

XG-25M Mobile Radio

50-Watt, 136 to 174 MHz

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1 REGULATORY AND SAFETY INFORMATION

1.1 SAFETY SYMBOL CONVENTIONS

The following conventions are used in this manual to alert the user to general safety precautions that must be observed during all phases of operation, installation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere violates safety standards of design, manufacture, and intended use of the product. Harris Corporation assumes no liability for the customer's failure to comply with these standards.



The **WARNING** symbol calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** symbol until the conditions identified are fully understood or met.



The **CAUTION** symbol calls attention to an operating procedure, practice, or the like, which, if not performed correctly or adhered to, could result in damage to the equipment or severely degrade equipment performance.



The **NOTE** symbol calls attention to supplemental information, which may improve system performance or clarify a process or procedure.

1.2 RF ENERGY EXPOSURE AWARENESS AND CONTROL INFORMATION FOR FCC OCCUPATIONAL USE REQUIREMENTS

Before using the two-way mobile radio, review the following important RF energy awareness and control information and operational instructions. Comply with this information and instructions in order to ensure compliance with RF exposure guidelines.



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



Changes or modifications not expressly approved by Harris could void the user's authority to operate the equipment.

This two-way radio uses electromagnetic energy in the radio frequency (RF) spectrum to provide communications between two or more users over a distance. It uses RF energy or radio waves to send and receive calls. RF energy is one form of electromagnetic energy. Other forms include, but are not limited to, electric power, sunlight, and x-rays. RF energy, however, should not be confused with these other forms of electromagnetic energy, which, when used improperly, can cause biological damage. Very high levels of x-rays, for example, can damage tissues and genetic material.

Experts in science, engineering, medicine, health, and industry work with organizations to develop standards for exposure to RF energy. These standards provide recommended levels of RF exposure for both workers and the general public. These recommended RF exposure levels include substantial margins of protection. All two-way radios marketed in North America are designed, manufactured, and tested to

ensure they meet government-established RF exposure levels. In addition, manufacturers also recommend specific operating instructions to users of two-way radios. These instructions are important because they inform users about RF energy exposure and provide simple procedures on how to control it. Refer to the following websites for more information on what RF energy exposure is and how to control exposure to assure compliance with established RF exposure limits:

<http://www.fcc.gov/oet/rfsafety/rf-faqs.html>

<http://www.osha.gov/SLTC/radiofrequencyradiation/index.html>

1.2.1 Federal Communications Commission Regulations

Before it was marketed in the United States, the XG-25M two-way mobile radio was tested to ensure compliance with FCC RF energy exposure limits for two-way mobile radios. When two-way radios are used as a consequence of employment, the FCC requires users to be fully aware of and able to control their exposure to meet occupational requirements. Exposure awareness can be facilitated by the use of a label directing users to specific user awareness information. The radio has an RF exposure product label. Also, this Installation and Product Safety Manual and the applicable Operator's Manual include information and operating instructions required to control RF exposure and to satisfy compliance requirements.

1.3 COMPLIANCE WITH RF EXPOSURE STANDARDS

The XG-25M two-way mobile radio is designed and tested to comply with a number of national and international standards and guidelines regarding human exposure to RF electromagnetic energy. This radio complies with the IEEE and ICNIRP exposure limits for occupational/controlled RF exposure environment at duty-cycle times of up to 50% (50% transmit, 50% receive), and it is authorized by the FCC for occupational use. In terms of measuring RF energy for compliance with the FCC exposure guidelines, the radio's antenna radiates measurable RF energy only while it is transmitting (talking), not when it is receiving (listening), or in a standby mode.

The XG-25M two-way mobile radio complies with the following RF energy exposure standards and guidelines:

- United States Federal Communications Commission (FCC), Code of Federal Regulations; 47 CFR § 2 sub-part J.
- American National Standards Institute (ANSI)/Institute of Electrical and Electronic Engineers (IEEE) C95.1-2005.
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-2005.
- IC Standard RSS-102, Issue 2, 2005: Spectrum Management and Telecommunications Radio Standards Specification. Radiofrequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands).



Table 1-1 lists the recommended minimum safe lateral distances for a controlled environment and for unaware bystanders in an uncontrolled environment, from transmitting antennas (i.e., monopoles over a ground plane, or dipoles) at rated radio power for mobile radios installed in a vehicle. Transmit only when unaware bystanders are at least the uncontrolled recommended minimum safe lateral distance away from the transmitting antenna.

Based on the highest radiated RF power and the highest antenna gain in antennas to be used with XG-25M, the distances listed in Table 1-1 are considered as safe distances for controlled and uncontrolled environments with the XG-25M mobile radio transmitting at a maximum 50% duty cycle:

Table 1-1: Recommended Minimum Safe Lateral Distance from Transmitting Antenna

ANTENNA ELEMENT PART NUMBER	ANTENNA DESCRIPTION	RECOMMENDED MINIMUM LATERAL HUMAN BODY DISTANCE FROM TRANSMITTING ANTENNA	
		CONTROLLED ENVIRONMENT	UNCONTROLLED ENVIRONMENT
AN-225002-001	136 to 174 MHz, 0 dBd Gain	24.8 Inches (63 Centimeters)	55.1 Inches (140 Centimeters)
AN-225006-001	132 to 960 MHz, 0 dBd Gain*		
AN-225002-003	136 to 174 MHz, 3 dBd Gain*	35.0 Inches (89 Centimeters)	78.0 Inches (198 Centimeters)
AN-225002-004	136 to 174 MHz, 2.4 dBd Gain*	32.7 Inches (83 Centimeters)	72.8 Inches (185 Centimeters)

* Element must be trimmed to proper length in order to minimize antenna system VSWR.

1.3.1 Mobile Antennas

The antenna(s) for the radio must be installed in accordance with Section 7 in this manual. Refer to Table 5-3 and/or Figure 7-1 for applicable antenna part numbers. Installation guidelines presented in Section 7 are limited to metal-body motor vehicles or vehicles with appropriate ground planes.

Use only approved/supplied antenna(s) or an approved replacement antenna. Unauthorized antennas, modifications, or attachments can cause the FCC RF exposure limits to be exceeded.

1.3.2 Approved Accessories

The radio has been tested and meets FCC RF guidelines when used with accessories supplied or designated for use with it. Use of other accessories may not ensure compliance with the FCC's RF exposure guidelines, and may violate FCC regulations. For a list of approved accessories refer to Section 5 in this manual (begins on page 23) and/or the Products and Services Catalog.

1.3.3 Contact Information

For additional information on RF exposure and other information, contact Harris using one of the contact links listed in Section 4.5 on page 22.

1.4 RADIO FREQUENCY INTERFERENCE

1.4.1 FCC Part 15

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference; and,
2. This device must accept any interference received, including interference that may cause undesired operation.

1.4.2 Industry Canada

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de

brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

1.5 OCCUPATIONAL SAFETY GUIDELINES AND SAFETY TRAINING INFORMATION

To ensure bodily exposure to RF electromagnetic energy is within the FCC allowable limits for occupational use. Always adhere to the following basic guidelines:

- The push-to-talk button should only be depressed when intending to send a voice message.
- The radio should only be used for necessary work-related communications.
- The radio should only be used by authorized and trained personnel. It should never be operated by children.
- Do not attempt any unauthorized modification to the radio. Changes or modifications to the radio may cause harmful interference and/or cause it to exceed FCC RF exposure limits. Only qualified personnel should service the radio.
- Always use only authorized accessories (antennas, control heads, speakers/mics, etc.). Use of unauthorized accessories can cause the FCC RF exposure compliance requirements to be exceeded.

The information listed above provides the user with information needed to make him or her aware of a RF exposure, and what to do to assure that this radio operates within the FCC exposure limits of this radio.

1.6 COMMON HAZARDS



The operator of any mobile radio should be aware of certain hazards common to the operation of vehicular radio transmissions. Possible hazards include but are not limited to:

- **Explosive Atmospheres** — Just as it is dangerous to fuel a vehicle while its engine is running, be sure to turn the radio **OFF** while fueling the vehicle. If the radio is mounted in the trunk of the vehicle, **DO NOT** carry containers of fuel in the trunk.

Areas with potentially explosive atmosphere are often, but not always, clearly marked. Turn the radio **OFF** when in any area with a potentially explosive atmosphere. It is rare, but not impossible that the radio or its accessories could generate sparks.
- **Interference To Vehicular Electronic Systems** — Electronic fuel injection systems, electronic anti-skid braking systems, electronic cruise control systems, etc., are typical of the types of electronic devices that can malfunction due to the lack of protection from radio frequency (RF) energy present when transmitting. If the vehicle contains such equipment, consult the dealer for the make of vehicle and enlist his/her aid in determining if such electronic circuits perform normally when the radio is transmitting.
- **Electric Blasting Caps** — To prevent accidental detonation of electric blasting caps, **DO NOT** use two-way radios within 1000 feet (305 meters) of blasting operations. Always obey the “**Turn Off Two-Way Radios**” (or equivalent) signs posted where electric blasting caps are being used. (OSHA Standard: 1926.900).
- **Radio Frequency Energy** — To prevent burns or related physical injury from radio frequency energy, do not operate the transmitter when anyone outside of the vehicle is within the minimum safe distance from the antenna as specified in Table 1-1. Refer to Section 1.2 for additional information.

- **Vehicles Powered By Liquefied Petroleum (LP) Gas** — Radio installation in vehicles powered by liquefied petroleum gas, where the LP gas container is located in the trunk or other sealed-off space within the interior of the vehicle, must conform to the National Fire Protection Association standard **NFPA 58**. This requires:
 - The space containing the radio equipment must be isolated by a seal from the space containing the LP gas container and its fittings.
 - Outside filling connections must be used for the LP gas container.
 - The LP gas container space shall be vented to the outside of the vehicle.
- **Vehicles Equipped with Airbags** — For driver and passenger safety, avoid mounting the radio's control head (or any other component) above or near airbag deployment areas. In addition to driver-side and passenger-side front-impact airbags, some vehicles may also be equipped with side-impact airbags. For occupant safety, verify the location of all airbags within the vehicle before installing the radio equipment.

1.7 SAFE DRIVING RECOMMENDATIONS

The American Automobile Association (AAA) advocates the following key safe driving recommendations:

- Read the literature on the safe operation of the radio.
- Keep both hands on the steering wheel and the microphone in its hanger whenever the vehicle is in motion.
- Place calls only when the vehicle is stopped.
- When talking from a moving vehicle is unavoidable, drive in the slower lane. Keep conversations brief.
- If a conversation requires taking notes or complex thought, stop the vehicle in a safe place and continue the call.
- Whenever using a mobile radio, exercise caution.

1.8 OPERATING RULES AND REGULATIONS

Two-way radio systems must be operated in accordance with the rules and regulations of the local, regional, or national government.

In the United States, the XG-25M mobile radio must be operated in accordance with the rules and regulations of the Federal Communications Commission (FCC). Operators of two-way radio equipment must be thoroughly familiar with the rules that apply to the particular type of radio operation. Following these rules helps eliminate confusion, assures the most efficient use of the existing radio channels, and results in a smoothly functioning radio network.

When using a two-way radio, remember these rules:

- It is a violation of FCC rules to interrupt any distress or emergency message. The radio operates in much the same way as a telephone "party line." Therefore, always listen to make sure the channel is clear before transmitting. Emergency calls have priority over all other messages. If someone is sending an emergency message – such as reporting a fire or asking for help in an accident, do not transmit unless assistance can be offered.
- The use of profane or obscene language is prohibited by Federal law.

- It is against the law to send false call letters or false distress or emergency messages. The FCC requires keeping conversations brief and confined to business. Use coded messages whenever possible to save time.
- Using the radio to send personal messages (except in an emergency) is a violation of FCC rules. Send only essential messages.
- It is against Federal law to repeat or otherwise make known anything overheard on the radio. Conversations between others sharing the channel must be regarded as confidential.
- The FCC requires self-identification at certain specific times by means of call letters. Refer to the rules that apply to the particular type of operation for the proper procedure.
- No changes or adjustments shall be made to the equipment except by an authorized or certified electronics technician.



Under U.S. law, operation of an unlicensed radio transmitter within the jurisdiction of the United States may be punishable by a fine of up to \$10,000, imprisonment for up to two (2) years, or both.

1.9 OPERATING TIPS

The following conditions tend to reduce the effective range of two-way radios and should be avoided whenever possible:

- Operating the radio in areas of low terrain, or while under power lines or bridges.
- Obstructions such as mountains and buildings.



In areas where transmission or reception is poor, communication improvement may sometimes be obtained by moving a few yards in another direction, or moving to a higher elevation.

2 MARITIME FREQUENCIES

Refer to Table 2-1 for a list of maritime frequencies per United States Coast Guard (USCG), National Oceanic and Atmospheric Administration (NOAA), and Canadian Department Fisheries and Oceans.

- United States (US)
- International (Intl)
- Canada (CA)

Table 2-1: Maritime Frequencies

CHANNEL			FREQUENCY		CHANNEL USAGE
US	INTL	CA	SHIP (MHz)	SHORE (MHz)	
	1	1	T: 156.05 R: 160.65	T: 160.65 R: 156.05	International: Public Correspondence, Port Operations
1a			T/R: 156.05	T/R: 156.05	US: Port Operations and Commercial, Vessel Traffic Service (VTS). New Orleans/Lower Mississippi area.
	2	2	T: 156.10 R: 160.70	T: 160.70 R: 156.10	International: Public Correspondence, Port Operations
	3	3	T: 156.15 R: 160.75	T: 160.75 R: 156.15	International: Public Correspondence, Port Operations
	4		T: 156.20 R: 160.80	T: 160.80 R: 156.20	International: Public Correspondence, Port Operations
		4a	T/R: 156.20	T/R: 156.20	Canada: Department Fisheries Ocean (DFO)/Canadian Coast Guard only in British Columbia coast area. Commercial fishing in east coast area
	5		T: 156.25 R: 160.85	T: 160.85 R: 156.25	International: Public Correspondence, Port Operations
5a		5a	T/R: 156.25	T/R: 156.25	US: Port Operations or VTS in Houston, New Orleans and Seattle areas.
6	6	6	T/R: 156.30	T/R: 156.30	US: Intership Safety International: Intership Canada: May be used for search and rescue communications between ships and aircraft.
	7		T: 156.35 R: 160.95	T: 160.95 R: 156.35	International: Public Correspondence, Port Operations
7a		7a	T/R: 156.35	T/R: 156.35	US: Commercial
8	8	8	T/R: 156.40	T/R: 156.40	US: Commercial (Intership only) International: Intership Canada: Also assigned for intership in the Lake Winnipeg area.
9	9	9	T/R: 156.45	T/R: 156.45	US: Boater Calling. Commercial and Non-Commercial. International: Intership, Port Operations Canada: Commercial - British Columbia coast area. May be used to communicate with aircraft and helicopters in predominantly maritime support operations.
10	10	10	T/R: 156.50	T/R: 156.50	US: Commercial International: Intership, Port Operations Canada: Commercial - British Columbia coast area. May also be used for communications with aircraft engaged in coordinated search and rescue and antipollution operations.

