

MOTOROLA

**GM 900, MC 900, GM 1200, MCX 1200,
GM 2000, MCS 2000, MC 2100**

**Mobile Radios, Installation Instructions
All Frequency Ranges**

68P02058U20-G



Related Publications

- MCS 2000 Mobile Radio Detailed User Reference Guide,68P81080C35
a full operating instruction manual covering models I, II and III
- MCS 2000 Short Form User Guide for Model I.68P81080C05
- MCS 2000 Short Form User Guide for Models II and III.68P81080C10
- Installation Instructions (this publication) 68P02058U20
covering mobile series 900 / 1100 / 1200 / 2000 / 2100
- MCS 2000 Mobile Radio Complete Service Instructions.68P81080C40
All frequency ranges, includes all volume 2s
- MCS 2000 Mobile Radio Service Instructions - Volume 1.68P81083C20
Non-frequency Range Specific.
- MCS 2000 Mobile Radio Service Instructions - Volume 2a.68P81080C43
800 MHz Frequency Range Specific, Low and Mid Power
- MCS 2000 Mobile Radio Service Instructions - Volume 2b.68P81080C41
VHF Frequency Range Specific, High Power
- MCS 2000 Mobile Radio Service Instructions - Volume 2c.68P81080C42
UHF Frequency Range Specific, High Power
- MCS 2000 Mobile Radio Service Instructions - Volume 2d.68P81080C44
900 MHz Frequency Range Specific, Low and Mid Power
- MCS 2000 Mobile Radio Service Instructions - Volume 2f.68P81080C39
UHF Frequency Range Specific, Mid Power
- MCS 2000 Mobile Radio Service Instructions - Volume 2g.68P81080C48
VHF Frequency Range Specific, Low Power
- MCS 2000 Mobile Radio Service Instructions - Volume 2h.68P81080C49
UHF Frequency Range Specific, Low Power
- MCS 2000 Mobile Radio Service Instructions - Volume 2j.68P81080C51
VHF Frequency Range Specific, Mid Power
- MCS 2000 Mobile Radio SECURENET Service Instructions68P81083C25
- Mobius/Radius Technical Manual VHF, UHF, MB 68P02058U21
covering mobile series 900 / 1100 / 1200 / 2100
- Accessory Guide, MCS 200068P81080C47
- Accessory Guide, Mobius/Radius. 68P81058U52
covering mobile series 900 / 1100 / 1200 / 2100
- FlashPort User's Guide68P81077C65
- SmartZone RSS Manual68P81077C15

Manual Revisions

Changes which occur after this manual is printed are described in Manual Revisions. These Manual Revisions provide complete information on changes including pertinent parts lists data.

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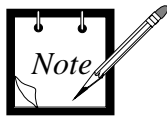
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NOTES

Safety Information and Warnings

Notes, Cautions, Warnings, Danger

Throughout this guide, you will notice the use of NOTES, CAUTIONS, WARNINGS, and DANGERS. Their use is explained below.



NOTE: A clarifying statement that expands on the text that follows.



Caution

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in equipment damage.



WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or injury.



DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

General Safety Information



Every radio, when transmitting, radiates energy into the atmosphere which may, under certain conditions, cause the generation of a spark. All users of vehicles fitted with radios should be aware of the following warnings (see also “Important Electromagnetic Emission Information” below).

- Do not operate radio near flammable liquids or in the vicinity of explosive devices.

During normal use, the radio will subject you to radio energy substantially below the level where any kind of harm is reported. To ensure personal safety, please observe the following simple rules:

- Do not transmit when the antenna is very close to, or touching, exposed parts of the body, especially the face and eyes.
- Do not hold the transmit (PTT) key in when not desiring to transmit.
- Check the laws and regulations on the use of two-way mobile radios in the areas where you drive. Always obey them. Also, when using your phone while driving, please:
 - give full attention to driving,
 - use hands-free operation, if available, and
 - pull off the road and park before making or answering a call if driving conditions so require.

Installation Safety Warning



Installation of vehicle communication equipment should be performed by a professional installer/technician qualified in the requirements for such installations.

Install the unit in a location which prevents incidental contact with the radio housing. The housing is a heat sink and its surface will become hot during operation.

Consider the occupants' safety when you choose a location for the radio. Do not mount the radio overhead or on a side wall unless you take the following special precautions.

- Do not mount the radio overhead or on a wall, unless you give it the added protection of a retaining strap.
- If someone were to remove the radio and fail to replace it properly, road shock could bump the radio loose, and the falling radio could, in some

circumstances, cause serious injury to the driver or a passenger. In a crash, even when properly installed, the radio could break loose and become a dangerous projectile.

Air Bag Warning



An air bag inflates with great force. DO NOT place objects, including communication equipment, in the area over the air bag or in the air bag deployment area. If the communication equipment is improperly installed and the air bag inflates, this could cause serious injury.

An air bag's size, shape and deployment area can vary by vehicle make, model and front compartment configuration (e.g., bench seat vs. bucket seats). Contact the vehicle manufacturer's corporate headquarters, if necessary, for specific air bag information for the vehicle make, model and front compartment configuration involved in your communication equipment installation.

LP Gas Warning



It is mandatory that radios installed in vehicles fuelled by liquefied petroleum gas conform to the National Fire Protection Association standard NFPA 58, which applies to vehicles with a liquid propane (LP) gas container in the trunk or other sealed off space within the interior of the vehicle. The NFPA58 requires the following:

- Any space containing radio equipment shall be isolated by a seal from the space in which the LP gas container and its fittings are located.
- Removable (outside) filling connections shall be used.
- The container space shall be vented to the outside.

Anti-Lock Braking System (ABS) and Anti-Skid Braking System Precautions



Disruption of the anti-skid/anti-lock braking system by the radio transmitter may result in unexpected vehicle motion.

Motorola recommends the following radio installation precautions and vehicle braking system test procedures to ensure that the radio, when transmitting, does not interfere with operation of the vehicle braking system.

Installation Precautions

1. Always provide as much distance as possible between braking modulator unit and radio, and between braking modulator unit and radio antenna and associated antenna transmission line. Before installing radio, determine location of braking modulator unit in vehicle. Depending on make and model of vehicle, braking modulator unit may be located in

trunk, under dashboard, in engine compartment, or in some other cargo area. If you cannot determine location of braking modulator unit, refer to vehicle service manual or contact a dealer for the particular make of vehicle.

2. If braking modulator unit is located on left side of the vehicle, install radio on right side of vehicle, and conversely.
3. Route all radio wiring including antenna transmission line as far away as possible from braking modulator unit and associated braking system wiring.
4. Never activate radio transmitter while vehicle is in motion and vehicle trunk lid is open.

Braking System Tests

The following procedure checks for the most common types of interference that may be caused to vehicle braking system by a radio transmitter.

1. Run vehicle engine at idle speed and set vehicle transmission selector to PARK. Release brake pedal completely and key radio transmitter. Verify that there are no unusual effects (visual or audible) to vehicle lights or other electrical equipment and accessories while microphone is NOT being spoken into.
2. Repeat Step 1 except do so while microphone IS being spoken into.
3. Press vehicle brake pedal slightly just enough to light vehicle brake light(s). Then repeat Step 1 and Step 2.
4. Press the vehicle brake pedal firmly and repeat Step 1 and Step 2.
5. Ensure that there is a minimum of two vehicle lengths between front of vehicle and any object in vehicle's forward path. Then, set vehicle transmission selector to DRIVE. Press brake pedal just far enough to stop vehicle motion completely. Key radio transmitter. Verify that vehicle does not start to move while microphone is NOT being spoken into.
6. Repeat Step 5 except do so while microphone IS being spoken into.
7. Release brake pedal completely and accelerate vehicle to a speed between 15 and 25 miles/25 and 40 kilometers per hour. Ensure that a minimum of two vehicle lengths is maintained between front of vehicle and any object in vehicle's forward path. Have another person key radio transmitter and verify that vehicle can be braked normally to a moderate stop while microphone is NOT being spoken into.
8. Repeat Step 7 except do so while microphone IS being spoken into.
9. Release brake pedal completely and accelerate vehicle to a speed of 20 miles/30 kilometers per hour. Ensure that a minimum of two vehicle lengths is maintained between front of vehicle and any object in vehicle's forward path. Have another person key radio transmitter and verify that vehicle can be braked properly to a sudden (panic) stop while microphone is NOT being spoken into.
10. Repeat Step 9 except do so while microphone IS being spoken into.
11. Repeat Step 9 and Step 10 except use a vehicle speed of 30 miles/50 kilometers per hour.

Operational Safety Warnings



WARNING

For vehicles equipped with Electronic Ignition Systems, check the vehicle service manual for warnings about the use of two-way radio equipment in the vehicle.

The radio may switch into transmit mode, immediately upon being connected to power, if an open circuit exists between pins 4 and 9 of the Accessory Connector. To avoid personal injury and/or damage to the radio, ensure that a jumper wire or an emergency switch that has normally closed contacts is connected between pins 4 and 9 of the accessory connector before the radio is connected to vehicle battery power or any other power supply.

Radio Care / Handling Cautions



Caution

- **Avoid physical abuse; do not pound, drop, or throw the radio. It may damage exposed parts such as controls and connectors.**
- **Do not connect accessories other than Motorola compatible equipment, as it may damage the radio. For a list of available compatible accessories consult the Mobius Accessories Guide part number 68P02058U52, or the MCS 2000 Accessories Guide part number 68P81080C47, or check with your local Motorola representative.**
- **The use of a Mini UHF Adaptor can damage the RF Antenna Connector and lead to radio failure, and is grounds for voiding warranty.**

Operating the radio without an antenna cable attached may lead to radio failure and is grounds for voiding warranty.

Important Safety Information: Electro-Magnetic Energy

Safe, Efficient Operation Guidelines for Exposure to Electro-Magnetic Energy

The design of your Motorola two-way radio, which generates radio frequency (RF) electromagnetic energy, complies with the international RF energy exposure standards listed below. The following description of these safety standards are Motorola's recommended operational procedures to assure compliance.

In Europe, the European Committee for Electrotechnical Standardization (CENELEC) has produced safety standards* containing basic restrictions and reference levels on the emission of electromagnetic energy. In the U.S., in August 1996 the Federal Communications Commission (FCC) adopted updated RF energy exposure guidelines for wireless products regulated by the FCC. These guidelines are consistent with the safety standards** previously set by both U.S. and international standards bodies.

The relevant CENELEC standards and documents are:

* ENV 50166-1 1995

Human exposure to electromagnetic fields Low-frequency (0 Hz to 10 kHz)

- * ENV 50166-2 1995 E
Human exposure to electromagnetic fields High frequency (10 kHz to 300 GHz)
- * Proceedings of SC211/B 1996
"Safety Considerations for Human Exposure to EMFs from Mobile Telecommunication Equipment (MTE) in the Frequency Range 30 MHz - 6 GHz." (EMF - Electro-Magnetic Fields)

The relevant U.S. and International Standards are:

- ** American National Standards Institute (C95.1 - 1992); National Council on Radiation - Radiation Protection and Measurements (NCRP-1986);
- ** International Commission on Non-Ionizing Radiation Protection (ICNRP- 1986)

To assure optimal radio performance and to ensure that exposure to RF energy is within the guidelines in the above standards, the following operating procedures should be observed:

For mobile radios installed in vehicles:

Properly install antennas externally on the vehicle, following recommended installation procedures.

Transmit only when people are inside the vehicle, or if outside the vehicle they are a distance away from the antenna specified in the following table:

Rated power of vehicle mounted radio	Distance of people from transmitting antenna
15 Watts or less	30cm (1 foot)
16 to 49 Watts	60cm (2 feet)
50 Watts or more	1 Meter (3 feet)

For control station operation:

When radio equipment is required to operate as a control station it is important that the antenna is installed outside the building and away from places where people maybe in close proximity.

Installation Planning and Procedures

Introduction

Your mobile two-way radio offers various methods of installation possibilities. Depending on the power level of the radio, the standard radio package contains a direct mounting trunnion, or a mounting tray, and power cables. Some models of the mobile radio may also be mounted in the car radio cut-out. This requires a mounting kit GRN6135 (per ISO7736). In both cases it should be assured that the cables can be routed to the radio cabinet without being exposed to excessive heat or mechanical damage.

At the bottom of the radio an accessory connector provides the connection to the different accessories required for the installation. The front control head panel has an eight pin telephone type connector to allow connection of various microphones.

The Low (1- to 25-Watt) and Mid Power (30- to 50-Watt) mobile radios may either be dash or remote mounted. This is determined by the mounting chosen by the customer. The High Power (50- to 110-Watt) mobile radios, however, can only be remote mounted.

Dash/Local Mounting

In the dash/local mounting version (Low and Mid Power radios only) the control head is mounted on the front of the radio housing. Electrical connection takes place via the connector on the front of the radio and at the back of the control head.

Remote Mounting

In the remote control version the radio unit and the control head are mounted separately in the vehicle. The control head is mounted in a remote trunnion. The transceiver is mounted by means of a trunnion or a mounting tray. If the radio is located in a car trunk be sure that secure mounting and sufficient cooling is provided. Do not cover the radio with baggage, blankets e.g.

Installation Planning - Mobile Radios

Planning is the key to fast, easy radio installation. Before a hole is drilled or a wire is run, 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.

Ignition Sense Cable



Motorola supplies an ignition sense cable and recommends that it be used with every *mobile* installation of the MCS 2000 Radio. The ignition sense cable allows the radio to be turned on and off with the vehicle ignition switch. It also ensures that the radio does not turn itself off during cranking of the vehicle engine. Without the ignition sense cable, the radio may turn itself off if the vehicle battery voltage drops below some minimum level while a heavy load (such as cranking/starting) is placed on the battery. Refer to Appendix A2 in this manual for ignition sense cable information and installation instructions.

Installation Planning - Base/Control Stations

The base/control station option provides the radio with a desk microphone and power supply for use at a fixed location. All operations are the same as the mobile, except for the desk microphone.

Choose a location for your base/control station as close as possible to where the antenna cable enters the building. Be sure line voltage power is available. Make sure sufficient air can flow around the radio to permit adequate cooling.

The antenna should be installed outside of any building, but in no instance shall the antenna be within two feet (less than 50 watts power output) or within three feet (50 watts or higher power output) of station operators or bystanders.

Installation Planning - Mobile Antenna Mounting

In keeping with sound installation practice and to maximize radiation efficiency, a one-quarter (1/4) wave length antenna should be installed at the center of the vehicle roof. If it is absolutely necessary to mount the antenna on the vehicle's trunk lid, use an appropriate 3-db gain antenna.



Caution

The High Power (110-Watt) radios will be damaged if an attempt is made to transmit even for a short period of time without an antenna connected. To avoid permanent damage to the radio, verify that the antenna is installed on the vehicle and is connected to the radio before attempting to transmit with the radio.



Caution

On MCS 2000 Mid Power and High Power VHF and UHF radios only: to avoid possible damage to the antenna connector on the radio body, the Mini-UHF male RF connector supplied with your antenna kit must be replaced with the Mini-UHF connector HLN6621 supplied with your MCS 2000 radio. Failure to replace the RF connector will void radio warranty.

Installation Examples

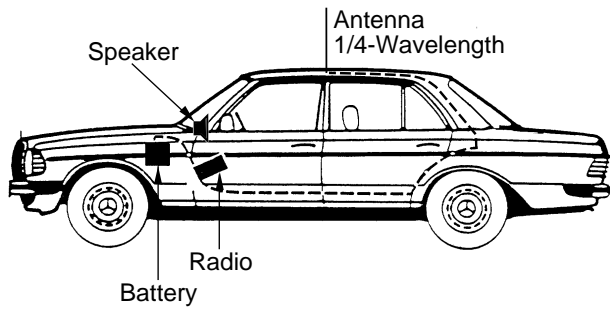


Figure 1 Mounting Flexibility in Middle Console

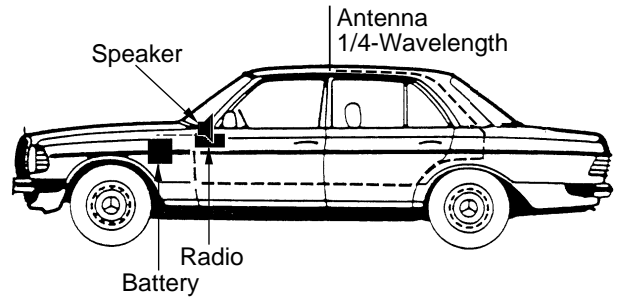


Figure 2 In Dash Mounting

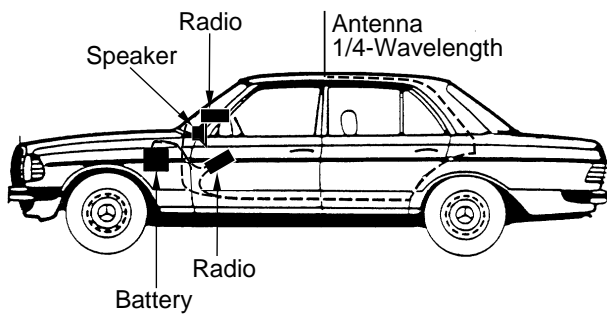


Figure 3 On Top or under Dash Mounting

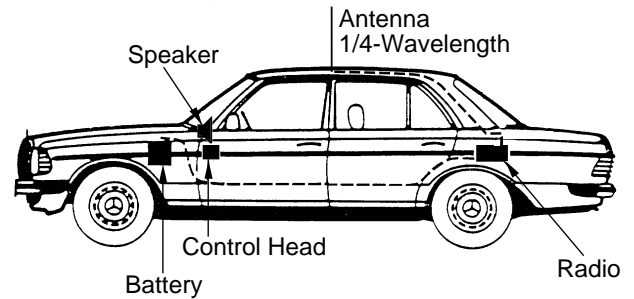


Figure 4 Remote Mount - Control Head in Dash

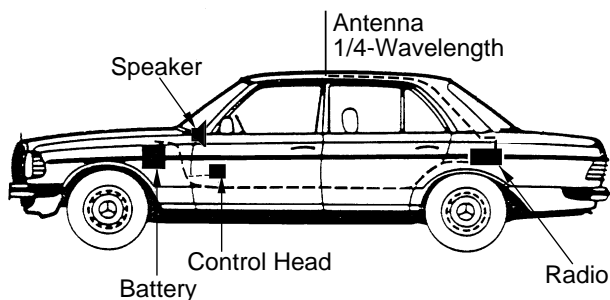


Figure 5 Remote Mount - Control Head in Console

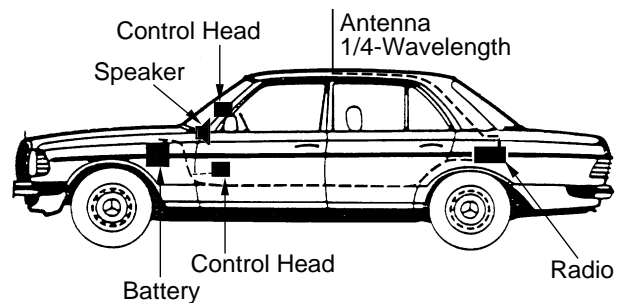


Figure 6 Remote Mount - Control Head on Top or under Dash

Replaceable Pushbutton Control Head

Certain MCS 2000 radios have a replaceable pushbutton control head feature. Refer to appendix A3 in the back of this manual for complete information about this feature.

