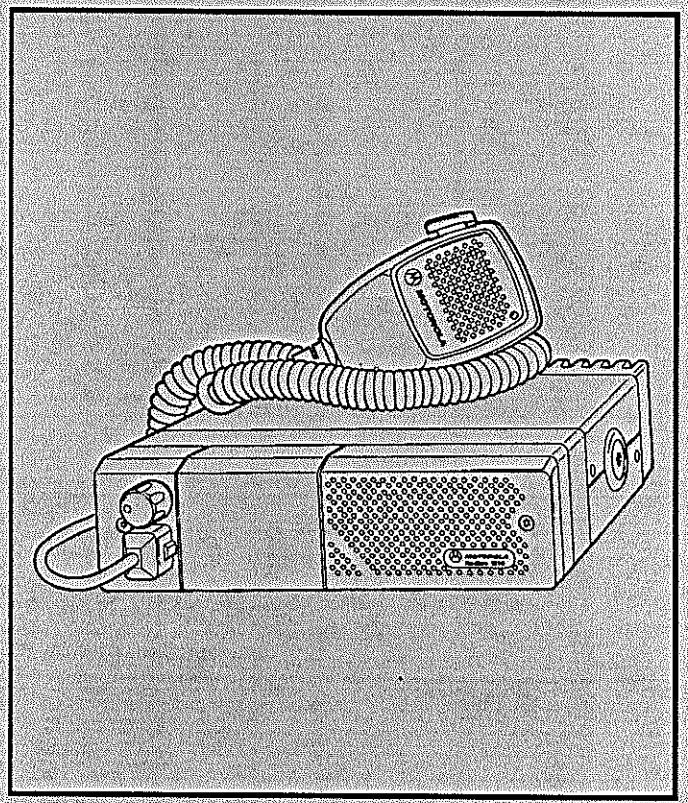
# Radius® M10

## Mobile Radios

Operating Instructions



MOTOROLA

# Contents

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# Introduction

Welcome to the Radius mobile family! Your choice of a Radius mobile means you have selected the highest of standards in design, quality, and performance. This manual is designed to acquaint you with all the features, care, and installation of the Radius mobile to better serve all your communication needs.

## *Radius Mobile Features*

The following features are standard in all models:

- Synthesized, Wide-Band Operation
- Multiple Coded Squelch (Private Line and Digital Private Line) Capability
- Radius High Performance Compact Microphone with On/Off Transmit LED & Hang-Up Clip
- 10 Foot Standard Mic Cord
- Local/Distance Programmability
- Field Programming Capability at Dealer
- Mil-Spec 810 C, D and E Performance (Shock & Vibration)
- Non-Locking Trunnion with Hardware
- 10 Ft. Power Cable
- 12 V DC Negative Ground
- 3 Watt Internal Speaker
- Rotary Volume Control
- Volume Control Knob Package
- Time-Out Timer
- Mini-UHF Antenna Connector
- Operator's Card and Owner's Manual

## *Radio Self-Check*

Every time the radio is turned on, it performs a functional self-check and if necessary, will sound a 5 second warning tone instead of the chirp tone normally heard at power-up. This is an indication that the radio is no longer operating at the exact parameters set in the factory or field and should be serviced immediately.

### *Service*

Because this unit contains a radio transmitter, most local governments prohibit anyone from making any internal adjustments to the transmitter unless specifically licensed to do so by government regulations. If your radio fails to operate or any operational difficulties should arise, contact your local Motorola Radius dealer.

Proper repair and maintenance procedures will assure efficient operation and long life for this radio.





## Dealer Programmable Features

### *Field Programming Capabilities*

The Radius M10 mobile uses non-volatile memory to store customer unique information. If a frequency, squelch code or local/distance channel needs to be changed, it can be done at a service location with the Radio Service Software (RSS). See your local dealer for more details.

