

Installation Manual

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September 2018

PRELIMINARY



XL Series Mobile Radios

Front and Remote Mount Installations



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MANUAL REVISION HISTORY

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-	Aug/18	Initial release.

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or
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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 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 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>

1.3 FEDERAL COMMUNICATIONS COMMISSION REGULATIONS

Before it was marketed in the United States, the XL 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 using a label directing users to specific user awareness information. The radio has an RF exposure product label. Also, this *Product Safety Manual* and the applicable *Operator's Manual* include information and operating instructions required to control RF exposure and to satisfy compliance requirements.

1.4 COMPLIANCE WITH RF EXPOSURE STANDARDS

The XL Mobile two-way mobile radio is designed and tested to comply with multiple 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.



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.

The XL Mobile 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 5, 2015: Spectrum Management and Telecommunications Radio Standards Specification. Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands).

Based on the highest radiated RF power and the highest antenna gain in antennas to be used with XL Mobile, the distances listed are considered as safe distances for controlled and uncontrolled environments with the XL Mobile radio transmitting at a maximum 50% duty cycle.

1.4.1 Mobile Antennas

The antenna(s) for the radio must be installed in accordance with the antenna installation procedures presented in the radio's *Installation Manual*. Refer to the Section 5.2 on page 23 for the respective publication number. Installation guidelines presented in the *Installation Manuals* 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. Refer to Section 4 for the list of approved antennas.

Table 1-1: Recommended Minimum Safe Lateral Distance from a Transmitting Antenna Connected to an XL Mobile Radio

TRANSMIT FREQUENCY	RECOMMENDED MINIMUM LATERAL HUMAN BODY DISTANCE FROM TRANSMITTING ANTENNA			
	U.S.		CANADA	
	CONTROLLED ENVIRONMENT	UNCONTROLLED ENVIRONMENT	CONTROLLED ENVIRONMENT	UNCONTROLLED ENVIRONMENT
763 – 806 MHz	17 in (43 cm)	37 in (94 cm)	20 in (50 cm)	54 in (137 cm)
806 – 944 MHz	17 in (44 cm)	39 in (99 cm)	20 in (50 cm)	57 in (145 cm)

1.4.2 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 the *Products and Services Catalog*.

1.4.3 Contact Information

For additional information on RF exposure and other information, contact Harris using one of the contact links listed in Section 14 on page 95.

1.5 REGULATORY APPROVALS

1.5.1 Applicable Type Acceptance/Certification Numbers

FCC Type Acceptance:

XL-185M:	OWDTR-0160-E
Applicable FCC Rules:	Part 2, Part 15B, Part 15.247, Part 15.407, Part 24, Part 90 and Part 101

Industry Canada Certification:

XL-185M:	3636B-0160
Applicable Industry Canada Rules:	RSS-247, RSS-119, ICES-003 Issue 6

1.5.2 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.

1.5.3 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.

1.6 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.
- Only use 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.

1.7 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 the following:

- **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 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 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.

1.8 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.

1.9 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 XL 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 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 operation for the proper procedure.
- No changes or adjustments shall be made to the equipment except by an authorized or certified electronics technician.

**CAUTION**

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.

1.10 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.

**NOTE**

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 RENSEIGNEMENTS SUR LA RÉGLEMENTATION ET SÉCURITÉ

2.1 CONVENTIONS SUR LES SYMBOLES DE SÉCURITÉ

Les conventions suivantes sont utilisées dans le présent manuel pour avertir l'utilisateur des précautions générales de sécurité qui doivent être observées pendant toutes les phases d'opération, d'entretien et de réparation de ce produit. Le non-respect de ces précautions ou d'avertissements précisés ailleurs enfreint les normes de sécurité de la conception, de la fabrication et de l'utilisation prévue du produit. Harris n'assume aucune responsabilité pour le non-respect de ces normes par le client.



Le symbole **MISE EN GARDE** attire l'attention sur une procédure ou une pratique qui, si elle n'est pas correctement effectuée ou observée, pourrait entraîner une blessure personnelle. Ne pas poursuivre au-delà d'un symbole de MISE EN GARDE avant que les conditions identifiées soient complètement comprises ou satisfaites.



Le symbole **AVERTISSEMENT** attire l'attention sur une procédure ou une pratique opérationnelle qui, si elle n'est pas correctement effectuée ou observée, pourrait entraîner un bris d'équipement ou une importante baisse de rendement de l'équipement.



Le symbole **REMARQUE** attire l'attention sur des renseignements supplémentaires qui peuvent améliorer le rendement du système ou clarifier un processus ou une procédure.

2.2 RENSEIGNEMENTS SUR UNE EXPOSITION À L'ÉNERGIE DES RF

2.2.1 Renseignements Sur Le Contrôle Et La Sensibilisation À L'énergie Des RF Pour Les Exigences D'une Utilisation Professionnelle De La FCC

Avant d'utiliser les radios mobiles bidirectionnelles, passez en revue les renseignements et les instructions opérationnelles importants suivants sur le contrôle et la sensibilisation à l'énergie des RF. Se conformer à ces renseignements et instructions pour assurer la conformité aux directives d'exposition aux RF.



Cette radio est destinée à être utilisée dans des conditions professionnelles/contrôlées, où les utilisateurs ont une pleine connaissance de leur exposition et peuvent exercer un contrôle sur leur exposition pour rester sous les limites d'exposition aux RF. Cette radio N'est PAS autorisée pour la population générale, les consommateurs ou toute autre utilisation.



Des changements ou modifications non expressément approuvés par Harris pourraient annuler le droit d'utilisation de l'équipement pour l'utilisateur.

Cette radio bidirectionnelle utilise une énergie électromagnétique dans le spectre des radiofréquences (RF) pour permettre une communication à distance entre deux utilisateurs ou plus. Elle utilise l'énergie des RF ou les ondes radio pour envoyer et recevoir des appels. L'énergie des RF est une forme d'énergie électromagnétique. D'autres formes comprennent, entre autres, l'énergie électrique, la lumière du soleil et les rayons X. Toutefois, l'énergie des RF ne doit pas être confondue avec ces autres formes d'énergie électromagnétique qui, lorsque mal utilisées, peuvent causer des dommages biologiques. Par exemple, des niveaux très élevés de rayons X peuvent endommager les tissus et le matériel génétique.

Des experts en science, en ingénierie, en médecine, en santé et de l'industrie travaillent avec des organismes pour établir des normes pour l'exposition à l'énergie des RF. Ces normes procurent des niveaux recommandés d'exposition aux RF autant aux travailleurs qu'au grand public. Ces niveaux d'exposition aux RF recommandés comprennent d'importantes marges de protection. Toutes les radios bidirectionnelles commercialisées en Amérique du Nord sont conçues, fabriquées et testées pour s'assurer qu'elles satisfont les niveaux d'exposition aux RF établis par le gouvernement. Les fabricants recommandent également des consignes d'utilisation particulières aux utilisateurs de radios bidirectionnelles. Ces instructions sont importantes, car elles informent les utilisateurs sur l'exposition à l'énergie des RF et donnent des procédures simples sur la manière de contrôler cette exposition. Consultez les sites Web suivants (en anglais) pour de plus amples renseignements sur ce qu'est l'exposition à l'énergie des RF et comment contrôler l'exposition pour assurer la conformité aux limites d'exposition établies :

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

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

2.2.2 Règlements de la Federal Communications Commission (« Commission fédérale des communications » aux États-Unis)

Avant d'être mise sur le marché aux États-Unis, la radio mobile bidirectionnelle XL a été testée pour s'assurer de sa conformité aux limites d'exposition à l'énergie des RF de la FCC pour les radios mobiles bidirectionnelles. Lorsque les radios bidirectionnelles sont utilisées à la suite d'une embauche, la FCC demande aux utilisateurs de bien connaître et de pouvoir contrôler leur exposition pour satisfaire les exigences professionnelles. La sensibilisation à l'exposition peut être facilitée par l'utilisation d'une étiquette qui dirige les utilisateurs vers des renseignements particuliers sur la sensibilisation de l'utilisateur. La radio possède une étiquette de produit sur l'exposition aux RF. De plus, le *Manuel sur la sécurité du produit* et le présent *Manuel de l'opérateur* comprennent des renseignements et les consignes d'utilisation nécessaires pour contrôler l'exposition aux RF et pour satisfaire les exigences de conformité.

2.3 CONFORMITÉ AUX NORMES D'EXPOSITION AUX RF

La radio mobile bidirectionnelle XL est conçue et testée pour être conforme à un certain nombre de normes et directives nationales et internationales quant à l'exposition humaine à l'énergie électromagnétique des RF. Cette radio est conforme aux limites d'exposition de l'IEEE et de la Commission internationale de protection contre les rayonnements non ionisants pour un environnement professionnel/contrôlé d'exposition aux RF à des périodes de cycle de service allant jusqu'à 50 % (50 % de transmission, 50 % de réception) et elle est autorisée par la FCC pour une utilisation professionnelle. Sur le plan de la mesure de l'énergie des RF pour la conformité aux directives d'exposition de la FCC, l'antenne de la radio irradie une énergie des RF mesurable seulement lorsqu'elle transmet (parler), et non lorsqu'elle reçoit (écouter) ou en mode d'attente.



Tableau 2-1 indiquent les distances latérales sécuritaires minimales recommandées pour un environnement contrôlé et pour les spectateurs ignorants dans un environnement non contrôlé, d'antennes de transmission (c.-à-d., des monopôles sur un plan de sol, ou des dipôles) à une puissance de radio évaluée pour les radios mobiles installées dans un véhicule. Ils ne transmettent que lorsque les spectateurs ignorants sont au moins à la distance latérale sécuritaire minimale recommandée non contrôlée de l'antenne de transmission.

La radio mobile bidirectionnelle XL est conforme aux normes et directives d'exposition à l'énergie des RF suivantes :

- Federal Communications Commission (FCC) américaine, le Code of Federal Regulations; 47 CFR § 2 sous-partie 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, numéro 5, 2015: Spectrum Management and Telecommunications Radio Standards Specification. Radiofrequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands).

Basées sur la puissance des RF irradiées la plus élevée et le gain d'antenne le plus élevé dans les antennes à utiliser avec le XL, les distances indiquées dans les Tableau 2-1 sont considérées comme des distances sécuritaires pour des environnements contrôlés et non contrôlés avec la radio mobile XL qui transmet à un cycle de service maximal de 50%.

Tableau 2-1: Distance latérale sécuritaire minimale recommandée d'une antenne de transmission branchée sur une radio mobile XL

FRÉQUENCE DE TRANSMISSION	DISTANCE MINIMALE RECOMMANDÉE DE L'ANTENNE DE TRANSMISSION POUR LE CORPS HUMAIN			
	U.S.		CANADA	
	ENVIRONNEMENT CONTRÔLÉ	ENVIRONNEMENT NON CONTRÔLÉ	ENVIRONNEMENT CONTRÔLÉ	ENVIRONNEMENT NON CONTRÔLÉ
763 – 806 MHz	17 po (43 cm)	37 po (94 cm)	20 po (50 cm)	54 po (137 cm)
806 – 944 MHz	17 po (44 cm)	39 po (99 cm)	20 po (50 cm)	57 po (145 cm)

2.3.1 Antennes Mobiles

Les antennes pour la radio doivent être installées conformément aux procédures présentées dans le *Manuel sur la sécurité du produit* et dans le *Manuel d'installation*. L'installation est limitée à un ou des véhicules motorisés en métal avec des plans au sol appropriés.

Utilisez uniquement les antennes approuvées/fournies ou une antenne de remplacement approuvée (voir la Section 4). Des antennes, des modifications ou des accessoires non autorisés peuvent causer un dépassement des limites d'exposition aux RF de la FCC.

2.3.2 Accessoires Approuvés

La radio a été testée et satisfait les directives de RF de la FCC lorsqu'elle est utilisée avec les accessoires fournis ou conçus pour être utilisés avec elle. L'utilisation d'autres accessoires peut ne pas garantir la conformité aux directives d'exposition de la FCC et peut enfreindre la réglementation de la FCC. Pour une liste d'accessoires approuvés, consultez le *Manuel d'installation* ou le *Catalogue de produits et services* de Harris.



Utilisez toujours des accessoires autorisés Harris (antennes, haut-parleurs/micros, etc.). L'utilisation d'accessoires non autorisés peut entraîner un dépassement des exigences de conformité pour une exposition aux RF professionnelle ou contrôlée de la FCC.

2.3.3 Coordonnées

Pour de plus amples renseignements sur l'exposition aux RF ou d'autres renseignements, contactez Harris en utilisant l'un des liens apparaissant à la Section 14.

2.4 INTERFÉRENCE DES RADIOFRÉQUENCES

2.4.1 Partie 15 de la FCC

Cet appareil est conforme à la Partie 15 de la réglementation de la FCC. Le fonctionnement est soumis aux deux conditions suivantes :

1. Cet appareil ne doit pas causer une interférence nuisible; et
2. Cet appareil doit accepter toute interférence reçue, y compris une interférence qui peut causer un fonctionnement non souhaité.

2.4.2 Industrie Canada

Cet appareil est conforme aux normes RSS exemptées de licence d'Industrie Canada. Le fonctionnement est soumis aux deux conditions suivantes : (1) cet appareil ne doit pas causer d'interférence et (2) cet appareil doit accepter toute interférence, y compris une interférence qui peut causer un fonctionnement non souhaité de l'appareil.

2.5 RENSEIGNEMENTS SUR LA FORMATION SUR LA SANTÉ ET LA SÉCURITÉ AU TRAVAIL

S'assurer que l'exposition physique à l'énergie électromagnétique des RF se situe dans les limites acceptables de la FCC pour l'utilisation professionnelle. Toujours se conformer aux directives de base suivantes :

- Le bouton de microphone doit être abaissé seulement lorsque l'on souhaite envoyer un message vocal.
- La radio doit être utilisée seulement pour les communications nécessaires liées au travail.
- La radio doit être utilisée seulement par du personnel autorisé et formé. Elle ne doit jamais être utilisée par des enfants.
- Ne tentez pas d'apporter une modification non autorisée à la radio. Des changements ou des modifications à la radio peuvent causer une interférence nocive ou entraîner un dépassement des limites d'exposition aux RF de la FCC. Seul le personnel qualifié doit utiliser la radio.

- Utilisez toujours seulement des accessoires autorisés (antennes, haut-parleurs/micros, etc.). L'utilisation d'accessoires non autorisés peut entraîner un dépassement des exigences de conformité pour une exposition aux RF de la FCC.

Les renseignements donnés ci-dessus donnent à l'utilisateur les renseignements nécessaires pour le sensibiliser à l'exposition aux RF et sur ce qu'il faut faire pour s'assurer que cette radio fonctionne dans les limites d'exposition de la FCC de cette radio.

3 SPECIFICATIONS¹

3.1 GENERAL

Dimensions: Height x Width x Depth (See footnote ²):

Front-Mount Radio with XL-CH: 2.4 x 6.9 x 12.8 in (60 x 175 x 325 mm)

Remote-Mount Radio: 2.0 x 6.9 x 9.7 in (50 x 175 x 247 mm)

Weight (See footnote ³):

Front-Mount Radio with XL-CH: 9.0 lbs. (4.08 kg)

Remote-Mount Radio: 7.5 lbs. (3.4 kg)

Operating Ambient Temperature Range:



CAUTION

The Vehicle Communications Hub (VCH) runs at elevated temperatures that can be up to 45°F above ambient.

Operating: -22°F to 140°F (-30°C to +60°C)

In Transit: -40°F to 176°F (-40°C to +80°C)

DC Supply Voltage Operating Ranges:

For Full Performance: 13.6 V

Overall Operating Range: 10.8 to 16.6 V

DC Supply Current Requirements:

Receive (includes Control Head)

With 15-Watt Speaker Output Power: 2 A

Transmit (includes Control Head):

At 35 Watts RF: 10 A

Quiescent/Off Currents

Mobile Radio Only: 280 mA

XL-CH Control Head Only: 175 mA

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

² Dimensions do not include space required for mounting brackets, cables, clearance/access, etc.

³ Weights do not include respective mounting brackets, cables, etc.

3.2 TRANSCEIVER

Frequency Ranges

700 MHz Band (INT):	763 to 776 MHz, 793 to 806 MHz
700 MHz Band (NA):	769 to 775 MHz, 799 to 805 MHz
800 MHz Band (INT):	806 to 825 MHz, 851 to 870 MHz
800 MHz Band (NA):	806 to 816 MHz, 851 to 861 MHz
900 MHz Band (INT):	896 to 902 MHz, 935 to 944 MHz
900 MHz Band (NA):	896 to 901 MHz, 935 to 944 MHz

3.2.1 Transmitter

Power Ranges:

700 MHz Band:	30 W
800 MHz Band:	35 W
900 MHz Band:	35 W

3.2.2 Receiver

Sensitivity at 12 dB SINAD:	-119 dBm (all bands)
Sensitivity at 5% BER (P25 Sensitivity):	-119 dBm (all bands)

3.2.3 Audio

Microphone Input Sensitivity:	dBspl provides 60% SRD (typical), which is equivalent to 82mV
Microphone Connector:	USB-C for the USB microphone; DB9 for analog microphone using accessory cable.
Microphone Types Available:	USB-C and Desk Microphone
External Speaker Connection	Standard XL-200M Speaker

3.3 ENVIRONMENTAL

The XL Mobile radio and the Control Head meet the following environmental specifications:

Table 3-1: XL Mobile Radio Environmental Specifications

DESCRIPTION	APPLICABLE STANDARD	METHOD OR SECTION	PROCEDURE
Low Pressure	MIL-STD-810G	500.5	I & II
High Temperature +60°C Operating +80°C Storage	MIL-STD-810G	501.5	I & II
Low Temperature -30°C Operating -57°C Storage	MIL-STD-810G	502.5	I & II

DESCRIPTION	APPLICABLE STANDARD	METHOD OR SECTION	PROCEDURE
Temperature Shock -30°C to +60°C	MIL-STD-810G	503.5	I-B
Solar Radiation (240 Hours)	MIL-STD-810G	505.5	II
Blowing Rain (CH & VCH) IP-65 (CH) IP-54 (VCH)	MIL-STD-810G	506.5	I
Humidity	MIL-STD-810G	507.5	II
Salt Fog	MIL-STD-810G	509.5	I
Blowing Dust	MIL-STD-810G	510.5	I
Basic Transportation Vibration	MIL-STD-810G	514.6	I, CAT 4
Min Integrity Vibration	MIL-STD-810G	514.6	I, CAT 24
Functional/Basic Shock	MIL-STD-810G	516.6	I
Transit Drop	MIL-STD-810G	516.6	IV
Vibration Stability	U.S.F.S.	Par. 2.15	N/A
IP-65 (CH) Dust Tight Water Jets	IEC 60529	Table 2, Par. 13.4 Table 3, Par. 14.2.5	N/A

4 OPTIONS AND ACCESSORIES

Only use Harris approved accessories. Refer to Harris' Product and Services catalog for the complete list of options and accessories available.



CAUTION

Always use the correct options and accessories for the radio.

PART NUMBER	DESCRIPTION
XM-AN7G	USB Mobile Mic
XMAN6H	Remote Speaker
AN-125001-002	Analog Deskmic
AN-125001-004	CH mounting kit
AN-125001-006	VCH mounting kit
12099-0300-01	Antenna, Flex, Heavy-Duty, 136-870 MHz
12099-0310-01	Antenna, Element, Multiband, 136-870 MHz, 0 dB
AN-125001-002	Antenna, Base, Standard Roof Mount Low Loss
AN-125001-004	Antenna, Base, Thick Roof Mount Low Loss
AN-125001-006	Antenna, Base, Standard Roof Mount Low Loss GPS
AN-125001-008	Antenna, Base, Magnetic Mount Low Loss
12099-0370-01	Mount, NMO Antenna, Magnetic, Heavy-Duty
AN-225001-001	Antenna, Element, 700/800 3dB
AN-225005-001	Antenna, Element, 900, 3 dB
AN-025187-001	Antenna, GPS, Roof Mount
AN-025187-003	Antenna, GPS, Magnet Mount
AN-125001-006	Antenna, Base, Standard Roof Mount Low Loss GPS
12099-0380-01	Antenna 3 dB 700/800/900 MHz, 12099-0380-01
14002-0174-50	Squid cable (HD44)
14050-6300-01	Ethernet Cable, overmold, 45 cm
14050-6300-02	Ethernet Cable, overmold, 9 m
CA-012616-001	DC power cables (CH)
CA-012365-001	DC power cables (VCH)

5 INTRODUCTION

This manual contains procedures for installing the XL Mobile radio, the Control Head, and related equipment. Procedures cover the mounting and cabling of the equipment in front-mount or remote-mount configurations and basic in-vehicle performance testing.

5.1 GENERAL DESCRIPTION

The XL Series mobile radio provides the advanced connectivity that first responders require, while addressing evolving voice and data communications. It meets MIL-STD-810G for durability. XL Mobile radios support P25 Trunking, P25 Conventional, Enhanced Digital Access Communications System (EDACS), analog conventional, and BeOn® operation over a Wi-Fi® or LTE network.

The XL Mobile is a P25 converged, *multiband* Land Mobile Radio with an option to include LTE (optional). Designed for anyone who needs to communicate with multiple agencies or across multiple bands, the XL Mobile delivers mission-critical connectivity.

The XL Mobile radio and related equipment are designed to typically operate in a motor vehicle. The radio must be connected to an external vehicle-mounted transmit/receive antenna system approved for use with the radio. Several different types of antenna mounts and a multiband antenna element are approved and available for use with the radio. The antenna elements and mounts are listed in Table 1-1.

The XL Mobile installation includes a Control Head and the Vehicular Communications Hub (VCH), which are described in the following sections.

5.1.1 Vehicular Communications Hub (VCH)

The XL Vehicular Communications Hub (VCH) is the main radio unit in a vehicular (mobile) radio system. A major feature of the VCH design is the use of IP networks for tethering multiple radio Control Heads.



