



# GlobalTRACS® Equipment Management System Installation and Diagnostic Guide

Released - Internal Use Only

**80-J5555-1 Rev. B**

**March 2004**

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GlobalTRACS®  
EQUIPMENT MANAGEMENT SYSTEM

Released - Internal Use Only

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# 1

## **GlobalTRACS<sup>®</sup> System Overview**

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### **Introduction to the GlobalTRACS System**

The GlobalTRACS<sup>®</sup> equipment management system is QUALCOMM<sup>®</sup>'s wireless equipment management solution for the construction industry. The GlobalTRACS system provides terrestrial wireless monitoring and management of equipment assets in the field for equipment rental companies, contractors, equipment dealers and service providers, and equipment manufacturers.

The GlobalTRACS system is a comprehensive, end-to-end equipment management system consisting of rugged mobile hardware, reliable network services, robust host software, and extensive data integration capabilities.

*Topics in this chapter include:*

- *The GlobalTRACS System Solution* ..... 1-2
- *The GlobalTRACS System* ..... 1-3

*If you have questions about the GlobalTRACS system, please contact QUALCOMM Wireless Business Solutions<sup>®</sup> (QWBS) Technical Support Hotline. Technical Support is staffed 24 hours a day, 365 days a year:*

*In the United States, call 800-541-7490  
In Canada, call 800-863-9191*

## **The GlobalTRACS System Solution**

The GlobalTRACS system enables users to access machine data, monitor engine run hours, locate equipment, reduce operating and maintenance costs, increase operating efficiencies, and improve customer service.

### **Who Needs the GlobalTRACS System?**

The GlobalTRACS system is designed for the following customers:

- Construction equipment OEMs
- Construction equipment dealers and distributors
- Equipment rental companies
- Construction fleets

### **GlobalTRACS System Service**

#### **Basic GlobalTRACS System Service**

Engine hours, equipment location, and geofencing are just some of the features available via the GlobalTRACS system web application.

#### **Service Equipment and Fleets**

Engine hours can be used to alert customers about maintenance and service schedules.

#### **Equipment Utilization and Billing**

The GlobalTRACS system provides customers with an historical record of equipment operation hours.

#### **Maintenance and Security**

The GlobalTRACS system incorporates a geofencing alarm system that alerts customers when equipment has moved into or out of a predefined geographical zone.



## **The GlobalTRACS System**

The GlobalTRACS system uses the following:

- Both an analog and digital Code Division Multiple Access (CDMA) networks.
- Data services or data delivery
  - Web browsing
  - Third-party data feeds to legacy systems
- Large-scale, fully redundant network operations center (NOC)
- Global Positioning System (GPS)

The GlobalTRACS terminal (GTT) is designed according to industry environmental specifications. It is flexible and adapts to engine-powered or electric vehicles, 12 VDC or 24 VDC systems, and allows for over-the-air (OTA) reprogramming of onboard firmware. The GlobalTRACS system mobile hardware consists of the following components:

- GlobalTRACS terminal (GTT) (10-J1010-2)
- Antenna with integral cable (CV90-J1045-6)
- Power/Signal cable (CV90-J5537-20)
- Various mounts (antenna and terminal)

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## How the GlobalTRACS<sup>®</sup> System Works

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### Introduction

This chapter provides information about the GlobalTRACS<sup>®</sup> equipment management system and how the various components interact to send information to the GlobalTRACS system customer.

*Topics in this chapter include:*

- *GlobalTRACS System Component Description . . . . . 2-2*
- *What is the GlobalTRACS System?. . . . . 2-3*

*If you have questions about the GlobalTRACS system, please contact QUALCOMM<sup>®</sup> Wireless Business Solutions<sup>®</sup> (QWBS) Technical Support Hotline. Technical Support is staffed 24 hours a day, 365 days a year:*

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## GlobalTRACS System Component Description

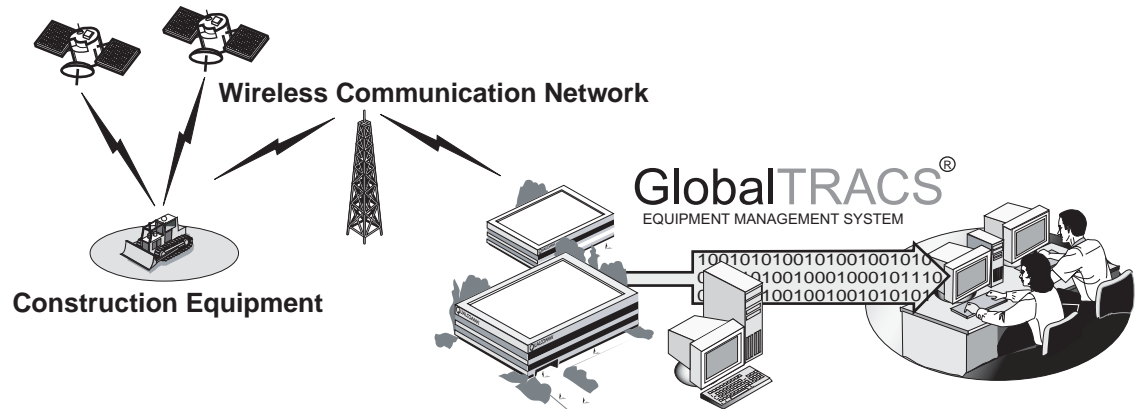
The GlobalTRACS system consists of these major components:

<b>Component</b>	<b>Description</b>
Network Operations Center (NOC)	This facility is responsible for processing and managing the message traffic between the customer and the construction equipment. Within the NOC is the Network Management Computer (NMC), which actually receives and handles the message traffic. The NOC is located at QUALCOMM, Inc. in San Diego, CA. A fully redundant back-up facility exists in Las Vegas, NV.
Customer	The customer's computer communicates with the NMC in order to receive messages from its construction equipment.
GTRACS Web	QUALCOMM's GlobalTRACS Web is the application used by the customer. This is the customer's interface with the GlobalTRACS system. It allows customers to receive messages, request equipment location information, and perform other functions. The customer's computer communicates with the NMC via the Internet.
Global Positioning System (GPS)	GPS is a constellation of 24 strategically placed satellites. Signals from the satellites determine the equipment's location, which is then reported to the NMC by GlobalTRACS.
Analog and Digital (CDMA) Wireless Communication Network	The GTT uses an existing wireless communication network to communicate.
GlobalTRACS Terminal (GTT)	The GTT is the interface between the equipment and the customer. It allows customers to receive messages about the equipment via an antenna mounted on the vehicle.

The following illustration shows the interaction between the GlobalTRACS system components. The terminal sends a message to the NMC through the wireless communication network provider's gateway. The gateway center sends the message out to its wireless network where RF signals are then retrieved by the NMC. After the NMC receives the message, it sends the message to the customer. The Customer can also request information from the GTT by sending a message to the NMC, which goes out over the wireless

communication network to the GTT. The GPS satellite constellation is used for location determination.

#### Global Positioning System (GPS)



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## What is the GlobalTRACS System?

The GlobalTRACS system hardware is installed on a customer's piece of equipment. It sends messages to customers over a terrestrial network and also computes vehicle location information using GPS technology. The GlobalTRACS system mobile hardware consists of the following components:

- Antenna with integral cable (CV90-J1045-6)—Communicates with a wireless communication network and computes vehicle location using GPS satellite signals.
- Terminal (10-J1010-2)—Rugged hardware component that houses the GlobalTRACS system technology. All cables connect to the terminal for system functionality.
- Power/Signal Cable (CV90-J5537-20)—Provides interconnection between the GlobalTRACS system components, as well as to the vehicle power source.
- Configuration tool and Diagnostic Cable (CV90-J1006-8)—Software used to configure the GlobalTRACS system. Please refer to the *GlobalTRACS Configuration Tool Installation and User Guide* (80-J5557-1) for more information. A laptop computer is needed (not provided) to run the configuration tool. The GlobalTRACS system can also be configured using the GlobalTRACS Web application. Diagnostic cable is provided.

### The GPS and Terrestrial Wireless Network Systems

The GlobalTRACS system uses GPS to locate a vehicle and a wireless communication network to communicate information about the vehicle to the customer.

### The Global Positioning System

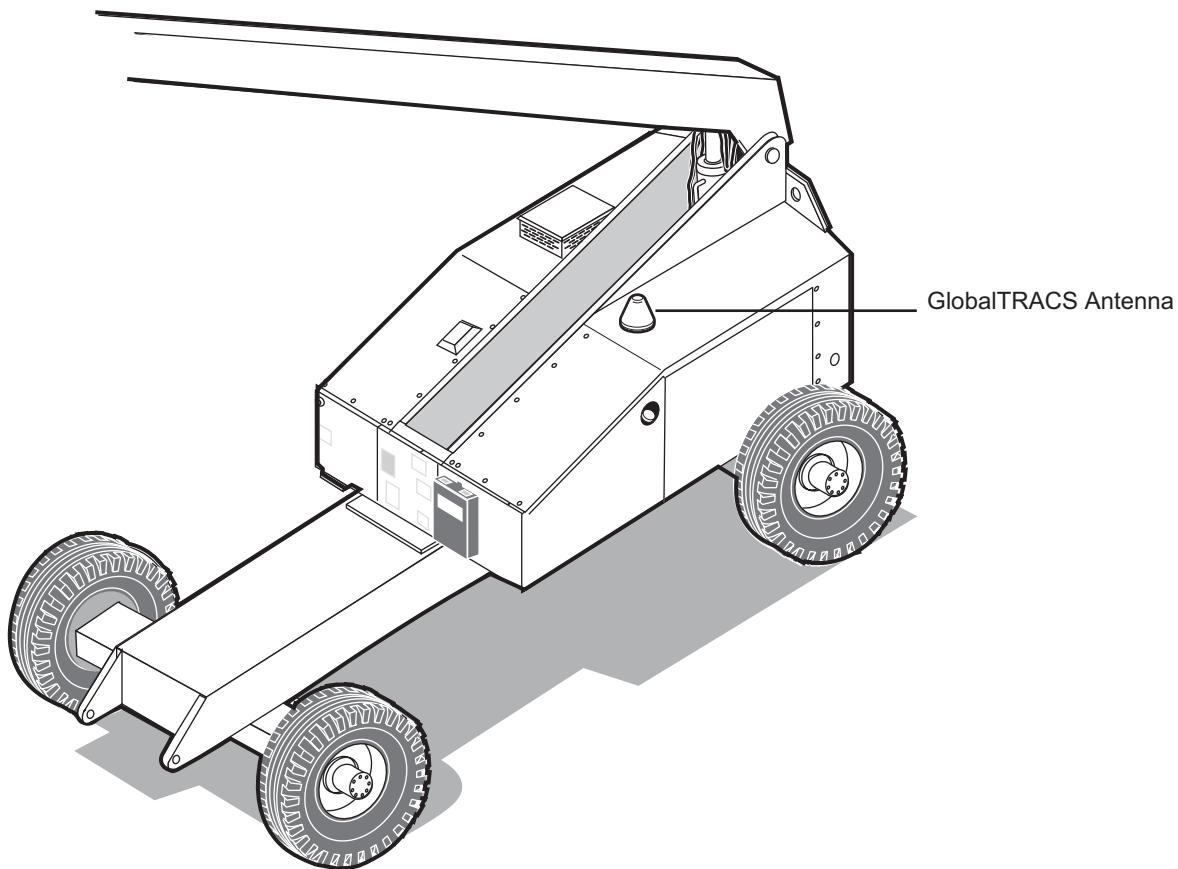
Originally created for and used by the military, the Global Positioning System (GPS) is a worldwide radio-navigation system formed from a constellation of 24 satellites and their ground stations. GPS uses the satellites as reference points to calculate positions accurate to a matter of meters. Essentially, GPS allows every square meter of the planet to have a

unique address. Currently, GPS is used in a number of industries, including the construction, film, farming, computer, and transportation industries.

### **How the GlobalTRACS System Uses GPS**

Signals received from the GPS constellation of 24 strategically placed satellites determine the GlobalTRACS system unit's location.

The GlobalTRACS system unit receives the GPS signals.



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The antenna resides on the construction equipment with a clear view of the sky. The GPS receiver resides inside the GTT to determine the equipment's position. It can receive information from up to 12 satellites at a time. The GPS receiver calculates the equipment's location based on the time that signals are received from the various satellites. The Equipment's location is then available for transfer to the NMC via the terrestrial wireless network.

Location information can be viewed by a customer using the GlobalTRACS Web application.

The NMC retrieves location data automatically at regular intervals and makes data available to the customer. In addition, the customer can request a location report at any time.

### ***The Terrestrial Wireless Communication Network***

The GlobalTRACS system uses analog and digital CDMA technology to connect customers and equipment over the wireless airwaves.

### ***How the GlobalTRACS System Uses Analog and Digital CDMA***

The GlobalTRACS system includes an antenna and the GTT that primarily consists of a microprocessor, a wireless modem module, and data storage.

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## GlobalTRACS<sup>®</sup> System Component Overview

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### GlobalTRACS System Component Introduction

This chapter describes the hardware components that will be installed and provides a wiring overview for a GlobalTRACS<sup>®</sup> equipment management system installation.

*Topics in this chapter include:*

- *The Installation Hardware* . . . . . 3-2
- *How the Components and Cables Interconnect.* . . . . . 3-2

*If you have questions about the GlobalTRACS system, please contact QUALCOMM<sup>®</sup> Wireless Business Solutions<sup>®</sup> (QWBS) Technical Support Hotline. Technical Support is staffed 24 hours a day, 365 days a year:*

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In Canada, call 800-863-9191*

## The Installation Hardware

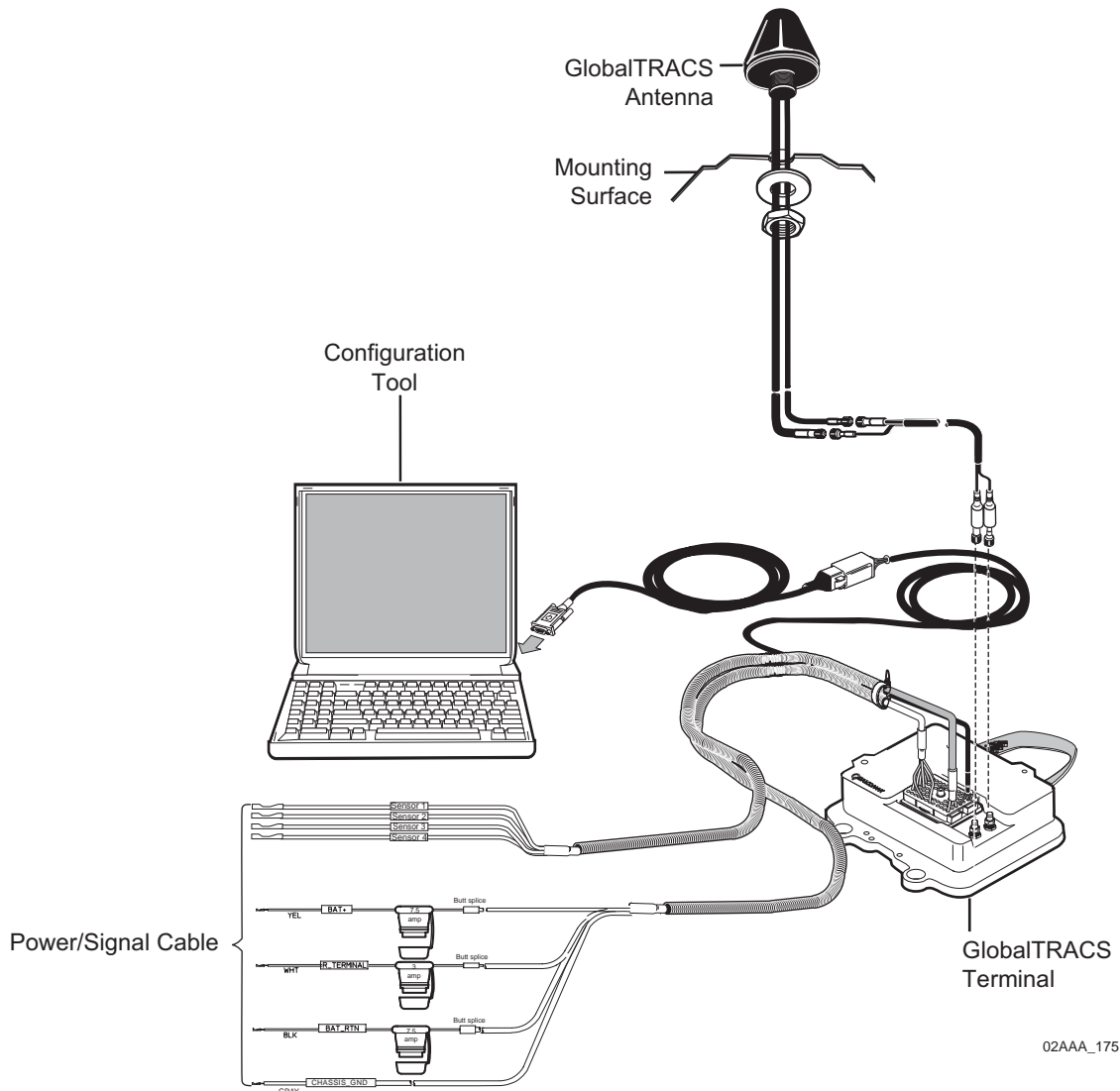
A GlobalTRACS system (Masterpack 10-J1046) installation involves these major hardware components:

- Antenna with integral cable
- Terminal
- Cables

The planning and installation instructions for these components are described in Chapters 4 through 7.

## How the Components and Cables Interconnect

Construction equipment differs greatly from model to model and from vehicle to vehicle. The following diagram shows how the GlobalTRACS system components and cables interconnect. (The laptop computer is not installed. It is used for system verification only.)



## The GlobalTRACS Antenna

**Caution**

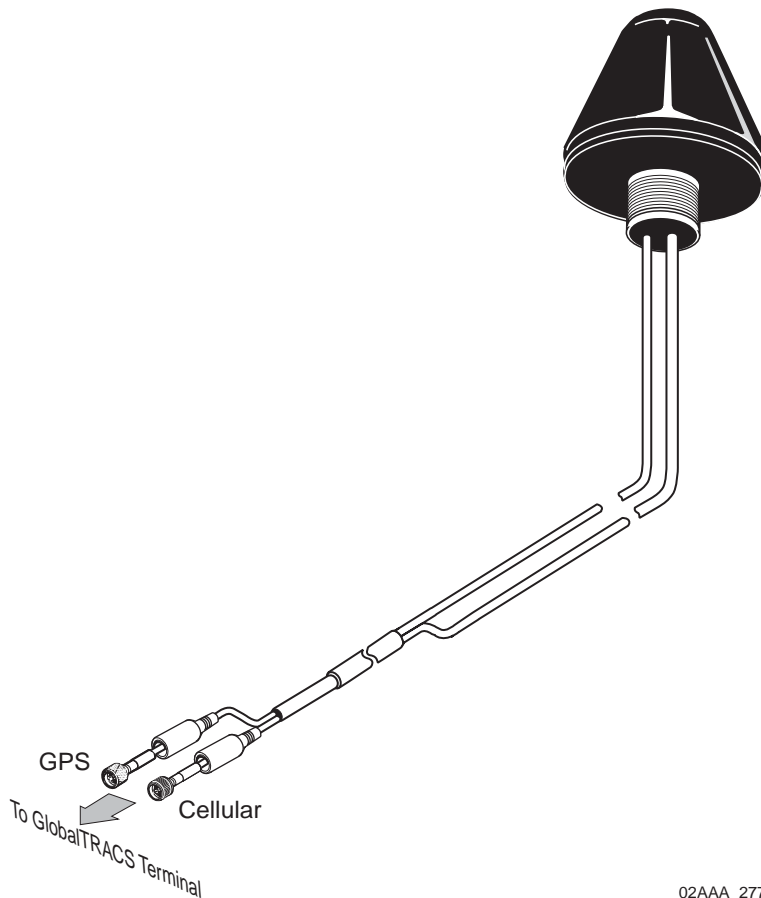
*DO NOT paint the antenna. This will void the warranties. Paint degrades the performance of the GlobalTRACS system.*

The GlobalTRACS system antenna with 6' integral cable (CV90-J1045-6) (a 14' cable [CV90-J1056-14] extension is available when more length is needed to make the connection) sends and receives signals in order to communicate information from the equipment to customers.

The antenna must be securely and safely attached to the equipment. The antenna is installed on the equipment so that it has a clear unobstructed view of the sky. The antenna should be positioned on a level plane when the vehicle is level.

The antenna cable connects the antenna to the GTT. The following figure shows the GlobalTRACS antenna with integral cable.

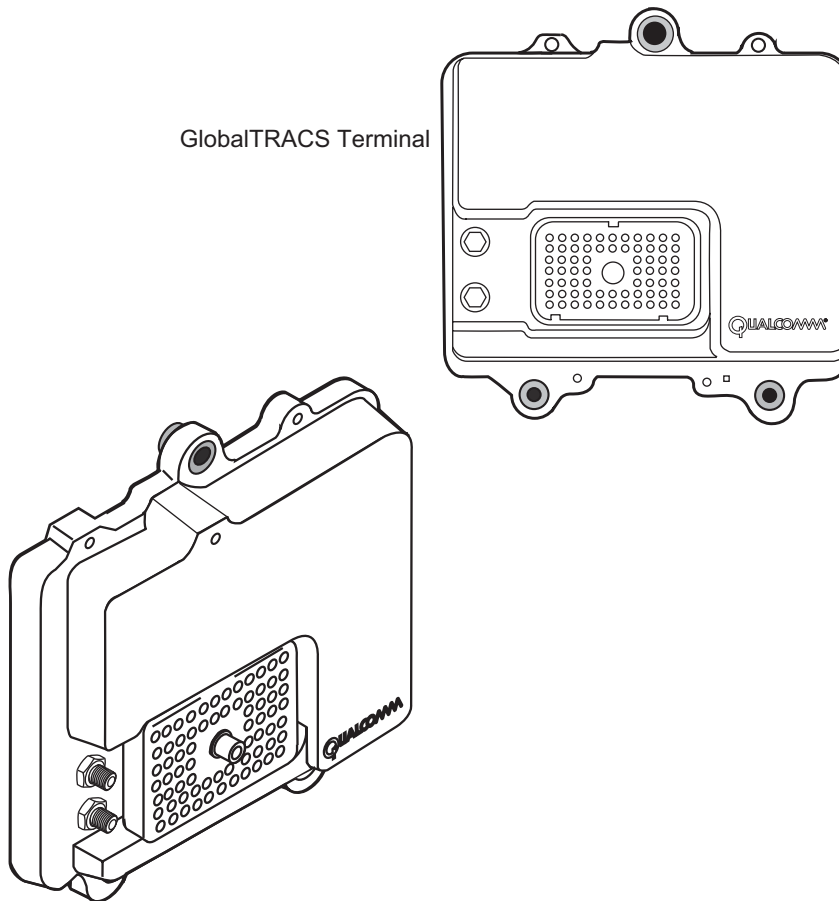
GlobalTRACS Antenna



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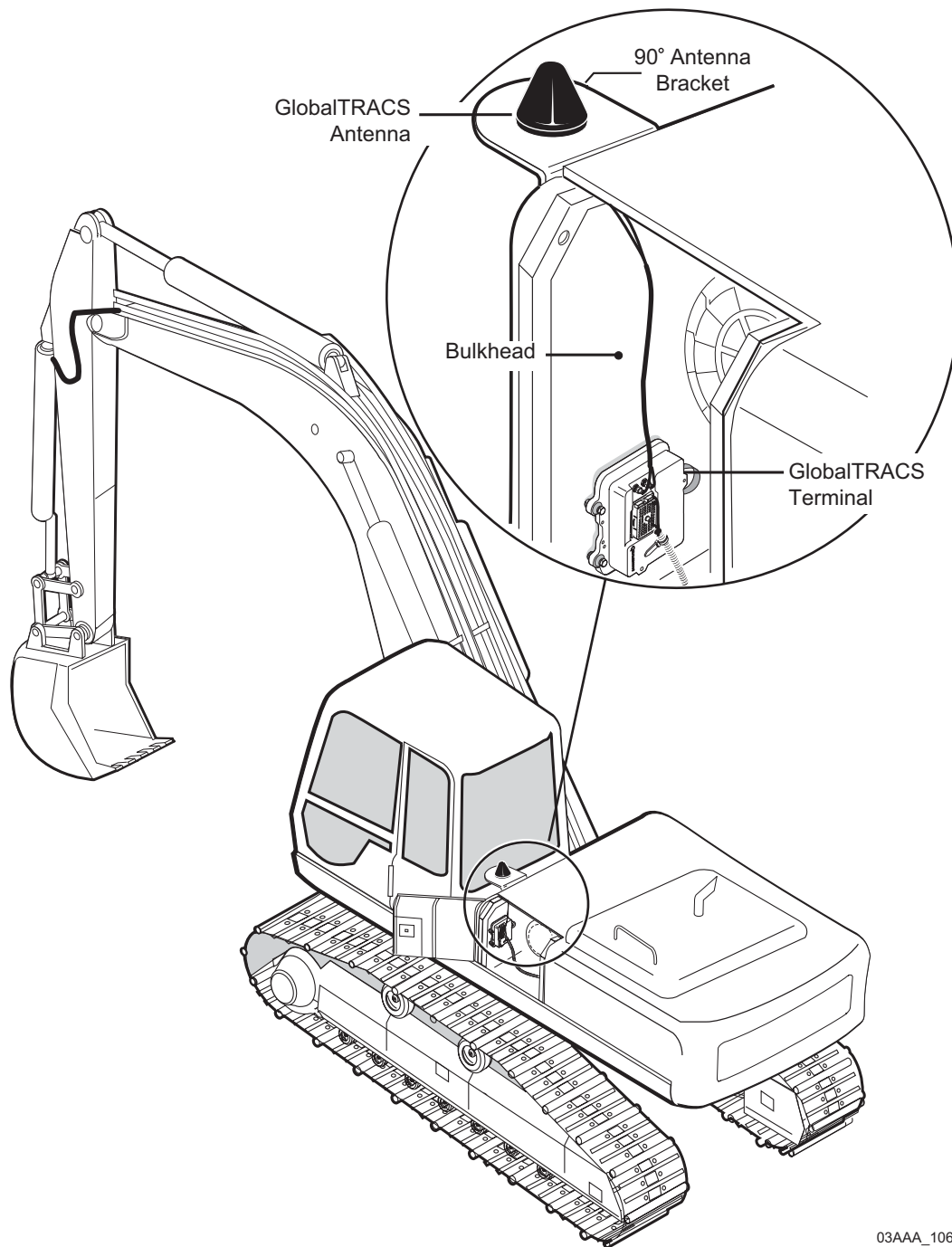
### The GlobalTRACS Terminal

The GlobalTRACS terminal (GTT) (10-J1010-2) contains the electronics unit for the GlobalTRACS system.



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The equipment operator does not need to access the GTT. It should be mounted in a safe and secure place within the vehicle. The following illustration shows the GTT mounted on a piece of construction equipment.



