APX8500 MOBILE RADIO
INSTALLATION MANUAL

Foreword

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

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

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

See "Installation Requirements for Compliance with Radio Frequency (RF) Energy Exposure Safety Standards,".

Manual Revisions

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

Parts Ordering

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

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

ATTENTION!

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

To ensure compliance to RF Energy Exposure Regulations:

- Install only Motorola Solutions approved antennas and accessories
- Be sure that antenna installation is per "Antenna Installation" of this manual
- Be sure that Product Safety and RF Safety Booklet enclosed with this radio is available to the end user upon completion of the installation of this radio

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

> For a list of Motorola Solutions-approved antennas and other accessories, visit the following web site which lists approved accessories for your radio model: http://www.motorolasolutions.com.

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Related Publications

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Mobile Radio Model Numbering Scheme

```
Typical Model Number:  M  3  7  T  S  S  9  P  W  1  A  N  S  P  0  1
          Position:     1  2  3  4  5  6  9 7 8  9 10 11 12 13 14 15 16
```

Position 1 - Type of Unit
M = Mobile
L = Table Top Station

Positions 2 & 3 - Model Series
Model Series
30 = APX 7500   24 = APX 2500
25 = APX 6500   22 = APX 4500
36 = APX1500   37 = APX 8500

Position 4 - Frequency Band
A = Less than 29.7MHz   UHF Range
B = 29.7 to 35.99MHz   N = 330 to 370MHz
C = 36 to 41MHz   P = 366 to 410MHz
D = 42 to 50MHz   Q = 403 to 437MHz
E = 300 to 345MHz   R = 438 to 482MHz
F = 66 to 80MHz   S = 470 to 620MHz
G = 74 to 90MHz   T = Product Specific
H = Product Specific   U = 806 to 870MHz*
     VHF Range   V = 825 to 870MHz
J = 136 to 162MHz   W = 896 to 941MHz
K = 146 to 178MHz   X = 403-470MHz
L = 174 to 210MHz   Y = 1.0 to 1.6GHz
M = 190 to 235MHz   Z = 1.5 to 2.0GHz
* For APX 7500 "K" in Position 4 represents
   136-174MHz.
* For APX 7500 "Q" in Position 4 represents
   380-470MHz.
* For APX 7500 "S" in Position 4 represent
   470-520MHz.
* For APX 7500 "U" in Position 4 represent
   762-870MHz.
Note: Values represented are not absolute,
   and are given to indicate range only

Position 5 - Power Level
A = 0 to 0.7 Watts   K = 36 to 60 Watts
B = 0.7 to 0.9 Watts   L = 61 to 110 Watts
C = 1.0 to 3.9 Watts   M = Up to 125 Watts
D = 4.0 to 5.0 Watts   N = 1 to 25 Watts
E = 5.1 to 6.0 Watts   P = 25 to 40 Watts
F = 6.1 to 10 Watts   Q = 25 to 45 Watts
G = 10.1 to 15 Watts   R = 10 to 35 Watts
H = 16 to 25 Watts   S = 10 to 50 Watts
J = 26 to 35 Watts   T = 25 to 110 Watts
Note: Values represented are not absolute
   and are given to indicate range only

Position 6 - Physical Packages
A = RF Modem Operation
B = Receiver Only
C = Standard Control; No Display
D = Standard Control; With Display
E = Limited Keypad; No Display
F = Limited Keypad; With Display
G = Full Keypad; No Display
H = Full Keypad; With Display
J = Limited Controls; No Display
K = Limited Controls; Basic Display
L = Limited Controls; Limited Display
M = Rotary Controls; Standard Display
N = Enhanced Controls; Enhanced Display
P = Low Profile; No Display
Q = Low Profile; Basic Display
R = Low Profile; Basic Display, Full Keypad
S = Tranceiver with Selectable Control Head
T =
U =
V = VDV Control Head
W = Control Head #2

Position 7 - Channel Spacing
0 =   5 = 15KHz
1 = 5KHz   6 = 20/25KHz
2 = 6.25KHz   7 = 30KHz
3 = 10KHz   8 = 12.5/25KHz
4 = 12.5KHz   9 = Variable/Programmable

Positions 13 - 16
SP Model Suffix

Position 12 - Unique Model Variations
C = Cenelec
N = Standard Package

Position 11 - Version
Version Letter (Alpha) - Major Change

Position 10 - Feature Level
1 = Basic   6 = Standard Plus
2 = Limited Package 7 = Expanded Package
3 = Limited Plus   8 = Expanded Plus
4 = Intermediate   9 = Full Feature/
5 = Standard Package   Programmable

Position 9 - Primary SystemType
A = Conventional
B = Privacy Plus
C = Clear SMARTNET
D = Advanced Conventional Stat-Alert
E = Enhanced Privacy Plus
F = Nauganet 888 Series
G = Japan Specialized Mobile Radio (JSMR)
H = Multi-Channel Access (MCA)
J = CoveragePLUS
K = MPT1327* - Public
L = MPT1327* - Private
M = Radiocom
N = Tone Signalling
P = Binary Signalling
Q = Phonenet
R = IDEN Basic
S = IDEN Advanced Feature
T = JSMR Digital
U = LTR Protocol
V = Single Sideband
W = Programmable
X = Secure Conventional
Y = Secure SMARTNET
Z = TETRA
2 = SmartZone
   * MPT = Ministry of Posts and Telecommunications

Position 8 - Primary Operation
A = Conventional/Simplex
B = Conventional/Duplex
C = Trunked Twin Type
D = Dual Mode Trunked
E = Dual Mode Trunked/Duplex
F = Trunked Type I
G = Trunked Type II
H = FDMA* Digital Dual Mode
J = TDMA** Digital Dual Mode
K = Single Sideband
L = Global Positioning Satellite Capable
M = Amplitude Companded Sideband (ACSB)
N = Digital Dispatch
P = Programmable
Q = Digital Interconnect
R = Digital Multi-Service
S = 9600 Capable
T = TDMA
   * FDMA = Frequency Division Multiple Access
   ** TDMA = Time Division Multiple Access

Notes

Commercial Warranty

Limited Warranty

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

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

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

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

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

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- the damage or defect is caused by charging or using the battery in equipment or service other than the Product for which it is specified.

H. Freight costs to the repair depot.

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

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

K. Normal and customary wear and tear.

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

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VII. Governing Law

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

Notes

Chapter 1   Introduction

This manual covers the installation procedures for ASTRO APX mobile and motorcycle radios with O2, O3, O5, O7 and O9 control heads, and accessories required to complete the radio system. The radio system consists of a control head, radio, antenna, microphone, speaker, cabling, Universal Relay Controller (URC), and accessories.

1.1   Mobile Radio Description

1.1.1   Dimensions

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

NOTE: The measurement unit used in Figure 1-1 to Figure 1-20 is millimeter.
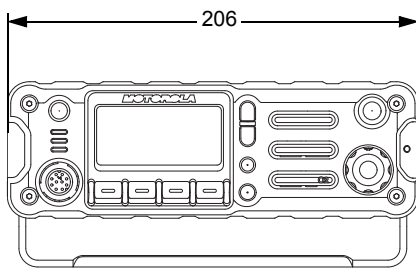
Figure 1-1. Front View of O2 Control Head Attached to APX 8500
Mid Power Dash Mount Transceiver and Trunnion
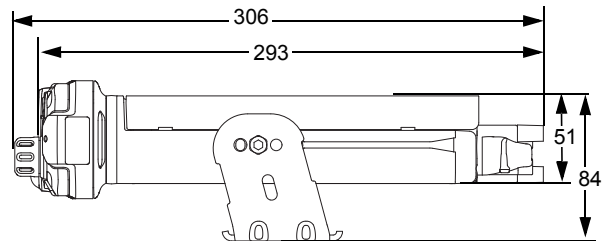
Figure 1-2. Side View of O2 Control Head Attached to APX 8500
Mid Power Dash Mount Transceiver and Trunnion
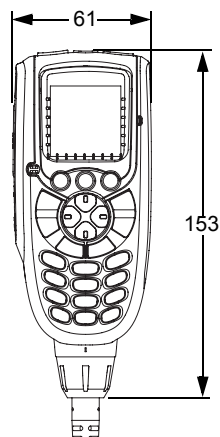
Figure 1-3. Front View of O3 Control Head with Coiled Cable
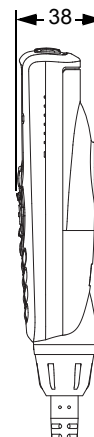
Figure 1-4. Side View of O3 Control Head with Coiled Cable
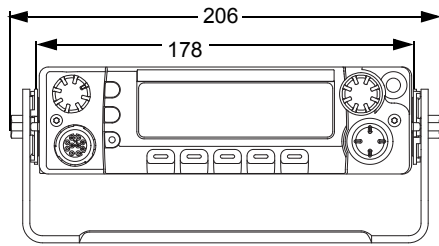
*Figure 1-5. Front View of O5 Control Head
Attached to APX 8500
Mid Power Dash Mount Transceiver and Trunnion*
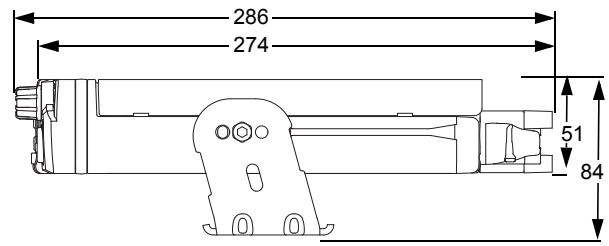
*Figure 1-6. Side View of O5 Control Head
Attached to APX 8500 Mid Power
Dash Mount Transceiver and Trunnion*
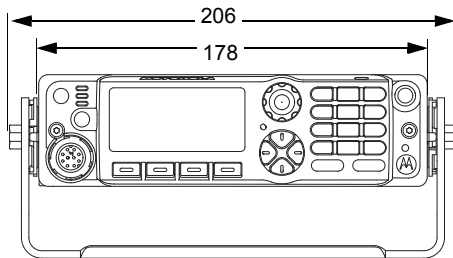
*Figure 1-7. Front View of O7 Control Head
Attached to APX 8500 Mid Power Dash Mount
Transceiver and Trunnion*
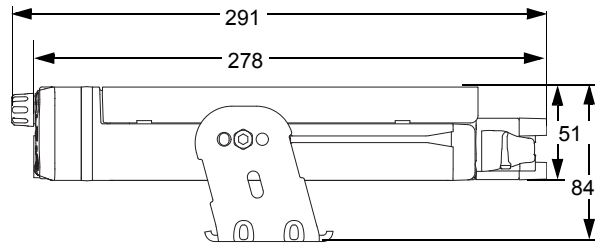
*Figure 1-8. Side View of O7 Control Head Attached
to APX 8500 Mid Power Dash Mount Transceiver
and Trunnion*

Figure 1-9 and Figure 1-10, show the basic dimensions of the remote mount transceiver trunnion APX mobile radio.
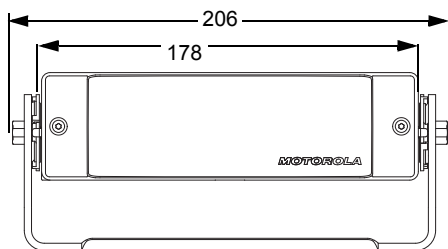
*Figure 1-9. Front View of Remote Mount and
Trunnion*
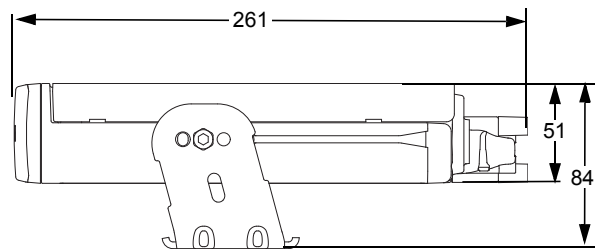
*Figure 1-10. Side View of Remote Mount and
Trunnion*
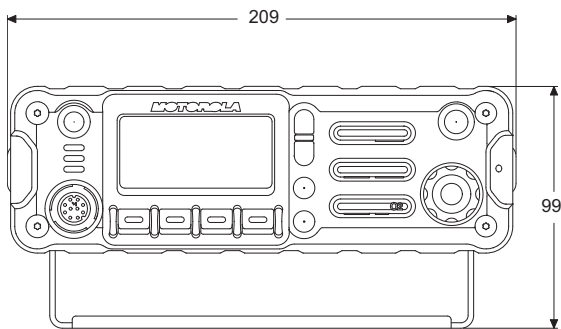
Figure 1-11. Front View of O2 Control Head with Remote Mount and Trunnion
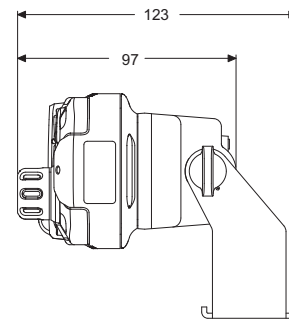
Figure 1-12. Side View of O2 Control Head with Remote Mount and Trunnion
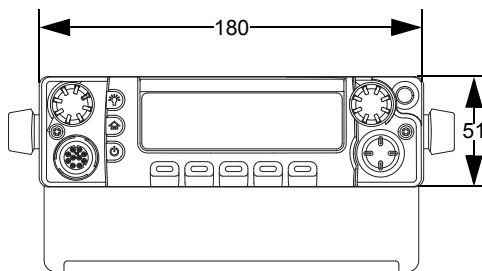
Figure 1-13. Front View of O5 Control Head with Remote Mount and Trunnion
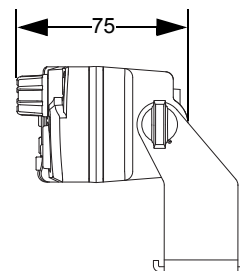
Figure 1-14. Side View of O5 Control Head with Remote Mount and Trunnion
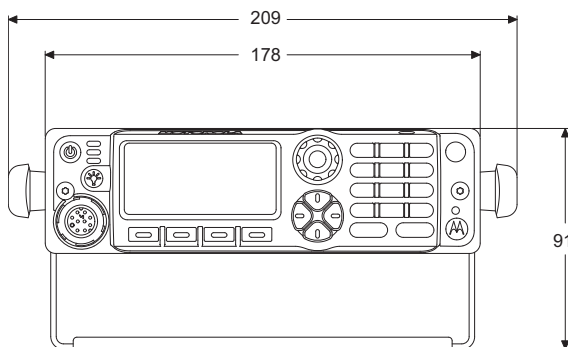
Figure 1-15. Front View of O7 Control Head with Remote Mount and Trunnion
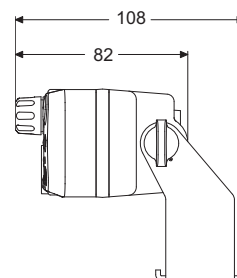
Figure 1-16. Side View of O7 Control Head with Remote Mount and Trunnion
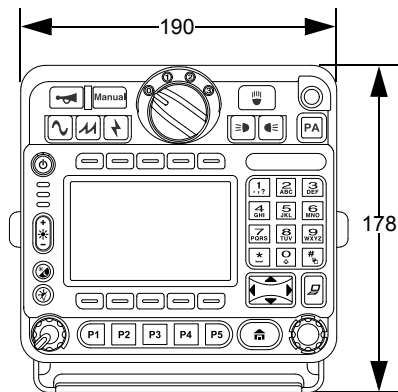
Figure 1-17. Front View of O9 Control Head with Trunnion
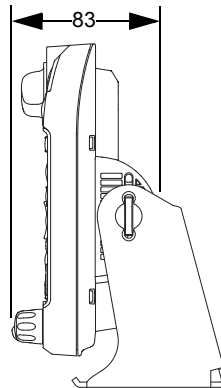
Figure 1-18. Side View of O9 Control Head with Trunnion
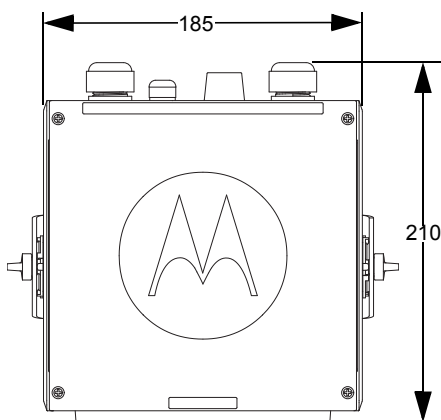
Figure 1-19. Top View of O9 Universal Relay Controller with Trunnion (URC is an orderable accessory)
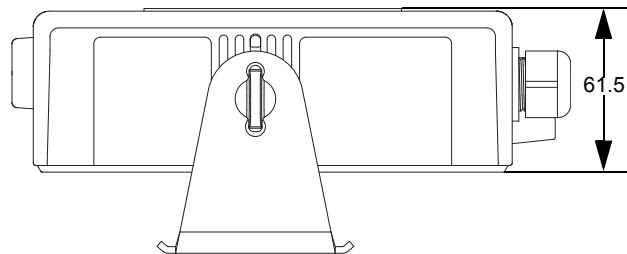
Figure 1-20. Side View of O9 Universal Relay Controller with Trunnion (URC is an orderable accessory)

Figure 1-21. Siren and Lights Interface Module (SLIM)
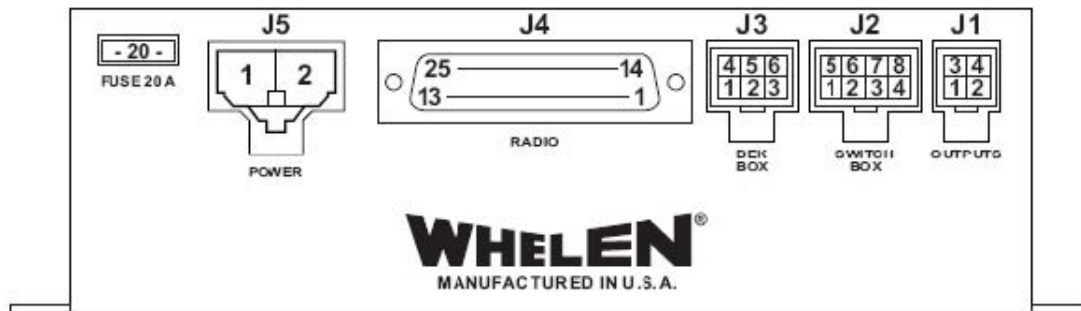
Figure 1-22. Front View of SB9600 Whelen Siren

T-Cable for Dual Control
Head Only

To Switch Box or
DEK

Speaker
Leads

Black Chassis
Ground Cable

Red Fused Cable
Connects to Battery
Positive Terminal

Siren/PA Unit
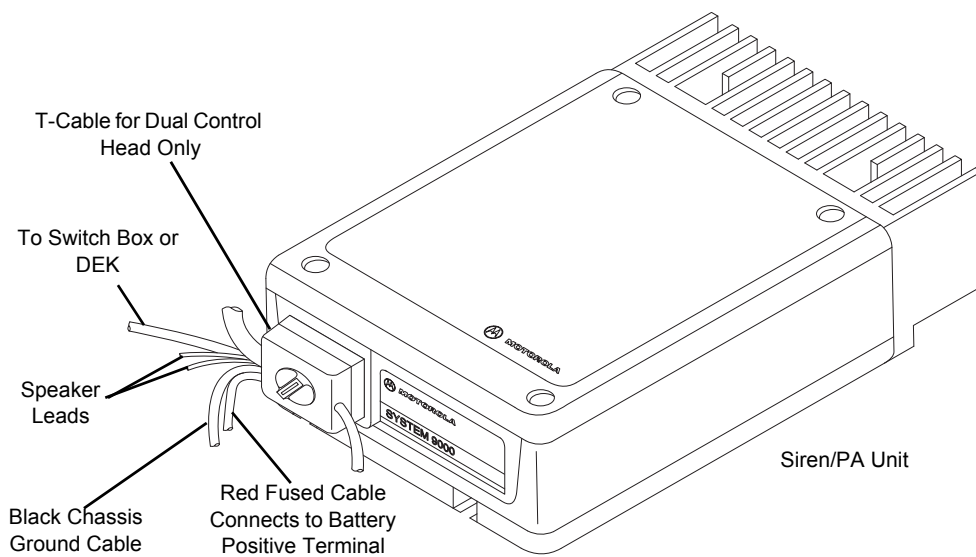
Figure 1-23. Siren/PA Cable Connections

1.2   Standard Configurations

1.2.1   Dash Mount Configuration

NOTE: The dash mount configuration is not applicable for O9 control heads.

There are two versions of the APX mobile dash mount. The first are the O2, O5 and O7 control heads which are mounted on the front of the transceiver housing. The second is the O3 control head which is connected to the transceiver via a coiled cable, which is plugged into the CAN connector on the transceiver.

Electrical connection between the two takes place within the radio via a flexible circuit board between the connectors on the front of the transceiver and at the back of the control head for O2, O5 and O7.
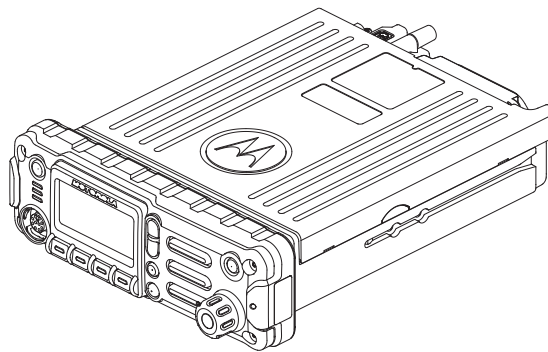
Figure 1-24. Dash Mount Configuration for O2 Control Head
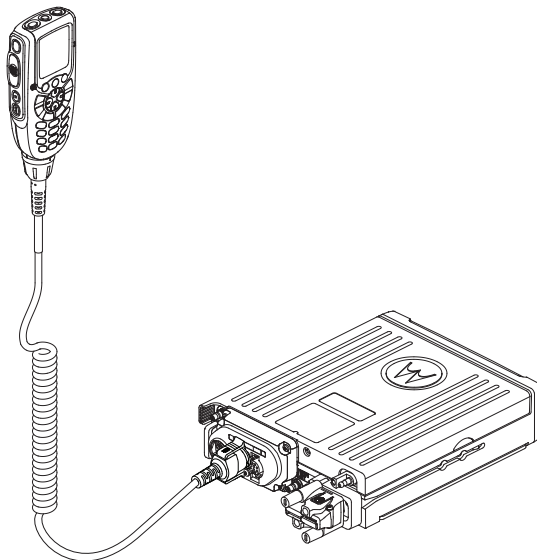
Figure 1-25. Dash Mount Configuration for O3 Control Head
(No Extension Cable Present)
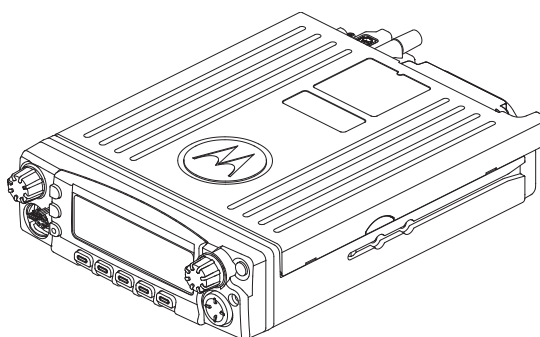
Figure 1-26. Dash Mount Configuration for O5 Control Head
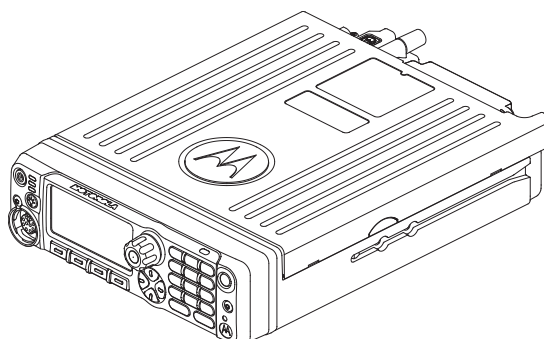
Figure 1-27. Dash Mount Configuration for O7 Control Head

For details on this configuration, see See 2.2.1.

1.2.2 Remote Mount Configuration

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

NOTE: The keypad mic should only be plugged into the Mobile Microphone Port (MMP) connector located on the control head, in either dash mount or remote mount configuration.
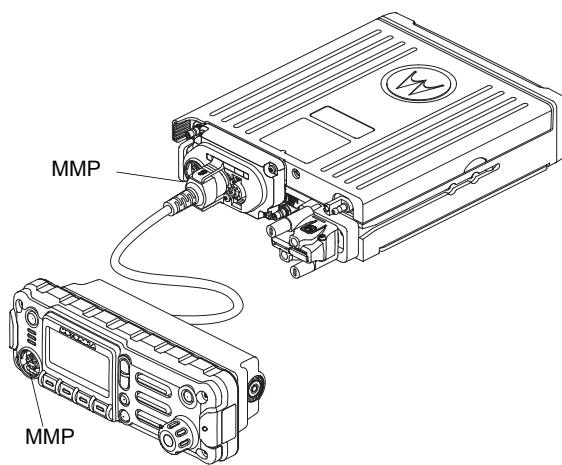
Figure 1-28. Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board, CHIB Rear Assembly and O2 Control Head
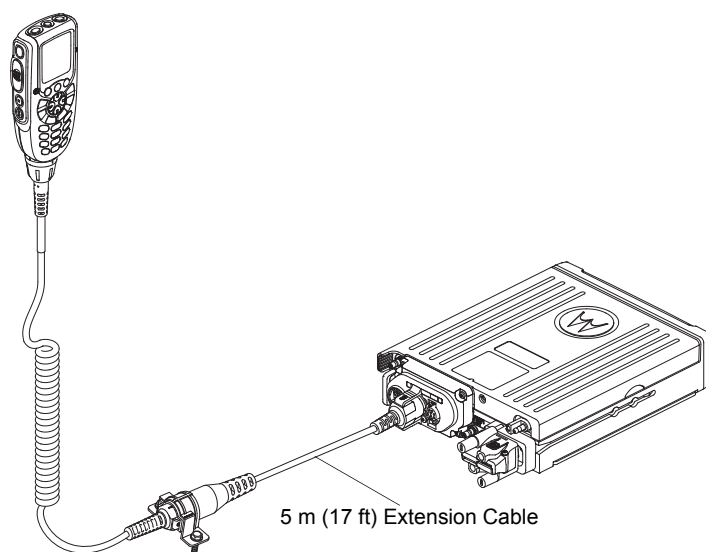
Figure 1-29. Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board and O3 Control Head
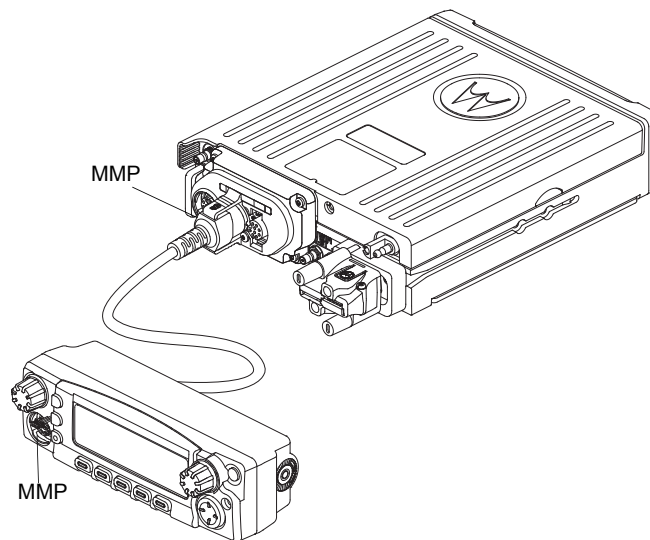
Figure 1-30. Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board, CHIB Rear Assembly and O5 Control Head
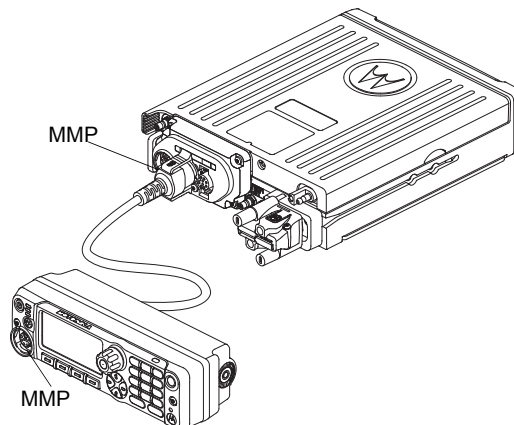
Figure 1-31. Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board, CHIB Rear Assembly and O7 Control Head
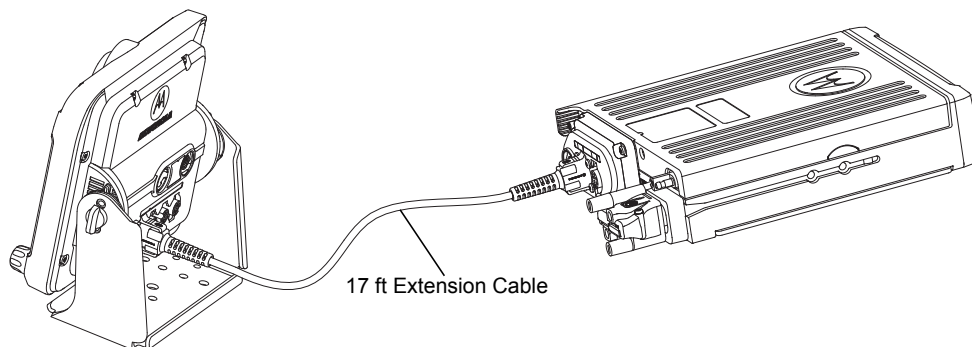
Figure 1-32. Remote Mount Configuration with Mid Power Transceiver, Transceiver Interface Board and O9 Control Head
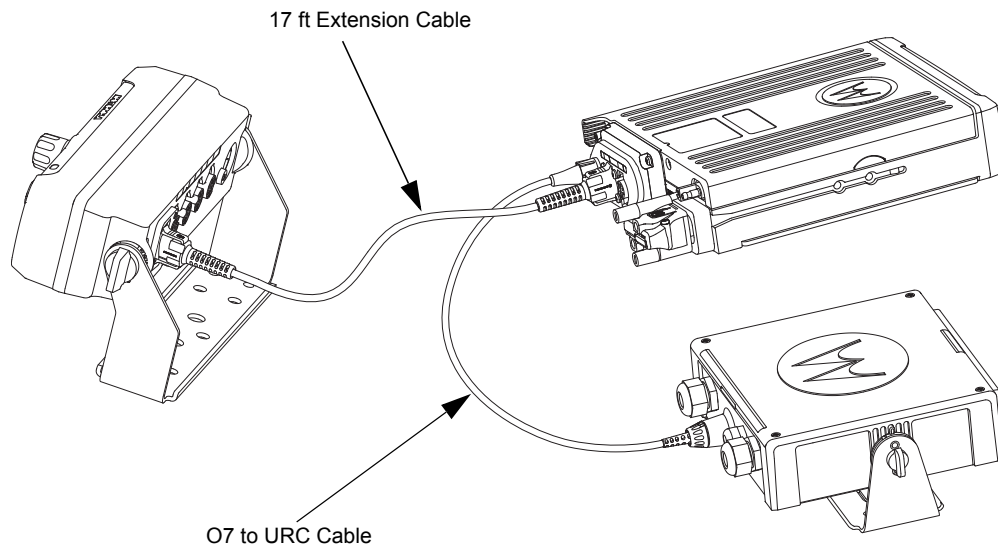
*Figure 1-33. Remote Mount Configuration with Mid Power Radio Transceiver,
Universal Relay Controller and O7 Control Head (URC is optional)*
(Also Applicable for O2 and O5 Control Heads)
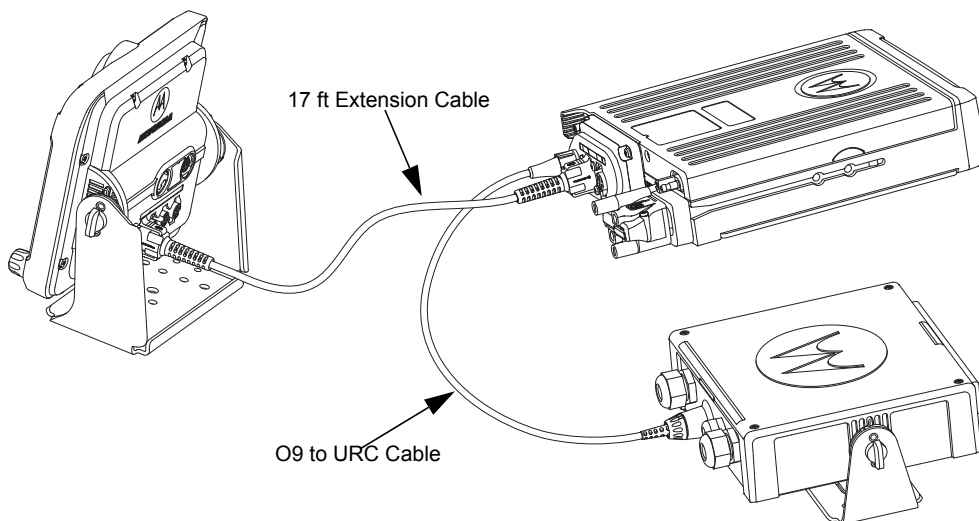
*Figure 1-34. Remote Mount Configuration with Mid Power Radio Transceiver,
Universal Relay Controller and O9 Control Head (URC is optional)*

For details on these configurations, See 2.2.2.

