TrimTrac End-User Manual For LocationXS

Including Enhanced Features and Vehicle Adapter Module
(Applies to LocationXS version 4.2 and later)

January 2007, LocationXS Version 4.2

Corporate Office
Teydo BV- Leijenseweg 111a - 3721 BC Bilthoven - Netherlands
Phone: +31-302293004 - Fax: +31-302740074
www.LocationXS.net - www.teydo.com

Release Notice
This document is release 4.2 of the LocationXS end user manual for Trimtrac. This manual is intended for use by end users (collectively, "end users"). It is not intended for partners of Teydo.

The following limited warranties give you specific legal rights. You may have others, which vary from country/state/jurisdiction to country/state/jurisdiction.

Patents
US Patents 6,801,853; 5,187,450; 5,311,149; 5,402,347; 5,564,098; 5,590,043; 5,592,173; 6,115,595; 6,898,234; and 6,990,140 apply.

Product Limited Warranty
Subject to the terms and conditions set forth herein, Teydo Holding Inc ("Teydo") makes the following warranty only to its End Users who purchase the hardware product ("Product") directly from Teydo: for a period of one (1) year from the date of shipment from Teydo, the Product will substantially conform to Trimble's standard published specifications for the Product and the Product hardware will be substantially free from defects in materials and workmanship. The foregoing warranty shall not apply to embedded software/firmware components.

This Product Limited Warranty is provided to End Users and to End Users only. For Product purchased from a Reseller the Reseller is solely responsible for any and all warranties made to its customers, and Teydo makes no warranties, express or implied, and shall have no obligations or liability to Reseller's customers or end-users of the Product. Reseller shall not make any representations or warranties on Teydo's behalf, and shall fully indemnify, defend and hold Teydo harmless from any breach of the foregoing.

For Product purchased from a Reseller, your Reseller shall be solely responsible for preparing and providing Product warranties and Product literature to end-users.

Service, Software and Firmware License, Limited Warranty
The service, software and/or firmware product (the "Software") is licensed and not sold. Its use is governed by the provisions of the applicable End User License Agreement ("EULA"), if any, included with the Software. In the absence of a separate EULA included with the Software providing different limited warranty terms, exclusions, and limitations, the following terms and conditions shall apply. Teydo warrants that the Software product will substantially conform to Teydo's applicable published specifications for the Software for a period of ninety (90) days, starting from the date of delivery.

Warranty Remedies
Teydo's sole liability and your exclusive remedy under the warranties set forth above shall be, at Teydo's option, to repair or replace any Product or Software that fails to conform to such warranty ("Nonconforming Product"), or refund the purchase price paid by you for any such Nonconforming Product, upon your return of any Nonconforming Product to Teydo in accordance with Teydo's standard return material authorization procedures.

Warranty Exclusions and Disclaimer
These warranties shall be applied only in the event and to the extent that: (i) the Products and Software are properly and correctly installed, configured, interfaced, maintained, stored, and operated in accordance with Teydo's relevant manual and specifications, and; (ii) the Products and Software are not modified or misused. The preceding warranties shall not apply to, and Teydo shall not be responsible for defects or performance problems resulting from (i) the combination or utilization of the Product or Software with products, information, data, systems or devices not made, supplied or specified by Teydo; (ii) the operation of the Product or Software under any specification other than, or in addition to, Teydo's standard specifications for its products; (iii) the unauthorized modification or use of the Product or Software; (iv) damage caused by accident, lightning or other electrical discharge, fresh or salt water immersion or spray; or (v) normal wear and tear on consumable parts (e.g., batteries). Teydo does not warrant or guarantee the results obtained through the use of the Product.

The foregoing terms of the Product Limited Warranty and Service, Software and Firmware License, Limited Warranty state Teydo's entire liability, and End User's exclusive remedies, relating to use and performance of the Product, the Service, the Software and the Firmware. Except as otherwise expressly provided for in this Limited Warranty, the accompanying documentation and materials, and/or any embedded software/service/firmware and updates thereto are provided "as-is" and without express or implied warranties of any kind, by either Teydo or anyone who has been involved in its creation, production, installation or distribution, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose, title and noninfringement. The stated express warranties are in lieu of all obligations or liabilities on the part of Teydo arising out of, or in connection with, the Product, the Service, the Software and the Firmware.

Without limiting the generality of the foregoing:

Teydo is not responsible for the operation or failure of operation of GPS satellites or wireless service or the availability of GPS satellite signals or wireless service.

The Product, Service, Software and Firmware may contain technology that is not fault tolerant and is not designed, manufactured or intended for use in environments or applications in which the failure of the Product, Service, Software and Firmware would lead to death, personal injury or severe physical or environmental damage or severe financial loss. Any use or distribution by End Users and Resellers or its customers in connection with any such environment or application shall be at End Users and Reseller's and its customers' sole risk, and Teydo shall have no liability whatsoever in connection therewith. End User and Reseller shall indemnify and hold Trimble and its suppliers harmless from any claim brough against Teydo which arises from End User's or Reseller's use or distribution of the Product, Service, Software and Firmware in connection with such envivronments or applications.

Some states and jurisdictions do not allow limitations on duration or the exclusion of an implied warranty, so certain of the above limitations may not apply to every Reseller.

Limitation of Liability
TEYDO'S ENTIRE LIABILITY UNDER ANY PROVISION HEREIN SHALL BE LIMITED TO THE GREATER OF THE AMOUNT PAID BY YOU FOR THE PRODUCT OR SOFTWARE LICENSE. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT SHALL TEYDO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHATSOEVER UNDER ANY CIRCUMSTANCE OR LEGAL THEORY RELATING IN ANY WAY TO THE PRODUCTS, SOFTWARE AND ACCOMPANYING DOCUMENTATION AND MATERIALS, (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION, OR ANY OTHER PECUNIARY LOSS), REGARDLESS WHETHER TEYDO HAS BEEN ADVISED OF THE POSSIBILITY OF ANY SUCH LOSS AND REGARDLESS OF THE COURSE OF DEALING WHICH DEVELOPS OR HAS DEVELOPED BETWEEN YOU AND TEYDO. BECAUSE SOME STATES AND JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

Notices
Class B Statement – Notice to End Users. This Product 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 Product 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

Product 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 Product and the receiver.
- Connect the Product into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

Regulatory Approvals

CE: The TrimTrac 1.5 product complies with the essential requirements of the R&TTE Directive 1999/5/EC as stated by the EC Declaration of Conformity (CE0681). The TrimTrac 1.5 product complies with the European Telecommunications Standards Institute Specifications ETS300-342-1 (EMC for GSM 900MHZ and DCS 1800MHZ Radio Equipment and Systems).

EEC: The TrimTrac 1.5 product complies with Directive 72/245/EEC as amended by Directive 95/54/EC (el*72/245*95/54).

FCC The TrimTrac product complies with the FCC Part 15, FCC Part 24, and Industry Canada requirements. The TrimTrac product complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

FCC ID: JUPTRIMTRACB
IC ID: 1756A-TRMTRAC

Contents

About this Manual

Welcome to the LocationXS end user manual for TrimTrac™ devices. This manual is intended for use by end users of the LocationXS web service. It is not intended for partners of Teydo.

This manual covers the LocationXS version 3.0 and TrimTrac with 1.10 and later firmware (released on August 22nd, 2005) and operating on 900 MHz, 1800 MHz and 1900 MHz Global System for Mobile communication (GSM) networks. Data and Event Reporting support is by Short Message Service (SMS). This manual describes how to set up, configure, install, operate, and troubleshoot the LocationXS service in combination with the TrimTrac. Even if you have used other GSM or Global Locationing System (GPS) products before, Teydo recommends that you spend some time reading this manual to learn about the special features of the TrimTrac. If you are not familiar with GSM or GPS, visit Trimble Component Technologies' Web site dedicated to the TrimTrac product (www.TrimTrac.com) for a look at the device, GSM and GPS. Teydo assumes that you are familiar with Microsoft Windows (2000, XP), including Internet Explorer, and know how to use a mouse, select options from menus and dialogs, make selections from lists, and refer to online help.

This manual is available in portable document format (PDF) from the following Web site:
http://www.LocationXS.net/support

Related Information

LocationXS Web site at www.LocationXS.net - This site is dedicated to LocationXS users. Application notes, technical notes, and other useful information are available from this site. These documents contain important information about software and hardware changes.

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

Technical Assistance

If you have a problem and cannot find the information you need in this manual or on the LocationXS Website, please contact your local sales office, sales engineer or distributor. The Teydo technical support organization can be reached format www.LocationXS.net within the United States, or at +31-302293004 when dialing from outside the United States.

You can always select the live help button on the website. Please note, all **Frequently Asked Questions** are listed in our Knowledge Base, which contains: up to date known issues; latest errors; and solutions!

Information Required for Technical Assistance

1. LocationXS username (typically your mobile phone number)
2. TrimTrac unit number

LocationXS Version 3.0

This manual covers the TrimTrac end user manual for LocationXS version 3.0 (1.10 and later firmware). The changes relative to LocationXS version 2.7 (1.08 firmware) are summarized in Table 1 below.

CHANGE DESCRIPTION
Geofencing added to monitor entry or leaving of a geographic area
Notification added for Geo-fences, low battery, account balance and alarm status
Added Set retrieving missing messages for Trimtrac
Export data includes message data next to location data
Optimized display of incoming messages in message trays

Table 1. LocationXS version 3.0 changes

Using a TrimTrac in LocationXS

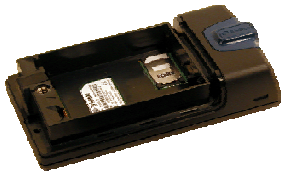
Introduction

LocationXS is a web based service which focuses on tracking of assets and people. With LocationXS you can see the GPS locations of your TrimTrac in the Internet Explorer web browser (version 5.5 and up) at any location and any moment. Please read this manual carefully to understand all options and possibilities of the LocationXS service in combination with your TrimTrac.

Getting started

Hardware

The shipment contains 3 elements: the TrimTrac with a detachable lid, this constitutes the main device; a SIM card, a chip card that allows the unit to communicate over mobile operator networks; and a set of 4 batteries. In some cases you will receive the unit pre-assembled.



1) Open up the TrimTrac by unscrewing the screw on the lid. On the inside of the TrimTrac you see the Trimble Unit ID sticker and the silver SIM card latch. Please insert the SIM card into the latch, make sure the cut corner is in the right bottom location (Same direction as the Trimble label).

2) To install the batteries, insert the battery holder aligning the arrows. Place the lid back on the TrimTrac and fasten the screw. The red LED on the long side of the device will blink fast after a few seconds. If you do not notice blinking, the SIM card may be incorrectly installed or the batteries need to be checked. If no blinking occurs redo the above process until you have a blinking LED

3) After installing the batteries and placing the lid back on again it is best to put the TrimTrac in a space where it has a clear view of the open sky. Leave it there for approximately 15-30 minutes and it will be ready for operation. When put in operation for the first time the TrimTrac refreshes certain GPS related data and since it is very well possible that your unit was inactive for over a week it needs to acquire that data.

Installation

The best location to install the TrimTrac is in a dry place with a clear sight of the sky and no obstructions. Covert installation is possible as long as there are few obstructions. For example, the TrimTrac is known to provide excellent results when placed in the center arm rest of a sedan. Since each environment, is different test the placement and to determine the optimal operation.

Diagnostics

The TrimTrac blinks at different rates depending on its operational state. If the TrimTrac is powered off, the LED is off. If the estimated battery life is below the threshold of 10%, the LED is turned on continuously between the location cycles; the TrimTrac is operational and does not blink. The blink rates described in Table 2 apply only if: the batteries are good; or the TrimTrac is connected to external power; or is operating on the internal standby battery with sufficient charge when a Vehicle Adapter Module is used.

To help you identify the status of the TrimTrac check the blinking sequence of the red LED on the side of the unit. See the table below for a detailed description of each blinking sequence.

TrimTrac State	Blink Rate	In Plain Words…
IDLE while sensing motion or if live locate is active	250ms ON / 250 ms OFF	Rapid blinking
Starting GPS FIX State	100ms ON / 300ms OFF.	Very short, rapid blinking
GPS FIX	2 Sec ON / 2 Sec OFF	Long Blink, Long Off
SEND DATA	200ms ON / 1800ms OFF	Short Blink, Long Off
RECEIVE NEW SETTINGS	1800ms ON / 200ms OFF	Long Blink, very short off time
SLEEP	250ms ON / 10 seconds OFF	If the LED blinks once every 10 seconds, then the device is in the SLEEP State
Collecting GPS Almanac	400ms ON / 200ms OFF / 400ms ON / 2200ms OFF	Two Medium Blinks followed by a Long Off
BATTERY	Always ON	Low Battery (either AA alkaline batteries or Vehicle Adapter Module standby battery).

Table 2, Diagnostic LED Blink Rates

Use Guidelines

Introduction

The TrimTrac is a completely self-contained end-user device that does not require installation. There are no external connections required for antennas or power when used in its standard battery-powered configuration. Like all GPS and wireless devices, the TrimTrac will work best where it can have a relatively unobstructed view of the sky and a GSM base station antenna. Nonetheless, the TrimTrac employs advanced GPS technology that increases its ability to acquire weak GPS signals. This allows the device to deploy in environments where traditional GPS receivers may not be able to determine location.

General Guidelines

Initial Use

The TrimTrac comes without current time being set and without GPS almanac or location stored in memory. The TrimTrac collects this information from the GPS satellites, after the device has completed its first successful location fix. It is important that the TrimTrac be given sufficient time to calculate its first location fix and to collect a complete GPS almanac.

While collecting a GPS almanac for the satellites, it is recommended that the TrimTrac be powered up, using either batteries or a Vehicle Adapter Module, and remain stationary with a clear, unobstructed view of the sky. This will allow the TrimTrac to calculate a location fix in the shortest possible time and allow it to collect a GPS almanac. During this first session, the TrimTrac will spend up to fifteen (15) minutes before sending the next message to LocationXS.

Placement and Orientation

Generally, the TrimTrac will perform best when placed at a slight incline with the TrimTrac logo facing up, preferably with reasonably unobstructed clearance around the unit. Field tests indicate that the TrimTrac performs reasonably well when placed in the glove box or under the front passenger seat in many contemporary automobiles. Do not install in the trunk of a vehicle unless placed near or under the rear-window package-shelf. Try to avoid placing the unit where metal or surfaces coated with metallic paint or films obstruct the view of the sky.

Field data indicates that a TrimTrac placed in the glove box of a vehicle will get approximately 50% fewer location fixes than an identically configured unit placed on the dashboard with a clear view of the sky. Actual results vary from vehicle to vehicle and based on the level of obstruction outside the vehicle itself.

Another important consideration is that battery life will be shorter for units placed in obscured locations since it will take longer to compute new location fixes. Units with a clear view of the sky will typically take 40-50 seconds to compute a new location fix. If the GPS signal, level becomes weaker due to obscuration, then the time to compute typically increases to over 6 minutes. During this additional time, the unit powers up and battery life will decrease accordingly.

Users may experience the GPS signal fading in and out while traveling through mountainous, heavily forested, and metropolitan areas. This is similar the difficulties satellite broadcast radio is often subject to signal blockages similar to those experienced by GPS. While not having been studied extensively, it is reasonable to assume that the GPS receiver has trouble acquiring the GPS signal.

RF Jamming

Install the TrimTrac as far away as possible from transmitting antennas, including satellite; communication; radar; VHF; and cellular. These transmitters may emit jamming signals that interfere with the GPS receiver's ability to track GPS satellite signals. Generally, the stronger the other transmitting device, the wider the distance required between antennas. The recommend minimum clearance from these transmitting devices, including other TrimTracs, is 45 cm (approximately 18 in).

Mounting

Optional mounting brackets are available for the TrimTrac. A metal bracket is available for installations that are more permanent and typically used when the TrimTrac is equipped with a Vehicle Adapter Module. A quick-release, plastic holster-style bracket is available for battery-powered installations or when a TrimTrac must move from vehicle to vehicle.

Environmental Conditions

The TrimTrac mounting location must not exceed the environmental specifications of the device. For instance, restrict installation inside a vehicle's engine compartment; wheel well; chassis; or any other location in which the conditions can reasonably be expected to exceed the device environmental specifications. Do not leave the TrimTrac in direct sunlight on the dashboard of a vehicle on hot, sunny days.

Exposure to RF Radiation

As noted in the Safety First and Detailed Safety Information chapters, on pages 52 and 52, respectively, avoid direct contact of TrimTrac with the body. Maintain a minimum separation distance of 0.6 inch (15 mm) during operation. The TrimTrac is not intended for body-worn applications.

Interference with Other Devices

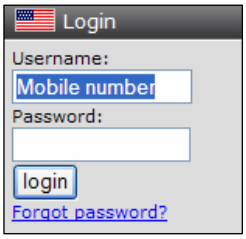
The TrimTrac includes a GSM modem that may interfere with other electronic systems, such as car stereos, when it is transmitting. To avoid such interference, we recommend not placing the TrimTrac in close proximity to any other electronic systems or devices.

Conversely, other electronic systems or devices may jam the TrimTrac, especially the GPS receiver. Placing two or more operating TrimTracs in close proximity to one another may cause interference, especially when some TrimTracs are transmitting to the GSM network while others are trying to get a GPS location fix. The GSM transmissions may very well prevent surrounding units from being able to compute GPS locations until the offending transmissions have stopped.

Batteries

The TrimTrac works with four standard AA alkaline batteries. Insert the batteries with the positive and negative polarities as indicated on the Battery Pack label. Do not reverse polarities or use non-alkaline AA batteries; otherwise, permanent damage to the TrimTrac may result or there may be a risk of explosion or fire. Dispose of used batteries in accordance with the battery manufacturer instructions.

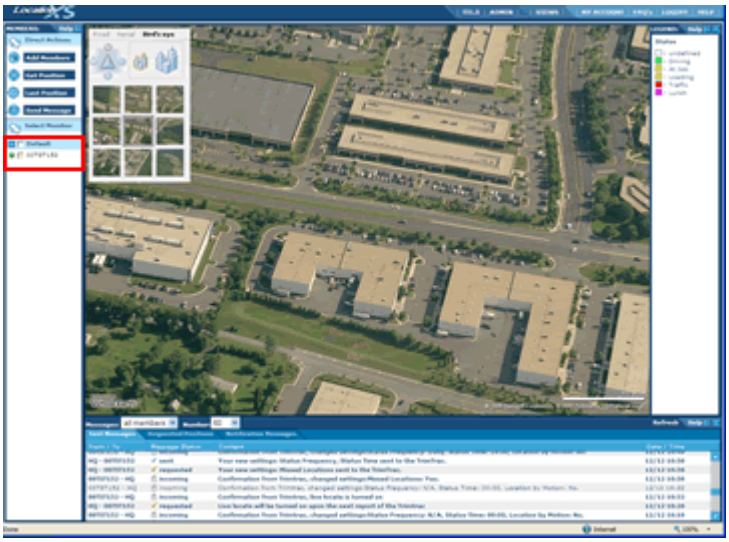
Activation of your TrimTrac in LocationXS



Before you can start using LocationXS, you need to have an account on LocationXS. The registration is part of the activation process and does imply you accept the general terms and conditions to create and use an account on LocationXS. The activation of a TrimTrac is required to activate the wireless subscription. During activation you will be asked to provide your mobile phone number and the TrimTrac MSISDN. To log in you need to enter your mobile phone number, this number is unique and only used as an identifier.

