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Operator Manual
Global Sentinel Device GS-6C

RSAE Labs, Inc.
Version 1.4
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Notice of Ownership

Contents

1. Overview

This document describes to the end user how to operate a GS-6C in context of a container logistics environment. This document describes the following GS-6C options and variations.

RSAE Part Number	HW Option	Communication Options	Color
80-1004-01	1079	mist®, 2G/3G Cellular, No Iridium	Medium Blue
80-1004-02	1080	mist®, 2G/3G Cellular, With Iridium	Medium Red

It is assumed that the GS-6C has been previously configured by RSAE Labs prior to the end user receiving the device. As such, details on configuring the device are outside of the scope of this document.

1.1. Device Description

The GS-6C, shown in Figure 1, is a battery-operated device used to secure and track standard ISO 20' and 40' containers. It includes sensors for accurately determining when and where the container doors are opened and closed. It includes a GPS/GNSS receiver for tracking the container around the world and alerting when containers arrive at specific locations such as origins, destinations, ports, and rail yards. In addition, the GS-6C includes light sensors for sensing whether the container has been breached through the ceiling, floor, and side panels.

The primary user interface is the mist® and System LED's as shown in Figure 2. The function of the LED's is described in Section 2.1 and 2.2. Operators should use the battery pack as a handle.

Figure 1 - GS-6C Primary Components from Container Side

Figure 2 - GS-6C Rear View with Components

1.2. Battery Charging

Before installation, the battery must be separated from the main housing and charged using an RSAE Labs provided charger as shown in Figure 3. It takes approximately 2 hours to charge a completely depleted battery. The charger has a trickle charge mode that activates after charging is complete. It is advised to discontinue charging the battery within 4 hours of entering the trickle charge mode. Please refer to the Battery Charging manual for additional information.

Battery charging is discussed in detail in Section 3.2.

Figure 3 - Battery Pack Separated from Main Housing

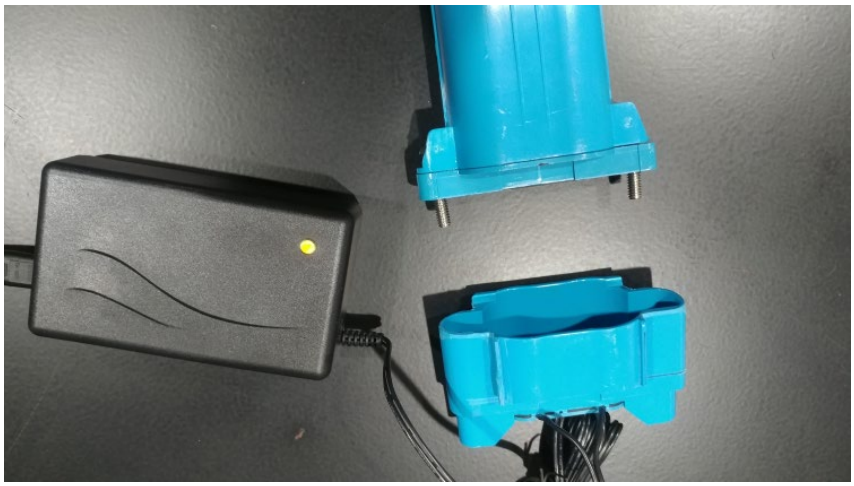

Figure 4 - GS-6C Battery with Charger Adapter

1.3. Installation

The GS-6C installs on the doors at the rear of the container as shown below. The device has high force magnets that hold it onto the cross beam as the doors are closed. A hookplate joins the radome and the main housing.

Once the doors are closed, the radome is exposed on the outside of the container while the electronics and batteries are hidden behind the door within the container. The seals of the door slide across the hookplate as the doors are closed maintaining the seal integrity.

Figure 5 - GS-6C with Both Container Doors Opened

Figure 6 - GS-6C With Left Container Door Closed

Figure 7 - GS-6C Mounted on Container with Doors Closed

1.4. Communications

The GS-6C communicates to the Device Management Center using one of its three radios:

- Cellular Radio. Either 2G/3G GSM compatible or LTE/Ca-tM1 compatible (future).
- Iridium Satellite Radio (optional).
- mist® Mesh Radio (IEEE 802.15.4).

For Cellular communications, RSAE Labs installs and provisions the SIM card once there is a service agreement in place. Iridium is an optional service that can provide global coverage in the absence of cellular networks such as on ocean freighters and rural locations. Communications over the mist® mesh radio is offered in conjunction with the deployment of mist® mesh gateways.

1.5. Device Management Center

The Device Management Center (DMC) is an internet service which interfaces to the GS-6C across the general internet. The DMC accepts data from the device and logs it into its database. That data may also be forwarded to customers. The DMC sends any pending configuration information and/or commands to the device whenever the device reports.

Communications is fully bidirectional and encrypted point-to-point between the DMC and the device.

