SHOUT ts USER GUIDE

Version 2.1.1

April 7, 2015

POWERED *by* **IRIDIUM™**

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Contents

Glossary

AES	Advanced Encryption Standard
BIS	Bureau of Industry and Security
CE	Conformité Européenne
CEP	Circular Error Probable
DoD	Department of Defense
DoD EMSS	DoD Enhanced Mobile Satellite Services
EAR	Export Administration Regulations
FCC	Federal Communications Commission
FDMA	Frequency Division Multiple Access
GMT	Greenwich Mean Time
GPS	Global Positioning System
HACC	Horizontal Accuracy
HDOP	Horizontal Dilution of Precision
IC	Industry Canada
IMEI	International Mobile Equipment Identification
LBT	L-Band Transceiver
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LNA	Low Noise Amplifier
NOC	Network Operation Center
OFAC	Office of Foreign Asset Controls
PDA	Personal Digital Assistant
PMS	PECOS Message Structure
POP	Post Office Protocol
RF	Radio Frequency
RUDICS	Router-Based Unrestricted Digital Internetworking Connectivity Solution
SBAS	Satellite Based Augmentation System
SBD	Short Burst Data
SMS	Short Message Service
SMTP	Simple Mail Transfer Protocol
TBR	Time-Between-Reports
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
VDOP	Vertical Dilution of Precision
USB	Universal Serial Bus

Introduction

The SHOUT ts is a handheld satellite messaging and personal tracking device. It is designed to operate with the Iridium satellite network utilizing short burst data (SBD). It can transmit location information determined by a highly sensitive GPS receiver, inbound and outbound status, text messaging, and emergency/alert notifications.

The SHOUT ts significantly improves service reliability over existing tracking products by allowing two-way communications and confirmation of the nature of the distress to the first responder community. This reduces false alerts, helps identify the nature of the emergency so that the correct assets can be deployed thereby reducing search and rescue costs, and provides communications feedback capability to the user to assist in rescue efforts. The SHOUT ts protocol is 100% compatible with the SHOUT, SHOUT nano and SHOUT gsm (when using the Iridium link). In this document, the terms SHOUT ts and ts are used interchangeably.

The SHOUT ts is designed with ultra-low power consumption electronics drawing less than 110μA during sleep. With an internal 1.95 A-Hr rechargeable Li-Ion battery and depending on the environmental conditions, it can send a position report every ten minutes for more than ten days (more than 1,500 reports). User is recommended to read Appendix C to learn about the impact of blocked antennas on the number of reports. The ts is equipped with a high resolution color touchscreen and on-screen keyboards allowing transmission of free-text, canned messages and a combination of free-text and canned messages. The menu options are displayed as icons for quick access. The device can periodically wake up from sleep to send its position report to a command center. A 911 button is used for immediate emergency/alert notifications. Data are packaged in either standard or 256-bit AES encrypted format.

The SHOUT ts is capable of sending position reports and text messages in PECOS Message Structure (PMS). The PMS complies with the Blue Force Tracking Data Format Specification as defined in the document PECOS 200907-001 Version 1.7. The ts is shipped without PMS features activated and can only be enabled by NAL Research at the request of an authorized user. Functions related to PMS can be found in Appendix A.

The SHOUT ts offers a variety of services including:

- **Normal Tracking —** The ts can be programmed to automatically wake up and send a position report at a set interval ranging from once every minute to once every seven days (at one minute increment).

- **Emergency Alert —** When the emergency 911 button is pushed, the ts immediately sends alerts to a designated monitoring center(s). The home base and user can then communicate to define further specifics of the situation and a response to the emergency.

- **Free-Text Messaging —** The ts allows user to send free-text via three different sets of touchscreen keyboards.

- **Canned Text Messaging —** The ts allows user to send canned (pre-defined) messages stored its memory. Sending canned messages saves bandwidth (effectively cost) because only short codes are transmitted to the server instead of the entire message body.

- **Waypoint Tracking —** The ts lets user send and/or save waypoints for later retrieval. A waypoint is a GPS location that a user wants to identify and mark with a specific name tag for future reference.

- **Check-In —** The ts allows a quick check-in message to be sent using a single key.

- **Man Down —** The ts has an integrated motion sensor used to activate man down situation.

- **Geofencing —** The ts accepts multiple fences defined as polygons (50 fences with up to 50 points each fence). The ts can be activated based on conditions set by these fences.

- **Data Logger —** The ts has a circular buffer and can be programmed to store up to 4,000 positions for later retrieval.

IMPORTANT: NAL Research can enable the SHOUT ts for use on the Iridium DoD EMSS Gateway. However, accessing the EMSS Gateway is not authorized until the SHOUT ts is provisioned (sign up for airtime). Unauthorized attempts to access the EMSS Gateway will result in immediate disabling of the offending device, which must then be returned to NAL Research for repair. Please see webpage https://sbd.pac.disa.mil for more information regarding DoD EMSS service provisioning.

IMPORTANT: User should not disassemble the ts for repair or services. The warranty is voided if the ts is disassembled. It should be returned to NAL Research for services by calling 703-392-1136 x203 or emailing contact@nalresearch.com.

Using the SHOUT ts

DEVICE DESCRIPTION

The SHOUT ts comprises of a touchscreen, a power/back button, a status LED, a guarded emergency button, and a micro USB port. The button is used to power up the device and can also be used as a back key. The touchscreen allows easy access to the device features. The micro USB port is for charging, firmware update and parameter setting. The LED displays device status during emergency and tracking.

IMPORTANT: The SHOUT ts must have full view of the sky during transmission.

Iridium Antenna — GPS Antenna

Touchscreen — Guard → Emergency Button

Micro USB Interface —

LED Status Display — Power/Back Button

ACCESSORIES

The following accessories are included with the SHOUT ts.

Manuals and Software   AC Wall Adapter   USB-to-micro USB Cable

CHARGING THE BATTERY

The SHOUT ts is shipped with its internal Lithium-Ion battery partially charged. User should fully charge the ts before use. There are two ways to charge the ts. One is to use the supplied AC wall adapter. The other is to connect to a standard USB device. With the AC wall adapter, the charging time is approximately five hours. Charging time using a USB port depends on the type of USB port. USB 1.0 should be able to charge the ts in about a day assuming the port is capable of producing

an output current of 100mA. USB 2.0 can charge in about twelve hours assuming the current output of 0.5A. NAL Research offers 12VDC and 28VDC chargers sold as separate items. For solar charges, NAL Research recommends any of Solio®'s products (www.solio.com).

⚠ WARNING!
All batteries can cause property damage, injury or burns if a conductive material, such as jewelry or keys, touches exposed terminals. The material may complete an electrical circuit and become extremely hot. To protect against such unwanted current drain, exercise care in handling any charged battery, particularly when placing it inside your pocket, purse or other container with metal objects. User should not disassemble the SHOUT ts for replacing battery. It should be returned to NAL Research for services. Risk of explosion if battery is replaced with an incorrect type. Dispose of the batteries (ts) according to local, state and federal regulations or laws.

The ts has a battery symbol 🔋 on top right corner of its screen indicating the battery is being charged. A message will appear when charging is complete. The device can be safely operated and does not need to be turned off while charging. The charging cycle will complete quicker when the device is shut down. While using the ts, the battery symbol turns red when the remaining power is less than 20%. A warning message will appear when the remaining power is less than 10%.

