

# CrossCheck<sup>®</sup> GPRS 1900

## Installation Manual



Part Number 47770-00-ENG  
Revision A  
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This is August 2002 release (Revision A) of the CrossCheck® *GPRS 1900 Installation Manual*, Part Number 47770-00-ENG. Use this manual with the EchoL<sup>DX</sup> *Message Terminal Installation and User's Manual*, Trimble part number 46667-00-ENG.

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- 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.

## CrossCheck GPRS 1900

### CE

The CrossCheck GPRS 1900 product complies with the essential requirements of the R&TTE Directive 199/5EC as stated by the EC Declaration of Conformity (CE0681) and the EC R&TTE Type Examination Certificate.

### FCC

The CrossCheck GPRS 1900 product complies with the FCC Part 15 and FCC Part 24, and Industry Canada requirements.

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.

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# About this Manual

Welcome to the *CrossCheck® GPRS 1900 Installation Manual*. This manual describes how to install, set up, and troubleshoot the CrossCheck GPRS 1900 product.

*Note – The CrossCheck GPRS 1900 does not support the IQEventEngine™ firmware used by other CrossCheck products and does not support the TAIP protocol.*

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](http://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 *EchoLDX™ Message Terminal 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](http://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 reseller or distributor* for technical assistance.

Prospective resellers (not under contract) can get general information about the CrossCheck GPRS 1900 by sending email to:

[sales\\_info@trimble.com](mailto:sales_info@trimble.com)

or at:

[www.trimble.com/telvisant](http://www.trimble.com/telvisant)

Existing resellers can obtain additional information about the CrossCheck GPRS 1900 by sending email to:

[trimble\\_support@trimble.com](mailto:trimble_support@trimble.com)

or by contacting your local sales office or sales engineer, or by accessing the Trimble Partners Web site.

## Your Comments

Your feedback about the supporting documentation helps us to improve it with each revision. To forward your comments, send an email to [ReaderFeedback@trimble.com](mailto:ReaderFeedback@trimble.com).

## 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.*



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

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

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## Abbreviations

The following abbreviations are used in this manual:

<b>Abbreviation</b>	<b>Definition</b>
AVL	Automatic Vehicle Location
CrossCheck	CrossCheck GPRS 1900 may be referred to simply as CrossCheck GPRS or CrossCheck.
EchoLDX or MDT	The EchoLDX Message Terminal is referred to as the EchoLDX or sometimes as the Mobile Data Terminal (MDT).
GPS	Global Positioning System
OTA	Over the air
TMS	Trimble Mobile Solutions Division
TWG	Telvisant™Wireless Gateway

# Overview

**In this chapter:**

- Introduction
- The CrossCheck GPRS 1900 Mobile Unit
- CrossCheck GPRS Applications
- The Global Positioning System
- GPS Receiver

## Introduction

This manual describes the CrossCheck GPRS 1900 Mobile Unit which is designed to be used with Trimble's Telvisant™ Wireless Gateway (TWG) for Fleet Asset Management and Automatic Vehicle Location (AVL) purposes.

The CrossCheck GPRS runs the firmware necessary to communicate with the TWG 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.



## The CrossCheck GPRS 1900 Mobile Unit

The CrossCheck GPRS 1900 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 GPRS cellular network and allows simple, fast, and efficient transfer of information between a vehicle and Trimble's Web-based gateway.

The CrossCheck GPRS 1900 Mobile Unit integrates the following into a single package:

- A GPRS 900/1900 MHz 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 GPRS does not support the IQEventEngine™ firmware used by other CrossCheck products and does not support the TAIP protocol.*

### CrossCheck GPRS Standard Features

The CrossCheck GPRS 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 GPRS also allows various asset utilization calculations.

The CrossCheck GPRS includes the following:

- Eight-channel GPS receiver
- A sophisticated event handler that allows the CrossCheck GPRS to be configured over the air (OTA) to respond to a wide variety of dispatch and fleet asset management operations
- One serial port for Messaging operation when using the Trimble EchoLDX Message Terminal (P/N 46722-00)
- 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 GPRS to store events and positions for up to one week while out of the network. Each item is checked for the one-week expiration and discarded if appropriate.

## **CrossCheck GPRS Options**

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

The EchoLDX terminal connects to the CrossCheck GPRS to receive and display text messages, Job Sites, and Home Sites from the Telvisant Wireless Gateway.

## Antenna Requirements

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

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

## CrossCheck GPRS System Accessories

Figure 1.1 illustrates the CrossCheck GPRS 1900 Mobile Unit and accessories.

1. CrossCheck GPRS 1900 Mobile Unit
2. EchoLDX Message Terminal Kit including:
  - EchoLDX Terminal
  - EchoLDX Power/Data cable
  - Pedestal Mounting Kit
  - EchoLDX *Quick Reference Guide*
3. Power and discrete I/O cable
4. GPS antenna with cable and SMA-p connector
5. GPRS antenna with cable and TNC-p connector

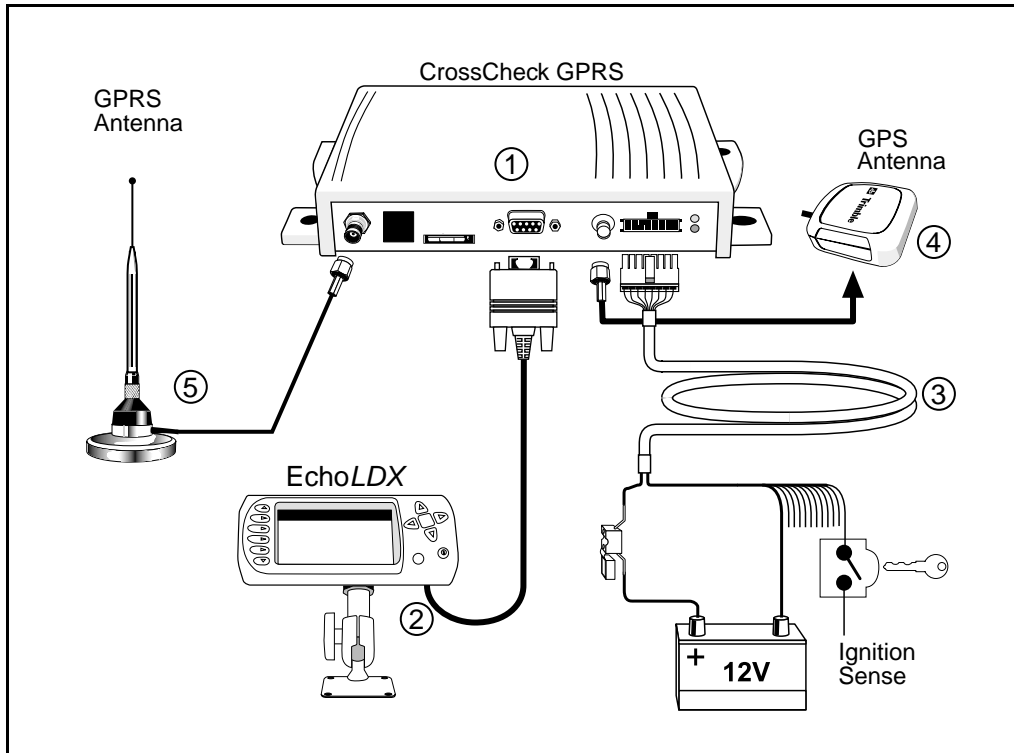


Figure 1.1 CrossCheck GPRS 1900 Mobile Unit and Accessories

## CrossCheck GPRS 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 GPRS 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 EchoLDX Message Terminal provides a driver interface to exchange messages or generate event reports.

The CrossCheck GPRS 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 GPRS 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 GPRS'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 GPRS Mobile Unit
- CrossCheck GPRS Connections
- Inspecting and Unpacking the Shipment
- Installer-Supplied Parts
- Mounting the CrossCheck GPRS
- Choosing the GPS Antenna Mounting Location
- Routing the GPS Antenna Cable
- Choosing a GPRS Cellular Antenna Mounting Location
- CrossCheck GPRS Power
- Installing the EchoLDX Kit

## Introduction

This chapter presents instructions for installing the CrossCheck GPRS 1900 Mobile Unit in a vehicle.



---

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

**Warning** – For 1900 MHz PCS:

A minimum separation distance of 20 cm must be maintained between the antenna and the person for this device to satisfy the RF exposure requirements of the FCC. For fixed mount operation, the antenna co-location requirements of Section 1.1307 (b) (3) of the FCC rules must be satisfied. The maximum antenna gain, including any cable loss, must not exceed 3dBi.

**Warning** – Portable operation of this unit is not permitted.

---

## Installing the CrossCheck GPRS Mobile Unit

The CrossCheck GPRS 1900 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 GPRS 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 Message Terminal to the unit, and you must be able to read the LED indicators if troubleshooting is required.



## CrossCheck GPRS Connections

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

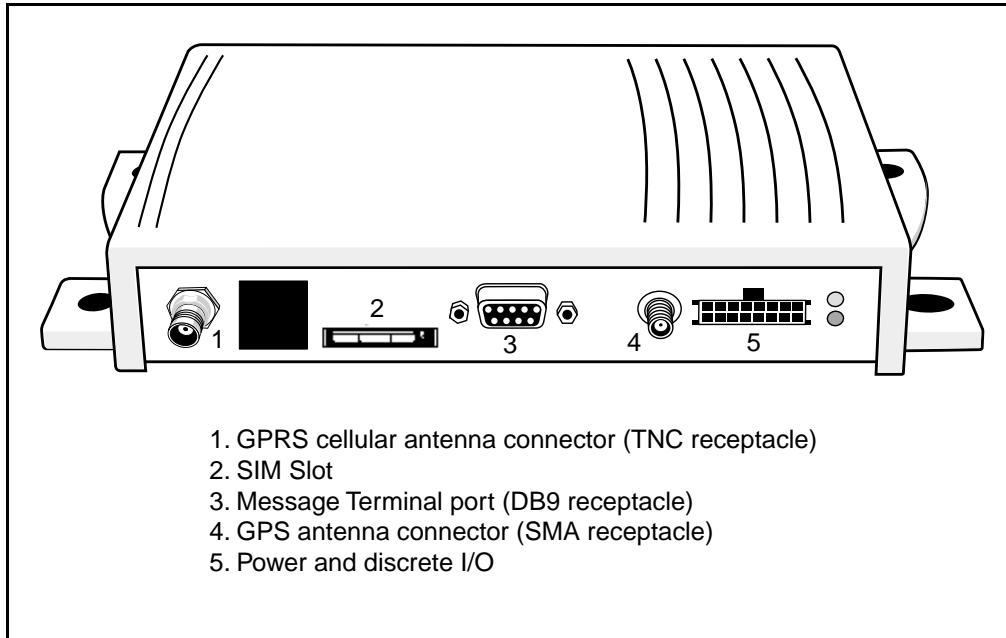


Figure 2.1 CrossCheck GPRS Connections



**Warning** – The SIM card provided with the CrossCheck GPRS must not be removed. It has been locked to work only with this device and cannot be used with any other GPRS phone.

### GPRS Antenna

The CrossCheck GPRS 1900 uses a TNC receptacle connector for the GPRS antenna. For more information, see Appendix A.

## Power and Discrete I/O Pinout

Table 2.1 lists the pinout for the power and discrete I/O signals.