Once you receive your TrimTrac, look on the shipping documents to find the MSISDN of your TrimTrac which is required to put the correct TrimTrac in your account. After activation you can login to your account using the password provided on the shipping documents. Please make sure you change this password upon first use in the My Account section. Make sure you have selected the correct Country/Language on the home page of www.LocationXS.net (your country flag should be next to Login). Your Default Opening Screen (DOS) will look like the screen below and have your default map displayed based on your address and post code or zip code.

When logged in you will see a general information screen with important messages for users. These messages are updated regularly to inform users of new functionality, known issues and changes or bugfixes. Please read this information carefully and proceed by clicking “Read and continue”.



The TrimTrac activation occurs when paying the activation fee. Go to the web shop on the homepage of www.LocationXS.net, select your device type and select “Activation”.

Upon activation, your TrimTrac starts sending locations and status messages to LocationXS. These messages appear underneath the map in the text message tray, the requested locations tray and the notification messages tray.

Once you have logged in you should see your TrimTrac in the Select Member area on the left hand side of the screen. Contact Support if the TrimTrac does not show.

Transaction Bundles

Upon activation of your TrimTrac, there is a starting device balance in your account on LocationXS. After you have used up this initial balance, you need to purchase a monthly transaction bundle for each device and it’s transactions in LocationXS. Go to the webshop area on the homepage of www.LocationXS.net and choose a transaction bundle. Pricing per transaction varies within each transaction bundle. To check the pricing per transaction check the pricing area on the LocationXS website.

The transaction bundle is a monthly subscription, debited from your credit card each month and credited in your balance in LocationXS. Unused credits do **not** carry forward into the next month. If you run out of credit before the end of the month, you may choose to top up your account with an incidental top up in the web shop. **Keep in mind that incidental top ups are only valid until your next monthly bundle is credited to your account**. If incidental top ups happens frequently, consider purchasing a higher monthly transaction bundle through the “Change Bundle” option in the webshop. Upon receipt of your next automatic payment of the monthly transaction bundle after an incidental top up your device balance is reset to 0 and the monthly bundle is credited to your account.

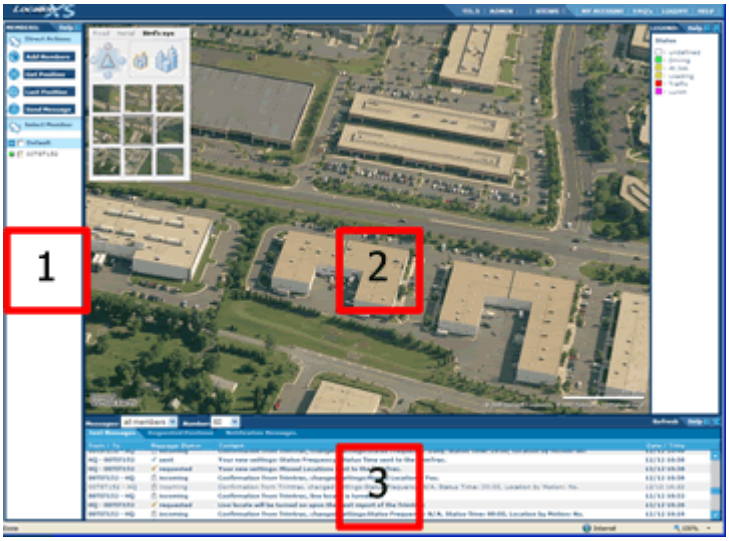
If you have subscribed to a certain monthly bundle and you need to change or cancel your subscription please use the unique Future Pay ID received with the initial invoice from our Merchant (Worldpay) which is send to you per email. You can only change or cancel your subscription by using the Future Pay ID. Changing or cancellation can be done at any moment so you are not “forced” into long lasting payment terms. If however you cancel your monthly bundle subscription for LocationXS and your Simcard, we will de-activate your Simcard resulting in blocked datacommunication.

You can add as many TrimTracs to your account as you like. Your credit (monthly bundle) applies to a specific TrimTracs in your account.

You can always check the balance of a specific device by selecting “My Account” and “My Balance” within your LocationXS account. Select the device of choice to see it’s balance and all related transactions.

If you start running out of credit on a device balance LocationXS will automatically send a message to you per email notification. If you run completely out of credit on a device balance your TrimTrac(s) will stop reporting locations and status messages. Once you have topped up your account and have a positive balance, LocationXS automatically re-activates your account. This process may take up to 24 hours.

Menu options in LocationXS



The main screen in LocationXS™ has 3 sections:

1. Member Center

The left column in LocationXS has all the registered devices you can track online. All the TrimTrac units in the account appear here. The labels on the units correspond with the unit ID in the TrimTrac center. TrimTracs may be renamed and grouped using the "Admin" menu options.

2. Map Center

The map area allows you to see one or more locations in the map as well as zoom and pan capabilities. The legend area provides insight in the displayed data.

3. Message Center

The message center has all incoming reports from your devices. There are 3 tabs in the message tray, one for all status reports, one for all location reports, one for all notifications send. The message and location report tray are the most important trays. The message tray will show if a status report has come in and alerts for low batteries etc.

Feel free to explore all menu options, the most frequently used features are in the menu options at the top of the screen. Since LocationXS™ is used for many different other devices as well as mobile phone tracking some features may not apply to the TrimTrac unit as explained below.

Zooming and panning

Microsoft Virtual Earth provides the maps used in LocationXS. You can zoom in and out by using your mouse on any point in the map. Double left click will zoom in out and left click will zoom in one level at the time. To move faster in zooming you can also use the plus and minus in the legend area in the left hand top of the map. A blue bar indicates the current level. You can move the blue bar to zoom in or out faster.

The main options of Virtual Earth are:

1. Panning on the map

Use the arrow keys to move around on the map

2. Road

Click "Road" to see a vector map of the selected geographical area.

3. Aerial

Click "Aerial" to see a satellite map of the selected geographical area. To see the streetnames on a satellite map select the "Show labels" box. When you have reached the maximum zoom level a message will appear if there are no satellite maps available.

4. Bird's eye

Click "See this location in bird's eye view" to see a detailed picture map of the selected geographical area. These types of maps are not available in certain geographic area's.

In general, the loading of a map should take 3-5 seconds each time on a 512 KB DSL connection. If you experience longer load times by simply zooming in and out please check your firewall settings since these might slow down the loading of the map. To display the maps faster add fol.LocationXS.net to your trusted sites.

Store and forward messaging

The data communication with the TrimTrac works on a store and forward principle. Since the TrimTrac spends most of it's time in SLEEP, LocationXS can only sent new data to the TrimTrac when your TrimTrac has sent a location, or an alarm/status message to the server (RECEIVE NEW SETTINGS MODE). For this reason, LocationXS stores all outgoing new settings until the TrimTrac reports itself to LocationXS. You can always see all new settings sent to the TrimTrac in the message tray as well as their status (scheduled, send). The TrimTrac confirms all new settings once they are applied. The only exception to this store and forward principle is when your TrimTrac is in "live locate"

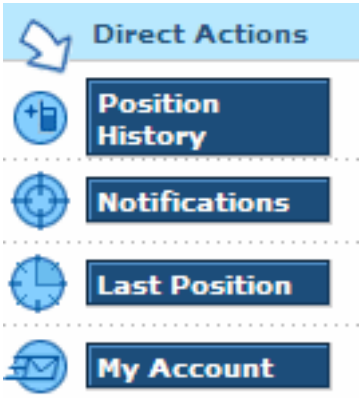
mode. Since the “live locate” mode means the GSM modem is switched on continuously all messages to the TrimTrac are sent to the unit immediately once you click the sent button in any pop up.

The Text Message Tray always shows the status of a message send to your TrimTrac:

1. Requested
Shows the requested change which will be sent to your TrimTrac upon the receipt of the next location or alarm/status message.

2. Sent
Shows the message which has now been sent to your TrimTrac. The orange V thus changes into a green V.

3. Incoming
Shows the confirmation from your TrimTrac it has received and applied the changes sent.

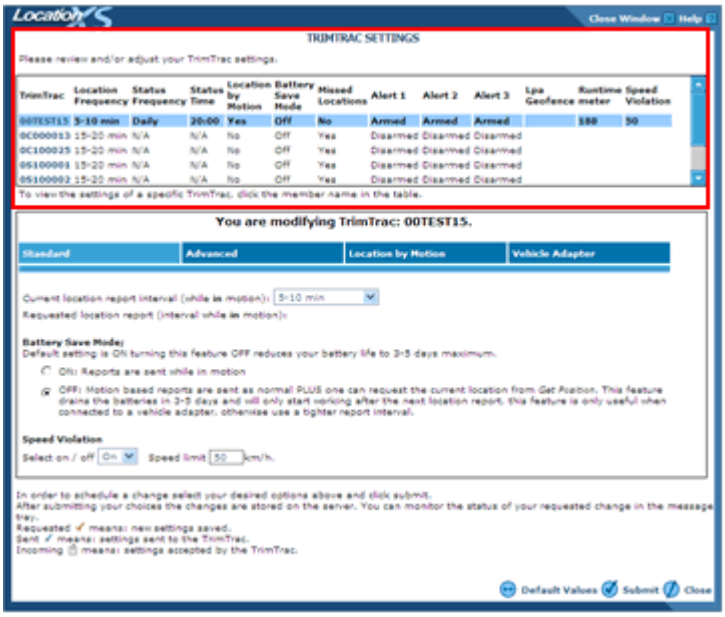
Direct Action buttons 	Use the direct action buttons after selecting a TrimTrac in the member list underneath these buttons. Direct Actions are simply a faster way rather then using the options available in the main top menu.
Location History	Location history displays the sequences of locations from a selected TrimTrac on a map. Select the required TrimTrac in the pull down box and then select the number of most recent locations you want to display on the map, then select get history. LocationXS will display all requested locations on the map. All timestamps of the requested history display in the legend area on the right hand side next to the map and will show on the map by moving your mouse over a certain location icon. If there are overlapping locations you will see the newest sequence number on top on the map Sometimes zooming in to a more detailed level will show that overlapping locations are not exactly at the same location.

Notifications	You can automatically monitor several events and define notification when a certain events occur. Select an event you want to monitor and choose if you want to receive an email or a SMS (standard tariff) when this event occurs. You can send an email notification to one or more email addresses (separated by ";"). You can only send SMS messages to GSM listed as a member in your account. Then type an email address and/or select a member's phone to receive the notification. The current events that can be monitored are: • Movement of a Trimtrac • Battery level low (< 10%) of a Trimtrac • Low balance (< 2.50) notifications to avoid your account running out of credit • Geo-fence notifications (see Geo-fence section) • Sensor message (High priority alarm) of a Trimtrac • Sensor message (Medium priority alarm) of a Trimtrac • Sensor message (Low priority alarm) of a Trimtrac Trimtracs equipped with a vehicle adapter generate Sensor messages.
Last location button	Last location gives you the last known historical location of all selected TrimTracs. Last known location does not actively locate any TrimTrac but retrieves the already received information. Select in the pop up which TrimTracs you want to display on the map by selecting the box next to each TrimTrac and select sent. LocationXS will display the requested last known locations on a map including an aging symbol explained in the legend on the right hand side next to the map.
My account	Under "My Account" all information is stored which relates to general setting for your account.
Selection boxes	The selection boxes left next to each TrimTrac can only be used when live locate is turned on (see also below live locate function). In normal operations, the selection box is grey and you cannot select it.

TrimTrac pull down menu

You can select a menu item by moving your mouse over the menu and than move your mouse to the required option. Select an option by left click with your mouse.

TrimTrac settings I



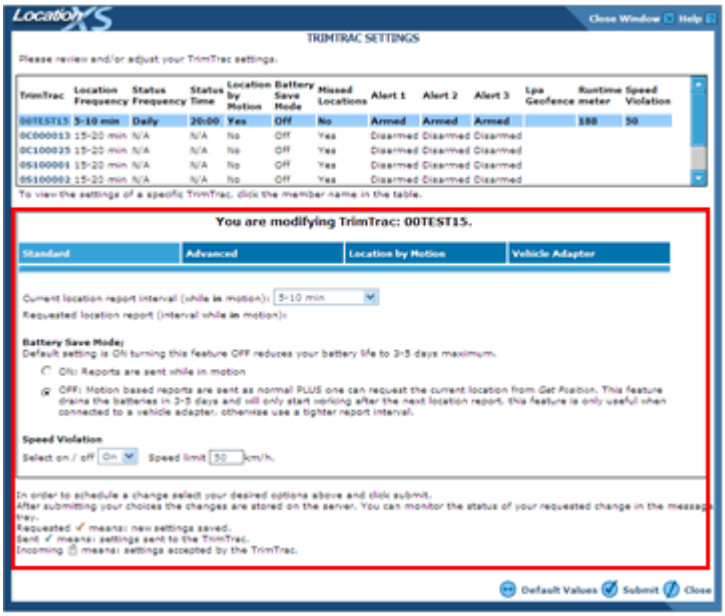
You can view the settings of your TrimTrac and set a profile here. Select a TrimTrac by left click with your mouse in the list on top. This will highlight the TrimTrac chosen and you can now see and change the individual settings of this TrimTrac.

The top list shows all the current settings of your TrimTrac(s). Depending on your user level you might not see all variables listed here.

- **Location frequency**: how often to send a location report when in motion
- **Status frequency**: how often to send a status report when no motion is detected.
- **Status time**: at what time to send the status report.
- **Location by motion**: send location reports based on motion, always or only on request.
- **Battery save mode**: setting to extend battery live
- **Missed locations**: setting to retrieve locations stored on the TrimTrac when wireless coverage was lost.
- **VAM Alert 1-3**: alert inputs from a TrimTrac equipped with a Vehicle Adapater.
- **Automatic Geofence**: creates a Geofence automatically when igniotion is turned off and the TrimTrac is equipped with a Vehicle Adapter.
- **Runtime meter**: counter connected to an external input to count runtime for TrimTracs equipped with a Vehicle Adapter.
- **Speed violation**: set speed at which a TrimTrac needs to report a violation.

All these variables are explained in detail below.

TrimTrac settings II



There are 4 user levels:

- **Standard**: to change the location frequency when in motion. Change the battery safe mode and set the speed violation level.
- **Advanced**: additional advanced settings
- **Location by motion**: override motion sensor settings
- **Vehicle Adapter**: settings for a Trimtrac with VAM

If you want a higher user level (more complexity) please contact support.

Once you click “Submit”, the new profile transmits to your TrimTrac(s) and the sent message will be shown in the message tray with an orange V in front of it stating “**Profile XX will be turned on upon the next report received from the TrimTrac**”. Once your TrimTrac reports to LocationXS, the new settings transmit to your TrimTrac. The orange V in the message tray turns green that proves receipt of the new settings and an incoming message will state “**Profile XX confirmed by Trimtrac**”. Always wait to send a new profile until confirmation of the earlier changes!

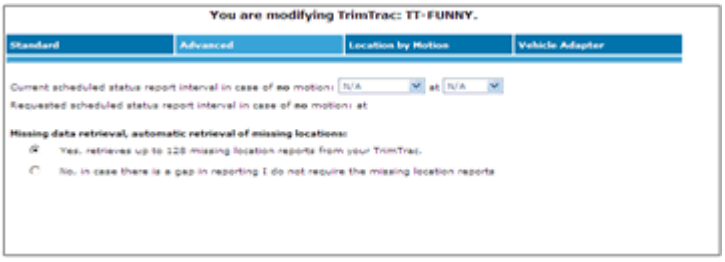
“Default Values” will show the factory settings as a reference.

TrimTrac Standard settings

The standard settings allow you to select a location interval from the pull down. The interval chosen defines the time between location reports when in motion. The interval is **NOT** exact since the time to retrieve a GPS signal depends on the signal strength which varies with the location of your TrimTrac.

The battery safe mode is used to extend your battery live. Typically a TrimTrac will operate for up to 3 month on 4 AA batteries. If you turn battery safe mode off the TrimTrac does not go to the Sleep mode. This enables location requests when needed and should only be used when your TrimTrac is connected to external power using a Vehicle Adapter.

TrimTrac Advanced settings



The advanced settings allow you to select a status message interval. A status message contains usefull information like battery status and is also valuable as a “sign of live” meaning your TrimTrac is working properly. If you select N/A your TrimTrac will never send a status message.

Missing data retrieval is used to collect location reports and status messages stored on your TrimTrac. Whilst the TrimTrac has lost the connection to the wireless network it will store up to 128 reports. If you want to make sure you get all reports you should select “Yes”.

TrimTrac Location by Motion settings

In the TrimTrac Location by Motion settings users select automatic retrieval of missed locations and messages from the Trimtrac.

Every message received contains a sequence number and LocationXS monitors automatically if there are missing sequence numbers. Non-concurrent sequence numbers occur due to poor network coverage in certain areas.

If you do NOT want this to happen automatically, then select the Trimtrac and select “No”. Click send to send your changes to the server.

If “Never” is selected the TrimTrac will only respond to location requests. This option typically applies to Trimtracs equipped with a Vehicle Adapter and the “battery safe mode” turned off. When using this option you might only want to see locations that you request and not any locations generated automatically based on motion.

Also keep in mind a response to a location request might take between 5-10 minutes since the actual GPS calculations might take this long. The location response is shown in the Reported Locations tray with a status “requested”.

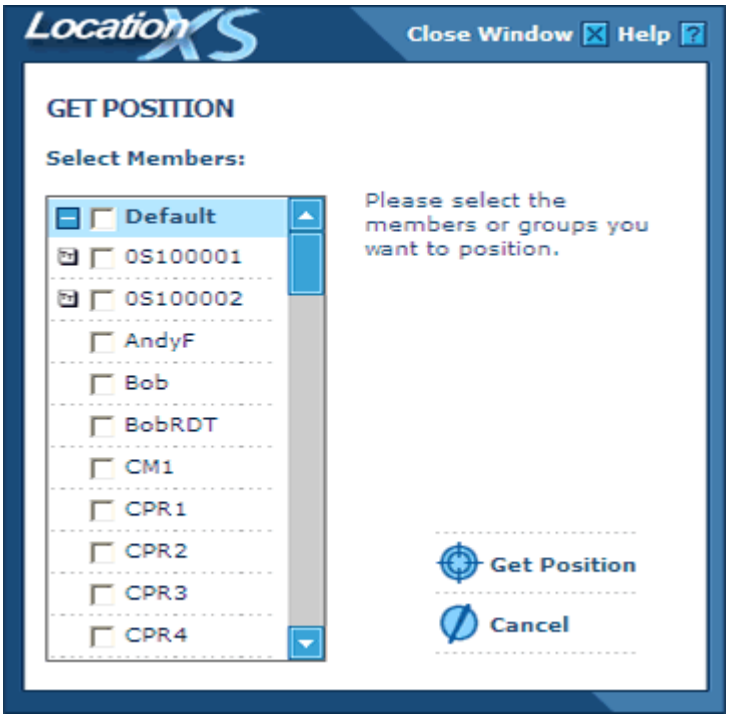
TrimTrac Vehicle Adapter settings

The Vehicle Adapter settings allow you to arm/disarm 3 alerts. Keep in mind that your TrimTrac is connected correctly to these inputs (see also Vehicle Adapter Wiring at page 64 of this manual and the additional Vehicle Adapter manual).

Automatic Geofence is used in combination with a Low Priority Alert (LPA or Alert 3). For example, when the LPA is connected to ignition the TrimTrac will “arm” itself with a Geofence at that location with the chosen radius. If the TrimTrac moves out of this Geofence without ignition turned on this will generate alerts to LocationXS and to your mobile phone/email (depending on how you set up your Notifications).

Runtime meter is used as a counter for hours of operation. The runtime meter counts the hours when the LPA input is turned on. To request the actual status select “Get current status” and check the message tray for the incoming report (once the TrimTrac sends it’s next motion report or scheduled report). To reset the runtime meter select “reset runtime meter”.

