GLOBAL SATELLITE ENGINEERING

GSatMicro

USER GUIDE

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SYSTEM THEORY

The GSatMicro Series is a suite of intelligent satellite terminals that provide behavior monitoring and management of fixed and mobile assets around the globe. Regardless of your asset type, the GSatMicro Series provides satellite enabled solutions that can be applied across multiple industries. All terminals in the series provide a global communications channel with optional encryption for transmitting and receiving data on demand whether on land, in the air, or at sea.

Tracking With Intelligence

The GSatMicro Series provides a fully programmable and customizable solution that allows for the creation and modification of scripts to expose custom behaviors and transmit data in a format dictated by a project's needs. The ability to execute a customized script allows the GSatMicro Series to perform real-time analysis of data captured out in the field, control other hardware, sensors, or electromechanical components, and perform other vital tasks.

MORE THAN JUST TRACKING DATA

The GSatMicro Series terminals are not just tracking devices, they are powered by a processing engine that has access to satellite networks, positional information, and a multitude of sensors.

CUSTOMIZABLE BEHAVIORS

The core of the GSatMicro is powered by eLua, allowing extensive integration customization and offering great versatility via device behavior control.

ANALYZE DATA WITH 'DEVICE-LEVEL INTELLIGENCE'

A powerful on-board virtual machine allows the execution of custom-built software code that can receive, analyze and transmit data depending on pre-programmed conditions.

CREATE A NEW TERMINAL ON THE FLY

With the ability to load new custom scripts and change parameters easily and quickly, you are able to transform a single GSatMicro into a completely different terminal that behaves the way you want it to.

Introducing the GSatMicro Series

A suite of intelligent, satellite enabled terminals that provide a vast set of features to help you quickly and effectively satellite enable your projects.

The GSatMicro Series is a suite of intelligent, satellite enabled terminals that provide advantageous, global behavior monitoring and management of fixed and mobile assets. Whether managing people, vehicles, aircrafts, vessels or remote installations, the GSatMicro Series terminals provide satellite enabled solutions across multiple industries. It provides an encrypted, secure communications channel around the globe for transmitting and receiving data, and in many cases, survivable communications on demand whether on land, in the air, or at sea.

The GSatMicro Series is fully programmable and customizable, allowing the creation and modification of scripts to expose custom behaviors and transmit data in a format dictated by your unique requirements. The ability to execute a customized script allows the GSatMicro Series to perform real-time analysis of data captured out in the field, control other hardware, sensors, or electromechanical components, and perform other vital tasks.

The core of the GSatMicro Series terminals is a processing engine between any and all of the built in interfaces: satellite, GPS, wireless, USB, encryption, serial port, analog inputs, digital outputs, accelerometer, battery/charging information, temperature, and shock/motion.

Core features for all GSatMicro Series terminals

- Intelligent
- Programmable
- Over-the-air Configuration
- Extremely Small Size
- 256-bit AES Encryption
- GPS Tracking
- Wireless Connectivity
- GSM Connectivity
- Behavior Monitoring
- Multiple Sensors
- Iridium Global Coverage
- Reporting Flexibility

IRIDIUM'S GLOBAL SATELLITE NETWORK

The GSatMicro Series utilizes Iridium's bi-directional SBD (Short Burst Data Service) satellite service to provide visibility and network connectivity with people and equipment anywhere in the world and offers a simple and efficient satellite communications service for transmitting small portions of data between remote assets and a centralized host. Iridium's SBD service offers low-latency, truly global coverage and near real-time communications capabilities.

MODELS

GSatMicro

GSE's handheld integration of the OEM is established as the smallest self-contained Iridium tracker in the world! The GSatMicro provides personnel communications equipment that is exceptionally secure, light, reliable, portable, and rugged, with the addition of added behavior control. The GSatMicro brings together powerful electronics with an intelligent core to create an extremely versatile unit that can detect and communicate the behavior of assets in the field.

In its handheld form factor, the GSatMicro is the world's smallest and lightest, self-contained Iridium satellite communications terminal. With the inclusion of the - GSatMicro OEM, a rechargeable battery, an antenna, I/O ports, wireless and GSM modules - absolutely everything you need is built in and very simple to interface with to a multitude of connectivity options. Within the ruggedized case resides an programmable intelligence capable of letting you know more than just the location of an asset but the behavior of the asset and how the world around it is affecting it. In essence, the GSatMicro is not just a tracking device, it is a powerful processing engine in the smallest and lightest form available on the market today.

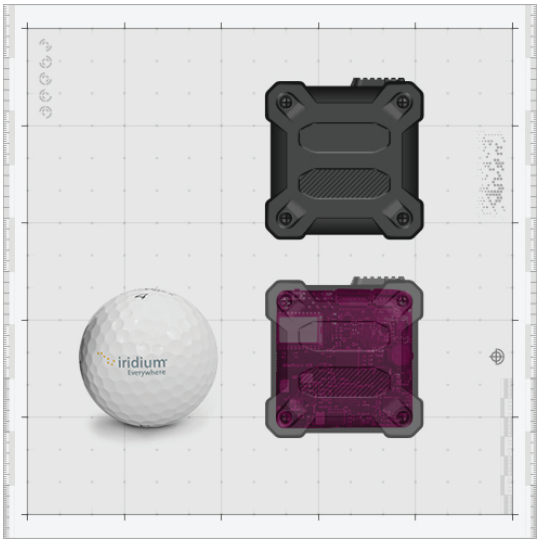
Additionally, it includes on-device behavior control and intelligence that allows it to perform logic and data analysis. With the ability to provide automated reporting, it comes standard with an Alert and check in button. LEDs let you know when the device is connected to GPS and the Iridium satellite network, as well as Alert, incoming messages and power status.

The GSatMicro provides strategic integration capabilities for diverse applications ideal for security and safety, personnel tracking, fleet management, or unique mission applications that require maximum dependability and flexibility in remote locations, whether on land, at sea, or in the air anywhere in the world.

CORE FEATURES:

- Fully Self-contained
- Waterproof
- Rugged Case (IP67)
- Small Size
- Status Indicators
- Alert Button
- Sleep & Storage Modes
- Rechargeable Battery
- Omni-Directional Antenna
- Multiple Sensor I/Os
- Smartphone Tethering & Apps
- Whitelabel Options

MODELS



GSatMicro OEM

The GSatMicro OEM is an incredibly customizable device which combines telematics and onboard intelligence in a way no other satellite device has before. Starting with an engineering challenge to design the smallest possible satellite tracking device, the GSatMicro OEM not only delivers, it includes extremely advanced functionality in an astonishingly small package. The GSatMicro OEM allows the ability to satellite enable unique projects to solve or develop strategic missions. It performs as a completely customizable telemetry device with multiple I/O ports allowing the ability to tie in a host of sensors capable of truly understanding how things are behaving.

