRC Approved Product unit in a hazardous location with the accessory contacts exposed. Keep the connector cover in place when accessories are not used.**

**WARNING: Turn radio off before removing or installing a battery or accessory.**

**WARNING: Do not disassemble the FMRC Approved Product unit in any way that exposes the internal electrical circuits of the unit.**

Radios must ship from the Motorola manufacturing facility with the hazardous atmosphere capability and FM Approval labeling. Radios will not be “upgraded” to this capability and labeled in the field.

A modification changes the unit’s hardware from its original design configuration. Modifications can only be done by the original product manufacturer at one of its FMRC audited manufacturing facilities.



**WARNING: Failure to use an FMRC Approved Product unit with an FMRC Approved battery or FMRC Approved accessories specifically approved for that product may result in the dangerously unsafe condition of an unapproved radio combination being used in a hazardous location.**

Unauthorized or incorrect modification of an FMRC Approved Product unit will negate the Approval rating of the product.

## 2.0 Repair of FMRC Approved Products

### **REPAIRS FOR MOTOROLA FMRC APPROVED PRODUCTS ARE THE RESPONSIBILITY OF THE USER**

You should not repair or relabel any Motorola manufactured communication equipment bearing the FMRC Approval label ("FMRC Approved Product") unless you are familiar with the current FMRC Approval standard for repairs and service ("Class Number 3605").

You may want to consider using a repair facility that operates under 3605 repair service approval.



**WARNING: Incorrect repair or relabelling of any FMRC Approved Product unit could adversely affect the Approval rating of the unit.**

**WARNING: Use of a radio that is not intrinsically safe in a hazardous atmosphere could result in serious injury or death.**

FMRC's Approval Standard Class Number 3605 is subject to change at any time without notice to you, so you may want to obtain a current copy of 3605 from FMRC. Per the December, 1994 publication of 3605, some key definitions and service requirements are as follows:

### 2.1 Repair

A repair constitutes something done internally to the unit that would bring it back to its original condition Approved by FMRC. A repair should be done in an FMRC Approved facility.

Items not considered as repairs are those in which an action is performed on a unit which does not require the outer casing of the unit to be opened in a manner which exposes the internal electrical circuits of the unit. You do not have to be an FMRC Approved Repair Facility to perform these actions.

### 2.2 Relabelling

The repair facility shall have a method by which the replacement of FMRC Approval labels are controlled to ensure that any relabelling is limited to units that were originally shipped from the Manufacturer with an FM Approval label in place. FMRC Approval labels shall not be stocked by the repair facility. An FMRC Approval label shall be ordered from the original manufacturer as needed to repair a specific unit. Replacement labels may be obtained and applied by the repair facility providing satisfactory evidence that the unit being relabelled was originally an FMRC Approved unit.

Verification may include, but is not limited to: a unit with a damaged Approval label, a unit with a defective housing displaying an Approval label, or a customer invoice indicating the serial number of the unit and purchase of an FMRC Approved model.

---

## **2.3 Do Not Substitute Options or Accessories**

The Motorola communications equipment certified by Factory Mutual is tested as a system and consists of the FM Approved portable, FM Approved battery, and FM Approved accessories or options, or both. This Approved portable and battery combination must be strictly observed. There must be no substitution of items, even if the substitute has been previously Approved with a different Motorola communications equipment unit. Approved configurations are listed in the FM Approval guide published by FMRC, or in the product FM Supplement. This FM Supplement is shipped with FM Approved radio and battery combination from the manufacturer. The Approval guide, or the Approval standard Class Number 3605 document for repairs and service, can be ordered directly through Factory Mutual Research Corporation located in Norwood, Massachusetts.





# 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 centre 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.

### Flexible Circuits

The flexible circuits are made from a different material than the rigid boards, and require different soldering techniques. Excessive prolonged heat on a flexible circuit can damage the material. Therefore, avoid excessive heat and excessive bending.

For parts replacement, use the ST-1087 Temperature-Controlled Solder Station with a 600-700 degree tip, and use small diameter solder such as ST-633. The smaller size solder will melt faster and require less heat to be applied to the circuit.

To replace a component on a flexible circuit:

1. Grasp with seizers (hemostats) the edge of the flexible circuit near the part to be removed.
2. Pull gently.
3. Apply the tip of the soldering iron to the component connections while pulling with the seizers.

**NOTE** Do not attempt to puddle-out components. Prolonged application of heat may damage the flexible circuit.

## 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
- penknife-size screwdriver
- TORX™ T6 screwdriver
- Chassis opener (6680702Z01)

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 Centre. (See Chapter 1 for a list of authorized service centres.)

The following disassembly procedures should be performed only if necessary:

Chassis Assembly Disassembly (Paragraph 6.2)

Keypad, Display, and Keypad/Option Board Disassembly (Paragraph 6.3)

Speaker, Microphone, and Universal Connector Flex Disassembly (Paragraph 6.4)

PTT Disassembly (Paragraph 6.5)

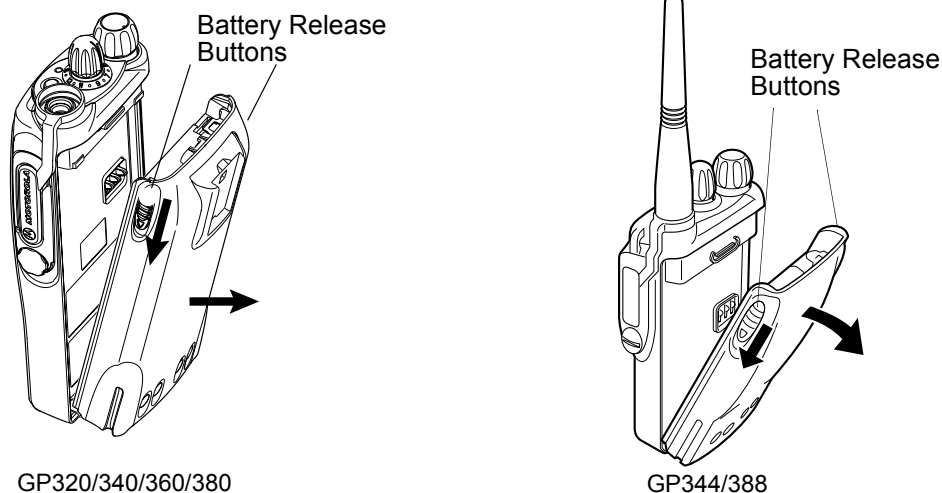
Controller Board Disassembly -GP344/GP388 (Paragraph 6.6)

Control Top Disassembly (Paragraph 6.7)

## 6.0 Radio Disassembly — Detailed

### 6.1 Front Cover from Chassis Disassembly

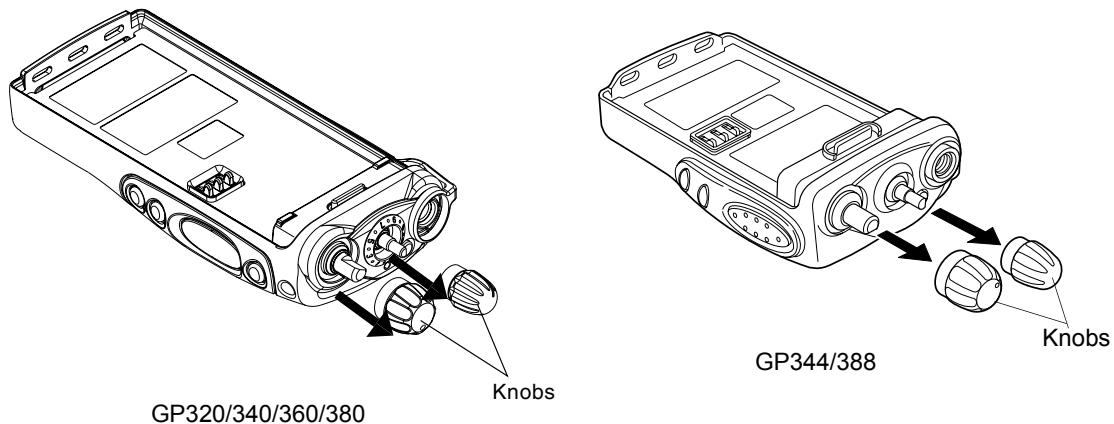
1. Turn off the radio.
2. Remove the battery:
  - a. Pull down on the two battery-release buttons.
  - b. With the buttons pulled down, the top of the battery will fall from the radio.
  - c. Remove the battery from the radio.



**Figure 3-1** Battery Removal

3. Remove the antenna.

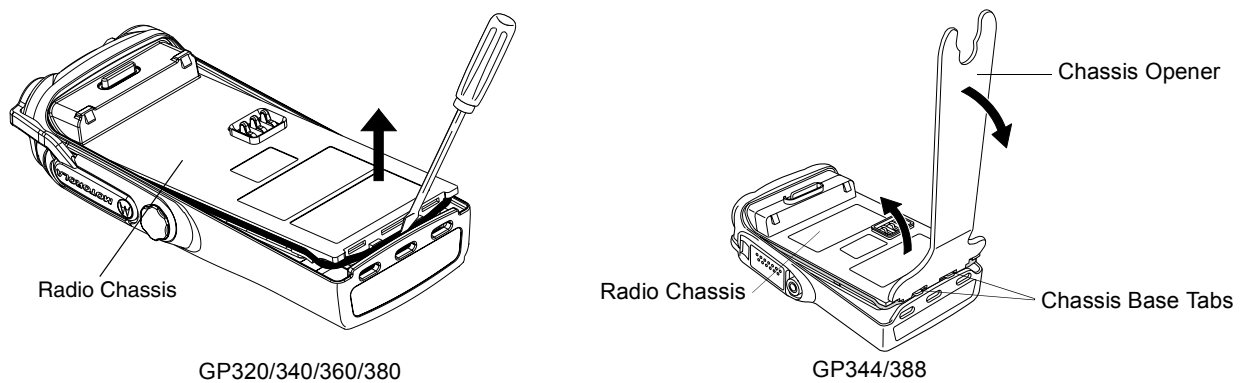
4. Pull the volume and channel selector knobs off of their shafts.



**Figure 3-2 Knob Removal**

**NOTE** Both knobs slide on and off. However, they are supposed to fit very tightly on their shafts.

5. Separate the chassis from the internal electronics front cover assembly as follows:
  - a. Insert a small, flat-blade screwdriver, or similar instrument, in between the thin retaining wall and the chassis at the bottom of the radio. Do not mar the O-ring sealing area on the housing.
  - b. Slowly pry the bottom of the chassis from the cover by pushing the small flat-blade screwdriver down, **or chassis opener (668070Z01)** and rotating the handle of the tool over and behind the base of the radio. This prying action forces the thin inner plastic wall toward the base of the radio, releasing the two chassis base tabs.