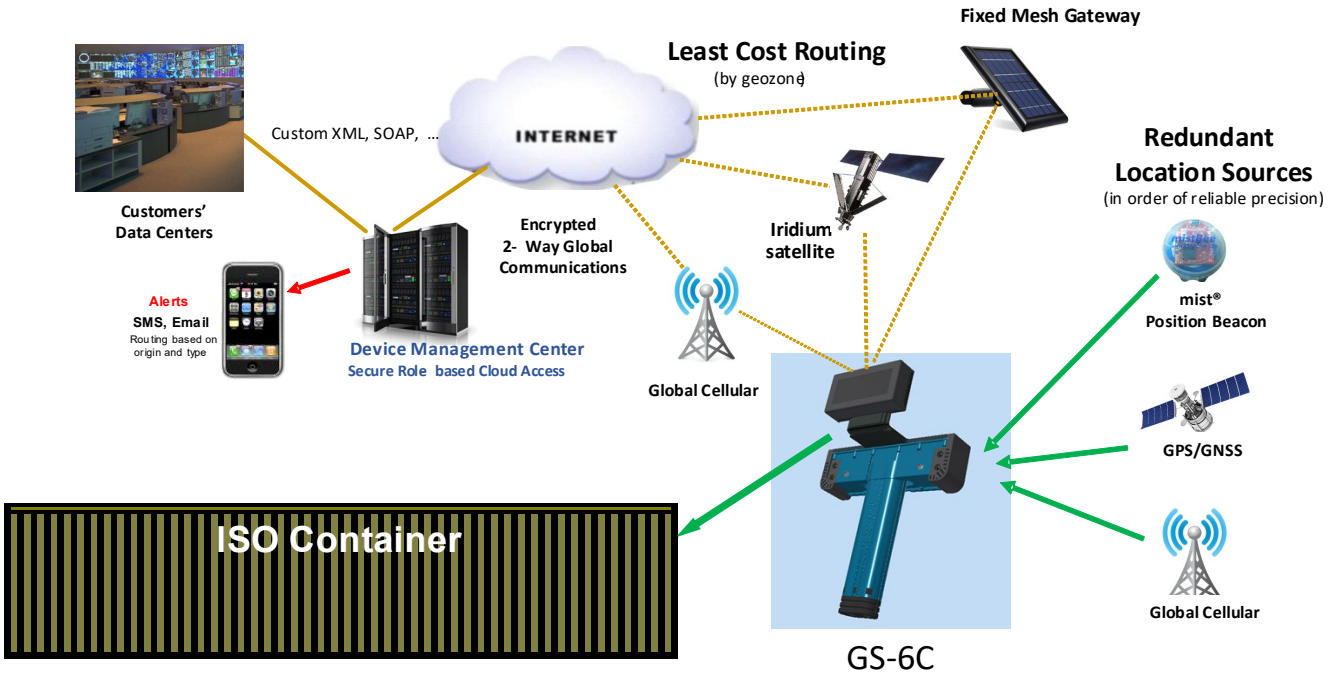

Figure 8 - GS-6C Communication Interfaces

1.6. Configuration

Configuration information is managed by the RSAE Labs DMC. Configuration data can be customer and supply chain specific. The DMC can load configuration information into one device or a fleet of devices on a customer and/or supply chain as operating paradigms dictate.

An example configuration is shown in Figure 9. Once the configuration is defined, it is loaded using Configuration-Over-The-Air (COTA) capabilities of the DMC and the device to perform operational reconfiguration tasks for the device. Use of the DMC to configure devices and download configurations is common among all Global Sentinel and mist® devices. It is described in separate documentation and is outside the scope of this manual.

The DMC is also used to upload Firmware-Over-The-Air (FOTA) using secure communications and image techniques. This keeps the devices current without having the unit return to RSAE Labs.

RSAE Labs coordinates COTA and FOTA updates to devices with customers to ensure changes do not adversely affect operation of the device.