IMPORTANT: The SHOUT ts must be kept in environments between 0°C (32°F) and 45°C (113°F) when charging.

TOUCHSCREEN   The SHOUT ts has a resistive touchscreen. Either a finger or a stylus can be used to select options displayed on the screen. Resistive touchscreen offers consistent and durable performance in harsh environment. However, as with any touchscreen devices, user must be careful not to damage it with a sharp object. Unlike a capacitive touchscreen on most cellular phones whereby a slight tap of the finger is required, a resistive touchscreen requires a more moderate finger pressure. A resistive touchscreen drifts slowly over time and needs to be recalibrated. This can be done using the Setting > Calibrate menu.

Either a stylus or gloved finger can be used to access features on the resistive touchscreen
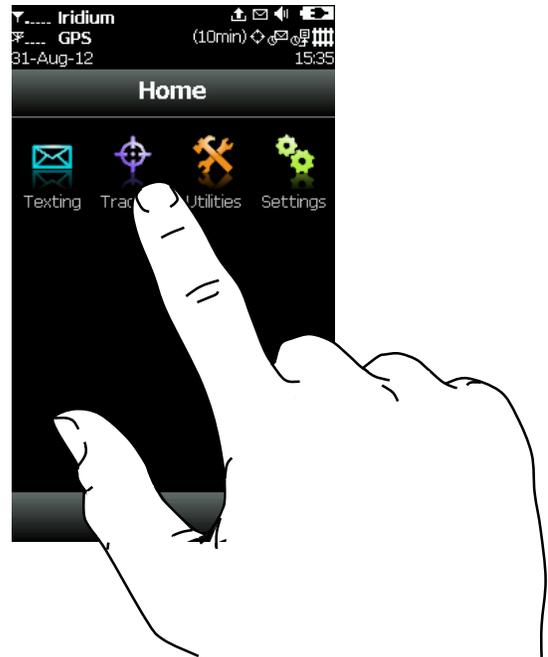
BASIC NAVIGATION

The SHOUT ts can be turned on by holding down the power/back button ⟲ for approximately two seconds. A delay in displaying time and date is normal since the unit first has to check its internal clock against the GPS receiver. Once the device is on, user can touch any icon to access device features. Again, user must remember to apply moderate pressure with a fingertip. Resistive screen requires a little more than a slight touch. The back key can be pressed at any time to return to the previous screen. Frequently use icons can be configured to appear on the bottom of the Home menu using Settings > Favorites. The ts can be turned off (completely off with no tracking or text messaging) at any time by holding down the power/back button for approximately two seconds. The device automatically "goes to sleep" after 90 seconds of inactivity.

USING THE KEYBOARDS

Some options require the use of on-screen keyboards to enter information. Three different keyboards are available in landscape orientation—lower case, upper case and number/special characters. User can toggle between keyboards with special designated keys next to the "Done" key. The keyboard screen is divided into three sections as shown in the figure below: (1) header bar, (2) text box and (3) keyboard.

The number displayed on the far right-hand side of the header bar indicates the remaining allowable number of characters that can be entered into the text box.

Cursor (flashing)

Header bar

Text Box

Keyboard

The keyboards are used to enter text inside the text box. The recommended hand-position is shown in the figure below utilizing two thumbs to tap the keyboard. While entering text, the position of the cursor in the text box is shown as a flashing white block. The block turns red when the maximum limit is reached (Remaining: 0). An alert will sound when the maximum number of characters is exceeded and additional text is entered.

User can hold down on any key while sliding around the keyboard. The key is not entered until the finger is lifted. The entire text box can be erased with the Clear button. Unclear reverses the process. Tap the Done button to accept entered text and return to the previous screen. Pressing the back key will ⟵ Ⓤ return to the previous screen _without_ all the changes—all the changes will be lost.
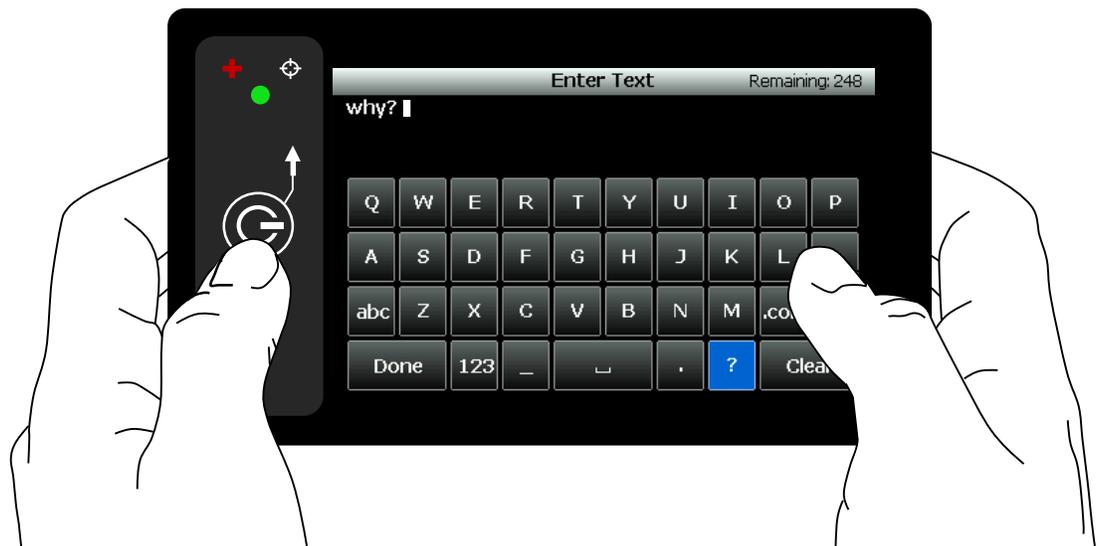
Entered text can be edited by tapping anywhere inside the text box. It is much easier to use a fingernail or a stylus to accurately position the cursor over the character to be edited. Holding and sliding a finger inside the text box will prompt the device to display a segment of the text in the header bar as shown in the figure below. The position of the cursor is displayed in red character. A space and enter key will appear as ⊔ and , ↵ respectively.


Finger position highlighted in red character
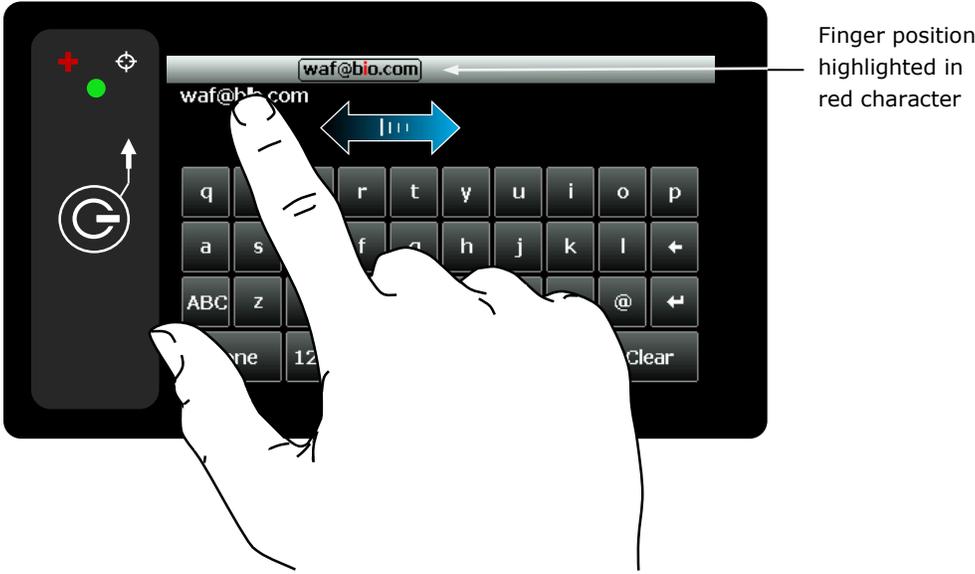
USING THE SEARCH BOX

Some menu options have a Search box allowing user to search for specific keywords or phrases. The search parameters are defined using Settings > Search menu. Touching the Search box will bring up a keyboard to enter the search item.

