

INSTALLATION GUIDE

Trimble® DCM300 Telematics



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INSTALLATION GUIDE

Trimble® DCM300TM Telematics

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Release Notice

This is the November 2010 release (Revision A) of the *DCM300 Telematics Installation Guide*.

Limited Warranty Terms and Conditions

Product Limited Warranty

Subject to the terms and conditions set forth herein, Trimble Navigation Limited (“Trimble”) warrants that for a period of (1) year from date of purchase this Trimble product (the “Product”) will substantially conform to Trimble’s publicly available specifications for the Product and that the hardware and any storage media components of the Product will be substantially free from defects in materials and workmanship.

Product Software

Product software, whether built into hardware circuitry as firmware, provided as a standalone computer software product, embedded in flash memory, or stored on magnetic or other media, is licensed and not sold. If accompanied by a separate end user license agreement, use of any such software will be subject to the terms of such end user license agreement (including any differing limited warranty terms, exclusions and limitations), which shall control over the terms and conditions set forth in this limited warranty).

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How to Obtain Warranty Service

To obtain warranty service for the Product, please contact your Trimble Construction Services dealer. Alternatively, you may contact Trimble to request warranty service at 1-888-801-4363 (toll free) or 1-720-457-0189 (24 hours a day) or e-mail your request to trimble_support@trimble.com. Please be prepared to provide:

- your name, address, and telephone numbers
- proof of purchase –this Trimble warranty card
- a description of the nonconforming Product including the model number
- an explanation of the problem.

The customer service representative may need additional information from you depending on the nature of the problem.

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(v) normal wear and tear on consumable parts (e.g., batteries). Trimble does not warrant or guarantee the results obtained through the use of the Product. NOTICE REGARDING PRODUCTS EQUIPPED WITH TECHNOLOGY CAPABLE OF TRACKING SATELLITE SIGNALS FROM SATELLITE BASED AUGMENTATION SYSTEMS (SBAS) (WAAS/EGNOS, AND MSAS), OMNISTAR, GPS, MODERNIZED GPS, OR GLONASS SATELLITES, OR FROM IALA BEACON SOURCES: TRIMBLE IS NOT RESPONSIBLE FOR THE OPERATION OR FAILURE OF OPERATION OF ANY SATELLITE BASED POSITIONING SYSTEM OR THE AVAILABILITY OF ANY SATELLITE BASED POSITIONING SIGNALS.

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Registration

To receive information regarding updates and new products, please contact your Trimble dealer or visit the Trimble website at www.trimble.com/register. Upon registration you may select the newsletter, upgrade or new product information you desire.

Notices

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the telematics device is connected.
- Consult the dealer or an experienced radio/TV technician for help.
- Cover the telematics device harness in a grounded shield wrap or run through a grounded shielding conduit.

Trimble DCM300C FCC Identifier: JUP-WCDCM300C
Contains FCC ID N7N-MC5728

Trimble DCM300C complies with FCC radiation exposure limits set forth for an occupational/controlled environment. This equipment should be operated with a minimum distance of 20cm between the radiator and your body.

Trimble DCM300C is certified for use with the following antennas:

Pulse NMO5E2400B (WIFI): +5dBi

Mobilemark RM3-2400 (WIFI): +5dBi

WIFI antennas to be fitted with reverse polarity TNC connector.

For GSM850 and PCS1900 operation, in order to maintain compliance with FCC RF exposure requirements, antennas with gains plus cable losses not exceeding 5.0dBi (850MHz) and 4.7dBi (1900MHz) must be used.

Approved antenna types are:

Pulse IP67 W4120GW5000 (GSM850, PCS1900): 0dBi gain

Taoglass MA.104 "Hercules" (GSM850, PCS1900): 0dBi Gain

Wilson NMO Cellular Antenna, 301104 (GSM850, PCS900): +5dBi Gain +cable loss

Trimble DCM300G FCC Identifier: JUP-WCDCM300G
Contains FCC ID QIPHC25

Trimble DCM300G complies with FCC radiation exposure limits set forth for an occupational/controlled environment. This equipment should be operated with a minimum distance of 20cm between the radiator and your body.

Trimble DCM300G is certified for use with the following antennas:

Pulse NMO5E2400B (WIFI): +5dBi

Mobilemark RM-2400 (WIFI): +5dBi

WIFI antennas to be fitted with reverse polarity TNC connector.

For GSM850 and PCS1900 operation, in order to maintain compliance with FCC RF exposure requirements, antennas with gains plus cable losses not exceeding 8.7dBi (850MHz) and 4.4dBi (1900MHz) must be used.

Approved antenna types are:

Pulse IP67 W4120GW5000 (GSM850, PCS1900): 0dBi gain

Taoglass MA.104 "Hercules" (GSM850, PCS1900): 0dBi Gain

Wilson NMO Cellular Antenna, 301104 (GSM850, PCS900): +5dBi Gain +cable loss

Trimble DCM300C and Trimble DCM300G comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

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

Canada

Pour DCM300G:

Trimble DCM300G conforme à l'exposition de l'industrie rayonnement Canada limites établies pour un travail / environnement contrôlé. Cet équipement doit être utilisé avec une distance minimale de 20 cm entre le radiateur et votre corps.

Trimble DCM300G est certifié pour une utilisation avec les antennes suivantes:

Pulse IP67 W4120GW5000 (GSM850, PCS1900): Gain 0dBi

Mobilemark RM-2400 (WIFI): +5dBi

WIFI antennes à être montés avec une polarité inverse connecteur TNC.

Pour un fonctionnement GSM850 et PCS1900, afin de maintenir la conformité aux exigences d'exposition aux RF IC, les antennes avec des gains et des pertes de câble dépassant pas 8.7dBi (850MHz) et 4.4dBi (1900MHz) doit être utilisé.

Types d'antennes sont approuvés:

Pulse IP67 W4120GW5000 (GSM850, PCS1900): Gain 0dBi

Taoglass MA.104 "Hercules" (GSM850, PCS1900): Gain 0dBi

Wilson NMO Antenne cellulaire, 301 104 (GSM850, PCS900): +5 Gain dBi + perte du câble

Trimble DCM300G complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

This radio transmitter 1756A-DCM300G has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio 1756A-DCM300G a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Europe

Trimble DCM300G is intended to be used in all EU member countries. This product has been tested and found to comply with the requirements for a Class B device pursuant to European Council Directive 89/336/EEC on EMC, thereby satisfying the requirements for CE Marking and sale within the European Economic Area (EEA). These requirements are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential or commercial environment.



R&TTE Directive 1999/5/EC

Hereby, Trimble Navigation declares that the Trimble DCM300G devices are in compliance with the essential requirements and other relevant provisions of R&TTE Directive 1999/5/EC.

Notice to Our European Union Customers

For product recycling instructions and more information, please go to www.trimble.com/ev.shtml. Recycling in Europe: To recycle Trimble WEEE (Waste Electrical and Electronic Equipment, products that run on electrical power.), Call +31 497 53 24 30, and ask for the "WEEE Associate". Or, mail a request for recycling instructions to: Trimble Europe BV c/o Menlo Worldwide Logistics Meerheide 45 5521 DZ Eersel, NL.



Additional Regulatory Conformance

This product has successfully completed the PTCRB requirements governing the release of new GSM 850/900/1800/1900 capable products into the global market.

Declaration of Conformity

We, Trimble Navigation Limited,
935 Stewart Drive PO Box 3642 Sunnyvale, CA 94088-3642 United States +1-408-481-8000
declare under sole responsibility that the product: DCM300 complies with Part 15 of FCC Rules.
Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

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Section 1

Introduction

Welcome to the DCM300 Installation Guide. This document describes how to install and verify initial operation of DCM300 M2M data radio.

Even if you have installed and operated other telematics devices before, Trimble recommends that you spend some time reading this manual to learn about the special features of this product. If you are not familiar with GPS or vehicle telematics, visit the Trimble website (www.trimble.com) for an interactive look at Trimble and these technologies.

About the DCM300

The Trimble DCM300 device comes in two models. The DCM300G supports GSM cellular communications. The DCM300C supports CDMA cellular communications. Both variants offer GPS positioning, cellular communications, Ignition sense, three digital inputs, WiFi, and wired communications using CANbus (two channels), RS-232, USB, and Ethernet. The Trimble DCM300 devices are designed to operate reliably in very harsh installation environments including all types of heavy construction equipment. These devices can be installed in-cab or out-of-cab.

Related information

Sources of related information include the following:

- Support Notes – Product support notes describe new features of the product, information not included in the installation guide, and information on machine model-specific installation. They are available from Trimble Support and the Trimble Construction Services Sales team.
- Trimble training courses – Consider a training course to help you use your GPS telematics system to its fullest potential. For more information, go to the Trimble website at www.trimble.com/training.html.