The GSatMicro OEM board clips directly onto the Iridium 9602 modem providing a platform for developers to integrate into their own projects. Every component of the GSatMicro OEM was designed to fit into a dense vertical stack, providing extremely advanced functionality in an astonishingly small package. It is capable of being fully integrated into a customized form factor designed to meet specialized demands of any project imaginable.

CORE FEATURES:

- Create Unique Terminals
- Satellite Enable Any Project
- Define Your Own Form
- Factors
- Completely Integrable
- Building Block For Endless
- Applications
- Quick To Market
- Built In Control & Functionality

MODELS

GSatMicro X Series

The X models of the GSatMicro Series add a redundant layer of communications by adding GSM capabilities to create a true hybrid solution. You are able to customize all aspects of the GSatMicro Series, even the network you want to connect to. The X Series adds a GSM module to your terminal enabling the ability to have multiple layers of network connectivity creating a redundant platform for your communications. Working as hybrid solutions, the GSatMicro X and the GSatMicro OEM X, have the capability to switch flawlessly between local, land-based cellular networks and Iridium's globally accessible satellite network.

Not only does a multi-network hybrid solution provide always-available communications, it can also reduce costs by using GSM as a less expensive way to send and receive data. You also have the option to choose which network is the primary means of transmitting data and which network is the failover network used for backup communications. The options are highly versatile and can be controlled based on the requirements of your project

CORE FEATURES:

- Satellite + GSM Networks
- Network Redundancy
- Customizable Switchover
- Increase Coverage
- Reduce Costs

ANATOMY 101

External Anatomy

1) I/O Ports: Interconnecting the device with other hardware, user input interfaces, monitoring hardware, or environment data becomes very simple.

- Two 1A Relay Outputs (Active Low) - Control external relays or outputs which have external power.
- Two ADC Inputs (0-30V) - Measure input voltage, and trigger wakeup conditions for the GSatMicro.

2) Case: Built to be rugged and reliable, the GSatMicro case prevents the intrusion of sand, dust, water, snow, mud, oil or just about anything else thrown at it. The case is designed with rugged plastics to start, sealed with a custom built silicon molding, and tightened with stainless steel screws. Internal to the unit is both moisture and pressure elimination to ensure functionality at various altitudes and temperatures. The connector is also a fully sealed IP67 connector with gold plated pins to ensure waterproof functionality. The unit functions in the harshest conditions and the most extreme environments.

3) Waterproof Seal: The GSatMicro has a button pad with LED lights, and is not just water resistant, it is Waterproof with Intrusion Protection. The GSatMicro has gone through rigorous testing and has proven that it can withstand full submersion for an extended period of time and still continue to work once removed from those conditions. It has an impressive IP67 rating:

- Liquid immersion with a depth up to 1 meter
- Dust tight; no ingress of dust; complete protection against contact (dust tight)

4) Button Panel: Activate by pressing both the 'Settings' and the 'Check-In' buttons at the same time. By activating alert mode, your positions are transmitted on the “alert” sleep time instead of the “normal” sleep time, allowing you to increase the reporting interval by simply switching to alert mode. The unit will also flag the transmitted positions with an alert flag that will display on the platform.

5) Status Indicator:

- LED / Default Function
- Green LED (Icon: Lightning) / Power
- Orange LED (Icon: GPS) / GPS
- Orange LED (Icon: Satellite) / Iridium
- Blue LED (Icon: Envelope) / Messages
- Red LED (Icon: !) / Alert Mode

ANATOMY 101

Internal Anatomy

1) Antenna: The helical antenna built into the GSatMicro provides the ultimate Iridium coverage by utilizing a self radiating element without a limiting ground plane. Tuned for Iridium and GPS, the integrated high-gain helical antenna provides 180 degrees radius of coverage. Also, a single antenna feed provides both Iridium and GNSS coverage to minimize weight and size of the GSatMicro

· Two ADC Inputs (0-30V) - Measure input voltage, and trigger wakeup conditions for the GSatMicro.

2) Iridium 9602: The Iridium 9602 is the next-generation SBD Transceiver from Iridium. Designed for integration into complete wireless solutions, it provides the critical global data communications necessary for today's global solutions.

The Iridium 9602 is designed to exclusively support Iridium's Short Burst Data Service. The small size and ease of integration make the Iridium 9602 ideal for Machine-to-Machine (M2M) solutions such as automatic vehicle location, asset monitoring, marine and personal tracking applications.

3) GSatMicro Core: The core of the GSatMicro Series terminals is a processing engine which allows communication between any and all of the built in interfaces including satellite, GPS, wireless, USB, encryption, serial port, analog inputs, digital outputs, accelerometer, battery/charging information, temperature, and shock/motion.

ANATOMY 101

Internal Anatomy

4) Battery: The GSatMicro can rest on the shelf for years without needing to be charged. For self powered operation, or operation on USB, an optional 2500 mAh LiPo battery pack can be added. This battery pack was custom designed with special LiPo materials to achieve a 20% increase in battery density. Also, the size was custom built to fit within the outline of the GSatMicro board for an efficient stackable design.

GETTING STARTED

Out of the box, your unit should be in off or storage mode. In order to power it up and start transmitting you will need to hold down the power button until power and GPS lights "fade up" (dark to bright). When you release the button it will start a position report cycle. The states of which are described below:

While the unit is powered on, it will go through progressive stages of acquiring, transmitting, and sleeping, as indicated by the Power and Message LED's.

1) Upon power up or wakeup from sleep, the Power LED will "fade up" until initialization is complete, after this the LED will indicate battery state (flashing up to 5 times if the battery is full).

2) Next, when GPS is enabled the GPS LED will fade up until satellites are acquired, at which point the number of flashes indicates the number of satellites acquired (up to 5) until a fix achieved, then the LED will stay on, solid.

3) Next, the Iridium modem will be enabled and the Satellite LED will fade up until signal is acquired. Once iridium signal is acquired, the LED will flash 1-5 times indicating signal level. The LED will stay on solid once a transmission has been successful.

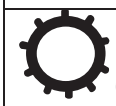
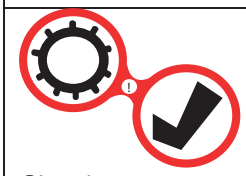
4) If only one report or message was pending the unit will then sleep until the next transmission. On battery all LEDs will turn off. If plugged into an external power source, LEDs will reflect last state achieved. The last status can be displayed by briefly pressing the power button if the unit is on battery. If transmission was successful your unit should appear on the map at its current location.

See the "Terminal Behavior" on p.10 for more details on button and LED behavior.

TERMINAL BEHAVIOR

The front interface panel has three buttons and 5 lights. Behavior is described below.