Figure 5-1: Vehicle Communications Hub (VCH)

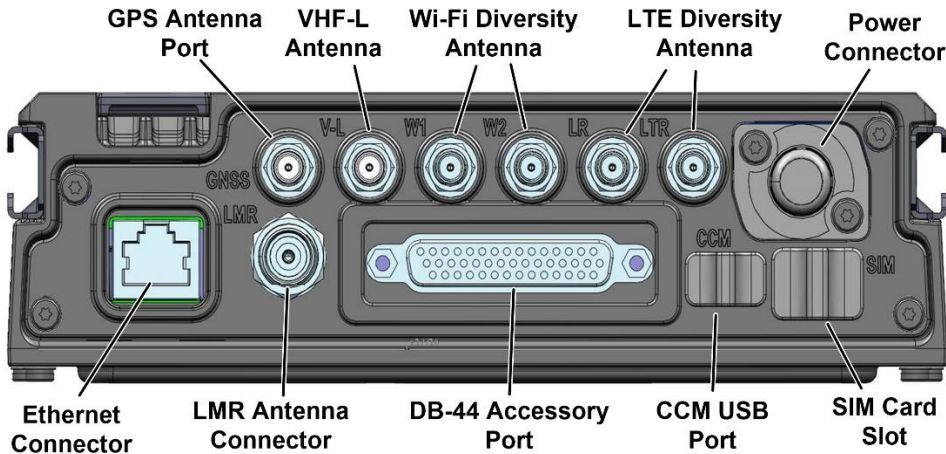


Figure 5-2: VCH Rear View

5.1.2 XL-CH Control Head

The XL Mobile supports the addition of an XL-CH Control Head to the VCH in a front-mount or remote-mount configuration. In the front-mount configuration, the VCH and Control Head are physically mounted together, while in the remote-mount configuration, the Control Head is in a separate location.

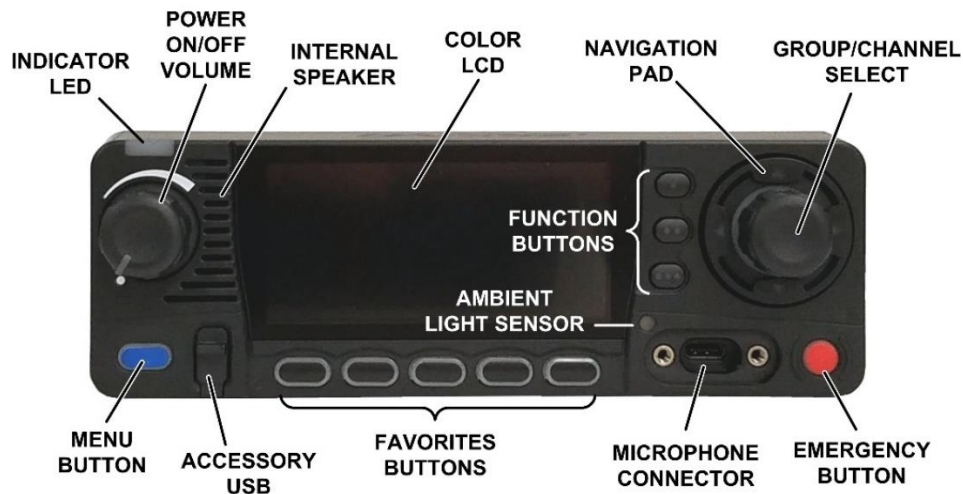


Figure 5-3: XL-CH Control Head – Front

The XL-CH's mission-critical design provides a tactile interface optimized for blind operation. The controls and display are laid out to give instant access to primary use cases.

Standard Control Head Features include:

- Wi-Fi (802.11B, G, N)
- Bluetooth 4.0
- Built-in Speaker
- Hi-visibility Color Display

5.2 RELATED PUBLICATIONS

The following publications contain additional information about the XL Mobile radio and Control Head:

MANUAL NUMBER	DESCRIPTION
14221-1850-2010	XL Mobile Product Safety Manual
14221-1850-1000	XL Mobile Quick Guide
14221-1850-2000	XL Mobile Operator Manual
14221-1850-5000	XL Mobile Maintenance Manual
14221-1800-8000	XLP Software Release Notes
MM1000019423	Key Manager and Key Admin Overview and Operation Manual
MM1000019424	Key Manager and Key Loader Overview and Operation Manual
14221-7200-6110	Voice Annunciation Feature Manual
14221-2100-3000	Advanced Access Control/Radio Personality Manager Overview Manual
14221-1100-8170	Radio Personality Manager 2 (RPM2) Software Release Notes
14221-1100-2060	RPM2 User's Manual
14221-7200-6130	BeOn Configuration and Use Feature Manual
14221-7200-6140	Noise Cancellation Feature Manual
14221-1800-4000	Nano SIM Card Install/Replacement Accessory Kit Installation Manual

The XL Mobile Operator's Manual and the Quick Guide are available online at <https://www.harris.com/solution-grouping/p25-and-public-safety-two-way-radios>. All XL Mobile radio publications can be obtained from the Tech-Link's Technical Manual Library via an Information Center login <https://premier.pspc.harris.com/infocenter/> (i.e., a user name and password are required).


CAUTION

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.

6 INSTALLATION PROCESS

6.1 GENERAL INFORMATION

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

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



NOTE

Before starting the installation, it is imperative to discuss with the customer the exact location in the vehicle where equipment is going to be installed. This will prevent hours of rework and reinstallation and will build customer satisfaction.

Figure 6-1 shows the high-level process for performing mobile radio installations.

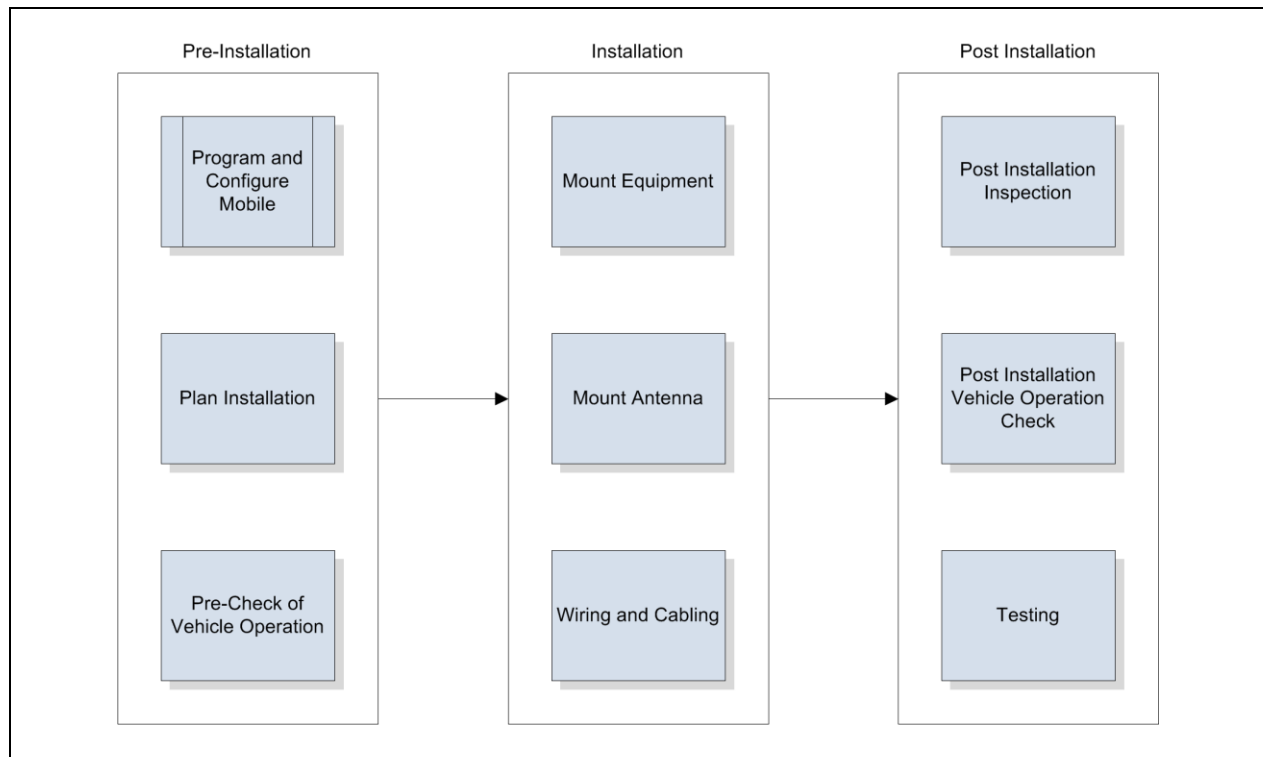


Figure 6-1: High-Level Installation Process

6.2 PRE-INSTALLATION VEHICLE CHECK

Performing a vehicle pre-installation equipment check provides a vehicle operation baseline prior to installing Harris mobile equipment. This pre-check can be documented using the sample Installation Checklist provided later in this manual (see Section 15).



NOTE

The performance of the pre-check may require a certified operator.

The items to be checked are detailed on the Installation Checklist. Check all items and indicate results on the checklist, or enter “n/a” or “not applicable” if the vehicle does not have it. Clearly record any items that are non-functional and any servicing that must be completed before the install can begin. Bring these to attention of the authorized customer representative.

6.3 PLANNING THE INSTALLATION

Carefully plan the mounting locations of all components (radio, Control Head, antenna, and cables) and determine the routes for all wiring and cables.



CAUTION

Before installing the mobile radio equipment, check the vehicle manufacturer’s user manual for warnings or recommendations.



CAUTION

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 will have no further obligation to the buyer for any damage caused to the product or to any person or personal property.



CAUTION

Use only Harris-supplied mounting brackets, hardware, and interconnect cabling when installing the mobile radio, Control Heads, and accessories (speakers, microphones, etc.).

Failure to use approved parts and accessories may cause product issues, such as; degraded radio performance, corrosion from dissimilar metals, or substandard equipment installations.



CAUTION

All cables should have a service loop near each connector. Do not bend the cables at severe angles near the connector. 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.



Ensure all equipment will be protected from possible damage:

- Plan equipment placement (especially Control Heads) to avoid direct impact from water and hose-down, snow, dust, smoke, gases, road debris, oils, chemicals and corrosive agents.
- If installing equipment behind a door or cover in a protective enclosure, ensure there is adequate airflow and cooling.
- Use splash guards, shields, or covers, to protect against direct impacts.



The radio uses a heat sink on the radio and natural convection as its method of cooling. Cooling occurs when the ambient temperature of the air surrounding the radio is lower than the radio's heat sink temperature, and air flows freely around the heat sink. The design of the heat sink is thermally sufficient to dissipate the maximum amount of heat generated by the radio if the ambient air temperature around it remains below the maximum specified limit of +140° Fahrenheit (+60° Celsius).

Follow these guidelines to ensure proper operation:

- Operate the radio within its specified temperature limits.
- Do not place items above, against, or around the radio.
- Do not mount the radio upside down. Mounting the radio upside down causes its heat sink to not operate as designed and could cause the radio to overheat in certain environments, reducing the radio's performance.
- When operating, keep the radio out of direct sunlight and away from heat sources.
- Installations behind a door, cover, or in a protective enclosure must provide adequate free-air ventilation or cooling to the radio.

The radio automatically reduces its transmit RF output power when its ambient temperature exceeds approximately +140° Fahrenheit (+60° Celsius).

Detailed installation procedures and testing mobile radio products are given in the applicable sections. Items to consider during the planning phase are listed in the following subsections.

6.3.1 Mounting Location and Considerations

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, the radio's *Product Safety Manual*, and other generally accepted professional radio installation practices.

Plan the mounting locations of all components (radio, Control Head, antenna, and cables) and determine the routes for all wiring and cables. Consider the connection of the radio for planning purposes. In addition, review the following:

- The radio's mounting location should be chosen to provide protection of the cables and connectors on the rear of the unit.
- Consider the location of the fuel tank and drive shaft. Mounting screws could pierce the tank or damage the shaft.
- Connectors on the rear panel of the radio are not watertight. Ensure waterproof covers are installed on unused connectors.
- Avoid installing where condensation from vehicle air-conditioners or leaking windows could spill onto the radio.

- Orientation of the radio should allow access to the connectors for future testing and programming.
- Position the control head so that the driver / operator can have easy view and access to the display and controls.
- The radio should be located as to not interfere with driver and passenger movement, or inhibit the movement or adjustment of vehicle seats.
- Locate the radio and any associated equipment out of the vehicle's airbag zone.
- A microphone hang-up clip is provided as part of the installation kit. This should be located to provide convenient access to the driver / operator, yet not interfere with any vehicle controls.
- Installations in certain harsh environments may require using best practices to protect the equipment, including the following:
 - Position the equipment to avoid direct impact from water and hose-down, snow, dust, smoke, gases, road debris, oils, chemicals and corrosive agents.
 - Installation behind a door or cover in a protective enclosure (must provide adequate airflow and cooling).
 - Use splash guards, shields, or covers, to protect against direct impacts.
 - Refer to the Caring for The Radio Equipment section on page 93 for additional information.

6.3.2 Power Source Location and Considerations

- Some vehicles operate on 24 VDC so it's important that the location chosen is a 12 VDC source. If a 12 VDC source is not available, a converter must be installed.
- Ensure that the location chosen is a main power source, allows the addition of added terminals, and supports the needed current draw.
- If an auxiliary fuse block is going to be used, ensure that the location chosen for the block guards against possible short circuits.
- Some vehicles, e.g., trucks, have studs on the firewall that can be used to pass power without the need for a through hole. These can be used only if verified that they are not used to connect data cables or wires.

6.3.3 Ignition Sense Location and Considerations

Chose an ignition sense that does not interfere with the safety related systems of the vehicle.

The ignition sense wire (white wire) connection determines how or when power is applied to the mobile radio. The white wire is sometimes referred to as the "white ignition switch wire" or the "ignition sense input wire."

There are three configurations for using of the ignition sense wire to power the mobile radio:

- The mobile radio is powered on and off with the vehicle ignition. See Section 6.3.3.1.
- The mobile radio is powered on and off with a master switch or timer. See Section 6.3.3.2.
- The mobile radio wired hot, power always applied to the mobile radio. See Section 6.3.3.3.

In a front-mount or remote-mount configuration, the ignition sense wire is part of the radio's and Control Head's power cable.

Regardless of the configuration, the radio's main DC power input (red A+ 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. It is important to use the proper crimp tool for crimping any terminals or fuse holder.



Any DC input power provided to the radio must not be higher or lower than 13.6 volts DC $\pm 10\%$.

If the vehicle experiences AC noise or DC spikes exceeding 18 volts, then DC conditioning is required before any DC power is connected to the radio. This includes conditioning for both the radio's main DC power input lead and for its switched ignition sense power input.

DC conditioning can be accomplished by a noise filter or DC isolation equipment such as Harris part number FL-018314-001 or FL-018314-002 for non-TDMA operations, or filters for TDMA operation with similar current draw specifications. A fuse must be placed in-line before any noise filter. Contact TAC for additional information.

6.3.3.1 Power On/Off Using Vehicle Ignition

For the mobile radio to be powered on and off with the vehicle's ignition, the sense wire needs to be connected to one of switched power sources, typically known as accessory power.

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 Control Head's on/off/volume control must be left in the on position for automatic power-up to function properly.

The accessory source is normally found in the vehicle's interior fuse block. The source chosen should have nothing to do with the vehicle's safety systems. Refer to the vehicle's owner manual when choosing an appropriate accessory source.

6.3.3.2 Power On/Off Using Master Power Switch or Timer

In this configuration, the ignition sense wire is connected to a 12 VDC power source with a master switch or a timer in-line. Typically, the 12 VDC source is the same as the mobile or Control Head's power source.

- Master switch install - This allows the radio to remain powered on after the ignition is turned off. It is important to note that the vehicle's battery will go dead if the switch is not powered off.
- Timer circuit install - This allows the radio to be powered on for a set time. This configuration can also drain the battery if it is weak or old.

6.3.3.3 Power On/Off Using Mobile Radio On/Off/Volume Control Knob

In this configuration, the ignition sense line is connected directly to a 12 VDC power source. The 3-amp fuse must be installed in-line. The mobile is powered on and off with the Control Head's on/off/volume control knob. The vehicle's battery will go dead if the vehicle is not running. Review the above mentioned quiescent current draw when ignition is on and the control head on/off knob is in off position.

6.3.4 Ground/Return Location and Considerations

- Ensure the location chosen is truly to vehicle ground.
- The location chosen should not be in an area that is prone to moisture retention.
- Ensure that the location will protect the terminal from being bumped and allow the connection to loosen.
- The location must allow a through bolt with a nut and lock washer or be at a factory ground.
- Choose a location that will allow the ground lead to be as short as possible.

6.3.5 Antenna Mounting Considerations

- Choose the antenna location based on the installation instructions provided in this manual and in consideration of other items installed on the vehicle's roof.
- There must be at least a 12" separation between the antenna and any other roof-mounted equipment.
- If the antenna being used requires a ground plane, the location chosen must provide an acceptable ground.
- If mirror mounts are being used, ensure the mirrors are properly installed.

6.3.6 Data, Antenna, and Power Cable Routing Considerations

- Cables should not be routed under vehicle carpeting where the occupant's feet rest.
- Plan the cable runs to protect the cables from chafing, crushing, moisture, or overheating.
- Routing under the dash should not interfere with, or pass through, the steering column, brake pedal, clutch pedal, or the accelerator mechanisms.
- Carefully chose the location where the wiring will exit the passenger compartment and enter the engine compartment.

6.4 WIRING AND CABLING REQUIREMENTS

6.4.1 Crimping Requirements

Use the proper crimp tool to insure a permanent connection is achieved. Pliers are never allowed. Ratcheting crimpers are recommended.

6.4.2 Splicing Requirements

Splicing the 12 VDC (A+) wire is not allowed. For other wires, if a splice must be installed such as to extend the wire, the following requirements must be followed:

1. When wire is routed through hidden locations such as door jams, under the dash or, otherwise hidden from view, use a solid run.

Any splice installed must be visible to future service technicians. The best way to accomplish this is to cut off the wire back near the equipment connector and splice on a new wire.

2. The splice wire used must have insulation rated for use in an engine compartment.
3. Estimate the length of the run and determine required wire gauge.

The gauge of the wire used must be based on the length of cable run for a load of approximately 10 Amps and maximum allowable voltage drop of 200 mV at peak load. If larger gauge wire is not required, the same gauge can be used, but never a smaller gauge.

4. When splicing a wire that could be exposed to moisture, use a butt splice encased within heat shrink tubing to seal the connection.

6.4.3 Battery Connection Requirements

The 12 VDC power source should be the battery if possible. Other sources can be used if a battery connection is not available or feasible. Acceptable sources are the input to the main relay / fuse panel in the engine compartment, other main 12 VDC terminal, or installation of an auxiliary fuse block.

An inline fuse holder is used for the mobile radio/Control Head to protect the equipment and the vehicle from a possible short circuit or excessive current draw. The fuse amperage must be according to this installation manual. The fuse holder is water resistant to protect the fuse from the elements and avoid the possibility of corrosion. For optimum safety, the fuse should be placed as close to the battery as possible.

If an auxiliary fuse block is being installed, the conductor used to connect it to 12 VDC should be gauged large enough to support the current flow of all the equipment that is fed by the block. The gauge of the cable to be used must be based on the length of cable run for a load of approximately 10 Amps and maximum allowable voltage drop of 200 mV at peak load. In most cases this conductor consists of #6 AWG or #8 AWG wire. The insulation of this conductor must be properly rated for engine compartments. An inline fuse holder must be installed on this wire near the battery. The fuse holder must be water resistant and the amperage of the fuse installed should be rated large enough to handle the total current flow of the block. In most cases, the fuse rating is 30 or 50 amps. In this configuration, the radio and Control Head in-line fuse holders will be located between the auxiliary fuse block and the radio/Control Head.

If the battery system is not a 12 VDC system, a converter must be installed. The same requirements apply for the wire feeding the converter as are listed in the previous paragraph for an auxiliary fuse block. Output specification of converter should match radio's DC power specification and should be clean (no noise). The radio performance be impacted if output of the converter is noisy.

6.5 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
- Titan 11955 Ratcheting Heat Shrink Terminal Crimper (or Equivalent)
- 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
- Heat Gun
- Phillips®-Head Screwdrivers, #1 and #2
- Flat-Blade Screwdrivers, 1/8-inch & 1/4-inch tips
- 3-Millimeter Allen Wrench or Hex Bit
- 7-Millimeter Hex Socket or Socket Bit
- 1/8-Inch Hex Key Wrench (Allen Wrench)
- 5/16-Inch Combination or Open-End Wrench (Only Needed for GPS Receiver Option)
- 3/4-Inch or 3/8-Inch Hole Saw with Depth Protection: 3/4-Inch = Ripley HSK 19 or Antenex HS34; 3/8-Inch = Antenex HS38
- Clutch-Type Cordless Drill with Drill Bits and Driver Bits
- Deburring Tool (for 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
- Heat Shrink

6.6 UNPACKING AND CHECKING THE EQUIPMENT

6.6.1 Materials

A typical set of materials for an XL Mobile radio installation includes:

- XL Mobile Radio
- XL-CH Control Head
- Installation Kit:
 - Installation Kit 14050-6200-01 (for radio transceiver) for Front-Mount XL Mobile - Contents listed in Table 6-1.
 - or
 - Installation Kit 14050-6210-01 (for control unit) and 14050-6200-01 (for radio transceiver) for Remote-Mount XL Mobile - Contents listed in Table 6-1 and Table 6-2.
- RF Antenna - As listed in Table 6-3. (A second antenna is required for the GPS receiver if a “combo” antenna is not used.)
- Microphone - See Table 6-4 for microphone part numbers.

6.6.2 Material Inspection



CAUTION

After removal from the carton, examine the radio, Control Head and other components for broken, damaged, loose, or missing parts. If any are noted, contact the Harris Customer Care center (see page 95) 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.