Get location

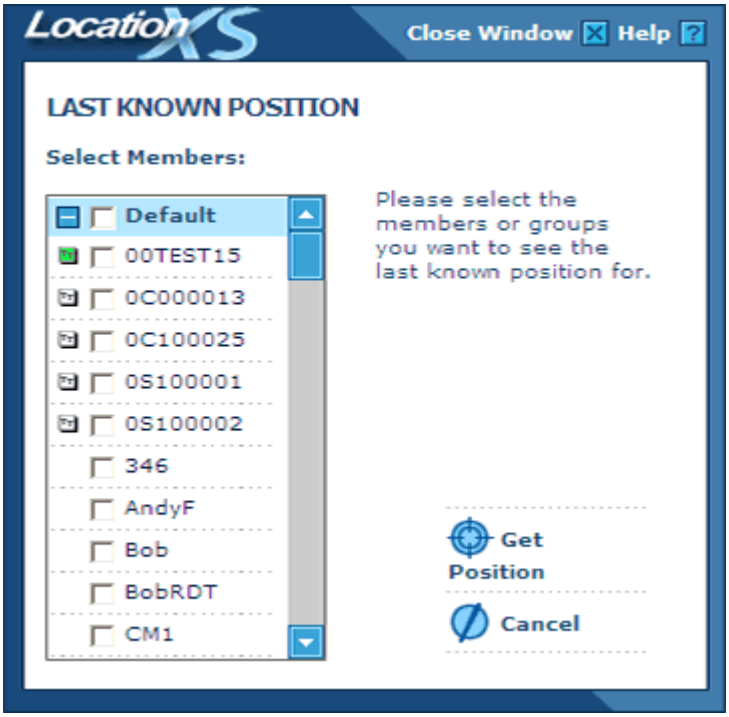


Select Get location to actively poll (ask) a location from one or more TrimTracs. This function will only be enabled when you have turned off “battery safe mode”. If your TrimTrac(s) do not appear in the selection area the TrimTrac(s) are not yet switched off. KEEP IN MIND LIVE LOCATE DRAINS YOUR BATTERY WHEN NOT USING A VEHICLE ADAPTER.

Select one or more TrimTrac(s) by selecting the box next to the TrimTrac. Selecting get location will send your request to the TrimTrac(s). All requests display in the text message tray underneath the map. Please allow 5-10 minutes for an active poll depending on the GPS signal at the current location of your TrimTrac(s). The location report shows in the Requested Positions Tray.

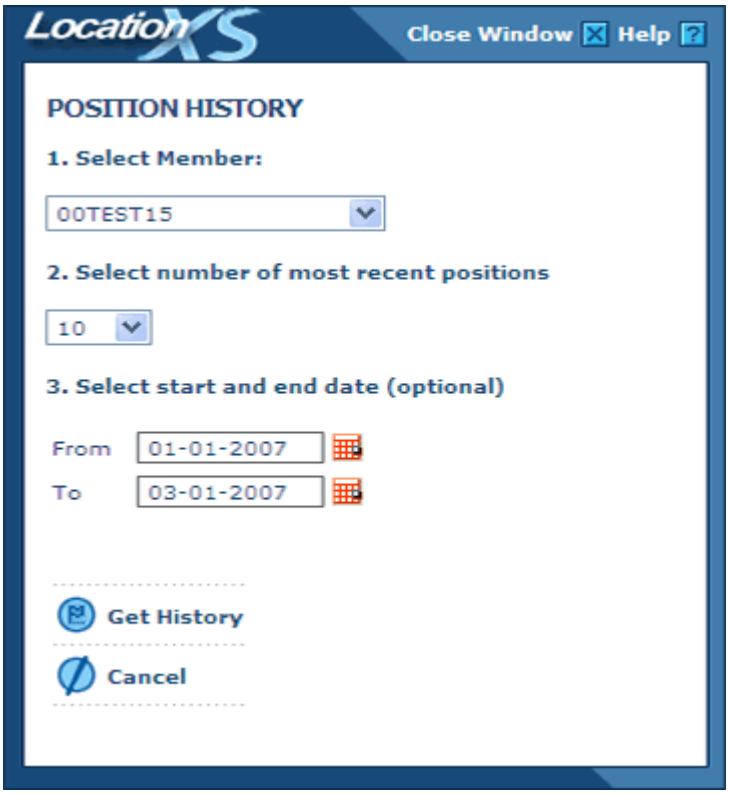
If no location can be retrieved a GPS timeout message will be sent by the TrimTrac as a response to your request and stating the GPS quality (0,1 or 2 satellites). You can check this information by clicking on the response message in the message tray.

Last known location



Last known location gives you the last known historical location of all selected TrimTracs. Last known location does not actively locate any TrimTrac but retrieves the already received information. Select in the pop up which TrimTracs you want to display on the map by selecting the box next to each TrimTrac and select “Get Location”. LocationXS will display the requested last known locations on a map including an aging symbol described in the legend on the right hand side next to the map.

Location history

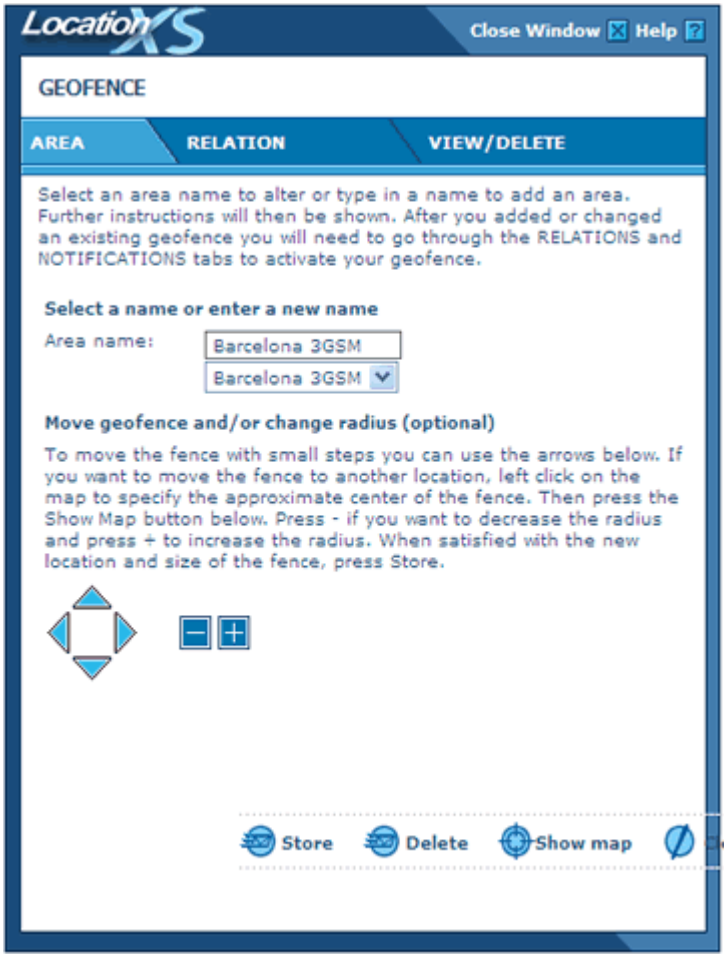


Location history displays the sequences of locations from a selected TrimTrac on a map. Select the required TrimTrac in the pull down box and then select the number of most recent locations you want to display on the map. Alternatively, you can also select a date from/to for which you want to see the historical locations. The server stores up to 90 days of historical information. To view the location on a map select get history.

LocationXS will display all requested locations on the map. The newest location is numbered 1 and the oldest location has the highest number. All sequence numbers and timestamps of the requested history display in the legend area on the right hand side next to the map. If there are overlapping locations you will see the newest sequence number on top on the map.

Sometimes zooming in to a more detailed level will show that overlapping locations are not exactly at the same location.

Geofencing – Area definition



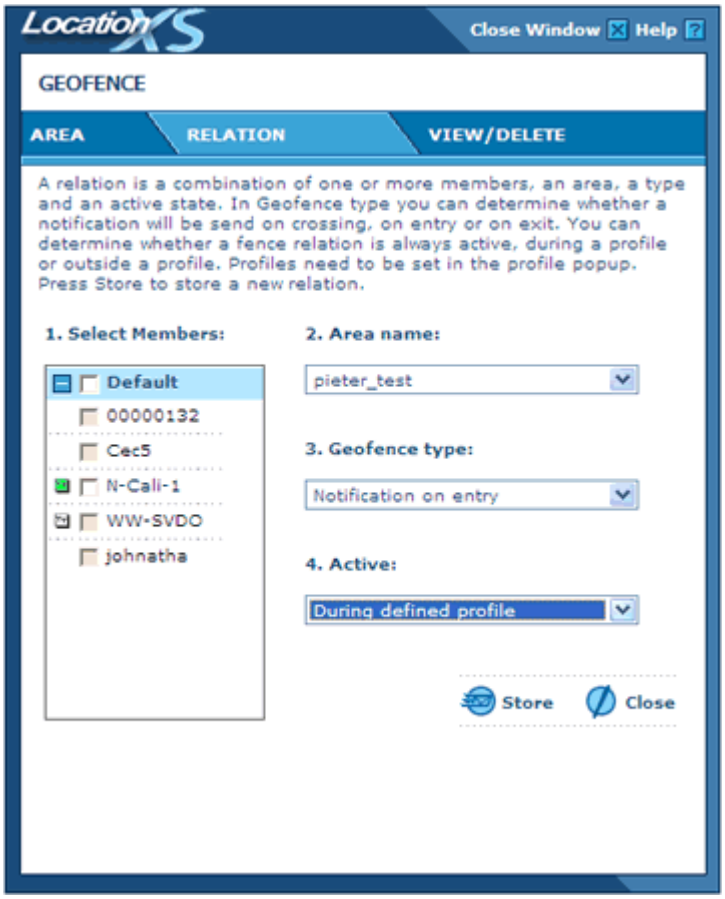
Geo-fences monitor if Trimtracs are inside or outside a pre-defined geographic area. When using Geo-fences you need to:

- Set up a Geo-fence in Areas
- Activate the Geo-fence for the required Trimtrac(s) in Relation
- Define the notification rules in Notification

Select a name for the Geo-fence area. Type in a postcode for the center of the Geo-fence or a latitude and longitude. Then select a radius for the Geo-fence. The minimum size is 10 meter or 0.01 mile (0.01 km/mile).

First select store and then look at your defined Geo-fence by selecting show map. You can also move the center of the Geo-fence by changing the latitude and longitude once you have stored it. Use this to location the center of the Geo-fence to the exact location if needed.

Geofences - Relation



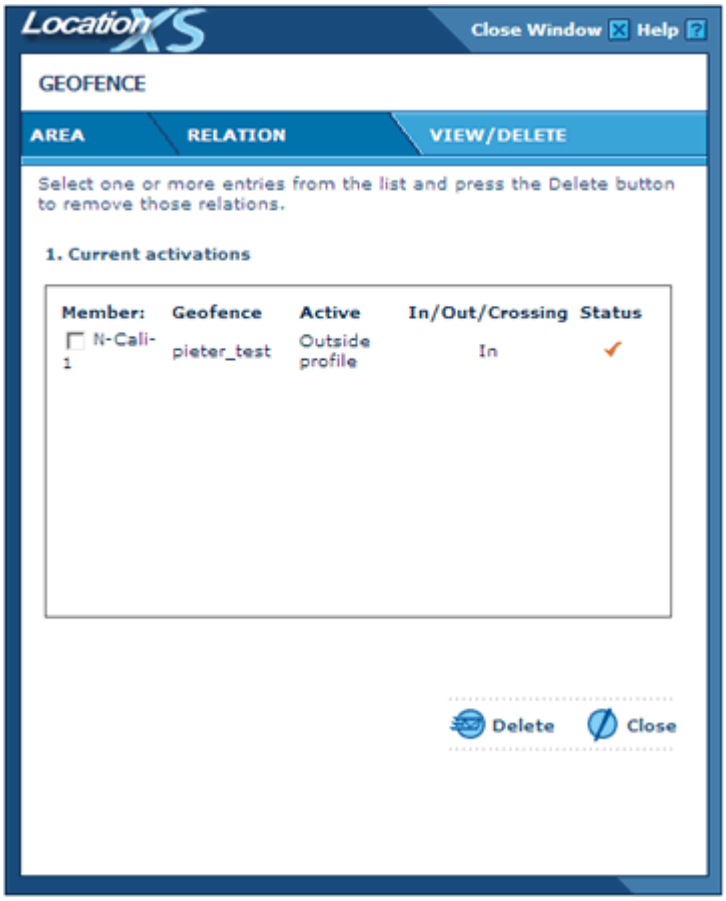
Once you have defined a Geo-fence you should define the relation between your TrimTrac(s) and the Geo-fence area. Select which TrimTrac(s) need activation and select which Geo-fence. You can have a maximum of 2 Geofences on a Trimtracs (thus 2 relations). If you try to define a third relation for a TrimTrac you will receive a warning message and you will be asked to delete one active Geo-fence before sending a new one. This is required since only you know which Geo-fence can be deleted from the TrimTrac.

Next, choose to monitor the entry of the Geo-fence or the exit of the Geo-fence or on Crossing the border of the Geofence. If you want continuous alerts of a Geo-fence violation select “notification on entry” or “notification on exit”. You will continue to receive alers whilst the Trimtrac is inside or outside the Geo-fence. If you only want an alert once select “notification on crossing”.

Then define when the Geo-fence is active. You can select always, during a stored profile or outside a stored profile on the TrimTrac. Please ensure you have set up and send a profile to your TrimTrac to use this option.

Once you have stored your Geo-fence, it is active and everytime the TrimTrac wakes up based on motion and the defined interval (see also TrimTrac Settings) all GPS locations will be compaired with the Geo-fences you have defined. If a Geo-fence rule is broken your TrimTrac will send an alert to LocationXS which you can see in the text messages tray. If you have set up to be notified per email and/or SMS you will also receive a notification message from LocationXS in your email and/or on your mobile phone.

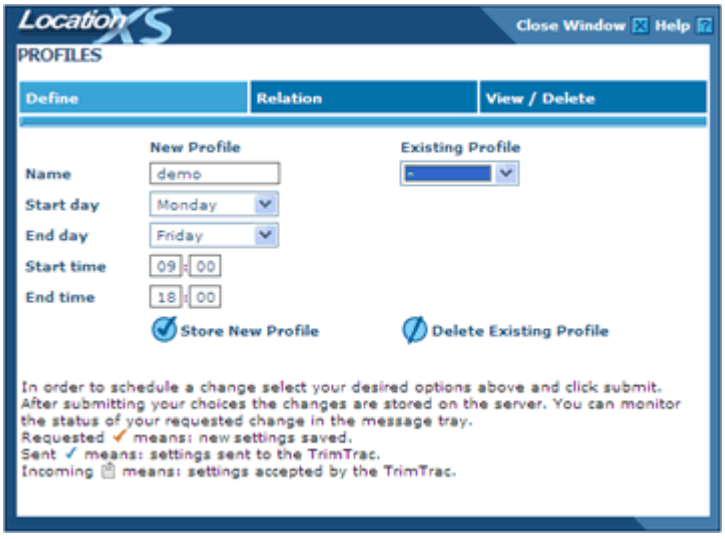
Geofences – View/Delete



To manage all defined Geo-fences and relations you can view them by selecting view/delete.

Simply select a relation/Geo-fence definition and click delete if you no longer need to monitor if the Trimtrac is entering/leaving the Geo-fence.

Profiles - Define



Profils are used to define during which days and/or hours of a day a TrimTrac should be active. You can define 1 profile per TrimTrac and store as many profiles as you like within LocationXS.

Currently these profiles are only used in combination with the Geofence function. Thus you can define when Geofences should be active or not

Define a new name, start day – end day, start time – end time for a new profile. Alternatively select a stored profile to edit the settings. Profiles active on a TrimTrac may not be edited and need to be deleted first. This means you need to delete and active profile and wait until your TrimTrac has confirmed the delete before you can change that profile. Alternatively you can send another profile to your TrimTrac which will overwrite the earlier stored profile.

Profiles - Relation

Once you have defined a Profile you should define the relation between your TrimTrac(s) and the Profile. Select which TrimTrac(s) need a Profile and select which Profile. You can store 1 profile on a TrimTrac. If you send a new Profile this will overwrite the earlier stored Profile on your TrimTrac.

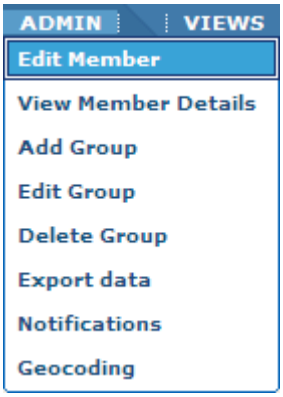
Once you have saved the relation it is stored on the server and send to your TrimTrac upon receipt of the next report from your TrimTrac. You can check the requested, sent and confirmed Profile in the Text Message tray.

Profiles – View / Delete

To manage all defined Profiles and relations you can view them by selecting view/delete.

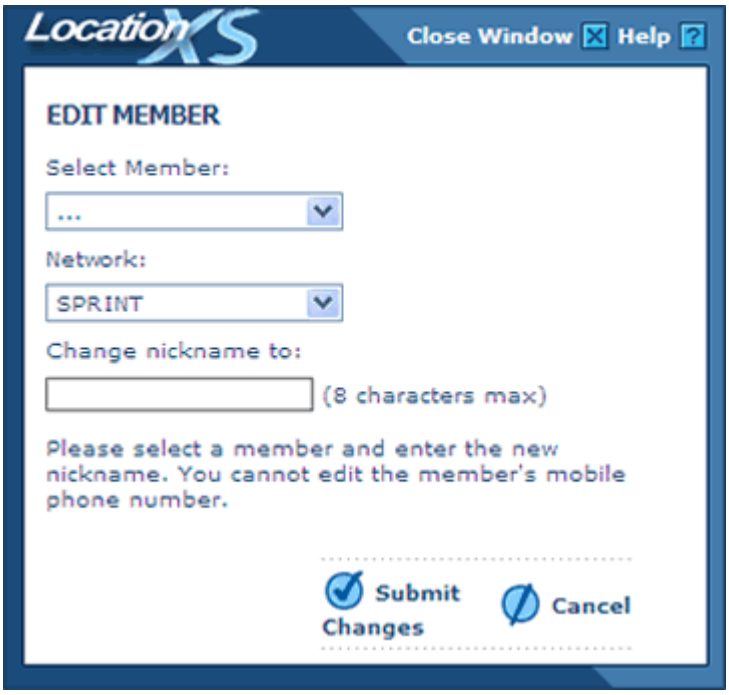
Simply select a relation/Profile definition and click delete if you no longer need to monitor if the Trimtrac is entering/leaving the Geo-fence.

Admin



The admin menu contains all data regarding your TrimTrac settings. In the pull down select, which action you want to execute.

Edit Member



Change the displayed name of each TrimTrac. In the pop up, select a TrimTrac and change the nickname in the box below. Then select submit changes and your changes show in the member center.

