CrossCheck® CDPD

Mobile Unit Manual

Trimble™

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Release Notice

This is January 2002 release (PRELIMINARY -
Revision A) of the CrossCheck® *CDPD Mobile
Unit Manual*, Part Number 46750-00-ENG. Use
this manual with the Echo*LDX Message Terminal
for CrossCheck CDPD and CrossCheck GPRS
Installation and User's Manual*, Trimble part
number 46667-00-ENG.

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Notices

Class B Statement – Notice to Users. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and the receiver.

– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

– Consult the dealer or an experienced radio/TV technician for help.

Changes and modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commission rules.

Regulatory Approvals CrossCheck CDPD

FCC

The CrossCheck CDPD product complies with the FCC Part 15, FCC Part 22, and Industry Canada requirements.

The CrossCheck CDPD product 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.

FCC ID

This equipment contains FCC ID NBZNRM-6832.

Contents

A   **Specifications**

About this Manual

Welcome to the *CrossCheck® CDPD Mobile Unit Manual*. This manual describes how to install, set up, and troubleshoot the CrossCheck CDPD product.

Even if you have used other Global Positioning System (GPS) products before, Trimble recommends that you spend some time reading this manual to learn about the special features of this product.

If you are not familiar with GPS, visit Trimble's Web site (www.trimble.com) for an interactive look at Trimble and GPS.

Trimble assumes that you know how to use a mouse, select options from menus, and make selections from lists.

Related Information

This manual is available in portable document format (PDF) from the following Web site:

http://www.trimble.com/support

Use this manual with the Echo*LDX™ Message Terminal for CrossCheck CDPD and CrossCheck GPRS Installation and User's Manual*, Trimble part number 46667-00-ENG.

Other sources of related information are:

- Release notes – the release notes describe new features of the product, information not included in the manuals, and any changes to the manuals. The release notes are available for download from the above Web address.

- The Fleet Management and Mobile Asset Tracking section of the Trimble Web site – application notes, technical notes, and other useful product information are available from this site. These documents contain important information about software and hardware changes.

- ftp.trimble.com – use the Trimble FTP site to send files or to receive files such as software patches, utilities, service bulletins, and FAQs. Alternatively, access the FTP site from the Trimble Web site: www.trimble.com/support.

Technical Assistance

If you have a problem and cannot find the information you need in the product documentation, *contact your local Distributor*.

Prospective resellers (not under contract) can get general information about the CrossCheck CDPD by sending email to:

sales_info@trimble.com

or by searching the Web site for information such as the CrossCheck CDPD data sheet.

Existing resellers can obtain additional information about the CrossCheck CDPD by sending email to:

crosscheck@trimble.com

or by contacting your local sales office or sales engineer.

Your Comments

Your feedback about the supporting documentation helps us to improve it with each revision. To forward your comments, do one of the following:

- Send an e-mail to ReaderFeedback@trimble.com.

- Complete the Reader Comment Form at the back of this manual and mail it according to the instructions at the bottom of the form.

If the reader comment form is not available, send comments and suggestions to the address in the front of this manual. Please mark it *Attention: Technical Publications Group*.

Notes, Cautions, and Warnings

Notes, cautions, and warnings are used to emphasize important information.

Note – Notes provide additional significant information about the subject to increase your knowledge, or guide your actions.

Caution – Cautions alert you to situations that could cause hardware damage or software error.

Warning – Warnings alert you to situations that could cause personal injury.

Abbreviations

The following abbreviations are used in this manual:

Abbreviation	Definition
AVL	Automatic Vehicle Location
CrossCheck	CrossCheck CDPD may be referred to simply as CrossCheck.
Echo*LDX* or MDT	The Echo*LDX* Message Terminal is referred to as the Echo*LDX* or sometimes as the Mobile Data Terminal (MDT).
GPS	Global Positioning System
OTA	Over the air
TMS	Trimble Mobile Solutions Division
WLG	Wireless Location Gateway

Overview

In this chapter:

Introduction

This manual describes the CrossCheck CDPD Mobile Unit which is designed to be used with Trimble's Wireless Location Gateway (WLG) for Fleet Asset Management and Automatic Vehicle Location (AVL) purposes.

The CrossCheck CDPD runs the firmware necessary to communicate with the Wire Location Gateway and automatically reports location-based information such as position, speed, and direction, and when the vehicle stops or exceeds a specified speed. It also provides information such as vehicle run time and mileage and is programmable over the air (OTA) by the gateway. Configuration parameters, or the entire code set, can be changed.

Regulatory Approvals - CrossCheck CDPD

FCC

The CrossCheck CDPD product complies with the FCC Part 15 Class B and and Part 22 (from OEM module), and Industry Canada requirements.

The CrossCheck CDPD product 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.

The CrossCheck CDPD Mobile Unit

The CrossCheck CDPD Mobile Unit is housed in a single, compact enclosure that simplifies installation and provides greater reliability.

This package is a mobile communications system module for Automatic Vehicle Location (AVL) and fleet asset management applications. It operates over the CDPD cellular network and allows simple, fast, and efficient transfer of information between a vehicle and Trimble's Web-based gateway.

The CrossCheck CDPD Mobile Unit integrates the following into a single package:

- A CDPD cellular transceiver module

- A high-sensitivity, 8-channel GPS receiver

- The controller, featuring the proprietary firmware and integrated datalogging functions

The product's features and functions are ***not*** identical to other products in the CrossCheck family, such as the CrossCheck AMPS CrossCheck GSM, and CrossCheck XR.

Note – The CrossCheck CDPD does not support the IQ*EventEngine firmware used by other CrossCheck products and does not support the TAIP protocol.*

CrossCheck CDPD Standard Features

The CrossCheck CDPD automatically reports arrival or departure from an area that has been previously defined via a Site Dispatching message, that can include either a new Job Site to be attended or a return to the Base or Home Site. CrossCheck CDPD also allows various asset utilization calculations.

The CrossCheck CDPD includes the following:

- Eight-channel GPS receiver

- A sophisticated event handler that allows the CrossCheck CDPD to be configured over the air (OTA) to respond to a wide variety of dispatch and fleet asset management operations

- One serial port for Mobile Data Terminal (MDT) operation

- Extensive discrete I/O inputs, pulse counters, and outputs for vehicle peripheral support

- Configurable Zone Logic Configuration packet:

  – Geo-fence area for Job Sites

  – Geo-fence area for Home Sites

  – Entry Speed Limit for Site Dispatch purposes

  – Exit Speed Limit for Site Dispatch purposes

  – Site dispatch time-out

  – Minimum duration time to detect entry/exit regions

- Support for datalogging that allows the CrossCheck CDPD to store events and positions for up to 1 week while out of the network. Each item is checked for the 1-week expiration and discarded if appropriate.

CrossCheck CDPD Options

The following option is available: Echo*LDX*™ Message Terminal (MDT), the messaging user-interface component of a fleet asset-management system.

The Echo*LDX* terminal connects to the CrossCheck CDPD to receive and display text messages, Job Sites, and Home Sites from the Wireless Location Gateway.

Antenna Requirements

CDPD and GPS antennas are required for operation. Bulkhead and magnetic mount GPS antennas are available from Trimble. Chapter 2 describes the antennas and antenna installation.

The standard CrossCheck CDPD configuration does not include a GPS or CDPD antenna because the type of antenna required depends on the application. Antennas must be ordered separately. For more information, see Appendix A, Specifications.

CrossCheck CDPD System Accessories

Figure 1.1 illustrates the CrossCheck CDPD Mobile Unit and accessories.

1. CrossCheck CDPD Mobile Unit

2. Echo*LDX* Message Terminal Kit . The kit includes:

    – Echo*LDX* Terminal

    – Power/Data cable

    – Pedestal Mounting Kit

    – Quick Reference Guide

3. Power and discrete I/O cable

4. GPS antenna with cable and SMA-p connector

5. CDPD antenna with cable and TNC-p connector
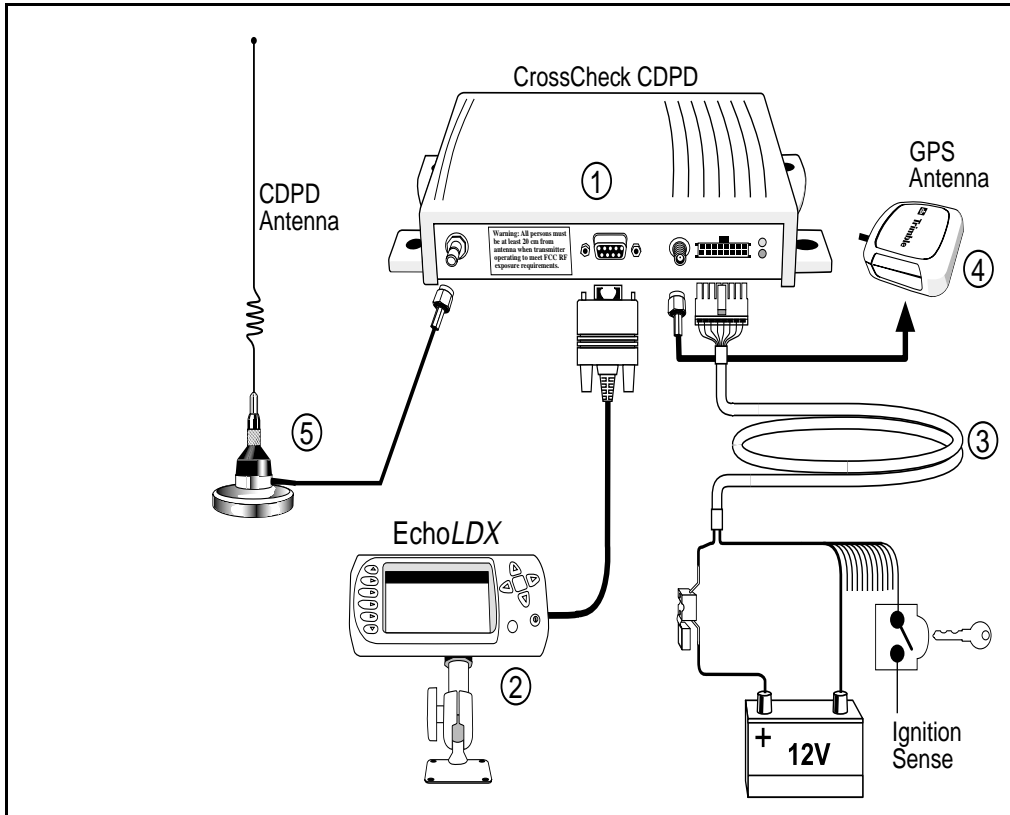
Figure 1.1   CrossCheck CDPD Mobile Unit and Accessories

CrossCheck CDPD Applications

The Trimble Mobile Solutions (TMS) Division provides you with the core products around which you can build systems and applications for managing your transport and logistics assets.

TMS products and services address the need for an end-to-end solution. They provide the building blocks at both ends of the asset management system including the on-board units mounted in the vehicle and the Trimble Web-based gateway for dispatch and control applications anywhere.

The on-board components are centered on the CrossCheck CDPD receiver. You can use the receiver as a standalone unit, or you can interface it with external accessories and sensors to make it function as part of an on-board system.

The optional Echo*LDX* Message Terminal provides a driver interface to exchange messages or generate event reports.

The CrossCheck CDPD and applications can do the following:

- Automate vehicle status changes for dispatching applications

- Determine time spent and distance traveled on jobs for accounts-payable systems

- Improve efficiency by detecting unauthorized vehicle stops or off-route activities

- Improve customer service by alerting customer-service systems of delays

- Drive compliance by keeping a time-stamped log of activities

- Improve safety by indicating speed limit violations

- Identify unauthorized use of equipment and detect theft

The Global Positioning System

The Global Positioning System (GPS) is a satellite-based navigation system operated and maintained by the U.S. Department of Defense. GPS consists of a constellation of 24 satellites providing world-wide, 24-hour, three-dimensional (3D) coverage. Although originally conceived for military needs, GPS has a broad array of civilian applications including timing, surveying, fleet management, marine, land, aviation, and vehicle navigation.

GPS is the most accurate technology available for navigation. As a satellite-based system, GPS is immune from the limitations of land-based systems, which have limited coverage and whose accuracy varies with geographic location and, even under ideal conditions, cannot compare with GPS.

By computing the distance to GPS satellites orbiting the earth, a GPS receiver can calculate an accurate position. This process is called satellite ranging. GPS receivers can also provide precise time, speed, and course measurements which are important for vehicle mobile positioning and communications applications.

GPS Receiver

The CrossCheck CDPD includes an advanced GPS receiver, which provides the position, course, speed and time information required for AVL and fleet management applications. A brief overview of the GPS receiver's architecture and operation is provided in the next paragraph.

The CrossCheck CDPD's GPS receiver features an eight-channel digital signal processor (DSP) which operates at the GPS L1 frequency (1575.42 MHz) and processes the Coarse/Acquisition (C/A) code portion of the GPS signal. The RF and digital signal-processing components of the GPS module are custom integrated circuits designed by Trimble.