Radio Mounting



When connecting the various microphones available, make sure to attach the “S Hook” provided on the microphone cable to the dash or remote mount trunnion to avoid damage to the microphone/control head interconnect.

Accessory Connector

Connect the 25 pin accessory connector (HLN6412) to the bottom of the radio. The connector must be plugged in for the radio to be operational, regardless of accessories being added or not (see page 22).



When a mobile radio is installed it is essential that pin 9 on the accessory connector is connected to ground if an external emergency switch is not to be connected. This is required in order that the radio can be turned on/off correctly. Pin 9 is the emergency input line.

Mounting Hardware

The standard Mounting Trunnion for Low and Mid Power models allows the radio to be mounted to a variety of surfaces. The standard Mounting Tray used for High Power radios requires a flat surface.

Be sure the mounting surface is able to adequately support the weight of the radio. Allow sufficient space around the radio for free air flow for cooling. Be sure the unit is close enough to the vehicle operator to permit easy access to operating controls. Although the trunnion can be mounted to a plastic dashboard (on Low and Mid Power radios), it is recommended that the mounting screws be located so they penetrate the supporting metal frame of the dashboard.



For High Power radios, the following precautions should be taken to optimize heat transfer efficiency:

- **Mount radio horizontally.**
- **Ensure that the mounting location contains enough clearance so not to reduce air flow around unit especially in the fin area.**

DC Power Cable Installation

This radio must be operated only in negative ground electrical systems. Reverse polarity will cause the cable fuse to blow. Check the vehicle ground polarity before you begin installation to prevent wasted time and effort.

The 3 meter (10 feet) DC power cable shipped with Low and Mid Power radios and the 6 meter (20 feet) DC power cable shipped with High Power radios is long enough for installation in most vehicles. Begin the power cable installation in the following manner:

1. Determine a routing plan for the power cable with reference to where the radio is to be mounted.
2. Locate an existing hole with a grommet in the vehicle fire wall, or drill a 10 mm Ø (0.4 inch) access hole at the location for passing the power cable into the engine compartment. Install a grommet with a 5 mm (0.4 inch) inner diameter in the access hole to avoid damage to the cable.



Caution

High degree of care should be exercised not to damage any existing vehicle wires.

For Mid and Low Power radios complete steps 3 - 9 For High Power radios go to step 10.

3. From inside the vehicle, feed the red and black leads (without lugs attached) through the access hole and into the engine compartment. (See Figure 7).
4. Locate the nearest available vehicle chassis ground mounting point and shorten the black lead to remove excess cable length.
5. Install ring lugs (supplied) onto stripped end of power cable black lead, and onto stripped end of red lead on fuse holder (See Figure 8).
6. Locate the fuse holder as close to the battery as possible and away from any hot engine component. Mount the fuse holder using the provided mounting hole and dress wires as necessary. Connect the fuse holder red adaptor lead plug to the mating receptacle on the red lead of the power cable (See Figure 8).
7. Connect the power cable black lead directly to the vehicle chassis ground.
8. Connect the power cable red lead from the fuse holder to the positive (+) battery terminal. Make sure the adaptor cable is connected to the main power cable red lead.
9. Plug fuse into in-line fuse holder (See Figure 8).



Failure to mount the red lead of the power cable kit directly to the battery may result in severe alternator whine interference.

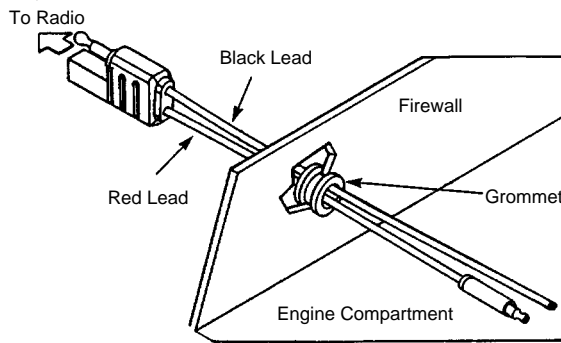


Figure 7 Cable Routing into Engine Compartment
(Low and Mid Power Radios)

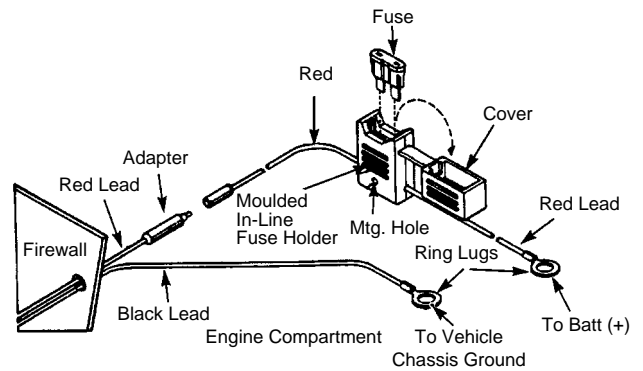


Figure 8 Power Cable Assembly
(Low and Mid Power Radios)

For High Power radios complete steps 10 - 16

10. From inside the vehicle, feed the red lead (without lug attached) through the access hole and into the engine compartment (See Figure 9).
11. Locate the nearest available vehicle grounding point and shorten the black lead to remove excess cable length. This will be in the general vicinity of the radio due to the shorter length of the black cable.
12. Connect the power cable black lead directly to vehicle chassis ground.
13. Install ring lugs (supplied) onto stripped end of power cable black lead and onto stripped end of red lead on fuse holder (See Figure 10).
14. Locate the fuse holder as close to the battery as possible and away from any hot engine component. Connect the fuse holder red adapter lead plug to the mating receptacle on the red lead of the power cable (See Figure 10).
15. Connect the power cable red lead from the fuse holder to the positive (+) battery terminal. Ensure that the adapter cable is connected to the main power cable red lead.
16. Plug the fuse into the in-line fuse holder (See Figure 10).

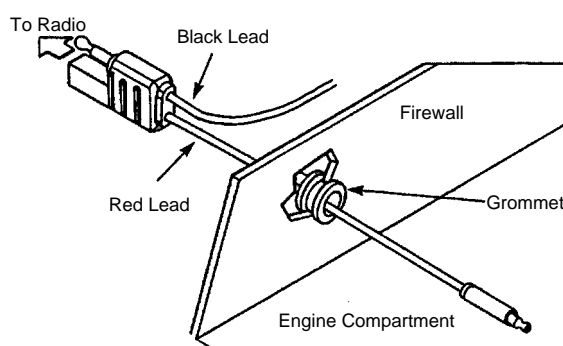


Figure 9 Cable Routing into Engine Compartment
(High Power Radios)

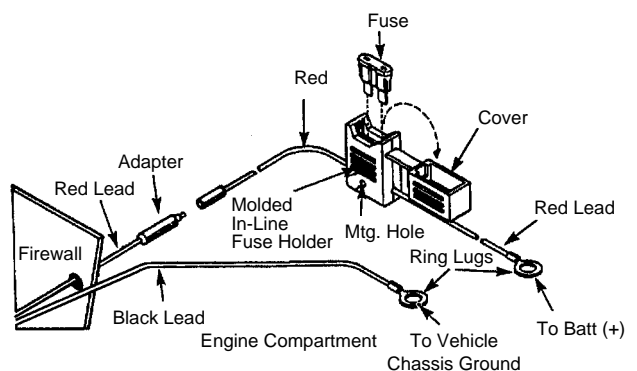


Figure 10 Power Cable Assembly
(High Power Radios)

Mounting Trunnion Installation

For Low and Mid Power Radios

Before installation see Warnings on page 1 and “Mounting Hardware” cautions on page 11.

1. Select the location to mount your radio either on the Transmission Hump (See Figure 11) or Under the Dash (See Figure 12). By mounting the trunnion on the transmission hump take care the transmission housing is not affected.
2. Using the trunnion mounting bracket as a template, mark the positions of the holes on the mounting surface. Use the innermost four holes for a curved mounting surface such as the transmission hump, and the four outmost holes for a flat surface such as under the dash.
3. Center-punch the spots you have marked and drill a 4 mm Ø (0.16 inch) hole at each.
4. Secure the trunnion mounting bracket with the four screws provided (See Figure 11).
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 11). Secure the radio with the two wing screws provided.
6. To complete your radio installation, plug the power cable into the radio power connector (See Figure 13).
7. Mount the antenna using the instructions provided with the antenna kit. Run the coaxial cable to the radio mounting location. If necessary, cut off the excess cable and install the cable connector.



Caution

Before performing step 8, which follows, refer to Caution at top of page 28.

8. Connect the antenna cable connector to the radio antenna connector on the rear of the radio (See Figure 13). Ensure that the antenna's cable connector is fully tightened. An adaptor should NOT be used between the antenna cable connector and the radio.
9. Mount the microphone clip to a convenient spot near your radio.
10. Plug the Microphone into the control head connector.
11. Attach the S-Hook and crimp (on microphone cable) to the hole on the radio trunnion (See Figure 12).

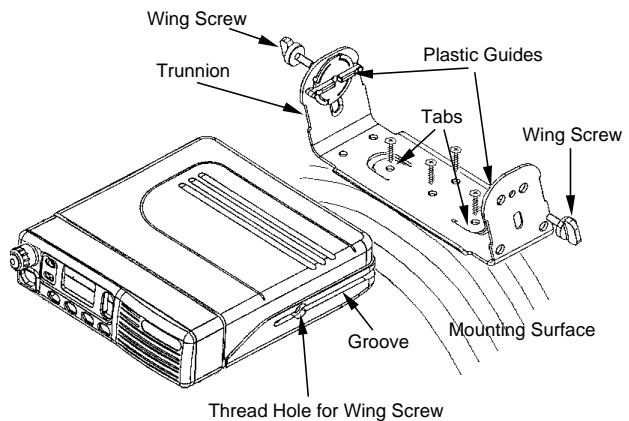


Figure 11 Low and Mid Power Radios Trunnion Mount. Transmission Hump Mounting (Mid Power Radio not shown)

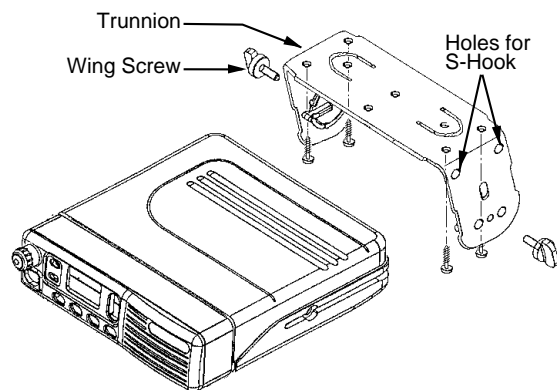


Figure 12 Low and Mid Power Radios Trunnion Mount. Below Dash Mounting (Mid Power Radio not shown)

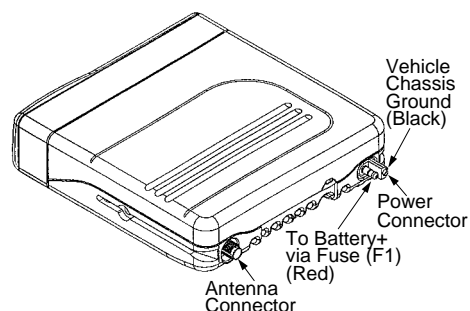


Figure 13 Low and Mid Power Radios. Connections to Radio Rear

Mounting Tray Installation

For High Power Radios

Before installation see Warnings on page 1 and "Mounting Hardware" cautions on page 11.

1. Select the location to mount your radio on a flat surface (See Figure 14).
2. Using the mounting tray as a template, mark hole positions on the mounting surface.
3. Center-punch each marked location. Drill a 4 mm Ø (0.16 inch) hole at each location.
4. Secure the mounting tray with the four 10 - 16x1 screws provided (See Figure 14).
5. Slide fins into rear slots of the mounting tray making sure that the plastic cover faces the tray, and push the radio in place (See Figure 15). Ensure that holes in chassis are aligned to holes in mounting tray. Secure the radio with 1/4" - 28x10 mm wing screws provided. Hand tighten screws ONLY. (Over-tightening with a tool will cause damage to both radio and mounting tray).
6. To complete the installation, plug power cable into radio's power connector (See Figure 16).



Caution

High Power radios will be damaged if operated in transmit even for a short period without an antenna connected.

To avoid possible damage to the antenna connector on the radio, replace the Mini-UHF male RF connector provided with your antenna kit with the Mini-UHF connector HLN6621 provided with your MCS 2000 radio. See instructions page 28.

7. Mount the antenna using the provided instructions. Run the coaxial cable to the radio's mounting location and cut excess cable. Install the cable connector.



Caution

Some antennas do not allow shortening of the cable. See the instructions with the antenna for details.

8. Connect the antenna's cable connector to the radio's antenna connector on the rear of the radio (See Figure 16). Ensure that the antenna's cable connector is fully tightened.



Caution

Tie wraps need to be in place on any cables coming off the radio and accessory connector fed through holes in the mounting tray (See Figure 17) to act as strain relief.

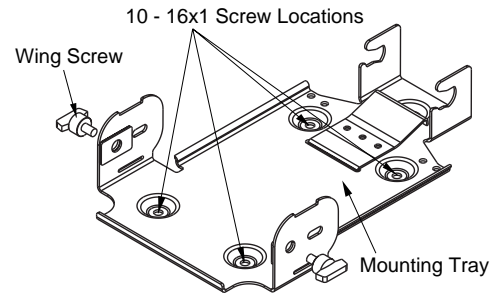


Figure 14 Mounting Tray for High Power Radios

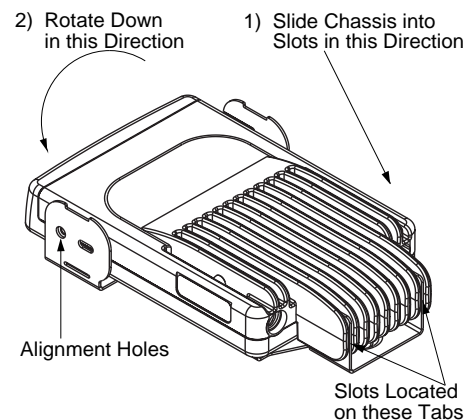


Figure 15 High Power Radio Assembled into Mounting Tray

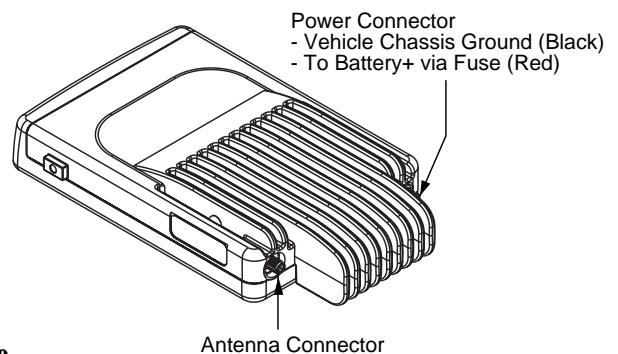


Figure 16 Connections to Radio Rear

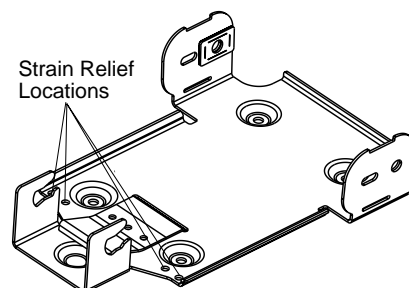


Figure 17 Strain Relief Locations in Mounting Tray

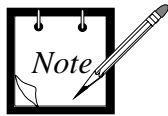
External Speaker Installation

The MCS 2000 Model I has an internal 4 W, 16 ohm speaker. The MCS 2000 Models II and III ship standard with the 7.5 W external speaker. Optional 7.5 W, 13 W, water resistant 7.5 W, and water resistant 13 W speakers are available for all models. All 7.5 W speakers are 8 ohms. The optional 13 W speakers are 3.2 ohms.

See installation procedure below for mounting the standard external speaker.



Before applying 13VDC primary power to the radio for the first time, inspect the wiring going to accessory connector very carefully. Ensure that pin 1 (speaker +), pin 2 (external speaker), and pin 3 (speaker -) *ARE NOT* connected to chassis ground. Failure to follow this precaution may result in permanent damage to radio and require replacement of audio power amplifier integrated circuit and/or complete transceiver board.



The audio power amplifier integrated circuit in the radio is a bridge amplifier. Its minimum load impedance is 3.2 ohms.

1. Remove the speaker from the trunnion bracket by loosening the two wing screws.
2. Choose a place to mount the speaker.
3. Using the trunnion bracket as template, mark the locations of the three mounting holes.
4. Centerpunch and drill a 4 mm Ø (0.16 inch) hole at each location.
5. Mount the trunnion bracket with the screws supplied (See Figure 18).
6. Insert the speaker into the trunnion bracket and tighten the two wing screws.
7. **a) Dash mount:** Insert the external speaker accessory plug into the accessory connector of radio.

b) Remote mount: Connect the external speaker plug to the loudspeaker connection on the remote control cable.