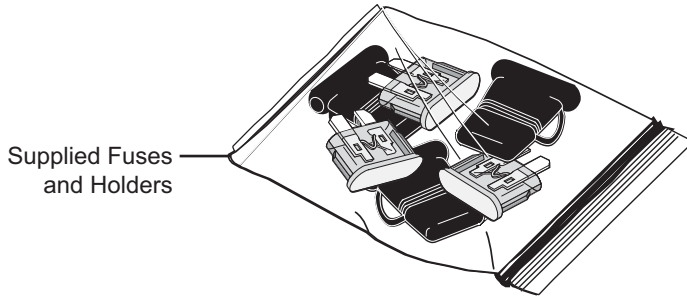
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### ***The GlobalTRACS Power/Signal Cable and Fuses***

The GlobalTRACS power/signal cable (CV90-J5537-20) interconnects the various pieces of hardware. A bag of three fuses is also supplied. The three fuses will be attached to the power/signal cable. They are not the same value. Ensure that the correct fuse is attached to

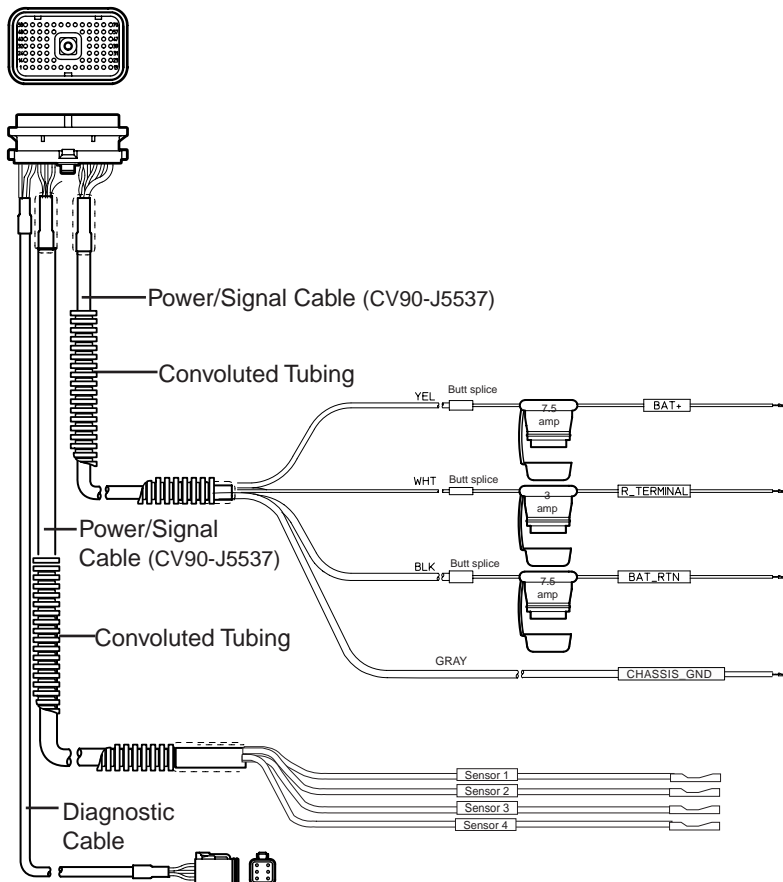
the correct wire on the power/signal cable (there is no fuse for the gray CHASSIS\_GND wire) as follows and in [Power/Signal Cable Installation and Run on page 7-15](#):

- 7.5-amp fuse attaches to the yellow BAT+
- 3-amp fuse attaches to the white R\_TERMINAL
- 7.5-amp fuse attaches to the black BAT\_RTN



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The power/signal cable connects the 12 VDC or 24 VDC vehicle power source and system ground to the GTT. The sensor cable and wires are for future use. DO NOT cut the sensor wires. Properly coil and store them. The diagnostic cable (CV90-J1006-8) is part of the power/signal cable harness and connects to a PC that runs the GlobalTRACS configuration tool for system verification. See the following illustration for cable details.



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## GlobalTRACS® System Installation Planning

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### Introduction

This chapter describes what to consider before installing the hardware and how to plan a GlobalTRACS® equipment management system installation.

*Topics in this chapter include:*

- *General Cautions and Safety Warnings . . . . . 4-2*
- *General Installation Information . . . . . 4-3*
- *Installation Guidelines . . . . . 4-7*
- *GlobalTRACS System Installation Overview . . . . . 4-8*
- *Tools and Supplies Needed for Installation . . . . . 4-15*

*If you have questions about the GlobalTRACS system, please contact QUALCOMM® Wireless Business Solutions® (QWBS) Technical Support Hotline. Technical Support is staffed 24 hours a day, 365 days a year:*

*In the United States, call 800-541-7490  
In Canada, call 800-863-9191*

#### **Note**

*Refer to [Chapter 7: GlobalTRACS® System Cable Installation](#), while planning your installation. The cable chapter provides specific information on cables and should be considered during the installation planning stage.*

#### **Note**

*Installers should be familiar with basic automotive wiring. It is recommended that installation personnel complete the appropriate QUALCOMM training courses prior to installing the GlobalTRACS system.*

## General Cautions and Safety Warnings

**Read these first!** Before installing the GlobalTRACS system components and routing the cables, please read the following cautions and warnings. It is highly recommended that these cautions and warnings are read and understood. Not following them may compromise job safety.

---

### WARNING



*NEVER drill into the Falling object protection structure (FOPS) or the Rollover protection system (ROPS) or modify these structural components to install the antenna or GTT. Such activity may compromise the integrity of these safety systems. Attaching the antenna or GTT (or mounting brackets) to existing holes and brackets on the FOPS or ROPS is acceptable practice, as well as drilling into objects already attached to the FOPS or ROPS by the manufacturer, such as a plastic or sheet metal canopy.*

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### Caution



*Never bypass the battery disconnect. Doing this could possibly prevent the operator from cutting power on the vehicle. The battery disconnect may be located on the negative (low) side or the positive (high) side of the battery. The installer should know where the battery disconnect is located before installation.*

---

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### Caution



*When the GTT is wired to the hot side of the disconnect switch, QUALCOMM recommends removing the GTT fuses and the battery negative terminal before performing welding operations. Doing this will protect the GTT and existing electronics, such as, electronic control modules (ECMs), from the possibility of damaging electrical currents.*

---

---

### Caution



*Before performing any electrical maintenance, turn the battery disconnect switch OFF or disconnect the negative (-) battery cable. Damage to electrical components or personal injury can occur if a power wire is shorted to ground. Multiple batteries may be wired in series and parallel configurations. Identify wiring configurations to verify power disconnect.*

---

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### Caution



*For **gasoline engines**, if possible, do not install the GTT in the engine compartment. If no other options for installation exist and the unit must be installed in the engine compartment, then ensure that the GTT and the cable assembly are at least 18" away from the ignition system (e.g., spark plug wires, distributor, battery, hydraulic wires). The farther away the GTT and cables can be mounted away from these factors, the better. If the minimum length requirement of 18" cannot be obtained, then a custom shield fixture will have to be installed.*

---



**Caution**

*DO NOT paint the antenna. This will void the warranties. Paint degrades the performance of the GlobalTRACS system. Avoid installing the antenna in a place where it could be a trip hazard or used as a foot hold or pull-up. DO NOT use the antenna as either a foot hold or pull-up.*

**Caution**

*Avoid installing or attaching any component or cable to any removable parts, such as, panels or plates.*

## General Installation Information

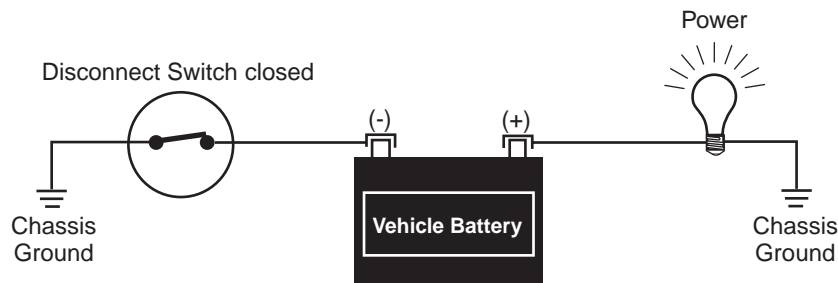
Consider the following information while planning a GlobalTRACS installation.

### Battery Disconnect Switches and Other Safety Cutouts

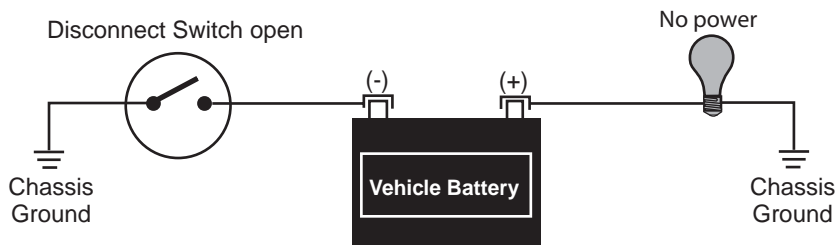
Three cases involving safety cutout devices follow:

#### Case 1: Battery Disconnect Switches

The battery disconnect switch will remove power from the entire machine. This device should never be defeated and nothing should ever be wired across the disconnect switch, as it could defeat the disconnect switch.



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The standard and recommended method is to wire to the low (chassis) side of the battery disconnect switch, which ensures that power to the machine is always available. Use a digital volt meter (DVM) to verify which side is the low (chassis) side of the batty disconnect switch.

**Alert**

*Always obtain permission from the customer when wiring to the hot (battery) side of the battery disconnect switch.*

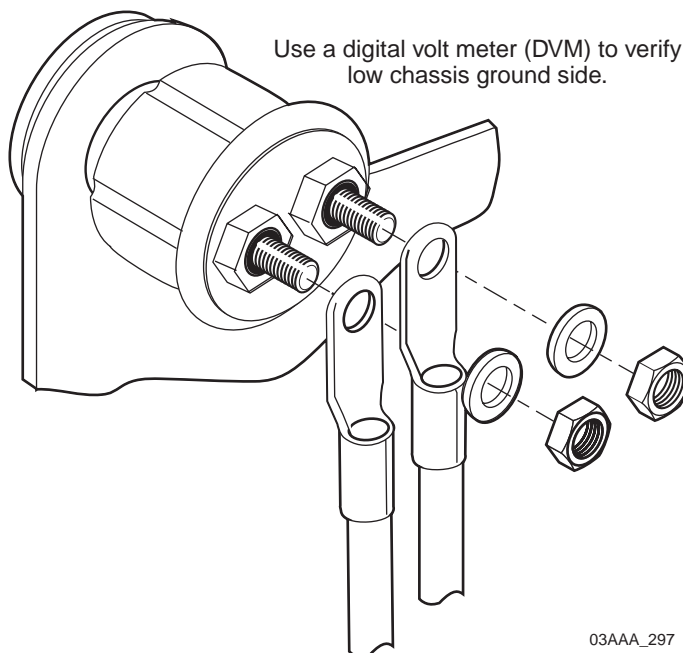
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**Caution**

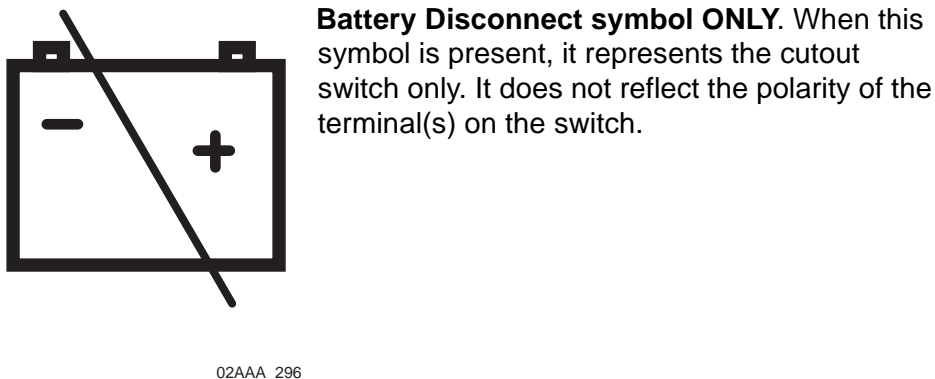
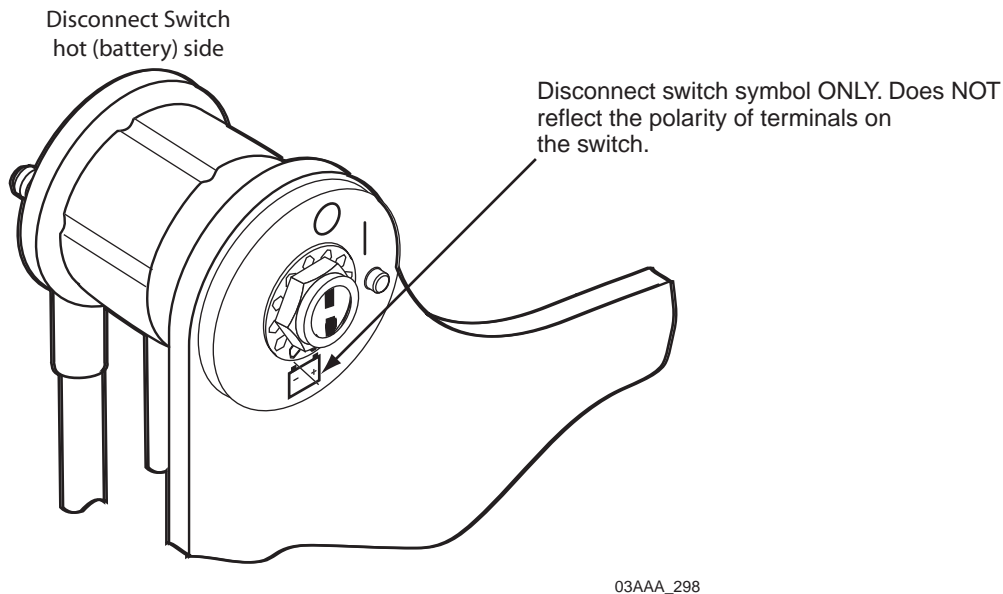
*When the GTT is wired to the hot side of the disconnect switch, QUALCOMM recommends removing the GTT fuses and the battery negative terminal before performing welding operations. Doing this will protect the GTT and existing electronics, such as, electronic control modules (ECMs), from the possibility of damaging electrical currents.*

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Disconnect Switch  
low (chassis/terminal) side



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### Case 2: Emergency Cutouts

On some equipment, such as boom lifts, there are “emergency cutout” switches that remove power from the ignition switch, thereby killing the engine and any accessory that is controlled by the ignition switch. It does not remove power from the entire machine as a battery disconnect switch does.

### Case 3: Master Power Relays

Another type of safety cutout is “master power relay.” In this case, the power to the engine and moving parts is cut off while the ignition is turned off. It does not remove power from the entire machine as does a battery disconnect switch.

In cases 2 and 3, it may be permissible to wire the GTT prior to the cutout or relay. However, the customer should be consulted. Contact your QUALCOMM customer service representative before wiring the GTT in these cases.

**Verify Equipment Good Operating Order**

Before beginning an installation, ensure that the construction equipment is in good working order. If possible, start the engine or have an equipment operator start the engine to verify that the system is running normally.

**Survey the Construction Equipment**

Formulating a plan and deciding where each part of the system is going to fit makes installation smoother and possibly error free.

Survey the equipment and decide where to install the hardware. The following factors should be considered before beginning an installation.

**In General**

- How is the equipment used (consider hazardous situations that the equipment could encounter)?
- Which parts of the equipment are movable?

**Terminal and Cables**

- Will the GlobalTRACS terminal (GTT) and cables be clear of moving parts?
- Will the GTT and cable locations hinder normal operation or maintenance of the equipment?
- Installation locations should be as far away as possible from excessive heat and vibration, such as the engine, hydraulic lines, and spark plug wires.
- Installation locations should be hidden if possible.

**Antenna**

- Will the antenna have a clear unobstructed view of the sky?
- Will the antenna be away from moving parts and protected from physical damage?
- Will the antenna be installed in a place where it could be used as either a foot hold or pull-up?

**Consult with the Customer Prior to Any Installation**

After formulating an installation plan, inform the customer of the plan. Some customers are particular about where parts are going to be installed or where electrical connections will be made. It is always a good idea to have valid reasons for why installing a part in a specific area is necessary.

**What to Consider Before Installing the System**

- Drill holes or weld new brackets only when necessary and in concurrence with the customer.
- It is recommended to use existing brackets on the equipment whenever possible.
- Use silicon (RTV) sealant when necessary to prevent leakage.
- When installing mounts (antenna or GTT), attach them to solid, firm fixtures.

**Installation Guidelines**

When making installation decisions, consider safety, security, quality and reliability, and accessibility.

**Safety****Note**

Refer to [General Cautions and Safety Warnings on page 4-2](#). Always adhere to industry safety standard guidelines. When an installation takes place at a customer's job site, consult with the customer prior to installation about imposed safety regulations enforced at the customer site.

- Use eye protection when using a drill or performing work that poses any hazard to the eyes.
- Use ear protection in a noisy working area.
- Wear appropriate clothing or uniforms (not too loose; no jewelry). Safety shoes (steel-tipped toes and shanks) are recommended.
- Make sure you know beforehand exactly what is behind the area you are about to drill. Is it electrical wires, condenser coils, or heavy gauge steel framing?
- Make sure ladders are in good repair.
- Do not place ladders in awkward or unsafe positions.

**Security**

- Never install hardware in a manner that will cause damage to the equipment over time or will work loose over time.
- Make sure there are no loose components or cables and that there are no unsecured components in or outside of the equipment.
- Use solid mounting surfaces.

**Quality and Reliability**

- Mount the antenna in a location that ensures the unit will receive uninterrupted and nondegraded GPS/cellular/CDMA signals.
- Install all components in a location where they will not be abused (kicked, tread upon, extreme heat, excessive vibration).
- Route all cables away from hot or abrasive areas where they might become damaged.

**Accessibility**

- Choose stealthy or out-of-sight installation locations where components are not likely to be tampered with or damaged (away from hydraulic tanks, the engine, exhaust, and areas where they could be kicked or tread upon).
- Choose a location that does not hinder routine equipment maintenance.

**GlobalTRACS System Installation Overview**

Refer to [General Cautions and Safety Warnings on page 4-2](#). Construction equipment differs greatly from model to model and manufacturer to manufacturer. The GlobalTRACS system was designed to work with a variety of equipment, however, every installation is unique and should be thoroughly planned out before implementation.

**Typical GlobalTRACS System Installation Sequence**

Before beginning the installation, plan the order in which you will install the GlobalTRACS components. Envision the “big picture” of the installation, taking into consideration cable lengths and run directions, when to protect cables with convoluted tubing, and where the GTT and antenna will ultimately reside. Every installation is different. The following is a typical installation sequence:

1. Survey the equipment and identify the installation locations.
2. Mount the GTT. (Refer to [Chapter 5: GlobalTRACS® System Terminal Installation](#).)
3. Mount the antenna. (Refer to [Chapter 6: GlobalTRACS® System Antenna Installation](#).)
4. Route and connect the cables. (Refer to [Chapter 7: GlobalTRACS® System Cable Installation](#).)
5. Attach appropriate fuses to power/signal cable. (Refer to [page 7-15](#).)
6. Connect the configuration tool and verify that the system is working properly. (Refer to [Chapter 8: GlobalTRACS® System Verification](#).)

**GlobalTRACS Terminal Installation Location**

Depending on the type of equipment, installation locations for the GTT will vary. Refer back to [Installation Guidelines on page 4-7](#) for more information.

**Caution**

*DO NOT bolt to the floor of a compartment as solvents or pooled liquids can damage the unit.*

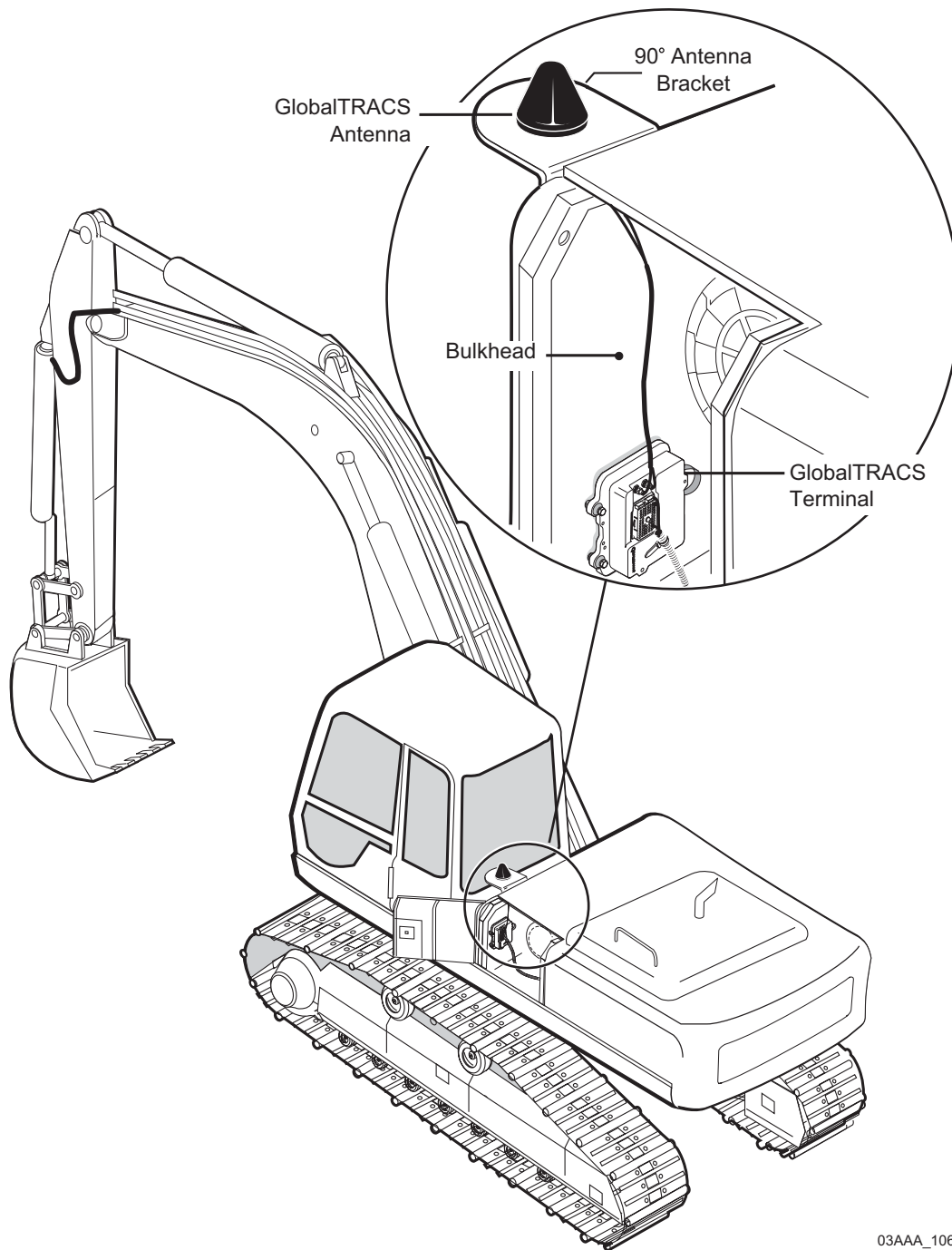
Some recommended locations to consider when determining where to mount the GTT follow:

- Bolted inside the battery box (or heavy iron) or beneath the cab in a fully or partially enclosed area.
- Bolted into an empty compartment on the equipment.
- Bolted to the underside of a toolbox.

**Note**

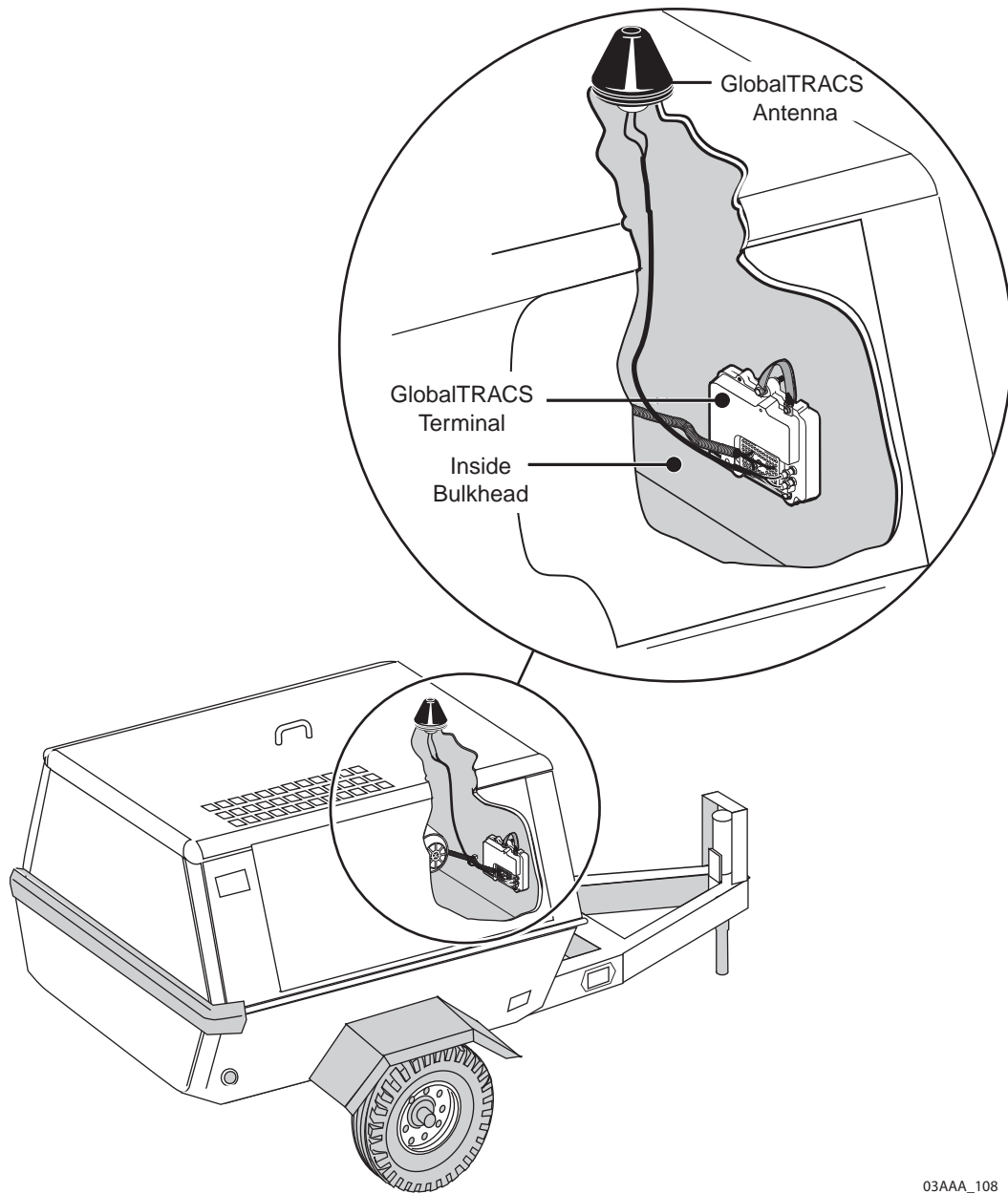
*Ensure that air can circulate around the mounted GlobalTRACS terminal. If installing on gasoline-engine equipment, all wiring and the GTT must be 18" away from the ignition system (e.g., spark plug wires, distributor, battery, hydraulic wires).*

The following illustrations show the GTT mounted on different equipment types.

