

HPD™ 1000 MODEM

Installation Manual



Foreword

This manual covers the HPD™ 1000 modem. It includes all the information necessary to maintain peak product performance and maximum working time, using levels 1 and 2 maintenance procedures. This level of service goes down to the board replacement level and is typical of some local service centers, self-maintained customers, and distributors.

For details on radio operation or component-level troubleshooting, refer to the applicable manuals available separately. A list of related publications is provided in the section [“Related Publications,” on page vi](#).

Product Safety and RF Exposure Compliance

See [“Installation Requirements for Compliance with Radio Frequency \(RF\) Energy Exposure Safety Standards,” on page iii](#).

Manual Revisions

Changes which occur after this manual is printed are described in FMRs (Florida Manual Revisions). These FMRs provide complete replacement pages for all added, changed, and deleted items.

To obtain FMRs, go to <https://businessonline.motorola.com>.

Parts Ordering

See [Appendix A: Replacement Parts Ordering](#) for information on how to obtain replacement parts. For part numbers, refer to the HPD 1000 Modem Basic Service Manual (Motorola publication part number 6816254H01).

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

ATTENTION!

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

To ensure compliance to RF Energy Safety Standards:

- Install only Motorola approved antennas and accessories
- Be sure that antenna installation is per “[Antenna\(s\) Installation](#),” on page 2-7 of this manual
- Be sure that Product Safety and RF Safety Booklet enclosed with this radio is available to the end user upon completion of the installation of this radio

Before using this product, the operator must be familiar with the RF energy awareness information and operating instructions in the Product Safety and RF Exposure booklet enclosed with each radio (Motorola Publication part number 68P81095C99) to ensure compliance with Radio Frequency (RF) energy exposure limits.

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

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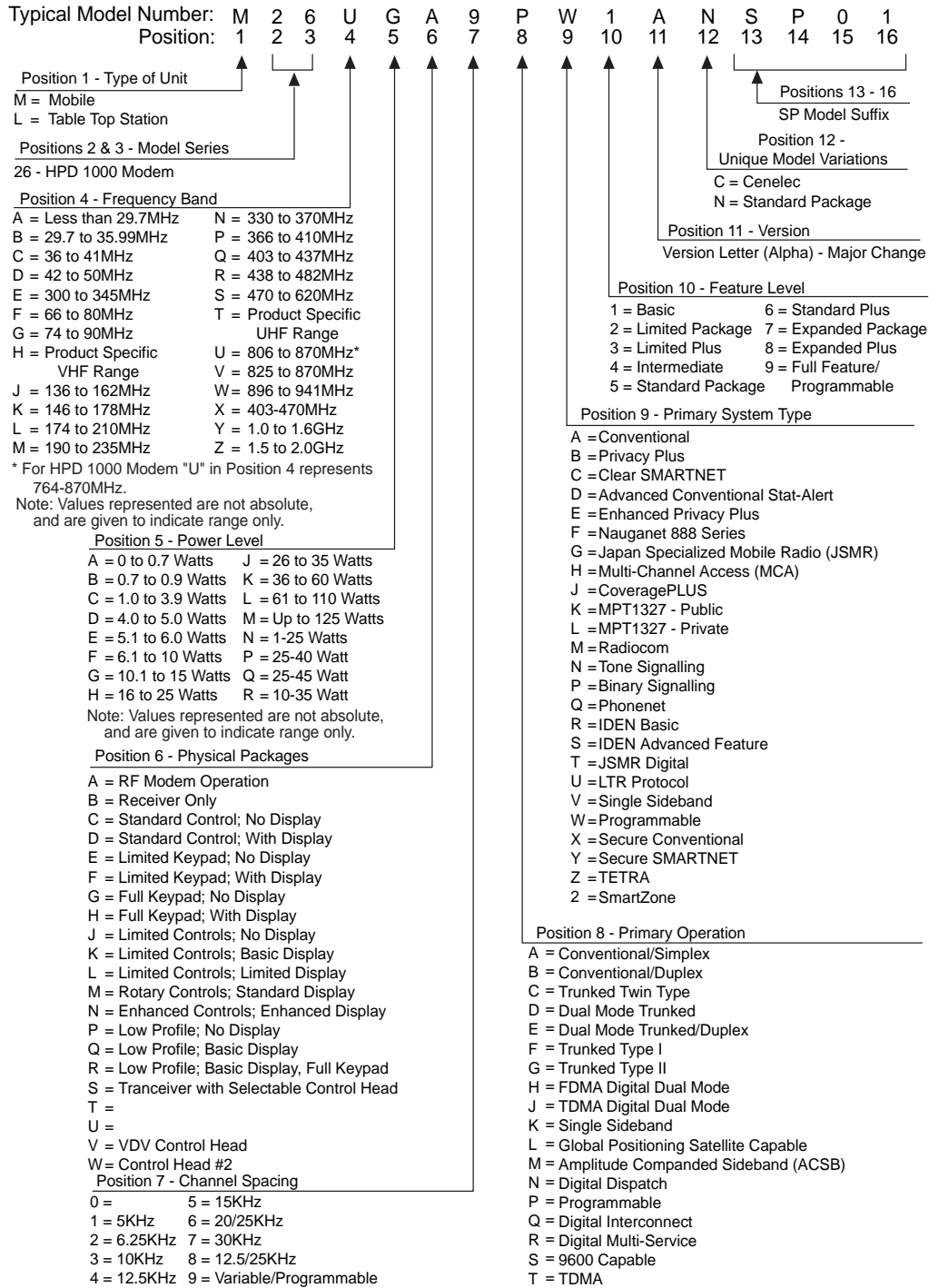
Related Publications

HPD™ 1000 Modem Basic Service Manual	6816254H01
HPD™ 1000 Modem Detailed Service Manual	6816255H01
HPD™ 1000 Modem User's Guide	6871218L01
Product Safety & RF Energy Exposure Booklet.....	68P81095C99

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Mobile Radio Model Numbering Scheme



Commercial Warranty

Limited Warranty

MOTOROLA COMMUNICATION PRODUCTS

I. What This Warranty Covers And For How Long

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

HPD 1000 Modem	One (1) Year
Product Accessories	One (1) Year

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

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III. State Law Rights

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LIMITATION ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION OR EXCLUSIONS MAY NOT APPLY.

