



GTX

Mobile Radio

Installation Manual

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Scope of Manual

This manual is intended for use by experienced technicians familiar with similar types of equipment. It covers the procedures for installing the GTX Mobile Radio.

How to use this Manual

Before you start installing the radio, read the information on licensing, power protection circuitry, and installation planning. While installing, ensure that you are using the tools given under "recommended tools for installation". This manual covers the procedures for installing the Antenna Mounting, Mounting Trunnion, DC Power Cable, and optional External Speaker.

Technical Support

To obtain technical support, you may call Motorola's Product Services. When you call, we ask that you have ready the model and serial numbers of the respective radio or its parts.

Service Policy

If malfunctions occur within 30 days that cannot be resolved over the phone with Product Services, a defective major component should be returned. You must obtain authorization from Product Services before returning the component.

Ordering Replacement Parts

You can order additional components and some piece parts directly through your price pages. When ordering replacement parts, include the complete identification number for all chassis, kits, and components. If you do not know a part number, include with your order the number of the chassis or kit which contains the part, and a detailed description of the desired component. If a Motorola part number is identified on a parts list, you should be able to order the part through Motorola Parts. If only a generic part is listed, the part is not normally available through Motorola. If no parts list is shown, generally, no user serviceable parts are available for the kit.

30-Day Warranty Technical Support Product Services

8000 W. Sunrise Blvd.
Plantation, FL 33322 USA

Motorola Radio Support Center

Attention: Warranty Return
3760 South Central Avenue
Rockford, IL 61102 USA
1-800-227-6772 (U.S. & Canada)

Major Component Repair Motorola Radio Support Center

3760 South Central Avenue
Rockford, IL 61102 USA

Motorola Parts Worldwide System and Aftermarket Products Division

Attention: Order Processing
1313 E. Algonquin Road
Schaumburg, IL 60196

Worldwide System and Aftermarket Products Division

Attention: International Order Processing
1313 E. Algonquin Road
Schaumburg, IL 60196

Customer Service

1-800-422-4210
1-847-538-8198 (FAX)

Parts Identification

1-847-538-0021
1-847-538-8194 (FAX)

Exposure to Radio Frequency Energy

Your Motorola radio is designed to comply with the following national and international standards and guidelines regarding exposure of human beings to radio frequency electromagnetic energy:

- United States Federal Communications Commission Code of Federal Regulations; 47 CFR part 2 sub-part J.
- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95.1-1992.

Electromagnetic Interference/Compatibility

- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition.
- National Council on Radiation Protection and Measurements (NCRP) of the United States, Report 86, 1986.
- International Commission on Non-Ionizing Radiation Protection (ICNRP) 1998.
- National Radiological Protection Board of the United Kingdom, 1995.
- Ministry of Health (Canada) Safety Code 6. Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz, 1999.
- Australian Communications Authority Radio-communications (Electromagnetic Radiation - Human Exposure) Standard 1999 (applicable to wireless phones only)

To assure optimal radio performance and to make sure human exposure to radio frequency electromagnetic energy is within the guidelines set forth in the above standards, always adhere to the following procedures:

Electromagnetic Interference/Compatibility

NOTE

Nearly every electronic device is susceptible to electromagnetic interference (EMI) if inadequately shielded, designed or otherwise configured for electromagnetic compatibility.

- To avoid electromagnetic interference and/or compatibility conflicts, turn off your radio in any facility where posted notices instruct you to do so. Hospitals or health care facilities may be using equipment that is sensitive to external RF energy.



Operational Warnings

For Vehicles with an Air Bag



WARNING

Do not install a mobile radio in the area over an air bag or in the air bag deployment area. Air bags inflate with great force. If a mobile radio is installed in the air bag deployment area and the air bag inflates, the radio may be propelled with great force and cause serious injury to occupants of the vehicle.

Potentially Explosive Atmospheres



WARNING

Turn off your two-way radio when you are in any area with a potentially explosive atmosphere, unless it is a radio type especially qualified for use in such areas (for example, Factory Mutual Approved). Sparks in a potentially explosive atmosphere can cause an explosion or fire resulting in bodily injury or even death.

Blasting Caps and Areas

To avoid possible interference with blasting operations, turn off your radio when you are near electrical blasting caps, in a blasting area, or in areas posted: "Turn off two-way radio". Obey all signs and instructions.

NOTE

The areas with potentially explosive atmospheres referred to above include fueling areas such as: below decks on boats or chemical transfer or storage facilities; areas where the air contains chemicals or particles, such as grain, dust or metal powders; and any other area where you would normally be advised to turn off your vehicle engine. Areas with potentially explosive atmospheres are often but not always posted.

Mobile Antenna Installation

Recommended mobile antenna installations are limited to metal body vehicles at the center of the roof and center of the trunk deck locations.

