

The TrimTrac Locator

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PRODUCT INFORMATION

PRODUCT OVERVIEW

The TrimTrac locator is the world's first affordable, fully integrated asset tagging and monitoring device suitable for any application requiring periodic autonomous position reporting and cost-effective wireless communications.

The TrimTrac locator combines worldwide GSM communications with GPS location technology to provide periodic location reports. It supports target applications by automatically determining and relaying location information for automatic data capture and processing. The TrimTrac locator is initially targeted at automotive markets such as vehicle security, monitoring and recovery.

The TrimTrac locator is self-contained in water-resistant housing and provides indoor and outdoor position reports. Its enhanced sensitivity mode allows it to operate in environments in which traditional GPS devices will not work.

The TrimTrac locator operates for up to 90 days in a typical application that enjoys good GPS signal strength (e.g. -130 dBm) on a single set of four AA batteries. No other connection to external power supply, antenna or other devices is required. For permanent vehicle installations, it can be connected to vehicle power with an optional plug-in module. The Vehicle Adapter Module also contains a stand-by battery that allows the TrimTrac locator to continue operating if vehicle power is disconnected.



The TrimTrac locator is small, lightweight and self-contained in water resistant housing.

The TrimTrac locator is about the size of a white board eraser (5.25" x 2.5" x 1") and weighs 3.6 ounces without batteries or optional modules. It can get its location position ("fix") in less than 90 seconds from a cold start, but most applications will typically use warm starts, in which case, fixes will be computed in less than 38 seconds when a strong GPS signal is present. Times to first fix are somewhat longer for enhanced GPS (when faced with weaker signals, e.g. indoors). All that a service provider needs to add



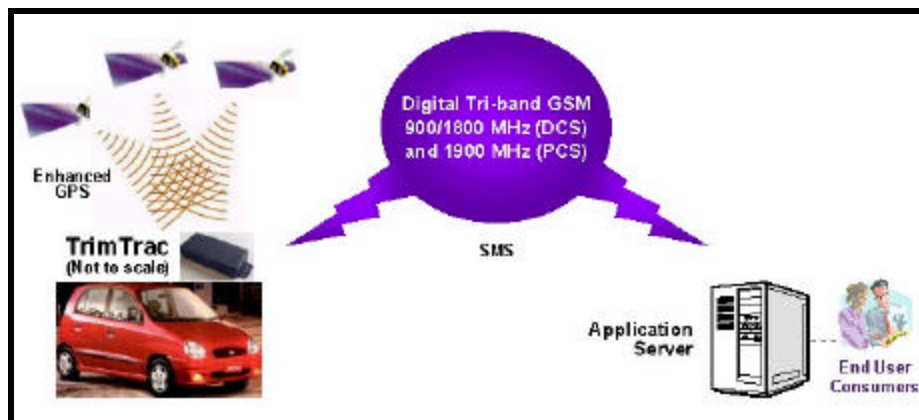
to activate the TrimTrac locator is a SMS-enabled SIM (Subscriber Identifier Module) card provided by a wireless carrier and four AA batteries.

The device spends a majority of the time in a “sleep” mode. Under normal operation, it only computes and reports its location while the device is in motion. Devices that are stationary for long periods of time will wake up periodically and send a status-only (no position information) message. Position and status reports are sent as SMS text messages over a GSM network. Commands can be sent to the device to ask it to do basic things like report more frequently (e.g. every second), go back to sleep or to report or change any of its configurable parameters.

The TrimTrac locator is the first in a series of innovative, multi-function products from Trimble's Component Technologies division. It is part of a product family that combines the latest in location and communication technologies. The product family leverages industry standard hardware and software for easy and rapid adoption, and deeply integrates location technologies for cost savings and power conservation. Over time, Trimble and its partners will offer a variety of plug-in modules that add innovative functionality such as BlueTooth, WiFi, automotive bus and OBD II interfaces, and other positioning technologies, such as using broadcast television signals to determine location.

BACKGROUND

The TrimTrac locator is derived from the Trimble GPS technology used so successfully by leading automotive manufacturers in their own in-vehicle navigation and telematics systems. The TrimTrac locator is the result of several million dollars in research and development to integrate the positioning and communications functions onto a single board with all functions using a common microprocessor. This unprecedented level of integration not only improves power efficiency, enhances functionality and reliability, but it also dramatically reduces device cost. The compelling aspect of the TrimTrac locator is that it offers most, if not all, of the same functionality and features as competitive devices that cost 2-5 times as much.



