

2.1.2

Wiring Diagrams

The following figures show the wiring diagrams for all the possible configurations. Identify which of these figures shows the configuration that you are installing, and use the diagram when planning the installation.

For remote mount configuration, refer to [Remote Mount: Power, Ignition, and Emergency Cable Installation on page 42](#) and [Installing Emergency Pushbutton or Footswitch on page 82](#) for further details and recommended wiring of the emergency cables.

Figure 24: Radio Installation (O2 Dash Mount)

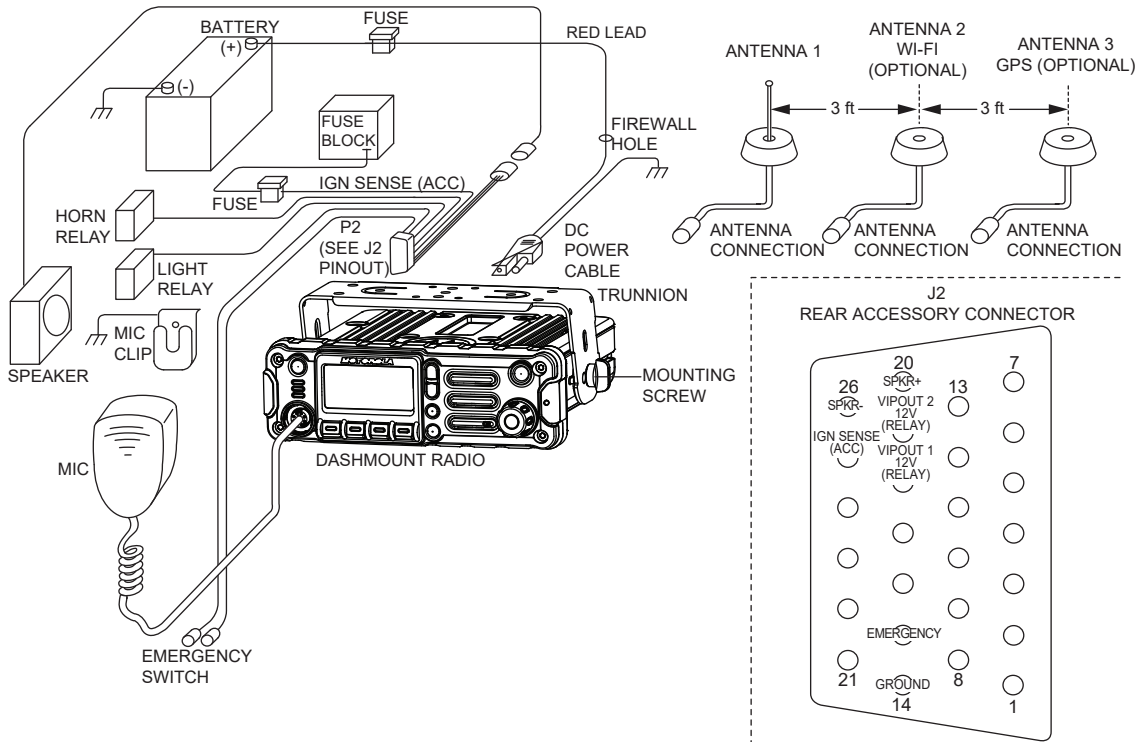


Figure 25: Radio Installation (O3 Dash Mount)

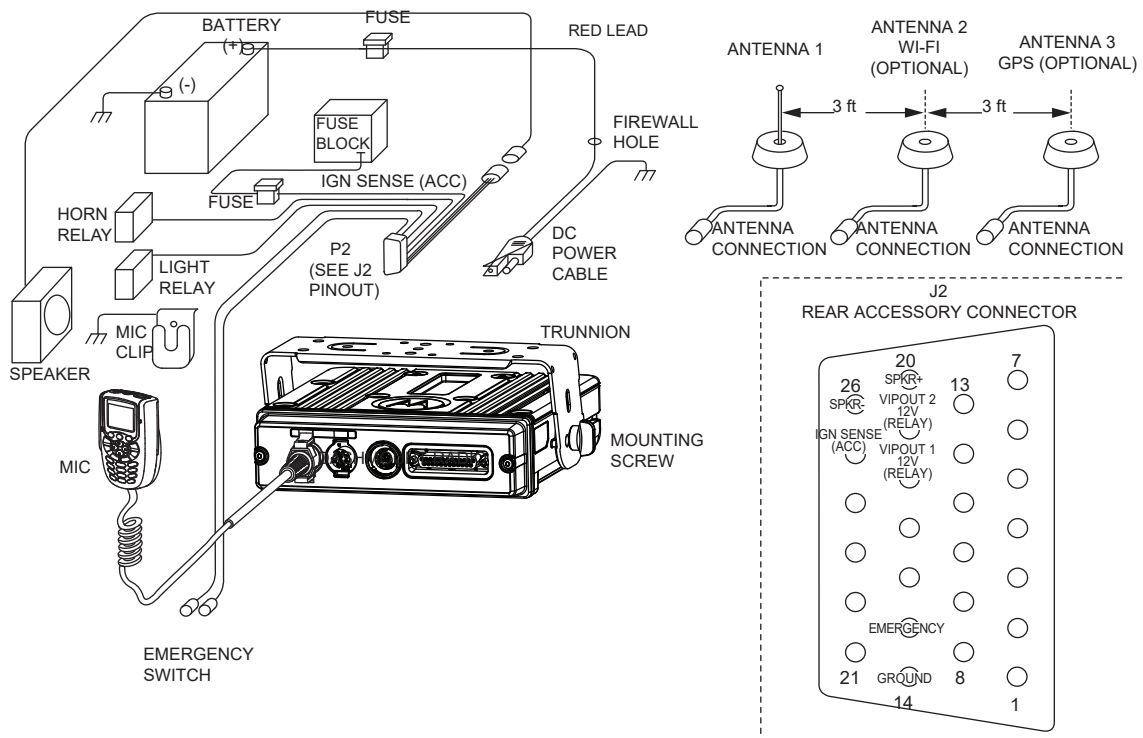


Figure 26: Radio Installation (O5 Dash Mount)