Technical Support

If you have a problem and cannot find the information that you need in the product documentation, contact your local Trimble Construction Service dealer or go to the Support area of the Trimble website (www.trimble.com/support.shtml). Select the product you need information on. Product updates, documentation, and any support updates are available for download.

If you need to contact Trimble technical support, complete the online inquiry form at www.trimble.com/support_form.asp.

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Device Overview

In this section:

- **Exterior Description**
- **Electrical Connector**
- **Antenna Connectors**
- **Mounting Hardware**

This section introduces the Trimble DCM300 M2M data modems. These units make it easy to receive status information from all types of construction assets to effectively manage them.

The DCM300 telematics devices are ideal for the following applications:

- Heavy earthmoving equipment – track type tractors, scrapers, motor graders, etc.
- On/Off Road equipment – dump trucks, aggregate haulers, service trucks, etc.
- Portable assets with engines – generators, compressors, pumps, etc.

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Exterior Description

The Trimble DCM300 devices are rugged telematics and data communications appliances. The device enclosure is made of heavy duty aluminum. The exterior has six faces-a bottom, top, and four sides. The front face of the device contains the electrical harness connector and antenna ports. The bottom of the device and includes the four mounting through-holes. Figure 1 below provides labels for most of these items.



Figure 1 - DCM300 Exterior

Electrical Connector

The main harness connector on the front face is a 34 pin weatherproof electrical connector with a mechanical locking system. The connector pinout and basic harness configuration are described in Appendix A of this document.

Each machine installation may utilize a specialized wiring harness depending on the telematics features available on that particular machine. Trimble recommends that only harnesses provided by Trimble or by your machine's original equipment manufacturer be used with the DCM300 device.



Important – If adding additional conductors to a factory harness, the conductors must be at least 18AWG. Larger conductors are acceptable.

Antenna Connectors

The DCM300 devices have connectors for three external antenna elements. Using standard components, each of these connectors attaches to a single antenna unit. The GPS antenna connector is an SMA female unit. The M2M GSM cellular modem connector is a TNC female unit. The WiFi antenna connector is a reverse polarity TNC female unit. Figure 2 below shows the locations of these connectors.



Figure 2 -Front Face

Mounting Hardware

DCM300 devices have four through-hole mounting points. These are located at the four outside corners of the bottom face. It is important to use the proper mounting hardware to install these devices. The device is intended to be rigidly mounted to the asset to be monitored. No shock mounts are required.

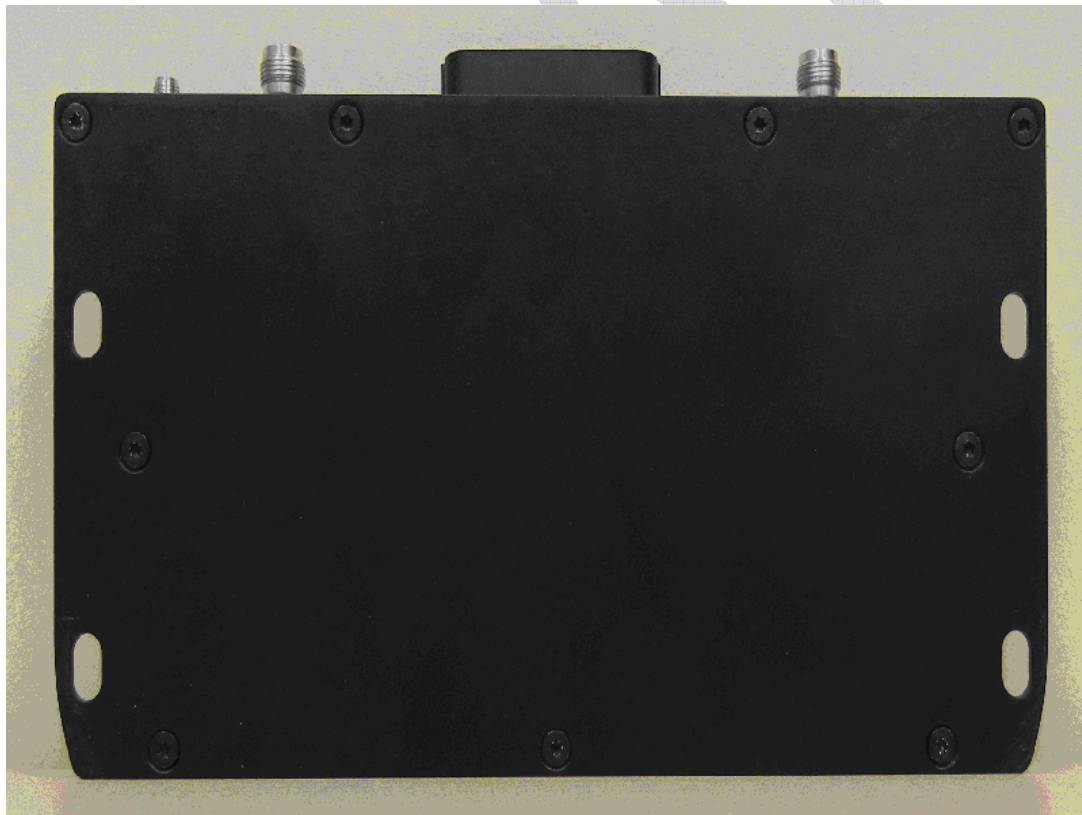


Figure 3- DCM300 Bottom Showing Mounting Holes

Device Installation

In this section:

- **Main Unit Location Determination**
- **Wiring Harness Route Planning**
- **Antenna Location Determination**
- **Main Unit Installation**
- **Antenna Installation**
- **Electrical Connections/Harness Installation**
- **SIM Card Installation**

This section describes the general procedure to install an DCM300 device and its necessary peripherals. The installer is expected to have a basic knowledge of mechanical and electrical technical operations. See Appendix C for a list of recommended tools and supplies for installation. Before installing any telematics device, note its serial number for later reference.

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General Installation Requirements

The general requirements for a system installation are to install the main unit, antennas, and wiring harness. From a high level, this is a very simple process. There are details to consider in each of these installation subprocedures. This section describes each of these items as a standalone topic in order to provide adequate detail. While reading this section, imagine the machine in which you will be installing and consider how these procedures will have to be altered for that machine. If you do not have a specific machine on which to install, use the vibratory compactor shown in Figure 4 as an example. It is important to keep all three of these installation items in mind during planning. The location of the antennas or the available route for the wiring harness could affect the location of the main unit.



Figure 4 - Sample Installation Asset

Main Unit Location Determination

Determining the mounting location of the DCM300 main device is an important part of the overall installation process. The device is intended to be installed in any location where an electronic control module (ECM) might be installed. ECMs are commonly installed in the cab or out of the cab in a service compartment. There are several factors to keep in mind when determining this location. These include:

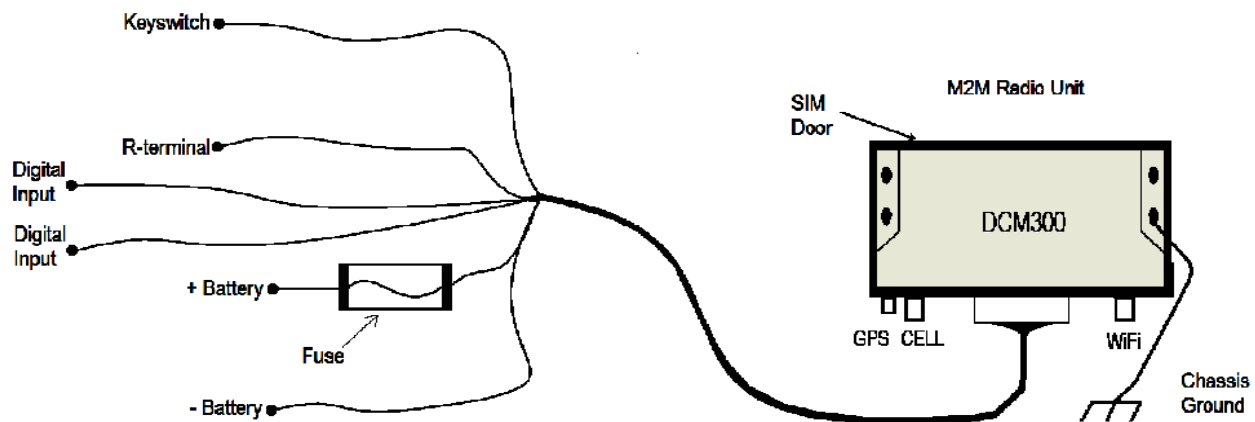
- Moisture - The device has a waterproof housing. However, you should take reasonable care to ensure that the unit is not continually exposed to water.
- Dirt/Debris – The device can withstand intrusions by solids but do not install it in a location where it will become caked in mud. This could lead to overheating.
- Heat – The device should not be installed in an overly hot environment. Do not mount the device in direct contact with a heat dissipating structure. If mounting near a radiator, the device must be on the cool air side of the radiator.
- Sunlight – Sunlight will not damage the device but solar energy will heat the device

potentially beyond its operating range. Install in a shaded location if possible.

