Installation Guide

Portable In-Transit Tracking Unit

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Documentation for Portable In-Transit Tracking Unit

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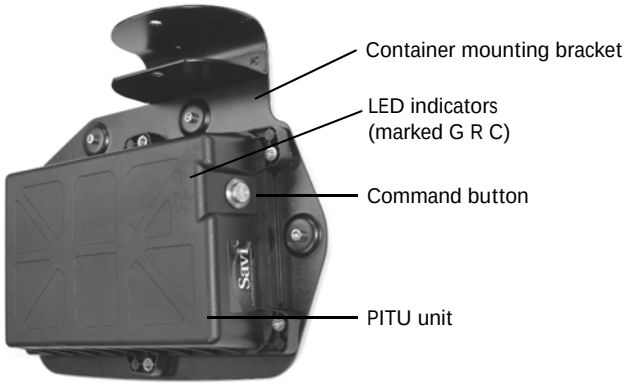
Contents

About the Portable In-Transit Tracking Unit

The Portable In-Transit Tracking Unit (PITU) provides a complete in-transit tracking solution by combining radio frequency identification (RFID), global positioning system (GPS), and wide area communications technology in a small self-contained integrated package. The PITU augments an RFID network with continuous real time GPS position information for tagged shipments and assets. The PITU electronically binds to a Savi RFID tag and monitors the tag by obtaining its GPS coordinates. The PITU is developed in partnership between Savi Technology and Vari-Trac Ltd. and uses GPRS or SatCom to relay the data to Savi SmartChain Server.

The PITU is GPS-based and uses GSM (global system for mobile communications) cellular telecommunications and Iridium's Short Burst Data (SBD) satellite data service for data transfer. The system also has other sensors, inputs, and outputs to interact with the operational environment. This includes a 3 axis motion sensor. The PITU is utilizes a non-rechargeable, field replaceable Lithium Thionyl battery pack that has a 10-year shelf life.

PITU Model# PITU-0001-B front view with container mounting bracket



PITU Model# PITU-0001-B rear view

Integrated Architecture

The PITU consists of the following key components in a small hardened enclosure:

- Vari-Trac GPS tracking module with GPRS communications
- Iridium satellite SBD module
- Savi RFID mobile reader (SMR-650)
- GPS, GSM, and satellite antennas
- Power control unit and Intelligent RS-232 I/O multiplexer

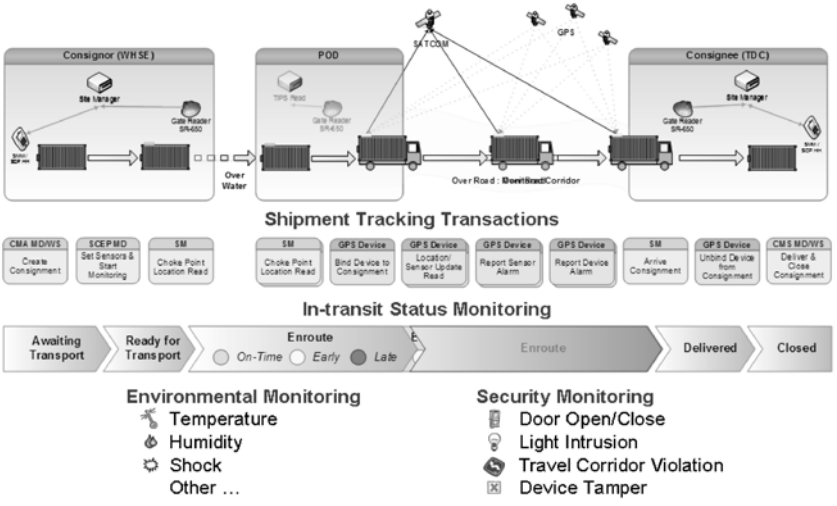
The PITU can be used anywhere in the global supply chain including harsh environments common in global military supply chains. Its small size makes it easy to handle when you mount and lock it on a standard ISO container or other conveyance. The PITU operates completely using internal battery power.