Button Behavior

Button	Description
 Power	<1 second: flash LEDs showing last state before sleep >=1 second: From off/storage, resume transmit/sleep (Power and GPS LEDs will "fade up" to indicate this will happen when button is released). From sleep or wake, enter off mode (power and GPS LEDs will "fade down") >=10 seconds: From any mode. Enter storage mode (Power, GPS, Satellite and Message LEDs will "fade down" to indicate the mode is selected)
 Check-in	Set the check-in bit for next transmission.
 Configuration	Hold for >=10 seconds (message LED will fade up) to enable wireless pairing. Hold for >=10 seconds while in pairing mode to disable pairing (led will fade down)
 Check-in+ Configuration	If ALERT mode is disabled, enable (Alarm will flash), transmit immediately. If ALERT is enabled, disable.

When you depress the Power button for more than 1 second, the unit will either turn Off if it is currently On and go into a deep sleep without transmitting, or if it is currently sleeping, will wake the unit and immediately transmit a position.

When you depress the Check-In button WHILE the unit is on, the next successful transmission report will contain a bit flag indicating that it is a Check In message. This mode will be cleared once a successful transmission is made. The MSG light will begin flashing slowly.

When you depress the Configuration + Check In button together for ALERT mode, the unit will IMMEDIATELY begin transmitting it's current location (even if it was sleeping). The MSG light will begin flashing rapidly. The unit will also use change the sleep interval to the value specified by "ALERT sleep" time in seconds indicated in the

"settings" function below. To exit ALERT mode, depress the Power + Check In button together again and the MSG light will turn off again.

LED modes

 Power	Description
1-5 flashes	1: 0-19% battery 2: 20-39% battery 3: 40-59% battery 4: 60-79% battery 5: 80-100% battery When charging between flashes LED will glow with diminished brightness. When not charging, LED is off between flashes. When on external power and battery >=95% power LED will be solid on.
Fade up	Powering up
Fade down	Powering Down
Off	Off

GPS GPS	Description
Slow flash	Powered, no fix
1-4 flashes	1-4 GPS satellites
5 flashes	>=5 GPS satellites
On	GPS fix acquired
Off	Off

 Iridium/ Satellite	Description
Fade up	Radio on, no signal
1-5 flashes	Iridium signal acquired, flash count corresponds to signal. More flashes, better signal
On	Transmitted message
Off	Off, or powered with no radio

Alert (!)	Description
Fast Flash	ALERT mode, cleared on successful transmit
Off	Not on ALERT mode

Message	Description
Medium Flash	Check-in mode, cleared on successful transmit
Off	Not in check-in mode
Fade up	Wireless pairing enabled (overrides check-in)
Fade down	Disabling wireless check-in

SPECIFICATIONS

- Dimensions: 55.5mm x 49.25mm x 89mm including battery, modem and antenna
- Dimensions: 41mm x 45mm x 17mm (OEM version)
- SiRFstarIV GPS with an amazing -163dBm sensitivity
- AES 256-bit encryption supported (optional)
- Rechargeable Lithium Polymer battery (2.4 Ah, up to 1000 position reports)
- Integrated omnidirectional helical antenna (high gain ceramic patch antenna for OEM model)
- Over the air configuration of terminal
- USB, RS-232 and wireless connections for programming
- Full 2 way communications network
- Wireless smartphone connectivity for messaging and configurations
- Truly global coverage with the Iridium satellite network.
- Nominal Battery Performance At Temperature Under Load
  2.3Ah @ 20C @ 1A
  2.02Ah @ -10C @ 1A
  1.82Ah @ -20C @ 1A
  1.57Ah @ -25C @ 1A
  .2Ah @ -30C @ 1A
  .2Ah @ -30C @ 1A

Interfaces

- USB DC Input (4.5V to 5.5V)
- High Voltage DC Input (7.5V to 36V) (protected to 40V DC)
- USC Interface (Power, Serial Console/Logging, Firmware Update)
- RS232 Interface (Serial Console/Logging)
- Wireless
- 2 Relay Outputs @ 250Ma (Open Drain)
- 2 Analog Inputs (0V to 30V DC)

BASIC FEATURES

The GSatMicro Series was designed from the ground up to fulfill a need for a robust, versatile, and powerful hybrid tracking device for the satellite and GSM market.

- Intelligent Device
- Rugged & Waterproof
- GPS Tracking
- Configurable & Programmable Logic
- Military Encryption
- Global Network Coverage

OVERVIEW

The GSatMicro is available in a handheld form or an OEM version providing strategic integration capabilities for diverse applications. Interconnecting the GSatMicro with other hardware, user input interfaces, monitoring hardware, or environment data becomes very simple. Charging is supported over USB or regular DC voltage for versatility; and it includes a serial port for programming and control, a SiRF V GPS chipset with Galileo + GLONASS support, wireless connectivity, two inputs, two outputs, an accelerometer, and a digital compass.

The GSatMicro Series terminals use Iridium's bi-directional SBD satellite service to provide visibility and network connectivity with people and equipment anywhere in the world. Environmentally sealed, the GSatMicro is suitable for the harshest and most challenging environments that are far from the reach of most communications systems. While the GSatMicro OEM is capable of being fully integrated into a customized form factor designed to meet mission demands.

eELUA SCRIPTING

Having the power to customize the behavior of the GSatMicro allows it to do more than just report position data. Scripting unlocks a powerful flexibility that you simply will not get with a traditional “tracking device”. eLua scripting enables you to truly understand the behavior of things by the way they interact with the GSatMicro. When you can control data collection to the specifications of your project, you are able to properly analyze what your assets are doing in the field and what steps you need to take to manage them.

The flexibility of the GSatMicro plus it’s core OS driven by eLua enabled applications empower developers to engage projects and applications on a new level. The eLua interface provides a simple console where integration and designs can be tested and implemented before going to the field, and allows for real time analysis and diagnostics.

For example, getting the serial number of the Iridium modem is simply “iridium.getserial()”, to transmit a message is simply “iridium.transmit(X)”, combine this to transmit the serial number of your GSatMicro over the air is “iridium.transmit(iridium.getserial())”. Take into account that there are 20+ modules in the GSatMicro plus the power of eLua, and you have the most powerful platform in the world.

AES 256-BIT & AES-CCM ENCRYPTION

By integrating encryption methods directly into the GSatMicro, we guarantee that your data is safe and secure. There is no need to worry about the security of the network when the transmissions are already encrypted.

AES encryption has become the standard for the United States government and is used worldwide. The encryption secures your data to completely protect it from brute-force attacks. Even if the transmission is intercepted and your data is stolen, hacker’s can not access it. This is extremely important when data is being distributed to multiple devices over multiple networks. There is no need to make sure that every device and every connection remains secure when the GSatMicro ensures that your data is protected at all times.

Additionally, encryption helps to maintain data integrity and prevent third parties from manipulating data transmissions. Keeping sensitive information protected is key to protecting your business and its assets and should be a priority.

WIRELESS CONNECTIVITY

Smart phones and tablets have become synonymous with doing business, keeping in touch with family, managing teams in the field, and have transformed into a powerful tool that acts as an extension of ourselves. The GSatMicro is capable of taking smart devices one step further by connecting them to a satellite network to be used worldwide. By interfacing the GSatMicro with mobile apps, new tools can be utilized to manage data and assets all over the globe.