CAUTION

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

6.6.3 Installation Kits

Table 6-1: Installation Kit 14050-6200-01 for Front-Mount XL Mobile Radio

PART NUMBER	QTY.	DESCRIPTION
14050-6200-02	1	Bracket, Mounting
N/A	4	M4x0.7x10, Low Head Height SHCS, Stainless Steel
N/A	4	M4 Tooth Lock Washer, Stainless Steel
N/A	4	M4 Flat Washer, Stainless Steel
N/A	4	Pan Head Screw, Phillips Drive, Blunt Tip, #10-32x1 Inch, Stainless Steel
N/A	4	#10 Split Lock Washer, Stainless Steel
N/A	4	#10 Flat Washer, Stainless Steel
14050-6200-03	2	Rail Plate

Table 6-2: Control Head with Installation Components, 14050-6210-01

PART NUMBER	QTY.	DESCRIPTION
14050-6210-02	1	Bracket, Mounting
N/A	2	M4x0.7x8 Low Head Height SHCS, Stainless Steel
N/A	2	M4 Flat Washer, Stainless Steel, 12 mm OD, 1 mm Thickness
N/A	2	M4 Male-Female Hex Standoff, Stainless Steel
N/A	4	M4 Split Washer, Stainless Steel, 1 mm Thickness

Table 6-3: Additional Options and Accessories for the XL Mobile Radios

PART NUMBER	DESCRIPTION
14002-0174-50	Cable, XL Accessory
14050-6300-01	Cable, Ethernet, Overmold, XL, 45 CM
14050-6300-02	Cable, Ethernet, Overmold, XL, 9 M
14002-0174-52	Cable, XL Speaker, 5.5 Feet
14002-0174-59	Cable, XL Speaker, 20 Feet
14002-0174-55	Cable, XL USB
14002-0174-51	Cable, XL USB and Speaker
CA-012365-001	Cable, DC Power,
14050-6100-01	External Speaker
14050-6020-01	Numeric Keypad Microphone
14050-6010-01	Standard Microphone

Table 6-4: Options and Accessories for the Control Head

PART NUMBER	DESCRIPTION
14002-0174-50	Cable, XL Accessory
14050-6300-01	Cable, Ethernet, Overmold, XL, 45 CM
14050-6300-02	Cable, Ethernet, Overmold, XL, 9 M
14002-0174-52	Cable, XL Speaker, 5.5 Feet
14002-0174-59	Cable, XL Speaker, 20 Feet
14002-0174-55	Cable, XL USB
14002-0174-51	Cable, XL USB and Speaker
CA-012616-001	Cable, DC Power,
14002-0174-57	Cover, Waterproof, CH Accessory Port
14002-0174-58	Cover, Waterproof, CH RJ45 Port
14002-0174-60	Cover, Waterproof, CH Mic Port

7 ANTENNA INSTALLATION

As a guide for determining the best possible mounting location to reduce human exposure to radio frequency (RF) electromagnetic energy during transmit mode, refer to the following procedures.

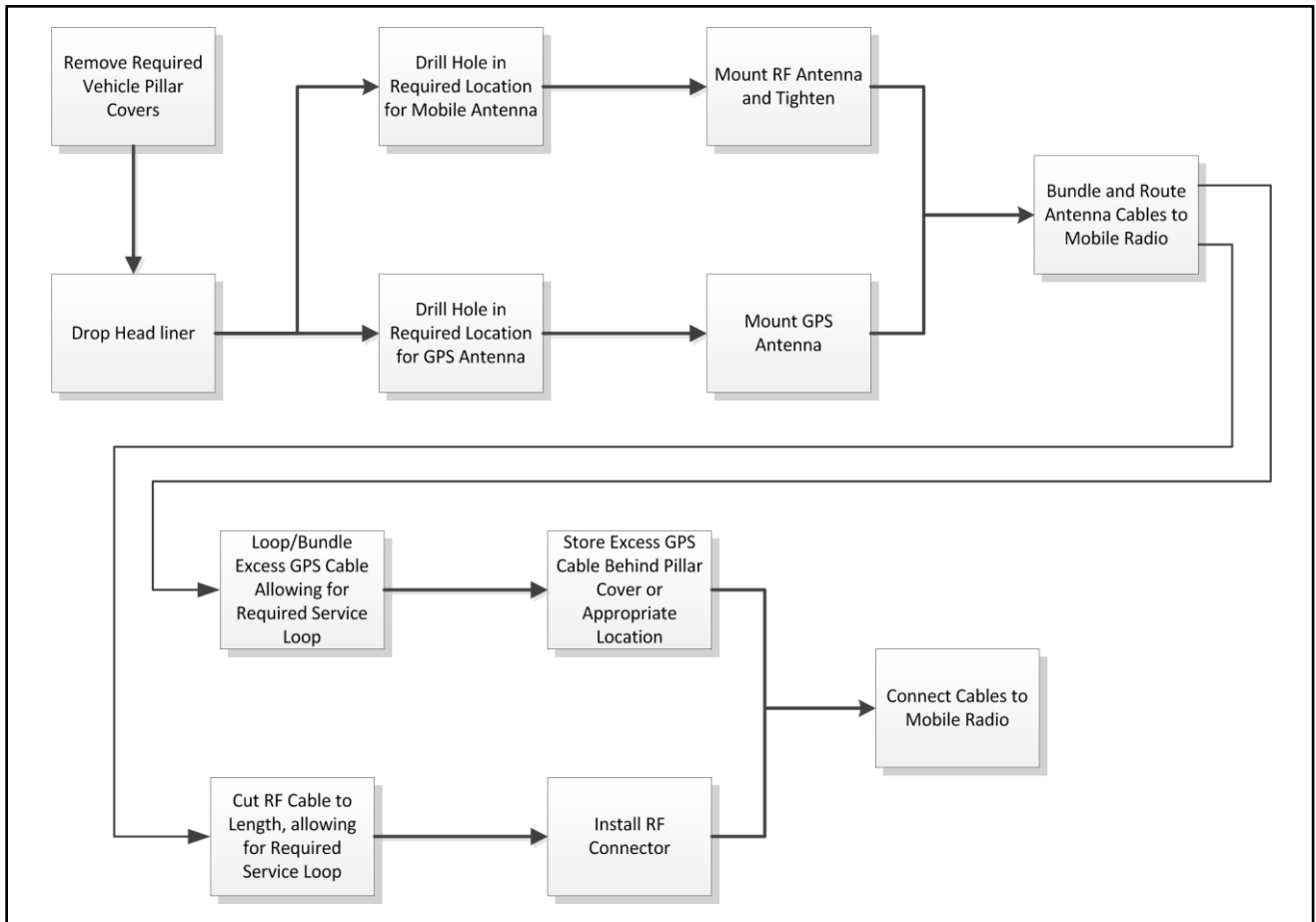


Figure 7-1: Antenna Installation Process

7.1 ANTENNA MOUNTING LOCATIONS

Antennas must be mounted in one of four (4) possible locations on the vehicle. Table 7-1 shows the recommended locations and antenna part numbers. A separation distance of five (5) feet or an intervening ground plane between the antenna, the mobile radio, and accessories is needed to avoid possible interference. See Table 6-3 on page 35 for detailed descriptions of the antenna element and the antenna mounts.



Review all Regulatory and Safety Information presented in the radio's Product Safety Manual and Section 1. A transmitting antenna must be installed in accordance with the guidelines presented in both the Product Safety Manual and this manual.



Failure to mount the antennas in the recommended locations may cause unintended interference. Always follow the antenna manufacturer's instructions when mounting an antenna.



Also refer to the respective Recommended Minimum Safe Lateral Distance table presented in Table 1-1. This table lists the recommended minimum safe distance 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.

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 Table 7-1). 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 Table 7-1).

7.1.2 Center of Trunk Lid

Some 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 ❹ in Table 7-1). The antenna 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 a GPS combination-type antenna is not utilized for the mobile radio installation and the radio's GPS receiver functions must be available for operational use, a stand-alone GPS receive antenna must be separately mounted and connected to the radio. The vehicle's rear deck lid (location ❸ in Table 7-1) is the recommended mounting location for this case. This locates the GPS antenna inside the vehicle.

7.1.4 Installation Precautions

When routing the antenna cable in the vehicle:

- Always keep the antenna cable as far away as possible from the vehicle's electronics equipment. Special precautions must be taken with vehicles that use electronic braking systems such as ABS system.
- For front-mount radio installations, do not route the antenna (RF) cable through the vehicle dash area; always keep the cable at floor level until it connects to the radio.

Table 7-1: Recommended Antenna Mounting Locations with Antenna Part Numbers

TOP VIEW OF A TYPICAL VEHICLE				
ANTENNA	LOCATION(S)			
	4	3	2	1
Antenna/element combinations listed in Table 1-1.	✓		✓	✓
GPS receive-only antennas.	✓	✓	✓	

7.2 RF ANTENNA INSTALLATION PROCEDURES



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

Table 1-1 list the mobile radio antennas available for use with the 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 Antenna Mounts AN-125001 -002, -004, and -006

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 Antenna Mounts AN-125001-002 and -006**

This standard $\frac{3}{4}$ -inch NMO antenna mount requires a $\frac{3}{4}$ -inch hole in a relatively flat area of the vehicle body, with a vehicle metal thickness of between 0.020 and 0.040 inches.

7.2.1.2 **Thick-Roof Antenna Mount AN-125001-004**

This thick-roof NMO antenna mount uses a $\frac{3}{8}$ -inch or a $\frac{3}{4}$ -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 ($\frac{3}{16}$ -inch maximum thickness).



NOTE

For thick-roof antenna mount AN-125001-004, using a $\frac{3}{8}$ -inch mounting hole requires better access to the underside of the mounting location than if a $\frac{3}{4}$ -inch hole is used. This is because, in the case of a $\frac{3}{8}$ -inch hole, the antenna mount's bushing assembly must be inserted from the underside of the mounting surface.

When using a $\frac{3}{4}$ -inch mounting hole to mount thick-roof antenna mount AN-125001-004, the thickness of the mounting surface must be at least $\frac{1}{8}$ -inch (0.125-inch minimum thickness). This is due to the thickness of the alignment ring used to center the bushing assembly within the $\frac{3}{4}$ -inch mounting hole.

7.2.1.3 Installation Procedure for Mounts AN-125001-002, -004, and -006

1. Select the antenna mounting location in accordance with the information presented in Section 1 of this manual and in the *Product Safety Manual*. If necessary, contact the Technical Assistance Center for assistance. See page 95 for 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 other 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.



CAUTION

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.

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.
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.

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 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 in position until the lock nut is installed.
8. If installing a thick-roof antenna mount (3/8-inch shank) into a 3/4-inch hole, place the alignment ring onto the threaded shank of the mount. This ring has an approximate 3/4-inch outside diameter.
 9. 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.
 10. 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.

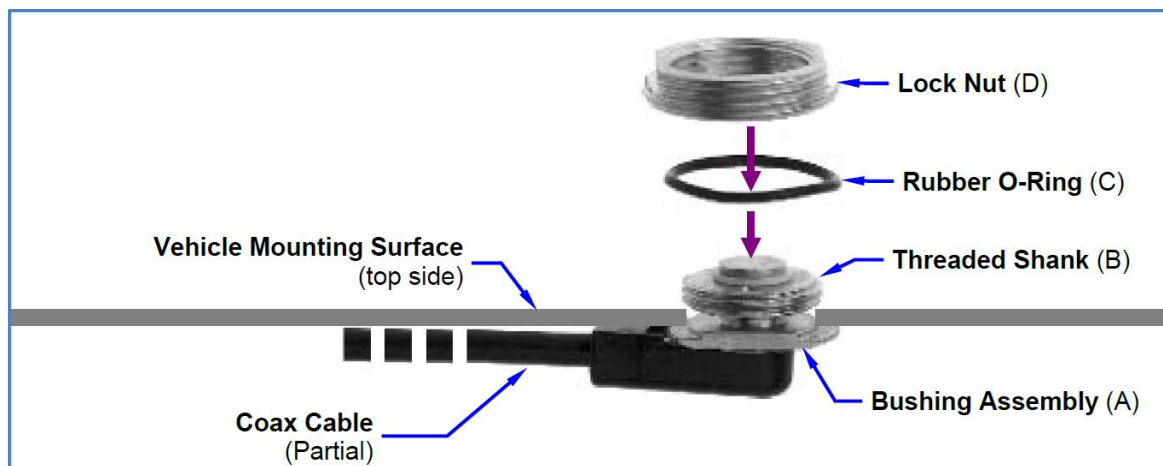


Figure 7-2: Installing Standard 3/4-Inch NMO Antenna Mount AN-125001-002

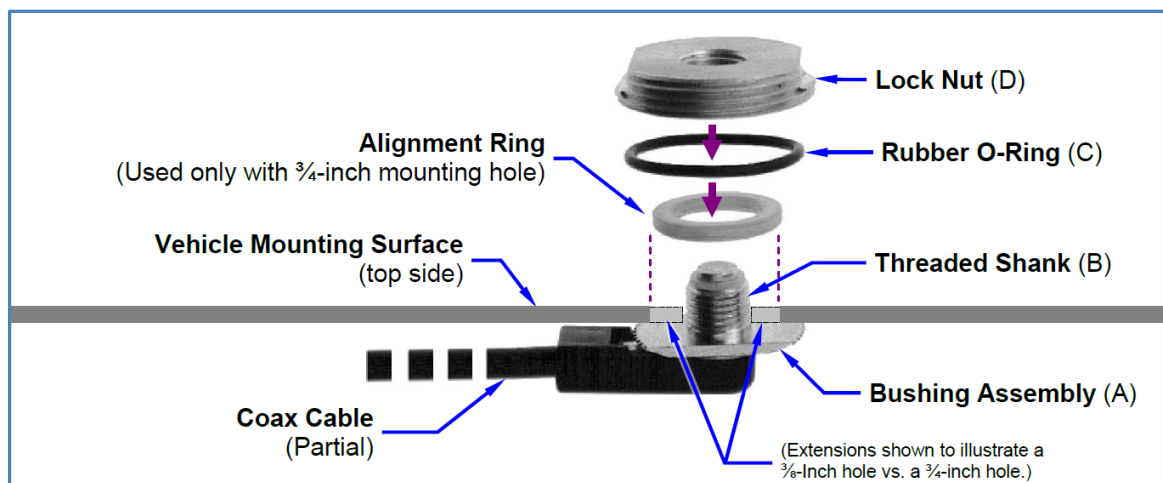


Figure 7-3: Installing Thick-Roof NMO Antenna Mount AN-125001-004

7.2.2 Installing Magnetic Antenna Mount AN-125001-008 and 12099-0370-01

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 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 using 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 according to the installation instructions included with the mount.

7.2.4 Attaching the NMO Antenna Element

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 the 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.
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.

- 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.

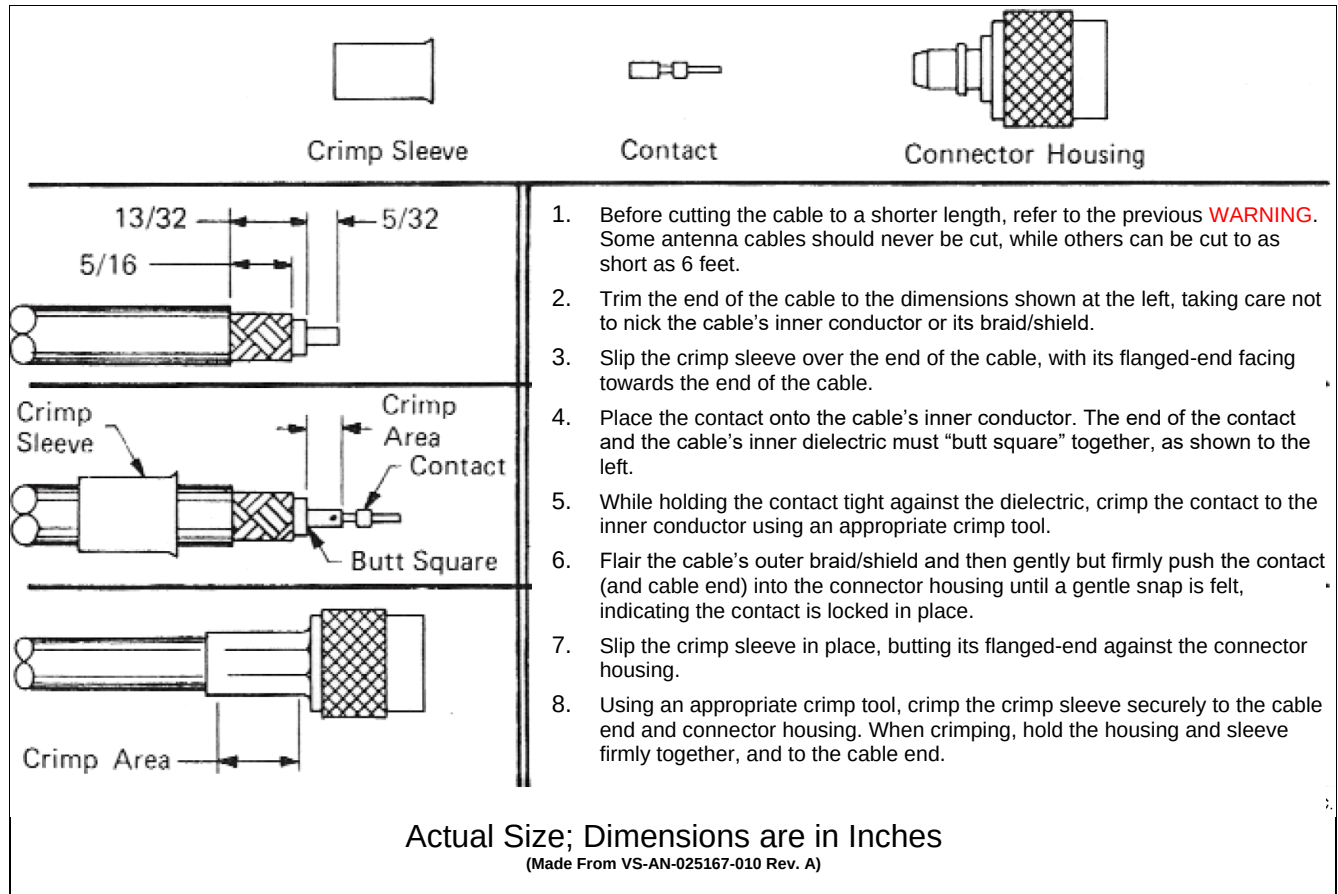


Figure 7-4: Crimping Instructions for TNC RF Connector

7.2.6 Install GPS Antenna (If Required)

If the XL Mobile radio must provide GPS location information via its built-in GPS receiver, 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. The following antenna installation procedure is recommended:



A combination ("combo") antenna kit includes a GPS antenna built into the base of the mobile antenna. Refer to Table 6-3 on page 35 for available combo antennas.

7.2.7 Installing a GPS Combo Antenna

- After selecting a mounting location, refer to the antenna manufacturer's mounting and testing instructions and install the antenna in accordance with these instructions.

If necessary, contact the Technical Assistance Center. See page 95 for TAC contact information.

- Remove headliner panel, interior panels, etc., as necessary.

3. Route the cable from the antenna base to the radio transceiver's mounting location.

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. **Do not alter the GPS antenna cable length; tie and stow excess cable as necessary.**

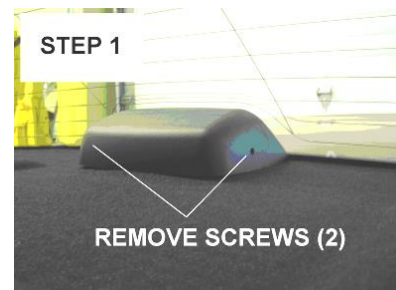
4. Protect the cable and its (male) SMA connector from damage, dirt, and/or metal shavings which may be generated during the mechanical and electrical installation of the radio. Temporarily tying the connector and cable-end in a small plastic bag is recommended.

The antenna cable will be connected to the radio's SMA receptacle-type (female) RF connector in a procedure presented in Section 12.2.

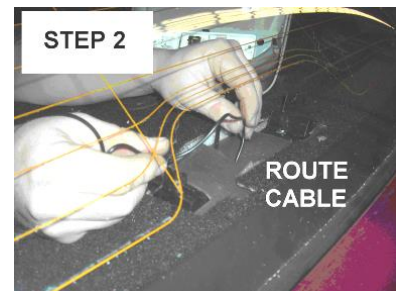
7.2.8 Installing a GPS Antenna Inside the Rear-Deck

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. Many vehicle makes/models, such as the Ford® Crown Victoria®, may use this installation method:

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.

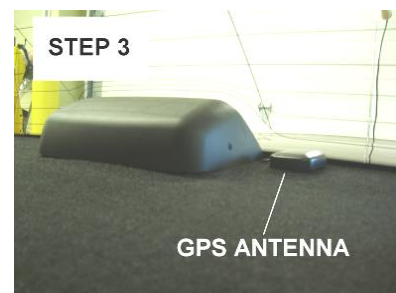


3. Position the antenna near the rear glass.

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.

Use 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. Protect the cable and its (male) SMA connector 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.
7. 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 using a procedure presented later in this manual (i.e., procedure on page 86).



NOTE

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

8 FRONT-MOUNT RADIO INSTALLATION

Installing a front-mount mobile radio consists of the following:

- Installing front-mount mobile radio bracket and radio.
- Installing radio wiring and cabling.
- Installing speaker bracket and speaker.
- Installing microphone and mic clip.

**NOTE**

Equipment should be mounted only after the authorized customer representative has approved the installation plan. Figure 8-1 shows a basic process flow for mounting the mobile equipment.

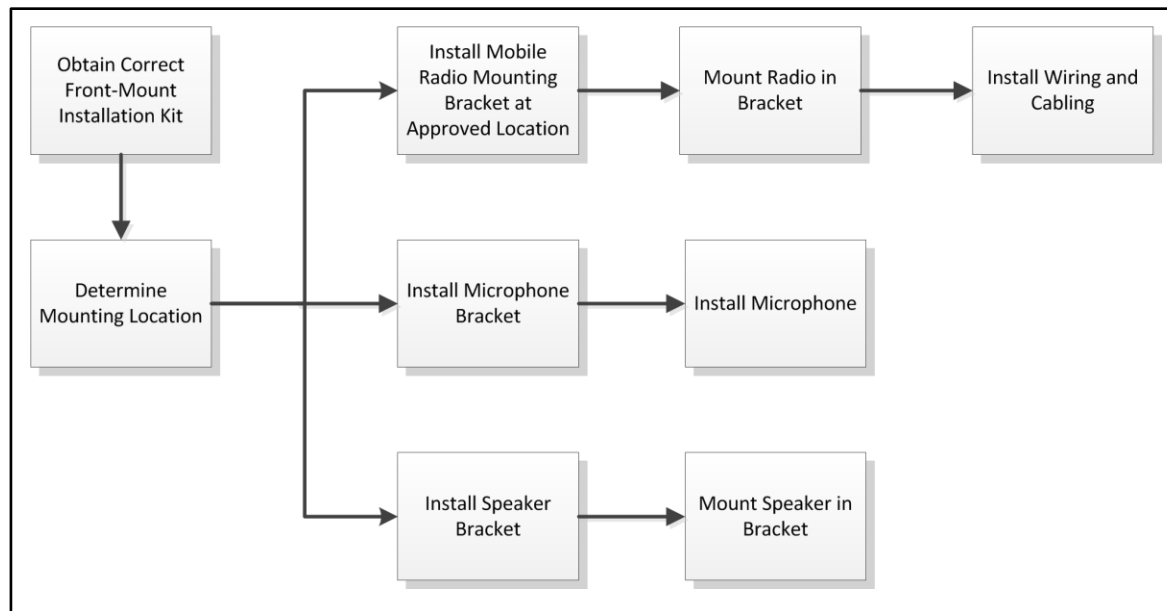


Figure 8-1: Front-Mount Equipment Installation Process

**NOTE**

Verify that the radio has the proper version of software and has been configured properly for this customer prior to beginning the physical installation. Consult with the radio system network administration personnel as necessary.