### *Time-Out Timer*

All models have a Time-Out Timer (TOT) that will terminate your transmission if you hold the PTT button down for 60 seconds. To warn the user, an alert tone will sound from the speaker about 4 seconds before the transmission is cut. The Time-Out Timer can be disabled or changed to any duration from 1 to 255 seconds. The default setting is 60 seconds. It is not necessary to open the radio for reprogramming.

# Operating Instructions

(M10 Conventional FM Radio, 2-channel Model - Figure 1)

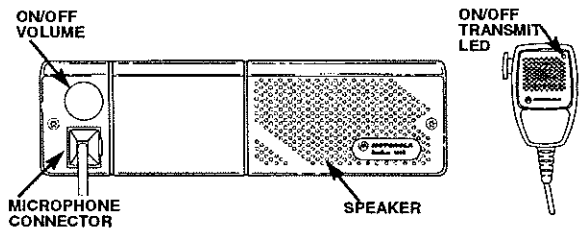


***Figure 1.*** ***a. M10 Conventional FM Radio, Front Panel b. Microphone With LED***

## *Using The Standard On/Off Volume Control Knob*

The following operating instructions refer to M10 usage with the standard On/Off Volume Control Knob. If you are using the Volume Control-Only Knob or the Fixed-Volume Cap, please refer also to the instructions on pages 7 and 8.

### To Turn The Radio On

Turn the ON/OFF VOLUME knob 1/2 turn clockwise. A start-up tone will sound and a green LED CHANNEL INDICATOR light will show on the ON/OFF TRANSMIT LED on the microphone front panel (Figure 1.b).

### To Set Radio Volume Level

Adjust the ON/OFF VOLUME knob to a comfortable listening level.

### To Receive

To receive only specific transmissions which have been pre-programmed with a PL/DPL code, remain on the channel and wait for a transmission. (The radio is now in the "coded squelch" or "PL/DPL" mode. This allows you to hear only those transmissions which are meant for you).

To receive all transmissions, take the microphone off hook.





To return back to the "coded squelch" mode, place the microphone back on hook. This will return the radio to receive only those transmissions which are meant for you.

### To Transmit

Before transmitting, make sure the channel is clear. You can listen for a transmission by taking the microphone off hook.

Once the channel is clear, press and hold down the Push-to-Talk (PTT) button on the side of the microphone and speak slowly and clearly. The ON/OFF TRANSMIT LED will remain red until the PTT is released to indicate that you are "on-the-air".

**NOTE**

If your radio's Time-Out Timer function is activated, transmission will terminate if the PTT button is pressed for over 60 seconds or the pre-programmed time period. When this occurs, an alert tone sounds for 4 seconds before the transmission is cut. To resume transmitting, release the PTT and press it again.

## *Using The Volume Control Knob Package*

The Volume Control Knob Package contains two controls for use with the M10 mobile radio. Either of these parts can replace the standard On/Off Volume Control Knob (refer to Figure 2):

- **Volume Control-Only Knob**
  The volume control-only knob allows the user to control the volume level for the M10 mobile radio. When this knob is installed, the M10 radio must be turned on and off by an external power source (such as your car's ignition).
- **Fixed-Volume Cap**
  The fixed-volume cap allows the user to set and keep fixed a particular volume level for the M10 mobile radio. When this cap is installed, the radio must be turned on and off by an external power source (such as your car's ignition).

### Installing An Alternate Control

#### Volume Control-Only Knob

To install the volume control-only knob, follow these steps:

1. Pull the standard on/off volume control knob straight off and set aside.
2. Choose the volume control-only knob (refer to Figure 3).
3. Align the flat edge of the recessed metal stem (inside the knob socket) with the flat side of the hole in the volume control-only knob.

**IMPORTANT**
Be sure that the peg protruding from the volume control-only knob does not hit the triangular plastic block inside the knob socket.

4. Push the volume control-only knob straight into the knob socket until it stops.
5. Operate radio according to "To Receive" and "To Transmit" instructions on pages 6 & 7.