The antenna installation must additionally be in accordance with:

- the requirements of the antenna manufacturer / supplier
- instructions in the Radio Installation manual.

Mobile Radio Operation and EME Exposure

Observe the following caution and electromagnetic energy exposure (EME) statements when installing antennas:

CAUTION

Use caution when installing antennas with mobile radio equipment using transmitter power of 7 W or greater. Install antennas only on metal bodied vehicles.

NOTE

For low-power mobile radios (less than 7 W) there are no antenna type or installation restrictions.

To assure optimal radio performance and that human exposure to radio frequency electromagnetic energy is within the guidelines referenced in this document, transmit *only* when people outside the vehicle are at least the minimum distance away from a properly installed, externally-mounted antenna.

Table 1-1 lists the minimum distance for several different ranges of rated radio power.

Selecting an Antenna Site

1. Install the vehicle antenna *external* to the vehicle and in accordance with the requirements of the antenna manufacturer/supplier
2. The best mounting location for the antenna is in the center of a large, flat conductive surface. In almost all vehicles, mounting the antenna in the center of the roof will satisfy these requirements. A good alternative location is in the center of the trunk lid. If you use the trunk lid, ensure that the trunk lid is grounded by connecting grounding straps between the trunk lid and the vehicle chassis.
3. Ensure the antenna cable can be easily routed to the radio. Ensure that the antenna cable is routed separately and not in parallel to any other vehicle wiring or mobile radio cable wiring.
4. Check the antenna location for any electrical interference.

NOTE

Any two metal pieces rubbing against each other (such as seat springs, shift levers, trunk and hood lids, exhaust

NOTE (Cont'd.)

pipes, etc.) in close proximity to the antenna can cause severe receiver interference.

5. If the vehicle is equipped with an electronic anti-lock braking system (ABS), mount the antenna at the center of the roof or trunk lid and do not route the antenna cable near the ABS Modulator Box. Mount the radio as far away from the Modulator Box as physically possible. This minimizes radio interference to the modulator box from the radio.
6. Make sure the mobile radio antenna is installed at least one foot (30.48cm) away from any other antenna on the vehicle.

Antenna Installation Procedure

1. Mount the antenna according to the instructions provided with the antenna kit. Run the coaxial cable to the radio mounting location. Unless specified otherwise by the antenna manufacturer/supplier, cut off the excess cable and install the cable connector.
2. Connect the antenna cable connector to the radio antenna connector on the rear of the radio. Refer to Figure 1-1.

Completing the Installation

1. Mount the microphone clip to a convenient spot near your radio.
2. Your microphone has a telephone-type connector at the end of its cord. Plug the microphone into the control head connector.
3. To complete your radio installation, plug the power cable into the radio power connector. Refer to Figure 1-1.

Fixed Site Antenna Installation

Mobile radio equipment is sometimes installed at a fixed location and operated as a control station or as a fixed unit. In such cases, the antenna installation must comply with the following requirements in order to assure optimal performance and make sure human exposure to radio frequency electromagnetic energy is within the guidelines set forth in the above standards:

Table 1-1. Rated Power and Distance

Rated Power of Vehicle-installed Mobile Two-Way Radios	Minimum Distance from Transmitting Antenna
7 to 15 W	1 Foot (30.5cm)
16 to 50 W	2 Feet (61cm)
More than 50 W	3 Feet (91.5cm)

