APX™ TWO-WAY RADIOS

APX MOBILES 02, 03, 05, 07 & 09 CONTROL HEAD INSTALLATION MANUAL

Foreword

This manual covers the O2, O3, O5, O7 and O9 models of the ASTRO® APX™ mobile radios. It includes all the information necessary to install mid power and high power radios, and configure radio installation inside vehicles.

For details on radio operation or component-level troubleshooting, refer to the applicable manuals available separately. A list of related publications is provided in the section “Related Publications,” on page vi.

RF Energy Exposure and Product Safety Guide for Mobile Two-way Radios

See “Installation Requirements for Compliance with Radio Frequency (RF) Energy Exposure Safety Standards,” on page ii.

Manual Revisions

Changes which occur after this manual is printed are described in PMRs (Publication Manual Revisions). These PMRs provide complete replacement pages for all added, changed, and deleted items.
To obtain PMRs, go to https://businessonline.motorola.com.

Parts Ordering

See Appendix A: Replacement Parts Ordering for information on how to obtain replacement parts. For part numbers, refer to the ASTRO APX Mobile Radio Basic Service Manual (Motorola publication part number 6875964M01).

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

ATTENTION!

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 approved antennas and accessories
- Be sure that antenna installation is per “Antenna Installation,” on page 2-38 of this manual
- Be sure that 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-approved antennas and other accessories, visit the following web site which lists approved accessories for your radio model: http://www.motorolasolutions.com.

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Related Publications

ASTRO APX Mobile Radio O2 Control Head User Guide 68012006035
ASTRO APX Mobile Radio O3 Control Head User Guide 6875946M01
ASTRO APX Mobile Radio O5 Control Head User Guide 6875947M01
ASTRO APX Mobile Radio O7 Control Head User Guide 68012006034
ASTRO APX Mobile Radio O9 Control Head User Guide 68007024014
ASTRO APX Mobile Radio Basic Service Manual 6875964M01
ASTRO APX Mobile Radio Detailed Service Manual 6875963M01

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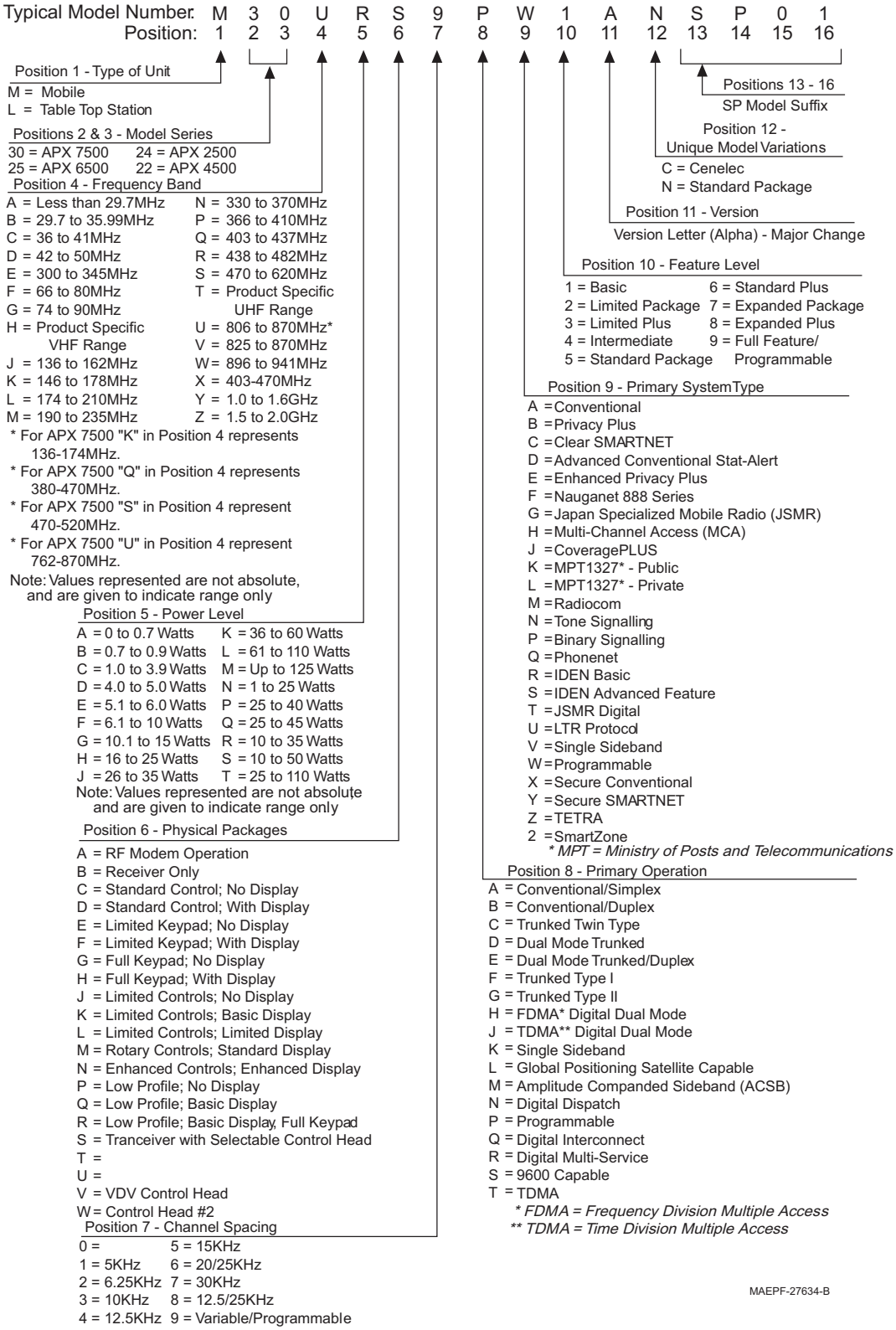
Mobile Radio Model Numbering Scheme



Notes

Commercial Warranty

Limited Warranty

MOTOROLA COMMUNICATION PRODUCTS

I. What This Warranty Covers And For How Long

MOTOROLA SOLUTIONS INC. (“MOTOROLA”) warrants the MOTOROLA 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:

ASTRO APX Mobile Radio	One (1) Year
Product Accessories	One (1) Year

Motorola, 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.

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

MOTOROLA cannot be responsible in any way for any ancillary equipment not furnished by MOTOROLA which is attached to or used in connection with the Product, or for operation of the Product with any ancillary equipment, and all such equipment is expressly excluded from this warranty. Because each system which may use the Product is unique, MOTOROLA disclaims liability for range, coverage, or operation of the system as a whole under this warranty.

II. General Provisions

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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 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 at 1-888-567-7347 US/Canada.

V. What This Warranty Does Not Cover

A. Defects or damage resulting from use of the Product in other than its normal and customary manner.

B. Defects or damage from misuse, accident, water, or neglect.

C. Defects or damage from improper testing, operation, maintenance, installation, alteration, modification, or adjustment.

D. Breakage or damage to antennas unless caused directly by defects in material workmanship.

E. A Product subjected to unauthorized Product modifications, disassemblies or repairs (including, without limitation, the addition to the Product of non-Motorola supplied equipment) which adversely affect performance of the Product or interfere with Motorola's normal warranty inspection and testing of the Product to verify any warranty claim.

F. Product which has had the serial number removed or made illegible.

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- any of the seals on the battery enclosure of 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.

H. Freight costs to the repair depot.

I. A Product which, due to illegal or unauthorized alteration of the software/firmware in the Product, does not function in accordance with MOTOROLA’s published specifications or the FCC certification labeling in effect for the Product at the time the Product was initially distributed from MOTOROLA.

J. Scratches or other cosmetic damage to Product surfaces that does not affect the operation of the Product.

K. Normal and customary wear and tear.

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A. that MOTOROLA will be notified promptly in writing by such purchaser of any notice of such claim;

B. that MOTOROLA will have sole control of the defense of such suit and all negotiations for its settlement or compromise; and

C. should the Product or parts become, or in MOTOROLA's opinion be likely to become, the subject of a claim of infringement of a United States patent, that such purchaser will permit MOTOROLA, at its option and expense, either to procure for such purchaser the right to continue using the Product or parts or to replace or modify the same so that it becomes noninfringing or to grant such purchaser a credit for the Product or parts as depreciated and accept its return. The depreciation will be an equal amount per year over the lifetime of the Product or parts as established by MOTOROLA.

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VII. Governing Law

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

Notes

Chapter 1 Introduction

This manual covers the installation procedures for ASTRO APX 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

1.1.1 Dimensions

Figure 1-1, Figure 1-2, Figure 1-3 and Figure 1-4 show the basic dimensions of the dash mount transceiver trunnion APX mobile radio. The transceiver portion of a remote mount APX mobile is sized similarly.

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

NOTE: The measurement unit used in Figure 1-1 to Figure 1-22 is millimeter.

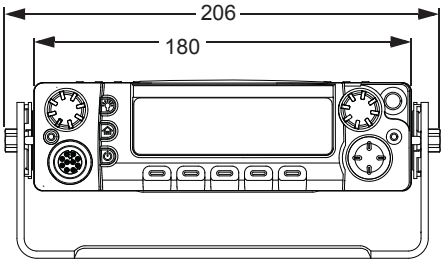


Figure 1-1. Front View of APX 7500 Mid Power Dash Mount Transceiver and Trunnion

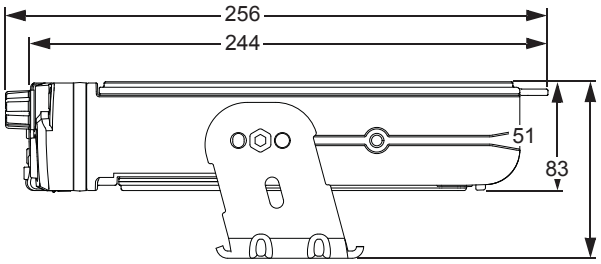


Figure 1-2. Side View of APX 7500 Mid Power Dash Mount Transceiver and Trunnion

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

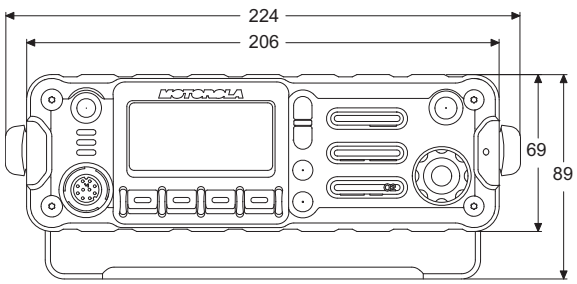


Figure 1-3. Front View of APX 2500/4500 Mid Power Dash Mount Transceiver and Trunnion

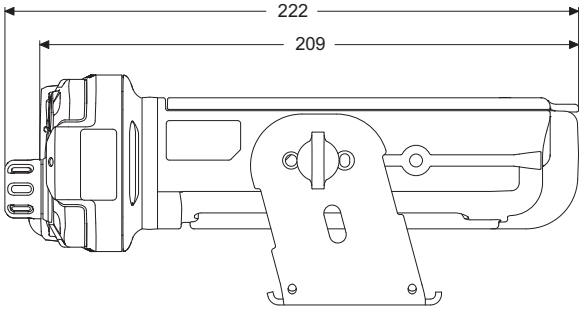


Figure 1-4. Side View of APX 2500/4500 Mid Power Dash Mount Transceiver and Trunnion

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

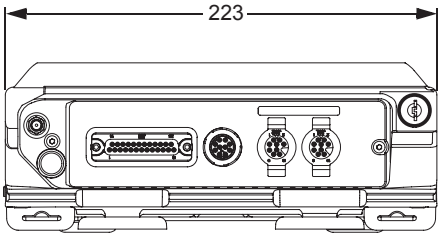


Figure 1-5. Front View of APX 7500 High Power (100W) Transceiver and Trunnion

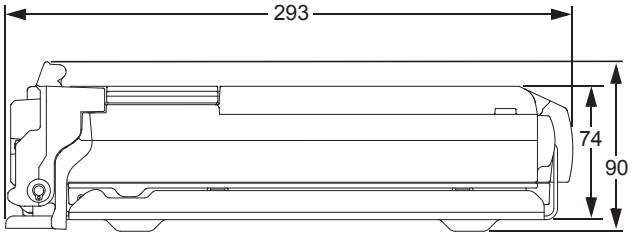


Figure 1-6. Side View of APX 7500 High Power (100W) Transceiver and Trunnion

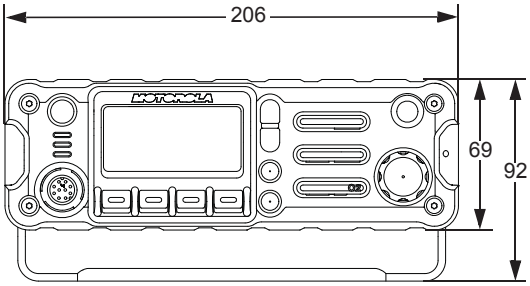


Figure 1-7. Front View of O2 Control Head Attached to APX 7500 Mid Power Dash Mount Transceiver and Trunnion

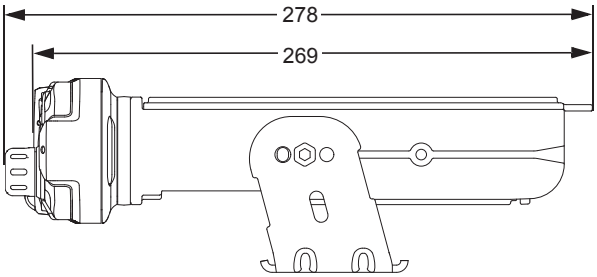


Figure 1-8. Side View of O2 Control Head Attached to APX7500 Mid Power Dash Mount Transceiver and Trunnion

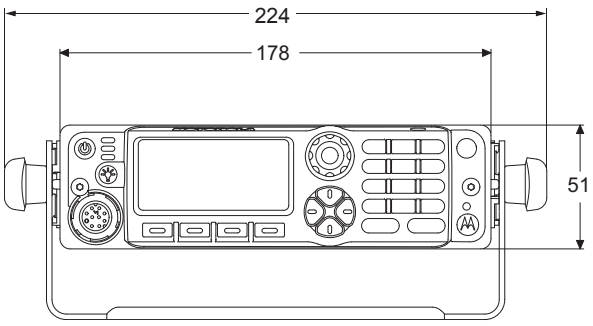


Figure 1-9. Front View of O7 Control Head Attached to APX 2500 Mid Power Dash Mount Transceiver and Trunnion

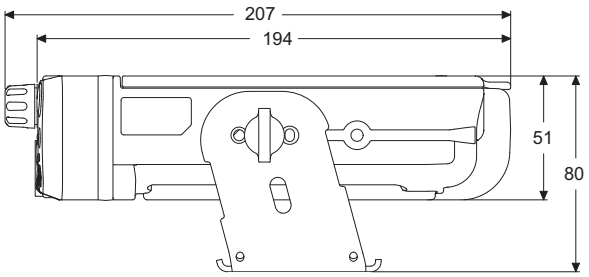


Figure 1-10. Side View of O7 Control Head Attached to APX 2500 Mid Power Dash Mount Transceiver and Trunnion

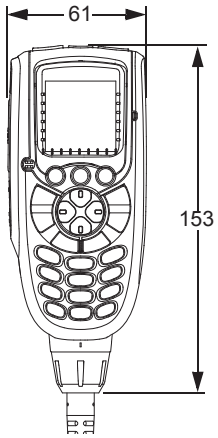


Figure 1-11. Front View of O3 Control Head with Coiled Cable

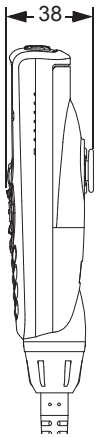


Figure 1-12. Side View of O3 Control Head with Coiled Cable

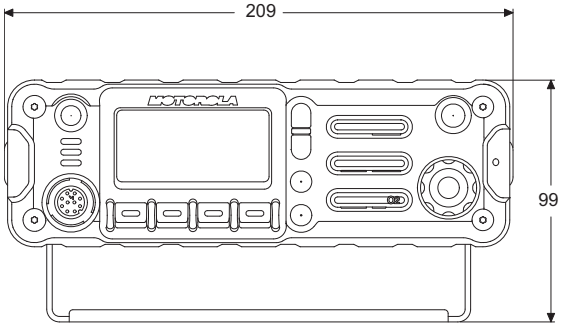


Figure 1-13. Front View of O2 Control Head with Remote Mount and Trunnion

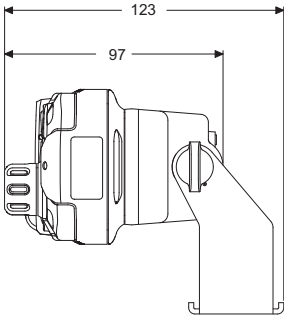


Figure 1-14. Side View of O2 Control Head with Remote Mount and Trunnion

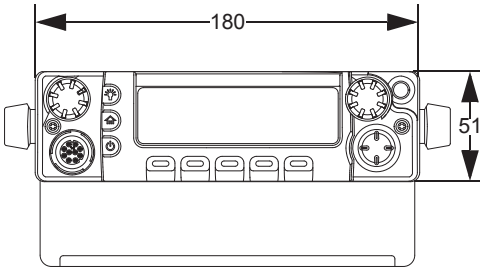


Figure 1-15. Front View of O5 Control Head with Remote Mount and Trunnion

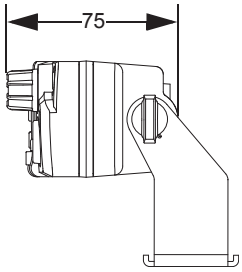


Figure 1-16. Side View of O5 Control Head with Remote Mount and Trunnion

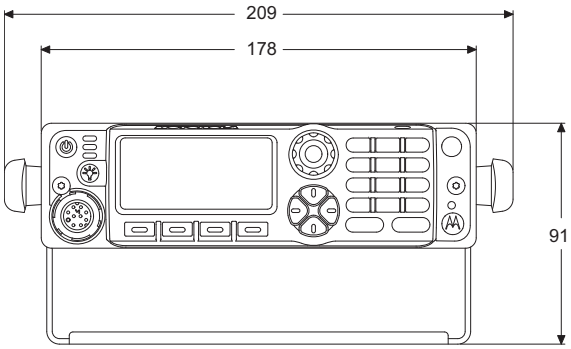


Figure 1-17. Front View of O7 Control Head with Remote Mount and Trunnion

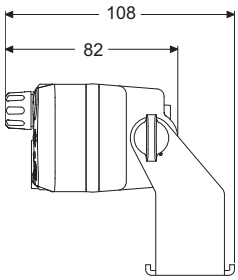


Figure 1-18. Side View of O7 Control Head with Remote Mount and Trunnion

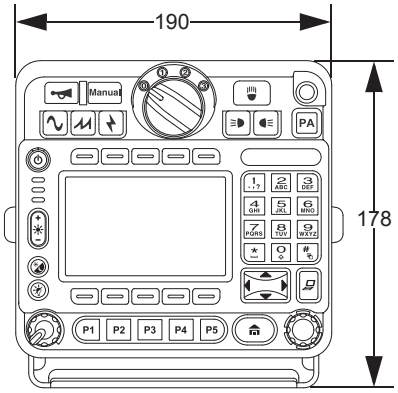


Figure 1-19. Front View of O9 Control Head with Trunnion

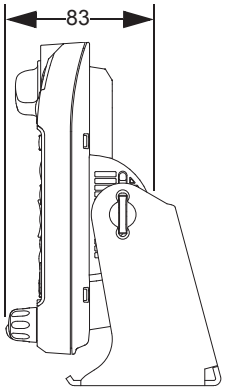


Figure 1-20. Side View of O9 Control Head with Trunnion

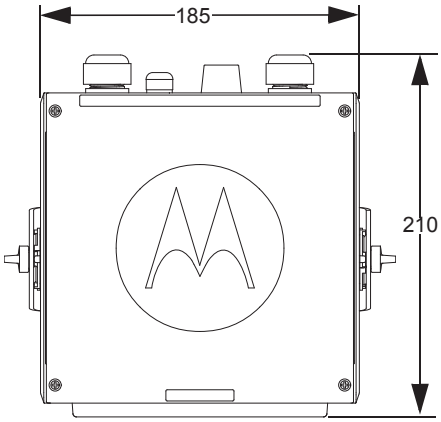


Figure 1-21. Top View of O9 Universal Relay Controller with Trunnion (URC is an orderable accessory.)

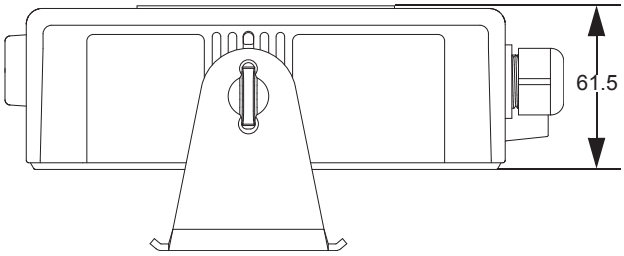


Figure 1-22. Side View of O9 Universal Relay Controller with Trunnion (URC is an orderable accessory.)

1.2 Standard Configurations

1.2.1 Dash Mount Configuration

NOTE: The dash mount configuration is not applicable for 100W radios and O9 control heads.

There are two versions of the APX 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 via a coiled cable, which is plugged into the CAN connector on the transceiver.

Electrical connection between the two takes place within the radio via 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.

