



# Mobile Radio

APX™ P25

# Enhanced Single Band Mobile Radio Installation Manual

**SEPTEMBER 2019**

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# Foreword

This manual includes all the information necessary to maintain peak product performance and maximum working time, using levels 1 and 2 maintenance procedures.



**CAUTION:** These servicing instructions are for the use of qualified personnel only. To reduce the risk of electric shock, do not service parts other than those contained in the Operating Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

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## European Union (EU) Waste of Electrical and Electronic Equipment (WEEE) directive



■ The European Union's WEEE directive requires that products sold into EU countries must have the crossed out trash bin label on the product (or the package in some cases).

As defined by the WEEE directive, this cross-out trash bin label means that customers and end-users in EU countries should not dispose of electronic and electrical equipment or accessories in household waste.

Customers or end-users in EU countries should contact their local equipment supplier representative or service centre for information about the waste collection system in their country.

# Notations Used in This Manual

Throughout the text in this publication, you will notice the use of warning, caution, and notice notations. These notations are used to emphasize that safety hazards exist, and due care must be taken and observed.



**WARNING:** WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or injury.



**CAUTION:** CAUTION indicates a potentially hazardous situation which, if not avoided, might result in equipment damage.



**NOTICE:** NOTICE indicates an operational procedure, practice, or condition that is essential to emphasize.

## Related Publications

The following list contains part numbers and titles of related publications.

- 68012006035, *ASTRO APX Mobile Radio O2 Control Head User Guide*
- 6875946M01, *ASTRO APX Mobile Radio O3 Control Head User Guide*
- 6875947M01, *ASTRO APX Mobile Radio O5 Control Head User Guide*
- 68012006034, *ASTRO APX Mobile Radio O7 Control Head User Guide*
- 68007024014, *ASTRO APX Mobile Radio O9 Control Head User Guide*
- MN005718A01, *Enhanced Single Band Mobile Radio Basic Service Manual*
- MN005719A01, *Enhanced Single Band Mobile Radio Detailed Service Manual*
- PMLN6193, *ASTRO APX Mobile Radio O2 Quick Reference Card*
- PMLN5591, *ASTRO APX Mobile Radio O3 Quick Reference Card*
- PMLN5592, *ASTRO APX Mobile Radio O5 Quick Reference Card*
- PMLN6194, *ASTRO APX Mobile Radio O7 Quick Reference Card*
- PMLN5711, *ASTRO APX Mobile Radio O9 Quick Reference Card*
- 6881095C99, *RF Energy Exposure Training and Product Safety Information for Mobile Two-Way Radios installed in Vehicles or as Fixed Site Control Stations*

# Commercial Warranty

## Limited Warranty

For information on warranty terms, see the Support page at <https://www.motorolasolutions.com>.

## I. What This Warranty Covers And For How Long

Motorola Solutions Inc. ("Motorola Solutions") warrants the Motorola Solutions manufactured Communication Products listed below ("Product") against defects in material and workmanship under normal use and service for a period of time from the date of purchase as scheduled below:

Mobile Radios	One Year
Product Accessories	One Year

The radios additionally ship with a standard 1-year Repair Service Advantage (RSA) (for U.S. customers) or 1-year Extended Warranty (for Canada customers). However, at the time of order, you may choose to omit these warranties. For more RSA or Extended Warranty information, please refer to the price pages.

Motorola Solutions, at its option, will at no charge either repair the Product (with new or reconditioned parts), replace it (with a new or reconditioned Product), or refund the purchase price of the Product during the warranty period provided it is returned in accordance with the terms of this warranty. Replaced parts or boards are warranted for the balance of the original applicable warranty period. All replaced parts of Product shall become the property of Motorola Solutions.

This express limited warranty is extended by Motorola Solutions to the original end user purchaser only and is not assignable or transferable to any other party. This is the complete warranty for the Product manufactured by Motorola Solutions. Motorola Solutions assumes no obligations or liability for additions or modifications to this warranty unless made in writing and signed by an officer of Motorola Solutions. Unless made in a separate agreement between Motorola Solutions and the original end user purchaser, Motorola Solutions does not warrant the installation, maintenance or service of the Product.

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## II. General Provisions

This warranty sets forth the full extent of Motorola Solutions responsibilities regarding the Product. Repair, replacement or refund of the purchase price, at Motorola Solutions option, is the exclusive remedy.

This warranty is given in lieu of all other express warranties, implied warranties, including without limitation, implied warranties of merchantability and fitness for a particular purpose, are limited to the duration of this limited warranty. In no event shall Motorola Solutions be liable for damages in excess of the purchase price of the product, for any loss of use, loss of time, inconvenience, commercial loss, lost profits or savings or other incidental, special or consequential damages arising out of the use or inability to use such product, to the full extent such may be disclaimed by law.



### III. State Law Rights (Applicable Only in U.S.A.)

Some states do not allow the exclusion or limitation of incidental or consequential damages or limitation on how long an implied warranty lasts, so the above limitation or exclusions may not apply.

This warranty gives specific legal rights, and there may be other rights which may vary from state to state.

### IV. How To Get Warranty Service

You must provide proof of purchase (bearing the date of purchase and Product item serial number) in order to receive warranty service and, also, deliver or send the Product item, transportation, and insurance prepaid, to an authorized warranty service location.

Warranty service will be provided by Motorola Solutions through one of its authorized warranty service locations. If you first contact the company which sold you the Product, it can facilitate your obtaining warranty service.