**Figure 3-3 Chassis Removal**

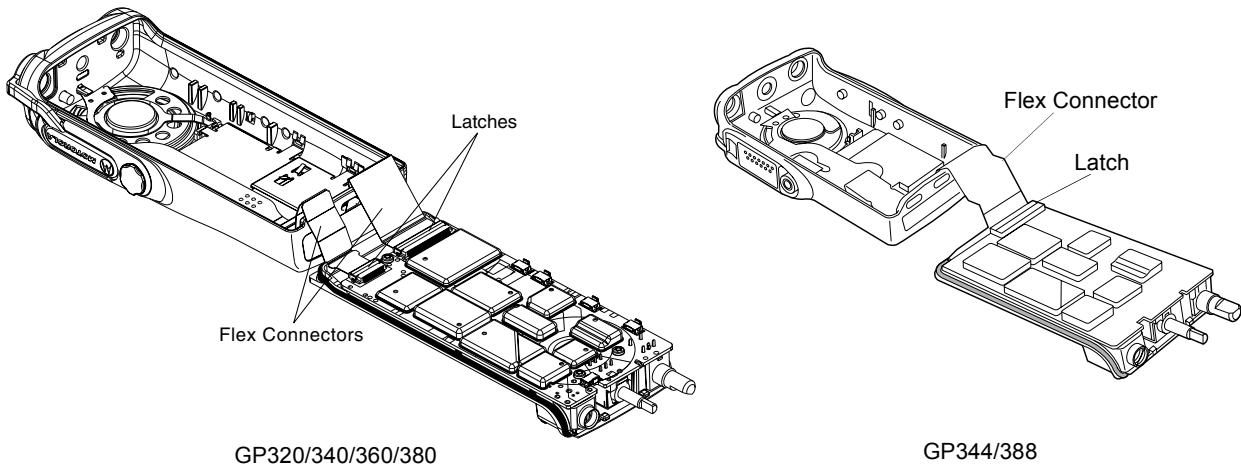


**CAUTION:** Marring the front cover O-ring sealing area will prevent the radio from sealing properly.

**NOTE** Flexible ribbon circuits (flexes) connecting the front cover assembly and the chassis prevent you from completely separating the two units. Display radios and radios with option boards have two flexes.

6. Lay the chassis down. Rotate the front cover backward and slightly away from the chassis.

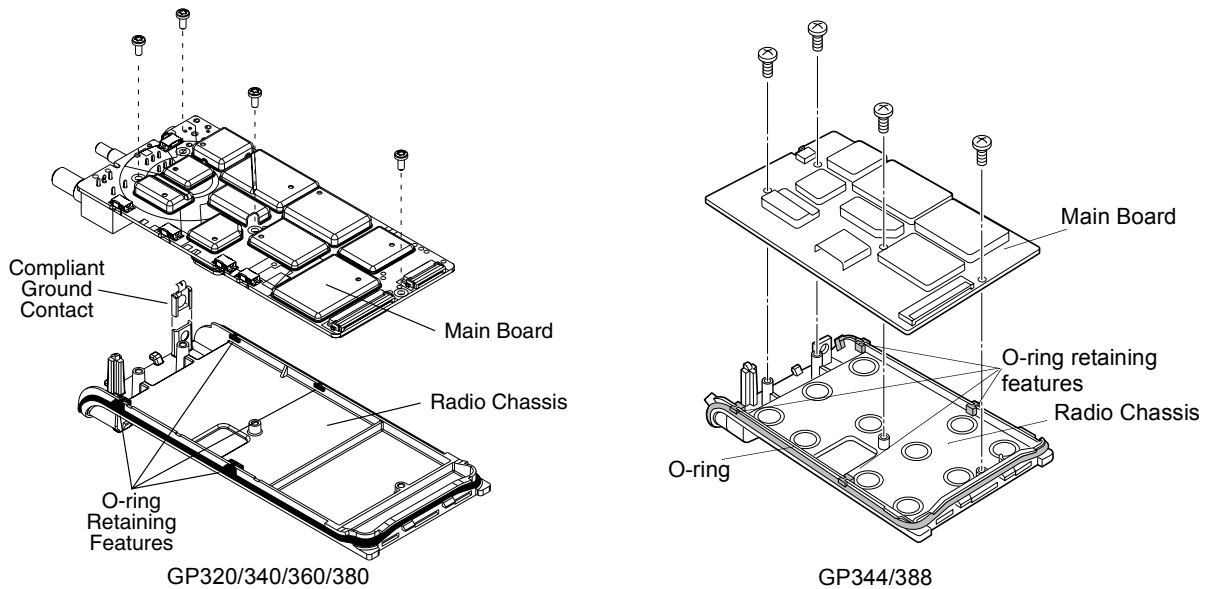
- Lift the latches on the main circuit board to release the flexes from their connectors.



**Figure 3-4** Unlatch Flex Connectors

## 6.2 Chassis Assembly Disassembly

- Use a TORX™ screwdriver with a T6 head to remove the four screws holding the main board to the chassis.



**Figure 3-5** Remove Main Board from Chassis

- Lift the main board from the chassis (See Figure 3-5).

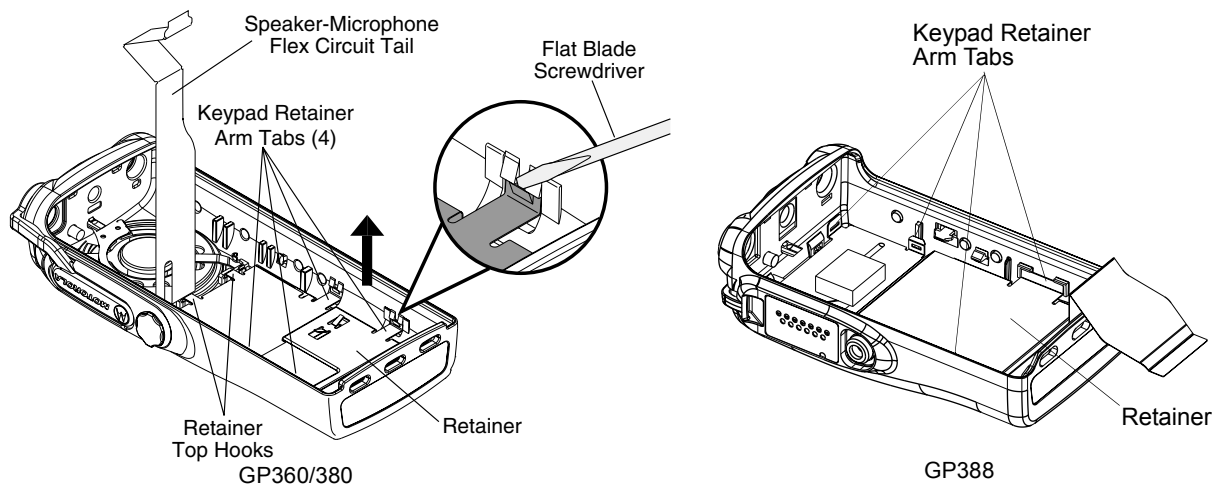


**CAUTION:** Refer to the **CMOS CAUTION** paragraph on page 2 before removing the main board. Be sure to use ESD protection when handling circuit boards.

- Remove the four small O-ring retainers from their slots in the chassis. Note the alignment of the retainers for reassembly.
- Remove the O-ring.
- Slide off the ground contact from the top corner boss of the radio chassis.

### 6.3 Keypad, Display, and Keypad/Option Board Disassembly

1. If the disassembly of the keypad, the keypad printed circuit board, or the display is required, lift the microphone flex circuit up, and carefully remove the microphone and its boot from the front cover pocket. (See Figure 3-6.)
2. Lay this flex circuit to one side.
3. To remove the keypad retainer shield:
  - a. Insert the tip of a “penknife size,” flat blade screwdriver in the opening at the end of the keypad retainer arm tab.
  - b. Pry the tab away from the side of the front cover until it moves past the ledges on the side wall. Duplicate this procedure for each of the four retainer arm tabs.



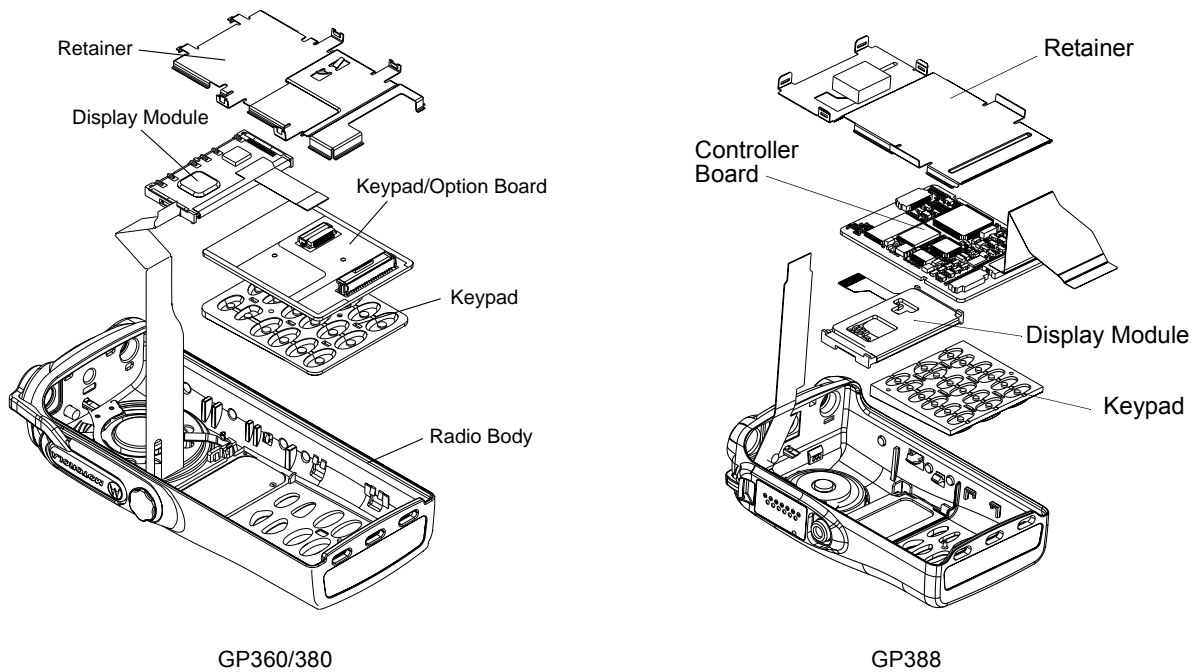
**Figure 3-6** Remove Retainer

4. Note that the two “top hooks” are still held underneath the front cover—right below the speaker. Lift the keypad retainer out of the front cover; then, lift and pivot the two hooks out of the front cover.
5. If disassembly involves the removal of the display module, disconnect the display flex from the keypad option board connector by lifting the latch on the connector. (This is similar to the process for releasing the flexes.)
6. The display module is attached to the front cover with a double-sided adhesive pad. Carefully pull up on the display module, using a small screwdriver, if necessary, and remove it from the front cover. Use a new piece of double-sided adhesive to re-mount the display to the cover.



**CAUTION: Take care not to damage the display. Do not cut, bend, or pinch the heat seal. Display modules contain CMOS devices. Be sure to use ESD protection.**

7. The keypad/option board, and the keypad, can be removed without the use of tools.



**Figure 3-7** Removing the Keypad Retainer and Other Boards from the Radio Body

**NOTE** At this point, the Option Board Installation Procedure should be performed, if necessary.

## 6.4 Speaker, Microphone, and Universal Connector Flex Disassembly

1. Turn the screw at the bottom of the dustcover counterclockwise with your fingers. Lift the dustcover out of its pocket.

