



SmartOne Solar™

User Manual



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1. SmartOne Basics

Overview

The Globalstar SmartOne series of products are designed to track the positions of trailers, cargo containers, heavy construction equipment, generators, boats/barges and any other mobile assets.

NOTE: Throughout the rest of this manual, the term SmartOne will refer to the SmartOne Solar™ product unless explicitly referred to otherwise.



The SmartOne processes GPS satellite signals to obtain its position in terms of longitude & latitude and transmits this information over Globalstar's Satellite Network. In addition to position information, the SmartOne transmits other message types that include battery status, input alarm status and diagnostic information. The SmartOne is configured using a computer & configuration cable or over Bluetooth® interface. The configuration parameters allow the SmartOne unit to communicate messages at certain times and/or under certain conditions.

The SmartOne has two dry contact or wetted-voltage inputs, to manage run time of engines and/or other alarm inputs, and one serial port for passive and smart sensors. The SmartOne incorporates a built-in solar panel that charges the internal battery pack providing up to 10 years of maintenance-free operation.

Modes of Operation

The SmartOne can be configured to operate in three different Modes:

- Standard Messaging Mode
- Reduced Messaging Mode
- Theft Alert Mode

Standard Messaging

In Standard Messaging Mode, the SmartOne reports its position at regular time intervals that are programmed during the configuration process. Standard Messaging Mode can also be configured to utilize the SmartOne's internal motion/vibration sensor. If enabled, the SmartOne will transmit its position at independently configured regular time intervals when the device is In Motion.

Location messages can be programmed to be constant (Interval Messaging) or the device may be configured to use up to 12 different intervals in sequence (Time(s) of Day Messaging). Message intervals can be programmed in one-minute intervals from 35 minutes up to 45 days.

- **Example of Message Interval:** The SmartOne is configured to report once every 24 hours when not In Motion and every two hours when In Motion. If the SmartOne went into motion at any time of day the Message Interval while In Motion would be every two hours beginning when the SmartOne started moving.
- **Example of Message-Time(s) of Day:** The SmartOne is configured with a message time of day of 9:00 AM, a second message time of day of 12:00 noon, a third message time of day of 8:00 PM and once per hour when In Motion. The SmartOne would transmit three messages a day at the same configured times every day. If the SmartOne went In Motion it would transmit its location message every hour.

- **Usage Example:** A Company is required to report the GPS locations of their hazardous chemical containers twice a day. Based on this requirement, the Company has two options: set a message interval of every 12 hours, the 12 hour interval begins when the device is powered up or when the configure message times of day are 12:00 noon and 12:00 midnight.

Reduced Messaging

Reduced Messaging Mode reduces the cost associated with transmitting messages over Globalstar's satellite network by sending messages at a minimal message interval when the asset is in a defined area and transmits at a higher message interval when the asset is changing locations. These message intervals are set as part of the configuration process based on the concept that repeated reporting information of the same location, when an asset has not moved from its defined area, is redundant and doesn't provide additional usable information about its current location.

By comparing current and prior position information, the SmartOne determines if its location is changing. The definable area in which the device should remain in Reduced Messaging Mode is called the Change of Location Area and it is a square. When the SmartOne goes outside of the square, its location is considered to be changing or relocating.

Usage Example: *A fleet operator owns 1,000 trailers. When the trailer(s) are sitting at a depot they want a location message once a day. They also want a message notification within one hour when a trailer has left a depot. Lastly, they want a location message every three hours when a trailer is moving between depots. Based on this requirement, the fleet operator will need to set the Change of Location Area (size of the depots where the trailers will visit), the message interval while the trailers are inside the Change of Location Area (one per day), the interval at which the SmartOne will check its location while in a State of Vibration and inside the Change of Location Area (one per hour), set the number of messages when the trailer leaves the Change of Location Area (one Change of Location Area Alert Message) and the message interval while the trailers are in transit between depots (every three hours).*

Theft Recovery

When the SmartOne is configured to operate in the Theft Recovery Mode, it differentiates between authorized and unauthorized movement of an asset. While the power to the SmartOne is turned off, all movement of the asset is considered authorized. When power is turned on, the SmartOne obtains a position from GPS satellites. The position is used to set the center of the defined Change of Location Area in Theft Alert Mode. While in the Change of Location Area, the SmartOne obtains position fixes at an interval set during configuration. If the SmartOne remains within the Change of Location Area, all movement is considered to be authorized.

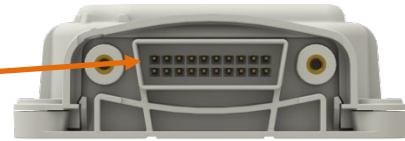
Once the SmartOne's position is outside of the Change of Location Area, it alerts the SmartOne to an unauthorized movement and immediately sends a location message (Change of Location Alert Message). The SmartOne continues to send location messages at a message interval set during the configuration process until the power is turned off or the battery is dead.

Usage Example: *A construction company is working on a job site for one year and wants to ensure that their generators and other heavy equipment on site aren't stolen. The company wants to check the location of their equipment 12 times a day, every 2 hours, to confirm the asset hasn't been stolen, but only wants a transmitted location message once per day. Based on this requirement, the construction company will need to set the Change of Location Area (size of the job site), the message interval while inside the Change of Location Area (one per day), the interval at which the SmartOne will check its location while in a State of Vibration and within the Change of Location Area (every two hours) and the message interval if the asset is outside the Change of Location Area.*

Inputs

The SmartOne has a 20-pin connector that provides ground, two dry contact or wetted-voltage inputs and the serial (TTL) communication lines.

SmartOne with connector cover off showing 20-pin connector



The SmartOne allows sending Input Status Changed Messages for both Input 1 and Input 2. The Inputs must be asserted for at least five seconds in order to be acknowledged.

Usage Example: *A construction company needs to document, per their contract, when they begin their work day and when they end their work day. Based on this requirement, the SmartOne would be connected to the ignition switch and configured to send a transmission with location when the input changes state.*

The SmartOne also allows the user to define the Message Interval while the Inputs are in an Undesired State, either Opened or Closed.

Usage Example: *A company has remote containers at job sites and would like to know if a door is ajar. If a door is left ajar the company would like a notification every two hours. Based on this requirement, the SmartOne would be connected to an open door sensor with the Undesired Input State Message enabled and set as Opened with a Message Interval of two hours.*

The SmartOne has the ability to send an Accumulate/Count Message at a regular configurable interval and/or based on configurable multiples of accumulated hours and/or number of counted events or hours of vibration.

Usage Example 1: *A construction company needs weekly engine run times for their heavy equipment to manage their maintenance scheduling. Based on this requirement, the company would schedule a weekly Accumulate/Count Message.*

Usage Example 2: *A construction company wants to insure that no equipment is ever operated beyond 400 hours without maintenance. Based on this requirement, the company would schedule an Accumulate/Count Message for every 400 hours of use.*

The SmartOne has the ability to send both the Status Change and Undesired State messages based on vibration.

Serial Commands

The SmartOne uses the I/O port for unit configuration as well as interface to remote passive and smart sensors. Two commands are provided in the unit interface to support smart sensors. External sensors or instruments, that can format and communicate with the SmartOne, can send user data through the SmartOne by using these two commands.

The SmartOne connects to smart sensors via the SmartOne Serial Cable. The SmartOne Serial Cable is sold as an accessory.

Solar Product Precautions

The SmartOne uses a built-in solar panel to recharge its internal batteries. To maximize the recharging capability of the SmartOne it is important to keep in mind the following:

- a) The clear plastic above the solar panel on the SmartOne device should be kept clean and free of soil, paint, or debris to maximize battery charging capability.
- b) Solar panels produce the most electricity when they are perpendicular to the sun.
- c) Shading and weather conditions may negatively affect the charging of the batteries from the solar panels.
- d) If the batteries of the SmartOne are depleted, it is recommended to allow the SmartOne to receive a full day (6+ hours) of adequate sunlight to fully charge the batteries.
- e) If the clear plastic panel covering the solar panel becomes cracked, the SmartOne should be replaced.

Also, review the limitations of using a solar-powered device in Appendix L.

Bluetooth Interface

The SmartOne uses its built-in Bluetooth interface to advertise itself and for programming configuration settings as well as updating firmware.

The SmartOne Configuration Software may be used to read and/or alter the SmartOne device's programmed configuration. Also, the SmartOne Configuration Software may be used to update the SmartOne device's firmware. The method to perform either of these functions is described in the SmartOne Configuration Software section.

The SmartOne Solar may also be configured to beacon its specific data, such as its ESN and Firmware Version, over its Bluetooth interface. This periodic advertisement allows a user to use a Bluetooth scanning program to read the advertisement data generated by the SmartOne Solar device. For example, a Bluetooth scanning program can read and parse the SmartOne's ESN and firmware version that is programmed into the device. Globalstar does not supply nor support any Bluetooth scanning programs.

For detailed protocol of the Bluetooth advertisement while beaconing, please refer to the SmartOne Solar Bluetooth LE Profile Reference Manual. This manual may be found on the Globalstar VAR Data Support portal at <https://var.globalstar.com>.

Satellite Communications

The SmartOne communicates with both the GPS satellite network and the Globalstar Satellite Network. All GPS locations are pulled from the GPS network and all transmissions are sent via the Globalstar Satellite Network.



The SmartOne has the unique ability to check its GPS coordinates at a programmable rate while it is inside of the Change of Location Area without actually sending a message over the Globalstar Satellite Network.

For a Location Message, the SmartOne will wake up at a scheduled interval or time of day and begin to acquire a GPS fix. Once it receives its GPS fix, the SmartOne will transmit its location to the Globalstar Satellite Network.

Globalstar Satellite Network

The Globalstar Satellite Network consists of Low Earth Orbiting (LEO) satellites that are constantly orbiting the earth and each satellite completes its orbit in less than two hours. Because of this, the SmartOne will be in contact with at least one of the satellites during each scheduled transmission. In LEO communication networks, the satellites are constantly changing their positions in the sky relative to the transmitter on earth. This minimized the shading effects seen in geostationary satellite systems where the mobile device must be pointed toward a specific direction in the sky. Geostationary satellites also orbit at a much higher altitude and move along the equator.



Messages are transmitted from the SmartOne via the Globalstar Satellite Network using an uplink-only connection (one-way data transmission) and received by a Globalstar Ground Station. The messages are then sent via an HTTP, HTTPS, or FTP server to the internet and received by the customer's back office application and converted into actionable data.

The SmartOne will send each message three times to ensure that the message has been received by the Globalstar Satellite Constellation. Once Globalstar receives the message, any remaining duplicate messages are ignored and discarded (Customer's account is only charged for one transmission).

2. Getting Started

The SmartOne Device

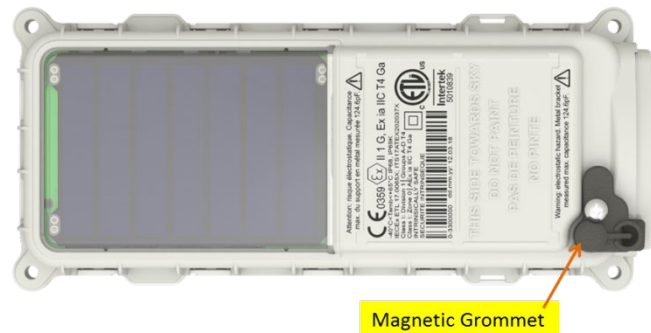
Battery Pack

The SmartOne is powered by an internal Nickel Metal Hydride(NiMH) battery pack. The battery pack is not accessible to the user and is not replaceable. The SmartOne is designed for the solar panels to recharge the battery pack. Ultimately, the user can realize up to 10 years of maintenance-free operation based on adequate sun exposure to recharge the battery pack.

Turning On and Off

The SmartOne ships with a magnetic switch that will shut down the unit if installed. To turn the SmartOne unit on, remove the magnetic switch and it will begin monitoring the asset. Do not remove the screw attaching the magnetic switch, simply pull the magnetic switch over the screw to remove it.

NOTE: If the asset is going to be stored indoors for extended periods of time, the SmartOne should be shut down by installing the magnetic switch to avoid draining the battery pack. Be careful to store the magnetic switch if removed from the SmartOne device.



Commissioning

Before installing the SmartOne device, record the Electronic Serial Number (ESN) and identify the asset to which it will be mounted. The ESN is etched on the top mounting surface of the SmartOne unit, such that it will be visible after installation. There is also a bar code that contains the ESN on the device.

Installation

The SmartOne unit must be mounted on the asset with a clear view of the sun and sky. The device requires a flat surface area of, at a minimum, 17.78 cm x 8.26 cm (7" x 3.25"). The ideal configuration is facing up on a flat horizontal surface.

The SmartOne unit can also be mounted on a flat vertical surface but this may reduce the communication reliability, decrease the maximum sustainable messaging rate, and may reduce the GPS location accuracy. If the device must be mounted vertically, it is recommended to point the device with the connector cap pointed upward towards the sky. This allows the messages to be transmitted best in a vertical mount application as the internal antennas are located closer to the connector cap end of the device.

Input Types

The SmartOne has two inputs that can be accessed by using the SmartOne External Input Cable. The inputs can be used either as dry contact or wetted-voltage inputs. The SmartOne External Input Cable is sold as an accessory to the device.

Dry Contact inputs provide the user with a way to incorporate a relay for sensing an Open or Closed position to one of the inputs of the SmartOne device.

For dry contact inputs:

<u>Action on input</u>	<u>Logic level reported by system</u>
Relay contact closed	LOW
Relay contact open	HIGH

Note that closing the contact reports the same logic as putting 0V on the pin and opening a contact is like putting 24V on the pin.

Wetted-voltage inputs may be directly connected to the SmartOne device. As an example, without having to use a relay, a wetted-voltage input can allow direct connection to an ignition switch and ground on the SmartOne Input. Usage of this type of Input must be selected in the Configuration Software and programmed into the SmartOne device.

For wetted-voltage inputs:

<u>Voltage on input</u>	<u>Logic level reported by system</u>
$V_{\text{input}} \geq 3.0V$	LOW
$V_{\text{input}} < 3.0V$	HIGH

Note: For either of the input types, by default, the SmartOne uses a five minute "hysteresis" window to prevent sending false alarms. This means that only one status change message can be sent within the hysteresis window. Any subsequent status changes will be detected but not reported. Multiple status changes during any hysteresis window will result in the transmission of incorrect trigger bits. Refer to Input Status Changed Message in the Messages Section for details of the trigger bits.

Mounting methods

The SmartOne can be mounted using different methods depending on the mounting surface or user preference.

Direct Bolt or Screw Installation

It is strongly recommended to bolt the SmartOne unit to the asset using the provided mounting holes. Four #6 machine screws (Pan head recommended) of the appropriate length are required. The unit can also be mounted using self-tapping screws adapted to the mounting substrate.

Mounting Screw Locations



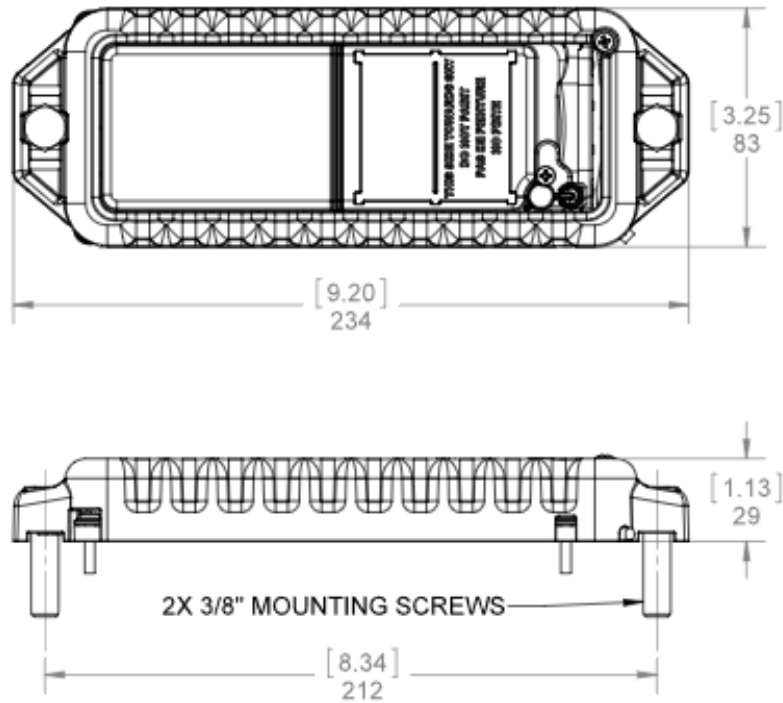
Mounting Screw Locations

NOTES:

- Do not use countersunk screws as this may damage the housing.
- Do not over-tighten the mounting screws: DO NOT exceed 1.2 N.m (10 in.lb) torque
- It is recommended to use 316 grade stainless steel fasteners for longevity.
- SmartOne Solar device mounting hole diameter is 3.81mm(0.150")

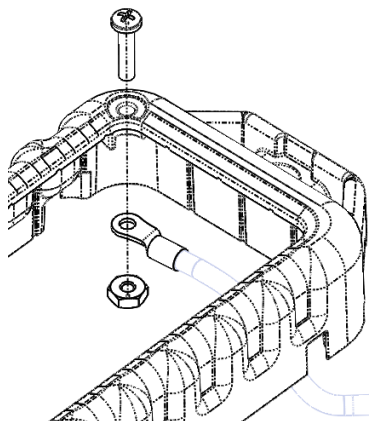
Optional Metal Bracket Installation

The optional stainless steel mounting bracket may be used to secure the device to the asset. Two 3/8" stainless steel screws or bolts should be used; their length will be determined by the installer based upon the application.



In most cases, the mounting bracket should be grounded to the asset by maintaining metal-to-metal contact between the bracket and the mounting surface. A separate grounding wire connected to the provided location on the mounting bracket may also be used.

The recommended method for installing the grounding wire is to use a #6 stainless steel machine screw (3/8" to 1" long) and nut and use a 5/16" max diameter ring terminal to terminate the ground wire. The bracket will prevent the nut from turning and can accept a wire up to 3/16" in diameter.





The mounting bracket may be painted or powder-coated provided the maximum coating thickness is less than 0.2mm.

NOTE: Using any other mounting bracket to secure the SmartOne device will invalidate using the device in an intrinsically safe application.

Adhesive Pad Installation

If drilling holes into the asset is not practical, the SmartOne may be installed using the die-cut adhesive pad. To ensure proper strength for mounting, the following recommendations must be followed; failure to follow proper procedure could lead to the SmartOne becoming detached from the asset in the field.

The ambient temperature must be above 10°C and the asset must be dry and protected from any form of precipitation (rain, snow, ice, etc.) before and during installation.

The mounting surface must be smooth and in good condition and be thoroughly cleaned using the following procedure: use water and soap first to remove any dirt and residues from the mounting surface and let dry. Wipe the mounting area and the bottom surface of the SmartOne with a solvent-impregnated clean cloth (such as Isopropyl Alcohol) and let air dry.

Peel one side of the adhesive gasket and install it to the bottom of the unit, ensuring the outer edges are aligned properly. Peel the other side of the adhesive gasket and place the SmartOne onto the asset. Apply at 80lb (350N) of force to the unit for a minimum of three seconds to achieve full bonding strength. This force and time is critical to ensure bonding.

3. SmartOne Configuration Software Overview

Configuring the SmartOne

The SmartOne comes ready to use with a factory configuration loaded into the device. The factory configuration is: Standard Messaging without Motion and Interval Messaging of 12 hours. These configuration settings may be changed using the SmartOne Configuration Software. Two methods of programming using the SmartOne Configuration Software may be utilized by connecting the USB Configuration Cable (Globalstar Part Number SP-SM2030-0261-01) to a Windows PC or via Bluetooth using the Bluegiga Bluetooth dongle (Globalstar Part Number 1950-0105-01) that is installed on the PC. More information on the Bluetooth dongle is provided in Section 4.

Installation of Configuration Software

The SmartOne Configuration Software program is available from Globalstar via the VAR Data Support portal at <https://var.globalstar.com>. Login to your VAR account using your username and password then navigate to the Downloads tab. The Configuration Software is supported by most versions of the Windows Operating System. It is recommended to use either Windows 7 or Windows 10 to run the SmartOne Configuration Software program. Make sure to download from the VAR Data Support site the Configuration Software version under the SmartOne Solar label otherwise, older versions of the program will not be able to connect to the SmartOne Solar device.

Configuration Software Panes Overview

The SmartOne Configuration Software is laid out in an easy to use format with two main Panes as shown:



The screenshot shows the SMARTONE configuration software interface. The title bar reads "SMARTONE STANDARD MESSAGING WITHOUT MOTION". The menu bar includes "File", "Tools", and "Help". The main window has tabs for "Getting Started", "Location Messages", "Input Settings", and "Options". The "Getting Started" tab is active, displaying the SMARTONE logo and "SATELLITE MANAGED ASSET READY TRACKER". Below the logo, the "Modes of Operation" section includes radio buttons for "Standard Messaging" (selected), "Without Motion", and "With Motion". There is a "SmartOne Solar Only" checkbox with "Speed and Heading" selected. Other options include "Reduced Messaging" and "Theft Alert". At the bottom, there is a "Connect By" section with radio buttons for "Serial Port" and "Bluetooth" (selected). A "List ESNs" button is next to it. To the right, there are buttons for "View Summary", "DFU", and "PROGRAM". A table at the bottom left shows the following data:

ESN - (1)	FW Ver	COM	Status
3303132	0.4.0.2	COM7	CONNECTABLE

Two orange boxes with labels point to specific areas of the interface: "User Data Entry Pane" points to the "Modes of Operation" section, and "Status Pane" points to the bottom section containing the table and connection options.