**Table 2.1 Power and I/O Pinout**

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

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

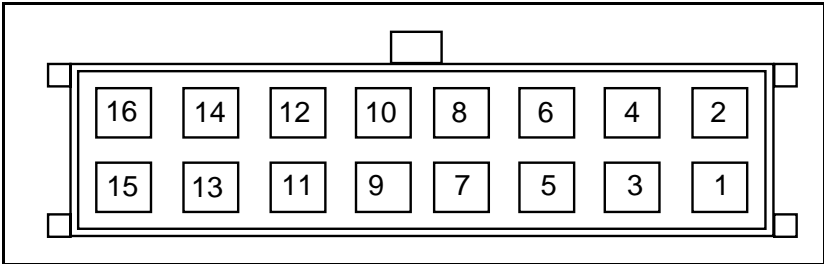


Figure 2.2 Power and Discrete I/O Pinout

**GPS Antenna**

The GPS antenna uses an SMA receptacle (SMA-r) connector. For more information, see Appendix A.

**Message Terminal Port**

Figure 2.3 illustrates the Message Terminal port pin configuration, a standard 9-pin DCE configuration.

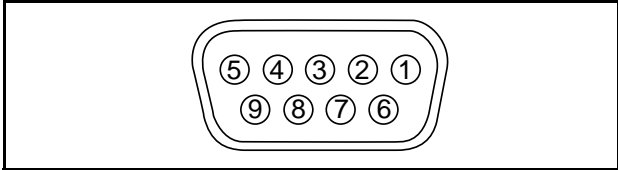


Figure 2.3 Message Terminal Pinout

Table 2.2 lists the Message Terminal connector pinout.

**Table 2.2 Message Terminal 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: 12 VDC @ 200 mA max. (Interpreted as RS-232 high-level.)

## Inspecting and Unpacking the Shipment

The CrossCheck GPRS 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 GPRS part numbers and the included components.

**Table 2.3 CrossCheck GPRS Units and Bundles**

Part Number	Description
46728-01	CrossCheck GPRS 1900 Mobile Unit Demo Kit (includes GPS magnetic mount antenna, GPRS magnetic mount antenna, power and I/O cable with cigarette lighter adapter, and EchoLDX Message Terminal Kit)
46728-11	CrossCheck GPRS 1900 Mobile Unit Kit (does not include Power and I/O cable—must be ordered separately as P/N 46598—or GPS and GPRS antennas)
46728-12	CrossCheck GPRS 1900 Ready Mix Mobile Unit Kit (does not include Power and I/O Cable—must be ordered separately as P/N 46598—or GPS and GPRS antennas)
46728-13	CrossCheck GPRS 1900 Heavy Vehicle Mobile Unit Kit (does not include Power and I/O Cable—must be ordered separately as P/N 46598—or GPS and GPRS antennas)

Additional cartons may be included in the shipment for GPS and cellular antennas interface cables, and EchoLDX Kit options. For a complete listing of CrossCheck GPRS and component part numbers, see Appendix A, Table A.19.

## Installer-Supplied Parts

The installer must supply the following parts:

- Mounting fasteners for the CrossCheck GPRS
- Fasteners for mounting the GPS or GPRS antenna if the antenna is the bulkhead type
- Cable ties for securing cables to the vehicle
- GPS antenna (supplied only with the CrossCheck GPRS Demo Kit P/N 46728-11 but also available as separate accessory item)
- GPRS Cellular antenna (supplied only with the CrossCheck GPRS Demo Kit P/N 46728-11, but also available as separate accessory item)

## Mounting the CrossCheck GPRS

The CrossCheck GPRS can be installed inside almost 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 GPRS can be installed on the floor under a seat, or on a wall behind a seat.

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

Choose a location for the CrossCheck GPRS 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 GPRS is not waterproof.)
- Areas where excessive dust will be present

To mount the CrossCheck GPRS:

1. Choose the mounting location.

The CrossCheck GPRS can be mounted horizontally, vertically, or in any convenient orientation. During normal system operation, you do not need to see the CrossCheck GPRS 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 GPRS 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 crack the plastic. Use washers sized small enough that they do not tighten down on the plastic cover of the CrossCheck GPRS 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.

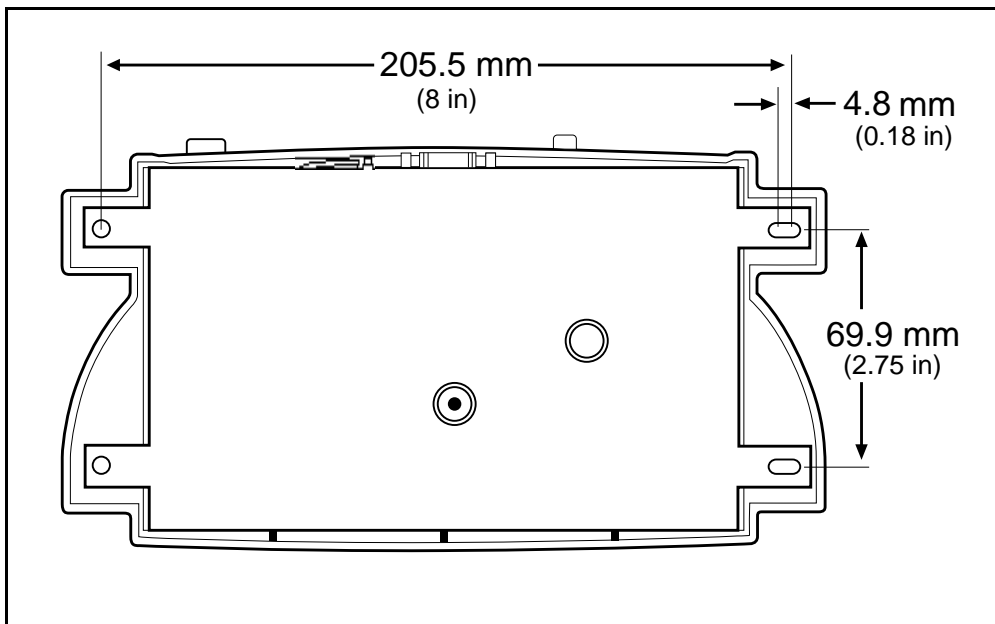


Figure 2.4 CrossCheck GPRS Mounting Dimensions

The installer must provide an appropriate selection of fasteners to secure the CrossCheck GPRS 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 GPRS to the Vehicle Chassis**

For proper operation, the aluminum chassis of the CrossCheck GPRS 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 GPRS 1900 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 GPRS 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 GPRS 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 GPRS should be left unconnected.*

## Connection through the Chassis Ground Wire

If the CrossCheck GPRS 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 20 AWG to connect the CrossCheck GPRS 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 GPRS.

## 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.

For optimum performance, the GPS antenna should be mounted on a metal groundplane of at least 7.5 cm square (3 in. x 3 in.).



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**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.

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***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 GPRS, including combined GPS/GSM cellular antenna solutions which have not been tested or 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.

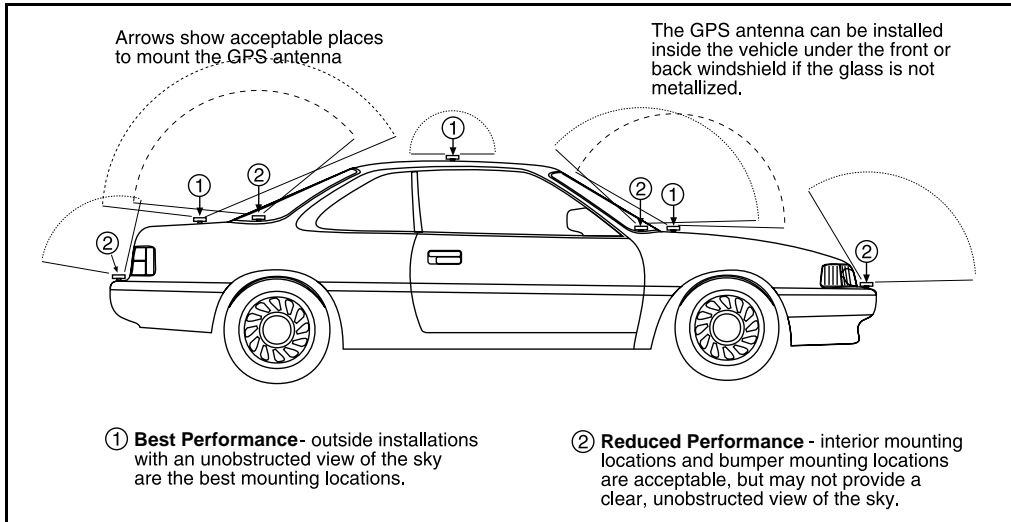


Figure 2.5 Antenna Mounting Locations for Automobile

Figure 2.6 shows the typical antenna mounting locations for a van.