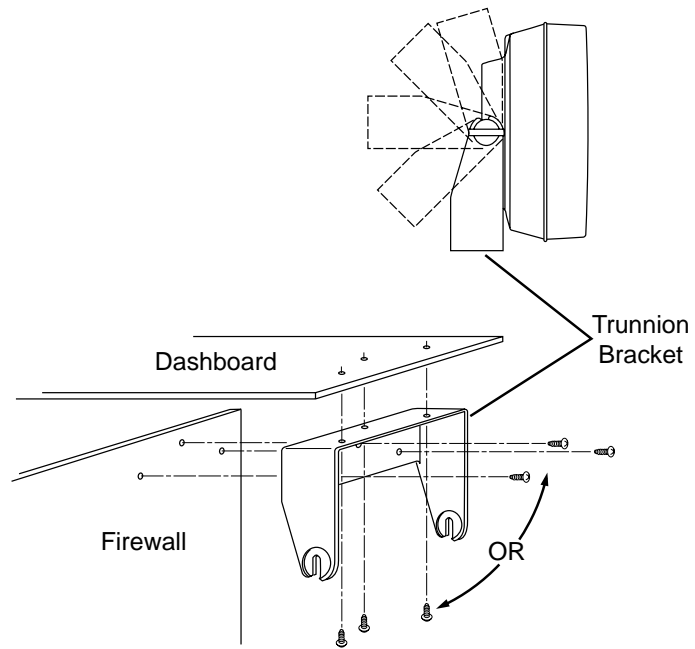


Figure 18 Mounting Speaker under Dashboard

Control Microphone Installation

Used for 900 Series Only

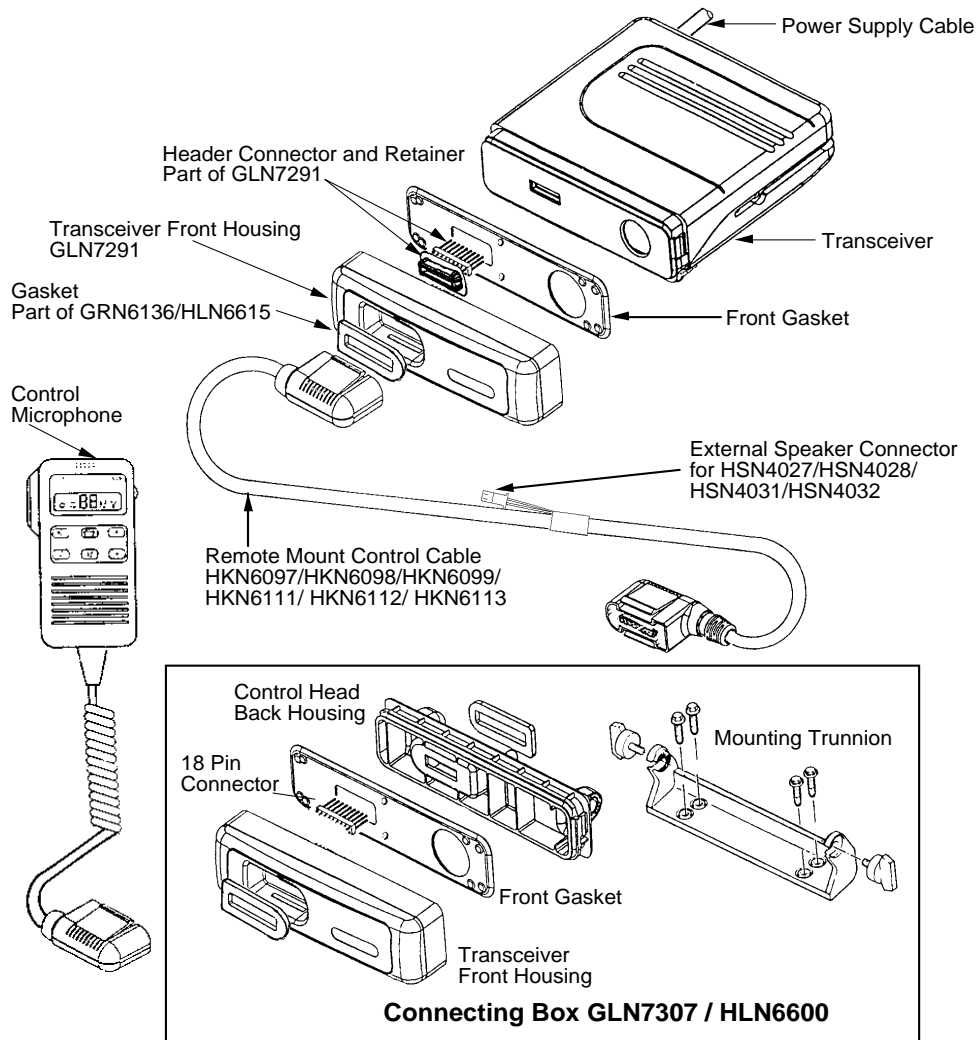


Figure 19 Control Microphone Installation

1. Select a location to install the control microphone by using the hang up switch.
2. When locating the connecting box take care that it is in acceptable distance to the operator.
3. To install the connecting box and the hang up switch mark positions of holes by using the trunnion and the hang up switch as templates, centerpunch the marked spots and drill a 4 mm Ø (0.16 inch) hole at each mark.
4. Mount the trunnion and the hang up switch with the screws which are supplied.
5. Slide the connecting box into the mounting trunnion until it snaps firmly into place and then hand tighten the wing screws (over-tightening with a tool will cause damage to both the control head and the trunnion).
6. Make sure that the plug gasket is mounted, and then connect the transceiver to the connecting box by the remote mount cable.
7. Cut the power supply cable to the desired length and add the plug into the power supply connector at the backside of the transceiver.

Control Head Remote Mount Installation for Low and Mid Power Radios

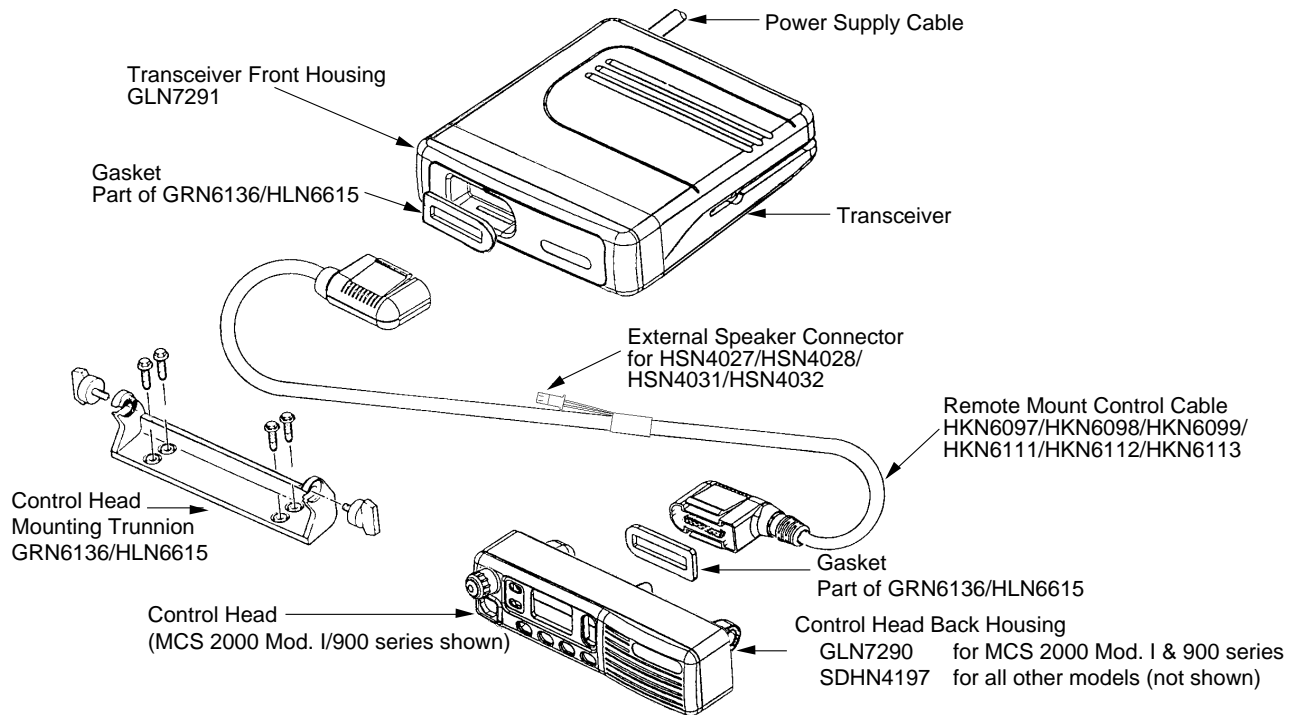


Figure 20 Control Head Remote Mount Installation for Low and Mid Power Radios

1. Connect the remote mount cable to the front housing of the transceiver making sure the gasket is in place.
2. Install the gasket onto the control head back housing. Connect the remote mount cable to the back of the control head.
3. Using the control head trunnion as a template, mark the positions of the holes, centerpunch the marked spots and drill a 4 mm Ø (0.16 inch) hole at each mark.
4. Mount the trunnion with the supplied screws.
5. Slide the remote control head into the mounting trunnion until it snaps firmly into place and then hand tighten the wing screws (over-tightening with a tool will cause damage to both the control head and the trunnion).
6. Cut the power supply cable to the desired length and add the plug into the power supply connector at the backside of the transceiver.



900 Series Radios and MCS 2000 Model I: Mute the internal speaker by removing the accessory connector and remove the jumpers with their pins placed in locations 1 and 2.

7. Mount the microphone clip to a convenient spot near the control head.
8. Plug the microphone into the control head connector. The microphone has a telephone type connector at the end of its cord. Connect and disconnect the radio microphone in the same manner you connect and disconnect the telephone handset.
9. Attach the S-Hook and crimp (on the microphone cable) to the hole on the control head trunnion.

Control Head Remote Mount Installation for High Power Radios

Used for MCS 2000 Models II & III Only

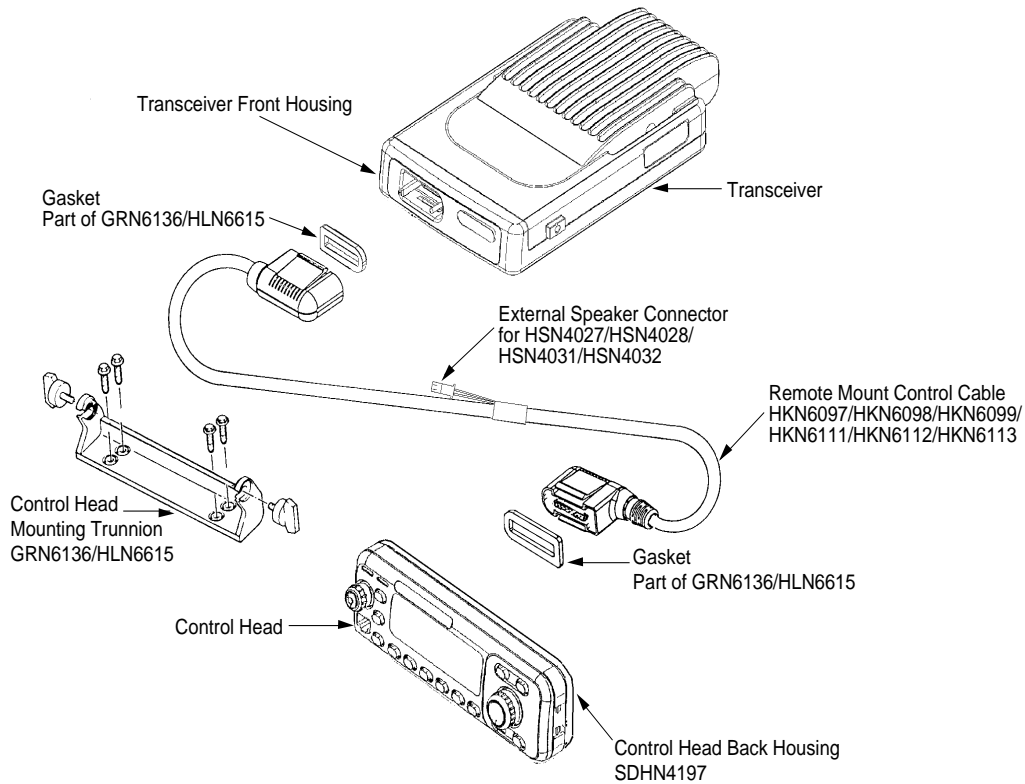


Figure 21 Control Head Remote Mount Installation for High Power Radios

1. Connect the remote mount cable to the front housing of the transceiver making sure that the gasket is in place.
2. Install the gasket onto the control head back housing. Connect the remote mount cable to the back of the control head.
3. Using the control head trunnion as a template, mark hole positions, centerpunch the marked locations and drill a 4 mm Ø (0.16 inch) hole at each mark.
4. Mount the trunnion using the supplied screws.
5. Slide the remote control head into the mounting trunnion until it snaps firmly into place. Install and hand tighten the wing screws (over-tightening with a tool will cause damage to both the control head and the trunnion).
6. Mount the microphone clip to a convenient spot near the control head.
7. Plug the microphone into the control head connector. The microphone has a telephone type connector at the end of its cord. Connect and disconnect the radio microphone in the same manner you connect and disconnect the telephone handset.
8. Attach the S-Hook and crimp (on the microphone cable) to the hole on the control head trunnion.

Installation Instructions and Diagrams

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Installation Instructions for Accessory Plug, MCS 2000 Radios Only

Introduction

The MCS 2000 Mobile Radio has an accessory connector, which is located on the bottom side of the radio. Unless an emergency switch accessory is connected to the radio via the accessory connector and plug, an accessory plug, which has an internal jumper wires between locations 4 and 9, must always be plugged into the accessory connector. Otherwise, the radio will not operate correctly.

Every MCS 2000 Radio is supplied with an accessory plug, Motorola Kit Number HLN6412. This accessory plug is supplied loose in a plastic bag packed with the radio. The accessory plug contains jumper wires between locations 1 and 2, and between locations 4 and 9. The jumper wire between locations 1 and 2 routes the audio signal from the output of the audio amplifier in the radio to a 4-Watt loudspeaker built into to control head of the MCS 2000 Model I Radio. The jumper wire between locations 4 and 9 closes the emergency circuit if an emergency switch accessory is not used.



The radio may switch into transmit mode, immediately upon being connected to power, if an open circuit exists between pins 4 and 9 of the accessory connector. To avoid personal injury and/or damage to the radio, ensure that a jumper wire or an emergency switch that has normally closed contacts is connected between pins 4 and 9 of the accessory connector before the radio is connected to vehicle battery power or any other power supply.

Accessory Plug Connection of External Loudspeakers

MCS 2000 Model II and Model III Radios do not have a loudspeaker built into their control heads. Therefore, an external loudspeaker is supplied with each of these radios. A Motorola Kit Number HSN4024 (7.5 Watt), Motorola Kit Number HSN4025 (13 Watt), Motorola Kit Number HSN4031 (7.5 Watt), or Motorola Kit Number HSN4032 (13 Watt) external loudspeaker is supplied with each Model II and Model III Radio. The HSN4024 and HSN4025 external loudspeakers connect to the accessory connector on the bottom of the radio. They may be supplied with an accessory plug already attached to the cable, or may be supplied just with pins crimped onto the two wires in the cable. In the latter case, the pins fit into the pin housing of the accessory plug.

For MCS Model II and Model III Radios, the jumper wire must be omitted from locations 1 and 2 in the accessory plug and the external loudspeaker connected to locations 1 and 3. This is how the speaker cable is wired when the external loudspeaker is supplied with an accessory plug already attached to its cable. The attached accessory plug also includes the necessary jumper wire between locations 4 and 9. Therefore, the separate accessory plug supplied with the radio can be discarded.

When the external loudspeaker is supplied just with pins crimped to the wires of its cable, the accessory plug must have the jumper wire between locations 1 and 2 removed and the pins on the wires of the loudspeaker cable inserted into locations 1 and 3. This requires that the accessory plug be disassembled,

the jumper removed from locations 1 and 2, the loudspeaker pins inserted into locations 1 and 3, and the plug reassembled.

Connection of Other Accessories

The accessory plug must also be disassembled and reassembled if accessories in addition to an external loudspeaker (e.g., an ignition sense cable or an emergency switch) are to be connected to the radio.



An ignition sense cable, Motorola kit number GKN6263, is supplied with every MCS 2000 Radio. Motorola strongly recommends that this ignition sense cable be used with every *mobile* installation of the MCS 2000 Radio. The ignition sense cable allows the radio to be turned on and off with the vehicle ignition switch. It also ensures that the radio does not turn itself off during cranking of the vehicle engine. Refer to Appendix A2 in this manual for ignition sense cable information and installation instructions.

Disassembling and Reassembling Accessory Plug



Numbers for pin locations in the pin housing of the accessory plug are visible only when the pin housing is removed from the shell and its wings are fully open.

Disassembly



When the external loudspeaker included with the Model II and Model III Radios is supplied with an accessory plug already attached to its cable, a strain relief clip for a low power radio is threaded over the cable between the loudspeaker and accessory plug.

1. Squeeze tabs together (See Figure 22), and remove the cover from the accessory plug (See Figure 23).
2. Remove the strain relief clip stored inside the plug. If radio is a **low power model**, save the clip for use in next procedure. If the radio is a **mid power or high power model**, discard the clip.

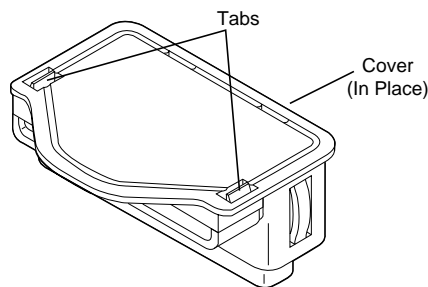


Figure 22

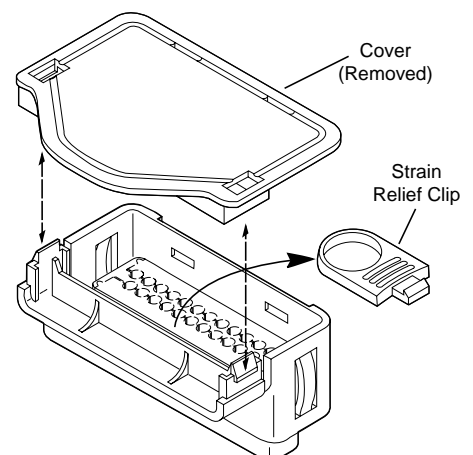


Figure 23

3. Using thumb pressure from the bottom of the shell, push the pin housing up and out of the shell (See Figure 24).
4. Open out both wings of the pin housing (See Figure 25).

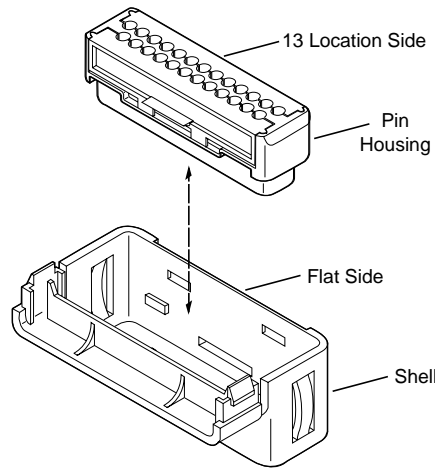


Figure 24

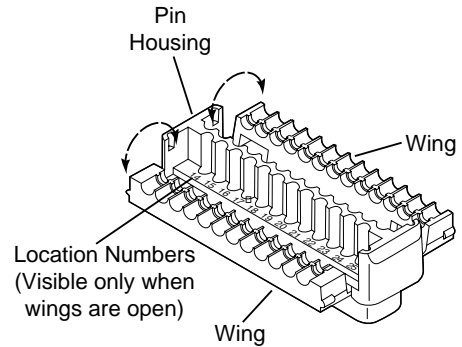


Figure 25

5. Connect the accessory wires to the accessory plug as described in the following paragraphs. Then reassemble the accessory plug as described in the paragraph below unless one of the accessories is an emergency switch. In that case, ensure that the jumper is in place between pins 4 and 9 (See Figure 26).

Reassembly

1. Insert the pin housing back into the shell in the opposite way it was removed. Be certain that the 13-location side of the pin housing is facing the flat side of the shell. Also be sure that the pin housing snaps securely into the shell and is not cocked in the shell.
2. Install the cover back onto the accessory plug by snapping the cover over the tabs and pressing down.

Connecting External Loudspeaker to Accessory Plug

This procedure is to be used only if an external loudspeaker is to be used with the radio and the cable of the external loudspeaker is not already equipped with an accessory plug.