Table 2-1: Maritime Frequencies

CHANNEL			FREQUENCY		CHANNEL USAGE
US	INTL	CA	SHIP (MHz)	SHORE (MHz)	
11	11	11	T/R: 156.55	T/R: 156.55	US: Commercial. VTS in selected areas. International: Port Operations Canada: VTS - British Columbia coast area. Also used for pilotage purposes.
12	12	12	T/R: 156.60	T/R: 156.60	US: Port Operations. VTS in selected areas. International: Port Operations Canada: VTS - British Columbia coast area. Also used for pilotage purposes.
13	13	13	T/R: 156.65	T/R: 156.65	US: Intership Navigation Safety (Bridge-to-bridge). Ships >20m length maintain a listening watch on this channel in US waters. International: Intership, Port Operations Canada: VTS - British Columbia coast area. Also used for pilotage purposes.
14	14	14	T/R: 156.70	T/R: 156.70	US: Port Operations. VTS in selected areas. International: Port Operations Canada: VTS - British Columbia coast area. Also used for pilotage purposes.
15	15	15	T/R: 156.75 (US: Rx Only)	T/R: 156.75	US: Environmental (Receive only). Used by Class C Emergency Position-Indicating Radio Beacons (EPIRBs). International: Intership, Port Operations Canada: Port operations and Ship Movement - British Columbia coast area. All operations limited to 1-watt maximum power. May also be used for on-board communications.
16	16	16	T/R: 156.80	T/R: 156.80	US: International Distress, Safety and Calling. Ships required to carry radio, US Coast Guard (USCG), and most coast stations maintain a listening watch on this channel. International: International Distress, Safety and Calling Canada: International Distress, Safety and Calling
17	17	17	T/R: 156.85	T/R: 156.85	US: State Control International: Intership, Port Operations Canada: Port operations and Ship Movement - British Columbia coast area. All operations limited to 1 watt maximum power. May also be used for on-board communications.
	18		T: 156.90 R: 161.50	T: 161.50 R: 156.90	International: Public Correspondence, Port Operations
18a		18a	T/R: 156.90	T/R: 156.90	US: Commercial Canada: Towing - British Columbia coast area.
	19		T: 156.95 R: 161.55*	T: 161.55* R: 156.95	International: Public Correspondence, Port Operations
19a		19a	T/R: 156.95	T/R: 156.95	US: Commercial Canada: DFO/Canadian Coast Guard. Pacific Pilots - British Columbia coast area.
20	20	20	T: 157.00 R: 161.60	T: 161.60 R: 157.00	US: Port Operations (Duplex) International: Public Correspondence, Port Operations Canada: Port operations only with 1 watt maximum power.
20a			T/R: 157.00	T/R: 157.00	US: Port Operations
	21		T: 157.05 R: 161.65*	T: 161.65* R: 157.05	International: Public Correspondence, Port Operations

Table 2-1: Maritime Frequencies

CHANNEL			FREQUENCY		CHANNEL USAGE
US	INTL	CA	SHIP (MHz)	SHORE (MHz)	
21a		21a	T/R: 157.05	T/R: 157.05	US: US Coast Guard only Canada: DFO/Canadian Coast Guard only.
		21b	--	T/R: 161.65	
	22		T: 157.10 R: 161.70	T: 161.70 R: 157.10	International: Public Correspondence, Port Operations
22a		22a	T/R: 157.10	T/R: 157.10	US: Coast Guard Liaison and Maritime Safety Information Broadcasts. Broadcasts announced on channel 16. Canada: For communications between Canadian Coast Guard and non-Canadian Coast Guard stations only.
	23	23	T: 157.15 R: 161.75	T: 161.75 R: 157.15	International: Public Correspondence, Port Operations
23a			T/R: 157.15	T/R: 157.15	US: US Coast Guard only
		23b	--	T/R: 161.75	Canada: Continuous Marine Broadcast (CMB) service.
24	24	24	T: 157.20 R: 161.80	T: 161.80 R: 157.20	US: Public Correspondence (Marine Operator) International: Public Correspondence, Port Operations
25	25	25	T: 157.25 R: 161.85	T: 161.85 R: 157.25	US: Public Correspondence (Marine Operator) International: Public Correspondence, Port Operations Canada: Also assigned for operations in the Lake Winnipeg area.
		25b		T/R: 161.85	
26	26	26	T: 157.30 R: 161.90	T: 161.90 R: 157.30	US: Public Correspondence (Marine Operator) International: Public Correspondence, Port Operations
27	27	27	T: 157.35 R: 161.95	T: 161.95 R: 157.35	US: Public Correspondence (Marine Operator) International: Public Correspondence, Port Operations
28	28	28	T: 157.40 R: 162.00	T: 162.00 R: 157.40	US: Public Correspondence (Marine Operator) International: Public Correspondence, Port Operations
		28b	--	T/R: 162.00	Canada: Continuous Marine Broadcast (CMB) service.
	60	60	T: 156.025 R: 160.625	T: 160.625 R: 156.025	International: Public Correspondence, Port Operations
	61		T: 156.075 R: 160.675	T: 160.675 R: 156.075	International: Public Correspondence, Port Operations
		61a	T/R: 156.075	T/R: 156.075	Canada: DFO/Canadian Coast Guard only in British Columbia coast area.
	62		T: 156.125 R: 160.725	T: 160.725 R: 156.125	International: Public Correspondence, Port Operations
		62a	T/R: 156.125	T/R: 156.125	Canada: DFO/Canadian Coast Guard only in British Columbia coast area.
	63		T: 156.175 R: 160.775	T: 160.775 R: 156.175	International: Public Correspondence, Port Operations

Table 2-1: Maritime Frequencies

CHANNEL			FREQUENCY		CHANNEL USAGE
US	INTL	CA	SHIP (MHz)	SHORE (MHz)	
63a		63a	T/R: 156.175	T/R: 156.175	US: Port Operations and Commercial, VTS. New Orleans/Lower Mississippi area. Canada: Tow Boats - British Columbia coast area.
	64	64	T: 156.225 R: 160.825	T: 160.825 R: 156.225	International: Public Correspondence, Port Operations
		64a	T/R: 156.225	T/R: 156.225	Canada: Commercial fishing only.
	65		T: 156.275 R: 160.875	T: 160.875 R: 156.225	International: Public Correspondence, Port Operations
65a		65a	T/R: 156.275	T/R: 156.275	US: Port Operations Canada: Search and rescue and antipollution operations on the Great Lakes. Towing on the Pacific Coast. Port operations only in the St. Lawrence River areas with 1 watt maximum power. Intership in inland Manitoba, Saskatchewan, and Alberta areas.
	66		T: 156.325 R: 160.925	T: 160.925 R: 156.325	International: Public Correspondence, Port Operations
66a		66a	T/R: 156.325	T/R: 156.325	US: Port Operations Canada: Port operations only in the St. Lawrence River/Great Lakes areas with 1 watt maximum power. 1 watt marina channel - British Columbia coast area.
67	67	67	T/R: 156.375	T/R: 156.375	US: Commercial. Used for Bridge-to-bridge communications in lower Miss. River. Intership only. International: Intership, Port Operations Canada: May also be used for communications with aircraft engaged in coordinated search and rescue and antipollution operations. Commercial fishing only in east coast and inland Manitoba, Saskatchewan, and Alberta areas. Pleasure craft - British Columbia coast area.
68	68	68	T/R: 156.425	T/R: 156.425	US: Non-Commercial International: Port Operations Canada: For marinas, yacht clubs and pleasure craft.
69	69	69	T/R: 156.475	T/R: 156.475	US: Non-Commercial International: Intership, Port Operations Canada: Commercial fishing only - east coast area. Pleasure craft - British Columbia coast area.
70	70	70	T/R: 156.525	T/R: 156.525	US: Digital Selective Calling (voice communications not allowed) International: Digital selective calling for distress, safety and calling Canada: Digital selective calling for distress, safety and calling
71	71	71	T/R: 156.575	T/R: 156.575	US: Non-Commercial International: Port Operations Canada: Ship Movement - British Columbia coast area. Marinas and yacht clubs - east coast and on Lake Winnipeg.
72	72	72	T/R: 156.625	T/R: 156.625	US: Non-Commercial (Intership only) International: Intership Canada: May be used to communicate with aircraft and helicopters in predominantly maritime support operations. Pleasure craft - British Columbia coast area

Table 2-1: Maritime Frequencies

CHANNEL			FREQUENCY		CHANNEL USAGE
US	INTL	CA	SHIP (MHz)	SHORE (MHz)	
73	73	73	T/R: 156.675	T/R: 156.675	US: Port Operations International: Intership, Port Operations Canada: May also be used for communications with aircraft engaged in coordinated search and rescue and antipollution operations. Commercial fishing only in east coast and inland Manitoba, Saskatchewan, and Alberta areas.
74	74	74	T/R: 156.725	T/R: 156.725	US: Port Operations International: Port Operations Canada: VTS and Ship Movement British Columbia coast area.
	75	75	T/R: 156.775	T/R: 156.775	International: Port Operations Canada: Simplex port operation, ship movement and navigation related communication only. 1 watt maximum.
	76	76	T/R: 156.825	T/R: 156.825	International: Port Operations Canada: Simplex port operation, ship movement and navigation related communication only. 1 watt maximum.
77	77	77	T/R: 156.875	T/R: 156.875	US: Port Operations (Intership only) International: Intership Canada: Pilotage - British Columbia coast area; 25 watts. Port operations only in the St. Lawrence River/Great Lakes areas with 1 watt maximum power.
	78		T: 156.925 R: 161.525	T: 161.525 R: 156.925	International: Public Correspondence, Port Operations
78a		78a	T/R: 156.925	T/R: 156.925	US: Non-Commercial Canada: Fishing Industry - British Columbia coast area.
	79		T: 156.975 R: 161.575	T: 161.575 R: 156.975	International: Public Correspondence, Port Operations
79a		79a	T/R: 156.975	T/R: 156.975	US: Commercial. Non-Commercial in Great Lakes only Canada: Fishing Industry - British Columbia coast area.
	80		T: 157.025 R: 161.625	T: 161.625 R: 157.025	International: Public Correspondence, Port Operations
80a		80a	T/R: 157.025	T/R: 157.025	US: Commercial. Non-Commercial in Great Lakes only Canada: Fishing Industry - British Columbia coast area.
	81		T: 157.075 R: 161.675	T: 161.675 R: 157.075	International: Public Correspondence, Port Operations
81a		81a	T/R: 157.075	T/R: 157.075	US: US Government only - Environmental protection operations Canada: DFO/Canadian Coast Guard use only.
	82		T: 157.125 R: 161.725	T: 161.725 R: 157.125	International: Public Correspondence, Port Operations
82a		82a	T/R: 157.125	T/R: 157.125	US: US. Government only Canada: DFO/Canadian Coast Guard use only.
	83		T: 157.175 R: 161.775	T: 161.775 R: 157.175	International: Public Correspondence, Port Operations
83a		83a	T/R: 157.175	T/R: 157.175	US: US Coast Guard only Canada: DFO/Canadian Coast Guard and other Government agencies.

Table 2-1: Maritime Frequencies

CHANNEL			FREQUENCY		CHANNEL USAGE
US	INTL	CA	SHIP (MHz)	SHORE (MHz)	
		83b	--	T/R: 161.775	
84	84	84	T: 157.225 R: 161.825	T: 161.825 R: 157.225	US: Public Correspondence (Marine Operator) International: Public Correspondence, Port Operations
85	85	85	T: 157.275 R: 161.875	T: 161.875 R: 157.275	US: Public Correspondence (Marine Operator) International: Public Correspondence, Port Operations
86	86	86	T: 157.325 R: 161.925	T: 161.925 R: 157.325	US: Public Correspondence (Marine Operator) International: Public Correspondence, Port Operations
87			T/R: 157.375	T/R: 157.375	US: Public Correspondence (Marine Operator)
	87	87	T: 157.375 R: 161.975	T: 161.975 R: 157.375	International: Port Operations Canada: Port operation and ship movement - east coast area. Pleasure craft - British Columbia coast area.
AIS1		87b	T/R: 161.975	T/R: 161.975	US: Automatic Identification System Canada: Automatic Ship Identification and Surveillance System.
	88	88	T: 157.425 R: 162.025	T: 162.025 R: 157.425	US: Commercial, Intership only. International: Port Operations Canada: Port operation and ship movement - British Columbia coast area.
88a			T/R: 157.425	T/R: 157.425	US: Commercial, Intership only. Canada: Automatic Ship Identification and Surveillance System.
		88b	T/R: 162.025	T/R: 162.025	
WX1		WX1		R: 162.55	Weather Channel 1 (receive only).
WX2		WX2		R: 162.4	Weather Channel 2 (receive only).
WX3		WX3		R: 162.475	Weather Channel 3 (receive only).
WX4				R: 162.425	Weather Channel 4 (receive only).
WX5				R: 162.45	Weather Channel 5 (receive only).
WX6				R: 162.5	Weather Channel 6 (receive only).
WX7				R: 162.525	Weather Channel 7 (receive only).

3 SPECIFICATIONS¹

3.1 GENERAL

Dimensions: (Height x Width x Depth)	2.8 x 7.24 x 7.9 inches (7.1 x 18.4 x 20 centimeters) (Includes knobs but <u>not</u> space required for mounting bracket and cables at rear of radio)
Weight:	5.9 pounds (2.68 kilograms), does not include bracket
Operating Ambient Temperature Range:	-22 to +140° Fahrenheit (-30 to +60° Celsius)
Storage Temperature Range:	-40 to +176° Fahrenheit (-40 to +80° Celsius)
Altitude	
Operating:	15,000 feet (4572 meters) maximum
Transport/Storage:	50,000 feet (15240 meters) maximum
DC Supply Voltage Operating Ranges	
For Full Performance:	+13.6 Vdc ±10% (Normal range per TIA-603)
Overall Operating Range:	+13.6 Vdc ±20%
Power Transients/Surge:	Per SAE J1455 Transient, Noise, and Electrostatic Characteristics for 12-Volt Vehicles
DC Supply Current Requirements	
Receive	
With Speaker Muted:	1.4 amps maximum
With 15-Watt Ext. Spkr. Output Power:	4.0 amps maximum
Transmit at 50 Watts:	15 amps maximum
Quiescent/Off Current:	2 milliamps maximum

3.2 TRANSCIVER

Frequency Range:	136 to 174 MHz (transmit and receive)
Transmit Power:	10 to 50 watts (programmable range)
Antenna Port Impedance:	50 ohms
Channel Spacing:	12.5 kHz or 25 kHz (mode dependent)
Voice and Data Communications Modes:	Half-Duplex
Frequency Stability:	±2 ppm
Receiver Sensitivity:	
Analog Mode:	better than -119 dBm (0.25 μV) at 12 dBm SINAD
P25 Mode (TIA-102 Method):	better than -116 dBm (0.35 μV) at 5% static BER
Audio Frequency Response:	300 to 3000 Hz (transmit and receive)
Microphone Input Sensitivity:	82 ±28 mV rms (typical)
Microphone Audio Frequency Response:	±0.5 dB from 100 Hz to 3000 Hz
Microphone Connector:	12-pin locking connector located on front panel

¹ These specifications are primarily intended for the use of the installation technician. See the appropriate Specifications Sheet for the complete specifications.

Speaker Audio Output Power:

Internal Speaker:

3 watts RMS minimum into 4-ohm speaker

External Speaker:

15 watts RMS minimum into 4-ohm speaker

Speaker Audio Output Distortion:

< 3% at rated audio output

3.3 REGULATORY**FCC Type Acceptance**

OWDTR-0075-E

Applicable FCC Rules:

Part 15, Part 80 and Part 90

Industry Canada Certification

3636B-0075

Applicable Industry Canada Rules:

RSS-119

4 INTRODUCTION

This manual contains installation procedures for the XG-25M mobile radio and related options and accessories. Procedures cover the mounting and cabling of the radio equipment, as well as basic in-vehicle radio test procedures. In addition, product safety-related information for the radio equipment is included.

4.1 GENERAL DESCRIPTION

The XG-25M mobile radio is a high-performance 136 to 174 MHz 50-Watt digital mobile radio. It can operate in Project 25 (P25) conventional and analog conventional modes. The radio's transmit output power is rated at 50 watts, with the power level adjustable from 10 to 50 watts via radio personality programming. The XG-25M is considered a front-mount radio, since its control head is an integral part of the radio. The head cannot be mounted separately from the radio.

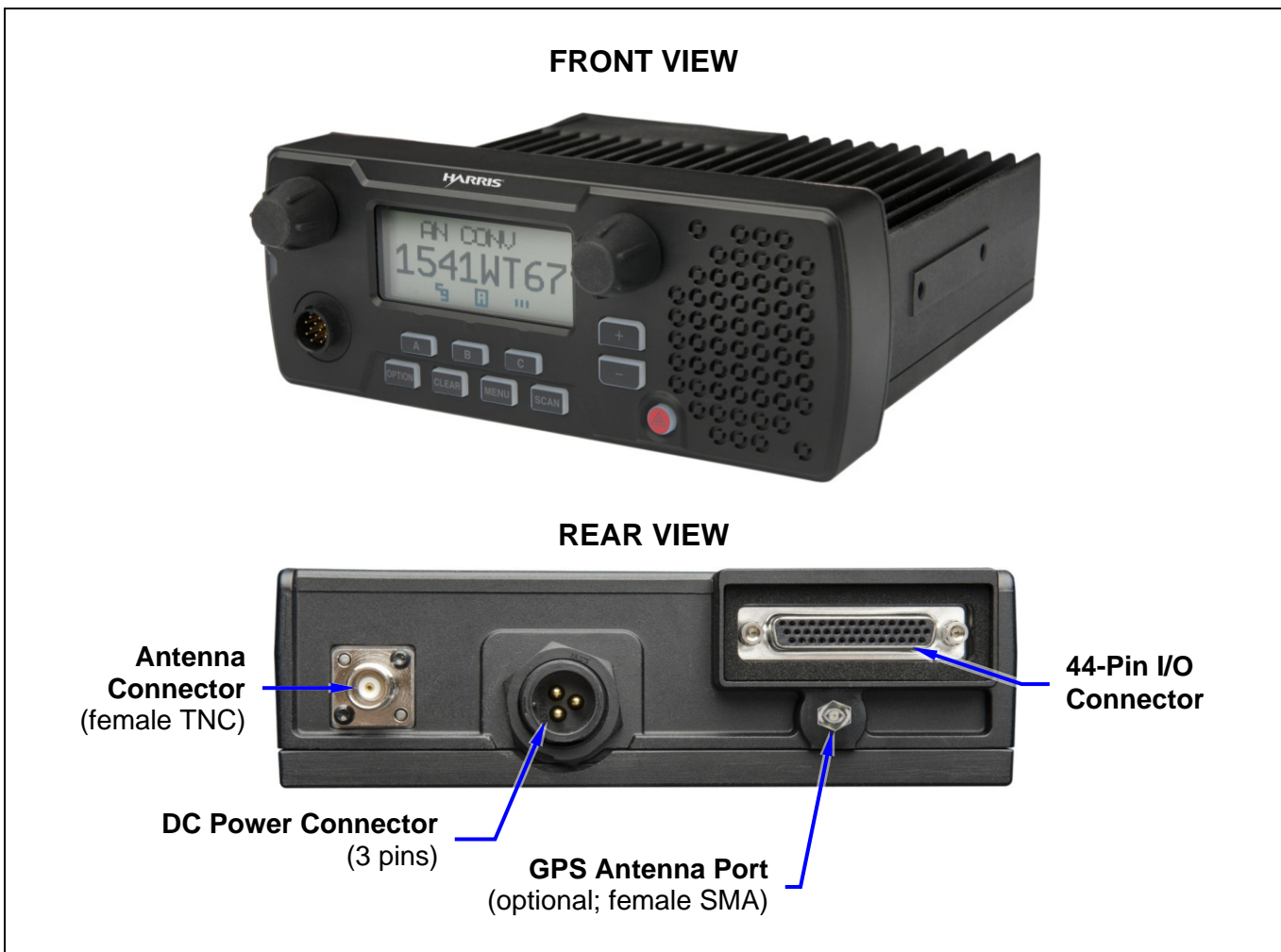


Figure 4-1: XG-25M Mobile Radio — Front and Rear Views

The XG-25M radio is designed to operate in a mobile environment, typically within a motor vehicle. It must be connected to an external transmit/receive antenna such as one mounted to the vehicle's rooftop or trunk lid. Several different types of external-mount antennas are approved and available for use with the radio, as listed in Table 1-1 and in Table 5-3.