With wireless connectivity enabled, the GSatMicro can be paired with mobile apps and provide instantaneous wake state when the app is opened for immediate communications and text messaging. Even with BLE constantly transmitting its beacon ID and waiting for commands, the GSatMicro battery will last more than *12 months in sleep.

Since the wireless module advertises a SPP (Serial Port Profile) which connects you directly to the eLua core, you can develop your own applications and features to augment the GSatMicro as an extension to your mobile apps. If you would like to enable your apps to transmit/receive commands via Iridium, simply integrate our wireless libraries with your application.

*Transmission/sleep intervals between GPS transmissions will deplete the battery faster, this calculation is evaluated considering the GSatMicro does not wake to transmit GPS.

PROPRIETARY HIGH COMPRESSION PACKET SIZE

With the option of 3 compressed binary formats right out of the box, you can select a highly compressed proprietary format, a simple to decode and openly published format, and a high accuracy openly published format. We have published 2 of the 3 formats, including a sample .net library, a wikipedia protocol definition, and a Google Sheets decoder, to make interfacing to these formats as simple as possible.

OMNI-DIRECTIONAL HIGH GAIN ANTENNA

The helical antenna built into the GSatMicro provides the ultimate Iridium coverage by utilizing a self radiating element without a limiting ground plane. Tuned for Iridium and GPS, the integrated high gain ceramic/helical antenna provides 180 degrees radius of coverage. Also, a single antenna feed provides both Iridium and GNSS coverage to minimize weight and size of the GSatMicro.

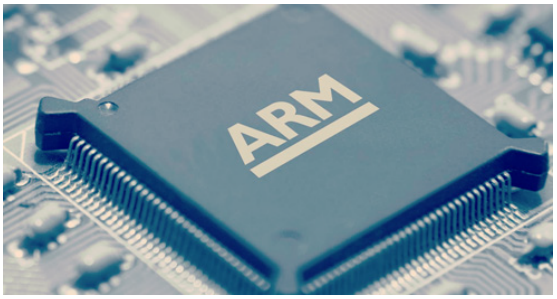
COMPACT, LIGHTWEIGHT AND PORTABLE

The GSatMicro is the smallest self-contained Iridium tracker in the world. Within its casing is a combination of a high performance antenna, the Iridium 9602, I/O ports, a long-life rechargeable battery, and the GSatMicro core. The result is a fully integrated satellite terminal that is roughly the size of a golf ball and weighs a mere 4.5 ounces. Extremely portable, the GSatMicro is designed to fit in a pocket, on a dashboard, clipped to a backpack, or even strapped to a helmet.

The GSatMicro OEM is even smaller; as it loses the battery, antenna and case to provide a platform for developers to integrate into their own projects. Only being a few millimeters thin, the GSatMicro OEM board clips directly onto the Iridium 9602. The 'stack' can then be placed into a custom form for any project imaginable. You can read more about OEM integration here:

NASA LDSD Project
NASA Flight Imagery Recorder Locator (FIRLo)

POWERFUL PROCESSOR

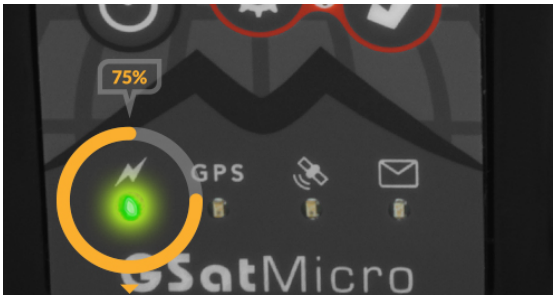


Using the latest 32-Bit ARM Cortex technology, the GSatMicro is both fast and very power efficient. The processor itself consumes only a few microamps when sleeping, and wakes up to full power mode in a millisecond to process high speed data. Using this power to run the eLua core is what empowers the GSatMicro technology.

REUSABLE INTERNAL BATTERY

The GSatMicro can rest on the shelf for years without needing to be charged. For self powered operation, or operation on USB, an optional 2500 mAh LiPo battery pack can be added. This battery pack was custom designed with special LiPo materials to achieve a 20% increase in battery density. Also, the size was custom built to fit within the outline of the GSatMicro board for an efficient stackable design.

- Integrated Battery Fuel Gauge
- Internal 2500mAh Lithium Polymer Battery
- Integrated Lithium Battery PTC Safety



ALERT BUTTON

By activating alert mode, your positions are transmitted on the “alert” sleep time instead of the “normal” sleep time, allowing you to increase the reporting interval by simply switching to alert mode. The unit will also flag the transmitted positions with an alert flag that will display on the platform.

ANALYZE ANY TYPE OF INFORMATION

Interconnecting the device with other hardware, user input interfaces, monitoring hardware, or environment data becomes very simple.

Multiple I/O Ports - GSatMicro

- Two 1A Relay Outputs (Active Low) - Control external relays or outputs which have external power
- Two ADC Inputs (0-30V) - Measure input voltage, and trigger wakeup conditions for the GSatMicro

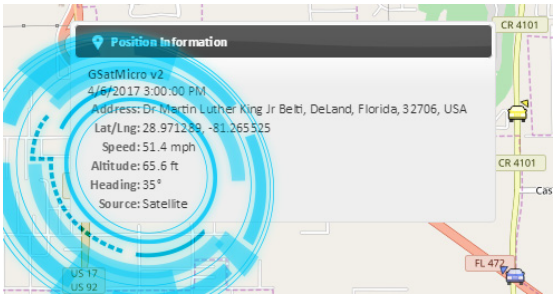
I/O BOARD - GSATMICRO OEM

Two flex circuit connectors on the GSatMicro OEM provide all of the I/O functionality and can be easily interfaced to with the I/O Board. The I/O Board provides both common connectors and solderable pins for your project. It includes Micro USB, DB9 RS232, DC power, 2 analog inputs, 2 relay outputs, 5 LEDs, and 3 N/O push buttons.

MONITOR ASSET BEHAVIOR

With its accelerometer and magnetic compass paired with onboard intelligence and I/O technology the GSatMicro Series eliminates restrictions to position information. Instead, the GSatMicro Series offers you the freedom to truly understand the behavior of your asset. You have control of how and why the device is going to report.