This warranty gives specific legal rights, and there may be other rights which may vary from state to state.

IV. How To Get Warranty Service

You must provide proof of purchase (bearing the date of purchase and Product item serial number) in order to receive warranty service and, also, deliver or send the Product item, transportation and insurance prepaid, to an authorized warranty service location. Warranty service will be provided by Motorola through one of its authorized warranty service locations. If you first contact the company which sold you the Product, it can facilitate your obtaining warranty service. You can also call Motorola at 1-888-567-7347 US/Canada.

V. What This Warranty Does Not Cover

- A. Defects or damage resulting from use of the Product in other than its normal and customary manner.
- B. Defects or damage from misuse, accident, water, or neglect.
- C. Defects or damage from improper testing, operation, maintenance, installation, alteration, modification, or adjustment.
- D. Breakage or damage to antennas unless caused directly by defects in material workmanship.
- E. A Product subjected to unauthorized Product modifications, disassemblies or repairs (including, without limitation, the addition to the Product of non-Motorola supplied equipment) which adversely affect performance of the Product or interfere with Motorola's normal warranty inspection and testing of the Product to verify any warranty claim.
- F. Product which has had the serial number removed or made illegible.
- G. Rechargeable batteries if:
 - any of the seals on the battery enclosure of cells are broken or show evidence of tampering.
 - the damage or defect is caused by charging or using the battery in equipment or service other than the Product for which it is specified.
- H. Freight costs to the repair depot.
- I. A Product which, due to illegal or unauthorized alteration of the software/firmware in the Product, does not function in accordance with MOTOROLA's published specifications or the FCC type acceptance labeling in effect for the Product at the time the Product was initially distributed from MOTOROLA.
- J. Scratches or other cosmetic damage to Product surfaces that does not affect the operation of the Product.
- K. Normal and customary wear and tear.

VI. Patent And Software Provisions

MOTOROLA will defend, at its own expense, any suit brought against the end user purchaser to the extent that it is based on a claim that the Product or parts infringe a United States patent, and MOTOROLA will pay those costs and damages finally awarded against the end user purchaser in any such suit which are attributable to any such claim, but such defense and payments are conditioned on the following:

- A. that MOTOROLA will be notified promptly in writing by such purchaser of any notice of such claim;
- B. that MOTOROLA will have sole control of the defense of such suit and all negotiations for its settlement or compromise; and
- C. should the Product or parts become, or in MOTOROLA's opinion be likely to become, the subject of a claim of infringement of a United States patent, that such purchaser will permit MOTOROLA, at its option and expense, either to procure for such purchaser the right to continue using the Product or parts or to replace or modify the same so that it becomes noninfringing or to grant such purchaser a credit for the Product or parts as depreciated and accept its return. The depreciation will be an equal amount per year over the lifetime of the Product or parts as established by MOTOROLA.

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VII. Governing Law

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

Notes

Chapter 1 Introduction

This manual covers the installation procedures for HPD 1000 modem and accessories required to complete the modem system. The modem system consists of the HPD transceiver, cables and antennas including:

- a transmit and a receive antenna if configured in full duplex
- a transmit/receive antenna if configured in half duplex
- a GPS antenna if this option is chosen

The modem is connected to a user supplied computer.

1.1 Mobile Modem Description

1.1.1 Dimensions

Figure 1-1 and Figure 1-2 show the basic dimensions of the trunk mounted HPD 1000 modem with trunnion.

When installing the modem, make sure to plan the installation carefully and leave additional room in the rear of the modem for cabling and in the front of the modem for access, controls, and cabling; and to the sides of the modem so that you may access and install the trunnion screws.

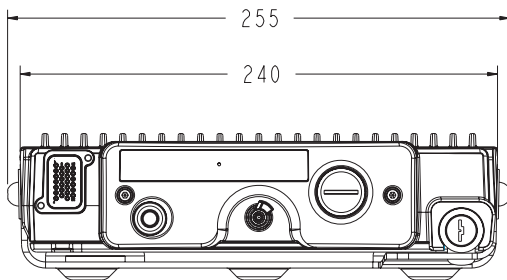


Figure 1-1. Front With Dims

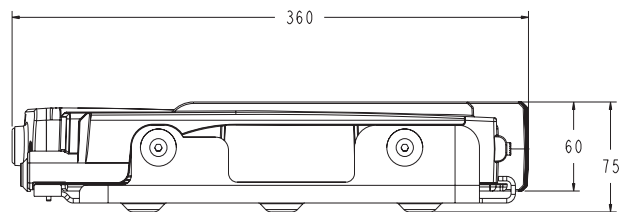


Figure 1-2. Side With Dims

NOTE: The front accessory connector adds 17mm to the overall length.
If the Ethernet connection is used, it adds a further 38mm to the front of the modem.

1.2 Standard Configurations

In the standard mount configuration, the modem is mounted remotely in the vehicle. The set-up is a typical Modem installation with the computer, near the operator, connected to the modem through a data cable, either Ethernet or USB. The modem is mounted by means of a trunnion or other mounting hardware. If the modem is located in a car trunk, be sure that secure mounting and sufficient cooling are provided. Do not cover the modem with baggage, blankets, etc.