Features

- Securely attaches anywhere in the supply chain
- Easily associates with RFID tags on the shipment
- Delivers GPS location updates to the server in real time using the lowest cost communications network available
- Relays security and sensor alarms from the associated tag
- Alarms if the shipment deviates from the expected route or travel path
- Alarms if the associated tag disappears or if the device is removed while en-route
- Easily disassociated from the RFID tag and removed from the shipment in authorized areas of the supply chain
- Weather tight, IP67-compliant standard external enclosure
- All components and antennas are completely enclosed
- Fits between container locking bars so the device is safe in a stacked environment
- Strong magnets hold device on the container during journey
- Standard metal container locking bolt secures device to bars
- Monitoring automatically starts when the container moves into a tracked region

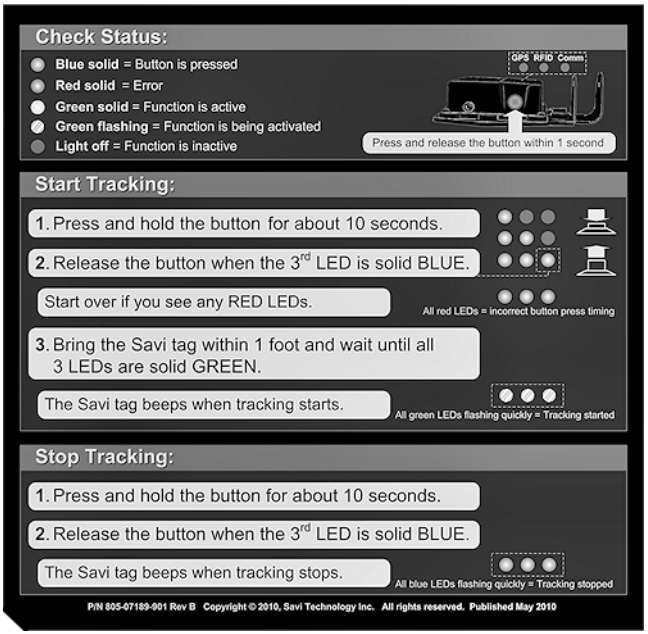
Extended In-Transit Tracking Workflow

The PITU provides an environmental and security shipment tracking solution for times when the shipment is between RFID monitored areas. As shown in the following diagram, the PITU bridges monitoring between the point of delivery and the consignee.



Quick Reference

The following quick reference appears on the back of the PITU. It provides a brief instruction on how to use the PITU operational commands. See “Issuing Operations Commands” on page 21 for detailed command instructions.



Note: This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

Setting Up the PITU

To set up and use the PITU, you must acquire and register an activated SIM card, install the SIM card in the PITU, install the battery pack in the PITU, and issue the commands to start tracking.

Prerequisites

- Registered activated SIM card

Verifying the PITU Pack Contents

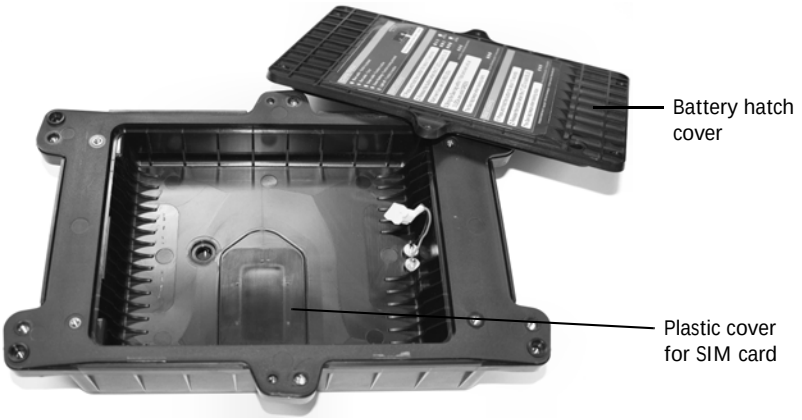
Make sure you PITU shipping package contains these items.