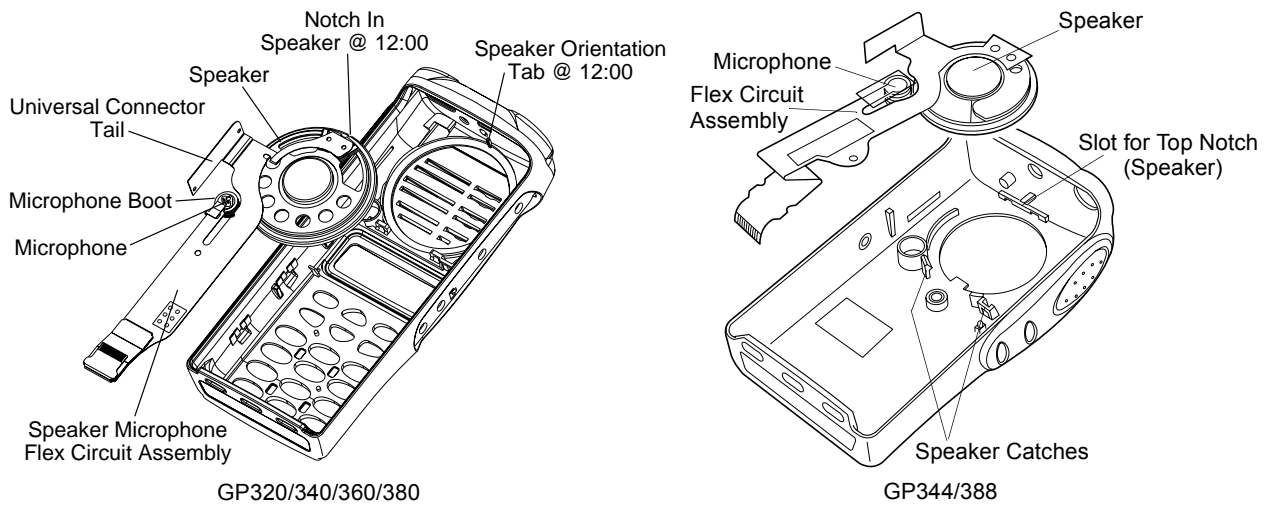
**NOTE** The dustcover must be removed to remove the speaker-microphone assembly flex circuit. The speaker is held in place with a two-legged retainer bracket. The bracket legs are secured by the front cover slots. Be careful not to damage the speaker when removing the retainer bracket.

2. Using a screwdriver, push down on the portion of the speaker retainer bracket pointing toward the bottom of the radio. Then, remove the retainer by slightly pushing it toward the top of the radio until you slide it past the front cover slot.
3. Pull the rubber microphone boot from its seated position. Unless you are replacing the microphone, leave it in the boot.

**NOTE** The speaker-microphone assembly flex circuit goes through the front cover wall to the outside wall. To replace this assembly, you must peel-off the universal connector escutcheon label. The existing escutcheon cannot be reassembled; a new part must be used. (See item number 10 [GP360/380] item number 12 [GP388] on the exploded view drawing.)

4. Peel-off the universal connector flex circuit escutcheon (label).
5. Pry the flex circuit (adhesive held) backer board away from the front cover, and remove the universal connector tail of the speaker-microphone assembly through its opening in the front cover.



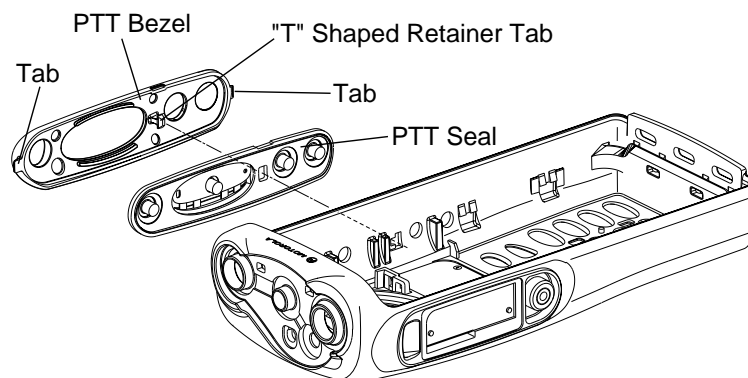


**Figure 3-8** Removal Speaker-Microphone Assembly

6. After the universal connector tail of the speaker-microphone assembly is removed, the assembly can be completely removed. If it is necessary to replace the speaker or microphone, or both, do it while the flex circuit is removed from the front cover. When reassembling the microphone in its boot, make sure the microphone port faces the round hole in the bottom of the boot.

## 6.5 PTT Disassembly

1. If required, the PTT bezel, and the PTT seal assembly, can be disassembled using a small screwdriver, as follows:



**Figure 3-9** PTT Removal

- a. Pry back the T-tab found inside the front cover (in between the four buttons on the PTT assembly).
- b. Remove the PTT bezel by slightly bowing it until the top and bottom tabs are released from the slots in the front cover.
- c. The PTT seal can be easily lifted from the bezel without the use of tools.

## 6.6 Controller Board Disassembly (GP344/GP388)

1. Use a Philips screwdriver to remove the screw from its position.
2. Insert a flat blade screwdriver in-between the controller board and front cover. Pull up the screwdriver to disassemble the controller board from the front cover.

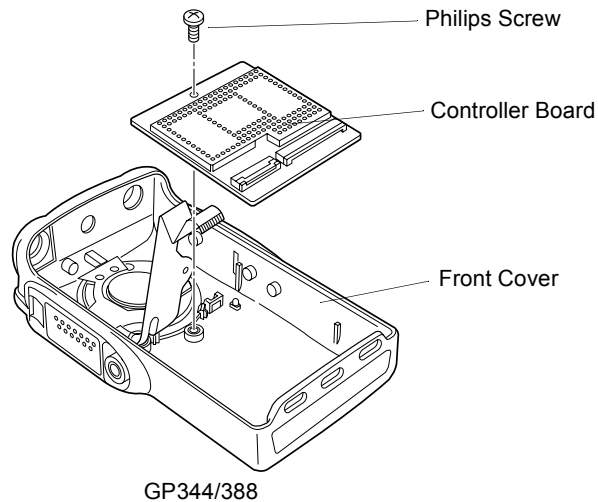


Figure 3-10 Controller Board Disassembly

## 6.7 Control Top Disassembly

1. To remove the control top assembly, place a screwdriver next to the antenna boss, and pry it against the control top escutcheon. This will lift the control top escutcheon away from its double-sided adhesive. Grab the double-sided adhesive near the volume potentiometer, and lift it away.
2. Remove the control top seal, emergency button, and transmit light pipe.

## 7.0 Radio Reassembly — Detailed

### 7.1 Control Top Reassembly

1. Replace transmit light pipe and control top seal.
2. Place a new control top escutcheon adhesive against the front cover. Press the control top escutcheon tightly against the adhesive.
3. Put the PTT seal in the PTT bezel.

### 7.2 Controller Board Reassembly (GP344/GP388)

1. Insert controller board into front cover and secure using the (M2x3) Philips screw.

### 7.3 PTT Reassembly

1. Place the bezel top tab in the top slot inside the front cover PTT opening. Slightly bow the bezel so that the bottom tab can fall inside the bottom slot.
2. Press the PTT assembly against the front cover opening.

**NOTE** Look inside the front cover to make sure the T-tab is fully engaged with the front cover. If necessary, press the T-tab toward the top of the radio until it becomes fully engaged.

### 7.4 Speaker, Microphone, and Universal Connector Flex Reassembly

1. Feed the universal connector tail of the speaker-microphone flex assembly through the opening in the side wall of the front cover.
2. Peel-off the adhesive liner on the back of the universal connector tail of the flex circuit. Attach the flex tail to the front cover using the guide pins for correct alignment.
3. Replace the universal connector escutcheon. Make sure that all the connector openings align with the gold pads on the flex circuit.
4. Align the notch in the speaker at the twelve o'clock position with the tab on the front cover. (See Figure 3-8.)
5. Place the speaker retainer bracket into the hole on the top of the front cover, and bend the retainer down to fit underneath the boss below the speaker.

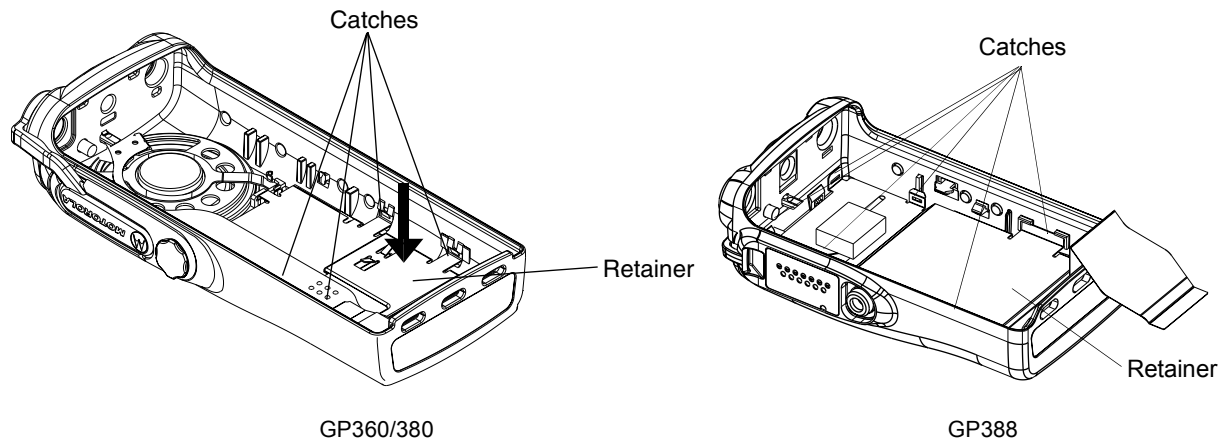
### 7.5 Keypad, Display, and Keypad Option Board Reassembly

1. If you are replacing the display, use a new double-sided adhesive display pad (item number 17 [GP360/380] item number 14 [GP388] on the exploded view diagram).
2. Replace the keypad, and the keypad/option board. Make sure the display module flex tail is connected correctly to the connector on the keypad/option board.
3. Insert the “top hooks” of the keypad retainer into the slots below the speaker (above the display) in the front cover. Snap all of the retainer arm tabs in place in the front cover.

**NOTE** Pull the speaker-microphone flex circuit out of harm's way during reassembly.

4. Re-insert the microphone and boot into the pocket in the front cover.

5. Lay the speaker-microphone flex on top of keypad/option board retainer.



**Figure 3-11** Lock retainer catches to the radio's body

## 7.6 Chassis Assembly Reassembly

1. Slide on the ground contact (if necessary) on the top corner boss of the chassis.
2. Replace the O-ring. The tabs on the O-ring should reach around the chassis and point down.
3. Stretch the O-ring to place it into the retaining pocket at the bottom end of the chassis.

**NOTE** When properly assembled, the retainers on the O-ring should align with the slots on the chassis. If this is not the case, remove and replace the O-ring until it is aligned with the chassis and completely seated in place around the perimeter.

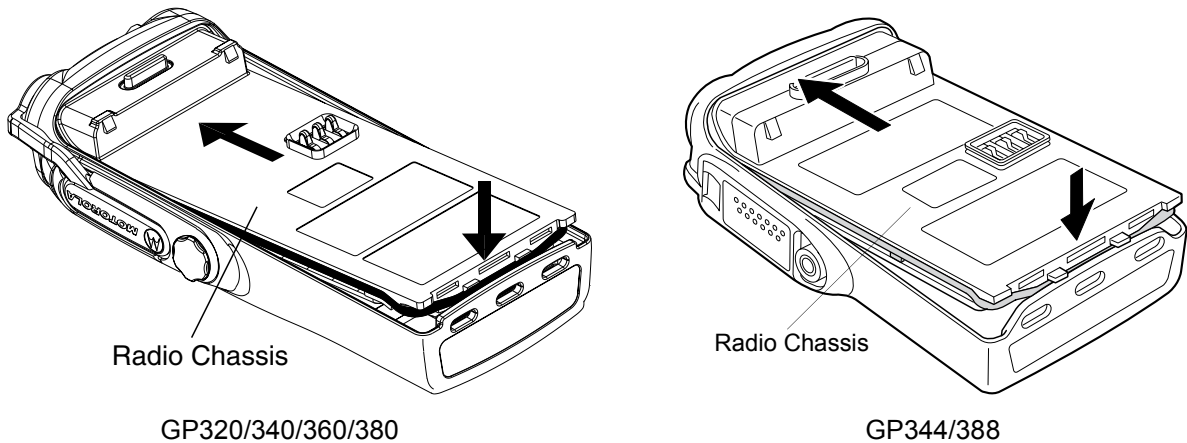
4. Ensure that the antenna nut insulator is correctly replaced by pushing it all the way to the top of the antenna nut.
5. Replace the battery contact seal (if necessary) surrounding the battery contact.
6. Place the main circuit board straight down on top of the chassis.