You can also call Motorola Solutions at 1-800-927-2744 US/Canada.

### V. What This Warranty Does Not Cover

This warranty does not cover the following conditions:

- Defects or damage resulting from use of the Product in other than its normal and customary manner.
- Defects or damage from misuse, accident, water, or neglect.
- Defects or damage from improper testing, operation, maintenance, installation, alteration, modification, or adjustment.
- Breakage or damage to antennas unless caused directly by defects in material workmanship.
- A Product subjected to unauthorized Product modifications, disassemblies or repairs (including, without limitation, the addition to the Product of non-Motorola Solutions supplied equipment) which adversely affect performance of the Product or interfere with Motorola Solutions normal warranty inspection and testing of the Product to verify any warranty claim.
- Product which has had the serial number removed or made illegible.
- Rechargeable batteries if:
  - Any of the seals on the battery enclosure or cells are broken or show evidence of tampering.
  - The damage or defect is caused by charging or using the battery in equipment or service other than the Product for which it is specified.
- Freight costs to the repair depot.
- A Product which, due to illegal or unauthorized alteration of the software/firmware in the Product, does not function in accordance with Motorola Solutions published specifications or the FCC type acceptance labeling in effect for the Product at the time the Product was initially distributed from Motorola Solutions.
- Scratches or other cosmetic damage to Product surfaces that does not affect the operation of the Product.
- Normal and customary wear and tear.



**WARNING:** The circuitry found on the control head and its associated interface boards is designed to function "as-is". Any attempt at modifying or altering the circuitry would void the warranty, and/or could result in radio malfunction or hazardous conditions for the radio and its associated vehicle.

## VI. Patent And Software Provisions

Motorola Solutions will defend, at its own expense, any suit brought against the end user purchaser to the extent that it is based on a claim that the Product or parts infringe a United States patent, and Motorola Solutions will pay those costs and damages finally awarded against the end user purchaser in any such suit which are attributable to any such claim.

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## VII. Governing Law

This Warranty is governed by the laws of the State of Illinois, USA.

## Notice

# Installation Requirements for Compliance with Radio Frequency (RF) Energy Exposure Safety Standards

**CAUTION:** This radio is intended for use in occupational/controlled conditions, where users have full knowledge of their exposure and can exercise control over their exposure to meet FCC limits. This radio device is NOT authorized for general population, consumer, or any other use.

To ensure compliance to RF Energy Safety Standards:

- Install only Motorola Solutions approved antennas and accessories.
- Be sure that antenna installation is per [Antenna Installation on page 62](#) of this manual.
- Be sure that the Product Safety and RF Safety Booklet enclosed with this radio is available to the end user upon completion of the installation of this radio.

Before using this product, read the guide enclosed with your radio which contains important operating instructions for safe usage and RF energy awareness and control for compliance with applicable standards and regulations.

For a list of Motorola Solutions-approved antennas and other accessories, visit <http://www.motorolasolutions.com>.



**WARNING:** This equipment is compliant with Class A of EN55032. In a residential environment, this equipment may cause radio interference.

# Introduction

This manual covers the installation procedures for ASTRO mobile and motorcycle radios with O2, O3, O5, O7, and O9 control heads and accessories required to complete the radio system.

The radio system consists of a control head, radio, antenna, microphone, speaker, cabling, Universal Relay Controller (URC), and accessories.

## 1.1

### Mobile Radio Description

This chapter covers the basic dimension of the mobile radio.

#### 1.1.1

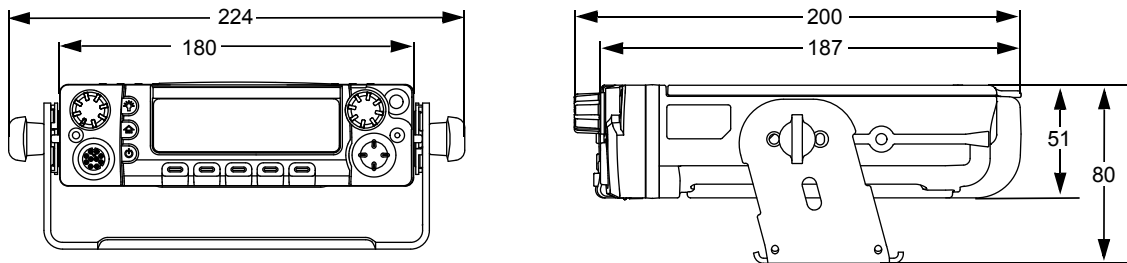
### Dimensions

When installing the radio, make sure to plan the installation carefully and leave extra room in the rear of the radio for cabling and accessory connections. Leave extra space in the front of the radio for access, controls, and cabling (if remote mount) and to the sides of the radio so that you can access and install the trunnion screws/wing screws.