The radio provides half-duplex voice and data communications. Voice communications are accomplished via a “push-to-talk” (PTT) type microphone and an external speaker connected to the radio’s control head.

The radio’s control head features a large text and graphics-based liquid-crystal display (LCD), and front panel controls for user control of the radio.

The XG-25M must be powered by an external +13.6-volt (nominal) DC power source. In mobile applications, the motor vehicle’s electrical system is utilized as the source of DC power. Specifications are included in Section 3 of this manual.

The XG-25M may be equipped with an optional built-in Global Positioning System (GPS) tracking receiver. The GPS antenna can be integrated into the mobile transmit/receive antenna (i.e., a “combination” antenna). Alternately, the GPS antenna can be located/mounted completely separate from the mobile transmit/receive antenna.

The XG-25M exceeds many tough environmental specifications included within military standard MIL-STD-810G, the radio industry standard TIA/EIA-603, and the radio standard established by the U.S. Forest Service.

The radio supports operation on APCO Project 25 compliant Common Air Interface (P25 CAI) radio networks, and operation in a talk-around mode in accordance with the APCO Project 25. P25 radio systems utilize Improved Multi-Band Excitation (IMBE) speech and data compression technology, developed by Digital Voice Systems, Inc.



Harris recommends the buyer use only an authorized representative to install and service this product. The warranties provided to the buyer under the terms of sale shall be null and void if this product is installed or serviced improperly, and Harris shall have no further obligation to the buyer for any damage caused to the product or to any person or personal property.

4.2 RADIO PROGRAMMING

Unless otherwise stated, all radio installation and test procedures presented in this manual assume the radio has been programmed by radio network administration personnel before it is delivered to radio installation personnel.

Radio Personality Manager (RPM) software application TQS3385 (part number SK-104768-001) is used to program the XG-25M mobile radio for trunked radio systems. TQS3385 can also be used to program the radio for analog conventional and P25 conventional operations. For additional information, refer to RPM’s built-in online help and/or RPM Software Release Notes, publication number MS-012550-001.

Conventional RPM software application TQS3389 (part number SK-012177-001) is used to program the XG-25M mobile radio for analog conventional and P25 conventional operations. Trunking mode programming is disabled in TQS3389. For additional information, refer to RPM’s built-in online help and/or Conventional RPM Software Release Notes, publication number MS-012761-001.

Both RPM applications can also be used to flash program new operating software (i.e., firmware) into an XG-25M mobile radio. Refer to the radio’s maintenance manual for additional information.

Both RPM applications also support other radios such as the M7100, M7200, M7300, and Unity XG-100M mobile radios, and the P7100, P7200, P7300, and Unity XG-100P portable radios.



RPM Release R9A or later is required for XG-25M mobile radio programming.

4.3 RELATED PUBLICATIONS

The following publications contain additional information about the XG-25M mobile radio:

- Quick Guide: 14221-1510-1000
- Operator's Manual: 14221-1510-2000

A Quick Guide is included with each mobile radio equipment package when it ships from the factory. The Quick Guide and the Operator's Manual are available at www.pspc.harris.com without a login.

4.4 REPLACEMENT PARTS

Replacement parts can be ordered via our Customer Care center. To order replacement parts, call, fax or e-mail:

United States:

- Phone Number: 1-800-368-3277
- Fax Number: 1-321-409-4393
- E-mail: PSPC_CustomerFocus@harris.com

International:

- Phone Number: 1-434-455-6403
- Fax Number: 321-409-4394
- E-mail: PSPC_InternationalCustomerFocus@harris.com

4.5 TECHNICAL ASSISTANCE

If any of the radio equipment requires repair, or if there are questions or concerns about the installation of this equipment, contact the Harris Technical Assistance Center (TAC) using the following telephone numbers or e-mail address:

- United States and Canada: 1-800-528-7711 (toll free)
- International: 1-434-385-2400
- Fax: 1-434-455-6712
- E-mail: PSPC_tac@harris.com

5 UNPACKING AND CHECKING THE EQUIPMENT

5.1 MATERIALS

A typical set of materials for an XG-25M mobile radio installation includes:

- **XG-25M Mobile Radio** — See Table 5-1 below for catalog and part number.
- **Installation Kit MAMW-TBD** — Contents listed in Table 5-2.
- **One or Two Antennas** — See Table 5-3. (A second antenna or a “combination” antenna is required if the optional GPS receiver is installed and used.)
- **Microphone** — See Table 5-3 for microphone part numbers.

Table 5-1: XG-25M Mobile Radio Catalog and Part Number

CATALOG NUMBER*	RADIO PART NUMBER	DESCRIPTION
DM-MV1B	14015-0010-01	XG-25M VHF 50-Watt Mobile Radio

* In addition to the radio, the catalog package also contains this *Installation and Product Safety Manual* and a *Quick Guide*.

5.2 MATERIAL INSPECTION



After removal from the carton, examine the radio and other components for broken, damaged, loose or missing parts. If any are noted, contact the Customer Care center (see page 22) immediately to discuss and arrange the return of the equipment to Harris for replacement. Any unauthorized attempts to repair or modify this equipment will void the warranty and could create a safety hazard.

Upon removing items from the carton and verifying that all equipment is accounted for, proceed with the installation.



Mounting of the radio and/or antenna in ways other than those described in this manual may adversely affect performance, violate FCC rules on RF exposure, and even damage the unit, posing a potential safety hazard.

Table 5-2: Installation Kit MAMW-TBD for XG-25M Mobile Radio

ITEM	QTY.	PART NUMBER	DESCRIPTION	ILLUSTRATION
1	1 <input type="checkbox"/>	14015-0201-01	Kit, Front-Mount Mounting Bracket.	
2	1 <input type="checkbox"/>	CA-012365-001	Cable, DC Power. Includes 10-AWG, 20-Foot DC Power Cable with straight connector, (2) waterproof HFB fuse holders, (1) 20-amp AGC fuse, (1) 15-amp AGC fuse, and (1) 3-amp AGC fuse.	
3	1 <input type="checkbox"/>	14002-0174-08	Cable, Option. See Section 11.1 (page 46).	



Do **not** use the 20-amp fuse included with DC Power Cable CA-012365-001. Radio main power should be protected with the 15-amp fuse included with the cable. Refer to Section 14 for additional information.

Table 5-3: Additional Options and Accessories for XG-25M Mobile Radios

PART NUMBER	DESCRIPTION
AN-125001-001	Antenna Mount: Standard Rooftop, NMO Mounting Base, 15-foot (4.6-meter) RG-58 A/U (or equivalent) Low-Loss RF Cable, Male TNC RF Connector
AN-125001-002	Antenna Mount: Standard Rooftop, NMO Mounting Base, 15-foot (4.6-meter) RF-195 (or equivalent) Low-Loss RF Cable, Male TNC RF Connector
AN-125001-003	Antenna Mount: Thick Rooftop, NMO Mounting Base, 15-foot (4.6-meter) RG-58 A/U (or equivalent) Low-Loss RF Cable, Male TNC RF Connector
AN-125001-004	Antenna Mount: Thick Rooftop, NMO Mounting Base, 15-foot (4.6-meter) RF-195 (or equivalent) Low-Loss RF Cable, Male TNC RF Connector
AN-125001-005	Antenna Mount: GPS Combo, Standard Rooftop, NMO Mounting Base, 17-foot (5.1-meter) RF-195 (or equivalent) Low-Loss RF Cable, Male TNC RF Connector; 17-foot (5.1-meter) RG174/U (or equivalent) GPS RF Cable with Male SMA RF Connector (attached); 2.7 to 3.3 Vdc or 4.8 to 5.2 Vdc Bias
AN-125001-006	Antenna Mount: GPS Combo Rooftop, NMO Mounting Base, 17-foot (5.1-meter) RF-195 (or equivalent) Low-Loss RF Cable, Male TNC RF Connector; 17-foot (5.1-meter) RG174/U (or equivalent) GPS RF Cable with Male SMA RF Connector (attached); 2.7 to 3.3 Vdc or 4.8 to 5.2 Vdc Bias
AN-125001-007	Antenna Mount: Magnetic, NMO Mounting Base, 15-foot (4.6-meter) RG-58 A/U (or equivalent) Low-Loss RF Cable, Male TNC RF Connector
AN-125001-008	Antenna Mount: Magnetic, NMO Mounting Base, 15-foot (4.6-meter) RF-195 (or equivalent) Low-Loss RF Cable, Male TNC RF Connector
AN-225002-001	Antenna Element: 136 to 174 MHz, 0 dBd Gain, NMO, Factory-Tuned
AN-225006-001	Antenna Element: 132 to 960 MHz, 0 dBd Gain, NMO, Field-Tuned*
AN-225002-003	Antenna Element: 136 to 174 MHz, 3 dBd Gain, NMO, Field-Tuned*
AN-225002-004	Antenna Element: 136 to 174 MHz, 2.4 dBd Gain, NMO, Field-Tuned*
AN-025187-001 (Cat. No. MAMW-NAN5F)	Antenna, GPS Receive Only, Roof-Mount, 17-foot (5.2-meter) RG174/U (or equivalent) RF Cable with Male SMA RF Connector (attached); 2.7 to 3.3 Vdc or 4.8 to 5.2 Vdc Bias
AN-025187-003 (Cat. No. MAMW-NAN3L)	Antenna, GPS Receive Only, Magnetic-Mount, 17-foot (5.2-meter) RG174/U (or equivalent) RF Cable with Male SMA RF Connector (attached); 2.7 to 3.3 Vdc or 4.8 to 5.2 Vdc Bias
14002-0174-08	Cable, Option. See page 46.
CA-013671-020	Cable, Serial Data (20 feet). See page 50.
CN-014756	Connector, RF; TNC Male Crimp-Type for RG58U, RG58A/U and RGU400 Coaxial Cable
MC-101616-060	Microphone, Standard.

* Element must be trimmed to proper length in order to minimize antenna system VSWR.

6 PLANNING THE INSTALLATION

6.1 GENERAL INFORMATION

Before starting, plan the installation carefully so it will meet the following requirements:

- The installation is safe for the operator and passengers within the vehicle.
- The equipment is installed away from the airbag deployment areas.
- The installation allows for convenient access by the operator, as applicable.
- The equipment is protected from water damage.
- The installation is neat and allows easy service access.
- The mobile radio is mounted in a location assuring the vehicle occupants' safety and out of the way of passengers and auto mechanics.



A professional radio installer should perform the installation!

6.2 TOOLS REQUIRED

The following tools are recommended to complete the installation. Where specific vendor names and model or part numbers are given, equivalent substitutes may be used:

- Non-Insulated Crimp Tool: Thomas & Betts WT-111-M
- Insulated Terminal Crimp Tool: Klein 1005
- Fuse Holder Crimp Tool: Thomas & Betts – WT-112M or California Terminal Products No. 1250 or Channelock No. 909
- 3-Blade Coax Cable Stripper for RG-58 Cable similar to Tyco Electronics 1490490-1 (includes blades)
- Ratcheting Hex-Crimp Tool for 50-Ohm TNC and BNC RF Connectors and RG-58 Cable similar to Tyco Electronics 58433-2 (includes Crimper 354940-1 and Die Set 58436-1) or Emerson Network Power 24-9960P
- Non-Metallic Fish Tape, 25-Foot: Klein-Lite 50156
- Various Socket and Driver Sets
- Soft-Jaw Pliers: Tessco 450520 or equivalent
- Phillips-Head Screwdrivers, #1 and #2
- Flat-Blade Screwdrivers, #1 and #2
- 4-Millimeter Hex Key Wrench
- $\frac{5}{16}$ -Inch Combination or Open-End Wrench (Only Needed for GPS Receiver Option)
- $\frac{3}{4}$ -Inch or $\frac{3}{8}$ -Inch Hole Saw with Depth Protection: $\frac{3}{4}$ -Inch = Ripley HSK 19 or Antenex HS34; $\frac{3}{8}$ -Inch = Antenex HS38
- Clutch-Type Cordless Drill with Drill Bits and Driver Bits
- Deburring Tool (for $\frac{3}{8}$ -inch and smaller holes)
- Flush-Cut and Large Wire Cutters
- Various Fasteners (e.g., machine screws and nuts, Tek screws, etc.)
- Tie Wraps: Nylon, 6-inches or larger



A separate list of test equipment is included in Section 15.1 on page 54.

6.3 LOCATING COMPONENTS

Plan the mounting locations of all components (radio, antenna, and cables) and determine the routes for all wiring and cables. Particularly consider the connection of the radio for planning purposes.

- Determine the customer's preferences, if any, for location of components. Comply with these preferences as long as they are consistent with safety recommendations and guidelines presented in this manual and other generally accepted professional radio installation practices.
- The radio may be mounted below or above the vehicle's dash, or at some other location per customer requirements, available space, and/or mounting surface strength. Dimensions for the radio are listed in Section 3.1 on page 18. As noted in that section, these dimensions do not include space required at the rear of the radio for cables. Several inches of clearance space is required.
- When selecting a mounting location, verify sufficient clearance behind the radio can be maintained so cables will not be stressed, crushed, twisted, or bent at severe angles. Also, the front and sides of the radio must have clearance for air circulation, access to mounting screws, mounting hardware, etc.
- Verify the drilling of holes and the insertion of screws will not damage or interfere with any existing vehicle components (for example, a fuel tank, fuel lines, the transmission housing, etc.), or any existing vehicle wiring.
- For antenna location and installation-related information, refer to Section 7.



CAUTION

The radio must be kept out of direct sunlight and away from heat sources. Adequate free-air ventilation must be provided to its cooling fins. The radio will automatically reduce its transmit RF output power when its ambient temperature exceeds approximately +140° Fahrenheit (+60° Celsius).



CAUTION

All cables should have a service loop near each connector end. Do not bend the cables at severe angles near the connector end. Above all, after all components are installed, verify no cable is under any tension. Failure to do so may lead to damaged cables, causing intermittent radio operation or complete radio failure.

7 ANTENNA INSTALLATION

7.1 ANTENNA MOUNTING LOCATIONS



At this time, review all information presented in the REGULATORY AND SAFETY INFORMATION section of this manual (see page 6). A transmitting antenna must be installed in accordance with the guidelines presented in both the REGULATORY AND SAFETY INFORMATION section, and in this section.

As a guide for determining the best possible mounting location in order to reduce human exposure to radio frequency (RF) electromagnetic energy during transmit mode, see Table 1-1 and Figure 7-1.

Antennas must be mounted in one of four (4) possible locations on the vehicle. Figure 7-1 shows the recommended locations and antenna part numbers. Also, see Table 5-3 for additional information. Always follow the antenna manufacturer's instructions when mounting an antenna.

7.1.1 Direct Center or Center-Rear of Rooftop

The center of the vehicle's roof is the best location for a rooftop-mount antenna (location ❶ in the following figures). For optimal performance, the mounting area under the antenna must be flat with a minimum radius of six (6) inches of metal ground plane. It must be located directly in the center of the roof to minimize human exposure to RF electromagnetic energy. Other obstructions such as a light bar or another antenna may prevent the antenna from being mounted in the direct center of the roof. In this case, the antenna should be mounted a minimum of one foot away from and behind the obstruction but in the middle of the roof with respect to the left and right sides of the vehicle (location ❷ in the following figures).

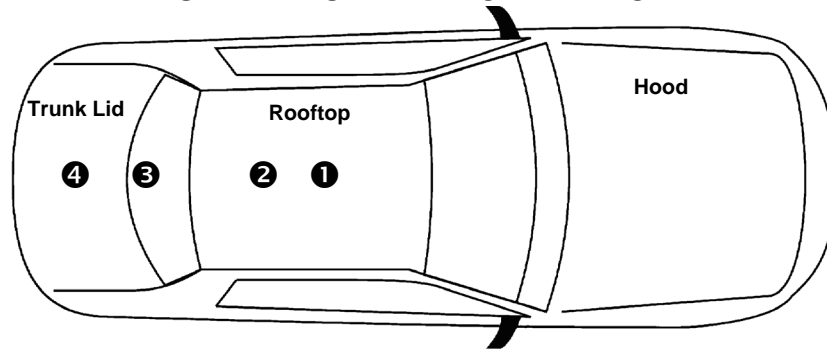
7.1.2 Center of Trunk Lid

Certain vehicles do not allow for the antenna to be placed in the center or center-rear of the roof. In this case, the next best location for the antenna is in the direct center of the trunk lid (location ❸ in the following figures). In this case, an elevated-feed-point antenna is recommended. Although this type of antenna does not require a metal ground plane, it must be located directly in the center of the trunk lid to minimize human exposure to RF electromagnetic energy.

7.1.3 Rear Deck Lid for Stand-Alone GPS Receive Antenna

If the XG-25M mobile radio does not use a GPS combination-type antenna and it is equipped with a GPS receiver, a stand-alone GPS receive antenna must be separately located and mounted. The vehicle's rear deck lid (location ❹ in the following figures) is the recommended mounting location for this case. This locates the GPS antenna inside the vehicle.