1.2.3   Multi Control Head

The multi control head option allows separate, remotely operated control heads to operate and control the radio. For example, a fire truck could have a control head located in the cab and on the rear of the truck so that the radio could be operated from outside the vehicle.

1.3   Motorcycle Configurations

NOTE: The motorcycle configurations are not applicable for O9 control heads.

See Chapter 5: Motorcycle Radio Installation for further information.

1.4   Base/Control Stations

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

If mobile radio equipment is installed at a fixed location and operated as a control station or as a fixed unit, the antenna installation must comply with the following requirements in order to ensure optimal performance and compliance with the RF energy exposure limits in the standards and guidelines listed in the Safety Manual (refer to related publications):

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

1.5   Tools Required for APX Mobile Installations

Tool	Part Number
10 mm wrench	–
5 mm Allen wrench	–
Regular slot screwdriver of Phillips #2	–
Pin removal tool	6680163F01

Notes

Chapter 2   Standard Configurations

2.1   Planning the Installation

The APX mobile radio operates only in negative ground electrical systems with a valid operating range of 13.6V +/- 20%. Before starting the radio installation, make sure that the ground polarity of the vehicle is correct. Accidentally reversing the polarity could damage the radio and cause the cable fuses to blow.

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

⚠️	Before installing any electrical equipment, check the vehicle manufacturer's user manual for warnings or recommendations.
Caution	The installation of this device should be completed by an authorized servicer or installer. Failure to properly install the device may result in damage to the device, or improper operation.

2.1.1   Installation Examples

The mobile two-way radio offers various methods of installation, with accessories placed to the vehicle as desired. The radio can be a dash or remote mount except with O9 control head, which can only be mounted remotely. The O9 control head with the radio and the URC can only be mounted remotely (see Figure 2-3).
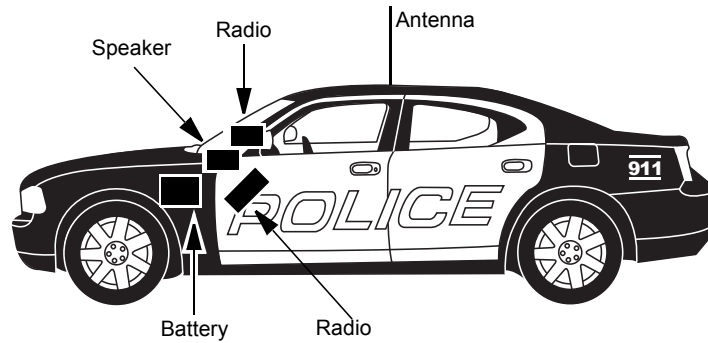
Figure 2-1. Dash Mount Radios Can Be Located in the Middle Console, on the Transmission Hump, or Under the Dash
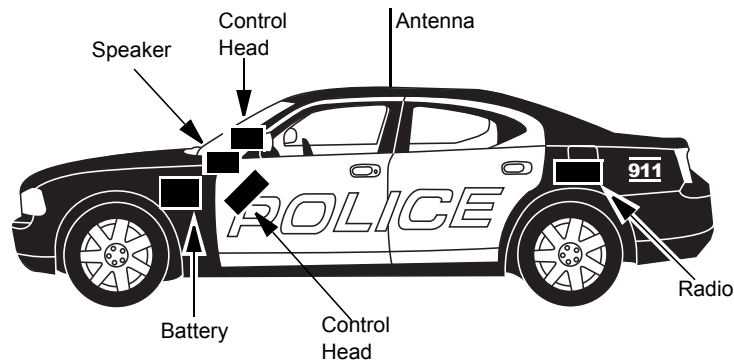
Figure 2-2. Remote Mount Radio Control Heads Can Be Located in the Middle Console, on the Transmission Hump, or Under the Dash
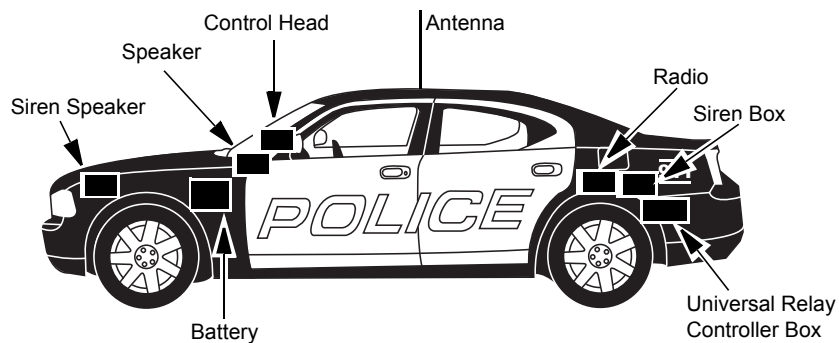
Figure 2-3. Remote Mount of the Radio, O9 Control Head and Universal Relay Controller (URC is optional)

2.1.2 Wiring Diagrams

Figure 2-4 through Figure 2-13 show the wiring diagrams for all the possible configurations. The title under each figure identifies the O2, O3, O5, O7 or O9 control head configurations. Identify which of these figures shows the configuration that you are installing, and use the diagram when planning the installation.
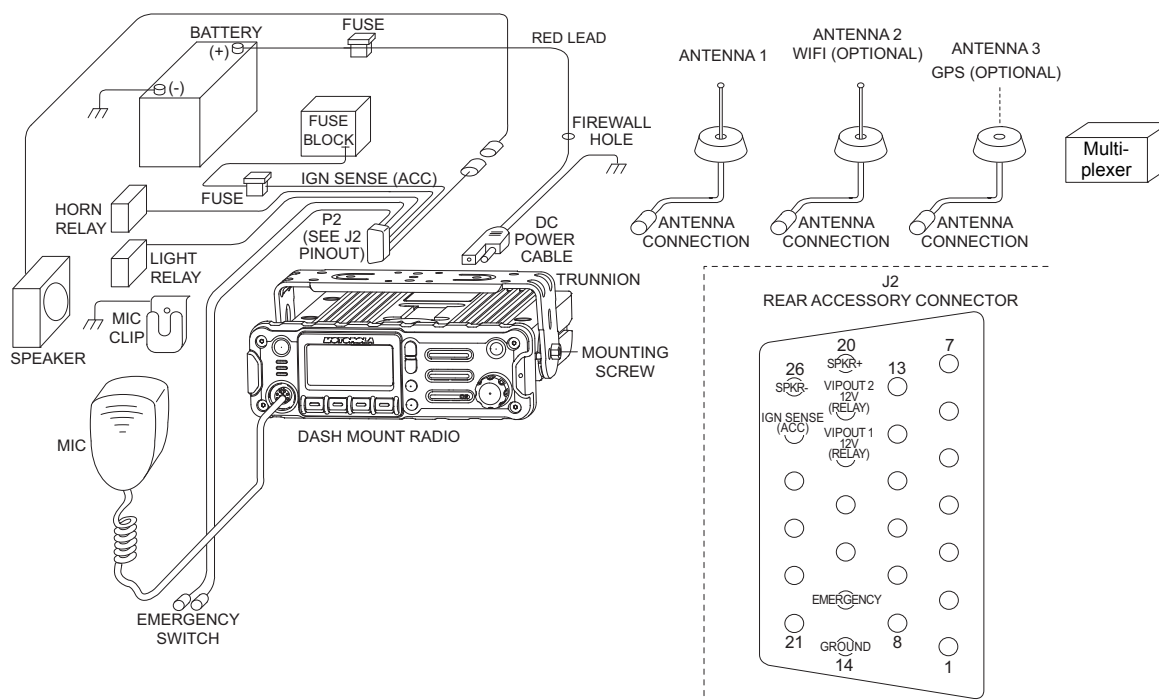
Figure 2-4. Radio Installation (O2 Mid Power Dash Mount)
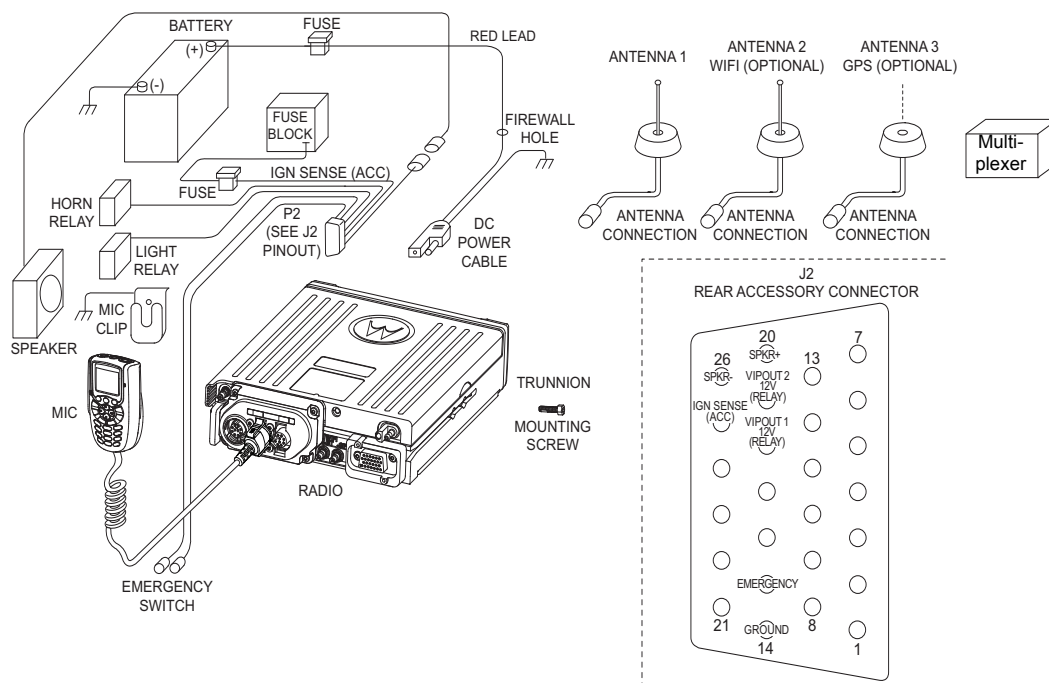
Figure 2-5. Radio Installation (O3 Mid Power Dash Mount)

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

Figure 2-7. Radio Installation (O7 Mid Power Dash Mount)
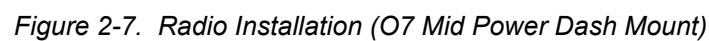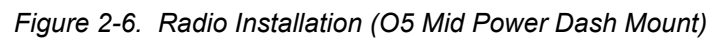
NOTE: In dash mount configuration, it is mandatory that a rear accessory cable be attached at the back of a mid power transceiver, in order to ground the Emergency pin to GND. Or, an emergency footswitch or pushbutton switch must be attached at the back of a mid power. If the emergency pin is not grounded, upon the attachment of the A+ cable at the DC connector, the radio will detect a HIGH for the emergency pin state, and assume that emergency has been activated. This will attempt to power on the radio, and will result in excessive current draw and incorrect radio operation. Refer to Section 2.1.3.1 for further details and recommended wiring of emergency in dash mount.

Radio Pin Number	VIP Cable (HKN6196_) Wire Color	Function
J400-1	RED	SWB +
J400-2	GREEN	GND
J400-3	-	NO PIN
J400-4	-	"VIP" detect: GPIO=HIGH
J400-5	BLUE	VIP_OUT_1
J400-6	YELLOW	VIP_OUT_2
J400-7	BLACK	VIP_OUT_3
J400-8	WHITE	VIP_IN_1 (VIP_IN GPIO)
J400-9	ORANGE	VIP_IN_2 (VIP_IN GPIO)
J400-10	VIOLET	VIP_IN_3
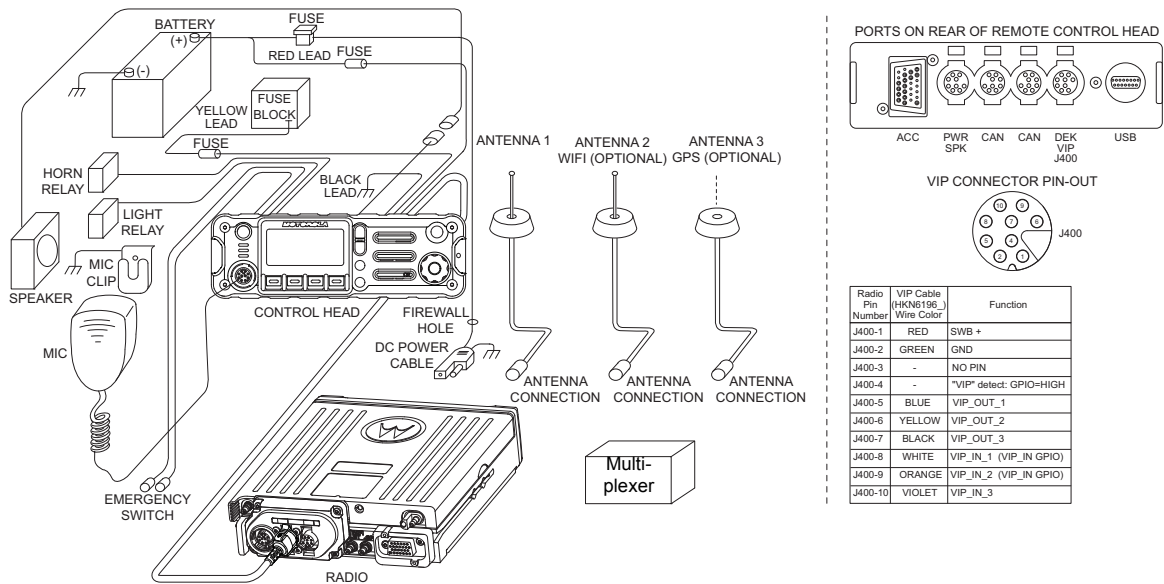
Figure 2-8. Radio Installation (O2 Mid Power Remote Mount)
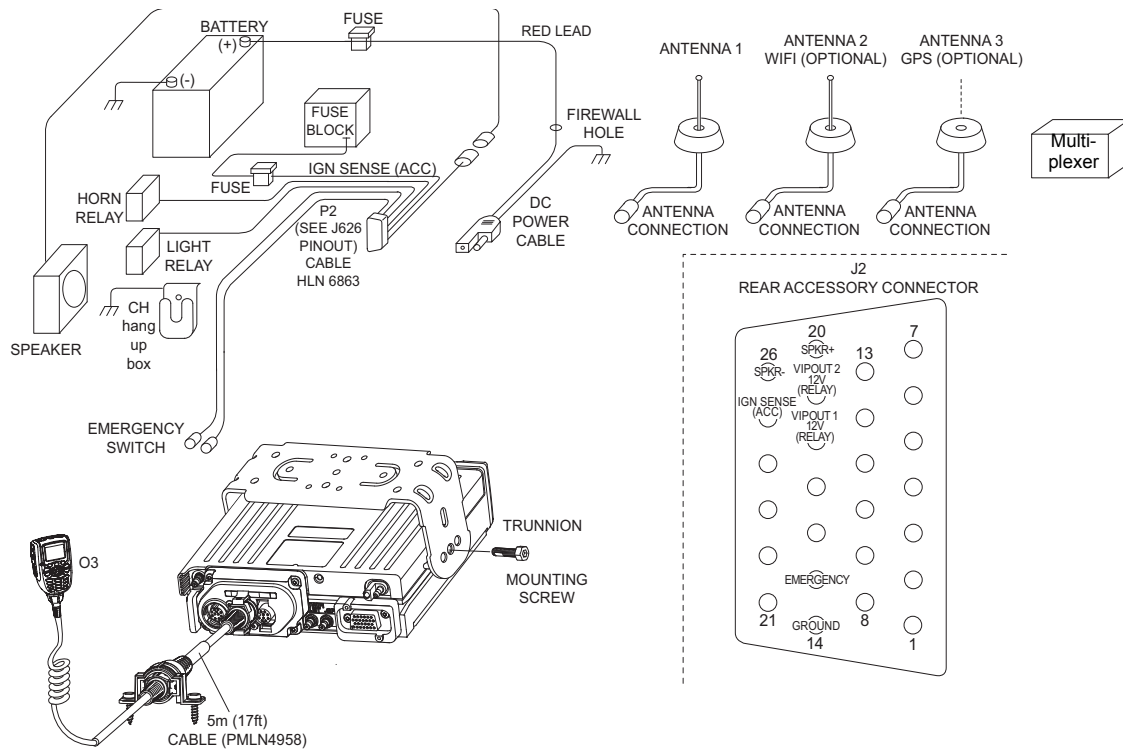
Figure 2-9. Radio Installation (O3 Mid Power Remote Mount)
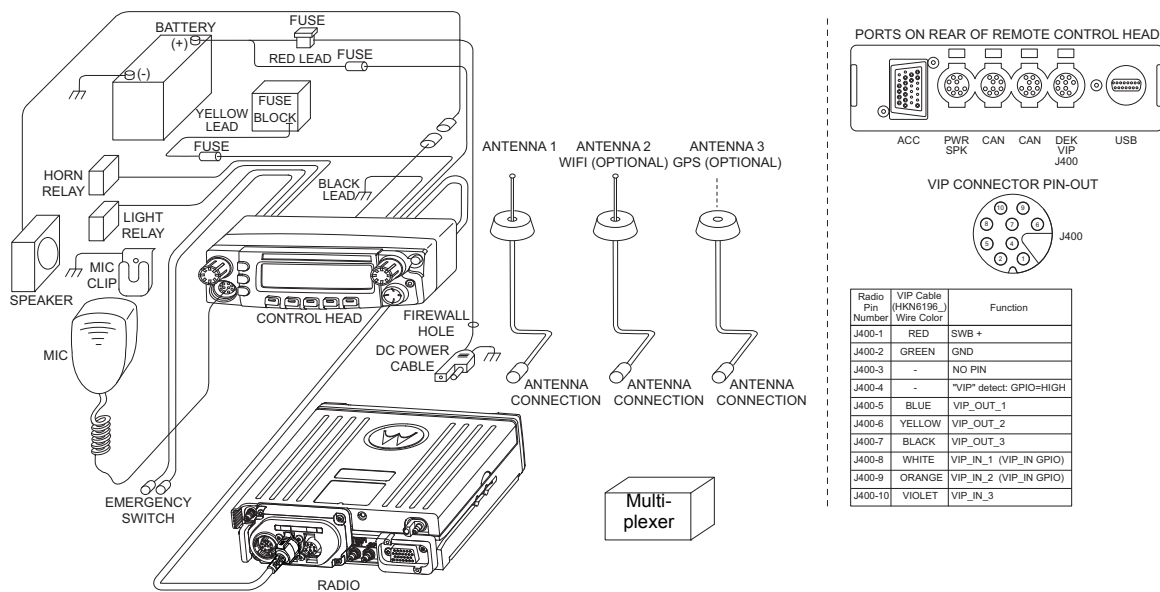
Figure 2-10. Radio Installation (O5 Mid Power Remote Mount)
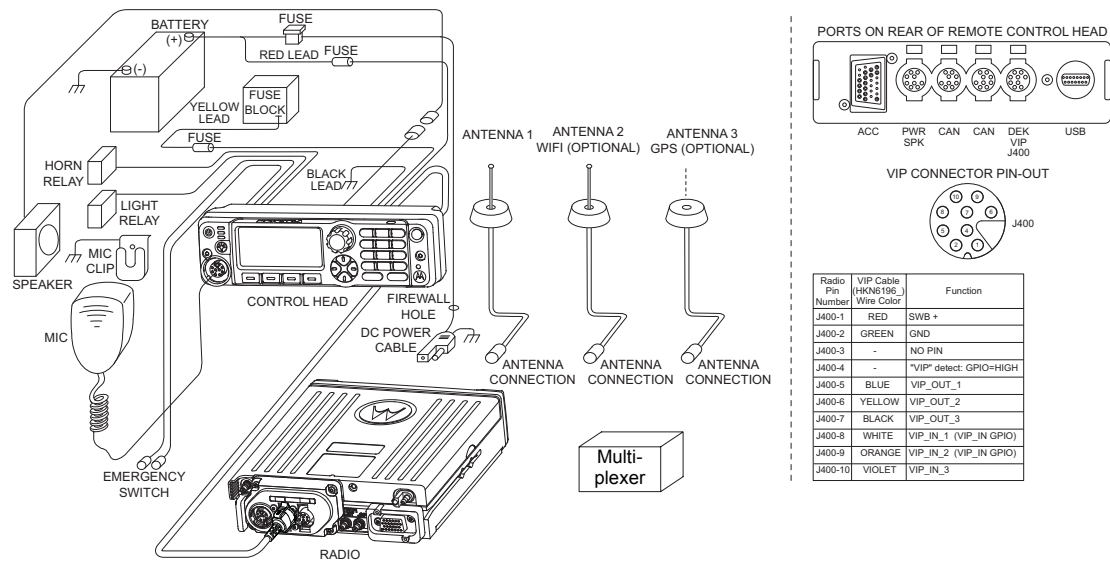
Figure 2-11. Radio Installation (O7 Mid Power Remote Mount)

Refer to Section 2.1.3.2 and Section 4.2.1 for further details and recommended wiring of emergency in remote mount.
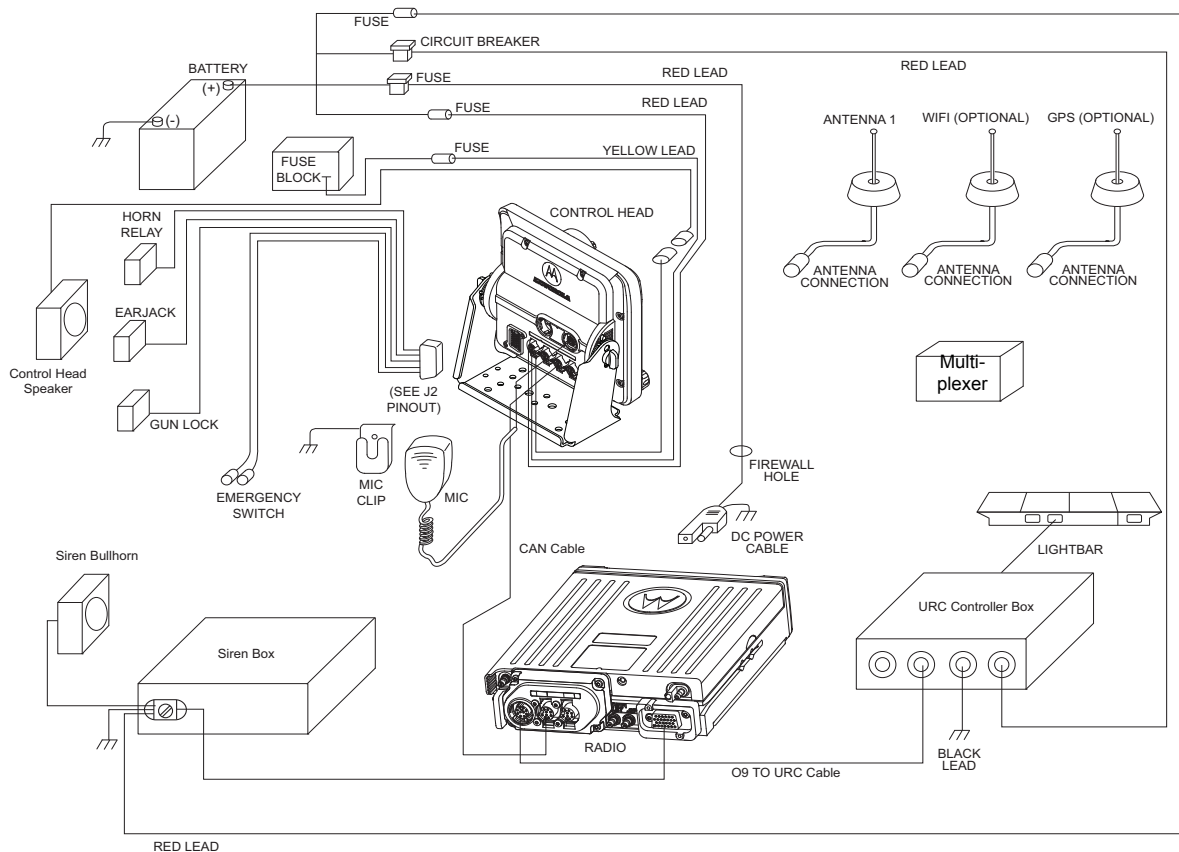
Figure 2-12. Radio Installation of O9 Remote Mount with Transceiver (URC is optional)

J2
REAR ACCESSORY CONNECTOR

20
26 SPKR+ 13 7
SPKR- VIPOUT 2
12V
(RELAY)
IGN SENSE
(ACC) VIPOUT 1
12V
(RELAY)

EMERGENCY
21 8
GROUND
14 1

VIP CONNECTOR PIN-OUT

J400

J500
USB

J100
M.A.P.

J200
PWR/SPKR
(RED)

J300L
CAN
(BLUE)

J300R
CAN
(BLUE)

J400
DEK/VIP
(YELLOW)

MMP

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

Figure 2-13. Radio Installation (O9 Remote Mount with Pinouts)

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

J200   J300L   J300R   J400   J500

J100

M.A.P.   PWR SPK (RED)   CAN (BLUE)   CAN (BLUE)   DEK VIP (YELLOW)   USB
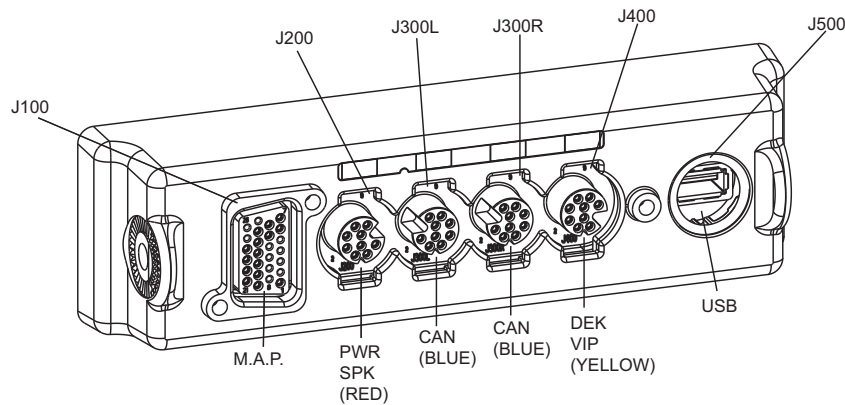
Figure 2-14. Remote Control Head Pinouts

Figure 2-15. Cabling Interconnect Diagram for Dash Mount
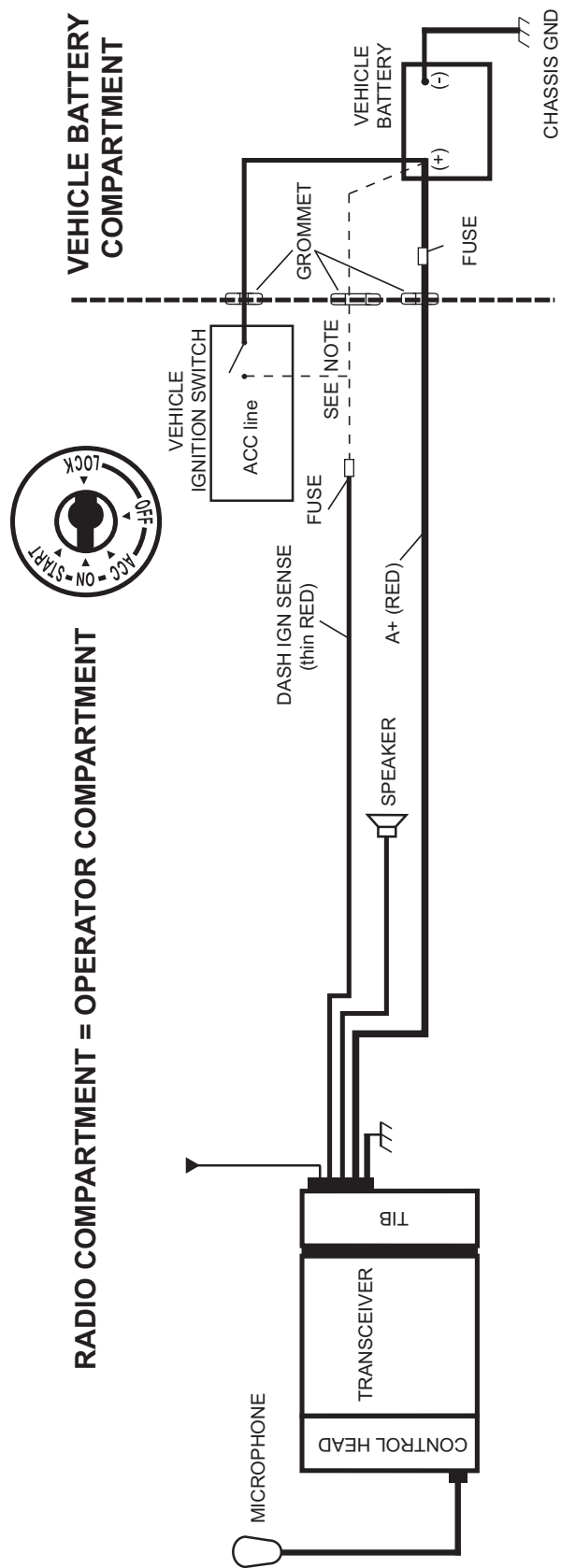
NOTE:
See TABLE 2-1 for wiring of the thin RED wire on rear accessory plug. A good GROUND connection to the car chassis is required for correct radio operation.

NOTE:
Ignition sense cable uses either 3-amp fuse (6580283E01) or 4-amp fuse (6580283E02)
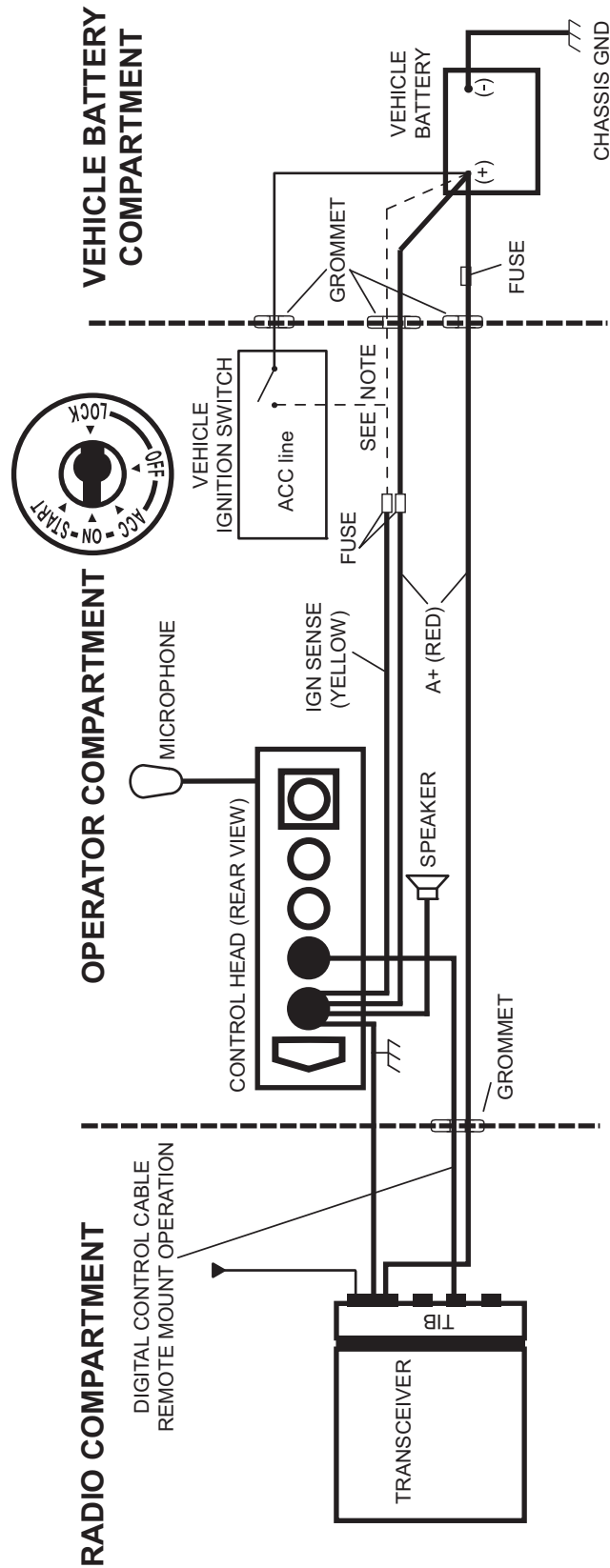
Figure 2-16. Cabling Interconnect Diagram for Remote Mount

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.
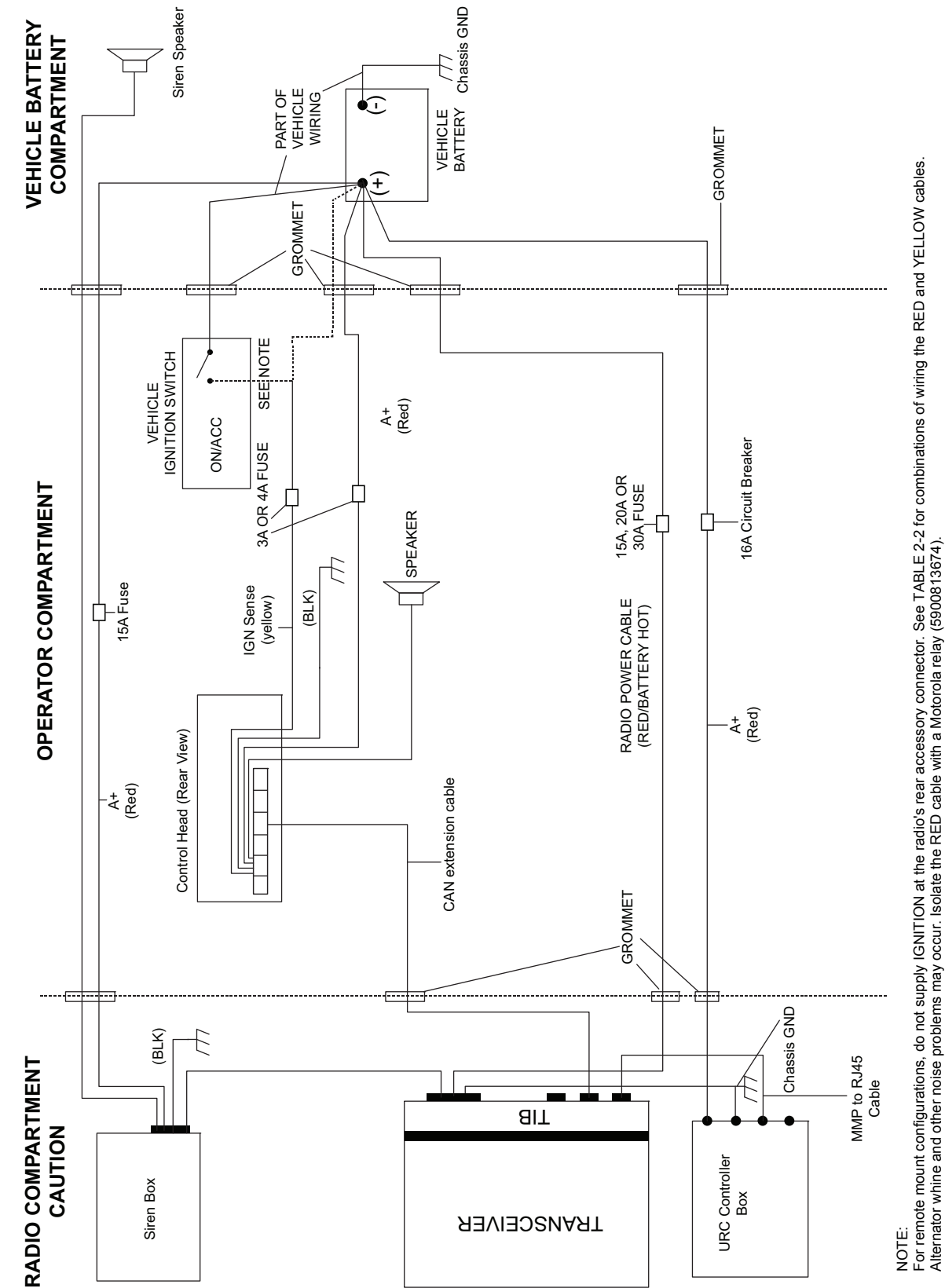
Figure 2-17. Cabling Interconnect Diagram for 09 Remote Mount (URC is optional)

NOTE:
For remote mount configurations, do not supply IGNITION at the radio's rear accessory connector. See TABLE 2-2 for combinations of wiring the RED and YELLOW cables. 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 from Table 2-1 or Table 2-2 the radio functionality you wish to achieve, which is controlled by the vehicle's ignition switch state, the physical wiring of the radio's ignition sense (ACC) wire, and by the programmed CPS setting. For additional radio functionality as determined by the programming of the ignition switch in CPS, refer to the HELP menu in your CPS (i.e. Ignition as: Required, Blank, Soft Power Off, TX Inhibit, PTT TX Inhibit, Ignition Only Power Up).