The TrimTrac locator by itself is only part of a complete customer solution. The complete solution will require a wireless carrier and typically a call center or end user



application. It is the application, such as vehicle monitoring over the Internet, that the end user customer perceives as providing value.

To put the TrimTrac locator into perspective, prior to 2004, vehicle-tracking devices were intelligent and rugged, and were designed for high-end consumer or commercial applications. They were also very expensive. The TrimTrac locator is the first in a new generation of low cost position sensor devices with GPS and GSM that work well wherever there is GSM coverage. This combination is more than adequate for a wide range of situations that only need periodic position updates rather than continuous guaranteed delivery updates and high bandwidth global connectivity.

Availability of the TrimTrac locator coincides with the rapid reduction in wireless communication costs. A decade ago, wireless communications cost much more (consider how many more people use cell phones today than ten years ago, primarily because monthly cell phone costs are now a lot lower). Today, with wireless communications costing significantly less, there is a large opportunity to provide a simple, low cost monitoring device that communicates periodically and inexpensively to a server application or directly to a modem-equipped PC.

ROLE OF THE SERVER APPLICATION

How and when the latest location and status information is presented to the end user is determined exclusively by the server or PC application (hereafter referred to as just the "application").

In this system architecture, the TrimTrac locator is a "sensor" that determines and reports location. The TrimTrac locator operates in accordance with the factory default configuration parameters or those set by the application. It is the application that determines the frequency at which the TrimTrac locator sends updated position information. The application can dynamically change the update rate when it communicates with the TrimTrac locator.

For instance, the application could configure the TrimTrac locator in "normal mode" to report its location every 15 minutes while the TrimTrac locator is in motion. If the TrimTrac locator is not in motion, there is no need to continuously report its location. When the user expects the vehicle to remain stationary, they could instruct the application to "arm" the TrimTrac locator. While "armed", any movement would cause a motion report to be sent immediately to the application. The application might then send a notification to the user and possibly increase the TrimTrac locator's reporting frequency, perhaps if and when the user confirms that the movement is unauthorized.

In other usage scenarios, it may be useful for the user to poll the TrimTrac locator to determine its current position. In response, the application could immediately report the unit's last reported position and then provide updates at preset intervals for when the TrimTrac locator is in motion. The application and not the TrimTrac locator enables this "polling" capability. Should the application require more frequent position updates, the application can increase the reporting frequency whenever the TrimTrac locator is in communication with the application.



Please refer to the manual for a more detailed description of the TrimTrac locator sequence of operation and state machine.

WIRELESS COMMUNICATION LINK

The TrimTrac locator uses SMS messages sent over GSM networks to communicate with the application. SMS is a store-and-forward data messaging system (which means that it is more like email as opposed to instant messaging).

PRIVATE VEHICLE APPLICATIONS

Market studies indicate that private automobiles are typically used in two one-hour periods for a total of two hours driving time each workday. During this time, drivers are commuting, shopping, getting lunch, shuttling people, running errands and so on. The vehicle is often stationary during the rest of the day.

Location Reporting

The TrimTrac locator has been developed, in part, with this usage profile in mind. To minimize communication costs and power consumption, the TrimTrac locator constantly monitors vehicle motion and only provides updated location reports while the vehicle is moving. It does not, for instance, repeatedly report location to the application if the vehicle has not moved since the last position report. To do otherwise would simply run-up communication costs and consume more power.

While the vehicle is in motion, the TrimTrac locator will report location at the reporting interval specified by the user or the application. The default is set at a 15-minute report frequency while the vehicle is in motion. This equates to approximately ten location reports per day, assuming two one-hour periods of vehicle usage typical for a daily two-hour commute.

Motion Reports

In its default configuration, the TrimTrac locator will first determine location before sending a location report after it first begins to move; however, in certain security-oriented applications, the end user may wish to be alerted just as a vehicle starts moving rather than waiting for a new full location report. In such security minded situations, the TrimTrac locator can be configured to report movement immediately and then follow up shortly thereafter with an updated position report. It is the role of the application to distinguish between expected and unexpected movement.