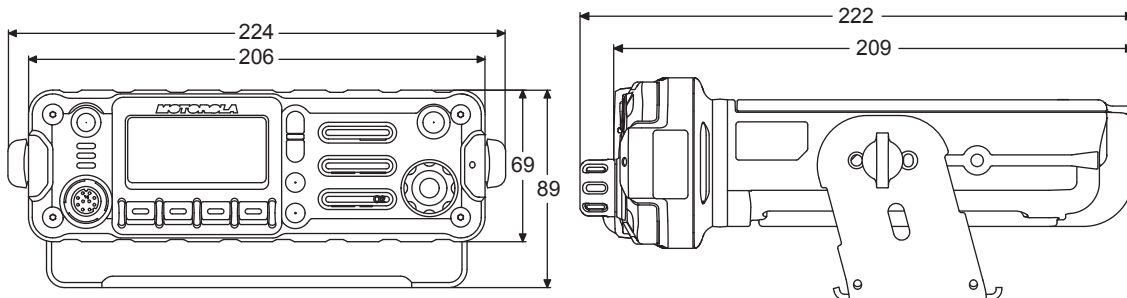


**NOTICE:** The rear accessory connector adds 0.75 in. to the overall length. The remote mount length is 244 mm.

**Figure 1: Front and Side View of O5 Control Head with Dash Mount Transceiver and Trunnion**

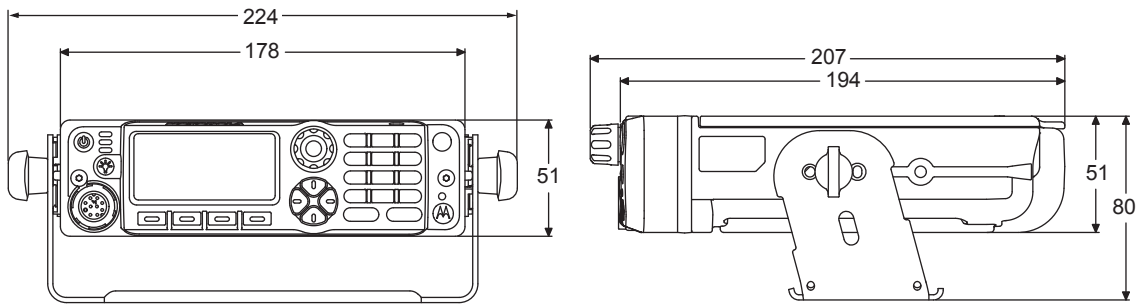


**Figure 2: Front and Side View of O2 Control Head with Dash Mount Transceiver and Trunnion**

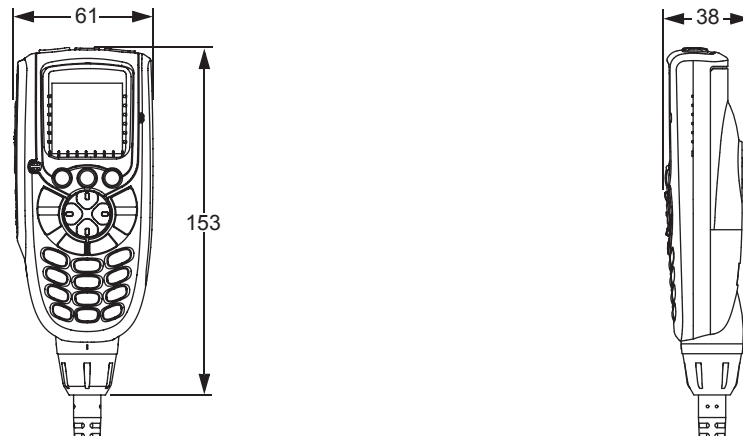


**NOTICE:** The rear accessory connector adds 0.75 in. to the overall length. The remote mount length is 194 mm.

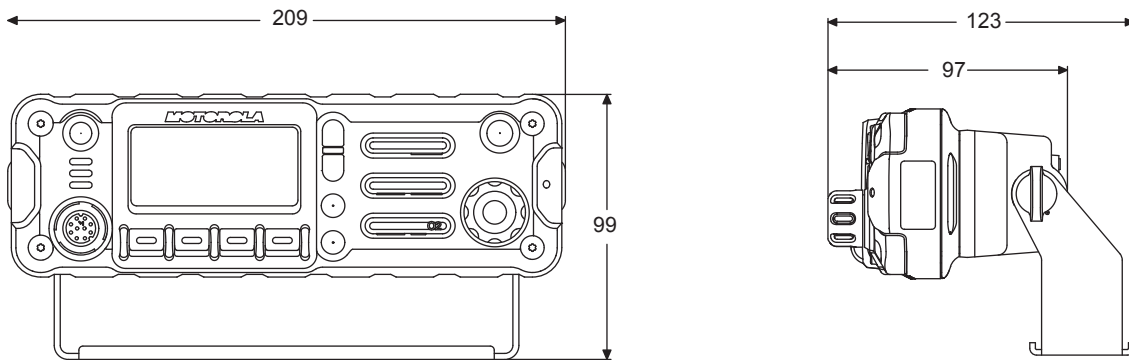
**Figure 3: Front and Side View of O7 Control Head with Dash Mount Transceiver and Trunnion**



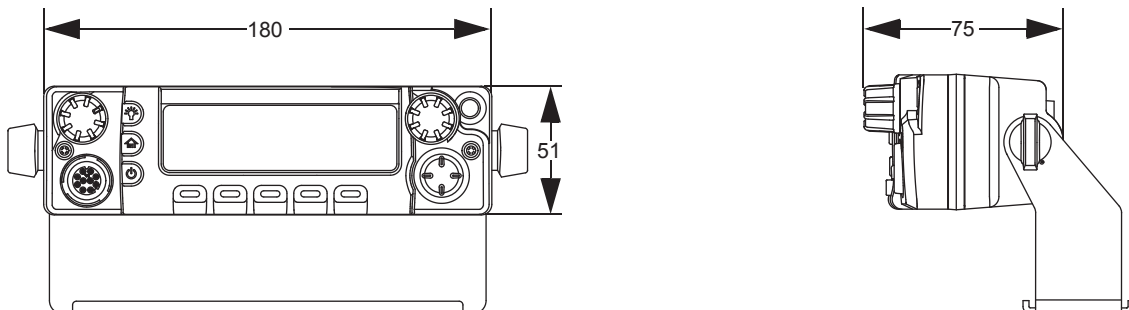
**Figure 4: Front and Side View of O3 Control Head with Coiled Cable**