Search Box
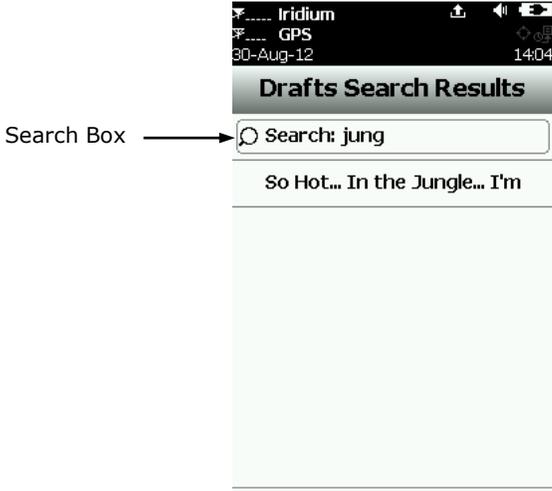
USING THE SLIDER BAR

For menus with options longer than the screen can display, a slider bar will appear on the right hand side. Hold and drag the slider with a fingertip causes the ts to quickly scroll the list. A slight finger movement either up or down makes the ts scroll one line at a time. Tapping above the slider prompts the screen to page up and tapping below the slider prompts the screen to page down. The active area or detect region of the slider bar is wider than the slider bar itself. Thus, it is possible to place a finger slightly away from the right edge of the screen to give a more comfortable feel.

Either slide to quickly scroll up and down or tap to page up and down
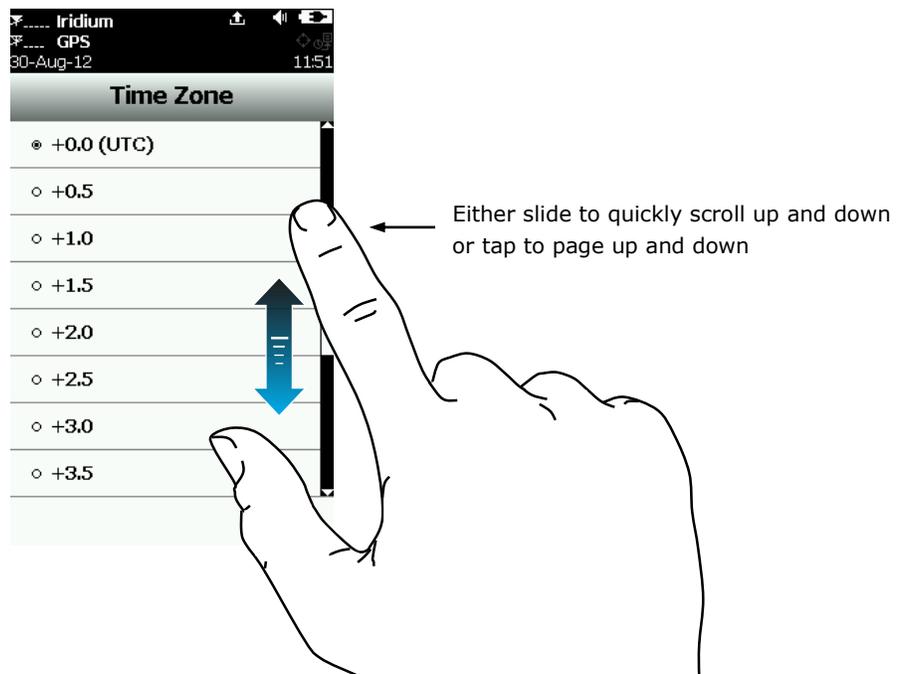
NETWORK OPERATING CENTER (NOC)

The SHOUT ts comprises of a 9602 module capable of SBD connectivity to the Iridium satellite network. As a messaging and tracking device, its function is to send GPS reports and text messages to a network operating center (NOC). While deployed in the field, the ts can also accept real-time text messages and commands from a NOC. For Iridium services, the SHOUT ts can be provisioned by NAL Research or any certified Iridium airtime service provider including DoD DISA EMSS office.

A NOC can be a sophisticated central monitoring center equipped with servers connected to high-speed networks. A NOC can also be as simple as a handheld mobile device, a laptop or a desktop attached to the Internet, to an Iridium transceiver or to any wireless network. A NOC is required to receive and implement the logic necessary for analyzing the ts messages and determine the appropriate response.

SERVER FOR TRACKER SOFTWARE

Upon request, NAL Research will provide Server for Trackers software allowing user to install on their NOCs to retrieve NAL Research's formatted GPS reports from the remote SHOUT ts. In addition, the program will let a NOC communicate with modems attached to its serial ports, communicate with POP3/SMTP servers, communicate with Iridium SBD DirectIP servers, and/or act as a RUDICS server/client to support incoming and outgoing communications with the ts. Under special cases and with a signed NDA, NAL Research will release our proprietary GPS report formats for developers to implement into their own tracking software.

SATTERM SOFTWARE

Along with Server for Trackers software, SatTerm software is included for user to set up the SHOUT ts operating parameters, geofences, contacts and canned messages. Most of the operating parameters can be set using the ts on-screen menus. However, more sophisticated features such as encryption and geofence must be carried out via SatTerm and a connected computer to the ts. For contacts and canned messages, the ts sends only short codes instead of the message body to a NOC server. Short codes are then mapped to the real addresses and/or canned messages with a lookup table saved on the NOC server during setup. Therefore, when SatTerm is used to enter contacts and canned messages, SatTerm will synchronize short codes between the ts and the NOC server. Email addresses, on the other hand, can be entered on the fly.

MAPPING NOC SERVER

NAL Research also makes available a mapping NOC server to our customers for demonstration purposes ONLY. Application developers can call to inquire on how to setup a free demo account. NAL Research's NOC server implements Google Earth to display tracking information. NAL Research assumes no responsibility for any claims or damages arising out of the use of our server. NAL Research makes no warranties on the performance or the availability of our server.

Home Screen

Immediately after powered up, user must press the unlock bar located on the bottom to the screen. A delay in displaying time and date is normal since the unit has to check its internal clock against the GPS receiver. A PIN is required if the device is setup with password protection. NAL Research ships the ts without password protection. However, if PIN is factory-set, it should be 1111.