**NOTE** Be sure the battery contact seal protrudes through the chassis and is not pinched under the chassis.

7. Use the T6 TORX screwdriver to fasten the screws holding the main board to the chassis.

## 7.7 Chassis and Front Cover Reassembly

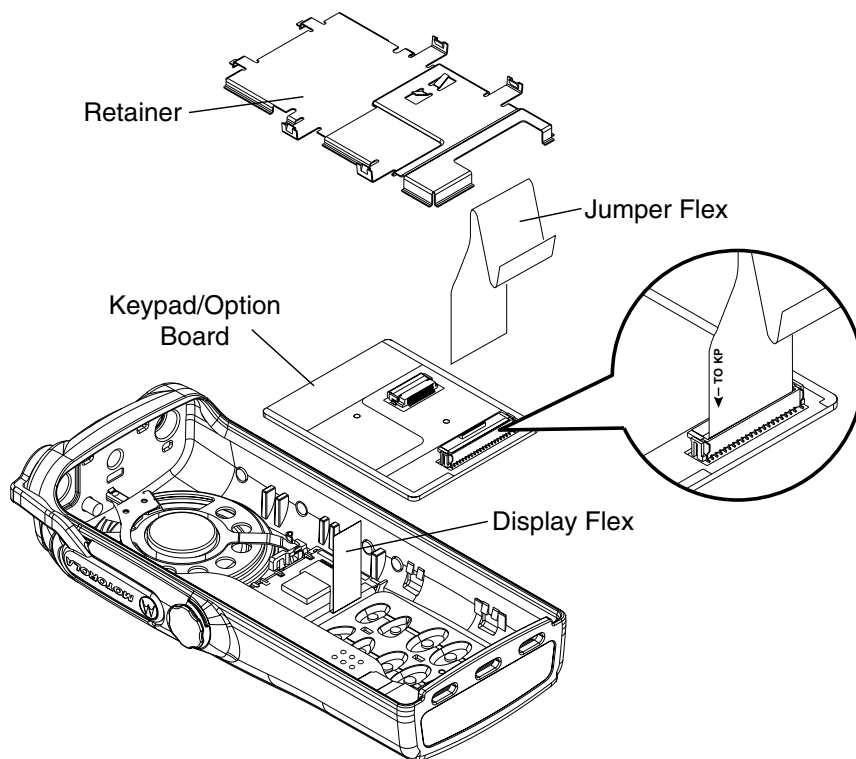
1. Align the chassis assembly end-to-end with the front cover assembly.
2. Insert the tails of the flex circuits into their respective connectors at the bottom of the front cover.
3. Push down the latches on the connectors to hold the flex circuits to the main board.
4. Slide the volume potentiometer and frequency switch shafts into their respective holes in the front cover.
5. Push the chassis assembly completely into the top of the front cover until it settles in place.
6. Be sure the O-ring is properly seated.
7. Snap the bottom of the chassis into the front cover.
8. Reassemble the knobs, dust cover, antenna, and battery.



**Figure 3-12** Fastening the Chassis

## 8.0 Option Board Installation

1. With the keypad retainer removed, the keypad backer board can be removed without the use of tools.
2. Remove the jumper flex from the connector on the keypad board. Notice the orientation of the flex to the connector. Arrows on the jumper flex point to the correct way of inserting the flex into the connector.
3. Discard the keypad backer board.
4. The “breakaway” tab at the top of all option boards contains an extra row of keys and is used to accommodate other radio models.
5. Break-off and discard the option board tab, taking care not to damage the option board. Trim any tab fragments that may remain on the option board.
6. Reassemble the option board to the front cover assembly.



**Figure 3-13** Changing the Keypad/Option Board

7. Insert the display flex circuit into the connector on the option board.
8. Insert the jumper flex circuit into the connector on the option board. Notice the orientation of the flex circuit. Arrows on the jumper flex point to the correct way of inserting the flex into the connector.

- 9.** Replace the retainer by placing the two top hooks into the slots below the speaker in the front cover; then, pivot the retainer into the front cover. Ensure that all four tab arms snap correctly into the front cover.
- 10.** With the keypad option board, display, and retainer correctly in place, the front cover assembly can now be reassembled as described in Paragraph 7.7 (Chassis and Front Cover Reassembly).

## 9.0 Mechanical Views and Parts Lists

### 9.1 GP320/GP340

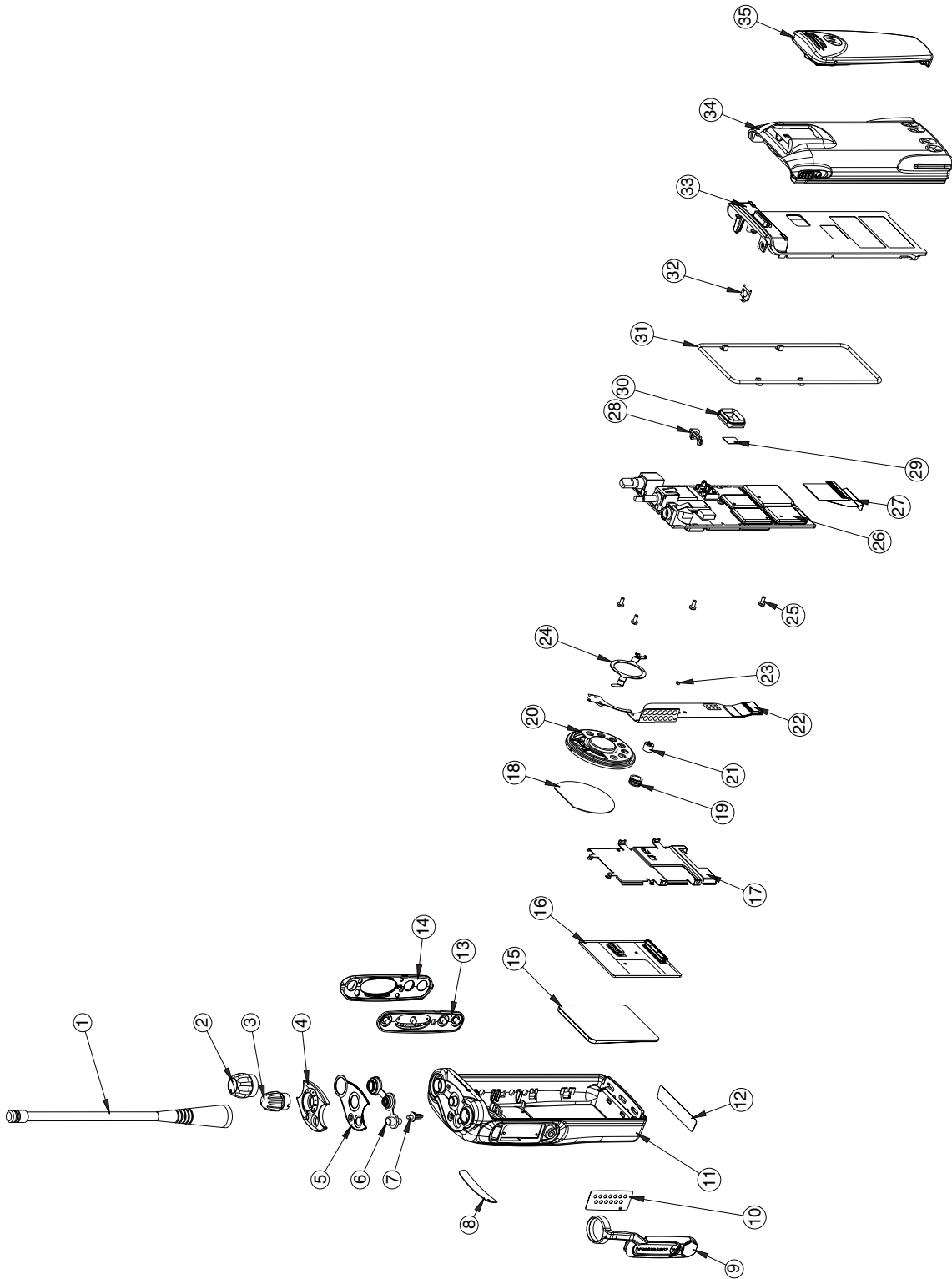


Figure 3-14 Radio Exploded Mechanical View (GP320/GP340)



Item	Motorola Part Number	Description
1	See Chapter 6	Antenna
2	3680529Z01	Knob, Volume
3	3680530Z01	Knob, Frequency
4	1380525Z01 1380525Z02	Escutcheon, Top - GP340 Escutcheon, Top - GP320
5	3380644Z01	Escutcheon, Label
6	3280533Z01 3280533Z02	Seal, Control Top - GP340 Seal, Control Top - GP320
7	6180527Z01	Litepipe, Tx
8	1364279B02 1364279B03	Front, label - GP320 Front, label - GP340
9	1586059A01	Dust Cover, Universal Connector
10	1386058A01	Escutcheon, Universal Flex
11	1580666Z03	Front Cover, Basic
	1580666Z04	Front Cover with Keypad (DTMF)
	1580666Z06	Front Cover - GP320
12	Not Field Replaceable	Escutcheon, FM
13	7580532Z01 7580532Z03 *	Keypad, Side Control - GP340 Keypad, Side Control - GP320
14	1380528Z01 1380528Z03 *	Bezel, Side Control - GP340 Bezel, Side Control - GP320
	4285672Z01 *	Retaining clip - GP320
15	7580620Z03 7580620Z04	Keypad, Blank Keypad, Full
16	0104007J99	Keypad Board Assembly
17	4280498Z01	Retainer, Keypad PCB

Item	Motorola Part Number	Description
18	3586057A01	Felt Speaker
19	1480577C01	Boot, Microphone
20	5085962A02	Speaker
21	5013920A04	Microphone
22	8480549Z01	Flex, UC
23	2113740A41	Capacitor, 33pF
24	4280504Z01	Retainer, Speaker
25	0304726J04	Screw
26	See Chapter 6	Back Cover Kit incl chassis main board
27	8480475Z02	Flex, Keypad/Controller - GP340
28	1480652Z01	Insulator, Antenna
29	7580556Z01	Pad, Thermal
30	3280534Z01	Seal, Contact
31	3280536Z01	Gasket, O-Ring
32	3980698Z01	Contact, Ground, Compliant, VHF
33	2780518Z01	Chassis
34	See Chapter 6	Battery
35	HLN9714	Beltclip

\*It is recommended that if any of these components need replacing, all three new components should be ordered at the same time to avoid possible mis-match of parts.