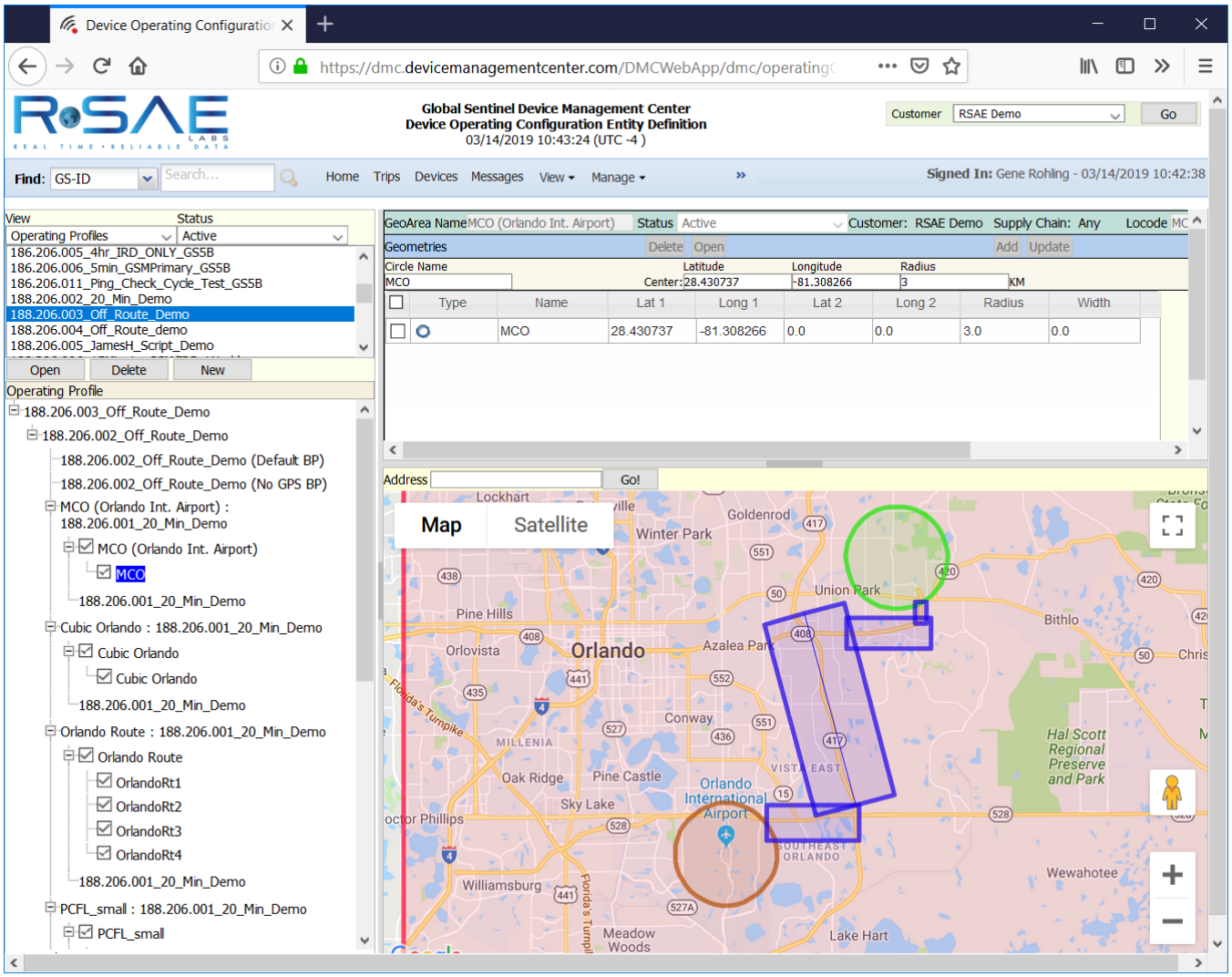

Figure 9 - Example DMC Global Sentinel Device Configuration

1.7. Required Tools and Accessories

The GS-6C has no user serviceable components other than installation and removal of the battery pack. The battery pack must be removed to be charged. The battery pack is held by two 5/32" hex head captive screws. In order to remove the battery pack, a corresponding 5/32" hex driver is required.

Battery pack removal and charging are discussed in detail in Section 3.2.

1.8. Certifications and Compliance

The GS-6C has been tested to meet the performance specifications defined in Section 8. Specifically, the GS-6C meets applicable Federal Communications Commission (FCC) and European (CE) standards. The GS-6C has been tested to meet applicable safety requirements for worldwide operation.

See section 9 for more information.

1.9. Warranty

The GS-6C is warranted to be free from defects in materials or workmanship for a period of 12 months from date of delivery.

This warranty does not apply to damage caused by misuse, abnormal use, neglect, impact, exposure to harmful liquids, improper handling or extreme environmental conditions outside the design tolerances specified in section 8.

There are no user serviceable parts inside the GS-6C main housing, radome, or battery pack. This warranty does not apply to GS-6C devices which have been opened by any user for any purpose. This warranty does not apply to any device which has been repaired, altered or modified in any way by any third party.

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2. User Interface

As a security and autonomous tracking device, the GS-6C was designed to have a minimal User Interface. The user interface of the GS-6C consists of two LEDs and a magnetic sensor. The GS-6C is meant to be “always on”. It can be powered off by removing the battery pack. Insertion of the battery immediately powers the device on. The majority of the operational states of the device can be controlled remotely over-the-air from the DMC.

2.1. System LED

The “Sys LED” is used to indicate the current state of the device. During routine monitoring, the LED is configured to blink green for one (1) second every 30 seconds. Note, the 30 second blink interval can be configured to blink at different rates or be completely turned off.

When the GS-6C has activated the GPS/GNSS receiver, the Sys LED will blink red continuously. A GPS/GNSS cycle generally takes between 30 – 120 seconds. When the GS-6C is communicating (or attempting to communicate) with the DMC, the Sys LED will blink green continuously. Depending upon the time to register on the communication network, the communications cycle takes between 1 – 5 minutes. For devices which roam onto a new cellular network, the communications cycle may take up to 10 minutes.

Introducing a magnet in the vicinity of the magnetic sensor causes the GS-6C to acquire its GPS/GNSS position and to initiate a report cycle with the DMC. The magnetic sensor can be disabled as part of the device configuration

A solid red LED indicates that the device is rebooting. This occurs after the device power has been removed and reapplied.

The table below shows a summary of the Sys LED states:

Sys LED State	**Meaning**
Green blink once every 30 seconds (configurable)	Routine monitoring
Continuous red blinking	Acquiring GPS/GNSS position
Continuous green blinking	Communications cycle
One second red blink	Follows magnetic sensor activation. Results in GPS/GNSS cycle followed by Communications cycle
Solid red LED	Device is rebooting

In addition to the states listed above, the LED can be used to indicate the approximate capacity of the battery pack. This is detailed in Section 7.5.

2.2. mist® LED

The “mist® LED” indicates whether the mist® radio within the GS-6C is active. The GS-6C can function as a mist® mesh gateway supporting a mesh network 1000’s of mist® mesh nodes. In addition, the mesh radio can be used to receive position beacons as a way to obtain an accurate location when GPS/GNSS is not obtainable. In the presence of another mesh gateway, the GS-6C can use the mist® network as an alternative communications path. The mist® LED has the following states:

LED off	mist® mesh radio is inactive
Blinking red	mist® radio is active, but is not accepting nodes or is not joined to a network
Blinking green	mist® radio is active and is functioning as a gateway or is joined to a network

2.3. Magnetic Sensor

The magnetic sensor can be used to cause the GS-6C to initiate a GPS/GNSS cycle followed by a report cycle.