#### Fixed-Volume Cap

To install the fixed-volume cap, follow these steps:

1. Pull the standard on/off volume control knob straight off and set aside.
2. Choose the fixed-volume cap (refer to Figure 4).
3. Align the flat edge of the recessed metal stem (inside the knob socket) with the flat side of the hole in the fixed-volume cap.
4. Push the cap into the knob socket about halfway, so that it protrudes about 1/8" out of the M10 housing.
5. Carefully turn the cap until the radio is set to the desired volume.
6. Push the cap completely into the knob socket, until the top is flush with the M10 housing surface.
7. Operate radio according to "To Receive" and "To Transmit" instructions on pages 6 & 7.





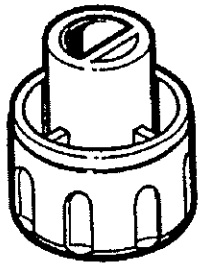

*Figure 2. Standard On/Off Volume Control Knob*

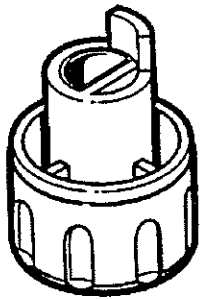

*Figure 3. Volume Control-Only Knob*

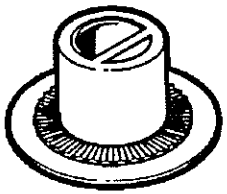

*Figure 4. Fixed-Volume Cap*

# Installation Planning And Procedures

### *Testing and Maintenance*

Your radio has been completely adjusted, tested, and inspected before shipment. However, local governmental regulations may state that a station license be obtained for each radio installation (mobile or base) by the owner of the equipment. The station licensee is responsible for ensuring the transmitter power, frequency, and deviation are within the limits permitted under the station license.

No technician's license is required for installing and maintaining radio equipment. However, the frequency and deviation of the transmitter must be checked on installation and at least once yearly.

### *Power Protection Circuitry*

The Radius mobile you are installing has been tested for proper transmitter power output before leaving the factory. Each radio is set to the proper output power level while connected to an accurate 50 ohm load impedance. Once the power level has been set, the internal power control/protection circuitry will reduce the power output whenever it senses a load impedance significantly different from 50 ohms. This protection circuitry significantly enhances the radio's reliability with minimal performance degradation.

If you check transmitter output power levels during installation, be sure you are using a good 50 ohm load, with a minimum of adapters and using short test cables. Any load variation from 50 ohm may cause an apparent reduction in output power due to the normal operation of the control/protection circuitry. If power seems to be unusually low (lower than can be explained by the normal calibration differences you experience), check your test set-up. If power output goes up as you improve the quality of the load impedance (be sure to de-key when making any changes in load), the control/protection circuitry is performing normally.

Typical mismatches in the load impedance (greater than 1.2:1 VSWR) may result in a 10-20% variation in the actual measure of power output. Within these limits, the radio operates normally and you should not attempt to service it.





### *Installation Planning - Mobile Radios*

Planning is the key to fast, easy radio installation. Before drilling a hole or running a wire, inspect the vehicle and determine how and where you intend to mount the antenna, radio, and accessories. Plan wire and cable runs to provide maximum protection from pinching, crushing, and overheating.

### *Installation Planning - Base/Control Stations*

The base/control station option provides the radio with a desk microphone and power supply for use at a fixed location. All operations are the same as the mobile, except for the desk microphone.

Choose a location for your base/control station as close as possible to where the antenna cable enters the building. Be sure 117V AC, 60 Hz power is available. Make sure sufficient air can flow around the radio to permit adequate cooling.