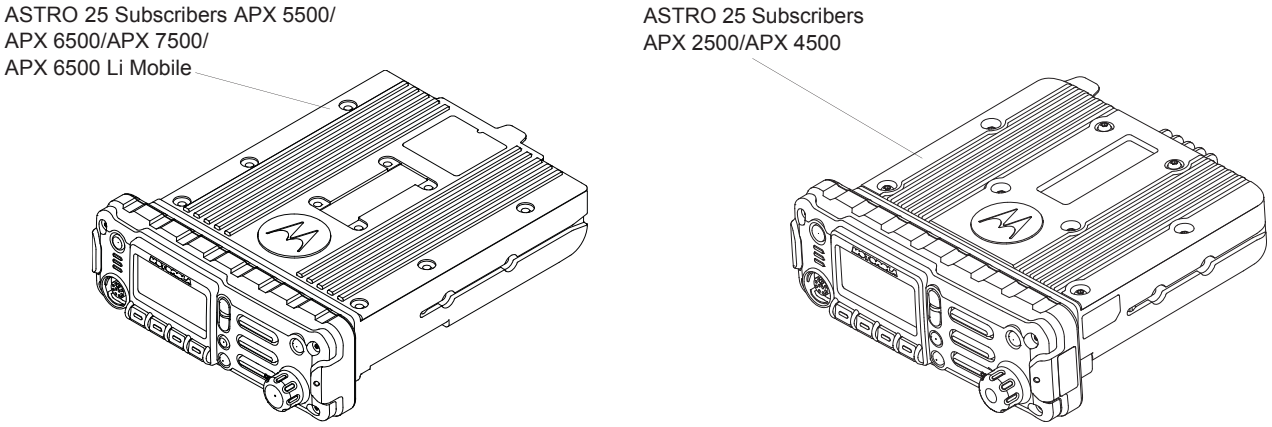


Figure 1-23. Dash Mount Configuration for O2 Control Head

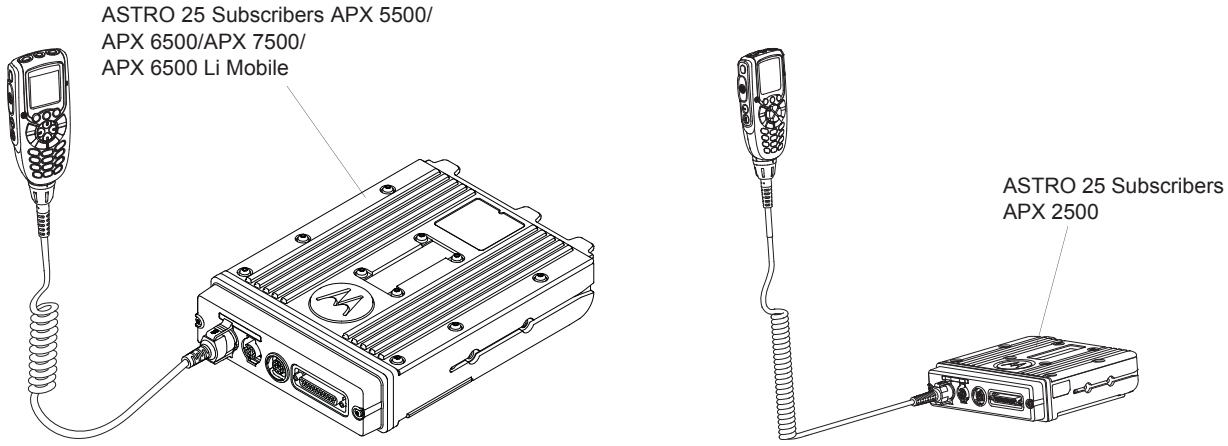


Figure 1-24. Dash Mount Configuration for O3 Control Head

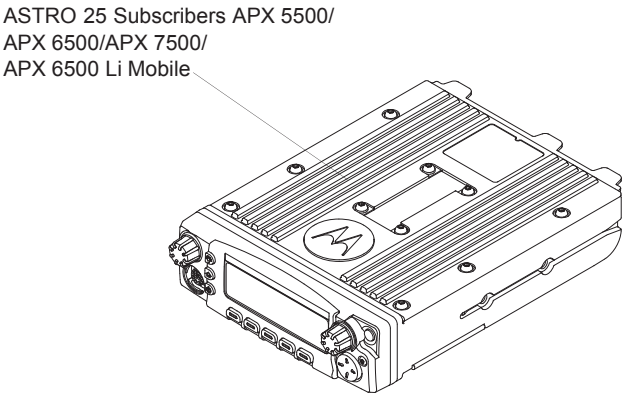


Figure 1-25. Dash Mount Configuration for O5 Control Head (Only Applicable for ASTRO 25 Subscribers APX 5500/APX 6500/APX 7500/APX 6500 Li Mobile)

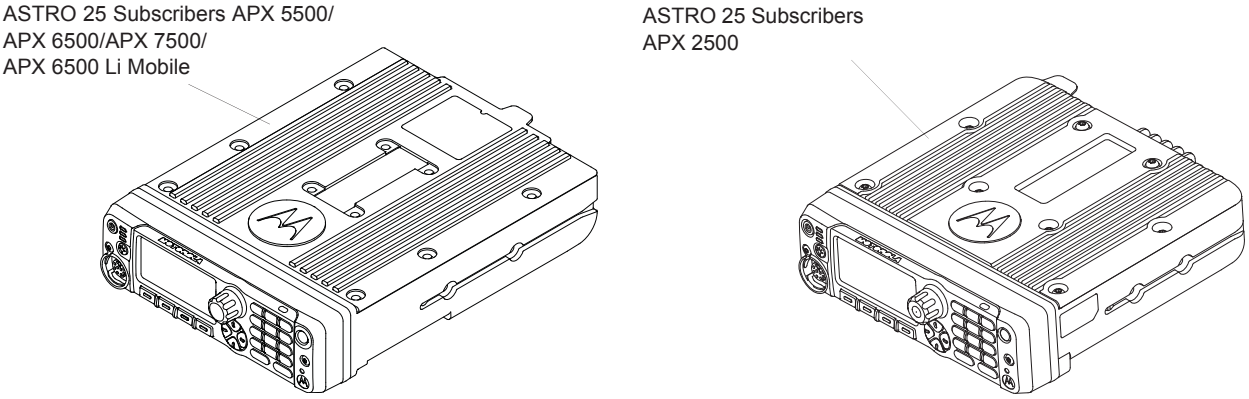


Figure 1-26. Dash Mount Configuration for O7 Control Head

For details on this configuration, see Section 2.2.1 on page 2-21.

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, etc.

NOTE: 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.

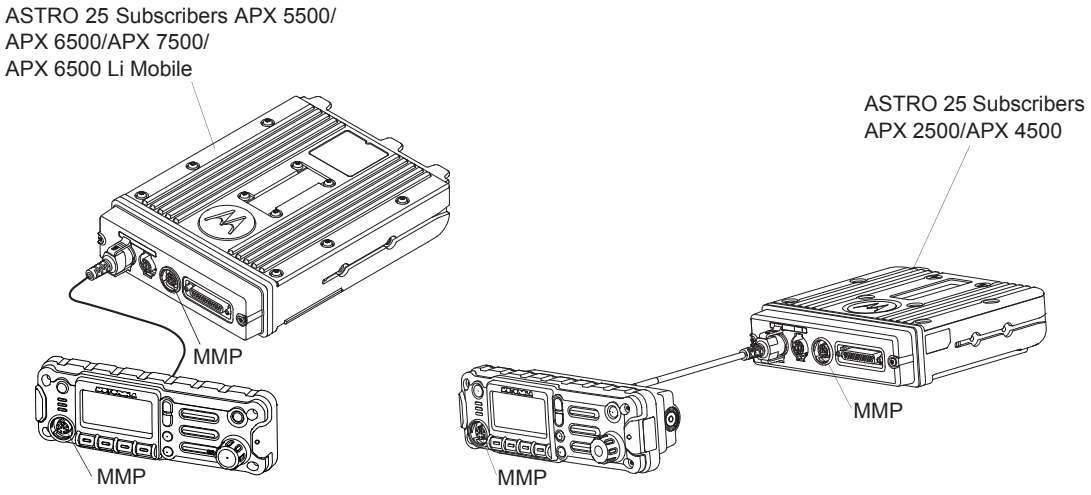


Figure 1-27. Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board, CHIB Rear Assembly and O2 Control Head

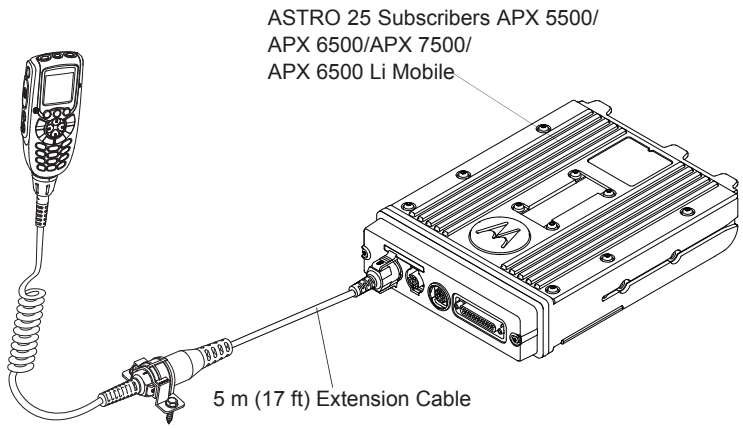


Figure 1-28. Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board and O3 Control Head

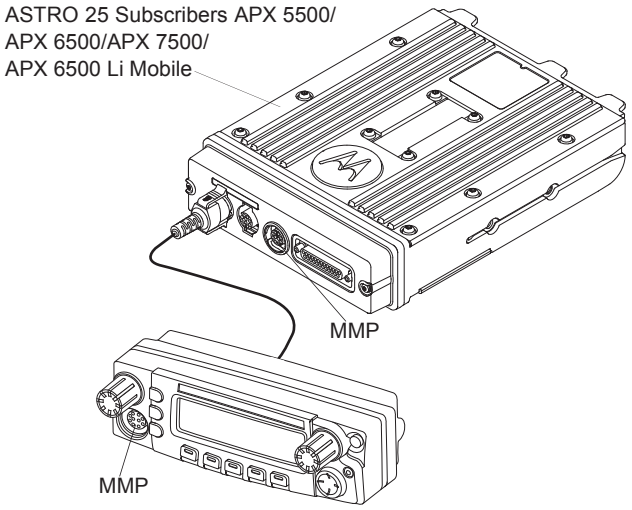


Figure 1-29. Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board, CHIB Rear Assembly and O5 Control Head

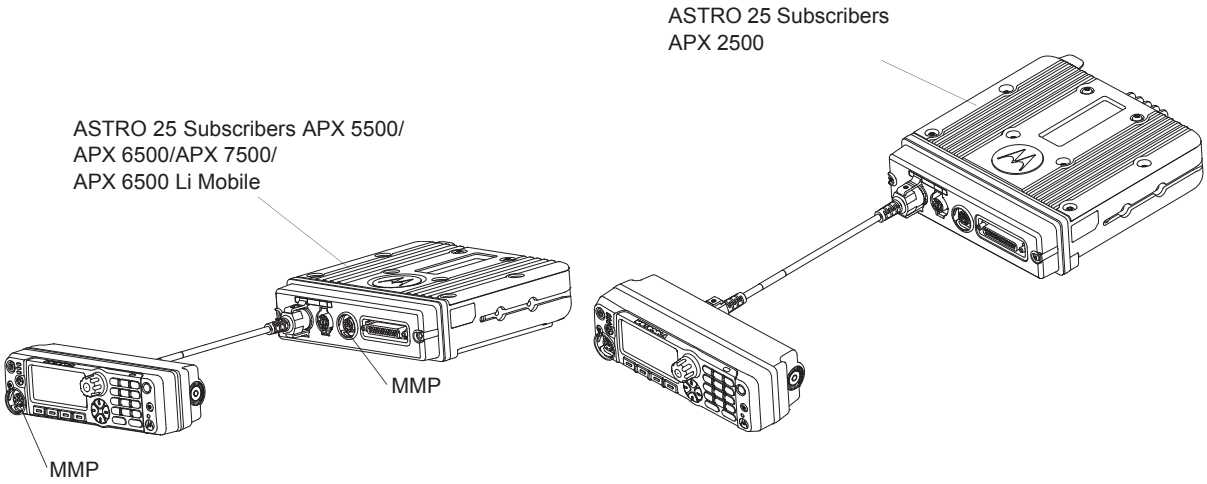


Figure 1-30. Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board, CHIB Rear Assembly and O7 Control Head

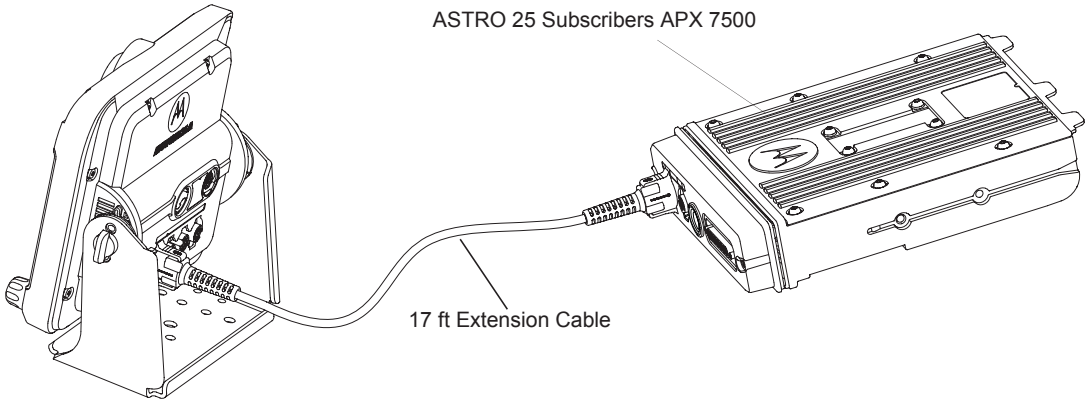


Figure 1-31. Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board and O9 Control Head

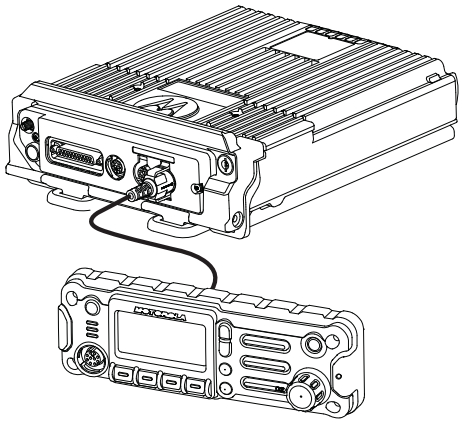


Figure 1-32. Remote Mount Configuration with High Power (100W) Radio Transceiver and O2 Control Head

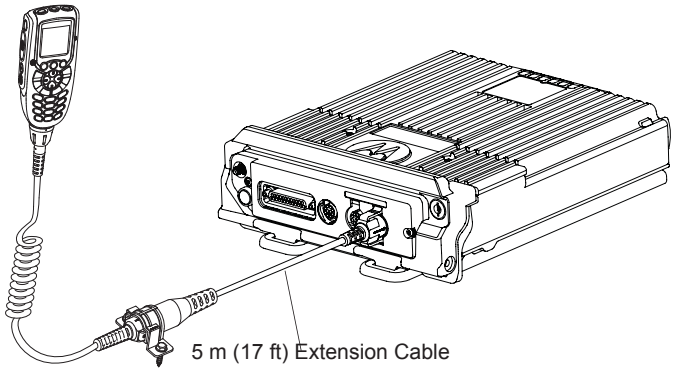


Figure 1-33. Remote Mount Configuration with High Power (100W) Radio Transceiver and O3 Control Head

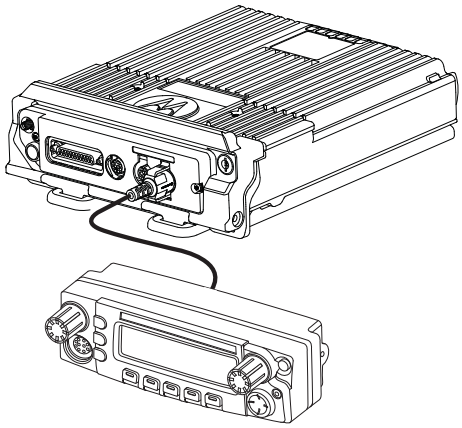


Figure 1-34. Remote Mount Configuration with High Power (100W) Radio Transceiver and O5 Control Head

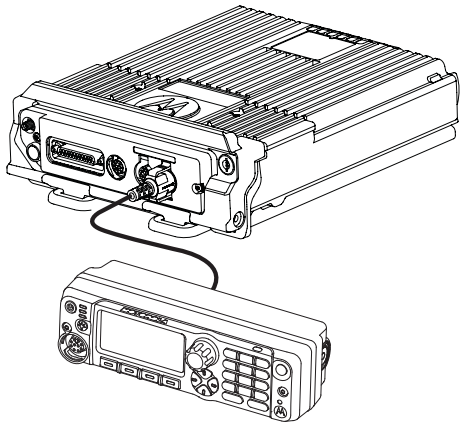


Figure 1-35. Remote Mount Configuration with High Power (100W) Radio Transceiver and O7 Control Head

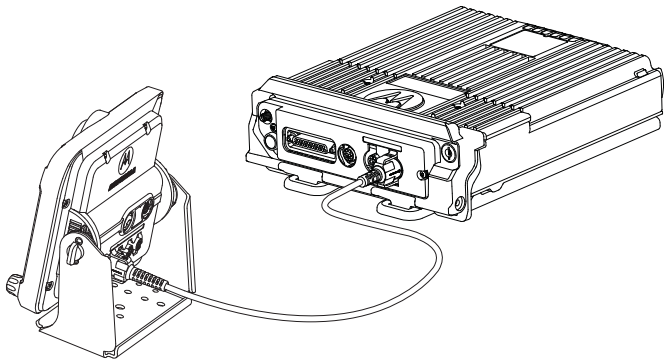


Figure 1-36. Remote Mount Configuration with High Power (100W) Radio Transceiver and O9 Control Head

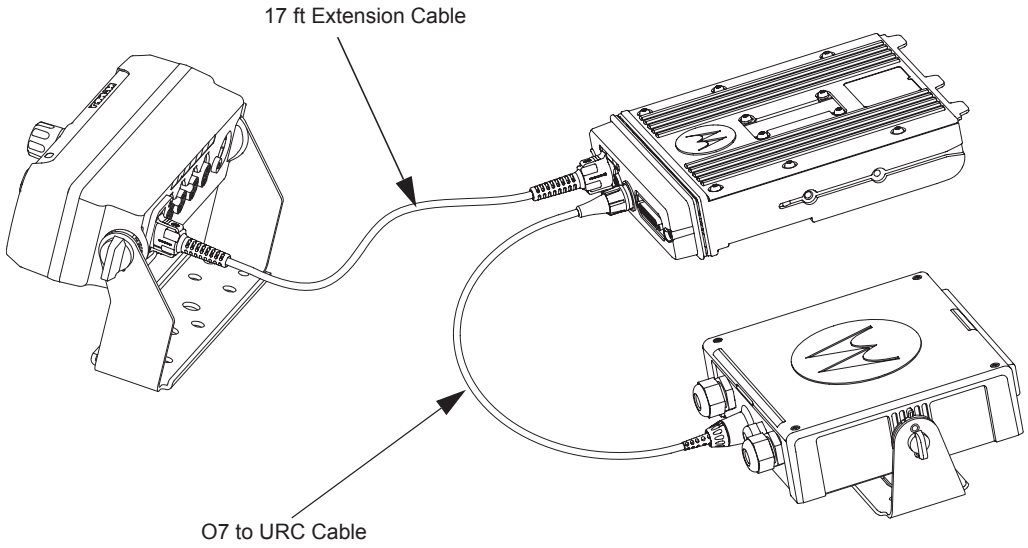


Figure 1-37. Remote Mount Configuration with Mid Power Radio Transceiver, Universal Relay Controller and O7 Control Head (URC is optional.)

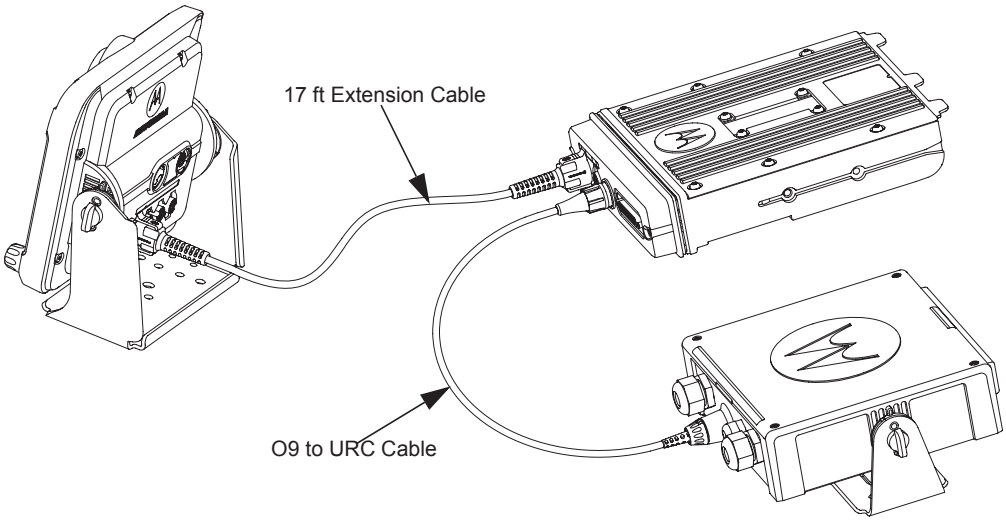


Figure 1-38. Remote Mount Configuration with Mid Power Radio Transceiver, Universal Relay Controller and O9 Control Head (URC is optional.)