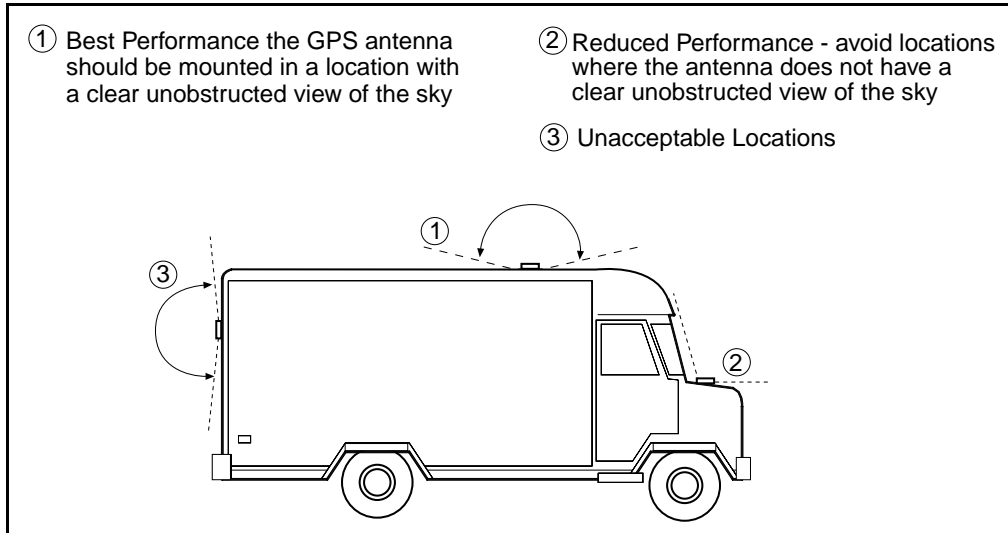


Figure 2.6 Antenna Mounting Locations for Van

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

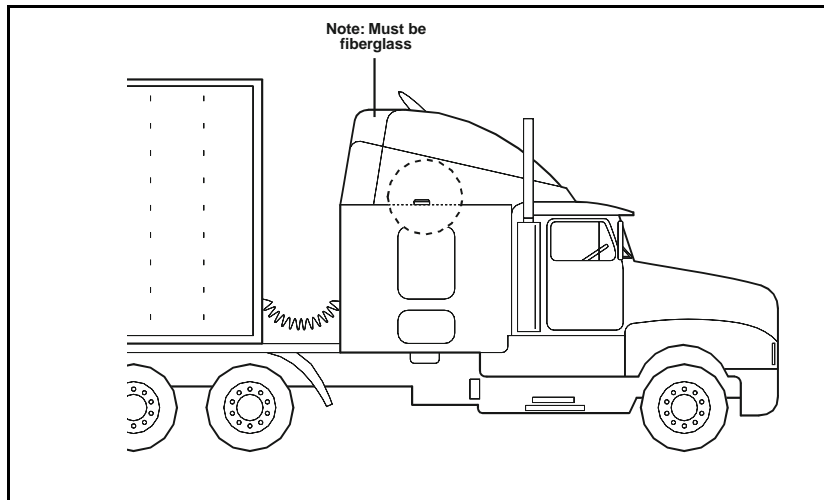


Figure 2.7 Antenna Mounted under Fiberglass Canopy

**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 GPRS 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.

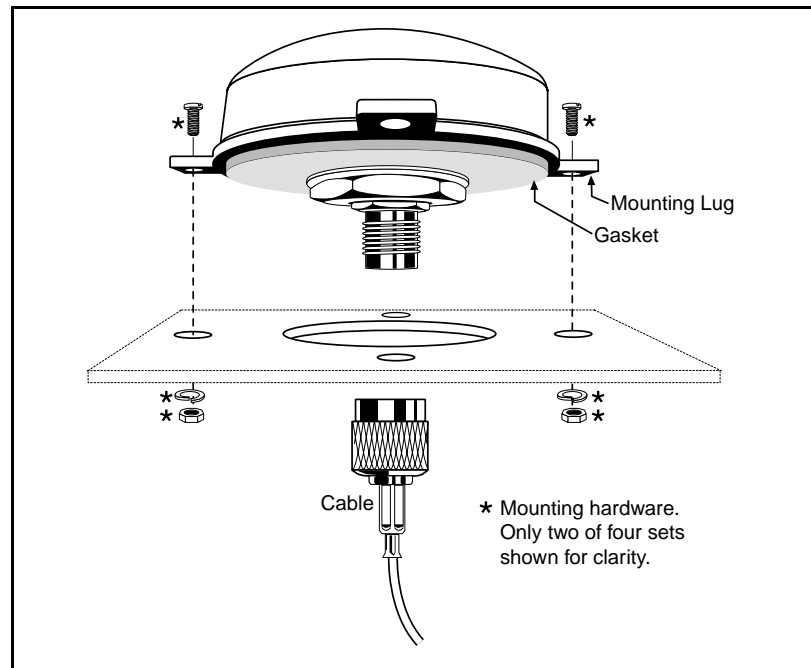


Figure 2.8 Miniature Bulkhead GPS antenna with Flange

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.

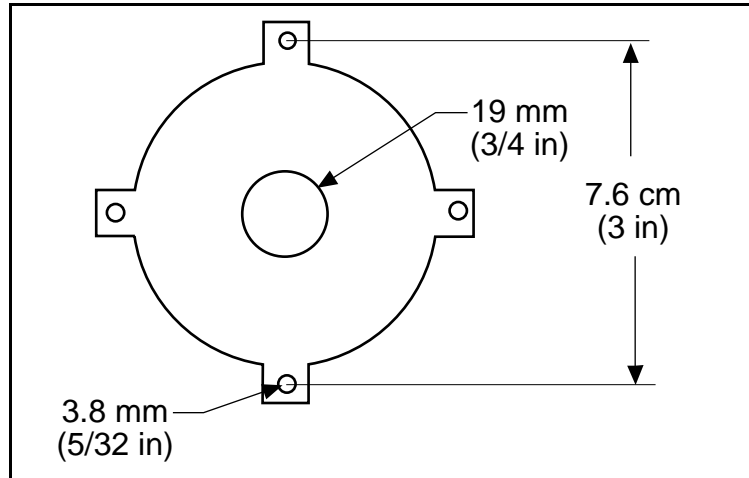


Figure 2.9 Mounting Hole Dimensions

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 GPRS 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 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 4.8 mm (0.1875 in.) or less.

Figure 2.10 illustrates the antenna without the flange. For more information, see Appendix A.

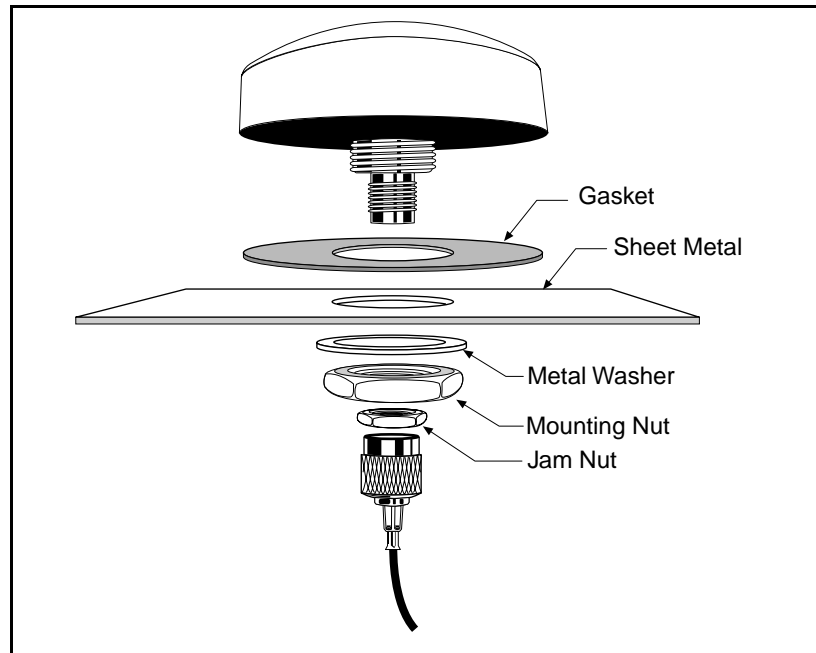


Figure 2.10 Miniature Bulkhead GPS Antenna without Flange

To mount the antenna:

1. Choose the antenna mounting location (see Choosing the GPS Antenna Mounting Location on page 20).
2. Drill a 3/4 inch 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 GPRS mounting location.
8. Connect the cable to the GPS antenna connector.

For detailed cable routing guidelines, see Routing the GPS Antenna Cable on page 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 5m cable with SMA connector.



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

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Figure 2.11 illustrates the miniature antenna.

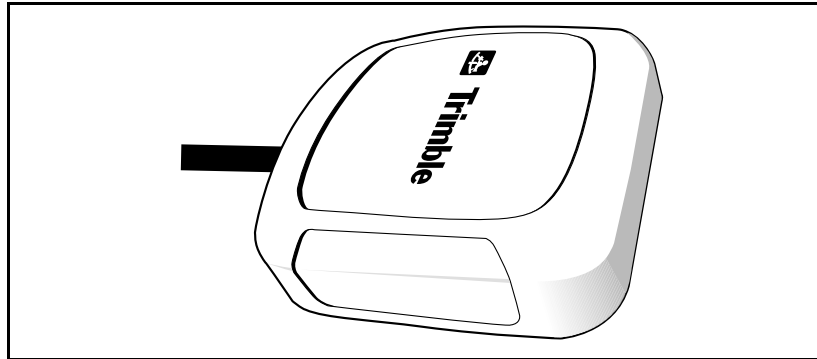


Figure 2.11 Miniature Magnetic GPS Antenna

To mount the Magnetic GPS Antenna:

1. Choose the antenna mounting location (see Choosing the GPS Antenna Mounting Location on page 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 GPRS is mounted.



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**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.

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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 separate cables.

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 GPRS while observing the following guidelines:

- Make sure that at least 5.1 cm (2 in.) of clearance exists between the CrossCheck GPRS'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 (1 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 cause interference problems.
- Protect cables from exposure to corrosive fluids.

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

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## Choosing a GPRS Cellular Antenna Mounting Location



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

**Warning** – For 1900 MHz PCS:

A minimum separation distance of 20 cm must be maintained between the antenna and the person for this device to satisfy the RF exposure requirements of the FCC. For fixed-mount operation, the antenna co-location requirements of Section 1.1307 (b) (3) of the FCC rules must be satisfied. The maximum antenna gain, including any cable loss, must not exceed 3dBi.

**Warning** – Portable operation of this unit is not permitted.

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*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 GPRS, including combined GPS/Cellular antenna solutions which have not been tested or certified by Trimble.*

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).

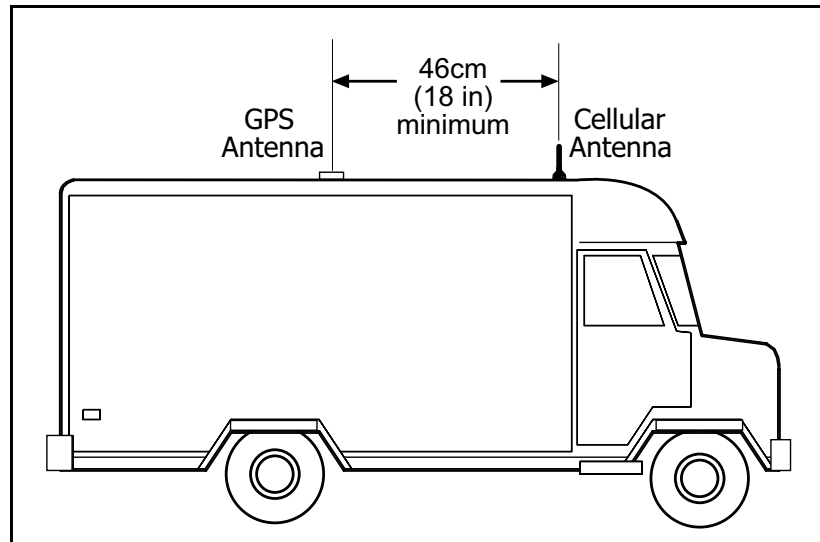


Figure 2.12 Distance Between Antenna Locations

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 three cellular antenna options for the CrossCheck GPRS. The Magnetic Mount Cellular Antenna is recommended for temporary installations. A Bulkhead Mount Cellular Antenna is recommended for permanent installations. A Glass Mount Cellular Antenna is also recommended for permanent installations.

## Magnetic Mount 850/1900 Cellular Antenna (P/N 46764)

The Magnetic Mount 850/1900 Cellular antenna and Magnetic Base (see Figure 2.13) is designed for temporary mounting on any ferrous surface.