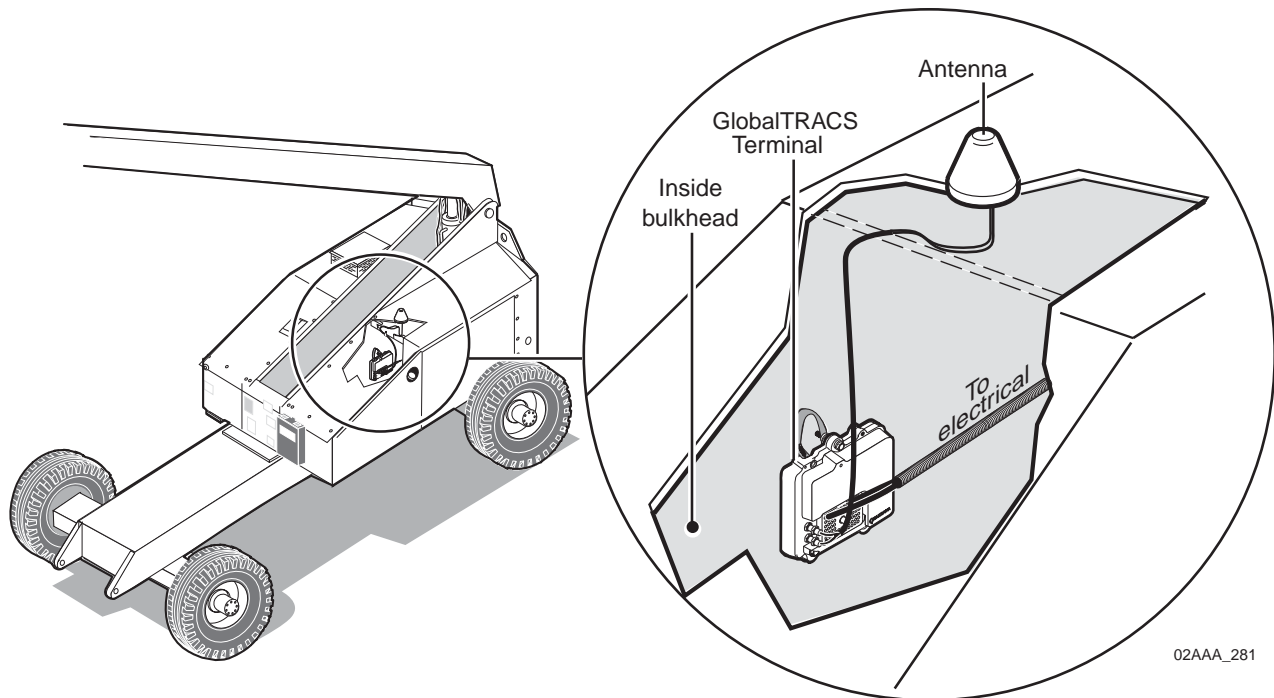


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### GlobalTRACS Antenna Installation Location

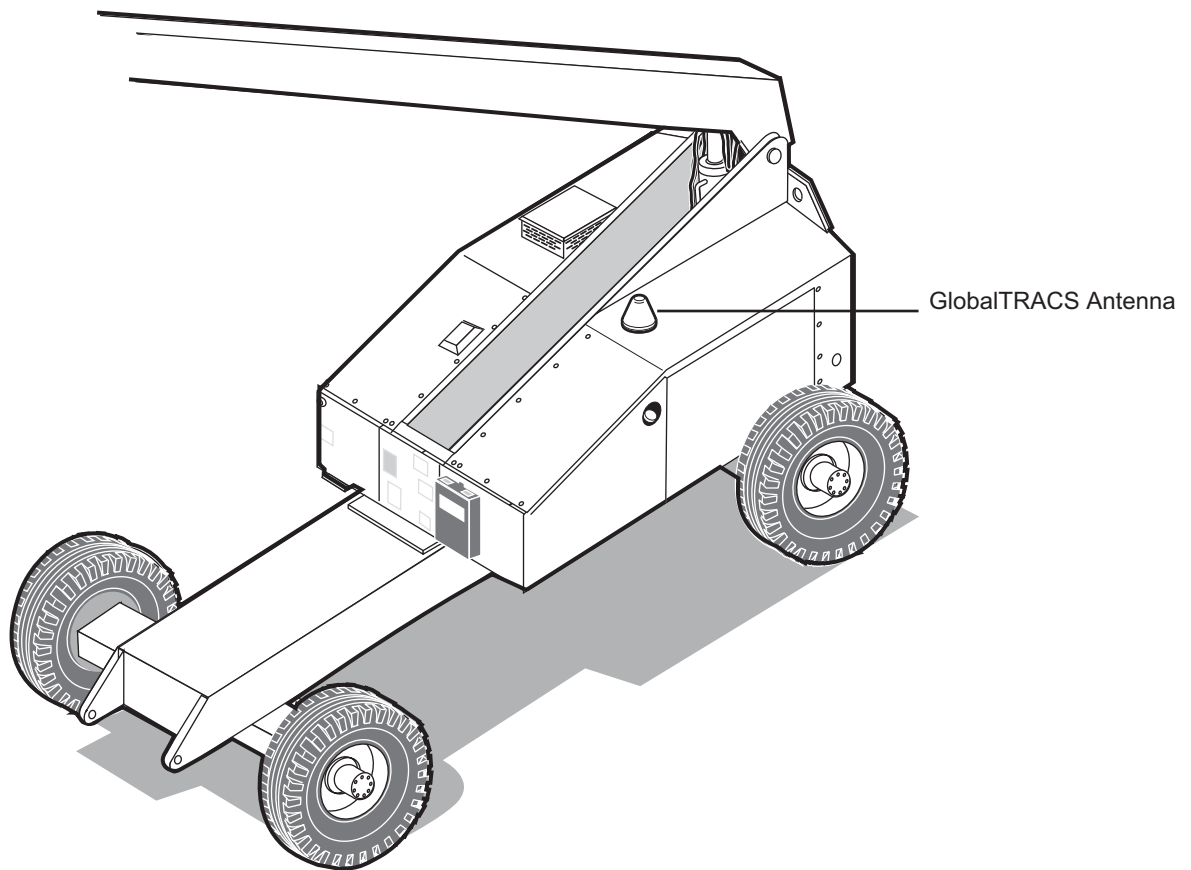
Refer to [General Cautions and Safety Warnings](#) on page 4-2. Depending on the type of equipment, mounting locations for the antenna will vary. Refer back to [Installation Guidelines](#) on page 4-7 for more information.

In general, the antenna should be protected from potential damage and have a clear, unobstructed view of the sky. Install it away from walkways and moving parts. Here are a few locations to consider when determining where to mount the antenna:

- Attached to the engine cover or other similar area.
- Just below the top of the vehicle's canopy so it is not damaged by anything that may roll across the canopy.

#### Note

Mounting brackets are available (refer to [Chapter 9: GlobalTRACS® System Mounts and Brackets](#) for information about available mounts and brackets). Consider antenna clearance so that GPS and cellular/CDMA signals are not blocked and that the antenna has a clear view of the sky.



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### **GlobalTRACS Cable Installation Locations**

Refer to [General Cautions and Safety Warnings on page 4-2](#). Depending on the type of equipment, connection locations for the cables will vary. Refer back to [Installation Guidelines on page 4-7](#) for more information.

Cables should be protected with protective sheathing (such as convoluted tubing) whenever the cables pass over or near sharp surfaces or face excessive exposure to ultraviolet light. When cables are routed outside, take care to secure the cables using cable-ties.

To ensure GlobalTRACS system accuracy, connect and run the cables properly. Determine where the 12 VDC or 24 VDC constant power sources are on the vehicle, as well as ground, battery return, and run terminal. This is where the cable connections will be made. The following table indicates several locations to consider when determining where to route

cabling and make power, ground, and run terminal connections. Refer also to [Grounding Guidelines on page 7-4](#) and [Making Electrical Connections on page 7-5](#).

<b>BAT +</b> (Constant 12 VDC or 24 VDC)	<b>BAT_RTN</b> (B-/Battery Return)	<b>R_TERMINAL</b> (Measures engine hours)	<b>GND</b> Chassis Ground
<ul style="list-style-type: none"> <li>• Alternator (constant 12 VDC or 24 VDC)</li> <li>• High side of vehicle main wiring bus.</li> <li>• Battery side of the fuse box. (Not the load side.)</li> <li>• Battery side of the ignition switch.</li> </ul>	<ul style="list-style-type: none"> <li>• Battery side of the cutout switch. (Must obtain permission from customer to connect here.)</li> <li>• Chassis side of the cutout switch. (Note that the GTT will not operate if the disconnect switch is open.)</li> <li>• Good ground (B-). Refer to <a href="#">Grounding Guidelines on page 7-4</a>.</li> </ul> <div>  <p><b>Caution</b> When establishing a good chassis ground, avoid areas that may be potentially isolated from ground by a hinge or some welds.</p> </div>	<ul style="list-style-type: none"> <li>• Run terminal on the alternator.</li> <li>• Hour meter.</li> <li>• Oil pressure switch.</li> <li>• Ignition switch. (Using the ignition switch could result in inaccurate hours because the ignition can sometimes be on without the engine running.)</li> </ul>	<ul style="list-style-type: none"> <li>• Create a good chassis ground. Refer to <a href="#">Grounding Guidelines on page 7-4</a>.</li> </ul> <div>  <p><b>Caution</b> When establishing a good chassis ground, avoid areas that may be potentially isolated from ground by a hinge or some welds.</p> </div>

## Tools and Supplies Needed for Installation

The following tools and supplies are recommended for performing installations. Other tools to facilitate certain installations and maintenance.

<b>Specific Tools</b>	
<ul style="list-style-type: none"> <li>• 7/16" end wrench and 7/16" socket (or two 7/16" end wrenches)</li> <li>• 9/32" drill bit</li> <li>• slotted screwdriver or 1/4" nut driver</li> <li>• utility knife</li> <li>• wire stripper</li> <li>• Antenna wrench</li> </ul>	<ul style="list-style-type: none"> <li>• 5/32" hex (Allen) wrench</li> <li>• heat gun</li> <li>• 9/32" centering punch</li> <li>• wire cutters</li> <li>• wire crimping tool</li> <li>• volt/ohm meter</li> </ul>
<b>Other Useful Tools</b>	
<ul style="list-style-type: none"> <li>• standard and metric combination wrench sets</li> <li>• torx bit set</li> <li>• assorted drill bits</li> <li>• assorted screwdrivers</li> <li>• assorted screwdrivers</li> <li>• power drill</li> </ul>	<ul style="list-style-type: none"> <li>• 3/8" drive standard and metric socket sets</li> <li>• SAE and metric hex bit sets</li> <li>• assorted hole saws</li> <li>• 1/2" drive standard and metric socket sets</li> <li>• nut drivers</li> </ul>
<ul style="list-style-type: none"> <li>• hammer</li> <li>• measuring tape</li> <li>• assorted files</li> <li>• standard pliers</li> <li>• portable hand-held grinder</li> </ul>	<ul style="list-style-type: none"> <li>• countersink</li> <li>• fish tape</li> <li>• wire brush</li> <li>• die grinder</li> <li>• welder</li> </ul>
<b>Useful Supplies</b>	
<ul style="list-style-type: none"> <li>• touch-up paint</li> <li>• assorted butt splices</li> <li>• assorted wire ties (zip ties)</li> <li>• silicone sealant</li> <li>• cutting fluid</li> <li>• 120 to 150 grit sandpaper</li> </ul>	<ul style="list-style-type: none"> <li>• assorted ring terminals</li> <li>• assorted rubber grommets</li> <li>• electrical tape</li> <li>• Loctite 242 (blue) or other thread-locking product</li> <li>• Grommets (1 1/8")</li> </ul>

**Continued**

<b>Special Tools</b>	
<ul style="list-style-type: none"><li>• Terminal Mounting Template Assembly (MCN 10-J5626-1)</li></ul>	
<b>Safety Equipment</b>	
<ul style="list-style-type: none"><li>• safety glasses</li><li>• flashlight</li><li>• gloves</li></ul>	<ul style="list-style-type: none"><li>• first-aid kit</li><li>• steel-tipped shoes</li><li>• hardhat</li></ul>

# 5

## **GlobalTRACS<sup>®</sup> System Terminal Installation**

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### **Introduction**

This chapter provides general guidelines and instructions for installing the GlobalTRACS<sup>®</sup> equipment management system terminal (GTT) (10-J1010-2).

*Topics in this chapter include:*

- *GlobalTRACS Terminal Installation Checklist . . . . . 5-2*
- *GlobalTRACS Terminal Installation . . . . . 5-3*

*If you have questions about the GlobalTRACS system, please contact QUALCOMM<sup>®</sup> Wireless Business Solutions<sup>®</sup> (QWBS) Technical Support Hotline. Technical Support is staffed 24 hours a day, 365 days a year:*

*In the United States, call 800-541-7490  
In Canada, call 800-863-9191*

**GlobalTRACS Terminal Installation Checklist**

- ☐ Select GlobalTRACS Terminal (GTT) mounting hardware.
- ☐ Make sure that the equipment's engine starts and that it is in good working order.
- ☐ Select the GTT mount location and orientation (see [Select a Mounting Location on page 5-3](#) for more information.)
- ☐ GTT Mounting Preparation.
- ☐ Mark three mounting holes using the GTT terminal template.
- ☐ Drill mounting holes and clean (debur) edges.
- ☐ Mount the GTT and install all hardware and vibration isolators.
- ☐ Attach the GTT ground strap to a good ground.
- ☐ Tighten all mounting bolts.



## GlobalTRACS Terminal Installation

### Note

Before beginning the GTT installation, refer to [Chapter 4: GlobalTRACS® System Installation Planning, General Cautions and Safety Warnings on page 4-2](#).

The GTT is installed in four steps:

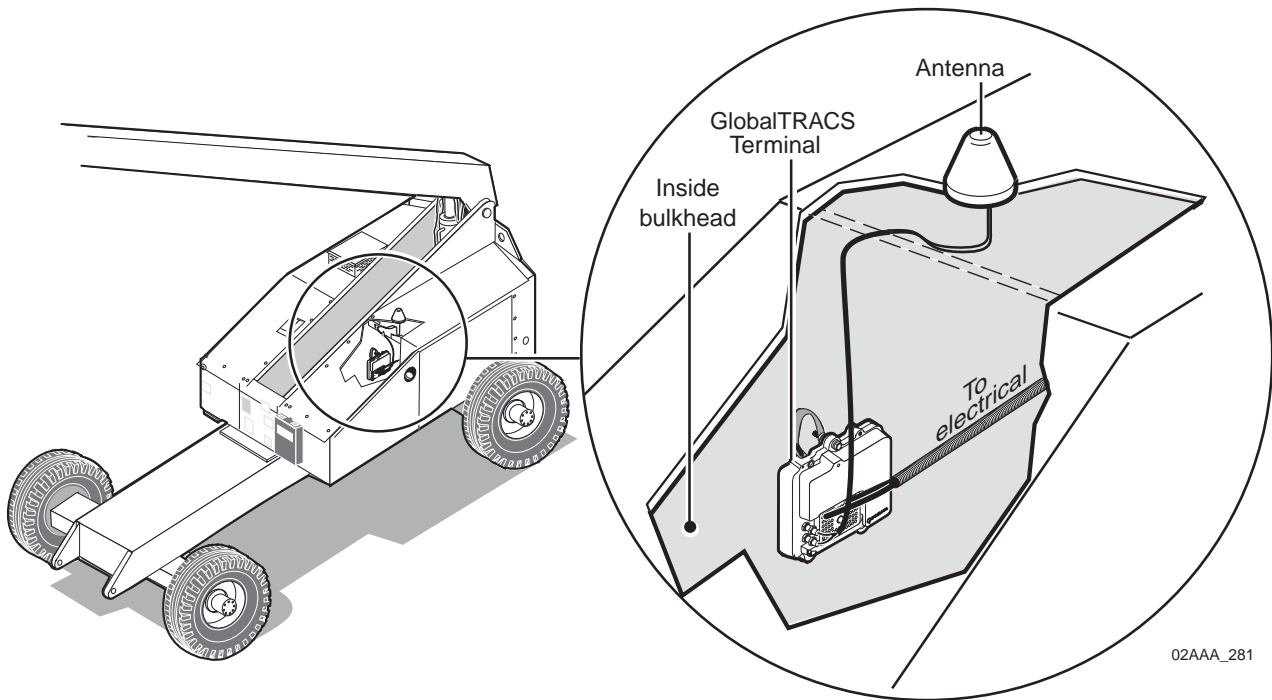
1. Start the equipment's engine to verify that the equipment is in good operating order.
2. Select an installation location.
3. Use the GTT or the Terminal Mounting Template Assembly (10-J5626-1) to mark the location drill points.
4. GTT Mounting Preparation.
5. Mounting the GTT.
  - Standard mounting method—Drilling holes, tightening nuts and bolts, and fastening supplied hardware.
  - Alternative method—Using the GlobalTRACS Terminal Weld Bracket (50-J5627-1).
6. Connect all cables to the terminal.

### Verify Equipment Good Operating Order

Before beginning an installation, ensure that the construction equipment is in good working order. If possible, start the engine or have an equipment operator start the engine to verify that the system is running normally.

### Select a Mounting Location

If possible, hide the terminal from sight by installing it in a safe, fully enclosed compartment of the vehicle. A stealthy, hidden location is the ideal and safest recommended location for the terminal.



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### Location and Orientation

The GTT was designed to accommodate numerous makes and models of construction equipment. The following are general guidelines to follow when locating and orienting the GTT (see also [Chapter 4: GlobalTRACS® System Installation Planning](#)):

- Choose a location where the GTT will not come into contact with corrosive liquids or solvents.
- Choose a location where chains, moving parts, or other tools will not likely be stowed on top of or interfere with the GTT or cables.
- Do not mount the GTT near items that may fall on it or bump cable connections.
- Choose a structurally rigid mounting location. The surface must support the full weight of the GTT (3 lbs.) under all circumstances.
- Install the GTT so that the cable connections are protected from accidental damage and potential tampering. Be sure to provide enough room for cable bends or the removal of cables for servicing (4" to 6" is required).
- Install the GTT so that equipment maintenance can be performed.

**WARNING**

Never drill into the Falling object protection structure (FOPS) or the Rollover protection system (ROPS) or modify these structural components to install the antenna or GTT. Such activity may compromise the integrity of these safety systems.

Attaching the antenna or GTT (or mounting brackets) to existing holes and brackets on the FOPS or ROPS is acceptable practice, as well as drilling into objects already attached to the FOPS or ROPS by the manufacturer, such as a plastic or sheet metal canopy.

**Caution**

For **gasoline engines**, if possible, do not install the GTT in the engine compartment. If no other options for installation exist and the unit must be installed in the engine compartment, then ensure that the GTT and the cable assembly are at least 18" away from the ignition system (e.g., spark plug wires, distributor, battery, hydraulic wires). The farther away the GTT and cables can be mounted away from these factors, the better. If the minimum length requirement of 18" cannot be obtained, then a custom shield fixture will have to be installed.

**Caution**

DO NOT install or attach any component or cable to any removable parts, such as, panels or plates.

**GlobalTRACS Terminal Mounting Preparation**

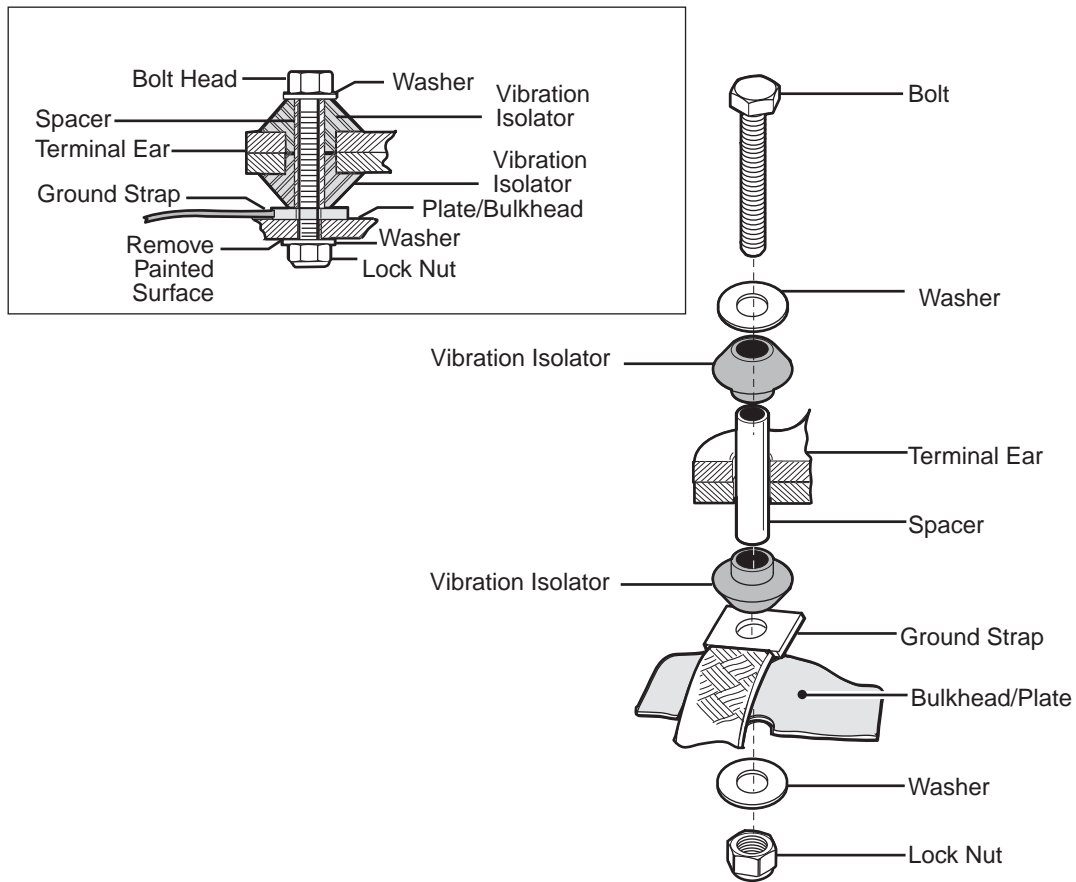
Before mounting the GTT, prepare the GTT for installation. The ground strap and vibration isolators must be properly installed on the GTT before the GTT is installed on the vehicle.

**GlobalTRACS Terminal Ground Strap and Vibration Isolators**

Screw or bolt the ground strap to the GTT housing *before* installing the GTT on the vehicle. The following illustrations depict where and how the ground strap is screwed on to the GTT.

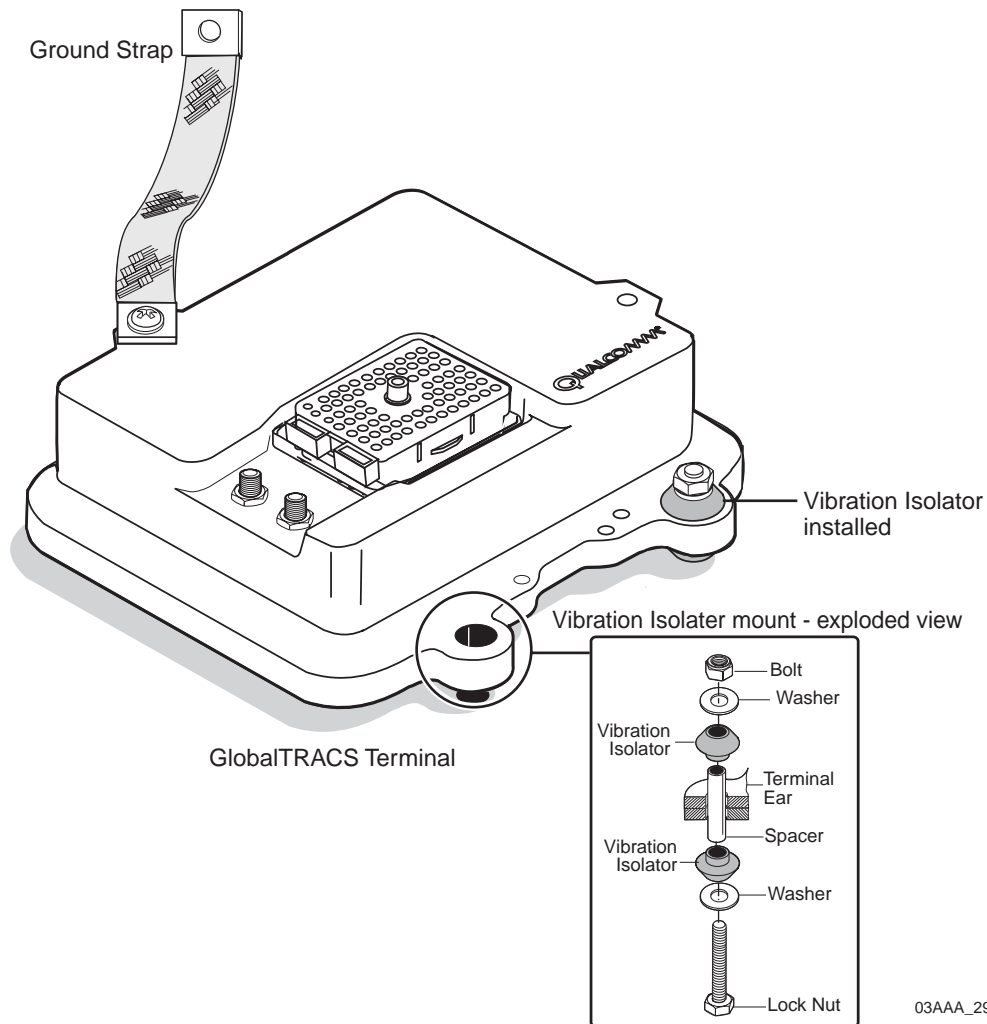
The GTT ground strap can be attached to any screw on the face of the GTT. It can also be attached at the topmost mounting hole bolt.

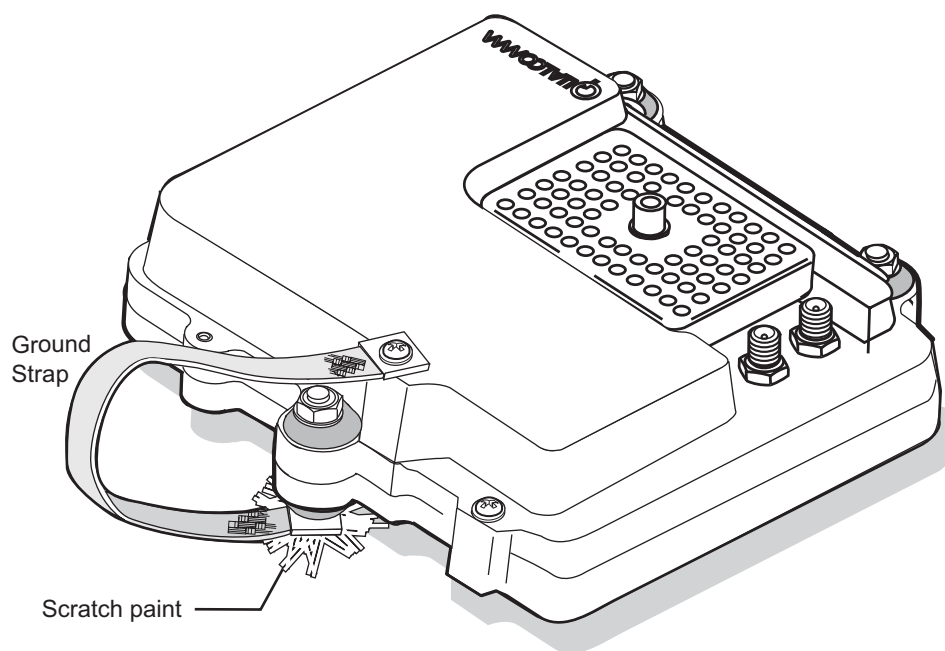
- If bolted on top (GTT face) of the mounting hole, attach *before* (on top) the washer and vibration isolator.
- If bolted at the underside of the mounting hole, attach between the vibration isolator and the bulkhead plate, as in the following illustrations.



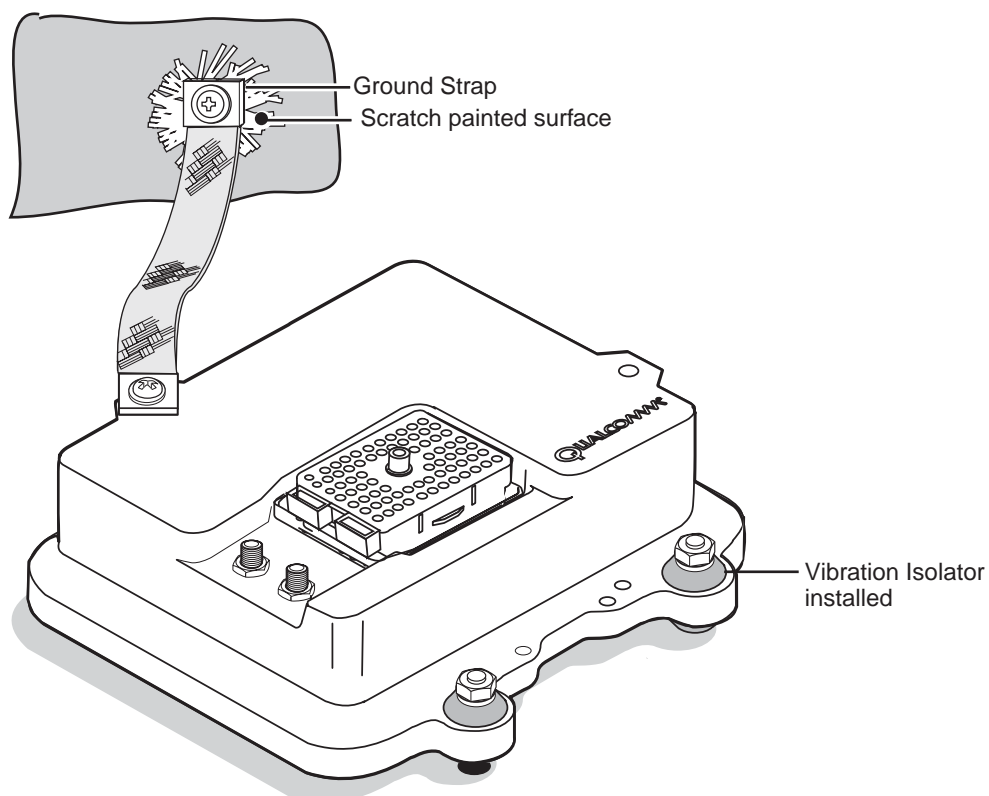
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The following illustration depicts the correct way to install the three vibration isolators. Ensure that they are properly in place *before* bolting the GTT into place. Install the vibration isolators and guides into the three mounting holes on the GTT.