TOP VIEW OF A TYPICAL VEHICLE



ANTENNA PART NUMBER	ANTENNA DESCRIPTION*	LOCATION(S)			
		4	3	2	1
AN-125001-001 (mount) with AN-225002-001 (element)	136 to 174 MHz, Standard Rooftop-Mount, 0 dBd Gain				✓
AN-125001-001 (mount) with AN-225006-001 (element)	132 to 960 MHz, Standard Rooftop-Mount, 0 dBd Gain				✓
AN-125001-001 (mount) with AN-225002-003 (element)	136 to 174 MHz, Standard Rooftop-Mount, 3 dBd Gain				✓
AN-125001-001 (mount) with AN-225002-004 (element)	136 to 174 MHz, Standard Rooftop-Mount, 2.4 dBd Gain				✓
AN-125001-003 (mount) with AN-225002-001 (element)	136 to 174 MHz, Thick Rooftop-Mount, 0 dBd Gain				✓
AN-125001-003 (mount) with AN-225006-001 (element)	132 to 960 MHz, Thick Rooftop-Mount, 0 dBd Gain				✓
AN-125001-003 (mount) with AN-225002-003 (element)	136 to 174 MHz, Thick Rooftop-Mount, 3 dBd Gain				✓
AN-125001-003 (mount) with AN-225002-004 (element)	136 to 174 MHz, Thick Rooftop-Mount, 2.4 dBd Gain				✓
AN-125001-005 (mount) with AN-225002-001 (element)	136 to 174 MHz, GPS Combo Standard Rooftop-Mount, 0 dBd Gain				✓
AN-125001-007 (mount) with AN-225002-001 (element)	136 to 174 MHz, Magnetic-Mount, 0 dBd Gain				✓
AN-125001-007 (mount) with AN-225006-001 (element)	132 to 960 MHz, Magnetic-Mount, 0 dBd Gain				✓
AN-125001-007 (mount) with AN-225002-003 (element)	136 to 174 MHz, Magnetic-Mount, 3 dBd Gain				✓
AN-125001-007 (mount) with AN-225002-004 (element)	136 to 174 MHz, Magnetic-Mount, 2.4 dBd Gain				✓
AN-025187-001	GPS Receive Only, Roof-Mount	✓	✓	✓	
AN-025187-003	GPS Receive Only, Magnetic-Mount	✓	✓	✓	

* See Table 5-3 on page 25 for detailed antenna descriptions.

Figure 7-1: Recommended VHF Antenna Mounting Locations with Antenna Part Numbers

7.2 ANTENNA INSTALLATION PROCEDURES



An antenna **must** be installed before completing the radio installation.

Table 5-3 (page 25) and Figure 7-1 list the mobile radio antennas available for use with the respective radio. As presented in the previous section, various mounting locations exist. Optimal performance is achieved via a rooftop antenna mounted in the direct center of the motor vehicle's roof.

7.2.1 Installing NMO Antenna Mounts AN-125001-001, -002, -003 and -004

These NMO style antenna mounts can each be used with several different antenna elements. Only limited access under the mounting location is typically required. The installation procedure is presented in Section 7.2.1.3.

7.2.1.1 **Standard NMO Antenna Mounts AN-125001-001 and AN-125001-002**

These standard 3/4-inch NMO antenna mounts require a 3/4-inch hole in a relatively flat area of the vehicle body, with a vehicle metal thickness of between 0.020 and 0.040 inches. AN-125001-002 has a very-low-loss coax cable (LMR/RF-195 or equivalent).

7.2.1.2 **Thick-Roof NMO Antenna Mounts AN-125001-003 and AN-125001-004**

Both of these thick-roof NMO antenna mounts use either a 3/8-inch or a 3/4-inch mounting hole in a relatively flat area of the vehicle body, with a vehicle metal thickness of between 0.040 and 0.1875 inches (3/16-inch maximum thickness). AN-125001-004 has a very-low-loss coax cable (LMR/RF-195 or equivalent).



For thick-roof NMO antenna mounts AN-125001-003 or AN-125001-004, using a 3/8-inch mounting hole will require better access to the underside of the mounting location than if a 3/4-inch hole is used. This is because, in the case of a 3/8-inch hole, the antenna mount's bushing assembly **must** be inserted from the underside of the mounting surface.

When using a 3/4-inch mounting hole to mount thick-roof NMO antenna mounts AN-125001-003 or AN-125001-004, the thickness of the mounting surface must be at least 1/8-inch (0.125-inch minimum thickness). This requirement is due to the thickness of the alignment ring used to center the bushing assembly within the 3/4-inch mounting hole.

7.2.1.3 **Installation Procedure for Mounts AN-125001-001 through -004**

1. Select the antenna mounting location in accordance with the information presented in Sections 1 and 7.1 of this manual. If necessary, contact the Technical Assistance Center for assistance. See page 22 for TAC contact information.
2. Verify no obstructions exist immediately below the respective mounting location on the underside of the vehicle body, such as vehicle ribbing/body framing, a wiring harness, air bag equipment, etc. Also verify there is a sufficient access path and clearance for the mount's coax cable. If there is an obstruction or insufficient clearance, select another nearby mounting location.
3. Measure and mark the center point of the selected antenna mounting location. Be sure to center the mark from side-to-side of the vehicle.

4. Obtain a hole saw specifically designed for drilling NMO mounting holes of the required diameter. (e.g., Antenex/Laird Technologies model HS34 or equivalent for a $\frac{3}{4}$ -inch hole; Antenex/Laird Technologies model HS38 or equivalent for a $\frac{3}{8}$ -inch hole).
5. If the vehicle's headliner panel, carpet, seats, or otherwise, is below the mounting location, move or remove the headliner panel, etc. as necessary to protect it. Alternately, apply a heat-resistant mask material (such as a fiberglass mat or thin sheet metal with masked edges) as required to "catch" the metal shavings and the metal plug (if any) produced by the hole saw. The plug (if any) may be relatively hot if/when it drops out of the saw upon completion of the hole drilling process. $\frac{3}{8}$ -inch diameter hole saws generally produce only shavings, not plugs.
6. With the hole saw and a drill, drill a hole at the marked hole center point. Position the drill square to (i.e., 90 degrees from) the vehicle mounting surface so paint immediately outside of the perimeter of the hole is evenly removed.



Excessive use of the hole saw and/or failure to position the drill "square" with (i.e., at a 90-degree angle from) the vehicle mounting surface may result in damage to the metal mounting surface, in the area immediately outside of the perimeter of the hole.

7. Ensure the saw removed the paint immediately around the hole as the drilling operation completes. If not, do so by reinserting the saw completely into the hole and spinning it as required. This allows proper grounding via the mount's lock nut on the top of the mounting surface. On the bottom of the mounting surface, the "teeth" of the mount's bushing assembly may not provide a good ground due to thick vehicle undercoating, thick primer, oxidation/rust, etc.
8. **For a $\frac{3}{4}$ -inch hole**, feed the unterminated end of the mount's coax cable into the hole from the top surface of the vehicle until the mount's bushing assembly is in position to drop into the hole. The bushing should be tilted at a slight angle and fed into the hole. The threaded shank of the mount's bushing assembly will not fall through a $\frac{3}{4}$ -inch hole.
For a $\frac{3}{8}$ -inch hole, feed the threaded shank of the mount's bushing assembly into the hole from the underside of the mounting surface. Hold it into position until the lock nut is installed.
9. If installing a thick-roof antenna mount ($\frac{3}{8}$ -inch shank) into a $\frac{3}{4}$ -inch hole, place the alignment ring onto the threaded shank of the mount. This ring has an approximate $\frac{3}{4}$ -inch outside diameter.
10. A tube of synthetic lubricant is included with the antenna mount. Apply this lubricant to the mount's rubber O-ring. Do **not** get any lubricant on the center contact of the mount's bushing assembly.
11. As illustrated in Figure 7-2 and Figure 7-3, add the O-ring (C) and lock nut (D) to the top of the mount's bushing assembly (A). With the O-ring in the groove in the underside of the lock nut, thread the lock nut onto the bushing assembly. Be sure the O-ring remains in the groove before tightening the lock nut.
12. Using a $\frac{15}{16}$ -inch open-end wrench, tighten the lock nut until it fully compresses the O-ring and makes good contact with the vehicle mounting surface. The groove's ridges on the bottom of the lock nut must make full contact with the unpainted metal surface of the vehicle.
13. Install the antenna element per the procedure in Section 7.2.4.

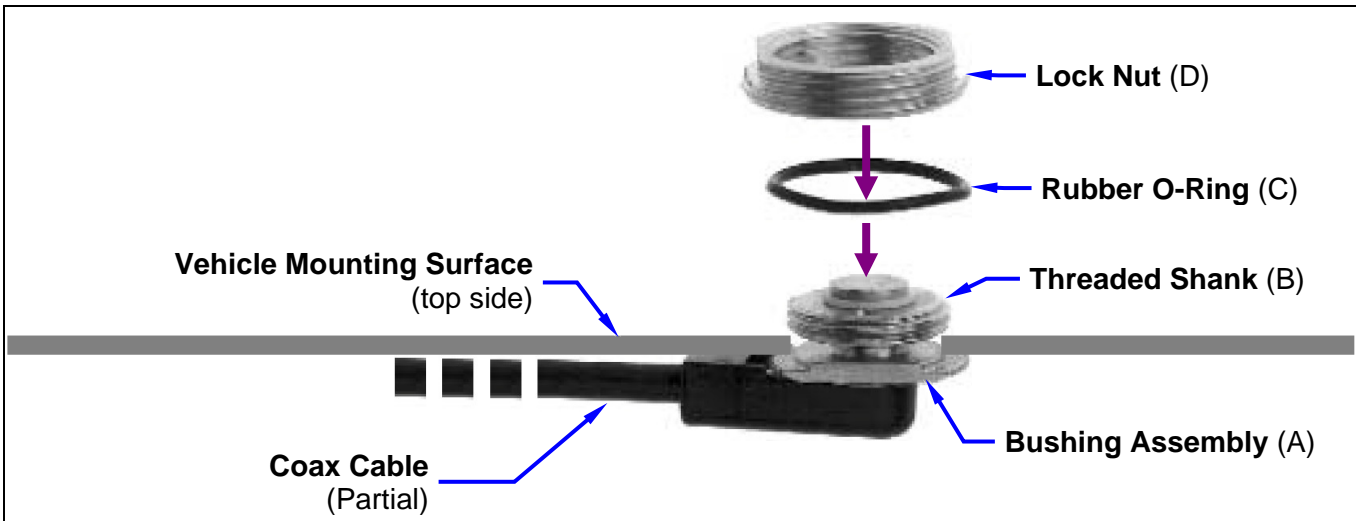


Figure 7-2: Installing a Standard $\frac{3}{4}$ -Inch NMO Antenna Mount
(e.g., AN-125001-001 or AN-125001-002)

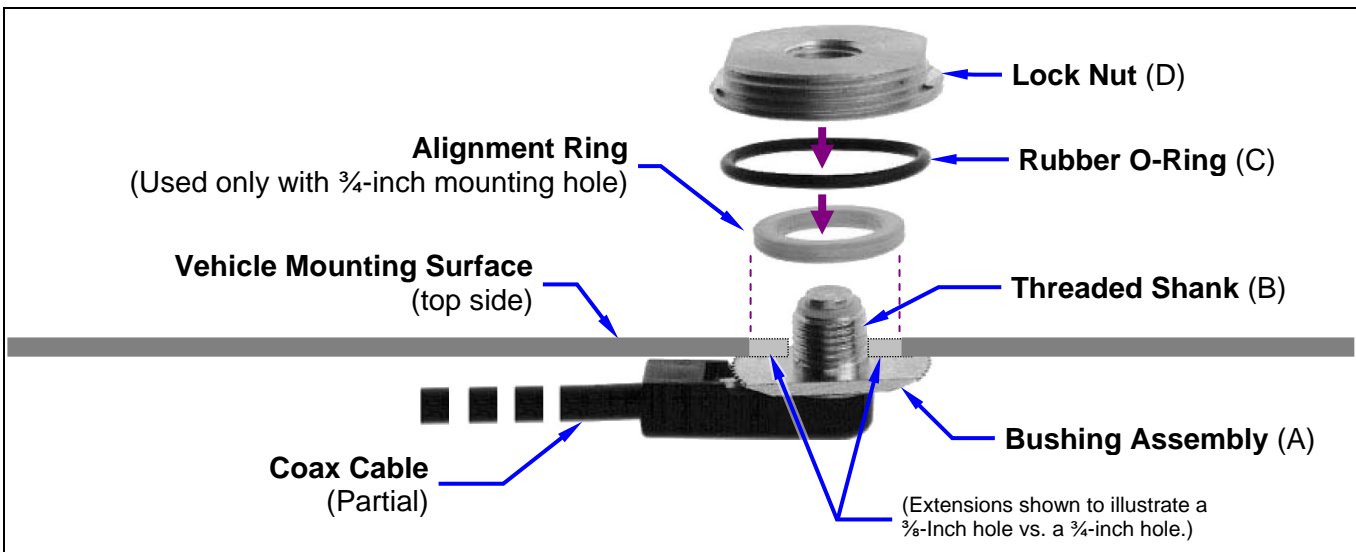


Figure 7-3: Installing a Thick-Roof NMO Antenna Mount
(e.g., AN-125001-003 or AN-125001-004)

7.2.2 Installing NMO Magnetic Antenna Mounts AN-125001-007 and AN-125001-008

1. Thoroughly clean the bottom of the magnetic mount and the selected vehicle mounting surface by removing all dust, dirt, etc.
2. Carefully place the magnet mount onto the metal surface of the vehicle at the selected location. The coax cable exiting the mount's base should be orientated towards the point at which it will enter into the interior of the vehicle. Do not try to reposition it by sliding it on a painted metal surface.
3. Route the mount's coax cable to the radio location, passing it by the trunk lid's perimeter gasket, door perimeter gasket, etc., as necessary.
4. Install the antenna element per the procedure in Section 7.2.4.



To remove a magnetic antenna mount, hold it at the bottom of its base and tilt it at an angle to release the magnetic attraction force. **Do not pull on the mount's coax cable. Do not drag the mount across the mounting surface.**

7.2.3 Installing All Other Antenna Mounts

For any other type of antenna mount not covered in the previous sections, such as GPS combination antennas, install the mount in accordance with the installation instructions included with the mount.

7.2.4 Attaching NMO Antenna Elements

1. Clean the top surface of the NMO mount and the surface of the vehicle immediately around the mount.
2. Place the gasket included with the antenna element (not pictured in Figure 7-2 or Figure 7-3) around the mount and against the surface of the vehicle. If a lubricant or sealant was included with the gasket, apply it to the gasket before placing the gasket.
3. Apply the antenna element to the top of the mount and tighten it in a clock-wise direction (as viewing from the top). Use an appropriate wrench if required. **Do not over-tighten.**
4. Install a placard (not supplied) on the vehicle's dash panel, in accordance with the following **CAUTION**. Place the placard in plain view of the vehicle operator's position.



Before entering any automatic vehicle ("car") wash equipment, remove the antenna element from the antenna mount, and secure the element in a safe location inside the vehicle. This will prevent the wash equipment from damaging the element and/or mount. After exiting the wash equipment, thoroughly dry the top of the mount before re-installing the element.

5. Continue with the connection procedure presented in the next section.

7.2.5 Installing the Coax Cable and TNC RF Connector

1. Route the coax cable from the antenna mount to the location where the mobile radio will be installed. Remove headliner panel, interior panels, etc., as necessary. The cable must be kept out of casual contact from persons within the vehicle. Tie and stow the cable as necessary to protect it from possible chafing. Observe and follow this **WARNING**:



Do not cut an antenna cable any shorter than six (6) feet (1.83 meters), as measured from the base of the antenna mount to the TNC connector that mates to the radio.

2. Using an appropriate crimp tool, crimp the supplied TNC RF connector to the end of the antenna cable. For crimping instructions, see Figure 7-4 or the instructions supplied with antenna mount.
3. The antenna cable is connected to the radio's TNC receptacle-type (female) RF connector per a procedure presented later in this manual. The cable and its TNC connector must be protected from damage, dirt, and/or metal shavings which may be generated during the mechanical and electrical installation of the radio. Temporarily tying the connector and cable-end within a small plastic bag is recommended.