Track Logging, Geo-Fencing and Speed Monitoring

Other popular features of vehicle applications include track logging, geo-fencing and excessive speed reports, all of which are determined by applications and supported by the TrimTrac locator data.



Track Logging. The TrimTrac locator enables two types of track logging: application-based and device-based. In application logging, historical location reports are stored and accessed by the user directly from the application server. In device-based logging, the TrimTrac locator will determine location and attempt to report this information at the specified reporting frequency. However, there will be times when there will be insufficient communication signal to send reports to the application. The TrimTrac locator maintains a log of the most recent 128 location or status reports and will, upon request by the application, communicate previously unsent reports once connection to a network is re-established.

Each report, whether sent by the TrimTrac locator or stored on the device, is assigned a unique sequence number. The application must keep a log of these sequence numbers to determine whether it missed any reports because coverage was unavailable or because the Report Delay Flag was set to "1". The application can retrieve any or all of the 128 reports logged in the TrimTrac locator. Once the device contains 128 reports, the oldest reports are overwritten as new reports are generated.

Geo-Fencing. In geo-fencing, the user instructs the application to establish geographic regions in which the vehicle is either expected or not expected to operate. The application compares the TrimTrac locator's reported location to expected areas and acts upon any exceptions.

Speed Monitoring. Location reports sent by the TrimTrac locator include velocity. If the reported speed exceeds the threshold set by the user, the application could request an additional position report immediately to confirm the speed. Once confirmed, the application can send an excessive speed message to the user.

Vehicle Power

The TrimTrac locator is a battery-powered device that uses four AA batteries. For most vehicle applications, the unit can be connected to vehicle power using the TrimTrac locator's optional Vehicle Adapter Module that replaces the standard battery pack.



MAJOR FEATURES AND BENEFITS

Complete packaged end user device -- easy to use; expensive installation eliminated

No external connections or antennas -- same as above plus lower cost

Tri-band GSM including 900/1800 MHz (DCS) and 1900 MHz (PCS) -- provides a wide coverage area. GSM is the dominant wireless standard in all regions of the world, especially in Europe and most of Asia. In the U.S., it works in all major metropolitan regions and along interstate corridors. Major carriers, like T-Mobile, AT&T Wireless and Verizon in the US, and many regional carriers, use GSM as their primary supported digital wireless standard. As a consequence the TrimTrac locator is expected to operate anywhere in the world where GSM network coverage is provided, assuming the appropriate inter-carrier roaming agreements exist.

Short Message Service (SMS) -- SMS is available on all GSM networks worldwide (unlike GPRS). It is an efficient, cost-effective and secure way to transmit the limited amount of data that is sent and received by individual TrimTrac locators.

Indoor and Outdoor Position Reports -- unlike traditional GPS devices that only operate outdoors, the TrimTrac locator uses enhanced GPS sensitivity to acquire weak GPS signals in a wide variety of indoor settings or similar environments that do not necessarily have a clear view of the sky.

Battery Powered or Connect to Vehicle Power -- battery power enables the TrimTrac locator to be instantly used without installation, as well as used for a wide variety of situations where external power is unavailable (e.g. on a shipping container). Alternately, the TrimTrac locator is appropriate for vehicle monitoring and recovery applications because the optional Vehicle Adapter Module features a stand-by battery that enables the TrimTrac locator to continue operating even if vehicle power is lost. The stand-by battery automatically recharges once vehicle power is restored.

90 Day Operation on four AA Batteries -- this is a major advance in power conservation, ease of use and maintenance, and cost of operation. Battery life will decrease if the TrimTrac locator is used in environments with low GPS signal strength due to longer times to first fix.



UNIQUE VALUE PROPOSITION

Notwithstanding that the TrimTrac locator is an innovative product from a GPS company whose name can be trusted, the TrimTrac locator's unique value proposition is understood by examining its unique set of capabilities and attributes:

- Autonomous, accurate position determination -- the TrimTrac locator determines its position using enhanced GPS. This allows it to be accurate within about 20 feet horizontally and 35 feet vertically. It is also able to get a position fix in many environments that traditional GPS cannot. It does not require other hardware (such as RFID) or signals (such as proximity to cell towers) to determine its location.
- Wireless Communication -- the TrimTrac locator leverages near GSM ubiquitous wireless networks to report its position. GSM is the prevailing worldwide digital wireless standard.
- Motion-Based Position Reporting – The unit only reports position when motion has occurred. This minimizes power consumption and communication costs and makes the TrimTrac locator well suited to the monitoring of mobile assets such as vehicles.
- End User Packaging -- integrating all of these components, along with power and antenna, in one package makes the TrimTrac locator very easy to use and eliminates expensive and hassle-prone installation.
- Power Conservation -- the unit is designed to run for 3 months on four AA batteries, assuming good signal strength and up to ten position reports per day.
- Permanent vehicle installation is supported by a Vehicle Adapter Module that:
 - Enables more frequent position updates and polling than what is possible with internal batteries alone
 - Eliminates the periodic changing of batteries (e.g. for covert use)
- The TrimTrac locator is produced by a manufacturer with high volume manufacturing capabilities and quality processes, resulting in the highest industry reliability.

This set of capabilities and attributes makes the TrimTrac locator ideally suited for vehicle monitoring and recovery applications because:

- it can determine location in both rural and high density urban areas
- it can access a widely available GSM network to report this information
- motion-based reporting allows the device to reduce power usage and communication costs
- end user packaging makes it easy to install and use
- power conservation and Vehicle Adapter Module extend operating life
- low cost opens up a whole new segment of the market



CONFIGURATION AND WARRANTY

The TrimTrac locator is available in four configurations:

- Base Unit (without Battery Pack or Vehicle Adapter Module)
- Standard (Base Unit + Battery Pack)
- Auto (Base Unit + Vehicle Adapter Module)
- Deluxe (Base Unit + Battery Pack + Vehicle Adapter Module)

The TrimTrac locator Accessories that can be purchased are:

- Vehicle Adapter Module (purchased separately)
- Battery Pack (purchased separately)
- Provisioning Module
- Developers Kit

WARRANTY

The warranty for the TrimTrac locator is one year on material and workmanship from date of shipment.

FOR MORE INFORMATION

The TrimTrac locator has its own web site at www.trimtrac.com, which contains detailed product information. For additional information, please contact your Trimble Components Technology Division representative.

GLOSSARY

2.5G: Wireless networks that have some third-generation functionalities (see 3G).

3G (Third Generation): An industry term used to describe the networks needed for the next generation of wireless applications. It represents a move from circuit-switched communications - where a user has to dial into a network - to broadband, high-speed, packet-based wireless networks. Third generation networks expand the digital premise by bringing high-speed connections and increasing reliability.

CDMA (Code-Division Multiple Access): Digital cellular technology that uses spread-spectrum techniques. CDMA does not assign a specific frequency to each user. Instead, every channel uses the full available spectrum. Individual conversations are encoded with a pseudo-random digital sequence.

Cellular: A communications system that divides a geographic region into sections, called cells, to make the most use out of a limited number of transmission frequencies. Each connection, or conversation, requires its own dedicated frequency.

Frequency: A measurement used to determine the number of vibrations a signal makes in one second. Most commonly measured in Hertz (Hz), or cycles per second.

GPS (Global Positioning System): A communication system composed of 24 well-spaced satellites that orbit the Earth. The location of a vehicle equipped with a GPS receiver can be determined by calculating the time it takes for the receiver to pick up signals from three to six satellites. Accuracy is between one meter and one hundred meters, depending on the receiver.

GSM (Global System for Mobile communications): A standard for the way data is coded and transferred through the wireless spectrum. GSM digitizes and compresses data and sends it down a channel with two other streams of user data. The standard is based on TDMA and is an alternative to CDMA.

TDMA (Time Division Multiple Access): This protocol allows large numbers of users to access one radio frequency by allocating time slots for multiple voice or data calls. TDMA breaks down data transmission, such as a phone conversation, into fragments and transmits each fragment in a short burst, assigning each fragment a time slot. TDMA works with GSM and digital cellular services.

SMS: Short Message Service protocol

SMSC: Short Message Service Center

Telematics: The broad industry related to using computers in concert with telecommunications systems. This includes dial-up service to the Internet, as well as all types of networks that rely on a telecommunications system to transport data. Telematics is commonly used to refer to automobile systems that combine global positioning satellite (GPS) technology and other wireless communication systems for automatic roadside assistance and remote diagnostics.