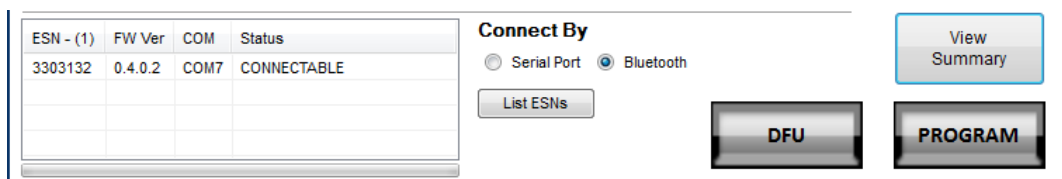
User Data Entry Pane

The user data entry pane contains a context-switched user entry area for displaying and inputting configuration data. The information is organized in pages with page manipulation provided through tabs along the top of the pane. Selecting a tab will change the context of the upper pane. The tabs are named to group similar functions on the same page. The tabs will change according to the operational Mode selected. The Back and Next buttons allow the user to move from tab to tab without clicking on the tab name.



Status Pane

The Status Pane is found at the bottom of the window and contains a table with a list of devices connected to the PC via serial cable or Bluetooth. This table lists the device ESN(s), firmware version, COM port assigned to each device, and the Bluetooth connected status. Execution buttons are also in this pane: List ESNs connected via Serial Cable or Bluetooth, View Summary of the loaded Configuration, performing a Program of the connected SmartOne devices and Device Firmware Update (DFU) of the connected SmartOne devices.

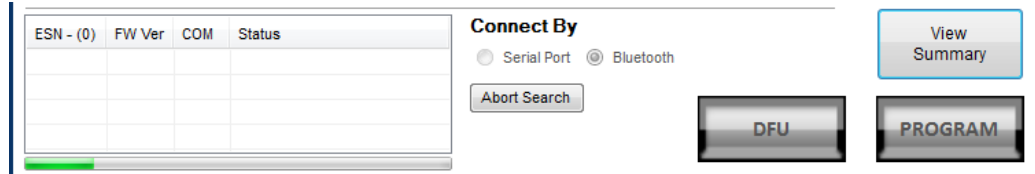


Electronic Serial Number(ESN) Status Display Table

- **ESN** - This column displays a list of the Electronic Serial Numbers for SmartOne(s) connected to the PC via Serial Cable or Bluetooth, dependent on the **Connect By** selection.
- **FW Ver** - This column displays a list of firmware version for each SmartOne in the list.
- **COM** - This column displays a list of the assigned communication ports for each SmartOne.
- **Status** – This column will show the Bluetooth status of the SmartOne; If configured for Bluetooth beaconing, it will show either CONNECTABLE or BEACONING. See Beaconing Mode section.

List ESNs Button

This button shall cause the Configuration Software to search for any valid devices that are connected to the PC via Serial Cable or Bluetooth, dependent on the **Connect By** selection. The status bar below the table indicates the progress of the search for SmartOne devices connected to the PC.

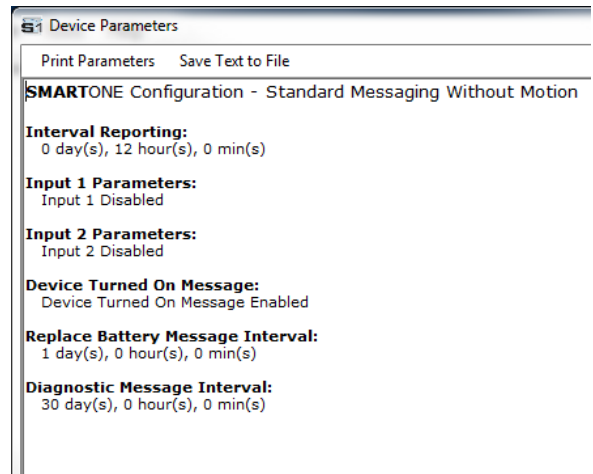


The screenshot shows a table with columns: ESN - (0), FW Ver, COM, and Status. Below the table is a progress bar. To the right of the table is a 'Connect By' section with radio buttons for 'Serial Port' and 'Bluetooth'. Below this is an 'Abort Search' button. Further right are two large buttons: 'DFU' and 'PROGRAM'. At the top right is a 'View Summary' button.

View Summary Button

This button causes the Configuration Software to open a pop-up window, which contains a plain text readout of the current configuration in the device just read.

- The Menu Bar in the View Summary Window allows the user to either print the parameters or save the configuration parameters to a text file.
- This window must be closed so that the user can alter any of the fields in the User Data Entry Pane tabs. Press the View Summary button again to display the updated configuration.

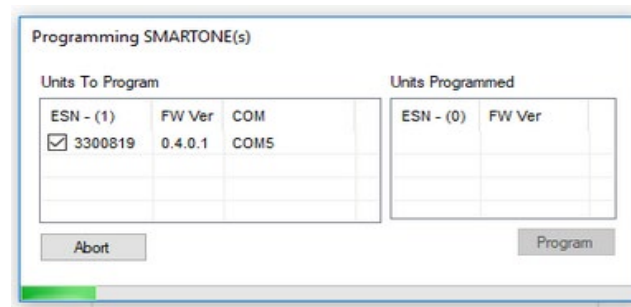


The screenshot shows a window titled 'Device Parameters'. It has a menu bar with 'Print Parameters' and 'Save Text to File'. The main content area displays the following configuration details:

- SMARTONE Configuration - Standard Messaging Without Motion**
- Interval Reporting:** 0 day(s), 12 hour(s), 0 min(s)
- Input 1 Parameters:** Input 1 Disabled
- Input 2 Parameters:** Input 2 Disabled
- Device Turned On Message:** Device Turned On Message Enabled
- Replace Battery Message Interval:** 1 day(s), 0 hour(s), 0 min(s)
- Diagnostic Message Interval:** 30 day(s), 0 hour(s), 0 min(s)

PROGRAM Button

The Program button in the Status Pane is used to send the data of the configuration to the connected SmartOne device(s). The devices will be programmed and any prior settings replaced. The user is queried to confirm this action on the device before execution of the function. Once executed, a progress window will appear that shows Units to Program and Units Programmed.

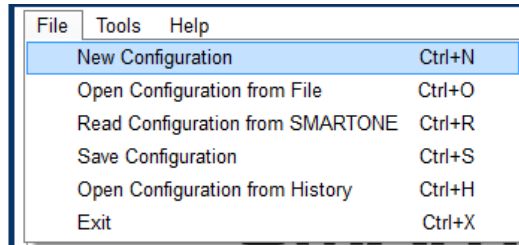


The screenshot shows a window titled 'Programming SMARTONE(s)'. It has two main sections: 'Units To Program' and 'Units Programmed'. The 'Units To Program' section contains a table with columns: ESN - (1), FW Ver, and COM. The first row shows a checked checkbox, ESN 3300819, FW Ver 0.4.0.1, and COM COM5. The 'Units Programmed' section contains a table with columns: ESN - (0) and FW Ver. At the bottom are 'Abort' and 'Program' buttons.

Toolbar

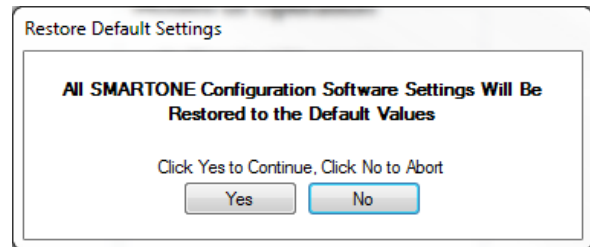
The Toolbar is listed at the top left of the Configuration Software program window. It contains three useful drop-down menus with which to navigate various functions of the program. The following paragraphs explain the functions included.

File Menu



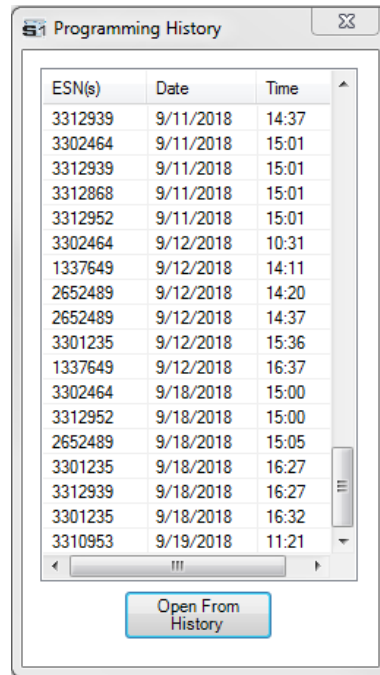
- **New Configuration** - This will reset the values for all configurable parameters to default. Standard Messaging without Motion with a transmission every 12 hours is the default Mode of operation.

This selection will open a prompt window asking for confirmation to restore all settings to their default. This will not affect the settings stored inside the connected SmartOne(s). The settings will only reset in the software display; it will not reset any device(s) connected to the PC. The **PROGRAM** button must be clicked on to download a configuration to the device.



- **Open Configuration from File.** This opens a window that allows the user to browse for a valid configuration file that has previously been saved. Selecting a file will cause all of the settings contained in the file to be loaded into the software display only, not in any devices connected to the PC. Click the PROGRAM button to download configuration to the device.
- **Read Configuration from SmartOne.** This will query all of the configurable parameters saved in a device connected to the PC. A pop-up window will be displayed to indicate that the configuration is being read from the connected SmartOne device. After the configuration has been read, the values for each configurable parameter in the device will be displayed in the User Data Entry Pane.
- **Save Configuration.** This will open a window that allows the user to browse to a location and save all of the configuration settings. Note: The configuration will be saved in a file formatted for the Configuration Software program.

- **Open Configuration from History.** Every time a device is successfully programmed, the configuration will save that occurrence to a text log file. The information stored is the ESN of the device, the local time at which it was programmed and the actual configuration of the device.



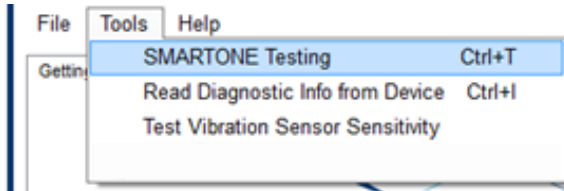
When selected, a window opens where the user can sort by ESN or date/time of programming and select a configuration. This loads the selected configuration settings into the User Data Entry Pane, but not into any device(s) connected to the PC.

- **Exit** This causes the configuration software program to close.

Tools Menu

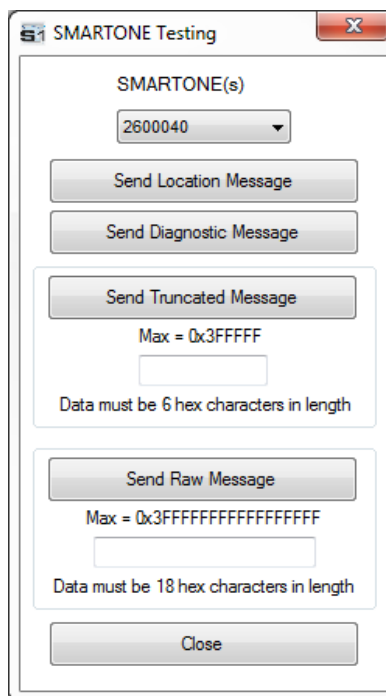
In order to effectively use the testing and diagnostic features on the SmartOne Software Tools, it is recommended to connect to the SmartOne device while it has a good view of the sky to successfully transmit over the satellite network.

- SmartOne Testing

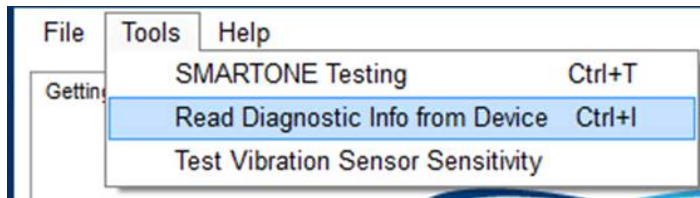


This command opens up a window with the following options:

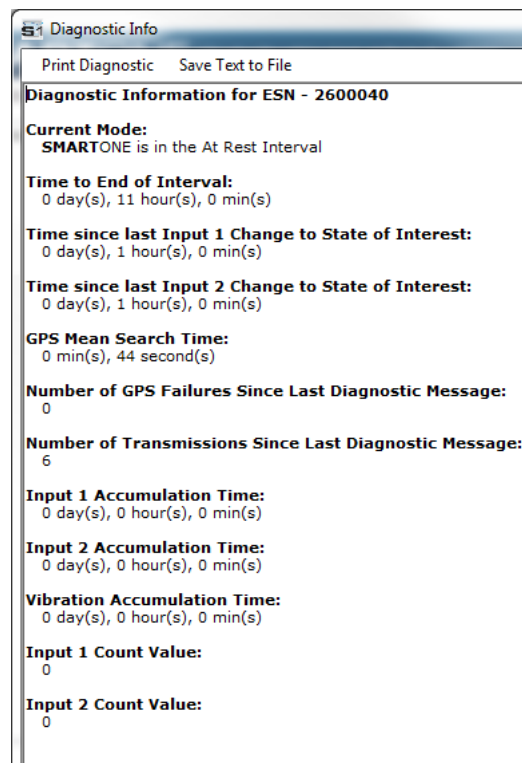
- **SMARTONE(s)** – Drop down list of connected SmartOne units listed by ESN.
- **Send Location Message Button** - Causes the SmartOne connected to the COM port to obtain a GPS fix and send a Location Message.
- **Send Diagnostic Message Button** – Causes the SmartOne connected to send diagnostic information including battery status, GPS average search time, GPS fails and number of transmissions since last diagnostic message.
- **Send Truncated Message Button** - Causes the SmartOne to seek a GPS location, and then send a Truncated SmartOne message (type 1). The hex-character data in the text box below the command will be appended to the GPS data and sent.
- **Send Raw Message Button** - Causes the SmartOne to send the first 8 bytes of data in the text box below the command as the payload for the Raw Payload Message (type 2). The hex-character data in the text box below the command will be sent instead of the normal SmartOne position data.
- **Close Button** – Causes the pop up window to close.



- Read Diagnostic Information from Device



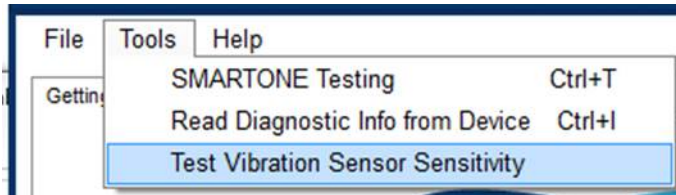
This command line causes the Configuration Software to query the diagnostic information from the SmartOne and display the information in a pop up window in a text format.



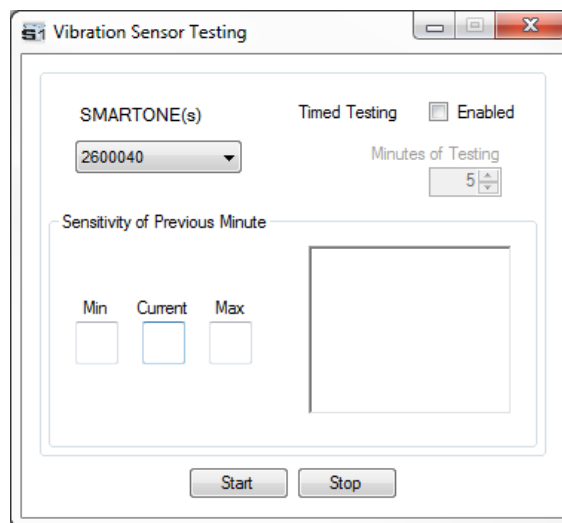
There are two menu options available in the pop up window:

- **Print Diagnostic** – Prints the diagnostic information.
- **Save Text to File** – Opens a window, which allows the user to browse for a location and save the diagnostic information in a text file.

- Test Vibration Sensor Sensitivity

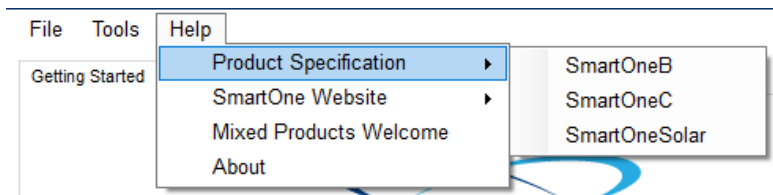


This menu helps to find the minimum, maximum and average vibration sensitivity detected by the vibration sensor installed in the SmartOne device. This information helps to determine the appropriate Level of Sensitivity for the motion sensor. This window will update real time while connected to the SmartOne. Contact your Globalstar Regional Sales Manager for additional guidance in using this feature.

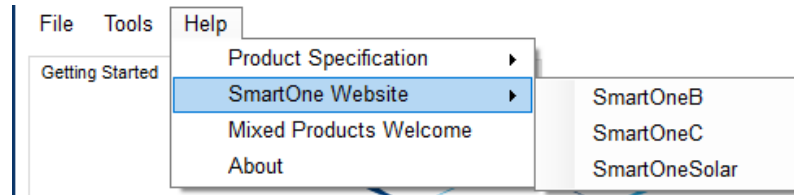


Help Menu

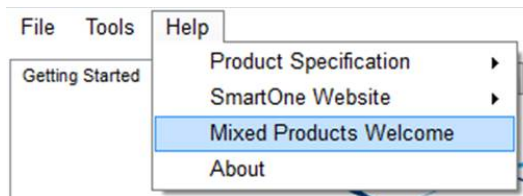
- **Product Specification.** This opens a PDF displaying the selected SmartOne's technical specification document.



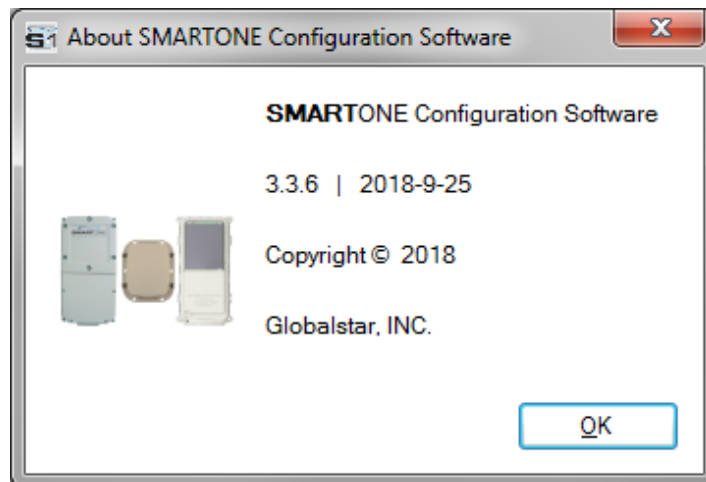
- **SmartOne Website.** This opens the selected SmartOne landing page located on the Globalstar website, displaying the specified SmartOne's features, accessories and purchasing information.



- **Mixed Products Welcome.** This opens a dialog box stating that the SmartOne Configuration Software has been updated to be able to program SmartOne Bs, SmartOne Cs and SmartOne Solars. Additionally, instructions on how to use a SmartOne B Configuration File are displayed.



- **About.** This pops up a window with the SmartOne Configuration Software's version number and release date. You may compare this version with the one located on the VAR Data Support portal to make sure you have the latest version.



4. SmartOne Configuration Software Interface

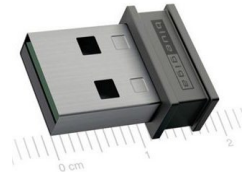
Bluetooth Interface Setup

Installing the Bluetooth Dongle

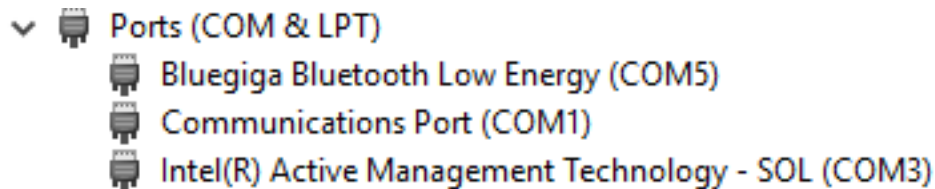
In order to scan the SmartOne device using Bluetooth, a specific Bluetooth dongle is required to be installed and its driver loaded into the (Windows)PC. The specific Bluetooth dongle is the [Bluegiga BLEDV112](#) manufactured by Silicon Laboratories.

Connect the Bluegiga dongle into the a USB port on the PC and wait for the driver to install itself. Normally, the Bluetooth dongle is plug-and-play, so you do not need to install the driver for it, but in the case where the Windows Operating System does not recognize the driver, it may be downloaded from web link below:

<https://www.silabs.com/products/wireless/bluetooth/bluetooth-low-energy-modules/bled112-bluetooth-smart-dongle>



In order to verify that the Bluegiga Bluetooth driver was installed properly, open the Windows Device Manager and expand the Ports (COM & LPT) devices label. It should indicate the Bluegiga Bluetooth Low Energy on a designated communications port:



For further assistance to obtain or install the Bluegiga Bluetooth dongle, contact your Globalstar Regional Sales Manager.

NOTE: The SmartOne must stay within range of the Bluetooth dongle to be properly discovered, programmed or for DFU. It is recommended to stay within an unobstructed distance of 10 meters with the device to perform these functions.

Reading SmartOne Devices over Bluetooth

Once the Bluegiga driver has been installed properly on the PC, the SmartOne Configuration program must be used. For the SmartOne Configuration program to recognize any SmartOne devices over Bluetooth nearby the PC, the magnet must be removed from the SmartOne device(s) prior to using the program.

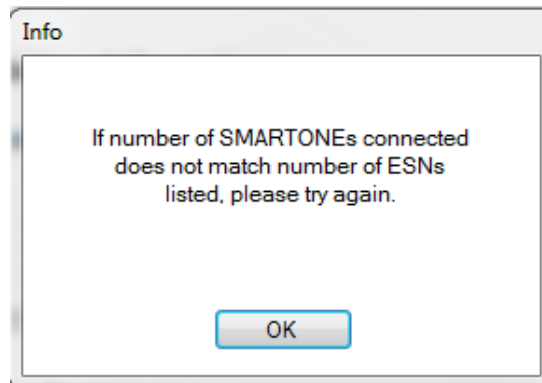
Open the SmartOne Configuration program and in the Status Pane, **Connect By** section, there are two selections with which to communicate with the SmartOne device. The program defaults to the Serial Port connection as shown in the picture above.

