

**XPR 4300/4350/4500/4550
Mobile Radio
Installation Manual**

Foreword

This manual covers the XPR 4300/4350/4500/4550 digital mobile radios. It includes all the information necessary to maintain peak product performance and maximum working time, using levels 1 and 2 maintenance procedures. This level of service goes down to the board replacement level and is typical of some local service centers, self-maintained customers, and distributors.

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.

Product Safety and RF Exposure Compliance

See “[Installation Requirements for Compliance with Radio Frequency \(RF\) Energy Exposure Safety Standards](#),” on page iii.

Manual Revisions

Changes which occur after this manual is printed are described in FMRs (Florida Manual Revisions). These FMRs provide complete replacement pages for all added, changed, and deleted items.

To obtain FMRs, 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 XPR 4300/4350/4500/4550 Digital Mobile Radio Basic Service Manual (Motorola publication part number 6816816H01).

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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 2-8 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, the operator must be familiar with the RF energy awareness information and operating instructions in the Product Safety and RF Exposure booklet enclosed with each radio (Motorola Publication part number 68P81095C99) to ensure compliance with Radio Frequency (RF) energy exposure limits.

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.motorola.com/governmentandenterprise>.

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Table of Contents

Foreword	ii
Product Safety and RF Exposure Compliance	ii
Manual Revisions	ii
Parts Ordering	ii
Computer Software Copyrights	ii
Document Copyrights	ii
Disclaimer.....	ii
Trademarks	ii
 Installation Requirements for Compliance with Radio Frequency (RF) Energy Exposure Safety Standards	 iii
 Mobile Radio Model Numbering Scheme	 viii
 Commercial Warranty	 ix
Limited Warranty	ix
MOTOROLA COMMUNICATION PRODUCTS	ix
I. What This Warranty Covers And For How Long	ix
II. General Provisions	ix
III. State Law Rights	x
IV. How To Get Warranty Service	x
V. What This Warranty Does Not Cover.....	x
VI. Patent And Software Provisions	xi
VII. Governing Law.....	xi
 Chapter 1 Introduction	 1-1
1.1 Mobile Radio Description	1-1
1.1.1 Dimensions	1-1
1.2.1 Dash Mount Configuration	1-2
1.3 Base/Control Stations	1-2
1.4 Tools Required for XPR 4300/4350/4500/4550 Installations	1-3
 Chapter 2 Standard Configurations	 2-1
2.1 Planning the Installation.....	2-1
2.2 Radio Mounting.....	2-4
2.2.2 Locking Kit (Optional)	2-6
2.2.2.1 All Radios.....	2-6
2.3 Power Cable	2-6
2.4 Ignition Sense Cable.....	2-8
2.5 Antenna Installation	2-8
2.5.1 Selecting an Antenna Site/Location on a Metal Body Vehicle	2-8
2.5.2 Mini-UHF Connection	2-9
2.6 Speaker	2-10
2.7 Microphone Hang-Up Clip	2-12

2.7.1	Standard Hang-Up Clip.....	2-12
2.7.2	Handheld Hang-Up Box.....	2-12
2.8	Completing the Installation	2-12

Chapter 3 Options and Accessories Installation 3-1

3.1	Emergency Pushbutton, Footswitch, Horn Relay, and Light Relay Installation.....	3-1
3.1.1	Emergency Pushbutton or Footswitch Installation.....	3-1
3.1.2	Horn (External Alarm) Relay Installation.....	3-1
3.1.3	Lights (External Alarm) Relay Installation.....	3-1
3.2	Dash-Mount Accessory Installation	3-1
3.2.1	MDC Emergency Pushbutton or Footswitch Installation.....	3-2
3.2.2	Horn and Lights (External Alarm) Relay	3-3

Appendix A Replacement Parts Ordering.....A-1

A.1	Basic Ordering Information.....	A-1
A.2	Motorola Online	A-1
A.3	Mail Orders	A-1
A.5	Fax Orders.....	A-2
A.6	Parts Identification	A-2
A.7	Product Customer Service.....	A-2

GlossaryGlossary-1

IndexIndex-1

Related Publications

XPR 4300/4350/4500/4550 Digital Mobile Radio Basic Service Manual	6816816H01
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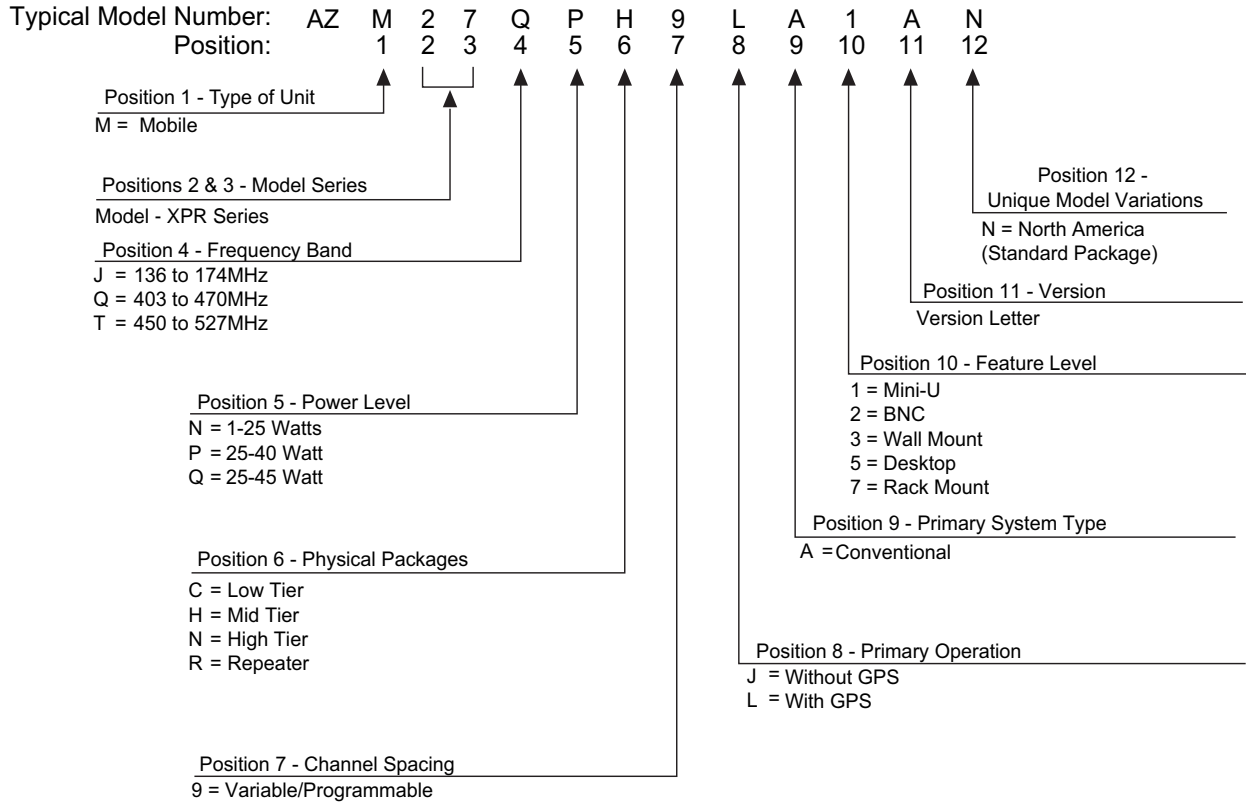
List of Figures

Figure 1-1. Front View of Dash Mount Transceiver Trunnion.....	1-1
Figure 1-2. Side View of Dash Mount Transceiver Trunnion.....	1-1
Figure 1-3. Dash Mount Configuration.....	1-2
Figure 1-4. Remote Mount Configuration, with 110W transceiver.....	1-2
Figure 2-1. Mounting Flexibility in Middle Console.....	2-1
Figure 2-2. On Top or Under Dash Mounting.....	2-1
Figure 2-3. Radio Installation (Dash Mount) with Transceiver.....	2-2
Figure 2-4. Pin Configuration.....	2-3
Figure 2-5. Trunnion Orientation.....	2-4
Figure 2-6. Transmission Hump Trunnion Mounting.....	2-5
Figure 2-7. Below Dash Trunnion Mounting.....	2-5
Figure 2-8. Locking Kit (Optional) 110W Radios.....	2-6
Figure 2-9. Cabling Interconnect Diagram for Dash Mount.....	2-7
Figure 2-30. Mini-UHF Connection (as shown on mid-power).....	2-9
Figure 2-31. Mini-UHF Connector Tool (as shown on mid-power).....	2-10
Figure 2-32. Speaker Mounting.....	2-11
Figure 3-1. VIP Connector Detail.....	3-1
Figure 3-2. Emergency Switch Wiring Diagram.....	3-2
Figure 3-3. Horn/Light Wiring Diagram.....	3-3

List of Tables

Table 3-1. Rear Accessory Jack Pin Functions.....	3-4
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Mobile Radio Model Numbering Scheme



Commercial Warranty

Limited Warranty

MOTOROLA COMMUNICATION PRODUCTS

I. What This Warranty Covers And For How Long

MOTOROLA 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:

XPR 4300/4350/4500/4550 Mobile Radio	Two (2) 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.