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

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

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

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

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

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

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

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

In Multi-Control Head installations, the yellow ignition wire must be connected to the head assigned ID # 1. Section 2.2.2.4: "Setting the Initial Control Head ID" for further information.

The design of the control head is different compared to the transceiver, therefore it is also **NOT** necessary to attach HLN6863 at J100 to prevent accidental emergency operation. The control head can have an emergency accessory attached at connector J100 instead of at the transceiver connector J2. Wherever the emergency accessory is placed, it is recommended to only attach at one location rather than multiple emergency accessories attached at different points of the radio.

Table 2-1. Dash and Remote O2, O3, O5, O7 or O9 Radio Power ON @ J2

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

Table 2-2. Remote O2, O5, O7 or O9 Radio Power ON @ J200

Remote	Control Head Red Wire @J200	Control Head Yellow Wire @J200	Control Head Red Wire @J200	Control Head Yellow Wire @J200	Control Head Red Wire @J200	Control Head Yellow Wire @J200
Connected to battery	X	X	X			X
Connected to ignition switch				X	X	X
Ignition switch controls	No ignition switch control.		Enables ignition switch functionality as programmed in the codeplug.		Illegal wiring configuration. See CAUTION note.	

Table 2-3. Ignition Interface Cables

Part Number	Description
HLN6863_	Cable, M.A.P. 26pin with Only Ignition and SPK
KT000274A01	Y-Cable, M.A.P to M.A.P. and DB 25

⚠ Caution	DO NOT connect any wires to the battery terminals until you have finished the entire radio installation (Dash or Remote Mount) configuration to avoid potential equipment damage.
	Incorrect wiring of the radio may result in incorrect ignition sense detection, incorrect power-on state, or incorrect power-off state of the radio system.
	The Control Head Power cable wire (RED) and Transceiver Power cable wire (RED) are always attached to the battery terminal and NOT to the ignition switch.

2.1.4 Ignition Sense Switch (Radio Wide Advance)

CPS selectable settings to control the radio's functionality based on the state of the vehicle's Ignition status. These descriptions can be found in the CPS (customer programming software) tool HELP Guides and are repeated here for convenience.

Table 2-4. Ignition Sense Switch Settings in CPS

Feature	Description
Blank	• Radio POWERS ON when the Power Button is pressed or with the emergency power up feature. • Radio POWERS OFF when the Power Button is pressed.
TX Inhibit	(Available only when: the radio is model/option capable) • Radio POWERS ON with a radio Power On button / knob selection. • Radio POWERS OFF with a radio Power Off button / knob selection, or when the Inactivity Auto Power Off timer expires. • While "**IGNITION**" is **not** present, certain communications are not possible: I. The radio does **not** register with ASTRO 25 (APCO) - Trunking Systems and therefore **cannot** receive this type of Trunking communications (see the System Type field), however, Type II Trunking Systems can receive dispatch without being registered. II. Also, the radio **cannot** be powered-on with the Emergency Power UP feature, and Emergency Alarm transmissions using the Emergency Power UP footswitch are **not** possible.
PTT TX Inhibit	(Available only when: the radio is model/option capable) • Radio POWERS ON with a radio Power On button / knob selection. • Radio POWERS OFF with a radio Power Off button / knob selection, **or** when the Inactivity Auto Power Off timer expires. • While "**IGNITION**" is **not** present, all **PTT button transmissions** are inhibited: I. The radio does **not** register with ASTRO 25 (APCO) - Trunking Systems and therefore **cannot** receive this type of Trunking communications (see the System Type field), however, Type II Trunking Systems can receive dispatch without being registered. II. Also, the radio **cannot** be powered-on with the an Emergency Power UP footswitch-press; however, the footswitch can be used to initiate Emergency Alarm transmissions if the radio is already on.
Required	• Radio POWERS ON when the Power Button is pressed and Ignition is present. • Radio POWERS ON when Ignition is cycled and radio was previously ON. • Radio POWERS OFF when the Power Button is pressed, or when Ignition is lost.
Soft Power Off	• Radio POWERS ON when the Power Button is pressed, or when Ignition is detected. • Radio POWERS OFF when the Power Button is pressed, or when Ignition is lost.
Ignition Only Power Up	• Radio POWERS ON when Ignition is present. • Radio POWERS OFF when Ignition is lost. • Control head power button is ignored.

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

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

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

2.1.5 Motorola Branded SB9600 Siren/PA Configuration/Programming

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

To change to another power level, perform the following:

1. Open the Siren/PA connector cover to gain access to the two-connector speaker leads. Do not change the speaker common lead (pin 20). The other lead is connected to pin 35 (for 100W operation).

2. Using an appropriate pin removal tool, extract pin 35 and move it to one of the following pin locations:

   - pin location 36 for 75W operation

   - pin location 28 for 65W or 130W operation

3. For 65W or 75W operation, no further changes are required. Reassemble the connector.

4. For 130W operation, you must parallel two 11Ω speakers, each rated at 65W minimum. Proper phasing of the two speakers is important--when connecting two speakers in parallel, wire similar speaker terminals together to ensure maximum loudness and prevent "deadspots." For example, if the terminals are marked "1" and "2", connect the terminals marked "1" together and connect those wires to one speaker lead. Connect the terminals marked "2" together and connect those wires to the other speaker lead.

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

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

6. Close and reconnect the Siren/PA connector cover.

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

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

Table 2-5. Power Level Configurations

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

2.2   Radio Mounting

⚠️ Caution	DO NOT mount the radio on a plastic mounting surface without first reinforcing the mounting surface; the weight of the radio may crack or break the mounting surface. DO NOT mount the radio on any surface where the radio could be partially submersed in water. This is especially important if the cab area of the vehicle is cleaned by spraying with water. If the radio sits in water for a length of time, moisture may seep inside the radio and damage the electronic components. DO NOT allow water to stand in recessed areas of vertically mounted radios. Remove any moisture immediately to prevent it from seeping down into the radio. Care must be taken to shield the control head (front and back) from direct exposure to pressurized water. The pressurized water from a hose, in most cases, is more severe than the stated test and conditions in typical environments.

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

NOTE: For optimum radio performance, orient the mounting trunnion as shown in Figure 2-18 for mid power. For new or existing installations of all use only the APX mobile trunnion, kit number HLN7002_.

RADIO FRONT

APPLIES TO RADIOS IN DASH AND REMOTE INSTALLATIONS
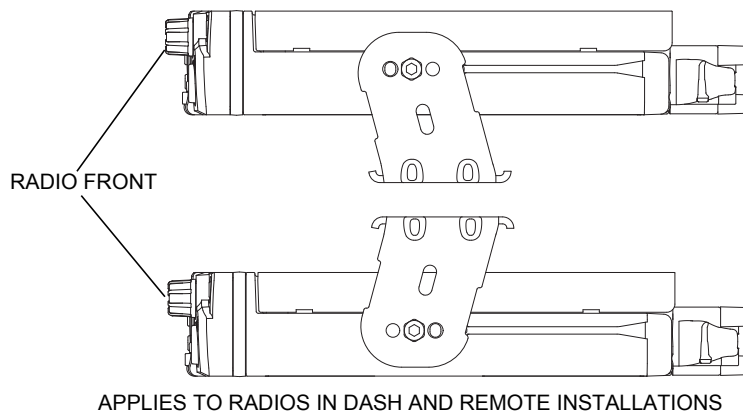
Figure 2-18. APX8500 Mid Power Trunnion Orientation

2.2.1   Dash Mount with Trunnion

1. Select the location to mount your radio on the transmission hump (see Figure 2-19) or under the dash (see Figure 2-20)

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

2. Using the trunnion mounting bracket as a template, mark the positions of the holes on the mounting surface. Use the innermost four holes for a curved mounting surface such as the transmission hump, and the four outmost holes for a flat surface such as under the dash.

3. Center punch the spots you have marked and realign the trunnion in position.

4. Secure the trunnion mounting bracket with the four self-drilling screws provided (see Figure 2-19 and Figure 2-20).

5. Ensure that the plastic guides are aligned (horizontal) to the grooves of the trunnion. Slide the radio into the grooves until it snaps into place (see Figure 2-20).

Table 2-6. Mid Power Trunnion Kit

Item	Part Number	Description	Mid Power Transceiver
1	0371859H01	Trunnion Mounting Screw	APX 8500
2	0312002B14	Self-Drilling Tapping Screw	APX 8500
3	HLN7002_	Mackinaw Trunnion Hardware Kit	APX 8500
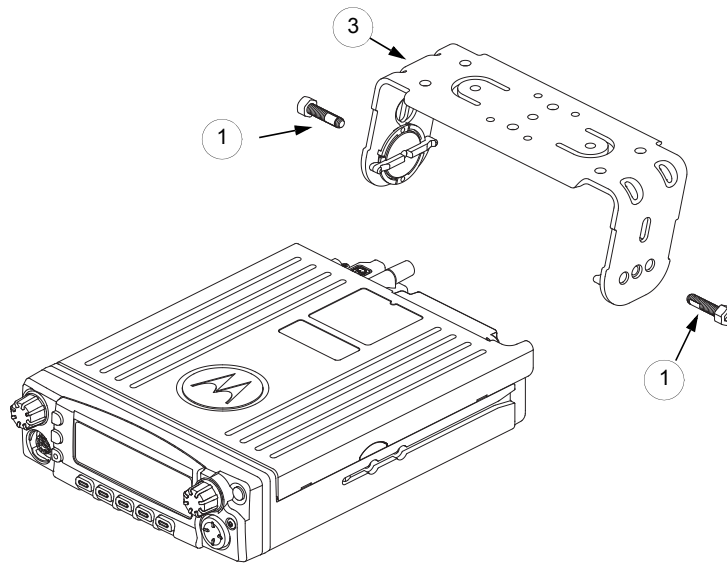
Figure 2-19. Transmission Hump Trunnion Mounting
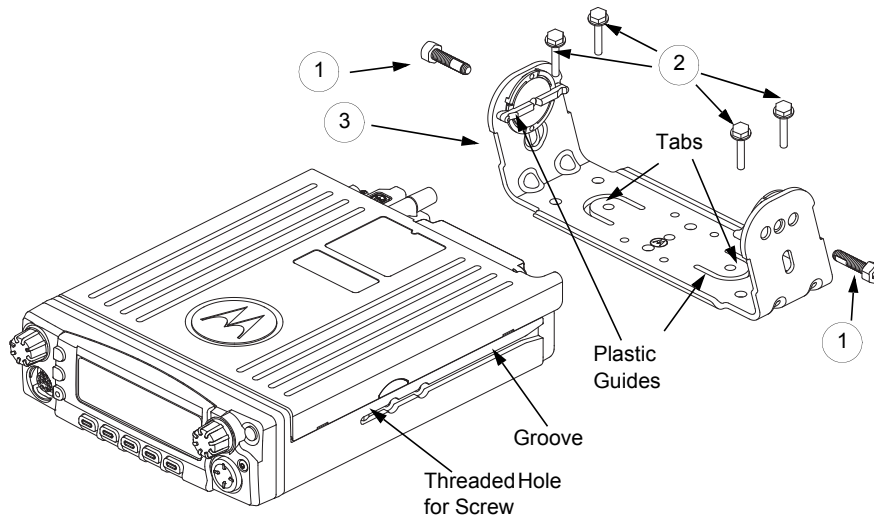
Figure 2-20. Below Dash Trunnion Mounting

6. Secure the radio with two screws provided (Item 1 in Table 2-6). The torque down force for 0371859H01 should be between 50in-lbf to 52in-lbf.

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

2.2.2 Remote Mount with Trunnion

⚠️ **Caution**	Before installing any electrical equipment, check the vehicle manufacturer's user manual. The installation of this device should be completed by an authorized servicer or installer. Before making any holes in the trunk for radio mounting, check the vehicle manufacturer's user manual for restrictions (e.g. due to the gas tank location).

For a remote mount installation, the transceiver may be mounted anywhere in the vehicle, provided that the installation location is safe, follows the cautions mentioned at the beginning of this section, and is accessible for servicing/maintenance as well as cabling. A typical mounting location recommended by Motorola is in the vehicle's trunk. The trunnion provided may still be used to mount the transceiver, and the mounting process is the same as for the dash mount installation (Section 2.2.1). See Figure 2-10 or Figure 2-11 for a 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. Figure 2-21 and Figure 2-22 shows how the trunnion, control head, and cables should be installed for the O2, O3, O5, O7 or O9 control head.

NOTE: Connector-protective covers (Remote Mount Dust Cover kit) KT000246A01 are provided with the radio.
They should be installed on exposed connectors for added environmental robustness.

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

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

1. Use the control unit trunnion as a template to mark the mounting holes; drill 5/32" holes. If mounting on a plastic surface, use a metal backing plate.

2. Attach the trunnion bracket using all four 10-16" x 5/8" self-tapping screws provided.

3. Temporarily install the control head (adjusting for proper viewing angle) and fasten it to the trunnion with two wing screws. Test the installation to be sure the control head feels securely locked in place while you are pressing its buttons.

4. Finish installation by fully tightening screws.
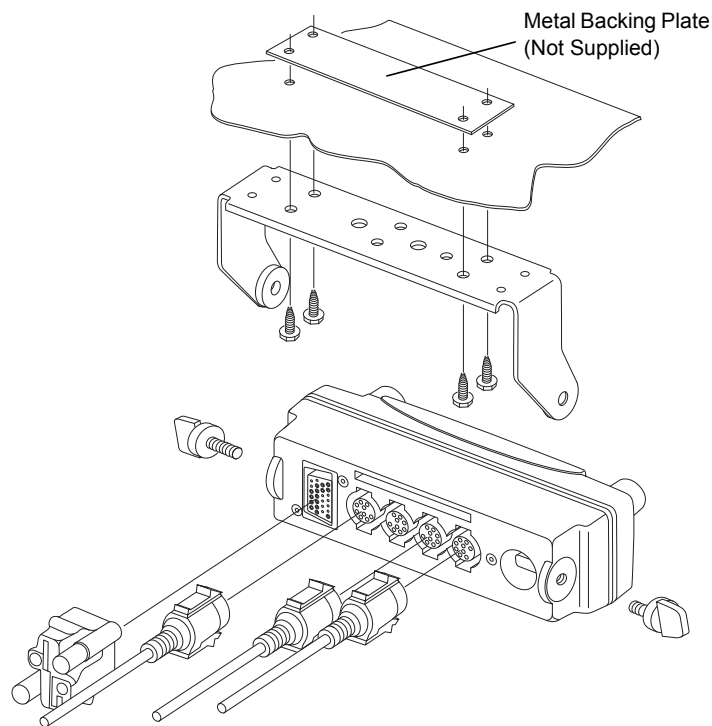
Figure 2-21. O5 Control Head Installation Exploded View (Also applicable for O2 and O7 Control Heads)

Adjust the control head to desired angle and secure with wing screws

Use four mounting screws on all installations

Trunnion

Mounting surface

Drill four 5/32" holes in mounting surface

IMPORTANT:
Use a metal backing plate (not supplied) if mounting trunnion on plastic or unstable surface
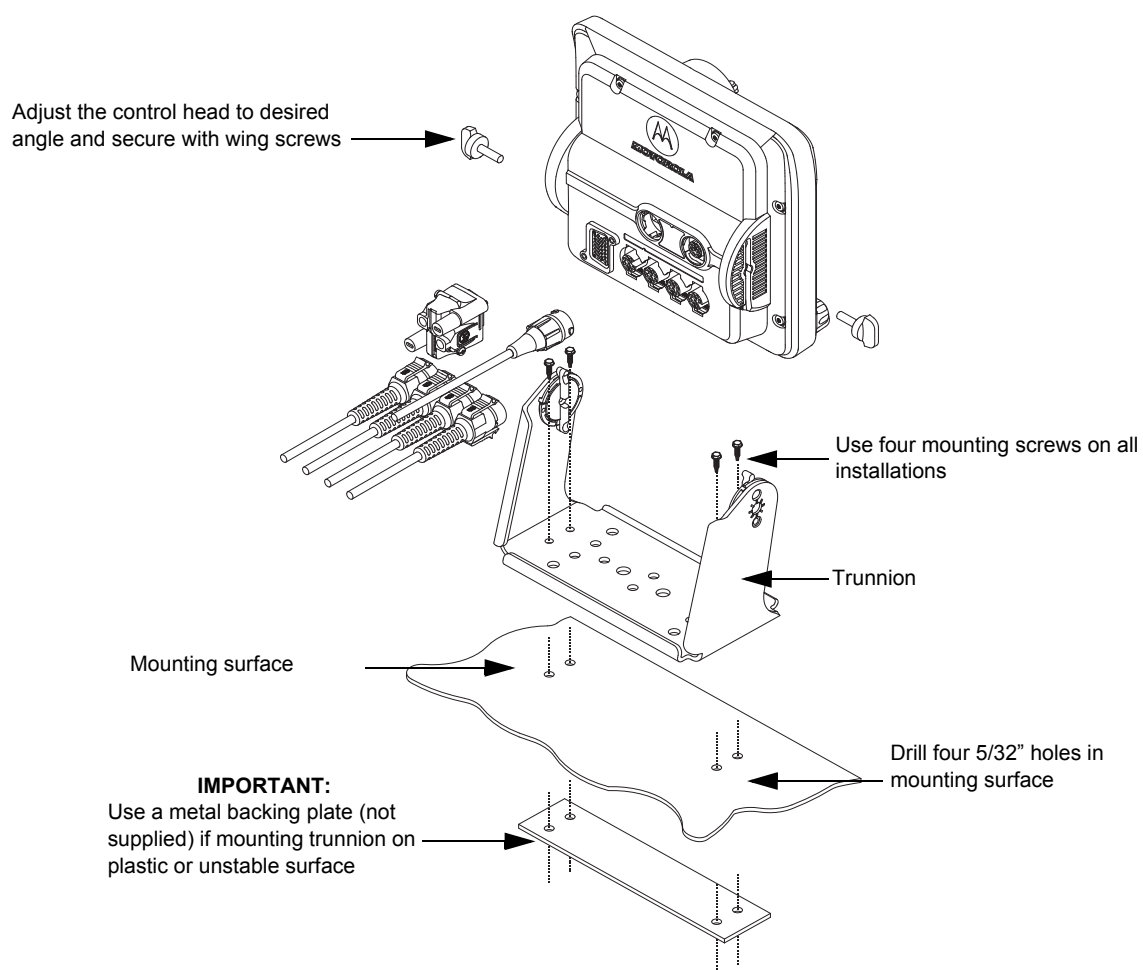
Figure 2-22. O9 Control Head Installation Exploded View
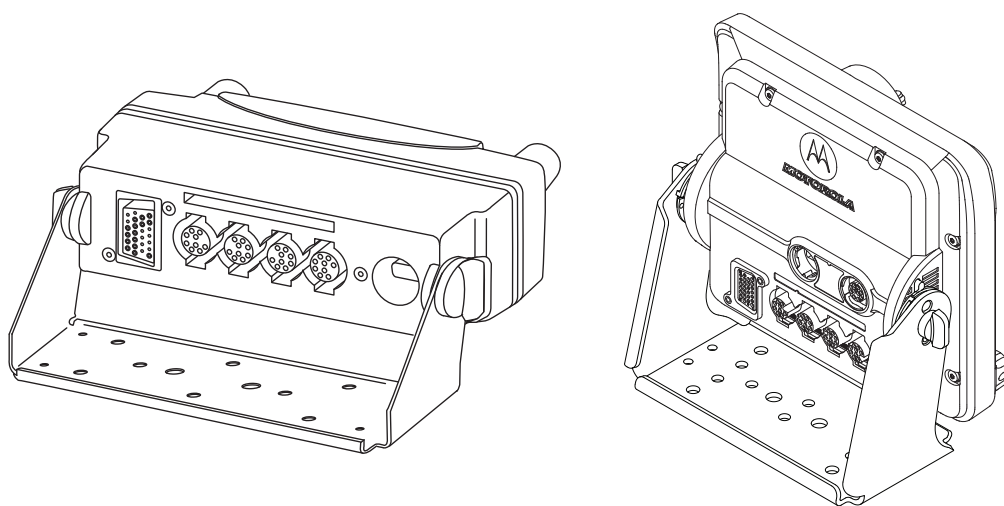
Figure 2-23. O5 and O9 Control Head Rear View

2.2.2.2 Multiple Control Head Installation

Control heads in a multiple control head configuration should be installed per the steps detailed in Section 2.2.2.1: "Remote Mount Control Head Installation" . Two heads can be connected to each of the two CAN connectors on the transceiver, see Figure 2-24. Control heads can also be connected a "daisy chain" configuration from a single transceiver CAN connector. See Figure 2-25 for examples.

NOTE: The transceiver must be configured for Multiple Control Head via CPS programming. Navigate to the "Control Head" tab in the Radio Wide section of CPS, and select "Help" for further information and tutorials.
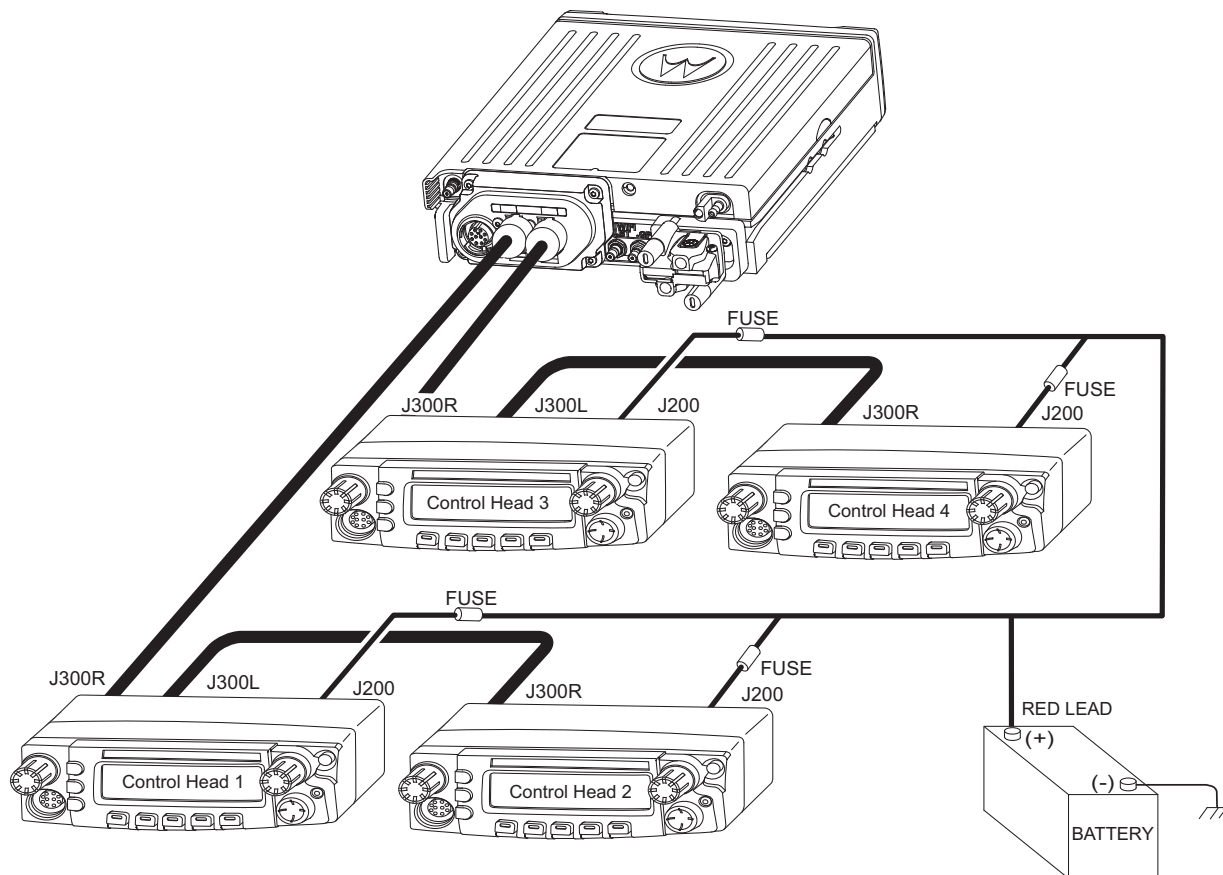
Figure 2-24. Multiple Control Heads Parallel Configurations
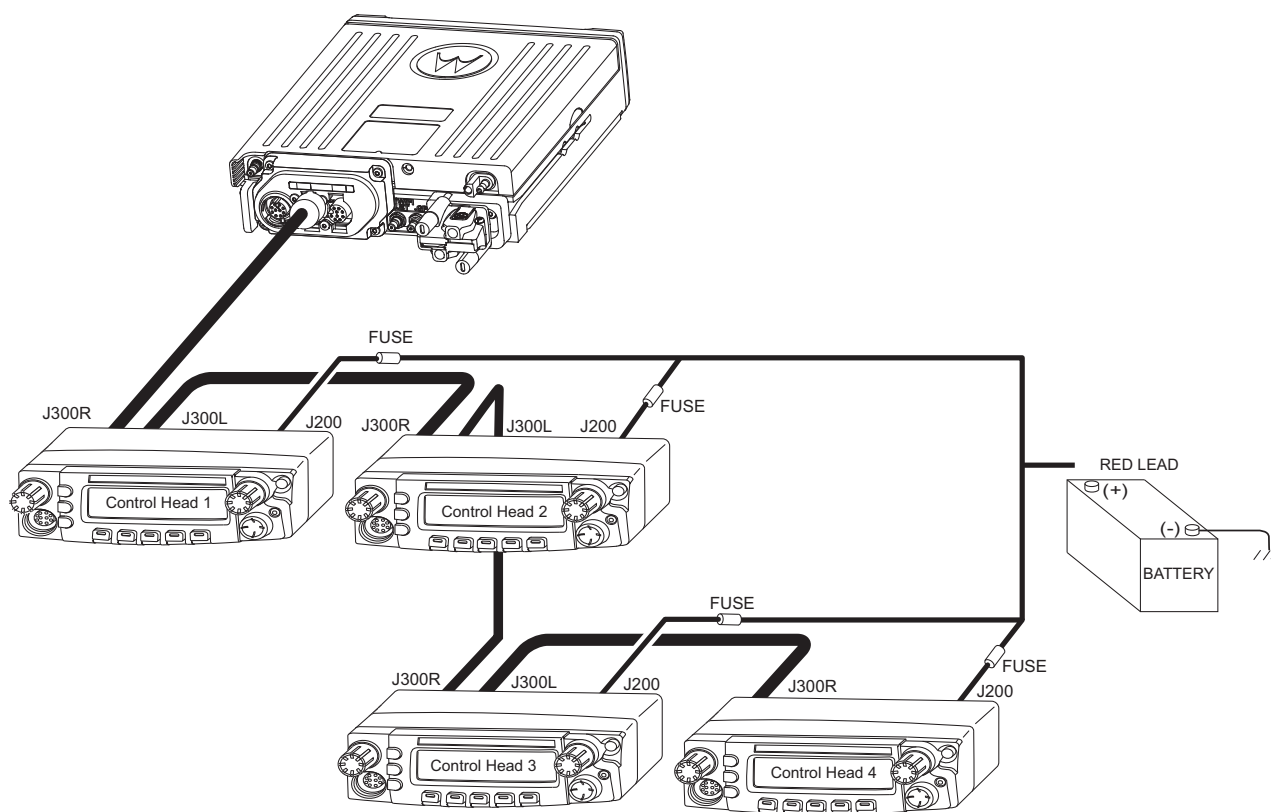
Figure 2-25. Multiple Control Heads Series Configurations

NOTE: In Multiple Control Head (MCH) installations, the yellow ignition sense wire must be connected to the head assigned ID # 1. Section 2.2.2.4: "Setting the Initial Control Head ID" for further information.

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

Table 2-7. Available CAN Cables

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

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 2-15 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.

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

1. Press the power button to power off the radio.

2. Press and hold left-most menu and the orange button on the control head simultaneously.
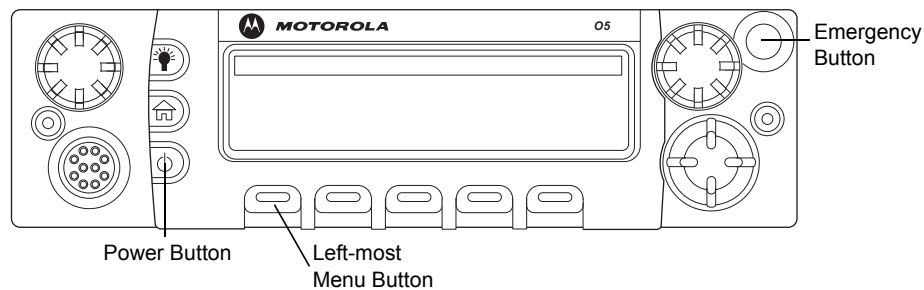
Figure 2-26. APX Mobile O5 Control Head Front View

3. Press the power button to power on the control head. The head will power on into FPP mode and display the current control head ID number:
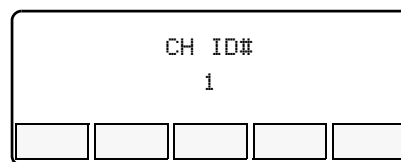
Figure 2-27. Radio Display with Current Control Head ID

4. Turn the **Mode** knob to change the control head's ID number.
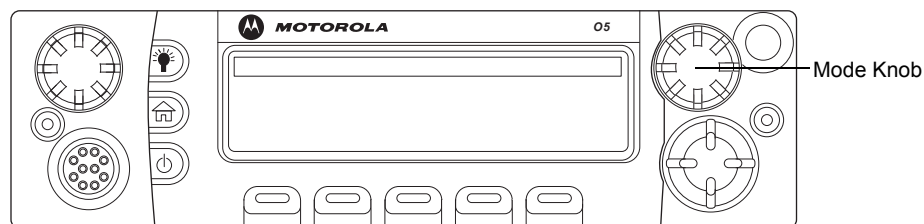
Figure 2-28. APX Mobile O5 Control Head Front View – Mode Knob

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

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

2.2.2.5 O3 Control Head and Remote Mount Cabling

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

Figure 2-29. O3 Control Head

The recommended mounting surface for the control unit is on the center console. Figure 2-31 shows how the hang-up clip control head, and cables should be installed for the O3 control head.