The equipment must always be secured to the vehicle using sheet metal screws or bolts and original mounting hardware provided with the installation kit. No other direct mounting to the radio or Control Head enclosure should be made, as this could damage internal components.

**NOTE**

Secure mounting of the radio and accessories is an important safety consideration. If the equipment is not securely mounted, the components could become a projectile during a vehicle accident or an emergency stop.

8.1 MOUNTING THE FRONT-MOUNT RADIO



NOTE

This section includes detailed instructions for mechanically installing and wiring a front-mount XL Mobile radio. For remote-mount XL Mobile radio installation procedures, refer to Section 9 which begins on page 57.

The Mounting Bracket Kit for the front-mount XL Mobile 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 8-4.

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 front-mount XL Mobile radio weighs approximately 9.0 pounds (4.08 kilograms).



WARNING

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 is unsafe. A weak mount could turn the radio and its mounting bracket into a dangerous 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, reinforce the surface with a metal backing plate (not supplied) or reinforce using another approved mounting method.



CAUTION

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 XL Mobile radio may experience degradation in the quality of voice and data communications.

8.1.1 Attaching the Control Head

1. Remove both side rails from the VCH, rotate, and re-attach so that they extend past the front of the VCH.
2. Attach ethernet cable(s) to the back of the control head.
3. Remove the Cable Retention Bracket from the top of the VCH. Slide the control head into the slots on the front of the VCH. Route the ethernet cable(s) and power cable from the XL-CH through the groove on top of the VCH.

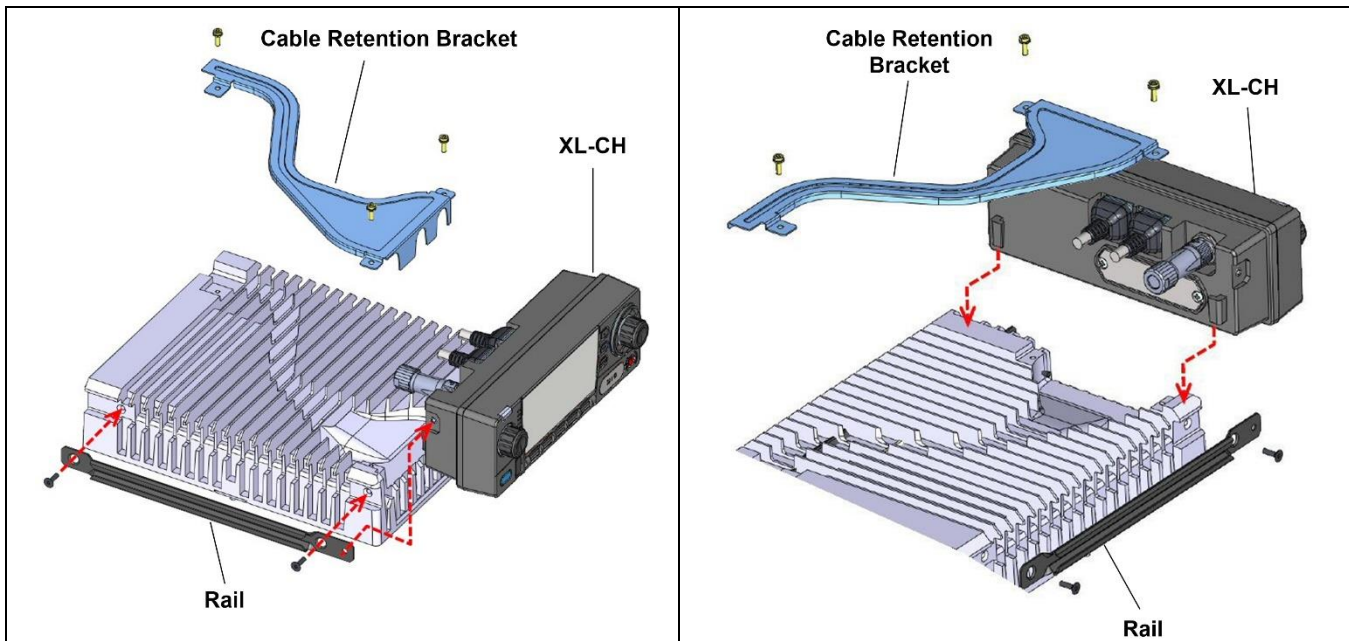


Figure 8-2: Front Mount Installation

4. Install the nut plates on each side of the radio, re-install the cable retention bracket, and secure the XL-CH as shown below. (Torque values???)

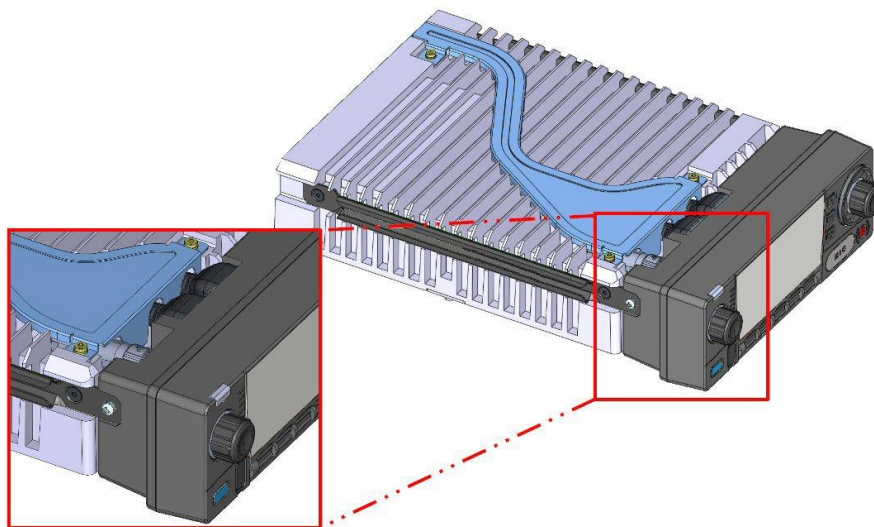


Figure 8-3: Secure XL-CH to VCH

8.1.2 Mounting Bracket Installation

The VCH Mounting Bracket Kit 14050-6200-01 contents are shown in Figure 8-4.

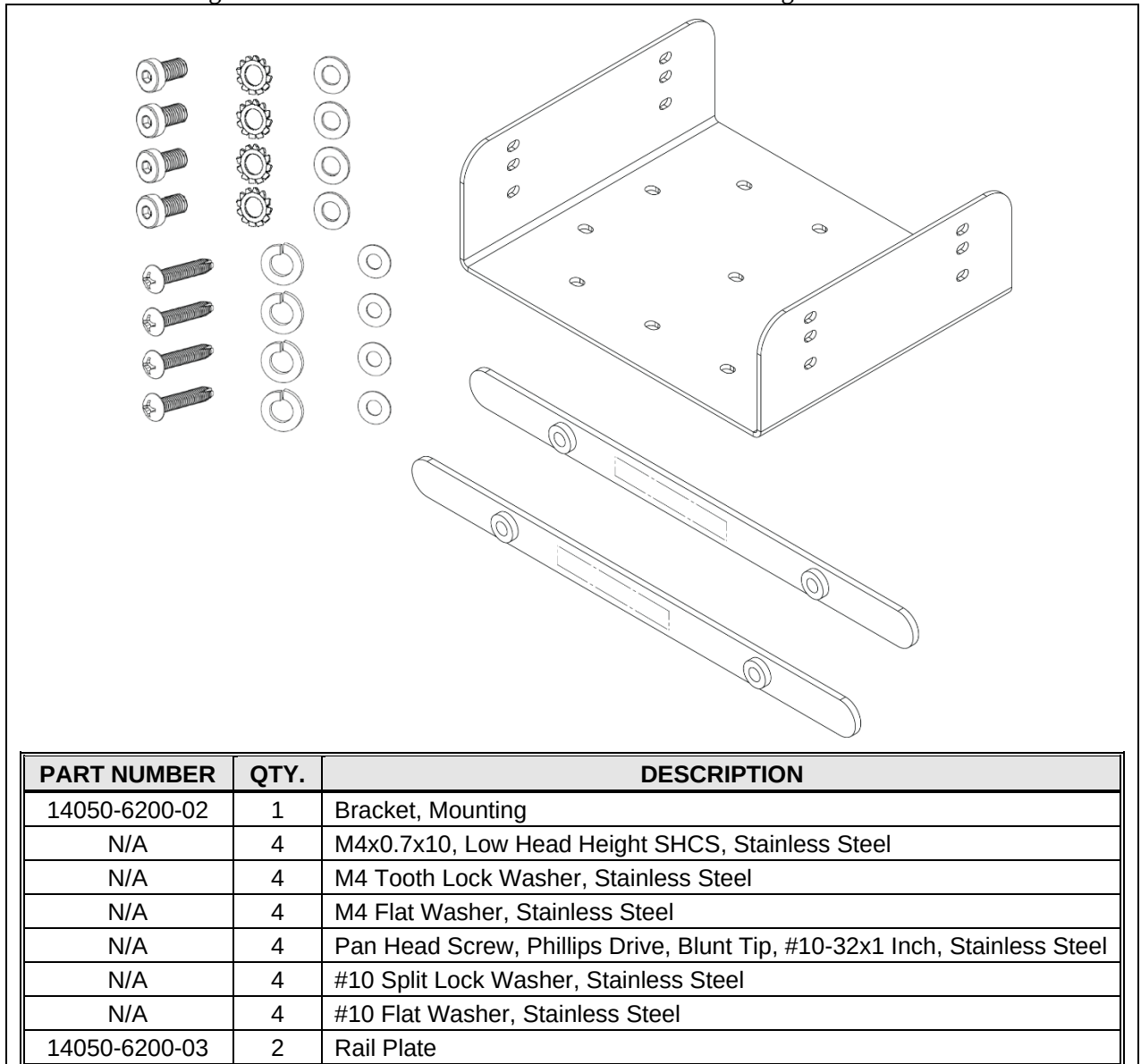


Figure 8-4: VCH Mounting Bracket Kit 14050-6200-01

When selecting a mounting location for the radio, verify there is sufficient clearance 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. 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.

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.

Other types 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. The mounting bracket has three (3) mounting holes:
 - The upper row of mounting holes is preferred for a front mount radio installation with the bracket located below the radio (e.g., for installation over a transmission hump).
 - The middle row of mounting holes is preferred for a remote mount radio with the bracket located below the radio (e.g., for installation over a transmission hump).
 - The bottom row of mounting holes is preferred for installing the radio with bracket located above the radio (e.g., for under-dash installation).
2. Loosely connect the rail plates to the mounting bracket using the socket head M4 screws, M4 star washers, and M4 flat washers. Tighten the screws approximately four (4) threads, ensuring they do not protrude beyond PEM nut on the rail plate (see Figure 8-5).

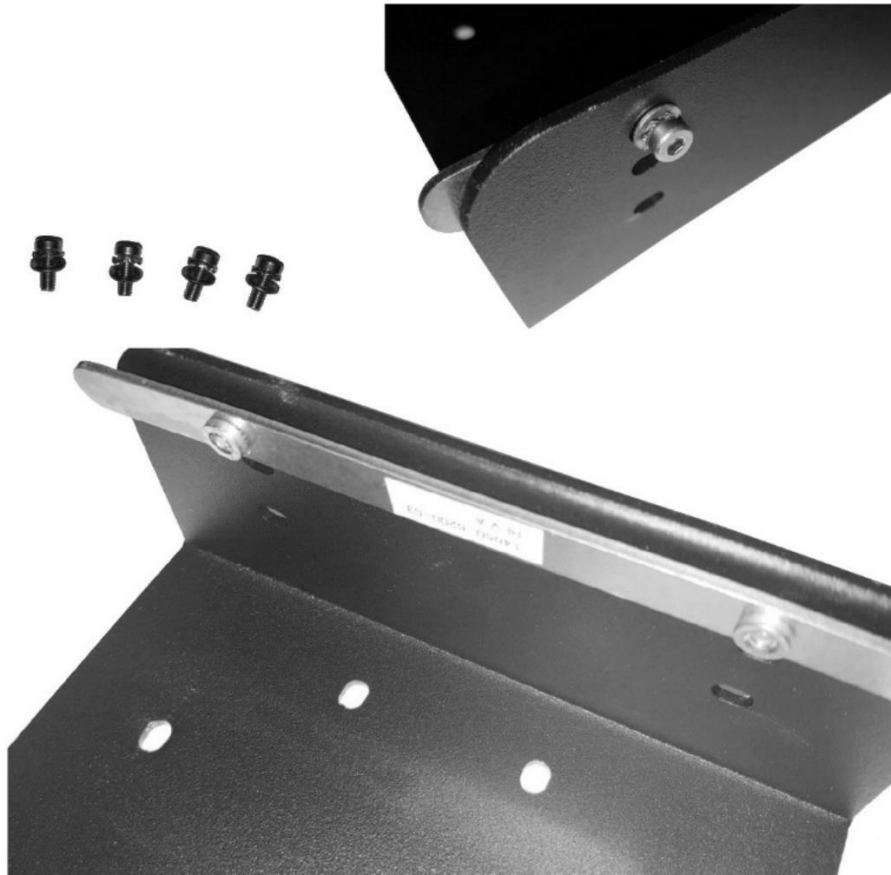


Figure 8-5: Install Side Rails in Mounting Bracket

3. Determine the best radio-to-bracket position and angle by test-fitting the radio into the mounting bracket at the selected vehicle mounting location. 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 Control Head.
4. 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.
5. On the mounting surface, mark the selected location for the bracket.

6. Clean and remove any foreign material from the mounting surface.
7. Using the bracket as a template, 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 (e.g., the fuel tank, a fuel line, the transmission housing, existing vehicle wiring, electronic control modules, etc.). Always verify how far the mounting screws will extend beyond the mounting surface prior to installation. Always deburr drilled holes before installing screws.

8. Deburr all the newly drilled holes.
9. If necessary, apply an approved paint or rust-inhibitor at the holes in the mounting surface.
10. Set the bracket back into place.
11. Install and tighten the mounting screws/hardware.
12. 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.

8.1.3 Inserting the Radio into the Mounting Bracket

Insert the radio into the mounting bracket according to this procedure:

1. Carefully align both rail plates, on the mounting bracket, with the rails on the VCH.

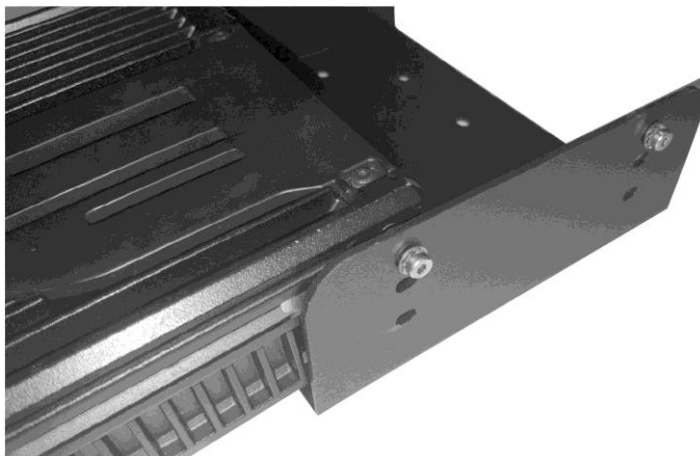


Figure 8-6: Align Bracket Rail Plates with VCH Rails

2. Slide the radio into the mounting bracket. Position the VCH within the mounting bracket, avoiding imbalance. Ensure the center of gravity is within the edges of the mounting bracket.



Figure 8-7: Acceptable VCH Positions within Bracket

3. When the radio is in the desired location within the bracket, tighten the four (4) M4 screws to a torque of 5.85Nm using the 3 mm Allen wrench, or hex bit.
4. Check the mounting area to ensure there is proper clearance for cable service looping, for air circulation, and an area for securing excess cable.



NOTE

Proper mounting helps ensure optimal radio performance. An improperly mounted radio may experience degradation in the quality of voice and data communications.

8.2 FRONT-MOUNT RADIO'S WIRING AND CABLING

The radio's DC Power Cable has a 3-pin connector, a 20-foot red (A+) wire (for the main 12 VDC power connection), a 20-foot white wire (for the switched power source connection), and a 4-foot black wire (for the ground connection). The installation procedures outlined in the following sections are recommended.



WARNING

Battery Ground WARNING: Before making connections to the battery's positive post, carefully disconnect the battery's negative (ground) cable(s). This prevents tools or other metallic objects which contact 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.



WARNING

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


CAUTION

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.


CAUTION

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

8.2.1 Radio Ground (Black Wire) Connection

Use the following procedure to provide a suitable ground connection for the radio:

1. Temporarily connect the radio's DC Power Cable to the radio by mating the cable's 3-pin connector to the radio's 3-pin power connector. Locking the two connectors is not necessary at this time.
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. Verify the black wire has sufficient length to reach the ground point. If not, it can be extended by splicing a 10-AWG wire to it. In this case, use approved wiring splicing methods and materials.
4. Strip the area of any paint or dirt to expose a bare metal surface, approximately ¾-inch square.
5. Drill a hole in the approximate center of the bare metal surface and deburr it. A ⅜-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.
6. Prepare the ground (black) wire:
 - a. Cut the black wire to the required length plus some additional length for a service loop.
 - b. Strip insulation back approximately ¼-inch.
 - c. Crimp a ⅜-inch non-insulated ring terminal (supplied with the cable) to the end of the black wire.
7. Fully connect the radio's DC Power Cable to the radio by mating its 3-pin connector to the radio's 3-pin power 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.
8. 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.
9. Apply an approved paint or rust-inhibitor over the remaining exposed bare metal surface and around the ring terminal.

8.2.2 Main Power (Red Wire and Main Fuse Holder) Connection

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.

2. Obtain the orange-wired inline blade fuse holder included with the DC Power Cable.
3. **Observe and follow the previously presented Battery Ground 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. Strip the wires coming from the fuse holder approximately $\frac{3}{8}$ -inch.
6. Cut the wire of the DC power cable and strip ends of the wires approximately $\frac{3}{8}$ -inch.
7. Slide heat shrink over end of each wire.
8. Place the yellow splice connectors on the DC power wire and securely crimp.
9. Insert wires of fuse holders into the splice connectors and securely crimp.
10. Slide heat shrink down over splice connectors and use heat gun to seal.
11. Label this fuse holder and red wire appropriately (e.g., "XL Mobile Radio Main Power: 20-AMP FUSE").



Do **not** install a fuse into the fuse holder at this time.

12. Crimp an appropriate electrical terminal to the short red wire. A corrosion-resistant $\frac{3}{8}$ -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.
13. 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).



A front-mount XL Mobile radio installation can be connected to an additional Control Head to form a multiple control head radio installation. In this case, refer to Section 9.2.2 for Control Head installation procedures.

8.2.3 Ignition Sense (White Wire) Connection

A review of the information [Ignition Sense Location and Considerations](#) information presented in Section 6.3.3, on page 29 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.

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

With this wiring configuration, the radio and its Control Head automatically turn 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. Otherwise, the radio will remain off when the ignition switch/key is on.



NOTE

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 because 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 black-wired blade fuse holder included with the radio's DC Power Cable.
4. Strip the wires coming from the fuse holder approximately $\frac{3}{8}$ -inch.
5. Cut the white wire of the DC power cable and strip ends of the wires approximately $\frac{3}{8}$ inch.
6. Slide heat shrink over each end of wire.
7. Place red splice connectors on the DC power wires and securely crimp.
8. Insert wires of fuse holders into the splice connectors and securely crimp.
9. Slide heat shrink down over splice connectors and use heat gun to seal.
10. Obtain the 3-amp AGC-type fuse included with the cable and install it into the fuse holder.
11. Tie and stow all wiring as necessary so it remains out of the way of casual contact and wire chafe is avoided.
12. Continue with the speaker installation procedures presented in Section 10.1 on page 77.

8.2.3.2 Radio Turns On and Off with a Manual Switch

With this wiring configuration, the radio (and its Control Head) 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. Otherwise, the radio will remain off when the switch is on.

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 black-wired blade 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 blade 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.**"
13. Continue with the speaker installation procedures presented in Section 10.1 on page 77.

8.2.3.3 Radio Is "Hot Wired"

In the "hot-wired" configuration, the radio (and its Control Head) 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 8.2.3.1, 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 blade fuse.

9 REMOTE-MOUNT RADIO INSTALLATION

Installing a Remote-Mount mobile radio consists of the following:

- Installing the remote mount mobile radio with a Control Head, and their brackets;
- Installing wiring and cabling
- Installing speaker bracket and speaker;
- Installing mic and mic clip.



NOTE

Equipment should be mounted only after the authorized customer representative has approved the installation plan. Figure 9-1 shows a basic process flow for installing the remote-mount mobile equipment.