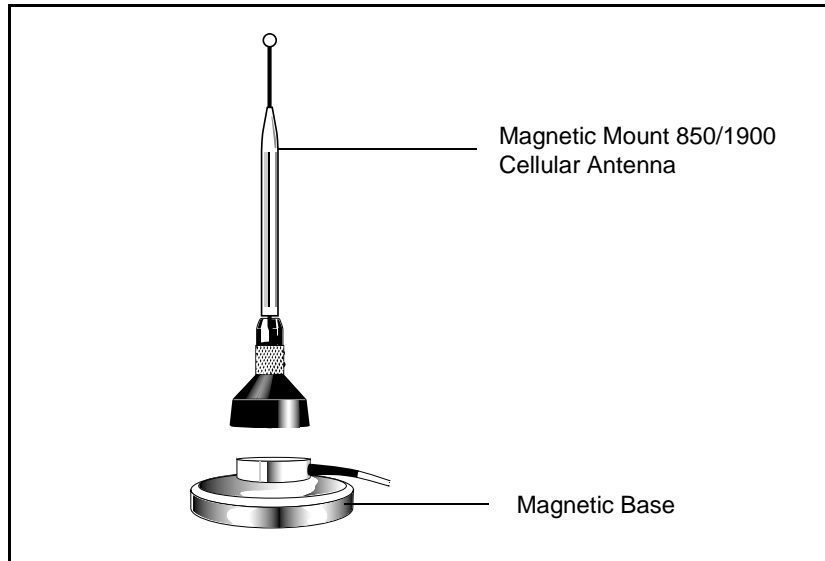


Figure 2.13 Magnetic Mount 850/1900 Cellular Antenna

The antenna features a 3.6 m (12 ft.) integral coaxial cable terminated with a TNC-P connector, which is compatible with the CrossCheck GPRS'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 850/1900 Cellular Antenna:

1. Select an appropriate location to mount the antenna. The center of the vehicle's roof is the best location.
2. Thoroughly clean and remove all dust and gritty material from the surface where the mount is to be placed (each time it is installed).
3. Using the antenna base as a handle, place the edge of the mount on the clean surface area. Slowly lower the mount towards the surface until it snaps into place.
4. Route the antenna cable. For detailed cable routing guidelines, see Routing the Cellular Antenna Cable on page 44.



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**Caution** – Do not slide the mount once it is in place—this can scratch the paint surface.

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***Note** – To avoid a reduction in holding power, do not use the mount should on vinyl surfaces—some loss in electrical capacitance will occur, which may interfere with operation of the antenna.*



### Bulkhead Mount 850/1900 Cellular Antenna (P/N 47771)

The Bulkhead Mount 850/1900 Cellular antenna is designed to be permanently mounted on the vehicle.

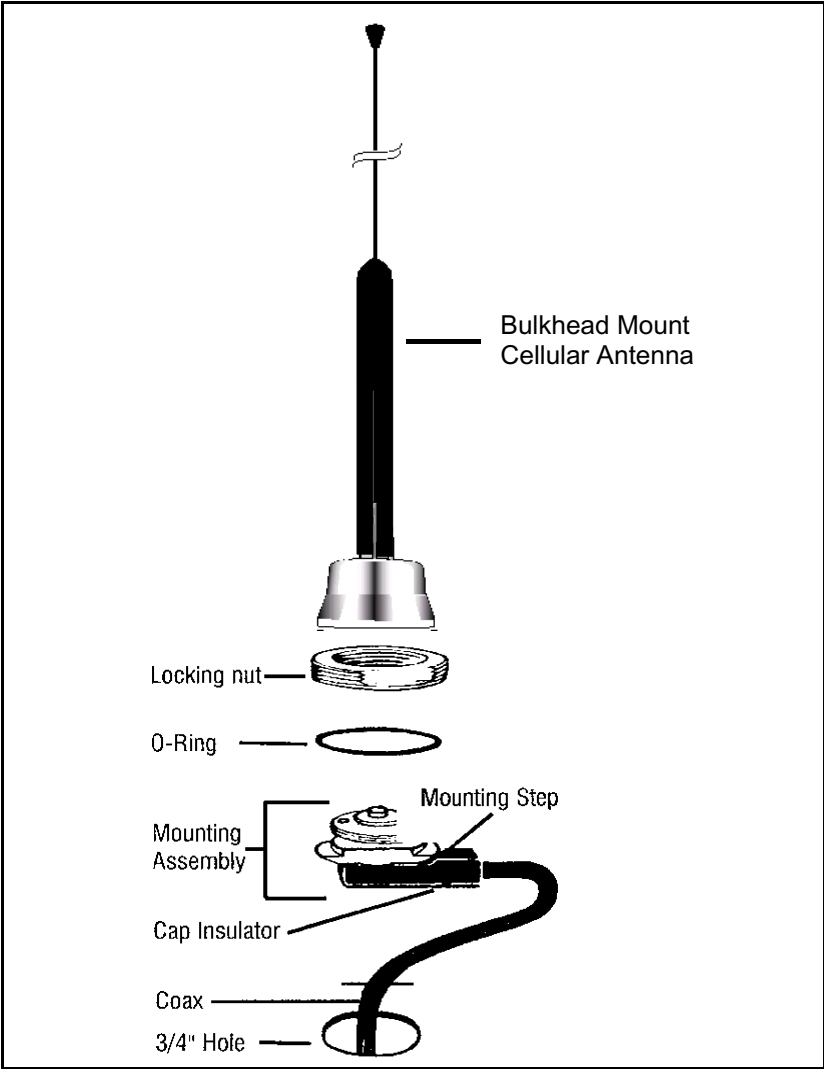


Figure 2.14 Bulkhead Mount 850/1900 Cellular Antenna

To install the antenna:

1. Drill a 19 mm (3/4 in.) hole through the vehicle's metal surface.
2. Carefully remove burrs from the underside of the hole and remove paint in a narrow ring around the hole (see Figure 2.15).

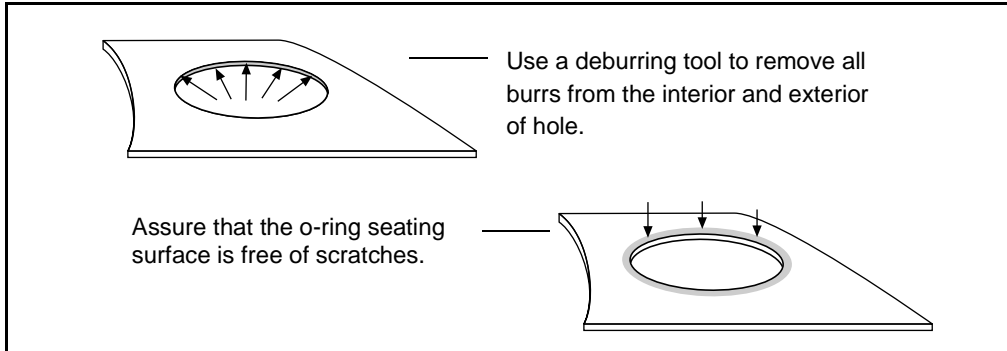


Figure 2.15 Burr Removal and O-Ring Seal Surface Inspection

**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.

3. Screw the locking nut onto the mounting assembly and twist one-and-a half times.

4. Feed the coax and serrated part of the mount (mounting assembly) through the hole (Step 1, Figure 2.16).

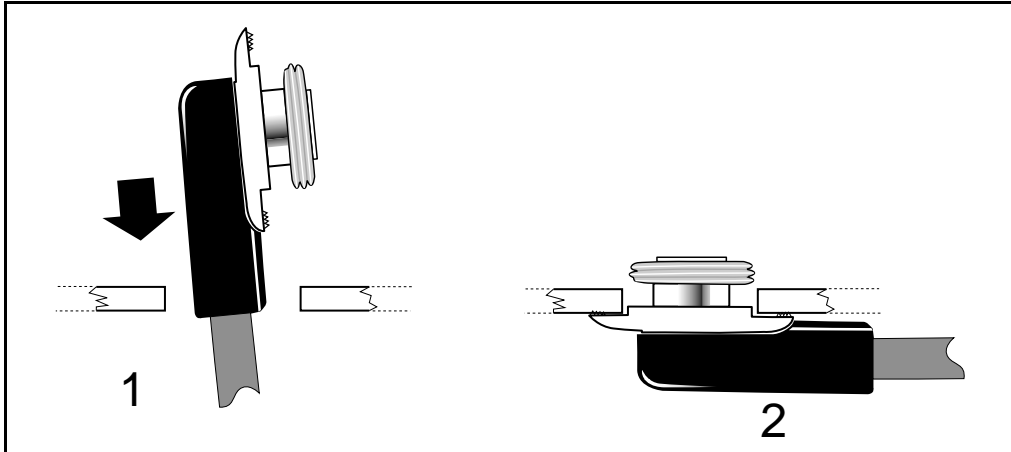


Figure 2.16 Mounting the Antenna Cable Assembly

5. Pull up on the locking nut and slip the mount step into proper alignment in the hole (Step 2, Figure 2.16).
6. Re-install the brass nut from the exterior of the vehicle (Figure 2.17).

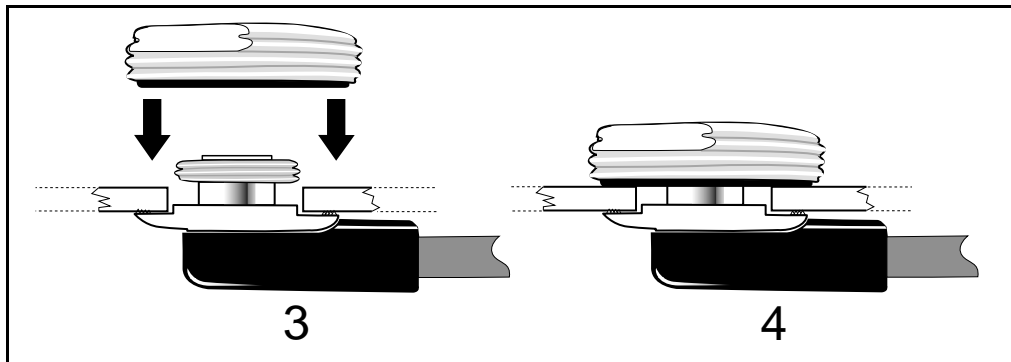


Figure 2.17 Re-installing the Brass Nut

- a. 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.
  - b. Use a spanner wrench or long-nose pliers to hold the mounting assembly. Then use an adjustable or open-end wrench on the locking nut and tighten firmly.
7. Place the rubber gasket over the brass nut (Step 5, Figure 2.18).

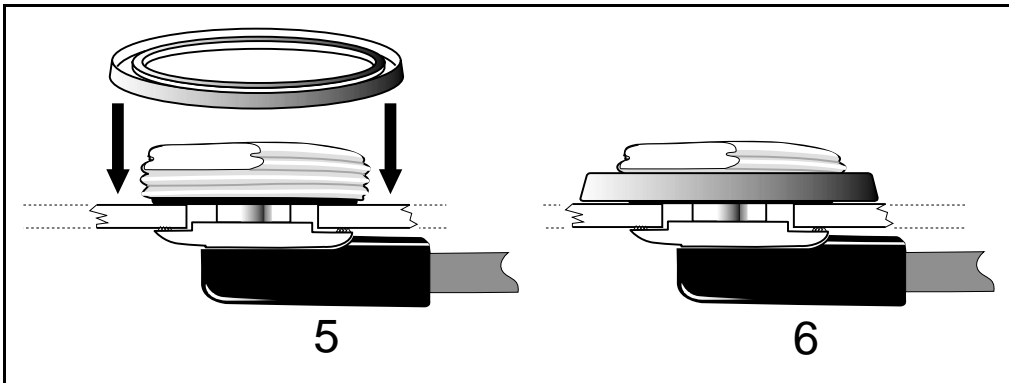


Figure 2.18 Attaching the Antenna to the Cable Assembly

8. 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 2.19 shows the antenna before and after assembly.



Figure 2.19 Attaching the Bulkhead Mount 850/1900 Cellular Antenna

9. Route the antenna cable to CrossCheck GPRS using the guidelines provided in Routing the Cellular Antenna Cable on page 44.
10. Cut the antenna cable to remove any extra slack, and install the TNC connector on the cable end, following the manufacturer's recommendations.