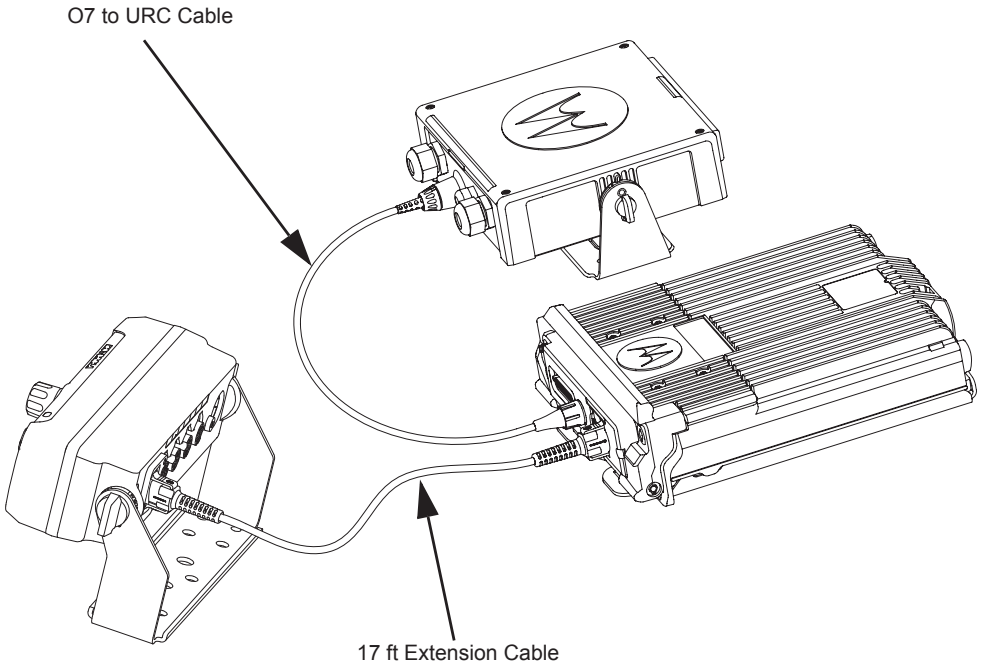


Figure 1-39. Remote Mount Configuration with High Power (100W) Radio Transceiver, Universal Relay Controller and O7 Control Head (URC is optional.)

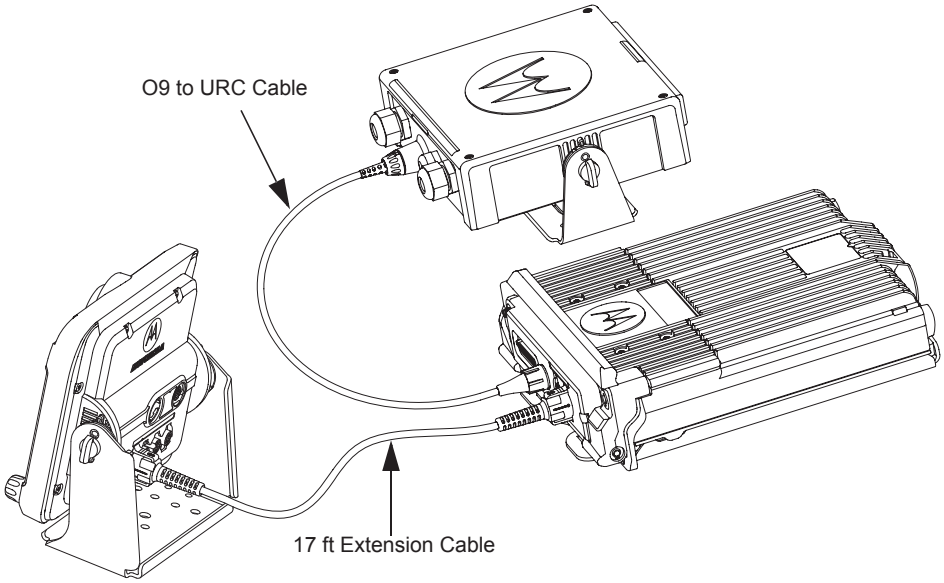


Figure 1-40. Remote Mount Configuration with High Power (100W) Radio Transceiver, Universal Relay Controller and O9 Control Head (URC is optional.)

For details on these configurations, see Section 2.2.2 on page 2-23.

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.

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

1.3 Motorcycle Configurations

NOTE: The motorcycle configurations are not applicable for 100W radios and O9 control heads.

The ASTRO APX mobile motorcycle radio models provide most of the equipment needed for installing a standard ASTRO APX mobile radio on a motorcycle. Most of this radio system is standard equipment. See Chapter 5: Motorcycle Radio Installation for further information.

1.4 Base/Control Stations

NOTE: The base/control station option is not applicable for 100W radios and O9 control heads.

If mobile radio equipment is installed at a fixed location and operated as a control station or as a fixed unit, the antenna installation must comply with the following requirements in order 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 in order to ensure that exposure limits are not exceeded.

1.5 Tools Required for APX Mobile 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_

Chapter 2 Standard Configurations

2.1 Planning the Installation

The APX mobile radio operates only in negative ground electrical systems with a valid operating range of 10.8VDC to 16.3VDC. Before starting the radio installation, make sure that the ground polarity of the vehicle is correct. Accidentally reversing the polarity will not damage the radio, but will cause the cable fuses to blow.

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 runs to provide maximum protection from inching, crushing, and overheating.

Caution

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

The installation of this device should be completed by an authorized servicer or installer. 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 a dash or remote mount except for the 100W radio or with 09 control head, which can only be mounted remotely. The O9 control head with the radio and the URC can only be mounted remotely (see Figure 2-3).

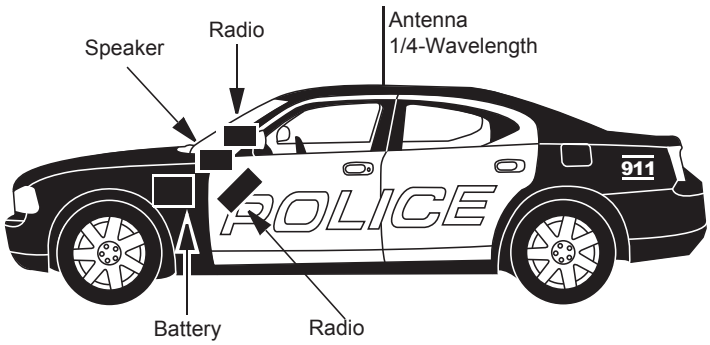


Figure 2-1. Dash Mount Radios Can Be Located in the Middle Console, on the Transmission Hump, or Under the Dash (See Figure 2-2 for 100W Radio Install)

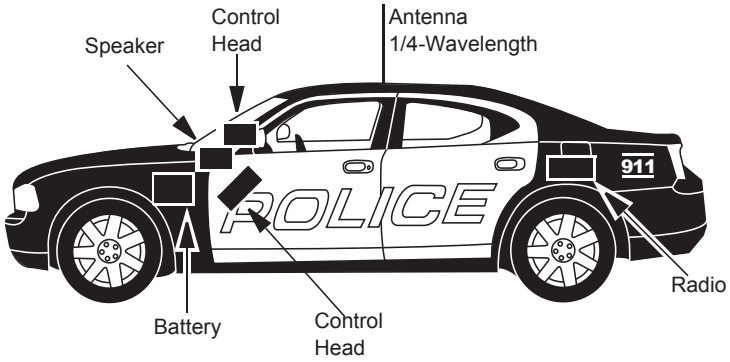


Figure 2-2. Remote Mount Radio Control Heads Can Be Located in the Middle Console, on the Transmission Hump, or Under the Dash

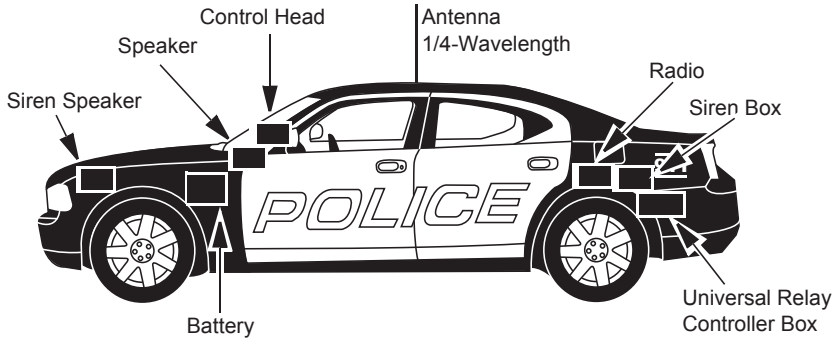


Figure 2-3. Remote Mount of the Radio, O9 Control Head and Universal Relay Controller (URC is optional.)

NOTE: 100W radio install is typically at the rear vehicle compartment.

2.1.2 Wiring Diagrams

Figure 2-6 through Figure 2-17 show the wiring diagrams for all the possible configurations. The title under each figure identifies the O2, O3, O5, O7 or O9 control head configurations. Identify which of these figures shows the configuration that you are installing, and use the diagram when planning the installation.

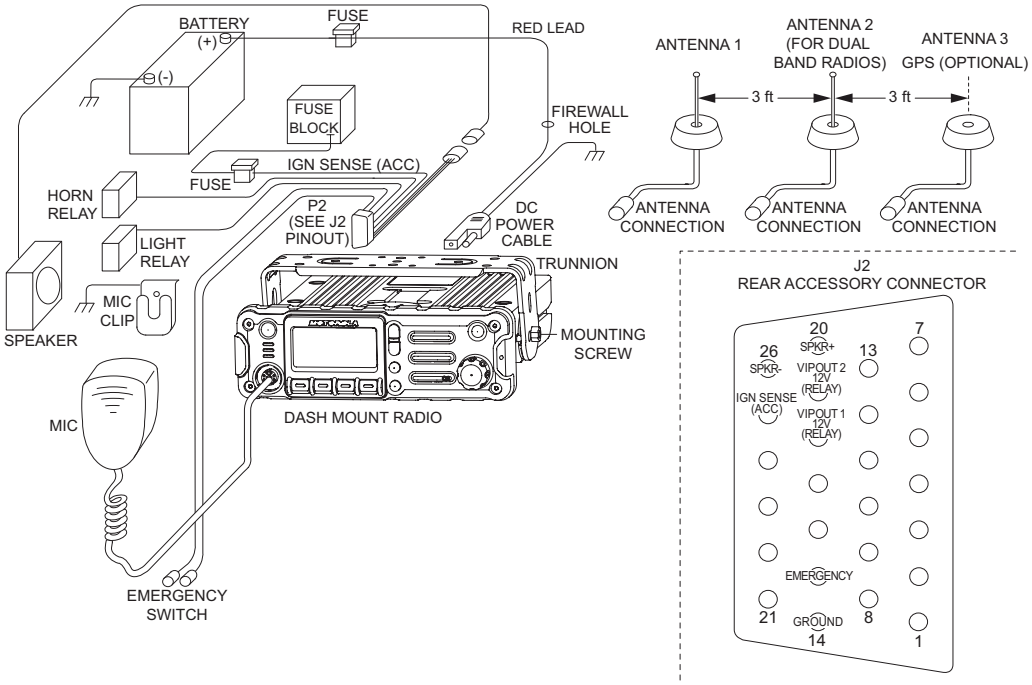


Figure 2-4. Radio Installation (O2 Mid Power Dash Mount)

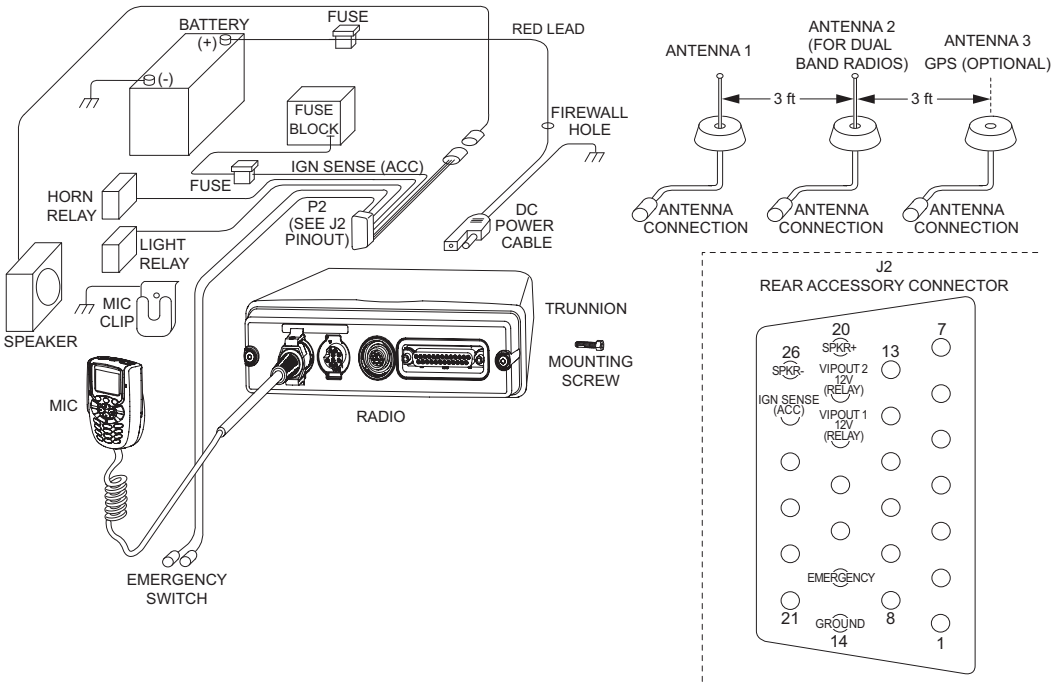


Figure 2-5. Radio Installation (O3 Mid Power Dash Mount)

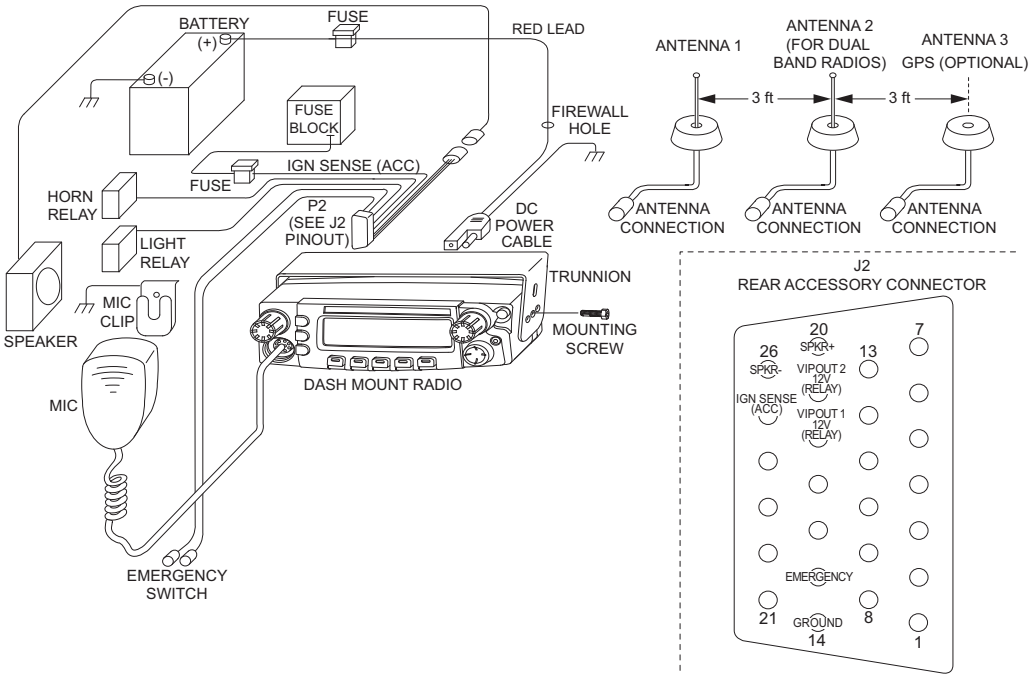


Figure 2-6. Radio Installation (O5 Mid Power Dash Mount)

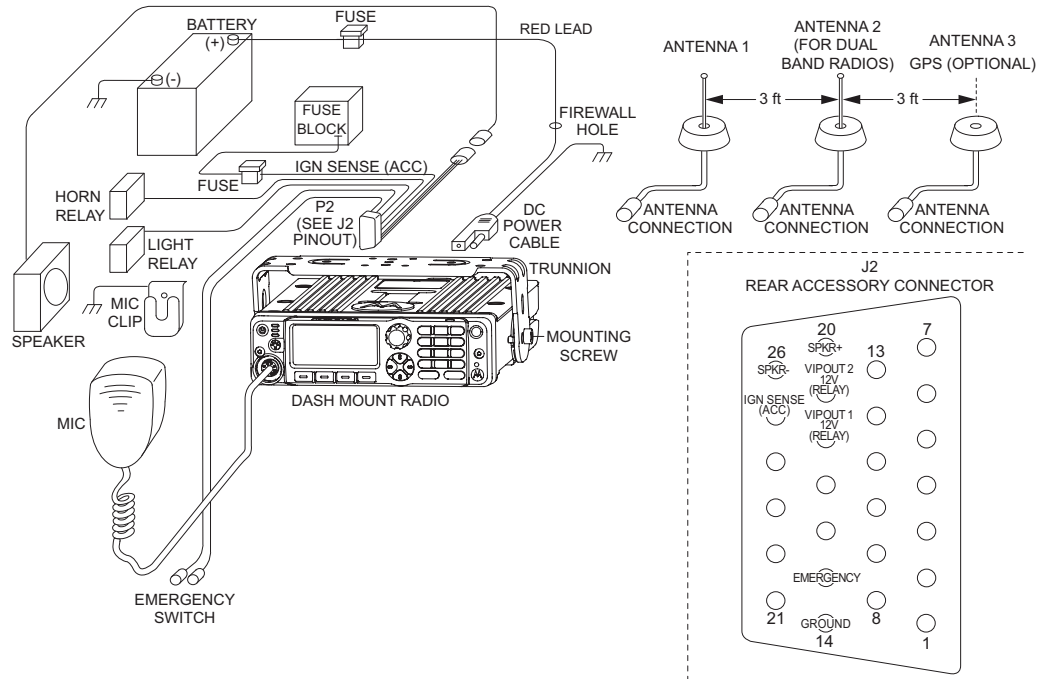
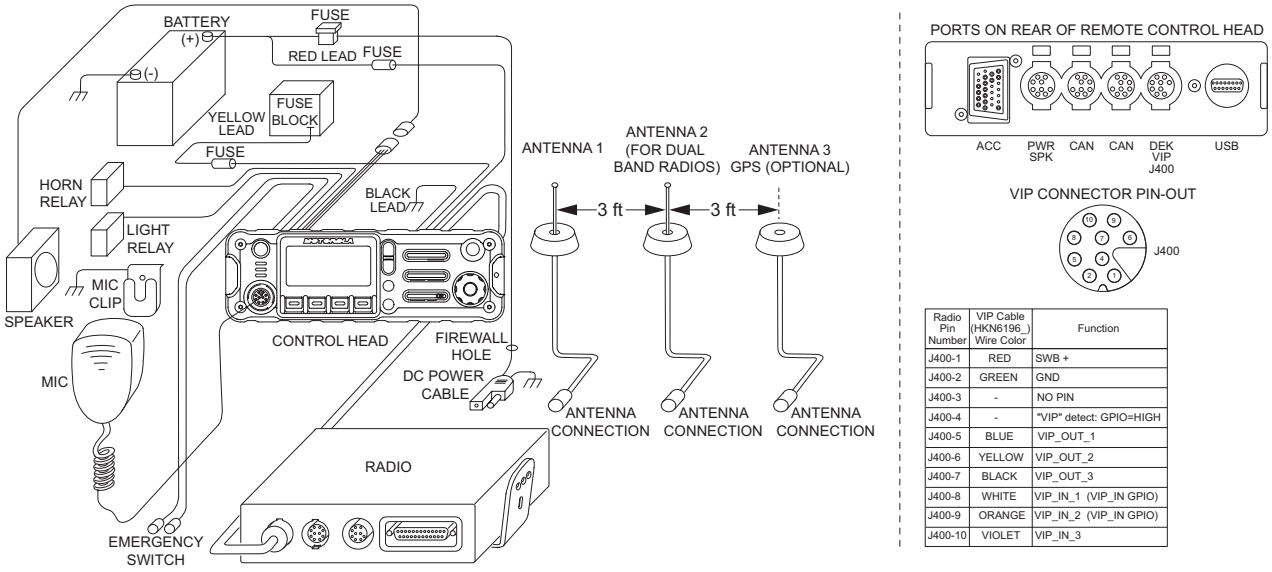


Figure 2-7. Radio Installation (O7 Mid Power Dash Mount)

NOTE: In dash mount configuration, it is mandatory that a rear accessory cable be attached at the back of a mid power transceiver, in order to ground the Emergency pin to GND. Or, an emergency footswitch or pushbutton switch must be attached at the back of a mid power. If the emergency pin is not grounded, upon the attachment of the A+ cable at the DC connector, the radio will detect a HIGH for the emergency pin state, and assume that emergency has been activated. This will attempt to power on the radio, and will result in excessive current draw and incorrect radio operation. Refer to Section 2.1.3.1 for further details and recommended wiring of emergency in dash mount.