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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.

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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.
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- F. Product which has had the serial number removed or made illegible.
- G. 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.
- 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 type acceptance 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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- 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 non-infringing 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 XPR 4300/4350/4500/4550 mobile and motorcycle radios with O5 control heads and accessories required to complete the radio system. The radio system consists of a control head, radio, antenna, microphone, speaker, cabling, and accessories.

1.1 Mobile Radio Description

1.1.1 Dimensions

Figure 1-1 and Figure 1-2 show the basic dimensions of the dash mount transceiver trunnion XPR 4300/4350/4500/4550. The transceiver portion of a remote mount 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; and to the sides of the radio so that you may access and install the trunnion wing screws.

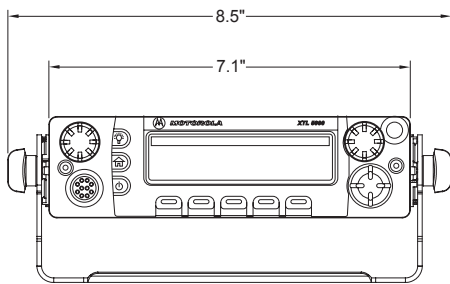


Figure 1-1. Front View of Dash Mount Transceiver Trunnion

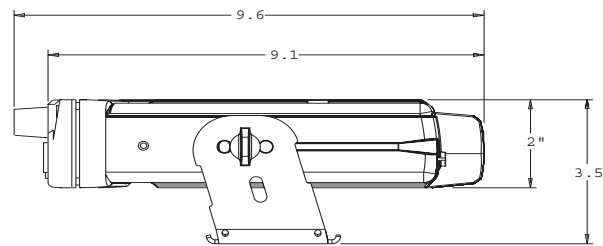


Figure 1-2. Side View of Dash Mount Transceiver Trunnion

NOTE: The rear accessory connector adds 0.75 in. to the overall length.

1.2 Standard Configurations

1.2.1 Dash Mount Configuration

In the dash mounting version of the XPR 4300/4350/4500/4550, the control head is mounted on the front of the transceiver housing. 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.

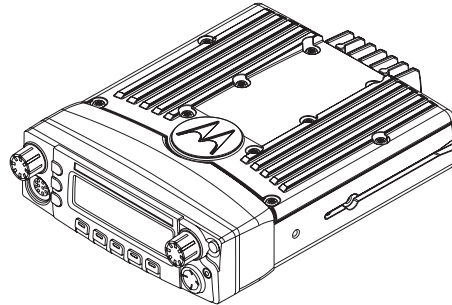


Figure 1-3. Dash Mount Configuration

For details on this configuration, see [Section 2.2.1 on page 2-5](#).

NOTE:

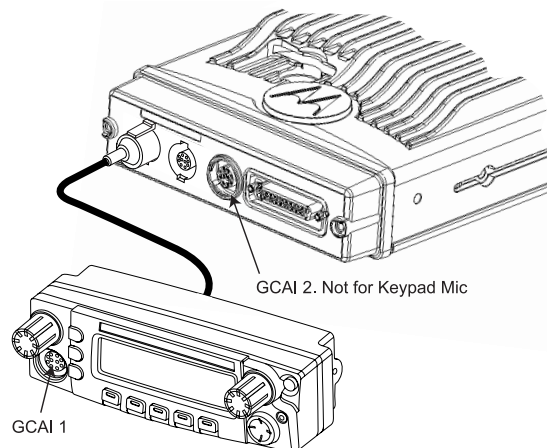


Figure 1-4. Remote Mount Configuration, with 110W transceiver

For details on these configurations, see [Section 2.2.2 on page 2-8](#).

1.3 Base/Control Stations

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 68P81095C99 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.

1.4 Tools Required for XPR 4300/4350/4500/4550 Installations

Tool	Part Number
11/32 hex driver	—
RF cable tool	HLN6695_
Regular slot screwdriver of Phillips #2	—
Pin removal tool	6680163F01
1/4 hex driver	—

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Chapter 2 Standard Configurations

2.1 Planning the Installation

The XPR 4300/4350/4500/4550 radio operates only in negative ground electrical systems. 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. The installation of this device should be completed by an authorized servicer or installer.

2.1.1 Installation Examples

Your mobile two-way radio offers various methods of installation, including dash or remote mount. Except for 110W radios, all versions of the XPR 4300/4350/4500/4550 can be either dash or remote mounted (see [Figure 2-1](#) through [Figure 2-2](#)).

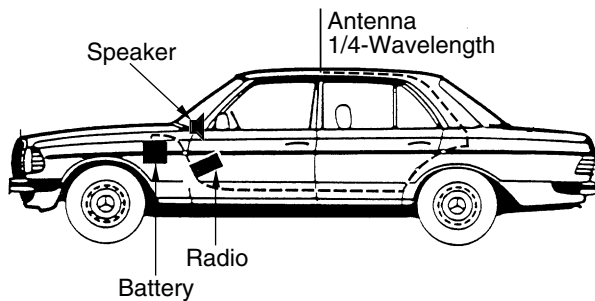


Figure 2-1. Mounting Flexibility in Middle Console

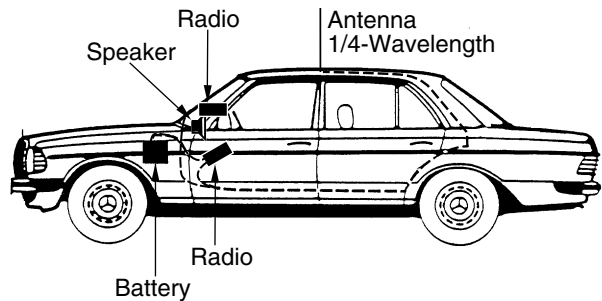


Figure 2-2. On Top or Under Dash Mounting

2.1.2 Wiring Diagrams

Figure 2-3 shows the wiring diagrams for all the possible configurations. The title under each figure identifies the O5 control head configurations. Identify which of these figures shows the configuration that you are installing, and use the diagram when planning the installation.

