

Figure 59: Installing the Locking Bracket

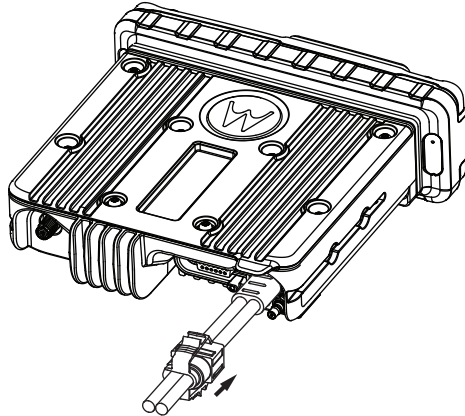
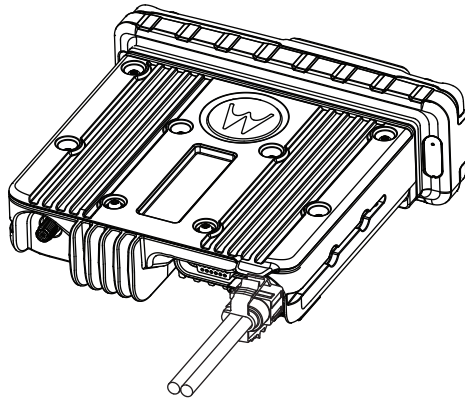


Figure 60: Bracket Installation (Assembled State)



- 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 61: Bracket Uninstallation (1 of 2)

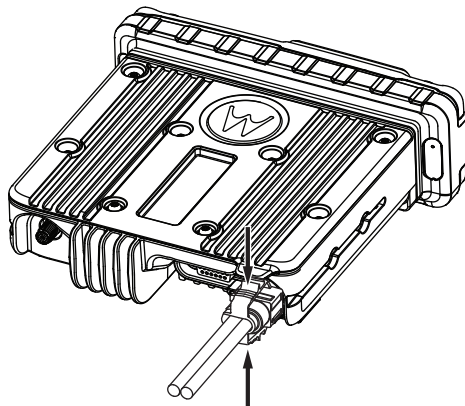
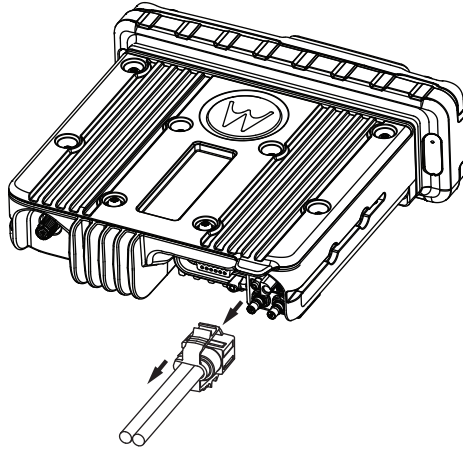


Figure 62: Bracket Uninstallation (2 of 2)



2.3.2

O2, O3, O5, O7, O9 or E5 Control Head Power Cables

Figure 63: HKN6188_ Power Cable with External Speaker Connector

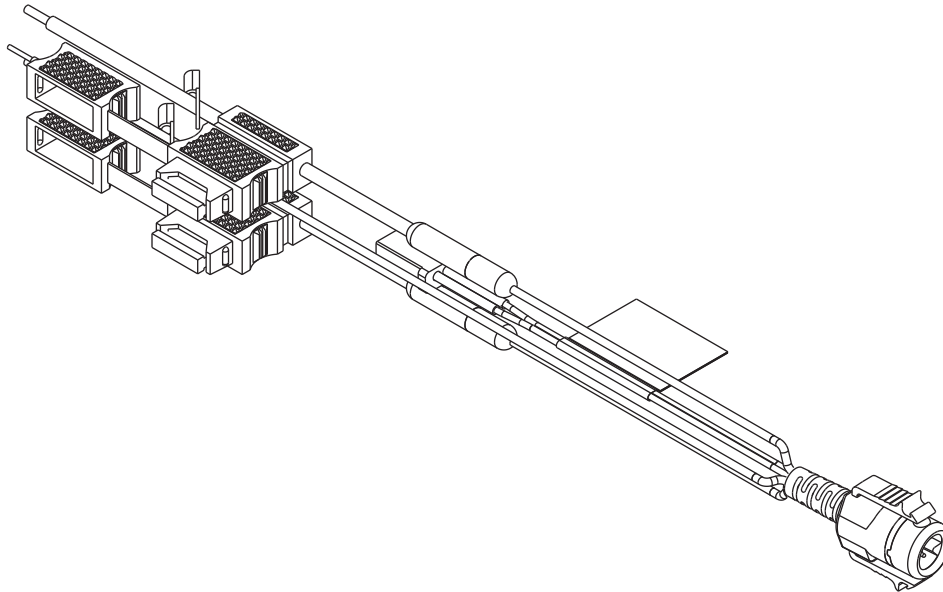
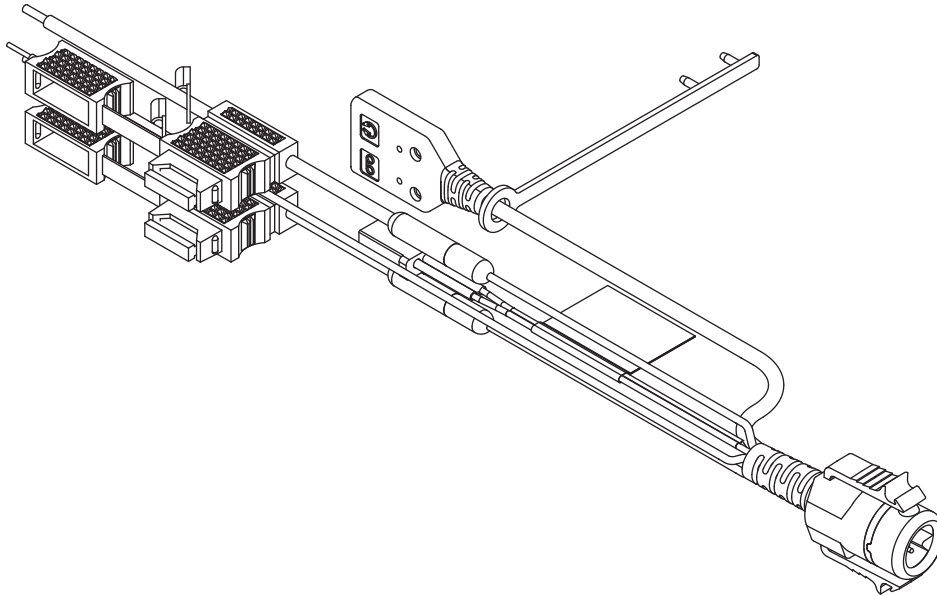


Figure 64: HKN6187_ Power Cable with External Speaker Connector, Record Audio Output Jack (2.5 mm) and Earphone Jack (2.5 mm)



NOTICE:

Audio Out – Does not require CPS programming. Attaching a headset mutes the external speakers of the radio which are attached to the SPK jack of the control head.

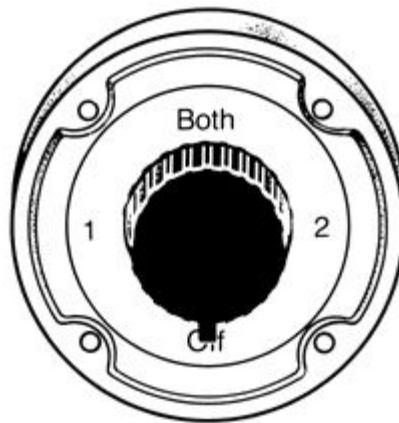
Record Out – Requires CPS programming. In CPS, navigate to **Radio Wide/Advanced/Record Audio** and select **TX + RX Audio**.

2.3.3

Battery Selector Switch

In vehicles with a Battery Selector Switch, the ignition sense (yellow) wire should be the only wire connected to the Battery Selector Switch. The 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 route all power and ignition sense wires 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 65: Battery Selector Switch



2.4

Antenna Installation



IMPORTANT: To ensure 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 consider the potential exposure of back seat passengers and bystanders outside the vehicle.



NOTICE: For mobile radios with rated power of 7 W or less, the only installation restrictions are to use only Motorola Solutions approved antennas and install the antenna externally on metal body vehicles. For mobile radios with tuned power greater than 7 W, always adhere to all the guidelines and restrictions in [Antenna Installation on a Metal Body Vehicle on page 65](#).

2.4.1

Antenna Installation on a Metal Body Vehicle

You can install the antenna at the following locations:

- 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.
- Roof top – For optimum performance and compliance with RF Energy Exposure regulations, mount the antenna at the center of the roof.
- Trunk lid – On some vehicles with clearly defined, flat trunk lids, you can mount the antennas of some radio models at the center 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 at the center of the roof. Ensure that the following are observed before installing an antenna on the trunk lid:
 - Ensure that the distance from the antenna location on the trunk lid is at least 85 cm (33 in.) from the rear seat head-rest to ensure compliance with RF Energy Exposure regulations.
 - 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.



NOTICE:

Do not cut the antenna cables to ensure compliance with RF Energy Exposure regulations.

To ensure compliance with RF Energy Exposure regulations, mount the 1/4 wave antenna of VHF and UHF bands only at the center of the roof, .

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.

Check the antenna location for any electrical interference.



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

2.4.2

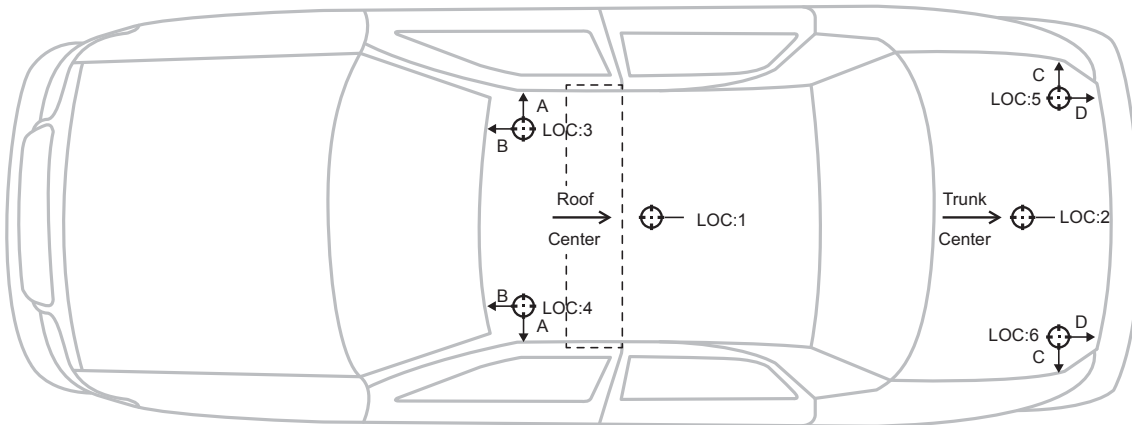
Distance Between Antennas

The following figure indicates the separation distances required for the various antennas used with all mobile radios. Each "cross-hair" symbol represents a possible location (LOC) of an antenna. The recommendation is to locate them as close to the center of the roof and/or trunk as possible, without interference with a lightbar.



NOTICE: Do not cut the antenna cable.

Figure 66: Multiple Antennas Separation for locations 1–6



Letters A, B, C, and D indicates the maximum distance of 8 inches between the edge of the ground plane and the accessory antenna location.



NOTICE:

- A minimum of 18 inches separation is required between the lightbar and any roof-mounted antennas to prevent interference with the lightbar circuitry (see lightbar manufacturers installation information).
- LMR antennas should only be placed at the center of the roof (LOC:1) or center of the trunk (LOC:2).
- To ensure compliance with RF Energy Exposure regulations, install VHF and UHF 1/4 wave antenna at LOC:1 (center of the roof only).
- The LTE antenna must be separated from any LMR antenna by at least 40 inches.
- Install the LTE Main and Diversity Antenna at LOC:5 and LOC:6 when the LMR antenna is only located at LOC:1 for a single band mobile radio (LTE opposite location from the LMR).
- Install the LTE Main and Diversity Antenna at LOC:3 and LOC:4 when the LMR antenna is only at LOC:2 for a single band mobile radio (LTE opposite location from the LMR).
- Install the Wi-Fi/Bluetooth roof mount antenna at LOC:3, LOC:4, LOC:5, or LOC:6. For the installation of glass mount Wi-Fi/Bluetooth antenna, refer to the antenna installation manual.
- In some mobile installations that include an LTE modem, external filtering on the LMR port and/or the LTE port is needed to reduce interference. Contact your local Motorola Solutions Service Center for more information and for filter kit numbers (see [Replacement Parts Ordering on page 132](#) on page 128 for contact information).

2.4.3

Mini-UHF Connection

To help the installation of the radio antenna, there are labels indicating the frequency. The first is on the FCC label at the top of the radio which calls out the frequency with arrows indicating the location of the RF connector at the back of the radio.

The second is at the back of the radio, next to the RF connector. To ensure a secure connection of an antenna cable mini-UHF plug to a radio mini-UHF jack, their interlocking features must be properly engaged. If they are not properly engaged, the system loosens. Do not use a tool (pliers or wrench) to overcome a poor engagement.

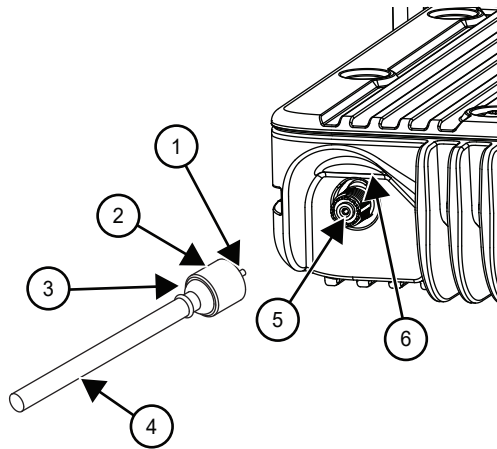


NOTICE: Applying excessive force with a tool such as stripping threads, deforming the collar or connector, or causing the connector to twist in the housing opening and break, can damage the antenna or the connector.

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

Motorola Solutions recommends the following sequence to ensure proper attachment of the system (see the following figures).