Select Bluetooth then select the List ESNs button. The SmartOne Configuration program will start scanning SmartOne device that are nearby the PC. When SmartOne devices are recognized by the program, the ESNs of the SmartOne devices will populate in the ESN Display Table next to the **Connect By** selection. Along with displaying the ESN of each device, the firmware version of the SmartOne and the COM port of the Bluetooth dongle will populate in the ESN Display Table. If the ESN searched for, does not show up in the list, it may be that the Bluetooth advertisement is not active. To make it active

again, simply place the magnet back onto the device and remove it after about 5 seconds then retry pressing the List ESNs button.



After the SmartOne Configuration Software program has completed scanning for attached devices, the following informational dialog will be displayed:

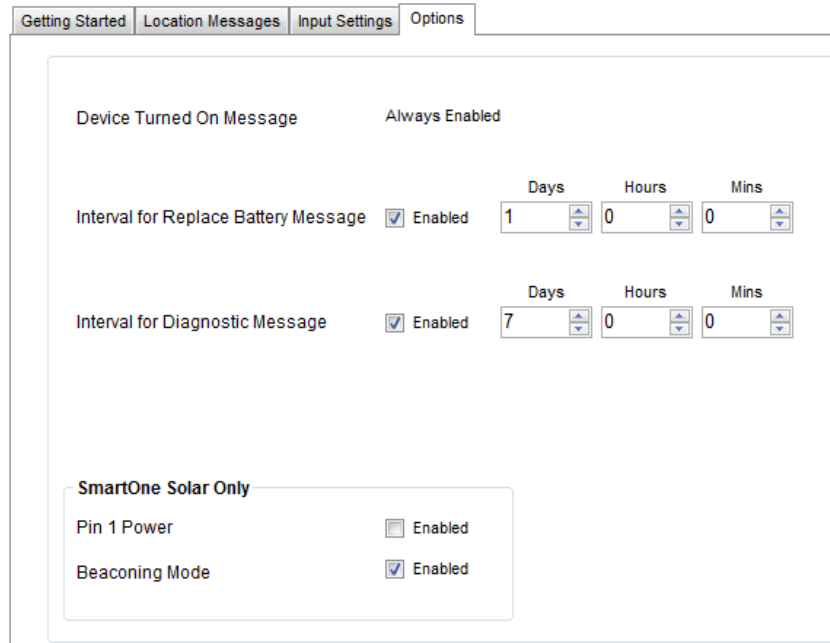


This information is to assist the user in determining if all connected devices have been properly accounted. It is not an error nor warning. Simply press the OK button to close the dialog.

Note: If a question mark is shown in the **FW Ver** column, the Configuration Software cannot properly read the SmartOne device over Bluetooth. Reset the SmartOne device with the magnet and try again.

Bluetooth Beaconing

The SmartOne Solar may be configured to beacon over Bluetooth by selecting the Beaconing Mode check box under the Options tab prior to Programming the device.



Getting Started | Location Messages | Input Settings | **Options**

Device Turned On Message Always Enabled

Interval for Replace Battery Message ☒ Enabled Days: 1 Hours: 0 Mins: 0

Interval for Diagnostic Message ☒ Enabled Days: 7 Hours: 0 Mins: 0

SmartOne Solar Only

Pin 1 Power ☐ Enabled

Beaconing Mode ☒ Enabled

If the SmartOne is configured for Bluetooth Beaconing, the Status column in the Status Pane will report the current status of the functionality. CONNECTABLE means that the SmartOne may be configured over Bluetooth while BEACONING means that the Bluetooth is in beaconing mode. To exit BEACONING mode, the user would need to reset the SmartOne by tapping the magnetic grommet on the device, adjacent to the grommet's mounting screw, to return to CONNECTABLE mode.



SMARTONE STANDARD MESSAGING WITHOUT MOTION

File Tools Help

Getting Started | **Location Messages** | Input Settings | Options

SMARTONE
SATELLITE MANAGED ASSET READY TRACKER

Modes of Operation

☒ Standard Messaging

☒ Without Motion ☐ With Motion

SmartOne Solar Only

☒ Speed and Heading

☐ Reduced Messaging

☐ Theft Alert

Back Next

ESN - (4)	FW Ver	COM	Status
3312939	1.2.0.0	COM7	CONNECTABLE
3312881	1.1.0.0	COM7	CONNECTABLE
3312868	1.2.1.0	COM7	BEACONING
3312879	1.0.1.0	COM7	CONNECTABLE

Connect By

☐ Serial Port ☒ Bluetooth

List ESNs

DFU PROGRAM

View Summary

For reference the following information details the elements that are advertised in the Bluetooth data for easy identification and monitoring of the device:

Manufacturer specific data

ESN

Bluetooth Signature (1398 Globalstar)

Battery Temp (°C)

Battery Voltage (mV)

Charging Voltage (mV)

FW Version Info

Further details of the Bluetooth advertisement while beaconing are contained in the *SmartOne Solar Bluetooth LE Profile Reference Manual*. This manual may be found on the Globalstar VAR Data Support portal at <https://var.globalstar.com>.

If the SmartOne is not configured for Bluetooth beaconing, the Status will display CONNECTABLE during the first 20 minutes of being powered on. After 20 minutes, the SmartOne will no longer be able to be discovered by the Configuration Software program. In order to be discoverable again, briefly place the magnetic grommet on the SmartOne device then remove it.

USB Configuration Cable Interface Setup

Installation of Windows USB Driver

To use the USB Configuration Cable to connect to the SmartOne, the required USB device driver must be installed on the PC running the Windows Operating System. In particular, the device driver for using the USB Configuration Cable is supplied by **Prolific** (PL2303_Prolific_DriverInstaller_v1.18.0B.zip) and may be downloaded at the following link:

http://www.prolific.com.tw/US/ShowProduct.aspx?p_id=225&pcid=41.

Download the ZIP file, unpack it, then run the DriverInstaller executable. It should seamlessly install the correct USB device driver for use with the SmartOne USB Configuration Cable.

USB Cable Connection to Device

The SmartOne may be connected to a PC using a USB Configuration Cable. The USB Configuration Cable plugs into the SmartOne when the connector cover is removed. Since the Windows Operating System needs to install the driver for the SmartOne USB Configuration Cable, first connect the cable to the PC, then to the SmartOne unit.

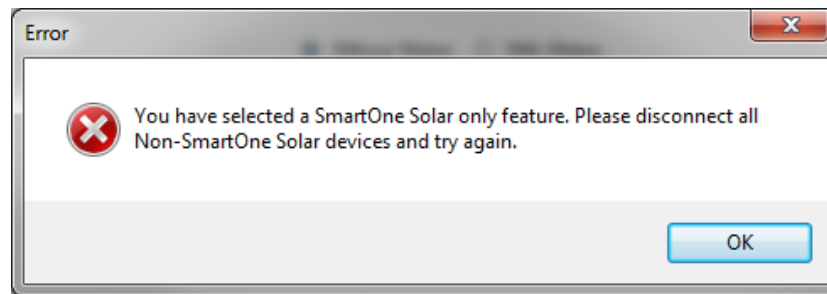


The SmartOne Configuration Software may be used without being connected to devices to prepare configurations but must be connected to a device to program it over the serial line. Once the Program button has been depressed the USB Configuration Cable should not be disconnected from the device and/or the PC.

NOTE: Although it is possible to connect multiple, different types of SmartOne devices via USB Configuration Cables, there are some configuration features that are valid only for SmartOne Solar devices. The SmartOne Configuration Software will prevent the user from attempting to program SmartOne B/LP or SmartOne C devices with any of the following features:

- Speed and Heading (located on Getting Starting tab)
- Wetted Voltage Input (located on Input Settings tab)
- Pin 1 Power (located on Options tab)
- Beaconing Mode (located on Options tab)

If you attempt to configure a SmartOne B/LP or SmartOne C device with SmartOne Solar only feature(s) enabled, after pressing the PROGRAM button the following dialog will be displayed:



It is highly recommended to only connect similar SmartOne products using USB Configuration Cables to program them. Do not mix and match different types of SmartOne devices when programming them over the serial interface. For instance, if a user has SmartOne C devices and SmartOne Solar devices, it is recommended to only connect the SmartOne C devices then program them. The user should then disconnect all the SmartOne C devices first, then connect the SmartOne Solar devices to program them.

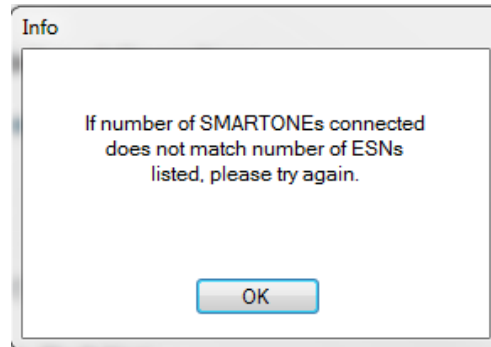
Cable Connection with Configuration Software Program

In the Status Pane, **Connect By** area, select Serial Port then select the List ESNs button. When SmartOne devices are recognized by the program, the ESN(s) of the SmartOne device(s) connected will populate in the ESN Display Table in the Status Pane. Along with displaying the ESN of each device, the firmware version of the SmartOne and the COM port of the associated USB Configuration Cable will populate in the ESN Display Table as shown below:

ESN - (3)	FW Ver	COM	Status
3312868	1.2.1.0	COM17	9600
3312939	1.2.1.0	COM13	9600
3312881	1.1.0.0	COM14	9600

Connect By
☒ Serial Port ☐ Bluetooth

After the Configuration Software program has completed scanning for attached devices, the following informational dialog will be displayed:



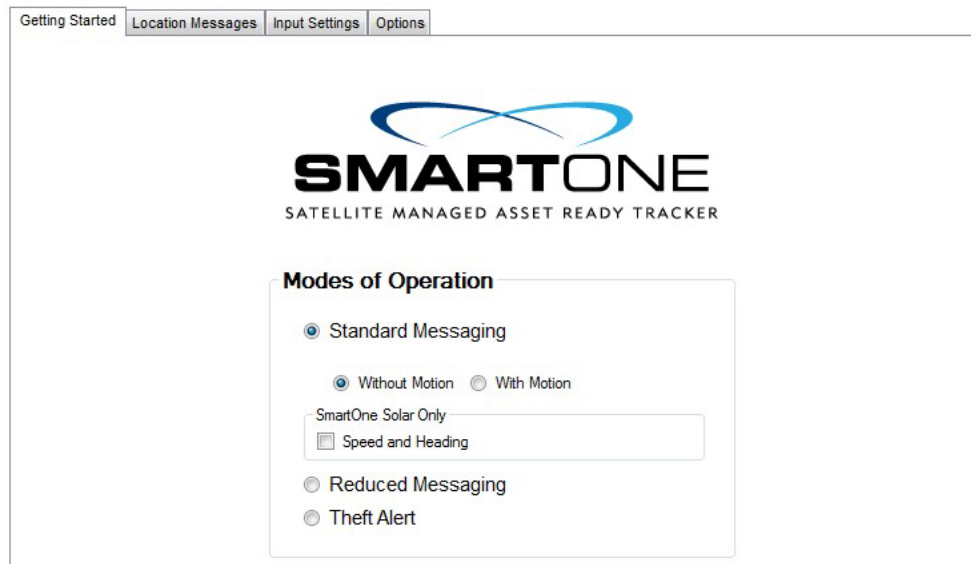
This information is to assist the user in determining if all connected devices have been properly accounted. It is not an error nor warning. Simply press the OK button to close the dialog.

5. Device Configuration with SmartOne Configuration Software

Getting Started Tab

The Getting Started Tab allows the user to select the Mode of operation for the SmartOne. The Modes includes:

- Standard Messaging, with or without Motion, and with or without Speed & Heading.
- Reduced Messaging
- Theft Alert Mode.



Standard Messaging

Standard Messaging Mode - Without Motion

The Standard Messaging without Motion Mode is selected for basic location functionality on the SmartOne. The SmartOne will automatically report its position at regular time intervals or using Time of Day(s) entries. The messages sent in this Mode are called Location Messages. These messages include the GPS coordinates of the actual location of the SmartOne. Along with other pertinent device information.

In this Mode, the motion sensor is OFF.

Standard Messaging Mode - With Motion

The Standard Messaging with Motion Mode is selected for basic tracking functionality with motion detection capabilities. It allows all the features of the Without Motion mode while adding With Motion parameters. The user defines the motion parameters for each application including the Level of Sensitivity of the motion sensor, Time to be in a State of Vibration and Time to be in a State of Lacking Vibration. The SmartOne can be set to report at a different rate, Message Interval while In Motion, compared to the Location Message Interval.

Standard Messaging Mode - With or Without Speed & Heading

For SmartOne Solar devices, Speed and Heading messages are sent in place of Normal Location messages. The Speed & Heading payload can be sent regardless of the sub-selection of Without Motion or With Motion. Please note that Speed and Heading cannot be used for SmartOne B/LP or SmartOne C devices. See the Speed and Heading Message description under the Messages Section for further information.

Reduced Messaging Mode

The Reduced Messaging Mode is ideal for asset management with reduced messaging capability of the SmartOne. The SmartOne creates a Change of Location Area of configurable size around the device. If the SmartOne stays within its Change of Location Area, the number of transmissions will be reduced.

When the SmartOne leaves the Change of Location Area and returned to a State of Lacking Vibration a new Change of Location Area is created around the SmartOne.

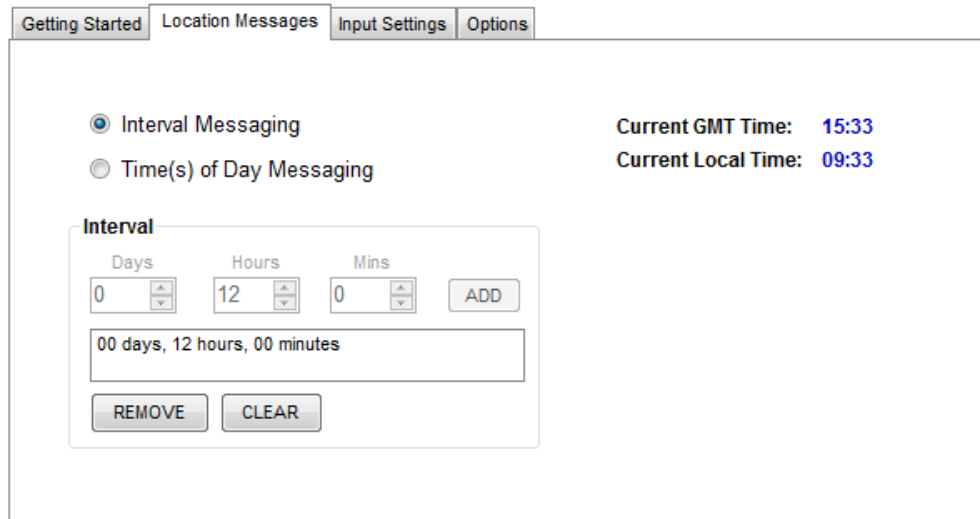
Theft Alert Mode

The Theft Alert Mode is ideal for assets that are high-risk for theft. In this Mode, the SmartOne creates a Change of Location Area around its location when powered. The size of the Change of Location Area is a configurable parameter equal to the distance the device must move to be considered outside the Change of Location Area. If outside the Change of Location Area, the SmartOne goes into alert mode, transmitting frequent messages until the asset is recovered. The message interval in alert mode is a configurable parameter; however, the default value is 30 minutes.

Standard Messaging - Without Motion

Location Messages Tab

Interval Messaging - The SmartOne can be configured to report at a specific message interval specified by days, hours and minutes. The SmartOne accepts a single interval only. Initially, the default value of 12 hours will be entered for the Interval.



Getting Started | **Location Messages** | Input Settings | Options

☒ Interval Messaging Current GMT Time: 15:33
☐ Time(s) of Day Messaging Current Local Time: 09:33

Interval

Days	Hours	Mins	
0	12	0	ADD

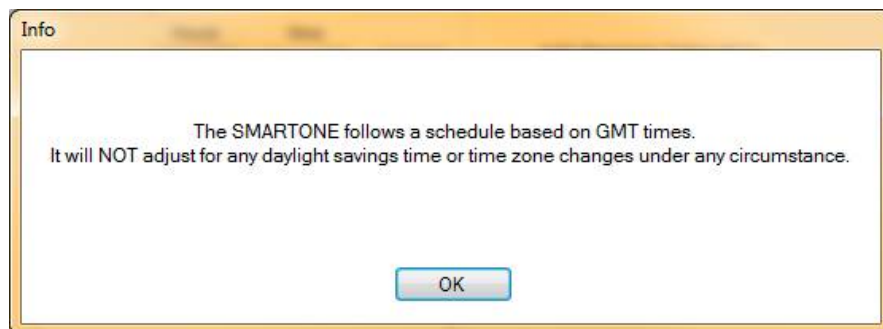
00 days, 12 hours, 00 minutes

REMOVE CLEAR

To enter a different Interval:

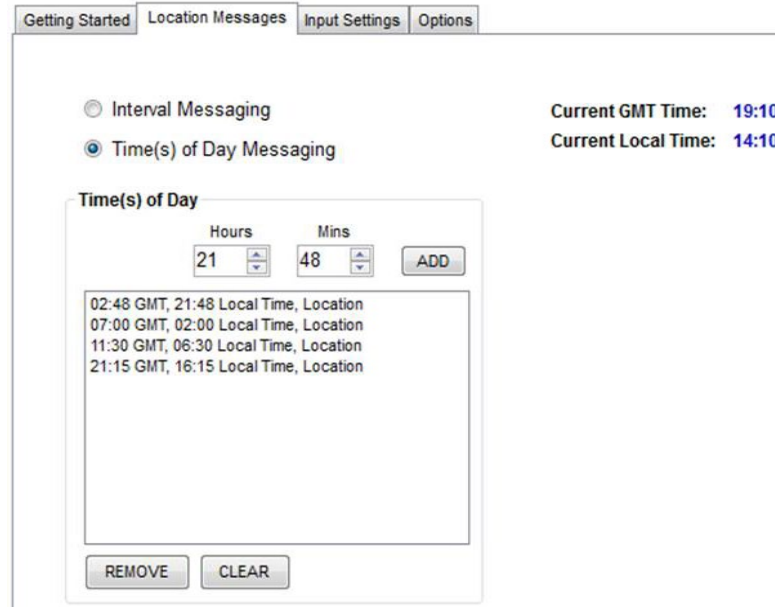
- Click the **REMOVE** or **CLEAR** button to delete the selected interval from the message Interval box.
- Click the **ADD** button to accept the Interval and add it to the message Interval box.

When selecting Time(s) of Day from Interval Messaging, the following informational warning message will be displayed:



Time(s) of Day Messaging - The SmartOne can be configured to report at specific time(s) of day. The message interval box allows up to 12 times of day to send Location Messages. The minimal interval between Time of Day settings is 35 minutes. Initially, there will be no Time(s) of Day entered in the message interval box.

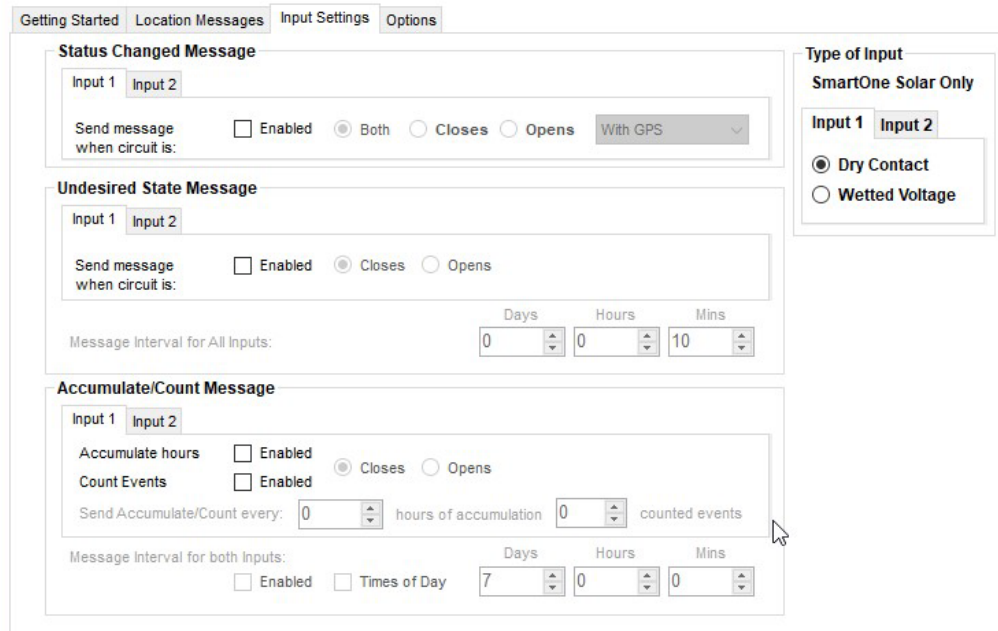
Create a Time of Day interval by selecting Hours and/or Minutes then:



- Click the **ADD** button to accept the interval and add it to the message interval box.
- Click the **REMOVE** button to delete the selected time of day from the message interval box.
- Click the **CLEAR** button to delete all the time of day(s) in the message interval box.