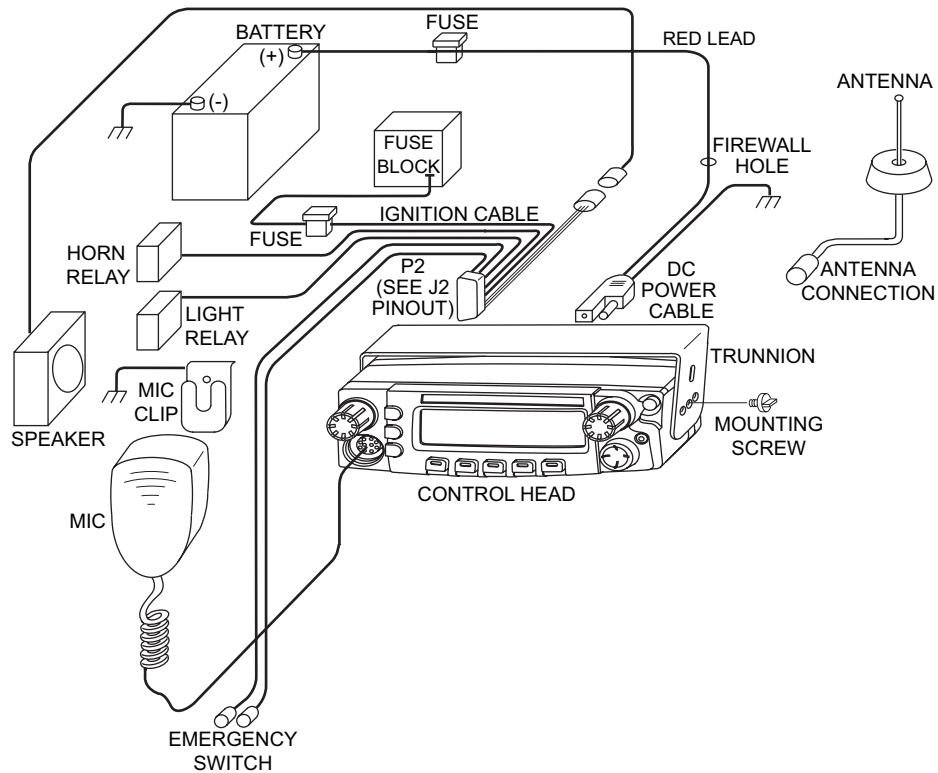


Figure 2-3. Radio Installation (Dash Mount) with Transceiver
(For complete pin configuration, see Figure 2-4.)

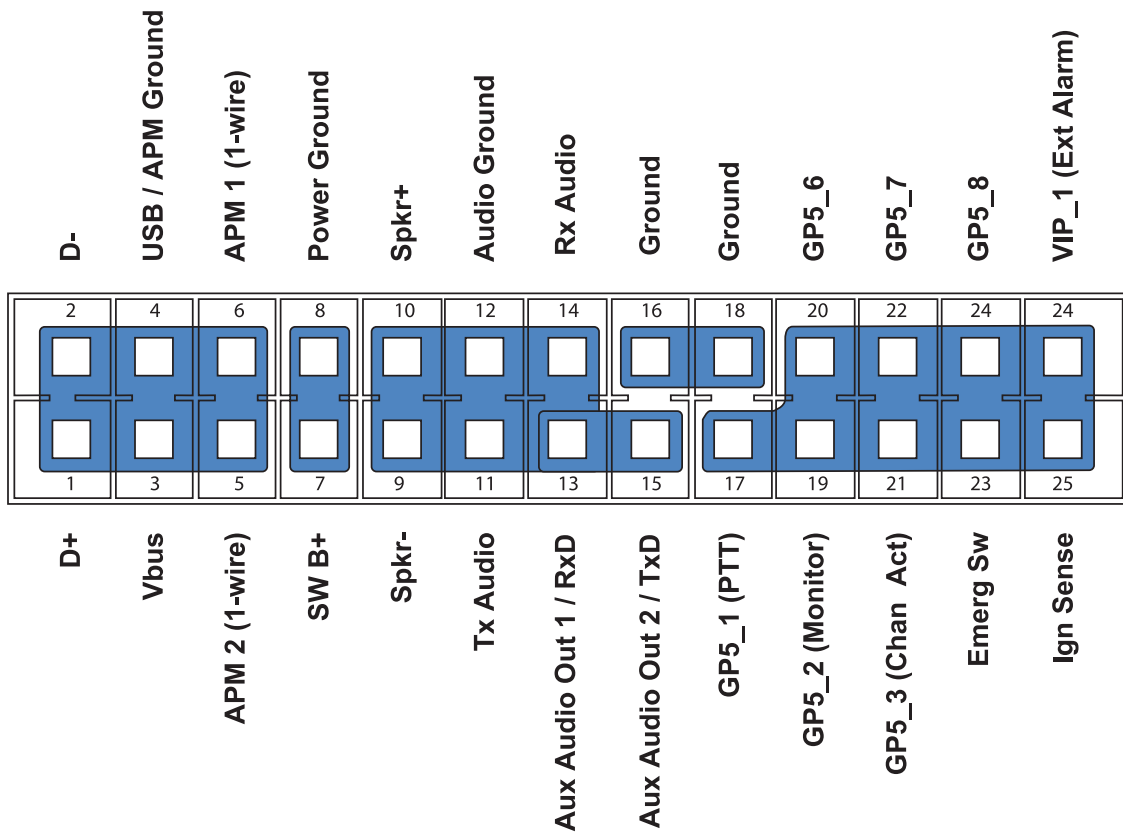


Figure 2-4. Pin Configuration

2.2 Radio Mounting



Caution

CAUTION: DO NOT mount the radio on a plastic dashboard without first reinforcing the dashboard; the weight of the radio may crack or break the dashboard.

CAUTION: 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.

CAUTION: 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.

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 new or existing installations, use one of the following mounting kits GLN7342B (Low profile mounting bracket), GLN7324B (High profile mounting bracket), RLN4799B (Key Lock mounting bracket) or RLN5999A (Dim Mounting Bracket). Orient the mounting trunnion as shown in [Figure 2-5](#)

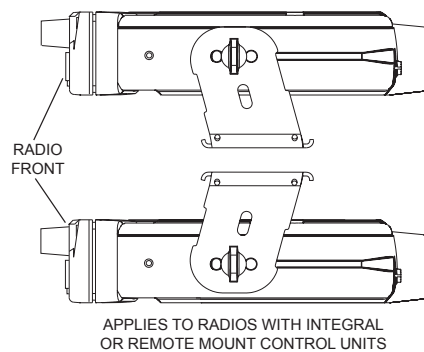


Figure 2-5. Trunnion Orientation

2.2.1 Dash Mount with Trunnion

1. Select the location to mount your radio on the transmission hump (see [Figure 2-6](#)) or under the dash (see [Figure 2-7](#)). When mounting the trunnion on the transmission hump take care the transmission housing is not affected.
2. Using the trunnion mounting bracket as a template, mark the positions of the holes on the mounting surface. Use the innermost four holes for a curved mounting surface such as the transmission hump, and the four outmost holes for a flat surface such as under the dash.
3. Center punch the spots you have marked and realign the trunnion in position.
4. Secure the trunnion mounting bracket with the four self-drilling screws provided (see [Figure 2-6](#) and [Figure 2-7](#)).
5. 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 2-6](#)). Secure the radio with the two wing screws provided.