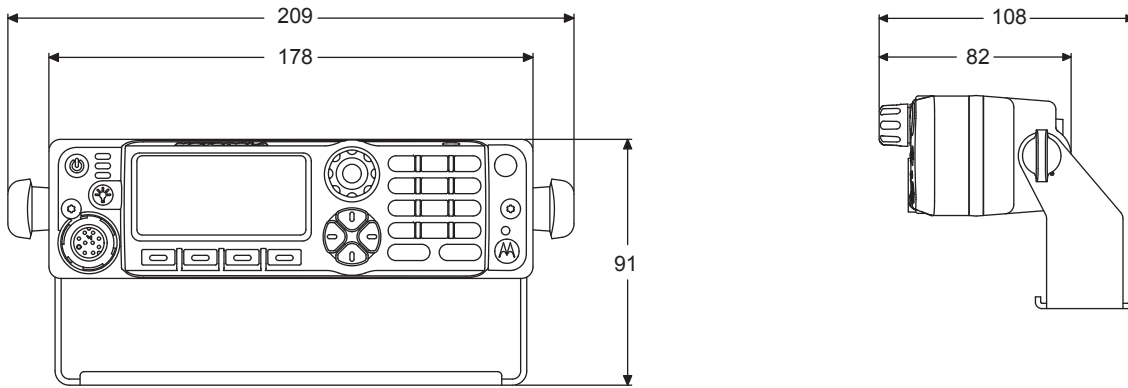
**Figure 5: Front and Side View of O2 Control Head with Remote Mount and Trunnion**



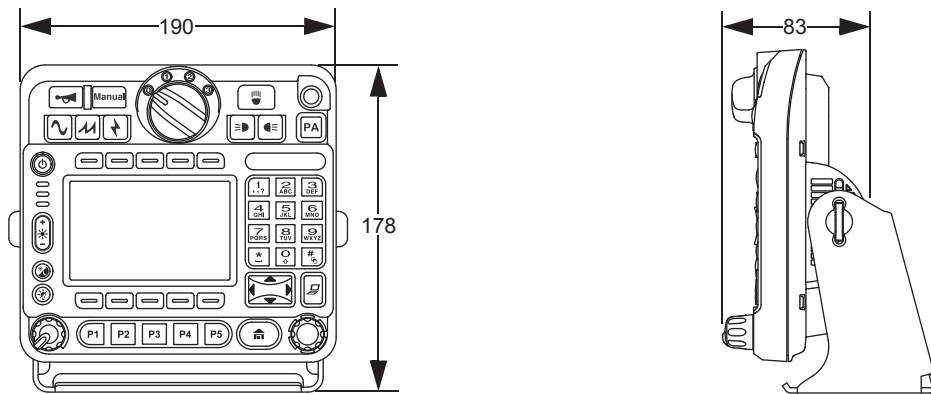
**Figure 6: Front and Side View of O5 Control Head with Remote Mount and Trunnion**



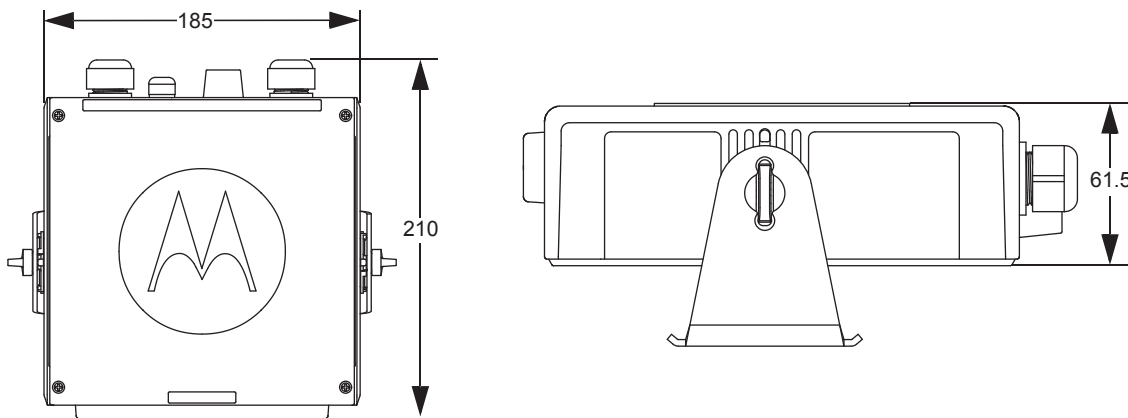
**Figure 7: Front and Side View of O7 Control Head with Remote Mount and Trunnion**



**Figure 8: Front and Side View of O9 Control Head with Trunnion**



**Figure 9: Top and Side View of O9 Universal Relay Controller (URC) with Trunnion (URC is an orderable accessory)**



1.2

## Standard Configurations

This chapter covers the dash mount, remote mount, and multi-control head configurations.