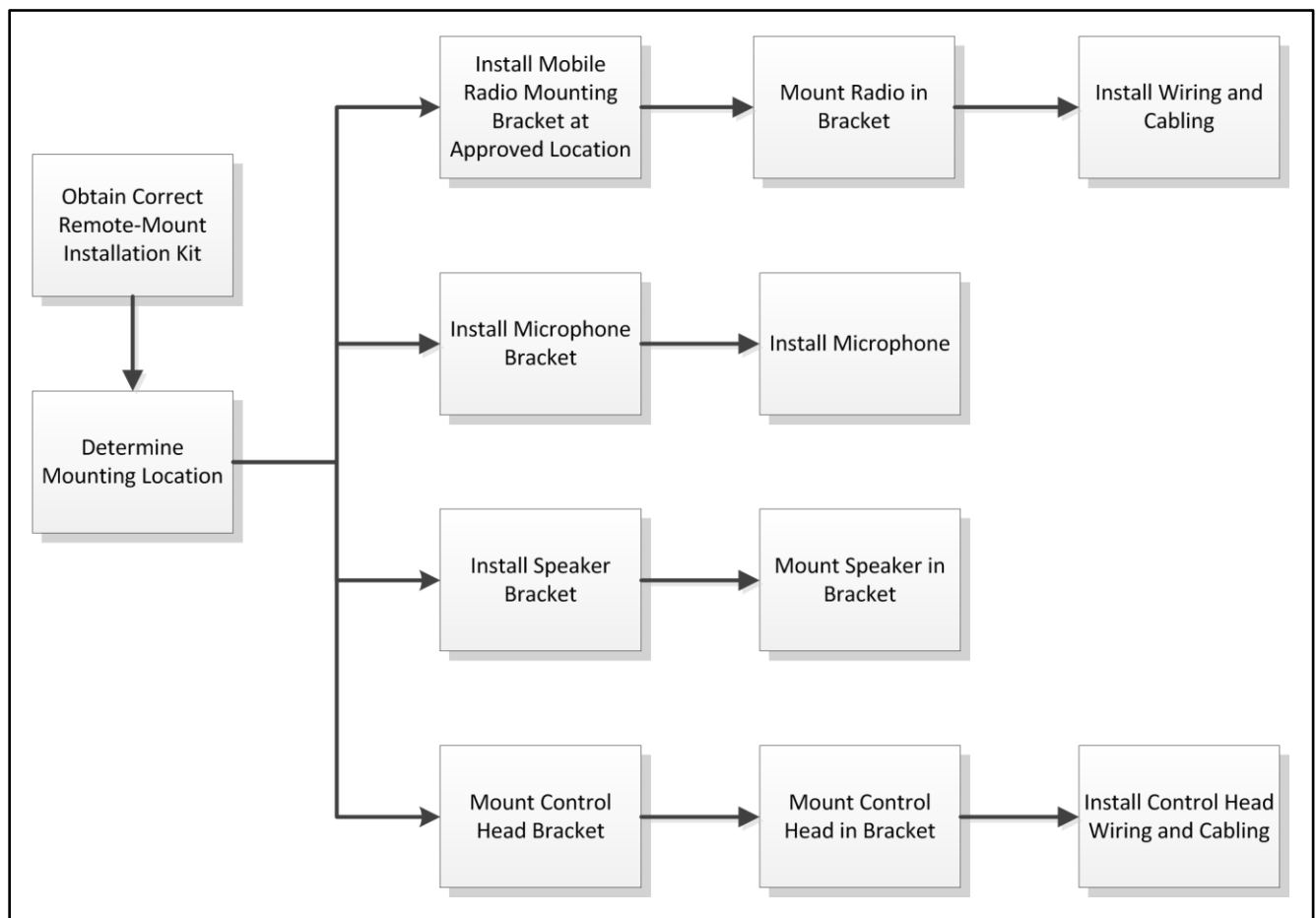


Figure 9-1: Remote-Mount Installation Process

9.1 MOUNTING THE REMOTE-MOUNT RADIO

**NOTE**

This section includes detailed instructions for mechanically installing and wiring a remote-mount XL Mobile radio. For front-mount XL Mobile radio installation procedures, refer to Section 8 which begins on page 46.

This section provides details on mounting a remote-mount XL Mobile radio in the vehicle. Control head installation procedures are included in Section 9.3 which begins on page 67.

The remote-mount radio weighs approximately 5.25 pounds (2.38 kilograms). The preferred mounting of the radio is on top of a firm, flat surface. Radio dimensions are provided in Section 3 on page 19.

**WARNING**

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 is unsafe. A weak mount could turn the radio and its mounting bracket into a dangerous 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, reinforce with a metal backing plate (not supplied) or reinforce using another approved mounting method.

**CAUTION**

Though generally mounted in a trunk or remote location, the remote-mount mobile radio must be kept away from heat sources. Mounting it in a location which is out of direct sunlight is recommended but not required.

Adequate ventilation space must be provided to the side fins. The radio reduces its RF output power when its ambient temperature exceeds approximately +140° Fahrenheit (+60° Celsius).

**CAUTION**

Before drilling holes and/or installing mounting screws, verify these operations will not damage or interfere with any existing vehicle component (e.g., the fuel tank, a fuel line, the transmission housing, existing vehicle wiring, electronic control modules, etc.). Check to see how far the mounting screws will extend beyond the mounting surface prior to installation. Deburr drilled holes before installing screws.

**CAUTION**

Ensure all equipment is protected from possible damage:

- Position the equipment (especially Control Heads) to avoid direct impact from water and hose-down, snow, dust, smoke, gases, road debris, oils, chemicals, and corrosive agents.
- If installing equipment behind a door or cover in a protective enclosure, always ensure there is adequate airflow and cooling.
- Use splash guards, shields, or covers, to protect against direct impacts.

**NOTE**

Prior to beginning the installation, verify the radio has the proper version of software and verify that it has been configured properly for customer usage. Consult with the radio system network administration personnel as necessary.

9.1.1 Mounting Bracket Installation

The VCH Mounting Bracket Kit 14050-6200-01 contents are shown in Figure 8-4.

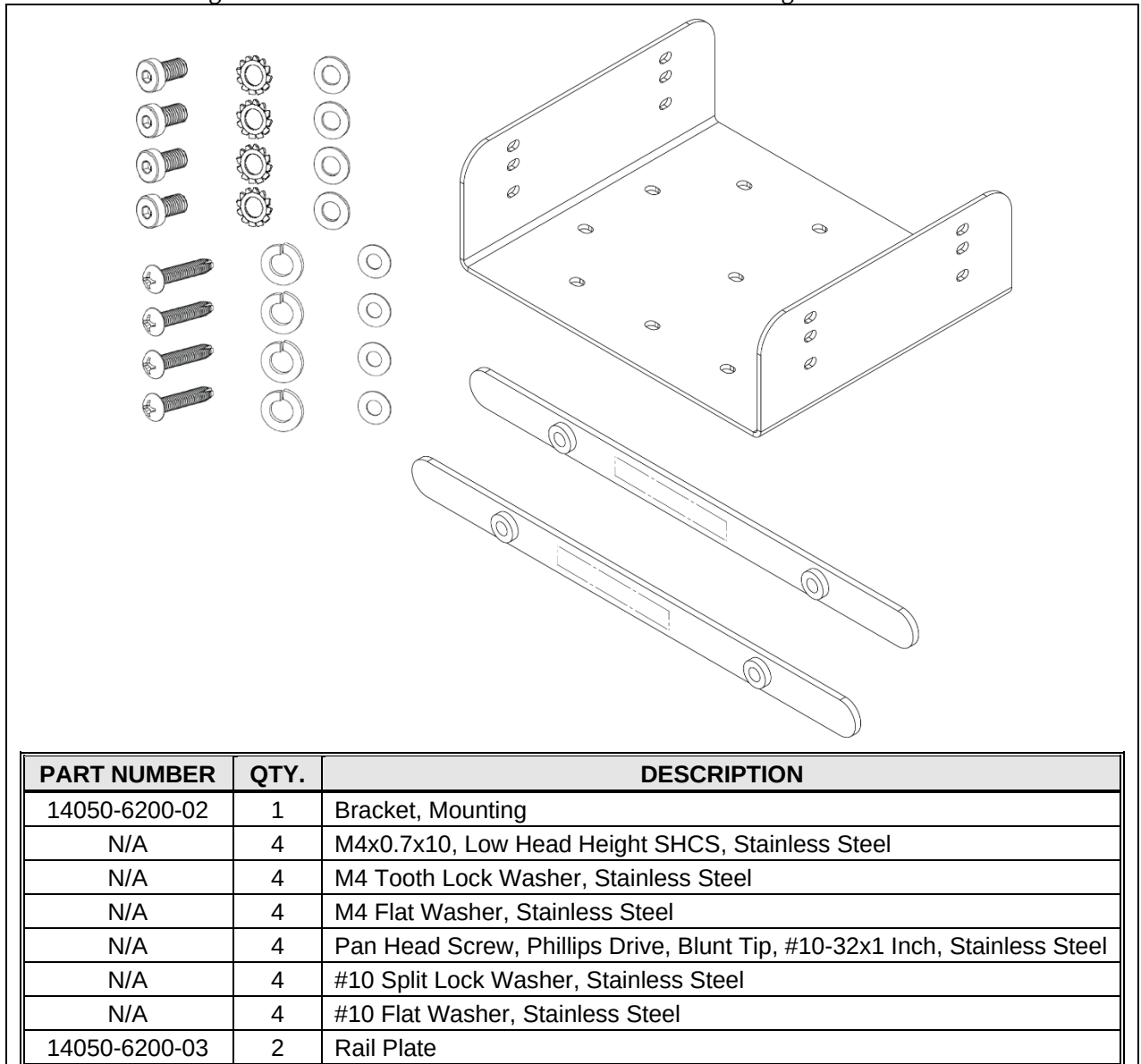


Figure 9-2: VCH Mounting Bracket Kit 14050-6200-01

When selecting a mounting location for the radio, verify there is sufficient clearance 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. 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.

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.

Other types 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. The mounting bracket has three (3) mounting holes:
 - The upper row of mounting holes is preferred for a front mount radio installation with the bracket located below the radio (e.g., for installation over a transmission hump).
 - The middle row of mounting holes is preferred for a remote mount radio with the bracket located below the radio (e.g., for installation over a transmission hump).
 - The bottom row of mounting holes is preferred for installing the radio with bracket located above the radio (e.g., for under-dash installation).
2. Loosely connect the rail plates to the mounting bracket using the socket head M4 screws, M4 star washers, and M4 flat washers. Tighten the screws approximately four (4) threads, ensuring they do not protrude beyond PEM nut on the rail plate (see Figure 8-5).

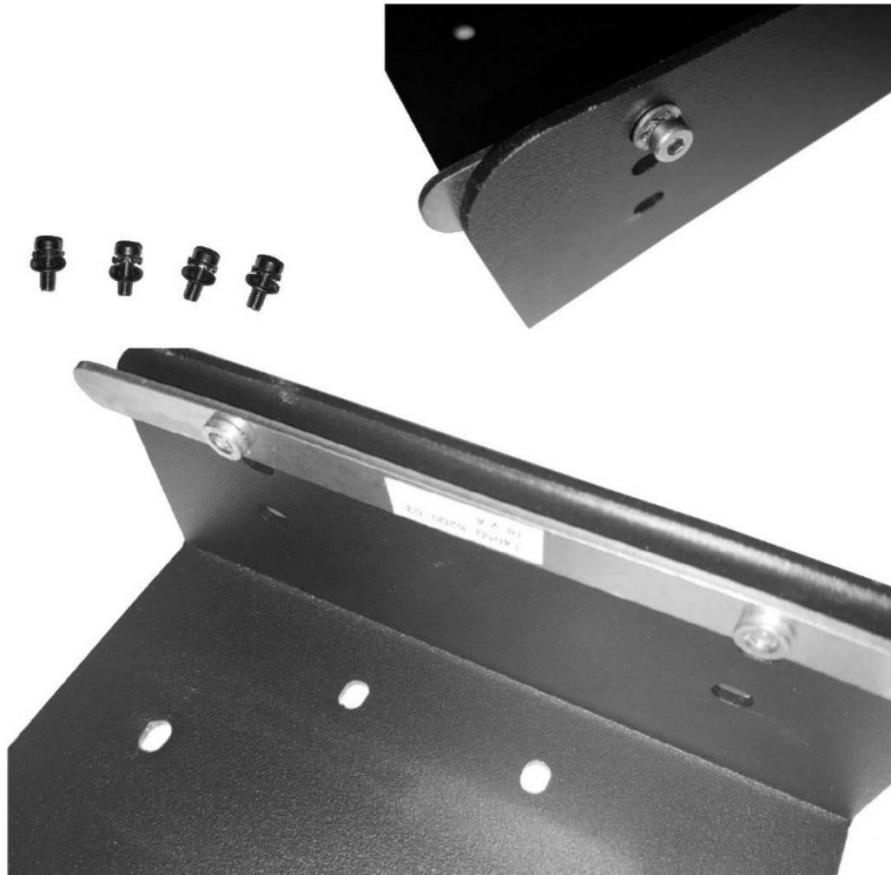


Figure 9-3: Install Side Rails in Mounting Bracket

3. Determine the best radio-to-bracket position and angle by test-fitting the radio into the mounting bracket at the selected vehicle mounting location. 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 Control Head.
4. 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.
5. On the mounting surface, mark the selected location for the bracket.

6. Clean and remove any foreign material from the mounting surface.
7. Using the bracket as a template, 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 (e.g., the fuel tank, a fuel line, the transmission housing, existing vehicle wiring, electronic control modules, etc.). Always verify how far the mounting screws will extend beyond the mounting surface prior to installation. Always deburr drilled holes before installing screws.

8. Deburr all the newly drilled holes.
9. If necessary, apply an approved paint or rust-inhibitor at the holes in the mounting surface.
10. Set the bracket back into place.
11. Install and tighten the mounting screws/hardware.
12. 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.

9.1.2 Inserting the Radio into the Mounting Bracket

Insert the radio into the mounting bracket according to this procedure:

1. Carefully align both rail plates, on the mounting bracket, with the rails on the VCH.

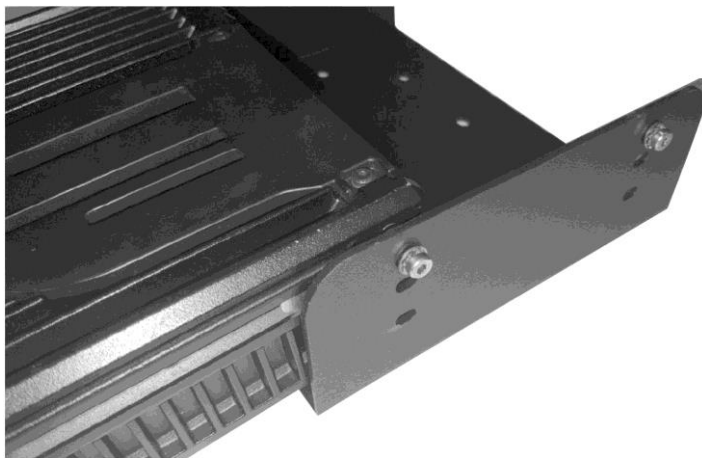


Figure 9-4: Align Bracket Rail Plates with VCH Rails

2. Slide the radio into the mounting bracket. Position the VCH within the mounting bracket, avoiding imbalance. Ensure the center of gravity is within the edges of the mounting bracket.



Figure 9-5: Acceptable VCH Positions within Bracket

3. When the radio is in the desired location within the bracket, tighten the four (4) M4 screws to a torque of 5.85Nm using the 3 mm Allen wrench, or hex bit.
4. Check the mounting area to ensure there is proper clearance for cable service looping, for air circulation, and an area for securing excess cable.



NOTE

Proper mounting helps ensure optimal radio performance. An improperly mounted radio may experience degradation in the quality of voice and data communications.

9.2 REMOTE-MOUNT RADIO'S WIRING AND CABLING

Wiring and cabling includes the following Items:

- 12 VDC battery connection (A+) and wire routing for the rear-mount radio and Control Head.
- Return connection and wire routing for the rear-mount radio and Control Head.
- Ignition sense connection and wire routing for the rear-mount radio and Control Head.



CAUTION

Any DC input power provided to the radio must not be higher or lower than 13.6 volts DC $\pm 10\%$.

The DC input power should be free and clear of any AC noise or DC spikes above 18 volts. If the vehicle cannot meet these requirements, then DC conditioning is required before any DC power is connected to the radio. This includes conditioning for both the radio's main DC power input lead and for its switched ignition sense power input. DC conditioning can be accomplished by a noise filter or DC isolation equipment such as Harris part number FL-018314-001 or FL-018314-002, or similar units with equal specifications. A fuse must be placed in-line before any noise filter. Contact TAC for additional information.

These filters **cannot** be used with the 110-watt VHF mobile radio; in this case, consult with TAC for details if necessary.



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.



To prevent damaging the radio, always connect power cables before connecting the Ethernet cables.

If only removing the transceiver, always disconnect the Ethernet cable first and then the power cable. When reinstalling the transceiver, always connect the power cable before connecting the Ethernet cable.



Do not confuse the radio's DC Power Cable which has a 10-AWG red wire with the Control Head's DC Power Cable which has a 12-AWG red wire. The radio requires much more DC operating current than the Control Head. Therefore, it requires the larger wire size of 10-AWG.

The part number of the radio's DC Power Cable is CA-012365-001 and it has two wires which are 20-feet long.

In a typical vehicle installation, as a time saving measure, most of the length of the Ethernet cable between the remote-mount radio and the Control Head can be routed together with the red wire of the radio's DC Power Cable. Also, any necessary option/accessory cables from the back of the radio can also be routed with this wire and cable.

The following wire and cable installation procedures are recommended:

9.2.1 Radio Power Ground (Black Wire) Connection

Use the following procedure to provide a suitable ground connection for the radio:

1. Obtain the radio's DC Power Cable, part number CA-012365-001.
2. Temporarily connect this cable to the radio by mating the cable's 3-pin connector to the radio's 3-pin power connector. Locking the two connectors is not necessary at this time.
3. 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.
4. Verify the black wire has sufficient length to reach the ground point. If not, it can be extended by splicing a 10-AWG wire to it. In this case, use approved wiring splicing methods and materials.
5. Strip the area of any paint or dirt to expose a bare metal surface, approximately ¾-inch square.
6. Drill a hole in the approximate center of the bare metal surface and deburr it. A ⅜-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.
7. Prepare the ground (black) wire:
 - a. Cut the black wire to the required length plus some additional length for a service loop.
 - b. Strip insulation back approximately ¼-inch.
 - c. Crimp a ⅜-inch non-insulated ring terminal (supplied with the cable) to the end of the black wire.
8. Fully connect the cable to the radio by mating its 3-pin connector to the radio's 3-pin power 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.

9. 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.
10. Apply an approved paint or rust-inhibitor over the remaining exposed bare metal surface and around the ring terminal.

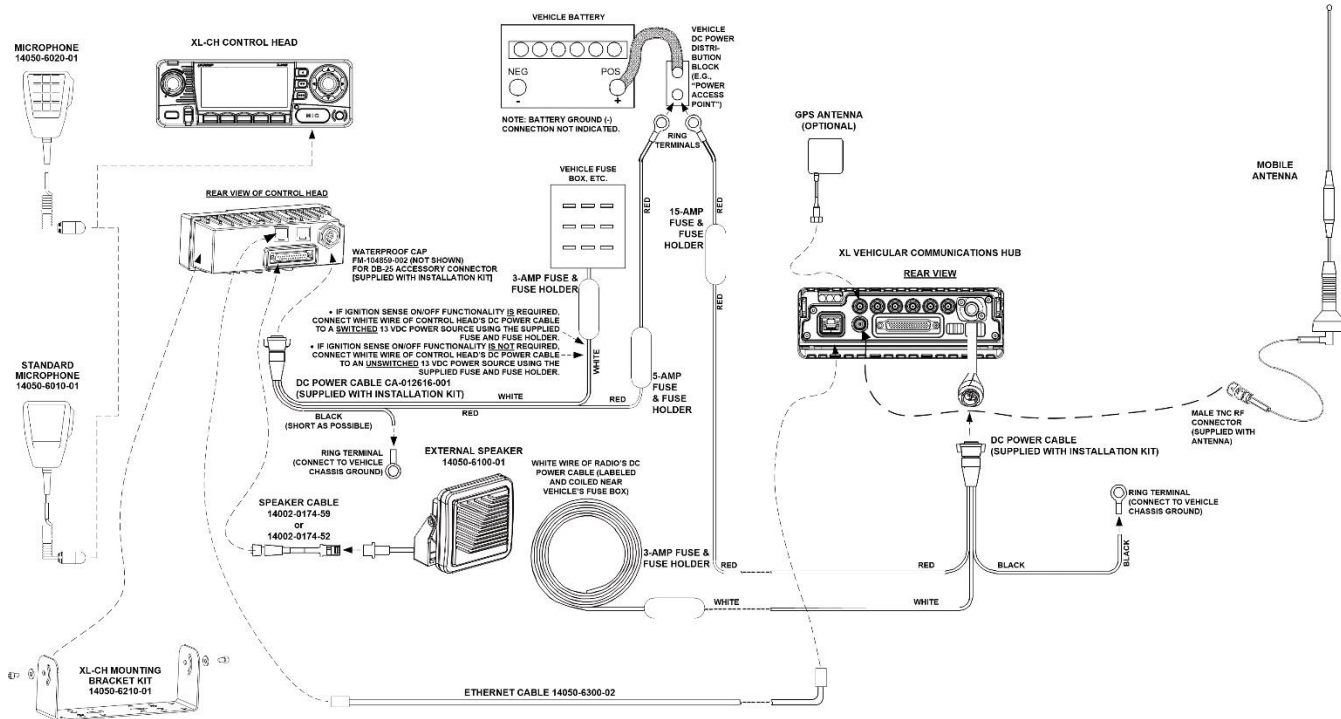


Figure 9-6: Wiring Diagram for a Remote-Mount Radio Installation

9.2.2 Red Wire, Main Fuse Holder Connection (Radio's Main Power Wire) and Ethernet Cable

In a typical vehicle installation, most of the Ethernet cable between the remote-mount radio and the Control Head can be routed through the vehicle along with the 10-AWG red wire of the radio's DC power cable. This is a time-saving measure. Any necessary option/accessory cables from the back of the radio can also be routed with this wire and cable within the vehicle's interior (i.e., up to but not through the vehicle's firewall). The following installation procedure is recommended:

1. From the installation kit, obtain the Ethernet cable.
2. Remove interior panels, door kick panels, etc., as necessary to route the 10-AWG red wire and the Ethernet cable from the area of the remote-mount radio (typically near the rear of the vehicle) to an area near the vehicle's firewall.
3. Route the red wire and the Ethernet cable through existing channels in the vehicle body to an area near the vehicle's firewall. Leave service loops at the rear of the radio. Ethernet cable installation is completed per a later procedure in this manual (Section 9.3.6).
4. Continue installation of the 10-AWG red wire by routing it through the vehicle's firewall to the location of the vehicle's battery (or its main DC bus bar or stud). Use an existing access hole in the vehicle's firewall if possible.