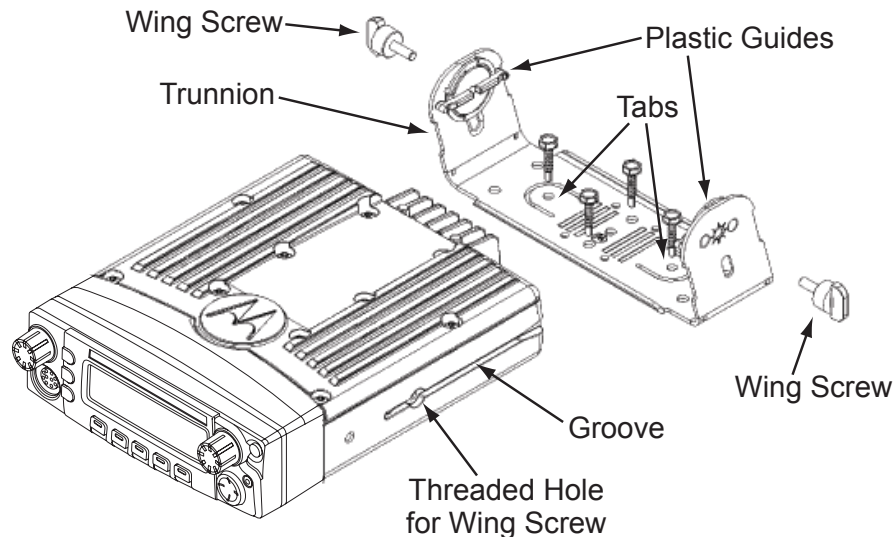


Figure 2-6. Transmission Hump Trunnion Mounting

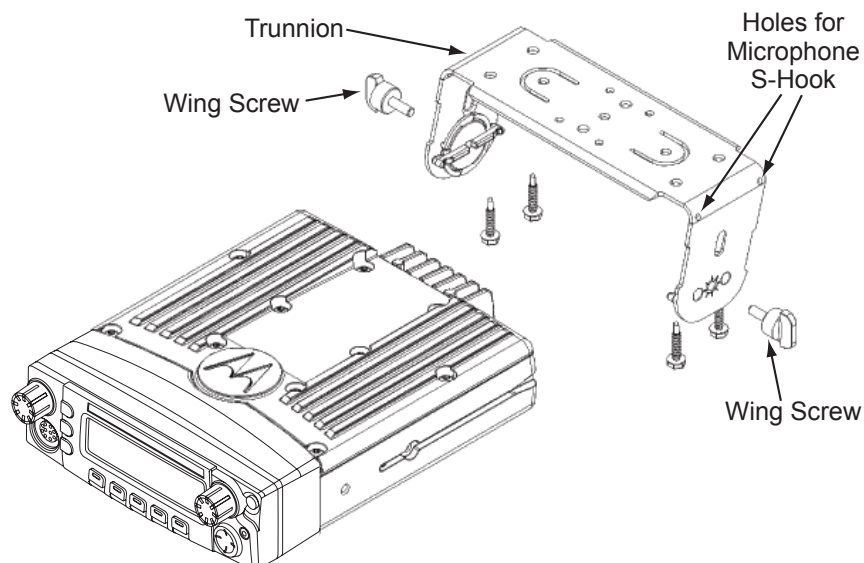


Figure 2-7. Below Dash Trunnion Mounting

2.2.2 Locking Kit (Optional)

2.2.2.1 All Radios

If an optional locking kit is used (shown in [Figure 2-8](#)), position the lock bottom housing on the trunnion before installing the radio mounting screws. Then slip the top lock housing on and remove the key. You can install the lock on either side of the radio, and by rotating it 180°, you can also install it on dash installations.

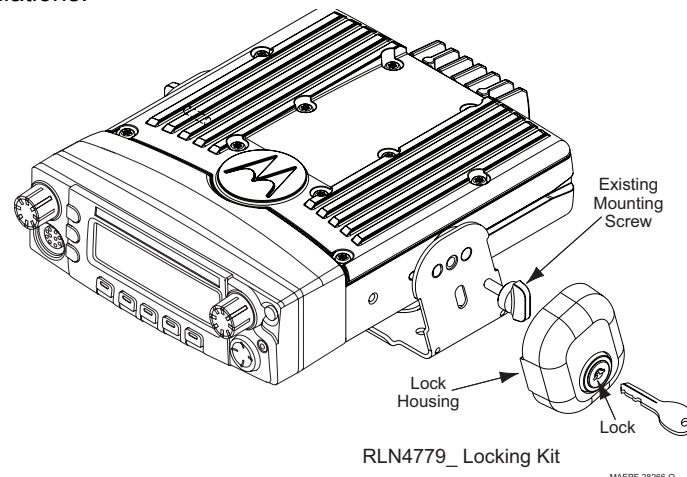
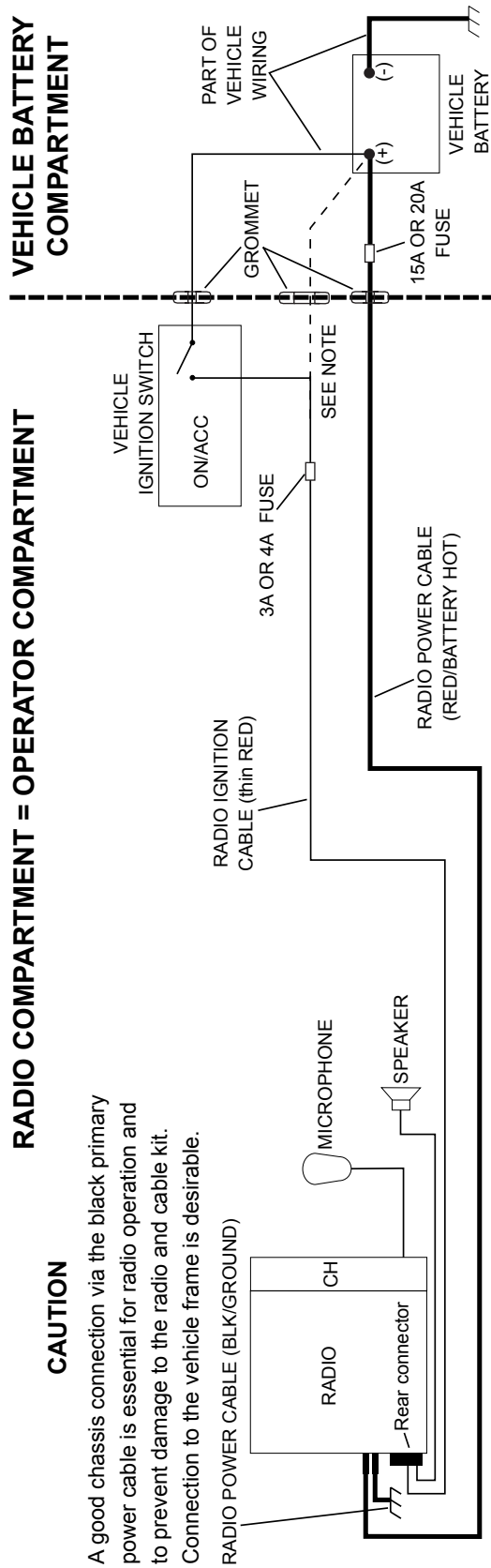


Figure 2-8. Locking Kit (Optional) 110W Radios

2.3 Power Cable

Route the red radio power cable from the radio 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 (for 110W) 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 2-9](#). Connect the black lead to a convenient solid chassis ground point. DO NOT connect the black lead directly to the battery's negative terminal.



NOTE:

Caution: if you choose to connect the radio's IGNITION line directly to the car's battery, excess use of the radio when the car's ignition is not running (i.e. alternator running) could result in a slow discharge of the car's battery. This configuration allows the radio to operate with the car's ignition switch ON or OFF.

If the radio's IGNITION line is wired to the car's ignition switch, the radio will only function when the car's ignition switch is turned ON.

MAEPF-27646-O

Figure 2-9. Cabling Interconnect Diagram for Dash Mount

2.4 Ignition Sense Cable

Motorola supplies an ignition sense cable and recommends that it be used with every *mobile* installation. The ignition sense cable allows the radio to be turned on and off with the vehicle ignition switch, and allows the radio to “remember” the state of the radio on/off switch, even if it is changed while the vehicle is off.

- For radio ON/OFF control independent of the ignition switch, connect the red ignition cable (yellow for remote) (pin 25 of accessory connector) to “battery hot” at the vehicle fuse block (dash mount only).
- For radio ON/OFF control via the ignition switch, connect the red ignition cable (yellow for remote) to “ignition” at the fuse block.

Note that for remote mount installations, the red and yellow leads are connected, not the red lead from the rear of the radio.

The ignition sense cable uses either a 3-amp (P/N 6580283E01) or 4-amp (P/N 6580283E02) fuse.

For other considerations when connecting the ignition cable, see the Basic Service Manual (Motorola publication part number 6881096C73).

2.5 Antenna Installation

IMPORTANT NOTE: 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 rated power greater than 7 Watts, always adhere to all the guidelines and restrictions in section 2.5.1 below.

2.5.1 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, sport 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.

IF THESE CONDITIONS CANNOT BE SATISFIED, THEN MOUNT THE ANTENNA ON THE ROOF TOP!

4. Mounting restrictions for certain radio models

For 40 Watt 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 other mobile radio antenna on this vehicle is at least one foot (30.48 cm) away from this antenna.

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.