- How fast the device is moving
- The heading of the device
- The Pitch and Roll of the device (such as on a ship in rough seas)
- A quick and sudden descending motion of the device (such as in an aircraft)
- A quick motion upwards



MAGNETIC COMPASS

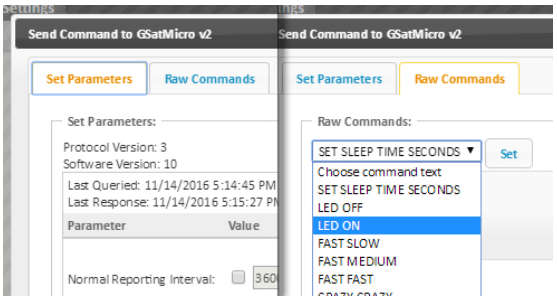
Determine heading when unit is stationary. GPS does not provide heading calculations when an asset is stationary so we use our internal magnetic compass to determine orientation. *Magnetic compass functionality requires a clear margin of metal or magnetic fields around the GSatMicro. For example, mounting on a metal ship deck does not perform well.

ACCELEROMETER

Monitor for movement, determined by a configured threshold to indicate motion, to transmit more frequently on motion vs stationary. You can also utilize your own custom eLua script to monitor forces up to 12G's for custom behaviors.

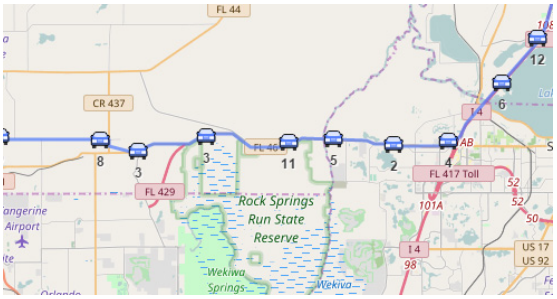
MANAGE YOUR DEVICE ANYWHERE

Remotely send eLua commands, update configuration parameters, and retrieve configuration information from the device over the Iridium network. It is imperative that tracking terminals remain in the field with their asset. For every moment the device is brought in to undergo software modifications, you are losing valuable data, time, money and possible the asset. Having the ability to command and control assets in the field without losing position based information is essential in today's fast paced, technology driven world. Remote configuration allows for device behavior changes on-the-fly that may be critical to the mission at hand.



SiRFstarV GPS WITH AN AMAZING SENSITIVITY

The GSatMicro is capable of sending and receiving data anywhere in the world, this includes positional data such as latitude, longitude and altitude. It acquires this data by using the latest GPS technology that integrates multi-constellation data to include GPS plus other positioning networks to enhance accuracy and availability of location data. It allows full control over the sensitivity settings through a simple configuration setting. Transmission time is enhanced through the utilization of advanced hot start data for acquiring new locations within 10 seconds after a sleep cycle.



WEATHER RESISTANT CASE

Built to be rugged and reliable, the GSatMicro case prevents the intrusion of sand, dust, water, snow, mud, oil or just about anything else thrown at it. The case is designed with rugged plastics to start, sealed with a custom built silicon molding, and tightened with stainless steel screws. Internal to the unit is both moisture and pressure elimination to ensure functionality at various altitudes and temperatures. The connector is also a fully sealed IP67 connector with gold plated pins to ensure waterproof functionality. The unit functions in the harshest conditions and the most extreme environments.

- Liquid immersion with a depth up to 1 meter
- Dust tight; no ingress of dust; complete protection against contact

IRIDIUM CONNECTION

Everywhere under one sky. In a world where global communications are increasingly critical, only one company connects everyone to the things that matter most, from pole to pole.

Powered by a uniquely sophisticated global constellation of 66 cross-linked Low Earth Orbit (LEO) satellites, the Iridium® network provides high-quality voice and data connections over the planet's entire surface, including across oceans, airways and polar regions.

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UNPARALLELED REACH AND HIGH DEPENDABILITY

For customers, the unparalleled coverage and high dependability of the Iridium network means they can rely on their critical communication lifelines to work when they need them most — anywhere.

A PLATFORM FOR CONTINUED INNOVATION

For partners, the flexible software-based design of the Iridium network serves as the technological backbone for the development of an impressive array of industry defining products and services.

Ready for what comes next

With Iridium NEXT, Iridium's groundbreaking second-generation constellation, Iridium is set to dramatically improve its ability to meet the growing demand for global mobile communications on land, at sea and in the skies — far into the future.

A uniquely sophisticated architecture

Iridium operates the world's largest commercial constellation, with a mesh architecture of 66 cross-linked low Earth orbit (LEO) satellites providing inherent performance and dependability advantages over bent pipe geostationary (GEO) configurations.

The low Earth orbit advantage

At only 476 miles (780 km) from the Earth, the proximity of Iridium's LEO network means pole-to-pole coverage, a shorter transmission path, stronger signals, lower latency and shorter registration time than with GEO satellites.

Unaffected by local conditions, such as natural disasters

In space, each Iridium® satellite is linked to up to four others — two in the same orbital plane and one in each adjacent plane — creating a dynamic network that routes traffic among satellites to ensure global coverage, even when traditional local systems are unavailable.

Extensive, interconnected and reliable

Iridium's global constellation is supported by a recently upgraded, extensive ground infrastructure that ensures the high reliability and capacity of the communications network through multiple layers of redundancy and back-up systems for all critical functions.

Dedicated to resiliency and performance

Interconnected by advanced fiber-optic and broadband satellite links, the Iridium® ground infrastructure consists of the Satellite Network Operating Center (SNOC), Ground Stations and Technical Support Center, which together provide: Terrestrial connections for mobile satellite voice and data; Network command, control and monitoring; Technical support

- Global Coverage
- Communication in remote areas
- Unaffected by local conditions
- Resilient Network

Original Source: https://www.iridium.com/network/globalnetwork
Wikipedia: https://en.wikipedia.org/wiki/Iridium_satellite_constellation

GSM

You are able to customize all aspects of the GSatMicro Series, even the network you want to connect to. The X Series adds a GSM module to your terminal enabling the ability to have multiple layers of network connectivity creating a redundant platform for your communications. Working as hybrid solutions, the GSatMicro X and the GSatMicro OEMx, have the capability to switch flawlessly between local, land-based cellular networks and Iridium's globally accessible satellite network.

Not only does a multi-network hybrid solution provide continuous communications, it can also reduce costs by using GSM as a less expensive way to send and receive data. You also have the option to choose which network is the primary means of transmitting data and which network is the failover network used for backup communications. The options are highly versatile and can be controlled based on the requirements of your project.

Benefits:

- Lower Cost
- Better coverage inside buildings
- Faster data transfer
- Network redundancy
- Versatile options

Wikipedia: https://en.wikipedia.org/wiki/GSM

ENHANCE YOUR COMMUNICATIONS SUITE

Smart phones and tablets have become synonymous with doing business, keeping in touch with family, managing teams in the field, and have transformed into a powerful tool that acts as an extension of ourselves. The GSatMicro is capable of taking smart devices one step further by connecting them to a satellite network to be used worldwide. By interfacing the GSatMicro with mobile apps, new tools can be utilized to manage data and assets all over the globe.

Operating System	Download Link
iOS	Download on the App Store
Android	In development
Windows	Not Available

GSATMICRO APP FEATURES

Send & Receive Text Messages via Satellite
Stay in contact with friends, business colleagues, and family members anywhere in the world. By connecting your smartphone or tablet to the GSatMicro, you are able to send & receive text messages over satellite!