### **Glass Mount 850/1900 Cellular Antenna (P/N 47773)**

The Glass Mount 850/1900 Cellular Antenna is designed for permanent installations mounted on the vehicle's window.



Figure 2.20 Glass Mount 850/1900 Cellular Antenna

To install the antenna:

1. Select an appropriate location to mount the antenna.  
Corners of the rear window or a side window are often best.



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**Warning** – Do not mount the antenna where it can obstruct the driver's visibility.

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**Caution** – Avoid installing the antenna:

- on curved glass.
  - on glass with metallic content (that is, passivated glass: “solar coat” or “solar cool”). Check with auto manufacturer.
  - on any dark tinted area, or an area where aftermarket tinting film has been applied.
  - over in-glass AM/FM dipole antenna.
- 

2. Clean both inside and outside mounting areas with enclosed alcohol pad. Wipe off excess alcohol (do not allow alcohol to dry on the glass). If there is an obvious film on the window, use a mildly abrasive detergent to clean.

**Note** – *To install the antenna over defroster wires, the wires must be placed at least one inch or more apart. Center the antenna over one wire, allowing it to pass between the horizontal coupling plate (see Figure 2.21).*

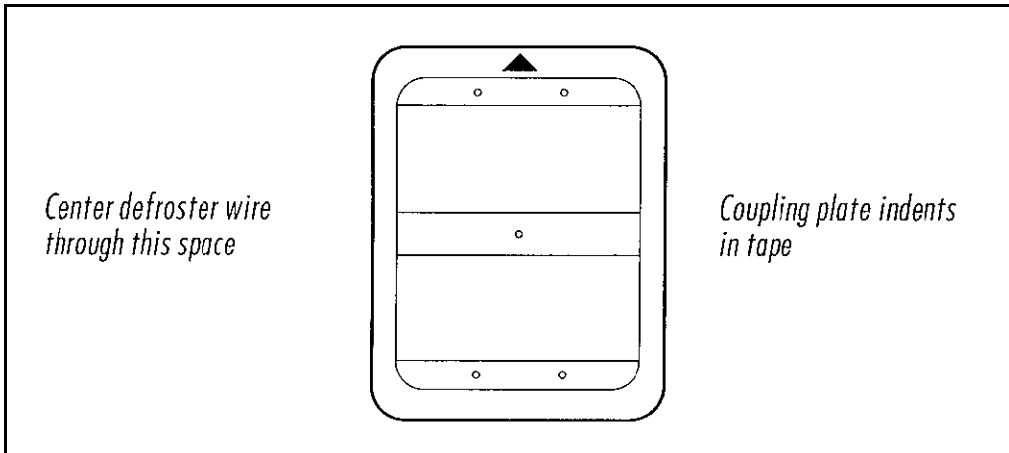
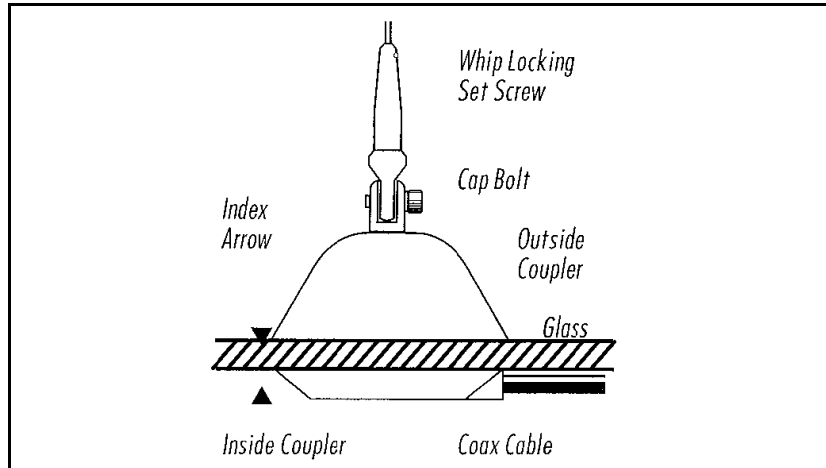


Figure 2.21 Underside of Glass Antenna

3. Prepare outside mounting area by swabbing enclosed liquid adhesion “enhancer”. Allow enhancer to dry completely before applying outside coupler.
4. Peel the protective liner from the adhesive tape on the outside coupler. With index arrow pointing up, mount the outside coupler starting at the top and rolling downward. From the inside of the window, check that the adhesive is making contact with edges and corners. Press firmly on all corners and in the center to ensure maximum contact. If the adhesive is not making contact, apply additional pressure where needed. The seal can be enhanced with a drop of clear silicone sealant.
5. Remove the protective liner from the adhesive tape on the inside coupler. With the index arrow pointing up, mount the inside coupler opposite the outside coupler (using the technique described above).
6. Route the antenna cable to the CrossCheck GPRS using the guidelines provided in Routing the Cellular Antenna Cable on page 44.



7. Position the swing arm and whip to the vertical position and tighten cap bolt at swing arm/coupler connection.



**Caution** – After installation, do not install whip or expose to water for 24-72 hours.

## Routing the Cellular Antenna Cable

The Magnetic Cellular antenna has a 3.65 m (12 ft.) integral antenna cable with a TNC-plug (TNC-p) connector. The Bulkhead Cellular antenna has a 5.1 m (17 ft.) integral cable and the Glass Mount Cellular antenna has a 4.5 m (15 ft.) integral cable; both cables are terminated without a connector.

After routing the Bulkhead Cellular or Glass Cellular cable, it must be fitted with a TNC-p connector before attaching the cable to the CrossCheck GPRS. Instructions for installing the TNC-p connector are included with the antenna kit.

The next step in the installation process is routing and connecting the antenna cable to the CrossCheck GPRS. When routing the cable, start at the antenna and choose the most direct path to the CrossCheck GPRS 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.

### **Connecting the Magnetic Cellular Antenna Cable**

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

### **Connecting the Permanent or Glass-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 TNC connector on the front panel of the CrossCheck GPRS.

## Connecting the Power and I/O Cable

Use the flexible power and I/O cable (PN 46598) to connect power and a variety of input and output peripherals to the CrossCheck GPRS as shown in Figure 2.22.

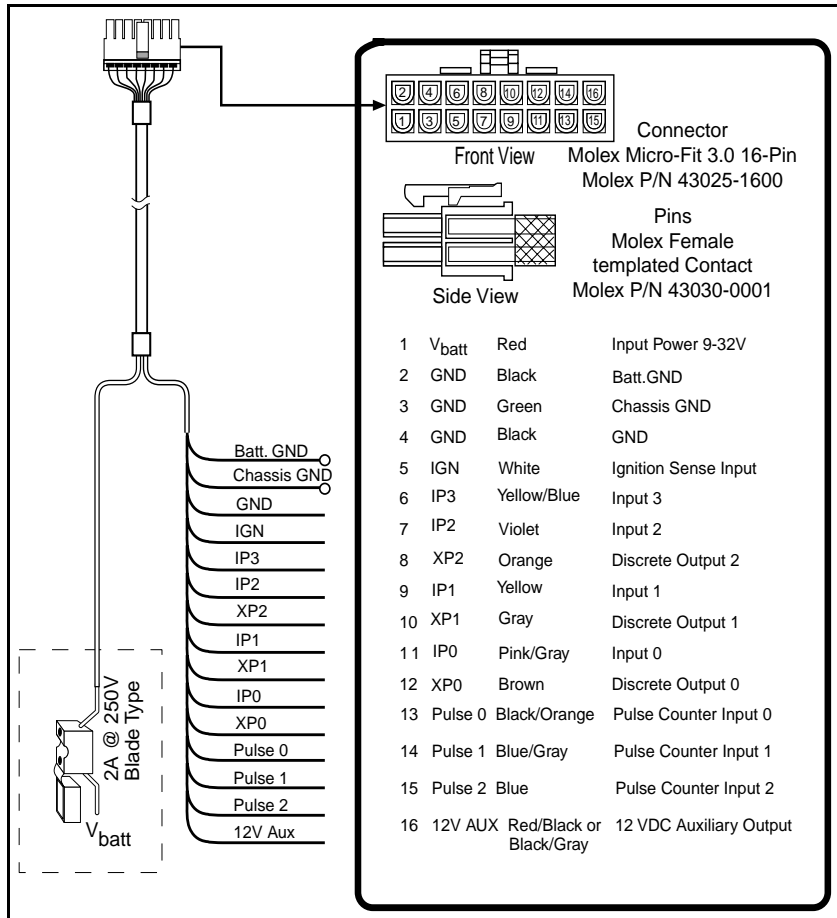


Figure 2.22 Power and I/O Cable

The Power and I/O Cable includes 14 wires with 91 cm (3 ft.) of length. The Input power wire (red) and the ignition sense input wire (white) are 4.87 meters (16 ft.) long.

Table 2.4 provides pinout information for the Power and I/O cable.

**Table 2.4 Power and I/O Cable Pinout**

Pin	Signal	Color	Termination	Length (in.)
1	V <sub>batt</sub>	Red	Cut Flush	192
2	BAT GND	Black	Ring Lug	36
3	CHAS GND	Green	Ring Lug	36
4	GND	Black/White	Cut Flush	36
5	IGN	White	Cut Flush	192
6	IP3	Yellow/Blue	Cut Flush	36
7	IP2	Violet	Cut Flush	36
8	XP2	Orange	Cut Flush	36
9	IP1	Yellow	Cut Flush	36
10	XP1	Gray	Cut Flush	36
11	IP0	Pink/Gray	Cut Flush	36
12	XP0	Brown	Cut Flush	36
13	PULSE 0	Black/Orange	Cut Flush	36
14	PULSE 1	Blue/Gray	Cut Flush	36
15	PULSE 2	Blue	Cut Flush	36
16	12V AUX	Red/Black or Black/Gray	Cut Flush	36

## Inputs (IP0 to IP3)

The CrossCheck GPRS supports four discrete inputs. The circuit diagram is shown in Figure 2.23.

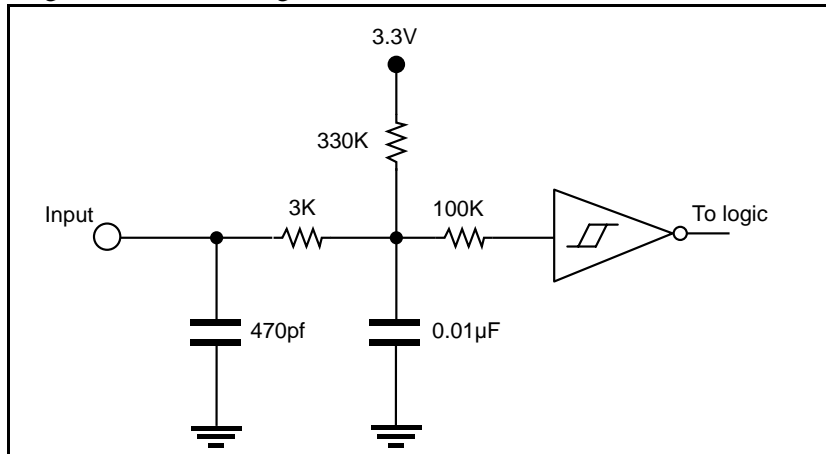


Figure 2.23 Input Circuit Diagram

**Input Logic High:** Open circuit or  $V_{in} > 2.4$  VDC

**Input Logic Low:**  $V_{in} < 0.8$  VDC

The inputs must remain in either state for at least 500 milliseconds before the CrossCheck GPRS detects the input.