Installation

- Introduction
- Installing the CrossCheck CDPD Mobile Unit
- CrossCheck CDPD Connections
- Inspecting and Unpacking the Shipment
- Installer-Supplied Parts
- Mounting the CrossCheck CDPD
- Choosing the GPS Antenna Mounting Location
- Routing the GPS Antenna Cable
- Choosing a CDPD Cellular Antenna Mounting Location
- CrossCheck CDPD Power
- Installing the Echo*LDX* Kit

Introduction

This chapter presents instructions for installing the CrossCheck CDPD Mobile Unit in a vehicle.

⚠ **Warning –** The CrossCheck CDPD and its antennas and accessories should only be professionally installed by Trimble Authorized dealers.

Warning – To meet FCC RF exposure requirements, the maximum gain for externally mounted antennas (plus any cable losses) cannot be more than 3 dBi.

Warning – To meet FCC RF exposure requirements, all persons must be at least 20 cm from the CDPD antenna when the transmitter is operating.

Installing the CrossCheck CDPD Mobile Unit

The CrossCheck CDPD Mobile Unit can be installed before or after configuring its firmware. For example, you might want to configure all of the units for a fleet of vehicles prior to installation.

Note – If you plan to install the CrossCheck CDPD receiver before installing the EchoLDX Message Terminal, be sure to leave adequate clearance to the Mobile Data Terminal port and other connectors. Adequate clearance must exist to connect the MDT to the unit, and you must be able to read the LED indicators if troubleshooting is required.

CrossCheck CDPD Connections

This section describes the CrossCheck CDPD component connections. Figure 2.1 shows the CrossCheck CDPD connections.

Warning: All persons must be at least 20 cm from antenna when transmitter operating to meet FCC RF exposure requirements.

1 Antenna TNC receptacle
2 MDT port
3 GPS antenna
4 Power and discrete I/O
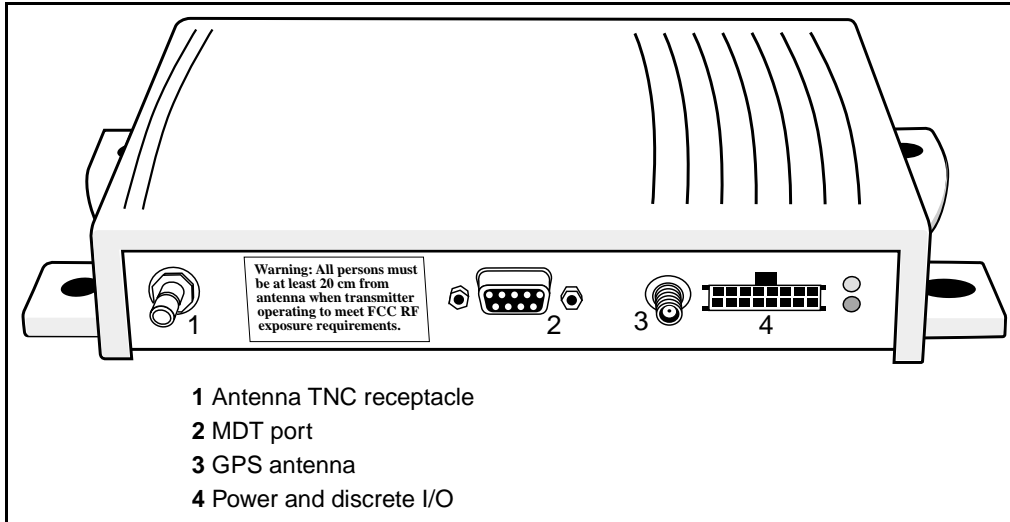
Figure 2.1   CrossCheck CDPD Connections

CDPD Antenna

The CrossCheck CDPD uses a TNC connector for the CDPD antenna. For more information, see Appendix A.

Power and Discrete I/O Pinout

Table 2.1 lists how the power and discrete I/O cable carriers signals.

Table 2.1   CrossCheck CDPD Connections

Pin	Signal	Function	Length (Ft.)
1	V GATT	Input: Power 9-32V	16
2	GND	Battery Ground	3
3	CHAS	Chassis Ground	3
4	GND	Ground	3
5	IGN	Input: Ignition Sense	16
6	IP3	Discrete Input 3	3
7	IP2	Discrete Input 2	3
8	XP2	Discrete Output 2	3
9	IP1	Discrete Input 1	3
10	XP1	Discrete Output 1	3
11	IPO	Discrete Input 0	3
12	XPO	Discrete Output 0	3
13	Pulse 0	Pulse Input 0	3
14	Pulse 1	Pulse Input 1	3
15	Pulse 2	Pulse Input 2	3
16	8V AUX	8 VDC Auxiliary output	3

Figure 2.2 illustrates the power and discrete I/O pinout.

Figure 2.2   Power and Discrete I/O Pinout

GPS Antenna

The GPS antenna uses an SMA female connector. For more information, see Appendix A.

MDT Port

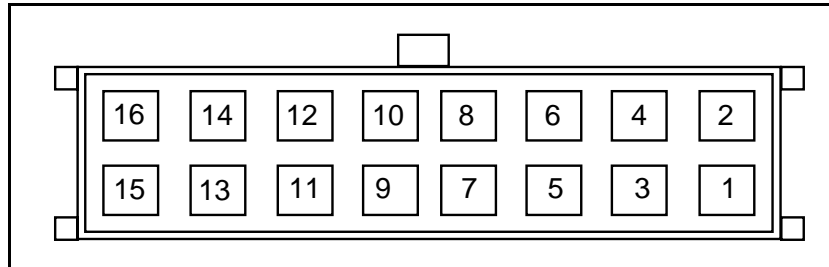Figure 2.3 illustrates the MDT port pin configuration, a standard 9-pin DCE configuration.
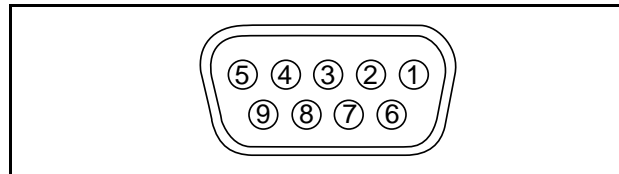
Figure 2.3   MDT Pinout

Table 2.2 lists the MDT connector pinout.

Table 2.2   MDT Connector Pinout

Pin	Signal	Connection
1	DCD	Output: Carrier Detect
2	RxD	Output: Serial Data
3	TxD	Input: Serial Data
4	DTR	Input: Data Terminal Ready
5	GND	Ground
6	DSR	Output: Data Set Ready
7	RTS	Input: Request to Send
8	CTS	Output: Clear to Send
9	PWR	Output: 8.5 VCD @ 200 mA max. (Interpreted as RS-232 hi-level.)

Inspecting and Unpacking the Shipment

The CrossCheck CDPD may be shipped in one or more cartons, depending on the number of units and the options ordered with the shipment. Before opening the shipping containers, inspect the cartons for punctures or damage and immediately report any damage to the shipping carrier. Then open the shipping cartons individually and check their contents against the packing slip.

Table 2.3 identifies the CrossCheck CDPDs and bundles and the included components.

Table 2.3 **CrossCheck CDPD Units and Bundles**

Part Number	Description
46720-00	CrossCheck CDPD Starter Kit (includes GPS antenna, CDPD cellular antenna, power and I/O cable, and Echo*LDX* Kit).
46720-10	CrossCheck CDPD Ten Pack (includes 10 CrossCheck CDPDs without GPS antennas or accessories).

Additional cartons may be included in the shipment for GPS and cellular antennas interface cables, and Echo*LDX* Kit options. For a complete listing of CrossCheck CDPD and component part numbers, see Appendix A, Table A.16.

Installer-Supplied Parts

The installer must supply the following parts:

- Mounting fasteners for the CrossCheck CDPD

- Fasteners for mounting the GPS antenna if the antenna is the bulkhead type

- Cable ties for securing cables to the vehicle

- Any special connectors and adapters required to connect interface devices and power leads (power and I/O cable supplied only with the CrossCheck CDPD Starter Kit P/N 46720-00)

- GPS antenna (supplied only with the CrossCheck CDPD P/N 46720-00 but also available as separate accessory item)

- CDPD Cellular antenna (supplied only with the CrossCheck CDPD Starter Kit P/N 46720-00, but also available as separate accessory item)

Note – The required accessories are not supplied with the Ten Pack Bundles.

Mounting the CrossCheck CDPD

The CrossCheck CDPD can be installed inside any type of vehicle and in any orientation. It can be installed in an enclosed compartment or in a location with limited accessibility, as long as the environmental specifications are maintained to ensure reliable operation. For example, the CrossCheck CDPD can be installed on the floor under a seat, or on a wall behind a seat.

Note – The CrossCheck CDPD cannot be installed inside the engine compartment, wheel well, chassis, or on any exterior surface of the vehicle.

Choose a location for the CrossCheck CDPD that allows for convenient routing and connection of the antenna and interface cables, and that has access to a power source. When selecting a mounting location, consider the specifications listed in Appendix A, and avoid the following hazards:

- Direct exposure to weather

- Excessive heat (exhaust manifolds)

- Excessive cold (refrigeration units)

- High-vibration areas (engine compartment, transmission)

- Corrosive fluids and gases (acids, petroleum products)

- Direct exposure to water
  (The CrossCheck CDPD is not waterproof.)

To mount the CrossCheck CDPD:

1. Choose the mounting location.

   The CrossCheck CDPD can be mounted horizontally, vertically, or in any convenient orientation. During normal system operation, you do not need to see the CrossCheck CDPD LED indicators. However, the ability to see the LED indicators is a definite advantage when troubleshooting the unit.

The integral mounting flange is designed to secure the CrossCheck CDPD to a flat surface. The flange has four holes for securing the unit with fasteners.

2.   Use self-tapping screws or machine screws to secure the unit to the mounting surface.

Caution – Over-stressing the plastic mounting surface when tightening the mounting screws can cause the plastic to crack. Use washers sized small enough that they do not tighten down on the plastic cover of the CrossCheck CDPD when the mounting screws are secured. Tightening screws without using washers can lead to compressing, cracking, or deforming the mounting surface.

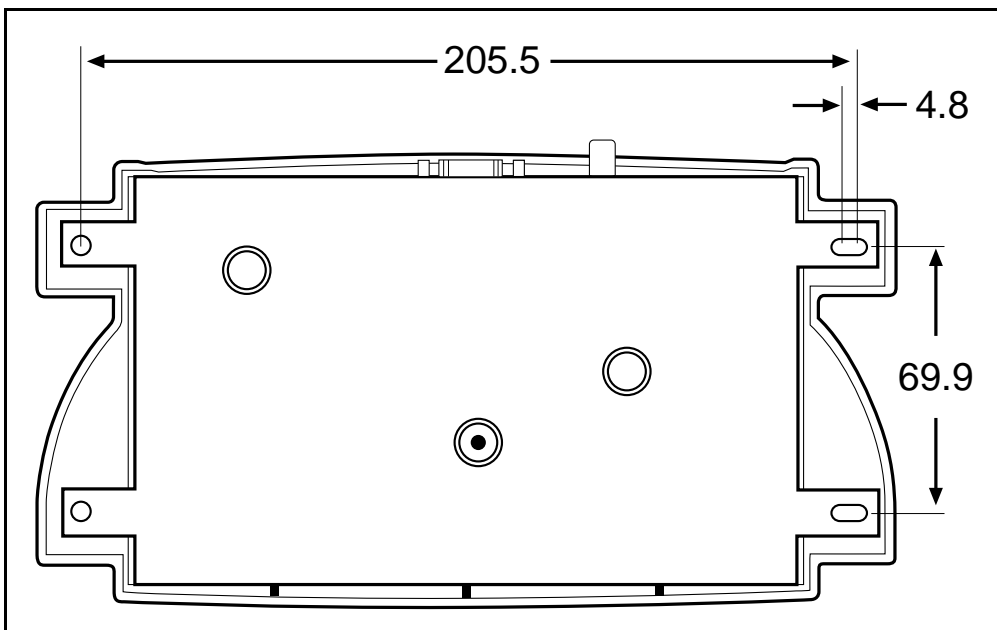Figure 2.4 shows the mounting dimensions.

Figure 2.4   CrossCheck CDPD Mounting Dimensions (in millimeters)

The installer must provide an appropriate selection of fasteners to secure the CrossCheck CDPD to the mounting surface.

- When using self-tapping screws:

    – Select an appropriate size and length for the mounting surface.

    – The hole size leaves some allowance for holes drilled slightly off center from the specified dimensions.

- When using machine screws:

    – Trimble recommends the use of number m3.5 (or number 6) pan-head machine screws.

    – Select a screw length, which extends a safe distance beyond the mounting surface.

    – Secure the screw with a washer and nut. Lock washers are recommended to prevent vehicle vibration from loosening the fasteners.