Figure 67: Mini-UHF Connection



No.	Description
1	Coax Conductor Plug (Pin)
2	Collar Pulled Back to Flange
3	Flange
4	Cable
5	Mini UHF Jack
6	RF Antenna Connector Label

2.4.3.1

Installing Mini-UHF Connection

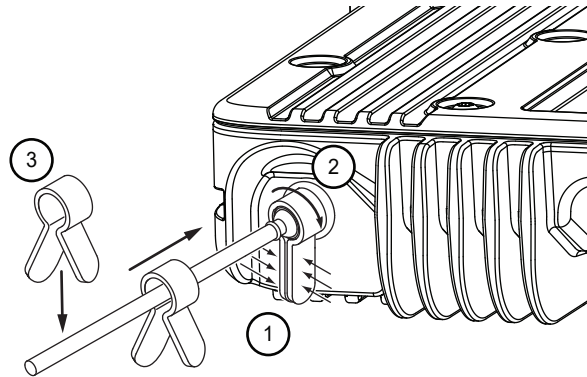
Prerequisites:

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

Procedure:

- 1 Slide the collar back against the flange.
- 2 Insert the antenna cable plug pin fully into the radio jack, but do not engage the threads.
- 3 Ensure that the plug and jack interlocking features are fully seated. Do the check up 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.
- 4 Finger-tighten the antenna cable plug collar onto the radio jack.
- 5 Give a final tug by hand to the collar and retighten by hand as firmly as possible.
- 6 Slip the mini-UHF connector tool over the coaxial cable, using the gap between the tool legs.

Figure 68: Mini-UHF Connector Tool



No.	Description
1	Squeeze Firmly Together
2	Tighten
3	HLN6695_

- 7 Slide the tool up onto the knurled collar of the plug.
- 8 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.



NOTICE: 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.

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.

2.4.4

GPS Antenna Placement

Place the GPS antenna (excluding the Motorcycle GPS antenna) at least, 3 ft (0.9 m) away from any transmitting antenna, and the antenna must have a clear, unobstructed view of the sky for best performance. Consider the length of the cabling before the installation is started.

2.4.5

QMA Connection

The radio uses a quick disconnect connection called QMA. This does not require any tightening.

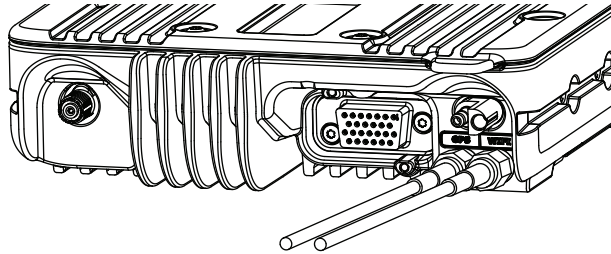
- Ensure there is sufficient slack in the antenna cable.
- Ensure that the collar of the antenna cable plug does not bind.
- Engage the QMA cable plug onto the jack, listening for a click to ensure proper engagement.
- Gently tug on the cable to ensure that it is engaged.
- To disengage, pull back on the cable plug collar and pull the cable straight off the jack.

2.4.6

GPS/GLONASS and Wi-Fi Antenna Connection

Connect GPS and Wi-Fi antenna cable QMA plug to the radio QMA jack for GPS and Wi-Fi respectively.

Figure 69: GPS/GLONASS and Wi-Fi Antenna Connector on the radio



2.5

Installing the Speaker

The speaker kit includes a trunnion bracket that allows the speaker to be mounted in various 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 the vehicle occupants cannot kick or knock around it.

Prerequisites:

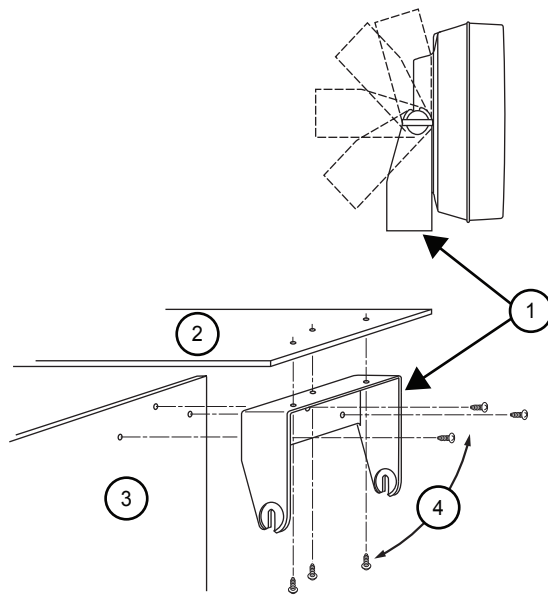


CAUTION: DO NOT ground the radio speaker leads. This system has a floating speaker output (DC voltage on both leads); damage to the audio circuit results if either lead is grounded or if they are shorted together.

Procedure:

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

Figure 70: Speaker Mounting



No.	Description
1	Trunnion Bracket
2	Firewall
3	Dashboard
4	EITHER way

2.5.1

Internal Speaker Disassembly

Prerequisites:



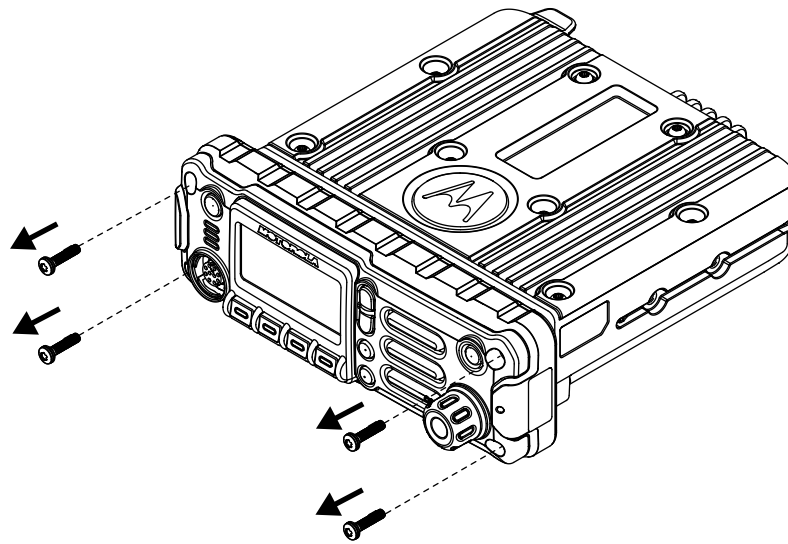
NOTICE:

This configuration is only applicable for O2 Control Heads.

Procedure:

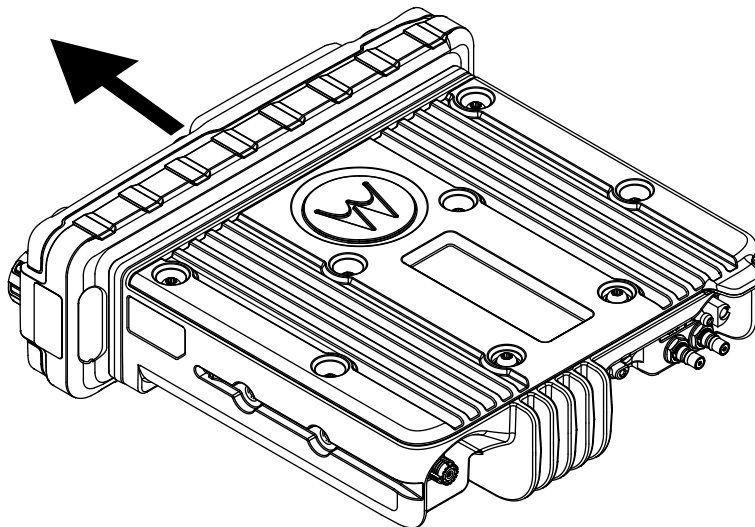
- 1 Unplug the power, antenna, microphone, and all accessories connections. If the radio is a remote-mount radio, disconnect the remote-mount control cable from the front of the transceiver.
- 2 Remove the four screws found on the control head with a Torx T-20 bit. Discard the screws.

Figure 71: Removing the screws on the Control Head



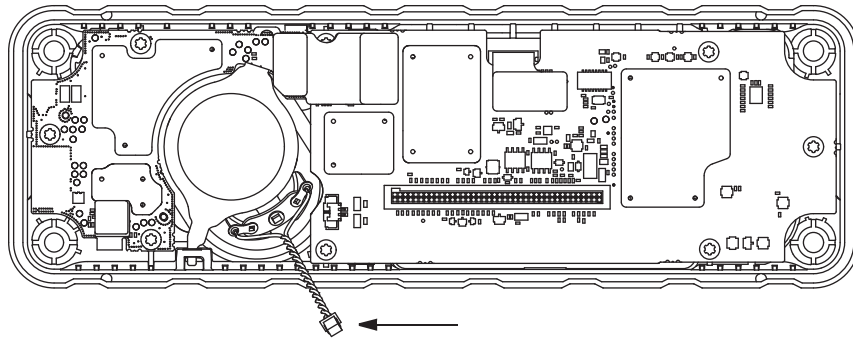
- 3 Firmly grasp the front panel of the control head. Carefully remove the front housing assembly from the back housing assembly. Note the position of the attached flex and do not pull on it excessively.

Figure 72: Removing the Control Head



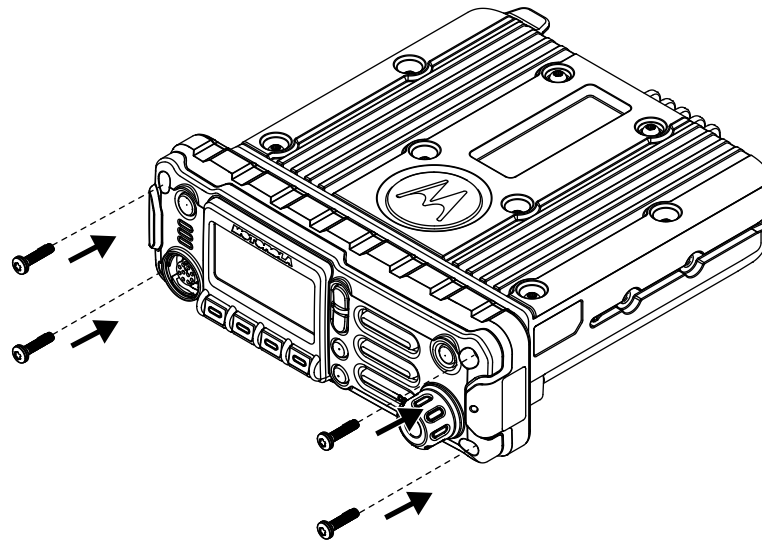
- 4 Put the control head face down on a clean, flat surface to avoid damaging it. Do not touch the o-ring on the back housing.
- 5 Carefully disconnect the speaker connector from the circuit board.

Figure 73: Disconnecting the Speaker Connector



- 6 Reattach the front housing assembly to the back housing assembly. Ensure that the flex is returned to its original position and that the o-ring on the back housing assembly is not pinched.

Figure 74: Reattaching the Control Head



- 7 Secure the front housing assembly back to the back housing assembly with four new screws using the Torx T-20 bit. Apply 9 in. lbs. torque for each screw.

2.6

Microphone Hang-Up Clip

This section describes the microphone hang-up clip for mobile radios.

The hang-up clip must be within reach of the operator and close enough to the control head to prevent cable strain. Measure this distance before actually mounting the bracket. Since the bracket has a positive-detent action, you can mount the microphone at any position.

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

Some microphone models require the grounding of the microphone clip in order for HUB operation to work correctly. Refer to the documentation that comes with your Motorola Solutions microphone model.



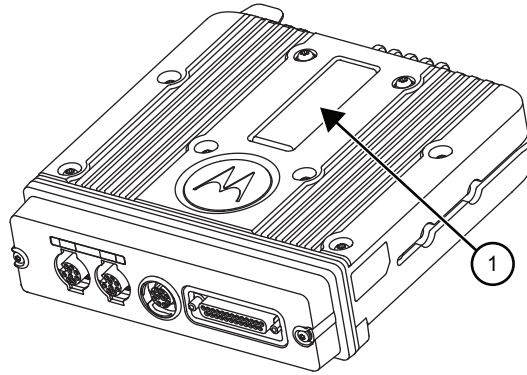
NOTICE: For multi-control head configuration where only one of the control heads has a microphone, the control heads without a microphone attached must have their HUB or Monitor pin (J100-22) jumpered by a wire to GND (J100-1 or J100-14) for HUB operation to work.

2.7

RFID (Option)

A mobile radio equipped with an RFID tag allows an alternate option to track the radio. Each RFID equipped radio has an RFID tag preprogrammed with the serial number (also found on the FCC label), band, and radio model information of the radio.

Figure 75: RFID Location



No.	Description
1	RFID Tag

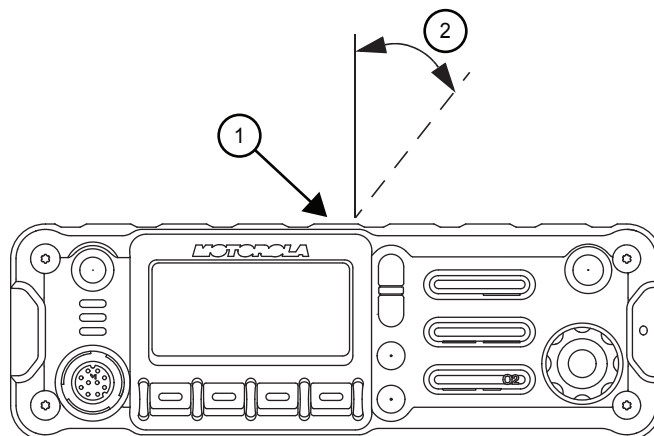
2.7.1

RFID Reading

To read an RFID tag using a UHF Gen 2 RFID reader (for example, Motorola Solutions MC9090-G), open an appropriate RFID read application, point the RFID reader at the tag, and activate the RFID antenna of the reader. The RFID reader must be within 1 ft. from the tag to read.

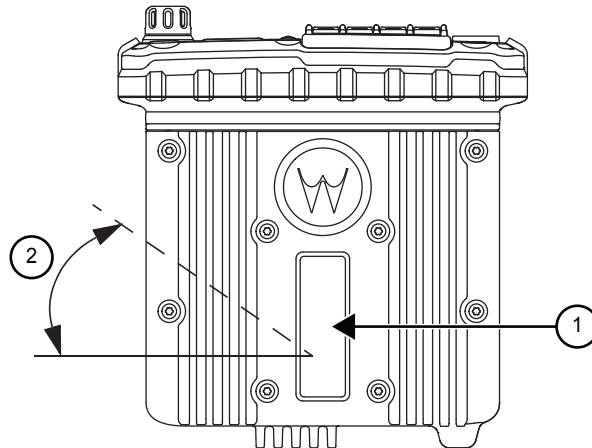
Two variables, Read Angle and Reader Orientation, aid in the distance to read and write the RFID Tag. Read distance is independent of Tag Angle, but the reader should be as close to perpendicular to the tag as possible (Read Angle). As Read Angle increases past 60 degrees, read distance begins to decrease, and the tag becomes unreadable once Read Angle exceeds 90 degrees. RFID tag cannot be read through metal. The orientation of the reader (Reader Orientation) and the tag must be aligned to improve read and writability.