1.2.1

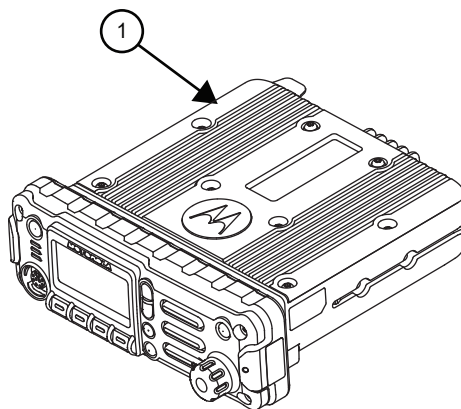
### Dash Mount Configuration

There are two versions of the mobile dash mount.

The first are the O2, O5, and O7 control heads which are mounted on the front of the transceiver housing. The second is the O3 control head which is connected to the transceiver through a coiled cable, which is plugged into the CAN connector on the transceiver.

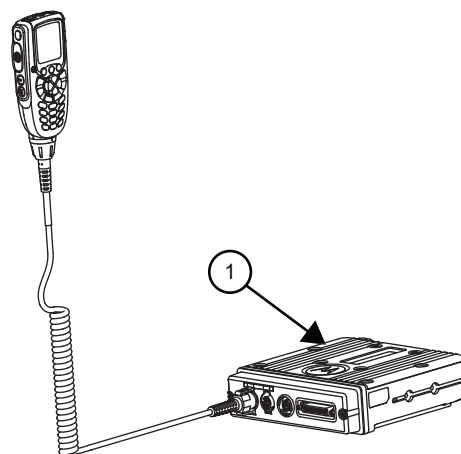
Electrical connection between the two takes place within the radio through a flexible circuit board between the connectors on the front of the transceiver and at the back of the control head for O2, O5, and O7 and between the connectors on the front of the transceiver and at the back of the TIB for the O3.

**Figure 10: Dash Mount Configuration for O2 Control Head**



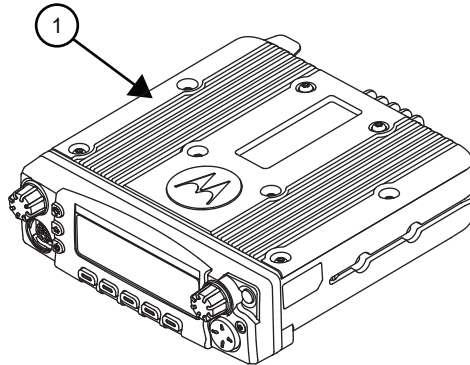
No.	Description
1	ASTRO 25 Subscribers Enhanced Single Band Mobile Radio

**Figure 11: Dash Mount Configuration for O3 Control Head**



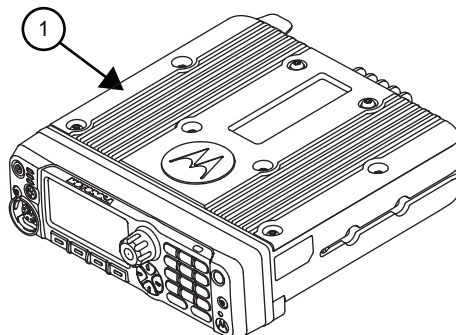
No.	Description
1	ASTRO 25 Subscribers Enhanced Single Band Mobile Radio

**Figure 12: Dash Mount Configuration for O5 Control Head**



No.	Description
1	ASTRO 25 Subscribers Enhanced Single Band Mobile Radio

**Figure 13: Dash Mount Configuration for O7 Control Head**



No.	Description
1	ASTRO 25 Subscribers Enhanced Single Band Mobile Radio

### 1.2.2

## Remote Mount Configuration

In the remote control version, the transceiver and the control head are mounted separately in the vehicle.

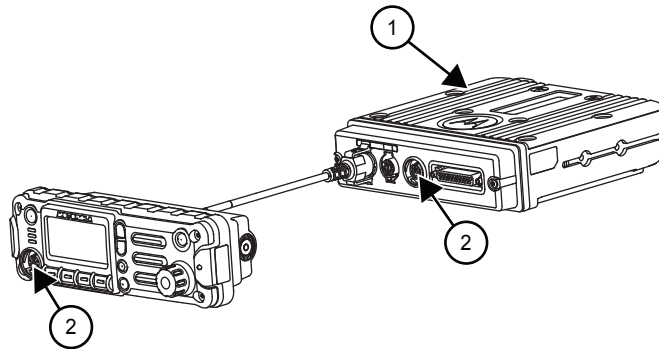
The O2, O5, and O7 control heads are mounted in remote trunnions near the operator. The O3 and O9 control heads are also mounted near the operator using extension cables. The transceiver and control head are mounted using a trunnion or other mounting hardware. If the transceiver is located in a car trunk, ensure that it is mounted securely and that sufficient cooling is provided. Do not cover the transceiver with baggage, blankets, and others.



**NOTICE:** The keypad mic should only be plugged into the Modified Modular Plug (MMP) connector located on the control head, in either dash mount or remote mount configuration.