Mobile Antenna Installation

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

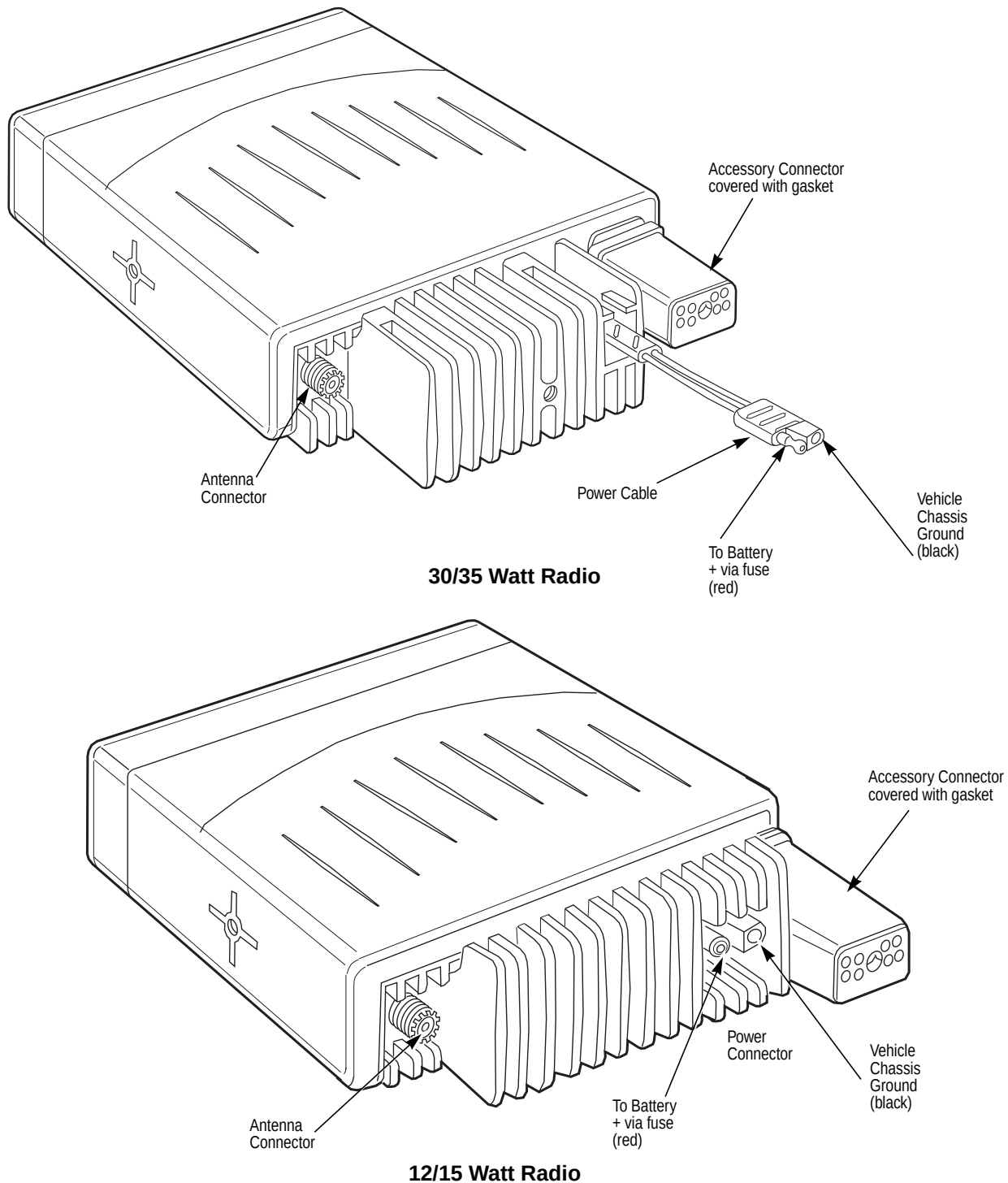


Figure 1-1.

Your mobile two-way radio offers various installation possibilities. The standard radio package contains a direct mounting trunnion and power cables. Ensure that the cables can be routed to the radio without being exposed to excessive heat or mechanical damage.

Before You Start

Licensing

For the United States only: The Federal Communications Commission (FCC) regulations state that a station license must be obtained for each radio installation by the owner of the equipment. The station licensee is responsible for ensuring the transmitter power, frequency, and deviation are within the limits permitted under the station license. For outside the United States: Adhere to the applicable rules of your local licensing authority.

Your radio is completely adjusted, tested, and inspected before shipment. No technician's license is required for installing and maintaining radio equipment. However, the frequency and deviation of the transmitter must be checked at the time of installation and at least annually.

Power Protection Circuitry

The GTX mobile you are installing has been tested for proper transmitter power output before leaving the factory. Each radio is set to the proper output power level while connected to an accurate 50 Ohm load impedance. Once the power level has been set, the internal power control/protection circuitry will reduce the power output whenever it senses a load impedance significantly different from 50 Ohm. This protection circuitry greatly enhances the radio's reliability with minimal performance degradation.

If you check transmitter output power levels during installation, be sure you are using a good 50 Ohm load, with a minimum of adapters and using short test cables. Any load variation from 50 Ohm may cause an apparent reduction in output power due to the normal operation of the control/protection circuitry. A load impedance of 50 Ohm is required for all bands. However, it has more effect in 800/900 MHz radios since cables, meters, connectors, etc. have larger effects in these bands. If power seems to be unusually low (greater than can be explained by the normal calibra-

tion differences you experience), check your test setup. If power output goes up as you improve the quality of the load impedance (be sure to de-key when making any changes in load), the control/protection circuitry is performing normally.

Typical mismatches in the load impedance (greater than 1.2:1 VSWR) may result in a 10-20% variation in the actual measured power output. Within these limits, the radio operates normally and you should not attempt to service it.

Installation Planning

Planning

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.

Recommended Tools For Installation

The following tools are recommended for proper installation of your new radio.

- Portable Drill
- Hammer
- Center Punch
- 5/16" (8 mm) Hex Nut Driver
- 1/4" (7 mm) Hex Nut Driver
- Phillips #2 Screwdriver
- TORX Screwdriver, T25
- 3/8" (9 mm) Diameter Drill Bit
- 5/16" (8 mm) Diameter Drill Bit
- 5/32" (4 mm) Diameter Drill Bit

Antenna Mounting

Refer to Section 1 of this manual in subsection "Mobile Antenna Installation" on pages 1-2 and 1-3.