Input Settings Tabs

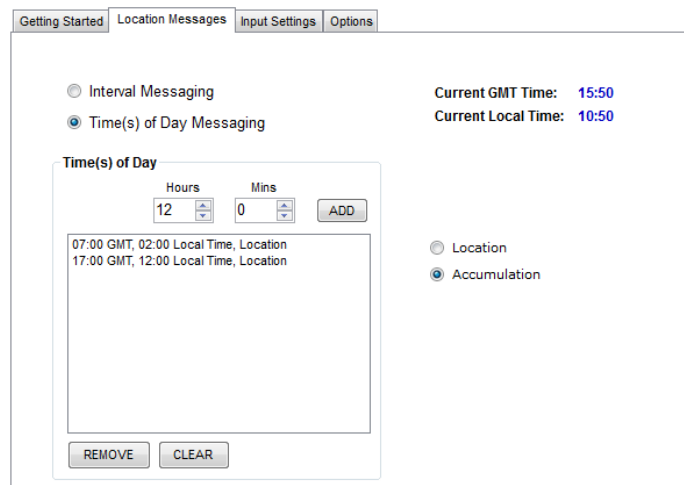
The Input Settings Tab allows a user to select either a Status Changed Message or an Undesired Status Message for each SmartOne Input. The program will not allow a user to select both types for each Input.



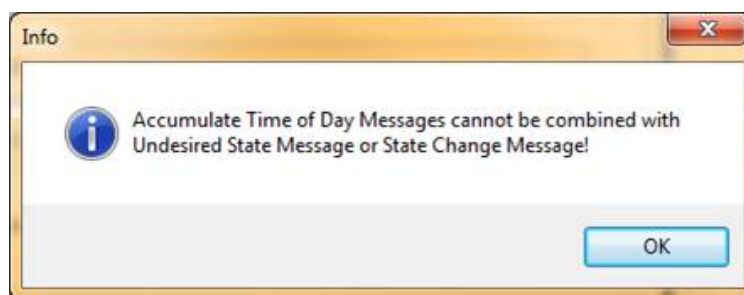
Also, for Smartone Solar devices only, the type of Input may be selected between Dry Contact and Wetted Voltage. See the Input Types section for descriptions of Dry Contact and Wetted Voltage input types. The program defaults to Dry Contact for each input.

Descriptions of the selectable configuration options:

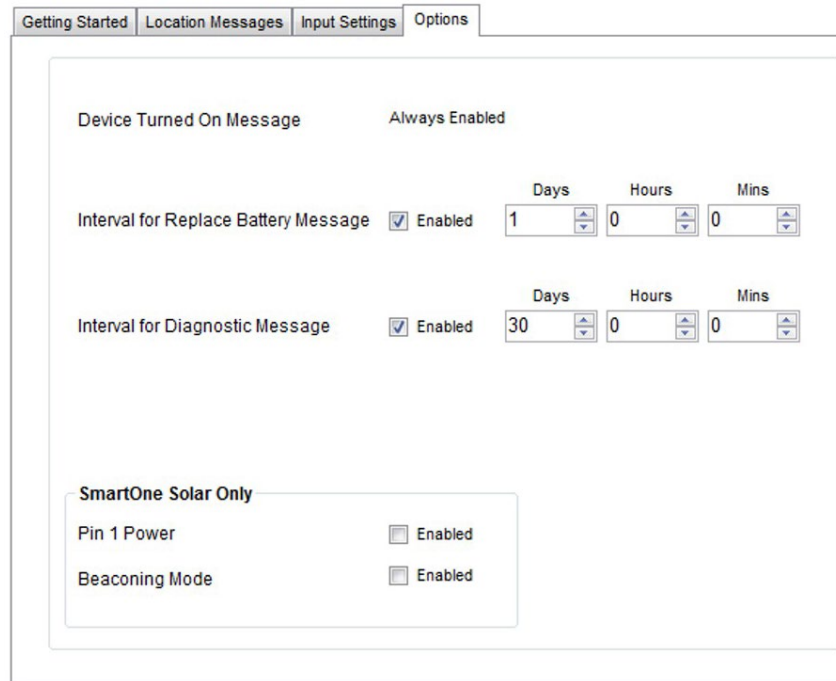
- **Status Changed Message** - The SmartOne has two inputs that can be configured to send a Status Changed Message once the selected input Opens, Closes, or Both. The Message sent can either contain or not contain the GPS coordinates of the device at the time the status of the input(s) changed.
- **Undesired State Message** - The SmartOne can be configured to send messages throughout the time the input is in the undesired state, either to the Open or Closed position. The Message Interval for All Inputs while the input is active can be configured in Days, Hours, and Minutes. Once the input is disabled, the SmartOne will return to the message interval or time (s) of day for Location Messages.
- **Accumulate/Count Message** - The SmartOne can accumulate hours and count events while Input 1 or Input 2 is enabled. The SmartOne can send an accumulate/count message once the configurable intervals are specified in days, hours, and minutes.
 - If Time(s) of Day Messaging was selected for Accumulate/Count Message, the user will need to specify the times in the Location Message Tab, as shown.



- NOTE: Accumulate Time of Day messaging cannot be combined with Undesired State or Status Changed Messaging. If attempted, the dialog below will be displayed.



Options Tab



The screenshot shows the 'Options' tab in a configuration window. At the top, there are four tabs: 'Getting Started', 'Location Messages', 'Input Settings', and 'Options'. The 'Options' tab is selected. Below the tabs, the configuration is organized into sections. The first section is 'Device Turned On Message', which is set to 'Always Enabled'. The second section is 'Interval for Replace Battery Message', which has a checked 'Enabled' checkbox and three spinners for 'Days' (set to 1), 'Hours' (set to 0), and 'Mins' (set to 0). The third section is 'Interval for Diagnostic Message', which also has a checked 'Enabled' checkbox and three spinners for 'Days' (set to 30), 'Hours' (set to 0), and 'Mins' (set to 0). The fourth section is titled 'SmartOne Solar Only' and contains two options: 'Pin 1 Power' and 'Beaconing Mode', both of which have unchecked checkboxes and the word 'Enabled' next to them.

Descriptions of the selectable configuration options:

- **Device Turned On Message** - The SmartOne is configured to always send a Device Turned On Message at Power-up. It is not changeable by the user.
- **Interval for Replace Battery Message** - The SmartOne can be configured to transmit a Replace Battery message based on a low battery condition.
 - To turn this feature on, select the Enabled checkbox.
 - Configuration range extends from 35 minutes to 45 days. The default is 1 day.
 - The SmartOne will detect low battery conditions while at least 100 more messages can still be transmitted.
- **Interval for Diagnostic Message** - The SmartOne can send a diagnostic message with information on the diagnostic status of the device.
 - To turn this feature on, select the Enabled checkbox.
 - The diagnostic message includes battery status, GPS average search time, GPS fails and number of transmissions since last diagnostic message.
 - Transmit interval of diagnostic messages with a transmission rate from 35 minutes to 45 days. The default is 30 days.

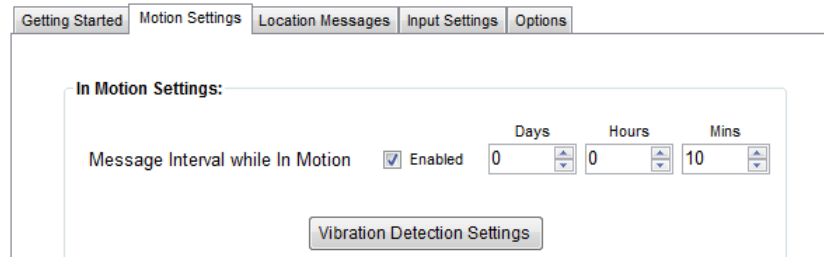
SmartOne Solar-only Options:

- **Pin 1 Power** - Enabling this feature makes limited power available to external devices connected via the serial connector. It is recommended to *not* enable this option without guidance from your Globalstar Sales contact person.
- **Beaconing Mode** - Enabling this feature allows the SmartOne to enter Bluetooth beaconing mode after 20 minutes of being turned on. While beaconing, it will send out a periodic advertisement of its Bluetooth data. See the section on Bluetooth Beaconing for further information.

Standard Messaging Mode - With Motion

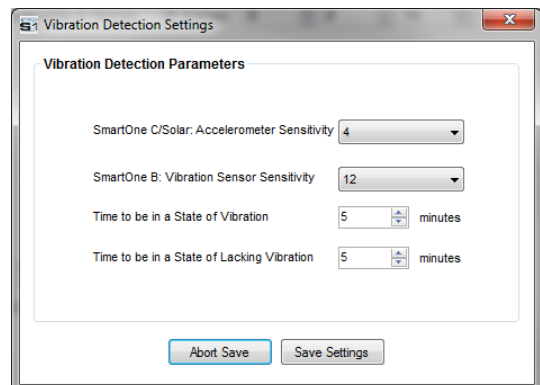
Motion Settings Tab

The Motion Settings Tab of the Configuration Software is used to define the Message Interval while In Motion. This tab also contains the Vibration Detection Settings, which defines how the sensitivity of the vibration sensor and how it determines the device is In Motion.



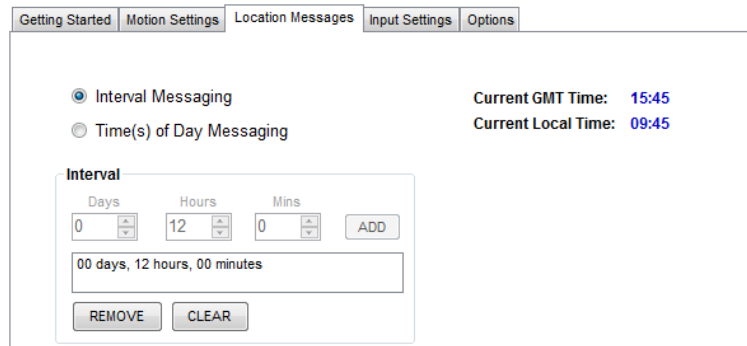
Descriptions of the selectable configuration options:

- **Message Interval while In Motion** - This parameter defines the transmission interval of location messages while SmartOne is In Motion with a transmission rate between 5 minutes to 45 Days. The default is 10 minutes. To turn on this feature, select the Enabled checkbox.
- **Vibration Detection Settings Button** - This button activates the Vibration Detection Settings window. This window contains settings to define how the motion sensor determines that the SmartOne is in a state of vibration. These parameters include Accelerometer Sensitivity, Vibration Sensor Sensitivity, Time to be in a State of Vibration and the Time to be in a State of Lacking Vibration.
 - **SmartOne C/Solar: Accelerometer Sensitivity** - The vibration sensor has a range of sensitivity from 2 to 7 (2 being most sensitive and 7 being least sensitive). The smaller the sensitivity level, the more sensitive the motion sensor would be to movement.
 - **SmartOne B: Vibration Sensor Sensitivity** - The vibration sensor has a range of sensitivity from 4 to 31 (4 being most sensitive and 31 being least sensitive). The smaller the sensitivity level, the more sensitive the motion sensor would be to movement.
 - **Time to be in a State of Vibration** - Time the motion sensor must be above the sensitivity level before being in a State of Vibration. If the device senses continuous vibration for a period of time less than the specified in this parameter, the device will ignore the vibration and will not enter into a State of Vibration.
 - **Time to be in a State of Lacking Vibration** - Time the vibration sensor must be below the sensitivity level before in a State of Lacking Vibration.
 - **Abort Save/Save Settings buttons** - Perform requested function of settings.



Location Messages Tab

Interval Messaging - The SmartOne can be configured to report at a specific message interval specified by days, hours and minutes. The SmartOne accepts a single interval only. Initially, the default value of 12 hours will be entered for the Interval.

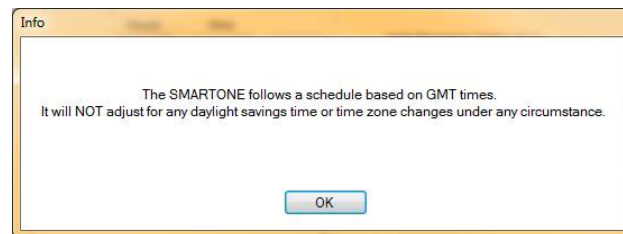


The screenshot shows the 'Location Messages' tab in the SmartOne configuration interface. It features two radio buttons: 'Interval Messaging' (selected) and 'Time(s) of Day Messaging'. To the right, it displays 'Current GMT Time: 15:45' and 'Current Local Time: 09:45'. Below the radio buttons is an 'Interval' section with three input fields for 'Days' (0), 'Hours' (12), and 'Mins' (0), each with up/down arrows. An 'ADD' button is to the right of these fields. Below the input fields is a text box showing '00 days, 12 hours, 00 minutes'. At the bottom of the interval section are 'REMOVE' and 'CLEAR' buttons.

To enter a different Interval:

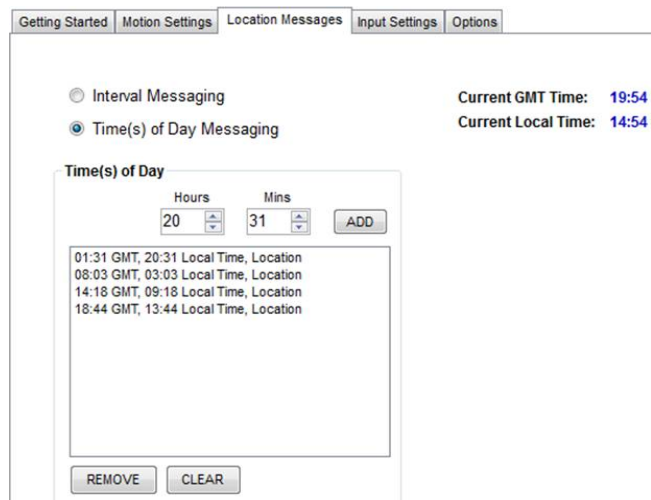
- Click the **REMOVE** or **CLEAR** button to delete the selected interval from the message Interval box.
- Click the **ADD** button to accept the Interval and add it to the message Interval box.

When selecting Time(s) of Day from Interval Messaging, the following informational warning message will be displayed:



Time(s) of Day Messaging - The SmartOne can be configured to report at specific time(s) of day. The message interval box allows up to 12 times of day to send Location Messages. The minimal interval between Time of Day settings is 35 minutes. Initially, there will be no Time(s) of Day entered in the message interval box. Create a Time of Day interval by selecting Hours and/or Minutes then:

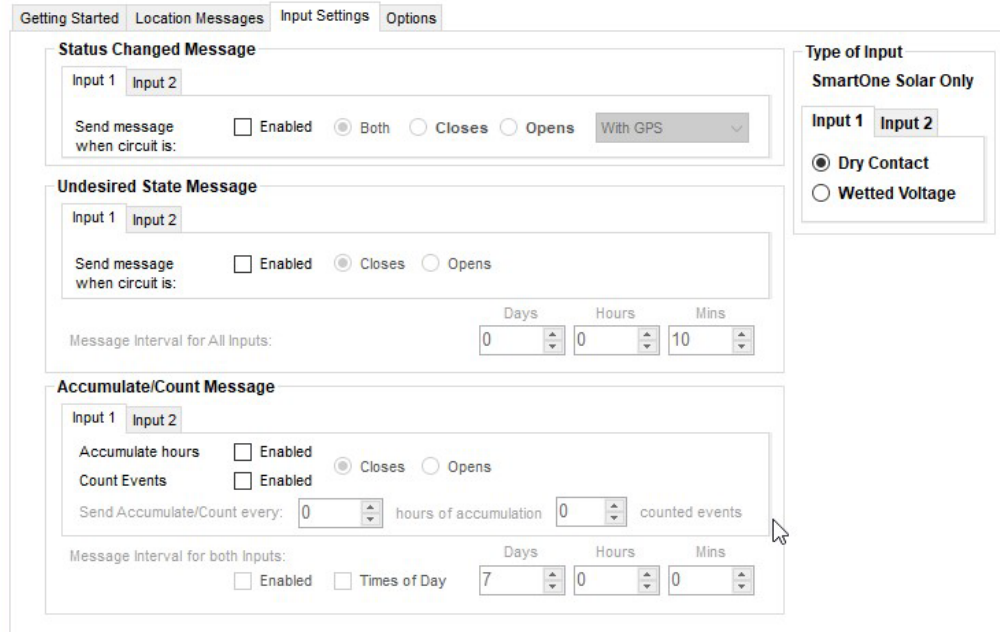
- Click the **ADD** button to accept the interval and add it to the message interval box.
- Click the **REMOVE** button to delete the selected time of day from the message interval box.
- Click the **CLEAR** button to delete all the time of day(s) in the message interval box.



The screenshot shows the 'Location Messages' tab with 'Time(s) of Day Messaging' selected. It displays 'Current GMT Time: 19:54' and 'Current Local Time: 14:54'. Below the radio buttons is a 'Time(s) of Day' section with 'Hours' (20) and 'Mins' (31) input fields, each with up/down arrows, and an 'ADD' button. Below these is a list box containing four entries: '01:31 GMT, 20:31 Local Time, Location', '08:03 GMT, 03:03 Local Time, Location', '14:18 GMT, 09:18 Local Time, Location', and '18:44 GMT, 13:44 Local Time, Location'. At the bottom of the section are 'REMOVE' and 'CLEAR' buttons.

Input Settings Tabs

The Input Settings Tab allows a user to select either a Status Changed Message or an Undesired Status Message for each SmartOne Input. The program will not allow a user to select both types for each Input.



Also, for Smartone Solar devices only, the type of Input may be selected between Dry Contact and Wetted Voltage. See the Input Types section for descriptions of Dry Contact and Wetted Voltage input types. The program defaults to Dry Contact for each input.

Descriptions of the selectable configuration options:

- **Status Changed Message** - The SmartOne has two inputs that can be configured to send a Status Changed Message once the selected input Opens, Closes, or Both. The Message sent can either contain or not contain the GPS coordinates of the device at the time the status of the input(s) changed.
- **Undesired State Message** - The SmartOne can be configured to send messages throughout the time the input is in the undesired state, either to the Open or Closed position. The Message Interval for All Inputs while the input is active can be configured in Days, Hours, and Minutes. Once the input is disabled, the SmartOne will return to the message interval or time (s) of day for Location Messages.
- **Accumulate/Count Message** - The SmartOne can accumulate hours and count events while Input 1 or Input 2 is enabled. The SmartOne can send an accumulate/count message once the configurable intervals are specified in days, hours, and minutes.
 - If Time(s) of Day Messaging was selected for Accumulate/Count Message, the user will need to specify the times in the Location Message Tab, as shown.

Getting Started | Location Messages | Input Settings | Options

☐ Interval Messaging
☒ Time(s) of Day Messaging

Current GMT Time: 15:50
Current Local Time: 10:50

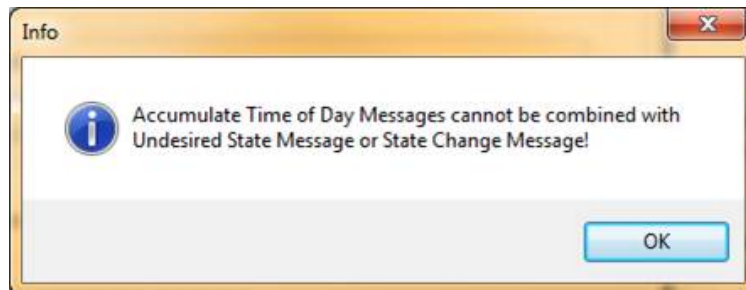
Time(s) of Day

Hours: 12 Mins: 0

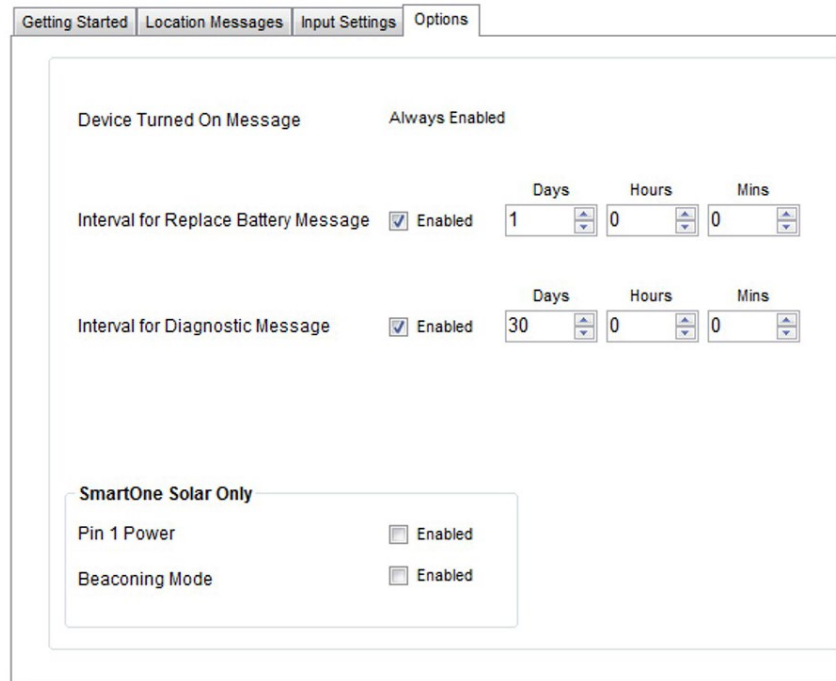
07:00 GMT, 02:00 Local Time, Location
17:00 GMT, 12:00 Local Time, Location

☐ Location
☒ Accumulation

- NOTE: Accumulate Time of Day messaging cannot be combined with Undesired State or Status Changed Messaging. If attempted, the dialog below will be displayed.



Options Tab



The screenshot shows the 'Options' tab in a configuration window. At the top, there are four tabs: 'Getting Started', 'Location Messages', 'Input Settings', and 'Options'. The 'Options' tab is selected. Below the tabs, the configuration is organized into sections. The first section is 'Device Turned On Message', which is 'Always Enabled'. The second section is 'Interval for Replace Battery Message', which is 'Enabled' with a checkbox. It has three input fields for 'Days' (1), 'Hours' (0), and 'Mins' (0). The third section is 'Interval for Diagnostic Message', which is 'Enabled' with a checkbox. It has three input fields for 'Days' (30), 'Hours' (0), and 'Mins' (0). The fourth section is 'SmartOne Solar Only', which contains two options: 'Pin 1 Power' and 'Beaconing Mode', both of which are 'Enabled' with checkboxes.