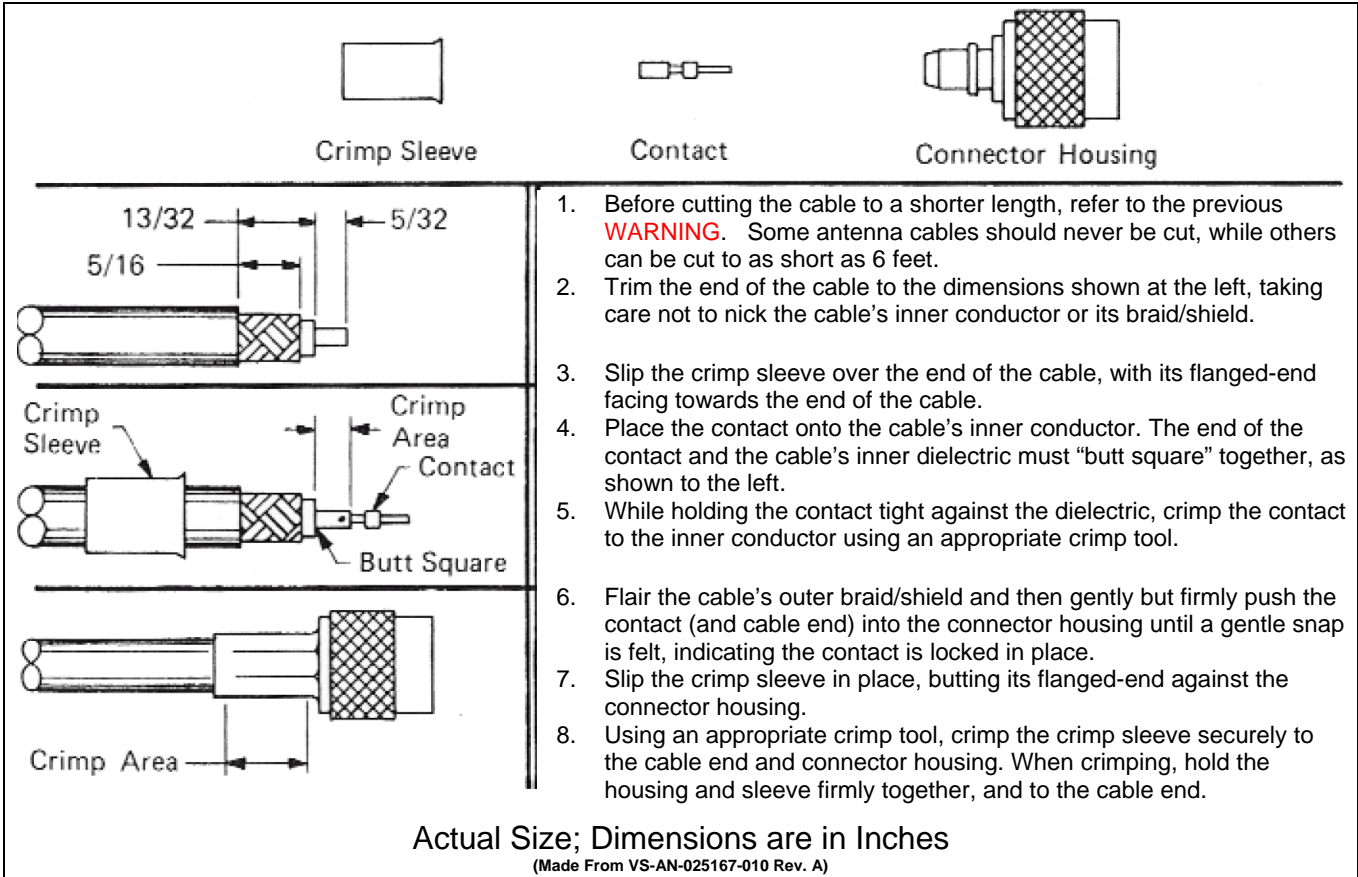


Figure 7-4: Crimping Instructions for TNC RF Connector



If the mobile radio installation includes unity-gain antenna element part number AN-225006-001, this element must be tuned (trimmed) for maximum performance (i.e., minimum reflection) during the test procedures presented in Section 15. Other antennas used with the radio are factory-tuned and therefore do not require tuning in the field.

7.2.6 Install GPS Antenna (Required Only if Radio has GPS Receiver Option)

If the XG-25M radio is equipped with the GPS receiver option, the GPS receiver requires connection to an externally-mounted GPS antenna. The GPS antenna must be kept at least six (6) inches away from any other antenna mounted on the vehicle and it must have at least six inches of surface ground plane beneath it.



Connection to a GPS antenna is only required if the (optional) GPS receiver is installed in the radio and if its functions will be utilized/required. Refer to Section 12 for additional information.



A combination (“combo”) antenna kit includes a GPS antenna built into the base of the mobile antenna. Refer to Table 5-3 (page 25) for available combo antennas.

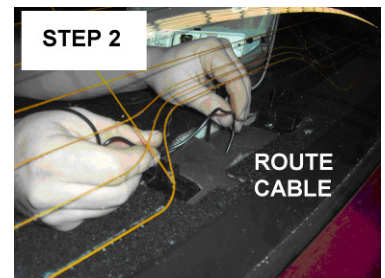
7.2.6.1 General Installation Procedure

1. After selecting a mounting location, refer to the antenna manufacturer’s mounting and testing instructions for installation guidance. Install the antenna in accordance with these instructions. If necessary, contact the Technical Assistance Center. See page 22 for TAC contact information. **Do not alter the GPS antenna cable length; tie and stow excess cable as necessary.**
2. Route the cable from the antenna base to the location of where the radio will be installed. Remove headliner panel, interior panels, etc., as necessary. The cable must be kept out of casual contact from persons within the vehicle. Tie and stow it as necessary to protect it from possible chafing.
3. The antenna cable is connected to the radio’s SMA receptacle-type (female) RF connector per a procedure presented later in this manual (i.e., procedure on page 52). The cable and its (male) SMA connector must be protected from damage, dirt, and/or metal shavings which may be generated during the mechanical and electrical installation of the radio. Temporarily tying the connector and cable-end in a small plastic bag is recommended.

7.2.6.2 Installation Procedure for Inside-Rear-Deck Mounting in Ford Crown Vic

The following GPS antenna installation procedure is recommended for inside-rear-deck mounting of GPS receive-only antennas, such as AN-025187-001 or AN-025187-003, in a Ford Crown Victoria. Other vehicle makes/models may use similar installation scenarios:

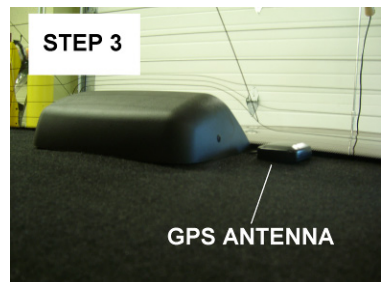
1. Carefully remove the center rear brake light assembly by removing the screws on each side of the assembly. Lift and set it aside.
2. Route the cable from the GPS antenna through the rear deck, next to the cable assembly for the rear brake light.



3. Position the antenna near the rear glass.

For an antenna that is not a magnetic-mount, secure it to the deck near the rear glass in accordance with the instructions provided with the GPS antenna.

4. Reassemble the rear deck brake light assembly while using caution to not to crimp/pinch the GPS coaxial cable. A small relief notch may need to be cut in the housing of the light assembly cable passage.



5. The cable and its (male) SMA connector must be protected from damage, dirt, and/or metal shavings which may be generated during the mechanical and electrical installation of the radio. Temporarily tying the connector and cable-end in a small plastic bag is recommended.
6. Route the cable to the area near where the radio will be installed. Tie and stow the antenna cable as necessary to prevent cable chafing or damage from moving items, like the trunk lid’s hinges and springs. The antenna cable is connected to the radio’s SMA receptacle-type (female) RF connector per a procedure presented later in this manual (i.e., procedure on page 52).



Do **not** alter the length of cable from the GPS antenna. The SMA connector on the end of the antenna cable is not field-replaceable.

8 RADIO INSTALLATION

8.1 MOUNTING THE RADIO

The Mounting Bracket Kit for the radio includes a heavy-gauge steel U-shaped mounting bracket. The radio should be attached to a mounting surface using this bracket. The bracket can be mounted above or below the radio. Kit contents are shown in Figure 8-2, and bracket dimensions are shown in Figure 8-3.

Both the radio and the mounting bracket have multiple holes in both sides for adjusting the radio within the bracket. The design allows for both front-to-rear tilting of the radio within the bracket for the best viewing angle, and a front-to-rear position offset. The radio has six (6) threaded mounting holes, three (3) per side, and the mounting bracket has ten (10) corresponding holes, five (5) per side. The radio must be secured to the bracket using at least four of the six M5 socket-head screws included in the Mounting Bracket Kit (2 screws per side).

Typically, the radio is front-to-rear centered within the bracket. However, it can be front-to-rear offset by approximately 2 inches (5.1 centimeters), if required. Also, the radio can be positioned straight in the bracket (i.e., parallel with the bottom surface of the bracket), or it can be tilted up or down at an angle of between approximately 10 to 20 degrees. When positioned straight and centered front-to-rear within the bracket, the radio extends approximately 2.5 inches (6.4 centimeters) from the front and rear edges of the bracket. In the rear, additional clearance must be included for cables. The area directly at the front of the radio must be completely clear of all objects (e.g., gear shift, other radio equipment, etc.) so the operator can easily access and view the radio's control head.

The mounting bracket must be attached to a secure metal surface that meets or exceeds the minimum 1/16-inch-thick steel sheet metal requirement in accordance with the following **WARNING**. For example, it can be attached directly to the bottom of the dash if the gauge of the sheet metal is high and the surface is firm and flat, or it can be attached to the transmission hump, etc., if a mounting wedge (not included) is utilized. The radio weighs approximately 6 pounds (2.7 kilograms).



At a minimum, the mounting surface should be 16-gauge (approximately 1/16-inch thick) steel sheet metal. Mounting to plastic or other material with low tensile and shear strength could lead to an unsafe and/or failed mounting condition, turning the radio and its mounting bracket into a projectile during a high-shock incident such as a motor vehicle accident. If the selected mounting surface does not meet the minimum 16-gauge steel sheet metal requirement, the surface should be reinforced with a metal backing plate (not supplied) or it should be reinforced using some other approved mounting method.



In addition to improving safety of the installation, firm mounting also prevents unreasonable vibration that could damage the radio, adversely affect transceiver performance and/or cause its cable connections to loosen. An improperly mounted radio may experience degradation in the quality of voice and data communications.

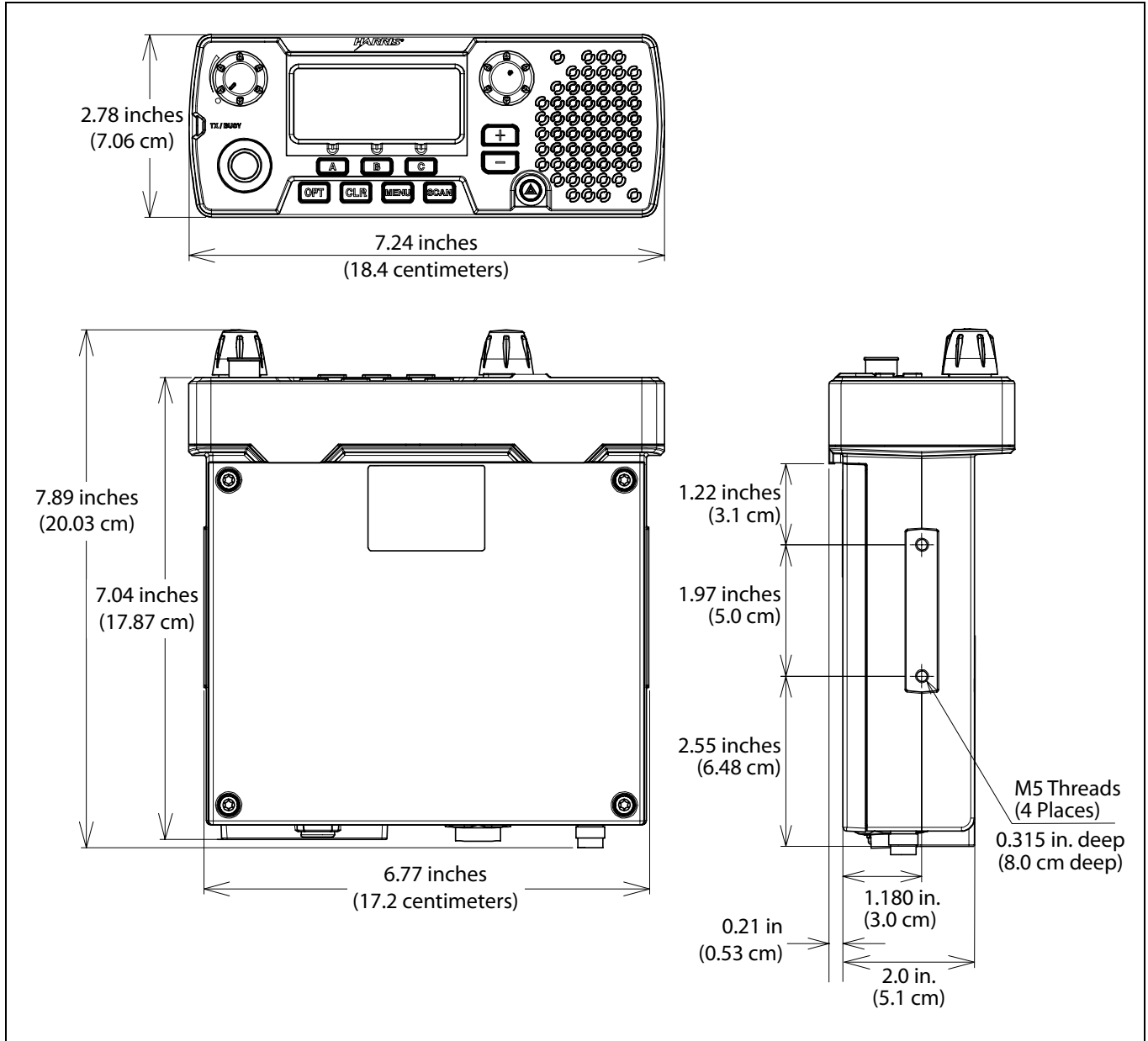


Figure 8-1: XG-25M Radio Dimensions

8.1.1 Mounting Bracket Installation

The radio's mounting bracket is included with the Mounting Bracket Kit 14015-0201-01. Kit contents are shown in Figure 8-2. This kit is Item 1 listed in Table 5-2 (page 24).

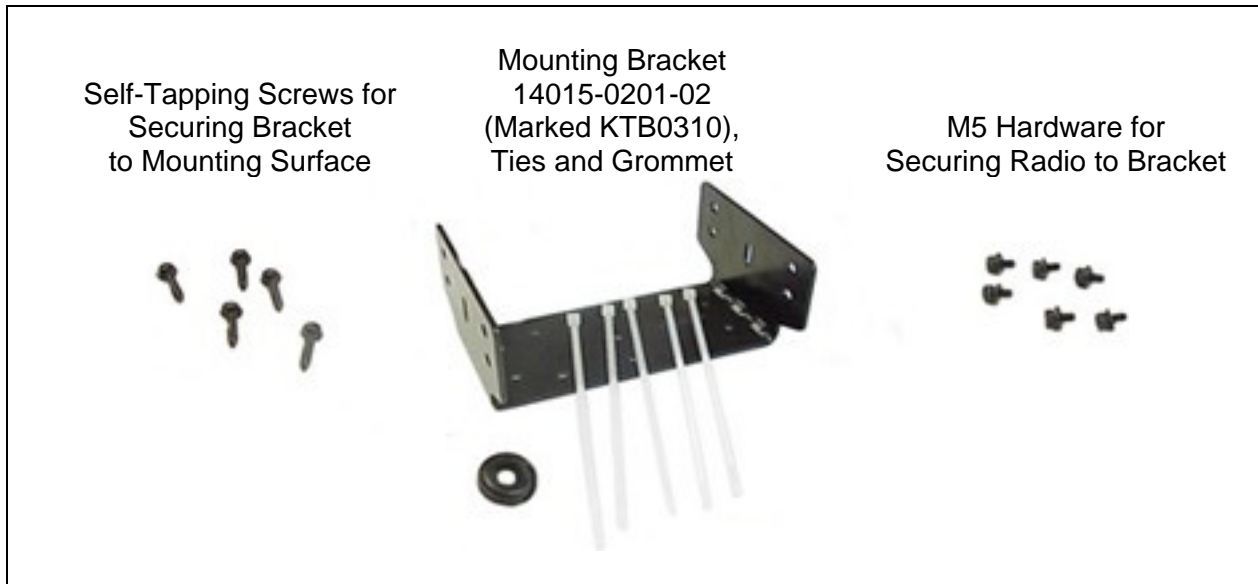


Figure 8-2: Mounting Bracket Kit 14015-0201-01

When selecting a mounting location for the radio, verify sufficient clearance can be maintained around the radio for installation and service access. A minimum clearance of approximately four (4) inches (10 centimeters) is recommended at the rear, left and right sides of the radio. As previously stated, the area directly at the front of the radio must be completely clear of objects so the operator can easily access and view the radio's control head.

As illustrated in Figure 8-3, the bracket is both left-to-right and front-to-rear symmetrical. It has eleven (11) holes for securing it to a mounting surface. At least four (4) of these holes must be used to secure the bracket to the mounting surface. Five 20-millimeter-long self-tapping screws are included in the Mounting Bracket Kit for this purpose. However, some other type of hardware (not supplied) may be used, such as #10-32 stainless-steel self-locking hardware (i.e., machine screws with washers and locking nuts), or self-drilling screws. Self-drilling screws such as "TEK" screws do not require drilling of a pilot hole prior to installation. Do not use common self-threading sheet metal screws because they will loosen over time with vehicle vibrations.

The following mounting procedure is recommended:

1. Determine the best radio-to-bracket position and angle by test-fitting the radio into the mounting bracket at the selected vehicle mounting location. Slide the radio between the sides of the bracket and temporarily secure it to the bracket with several of the M5 socket-head screws from the bracket kit. When positioned straight and centered front-to-rear within the bracket, the radio extends approximately 2.5 inches (6.4 centimeters) from the front and rear edges of the bracket. In the rear, additional clearance must be included for cables. The area directly at the front of the radio must be completely clear of all objects (e.g., gear shift, other radio equipment, etc.) so the operator can easily access and view the radio's control head.
2. At the rear of the radio, verify sufficient clearance is available for cables and service access.