Figure 76: Read Angle for Enhanced Single Band Mobile Radio



No.	Description
1	RFID Tag
2	Read Angle

Figure 77: Tag Angle for Enhanced Single Band Mobile Radio



No.	Description
1	RFID Tag
2	Tag Angle

Figure 78: Examples of Reader and Tag Aligned (Reader Orientation)

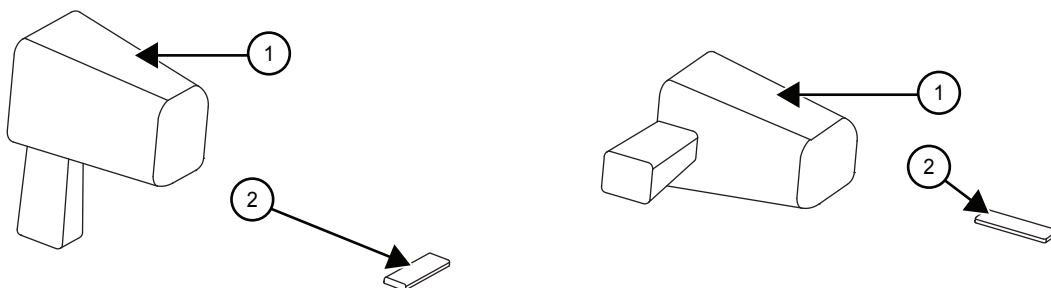
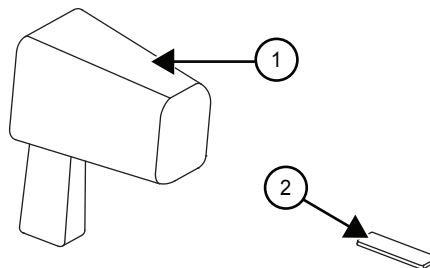


Figure 79: Example of Reader and Tag Misalignment (Reader Orientation)



No.	Description
1	Reader

No.	Description
2	Tag

2.7.2

Programming RFID (If Equipped)

Reprogram the tag (up to 12 ASCII characters when encoded to hexadecimal format) by using any UHF Gen 2 capable RFID writer, for example, Motorola Solutions MC9090-G.



NOTICE: Follow the read direction in [RFID Reading on page 74](#) to optimize reprogramming.

Table 11: Model Number Chart in 12-Digit ASCII Format

Model Number	Radio Tier/Band/Output Level	Last Two Digits
M22URS9PW1BN	APX 4500 700/800 MHZ	F8
M24URS9PW1BN	APX 2500 700/800 MHZ	F8
M25URS9PW1BN	APX 6500 700/800 MHZ	F5
M25URS9PW1BNI	APX 5500 700/800 MHZ	F5
M36URS9PW1BN	APX 1500 700/800 MHZ	F9

Table 12: Serial Number with Radio Band/Tier/Power

Characters	Radio Band/Tier/Power
F	700/800 and 900
D	VHF
E	UHF
R	700/800 and VHF
T	VHF and UHF
E	UHF1 and UHF2
S	700/800 and UHF
1	APX 7000
2	APX 7500 Mid Power
3	APX 7500 High Power
4	APX 6000
5	APX 6500 Mid Power
6	APX 6500 High Power
7	APX Low Tier Portable
8	APX Low Tier Mobile MP/APX 4500 MP/APX 2500 MP
9	APX Lowest Tier Mobile MP/APX 1500 MP

2.8

Completing the Installation

Follow the following steps to complete the installation.

Procedure:

- 1 Connect the speaker to the accessory cable.
- 2 Verify that the ignition sense wire is attached according to planned ignition sense.
- 3 Attach the accessory cable into J600.
- 4 Verify that the control head is attached to either the TIB or the CAN extension cable.
- 5 Attach the power cable to the back of the transceiver.

Chapter 3

Universal Relay Controller Installation

The Universal Relay Controller (URC) is an extension of an orderable accessory for O7 or O9 control head.

URC is used to control high power switching peripherals, for example, lightbar. URC works on all power application controlled lightbars. URC is connected to the transceiver GCAI port. The URC design consists of a microcontroller and uses ten relays to control the switching device. A separate ground for isolation exists between the relay and MCU sections, which is provided by the use of iCoupler from Analog Devices. Each relay is connected to an output with 15 A fuse. The maximum load allowed on each output is 12 A. Two cables, each with the maximum of 60 A, can be used to connect to the input connector at the bus bar. Each cable is connected with a 60 A circuit breaker. One-wire EEPROM is employed to enable GCAI to recognize the URC accessory ID. CPS can be used to program the relay patterns.

When installing URC, make sure to plan the installation carefully and leave more room in the front and rear of the box for cabling and accessory connections; and also to the sides of the radio so that you may access and install the trunnion screws.

The recommended mounting location for URC is in the car trunk, either next to the transceiver or within the area not further than 4.5 m away from the transceiver. Ensure that sufficient cooling is provided. Do not cover URC with baggage, blankets, and so on.



CAUTION: Do not backfeed power into URC.

3.1

Universal Relay Controller Mounting

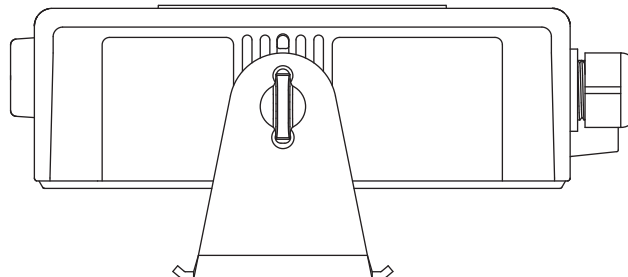
The mounting location must be accessible and visible. Select a location that permits routing the cable as directly as possible.

Prerequisites:



NOTICE: For optimum URC performance, orient the mounting trunnion as shown in the following figure.

Figure 80: Universal Relay Controller Orientation

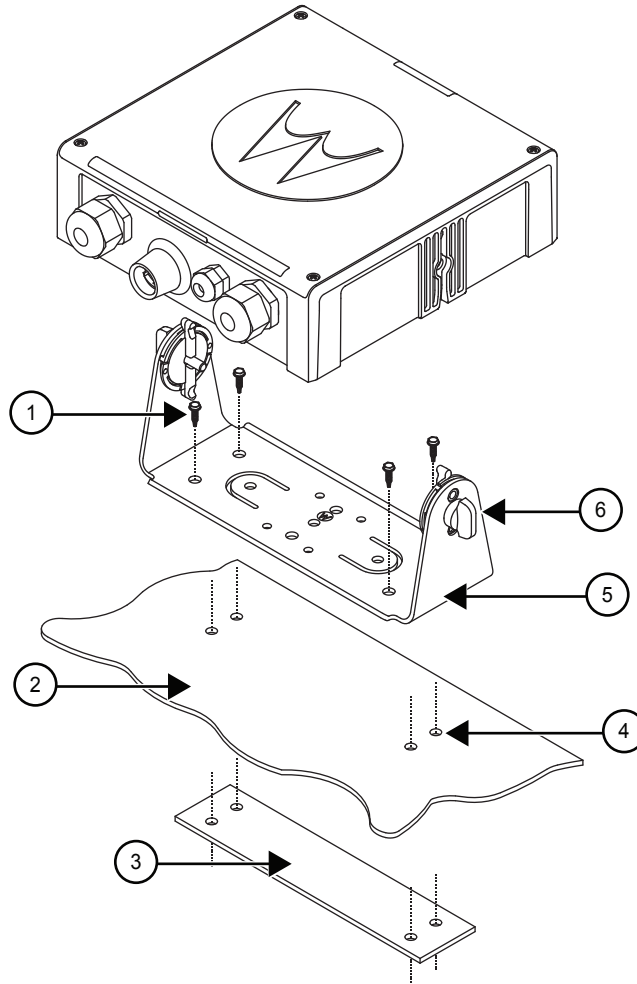


An adjustable trunnion, which allows several mounting positions, is supplied for mounting the URC. The installation must not interfere with the operation of the vehicle or its accessories.

Procedure:

- 1 Use the URC trunnion as a template to mark the mounting holes. Then, drill 5/32 in. holes. If mounting on a plastic surface, use a metal backing plate.
- 2 Attach the trunnion bracket using all four 10 – 16 in. x 5/8 in. self-tapping screws provided.
- 3 Temporarily install the URC (adjust for proper viewing angle) and fasten it to the trunnion with two wing screws. Test the installation to ensure that the unit is securely locked in place.

Figure 81: Universal Relay Controller Installation Exploded View



No.	Description
1	Use four mounting screws on all installations
2	Mounting surface
3	Metal backing plate (not supplied)  IMPORTANT: Use this plate if mounting trunnion on plastic or unstable surface.
4	Drill four 5/32" holes in mounting surface
5	Trunnion

No.	Description
6	Adjust the universal relay controller to desired angle and secure with wing screws

3.2

O7/O9 Universal Relay Controller Cable Assembly

This sections provides the instruction for URC cable assembly.

3.2.1

Installing the Power Cable

Procedure:

- 1 Remove the cap nut of power cable gland assembly, and insert the power cable through the cap nut and neoprene seal in the cable gland body. Use power cable with either AWG 6 or AWG 8 only (recommended OD range of cable is 5.5 mm to 9 mm) that is able to withstand 80 A and 50 A respectively, to ensure water sealing of the controller. User can decide to install one or two power cables based on the requirements. The power cables (A+) are not supplied.
- 2 The loose end of the power cable with cable strip length 7.94 mm (5/16") is then placed on the power lug and secured down by a set screw. The cap nut is then reassembled with tightening torque 18 lb-in.
- 3 The other end of the power cable should be connected to circuit breaker (Motorola Solutions part number 40012006001) end which indicates "AUX" and then, to power supply on the other end which indicates "BAT", instead of connecting to power supply directly.
- 4 Repeat [step 1](#) to [step 3](#) to install the second power cable, if required.
- 5 If only one power cable is installed, it is recommended to cover the other side of the power cable gland with power cable gland seal with tightening torque 18 lb-in.

3.2.2

Installing Ground Cable

Procedure:

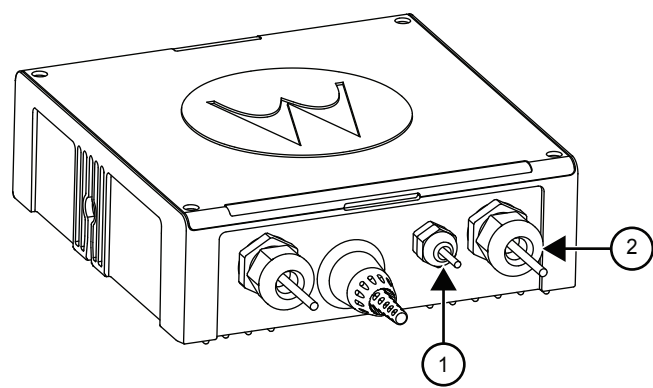
- 1 Remove the cap nut of ground cable gland assembly, insert the ground cable through the cap nut, and then reassemble the cap nut. Use ground cable with AWG 14 only (recommended OD range of cable is 2 mm to 4 mm) that is able to withstand 5 A. The ground cables (A+) are not supplied.



NOTICE: The ground is used to switch the relays, and not act as a ground to the actual device being controlled.

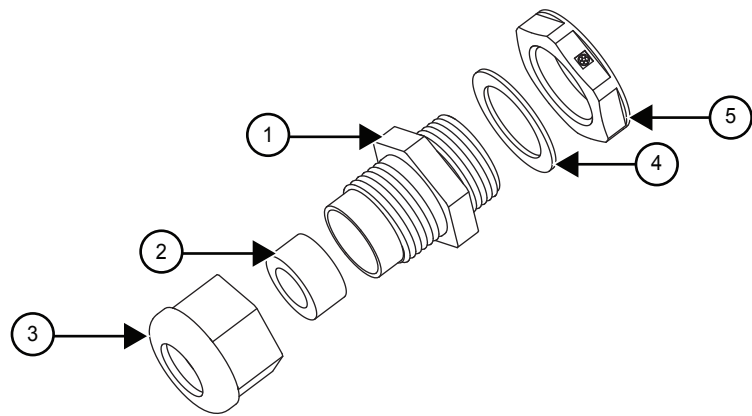
- 2 The loose end of the ground cable with cable strip length 7.94 mm (5/16") is then connected to a two-pin terminal block. Both pins on the terminal block are inter-connected and either pin can be used. The cap nut is then reassembled with tightening torque 7 lb-in.

Figure 82: Power and Ground Cable Glands



No.	Description
1	Ground Cable Gland
2	Power Cable Gland

Figure 83: Cable Gland Assembly with Gasket



No.	Description
1	Cable Gland Body
2	Neoprene Seal
3	Cap Nut
4	Gasket, Cable Gland
5	Counter Nut

3.2.3

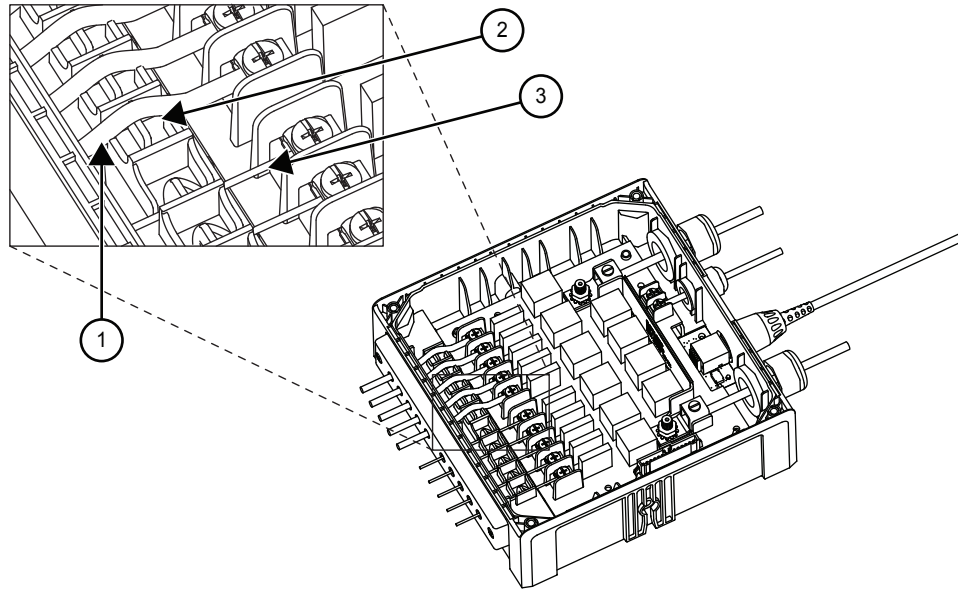
Installing the Wires

Procedure:

- 1 Assemble the wires into the lightbar gasket retainer and lightbar gasket. The URC can support lightbars through control wires with outer diameter ranging from 1.52 mm to 3.77 mm (0.06 in. to 0.148 in.), with wire gauges ranging from AWG 12–20.