Starting The Installation

Radio Mounting**Mounting Trunnion**

The mounting trunnion allows the radio to be mounted to a variety of mounting surfaces. 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 the operating controls.

CAUTION

Do not mount the trunnion to a plastic dash board. In an accident, the radio and trunnion could break loose and become a potential flying hazard. Always secure the trunnion to the metal support frame of the dashboard.

Standard Mounting Trunnion

The standard mounting trunnion should be used for installing only the low power (12 W and 15 W) radios.

3-Point Mounting Trunnion

The high power (30 W and 35 W) radios must be installed with the 3-point mounting trunnion.

Starting The Installation**DC Power Cable Installation**

The radio must be operated only in negative ground electrical systems. Reverse polarity does not damage the radio however, radio protection circuits cause the cable fuse to open. Check the vehicle ground polarity before you begin installation to prevent wasted time and effort.

The 3 meter (10 feet) UIC power cable shipped with the radio 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 firewall, or drill a 3/8" access hole at the location for passing the power cable into the engine compartment. Install a grommet with a 1/4" (7mm) 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.

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 2-1.

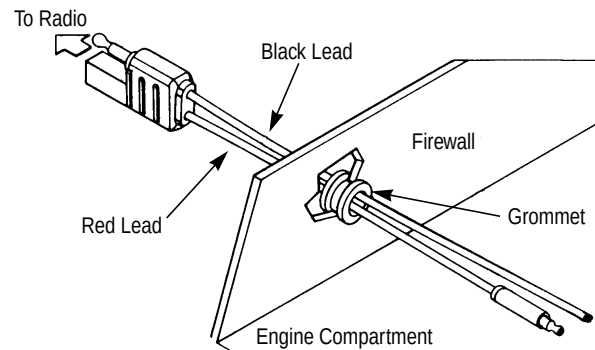


Figure 2-1. Power Cable Routing into the Engine Compartment

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 the red lead on the fuse holder. See Figure 2-2.

CAUTION

To prevent a possible fire due to an accidental short along the power cable, always install the power cable with the fuse holder.

6. Locate the fuse holder as close to the battery as possible and away from any hot engine components. Mount the fuse holder using the provided mounting hole and dress the wires as necessary. Connect the fuse holder red adapter lead to the mating receptacle on the red lead of the power cable. See Figure 2-2.

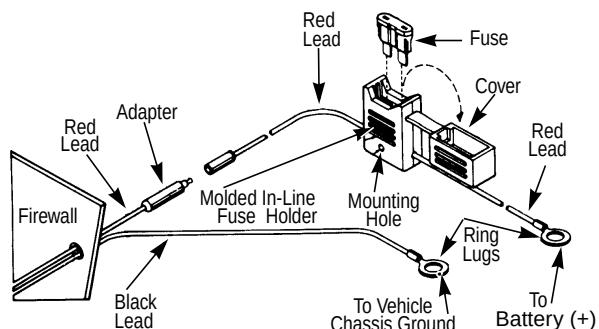


Figure 2-2. Power Cable Assembly

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 adapter cable is connected to the main power cable red lead.

NOTE

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

9. Plug the fuse into the in-line fuse holder as shown in Figure 2-2.

Mounting Trunnion Installation (35 W & 30 W)

1. Select the location to mount your radio - either on the transmission hump or under the dashboard. If the trunnion is to be mounted on the transmission hump, ensure that 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 five holes for a curved mounting surface such as the transmission hump.
3. Center punch the spots you have marked and drill a 5/32" (4 mm) hole at each location.
4. Secure the trunnion mounting bracket to the surface with the five 10-16x3/4" (20 mm) screws provided.
5. Place the radio in the mounting trunnion and secure it with the two M5 thumb screws provided and one TT5 rear screw.
6. Mount the antenna using the instructions provided with the antenna kit. Run the coaxial cable to the radio mounting location. Unless specified otherwise in the antenna instructions, cut off the access cable and install the cable connector.
7. Connect the antenna cable connector to the radio antenna connector on the rear of the radio. See Figure 2-4.
8. Mount the microphone clip to a convenient spot near your radio, and ensure that it is grounded.
9. Plug the microphone cord into the control head connector. Refer to Figure 2-3. Your microphone has a telephone type connector at the end of its cord. Connect and disconnect your radio microphone cord in the same manner you connect and disconnect your telephone handset cord.