Descriptions of the selectable configuration options:

- **Device Turned On Message** - The SmartOne is configured to always send a Device Turned On Message at Power-up. It is not changeable by the user.
- **Interval for Replace Battery Message** - The SmartOne can be configured to transmit a Replace Battery message based on a low battery condition.
 - To turn this feature on, select the Enabled checkbox.
 - Configuration range extends from 35 minutes to 45 days. The default is 1 day.
 - The SmartOne will detect low battery conditions while at least 100 more messages can still be transmitted.
- **Interval for Diagnostic Message** - The SmartOne can send a diagnostic message with information on the diagnostic status of the device.
 - To turn this feature on, select the Enabled checkbox.
 - The diagnostic message includes battery status, GPS average search time, GPS fails and number of transmissions since last diagnostic message.
 - Transmit interval of diagnostic messages with a transmission rate from 35 minutes to 45 days. The default is 30 days.

SmartOne Solar-only Options:

- **Pin 1 Power** - Enabling this feature makes limited power available to external devices connected via the serial connector. It is recommended to *not* enable this option without guidance from your Globalstar Sales contact person.
- **Beaconing Mode** - Enabling this feature allows the SmartOne to enter Bluetooth beaconing mode after 20 minutes of being turned on. While beaconing, it will send out a periodic advertisement of its Bluetooth data. See the section on Bluetooth Beaconing for further information.

Reduced Messaging Mode

Change of Location Tab

Getting Started | **Change of Location** | Input Settings | Options

Inside Change of Location Area

Change of Location Range: 1000 meters

Message Interval inside Change of Location Area: ☐ Enabled
 Days: 1, Hours: 0, Mins: 0

Position Check Interval while in State of Vibration: Days: 0, Hours: 1, Mins: 0

Vibration Detection Settings

Outside Change of Location Area

Change of Location Message: 1

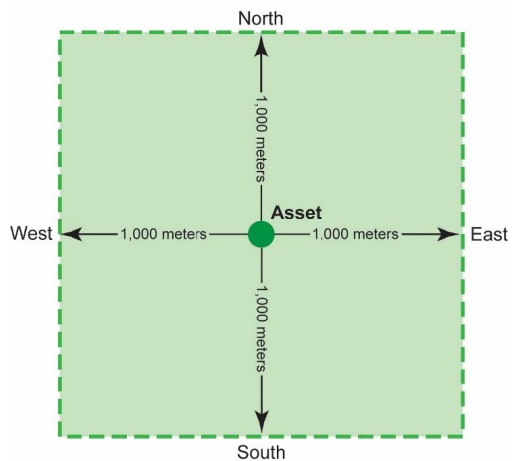
In Motion Interval: Days: 0, Hours: 1, Mins: 0

Change of Location Re-Center Message: ☒ Enabled

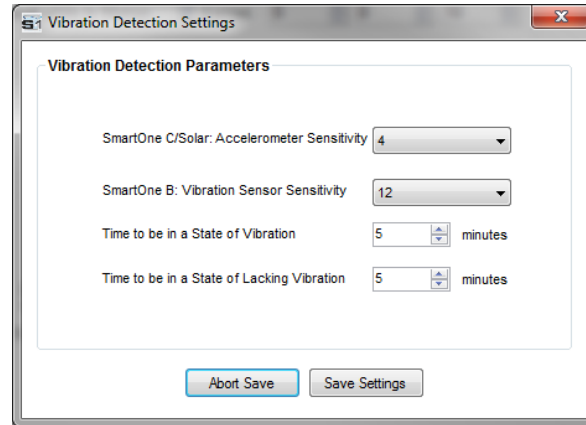
Descriptions of the selectable configuration options:

- **Inside Change of Location Area** The parameters in this section define the functionality of the device while inside its Change of Location Area while in Reduced Messaging Mode.
 - **Change of Location Range** - Specifies the length (in meters, kilometers, yards, or miles) from the center of the Change of Location Area.
 - **Message Interval inside the Change of Location Area** - The SmartOne can be configured to transmit messages while inside the Change of Location Area. This parameter allows you to configure the message interval inside the Change of Location Area in days, hours and minutes. In the Reduced Messaging Mode, the asset will send infrequent messages if asset is in its Change of Location Area.
 - **Position Check Interval while in State of Vibration** - The SmartOne can be configured to check GPS coordinates at a rate different from the transmission rate. This interval will determine the accuracy in time on how quickly the device will sense that it has left its Change of Location Area.

Change of Location Range: Reduce Messaging



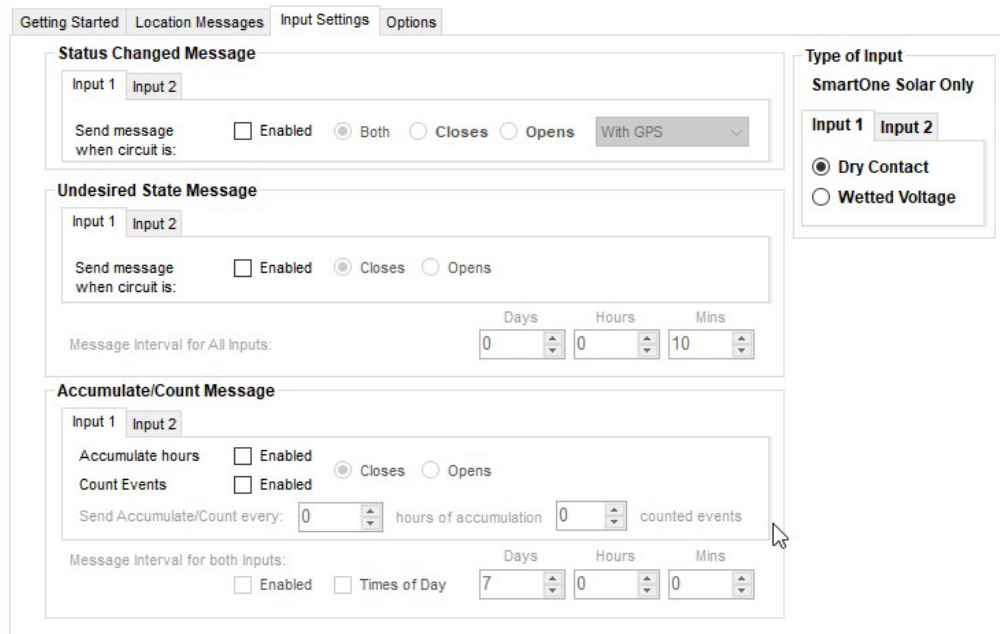
- **Vibration Detection Settings Button** - This button activates the Vibration Detection Settings window. This window contains settings to define how the motion sensor determines that the SmartOne is in a state of vibration. These parameters include Accelerometer Sensitivity, Vibration Sensor Sensitivity, Time to be in a State of Vibration and the Time to be in a State of Lacking Vibration.



- **SmartOne C/Solar: Accelerometer Sensitivity.** The vibration sensor has a range of sensitivity from 2 to 7 (2 being most sensitive and 7 being least sensitive). The smaller the sensitivity level, the more sensitive the motion sensor would be to movement.
- **SmartOne B: Vibration Sensor Sensitivity.** The vibration sensor has a range of sensitivity from 4 to 31 (4 being most sensitive and 31 being least sensitive). The smaller the sensitivity level, the more sensitive the motion sensor would be to movement.
- **Time to be in a State of Vibration.** Time the motion sensor must be above the sensitivity level before being in a State of Vibration. If the device senses continuous vibration for a period of time less than the specified in this parameter, the device will ignore the vibration and will not enter into a State of Vibration.
- **Time to be in a State of Lacking Vibration.** Time the vibration sensor must be below the sensitivity level before in a State of Lacking Vibration.
- **Abort Save/Save Settings buttons.** Perform requested function of settings.
- **Outside Change of Location Area** - The parameters in this section define the functionality of the device while outside its Change of Location Area.
 - **Change of Location Alert Message** - The SmartOne can be configured to send a Change of Location Area Alert message when the device leaves the Change of Location Area. This special message can be processed by the back office application to send a notification to a cellular phone or to an email account that the asset has left the Change of Location Area. The number of Change of Location Area Alert messages sent by the device is set to 1 and cannot be altered by the user.
 - **In Motion Interval** - This parameter determines the message interval once the SmartOne device is outside the Change of Location Area and In Motion.
 - **Change of Location Re-Center Message** - If Enabled, once the SmartOne creates a new Change of Location Area after entering the At Rest State, it will send a Change of Location Re-Center Message.

Input Settings Tabs

The Input Settings Tab allows a user to select either a Status Changed Message or an Undesired Status Message for each SmartOne Input. The program will not allow a user to select both types for each Input.

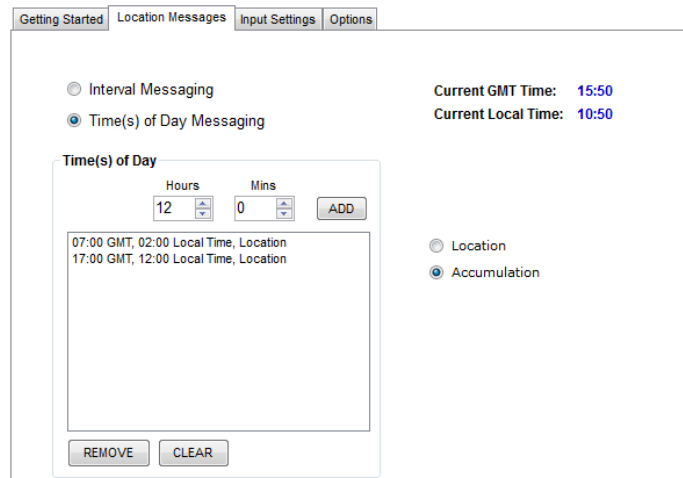


Also, for Smartone Solar devices only, the type of Input may be selected between Dry Contact and Wetted Voltage. See the Input Types section for descriptions of Dry Contact and Wetted Voltage input types. The program defaults to Dry Contact for each input.

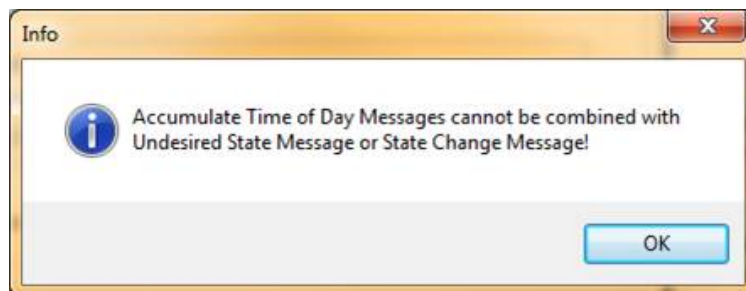
Descriptions of the selectable configuration options:

- **Status Changed Message** - The SmartOne has two inputs that can be configured to send a Status Changed Message once the selected input Opens, Closes, or Both. The Message sent can either contain or not contain the GPS coordinates of the device at the time the status of the input(s) changed.
- **Undesired State Message** - The SmartOne can be configured to send messages throughout the time the input is in the undesired state, either to the Open or Closed position. The Message Interval for All Inputs while the input is active can be configured in Days, Hours, and Minutes. Once the input is disabled, the SmartOne will return to the message interval or time (s) of day for Location Messages.

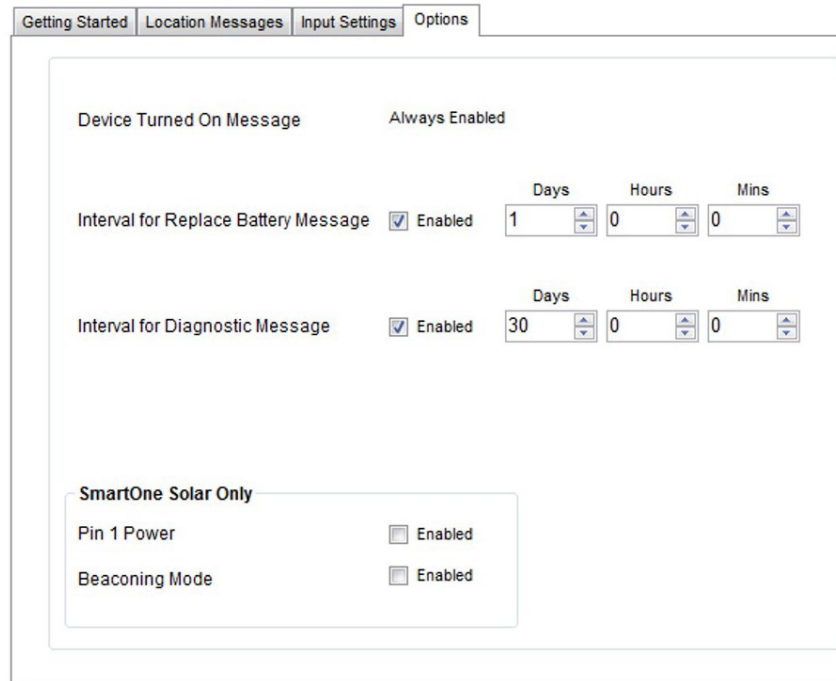
- **Accumulate/Count Message** - The SmartOne can accumulate hours and count events while Input 1 or Input 2 is enabled. The SmartOne can send an accumulate/count message once the configurable intervals are specified in days, hours, and minutes.
 - If Time(s) of Day Messaging was selected for Accumulate/Count Message, the user will need to specify the times in the Location Message Tab, as shown.



- NOTE: Accumulate Time of Day messaging cannot be combined with Undesired State or Status Changed Messaging. If attempted, the dialog below will be displayed.



Options Tab



Descriptions of the selectable configuration options:

- **Device Turned On Message** - The SmartOne is configured to always send a Device Turned On Message at Power-up. It is not changeable by the user.
- **Interval for Replace Battery Message** - The SmartOne can be configured to transmit a Replace Battery message based on a low battery condition.
 - To turn this feature on, select the Enabled checkbox.
 - Configuration range extends from 35 minutes to 45 days. The default is 1 day.
 - The SmartOne will detect low battery conditions while at least 100 more messages can still be transmitted.
- **Interval for Diagnostic Message** - The SmartOne can send a diagnostic message with information on the diagnostic status of the device.
 - To turn this feature on, select the Enabled checkbox.
 - The diagnostic message includes battery status, GPS average search time, GPS fails and number of transmissions since last diagnostic message.
 - Transmit interval of diagnostic messages with a transmission rate from 35 minutes to 45 days. The default is 30 days.

SmartOne Solar-only Options:

- **Pin 1 Power** - Enabling this feature makes limited power available to external devices connected via the serial connector. It is recommended to *not* enable this option without guidance from your Globalstar Sales contact person.
- **Beaconing Mode** - Enabling this feature allows the SmartOne to enter Bluetooth beaconing mode after 20 minutes of being turned on. While beaconing, it will send out a periodic advertisement of its Bluetooth data. See the section on Bluetooth Beaconing for further information.

Theft Alert Mode

Change of Location Tab

Getting Started | **Change of Location** | Input Settings | Options

Inside Change of Location Area

Change of Location Range: 1000 meters

Message Interval inside Change of Location Area: ☒ Enabled
 Days: 1, Hours: 0, Mins: 0

Position Check Interval while in State of Vibration: Days: 0, Hours: 1, Mins: 0

Vibration Detection Settings

Outside Change of Location Area

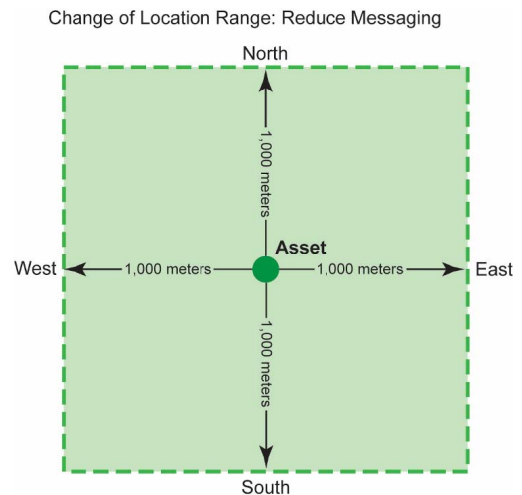
Change of Location Message: 1

In Motion Interval: Days: 0, Hours: 1, Mins: 0

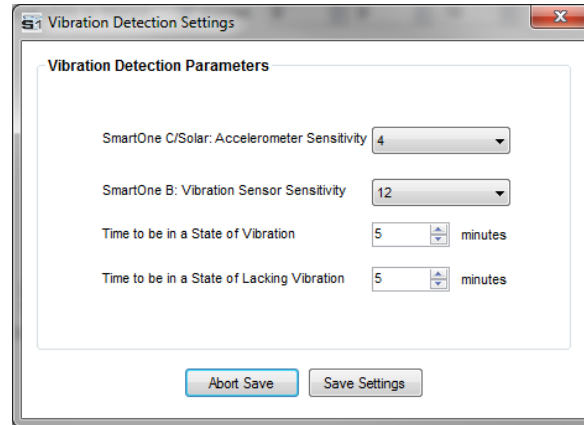
Change of Location Re-Center Message: ☒ Enabled

Descriptions of the selectable configuration options:

- **Inside Change of Location Area** The parameters in this section define the functionality of the device while inside its Change of Location Area while in Reduced Messaging Mode.
- **Change of Location Range. Change of Location Range** - Specifies the length (in meters, kilometers, yards, or miles) from the center of the Change of Location Area.
- **Message Interval inside the Change of Location Area** - The SmartOne can be configured to transmit messages while inside the Change of Location Area. This parameter allows you to configure the message interval inside the Change of Location Area in days, hours and minutes. In the Reduced Messaging Mode, the asset will send infrequent messages if asset is in its Change of Location Area.
- **Position Check Interval while in State of Vibration** - The SmartOne can be configured to check GPS coordinates at a rate different from the transmission rate. This interval will determine the accuracy in time on how quickly the device will sense that it has left its Change of Location Area.



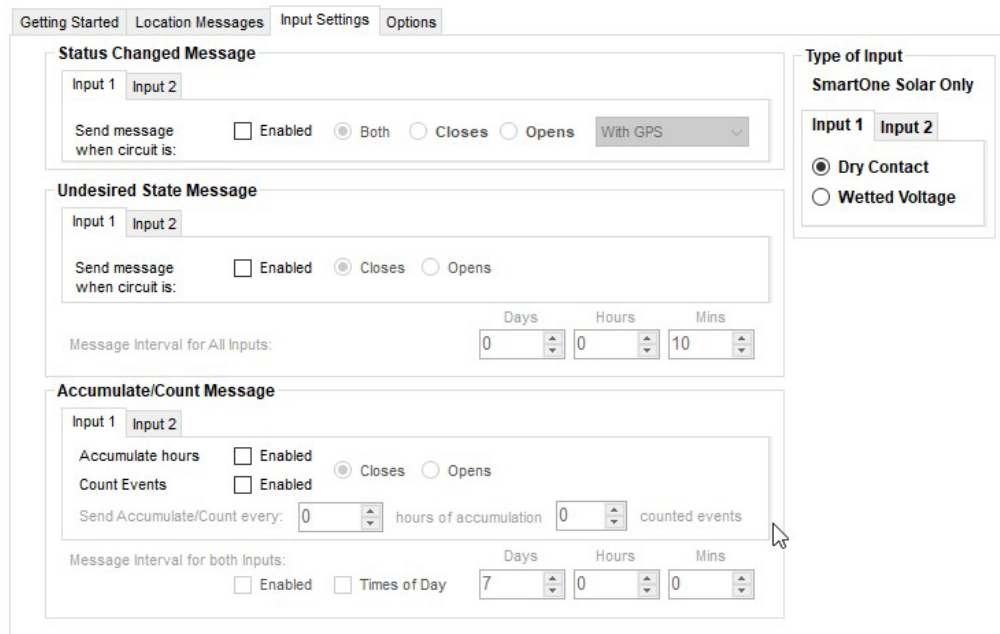
- **Vibration Detection Settings Button** - This button activates the Vibration Detection Settings window. This window contains settings to define how the motion sensor determines that the SmartOne is in a state of vibration. These parameters include Accelerometer Sensitivity, Vibration Sensor Sensitivity, Time to be in a State of Vibration and the Time to be in a State of Lacking Vibration.



- **SmartOne C: Accelerometer Sensitivity.** The vibration sensor has a range of sensitivity from 2 to 7 (2 being most sensitive and 7 being least sensitive). The smaller the sensitivity level, the more sensitive the motion sensor would be to movement.
- **SmartOne B: Vibration Sensor Sensitivity.** The vibration sensor has a range of sensitivity from 4 to 31 (4 being most sensitive and 31 being least sensitive). The smaller the sensitivity level, the more sensitive the motion sensor would be to movement.
- **Time to be in a State of Vibration.** Time the motion sensor must be above the sensitivity level before being in a State of Vibration. If the device senses continuous vibration for a period of time less than the specified in this parameter, the device will ignore the vibration and will not enter into a State of Vibration.
- **Time to be in a State of Lacking Vibration.** Time the vibration sensor must be below the sensitivity level before in a State of Lacking Vibration.
- **Abort Save/Save Settings buttons.** Perform requested function of settings.
- **Outside Change of Location Area** - The parameters in this section define the functionality of the device while outside its Change of Location Area.
 - **Change of Location Alert Message** - The SmartOne can be configured to send a Change of Location Area Alert message when the device leaves the Change of Location Area. This special message can be processed by the back-office application to send a notification to a cellular phone or to an email account that the asset has left the Change of Location Area. The number of Change of Location Area Alert messages sent by the device is set to 1 and cannot be altered by the user.
 - **In Motion Interval** - This parameter determines the message interval once the SmartOne device is outside the Change of Location Area and In Motion.
 - In Theft Alert Mode, the device will continue to send messages outside of Change of Location Area at the specified In Motion message interval until the device is Re-Centered by toggling the switch under the connector cover from ON to OFF then back to ON.
 - The device will create a new Change of Location Area in the Theft Alert Mode immediately after turning ON the device using the connector.
 - **At Rest Interval** - This parameter determines the message interval once device is outside the Change of Location Area and At Rest. The device is considered to be at rest when the comparison of a new GPS reading to a previous GPS reading indicates that the tracker has not changed location by more than a specified minimum distance.