### *Recommended Tools for Installation*

The following tools are recommended for proper installation of your new radio:

- Portable Drill
- Hammer
- Center Punch
- 5/16" Hex Nut Driver
- 1/4" Hex Nut Driver
- Phillips #1 Screwdriver
- Phillips #2 Screwdriver
- 3/16" Blade Screwdriver
- 3/8" Diameter Drill Bit
- 5/16" Diameter Drill Bit
- 5/32" Diameter Drill Bit

### *Antenna Mounting*

The best mounting location for the antenna is in the center of a large, flat conductive surface. In almost all vehicles, these requirements are best satisfied by mounting the antenna at the center of the roof. Some vehicles have a large trunk lid that provides a good antenna location. If the trunk lid is used, connect grounding straps between the trunk lid and vehicle chassis to insure the trunk lid is a chassis ground. See the instruction manual supplied with the antenna for complete installation information.

# Radio Mounting

### *Non-Locking Trunnion*

The standard non-locking trunnion allows the radio to be mounted to a variety of mounting surfaces. Be sure the mounting surface is able to adequately support the weight of the radio. Allow sufficient space around the radio for free air flow for cooling. Be sure the unit is close enough to the vehicle operator to permit easy access to operating controls. Although the trunnion can be mounted to a plastic dashboard, we recommend that the mounting screws be positioned so they penetrate the supporting metal frame of the dashboard.

### *Floor Mount*

A floor mount wedge (HLN9450) is available, which allows the radio to be tilted at either 45 or 60 degrees. (HLN9404 - Sleeve mounting bracket is also required).

### *Quick Disconnect Slide Mount*

The quick disconnect slide mount option is provided to allow the easy removal and installation of the radio. You may desire this option for security reasons, or to allow the use of one radio in multiple vehicles. The quick disconnect slide mount securely mounts the radio and makes all electrical connections, including the antenna connection.

### *Extra Stability Mounting Tray*

The optional extra stability mounting tray is used in conjunction with the non-locking trunnion. If the radio is mounted on a rounded surface, you may need to supply and install shim washers (not provided) between the bracket and the mounting surface. Shims are necessary to tilt the radio because the heavy duty bracket blocks the standard trunnion adjustments. Follow instruction provided with the option.





### *Locking Trunnion*

The optional locking trunnion consists of a two-piece trunnion type mounting bracket equipped with a key lock. It is designed for easy removal from the mounting bracket. The locking trunnion may be mounted on either metal or plastic surfaces, provided the mounting surface adequately supports the weight of the radio. Follow instructions provided with the option.

Before attempting to install the locking trunnion, examine the vehicle for suitable mounting locations. This bracket requires a flat mounting surface, 8" x 2" minimum with adequate clearance for inserting the radio. The chosen location should be convenient to the vehicle operator and provide access to the power and the antenna connectors. Be careful to choose a location that permits the locking trunnion to be removed from the mounting bracket. Vehicle operation should never be impaired by the location of the trunnion or radio.

**NOTE**
Overhead mounting is not recommended.

### *Remote Mount Capability*

The remote mount kit provides the necessary equipment to detach the front panel controls of the M10 from the transceiver. This allows for the installation of the transceiver box in the vehicle's trunk or under the seat.

# Begin Installation

## *DC Power Cable Installation*

This radio must be operated only in negative ground electrical systems. Reverse polarity does not damage the radio; however, radio protection circuits cause the cable fuse to open. Check the vehicle ground polarity before you begin installation to prevent wasted time and effort.

The 10 foot DC power cable shipped with the radio is long enough for installation in most vehicles. Begin the power cable installation in the following manner:

1. Determine a routing plan for the power cable with reference to where the radio is to be mounted.
2. Locate an existing hole with a grommet in the vehicle fire wall, or drill a 3/8" access hole at the location for passing the power cable into the engine compartment. Install a grommet with 1/4" I.D. in the access hole to avoid damage to the cable.