- Chemical exposure – Do not install the device where it will be continually sprayed by chemicals including fuel, oil, and hydraulic fluid.
- Airflow – The device should be installed in a location with free airflow if possible. This may not be a concern in extremely cold environments.
- Accessibility – The device should be installed in a location that is easily accessible for service.
- Security – If possible, the device should be installed in a compartment that will be locked when the asset is unattended. Alternatively, the device should be installed where it is not easily sighted to reduce the chances of tampering.
- Shock and Vibration – The DCM300 is designed for use on construction equipment. Attaching to the vehicle chassis or body is standard procedure and will work well. Do not attach the device to a subcomponent that is prone to extreme shock or vibration. Examples of undesirable attachment locations include the engine block, vibratory implements, and suspension components.
- Mounting space – There must be a flat attachment area with minimum dimensions of 230mm x 185mm.
- Main Harness access – It must be possible to route the main harness to the location of the DCM300 device.
- Coaxial Connector access – It must be possible to access the coaxial connector face of the device and to attach cables to that face. Note that the connector face of the device is one of the longer (215mm) sides of the enclosure.
- Antenna cable access – It must be possible to route the antenna cables between the antenna locations and the DCM300 device location.
- Electrical Interference – The DCM300 device operates well in electrically noisy environments but installation best practices include avoiding close proximity to alternators, generators, electric motors, DC to AC converters, switching power supplies, and arc welding equipment. If electrical interference is suspected, enclose the DCM300 device wiring harness in a grounded shield wrap or grounded conduit.
- Nearby connection to the asset's CANbus data bus. Limiting the length of this portion of the wiring harness will reduce the likelihood of affecting data bus performance.

Wiring Harness Route Planning

The wiring harness must have its 34 pin connector located at the main unit location. The other end of the conductors may go to various locations. Now that the location of the main unit is planned, locate the chassis conductors that will have to be attached to the main harness. Make sure that there is a route available for each conductor. Also make sure that it is possible to mechanically secure all conductors frequently along their routes. This will help eliminate chaffing and mechanical breakdown of the system wiring. Also plan the location of all inline fuses. These will have to be easily accessible for future maintenance. Plan to wrap as much of the harness and individual conductors as possible in a sheath of some sort to reduce the chances of damage. This sheath may be as simple a split loom or as complex as rigid conduit depending on available materials and the service duty expected on the particular machine. Figure 5 below shows some of the major connections common in many installations.



NOTE: All wires used in installation must be 18 AWG or larger

Figure 4 - Harness Wiring Diagram

Antenna Location Determination

The antenna locations will have a significant effect on the quality of your DCM300 device performance. It is not always possible to install the antennas in a perfect location but the installer should strive to eliminate compromises wherever possible.

The general requirements for the antenna locations and mounts are:

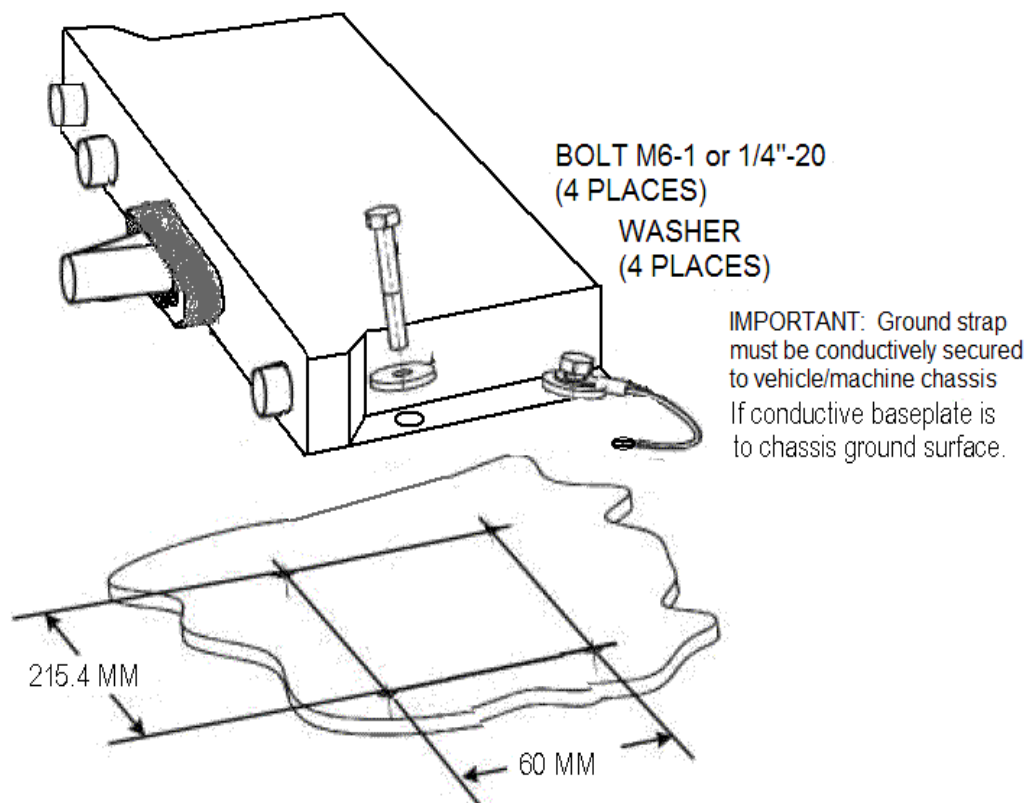
- Signal blockages - Clear sky from the zenith to the horizon, in all directions (360 degrees).
- Orientation - Antenna should be close to level with the receiving elements aimed skyward.
- Interference – Avoid antenna colocation. A separation of at least 1m(3.14') from radio signal transmitters is necessary.
- Separation – GPS/Cellular antenna and the WiFi antenna must be spaced at least 20cm from one another to comply with radio frequency regulations.
- Proximity to people – The antennas must be located at least 20cm away from the machine operator and any other occupants.
- Security – The antennas should not be easily sighted for tampering/disablement.
- Permanence – The antennas should be firmly attached to the asset so that they will not come loose due to shock, vibration, or thermal cycling.
- Space/Attachment point – There must be adequate space to adhere or mechanically attach the antennas to the asset.
- Distance to the Main Unit – It must be possible to connect the antennas to the DCM300 device with the available length of antenna cable.
- Electrical Isolation – If the antenna has a conductive housing, that housing must not connect to chassis ground.

Main Unit Installation

Once the mounting location is known, the main unit installation is a straightforward process. The mounting surface should be drilled to provide four mounting bolt holes. The dimensions of this hole array are 215.4mm x 60mm. The coaxial connectors are on one of the longer faces of the device which coincides with the 215.4mm mounting hole dimension. Be sure that there is connector access on one of the sides with the 215mm dimension. The drilled holes should be large enough to pass a 1/4" bolt through them.

Once the mounting bolt holes have been prepared, gather the required attachment hardware. This may include nuts and washers for the back side of the attachment face. Using bolts or bolts and nuts, secure the device to the mounting surface. Torque the attaching hardware to the proper specification.

Figure 5 - DCM300 Main Unit Mounting



Antenna Installation

Install the antennas in the locations selected using the criteria stated on the previous page. Follow the instructions for the particular antenna kit provided. Antenna installation will involve either bolting a mount to the asset or attaching an antenna using industrial double-sided tape. Protect the antenna coaxial cable at any locations where it might be subjected to abrasion or stress. Use conduit or split-loom for this. Attach the two antenna connectors to the main unit to complete the antenna installation process. Only hand tighten these connectors. Using tools will lead to over-tightening and connector damage.

Each antenna must be at least 20 cm away from any other antenna.
Wifi and Cell antennas must be at least 20 cm away from vehicle operator location.



Important - If the antenna used has a conductive housing, that housing must not connect to chassis ground.

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Main Harness Installation

The main harness provides all electrical signals to and from the DCM300 main unit. If using a main harness specifically designed for the make and model of construction asset on which you are installing, follow the manufacturer's instructions to install that harness.

The connection points to the asset's wiring will have to be located before making any connections. There are two signals that must be supplied to the device in any application – unswitched positive power and battery negative. Do not bypass the negative master disconnect switch in heavy equipment. Do not use chassis ground in place of battery negative. In order to track engine hours, the ignition sense signal wire should be connected to a ignition-switched source or the alternator's R-terminal. Any desired digital inputs will need to be connected to the main harness. If CANbus communications will be used, the proper two conductors for the vehicle bus must be located. A fuse should be installed on all power connections. If you must extend any of the main harness conductors for the installation, the wire used must be 18awg or larger. This means that the awg label number will be 18 or a lower number. Appendix A contains a complete description of the conductors in the main harness.