Alternately, drill a new hole approximately $\frac{3}{8}$ -inch in diameter and install a small rubber grommet to protect the wire from chafing on the hole's sharp metal edge.



CAUTION

To prevent fumes from entering the passenger compartment, any hole/grommet/wire combination in the vehicle's firewall must be sealed with a silicon-based sealer before completing the installation.

5. Protect the red wire and the Ethernet cable from possible chafing where necessary. Tie and stow as necessary.



WARNING

Battery Ground WARNING! 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 and Control Head 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.



CAUTION

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.

6. Obtain the orange-wired blade fuse holder included with the DC Power Cable.
7. Observe and follow the previously presented **Battery Ground WARNING!**
8. 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).
9. Strip the wires coming from each fuse holders approximately $\frac{3}{8}$ -inch.
10. Cut the red wire of the DC power cable and strip ends of the wires approximately $\frac{3}{8}$ inch.
11. Slide heat shrink over end of each wire.
12. Place the yellow splice connectors on the DC power wire and securely crimp.
13. Insert wires of fuse holders into the splice connectors and securely crimp.
14. Slide heat shrink down over spice connectors and use heat gun to seal.
15. Label this fuse holder and red wire appropriately (e.g., "XL Mobile Radio Main Power: 20-AMP FUSE").
16. Do NOT install a fuse into the fuse holder at this time.

17. Crimp an appropriate electrical terminal to the short red wire. A corrosion-resistant $\frac{3}{8}$ -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.
18. 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).

9.2.3 **Radio's Ignition Sense (White Wire) Connection**

For Remote-Mount configurations, the radio's DC Power Cable white wire is not used. This wire should be labelled and coiled near the vehicle's fuse box. Proceed to Section 9.3 on page 67 for [Control Head Installation](#).



NOTE

Most XL Mobile radio installations have one or more Control Heads connected to the radio. In an installation of this type, the white wire of the radio's DC Power Cable requires no electrical connection. Rather than be cut from the cable, it is recommended that it be routed up to the vehicle's fuse box, coiled, labeled, and stowed for possible future use.

The white wire of the Control Head's DC Power Cable is the radio installation's ignition sense input for on/off power control of both the Control Head and radio. Radio on/off power control is accomplished by the Control Head. The Control Head "wakes-up" the radio via data activity on the Ethernet link.

9.3 CONTROL HEAD INSTALLATION

The remote-mount XL Mobile radio must be connected to a Control Head to provide the operator-to-radio interface; see Figure 9-7. A Control Head is interfaced to the radio via an Ethernet cable. The Control Head is separately fused and powered by an individual DC power cable.

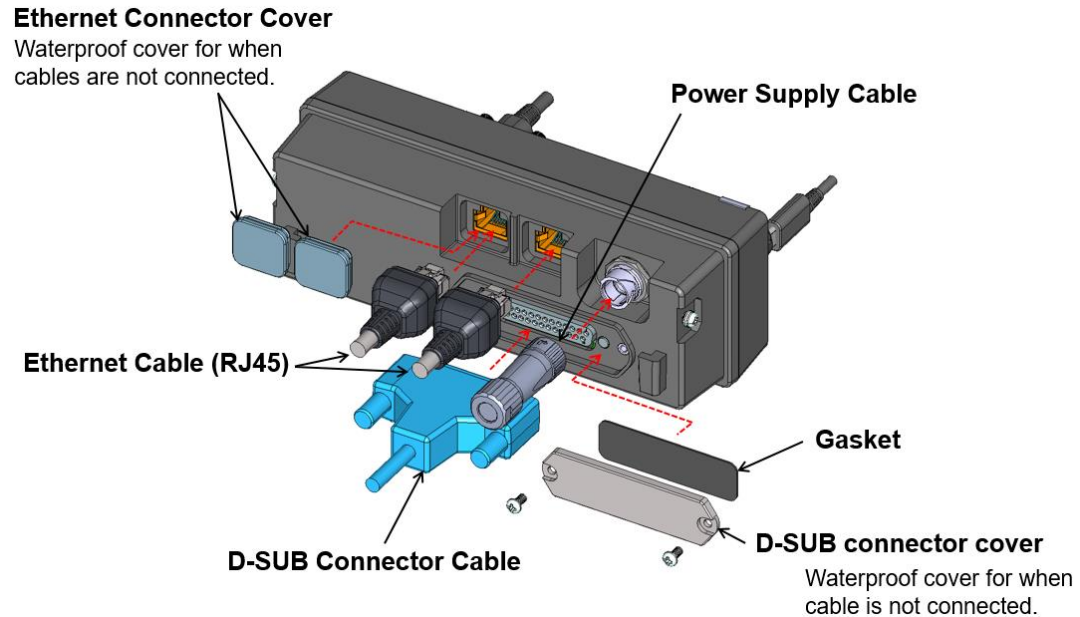


Figure 9-7: XL-CH Rear Panel

9.3.1 General Information on the Control Head

The Control Head's mounting bracket allows pitch-axis (tilt) positioning for best viewing angle. Pitch adjustments are accomplished by loosening socket-head cap screws on each side of the bracket, changing the pitch/tilt of the head as needed, and then retightening the socket-head cap screws.

9.3.2 Multiple Control Head Radio Installations

A multiple control head installation could be required in a vehicle such as a fire truck or any large vehicle where more than one operator position must support radio use. For example, a ladder fire truck could have a front-mount XL Mobile radio mounted under the truck's dash panel and a remote-mount Control Head mounted at the ladder operator's position. Each Control Head in a multi-head installation is equipped with an external speaker, a microphone, and optionally-connected equipment. Multi-control head installations provide other benefits such as intercom functionality.

For a multi-control head radio installation, mechanical installation and DC power connections for an additional control head are accomplished in the same manner as for a single-head remote-mount radio installation. See Sections 9.3.3 and 9.3.4 respectively.

9.3.3 Control Head Installation

**NOTE**

Prior to installing the Control Head, verify it has the proper software version installed and verify that it is properly configured for customer use. Consult the radio system administration personnel as necessary.

9.3.3.1 Selecting the Mounting Location

**CAUTION**

When selecting a mounting location, ensure the Control Head and all associated accessories (microphones, speakers, cabling, mounting brackets, and hardware) are protected from possible damage.

- Install and protect the Control Head(s) to avoid direct impact from water and hose-down, snow, dust, smoke, gases, road debris, oils, chemicals and corrosive agents.
- Use splash guards, shields, or covers to protect the Control Head from direct impacts.

When selecting a location for the Control Head, first observe the safety and operator convenience-related information presented in Section 6.3 on page 27. Always consider and include clearance for the microphone's connector that must mate to the mic connector on the front panel of the head, and clearance for the connectors/cables that must mate to the connectors on the rear panel of the head. The Control Head can be mounted under or on top of a mounting surface (typically the vehicle's dash) as space permits using either the standard U-shaped mounting bracket or the optional mounting pedestal.

The radio, the Control Head must be mounted to a mechanically-rigid surface. The Control Head must not vibrate when the vehicle is in motion and it must remain stable during normal operations by an operator (i.e., button presses, knob rotation, excessive tugs on the mic cord, etc.). If the Control Head is mounted to a plastic dash panel, either fender washers or a field-fabricated metal backing plate should be utilized to mount the head's bracket to the plastic dash panel.

9.3.3.2 Installation Using the Standard U-Shaped Mounting Bracket

Follow this procedure if using the standard U-shaped mounting bracket to mount the Control Head:

1. Obtain the mounting bracket from the respective installation kit, as illustrated in Figure 9-8.

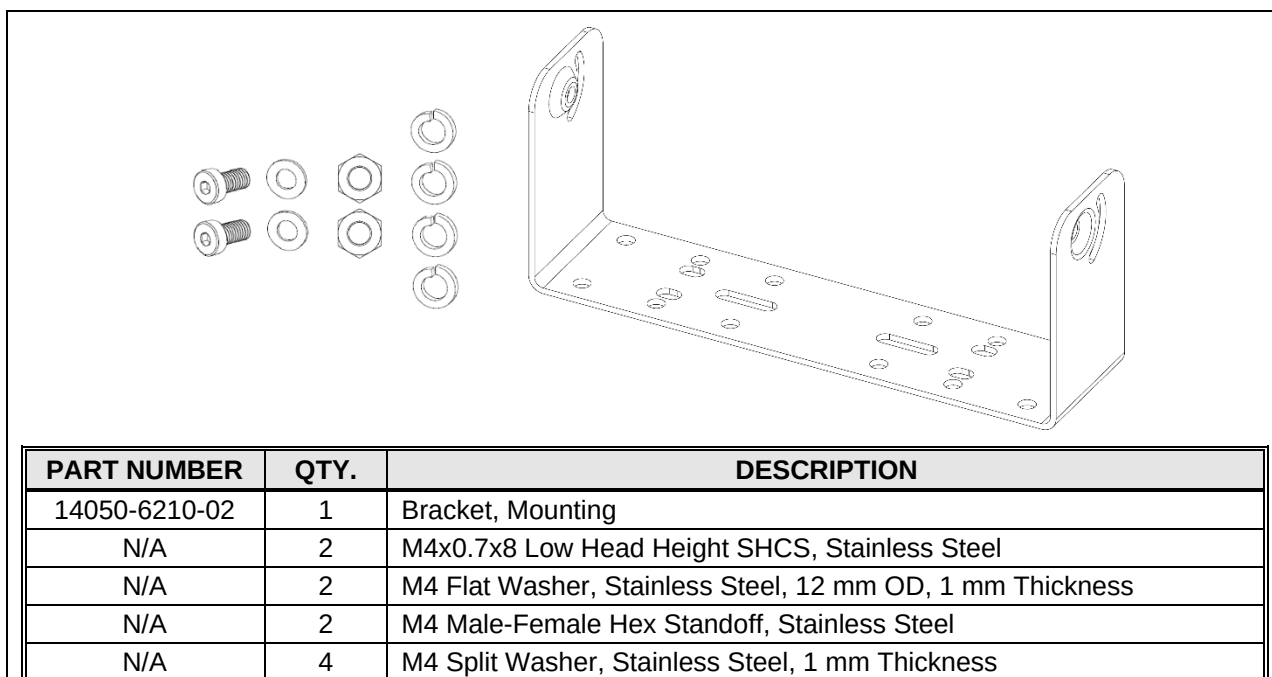


Figure 9-8: XL-CH Mounting Bracket Kit 14050-6210-01

2. Using the mounting bracket as a template, mark and drill mounting holes into the mounting surface as required. The round and elliptical holes in the bracket's vehicle mounting surface are symmetrical, so forwards/backwards positioning is not important during this step. However, positioning is important in the next step.



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, electronic control modules, etc.). Always check to see how far the mounting screws will extend beyond the mounting surface prior to installation. Always deburr drilled holes before installing screws.

3. Position the bracket at the mounting surface so the two round holes in its two side "ears" are nearest to the normal location of the operator (typically towards the rear of the vehicle) and the two slotted holes are furthest from the normal location of the operator (typically towards the front of the vehicle).
4. Install and tighten the mounting screws. Screws for mounting the bracket to the mounting vehicle's surface are not included, as all installations differ. Self-threading screws are recommended. Use of self-drilling screws may cause damage to some mounting surfaces, such as a plastic dash panel.
5. Verify the bracket is held firmly to the mounting surface. Firm mounting prevents unreasonable vibration, which could damage the Control Head and/or cause its cable connections to loosen.

6. Referring to Figure 9-9, install a hex spacer on each side of the XL-CH and torque to 5.85 Nm. Slide the XL-CH into the bracket and secure with the locking screw.

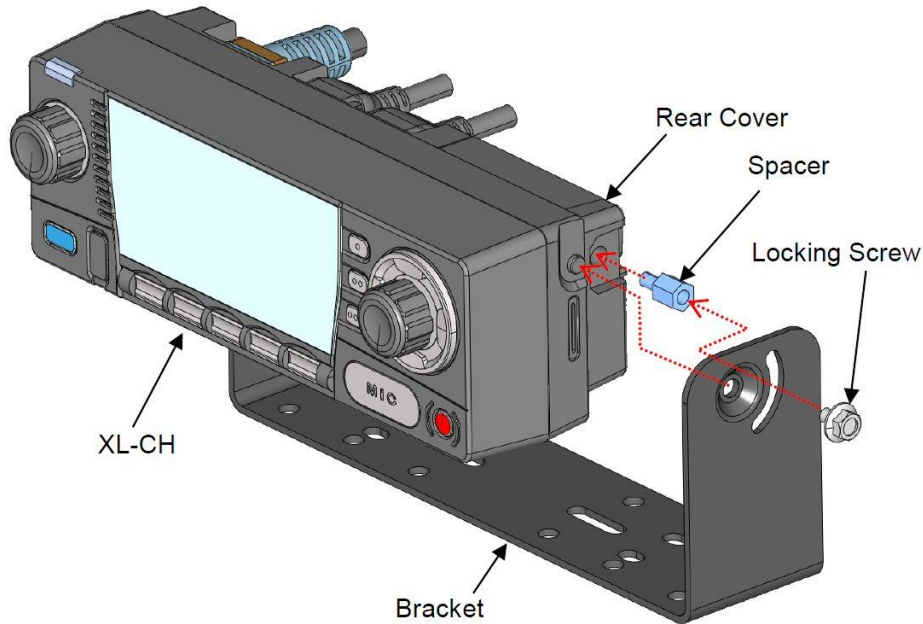


Figure 9-9: Install the XL-CH into the Bracket

7. Position the XL-CH to the desired position and tighten both locking screws to 5.85 Nm. Do not over-tighten.



CAUTION

Locking screws should not be installed/re-used more than eight (8) times, because thread locking strength may suffer after this number of re-installations. Replace the screws with new cap screws if their locking strength is in question and/or after exceeding eight (8) installations.

9.3.3.3 Installation Using the Gimbal Mounting Pedestal (Optional)????

An optional Gimbal Mounting Pedestal, part number TBD????, may be purchased separately to replace the standard U-shaped mounting bracket.

The pedestal attaches to the bottom of the Control Head with Pedestal Mounting Kit TBD?????. This kit includes Adapter Bracket TBD???? and stainless-steel #8 hardware. The complete assembly is then attached to a mounting surface located below the assembly, such as the top of the vehicle's dash panel.



CAUTION

Be sure to use the #8-32 screws (with washers) supplied with the pedestal to attach it to the head. These screws are the correct length for this application and they have SEMS-type washers that will not easily separate from the screw. Installing the wrong screws or the correct screws without the washers and/or the bracket in place could punch-out the floor of the threaded holes, possibly damaging internal components of the head.

9.3.4 Control Head Power Cable Installation

Plan the route of the Control Head's DC Power Cable carefully. Do not route the cable where it will be damaged by heat sources or by casual contact, and protect it from wire chafe per standard installation methods. The following procedures are recommended:

1. Obtain the Control Head's DC Power Cable from the respective installation kit.
2. Connect this cable to the large 3-pin connector at the rear of the head.
Visually align the key and gently push and turn the outer locking ring clockwise until it stops. A click will be sensed to confirm proper mating.
3. Prepare the ground (black) wire:
 - a. Cut the black wire to the required length plus some additional length for a service loop.
 - b. Strip insulation back approximately ¼-inch.
 - c. Crimp a ⅜-inch non-insulated ring terminal (supplied with the cable) to the end of the black wire.
4. Drill a hole, as necessary, and attach this ring terminal to chassis ground.
Use stainless-steel self-locking hardware (i.e., machine screws with washers and locking nuts) or other appropriate hardware to ensure reliable terminal-to-metal contact. Tighten securely.
5. At the back of the Control Head, tie and stow the cable as necessary.
6. For the positive 12-volt DC main power source connection, route the cable's red wire to the location of an **unswitched** 12-volt DC power source, typically near the vehicle's battery.
Remove interior panels, door kick panels, etc. Protect the wire from possible chafing as necessary. This is the Control Head's main DC power source.
7. Obtain one of the orange-wired blade fuse holders included with the Control Head's DC Power Cable.
8. Cut excess length from the red wire and crimp the fuse holder into it, near the location of the unswitched 12-volt DC power source connection point.
9. Using an appropriate electrical terminal, connect the red wire to the unswitched DC power source.
A ⅜-inch ring terminal is included with the cable for this purpose, but another terminal type (not supplied) may be used if required.
10. Obtain the 5-amp blade fuse included with the cable and install it into the fuse holder.



CAUTION

The fuse for the Control Head's red wire is rated at 5 amps. The 3-amp fuse included with the cable must **not** be used for fusing the Control Head's main DC power. It fuses the head's white wire.



NOTE

Do not share the Control Head's fuse with any other device. Doing so can cause excess current to flow through the fuse, causing it to blow unnecessarily.

9.3.5 Ignition Sense (White Wire) Connection

Radio on/off power control is accomplished by the Control Head, except in the case of a data-only radio installation which has no Control Head. In a standard installation, when the Control Head is turned on, it “wakes-up” the radio via data activity on the Ethernet link.

A review of the [Ignition Sense Location and Considerations](#) information presented in Section 6.3.3, on page 29 may be beneficial. As required per the chosen power-up configuration, connect the white wire by following one of the three procedures presented in the following sub-sections.

- **Radio turns on and off automatically with vehicle’s ignition switch/key** - The white wire of the Control Head’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 Control Head’s on/off/volume control must be left in the on position for automatic power-up/down to function properly.



NOTE

In a remote-mount radio installation, to fuse the white wire of the Control Head’s DC Power Cable, a black-wired blade fuse holder and a 3-amp blade fuse are included with the cable.

- **Radio turns on and off with a manual switch** - The Control Head’s DC Power Cable white wire 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 amps.
 - When using this configuration, the Control Head’s on/off/volume control must be left in the on position for automatic power-up/down to function properly.
- **Radio turns on with Control Head’s on/off/volume control (“hot-wired”)** - The Control Head’s DC Power Cable white wire must be connected to unswitched and fused vehicle power. The required fuse rating is 3 amperes.

In all three configurations, both the radio’s main DC power input (red wire) and the Control Head’s main DC power input (also a red wire) must each be connected through separate in-line fuses to unswitched vehicle DC power.

9.3.5.1 Control Head and Radio Turn on with Vehicle’s Ignition Switch/Key

With this wiring configuration, the Control Head and radio automatically turn on and off with the vehicle’s ignition switch/key. The white wire of the Control Head’s DC Power Cable 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. Otherwise, the radio will remain off when the ignition switch/key is on.


NOTE

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 because 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 Control Head's DC Power Cable from the back of the head to the area near this connection point. Protect the wire from possible chafing as necessary.
3. Obtain one of the black-wired blade fuse holders included with the Control Head'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. Strip the wires coming from the fuse holder approximately $\frac{3}{8}$ -inch.
6. Cut the white wire of the DC power cable and strip ends of the wires approximately $\frac{3}{8}$ -inch.
7. Slide heat shrink over end of each wire.
8. Place the red splice connectors on the DC power wires and securely crimp.
9. Insert wires of fuse holder into the splice connectors and securely crimp.
10. Slide heat shrink down over splice connectors and use heat gun to seal.
11. 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.

12. Obtain the 3-amp blade fuse included with the cable and install it into the fuse holder.
13. Tie and stow all wiring as necessary so it remains out of the way of casual contact and wire chafe is avoided.

9.3.5.2 Control Head and Radio Turn On with a Manual Switch

With this wiring configuration, the Control Head and radio are manually turned on and off via an on/off switch mounted separately from the Control Head and 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. Otherwise, the radio will remain off when the switch is on.

1. Route the white wire of the Control Head's DC Power Cable from the back of the head 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 one of the black-wired blade fuse holders included with the Control Head'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 this 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 blade 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.**"

9.3.5.3 Control Head and Radio Are "Hot Wired"

In the "hot-wired" configuration, the Control Head and radio are 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 Control Head's white wire must be connected to **unswitched and fused 12-volt** vehicle power.

Follow the procedure presented in Section 9.3.5.1, 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 blade fuse.

9.3.6 Control Head-to-Radio Ethernet Cable Connections

Figure 9-10 illustrates Ethernet cable connections for a single Control Head installation. Figure 9-11 illustrates this for a multi-head Control Head installation where, for example, one Control Head is located at the main operator location and another is located near the rear of the vehicle.



To prevent damaging the radio, always connect power cables before connecting the Ethernet cables.

If only removing the transceiver, always disconnect the Ethernet cable first and then the power cable. When reinstalling the transceiver, always connect the power cable before connecting the Ethernet cable.

Always connect or disconnect radio cables in the following sequence:

Connecting Cables:

1. Connect the DC power cable to each remote Control Head.
2. Connect the Ethernet cable to each remote Control Head.
3. Connect the DC power cable to the transceiver.
4. Connect the Ethernet cable to the transceiver.