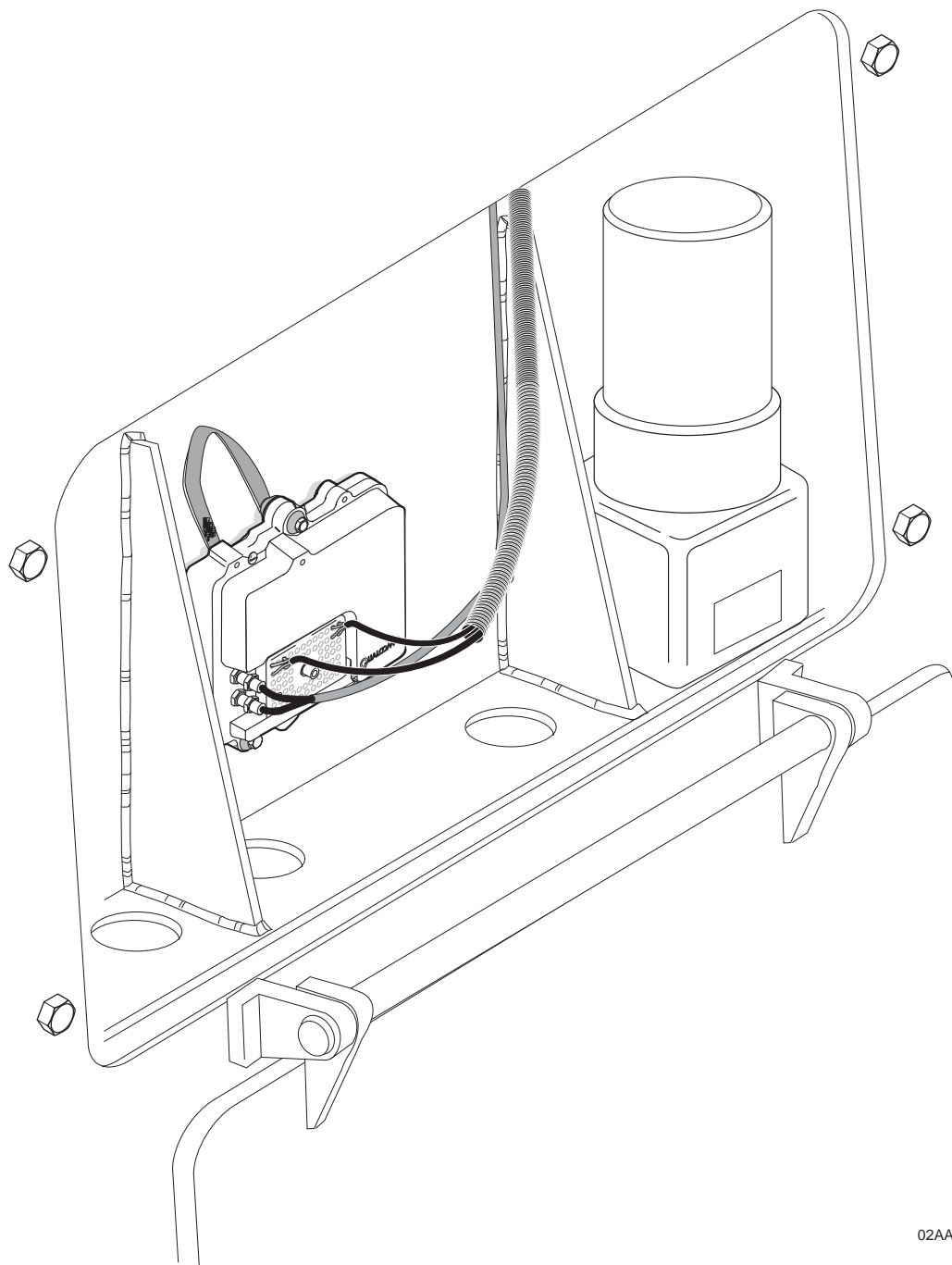


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GlobalTRACS Terminal

03AAA\_290B

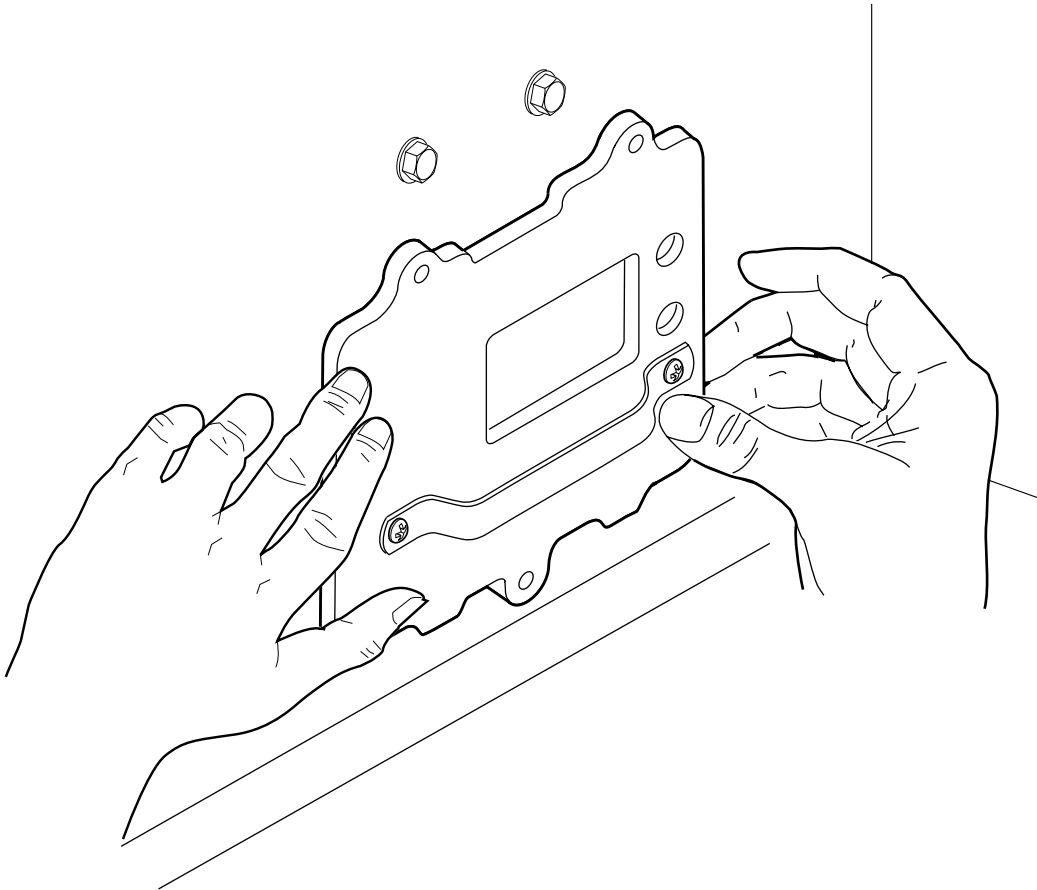
**Installing the GlobalTRACS Terminal**

Finding the right location to install the GTT often involves temporarily removing seats, panels, sections of headliners, and flooring.

**Standard Terminal Mounting Method and Installation**

After locating the designated installation area, follow these steps to mount the GTT:

1. Before marking and drilling, consider which direction the cable connectors will be facing when the GTT is finally mounted and if they will be in the best position for installation. Adjust, if necessary, to ensure cable connectors are in the best position.
2. Using a GTT or terminal template, mark one, or all, of the mounting holes. The GTT mounting template (10-J5626-1) can also be used as a drill guide for drilling all mounting holes.



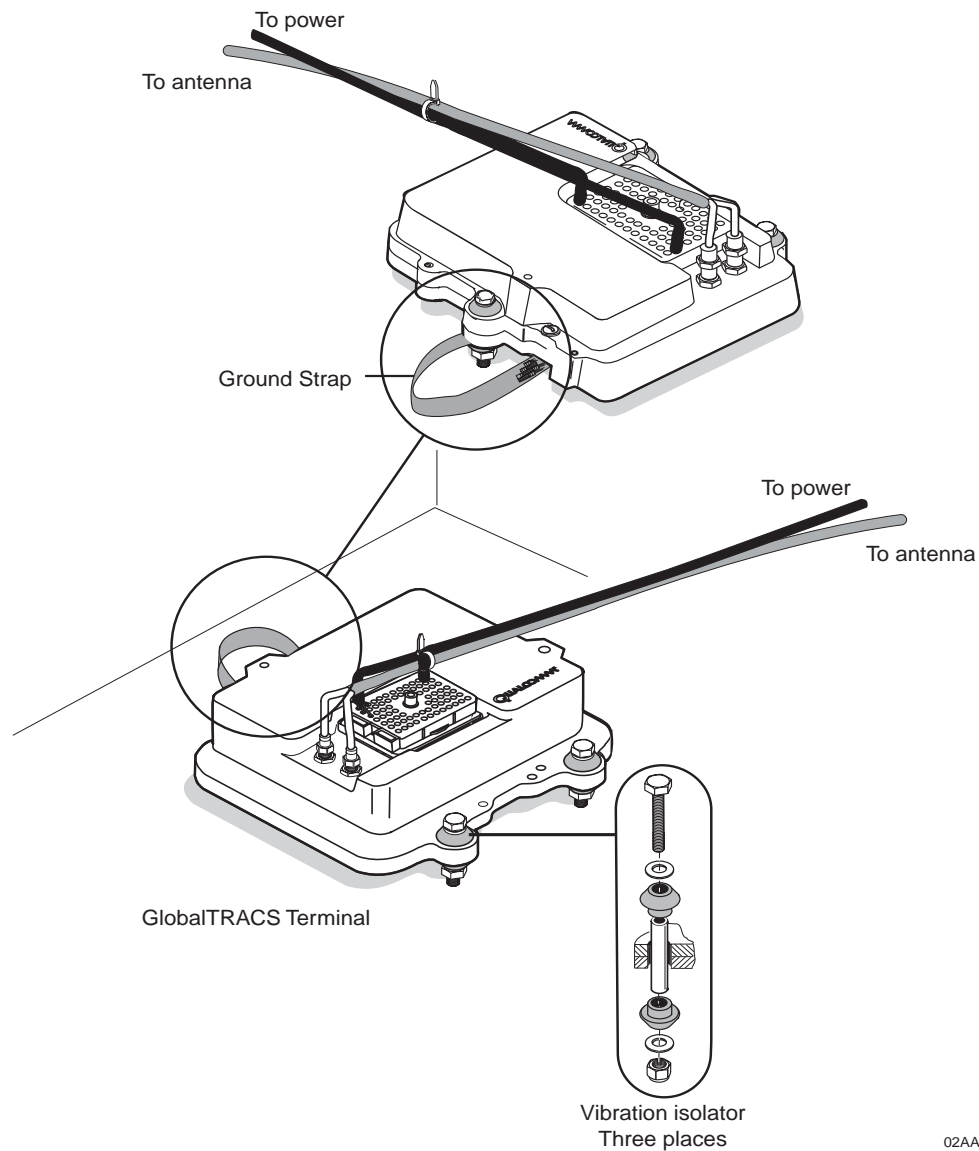
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**Note**

*If the GTT will not be easily accessible after it has been bolted into place.*

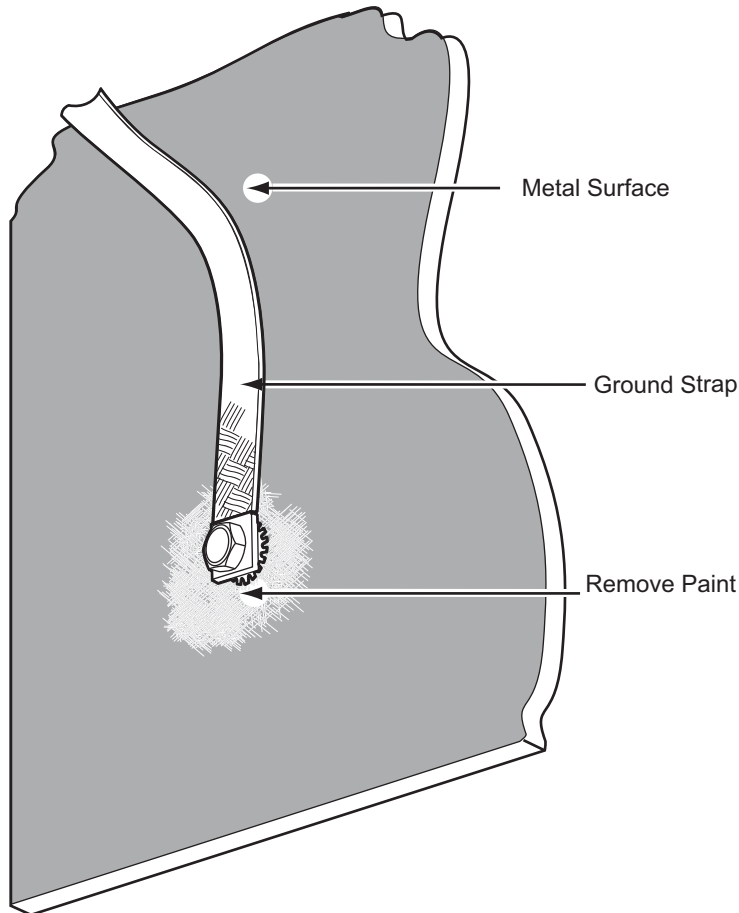
3. Use a center punch to create an indentation for the drill bit.
4. Drill the hole using the 9/32" bit.
5. Clean (deburr) the edges of the new hole (especially the back side if possible) with a deburring countersink.
6. Mount the GTT with one of the mounting bolts and all of the necessary hardware, including rubber vibration isolators and washers.





- 7.** Locate the GTT in the desired location and tighten the first mounting bolt.
- 8.** Drill the remaining two holes.

9. Attach the ground strap from the GTT to any good ground (often this is one of the terminal bolts (see also [GlobalTRACS Terminal Mounting Preparation on page 5-5](#)). Remove any paint off the metal if necessary to obtain a good ground. See [Chapter 7: GlobalTRACS® System Cable Installation](#), for more information on obtaining a good ground.



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**Note**

*Obtain permission from the customer or OEM before installing on an electrically isolated location. Ensure that the customer understands that this area will no longer be electrically isolated and that this is acceptable to the customer.*

10. Finish attaching all the hardware, including the ground strap, and verify that the TNC o-rings are in proper position. Tighten the 1/4" bolts until they bottom out on the guide.
11. Where the bolts protrude on the *other side* of the installation area, remove any paint surrounding the bolt with the attached ground strap to ensure a good ground. If the mounting location is electrically isolated, an additional ground strap *must* be installed to ground the terminal to chassis ground.

### **Alternative Terminal Mounting Method and Installation**

In addition to the direct-mount procedure, there is an alternative way to install the GTT using the GlobalTRACS Terminal Weld Bracket. See [Chapter 9: GlobalTRACS® System Mounts and Brackets](#), for more information about mounts, brackets, and hardware.

After locating the designated mount area, follow these steps to install the GTT using the weld bracket.

- 1.** Attach weld brackets to the weld bracket template to weld mounts to the mount area.
- 2.** Orient the template with the weld brackets in the designated mount location. Before welding, consider which direction the cable connectors will be facing when the GTT is finally mounted and if they will be in the best position for installation.
- 3.** Tack weld the weld brackets to the vehicle mount area. Remove the template and finish welding the weld brackets in place.

#### **Note**

*If the GTT is not easily accessible after being bolted into place, first screw the ground strap to the housing before bolting the terminal in place.*

- 4.** Mount the GTT into proper designated position using 1/4-20 x 2.0" bolts and fully compress the vibration isolators.
- 5.** Attach the ground strap from the GTT to any one of the bolts.
- 6.** Secure the GTT in place using the supplied mounting hardware.
- 7.** The TNC o-rings are already installed, but verify that they are attached.
- 8.** Tighten the 1/4-20 x 2.0" bolts until they bottom out on the guide. After the GTT has been successfully mounted, it is time to mount the antenna, followed by cable connecting and routing, and system verification. Please continue to the next chapter for antenna installation instructions.

If you have questions about installing the GTT, please contact QWBS Technical Support Hotline:

In the United States, call 800-541-7490;  
in Canada, call 800-863-9191.

Released - Internal Use Only

Released - Internal Use Only

# 6

## **GlobalTRACS<sup>®</sup> System Antenna Installation**

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### **Introduction**

This chapter gives general guidelines for installing the GlobalTRACS<sup>®</sup> equipment management system antenna with integral cable (CV90-J1045-6).

*Topics in this chapter include:*

- *GlobalTRACS Antenna Installation Checklist. . . . . 6-2*
- *GlobalTRACS Antenna Installation . . . . . 6-3*

*If you have questions about the GlobalTRACS system, please contact QUALCOMM<sup>®</sup> Wireless Business Solutions<sup>®</sup> (QWBS) Technical Support Hotline. Technical Support is staffed 24 hours a day, 365 days a year:*

*In the United States, call 800-541-7490  
In Canada, call 800-863-9191*

**GlobalTRACS Antenna Installation Checklist**

- ☐ Select GlobalTRACS antenna mounting location and positioning. (See [Positioning and Installing the Antenna on page 6-6](#) for more information.)
- ☐ Chose a proper mounting bracket (if necessary).
- ☐ Decide which mounting method to use: hole-mount or bracket-mount. (See [Positioning and Installing the Antenna on page 6-6](#) for more information.)
- ☐ Drill hole (or use mounting bracket and weld), tighten nuts and bolts, and fasten supplied hardware.
- ☐ Route the antenna through the hole.
- ☐ Apply silicone sealant around the drilled hole to prevent water leakage.
- ☐ Center the antenna over the hole and attach the washer and nut to the antenna bolt. Tighten the nut.
- ☐ Route the antenna cable to the GlobalTRACS Terminal (GTT).

## GlobalTRACS Antenna Installation

**Caution**

*DO NOT paint the antenna. This will void the warranties. Paint degrades the performance of the GlobalTRACS system. Avoid installing the antenna in a place where it could be a trip hazard or used as a foot hold or pull-up. DO NOT use the antenna as either a foot hold or pull-up.*

**Caution**

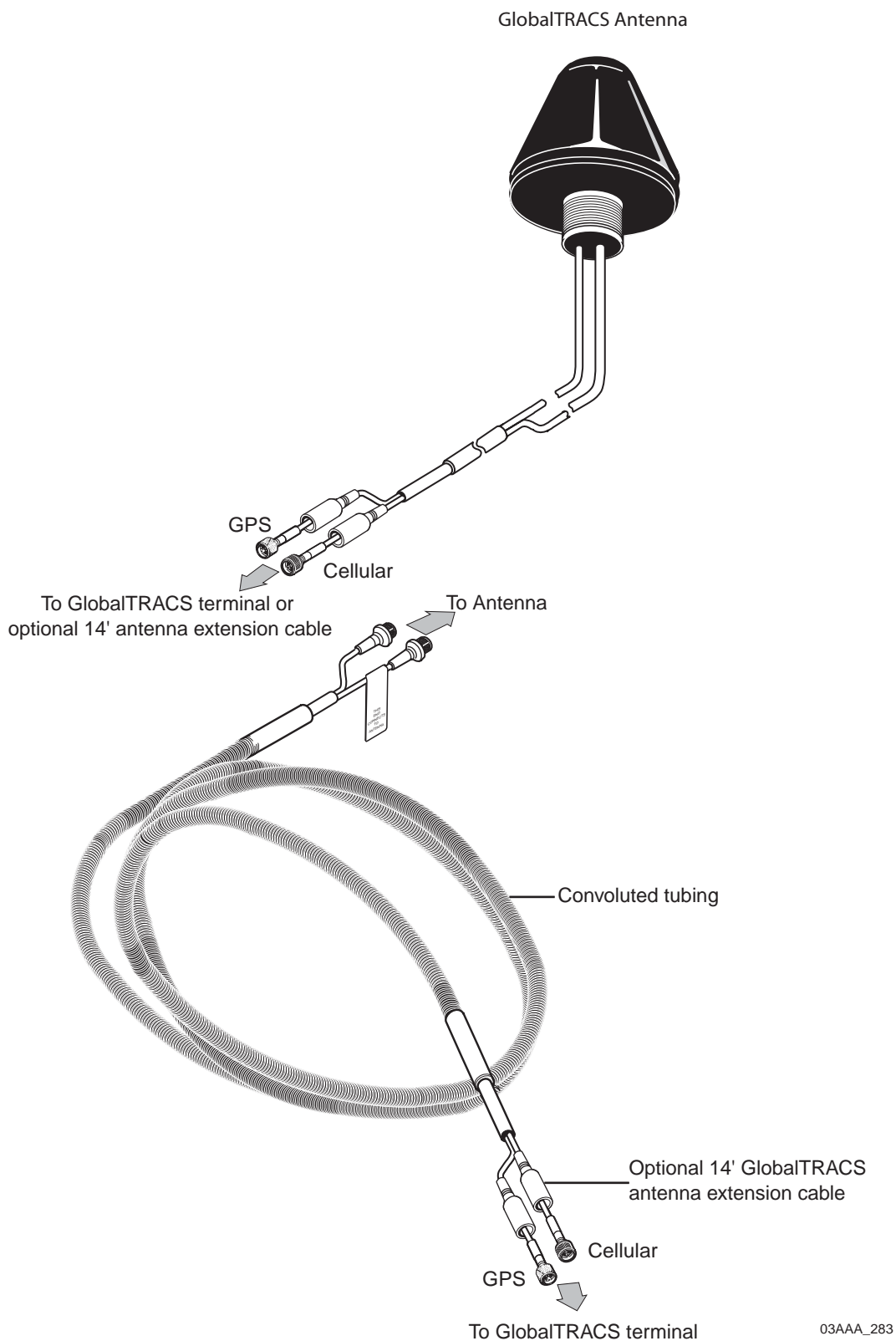
*Avoid installing or attaching any component or cable to any removable parts, such as, panels or plates.*

Installing the antenna involves the following four steps:

1. Choose a location and positioning the antenna on the equipment. Always consider cable run path and distance to the GTT.

If the standard 6' antenna cable (CV90-J1045-6) is not long enough to make the connection from the antenna to the GTT, the 14' antenna extension cable (CV90-J1056-14) can be ordered. There are mating boots on both ends of the 14' cable that indicate which end mates with either the 6' antenna cable or the GTT.

2. Choose a proper mounting bracket (see, for more information on predrilled or custom-fabricated mounts) or fabricating a custom mount.
3. Mount the antenna. There are two mounting methods to choose from:
  - Hole-mount method—Drilling holes, tightening nuts and bolts, and fastening supplied hardware.
  - Bracket-mount method—Using a predrilled mounting bracket (see [Chapter 9: GlobalTRACS® System Mounts and Brackets](#), for more information on predrilled mounts).
4. Connecting and routing the antenna cable to the GTT.

**GlobalTRACS Antenna Installation Information**



The 6' long (a 14' cable extension is available when more length is needed to make the connection) GlobalTRACS antenna is rugged and durable and is mounted on the outside of the vehicle, usually on the canopy or some similar place with a direct view of the sky. Several antenna mounting brackets are available as well, or mounting brackets can be fabricated on site (please see [Chapter 4: GlobalTRACS® System Installation Planning](#) and [Chapter 9: GlobalTRACS® System Mounts and Brackets](#) for more specific information on installing the antenna).

### Antenna Installation Guidelines

Wherever possible, mount the antenna where it is protected from hazards such as tree limbs, falling debris, or the possibility of someone treading on it. If possible, find an installation area that is somewhat hidden from view.

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#### **WARNING**



*Never drill into the Falling object protection structure (FOPS) or the Rollover protection system (ROPS) or modify these structural components to install the antenna or GTT. Such activity may compromise the integrity of these safety systems.*

*Attaching the antenna or GTT (or mounting brackets) to existing holes and brackets on the FOPS or ROPS is acceptable practice, as well as drilling into objects already attached to the FOPS or ROPS by the manufacturer, such as a plastic or sheet metal canopy.*

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Keep in mind that many construction equipment components are known to block the wireless communication network's signals, including metal and wood bracing, metallic paints, lead-based paints, and even some company logo decals that contain metallic properties.

- The antenna cable minimum bend radius is 3". Do not coil the cable tighter than a 6" diameter loop. Also, be careful when routing the cable to avoid any tight bends or kinks in the cables.

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#### **Caution**



*Tight bends or kinks in the antenna cable could damage the cable and adversely affect the high frequency signal path.*

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- The antenna cable can be routed inside or outside the vehicle and should be protected with the supplied convoluted tubing and held tight against the vehicle to prevent any unnecessary movement. Secure the cable to the vehicle with UV-resistant cable ties installed every 12" to 18" along the cable length.
- Route the antenna cable as far away as possible from the vehicle exhaust system to avoid exposing the cable to extremely high temperatures.
- Whenever holes are drilled into an interior area that should be kept dry, seal the holes using silicone sealant (RTV). This includes the self-tapping screws used to secure cable ties. The sealant should be applied so it slightly overlaps the edges of the holes. This will ensure a good seal when the screw or bolt is installed in the hole.

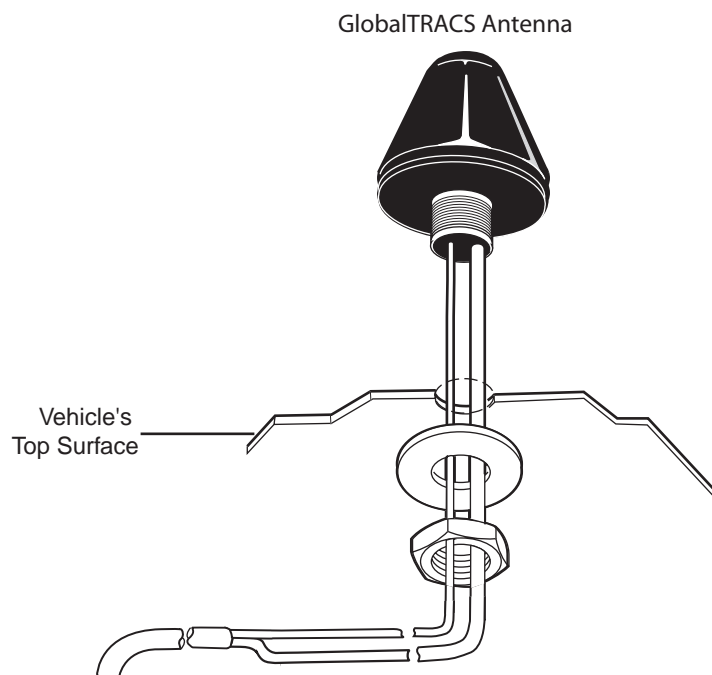
Depending on the type of equipment, installation locations for the antenna will vary. Refer to [Installation Guidelines on page 4-7](#) for more information.

### **Positioning and Installing the Antenna**

A hole-mount installation method and a bracket-mount installation method exist for the antenna.

#### **Antenna Hole-mount Method and Installation**

Finding the right location to install the GlobalTRACS antenna often involves temporarily removing insulation panels or sections of headliners so that holes can be properly drilled and nuts and bolts properly fastened.



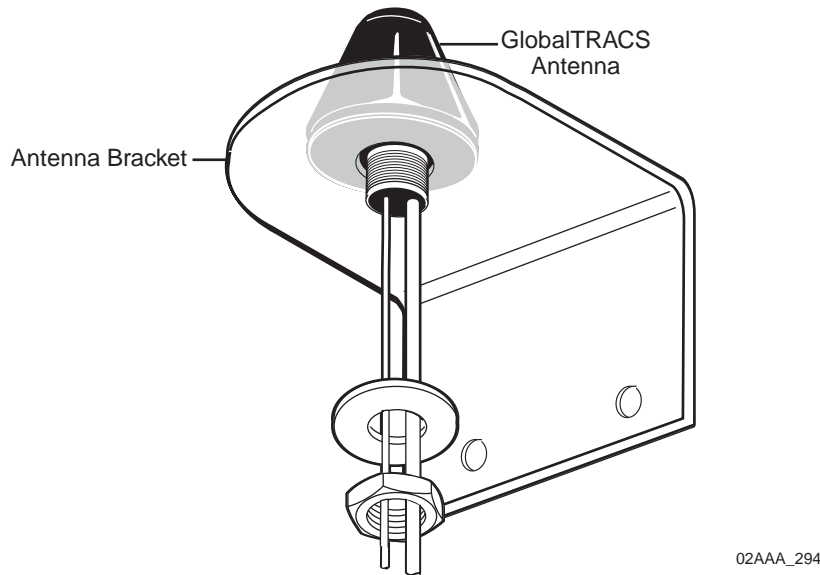
After locating the designated installation area, follow these steps to mount the antenna using the standard method:

- 1.** After positioning the antenna, drill a 1" diameter hole for the antenna cable to pass through.
- 2.** Remove (deburr) all sharp edges and metal shards. If necessary, clean the newly drilled mounting surface using rubbing alcohol to ensure it is clean.
- 3.** Route the antenna cable down through the 1" diameter hole.
- 4.** Center the antenna over the 1" diameter hole, ensuring that the antenna rests evenly on the mounting surface.
- 5.** Attach the washer and nut to the antenna bolt at the underside of the mount location.

6. Using the supplied antenna wrench, tighten the nut until the antenna is secure against the mounting bracket. Make snug, but do not over tighten.

### **Antenna Bracket-mount Method and Installation**

In addition to the standard direct-mount procedure, there is an alternative way to install the antenna using a predrilled mounting bracket. See [Chapter 9: GlobalTRACS® System Mounts and Brackets](#), for more information on predrilled mounts). The antenna is bolted to a mounting bracket, which in turn is either bolted or welded to the vehicle.