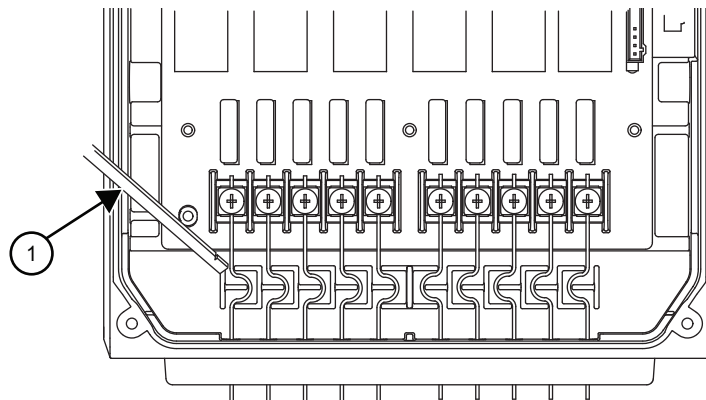
- 2 Each individual loose wire (before stripping off the wire jacket) is inserted one at a time through the chassis. Ensure that the lightbar wire is straight before inserting the wire into the chassis. The radial gasket seals each of the wire individually. When a thick wire (for example AWG 14 wire or wire OD > 2.90 mm) is inserted through the chassis, there is potential tearing at the rubber gasket. Remove the rubber gasket residual.
- 3 Thin wires 2.5 mm and below should be dressed into the retention feature using a black stick. Thick wires above 2.5 mm should be routed above the retention feature. Strip off the wire until 7.94 mm (5/16 in.) after the wire is inserted into the URC, and install the wire into the respective lightbar terminal block.

Figure 84: Wires Installation



No.	Description
1	Lightbar Wire with Diameter above 2.5 mm
2	Lightbar Wire with Diameter 2.5 mm and below
3	Wire Retention Feature

Figure 85: Wire Installation with Black Stick



No.	Description
1	Black Stick

- 4 Cover the lightbar gasket retainers hole with seal, gasket, and ground cable gland, if no wire is inserted.
- 5 The lightbar gasket should be replaced at each reassembly of the wire.



NOTICE: Use of other cable gauges except as recommended in this manual may result in water intrusion. Any reassembly of wire needs a new lightbar gasket replaced. If the current loading for one wire is higher than 12 A, the wires should be split before being assembled to the URC system. Wires kit (PMKN4109_) is provided to ease installation of the URC. Incorrect use of the wires kit, for example, improper connection at external loose end wires, may impact the robustness of the URC.

- 6 Remove the wires and gasket residual inside the URC after the wire installation, before closing the top housing of the URC.

3.2.4

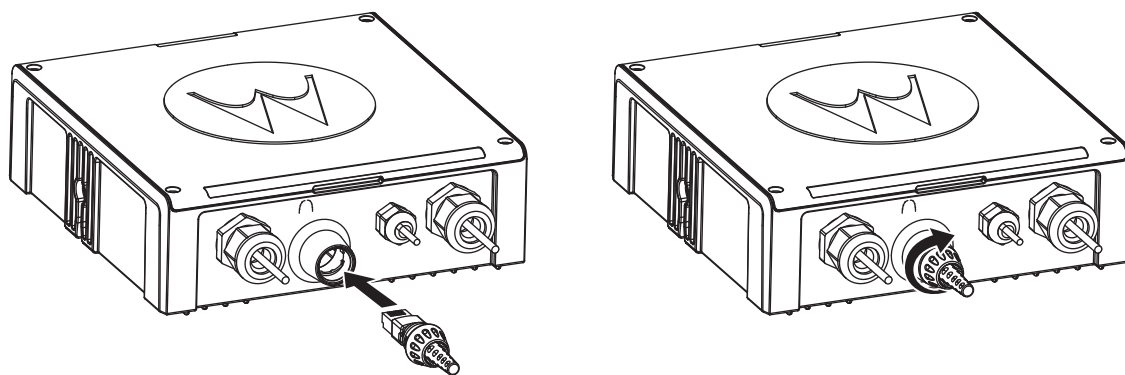
Installing the O7/O9 to URC Cable

The O7/O9 to URC cable (Motorola Solutions part number 3064153H02) can be assembled either before or after reassembling the top housing.

Procedure:

- 1 Insert the RJ45 port of the cable into the RJ45 connector on the URC and turn the locking collar 90° to the right to ensure that it is locked properly.
- 2 Test if the cable is locked properly by trying to pull out the cable.

Figure 86: O7/O9 to URC Cable Installation



Chapter 4

Options and Accessories Installation

This chapter provides the options and accessories installation for dash mounted and remote mounted configurations.

4.1

Dash-Mount Accessory Installation

For dash-mounted configurations, the accessories must be installed through the accessory connector assembly that is on the rear of the radio, next to the power connector. Motorola Solutions-approved accessories are supplied with male terminals crimped to a 20-gauge wire 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. Do not use other generic terminals in the plug. Generic terminals cause electrical intermittences and may damage the plug.

4.1.1

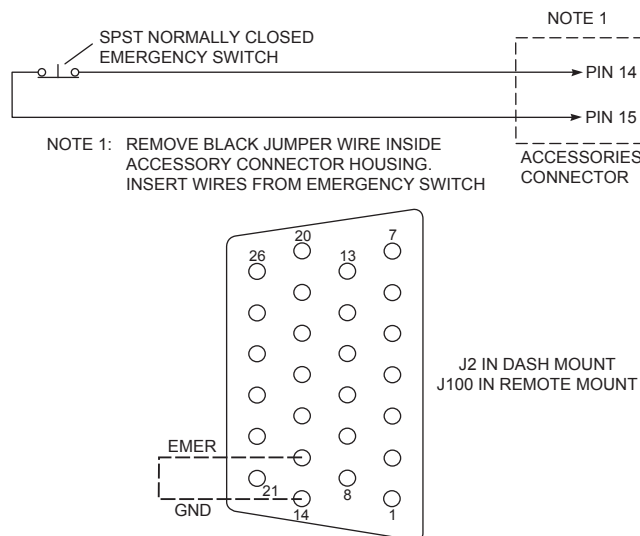
Dash-Mount Emergency Pushbutton or Footswitch Installation

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 14 and 15 (see [Figure 87: Emergency Switch Wiring Diagram on page 84](#)). Close the connector housing; route the finished cable from the switch location to the control head location.



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

Figure 87: Emergency Switch Wiring Diagram





CAUTION: The radio is sold with correct accessory cables and jumpers to have emergency deactivated by default, regardless of the setting in Customer Programming Software (CPS). However, if cables are not used, or if jumpers are removed without replacing with an emergency accessory button/switch at one of the accessory ports, the radio powers up upon the application of A+. The display may not show an indication that the radio is on, and this condition can result in an incorrect operation of the radio and excessive current drain of the vehicles battery when the engine is off.

4.1.2

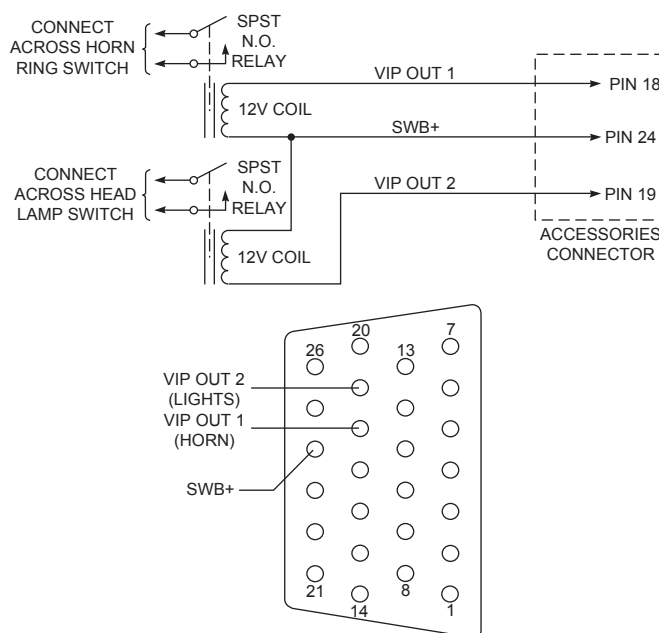
Dash-Mount Horn and Lights (External Alarms) Relays

Prerequisites: For installations that use the horn/lights option, select a suitable location for mounting (normally under the dash). Referring to [Figure 88: Horn/Light Wiring Diagram on page 85](#), perform the following procedure:

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 18 and 24 of the connector.
- 2 Lights Relay – Connect the relay across the head lamp ON/OFF switch, typically found in the steering column. Open the accessory cable connector and connect the two control wires (male pins) into locations 19 and 24 of the accessory connector.

Figure 88: Horn/Light Wiring Diagram



4.2

Installing Remote-Mount Accessory

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 13: VIP Output Connections on page 91](#) and [Table 14: VIP Input Connections on page 92](#)).



CAUTION: The radio is sold with correct accessory cables and jumpers to have emergency de-activated by default, regardless of the setting in Customer Programming Software (CPS). However, if cables are not used, or if jumpers are removed without replacing with an emergency accessory button/switch at one of the accessory ports, the radio will power up upon the application of A+. The display may not show an indication that the radio is on, and this can result in an incorrect operation of the radio and excessive current drain of the vehicle battery when the engine is off.

4.2.1

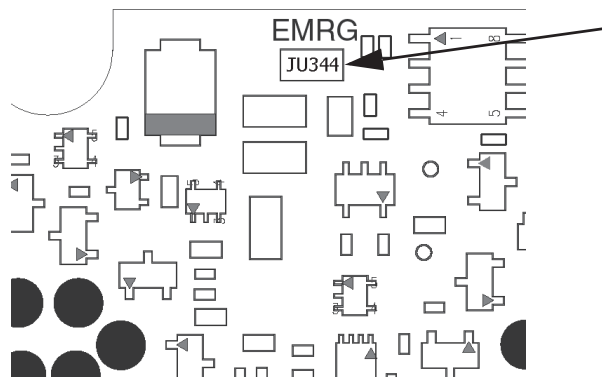
Installing Emergency Pushbutton or Footswitch

When and where to use:

Mount the switch using the hardware that comes with the kit. Connect the button/switch wires to a ground pin and the emergency pin, removing the default jumper wire in the rear accessory cable. The button/switch shorts the pins when inactive. When the button/switch is pressed, its contact opens, the emergency path is ungrounded and pulled-high inside the radio transceiver, and detected by the processor. If an emergency accessory is used at either (or both) J2 connector and J626 connectors, all jumper wires, shorting emergency to ground, must be removed so the button/switch press can be detected.

In addition to removing the default jumper wires in accessory cables, remove a jumper part on the printed circuit board of the TIB, in order for the button/switch to be detected. On the TIB PCB (both mid power and high power use the same TIB), a 0 Ω jumper is placed by default so that the radio does not go into emergency when no cable is attached at either J2 or J626 in remote mount configuration. This jumper part, JU344, must be removed if either or both J2 and J626 have any type of emergency cable and button/switch attached. Otherwise, the processor will never see emergency become un-grounded.

Figure 89: Emergency Jumper Removal in Remote Mount



Procedure:

- 1 Turn off power to the radio system.
- 2 Detach the TIB from the radio transceiver.
- 3 Detach the TIB flex.
- 4 Remove TIB PCB from the plastic housing using TORX T10 screwdriver. Refer to the disassembly procedure in the Basic Service Manual.
- 5 Locate JU344, See [Figure 89: Emergency Jumper Removal in Remote Mount on page 86](#).
- 6 Remove JU344 from the TIB PCB using a soldering gun. Clean off excess solder.

- 7 Reassemble the TIB following the Basic Service Manual procedure. Use 6-8 in-lbs torque on each screw. Remember to include the TIB O-ring gasket.
- 8 Reattach the TIB flex.
- 9 Reattach the TIB to the radio transceiver.
- 10 To secure the TIB to the radio transceiver, apply 6-8 in-lbs of torque to each screw .

4.2.2

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.

4.2.3

Lights (External Alarm) Relay Installation

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

4.2.4

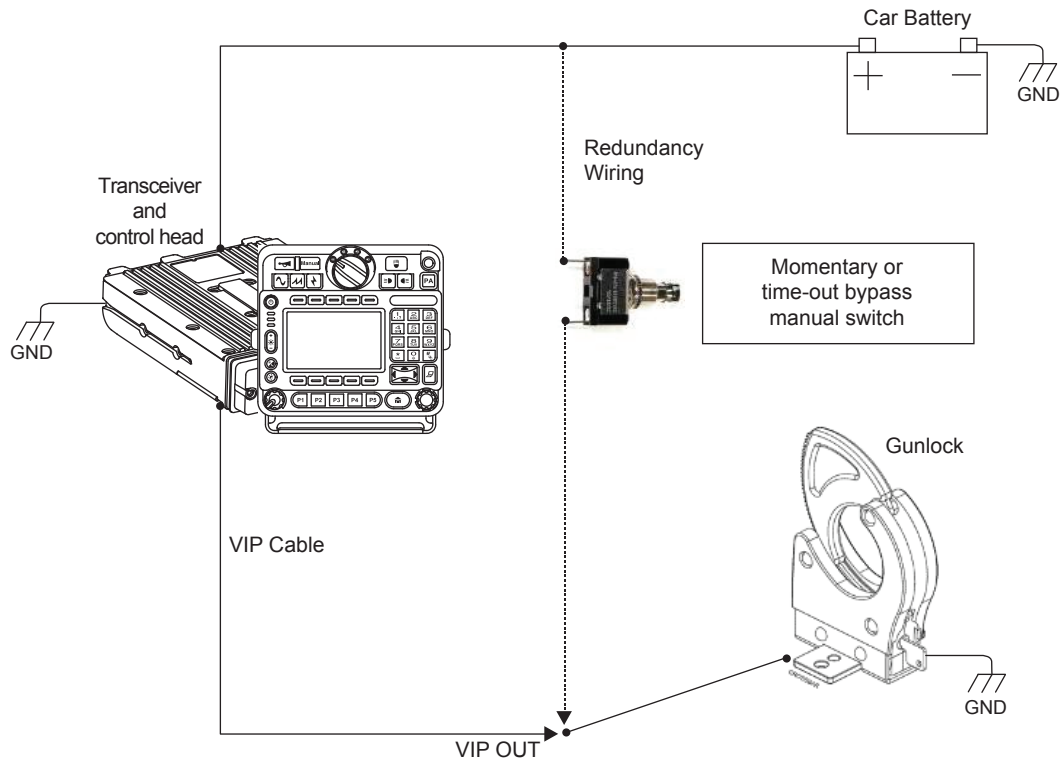
Gunlock Installation

The O7 or O9 control head can program up to three gunlocks through the programmable buttons.