Connecting CrossCheck CDPD to the Vehicle Chassis

For proper operation, the aluminum chassis of the CrossCheck CDPD must be connected electrically (grounded) to the chassis of the vehicle on which it installed. This can be accomplished in two ways:

- Direct connection through metal screws (preferred)
- Connection through the chassis ground wire

Direct Connection through Mounting Screws

To mount the CrossCheck CDPD Mobile Unit on a metal surface that is permanently attached to the vehicle chassis (for example, the base of the trunk, or a mounting plate that is permanently attached to the chassis using metal screws):

1. Fasten down the CrossCheck CDPD using metal screws driven through the metal tabs on the sides of the unit.

2. Use star washers to ensure a reliable electrical contact to the metal tabs.

3. Make sure the screws are tight, and that they make contact both with the metal on the CrossCheck CDPD and with the vehicle chassis.

Note – If this direct connection through mounting screws method is used for chassis connection, then the chassis ground (pin 3 on the power and discrete I/O connector) on the CrossCheck CDPD should be left unconnected.

Connection through the Chassis Ground Wire

If the CrossCheck CDPD cannot be mounted directly on a metal surface that is attached to the vehicle, then use the chassis ground wire (pin 3 on the power and discrete I/O connector) to make electrical contact to the vehicle chassis:

1. Use a wire with gauge of at least 18 AWG to connect the CrossCheck CDPD power connector to the vehicle chassis.

2. Use a metal screw with a star washer to ensure a reliable electrical contact to the vehicle chassis.

3. Keep the wire length as short as possible by selecting a connection point in the vehicle chassis that is close to the CrossCheck CDPD.

Choosing the GPS Antenna Mounting Location

Antenna location is critical for optimum GPS performance. When choosing a location for the GPS antenna, consider these guidelines:

- The antenna has an unobstructed view of the sky.

- The antenna is safe from damage during normal vehicle operation and maintenance.

- The antenna is not shielded from satellite signals by metal objects or other impenetrable materials.

GPS signals can penetrate plastic, glass and tinted glass (except metallized glass), fiberglass, and plexiglass materials as long as the surface is relatively dry. GPS satellite signals do not penetrate metal or dense wood.

Since GPS satellite signals can penetrate plastic, fiberglass, and glass, the GPS antenna can also be installed on a dashboard under a sloped windshield (if the windshield is not metallized) or under a plastic fender or bumper. These alternative locations are likely to offer less satellite coverage, since the metal components of the vehicle shield the antenna from portions of the sky.

Caution – Do not mount the GPS antenna under a metallized glass windshield, such as those used in some vehicles for window de-fogging or de-icing systems. However, the GPS antenna can be mounted under a tinted-glass windshield.

Disclaimer - The instructions included in this section apply to the GPS antennas sold by Trimble and may not apply to third-party products. There are many other GPS antennas available on the market which may or may not be compatible with the CrossCheck CDPD, including combined GPS/CDPD cellular antenna solutions which have not yet been tested and certified by Trimble.

Additional guidelines to follow include:

- Mount the antenna in a horizontal position facing the sky, as shown in Figure 2.5.

  If the antenna must be located in the vicinity of other antennas (radio, cellular phone), locate the GPS antenna at least 46 cm (approximately 18 in.) away.

- Avoid areas of high vibration (for example, engine hoods).

  For permanent installations, choose a location with access both above and below the antenna-mounting surface. This access is required for installing fasteners and for routing the antenna cable.

  Note – *The standard length of magnetic-mount and bulkhead-mount GPS antenna cables supplied by Trimble is 5 m (approximately 16 ft.). Longer bulkhead-mount antenna cables can be prepared by the installer using the guidelines presented in Appendix A.*

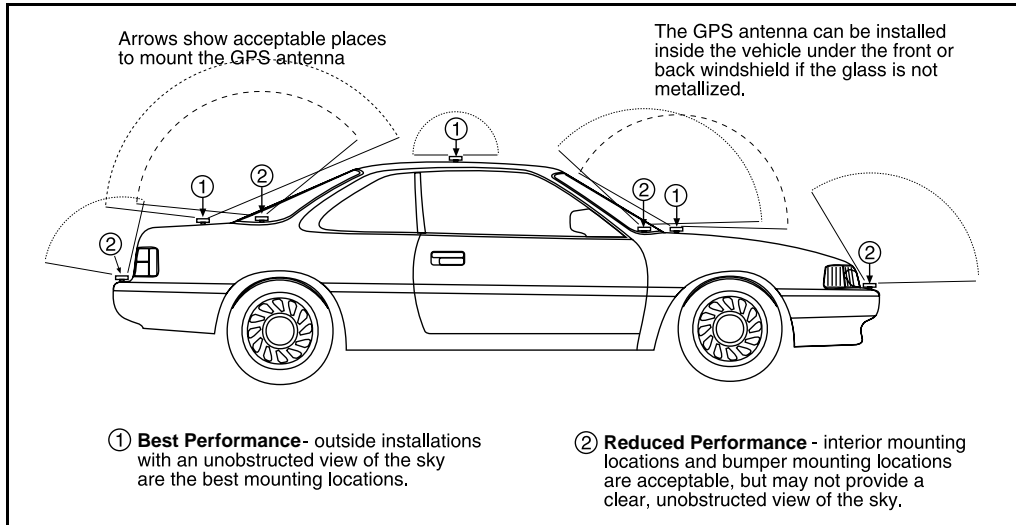Figure 2.5 shows typical antenna-mounting locations for an automobile.

Figure 2.5 Antenna Mounting Locations for Automobile

Figure 2.6 shows the typical antenna mounting locations for a van.
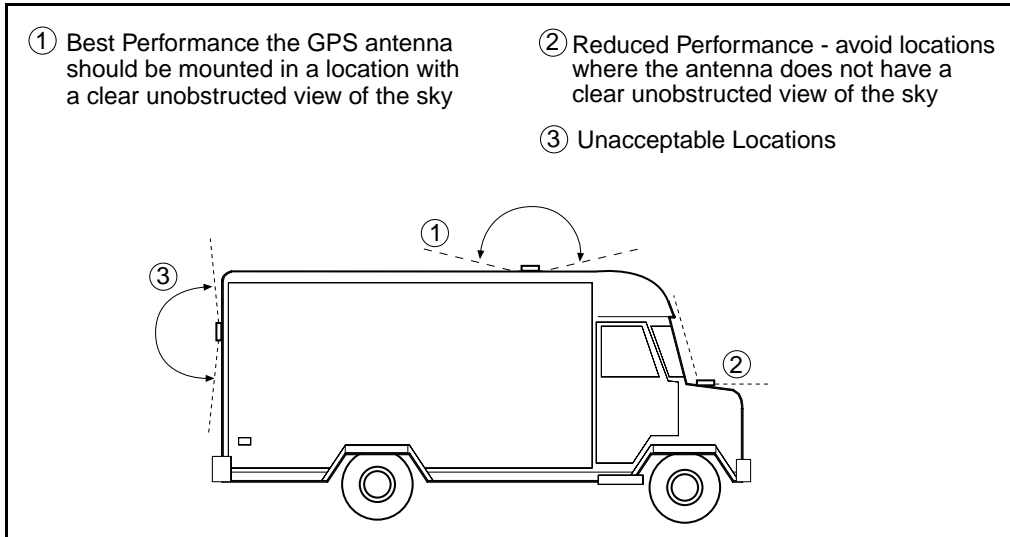
Figure 2.6   Antenna Mounting Locations for Van

The antenna can be mounted under a fiberglass wind deflector such as those used on conventional and cabover trucks as shown in Figure 2.7. Make sure the wind deflector is not painted with a metallic finish.
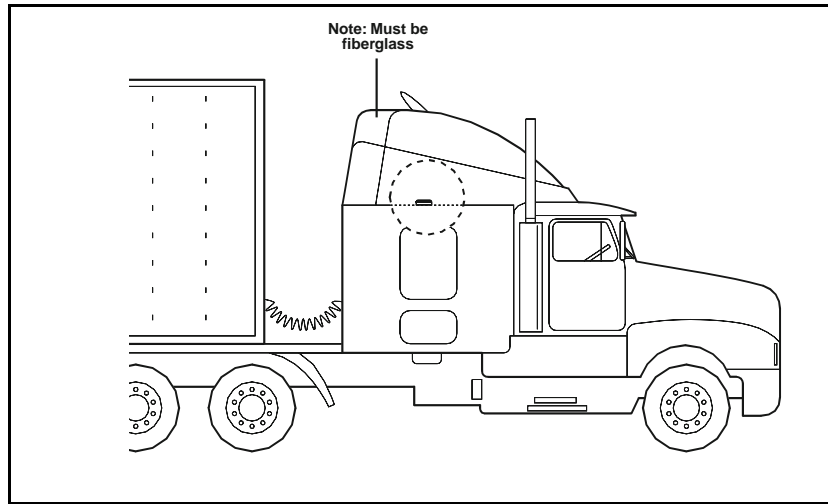
Figure 2.7   Antenna Mounted under Fiberglass Canopy

Note – The GPS antenna may be subject to performance degradation when covered by a heavy layer of snow or ice. If these are typical conditions for your application, mount the antenna in an accessible location so snow can be easily removed.

The CrossCheck CDPD can receive GPS signals from one of two types of optional Miniature Bulkhead GPS antennas, or a Miniature Magnetic GPS antenna, all available from Trimble. Follow the applicable procedure (below) to mount the GPS antenna.

Miniature BulkHead GPS Antenna with Flange (P/N 31192-00)

Two cables are available for the Miniature Bulkhead Antenna with Flange:

- A straight TNC-Plug-to-SMA-Plug antenna cable (P/N 36107)

- A right-angle TNC-Plug-to-straight SMA-Plug antenna cable (P/N 36106)

For more information, see Appendix A.

Figure 2.8 shows the Miniature Bulkhead GPS antenna mounting.
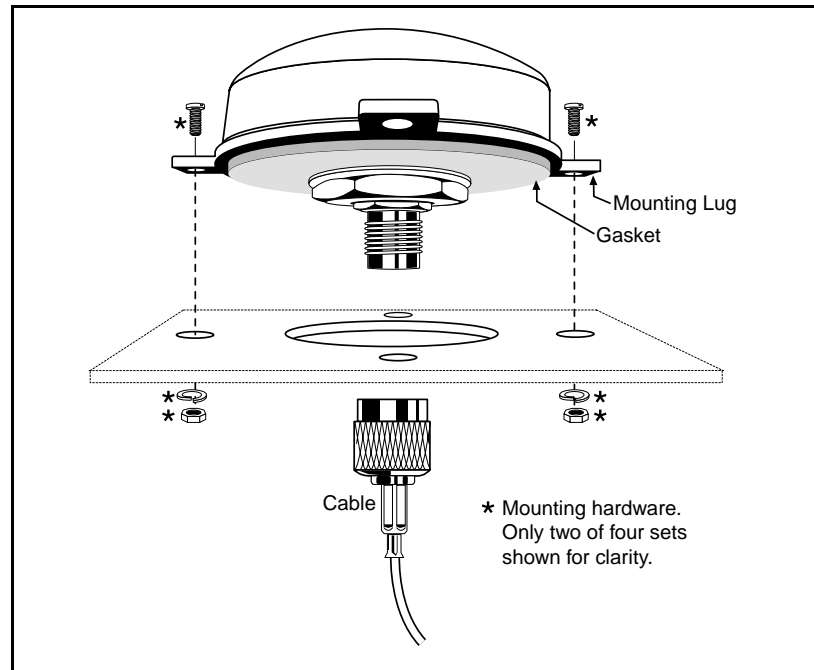
Figure 2.8   Miniature Bulkhead GPS antenna with Flange (P/N 31192-00)

To mount the Miniature Bulkhead GPS antenna with Flange:

1. Drill holes in the mounting surface using the antenna mounting template shown in Figure 2.9.
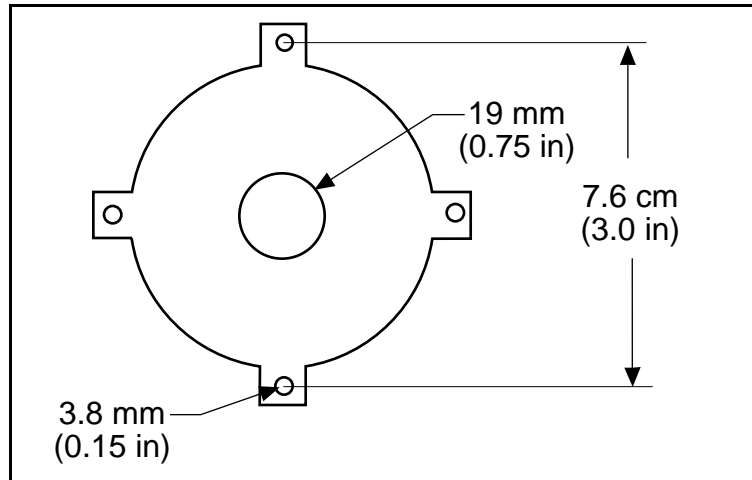
Figure 2.9   Mounting Hole Dimensions

2. Slip the antenna through the larger hole in the center of the hole pattern and rotate the antenna until the four holes in the antenna mounting flange are aligned to the hole circle.

3. Secure the antenna with the four screws, lock washers, and nuts.

4. Connect the TNC connector on the antenna cable to the TNC connector on the antenna.

5. Route the cable to the CrossCheck CDPD mounting location. Use cable ties to secure the cable along the routing path.

For detailed cable routing guidelines, see Routing the GPS Antenna Cable on page 2-30.