Once the correct PIN is entered after powered up, the home screen will appear. Device status symbols will be shown along the top three lines of the home screen. Some symbols will not appear until an event is initiated such as sending or receiving a message.

Status Symbols   denotes the Iridium transceiver is off. To preserve battery life the Iridium transceiver will only be turned on when transmitting a message or position report and, thus, a diagonal line is drawn over the symbol when off.

denotes: (1) the either Iridium transceiver is on with real-time signal strength represented by the number of vertical bars or (2) SBD message

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transmission is in progress. The signal strength can range from the lowest of zero to the highest of five bars. During transmission the antenna must have a clear view of the sky. The SHOUT ts cannot send messages or reports from inside a building.

denotes the GPS receiver is off. The GPS receiver is always kept off to preserve battery life until time, date or position information is needed.

denotes the GPS receiver is on with real-time satellite acquisition status represented by the number of vertical bars. One bar represents valid time and date fix, two bars represent 2-D fix or dead reckoning, three bars represent 3-D fix with HDOP higher than 2.0 and four bars represent 3-D fix with HDOP less than 2.0. Although the SHOUT ts' GPS receiver can often obtain a location fix when the antenna is partially blocked (near buildings, in a room next to a window, etc.), it is recommended that the antenna must have a clear view of the sky to minimize acquisition time and better position accuracy.

battery indicator.

denotes the battery is being charged by an external power source.

denotes all audio alerts are off.

denotes audio alert is on.

denotes unread message(s) is in the Inbox.

denotes message(s) is in the Outbox ready to be sent or message(s) in queue failed to send.

denotes Geofences is on when the symbol is bright white. The symbol turns dimmed gray when geofence tracking is off. The geofence symbol will not appear when there are no fences saved into the device.

denotes Call Out is on when the symbol is bright white. The symbol turns dimmed gray when Call Out is off. The Call Out symbol will not appear when there are no Call Out times saved into the device.

denotes Mailbox Check is on when the symbol is bright white. The symbol turns dimmed gray when Mbox Check is off.

denotes Tracking (standard tracking, geofence tracking, etc.) is on when the symbol is bright white. When standard tracking is on, a countdown timer to the next report will appear beside the tracking symbol. The symbol turns dimmed gray when tracking is off.

denotes Man Down is on.

Date/Time The current date and time are displayed in formats set by Settings > Time > Date option. The GPS receiver has an internal clock and, as long as the battery is not depleted and a valid position fix was previously acquired, the SHOUT ts can recall the correct date and time. The message "Date/Time unavailable" is displayed when the ts is unable to restore information from the GPS receiver.

Home Icons The SHOUT ts displays four main icons on its home screen each representing a menu option—Texting, Tracking, Utilities and Settings. Detailed descriptions of each of these menu options are included in the next section.

Favorite Icons The bottom of home screen has a favorite bar. Any of the menu icons can be configured to appear on the favorite bar using Settings > Favorites. This allows quick and easy access to the most frequently used options. A maximum of four favorite icons are allowed. The icons appear in the order of selection from left to right.

Quick Start

Airtime services must first be purchased for Iridium before use. Iridium airtime can be purchased directly from NAL Research or from any of Iridium certified airtime resellers.

User is encouraged to read the entire manual to learn on how to operate the ts as a messaging device. As a tracking device, user can quickly set up the ts with just a few simple steps shown below. However, a server is required to receive tracking reports.

1. Turn the ts on by holding down the power/back button   for about two seconds.

2. Go to Tracking > Format menu to set the report format   .

3. Go to Tracking > Rpt Rate menu to set the reporting rate and turn tracking on   . The ts is now in tracking mode and ready to send position reports. No further action is required. The unit automatically goes to "sleep" in between reports.

IMPORTANT: NAL Research can enable the SHOUT ts for use on the Iridium DoD EMSS Gateway. However, accessing the EMSS Gateway is not authorized until the SHOUT ts is provisioned (sign up for airtime). Unauthorized attempts to access the EMSS Gateway will result in immediate disabling of the offending device, which must then be returned to NAL Research for repair. Please see webpage https://sbd.pac.disa.mil for more information regarding DoD EMSS service provisioning.

Texting Menu

TEXTING

The Texting menu allows user to compose, save, view, send canned or free-text messages, check mailbox for incoming messages and setup an automatically mailbox check frequency.

Inbox

The Inbox folder contains all incoming read and unread messages with the newest on top of the list. Read messages have a white opened envelope ⊠ symbol next to them. Unread messages have a green closed envelope symbol ✉ next to them. A closed envelope symbol ✉ will appear on top of the screen when an unread message(s) is in the Inbox. When enabled using the Settings > Audio menu, the speaker will provide an audible alert for all new incoming messages.

Drafts

The Drafts folder contains draft messages saved under the Compose menu. The ts stores the newest message on top and the oldest message on bottom of the list. Selecting a draft message takes user back to the Compose screen. If Send is selected, a Confirm and then Success screen will appear to indicate that the message has been added to the Outbox. If Inc GPS option is enabled then GPS location will be attached to a message. Messages with GPS location attached can take longer to complete since the ts has to acquire a GPS position.

Outbox

The Outbox folder contains either messages waiting to be sent or messages failed to send. A message *in the process* of being sent has a ≪ symbol next to it. A message *failed* to send has a red **X** symbol. And a message *in queue* waiting to be sent has no symbol. For each message queued in the Outbox waiting to be sent,

the ts has a two-minute window to transmit. After which time, the message will be dequeued to avoid draining the battery.

Failed to send messages will stay in the Outbox sorted in the order of priority and then by the oldest to the newest messages. The symbol ⬆ appears on top of the screen when there is a queued or dequeued message(s) in the Outbox.

Failed messages can be deleted or resent (enqueue). However, if user decides to resend a failed message and if the failed message is successfully retransmitted, the SHOUT ts will automatically attempt to resend as many remaining failed messages in the Outbox as possible in the following order of priority.

> Category 1 (highest priority):
>> Callout
>> Cancel Emergency
>> Geofence Arrive/Depart
>> Man Down
> Category 2:
>> Check-In
>> Queued Tracking Report
> Category 3:
>> Motion Start/End Report
>> Statistics Report
>> Test Report
> Category 4 (lowest priority):
>> Remote Update Response
>> Poll Report
>> Text Message
>> Waypoint

If there are multiple items in the same category, the oldest will be sent first. The SHOUT ts will also automatically resend failed messages in the order stated above after a successful transmission by any option involved accessing the network such as Tracking, Test Report, Waypoint, etc. To avoid draining the battery, user should carry out frequent maintenance on the Outbox and delete unwanted failed reports.

Sent

The Sent folder contains messages successfully sent to a NOC server. A message can be resent, forwarded or deleted. Resend puts a message back to the bottom of the Outbox folder's sending queue. Forward takes user back to the Compose menu for additional information to be entered. User can then resend the message after

modifying it or cancel the process. Delete permanently removes the message from the Sent folder. The ts stores messages in the Sent folder with the newest message displayed on top of the list.

Compose

The Compose menu allows user to enter, edit and send canned messages, free-text messages or a combination of canned and free-text messages to: (1) a NOC server, (2) a pre-defined list of email addresses or/and (3) any email addresses entered via the keyboards.