**Input Current (Max)** < 1 mA 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 GPRS 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 GPRS 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 GPRS also supports three pulse-counting inputs that can be used to support different sensors like a speed sensor or others for different applications. The circuit diagram is shown in Figure 2.23.

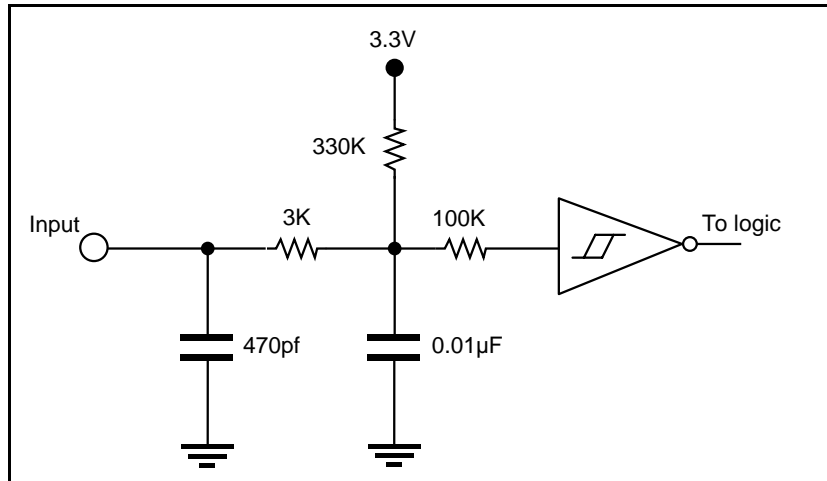


Figure 2.24 Pulse Counting Input Circuit Diagram

<b>Input Logic High:</b>	Open circuit or $V_{in} > 2.4$ VDC
<b>Input Logic Low:</b>	$V_{in} < 0.8$ VDC
	The inputs must remain in either state for at least 500 microseconds before the CrossCheck GPRS detects the input.
<b>Input Current (Max)</b>	$I_{in} < 1$ mA at 12 V
<b>Minimum Pulse Width</b>	500 microseconds
<b>Input Protection:</b>	Protected up to at least $V_{batt}$ continuous

## Outputs (XP0 to XP2)

The CrossCheck GPRS features three discrete outputs (XP0–XP2) for driving external devices such as relays, alarms, and so on.

- 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 2.25 shows a diagram of a discrete output.

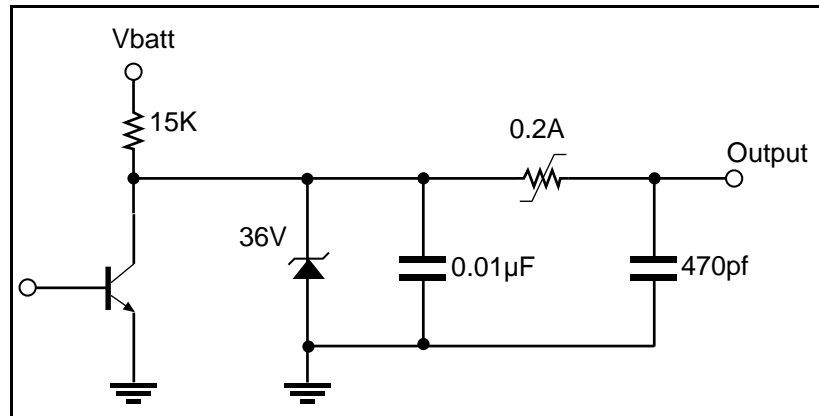


Figure 2.25 Output Circuit Diagram

<b>Output Inactive:</b>	15 kOhms through $V_{batt}$
<b>Output Active:</b>	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
<b>Output Protection:</b>	Protected against direct shorts to ground
<b>Output Sink Current Capability</b>	Up to 200 mA



Figure 2.26 shows the cable connections between the EchoLDX Messaging Terminal and the CrossCheck GPRS.

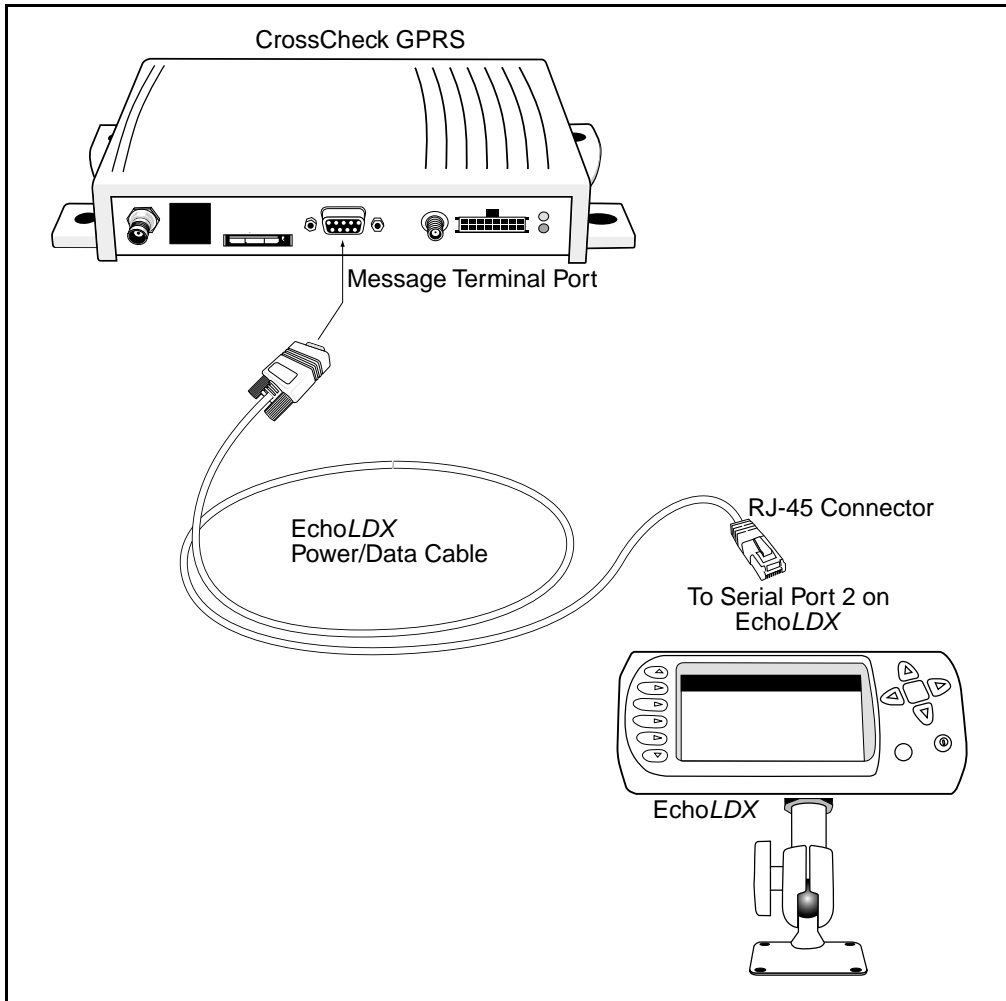


Figure 2.26 EchoLDX Message Terminal to CrossCheck GPRS Connections

## CrossCheck GPRS Power

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

The CrossCheck GPRS'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 GPRS power requirements, see Appendix A.

Figure 2.27 illustrates the power and I/O cable.

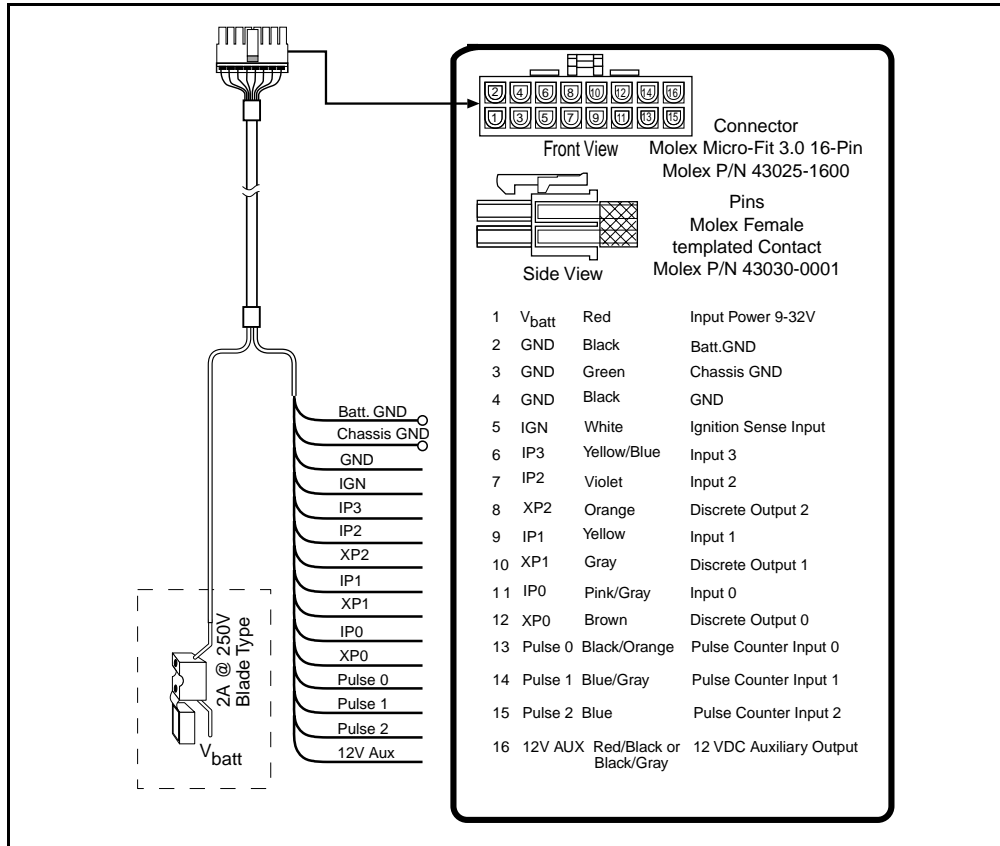


Figure 2.27 Power and I/O Cable

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



**Warning** – The CrossCheck GPRS requires a 2A fuse to be installed in its power cable (V<sub>batt</sub>). A 2A fuse and fuse holder is supplied with the Power/Data cable P/N 46598. Install the fuse holder and fuse as close as possible to the vehicle battery.

The CrossCheck GPRS is protected against both input power over-voltage and reverse polarity. 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 GPRS operates continuously only when the vehicle is running. When the ignition is off, the CrossCheck GPRS 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 GPRS is the following:

- When the ignition is OFF, the unit goes to sleep state after 15 minutes.
- If the EchoLDX is connected to the CrossCheck, the EchoLDX will turn off 1 minute after ignition OFF is detected.

Figure 2.28 illustrates the Power Management connections.