Note: This sensor is available as a configuration item to initiate a report with the unit on a bench, in a box, or on a container with the doors open. It is intentionally not able to initiate a report when the unit is on a container with doors closed. This is for security reasons. Someone outside the container should not be able to trip the magnetic sensor.

2.4. Power Control

The removable battery pack is used to power the device. To turn the device off, separate the battery pack from the main housing. To turn the device on, plug the battery pack into the main housing and secure it with the mounting screws.

2.5. Rebooting GS-6C

To reboot or reset the GS-6C, release the battery screws, remove the battery pack, wait 5 seconds, reinstall the battery pack, and then tighten the screws.

3. Charging the Battery

This section describes battery maintenance of the GS-6C.

3.1. Battery Charger

The battery charger is designed for indoor use. Please refer to the Battery Charger manual for more details on its use. The bottom of the charger describes the LED states and the indicated charging phase by LED color.

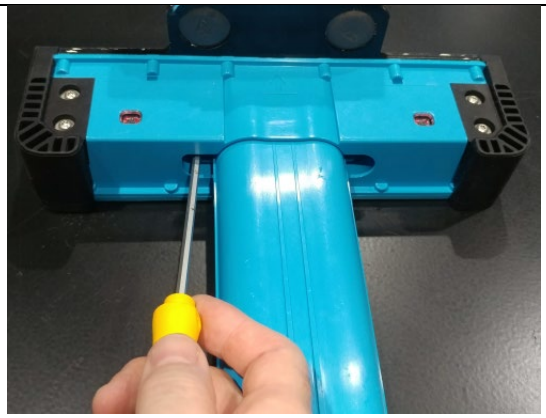
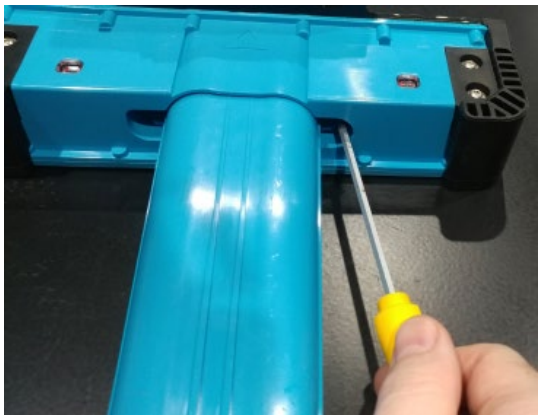
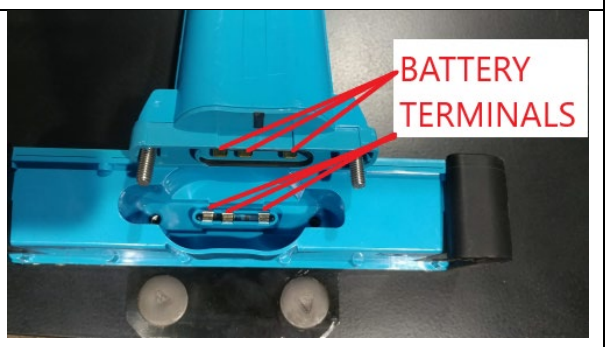
The battery pack used for the GS-6C is a commercially available charger with a custom GS-6C battery interface cap. The charger is described below.

DESCRIPTION	SPECIFICATION
Manufacturer	Cell-Con
Model	452415-NB
Wall Power Input	120-240 VAC, 1.3A Maximum 50-60 Hz
Output	Fast Charge: 4 A Top-Off Charge: 560 mA Trickle Charge: 130 mA

3.2. Removing the Battery Pack

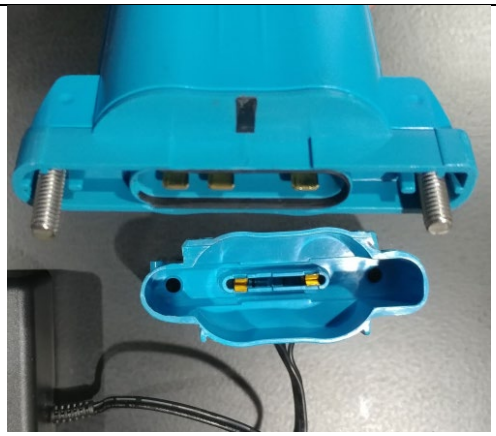
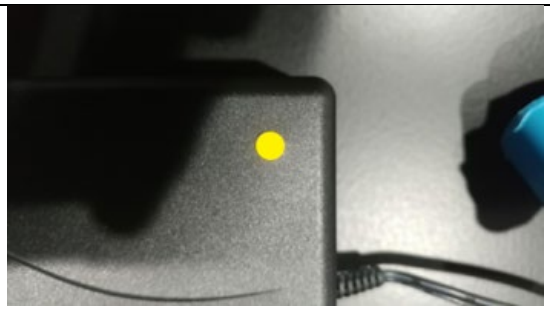
Removing the battery pack is described in the procedure below. Once the battery pack has been removed, it should be inspected for damage to the three terminals that mate with the main housing. If any of these terminals are missing or damage, the battery pack must be replaced.