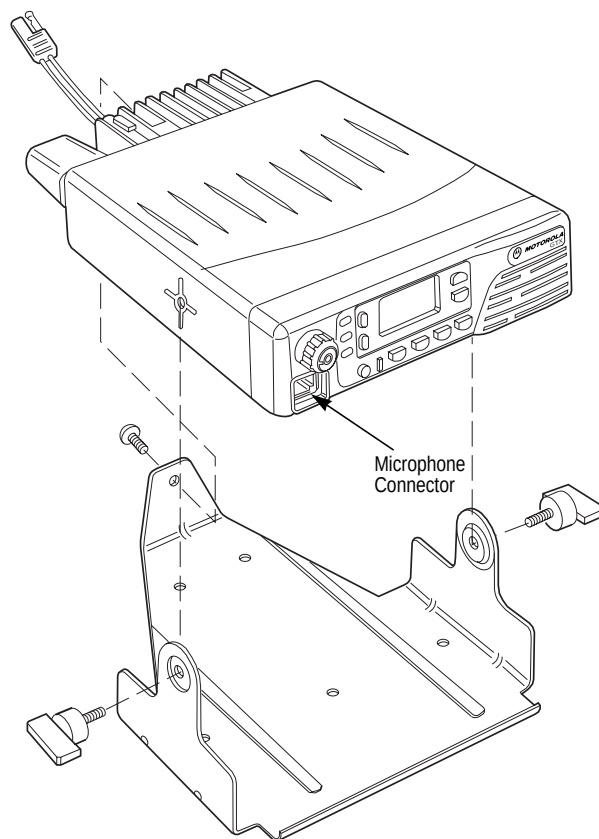


Figure 2-3. 35 W & 30 W Radio Being Placed onto a Trunnion

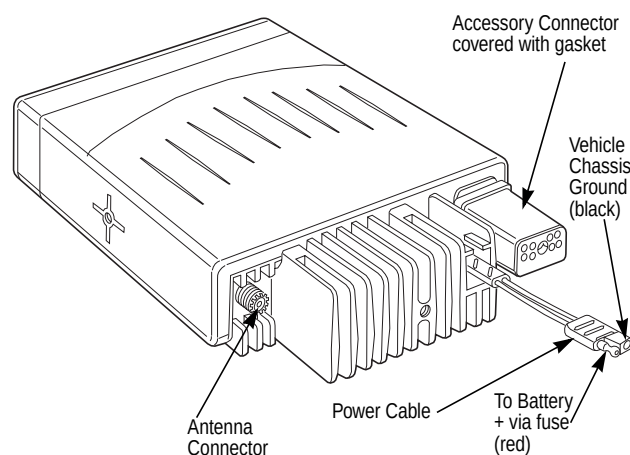


Figure 2-4. 30 W & 35 W Connections to Radio Rear Panel

10. To complete your radio installation, plug the power cable into the radio power cable. Refer to Figure 2-4.

Starting The Installation

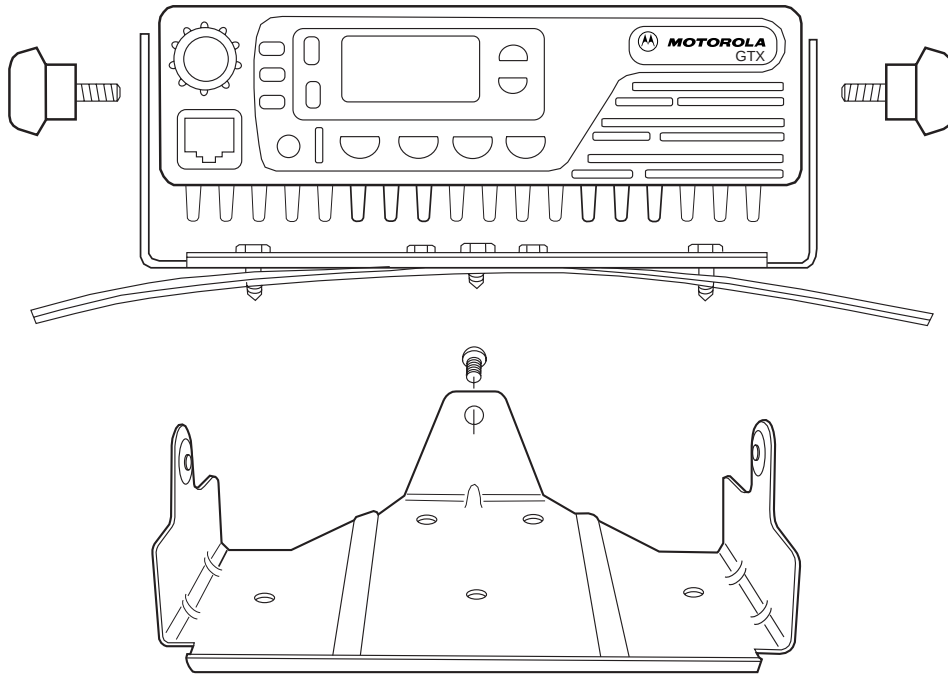


Figure 2-5. 30 W & 35 W Transmission Hump Mounting

Mounting Trunnion Installation (12 W & 15 W)