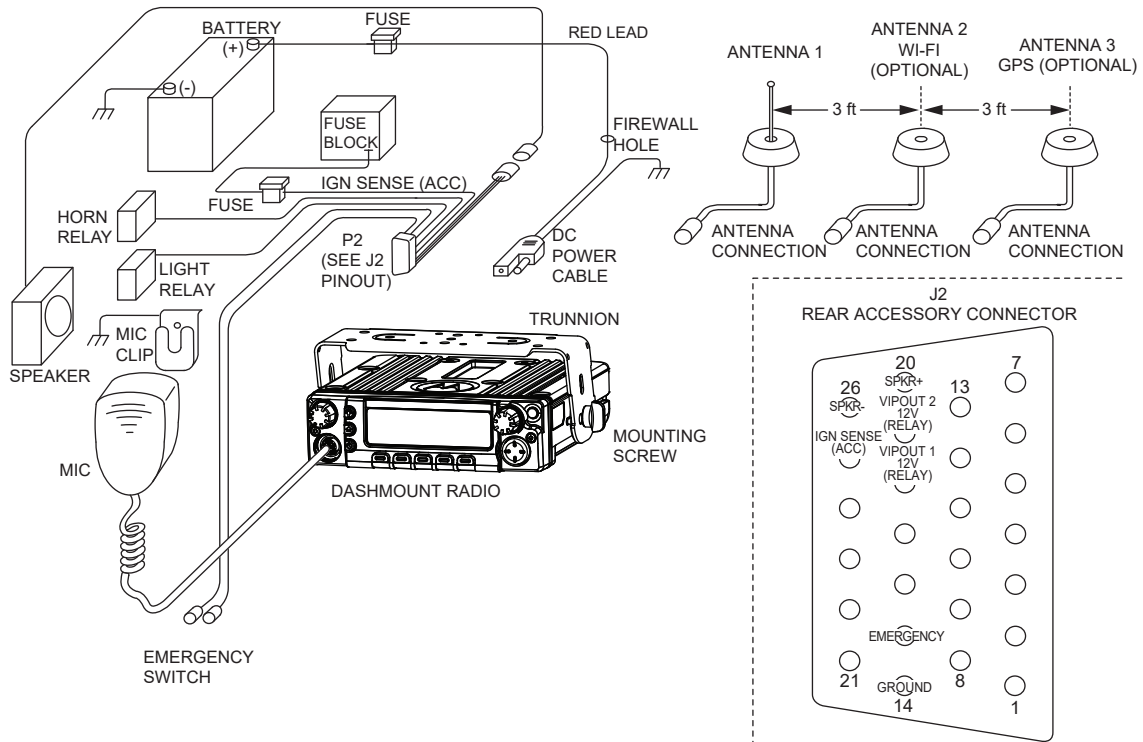
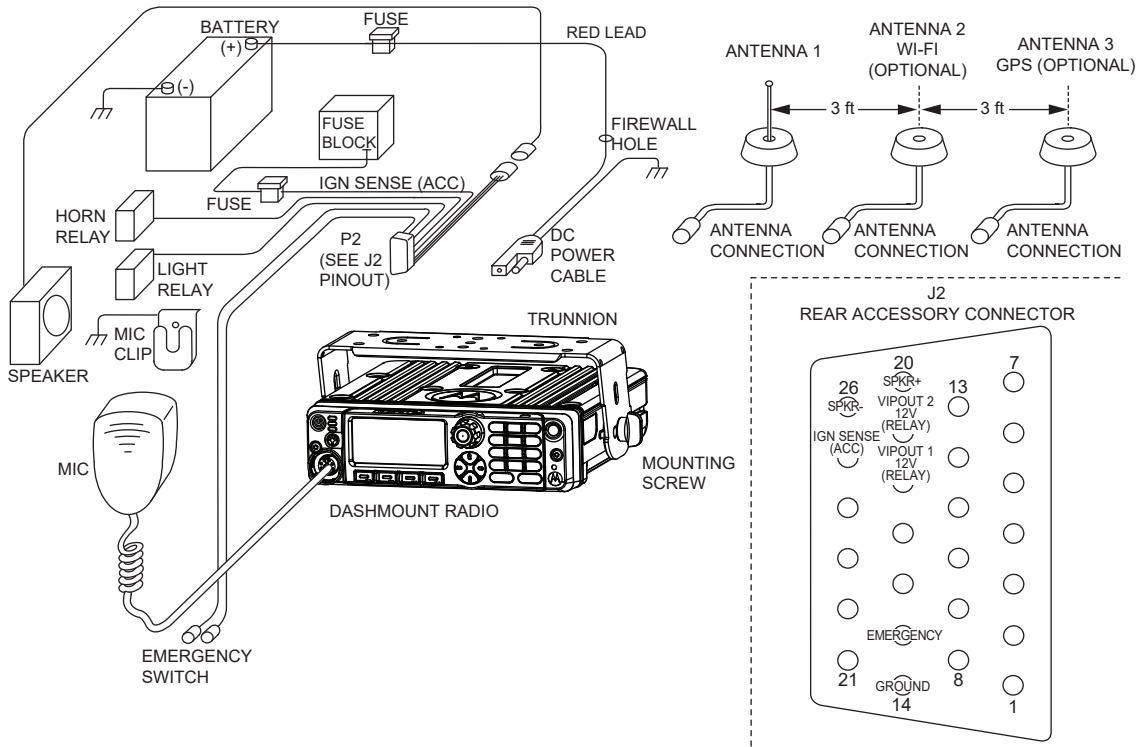


Figure 27: Radio Installation (O7 Dash Mount)



NOTICE: In dash mount configuration, it is mandatory that a rear accessory cable is attached to the back of a mid power radio, to ground the Emergency pin to ground (GND). Or, an emergency footswitch or pushbutton switch must be attached to the back of a mid power radio. If the emergency pin is not grounded, upon the attachment of the A+ cable at the DC connector, the radio detects **HIGH** for the emergency pin state, and assume that emergency has been activated. This condition is an attempt to power on the radio, and results in excessive current draw and incorrect radio operation. Refer to [Dash Mount: Power, Ignition, and Emergency Cable Installation on page 42](#) for further details and recommended wiring of Emergency in dash mount configuration.

Figure 28: Radio Installation (O2 Remote Mount)

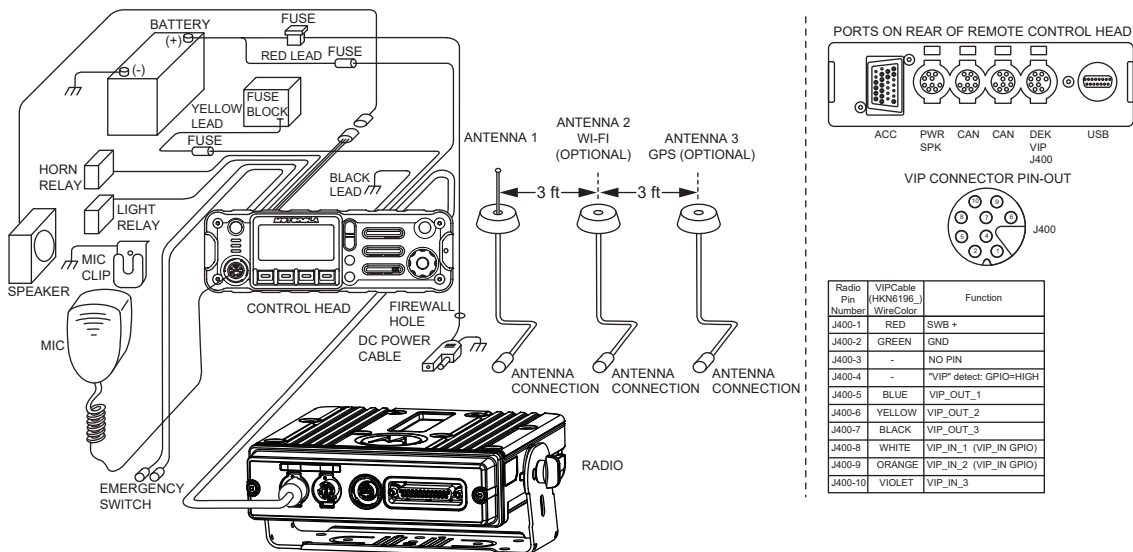


Figure 29: Radio Installation (O3 Remote Mount)

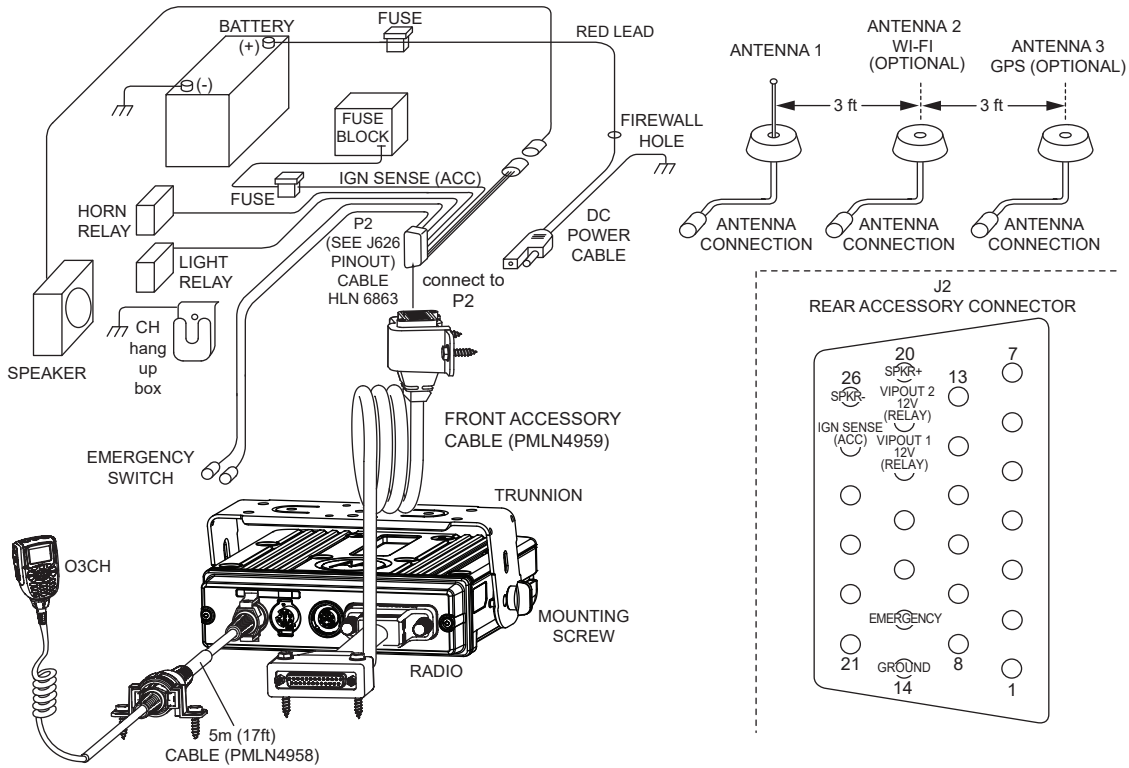


Figure 30: Radio Installation (O5 Remote Mount)