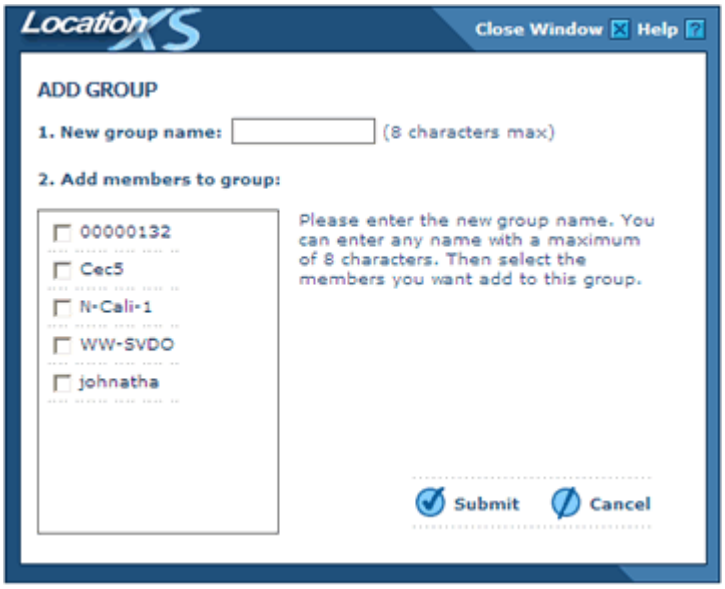
The network selection option should not be changed.

View Member Details

View all Member (TrimTrac) details gives you all relevant information for all your TrimTracs in one view.

Nickname, mobile number (MSISDN), time windows (do not apply to TrimTrac!), Network, GSM or TrimTrac device, current profile, requested profile and live locate status.

Add Group

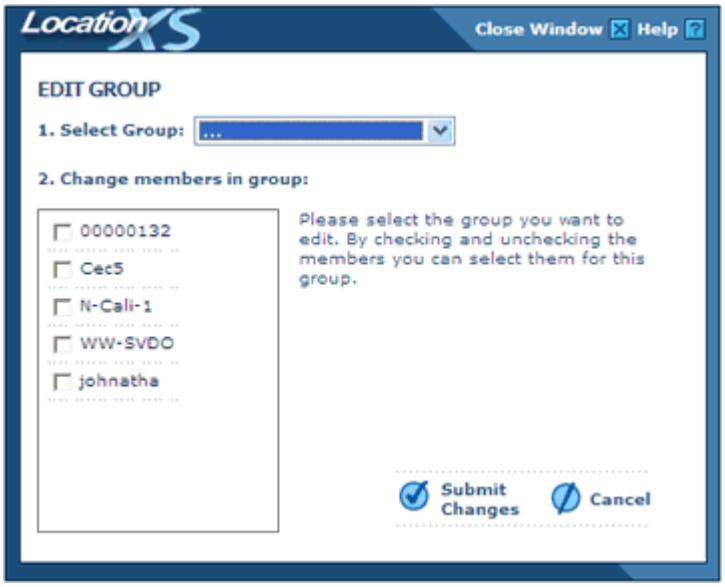


In order to keep your TrimTracs organized you can divide them into groups.

Type a group name and select which TrimTracs belong to that group. A TrimTrac can be part of multiple groups.

The “default” group is a standard group and will always contain all TrimTracs. The “default” group cannot be deleted. If you do not want to see it in your actual view minimize it by clicking the – in front of each group.

Edit Group

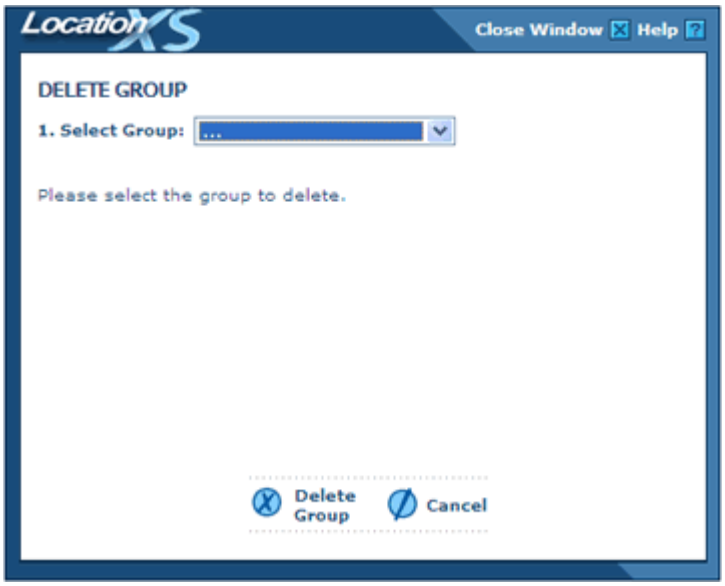


Using Edit Groups, you select which TrimTracs are in a certain group.

Select a group using the pull down and select the TrimTrac(s) within that group by clicking the selection box next to the TrimTrac(s). Then select submit changes to send your changes to the server.

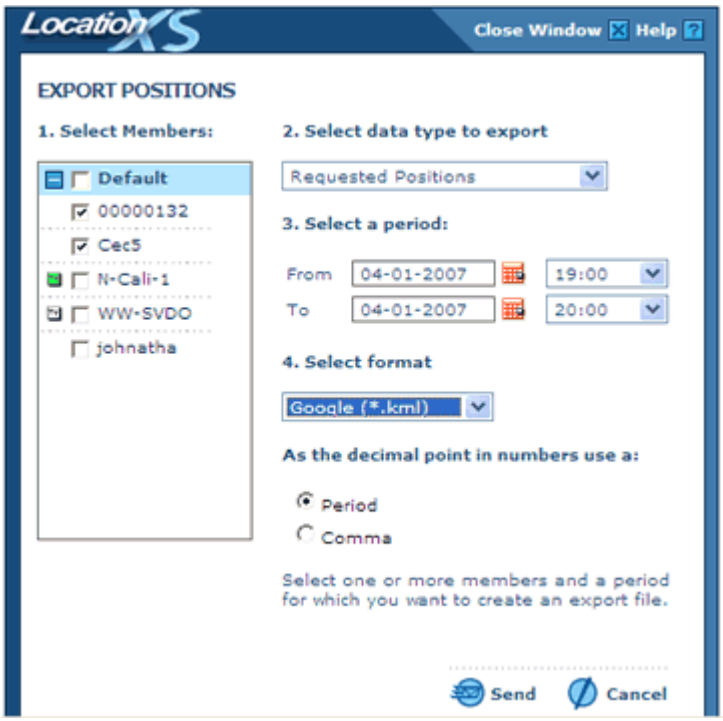
TrimTracs can be in more then one group.

Delete Group



It is possible to delete Groups. This will only affect the group and not your TrimTracs since the TrimTracs always remain present in the default group.

Export Data



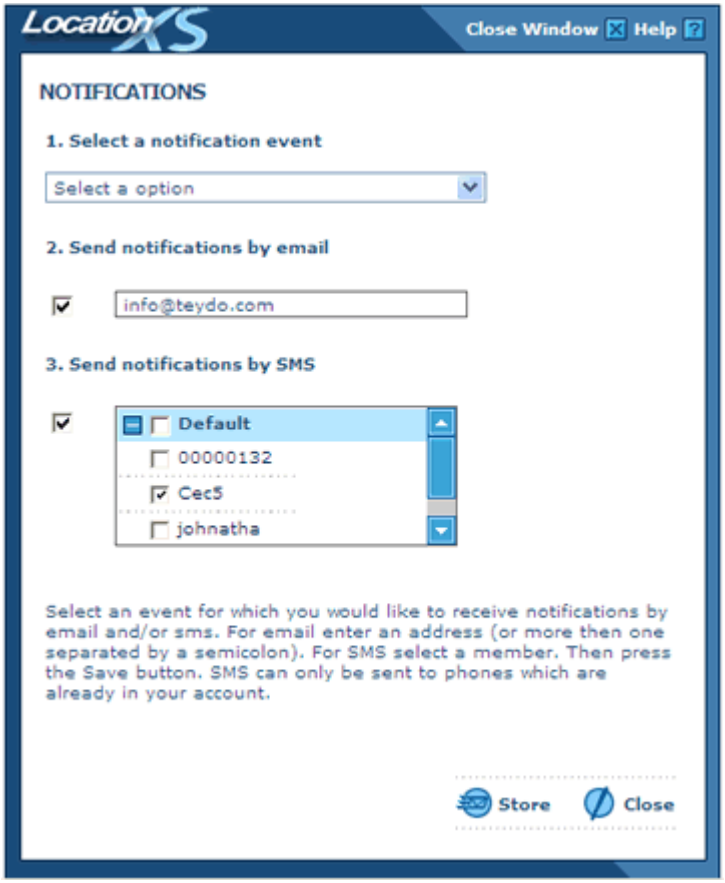
In order to keep historic data available for yourself you need to export the data. LocationXS stores, in your live account, up to 500 locations and 500 messages or 1 month of data. With the export function, you can select up to three month of historic data. Locations and messages export in Excel format.

Select one or more TrimTracs for which you want to export the locations and messages. Selecting a group will select all TrimTracs in the group automatically. Then select a start date and time as well as an end date and time for your export.

For European users (excluding the UK) the comma is the most likely export format (decimal point is exported as a comma) whereas user in the US, UK, South America, Canada and Asia would use the decimal point to be a period. Selecting the correct decimal pointer ensures accurate importation of data into other mapping and routing software like MapPoint Streets&Maps, Map&Guide, Google etc.

In case you have forgotten to export your data before it is deleted from your live account and you need it for your analysis please contact our support desk.

Notifications



You can automatically monitor several events and define notification when a certain events occur.

Select an event you want to monitor and choose if you want to receive an email or a SMS (standard tariff) when this event occurs. You can send an email notification to one or more email addresses (separated by ";"). You can only send SMS messages to GSM listed as a member in your account.

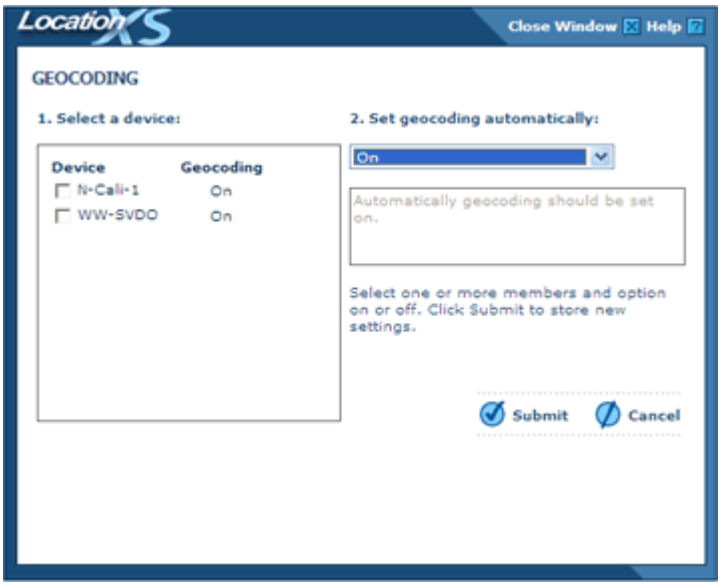
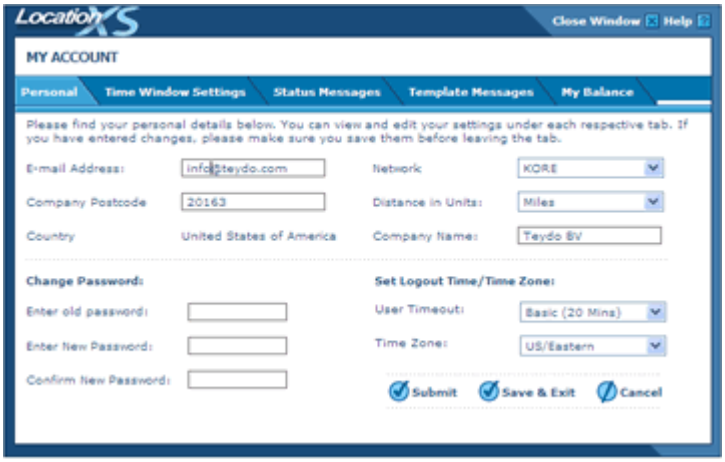
Then type an email address and/or select a member's phone to receive the notification.

The current events that can be monitored are:

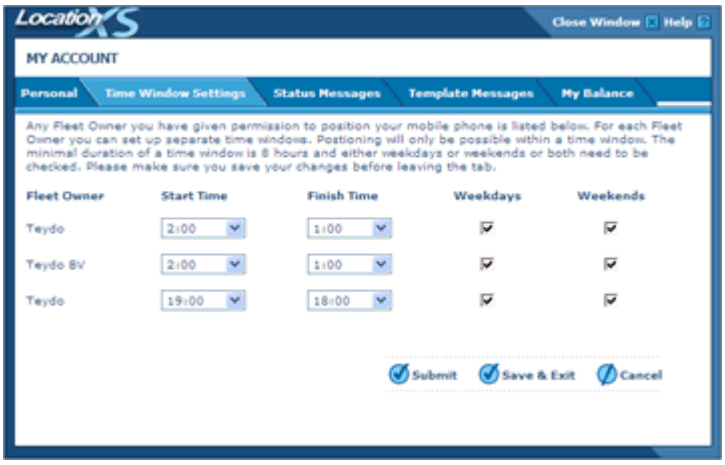
- Battery level low (< 10%) of a Trimtrac
- Movement of a Trimtrac
- Low balance (< 2.50) notifications to avoid your account running out of credit
- Geo-fence notifications (see Geo-fence section)
- When a speed violation message is received
- At the end of a set runtime counter (Vehicle adapter equipped TrimTracs only)
- Sensor message of a Trimtrac (High/Medium/Low priority alarm - Vehicle adapter equipped TrimTracs only)
- Geofence LPA notification of a TrimTrac (see Vehicle Adapter section)

The notification will be send to the address of your choice (or both email and SMS) containing the following example text: **Member <MEMBER NAME> has left/entered Geo-fence <NAME GEO-FENCE> at 05/08 15:51 hr and is currently at <ADDRESS, ZIP, CITY>**.

All notifications send per email and/or SMS will appear in the notifications tray underneath the map

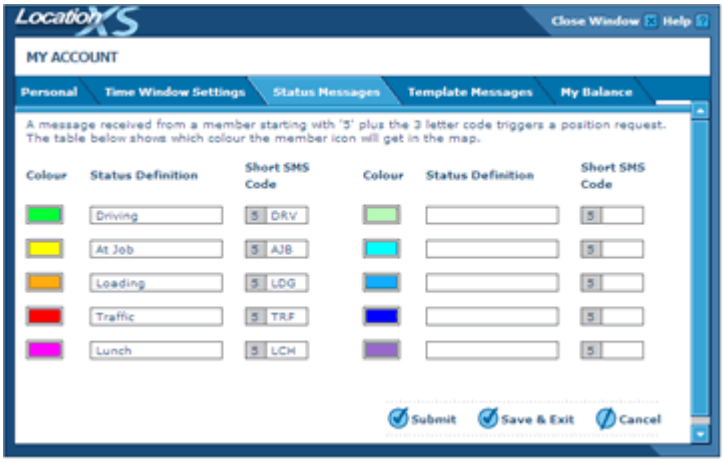
Geocoding 	Geocoding is the retrieval of an address with a received location. Standard Geocoding is turned off to avoid charges to your account. Specially with the new TrimTrac (using GPRS) it is likely that you want to receive many location reports and you do not need all the address information. To turn Geocoding on select the TrimTrac by selecting the box next to it. Then select “On” from the pull down and submit your settings to the server. Even if Geocoding is turned off all alerts which result in a notification will be automatically geocoded. There for your important notifications will always have address information for your reference. If you want to Geocode an individual location report you can do so in the locations tray by clicking the geocode option for the location report of choice. Keep in mind each Geocode is charged to your device balance (charges are related to your monthly bundle and can be found in the pricing section on the website)
Views	You can select to see the standard view with both the maps and message/location tray in one view. In addition, you can expand the map view or the message/location tray to display in the center panel of your Default Opening Screen.
My account	Under “My Account” all information is stored which relates to general setting for your account.
My details 	In the “Personal tab” you can check and edit company details, your email address, and your password. Next to this standard information you can also set your: **Company postcode**: this postcode determines your standard map. **Network**: this displays the standard network for your communications; you normally should not change this. **Distance in units**: this influences the display of miles or km with all locations received. **User time out**: this determines how long your account remains open when you do not use it. For security reasons, LocationXS will log off your account automatically at the chosen time interval. **Time zone**: this influences the date and time stamp of every status message and location, sent, or received.

Time window settings



The “Time windows” tab only apply to mobile phone locationing. Here you see the time windows set during which you can locate your employees.

Status messages

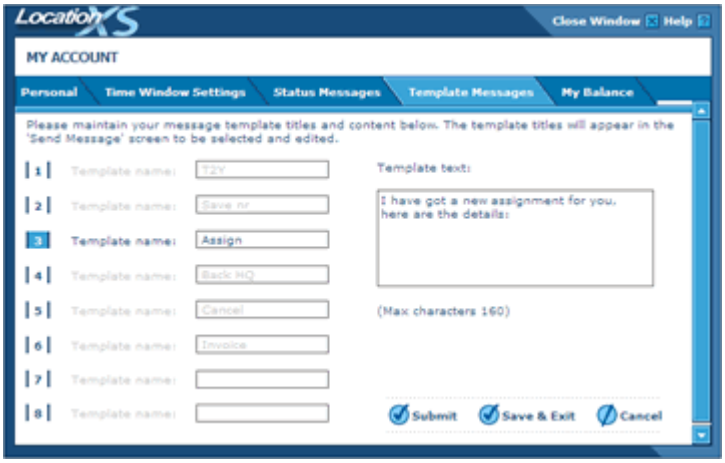


The “Status Messages” tab applies to messages received from normal mobile phones and not to TrimTrac.

Create Status messages by choosing any 3-letter abbreviation (for example DRV for driving). You can define up to 10 status messages. Each status message must start with the number 5 in order for LocationXS to recognize the incoming message as a status message. Upon receipt of the status message from a mobile phone, LocationXS will automatically retrieve a location and display the related status color on the map once the location.

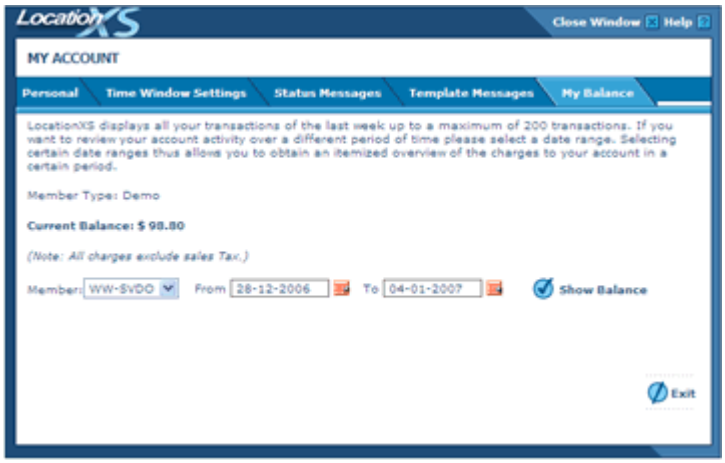
Using this function, you can easily build time and attendance reports that automatically include a location check for each status message sent. This enables you to validate the input sent to you.

Template messages



Standard messages apply to text messages sent to normal mobile phones and not to TrimTracs.

You can store to 10 standard text messages, to avoid typing the same text over. Once you sent a new text message, you can select the stored standard text messages from a drop down list.

My balance 	"My Balance" contains all billing and charging information related to your devicest. Select for which TrimTrac you want to see the charges and top ups (monthly bundle or incidental top up). Then click the calendar icons for a specific time-period and select "Show Balance". In the balance all credits and debits to your device balance display for each individual transaction as well as for your activation, your monthly bundle, and incidental top ups.
FAQ's	In the "FAQ's" you find detailed information on the usage of LocationXS and TrimTrac. The information in the "FAQ's" is the same information as included in this manual.
Log off	To stop using LocationXS and safely close the connection to your account "Log Off".
Help	The "Help" files contain detailed information on the usage of LocationXS. The information under "Help" is the same information as included in this manual.