You can set the time for the momentary trigger using the time-out trigger button. Connect the relay contacts across the gunlock switch to install the gunlock. Connect the two control wires to a SW B+ pin and a VIP OUT pin on the VIP connector.

Install a failsafe or redundant bypass switch for the gunlock. It is suggested to use a separate timer switch or a manual push-on button switch to activate the gunlock. Connect the switch from the supply to the gunlock directly, as shown in [Figure 90: Gunlock Switch Redundancy Diagram on page 88](#). Place the manual button at a suitable and reachable location, yet not easily seen.

Figure 90: Gunlock Switch Redundancy Diagram

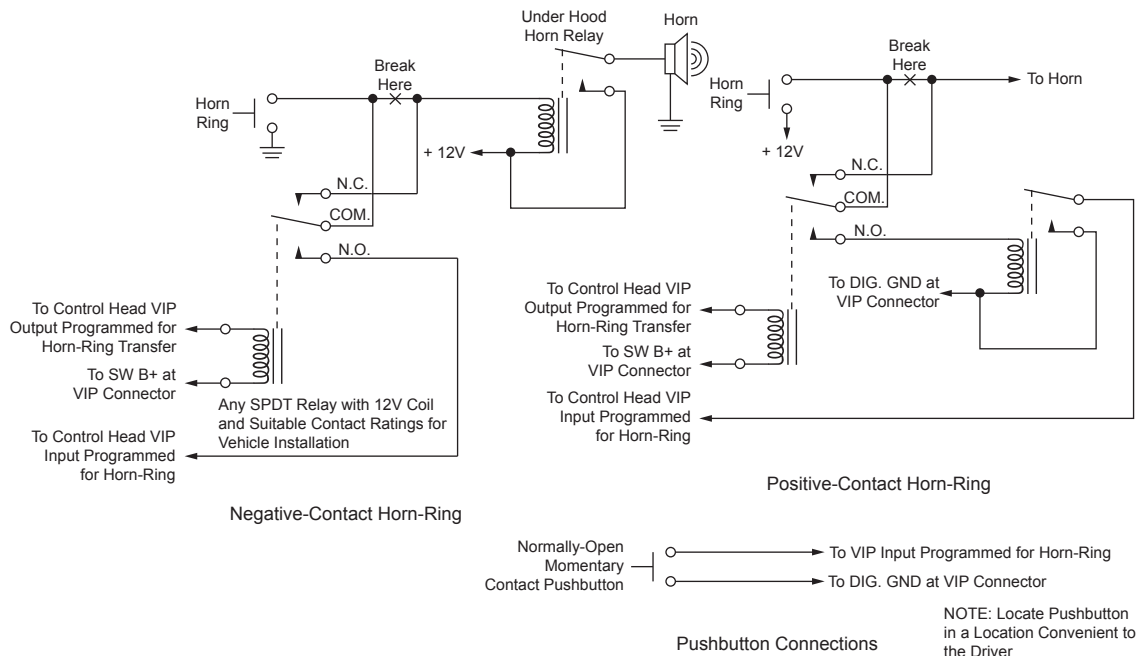


4.2.5

Horn-Ring Transfer

Configure the Horn Relay for either Negative Contact or Positive Contact as shown in “section 6.3” of the siren/PA manual (6881093C18).

Program the designated VIP-OUT line for “Horn-Ring Transfer” and program the designated VIP-IN line for “Horn-Ring”. [Figure 91: Siren/PA Horn-Ring Connections on page 89](#) shows wiring diagrams for connecting the Horn-Ring through a transfer relay for both negative and positive ground systems. Refer to the siren/PA manual (6881093C18) for more information.

Figure 91: Siren/PA Horn-Ring Connections**4.2.6****Record Audio Out Jack of Transmit and Receive Audio**

The use of Power Cable kit HKN6187_ (see [Figure 64: HKN6187_ Power Cable with External Speaker Connector, Record Audio Output Jack \(2.5 mm\) and Earphone Jack \(2.5 mm\) on page 64](#)) provides access to both the transmitted and the received audio speech. This audio can be recorded with a standard tape recorder using a 2.5 mm connector.

4.2.7**Earphone Jack**

The use of Power Cable kit HKN6187_ (see [Figure 64: HKN6187_ Power Cable with External Speaker Connector, Record Audio Output Jack \(2.5 mm\) and Earphone Jack \(2.5 mm\) on page 64](#)) allows the use of a standard earphone/headset instead of the external speaker. Once a cable is plugged into this 2.5 mm jack, the external speaker attached at the control head turns mute.

4.2.8**USB Data Cables**

It is recommended that the USB 1.5 m data cable HKN6163_ is used for both dash mount configurations (at J2 connector) and for remote mount configurations (at J100 connector) because the HKN6163_ has the emergency jumper present, which is necessary for correct dash mount configurations.

For interfacing at the MMP port, use Cable HKN6184_ which is a USB device cable. The USB 4 m (15 ft.) data cable HKN6172_ is recommended for remote mount configurations only (at J100).

If the customer intends to use the HKN6172_ for dash mount configurations (at J2), the cable 26-pin connector must be opened and an emergency jumper-wire placed across pins 14 and 15. Refer to [Figure 87: Emergency Switch Wiring Diagram on page 84](#).

4.2.9

RS232 Cables

RS232 cables are not compatible with Customer Programming Software (CPS) radio reading or programming, but can be used for interfacing with RS232 accessories or RS232 computer programs.

HKN6122_ is an RS232 serial COM port computer interface cable from J600 connector. The followings are the RS232 cables :

- HKN6160_ is a 6 feet dash RS232 cable from J2 connector
- HKN6161_ is a 20 feet dash RS232 cable from J2 connector
- HKN6183_ is a 4 meter cable from MMP connector

4.3

Vehicle Interface Port Overview

The Vehicle Interface Port (VIP) allows the control head to operate outside circuits and to receive inputs from outside the control head. There are three VIP outputs which are used for relay control. There are also three VIP inputs which accept inputs from switches (remote mount only).

Figure 92: Remote Control Head Pinouts

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

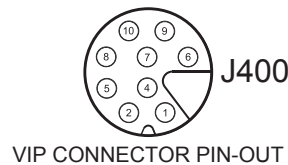
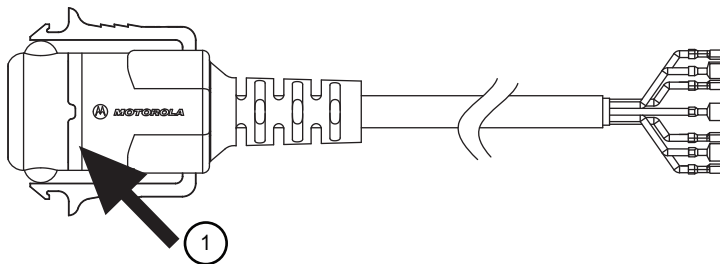


Figure 93: HKN6196_ VIP Connector Detail



No.	Description
1	Yellow Ring

4.3.1

VIP Output Connections

The VIP output pins are on the back of the control head (J100 and J400), or the rear accessory port (J2), as shown in [Wiring Diagrams on page 34](#), [Figure 98: Rear Accessory Connector Audio](#)

Configuration on page 96 and Figure 99: Rear Accessory Connector Data Configuration on page 96, respectively.

Use these connections to wire control relays. One end of the relay should connect to switched B+ voltage, while the other side connects to a software controlled ON/OFF switch inside the control head. The relay can be normally on or normally off depending on the configuration of the VIP outputs. There are three VIP output connections, as follows:

Table 13: VIP Output Connections

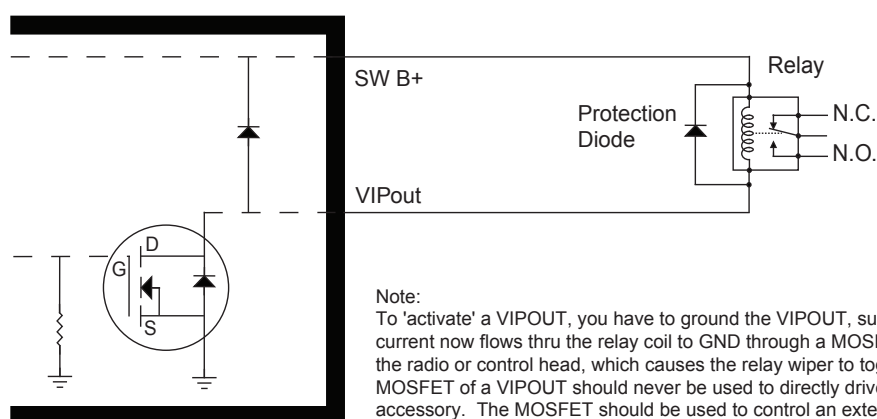
VIP OUT NUMBER	J400		J2		J100	
	SW B+ Pin Number	On/Off Switched Pin Number	SW B+ Pin Number	On/Off Switched Pin Number	SW B+ Pin Number	On/Off Switched Pin Number
1	Red 1	5 (Blue)	24	18	24	18
2	Red 1	6 (Yellow)	24	19	24	19
3	Red 1	7 (Black)	NA	NA	NA	NA

The function of these VIP outputs can be field programmed in the control head. Typical applications for VIP outputs are external horn/lights alarm and horn ring transfer relay control. For further information on VIP outputs, see the control head programming manual.

VIP OUT 1 and VIP OUT 2 can be accessed from either J100 or J400 connectors to allow a previously wired VIP OUT at J2 to move easily to J100. However, when any cable is inserted into J400, J100 VIP OUTs are disabled.

When installing relays to the VIP OUT lines, a diode is necessary to prevent damage to the transistor or MOSFET, due to “back EMF” when the field collapses on the relay coil. Some vendor relays already come with this diode built-in, and other relays require the customer to install it. Figure 94: Relay Coil on page 91 shows the proper placement of the diode across the relay coil. The transistor or MOSFET is located inside the radio or the D.E.K. box.

Figure 94: Relay Coil



NOTICE: See Replacement Parts Ordering on page 132 to order relay for your VIP OUT applications. Example relay hardware: TLN4533_ (relay without internal diode), HLN6969_ (relay with internal back EMF protection diode), and HKN4258_ (relay wiring cable).

4.3.2

VIP Input Connections

The VIP input pins are only available on the back of the control head (remote mount).

These connections control inputs from switches. One side of the switch connects to ground while the other side connects to a buffered input on the control head. The switch can be normally closed (NC) or normally open (NO) depending on the configuration of the VIP inputs. The following are the three VIP input connections:

Table 14: VIP Input Connections

VIP IN NUMBER	J400		J2	
	Ground Pin Number	On/Off Switch-ed Pin Number	Ground Pin Number	On/Off Switch-ed Pin Number
1	2 (green)	8 (white)	NA	NA
2	2 (green)	9 (orange)	NA	NA
3	2 (green)	10 (violet)	NA	NA



NOTICE: Remote Mount requires the VIP cable to be attached to J400.

MCH installations require the VIP inputs to be connected to the head assigned ID #1. See [Setting the Initial Control Head ID on page 56](#) for further information.



CAUTION: ASTRO mobile radios equipped with the following features are able to transmit automatically, even if the radio is turned off:

- Automatic Vehicle Location
- Other Special Data Products

All ASTRO mobile radios have accessory connector pins 14 and 15 connected together to allow the radio to power down. Opening this connection by removing the accessory connector, or otherwise failing to maintain a normally closed path, could, if left unchecked, drain the vehicle battery, and possibly cause transmissions to occur.

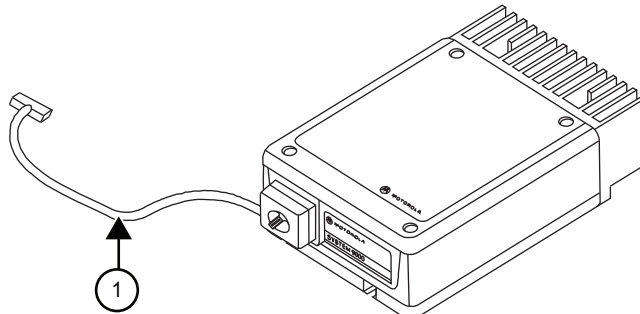
4.4

Compatibility of Emergency when Attaching a Siren

Procedure:

- 1 When using emergency footswitch or pushbutton with siren/PA configuration, REMOVE pin 8 (emergency) from the siren connector of the HKN4363_ siren cable.

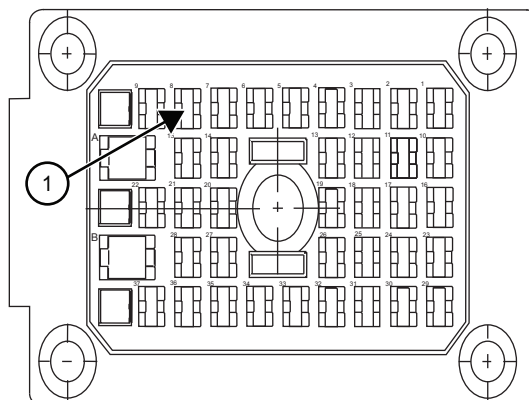
Figure 95: Field adjustment for Emergency Operation with Siren Accessory



No.	Description
1	Siren Cable

- 2 Remove the knob from the siren/PA cable connector.
- 3 Remove all four screws from the connector in the siren/PA cable.
- 4 Open the connector cap and locate pin 8.
- 5 Using the contact removal tool (6684690C02), remove pin 8 from the connector.
- 6 Put the connector cap in place and proceed to reinstall the four screws and the knob.

Figure 96: Location for Pin 8



4.5

Accessory Connector Assembly Details (P2)

The APX mobile accessory connector assembly is mounted on the right rear of the radio, opposite the antenna and next to the power connector.

It is fastened to the radio via jackscrews and held together by the two cover screws. It is a multi-functional connector that allows for many different types of adaptations. All approved accessory wires are securely strain-relieved through the exiting slots at the back of the accessory connector assembly. The terminations that are supplied with all accessories are fully engaged and locked into the plug connector (6680163F01). They can also be detached for service with the assistance of a terminal removal tool. The accessory connector assembly can be serviced multiple times for future installation upgrades.