Radio Pin Number	VIP Cable (HKN6196_) Wire Color	Function
J400-1	RED	SWB +
J400-2	GREEN	GND
J400-3	-	NO PIN
J400-4	-	"VIP" detect: GPIO=HIGH
J400-5	BLUE	VIP_OUT_1
J400-6	YELLOW	VIP_OUT_2
J400-7	BLACK	VIP_OUT_3
J400-8	WHITE	VIP_IN_1 (VIP_IN GPIO)
J400-9	ORANGE	VIP_IN_2 (VIP_IN GPIO)
J400-10	VIOLET	VIP_IN_3

Figure 2-8. Radio Installation (O2 Mid Power Remote Mount)

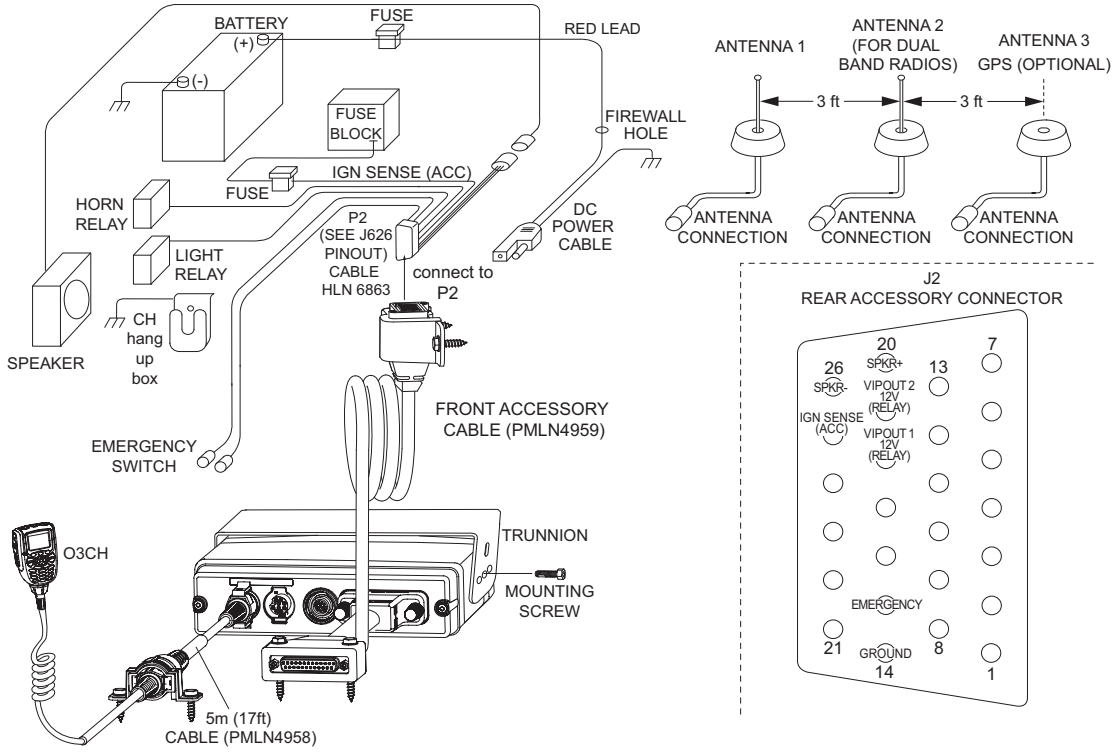
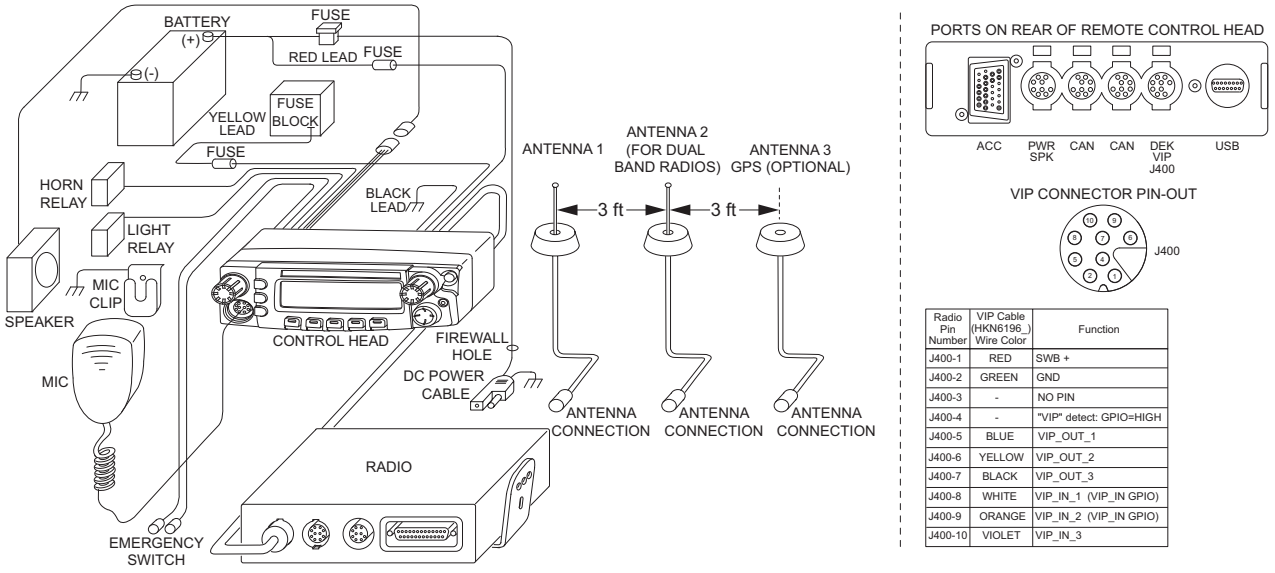
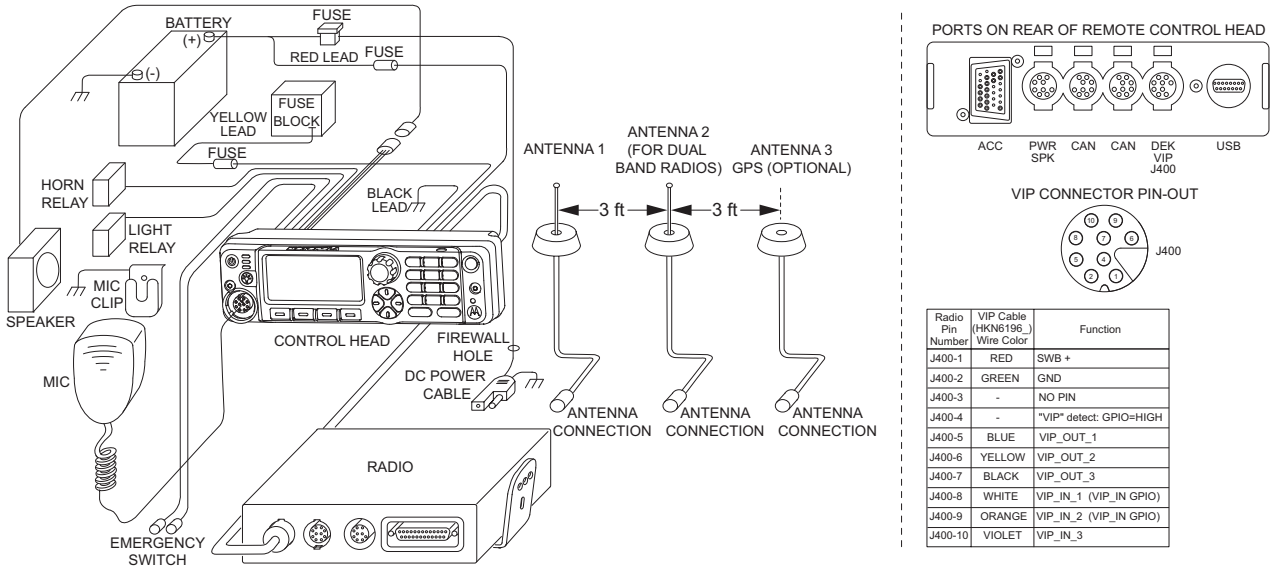


Figure 2-9. Radio Installation (O3 Mid Power Remote Mount)



Radio Pin Number	VIP Cable (HKN6196_) Wire Color	Function
J400-1	RED	SWB +
J400-2	GREEN	GND
J400-3	-	NO PIN
J400-4	-	"VIP" detect: GPIO=HIGH
J400-5	BLUE	VIP_OUT_1
J400-6	YELLOW	VIP_OUT_2
J400-7	BLACK	VIP_OUT_3
J400-8	WHITE	VIP_IN_1 (VIP_IN GPIO)
J400-9	ORANGE	VIP_IN_2 (VIP_IN GPIO)
J400-10	VIOLET	VIP_IN_3

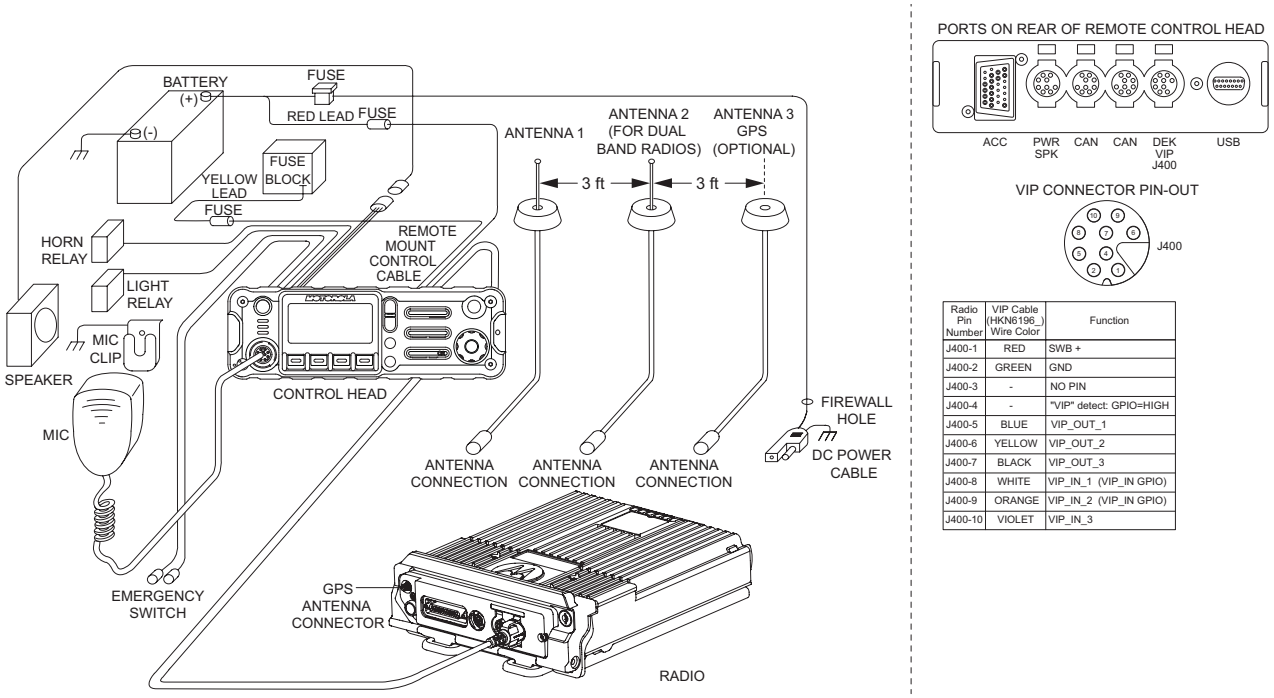
Figure 2-10. Radio Installation (O5 Mid Power Remote Mount)



Radio Pin Number	VIP Cable (HKN6196_) Wire Color	Function
J400-1	RED	SWB +
J400-2	GREEN	GND
J400-3	-	NO PIN
J400-4	-	"VIP" detect: GPIO=HIGH
J400-5	BLUE	VIP_OUT_1
J400-6	YELLOW	VIP_OUT_2
J400-7	BLACK	VIP_OUT_3
J400-8	WHITE	VIP_IN_1 (VIP_IN GPIO)
J400-9	ORANGE	VIP_IN_2 (VIP_IN GPIO)
J400-10	VIOLET	VIP_IN_3

Figure 2-11. Radio Installation (O7 Mid Power Remote Mount)

Refer to Section 2.1.3.2 and Section 4.2.1 for further details and recommended wiring of emergency in remote mount.



Radio Pin Number	VIP Cable (HKN6196_) Wire Color	Function
J400-1	RED	SWB +
J400-2	GREEN	GND
J400-3	-	NO PIN
J400-4	-	"VIP" detect: GPIO=HIGH
J400-5	BLUE	VIP_OUT_1
J400-6	YELLOW	VIP_OUT_2
J400-7	BLACK	VIP_OUT_3
J400-8	WHITE	VIP_IN_1 (VIP_IN GPIO)
J400-9	ORANGE	VIP_IN_2 (VIP_IN GPIO)
J400-10	VIOLET	VIP_IN_3

Figure 2-12. Radio Installation (O2 High Power Remote Mount)

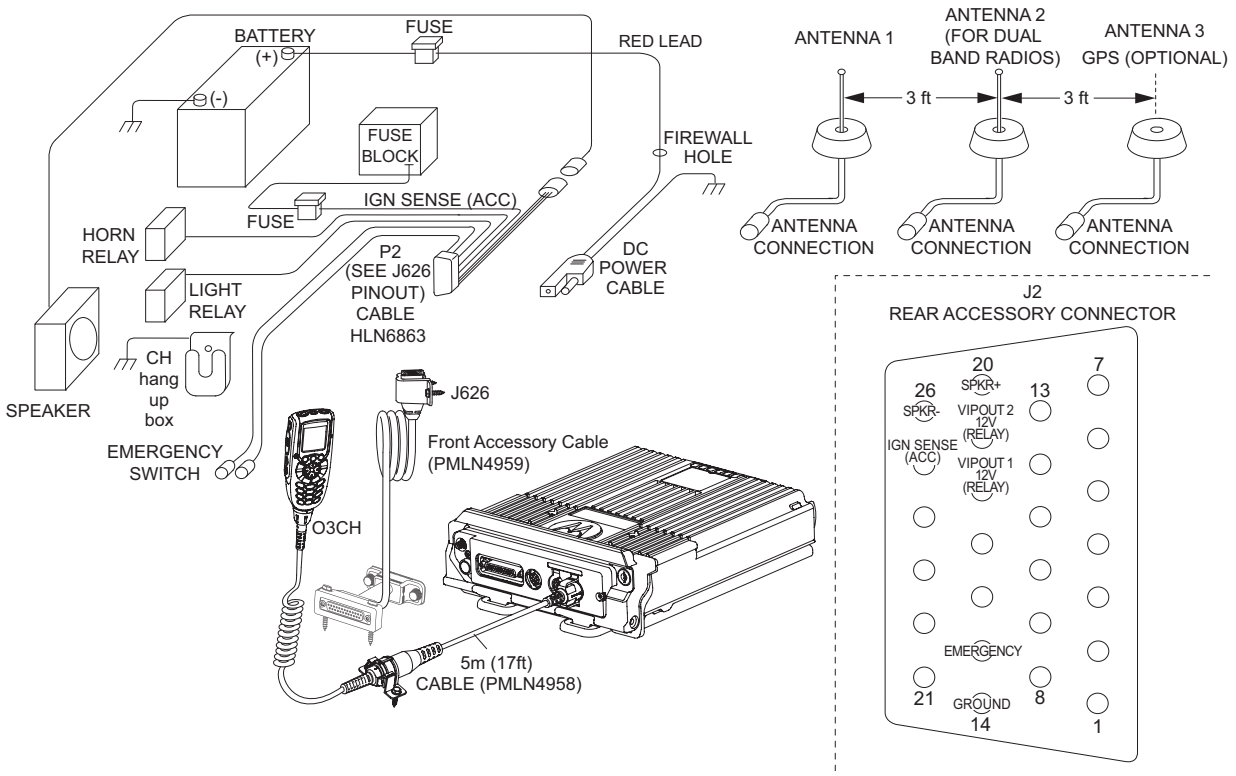
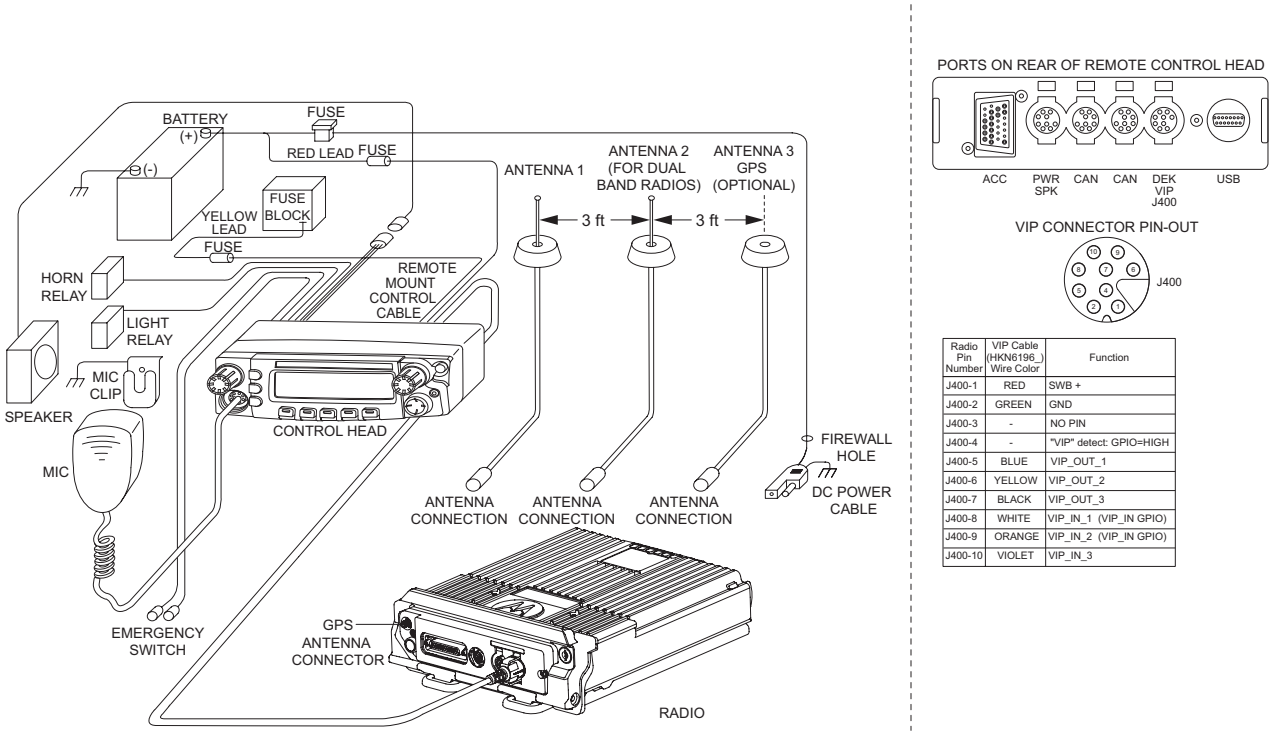
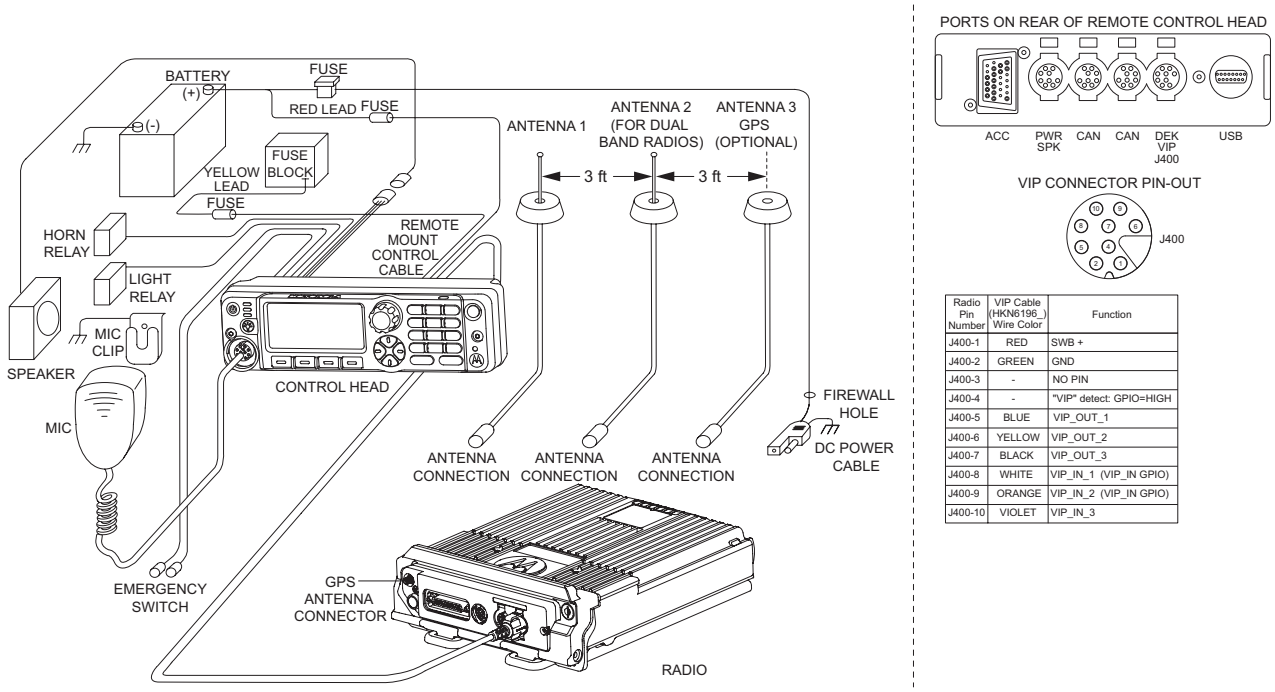


Figure 2-13. Radio Installation (O3 High Power Remote Mount)



Radio Pin Number	VIP Cable (HKN6196_) Wire Color	Function
J400-1	RED	SWB +
J400-2	GREEN	GND
J400-3	-	NO PIN
J400-4	-	"VIP" detect: GPIO=HIGH
J400-5	BLUE	VIP_OUT_1
J400-6	YELLOW	VIP_OUT_2
J400-7	BLACK	VIP_OUT_3
J400-8	WHITE	VIP_IN_1 (VIP_IN GPIO)
J400-9	ORANGE	VIP_IN_2 (VIP_IN GPIO)
J400-10	VIOLET	VIP_IN_3

Figure 2-14. Radio Installation (O5 High Power Remote Mount)



Radio Pin Number	VIP Cable (HKN6196_) Wire Color	Function
J400-1	RED	SWB +
J400-2	GREEN	GND
J400-3	-	NO PIN
J400-4	-	"VIP" detect: GPIO=HIGH
J400-5	BLUE	VIP_OUT_1
J400-6	YELLOW	VIP_OUT_2
J400-7	BLACK	VIP_OUT_3
J400-8	WHITE	VIP_IN_1 (VIP_IN GPIO)
J400-9	ORANGE	VIP_IN_2 (VIP_IN GPIO)
J400-10	VIOLET	VIP_IN_3

Figure 2-15. Radio Installation (O7 High Power Remote Mount)