SatTerm software is used to create and save predefined email addresses onto the SHOUT ts' contact list. During setup SatTerm requires connectivity between the ts and a NOC server to synchronize the lookup table of short codes. As with canned messages, short codes are used to map the actual email addresses to a lookup table located at a NOC.

When the Compose menu is selected, a screen will appear with two distinct regions—"To: Server" and "Canned Message:". Holding a finger inside the To: Server region prompts the SHOUT ts to display two options, Choose Contacts and Enter Emails, as shown in figure below. User can slide a finger back and forth between these two options and must also remember to apply moderate pressure on the touchscreen while sliding the finger. DO NOT lift the finger until the right choice is selected. Slide the finger away to the top of the screen or bottom of the screen cancels this option.

After Choose Contacts is selected and if contacts were entered with SatTerm, a list

of contacts will appear in alphabetical order. Select a single contact or multiple contacts on the list and tap Add to accept. A contact can be removed by going back to Choose Contact, unselecting the contact and tapping Add. Pressing the back key instead of Add after selecting or unselecting a contact will cancel the choice(s).
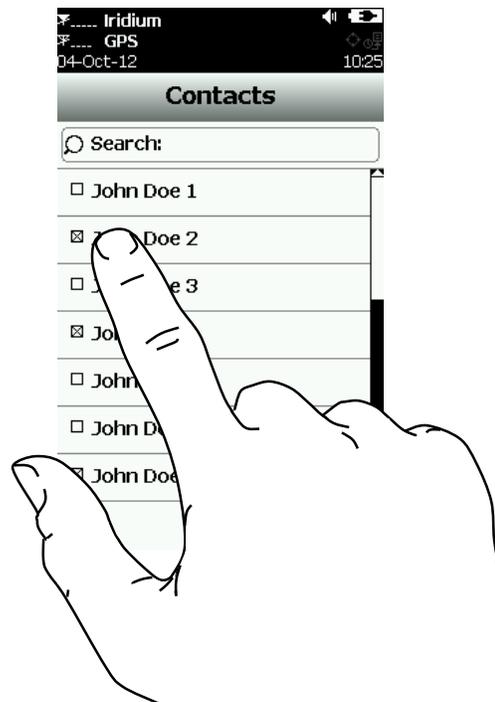
After Enter Emails is selected a keyboard will appear. Multiple email addresses can be entered separated by a comma. All email addresses including the commas must be added up to a total of 255 characters or less. The ts keeps track of the limit and will prevent user from entering email addresses longer than allowed. Email addresses and free-text message share the same memory space with a maximum allowable length of 309 characters. Long email addresses or multiple email addresses will reduce the number of characters available for a free-text message. User is reminded that the ts sends short codes representing the contacts listed under To; however, the ts sends the actual email addresses listed under Emails. Any email addresses entered under Enter Emails can be removed by going back to the keyboard under the Enter Emails popup menu.

Holding a finger inside the Canned Message region prompts the ts to display two options—Choose Can'd Msg and Enter Text. After Choose Can'd Msg is selected and if canned messages were entered with SatTerm, a list of canned messages will appear in the order they were entered with SatTerm. Tap on a canned message to prompt the ts to display the complete canned message and tap Select to choose

the message. After a canned message has been chosen, holding a finger inside the Canned Message region will show Remove Can'd Msg. Selecting Remove Can'd Msg allows user to remove the selected canned message at any time, even after free-text has been entered.
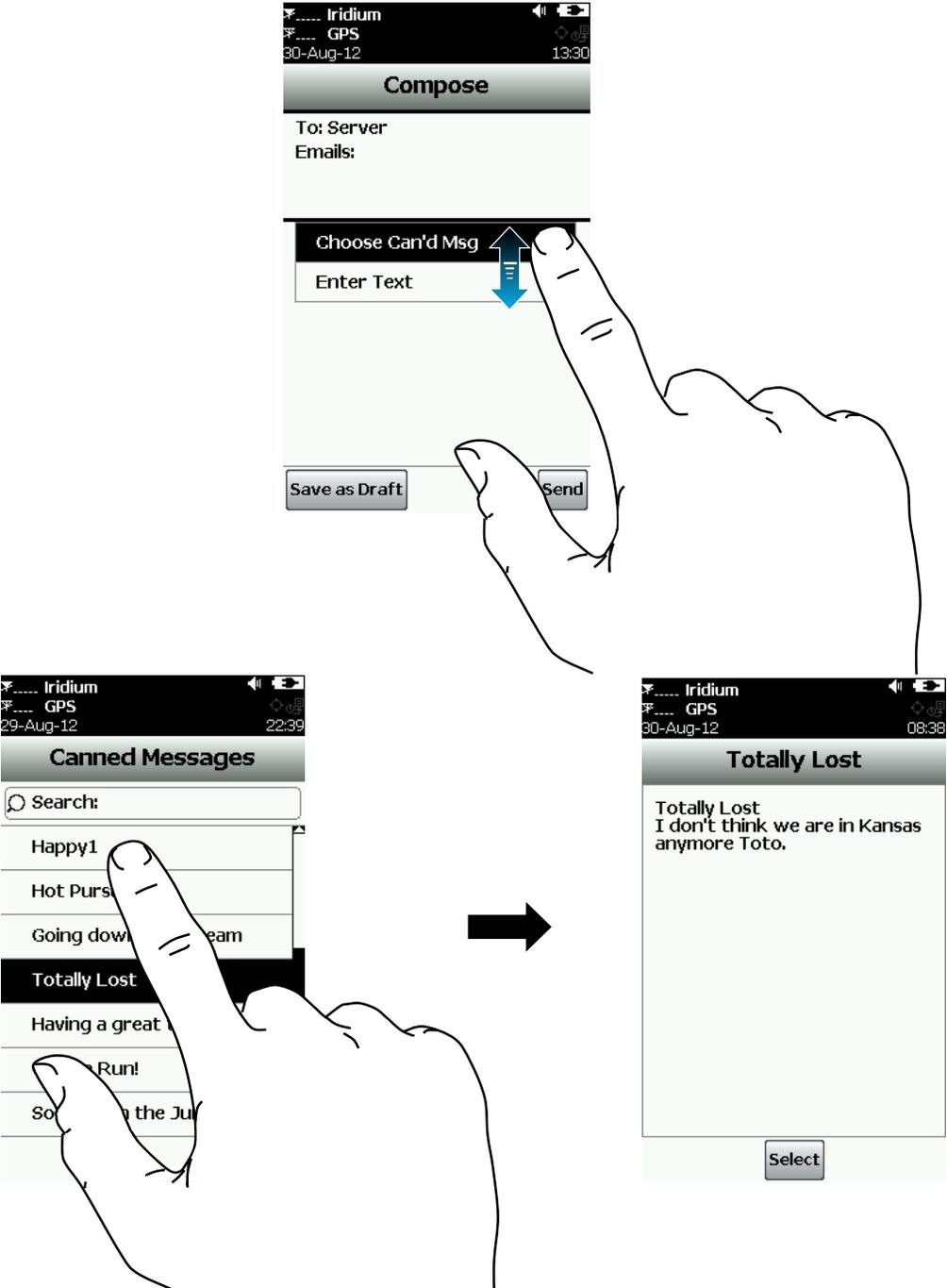
As with the contact list, SatTerm is used to create and save canned messages into the SHOUT ts' memory. During setup SatTerm requires connectivity between the ts

and a NOC server to synchronize the lookup table of short codes. Sending canned messages saves bandwidth and airtime cost because it is only short codes that are being transmitted instead of the entire message body. The short codes are defined by application developers and not by the ts.