2.5.2 Mini-UHF Connection

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 2-30](#)):

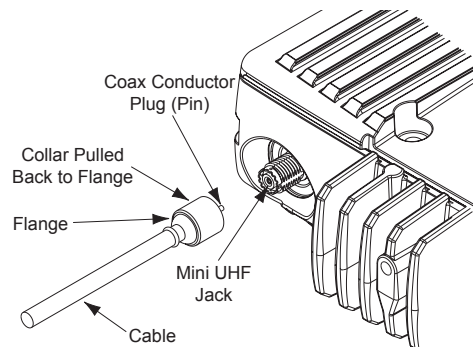


Figure 2-30. Mini-UHF Connection (as shown on mid-power)

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 2-31](#)). 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.

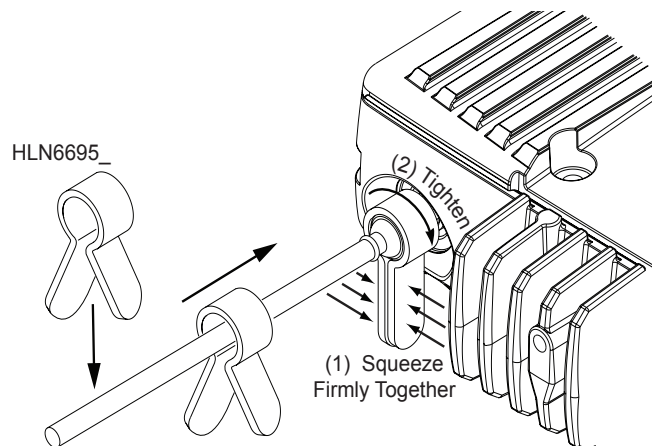


Figure 2-31. Mini-UHF Connector Tool (as shown on mid-power)

2.6 Speaker

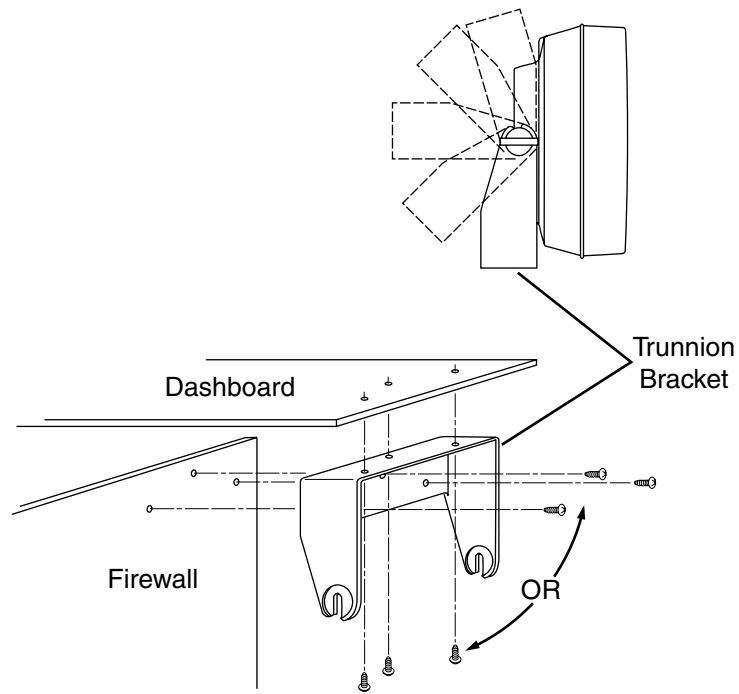


Caution

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 trunion bracket that allows the speaker to be mounted in a variety of ways. With the trunion bracket, the speaker can mount permanently on the dashboard or in accessible firewall areas. The trunion 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 trunion.
3. Attach the speaker and fasten to the trunion 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.



MAEPF-25764-O

Figure 2-32. Speaker Mounting

2.7 Microphone Hang-Up Clip

2.7.1 Standard Hang-Up Clip

The hang-up clip must be within reach of the operator(s). Measure this distance before actually mounting the bracket. Since the bracket has a positive-detent action, the microphone can be mounted in any position. The microphone hang-up clip must be grounded.

Use the hang-up clip as a template to locate the mounting holes. To avoid interference when removing the microphone, install the flathead screw in the top clip hole.

2.7.2 Handheld Hang-Up Box

Use the hang-up box (HUB) as a template to locate the mounting holes. Be sure the HUB will be within easy reach of the operator. Route the control wire with the male pin to the accessory cable connector at the rear of the radio or cable harness as shown in [Figure 2-3](#). Open the accessory cable connector and connect the HUB control wire to location 3 of the accessory connector. Connect the other control wire from the HUB to a convenient solid chassis ground point.

2.8 Completing the Installation

Complete the installation by connecting the speaker and power wires and plugging in the microphone cable/handheld control unit. Be sure to connect the microphone S-hook to the holes in the trunnion provided (see [Figure 2-7](#)) for strain relief (this is not applicable for 110W radios).

Chapter 3 Options and Accessories Installation

3.1 Emergency Pushbutton, Footswitch, Horn Relay, and Light Relay Installation

Perform the following installation procedure:

1. Select an appropriate place to mount the option or accessory hardware.
2. Route the accessory-to-control head cables under floor coverings or behind panels so that the vehicle occupants do not snag or break the wires.
3. Attach wires from the accessory to the appropriate wire on the VIP cable. (see [Table 3-1](#) and [Table 3-2](#)). [Figure 3-1](#) shows how wires are plugged into the connector and how to use an extraction tool to remove wires.

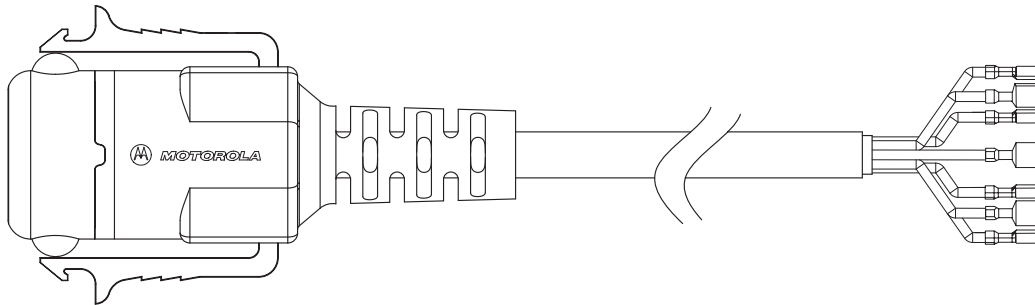


Figure 3-1. VIP Connector Detail

3.1.1 Emergency Pushbutton or Footswitch Installation

Mount the switch using the hardware that comes with the kit. Connect the emergency switch wires to a ground pin and a VIP IN pin on the VIP connector.

3.1.2 Horn (External Alarm) Relay Installation

Mount the horn relay in a suitable location (normally under the dash). Connect the relay contacts across the horn ring switch, typically found in the steering column. Connect the two control wires to a SW B+ pin and a VIP OUT pin on the VIP connector.

3.1.3 Lights (External Alarm) Relay Installation

Mount the light relay in a suitable location (normally under the dash). Connect the relay contacts across the headlamp ON/OFF switch. Connect the two control wires to a SW B+ pin and a VIP OUT pin on the VIP connector.

3.2 Dash-Mount Accessory Installation

For dash-mounted configurations, the accessories must be installed through the accessory connector assembly that is located on the rear of the radio, adjacent to the power connector. Motorola-approved accessories are supplied with male terminals crimped to a 20-gauge wire specifically designed to fit the plug of the accessory connector assembly.

Insert the male terminal into the accessory connector assembly in the appropriate location and connect the accessory connector assembly in the rear accessory port (see [Figure 3-8](#)). Do not use other generic terminals in the plug. Generic terminals can cause electrical intermittencies and may cause damage to the plug.

3.2.1 MDC Emergency Pushbutton or Footswitch Installation

Mount the footswitch using the hardware that comes with the kit. Open the accessory cable connector housing; remove the jumper wire. Connect the emergency switch wires to pins 23 and 18 (see [Figure 3-2](#)). Close the connector housing; route the finished cable from the switch location to the control head location.

NOTE: The emergency footswitch should be attached with A+ unattached. A+ should be attached after successfully securing the screws in the connector.