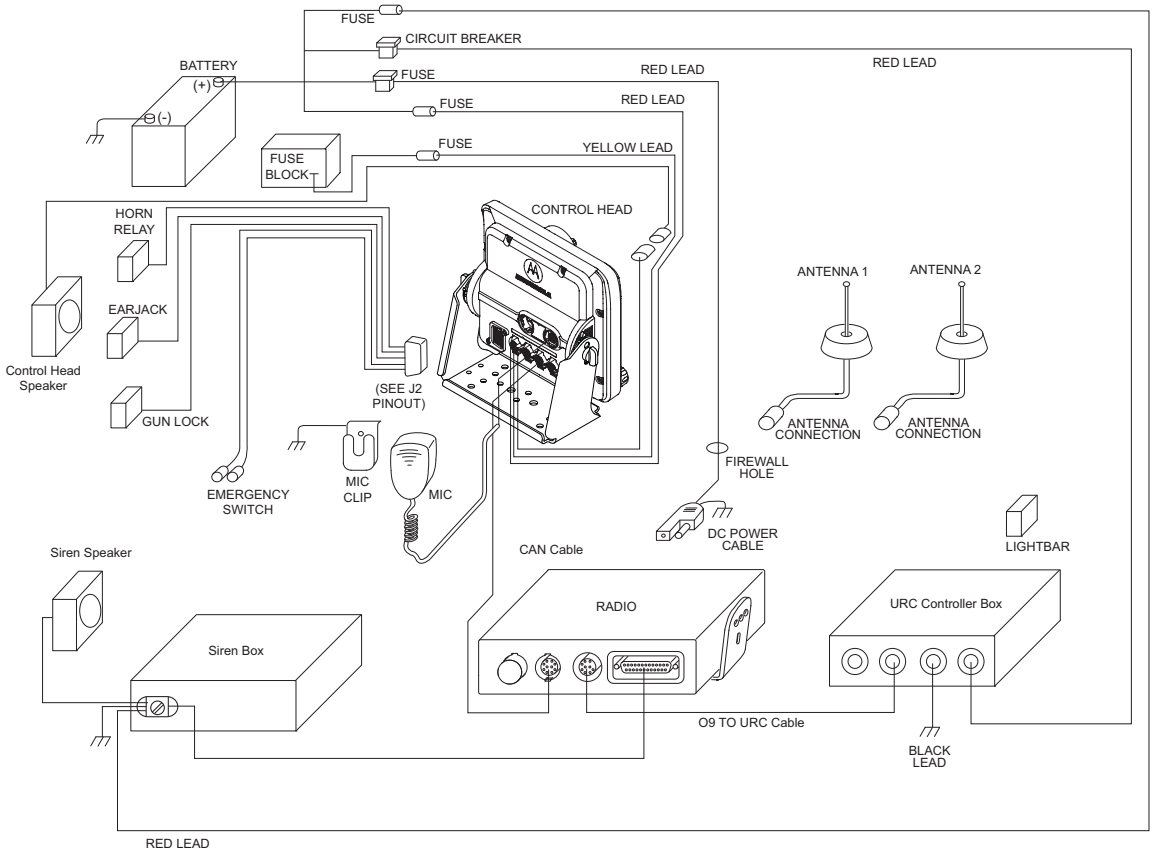
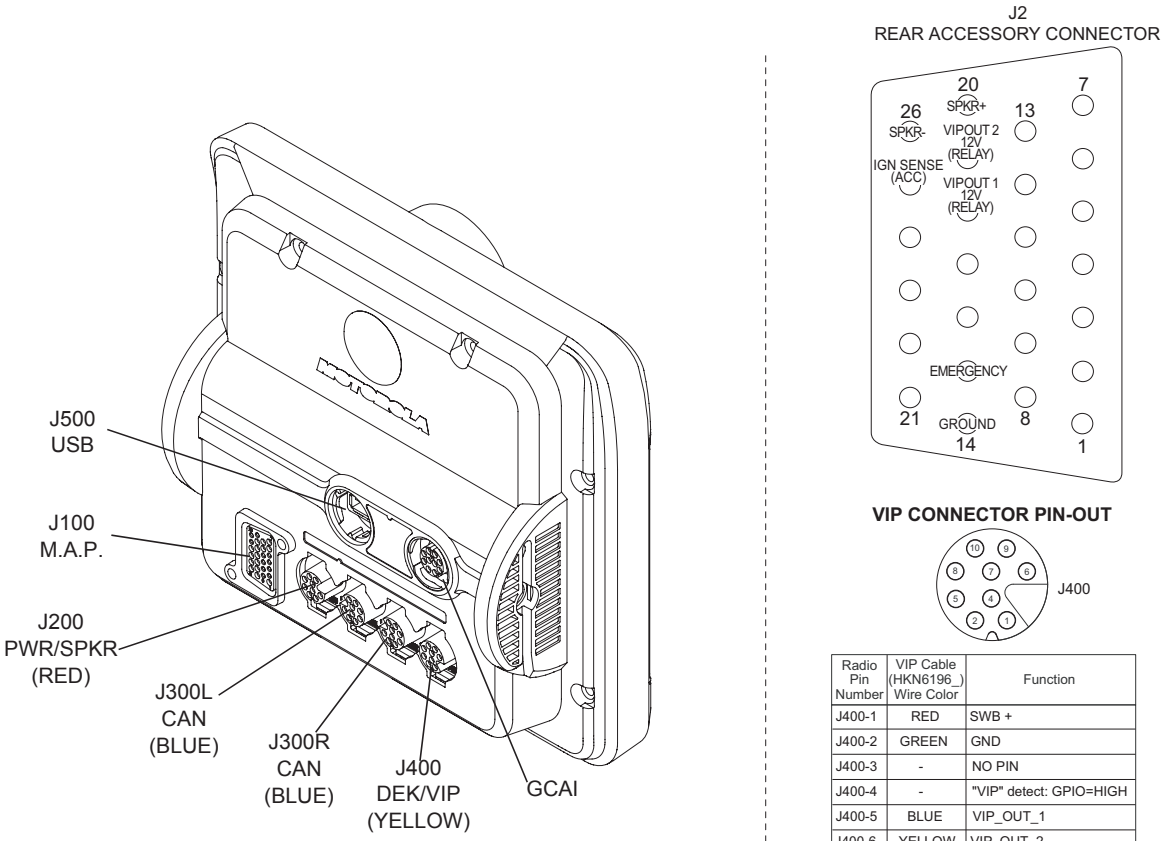


Figure 2-16. Radio Installation of O9 Remote Mount with Transceiver (URC is optional.)



Radio Pin Number	VIP Cable (HKN6196_) Wire Color	Function
J400-1	RED	SWB +
J400-2	GREEN	GND
J400-3	-	NO PIN
J400-4	-	"VIP" detect: GPIO=HIGH
J400-5	BLUE	VIP_OUT_1
J400-6	YELLOW	VIP_OUT_2
J400-7	BLACK	VIP_OUT_3
J400-8	WHITE	VIP_IN_1 (VIP_IN GPIO)
J400-9	ORANGE	VIP_IN_2 (VIP_IN GPIO)
J400-10	VIOLET	VIP_IN_3

Figure 2-17. Radio Installation (O9 Remote Mount with Pinouts)

Refer to Section 2.1.3.2 and Section 4.2.1 for further details and recommended wiring of emergency in remote mount.

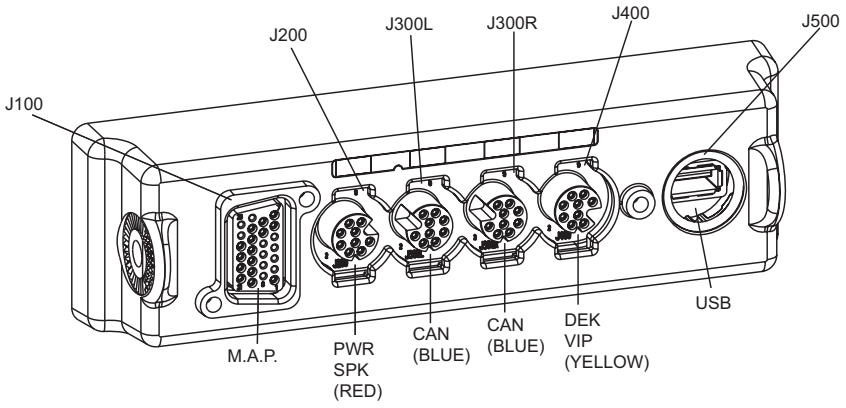
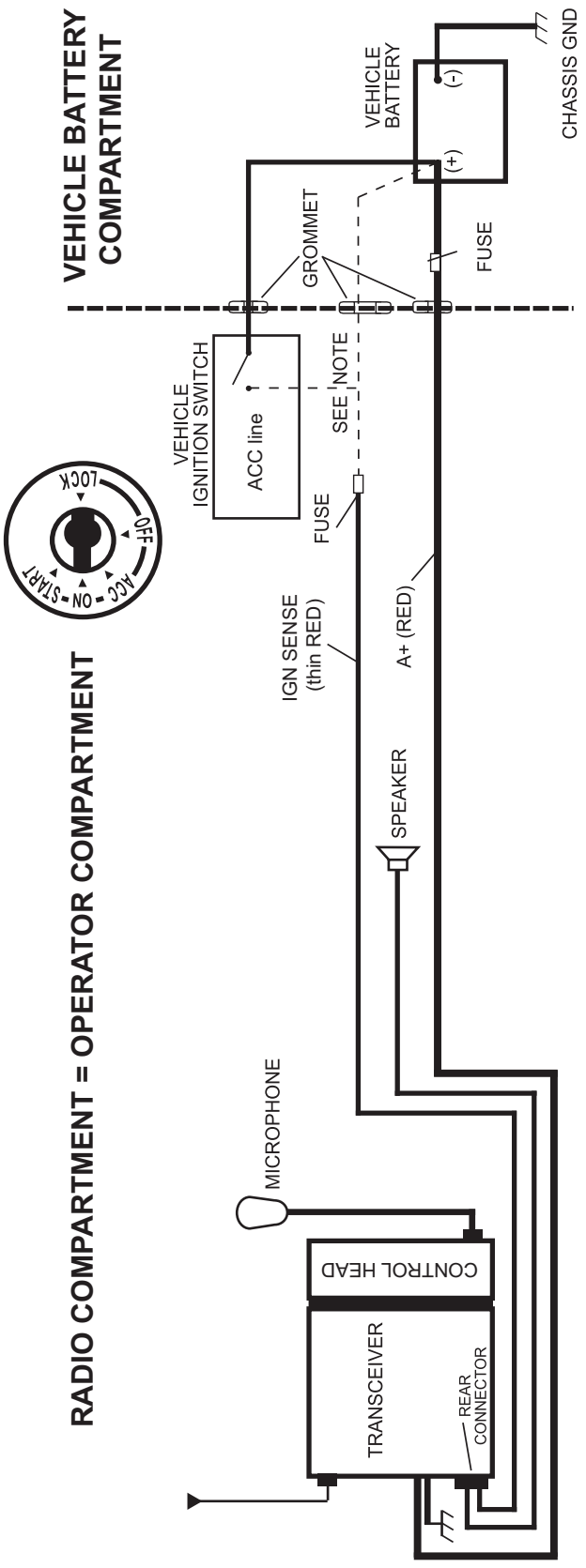


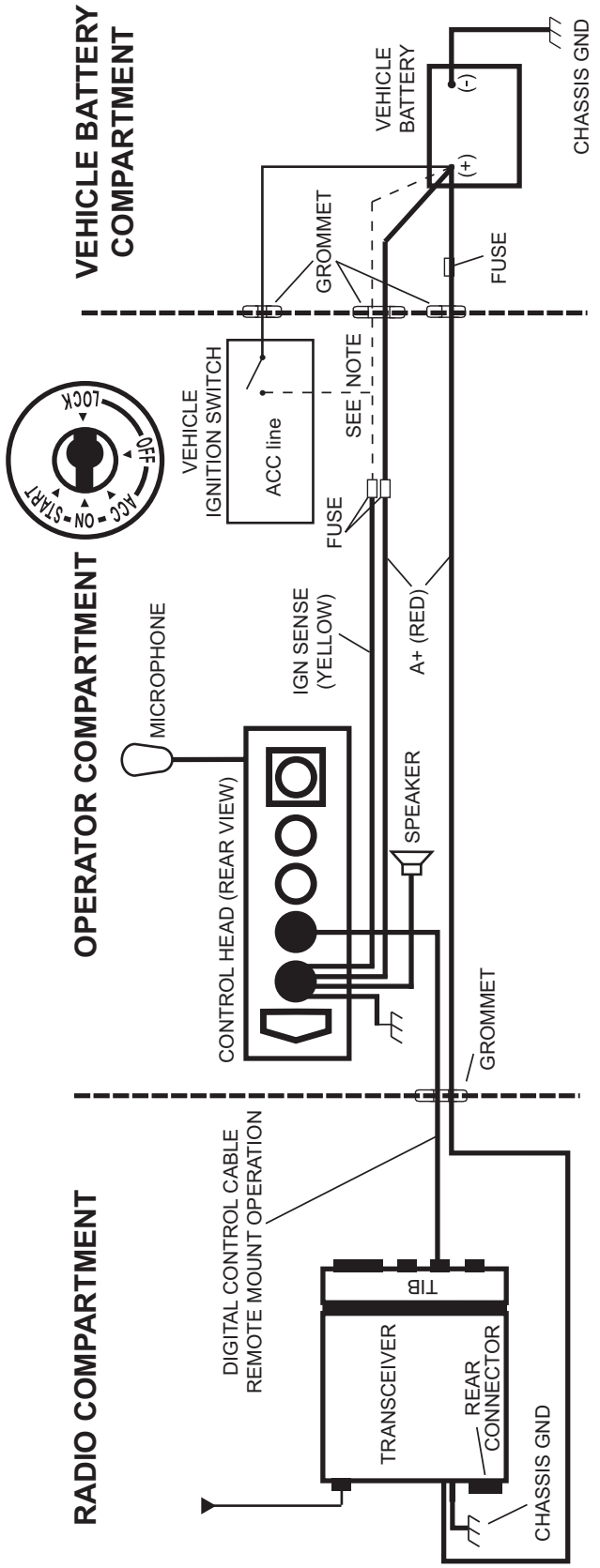
Figure 2-18. Remote Control Head Pinouts



NOTE:
See TABLE 2-1 for wiring of the thin RED wire. A good GROUND connection to the car chassis is required for correct radio operation.

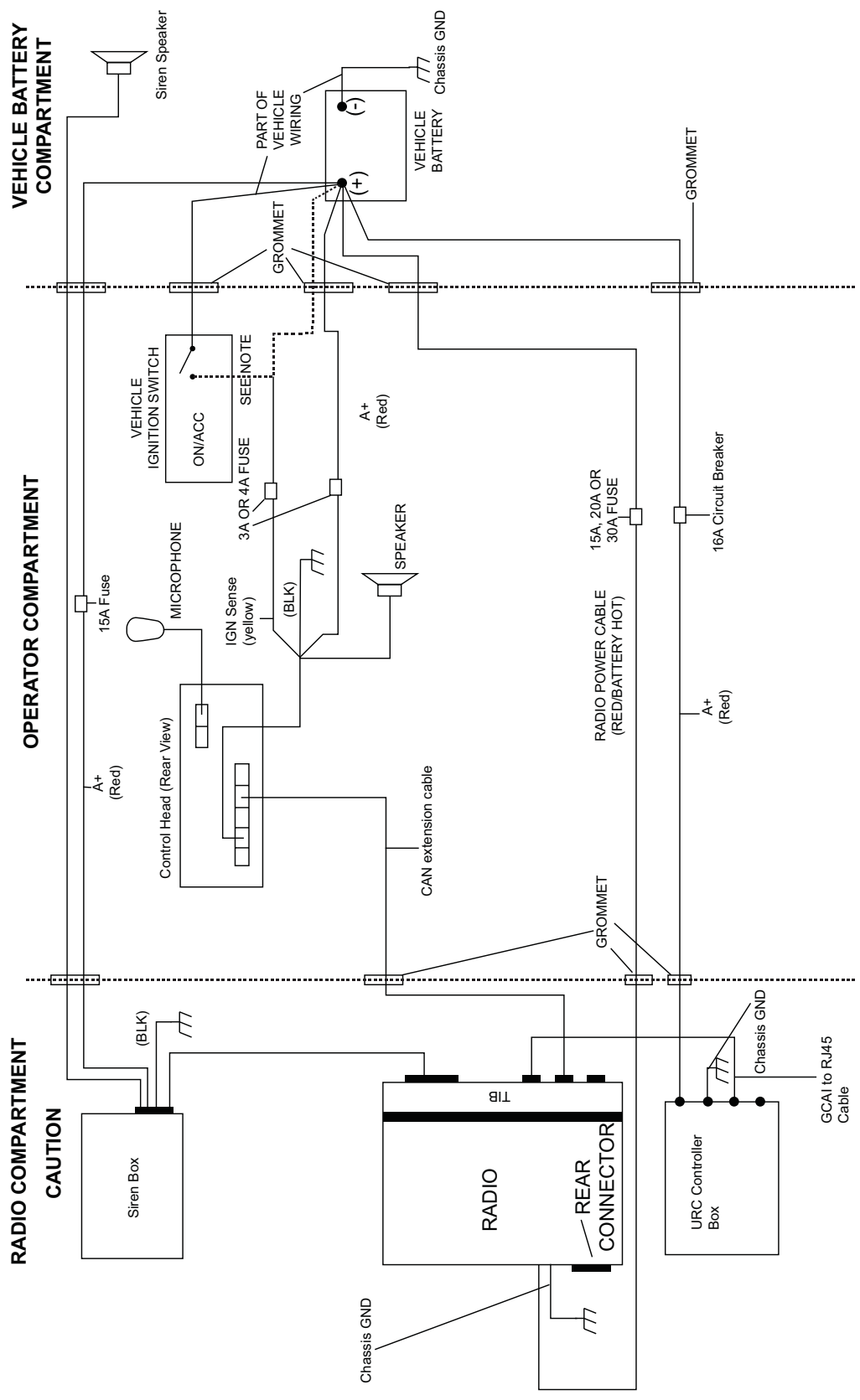
NOTE:
Ignition sense cable uses either 3-amp fuse (6580283E01) or 4-amp fuse (6580283E02)

Figure 2-19. Cabling Interconnect Diagram for Dash Mount (Cannot Be Used for 100W Radios)



NOTE:
See TABLE 2-1 for wiring of the YELLOW wire. A good GROUND connection to the car chassis is required for corrrect radio operation.

Figure 2-20. Cabling Interconnect Diagram for Remote Mount



NOTE:
For remote mount configurations, do not supply IGNITION at the radio's rear accessory connector. IGNITION should be supplied according to TABLE 2-2. See TABLE 2-2 for combinations of wiring th
RED and YELLOW cables.
The RED and YELLOW power cables connect to either the vehicle battery or the ignition switch. Connect the RED cable directly to the battery. The receiver operates when the control head is on. Connec
the YELLOW cable to the ignition switch. The transmitter operates only when the ignition switch is on.
Alternate connections: Connecting both RED and YELLOW cables to the battery allows the control head to turn the receiver and transmitter on or off. Connecting both RED and YELLOW cables to th
ignition switch allows the ignition switch to turn the receiver and transmitter on or off. Alternator whine and other noise problems may occur. Isolate the RED cable with a Motorola relay (5900813674).

Figure 2-21. Cabling Interconnect Diagram for 09 Remote Mount (URC is optional.)

2.1.3 Radio Operation Wiring for Dash and Remote Configurations

Determine from Table 2-1, Table 2-2, or Table 2-3 the radio functionality you wish to achieve, which is controlled by the vehicle's ignition switch state, the physical wiring of the radio's ignition sense (ACC) wire, and by the programmed CPS setting. For additional radio functionality as determined by the programming of the ignition switch in CPS, refer to the HELP menu in your CPS (i.e. Ignition as: Required, Blank, Soft Power Off, TX Inhibit, PTT TX Inhibit, Ignition Only Power Up).

Choose a clean ignition point which is not shared in the immediate vicinity by other high current accessories/devices. This will help to reduce the transients on the ignition line. Examples of high-current accessories/devices are: Air Horn, relays, lightbars and etc. It is recommended to wire to the vehicle's ACC line, not the START or the solenoid side of the ignition circuit. Refer to chapter 6 for best installation practices. The Ignition sense (ACC) cable uses either a 3-amp fuse (6580283E01) or 4-amp fuse (6580283E02).

2.1.3.1 Dash Mount: Power, Ignition, and Emergency Cable Installation

The standard dash mount rear ignition sense cable HLN6863 contains a "thin red" ignition wire, a jumper wire that shorts emergency to ground, and two gray wires attached to an external speaker plug. The thin RED wire is the ignition sensed wire. Refer to Table 2-1, Table 2-2, or Table 2-3 for its correct wiring configurations.

NOTE: This cable **MUST** be attached in order for the radio to operate in Dash mount, regardless of how emergency is programmed in CPS or wired inside the vehicle. Either the emergency jumper wire or an emergency accessory (footswitch or button) must be wired to the rear of the transceiver in Dash mount. Otherwise, upon attachment of the radio's power cable to the vehicle battery, the radio will incorrectly determine that emergency operation has been activated, such as when an emergency footswitch is de-pressed and the emergency pin is ungrounded.

2.1.3.2 Remote Mount: Power, Ignition, and Emergency Cable Installation

The single control head O2, O5, O7 or O9 remote mount configurations receive power from the J200 connector's red and black wires. The yellow wire at J200 is one ignition sense wire. On mid power radios, the J2 and J600 connectors can also be used for ignition sense. On high power radios, the J200 yellow wire or the J600 connector can be used for ignition sense. If the HLN6863 is attached at J100 of the O2, O5, O7 or O9 control head, the "thin red" wire will NOT function as an ignition sense wire, since the J100 connector has no ignition sense electrical connection.

NOTE: It is incorrect for installation to attach ignition sense at more than one wire or connector. Refer to Table 2-1 or Table 2-2 for its correct wiring configurations.