### 9.2 GP360/GP380

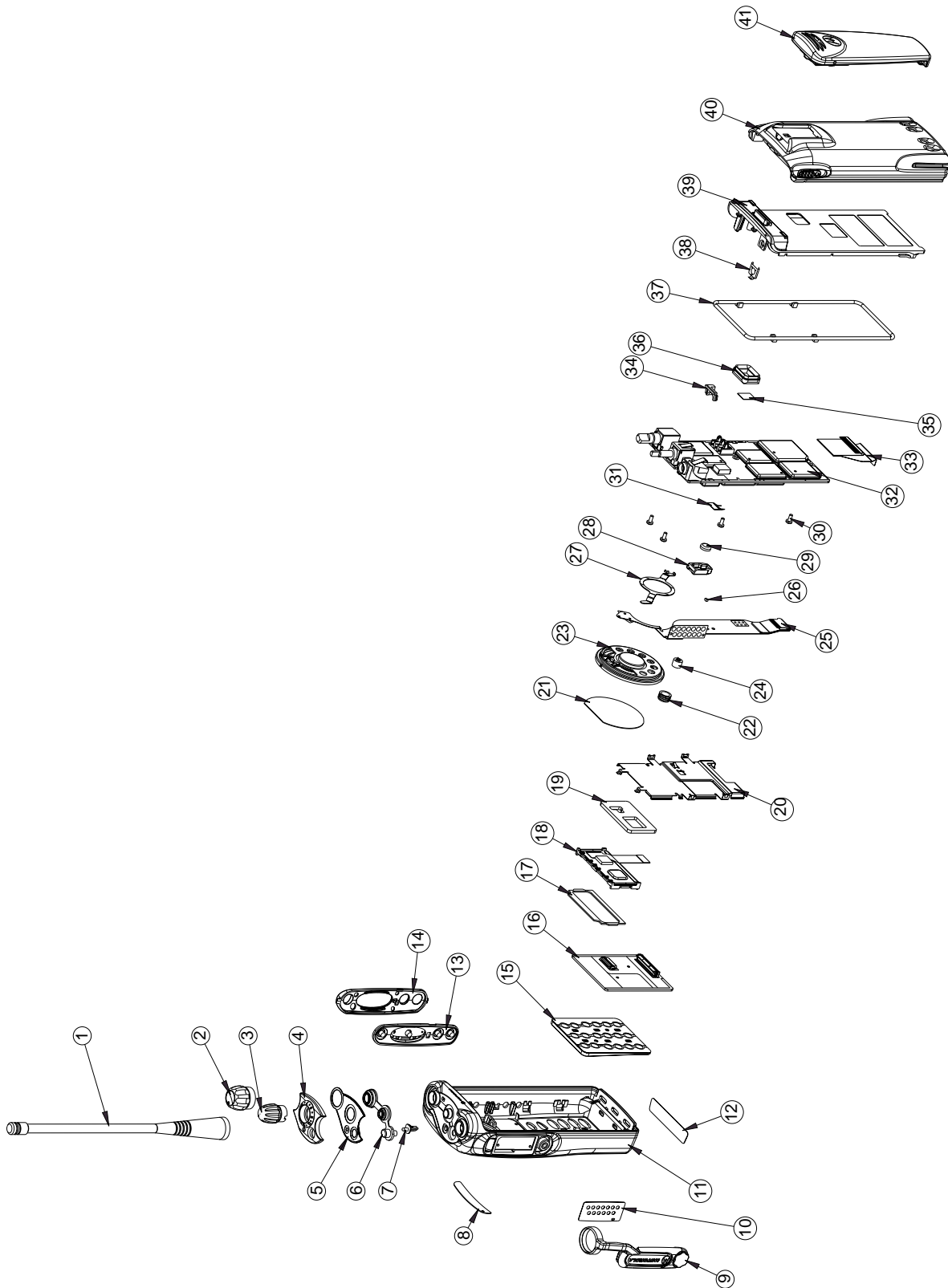


Figure 3-15 Radio Exploded Mechanical View (GP360/GP380)

Item	Motorola Part Number	Description
1	See Chapter 6	Antenna
2	3680529Z01	Knob, Volume
3	3680530Z01	Knob, Frequency
4	1380525Z03	Escutcheon, Top
5	3380644Z01	Escutcheon, Label
6	3280533Z01	Seal, Control Top
7	6180527Z01	Litepipe, Tx
8	1364279B04 1364279B05	Front, label GP360 Front, label GP380
9	1586059A01	Dust Cover, Universal Connector
10	1386058A01	Escutcheon, Universal Flex
11	1580666Z04	Front Cover with Keypad (DTMF)
12	Not Field Replaceable	Escutcheon, FM
13	7580532Z01	Keypad, Side Control
14	1380528Z01	Bezel, Side Control
15	7580620Z05	Keypad
16	0104007J99	Keypad Board Assembly
17	7580540Z01	Pad, Display
18	5104949J07	LCD Module
19	7580637Z01	Pad, LCD Back
20	4280498Z01	Retainer, Keypad PCB
21	3586057A01	Felt Speaker
22	1480577C01	Boot, Microphone
23	5085962A02	Speaker
24	5013920A04	Microphone
25	8480549Z01	Flex, UC
26	2113740A41	Capacitor, 33pF

Item	Motorola Part Number	Description
27	4280504Z01	Retainer, Speaker
28	1480503Z01	Boot, Backup Battery
29	6062884G01	Backup Battery
30	0304726J04	Screw
31	3980667Z01	Contact, finger
32	See Chapter 6	Back Cover Kit incl. chassis main board
33	8480475Z02 8480475Z01	Flex, Keypad/Controller GP360 Flex, Keypad/Controller GP380
34	1480652Z01	Insulator, Antenna
35	7580556Z01	Pad, Thermal
36	3280534Z01	Seal, Contact
37	3280536Z01	Gasket, O-Ring
38	3980698Z01	Contact, Ground, Compliant
39	2780518Z01	Chassis
40	See Chapter 6	Battery
41	HLN9714	Beltclip

### 9.3 GP344

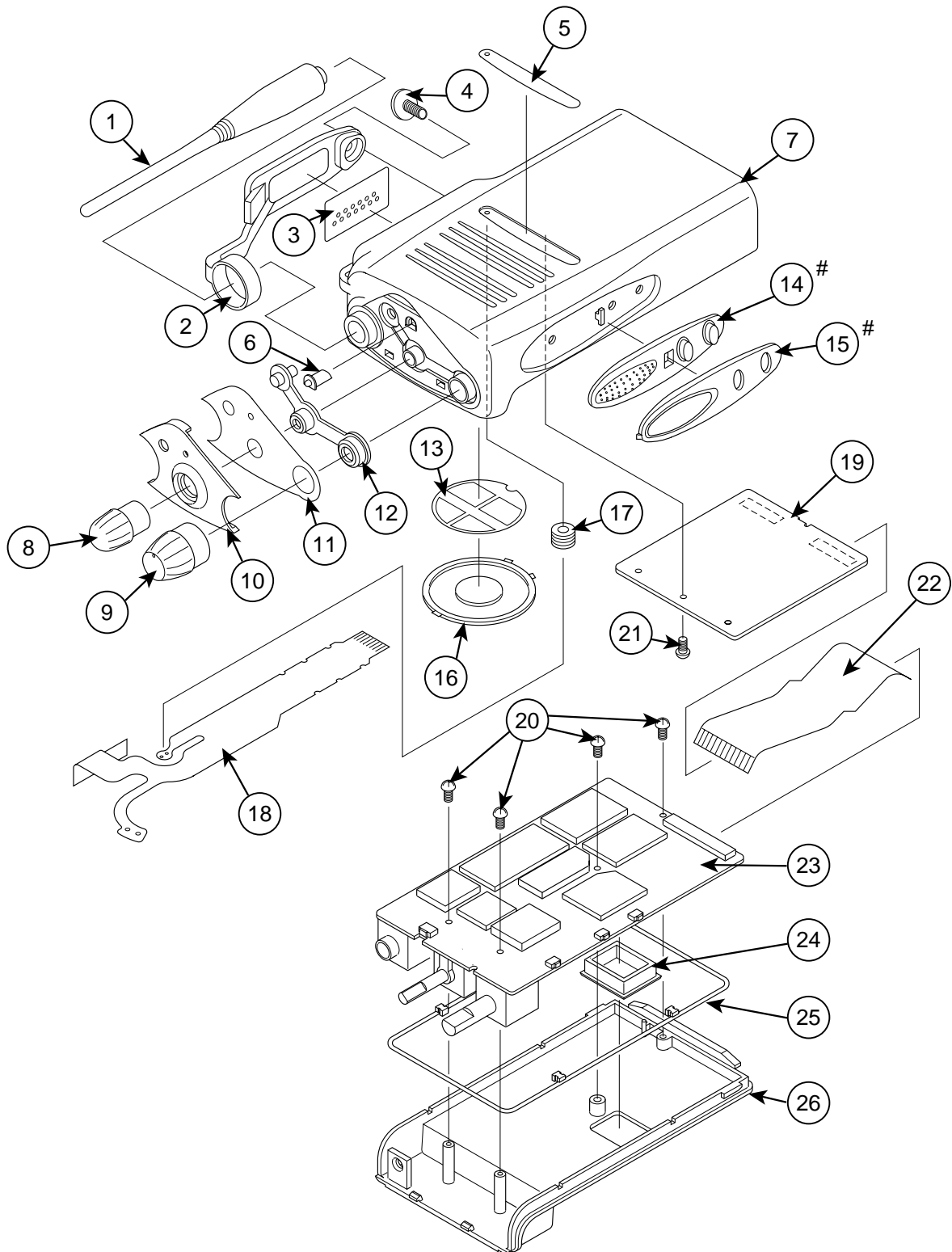


Figure 3-16 Radio Exploded Mechanical View (GP344)

<b>Item</b>	<b>Motorola Part Number</b>	<b>Description</b>
1	See Chapter 6	Antenna
2	JMLN4638_	Dust Cover
3	1385905Z01	Universal Connector Seal
4	0302020P03	Screw for Dust Cover
5	3385959Z07	Front, label GP344
6	6102001P10	Light Pipe
7	0104031G98	Front Cover Assembly
8	3680530Z02	Frequency Knob
9	3680529Z01	Volume Knob
10	1302012P06	Top Plastic Plate
11	3385906Z01	Top Sheet
12	3202000P15	Top Seal Rubber
13	3502416P03	Speaker Mesh
14*	Part of Item 7	PTT Rubber
15*	Part of Item 7	PTT Plastic Cover
16	5005679X01	Speaker
17	1480577C01	Boot Microphone
18	8404079G01	Flex PCB Universal
19*	8404051G07	Controller Board
20	0385913Z01	4 M2x4 Philips Screws
21	0302020P05	1 M2x1 Philips Screw
22	8404078G01	Flex PCB RF Controller
23*	8404055G05	RF Board (VHF)
	8404077G01	RF Board (UHF)
	8485641Z02	RF Board (UHF 2)
24	3280534Z01	Seal Contact
25	3202000P14	O-ring
26	1502001P31	Chassis