- PITU unit
- Container mounting plate
- Battery pack
- Torx key screws (10 ea.)
- X20 Torx key screwdriver
- Documents including this guide, Packing List, Statement of Certification, and Savi Customer Service leaflet

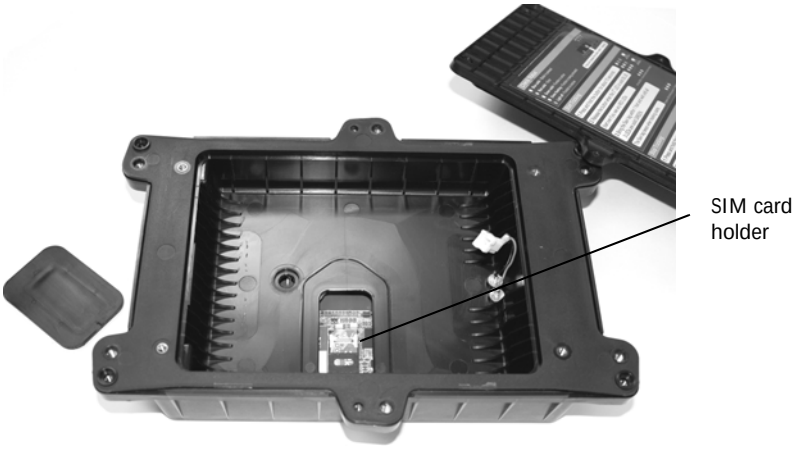
Installing a GSM SIM Card

1. Locate the Torx key screwdriver included with the battery pack.

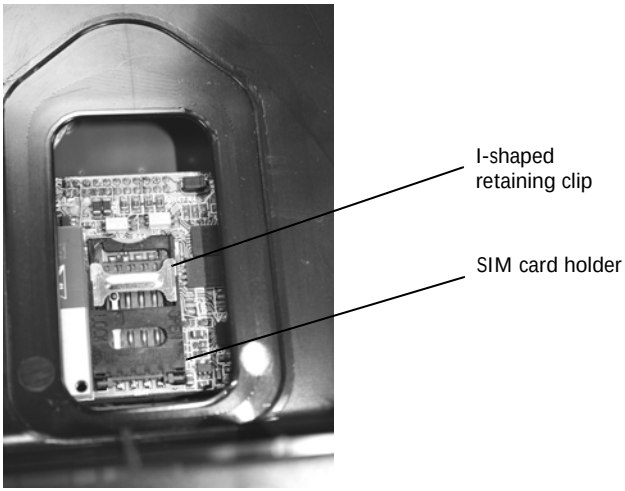
2. Using the Torx key screwdriver, unscrew and set aside the 6 screws securing the battery hatch cover at the back of the PITU.



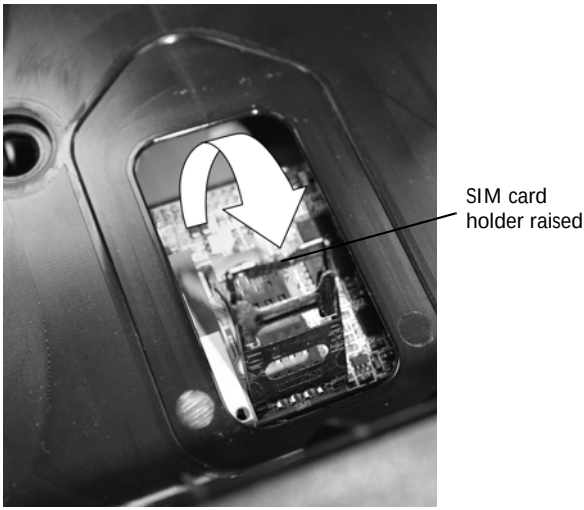
3. Remove the battery hatch cover to expose the inner compartment and the hard plastic cover for the SIM card holder recess.