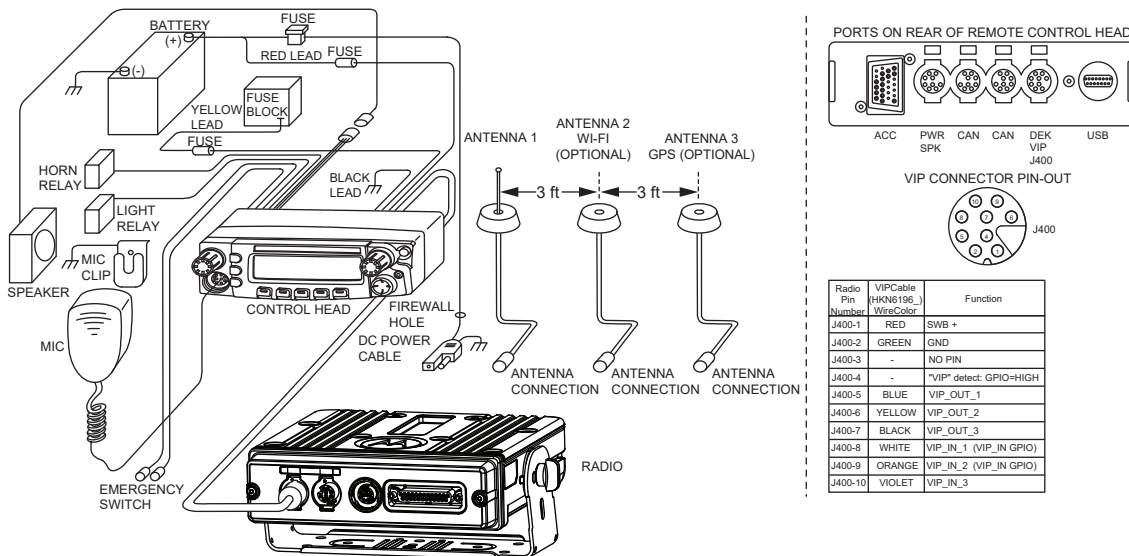


Figure 31: Radio Installation (O7 Remote Mount)

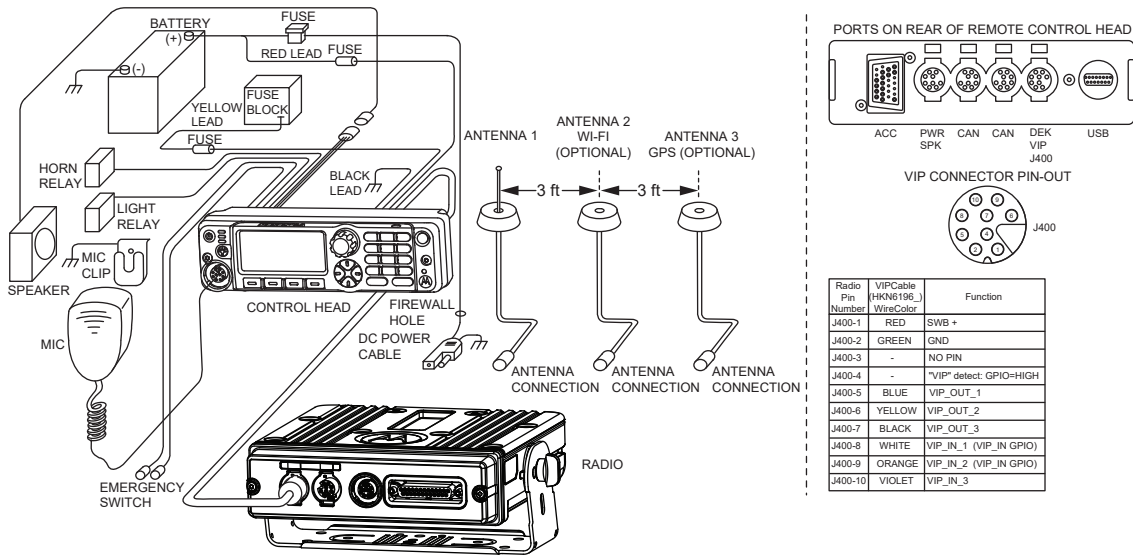


Figure 32: Radio Installation of O9 Remote Mount with Transceiver (URC is optional)