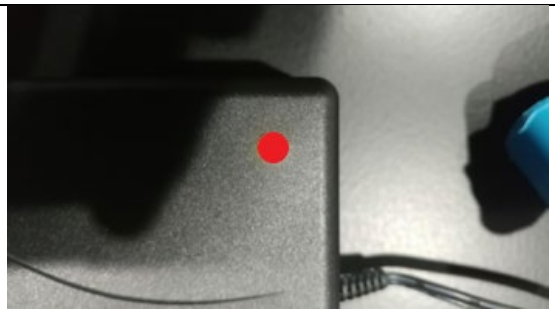
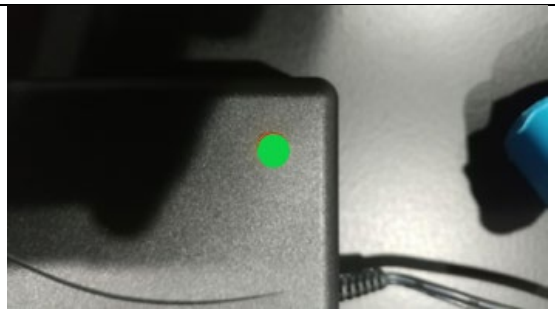
Once the battery pack has been removed, it is advised that the terminals be cleaned with a dry cloth prior to charging.

Step	Action	Picture
1	Remove the screws holding the battery to the device using a 5/32” x 125 hex head driver. Remove both left and right screws until the battery pack separates. Note that these screws are designed to be captive. Keep screws with the battery pack.	 
2	Separate the battery pack from the main housing.	
3	Inspect battery terminals and verify there is no damage. Check both the battery pack and main housing terminals shown. Discard the battery as damaged if the terminals are not straight or intact as shown in the figure below.	
4	Wipe the battery terminals with a clean cloth.	

3.3. Connecting Battery Charger

Use the procedure below to connect the battery pack to the charger and charge the batteries for the next mission.

Step	Action	Picture
1	If not already separated, remove the battery pack from the main housing as described in Section 3.2 above.	
2	Connect the battery to the charger as shown. The charger interface adapter is keyed to prevent reversal of the battery terminals. DO NOT USE FORCE to connect the charger interface adapter to the battery pack.	 
3	If charger was not previously connected, connect charger to wall outlet and verify the charger light turns yellow. It will not change color until a battery is connected.	

4	The LED should turn red within 5 seconds if the charger has just been powered on. This indicates that the battery is being “fast charged”. If a previous battery was just removed, it may take up to 5 minutes for the LED to turn red. If the battery is already charged, the LED will not turn red but will stay green (trickle charging).	
5	Allow the battery to pack charge for at least 2 hours. The battery pack can be removed when the charger light turns green and blinks very quickly yellow at a 2 per second rate. This is “trickle charge” mode as described on the bottom of the charger. CAUTION: Failure to remove the charger from the battery pack 8 to 12 hours after charging has completed may result in reduced battery life performance on the GS-6C.	
6	Remove the battery back from charger.	
7	Reinstall the battery pack on the main housing and tighten the screws to “hand tight” plus ¼ turn. 	

3.4. Detecting Failed Batteries

Battery packs should not be used if any of the following conditions occur.

- Visible damage to battery pack

- Leaking fluids or substances from battery pack
- Charger does not display green light after 2 hours of charging

Do not ship battery packs which have failed using expedited “Air” services as they should be considered hazardous materials.

3.5. Disposal of Batteries

The GS-6C battery pack uses Nickel Metal Hydride (NiMH) cells. These batteries do not contain Cadmium (Cd), Mercury (Hg) or Lead (Pb).

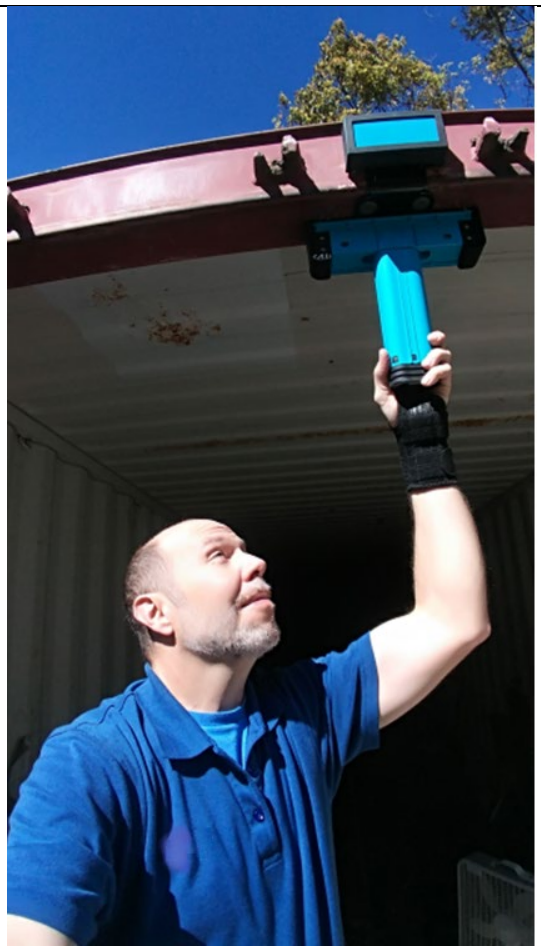
The Nickel and electrolyte in the NiMH battery cells are considered “semi-toxic”. In large quantities, nickel can be dangerous. It is a known carcinogen, can cause cardiovascular disease, and can cause liver and kidney damage. RSAE Labs encourages recycling to recover the metals, be environmentally responsible, and prevent exposure to humans. However, in most states within the USA it is acceptable to dispose of small quantities (under 10) NiMH batteries in household trash.