Input Settings Tab

The Input Settings Tab allows a user to select either a Status Changed Message or an Undesired Status Message for each SmartOne Input. The program will not allow a user to select both types for each Input.



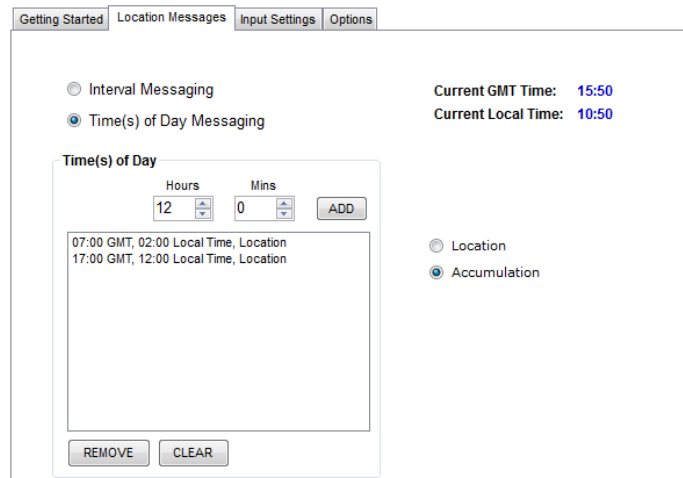
The screenshot shows the 'Input Settings' tab with three main sections: 'Status Changed Message', 'Undesired State Message', and 'Accumulate/Count Message'. Each section has settings for 'Input 1' and 'Input 2'. The 'Status Changed Message' section includes options for 'Send message when circuit is:' (Enabled, Both, Closes, Opens) and a 'With GPS' dropdown. The 'Undesired State Message' section includes options for 'Send message when circuit is:' (Enabled, Closes, Opens) and a 'Message Interval for All Inputs' section with Days, Hours, and Mins dropdowns. The 'Accumulate/Count Message' section includes options for 'Accumulate hours' and 'Count Events' (Enabled, Closes, Opens), a 'Send Accumulate/Count every:' section with a dropdown and 'hours of accumulation' and 'counted events' fields, and a 'Message Interval for both Inputs' section with 'Enabled' and 'Times of Day' checkboxes and Days, Hours, and Mins dropdowns. On the right side, there is a 'Type of Input' section for 'SmartOne Solar Only' with 'Input 1' and 'Input 2' tabs and radio buttons for 'Dry Contact' and 'Wetted Voltage'.

Also, for Smartone Solar devices only, the type of Input may be selected between Dry Contact and Wetted Voltage. See the Input Types section for descriptions of Dry Contact and Wetted Voltage input types. The program defaults to Dry Contact for each input.

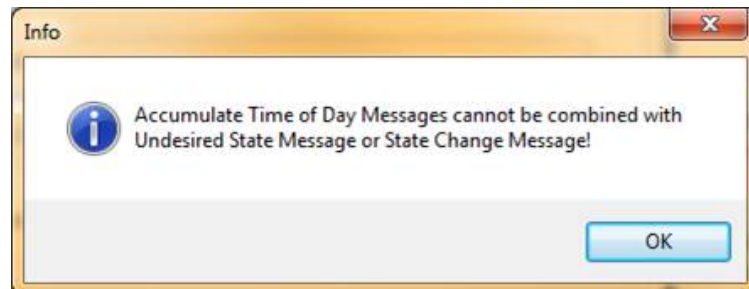
Descriptions of the selectable configuration options:

- **Status Changed Message** - The SmartOne has two inputs that can be configured to send a Status Changed Message once the selected input Opens, Closes, or Both. The Message sent can either contain or not contain the GPS coordinates of the device at the time the status of the input(s) changed.
- **Undesired State Message** - The SmartOne can be configured to send messages throughout the time the input is in the undesired state, either to the Open or Closed position. The Message Interval for All Inputs while the input is active can be configured in Days, Hours, and Minutes. Once the input is disabled, the SmartOne will return to the message interval or time (s) of day for Location Messages.

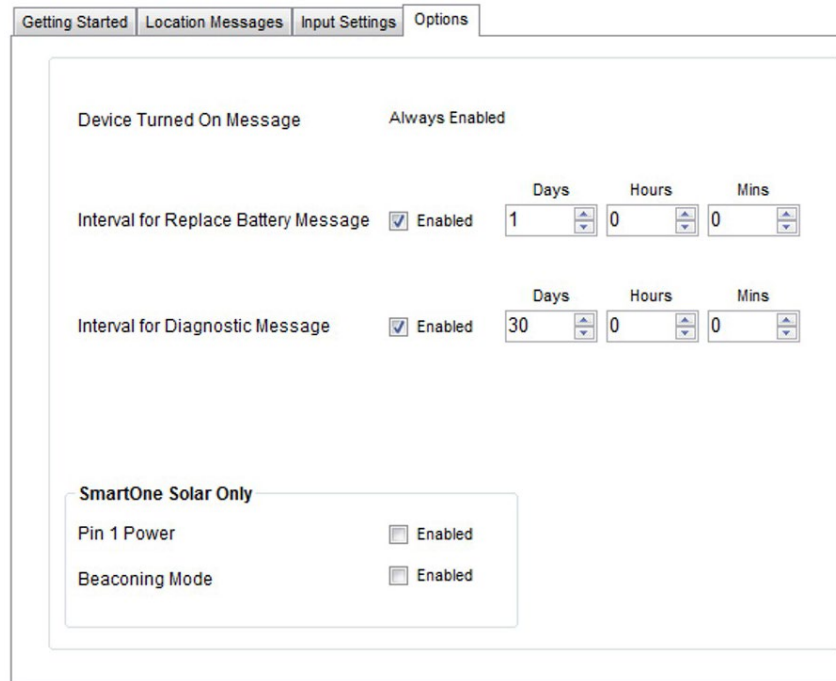
- **Accumulate/Count Message** - The SmartOne can accumulate hours and count events while Input 1 or Input 2 is enabled. The SmartOne can send an accumulate/count message once the configurable intervals are specified in days, hours, and minutes.
 - If Time(s) of Day Messaging was selected for Accumulate/Count Message, the user will need to specify the times in the Location Message Tab, as shown.



- NOTE: Accumulate Time of Day messaging cannot be combined with Undesired State or Status Changed Messaging. If attempted, the dialog below will be displayed.



Options Tab



Descriptions of the selectable configuration options:

- **Device Turned On Message** - The SmartOne is configured to always send a Device Turned On Message at Power-up. It is not changeable by the user.
- **Interval for Replace Battery Message** - The SmartOne can be configured to transmit a Replace Battery message based on a low battery condition.
 - To turn this feature on, select the Enabled checkbox.
 - Configuration range extends from 35 minutes to 45 days. The default is 1 day.
 - The SmartOne will detect low battery conditions while at least 100 more messages can still be transmitted.
- **Interval for Diagnostic Message** - The SmartOne can send a diagnostic message with information on the diagnostic status of the device.
 - To turn this feature on, select the Enabled checkbox.
 - The diagnostic message includes battery status, GPS average search time, GPS fails and number of transmissions since last diagnostic message.
 - Transmit interval of diagnostic messages with a transmission rate from 35 minutes to 45 days. The default is 30 days.

SmartOne Solar-only Options:

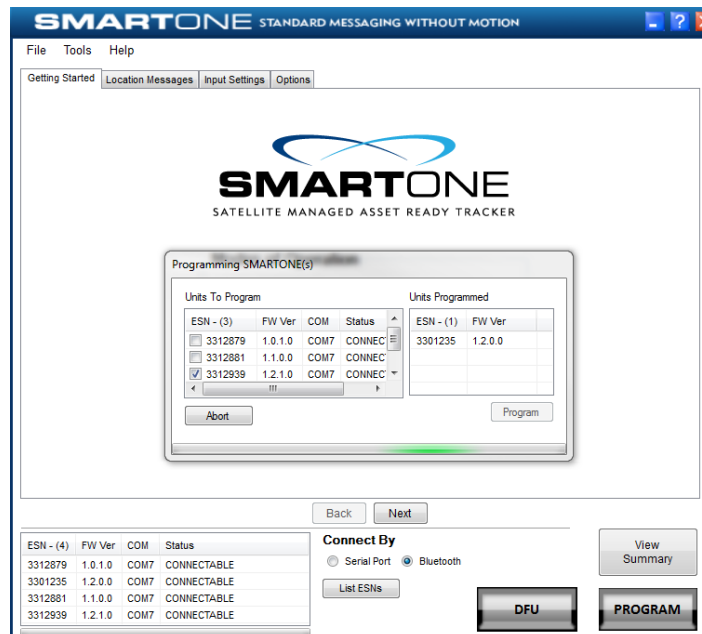
- **Pin 1 Power** - Enabling this feature makes limited power available to external devices connected via the serial connector. It is recommended to *not* enable this option without guidance from your Globalstar Sales contact person.
- **Beaconing Mode** - Enabling this feature allows the SmartOne to enter Bluetooth beaconing mode after 20 minutes of being turned on. While beaconing, it will send out a periodic advertisement of its Bluetooth data. See the section on Bluetooth Beaconing for further information.

Configuration Software Programming Overview

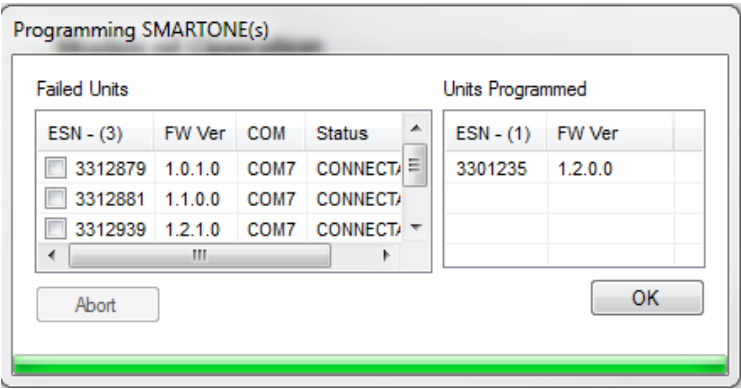
When using the Bluetooth interface, multiple SmartOne devices may be programmed simultaneously. Once the devices have been scanned and the ESNs are populated in the ESN Display Table, the SmartOne devices are ready to be programmed. Configure the device using the Configuration Software's user interface and press the Program button. The screen similar to the one below will be displayed:



By default, the Configuration Software will select all the ESNs. If you do not want to program all units, uncheck them from the list and click Program button in the Programming SMARTONE(s) window. The Configuration Software program will start programming the SmartOne devices individually and a progress bar will be displayed as shown:



When the SmartOne has been programmed successfully the dialog below will be displayed.



SmartOne Solar DFU

Overview

The SmartOne Solar contains a Bluetooth radio, allowing Device Firmware Update over the air with Bluetooth and the Bluegiga dongle, or via serial port connection using the Globalstar USB Configuration Cable. This section describes the procedure to accomplish a DFU using either connection method.

Before starting the Device Firmware Update, make sure that you have the firmware files installed on your machine. Check that the following three files are in the same directory as the SmartOne Configuration Software executable:

- iris_app_dfu_release.bin
- iris_app_dfu_release.dat
- iris_app_release_rev_d_package.zip

If the file(s) are not there, download the latest SmartOne Solar Release Package from the Globalstar VAR Support site and place all files in the same Windows folder as the SmartOne Configuration Software executable file as shown below:

 SmartOne Configuration Software 3.3.6.exe	938 KB	9/25/2018 2:00 PM	Application
 iris_app_dfu_release.bin	143 KB	9/7/2018 3:35 PM	BIN File
 iris_app_dfu_release.dat	1 KB	9/7/2018 3:35 PM	DAT File
 iris_app_release_rev_d_package.zip	144 KB	9/10/2018 11:31 AM	IZArc ZIP Archive

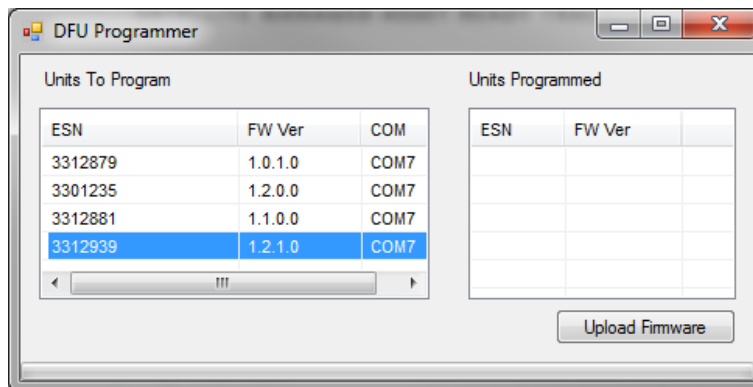
To commence the DFU procedure, perform a scan for devices by selecting either the Serial Port or Bluetooth buttons in the Status Pane, Connect By section, and press List ESNs. The SmartOne Configuration Software program will now scan for SmartOne Solar units in the nearby area that are actively broadcasting their presence (if using Bluetooth) and will scan for physically connected units if using Serial Port and USB Configuration Cables.

For Bluetooth, if ESNs do not appear listed in the window, ensure that any over-the-air units are broadcasting their presence properly by tapping the included magnet at the designated area on the device and try again by clicking on List ESNs. For cable-connected units, check your connections and try again.

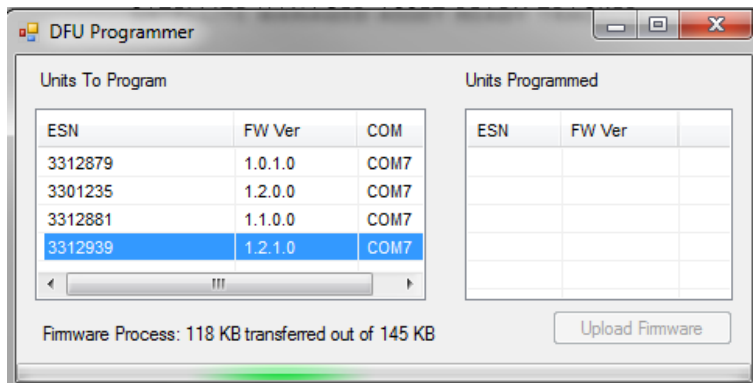
Once scanned, devices will be shown in the list. Click the DFU button and the SmartOne Configuration Software program will open a screen with a list of scanned devices:



On the left-hand side of the DFU Programmer pop-up window, you will see all the units ready for the firmware update. After the process completes, these units will be listed on the right-hand side.

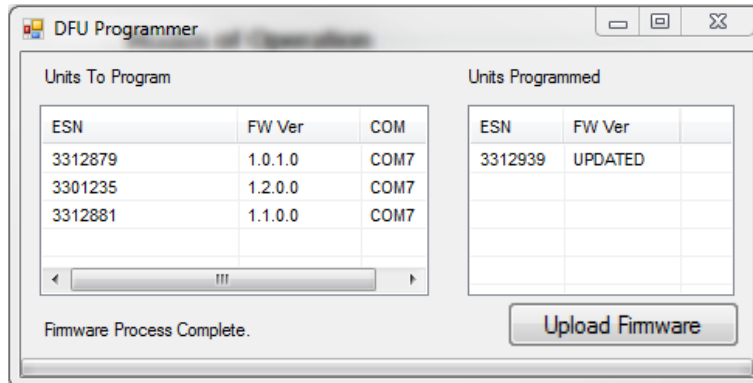


Select the ESN of the unit you want to receive the firmware upgrade and click the Upload Firmware button. This will commence the Device Firmware Update process and show a progress bar:



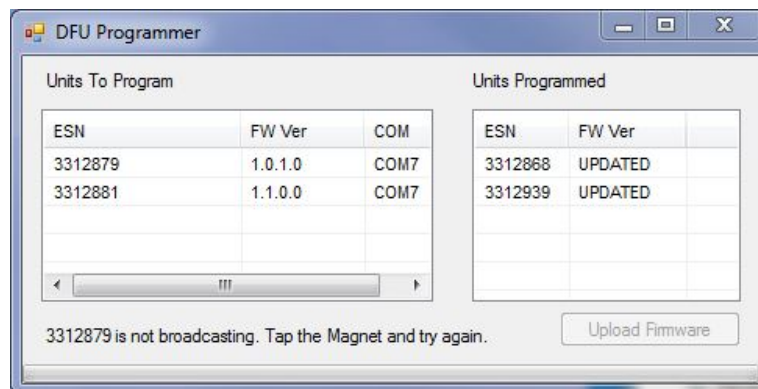
This procedure should take just under 10 minutes to complete successfully. Once the firmware is fully

uploaded to the unit, the window will display a Firmware Process Complete message.



You can then select another device to update if you have multiple devices to receive the same firmware upgrade.

NOTE: Using Bluetooth for this process will probably not work for more than 2 devices sequentially. This is because the Bluetooth advertisement only allows the device to be CONNECTABLE for 20 minutes after removing the magnet. If the device loses CONNECTABLE status over Bluetooth, the following dialog will be displayed, indicating the broadcast status of the device attempting DFU:



Therefore, to perform firmware upgrade over Bluetooth, it is recommended to DFU only one SmartOne device at a time. For further information see the section titled Bluetooth Interface Setup. Sequentially performing the DFU process on multiple devices connected via USB Configuration Cables should not encounter this problem.

If an error occurs during the DFU process, a message will be displayed with instructions to wait five minutes before re-attempting the DFU procedure. Click OK, wait at least five minutes, and try again.

6. Messages

The SmartOne produces on-air messages conforming to the Globalstar specified format. See Appendix G through J for detailed examples of various message decoding.

The data being communicated to the end user is contained entirely in the 72 bit (9 byte) field.

This section will describe the use of the 9 byte user information segment for communicating the range of information that the SmartOne is able to convey to the user.

Note: User information is also referred to as the Message Payload.

Global Message Type

Bits 0 and 1 in the first byte of the user data defines the Global Message Type; there are four total global types. Types 0 and 3 are applicable to the function and features of the SmartOne, Type 1 and 2 are user defined message types.

- **Type 0** - Standard Message: All of the various message types that contain Latitude and Longitude data that are transmitted by the SmartOne will be of this type.
- **Type 1** - Truncated Message: This message type provides for up to 2 bytes plus 6 bits of user data to be appended to the status byte and GPS location information.
- **Type 2** - Raw Message: This message type provides for up to 8 bytes plus 6 bits of user data.
- **Type 3** - Non Standard Message: This is the message type that covers the category “none of the above”. The SmartOne will use this message type for messages that do not contain Latitude and Longitude data. Smart One message types which fall into this category include Accumulate/Count messages, Diagnostic messages, Contact Service Provider messages and Low Battery messages.

Type 0 Message Class

Message Format

The table below displays the format of all standard messages. Specific variants of the message will be shown individually in the following subsections.

Byte #	Variable	Bits	Description
0	Type Field	2	Bit (1:0) = 0 - Message Type: Described above.
0	Battery State	1	Bit (2) 0 = Good battery. 1 = Replace battery.
0	GPS Data Valid	1	Bit (3) 0 = GPS Data valid in this message. 1 = GPS failed in this message cycle, ignore Latitude and Longitude fields.
0	Missed Input State Change	2	Bit (4) = Missed Input 1. A value of 1 in this bit means that an input state change of Input 1 was missed due to the transmission of a higher priority message. Bit (5) = Missed Input 2. A value of 1 in this bit means that an input state change of Input 2 was missed due to the transmission of a higher priority message.
0	GPS Fail Counter	2	Bit (7:6) = GPS fail counter. Counts up to a maximum value of 3 upon GPS failure.

Byte #	Variable	Bits	Description
1,2,3,4,5,6	Latitude/Longitude	48	Byte 1 = Latitude MSByte Byte 2 = Latitude Byte 3 = Latitude LSByte Byte 4 = Longitude MSByte Byte 5 = Longitude Byte 6 = Longitude LSByte 360 degrees of Longitude coded in signed binary with 3 bytes and 180 degrees of Latitude coded in signed binary with 3 bytes. Positive Longitudes correspond to East Longitudes Positive Latitudes correspond to North Latitudes See Appendix G for an Lat/Long decoding example
7	Input Status	4	These bits reflect the state of the Inputs and indicate which one, if any, triggered an Input Status Changed message. Bit 0: Input 1 change: 0 = Did not trigger message, 1 = Triggered message. Bit 1: Input 1 state: 0 = Closed, 1 = Open Bit 2: Input 2 change: 0 = Did not trigger message, 1 = Triggered message Bit 3: Input 2 state: 0 = Closed, 1 = Open
7	Message Sub-Type	4	Bits (7:4) message sub-type code. See subtypes below: Value is 0 in the location message. Value is 1 in the Device Turned On message. Value is 2 in the Change of Location Area alert message. Value is 3 in the Input Status Changed message. Value is 4 in the Undesired Input State message. Value is 5 in the Re-Centering message. Value is 6 in the Speed & Heading message (see Speed & Heading sub-type detail later in this section)
8	RESERVED	3	Bits (2:0) RESERVED in SmartOne
8	Vibration Triggered Message	1	Bit (3) – Value 1 = This message is being sent because Transmit on Change of Vibration State is selected, and the vibration just changed state, or Undesired Vibration State is selected and the vibration is in the undesired state. Value 0 = This message is being transmitted for a reason other than the above reasons.
8	Vibration Bit.	1	Bit (4) – Value 1 = Unit is in a state of vibration. Value 0 = Unit is not in a state of vibration.
8	2D	1	Bit (5) – Value 1 = GPS data reported is from a 2D fix. (Only 3 satellites were used in the fix.) Value 0 = GPS data reported is from a 3D fix.
8	Motion	1	Bit (6) – Value 1 = Device was In-Motion when the message was transmitted. Value 0 = Device was At-Rest when the message was transmitted.
8	Fix Confidence Bit.	1	Bit (7) 1=Reduced confidence in GPS fix accuracy, 0=High confidence in GPS fix accuracy,

Location Message

This is the message that is transmitted on an interval. When this message is received, it indicates that the transmission is due to a scheduled interval at either the At Rest rate or In Motion rate. Whether the device is At Rest or In Motion can be determined by the Motion bit (Byte 8, bit 6).