Configure Your GSatMicro
Quickly edit the settings of your GSatMicro without having to plug it in. You are able to change parameters which the touch of a button to achieve the desired device behavior.

Manage Multiple Devices
Pairing options allow you to connect to different GSatMicros and manage them quickly and easily!

Monitor Device Behavior
Get a look under the hood of your GSatMicro to see exactly what it is doing. All device behavior is displayed, allowing you to monitor and analyze the data.

Read Sensor Data
Not only can you monitor your GSatMicro, but you can also monitor the devices plugged into its I/O ports. Now you can use your smartphone or tablet to monitor all types of data!

CREATIVE CUSTOM MOBILE APPS

Mobile apps have enhanced our day to day communications around the world. Why limit yourself to using them over the cellular networks when you can create your own to pair with the GSatMicro and utilize Iridium SBD to transmit data. Because the GSatMicro Series is able to be embedded into multiple industries and projects, the versatility of its implementation allows users to design custom mobile apps for their projects.

- Satellite enable your smartphones and tablets
- Create custom apps to enhance your GSatMicro powered project
- Receive, analyze and manage data the way you need to
- Use your mobile app anywhere in the world using Iridium's satellite network

WHAT IS THE GSATMICRO TOOLKIT?

The GSatMicro Toolkit is essentially a set of drivers with a UI that allows users the ability to troubleshoot and manage their GSatMicro from a simple interface that provides access to the terminal's shell operations panel. While the terminal already handles a number of operations via command line, the toolkit provides a means of performing those commands through an interface instead of having to remember them and manually operating the device with hardcoded commands. This increases the ease of use, allowing for a more standard experience that reduces the need for technical expertise. It allows for the configuration of parameters, saving and loading of previously saved configurations, general debugging, and other maintenance operations.

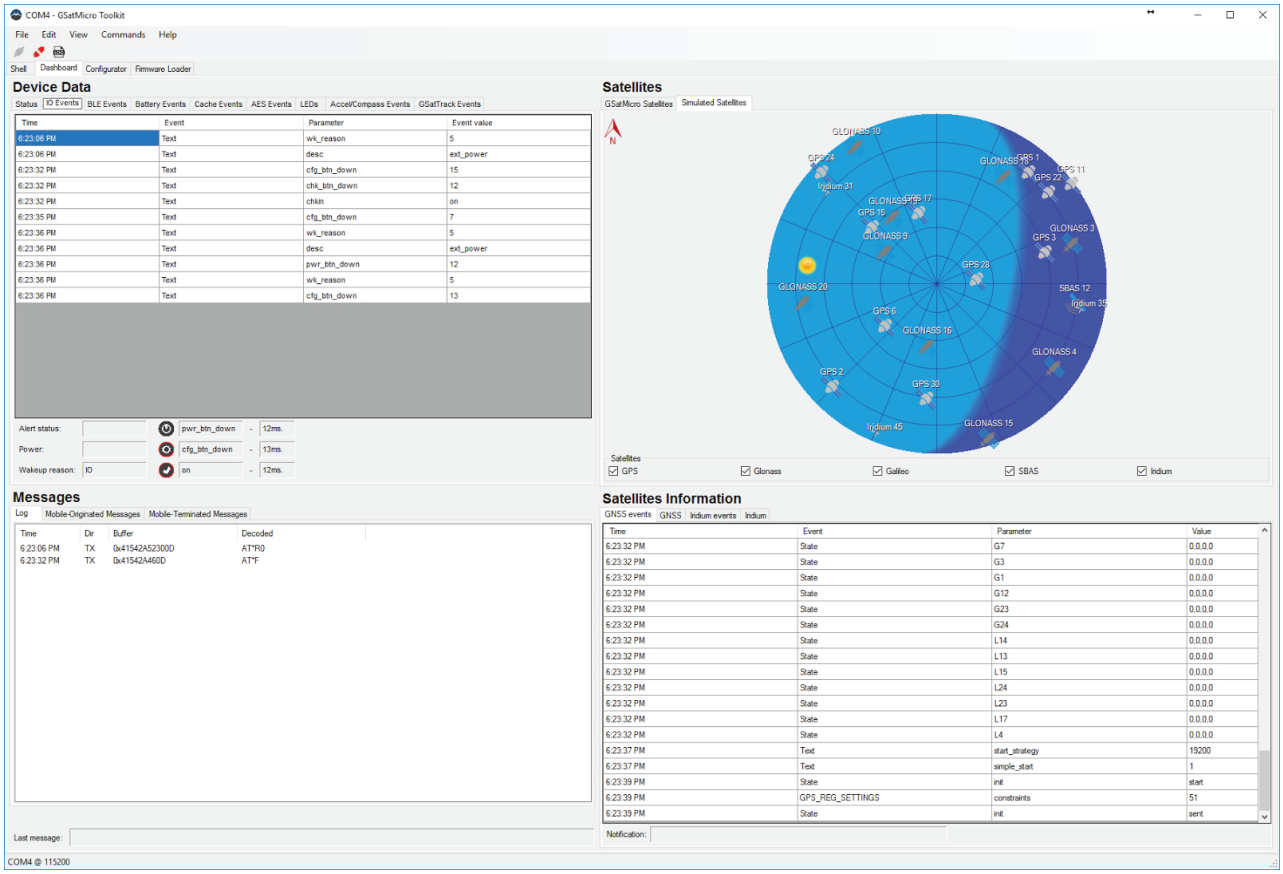
Additionally, the UI provides a display of the reporting metrics that all users will be able to view in a more generally relatable capacity. Any and all messages sent to and from the terminal will display in the UI, allowing a tech or manager to view all commands and alerts in one central location. One can also simulate the display to show the satellites overhead vs. those the GSatMicro can see. In all, the toolkit provides an easy to use interface that is essential for any asset manager working with any custom GSatMicro solution.