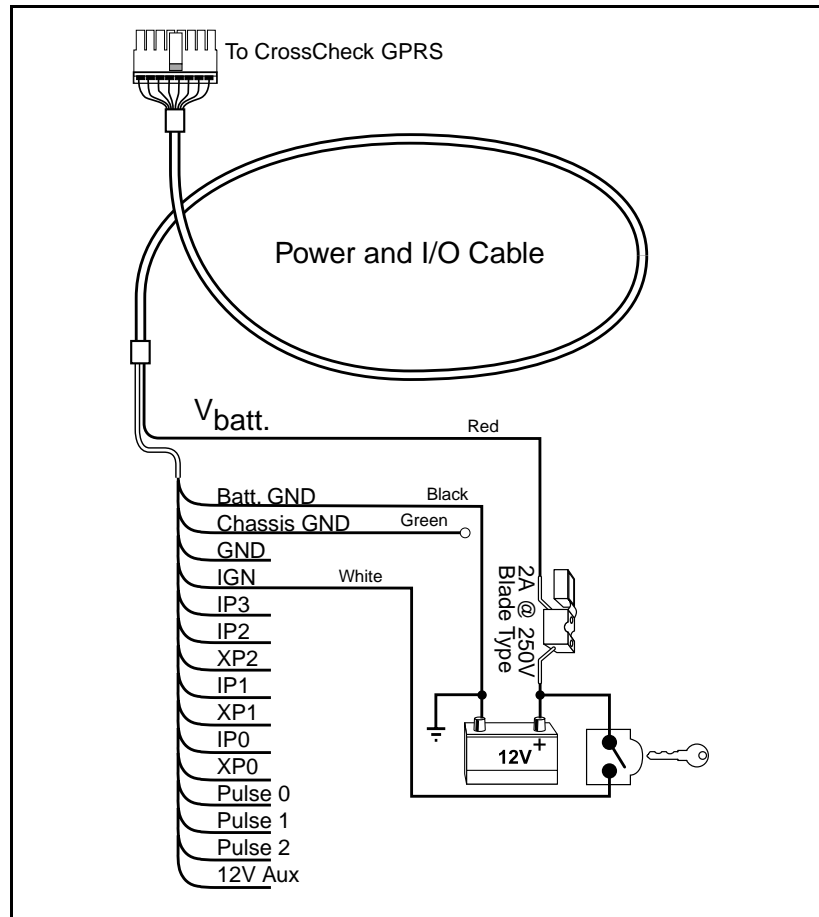


Figure 2.28 Power Management Connections

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 connection (see Figure 2.29), the CrossCheck GPRS operates and draws power continuously, even when the vehicle is not running:

- Idle mode (not transmitting) without the EchoLDX Message Terminal, 150 mA is typical @ 12 VDC
- Idle mode (not transmitting) with the EchoLDX Message Terminal, 220 mA is typical @ 12 VDC



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**Caution** – When using the Continuous Power connection, the CrossCheck GPRS may drain a car battery in a vehicle that is not running in 1 to 3 weeks, depending on the battery size, quality, and remaining life span. In the Continuous Power connection, the CrossCheck GPRS can also drain the battery of a vehicle that is not running long enough to compensate for the current draw of the CrossCheck. **Observe extreme care when using this connection option.** The CrossCheck GPRS will automatically power off when the voltage drops below 9 VDC.

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Figure 2.29 illustrates connections for Continuous Power.

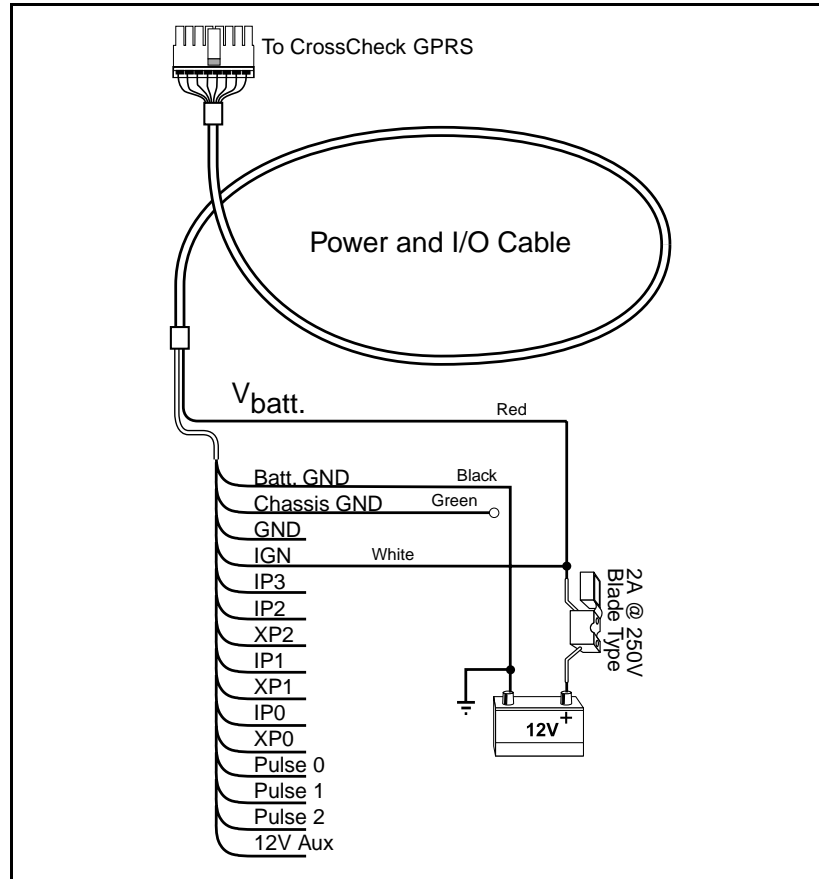


Figure 2.29 Continuous Power Connections

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.





# Operation

**In this chapter:**

- Introduction
- LED Indicators
- GPS Receiver Operation

## Introduction

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

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

- LED Indicators
- GPS Receiver
- GPRS Transceiver

## LED Indicators

The CrossCheck GPRS includes two LED indicators: GPS and GPRS. The firmware continuously monitors the GPS receiver and the CrossCheck GPRS operation.

Figure 3.1 shows the CrossCheck GPRS LED indicators.

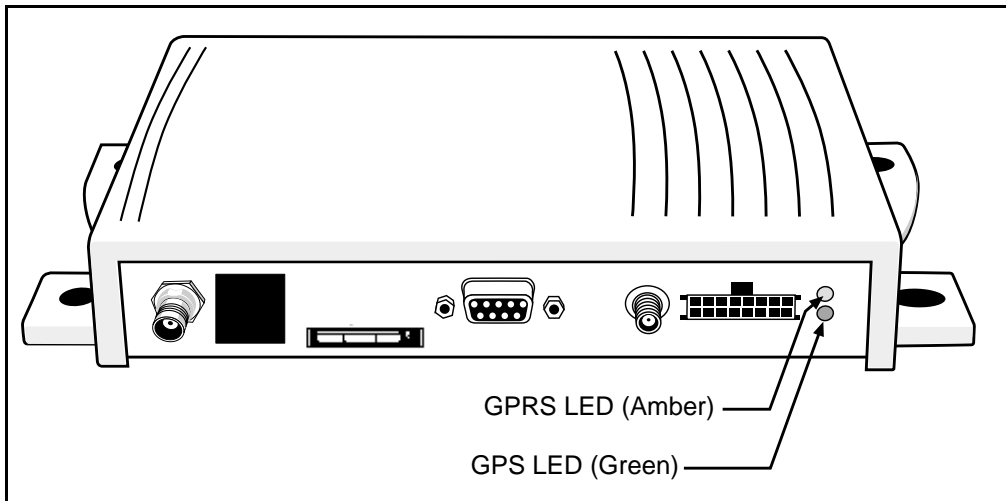


Figure 3.1 CrossCheck GPRS LED Indicators

## LED States

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

When both LED indicators are off, the CrossCheck GPRS'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 GPRS's ignition input and power inputs are activated:

- The LEDs blink once.
- Both turn off for approximately 5 seconds.

The GPS LED is on for approximately 2 seconds, then blinks until the *first* position *fix* is computed. The GPRS LED blinks until the unit is registered with a GPRS network, at which point the GPRS LED turns on.

## GPS and GPRS 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 the ignition is off.

Table 3.2 identifies the GPRS LED states.

**Table 3.2 GPRS LED States (Amber LED)**

GPRS LED State	Meaning
On	Data call in progress.
Slow Blink	No GPRS coverage is available; the CrossCheck GPRS is not registered with network.
Off	No power is available, or the ignition is off.

## GPS Receiver Operation

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

- During the satellite acquisition process—which normally requires less than 45 seconds—the green GPS LED blinks.
- Once three or more satellites are acquired, the GPS receiver computes positions, course, and speed, 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.

***Note** – If the CrossCheck GPRS unit does not have a valid last-known position, the unit will be forced to perform a cold start which normally requires less than 3 minutes. For example, this would happen the first time the unit is turned on, or if the unit has never been on long enough to obtain an Almanac. To obtain an Almanac, the unit must track GPS satellites for up to 30 minutes.*



# A

## Specifications

**In this appendix:**

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

## Introduction

This appendix lists the CrossCheck GPRS 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
- GPRS Communications Specifications, Table A.5
- Cellular Antenna Requirements, Table A.6
- CrossCheck GPRS Mobile Unit Physical Specifications, Table A.7
- CrossCheck GPRS Mobile Unit, 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.15
- Discrete Inputs: IP0 to IP3, Table A.16
- Pulse Counter Inputs, Table A.17
- Discrete Outputs: XP0 to XP2, Table A.18
- Component Part Numbers, Table A.19



**Table A.1 General Specifications**

<b>Item</b>	<b>Specification</b>
Input Voltage	9.0 to 32.0 VDC
Current Consumption (typical)	<p><b>Transmitting:</b>  with MDT: 340 mA (1.6 A peak) at 12 VDC  without MDT: 270 mA (1.5 A peak) at 12 VDC</p> <p><b>Not transmitting:</b>  with MDT: 160 mA at 12 VDC  without MDT: 90 mA at 12 VDC</p> <p><b>Sleepmode:</b> &lt; 10 mA at 12 VDC</p>
MDT Port	(1) RS-232 DCE
Serial Port Speed (bps)	9600
Inputs & Outputs	Discrete Inputs: (4) switch closures Ignition sense: Off: <0.8 V; On: >2.4 V Pulse Counting Inputs: (3) minimum pulse width: 500 microseconds Discrete Outputs: (3) 200 mA low -side drivers,
Sensor Power Output	(1) 100 mA max at 11.5 V ±1.0 VDC
Status LEDs	GPS (green) and GPRS (amber)

## A Specifications

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**Table A.2 Firmware Specifications**

<b>Item</b>	<b>Specification</b>
Configurable Parameters (Over the Air)	Geo-fence area for Job Sites Geo-fence area for Home Sites Entry Speed Limit for Site Dispatch Exit Speed Limit for Site Dispatch Site dispatch time-out Minimum duration time to detect entry/exit regions Automatic status reporting for ready mix applications.
Speeding Reports	Enable speed and duration thresholds
Stop Reports	Enable speed and duration thresholds
Mileage/Run time	Set the initial odometer value and engine run time counter Support datalogging that allows the CrossCheck GPRS to store messages and events for up to 1 week while out of the network coverage.
Messaging	Available through Trimble's EchoLDX Message Terminal

**Table A.3 GPS Specifications**

<b>Item</b>	<b>Specification</b>
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, no S/A*	Position: < 10 meters (50% CEP) Velocity: < 0.5 meters/second

**Table A.3 GPS Specifications (Continued)**

First Acquisition	Cold start: < 180 seconds in 90% of cases Warm start: < 45 seconds in 90% of cases Reacquisition after 15 seconds of blockage: < 2 seconds in 90% of cases
Datum	WGS-84
Reacquisition after Signal Loss	< 2 seconds in 90% of cases

\* All GPS receivers are subject to degradation of position and velocity accuracies under Department of Defense imposed Selective Availability (S/A).