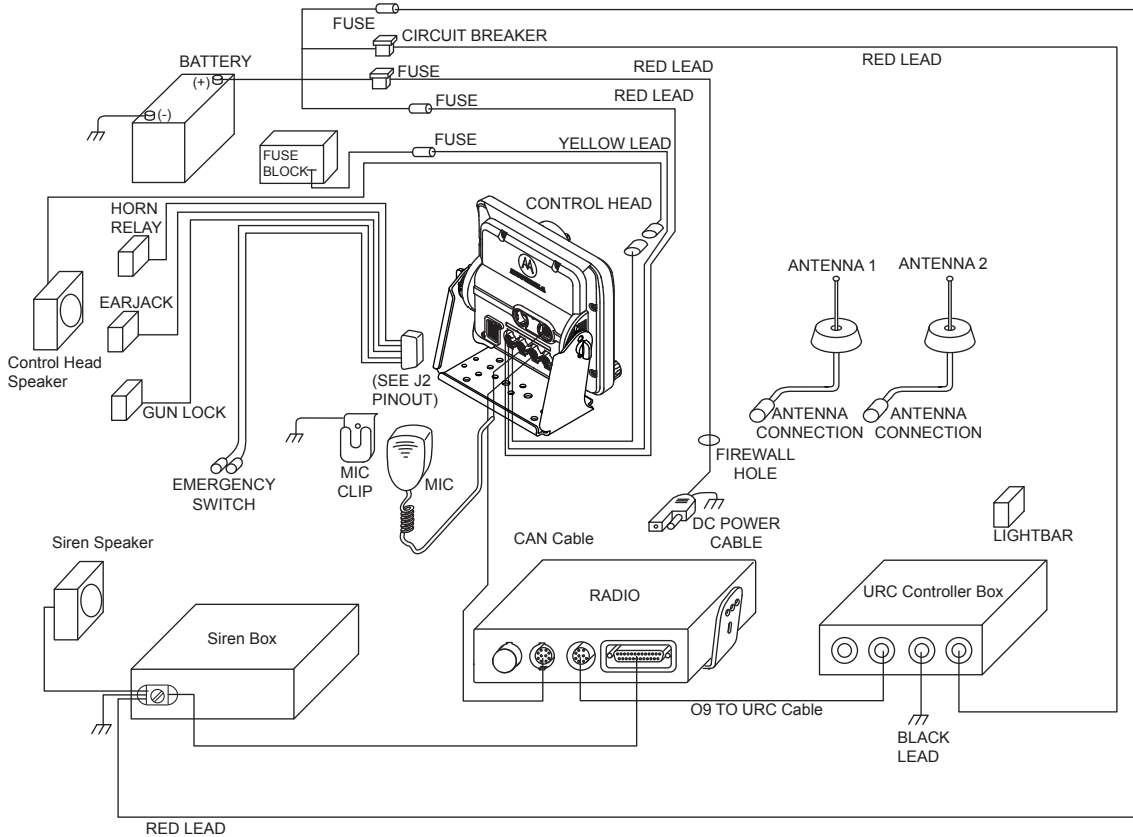
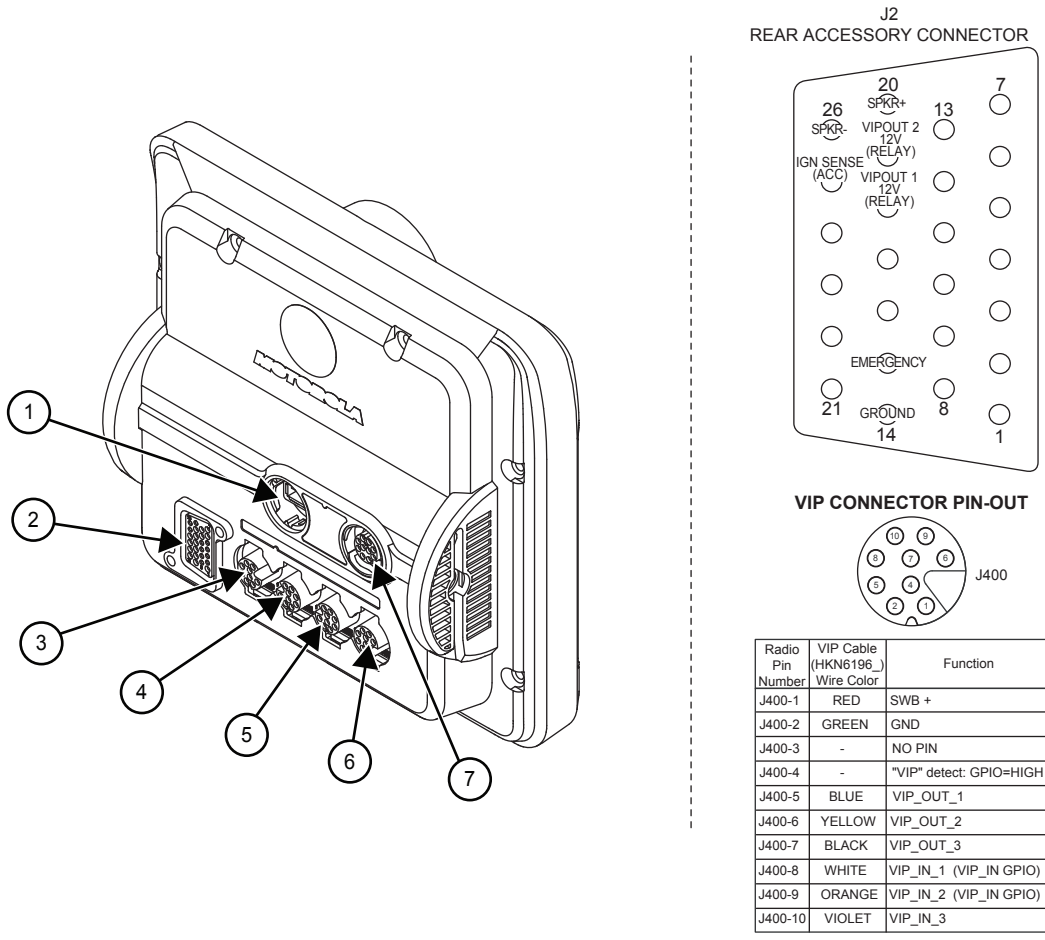
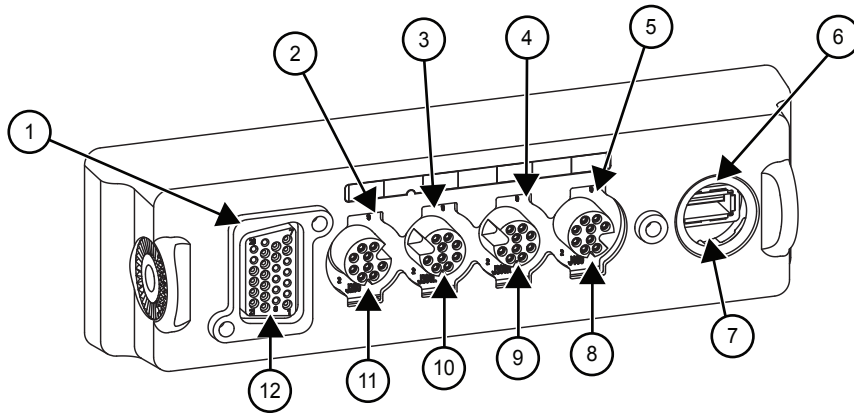


Figure 33: Radio Installation (O9 Remote Mount with Pinouts)



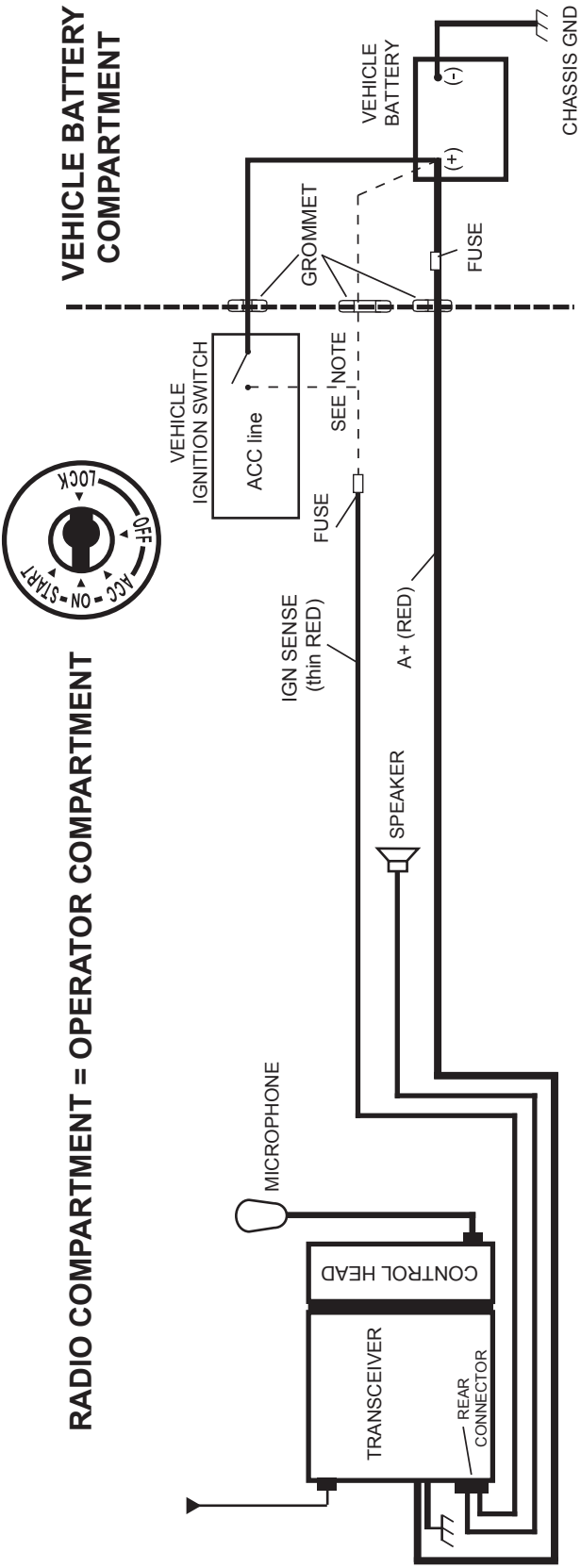
No.	Description
1	J500 USB
2	J100 M.A.P
3	J200 PWR/SPKR (RED)
4	J300L CAN (BLUE)
5	J300R CAN (BLUE)
6	J400 DEK/VIP (YELLOW)
7	GCAI

Figure 34: Remote Control Head Pinouts



No.	Description
1	J100
2	J200
3	J300L
4	J300R
5	J400
6	J500
7	USB
8	DEK VIP (YELLOW)
9	CAN (BLUE)
10	CAN (BLUE)
11	PWR SPK (RED)
12	M.A.P