Before connecting any signal conductors, place the main harness 34 pin connector very near the DCM300 device's corresponding connector. Do not plug the harness in yet. With the connectors in close proximity, attach the main harness to the machine using tie wraps. This will ensure that the connectors can be mated after the harness has been wired to the asset.

Connect the Ground signal conductor (black) to a battery negative source. Connect the Unswitched Power conductor (red) to an uninterrupted source of positive voltage. Be sure to place a fuse inline with this connection. These two conductors are enough to provide basic device operation.

In order to track the asset's run time hours, the Ignition Sense wire (white) should be connected to the R-terminal on the engine alternator or a signal source that switches high when the ignition key is activated.

There are three digital inputs available on DCM300 devices. Digital Input 1 is active high. This means that the device will treat the input as active when the input signal on this line rises to the system voltage. Digital Inputs 2 through 4 are active low. This means that these inputs will be treated as active when the input signal is grounded.

The DCM300 also supports a single serial port and a dual CANbus ports. Trimble does not recommend that these be connected in a basic installation. If these connections are needed in an installation, please contact Trimble for additional details on connecting these items.

As a final step, mate the main harness connector to the 34 pin port on the DCM300 device.

Move the asset to a location where the GPS antenna has a clear sky view and cellular signal reception.

SIM Card Installation

In some regions, the factory SIM card in the DCM300G unit will need to be replaced with a card for a local cellular provider. If this is the case for the unit to be installed, follow the instructions in this section.

The SIM card installation should take place in a dry, clean environment. Before beginning work, discharge the DCM300 enclosure to chassis ground to reduce the chances of ESD damage. The SIM door is located at the back of the enclosure, away from the 34 pin connector.

- 1) Remove the two screws securing the SIM door.
- 2) Remove the SIM door. Place SIM door and screws to the side.
- 3) This SIM carrier needs to be ejected by pushing on the unlock button to the side of the SIM carrier.
- 4) Slide the SIM carrier out and turn upside down. Place SIM with the notched corner matching the notched corner in the carrier.
- 5) Turn SIM carrier upside down, with SIM facing the back of the case, SIM carrier with notch on the forward edge.
- 6) Carefully slide SIM carrier back into the SIM rails until it is seated in place.
- 7) Reinstall the door and 2 retaining screws and torque to 5 in/lbs.
- 8) Update the SIM door label to reflect the new SIM information.

Figure 4 - SIM Door Bottom Detail

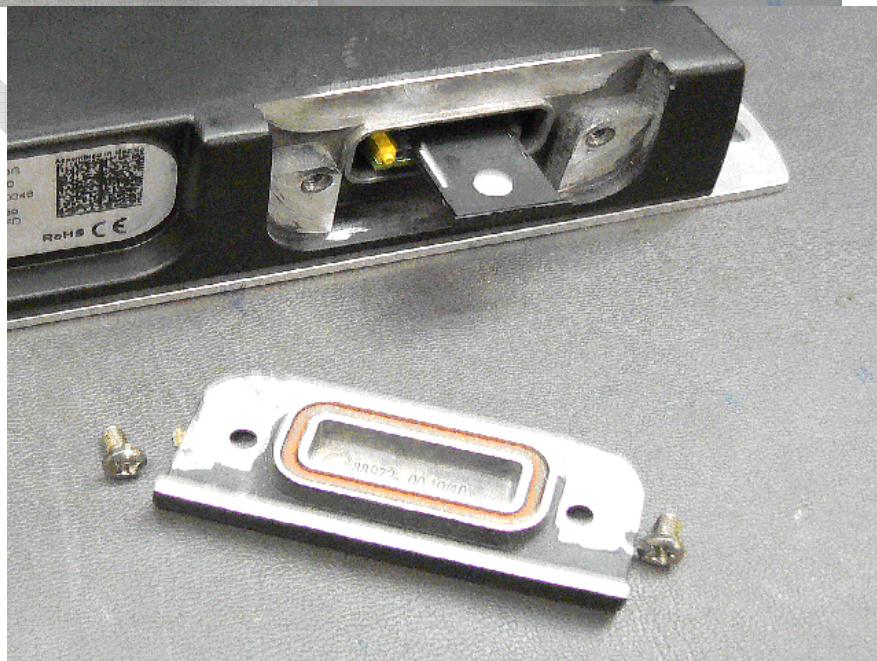
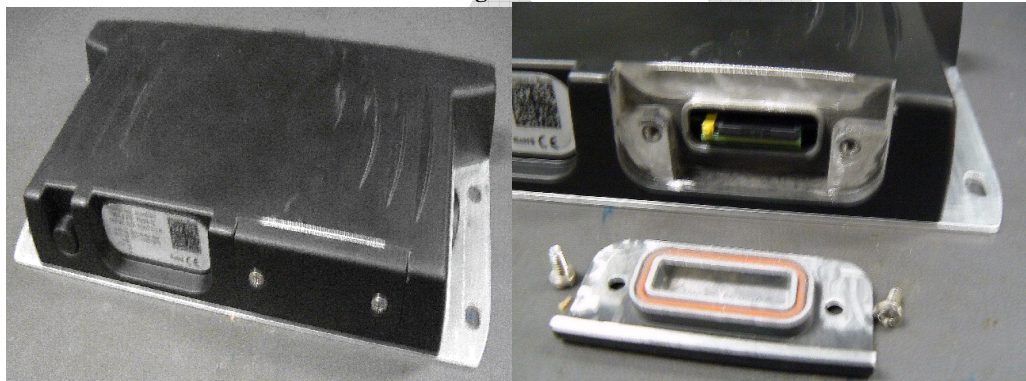


Figure 5 - SIM Carrier Installation

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Operation Verification

In this Section:

- **Setup and Assistance**
- **Verifying Positioning and Communications**
- **Verifying Ignition Sense**
- **Verifying Digital Inputs**

This section describes procedures to verify the basic operation of a newly-installed DCM300 device.

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Setup and Assistance

- a. PC with serial and Ethernet ports
 - i. Ethernet adapter on PC must be configured as

IP Address: 192.168.1.1

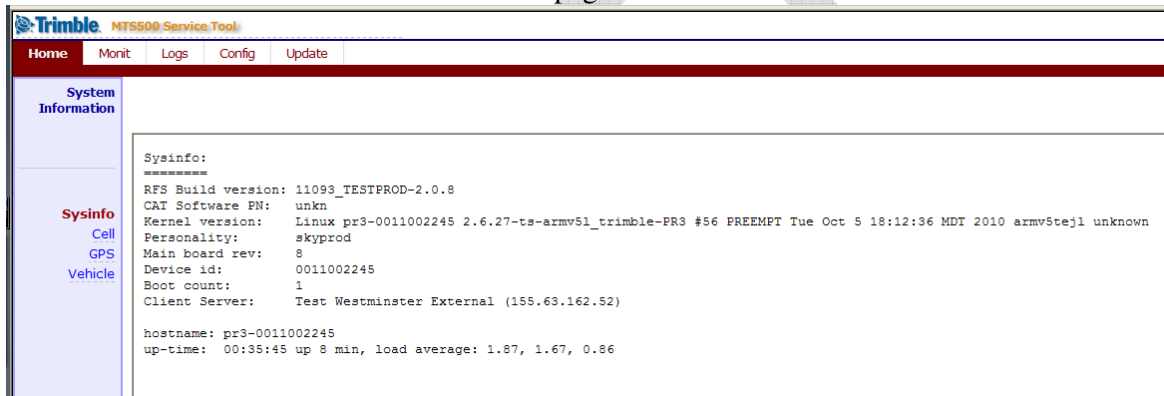
Subnet Mask: 255.255.255.0

- b. Hyperterminal

Set to 115,200 baud ; 8 data bits ; No parity ; 1 stop bit

1. Verifying that the unit is powered

- a. Connect the operating PC to the Ethernet port on the DCM300.
- b. Turn the machine's keyswitch to On.
- c. Open a browser on the PC.
- d. In the browser's address bar, type 192.168.88.3.
- e. Press Enter. You should reach a web page as shown below.