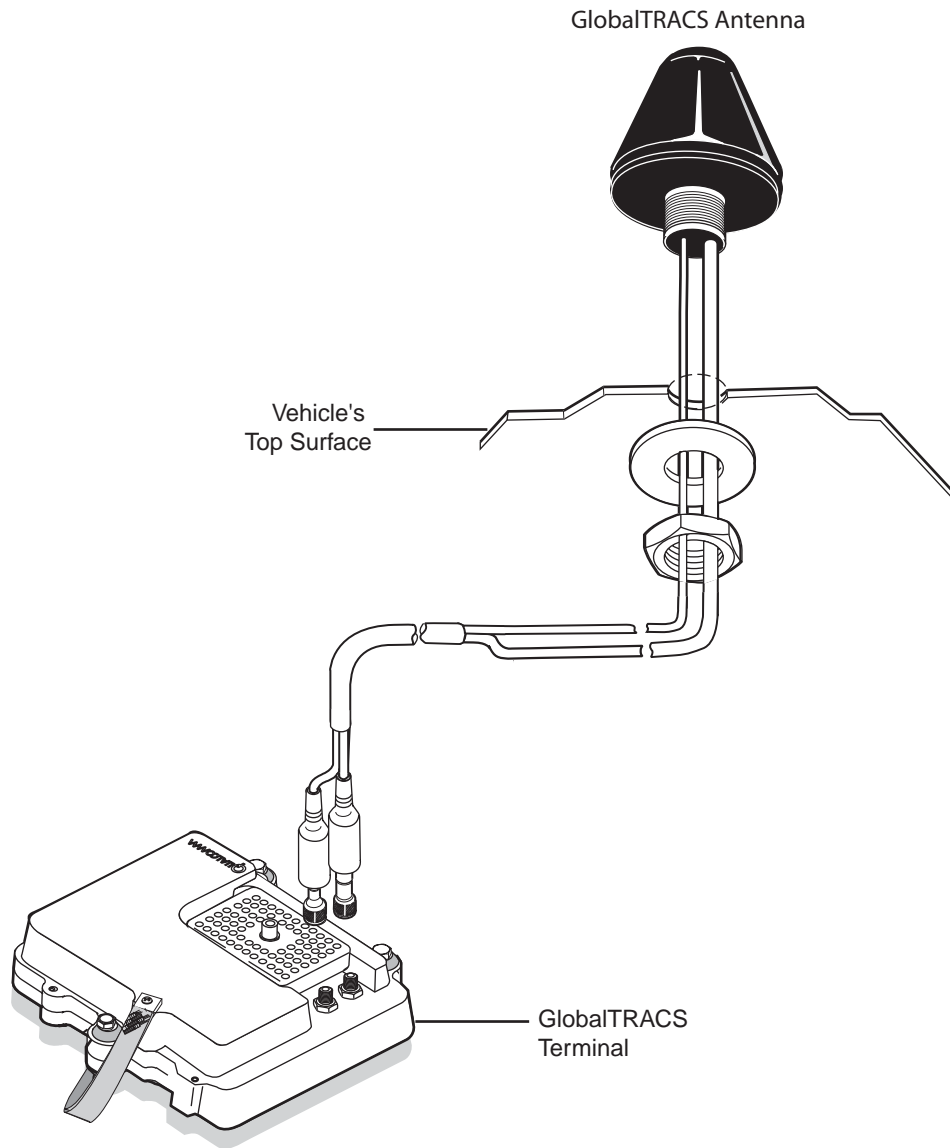
After locating the designated mount area, follow these steps to install the antenna using the predrilled mounting bracket:

1. After designating a mount location and positioning the mounting bracket, attach the mounting bracket to the vehicle by either bolting (using supplied hardware) or welding it into place.
2. Remove (debur) all sharp edges and metal shards.
3. Paint any exposed metal on the mounting bracket and vehicle to prevent rust and corrosion. Let the paint dry completely before attaching the antenna.
4. Route the antenna cable down through the predrilled hole on the mounting bracket.
5. Apply a silicone sealant around the bolt areas to prevent water leakage.
6. Center the antenna over the predrilled hole, ensuring that the antenna rests evenly on the mounting bracket surface.

## Antenna Cable Routing

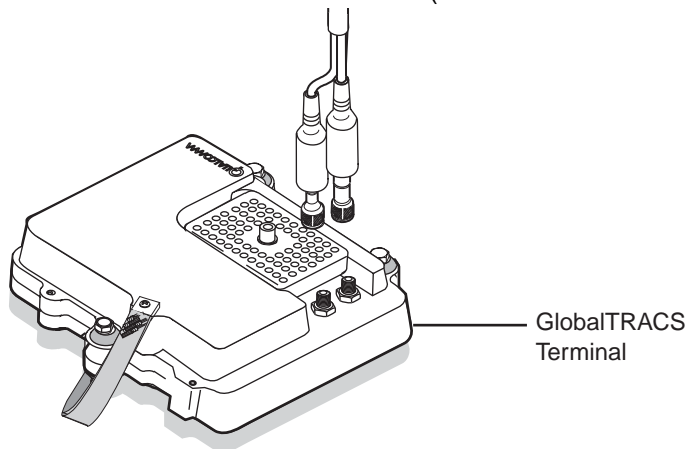
Follow these cable routing directions:

1. The antenna cable has two cable boots and connectors. There are two o-rings, one red (GPS) and one black (cellular). Verify that they are present and correctly attached (the antenna connectors are marked "GPS" and "Cellular").



02AAA\_291

2. Mate the appropriate connectors (cellular and GPS) from the antenna to the mating connections on the GTT (boots towards the GTT). Ensure connectors are fully mated.



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3. Refer to [Chapter 7: GlobalTRACS® System Cable Installation](#), for more information on how to properly route cables. Always use protective sheathing (such as convoluted tubing) whenever the antenna cable will pass over sharp edges, come in contact with excessive heat, or ultraviolet light.

### Antenna View-of-Sky Requirements



#### Caution

*Failure to comply with the View-of-sky requirements and installation guidelines sections of this document could degrade the performance of the GlobalTRACS system.*

The antenna should have a clear, unobstructed line-of-sight view of the sky for optimum antenna operation. Normally, the signals can pass through a single layer of glass, fiberglass, or plastic with minimal signal loss. However, other obstructions, such as metallic paint, may degrade performance or completely block the signals.

Commonly encountered obstructions on vehicles include:

- metallic paint
- metal canopies
- metal cages

### Antenna Signal Strength Verification

Refer to [Chapter 8: GlobalTRACS® System Verification](#), page 8-7, to verify that the antenna has a strong signal and is operating effectively.

After the GlobalTRACS antenna has been successfully mounted, it is time to connect and route the cables and perform a system verification. Please continue to the next chapter for cable installation and routing instructions.

If you have questions about installing the GlobalTRACS antenna, please contact QWBS Technical Support Hotline:

In the United States, call 800-541-7490;  
in Canada, call 800-863-9191.

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# 7

## **GlobalTRACS<sup>®</sup> System Cable Installation**

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### **Introduction**

This chapter describes how to install and route the cables for a GlobalTRACS<sup>®</sup> equipment management system installation.

Because construction equipment differ widely, cables can be installed and routed in many different ways. This chapter provides guidelines for recommended best practices and some typical installations.

The instructions in this chapter will help you ensure that the installation is free from defects and potential problems.

*Topics in this chapter include:*

- *GlobalTRACS Cable Installation Checklist. . . . . 7-2*
- *Cable Basics . . . . . 7-3*
- *Routing and Protecting Cables . . . . . 7-3*
- *Grounding Guidelines . . . . . 7-4*
- *Making Electrical Connections. . . . . 7-5*
- *Cable Installation . . . . . 7-15*

*If you have questions about the GlobalTRACS system, please contact QUALCOMM<sup>®</sup> Wireless Business Solutions<sup>®</sup> (QWBS) Technical Support Hotline. Technical Support is staffed 24 hours a day, 365 days a year:*

*In the United States, call 800-541-7490  
In Canada, call 800-863-9191*

**GlobalTRACS Cable Installation Checklist**

- ☐ Consider all battery and safety cutouts. See [Battery Disconnect Switches and Other Safety Cutouts on page 4-3](#).
- ☐ Route and protect cables with convoluted tubing (if necessary).
- ☐ Create clean, secure, tight, metal-to-metal grounds.

Attach fuses to wires per [Power/Signal Cable Installation and Run on page 7-15](#). Ensure that the correct fuse is attached to the correct wire on the power/signal cable as follows and in the illustration on page [7-17](#) of this guide:

- 7.5-amp fuse attaches to the yellow BAT+.
- 3-amp fuse attaches to the white R\_TERMINAL.
- 7.5-amp fuse attaches to the black BAT\_RTN.
- (No fuse for the gray CHASSIS\_GND wire or sensor wires.)

- ☐ Make electrical connections.
- ☐ Tighten cable connectors.



## Cable Basics

- The standard length for the GlobalTRACS power/signal cable (CV90-J5537-20) is 20 feet.
- The standard length for the GlobalTRACS antenna cable (CV90-J1045-6) is 6 feet.

An optional 14' antenna cable assembly (CV90-J1056-14) is available if needed. You may need to trim the power/signal cable length to fit a specific vehicle. DO NOT trim the cable length until you know where all the components will be mounted and lengths are determined.



---

**Caution**

*Vibration can cause nicked wires to fail. Use care in stripping and crimping wires. Using wire cutters, crimpers, knives, or other tools can damage the conductor wire.*

---

- Use only wire strippers for stripping wires.
- Use existing holes for cable routing if possible.
- DO NOT cut excess sensor wires. They are for future use and should be properly coiled and stored.

## Routing and Protecting Cables

**Note**

*Installers are responsible for performing a cursory level, visual examination of all system wiring and cabling that may effect the GTT's operation and performance. This includes existing wiring on the vehicle before the GTT wiring occurs and all GTT wiring after installation. If an existing wiring problem on the vehicle is evident prior to performing the GTT wiring, customer maintenance personnel at the shop should be notified before GTT wiring begins.*

Try to avoid routing cables in the following locations:

- Near exhaust pipes and other sources of heat
- Over sharp edges
- Over moving parts
- Near foot traffic areas

**Cable Routing Guidelines**

- When routing outside of the vehicle, around sharp edges, and near sources of heat, always use protective sheathing, such as convoluted tubing or wire loom to protect the cables.
- Route away from exhaust pipes and moving parts. If an exhaust pipe or moving part must be crossed, use extra tie-wraps and route the cable so that if the wrap fails, the cable will be caught or rest on a safe part (not hot or moving).
- If drilling penetrates into an enclosed area, seal all holes to keep moisture out.
- Whenever possible, route cables with any existing vehicle cables.
- When reinstalling floor mats or kick plates, be careful that screws do not penetrate cables.
- Use rubber grommets when cables are routed through holes with sharp edges.

**Storing Excess Cabling**

Secure any excess cabling with tie-wraps in a safe, secure location.

**Using Protective Sheathing**

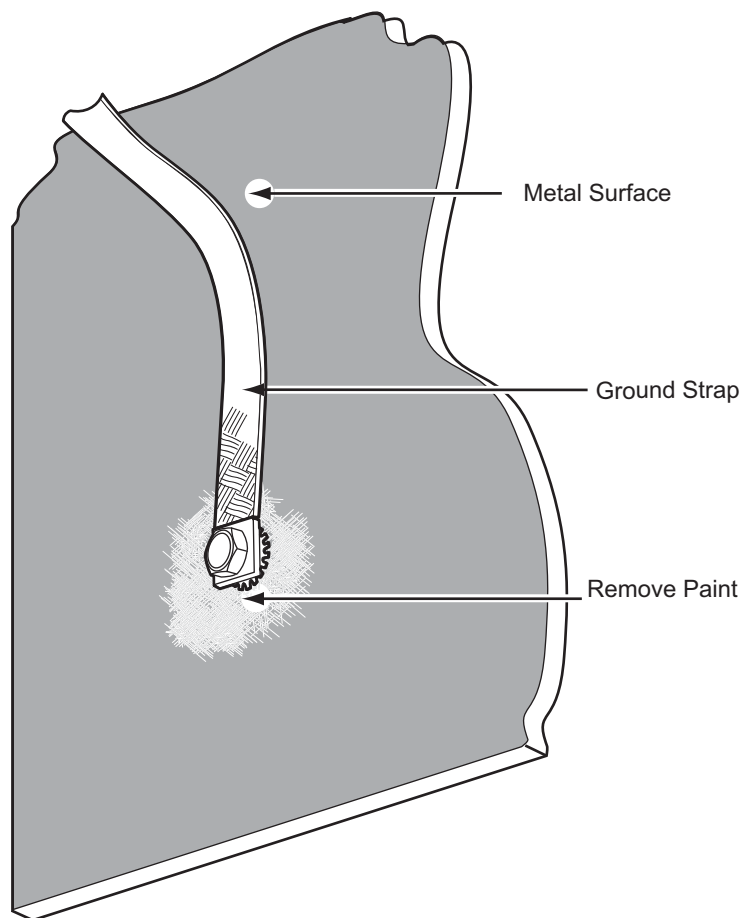
If necessary, protect all cables with protective sheathing, such as convoluted tubing or wire loom. If you know the lengths of exposed cables, you can save time by installing protective sheathing on the cables before you route them.

**Grounding Guidelines****Caution**

*When establishing a good chassis ground, avoid areas that may be potentially isolated from ground by a hinge or some welds.*

It is extremely important that you create clean, secure, tight, metal-to-metal grounds.

If grounding terminals are not available, remove the paint from the surface of the metal connected to the chassis to make the ground. Make sure the wires are not strained or vulnerable to damage.



03AAA\_122

## Making Electrical Connections

### Wire Stripping, Butt Splicing, and Crimping Guidelines

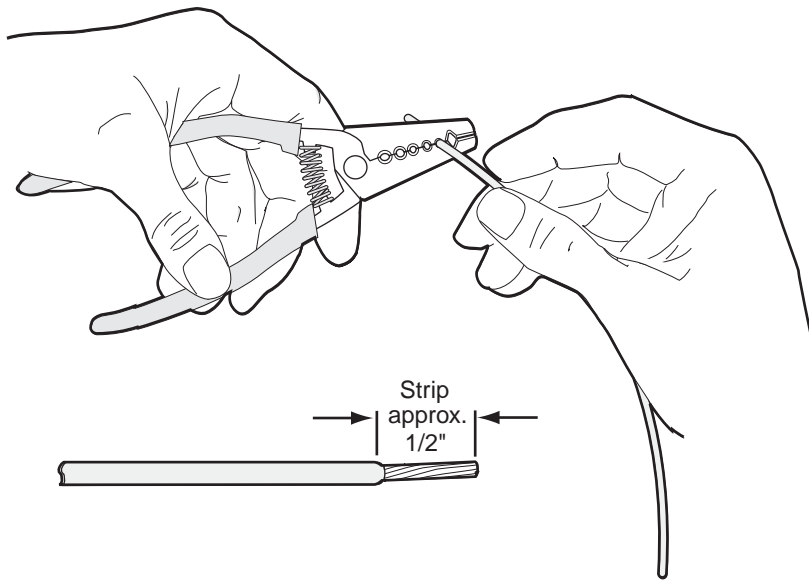
The following sections provide detailed information to properly strip, butt splice, and crimp wires for successful electrical connections.

#### Wire Stripping

Knowing proper wire stripping techniques is essential for successful and safe electrical connections of all the GlobalTRACS system components.

To properly strip a wire follow these instructions:

1. Using a wire stripper, strip 3/8" to 1/2" off the end of an insulated wire.



03AAA\_270

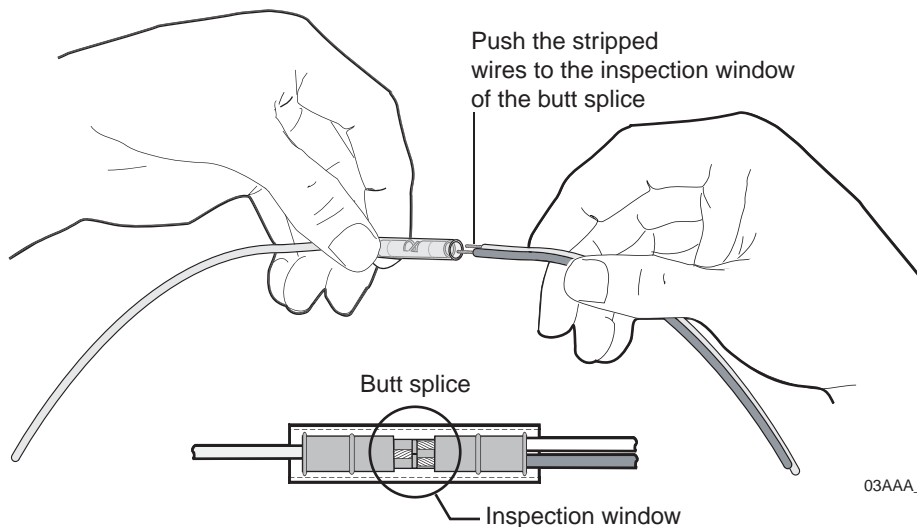
2. After stripping the wire, verify that the wire conductor is not severed or damaged by the stripping tool. If the wire has been properly stripped, it is ready to be butt spliced.

### Butt Splicing

Make sure the size of the butt splice is appropriate for the job. A good butt splice has these characteristics:

- The ends of the bare conductor wires are visible through an inspection window.
- The ends of the conductor wires "butt" against the stop.
- Whenever possible, use heat-shrinkable butt splices to protect and secure the connection.

1. Insert the stripped wire approximately half way into a butt splice, preferably one with an inspection window for verifying that the wire is in the correct position.



03AAA\_272

2. Repeat this process for the wire on the opposite end of the butt splice. Once a proper butt splice is confirmed, it is important to properly crimp the butt splice to hold the connection.

### **Crimping**

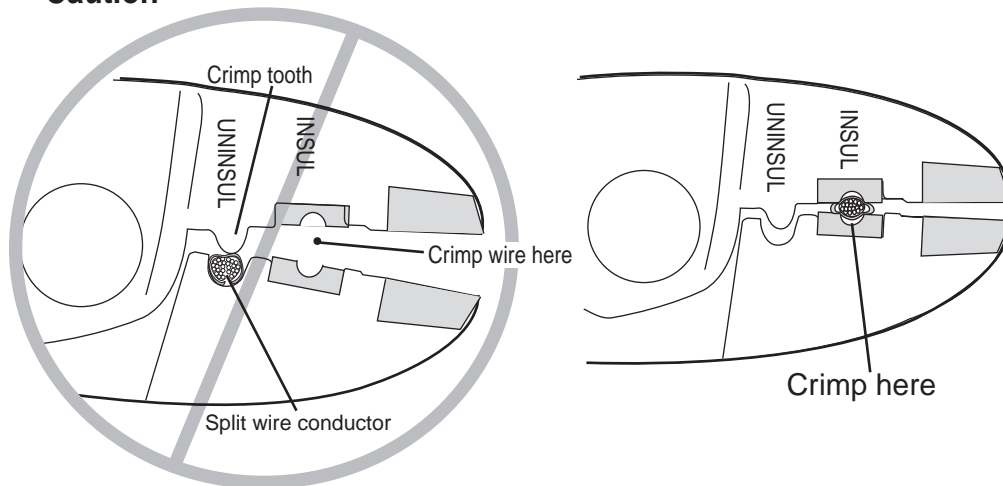
QUALCOMM recommends Nylon insulated, seamless butt connectors with inspection windows. Heat-shrinkable butt connectors are the most preferable.

When crimping a butt-spliced wire or cable, be sure that the butt splice is not directly placed on the heavy-duty crimping "tooth" of the tool. Crimping butt splices this way can result in a split conductor wire and a failed wire connection.



**DO NOT crimp on the crimp "tooth."**

**Caution**

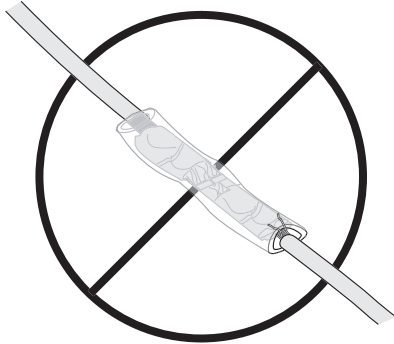


03AAA\_90a

1. Using a crimping tool, crimp the butt splice one end at a time. **First**, crimp the inside crimp area where the wire has been stripped. Apply necessary pressure to this inside area. Remember, the wire is stripped!

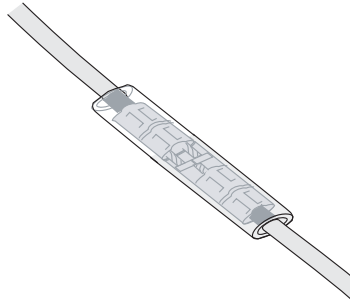
**Note**

The object is to apply only the necessary pressure to crimp the butt splice closed and hold the wire connections together. **Do not** apply so much pressure as to crush the butt splice and sever the wire or the insulation on the wire.

**WRONG**

Butt splice is visibly crushed, possibly damaging the wire and the wire connection.

Some wires are exposed.

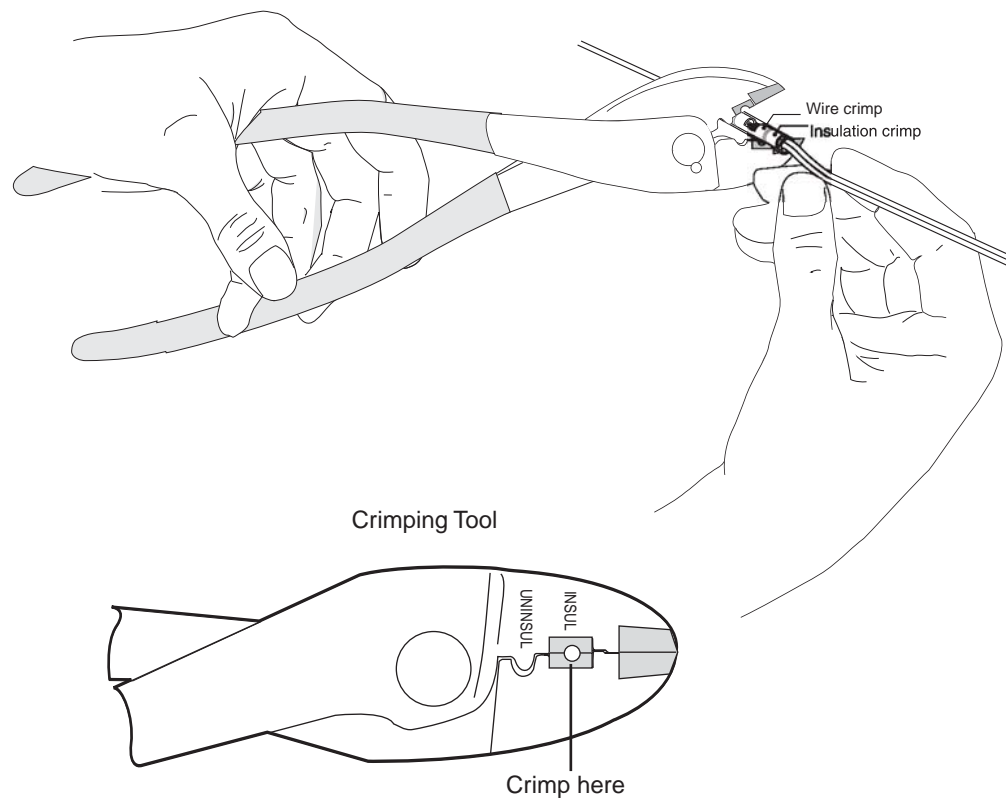
**CORRECT**

Crimping is done properly, protecting the wire and the wire connection.

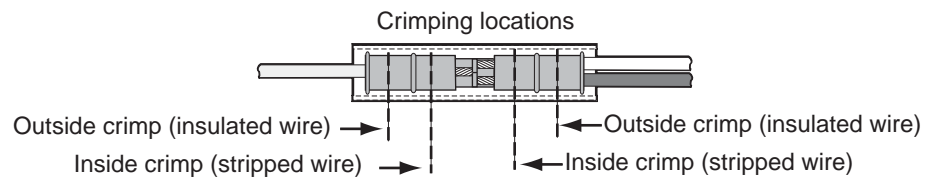
No exposed wires.

03AAA\_277

2. After crimping the inside of both ends of the butt splice at the “insulated” area of the crimping tool, next crimp the outside of both ends of the butt splice.



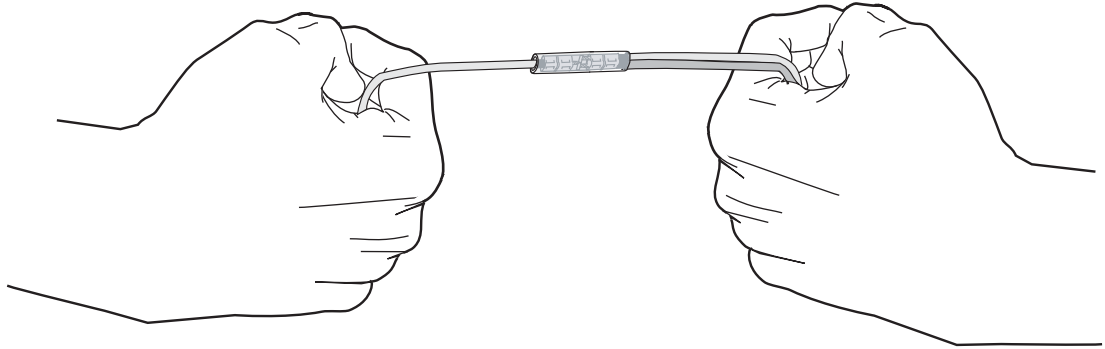
03AAA\_271



03AAA\_273

3. Verify that the crimps are good and that the wires have not been damaged.

4. Do a pull test. Pull on both ends of the wires to ensure a solid butt-spliced connection exists. The crimped butt splice securely grips the insulated wires.



03AAA\_282

5. If the crimps are confirmed good, when necessary, use a heat gun to shrink the heat-shrinkable crimp over the butt splice.

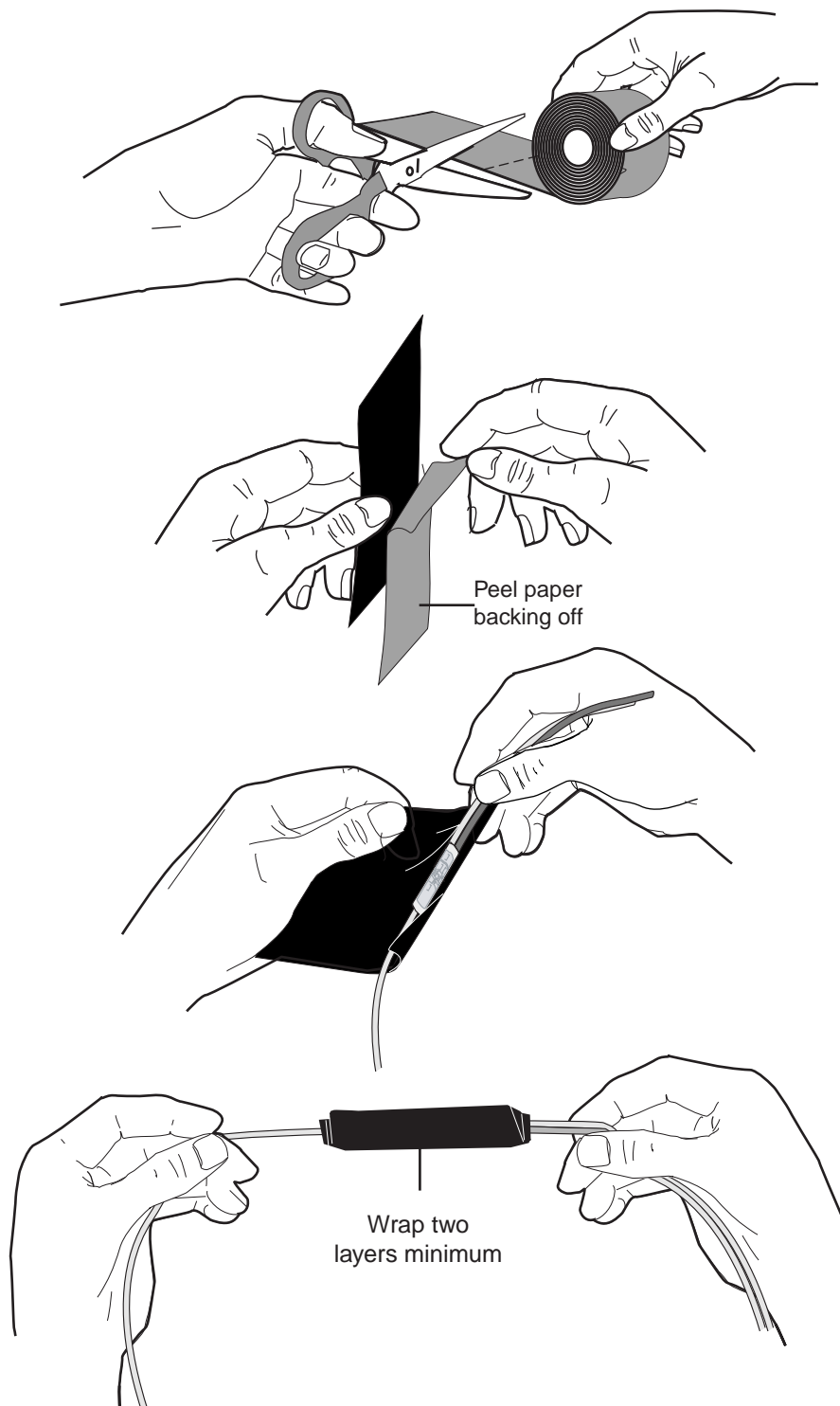
**Caution**

*DO NOT use a heat gun or open flame near combustible materials.*

*Use a heat gun only when it is safe and appropriate to do so. Protect surrounding wiring and other components when using a heat gun.*



6. When the butt splice is verified a good connection, use plastic seal tape to wrap the entire connection. Use a minimum of two layers of seal tape to completely wrap the connection.