Disconnecting Cables:

1. Disconnect the Ethernet cable from the transceiver.

2. Disconnect the DC power cable from the transceiver.

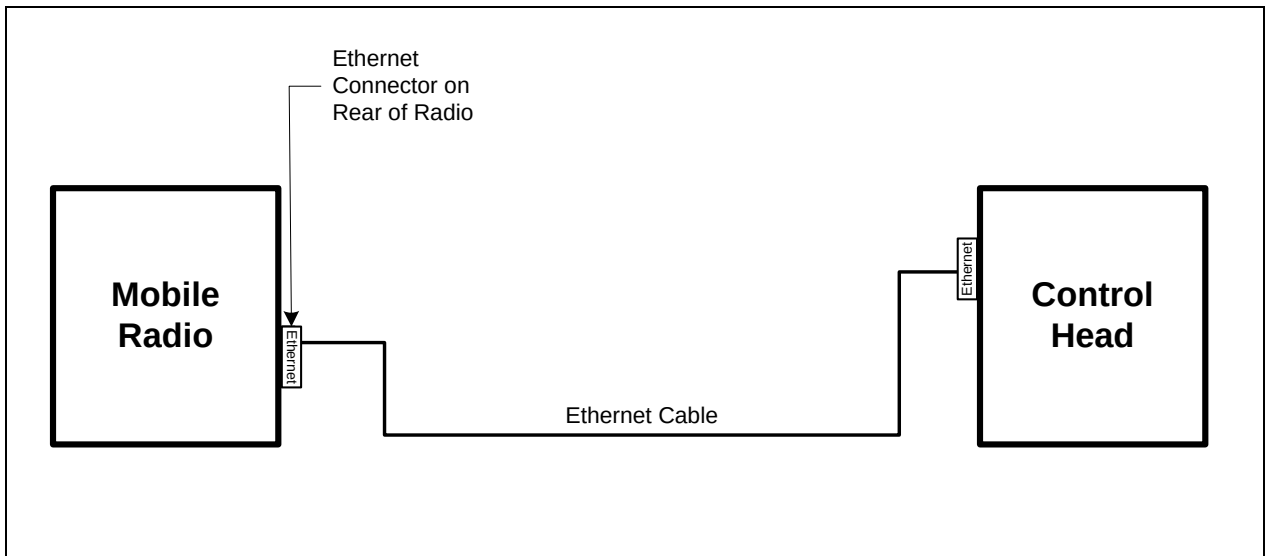


Figure 9-10: Ethernet Connection for a Single Control Head Installation

Follow this procedure for an installation which has only one Control Head. For a multi-control head installation, refer to Figure 9-11 as necessary (up to five control heads can be daisy chained this way).

1. If the Ethernet cable was partially installed along with the red wire, as described in Section 9.2.2, continue to install the Ethernet cable by routing it to the area near the rear of the Control Head.

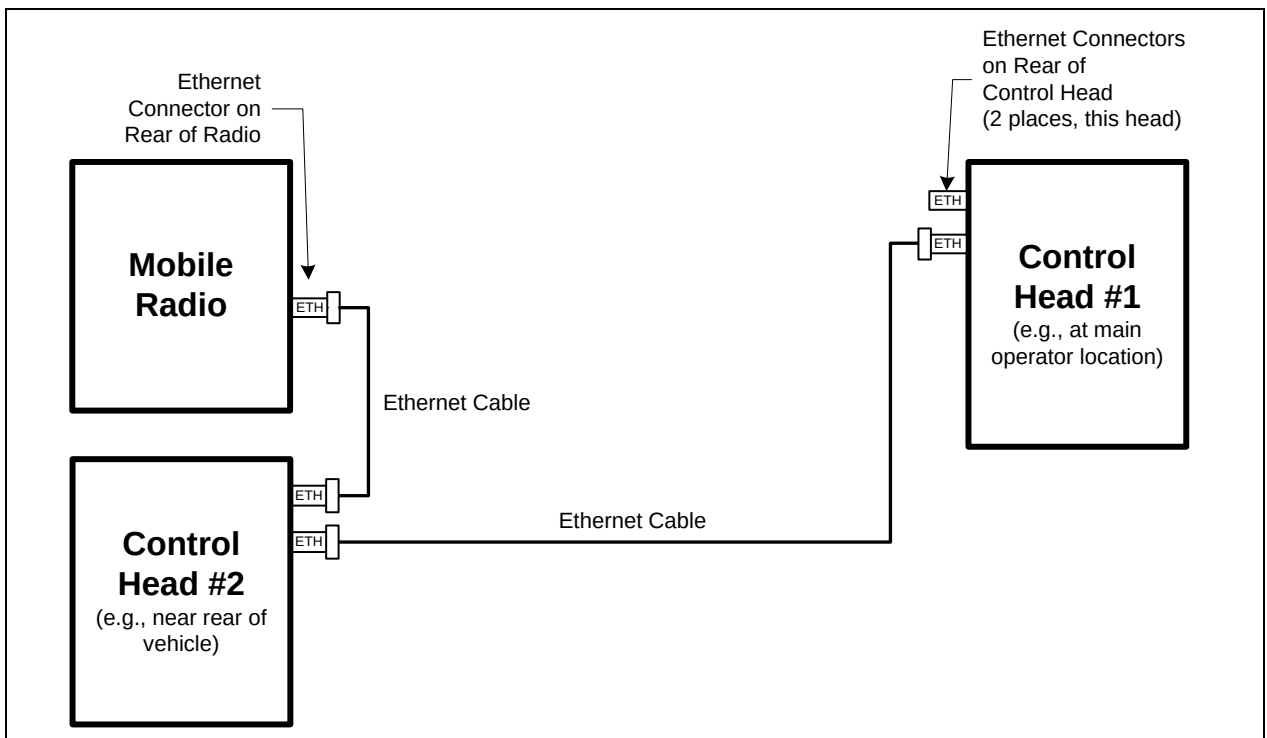


Figure 9-11: Ethernet Connections for Multiple-Control Head Installation

**NOTE**

If the mobile radio installation must be interfaced to other equipment that is mounted near the Control Head, simultaneous routing of the related interface cables along with the Ethernet cable saves time.

2. Mate one end of the Ethernet cable to the other Ethernet connector on the rear panel of the Control Head.
3. If not already mated, mate the other end of the Ethernet cable to the Ethernet connector on the rear panel of the radio.
4. Any necessary option/accessory cables from the back of the radio can also be routed with this wire and cable within the vehicle's interior (i.e., up to but not through the vehicle's firewall).
5. Loop, tie, and stow the cable(s) as necessary, leaving a service loop at the back of the radio and at the back of the Control Head. Protect the entire length of the cable(s) and wire(s) from possible chafing.

10 OPTIONS AND ACCESSORIES

10.1 SPEAKER INSTALLATION



CAUTION

Ensure the speaker is adequately protected if it could be exposed to a harsh environment, such as water and hose-down, snow, dust, smoke, gases, road debris, oils, chemicals and corrosive agents.

10.1.1 Front-Mount Radio Installation

In a front-mount radio installation, total speaker cable length (of both cables) 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 at moderate volume.
2. Install the speaker using the hardware and mounting bracket supplied with it. For the speaker's part number, see Table 6-1 on page 35.
3. Route the speaker cable to the rear of the radio.
4. Connect Option Cable 14002-0174-50 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.



NOTE

If the approximate speaker cable length of 10 feet is not long enough, 20-foot Speaker-Only Option Cable 14002-0174-52 can be used in place of Option Cable 14002-0174-50. However, Speaker-Only Option Cable 14002-0174-52 does **not** support any optional connections at the 44-pin (DB-44) connector on the rear of the radio. Use of Speaker-Only Option Cable 14002-0174-52 will provide approximately 25 feet of total cable length for the speaker connection.

5. Mate the Option Cable's 2-pin connector (identified P2 with green and white wires) 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.

10.1.2 Remote-Mount Radio Installation

In a remote-mount mobile radio installation with a Control Head, an audio amplifier in the Control Head drives the external speaker.

For either case, total speaker cable length of both cables between the Control Head and speaker is approximately five (5) feet. Therefore, to include service loops in these cables, the speaker must be mounted within approximately 4.5 feet of the installation's Control Head.

1. Select a location for the speaker that will allow for proper listening range at moderate volume.
2. Install the speaker using the hardware and mounting bracket with which it is supplied.
3. Route the speaker cable to the rear of the Control Head.

4. Mate the 6-inch speaker cable to the 2-pin connector at the rear of the Control Head by visually aligning the $\frac{3}{4}$ -moon-shaped keys of the connectors, and then pushing and turning the outer locking ring of the cable connector clockwise until it stops. A mild click will be sensed to confirm proper mating.
5. Connect the speaker cable's 2-pin plastic connector to the respective mating connector on the 6-inch speaker cable.
6. Route the cables out of the way of casual contact. Tie and stow as necessary.

**NOTE**

In a multi-control head installation, an audio amplifier in each control head drives the head's speaker. Therefore, no special speakers or relays are needed.

10.2 MICROPHONE ATTACHMENT

The XL Mobile microphone is connected to the radio via a USB connector (refer to Figure 5-3).

A microphone hanger is included with each microphone. The radio can be configured to provide a monitor function when the microphone is inserted into the hanger.

**CAUTION**

Harris mobile radio microphones and Harris mic hangers are mechanically optimized to coexist with each other. The respective Harris mic hanger part numbers include 344A4678P1 or 14050-6015-01 for standard applications. The use of a third-party mic hanger with a Harris microphone could potentially result in damage to the microphone and/or inhibit normal radio operation.

Connect the mic to the Control Head and install the mic hanger as follows:

1. Plug the microphone into of the Control Head's USB mic connector.
2. Tighten the thumbscrew securely. Do **not** over-tighten.
3. Using the mic hanger 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 inserted to its hanger, and then attach the microphone hanger 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 hanger does **not** require grounding.
5. Insert the mic into the hanger.

**CAUTION**

Ensure the microphone is adequately protected if it could be exposed to a harsh environment, such as water and hose-down, snow, dust, smoke, gases, road debris, oils, chemicals and corrosive agents.

10.3 GPS NMEA-FORMATTED DATA CONNECTION

To obtain GPS NMEA-formatted serial data from the radio, Option Cable 14002-0174-50 is required. Follow this procedure to complete the GPS NMEA-formatted serial data connections:

1. Obtain Option Cable 14002-0174-50. 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 to the computer’s serial port DB-9 male connector—either directly or extended via cable CA-013671-020 (a 20-foot-long cable). 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 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).

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

11 CABLES AND CONNECTIONS

11.1 ACCESSORY CABLE 14002-0174-50

Accessory Cable 14002-0174-50 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 I/O interfaces provided by the radio. The cable also shortens radio removal and re-installation time when required. The cable is shown in Figure 11-1 below. The cable's 44-pin D-subminiature connector (P8) mates with the connector on the rear of the radio.



CAUTION

Use caution when 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., is powered separately from the radio), both the radio **and** the external device must be properly grounded to the vehicle **before** connecting the two units together and before making a positive (+) DC power connection to either unit. Otherwise, equipment damage may occur.

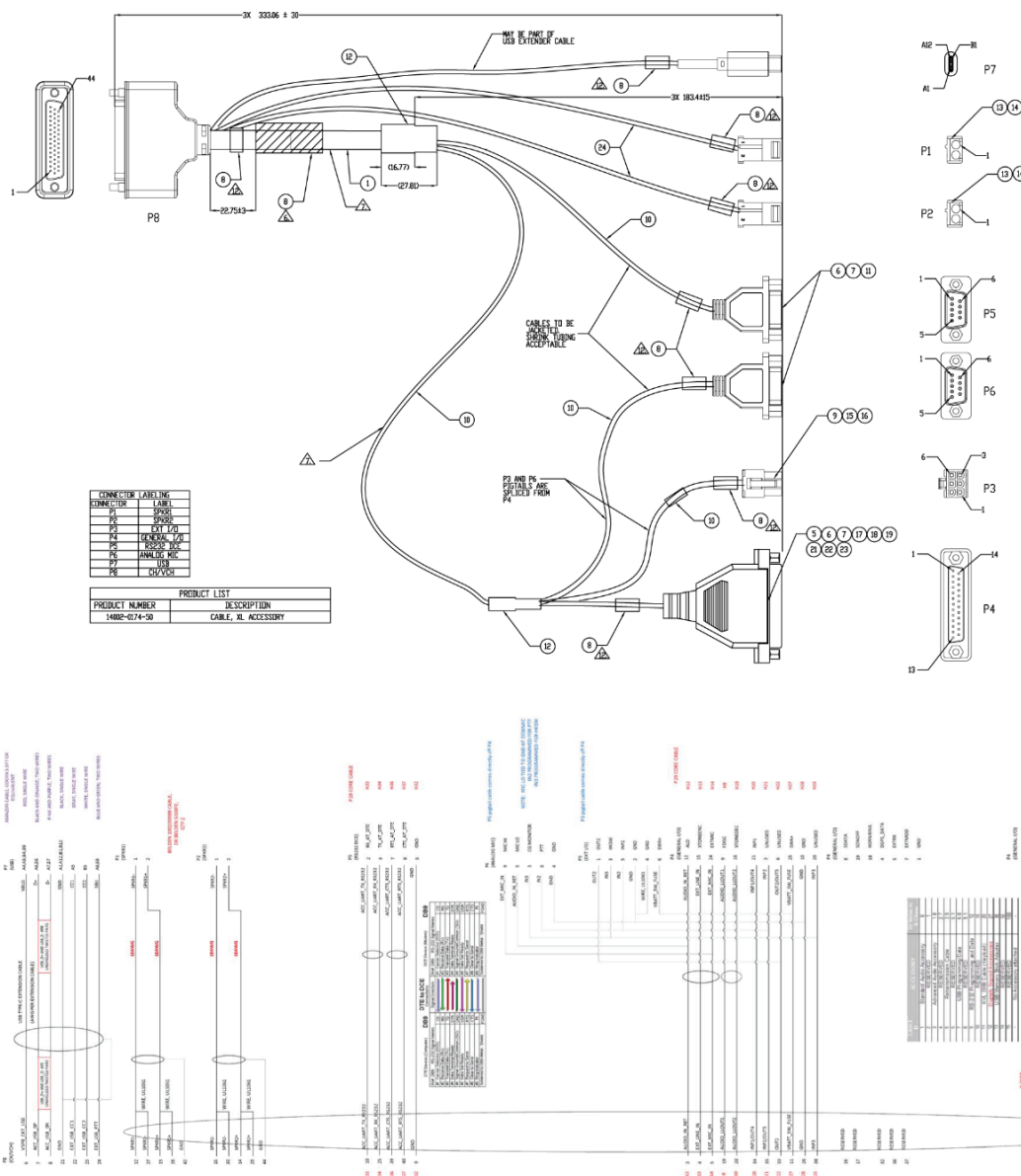


Figure 11-1: Accessory Cable 14002-0174-50

P1 and P2, the cable's 2-pin connectors, provides connections for external speakers.

P3, the cable's 6-pin connector, is a connector for basic accessories (e.g., hookswitch, external relay with back-EMF diode, etc.).

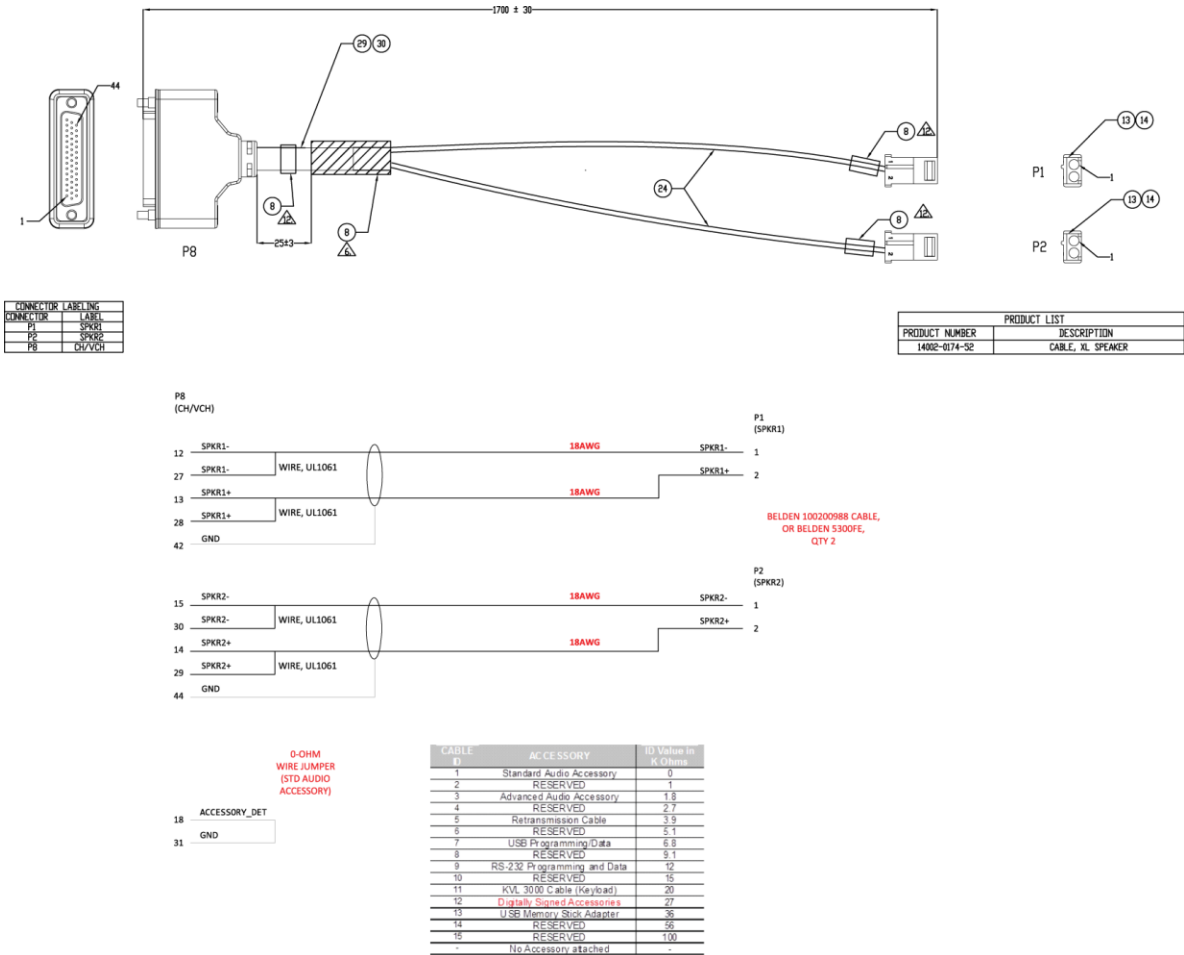
P4, the cable's D-subminiature 25-pin connector, provides audio and data connections for optional equipment.

P5, the cable's D-subminiature 9-pin connectors, provide serial data connections. See Section 10.3 on page 79 for additional information.

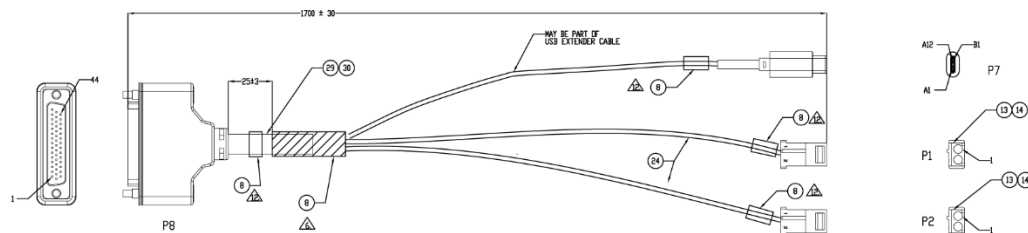
P6, the cable's D subminiature 9 pin connector, provide serial data connection to an analog microphone (similar to MC-014121-003).

P7, the cable's USB Connector, provides connections for USB accessories and the programming cable.

11.2 SPEAKER CABLE 14002-0174-52

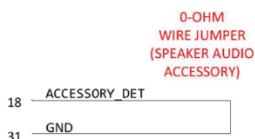
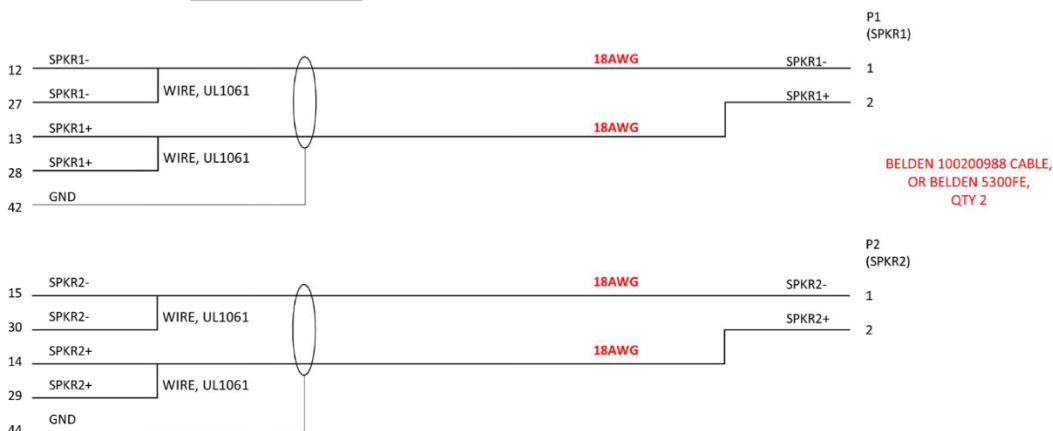
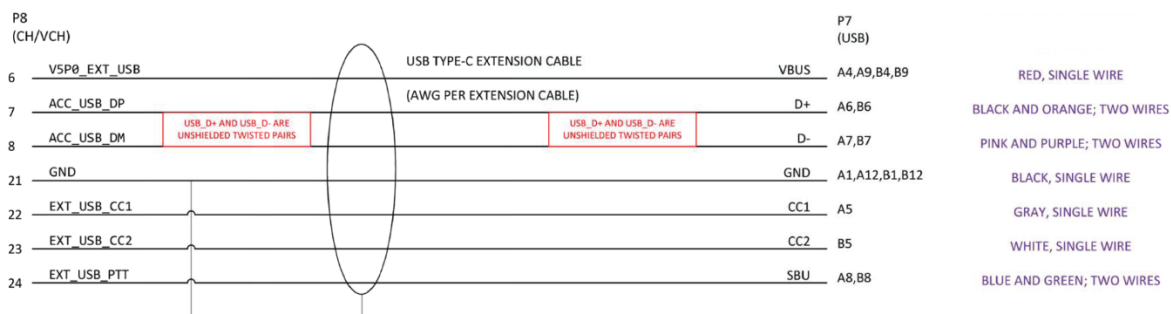


11.3 SPEAKER AND USB CABLE 14002-0174-51



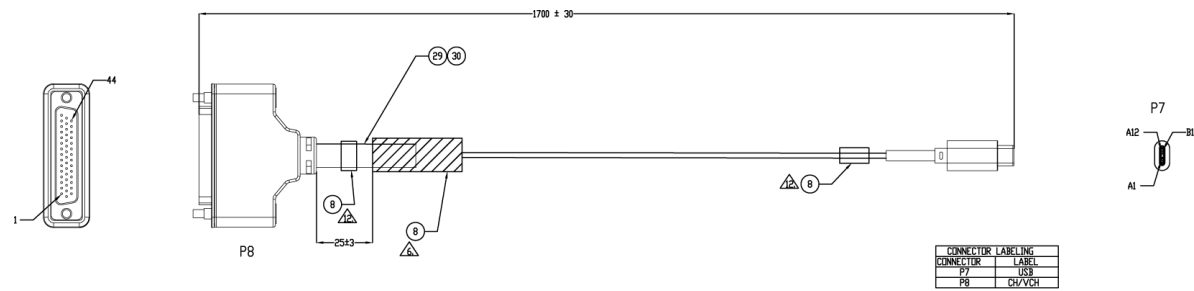
PRODUCT LIST	
PRODUCT NUMBER	DESCRIPTION
14002-0174-51	CABLE, R, USB AND SPEAKER

CONNECTOR LABELING	
MINIATURE	LABEL
P1	SPEAKER
P7	USB
P8	CH/VCH

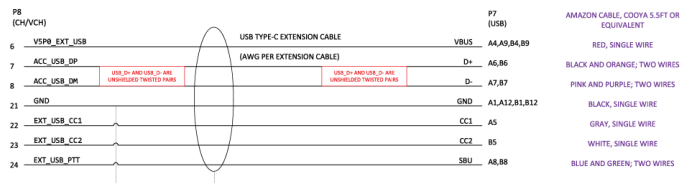


CABLE ID	ACCESSORY	ID Value in K Ohms
1	Standard Audio Accessory	0
2	RESERVED	1
3	Advanced Audio Accessory	1.8
4	RESERVED	2.7
5	Retransmission Cable	3.9
6	RESERVED	5.1
7	USB Programming/Data	6.8
8	RESERVED	9.1
9	RS-232 Programming and Data	12
10	RESERVED	15
11	KVL 3000 Cable (Keyload)	20
12	Digitally Signed Accessories	27
13	USB Memory Stick Adapter	36
14	RESERVED	56
15	RESERVED	100
-	No Accessory attached	-

11.4 USB CABLE 14002-0174-55



PRODUCT LIST	
PRODUCT NUMBER	DESCRIPTION
14002-0174-55	CABLE, XL USB



12 INSTALLATION INSPECTION AND TESTS

This section provides procedures for performing the initial power-up and the radio performance tests. At the end of this section is the [Post Installation Inspection](#) (Section 12.4) checklist. This checklist must be reviewed prior to completing the installation.