The screenshot shows the Trimble MTS500 Service Tool web interface. The top navigation bar includes 'Home', 'Monit', 'Logs', 'Config', and 'Update'. The left sidebar has 'System Information' selected, with sub-links for 'Sysinfo', 'Cell', 'GPS', and 'Vehicle'. The main content area displays system information:

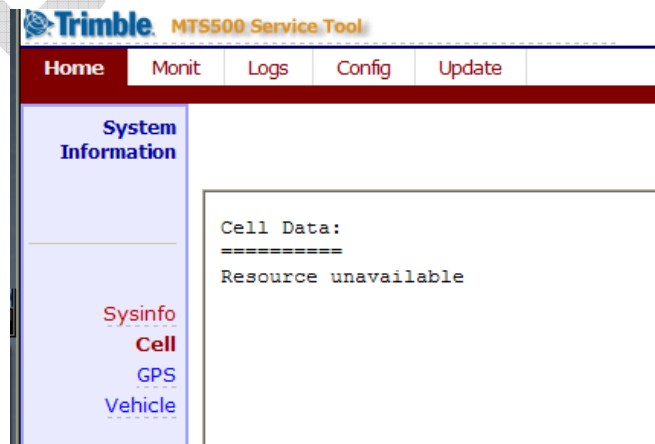
```
Sysinfo:
=====
RFS Build version: 11093_TESTPROD-2.0.8
CAT Software PN: unkn
Kernel version: Linux pr3-0011002245 2.6.27-ts-armv5l_trimble-PR3 #56 PREEMPT Tue Oct 5 18:12:36 MDT 2010 armv5tej1 unknown
Personality: skyprod
Main board rev: 8
Device id: 0011002245
Boot count: 1
Client Server: Test Westminster External (155.63.162.52)

hostname: pr3-0011002245
up-time: 00:35:45 up 8 min, load average: 1.87, 1.67, 0.86
```

The display of this webserver indicates that the DCM300 is powered and operating.

2. Verifying that the cellular modem is operating

- a. Still in the DCM300 Service Tool web page, left click on the "Cell" menu item at the left side of the screen. A screen like the one shown below will be displayed.
- b. Inspect the xxxx field. This should display a value of yyy or ssss to indicate that the modem is operating.

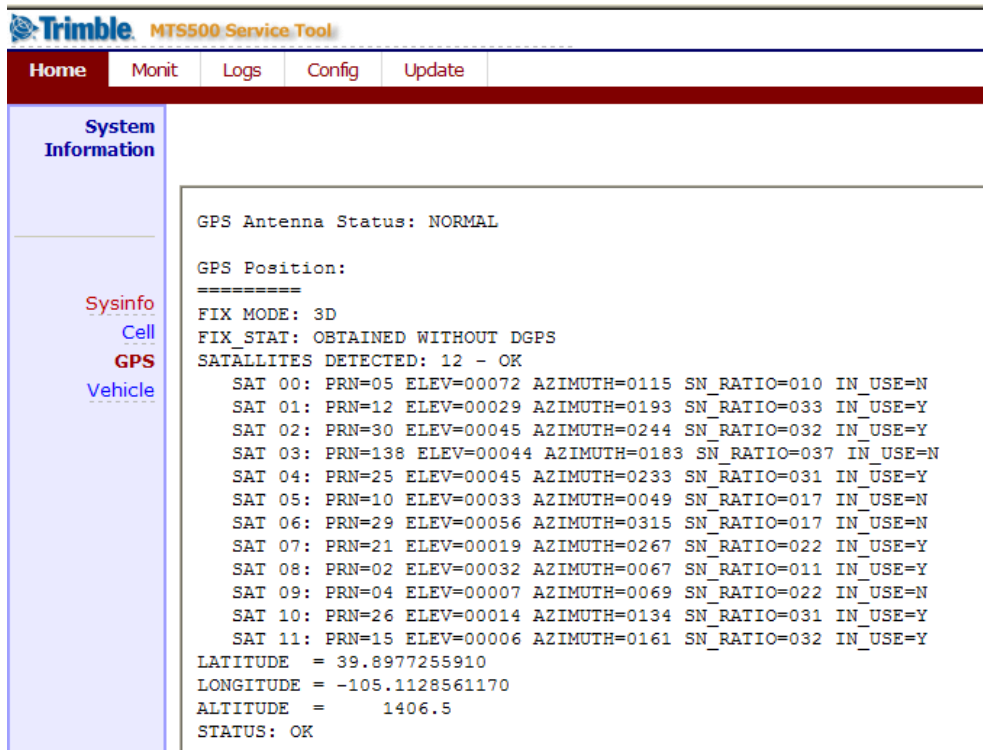


The screenshot shows the Trimble MTS500 Service Tool web interface with the 'Cell' menu item selected in the left sidebar. The main content area displays cell data:

```
Cell Data:
=====
Resource unavailable
```

3. Verifying that the GPS receiver is operating

- a. Still in the DCM300 Service Tool web page, left click on the “GPS” menu item at the left side of the screen. A screen like the one shown below will be displayed.



The screenshot displays the Trimble MTS500 Service Tool web interface. The top navigation bar includes 'Home', 'Monit', 'Logs', 'Config', and 'Update'. The left sidebar contains 'System Information', 'Sysinfo', 'Cell', 'GPS', and 'Vehicle'. The main content area shows the following text:

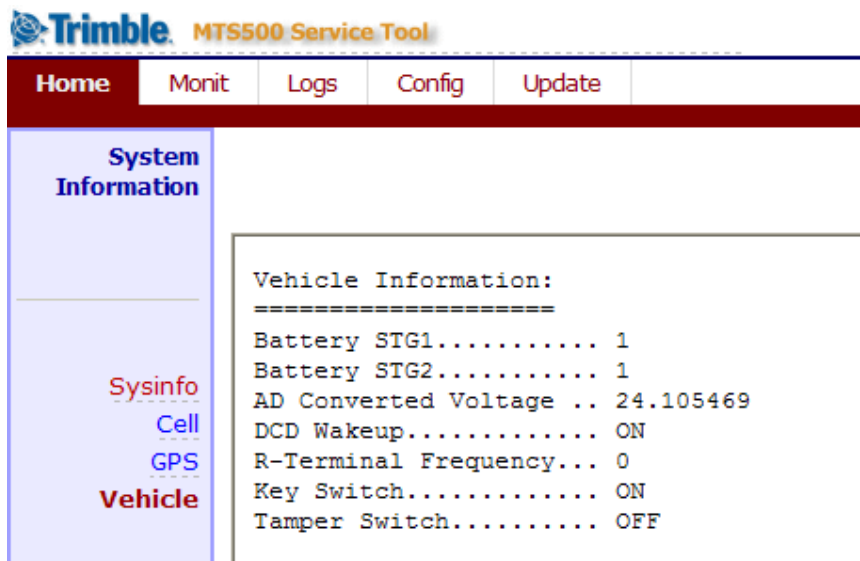
```
GPS Antenna Status: NORMAL

GPS Position:
=====
FIX MODE: 3D
FIX_STAT: OBTAINED WITHOUT DGPS
SATALLITES DETECTED: 12 - OK
SAT 00: PRN=05 ELEV=00072 AZIMUTH=0115 SN_RATIO=010 IN_USE=N
SAT 01: PRN=12 ELEV=00029 AZIMUTH=0193 SN_RATIO=033 IN_USE=Y
SAT 02: PRN=30 ELEV=00045 AZIMUTH=0244 SN_RATIO=032 IN_USE=Y
SAT 03: PRN=138 ELEV=00044 AZIMUTH=0183 SN_RATIO=037 IN_USE=N
SAT 04: PRN=25 ELEV=00045 AZIMUTH=0233 SN_RATIO=031 IN_USE=Y
SAT 05: PRN=10 ELEV=00033 AZIMUTH=0049 SN_RATIO=017 IN_USE=N
SAT 06: PRN=29 ELEV=00056 AZIMUTH=0315 SN_RATIO=017 IN_USE=N
SAT 07: PRN=21 ELEV=00019 AZIMUTH=0267 SN_RATIO=022 IN_USE=Y
SAT 08: PRN=02 ELEV=00032 AZIMUTH=0067 SN_RATIO=011 IN_USE=Y
SAT 09: PRN=04 ELEV=00007 AZIMUTH=0069 SN_RATIO=022 IN_USE=N
SAT 10: PRN=26 ELEV=00014 AZIMUTH=0134 SN_RATIO=031 IN_USE=Y
SAT 11: PRN=15 ELEV=00006 AZIMUTH=0161 SN_RATIO=032 IN_USE=Y
LATITUDE = 39.8977255910
LONGITUDE = -105.1128561170
ALTITUDE = 1406.5
STATUS: OK
```

- b. If at least one satellite is detected, the GPS system is probably capable of functioning. If the antenna currently has a clear sky view, there should be at least four satellites in view.
- c. If latitude and longitude values are displayed, and the Status is OK, the GPS receiver is working well.

4. Verifying keyswitch state sensing

- a. Still in the DCM300 Service Tool web page, left click on the “Vehicle” menu item at the left side of the screen. A screen like the one shown below will be displayed.