1. Select the location to mount your radio - either on the transmission hump or under the dashboard. If the trunnion is to be mounted on the transmission hump ensure that 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 three holes for a curved mounting surface, such as the transmission hump, and the four outermost holes for a flat surface, such as under the dash.
3. Center punch the spots you have marked and drill a 5/32" (4 mm) hole at each location.
4. Secure the trunnion mounting bracket to the surface with three or four 10-16x3/4" (20 mm) screws that are provided.
5. Place the radio in the trunnion mounting bracket and secure it with the two M5 thumb screws provided.
6. Mount the antenna using the instructions provided with the antenna kit. Run the coaxial cable to the radio mounting location. Unless specified otherwise in the antenna instructions, cut off the access cable and install the cable connector.

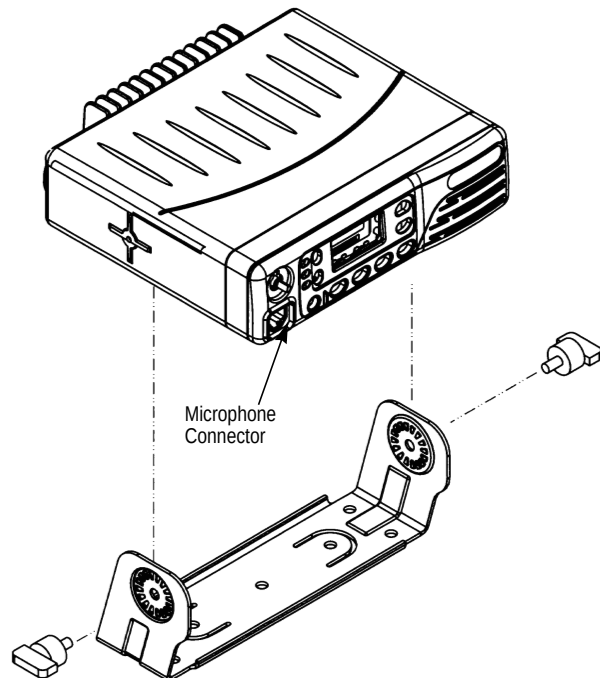


Figure 2-6. 12 W & 15 W Radio
Being Placed onto a Trunnion

7. Connect the antenna cable connector to the radio antenna connector on the rear of the radio. See Figure 2-7.
8. Mount the microphone clip to a convenient spot near your radio, and ensure that it is grounded.
9. Plug the microphone cord into the control head connector. Refer to Figure 2-6. Your microphone has a telephone type connector at the end of its cord. Connect and disconnect your radio microphone cord in the same manner you connect and disconnect your telephone handset cord.
10. To complete your radio installation, plug the power cable into the radio power connector. Refer to Figure 2-7.

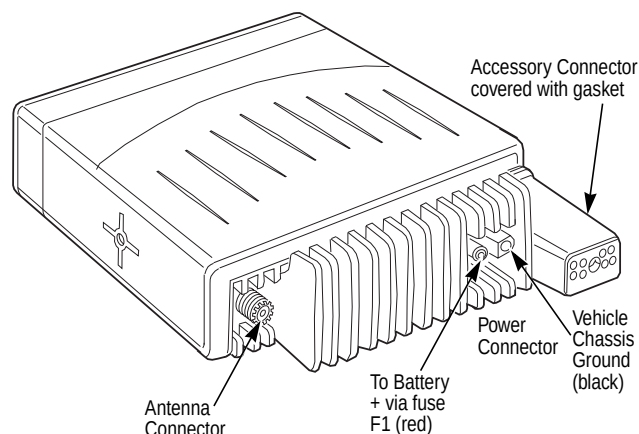
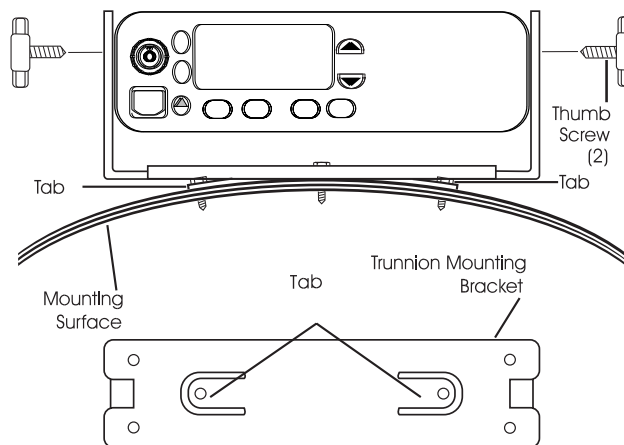