12.1 REQUIRED TEST EQUIPMENT

Table 12-1: Required Test Equipment

TEST EQUIPMENT	MODEL / PART NUMBER & DESCRIPTION
Peak-Reading Wattmeter	Bird Electronic Corp. Model 4314B (or equivalent) with Type N female connectors at input and output ports.
Wattmeter Element	Bird Electronic Corp. Element 50C or 100C (50 or 100-Watt max. respectively), 100 - 250 MHz frequency range (or equivalent).
Wattmeter Element	Bird Electronic Corp. Element 50E (50-Watt max.), 400 - 1000 MHz frequency range (or equivalent).
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 PE6106 (or equivalent) 50-ohm RF terminator rated at greater than 50 watts power, 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.

12.2 INITIAL POWER-UP TEST

1. Carefully reconnect the vehicle's battery ground cable.
2. At the radio's main waterproof fuse holder installed near the vehicle battery, insert the 20-amp blade fuse that was included with the radio's DC Power Cable. The 15-amp fuse included with the cable is not used in this application of the cable.
3. Tie and stow all fuse holders at this location to prevent excess vibration/movement.
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 the performance tests in Section 12.3 are complete.
5. 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 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 the Control Head's on/off/volume control clockwise out of the Off detent position.
8. Verify the Control Head has powered-up by observing its display. If the display is not functioning, refer to the [Ignition Sense Location and Considerations](#) information presented in Section 6.3.3, on page 29.

If the software configuration parameters have been loaded, successful installation is almost immediately realized:

- After a short boot-up sequence, the Control Head displays system/zone and/or the selected 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 95).
 - Consult the *Operator's Manual* for operational information.
9. Advance to Section 12.3 and complete the performance test procedures.

12.3 PERFORMANCE TESTS

This section includes procedures to verify the performance of the installation's mobile antenna system. There are two (2) test procedures in this section:

- **Transmitting into a 50-Ohm RF Terminator** ("Dummy Load") - Section 12.3.1 - This test verifies the radio's RF output power is satisfactory.
- **Transmitting into the Mobile Antenna** - Section 12.3.2 - This test verifies the radio's multiband antenna system is satisfactory.



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!



CAUTION

The accuracy of test results depends upon a DC power source in the range of 13.6 volts DC $\pm 10\%$, with a current capacity of greater than 20 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 previous WARNING!**



CAUTION

If a vehicle equipped with this radio requires jump-starting, the radio installation's main fuse (20-amp) should be removed from the holder prior to jump-starting. Doing so will prevent damage to the radio system.



NOTE

The multiband antenna element is an untuned antenna with a Voltage Standing-Wave Ratio (VSWR) of $\leq 3:1$. If an antenna analyzer is available, the antenna installation should be tested with it prior to performing tests presented in this section. Tests with an antenna analyzer can be performed without powering-up the radio. Tests with an antenna analyzer are beyond the scope of this manual, and therefore, an analyzer is not listed in Table 12-1. Refer to the analyzer's operating/user manual for complete testing instructions.



NOTE

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.

12.3.1 Transmitting into a 50-Ohm Dummy Load - Testing the Radio's RF Output Power

1. Turn off the radio.
2. 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 12-1 as necessary.
3. Connect the 50-ohm dummy load to the wattmeter's output connector, in place of the antenna cable from the vehicle-mounted antenna.
4. Turn the radio on and set it to a VHF P25 conventional channel allocated for radio testing. This same channel should be used during the antenna test procedures presented in the subsequent section.
5. Position the wattmeter's slug to measure forward RF output power. Rotate it if necessary. The arrow on the face of the slug must point away from the radio and towards the dummy load for forward power measurements.
6. Set the wattmeter to measure peak RF power.
7. Key the radio's transmitter via the microphone's PTT button.



NOTE

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

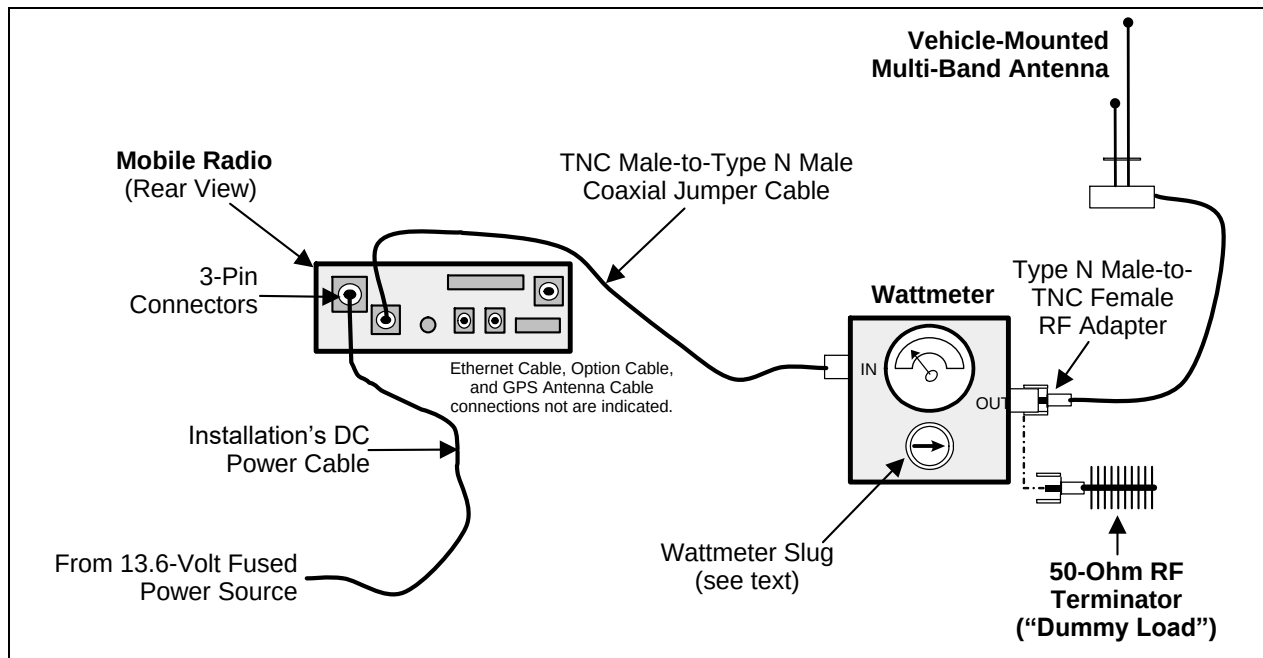


Figure 12-1: Wattmeter Connections for Antenna System Tests

8. Verify the measured transmit output power is within the respective range:
 - For **VHF or UHF band** transmission, compare the wattmeter's reading with the target RF output power range of between **39.8 and 63 watts** (50 watts ± 1 dB). This transmit output power range assumes the radio is currently configured for high-power transmit.

- For **700 MHz band** transmission, compare the wattmeter's reading with the target RF output power range of between **23.8 and 37.7 watts** (30 watts $\pm$ 1 dB). This transmit output power range assumes the radio is currently configured for high-power transmit.



NOTE

For 700 MHz band transmissions, if an interoperability channel is selected, the radio will only transmit with approximately 2 watts of RF output power.

- For **800 MHz band** transmission, compare the wattmeter's reading with the target RF output power range of between **27.8 and 44.1 watts** (35 watts $\pm$ 1 dB). This transmit output power range assumes the radio is currently configured for high-power transmit.
9. **If the wattmeter reading is within the range**, record the measured value in the appropriate space on the [Installation Checklist](#) on page 96.
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 95).
 10. Repeat on test channels within the other RF bands, until at least one channel in all bands has been tested.

12.3.2 Transmitting into The Mobile Antenna—Testing the Antenna System

1. Turn off the radio.
2. Connect the antenna cable from the vehicle-mounted antenna to the wattmeter as shown in Figure 12-1.
3. Turn the radio on and set it to a VHF P25 conventional channel allocated for radio testing. This should be the same channel that was used during the previous test procedure.



CAUTION

When transmitting into an antenna, always observe and follow all RF exposure-related safety information presented in the *Product Safety Manual*.

4. Position the wattmeter's slug to measure forward RF output power. Rotate it if necessary. The arrow on the face of the slug must point away from the radio and towards the antenna for forward power measurements.
5. Set the wattmeter to measure peak RF power.
6. Key the radio's transmitter via the microphone's PTT button.



NOTE

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

7. Verify the measured transmit output power is within the respective range:
 - For **VHF or UHF band** transmission, 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 for high-power transmit.

- For **700 MHz band** transmission, compare the wattmeter's reading with the target RF output power range of between **23.8 and 37.7 watts** (30 watts $\pm$ 1 dB). This transmit output power range assumes the radio is currently configured for high-power transmit.

**NOTE**

For 700 MHz band transmissions, if an interoperability channel is selected, the radio will only transmit with approximately 2 watts of RF output power.

- For **800 MHz band** transmission, compare the wattmeter's reading with the target RF output power range of between **27.8 and 44.1 watts** (35 watts $\pm$ 1 dB). This transmit output power range assumes the radio is currently configured for high-power transmit.
8. **If the wattmeter reading is within the range**, record the value in the appropriate space on the [Installation Checklist](#) on page 96.
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 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 95).
 9. Position the wattmeter's slug to measure reverse (reflected) RF power from the antenna. The arrow on the face of the slug 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.

**NOTE**

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

11. Compare the wattmeter reading with the RF power output range of **15 watts or less**. This limit exists because the multi-band (untuned) antenna has a VSWR of $\leq$ 3:1.
12. **If the wattmeter reading is within the range**, record the value in the appropriate space on the [Installation Checklist](#) on page 96, and then advance to the next step in this procedure.
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 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 95).
13. Repeat on test channels within the other RF bands, until at least one channel in all bands has been tested.
14. Disconnect the coaxial cable jumper and wattmeter.
15. 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.
16. 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.

**WARNING**

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

**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.

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

12.4 POST INSTALLATION INSPECTION

Perform a functional and visual vehicle inspection to ensure that the installation meets the workmanship requirements set out in this manual and other owner/product manuals:

The items to be checked are detailed on the [Installation Checklist](#). All items are to be checked, and the results indicated on the checklist, or indicated as “n/a” or “not applicable.” Record clearly any items that are non-functional, and any servicing that must be completed before approving the installation. Bring these to attention of the authorized customer representative.

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!
- Verify waterproof caps are installed on all unused connectors.
- 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; such as kick panels, headliners, and seats are properly reinstalled.
- 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.
- If necessary, clean the radio equipment (i.e., radio, Control Head, microphone, speaker) using one of the procedures presented in Section 13.
- Verify all equipment is protected from exposure to harsh environments.
- Verify the test performance data has been recorded on the [Installation Checklist](#).

13 CARING FOR THE RADIO EQUIPMENT

13.1 PREVENTIVE MAINTENANCE

Preventive maintenance on the radio and the Control Head installation should be performed periodically. Harris recommends performing preventive maintenance on an annual basis, or more often in harsh environments such as an installation in a fire truck or motorcycle. At a minimum, preventive maintenance should include:

- Inspecting all mobile radio related hardware to verify it is in place and securely tight. Any missing or loose hardware should be replaced and/or tightened as necessary.
- Inspecting all Control Head related hardware to verify it is in place and securely tight. Any missing or loose hardware should be replaced and/or tightened as necessary.
- Inspecting all cabling to verify it is not damaged, it is securely tied-and-stowed, and all related cable connectors are tight. Repair as necessary.
- Performing radio and antenna system performance tests as described in this manual. Repair the antenna system as necessary.
- Verifying overall radio operation by performing an operations check.

13.2 CLEANING THE RADIO EQUIPMENT

Keep the exterior of the radio equipment clean. This includes the radio, Control Head, microphone, and speaker. Periodically clean them using either the Light-duty cleaning procedure or in extreme cases the Heavy-duty cleaning procedure:

13.2.1 Light-Duty Cleaning Procedure

The following general cleaning procedure is recommended for light-duty cleaning:

1. Turn off the radio via the Control Head's on/off/volume control.
2. To remove excess dust and dirt from the radio equipment, first brush the equipment with a clean dry soft-bristle brush.
3. Next, remove any remaining dust and dirt using a soft clean cloth dampened with a solution of mild detergent soap and warm water. Mix at a ratio of 1 ounce of detergent to at least 4 cups of water.
4. Follow-up by wiping the equipment with a soft clean cloth dampened with only clean warm water.
5. Finish by wiping the equipment dry with clean dry cloth.

13.2.2 Heavy-Duty Cleaning Procedure

The following cleaning product is recommended for heavy-duty cleaning:

Chemtronics® Electro-Wash® PR (ES1603)



Do not use other chemical cleaners, sprays, or any petroleum-based products. They may damage the radio housing, display, knob, and/or button surfaces.

Always follow all manufacturer's usage recommendations when using any cleaning product/solution. This includes but is not limited to ensuring the work area is properly ventilated and the wearing of safety glasses/goggles.

Use this cleaning procedure:

1. Turn off the radio via the Control Head's on/off/volume control.
2. Remove the radio's main power fuse and the Control Head's ignition power fuse. Mark the two fuses so they can be re-installed into their original locations later.
3. To remove excess dust and dirt from the radio equipment, first brush the equipment with a clean dry soft-bristle brush.
4. Apply the cleaning product to a soft clean cloth. To prevent excessive vapor concentrations, be sure the surrounding area is well-ventilated. Do not spray any cleaning product directly on the radio equipment.
5. Wipe the radio equipment clean with the dampened cloth. Always apply the cleaning product to a soft clean cloth, and then use the dampened cloth to wipe the equipment clean.
6. Next, wipe off the radio equipment with clean damp cloth using mild warm soapy water.
7. Follow-up by wiping the equipment with a clean cloth dampened with only clean warm water.
8. Finish by wiping the equipment dry with clean dry cloth.
9. Re-install the two fuses into their original locations.

14 CUSTOMER SERVICE

14.1 TECHNICAL SUPPORT

The Harris Technical Assistance Center (TAC) resources are available to help you with overall system operation, maintenance, upgrades, and product support. TAC is your point of contact when you need technical questions answered.

Product specialists, with detailed knowledge of product operation, maintenance, and repair, provide technical support via a toll-free telephone number (in North America). Support is also available through mail, fax, and e-mail.

For more information about technical assistance services, contact your sales representative, or call the Technical Assistance Center directly at:

North America:	1-800-528-7711
International:	1-434-385-2400
Fax:	1-434-455-6712
E-mail:	PSPC_tac@harris.com

14.2 TECH-LINK

For more information about this and other Harris PSPC products, check out our Tech-Link service at:

<https://premier.pspc.harris.com/infocenter/>

Tech-Link is a one stop link to Technical Documentation (downloadable PDFs), Software Revisions, Feature Encryption, pictorials of parts and accessories, and other information pertaining to our products.

This is information that will enhance your service efforts; 24 hours a day and 7 days a week.

14.3 CUSTOMER CARE

If any part of the system equipment is damaged on arrival, contact the shipper to conduct an inspection and prepare a damage report. Save the shipping container and all packing materials until the inspection and the damage report are completed. In addition, contact the Customer Care center to arrange for replacement equipment. Do not return any part of the shipment until you receive detailed instructions from a Harris representative.

Contact the Customer Care center at <https://www.harris.com/solution/pspc-customer-service> or:

North America:

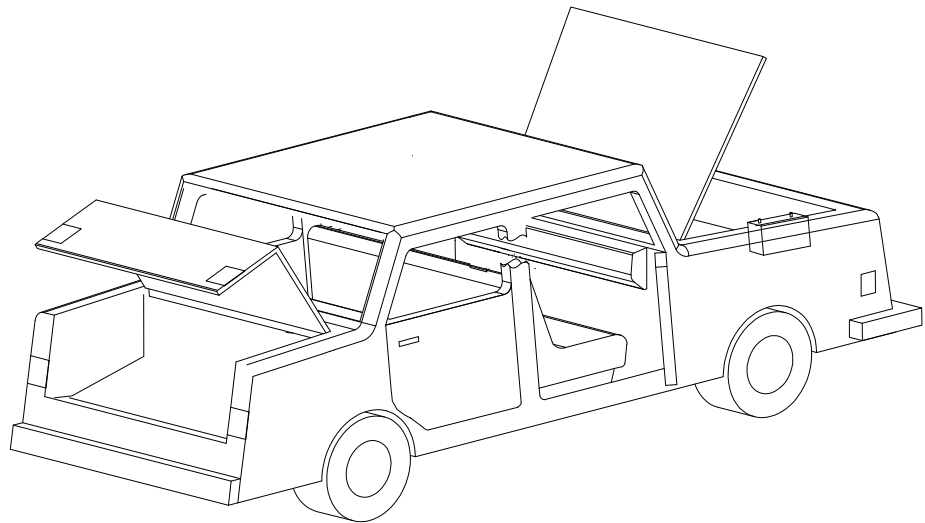
Phone Number:	1-800-368-3277
Fax Number:	1-321-409-4393
E-mail:	PSPC_CustomerFocus@harris.com

International:

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

Make copies of this form.

VCH Location, Fuse Location
CH Location, Fuse Location
Ignition Sense Location
Antenna Location
Speaker Location
Mic Location
Power Points (F=Factory)
Ground Points (F=Factory)
Splice Location(s)
Wire Routes



Customer OK:_____

96

RF POWER TEST	
RF Forward Power: _____ Watts	Reverse Power: _____ Watts
VOLTAGE TEST	
VCH Engine OFF: _____ Vdc CH Engine OFF: _____ Vdc UNDER VOLTAGE RESISTANCE CHECKS: Engine OFF: _____ Ohms	Engine ON: _____ Vdc Engine ON: _____ Vdc Engine ON: _____ Ohms

Pre-Install Checks

Interior Lights Yes [] No [] N/A []	Exterior Vehicle Lights Yes [] No [] N/A []	Ext. Emergency Lights Yes [] No [] N/A []	Horn Yes [] No [] N/A []
Siren Yes [] No [] N/A []	P/A Yes [] No [] N/A []	AM/FM Radio Yes [] No [] N/A []	Wipers Yes [] No [] N/A []
Turn Signals Yes [] No [] N/A []	Radio Speaker Install Yes [] No [] N/A []	Microphone Install Yes [] No [] N/A []	Antenna Install Yes []
Cigarette/Convenience Outlet Yes [] No []	Fuses Correct Amp Check Yes []	Clean-Up check Yes []	Old Radio Boxed & Tagged Yes [] N/A []

Post-Install Checks

Interior Lights Yes [] No [] N/A []	Exterior Vehicle Lights Yes [] No [] N/A []	Ext. Emergency Lights Yes [] No [] N/A []	Horn Yes [] No [] N/A []
Siren Yes [] No [] N/A []	P/A Yes [] No [] N/A []	AM/FM Radio Yes [] No [] N/A []	Wipers Yes [] No [] N/A []
Turn Signals Yes [] No [] N/A []	Radio Speaker Install Yes [] No [] N/A []	Microphone Install Yes [] No [] N/A []	Antenna Install Yes []
Cigarette/Convenience Outlet Yes [] No []	Fuses Correct Amp Check Yes []	Clean-Up check Yes []	Old Radio Boxed & Tagged Yes [] N/A []

SIGN-OFF			
Harris/ASC Inspector		Customer (Witness)	

Print Name:

Print Name:

16 WARRANTY REGISTRATION

Please register this product within 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 the Customer Care center webpage:

<https://www.harris.com/solution/pspc-customer-service>.

While on the webpage, please review the applicable battery and/or product warranty literature.

About Harris Corporation

Harris Corporation is a leading technology innovator, solving customers' toughest mission-critical challenges by providing solutions that connect, inform and protect. Harris supports government and commercial customers in more than 100 countries and has approximately \$6 billion in annual revenue. The company is organized into three business segments: Communication Systems, Space and Intelligence Systems and Electronic Systems. Learn more at harris.com.

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NEW YORK

VIRGINIA

BRAZIL

UNITED KINGDOM

UAE

SINGAPORE