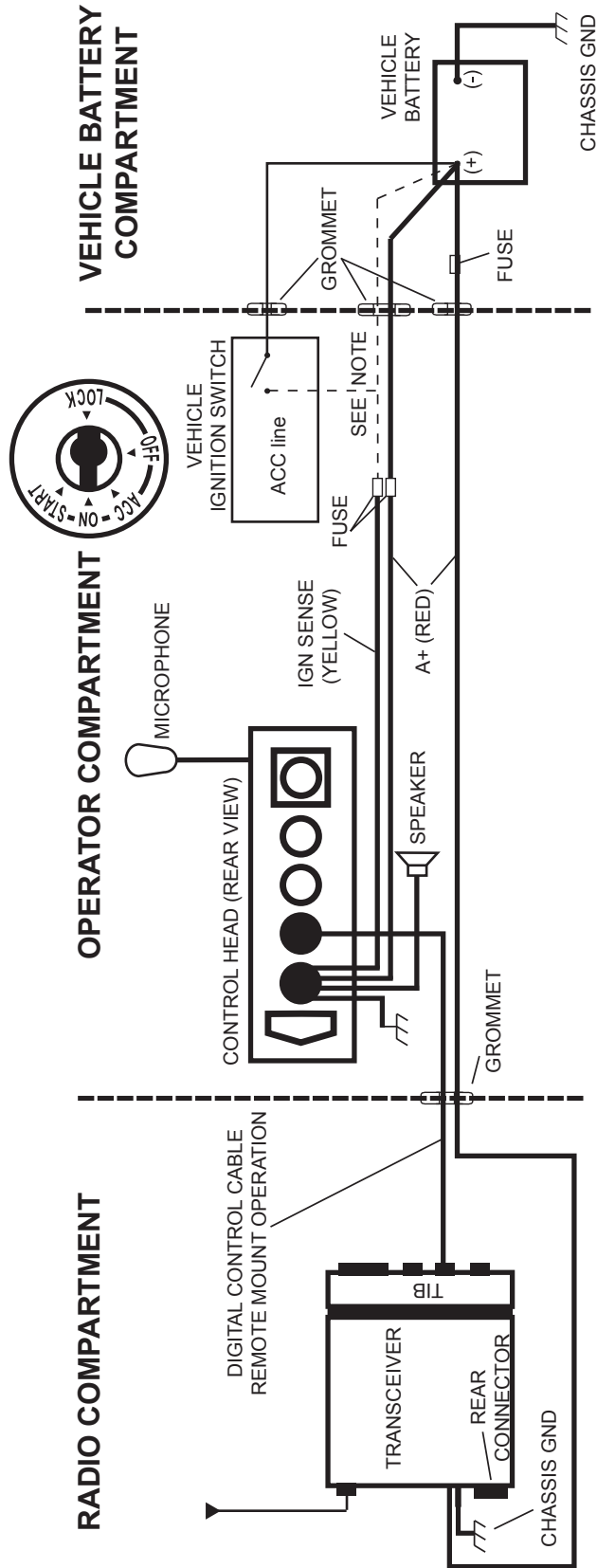
Figure 35: Cabling Interconnect Diagram for Dash Mount



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

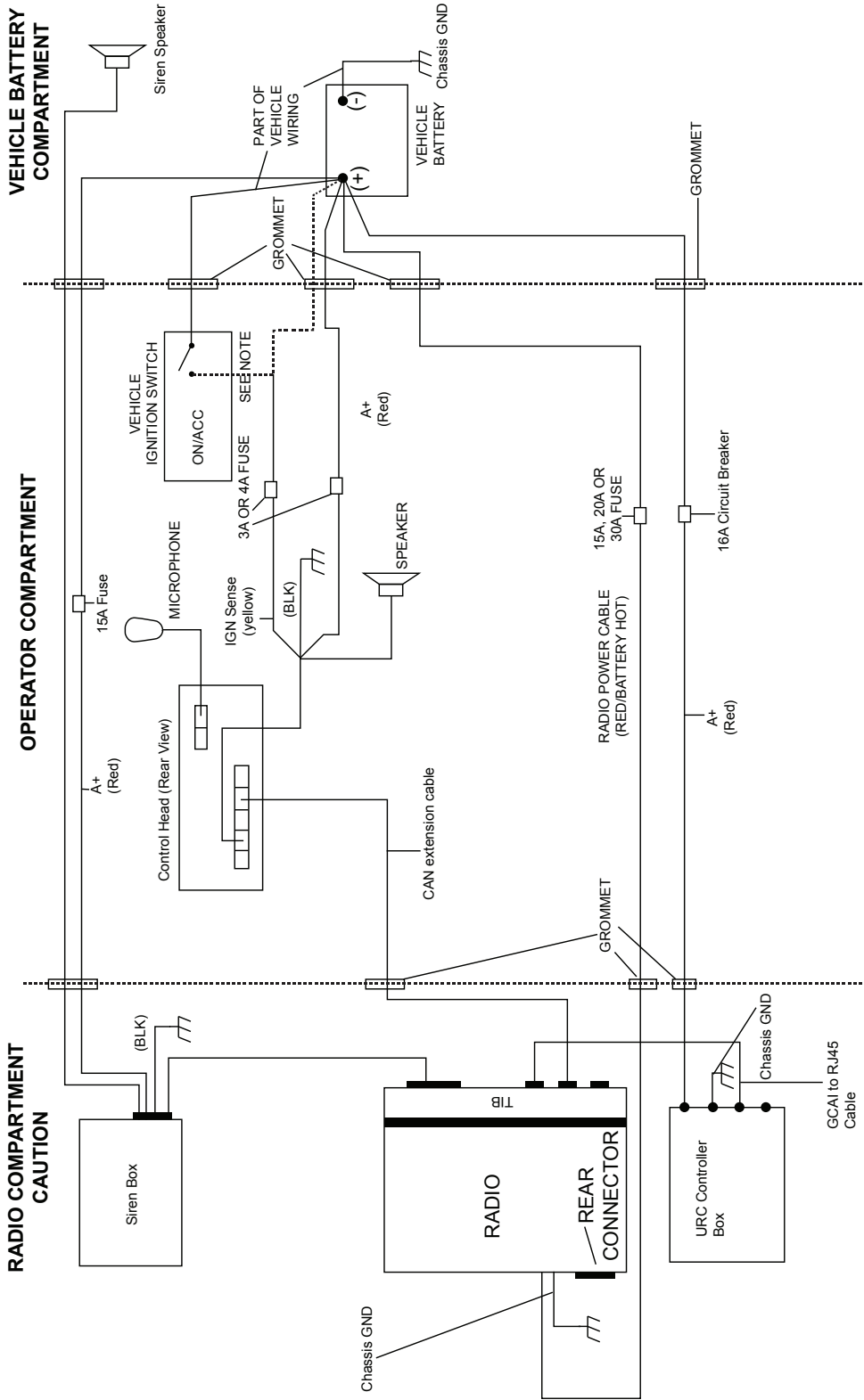
NOTE:
 Ignition sense cable uses either 3-amp fuse (6580283E01) or 4-amp fuse (6580283E02)

Figure 36: Cabling Interconnect Diagram for Remote Mount



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

Figure 37: Cabling Interconnect Diagram for O9 Remote Mount (URC is optional)



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

2.1.3

Radio Operation Wiring for Dash and Remote Configurations

Determine the radio functionality you wish to achieve from the tables in [Remote Mount: Power, Ignition, and Emergency Cable Installation on page 42](#), which is the vehicle ignition switch state is controlling, the physical wiring of the radio ignition sense (ACC) wire, and by the programmed CPS setting. For more radio functionality as determined by the programming of the ignition switch in the CPS, refer to the **Help** menu in your CPS (Ignition as: Required, Blank, Soft Power Off, TX Inhibit, PTT TX Inhibit, Ignition Only Power Up).

Choose a clean ignition point which is not shared in the immediate vicinity by other high current accessories/devices. This choice helps to reduce the transients on the ignition line. Examples of high-current accessories/devices are air horn, relays, and lightbars. It is safe to wire to the vehicle ACC line, not the START, or the solenoid side of the ignition circuit. Refer to [Finishing the Installation on page 121](#) for best installation practices. The Ignition sense (ACC) cable uses either a 3 A fuse (6580283E01) or 4 A fuse (6580283E02).