- b. Note the Key Switch item’s location. This should currently display “ON”.
- c. Turn the machine’s keyswitch to the off position.
- d. Wait for the web page to update. The Key Switch value should change to “OFF”.
- e. Turn the machine’s keyswitch to the on position.
- f. Wait for the web page to update. The Key Switch value should change to “ON”. This is a positive indication of proper keyswitch state sensing.

5. Verifying that DCM300 is communicating with the VisionLink platform

- a. Power unit with keyswitch on and contact Trimble for verification in the VisionLink application

6. Verifying that DCM300 is communicating with machine’s J1939 bus

- a. Power unit with CANbus active and contact Trimble for verification in the VisionLink application
- b. Carl Thompson (303) 931 – 1281 & Tony Bowers

Testing the operation of an DCM300 device requires access to the Trimble VisionLink software application. The application could be on a portable computer with Internet access that is in the vicinity of the installation. Alternatively, an assistant could operate the software at a remote location and report the device interaction by cellular phone. An important consideration is that the DCM300 device is intended to provide data to an equipment manager in an office setting. The device does not normally provide information for the equipment operator or for use at the machine itself.

Verifying Positioning and Communications

Launch the VisionLink application using administrator credentials. Locate the serial number of the newly installed device in this software. Go to the Asset Details page. The last device position will be from the time that the machine was moved to a clear sky view area or newer. A screen similar to the one shown in Figure 7 below indicates recent communications and proper positioning. The “Date Last Reported” item in the lower left of the screen should be from a time within the last few minutes. The position on the map should be close to the actual machine position.

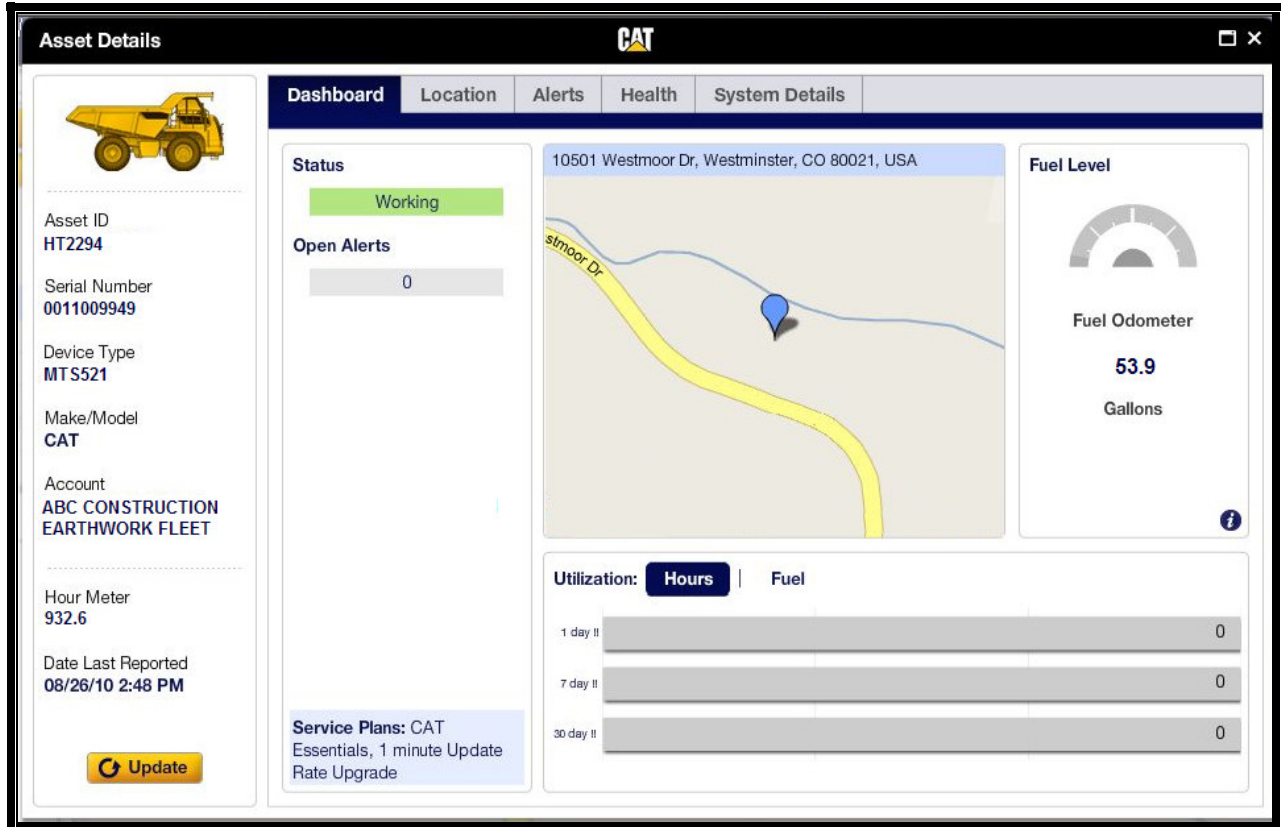


Figure 6 - VisionLink Asset Details Page

Verifying Ignition Sense

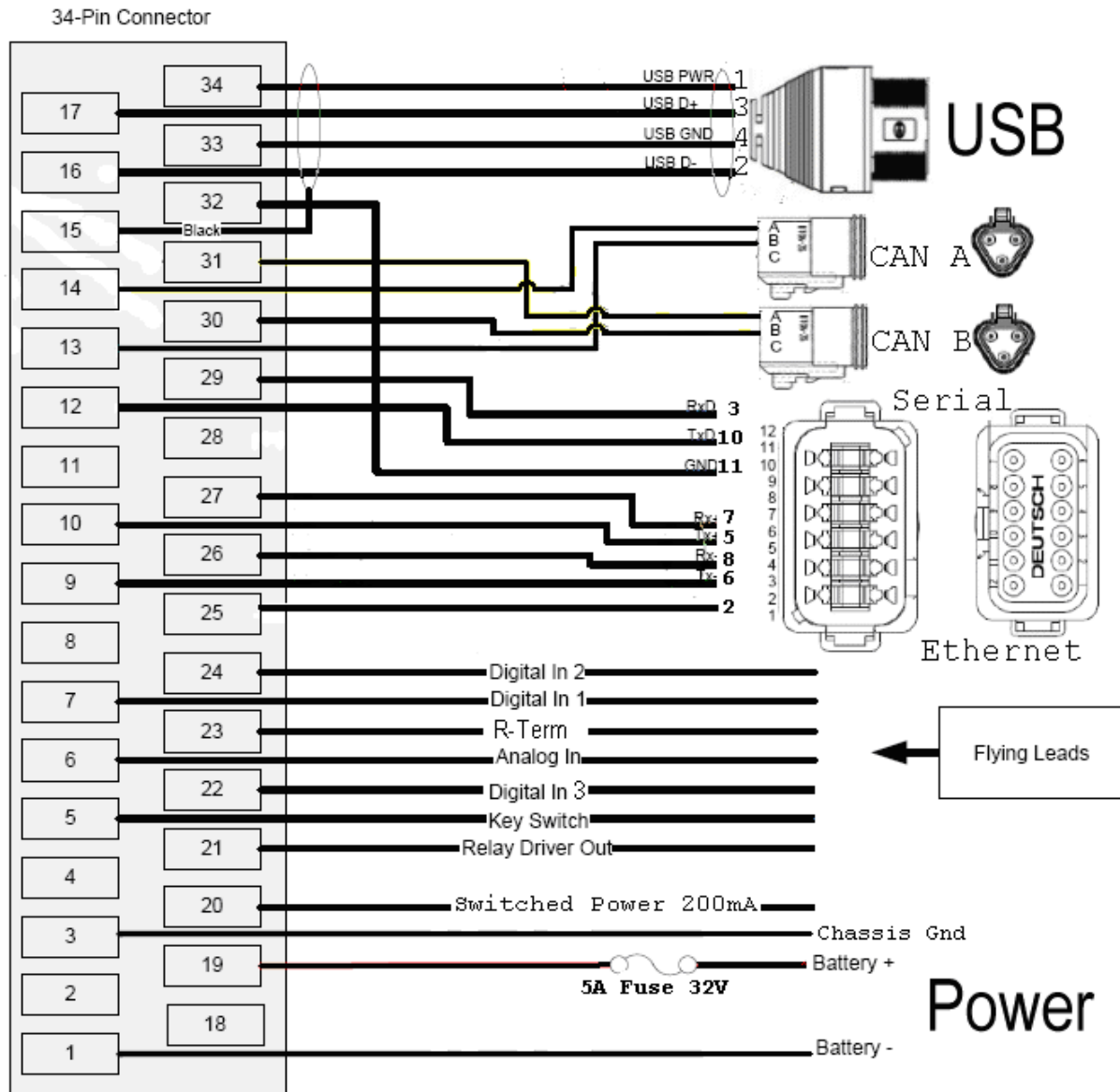
Start the engine in the newly-equipped asset. Let the engine run for approximately thirty seconds then turn the ignition off. The VisionLink Device asset details page will contain messages indicating this sequence of engine operation.