Within the European Union, follow the guidance provided by EU Directive 2006/66/EC (or most current directive) as implemented by the appropriate Member State.

4. Installation

This section describes how to install the GS-6C on an ISO 20’ or 40’ container.

If appropriate, charge the battery prior to installation as described in Section 3 above.

Step	Action	Picture
1	Place the GS-6C unit on the ISO container beam as shown. Center the unit on the beam between the locking bars as shown. Strong magnets should pull the unit into place on the beam and hold it there until the doors are closed. CAUTION: If using a ladder, follow all appropriate safety precautions associated with its use. Do not stand the ladder immediately underneath the device in case the device it falls. CAUTION: Installation personnel must not stand underneath the GS-6C unit while it is being held in place with magnets in case the unit works free and falls. Allow the unit to fall to the ground rather than allowing it to strike installation personnel. WARNING: Failure to remain clear of the device when it is held with magnets may result in injury or death.	
2	Close the left container door sandwiching half of the GS-6C hookplate as shown. Verify that the unit remains in the center of the door stanchions.	
3	Verify the installation appears as shown in this picture. Specifically, the unit should be centered between the stanchions and the seals should overlap the hookplate.	

4	After 5 minutes, verify on the DMC that the container door state is shown as “Closed” and the security state is “Armed”.	

5. Removal

This section describes how to remove the GS-6C on an ISO 20’ or 40’ container.

WARNING: Do not stand directly beneath or within 2 foot of the drop area of the GS-6C as the doors are being opened. Failure to follow this rule may result in injury or death.

Step	Action	Picture
1	Start with both container doors closed as shown.	
2	Open the right container door leaving the GS-6C sandwiched on between the left door and the container beam.	
3	Carefully open the left door attempting to keep the GS-6C up against the container beam. The goal is to leave the unit on the beam as shown without the unit falling from the beam. If the unit moves while the left door is being opened, have a second person climb into the container and hold the unit from the battery pack as it is removed. CAUTION: It is very important that personnel not stand under the GS-6C device during this phase as the device may fall.	

4	Using the battery pack, remove the device from the container. If the installer is at ground level and the container is on a trailer chassis, it may be necessary to climb into the container to perform this step. CAUTION: Follow all safety procedures for climbing or entering into the container as approved by your organization.	

6. Locating Position

The GS-6C employs a number of methods to determine its geographic location. These are discussed in the proceeding sections

6.1. GPS/GNSS Receiver

The GS-6C contains a high accuracy state-of-the-art, multi-constellation concurrent Global Navigation Satellite System (GNSS) receiver. The receiver is capable of acquiring satellite signals from the United States GPS constellation, the Russian GLONASS constellation and in the near future the European Galileo constellation. With unobstructed view of the sky, the GNSS receiver can generally obtain a location within 30 seconds. The GS-6C allows up to 90 seconds of acquisition to allow the unit to obtain a more accurate fix.

If the receiver is not able to obtain a suitable position fix within the allotted time, it will discontinue operation in order to preserve battery power.

6.2. Cell Tower Location Services

If the GS-6C is unable to obtain a suitable position via the GPS/GNSS receiver, it will, as part of the cellular communications cycle, obtain a list of neighboring cell towers. The GS-6C will transmit the cell tower list to the DMC. The DMC, using a third-party location API, will then obtain the approximate location of the device based upon the list of cell tower. Cell tower derived location, while not as accurate as GPS/GNSS, can provide a useful location and provide an awareness as to the location of the container that is being tracked.

6.3. mist® Beacons

The GS-6C can also determine its location by the use of mist® beacons. These fixed mount devices are programmed to “beacon” out their location and are used mainly in indoor locations which are GPS/GNSS denied. Since cell tower derived locations can be somewhat inaccurate, mist® beacons can be used to greatly improved the location accuracy. By deploying multiple beacons within a warehouse, the location within the warehouse can be determined.

7. GS-6C Sensors

The GS-6C includes several sensors which provide situational awareness of the container state. The values of these sensors are reported to the DMC based on a schedule and when an unexpected event occurs.

The GS-6C uses data from these sensors along with the GPS/GNSS, cellular, and satellite radio outputs to provide an integrated view of the container. This integrated view allows the GS-6C to perform several actions autonomously.

7.1. Door Sensors

The GS-6C uses a dual IR/Proximity and Ambient Light Sensor (ALS) to determine if a container door is opened or closed. The device automatically calibrates itself to the container and using our Adaptive Container Management (ACM) software reliably differentiates between door chatter and a true door opening. Upon sensing a door state change (opening or closing), the GS-6C immediately reports this to the DMC along with a timestamp and location report.

7.2. Internal Cargo Light Sensor

In addition to the ALS, the GS-6C includes a cargo light sensor. Along with the ALS, the GS-6C is able to differentiate between a door opening and an intrusion into the container. As such, the GS-6C provides a notification if the container has been breached.

7.3. Accelerometer

The GS-6C includes an accelerometer that is used to determine whether the container is at rest or moving. It can be configured to detect and record tilt events, shock events, and drop events.