The O3 control head receives its power down the CAN cable, and detects the ignition state by the ignition sense pin at either J2 or J600. On mid power radios, the J2 and J600 connectors can also be used for ignition sense. On high power radios, only the J600 connector can be used for ignition sense.

In Multi-Control Head installations, the yellow ignition wire must be connected to the head assigned ID # 1. See Section 2.2.2.5 "Setting the Initial Control Head ID" on page 2-29 for further information.

In remote mount O2, O3, O5, O7 or O9, an Emergency jumper to ground is placed by default on the TIB (JU344) so that there is no need to attach a cable with an emergency accessory at either J2 or at J600. This jumper must be removed if an emergency accessory (footswitch or button to Ground) is installed at either J2 or J600 (or J626 on the accessory cable) locations. If the jumper JU344 is removed but no emergency accessory is installed, the radio will power-up incorrectly into emergency mode all the time. Refer to Figure 4-3 for details.

The design of the control head is different compared to the transceiver, therefore it is also **NOT** necessary to attach HLN6863 at J100 to prevent accidental emergency operation. The control head uses an edge-detect, not a state-detect like on the transceiver, so mounting of HLN6863 is not mandatory.

Table 2-1. Dash O2, O5 or O7 Radio Operations Dependent Upon A+ and Ignition Connections

Dash Mount	Transceiver Red Power Wire	HLN6863 Thin Red Wire	Transceiver Red Power Wire	HLN6863 Thin Red Wire	Transceiver Red Power Wire	HLN6863 Thin Red Wire
Connected to battery	X	X	X			X
Connected to ignition switch				X	X	X
Ignition switch controls	No ignition switch control.		Enables ignition switch functionality as programmed in the codeplug.		Illegal wiring configuration. See CAUTION note.	

Table 2-2. Remote O2, O5, O7, or O9 Radio Operations Dependent Upon A+ and Ignition Connections

Remote Mount	Control Head Red Wire	Control Head Yellow Wire	Control Head Red Wire	Control Head Yellow Wire	Control Head Red Wire	Control Head Yellow Wire
Connected to battery	X	X	X			X
Connected to ignition switch				X	X	X
Ignition switch controls	No ignition switch control.		Enables ignition switch functionality as programmed in the codeplug.		Illegal wiring configuration. See CAUTION note.	

Table 2-3. Remote O2, O5, O7 or O9 Radio Operations Dependent Upon A+ and Ignition Connections

Mid Power Dash/Remote / High Power Dash/Remote	Transceiver Red Power Wire	HLN6863 Thin Red Wire at J2 / HLN6863 Thin Red Wire at J626	Transceiver Red Power Wire	HLN6863 Thin Red Wire at J2 / HLN6863 Thin Red Wire at J626	Transceiver Red Power Wire	HLN6863 Thin Red Wire at J2 / HLN6863 Thin Red Wire at J626
Connected to battery	X	X	X			
Connected to ignition switch				X	X	X
Ignition switch controls	No ignition switch control.		Enables ignition switch functionality as programmed in the codeplug.		Illegal wiring configuration. See CAUTION note.	

Caution

DO NOT connect any wires to the battery terminals until you have finished the entire radio installation (Dash or Remote Mount) configuration to avoid potential equipment damage.

Incorrect wiring of the radio may result in incorrect ignition sense detection, incorrect power-on state, or incorrect power-off state of the radio system.

The Control Head Power cable wire (RED) and Transceiver Power cable wire (RED) are always attached to the battery terminal and NOT to the ignition switch.

2.1.4 Ignition Sense Switch (Radio Wide Advance)

CPS selectable settings to control the radio's functionality based on the state of the vehicle's Ignition status.

Table 2-4. Ignition Sense Switch Settings in CPS

Feature	Description
Blank	• Radio POWERS ON when the Power Button is pressed or with the emergency power up feature. • Radio POWERS OFF when the Power Button is pressed.
TX Inhibit	• Radio POWERS ON when the Power Button is pressed or with the emergency power up feature. • Radio POWERS OFF when the Power Button is pressed. • If **IGNITION** is not present all transmissions are inhibited. • The radio will not affiliate with trunking systems and therefore **CANNOT** receive any trunking dispatch communications. • Emergency Alarm transmissions are **NOT** possible with the use of the emergency power up feature.
PTT TX Inhibit	• Radio POWERS ON when the Power Button is pressed or with the emergency power up feature. • Radio POWERS OFF when the Power Button is pressed. • If **IGNITION** is not present all transmissions are inhibited. • The radio is able to affiliate with trunking systems. The radio can **ONLY** receive trunking dispatch communications. • Emergency Alarm transmissions are possible with the use of the emergency power up feature.
Required	• Radio POWERS ON when the Power Button is pressed and Ignition is present. • Radio POWERS ON when Ignition is cycled and radio was previously ON. • Radio POWERS OFF when the Power Button is pressed, or when Ignition is lost.
Soft Power Off	• Radio POWERS ON when the Power Button is pressed, or when Ignition is detected. • Radio POWERS OFF when the Power Button is pressed, or when Ignition is lost.
Ignition Only Power Up	• Radio POWERS ON when Ignition is present. • Radio POWERS OFF when Ignition is lost. • Control head power button is ignored.

NOTE: When either TX Inhibit, PTT TX Inhibit or Required are selected, the Emergency Power Up feature will not be available to the radio-user.

When any other Ignition Switch setting is made, Emergency Power Up is available to the radio-user, regardless of current ignition state.

Any optional inactivity time-out timer setting in CPS may delay the power off of the radio once Ignition sense is removed.

2.1.5 Siren/PA Configuration/Programming

The Siren/PA is shipped pre-wired for 100W operation. It can be rewired for 65W, 75W, or 130W power levels.

To change to another power level, perform the following:

1. Open the Siren/PA connector cover to gain access to the two-connector speaker leads. Do not change the speaker common lead (pin 20). The other lead is connected to pin 35 (for 100W operation).
2. Using an appropriate pin removal tool, extract pin 35 and move it to one of the following pin locations:
   - pin location 36 for 75W operation
   - pin location 28 for 65W or 130W operation
3. For 65W or 75W operation, no further changes are required. Reassemble the connector.
4. For 130W operation, you must parallel two 11Ω speakers, each rated at 65W minimum. Proper phasing of the two speakers is important--when connecting two speakers in parallel, wire similar speaker terminals together to ensure maximum loudness and prevent "deadspots." For example, if the terminals are marked "1" and "2", connect the terminals marked "1" together and connect those wires to one speaker lead. Connect the terminals marked "2" together and connect those wires to the other speaker lead.

Caution

Before continuing, remember that under a high-line supply condition (16.6V), up to 30% more power will go to the speaker(s) after reconfiguring for 130W operation. Do this only when your PA speakers are capable of handling the extra power.

5. When the Siren/PA is configured for dual speaker, 130W operation, it is necessary to remove a resistor and move two jumpers to set the correct power level. Remove the Siren/PA cover, and locate resistor R219 (0 ohm). This resistor should be removed for 130W operation. Locate jumpers JU100 and JU101. These jumpers should be installed for 130W operation.
6. Close and reconnect the Siren/PA connector cover.

NOTE: Jumpers JU100 and JU101 do not affect the Siren output level. JU100 and JU101 compensate for the lower speaker load and the two speakers in parallel, by decreasing the gain U102-1. JU100 affects the radio PA level and JU101 affects the PA audio level.

Pin locations of various power level configurations are listed in Table 2-5

Table 2-5. Power Level Configurations

	Pin location of speaker leads	R219	JU100/JU101
65W	20,28	IN	Across pins A and B
75W	20,36	IN	Across pins A and B
100W	20,35	IN	Across pins A and B
130W	20,28	OUT	Across pins B and C

2.2 Radio Mounting

Caution

DO NOT mount the radio on a plastic mounting surface without first reinforcing the mounting surface; the weight of the radio may crack or break the mounting surface.

DO NOT mount the radio on a flat or concave surface where the radio could be partially submersed in water. This is especially important if the cab area of the vehicle is cleaned by spraying with water. If the radio sits in water for a length of time, moisture may seep inside the radio and damage the electronic components.

DO NOT allow water to stand in recessed areas of vertically mounted radios. Remove any moisture immediately to prevent it from seeping down into the radio.

Care must be taken to shield the control head (front and back) from direct exposure to pressurized water. The pressurized water from a hose, in most cases, is more severe than the stated test and conditions in typical environments.

The mounting location must be accessible and visible. Select a location that will permit routing the RF antenna cable as directly as possible.

NOTE: For optimum radio performance, orient the mounting trunnion as shown in Figure 2-22 or Figure 2-23 for mid power and Figure 2-24 for high power. For new or existing installations of all but 100W radios, use only the APX mobile trunnion, kit number HLN7002_except for APX 2500 and APX 4500 which shall use the trunnion with kit number HLN6861_. For new or existing installations of 100W radios, use only the APX mobile trunnion, kit numbers HLN7003_.

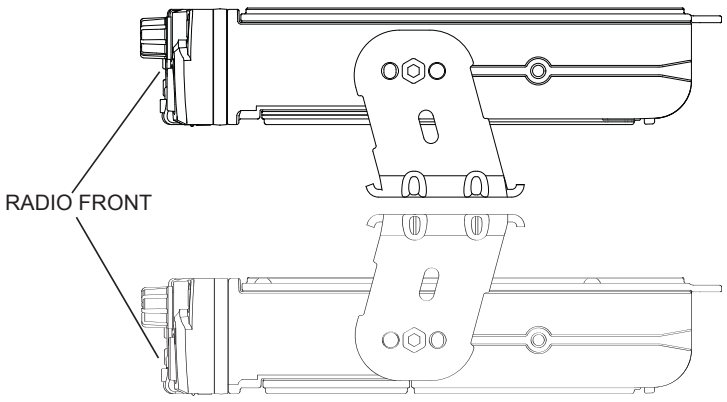


Figure 2-22. APX 7500/ APX6500/ APX5500/ APX6500Li Mid Power Trunnion Orientation (Cannot Be Used for 100W Radios)

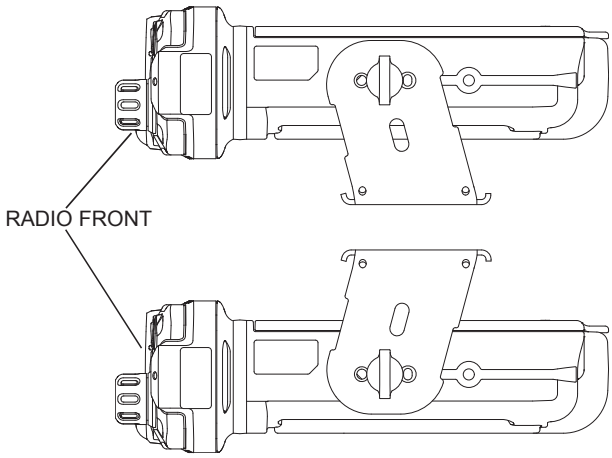


Figure 2-23. APX 2500/APX4500 Mid Power Trunnion Orientation (Cannot Be Used for 100W Radios)

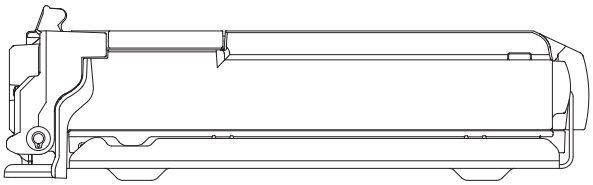


Figure 2-24. Trunnion Orientation for 100W Radios

2.2.1 Dash Mount with Trunnion

NOTE: This configuration is not applicable for 100W radios.

1. Referring to Figure 2-6, select the suitable trunnion kit per the type of mid power transceiver.
2. Select the location to mount your radio on the transmission hump (see Figure 2-25) or under the dash (see Figure 2-26).

NOTE: When mounting the trunnion on the transmission hump take care the transmission housing is not affected. Plan your installation ensuring enough room for the Accessory connector and cable in the back of the radio.

3. 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 outmost holes for a flat surface such as under the dash.
4. Center punch the spots you have marked and realign the trunnion in position.
5. Secure the trunnion mounting bracket with the four self-drilling screws provided (see Figure 2-25 and Figure 2-26).
6. Ensure that the plastic guides are aligned (horizontal) to the grooves of the trunnion. Slide the radio into the grooves until it snaps into place (see Figure 2-26).

Table 2-6. Mid Power Trunnion Kit

Item	Part Number	Description	Mid Power Transceiver
1	0371859H01	Trunnion Mounting Screw	APX 5500/APX 6500/APX 6500 Li/APX 7500
	0305760W02	Trunnion Mounting Wing Screw	APX 2500/APX 4500
2	0312002B14	Self-Drilling Tapping Screw	APX 5500/APX 6500/APX 6500 Li/APX 7500
			APX 2500/APX 4500
3	HLN7002_	Mackinaw Trunnion Hardware Kit	APX 5500/APX 6500/APX 6500 Li/APX 7500
	HLN6861_	Millenium Trunnion Hardware Kit	APX 2500/APX 4500

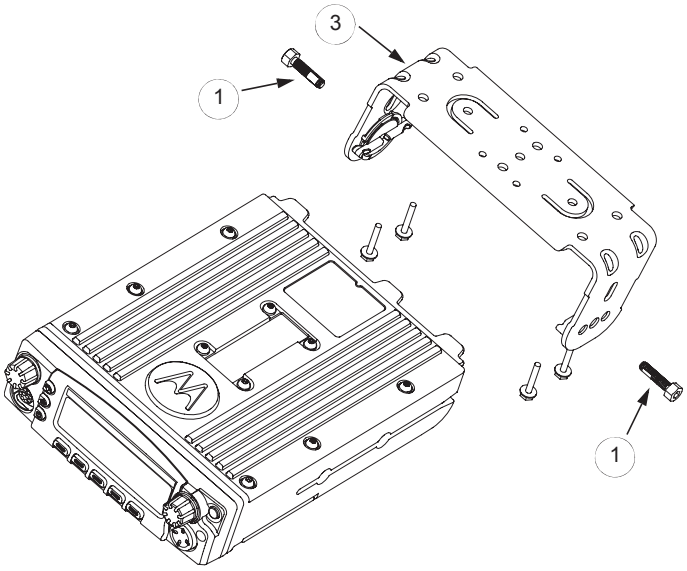


Figure 2-25. Transmission Hump Trunnion Mounting

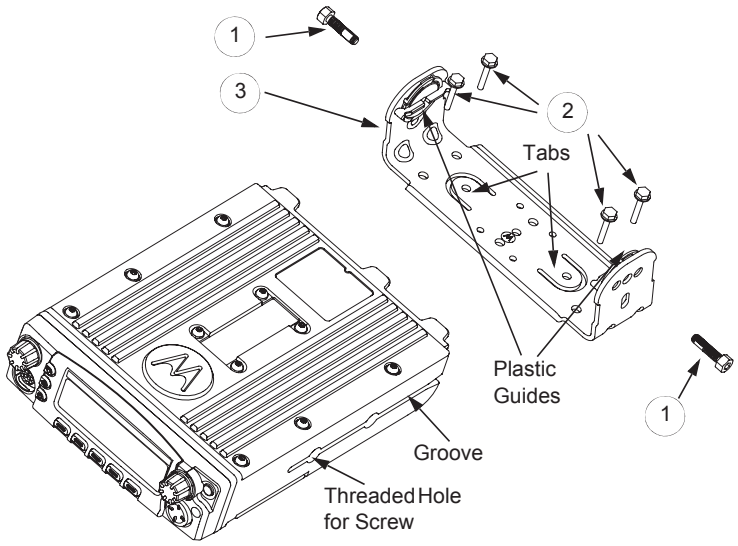


Figure 2-26. Below Dash Trunnion Mounting

7. Secure the radio with two screws provided (Item 1 in Table 2-6). The torque down force for 0371859H01 should be between 50in-lbf to 52in-lbf.
8. For screw 0305760W02, the wing screw torque tool (HLN6970_) is designed to securely tighten the trunnion wing screws while installing the radio. The tool can also be used to loosen the wing screws. Detailed instructions are included in the tool packaging.

NOTE: This configuration shows the O5 control head. The TIB is used for O3 control head for the same configuration.

2.2.2 Remote Mount with Trunnion

Caution

Before installing any electrical equipment, check the vehicle manufacturer's user manual.

The installation of this device should be completed by an authorized servicer or installer.

Before making any holes in the trunk for radio mounting, check the vehicle manufacturer's user manual for restrictions (e.g. due to the gas tank location).

For a remote mount installation, the transceiver may be mounted anywhere in the vehicle, provided that the installation location is safe, follows the cautions mentioned at the beginning of this section, and is accessible for servicing/maintenance as well as cabling. A typical mounting location recommended by Motorola is in the vehicle's trunk. The trunnion provided may still be used to mount the transceiver, and the mounting process is the same as for the dash mount installation (Section 2.2.1 on page 2-21). However, for 100W radios you must follow the procedure detailed below in Section 2.2.2.1. See Figure 2-10, Figure 2-11, Figure 2-13, or Figure 2-14 for a remote installation.

2.2.2.1 100W Radios Only

NOTE: Cabling to the front of the radio (TIB) should not be completed with the handle opened as it is needed to be removed to close the handle. It is suggested that the cabling is to be attached to the front of the radio after the radio is assembled into the trunnion.

1. After selecting the mounting location, use the trunnion mounting bracket as a template and mark the positions of the holes on the mounting surface.
2. Center-punch the spots you have marked and realign the trunnion in position.
3. Secure the trunnion mounting bracket with the four self-drilling screws provided (see Figure 2-27).
4. After the trunnion has been mounted in the vehicle using the screws provided, install the radio. Place the radio with the lock handle fully opened on the trunnion, oriented at least 10 mm in front of the rear catches. Push the radio towards the rear catches. The radio is lifted up slightly and then drops back down, flushed with the trunnion, and stops against the rear catches. Once this occurs, close the lock handle. Rotate the handle towards the top of the radio until it is locked in place. The key is not needed in the lock to close the handle, but is needed to reopen. The keys can only be removed from the lock when it is in the locked position.

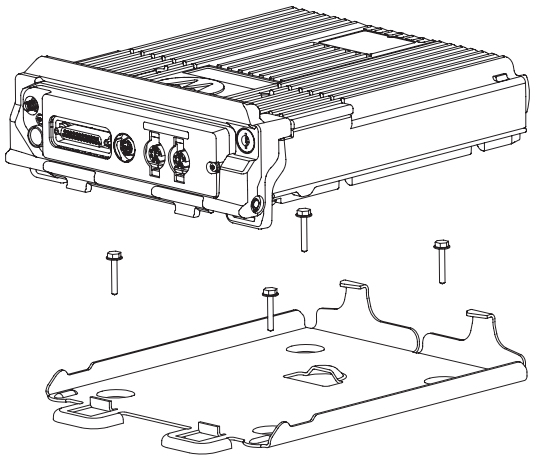


Figure 2-27. 100W Radio Mounting into Quick Release Trunnion

2.2.2.2 Remote Mount Control Head Installation

Choose a mounting location for the radio, considering accessibility, and control and antenna cable lengths.

The recommended mounting surfaces for the control unit are under the mounting surface, on the transmission hump, or on the center console. Figure 2-28 and Figure 2-29 shows how the trunnion, control head, and cables should be installed for the O2, O5, O7 or O9 control head.

NOTE: Connector-protective covers (i.e. Dust Covers) HLN6980_ are provided with the radio. They should be installed on exposed connectors for added environmental robustness.

An adjustable trunnion, which allows a number of mounting positions, is supplied for mounting the control unit. The installation must not interfere with the operation of the vehicle or its accessories, nor disturb passenger seating or leg room. The control head must be within convenient reach and viewing of the user.

If the trunnion is mounted on a plastic mounting surface, all four mounting screws should penetrate the mounting surface's supporting metal frame. If that is not possible, use a metal backing plate (not supplied) to strengthen the installation. Install the control follows:

1. Use the control unit trunnion as a template to mark the mounting holes; drill 5/32" holes. If mounting on a plastic surface, use a metal backing plate.
2. Attach the trunnion bracket using all four 10-16" x 5/8" self-tapping screws provided.
3. Temporarily install the control head (adjusting for proper viewing angle) and fasten it to the trunnion with two wing screws. Test the installation to be sure the control head feels securely locked in place while you are pressing its buttons.
4. Finish installation by fully tightening screws.