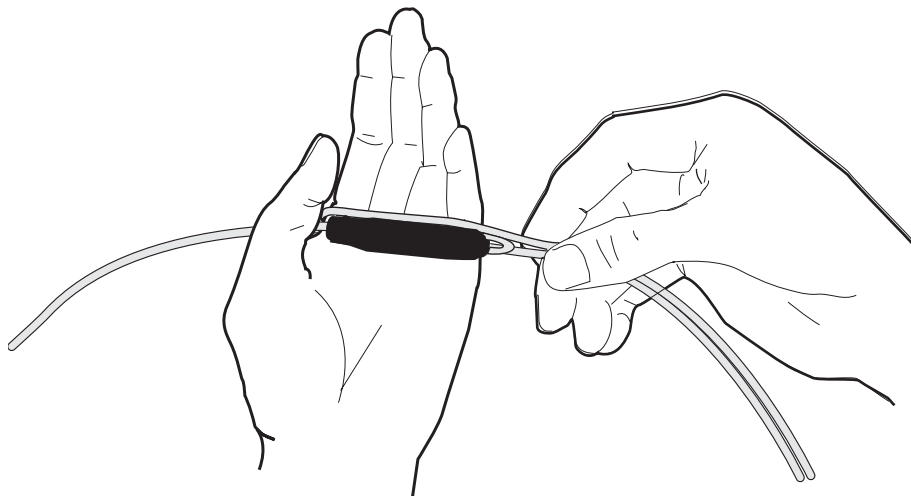


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### Completing the Wire Connection

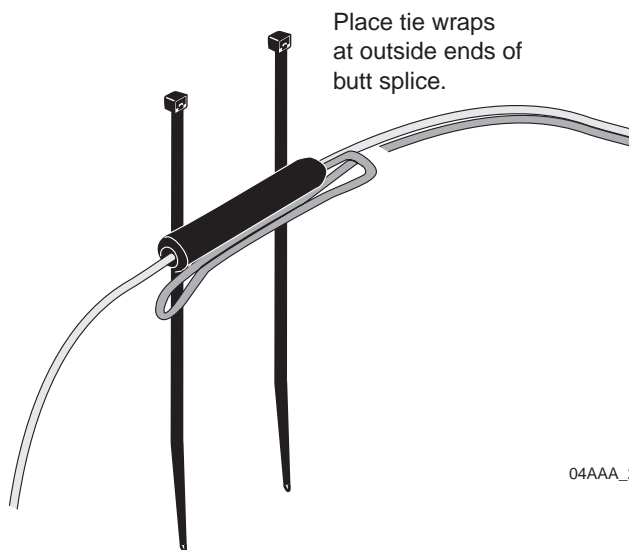
Create extra protection for the wire connection by following these additional steps:

1. Wrap a wire around four fingers of a hand, one full loop, so that the wire loop is longer than the wrapped butt splice.
2. Cinch tight the loop and center it against the wrapped butt splice.



04AAA\_24a

3. Secure the wires together and place tie wraps at the outside ends of the butt splice.

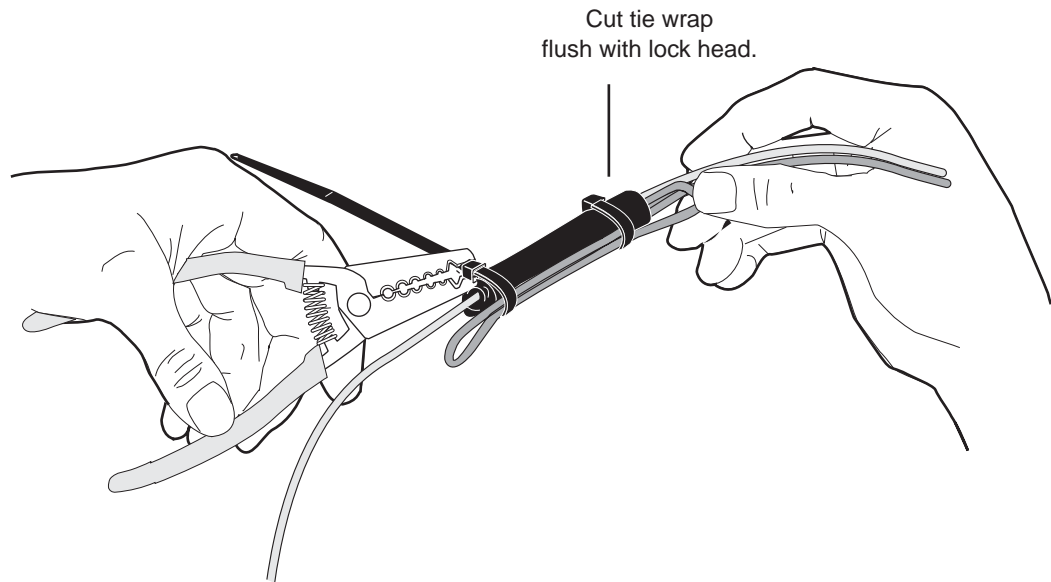


04AAA\_23a

4. Cinch the tie wraps tight and cut them *flush* to the lock head.

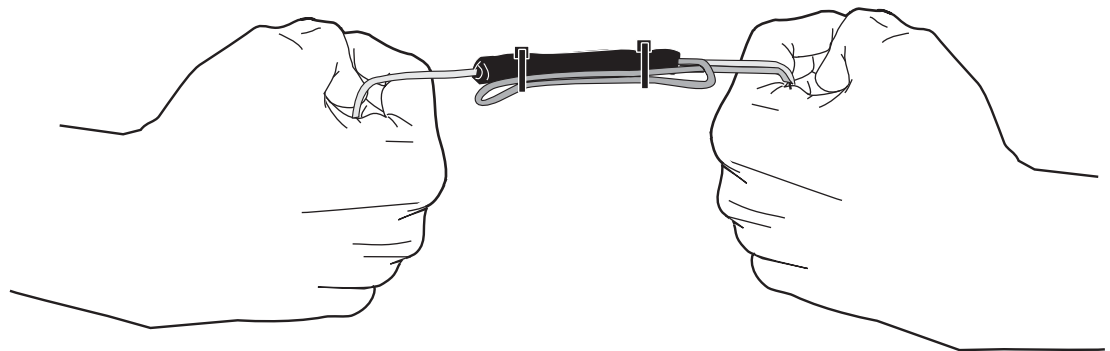
**Caution**

*Failure to cut the tie wraps flush to the lock head can result in injury.*



04AAA\_25a

5. Firmly tug on the butt-spliced wire connection to make sure the tie wraps do not pull loose.

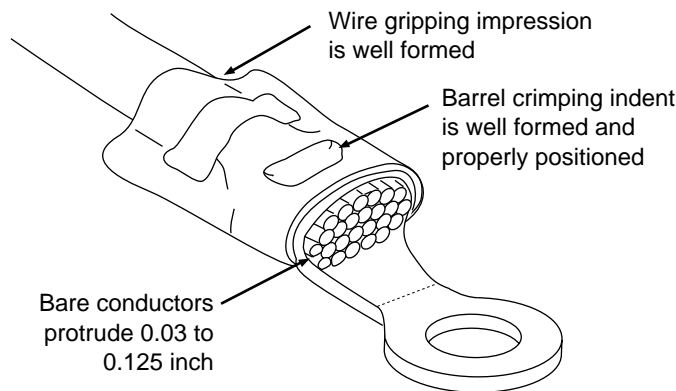


04AAA\_26a

## Ring Terminals

When making electrical connections, crimp ring terminals onto the ends of the wires to ensure good contacts. A properly crimped ring terminal has these characteristics:

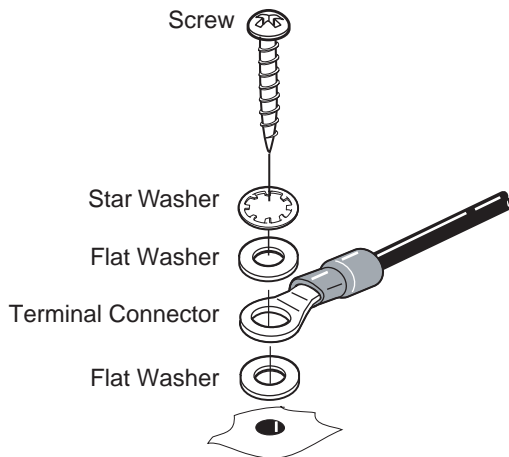
- The barrel crimping indent is well-formed and properly positioned.
- The insulated wire's grip impression is well-formed and provides proper support without crushing the insulation.
- The conductor does not move independently of the lug. Firmly tug on the ring terminal to ensure it does not pull loose.
- The end of the bare conductors protrude through the crimp barrel approximately 0.03 to 0.125" depending on the lug size and crimp tool recommended stop setting.



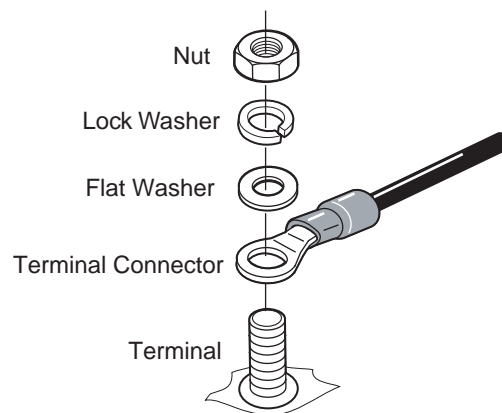
OM/E-0093-97

Install the ring terminal on the terminal connection as follows:

### GlobalTRACS Ring Terminal



### Generic Ring Terminal

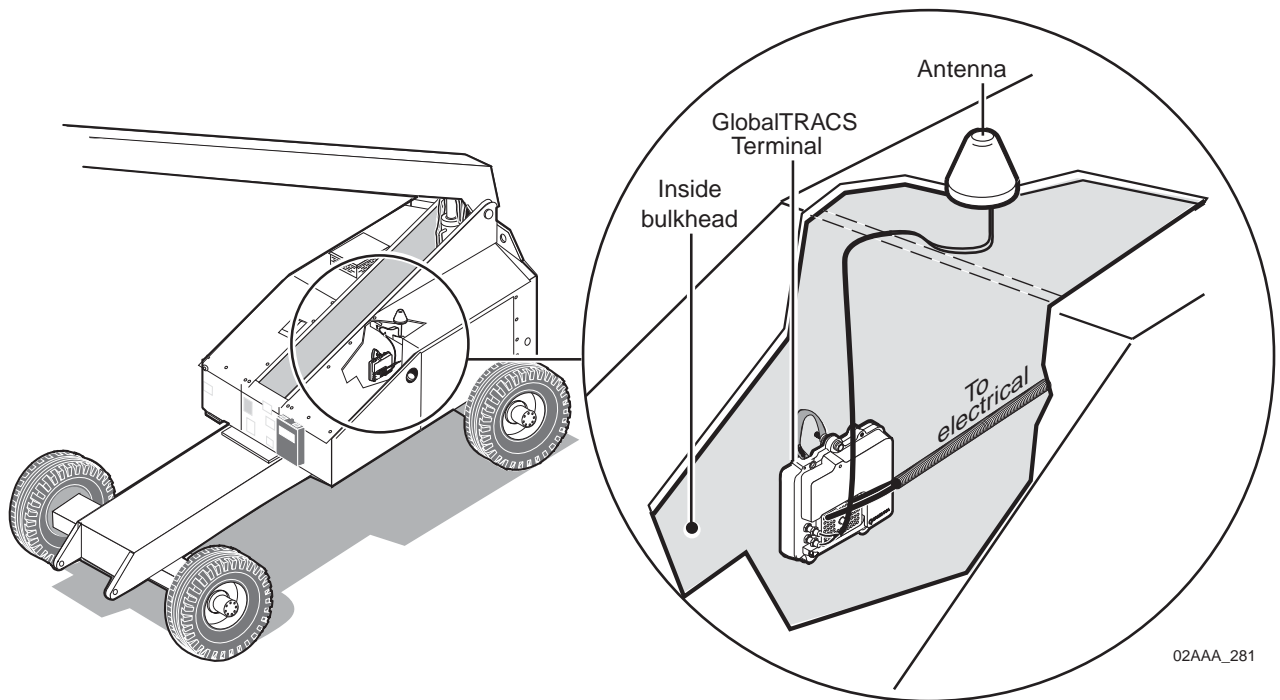


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## Cable Installation

Because construction equipment differs widely, cables can be installed in many different ways.

If the installation was planned according to [Chapter 4: GlobalTRACS® System Installation Planning](#), you already know where the antenna and the terminal have been installed. Determine the most direct and protected route you can follow in routing cables to connect these units to each other and to the vehicle. Follow the guidelines concerning battery disconnect switches and other safety cutouts *before* installing the cables. See [Battery Disconnect Switches and Other Safety Cutouts on page 4-3](#) for more information.



### Antenna Cable Installation and Run

Refer to [Chapter 6: GlobalTRACS® System Antenna Installation](#) for detailed information regarding installing and running the antenna cable.

### Power/Signal Cable Installation and Run

The power/signal cable connects the GTT to the equipment's electrical power source. It may be necessary to drill holes in the vehicle (e.g., cab floor) to provide a route from the vehicle electrical connections to the GTT.

A bag of three fuses is supplied with the power/signal cable. The fuses must be attached according to [Cable Basics on page 7-3](#) after the power/signal wires have been trimmed and

before final connection. (There is no fuse for the gray CHASSIS\_GND wire or the sensor wires.)

When making electrical connections, ensure that the circuit being fused is the GlobalTRACS system circuit and not the vehicle's circuit.

The three fuses are not the same value. Ensure that the correct fuse is attached to the correct wire on the GlobalTRACS power/signal cable, as follows and in the illustrations that follow.

**Caution**

*The three fuses **are not** the same value. Ensure that the correct fuse is attached to the correct wire on the GlobalTRACS power/signal cable.*

---

**Caution**

*When making electrical connections, ensure that the circuit being fused is the GlobalTRACS system circuit **not** the vehicle's circuit. The fuse should always be on the GlobalTRACS system side of the butt splice.*

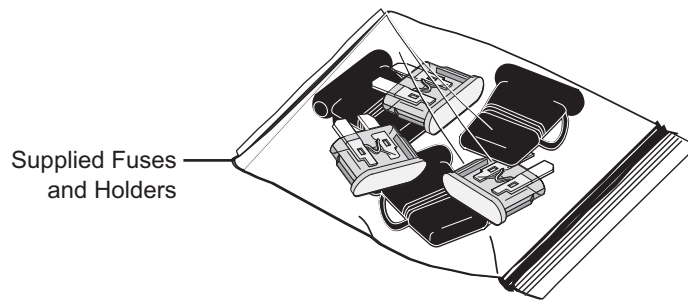
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**Caution**

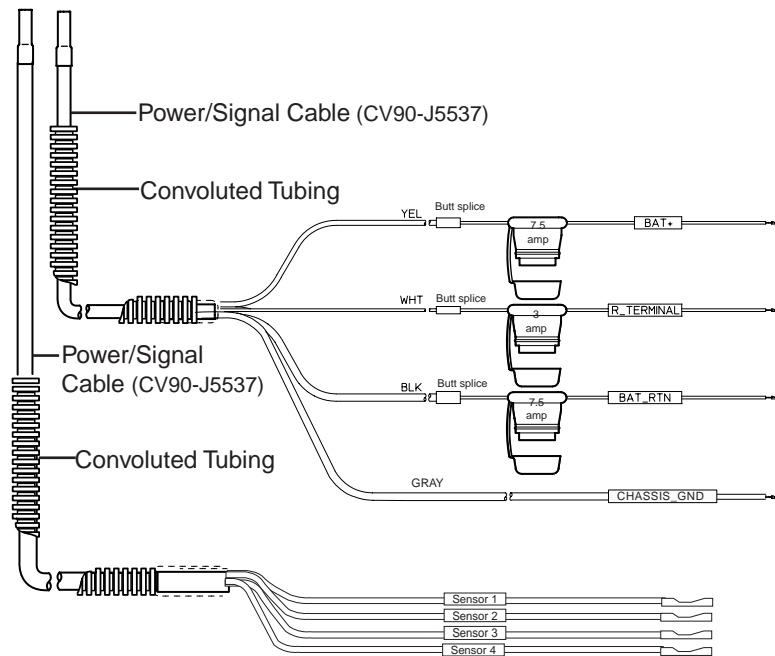
*When the GTT is wired to the hot side of the disconnect switch, QUALCOMM recommends removing the GTT fuses and the battery negative terminal before performing welding operations. Doing this will protect the GTT and existing electronics, such as, electronic control modules (ECMs), from the possibility of damaging electrical currents.*

---

- 7.5-amp fuse attaches to the yellow BAT+.
- 3-amp fuse attaches to the white R\_TERMINAL.
- 7.5-amp fuse attaches to the black BAT\_RTN.
- (No fuse for the gray CHASSIS\_GND wire or the sensor wires.)



03AAA\_110



02AAA\_187b

### Cable Run

**Run Direction** - The power/signal cable can be routed from the GTT to the power source or from the power source to the GTT.

**Routing Location** - If possible route the cable internally, however, an external route is acceptable (protected with convoluted tubing). Use existing cable routes, if possible.

**Cable Dressing** - If routed externally, protect with convoluted tubing. If possible, coil excess cable and secure in a safe place. Otherwise, the power/signal cable may be cut to length.

### Power/Signal Cable Routing

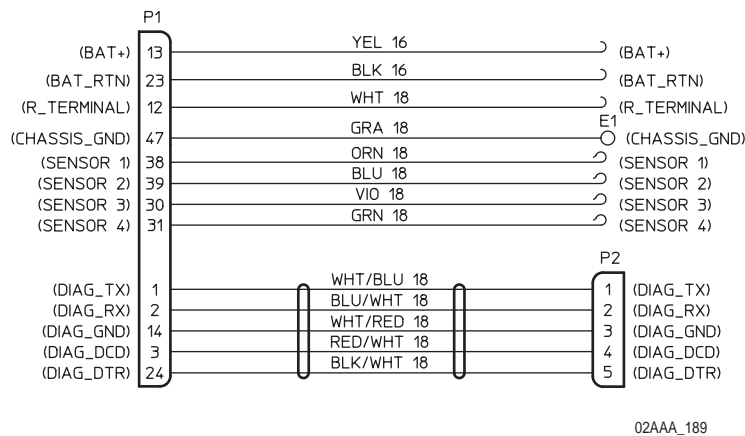
Follow these steps to route the power/signal cable:

1. Route the power/signal cable from the GTT to the equipment's power source. Route the cable with other cables, if possible. Make sure the cable reaches the power interface location and that you have enough cable to work with.
2. Connect the power/signal cable wire to the vehicle's power, which often exists at the:
  - Ignition switch
  - Bus bar
  - Circuit breakers
  - Alternator

**Power/Signal Cable Wire Connections**

The vehicle battery supplies the power to the GTT. There are three required wire connections that you must make from the power/signal cable:

- BAT + (yellow)/+12 VDC or +24 VDC battery
- R\_TERMINAL (white) (voltage present when engine is running)
- BAT\_RTN (black)/B- ground
- CHASSIS\_GND (gray)/chassis ground





02AAA\_189

**Note**

*The sensor wires are for future use. Coil and store the sensor wires properly.*

The following table indicates several locations to consider when determining where to route cabling and make power, ground, and run terminal connections. Refer also to [Grounding Guidelines](#) on page 7-4 and [Making Electrical Connections](#) on page 7-5



<b>BAT +</b> <i>(Constant 12 VDC or 24 VDC)</i>	<b>BAT_RTN</b> <i>(B-/Battery Return)</i>	<b>R_TERMINAL</b> <i>(Measures engine hours)</i>	<b>GND</b> <i>Chassis Ground</i>
<ul style="list-style-type: none"><li>• Alternator (constant 12 VDC or 24 VDC)</li><li>• High side of vehicle main wiring bus.</li><li>• Battery side of the fuse box. (Not the load side.)</li><li>• Battery side of the ignition switch.</li></ul>	<ul style="list-style-type: none"><li>• Battery side of the cutout switch. (Must obtain permission from customer to connect here.)</li><li>• Chassis side of the cutout switch. (Note that the GTT will not operate if the disconnect switch is open.)</li><li>• Good ground (B-). Refer to <a href="#">Grounding Guidelines on page 7-4</a>.</li></ul> <div><p><b>Caution</b> When establishing a good chassis ground, avoid areas that may be potentially isolated from ground by a hinge or some welds.</p></div>	<ul style="list-style-type: none"><li>• Run terminal on the alternator.</li><li>• Hour meter.</li><li>• Oil pressure switch.</li><li>• Ignition switch. (Using the ignition switch could result in inaccurate hours because the ignition can sometimes be on without the engine running.)</li></ul>	<ul style="list-style-type: none"><li>• Create a good chassis ground. Refer to <a href="#">Grounding Guidelines on page 7-4</a>.</li></ul> <div><p><b>Caution</b> When establishing a good chassis ground, avoid areas that may be potentially isolated from ground by a hinge or some welds.</p></div>

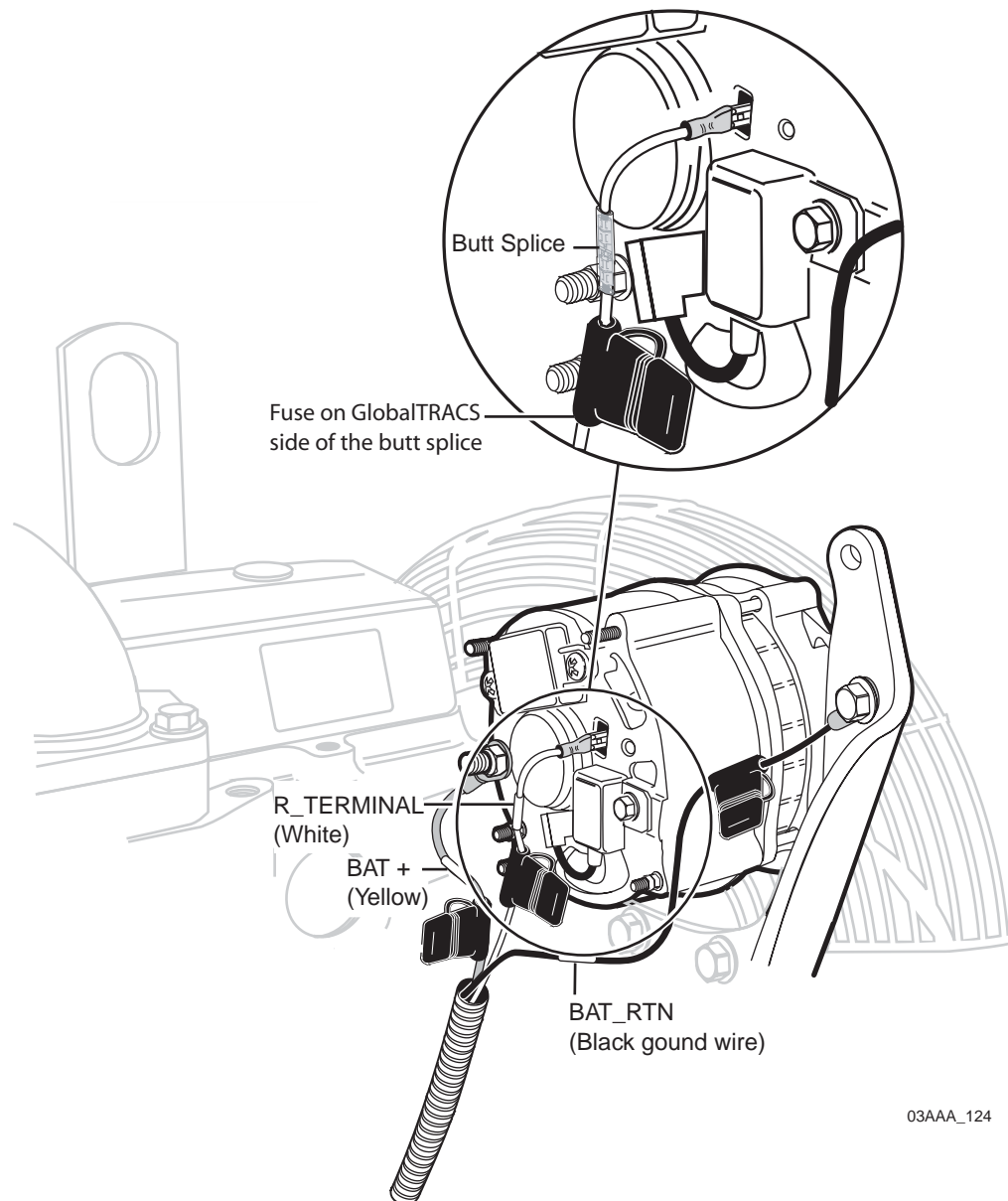
1. The yellow wire labeled BAT+ is for the unswitched (main) +12 VDC or + 24 VDC connection. (Attach a supplied 7.5-amp fuse, according to [Cable Basics on page 7-3](#) before making the final connection.) Connect the BAT+ wire to an unswitched +12 VDC power source, such as the hot side of the vehicle main wiring bus, the battery side of the ignition switch, or the battery side of the fuse block (not the load side). This line provides constant power to the GTT.
2. The white wire labeled R\_TERMINAL is for sensing engine hours. (Attach the supplied 3-amp fuse, according to [Cable Basics on page 7-3](#) before making the final connection.) Connect the R\_TERMINAL wire to the run terminal on the alternator, oil pressure switch, or another switched power source.

Verify that **no voltage is present**, during nonrunning conditions, at the location where you will connect the R\_TERMINAL wire.

**Note**

Using the run terminal on the alternator is the preferred method. The engine oil pressure switch is also a good source, however, ensure that the switch provides at least +5 volts when the engine is running. If neither the run terminal or the oil pressure switch are available, then use the ignition switch.

Alternators vary from vehicle to vehicle. The following illustration shows a typical wiring configuration for the white R\_TERMINAL wire connected at the run terminal on an alternator.



03AAA\_124

**Caution**

When making electrical connections, ensure that the circuit being fused is the GlobalTRACS system circuit **not** the vehicle's circuit. The fuse should always be on the GlobalTRACS system side of the butt splice.

3. The black wire labeled BAT\_RTN should be connected to a good ground (BAT-). (Attach a supplied 7.5-amp fuse, according to [Cable Basics on page 7-3](#) before making the final connection.)

**Note**

Sometimes thermal couplers are mistaken for chassis ground. Avoid thermal couplers and ensure a good, proper chassis ground connection.

**Connecting the Antenna Connectors to the GlobalTRAC® Terminal**

Plug the antenna TNC connectors into the appropriate connectors on the GTT. Securely finger-tighten the screwlocks on the connector.

**Connecting the Power/Signal Connector to the GlobalTRACS Terminal**

Plug the power/signal connector into the appropriate connector on the GTT. Tighten with a 5/32" hex wrench.

**Checking All GlobalTRACS Terminal Cable Connections****Note**

Installers are responsible for performing a cursory level, visual examination of all system wiring and cabling that may effect the GTT's operation and performance. This includes existing wiring on the vehicle before the GTT wiring occurs and all GTT wiring after installation. If an existing wiring problem on the vehicle is evident prior to performing the GTT wiring, customer maintenance personnel at the shop should be notified before GTT wiring begins.

- Make sure all cable connections are securely tightened. Check that all cables have service loops and that they are free from interference.
- Cables should not be pulled tight. Provide strain relief to allow for equipment vibration and movement.
- Cables should have enough slack for easy removal.
- Connectors should emerge straight out from the GTT and should not be pulled to the side or weighted down by any items.

**Securing Cables**

After installing all the GlobalTRACS components, provide a professional, finished layout with cables securely fastened out of the way and out of sight, if possible.

Secure any excess cabling with cable ties and stow them out of the way in a safe, secure location or trim cables to run length.

After the GlobalTRACS cables have been installed and routed, it is time to perform a system verification. Please continue to the next chapter for system verification and general diagnostics.