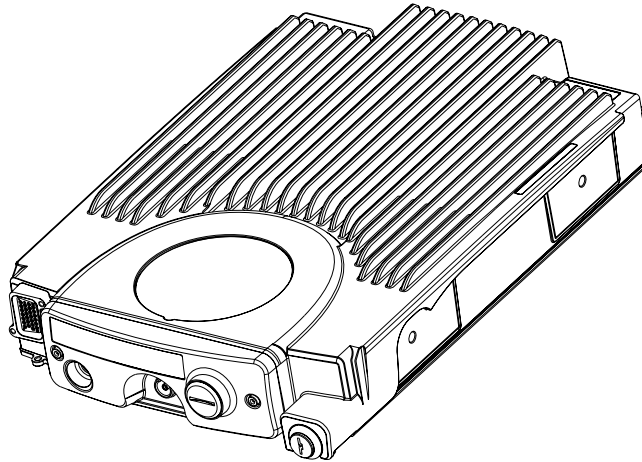


Figure 1-3. Standard Mount Configuration

For details on this configuration, see [Section 2.1.1 on page 2-1](#) and [Section 2.1.2 on page 2-2](#).

1.3 Tools Required for HPD 1000 Installations

Tool	Part Number
5/16 hex driver	—
RF cable tool	HLN6695_
Center-punch	—
Allen Wrench 5mm	—

Chapter 2 Standard Configurations

2.1 Planning the Installation

The HPD 1000 modem operates only in negative ground electrical systems. Before starting the modem installation, make sure that the ground polarity of the vehicle is correct. Accidentally reversing the polarity will not damage the modem, but will cause the cable fuses to blow.

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

CAUTION Before installing any electrical equipment, check the vehicle manufacturer's user manual. The installation of this device should be completed by an authorized servicer or installer.

2.1.1 Installation Examples

Your HPD 1000 modem method of installation is trunk mount only. The modem can be mounted in two configurations, either Duplex (Dedicated antennas for transmit and receive) or Half Duplex (One antenna for both transmit and receive).

HPD 1000 modems can **ONLY** be mounted remotely.
(see [Figure 2-1](#) through [Figure 2-2](#)).

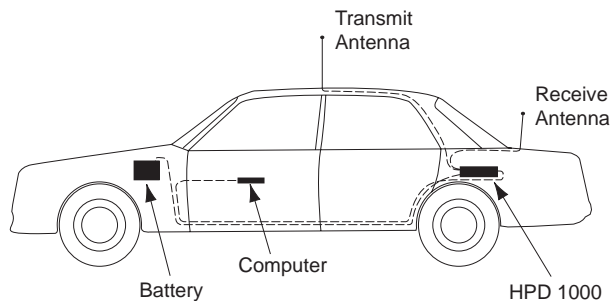


Figure 2-1. Duplex

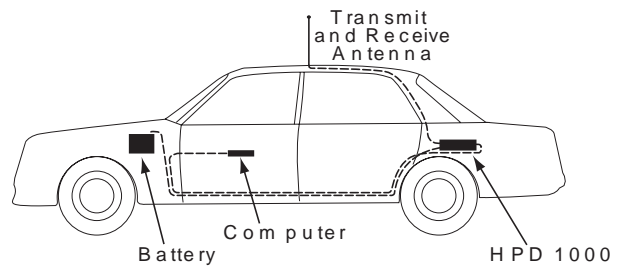


Figure 2-2. Half Duplex

2.1.2 Wiring Diagrams

Figure 2-3 shows the modem wiring diagram. Use the diagram when planning the installation.