Verifying Digital Inputs

Start the asset's engine again. Trigger any installed digital inputs with at least a thirty second active period. Turn the asset ignition off. The VisionLink asset details page will contain messages indicating this sequence of digital input operations.

Appendix A - Harness and Main Connector Description

Table 1 – Standard Harness Pinout



Pin	Function	Pin	Function
1	Battery - Input	19	Battery +
3	Chassis Ground	20	Switched Power 200mA
5	Key Switch Input	21	Relay Driver Output
6	Analog input	22	Digital Input 3
7	Digital Input 1	23	R-Terminal
8	Signal Ground	24	Digital Input 2
9	Ethernet TX-	25	Ethernet Shield Gnd
10	Ethernet TX+	26	Ethernet RX-
11	Signal Ground	27	Ethernet RX+
12	RS-232 TX	29	RS-232 RX
13	CAN A Low	30	CAN B Low
14	CAN A High	31	CAN B High
15	USB Shield	32	RS-232 GND
16	USB Data-	33	USB Ground
17	USB Data+	34	USB + 5V

Table 3 – DCM300 34 Pin Harness Connector Pinout

IMPORTANT NOTE:

All electrical conductors used in the installation of an DCM300 M2M data radio must be 18 AWG or larger.

Appendix B - Locating the R-terminal

The location of the R-Terminal differs depending on the alternator used in the machine. If you cannot locate the alternator's R-Terminal, please contact a qualified service technician for that machine.

Below are some examples of different alternators used in heavy machines, and the location of the R-Terminal.

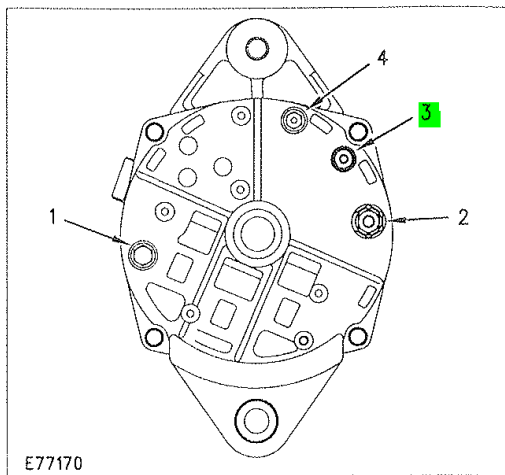


Illustration 3. Delco-Remy 155-7434 Alternator.
(1) B- terminal. (2) B+ terminal. (3) R terminal.
(4) Indicator light terminal.

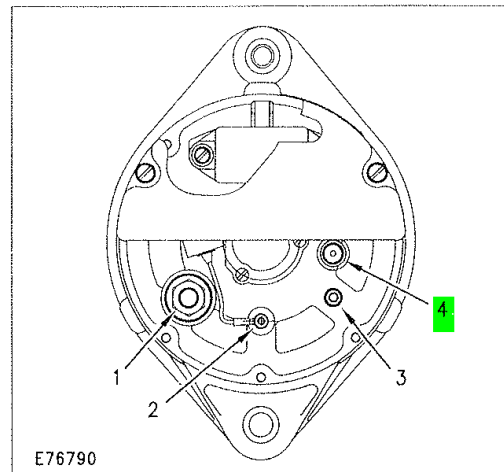


Illustration 1. Bosch 7N-9720, 9G-9538 and 100-5046 Alternators.
(1) B+ terminal. (2) D+ terminal. (3) B- terminal. (4) R terminal.

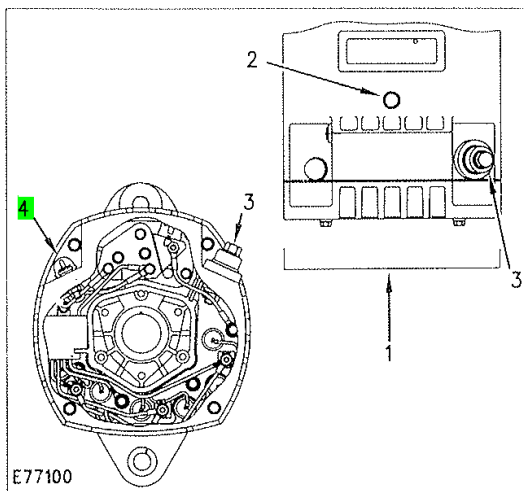


Illustration 4. Delco-Remy 3E-7892, 3E-7578, 3E-7577 and 112-5041 Alternators.
(1) Top view. (2) B- terminal. (3) B+ terminal. (4) R terminal.

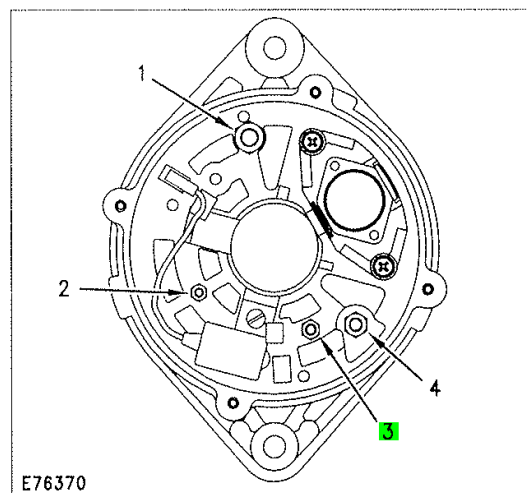


Illustration 2. Bosch 9W-3043 Alternator.
(1) B+ terminal. (2) D+ terminal. (3) R terminal. (4) B- terminal.

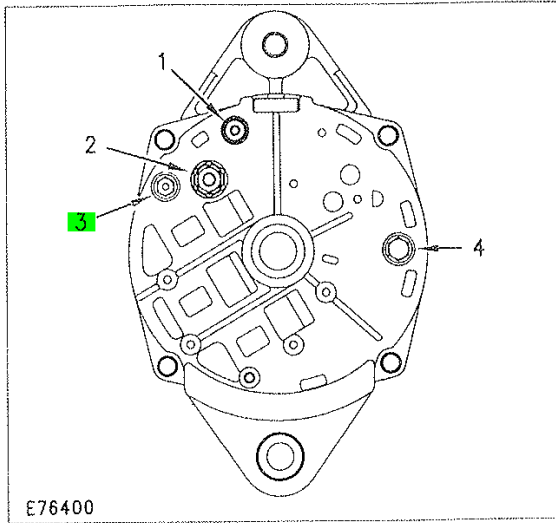


Illustration 7. Delco-Remy 9X-6796, 107-7977, 117-1379, 121-4134, 121-4135, 125-9597 and 132-2156 Alternators. (1) Optional warning light terminal. (2) B+ terminal. (3) R terminal. (4) B- terminal.

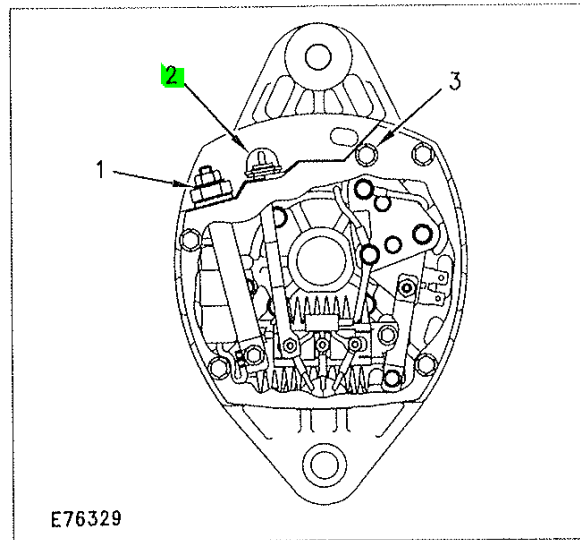


Illustration 6. Delco-Remy 3T-6352, 5N-5692 and 7G-7889 Alternators. (1) B+ terminal. (2) R terminal. (3) B- terminal.