4. Remove the hard plastic cover to expose the SIM card holder and verify there is no SIM card installed.



5. Slide the silver I-shaped holder retaining clip toward the outside edge of the PITU to unlock the SIM card holder.

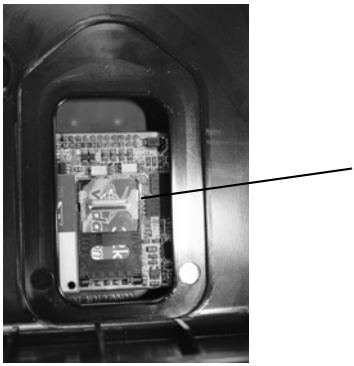


6. Raise the edge of the SIM card holder closest to the center of the PITU.

7. Insert the SIM card in the correct orientation as shown above.

   NOTE: The cut-off corner of the SIM card is at the upper-left in the picture above.

   If a SIM card is pre-installed, remove it and install the SIM card you activated.



8. Lower the SIM card holder and slide the silver I-shaped holder retaining clip toward the center of the PITU to lock the SIM card holder in place.

9. Realign and press the hard plastic cover for the SIM card holder recess into place.

   NOTE: The wider edge of the cover is toward the center of the PITU. The cover only fits in one direction.

10. Proceed to installing the battery power pack.

Installing the Battery Power Pack

Use only the supplied battery pack. See also “Replacing the Battery Power Pack” on page 18.

1. Remove the power pack from all shipping materials.

2. Partially insert the battery power pack into the PITU battery compartment as shown.

The connector from the battery pack is at the same side as the battery connector inside the PITU battery compartment.

3. Align and connect the cable end from the battery pack to the cable end protruding from the inside of the battery compartment. Press the two ends together until they click.
4. Lower the battery power pack completely and seat it in the compartment ensuring the connector cable is clear of the opening.
5. Replace the battery hatch cover and re-insert the 6 Torx screws.
6. Use the Torx screwdriver to evenly re-screw all 6 screws on the cover ensuring the hatch is sealed.

Replacing the Battery Power Pack

WARNING: Use only the supplied battery power pack. There is risk of explosion if you replace the battery pack with an incorrect type.

Dispose of used battery packs in accordance with local safety standards and the instructions in step 4 on page -19.

1. Remove the power pack from all shipping materials.
2. Use the Torx key screwdriver to unscrew and set aside the 6 screws securing the battery hatch cover at the back of the PITU.
3. Disconnect the cable end from the battery pack and the cable end protruding from the inside of the battery compartment.

4. Remove the used battery pack from the battery compartment.

   WARNING: Disposal of spent battery packs in the European Union must conform to EC Directives 91/157/EEC of 18/03/91 and 98/86/EEC of 04/10/93 as per each independent member country.

   Disposal of spent battery packs in the United States must conform to EPA Disposal Code D003 UN# 3090 Waste Lithium Batteries.

5. Partially insert the new battery power pack into the PITU battery compartment as shown.

   The connector from the battery pack is at the same side as the battery connector inside the PITU battery compartment.

6. Align and connect the cable end from the battery pack to the cable end protruding from the inside of the battery compartment. Press the two ends together until they click.
7. Lower the battery power pack completely and seat it in the compartment ensuring the connector cable is clear of the opening.
8. Replace the battery hatch cover and re-insert the 6 Torx screws.

   NOTE: The hatch cover only fits in one direction.

9. Use the Torx screwdriver to evenly re-screw all 6 screws on the cover ensuring the hatch is sealed.

Issuing Operations Commands

LED Status Indicators

The three LEDs embedded in the top of the PITU provide status information about the GPS, RFID, and satellite communication components. Each LED is marked by a letter representing the function. G identifies the GPS function, R identifies the RFID module, and C indicates Communications. The color and action of the LED show the status:

- Blue LED - operation button is pressed down
- Red LED - error/condition unknown
- Green LED - function is active
- LED off - function is inactive
- LED solid on - function is active in ready mode
- LED flashing - function is being activated

Checking Function Status

To check the status of the PITU functions, press the button once for less than 1 second.