\* Not field serviceable

### 9.4 GP388

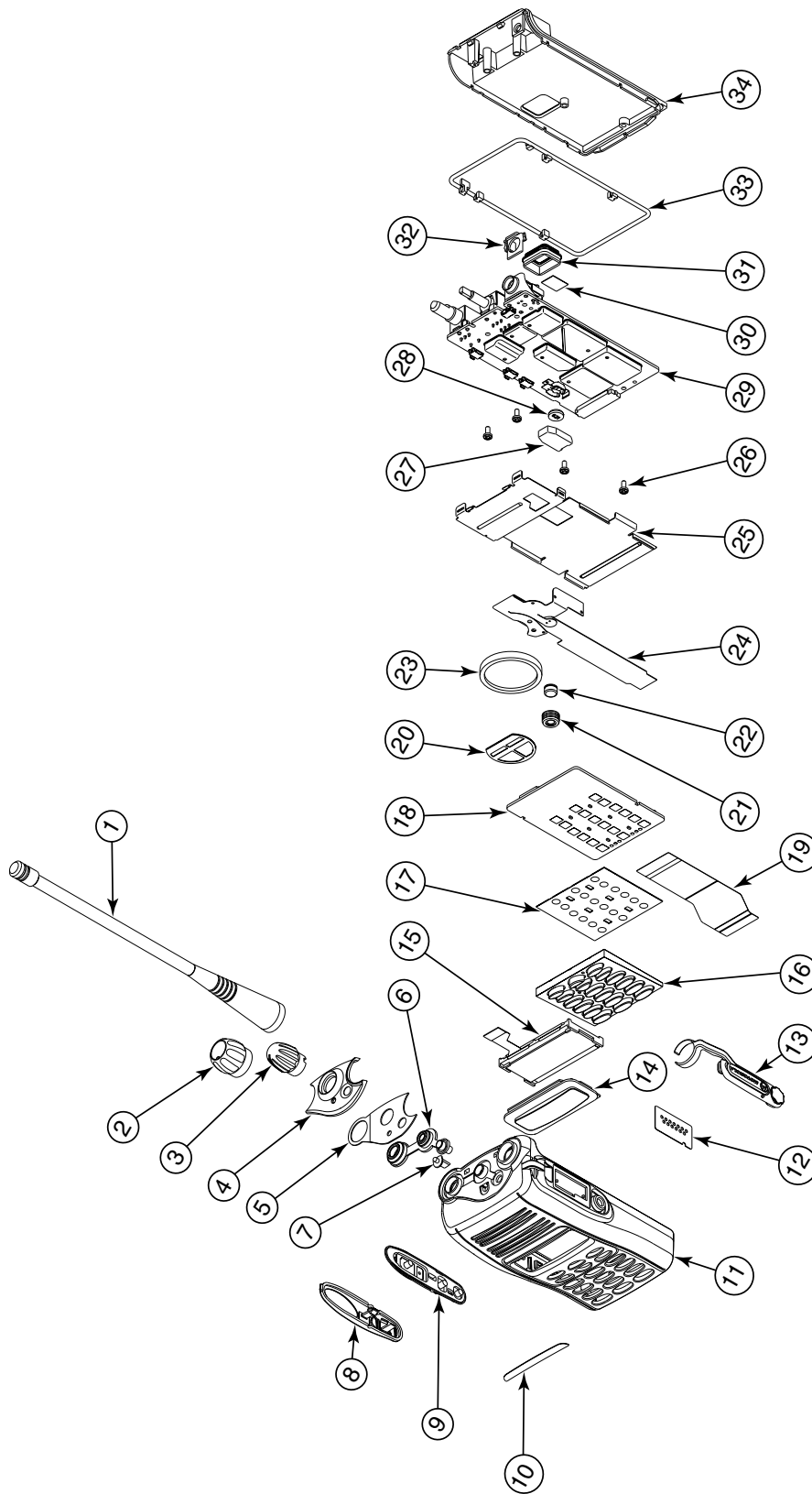


Figure 3-17 Radio Exploded Mechanical View (GP388)

Item	Motorola Part Number	Description
1	See Chapter 6	Antenna
2	3680529Z01	Volume Knob
3	3680530Z02	Frequency Knob
4	1386160Z01	Top Escutcheon
5	3385906Z01	Escutcheon Label
6	3286159Z01	Control Top Seal
7	6186158Z01	Lightpipe
8	1386091Z01	PTT Bezel
9	7586090Z01	PTT Rubber
10	3386098Z05	Nameplate GP388
11	1586088Z01	Front Cover Assembly
12	1385905Z01	Escutcheon, Universal Connector
13		Dust Cover, Universal Connector
14	7580540Z01	LCD Front Pad
15	5104949J11	LCD Module
16	7586096Z01	Main Keypad
17	4086199Z01	Keypad Polydome
18	8404056G01	Controller Board
19	8404078G01	Flex RF Controller
20	3586092Z01	Speaker Felt
21	1480577C01	Microphone Boot
22	5013920A04	Microphone
23	5086094Z01	Speaker
24	8486095Z01	Flex, Universal Connector
25	4286097Z01	Keypad Retainer
26	0386104Z01	Screw
27	1480503Z01	Backup Battery Boot
28	6080656Z01	Battery Backup

Item	Motorola Part Number	Description
29	8404055G05	RF Board (VHF)
	8404077G01	RF Board (UHF)
30	7580556Z01	Thermal Pad
31	3280534Z01	Battery Module Seal
32	1485673Z01	Antenna Nut Insulator
33	3285892Z01	Main O-Ring
34	2786154Z01	Chassis

## 10.0 Service Aids

Table 3-1 lists service aids recommended for working on the GP300 Series Radios. While all of these items are available from Motorola, most are standard shop equipment items, and any equivalent item capable of the same performance may be substituted for the item listed.

**Table 3-1** Service Aids

<b>Motorola Part No.</b>	<b>Description</b>	<b>Application</b>
RLN4460_	Portable Test Set	Enables connection to the audio/accessory jack. Allows switching for radio testing.
RKN4075_	Ribless Programming Cable	Connects radio to Computer.
RKN4074_ (GP320/340/360/380) JMKN4123_ (GP344/388)	Programming Cable/Test Cable	Connects radio to RIB (RLN4008_).
RLN4008_	Radio Interface Box (RIB)	Enables communications between the radio and the computer's serial communications adapter.
HLN9756_	BNC Adaptor	Adapts radio's antenna port to BNC cabling of test equipment.
HKN9743_	MAP27 Cable	Connects radio to computer for MAP27 applications in MPT requirements.
HLN9742_	Flash Upgrade Adapter	Provides connections to the computer or RIB programming /test cable
0180305G54	Shop Battery Eliminator	Interconnects radio to power supply.
8180384F66	Bench Test Housing Eliminator for long housing.	Provides for troubleshooting of the radio when the housing is removed.
8180384F68 (GP320/340/360/380) 8180384M30 (GP344/388)	Bench Test Housing Eliminator for short housing.	Provides for troubleshooting of the radio when the housing is removed.
RLN4510 (GP320/340/360/380) JMKN4125_ (GP344/388)	Battery Eliminator 7.5V	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. All other IBM models use B71. Connects the computer's serial communications adapter to the RIB. (RLN4008_)



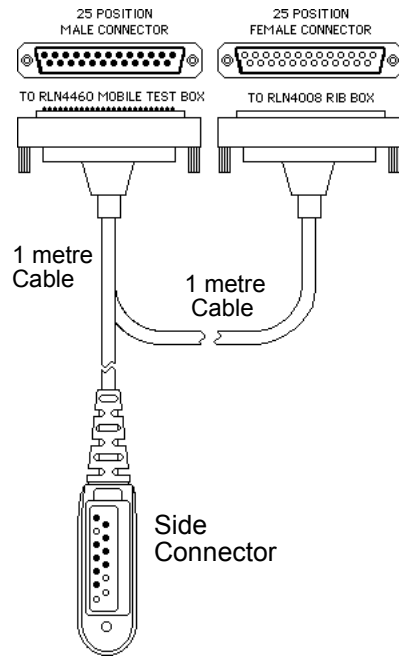
## 11.0 Test Equipment

Table 3-2 lists test equipment required to service the GP300 Series Radios and other two-way radios.

**Table 3-2** Recommended Test Equipment

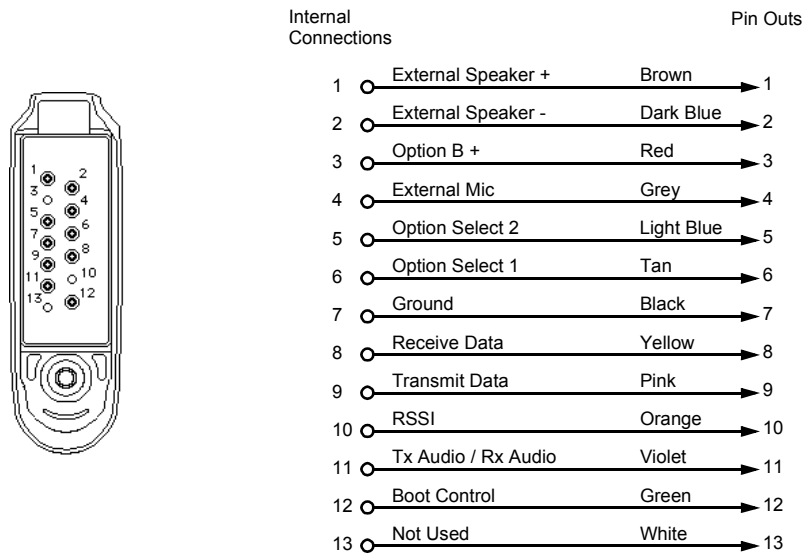
Motorola Part No.	Description	Characteristics	Application
R2600_NT	Comms System Analyzer (non MPT)	This monitor will substitute for items with an asterisk *	Frequency/deviation meter and signal generator for wide-range troubleshooting and alignment
R2680_NT to be ordered with RLN1022_ (H/W) RLN1023_ (S/W)	Comms System Analyzer (MPT1327)	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 $\mu$ V 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_  0180305F22 0180305F30 0180305F39 RLN4610_  *T1013_	Wattmeter,  Plug-in Element Plug-in Element Plug-in Element Carry case  RF Dummy Load	Thru-line 50-Ohm, $\pm$ 5% accuracy 10W, 50 - 125 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
S1348_	220V Power Supply	0-20V, 5A	Programmable

## 12.0 Programming/Test Cable



GP320/340/360/380 - RKN4074\_  
 GP344/388 - JMKN4123\_

**Figure 3-18** Programming Test/Cable



**Figure 3-19** Pin Configuration of the Side Connector

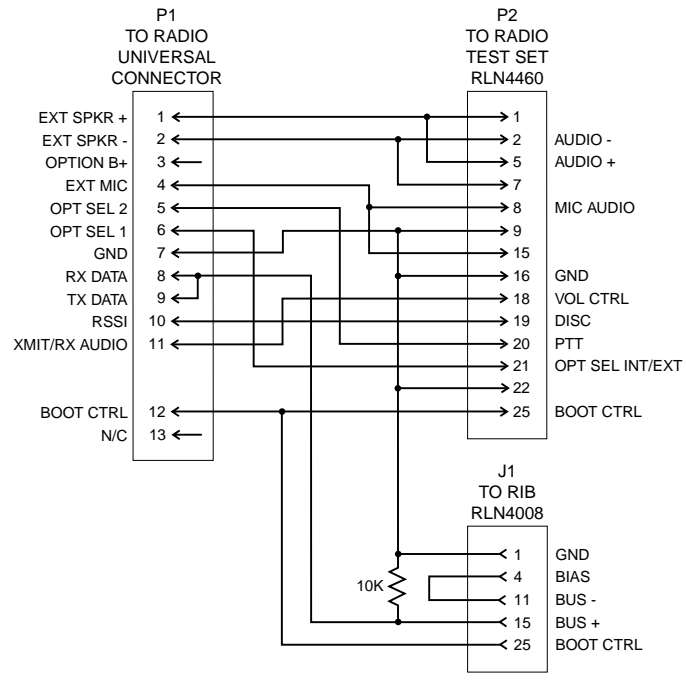
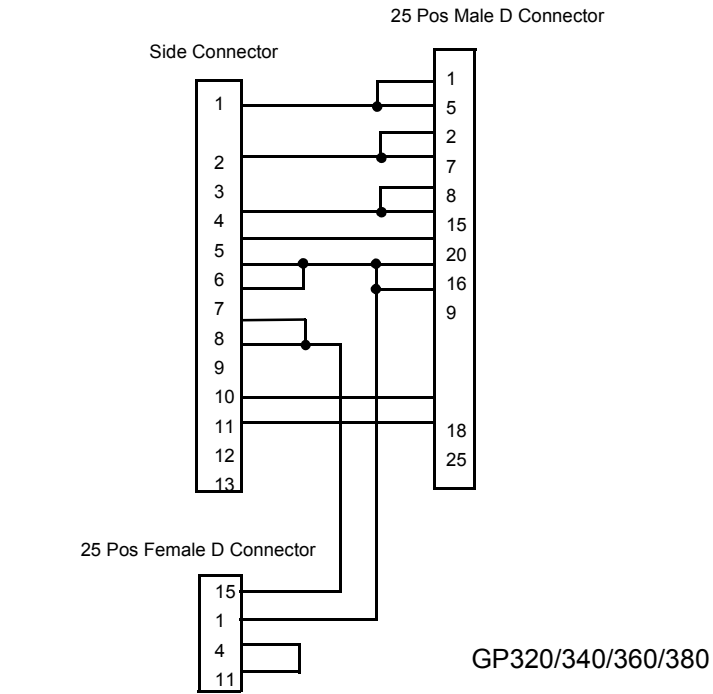


Figure 3-20 Wiring of the Connectors



# Chapter 4

## PERFORMANCE TESTING

### 1.0 Introduction

The receiver and transmitter performance tests are contained in Tables 4-1 and 4-2 respectively. Refer to Chapter 5 for the test equipment set up. Note that all test measurements are taken at 25°C.