**CAUTION**
YOU SHOULD EXERCISE A HIGH DEGREE OF CARE TO AVOID DAMAGE TO ANY WIRES IN YOUR VEHICLE.

3. From inside the vehicle, feed the red and black leads (without lugs attached) through the access hole and into the engine compartment (refer to Figure 5).
4. Locate the nearest available vehicle chassis ground mounting point and shorten the black lead to remove excess cable length.
5. Install ring lugs (supplied) onto the stripped end of the power cable black lead, and onto the stripped end of the red lead on fuse holder as shown in Figure 6.
6. Position the fuse holder as close to the battery as possible and away from any hot engine component. Mount the fuse holder using the provided mounting hole and dress wires as necessary. Connect the fuse holder red adapter lead plug to the mating receptacle on the red lead of the power cable as shown in Figure 6.





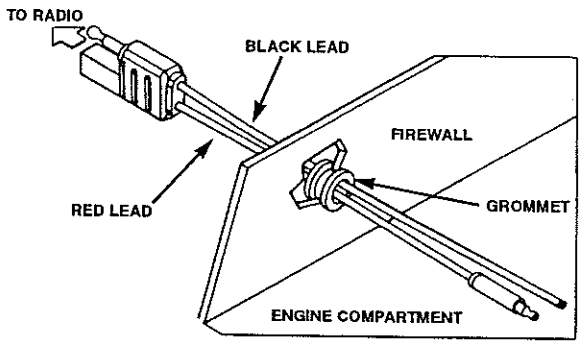


***Figure 5. Power Cable Routing Into Engine Compartment***

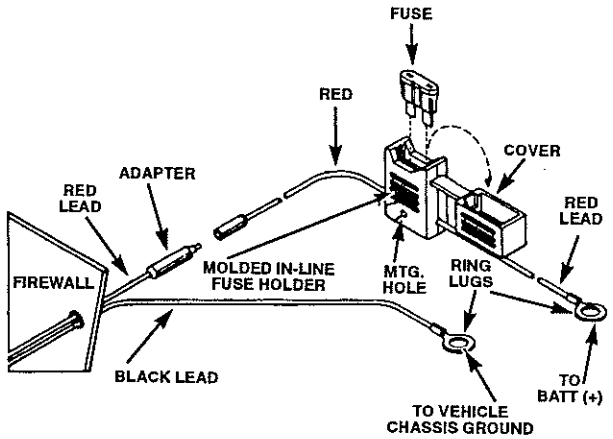


***Figure 6. Power Cable Assembly***

7. Connect the black lead of the power cable directly to the VEHICLE CHASSIS GROUND (refer to Figure 7).

8. Connect the red lead of the power cable from the fuse holder to the positive (+) battery terminal. Make sure the adapter cable is connected to the red lead of the main power cable (refer to Figure 7).

9. Plug fuse into in-line fuse holder as shown in Figure 6.

NOTE

Failure to mount the red lead of the power cable kit directly to the battery may result in severe alternator whine interference and cause radio to revert to mode 1 each time the power is turned off.

### *Non-Locking Trunnion Installation*

1. Select the location to mount your radio either on the **Transmission Hump or Under the Dash** (refer to Figure 8).

2. Using the trunnion mounting bracket as a template, mark the positions of the holes on the mounting surface. Use the innermost four holes for a curved mounting surface such as the transmission hump, and the four outermost holes for a flat surface such as under the dash.

3. Center-punch the spots you have marked and drill a 5/32" hole at each.

4. Secure the trunnion mounting bracket with the two thumb screws provided.

5. To complete your radio installation, plug the power cable into the radio POWER CONNECTOR (refer to Figure 7).

6. Mount the antenna using the instructions provided with the antenna kit. Run the coaxial cable to the radio mounting location. If necessary, cut off the access cable and install the cable connector.





7. Connect the antenna cable connector to the radio ANTENNA CONNECTOR on the rear of the radio (refer to Figure 7).

8. Mount the microphone clip. Follow instructions provided with the microphone clip.

9. Plug the Microphone into the front panel connector. Your microphone has a telephone type connector at the end of its cord. Connect and disconnect your Radio Microphone in the same manner you connect and disconnect your telephone handset.