The GS-6C does not naturally remain in an upright position as it is difficult to balance on the long end of the battery pack. The accelerometer measures the orientation. Together with the door states, the accelerometer is used to automatically determine when the GS-6C is mounted or unmounted.

When properly mounted on a container, the tilt of the GS-6C can be used to determine the tilt of the container. This can be configured to generate an event identifying where and when a container has been tilted enough to cause cargo to shift.

The GS-6C free-fall detector can be used to determine if the GS-6C has been dropped. Along with other sensors, this helps identify when and where a container may have been damaged.

7.4. Temperature and Humidity

The GS-6C includes a precision temperature and humidity sensor. The GS-6C can be configured with upper and lower limits to detect and report abnormal temperature and humidity inside the container. The device implements hysteresis around these limits to reduce the number of reports or “chattering”.

7.5. Battery Meter

The GS-6C calculates its battery usage based upon the frequency of sensor reads, the number and length of GPS/GNSS cycles and the number and length of communication cycles. The estimated remaining battery capacity and battery voltage is reported to the DMC. The DMC can be configured to alert users when the battery capacity is below a threshold value or the battery voltage is at a critical value.

In addition to reporting the battery capacity and voltage to the DMC, the Sys LED can be used as an estimate of the battery capacity. By tilting the unit from flat to upright, the LED will momentarily light as follows:

LED Color	Battery Capacity
Green	>50%
Orange	20 – 49%
Red	<20%

While only a guide, this can provide the end user with an approximate indication of the remaining battery capacity. RSAE Labs suggests that before any deployment of the GS-6C that the battery pack is recharged to ensure near 100% battery capacity.

8. Device Performance

This section describes the operational and environmental performance criteria which the GS-6C meets.

8.1. Overall Characteristics

Overall Dimensions	14.25” x 10.75” x 5.38”
Radome Dimensions	3.0” x 5.875” x 1.5”
Battery Dimensions	9.38” x 4.25” x 1.75”
Overall Weight	5.3 lbs
Main Unit Weight	2.61 lbs
Battery Weight	2.69 lbs (NiMH)
Magnets	Qty 7, embedded in hookplate

8.2. Environmental Characteristics

Temperature Range, Normal Operation	-20 ºC to +60 ºC (NiMH) -40 ºC to +85 ºC (LiSOCI2)
Temperature Range, Electronics	-40 ºC to +85 ºC
Temperature Range, NiMH Battery	-20 ºC to +60 ºC
Humidity Range, condensing	0 to 100% at 40 ºC
Vibration	SAE J1455 (2006) 6G RMS All Axis
Shock (survival)	2 Meter drop, Any 6 sides
Water Resistance	IP-67 / NEMA-4

8.3. GPS/GNSS Characteristics

Concurrent Reception	3 GNSS satellites (GPS, Galileo, GLONASS, BeiDou) with omnidirectional and wideband

	antenna.
Channels	72
Sensitivity	-148 dBm (cold start)
Time to First Fix, Cold Start	26 seconds
Position Accuracy, Unobstructed	2.5 Meters
Power Consumption while Active	28 mA

8.4. Power Source

Battery Pack, Technology	Rechargeable, Low Self-Discharge Nickel Metal Hydride (NiMH)
Cell Configuration	6 cells, 10.0 AH @ 1.2V each cell
Estimated Reports	1800 reports or over 5 months whichever comes first.
Operating temperature range	-20 ºC to +60 ºC
Weight	2.69 lbs

8.5. Sensors

Door State, Proximity	Independent Right, Left doors
Door State, Light	Independent Right, Left doors
Detectable Light Wavelength	350 nm to 970 nm
Measurable Temperature Range, Ambient Air	-40 ºC to +85 ºC
Temperature Accuracy	±2.5 ºC
Humidity Range, Ambient Air	0-100% RH
Humidity Accuracy	± 5% RH
Magnetic	
Indicators	Sys LED, Red / Green

	mist® LED, Red / Green

8.6. Test Certifications

FCC	Part 15B and 15C
European	CE/RED
Environmental	SAE J1455 2017 IP-67, NEMA-4
Lead Free	All components RoHS compliant
FCC ID	2ASIM-GS6C1

8.7. Functional

Low Latency Reporting	One attempt within 2 minutes of event
Encryption	AES-128 / CCM
Data Storage	1 Mbyte
Reporting	Timed, Event Driven Geofence Transition
Geofencing	2040 user defined zones on device
Position	Timed or Event driven acquisition GPS/GNSS or mist® Beacon
Configuration Updates (COTA)	Remote from DMC via cellular or Iridium
Firmware Updates (FOTA)	Remote from DMC via cellular

8.8. Cellular Communication Radio

Option 1 – 2G/3G (GSM)	3G bands 1, 2, 4, 5, 8 2G bands 2, 3, 5, 8 Modem: Ublox SARA-U201
Option 2 – LTE (Cat M1/NB1)	LTE bands 2, 3, 4, 5, 8, 12, 13, 20, 28

	Modem: Ublox SARA-R410-02B

8.9. Satellite Communication Radio (Option)

Radio Type	Iridium 9602
Communication Mode	Short Burst Data (SBD)
Transmit / Receive	1616 MHz-1626.5 MHz
ERP	+3 dBm
SBD Message Size	340 Bytes Mobile Originated 270 Bytes Mobile Terminated

8.10. mist® Communication Radio

Radio Type	TI CC2538
Protocol	802.15.4 Phy Layer RSAE Labs mist®
Transmit	2402 MHz – 2480 MHz
Receive	2402 MHz – 2480 MHz
Output Power	4.5 dBm
Modulation	DSSS
DSSS Chip Rate	2 MChips/Sec
Effective Data Rate	250 kbps
Channels	16
Channel Bandwidth	3 MHz

9. Compliance and Certifications

9.1. Lead Free

The GS-6C and all subcomponents comply with all RoHS and $RoHS_2$ directives.