Miniature Bulkhead GPS Antenna without Flange (P/N 32434)

Two cables are available for the Miniature Bulkhead Antenna without Flange:

- A straight TNC-Plug-to-SMA-Plug antenna cable (P/N 36107)

- A right-angle TNC-Plug-to-straight-SMA-Plug antenna cable (P/N 36106)

Check the metal thickness at the mounting location before drilling the mounting hole. The bulkhead mount on the antenna is designed to attach to metal surfaces with a thickness of 48 mm (0.1875 in.) or less.

Figure 2.10 illustrates the antenna without the flange. For more information, see Appendix A.
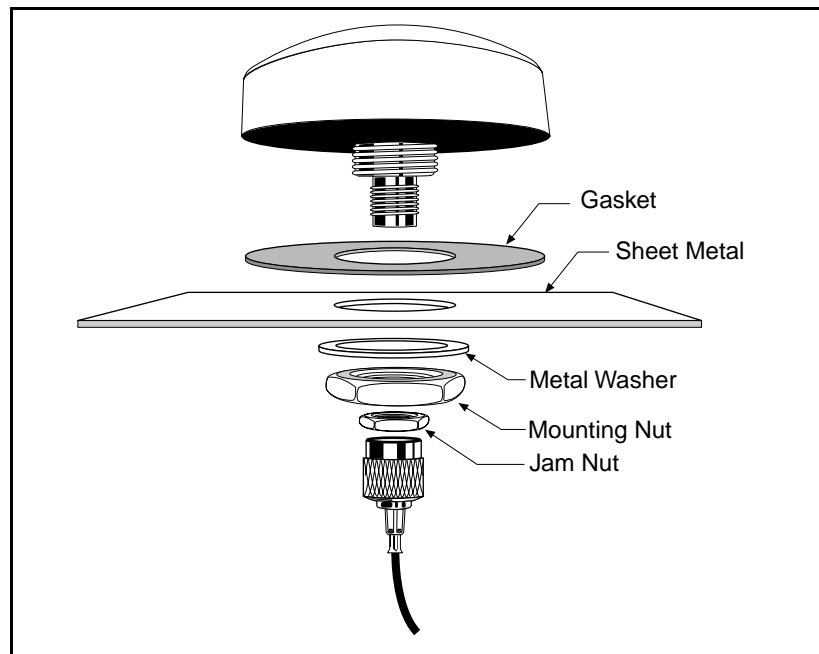
Figure 2.10   Miniature Bulkhead GPS Antenna without Flange (P/N 32434)

To mount the antenna:

1.   Choose the antenna mounting location (see Choosing the GPS Antenna Mounting Location on page 2-20).

2.   Drill a 19 mm (0.75 in.) hole at the mounting location.

3.   Remove the large nut from the bottom of the antenna.

4.   Mount the gasket as shown in Figure 2.10.

5.   Slip the antenna through the mounting hole, and secure it with the large nut.

6.   Connect the antenna cable as shown in Figure 2.10.

7.   Route the cable to the CrossCheck CDPD mounting location.

8.   Connect the cable to the GPS antenna connector.

For detailed cable routing guidelines, see Routing the GPS Antenna Cable on page 2-30.

Miniature Magnetic GPS Antenna (P/N 37167)

The Miniature Magnetic Antenna features a magnetic mount for attaching the unit to ferrous metal surfaces and an integral 5-m cable with SMA connector.

Caution – The magnetic-mount antenna cable has no strain relief at the antenna end of the cable and is not recommended for permanent installations.

Figure 2.11 illustrates the miniature antenna.
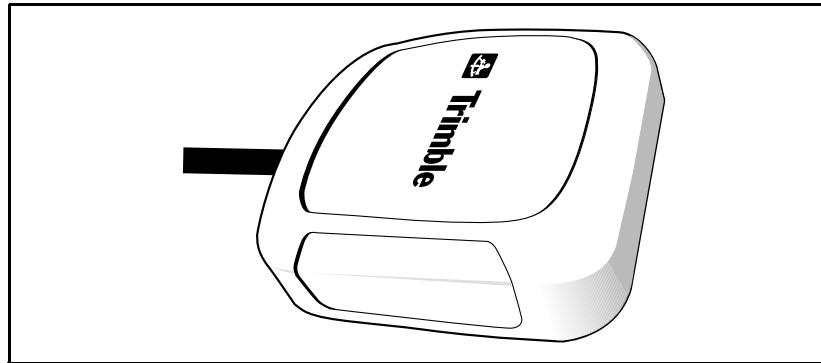
Figure 2.11   Miniature Magnetic GPS Antenna

To mount the Magnetic GPS Antenna:

1.   Choose the antenna mounting location (see Choosing the GPS Antenna Mounting Location on page 2-20).

2.   Mount the antenna to a ferrous surface.

3.   Route the antenna cable.

The antenna features a permanent antenna cable which must be routed to the location where the CrossCheck CDPD is mounted.

Caution – The magnetic-mount antenna cable is exposed to the environment. Wind could cause damage to the cable; use tie wraps to secure the cable along its route.

See Routing the GPS Antenna Cable in the next section.

Routing the GPS Antenna Cable

The Magnetic GPS Antenna has an integral antenna cable, and the Miniature Bulkhead GPS Antennas have a separate 5-m (approximately 16 ft.) cable.

If you are using one of the Miniature Bulkhead GPS Antennas, attach the antenna cable to the connector on the base of the antenna prior to routing the cable. When routing the cable, start at the antenna and choose the most direct path to the CrossCheck CDPD while observing the following guidelines:

- Make sure that at least 5.1 cm (2 in.) of clearance exists between the CrossCheck CDPD's antenna connector and the nearest obstacle.

- Make all cable bends, especially the bend at the SMA strain relief to the antenna connector, with at least 1.3 cm (0.5 in.) bend radius.

- Provide an adequate service loop when routing the cable around vehicle hinges to ensure that the cable is not pinched when a hinged door opens or closes.

- Make sure that the coax cable is not routed through areas where vehicle movement can abrade the cable surface.

- Never coil the excess antenna cable, particularly the Magnetic GPS antenna cable. A coiled cable can act as an antenna and may receive interference.

- Protect cables from exposure to corrosive fluids.

Once the cable is routed and secured, attach the cable to the CrossCheck CDPD GPS (SMA) connector.

Choosing a CDPD Cellular Antenna Mounting Location

Caution – This product can be used with an externally mounted antenna of no more than 3db of gain. A minimum separation distance of 20 cm (approximately 8 in.) must be maintained between the radiating CDPD antenna and the user for this device to satisfy the RF Exposure requirements of the FCC

Disclaimer - The instructions included in this section apply to the cellular antennas sold by Trimble and may not apply to third-party products. There are many other cellular antennas available on the market which may or may not be compatible with the CrossCheck CDPD, including combined GPS/Cellular antenna solutions which have not yet been tested and certified by Trimble.

Although not as critical as GPS antenna placement, cellular antenna placement is also important. Mount the cellular whip antenna in a vertical orientation in a location where it is safe from damage during normal vehicle operation and maintenance. Automated vehicle washes may damage misplaced cellular antennas.

Maintain a separation of at least 46 cm (or approximately 18 in.) between the cellular (or other) and GPS antennas (as illustrated in Figure 2.12).
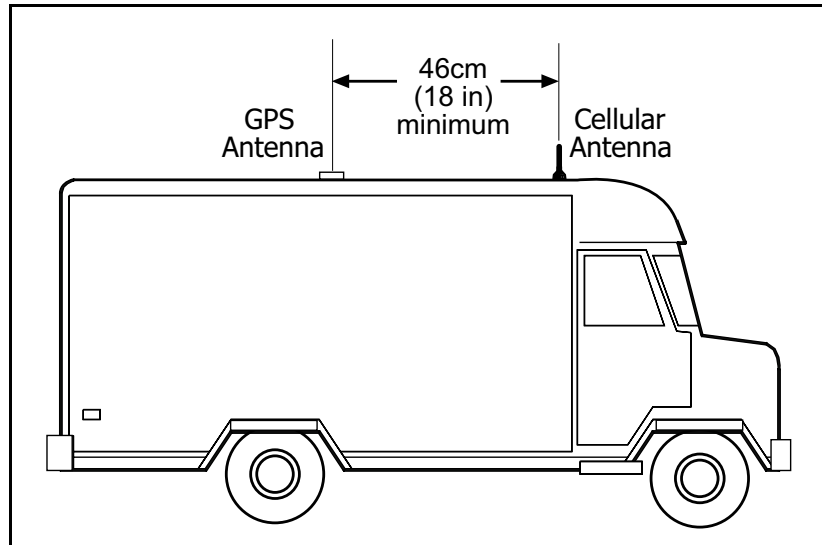
Figure 2.12   Distance Between Antenna Locations

In general, the greater the separation, the less chance of interference. For permanent antenna installations, choose a location with access both above and below the antenna mounting surface. This access is required for installing fasteners and for routing the antenna cable.

Cellular phone dealers and installers are experts on cellular antenna placement. For some installations, the installer may substitute a glass-mount antenna for the antenna supplied by Trimble. Other antennas are acceptable as long as they conform to the requirements listed in Appendix A.

Trimble offers two cellular antenna options for the CrossCheck CDPD. The Magnetic Antenna is recommended for temporary installations. A Bulkhead Antenna is recommended for permanent, surface-mount installations.

Magnetic Cellular Antenna (P/N 46721)

The Magnetic-Mount Cellular antenna and Magnetic Base (see Figure 2.13) is designed for temporary mounting on any ferrous surface.
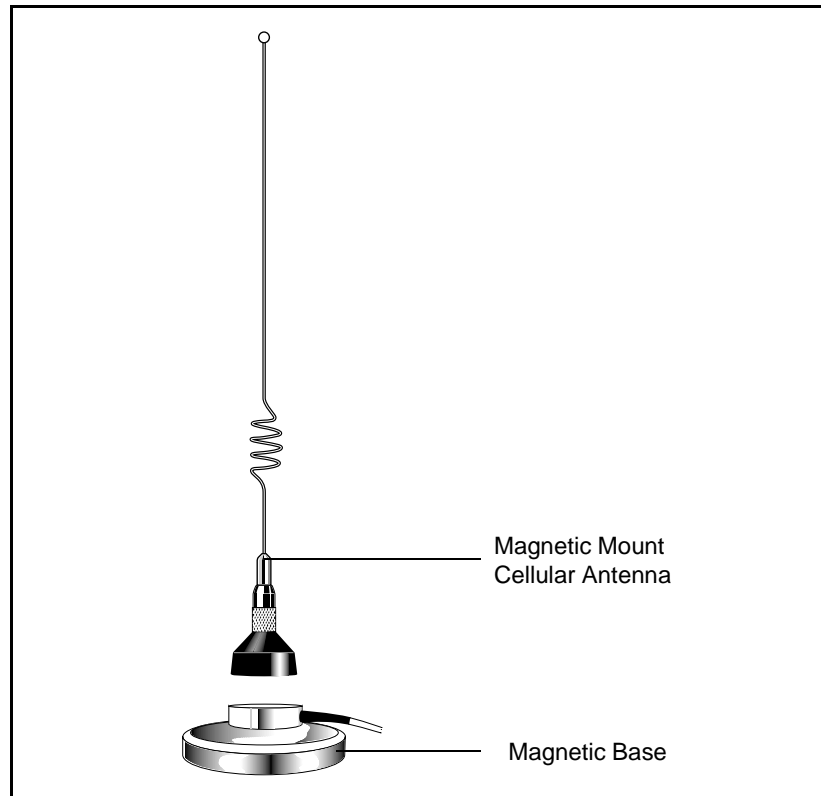
Figure 2.13   Magnetic Cellular Antenna

The antenna features a 3.5 m (11.5 ft.) integral coaxial cable terminated with a TNC-M connector, which is compatible with the CrossCheck CDPD's Cellular Antenna connector. The antenna's magnetic base adheres to any ferrous surface and requires no fasteners or mounting hardware.

To mount the Magnetic-Mount Cellular Antenna:

1.   Mount the antenna to a ferrous surface, following the instructions provided with the antenna.

2.   Route the antenna cable. For detailed cable routing guidelines, see Routing the Cellular Antenna Cable on page 2-38.

Bulkhead Cellular Antenna (P/N 46730)

The Bulkhead Cellular antenna is designed to be permanently mounted on the vehicle.

To install the antenna:

1.   Drill a 19 mm (0.75 in) hole through the vehicle's metal surface, and carefully use a deburring tool to remove burrs from the interior and exterior of the hole (see Figure 2.14).

Use a deburring tool to remove all burrs from the interior and exterior of hole.