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

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

Install the mounting clip as follows:

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

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

Vehicle Mounting Surface

1

2

2

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

Figure 2-30. O3 Control Head Rear View   *Figure 2-31. Hang-Up Clip Installation Exploded View*

2.2.3 Locking Kit (Optional)

2.2.3.1 All Radios

If an optional locking kit (HLN6372_) is used (shown in Figure 2-32), position the lock housing on the trunnion after installing the radio mounting screws. Then rotate the lock with the key in it and remove the key to lock the radio. You can install the lock on either side of the radio, and in dash and remote mount installations.
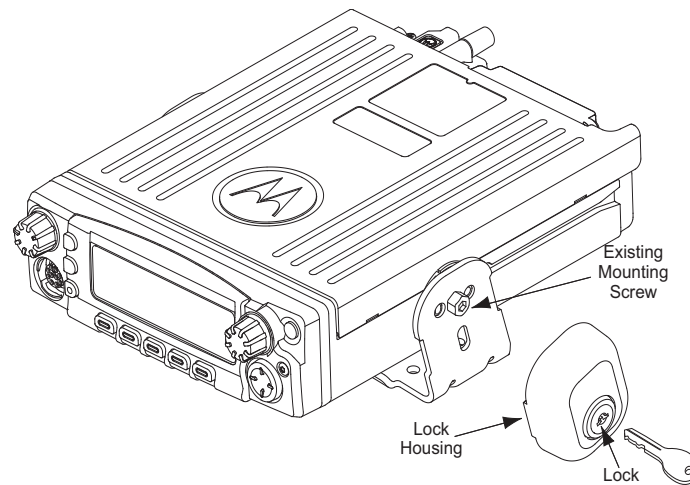
Figure 2-32. Locking Kit (Optional)

2.3   Power Cables (Transceiver and Control Head)

Route the RED power cable from both the radio and the control head to the vehicle's battery compartment, using accepted industry methods and standards. Be sure to grommet the firewall hole to protect the cable. Remove the 15-amp (part number 6580283E06), 20-amp (part number 6580283E07) or 30-amp (part number 6580283E09) fuse from the fuseholder and connect the red lead of the radio power cable to the positive battery terminal using the hardware provided as shown in Figure 2-33 and Figure 2-34. Connect the black lead to a convenient solid chassis ground point. DO NOT connect the black lead directly to the battery's negative terminal.

Table 2-8. Power Cables

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

2.3.1   O2, O5, O7 or O9 Control Head Power Cables
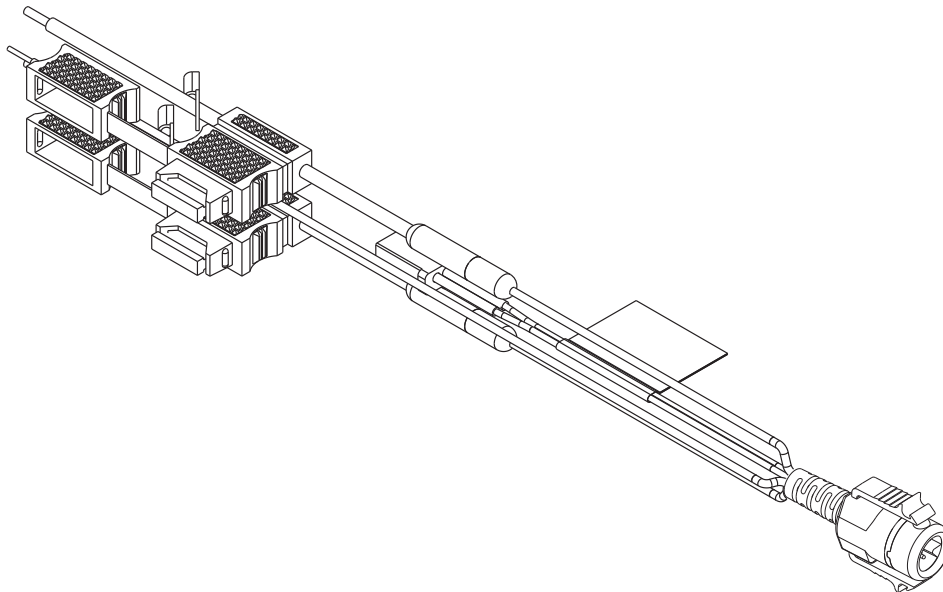
Figure 2-33. HKN6188_ Power Cable with External Speaker Connector
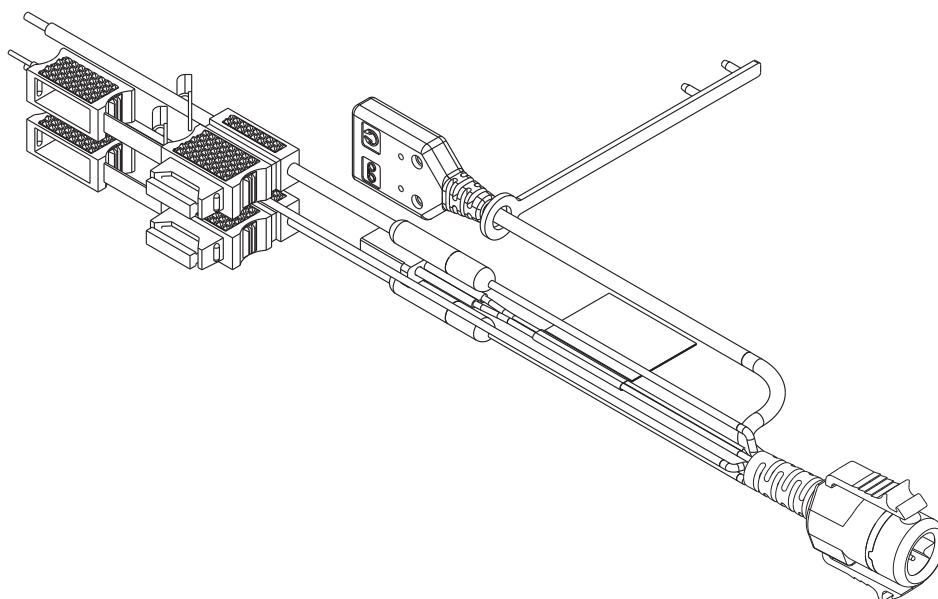
Figure 2-34. HKN6187_ Power Cable with External Speaker Connector, Record Audio Output Jack (2.5 mm) and Earphone Jack (2.5 mm)

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

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

2.3.2 Battery Selector Switch

In vehicles which have installed a Battery Selector Switch, the ignition sense (yellow) wire should be the only wire connected to the battery selector switch (see Figure 2-35). Radio transceiver and control head power wires (red) must be connected directly to the vehicle battery. If the control head power wire and the control head ignition sense wire are both connected to a battery selector switch, but the radio transceiver power lead is not, improper power-cycling and off-state battery drainage may occur. If the desired state of the radio is a total battery drain elimination, then all power and ignition sense wires must be routed through the battery selector switch, so that the control head and radio transceiver both see the loss of battery power at the same time.
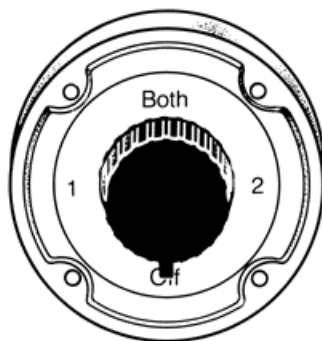
Figure 2-35. Battery Selector Switch

2.4   Antenna Installation

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

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

1. **External installation** – Check the requirements of the antenna supplier and install the
   vehicle antenna external to a metal body vehicle in accordance with those requirements.

2. **Roof top** – For optimum performance and compliance with RF Energy Exposure regulations,
   mount the antenna in the center area of the roof.

3. **Trunk lid** – On some vehicles with clearly defined, flat trunk lids, the antennas of some radio
   models (see restrictions below) can also be mounted on the center area of the trunk lid. For
   vehicles without clearly defined, flat trunk lids (such as hatchback autos, sports utility
   vehicles, and pick-up trucks), mount the antenna in the center area of the roof.

   Before installing an antenna on the trunk lid,

   - Be sure that the distance from the antenna location on the trunk lid will be at least 85 cm
     (33 inches) from the 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.

---

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

   NOTE: Do not cut antenna cables to ensure compliance with RF Energy Exposure regulations

   NOTE: *VHF and UHF 1/4 wave antenna* should be mounted *only in the center area of the roof*,
   not on the trunk lid, to ensure compliance with RF Energy Exposure regulations.

5. Ensure that the antenna cable can be easily routed to the radio. Route the antenna cable as
   far away as possible from any vehicle electronic control units and associated wiring.

6. Check the antenna location for any electrical interference.

   NOTE: Any two metal pieces rubbing against each other (such as seat springs, shift levers, trunk and
   hood lids, exhaust pipes, etc.) in close proximity to the antenna can cause severe receiver
   interference.
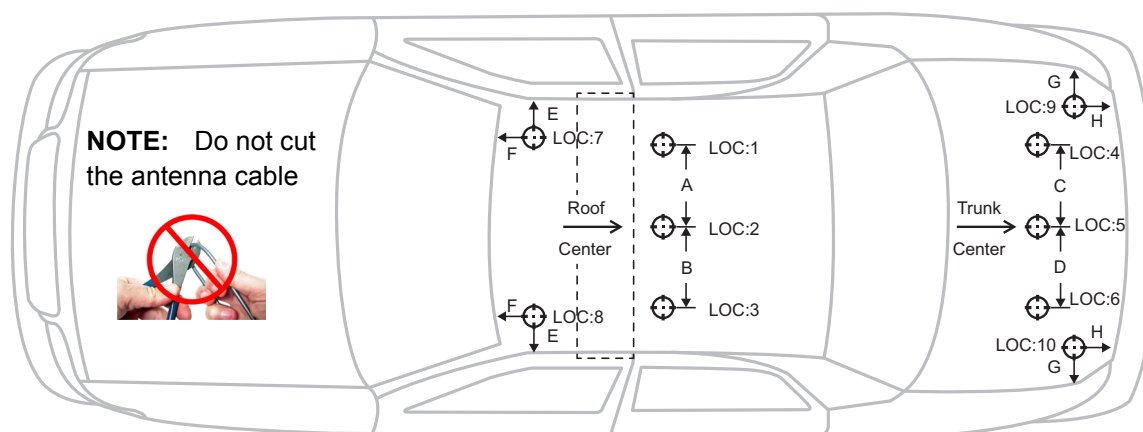
Figure 2-36. Multiple Antennas Separation for locations 1-10

Figure 2-36 indicates the separation distances required for the various antennas used with an APX 8500 midpower radio. Each "cross-hair" symbol represents a possible location (i.e. 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. This picture is not drawn to scale.

For letters A, B, C, and D, the table indicates the EXACT distance for separation of the LMR antennas.

For letters E, F, G, and H, the table indicates the maximum distance between the edge of the ground plane and the accessory antenna location.

Table 2-1 Distance Between Antenna

Characters	Distance	Characters	Distance
A	8 inches	E	8 inches
B	8 inches	F	8 inches
C	8 inches	G	8 inches
D	8 inches	H	8 inches

NOTE:
- A minimum of 18 inch separation is required between lightbar and any roof mounted antennas, to prevent interference with the lightbar circuitry (see lightbar manufacturers installation information).

- The LMR 700/800 antennas should only be placed at LOC:2 or LOC:5.

- Standard LMR VHF and UHF antennas should only be placed at LOC:1, LOC:3, LOC:4 and LOC:6.

- 1/4 wave LMR VHF and UHF antennas should only be placed at LOC:1 and LOC:3 (i.e.roof only) to ensure compliance with RF Energy Exposure regulations.

- The VML antenna must be separated from any LMR antenna by at least 40 inches.

- The LTE Main and Diversity Antenna locations should be at LOC:9 and LOC:10 when the LMR All-Band or LMR 700/800 narrow band antennas are at LOC:2 (i.e LTE opposite location from the LMR).

- The LTE Main and Diversity Antenna locations should be at LOC:7 and LOC:8 when the LMR All-Band or LMR 700/800 narrow band antennas are at LOC:5 (i.e LTE opposite location from the LMR).

- In some mobile installations that include an LTE modem, external filtering on the LMR port and/ or the LTE port may be needed to reduce interference. Contact your local Motorola Solutions Service Center for more information and for filter kit numbers (See Appendix for contact info).

2.4.2   Multiplexers and Vehicle Installation
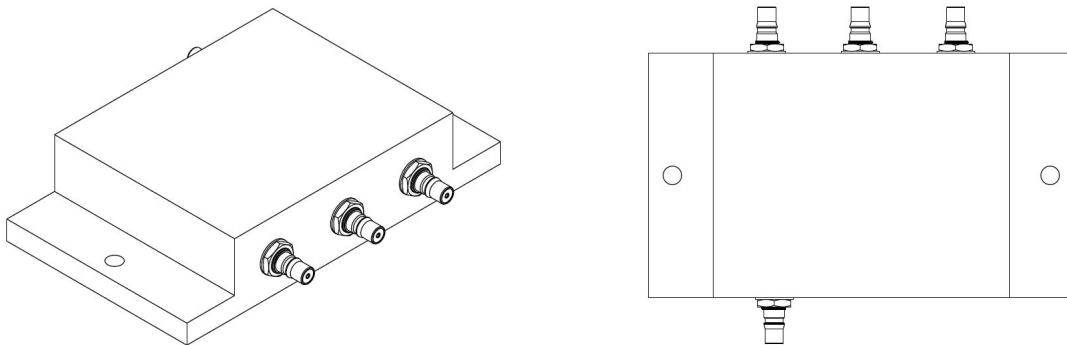
Figure 2-37. Multiplexer Views

2.4.3   QMA Connection (APX8500 Only)

APX8500 is using 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's collar and pull the cable straight off the jack.

2.4.4   GPS/GLONASS/Wi-Fi/Antenna Placement (APX8500 Only)
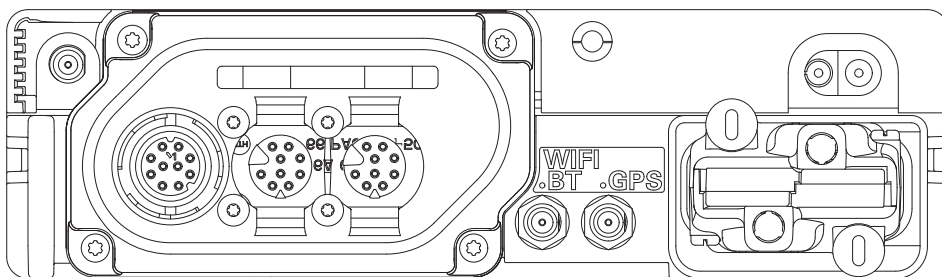
Figure 2-38. GPS/GLONASS and Wi-Fi Antenna Connector on the Back of the Mid Power Radio

2.5   Speaker

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

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

1. Use the speaker mounting bracket as a template to mark the mounting hole locations.

2. Use the self-drilling screws provided to fasten the trunnion.

3. Attach the speaker and fasten to the trunnion with two wing screws.

4. Route the speaker wires under the carpet or floor covering, or behind the kick panels. Be sure the wires are out of the way and will not be snagged and broken by the occupants of the vehicle.

5. Do not submerse the 2-pin speaker connector in water nor place this connector in an area that could have standing water.
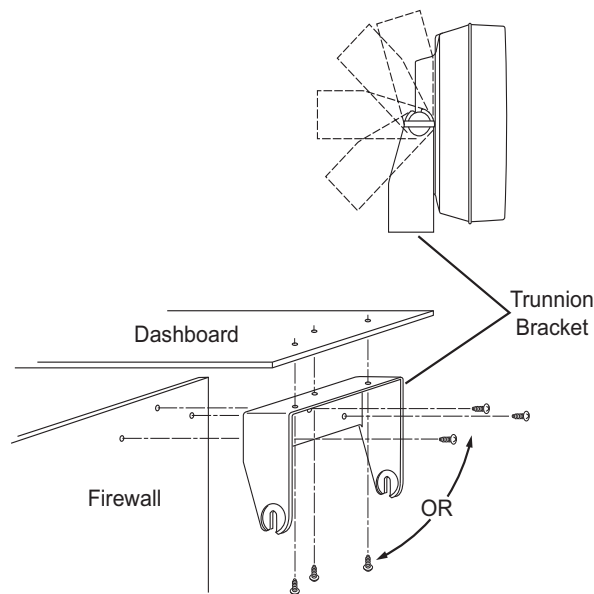
Figure 2-39.   Speaker Mounting

2.5.1   Internal Speaker Disassembly

NOTE: This configuration is only applicable for O2 Control Heads.

You can disable the internal speaker of your radio by following the instructions below.

Use the following procedure to disassemble your radio:

1. Unplug 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 as shown in Figure 2-40. Discard the screws.
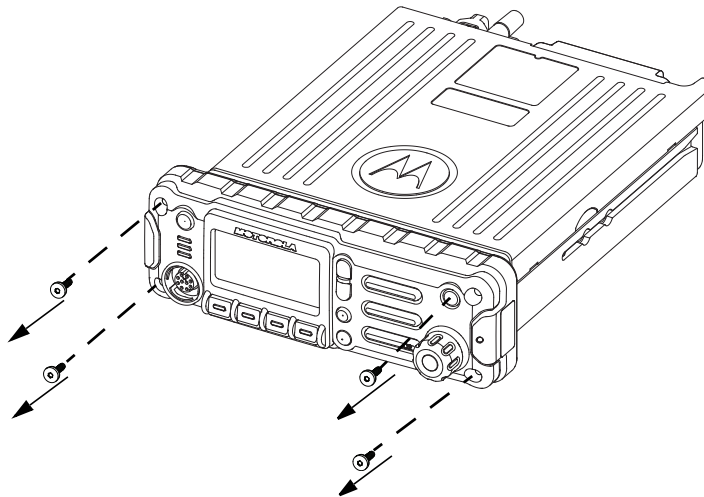
Figure 2-40. Removing the screws on the Control Head

3. Firmly grasp the front panel of the control head. Carefully remove the front housing assembly from the back housing assembly as shown in Figure 2-41. Note the position of the attached flex and do not pull on it excessively.
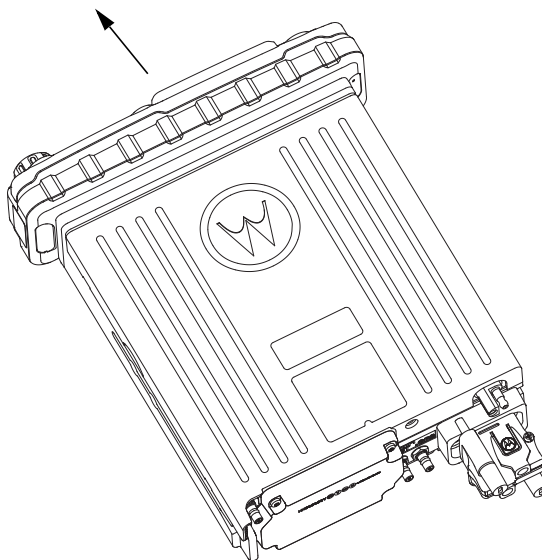
Figure 2-41. Removing the Control Head

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 as shown in Figure 2-42.
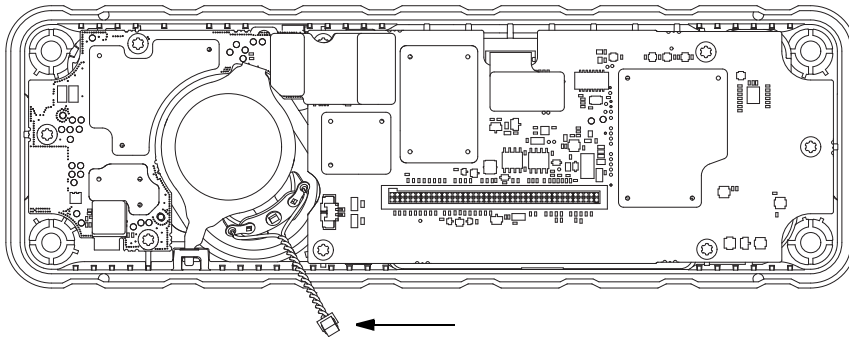
Figure 2-42. Disconnecting the Speaker Connector

6. Reattach the front housing assembly to the back housing assembly as shown in Figure 2-43. Make sure that the flex is returned to its original position and that the o-ring on the back housing assembly is not pinched.
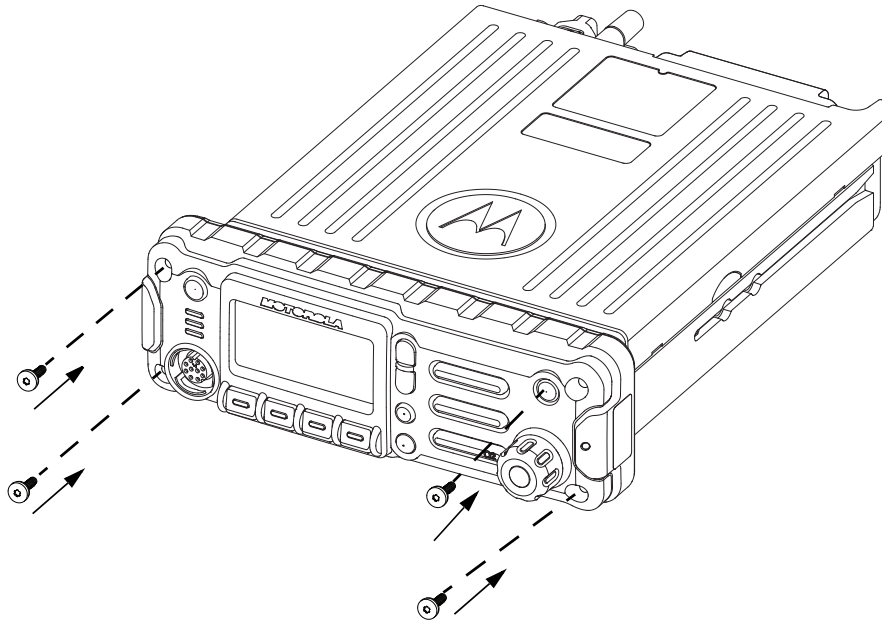
Figure 2-43. Reattaching the Control Head

7. Secure the front housing assembly back to the back housing assembly with four new screws using the Torx T-20 bit as shown in Figure 2-43. Apply 9 in. lbs. torque for each screw.

2.6   Microphone Hang-Up Clip

2.6.1   Standard or O3 Control Head Hang-Up Clip

The hang-up clip must be within reach of the operator(s) 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, the microphone can be mounted in any position.

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

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 microphone model.

NOTE: 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)

An APX mobile radio equipped with an RFID tag allows an alternate option for tracking the radio asset. Each RFID equipped radio has an RFID tag preprogrammed with the individual radio's serial number (also found on the FCC label) as well as band and radio model information (see below for further information).
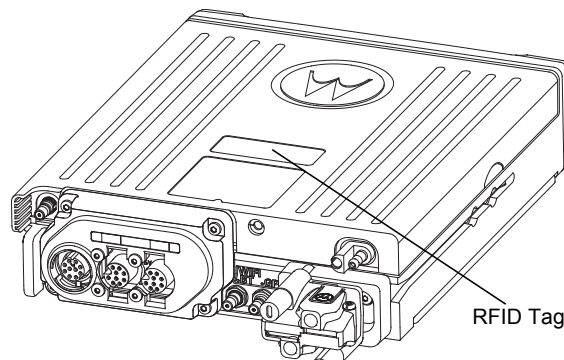
RFID Tag

Figure 2-44. RFID Location on Mid Power Radio

2.7.1 RFID Reading

To read an RFID tag using a UHF Gen 2 RFID reader (e.g. Motorola's MC9090-G), open an appropriate RFID read application, point the RFID reader at the tag and activate the reader's RFID antenna (e.g. pull Motorola's MC9090-G scanning trigger). RFID reader must be within 1 foot from tag in order to read.

Two variables, Read Angle and Reader Orientation, aid in the distance needed to read and write to 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 will begin to decrease; tag will become unreadable once Read Angle exceeds 90 degrees (see Figure 2-45). 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 (see Figure 2-47).
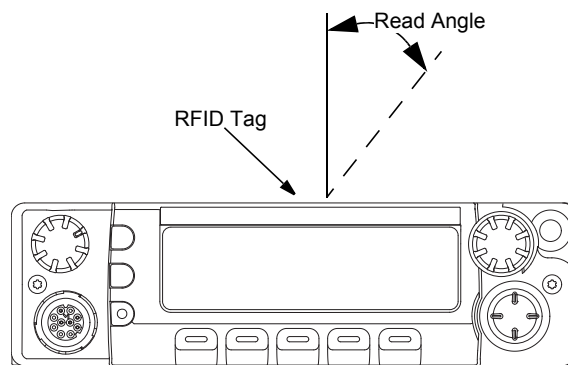
Figure 2-45. Read Angle for Mid Power Radio

.
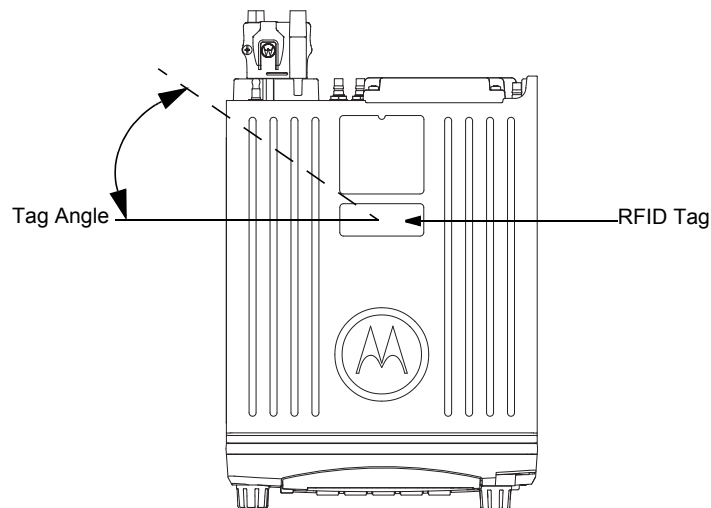
Figure 2-46. Tag Angle for Mid Power Radio
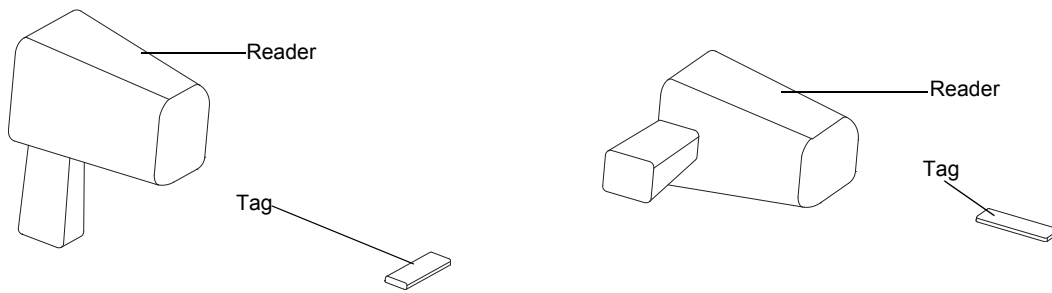
Figure 2-47. Examples of Reader and Tag Aligned (Reader Orientation)
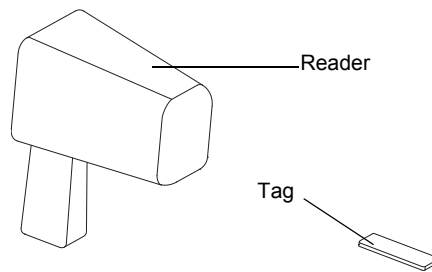
Figure 2-48. Example of Reader and Tag Misaligned (Reader Orientation)

2.7.2   Programming RFID (If Equipped)

The user can reprogram the tag (up to 12 ASCII characters when encoded to hexadecimal format) using any UHF Gen 2 capable RFID writer (e.g. Motorola's MC9090-G).

NOTE: Follow read direction in Section 2.7.1 to optimized reprogramming.

Table 2-1. Model Number Chart in 12-Digit ASCII Format

Model Number	Radio Tier/Band/Output Level	Last Two Digits
M37TSS9PW1AN	APX Mobile 700/800 VHF UHF–MP	T0
M30KSS9PW1AN	APX Mobile SB–MP VHF	D2
M24KSS9PW1AN	APX Low Tier Mobile–MP VHF	D8
M22KSS9PW1AN		
M36KSS9PW1AN	APX Lowest Tier Mobile–MP VHF	D9
M30KTS9PW1AN	APX Mobile SB–HP VHF	D3
M30QSS9PW1AN	APX Mobile SB–MP UHF1	E2
M30QTS9PW1AN	APX Mobile SB–HP UHF1	E3
M30SSS9PW1AN	APX Mobile SB–MP UHF2	D2
M20TSS9PW1AN	APX Mobile DB–MP 700/800–MP VHF	R2
M30TXS9PW1AN	APX Mobile DB–MP 700/800–HP VHF	R3
M30URS0PW1AN	APX Mobile SB–MP 700/800	F2
M22URS9PW1AN	APX Low Tier Mobile–MP 700/800	F8
M24URS9PW1AN		
M36URS9PW1AN	APX Lowest Tier Mobile–MP 700/800	F9
M24QSS9PW1AN	APX Low Tier Mobile–MP UHF1	E8
M22QSS9PW1AN		
M36QSS9PW1AN	APX Lowest Tier Mobile–MP UHF1	E9
M24SSS9PW1AN	APX Low Tier Mobile–MP UHF2	E8
M22SSS9PW1AN		
M36SSS9PW1AN	APX Lowest Tier Mobile–MP UHF2	E9
M22WRS9PW1AN	APX Low Tier Mobile–MP 900	F8

Table 2-2. Serial Number with Radio Band/Tier/Power

Characters	Radio Band/Tier/Power
F	700/800 and 900
D	VHF

Table 2-2. Serial Number with Radio Band/Tier/Power

E	UHF
R	700/800 and VHF
T	Multi-Band
E	UHF1 and UHF2
S	700/800 and UHF
0	APX 8500
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

Complete the installation by connecting the speaker to the accessory cable; verify the ignition sense wire is attached according to planned ignition sense; verify the control head is attached to either the TIB or the CAN extension cable; and then 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 and an orderable accessory for O7 or O9 control head. URC is used to control high power switching peripherals, e.g. lightbar. URC works on all lightbars which can be controlled by power application. URC is connected to the transceiver's MMP port.

The URC design consists of a microcontroller and uses 10 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 MMP 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 additional 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, etc.

> ⚠ **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.

NOTE: For optimum URC performance, orient the mounting trunnion as shown in Figure 3-1.
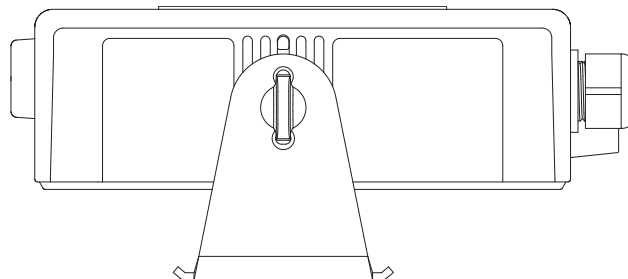
Figure 3-1. Universal Relay Controller Orientation

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

Install the URC as follows:

1. Use the URC 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 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.