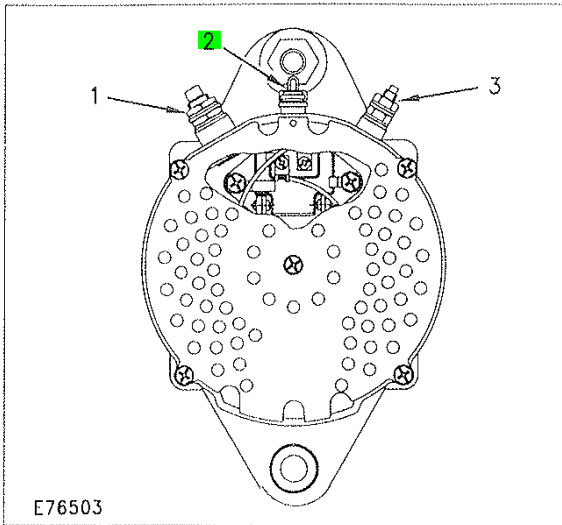


Illustration 9. Denso 9G-4574, 6T-7223 and 100-5045 Alternators. (1) B+ terminal. (2) R terminal. (3) B- terminal.

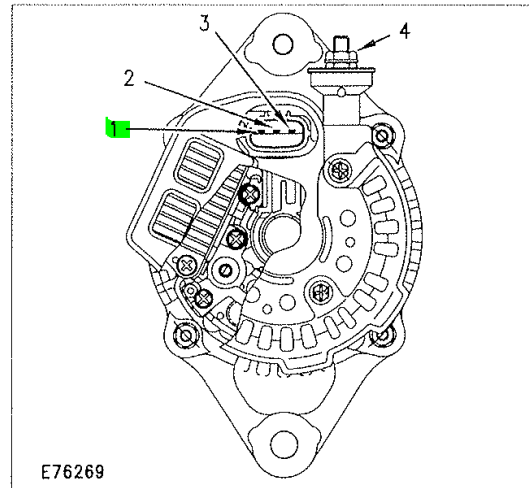


Illustration 10. Denso 3E-7772, 105-2811, 105-2812, 105-2813, 105-2814 and 105-3132 Alternators. (1) R terminal. (2) Ignition. (3) Indicator lamp. (4) B+ terminal.

Appendix C - Recommended Tools and Supplies

- Wire cutters and strippers
- Digital multi-meter
- P2 Phillips screwdriver
- Crimp tool for insulated barrel type connectors
- Solderless 18-22 AWG barrel type butt connectors
- Solderless 14-16 AWG barrel type butt connectors
- Solderless #10-5/16" 18-22 AWG ring terminals
- (4) 1/4" or 6mm fasteners -either nuts and bolts with suitable washers (Stainless steel is preferred) or self-tapping screws
- Tie Wraps
- IP8 torque plus driver (if opening SIM door)
- Mechanic's socket set
- Mechanic's open end wrench set
- Electrical Tape
- Heat Shrink Tubing – assorted sizes
- Heat source – to shrink tubing
- Trimble VisionLink software

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Appendix D - Device Specifications

Input Voltage.....7.0-32.0 V DC

Unit will tolerate an 80V jump start transient for at least 2 minutes. Meets SAE J1113/11 cold cranking waveform specifications for both 12V and 24V systems

Current Consumption (typical)

Transmitting data: 470mA (1 A peak) at 12V DC

Not transmitting: 330 mA at 12 V DC;

Not transmitting low power standby mode: <11mA at 12 V DC

Inputs & Outputs

3 Active Low Digital Inputs

1 Analog Input – voltage sensing

1 Relay Driver Output—250mA maximum sinking current

1 Serial Port – Three wire RS-232 – connect to sensors, data terminals, computers, or external radios*

R-terminal Input – Ready for direct connection to alternator to detect engine running

Enhanced Communications

2 Channel CANbus – support for J1939 communications including diagnostics up to 250kb/s. ISO11783-compliant

1 Ethernet Port - 10/100 Base-T; built in webserver; connect to computers, sensors, or custom radios

1 USB Port – version 2.0; connect to computers, sensors, custom radios, or storage devices

WiFi – communicate with other assets or the Internet

Modes.....Infrastructure client; ad hoc

Supported Protocols.....802.11b/g/h/e

Maximum Transmit power.....18mW

Sensitivity.....-93dbm@1Mb/s b, 90dm@6mb/s g

Physical Specifications

Enclosure Material.....Cast Aluminum

Dimensions (WxDxH).....230mm x 136.3mm x 40mm

Weight.....1.09kg

Connectors:

Multi.....34 Pin male positive locking

GPS Antenna.....SMA Female

Cellular Antenna.....TNC Female

Wi-Fi.....RP TNC Female

Environmental

Temperature

Operating-40°C to +75° Storage.....-40°C to +85°C

Humidity.....SAE J1455

Shock.....SAE J1455

Vibration Operating.....SAE J1455

Motion Sensing

Frequency.....3 to 500Hz

Sensitivity.....0.5ips and up

Adjustable Threshold.....0.1ips increments

Regulatory Compliance

FCC Class B Part 15, CE mark; A-tick mark; WEEE; RSS-310

Industry Canada; Canadian ICES-003 Class B;

RoHS; SAE J1171; SAE J1113-13; SAE J1455; R&TTE; PCT Mark;

EN61000;

Cellular Communications

GSM Quad Band Modem

Data Overlay.....HSDPA/Edge

Bands.....850, 900, 1800, and 1900 MHz

CDMA Dual Band Modem

Data Overlay.....EV-DO Rev A

Bands.....800 and 1900 MHz

Positioning

GPS Receiver

Type.....12 channel; L1 C/A Code, Continuous Tracking

SBAS Support.....WAAS, EGNOS

Horizontal Accuracy.....<2.5m (50% CEP)

Maximum Update Rate.....1Hz

Tracking Sensitivity.....-160 dBm

Acquisition Sensitivity.....-146dBm

Time to Position (typical)

Cold Start.....38 Seconds

Warm Start.....35 Seconds

After 15 Second Signal Blockage... <2 Seconds

Configurable Parameters

Geofences.....Over-the-Air, 50 sides, 100 stored onboard

Stop Reports.....Enable, speed, and duration limits

Mileage.....Set the initial odometer reading

Engine Runtime.....Set the initial hours reading

Data Logging.....Supports message and event storage of 4000 or more records when Internet communications are unavailable.

Digital Inputs.....Assign Machine-specific functions

Relay Driver Output.....Assign Machine-specific functions

Serial Port Operations.....Assign sophisticated sensor

Communications throughput

CANbus Operations.....Create automatic alerts and

scheduled reports

Motion Sensing...Set tailored threshold levels for different assets

Subscription Plan Support

VisionLink Ready supporting:

Essentials

Health

Maintenance

Rapid Reporting

Connected Data

Connected RTK

Status Indicators

External LEDs

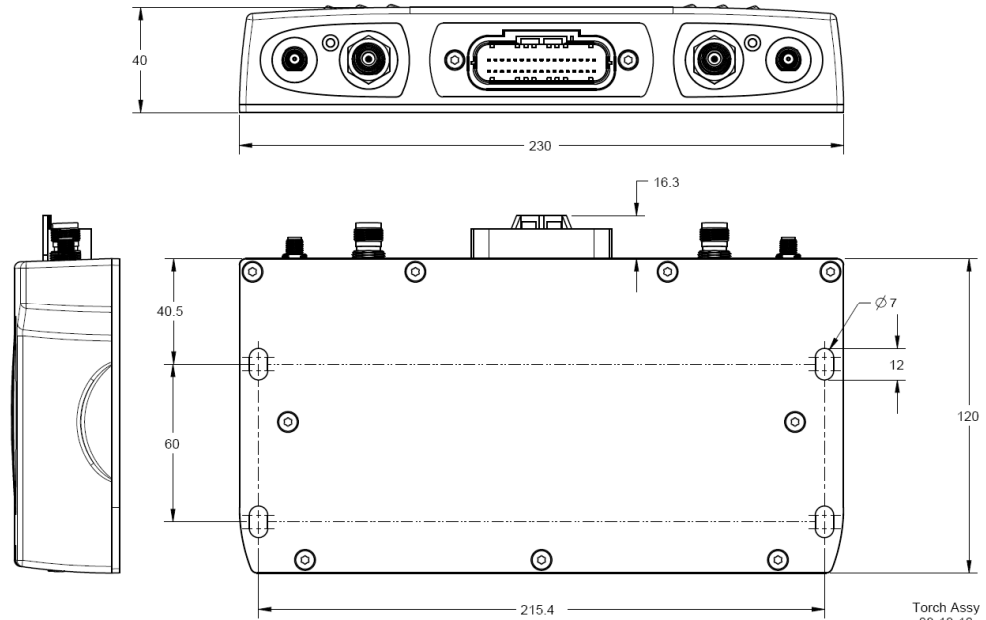
Amber.....Power and General Status

Green.....Wireless Communications Status

Webserver

Provides rich status details and allows configuration in the field

* external radios may include 450MHz, 900MHz, Trunking data radios, Mesh modems, and Satellite modems.



Torch Assy
08-18-10
SCALE 1:1

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