Assure that the o-ring seating surface is free of scratches.
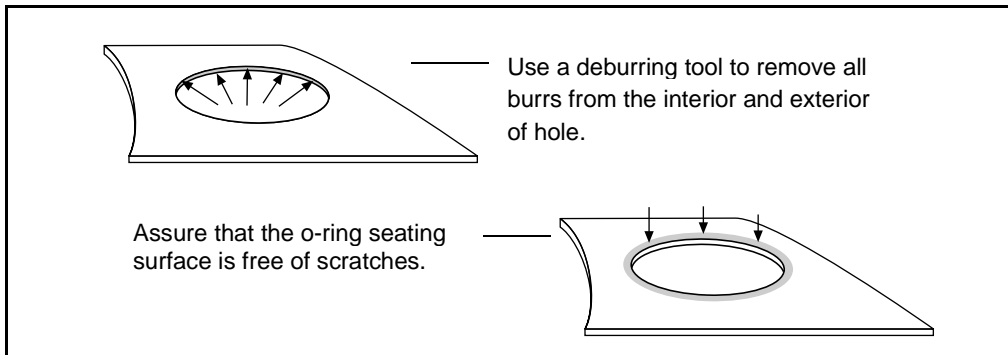
Figure 2.14   Burr Removal and O-Ring Seal Surface Inspection

Note – Use care to avoid scratching the top surface of the hole. The o-ring on the cable mounting assembly must seal to the top surface of the vehicle's sheet metal. Scratches may prevent the o-ring from sealing properly and could result in water leakage.

2.   Carefully remove the brass nut on the antenna cable mounting assembly, using care to avoid damaging the o-ring in the lower surface of the brass nut.

3.   Position the cable mounting assembly below the 19 mm (0.75 in.) hole from the interior of the vehicle (see Figure 2.15).
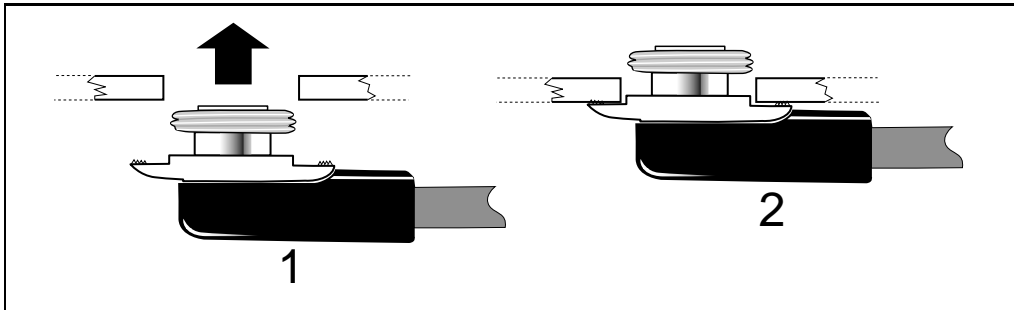
Figure 2.15   Mounting the Antenna Cable Assembly

Two people may be required to perform this operation, depending on the vehicle location where the antenna is mounted.

4.   Re-install the brass nut from the exterior of the vehicle (see Figure 2.16). Turn the brass nut until the cable mounting assembly is secured in place. The brass nut must make metal-to-metal contact with the vehicle's sheet metal to allow the o-ring to seal properly.
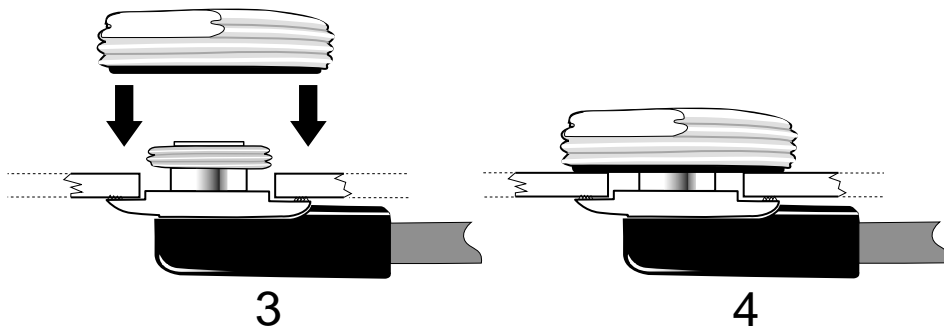
Figure 2.16   Re-installing the Brass Nut

5. Place the rubber gasket over the brass nut (see Figure 2.17).
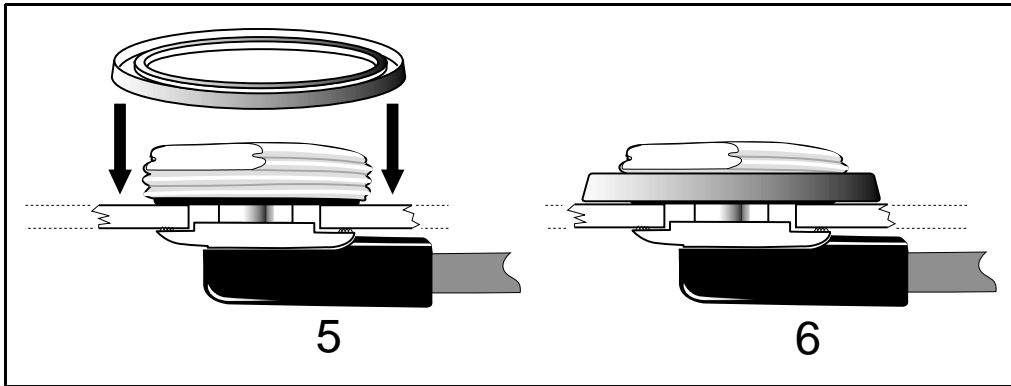
Figure 2.17   Attaching the Antenna to the Cable Assembly

6. Carefully thread the antenna mount onto the brass nut protruding through the top of the sheet metal. Continue to turn the antenna mount until the rubber gasket firmly seats against the vehicle's sheet metal surface.

Figure 2.18 shows the antenna before and after assembly.
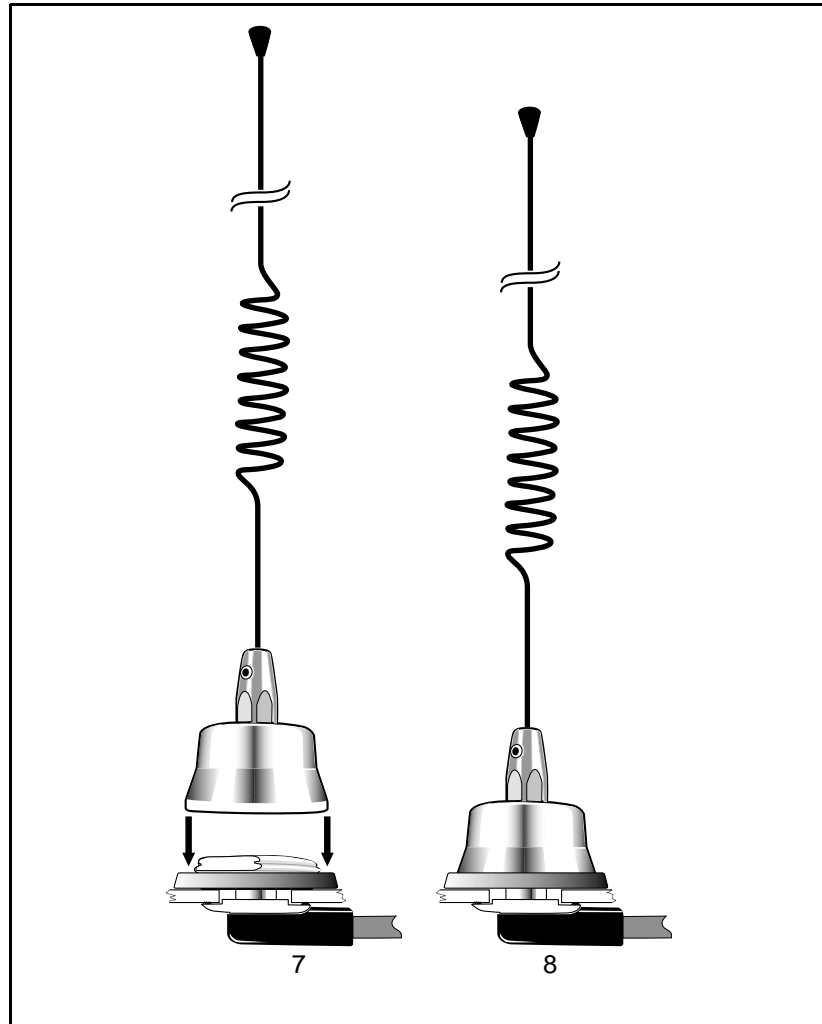
Figure 2.18   Attaching the Cellular Antenna

7. Route the antenna cable to CrossCheck CDPD using the
    guidelines provided in Routing the Cellular Antenna Cable on
    page 2-38.

8. Cut the antenna cable to remove any extra slack, and install the TNC connector on the cable end, following the manufacturer's recommendations.

Routing the Cellular Antenna Cable

The Magnetic Cellular antenna has an integral antenna cable with a TNC-M connector. The Bulkhead Cellular antenna has a 5-m (16 ft.) integral antenna cable, which is terminated within the FME connector. After routing the Bulkhead Cellular cable, the cable must be fitted with a TNC (plug) connector, before attaching the cable to the CrossCheck CDPD. Instructions for installing the TNC connector are included with the antenna kit.

The next step in the installation process is routing and connecting the antenna cable to the CrossCheck CDPD. When routing the cable, start at the antenna and choose the most direct path to the CrossCheck CDPD while avoiding the following hazards:

*   Excess coils in the antenna cable, particularly the cellular antenna cable. A coiled cable can act as an antenna and may receive interference.

*   Pinching the cable in a hinged door. Provide an adequate service loop when routing the cable around vehicle hinges.

*   Vehicle movement that might cause cable damage. Make sure that the coax cable is not routed through areas where vehicle movement can abrade the cable surface.

*   Exposure to environmental damage. If your cellular antenna cable is exposed to the environment, use tie wraps to secure the cellular antenna cable along its route to prevent wind damage. The Magnetic Cellular antenna cable is exposed to the environment. Since the wind could cause the cable to whip around, tie wraps should be used to secure the cable along its route.

Connecting the Magnetic Cellular Antenna Cable

After routing the Magnetic Cellular Antenna cable, connect the cable to the TNC connector labeled *Cellular* on the front panel. Tighten the connector firmly to prevent loosening caused by normal vehicle vibration.

Connecting the Permanent-Mount Cellular Cable

Once the cable routing is complete and the cable is secured attach the TNC connector on the antenna cable. Then attach the cable to the connector labeled *Cellular* on the front panel of the CrossCheck CDPD.

Inputs (IP0 to IP3)

The CrossCheck CDPD supports four discrete inputs. The circuit diagram is shown in Figure 2.19.
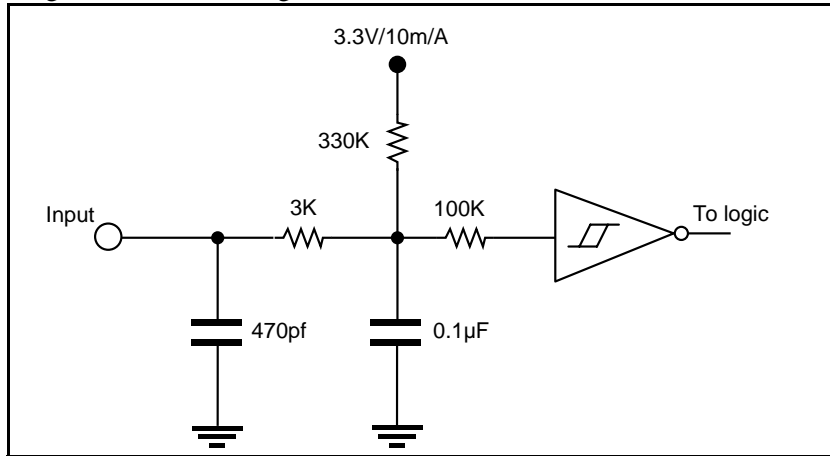
Figure 2.19   Input Circuit Diagram

Input Logic High:	Open circuit or V_{in} > 2.4 VDC
Input Logic Low:	V_{in} < 0.6 VDC
	The inputs must remain in either state for at least 200 milliseconds before the CrossCheck CDPD detects the input.
Input Current (Max)	I_{in} < 3 mA
	1 mA is typical at 12 VDC.
Input Protection:	Protected up to at least V_{Batt} continuous

Each input floats to a logic-high state (inactive) when left open. Grounding an input causes a logic-low state (active). The CrossCheck CDPD can be configured to detect either logic-high or logic-low states at the inputs whenever the unit is powered on.

Note – When the CrossCheck CDPD is powered off or in Power Management mode, it can only detect a logic-low (grounded) input.

The discrete inputs are compatible with properly connected relays and switches or with standard 3.3 VDC logic levels. A properly connected relay or switch allows the input to float high in one position and grounds the input in the other position.