The accessory connector assembly, supplied with every APX mobile dash-mounted radio, is equipped with a 26-pin plug assembly, two covers, two jackscrews, two cover screws, one emergency jumper, one ignition sense cable assembly, and one speaker pigtail. The jumper is provided to complete the circuit for emergency mode. If this circuit becomes open, the radio is set to emergency mode.

3980034F05 is the crimping pin part number for use with any wires used inside the accessory cable connector.

4.5.1

Disassembly and Assembly

This section provides the detailed disassembly and reassembly information.

4.5.1.1

Disassembly

Procedure:

- 1 Disconnect the negative terminal from the vehicle battery. Make sure that the battery cable is secured such that it cannot power the vehicle electrical system.
- 2 Unscrew both jackscrews completely.
- 3 Pull the accessory connector assembly out from the radio.
- 4 Loosen both cover screws, but do not remove them completely.
- 5 Pull the jackscrews away from the plug and hold them back.
- 6 Pry apart the accessory connector assembly covers.
- 7 Attach any new wire to its proper location by pushing in the male terminal. When you hear a pop, the wire is engaged. To verify that the wire is engaged, tug gently on the wire and be sure that it does not come out. To avoid severe damage to the plug, do not overload the wire.

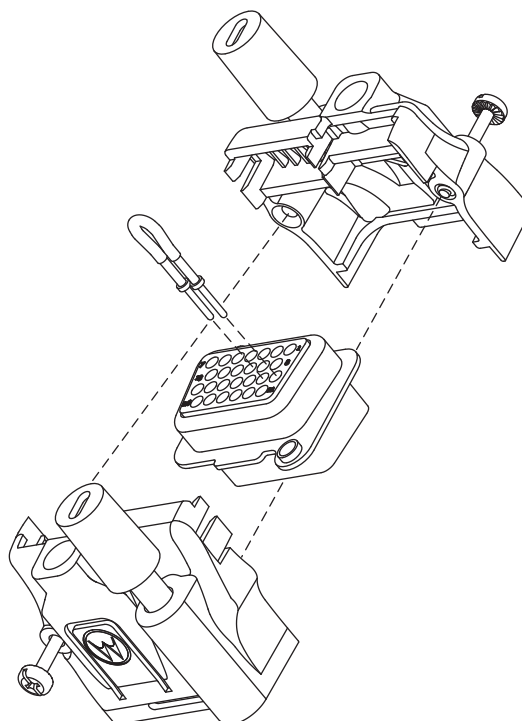
4.5.1.2

Assembly

Procedure:

- 1 Place the plug-in one cover. Be sure that the flange of the plug is in the slot of the cover. See [Figure 97: Exploded View of Accessory Connector Assembly \(HLN6863_\) on page 95](#).
- 2 Push the jackscrew through the plug to hold it in.
- 3 Position each wire across the strain-relief features in the cover. Avoid damaging loads on the plug by allowing some slack in each wire in the accessory connector wire chamber.
- 4 Place the second cover onto the plug. Be sure that the flange is protruding through both covers.

Figure 97: Exploded View of Accessory Connector Assembly (HLN6863_)



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



NOTICE: See *Enhanced Single Band Mobile Radio Basic Service Manual* for detailed descriptions of these pins and other connectors located in the mobile radio.

4.5.2

Adapter Cable

If you are planning on installing a mobile radio as a replacement for an ASTRO Spectra radio, the following adapter cables are available:

Table 15: Adapter Cable

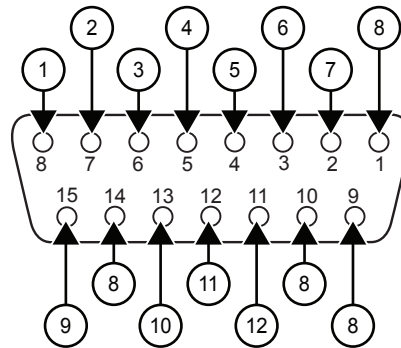
Part Number	Description
HKN6158_	Cable, Audio Adapter Kit
HKN6159_	Cable, Data Adapter Kit



NOTICE: The adapter cables can only be connected to J2 in the rear of the transceiver.

Use the HKN6158_ audio adapter kit cable if your vehicle was formerly wired for an ASTRO Spectra or ASTRO Spectra Plus radio, and use the rear cable pins as shown in the following figure.

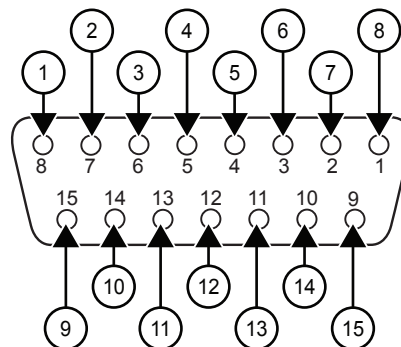
Figure 98: Rear Accessory Connector Audio Configuration



No.	Description
1	GND
2	SPKR LO-
3	SPKR HI+
4	IGNITION
5	SWB+
6	VIP OUT 2
7	EMER
8	N.C.
9	MIC HI
10	PTT
11	VIP OUT 1
12	DISC. AUD

Use the HKN6159_ data adapter kit cable if your vehicle was formerly wired for an ASTRO Spectra or ASTRO Spectra Plus radio, and used the rear cable pins as shown in the following figure.

Figure 99: Rear Accessory Connector Data Configuration



No.	Description
1	DIG GND
2	SPKR LO-

No.	Description
3	SPKR HI+
4	IGNITION
5	SWB+
6	VIP OUT 2
7	EMER
8	CTS-ASTRO RTS_DCE
9	RTS- ASTRO CTS_DCE
10	BUS+
11	TX-ASTRO RX_DCE
12	VIP OUT 1
13	RX-ASTRO RX_DCE
14	BUS-
15	BUSY

You must attach the correct adapter. Installing the wrong adapter may damage the data communication circuitry inside your radio. If you are unsure of the pinout of your former wiring harness, consult your ASTRO radio installation technician.

4.6

Memory and Three-Day Secure Key Retention Option

For the installation or removal of the Memory or 3-Day Secure Key Retention Options (MHLN6999_ and MHLN7000_), see the *Enhanced Single Band Mobile Radio Basic Service Manual*.



NOTICE: The Three-Day Secure Key Retention Option is not applicable for APX 2500/APX 4500/APX 1500 Enhanced Single Band Mobile Radio.

Chapter 5

Motorcycle Radio Installation

This chapter covers the motorcycle radio installation. The motorcycle radio installation is not applicable for APX 4500/APX 1500 radios and O9 control heads.

5.1

Motorcycle Radio Description

The motorcycle model includes all the same components in the standard radio, with the exceptions listed in the model charts in the Enhanced Single Band Mobile Radio Basic Service Manual (MN005718A01).

5.1.1

Transceiver Enclosure

The transceiver is mounted in the weather-resistant enclosure that consists of a bottom housing and a hinged top cover.

The top cover has a locking latch that requires a key to open. The enclosure is mounted above the rear motorcycle wheel, oriented so that the lock is forward and the hinged cover opens toward the rear of the motorcycle. The bottom housing has a grommeted hole for cable entry and weep holes to permit water drainage.

The enclosure is mounted on the motorcycle with a universal mounting plate and shock and vibration isolators. A large, braided ground-strap (installed between the mounting plate bolts and the motorcycle frame) grounds the transceiver.

5.1.2

Control/Display Unit

All radio functions, except push-to-talk (PTT), are activated from the weather-resistant control head.

The control head and the external speaker are mounted for easy access near the center of the handlebars. The control head is positioned for unobstructed viewing, and it may be tilted on the horizontal axis for ease of viewing. The microphone cable port on the front of the control head is plugged and is not used.

5.1.3

Control Head Cable

The control-head cable connects the control head to the transceiver.

The cable is routed along the motorcycle frame and has weather-resistant connections at both ends. Excess cable is coiled under the transceiver inside the weather-resistant enclosure.

Each end of the cable is strain-relieved with jackscrews at the control head and the transceiver. The cable is shielded to reduce the effects of radio frequency interference and ignition sense noise.

5.1.4

Microphone

A weather-resistant, palm microphone, and coiled cord plug into a pigtail connector on the control cable.

The microphone attaches to a hang-up bracket located within easy reach of the motorcycle rider. The coiled cord is long enough to be operated by someone standing next to the motorcycle, yet short enough to not interfere with the motorcycle steering or operation.

5.1.5

External Speaker

A 3.2-Ohm, 10-watt-rated-audio-power, external speaker is mounted on the front of the motorcycle.

The speaker cable is routed along the motorcycle frame to the transceiver rear accessory connector. A sealed, weather-resistant, speaker-muting (toggle) switch is mounted on top of the speaker.

The external speaker connects to the rear accessory connector of the transceiver.

5.1.6

Headset Capability

The motorcycle radio is compatible with headset accessories that would provide hands-free operation of the radio.

Motorola Solutions does not manufacture headset equipment, but provides the interconnection for headset equipment with the motorcycle radio. Aftermarket headset equipment is available through Motorola Solutions (see [Replacement Parts Ordering on page 132](#)).



CAUTION: To avoid loud audio, refer to the CPS help menu for audio settings if the Motorola Solutions mobile radio is used with any motorcycle helmet headset.

5.1.7

Antenna

The antennas are mounted on top of the transceiver weather-resistant enclosure. The enclosure metal lining acts as the antenna ground plane.

5.1.8

Ignition Sense (ACC) Wire

The ignition sense wire connects to the motorcycle fuse box and is routed along the motorcycle frame to the transceiver rear accessory connector.

The radio is wired so that transmission is inhibited if the motorcycle ignition sense switch is off. If the PTT switch is pressed with the ignition sense off, a low-frequency tone sounds. The receiver is controlled by the control head on/off switch.

5.2

Installation Overview

All mobile radios are tested and inspected before shipment. It is suggested that the transmitter frequency, deviation, and power output be checked at the time of installation.

It is the license holder's responsibility to ensure that the operating parameters of his station comply with applicable laws governing radio communications equipment. For tests and alignment procedures, refer to the appropriate service manual (refer to [Related Publications on page 15](#)).

Generally, the installation of the motorcycle radio takes place in the following parts:

- Mounting the universal mounting plate and related hardware at the rear of the motorcycle.
- Mounting the control head, speaker, microphone, and related hardware forward on the motorcycle.
- Routing the power cable, control-head cable, speaker cable, and ignition sense cable to the weather-resistant enclosure.
- Mounting the weather-resistant enclosure and radio chassis, and connecting the cables.
- Mounting the antennas to the weather-resistant enclosure.

A universal mounting plate, supplied by Motorola Solutions, is first mounted to either a motorcycle carrier at the rear of the motorcycle or to the rear frame of the motorcycle itself. The mounting procedures for the universal mounting plate vary from motorcycle to motorcycle. Therefore, the procedures given in this manual for installing the mounting plate may not specifically apply, but are provided for guidance.

The control head, speaker, and microphone are mounted forward on the motorcycle, on or near the steering column. There are several possible mounting configurations which use a combination of Motorola Solutions and customer-built brackets. These configurations are outlined in this manual. Because of the large number of motorcycle makes and models in existence, the customer-built brackets are necessary to tailor the mounting of the Motorola Solutions equipment to the particular motorcycle being used. Suggestions for customer-built brackets are given in this manual.

The power cable, control-head cable, speaker cable, and ignition sense cable are routed to the weather-resistant enclosure position. The enclosure and the radio chassis are then mounted. Special care is required when connecting cables to the radio equipment within the enclosure.

5.2.1

Important Installation Hints

Consider the following when mounting the radio components:

- Excess lengths of control-head, power, ignition sense, and speaker cables must be routed in the enclosure as shown in [Figure 112: Installing Cables on page 117](#).
- All components must be mounted securely in order to withstand the constant and sometimes severe vibration experienced on a motorcycle.
- No cantilever action, which could cause severe vibration, should be generated in the mounting hardware.
- The control head and microphone must be placed for ease of accessibility by the motorcycle operator.
- Forward components (control head, microphone, and speaker) should not interfere with visual or physical access to controls and instruments.
- Forward components should not interfere with the handling of the motorcycle.
- Cabling between the control head and the radio chassis should be run to minimize interference with operator movements.
- The weather-resistant enclosure should be placed to avoid any interference with the motorcycle operator.
- Electrical continuity must be present through the enclosure shock mounts to the motorcycle frame for proper electrical and RF grounding.
- The antenna is designed for mounting on the top of the weather-resistant enclosure.
- Only the supplied microphone mounting clip should be used to ensure secure mounting of the microphone. This clip has a very strong spring to ensure positive retention of the microphone over rough terrain. Also, there must be electrical continuity from this clip to the motorcycle frame for DC grounding.

- Direct access to the microphone should be provided from both sides of the motorcycle.
- Sufficient slack in the microphone coiled cord should be allowed so as not to impede steering.
- Mounting hardware must be stainless steel to prevent corrosion.
- If an extra length of cable is used to extend the microphone, ensure that the added capacitance does not interfere with the operation of the radio.
- A suitable covering should be applied to the DB-9 receptacle when the water resistant microphone (HMN1079B) is not connected.

5.2.2

Parts Identification

The following installation procedures refer to [Figure 100: Universal Mounting Plate Installation \(Part of Radio Enclosure Kit\) on page 102](#) through [Figure 113: Installing the Transceiver on page 119](#). Detailed descriptions of the mounting hardware used in each procedure are provided in parts lists section of the *Enhanced Single Band Mobile Radio Basic Service Manual*. The parts that are supplied by Motorola Solutions are contained in one of the following kits:

- Motorcycle Weather-Resistant Microphone
- Motorcycle Weather-Resistant Speaker with Mute Switch
- Motorcycle Hardware Kit SECURENET or Motorcycle Hardware Kit
- Motorcycle Power Cable Kit
- Motorcycle Mounting Kit
- Weather-Resistant Enclosure (Black)
- Antenna

5.2.3

Order of Installation

Prerequisites:

Before starting the installation, familiarize yourself with the mounting hardware (see [Figure 100: Universal Mounting Plate Installation \(Part of Radio Enclosure Kit\) on page 102](#) through [Figure 113: Installing the Transceiver on page 119](#)). Perform the installation procedures in the order that follows.

Procedure:

- 1 Install the universal mounting plate on the motorcycle.
- 2 Install the control head and speaker.
- 3 Install the microphone hang-up clip.
- 4 Install antenna base and cable onto enclosure.
- 5 Install the cables.
- 6 Install the weather-resistant enclosure on the universal mounting plate.
- 7 Route the cables inside the weather-resistant enclosure.
- 8 Install the transceiver in the weather-resistant enclosure.
- 9 Install the antennas on the enclosure.