The Location Message Subtype field of this message, contained in byte 7; bits 4-7 have a value of zero 0.

Device Turned On Message

This is the message transmitted at power on.

The Standard Message Subtype field of this message, contained in byte 7; bits 4-7, has a value of 1.

Change of Location Area Alert Message

This is the message transmitted when the SmartOne detects that it has left its Change of Location Area.

The Standard Message Subtype field of this message, contained in byte 7; bits 4-7, has a value of 2.

Input Status Changed Message

This is the message that will be transmitted upon the change of state of the inputs if it is enabled and as selected by the user:

- Input 1 open, Input 1 closed, or Input 1 both(open or closed)
- Input 2 open, Input 2 closed, or Input 2 both(open or closed)

The Standard Message Subtype field of this message, contained in byte 7; bits 4-7, has a value of 3.

The Input Status Value of byte 7; bits 0-3 in the message indicates which input changed state to trigger the message and also reports the states of both inputs.

Undesired Input State Message

This is the message that is transmitted when the user has selected an undesired input state to cause a different report rate. When this Mode is enabled, the user defined Undesired Input State report rate supersedes the At Rest and In Motion report rates when the Input(s) is (are) in an undesired state.

The Standard Message Subtype field of this message, contained in byte 7; bits 4-7, has a value of 4.

The Input Status portion of byte 7; bits 0-3 in the message indicate which Input(s) are in the undesired state and triggering the Undesired Input State report rate.

Re-Center Message

The Re-Center message is transmitted when Reduced Messaging Mode is selected and the SmartOne re-centers (automatically sets a new Change of Location Area).

The Standard Message Subtype field of this message, contained in byte 7; bits 4-7, has a value of 5.

Speed and Heading Message

The Speed and Heading message is transmitted when this feature is selected in the Configuration Software under Modes of Operation in the Getting Started tab. When enabled, it will transmit according to the message sub-type detail provided in the table below. Speed and Heading messages are sent in place of Normal Location messages; other message types will follow their defined bit designations as described in the Type 0 Message Class list section.

Note that Speed is limited to 255 km/h.

Byte #	Variable	Bits	Description
0	Type Field	2	Bit (1:0) = 0 Standard Message Type
0	Battery State	1	Bit (2) 0 = Good battery. 1 = Replace battery.
0	GPS Data Valid	1	Bit (3) 0 = GPS Data valid in this message. 1 = GPS failed in this message cycle, ignore Latitude and Longitude fields.
0	Dry Contact Status	2	Reflect the status of the Dry Contacts when this msg was transferred. Bit (4) Dry Contact 1 state: 0=Closed, 1=Open Bit (5) Dry Contact 2 state: 0=Closed, 1=Open
0	Motion	1	Bit (6): 1 = Device was In-Motion when msg was transmitted 0 = Device was At Rest when msg was transmitted.
0	Reserved	1	Reserved
1,2,3,4,5,6	Latitude/Longitude	48	Byte 1 = Latitude MSByte Byte 2 = Latitude Byte 3 = Latitude LSByte Byte 4 = Longitude MSByte Byte 5 = Longitude Byte 6 = Longitude LSByte 360 degrees of Longitude coded in signed binary with 3 bytes and 180 degrees of Latitude coded in signed binary with 3 bytes. Positive Longitudes correspond to East Longitudes Positive Latitudes correspond to North Latitudes
7	Heading – 8 sectors (N, NE, E, SE, S, SW, W, NW)	3	Bits (2:0) Heading 000 = N 001 = NE 010 = E 011 = SE 100 = S 101 = SW 110 = W 111 = NW
7	Reserved	1	Bit 3 is Reserved
7	Standard Message Sub-Type	4	Bits (7:4) message sub-type code: Any value other than 6 is not valid for Speed & Heading message 0110 = Speed & Heading message.
8	Speed Over Ground	8	Bits (7:0) SOG in Kilometers per Hour. Range is 0 to 255 km/h with resolution of 1 km/h.

Type 1 Message Class

Truncated Message Type – Single Packet

This message type provides for up to 2 bytes plus 6 bits of user data to be appended to the status byte and GPS location information. The input and status bits data of the standard message are replaced with user data from the configuration port. The Truncated message will follow the following on-air format:

Variable	Bits	Description
Status Byte	8	Bit (1:0) = 1 Truncated message type Bit (7:2) = Submask data from Truncated user data
Latitude/Longitude	48	Byte 1 = Latitude MSByte Byte 2 = Latitude Byte 3 = Latitude LSByte Byte 4 = Longitude MSByte Byte 5 = Longitude Byte 6 = Longitude LSByte 360 degrees of longitude coded in signed binary with 3 bytes and 180 degrees of latitude coded in signed binary with 3 bytes Positive longitude corresponds to East longitudes Positive Latitude corresponds to North latitudes See Appendix G for an Lat/Long decoding example
User Data	16	Byte 1 = User data byte 1 Byte 2 = User data byte 2

Truncated Message Type – Multiple Packet Version

The Globalstar simplex messaging protocol provides for single and multiple packet messaging. In the event that the user application requests a user data length exceeding 9 bytes, the SmartOne (running firmware version 2.1 or later) will automatically “packetize” the message, that is, transmit it as multiple 9 byte packets. The ground station appliqué will reverse the process, “de-packetizing” the message back into a single (“long”) message. From the user application point of view, this eliminates the 9 byte limitation allowing the user to compose longer messages transparently. They are presented to the user by the Globalstar back office as complete messages of a length longer than 9 bytes. The SmartOne supports user-defined messages (Class 1 and 2) of up to 54 bytes.

This message type provides for up to 47 bytes plus 6 bits of user data to be appended to the status byte and GPS location information. The input and status bits data of the standard message are replaced with user data from the configuration port.

NOTE: Total message length will be a minimum of 9 bytes in length, and a maximum of 54 bytes in length, and the length sent to the user will always be divisible by 9.

The Truncated message will follow the following on-air format:

Variable	Bits	Description
Status Byte	8	Bit (1:0) = 1 = Truncated message type Bit (7:2) = submask data from Truncated user data
Latitude/Longitude	48	Byte1 = Latitude MSByte Byte 2 = Latitude Byte 3 = Latitude LSByte Byte 4 = Longitude MSByte Byte 5 = Longitude Byte 6 = Longitude LSByte 360 degrees of longitude coded in signed binary with 3 bytes and 180 degrees of latitude coded in signed binary with 3 bytes Positive longitude corresponds to East longitudes Positive Latitude corresponds to North latitudes See Appendix G for an Lat/Long decoding example
User Data	Variable	Byte 1 = User data byte 1 Byte 2 = User data byte 2 Byte 3 = User data byte 3 Byte 47 = User data byte 47

Type 2 Message Class

Raw Message Type – Single Packet Version

Message type 2 shall be a Raw Payload message. This message type provides for up to 8 bytes plus 6 bits of user data. This mode is provided to enable the user to directly send a single data burst through the network. The only bits not accessible to the user are the message type bits needed by the receiving data processor to delineate message type associated to the transmit ID. User data less than the full payload will be zero padded as necessary.

The Raw Payload message Single Packet version will follow the following on-air format:

Variable	Bits	Description
Status Byte	8	Bit (1:0) = 2 = Raw message type Bit (7:2) = submask data from Raw Payload user data
User Data	Variable	Byte 1 = User data byte 1 Byte 2 = User data byte 2 Byte 3 = User data byte 3 Byte 4 = User data byte 4 Byte 5 = User data byte 5 Byte 6 = User data byte 6 Byte 7 = User data byte 7 Byte 8 = User data byte 8

Raw Message Type – Multiple Packet Version

The Globalstar simplex messaging protocol provides for single and multiple packet messaging. In the event that the user application requests a user data length exceeding 9 bytes, the SmartOne will automatically “packetize” the message, that is, transmit it as multiple 9 byte packets. The ground station appliqué will reverse the process, “de-packetizing” the message back into a single (“long”) message. From the user application point of view, this eliminates the 9 byte limitation allowing the user to compose longer messages transparently. They are presented to the user by the Globalstar back office as complete messages of a length longer than 9 bytes. The SmartOne supports user-defined messages (Class 1 and 2) of up to 54 bytes.

Message type 2 shall be a Raw Payload message. This message type provides for up to 53 bytes plus 6 bits of user data. This mode is provided to enable the user to directly send a single data burst through the network. The only bits not accessible to the user are the message type bits needed by the receiving data processor to delineate message type associated to the transmit ID. User data less than the full payload will be zero padded as necessary. Note: Total message length will be a minimum of 9 bytes in length, and a maximum of 54 bytes in length, and the length sent to the user will always be divisible by 9.

The Raw Payload message Multiple Packet version will follow the following on-air format:

Variable	Bits	Description
Status Byte	8	Bit (1:0) = 2 = Raw message type Bit (7:2) = submask data from Raw Payload user data
User Data	Variable	Byte 1 = User data byte 1 Byte 2 = User data byte 2 Byte 3 = User data byte 3 Byte 53 = User data byte 53

Type 3 Message Class

The SmartOne will use the Type 3 message class for the following message types:

- Diagnostic Message – Subtype 21.
- Replace Battery Message – Subtype 22. ← Solar product does not require this message
- Contact Service Provider Message – Subtype 23.

Diagnostic Message

The Diagnostic Message includes battery status, GPS average acquisition time, GPS fails and number of transmissions since the last Diagnostic Message.

Appendix I has an example of a decoded Diagnostic Message.

The format and fields of the SmartOne Diagnostic Message is shown in the table below.

Byte #	Variable	Bits	Description
0	Type Field	2	Bit (1:0) = 3 Non Standard message type:
0	Subtype	6	Bit (7:2) = 21 for Diagnostic Message. Bit (7:2) = 22 for Replace Battery Message. Bit (7:2) = 23 Contact Service Provider Message..
1	Number of Transmissions per Burst.	4	Bits(3:0) = Number of Transmissions (1 to 15 Transmissions)
1	Battery Condition	1	Bit 4: 0 = Good battery. 1 = Replace Battery
1	GPS Subsystem Fault	1	Bit 5: 0 = GPS system OK. 1 = Fault
1	Transmitter Subsystem Fault	1	Bit 6: 0 = Transmitter OK. 1 = Fault.
1	Scheduler Subsystem Fault	1	Bit 7: 0 = OK. 1 = Fault
2	Min Interval	8	Minimum Interval between transmission attempts (5 second resolution) Default is 300 seconds
3	Max Interval	8	Maximum Interval between transmission attempts. Default is 600 seconds
4	GPS Mean Search Time	8	Unsigned binary count in seconds for mean GPS search to acquire
5,6	# GPS Fails	16	Unsigned binary count of failed GPS attempts since last Diagnostic Message
7,8	# Transmissions	16	# of transmissions since last Diagnostic message

Contact Service Provider Message

The SmartOne will send a Contact Service Provider message when an internal fault is detected. The SmartOne will send one such message upon the detection of an internal fault. It will then attempt to continue to operate normally. The SmartOne will not send another Contact Service Provider message unless the fault is determined to have cleared, and then determined to have come back again.

Accumulate/Count Message

The Accumulate/Count message is used to report the accumulation of time that an input is in a specified state as defined by the user, the accumulation of time that the device is in a State of Vibration, and/or the total transitions of the Inputs, as configured by the user. The message is transmitted either at a pre-set interval, at a point where any of the accumulation or count registers reach multiples as programmed by the user, just before rollover of any count/accumulate register, or all of the above.

Appendix J has an example of a decoded Accumulate/Count message.

Byte #	Variable	Bits	Description
0	Type Field	2	Bit (1:0) = 3 Non Standard message type:
0	Subtype	6	Bit (7:2) = 24 Accumulate/Count message..
1, 2	Accumulated Input 1	16	Accumulated time that Input 1 has been in its undesired state with a resolution of 10 minutes. For example: 1 hour would be represented as a value of 6, 2 hours as a value of 12, etc. This resolution results in a rollover rate of a total time accumulation of approximately 1.25 years. (OxFFFF means that Input 1 Accumulate has been turned off)
3, 4	Accumulated Input 2	16	Accumulated time that Input 2 has been in its undesired state with a resolution of 10 minutes. For example: 1 hour would be represented as a value of 6, 2 hours as a value of 12, etc. This resolution results in a rollover rate of a total time accumulation of approximately 1.25 years. (OxFFFF means that Input 2 Accumulate has been turned off)
5, 6	Accumulated Vibration	16	Accumulated time that the SmartOne has been in a State of Vibration with a resolution of 10 minutes. For example: 1 hour would be represented as a value of 6, 2 hours as a value of 12, etc. This resolution results in a rollover rate of a total time accumulation of approximately 1.25 years. (OxFFFF means that Accumulated Vibration has been turned off)
7	Input 1 Count	8	The total number of openings or closings of input 1 as selected by the user. (OxFF means that Input 1 Accumulate has been turned off)
8	Input 2 Count	8	The total number of openings or closings of input 2 as selected by the user. (OxFF means that Input 2 Accumulate has been turned off)

Messaging Priority

Prioritization of Periodic Standard Message Report Rates

The SmartOne supports several rates at which it will send a Periodic standard message. Periodic versus Scheduled standard message rates are mutually exclusive. This is the priority of the different rates at which the SmartOne will send a standard message (Highest is listed first):

- Rate specified by Undesired Input State.
- Rate specified for when the SmartOne is inside its Change of Location Area.
- Rate specified for when device is In Motion. (Note, when inside the Change of Location Area, this rate affects sampling, but not reporting, as indicated by a higher priority for inside Change of Location Area.)
- Rate specified for when the device is At Rest.

Message Priorities

It is possible that message types may collide. Whenever feasible, the SmartOne will examine its known schedule and reschedule lower priority messages to occur after higher priority ones. If there is not enough time in the known schedule for all scheduled messages to be transmitted in a reasonable time, or there is insufficient memory to queue them, the lowest priority message(s) could be dropped. In any case, unscheduled messages (for example, Input Status Changed) shall cancel pending messages of lower priority and not cancel pending messages of higher priority. The following list shows the priority of message types, with the highest priority being listed first.

- Contact Service Provider
- User Defined Raw message. *
- User Defined Truncated message. *
- Change of Location Area
- Replace Battery ←Solar product does not require this message
- Undesired Input State
- Re-Center
- Diagnostics
- Accumulate/Count
- Input Status Changed
- Device Turned On
- Normal Location (In-Motion or At-Rest).

***Note:** The two user defined message types actually have equal priority. Either one will cancel the other one. If, for example, the user interface commands the device to send a Truncated message, and then, before it has time to obtain a fix and send the message, the user commands a Raw message, the Raw message will be sent.

7. Serial Commands

The SmartOne uses the I/O port for unit configuration as well as interface to remote passive and smart sensors. Two commands are provided in the unit interface to support smart sensors. External sensors that can format and communicate to the SmartOne can send user data through the SmartOne by using these two commands.

This section describes the serial interface between the SmartOne and a computer or other programming device. SmartOne will respond to any command that contains fields with invalid values with a NAK response (command field set to 0xFF).

Serial Packet Format (commands and answers)

Communication to the SmartOne will follow the following specific format:

Preamble	Length	Cmd	Data	CRC
1 byte	1 byte	1 byte	Variable length 0 – 54 bytes	2 bytes

Total length range permitted: 5 bytes (Data field length 0) to 59 bytes (Data field length 54).

Serial Packet Fields

The different fields are defined as:

Preamble	Fixed Pattern 0xAA
Length	Total number of bytes in the serial packet including the preamble
Cmd	Command type (See table below). Responses to commands carry the same command type as the command that initiated the answer
Data	Data associated with the command or answer
CRC Low	Least significant byte of the 16-bit CRC
CRC High	Most significant byte of the 16-bit CRC

CRC Algorithm

The Security Field is a 16-bit CRC of all of the previous fields including the preamble, length, and command bytes. The remainder is initialized to all 1's (0xFFFF) and the CRC is inverted before being sent. Following is a sample C routine that implements the algorithm using the reversed technique:

```
WORD crc16_lsb(BYTE *pData, WORD length)
{
    BYTE i;
    WORD data, crc;
    crc = 0xFFFF;
    if (length == 0)
        return 0;

    do
    {
        data = (WORD)0x00FF & *pData++;
        crc = crc ^ data;
        for (i = 8; i > 0; i--)
        {
            if (crc & 0x0001)
                crc = (crc >> 1) ^ 0x8408;
            else
                crc >>= 1;
        }
    } while (--length);

    crc = ~crc;
    return (crc);
}
```

As an example, for a type (0x01) "Get ID" message made up of the following bytes: **AA 05 01**

The following 2 byte CRC would be calculated: **D5 50**

The complete message sent by the host to the SmartOne is: **AA 05 01 50 D5**

Serial Packet Types

Cmd	Description/Usage/ Comment	Command Data Bytes	Acknowledge Data Bytes
0x01	User requests the SmartOne to reply with integral ESN (Electronic Serial Number). This is the ID used by Globalstar to identify the unit	None	Four data bytes, which contain the unit ID as an unsigned integer. The MSByte is sent first. Only the 27 LSbits are non-zero
0x26	Send Truncated Message	See Truncated Message section below	None
0x27	Send Raw Message	See Raw Message section below	None

Send Truncated Message (serial message type 0x26)

The SmartOne will perform a GPS location and append user data passed to the unit via the Truncated Message command 0x26.

47 bytes plus 6 bits of user data may be sent with the standard GPS location information in a messaging burst. Two bits are set in the on-air message by the SmartOne informing the recipient that the message is the Truncated type.

The following table defines the message structure of the “data” portion of the command used to send a Truncated message.

Communication to the SmartOne will follow the following specific format:

Byte	Bit	Parameter	Description	Default Value
0	7.2	Submask Bits	User data bits. Bits 1:0 are reserved and will be masked by SmartOne	0x00
Variable		User Data	Supports a maximum of 47 total bytes in this field. User application (smart sensor) should transmit only as many bytes as needed (don't pad the message) in order to keep on air packets to a minimum	

Example 1 - Sending a “Truncated” User Message

The host sends:

AA 08 26 10 22 33 <CRC-low> <CRC-High>

The SmartOne would respond:

AA 05 26 <CRC-Low> <CRC-High>

What would go out over the air is:

11 Lat-3 Lat-2 Lat-1 Lon-3 Lon-2 Lon-1 22 33

Note: All on air messages are padded to a multiple of 9 bytes. This is the reason for the trailing zeros in this example.

Note: The least two significant bits of the first byte are always “01” for a trunc message, the remaining 6 bits make up the top 6 bits of the first byte sent in the serial command, in this example 000100xx (with the “xx” representing the two bits that the SmartOne forces to “01”).

The 22 and the 33 that the user sent are appended after the 6 bytes of latitude and longitude.

Example 2 - Using a Longer Message

The host sends:

AA 0D 26 10 22 33 44 55 66 77 88 <CRC-low> <CRC-High>

Note: The length field: 0D – 0D is the number 13 in hexadecimal, the length of the total serial command.

The SmartOne would respond:

AA 05 26 <CRC-Low> <CRC-High>

What would go out over the air is:

11 Lat-3 Lat-2 Lat-1 Lon-3 Lon-2 Lon-1 22 33 44 55 66 77 88 00 00 00 00

Send Raw Message (serial message type 0x27)

The SmartOne will send raw user data using the Raw Payload command 0x27.

53 bytes plus 6 bits of user data may be sent. Two bits are set in the on-air message by the SmartOne informing the recipient that the message is Raw.

The following table defines the message structure used to send a Raw message.

Byte	Bit	Parameter	Description	Default Value
0	7.2	Submask Bits	User data bits. Bits 1:0 are reserved and will be masked by SmartOne	0x00
Variable		User Data	Any user data Supports a maximum of 53 total bytes in this field. User application (smart sensor) should transmit only as many bytes as needed (don't pad the message) in order to keep on air packets to a minimum	

Example 1 - Sending a Raw User Message:

The Host sends:

AA 0E 27 10 22 33 44 55 66 77 88 99 <CRC-low> <CRC-high>

The SmartOne Responds:

AA 05 27 <CRC-low> <CRC-high>

What actually goes out over the air is:

12 22 33 44 55 66 77 88 99

Note: The least two significant bits of the first byte are always “10” for a raw message (a HEX or decimal value of “2”, the remaining 6 bits make up the top 6 bits of the first byte sent in the serial command, in this example 000100xx (with the “xx” representing the two bits that the SmartOne forces to “10”).

Example 2 - Using a Longer Message:

The Host sends:

AA 21 27 10 22 33 44 55 66 77 88 99 AA BB CC DD EE FF 11 22 33 44 55 66 77 88 99 AA 44 56 78 <CRC-low> <CRC-high>

Note: The length field, the command contains a total of 33 bytes. The length is 21 Hexadecimal, which is equal to 33 decimal.

The SmartOne Responds:

AA 05 27 <CRC-low> <CRC-high>

What actually goes out over the air is:

12 22 33 44 55 66 77 88 99 AA BB CC DD EE FF 11 22 33 44 55 66 77 88 99 AA 44 56 78 00 00 00 00 00 00 00

Note: All on air messages are padded to a multiple of 9 bytes. This is the reason for the trailing zeros in this example.

A simple ACK or NAK from the SmartOne Device to the host (smart sensor):

ACKs.

AA 05 26 <crc crc> (for the Truncated message)

AA 05 27 <crc crc> (for the Raw message)

NAK:

AA 05 FF <crc crc> (NAK).