Pulse Counting Inputs (Pulse 0 to Pulse 2)

The CrossCheck CDPD also supports three pulse-counting inputs that can be used in several applications. The circuit diagram is shown in Figure 2.19.
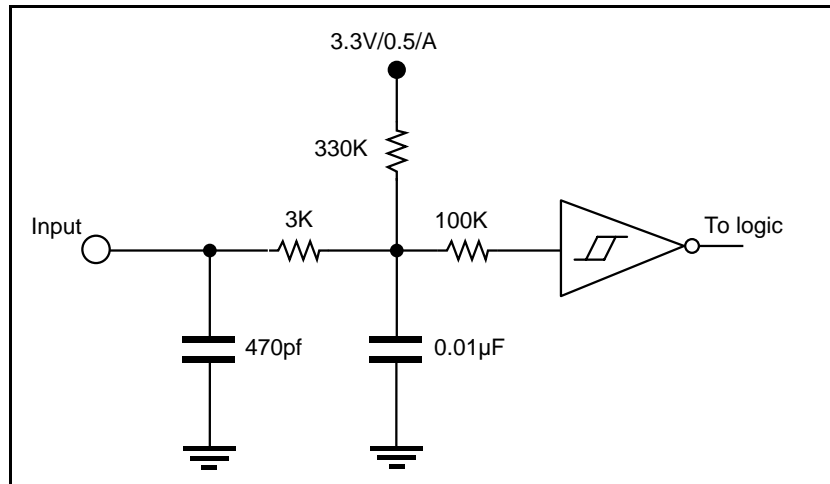
Figure 2.20   Pulse Countin Input Circuit Diagram

Input Logic High:	Open circuit or $V_{in} > 2.4$ VDC
Input Logic Low:	$V_{in} < 0.6$ VDC
	The inputs must remain in either state for at least 200 milliseconds before the CrossCheck CDPD detects the input.
Input Current (Max)	$I_{in} < 3$ mA
	1 mA is typical at 12 VDC.
Minimum Pulse Width	500 microseconds
Input Protection:	Protected up to at least V_{Batt} continuous

Outputs (XP0 to XP2)

The CrossCheck CDPD features three discrete outputs (XP0–XP2) for driving external devices such as relays.

- When inactive (use state), the discrete outputs are tied to vehicle battery voltage (nominally 12 VDC) through a 15 kOhm resistor.

- When active, the outputs are shorted to ground through a bipolar junction transistor. In the active (low) state, the outputs can sink up to 200 mA.

Figure 2.21 shows a diagram of a discrete output.
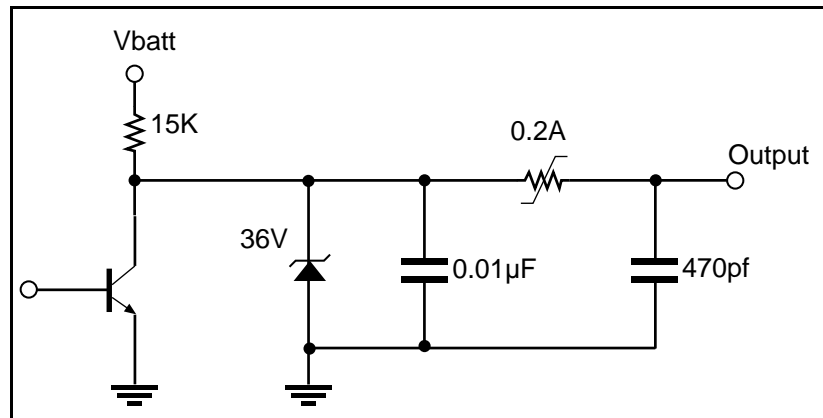
Figure 2.21   Output Circuit Diagram

Output Inactive:	15 kOhms through $V_{vehicle-battery}$
Output Active:	Tied to ground through a saturated bipolar junction transistor, V_{out} 1.5 VDC at 200 mA; V_{out} < 0.5 VDC at 10 mA
Output Protection:	Protected against direct shorts to ground
Output Sink Current Capability	Up to 200 mA

Figure 2.22 shows the cable connections between a PC and the CrossCheck CDPD.
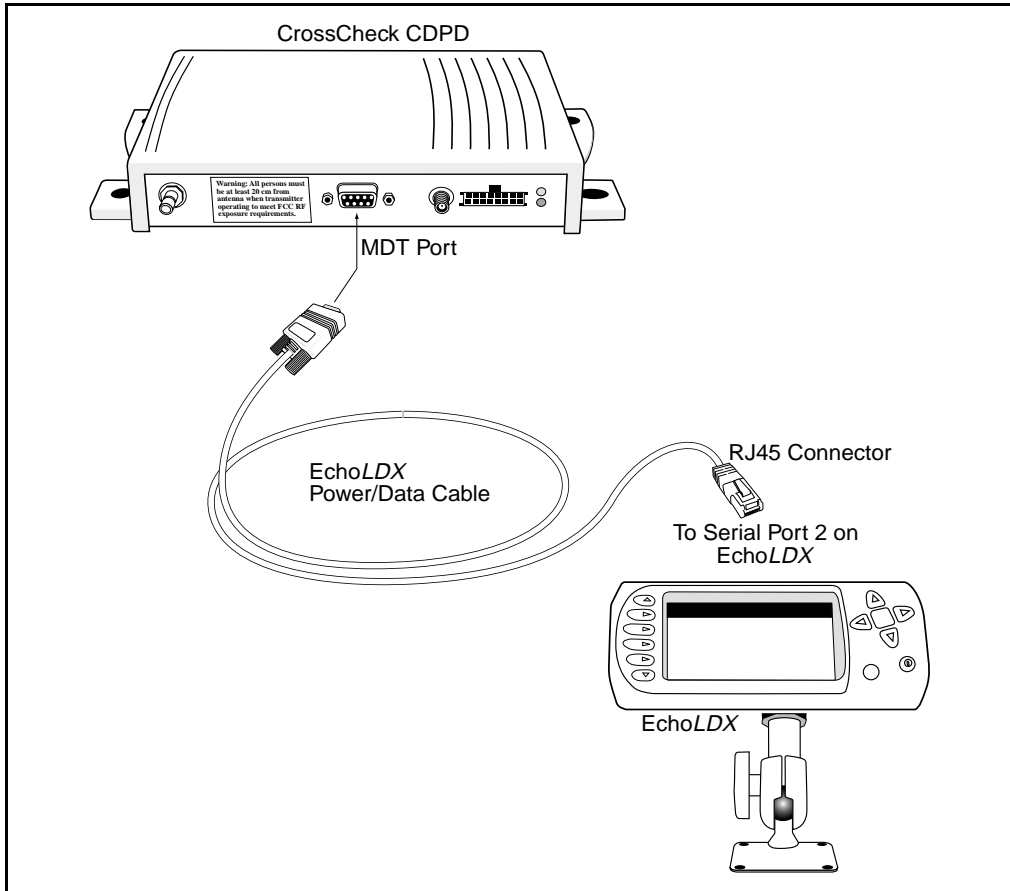
Figure 2.22   PC to CrossCheck CDPD Connections

CrossCheck CDPD Power

The CrossCheck CDPD operates on input voltages from 9–32 VDC. The low-noise amplifier integrated on the GPS antenna draws power from the CrossCheck CDPD through the antenna cable. The CrossCheck CDPD does not require any special power-up or down sequencing.

The CrossCheck CDPD's power circuitry is designed to protect the unit from random power fluctuations and conditions. Input circuits protect against transient voltage spikes found in most auto and truck environments. An external fuse protects against excessive current.

For more information on the CrossCheck CDPD power requirements, see Appendix A.

Figure 2.23 illustrates the power and I/O cable.
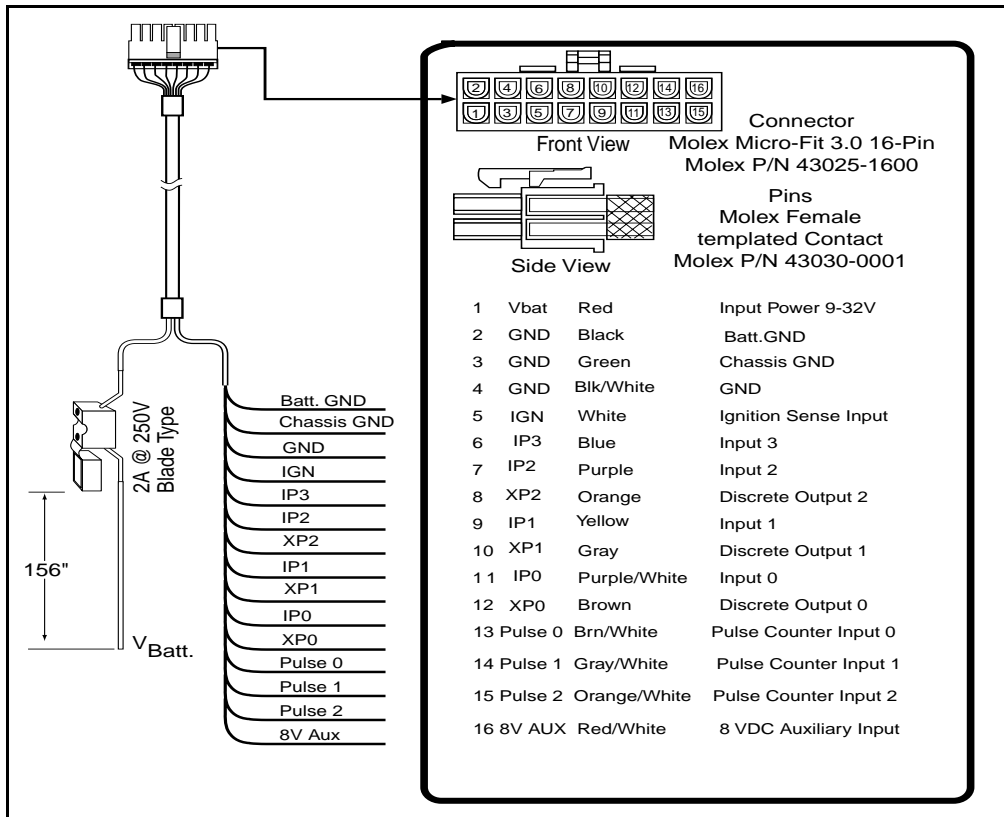
Figure 2.23   Power and I/O Cable (P/N 46598-00)

Note – Trimble recommends installing the power and ground leads as close to the battery as possible to ensure that the CrossCheck CDPD is connected to the cleanest possible source of power.

The CrossCheck CDPD is protected against both input power over-voltage and reverse polarity. The primary power cable has a built-in fuse. The DC ground line connects to the vehicle's DC ground. The ignition-sense lead, if connected to a source of ignition-switched battery voltage, senses when the vehicle's ignition is active. There are three connection options for connecting the power, ground, and ignition-sense wires. These options are described in the next three sections.

Connections For Power Management

The CrossCheck CDPD operates continuously only when the vehicle is running. When the ignition is off, the CrossCheck CDPD goes to sleep, drawing reduced power. For more information on current draw in different operation modes, see Appendix A.

The default Power Management configuration for the CrossCheck CDPD is the following:

- When the ignition is OFF, the unit goes to sleep state after 3 minutes.

- If the Echo*LDX* is connected to the CrossCheck, the Echo*LDX* will turn off 1 minute after ignition OFF is detected.

Figure 2.24 illustrates the Power Management connections.
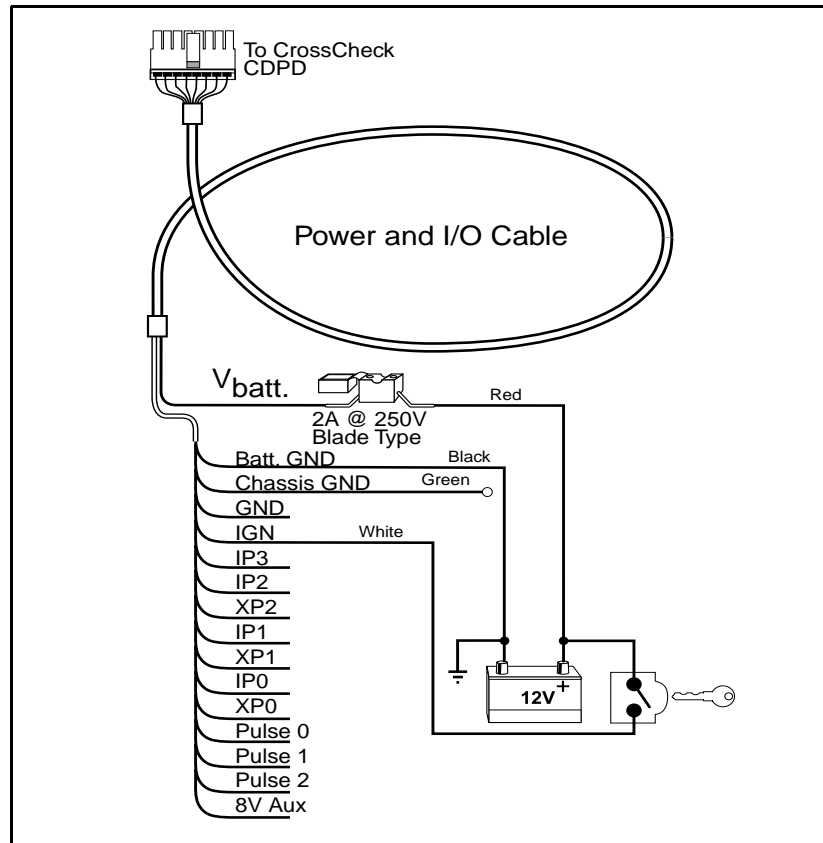
Figure 2.24   Power Management Connections

To install the power cable for use with the Power Management feature:

1. Connect the primary power line to a nonswitched/continuous source of DC power, such as the vehicle's battery.

2. Connect the ignition-sense line to ignition-switched battery power so that this line is active when the ignition is on.