2.1.3.1

Dash Mount: Power, Ignition, and Emergency Cable Installation

The standard dash mount rear ignition sense cable HLN6863 contains a “thin red” ignition wire, a jumper wire that shorts emergency to ground, and two gray wires attached to an external speaker plug. The thin RED wire is the ignition sense wire. Refer to the tables from [Remote Mount: Power, Ignition, and Emergency Cable Installation on page 42](#) for its correct wiring configurations.



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

2.1.3.2

Remote Mount: Power, Ignition, and Emergency Cable Installation

The single control head O2, O3, O5, O7, and O9 remote mount configurations receive power from the J200 red and black wires connector. The yellow wire at J200 is an ignition sense wire.

On mid power radios, the J2 and J600 connectors can also be used for ignition sense. On high-power radios, the J200 yellow wire or the J600 connector can be used for ignition sense.

If HLN6863 is attached at J100 of the O2, O3, O5, O7, or O9 control head, the “thin red” wire do not function as an ignition sense wire, since the J100 connector has no ignition sense electrical connection.



NOTICE: It is incorrect to attach the ignition sense wire to more than one wire or connector. Refer to the following tables for its correct wiring configurations.

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

In Multi-Control Head installations, the yellow ignition wire must be connected to the head assigned ID #1. See [Setting the Initial Control Head ID on page 53](#) for further information.

In remote mount O2, O3, O5, O7, or O9, an Emergency jumper to ground is placed by default on the TIB (JU344) so that there is no need to attach a cable with an emergency accessory to either J2 or J600. This jumper must be removed if an emergency accessory (footswitch or button to Ground) is installed at either J2 or J600 (or J626 on the accessory cable). If the jumper JU344 is removed but no

emergency accessory is installed, the radio powers up incorrectly into emergency mode all the time. Refer to [Figure 83: Emergency Jumper Removal in Remote Mount on page 82](#) for details.

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

Table 2: Dash O2, O3, O5, O7, or O9 Radio Operations Dependent Upon A+ and Ignition Connections

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

Table 3: Remote O2, O3, O5, O7, or O9 Radio Operations Dependent Upon A+ and Ignition Connections

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

Table 4: Remote O2, O3, O5, O7, or O9 Radio Operations Dependent Upon A+ and Ignition Connections

Mid Power Dash/ Remote	Transceiver Red Power Wire	HLN6863 Thin Red Wire at J2	Transceiver Red Power Wire	HLN6863 Thin Red Wire at J2	Transceiver Red Power Wire	HLN6863 Thin Red Wire at J2
High-Power Dash/ Remote		HLN6863 Thin Red Wire at J626		HLN6863 Thin Red Wire at J626		HLN6863 Thin Red Wire at J626
Connected to battery	X	X	X			

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



CAUTION:

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

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

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

2.1.4

Ignition Sense Switch (Radio Wide Advance)

The CPS (Customer Programming Software) selectable settings is used to control the radio functionality based on the state of the vehicle Ignition status. These descriptions can be found in the CPS tool HELP Guides and are repeated here for convenience.

Table 5: Ignition Sense Switch Settings in CPS

Feature	Description
Blank	<ul style="list-style-type: none"> Radio POWERS ON when the Power button is pressed or with the Emergency Power-up feature. Radio POWERS OFF when the Power button is pressed.
TX Inhibit	<ul style="list-style-type: none"> Radio POWERS ON when the Power button is pressed or with the Emergency Power-up feature. Radio POWERS OFF when the Power button is pressed. If IGNITION is not present, all transmissions are inhibited. The radio does not affiliate with trunking systems and therefore cannot receive any trunking dispatch communications. Emergency Alarm transmissions are NOT possible with the use of the Emergency Power-up feature.
PTT TX Inhibit	<ul style="list-style-type: none"> Radio POWERS ON when the Power button is pressed or with the Emergency Power-up feature. Radio POWERS OFF when the Power button is pressed.

Feature	Description
	<ul style="list-style-type: none"> • If IGNITION is not present, all transmissions are inhibited. • The radio is able to affiliate with trunking systems. The radio can ONLY receive trunking dispatch communications. • Emergency Alarm transmissions are possible with the use of the Emergency Power-up feature.
Required	<ul style="list-style-type: none"> • Radio POWERS ON when the Power button is pressed and Ignition is present. • Radio POWERS ON when Ignition is cycled and radio was previously turned ON. • Radio POWERS OFF when the Power button is pressed, or when Ignition is lost.
Soft Power-off	<ul style="list-style-type: none"> • Radio POWERS ON when the Power button is pressed, or when Ignition is detected. • Radio POWERS OFF when the Power button is pressed, or when Ignition is lost.
Ignition Only Power-up	<ul style="list-style-type: none"> • Radio POWERS ON when Ignition is present. • Radio POWERS OFF when Ignition is lost. • Control head Power button is ignored.



NOTICE: When either TX Inhibit, PTT TX Inhibit or Required are selected, the Emergency Power-up feature is not available.

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

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

2.1.5

Siren/PA Configuration and Programming

The Siren/PA is shipped pre-wired for 100 W operation. It can be rewired for 65 W, 75 W, or 130 W power levels. Refer to this procedure if you want to change to another power level.

Procedure:

- 1 Open the Siren/PA connector cover to gain access to the two-connector speaker leads.
Do not change the speaker common lead (pin 20). The other lead is connected to pin 35 (for 100 W operation).
- 2 Using an appropriate pin removal tool, extract pin 35 and move it to one of the following pin locations:
 - Pin location 36 for 75 W operation
 - Pin location 28 for 65 W or 130 W operation
- 3 Do one of the following:
 - For 65 W or 75 W operation, reassemble the connector.

- For 130 W operation, parallel the two 11 Ω speakers, each rated at 65 W minimum.

Proper phasing of the two speakers is important when connecting two speakers in parallel, wire similar speaker terminals together to ensure maximum loudness and prevent "deadspots". For example, if the terminals are marked "1" and "2", connect the terminals marked "1" together and connect those wires to one speaker lead. Connect the terminals marked "2" together and connect those wires to the other speaker lead.



CAUTION: Before continuing, remember that under a high-line supply condition (16.6 V), up to 30% more power goes to the speakers after reconfiguring for 130 W operation. Do this setting only when your PA speakers can handle the extra power.

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



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

Pin locations of various power level configurations are listed in the following table.

Table 6: Power Level Configurations

Power Level	Pin Location of Speaker Leads	R219	JU100/JU101
65 W	20, 28	IN	Across pins A and B
75 W	20, 36	IN	Across pins A and B
100 W	20, 35	IN	Across pins A and B
130 W	20, 28	OUT	Across pins B and C

2.2

Radio Mounting



CAUTION:

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

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

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

Shield the control head (front and back) from direct exposure to pressurized water. The pressurized water from a hose usually is more severe than the stated test and conditions in typical environments.

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


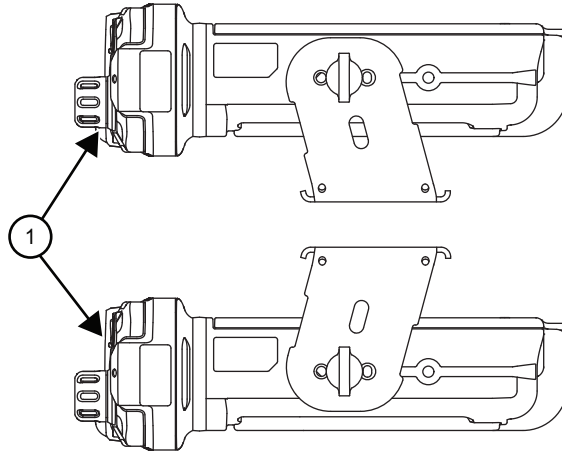
 **NOTICE:** For optimum radio performance, orient the mounting trunnion as shown in the following figures. For new or existing installations of APX 2500, APX 4500, and APX 1500, use only the APX mobile trunnion, kit number HLN6861_.