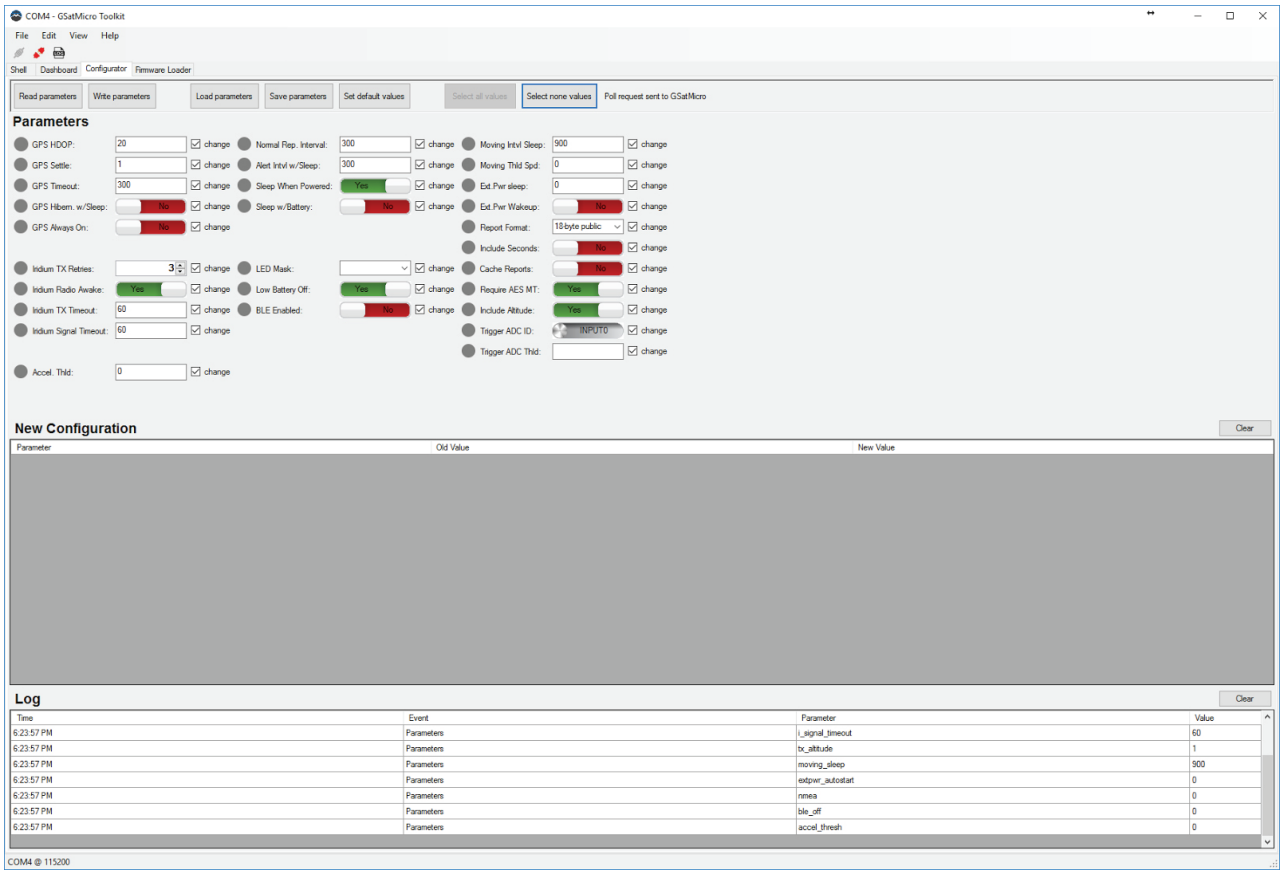
Features

- Allows customers easier access to the terminal's shell interface
- Configure parameters
- View events and other reporting metrics in the GSatMicro
- General debugging
- Toggle transceiver on/off
- Firmware configurations
- Use GUI to change settings and parameters instead of remembering the commands
- Save and load previously saved configurations
- Visual display of satellite network, both live and simulated
- Save log files
- Commands saved in the log

Download Software

OS	Download Link	Requirements	Date	Size
Windows	GSatMicro Toolkit	• GSatMicro Firmware v1.0.3 • Microsoft Windows	10/17/2017	4.1 MB


COM4 - GSatMicro Toolkit
File Edit View Commands Help
Shell Dashboard Configurator Firmware Loader
Device Data
Status IO Events BLE Events Battery Events Cache Events AES Events LEDs Accel/Compass Events GSatTrack Events
Time Event Parameter Event value
6:23:06 PM Text wk_reason 5
6:23:06 PM Text desc ext_power
6:23:32 PM Text cfg_btn_down 15
6:23:32 PM Text chk_btn_down 12
6:23:32 PM Text chkin on
6:23:35 PM Text cfg_btn_down 7
6:23:36 PM Text wk_reason 5
6:23:36 PM Text desc ext_power
6:23:36 PM Text pwr_btn_down 12
6:23:36 PM Text wk_reason 5
6:23:36 PM Text cfg_btn_down 13
Alert status:
Power:
Wakeup reason: IO
pwr_btn_down - 12ms.
cfg_btn_down - 13ms.
on - 12ms.
Satellites
GSatMicro Satellites Simulated Satellites
GLONASS 10
GPS 24
Iridium 31
GLONASS 17
GPS 15
GLONASS 8
GLONASS 1
GPS 22
GPS 11
GLONASS 3
GPS 3
GPS 28
GLONASS 20
SBAS 12
Iridium 35
GPS 6
GLONASS 16
GLONASS 4
GPS 2
GPS 30
Iridium 45
GLONASS 15
Satellites
GPS Glonass Galileo SBAS Iridium
Messages
Log Mobile-Originated Messages Mobile-Terminated Messages
Time Dir Buffer Decoded
6:23:06 PM TX 0x41542A52300D AT*R0
6:23:32 PM TX 0x41542A460D AT*F
Last message:
Satellites Information
GNSS events GNSS Iridium events Iridium
Time Event Parameter Value
6:23:32 PM State G7 0,0,0,0
6:23:32 PM State G3 0,0,0,0
6:23:32 PM State G1 0,0,0,0
6:23:32 PM State G12 0,0,0,0
6:23:32 PM State G23 0,0,0,0
6:23:32 PM State G24 0,0,0,0
6:23:32 PM State L14 0,0,0,0
6:23:32 PM State L13 0,0,0,0
6:23:32 PM State L15 0,0,0,0
6:23:32 PM State L24 0,0,0,0
6:23:32 PM State L23 0,0,0,0
6:23:32 PM State L17 0,0,0,0
6:23:32 PM State L4 0,0,0,0
6:23:37 PM Text start_strategy 19200
6:23:37 PM Text simple_start 1
6:23:39 PM State init start
6:23:39 PM GPS_REG_SETTINGS constraints 51
6:23:39 PM State init sent
Notification:
COM4 @ 115200


COM4 - GSatMicro Toolkit
File Edit View Help
Shell Dashboard Configurator Firmware Loader
Read parameters
Write parameters
Load parameters
Save parameters
Set default values
Select all values
Select none values
Poll request sent to GSatMicro
Parameters
GPS HDOP: 20 change
GPS Settle: 1 change
GPS Timeout: 300 change
GPS Hibern. w/Sleep: No change
GPS Always On: No change
Normal Rep. Interval: 300 change
Alert Intvl w/Sleep: 300 change
Sleep When Powered: Yes change
Sleep w/Battery: No change
Moving Intvl Sleep: 900 change
Moving Thld Spd: 0 change
Ext.Pwr sleep: 0 change
Ext.Pwr Wakeup: No change
Report Format: 18 byte public change
Include Seconds: No change
Cache Reports: No change
Require AES MT: Yes change
Include Altitude: Yes change
Trigger ADC ID: INPUT0 change
Trigger ADC Thld: change
Iridium TX Retries: 3 change
Iridium Radio Awake: Yes change
Iridium TX Timeout: 60 change
Iridium Signal Timeout: 60 change
LED Mask: change
Low Battery Off: Yes change
BLE Enabled: No change
Accel. Thld: 0 change
New Configuration
Clear
Parameter Old Value New Value
Log
Clear
Time Event Parameter Value
6:23:57 PM Parameters i_signal_timeout 60
6:23:57 PM Parameters tx_altitude 1
6:23:57 PM Parameters moving_sleep 900
6:23:57 PM Parameters extpwr_autostart 0
6:23:57 PM Parameters nmea 0
6:23:57 PM Parameters ble_off 0
6:23:57 PM Parameters accel_thresh 0
COM4 @ 115200