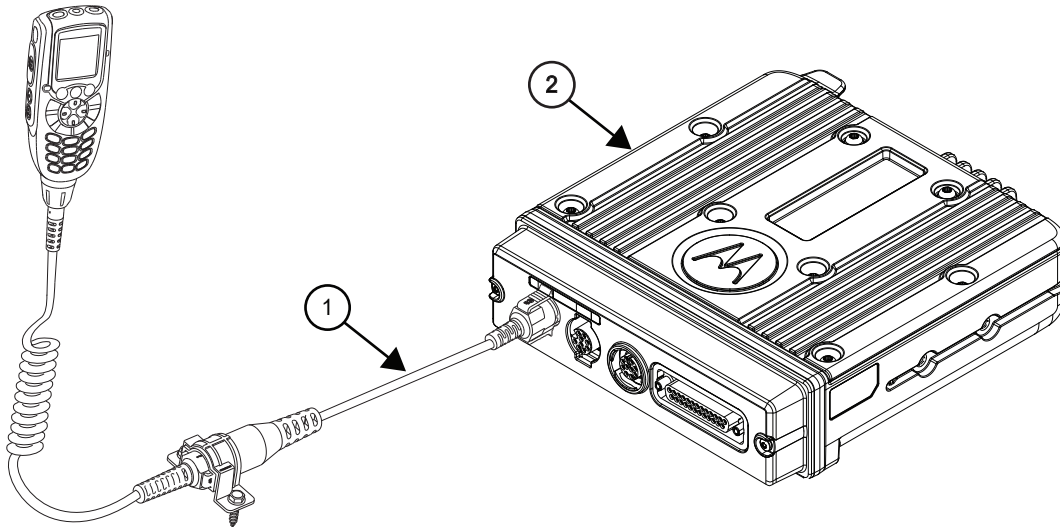


**Figure 14: Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board, CHIB Rear Assembly, and O2 Control Head**



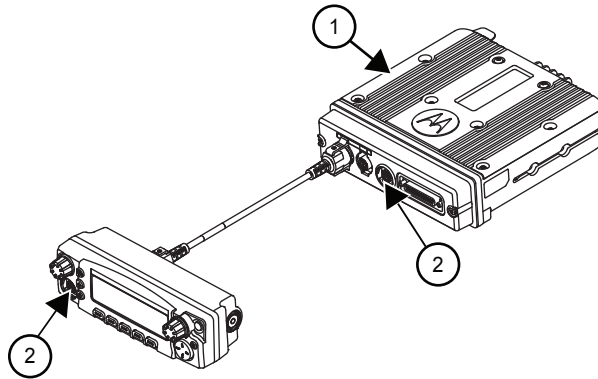
No.	Description
1	ASTRO 25 Subscribers Enhanced Single Band Mobile Radio
2	MMP

**Figure 15: Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board, and O3 Control Head**



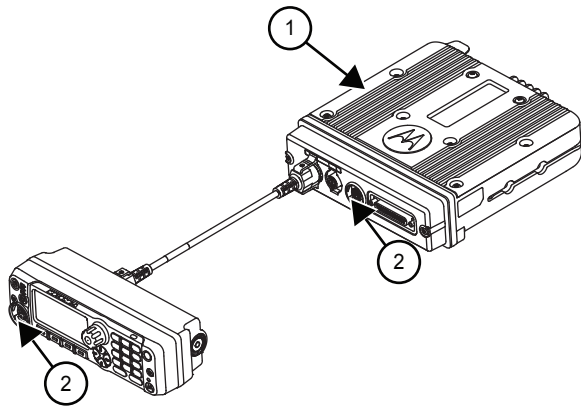
No.	Description
1	5 m (17 ft) Extension Cable
2	ASTRO 25 Subscribers Enhanced Single Band Mobile Radio

**Figure 16: Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board, CHIB Rear Assembly, and O5 Control Head**



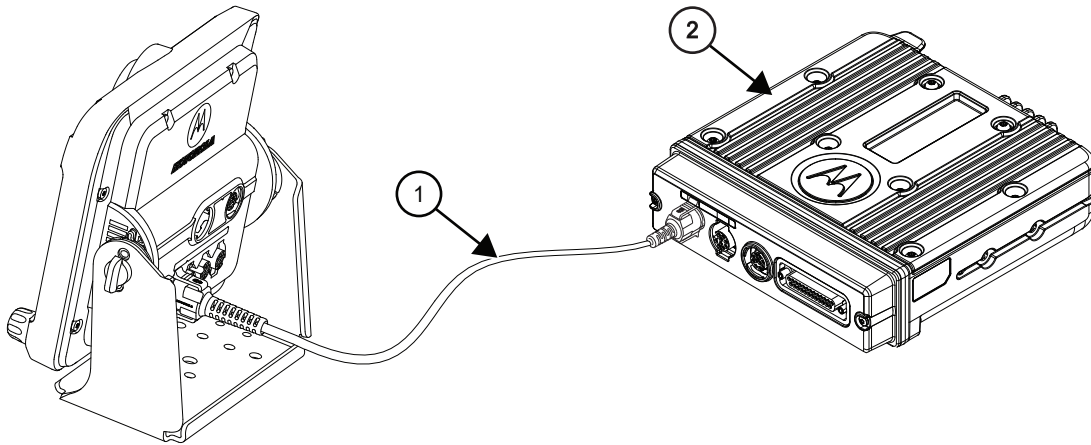
No.	Description
1	ASTRO 25 Subscribers Enhanced Single Band Mobile Radio
2	MMP