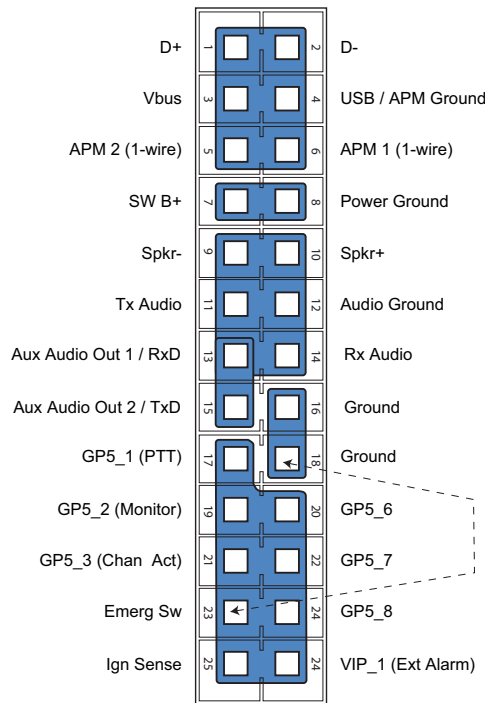
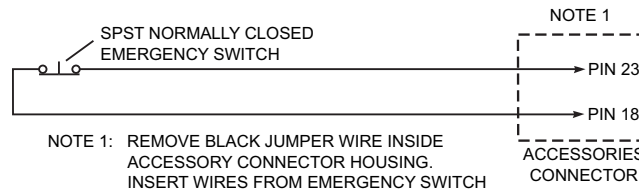


Figure 3-2. Emergency Switch Wiring Diagram

3.2.2 Horn and Lights (External Alarm) Relay

For installations that use the horn/lights option, select a suitable location for mounting (normally under the dash) and, referring to [Figure 3-3](#), perform the following procedure:

1. Horn Relay—Connect the relay contacts across the horn ring switch, typically found in the steering column. Open the accessory cable connector and connect the two control wires (male pins) into locations 26 and 7 of the connector.
2. Lights Relay—Connect the relay across the headlamp ON/OFF switch, typically found in the steering column. Open the accessory cable connector and connect the two control wires (male pins) into locations 26 and 7 of the accessory connector.

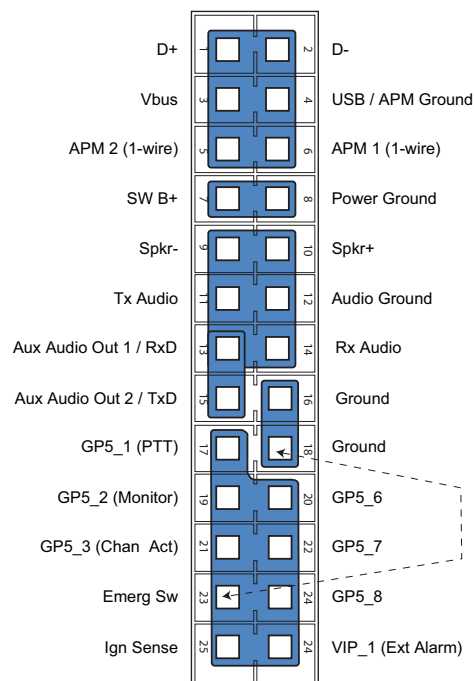
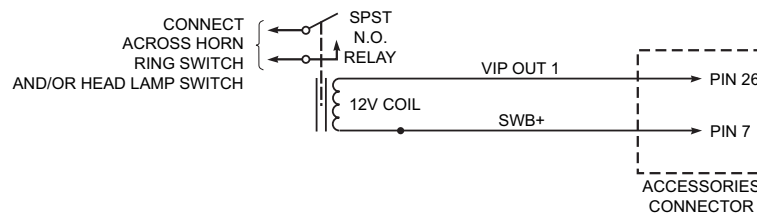


Figure 3-3. Horn/Light Wiring Diagram

3. Squeeze the covers together bending the wires in the strain-relief features. You may need a pair of pliers to seat the assembly covers.
4. Once the covers are fully seated, fasten them with the cover screws. Tighten the screws firmly but do not over-tighten them. Be sure none of the wires are pinched.
5. Reattach the accessory connector assembly to the back of the radio and fasten it by finger-tightening the jackscrews to prevent any loosening.

Table 3-1. Rear Accessory Jack Pin Functions

Pin No.	Pin Name	Pin Function	Pin No.	Pin Name	Pin Function
1	USB+	USB + (Data)	14	Rx Audio	Receive Live Audio 3
2	USB-	USB - (Data)	15	AUX Audio 2	PUBLIC Address 2 ¹
3	VBUS	USB Power (5V from USB accessory/cable)	16	GND	Ground
4	USB GND	USB/APM Ground	17	GPS-1(PTT)	5V Level GPIO, PTT Input ²
5	APM2	One Wire Data	18	GND	Ground
6	APM1	One Wire Data	19	GPS-2(Monitor)	5V Level GPIO, Monitor Input
7	SW B+	Switched Battery Voltage	20	GPS-6	5V Level GPIO
8	PWRGND	Ground	21	GPS-3	5V Level GPIO, Channel Activity Function
9	SPKR-	Speaker - (3.2 ohm minimum impedance)	22	GPS-7	5V Level GPIO
10	SPKR+	Speaker + (3.2 ohm minimum impedance)	23	EMERGENCY	Emergency Switch Input 1
11	Tx Audio	Rear External Microphone Input ⁵	24	GPS-7	5V Level GPIO
12	Audio GND	Audio Ground	25	IGN SENSE	Ignition Sense ⁶
13	AUX Audio 1	PUBLIC Address 1	26	VIP-1	12V Tolerant, 5V GPIO, External Alarm

¹ This pin must be connected to ground by jumper on accessory cable if emergency is disabled, even if disabled by CPS. If enabled, this line must be grounded via a switch, which is normally closed. The emergency debounce time is programmable via CPS.

² Pulling this line to ground will activate PTT function, activating the AUX_MIC input.

³ Fixed level (independent of volume level) received audio signal, including alert tones. Flat or de-emphasis are programmed by CPS. Output voltage is approximately 100 mVrms per 1kHz of deviation. The DC offset is 1.4V.

⁴ This output is used to detect when a rear microphone accessory is taken off-hook, to override PL to alert the user to busy traffic prior to transmitting.

⁵ This microphone signal is independent of the microphone signal on the front microphone connector. The nominal input level is 80mVrms for 60% deviation when used for motorcycle, but can also support 300 mVrms for future APCO accessories. The DC impedance is 660 ohms and the AC impedance is 560 ohms.

⁶ See Table 2-1 in Chapter 2 for wiring options.

Note: Please see the XPR 4300/4350/4500/4550 Basic Service manual (Motorola publication part number 6816816H01) for more detailed descriptions of these pins.

Appendix A Replacement Parts Ordering

A.1 Basic Ordering Information

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Crystal orders should specify the crystal type number, crystal and carrier frequency, and the model number in which the part is used.

The XPR 4300/4350/4500/4550 Digital Mobile Radio Basic Service Manual (Motorola publication part number 6816816H01) includes complete parts lists and parts numbers.

A.2 Motorola Online

Motorola Online users can access our online catalog at

<https://www.motorola.com/businessonline>

To register for online access:

- Domestic customers: please call 800-814-0601 (U.S. and Canada).
- International customers: please go to <https://www.motorola.com/businessonline> and click on "Sign Up Now."

A.3 Mail Orders

Send written orders to the following addresses:

**Replacement Parts/
Test Equipment/Manuals/
Crystal Service Items:**

Motorola Inc.
Radio Products and Services
Division*
Attention: Order Processing
2200 Galvin Drive
Elgin, IL 60123
U.S.A.

Federal Government Orders:

Motorola Inc.
U.S. Federal Government
Markets Division
Attention: Order Processing
7230 Parkway Drive
Landover, MD 21076
U.S.A.

International Orders:

Motorola Inc.
Radio Products and Services
Division*
Attention: Order Processing
2200 Galvin Drive
Elgin, IL 60123
U.S.A.