CROSS-INDUSTRIAL INTEGRATIONS

The GSatMicro Series offers powerful solutions across all sectors and industries where remote data acquisition is vital to lives, enhancing business or cost savings. Each distinct industry presents a number of opportunities to augment efficiency, enable remote projects previously thought to be impossible, or collect and utilize telemetric data to improve processes.

M2M and IoT Communications Across Multiple Sectors

Particularly effective for use in public sectors, the GSatMicro Series of products find homes across the field in Public, Private, Commercial, and Research capacities. Each distinct industry presents a number of opportunities to augment efficiency, enable remote projects previously thought to be impossible, or collect and utilize telemetric data to improve processes.

Public Sector

Within the public sector, a number of uses for public safety, law enforcement, military, and other personnel-command and mission control applications demand the real-time tools provided by the GSatMicro Series. Pivotal decision-making in times of emergency, crisis, or high-risk scenarios can be more informed and better executed because of the level of remote monitoring and management available from the devices and through the tracking portal.

Other public sector uses include those with large-scale asset management requirements like fleet behavior monitoring, public transport logistical control, and public utilities management and administration. All of these departments often suffer inefficiencies due to the large swaths of territory they serve coupled with under-staffing or environmental considerations. The GSatMicro Series offers ease of use and alleviates much of the pain points associated with large-scale systems maintenance, monitoring, and control.

Public Sector

Within the private and commercial sectors, the largest driver of economic opportunity in technology at the moment is the technical enablement and automation of everything that can be attributed to the Internet of Things (IoT) sprint. Without getting too far into it, the IoT revolution attempts to make it so that all people only need to understand how to operate one thing (like their smartphones) in order to be able to operate all things. This sprint has opened the door for satellite-enabled products in the consumer markets, and represents billions of dollars in revenue opportunity on a daily basis, and the GSatMicro Series satellite terminals are the perfect way to enable some of the more robust “smart ecosystem” mainstays.

Industries

Custom Tracking Solution
Between the extremely powerful eLua scripting and external interfaces, its integration can provide truly customizable tracking. Whether monitoring fuel moving through a pipe or a soldier in the field, the opportunities are endless.

Vessel Tracking
While used as a tracker on vessels, it is also possible to program the unit to obtain pitch and roll measurements. This gives customers a greater ability to monitor how they are using fuel and even send an alert if the waves are too great or if a boat is capsized.

Fuel Monitoring and Logistics, Oil & Gas
With two analog inputs and two relay outputs through the main port, external voltages can be sensed using a built-in analog to digital converter, and devices can be turned on and off using relay outputs.

Fleet Management
The terminal can be customized to measure driver acceleration in addition to location, and pair wirelessly with other devices to provide a complete solution.

Container Tracking
Programming capabilities allow device behavior to be customized to respond to events like movement rather than just timed intervals, cutting down on battery usage. Small size allows it to be less intrusive and less conspicuous than traditional units.

Security Services
With an astonishing size and weight, the device can be hidden and secured with minimal effort. Encryption and ability to interact with other devices over the air is ideal for security and government applications.

Recreational
Small and rugged, it can interface with other devices allowing greater communication than most personal trackers on the market. It has an alert button in case of distress and a check-in button for user-selected report timing.

FAQ

- What network does the GSatMicro operate on?

It operates on the Iridium Satellite Network – a truly global coverage.

- Does the device make any noise/have any lights?

The device does not make any noise but it does have lights informing you: if the device is powered on, the battery level, GPS connections, 'Alert Mode' status, satellite connections and if you have an incoming message.

- Do you offer a monthly plan for tracking GSatMicro?

Yes, the GSatMicro integrates exceptionally well with our tracking platform: GSatTrack.
Go to www.gsattrack.com/SignUp for a one month free demo account.

- What is the life of the battery on this device?

On average, about 800 reports before the device needs to be recharged.

- What color does the GSatMicro come in?

Standard editions come in black, however, other solid colors may be requested for a small fee. If further customization is required; custom "skins" such as camouflage or carbon fibre patterns may be requested for an additional cost.

- Is the GSatMicro waterproof?

Yes, the GSatMicro case is waterproof and dust tight. It has an 'Intrusion Protrection' rating of IP67.

- What type of antenna is used on the device?

The GSatMicro has a single, integrated, omni-directional, high gain helical antenna. Our antenna provides 180 degrees of coverage allowing it to connect from any angle.

- What are a few features you have with GSatMicro that others may not have?

Our device includes a magnetic compass, accelerometer, wireless connectivity, weather proof case, USB interface AND an eLUA powered core that allows custom scripted behaviors.

- What is the Voltage Input Range for the OEM model?

7.5V to 36V (protected to 40V DC)

- What are the technical details of the end-to-end encryption?

https://www.gsatmicro.com/support/wiki/gsatmicro-wiki#Encrypted_Message_Type_7

- What is the difference between the GSatMicro and GSatMicro X models? Is there anything these can do that the OEM model can't do?

The GSatMicro OEM is the base product line, which includes a satellite modem, satellite antenna, microcontroller, battery, basic buttons (power on/off, check-in, config) and leds (power, GPS, satellite and data transmission status) with optional wireless connectivity.

The GSatMicro is a handheld version of the OEM with an integrated wireless module. There is no difference between the two despite the form factor.

The GSatMicro X Series provides dual-mode functionality, allowing communication via both satellite and GSM.

- What can the wireless module allow access to?

Control/configuration of the device - Allows you to view/set/change current configuration and status of the device

Extracting data from the device - Allows you to exchange data with the device, e.g. submit/retrieve messages over satellite and/or GSM (model dependant)

Interfacing with other hardware - Integration with most wireless compatible sensors/accessories is potentially supported, but disables the device from communicating with a mobile phone at the same time. E.g. ibeacons, wearables that perform monitoring of heart rate / level of oxygen in blood, etc.

- Is there a 3G/4G module instead of the GSM module?

Currently available is the 3G chipset. In the near future, 4G will be possible in one of the following chipsets:

- B4 and B13
- B2, B4 and B12
- B3 and B8
- B1 and B8

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