**Figure 17: Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board, CHIB Rear Assembly, and O7 Control Head**



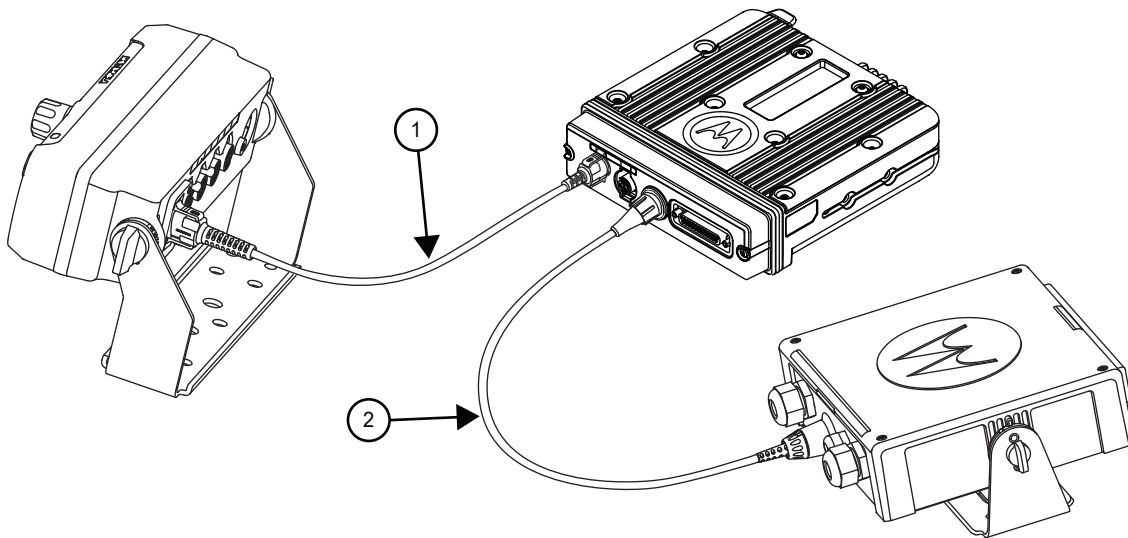
No.	Description
1	ASTRO 25 Subscribers Enhanced Single Band Mobile Radio
2	MMP

**Figure 18: Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board, and O9 Control Head**



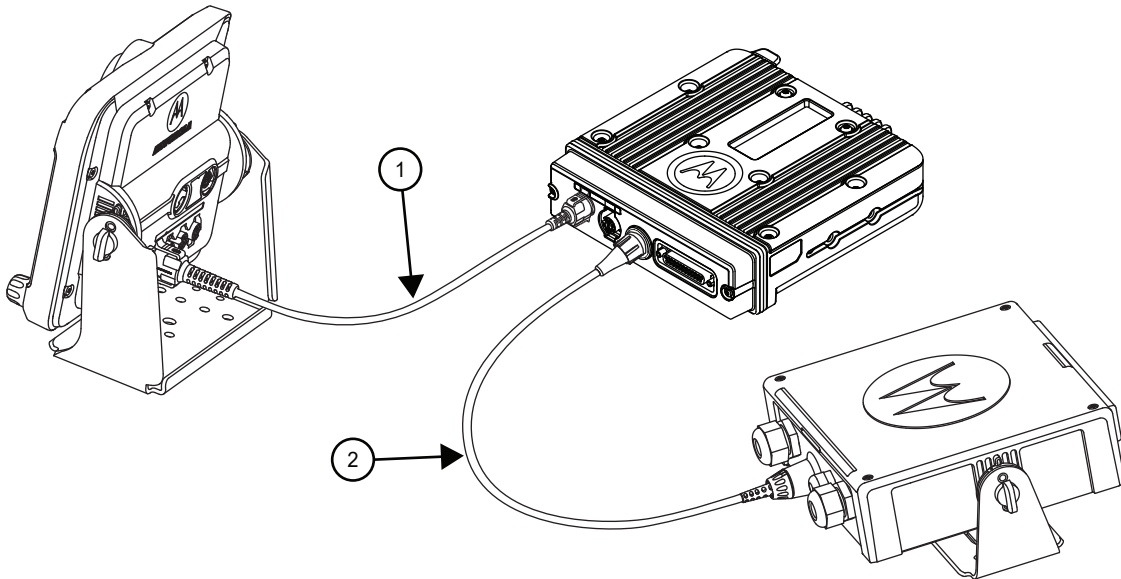
No.	Description
1	17 ft Extension Cable
2	ASTRO 25 Subscribers Enhanced Single Band Mobile Radio

**Figure 19: Remote Mount Configuration with Mid Power Radio Transceiver, Universal Relay Controller (URC), and O7 Control Head (URC is optional)**



No.	Description
1	17 ft Extension Cable
2	O7 to URC Cable

**Figure 20: Remote Mount Configuration with Mid Power Radio Transceiver, Universal Relay Controller (URC), and O9 Control Head (URC is optional)**



No.	Description
1	17 ft Extension Cable
2	O9 to URC Cable

### 1.2.3

## Multi Control Head

The multi control head option allows separate, remotely operated control heads to operate and control the radio.

For example, a fire truck could have a control head located in the cab and on the rear of the truck so that the radio could be operated from outside the vehicle.



**NOTICE:** The dual control head can be used together in the future.

### 1.3

## Motorcycle Configurations

The mobile motorcycle radio models provide most of the equipment needed for installing a standard mobile radio on a motorcycle.