5.3

Universal Mounting Plate

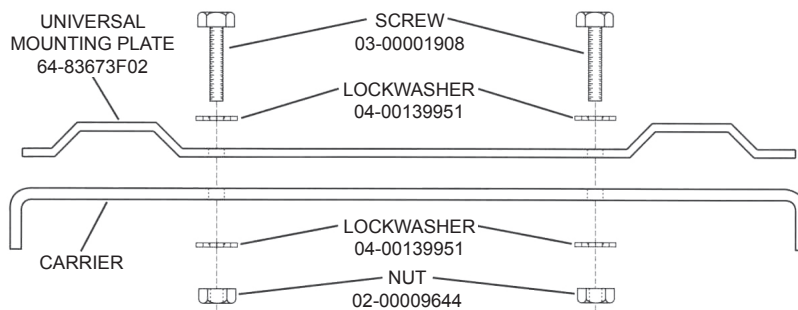
The universal mounting plate, supplied with the motorcycle radio, must be mounted on the motorcycle first. It provides the base for the weather-resistant enclosure to be mounted.

The method used for mounting the plate depends on the make and model of the motorcycle and whether the plate is mounted to a carrier or to the motorcycle chassis. After the plate has been securely mounted to the motorcycle, mounting the weather-resistant enclosure onto the plate is straightforward.

Figure 100: Universal Mounting Plate Installation (Part of Radio Enclosure Kit) on page 102 illustrates the universal mounting plate mounted to a motorcycle carrier. Since there are so many makes and models of motorcycles and motorcycle carriers, it is impossible to give specific step-by-step instructions for mounting the universal mounting plate. However, noting the following considerations aids in the installation procedure.

- A minimum of holes are pre-drilled into this plate as supplied. Mounting holes must be drilled as required for the particular motorcycle on which the plate is being mounted.
- The universal mounting plate should be mounted on the motorcycle in such a manner that the later mounting of the weather-resistant enclosure does not interfere with the motorcycle seat back, with any other obstacles, or with the motorcycle operator. The enclosure may be temporarily bolted to the universal mounting plate and the unit positioned on the motorcycle to ensure that the criteria are met.
- To ensure a good grounding path from the universal mounting plate to the motorcycle carrier or frame, stainless steel lock washers must be used with the mounting hardware in two areas to score through the paint on the universal mounting plate and on the carrier or frame. It provides good electrical contact with the underside of the motorcycle carrier or motorcycle frame.

Figure 100: Universal Mounting Plate Installation (Part of Radio Enclosure Kit)



5.3.1

Installing the Universal Mounting Plate

Follow the procedure to mount the universal mounting plate to the motorcycle.

Procedure:

- 1 Determine the mounting position for the mounting plate.
- 2 Determine whether stainless steel spacers are required for clearance in mounting the plate.
- 3 Drill four 9/32-inch holes in the mounting plate and the corresponding motorcycle carrier or chassis for mounting the plate.
- 4 Attach the universal mounting plate to the motorcycle using four machine screws, eight lock washers, and four nuts. Tighten screws securely. The lock washers must cut through the paint on the plate and motorcycle carrier or frame to ensure a good ground path.

5.4

Speaker and Control Head Installation



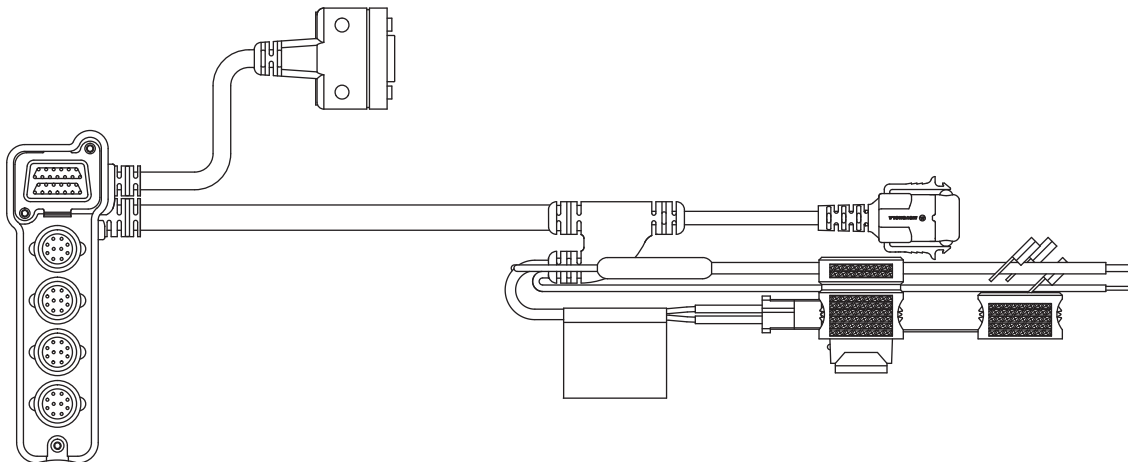
NOTICE: To disable the internal speaker of the O2 Control Head, refer to [Internal Speaker Disassembly on page 71](#).

The control head mounting location and configuration is determined largely by the make and model of motorcycle. Two different mounting configurations are described below. One involves mounting the speaker and control head together as a unit using the combination speaker/control-head bracket (shown in [Figure 102: Handlebar Installation with Speaker and Control Head Mounted Together on page 104](#)) supplied by Motorola Solutions. Alternately, the control head may be mounted by itself using a smaller control-head bracket supplied by Motorola Solutions. In this case, the speaker is mounted elsewhere. This section outlines installation procedures for each configuration mentioned above. The customer (or installer) is in the best position to determine the most appropriate mounting configuration for the control head and speaker based on the particular motorcycle on which the equipment is to be mounted.



CAUTION: When determining its location, position the control head so that it is clearly visible and within easy reach of the motorcycle operator.

Figure 101: Motorcycle Control Head Cabling (3075217A01)

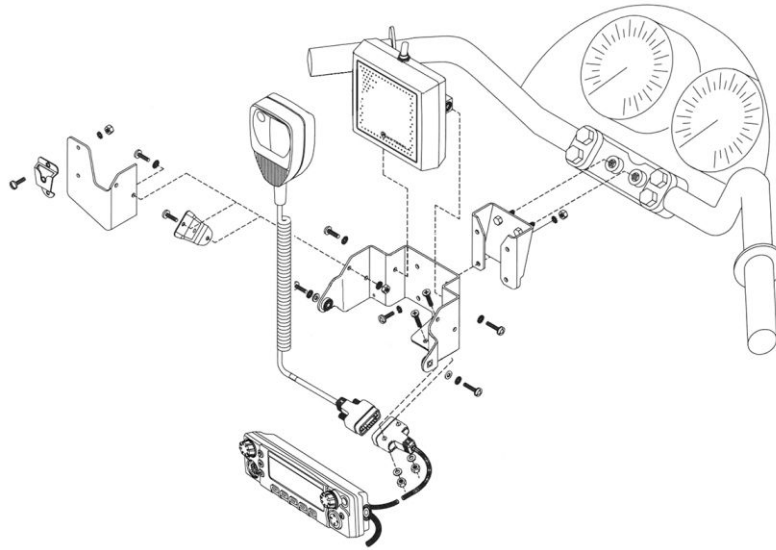


5.4.1

Handlebar Installation with Speaker and Control Head Mounted Together

[Figure 102: Handlebar Installation with Speaker and Control Head Mounted Together on page 104](#) illustrates the combination of speaker/control head bracket. This combination bracket is used only when the control head and speaker are mounted as a unit. Handlebar-mounting bracket which may be required if the combination speaker/control-head bracket cannot be easily mounted to the motorcycle. In this case, the handlebar-mounting bracket is mounted to the motorcycle, and the combination bracket is then mounted to the handlebar-mounting bracket.

Figure 102: Handlebar Installation with Speaker and Control Head Mounted Together



Provision has been made on the combination speaker/control-head bracket for mounting the microphone hang-up clip. If that mounting is desired, the hang-up clip must be attached to the bracket before installing the control head and speaker. See [Microphone Hang-Up Clip on page 73](#) for the hang-up clip procedure.

5.4.1.1

Installing Handlebar with Speaker and Control Head Mounted Together

Follow the procedure to install the speaker and control head.

Procedure:

- 1 Determine the location to mount the speaker/control head. Consider how the speaker/control-head bracket may be mounted, and whether a handlebar-mounting bracket is needed. Select a location that is not only mechanically convenient, but is located for ease of operation.
 **NOTICE:** The angle at which the handlebar-mounting bracket or the speaker/control-head bracket is mounted to the motorcycle determines the firing angle of the speaker.
- 2 If the handlebar-mounting bracket is needed, install it first.
- 3 Mount the speaker/control-head bracket, either directly to the motorcycle, or, if used, to the handlebar-mounting bracket, using four stainless-steel machine screws, lock washers, and nuts.
- 4 Mount the 9-pin D-connector end of the motorcycle control-head cable to the speaker/control head bracket, using two machine screws, flat washers, and nuts. (Cable routing directions appear later in this section.)
- 5 Mount the speaker on the speaker/control-head bracket, using two machine screws and lock washers. Torque these screws to 20 in-lbs.
- 6 Attach the control-head cable to the control head and tighten the locking screws on the connector. This connection must be made before you mount the control head in the bracket. (Cable routing directions appear later in this section.)
- 7 Mount the control head to the bracket, using two machine screws, lock washers, and flat washers.
- 8 Adjust the control head viewing angle by loosening its mounting screws and rotating the control head to the desired angle. Re-tighten the screws to 20 in-lbs torque.

5.4.2

Fuel Tank Console Installation with Speaker and Control Head Mounted Together

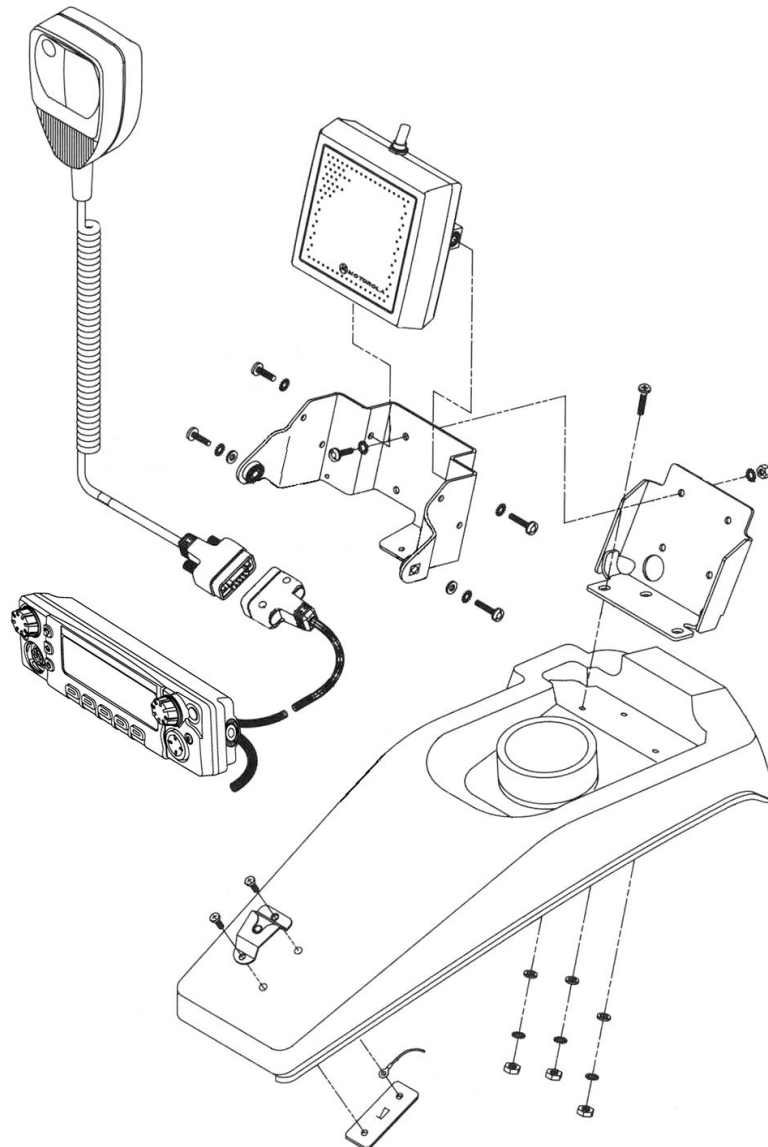
Some motorcycles provide a console for mounting radio equipment. This console is attached to the top of the fuel tank. With the use of a mounting bracket, screws, nuts, and lock washers, the combination speaker/control-head bracket can be mounted to this console. [Figure 103: Fuel Tank Console Installation with Speaker and Control Head Mounted Together on page 105](#) illustrates this type of mounting.

The console attachment screws must be removed, and the console must be lifted slightly from the fuel tank to gain access to attach mounting hardware, and to route cables later.

In this installation, the microphone (mic), mic hang-up bracket, and mic extension bracket interfere with handlebar travel.

Installation using this method is the same as in [Installing Handlebar with Speaker and Control Head Mounted Together on page 104](#).