1. Disassemble the accessory plug using the instructions provided on the previous pages.
2. For speaker kits HSN4031 and HSN4032, connect speaker cable adapter to external speaker cable (see Figure 25A.).
3. Remove the jumper wires from locations 1 and 2 in the pin housing. Leave the jumper wires between locations 4 and 9 in place (See Figure 26).
4. For **low power radios**, pass the free end of the external loudspeaker cable or adapter cable through the eye of the strain relief clip removed

earlier from inside the accessory plug. For **mid and high power radios**, discard the strain relief clip removed earlier from inside the accessory plug.

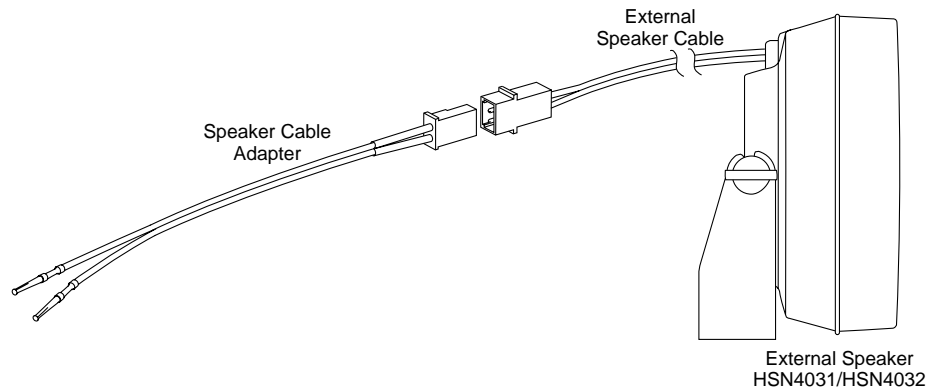


Figure 25A.

MAEPF-25762-O

5. Insert pins on the wires in the external loudspeaker cable or adapter cable into locations 1 and 3 of the pin housing (See Figure 27).
6. If other accessories (e.g., an ignition sense cable) are to be connected to the radio, proceed to the next paragraph. Otherwise, reassemble the accessory plug using the instructions provided on the previous pages.

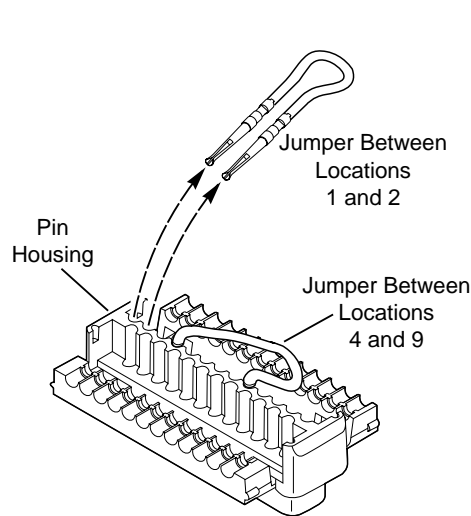


Figure 26

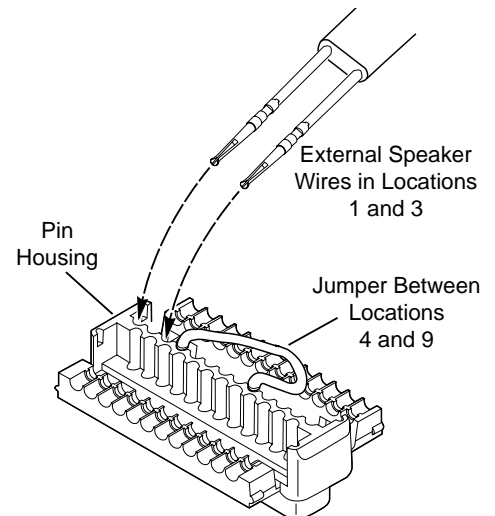


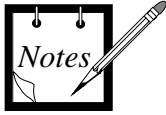
Figure 27

Connecting Additional Accessories (such as Ignition Sense Cable) to Accessory Plug



When performing the following procedure, be sure that the pins on the wires of the loudspeaker cable, in locations 1 and 3, remain inserted securely in the pin housing. If an emergency switch accessory is not to be connected to the radio, also be sure that the pins on the jumper wire, in locations 4 and 9, remain inserted securely in the pin housing.

1. For **low power radios**, pass the pin ends of the wires for any additional accessories (e.g., an ignition sense cable), which are to be connected to the radio, through the eye of the strain relief clip removed earlier from inside the accessory plug. For **mid power radios**, pull off the strain relief clip from the heat fins on the bottom of the radio, slide the clip over the wires for any additional accessories, then push the clip back onto the fins. For **high power radios**, pass the free ends of the accessory wires under the cable tiedown strap at the rear of the radio mounting tray.



- The pin on the ignition sense cable goes into location 15 in the pin housing.
 - If an emergency switch is to be connected to the radio in the next step, the jumper wire between locations 4 and 9 must first be removed from the pin housing.
2. Insert the pins on the wires for any additional accessories to be connected to the radio into the locations in the pin housing. If an emergency switch is one of the accessories to be connected, remove the jumper wire first between locations 4 and 9 before connecting the switch.
 3. Reassemble the accessory plug using the instructions provided on (page 24).

Completing Connection of Accessories to Radio

1. Plug the accessory plug into the accessory connector on the bottom of radio.
2. For **low power radios**, plug the strain relief clip, which is already threaded over the speaker cable and other accessory wires (if any), into the slot in the back of the radio. For **mid power radios**, pull off the strain relief clip from the heat fins on the bottom of the radio, slide the clip over the loudspeaker cable and any other accessory wires, then push the clip back onto the heat fins.
3. If the radio is **mid or high power** level and an unused strain relief clip is threaded over the loudspeaker cable, use diagonal pliers to clip the unused strain relief clip off of the loudspeaker cable.
4. If an ignition sense cable is being used with the radio, route the free end to the front of the vehicle. Connect the ignition sense cable to one of the hot terminals of the ignition switch (switched or not switched) or directly to the positive terminal of the vehicle battery.
5. Route other accessory wires to appropriate locations in the vehicle and connect them to their respective accessories.

Installation Instructions for 900 Series Accessories Only

Microphone

Only ONE External Microphone may be connected directly to the 900 series radio. However, the Emergency Microphone may still be added via a RELAY to this configuration.

Car Radio Mute

If a car audio system has 0 V for mute (e.g. Pioneer, Kenwood etc.) the two-way radio car audio mute output may be directly connected to the mute input on the audio system. If the system requires 12 V to mute, an external relay will need to be wired with coil between the output pin 8 and 12V supply; and with its contacts connecting 12V to the mute pin on the car audio unit. This means that at least only three connections need to go to the relay, and two of them (12 V and mute) can be derived from the accessory connector.

Emergency Microphone

If Emergency is enabled a second hidden Emergency microphone can be used. When using this emergency microphone a relay has to be inserted. The relay coil needs to be wired between 12 V pin 14 and the output pin 20, both of which can be obtained from the accessory connector, and the contacts wired between the microphones and microphone input.

The relay must have a back EMF protection diode fitted across its coil; cathode to +12 V side to prevent any damage to the radio.

Specifications

- Coil resistance: Minimum 300 ohms
- Contact type: Single pole switch, normally open
- Contact resistance: Maximum 5 ohms

Coil to be protected with a reverse polarity protection diode, min. 1 A forward current, 50 V reverse breakdown, wired with cathode to +12V supply (For example Motorola Part No 4883654H01).

Contacts to be wired: Between emergency microphone (mic +) and microphone input (Accessory connector pin 13). Microphone -/ground/0 V to be wired to analog ground (Accessory connector pin 10).

Horn Relay

The horn relay output should have a protection diode across the relay coil, anode to 0 V.

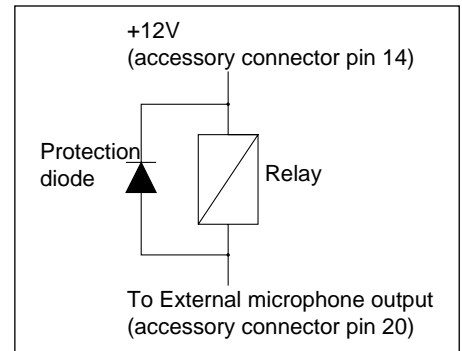


Figure 28 Installation of Relay for Second Emergency Microphone

Instructions for Replacement of Antenna Connector, MCS 2000 Mid and High Power Radios Only



Caution

On MCS 2000 Mid Power and High Power VHF and UHF radios only:
To avoid possible damage to the antenna connector on the radio body, the Mini-UHF male RF connector supplied with your antenna kit must be replaced with the Mini-UHF connector HLN6621 supplied with your MCS 2000 radio. Failure to replace the RF connector will void radio warranty.

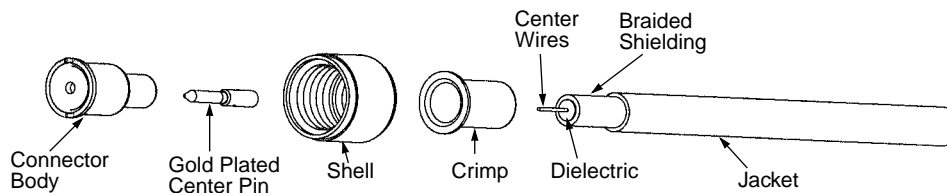


Figure 29

In Figure 29 the antenna kit items are shown in the order in which they have to be mounted on to the cable.

1. Trim the jacket, the braided shielding, and the dielectric of the cable to 6 mm (0.24 in.) from the end of the cable in order to expose the center wires (See Figure 30).
2. Trim the jacket back an additional 10 mm (.4 in) (See Figure 31).
3. Insert the cable into the crimp making sure that the flange of the crimp is facing towards the end of the cable and then insert the cable into the shell making sure that the end with the larger diameter opening is facing towards the end of the cable (See Figure 32).
4. Solder the gold plated center pin to the center wires by adding solder to the hole in the back of the pin. Then while heating the pin so that the solder remains melted, insert the wire in all the way (See Figure 33).



Note Be sure not to allow solder to get on the outside of the pin.

5. Insert the cable into the connector body ensuring that the pin is pushed forward as far as possible, and allowing the braided shielding to extend on the outside of the connector body (See Figure 34).
6. Push the shell forward until it sits on the body of the connector and then push the crimp forward allowing the braided shielding to be compressed between the crimp and the body of the connector (See Figure 35).
7. Use a standard crimping tool to form the crimp into place.



Figure 30



Figure 31

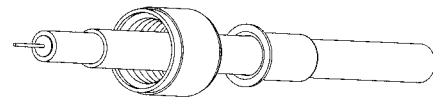


Figure 32

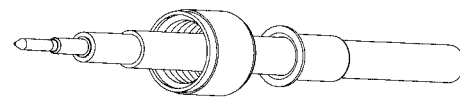


Figure 33

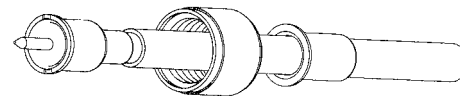


Figure 34



Figure 35

Connection Plan for Speaker, Microphone and PTT Switch

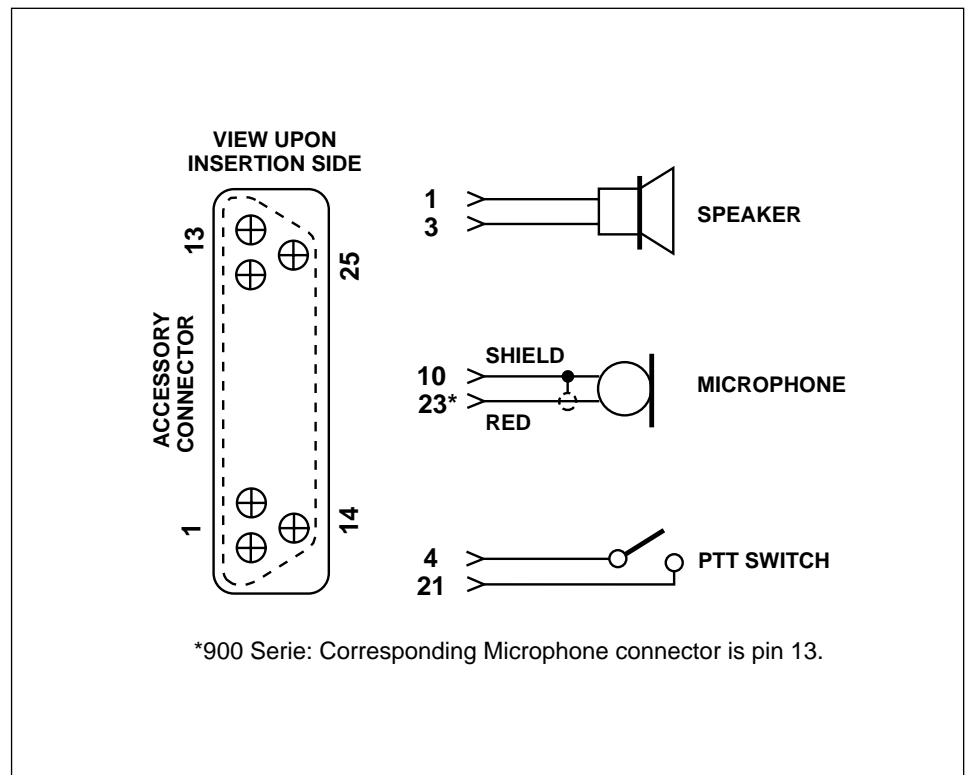


Figure 36 Speaker, Microphone and PTT Switch Connection Plan



WARNING

- The emergency jumper from pin 9 to ground on the accessory connector must **ONLY** be removed when an External Emergency switch is installed. In all other cases the jumper **MUST** be installed. Failure to observe this may destroy the microprocessor EEPROM.
- The radio may start to transmit upon receiving vehicle battery power if emergency switch circuit (4 and 9 of accessory plug) is not closed with either a jumper or an emergency switch that has normally-closed contacts.

Connection Plan for Buzzer and Alarm Relay

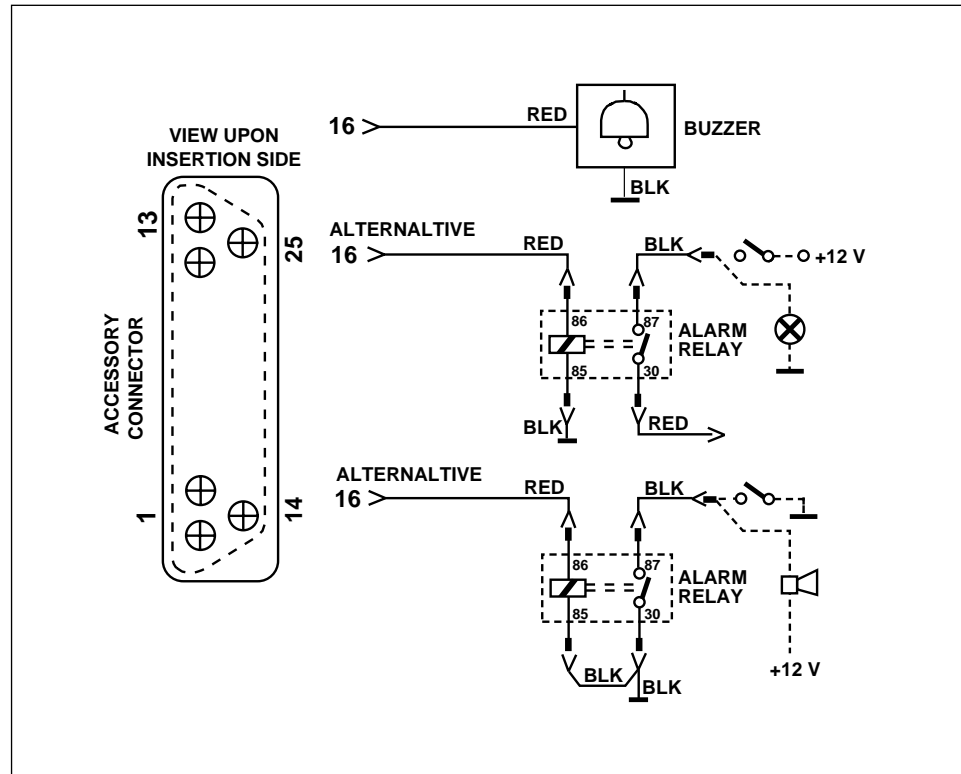


Figure 37 Buzzer and Alarm Relay Connection Plan



Caution

Do not short pin 16 on the accessory connector to ground, as this may damage the radio.

Connection Plan for Car Radio Mute, Ignition Switch On/Off, Emergency Switch and Emergency Hot Mic

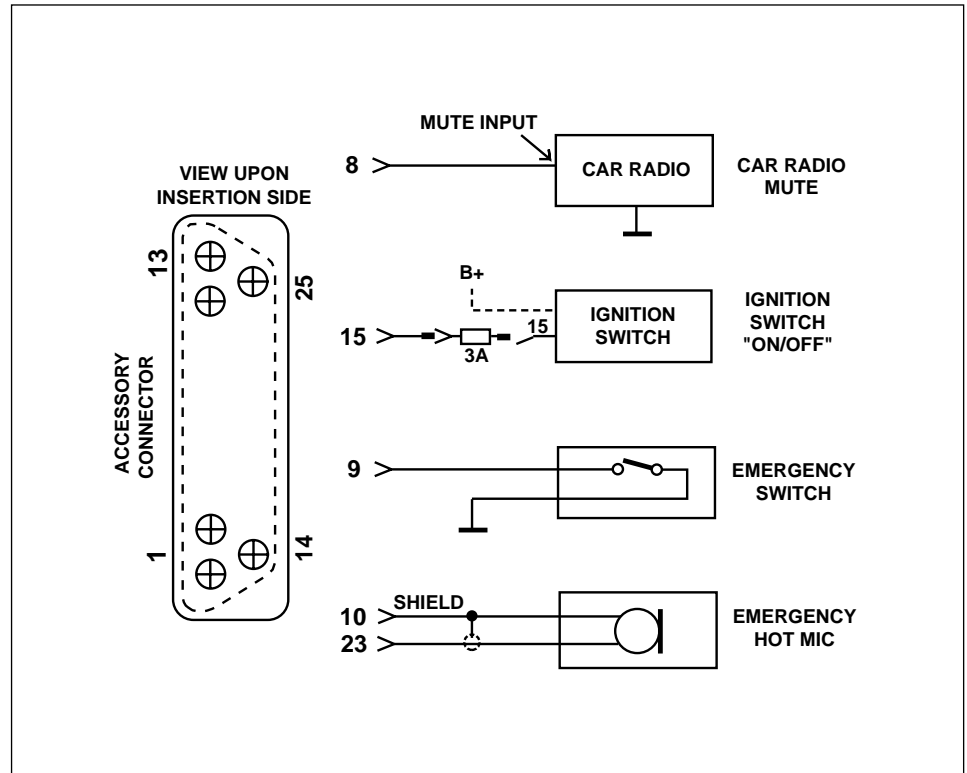


Figure 38 Car Radio Mute, Ignition Switch On/Off, Emergency Switch and Emergency Hot Mic Connection Plan



- If the Emergency Switch is disconnected the emergency will be sent automatically.
- Emergency Hot Mic IS NOT available on MCS 2000 model I.