Continuous Power Connection (No Power Management)

For the Continuous Power configuration (see Figure 2.25), the CrossCheck CDPD operates and draws power continuously, even when the vehicle is not running:

- Idle mode (not transmitting) without the Echo*LDX* Message Terminal, 130 mA is typical @ 12 VDC

- Idle mode (not transmitting) with the Echo*LDX* Message Terminal, 200 mA is typical @ 12 VDC

Caution – With the Continuous Power Configuration, the CrossCheck CDPD may drain a car battery in 1 to 3 weeks, depending on the battery quality and remaining life span, and whether or not the vehicle is operating during the entire time. **Observe extreme care when using this connection option.** The CrossCheck CDPD will automatically power off when the voltage drops below 9 VDC.

Figure 2.25 illustrates connections for Continuous Power.
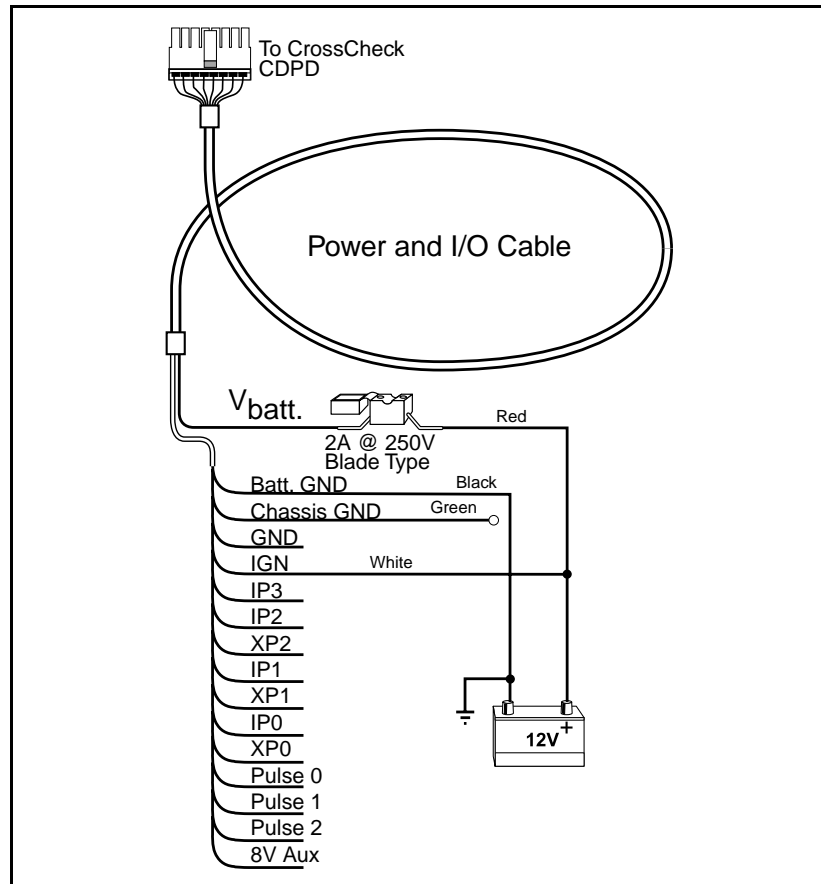
Figure 2.25   Continuous Power Connections

To connect the power cable to Continuous Power:

1. Connect the primary power line.

2. Connect the ignition-sense line to a nonswitched/continuous source of DC power, such as the vehicle's battery.

Installing the Echo*LDX* Kit

The Echo*LDX* Message Terminal can be installed in almost any type of vehicle. There are four steps in this procedure:

1. Assemble the mounting pedestal.

2. Mount the Echo*LDX*.

3. Route the Power/Data cable.

4. Connect the Power/Data cable to the CrossCheck CDPD.

This section provides detailed installation instructions.

Configuration Parameters

In addition to the physical installation of the unit, configuration parameters can be set in each unit. Trimble recommends that if a configuration other than the factory setting is used, every unit in the fleet be given the same settings so that operation is consistent from vehicle to vehicle. Echo*LDX* configuration is discussed in the Echo*LDX Message Terminal for CrossCheck CDPS and CrossCheck GPRS Installation and User's Manual,* Trimble Part Number 46667-00-ENG.

Preparing for Installation

Inventory

Prior to installation, confirm that you have received the required Echo*LDX* components:

• Echo*LDX* Message Terminal

• Power/Data cable

• Echo*LDX* mounting pedestal kit (6") and mounting hardware

• Echo*LDX Quick Reference Guide*

Choosing a Location

Choose a location for the Echo*LDX* where the display is easy to view and the keypad is readily accessible. When selecting a location, avoid exposure to extreme environmental conditions, including:

- Excessive heat or cold

- High vibration

- Corrosive fluids and gases

- Wet or damp locations

Avoiding these conditions will improve the Echo*LDX*'s performance and will ensure long-term reliability.

All standard external connections to the Echo*LDX* are made through the connector (marked as 2) on the bottom of the unit.

Mounting the Pedestal and Installing the Echo*LDX*

The Echo*LDX* can be attached to any flat surface using the mounting assembly. When positioning the assembly on the mounting surface, allow sufficient clearance beneath the Echo*LDX* for the Power/Data cable and on the right side of the unit for the maintenance and upgrade cable.

To mount the pedestal:

1. In the vehicle, select a mounting surface for the pedestal and temporarily place the MDT at the top on the pedestal. Ensure that the MDT is accessible by all possible operators.

2. Verify that there is clearance behind the mounting surface for the mounting screws. Choose the appropriate screws to install the pedestal to the mounting surface—either sheet metal screws or machine screws with lock nuts.

3. Remove the MDT from the top of the pedestal.

4. Place the pedestal base on the mounting surface and secure it with the appropriate screws.

Figure 2.26 Echo*LDX* Attached to Mounting Assembly

5. Affix the MDT to the mounting pedestal. Position the MDT and tighten all locking nuts.

Routing the Power/Data Cable

The next step in the installation process is to route the Power/Data cable from the Echo*LDX* to the CrossCheck. When routing the cable, avoid the following hazards:

- Sharp bends or kinks in the cable
- Hot surfaces (exhaust manifolds or stacks)
- Rotating or reciprocating equipment

- Sharp or abrasive surfaces

- Door and window jambs

- Corrosive fluids or gases

Follow these installation guidelines:

- Choose the most direct path to the destination.

- Leave enough excess cable for a *service loop*, to allow for removal of the Echo*LDX* and the CrossCheck.

- Secure the cable to the pedestal with a cable tie.

Power and Interface Connections

The 2.90 m Power/Data cable provided with the Echo*LDX* includes a RJ-45 connector at one end and a serial connection and a DB9M at the other (as shown in Figure 2.27).
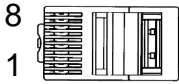
Figure 2.27   Echo*LDX* Power/Data Cable

The cable connects to the CrossCheck through the DB9F connector labeled MDT. Power is supplied to the Echo*LDX* through the same data cable.

Note – When the cable connection is complete, secure the cable using a cable tie.

Table 3.1 describes the pin locations for the Echo*LDX* connector and the Power/Data cable, as viewed from the front of the connector.

Table 2.4   Echo*LDX* Power/Data Cable Pinout Connections

CrossCheck MDT Port DB9 Pin Number	Echo*LDX* Power/Data Cable Wire Color	Echo*LDX* Cable RJ-45 Connector Pin Number	Signal Name
2	Green with white stripe wire	5	RxD, Input to MDT
3	White with Brown stripe wire	4	TxD, Output to MDT
5	Gray with white stripe wire	1	Ground
7	Brown with white stripe wire	3	RTS (Handshake output from MDT)
8	White with green stripe wire	6	CTS (Handshake input to MDT)
9	White with Grey stripe wire	2	Power

Operation

In this chapter:

- ■ Introduction
- ■ LED Indicators
- ■ GPS Receiver Operation

Introduction

Once you have installed and configured the CrossCheck CDPD, it is ready for operation. When power is applied, the CrossCheck CDPD operates automatically without user intervention, based on its firmware configuration.

This chapter provides a basic overview of the CrossCheck CDPD's operation, including:

- LED Indicators

- GPS Receiver

- CDPD Transceiver

LED Indicators

The CrossCheck CDPD includes two LED indicators: GPS and GSM. The firmware:

- Continuously monitors the GPS receiver and the CrossCheck CDPD phone operation

- Controls the two LED indicators

Figure 3.1 shows the CrossCheck CDPD LED indicators.

CDPD LED (Amber)

GPS LED (Green)
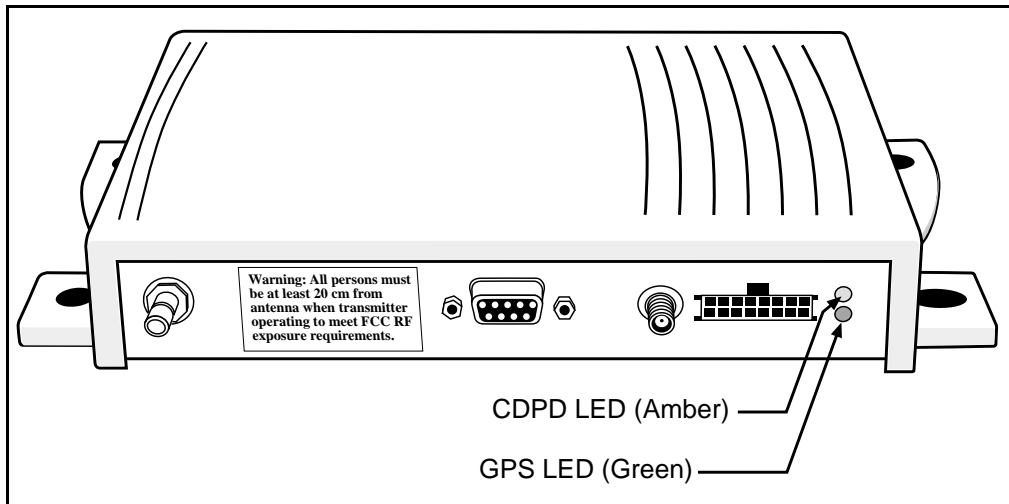
Figure 3.1   CrossCheck CDPD LED Indicators

LED States

The GPS and CDPD LED have three states: On, Off, and Blink.

When both LED indicators are off, the CrossCheck CDPD's power is off. When one or more LED indicators are on or blinking, the power is on.

LED Power-On Sequence

When the CrossCheck CDPD's ignition input and power inputs are activated:

- The LEDs blink once.

- Both turn off for approximately 5 seconds.

- Both remain on for approximately 2 seconds.

The GPS LED is on for approximately 2 seconds, then blinks until the *first* position *fix* is computed. During this period, the CDPD LED blinks until the unit is established in a CDPD area, at which point the CDPD LED turns off. When a call is active, the CDPD LED stays on for the duration of the call.

GPS and CDPD LED States

Table 3.1 identifies the GPS LED states.

Table 3.1   GPS LED States (Green LED)

GPS LED State	Meaning
On	Computing GPS position fixes.
Blink	Not computing GPS position fixes.
Off	No power is available, or CrossCheck CDPD is in Sleep mode.

Table 3.2 identifies the GSM LED states.

Table 3.2   GSM LED States (Amber LED - when GPS green LED is on or flashing)

CDPD LED State	Meaning
On	Data call in progress.
Slow Blink	No CDPD coverage is available; the CrossCheck CDPD is not registered with network.
Off	CDPD coverage is available; no call in progress.

GPS Receiver Operation

At power-up, the GPS receiver initializes with the last-known position. Using this information, the GPS receiver acquires satellite signals.

- During the satellite acquisition process—which normally requires less than 2 minutes—the green GPS LED blinks.

- Once three or more satellites are acquired, the GPS receiver computes positions, course, speed and time fixes, and the GPS LED remains on.

A blinking GPS LED indicates that the GPS receiver is not tracking enough satellites to calculate a current position. This occurs occasionally when the vehicle is obscured from satellite signals by terrain, buildings, trees, tunnels or other structures. During this period—called satellite reacquisition—the GPS receiver continuously searches for the obscured satellites and expands its search to other satellites to continue position computations. For brief blockages, the GPS receiver normally reacquires a lost satellite signal and resumes position fixes in less than 2 seconds.

Specifications

In this appendix:

- ■ Introduction
- ■ Standard Components
- ■ Environmental Specifications
- ■ I/O Characteristics
- ■ Accessories (ordered separately)
- ■ CrossCheck CDPD Part Numbers

Introduction

This appendix lists the CrossCheck CDPD Mobile Unit and antenna specifications.