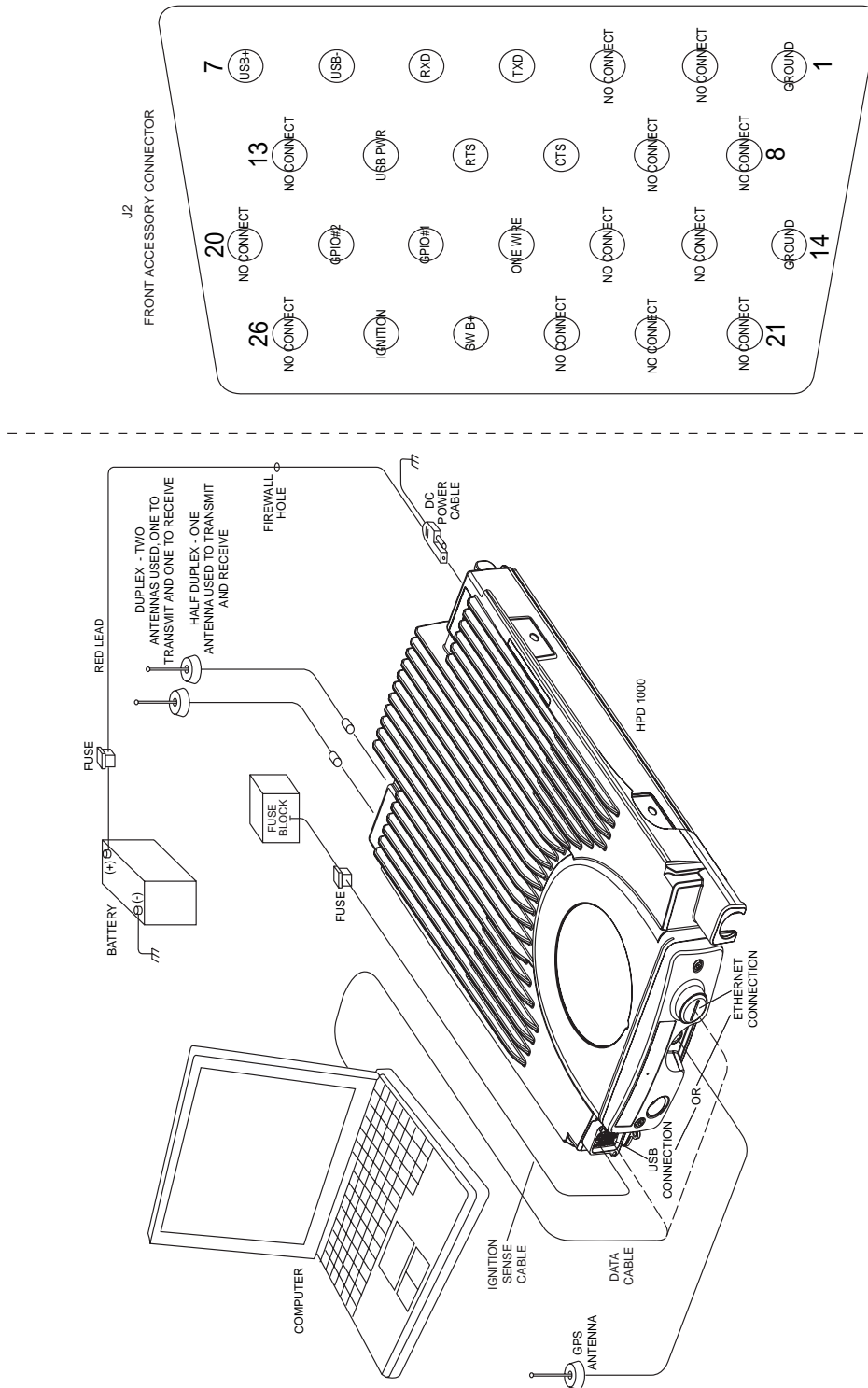


Figure 2-3. Modem Installation

2.2 Modem Mounting



Caution

CAUTION: DO NOT mount the modem on a flat or concave surface where the modem could be partially submersed in water. This is especially important if the cab area of the vehicle is cleaned by spraying with water. If the modem sits in water for a length of time, moisture may seep inside the modem and damage the electronic components.

CAUTION: DO NOT allow water to stand in recessed areas of vertically mounted modems. Remove any moisture immediately to prevent it from seeping down into the modem.

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

NOTE: For optimum modem performance, orient the mounting trunnion as shown in [Figure 2-4](#). For new or existing installations, use only the HPD 1000 trunnion, kit number HLN6920_.

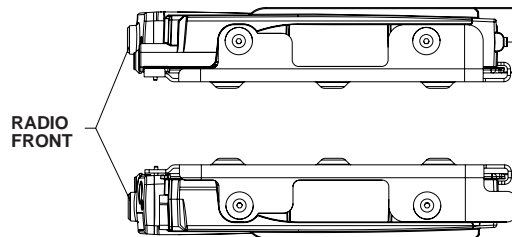


Figure 2-4. Trunnion Orientation

2.2.1 Standard Mount with Trunnion

CAUTION Before installing any electrical equipment, check the vehicle manufacturer's user manual.

The installation of this device should be completed by an authorized servicer or installer.

Before making any holes in the trunk for modem mounting, check the vehicle manufacturer's user manual for restrictions (e.g. due to the gas tank location).

For a standard mount installation, the modem may be mounted anywhere in the vehicle, provided that the installation location is safe, follows the cautions mentioned at the beginning of this section, and is accessible for servicing/maintenance as well as cabling. A typical mounting location recommended by Motorola is in the vehicle's trunk. The trunnion provided should be used to mount the modem. Choose a mounting location for the modem, considering accessibility, control and antenna cable lengths.

1. After selecting the mounting location, use the trunnion mounting bracket as a template and mark the positions of the holes on the mounting surface.
2. Center-punch the spots you have marked and realign the trunnion in position.
3. Secure the trunnion mounting bracket with the five self-drilling screws provided (5/16 Hex driver) (see [Figure 2-5](#)).

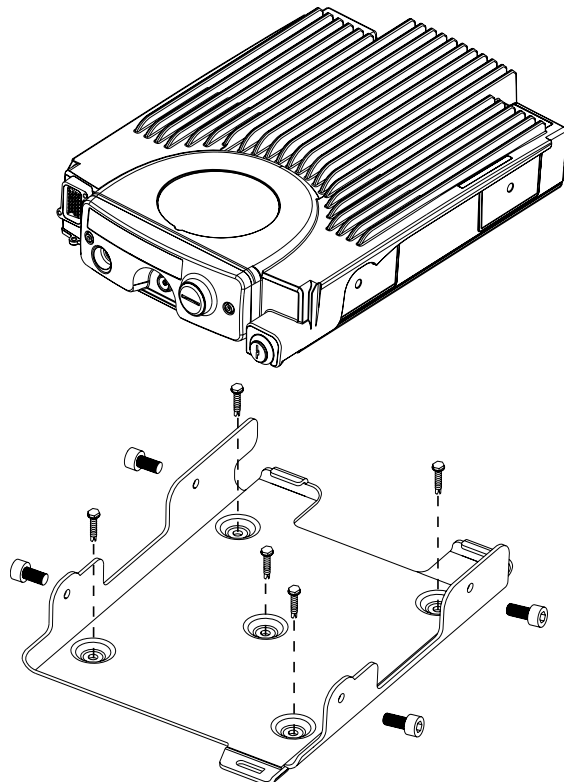


Figure 2-5. Screw-Mounted Trunnion

4. After mounting the trunnion to the vehicle using the screws provided, insert the rear of the modem into the rear catches of the trunnion and rotate the modem down into place. Secure the modem by firmly installing the four screws provided (Allen Wrench 5mm, to 42 in-lbs).