Text message tray

Select the message tray by clicking on the tab titled “Text Messages”. All incoming and outgoing text messages display **bold** in the message tray underneath the mapping area. Once you have clicked the message and read it the bold font will disappear. For each message there is an indicator showing the status of the message (incoming, sent, requested).

The message tray is updated automatically every 5 minutes when you are logged in to your account. To refresh the data manually click refresh data in tray at the right hand top of the tray.

Each message can contain more data than displayed in the message tray. Click the message to see the full content including: battery status; sensor information (Vehicle Adapter only); and which trigger caused the message.

Each message contains a date and time stamp, which is the actual timestamp of the message from the device. In times of heavy traffic, message queues do exist at GSM operators, which could cause delays in the delivery of a message to a TrimTrac or arriving from a TrimTrac. Typical delivery or receipt time is 2-4 seconds.

If you click an individual message, the full content displays. You can delete a message after you have read it. In addition, you can reset a sensor by selecting the reset button in a message (only applicable to TrimTrac with a vehicle adapter).

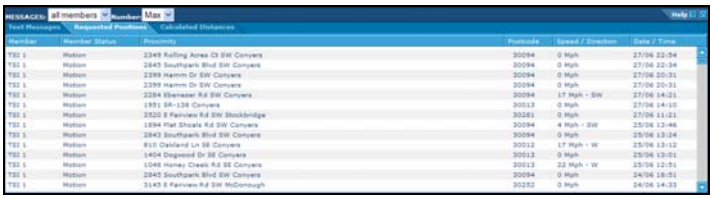
The message tray has several selectable headers to sort messages. By default, all messages display in date/time stamp order with the newest message on top.

LocationXS displays a maximum of 500 messages or approximately, 1 month of data. This avoids long loading times in your browser. If the browser has long loading time, select a smaller number of messages to display.

To select messages from a specific TrimTrac use the TrimTrac selection pull down menu above the message tray.

To export messages go to the Export function in the Admin menu. LocationXS stores up to 3 months of messages. If you need older data please contact our support desk.

Requested locations tray



Select the “Requested Locations” tray by clicking on the tab containing the locations. All incoming locations display in the location tray underneath the mapping area. For each location, LocationXS displays the trigger, which caused the location (request, motion, and sensor).

The location tray is updated automatically every 5 minutes when you are logged in to your account. To refresh the data manually click refresh data in tray at the right hand top of the tray.

Each location is **not** automatically geocoded! If you click the Geocode option of a location report (or turn the geocoding on) this will result in a street address (including house number if available), zipcode, and city. Each location also contains information about speed and heading. Click the location to display it on a map.

Each location contains a date and time stamp, which is the actual timestamp the TrimTrac, retrieved the GPS location. In times of heavy traffic, message queues do exist at GSM operators that could cause delays in the delivery of a location to LocationXS. Typical receipt time is 2-4 seconds.

The location tray has several headers used to sort the specific column when clicked. Typically, all locations display in a date/time stamp order with the newest location on top.

LocationXS displays a maximum of 500 locations or 1 month of data to avoid long loading times in your browser. If your browser is still slow in displaying the location tray, select a smaller number of locations to display using the pull down menu above the location tray.

To select locations from a specific TrimTrac use the TrimTrac selection pull down menu above the location tray.

To export locations go to the Export function in the Admin menu. LocationXS stores up to 3 months of locations. If you need older data, please contact our support desk.

You cannot delete a location. Locations automatically delete from your account after 3 months.

Notifications tray

Select the notifications tray by clicking on the tab containing the notifications. All sent notifications display in the notification tray underneath the mapping area. For each notification, the service displays the recipient's address to including date and time stamp. Click on a notification to see the details.

The notification tray is updated automatically every 5 minutes when you are logged in to your account. To refresh the data manually click refresh data in tray at the right hand top of the tray.

You can delete notifications by clicking the notification message and select delete after you have read the notification message.

Theory of Operation of a TrimTrac

Introduction

In LocationXS, motion-based reporting is the fundamental operating premise of the TrimTrac. This means that the unit computes and reports new GPS location fixes only if the unit is in motion and once more after coming to rest.

To conserve power and minimize communication costs, the TrimTrac attempts to be in “Sleep Mode” as much as possible. In general, the TrimTrac will spend a majority of its time in the “Sleep Mode” state during periods of no motion. How frequently the unit computes a new location fix while in motion is determined predominantly by the setting of the profile in LocationXS.

TrimTrac locationing cycles

In LocationXS, motion-based reporting is the fundamental operation. The TrimTrac state engine transitions through several states based on motion, external inputs, timeouts, and as a result of completing defined actions (i.e. communicating to the server), as follows:

IDLE: The TrimTrac spends the majority of its time in the IDLE state. The two factors that wake the TrimTrac are:

The TrimTrac wakes up out of IDLE by detection of motion, which results a GPS fix for a maximum 10 minutes. Once the GPS fix has been made (average of 2 minutes), the location will be sent to LocationXS and will appear in the “requested location” tray underneath the map. If unable to retrieve a GPS location the TrimTrac sends a status message to LocationXS stating such. The messages appear in the “Text Message” tray underneath the map area in LocationXS. Clicking on a message displays the details.

The other reason a TrimTrac transitions through “IDLE” state is the expiration of the daily timer (standard 24 hrs) which sends a “Status” message as a “proof of life”.

GPS FIX: The TrimTrac attempts to fix a location for a maximum period of 10 minutes. Once achieved, the location transmits to LocationXS and the internal clock resets. When the clock resets, the next location does not transmit earlier then stated in the profile. If no movement occurs, the next status message appears 24 hours after your last location.

The GPS fix time is typically in the order of 2 to 5 minutes, except during almanac collection. Almanac collection happens mostly when the TrimTrac moved over a long distance (for example by plain or car) whilst the battery pack or Vehicle Adapter was disconnected. The collection of the GPS almanac requires up to 20 minutes and needs to happen in clear view of the sky!

If during the cycle of acquiring a GPS fix, SEND DATA, RECEIVE NEW SETTING AND SLEEP motion is detected the TrimTrac will always do a final cycle to determine the last known location. This location is typically the location where the TrimTrac no longer has detected any motion, thus where it is at present.

SEND DATA: After wake up by motion or due to the internal timer or when using the Vehicle Adapter by one of the three external inputs, the TrimTrac sends its data to LocationXS.

If the wake up was due to motion this results in a location.

If no GPS fix is possible a “Status” message transmits stating that the unit detected motion and no fix is possible. The number of satellites that detected gives an indication of the GPS signal reception: 0 = no satellites; 1 and 2 = 1 or 2 satellites). The TrimTrac needs at least 3 satellites for an accurate location.

If the wake up occurs because due expiration of the internal clock, a normal status message transmits to LocationXS as a “health check”.

All the status messages include battery condition and wake up event type: motion or timer expiration. All the location reports also include speed, direction: North, North/East, and East etc represented by the nearest address with house number when available.

If no data transmits due to bad coverage of the GSM network, the TrimTrac stores up to 128 locations and/or status messages. LocationXS retrieves these missed locations and messages automatically. You can turn this option off through the TrimTrac menu by selecting “Automatic retrieval missing reports”.

RECEIVE NEW SETTINGS: The TrimTrac waits after sending each message or location for 1 minute to receive new profile information or live locate instructions. It is during this period that new settings tranmsit to the TrimTrac.

Normally, the TrimTrac receives and processes new settings sent from LocationXS while in the RECEIVE NEW SETTNG state; however, it can always receive messages if live locate has been turned on.

The TrimTrac confirms all new settings sent to the TrimTrac. In LocationXS all new settings sent to the unit, as well as the confirmation of the new active settings being, display in the text message tray underneath the map.

SLEEP: The TrimTrac goes to sleep after sending a location to LocationXS for a programmable time defined in the profile. During this period, the unit is unreachable. The profile defines how often the TrimTrac will send locations when moving. If live locate is turned on, then the GSM modem will always remain operational, and the TrimTrac will be able to receive and process new profiles, location requests and “live locate off” messages.

Motion Detection and Filtering

In LocationXS, motion-based reporting is the fundamental operating premise of the TrimTrac. The TrimTrac includes a mechanical motion detector that is sensitive to shock, vibration, tilting and motion.

If the motion detector senses motion, the TrimTrac wakes and transitions out of the IDLE State to start acquiring a GPS location.

If required the motion sensor diables, limiting the number of messages from the TrimTrac to LocationXS to the “Daily Status Messages”. When using a Vehicle Adapter and “Live Locate” this enables you to requests locations only when really needed. To turn off the motion sensor please contact support.

Alert Handling – Vehicle Adapter Module

When using a Vehicle Adapter Module with the TrimTrac, the device monitors, and reports on High, Medium and Low priority inputs as shown in Figure 7, VAM Alert Wiring Diagram, on page 64. Regardless of priority, each input will be in one of the following states at any given time:

0=Normal
1=Activated
2=Sent
3=Acknowledged

Check the input state by clicking the status message in the message tray containing these alerts. To reset an alert, click “reset alert” within the pop up that appears when clicking the alert message.

General Alert Handling

LocationXS processes Alerts in descending order of priority. High Priority Alerts, for instance, always take precedence over Medium and Low Priority Alerts and so on. Other than having their status included in any outgoing SMS messages, lesser priority alert alarms are ignored until all higher priority alerts have been either cleared to “0=Normal” or set “3=Acknowledged”.

When a VAM equipped TrimTrac detects activation of a monitored switch or device, loss of external power or tampering with the external wiring, it will set the appropriate priority alert to “1=Activated”. The one exception to this, as more fully described below, is a Low Priority Alert for which the TrimTrac needs to also detect motion in addition to activation of the switch before the Low Priority Alert is set “1=Activated”.

Clicking on the “Alert Message” and selecting “Reset Alarm”, resets the alarm on the TrimTrac.

Furthermore, activated alerts can only be cleared back to “0=Normal” after the fault or activated device has been restored to normal AND the TrimTrac has received the reset alarm from LocationXS. This will help guard against an unauthorized person disabling the TrimTrac and Vehicle Adapter Module inputs.

Whenever an alert changes to “Activated” from “Normal” the TrimTrac transitions from its current state as follows:

1. If High Alert is “Activated”, then sent a DATA REPORT immediately
2. If Medium Alert is “Activated”, then send DATA REPORT immediately unless in GPS FIX or SEND DATA state; otherwise complete current GPS FIX or SEND DATA state before sending DATA REPORT. After sending DATA REPORT, it goes to GPS FIX state.

3. If Low Alert is “Activated”, and motion is detected then send DATA REPORT immediately unless in GPS FIX or SEND DATA state; otherwise complete current GPS FIX or SEND DATA state before sending DATA REPORT. After sending, a DATA REPORT the unit goes to GPS FIX state.

Alerts are:

1. “Sent” from “Activated” - during the “SEND DATA” state if and only if the GSM protocol software has confirmed that the message has been successfully transmitted to the GSM network.
2. “Acknowledged” - only upon the receipt of an appropriate confirmation from LocationXS.
3. “Normal” - only upon the receipt of an appropriate confirmation from LocationXS; provided, however, whatever condition that triggered the original alert has been cleared.

Password

LocationXS uses Passwords in all communications with the TrimTrac.

The TrimTrac checks all incoming messages for a Password which must exist. If the Password sent does not match the Password configured in the TrimTrac, then the unit ignores the message.

Unit ID

LocationXS uses a Unit ID in all communications with the TrimTrac.

The TrimTrac checks all incoming messages for a Unit ID and all incoming message must include a Unit ID. If the Unit ID included in a message sent to TrimTrac does not match the Unit ID configured in the TrimTrac, then the unit ignores the message.

Simcard

All TrimTracs contain a Simcard, which enables them to SEND DATA over the GSM network. Every Simcard and TrimTrac comes programmed with a unique PIN code. Due to this protection, you cannot switch Simcards between TrimTracs nor use any other Simcard without contacting the support desk.

Application Scenarios

Introduction

The TrimTrac is both elegant and powerful in its simplicity. How to best configure it for any given application, however, may not be obvious. The intent of this section is to provide operational insight and specific configuration suggestions based on different application environments.

General Considerations

When deciding how to best configure the TrimTrac, consider the following:

1. What is the expected frequency and duration of motion?
2. How often should the unit compute a new location fix while in motion?
3. How often should the unit report while in motion or stationary?
4. How sensitive is the end-user application to power consumption, recurring communication costs, or both?

Motion Profile

How frequently the TrimTrac moves and how long it remains in motion will effect unit operation. For instance, a unit that is expected to make many short trips per day will generally benefit from having a higher number of location fixes than one that moves only a couple of times per day but remains in motion longer during each trip.

Location reports While in Motion

In general, if there are going to be multiple trips per day, choosing a profile of 15-20 minutes will provide a reasonable fix density. For instance, if the average time of each trip is approximately one hour, setting the profile to 15-20 has proven to be a good balance between fix densities, power consumption and, if transmitted, communication costs.

The maximum fix density one can expect to get from the TrimTrac is one location fix every 2 to 5 minutes. While this is probably not sufficient for some dispatch, intercept and real-time fleet management application, a fix density of 2 to 5 minutes is more than acceptable for an extremely wide range of less real time critical applications.

Battery Life and Communication Costs

In any given application, there must be an appropriate trade off between communication costs, power consumption and battery life versus the need for information. Considering this, the following sections look at different application scenarios and multiple configuration possibilities.

Live Locate

In LocationXS, live locate can be activated enabling an appropriate mixture of communication costs and the need for locations. However, enabling live locate will have a significant impact on power consumption and will limit the life of four AA alkaline batteries to no more than 3-5 days. We strongly recommend using the TrimTrac with a Vehicle Adapter module when using Live Locate.

Example Settings

Standard Settings

TrimTrac bases default values on one location every hour, when moving, and one status message per 24 hours. Market research studies indicate that most end-user consumers believe a nominal 60-minute location reporting interval while the vehicle is moving is a good combination of timely information, reasonable SMS communication costs, and battery life.

The standard settings, assuming good GPS signal strength and GSM coverage, will yield 5-10 location reports per day plus one status message each day, depending upon frequency of trips over the course of a day. Using the default settings, four AA alkaline batteries usually last for 60 to 90 days before needing replacement.

On Demand Location Queries

Some customers prefer daily status updates, to confirm device health and battery level. Users have the ability to get current location information from time-to-time using live locate in LocationXS, this feature for optimal power consumption should be used in conjunction with the Vehicle Adapter.

Stationary Assets

Whereas a personal automobile normally moves on a daily basis, some other assets may seldom or never move and, when they do move, it is an extraordinary event requiring immediate action. Under normal stationary conditions, only a periodic heartbeat is necessary to inform the server application that it is functioning.

Using a profile with long reporting times (e.g. 24 hrs) the unit can closely monitor and report upon initial movement, while providing a regularly scheduled heart beat. Expected battery life of four AA alkaline batteries, would be approximately 9-10 months even if the asset moved once a week for an hour or so.

High-Performance Tracking and Reporting

If power consumption and communication costs are not of concern and the application requires maximum fix density and constant communication, then the device can be configured to report as frequently as once every 3 to 5 minutes, by selecting a profile within LocationXS with a 5-10 minutes location interval.

The communication cost would increase substantially if the device were transmitting location fixes at the rate of one every 3 to 5 minutes. If the live locate is turned on then four AA alkaline batteries may last no more than 3 to 5 calendar days, even if there are no reports being transmitted, using the vehicle Adapter Module removes all battery concerns.

Vehicle Adapter Module without Alerts

WARNING:

Before inserting a Vehicle Adapter Module into a TrimTrac base unit:

A) Connect the red (+) and black (-) wires to a 9-32 VDC power source

FAILURE TO DO EITHER OF THESE WILL CAUSE THE TRIMTRAC TO IMMEDIATELY ACTIVATE A MEDIUM PRIORITY ALERT AND BEGIN TRANSMITTING NOMINALLY EVERY 2-3 MINUTES UNTIL AN ACKNOWLEDGEMENT IS RECEIVED.

B) All TrimTrac ship with the external input (yellow) cables disabled to avoid installation issues. Once you have connected the sensors correctly, please contact our support desk, which can enable the external input cables remotely for you. Keep in mind that incorrect installation (see also wiring diagram in the Vehicle Adapter wiring diagram section of this manual) will cause the TrimTrac to assume there is a sensor input, which can result in an ongoing reporting of messages to LocationXS. In case this happens, you need to ensure that the device initiating the alert in the first place is returned to its "normal" condition AND you sent a reset command from LocationXS by clicking the related message and select the reset button.

Vehicle Adapter Alert Processing

Priority and Status-Levels

The TrimTrac can be equipped with a Vehicle Adapter Module capable of monitoring vehicle power and externally wired switches and relay contacts. Users must assign one of three different priority levels (High, Low, and Medium) to each device. The TrimTrac reports as Medium Priority Alerts loss of external voltage and tampering (opens, shorts, grounds) with external wiring.

Each alert, regardless of priority, can be in one of four status-levels at any given time:

0=Normal
1=Activated
2=Sent
3=Acknowledged

Operation of the TrimTrac alters depending upon the status of each monitored device and status of the alert. By definition, an alert is "normal".

The TrimTrac sets an alert to "Activated" when a High or Medium Priority switch or device changes from its normal condition for 200 mSeconds or more; or upon loss of external power in the case of the Medium Priority alert. The exception to this is a Low Priority switch held closed while motion is sensed before its status is changed to "Activated".

The status of an "Activated" alert will be set to "Sent" once the TrimTrac has successfully transmitted the associated message to the GSM network. Depending on the priority of the alert, the TrimTrac will operate in accordance with the associated configuration, unless otherwise instructed by LocationXS.

SMS text messaging is a store-and-forward communication technology with no guarantee of delivery. Even if the TrimTrac has successfully transmitted the alert message to the GSM network, there is no guarantee that the server application has received the transmitted alert message. With this under consideration, the TrimTrac continues transmitting the alert messages until it receives a reset alert message from LocationXS.

Finally, when the device that initiated the alert in the first place returns to its "Normal" condition and receives a reset alert message, then the alert can be "cleared". If a "reset" message transmits before the monitor switch or device is returned to its "normal" condition, then a new alert will be initiated immediately and the clearing process begin anew.

High Priority Alert Processing

An example of a High Priority Alert could be a manually operated switch or device that requires immediate and continuous transmission of the resulting alert message until acknowledged or cleared by the server application.

Initiation of a High Priority Alert will cause the TrimTrac to terminate immediately whatever state it happens to be in at the time and to commence continuous transmission of the alert message until a reset alert message acknowledging or clearing the activated High Priority Alert is received by the TrimTrac.

Medium Priority Alert Processing

Activation of a Medium Priority Alert will allow the TrimTrac to complete some of its current operations before beginning to transmit a Medium Priority Alert message. For instance, if the device happens to be in either the GPS FIX or SEND DATA states, it will attempt to complete those tasks, within certain time limits, before transitioning back into the SEND DATA state to begin sending the Medium Priority Alert. Then, once sent, the device will go collect new location information while waiting for an acknowledgement from the server application. This is different than a High Priority Alert that would continuously re-transmit the alert message without computing a new location fix.

An example of a Medium Priority Alert could be a relay interconnected with an on-board security system. The relay would be activated, for instance, when the security system is in a state of "alarm" (i.e. annuciators operating).