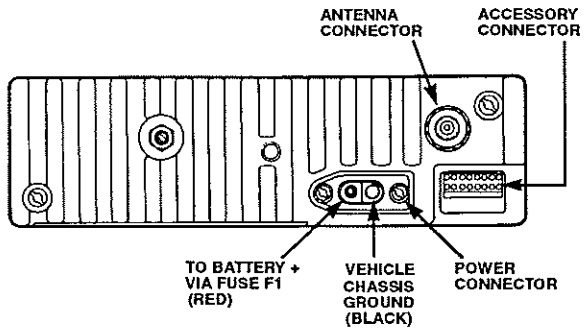


***Figure 7. Connections to Radio Rear Panel***

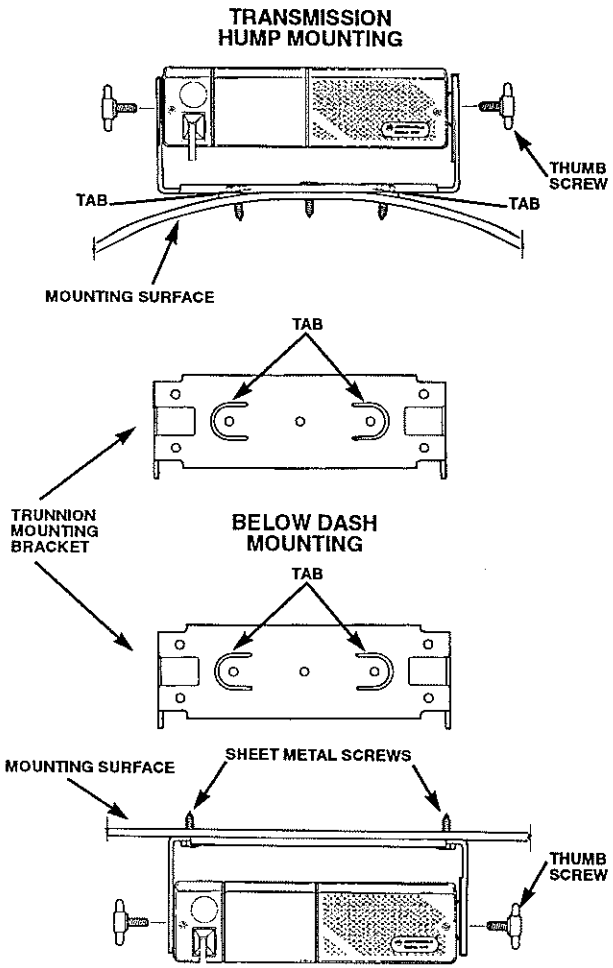


*Figure 8. Trunnion Mount for Radio*





## Accessories

Radius offers several accessories to increase communications efficiency. Many of the accessories available are listed below, but for a complete list, consult your Radius dealer.

**Antennas:**

| | |
|---|---|
| HAD4007_R | VHF 146-150.8 MHz, 1/4 wave roof mount |
| HAD4008_R | VHF 150.8-162 MHz, 1/4 wave roof mount |
| HAD4009_R | VHF 162-174 MHz, 1/4 wave roof mount |
| HAD4014_R | VHF 146-172 MHz, 3dB gain roof mount |
| HAE4003_R | UHF 450-470 MHz, 1/4 wave roof mount |
| HAE4004_R | UHF 470-512 MHz, 1/4 wave roof mount |
| HAE4011_R | UHF 450-470 MHz, 3.5 dB gain roof mount |
| HAE4019_R | UHF 450-470 MHz, 3.5 dB gain roof mount |

**Microphones:**

| | |
|---|---|
| HLN9073_R | Microphone hang-up clip (all microphones) |
| HMN3001 | M10 compact mic w/LED indicator and hang-up clip |