Accessory Extension Cable GKN6269

(Available only through Taunusstein parts department)

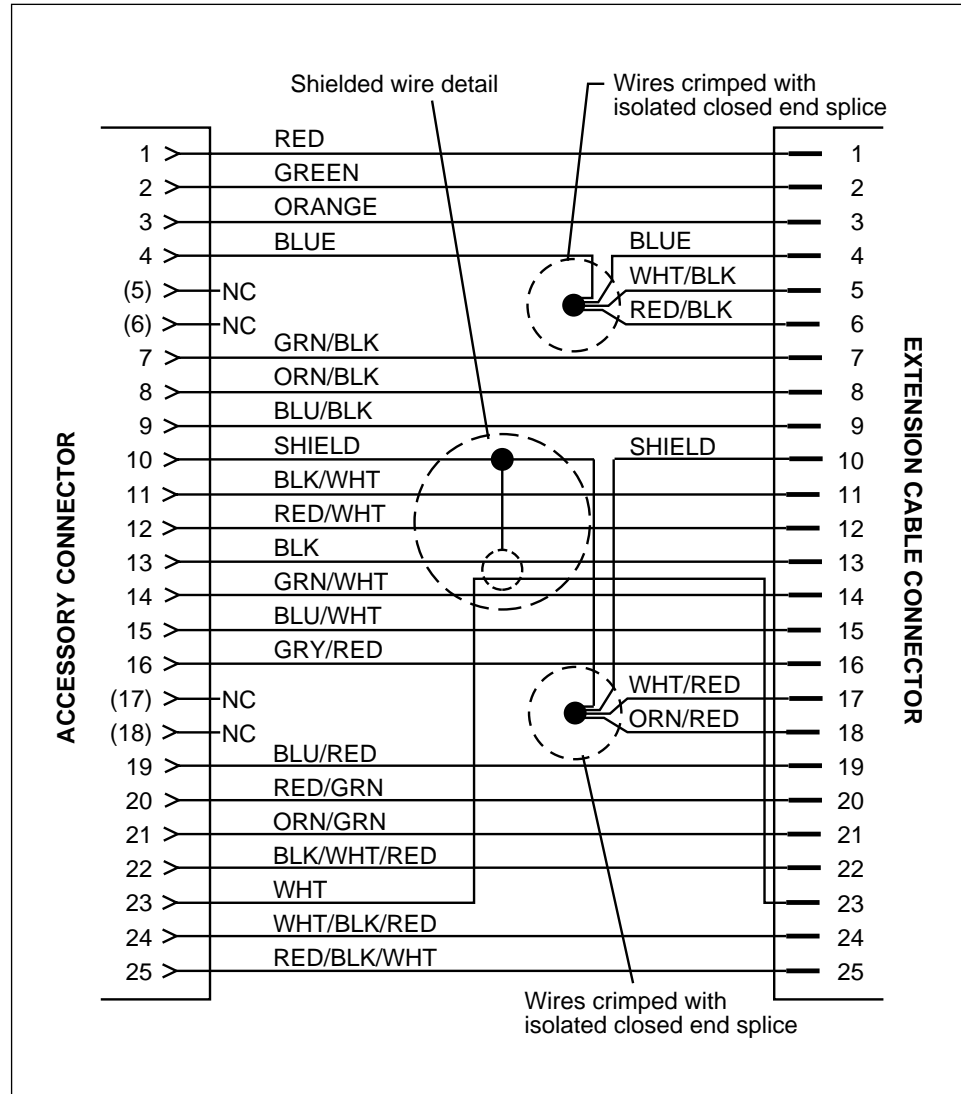


Figure 39 Accessory Extension Cable GKN6269

5 1/2" Speakers HSN4031 (7.5 Watts), HSN4032 (13 Watts)

For dash mount radios, a speaker-to-radio adapter cable, Motorola kit number HKN6127, is required for connection to mobile.

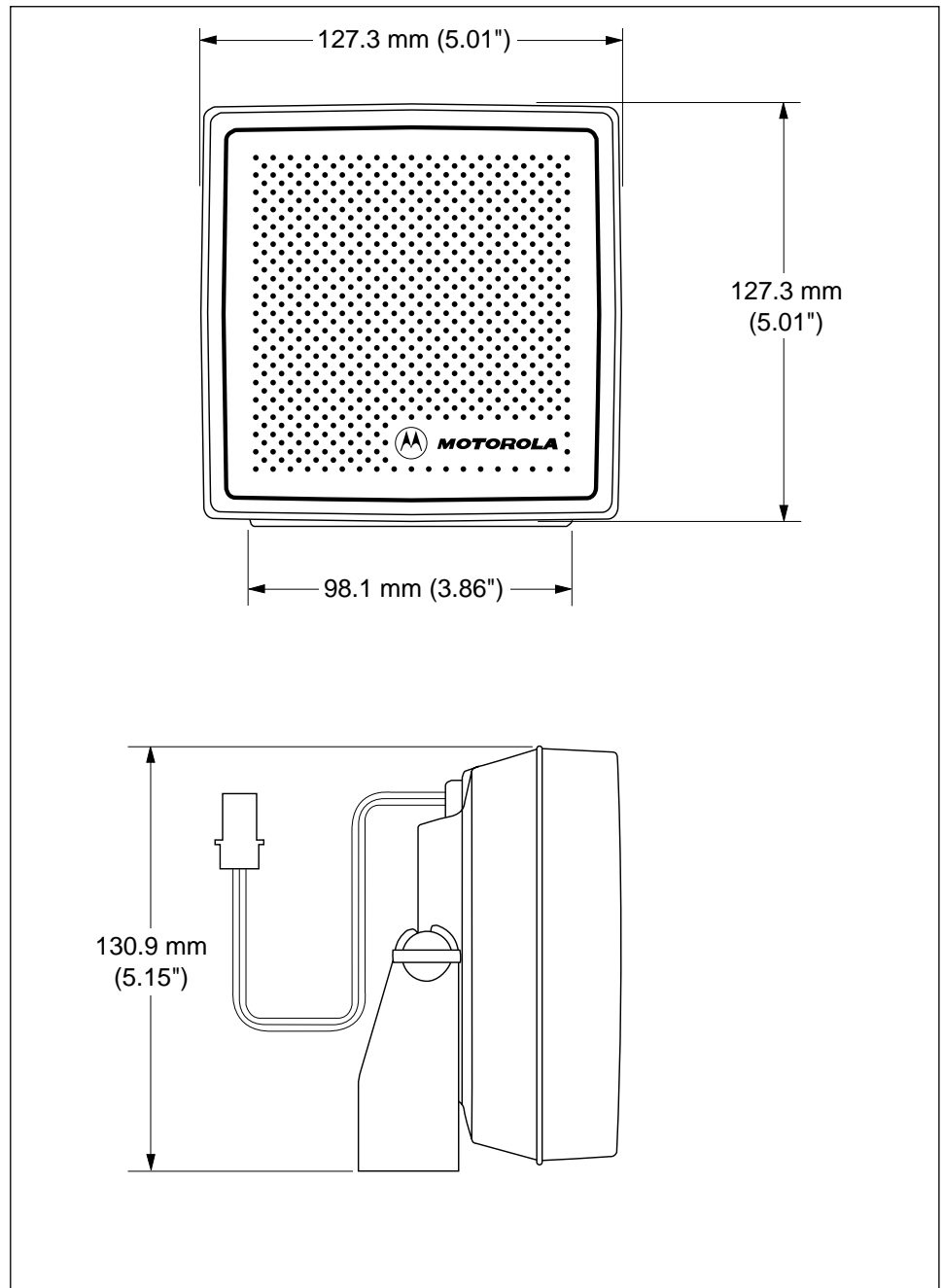


Figure 39A 5 1/2" Speakers HSN4031, HSN4032

Water Resistant 5 1/2" Speakers HSN4024, HSN4025, HSN4027, HSN4028

Dash Mount Speakers: HSN4024 (7.5 W), HSN4025 (13 W)

Remote Mount Speakers: HSN4027 (7.5 W), HSN4028 (13 W)

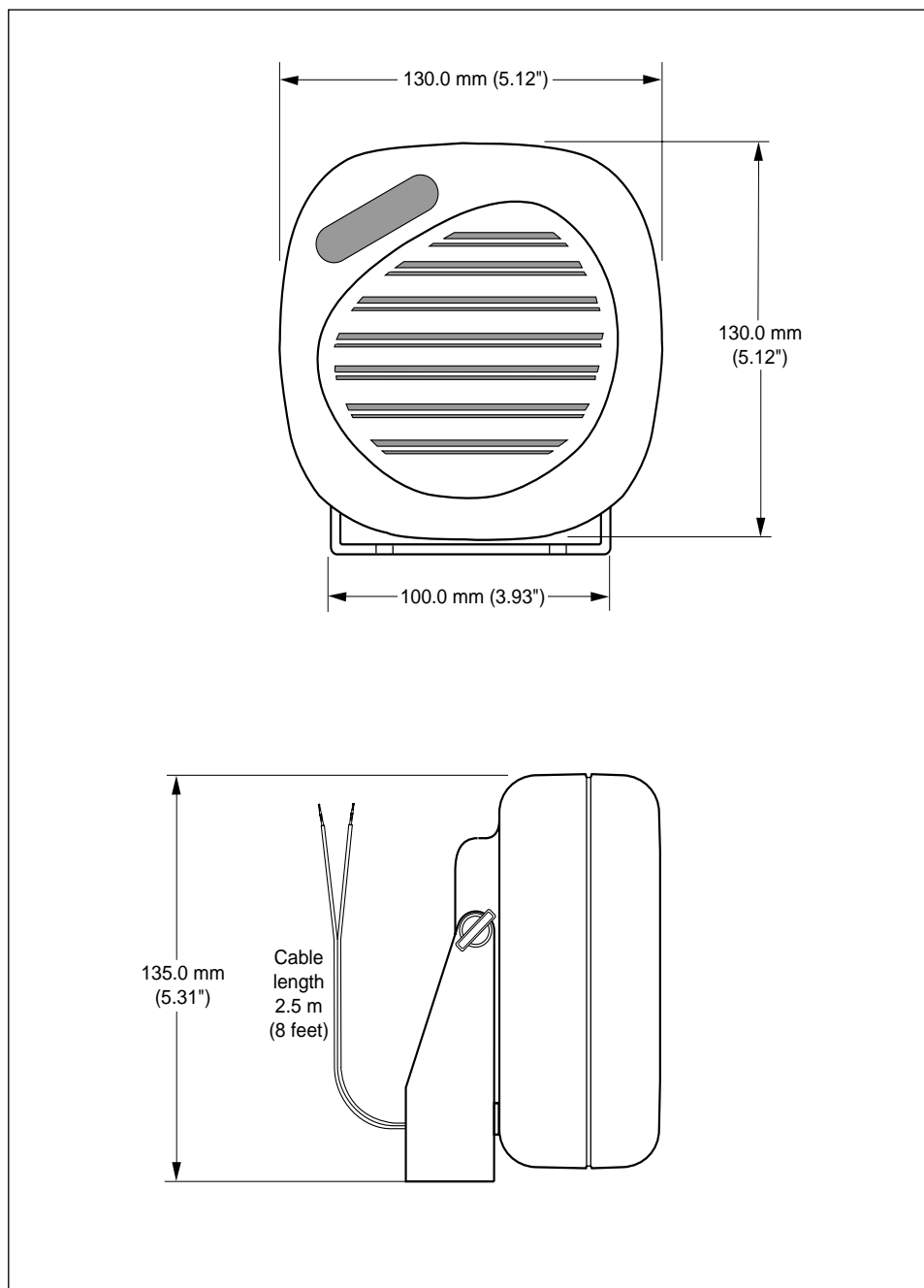


Figure 40 5 1/2" Speakers HSN4024, HSN4025, HSN4027, HSN4028
(Dash Mount with no Accessory Connector Shown)

Rectangular Radius Speaker GSN6056 (5 Watts 20 Ohm)

(Available only through Taunusstein parts department)

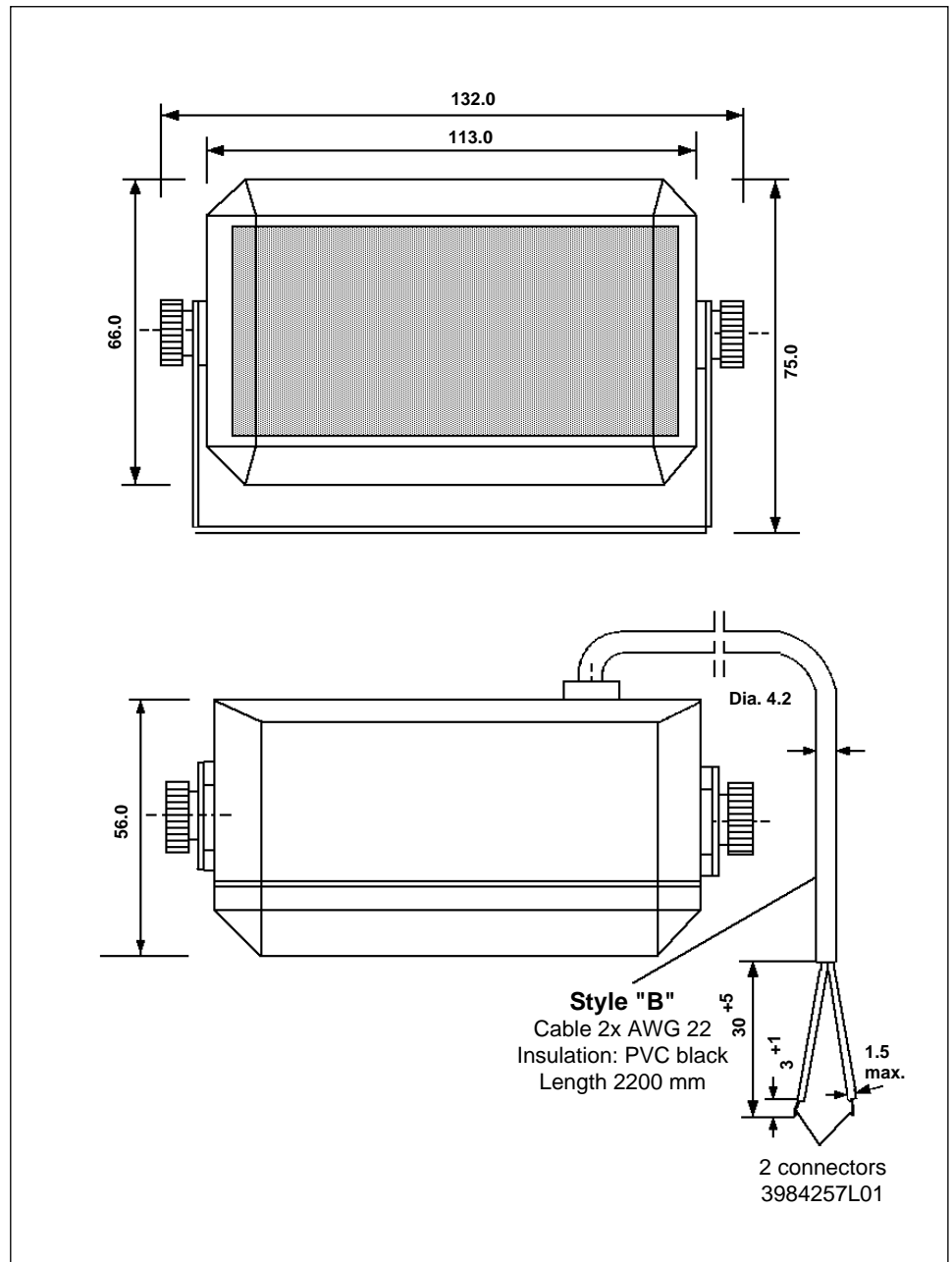


Figure 41 Rectangular Radius Speaker GSN6056

External Speaker GSN6055 (4/5 Watts 20 Ohm)

(Available only through Taunusstein parts department)

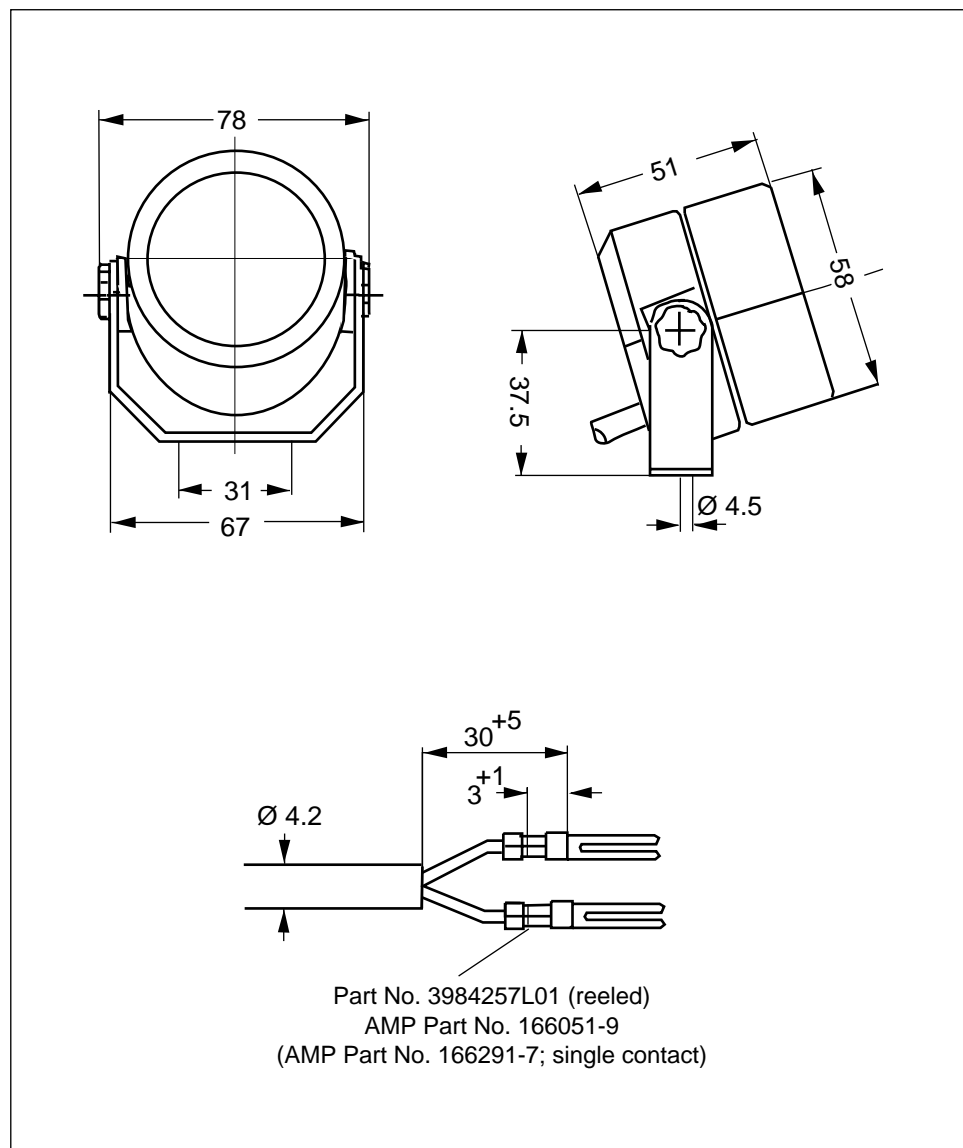


Figure 42 External Speaker GSN6055

Ackermann Handset GLN7276

Not available for MCS 2000 Radios

(Available only through Taunusstein parts department)