Low Priority Alert Processing

A Low Priority Alert is processed much the same as a Medium Priority Alert with the exception that there must also be motion before a Low Priority Alert is initiated. For instance, closing the Low Priority Alert switch by itself cause the Low Priority Alert to be initiated. Opening the Low Priority Alert switch must also be accompanied by motion before becoming “activated.” An application example would be interlocking a relay with the on-board security system such that when the security system is “armed”, the relay is also activated. Any subsequent motion until the security system is turned-off by the owner would be “unauthorized”. The TrimTrac would sense this motion and commence transmitting an alert message until acknowledged or cleared by LocationXS.

Summary End-user and Installation Instructions

Battery Powered Units

1. If SIM card is not already installed, remove the TrimTrac base cover and any installed modules to access the SIM card holder.
2. Insert the activated SMS-enabled SIM card from LocationXS or your wireless carrier into the SIM card holder and close latch making sure the SIM card is securely seated and locked into place.
3. Place the empty Battery Module in the TrimTrac base while aligning the arrow on Battery Module with the arrow on the TrimTrac base.
4. Press down on the Battery Module to snap it securely in place on all four corners making sure all corner clip tabs are all fully engaged.
5. Insert four fresh AA alkaline batteries into the Battery Module with polarities as shown on the Battery Module.

   Note: The LED may or may not immediately begin flashing when the unit is shaken depending upon which operational state the device may have been in when batteries were inserted.
6. Install TrimTrac base cover and tighten the hold down screw.
7. Place the TrimTrac at a slight incline (TrimTrac logo facing up) with as clear of a view of the sky as possible.
8. To change batteries, remove the TrimTrac base cover and properly dispose of old batteries, then follow steps 6 through 8 above.
9. If you experience issues after opening your TrimTrac after battery or simcard replacement please reset the unit as explained in Reset TrimTrac section of this manual. To avoid the unit to “hang up” on you do never open it when in SLEEP mode (one flash from the led every 10 seconds).

Vehicle Adapter Module Equipped Units

PLEASE CONNECT ALL WIRE LEADS **PRIOR** TO INSERTING THE VEHICLE ADAPATER MODULE INTO THE TrimTrac base

REQUIRED CONNECTIONS:

1. Connect RED wire to a constant, non-switched 9-32 VDC source of power (+).
2. Connect the BLACK wire to vehicle ground.
3. Connect YELLOW wires as follows:
   a. Connect YELLOW wires to High, Medium and/or Low Priority Alert devices as described in the OPTIONAL INPUTS AND ALERTS below; OR.
   b. Cut or tape off the YELLOW wires. Make sure the TrimTrac is programmed to Disable Medium Priority Alerts.

OPTIONAL INPUTS AND ALERTS:

1. Refer to the wiring diagram provided in the Technical Manual, Figure 7, VAM Alert Wiring Diagram.

2. Mount the monitored switches or devices in the desired locations. It is best to install resistors with the values specified on the wiring diagram at the monitored switch or device (instead of at the TrimTrac). In so doing, maximum tampering protection is afforded.
3. Install a 100K Ohm End-of-Line resistor as shown in the wiring diagram.

FINAL ASSEMBLY AND INSTALLATION:

1. Remove the TrimTrac base cover and any previously installed module to access the SIM card holder.
2. Insert the SIM card from LocationXS or your wireless carrier into the SIM card holder and close latch making sure the SIM card is securely seated and locked into place.
3. Remove rubber channel plug from the TrimTrac base unit (near the cover screw insert)
4. Place the Vehicle Adapter Module in the TrimTrac base while aligning the arrow on Vehicle Adapter Module with the arrow on the TrimTrac base.
5. Press down on the Vehicle Adapter Module to snap in securely in place on all four corners making sure all corner tabs are all fully engaged.
6. Route the wires and press the molded rubber piece into the channel provided.
7. Install TrimTrac base cover and tighten the hold down screw.
8. Place the TrimTrac at a slight incline (TrimTrac logo facing up) with as clear of a view of the sky as possible. Use the optional metal bracket for permanent installations.

STAND-BY BATTERY RECHARGE:

The internal stand-by battery should be recharged no less frequently than once every three months.

Vehicle Placement Guidelines

1. Placing the TrimTrac where it has a clear view of the sky unobstructed by metal will maximize its ability to determine its location; provided, however, locations subject to extreme environmental conditions (temperature, vibration, water) are avoided. For instance:
   a. DO NOT Leave the TrimTrac on the dashboard exposed to direct sunlight
   b. DO NOT mount it inside the engine compartment
   c. DO NOT subject it to direct water spray from the vehicle wheels.
2. Typical placement locations for the TrimTrac include:
   a. Temporary use on the dashboard or rear window package shelf; provided, however, that it is securely fasten down and protected from direct sunlight.
   b. In the glove box.
   c. Under a passenger seat.

   It is not recommended that the TrimTrac be placed in the trunk or boot of the vehicle unless the vehicle is a hatch-back style with a large rearward sloping window and, preferably, if the device is mounted up under the rear window package shelf.
3. Depending upon how the TrimTrac is configured to operate, placement within the vehicle can have a significant impact on battery life and, as shown in the Figure below, the number of location reports that are generated. Actual results will vary.

Report Density v. Unit Placement and DELAY State Timeout, T4

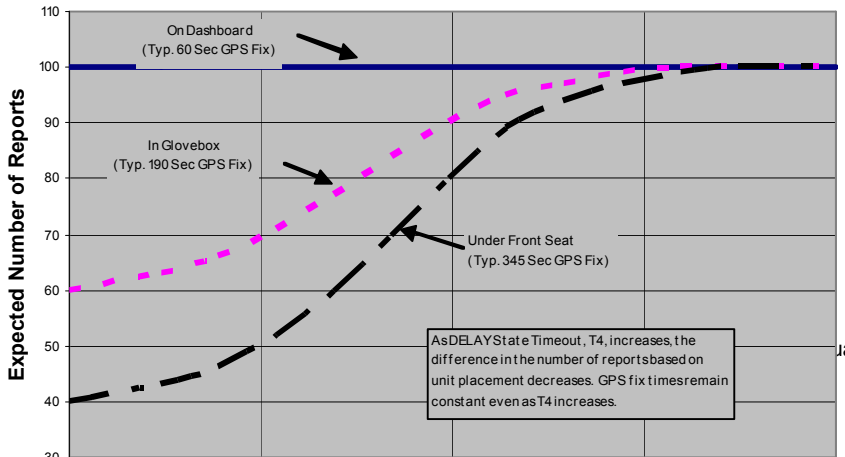


Figure 1, Vehicle Placement versus Expected Number of Reports

Technical Tips and Troubleshooting

Introduction

When used and maintained properly, the TrimTrac provides years of trouble-free service. The TrimTrac has no user-serviceable parts other than its replaceable batteries.
Should the TrimTrac fail to operate properly, the user or service technician should troubleshoot the installation before returning any components for repair. If a component fails, return the TrimTrac to the authorized Service and Repair Center for repair.

This chapter provides some guidelines for troubleshooting common problems associated with the TrimTracs operation. Potential operating problems might include:

- Dead Batteries
- Poor contact between the Battery Pack or Vehicle Adapter Module and TrimTrac base
- Poor GPS reception
- Poor GSM coverage
- Communication failure with base
- TrimTrac Application programming errors

If the TrimTrac continues to operate poorly after you follow the troubleshooting guidelines described in this chapter, contact your TrimTrac supplier for assistance.

Battery Problems

Make sure your batteries are generating sufficient current to power your TrimTrac and that they are installed with correct polarities. Make sure the Battery Module is securely snapped into place and the cover screw is properly tightened. Do not mix old and new batteries.

Battery Temperature Ranges

Just like the GSM system itself, the TrimTrac is specified to operate from –10 to +55 degrees C. This does not necessarily mean that the GSM system or the TrimTrac stop working outside this range. In the case of the TrimTrac, for instance, it means that it is type approved over this range. The device may continue to operate in terms of computing location fixes and transmitting or receiving messages both above and below this range, however, such operation is neither specified nor guaranteed by Trimble or type approved.

In practice, the limiting factors in any battery-powered device in terms of temperature ranges are the batteries themselves. The capacity of alkaline batteries is, for instance, severely compromised when subjected to high temperatures. The TrimTrac will survive when subjected to temperatures as high as +105 degrees C; however, alkaline batteries would likely be damaged beyond usability at this temperature. The NiMH battery in the Vehicle Adapter Module has a wider operating range than alkaline or LiION batteries, but it too will suffer from temperature extremes. In particular, the charge capacity and cycles of a NiMH battery will be decreased substantially when subjected to high temperatures. At least they will not explode or catch fire when their rated temperature specifications are exceeded like LiION batteries.

Low temperatures do less permanent damage to batteries than high temperatures. Generally, a battery subjected to low temperature will stop working, but will generally recover once unit temperature is brought back to normal.

All battery life estimates that the batteries are at normal temperature (20 degrees C), have never been subjected to temperature extremes either high or low, and, in the case of the Vehicle Adapter Module NiMH battery, are fully charged and have never been completely and fully discharged.

GPS Reception Problems

Even though the TrimTrac uses enhanced GPS sensitivity technology, it is still advisable to location the device with as clear of a view of the sky as possible. Make sure that the TrimTrac is reasonably locationed to receive GPS signals.

GPS Almanac Collection

When the TrimTrac is used for the first time after being provisioned, the unit may not have a complete or current GPS almanac. The unit is allowed up to 15 minutes to collect an almanac after it has computed its first fix. In other words, the TrimTrac can dwell in the GPS FIX state for up to 15 minutes. This will occur whenever the almanac is either incomplete or out of date. During this almanac collection process, users may notice that it takes longer than usual for the unit to transition through the GPS FIX state. Under normal conditions, it may take on average 45-60 seconds to get a GPS location fix and complete the GPS FIX state; however, this compares to as long as 20 minutes. To facilitate the process of almanac collection, it is recommended that the TrimTrac be placed in an area with a clear view of the sky and not be moved until it has completed its first GPS FIX state.

GPS Almanac Loading

A current almanac can be collected from any operational TrimTrac using the TrimTrac GPS Almanac Tool. The almanac can, in turned, be loaded into any other TrimTrac. In so doing, the 15-minute almanac collection time after the first location fix can be avoided altogether.

Location

The TrimTrac should be at a slight incline, preferably with a reasonably clear view of the horizon and sky. If something on the vehicle—for example, the air conditioning unit on a cab or the trailer connected to a tractor—blocks a significant portion of the horizon and the GPS signals, the GPS receiver will take longer to acquire enough satellites for a location fix. If the TrimTrac frequently times out before completing a location fix, try moving the TrimTrac to a new location where it is not blocked as much.

GPS Jamming

The TrimTrac should be installed as far away as possible from transmitting antennas, including satellite communication, radar, VHF and cellular. These transmitters may emit jamming signals that interfere with the GPS receiver's ability to track GPS satellite signals. Generally, the stronger the other transmitting device, the wider the distance required between antennas. For the TrimTrac, Trimble recommends a minimum clearance of 46 cm (approximately 18 in.) from these transmitting devices.

Land-based transmitters, including microwave and television transmitters, can also interfere with GPS reception. If the TrimTrac is operating near an antenna farm, the TrimTrac may temporarily lose GPS reception while in the vicinity of the transmitters. Reception should return once the TrimTrac moves away from the transmitters. If your GPS signals are being jammed and moving does not correct the situation, the source of the jamming signal may be another antenna mounted too close to your TrimTrac. If possible, turn off the equipment using other nearby antennas to see if this corrects the problem. If turning off nearby equipment un-jams your GPS signals, you need to relocate one or more of the jamming antennas.

Poor GSM Coverage

Check to make sure the SIM is not missing or incorrectly installed, or the PIN number configured in the TrimTrac does not match the PIN in the SIM. Do the following:

1. Insert a SIM if none is present.
2. Remove and reinsert the existing SIM to verify proper installation.
3. Check the TrimTrac configuration to ensure the correct PIN is programmed.

4. Make sure that the SIM card hold-down latch is securely fastened and all four corners are locked down.

TrimTrac Location

The TrimTrac should be used at a slight incline, preferably with reasonably unobstructed clearance around the unit. If the current location is suspect:

Try another location; and/or

Try a known-good TrimTrac or mobile phone

Even in areas with strong GSM service, there may be pockets where GSM service is poor or nonexistent due to how the carrier builds the network. Contact your local service provider for information on GSM coverage.

How to Evaluate TrimTrac Placement

The number one rule in GPS is that a GPS receiver with a clear view of the sky will have better performance than one that has a blocked view. For instance, a TrimTrac placed on the dashboard of a vehicle will almost certainly have more GPS fixes than a unit placed under the seat or in the glove box, everything else being equal. The real question is whether the TrimTrac will provide the level of performance required to meet the needs of the application.

The answer to this question is best derived from field-testing of the specific vehicle and placement options. The test plan should call for one unit on the dashboard with a clear view of the sky and at least one unit for each of the alternate locations of interest. For example, if one wishes to evaluate the relative performance of placing units in the glove box and under the front seat, then a minimum of three units, all identically configured, is needed. One unit would be placed on the dashboard, one in the glove box and one under the front seat.

The vehicle should be operated as one would expect in the actual application environment. The data logged by the dashboard TrimTrac will provide a performance baseline against which the other units will be compared. The analysis should compare the number of attempted location fixes versus the number of successful location fixes during the test period by unit.

In general, testing done to date indicates that a unit located in the glove box will on average get approximately 50% fewer location fixes than a unit located on the dashboard of the vehicle. Units placed under the front seat will performance about the same as units placed in the glove box unless the seat is a power seat. Power seats have considerably more metal than manually adjusted seats and the added metal attenuates the GPS signal that much more. It is not recommended that units be placed in the trunk of standard 3-box style sedans. Reasonable results may, however, be achieved in hatchback cars with a large, rearward slopping back window and non-metal rear package shelf.

GSM Jamming

The TrimTrac should be installed as far away as possible from other transmitting antennas including other TrimTracs, satellite communication, radar, and VHF radio. These transmitters may emit jamming signals that interfere with the GSM phone's ability to track the GSM signal. If there are other transmitting antennas located on the vehicle, try moving the TrimTrac farther away from these antennas. Generally, the stronger the other transmitting device, the wider the distance required between antennas.

No Data Communication with LocationXS

If the TrimTrac is not communicating with LocationXS as expected, do the following:

1. Confirm that the SIM is inserted in the unit and that the hold down latch is pressed all the way down and securely holding the SIM card at all four corners.
2. Check that the LED on the side is blinking in the sequences described.
3. Confirm your account has not run out of credit.

Defective TrimTrac

To confirm that a TrimTrac is defective, do the following:

1. Try a known good TrimTrac.
2. Move into an area with strong GSM coverage.
3. Sent the TrimTrac a location request or profile change forcing a response.

Note – Before returning the TrimTrac, be sure to save the TrimTracs configuration settings, and remove your SIM.

TrimTrac Not Reporting

If it appears that the TrimTrac is not reporting to LocationXS as expected, diagnose as follows:

1. **Replaced batteries.** When replacing batteries it is always better to shorten the two contacts as shown below to ensure the unit is reset.
2. **Lost Reports.** In this case, the TrimTrac has successfully created a new message (Location, Status, or Alert) and it has been sent to the GSM network. If such sent messages are not received by LocationXS, then perhaps the messages are getting lost or delayed in the GSM network.

   Review the LocationXS text message tray and requested locationing tray for periods you are sure messages were sent and you have seen the red led blinking.

Unit Does Not Report Stopped Location

In its default configuration, the TrimTrac will attempt one additional location fix after the unit has come to rest. If, however, the unit is in a vehicle that has come to rest in a covered parking structure or garage, there may be insufficient GPS signal to compute a final location fix. The device will log a Status Message, but a new Location Report may not be available. In LocationXS, this may be problematic in that LocationXS will not know whether the device has entered a geo-fence area.

Continued Reporting After Coming to Rest

In the event a TrimTrac continues to report after coming to rest, it may be because the motion detector is overly sensitive for the given application environment. Fine-tuning of the motion detector settings can be done by the LocationXS Support desk upon request.

TrimTrac Will Not Stop Reporting Every 2-3 Minutes

Chances are a Vehicle Adapter Module was inserted into a TrimTrac base when the Medium Alert mode was set “Automatic” and before the Vehicle Adapter Module was:

1. Connected to an external 9-32 VDC power supply; and/or
2. An end-of-line resistor was installed across the Yellow leads (See Figure 7, VAM Alert Wiring Diagram)

The TrimTrac Vehicle Adapter Module has an internal rechargeable standby battery that has a residual charge when shipped from the factory. This residual charge is typically enough to support operation of the TrimTrac when the Vehicle Adapter Module is first inserted into the TrimTrac.

The TrimTrac will sense the lack of external power and/or the lack of the end-of-line resistor and activate the Medium Priority Alert.

Once the Medium Priority Alert is activated, the TrimTrac will continuously transmit nominally every 2-3 minutes until the Medium Priority alert status is changed to “Acknowledged” from “Activated”. This can only happen once the TrimTrac has received reset alert message from LocationXS.

LED Indicator

The LED indicator is useful for diagnosing problems. For more information, see LED States, page 9. If you detect a problem, then have the TrimTrac inspected by qualified service personnel.

Responding to received messages

The TrimTrac processes and responds immediately to any message that it receives while in the RECEIVE NEW SETTINGS state.

The TrimTrac, however, will not respond to messages that are invalid (i.e. incorrect format, Password, Unit ID and Sum check).

LED not blinking after Battery Change

Changing batteries will usually cause the unit to wake back up in the IDLE state; however, if batteries were removed while the unit was in the SLEEP state and not replaced prior to expiration of the SLEEP timeout defined by your profile of choice then the device may not immediately wake back up.

Normal operation can be restored by resetting the device or by leaving the device without batteries or VAM installed for 24-hours.

Reporting Frequency

The time it takes for a TrimTrac to compute a new location fix is inversely proportional to available GPS signal level. When the TrimTrac has an unobstructed view of the sky, GPS signal strength is approximately –130 dBm. This would equate to approximately 40 seconds to compute a new location fix as shown in Figure 3, Warm Start TTFFs on page 50. For the most part, this is equivalent to the unit being placed on the dashboard or rear package shelf of a vehicle; provided, however, the window has no metalized coatings that would attenuate the GPS signal.

A unit placed in the glove box of a typical vehicle, on the other hand, may only see –136 dBm of GPS signal. In this circumstance, the unit may take upwards of 400 seconds to compute a new location fix and this assumes that objects, such as buildings and trees, outside of the vehicle, do not further obscure view of the sky.