The Enter Text option lets user create free-text messages with three on-screen keyboards. If a canned message is previously selected then the entered free-text will be appended to the canned message.

After finish selecting a canned message and/or composing a free-text message, user can either Send the message or Save as Draft. If Send is selected, a Success screen will appear to indicate that the message has been added to the Outbox. The ts must then be held with the antennas having full view of the sky if the Iridium link is used. If Inc GPS option is turned on then GPS location will be added to the message. Messages with GPS location takes longer to complete since the ts has to acquire a GPS fix.

Contacts

The Contacts is an address book with a list of contacts created and saved into the SHOUT ts' memory using NAL Research's SatTerm software. During setup SatTerm requires connectivity between the ts and a NOC server to synchronize the lookup table of short codes. As with canned messages, short codes are used to map real addresses to a lookup table located at a NOC.

Each contact is stored in a four-line format. The first line can have up to 30 characters, the second can have 50 characters, the third can have 30 characters and the fourth can have 30 characters. The information contained in each line is defined by developers and not by the ts.

Figure below displays an example of the formatted contact *defined by the NAL Research's NOC server*. The first line has the contact name, the second line has the e-mail address, the third line has the phone number and the fourth line has the home address. Upon receiving a free-text or canned message from the ts that is referenced to a specific contact, the NAL Research's NOC server forwards the message to the email address listed on the second line of the contact. Application developers can *define their own set of rules* with information contained in the contact so that their NOC servers can use to determine the appropriate response.
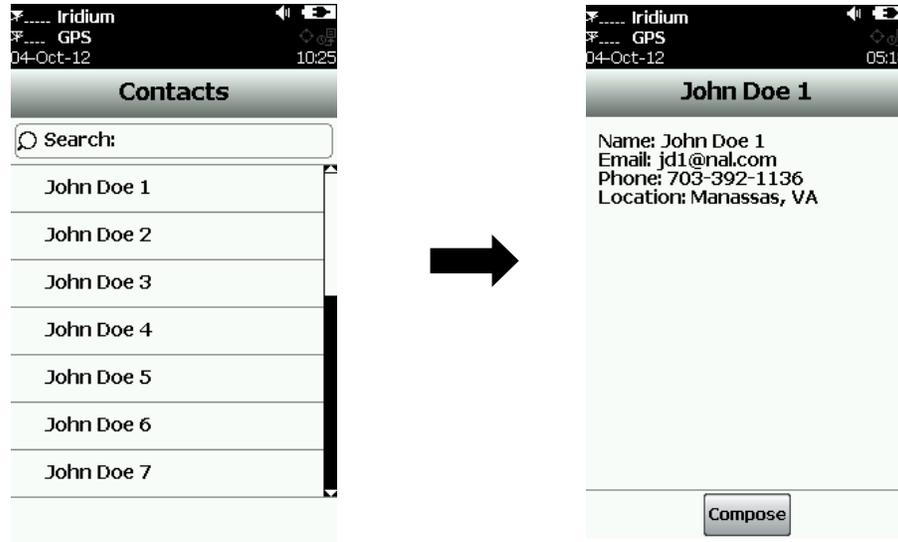
Chk Mbox

This option is available ONLY when the Iridium link is enabled.

There are three ways the SHOUT ts can initiate a mailbox check for any pending messages at the Iridium gateway:

1. User can manually force the ts to check the mailbox at any time using Chk Mbox menu.
2. When tracking mode is enabled, the ts automatically checks the mailbox each time it wakes up to send a position report.
3. Using the Mbox Rate menu (see below for detailed description), the ts can be set to automatically wake up and check the mailbox at a preset frequency. A position report will not be sent when the ts wakes up to check the mailbox unless the mailbox check rate coincides with the tracking report rate.

The Check Mailbox menu can either be in Idle or Checking the Iridium gateway for any pending messages to be downloaded. As the messages are being downloaded, the ts shows the number of Unread messages in the Inbox and the number of messages still Queued at the Iridium gateway to be downloaded.

Mbox Rate

This option is available ONLY when the Iridium link is enabled.

The Mbox Rate is used to set mailbox check rate (time between mailbox checks) and to enable mailbox check automatically. User can select either a predefined rate or a user-defined rate with an onscreen keypad. The Mailbox Check Rate menu is dimmed when mailbox check is disabled. However, even when mailbox check is

disabled and the labels are dimmed, user can still enter the rate.
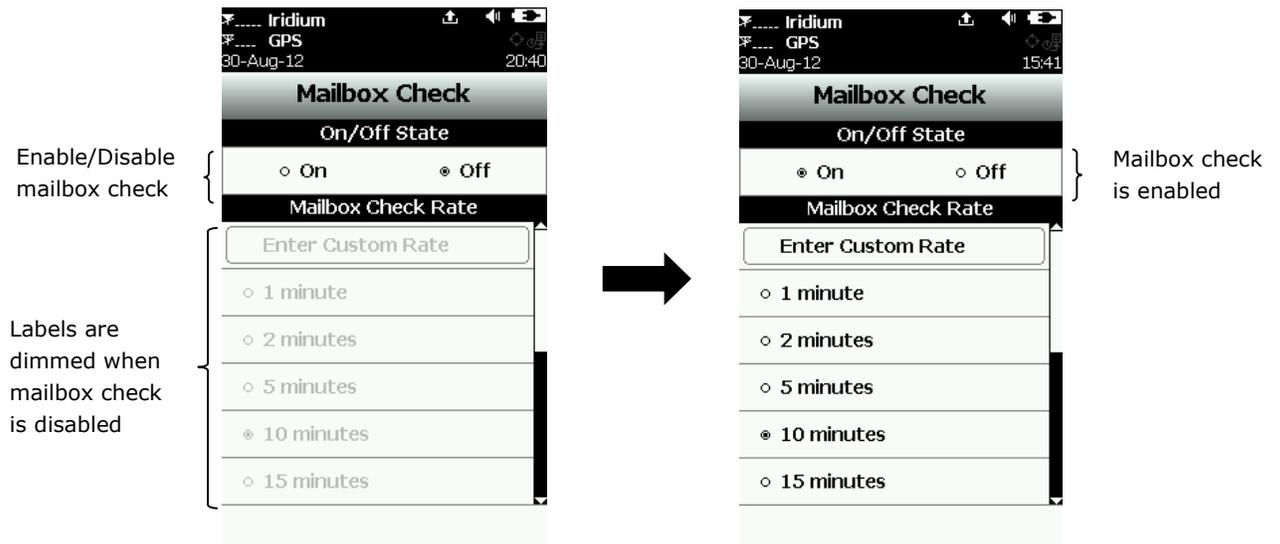
When mailbox check is enabled, the symbol ⌖✉ will light up from dimmed gray to bright white on top of the screen. The ts will check the Iridium gateway automatically for any pending messages on the next scheduled time. When mailbox check is enabled and the ts sleeps in between checks, the status LED flashes once every five seconds. The status LED can be turned off during sleep to reduce power consumption by using Settings > LED menu.