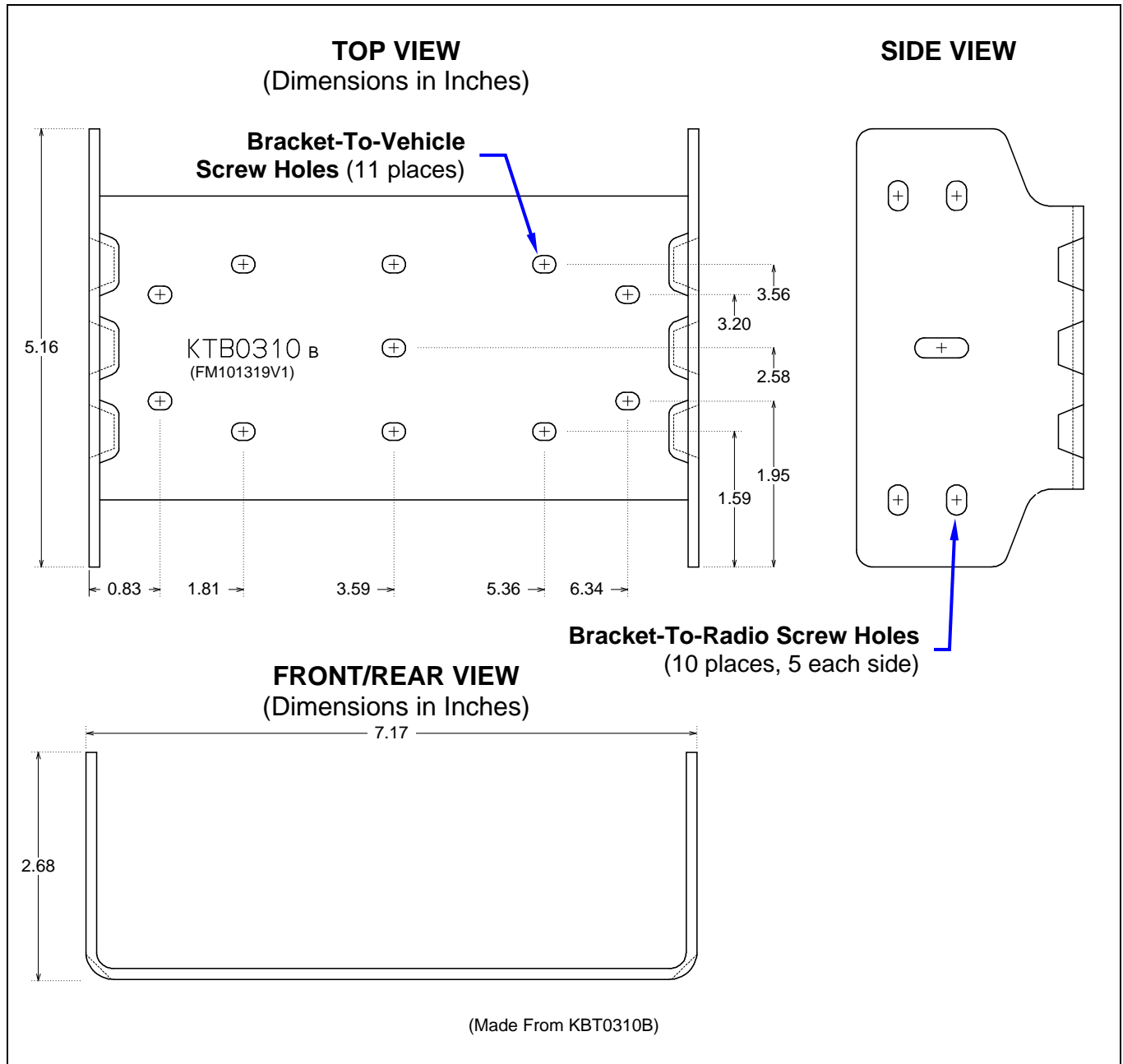


Figure 8-3: Mounting Bracket 14015-0201-02 Dimensions (Radio Not Shown)

3. If the mounting surface is not flat (such as the top of a transmission hump), construct a suitable mounting wedge as necessary, and attach the wedge to the surface using an approved attachment method. Never mount the bracket directly to a non-flat surface.
4. On the mounting surface, mark the selected location for the bracket, and then remove the radio from the bracket.
5. Clean and remove any foreign material from the mounting surface.
6. Using the bracket as a template, and/or the dimensional information shown in Figure 8-3, mark and drill at least four (4) mounting holes into the mounting surface as required per the type of hardware used.



Before drilling holes and/or installing mounting screws, verify these operations will not damage or interfere with any existing vehicle component (the fuel tank, a fuel line, the transmission housing, existing vehicle wiring, etc.). Always check to see how far the mounting screws will extend below the mounting surface prior to installation. Always deburr drilled holes before installing screws.

7. Temporarily remove the bracket and deburr all of the newly drilled holes.
8. If necessary, apply an approved paint or rust-inhibitor at the holes in the mounting surface.
9. Set the bracket back into place.
10. Install and tighten the mounting screws/hardware.
11. Verify the bracket is firmly secured to the mounting surface. A secure mount prevents unreasonable vibration, which could damage the radio and/or cause its cable connections to loosen.
12. If the rear of the radio is easily accessible when the radio is positioned in the selected position within the bracket, it is recommended that the radio be temporarily inserted into the bracket. Otherwise, do not mount the radio into the bracket at this time, because several cable connections must be made at the rear of the radio.

8.1.2 Inserting the Radio into the Mounting Bracket

The radio should now be inserted into the mounting bracket according to this procedure:

1. Lay the radio into the mounting bracket with the front of the radio facing in the correct direction (usually towards the rear of the vehicle).
2. Secure the radio to the bracket using at least four (4) of the six (6) M5 x 10 mm stainless-steel socket-head screws included with the Mounting Bracket Kit. These screws have captive lockwashers. Kit contents are shown in Figure 8-2. This kit is Item 1 listed in Table 5-2 (page 24).
3. Tighten all screws using a 4-millimeter hex key wrench until each lockwasher is fully compressed and the radio is firm and flush in between the brackets.
4. Check the mounting area for proper clearance for cable service looping and for air circulation, plus an area to secure and rest the excess cable lengths.



Proper mounting is one factor that ensures optimal radio performance. An improperly mounted radio may experience degradation in the quality of voice and data communications.

8.2 DC POWER CABLE INSTALLATION

8.2.1 Overview of On/Off Power Wiring Configurations

The following power wiring configurations are supported:

- **Radio turns on and off automatically with vehicle's ignition switch/key** — This configuration allows the on/off state of the vehicle's ignition switch/key to control the on/off power state of the radio. The white wire of the radio's DC Power Cable is connected to a fused switched power source, typically identified as vehicle "Accessory" power. This source must switch on (up to positive (+) battery voltage potential) when the vehicle's ignition switch/key turns on, and it must switch off (to near zero volts) when the ignition switch/key turns off. The required fuse rating is 3 amperes. When

using this configuration, the on/off/volume control must be left in the on position for automatic power-up/down to function properly.

- **Radio turns on and off with a manual switch** — This configuration is used when, for example, the radio has to remain on even when the ignition key must be removed from the vehicle and a separate on/off switch is acceptable. The white wire of the radio's DC Power Cable is connected to one side of a manually-controlled switch, and the other side of this switch is connected to unswitched and fused vehicle power. The required fuse rating is 3 amperes. When using this configuration, the on/off/volume control must be left in the on position for automatic power-up/down to function properly.
- **Radio turns on with its on/off/volume control ("hot wired")** — This configuration allows radio on/off power control only via its on/off/volume control. It may be desired if, for example, the radio has to remain on even when the ignition key must be removed from the vehicle and a separate on/off switch is not desired and/or not acceptable. The white wire of the radio's DC Power Cable must be connected to unswitched and fused vehicle power. The required fuse rating is 3 amperes.

In all of the above cases, the radio's main DC power input (red wire) must be connected through an in-line fuse to unswitched vehicle DC power. The red wire must be connected to raw battery power (positive battery terminal) via the supplied fuse.

8.2.2 DC Power Cable and Main Fuse Holder Installation

The radio's DC Power Cable has a 3-pin connector, a 20-foot red wire (for the main power connection), a 20-foot white wire (for the switched power source connection), and a 4-foot black wire (for the ground connection). It is supplied with waterproof fuse holders, two AGC-type fuses, and non-insulated ring terminals. The following installation procedures are recommended:

8.2.2.1 Black Wire Connection (Ground Wire)

1. Connect the radio's DC Power Cable to the radio by mating its 3-pin connector to the radio's 3-pin power cable connector as follows: Visually align the key and firmly push and turn the outer locking ring clockwise until it stops. A click will be sensed to confirm proper mating.
2. Prepare to connect the cable's black wire to vehicle ground by locating an area of vehicle metal within approximately two (2) feet of the radio. This surface must have a solid and stable connection to vehicle ground. If not, add grounding strap(s) as necessary.
3. Strip the area of any paint or dirt to expose a bare metal surface, approximately 3/4-inch square.
4. Drill a hole in the approximate center of the bare metal surface, and deburr it. A 3/8-inch non-insulated ring terminal is supplied with the cable to make this ground connection. Therefore, hole diameter should be appropriate for the utilized grounding screw/bolt size and type used to connect the ring terminal to the bare metal surface. This hardware is not supplied.
5. Cut the black wire to the required length plus some additional length for a service loop, then strip insulation back approximately 1/4-inch.
6. Crimp a 3/8-inch non-insulated ring terminal (supplied with the cable) to the end of the black wire.
7. Attach the ring terminal and black wire to the bare metal surface using stainless-steel self-locking hardware (i.e., machine screws with washers and locking nuts) or other appropriate hardware to ensure a reliable terminal-to-metal contact. Tighten securely.
8. Apply an approved paint or rust-inhibitor over the remaining exposed bare metal surface and around the ring terminal.

8.2.2.2 Red Wire and Main Fuse Holder Connection (Radio's Main Power Wire)

1. Continue installation of the radio's DC Power Cable by routing its 20-foot 10-AWG red wire to the location of the vehicle's battery (or its main DC bus bar or stud). Remove interior panels, door kick panels, etc., and route the wire through existing channels in the vehicle body as necessary. Protect the wire from possible chafing where necessary. Tie and stow the wire as necessary.



Plan the routing of the 10-AWG red wire carefully, using an existing access hole in the vehicle's firewall if possible. Alternately, drill a new hole approximately ½-inch in diameter and install a small rubber grommet (one supplied with the bracket kit) to protect the wire from chafing at the hole's sharp metal edge. **To prevent fumes from entering the passenger compartment, this hole/grommet/wire combination must also be sealed with a silicon-based sealer before completing the installation.**



Do **not** install any wiring or fuse holder over or in the near vicinity of the vehicle's engine. Excessive engine heat can cause permanent damage to these components and can lead to intermittent electrical connection to the battery.



Before making connections to the battery's positive post, carefully disconnect the battery's negative (ground) cable(s). This will prevent tools or other metallic objects which come in contact with the battery's positive terminal from shorting to vehicle ground, causing sparks or even a fire or an explosion! When disconnecting the negative cable(s), cover/insulate the positive post(s) if it is not already so a tool cannot short between the posts. Some vehicles, such as those with diesel engines have more than one battery; in this case, disconnect the negative cables at all batteries.

Radio fuses should not be installed until all wiring is complete. This will prevent the radio from powering up prematurely and/or causing an in-rush of current that could lead to shorting of the battery, sparks, or even fire.

2. Obtain the orange waterproof (HFB type) fuse holder included with the DC Power Cable.
3. **Observe and follow the previously presented WARNING!**
4. Cut the red wire to the required length for connection to the battery's positive (+) battery terminal (or the main DC bus bar or stud).
5. Prepare to splice the fuse holder into the red wire by cutting it again, at approximately three (3) to six (6) inches from the end.
6. Strip all three (3) wire ends back approximately ⅜-inch, place a fuse holder shell on each wire, and securely crimp a fuse holder terminal to each wire end. Before crimping, verify fuse holder shells are oriented in the correct directions (i.e., with each large end towards the wire end).
7. Label this fuse holder and red wire appropriately (e.g., "VHF Radio Main Power: 15-AMP FUSE").
8. **Do NOT install a fuse into the fuse holder at this time.**
9. Crimp an appropriate electrical terminal to the short red wire. A corrosion-resistant ⅜-inch ring terminal is included with the cable for this purpose, but another size corrosion-resistant terminal type (not supplied) may be used if required.

10. Connect the ring terminal directly to the battery's positive post (or if present, to a stud on the battery's main/non-switched power distribution terminal block).

8.2.2.3 White Wire Connection

A review of the information presented in Section 8.2.1 (page 40) may be beneficial at this time. As required per the chosen power-up configuration, connect the white wire by following one of the three procedures presented in the respective sub-section that follows.

8.2.2.3.1 Radio Turns On and Off with Vehicle's Ignition Switch/Key

With this wiring configuration, the radio automatically turns on and off with the vehicle's ignition switch/key. The white wire is sometimes referred to as the "white ignition switch wire" or the "ignition sense input wire." In this configuration, the white wire connects to a switched power source, typically identified as "Accessory" power, that switches on and off with the vehicle's ignition switch/key. When using this configuration, the on/off/volume control must be left in the on position for automatic power-up/down to function properly.



The white ignition sense wire must be connected to a fused power source that switches from approximately zero volts to approximately +13.6 volts when the vehicle's ignition switch/key is turned from the OFF position to the ACCESSORY and RUN positions. Use of a switched power source that is subject to voltage changes as a result of other actions, such as opening a vehicle door, may result in undesirable radio power cycles.

1. Locate the vehicle's switched ignition or "Accessory" power connection point that will be used for the switched ignition 12-volt DC power source. This point is typically located at or near the vehicle's fuse panel. It may be necessary to consult the vehicle manufacturer's wiring diagram.
2. Route the white wire of the radio's DC Power Cable from the back of the radio to the area near this connection point. Protect the wire from possible chafing as necessary.
3. Obtain the other waterproof (HFB-type) fuse holder included with the radio's DC Power Cable.
4. Cut excess length from the white wire and splice the fuse holder into it, near the location of the connection point.
5. Using an appropriate electrical terminal, connect the white wire to the switched power connection point. An open-barrel spade terminal is included with the cable for this purpose, but another type of terminal (not supplied) may be used as required.
6. Obtain the 3-amp AGC-type fuse included with the cable, and install it into the fuse holder.
7. Tie and stow all wiring as necessary so it remains out of the way of casual contact and wire chafe is avoided.

8.2.2.3.2 Radio Turns On and Off with a Manual Switch

With this wiring configuration, the radio is manually turned on and off via an on/off switch mounted separately from the radio, not through the vehicle's ignition switch/key. This configuration is used when, for example, the radio must remain on even when the ignition key must be removed from the vehicle and a separate on/off switch is acceptable and/or required. In this configuration, the white wire connects to a fused switched power source such as that provided by a toggle switch mounted on the vehicle's dash panel. When using this configuration, the on/off/volume control must be left in the on position for automatic power-up/down to function properly.

1. Route the white wire of the radio's DC Power Cable from the back of the radio to an area near the location of the panel-mounted on/off switch. Protect the wire from possible chafing as necessary.
2. Cut a short section (6 to 8 inches) off the end of the white wire and strip the ends.
3. Obtain the other waterproof (HFB-type) fuse holder included with the radio's DC Power Cable, and crimp one half of it to one end of the short section of wire.
4. Using an appropriate electrical terminal, connect this short white wire to unswitched 12-volt DC power source at or near the vehicle's fuse box.
5. Cut another section of white wire from the cable. This wire must be long enough to reach from the fuse holder to the location of the panel-mounted on/off switch.
6. Strip one end of this wire and crimp the other half of the waterproof fuse holder to this wire end.
7. Strip the other end of this wire and, using an appropriate electrical terminal, connect it to the common terminal of the switch.
8. Connect the white wire of the power cable to the load (switched) side of the switch.
9. If not already, mount the switch to the vehicle's dash panel, or other customer-selected location.
10. Obtain the 3-amp AGC-type fuse included with the cable, and install it into the fuse holder.
11. Tie and stow these wires as necessary so they remain out of the way of casual contact and wire chafe is avoided.
12. Label this power switch accordingly. For example: "**RADIO ON/OFF.**"

8.2.2.3.3 Radio Is "Hot Wired"

In the "hot-wired" configuration, the radio is turned on and off only by the control head's on/off/volume control located on the front panel of the control head. In this configuration, the white wire must be connected to unswitched and fused 12-volt vehicle power. Follow the procedure presented in Section 8.2.2.3.1, except connect the white wire to unswitched battery power instead of switched ("Accessory") power. Be sure to fuse this connection with the provided in-line fuse holder and 3-amp AGC fuse.

9 EXTERNAL SPEAKER INSTALLATION (OPTIONAL)

The radio has a built-in speaker on its front panel. If a speaker external of the radio is required, install it in according to the following procedure. Total available speaker cable length is approximately 10 feet (308 centimeters). Therefore, to include service loops in these cables, the speaker must be mounted within approximately 9.5 feet (290 centimeters) of the radio.

1. Select a location for the speaker that will allow for proper listening range with a moderate volume setting.
2. Install the speaker using the hardware and mounting bracket supplied with it. For the speaker's part number, see Table 5-2 (page 24).
3. Route the speaker cable to the rear of the radio.
4. Connect the Option Cable 14002-0174-08 (item 3 in Table 5-2) to the DB-44 connector on the rear of the radio. Tighten the cable's two (2) jackscrews securely. See Section 11.1 for additional information on this cable.
5. Mate the Option Cable's 2-pin connector (identified P2) to the 2-pin connector on the end of the speaker cable. A mild click will be sensed to confirm proper mating.
6. Route the cables out of the way of casual contact. Tie and stow as necessary.