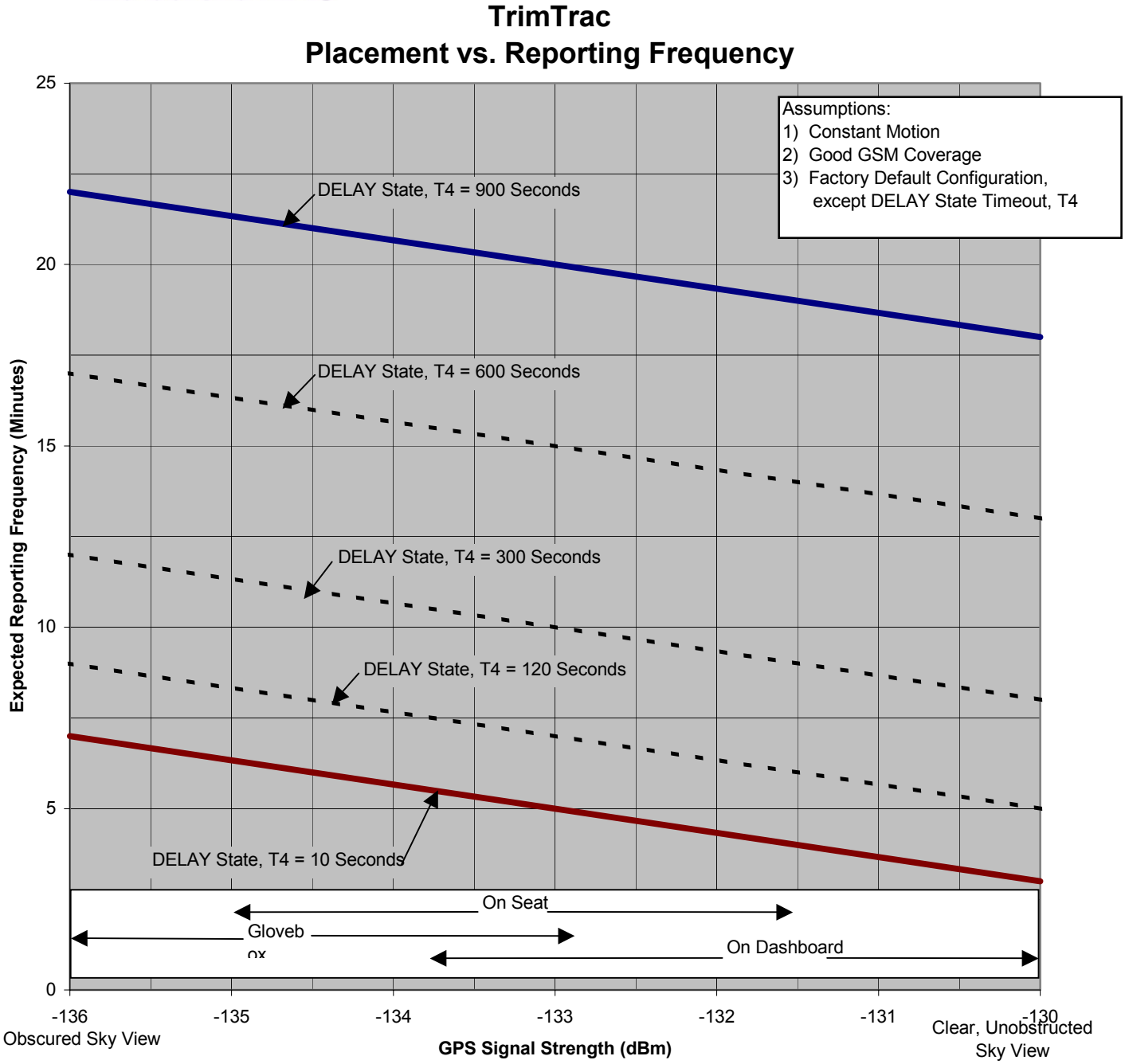


Figure 2, Expected Reporting Frequencies

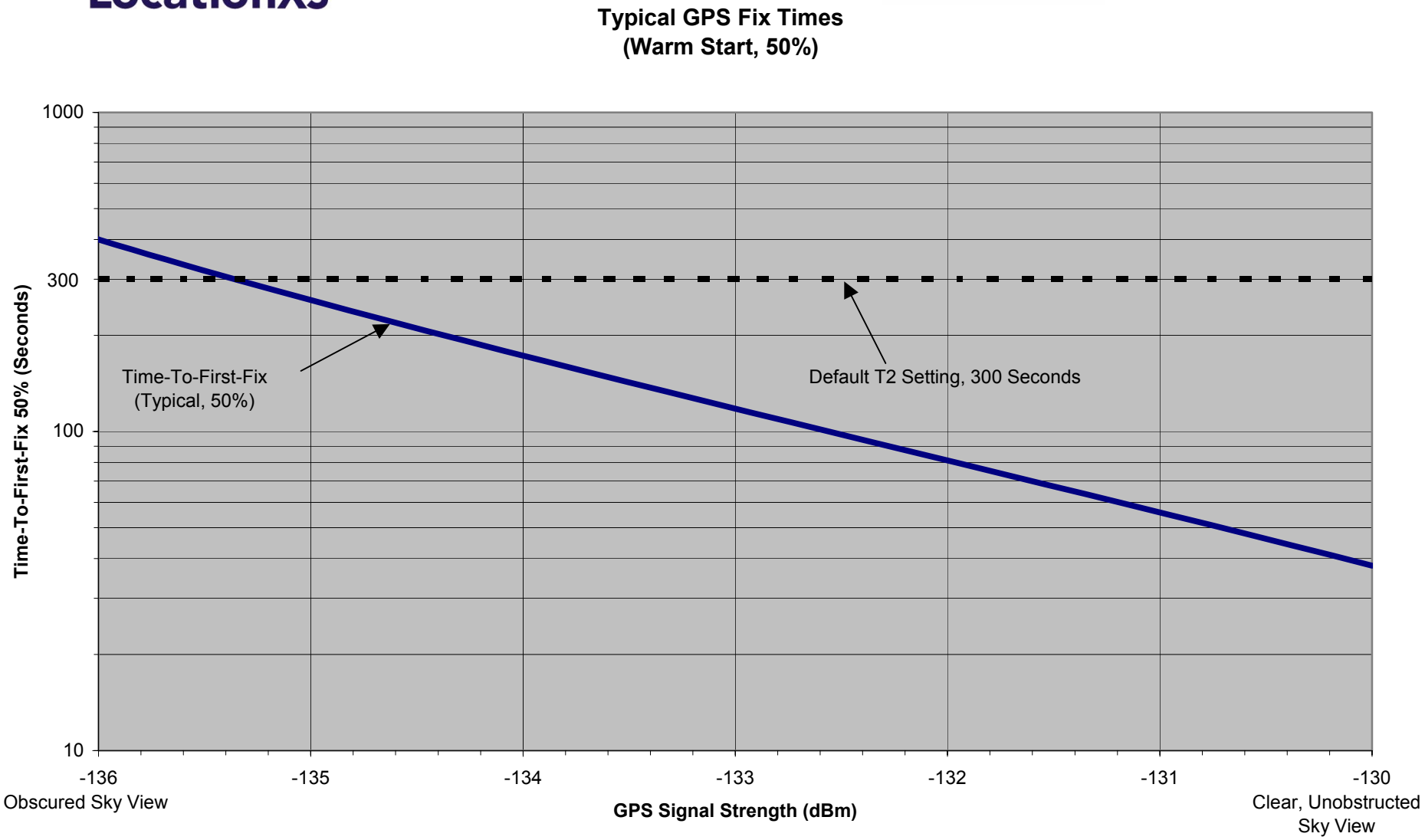


Figure 3, Warm Start TTFFs

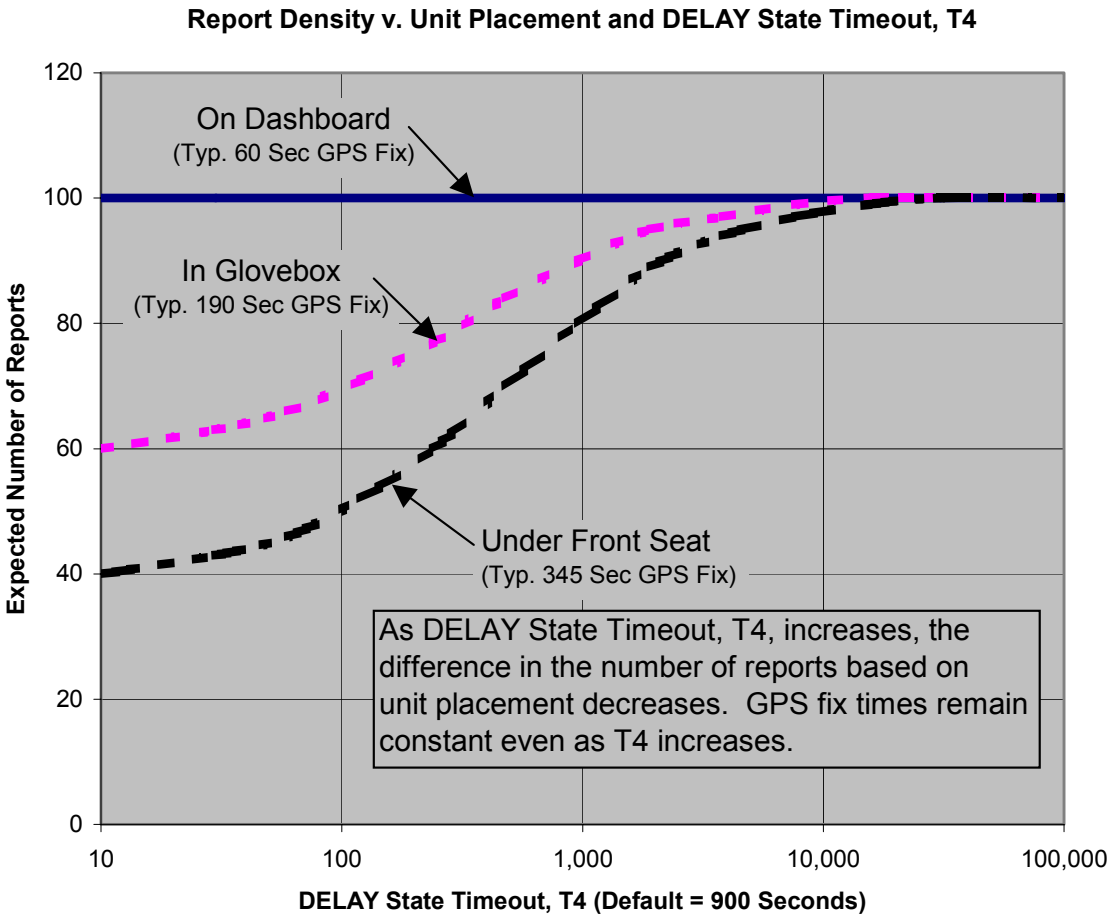


Figure 4, Report Density versus Unit Placement and DELAY State Timeout, T4

Safety First

Simple Guidelines

Please follow these guidelines when configuring or using the TrimTrac. Violating these guidelines may be dangerous, illegal or otherwise detrimental. Further detailed information is provided in this manual.

Do Not Operate Where Prohibited

Do not allow the TrimTrac to operate wherever wireless phone use is prohibited or when doing so may cause interference or danger. Examples include but are not limited to operation in hospitals, aircraft, near blasting sites or wherever operation can cause interference.

Interference

Like all wireless devices, the TrimTrac may encounter electrical interference that may affect its performance.

Avoid Body Contact with Device during Operation

Do not operate the TrimTrac in direct contact with your body. Maintain minimum separation distance of 0.6 inch (15 mm) between the device and any parts of your body.

Qualified Service

Except for batteries and Subscriber Identification Module (SIM) card, the TrimTrac contains no user serviceable or replaceable parts. Non-functioning units must be returned to an authorized service center for repair or replacement.

Accessories and Batteries

Use only approved accessories or batteries. Do not connect incompatible products. There is risk of explosion if an incorrect type replaces batteries. Dispose of used batteries according to the instructions provided with the batteries.

Water-Resistance

The TrimTrac is not waterproof. Even though it is water-resistant, it is recommended that it be used where it is relatively dry and not subjected to either water streams or submersion.

Detailed Safety Information

Exposure to Radio Frequency Signals

The TrimTrac is a low power radio transmitter and receiver. When it is ON, it receives and also sends out radio frequency (RF) signals.

In August 1996, the Federal Communications Commissions (FCC) adopted RF exposure guidelines with safety levels for hand-held wireless phones. Those guidelines are consistent with safety standards previously set by both U.S. and international standards bodies:

ANSI C95.1 (1992)

NCRP Report 86 (1986)

ICNIRP (1996)

Those standards were based on comprehensive and periodic evaluations of the relevant scientific literature. For example, over 120 scientists, engineers, and physicians from universities, government health agencies, and industry reviewed the available body of research to develop the ANSI Standard (C95.1)

While the TrimTrac is not intended for hand-held use, its design nonetheless complies with the FCC guidelines (and those standards).

Electronic Devices

Most modern electronic equipment is shielded from RF signals. However, certain electronic equipment may not be shielded against the RF signals generated by the TrimTrac.

Pacemakers

The Health Industry Manufacturers Association recommends that a minimum separation of six (6") inches be maintained between a handheld wireless phone and a pacemaker to avoid potential interference with the pacemaker. These recommendations are consistent with the independent research by and recommendations of Wireless Technology Research.

Persons with pacemakers:

Should ALWAYS keep the TrimTrac more than eight inches from their pacemaker with the device is operational.

Should not carry the TrimTrac on their person

If there is any reason to suspect that interference is taking place, the TrimTrac Battery Pack or Vehicle Adapter Module should be removed immediately.

Other Medical Devices

If any other personal medical devices are used in the vicinity of a TrimTrac, consult the manufacturers of the medical devices to determine if they are adequately shielded from external RF energy. Physicians may be able to assist in obtaining this information.

Disable operation of the TrimTrac by removing the Battery Pack or Vehicle Adapter Module in health care facilities when any regulations posted in these areas prohibit the use of wireless phones or two-way radios. Hospitals and health care facilities may be using equipment that could be sensitive to external RF energy.

Vehicles

RF signals may affect improperly installed or inadequately shielded electronic systems in motor vehicles. Check with the manufacturer or its representative regarding the vehicle. Also consult the manufacturer of any equipment that has been added to the vehicle.

Posted Facilities

Disable operation of the TrimTrac by removing the Battery Pack or Vehicle Adapter Module in any facility where posted notices prohibit the use of wireless phones or two-way radios.

Aircraft

FCC and FAA regulations prohibit using wireless phones while in the air. Disable operation of the TrimTrac by removing the Battery Pack or Vehicle Adapter Module prior to boarding or loading in an aircraft

Blasting Areas

To avoid interfering with blasting operations, disable operation of the TrimTrac by removing the Battery Pack or Vehicle Adapter Module when in a "blasting area" or in areas posted: "Turn off two-way radio". Obey all signs and instructions.

Potentially Explosive Atmospheres

Disable operation of the TrimTrac by removing the Battery Pack or Vehicle Adapter Module prior to entering any area with a potentially explosive atmosphere and obey all signs and instructions. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Areas with a potentially explosive atmosphere are often, but not always marked clearly. Potential areas may include: fueling areas (such as gasoline stations); below deck on boats; fuel or chemical transfer or storage facilities; vehicles using liquefied petroleum gas (such as propane or butane); areas where the air contains chemicals or particles (such as grain, dust, or metal powders); and any other area where it would normally be advisable to turn off motor vehicle engines.

For Vehicles Equipped with an Air Bag

An air bag inflates with great force. DO NOT place objects, including the TrimTrac, in the area over the air bag or in the air bag deployment area. If in-vehicle wireless equipment is improperly installed and the air bag inflates, serious injury could result.

Specific Absorption Rates (SAR)

ALTHOUGH BODY WORN TEST LOCATIONS FOR THE TrimTrac ARE NOT REQUIRED BY EITHER THE EN50360/1 FOR GSM 1800 DCS BAND OR GSM900 OR FCC REQUIREMENTS FOR 1900 PCS BAND, THE TrimTrac IS CAPABLE OF COMPLIANCE WITH LOCALIZED SPECIFIC ABSORPTION RATES (SARs) SPECIFIED IN COUNCIL 1999/519/EC AND CERTAIN FCC REQUIREMENTS FOR EXPOSURE TO RADIO WAVES.

The TrimTrac is a radio transmitter and receiver. It is designed and manufactured not to exceed the emissions limits from exposure to radio frequency (RF) energy set by the Federal Communications Commission of the U.S. government when used in accordance with the instructions set forth in this manual. These limits are part of comprehensive guidelines and establish permitted levels of RF energy for the general population. The guidelines are based on standards that were developed by independent scientific organization through periodic and thorough evaluation of scientific studies. The standards include a substantial safety margin designed to assure the safety of all persons, regardless of age and health.

The exposure standard for wireless mobile phones employs a unit of measurement known as the Specific Absorption Rate, or SAR. The SAR limit set by the FCC is 1.6W/kg.[1] Tests of SAR are conducted using standard operation locations specified by the FCC with the phone transmitting at its highest certified power level in all tested frequency bands. Although the SAR is determined at the highest certified power level, the actual SAR level of the phone while operating can be well below the maximum value. This is because the phone is designed to operate at multiple power levels so as to use only the power required to reach the network. In general, the closer the device is to a GSM cell site, the lower the power output.

Before a phone is available for sale to the public, it must be tested and certified to the FCC that it does not exceed the limit established by the government-adopted requirement for safe exposure when used in accordance with manufacturer instructions. The tests are performed in locations and locations (e.g. near or on the body) as required by the FCC for each model. The SAR value for the TrimTrac is less than 1.6 W/kg measured at a minimum separation distance of 0.6 inch (15 mm). The TrimTrac is not designed to be worn on a person's body.

The FCC has granted an Equipment Authorization for the TrimTrac with all reported SAR levels evaluated as in compliance with the FCC RF guidelines for devices not worn on the body. SAR information on the TrimTrac is on file with the FCC and can be found under the Display Grant section of http://www.fcc.gov/oet/fccid after searching on FCC ID: JUPTRIMTRAC1.

Additional information on Specific Absorption Rates (SAR) can be found on the Cellular Telecommunications & Internet Association (CTIA) Web site at http://www.phonefacts.net

Battery Safety Information

Adhere to the following guidelines to avoid the risk of fire or explosion:

1. Do not batteries are replaced by an incorrect type.
2. Dispose of used batteries according to the instructions provided with the batteries.
3. Do not drop, puncture, disassemble, mutilate, or incinerate batteries.
4. Touching both terminals of a battery with a metal object will short circuit the battery. Do not carry batteries loosely if the contacts may touch coins, keys, and other metal objects (such as in pockets or bags).
5. Do not heat the batteries to try to rejuvenate their charge.
6. Replace all four batteries at the same time.
7. Do not mix batteries with different charge levels.

Overview

Introduction

This manual covers the TrimTrac operating on 900 MHz, 1800 MHz and 1900 MHz GSM networks. As used in this manual, the term GSM shall include any and all of these frequencies.

[1] In the United States and Canada, the SAR limit for mobile phones used by the public is 1.6 watts/kg (W/kg) averaged over one gram of tissue. The standard incorporates a substantial margin of safety to give additional protection for the public and to account for any variations in measurement.

Regulatory Approvals

CE
The TrimTrac product complies with the essential requirements of the R&TTE Directive 1999/5/EC as stated by the EC Declaration of Conformity (CE0681).

The TrimTrac product complies with the European Telecommunications Standards Institute Specifications ETS300-342-1 (EMC for GSM 900MHZ and DCS 1800MHZ Radio Equipment and Systems).

EEC
The TrimTrac product complies with Directive 72/245/EEC as amended by Directive 95/54/EC (el*72/245*95/54).

FCC
The TrimTrac product complies with FCC Part 15, FCC Part 24, and Industry Canada requirements.

The TrimTrac product complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

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

TrimTrac

The TrimTrac is housed in a single, compact enclosure that simplifies installation and leads to greater reliability. The standard TrimTrac has four end-user replaceable alkaline AA batteries and there are no external antennas or other external connections. This package is a mobile communications and locationing system module ideally suited for high volume automotive and asset management applications requiring a low-cost, battery or externally powered tracking device. It operates over the GSM cellular networks and allows simple, fast, and efficient transfer of information between a mobile asset and an application hosted either on a server or on an end-user PC.

Standard Features

The TrimTrac integrates the following into a single package:

- GSM 900/1800/1900 MHz modem
- High-sensitivity, 12-channel GPS receiver
- Internal GSM and GPS antennas
- TrimTrac Application firmware and other integrated functions
- Password-protected data communications
- Support for limited data logging of up to 128 location or status records for subsequent download

Subscriber Identity Module (SIM card)

You must install a SMS-enabled Subscriber Identity Module (SIM card) that has been initialized by LocationXS.