Use four mounting screws on all installations

Adjust the universal relay controller to desired angle and secure with wing screws

TRUNNION

Mounting surface

Drill four 5/32" holes in mounting surface

IMPORTANT:
Use a metal backing plate (not supplied) if mounting trunnion on plastic or unstable surface
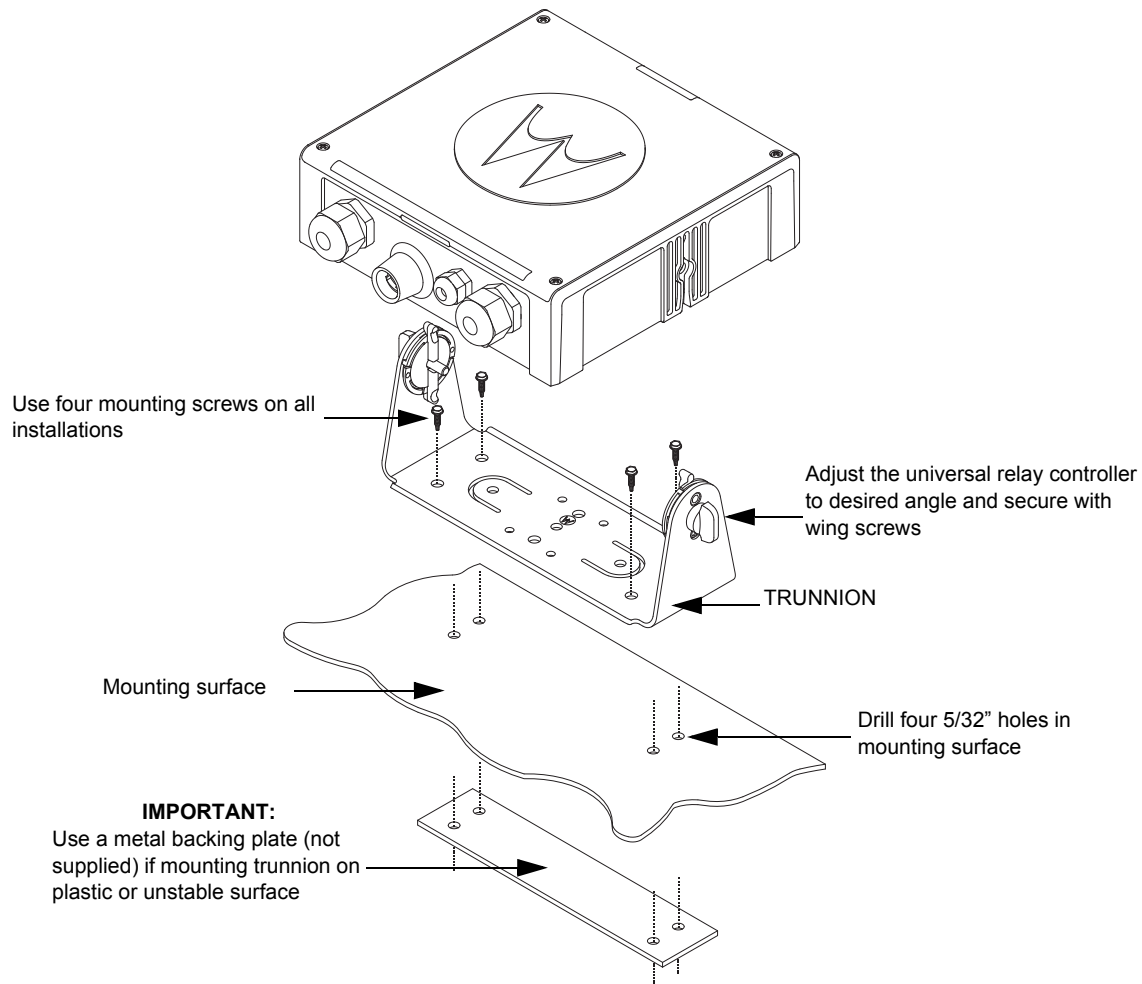
Figure 3-2. Universal Relay Controller Installation Exploded View

3.2   O7/O9 Universal Relay Controller Cable Assembly

3.2.1   Power Cable

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 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 steps 1 to 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   Ground Cable

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.

NOTE: 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.
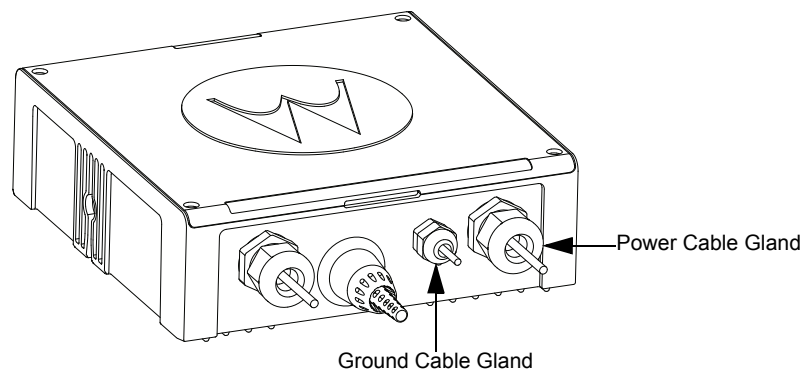
Figure 3-3. Power and Ground Cable Glands
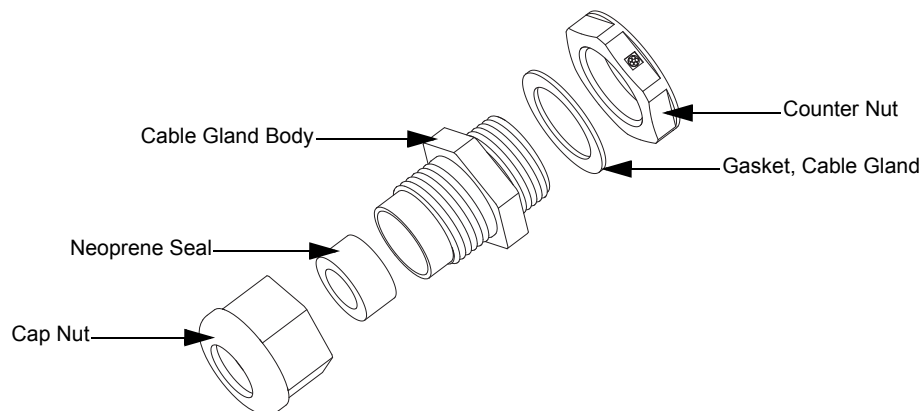
Figure 3-4. Cable Gland Assembly with Gasket

3.2.3   Wires

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" to 0.148"), with wire gages ranging from AWG 12 – 20.

2. Each individual loose wire (prior to stripping off the wire jacket) needs to be inserted one at a time through the chassis. Ensure the lightbar wire is straight before inserting the wire into the chassis. Each wire is sealed individually by the radial gasket seal. When a thick wire (i.e. AWG 14 wire or wire OD > 2.90 mm) is inserted through the chassis, there is potential torn at the rubber gasket. Remove the rubber gasket residual and continue to the next step.

3. Thin wires 2.5 mm and below should be dressed into the retention feature using a black stick (see Figure 3-5); thick wires above 2.5 mm should be routed above the retention feature. Strip off the wire until 7.94 mm (5/16") after the wire is inserted into the URC, and install the wire into respective lightbar terminal block.

4. Cover the lightbar gasket retainer's hole with seal, gasket and ground cable gland, if no wire is inserted.
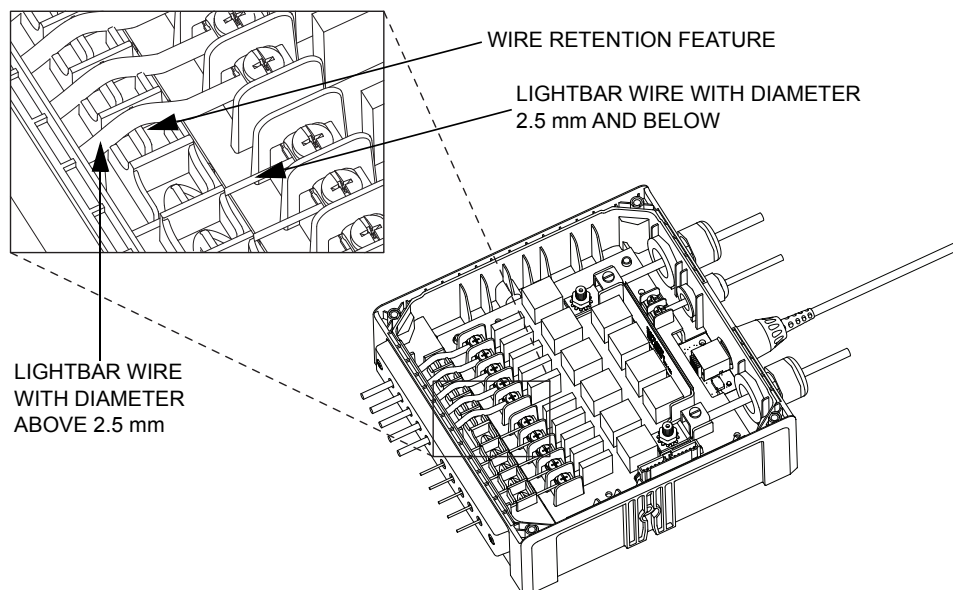
Figure 3-5. Wires Installation
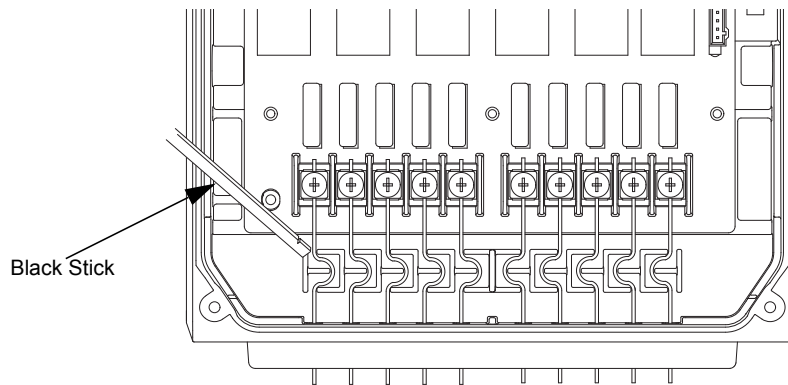
Figure 3-6. Wire Installation with Black Stick

5.   The lightbar gasket should be replaced at each reassembly of the wire.

NOTE: Use of other cable gages 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 splitted before being assembled to the URC system. Wires kit (PMKN4109_) is provided to ease installation of the URC. Incorrect use of the wires kit, e.g. improper connection at external loose end wires, may impact the robustness of the URC.

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

3.2.4   O7/O9 to URC Cable

The O7/O9 to URC cable (Motorola part number 3064153H02) can be assembled either before or after reassembling the top housing. Assemble the RJ45 port of the cable into the RJ45 connector on the URC and turn the locking collar instead of cable, 90 degrees to the right to ensure it is locked properly. After that, test whether the cable is locked properly or not by trying to pull out the cable.
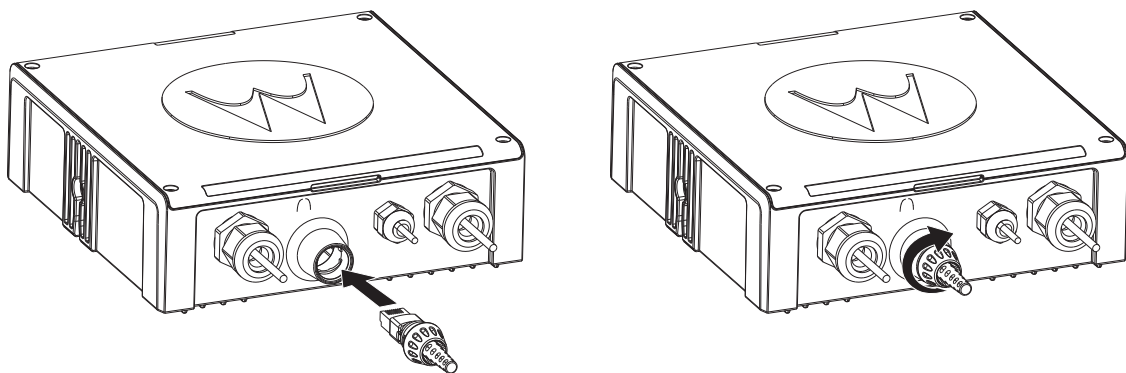
Figure 3-7. O7/O9 to URC Cable Installation

Notes

Chapter 4   Options and Accessories Installation

4.1   Dash-Mount Accessory Installation

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

Insert the male terminal into the accessory connector assembly in the appropriate location and connect the accessory connector assembly in the rear accessory port. Do not use other generic terminals in the plug. Generic terminals can cause electrical intermittencies and may cause damage to 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 4-1). Close the connector housing; route the finished cable from the switch location to the control head location.

NOTE: The emergency footswitch should be attached with A+ unattached.
A+ should be attached after successfully securing the screws in the connector.
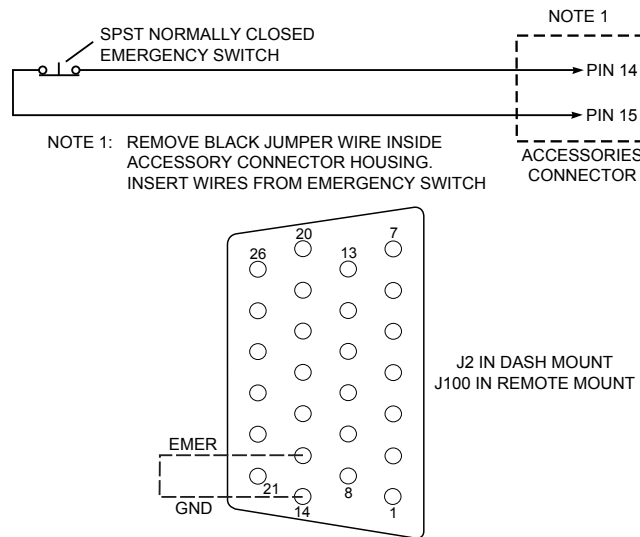
Figure 4-1. Emergency Switch Wiring Diagram

> ⚠ **C a u t i o n**
>
> The radio is sold with correct accessory cables and jumpers in order to have emergency de-activated by default, regardless of the setting in 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 as well as excessive current drain of the vehicle's battery when the engine is off.

4.1.2 Dash-Mount Horn and Lights (External Alarms) Relays

NOTE: For installations that use the horn/lights option, select a suitable location for mounting (normally under the dash) and, referring to Figure 4-2, perform the following procedure:

1. **Horn Relay** – Connect the relay contacts across the horn ring switch, typically found in the steering column. Open the accessory cable connector and connect the two control wires (male pins) into locations 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.
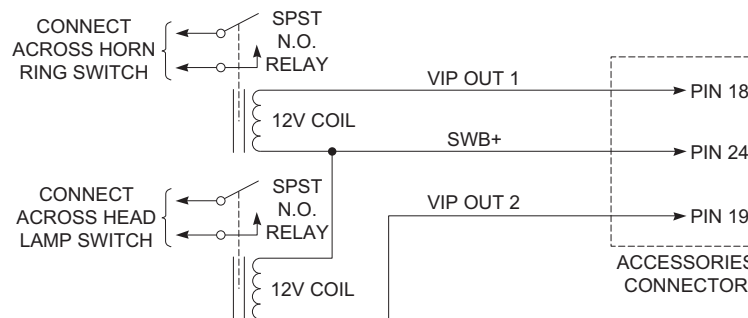
Figure 4-2. Horn/Light Wiring Diagram
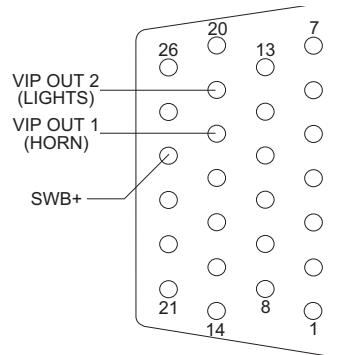
Figure 4-3. Radio MAP Connector

4.2 Remote-Mount Accessory Installation

Perform the following installation procedure:

1. Select an appropriate place to mount the option or accessory hardware.

2. Route the accessory-to-control head cables under floor coverings or behind panels so that the vehicle occupants do not snag or break the wires.

3. Attach wires from the accessory to the appropriate wire on the VIP cable (see Table 4-1 and Table 4-2).

> ⚠️ **Caution**
> The radio is sold with correct accessory cables and jumpers in order to have emergency de-activated by default, regardless of the setting in 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 as well as excessive current drain of the vehicle's battery when the engine is off.

4.2.1 Emergency Pushbutton or Footswitch Installation

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 will short the pins when in-active. When the button/switch is pressed, its contact opens, the emergency path is un-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 connector, all jumper wires, shorting emergency to ground, must be removed so button/switch press can be detected.

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.

It is recommended to install a failsafe/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 4-4. Place the manual button at a suitable and reachable location, yet not easily seen.
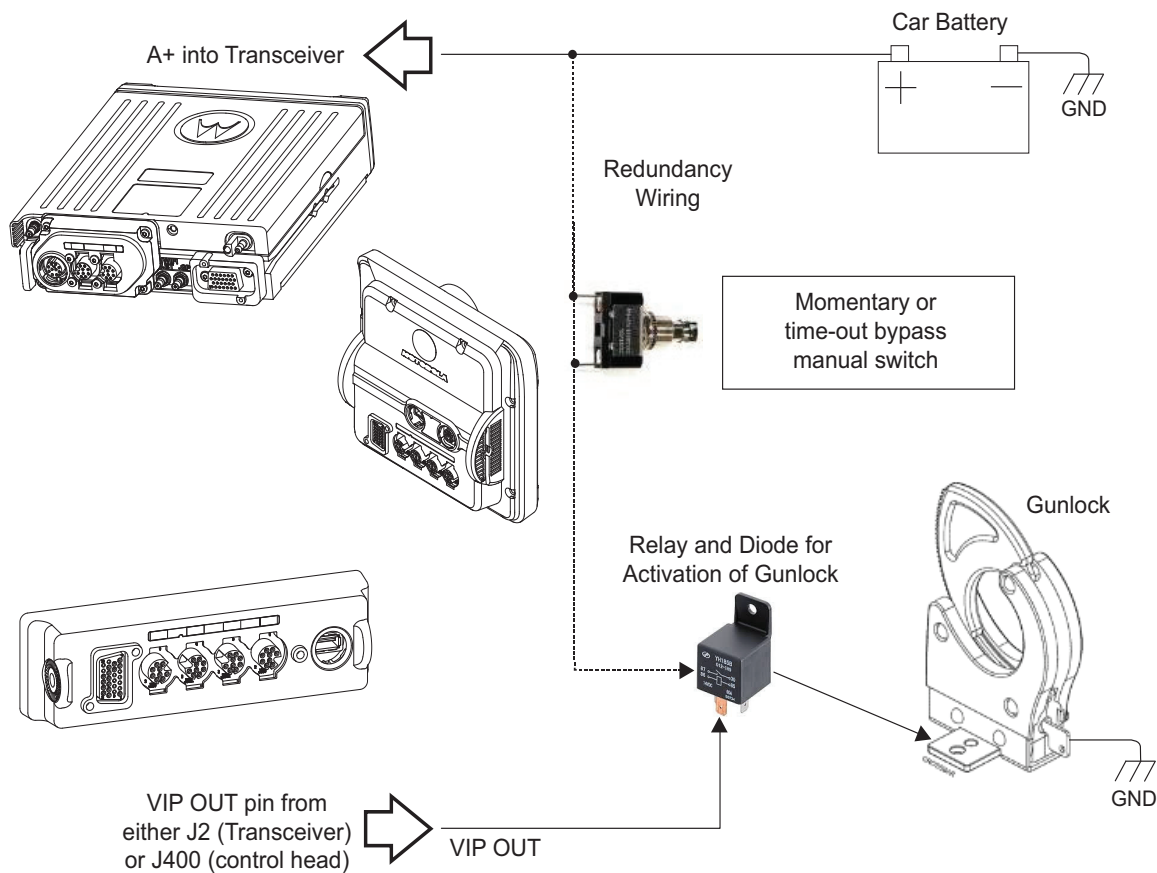
Figure 4-4. Gunlock Switch Redundancy Diagram

NOTE: Refer to section 4.3.1 for information related to wiring and activation of VIPOUTs

The Y-cable KT000247A01 is primarily designed to allow for simultaneous operation of the Motorola Branded SB9600 siren and still retain duplicate access to all the MAP (J2) connector pins located on the APX 8500 remote TIB. Use of emergency accessories, speakers, programming cables, VIPS, etc are possible via the P3 connector of Y-cable KT000247A01. The 26pin connector P2 does not contain every signal from the legacy DB25 port, called J600 on the APX 7500. Therefore, some legacy functionality (i.e. A+) is reduced with the APX 8500 remote mount configuration compared to the APX 7500 remote mount configuration.

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 4-5 shows wiring diagrams for connecting the Horn-Ring via a transfer relay for both negative and positive ground systems. Refer to the siren/PA manual (6881093C18) for more information.
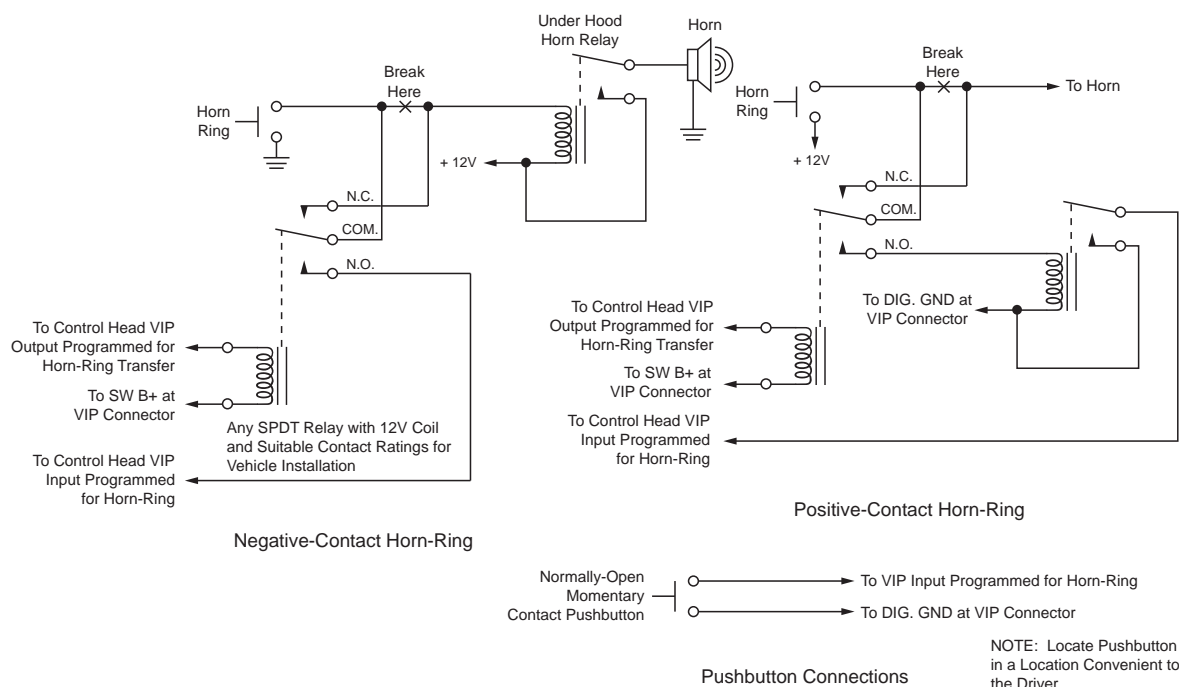
Figure 4-5. Siren/PA Horn-Ring Connections

4.2.6 Record Audio Out Jack of Transmit and Receive Audio

The use of Power Cable kit HKN6187_ (see Figure 2-34) provides access to both the transmitted audio speech, as well as the received audio speech. This 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 2-34) provides the ability to use 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 will turn mute.

4.2.8 USB Data Cables

It is recommended that the USB 1.5 meter data cable HKN6163_ is used for both dash mount configurations (at J2 connector) and for remote mount configurations (at J100 connector). This is 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 meter (15 feet) data cable HKN6172_ is recommended for remote mount configurations only (at J2).

If the customer intends to use the HKN6172_ for dash mount configurations (at J2), the cable's 26-pin connector must be opened and an emergency jumper-wire placed across pins 14 and 15. Refer to Figure 4-1.

4.2.9 RS232 Cables

The following are RS232 cables. Although not compatible with CPS radio reading or programming, they can be used for interfacing with RS232 accessories or RS232 computer programs. HKN6160_ is a 6 feet dash RS232 cable from J2 connector. HKN6161_ is a 20 feet dash RS232 cable from J2 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).

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

VIP CONNECTOR PIN-OUT

Figure 4-6. Remote Control Head Pinouts

YELLOW RING
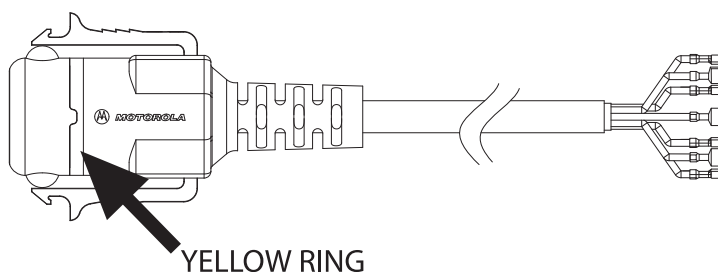
Figure 4-7. HKN6196_ VIP Connector Detail

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 Figure 2-10. 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 4-1. VIP Output Connections

VIP OUT #	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. This is 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 4-8 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.

SW B+

VIPout

Relay

Protection Diode

N.C.

N.O.

Note:
To 'activate' a VIPOUT, you have to ground the VIPOUT, such that the current now flows thru the relay coil to GND through a MOSFET inside the radio or control head, which causes the relay wiper to toggle. The MOSFET of a VIPOUT should never be used to directly drive an accessory. The MOSFET should be used to control an external relay.

Figure 4-8. Relay Coil

NOTE: See Appendix A: Replacement Parts Ordering to order relay's 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. There are three VIP input connections, as follows:

Table 4-2. VIP Input Connections

VIP IN #	J400		J2	
	Ground Pin Number	**On/Off Switched Pin Number**	**Ground Pin Number**	**On/Off Switched Pin Number**
1	2 (green)	8 (white)	NA	NA
2	2 (green)	9 (orange)	NA	NA
3	2 (green)	10 (violet)	NA	NA

NOTE: 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 Section 2.2.2.4 for further information.

	APX mobile radios equipped with the following features are capable of transmitting automatically, even if the radio is turned off:
⚠️ **C a u t i o n**	• Automatic Vehicle Location • Other Special Data Products All APX mobile 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   Accessory Connector Assembly Details (P2)

The APX mobile accessory connector assembly is mounted on the right rear of the radio, opposite the antenna and adjacent 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 designed to be 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 will be set to emergency mode.

39800834F05 is the crimping pin part number for use with any wires used inside the accessory cable connector.

4.4.1   Disassembly and Assembly

4.4.1.1 Disassembly

1. Disconnect the negative terminal from the vehicle's battery. Make sure that the battery cable is secured such that it will not power the vehicle's 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 it does not come out. Do not overload the wire: severe damage will result to the plug.

4.4.1.2 Assembly

1. Place the plug in one cover. Be sure that the flange of the plug is in the slot of the cover. See Figure 4-9.

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 assembly's wire chamber.

4. Place the second cover onto the plug. Be sure that the flange is protruding through both covers.
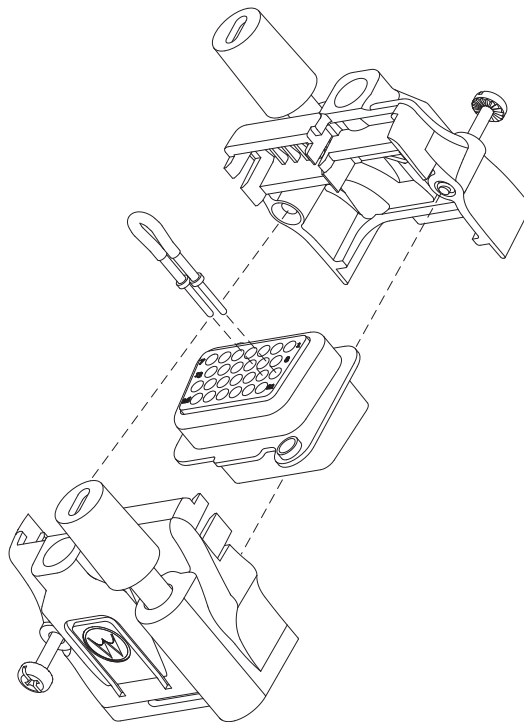
Figure 4-9. Exploded View of Accessory Connector Assembly (HLN6863_)

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 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.

NOTE: See APX Mobile Basic Service Manual for more detailed descriptions of these pins and other connectors located in the APX mobile radio.

4.5   Motorola Branded SB9600 Siren Connection to APX 8500
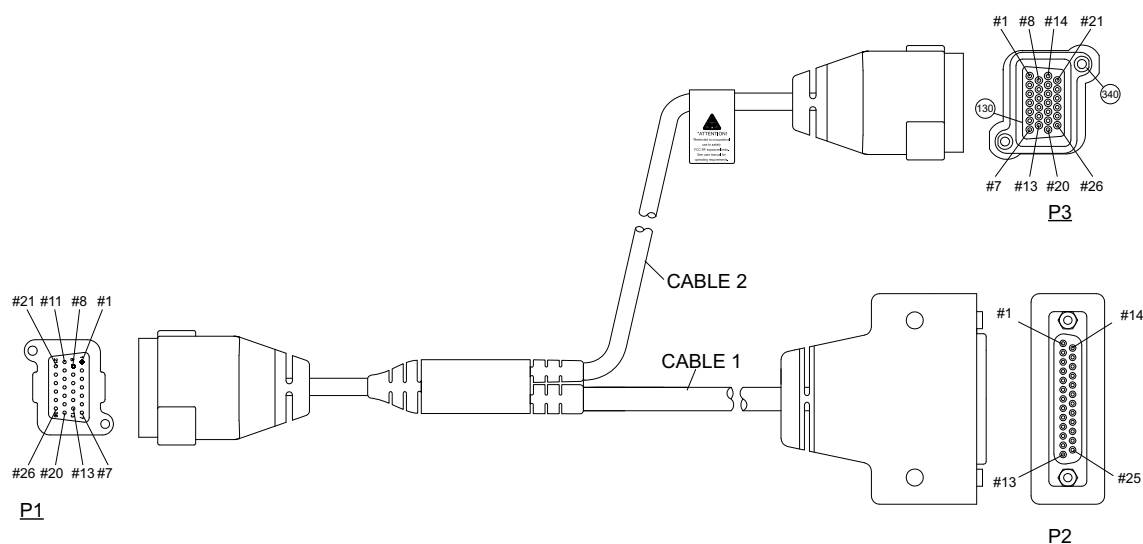
Figure 4-10. J600 Accessory Connector Y-Cable KT000247A01

CONNECTION

P3		P1		P2
1	22 AWG YELLOW	1	22 AWG YELLOW	10/11
	SPIRAL		SPIRAL	
CUT		2		5
	22 AWG BROWN		22 AWG BROWN	
CUT		3		14
	SPIRAL		SPIRAL	
4		4		2
	SPIRAL		SPIRAL	
5		5		3
	22 AWG ORANGE		22 AWG ORANGE	
6		6		CUT
	22 AWG WHITE		22 AWG WHITE	
7		7		CUT
	SPIRAL		SPIRAL	
CUT		8		19
	22 AWG BLACK		22 AWG BLACK	
CUT		9		23
	22 AWG PINK		22 AWG PINK	
10		10		8/17
	22 AWG PURPLE		22 AWG PURPLE	
11		11		4
	22 AWG GRAY		22 AWG GRAY	
12		12		CUT
	22 AWG TAN		22 AWG TAN	
13		13		CUT
	22 AWG DRAIN		22 AWG DRAIN	
14		14		18/21
	22 AWG BLUE		22 AWG BLUE	
15		15		13
	22 AWG RED		22 AWG RED	
16		16		1
	22 AWG GREEN		22 AWG GREEN	
17		17		CUT
	18 AWG RED		18 AWG RED	
18		18		15
	18 AWG YELLOW		18 AWG YELLOW	
19		19		CUT
	22 AWG LIGHT BLUE		22 AWG LIGHT BLUE	
20		20		25
	22 AWG LIGHT GREEN		22 AWG LIGHT GREEN	
21		21		6/9
	18 AWG ORANGE		18 AWG ORANGE	
22		22		CUT
	18 AWG BROWN		18 AWG BROWN	
23		23		12
	22 AWG BROWN/WHITE		22 AWG BROWN/WHITE	
24		24		20/22
	22 AWG BLACK/WHITE		22 AWG BLACK/WHITE	
25		25		16
	18 AWG BLACK		18 AWG BLACK	
26		26		24

Figure 4-11. Pinout for cable KT000247A01

Siren Cable
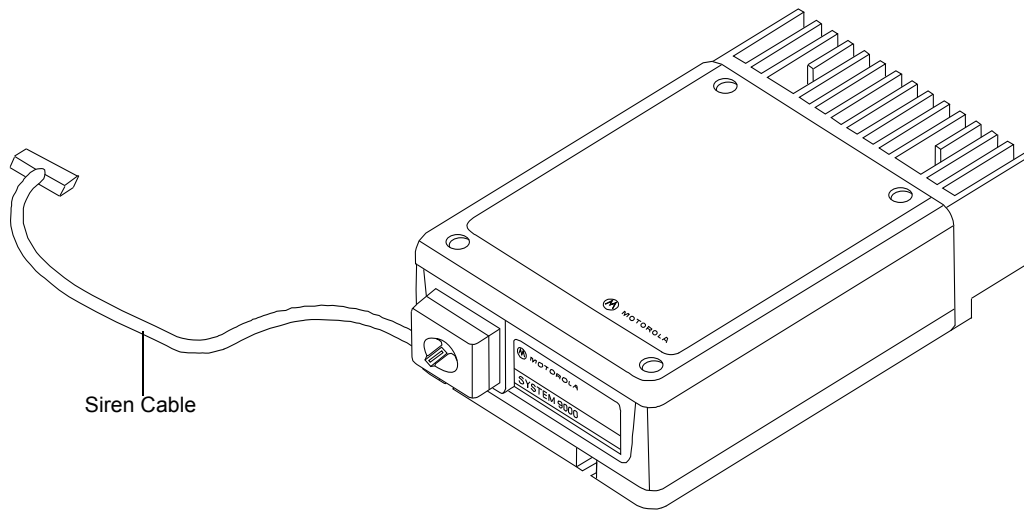
Figure 4-12. Interfacing the Y-cable to the Motorola Branded SB9600 Siren and External Accessories

The Y-cable KT000247A01 is primarily designed to allow for simultaneous operation of the Motorola Branded SB9600 siren and still retain duplicate access to all the MAP (J2) connector pins located on the APX 8500 remote TIB. Use of emergency accessories, speakers, programming cables, VIPS, etc are possible via the P3 connector of Y-cable KT000247A01. The 25pin connector P2 does not contain every signal from the legacy DB25 port, called J600 on the APX 7500. Therefore, some legacy functionality (i.e. A+) is reduced with the APX 8500 remote mount configuration compared to the APX 7500 remote mount configuration.