### 2.0 Receiver Performance Tests

The receiver performance tests are described in Table 4-1 below.

**Table 4-1** Receiver Performance Checks

Test Name	Communications Analyzer	Radio	Test Set	Comments
Reference Frequency	Mode: PWR MON 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 $\pm 200\text{Hz}$ VHF $\pm 600\text{Hz}$ UHF
Rated Audio	Mode: GEN Output level: 1.0mV RF Mod: 1kHz tone at 3kHz deviation Monitor: DVM: AC Volts	TEST MODE Test Channel 4 carrier squelch	PTT to OFF (centre), meter selector to Audio PA	Set volume control to 3.16Vrms (GP320/340/360/380) 3.46Vrms (GP344/388)
Distortion	As above, except to distortion	As above	As above	Distortion 3.0% Typical
Sensitivity (SINAD)	As above, except SINAD, lower the RF level for 12dB SINAD.	As above	PTT to OFF (center)	RF input to be 0.25 $\mu\text{V}$ <0.35 $\mu\text{V}$ (GP344/388)
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 (GP320/340/360/380) 3.46Vrms (GP344/388)
	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 <0.25 $\mu\text{V}$ . Preferred SINAD = 9-10dB

### 3.0 Transmitter Performance Tests

The transmitter performance tests are described in Table 4-2 below.

**Table 4-2** Transmitter Performance Checks

Test Name	Communications Analyzer	Radio	Test Set	Comments
Reference Frequency	Mode: PWR MON Monitor: Frequency error Input at RF In/Out	TEST MODE, Test Channel 4 carrier squelch	PTT to continuous (during the performance check)	Frequency error to be $\pm 200\text{Hz}$ VHF $\pm 600\text{Hz}$ UHF
Power RF	As above	As above	As above	Refer to Maintenance Specifications
Voice Modulation	Mode: PWR MON atten to -70, input to RF In/Out Monitor: DVM, AC Volts Set 1kHz Mod Out level for 0.025Vrms at test set, 80mVrms at AC/DC test set jack	As above	As above, meter selector to mic	Deviation: VHF, UHF, $\geq 4.0\text{kHz}$ but $\leq 5.0\text{kHz}$ . (25 kHz Ch Sp)
Voice Modulation (internal)	Mode: PWR MON atten to -70, input to RF In/Out	TEST MODE, Test Channel 4 carrier squelch output at antenna	Remove modulation input	Press PTT switch on radio. Say "four" loudly into the radio mic. Measure deviation: VHF, UHF, $\geq 4.0\text{kHz}$ but $\leq 5.0\text{kHz}$ (25 kHz Ch Sp)
DTMF Modulation	As above,	TEST MODE, Test Channel 4 DTMF output at antenna	As above	Deviation: VHF, UHF, $\geq 3.05\text{kHz}$ but $\leq 3.45\text{kHz}$ (25 kHz Ch Sp).
PL/DPL Modulation	As above BW to narrow	TEST MODE, Test Channel 4 TPL DPL	As above	Deviation: VHF, UHF, $\geq 500\text{Hz}$ but $\leq 1000\text{Hz}$ . (25 kHz Ch Sp).

## RADIO TUNING AND PROGRAMMING

### 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.

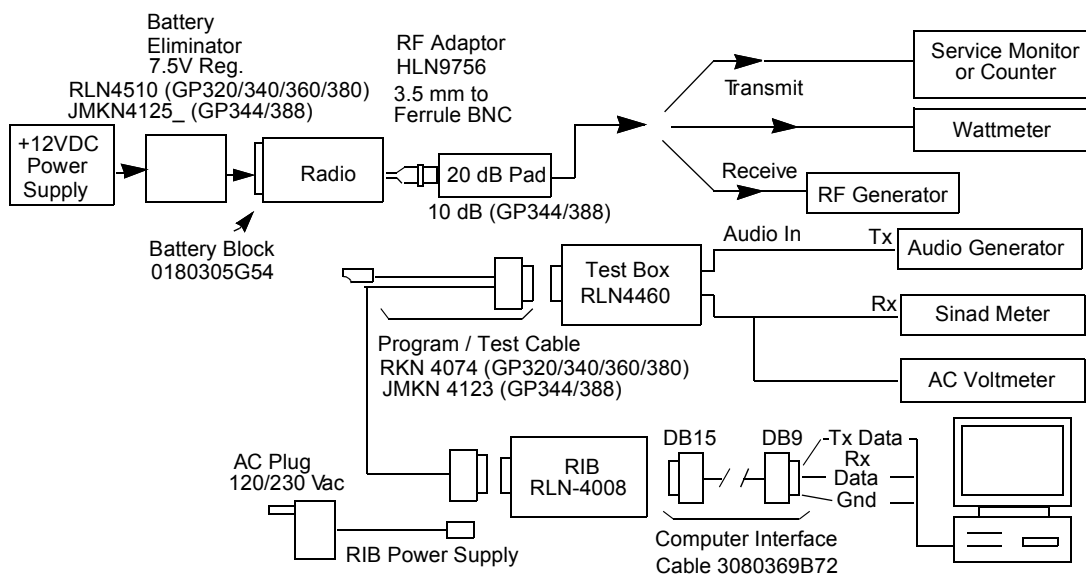
**NOTE** Refer to the appropriate program on-line help files for the programming procedures.

**Table 5-1** Software Installation Kits Radio Tuning Setup

Description	Kit Number
EMEA CD	ENLN4115_
Installation Card	68P64113B14_

### 2.0 Global Radio Tuning Setup

A personal computer (PC) using Windows 95/98 and a global 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 shown in Figure 5-1.



**Figure 5-1** Radio Tuning Test Equipment Setup

## 2.1 Initial Test Equipment Setup

The supply voltage is connected to the radio using a Motorola battery eliminator, P/N 0180305G54. The initial test equipment (Figure 5-1) control settings are listed in Table 5-2.

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

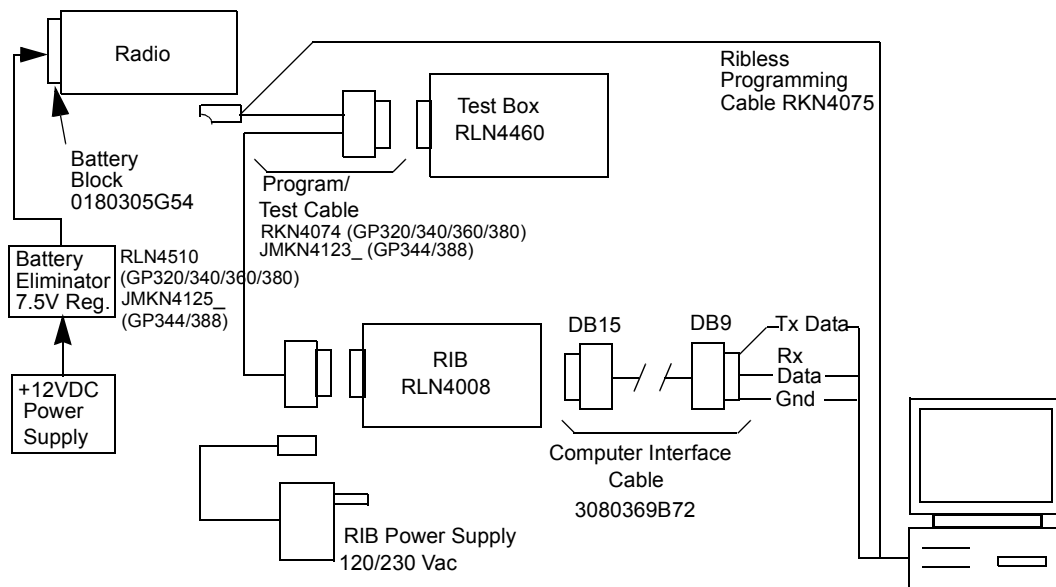
**Table 5-2** Initial Equipment Control Settings

Service Monitor	Test Set	Power Supply
Monitor Mode: Power Monitor	Speaker set: A	Voltage: 7.5Vdc
RF Attenuation: -70	Speaker/load: Speaker	DC on/standby: Standby
AM, CW, FM: FM	PTT: OFF	Volt Range: 10V
Oscilloscope Source: Mod Oscilloscope Horizontal: 10mSec/Div Oscilloscope Vertical: 2.5kHz/Div Oscilloscope Trigger: Auto Monitor Image: Hi Monitor BW: Nar Monitor Squelch: mid CW Monitor Volume: 1/4 CW		Current: 2.5A

## 3.0 CPS Programming Setup

The CPS programming setup, shown in Figure 5-2, is used to program the radio codeplug.

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



**Figure 5-2** CPS Programming Setup



## MODEL CHART AND TEST SPECIFICATION

### 1.0 Model Chart (UHF)

Professional GP300 Series (UHF)							
Model							Description
						MDH25RDC9AN0_E	GP320 UHF 403-470MHz 4W 1-Ch
						MDH25RDC9AN3_E	GP340 UHF 403-470MHz 4W 16-Ch
						MDH38RDC9AN3_E	GP344 UHF 403-470MHz 4W 16-Ch
						MDH38SDC9AN3_E	GP344 UHF2 450-527MHz 4W 16-Ch
						MDH25RDF9AN5_E	GP360 UHF 403-470MHz 4W 255-Ch
						MDH25RDH9AN6_E	GP380 UHF 403-470MHz 4W 255-Ch
						MDH38RDH9AN6_E	GP388 UHF 403-470MHz 4W 255-Ch
						<b>Item</b>	<b>Description</b>
X						PMLE4140_	GP320 UHF Back Cover Kit
X						PMLN4253_	GP320 UHF Front Cover Kit
	X					PMLE4137_	GP340 UHF Back Cover Kit
	X					PMLN4216_	GP340 UHF Front Cover Kit
		X				JMHE4001_	GP344 UHF Back Cover Kit
		X				PMHE4006_	GP344 UHF Front Cover Kit
			X			PMHE4004_	GP344 UHF2 Back Cover Kit
			X			PMHE4008_	GP344 UHF2 Front Cover Kit
				X		PMLE4141_	GP360 UHF Back Cover Kit
				X		PMLN4302_	GP360 UHF Front Cover Kit
					X	PMLE4138_	GP380 UHF Back Cover Kit
					X	PMLN4304_	GP380 UHF Front Cover Kit
					X	PMHE4010_	GP388 UHF Back Cover Kit
					X	PMHE4007_	GP388 UHF Front Cover Kit
X						6864110B12_	GP320 Basic User Guide
	X					6864110B13_	GP340 Basic User Guide
		X	X			6864110B54_	GP344 Basic User Guide
				X		6864110B16_	GP360 Basic User Guide
					X	6864110B18_	GP380 Basic User Guide
					X	6864110B97_	GP388 Basic User Guide

x = Indicates one of each is required.