**Table A.4 GPS Antenna Requirements**

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

**Table A.5 GPRS Communications Specifications**

Item	Specification
Cellular	Internal GPRS module Class B Time slots 2 Rx, 1 Tx 2W @ 900 MHz 1W @ 1900 MHz

## A Specifications

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**Table A.5 GPRS Communications Specifications (Continued)**

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Frequencies	Dual band 900/1900 MHz
SIM	3 VDC
Regulatory Approvals	CrossCheck GPRS complies with the European Telecommunications Standards Institute specifications ETS 301 489-1; CE MARK; EC R&TTE Type Examination, FCC Part 15, FCC Part 24, Low Voltage Directive (EN60950), e-mark, PTCRB and Industry Canada requirements.

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**Table A.6 Cellular Antenna Requirements for GSM 1900 PCS**

<b>Item</b>	<b>Specification</b>
Antenna Type	For the CrossCheck GPRS 1900: Passive, 1900 or 900/1900 MHz nominal, omnidirectional
Antenna Impedance	50 $\Omega$ (nominal)
VSWR	2:1 Max over entire frequency range
Gain (including cable loss)	Min 0 dBi Max for mobile installations: 3 dBi Max for fixed installations: 7 dBi
Frequency	Tx: 1850-1910 MHz GPRS 1900 Rx: 1930-1990 MHz GPRS 1900

**Warning – For 1900 MHz PCS:**

A minimum separation distance of 20 cm must be maintained between the antenna and the person for this device to satisfy the RF exposure requirements of the FCC. For fixed mount operation, the antenna co-location requirements of Section 1.1307 (b) (3) of the FCC rules must be satisfied. The maximum antenna gain, including any cable loss, must not exceed 3dBi.

**Warning –** Portable operation of this unit is not permitted.

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

<b>Item</b>	<b>Specification</b>
Assembly	Bottom: Aluminum Top: Injection-molder plastic with integrated shield
Size	228 mm W x 121 mm D x 36 mm H (8.97 in. W x 4.76" D x 1.42 in. H)
Weight	485 g (1 lb, 1.1 oz.)
Connectors	MDT: DB9 (receptacle) Power/Ignition + Digital I/O: Molex Micro-Fit 3.0 16-pin 2-row locking (plug) GPS antenna: SMA (receptacle) 50 $\Omega$ GPRS antenna: TNC (receptacle) 50 $\Omega$

## Environmental Specifications

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

- CrossCheck GPRS Mobile Unit
- 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 GPRS Mobile Unit**

Item	Specification
Operating Temperature	-20°C to +55°C (-4°F to 131°F) for 900 -10°C to +55°C (-14°F to 131°F) for 1900
Storage (non-operating) Temperature	-40°C to +85°C (-40°F to 185°F)
Humidity	5% to 95% RH, non-condensing at +40°C
Velocity	450 meters/second
Vibration	0.008g <sup>2</sup> /Hz      5 Hz +3dB/Octave      5 Hz to 20 Hz 0.05g <sup>2</sup> /Hz      20 Hz to 100 Hz -3dB/Octave      100 Hz to 800 Hz 0.001g <sup>2</sup> /Hz      800 Hz to 1000 Hz
Shock	Operational: 40 g for 11 milliseconds Non operational: 75 g for 6 milliseconds
MTBF	100,000 hours

## A Specifications

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

<b>Item</b>	<b>Specification</b>
Size	62.6 mm D x 19.0 mm H (3.5 in. D x 0.75 in. 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 (-40°F to 185°F)
Storage Temperature	-55°C to +85°C (-67°F to 185°F)
Humidity	5% to 95% RH, non-condensing at +40°C (104°F)
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)**

<b>Item</b>	<b>Specification</b>
Size	62.6 mm D x 19.0 mm H (3.5 in. D x 0.75 in. H)
Weight	0.13 kg (4.59 ounces)
Center Mounting Hole	63 mm (0.75 in.)
Threaded Nut	63 mm TNC (0.75 in.)
Operating Temperature	-40°C to +85°C (-40°F to 185°F)
Storage Temperature	-55°C to +85°C (-67°F to 185°F)
Humidity	5% to 95% RH, non-condensing at +40°C (104°F)



**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 in. W x 1.85 in. D x 0.524 in. 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 (-40°F to 185°F)
Storage Temperature	-55°C to +85°C (-67°F to 185°F)
Humidity	5% to 95% RH
Casing	Dustproof, waterproof, shock-resistant polycarbonate with magnetic mount
Minimum Gain	26 dBi

**Table A.12 Magnetic Mount 850/1900 Cellular Antenna (P/N 46764)**

Item	Specification
Frequency	825-896 / 1850-1990 MHz
Gain	Cellular: 3 dBd/5.2 dBi (1.5 dBd/3.7 dBi including cable loss) PCS: 3 dBd/5.2 dBi (0.7 dBd/2.9 dBi including cable loss)
Type	Cellular: Collinear PCS: 5/8 over 5/8 over 1/2 wave
VSWR (see bandwidth)	2.0:1 or less
Power Rating	7 W
Color	Black

## A Specifications

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**Table A.12 Magnetic Mount 850/1900 Cellular Antenna (P/N 46764) (Continued)**

<b>Item</b>	<b>Specification</b>
Cable Type	Coaxial RG-58/U Dual Shield
Cable Length	2.65 m (12 ft)
Base Size	76 mm (3 in.)
Max Height	330 mm (13 in.)

**Table A.13 Bulkhead Mount 850/1900 Cellular Antenna (P/N 47771)**

<b>Item</b>	<b>Specification</b>
Frequency	825-896/ 1850-1990 MHz
Gain	Cellular: 3 dBd/5.2 dBi (1.5 dBd/3.7 dBi including cable loss) PCS: 3 dBd/5.2 dBi (0.7 dBd/2.9 dBi including cable loss)
Type	Cellular: Collinear PCS: 5/8 over 5/8 over 1/2 wave
VSWR (see bandwidth)	1.5:1 or less
Power Rating	100 W
Color	Black
Cable Type	Coaxial RG-58/U Dual shield
Cable Length	5.18 m (17 ft.)
Max Height	355 mm (14 in.) max
Mounting	19 mm (3/4 in.) roof mount

**Table A.14 Glass Mount 850/1900 Cellular Antenna (P/N 47773)**

<b>Item</b>	<b>Specification</b>
Frequency	825-896/ 1850-1990 MHz
Gain	Cellular: 3 dBd/5.2 dBi (1.5 dBd/3.7 dBi including cable loss) PCS: 3 dBd/5.2 dBi (0.7 dBd/2.9 dBi including cable loss)
Type	Cellular: Collinear PCS: 5/8 over 5/8 over 1/2 wave
VSWR (see bandwidth)	2.0:1 or less
Power Rating	100 W
Color	Black
Cable Type	Coaxial RG-58/U Dual Shield
Cable Length	4.057 m (15 ft.)
Base Size	44.45 mm X 48.26 mm (1.75 in. X 1.9 in.)
Max Height	355.6 mm (14 in.)

## I/O Characteristics

**Table A.15 MDT Port**

<b>Item</b>	<b>Specification</b>
Physical	DB9 - receptacle
Logical	TXD, RXD, RTS, CTS, GND, DTR, DCD, DTS, 12 $\pm$ 0.5 V provided through Pin 9
Baud Rates	9600, No parity, 8 bits, 1 stop bit

## A Specifications

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**Table A.16 Discrete Inputs: IP0 to IP3**

Item	Specification
Input Logic High	Open circuit or $V_{in} > 2.4$ VDC
Input Logic Low	$V_{in} < 0.8$ VDC The inputs must remain in either state for at least 500 milliseconds before the CrossCheck GPRS detects the input.
Input Current	$I_{in} \pm 1$ mA
Input Protection	Protected up to at least $V_{Batt}$ continuous

**Table A.17 Pulse Counter Inputs**

Item	Specification
Input Logic High	Open circuit or $V_{in} > 2.4$ VDC
Input Logic Low	$V_{in} < 0.8$ VDC
Input Current	$I_{in} \pm 1$ mA
Minimum Pulse Width	500 $\mu$ s
Input Protection	Protected up to at least $V_{Batt}$ continuous

**Table A.18 Discrete Outputs: XP0 to XP2**

Item	Specification
Output Inactive	15 K $\Omega$ tied to $V_{batt}$ <i>Warning: Short circuits to <math>V_{batt}</math> must be avoided as they can cause damage to the unit.</i>
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
- Power and Digital I/O Cable with or without Cigarette Adapter
- Optional EchoLDX Message Terminal Kit including:
  - EchoLDX Mobile Data Terminal
  - Power/Data Cable
  - Pedestal Mount Kit (6")
  - *EchoLDX Message Terminal Installation and User's Manual* (available online)
  - Quick Reference Guide

## CrossCheck GPRS Part Numbers

Part numbers for the CrossCheck GPRS, options, and accessories are listed in Table A.19.

**Table A.19 Component Part Numbers**

Description	Part No.
CrossCheck GPRS 1900 Mobile Unit Demo Kit (includes GPS magnetic mount antenna, GPRS magnetic mount antenna, power and I/O cable with cigarette lighter adapter, and EchoLDX Message Terminal Kit)	46728-01
CrossCheck GPRS 1900 Mobile Unit Kit (does not include Power and I/O cable—must be ordered separately as P/N 46598—or GPS and GPRS antennas)	46728-11
CrossCheck GPRS 1900 Ready Mix Mobile Unit Kit (does not include Power and I/O Cable—must be ordered separately as P/N 46598—or GPS and GPRS antennas)	46728-12
CrossCheck GPRS 1900 Heavy Vehicle Mobile Unit Kit (does not include Power and I/O Cable—must be ordered separately as P/N 46598—or GPS and GPRS antennas)	46728-13

## A Specifications

**Table A.19 Component Part Numbers (Continued)**

Description	Part No.
<b>Upgrade Kits</b>	
EchoLDX Message Terminal Kit	46722-00
<b>GPS Antenna and Cable Bundles</b>	
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
<b>GPS Antennas and Cables - separate</b>	
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
<b>GPRS Cellular Antennas</b>	
Magnetic Mount 850/1900 Cellular antenna	46764
Bulkhead Mount 850/1900 Cellular antenna	47771
Glass Mount 850/1900 antenna	47773
<b>Cables and Accessories</b>	
Power and I/O Cable - single	46598

**Table A.19 Component Part Numbers (Continued)**

<b>Description</b>	<b>Part No.</b>
EchoLDX Power/Data Cable, 2.90 meter	46755
EchoLDX Quick Reference Guide	46845-00-ENG
Pedestal Mounting Kit (6")	46950
<b>Documentation (free download of latest version from the Web site)</b>	
<i>CrossCheck GPRS 1900 Installation Manual</i> (only in electronic PDF format)	47770-00-ENG
<i>EchoLDX Message Terminal Installation and User's Manual</i> (only in electronic PDF format)	46667-00-ENG