A.4 Telephone Orders

Radio Products and Services Division*
(United States and Canada)
7:00 AM to 7:00 PM (Central Standard Time)
Monday through Friday (Chicago, U.S.A.)
1-800-422-4210
1-847-538-8023 (International Orders)

U.S. Federal Government Markets Division (USFGMD)
1-800-826-1913 Federal Government Parts - Credit Cards Only
8:30 AM to 5:00 PM (Eastern Standard Time)

A.5 Fax Orders

Radio Products and Services Division*
(United States and Canada)
1-800-622-6210
1-847-576-3023 (International)

USFGMD
(Federal Government Orders)
1-800-526-8641 (For Parts and Equipment Purchase Orders)

A.6 Parts Identification

Radio Products and Services Division*
(United States and Canada)
1-800-422-4210, menu 3

A.7 Product Customer Service

Customer Response Center
(Non-technical Issues)
1-800-247-2346
FAX:1-800-247-2347

*The Radio Products and Services Division (RPSD) was formerly known as the Customer Care and Services Division (CCSD) and/or the Accessories and Aftermarket Division (AAD).

Glossary

This glossary contains an alphabetical listing of terms and their definitions that are applicable to ASTRO portable and mobile subscriber radio products.

Term	Definition
A/D	<i>See analog-to-digital conversion.</i>
Abacus IC	A custom integrated circuit providing a digital receiver intermediate frequency (IF) backend.
ADC	<i>See analog-to-digital converter.</i>
ADDAG	<i>See Analog-to-Digital, Digital-to-Analog and Glue.</i>
ALC	<i>See automatic level control.</i>
analog	Refers to a continuously variable signal or a circuit or device designed to handle such signals. <i>See also digital.</i>
Analog-to-Digital, Digital-to-Analog and Glue	An integrated circuit designed to be an interface between the radio's DSP, which is digital, and the analog transmitter and receiver ICs.
analog-to-digital conversion	Conversion of an instantaneous dc voltage level to a corresponding digital value. <i>See also D/A.</i>
analog-to-digital converter	A device that converts analog signals into digital data. <i>See also DAC.</i>
automatic level control	A circuit in the transmit RF path that controls RF power amplifier output, provides leveling over frequency and voltage, and protects against high VSWR.
band	Frequencies allowed for a specific purpose.
BBP	<i>See baseband interface port.</i>
baseband interface port	Synchronous serial interface to the transceiver board used to transfer transmit and receive audio data.
BGA	<i>See ball grid array.</i>
ball grid array	A type of IC package characterized by solder balls arranged in a grid that are located on the underside of the package.
CODEC	<i>See coder/decoder.</i>
coder/decoder	A device that encodes or decodes a signal.

Term	Definition
CPS	<i>See Customer Programming Software.</i>
Customer Programming Software	Software with a graphical user interface containing the feature set of an ASTRO radio.
D/A	<i>See digital-to-analog conversion.</i>
DAC	<i>See digital-to-analog converter.</i>
default	A pre-defined set of parameters.
digital	Refers to data that is stored or transmitted as a sequence of discrete symbols from a finite set; most commonly this means binary data represented using electronic or electromagnetic signals. <i>See also analog.</i>
digital-to-analog conversion	Conversion of a digital signal to a voltage that is proportional to the input value. <i>See also A/D.</i>
digital-to-analog converter	A device that converts digital data into analog signals. <i>See also ADC.</i>
Digital Private-Line	A type of digital communications that utilizes privacy call, as well as memory channel and busy channel lock out to enhance communication efficiency.
digital signal processor	A microcontroller specifically designed for performing the mathematics involved in manipulating analog information, such as sound, that has been converted into a digital form. DSP also implies the use of a data compression technique.
digital signal processor code	Object code executed by the Digital Signal Processor in an ASTRO subscriber radio. The DSP is responsible for computation-intensive tasks, such as decoding ASTRO signaling.
DPL	<i>See Digital Private-Line. See also PL.</i>
DSP	<i>See digital signal processor.</i>
DSP code	<i>See digital signal processor code.</i>
DTE	Data terminal equipment: i.e., a computer.
DTMF	<i>See dual tone multi-frequency.</i>
dual tone multi-frequency	The system used by touch-tone telephones. DTMF assigns a specific frequency, or tone, to each key so that it can easily be identified by a microprocessor.
FCC	Federal Communications Commission.

Term	Definition
firmware	Code executed by an embedded processor such as the Host or DSP in a subscriber radio. This type of code is typically resident in non-volatile memory and as such is more difficult to change than code executed from RAM.
FGU	<i>See frequency generation unit.</i>
flash	A non-volatile memory device similar to an EEPROM. Flash memory can be erased and reprogrammed in blocks instead of one byte at a time.
frequency	Number of times a complete electromagnetic-wave cycle occurs in a fixed unit of time (usually one second).
frequency generation unit	This unit generates ultra-stable, low-phase noise master clock and other derived synchronization clocks that are distributed throughout the communication network.
General-Purpose Input/Output	Pins whose function is programmable.
GPIO	<i>See General-Purpose Input/Output.</i>
host code	Object code executed by the host processor in an ASTRO subscriber radio. The host is responsible for control-oriented tasks such as decoding and responding to user inputs.
IC	<i>See integrated circuit.</i>
IF	Intermediate Frequency.
inbound signaling word	Data transmitted on the control channel from a subscriber unit to the central control unit.
integrated circuit	An assembly of interconnected components on a small semiconductor chip, usually made of silicon. One chip can contain millions of microscopic components and perform many functions.
ISW	<i>See inbound signaling word.</i>
kHz	<i>See kilohertz.</i>
kilohertz	One thousand cycles per second. Used especially as a radio-frequency unit.
LCD	<i>See liquid-crystal display.</i>
LED	<i>See light emitting diode.</i>
light emitting diode	An electronic device that lights up when electricity is passed through it.
liquid-crystal display	An LCD uses two sheets of polarizing material with a liquid-crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them.

Term	Definition
LO	Local oscillator.
low-speed handshake	150-baud digital data sent to the radio during trunked operation while receiving audio.
LSH	<i>See low-speed handshake.</i>
Master In Slave Out	SPI data line from a peripheral to the MCU.
Master Out Slave In	SPI data line from the MCU to a peripheral.
MCU	<i>See microcontroller unit.</i>
MDC	Motorola Digital Communications.
MDI	MCU/DSP Interface internal to the Patriot IC.
MHz	<i>See Megahertz.</i>
Megahertz	One million cycles per second. Used especially as a radio-frequency unit.
microcontroller unit	Also written as μC . A microprocessor that contains RAM and ROM components, as well as communications and programming components and peripherals.
MISO	<i>See Master In Slave Out.</i>
MOSI	<i>See Master Out Slave In.</i>
multiplexer	An electronic device that combines several signals for transmission on some shared medium (e.g., a telephone wire).
MUX	<i>See multiplexer.</i>
NiCd	Nickel-cadmium.
NiMH	Nickel-metal-hydride.
OMPAC	<i>See over-molded pad-array carrier.</i>
open architecture	A controller configuration that utilizes a microprocessor with extended ROM, RAM, and EEPROM.
oscillator	An electronic device that produces alternating electric current and commonly employs tuned circuits and amplifying components.
OSW	<i>See outbound signaling word.</i>
OTAR	<i>See over-the-air rekeying.</i>
outbound signaling word	Data transmitted on the control channel from the central controller to the subscriber unit.
over-molded pad-array carrier	A Motorola custom IC package, distinguished by the presence of solder balls on the bottom pads.