Inc GPS

The Inc GPS option forces the SHOUT ts to attach GPS location to Check-In and canned and free-text messages. Under default setting, these messages do not have GPS information included. Messages with GPS location attached can take longer to complete since the ts has to acquire a GPS fix first. Depending on the validity of the stored ephemeris data, it could take an additional 29 seconds.

Memory

Memory is used to clear messages in all mail boxes or clear messages in each individual box—Drafts, Inbox, Outbox and Sent.

Tracking Menu

TRACKING

The Tracking menu for the SHOUT ts is shown below. Some options are very complex including Geofences, and Call Out that require SatTerm to setup. For these options, user is referred to the "SatTerm for SHOUT ts" manual.

Rpt Rate

The Rpt Rate is used to set the tracking report rate (time between tracking reports) and to enable tracking. User can select either a predefined rate or a user-defined rate with an onscreen keypad. The Reporting Rate menu is dimmed when tracking is disabled. However, even when tracking is disabled and the labels are dimmed, user can still enter the report rate.

The On/Off buttons are used to enable/disable the SHOUT ts tracking mode. When tracking is On, the tracking symbol ✛ on top of the screen changes from dimmed gray to bright white. The ts immediately turns the GPS receiver on to acquire a GPS fix and then attempts to transmit a position report. The next position report is sent automatically based on the reporting rate. Countdown timer to next report is displayed inside the parentheses next to the tracking symbol. When tracking is enabled and the ts sleeps in between position reports, the status LED ⊕ flashes once every five seconds. It can be turned off during sleep to reduce power consumption by using Settings > LED menu. The emergency 911 button can be activated at any time during tracking mode or non-tracking mode. The ts can also be powered up at any time and be used as a texting device.

When waking up to transmit a location report and the Iridium link is used, the ts

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antennas must have full view of the sky; otherwise, it will fail to send. By default, a failed report will not be resent. Using the Q Rpt menu, failed reports can be forced to stay in the Outbox awaiting to be resent (see Outbox description).

The entire reporting duration can take up to two minutes depending on the Iridium satellite visibility and the validity of the GPS ephemeris data. Ephemeris data saved on the GPS receiver is valid for approximately two hours allowing the receiver to obtain a hot-start fix. Report rate (time between reports) set to more than two hours forces the GPS receiver into either a warm-start or cold-start fix (~29 seconds). As a result, the ts will consume more battery power and the total number of reports is reduced. User is encouraged read the Appendix C.

IMPORTANT: The SHOUT ts will <u>automatically resend</u> all failed messages in the Outbox after a successful position report transmission. To avoid draining the battery unintentionally, user should carry out frequent maintenance on the Outbox and delete unwanted failed messages.

The ts logs and saves all position reports in its circular memory. When its memory is full, the oldest report is over-written. SatTerm can be used to retrieve all position reports saved on the ts.

Format

The SHOUT ts can transmit position reports in either 30-byte format or 10-byte format. Both of these formats are backward compatible with the SHOUT nano.

The 30-byte format includes UTC date, UTC time, latitude, longitude, altitude, speed, course, vertical velocity, number of satellites used to obtain 3-D fix, HDOP and VDOP. Latitude and longitude are recorded with about 0.18 meters in resolution.

The 10-byte format includes UTC time, latitude, longitude and PDOP. With UTC date omitted, the ts relies on the NOC server to stamp the date as the report arrives. Encryption is not available with the 10-byte format. Latitude and longitude are recorded with about 1.1 meters in resolution. The 10-byte format is selected strictly for the purpose of Iridium airtime cost-saving.

The ts can also send position reports in PECOS Message Structure (PMS). The PMS complies with the Blue Force Tracking Data Format Specification. The ts is shipped without PMS features activated and can only be enabled by NAL Research at the request of an authorized user. Functions related to PMS can be found in Appendix A.

Link

The SHOUT ts' default setting is **Yes** to allow the Iridium Link to be used to transmit reports and messages. If the Iridium Link is not allowed to be used (radio silence), set the Allowed setting to **No**. In the case when Tracking is on, Data Logging is on and Iridium Link is set to **No**, tracking reports will be saved in its circular memory.
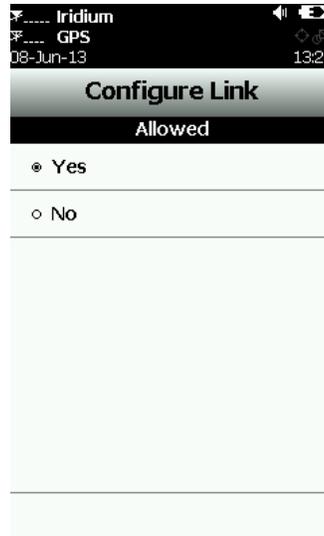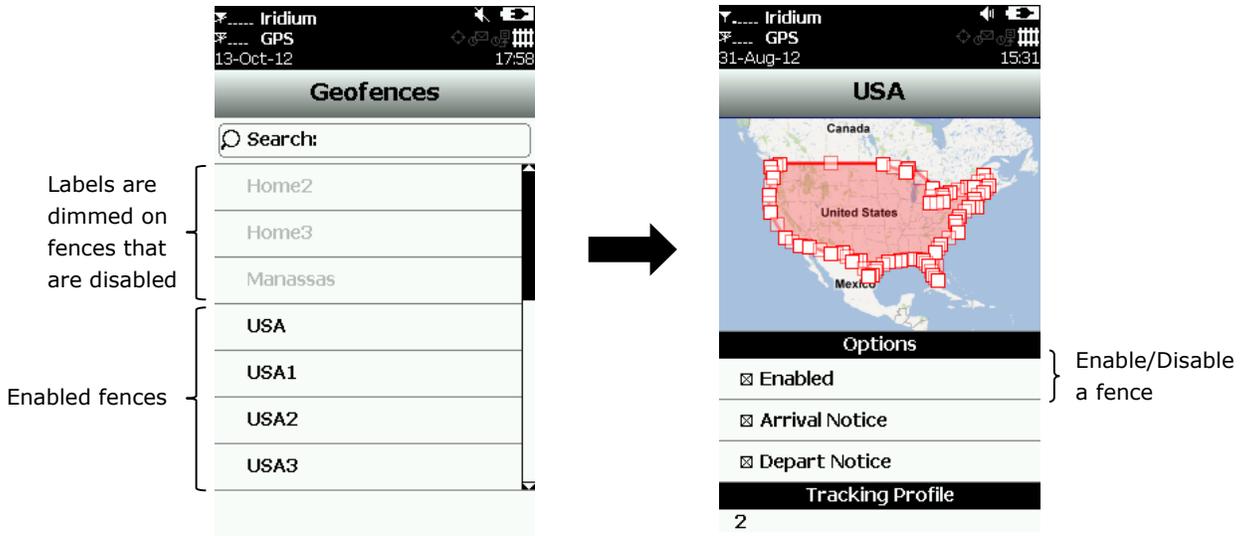

Geofences

In addition to "standard" tracking enabled through the Rpt Rate menu, Geofences is another tracking option tailored for specific applications. Geofence tracking works independently as a separate tracking mode or can be implemented along with standard tracking. Setting geofence parameters is complex. NAL Research recommends the use of both SatTerm and Google Maps®. User can also enter a sequence of latitude and longitude pairs to define a fence using just SatTerm. User is referred to the "SatTerm for SHOUT ts" manual.