The Comms LED lights blue when you press the button, then lights green briefly. Otherwise, all 3 LEDs light red to indicate an error.

The positive status response is all 3 LEDs will flash fast green or blue.

Getting Ready to Communicate

NOTE: You can perform a get ready command to make sure all communications links are working before you mount the PITU or are near a tag you want to bind with and track.

The default state of the PITU is inactive or sleeping to conserve battery life. While in the inactive state, the PITU does not monitor tags, send tracking messages, or respond to commands. You initiate a get ready command to wake up the PITU and put it in an active state.

Press and release the button 3 consecutive times for less than 1 second each. Each release should not be more than 1 second between presses.

The Comms blue LED lights on the first press, the RFID blue LED lights on the second press, and the GPS blue LED on the third press. The RFID LED briefly lights green. Otherwise, all 3 LEDs light red to indicate an error.

A positive get ready response is all 3 LEDs will flash fast green or blue. Note that the LEDs will be blank for a few seconds while the main system boots up. The LEDs automatically update upon a change in the GPS, RFID, or Comms connection status.

NOTE: GPS failure may be caused by GPS hardware failure or insufficient signal coverage resulting in a time out.

RFID being ready means that the main system established successful communications with the RFID mobile reader contained within the PITU.

Comms being ready means that a login to back office was successful with any medium available such as GPRS, satellite, and so forth.

Binding to a Tag and Starting Tracking

NOTE: You can perform a get ready command to make sure all communications links are working before you mount the PITU or are near a tag you want to bind with and track. See "Getting Ready to Communicate" on page 22.

After obtaining the function status, you can initiate a command to bind with a tag and start tracking. Once all functions are ready, the PITU uses RFID to communicate with the Savi tag and beeps the tag closest to the unit that will be used for the tracking operation. After a successful RFID scan, the PITU uses GPRS or SatCom to transmit the tag data and the current GPS coordinates to SmartChain Server.

When start tracking is active, the PITU wakes up at a predetermined interval, communicates with the Savi tag, reads the tag's current GPS coordinates, and transmits all data to SmartChain Server.

To bind with a tag and start tracking, press and hold down the button until all 3 lights are on, then release immediately. If you continue to hold down the button, the PITU will initiate a reset and you will have to start over from the beginning.

The Comms blue LED lights after holding the button for 2 seconds, the RFID blue LED lights after holding the button for 4 seconds, and the GPS blue LED lights after holding the button for 6 seconds.

While a function such as GPS, RFID, and GPRS or SatCom is getting ready, the corresponding green LED flashes. Solid green LEDs indicate when the corresponding function is ready. Otherwise, all 3 LEDs light red to indicate an error.

3 fast flashing green LEDs indicate start tracking is successful.

Stopping Tracking and Unbinding from a Tag

After verifying the function status, you can initiate a command to stop tracking and unbind the PITU from a tag.

To stop tracking and unbind from a tag, press and hold down the button until all 3 lights are on, then release immediately. If you continue to hold down the button, the PITU will initiate a reset and you will have to start over from the beginning.

The Comms blue LED lights after holding the button for 2 seconds, the RFID blue LED lights after holding the button for 4 seconds, and the GPS blue LED lights after holding the button for 6 seconds.

While a function such as GPS, RFID, and GPRS or SatCom is getting ready, the corresponding green LED flashes. Solid green LEDs indicate when the corresponding function is ready. Otherwise, all 3 LEDs light red to indicate an error.

3 fast flashing blue LEDs indicate stop tracking is successful.

Placing the PITU in Service Mode

> *NOTE:* A reset is similar to service mode but a reset causes the PITU to fall back to the previous state.