2.2.2 Locking Kit

To lock the modem to the trunnion (shown in [Figure 2-6](#)), insert the key into the lock and turn it to make sure the lock is at the unlocked position. Ensure the modem is fully seated and all trunnion screws are attached. Then turn the key to the locked position and remove the key.

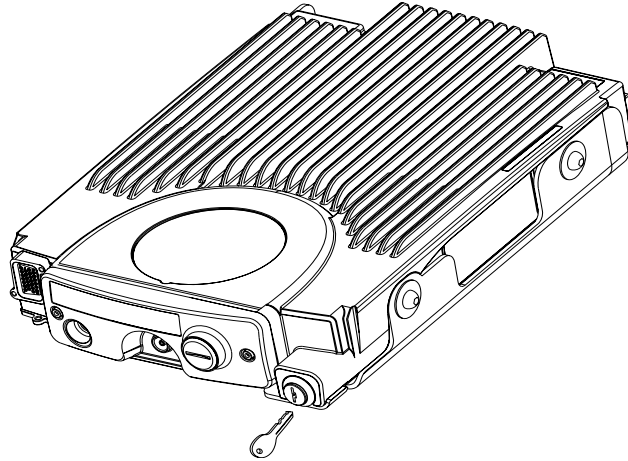


Figure 2-6. Lock

2.3 Power Cable

Route the red modem power cable from the modem to the vehicle's battery compartment, using accepted industry methods and standards. Be sure to grommet the firewall hole to protect the cable. Remove the 15-amp fuse from the fuseholder and connect the red lead of the modem power cable to the positive battery terminal using the hardware provided as shown in [Figure 2-7](#). Connect the black lead to a convenient solid chassis ground point. **DO NOT** connect the black lead directly to the battery's negative terminal.

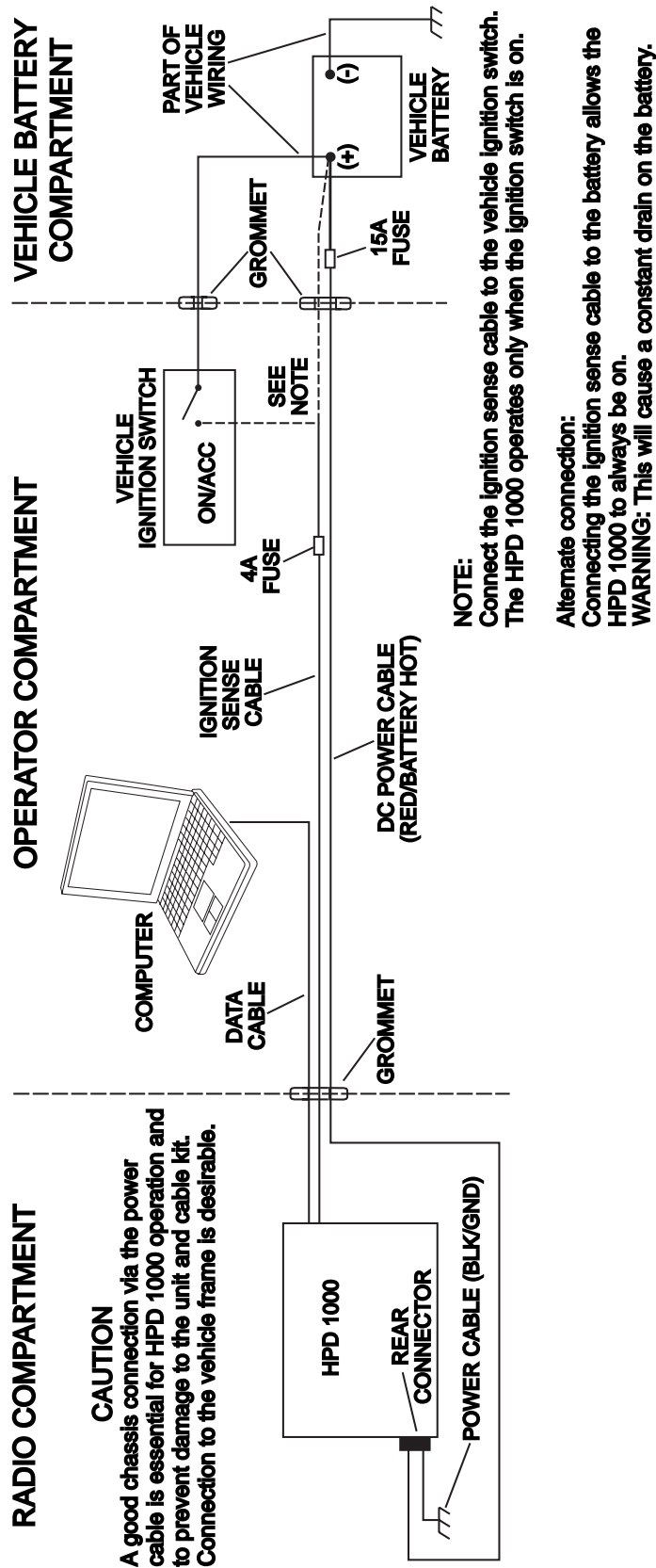


Figure 2-7. Cabling Interconnect Diagram for Remote Mount

2.4 Ignition Sense Cable

Motorola supplies an ignition sense cable and recommends that it be used with every *mobile* installation. The ignition sense cable allows the modem to be turned on and off with the vehicle ignition switch.

- For modem ON/OFF control independent of the ignition switch, connect the red ignition cable (yellow for remote) (pin 25 of accessory connector) to “battery hot” at the vehicle fuse block.

Warning: In this configuration, the HPD 1000 will always be on, and there will be a constant drain on the battery.