Term	Definition
over-the-air rekeying	Allows the dispatcher to remotely reprogram the encryption keys in the radio.
PA	Power amplifier.
paging	One-way communication that alerts the receiver to retrieve a message.
Patriot IC	A dual-core processor that contains an MCU and a DSP in one IC package.
PC Board	Printed Circuit Board. Also referred to as a PCB.
phase-locked loop	A circuit in which an oscillator is kept in phase with a reference, usually after passing through a frequency divider.
PL	<i>See private-line tone squelch.</i>
PLL	<i>See phase-locked loop.</i>
private-line tone squelch	A continuous sub-audible tone that is transmitted along with the carrier. <i>See also DPL.</i>
Programmable Read-Only Memory	A memory chip on which data can be written only once. Once data has been written onto a PROM, it remains there forever.
programming cable	A cable that allows the CPS to communicate directly with the radio using RS232.
PROM	<i>See Programmable Read-Only Memory.</i>
PTT	<i>See Push-to-Talk.</i>
Push-to-Talk	The switch or button usually located on the left side of the radio which, when pressed, causes the radio to transmit. When the PTT is released, the unit returns to receive operation.
radio frequency	The portion of the electromagnetic spectrum between audio sound and infrared light (approximately 10 kHz to 10 GHz).
radio frequency power amplifier	Amplifier having one or more active devices to amplify radio signals.
Radio Service Software	Not used with XTL 5000. <i>See Customer Programming Software.</i>
RAM	<i>See random access memory.</i>
random access memory	A type of computer memory that can be accessed randomly; that is, any byte of memory can be accessed without touching the preceding bytes.
read-only memory	A type of computer memory on which data has been prerecorded. Once data has been written onto a ROM chip, it cannot be removed and can only be read.

Term	Definition
real-time clock	A module that keeps track of elapsed time even when a computer is turned off.
receiver	Electronic device that amplifies RF signals. A receiver separates the audio signal from the RF carrier, amplifies it, and converts it back to the original sound waves.
registers	Short-term data-storage circuits within the microcontroller unit or programmable logic IC.
repeater	Remote transmit/receive facility that re-transmits received signals in order to improve communications range and coverage (conventional operation).
repeater/talkaround	A conventional radio feature that permits communication through a receive/transmit facility, which re-transmits received signals in order to improve communication range and coverage.
RESET	Reset line: an input to the microcontroller that restarts execution.
RF	<i>See radio frequency.</i>
RF PA	<i>See radio frequency power amplifier.</i>
ROM	<i>See read-only memory.</i>
RPCIC	Regulator/power control IC.
RPT/TA	<i>See repeater/talkaround.</i>
RS232	A common interface standard for data communications equipment.
RSS	<i>See Radio Service Software.</i>
RTC	<i>See real-time clock.</i>
RX	Receive.
RX DATA	Recovered digital data line.
SAP	<i>See Serial Audio CODEC Port.</i>
SCI IN	Serial Communications Interface Input line.
Serial Audio CODEC Port	SSI to and from the GCAP II IC CODEC used to transfer transmit and receive audio data.
Serial Communication Interface Input Line	A full-duplex (receiver/transmitter) asynchronous serial interface.
SCI IN	<i>See Serial Communication Interface Input Line.</i>
Serial Peripheral Interface	How the microcontroller communicates to modules and ICs through the CLOCK and DATA lines.

Term	Definition
signal	An electrically transmitted electromagnetic wave.
Signal Qualifier mode	An operating mode in which the radio is muted, but still continues to analyze receive data to determine RX signal type.
softpot	<i>See software potentiometer.</i>
software	Computer programs, procedures, rules, documentation, and data pertaining to the operation of a system.
software potentiometer	A computer-adjustable electronic attenuator.
spectrum	Frequency range within which radiation has specific characteristics.
SPI	<i>See Serial Peripheral Interface.</i>
squelch	Muting of audio circuits when received signal levels fall below a pre-determined value. With carrier squelch, all channel activity that exceeds the radio's preset squelch level can be heard.
SRAM	<i>See static RAM.</i>
SSI	<i>See Synchronous Serial Interface.</i>
Standby mode	An operating mode in which the radio is muted but still continues to monitor data.
static RAM	A type of memory used for volatile, program/data memory that does not need to be refreshed.
Synchronous Serial Interface	DSP interface to peripherals that consists of a clock signal line, a frame synchronization signal line, and a data line.
system central controllers	Main control unit of the trunked dispatch system; handles ISW and OSW messages to and from subscriber units (<i>See ISW and OSW</i>).
system select	The act of selecting the desired operating system with the system-select switch (also, the name given to this switch).
thin small-outline package	A type of dynamic random-access memory (DRAM) package that is commonly used in memory applications.
time-out timer	A timer that limits the length of a transmission.
TOT	<i>See time-out timer.</i>
transceiver	Transmitter-receiver. A device that both transmits and receives analog or digital signals. Also abbreviated as XCVR.
transmitter	Electronic equipment that generates and amplifies an RF carrier signal, modulates the signal, and then radiates it into space.
TSOP	<i>See thin small-outline package.</i>

Term	Definition
TX	Transmit.
UART	<i>See also Universal Asynchronous Receiver Transmitter.</i>
UHF	Ultra-High Frequency.
Universal Asynchronous Receiver Transmitter	A microchip with programming that controls a computer's interface to its attached serial devices.
Universal Serial Bus	An external bus standard that supports data transfer rates of 12 Mbps.
USB	<i>See Universal Serial Bus.</i>
VCO	<i>See voltage-controlled oscillator.</i>
VHF	Very-High Frequency.
VIP	Vehicle Interface Port.
VOCON	<i>See vocoder/controller.</i>
vocoder	An electronic device for synthesizing speech by implementing a compression algorithm particular to voice. <i>See also voice encoder.</i>
vocoder/controller	A PC board that contains an ASTRO radio's microcontroller, DSP, memory, audio and power functions, and interface support circuitry.
voice encoder	The DSP-based system for digitally processing analog signals, and includes the capabilities of performing voice compression algorithms or voice encoding. <i>See also vocoder.</i>
voltage-controlled oscillator	An oscillator in which the frequency of oscillation can be varied by changing a control voltage.

Index

Numerics

100W radios
configurations 1-2

A

accessories
connector assembly 3-1
installing
dash mount 3-1
emergency pushbutton 3-1
footswitch 3-1
horn relay 3-1
light relay 3-1
remote mount 3-1
antenna
cable, see Cables, antenna
connection 2-9
diagrams 2-9, 2-10
installing 2-8
mounting 2-8
site 2-8

B

base stations 1-2
black lead 2-6

C

cables
accessory 2-12, 3-1, 3-2, 3-3
antenna 2-4, 2-9
diagrams 2-2, 2-7, 2-9
ignition 2-8
ignition sense 2-8
power 2-6
programming A-5
tools 1-3
configurations
100W radios 1-2
dash mount 1-2
control head
dash mount 1-2
see also specific model names
control stations 1-2

D

dash mount
accessories installations 3-1
configuration 1-2
installation 2-2

installation examples 2-1
radio dimensions 1-1
trunnion 2-5

E

emergency footswitch 3-1, 3-2
emergency pushbutton 3-1, 3-2
external alarm
see also Horn relay or Light relay

F

footswitch, emergency 3-1, 3-2

G

green lead 2-8

H

horn relay 3-1, 3-3

I

ignition
cable 2-8
installation
examples 2-1

J

J2
pin configuration 2-2

L

leads
black 2-6
green 2-8
orange 2-8
light relay 3-1, 3-3
locking kit, installing 2-6

M

microphone
hang-up box 2-12
hang-up clip, standard 2-12
S-hook 2-5, 2-12
mounting configurations 2-4
dash 1-2, 2-5
mounting, antenna
restrictions 2-9
roof top 2-8
trunk lid 2-8

O

orange lead 2-8
 ordering replacement parts A-1

P

parts, ordering replacement A-1
 pin
 functions 3-4
 ground 3-1
 removal tool 1-3
 SW B+ 3-1
 VIP out 3-1
 pin configurations
 J2 2-2
 pushbutton, emergency 3-1, 3-2

R

rear accessory jack, see J2
 relays
 horn 3-1, 3-3
 light 3-1, 3-3
 remote mount
 accessory installations 3-1
 installation examples 2-1
 replacement parts, ordering A-1

S

speaker
 connecting 2-12
 mounting 2-10, 2-11

T

tools, required 1-3
 trunnion
 below dash mounting 2-5
 bracket for speaker 2-10
 dash mount 2-5
 locking kit 2-6
 mounting bracket 2-5
 orientation 2-4
 transmission hump mounting 2-5

V

VIP
 connector 3-1

W

W4 control head 3-1
 W5 control head 3-1
 W7 control head 3-1
 W9 control head 3-1
 wiring diagrams 2-2