Standard Components

The tables include general specifications and requirements for the following:

- General Specifications, Table A.1

- Firmware Specifications, Table A.2

- GPS Specifications, Table A.3

- GPS Antenna Requirements, Table A.4

- CDPD Cellular Specifications, Table A.5

- Cellular Antenna Requirements, Table A.6

- CrossCheck CDPD Mobile Unit Physical Specifications, Table A.7

- CrossCheck CDPD Mobile Unit P/N 46707-00, Table A.8

- Miniature Bulkhead GPS Antenna with Flange (P/N 31192-00), Table A.9

- Miniature Bulkhead GPS Antenna without Flange (P/N 32434), Table A.10

- Miniature Magnetic GPS Antenna (P/N 37167), Table A.11

- MDT Port, Table A.12

- Discrete Inputs: IP0 to IP3, Table A.13

- Pulse Counter Inputs, Table A.14

- Discrete Outputs: XP0 to XP2, Table A.15

- Component Part Numbers, Table A.16

Table A.1   General Specifications

Item	Specification
Power Requirements	**Transmitting** - without Mobile Data Terminal: Typical 450 mA (1.5 A peak) at 12 V (Transmitter at max power level)
	Transmitting - with Mobile Data Terminal: Typical 520 mA (1.6 A peak) at 12 V (Transmitter at max power level)
	Idle (not transmitting) - without Mobile Data Terminal: Typical 130 mA at 12 V
	Idle (not transmitting) - with Mobile Data Terminal: Typical 200 mA at 12 V
	Sleepmode (all functions off, IGN sense and inputs active): < 10 mA at12 V
MDT Port	(1) RS-232 DCE
Serial Port Speed (bps)	9600
Data Rate over the Air	19,200 bps maximum
Discrete I/O Ports	Discrete Inputs: (4) switch closures; ignition
	Pulse Counting Inputs (3) minimum pulse width: 500 microseconds
	Outputs: (3) 200 mA low-side drivers, Auxiliary output for sensors: 100 mA max at 8.5 ±0.5 V
Status LEDs	GPS (green) and CDPD (amber)

Table A.2   Firmware Specifications

Item	Specification
Event Handlers	Geo-fence area for Job Sites
	Geo-fence area for Home Sites
	Entry Speed Limit for Site Dispatch purposes
	Exit Speed Limit for Site Dispatch purposes
	Site dispatch time-out
	Minimum duration time to detect entry/exit regions
	Support datalogging that allows the CrossCheck CDPD to store messages and events for up to 1 week while out of the network when outside CDPD coverage.
	Automatic status reporting for ready mix applications.
Messaging	Available through the Echo*LDX* terminal
Ignition Sense	Off: V < 0.8 VDC; On: V > 2.4 VDC

Table A.3   GPS Specifications

Item	Specification
Receiver	L1 frequency, C/A code (SPS), 8-channel continuous tracking receiver using the Trimble FirstGPS™ and Colossus™ technology
Update Rate	Once per second maximum
Accuracy	Position: better than10 meters (50% CEP) Velocity: < 0.5 meter/second
Time to First Fix	Cold start: < 180 seconds 90% of cases Warm start: < 45 seconds 90% of cases Hot start: < 20 seconds 90% of cases Reacquisition after 15-second blockage: < 2 seconds 90% of cases
Datum	WGS-84

Table A.4   GPS Antenna Requirements

Item	Specification
Antenna Impedance	50 Ω
Antenna RF Gain	20 dBi minimum gain, measured at the input connector to the CrossCheck CDPD
Noise Figure	2.5 dB maximum, measured at the input connector to the CrossCheck CDPD
VSWR	2:1 Max over range
Power	5.0 ±0.5 VDC @ 40 mA maximum on center conductor

Table A.5   CDPD Cellular Specifications

Item	Specification
Cellular	CDPD Specification 1.0 and 1.1, 600 mW Full Duplex
Frequencies	Transmit: 824 to 849 MHz
	Receive: 869 to 894 MHz
Receiver Sensitivity	−111 dBm
Type Approvals	FCC Part 15 Class B and Part 22 (from OEM module) FCC ID = JUPCCKCDPD Industry Canada

Table A.6 **Cellular Antenna Requirements**

Item	Specification
Antenna Impedance	50 Ω
Maximum Antenna Gain	Externally mounted antenna gain plus cable loss should total no more than 3 dBi gain to comply with FCC limits.
VSWR	1.5:1 nominal, 2.0:1 maximum

⚠ **Warning –** To meet FCC RF exposure requirements, the maximum gain for externally mounted antennas (plus any cable losses) cannot be more than 3 dBi.

Warning – To meet FCC RF exposure requirements, all persons must be at least 20 cm from the CDPD antenna when the transmitter is operating.

Table A.7 **CrossCheck CDPD Mobile Unit Physical Specifications**

Item	Specification
Assembly	Bottom: Aluminum Top: Injection-molder plastic with integrated shield
Size	228 mm W x 121 mm D x 28 mm H (9.6" W x 4.75" D x 1.9" H)
Weight	450 g (1 lb.)
Connectors	MDT: DB9 (receptacle) Power/Ignition + Digital I/O: Molex Micro-Fit 3.0 16-pin 2-row locking (receptacle) GPS antenna: SMA (receptacle) 50 Ω CDPD antenna: TNC (receptacle) 50 Ω

Environmental Specifications

The tables in this section list the environmental specifications for the for following:

- CrossCheck CDPD Mobile Unit P/N 46707-00

- Miniature Bulkhead GPS Antenna with Flange (P/N 31192-00)

- Miniature Bulkhead GPS Antenna without Flange (P/N 32434)

- Miniature Magnetic GPS Antenna (P/N 37167)

Table A.8   CrossCheck CDPD Mobile Unit P/N 46707-00

Item	Specification	
Operating Temperature	−20°C to +60°C	
Storage Temperature	−40°C to +85°C	
Humidity	5% to 95% RH, non-condensing at +40°C	
Altitude Range	−1000 to +18,000 meters	
Velocity Range	0 to 515 meters/second (999 miles/hour)	
Vibration	$0.008g^2$/Hz	5 Hz
	+3dB/Octave	5 Hz to 20 Hz
	$0.05g^2$/Hz	20 Hz to 100 Hz
	−3dB/Octave	100 Hz to 800 Hz
	$0.001g^2$/Hz	800 Hz to 1000 Hz
Shock	Operational: 40 g for 11 milliseconds Non operational: 75 g for 6 milliseconds	
Vehicle Transient Noise	ETS 300 342-1, Section 9-5	

Table A.9   Miniature Bulkhead GPS Antenna with Flange (P/N 31192-00)

Item	Specification
Size	62.6 mm D x 19.0 mm H (3.5" D x 0.75" H)
Weight	0.13 kg (4.59 ounces)
Mounting Hole Circle	762 mm (3.0 in.), 4 holes, 0.6 mm (0.15 in.)
Center Mounting Hole	63 mm (0.75 in.)
Threaded Nut	63 mm TNC (0.75 in.)
Operating Temperature	–40°C to +85°C
Storage Temperature	–55°C to +85°C
Humidity	5% to 95% RH, non-condensing at +40°C
Casing	Dustproof, waterproof, shock-resistant polycarbonate
Minimum Gain	28 dBi
Maximum Allowable Cable Loss	8 dB

Table A.10   Miniature Bulkhead GPS Antenna without Flange (P/N 32434)

Item	Specification
Size	62.6 mm D x 19.0 mm H (3.5" D x 0.75" H)
Weight	0.13 kg (4.59 ounces)
Mounting Hole Circle	762 mm (3.0 in.), 4 holes, 0.6 mm (0.15 in.)
Center Mounting Hole	63 mm (0.75 in.)
Threaded Nut	63 mm TNC (0.75 in.)
Operating Temperature	–40°C to +85°C
Storage Temperature	–55°C to +85°C
Humidity	5% to 95% RH, non-condensing at +40°C

Table A.10   Miniature Bulkhead GPS Antenna without Flange (P/N 32434) (Continued)

Casing	Dustproof, waterproof, shock-resistant polycarbonate
Minimum Gain	28 dBi
Maximum Allowable Cable Loss	8 dB

Table A.11   Miniature Magnetic GPS Antenna (P/N 37167)

Item	Specification
Size	40.0 mm W x 47.0 mm D x 13.3 mm H (1.515" W x 1.85" D x 0.524" H)
Weight	Antenna and cable: 0.13 kg (4.59 ounces) Antenna only: 0.045 kg (1.59 ounces)
Operating Temperature	–40°C to +85°C
Storage Temperature	–55°C to +85°C
Humidity	5% to 95% RH, non-condensing at +40°C
Casing	Dustproof, waterproof, shock-resistant polycarbonate with magnetic mount
Minimum Gain	26 dBi

I/O Characteristics

Table A.12   MDT Port

Item	Specification
Physical	TXD, RXD, RTS, CTS, GND, DTR, DCD, DTS, 8.5 ±.5 V provided through Pin 9
Baud Rates	9600, No parity, 8 bits, 1 stop bit

Table A.13   Discrete Inputs: IP0 to IP3

Item	Specification
Input Logic High	Open circuit or V_{in} > 2.4 VDC
Input Logic Low	V_{in} < 0.6 VDC
	The inputs must remain in either state for at least 500 milliseconds before the CrossCheck CDPD detects the input.
Input Current	I_{in} ± 3 mA
Input Protection	Protected up to at least V_{Batt} continuous

Table A.14   Pulse Counter Inputs

Item	Specification
Input Logic High	Open circuit or V_{in} > 2.4 VDC
Input Logic Low	V_{in} < 0.6 VDC
Input Current	I_{in} ±3 mA
Minimum Pulse Width	500 microseconds
Input Protection	Protected up to at least V_{Batt} continuous

Table A.15   Discrete Outputs: XP0 to XP2

Item	Specification
Output Inactive	15 KΩ tied to $V_{vehicle-battery}$ V_{out} depending on load
Output Active	Tied to ground through a saturated bipolar junction transistor, V_{out} < 1.5 VDC @ 200 mA; V_{out} < 0.5 VDC @ 10 mA
Output Sink Current Capability	Up to 200 mA
Output Protection	Protected against shorts to ground

Accessories (ordered separately)

The following accessories can be ordered separately:

- GPS antennas: Permanent or magnetic mount

- Combination power and digital I/O cable (10-packs)

- Optional Echo*LDX* Message Terminal Kit including:

    – Echo*LDX* Mobile Data Terminal

    – Power/Data Cable

    – Pedestal Mount Kit (6")

    – *Echo*LDX *Message Terminal for CrossCheck CDPD and CrossCheck GPRS Installation and User's Manual* (available online)

    – Quick Reference Guide

CrossCheck CDPD Part Numbers

Part numbers for the CrossCheck CDPD, options, and accessories are listed in Table A.16.

Table A.16   Component Part Numbers

Description	Part No.
CrossCheck CDPD Starter Kit	46720-00
CrossCheck CDPD - Ten Pack	46720-10
Upgrade Kits	
Echo*LDX* Message Terminal Kit	46722-00
Echo*LDX* Message Terminal Kit - Ten Pack	46722-10

Table A.16   Component Part Numbers (Continued)

Description	Part No.
GPS Antenna and Cable Bundles	
GPS Antenna bundle (flange, straight cable), Includes: 31192-00 Mini Bulkhead antenna, TNC-p, gasket, 5-hole flange 36107 Cable, straight, TNC-r to straight SMA-p, 5 meter	36697-00
GPS Antenna bundle (flange, right-angle cable), Includes: 31192-00 Mini Bulkhead antenna, TNC-p, gasket, 5-hole flange 36106 Cable, right angle, TNC-r to right angle SMA-p, 5 meter	36698-00
GPS Antenna bundle (no flange, straight cable), Includes: 32434 Mini Bulkhead antenna, TNC-p, gasket, no flange 36107 Cable, straight, TNC-r to straight SMA-p, 5 meter	36699-00
GPS Antenna bundle (no flange, right-angle cable), Includes: 32434 Mini Bulkhead antenna, TNC-p, gasket, no flange 36106 Cable, right angle, TNC-r to right angle SMA-p, 5 meter	36700-00
GPS Antennas and Cables - separate	
Mini Bulkhead antenna, TNC-p, gasket, 5-hole flange	31192-00
Mini Bulkhead antenna, TNC-p, gasket, no flange	32434
Cable, right angle, TNC-r to straight SMA-p, 5 meter	36106
Cable, straight, TNC-r to straight SMA-p, 5 meter	36107
Right angle adapter, SMA-p to SMA-r	36200
Mini Magnetic antenna with 5-meter cable, SMA-p	37167
CDPD Cellular Antennas	
CDPD magnetic mount antenna TNC-p with 3.5 m cable	46721
CDPD bulkhead antenna TNC-p with 5 m cable	46730
Cables and Accessories	
Power and I/O Cable Ten Pack	46598-10
Echo*LDX* Power/Data Cable, 2.90 meter	46755
Pedestal Mounting Kit	
Echo*LDX* Quick Reference Guide	46845-00-ENG

Table A.16   Component Part Numbers (Continued)

Description	Part No.
Documentation (free download of latest version from the Web site)	
CrossCheck CDPD Mobile Unit Manual (only in electronic PDF format)	46750-00-ENG
Echo*LDX Message Terminal for CrossCheck CDPD and CrossCheck GPRS Installation and User's Manual* (only in electronic PDF format)	46667-00-ENG.

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