- For modem ON/OFF control via the ignition switch, connect the red ignition cable (yellow for remote) to “ignition” at the fuse block.

The ignition sense cable uses a 4-amp (P/N 6580283E02) fuse.

For other considerations when connecting the ignition cable, see the HPD 1000 Basic Service Manual (Motorola publication part number 6816254H01).

2.5 Antenna(s) Installation

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

NOTE: For mobile modems with rated power greater than 7 Watts, always adhere to all the guidelines and restrictions in section 2.5.1 below.

NOTE: Antennas must get 35 dB of isolation. This is best done by placing antennas on different planes, i.e. roof and trunk. If same plane is used, do not use a Gain antenna and ensure over 3' of separation between antennas. If your current antenna is a Gain antenna, keep 4-6' of separation to next antenna on same plane.

Before installation of the antennas for full duplex, apply the provided Transmit & Receive labels (HLN6965_) to the modem end of the antennas to ensure the correct antenna orientation when attached to the modem. Refer to safety manual 6881095C99-E.

NOTE: Any two metal pieces rubbing against each other (such as seat springs, shift levers, trunk and hood lids, exhaust pipes, etc.) in close proximity to the antenna can cause severe receiver interference.

2.5.1 Selecting the Antenna(s) Site/Location on a Metal Body Vehicle

2.5.1.1 Full Duplex

1. **External installation** – Check the requirements of the antenna supplier and install the vehicle antenna external to a metal body vehicle in accordance with those requirements.
2. **Roof top** – For optimum performance and compliance with RF Energy Safety standards, mount the transmitter antenna in the center area of the roof.
3. **Trunk lid** – For optimum performance, the Receive antenna should be mounted on the trunk lid at least 3' from the transmit antenna and any other antenna. Ensure that the trunk lid is grounded by connecting grounding straps between the trunk lid and the vehicle chassis.
4. **Mounting restrictions for the HPD 1000 modem**
 - The Transmit antenna should be mounted only in the center area of the roof, not on the trunk lid, to assure compliance with RF Energy Safety standards.

5. Ensure that the antenna cable can be easily routed to the modem. Route the antenna cable as far away as possible from any vehicle electronic control units and associated wiring.
6. Check the antenna location for any electrical interference.
7. Ensure that any other antennas on the vehicle are at least 92cm (3 feet) away from this antenna.

2.5.1.2 Half Duplex

1. **External installation** – Check the requirements of the antenna supplier and install the vehicle antenna external to a metal body vehicle in accordance with those requirements.
2. **Roof top** – For optimum performance and compliance with RF Energy Safety standards, mount the transmitter antenna in the center area of the roof.
3. **Trunk lid** – On some vehicles with clearly defined, flat trunk lids, the antennas of some modem models (see restrictions below) can also be mounted on the center area of the trunk lid. For vehicles without clearly defined, flat trunk lids (such as hatchback autos, sport utility vehicles, and pick-up trucks), mount the antenna in the center area of the roof.

Before installing an antenna on the trunk lid

- Be sure that the distance from the antenna location on the trunk lid will be at least 85 cm (33 inches) from the front surface of the rear seat-back to assure compliance with RF Energy Safety standards.
- Ensure that the trunk lid is grounded by connecting grounding straps between the trunk lid and the vehicle chassis

IF THESE CONDITIONS CANNOT BE SATISFIED, THEN MOUNT THE ANTENNA ON THE ROOF TOP!

4. Ensure that the antenna cable can be easily routed to the modem. Route the antenna cable as far away as possible from any vehicle electronic control units and associated wiring.
5. Check the antenna location for any electrical interference.
6. Ensure that any other modem antenna on this vehicle is at least 92 cm (3 feet) away from this antenna.

2.5.1.3 GPS

The GPS antenna should be located at least 92cm (3 feet) from all other antenna. The length of the cabling must be taken into consideration before the installation is started.

2.5.2 Mini-UHF Connection

To ensure a secure connection of an antenna cable's mini-UHF plug to a modem's mini-UHF jack, their interlocking features must be properly engaged. If they are not properly engaged, the system may loosen. Using a tool (pliers or wrench) will not overcome a poor engagement, and is not recommended.

NOTE: Applying excessive force with a tool can cause damage to the antenna or the connector (e.g., stripping threads, deforming the collar or connector, or causing the connector to twist in the housing opening and break).

The mini-UHF connector tool (Motorola part number HLN6695_) is designed to securely tighten the antenna plug–radio jack connection without damaging either the plug or the jack.

Motorola recommends the following sequence to ensure proper attachment of the system (see [Figure 2-8](#)):

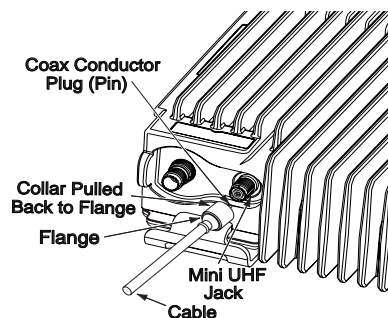


Figure 2-8. Mini-UHF Connection

1. Make sure that there is sufficient slack in the antenna cable.
2. Make sure that the collar of the antenna cable plug is loose and does not bind.
3. Make sure that the mini-UHF jack is tight in the modem housing.
4. Slide the collar back against the flange. Insert the antenna cable plug's pin fully into the radio jack, but do not engage the threads.
5. Ensure that the plug's and jack's interlocking features are fully seated. Check this by grasping the crimp on the cable jack, rotating the cable, and noting any movement. If the features are seated correctly, there should be NO movement.
6. Finger-tighten the antenna cable plug's collar onto the modem's jack.
7. Give a final tug, by hand, to the collar, and retighten by hand as firmly as possible.
8. Slip the mini-UHF connector tool over the coaxial cable, using the gap between the tool's legs (see [Figure 2-9](#)). Then, slide the tool up onto the plug's knurled collar. Squeeze the two straight legs of the tool firmly together between your thumb and index finger and turn clockwise (as shown) to tighten the collar. It should take 1/4 turn or less. When you feel the tool slipping on the collar, the connection has been properly tightened. The tool can also be used to loosen a tight collar.