Figure 103: Fuel Tank Console Installation with Speaker and Control Head Mounted Together



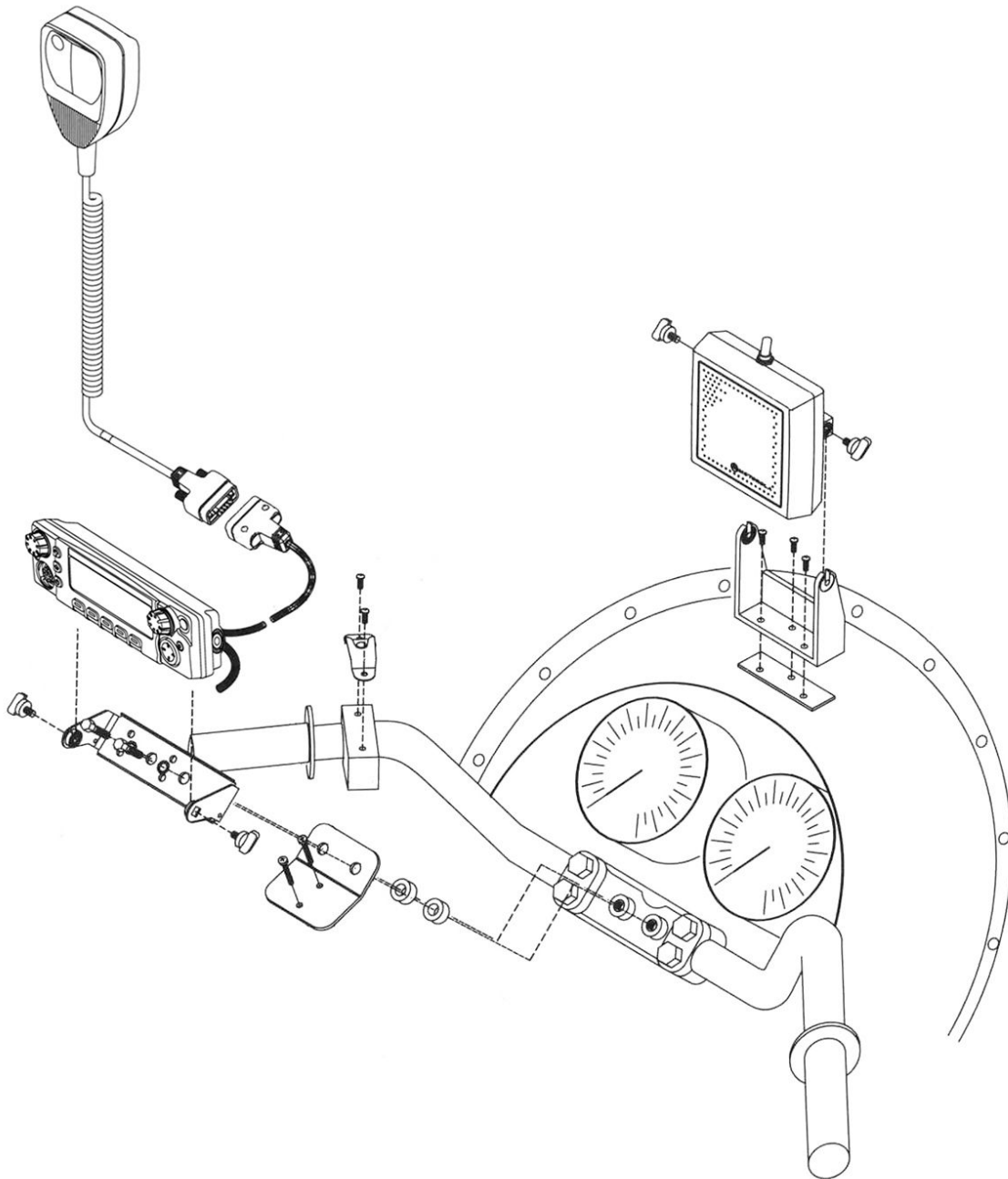
5.4.3

Handlebar Installation with Speaker and Control Head Mounted Separately

It may be necessary to use the smaller control head bracket (part number 0780127N02) and mount the speaker and microphone hang-up clip in another location on the motorcycle.

Temporarily fasten the control-head end of the control-head cable to the control head. Also, fasten the control head to its bracket before installing the control head using the described bracket. Motorola Solutions-supplied spacers and mic-cable bracket are required to mount the control head to the handlebar. This mic-cable bracket has holes to mount the microphone-cable connector.

Figure 104: Handlebar Installation with Speaker and Control Head Mounted Separately



5.4.3.1

Installing Handlebar with Speaker and Control Head Mounted Separately

Follow the procedure when mounting the smaller control-head bracket.

Procedure:

- 1 Determine the location to mount the control head. Choose a location that is not only mechanically convenient, but is located for ease of operation.
- 2 Securely mount the Motorola Solutions-supplied spacers, mic-cable bracket, and small control-head bracket to the handlebars.
- 3 Mount the 9-pin D-connector end of the motorcycle control-head cable to the mic-cable bracket, using two machine screws, flat washers, and nuts. Refer to [Cable Routing on page 113](#) for Cable routing directions.
- 4 Attach the control-head end of the cable to the control head and tighten the locking screws on the connector.
- 5 Mount the control head to the small control-head bracket, at the proper viewing angle, using two wing screws and tighten firmly.

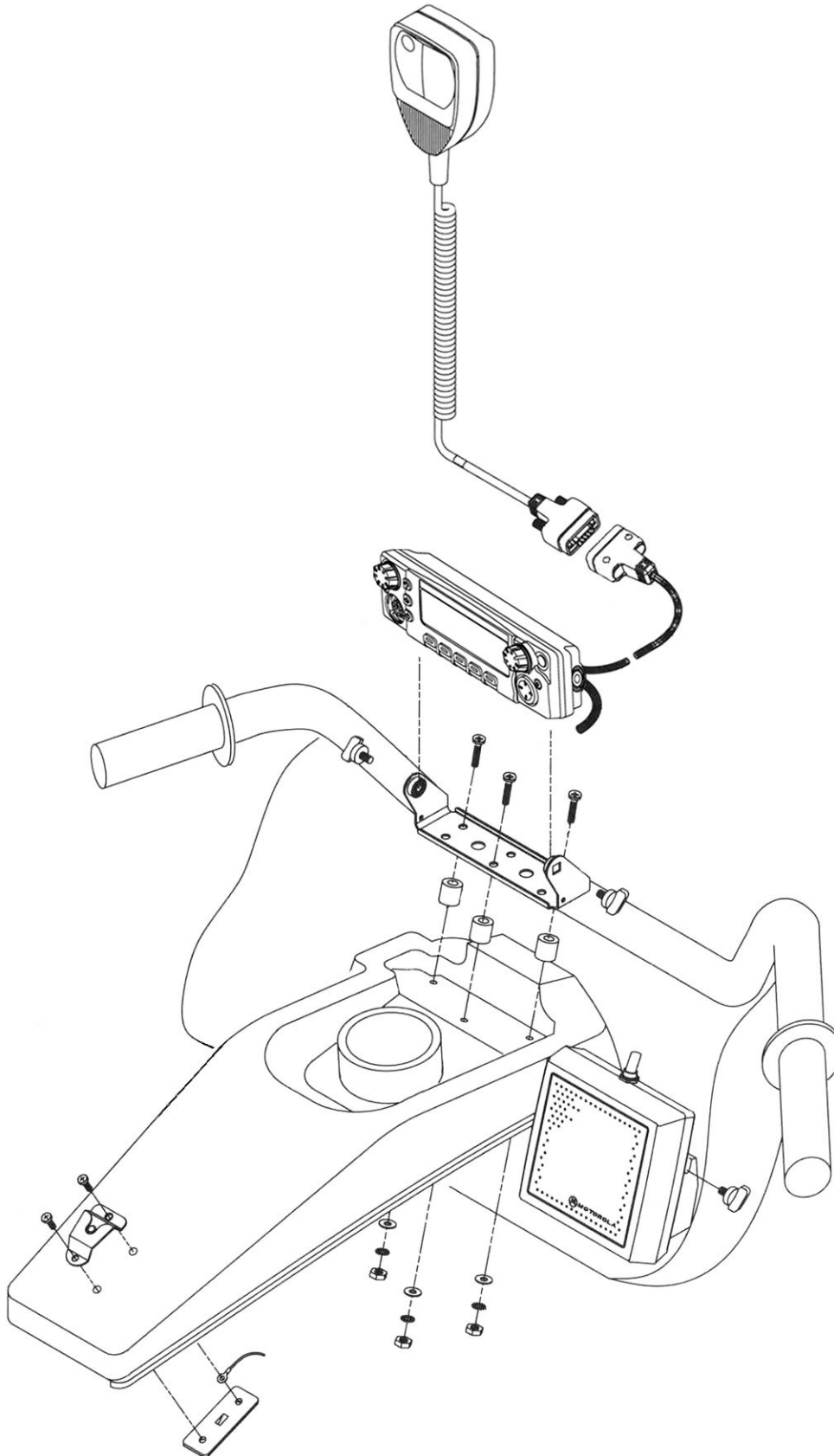
5.4.4

Fuel Tank Console Installation with Speaker and Control Head Mounted Separately

The control head may be mounted to the fuel tank console using the smaller control-head bracket and spacers/hardware.

In this configuration, the microphone cable connector may be attached directly to the console, eliminating the need for a custom bracket.

Figure 105: Fuel Tank Console Installation with Speaker and Control Head Mounted Separately



Installation is the same as detailed in [Fuel Tank Console Installation with Speaker and Control Head Mounted Together on page 105](#) and [Installing Handlebar with Speaker and Control Head Mounted Separately on page 107](#).

5.5

Installing the Speaker

Follow the procedure when the speaker is mounted separately from the control head.

When and where to use: The speaker bracket supplied with the speaker may be used alone if a suitable location can be found, or if necessary, a customer-supplied bracket may be fabricated for mounting the speaker.



NOTICE: To disable the internal speaker of the O2 Control Head, please refer to [Internal Speaker Disassembly on page 71](#).

Procedure:

- 1 Determine the location to mount the speaker and whether there is a requirement for a customer-supplied bracket.
- 2 Fabricate a bracket if required. Use the Motorola Solutions-supplied speaker bracket as a template for drilling mounting holes. Drill holes in the fabricated bracket for mounting to the motorcycle.
- 3 Mount the fabricated bracket to the motorcycle chassis.
- 4 Mount the Motorola Solutions-supplied bracket to the fabricated bracket using two machine screws, flat washers, lock washers, and nuts.
- 5 Mount the speaker to the speaker bracket using two wing screws. Refer to [Cable Routing on page 113](#) for Cable routing directions.

5.6

Microphone Hang-Up Clip Installation

Install the hang-up clip either on the supplied microphone extension bracket or on the side of the speaker/control head bracket. Both methods are shown in [Figure 102: Handlebar Installation with Speaker and Control Head Mounted Together on page 104](#). Determine the mounting location and install as described in the following paragraphs.



NOTICE: Wherever the hang-up clip is mounted, it must be DC grounded for proper operation. After mounting the clip, be sure there is electrical continuity between the clip and the motorcycle chassis.

5.6.1

Extension Bracket Mounting

Follow the procedure to mount the clip facing the operator.

Procedure:

- 1 Attach the bracket to the speaker/control-head bracket using two machine screws, four lock washers, and two nuts as shown in [Figure 102: Handlebar Installation with Speaker and Control Head Mounted Together on page 104](#).
- 2 Torque nuts to 20 in-lbs torque.
- 3 Fasten the hang-up clip to the extension bracket using two machine screws, lock washers, and nuts as shown in [Figure 102: Handlebar Installation with Speaker and Control Head Mounted Together on page 104](#).

- 4 Torque nuts to 20 in-lbs torque.

5.6.2

Speaker/Control Head Bracket Side Mounting

Follow the procedure for the speaker/control head bracket side mounting.

Procedure:

- 1 Attach the hang-up clip to the left side of the speaker/control-head bracket using two machine screws, lock washers, and nuts as shown in [Figure 102: Handlebar Installation with Speaker and Control Head Mounted Together on page 104](#).
- 2 Torque nuts to 20 in-lbs. torque.

5.6.3

Other Hang-Up Clip Mounting

A customer-supplied bracket may be used to mount the microphone hang-up clip in another location.

When and where to use:

Suggested locations include the handlebars, fuel-tank console, or any location which provides easy access to the microphone without blocking controls and indicators and without interfering with motorcycle handling. See [Figure 103: Fuel Tank Console Installation with Speaker and Control Head Mounted Together on page 105](#), [Figure 104: Handlebar Installation with Speaker and Control Head Mounted Separately on page 106](#), and [Figure 105: Fuel Tank Console Installation with Speaker and Control Head Mounted Separately on page 108](#) for alternative microphone hang-up clip mounting methods.

Procedure:

- 1 Fabricate a bracket, then secure it to the motorcycle.
- 2 Use two machine screws, lock washers, and nuts to secure the hang-up clip to the customer-supplied bracket. Ensure that the microphone clip is DC grounded to the motorcycle chassis (a grounding lug and strap are provided in the hang-up clip kit for this purpose) – this is essential for proper radio operation.

5.7

Installing Antenna Base and Cables

Prerequisites:

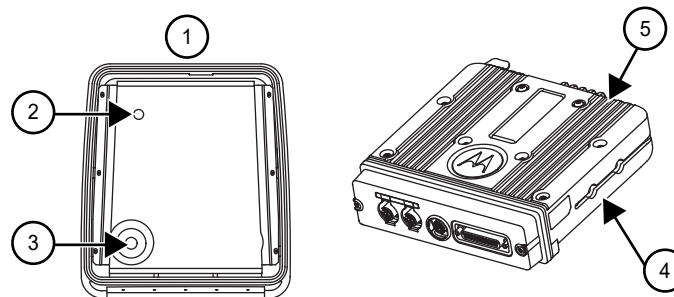
The GPS antenna assembly must be done after the removal of the metal liner but before reinstalling the radio liner.

Procedure:

- 1 Open the top cover of the weather-resistant enclosure.
- 2 Uninstall the metal liner that is shipped attached to the weather-resistant enclosure. This liner has one depressed area at the top of the enclosure liner just toward the rear of the enclosure. This metal liner is not used with Enhanced Single Band Mobile Radio.
- 3 Place the metal liner with two round, depressed areas toward the enclosure hinge and 5/8-inch hole near the front of the housing, inside the top cover, and align the six slots in the metal liner with the screw holes in the top housing.
- 4 The metal liner of the enclosure top cover acts as a ground plane for the antenna.
- 5 Locate the two round, depressed areas about 3 inches in diameter in the metal liner near the enclosure hinge. These areas are either Band 1 or Band 2 depending on the antenna port they

align to. Refer to band markings on radio for the proper antenna port location. For the GPS antenna, use the 5/8-inch hole near the front of the housing near the lock.

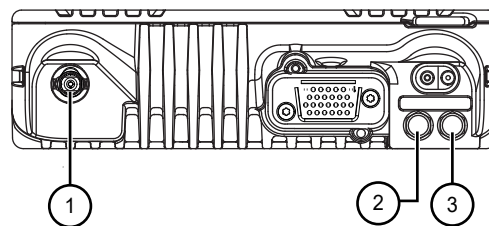
Figure 106: Location of Antenna Port



No.	Description
1	Top Cover for Radios
2	GPS/Wi-Fi
3	Antenna
4	Enhanced Single Band Mobile Radio
5	Antenna Port

- 6 These holes in the metal liner is used as a template to mark the position of the holes to be drilled at the top cover. The following guidelines provide the available options.
- Single Band – Attached your single band antenna in the appropriate antenna position.
 - GPS/Wi-Fi – Mark a hole in the GPS/Wi-Fi Antenna position.

Figure 107: Enhanced Single Band Mobile Radio Antenna Band Identification



No.	Description
1	Antenna Port
2	GPS Antenna Port
3	Wi-Fi Antenna Port

- 7 Remove the metal liner from the top cover.
- 8 For antenna positions, use the Motorola Solutions RPX-4378A Hole-Cutting Saw or equivalent, and carefully drill a 3/4-inch hole at the marked location from the inside of the cover until the saw bottoms out. For the GPS/Wi-Fi, carefully drill a 1 1/16-inch hole at the marked location from the inside of the cover until the saw bottoms out. The saw should have a clean and neat circle to ensure good contact between the antenna and the housing.