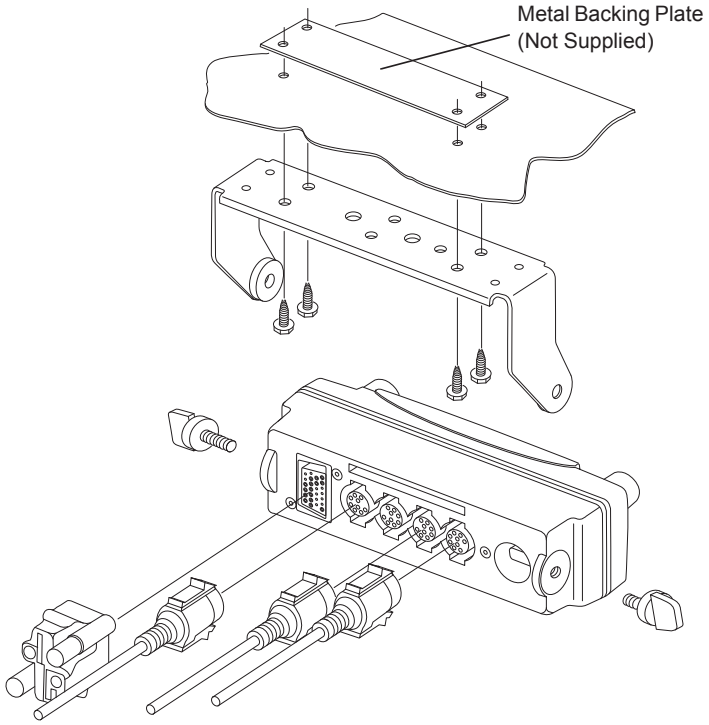


Figure 2-28. O5 Control Head Installation Exploded View (Also applicable for O2 and O7 Control Heads)

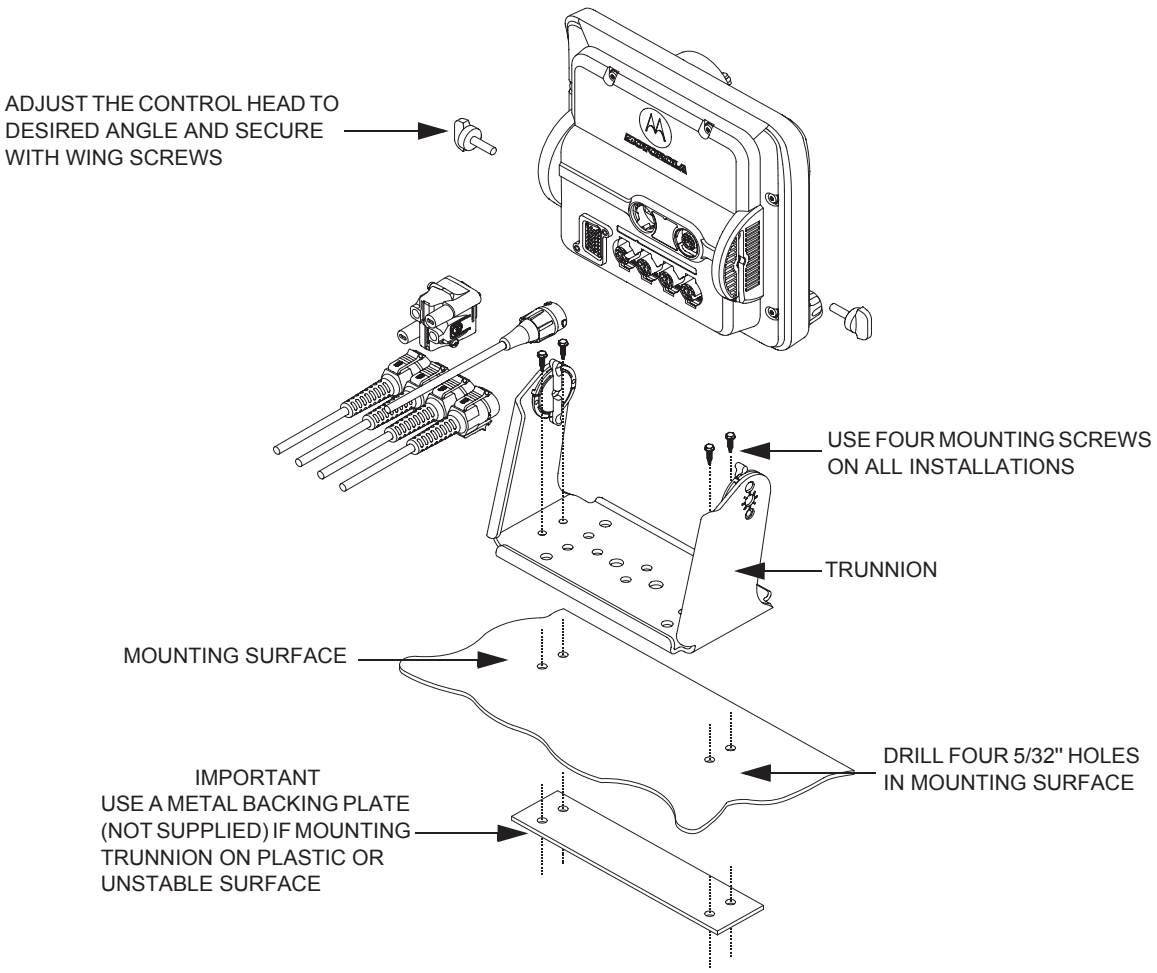


Figure 2-29. O9 Control Head Installation Exploded View

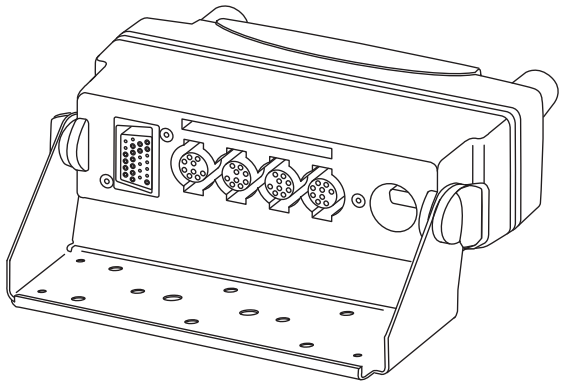


Figure 2-30. O5 Control Head Rear View
(Also applicable for O2 and O7 Control Heads)

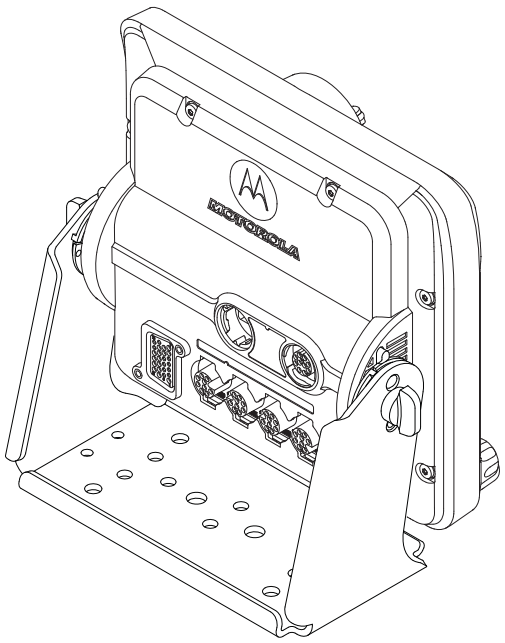
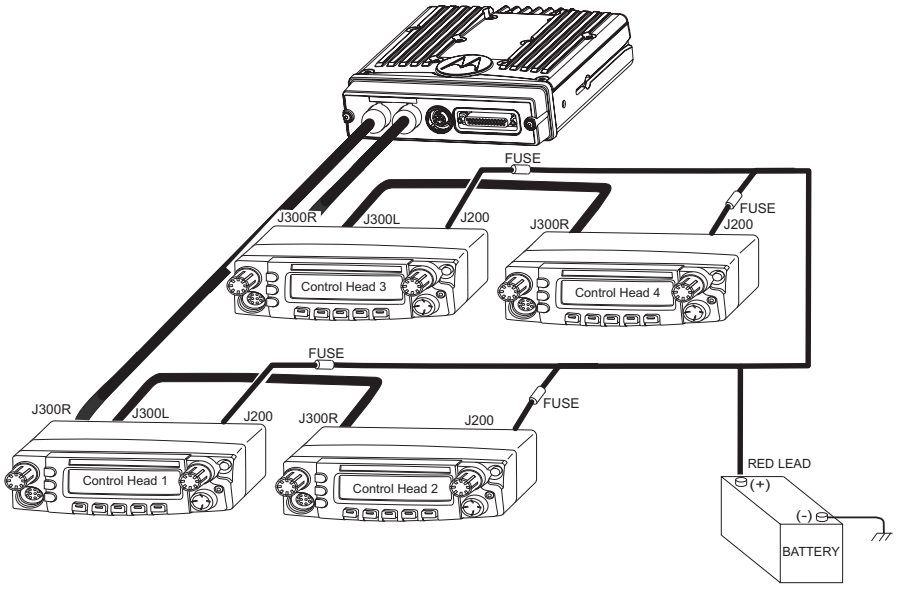


Figure 2-31. O9 Control Head Rear View

2.2.2.3 Multiple Control Head Installation

Control heads in a multiple control head configuration should be installed per the steps detailed in Section 2.2.2.2: “Remote Mount Control Head Installation” on page 2-24. Two heads can be connected to each of the two CAN connectors on the transceiver, with the remaining heads connected to one or both of the first two. Control heads can also be connected a “daisy chain” configuration from a single transceiver CAN connector. See Figure 2-32 for examples.

NOTE: The transceiver must be configured for Multiple Control Head via CPS programming. Navigate to the “Control Head” tab in the Radio Wide section of CPS, and select “Help” for further information and tutorials.



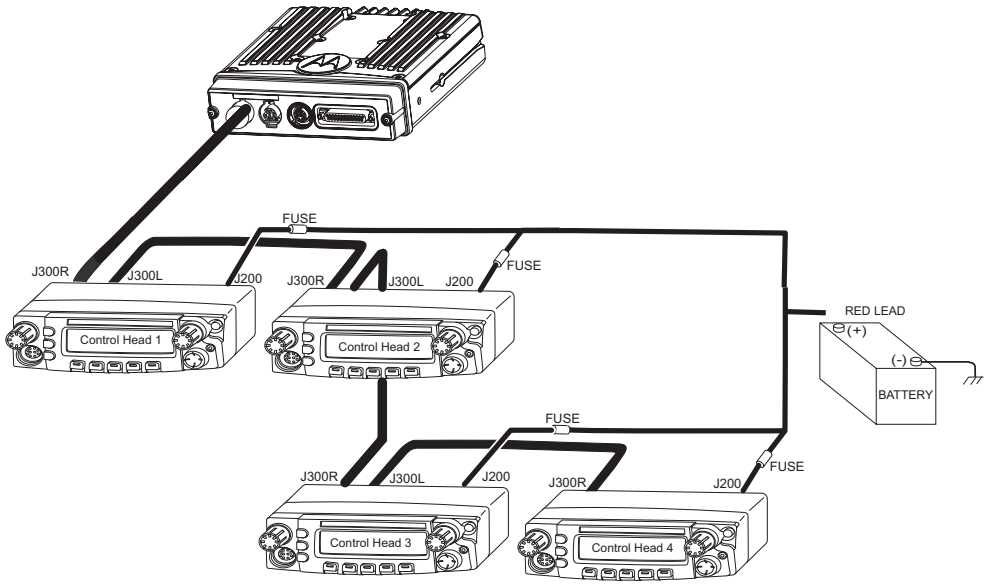


Figure 2-32. Multiple Control Heads Example Configurations

NOTE: In Multiple Control Head (MCH) installations, the yellow ignition sense wire must be connected to the head assigned ID # 1. See Section 2.2.2.5 “Setting the Initial Control Head ID” on page 2-29 for further information.

Use the most convenient configuration for your installation, ensuring that the combined cable lengths do not exceed 131 feet (40 meters). See Table 2-7 for a list of available CAN cable lengths. Control head ground, power and ignition sense wires (black, red, and yellow respectively) may need additional length (not supplied) in installations that locate the head more than 10 feet from a power source.

Table 2-7. Available CAN Cables

Part Number	Description
HKN6164_	Cable, Remote Mount, 40m (131ft)
HKN6165_	Cable, Remote Mount, 35m (115ft)
HKN6166_	Cable, Remote Mount, 23m (75ft)
HKN6167_	Cable, Remote Mount, 15m (50ft)
HKN6168_	Cable, Remote Mount, 9m (30ft)
HKN6169_	Cable, Remote Mount, 5m (17ft)
HKN6170_	Cable, Remote Mount, 3m (10ft)
PMLN4958_	Cable, O3 Extension, 5m (17ft)

Table 2-8. Ignition Interface Cables

Part Number	Description
HLN6863_	Cable, M.A.P. 26pin with Only Ignition and SPK
PMLN4959_	Cable, Y-Splitter with DB-25 and M.A.P. Interface

2.2.2.4 Cable Installation

Route the cables where they are protected from pinching, sharp edges or crushing. Use grommets in any holes where the cable passes through metal panels. Figure 2-19 shows how the cables and components are connected. It is not recommended to route cabling or wiring inside the wheel wells of a vehicle.

2.2.2.5 Setting the Initial Control Head ID

The Front Panel Programming (FPP) mode allows you to define which control head in a Multi Control Head system becomes control head number 1-4.

Set the control head ID number for each attached head the first time Multi Control Head is used.

1. Press the power button to power off the radio.
2. Press and hold left-most menu and the orange button on the control head simultaneously.

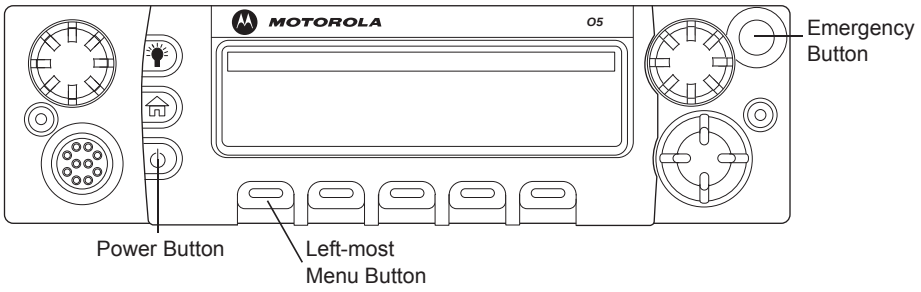


Figure 2-33. APX Mobile O5 Control Head Front View

3. Press the power button to power on the control head. The head will power on into FPP mode and display the current control head ID number:

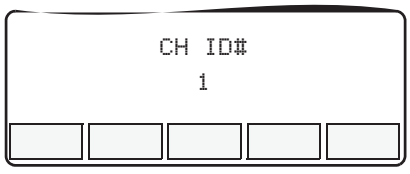


Figure 2-34. Radio Display with Current Control Head ID

4. Turn the **Mode** knob to change the control head's ID number.

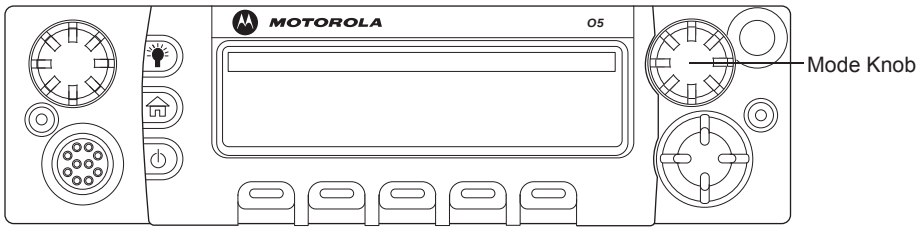


Figure 2-35. APX Mobile O5 Control Head Front View – Mode Knob

5. Repeat steps 1 to 4 above to set the ID of the remaining control heads.

NOTE: In Multiple Control Head (MCH) installations, the yellow ignition sense wire must be connected to the head assigned ID # 1.

2.2.2.6 O3 Control Head and Remote Mount Cabling

Choose a mounting location for the radio, considering accessibility, and control and antenna cable lengths. The control head extension cable and the accessories cable should be installed and routed properly to avoid complications. Route the cables in the vehicle's wiring troughs (where available) or route the cables where they are protected from pinching, sharp edges, or crushing. One suggested route is along one side of the driveshaft hump under the carpet. Use grommets in any holes where the cable passes through metal panels.

Figure 2-36. O3 Control Head

The recommended mounting surface for the control unit is on the center console. Figure 2-38 shows how the hang-up clip control head, and cables should be installed for the O3 control head.

NOTE: Connector-protective covers are provided with the radio. They should be used for added environmental robustness.

A mounting clip, which allows the control head to be mounted, is supplied together with the control head. The installation must not interfere with the operation of the vehicle or its accessories, nor disturb the passenger seating. The control head must be within convenient reach and viewing of the user.

Install the mounting clip as follows:

1. Use the provided mounting clip to determine the location of the two screw holes.
2. Drill 7/16” deep holes for upper and lower screws.
3. Use the tapping screw provided to install the mounting clip.

Caution

Care must be taken to shield the control head (front and back) from direct exposure to pressurized water. The pressurized water from a hose, in most cases, is more severe than the stated test and conditions in typical environments.

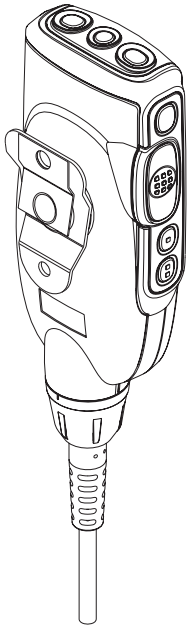
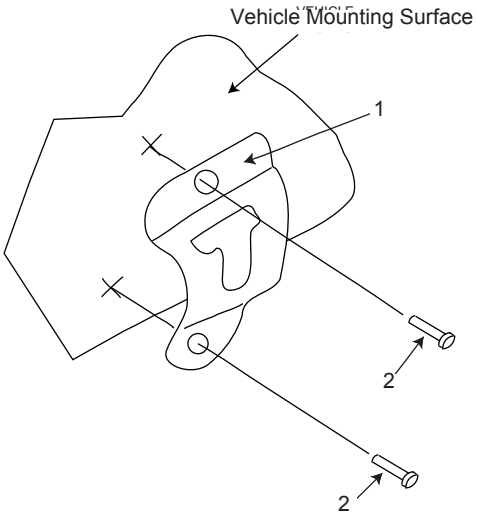


Figure 2-37. O3 Control Head Rear View



Item No.	Part Number	Description
1	01-80743T91	Mic Hang-Up Clip Assembly
2	03-07644M19	Screw, Machine, 8-32 x 7/16

Figure 2-38. Hang-Up Clip Installation Exploded View

2.2.3 Locking Kit (Optional)

2.2.3.1 All Radios Except 100W

If an optional locking kit (HLN6372_) is used (shown in Figure 2-39), position the lock housing on the trunnion after installing the radio mounting screws. Then rotate the lock with the key in it and remove the key to lock the radio. You can install the lock on either side of the radio, and in dash and remote mount installations.

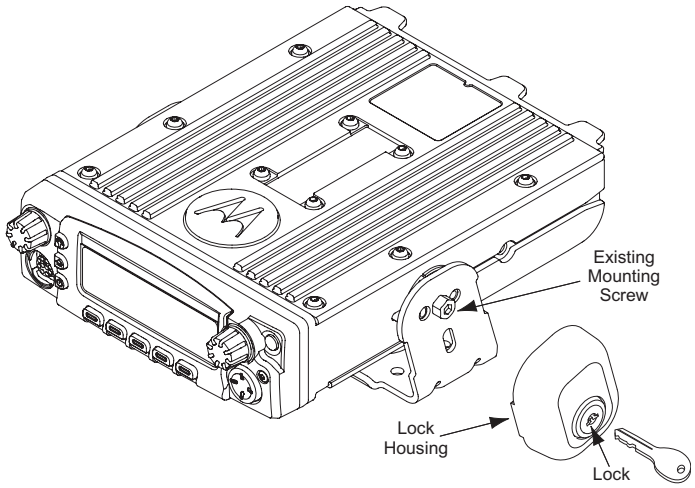


Figure 2-39. Locking Kit (Optional) (Cannot Be Used for 100W Radios)

2.2.3.2 100W Radios

An integral lock is included with all 100W radios. The use of a key is only required to unlock the radio (see Figure 2-40).

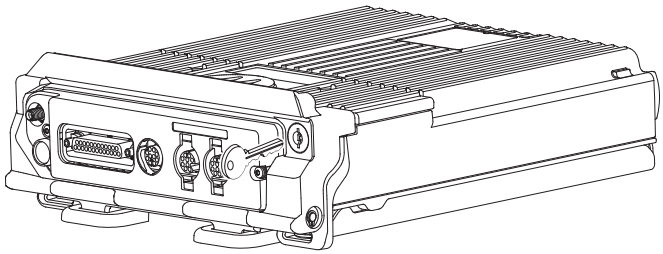


Figure 2-40. Lock Supplied with 100W Quick Release Trunnion

2.3 Power Cables (Transceiver and Control Head)

Route the RED power cable from both the radio and the control head to the vehicle's battery compartment, using accepted industry methods and standards. Be sure to grommet the firewall hole to protect the cable. Remove the 15-amp (part number 6580283E06), 20-amp (part number 6580283E07) or 30-amp (part number 6580283E09) fuse from the fuseholder and connect the red lead of the radio power cable to the positive battery terminal using the hardware provided as shown in Figure 2-46 and Figure 2-47. Connect the black lead to a convenient solid chassis ground point. DO NOT connect the black lead directly to the battery's negative terminal.

Table 2-9. Power Cables

Description	Part Number
Mid Power Dash Mount	HKN4191_
Mid Power Remote Mount	HKN4192_
High Power Remote Mount	HKN6110_
O5, O7, and O9 Remote Control Head Power Cable	HKN6188_

NOTE: Remote Control Head power cable uses a 5A Fuse (part number 6580283E03).

2.3.1 Optional Locking Feature for High Power Chassis Power Cables

An optional clip (HLN7017_) can be used to increase DC cable retention in the high power radios. Directions for assembly and disassembly are:

1. Install the DC cable to the radio by aligning the male and female portions of the battery side with the mating components on the radio side.

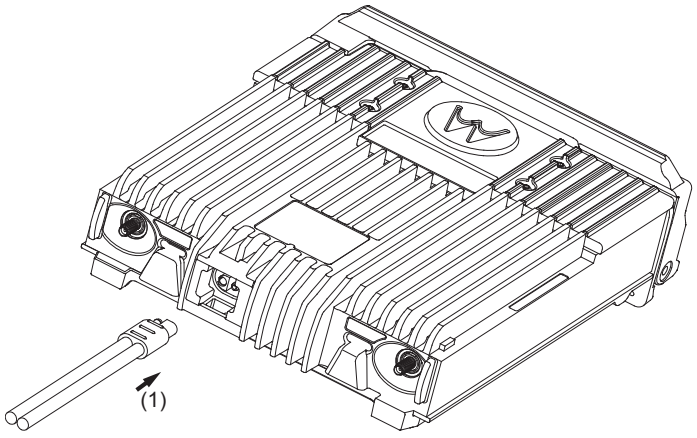


Figure 2-41. Bracket Installation

2. Insert the locking bracket (HLN7017_) onto the DC cable.
3. Slide the bracket toward the radio until the bracket clips snap onto the radio features.