<b>Professional GP300 Series (UHF)</b>									
<b>Model</b>							<b>Description</b>		
X	X	X		X	X	X	NAE6483_	UHF Whip (403-470 MHz) Antenna	
			X				PMAE4008_	UHF2 Whip (450-527 MHz) Antenna	
		X	X			X	JMNN4023__	Battery, Li-Ion Standard	
X	X			X	X		HNN9008_	Battery, NiMH Standard	

x = Indicates one of each is required.

## 2.0 Model Chart (VHF)

<b>Professional GP300 Series (VHF)</b>						
<b>Model</b>						<b>Description</b>
MDH25KDC9AN0_E						GP320 VHF 136-174MHz 5W 1-Ch
MDH25KDC9AN3_E						GP340 VHF 136-174MHz 5W 16-Ch
MDH38KDC9AN3_E						GP344 VHF 136-174MHz 5W 16-Ch
MDH25KDF9AN5_E						GP360 VHF 136-174MHz 5W 255-Ch
MDH25KDH9AN6_E						GP380 VHF 136-174MHz 5W 255-Ch
MDH38KDH9AN6_E						GP388 VHF 136-174MHz 5W 255-Ch
<b>Item</b>						<b>Description</b>
X					PMLD4121_	GP320 VHF Back Cover Kit
X					PMLN4253_	GP320 VHF Front Cover Kit
	X				PMLD4117_	GP340 VHF Back Cover Kit
	X				PMLN4216_	GP340 VHF Front Cover Kit
		X			JMHD4005_	GP344 VHF Back Cover Kit
		X			PMHD4004_	GP344 VHF Front Cover Kit
			X		PMLD4119_	GP360 VHF Back Cover Kit
			X		PMLN4302_	GP360 VHF Front Cover Kit
				X	PMLD4118_	GP380 VHF Back Cover Kit
				X	PMLN4304_	GP380 VHF Front Cover Kit
				X	PMHD4006_	GP388 VHF Back Cover Kit
				X	PMHD4005_	GP388 VHF Front Cover Kit
X					6864110B12_	GP320 Basic User Guide
	X				6864110B13_	GP340 Basic User Guide
		X			6864110B54_	GP344 Basic User Guide
			X		6864110B16_	GP360 Basic User Guide
				X	6864110B18_	GP380 Basic User Guide
				X	6864110B97_	GP388 Basic User Guide
X	X	X	X	X	PMAD4023_	VHF 14cm (150-161 MHz) Antenna
X	X		X	X	HNN9008_	Battery, NiMH Standard
		X		X	JMNN4023_	Battery, Li-Ion Standard

x = Indicates one of each is required.

### 3.0 Model Chart (LB)

<b>Professional GP300 Series (LB)</b>						
<b>Model</b>					<b>Description</b>	
MDH25BEC9AN3_E					GP340 LB1 29.7-42 MHz 6W 16-Ch	
MDH25BEH9AN6_E					GP380 LB1 29.7-42 MHz 6W 255-Ch	
MDH25CEC9AN3_E					GP340 LB2 35-50 MHz 6W 16-Ch	
MDH25CEH9AN6_E					GP380 LB2 35-50 MHz 6W 255-Ch	
X					PMLB4006_	GP340 LB1 Back Cover Kit
X					PMLN4216_	GP340 LB1 Front Cover Kit
	X				PMLB4016_	GP380 LB1 Back Cover Kit
	X				PMLN4304_	GP380 LB1 Front Cover Kit
		X			PMLB4012_	GP340 LB2 Back Cover Kit
		X			PMLN4216_	GP340 LB2 Front Cover Kit
			X		PMLB4017_	GP380 LB2 Back Cover Kit
			X		PMLN4304_	GP380 LB2 Front Cover Kit
X		X			6864110B13_	GP340 Basic User Guide
	X		X		6864110B18_	GP380 Basic User Guide
X	X	X	X		NAB6064_	Low/Mid Band (29-50MHz) Heliflex, Trimmable Antenna
X	X	X	X		HNN9008_	Battery, NiMH Standard

#### 4.0 Model Chart (300R1)

<b>Professional GP300 Series (300R1)</b>			
<b>Model</b>		<b>Description</b>	
MDH25EDC9AN3_E		GP340 300R1 300-350 MHz 4W	
		<b>Item</b>	<b>Description</b>
X		PMLD4141_	GP340 300R1 Back Cover Kit
X		PMLN4216_	GP340 300R1 Front Cover Kit
X		6864110B13_	GP340 Basic User Guide
X		PMAD4022_	VHF 9cm (300-344 MHz) Antenna
X		HNN9008_	Battery, NiMH Standard

x = Indicates one of each is required.

## 5.0 Specifications - Professional GP300 Series Radios

### 5.1 GP320/340/360/380

Data is specified for +25°C unless otherwise stated.

General Specifications	
Channel Capacity	
<b>GP320</b>	1
<b>GP340</b>	16
<b>GP360</b>	255
<b>GP380</b>	255
Power Supply	Rechargeable battery 7.5v
Dimensions: H x W x D (mm)	Height excluding knobs
With standard high capacity NiMH battery	137 x 57.5 x 37.5
With ultra high capacity NiMH battery	137 x 57.5 x 40.0
With NiCD battery	137 x 57.5 x 40.0
With Lilon battery	137 x 57.5 x 33.0
Weight: (gm)	<b>GP320/GP340</b> <b>GP360/GP380</b>
With Standard high capacity NiMH battery	420                      428
With Ultra high capacity NiMH battery	500                      508
With NiCD battery	450                      458
With Lilon battery	350                      358
Average Battery Life @5/5/90 Cycle:	Low Power      High Power
With Standard high capacity NiMH battery	11 hours      8 hours
With Ultra high capacity NiMH battery	14 hours      11 hours
With NiCD battery	12 hours      9 hours
With Lilon battery	11 hours      8 hours
Sealing:	Withstands rain testing per MIL STD 810 C/D /E and IP54
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D /E and TIA/EIA 603
Dust and Humidity:	Protection provided via environment resistant housing exceeding MIL STD 810 C/D /E and TIA/EIA 603

<b>Transmitter</b>	<b>UHF/VHF/300R1</b>	<b>LB</b>
*Frequencies - Full Bandsplit	VHF 136-174 MHz UHF 403-470 MHz 300R1 300-350MHz	LB1 29.7-42 MHz LB2 35-50 MHz
Channel Spacing	12.5/20/25 kHz	
Frequency Stability (-25°C to +55°C, +25° Ref.)	±2.5 ppm @ 12.5kHz ±5.0 ppm @ 25 kHz ±5.0 ppm (300R1)	±10ppm
Power	136 - 174 MHz: 1-5W 403 - 470 MHz: 1-4W 300 - 350 MHz: 1-4W	1-6W
Modulation Limiting	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz	
FM Hum & Noise	-40 dB typical	
Conducted/Radiated Emission	-36 dBm <1 GHz -30 dBm >1 GHz	
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 25 kHz	
Audio Response (300 - 3000 Hz)	+1 to -3 dB	
Audio Distortion	<3% typical <5% typical (300R1)	

<b>Receiver</b>	<b>UHF/VHF/300R1</b>	<b>LB</b>
*Frequencies - Full Bandsplit	VHF 136-174 MHz UHF 403-470 MHz 300R1 300-350 MHz	LB1 29.7-42 MHz LB2 35-50 MHz
Channel Spacing	12.5/20/25 kHz	
Sensitivity (12 dB SINAD) EIA	0.25 µV typical	
Sensitivity (20 dB SINAD) ETS	0.35 µV typical (300R1)	
Intermodulation EIA	0.50 µV typical	
Adjacent Channel Selectivity	65 dB	
Spurious Rejection	60 dB @ 12.5 kHz 70 dB @ 25 kHz	
Rated Audio	>70 dB	
Audio Distortion @ Rated Audio	0.5W	
Hum & Noise	<3% typical	
Audio Response (300 - 3000 Hz)	-45 dB @ 12.5 kHz -50 dB @ 20/25 kHz	
Conducted Spurious Emission	+1 to -3 dB	
	-57 dBm <1 GHz -47 dBm >1 GHz ETS 300 086	

\*Availability subject to the laws and regulations of individual countries.

## 5.2 GP344/388

Data is specified for +25°C unless otherwise stated.

<b>General Specifications</b>	
Channel Capacity <b>GP344</b> <b>GP388</b>	16 255
Power Supply	Rechargeable battery 7.5v
Dimensions: H x W x D (mm)  With standard Lilon battery With high capacity Lilon battery	Height excluding knobs <b>GP344</b> <b>GP388</b> 101.5 x 55.5 x 30.5    101.5 x 55.5 x 33.0 101.5 x 55.5 x 35.5    101.5 x 55.5 x 38.0
Weight: (gm) With Standard Lilon battery With high capacity Lilon battery	<b>GP344</b> <b>GP388</b> 250                              265 270                              285
Average Battery Life @5/5/90 Cycle: With Standard Lilon battery With high capacity Lilon battery	Low Power                      High Power >9 hours                      >7 hours >13 hours                      >10 hours
Sealing:	Withstands rain testing per MIL STD 810 C/D /E and IP54
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D /E and TIA/EIA 603
Dust and Humidity:	Protection provided via environment resistant housing exceeding MIL STD 810 C/D /E and TIA/EIA 603



<b>Transmitter</b>	<b>VHF</b>	<b>UHF1/UHF2</b>
*Frequencies - Full Bandsplit	VHF 136-174 MHz	UHF1 403-470 MHz UHF2 450-527 MHz
Channel Spacing	12.5/20/25 kHz	
Frequency Stability (-30°C to +60°C, +25° Ref.)	0.00025%	
Power	Low: 1W High: 5W	Low: 1W High: 4W
Spurs/Harmonics	-36 dBm <1 GHz -30 dBm >1 GHz	
FM Hum & Noise	-40 dB typical	
Audio Response (300 - 3000 Hz)	+1 to -3 dB	
Audio Distortion	<5% typical	

<b>Receiver</b>	<b>VHF</b>	<b>UHF1/UHF2</b>
*Frequencies - Full Bandsplit	VHF 136-174 MHz	UHF1 403-470 MHz UHF2 450-527 MHz
Channel Spacing	12.5/20/25 kHz	
Sensitivity (12 dB SINAD) EIA	0.35 µV typical	
Intermodulation ETS	-65 dB	
Adjacent Channel Selectivity	60 dB @ 12.5 kHz 70 dB @ 25 kHz	
Spurious Rejection	-70 dB	
Rated Audio	0.5W	
Image Rejection	-70 dB	
Frequency Stability (-30°C to +60°C, +25° Ref.)	0.00025%	

\*Availability subject to the laws and regulations of individual countries.



# Chapter 7

## 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 7-1 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 7-1.

**Table 7-1** Power-up Error Codes

<b>If the error code displayed is...</b>	<b>The LED flashes...</b>	<b>then, there is a...</b>	<b>To correct the problem...</b>
"Test 1 Failed"	Once	Hardware codeplug error, possibly codeplug structure mismatch or non-existent 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