Service mode is a maintenance or debugging mode that is intended to be used only during testing. In service mode the GPS is active, and GPRS or SatCom will periodically connect, but the RFID reader is not bound to a tag.

To put the PITU into service mode, press and hold the button for at least 26 seconds.

The Comms blue LED lights after holding the button for 2 seconds, the RFID blue LED lights after holding the button for 4 seconds, and the GPS blue LED lights after holding the button for 6 seconds.

Next the blue LEDs flash sequentially two times. The blue LEDs flash sequentially two more times, each progressively faster. All 3 LEDs flash green briefly. Otherwise, all 3 LEDs light red to indicate an error. Wait 10 seconds after releasing the button, then press the button for less than 1 second to put the unit into service mode.

When the unit goes out of service mode all 3 LEDs flash green and then flash red.

Resetting the PITU

NOTE: A reset is similar to service mode but a reset causes the PITU to fall back to the previous state.

To reset the PITU, press and hold down the button for at least 26 seconds.

The Comms blue LED lights after holding the button for 2 seconds, the RFID blue LED lights after holding the button for 4 seconds, and the GPS blue LED lights after holding the button for 6 seconds.

Next the blue LEDs flash sequentially two times. The blue LEDs flash sequentially two more times, each progressively faster. Otherwise, all 3 LEDs light red to indicate an error. The unit completes resetting in approximately 60 seconds quickly green and then quickly red.

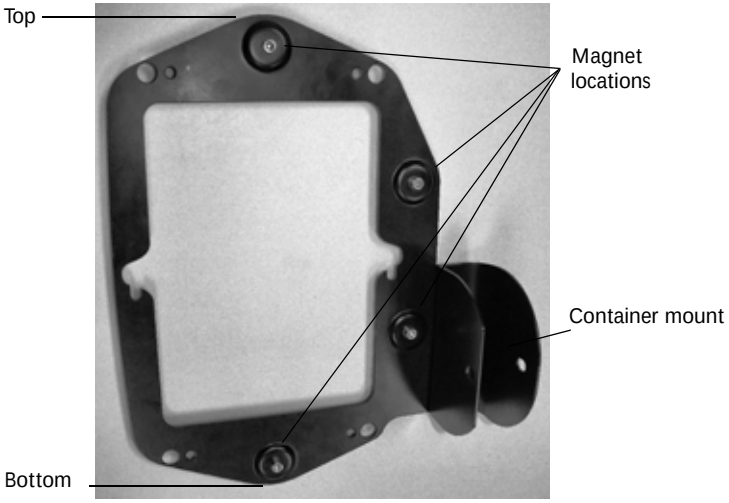
Mounting the PITU

Attaching the Container Mounting Bracket

WARNING: All magnets except those that are steel and rubberized are brittle and may break or chip if allowed to fall onto a hard surface, or if they slap against each other or a ferrous surface.

Keep very strong magnets away from small children. More powerful magnets may pinch fingers. It is safest to slide strong magnets together or apart.

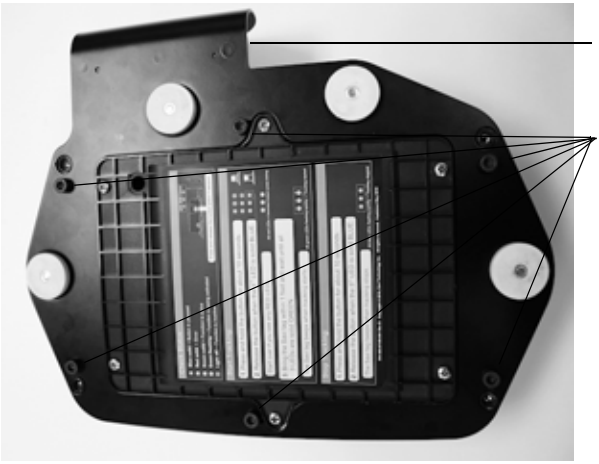
Keep magnets away from credit cards, audio tapes, video tapes, and computer disks. CDs are not affected. Strong magnets can be harmful to computer monitors and television screens. Savi will not be held responsible for any damage or magnetic data lost through accident with, or misuse of, these magnets.