Figure 2-7. 12 W & 15 W Connections to Radio Rear Panel

TRANSMISSION HUMP MOUNTING



BELOW DASH MOUNTING

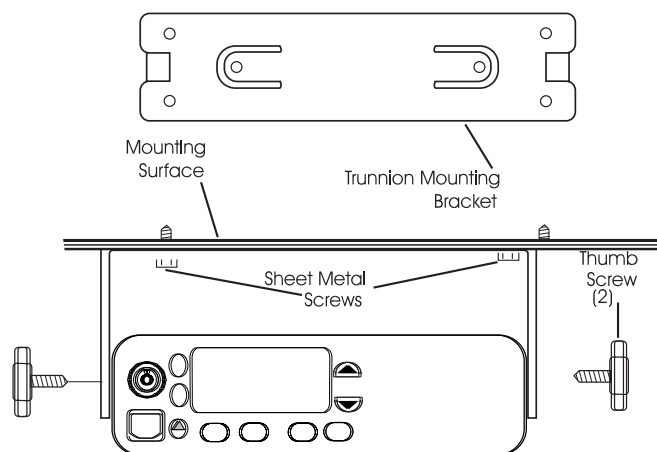


Figure 2-8. 12 W & 15 W Trunnion Mounting Locations

Starting The Installation

External Speaker Installation

1. Remove the speaker from the trunnion bracket by loosening the two M5 wing screws.
2. Choose a place to mount the speaker.
3. Using the trunnion bracket as a template, mark the locations of the three mounting holes.
4. Centerpunch and drill a 5/32-inch (4 mm) diameter hole at each location.
5. Mount the trunnion bracket with the screws supplied. Refer to Figure 2-9.
6. Insert the speaker into the trunnion bracket and tighten the two M5 wing screws.
7. Insert the external speaker accessory plug into the accessory connector of radio. Refer to Figure 2-7 for 12 W and 15 W radios or Figure 2-4 for 30 W and 35 W radios.

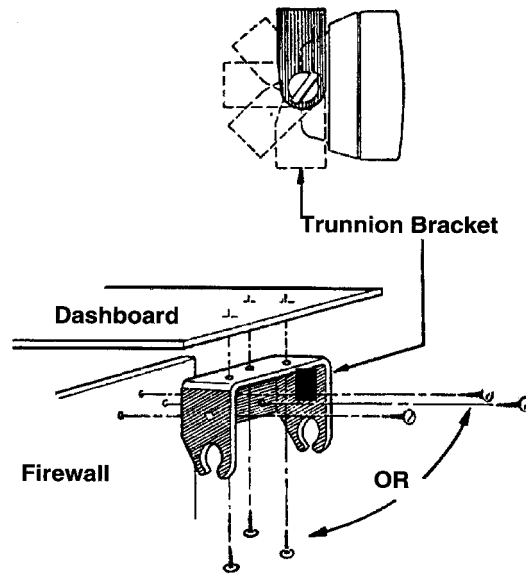


Figure 2-9. Mounting the Speaker Under the Dashboard

Section 3

Accessory Connector Procedures

This section provides the connection procedures for the various accessories of the GTX Mobile Radio. The diagrams are self-explanatory and wherever applicable relevant information is included. The accessory connections shown are not compatible to other models of Motorola radios. Check the appropriate accessory or technical manual for further information.

Table 3-1. GTX Enhanced 12-15 W and 30-35 W Models - Normal mode operation (S401-1 ON position)

Pin #	Description
1	External Speaker Negative (CAUTION: Not Ground)
2	External Microphone Audio
3	Microphone PTT
4	External Alarm Output (Active Low)
5	Flat Transmit Audio
6	Not Used
7	Ground
8	Not used
9	Switch B+ 0.5 Amps Max.
10	Ignition Sense Input
11	External Receive Audio (Gated, de-emphasized)
12	Public Address Enable (Active Low)
13	Internal Speaker Positive
14	Remote Hook Switch Input (Active Low)
15	Receive System Busy Output (Active Low)
16	External Speaker Postive

Table 3-2. GTX Enhanced 12-15 W and 30-35 W Models - DATA Mode Operation (S401-1 OFF position)

Pin #	Description
1	External Speaker Negative (CAUTION: Not Ground)
2	External Microphone Audio
3	DATA PTT
4	Transmission Sense Output (Active Low)
5	Flat Transmit Audio
6	Not Used
7	Ground
8	Not used
9	Switch B+ 0.5 Amps Max.
10	Ignition Sense Input
11	Flat Receive Audio
12	Speaker Mute Input (Active Low)
13	Internal Speaker Positive
14	Remote Hook Switch Input (Active Low)
15	Receive System Busy Output (Active Low)
16	External Speaker Postive

Speaker, Microphone, PTT Switch & Ignition Sense

Connection Procedures

Figure 3-1 shows the connection diagram of the Speaker, Microphone, PTT Switch, and Ignition Sense Switch.