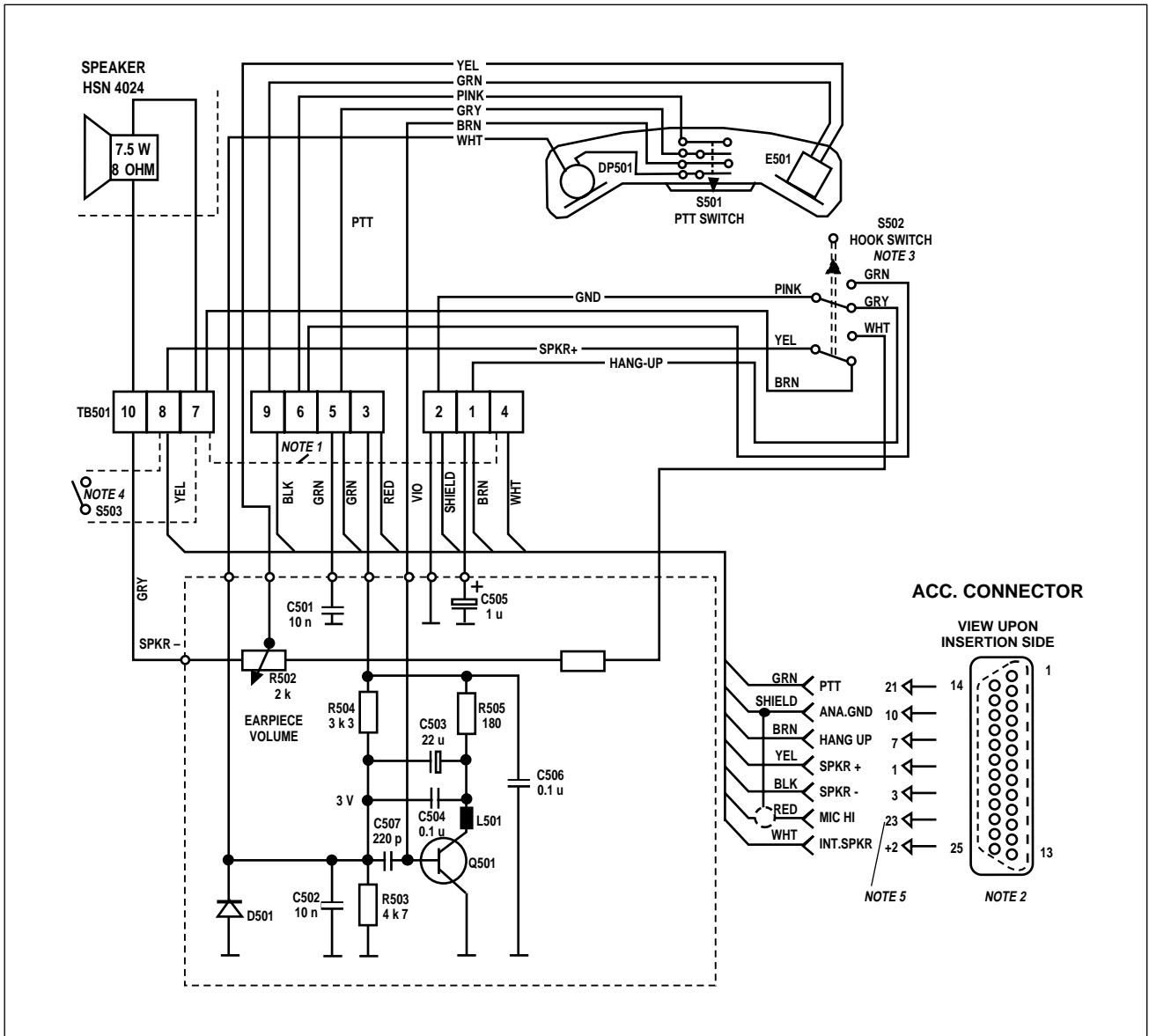


Figure 43 Ackermann Handset GLN7276

NOTES:

1. Only for Control Head with internal speaker
2. Jumper from pin 9 to ground required if no external Emergency switch is installed
3. S502 shown with handset in cradle
4. S503 for monitoring purposes - not part of standard handset
5. Pin 23 on accessory connector: on **900 series radios** the corresponding Microphone Connector is pin 13.

Base Trays HLN6404, HLN6405, HLN6580, HLN6581

Low Power: HLN6404 with Speaker, HLN6405 without Speaker

Mid Power: HLN6580 with Speaker, HLN6581 without Speaker

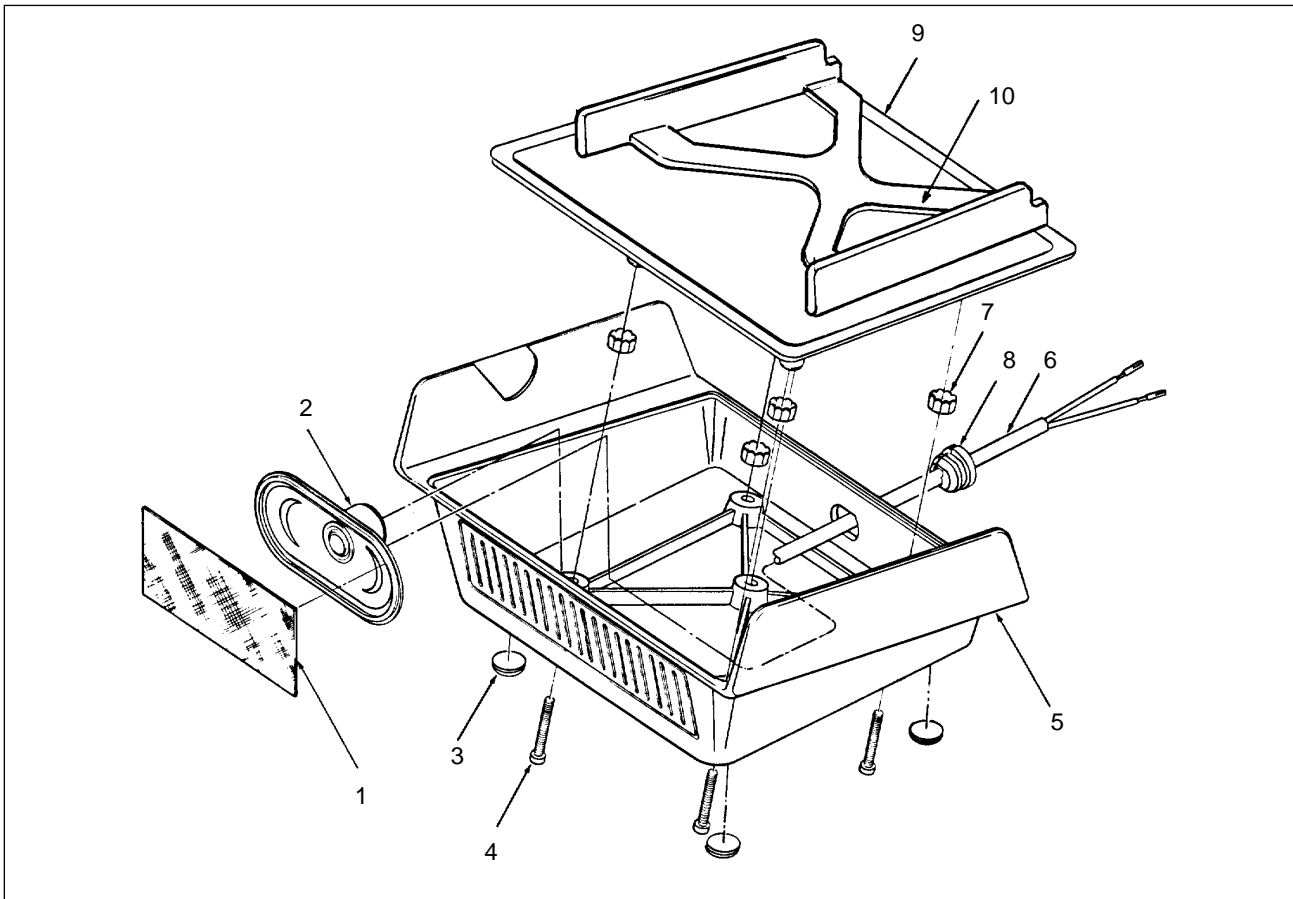


Figure 44 Base Trays HLN6404, HLN6405, HLN6580, HLN6581

Post.	Part No	HLN6404	HLN6405	HLN6580	HLN6581	Description
1	3580009K01	YES	YES	YES	YES	Grille Cloth, Speaker
2	5080085D03	YES	NO	YES	NO	Speaker, 75 x 44 mm dual
3	7510606A06	YES	YES	YES	YES	Bumper Rubber Black
4	0384725C09	YES	YES	YES	YES	Screw Tap 4.2 x 16 Phil. zn
5	1580155J01	YES	YES	YES	YES	Housing, Base Tray
6	3002509Y01	YES	NO	YES	NO	Cable, Base Tray
7	4205722C02	YES	YES	YES	YES	Clip Fastener
8	4282018H18	YES	YES	YES	YES	Cable Retainer
9	1580154J02	YES	YES	YES	YES	Cover, Base Tray
10a	7505190X01	YES	YES	NO	NO	Spacer, Base Tray
10b	4305477Y01	NO	NO	YES	YES	Spacer, Base Tray, Mid Pwr

Table 1. Mechanical Parts for Base Trays HLN6404, HLN6405, HLN6580, HLN6581

Accessory Connector Pin Functions

This appendix describes the accessory connector pin functions for each of the following mobile radio series: 900 series (Table 2 on page 39), 1200 series (Table 3 on page 41), 2000 series (Table 4 on page 43) and 2100 series (Table 5 on page 45).

The description gives information on the type of signals, voltages and current conditions.

Pins which are marked with no function, should not be connected.

900 Series Radios

Table 2. 900 Series Accessory Connector Pin Functions

Pin	Name	Function	Description
1	SPK+	Speaker+	Speaker+ and Speaker- (Pin 3) are used to connect an external speaker. The audio PA is a bridge amplifier with a minimum load of 3.2 Ohms.
2	INT_SPK+	Internal Speaker Return	A jumper from Pin 1 to Pin 2 will enable the internal speaker.
3	SPK-	Speaker-	Refer to Speaker+ Pin 1.
4	(GND)	Digital ground	Used as ground for Digital signals.
5	BUSY	SB9600 Busy	This is part of the Motorola Bus to connect external devices.
6	BUS+	SB9600 Bus+	This is part of the Motorola Bus to connect external devices.
7	IO_6	HUB/Monit or Input Line	This line has an internal pull-up resistor. The radio will enter the monitor mode when this line is not connected to ground.
8	IO_5	Car radio mute	The function of this pin can be programmed by RSS as car radio mute, speaker on, carrier on, or no function. This line is active low.
9	EMERGENCY	Emergency	This pin must be connected to ground by jumper on accessory connector if emergency is disabled, even if disabled by the RSS. If emergency is enabled, this line must be grounded via a switch, which is normally closed. The emergency debounce time is programmable via the RSS.
10	(GND)	Analog Ground	Used as ground for Analog signals.

Table 2. 900 Series Accessory Connector Pin Functions

Pin	Name	Function	Description
11	RX_HI:FIL_AUDIO	Filtered Audio Out	This is a fixed level received audio. The signal has passed the received filtering and contains the alert tones. This audio is controlled by the squelch logic. Flat or Deemphasis are as programmed by the RSS. The output voltage is approximately 230 mV at a nominal deviation at 1 kHz. The DC offset is 4.6 V.
12	AUX_RX_IN2	no function	
13	MIC_IN	Mic In and Radio On-Off	This Microphone input is parallel to the Microphone input of the control head microphone connector. The nominal input level is 80 mV for 60% deviation. The DC impedance is 1100 Ohms and the AC impedance is 1000 Ohms. Pulling this line low (below 1.7 VDC) will switch the radio on or off, depending of the previous state. Note: Only one Microphone should be active at the same time, to make sure that no on/off function is detected by the radio.
14	SW_B+	SW B+	This voltage is available, when the radio is switched on.
15	IGNITION	Ignition	Turning off the ignition will only cause the radio to power down if the radio was powered up via the momentary on/off switch after the ignition was turned on. Powering up the radio via the momentary on/off switch before the ignition was turned on, will cause subsequent changes in ignition to have no affect on the radio.
16	IO_2	External Alarm	This line is active high (Battery Voltage). This line can directly drive the Motorola Buzzer GLN7282 or the Motorola External Alarm Relay GLN7283. The other pin of the Buzzer or Relay must be connected to ground. The active time can be programmed via the RSS. External Alarm must be enabled by the RSS and must be activated by the user via the control head.
17	RESET	SB9600 Reset	This is part of the Motorola Bus to connect external devices.
18	BUS-	SB9600 Bus-	This is part of the Motorola Bus to connect external devices.
19	SCI_RX_DATA	no function	
20	IO_4	External Mic enable	This is an O/Collector Output. If Emergency is active, this line goes low. An external relay can switch the Mic input pin 13 to a second emergency microphone.
21	IO_3	PTT	This line has an internal pull-up resistor. Pulling this line to ground will activate the PTT function. Mic Input Pin 13 is active. The response time is about 30 ms.
22	RSSI_OUT	RSSI (Radio Signal Strength Indicator)	This is an analog output which indicates the strength of the received signal.
23	EXTERNAL_MIC-IN	no function	
24	AUX_TX_IN2	Aux Tx (Auxiliary TX input)	This input is used in data modem applications.
25	BUFFERED_DISCRIMINATOR	Universal I/O Out	This is a buffered output of the discriminator audio. The output voltage depends on the channel spacing of the received channel. Approximately 200 mV at 12.5 kHz channel spacing for 60% of FSD full system deviation.

1200 Series radios

Table 3. 1200 Series Accessory Connector Pin Functions

Pin	Name	Function	Description
1	SPK+	Speaker+	Speaker+ and Speaker- (Pin 3) are used to connect an external speaker. The audio PA is a bridge amplifier with a minimum load of 3.2 Ohms.
2	INT_SPK+	no function	
3	SPK-	Speaker-	Refer to Speaker+ Pin 1.
4	(GND)	Digital ground	Used as ground for Digital signals.
5	BUSY	SB9600 Busy	This is part of the Motorola Bus to connect external devices.
6	BUS+	SB9600 Bus+	This is part of the Motorola Bus to connect external devices.
7	IO_6	RTS In	Request To Send (MAP 27 Mode): Must not be connect to ground when used in MAP27 mode. It has 5 volt logic with an internal pull-up to 5 volts.
8	IO_5	CTS Out	Data Channel Activity Indication (Trunking Mode): Active low (0 V) indicates that the radio is on an allocated traffic channel. High (5 V) indicates that the radio is not on a traffic channel. Carrier Indication (Conventional Mode): Active low (0 V) indicates that the radio is receiving carrier. High (5 V) indicates that the radio is squelched.
9	EMERGENCY	Emergency In, NPD Call Request and NPD Call Cleardown	This pin must be connected to ground by jumper on accessory connector if emergency is disabled, even if disabled by the RSS. If emergency is enabled, this line must be grounded via a switch, which is normally closed. The emergency debounce time is programmable via the RSS. NPD Call Request (trunking data mode): Active open contact emergency line giving emergency line where a call destination string is a valid non-emergency call string. Call Cleardown (trunking data mode): Grounded will give deactivation of the emergency line clearing down outgoing NPD calls.
10	(GND)	Analog Ground	Used as ground for Analog signals.
11	RX_HI:FIL_AUDIO	Filtered Audio	This is a fixed level received audio. The signal has passed the received filtering and contains the alert tones. This audio is controlled by the squelch logic. Flat or Deemphasis are as programmed by the RSS. The output voltage is approximately 200 mV at nominal deviation with 1 kHz modulation. The DC offset is 4.6 V.
12	AUX_RX_IN2	no function	
13	MIC_IN	Mic In and Radio On-Off	This Microphone input is active when the radio detects a PTT press from the control head. The Microphone input is parallel to the Microphone input of the control head microphone connector. The nominal input level is 80 mV for 60% deviation. The DC impedance is 1100 Ohms and the AC impedance is 1000 Ohms. Pulling this line low (below 1.7 VDC) will switch the radio on or off, depending of the previous state. Note: Only one microphone should be connected to this input, to make sure that no on/off detection will occur.

Table 3. 1200 Series Accessory Connector Pin Functions

Pin	Name	Function	Description
14	SW_B+	SW B+	This voltage is available, when the radio is switched on. It is also available if the radio is not visibly switched on in emergency mode (emergency was active when the radio was switched off).
15	IGNITION	Ignition	If the radio is switched on prior to the vehicle ignition being switched on, then the vehicle ignition being switched off/on shall not cause the radio to switch off/on. If the radio is switched on after the vehicle ignition is switched on, then when the ignition is subsequently switched off/on the radio must switch off/on. Pressing the on/off switch when the radio is on will always cause the radio to switch off.
16	IO_2	External Alarm Out and NPD Call In Progress	This line is active high (Battery Voltage). This line can directly drive the Motorola Buzzer GLN7282 or the Motorola External Alarm Relay GLN7283. The other pin of the Buzzer or Relay must be connected to ground. The active time can be programmed via the RSS. The External Alarm must be enabled by the RSS and must be activated by the user via the control head. NPD Call In Progress (trunking data mode): External alarm line switched B+ when NPD call in progress.
17	RESET	SB9600 Reset	This is part of the Motorola Bus to connect external devices.
18	BUS-	SB9600 Bus-	This is part of the Motorola Bus to connect external devices.
19	SCI_RX_DATA	Rx Data	Serial Data Input (MAP27 mode): Digital RS232 type async. serial data (using 5 V logic levels) to the radio. Requires an external level shifter interface (EKN4569) to connect with RS232 device.
20	IO_4	Tx Data	Serial Data Output (MAP27 mode): Digital RS232 type async. serial data (using 5 V logic levels) from the radio. Requires an external level shifter interface (EKN4569) to connect with RS232 device.
21	IO_3	PTT	This line has a internal pull-up resistor. Pulling this line to ground will activate the PTT function. The second microphone on pin 23 is selected. The response time is about 80 to 120 msec.
22	RSSI_OUT	RSSI (Radio Signal Strength Indicator)	This is an analog output which indicates the strength of the received signal.
23	EXTERNAL_MIC_IN	2nd Mic input	This mic is selected if PTT is activated on the accessory connector Pin 21. The nominal input level is 80 mV for 60% deviation. The DC impedance is 1600 Ohms and the AC impedance is 600 Ohms.
24	AUX_TX_IN2	Tx Audio	Analog input modulating signal for NPD. Requires a suitable external modem for data. Nominal Input Level (at 60% deviation): 220 mV. Input Impedance: 6.8 kohms. Note: input must be AC coupled via a suitable capacitor.
25	BUFFERED_DISCRIMINATOR	Rx Audio	Analog output signal for NPD. Requires a suitable external modem for data. Nominal input level (at 60% deviation): 220 mV. Deemphasis: none.