1. Remove the container mount from all shipping materials.

2. Place the PITU face down on a flat surface with the large command button toward you.

3. Place the mounting bracket onto the back of the PITU ensuring the locking bar clamp is face down on the left side.



4. Align and insert the 6 Torx screws provided through the mounting bracket holes into the holes of the PITU.
5. Use the Torx key screwdriver to evenly secure the screws in place.

Positioning the PITU

Mount the PITU to the container as pictured below.

- Ensure the PITU is located above the RFID tag it will be bound to
- Mount the PITU as high as possible on the container rear door
- Mount the PITU between the container locking bars where it is safe in a stacked environment
- Secure the device with the container mounting bolt

Contacting Savi Global Support Services

Savi Global Support Services operates 24x7. Access to 24x7 support depends on your Savi support plan.

For product information, including firmware updates:

- Go to www.savi.com and click SAVI SUPPORT.
- Send an email to help@savi.com.
- Call 1-888-994-7284 (North America only) or 1-650-316-4760.

When you contact Savi Global Support Services by telephone or email, have the following information available:

- Contact information (company name, your name, email, and phone number)
- Problem description
- Product name/model
- Product/software version
- Serial number or license information

Specifications

Model Number	PITU-0001-B
Physical Characteristics	Dimensions: 28.7 cm (11.30 in) x 19.5 cm (7.68 in) x 6.6 cm (2.60 in) excluding mount Weight: 1700 grams (3.97 lb) Color: Black
Environmental	Temperature: Operating: -20°C to +60°C ambient; Storage -20°C to +60°C ambient Humidity: 5% to 95% non-condensing Altitude: Max is 12,500 m (7.76 miles) Vibration and shock: MIL-STD-810E Enclosure: IP67 compliant
Iridium SBD Module	Frequency: 1616 MHz to 1626.5 MHz Duplexing Method: TDD (Time Domain Duplex) Oscillator Stability: ± 1.5 ppm Input/Output Impedance: 50 Ohm Multiplexing Method: TDMA/FDMA Max. transmit power: 1.6 W
GSM/GPRS Module	Frequency: 850/900/1800/1900 MHz Internet Protocols: TCP/IP, UDP GPRS: Class 10: max. 86 kbps (DL) SMS: Point-to-point MO and MT, Text and PDU mode Input/Output Impedance: 50 Ohm Output Power: Class 4 (2 W) for EGSM 850/900, Class 1 (1 W) for GSM 1800/1900

GPS Module	Processor: SiRF III GSC3e/LP Tracking capability: 20 satellites simultaneously Horizontal accuracy: 2.2 m (CEP), 5.5 m 2dRMS PPS accuracy: typically better than 1 s Acquisition performance: -140 dBm = hot start TTFF <1 s, warm start TTFF <49 s, cold start TTFF <52 s
Savi UHF Receiver (uplink) Savi UHF Transmitter (downlink)	UHF Frequency: 433.92 MHz UHF Range: Up to 200 feet (61 m) with the SaviTag 600/410 series Modulation: FSK, deviation +/- 50KHz Data Rate: 27.8 Kbps, 50% duty cycle Data Coding: Manchester (EBCS/EP) and PCM (BCS) UHF Air Protocol: EchoPoint Air Protocol 2.1 (two-way UHF commands; Seal extension commands) BCS/EBCS Commands Receiver sensitivity: -100 dBM UHF Antenna: 50 Ohms matched external helical antenna Max. Transmit Power: 0.6 mW
Power	Battery type: 10.8 volt lithium-thionyl chloride (Li-SOCl2) (55 Ah) Battery life: Approximately 4 years at 4 polls per day; 10-year shelf life
Approval	R&TTE 1999/5/EC, FCC Part 15