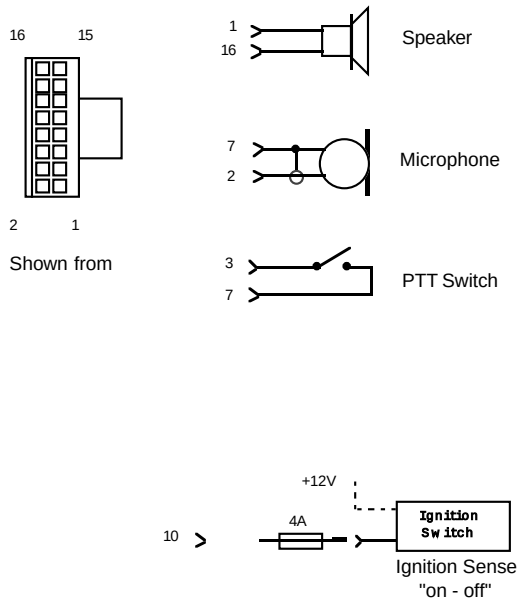


Figure 3-1. Connection Diagram for Speaker, Microphone, PTT Switch, Emergency Switch, and Ignition Sense Switch

NOTE

The mobile radio is shipped with ignition sense disabled. To enable, slide S401-2 off.

Figure 3-2 shows the connection diagram of the External Alarm, Relay and Cable.

Speaker

The GTX radios use a 7.5 Watt speaker. Refer to Figure 3-3.

This speaker can be connected to the accessory connector located on the rear side of the radio between pin 1 and pin 16. Refer to Figure 3-1.

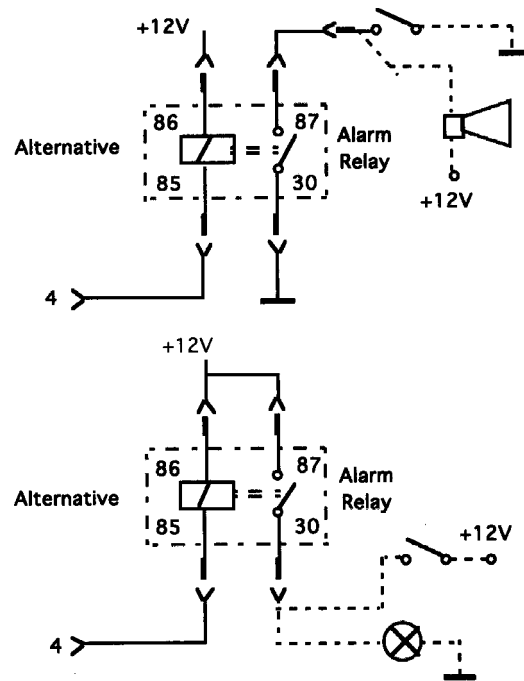


Figure 3-2. External Alarm Relay and Cable

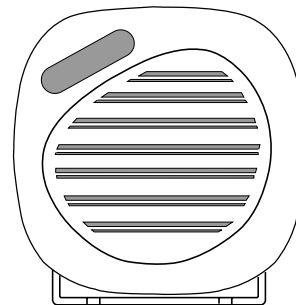


Figure 3-3. 7.5 Watt Speaker

List of Accessories

Audio

HMN3413	Compact Microphone
HMN1035_R	Heavy Duty Palm Microphone
HMN3013	DTMF Non-Backlit Microphone with Hang-Up Clip
AAREX4617	Handset with Hang-up Clip
HLN9073	Hang-up Clip

Speaker

FSN5510	7.5 W External Speaker
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Installation

HLN9640	Trunnion Kit; 30 W / 35 W
GLN7317	Trunnion Kit; 12 W / 15 W

Cables

HKN4191	Power Cable; 30 W / 35 W
GKN7270	Power Cable; 12 W / 15 W
GKN6271	Ignition Sense Cable
GKN6272	External Alarm Relay and Cable

Antennas

HAF4002	806-900 MHz, 1/4 Wave Roof Mount
RRA4983	800 MHz, 3 dB Gain Roof Mount w / Teflon Cable
RRA4914	800 MHz, 3 dB Gain Roof Mount
RRA4935	900 MHz, 3 dB Gain Roof Mount

Control Station

RLN4834	Control Station Package; 30 W / 35 W
HLN3067	Control Station Package; 12 W / 15 W
GLN7318	Base Station Tray
HPN4001	Power Supply and Cable (greater than 25 W)
HPN4002	Power Supply and Cable (less than or equal to 25 W)
HKN9088	Mobile Mini-U Antenna 8 ft. Adapter Cable
HMN3000	Desk Microphone

Manuals/Kits

6880907Z20	GTX LTR User's Guide (English / French)
6880907Z21	GTX Privacy Plus User's Guide (English / French)
6880905Z99	Service Manual
RVN4150	GTX Radio Service Software Kit

6880907Z66-O

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