**Installation Accessories:**

| | |
|---|---|
| HLN9284_R | Key lock mount |
| HLN5189_R | Non-locking bracket |
| HLN5226_R | Extra stability mount (use with HLN5189) |
| HLN9450_R | 45 - 60 degree floor mount wedge (requires HLN9404) |
| HLN9404_R | Sleeve mounting bracket |
| HKN4137_R | VHF/UHF/800 MHz low power cable |
| HLN5282_R | Mini-U connector (all bands) |
| HKN9557_R | PL259/Mini-U antenna adapter - 8 inch cable |
| HLN8027_R | Mini - UHF to BNC antenna adapter |
| HLN8097_R | Removable slide mount tray package |
| HLN8098_R | Radio slide mount tray |
| HLN8099_R | Vehicle slide mount tray |
| HLN8143_R | Remote mount kit (18 ft. length) |
| HLN8144_R | Remote mount kit (8 ft. length) |
| HLN8413_R | Slide mount tray bracket |

**Accessories / Kits Interfacing with the 16 Pin Connector:**

| | |
|---|---|
| HKN9327_R | Ignition switch cable |
| HSN8145_R | 7.5 Watt external speaker - for receiver audio |
| HKN9969_R | Accessory for repeater interface communications kit-additional 3 foot, 16 conductor cable for connection to other accessories |

| | |
|---|---|
| HLN3333_R | Repeater interface communications kit- includes interface box, mounting bracket, and two 6 conductor cables |
| HLN9457_R | Hardware kit-includes 16 conn. pins, (9) 8" wires with pins & extra housing |

**Manuals:**

| | |
|---|---|
| 6880903Z03 | Service manual |
| 6880903Z05 | Owner's manual |





# Licensing And Safety Information

Your Radius radio operates on FM radio communication frequencies and is subject to the Rules and Regulations of the Local Communications Governing Agencies. These agencies may require that all operators using Private Land Mobile or General Mobile Radio frequencies obtain a radio license before operating their equipment. The operator receives a license for use of the radio equipment under a specific eligibility and on a particular frequency or set of frequencies. To determine eligibility for use of Private Land Mobile Service frequencies contact your local communications governing agency. They will be able to supply information required to properly obtain and complete the license application form.

**Agency addresses for several countries are listed below:**

**In the United States contact:**

Federal Communications Commission
Consumer Assistance
Branch License Division
Gettysburg, PA 17326
Tel (717) 337-1212

**In Canada contact:**

Head Equipment Approval Unit
Department of Communications
1241 Clyde Avenue
Ottawa, Ontario K2C-1Y3
Canada
Tel (613) 998-5968

**In the United Kingdom contact:**

Radio communications Agency
P.O. Box 20
London
SE1 8TZ
Tel 71 215 2152

**In Mexico contact:**

Secretaria De Comunicaciones Y Transportes
Direccion General De Politicas
Y Normas De Comunicaciones
Av. Eugenia No. 197-5o. Piso
Mexico, D.F. 06700

**In Singapore contact:**

Telecommunications Authority of Singapore
3rd Storey Comcenter
31 Exeter Road
Singapore, 0923
Singapore

**In Japan contact:**

Communications Research Laboratory
Ministry of Posts & Telecommunications
MKK Building
7-2, 5-chome
Yashio, Shinagawaku
Tokyo, 140 Japan

**In Hong Kong contact:**

Hong Kong Telecommunications Authority
Telecommunications Branch
Post Office, Hong Kong
6/F Sincere Building
173 Des Voeux Road Central
Hong Kong





## *Safety Standards*

The FCC, with its action in General Docket 79-144, March 13, 1986, has adopted a safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC regulated equipment. Motorola subscribes to the same safety standard for the use of its products. Proper use of this radio will result in exposure below government limits.