Figure 38: Enhanced Single Band Mobile Radio Trunnion Orientation



Applies to radios in dash and remote installations.

No.	Description
1	Radio Front

2.2.1

Dash Mount with Trunnion

Procedure:

- 1 Referring to the following table, select the suitable trunnion kit per the type of mid power radio.
- 2 Mount your radio on the transmission hump or under the dash.



NOTICE:

When mounting the trunnion on the transmission hump, ensure that the transmission housing is not affected. Plan your installation, ensuring enough room for the accessory connector and cable at the back of the radio.

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

Figure 39: Transmission Hump Trunnion Mounting

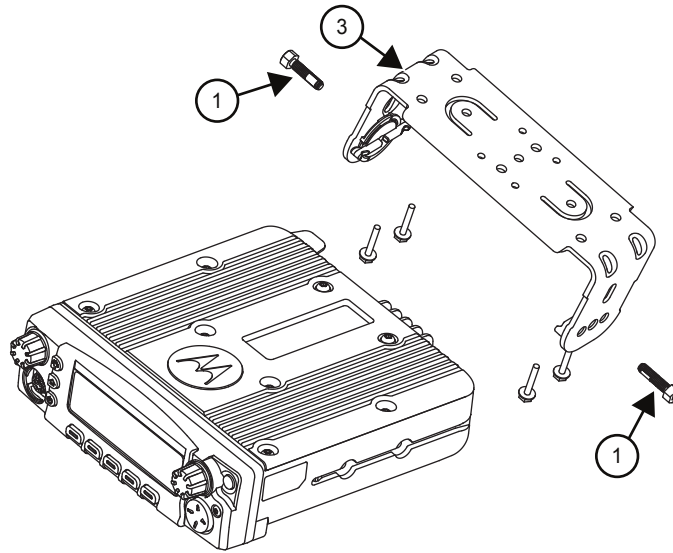


Figure 40: Below Dash Trunnion Mounting

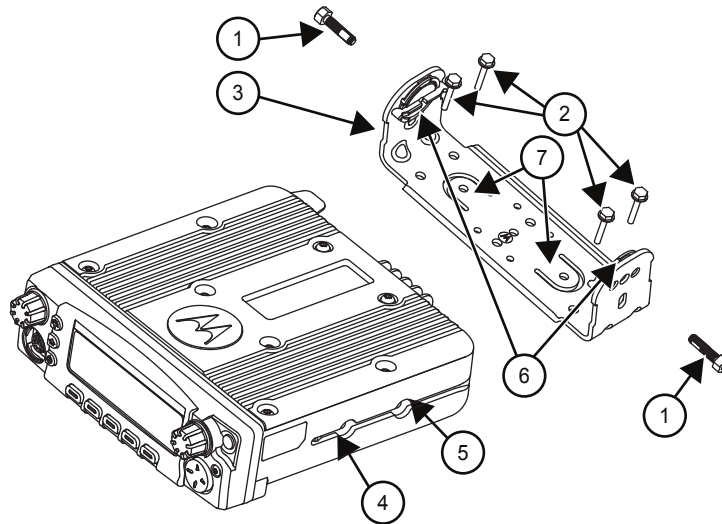


Table 7: Mid Power Trunnion Kit

Item	Part Number	Description	Mid Power Radio
1	0305760W04	Trunnion Mounting Wing Screw	Enhanced Single Band Mobile
2	0312002B14	Self-Drilling Tapping Screw	Enhanced Single Band Mobile
3	HLN6861_	ASTRO Trunnion Hardware Kit	Enhanced Single Band Mobile
4	-	Threaded Hole for Screw	-
5	-	Groove	-

Item	Part Number	Description	Mid Power Radio
6	-	Plastic Guides	-

- 3 Using the trunnion mounting bracket as a template, mark the positions of the holes on the mounting surface. Use the innermost four holes for a curved mounting surface such as the transmission hump, and the four outermost holes for a flat surface such as under the dash.
- 4 Center punch the spots you have marked and realign the trunnion in position.
- 5 Secure the trunnion mounting bracket with the four self-drilling screws provided.
- 6 Ensure that the plastic guides are aligned (horizontal) to the grooves of the trunnion. Slide the radio into the grooves until it snaps into place.
- 7 Secure the radio with the two screws provided (Item 1). The torque down force for 0371859H01 should be between 50 in-lbf to 52 in-lbf.
- 8 For screw 0305760W04, the wing screw torque tool (HLN6970_) is designed to securely tighten the trunnion wing screws while installing the radio. The tool can also be used to loosen the wing screws. Detailed instructions are included in the tool packaging.

2.2.2

Remote Mount with Trunnion

For remote mount installation, the radio may be mounted anywhere in the vehicle, as long as the installation location is safe, follows the cautions mentioned at the beginning of this section, and is accessible for servicing/maintenance and cabling. A typical mounting location recommended by Motorola Solutions is in the trunk of the vehicle. The trunnion provided may still be used to mount the transceiver, and the mounting process is the same for dash mount installation. See [Figure 30: Radio Installation \(O5 Remote Mount\) on page 35](#) or [Figure 31: Radio Installation \(O7 Remote Mount\) on page 36](#) for remote installation.

2.2.2.1

Remote Mount Control Head Installation

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

The recommended mounting surfaces for the control unit are under the mounting surface, on the transmission hump, or on the center console. [Installing Remote Mount Control Head on page 50](#) shows how you should install the trunnion, control head, and cables for the O2, O3, O5, O7, or O9 control head.



NOTICE:

Connector-protective covers (Dust Covers) HLN6980_ are provided with the radio. Install the covers on exposed connectors for added environmental robustness.

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

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

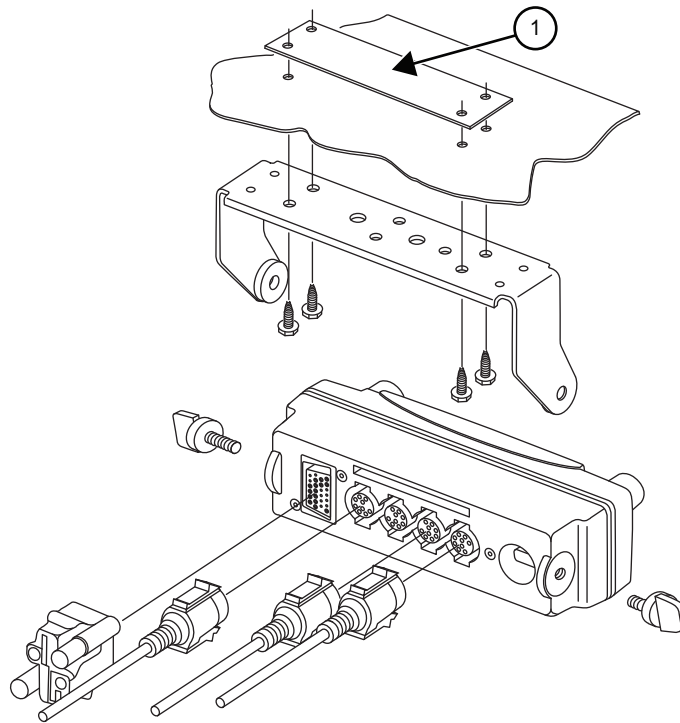
2.2.2.1.1

Installing Remote Mount Control Head

Procedure:

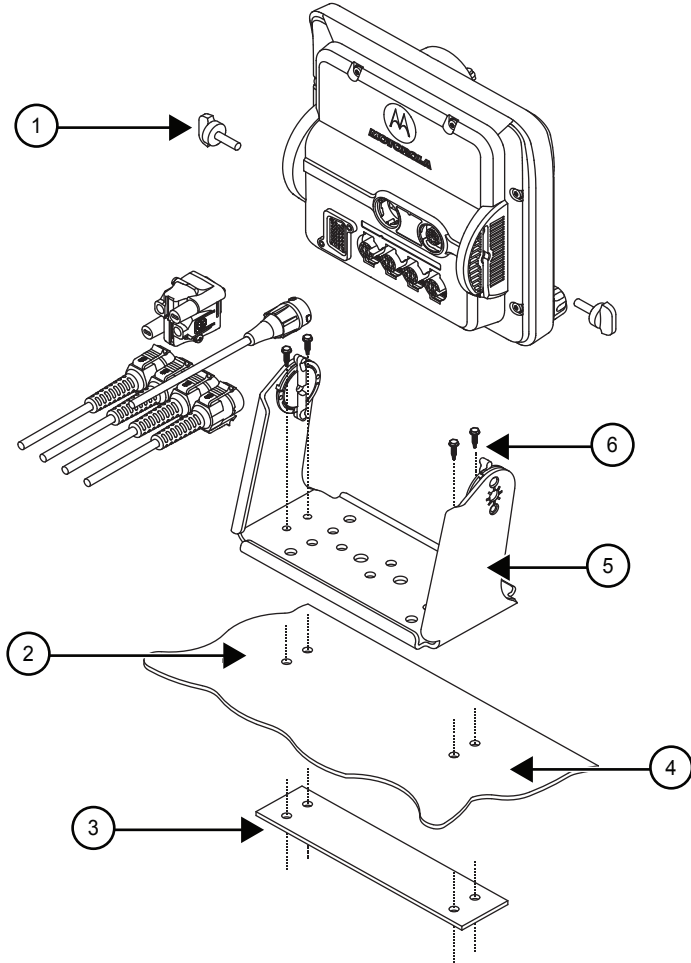
- 1 Use the control unit trunnion as a template to mark the mounting holes; drill 5/32" holes. If mounting on a plastic surface, use a metal backing plate.
- 2 Attach the trunnion bracket using all four 10-16" x 5/8" self-tapping screws provided.
- 3 Temporarily install the control head (adjusting for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

Figure 41: O5 Control Head Installation Exploded View (Also applicable for O2 and O7 Control Heads)



No.	Description
1	Metal Backing Plate (Not Supplied)

Figure 42: O9 Control Head Installation Exploded View




No.	Description
1	Adjust the control head to a desired angle and secure with wing screws
2	Mounting surface
3	 IMPORTANT: If the trunnion is mounted on a plastic or unstable surface, use a metal backing plate (not supplied).
4	Drill four 5/32" holes in the mounting surface
5	Trunnion
6	Use four mounting screws on all installations

Figure 43: O5 Control Head Rear View (Also applicable for O2 and O7 Control Heads)

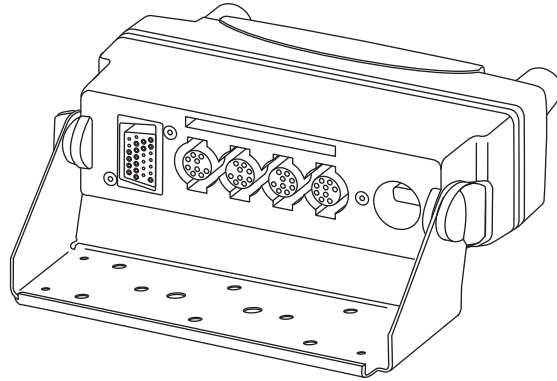
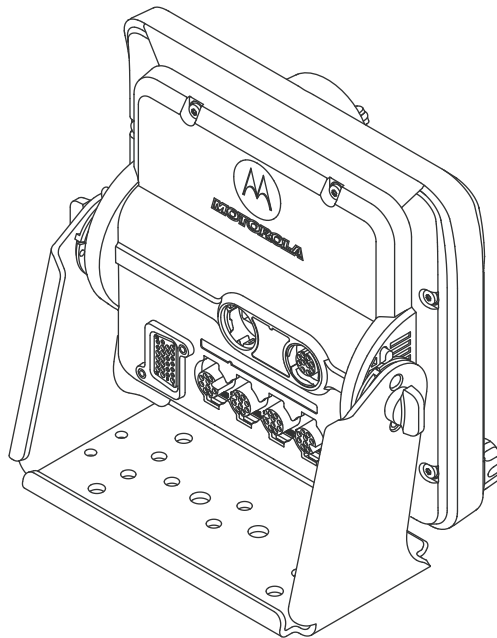


Figure 44: O9 Control Head Rear View



2.2.2.2

Multiple Control Head Installation

Install control heads in a multiple control head configuration as per the steps detailed in [Installing Remote Mount Control Head on page 50](#). Two heads can be connected to each of the two CAN connectors on the radio, with the remaining heads connected to one or both of the first two. You can also connect control heads in a “daisy chain” configuration from the CAN connector of a single radio. See the following figures for examples.



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



NOTICE: In Multiple Control Head (MCH) installations, the yellow ignition sense wire must be connected to the head assigned ID # 1. See [Setting the Initial Control Head ID on page 53](#) for further information.

Use the most convenient configuration for your installation, ensuring that the combined cable lengths do not exceed 131 feet (40 meters). See [Table 8: Available CAN Cables on page 53](#) for a list of

available CAN cable lengths. Control head ground, power and ignition sense wires (black, red, and yellow respectively) may need more length (not supplied) in installations that locate the head more than 10 feet from a power source.

Table 8: Available CAN Cables

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

Table 9: Ignition Interface Cables

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

2.2.2.3

Cable Installation

Route the cables where they are protected from pinching, sharp edges or crushing. Use grommets in any holes where the cable passes through metal panels.

Figure 35: [Cabling Interconnect Diagram for Dash Mount on page 39](#) shows how the cables and components are connected. It is not recommended to route cabling or wiring inside the wheel wells of a vehicle.

2.2.2.4

Setting the Initial Control Head ID

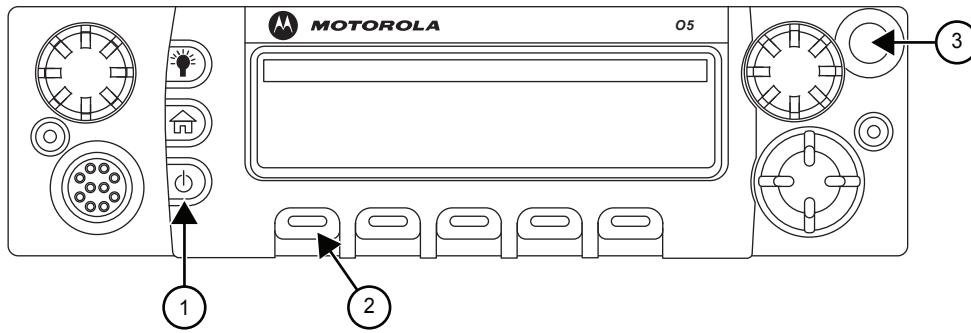
The Front Panel Programming (FPP) mode allows you to define which control head in a Multi-Control Head system becomes control head number 1–4.

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

Procedure:

- 1 Press the **Power** button to power off the radio.
- 2 Simultaneously press and hold the left-most **Soft Menu** key and the **Emergency** button on the control head.

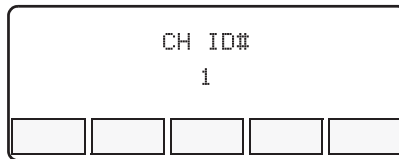
Figure 45: APX Mobile O5 Control Head Front View



No.	Description
1	Power button
2	Left-most Soft Menu key
3	Emergency button

- 3 Press the **Power** button to power on the control head.

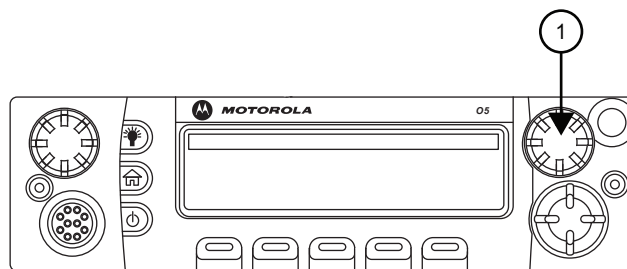
Figure 46: Radio Display with Current Control Head ID



The head is powered on into FPP mode and displays the current control head ID number.


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

Figure 47: APX Mobile O5 Control Head Front View – Mode Knob



No.	Description
1	Mode Knob

- 5 Repeat [step 1](#) through [step 4](#) to set the ID of the remaining control heads.

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