Most of this radio system is standard equipment. See [Motorcycle Radio Installation on page 94](#) for further information.



**NOTICE:** The motorcycle configurations are not applicable O9 control heads.

### 1.4

## Base/Control Stations



**NOTICE:** The base/control station option is not applicable for O9 control heads.

The antenna installation must comply with the following requirements if mobile radio equipment is installed at a fixed location and operated as a control station or as a fixed unit to ensure optimal performance and compliance with the RF energy exposure limits in the standards and guidelines listed in the 6881095C99 manual:

- The antenna should be mounted outside the building on the roof or a tower if at all possible.
- As with all fixed site antenna installations, it is the responsibility of the licensee to manage the site in accordance with applicable regulatory requirements and may require additional compliance actions such as site survey measurements, signage, and site access restrictions to ensure that exposure limits are not exceeded.

## 1.5

### Tools Required for Radio Installations

These are the tools required for mobile radio installation.

Table 1: Tools Required for Radio Installations

Tool	Part Number
10 mm wrench	–
5 mm Allen wrench	–
Rubber-coated pliers	–
Regular slot screwdriver of Phillips #2	–
Pin removal tool	6680163F01
RF antenna tool	HLN6695_
Wing screw torque tool	HLN6970_

# Standard Configurations

The radio operates only in negative ground electrical systems with a valid operating range of 10.8–16.3 VDC. Before starting the installation, ensure that the ground polarity of the vehicle is correct. Accidentally reversing the polarity could damage the radio and cause the cable fuses to blow.

## 2.1

### Planning the Installation

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



**CAUTION:**

Before installing any electrical equipment, check the user manual of the vehicle for warnings or recommendations.

Authorized servicer or installer should complete the installation of this device. Failure to properly install the device may result in damage to the device, or improper operation.

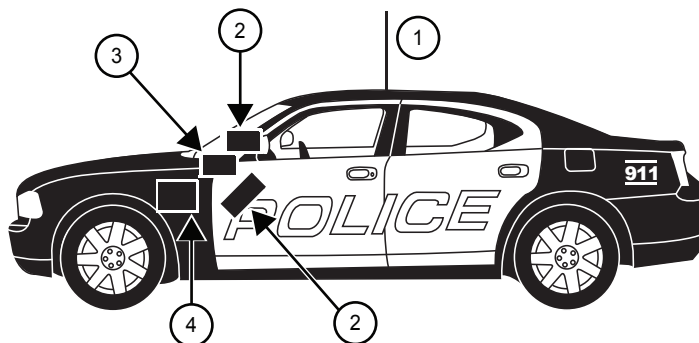
#### 2.1.1

### Installation Examples

The mobile two-way radio offers various methods of installation, with accessories placed to the vehicle as desired. The radio can be dash or remote mounted except for the O9 control head, which can only be mounted remotely.

**Figure 21: Dash Mount Installation**

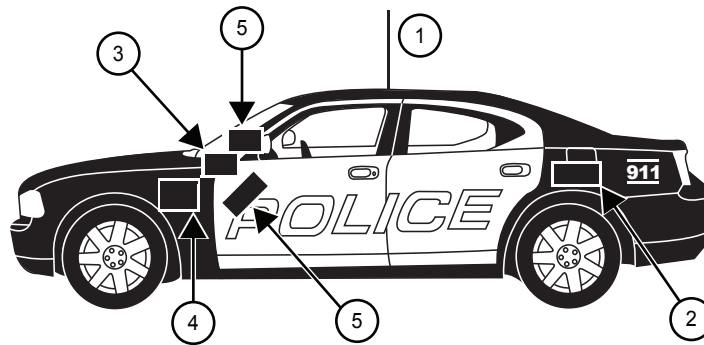
Dash mount radios mounted in the middle console, on the transmission hump, or under the dash,



No.	Description
1	Antenna ¼-Wavelength
2	Radio
3	Speaker
4	Battery

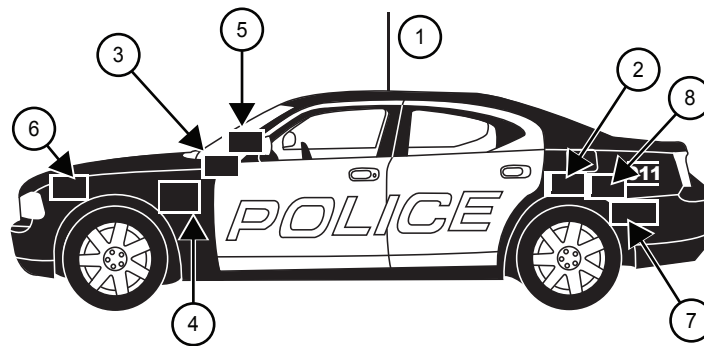
**Figure 22: Remote Mount Installation**

Remote mount radio control heads mounted in the middle console, on the transmission hump, or under the dash.



No.	Description
1	Antenna 1/4-Wavelength
2	Radio
3	Speaker
4	Battery
5	Control Head

**Figure 23: Remote Mount Installation for Radio with O9 Control Head and Universal Relay Controller (URC is optional)**



No.	Description
1	Antenna 1/4-Wavelength
2	Radio
3	Speaker
4	Battery
5	Control Head
6	Siren Speaker
7	Universal Relay Controller Box
8	Siren Box