If you have questions about installing and routing the GlobalTRACS system cables, please contact QWBS Technical Support Hotline:

In the United States, call 800-541-7490;  
in Canada, call 800-863-9191.

# 8

## **GlobalTRACS<sup>®</sup> System Verification**

---

### **Introduction to System Verification**

This chapter describes the GlobalTRACS<sup>®</sup> equipment management system verification process and basic diagnostic procedures.

*Topics in this chapter include:*

<i>What Is GlobalTRACS System Verification? . . . . .</i>	<i>8-2</i>
<i>GlobalTRACS System Verification . . . . .</i>	<i>8-2</i>
<i>Diagnostic Flowchart—GlobalTRACS System Verification . . . . .</i>	<i>8-3</i>
<i>GlobalTRACS System Verification Procedure . . . . .</i>	<i>8-4</i>
<i>System Verification Form . . . . .</i>	<i>8-10</i>
<i>GlobalTRACS System Verification Form . . . . .</i>	<i>8-11</i>

*If you have questions about the GlobalTRACS system, please contact QUALCOMM<sup>®</sup> Wireless Business Solutions<sup>®</sup> (QWBS) Technical Support Hotline. Technical Support is staffed 24 hours a day, 365 days a year:*

*In the United States, call 800-541-7490  
In Canada, call 800-863-9191*

For configuration tool information and setup procedures, see the *GlobalTRACS Configuration Tool Installation and User Guide*, 80-J5557-1.

## **What Is GlobalTRACS System Verification?**

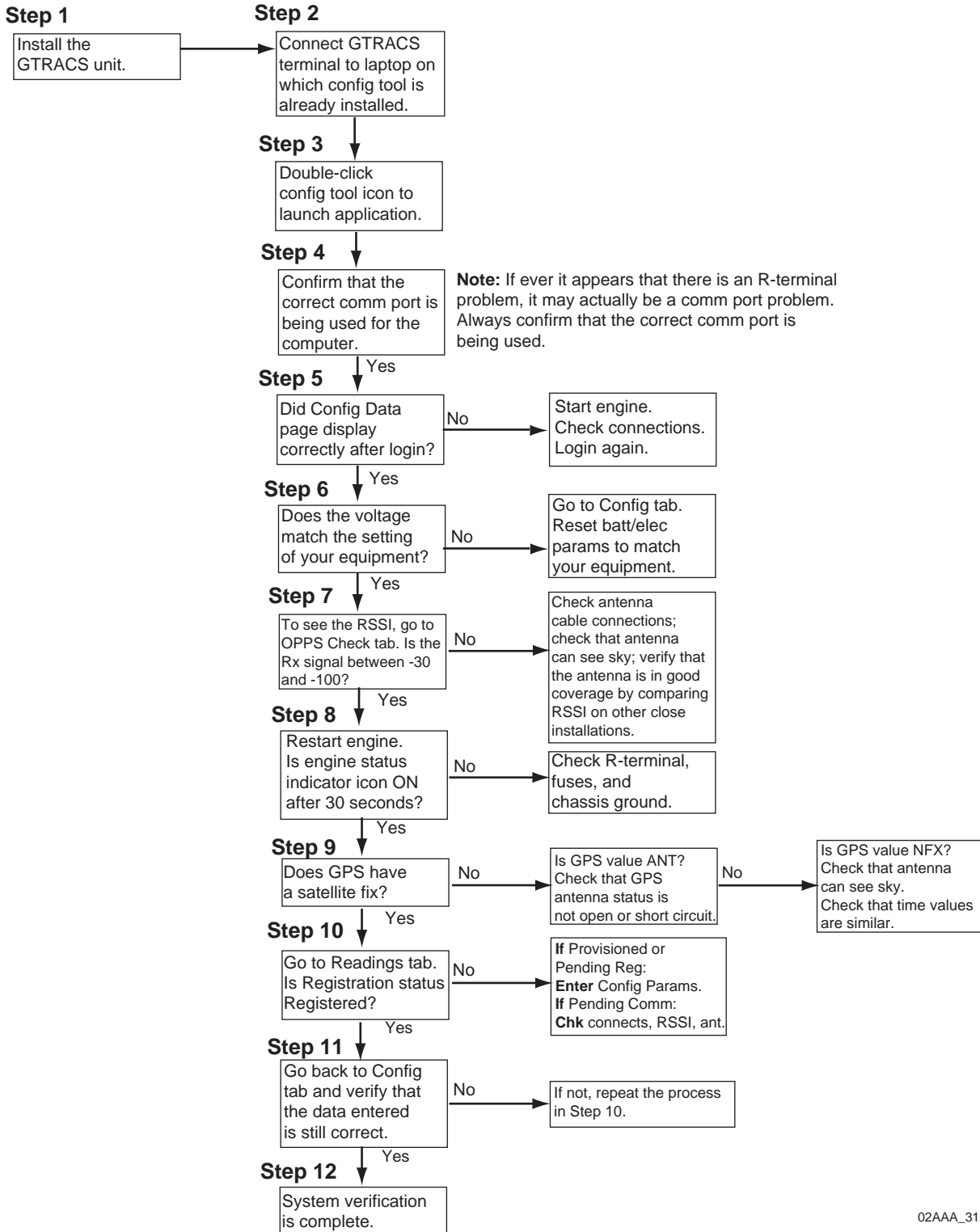
The GlobalTRACS system verification is a functional system check that should be performed after installation of the GlobalTRACS terminal (GTT), antenna, and the various cables and after service to verify that the GlobalTRACS system is operating properly.

### **Note**

*There are two ways to configure GlobalTRACS, either by using the configuration tool or by using the GlobalTRACS Web application.*

## **GlobalTRACS System Verification**

The flowchart on the following page represents a step-by-step guide to the verification procedures. It is important that you read the procedure on the pages following the flowchart for detailed information about this process. If, at any time, you reach a step and cannot proceed, call QUALCOMM Wireless Business Solutions (QWBS) Technical Support Hotline at (800-541-7490).

**Diagnostic Flowchart—GlobalTRACS System Verification**

02AAA\_312

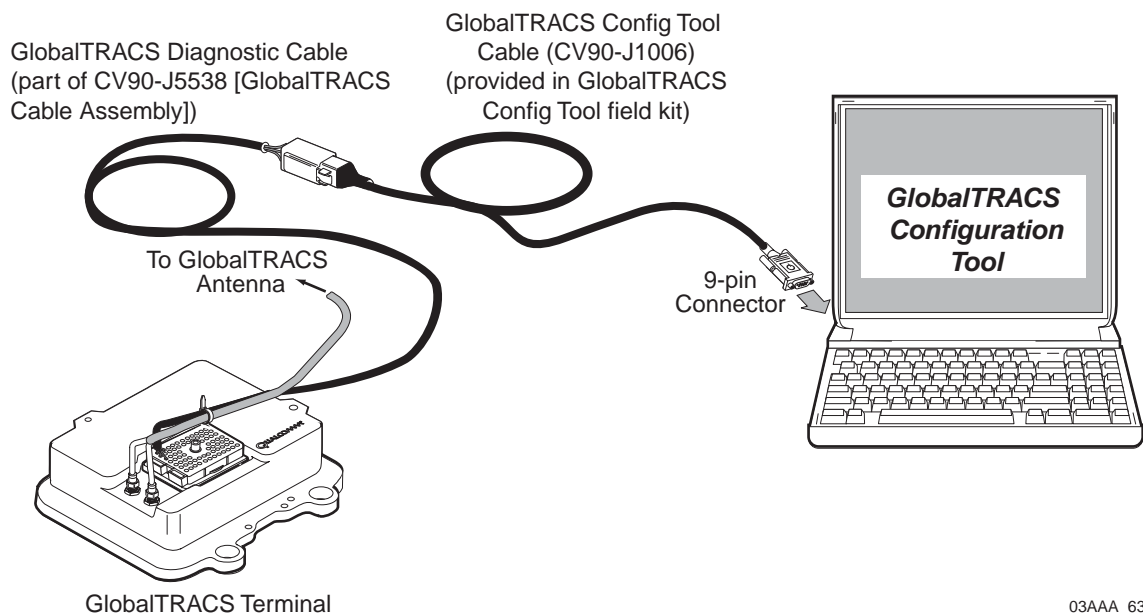
## GlobalTRACS System Verification Procedure

The steps in this procedure match the steps in the flowchart on the previous page.

This system verification procedure presumes you are using the GlobalTRACS configuration tool.

1. Install the GTT, antenna, and various cables according to the steps described in Chapters 4–7 of this manual. Go to step 2.
2. Connect the GTT to a laptop computer on which the GlobalTRACS configuration tool has already been installed. Go to step 3.

For specific configuration tool installation instructions, see the *GlobalTRACS Configuration Tool Installation and User Guide*, 80-J5557-1.



03AAA\_63

3. Double-click the GlobalTRACS configuration tool icon to launch the application. The GlobalTRACS device configuration tool login screen is displayed.



- Choose the session reason. Select the correct comm port. If you do not know the session purpose, click the Help Wizard.

**Note**

Configuration changes **cannot** be made in the “Safe Mode—monitor values only.”

4. Confirm that the correct comm port is being used on the computer.

**Note**

If ever it appears that there is an R-terminal problem, it may actually be a comm port problem, e.g., not using the correct comm port on the laptop computer. Always confirm that the correct comm port is being used.

5. Did the “Configuration Data” page display correctly after login?
  - If yes, go to step 5.
  - If no, start the engine, check the connections, and log in again.







**Caution**

Before turning the equipment ON, observe all safety and operational guidelines for heavy equipment.

**Note**

If the GlobalTRACS configuration tool displays the “Flash Upgrades” page immediately after logging in to a newly installed GlobalTRACS terminal, call QUALCOMM Wireless Business Solutions Technical Support Hotline (800-541-7490).

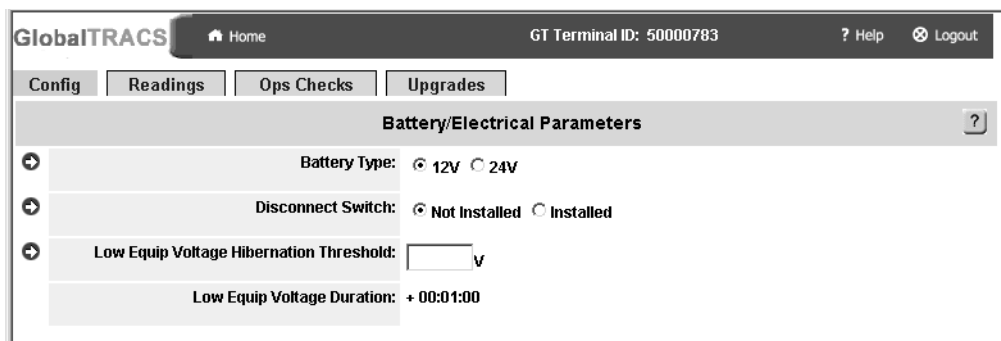
6. Check the equipment voltage on the status bar. Is the unit reading a proper voltage, depending on your type of equipment?

Engine Status: 	RxSignal: 	GPS: 3-D	Geofence: 
Msgs in Queue: 0	Hours: 319.4	Equip Voltage: 13.96V	GTT Active: 






Click the Config tab and check that the battery/electrical parameters are set correctly to either 12V or 24V. This setting should match your battery type so the unit does not go into hibernation.





**Note**

*The equipment default is set to 12V on a new terminal.*



The screenshot shows the GlobalTRACS web interface. At the top, there's a navigation bar with 'Home', 'GT Terminal ID: 50000783', 'Help', and 'Logout'. Below this is a tabbed interface with 'Config', 'Readings', 'Ops Checks', and 'Upgrades'. The 'Config' tab is active, and within it, the 'Battery/Electrical Parameters' section is expanded. This section contains four rows of settings, each with a plus icon on the left: 'Battery Type' with radio buttons for '12V' (selected) and '24V'; 'Disconnect Switch' with radio buttons for 'Not Installed' (selected) and 'Installed'; 'Low Equip Voltage Hibernation Threshold' with a text input field followed by 'V'; and 'Low Equip Voltage Duration' with a text input field showing '+ 00:01:00'.

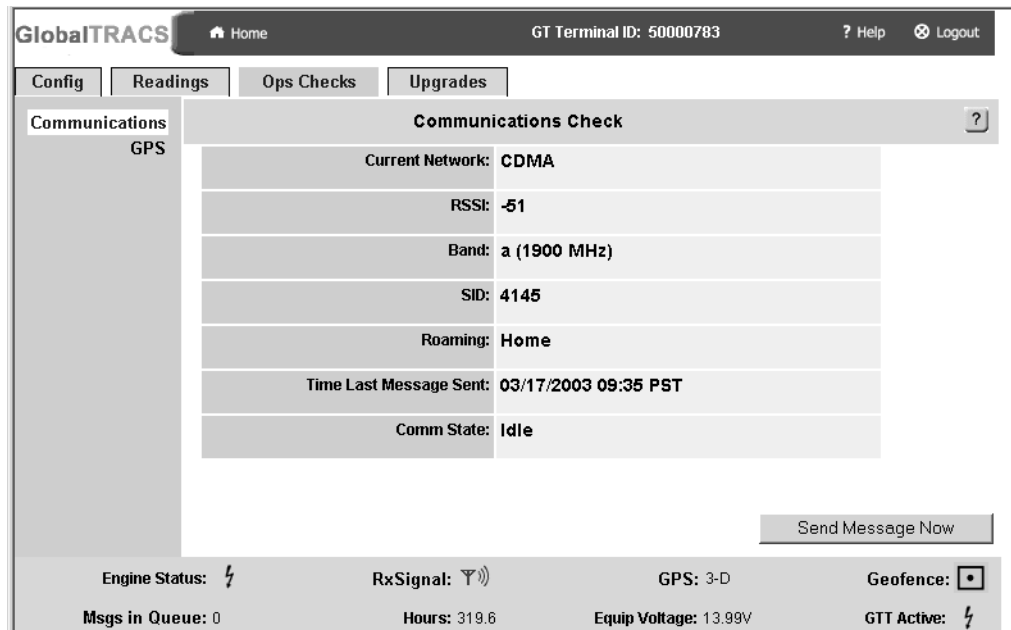
7. Check the Rx signal on the status bar. Possible signal values are: no signal , low signal , medium signal , high signal , and unknown signal .

Engine Status: 	RxSignal: 	GPS: 3-D	Geofence: 
Msgs in Queue: 0	Hours: 319.4	Equip Voltage: 13.96V	GTT Active: 

You can also check the signal strength (RSSI) at the Ops Checks tab. Use the following RSSI values as a guide for acceptable/not acceptable signal strengths:

-30 to -100 is acceptable. Values between -100 and -120 may indicate marginal coverage or poor antenna connections/performance. If other installations in the same vicinity also show values between -100 and -120, this may indicate a coverage problem not a poor antenna connections/performance problem, and would therefore qualify as acceptable.

-120 and below is not acceptable and indicates no coverage or an antenna problem.



Communications Check	
Current Network:	CDMA
RSSI:	-51
Band:	a (1900 MHz)
SID:	4145
Roaming:	Home
Time Last Message Sent:	03/17/2003 09:35 PST
Comm State:	Idle

Send Message Now

Engine Status: RxSignal: GPS: 3-D Geofence:

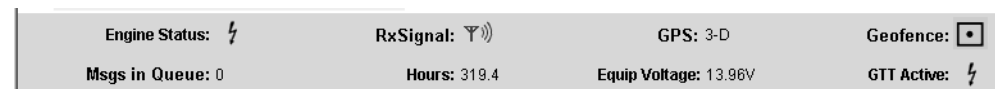
Msgs in Queue: 0 Hours: 319.6 Equip Voltage: 13.99V GTT Active:

Is there a signal?

- If the signal strength is acceptable, go to step 7.
- If the signal strength is not acceptable and you are in coverage, check the antenna-cable connections and check that the antenna is not blocked or covered and has a clear view of the sky.

8. Restart the engine and check the engine status on the status bar.

Is the “Engine Status” indicator ON ?





Engine Status: RxSignal: GPS: 3-D Geofence:

Msgs in Queue: 0 Hours: 319.4 Equip Voltage: 13.96V GTT Active:

#### Note

*This may take up to 30 seconds to display properly.*





- If yes, go to step 8.

- If the engine status indicator is OFF  or unknown , check the R-terminal, the fuses, and the chassis ground.

**Note**

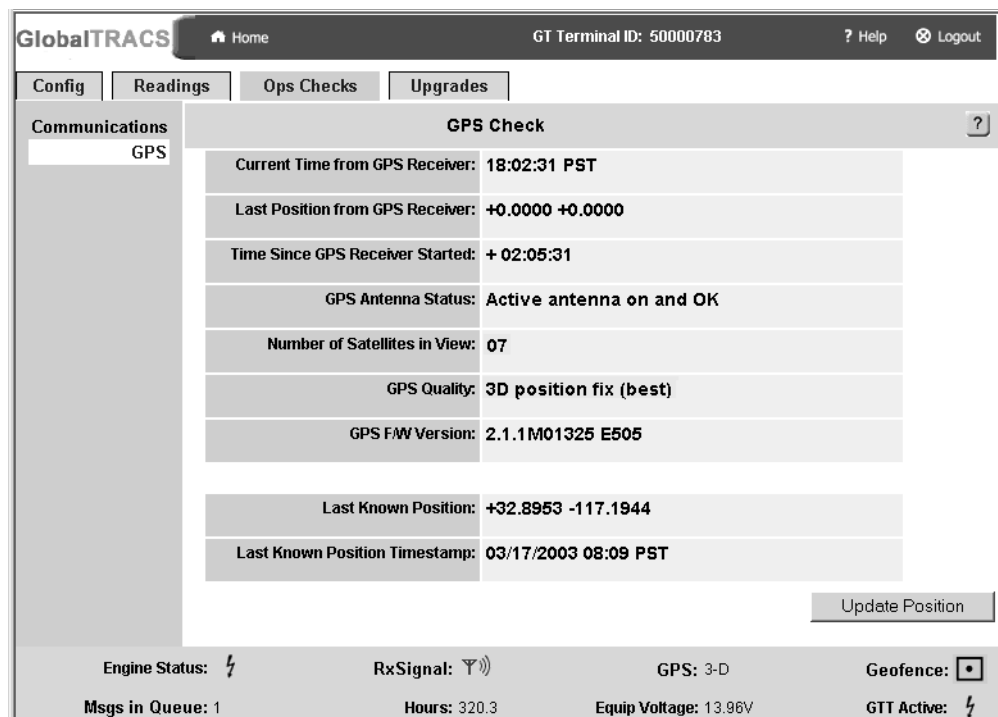
*If the GlobalTRACS R-terminal wire is connected to the alternator or oil pressure switch, the icon changes from OFF or UNKNOWN to ON when the engine is running.  
If the GlobalTRACS R-terminal wire is connected to switched 12V, the icon changes from OFF or UNKNOWN to ON when the ignition is in either the AUX or ON position.*

9. Check the GPS reading on the status bar. Possible GPS values are: NFX (no fix), 2-D (good), 3-D (best), UNK (unknown), and ANT (antenna problem).

Engine Status: 	RxSignal: 	GPS: 3-D	Geofence: 
Msgs in Queue: 0	Hours: 319.4	Equip Voltage: 13.96V	GTT Active: 

**Note**





*To check GPS functionality at the Ops Checks tab, click GPS.*



The screenshot shows the GlobalTRACS web interface. At the top, there's a navigation bar with 'Home', 'GT Terminal ID: 50000783', and links for 'Help' and 'Logout'. Below this is a tabbed interface with 'Config', 'Readings', 'Ops Checks', and 'Upgrades'. The 'Ops Checks' tab is active, and within it, the 'GPS' sub-tab is selected. The 'GPS Check' section displays the following information:

Current Time from GPS Receiver:	18:02:31 PST
Last Position from GPS Receiver:	+0.0000 +0.0000
Time Since GPS Receiver Started:	+ 02:05:31
GPS Antenna Status:	Active antenna on and OK
Number of Satellites in View:	07
GPS Quality:	3D position fix (best)
GPS F/W Version:	2.1.1M01325 E505
Last Known Position:	+32.8953 -117.1944
Last Known Position Timestamp:	03/17/2003 08:09 PST

At the bottom of the GPS Check section is an 'Update Position' button. Below the main content area is a status bar with the following information:

Engine Status: 	RxSignal: 	GPS: 3-D	Geofence: 
Msgs in Queue: 1	Hours: 320.3	Equip Voltage: 13.96V	GTT Active: 

Does the GPS have a 2-D or 3-D fix?

- If yes, go to step 9.
- If the GPS value is ANT, check the "GPS Antenna Status."

Is the status "Open circuit antenna"?

- If yes, check that the antenna is connected and there is no break in the cable.

Is the status “Short circuit in antenna”?

- If yes, check that the antenna is not crimped or shorted.

**Note**

*After you correct the short circuit problem, you must cycle power on the terminal by removing and re-inserting the BAT+ fuse to clear the condition.*

- If the GPS value is NFX, check that the current time on the GPS receiver is close to the correct time. (If times are different, wait a few minutes. The GPS may be in the process of getting a fix on the satellite.) Also check that the antenna is not blocked or covered and has a clear view of the sky.

**Note**

*If this is a new unit, it may take a few minutes for it to get a satellite fix.*

**10.** Verify the unit is communicating with the NMC.

Click the Readings tab and select “Registration” from the menu at the left. If the Registration status is “Registered,” the process is complete. If the Registration status is “Provisioned” or “Pending,” follow the instructions below to complete the Registration process. The process is not complete until the status changes to “Registered.”

- Provisioned—You will need to enter the Config Params; the terminal will then communicate with the NMC to complete the Registration process.
- Pending Registration—You will need to enter the Config Params to complete the Registration process.
- Pending Communication—The terminal needs to communicate with the NMC to complete the Registration process. While you are waiting, you may want to check the Rx signal level (see step 6, above).
- Registered—The Registration process is complete.

**GlobalTRACS** Home GT Terminal ID: 50000783 ? Help Logout

Config Readings Ops Checks Upgrades

**Key Readings**

- Sensor Readings
- Registration**
- Version Info
- Equipment
- Battery
- Timings
- Geofence

**Registration/Provisioning Configuration**

GT Terminal ID:	50000783
IMSI:	000003163779318
MDN:	3163779318
Home SID:	4145
ESN:	146-02006420
Registration Status:	Registered

Engine Status: RxSignal: GPS: 3-D Geofence:

Msgs in Queue: 0 Hours: 320.3 Equip Voltage: 13.99V GTT Active:

**Note**

*You can also verify the registration status of the terminal on GlobalTRACS Web at the "Terminal Details" page.*

- 11.** Go back to the Config tab and verify that the data you entered is correct. If not, correct the data by following the procedure in step 9.
- 12.** System verification is complete.

**System Verification Form**

On the following page is the GlobalTRACS Installation and System Verification Form. You can make copies of this form and record important information concerning the vehicle and the GlobalTRACS unit.

**Note**

*To access the information for the GlobalTRACS Installation and System Verification Form, you must use the configuration tool.*

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## GlobalTRACS Installation and System Verification Form

<b>Customer:</b>	<b>Location:</b>	<b>Mechanic:</b>	<b>Date:</b>
<b>Installation Company:</b>	<b>Installer #1:</b>	<b>Installer #2:</b>	<b>Page</b> _____ <b>of</b> _____

	Terminal S/N:	Equipment ID:	Make:	Model: VIN:	Year:	Hours:
<b>1</b>	<b>Battery</b>	<b>R-Term Connection</b>	<b>Times</b>	<b>Configuration</b>	<b>Comments:</b>	
	Volts: 12 <input type="checkbox"/> 24 <input type="checkbox"/>	Alternator <input type="checkbox"/>	Start:	RSSI:		
	Disconnect Switch: Y / N	Oil Press Switch <input type="checkbox"/>	End:	Satellites:		
	Wired Hot: Y / N	IGN Switch <input type="checkbox"/>	Duration:	Registered Engine: Y / N		
		Fuel Pump <input type="checkbox"/>		ON/OFF check: <input type="checkbox"/>		
		Hydraul Press <input type="checkbox"/>		Disconnect Switch Check: <input type="checkbox"/>		
		Other:				
<b>Initial or sign name when system verification is complete.</b>		<b>Installer #1:</b>	<b>Installer #2</b>	<b>Customer:</b>		

	Terminal S/N:	Equipment ID:	Make:	Model: VIN:	Year:	Hours:
<b>2</b>	<b>Battery</b>	<b>R-Term Connection</b>	<b>Times</b>	<b>Configuration</b>	<b>Comments:</b>	
	Volts: 12 <input type="checkbox"/> 24 <input type="checkbox"/>	Alternator <input type="checkbox"/>	Start:	RSSI:		
	Disconnect Switch: Y / N	Oil Press Switch <input type="checkbox"/>	End:	Satellites:		
	Wired Hot: Y / N	IGN Switch <input type="checkbox"/>	Duration:	Registered Engine: Y / N		
		Fuel Pump <input type="checkbox"/>		ON/OFF check: <input type="checkbox"/>		
		Hydraul Press <input type="checkbox"/>		Disconnect Switch Check: <input type="checkbox"/>		
		Other:				
<b>Initial or sign name when system verification is complete.</b>		<b>Installer #1:</b>	<b>Installer #2</b>	<b>Customer:</b>		

	Terminal S/N:	Equipment ID:	Make:	Model: VIN:	Year:	Hours:
<b>3</b>	<b>Battery</b>	<b>R-Term Connection</b>	<b>Times</b>	<b>Configuration</b>	<b>Comments:</b>	
	Volts: 12 <input type="checkbox"/> 24 <input type="checkbox"/>	Alternator <input type="checkbox"/>	Start:	RSSI:		
	Disconnect Switch: Y / N	Oil Press Switch <input type="checkbox"/>	End:	Satellites:		
	Wired Hot: Y / N	IGN Switch <input type="checkbox"/>	Duration:	Registered Engine: Y / N		
		Fuel Pump <input type="checkbox"/>		ON/OFF check: <input type="checkbox"/>		
		Hydraul Press <input type="checkbox"/>		Disconnect Switch Check: <input type="checkbox"/>		
		Other:				
<b>Initial or sign name when system verification is complete.</b>		<b>Installer #1:</b>	<b>Installer #2</b>	<b>Customer:</b>		

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## GlobalTRACS® System Mounts and Brackets

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### Introduction to Mounts and Brackets

The following pages describe the various predrilled mounts and brackets that exist for the GlobalTRACS® equipment management system. The mounts and brackets are for use with the GlobalTRACS terminal (GTT) and the antenna. Most mounts and brackets can be bent to shape, cut, drilled, and welded for a custom fit.

Also included in the following pages are several mount assemblies and the accessories available to aid in installation of the GTT and the antenna.

*Topics in this chapter include:*

<i>Mounts and Brackets Parts List . . . . .</i>	<i>9-2</i>
<i>GlobalTRACS Terminal Mounting Parts . . . . .</i>	<i>9-4</i>
<i>GlobalTRACS Antenna Mounting Parts . . . . .</i>	<i>9-6</i>
<i>Sample Antenna Mount Assembly . . . . .</i>	<i>9-10</i>

*If you have questions about the GlobalTRACS system, please contact QUALCOMM® Wireless Business Solutions® (QWBS) Technical Support Hotline. Technical Support is staffed 24 hours a day, 365 days a year:*

*In the United States, call 800-541-7490  
In Canada, call 800-863-9191*

#### **Note**

*To ensure proper and successful operation of the GlobalTRACS system, refer to the following chapters before mounting a GTT or an antenna:*

- [Chapter 4: GlobalTRACS® System Installation Planning](#)
- [Chapter 5: GlobalTRACS® System Terminal Installation](#)
- [Chapter 6: GlobalTRACS® System Antenna Installation](#)

## Mounts and Brackets Parts List

The following parts list contains all of the available mounts, brackets, and hardware offered to aid in mounting the GTT and antenna. To order any of these items, please call the QUALCOMM Wireless Business Solutions (QWBS) Customer Support Network Hotline. The Hotline is staffed 24 hours a day, 365 days a year. In the United States, call 800-541-7490; in Canada, call 800-863-9191.

Additional information, including illustrations, regarding the many available mounting parts can be found throughout this chapter.