NOTE: Only USB 1.5 meter data cable HKN6163_ is approved for use in series with the Y-cable KT000247A01 at connector P3. USB 4 meter data cable HKN6172_ is not approved for use in series with the Y-cable at connector P3.

4.6 Compatibility of Emergency when Attaching a Motorola Branded SB9600 Siren

When using emergency footswitch or pushbutton with siren/PA configuration, **REMOVE** pin 8 (emergency) from the siren connector of the HKN4363_ siren cable as follows:

Siren Cable
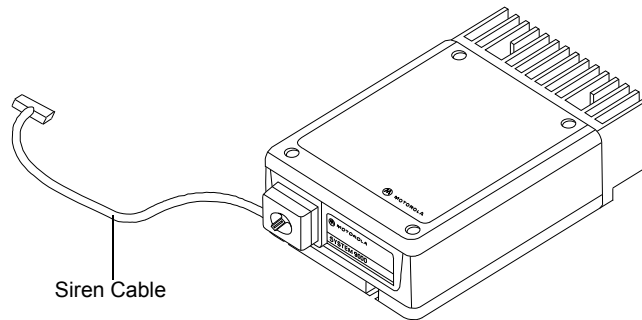
Figure 4-13. Field adjustment for Emergency Operation with Siren Accessory

1. Remove the knob from the siren/PA cable connector.

2. Remove all four screws from the connector in the siren/PA cable.

3. Open the connector cap and locate pin 8.

4. Using the contact removal tool (6684690C02), remove pin 8 from the connector.

5. Put the connector cap in place and proceed to reinstall the four screws and the knob.
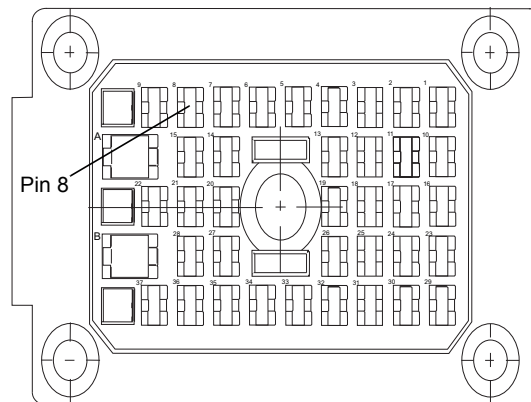
Pin 8

Figure 4-14. Location for Pin 8

Notes

Chapter 5   Motorcycle Radio Installation

5.1   Motorcycle Radio Description

The motorcycle model includes all the same components in the standard radio. The following paragraphs describe the unique items provided with the motorcycle models.

A small label is included with the motorcycle radio, which can be placed on the radio to identify it as a motorcycle radio. The label should be placed on a flat and protected area to avoid damage during handling. See Figure 5-1.
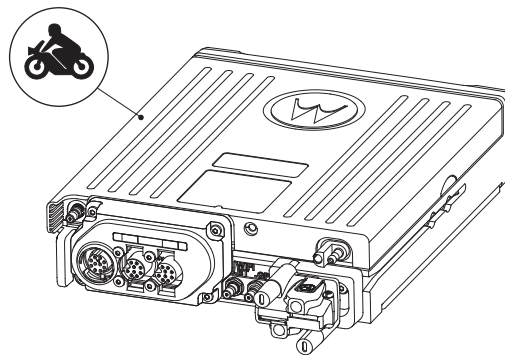
Figure 5-1. Identification of a Motorcycle Radio by Using a Label

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 control head, which also is weather-resistant. 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's 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's 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's 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 various headset accessories that provide hands-free operation of the radio. Motorola does not manufacture headset equipment, but provides the interconnection for headset equipment with the motorcycle radio. Aftermarket headset equipment is available through Motorola (see Appendix A: Replacement Parts Ordering).

> ⚠️
> **Caution**
>
> To avoid loud audio, refer to the CPS help menu for audio settings if the Motorola mobile radio is used with any motorcycle helmet headset.

5.1.7   Antenna

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

5.1.8   Ignition Sense (ACC) Wire

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

The radio is wired so that transmission is inhibited if the motorcycle's 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

5.2.1   General

All APX mobile radios are tested and inspected before shipment. It is, however, 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".

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 antenna(s) to the weather-resistant enclosure.

A universal mounting plate, supplied by Motorola, 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 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 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.

5.2.2   Important Motorcycle 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 5-19.

- 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(s) are designed for mounting on the top of the weather-resistant enclosure and an adequate metal ground plane.

- 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 (HMN1079) is not connected.

5.2.3 Parts Identification

The following installation procedures refer to Figure 5-2 through Figure 5-20. Detailed descriptions of the mounting hardware used in each procedure are provided in parts lists located in the exploded views located in the APX Mobile Basic Service Manual (see related documentation). Those parts supplied by Motorola 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
- Antenna

5.2.4 Order of Installation

Before starting the installation, familiarize yourself with the mounting hardware (see Figure 5-2 through Figure 5-20). Perform the installation procedures in the order that follows.

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 antenna(s) on the enclosure.

5.3   Installing the Universal Mounting Plate

The universal mounting plate, supplied with the motorcycle radio, must be mounted on the motorcycle first. It provides the base on which the weather-resistant enclosure is 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 5-2 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 will aid in the installation procedure.

- A minimum of holes are predrilled 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 will 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 the above 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, thereby, providing good electrical contact with the underside of the motorcycle carrier or motorcycle frame.
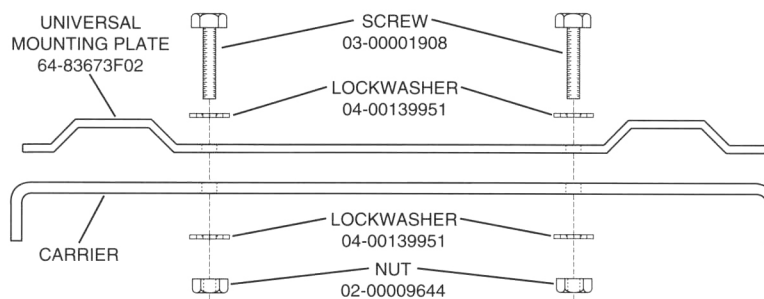
Figure 5-2. Universal Mounting Plate Installation (Part of Radio Enclosure Kit)

Follow the procedures below to mount the universal mounting plate to the motorcycle (see Figure 5-2).

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   Installing the Speaker and Control Head

NOTE: To disable the internal speaker of the O2 Control Head, please refer to Section 2.5.1: "Internal Speaker Disassembly" .

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 5-4) supplied by Motorola. Alternately, the control head may be mounted by itself using a smaller control-head bracket supplied by Motorola. 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.
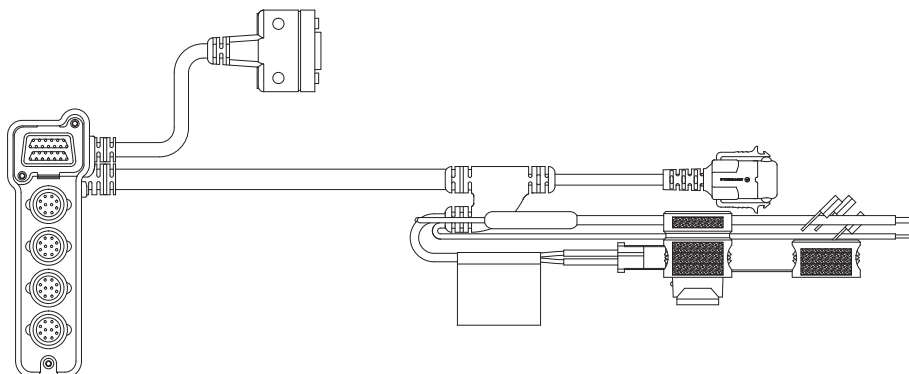
Figure 5-3. Motorcycle Control Head Cabling (3075217A01)

5.4.1   Handlebar Installation with Speaker and Control Head Mounted Together

Figure 5-4 illustrates the combination speaker/control head bracket. This combination bracket is used only when the control head and speaker are to be mounted as a unit. Also illustrated in Figure 5-4 is a 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 5-4. 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 Section 5.6: "Installing the Microphone Hang-Up Clip" for the hang-up clip procedure. Install the speaker and control head as described below.

1. Determine the location where the speaker/control head is to be mounted. Consider how the speaker/control-head bracket may be mounted, and whether or not a handlebar-mounting bracket is needed. Take care to select a location that is not only mechanically convenient, but is located for ease of operation.

NOTE: 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. Then, retighten screws to 20 in-lbs torque. This concludes the speaker/control-head installation.

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 5-5 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 in order to attach mounting hardware, and to route cables later.

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

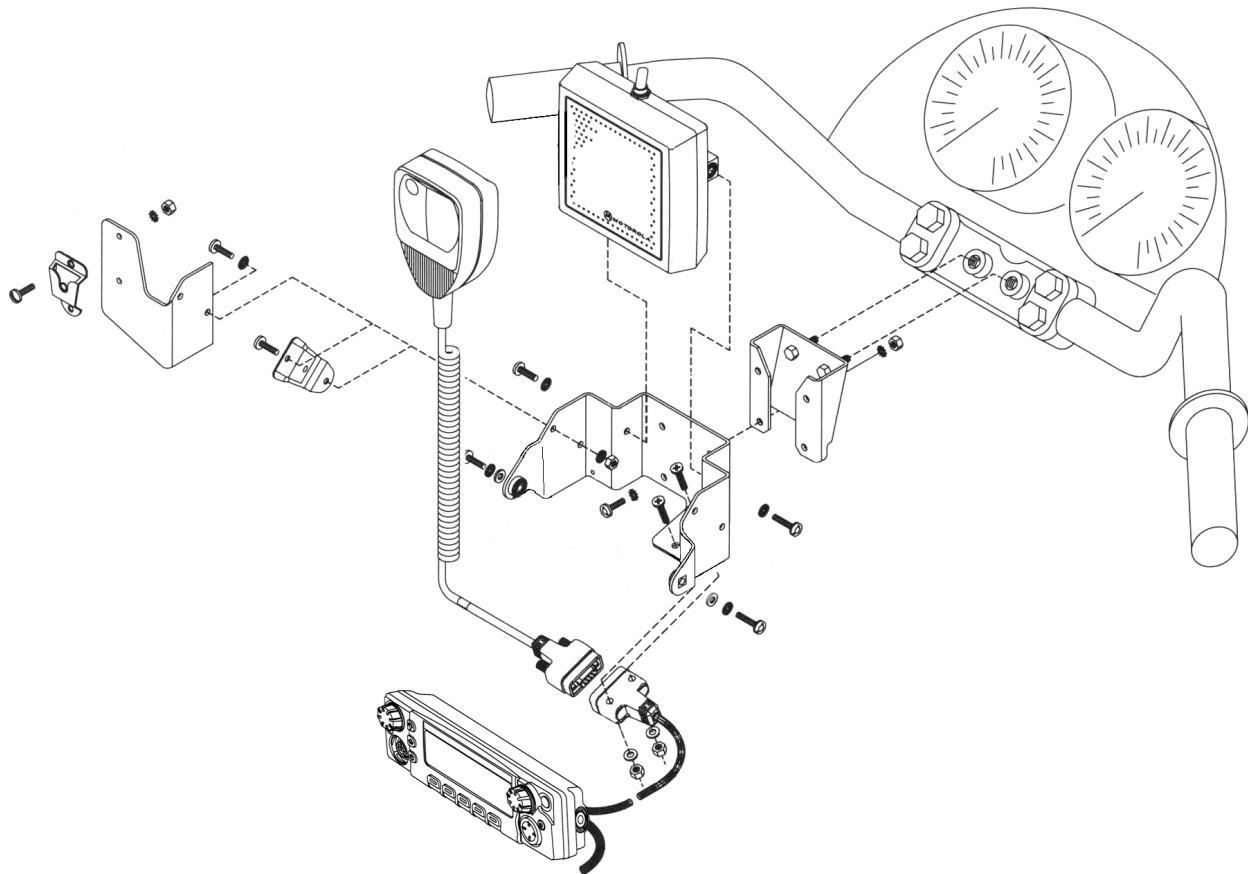Installation using this method is the same as in Section 5.4.1: "Handlebar Installation with Speaker and Control Head Mounted Together" .

Figure 5-5. 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 07-80127N02) and mount the speaker and microphone hang-up clip in another location on the motorcycle.

Before installing the control head using the bracket described above, the control-head end of the control-head cable should be temporarily fastened to the control head, and the control head fastened to its bracket. Motorola-supplied spacers and the 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.

Follow these procedures when mounting the smaller control-head bracket:

1. Determine the location at which the control head is to be mounted. Take care to choose a location that is not only mechanically convenient, but is located for ease of operation.

2. Securely mount the Motorola-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. (Cable routing directions appear later in this section.)

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. Tighten firmly. This concludes the control-head installation.
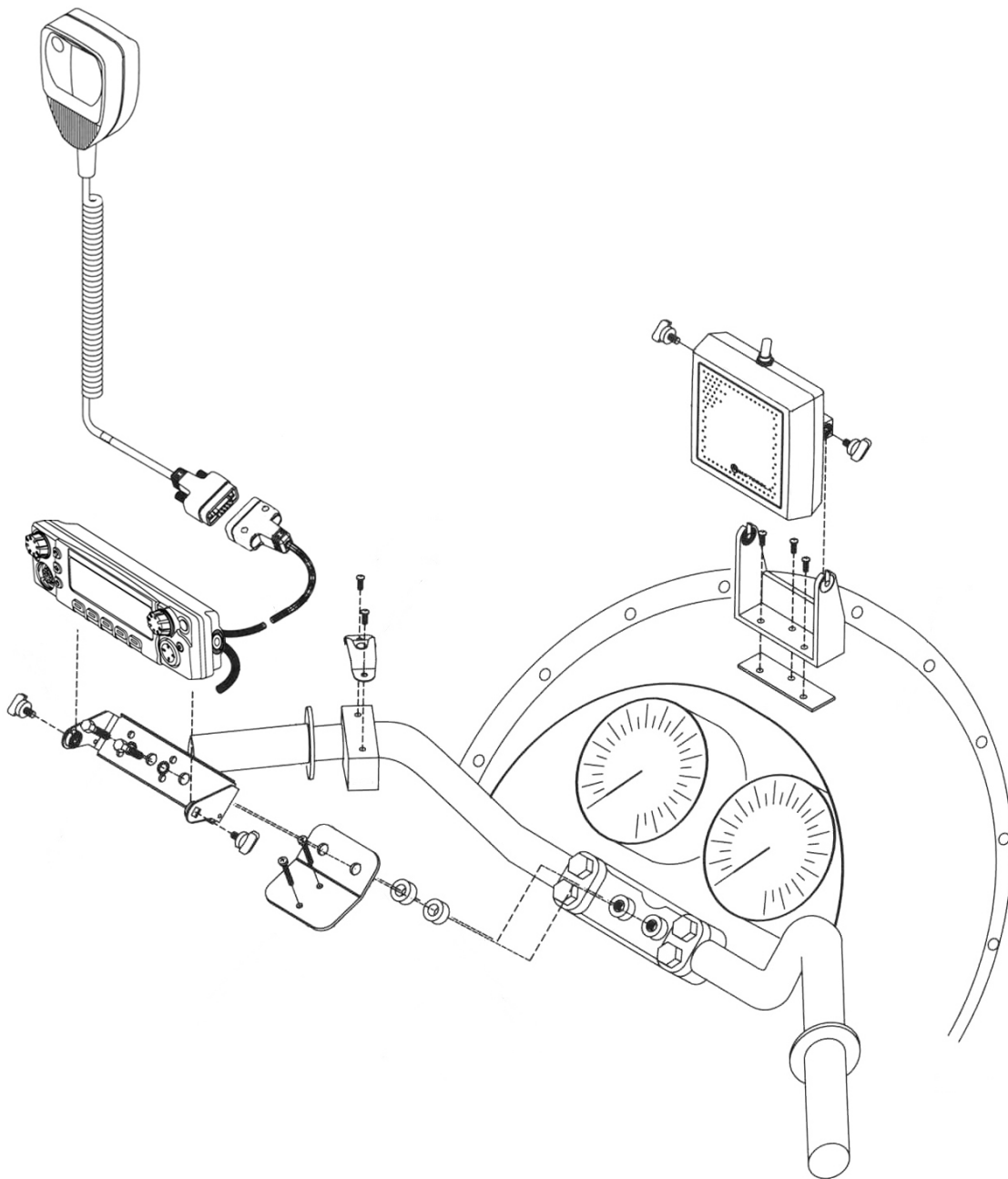
Figure 5-6. Handlebar Installation with Speaker and Control Head Mounted Separately

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 5-7. Fuel Tank Console Installation with Speaker and Control Head Mounted Separately

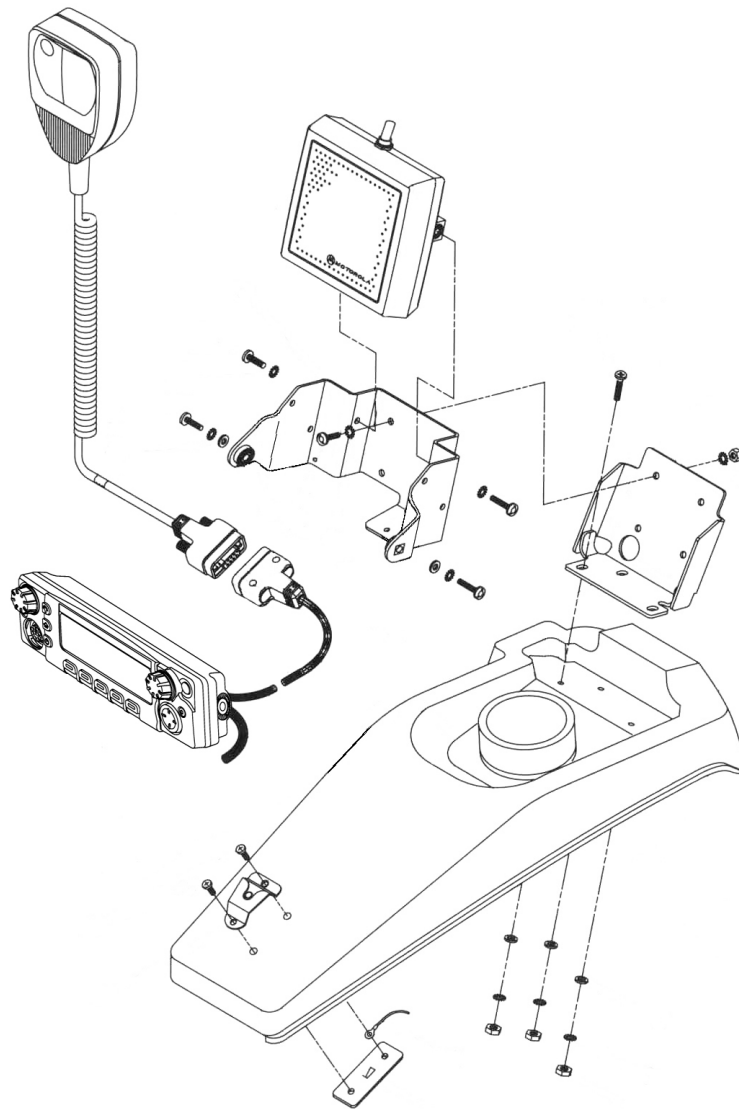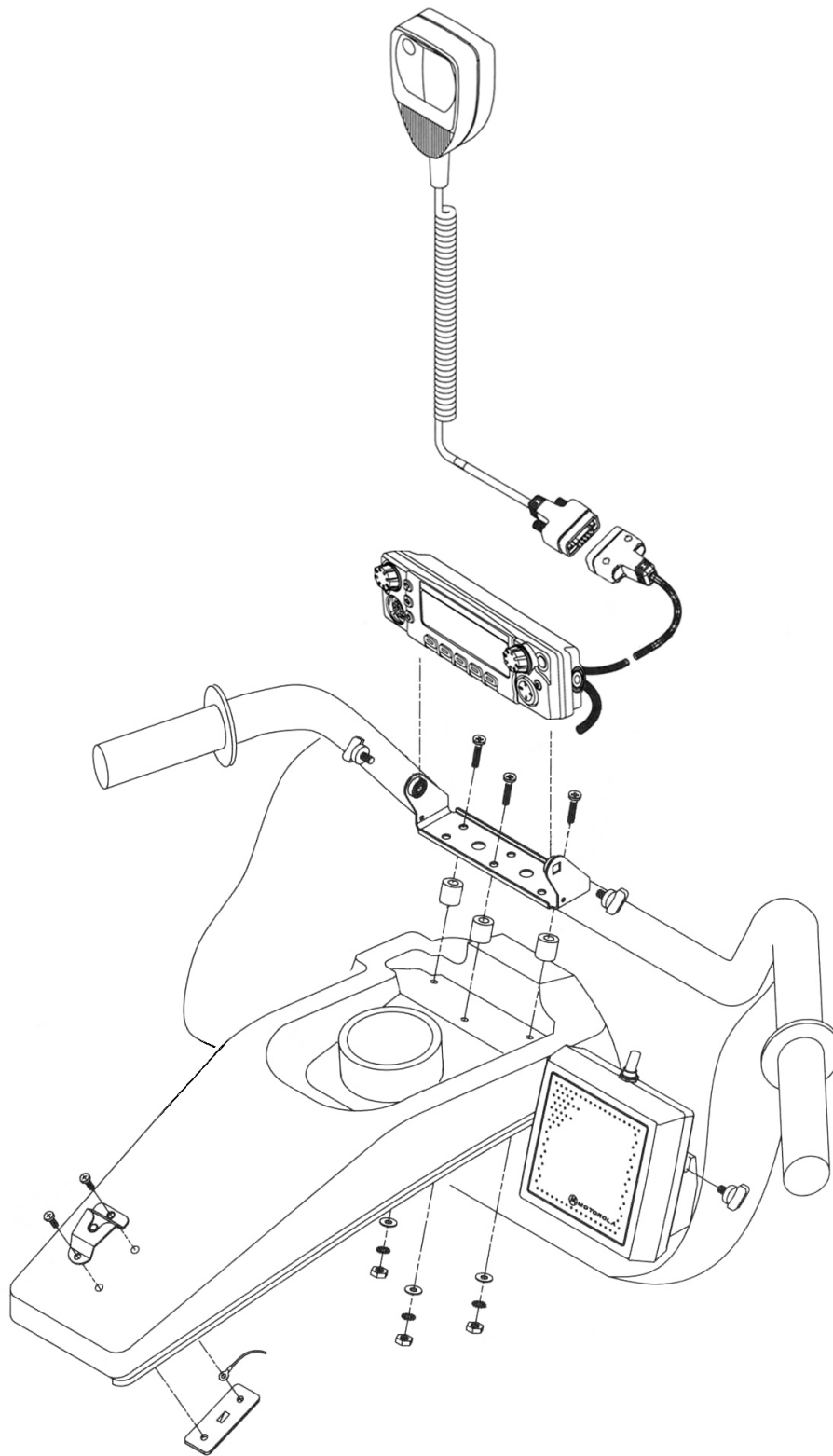Installation is the same as detailed in Section 5.4.2: "Fuel Tank Console Installation with Speaker and Control Head Mounted Together" and Section 5.4.3: "Handlebar Installation with Speaker and Control Head Mounted Separately" .

5.5   Installing the Speaker

NOTE: To disable the internal speaker of the O2 Control Head, please refer to Section 2.5.1: "Internal Speaker Disassembly" .

Use the following procedure when the speaker is mounted separate from the control head. 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.

1. Determine the location in which the speaker is to be mounted and whether there is a requirement for a customer-supplied bracket.

2. Fabricate a bracket if required. Use the Motorola-supplied speaker bracket as a template for drilling mounting holes. Also drill holes in the fabricated bracket for mounting to the motorcycle.

3. Mount the fabricated bracket to the motorcycle chassis.

4. Mount the Motorola-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. Directions for speaker cable routing appear later in this section. Speaker mounting is now complete.

5.6   Installing the Microphone Hang-Up Clip

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 5-4. Determine the mounting location and install as described in the following paragraphs.

NOTE: 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

Using this method, you can mount the clip so that it faces the operator.

1. Attach the bracket to the speaker/control-head bracket using two machine screws, four lock washers, and two nuts as shown in Figure 5-4.

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 5-4.

4. Torque nuts to 20 in-lbs torque.

5.6.2   Speaker/Control Head Bracket Side Mounting

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 5-4. Torque nuts to 20 in-lbs. torque.

5.6.3   Other Hang-Up Clip Mounting

To mount the microphone hang-up clip in another location, a customer-supplied bracket may be used. 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 5-5, Figure 5-6, and Figure 5-7 for alternative microphone hang-up clip mounting methods.

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, Cables and Multiplexer

NOTE: Antenna hole placement and cable routing in 700/800, VHF and UHF antenna manuals are not applicable for the APX Series.

The GPS antenna assembly must be done after the removal of the metal liner but before reinstalling the APX Series liner.
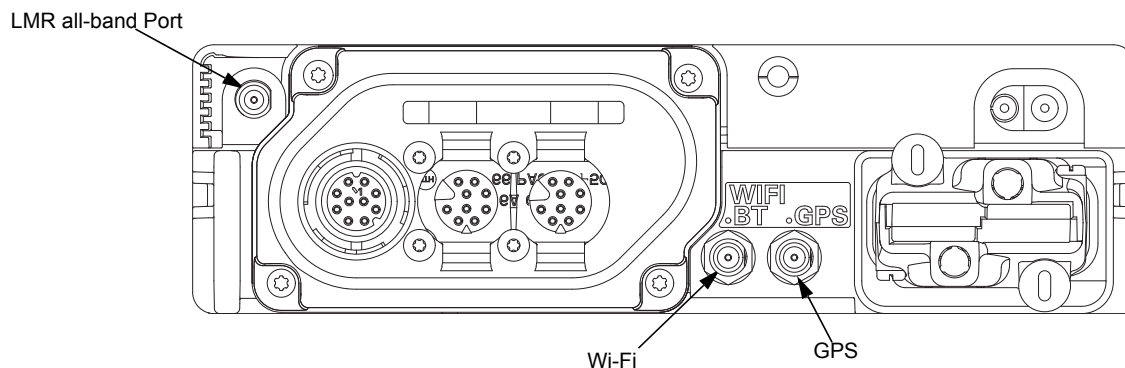
Figure 5-8. Antenna Band Identification

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 APX Series products.

3.   Place the metal liner with two round, depressed areas toward the enclosure hinge and 1 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's 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. Referring to Figure 5-9, these areas are either VHF or UHF depending on the antenna port locations. For the GPS antenna, use the 1 inch hole near the front of the housing near the lock.

Top Cover for APX Radios

Figure 5-9. Antenna Port Locations

6. These holes in the metal liner is used as a template to mark the position of the hole(s) to be drilled at the top cover. Follow the below guidelines for the various options.

7. Remove the metal liner from the top cover.

8. For LMR all-band antenna, use the Motorola RPX-4378A Hole-Cutting Saw or equivalent, and carefully drill a 3/4-inch hole at the marked locatio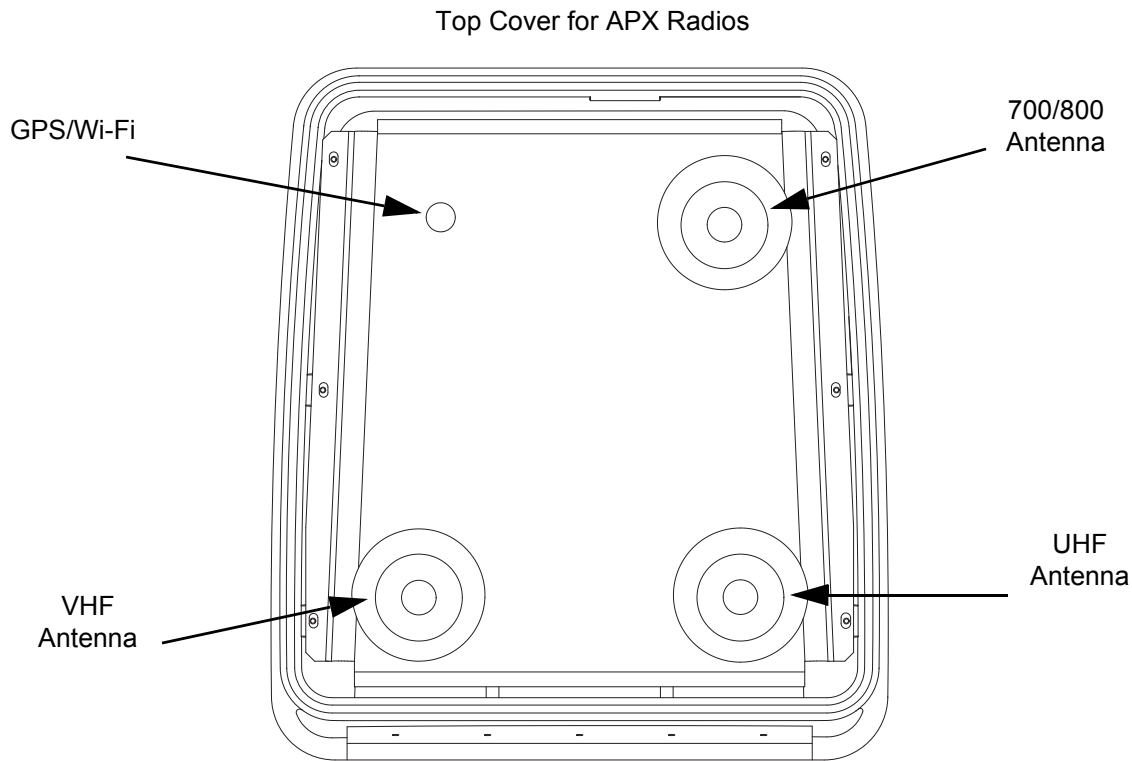n from the inside of the cover until the saw bottoms out. For the GPS/WiFi carefully drill a 1 1/16-inch hole at the marked location from the inside of the cover until the saw bottoms out. The saw should clean a neat circle to assure good contact between the antenna and the housing.

IMPORTANT: **For proper seating of the antennas, deburr and scrape any foreign matter from both sides of the hole, being careful not to mar the finish of the shell.**

9. Clean the mounting surface around the hole to remove dirt and wax.

10. Refer to the Motorcycle GPS Instruction Manual for further installation instruction for the GPS. GPS must be mounted before the APX metal liner is installed.

11. Reinstall the APX metal liner with the cable clamps provided in the weather-resistant housing.

12. Attach the 700/800, VHF or UHF antenna base per Antenna Installation Manual.

IMPORTANT: **Antenna Placement and Cable Routing in the Antenna Installation Manual is not applicable for the APX series.**

13. Route the coaxial cable for the 700/800, VHF or UHF antenna(s) through the cable clamps per Figure 5-11 for VHF hole, Figure 5-12 for 700/800 hole and Figure 5-13 for UHF hole.

> ⚠ Be sure to observe the correct routing of the antenna cable. Failure to do so can damage the cable.
>
> **C a u t i o n**

14. After routing cable, allow enough of the cable to reach the radio's antenna connector and cut off any excess length of the cable.