**The following precautions are recommended:**

- **DO NOT** operate the transmitter of a mobile radio when someone outside the vehicle is within two feet (0.6 meter) of the antenna.
- **DO NOT** operate the transmitter of a fixed radio (base station, microwave, the rural telephone RF equipment) or marine radio when someone is within two feet (0.6 meter) of the antenna.
- **DO NOT** operate the transmitter of any radio unless all RF connectors are secure and any open connectors are properly terminated.
- **DO NOT** operate the equipment near electrical blasting caps or in an explosive atmosphere.
- All equipment must be properly grounded according to Motorola installation instructions for safe operation.
- All equipment should be serviced only by a qualified technician.

## *Safety Guidelines*

### INSTALLATION SAFETY WARNING

Consider the occupants' safety when you choose a location for the radio. Do not mount the radio overhead or on a side wall unless you take special precautions.

If someone were to remove the radio and fail to replace it properly, road shock could bump the radio loose, and the falling radio could, in some circumstances, cause serious injury to the driver or a passenger. In a crash, even when properly installed, the radio could break loose and become a dangerous projectile.

If you must mount the radio overhead or on a side wall, give it the added protection of a retaining strap.

### OPERATIONAL SAFETY WARNINGS

WARNING

For vehicles equipped with electronic anti-skid systems, see "ANTI-SKID BRAKING PRECAUTIONS" Publication, Motorola Number 68P81109E34.

WARNING

For vehicles equipped with electronic ignition systems, check the service manual for warnings about the use of two-way radio equipment in the vehicle.





WARNING

It is mandatory that radio installations in vehicles fueled by liquefied petroleum gas conform to the following standards:

National Fire Protection Association standard NFPA 58 applies to radio installations in vehicles fueled by liquefied petroleum (LP) gas with LP gas container in the trunk or other sealed-off space within the interior of the vehicles. This standard requires that:

1. Any space containing radio equipment shall be isolated by a seal from the space in which the LP-gas container and its fittings are located.
2. Remote (outside) fitting connections shall be used.
3. The container space shall be vented to the outside.

CAUTION

### INSTALLATION OF ANTENNAS WITH MOBILE RADIO EQUIPMENT WITH TRANSMITTER POWER IN EXCESS OF 7 WATTS

NOTE

For low power mobile radios (7 watts or less), there are no antenna type or installation restrictions.

Non-Metallic Body Vehicles - In non-metallic body vehicles with transmitters at any frequency having a power output in excess of 7 watts, ***do not*** install any type of antenna closer than 2 feet in distance from any occupant of the vehicle. Failure to follow this procedure may result in the exposure, of the vehicle occupants, to radio frequency energy levels higher than recommended by the American National Standards Institute (ANSI).

Metal Body Vehicles - In metal body vehicles with transmitters at any frequency having a power output in excess of 7 watts, it is mandatory that when using a glass mount antenna the installation instructions covering the location of the antenna at the top of the front or rear window and the

cable routing be followed exactly as described. Failure to follow this procedure may result in the exposure of the vehicle occupants to radio frequency energy exposure levels higher than recommended by the American National Standards Institute (ANSI).

For other antenna types follow the existing installation instructions. The best location for the antenna is at the center of vehicle roof. A good alternate location is at the center of the trunk lid.

**IMPORTANT**

If installations different from these recommendations have already taken place, immediately notify your local Service Representative so that appropriate corrective action can be taken.

**CAUTION**

**UNSAFE USE OF CONVERTED MOBILE EQUIPMENT FOR PORTABLE APPLICATIONS**

Motorola two-way radio products which have been designed for mobile operation should not be used as battery operated portable units. In such use there is the danger that the user or other persons will be exposed to excessive radio frequency energy levels. This warning applies to all two-way radio equipment radiating in excess of seven (7) watts RF power. Motorola strongly recommends that any product which converts high power equipment for portable operation not to be used.





NOTES

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