2000 Series Radios

Table 4. 2000 Series Accessory Connector Pin Functions

Pin	Name	Function	Description
1	SPK+	Speaker+	Speaker+ and Speaker- (Pin 3) are used to connect an external speaker. The audio PA is a bridge amplifier with a minimum load of 3.2 Ohms.
2	INT_SPK+	Internal Speaker Return	A jumper from Pin 1 to Pin 2 will enable the internal speaker.
3	SPK-	Speaker-	Refer to Speaker+ Pin 1
4	(GND)	Digital ground	Used as ground for Digital signals.
5	BUSY	SB9600 Busy	This is part of the Motorola Bus to connect external devices.
6	BUS+	SB9600 Bus+	This is part of the Motorola Bus to connect external devices.
7	IO_6	HUB/Monit or Input Line or RS232 RTS or GP I/O6	This line has an internal pull-up resistor. The radio will enter the monitor mode when this line is not connected to ground.
8	IO_5	Car radio mute or RS232 CTS or GP I/O5	The function of this pin can be programmed by RSS as car radio mute, speaker on, carrier on or no function. This line is active low.
9	EMERGENCY	Emergency	This pin must be connected to ground by jumper on accessory connector if emergency is disabled, even if disabled by the RSS. If emergency is enabled, this line must be grounded via a switch, which is normally closed. The emergency debounce time is programmable via the RSS.
10	(GND)	Analog Ground	Used as ground for Analog signals.
11	RX_HI:FIL_AUDIO	Filtered Audio Out	This is a fixed level received audio. The signal has passed the received filtering and contains the alert tones. This audio is controlled by the squelch logic. Flat or Deemphasis are as programmed by the RSS. The output voltage is approximately 230 mV at a nominal deviation at 1 kHz. The DC offset is 4.6 V.
12	AUX_RX_IN2	Aux Rx In2	
13	MIC_IN	Mic In and Radio On-Off	This Microphone input is parallel to the Microphone input of the control head microphone connector. The nominal input level is 80 mV for 60% deviation. The DC impedance is 1000 Ohms and the AC impedance is 1100 Ohms. Pulling this line low (below 1.7 VDC) will switch the radio on or off, depending of the previous state. Note: Only one Microphone should be active at the same time, to make sure that no on/off function is detected by the radio.
14	SW_B+	SW B+	This voltage is available, when the radio is switched on.
15	IGNITION	Ignition	Refer to Table 6 in Appendix A2 for details about the ignition sense function.

Table 4. 2000 Series Accessory Connector Pin Functions

Pin	Name	Function	Description
16	IO_2	External Alarm or GP I/O2	This line is active high (Battery Voltage). This line can directly drive the Motorola Buzzer GLN7282 or the Motorola External Alarm Relay GLN7283. The other pin of the Buzzer or Relay must be connected to ground. The active time can be programmed via the RSS. External Alarm must be enabled by the RSS and must be activated by the user via the control head.
17	RESET	SB9600 Reset	This is part of the Motorola Bus to connect external devices.
18	BUS-	SB9600 Bus-	This is part of the Motorola Bus to connect external devices.
19	SCI_RX_DATA	RS232 Rx Data	
20	IO_4	RS232 Rx Data or GP I/O4	Serial Data Input. Digital RS232 type asynchronous serial data to the radio.
21	IO_3	PTT or Vpp or GP I/O3	This line has an internal pull-up resistor. Pulling this line to ground will activate the PTT function. Mic Input Pin 13 is active. The response time is about 30 ms. Used also when FLASHing the radio.
22	RSSI_OUT	RSSI (Radio Signal Strength Indicator)	This is an analog output which indicates the strength of the received signal.
23	EXTERNAL_MIC_IN	External Mic In	Used for a vehicular speaker mic (VSP) or a 2nd microphone.
24	AUX_TX_IN2	Aux Tx (Auxiliary TX input)	
25	BUFFERED_DISCRIMINATOR	Universal I/O Out	This is a buffered output of the discriminator audio. The output voltage depends on the channel spacing of the received channel. Approximately 200 mV at 12.5 kHz channel spacing for 60% of FSD full system deviation.

2100 Series Radios

Table 5. 2100 Series Accessory Connector Pin Functions

Pin	Name	Function	Description
1	SPK+	Speaker+	Speaker+ and Speaker- (Pin 3) are used to connect the Speaker. The audio PA is a bridge amplifier with a minimum load of 3.2 Ohms.
2	INT_SPK+	no function	no function
3	SPK-	Speaker-	refer to Speaker+ Pin 1
4	(GND)	Digital ground	
5	BUSY	SB9600 Busy	This is part of the Motorola Bus to connect external devices.
6	BUS+	SB9600 Bus+	This is part of the Motorola Bus to connect external devices.
7	IO_6	HUB/Monit or Input Line	This line has an internal pull-up resistor. The radio will enter the monitor mode when this line is not connected to ground. The function can be changed via the RSS.
8	IO_5	Car radio mute	This line is active low. As long the radio is in monitor mode or PTT is pressed, this line is active.
9	EMERGENCY	Emergency	This pin must be connected to ground by jumper on accessory connector if emergency is disabled, even if disabled by the RSS. If emergency is enabled, this line must be grounded via a switch, which is normally closed. The emergency debounce time is programmable via the RSS.
10	(GND)	Analog Ground	
11	RX_HI:FIL_AUDIO	Filtered Audio	This is a fixed level received audio. The signal has passed the received filtering and contains the alert tones. This audio is controlled by the squelch logic. Flat or Deemphase are as programmed by the RSS. The output voltage is approximately 200 mV at nominal deviation at 1 kHz. The DC offset is 4.6 V.
12	AUX_RX_IN2	no function	no function
13	MIC_IN	Mic In and Radio On-Off	This Microphone input is active when the radio detects a PTT press from the control head. This Microphone input is parallel to the Microphone input of the control head microphone connector. The nominal input level is 80 mV for 60% deviation. The DC impedance is 1100 Ohms and the AC impedance is 1000 Ohms. Pulling this line low (below 1.7 V) will switch the radio on or off, depending of the previous state. Note: Only one microphone should be connected to this input to make sure, that no on/off detection will occur.
14	SW_B+	SW B+	This voltage is available, when the radio is switched on. It is also available if the radio is not visibly switched on in emergency mode (emergency was active when the radio was switched off)
15	IGNITION	Ignition	Ignition can be enabled or disabled via the RSS. If enabled via the RSS, the radio will follow this scheme: Battery Voltage at this pin will switch the radio on. Disconnecting this pin from the battery voltage will switch the radio off. The momentary on/off switch is still functional.

Table 5. 2100 Series Accessory Connector Pin Functions

Pin	Name	Function	Description
16	IO_2	External Alarm	This line is active high (Battery Voltage). This line can directly drive the Motorola Buzzer GLN7282 or the Motorola External Alarm Relay GLN7283. The other pin of the Buzzer or Relay must be connected to ground. The active time can be programmed via the RSS. The external alarm must be enabled by the RSS and must be activated by the user via the control head.
17	RESET	SB9600 Reset	This is part of the Motorola Bus to connect external devices.
18	BUS-	SB9600 Bus-	This is part of the Motorola Bus to connect external devices.
19	SCI_RX_DATA	no function	no function
20	IO_4	no function	no function
21	IO_3	PTT	This line has an internal pull-up resistor. Pulling this line to ground will activate the PTT function. The second microphone on pin 23 is selected. Response time is about 80 to 120 msec.
22	RSSI_OUT	RSSI (Radio Signal Strength Indicator)	This is an analog output which indicates the strength of the received signal.
23	EXTERNAL_MIC_IN	2nd Mic input	This microphone is selected if PTT is activated on the accessory connector pin 21. The nominal input level is 80 mV for 60% deviation. The DC impedance is 1600 Ohms and the AC impedance is 600 Ohms.
24	AUX_TX_IN2	no function	no function
25	BUFFERED_DISCRIMINATOR	Universal I/O out	This function will be implemented in Phase II. This is a buffered output of the Discriminator Audio The output voltage depends on the channel spacing of the received channel. Approximately 200 mV at 12.5 kHz.

Ignition Sense Cable Kit Installation

Introduction

This appendix provides installation instructions for the ignition sense cable, Motorola Kit No. HKN6128, supplied with each MCS 2000 Mobile Radio intended for installation *in a vehicle*.

The ignition sense cable kit is an accessory for the MCS 2000 radio. Motorola supplies an ignition sense cable and recommends that it be used with every *mobile* installation of the MCS 2000 Radio. The ignition sense cable allows the radio to be turned on and off with the vehicle ignition switch. It also ensures that the radio does not turn itself off during cranking of the vehicle engine. Without the ignition sense cable, the radio may turn itself off if the vehicle battery voltage drops below some minimum level while a heavy load (such as cranking/starting) is placed on the battery.

Operation of the ignition sense function varies according to how the radio is programmed using the Radio Service Software (RSS). Table 6 summarizes operation of the ignition sense function and indicates how its operation varies according to RSS programming of the radio.

When the ignition sense feature is desired and is enabled with the RSS (Ignition Sense set to Soft Power Off, TX Inhibit, or PTT Inhibit), ignition sense cable should be connected to ignition terminal (i.e., not battery, accessory, or starter terminal) of the vehicle ignition switch. When the ignition sense feature is not desired and is disabled with the RSS (Ignition Sense set to Blank), the ignition sense cable should be connected to the positive terminal of the vehicle battery or an equivalent connection point in the vehicle. This will eliminate the possibility that the radio will shut off during vehicle cranking.

Contents of Kit

The ignition sense cable kit consists of the components listed in table 7. The components are illustrated in the paragraph titled Installation Instructions.

NOTE: The Motorola Part Numbers given in the first column of table 7 are for reference only. Those parts, except for the fuse, Motorola Part No. 6580283E01, are *not* available separately from the Motorola Parts Depot.

References

While installing ignition sense cable kit, refer to the following topics in section 4 of this Manual.

1. Installation Instructions for Accessory Plug, MCS 2000 Radios Only
2. Connecting Plan for Car Radio Mute, Ignition Switch On/Off, Emergency Switch and Emergency Hot Mic

Table 6. MCS 2000 Ignition Sense Function - Operator Action vs. Resultant Radio States

This Action During This State of Radio				Causes The Following Radio States to Occur			
Present State of Radio				Functions Available Through Ignition Sense Programmed in RSS			
Action	On/ Off	Receive/ Stand-by/ Emergency	Ignition	Blank (Default from Factory ¹)	Soft Power Off Default from Factory	TX Inhibit	PTT Inhibit
Press On/Off Button	On	Receive/ Stand-by	On	Off	Off	Off	Off
Press On/Off Button ²	On	Emer	On	Off	Off	Off	Off
Press On/Off Button	Off	Off	On	On	On	On	On
Press On/Off Button	On	Receive/ Stand-by	Off	Off	Off	Off	Off
Press On/Off Button	On	Emer	Off	Off	Off	Off	Off
Press On/Off Button	Off	Off	Off	On	On (Off ³)	On - RX or Standby	On -RX or Standby
Short Press Emer Button	On	Receive/ Stand-by	On	On - Emer TX	On - Emer TX	On - Emer TX	On - Emer TX
Long Press Emer Button	On	Emer	On	On	On	On	On
Short Press Emer Button ²	Off	Off	On	Off	Off	Off	Off
Short Press Emer Button ²	On	Receive/ Stand-by	Off	On - Emer TX	Off	Emer Displayed for 3 Seconds then No Ack Displayed - No TX (All of the above plus sidetones ³)	On - Emer TX
Long Press Emer Button	On	Emer	Off	On	Off	On	On
Short Press Emer Button ²	Off	Off	Off	Off	Off	Off	Off
Turn Ignition On	On	Receive/ Stand-by	Off	On	On	On	On - No PTT TX
Turn Ignition On ²	On	Emer	Off	On - Emer TX	On	On - Emer TX	On - Emer TX
Turn Ignition On	Off	Off	Off	Off	On	Off	Off
Turn Ignition Off	On	Receive/ Stand-by	On	On	Off	On - No TX	On - No TX
Turn Ignition Off ²	On	Emer	On	On - Emer TX	Off	On - Emer TX	On -Emer TX
Turn Ignition Off	Off	Off	On	Off	Off	Off	Off
Data PTT	On	Data Mode	Off	TX	Off	No TX	No TX
Press On/Off Button	On	Data Mode	On	Off	Off	Off	Off
Press On/Off Button	On	Data Mode	Off	Off	Off	Off	Off
Short Press Emer Button	On	Data Mode	On	On - Emer TX	On - Emer TX	On - Emer TX	On - Emer TX

This Action During This State of Radio				Causes The Following Radio States to Occur			
Present State of Radio				Functions Available Through Ignition Sense Programmed in RSS			
Action	On/ Off	Receive/ Stand-by/ Emergency	Ignition	Blank (Default from Factory ¹)	Soft Power Off Default from Factory	TX Inhibit	PTT Inhibit
Short Press Emer Button ²	On	Data Mode	Off	On - Emer TX	Off	Emer Displayed for 3 Seconds then No Ack Displayed - No TX	On - Emer TX
Turn Ignition On	On	Data Mode	Off	On	N/A	On	On - No PTT TX
Turn Ignition Off	On	Data Mode	On	On	Off	On - No TX	On - No TX

1) The "Default from Factory" was changed in Release 4.01.

2) Take special note of Emergency operation (shown in oversize bold print) under these conditions

3) For firmware versions older than Release 4.0, the feature will operate as shown in parenthesis. To determine firmware version present in radio, proceed as follows:

Within 10 Seconds after powering on the radio, press the test mode entry button five times. On Model I radio, test mode entry button is third button from left on bottom row of buttons. On radio Models II and III, test mode entry button is first button on left side of bottom row of buttons. When the test mode entry button is pressed five times, the radio will scroll sequentially through six displays. The first display in the sequence is SERVICE. The second display is the radio firmware version (e.g., R03.11).

Table 7. Components of Ignition Sense Cable Kit No. GKN6263

Motorola Part Number	Quantity	Description
3005707Y01	1	Ignition Sense Cable, 21-Feet Long (with accessory plug pin, Motorola Part No. 3984257L01, crimped onto one end)
3080094G02	1	Fused Power Cable Adapter (with female contact, Motorola Part No. 2802098M03, crimped onto short lead)
6580283E01	1	Fuse, 3-Amperes, Blade-Type, Fast Acting
2802496Y01	1	Faston Receptacle, Type PIDG, AMP Part No. 9-160463-2
2802496Y02	1	Circular Connector Plug, Type PIDG, AMP Part No. 165590-1
4210217A02	2	Tie Strap

Tools
Required But
Not Supplied

One of the following two crimping tools is required for installation of the ignition sense cable: AMP Hand Crimping Tool No. 47386; or AMP TETRA-CRIMP Hand Crimping Tool No. 59824-1.

Installation Instructions

Installation of the ignition sense cable consists of the following three procedures: connecting ignition sense cable to radio accessory plug; routing ignition sense cable and cutting it to proper length and attaching plug to free end; attaching receptacle to fused power cable adapter; connecting ignition sense cable to fused power cable adapter; and connecting fused power cable adapter to vehicle power source. Each of these procedures are provided in the subparagraphs that follow.

Connecting Ignition Sense Cable to Radio Accessory Plug

1. Refer to chapter 4 of this manual for accessory plug disassembly and reassembly instructions.
2. Unplug accessory plug from accessory connector on bottom of radio.
3. If radio is low and mid power type, thread pin end of ignition sense cable through strain relief device on bottom or rear of radio. If radio is high power type, thread pin end of ignition sense cable under tiedown strap on rear of radio mounting tray.
4. Disassemble accessory plug, insert connector pin on end of ignition sense cable into pin location 15, then reassemble accessory plug.
5. Plug accessory plug back into accessory connector on radio.

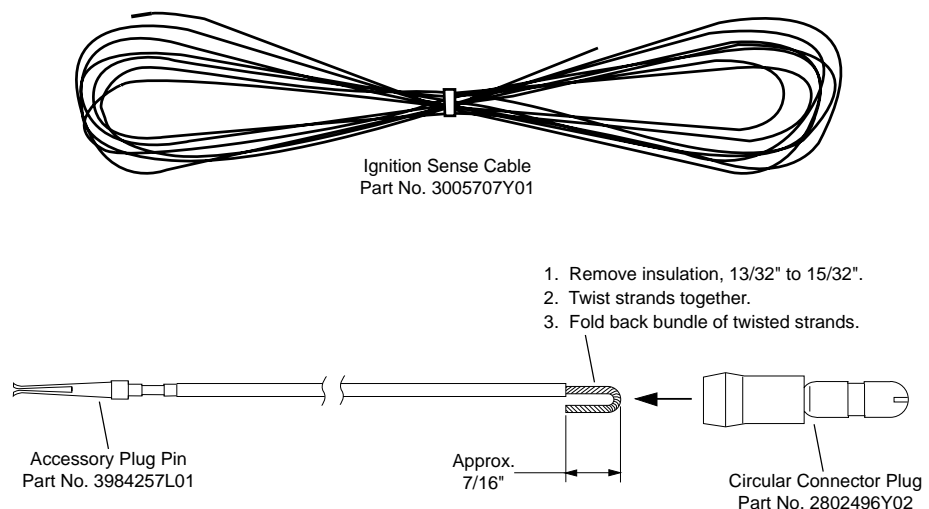


Figure 45 Ignition Sense Cable

MAEPF-25667-O

Routing Ignition Sense Cable, Cutting It To Proper Length, and Attaching Plug to Free end

1. Refer to Figure 45. Route ignition sense cable as required from radio to area in vehicle where it is to be connected to vehicle power source. Be careful to route the cable in such a way that it will not be subjected to abrasion, stretching, sharp bends, or other types of injury that may lead to its eventual failure.
2. Remove 0.4 to 0.5-inch of insulation from end of ignition sense cable being very careful to avoid nicking or otherwise damaging strands of cable.

3. Twist strands of cable tightly then fold back end of twisted strands so that end of twisted strands just touches the point where insulation ends on cable.
4. Insert twisted strands of cable into circular connector plug so that when plug is crimped back crimp will grasp end of insulation on cable and front crimp will grasp folded back twisted strands of cable.
5. Using AMP crimping tool No. 47386 or 59824-1, crimp circular connector plug onto end of ignition sense cable so that back crimp grasps end of insulation on cable and front crimp grasps twisted strands of cable.

Attaching Receptacle To Fused Power Cable Adapter

1. Refer to Figure 46. Remove 0.2 to 0.3-inch of insulation from unterminated wire of fused power cable adapter.
2. Twist strands of wire together and insert into Faston receptacle so that when receptacle is crimped back crimp will grasp end of insulation on wire and front crimp will grasp twisted strands of wire.
3. Using AMP crimping tool No. 47386 or 59824-1, crimp Faston receptacle onto end of fused power cable adapter wire so that back crimp grasps end of insulation on wire and front crimp grasps twisted strands of wire.