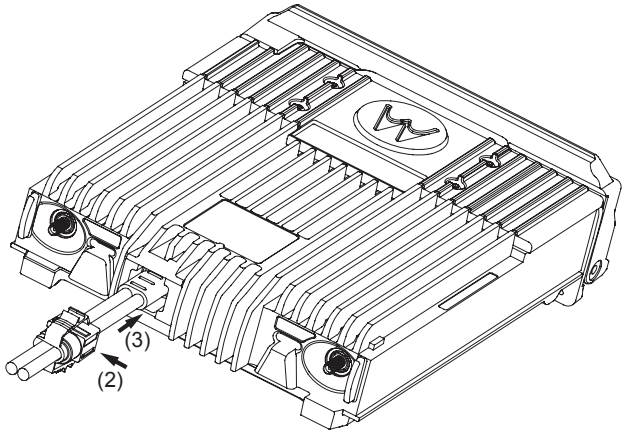


Figure 2-42. Bracket Installation

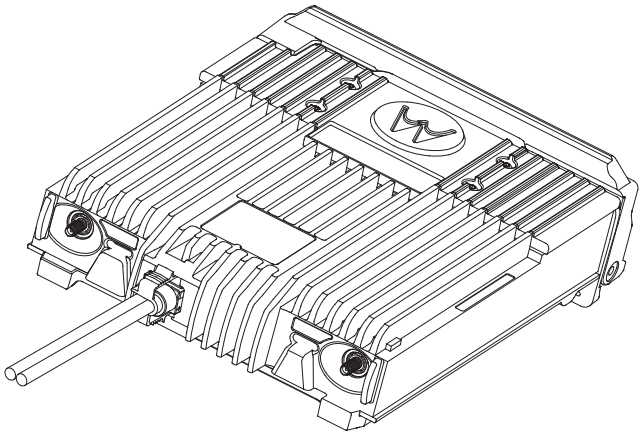


Figure 2-43. Bracket Installation (Assembled State)

4. To disassemble the power cable, squeeze the locking bracket clips inward and while squeezing the clips, pull the locking clip and power cable to remove the power cable.

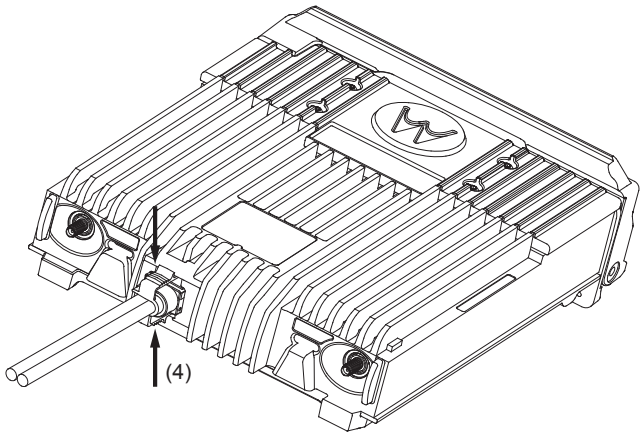


Figure 2-44. Bracket Uninstallation

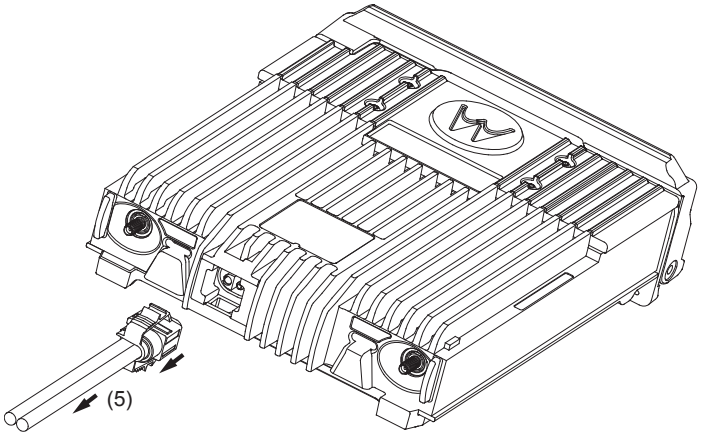


Figure 2-45. Bracket Uninstallation

2.3.2 O2, O5, O7 or O9 Control Head Power Cables

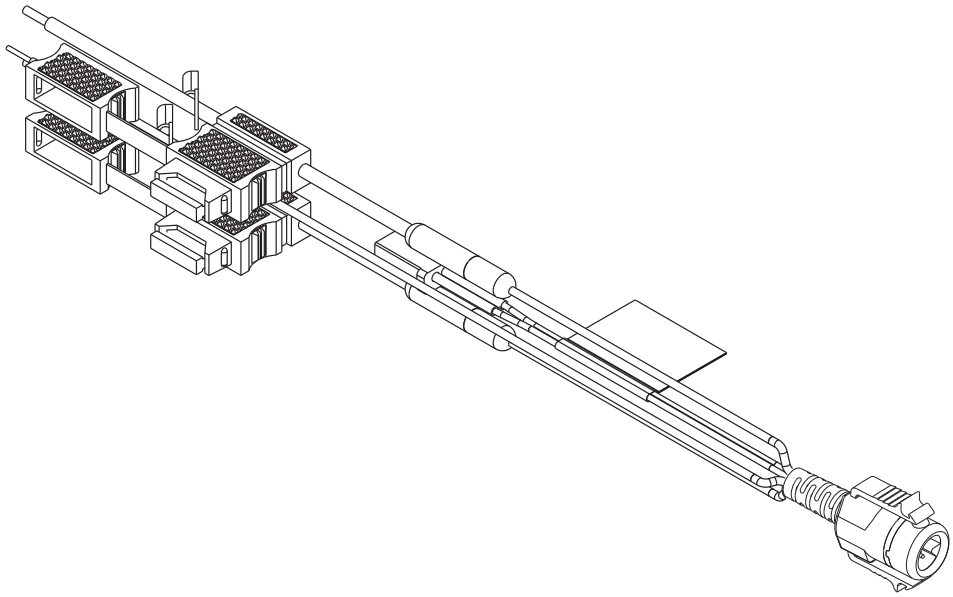


Figure 2-46. HKN6188_ Power Cable with External Speaker Connector

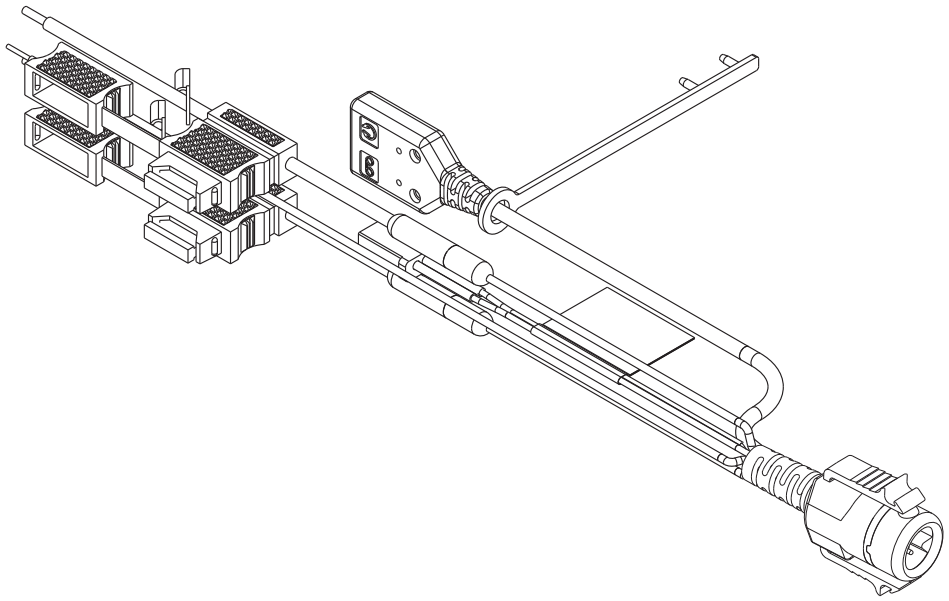


Figure 2-47. HKN6187_ Power Cable with External Speaker Connector, Record Audio Output Jack (2.5 mm) and Earphone Jack (2.5 mm)

NOTE: Audio Out – Does not require CPS programming. Attaching a headset will mute the external speakers of the radio which are attached at the SPK jack of the control head.

Record Out – Requires CPS programming. In CPS, navigate to Radio Wide/Advanced/ Record Audio and select TX + RX Audio.

2.3.3 Battery Selector Switch

In vehicles which have installed a Battery Selector Switch, the ignition sense (yellow) wire should be the only wire connected to the battery selector switch (see Figure 2-48). Radio transceiver and control head power wires (red) must be connected directly to the vehicle battery. If the control head power wire and the control head ignition sense wire are both connected to a battery selector switch, but the radio transceiver power lead is not, improper power-cycling and off-state battery drainage may occur. If the desired state of the radio is a total battery drain elimination, then all power and ignition sense wires must be routed through the battery selector switch, so that the control head and radio transceiver both see the loss of battery power at the same time.

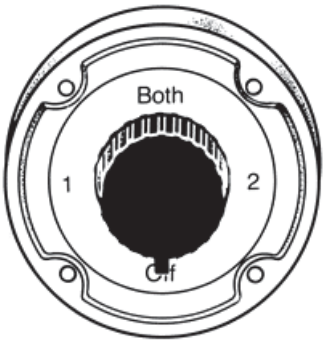


Figure 2-48. Battery Selector Switch

2.4 Antenna Installation

IMPORTANT: To assure optimum performance and compliance with RF Energy Safety standards, these antenna installation guidelines and instructions are limited to metal-body vehicles with appropriate ground planes and take into account the potential exposure of back seat passengers and bystanders outside the vehicle.

NOTE: For mobile radios with rated power of 7 watts or less, the only installation restrictions are to use only Motorola approved antennas and install the antenna externally on metal body vehicles. For mobile radios with tuned power greater than 7 watts, always adhere to all the guidelines and restrictions in Section 2.4.1 below.

2.4.1 Selecting an Antenna Site/Location on a Metal Body Vehicle

1. **External installation** – Check the requirements of the antenna supplier and install the vehicle antenna external to a metal body vehicle in accordance with those requirements.
2. **Roof top** – For optimum performance and compliance with RF Energy Safety standards, mount the antenna in the center area of the roof.
3. **Trunk lid** – On some vehicles with clearly defined, flat trunk lids, the antennas of some radio models (see restrictions below) can also be mounted on the center area of the trunk lid. For vehicles without clearly defined, flat trunk lids (such as hatchback autos, sports utility vehicles, and pick-up trucks), mount the antenna in the center area of the roof.

   Before installing an antenna on the trunk lid,

   - Be sure that the distance from the antenna location on the trunk lid will be at least 85 cm (33 inches) from the front surface of the rear seat-back to assure compliance with RF Energy Safety standards.
   - Ensure that the trunk lid is grounded by connecting grounding straps between the trunk lid and the vehicle chassis.


Caution

If these conditions cannot be satisfied, then mount the antenna on the roof top.

4. **Mounting restrictions for certain radio models.**

   For all VHF and UHF models, the 1/4 wave antenna should be mounted ***only in the center area of the roof***, not on the trunk lid, to assure compliance with **RF Energy Safety standards**.
5. Ensure that the antenna cable can be easily routed to the radio. Route the antenna cable as far away as possible from any vehicle electronic control units and associated wiring.
6. Check the antenna location for any electrical interference.

7. Ensure that any transmitting radio antennas on this vehicle are separated from each other by at least 3 feet (0.9 meter). See Figure 2-49.
8. The minimum distance between the antenna and the radio/accessories should be at least 3 feet (91.44 cm).

NOTE: Any two metal pieces rubbing against each other (such as seat springs, shift levers, trunk and hood lids, exhaust pipes, etc.) in close proximity to the antenna can cause severe receiver interference.

Figure 2-49. Multiple Antennas Separation

2.4.2 Mini-UHF Connection

To help aid in the installation of the radio antenna(s), there are labels indicating the frequency. The first is on the FCC label at the top of the radio which calls out the frequency and by using arrow points, which side the RF connector of the frequency is located at the back of the radio. The second is located at the back of the radio, next to the RF connector(s) (see Figure 2-50). To ensure a secure connection of an antenna cable's mini-UHF plug to a radio's mini-UHF jack, their interlocking features must be properly engaged. If they are not properly engaged, the system will loosen. Using a tool (pliers or wrench) will not overcome a poor engagement, and is not recommended.

NOTE: Applying excessive force with a tool can cause damage to the antenna or the connector (e.g., stripping threads, deforming the collar or connector, or causing the connector to twist in the housing opening and break).

The mini-UHF connector tool (Motorola part number HLN6695_) is designed to securely tighten the antenna plug–radio jack connection without damaging either the plug or the jack.

Motorola recommends the following sequence to ensure proper attachment of the system (see Figure 2-50 and Figure 2-51):

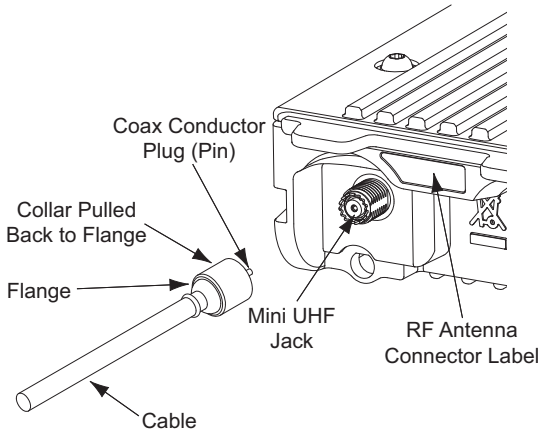


Figure 2-50. Mini-UHF Connection (As Shown on Mid Power)

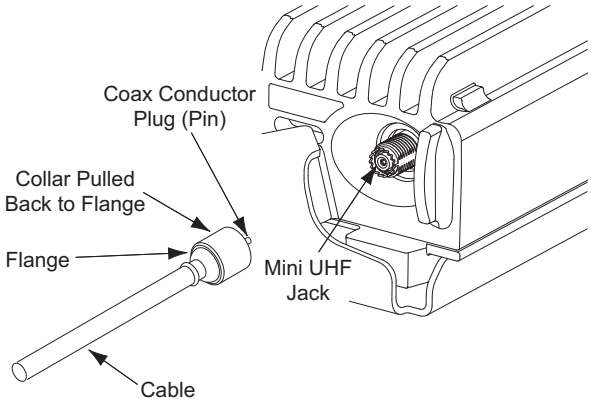


Figure 2-51. Mini-UHF Connection (100W Radios Only)

1. Make sure that there is sufficient slack in the antenna cable.
2. Make sure that the collar of the antenna cable plug is loose and does not bind.
3. Make sure that the mini-UHF jack is tight in the radio housing.

4. Slide the collar back against the flange. Insert the antenna cable plug's pin fully into the radio jack, but do not engage the threads.
5. Ensure that the plug's and jack's interlocking features are fully seated. Check this by grasping the crimp on the cable jack, rotating the cable, and noting any movement. If the features are seated correctly, there should be NO movement.
6. Finger-tighten the antenna cable plug's collar onto the radio's jack.
7. Give a final tug, by hand, to the collar, and retighten by hand as firmly as possible.
8. Slip the mini-UHF connector tool over the coaxial cable, using the gap between the tool's legs (see Figure 2-52). Then, slide the tool up onto the plug's knurled collar. Squeeze the two straight legs of the tool firmly together between your thumb and index finger and turn clockwise (as shown) to tighten the collar. It should take 1/4 turn or less. When you feel the tool slipping on the collar, the connection has been properly tightened. The tool can also be used to loosen a tight collar.

NOTE: **DO NOT** use pliers or any other device to grip the tightening tool. It has been designed to allow you to achieve the proper torque on the collar without overtightening. Overtightening the collar can damage the connector and the radio.

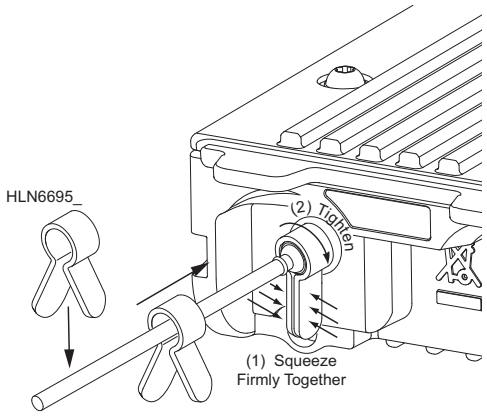


Figure 2-52. Mini-UHF Connector Tool (As Shown on Mid Power)

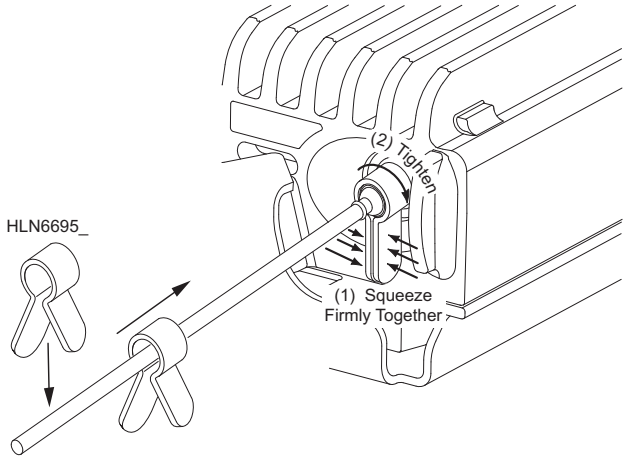


Figure 2-53. Mini-UHF Connector Tool (100W Radios Only)

2.4.3 GPS Antenna Placement

The GPS antenna (excluding the Motorcycle GPS antenna) must be placed at least, 3 feet (0.9 meters) away from any transmitting antenna, and the antenna must have a clear, unobstructed view of the sky for best performance. The length of the cabling must be taken into consideration before the installation is started.

2.4.4 GPS Connection

To ensure a secure connection of the GPS antenna cable's SMA plug to a radio's SMA jack, the connector must be fully seated. If the connectors are not fully seated, the system will loosen. This should be done by hand to ensure excess force is not applied. GPS positions as shown in Figure 2-54 and Figure 2-55 are located in different positions. The mid power radio has the GPS antenna connector on the back of the radio while the 100W radio has the antenna connector on the front of the radio.

NOTE: Applying excessive force with a tool can cause damage to the antenna or the connector (e.g. stripping threads, deforming the collar or connector, or causing the connector to twist in the housing opening and break).

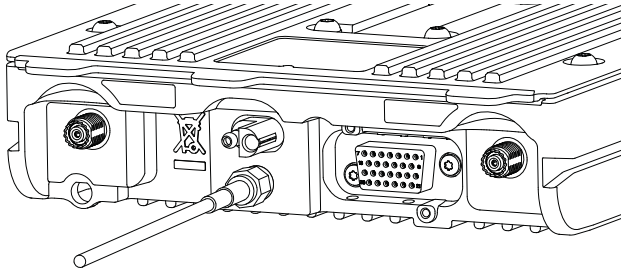


Figure 2-54. GPS Antenna Connector on the Back of the Mid Power Radio

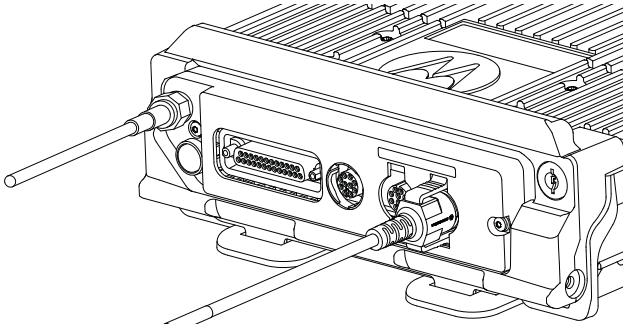


Figure 2-55. GPS Antenna Connector on the Front of the 100W Radio

2.5 Speaker

Caution

DO NOT ground the radio's speaker leads. This system has a floating speaker output (DC voltage on both leads); damage to the audio circuit will result if either lead is grounded or if they are shorted together.

The speaker kit includes a trunnion bracket that allows the speaker to be mounted in a variety of ways. With the trunnion bracket, the speaker can mount permanently on the mounting surface or in accessible firewall areas. The trunnion allows the speaker to tilt for best operation. Mount the speaker out of the way so that it will not be kicked or knocked around by the vehicle occupants. Mount the speaker as follows:

1. Use the speaker mounting bracket as a template to mark the mounting hole locations.
2. Use the self-drilling screws provided to fasten the trunnion.
3. Attach the speaker and fasten to the trunnion with two wing screws.
4. Route the speaker wires under the carpet or floor covering, or behind the kick panels. Be sure the wires are out of the way and will not be snagged and broken by the occupants of the vehicle.
5. Do not submerse the 2-pin speaker connector in water nor place this connector in an area that could have standing water.

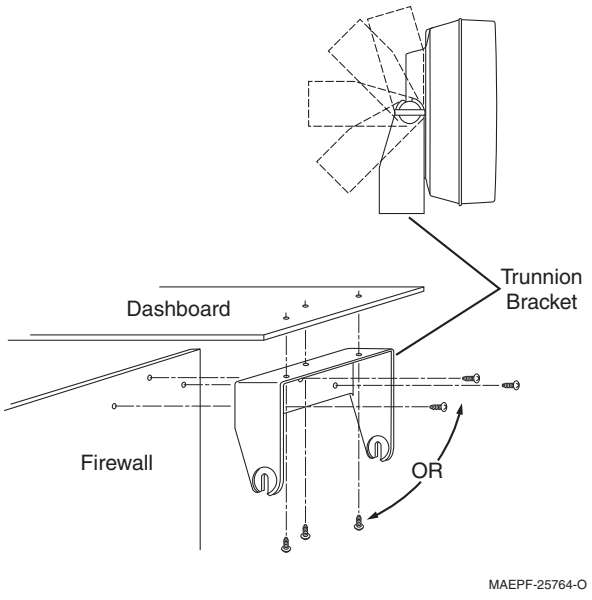


Figure 2-56. Speaker Mounting