15. Install the connector per Antenna Installation Manual.

Cable Clamps need to be included and routing to be through cable clamps

NOTE: Do not cut the antenna cable

Cable routes underneath radio mounting plate and connects to multiplexer mounted underneath radio on the radio mounting plate

GPS/Wi-Fi cables connect to radio directly
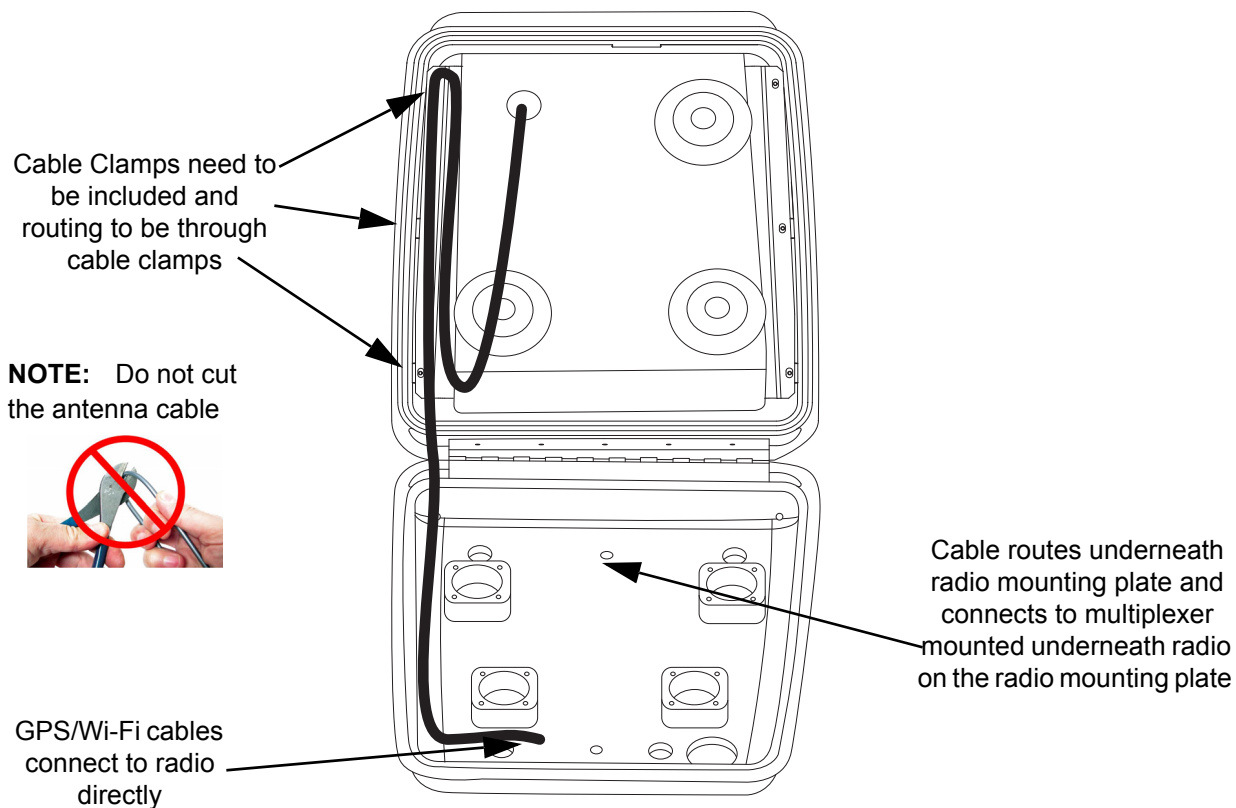
Figure 5-10. Routing the GPS/Wi-Fi Cable

Cable Clamps need to be included and routing to be through cable clamps

NOTE: Do not cut the antenna cable

Cable routes underneath radio mounting plate and connects to multiplexer mounted underneath radio on the radio mounting plate
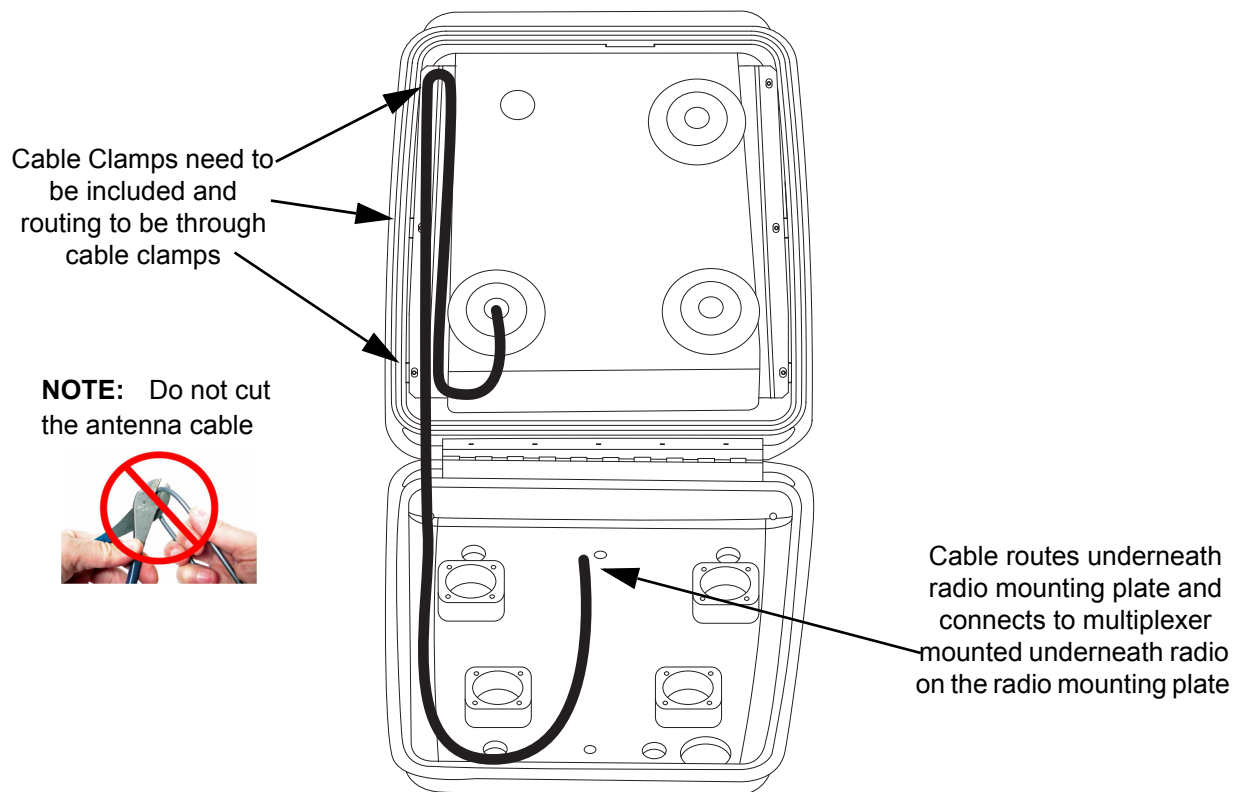
Figure 5-11. Routing the VHF Antenna Cable

Cable Clamps need to be included and routing to be through cable clamps

NOTE: Do not cut the antenna cable

Cable routes underneath radio mounting plate and connects to multiplexer mounted underneath radio on the radio mounting plate
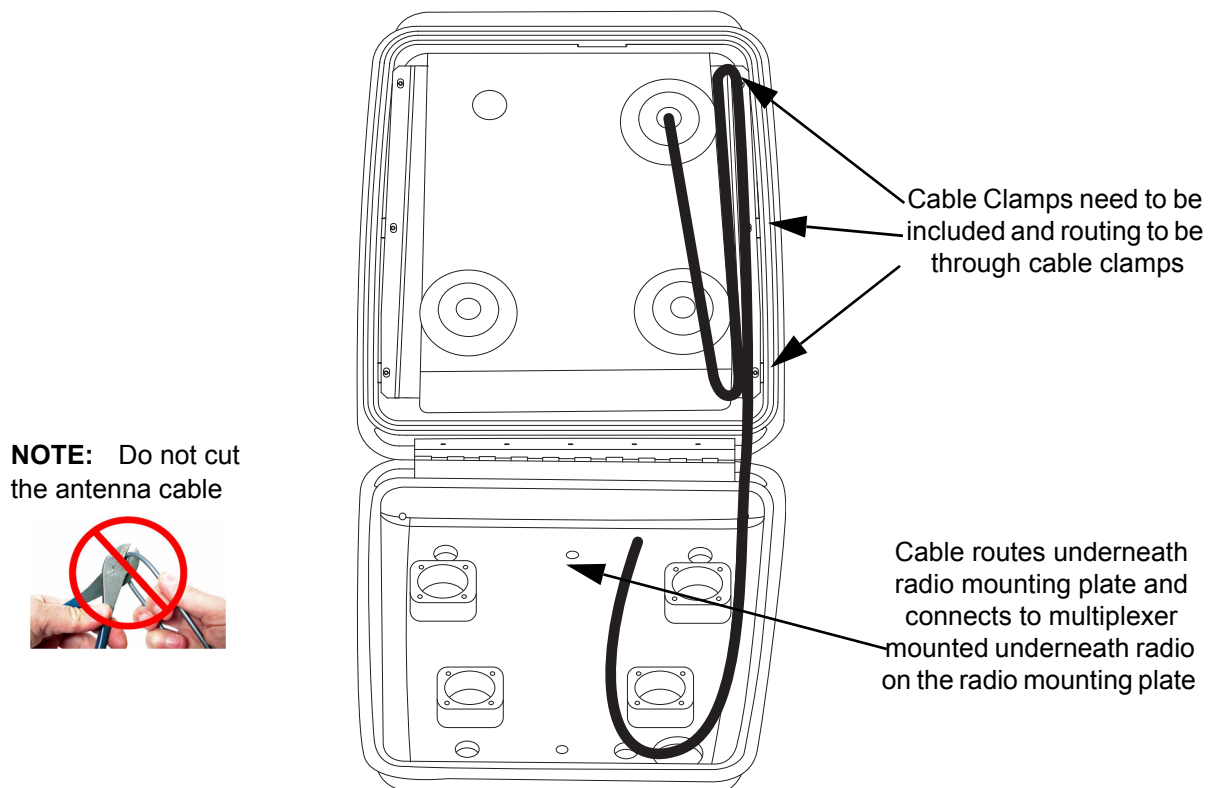
Figure 5-12. Routing the 700/800 Antenna Cable

NOTE: Do not cut the antenna cable

Cable Clamps need to be included and routing to be through cable clamps

Cable routes underneath radio mounting plate and connects to multiplexer mounted underneath radio on the radio mounting plate

Figure 5-13. Routing the UHF Antenna Cable
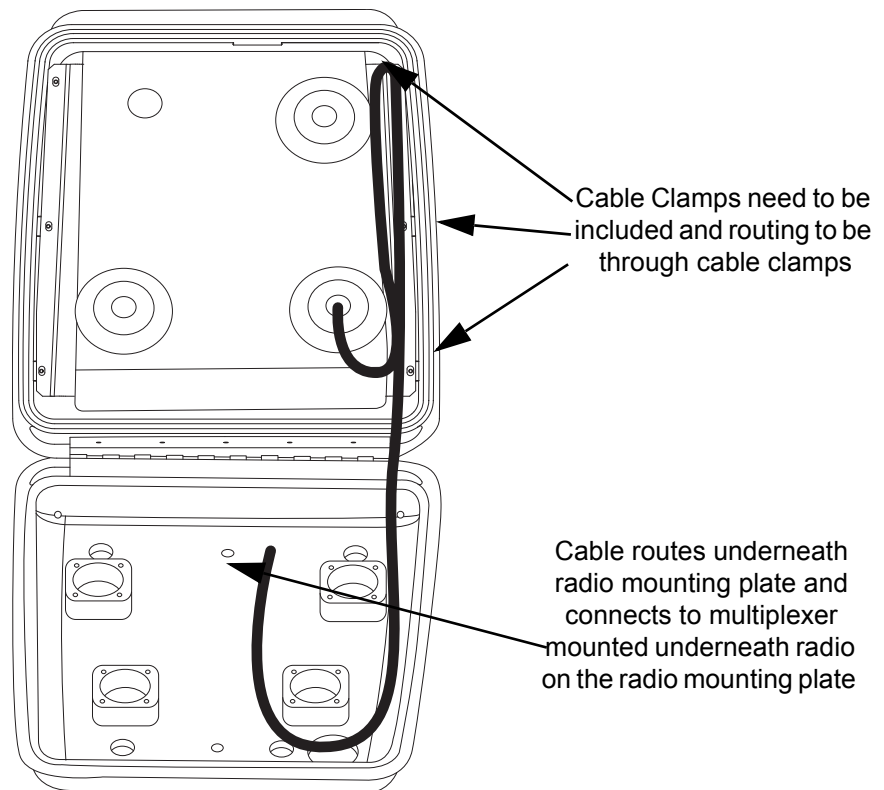

Figure 5-14. Multiplexer and Trunnion Mounting

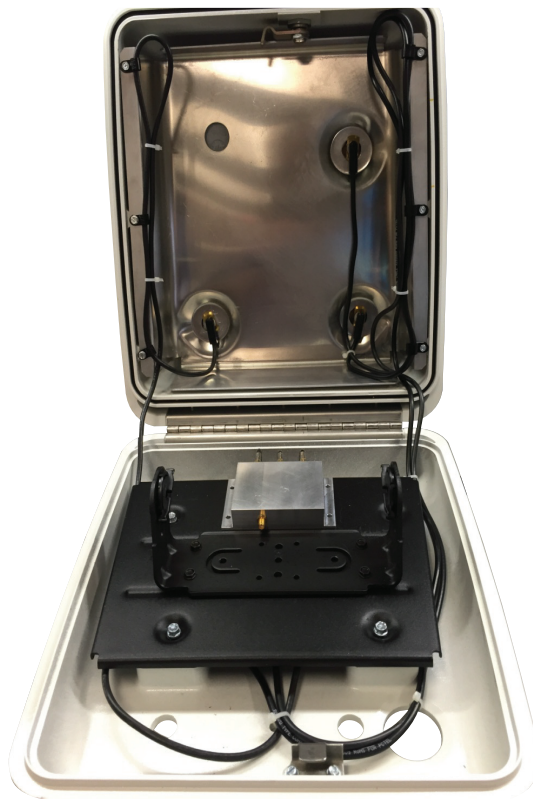**NOTE:** Do not cut the antenna cable

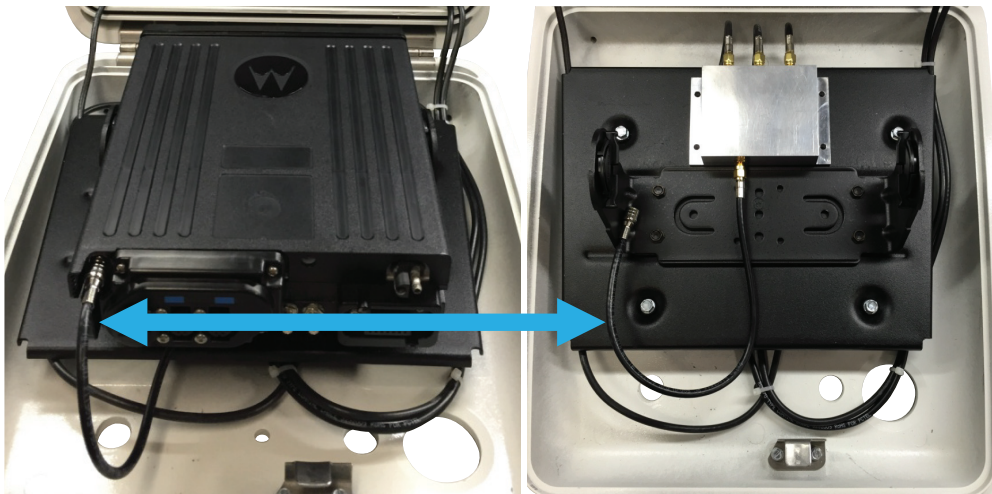*Figure 5-15. Cable Routing*

Figure 5-16. Cable from Radio to Multiplexer

NOTE: Radio has to be mounted with the TIB facing the front of the enclosure

5.8   Installing the Antenna

IMPORTANT: **Antenna Placement and Cable Routing as described inside the Antenna Installation Manual is not applicable for the APX radio series. Refer to information listed below.**

- Connect the appropriate antenna connectors to the antenna receptacles on the radio. Tighten the coupling until fully engaged.

5.9   Cable Routing

Five cables must be installed to interconnect the components of the radio system as shown in Figure 5-17. The antenna cable is routed away from the other cables inside the enclosure's hinged cover (see Section 5.7). The four remaining cables, routed along the motorcycle frame, are described in the following paragraphs.

NOTE: Antenna Hole Placement and Cable Routing information in the Antenna Installation Manual is not applicable to the APX series.

Removal of the fuel tank and seat from the motorcycle will facilitate routing the cables along the frame. Motorcycles with consoles attached to fuel tanks require routing cables between console and fuel tank. In this case the tank is not removed.
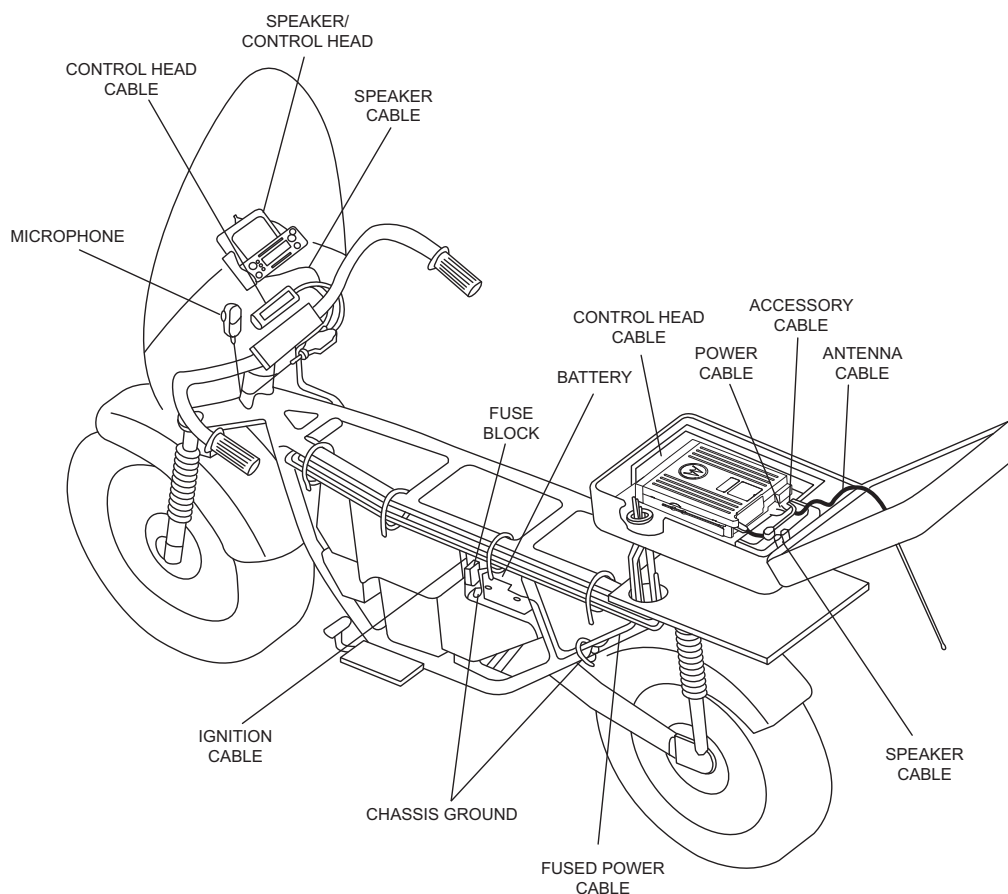

Figure 5-17. Cable Routing

1. **Speaker Cable** – runs from the speaker to the accessory-cable connector inside the weather-resistant enclosure.

2. **Control Cable** – runs from the rear of the control head to the front of the transceiver inside the enclosure.

3. **Ignition Sense (Red) Wire Portion of Accessory Cable** – runs from the ignition sense fuse terminal of the fuse box to the rear area inside the enclosure. The lug for attaching the ignition sense wire is contained on the accessory cable.

4. **Power Cable** – The red, unterminated end runs from the positive terminal of the battery to the power connector that plugs in the rear of the transceiver. Lugs for attaching the red and black leads are contained in the motorcycle power-cable kit. The black, unterminated end runs from a suitable motorcycle chassis ground to the power connector. DO NOT connect the black lead directly to the negative battery post.

You may route the cables in any order. As you route each cable, temporarily fasten it at both ends. When all cables have been run, permanently fasten the cables with appropriate cable tie wraps. Observe the following during routing and hook-up:

1. Route the cables so that none interfere with motorcycle operation.

2. Fasten the cables with supplied nylon tie wraps. The wraps should be firmly installed at frequent intervals along the cable length in such a manner that motorcycle vibration will not cause metal fatigue and subsequent breakage of the cable wires.

3. Take care to position cables away from parts of the motorcycle that get hot.

Bundle excess cable length inside the weather-resistant enclosure as discussed later in Section 5.11: "Transceiver, Cabling and Multiplexer Installation" .

The fifth cable is the microphone with coiled cord. Plug the 9-pin D-connector end of the coiled cord into its mating connector, which was attached near the control head discussed in an earlier paragraph. Tighten the coiled-cord-retention screws. Insert the S-hook strain relief (terminated to the coiled cord) into the hole in the mounting bracket. Slide the microphone into the microphone hang-up bracket.

5.10 Installing the Weather-Resistant Enclosure
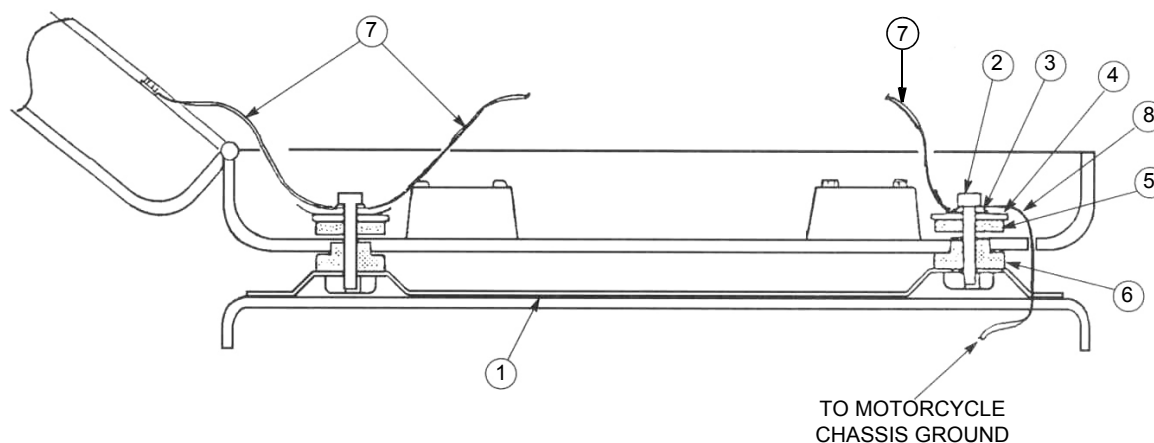
Item No.	Description	Item No.	Description
1	Universal Mounting Plate	5	Flat Rubber Washer
2	Machine Screw	6	Shouldered Rubber Washer
3	Lockwasher	7	7-1/2-inch Ground Strap
4	Flat Washer	8	Ground Strap

Figure 5-18. Weather-Resistant Enclosure Installation

1. Remove the radio-mounting plate by removing four screws, lock washers, and flat washers.

2. The weather-resistant enclosure is mounted to the universal mounting plate using shock mounts. Assemble the shock-mount components exactly as shown in Figure 5-18. Be sure to install ground straps between the shock-mount and the transceiver trunnion mount, and install one 7-1/2-inch ground strap between the right rear mount and the enclosure lid's antenna ground plane 0 (shown in Figure 5-18 and in Figure 5-20).

3. The order of assembly is important to ensure proper shock mount operation. All components are supplied with the mounting kit. The five 7- 1/2-inch straps are used on the rear and front shock mounts – four from shock mount to trunnion, and one from the shock mount to the lid's antenna ground plane.

NOTE: Grounding through the power-supply cable is NOT sufficient. Whether the radio transceiver is mounted to a carrier or the chassis itself, the transceiver MUST be properly grounded to the motorcycle chassis. The ground strap supplied with the installation kit may have to be used to ensure a good RF ground path from the radio transceiver to the motorcycle chassis.

4. Install the 3-foot ground strap on one of the front shock mounts. Route it through the cable-routing hole and connect the other end to the motorcycle frame (see Figure 5-18).

⚠️ **WARNING**	**DO NOT connect the ground strap directly to the negative battery post.**

5. The diagram of the shock mount is shown loosely assembled. After the hex screws are tightened, the rubber washers are compressed to fasten the weather- resistant enclosure securely to the universal mounting plate.

6. Figure 5-20 is an exploded view of the enclosure; it shows details that will help to understand how the enclosure is mounted. After the enclosure is completely mounted, check for proper ground connection–continuity between the antenna ground plane and the motorcycle frame.

5.11 Transceiver, Cabling and Multiplexer Installation

After the weather-resistant enclosure has been installed, the radio chassis (transceiver) is installed in the enclosure and then appropriate cables are connected. However, before the transceiver can be installed, the cabling must be properly positioned in the enclosure.

5.11.1 Installing Cabling in the Enclosure

Position the cabling in the weather-resistant enclosure as follows:

1. Run the speaker, power, control-head, and ignition sense cables into the enclosure.

2. Lay the excess cable length between the radio mounting bosses in an S configuration as shown in Figure 5-19. Do not coil any excess cable. Use the supplied tie wraps to bundle cable as shown.

NOTE: If the extra cable length is not sufficient to match the illustrated cable routing, then match the illustration as closely as possible.

3. Connect the speaker cable to the accessory cable connector.

NOTE: The accessory-cable emergency connector is shipped with a shorting plug installed. The headset connector is also shipped with a shorting plug installed. The plugs must remain in if an emergency switch and/or headset is not used. If an emergency switch and/or headset is used, remove the shorting plug(s) and discard.

4. Install the mounting plate in position on top of the cables installed above. Take care not to damage or pinch the cables when securing the mounting plate in position.

NOTE: At this point, the control-head cable plug should be located at the forward end of the enclosure, and the power-cable, speaker-cable, and accessory-cable plugs should be located at the rear of the enclosure.
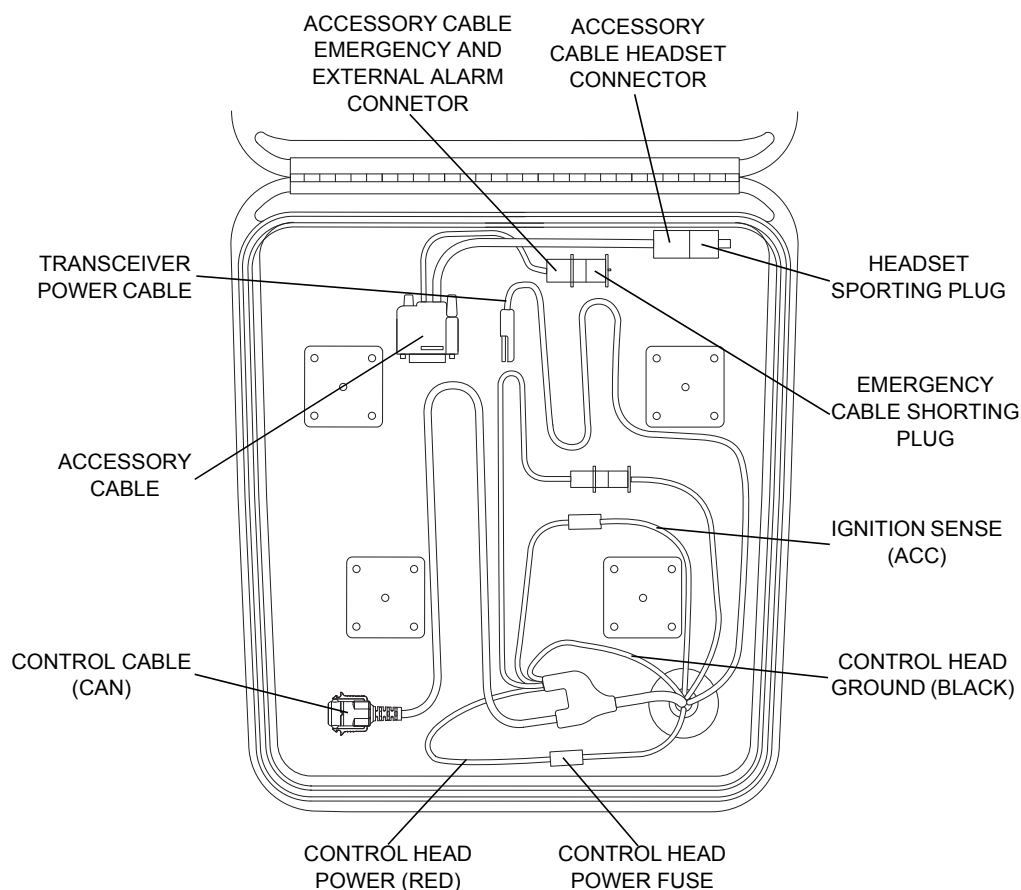
Figure 5-19. Installing Cables

5.11.2 Installing the Transceiver

Install the transceiver in the weather-resistant enclosure as follows (see Figure 5-20).

NOTE: For new or existing installations, use only the APX mobile trunnion (kit number: HLN7002_).

1. Install the mounting trunnion and loose ends of the four ground straps to the radio-mounting plate, using four screws, flat washers, and external-tooth lock washers (see Figure 5-20). The ground straps must be sandwiched between the flat washers and lock washers. The lock washer must be against the trunnion. The flat washer must be under the screw head.

2. Attach the transceiver to the mounting trunnion and secure with the two screws provided.

3. Connect the control cable to the front of the transceiver. Ensure the control-cable connector screws are tightened.

4. Attach the accessory connector to the transceiver. Plug in the power connector.

5. Install the grommet around the cables and push the grommet into the cable-routing hole of the weather-resistant enclosure.
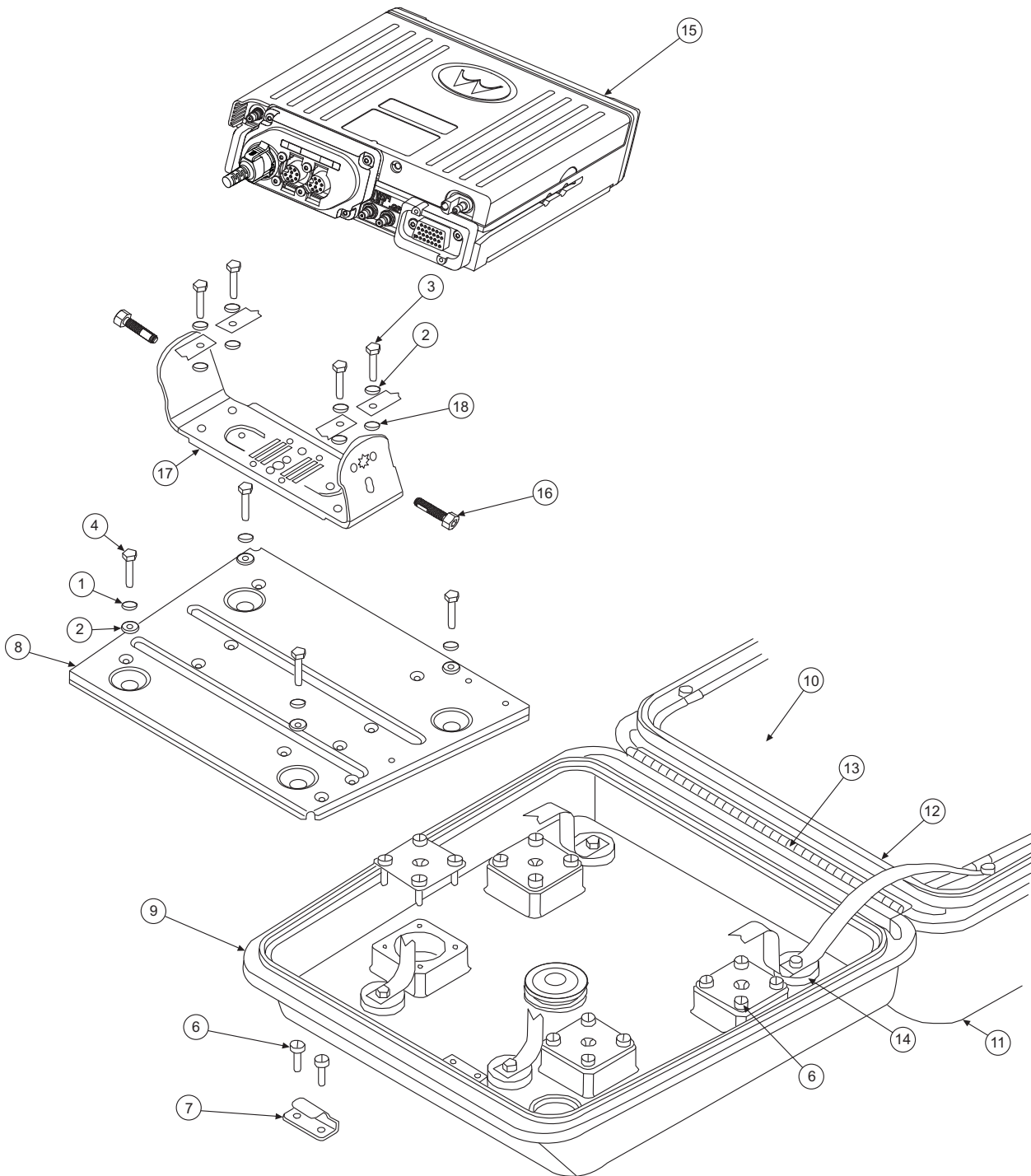
Figure 5-20. Installing the Transceiver

Table 5-1. Transceiver Installation Parts List

Item No.	Description	Item No.	Description
1	Lock washer	10	Ground shield plane
2	Flat washer (8 used)	11	Top cover
3	Screw	12	Gasket
4	Screw	13	Hinge
5	Grommet	14	Enclosure mounts
6	Screw	15	Transceiver
7	Lock catch	16	Screw
8	Radio mounting plate	17	Trunnion
9	Bottom housing	18	External tooth lock washer (8 used)

5.12   Installing the Emergency Switch Option

Use the two-conductor, green/black cable which has as one end terminated with two contacts (part number 3080221P02) and which is supplied with this W688 Motorcycle Emergency Push Button. Disconnect the emergency switch shorting plug from the accessory cable. Replace the shorting wire of the shorting plug with the terminated end of the green/black emergency cable. Reconnect the plug to the accessory cable.

5.13   Installing the External Alarm Relay Option

The motorcycle radio is offered with only one optional relay connection. If both horn and lights are required, wire a second relay coil parallel to the first relay. Use the two-conductor green/black cable which has one end terminated with two contacts (part number 3080221P02) and which is supplied with this W116 Motorcycle Alarm Relay Option. Insert the contacts into positions 3 and 4 of the emergency shorting plug of the accessory cable. Refer to Figure 5-26.