9.2. Radio Operation

The GS-6C 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.

9.3. Embedded Radios

The GS-6C includes the following embedded radio components tested for FCC and EU compliance. The module level FCC certifications for these components are as follows.

Manufacturer	**Part Number**	**FCC-ID**
GS-6C Top Level Assembly	80-1004-01	**2ASIM-GS6C1**
uBlox	SARA-U201	XPY1CGM5NNN
Iridium	SBDN9602A01	Q639602-SB
Texas Instruments	CC2538	**Tested under 2ASIM-GS6C1**

9.4. Interference

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Consult RSAE Labs for help.

9.5. Modifications

This device contains radio equipment and must comply with FCC rules. Changes or modifications not expressly approved by RSAE Labs may void the user's authority to operate the equipment.

9.6. Human Exposure

In order to comply with FCC/ISED RF Exposure requirements, this device must be installed to provide at least 25 cm (9.8 inches) separation from the human body at all times. This requirement is relative to the radome component which houses the cellular and satellite modem emitters.

Holding the device by the battery handle does not expose the human body to excessive RF exposure since it is more than 25 cm from the cellular and satellite modem emitters. During normal operation, please handle the unit by the battery pack.

Note that the cellular and satellite modems (if installed) are seldom powered on and transmitting. In normal operation, these modems are seldom turned on for less than 60 seconds and have a duty cycle of around 30 minutes to 24 hours. It is still suggested personnel hold the unit by the battery pack.

Note that with the battery pack removed the device does not transmit.

9.7. Conflict Minerals

RSAE Labs, Inc is committed to being a responsible corporate citizen and is opposed to human rights abuses. As part of that commitment, RSAE Labs seeks to source products, components and materials from companies that share our values around human rights, ethics and environmental responsibility.

In August 2012, the U.S. Securities and Exchange Commission (“SEC”) adopted final rules implementing Section 1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act (the “Conflict Minerals Rule”). Under these rules, publicly traded companies must annually report to the SEC whether the products they manufacture or contract to manufacture contain “conflict minerals” originating from the Democratic Republic of the Congo (the “DRC”) or adjoining countries. Revenue from the mining and transport of these conflict minerals is believed to be financing or benefiting groups that are responsible for human rights violations. "Conflict minerals" refers to columbite-tantalite (coltan), cassiterite, gold, wolframite and the derivatives tantalum, tin and tungsten, without regard to the location or origin of the minerals or derivative metals.

RSAE Labs supports industry-wide efforts to identify, reduce and hopefully eliminate the use of conflict minerals originating from the DRC and adjoining countries to the extent believed to be financing or benefiting groups committing human rights violations. RSAE Labs is committed to complying with any applicable requirements under the Conflict Minerals Rule and has implemented a due-diligence process to meet its obligations under the legislation.

Suppliers to RSAE Labs are expected to establish their own conflict minerals policies, due diligence frameworks and management systems that are designed to prevent conflict minerals originating from the DRC or an adjoining country, to the extent that they benefit groups committing human rights violations, from being included in the products sold to RSAE Labs. In the event RSAE Labs determines that a supplier has failed to develop and implement reasonable steps to comply with this Policy, RSAE Labs reserves the right to take appropriate actions, which may include discontinuing the business relationship with the supplier.

Appendix A - Supplier's Declaration of Conformity

We, the developer and manufacturer:

Business Name:	RSAE Labs, Inc.
Address:	400 East 16th St, Panama City, Florida, 32405
Country:	United States of America

Declare under our sole responsibility for the equipment:

Equipment Name:	GS-6C
Model or Type:	Part Number 80-1004-01, 80-1004-02
Serial Numbers:	All in series 118xx00010 to 118xx09999 where xx = Year of Mfg
Object:	

That the equipment is in conformity with the following relevant Union harmonization legislation:

- DIRECTIVE: 2014/53/EU relating to placing radio equipment in the market
- DIRECTIVE: 2014/30/EU relating to electromagnetic compatibility
- DIRECTIVE: 2006/66/EC relating to marking and recycling of batteries
- DIRECTIVE: 2011/65/EU relating to use of hazardous substances in electronic equipment ($RoHS_2$)

And that the equipment is in conformity with the following harmonized standards and/or other normative documents or technical specifications:

- EN 301 489-1 V2.2.0, (Guide EG203367 V1.1.1)
- EN 301 489-17 V3.2.0
- EN 301 489-19 V2.1.0
- EN 301 489-52 V1.1.0
- EN 61326-1:2013 (Immunity)
- EN 5501:2009 (Emissions with A1:2010 amendment)
- EN 62368-1:2014 (Electrical and Mechanical Safety)

Place and date of issue: Panama City, Florida, ____/_____/_____

Signed for the manufacturer:

Name: Randall Shepard Function: Chief Executive Officer