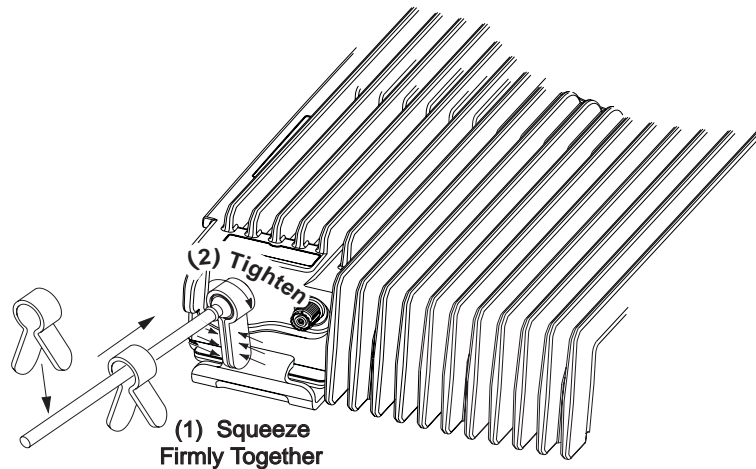


Figure 2-9. Mini-UHF Connector Tool

NOTE: DO NOT use pliers or any other device to grip the tightening tool. It has been designed to allow you to achieve the proper torque on the collar without overtightening. Overtightening the collar can damage the connector and the modem.

NOTE: For Duplex antenna connection, the Receive antenna is attached to the connector closest to the edge of the radio with the Transmit attached to the connection to the right. For Half Duplex the Transmit/Receive antenna is attached to the inner antenna. (see [Figure 2-10](#)).

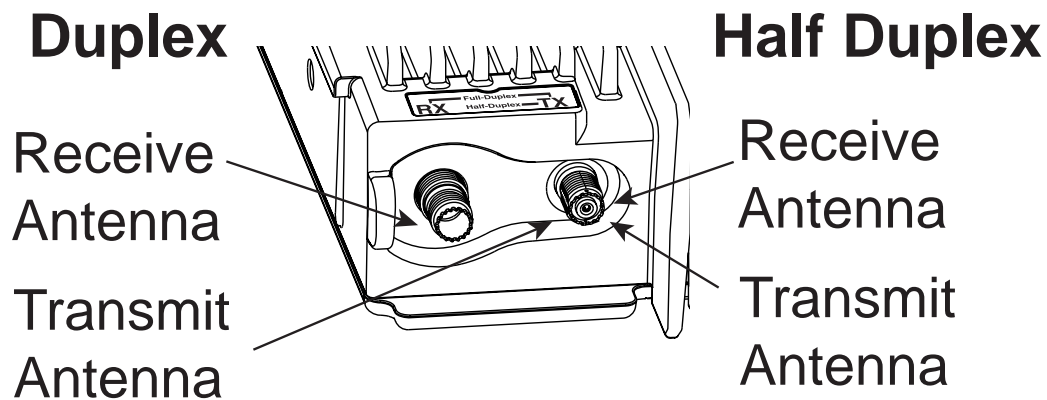


Figure 2-10. RF Connectors

Chapter 3 Finishing the Installation: Cable Connection

Perform the following if it has not been previously done:

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

1. Install the 15-amp fuse in the modem power cable fuseholder and the 4-amp fuse in the ignition cable fuseholder(s).
2. Connect the s-hook attached to the GPS antenna wire to the transceiver housing (see [Figure 3-1](#)).
3. Connect the computer via the data cable.
4. Depress the power button on the modem brick to turn the modem **ON**. Modem operation in most installations require turning on the ignition.
5. Dress the control and power cables out of the way to prevent damage (pull any excess cable into the trunk area) securing with clamps and tie wraps where necessary.

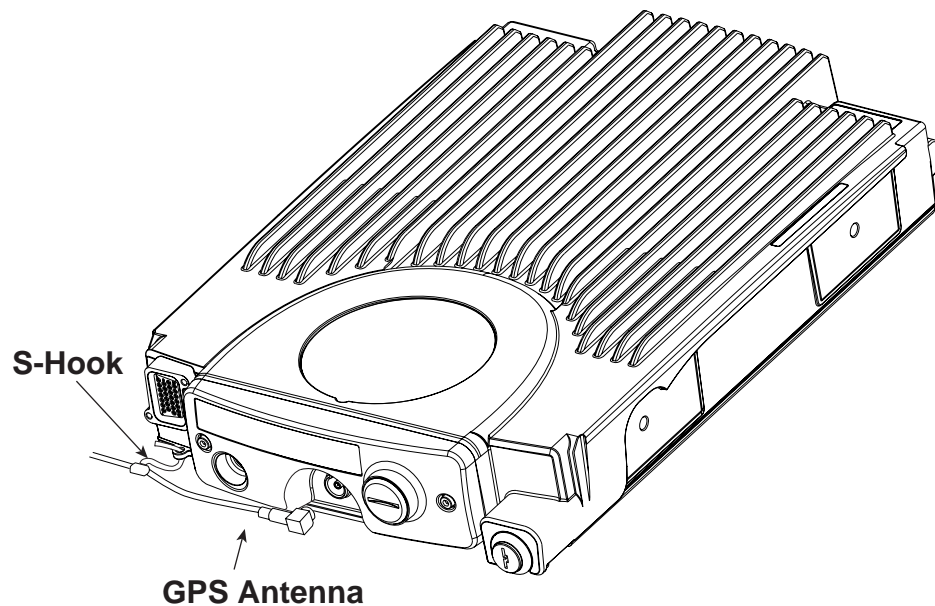


Figure 3-1. S-Hook

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Appendix A Replacement Parts Ordering

A.1 Basic Ordering Information

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

The HPD 1000 Basic Service Manual (Motorola publication part number 6816254H01) includes complete parts lists and parts numbers.