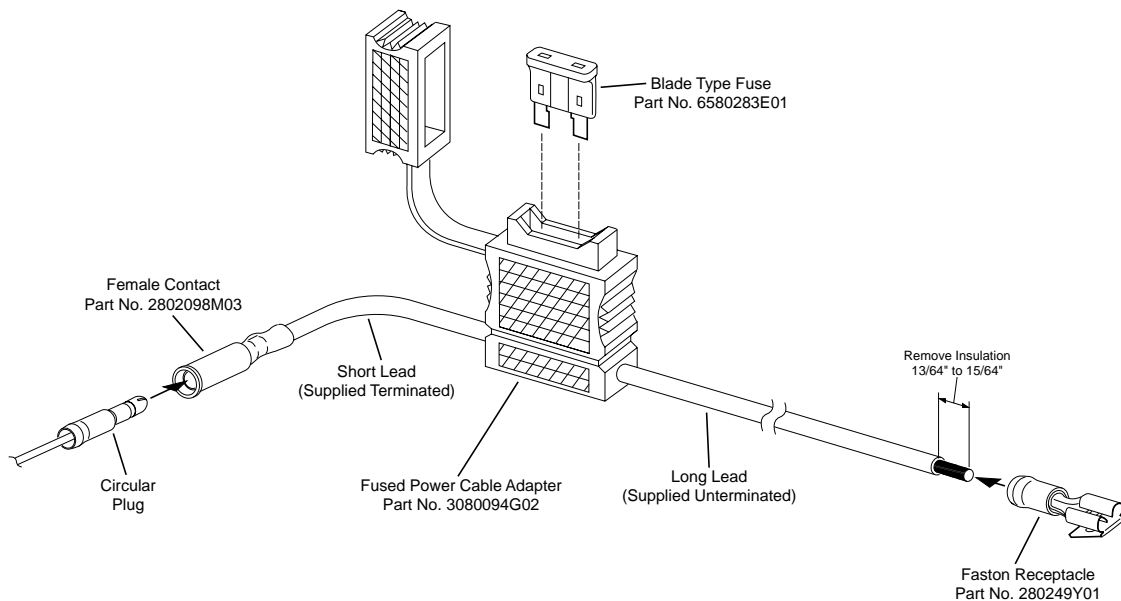


Figure 46 Fused Power Cable Adapter

MAEPF-25666-O

Completing Installation of Ignition Sense Cable

1. Open top of fuseholder on fused power cable adapter and ensure that fuse *is not* installed. If necessary, remove fuse by grasping top edge with fingers and pulling it straight out.
2. Connect Faston receptacle on wire of fused cable adapter onto hot terminal (switched or unswitched) of vehicle ignition switch or other source of vehicle power.
3. Plug circular plug on end of ignition sense cable securely into female contact on wire of fused power cable adapter.
4. Install fuse in fuseholder of fused power cable.

Replaceable Pushbutton Control Head



Availability of replaceable pushbutton control heads depends upon date order was placed, shipped and based upon options ordered. Contact your Parts division for aftermarket kits and parts.

Introduction

This appendix of the installation manual applies only to MCS 2000 radios that have the replaceable pushbutton feature. The replaceable pushbutton feature allows the functions of certain control head pushbuttons to be changed to functions other than those that were assigned by default at the time the radio was manufactured.

Changing the pushbutton functions requires two procedures. The first procedure consists of physically moving and/or replacing the legend caps on certain pushbuttons. The second procedure is that of reprogramming the radio using Radio Service Software (RSS) to assign the desired functions to the desired pushbuttons.

Applicability

The MCS 2000 radios that have the replaceable pushbutton feature can be identified by the following kit numbers printed on the paper tag fastened to the front bottom edge of the control head.

MCS 2000 Radio Model	Kit Number
I	HCN1116
II	HCN1117
III	HCN1118

Description

There are five sizes of replaceable pushbuttons, which are designated sizes A, B, C, D, and E. The replaceable pushbuttons on the Model I radio are size E. Those on the Model II radios are sizes A, B, and C. Those on the Model III radios are sizes A, B, and D. The locations and sizes of the Model I, II and III replaceable pushbuttons are shown in Figures 47, 48, and 49, respectively.














All available replaceable pushbuttons, cross-referenced to their legend descriptions, colors, sizes, and part numbers, are listed in Table 8. Each



pushbutton size for each legend type has an individual Motorola part number. Note from the table that not all legend types are available for all pushbutton sizes. An N/A in a specific cell in the table indicates that the corresponding pushbutton legend is not available for that particular pushbutton size.

Instructions for removing and replacing the replaceable pushbuttons are provided following Table 8.

Table 8. Replaceable Pushbutton Graphics and Part Numbers

Graphic			Pushbutton Part Number				
Legend	Description	Color	Size A	Size B	Size C	Size D	Size E
BLANK	Blank	White	3805230Z01	3805231Z01	3805232Z01	3886267A01	3886267A01
BLANK	Blank	Orange	3805230Z18	3805231Z14	3805232Z10	N/A	3886267A10
A	A	Black	3805230Z42	3805231Z42	3805232Z42	N/A	3886267A40
B	B	Black	3805230Z43	3805231Z43	3805232Z43	N/A	3886267A41
C	C	Black	3805230Z44	3805231Z44	3805232Z44	N/A	3886267A42
Call	Call	Black	3805230Z21	3805231Z07	3805232Z13	N/A	3886267A13
D	D	Black	3805230Z45	3805231Z45	3805232Z45	N/A	3886267A43
Del	Delete	Black	3805230Z35	3805231Z35	3805232Z35	N/A	3886267A14
Dim	Dim	Black	3805230Z12	3805231Z17	3805232Z14	N/A	3886267A15
Dir	Dir	Black	3805230Z38	3805231Z38	3805232Z38	N/A	3886267A36
Emer	Emergency	White	3805230Z22	3805231Z09	3805232Z15	N/A	3886267A16
Emer	Emergency	Orange	3805230Z20	3805231Z16	3805232Z12	N/A	3886267A12
H/L	Horn/Light	Black	3805230Z23	3805231Z04	3805232Z16	N/A	3886267A17
Home	Home	Black	3805230Z10	3805231Z18	3805232Z03	N/A	3886267A18
Menu	Menu	Black	3805230Z09	3805231Z19	3805232Z04	N/A	3886267A05
Mess	Message	Black	3805230Z46	3805231Z46	N/A	N/A	N/A
Mon	Monitor	Black	3805230Z33	3805231Z33	3805232Z33	N/A	3886267A19
Mpl	Mpl	Black	3805230Z41	3805231Z41	3805232Z41	N/A	3886267A39
Opt	Option	Black	3805230Z05	3805231Z20	3805232Z02	N/A	3886267A20
Page	Page	Black	3805230Z03	3805231Z08	3805232Z17	N/A	3886267A21
Phon	Phone	Black	3805230Z24	3805231Z05	3805232Z18	N/A	3886267A22
Pwr	Power	Black	3805230Z39	3805231Z39	3805232Z39	N/A	3886267A37
Read	Read	Black	3805230Z48	3805231Z48	N/A	N/A	N/A
Rcl	Recall	Black	3805230Z36	3805231Z36	3805232Z36	N/A	3886267A34
S	Menu	Black	3805230Z16	3805231Z21	3805232Z06	N/A	3886267A08
Scan	Scan	Black	3805230Z25	3805231Z06	3805232Z19	N/A	3886267A23
Sec	Secure	Black	3805230Z34	3805231Z34	3805232Z34	N/A	3886267A24
Sel	Select	Black	3805230Z08	3805231Z22	3805232Z05	N/A	3886267A06

Graphic			Pushbutton Part Number				
Legend	Description	Color	Size A	Size B	Size C	Size D	Size E
Site	Site	Black	3805230Z37	3805231Z37	3805232Z37	N/A	3886267A35
Srch	Search	Black	3805230Z11	3805231Z23	3805232Z20	N/A	3886267A25
Stat	Status	Black	3805230Z47	3805231Z47	N/A	N/A	N/A
Sys	System	Black	3805230Z40	3805231Z40	3805232Z40	N/A	3886267A38
Zone	Zone	Black	3805230Z02	3805231Z24	3805232Z21	N/A	3886267A26
	Call Symbol	Black	3805230Z26	3805231Z13	3805232Z22	N/A	3886267A07
	Emergency Symbol	White	3805230Z27	3805231Z02	3805232Z23	N/A	3886267A02
	Emergency Symbol	Orange	3805230Z19	3805231Z15	3805232Z11	N/A	3886267A11
	Horn/Light Symbol	Black	3805230Z28	3805231Z10	3805232Z24	N/A	3886267A27
	Home Symbol	Black	3805230Z29	3805231Z25	3805232Z09	N/A	3886267A28
	Monitor Symbol	Black	3805230Z04	3805231Z26	3805232Z25	N/A	3886267A29
	Option Symbol	Black	3805230Z15	3805231Z27	3805232Z08	N/A	3886267A30
	Page Symbol	Black	3805230Z14	3805231Z28	3805232Z26	N/A	3886267A31
	Phone Symbol	Black	3805230Z30	3805231Z11	3805232Z27	N/A	3886267A04
	Scan Symbol	Black	3805230Z31	3805231Z12	3805232Z28	N/A	3886267A03
	Secure Symbol	Black	3805230Z32	3805231Z03	3805232Z29	N/A	3886267A32
	Select Symbol	Black	3805230Z17	3805231Z29	3805232Z07	N/A	3886267A09
	Up Arrow Symbol	Black	3805230Z06	3805231Z30	3805232Z30	N/A	N/A

Graphic			Pushbutton Part Number				
Legend	Description	Color	Size A	Size B	Size C	Size D	Size E
	Down Arrow Symbol	Black	3805230Z07	3805231Z31	3805232Z31	N/A	N/A
	Zone Symbol	Black	3805230Z13	3805231Z32	3805232Z32	N/A	3886267A33
1	Decimal Number	Black	N/A	N/A	N/A	3886267A02	N/A
2	Decimal Number	Black	N/A	N/A	N/A	3886267A03	N/A
3	Decimal Number	Black	N/A	N/A	N/A	3886267A04	N/A
4	Decimal Number	Black	N/A	N/A	N/A	3886267A05	N/A
5	Decimal Number	Black	N/A	N/A	N/A	3886267A06	N/A
6	Decimal Number	Black	N/A	N/A	N/A	3886267A07	N/A
7	Decimal Number	Black	N/A	N/A	N/A	3886267A08	N/A
8	Decimal Number	Black	N/A	N/A	N/A	3886267A09	N/A
9	Decimal Number	Black	N/A	N/A	N/A	3886267A10	N/A
*	Special Character	Black	N/A	N/A	N/A	3886267A11	N/A
0	Decimal Number	Black	N/A	N/A	N/A	3886267A12	N/A
#	Special Character	Black	N/A	N/A	N/A	3886267A13	N/A
2ABC	Numeral-Letter	Black	N/A	N/A	N/A	3886267A14	N/A
3DEF	Numeral-Letter	Black	N/A	N/A	N/A	3886267A15	N/A
4GHI	Numeral-Letter	Black	N/A	N/A	N/A	3886267A16	N/A
5JKL	Numeral-Letter	Black	N/A	N/A	N/A	3886267A17	N/A
6MNO	Numeral-Letter	Black	N/A	N/A	N/A	3886267A18	N/A
7PRS	Numeral-Letter	Black	N/A	N/A	N/A	3886267A19	N/A
8TUV	Numeral-Letter	Black	N/A	N/A	N/A	3886267A20	N/A
9WXY	Numeral-Letter	Black	N/A	N/A	N/A	3886267A21	N/A



The letters A, B, C, and D in the three control head illustrations, Figures 47, 48 and 49 below, refer to the four different physical sizes of pushbuttons and their locations.

Instructions for removing and replacing the replaceable pushbuttons are provided following Figure 49.

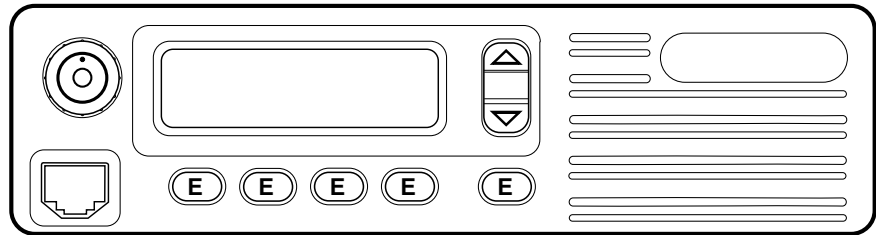


Figure 47 Model I Replaceable Pushbuttons

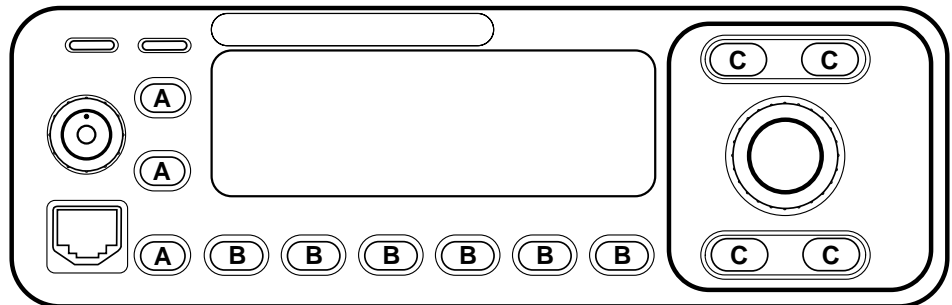


Figure 48 Model II Replaceable Pushbuttons

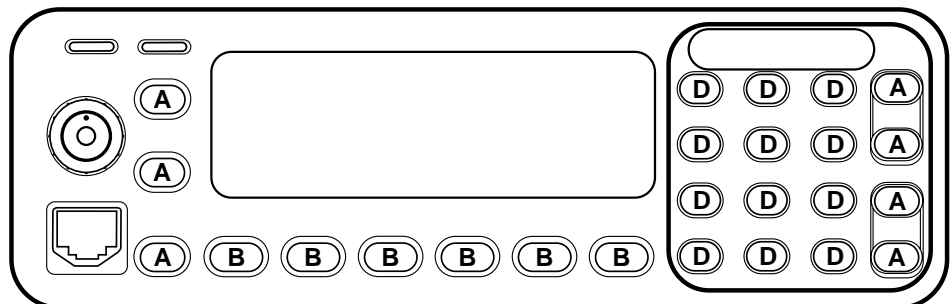


Figure 49 Model III Replaceable Pushbuttons

Special Tools Required

Replacing the replaceable pushbuttons requires the following special tools:

- Flat end pliers (End Cutter), Motorola Part Number 6685629A01

- Radio Service Software (RSS) Disks and Manual Motorola Kit Number RVN4113. The RSS manual is available separately as Motorola Publication Number 6881081C15.

Removing and Replacing Pushbuttons

The replaceable style pushbuttons have two expandable tabs on the inside edge, one on the top and one on the bottom. When expanded, these tabs press against the inside surface of the control head faceplate and hold the pushbutton in place. To replace a pushbutton, refer to Figures 50 and 51 and proceed as follows:



Caution

Be careful to avoid damaging surface of control head front panel when using flat end pliers to grasp pushbutton to be removed.

1. Grasp pushbutton to be removed with flat end pliers as close as possible to control head faceplate.



Caution

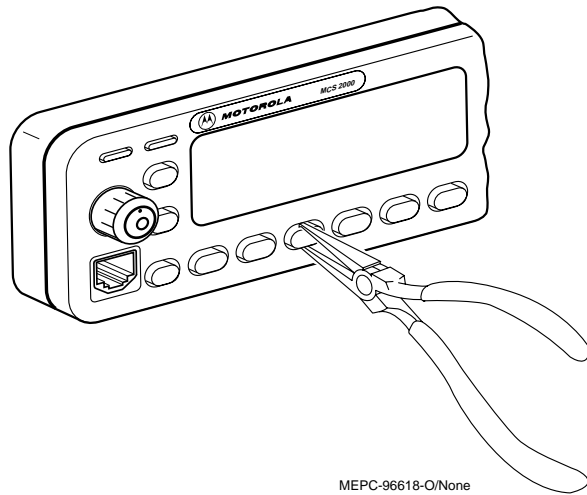
In step 2 below, to avoid damage to pushbutton, compress pushbutton only enough to allow tabs on pushbutton to clear edges of hole in faceplate.

2. Compress pushbutton *just enough* so that the tabs can clear the control head faceplate. Then pull pushbutton away from control head.
3. Orient the new pushbutton so that legend is oriented correctly.



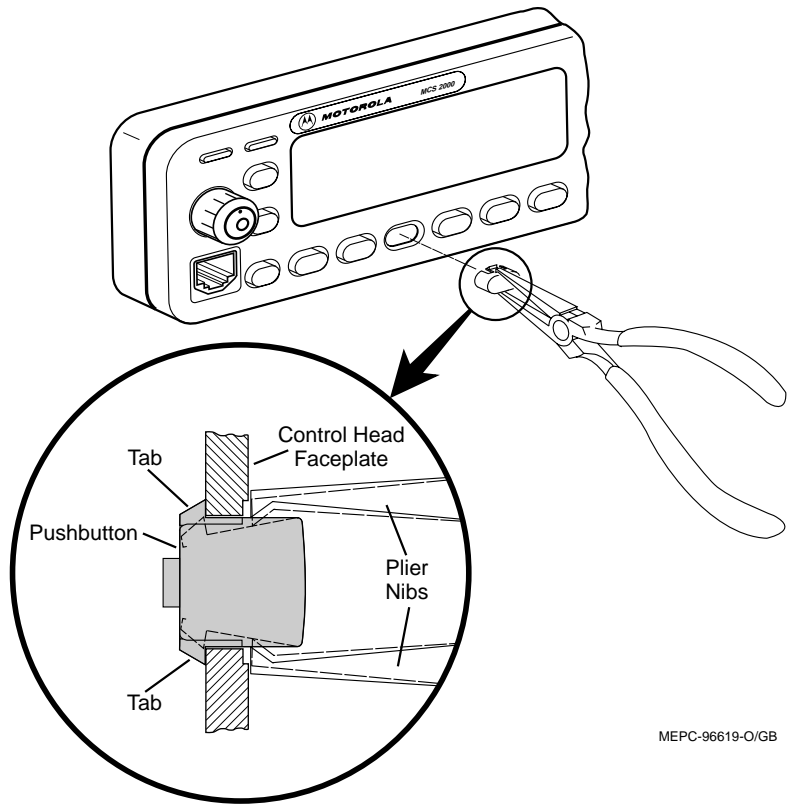
No tools are required to perform step 4 below.

4. Snap replacement pushbutton into opening in control panel faceplate.
5. Verify that tabs on replacement pushbutton are engaged behind control head faceplate and that pushbutton operates freely.
6. Using RSS software and manual, reprogram the radio so that replaced pushbutton has the desired function.



MEPC-96618-O/None

Figure 50 Grasping Pushbutton with Flat End Pliers



MEPC-96619-O/GB

Figure 51 Pulling Pushbutton Away from Control Head

NOTES