<b>Part</b>	<b>Part Number</b>	<b>Used with Antenna</b>	<b>Used with GTT (terminal)</b>
Terminal mounting template assembly	10-J5626-1		Tool used as a drill template for creating mounting holes to mount the GTT and as a welding jig to position terminal weld brackets. See <a href="#">Terminal Mounting Template Assembly on page 9-4</a> .
Terminal weld bracket	50-J5627-1		Z-bracket for GTT mounting. See <a href="#">Terminal Weld Bracket on page 9-4</a> .
Universal terminal mounting plate	50-J5628-1 (10" x10")		3/16" thick steel, powder-coated plate for GTT mounting. See <a href="#">Universal Terminal Mounting Plate on page 9-5</a> .
Flat antenna mounting plate	50-J5583-1	1/8" thick steel, powder-coated plate used for mounting the antenna. See <a href="#">Flat Antenna Mounting Plate on page 9-6</a>	
Right angle antenna mounting plate	50-J5584-1	1/8" thick steel, powder-coated plate used for mounting the antenna. See <a href="#">Right Angle Antenna Mounting Plate on page 9-6</a> .	
Mount antenna plate	50-J5630-1	1/8" thick steel, powder-coated plate used for mounting the antenna. See <a href="#">Mount Antenna Plate on page 9-7</a> .	

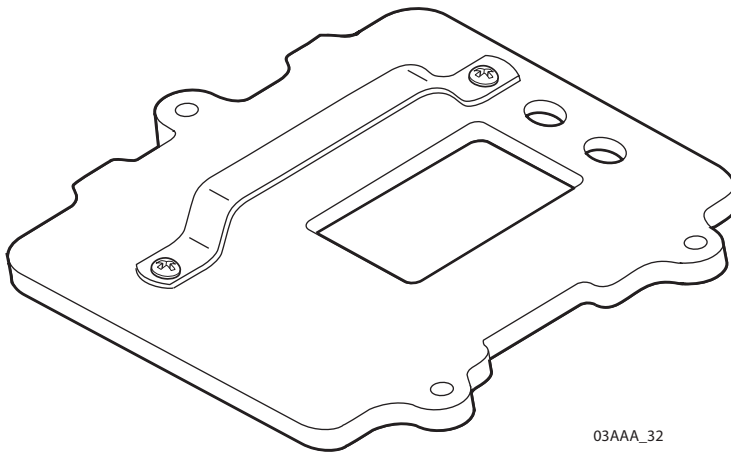
<b>(Continued) Part</b>	<b>Part Number</b>	<b>Used with Antenna</b>	<b>Used with GTT (terminal)</b>
Antenna mounting bracket (L-shape)	50-J5558-1	Bracket for use with the antenna mount plate (see <a href="#">Antenna Mount Plate on page 9-8</a> ) to mount the antenna to a vertical surface. See <a href="#">Antenna Mounting Brackets on page 9-8</a> .	
Antenna mounting bracket (U-shape)	50-J5559-1	Bracket for use with the antenna mount plate (see <a href="#">Antenna Mount Plate on page 9-8</a> ) to mount the antenna to a horizontal surface. See <a href="#">Antenna Mounting Brackets on page 9-8</a> .	
Antenna mount plate (8" square)	50-J5563-1 (8" square)	8" square plate accommodates the antenna.  The mounting plate provides a good ground plane and can be used with the antenna mount brackets (see <a href="#">Antenna Mounting Brackets on page 9-8</a> ) to mount the antenna. See <a href="#">Antenna Mount Plate on page 9-8</a> .	This 8" plate can be used as a GTT mounting plate.

## GlobalTRACS Terminal Mounting Parts

The following mounts and assemblies may be used to customize or assist an installation of the GTT.

### Terminal Mounting Template Assembly

The GlobalTRACS Terminal Mounting Template Assembly (10-J5626-1) can be used as a drill template for creating mounting holes in the equipment during GTT installation and as a welding jig to position terminal weld brackets. It is also useful as a jig for welding the [Terminal Weld Bracket on page 9-4](#) to the equipment.

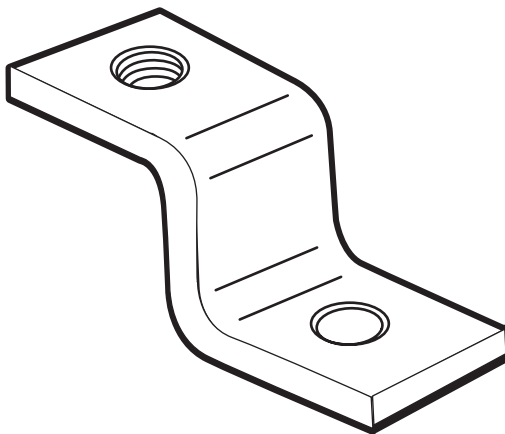


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### Terminal Weld Bracket

The GlobalTRACS Terminal Weld Bracket (50-J5627-1) is a 3/16" thick, uncoated steel Z-bracket that can be used to mount the GTT. It features two drilled holes, one is 1/4-20 threaded; the other is .290 diameter through. It can be either welded or bolted into place on the equipment. **After installation this bracket must be painted.**

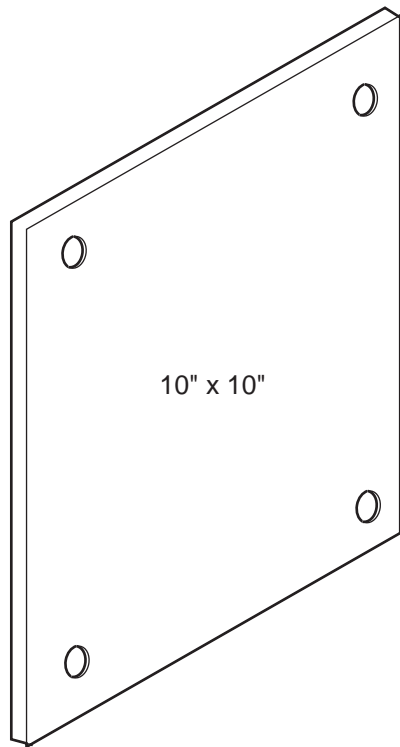
The [Terminal Mounting Template Assembly on page 9-4](#) can be used to aid in positioning this bracket.



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**Universal Terminal Mounting Plate**

The GlobalTRACS Universal Terminal Mounting Plate (50-J5628-1) is a 10" x 10", 3/16" thick steel, powder-coated plate that can be cut, welded, and mounted with hardware to the equipment. By attaching the plate to the equipment and then installing the GTT to the plate, it provides extra support for the GTT at its installation location.



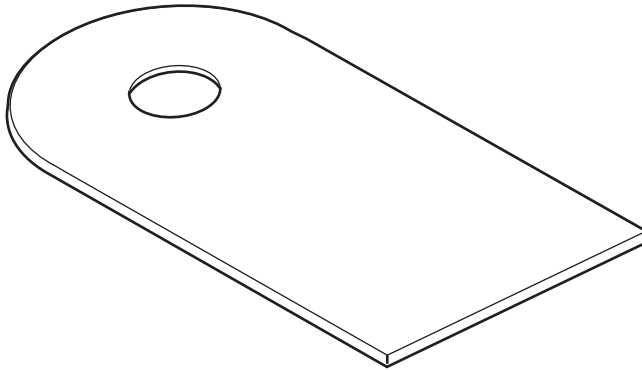
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## GlobalTRACS Antenna Mounting Parts

The following mounts and assemblies may be used to customize or assist an installation of the GlobalTRACS antenna.

### Flat Antenna Mounting Plate

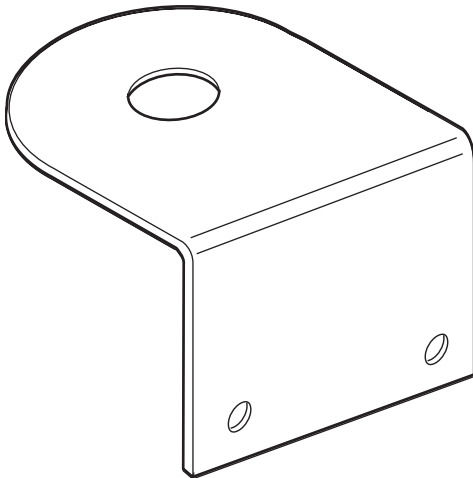
The GlobalTRACS Flat Antenna Mounting Plate (50-J5583-1) is a 1/8" thick steel, powder-coated plate that can be bent to shape, cut, drilled, and welded to accommodate the antenna.



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### Right Angle Antenna Mounting Plate

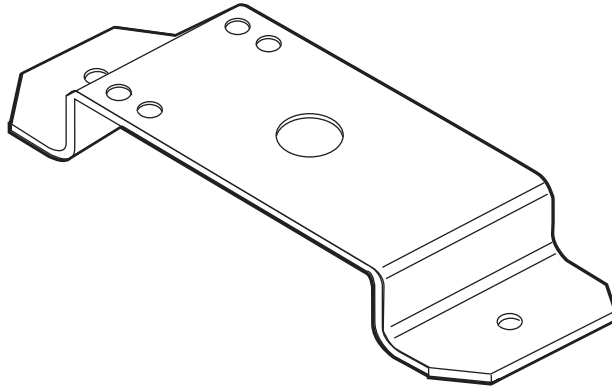
The GlobalTRACS Right Angle Antenna Mounting Plate (50-J5584-1) is a 1/8" thick steel, powder-coated plate that can be bent to shape, cut, drilled, and welded to accommodate the antenna.



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**Mount Antenna Plate**

The GlobalTRACS Mount Antenna Plate (50-J5630-1) is a 1/8" thick steel, powder-coated plate that can be used to mount either the antenna. The mount antenna plate can be welded, cut, or bent for a custom antenna mount.



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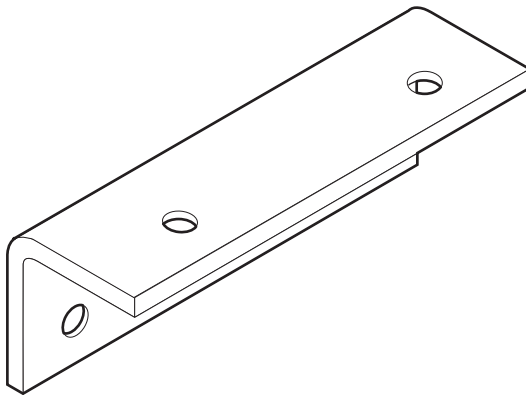
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## Antenna Mounting Brackets

The following GlobalTRACS mounting brackets can be used alone or with the square [Antenna Mount Plate on page 9-8](#) to mount the antenna to a vertical or horizontal surface.

### L-shape Antenna Mounting Bracket

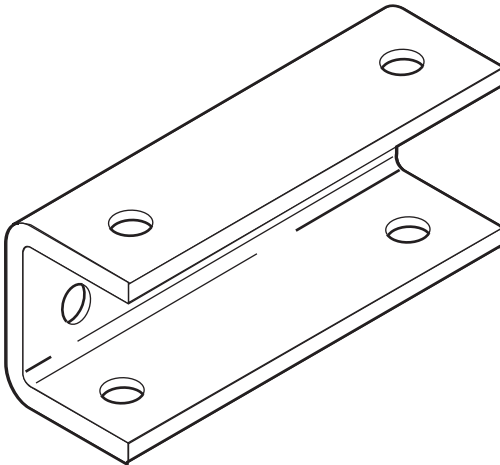
The L-shape Antenna Mounting Bracket (50-J5558-1) can be used to mount the antenna to a vertical surface with a square, 6" or 8" antenna mount plate. (See [Antenna Mount Plate on page 9-8](#).)



03AAA\_47

### U-shape Antenna Mounting Bracket

The U-shape Antenna Mounting Bracket (50-J5559-1) can be used to mount the antenna to a horizontal surface with a square, 6" or 8" antenna mount plate. (See [Antenna Mount Plate on page 9-8](#).)



03AAA\_48

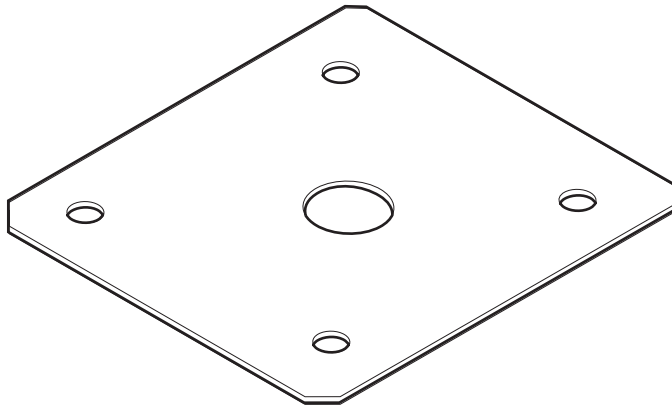
## Antenna Mount Plate

The following GlobalTRACS square mount plate provides a good ground plane for the antenna. The mount plate can be used alone or with other antenna mount assemblies.



**Square Antenna Mount Plate—8"**

The 8" square antenna mount plate (50-J5563-1) provides a good ground plane for the antenna. It can also be used as a terminal mounting plate.



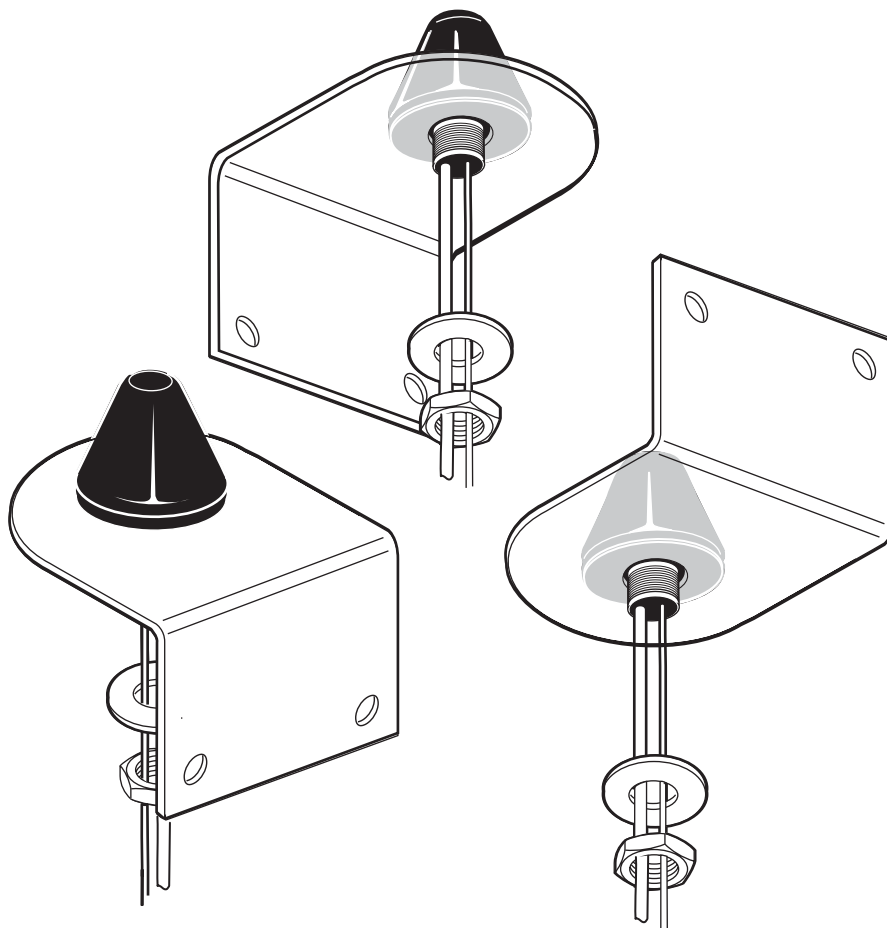
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## Sample Antenna Mount Assembly

The following illustrations show a typical antenna mount assembly using the Right Angle Antenna Mounting Plate (50-J5584-1).



03AAA\_51

If you have questions about the GlobalTRACS system mounts and brackets, please contact QWBS Technical Support Hotline.

In the United States, call 800-541-7490;  
in Canada, call 800-863-9191.

# A

## **GlobalTRACS<sup>®</sup> Standard Return Material Authorization Procedure**

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This appendix describes QUALCOMM's Return Material Authorization (RMA) procedure and policies as they apply to GlobalTRACS<sup>®</sup> products that need to be returned for replacement. For detailed information on the RMA procedure for all other current QUALCOMM Wireless Business Solutions (QWBS) products, refer to *Standard RMA Procedure*, 80-30184-1.

*Topics include:*

<i>The Return Material Authorization Process . . . . .</i>	<i>A-1</i>
<i>How to Obtain an RMA Number. . . . .</i>	<i>A-2</i>
<i>RMA Fax Request Form. . . . .</i>	<i>A-4</i>
<i>RMA Policies . . . . .</i>	<i>A-5</i>

### **The Return Material Authorization Process**

RMAs are used whenever equipment must be returned. They authorize, schedule, and track the return, repair or replacement, and shipment of equipment.

The RMA process involves three separate events:

- You request an RMA number.
- QUALCOMM arranges shipment of a replacement component to you.
- You return a failed component to the address specified by QUALCOMM.

The RMA process is started when you request an RMA number. The RMA number is a reference number that is used to track the status of each part as it moves through the RMA process. After you are issued the RMA number, a replacement part will be shipped to you. You are responsible for returning the defective equipment to the address specified by QUALCOMM within 14 days.

## How to Obtain an RMA Number

There are three ways to obtain an RMA number:

- Visit our website at [www.qualcomm.com/qwbs/](http://www.qualcomm.com/qwbs/) (see the Returns & Warranties section).
- Call QUALCOMM Wireless Business Solutions Technical Support Hotline at 800-541-7490 and request an RMA number.
- Complete an *RMA Fax Request Form* and fax it to QUALCOMM at 858-658-1598.

### Note

*If you have five or more items to RMA, we recommend that you send a fax form.*

Our website provides customers with an *RMA Fax Request Form*. If you call the Hotline between 6:00 a.m. and 5:00 p.m. Pacific time, Monday through Friday, you can be issued an RMA number over the phone. If you use an *RMA Fax Request Form*, you will receive an RMA number by return fax that same day during normal business hours or by 8:00 a.m. Pacific time the next business day.

## Required Information

In any case, before the RMA number can be issued, you need to provide QUALCOMM with the following information (which is based on filling out an *RMA Fax Request Form*).

**Date.** The date that you are sending the form to QUALCOMM.

**Customer Name and Contact.** The name of the company that is requesting the RMA and the name of the person making the RMA request.

**“Ship to:” Address.** The complete address where the replacement component is to be shipped, plus the name of the person to whose attention the package should be addressed.

**Delivery Priority.** All replacements are **typically** shipped within 48 hours (two business days). If you require 24-hour delivery, you will need to include your shipper account number. (This is your FedEx or UPS account number.) The cost of shipping for 24-hour delivery will be billed to your shipper account number.

**Return Code.** The code that best describes the reason you are returning the unit. Frequently used codes include:

CD	<b>Customer Damage.</b> Any damage that occurred due to improper or negligent use of the equipment by the customer. Customer damage may be caused by an accident, incorrect installation, mishandling, or intentional abuse. A purchase order number is required in order to process a customer damage RMA.
DOA	<b>Dead on Arrival.</b> A component is considered DOA if it fails to function when taken out of the box at installation.
FF	<b>Field Failure.</b> A working unit that has failed in the field after installation.
OE	<b>Order Error.</b> Receipt of wrong parts or of parts not ordered.
SE	<b>Shipping Error.</b> The correct part was ordered but the wrong part was received.

UP	<b>Upgrade.</b> The return of a working unit for an upgraded model. Upgrades can be made to software or hardware. Use of this return code requires a contractual amendment and a purchase order number.
----	---

**Equipment ID Number.** The identification number of the equipment on which the component was installed.

**Unit ID (System Serial Number).** This identification number is required to verify correct ownership of the system. It is also used to determine warranty status of the unit. The serial number decal is affixed to the component chassis. (Do not include the leading zeros in a serial number.)

**Part Number (Product ID/MCN).** Due to the multiple variations of QUALCOMM equipment, the part number—Material Control Number (MCN)—must be provided to ensure that the correct replacement part is shipped. Be sure to verify the part number by looking at the actual part being returned, not by checking a pre-defined parts list.

**Failed Serial Number.** A serial number (S/N) is required for each serialized component on an RMA. For GlobalTRACS, this is the GlobalTRACS terminal. The serial number decal is affixed to the component chassis. (Do not include the leading zeros in a serial number.)

**Replacement Serial Number.** The serial number (S/N) of the unit that was installed to replace the failed part listed on the RMA. (Do not include leading zeros in a serial number.)

**Purchase Order.** A purchase order (P.O.) number may be required when an item is customer damaged or when you are requesting an upgrade.

**Failure Description.** A complete description of the problem associated with the GlobalTRACS unit. Please be specific. QUALCOMM needs as much information as possible to effectively duplicate the failure, diagnose the problem, and repair the failed unit. It is better to give too much information than not enough information. Descriptions such as “Unit not operating” or “Not working” do not provide enough information.

All other fields on the Fax Request Form will be completed by QUALCOMM.

### **RMA Fax Request Form**

You can fill out the RMA Fax Request Form shown below instead of phoning in to create an RMA number. You can request one or more RMAs using this form which is also available on our website at [www.qualcomm.com/qwbs/](http://www.qualcomm.com/qwbs/).

Fax the completed form to 858-658-1598. After receiving the fax, QUALCOMM will assign the RMA number(s) and contact you via a return fax.

During normal Customer Support Administration business hours (6:00 a.m. to 5:00 p.m., Pacific time, Monday through Friday), the completed RMA form, showing the assigned RMA number(s), will normally be faxed back to you that same day during normal business hours or by 8:00 a.m. Pacific time the next business day.

Rev 12/13/99 omni-fs1

Return Material Authorization (RMA) - for Customers							
Date: _____	FAX RMA Request Form		Ship To: _____				
Customer: _____							
Contact: _____	Hotline: (800) 541-7490						
	RMA FAX: (858) 658-1538						
Phone: _____							
FAX: _____							
<b>Delivery:</b> 48 hr. ( 2 business days) <b>For 24 hr. shipment,</b> please include FedEx or UPS Account number: _____							
RMA Number	Return Code <small>*See Below</small>	Truck or Vehicle Number	Unit ID <small>(System Serial #)</small>	Failed Part		Replacement Serial Number	P.O. Number <small>Required for Upgrade or Customer Damage</small>
				Part Number <small>(Product ID/MCN)</small>	Serial Number		
		Complete Failure Description ---->					
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**\*Return Codes:** CD=Customer Damage, DA=Dead on Arrival, FF= Field Failure, UP= Upgrade.

\* Please return required items to QUALCOMM within 14 days.

## **RMA Policies**

### **What to Return/Not Return**

Normally, **all** failed equipment must be returned for repair or replacement. The following major system components **need to be returned**:

- GlobalTRACS terminal (GTT)
- Any Dead on Arrival (DOA) component

There are a few **exceptions** to this policy. You are **not required to return** the following components **unless** they are Dead on Arrival.

- Cables
- Antennas

Any components that are found to be Dead on Arrival (DOA) within 90 days of shipment, including cables and antennas, must be returned to QUALCOMM for failure analysis. If available, please provide the Lot Date Code for the defective component when you request the RMA. If possible, return the defective component in its original packaging.

### **Where to Return Equipment**

Please return equipment to QUALCOMM at the following address. Make sure that the RMA number is marked clearly on the outside of the box.

QUALCOMM Incorporated  
5525 Morehouse Drive  
San Diego, CA 92121  
Attn.: QWBS Repair Center

RMA #: \_\_\_\_\_

800-541-7490

To prevent damage during shipment and handling, carefully package all equipment being returned. If the original shipping container and packing material are available, please use them to return the equipment.

### **"Past Due" Equipment**

QUALCOMM's standard policy is to "advance replace" equipment when the RMA number is issued. This means that a replacement component will be shipped before the defective component is received at QUALCOMM. Customers are responsible for returning the failed equipment to QUALCOMM within fourteen (14) days after receiving the RMA number.

If the failed items are not received within this time period, QUALCOMM may invoice the customer for the higher of the current price or the applicable spare part price for the component. In addition, customers with "past due" equipment will be notified that QUALCOMM will discontinue its "advance replace" RMA policy and future RMAs will be

considered “no advance replace.” This means that a replacement component will not be shipped until the defective component is received at QUALCOMM. When all the past due components are received by QUALCOMM or paid in full, QUALCOMM may resume advance replacement of failed equipment. Certain upgrade programs may be structured as no advance replace.

### **Customer-Damaged Equipment**

Customer-damaged items are those which have been damaged as a result of improper or negligent use of the equipment. This can include accidental damage, incorrect installation, mishandling, or intentional abuse. Customer-damaged equipment must be identified at the time the RMA is requested.

### **Repair or Scrap Equipment**

If an RMA item cannot be repaired, it will be declared “scrap.” The “scrap” determination will be made if the cost of repairing the item exceeds the cost of replacing it. The following types of damage usually result in the GlobalTRACS terminal being scrapped: Crushed, internal corrosion, fire damage, or cracked housing.



#### **Caution**

*Never open the GlobalTRACS terminal. Breaking the seal voids the warranty and causes it to be treated as a customer-damaged item.*

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### **Missing, Lost, Stolen, or Destroyed Equipment**

It is not necessary to obtain an RMA number for missing, lost, stolen, or destroyed equipment since nothing will be returned to QUALCOMM. Replacements for missing, lost, stolen, or destroyed equipment should be ordered through Sales Administration as spare parts. P.O. numbers are required for all spare parts orders.



## Glossary

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<b>Term</b>	<b>Definition</b>
<b>Antenna</b>	A digital PCS/cellular/GPS antenna communicating with a wireless network combined into one unit. The antenna is rugged and durable. It has a 20-foot IF and REF cable attached to the bottom of the unit.
<b>Antenna cable</b>	The antenna cable connects the antenna to the GTT.
<b>Cables</b>	Cables provide interconnection between all GlobalTRACS components, as well as to the power source.
<b>Cellular/Personal Communications Service (PCS) Wireless Network</b>	Radio Frequencies (RF) signals are received through a PCS or cellular antenna by GlobalTRACS from a wireless communication network (varies depending on geographic location).
<b>Code Division Multiple Access (CDMA)</b>	A digital wireless technology in which users share time and frequency allocations that are divided into channels using unique assigned codes.
<b>Configuration tool</b>	A computer (usually a PC) used to configure the GlobalTRACS system.
<b>Equipment utilization</b>	Allows GlobalTRACS customers to know when equipment is being used or when it is sitting idle.
<b>Fleet Management Center (FMC)</b>	This facility is the customer's management center. The customer's computer communicates with the Network Management Computer (NMC) in order to receive messages from the fleet.
<b>Geofencing</b>	A logical boundary that uses latitude and longitude limits (a zone) to create the equivalent of an electronic fence. An alarm system alerts customers when equipment is moved into or out of that predefined geographical zone.

<b>Global Positioning System (GPS)</b>	Signals are received through a GPS antenna from the GPS constellation of 24 strategically placed satellites. Signals from the satellites determine the equipment's location, which is then reported to the Network Management Computer (NMC) by GlobalTRACS.
<b>GlobalTRACS</b>	The GlobalTRACS equipment management system is installed on a customer's equipment. GlobalTRACS sends messages to customers via an antenna over a terrestrial network. GlobalTRACS also computes vehicle location information using GPS technology.
<b>GlobalTRACS Terminal (GTT)</b>	The GTT is the heart of the GlobalTRACS system. It is the interface between the equipment and the equipment manager. It allows customers to receive messages about the equipment via an antenna mounted on the vehicle.
<b>GTRACS Web</b>	QUALCOMM's GlobalTRACS Web is the application used by the customer. This is the customer's interface with the GlobalTRACS system. It allows customers to receive messages, request equipment location information, and perform other functions. The customer's computer communicates with the Network Management Computer (NMC) via the Internet.
<b>Network Management Computer (NMC)</b>	The high-level controller for the OmniTRACS network. It coordinates message transmission between customers and mobile units, and tracks mobile unit positions. The U.S. OmniTRACS network configuration consists of multiple NMCs.
<b>Network Operations Center (NOC)</b>	<p>This facility is responsible for processing and managing the message traffic between the customer and the construction equipment. Within the NOC is the Network Management Computer (NMC), which actually receives and handles the message traffic. The NOC is located at QUALCOMM in San Diego, CA. A fully redundant back-up facility exists in Las Vegas, NV.</p> <p>This term refers to the service center that contains the hardware and software necessary to support communication (satellite and terrestrial) to and from mobile units.</p>
<b>Over the air</b>	Involves using the forward or return channel via the communication network, which may either be satellite or terrestrial.

## Glossary

<b>Personal communication service (PCS)</b>	A lower-powered, higher-frequency digital technology competitive with cellular technology. PCS generally operates in the 1.5 to 1.8 GHz range.
<b>Power/signal cable</b>	The power/signal cable connects the 12V or 24V power source and system ground to the GTT. The cable also contains the run signal used to measure engine hours.
<b>QWBS</b>	QUALCOMM Wireless Business Solutions
<b>Received signal strength indicator (RSSI)</b>	The received signal strength indicator measured in dB on a gateway. (This value will display as a negative number.) The approximate normal range of values is between -115dB and -80dB.
<b>RF</b>	Radio frequency
<b>Terminal</b>	The rugged hardware component that houses the GlobalTRACS technology. All cables connect to the terminal for system functionality.

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