A.2 Motorola Online

Motorola Online users can access our online catalog at

<https://www.motorola.com/businessonline>

To register for online access:

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

A.3 Mail Orders

Send written orders to the following addresses:

**Replacement Parts/
Test Equipment/Manuals/
Crystal Service Items:**

Motorola Inc.
Radio Products and Services
Division*
Attention: Order Processing
2200 Galvin Drive
Elgin, IL 60123
U.S.A.

Federal Government Orders:

Motorola Inc.
U.S. Federal Government
Markets Division
Attention: Order Processing
7230 Parkway Drive
Landover, MD 21076
U.S.A.

International Orders:

Motorola Inc.
Radio Products and Services
Division*
Attention: Order Processing
2200 Galvin Drive
Elgin, IL 60123
U.S.A.

A.4 Telephone Orders

Radio Products and Services Division*
(United States and Canada)
7:00 AM to 7:00 PM (Central Standard Time)
Monday through Friday (Chicago, U.S.A.)
1-800-422-4210
1-847-538-8023 (International Orders)

U.S. Federal Government Markets Division (USFGMD)
1-800-826-1913 Federal Government Parts - Credit Cards Only
8:30 AM to 5:00 PM (Eastern Standard Time)

A.5 Fax Orders

Radio Products and Services Division*
(United States and Canada)
1-800-622-6210
1-847-576-3023 (International)

USFGMD
(Federal Government Orders)
1-800-526-8641 (For Parts and Equipment Purchase Orders)

A.6 Parts Identification

Radio Products and Services Division*
(United States and Canada)
1-800-422-4210, menu 3

A.7 Product Customer Service

Customer Response Center
(Non-technical Issues)
1-800-247-2346
FAX:1-800-247-2347

*The Radio Products and Services Division (RPSD) was formerly known as the Customer Care and Services Division (CCSD) and/or the Accessories and Aftermarket Division (AAD).

Glossary

This glossary contains an alphabetical listing of terms and their definitions that are applicable to ASTRO portable and mobile subscriber radio products.

Term	Definition
APCO 25	A standard of digital two-way radio communications, developed by the Association of Public-Safety Communications Officials, providing maximum radio spectrum efficiency; competition in system life cycle procurements; effective, efficient and reliable intra-agency and inter-agency communications; and “user friendly” equipment. <i>See also Association of Public-Safety Communications Officials.</i>
Association of Public-Safety Communications Officials	An association dedicated to an industry-wide effort (known as APCO 25 or Project 25) to set the recommended voluntary standards of uniform digital two-way radio technology for public safety organizations. This allows radio interoperability with multiple vendor products which are all APCO 25 compatible. <i>See also APCO 25.</i>
default	A pre-defined set of parameters.
digital signal processor	A microcontroller specifically designed for performing the mathematics involved in manipulating analog information, such as sound, that has been converted into a digital form. DSP also implies the use of a data compression technique.
EEPROM	<i>See Electrically Erasable Programmable Read-Only Memory.</i>
Electrically Erasable Programmable Read-Only Memory	A special type of PROM that can be erased by exposing it to an electrical charge. An EEPROM retains its contents even when the power is turned off.
Ethernet	A local-area network (LAN) architecture developed by Xerox Corporation in cooperation with DEC and Intel in 1976. Ethernet uses a bus or star topology and supports data transfer rates
FCC	Federal Communications Commission.
FGU	<i>See frequency generation unit.</i>
FLASHport	A Motorola term that describes the ability of a radio to change memory. Every FLASHport radio contains a FLASHport EEPROM memory chip that can be software written and rewritten to, again and again.
frequency	Number of times a complete electromagnetic-wave cycle occurs in a fixed unit of time (usually one second).

Term	Definition
frequency generation unit	This unit generates ultra-stable, low-phase noise master clock and other derived synchronization clocks that are distributed throughout the communication network.
GPS	Global Positioning Satellite
HPD	High Performance Data
IF	Intermediate Frequency.
kHz	<i>See kilohertz.</i>
kilohertz	One thousand cycles per second. Used especially as a radio-frequency unit.
LED	<i>See light emitting diode.</i>
light emitting diode	An electronic device that lights up when electricity is passed through it.
MHz	<i>See Megahertz.</i>
Megahertz	One million cycles per second. Used especially as a radio-frequency unit.
Project 25	<i>See APCO 25.</i>
radio frequency	The portion of the electromagnetic spectrum between audio sound and infrared light (approximately 10 kHz to 10 GHz).
receiver	Electronic device that amplifies RF signals. A receiver separates the audio signal from the RF carrier, amplifies it, and converts it back to the original sound waves.
RF	<i>See radio frequency.</i>
RX	Receive.
signal	An electrically transmitted electromagnetic wave.
Standby mode	An operating mode in which the radio is muted but still continues to monitor data.
TX	Transmit.
UHF	Ultra-High Frequency.
USB	<i>See Universal Serial Bus.</i>
Universal Serial Bus	An external bus standard that supports data transfer rates of 12 Mbps.
VHF	Very-High Frequency.

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