10 MICROPHONE ATTACHMENT

There are several versions of microphones available for use with the radio. Each has a 12-pin connector that mates with the mic connector on the front panel of the control head. A microphone clip is included with each microphone. The radio can be configured to provide a monitor function when the microphone is cradled in the clip. Connect the mic to the control head and install the clip as follows:

1. Position the mic's connector just in front of the control head's mic connector so it can engage straight into the mic connector. The small notch on the end of the mic's connector must be positioned straight up so it engages with the key in the connector of the radio.
2. Mate the two connectors by pressing them fully together. A click should be sensed when the connectors latch together.
3. Using the microphone clip as a template, drill mounting holes in the surface of the selected location.
4. Select a mounting surface location that has clearance for the mic when it is clipped to the clip, and then attach the microphone clip to the surface. Use self-locking hardware (i.e., machine screws with washers and locking nuts), self-drilling screws, or other appropriate hardware as necessary. Tighten securely. The microphones have integrated hookswitches. Therefore, the microphone clip does not require grounding.
5. Clip the microphone to the clip.

11 OPTIONAL CABLES

11.1 OPTION CABLE 14002-0174-08

Option Cable 14002-0174-08 connects to the 44-pin I/O connector on the rear of the radio. It breaks out into several smaller standardized connectors, allowing straightforward access to external interfaces provided by the radio. The cable is shown in Figure 11-1 below. The cable's 44-pin D-subminiature connector that mates with the connector on the rear of the radio is identified P1.

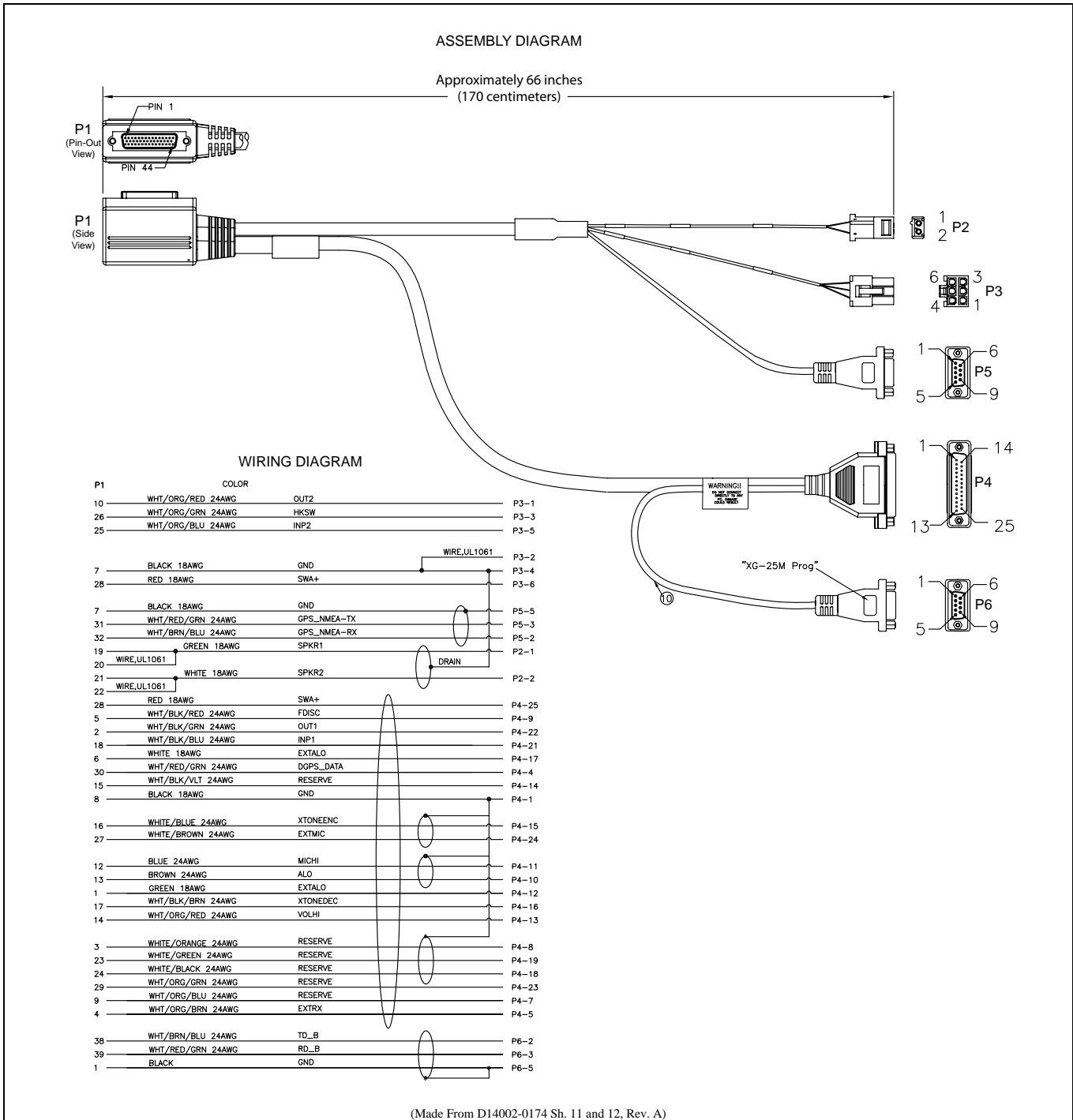


Figure 11-1: Option Cable 14002-0174-08



Observe caution before connecting any external device to the radio via its 44-pin I/O connector. If an external device has its own DC power source/cable (i.e., if it is powered separately from the radio), both the radio **and** the external device must be properly grounded **before** connecting the two units and before making a positive (+) power connection to either unit. Otherwise, fuse(s) inside the radio may fail (open) and/or other equipment damage could occur.

Connector P2 is the cable's 2-pin connector that provided connections for an optional speaker. Connection is not required if only the radio's internal speaker will be used.

Connector P3, the cable's 6-pin connector, is a connector for basic accessories (e.g., hookswitch, etc.).

Connector P4, the cable's D-subminiature 25-pin connector, provides audio and data connections for optional equipment.

Connector P5, a D-subminiature 9-pin connector, provides NMEA-formatted GPS serial data connections for the external computer processing the NMEA-formatted GPS data received by the radio's internal GPS receiver. See Section 12 on page 50 for additional information. This is serial port A of the radio.

Connector P6 provides a serial data interface used for radio programming. Like P5, this is a D-subminiature 9-pin connector. This is serial port B of the radio.

Table 11-1: Option Cable 14002-0174-08 Interconnections

44-PIN I/O CABLE CONNECTOR P1 PIN	SIGNAL NAME	TO/FROM	DESCRIPTION
19	SPKR1	P2 pin 1	Speaker Audio Outputs 1 and 2 (differential). This output can be used to drive an optional external/remote speaker connected to the radio.
20			
21	SPKR2	P2 pin 2	Enable/Disable this and the radio's internal speaker via Radio Personality Manager (RPM). By default, only the internal speaker is enabled.
22			
10	OUT2	P3 pin 1	Digital Output 2 for auxiliary control. Open-collector, 10 milliamps / 16 volts maximum. External pull-up resistor needed if required by the external device's input during the high/off state. Use P3 pin 2 or 4 for ground. Configure via the "External Output Control Line 2" in RPM's External I/O dialog box. For example, an external logging recorder's record enable/disable input can be controlled by setting "External Output Control Line 2" to "Extern. Tx Indicator."
7	GND	P3 pins 2 & 4	Chassis Ground.
26	HKSW	P3 pin 3	Digital Input for Hookswitch. Active = Ground. Inactive = Open.
25	INP2	P3 pin 5	Digital Input 2. Active = Ground. Inactive = Open. Use P3 pin 2 or 4 for ground. Configure via the "Auxiliary Input 2" in RPM's External I/O dialog Box.
28	SWA+	P3 pin 6	Switched A+ Output. Approximately 12 volts DC.
8	GND	P4 pin 1	Chassis Ground.

Table 11-1: Option Cable 14002-0174-08 Interconnections

44-PIN I/O CABLE CONNECTOR P1 PIN	SIGNAL NAME	TO/FROM	DESCRIPTION
30	DGPS_DATA	P4 pin 4	NMEA-Formatted GPS Receiver Module DGPS Correction Data Serial Data Input. ± 15 -volt RS-232 input level.
4	EXTRX	P4 pin 5	External Rx Audio Input (from external/2 nd receiver; summed; typically not used).
9	(reserved)	P4 pin 7	Pin is not used.
3	(reserved)	P4 pin 8	Pin is not used.
5	FDISC	P4 pin 9	Buffered Filtered Discriminator Audio Output (typically not used). A fixed-level audio output with DC bias. Approximately 200 mV rms into a 600-ohm load at rated deviation. Does <u>not</u> contain signaling (e.g., CTCSS). Mutes when speaker mutes. Use a 33 μ F / 50 V (or greater) AC-coupling capacitor to couple to a 600-ohm load. Use P4 pin 12 for ground.
13	ALO	P4 pin 10	MICHI is a microphone audio input, the same as the front/main mic. 82 mV rms produces SRD. 600-ohm input impedance. Typically not used. ALO is ground/return for MICHI.
12	MICHI	P4 pin 11	
1	SUPGND	P4 pin 12	Low-power audio output for an optional external amplifier and speaker. VOLHI is a single-ended AC-coupled audio signal. Use SUPGND as return/ground for VOLHI. Rated audio signal level is approximately 500 mV rms.
14	VOLHI	P4 pin 13	
15	(reserved)	P4 pin 14	Pin is not used.
16	XTONEENC	P4 pin 15	External Tone Encode Audio Input. Reference input audio level is 220 mV rms. 47k ohm input impedance.
17	XTONEDEC	P4 pin 16	External Tone Decode Audio Output.
6	EXTALO	P4 pin 17	Reference/Ground for external audio (EXTMIC).
24	(reserved)	P4 pin 18	Pin is not used.
23	(reserved)	P4 pin 19	Pin is not used.
18	INP1	P4 pin 21	Digital Input 1. Active = Ground. Inactive = Open. Use P4 pin 1 for ground. Configure via the "Auxiliary Input 1" in RPM's External I/O dialog box.
2	OUT1	P4 pin 22	Digital Output 1 for auxiliary control. Open-collector, 10 milliamps / 16 volts maximum. External pull-up resistor needed if required by the external device's input during the high/off state. Use P4 pin 1 for ground. Configure via the "External Output Control Line 1" in Radio Personality Manager's (RPM's) External I/O dialog Box.
29	(reserved)	P4 pin 23	Pin is not used.
27	EXTMIC	P4 pin 24	External/Auxiliary Mic Audio Input. Reference input audio level is 82 mV rms. 2.2k ohm input impedance. Use P4 pin 17 for ground.
28	SWA+	P4 pin 25	Switched A+ DC Power Output. Typically, this output is not used.

Table 11-1: Option Cable 14002-0174-08 Interconnections

44-PIN I/O CABLE CONNECTOR P1 PIN	SIGNAL NAME	TO/FROM	DESCRIPTION
32	GPS_NMEA_RX	P5 pin 2	NMEA-Formatted GPS Receiver Position Data Serial Data Output. ± 5 -volt minimum RS-232 output level; ± 5.4 -volt typical.
31	GPS_NMEA_TX	P5 pin 3	NMEA-Formatted GPS Receiver Module Initialization Data Serial Data Input. ± 15 -volt RS-232 input level.
7	GND	P5 pin 5	Ground for GPS Serial Data Signals.
33	MIC_NOISE	(none)	Background noise microphone input (MIC_NOISE) and input ground/reference (MIC_NOISE_ALO). As of the publication of this manual, this input/function is not supported. 600-ohm input impedance. MIC_NOISE_ALO is connected to ground.
36	MIC_NOISE_ALO	(none)	
38	TD_B	P6 pin 2	Transmit Data, Receive Data, Clear-To-Send, and Ready-To-Send, and Ground/Reference lines for serial port B. This radio programming port is active when the front panel mic connector's sense pin is not grounded. This port's Clear-To-Send and Ready-To-Send handshake lines are not available at P6.
39	RD_B	P6 pin 3	
42	CTS_B	(none)	
43	RTS_B	(none)	
1	GND	P6 pin 5	
11, 34, 35, 37, 40, 41 and 44	(reserved)	(none)	These pins are not used.

11.2 SERIAL DATA CABLE CA-013671-020

Serial Data Cable CA-013671-020 (20 feet long) can be used to extend data connections from the radio to data communications equipment such as a Mobile Data Terminal (MDT) or a GPS NMEA-format device. The cable's assembly and wiring diagrams are shown in Figure 11-2 below.

The cable's male DB-9 connector (J1) mates to a female DB-9 serial port connector of Option Cable 14002-0174-08, either connector P5 or P6.

The cable's female DB-9 connector (J2) mates to a PC's male DB-9 serial port connector. If the utilized PC is not equipped with a DB-9 serial port connector, the use of a suitable adapter is required, such as USB-to-RS-232 Adapter Cable CN24741-0001. As of the publication of this manual, CN24741-0001 is available via the Customer Care center; refer to Section 4.4 on page 22 for contact information.

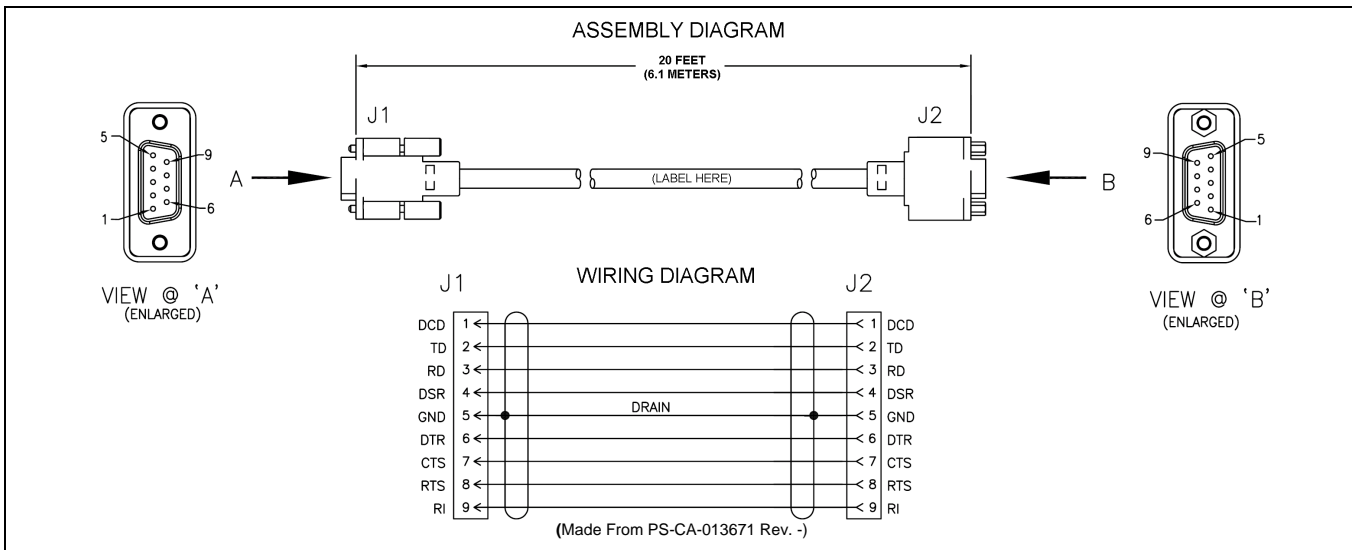


Figure 11-2: Serial Data Cable CA-013671-020

12 GPS NMEA-FORMATTED DATA CONNECTION

To obtain GPS NMEA-formatted serial data from the radio, the radio must be equipped with the GPS receiver option, and Option Cable 14002-0174-08 is required. For radios equipped with a GPS receiver, follow this procedure to complete the GPS NMEA-formatted serial data connections:

1. Obtain Option Cable 14002-0174-08. Each "leg" of this cable is approximately 65 inches long (166 centimeters).
2. Connect the cable's 44-pin D-subminiature (DB-44) male connector to the DB-44 female connector on the rear panel of the radio. Tighten the two jackscrews with a small flathead screwdriver. Do not over-tighten.
3. Connect the cable's DB-9 female connector identified as P5 to the computer's serial port DB-9 male connector—either directly or extended via cable CA-013671-020 (a 20-foot-long cable); see Section 11.2. Tighten the screws firmly, and then route the cabling as required. If the computer is not equipped with a DB-9 serial port connector, the use of a suitable adapter is required, such as USB-to-RS-232 Adapter Cable CN24741-0001.
4. Follow the manufacturer's instructions on processing the NMEA-formatted GPS data from the radio.



If the Option Cable 14002-0174-08 is not available, a 3-wire serial cable can be field-fabricated. On the radio end, this cable must interface to the three GPS-related signals of the radio's 44-pin I/O Cable connector (pins 7, 31, and 32). See Table 11-1 for additional information.

Industry software to process GPS information through this interface is not supported by Harris.

13 MOBILE DATA CONNECTION

If the radio installation must support mobile data communications of a computer running Mobile Data Terminal (MDT) or similar software, follow this procedure to connect the computer to the radio:

1. Obtain cable CA-013671-020 (or equivalent). This is a 20-foot-long standard serial data cable.
2. Connect this cable's male DB-9 connector to the female DB-9 connector on the rear of the radio. Tighten the two (2) jackscrews securely.
3. Route the cable through the vehicle's interior wire/cable channeling to the computer. Remove interior panels, door kick panels, etc., as necessary. Protect the cable from possible chafing and tie-and-stow it as necessary.
4. Connect the cable's female DB-9 connector to the computer. If the computer is not equipped with a DB-9 serial port connector, use a suitable adapter, such as USB-to-RS-232 Adapter Cable CN24741-0001.



Before data communications can occur on a P25 system, the respective data option must be enabled. Contact the Technical Assistance Center (TAC) for additional information. TAC contact information is included on page 22.