5.14   Installing the Headset Accessory

A six-position connector on the accessory cable has been made available for connecting a headset accessory. Headset manufacturers should be consulted for compatibility with the motorcycle radio prior to purchase and installation of the headset. To install, disconnect the headset shorting plug. Remove the headset shorting wire from the headset shorting plug. Terminate the contacts provided to the applicable wires of the headset cable. Insert the terminated wires into the headset shorting plug per the contact positions illustrated in the typical headset schematic found in this manual. Reconnect the terminated headset shorting plug to the accessory cable.

When upgrading from an APX mobile radio, the existing headset cable HLN6890 requires these two pins to be swapped (see Figure 5-21). The other motorcycle headset cable with this pin change already performed is called cable 3080010R04.

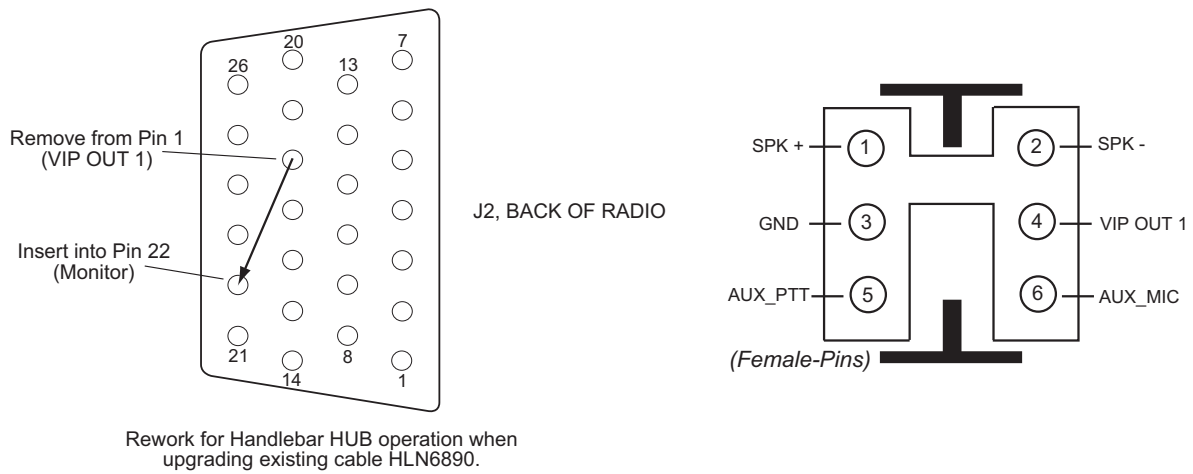Remove from Pin 1
(VIP OUT 1)

Insert into Pin 22
(Monitor)

J2, BACK OF RADIO

SPK + ① ② SPK -
GND ③ ④ VIP OUT 1
AUX_PTT ⑤ ⑥ AUX_MIC

(Female-Pins)

Rework for Handlebar HUB operation when
upgrading existing cable HLN6890.

Figure 5-21. Motorcycle Wiring Harness Rework

5.15 Installing the O5 Control Head Sunshield

Install the sunshield (part number NNTN7279_) to the O5 control head as follows.

1. Assemble the sunshield to the remote mount trunnion as shown in Figure 5-22. The same process can be used for the motorcycle trunnion.
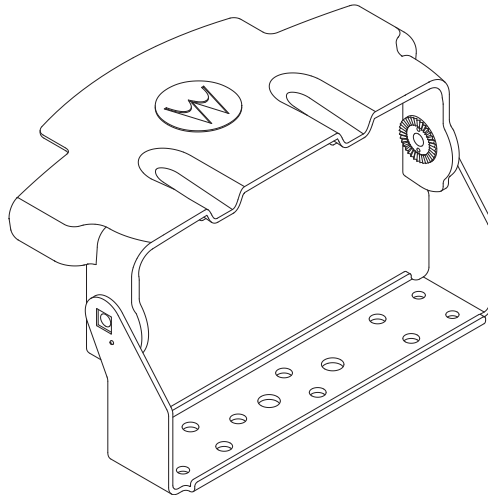

Figure 5-22. Remote Mount Trunnion with Sunshield

2. Position the sunshield as shown in Figure 5-23 and remove the Velcro adhesive backing.
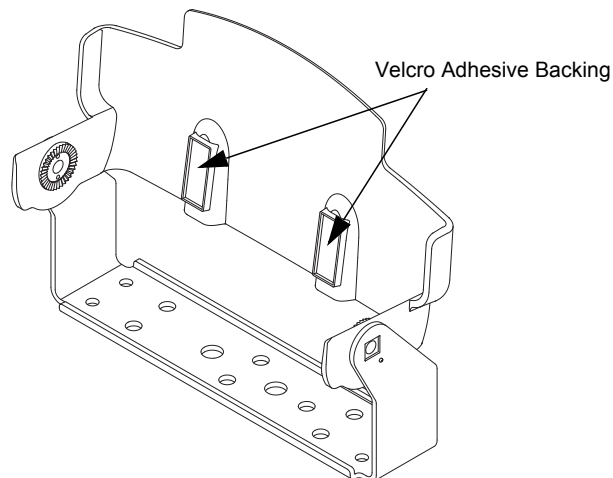

Figure 5-23. Position the Sunshield

3. Slide the control head onto the trunnion while aligning the edge of the control head with the edge of the sunshield as shown in Figure 5-24. Make sure the Velcro properly adheres to the control head.
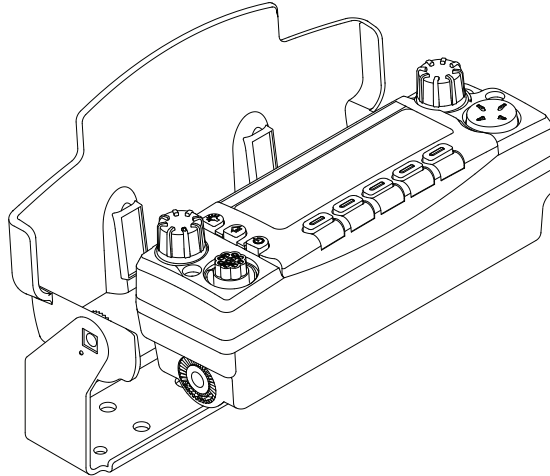

Figure 5-24. Slide the Control Head onto Trunnion

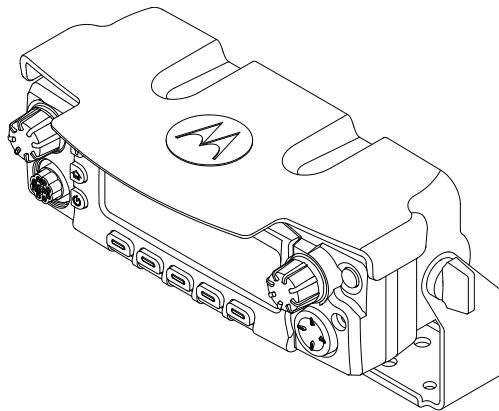4. Position control head as desired and install screws as shown in Figure 5-25.

Figure 5-25. Position Control Head as Desired
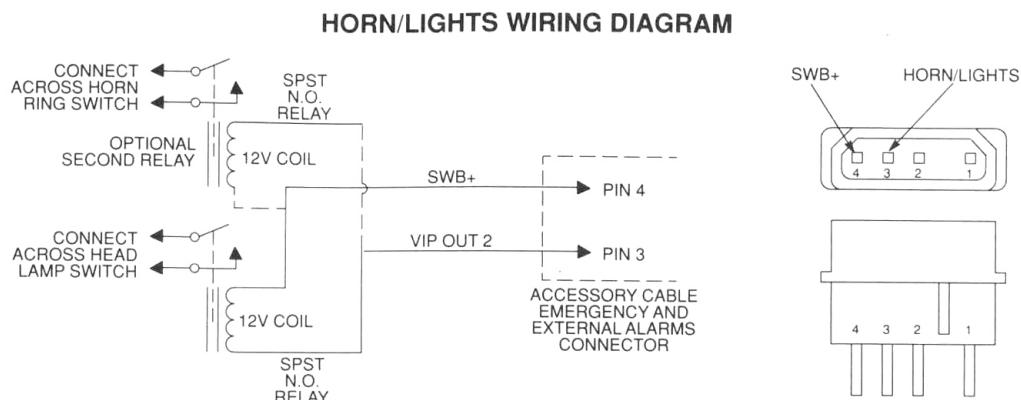
5.16   Horn/Lights Wiring

Figure 5-26. Horn/Lights Wiring Diagram

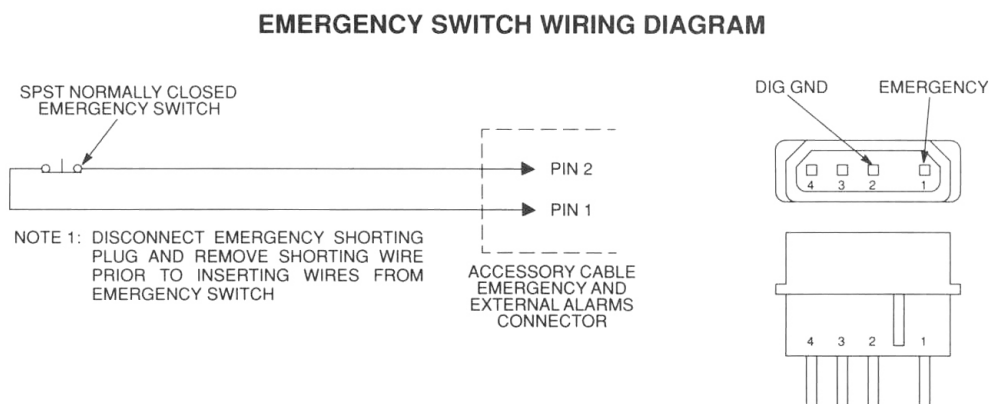## 5.17   Emergency Switch Wiring

Figure 5-27. Emergency Switch Wiring Diagram

⚠ WARNING	Motorcycle products must have pins 1 and 2 connected together to allow the radio to power down. Opening this connection by REMOVING the emergency shorting plug, or pressing the emergency switch, will turn on the radio. Failure to maintain a normally-closed path could drain the vehicle battery if left unchecked. EMERGENCY-equipped radios are capable of TRANSMITTING without warning.

Chapter 6   Finishing the Installation

6.1   Cable Connection

6.1.1   O2 Control Head

Perform the following if it has not been previously done:

1. Remove the control head from its mounting trunnion. Plug the radio's CAN cable into the proper location on the back of the control head (see Figure 2-21 and Figure 2-23 in Chapter 2). The connectors "click" when snapped into place. The control head model can have the microphone plugged into the lower left corner of the control head front panel.

2. Connect the plug from the speaker lead to the mating connector coming out of the power cable.

3. Plug the VIP connector into the correct location on the back of the control head.

4. Connect the CAN cable to the proper location on the transceiver.

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

Be sure the control head and microphone PTT switches are OFF. Install the 15-amp fuse in the radio power cable fuseholder and the 3- or 4-amp fuse(s) in the ignition sense cable fuseholder(s).

Turn the radio **ON** at the control head and verify proper operation of all controls and indicators. Radio operation in some installations require turning on the ignition sense. Perform a complete operational check of the radio.

Dress the control and power cables out of the way to prevent damage (pull any excess cable into the trunk area) securing with clamps and tie wraps where necessary.

6.1.2   O3 Control Head

Perform the following if it has not been previously done:

1. Unplug the CAN coiled cable connector on the Transceiver Interface. Plug in the connector again. A "click" sound should be heard. Ensure location of CAN connector is correct (i.e. J800L or J800R) on the transceiver interface.

Connect the plug from the speaker lead to the mating connector of J2.

6.1.3   O5 Control Head

Perform the following if it has not been previously done:

1. Remove the control head from its mounting trunnion. Plug the radio's CAN cable into the proper location on the back of the control head (see Figure 2-21 and Figure 2-23 in Chapter 2). The connectors "click" when snapped into place. The control head model can have the microphone plugged into the lower left corner of the control head front panel.

2. Connect the plug from the speaker lead to the mating connector coming out of the power cable.

3. Plug the VIP connector into the correct location on the back of the control head.

4. Connect the CAN cable to the proper location on the transceiver.

6.1.4   O7 Control Head

Perform the following if it has not been previously done:

1. Remove the control head from its mounting trunnion. Plug the radio's CAN cable into the proper location on the back of the control head (see Figure 2-21 and Figure 2-23 in Chapter 2). The connectors "click" when snapped into place. The control head model can have the microphone plugged into the lower left corner of the control head front panel.

2. Connect the plug from the speaker lead to the mating connector coming out of the power cable.

3. Plug the VIP connector into the correct location on the back of the control head.

4. Connect the CAN cable to the proper location on the transceiver.

6.1.5   O9 Control Head

Perform the following if it has not been previously done:

1. Remove the control head from its mounting trunnion. Plug the radio's CAN cable into the proper location on the back of the control head (see Figure 2-22 and Figure 2-23 in Chapter 2). The connectors "click" when snapped into place. The control head model can have the microphone plugged into the MMP connection on the control head back panel.

2. Connect the plug from the speaker lead to the mating connector coming out of the power cable.

3. Plug the VIP connector into the correct location on the back of the control head.

4. Connect the CAN cable to the proper location on the transceiver.

6.2 Dust Cover Installation

To help protect and ensure debris does not effect or damage your unused connectors, please use the provided dust covers. Refer to Figure 6-1 to determine which cover is for which connector.

Table 6-1 Dust Cover Kit Number

Kit Number	Description
KT000245A01	Dash Mount
KT000246A01	Remote Mount

A: 1515047C01   B: 1515048C01   C: 7575262A01   D:SL000319A01   E: 1515327H02

Control Head

Control Head (Rear)

APX 8500 Rear (with no TIB)

APX 8500 Rear (with TIB)
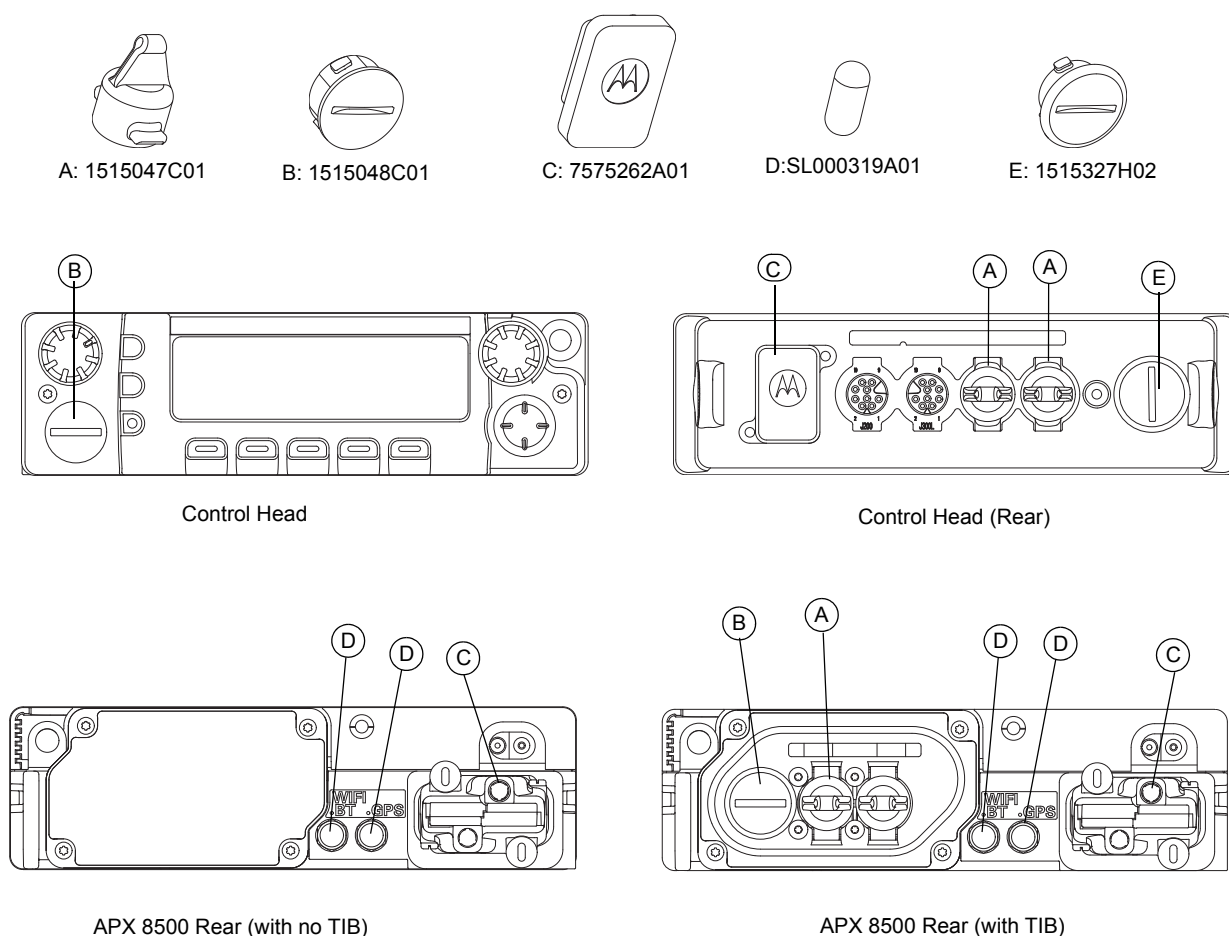
Figure 6-1. Dust Cover Installation Locations

NOTE: Parts B and E require inserting then turning approximately 1/3 turn using a coin as a tool until it contacts the stop.

Part C shall be installed onto DB25 accessory cable assembly when the corresponding cable assembly connection is not in use.

Chapter 7   Best Practices: Installation & Troubleshooting

In this section are Motorola recommended vehicle installation practices that can address or prevent many issues, including:

- Radio circuit damage due to over voltage condition
- Radio/Accessories "lock up"
- Radio/Accessories change state/lock-up when radio PTT is depressed
- Radio powers up in the FL 01/90 state (general communication error code)
- Radio intermittently resets
- Radio loses secure key
- Transmit audio distortion on motorcycle radio when engine is running
- Keypad buttons become inoperative for motorcycle radios when engine is running
- Alternator whine present when transmitting with engine running
- Radio/Accessories turn themselves on/off

7.1   Check Wiring of Ignition and Radio Ignition Sensing

- If it is required to turn the radio on and off via the ignition sense switch, in addition to the control head's on/off switch, connect the ignition sense lead to the accessory terminal from the ignition switch (usually in the vehicle's fuse panel under accessory or radio).

NOTE: Motorola Solutions recommends protecting or isolating the radio's ignition sense input from voltage spikes in excess of +/- 40VDC. Such spikes can be hundreds of volts in amplitude and are common in larger vehicles (utility trucks, buses and etc.), especially when the source is common to a solenoid coil. A triggerable oscilloscope is required to determine the existence of such spikes as most voltmeters cannot measure in short duration (< 1 msec). If the condition of the intended ignition sense source is unknown, Motorola Solutions recommends isolating the source from the radio with a relay or the use of a suppression diode wired between the source and ground. Any high current suppression diode (i.e. MR2535) with a breakdown voltage of between 18 and 40 volts will suffice. A suitable diode kit is available from Motorola Solutions parts, kit number HLN6325_.

- If it is required to have the radio power up only via the control head's on/off switch, then connect the ignition sense lead directly to the positive terminal of the battery. This will mean the ignition sense will always be ignored and a re-wiring will be necessary in the future if the operator chooses any ignition sense CPS setting.

7-2

Best Practices: Installation & Troubleshooting
Check Physical Installation of Radio Ground and Radio Accessory Wiring

7.2 Check Physical Installation of Radio Ground and Radio Accessory Wiring

- Take care to scrape away paint on the chassis at the place where the ground connection is to be made, and try to keep the ground lead as short as possible.

NOTE: Some vehicles have dedicated ground points. If available, use the ground points for the radio ground connection.

- Verify that the A+ lead (red) is connected directly to the positive terminal of the battery and the ground lead (black) is connected to the vehicle's chassis using as short of a length of wire as is practical.

- For vehicles that have other types of electronic equipment installed (lights, flashers, computers siren/PA and etc.), use a separate ground for the mobile radio equipment.

- Make sure that the mobile radio antenna is the minimum required distance (three feet) from the mobile radio equipment to prevent radio frequency interference (RFI) from interfering with the radio and/or accessories.

NOTE: If multiple radios/antennas are installed, ensure that the minimum antenna separation requirements are met.

- Do not coil up any excess length of the A+ (red) lead. Doing this may cause a large transient voltage to be produced when there is a high current drain (e.g. during transmit). This could cause the radio to reset when the push-to-talk (PTT) is depressed.

- For motorcycle mounted radios, make sure that the antenna ground connection is solid. An intermittent ground connection can cause the transmission to be distorted when the motorcycle's engine is running.

- Do not coil up any excessive length of antenna cable, if possible. It may affect the radio's receive performance.

- If an extra length of cable is used to extend the microphone, make sure the added capacitance does not interfere with the operation of the radio.

7.3 Improve the Electrical Quality of the Power and Ignition Lines

- Use a relay to isolate the vehicle's ignition switch point (ACC) from the radio's ignition sense point. Control this relay from the vehicle's ignition switch point (ACC). Supply a cleaner voltage from the positive terminal of the battery into the relay, which will now be attached to the radio's ignition sense point. Now the ACC line toggles the relay, instead of directly toggling the radios ignition sense line.

- Install a Power Line Filter between the A+ lead and the positive terminal of the battery. This is intended to filter the battery power applied to the transmitter power amplifiers. Pay extra caution to this because the series filter will introduce a negative spike when the radio transmits that may cause problems with radio operation.

- For vehicles that use electromechanical relays to control external devices (lights, motors, switch boxes and etc.), these relay circuits should be isolated as best as possible from the mobile radio equipment. Also, diode suppression should be used across the relay contacts to minimize the noise produced by the collapsing magnetic field.

- If the ignition sense switch is to be used, make sure that there is not a large voltage drop between the A+ point (usually the positive terminal of the battery) and the ignition sense point. In general, the voltage difference between these two points, should not be greater than 1.5 volts when all accessories/air-conditioner, etc. are turned on. Refer to the Basic Service Manual for specifications for minimum and maximum voltage levels. Typical battery voltage levels are 13.6V +/- 20%.

7.4   Minimize the Effect of Poorly Grounded Antennas

- For vehicles with high power radios that use glass mount antennas, care must be taken to keep the radio and antenna cable as far as possible from the radiating element of the antenna. If a sufficient distance is not maintained, the glass mount antenna's lack of a proper ground plane may cause the radio's transmit signal to interfere with itself and cause a reset. To minimize this effect, it may be necessary to install ferrite beads on the antenna cable to protect the radio from this interference.

7.5   Jump-Start the Vehicle

> ⚠️
> **Caution**
>
> Do not jump-start vehicle with radio power or ignition sense cables connected. Damage to the radio and/or accessories may result.

Jump-starting a motorcycle can crank **300+ volts** through the vehicle's charging system and these transients can damage electrical equipment.

The state of your radio prior to needing a jump-start may be unknown, and the radio may attempt to return to its last state (radio ON), when doing a jump-start. Therefore, Motorola recommends the following steps be taken before jump-starting any vehicle containing a radio.

1. Locate the ignition sense line (thin yellow wire or thin red wire, depending on dash mount or remote mount installation) and the main power leads (thick red wire) near the battery positive terminal.

NOTE: These lines are fused. In the event these lines are not fused (add the appropriate fuse in line) use whatever tools necessary to physically disconnect the ignition sense and power lines from the battery terminal.

Make sure that the disconnected lines are not in the way of moving motorcycle parts or interfering with the motorcycle operation in any way.

2. Open up the fuse holders and remove the fuses out of the kits.
3. Re-tighten the fuse holders but without the fuses to insure that ignition sense and power lines do not interfere with moving motorcycle parts.
4. Proceed with the jump-start routine as described by your vehicle owner's manual.
5. Once the jump-start process is complete, re-install the fuses into their holders.

7.6   Eliminate Noise/Howling from PA Speaker

1. Refer to Section 2.1.1 for recommended methods of installation available for the mobile two-way radio, with accessories placed on or inside the vehicle.
2. Refer to Section 2.1.2 for the wiring diagrams for the recommended configurations.
3. Refer to the Siren/PA User Manual for further details on lowering the wattage.

Notes

Appendix A   Replacement Parts Ordering

A.1   Basic Ordering Information

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

The ASTRO APX Mobile Radio Basic Service Manual includes complete parts lists and part numbers.

Refer to Table of Content for applicable manual numbers.

A.2   Motorola Online Service and Support

For general support, users can access

- http://www.motorolasolutions.com/en_us/support.html
- http://www.motorolasolutions.com/en_us/contact-us.html
- http://www.motorolasolutions.com/en_us/products/two-way-radios/project-25-radios/mobile-radios/apx8500.html
- Motorola Online Website: https://businessonline.motorolasolutions.com/
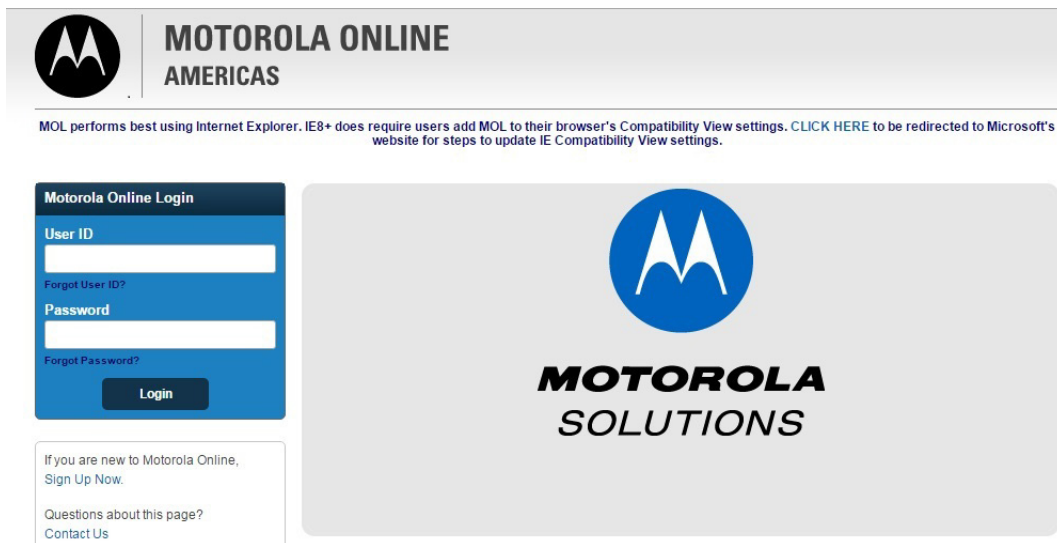
To register for online access:

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

- ECAT
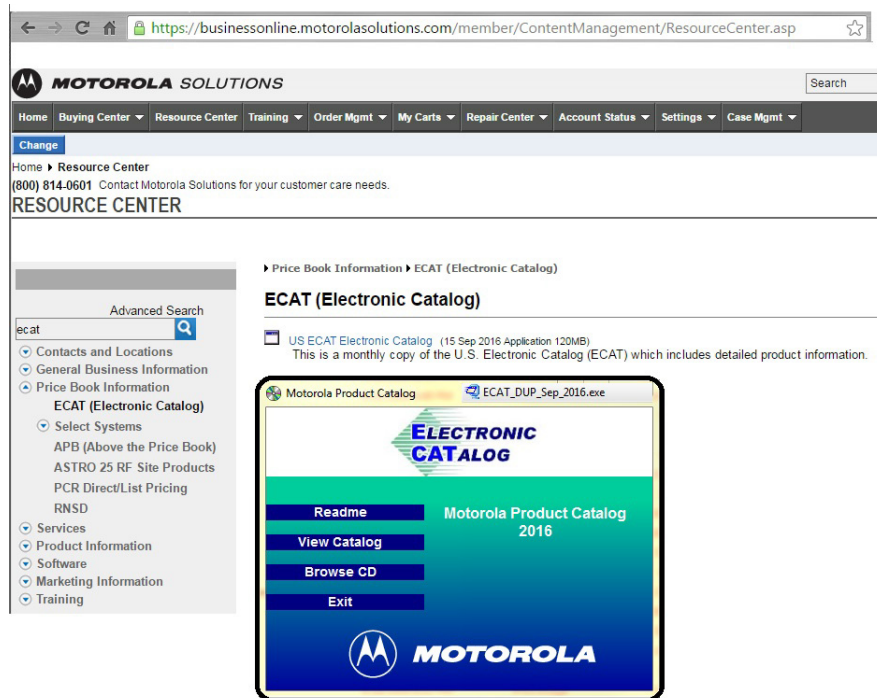
As a registered user, you have access to the electronic catalogue for purchasing accessories and radios.

A.3 Accessories Aftermarket Division (AAD)

The Accessories Aftermarket Division is able to provide Motorola Solutions Branded accessories for all your radio needs. Contact Motorola Solutions after you have a KIT number, identified from the Motorola Online website and/or the ECAT catalog. You can contact them at: 800-422-4210.

Index

Glossary

This glossary contains an alphabetical listing of terms and their definitions that are applicable to the ASTRO radio.

Term	Definition
band	Frequencies allowed for a specific purpose.
CPS	*See Customer Programming Software.*
Customer Programming Software	Software with a graphical user interface containing the feature set of an ASTRO radio.
default	A pre-defined set of parameters.
D.E.K	Direct Entry Keyboard.
digital	Refers to data that is stored or transmitted as a sequence of discrete symbols from a finite set; most commonly this means binary data represented using electronic or electromagnetic signals.
FCC	Federal Communications Commission.
firmware	Code executed by an embedded processor such as the Host or DSP in a subscriber radio. This type of code is typically resident in non-volatile memory and as such is more difficult to change than code executed from RAM.
frequency	Number of times a complete electromagnetic-wave cycle occurs in a fixed unit of time (usually one second).
GLONASS	GLObalnaya NAvigatsionnaya Sputnikovaya Sistema: The Russian Global Navigation satellite system, consisting of at least 24 operational satellites which fly in medium Earth orbit at an altitude of approximately 19,130 km. Each satellite circles the Earth slightly faster than twice a day. GLONASS provides Time and Location to anywhere on Earth, where there is an unobstructed line of sight to four or more GPS satellites. A GLONASS receiver triangulates its position using these satellites.
GNSS	Global Navigation Satellite System: Standard generic term for satellite navigation systems that provide geo-spatial positioning with global coverage. This term includes GPS, GLONASS, Galileo, Beidou and other regional systems. GNSS is a term used worldwide The advantage to having access to multiple satellites is accuracy, redundancy and availability at all times.

Term	Definition
GPS	Global Positioning System: U.S.A.'s Satellite based radio navigation system developed by the U.S. Department of Defense and operated by the U.S. Air Force, which consists of at least 24 operational satellites which fly in medium Earth orbit at an altitude of approximately 20,180 km. Each satellite circles the Earth twice a day. GPS provides Time and Location to anywhere on Earth, where there is an unobstructed line of sight to four or more GPS satellites. A GPS receiver triangulates its position using these satellites.
kHz	*See kilohertz.*
kilohertz	One thousand cycles per second. Used especially as a radio-frequency unit.
MCU	*See microcontroller unit.*
MHz	*See Megahertz.*
Megahertz	One million cycles per second. Used especially as a radio-frequency unit.
microcontroller unit	Also written as µC. A microprocessor that contains RAM and ROM components, as well as communications and programming components and peripherals.
PA	Power amplifier.
paging	One-way communication that alerts the receiver to retrieve a message.
PTT	*See Push-to-Talk.*
Publication Manual Revision	A publication that provides supplemental information for its parent publication before it is revised and reissued.
Push-to-Talk	The switch or button that causes the radio to transmit when pressed. When the PTT switch or button is released, the unit returns to standby or receive operation.
radio frequency	The portion of the electromagnetic spectrum between audio sound and infrared light (approximately 10 kHz to 10 GHz).
receiver	Electronic device that amplifies RF signals. A receiver separates the audio signal from the RF carrier, amplifies it, and converts it back to the original sound waves.
registers	Short-term data-storage circuits within the microcontroller unit or programmable logic IC.
RESET	Reset line: an input to the microcontroller that restarts execution.
RF	*See radio frequency.*
RX	Receive.

Term	Definition
signal	An electrically transmitted electromagnetic wave.
software	Computer programs, procedures, rules, documentation, and data pertaining to the operation of a system.
time-out timer	A timer that limits the length of a transmission.
TOT	*See time-out timer.*
transceiver	Transmitter-receiver. A device that both transmits and receives analog or digital signals. Also abbreviated as XCVR.
transmitter	Electronic equipment that generates and amplifies an RF carrier signal, modulates the signal, and then radiates it into space.
Triangulation	A method of determining the relative positions of points in space by measuring the distances, and sometimes angles, between those points and other reference points whose positions are known. Triangulation involves the use of trigonometry. It is commonly used in the navigation of vehicles, aircraft and boats, and is the method used in the Global Positioning System, in which the reference points are satellites.
TX	Transmit.
UHF	Ultra-High Frequency.
Universal Serial Bus	An external bus standard that supports data transfer rates of 12 Mbps.
USB	*See Universal Serial Bus.*
VHF	Very-High Frequency.
Waypoint	Geographic Coordinates of a specific location. It can also be an Intermediate point on a route or line of travel.
Wi-Fi	Wireless Data Transmission protocol 802.11.
XCVR	*See transceiver.*

Notes

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