Note: As the SmartOne operates, some debugging traces come out of the serial port. Those traces should simply be ignored. Once the handshake line is pulled low, the unit is in “command mode” and debugging traces will stop.

Note: User commands will ALWAYS be responded to immediately with either an acknowledgement or a NAK (as shown in the examples above). Once an acknowledgement (or NAK) is received, the host should simply ignore the serial port until the next time it sends a command.

Note: The most common reasons for a NAK are incorrect CRC, incorrect length field, or incorrect command field (i.e. not 0x26 or 0x27 for trunc and raw respectively).

The Handshake Line

The handshake line should be pulled low before sending each serial message. The recommended use of the handshake line is:

- 1) Pull handshake low.
- 2) Wait 2-3 milliseconds.
- 3) Send command
- 4) Receive response.
- 5) Raise handshake high.

8. Connecting Serial Devices to the SmartOne

The SmartOne accepts a serial connection at a 3 Volt level (Max), at 9600 baud. The relevant pins are TX, RX, Handshake and Ground. The SmartOne can connect with devices that contain an asynchronous UART at 3 volt levels. (High State: 2.7-3 Volts, Low State: 0 Volts. Please contact Globalstar Support for more information).

CAUTION: NEVER attempt to connect the SmartOne directly to the pins on a computer's RS232 or USB port. The voltages in RS232/USB are too high and can irrevocably damage the SmartOne. This damage is not covered by our warranty.

Any deviations from the above guidelines will violate all RMA requirements and void the warranty.

Note: See Appendix K for information on the External Input Cables for the SmartOne.

Appendix A - Glossary of Terms

A

Accelerometer – A sensor used for detecting and measuring vibration.

Accumulate Hours – The activity time accumulated in the Inputs of the device while the Input is in the user defined state.

Activation – The activation of an ESN (electronic serial number) on the Globalstar satellite network. The process consists of programming a start and an end date for the use of the ESN and the payment of certain fees to Globalstar. Sometimes referred to as “provisioning.”

At Rest – A tracker is considered to be at rest when the comparison of a new GPS reading to a previous GPS reading indicates that the tracker has not changed location by more than a specified minimum distance. The specified minimum time and the specified minimum distance are both configuration parameters.

C

Configuration – The collection of variables that control the operating performance of a device.

Configure (configuring) – Programming (setting) the variables that control the operation performance of a tracker.

Count Events – The accumulated number of state changes in the Inputs of the device.

D

Delay To Start – Specific delay in time following the programming of the device to commence operation.

Desired State – The state of the Input in normal condition defined by the user.

E

ESN – Electronic Serial Number is a unique number assigned to each SmartOne device. The ESN Network is used by Globalstar Simplex to identify messages from the devices in the field.

F

Failed GPS reading – A GPS reading could not be processed from available GPS satellite signals.

FW Ver – Firmware version is the existing software loaded in the device main processor

G

GPS – The GPS (Global Positioning System) is a "constellation" of 24 well-spaced satellites that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location.

GPS reading – The longitude, latitude, time, and date information obtained from processing the signals from the GPS satellites.

I

In Motion – The unit is considered to be In Motion when there is a State of Vibration – and – when a comparison of a new GPS reading to a previous GPS reading indicates the device has changed location by at least a specified minimum distance (100 meters by default).

Inaccurate GPS reading – The longitude and latitude information obtained from processing the signals from the GPS satellites when a tracker cannot observe an adequate number of satellites; the GPS signals were jammed by electronic interference; the GPS signals were reflected from objects creating multi-path conditions; or weather conditions distorted the GPS signals. An inaccurate GPS reading may have longitude and latitude errors of a mile or more.

Input – A digital channel in the device that allows the detection of switch stage changes. The inputs are dry contact inputs, ON/OFF.

M

Message – A collection of information that is transmitted in a group over the satellite network.

Message Interval – The message interval indicates the amount of time specified by the user between Location Messages. The SmartOne transmits a Location Message once the Message Interval has elapsed. The internal clock on the device is reset to the interval time after each transmission. The SmartOne is in low power consumption Mode during the interval to preserve battery life.

Message Time(s) of Day – The specific time of day in military format for the SmartOne to transmit Location Messages. The SmartOne is in low power consumption Mode between the specific times of day to preserve battery life.

Message Transmission – The indicates the process of sending a message over the satellite network. The process includes sending a message multiple times to improve the transmission success rate.

N

Number of message repeats – The number of times a message is sent in a message transmission with the same Unique Message Number(UMN). The number of message repeats is configurable during the tracker set up process. Globalstar only counts repeated messages as one message if it is received three times or less. If the same message is received more than three times, Globalstar may count the message as more than one message for billing purposes

P

PV – Photovoltaic cells; the name of the cells contained in the solar panel.

S

Self Test – An internal unit test that is performed by the processor, checking for the proper operation of unit functions.

State of Lacking Vibration – The motion sensor is indicating a cease of vibration when the number of vibration pulses per minute is lower than the Level of Sensitivity for Vibration Sensor number for the time required to determine if a State of Vibration has ceased.

I

Time to be in a State of Lacking Vibration – A configurable parameter that sets the period of time vibration has to be absent to determine if a State of Vibration has ceased.

Time to be in a State of Vibration – A configurable parameter that sets the period of time used to determine if a State of Vibration exists.

U

Undesired State Message – The SmartOne sends this message at a user defined interval while any of its Inputs are in the undesired state selected by the user, either closed or opened.

Appendix B - Technical Support

We suggest VARs reference our online content at our Globalstar VAR Data Support Website <http://var.globalstar.com/> prior to contacting our VAR Support. The content located there should address most activation/provisioning inquiries and minor frequently asked questions concerning business account management functions. Please create an account by accessing this site and clicking on:

[Sign Up for Access Here](#)

For all other support issues, please contact Globalstar, Inc. at our corporate headquarters:

- Email: varsupport@globalstar.com.
- Phone: +1 (985) 335-1590
- Address: Globalstar, Inc.
300 Holiday Square Blvd.
Covington, LA 70433

Appendix C - RF Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

NOTE: The SmartOne antennas are located in the unit under the embossed words:

“THIS SIDE TOWARDS SKY”.



RAPPORT D'EXPOSITION DE RAYONNEMENT DE LA FCC RF Cet equipment est conforme aux limites d'exposition de rayonnement de la FCC RF determinees pour un environnement non controle. Cet equipment devrait etre installe et actionne avec une distance minimum de 20 cm entre le radiature et votre corps.

Appendix D - Regulatory Notices

FCC/IC Notices

This device 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. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: 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 or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause interference; and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAN ICES-3 (B)/NMB-3(B) – This Class B Digital Apparatus Complies with Canadian ICES-003.

Cet Appareil numerique de la classe (B) est conforme a la norme NMB-003 du Canada.

CE Notices

DECLARATION OF CONFORMITY FOR EUROPEAN CUSTOMERS

Hereby, Globalstar declares that this SmartOne Solar is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

The declaration of conformity may be consulted at www.Globalstar.com/Regulatory.

SmartOne Solar™ Transmit Frequencies: 1611.25 Mhz - 1618.75 Mhz (4 Channels)

SmartOne Solar™ Max Power Out: 23.46 dBm EIRP

The SmartOne Solar has been so constructed that the product complies with the requirement of Article 10(2) as it can be operated in at least one Member State as examined and the product is compliant with Article 10(10) as it has no restrictions on being put into service in all of the EU except Ireland. The SmartOne Solar cannot be marketed in Ireland.

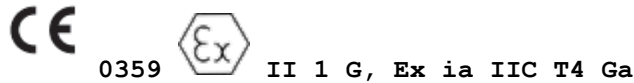


~~IE~~ Not to be Marketed in the Republic of Ireland

Hazardous Locations Safe Use Conditions

Certification and Ratings

This device is certified Intrinsically Safe to the following standards:



-40°C<T_{amb}<+65°C IP68, IP69K

IECEX ETL 17.0065X; ITS17ATEX202037X

Class I: Division 1|Groups A-D T4

US: Class I: Zone 0|AEx ia IIC T4 Ga

CAN: Class I: Zone 0|Ex ia IIC T4 Ga

Conforms to UL STDS 60079-0, 60079-11, & 913

Certified to CSA STD C22.2 # 60079-0, 60079-11, & 157

The device can be installed and operated safely in hazardous locations covered by the above ratings provided the following safety instructions and warnings are followed.

External Electrical Connections

WARNING: The external connector is not intended for use in hazardous locations.

Electrical rating: Um=250Vrms for non-intrinsically safe sources connected in non-hazardous locations.

While it may be possible to connect certain equipment in a safe manner, a field evaluation must be carried out by the relevant authority and installations certified on a case-by-case basis.

Hazards of Electromagnetic Radiation to Ordnance(HERO) Requirements

Based on Air Force Instruction, AFI 91-208, requirements for portable electronics transmitting at less than 1 watt, the device has varying safe distances for different types of ordnance. The following information is for the SmartOne Solar:

- The SmartOne Solar can be operated at any distance from any ordnance the Air Force classifies as SAFE, when the SmartOne Solar is fully operational. Note that the device antenna shall not make contact with the ordnance.
- The SmartOne Solar can be operated at a safe distance of 1 foot from any ordnance the Air Force classifies as SUSCEPTIBLE, when the SmartOne Solar is fully operational.
- The SmartOne Solar can be operated at a safe distance of 5 feet from any ordnance the Air Force classifies as UNSAFE, when the SmartOne Solar is fully operational.

Static Electricity Warning

WARNING: the housing of this product is made of non-conductive material that may build an ignition-capable electrostatic charge under certain conditions. Do not touch, wipe, or clean the unit in hazardous environments. Installation and maintenance should only be performed when the environment has been confirmed to be safe.

Metal Protection Bracket Installation

WARNING: The measured capacitance of the worst case unearthed protection bracket was determined to be 124.6 pF as measured per clause 26.14 of IEC 60079-0: 2011. It is the installer's responsibility to determine safe use conditions when installing in a hazardous location where proper grounding of the bracket is not guaranteed or the bracket is purposefully insulated.

In most cases, the bracket should be grounded to the asset by maintaining metal-to-metal contact between the bracket and the mounting surface. A separate grounding wire connected to the provided location on the bracket may also be used.

The bracket may be painted or powder-coated provided the maximum coating thickness is less than 0.2mm.

Appendix E – General Warnings



Warning - Modifications: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



Warning – Driving: Always follow safe driving practices and local rules and regulations regarding the use of wireless devices while driving. Do not drive when programming or servicing the SmartOne.



Warning - Installation and Service: Allow only authorized personnel to install or service the SmartOne Solar and accessories. Faulty installation or service can be dangerous and can void the warranty.



Warning – Mounting: Using any other mounting bracket than the optional metal mounting bracket to secure the SmartOne device will void all warranties and Intrinsically Safe certifications.



Warning - Pacemakers: The Health Industry Manufacturers Association(HIMA USA) recommends that a minimum separation of six (6”) inches be maintained between the SmartOne Solar and a pacemaker to avoid potential interference with the pacemaker.



Warning – External Power: When connecting external power to the SmartOne Solar, make sure that the supply voltage to the unit is at the rated voltage(See Appendix K). If the supply voltage to the SmartOne Solar is not at the rated voltage, the unit may not operate correctly and damage to the unit may occur. Also, it will void the warranty if an invalid voltage is supplied via external input and the SmartOne Solar is damaged.



Warning – Tightening Cover Screws: Upon replacing the Configuration Cable Cover, tighten the screws according to specification(Section 2 of this manual); otherwise the unit may no longer retain its water-tight capability.



Caution - Battery Pack: The SmartOne NiMH battery pack is not designed to be replaced by the end user. There is a risk of explosion if the battery pack is replaced by an incorrect type. Please recycle the entire device.

Appendix F – Specifications & Standards

Specifications	
Dimensions	H·W·D(metric): 8.26 cm x 17.78 cm x 2.86 cm
	H·W·D(English): 3.25" x 7" x 1.125"
Weight	385 grams; with optional bracket 1150 grams
	13.5 oz.; with optional bracket 40.57 oz.
Operating/Storage Temperature Range	-40°C to 85°C (-40°F to 185°F)
	NOTES: While functional in the specified Operating Temperature Range, usage of the SmartOne Solar™ above 60°C may cause RF signal degradation and decreased battery lifetime of the unit. The unit is certified Intrinsically Safe for hazardous environments over the temperature range -40° to +65°C (-40°F to 149°F).
Input Voltage	10 to 48 VDC
Battery Type	Built-in Nickel Metal Hydride rechargeable

Standards		
Continuous Water Immersion	IPX8	Sample immersed for 1 hour in water at room temperature. Water level set at 1 meter above units.
Water & Dust Ingress	IP69K	Ingress Protection (Dust & Waterproofing)
Military Standards	MIL-STD-810G	Fording – Water Immersion (Method 512.5) Impact resistance (Method 516.7) Salt Fog (Method 509.5) Acidic Atmosphere (Method 518.1) Humidity (Method 507.6) Vibration (Figure 514.7)
WEEE Compliant		
GMPCS-MoU		

Appendix G – Latitude/Longitude Decoding

Example Message = 0x002B5372BFF12F0A02

0x 00 2B 53 72 BF F1 2F 0A 02

Signed integer (MSB..LSB)

Lat2	Lat1	Lat0	Long2	Long1	Long0
------	------	------	-------	-------	-------

Calculating Latitude

Negative Latitude corresponds to Latitude in the SOUTHERN Hemisphere.
Positive Latitude corresponds to Latitude in the NORTHERN Hemisphere.

Degree_per_count_lat = $(90.0/2^{23})$

Hex Lat = 0X2B5372 ; Conversion to Decimal = 2,839,410

Latitude = Decimal Lat bytes * **Degree_per_count_lat**
 = 2,839,410 * $(90.0/2^{23})$
 = 30.463564 degrees NORTH

Note: If greater than 90 degrees, 180 must be subtracted from result

Calculating Longitude

Negative Longitude corresponds to Longitude in the WESTERN Hemisphere.
Positive Longitude corresponds to Longitude in the EASTERN Hemisphere.

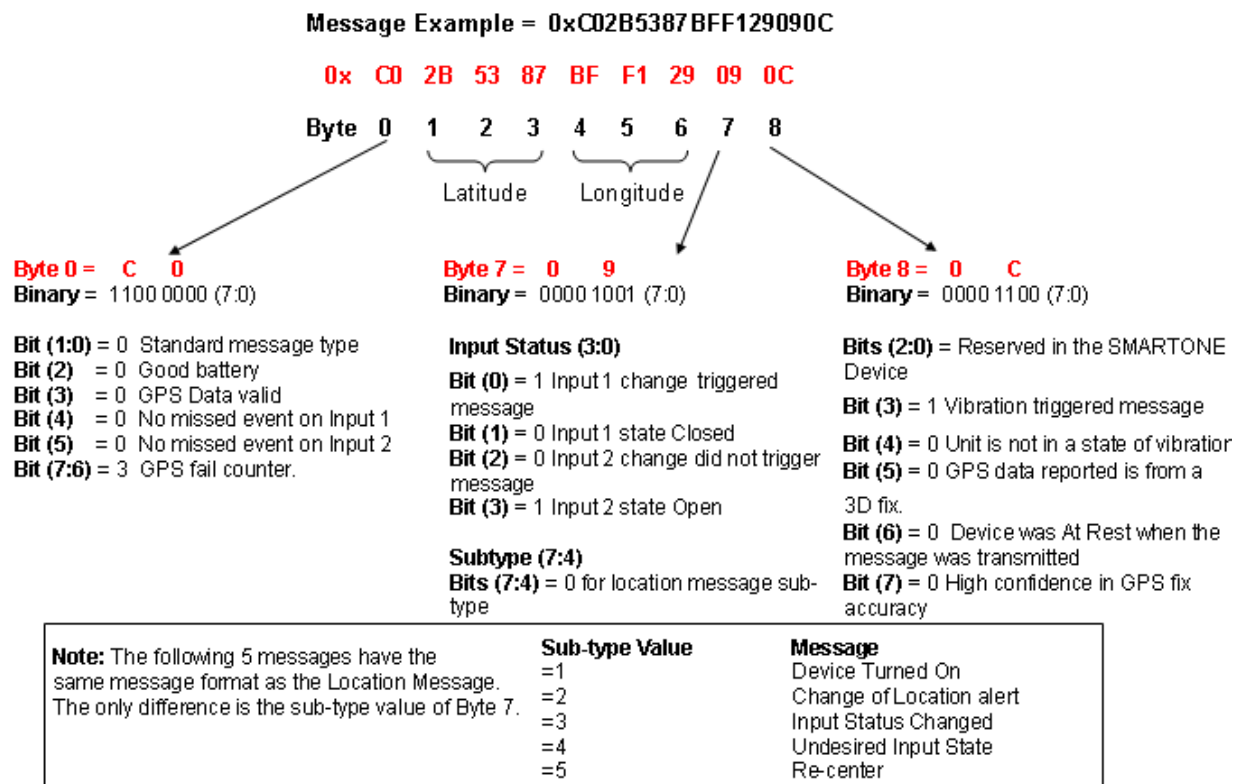
Degree_per_count_long = $(180.0/2^{23})$

Hex Long = 0XBFF12F ; Conversion to Decimal = 12,579,119

Longitude = Decimal Long bytes * **Degree_per_count_long**
 = 12,579,119 * $(180.0/2^{23})$
 = 269.918611

Note: If greater than 180 degrees, 360 must be subtracted from result. Therefore, **269.918611 degrees – 360 degrees**
 = -90.081388 degrees
 = 90.081388 degrees WEST

Appendix H – Standard Message Decoding



Appendix I - Diagnostic Message Decoding

Message Example = 0x 57033C784F00000009

0x 57 03 3C 78 4F 00 00 00 09
Byte 0 1 2 3 4 5 6 7 8

Byte 0 = 5 7

Binary = 0101 0111 (7:0)

Bits (1:0) = 3 Non Standard message type

Bits (7:2) = 21 for Diagnostic Message

Byte 2 = 3 C

Decimal = 60

Minimum Interval between
transmission attempts
(5 second resolution, 300)

Byte 4 = 4 F

Decimal = 79

Unsigned binary count in
seconds for mean GPS
search to acquire

Byte 1 = 0 3

Binary = 0000 0011 (7:0)

Bits(3:0) = 3 Number of Transmissions

Bit (4) = 0 Good battery

Bit (5) = 0 GPS system OK

Bit (6) = 0 Transmitter OK

Bit (7) = 0 Scheduler Subsystem OK

Byte 3 = 7 8

Decimal = 120

Maximum Interval between
transmission attempts.
(5 second resolution, 600)

Byte 5 & 6 = 00 00

Decimal = 0

Unsigned binary count of
failed GPS attempts since
last Diagnostic Message

Byte 7 & 8 = 00 09

Decimal = 9

of transmissions since last
Diagnostic message

Note: The following 2 messages have the same message format as the Diagnostic Message. The only difference is the value of Bits(7:2) of Byte 0

Bits (7:2) Value	Message
=22	Replace Battery
=23	Contact Service Provider

Appendix J - Accumulate/Count Message Decoding

Message Example = 0x63FFFFFFFFFFFF7DFF

0x	63	FF	FF	FF	FF	FF	FF	7D	FF
Byte	0	1	2	3	4	5	6	7	8

Byte 0 = 6 3

Binary = 0110 0011 (7:0)

Bits (1:0) = 3 Non Standard message type

Bits (7:2) = 24 for Accumulate/Count Message

Byte 1 & 2 = FFFF

Accumulated time that Input 1 has been in its undesired state with a resolution of 10 minutes.

0xFFFF means that Input 1

Accumulate has been turned off

Byte 3 & 4 = FFFF

0xFFFF means that Input 2

Accumulate has been turned off

Byte 5 & 6 = FFFF

Accumulated time that the SMARTONE has been in a State of Vibration with a resolution of 10 minutes.

0xFFFF means that accumulate time of vibration been turned off

Byte 7 = 7D

Decimal = 125

The total number of openings or closings of Input 1

Byte 8 = FF

0xFF means that Input 2

Accumulate count has been turned off

Appendix K - External Input Cable

INSTRUCTIONS AND WIRING DIAGRAM FOR EXTERNAL INPUT CABLE (PN# 2030-0265-04)

INSTRUCTIONS

1. This cable is designed to work with the SmartOne Solar product only. Do not use with any other SmartOne product.
2. This cable is designed to work with 3V logic only. Do not use with 5V logic devices.
3. Be certain that unused wires do not short to each other.
4. All ground wires are common; therefore, any ground can be used with any function.

Connector PIN #	Color	Function
2	Green	Ground
3	Brown	Setup (Handshake from Serial Device)
4	Red	RX (connect to Serial Device TX)
5	Orange	TX (connect to Serial Device RX)
8	Light Blue	Dry Contact 2
9	White	Dry Contact 1
11	Yellow	Unused
12	Blue	Ground
19	Violet	Line Power + (positive)
20	Gray	Line Power – (negative)

Appendix L – Solar Powered Limitations

Storage (Shelf Life)

The rechargeable NiMH battery pack may be considered operational for up to 8 months with the device powered off while in storage without sunlight.

Allowing a battery to fully drain is detrimental to its health and longevity, so long-term storage with an absence of sunlight (or halogen light) is to be avoided.

Typical Usage Life

Battery life is dependent on several factors:

- View of the sky (optimal is no blockage of solar panel, no clouds, sun 90° overhead)
- Ambient temperature
- How often the device is transmitting
- Age of batteries
- Battery charging due to battery voltage present
- Frequency of, and success of obtaining, GPS fixes

Typically, the SmartOne batteries will have a lifetime of up to 10 years when sending up to 140 In-Motion/Exception Reports or Location Messages per day.

Usage in the Absence of Sunlight

A fully charged SmartOne device should remain operational up to 6 months with a clear view of the sky in the absence of sunlight under any of the following mutually exclusive conditions:

- 1) Two Location Messages/day
- 2) Two nine-byte raw messages/day
- 3) Two GPS fixes/day