14 INITIAL POWER-UP TEST

1. At the radio's main waterproof (HFB-type) fuse holder installed near the vehicle battery, insert the **15-amp** fuse that was included with the radio's DC Power Cable.
2. Tie and stow all fuse holders at this location to prevent excess vibration/movement.
3. Carefully reconnect the vehicle's battery ground cable.
4. If not already, temporarily connect the mobile antenna cable from the vehicle-mounted mobile antenna to the female TNC RF connector on the rear panel of the radio. This is a temporary connection until test procedures in Section 15 are complete.
5. If the radio is equipped with the GPS receiver option, permanently connect the antenna cable from the GPS antenna (or mobile/GPS combo antenna) to the female SMA connector on the rear panel of the radio. The male SMA connector on most GPS antenna cables has a $\frac{5}{16}$ -inch hex collar, so the use of a wrench of this same size is normally required for tightening. However, some may have collars with only knurled surfaces, so a standard wrench or torque wrench cannot be used. In either case, do not over tighten the connector and do not twist the cable when tightening.
6. If the installation is wired so the vehicle's ignition key/switch turns the radio on and off, turn the switch to the Accessory or Run position.
7. If the radio is not already powered up, do so by rotating its on/off/volume control clockwise out of the detent position.
8. Verify the radio has powered-up by observing its display. If the display is not functioning, refer to Section 8.2.1 as necessary.

As long as the software configuration parameters have been loaded, successful installation is almost immediately realized:

- After a short boot-up sequence, the radio displays login information and/or a talk group.
- If no errors are displayed, the installation is most-likely properly wired.
- If an error is displayed, recheck all cable connections, verify all fuses are properly installed, and verify battery power on the load side of the fuses, etc. If problems persist, contact the Technical Assistance Center (see page 22).
- Consult the Operator's Manual for operational information.

Refer to Section 15 for performance test information.

15 PERFORMANCE TESTS

This section includes procedures to verify the performance of the installation's mobile antenna system. There are three (3) procedures in this section:

- Changing Operating Mode for Tests
- Testing by Transmitting into a Dummy Load (a 50-Ohm RF Terminator)
- Testing by Transmitting into the Mobile Antenna



The accuracy of test results depends upon a DC power source in the range of 13.6 volts DC $\pm 10\%$. The current capacity of the power source must be greater than 15 amps. Make sure the vehicle's battery is fully charged by running the engine for a few minutes before the test, and keep the engine running during the test procedures. **Abide by the following WARNING!**



If the vehicle's engine must remain running, the vehicle location should be well ventilated so exhaust fumes from the engine do not cause harm!



If a vehicle equipped with this radio requires jump-starting, the radio installation's main fuse should be removed from the holder prior to jump-starting. Doing so will prevent damage to the radio system.



Prior to installation, the radio's power level should be configured appropriately. The wide range of power levels indicated in the following procedures takes into account such things as: customer's requirements; measurement errors, especially to include uncalibrated equipment; cabling losses; and voltage and temperature variations. By no means should the result from Performance Testing in this section be construed as the exact value of power level output from the radio, as the value is set and more accurately measured in the factory. The values obtained in these test procedures determine a successful installation only.

15.1 REQUIRED TEST EQUIPMENT

Table 15-1: Required Test Equipment

TEST EQUIPMENT	MODEL / PART NUMBER & DESCRIPTION
Average-Responding Wattmeter (for conv. measurements) or	Bird Electronic Corp. Model 43 (or equivalent) with Type N female connectors at input and output ports, and Element 50C or 100C (50 or 100-Watt max. respectively), 100 - 250 MHz frequency range (or equivalent).
Digital Wattmeter	Bird Electronics Corp Model 5000-XT with Wideband Power Sensor 5017, 25 MHz to 1000 MHz Range
RF Coaxial Jumper Cable	Pasternack Enterprises PE3661-36 (or equivalent) 50-Ohm Coaxial Cable with TNC male connector and Type N male connector, approximately three (3) feet in length. The utilized cable must have VSWR below 1.5:1 within the RF passband.
N-to-TNC RF Adapter	Pasternack Enterprises PE9090 (or equivalent) Type N male to TNC female adapter. Required to connect the cable of the vehicle-mounted antenna to the wattmeter.
50-Ohm RF Terminator ("Dummy Load")	Pasternack Enterprises PE6167 (or equivalent) 50-ohm RF terminator rated at 50 watts or greater, with Type N male connector.
Vehicle-Mounted Antenna	Tests are performed with the vehicle-mounted antenna per the installation described in Section 7 of this manual.

15.2 TRANSMITTING INTO A DUMMY LOAD

- Using the Type N male to TNC male RF coaxial jumper cable, connect the radio’s antenna connector to the wattmeter’s input connector. Refer to Figure 15-1 as necessary.
- Connect the 50-ohm dummy load to the wattmeter’s output connector, in place of the antenna cable from the vehicle-mounted antenna.



As previously stated, if conventional mode is not available per radio programming, a peak-reading RF wattmeter is required to measure RF transmit power. Otherwise, the use of an average-responding wattmeter is recommended. See Table 15-1.

- If not already, turn the radio on and set it to the required operating mode (based upon available radio programming and test equipment).
- Set the radio to a test talk group or conventional channel, if available.
- Position the wattmeter’s element to measure forward RF output power. Rotate it if necessary. The arrow on the face of the element must point away from the radio and towards the dummy load for forward power measurements.
- Set the wattmeter to measure average RF power.



It is recommended that a test talk group/channel be allocated for this testing. This same group should be used during the antenna test procedure which is presented in the subsequent section.

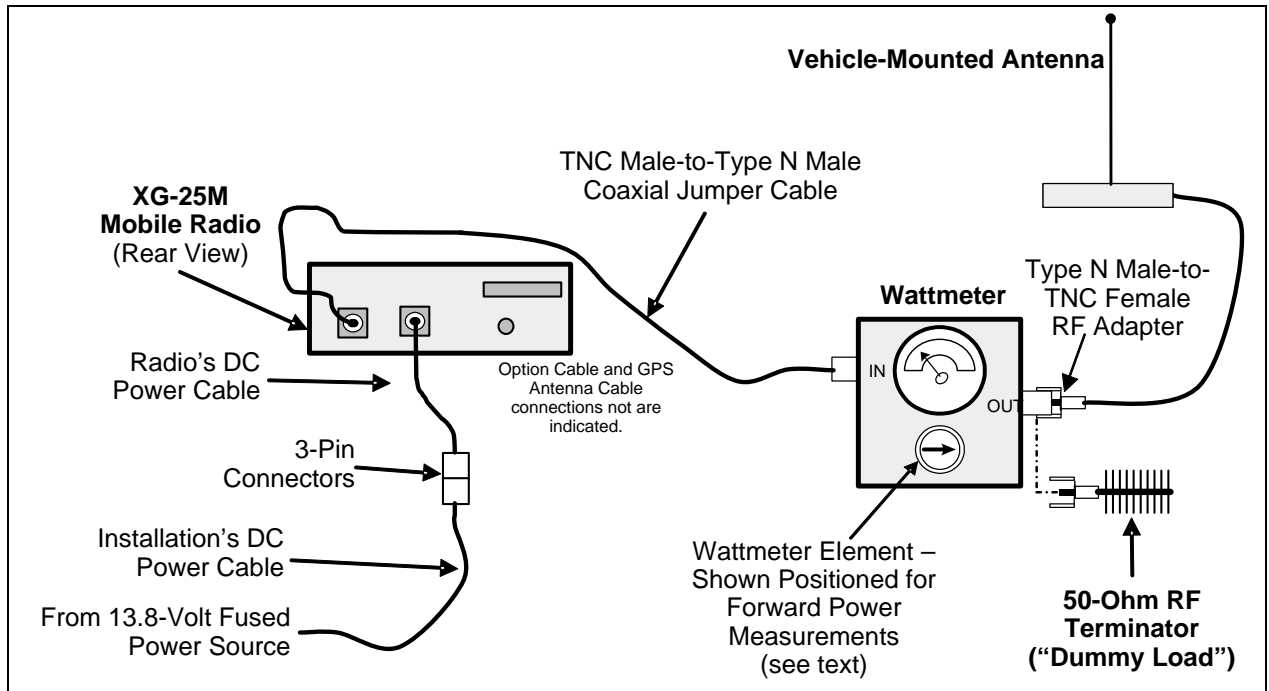


Figure 15-1: Wattmeter Connections for Antenna System Tests

7. Key the radio's transmitter via the microphone's PTT button.
8. Compare the wattmeter's reading with the target RF output power range of between **39.8 and 63 watts** (50 watts \pm 1 dB). This transmit output power range assumes the radio is currently configured at the maximum transmit power level.



NOTE

Transmit only for as long as needed to take the measurement, then immediately disable the transmission.

9. **If the wattmeter reading is within the range**, record the measured value in the appropriate space on the data collection form near the end of this manual.

If the wattmeter reading is outside the range, verify the radio's power supply voltage (i.e., battery voltage) is within the specified range, recheck all connections, and measure the RF output power again. If this fails to produce a reading within the range, replace it and repeat this procedure. If problems persist, contact the Technical Assistance Center (see page 22).

15.3 TRANSMITTING INTO THE MOBILE ANTENNA

1. Connect the antenna cable from the vehicle-mounted antenna to the wattmeter as shown in Figure 15-1.
2. If not already, turn the radio on and set it to the required operating mode (based upon available radio programming and test equipment).
3. Set the radio to a test talk group or conventional channel, if available.



It is recommended that a test talk group/channel be allocated for this testing. Otherwise, interference with other radio users in the system may occur. **Also, during transmissions, always observe the RF exposure-related safety information presented in Section 1.2 (begins on page 6).**

4. Position the wattmeter's element to measure forward RF output power. Rotate it if necessary. The arrow on the face of the element must point away from the radio and towards the antenna for forward power measurements.
5. Set the wattmeter to measure average RF power.
6. Key the radio's transmitter via the microphone's PTT button.
7. Compare the wattmeter's reading with the target RF output power range of between **39.8 and 63 watts** (50 watts \pm 1 dB). This transmit output power range assumes the radio is currently configured at the maximum transmit power level.



Transmit only for as long as needed to take the measurement, then immediately disable the transmission.

8. **If the wattmeter reading is within the range**, record the value in the appropriate space on the data collection form near the end of this manual.

If the wattmeter reading is outside the range, verify the radio's power supply voltage (i.e., battery voltage) is within the specified range, recheck all connections, and measure the forward power again. If the installation employs a 1/4-wave unity-gain antenna, observe the following NOTE. If these checks/corrections fail to produce a reading within the range, check all cabling and connections and repeat the testing procedure to this point. In the event the wattmeter reading still falls outside the range, replace the antenna, make sure all connections are seated firmly, and repeat the testing procedure. If problems persist, contact the Technical Assistance Center (see page 22).



If the mobile radio installation employs a 1/4-wave unity-gain antenna (part number AN-225006-001), the driven element (i.e., whip) of the antenna must be trimmed to the proper length in order to minimize antenna system VSWR. Refer to the instructions included with the antenna for trimming instructions.

9. Position the wattmeter's element to measure reverse (reflected) RF power from the antenna. The arrow on the face of the element must point away from the antenna and to the radio to measure reverse power.
10. Key the radio's transmitter via the microphone's PTT button.
11. Compare the wattmeter reading with the RF power output range of **2 watts or less**.



Transmit only for as long as needed to take the measurement, then immediately disable the transmission.

12. **If the wattmeter reading is within the range**, record the value in the appropriate space on the data collection form near the end of this manual.

If the wattmeter reading is outside the range, make sure the antenna is consistent with the specified frequency range of the radio. Recheck all antenna connections, and measure the reverse power again. If the installation employs a ¼-wave unity-gain antenna, observe the **NOTE** that immediately follows step 8. If these checks/corrections fail to produce a reading within the range, replace the antenna and repeat the entire antenna test procedure. Any value exceeding the maximum allowable reflected power value will result in a diminished RF output signal. If problems persist, contact the Technical Assistance Center (see page 22).

13. Disconnect the coaxial cable jumper and wattmeter.
14. Permanently connect the cable from the vehicle-mounted antenna to the radio's antenna cable by mating the two TNC connectors together. Use two pairs of soft-jaw pliers to gently tighten this connection. Do not over tighten and do not twist either cable.
15. Make several test calls on the radio system to verify operation of the mobile radio. Before making the calls, select other talk groups or conventional channels, as required to verify operation.

**NOTE**

To prevent RF leakage and ensure peak performance, make sure the RF connectors are tight, but do not over-tighten so connector damage will not occur.

**WARNING**

Improper installation of the RF cables may lead not only to poor radio performance but also to harmful exposure to RF electromagnetic energy.

Testing is complete. The radio is now ready for normal communications.

15.4 TEST PERFORMANCE DATA FORM

Clip Here

Enter the information requested on this data collection form. Clip this form and file it as a permanent record of the tested performance of the XG-25M mobile radio installation.

Mobile Radio Serial Number

Antenna Make and Model Numbers

Date of Test
(mm/dd/yyyy)

Company Performing Installation

Technician Performing Test



Watts
Power into a Dummy Load

Watts
Forward Power with Antenna

Watts
Reflected Power with Antenna

16 COMPLETE THE INSTALLATION

Double-check the following items before considering the installation completed:

- Verify all newly installed mechanical hardware is mounted securely and all respective mounting hardware is tight.
- Verify all electrical interconnections are connected properly and the associated connector attachment hardware is tight. Pay special attention to all RF antenna cables!
- Verify all related fuses are correctly installed and properly rated.
- Verify all electrical cables and wiring are tied, stowed, and protected so they are out of the way of casual contact, away from sources of extreme heat, and wire chafing cannot occur. Pay special attention to all RF antenna cables!
- To prevent fumes from entering the vehicle's passenger compartment, seal the hole/grommet/wire combination at the firewall with a silicon-based sealer.
- Verify all vehicle components are properly reinstalled such as kick panels, headliners, and seats.
- If the installation includes a separately-mounted on/off power switch for manually turning the radio (and possibly other systems) on and off, verify it is labelled accordingly. For example: **"Radio ON/OFF."**
- Remove all tools and unused hardware from the vehicle.
- Verify the test performance data has been recorded on the data collection form shown in this manual.

17 WARRANTY REGISTRATION

Please register this product within ten (10) days of purchase. Registration validates the warranty coverage, and enables Harris to contact you in case of any safety notifications issued for this product.

Registration can be made on-line at <http://www.pspc.harris.com/Service/WarrantySupport.asp>.

18 WARRANTY

- A. Harris Corporation, a Delaware Corporation, through its RF Communications Division (hereinafter "Seller") warrants to the original purchaser for use (hereinafter "Buyer") that Equipment manufactured by or for the Seller shall be free from defects in material and workmanship, and shall conform to its published specifications. With respect to all non-Seller Equipment, Seller gives no warranty, and only the warranty, if any, given by the manufacturer shall apply. Rechargeable batteries are excluded from this warranty but are warranted under a separate Rechargeable Battery Warranty (ECR-7048).
- B. Seller's obligations set forth in Paragraph C below shall apply only to failures to meet the above warranties occurring within the following periods of time from date of sale to the Buyer and are conditioned on Buyer's giving written notice to Seller within thirty (30) days of such occurrence:
1. for fuses and non-rechargeable batteries, operable on arrival only.
 2. for parts and accessories (except as noted in B.1 and B.5), ninety (90) days.
 3. for XG-25P, XG-75, P7300, P7200, P7100^{IP}, P5500, P5400, P5300, P5200, P5100, P3300, M7300, M7200 (including V-TAC), M7100^{IP}, M5300, M3300 and SG5300 radios, two (2) years, effective 10/01/2007.
 4. for Unity[®] XG-100P and XG-100M, three (3) years.
 5. for Six-Bay battery Chargers (12082-0314-xx and CH-104570-xxx), one (1) year.
 6. for all other equipment of Seller's manufacture, one (1) year.
- C. If any Equipment fails to meet the foregoing warranties, Seller shall correct the failure at its option (i) by repairing any defective or damaged part or parts thereof, (ii) by making available at Seller's factory any necessary repaired or replacement parts, or (iii) by replacing the failed Equipment with equivalent new or refurbished Equipment. Any repaired or replacement part furnished hereunder shall be warranted for the remainder of the warranty period of the Equipment in which it is installed. Where such failure cannot be corrected by Seller's reasonable efforts, the parties will negotiate an equitable adjustment in price. Labor to perform warranty service will be provided at no charge during the warranty period only for the Equipment covered under Paragraph B.3, B.4 and B.5. To be eligible for no-charge labor, service must be performed at Seller's factory, by an Authorized Service Center (ASC) or other Servicer approved for these purposes either at its place of business during normal business hours, for mobile or personal equipment, or at the Buyer's location, for fixed location equipment. Service on fixed location equipment more than thirty (30) miles (48 km) from the Service Center or other approved Servicer's place of business will include a charge for transportation.
- D. Seller's obligations under Paragraph C shall not apply to any Equipment, or part thereof, which (i) has been modified or otherwise altered other than pursuant to Seller's written instructions or written approval or, (ii) is normally consumed in operation or, (iii) has a normal life inherently shorter than the warranty periods specified in Paragraph B, or (iv) is not properly stored, installed, used, maintained or repaired, or, (v) has been subjected to any other kind of misuse or detrimental exposure, or has been involved in an accident.
- E. The preceding paragraphs set forth the exclusive remedies for claims based upon defects in or nonconformity of the Equipment, whether the claim is in contract, warranty, tort (including negligence), strict liability or otherwise, and however instituted. Upon the expiration of the warranty period, all such liability shall terminate. The foregoing warranties are exclusive and in lieu of all other warranties, whether oral, written, expressed, implied or statutory. **NO IMPLIED OR STATUTORY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY. IN NO EVENT SHALL THE SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, INDIRECT OR EXEMPLARY DAMAGES.**

This warranty applies only within the United States.

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