Optional Plug-In Modules

The following options are available as plug-in modules that replace the standard TrimTrac batteries:

Vehicle Adapter Module. Allows connection to an external 9-32 VDC power supply and provides three types of open/closed switch and wiring monitoring connections. The Vehicle Adapter Module includes a rechargeable stand-by battery that allows continued operation of the TrimTrac for a limited period of time if external power is lost.

Global System for Mobile Communications

Cellular mobile telephone systems are widely available throughout the world. However, because cellular mobile telephone systems are regulated at the national level, these systems are not generally compatible with each other. To resolve the dilemma of being able to communicate from almost anywhere, but only within your own system, the European telecommunications operators—the Conference of European Postal and Telecommunications Administration (CEPT)—designed a new mobile telephone network.

This network has evolved into GSM, and CEPT has turned over management of GSM to the European Technical Standards Institute (ETSI). GSM is the predominant mobile communications system throughout the world. Outside the United States, most GSM systems operate at 900 MHz, 1800 MHz or both and services provided by these networks are generally referred to as Digital Communication Services (DCS). The United States GSM system operates at 1900 MHz and is generally referred to as Personal Communication Service (PCS).

GSM Cellular Phone System

The Global System for Mobile (GSM) protocol offers a variety of data services that allow users to sent and receive data at rates of up to 9600 bps. Data can be delivered over ISDN, Packet Switched or Circuit Switched Data Networks (PSDN or CSDN) and via the Short Message Service (SMS). The TrimTrac uses SMS, which is a store-and-forward service for the bi-directional exchange of alphanumeric messages of up to 160 characters.

Architecture of the GSM network

Any asset tracking or management system on GSM consists of several distinct components. The TrimTrac is the mobile unit that is installed in the vehicle, equipment or other mobile asset and contains the Subscriber Identity Module (SIM). The SIM card contains a unique International Mobile Subscriber Identity (IMSI) number. This enables the network to identify the user and therefore allow the terminal to have access to specific, subscriber services.

The GSM system is made up of two sections:

The Base Station Subsystem that controls the radio link with the mobiles through local cells

The Network Subsystem that controls the switching of calls between the network users, mobile to mobile, and between mobile and fixed lines

The Network Subsystem stores all administrative information including the current cell being used by the mobile unit that allows call routing and the roaming ability of GSM. An important feature of GSM is this ability to move across international and network borders, a feature that is described as “roaming.” If arrangements have been made with the service provider, the SIM card will be enabled for roaming.

Mobile Station (MS)

1. The TrimTrac includes a radio transmitter and receiver.
2. Subscriber Identity Module (SIM) – an electronic card containing a computer chip. The chip contains the subscriber information and operating system parameters. SIMs provide authentication, encryption, information storage, and subscriber account protection services (including Personal Identity Number or PIN, and Pin Unblocking Key or PUK).

Other network components (part of the GSM network)

1. Short Message Service Center (SMSC)
2. Delivers text messages (up to 160 characters) to GSM users.

GSM Operational Overview

The TrimTrac operates in accordance with the state diagram more fully described in the theory of operation of this manual.

Whenever the TrimTrac has a new location or status to report, it updates its Status Message. The TrimTrac then enters the GSM Transmit State and automatically searches for a GSM network using a set of tables on the SIM card to determine which GSM network the phone should try to reach.

These tables are the Public Land Mobile Network (PLMN) tables and each GSM network has its own unique PLMN number. This number is the Mobile Country Code (MCC) and the Mobile Network Code (MNC), which are also the first numbers of the subscriber’s IMSI. (The IMSI is the MCC, plus the MNC, plus the Mobile Station Identification Number.) The PLMN table finds either the subscriber’s home network or a network that will allow service, and registers to the network consistent with the handset.

The responding network's Mobile Switching Center (MSC) passes this request for service to the Visitor Location Register (VLR). If the VLR has information about this IMSI, then it passes the request to the authentication center. If the VLR cannot find any information on this IMSI, it must pass the request to the Home Location Register and get approval before passing on the request.

Once the VLR has approval to grant the request for service, it knows the user identity, what features are authorized, and the authentication codes. The VLR then passes the request back to the MSC for routing to destination address specified by the TrimTrac. If the destination address is a land-based number, the MSC passes the call to the Public Switched Telephone Network (PSTN) for connection. If the destination address is another mobile number, the MSC repeats the process described above to locate the number being dialed.

Global Locationing System

The Global Locationing System (GPS) is a satellite-based navigation system operated and maintained by the U.S. Department of Defense. GPS consists of a constellation of 24 satellites providing worldwide, 24-hour, three-dimensional (3D) coverage. Although originally conceived for military needs, GPS has a broad array of civilian applications including timing, surveying, fleet management, marine, land, aviation, and vehicle navigation. GPS is the most accurate technology available for navigation. As a satellite-based system, GPS is immune from the limitations of land-based systems, which have limited coverage and whose accuracy varies with geographic location and, even under ideal conditions, cannot compare with GPS. By computing the distance to GPS satellites orbiting the earth, a GPS receiver can calculate an accurate location. This process is called satellite ranging. GPS receivers can also provide precise time, speed, and course measurements that are important for vehicle mobile locationing and communications applications.

GPS Receiver

The TrimTrac includes an advanced GPS receiver, which provides the location, course, speed and time information required for mobile asset management applications. The TrimTracs GPS receiver features a twelve-channel digital signal processor (DSP) which operates at the GPS L1 frequency (1575.42 MHz) and processes the Coarse/Acquisition (C/A) code portion of the GPS signal. The RF and digital signal processing components of the GPS module are custom ASICs designed by Trimble.

TrimTrac Defaults

Introduction

Factory default settings of the TrimTrac are a daily (24 hrs) status message and one location every 5 minutes when moving. All such default settings can be changed to suit the particular application requirements. While most of the settings can be configured or changed by sending the appropriate SMS text messages over the GSM network, non-default entries for certain fields such as the Unit Identification number, the Password can only be entered or changed while the device is connected to a PC using the Provisioning Module.

The TrimTrac comes from the factory without set time and with no GPS almanac or location stored in memory. The time and location is set once the device has achieved its first location fix. A GPS Almanac can be loaded as follows:

1. Allow the TrimTrac time after its initial location fix to download a complete current almanac from the GPS satellites.

If an almanac is collected from the GPS satellites, it is important that when the TrimTrac is first activated that it be given a clear view of the sky with sufficient time to calculate its first location fix and to collect a full almanac. Please see additional instructions in Use Guidelines chapter beginning on page 10.

Security Considerations

Communication Security

The security of the TrimTrac supports Short Message Peer to Peer (SMPP) protocol, which allows the server application or wireless carrier to insert any originating address into the messages it sends to the TrimTrac. To maintain the security of the TrimTrac it will only accept an incoming TrimTrac Application message if its Unit ID field matches its own Unit ID, the Password matches and the appropriate Checksum value is included. This will ensure that only the server application is able to sent commands to direct it to report to a different location or to start reporting at a different rate.

Configuration Security

The SIM PIN is a feature of GSM SIMs that allows the owner of the SIM to put a lock on the SIM. In order to use the account associated with the SIM, the user of the GSM device must provide the SIM PIN after SIM insertion or device power up. The SIM PIN setting is stored in the firmware and is used if the SIM requests it. If so requested, the SIM PIN is used to attempt to unlock the SIM. If the unlock fails, the SIM PIN is marked as having caused a failure. To reset a SIM PIN the TrimTrac needs to be sent to an authorized dealer. The SIM PIN cannot be read back once set. It can only be overwritten.

Specifications

GSM Specifications

GSM 900/1800/1900 MHz

Normal MS – SMS Data Only
Class 4 (2W) @ 900 MHz (EGSM)
Class 1 (1W) @ 1800 MHz (GSM 1800) and 1900 MHz (GSM 1900 PCS)

Subscriber Identity Module

1.8/3.0 Volt

Type Approvals

FCC Part 15, FCC Part 24
Industry Canada
CE MARK
EC R&TTE Type Examination

GPS Specifications

General

L1 (1575.42 MHz) frequency, C/A code
12-Channels, 48 Correlators

Sensitivity

Minimum –136.0 dBm with GSM coverage.

Accuracy

Horizontal: < 6 meters (50%)
Altitude: <11 meters (50%)

Acquisition

Signal Power	-130.0 dB	-136.0 dB
Hot Start (50%)	<24 sec	
Warm Start (50%)	<38 sec	<400 sec
Cold Start (50%)	<90 sec	

Dynamics

Acceleration: 4g (39.2 m/sec2)
Motional jerk: 20 m/sec3

Environmental Specifications

Temperature

Operating: -10°C to + 55°C

Humidity

5% to 95% RH non-condensing @ +40oC

Vibration*

0.008 g2/Hz 5 Hz to 20 Hz
0.05g2/Hz 20 Hz to 100 Hz
-3 dB/octave 100 Hz to 900 Hz

Shock*

Operational: 40g for 11mSec
Non-operational:
75g for 6 mSec

* = Requires Vehicle Adapter Module

Physical Specifications

Assembly

Injection molded plastic with integrated battery pack

Size

143 mm x 76 mm x38 mm
5.78” x 2.99” x1.44”

Weight

205 grams (7.2 oz) not including batteries

TrimTrac Part Numbers

The following are LocationXS part numbers for the TrimTrac and accessories:

Part Number	Description
54200-10	Battery-powered TrimTrac
54200-20	TrimTrac with Vehicle Adapter Module
54200-30	TrimTrac with Vehicle Adapter and Battery Modules
54200-40	Provisioning Module Kit
54200-50	Starter Kit
Accessories and Parts	
54200-00	TrimTrac Base
54206-00	TrimTrac Cover
54207-00	TrimTrac Battery Module
54208-00	Vehicle Adapter Module
54209-00	Provisioning Module
53226	Metal Bracket
53227	Plastic Bracket
51197	CD-ROM Technical Manual
48274	USB A-to-A Cable 1 Meter

Table 3, TrimTrac Part Numbers

Bibliography

TrimTrac Technical Manual by Bill Dussell. This manual is also available at: www.trimtrac.com.

European Telecommunications Standards Institute (ETSI). ETSI is the standards body for GSM worldwide operations. Specifications on various aspects of GSM phone operations (AT commands, installation requirements, and terminology) are available for download from ETSI at: www.etsi.org

GPS, A Guide to the Next Utility, Trimble P/N 18239 (1992). A short, non-technical introduction to GPS. Explains what GPS does, how it works, and its capabilities and limitations. www.trimble.com

GSM Made Simple, by George Lamb published by Cordero Consulting and Regal Printing, Atlanta GA, 1997 (ISBN 0-966-57520-2).

GSM World. The GSM World site has information on the technical and business aspects of GSM. Contact information is available for GSM carriers as well as GSM hardware manufacturers. www.gsmworld.com

ICD-GPS-200. *NAVSTAR GPS Space Segment: Navigation User Interfaces*, drawing number ICD-GPS-200 (3 July 1991). The official definition of the data formats used in NAVSTAR GPS satellite signals. www.navcen.uscg.gov/gps

Commanding Officer
USCG NAVCEN
7323 Telegraph Road
Alexandria, VA 22315
703-313-5900

Proceedings of the Institute of Navigation, Washington DC. A series of three volumes of papers describing GPS Theory published between 1980 and 1986 by the Institute of Navigation. Essential source material for system designers. www.ion.org

SAE J1455 Joint SAE/TMC Recommended Environmental Practices for Electronic Equipment Design (Heavy Duty Trucks). www.sae.org

Glossary

The Glossary defines technical terms and abbreviations used in this manual. It includes terms from the fields of wireless communications and GPS technology.

0D	Time only in GPS terminology.
2D	Two dimensions and time in GPS terminology.
3D	Three dimensions and time in GPS terminology.
2D	GPS Two-dimensional GPS location fix and time.
3D	GPS Three-dimensional GPS location fix and time.
Altitude	Height above mean sea level (MSL).
ASCII	American Standard Code for Information Interchange.
C/A	Coarse Acquisition code used to receive GPS signals with receivers designed operate using SPS (Standard Locationing Service).
Checksum	The message checksum field provides for a two-digit hexadecimal checksum value, which is computed by XOR'ing all characters from the beginning of the sentence up to and including the * character. The checksum is always the last element of the sentence before the message < delimiter. The use of checksums can help in instances where the communication channel is noisy.
ETSI	European Telecommunications Standards Institute.
GPS	Global Locationing System.
GSM	Global System for Mobile communications.
HPA	High Priority Alert
IMEI	International Mobile Equipment Identity.
IMSI	International Mobile Subscriber Identity.
Latitude	Latitude coordinate of location fix with positive value indicating North.
LED	Light-Emitting Diode.
Longitude	Longitude coordinate of location fix with positive value indicating East.
LPA	Low Priority Alert
MPA	Medium Priority Alert
PC	Windows (2000, XP)-compatible Personal Computer.
PCS	Personal Communications Service.
PIN	Personal Identity Number.
RF	Radio Frequency.
SIM	Subscriber Identity Module.
SMPP	Short Message Peer to Peer.
SMS	Short Message Service.
SPS	Standard Locationing Service.
TAIP	Trimble ASCII Interface Protocol.

Reset TrimTrac

If your TrimTrac Locator Fails to Operate after Battery or VAM Change.

General Condition:

Some users may report that the TrimTrac stops working after changing the batteries or inserting a Vehicle Adapter Module (VAM). User observable symptoms may include:

1) LED no longer operational;
2) Device is no longer communicating or responding to queries; and
3) No amount of motion or shaking causes the device to “wake up” after the battery or VAM change.

Root Cause:

If the batteries or VAM are removed from an operational TrimTrac locator while the device is in the DELAY State, the device may stop functioning if the batteries or VAM are not reinserted prior to the expiration of the DELAY State Timeout, T4. The chance of this happening increases with shorter DELAY State Timeout, T4, settings.

Field Corrective Actions:

Normal operation can be restore by resetting the device in any of the following ways:

1) Using a paperclip or short wire to momentarily short the:
    a. Battery contacts as shown in Figure 1; or
    b. Main power pins (1or2 with 15or16) as shown in Figure 2.
2) Leaving the device without batteries or VAM installed for 24-hours.

Additional Comments:

It is important to note that just because the LED does not blink does not mean that the device is not operating. For instance, if the device is in the DELAY State during normal default operation, no amount of shaking or motion will cause the LED to blink.

If the batteries or VAM are removed in any state other than DELAY State or, if OnDemand Polling is enabled, then operation of the device will not be affected.

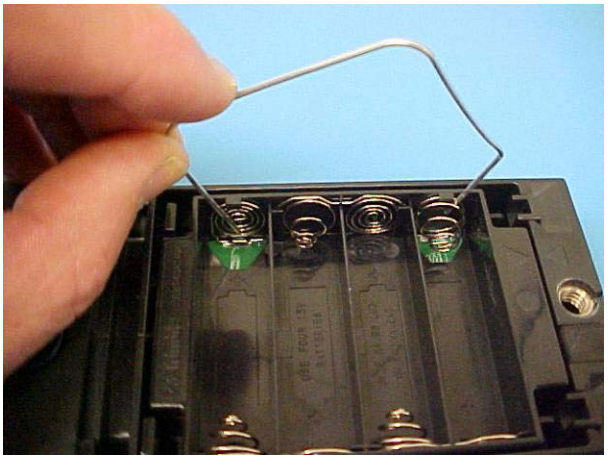
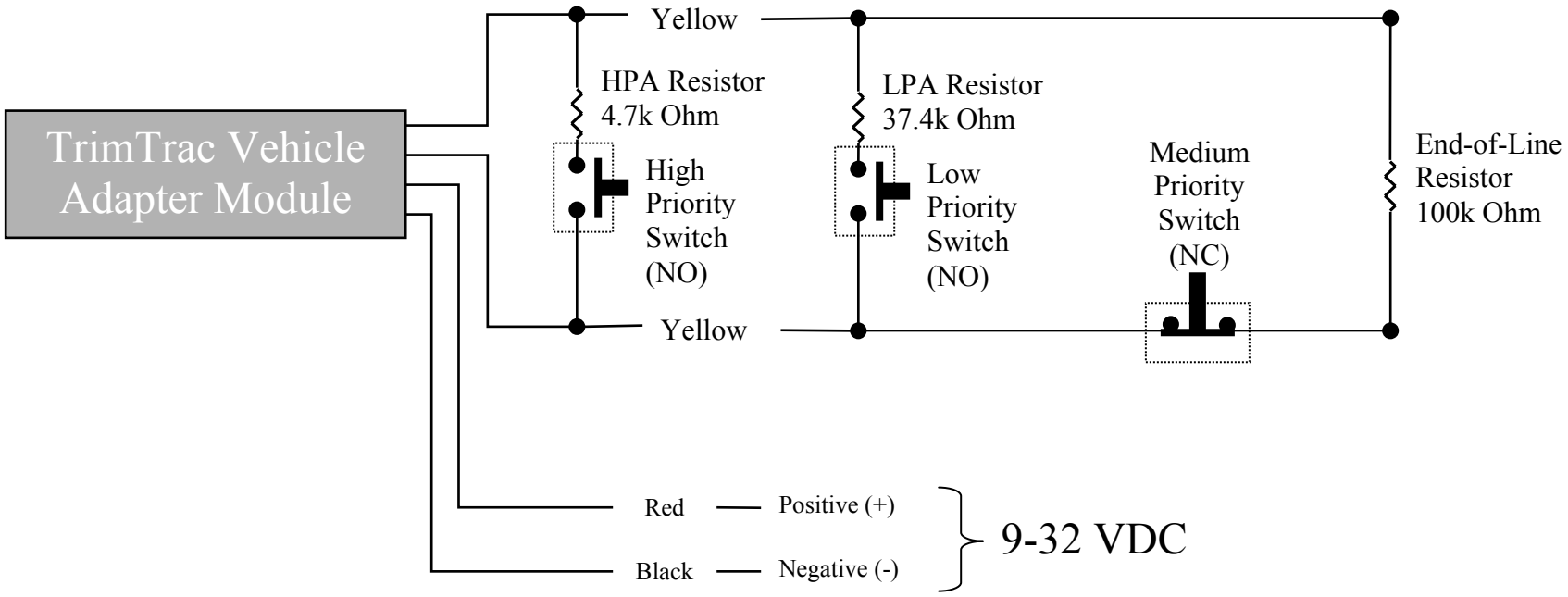


Figure 5, Shorting Battery Contacts

Figure 6, Shorting Main Power Pins

Vehicle Adapter wiring diagram



Notes:

- High and Low Priority switches must be Normally Open; Medium Priority switch must be Normally Closed
- HPA and MPA Switches can be either Momentary or Latching, LPA switch must latching-type
- High, Low and Medium Switches are optional and can be used in any combination
- Multiple switches can be used in parallel in each branch circuit; provided, however that branch resistance values are maintained as shown.
- End-of-Line Resistor is required unless MPA Mode is set “1=Disabled”
- If Alert Switches are not used, then set HPA, MPA and LPA Modes all to “1=Disabled”
- Set MPA Mode to “1=Disabled” if you do not want a MPA message if no external VDC is available.
- All resistors (+/- 5%, .250 Watt min.) and switches provided by installer.
- Opens, shorts and ground faults on main circuit and loss of external VDC handled as “Medium Priority Alerts”
- New High and Low Priority alerts may not be recognized if a Medium Priority alert caused by an open, short or ground fault is in already in effect.

Figure 7, VAM Alert Wiring Diagram