A geofence is a set of connected latitude and longitude coordinates that defines a region or zone of interest. A geofence must be bounded by a minimum of 3 coordinates and a maximum of 50. Each fence has a unique tracking profile that triggers the SHOUT ts to change its tracking behavior while inside a specific fence; e.g., allows the SHOUT ts to turn off the Iridium link for regions that require radio silence. A geofence can be configured to send special arrive/depart report upon entering and/or exiting the fence.

The Geofences menu limits user to a just few options including: (1) browsing a list of fences loaded into the device through SatTerm, (2) viewing the map of each fence and its type of notification (arrival or departure), and (3) enabling/disabling a fence. Other geofence features must be entered through SatTerm.

Labels are dimmed on fences that are disabled

Enabled fences

Enable/Disable a fence

When a fence or fences are enabled, the Geofences symbol ▦ on top of the screen changes from dimmed gray to bright white. The ts immediately checks the GPS receiver to see whether the device is inside an enabled fence. If the ts is inside an enabled fence, the Geofences symbol turns green and the fence label turns green as well with the word Active attached to it. When a fence(s) is enabled and the ts sleeps, the status LED ⊕ flashes once every five seconds. It can be turned off during sleep to reduce power consumption by using Settings > LED menu.

Symbol turns green when the device is inside an active fence

Active fence
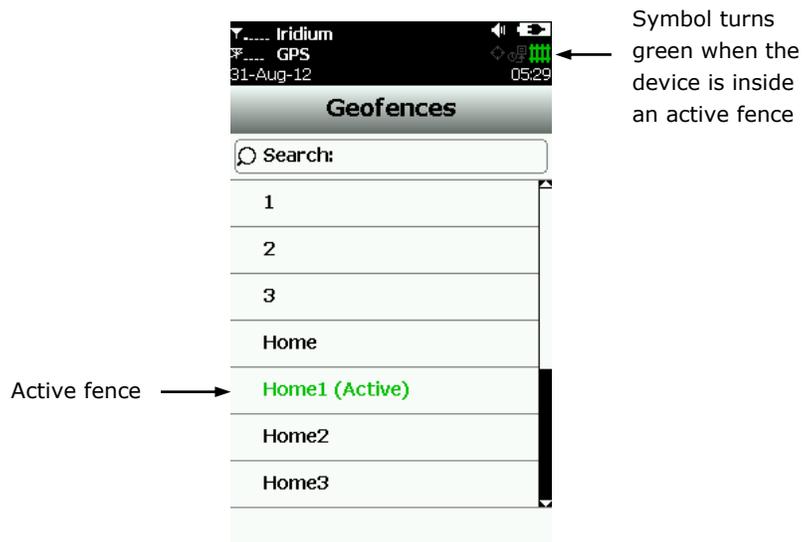
Brevity

The Brevity code is part of the PMS format. The ts will ignore the Brevity code settings if PMS/PECOS format is not activated and not selected. Functions related to Brevity code can be found in Appendix A.
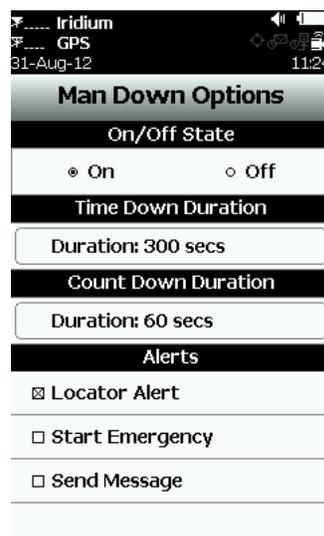
Man Down

The Man Down option allows user to set the options used by the Man Down Alert feature. The Man Down Alert detects when the SHOUT ts is motionless for a configurable amount of time and triggers up to 3 different alerts if user does not respond affirmatively to an "Are You OK?" popup menu. Once Man Down begins alerting, it can be canceled by selecting the Cancel 911 menu or selecting "Off" on this menu. The following settings are configurable through this menu:

Time Down Duration – the amount of time the device must remain motionless before the "Are You OK?" menu will display. "Motionless" is defined as when the SHOUT ts does not detect a predefined type of motion over a period of time called Time Down Duration. SatTerm software is used to enter the predefined type of motion into the SHOUT ts.

Count Down Duration – the amount of time for user to respond to the "Are You OK?" popup menu. If the countdown expires or the user selects "No", the selected Man Down Alerts will trigger.

Alerts – any combination of the following three alerts can be selected.

Locator Alert	Configurable audio alert that sounds until the Man Down Alert is disabled. The alert type can be set from the Audio menu.
Start Emergency	Starts emergency mode as if the red emergency button were pressed.
Send Message	Sends a text message with a Man Down short code and GPS location information.

Symbol is shown when Man Down is enabled
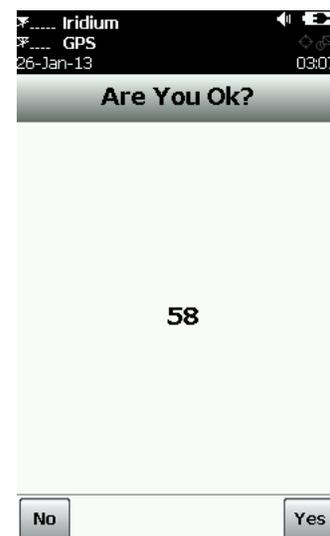
Call Out

The Call Out allows the SHOUT ts to send a scheduled daily tracking report at a defined GMT time using a specific link. Scheduled times are entered via SatTerm software and are listed under the Call Out menu. When a Call Out time is selected, the ⏱ symbol will light up from dimmed gray to bright white on top of the screen.

The Call Out option could be used by customers who need the device to transmit at a specific time and/or want to generate a daily heart beat message for each link. User is referred to the "SatTerm for SHOUT ts" manual.

Q Rpt

The SHOUT ts' default setting is to discard all tracking reports that were failed to transmit because of poor signal quality. Q Rpt allows user to force failed tracking reports to stay in the Outbox waiting to be resent at a later time. User is referred to the Outbox section on description of when failed tracking reports get resent.

Blk Rpt

The SHOUT ts' default setting is to send all tracking reports, even those with invalid GPS position. Blk Rpt gives user the option to configure the SHOUT ts to send only tracking reports with a valid GPS position.

Data Log

The SHOUT ts' default setting is to log and save all position reports in its circular memory. This feature can be turned off with the Data Log menu. When the ts' memory is full, the oldest reports are over-written. SatTerm can be used to retrieve all position reports saved on the ts.

Stats

The Stats menu has a countdown timer to the next report on top of the screen and is replaced with Off when tracking is disabled. The bottom half of the screen displays the last successful report sent by tracking or emergency notification. Check-In, Way Point, free-text and canned messages are not considered as "reports" and, therefore, will not be displayed even if a message was sent successfully.

Cancel 911

After the red emergency button ● in the back of the ts is pressed, user can deactivate the emergency alert by selecting the Cancel 911 option. The cancellation message is then queued in the Outbox to be transmitted. The emergency mode ends immediately. The emergency LED ✚ is turned off and the top bar turns from red back to black.
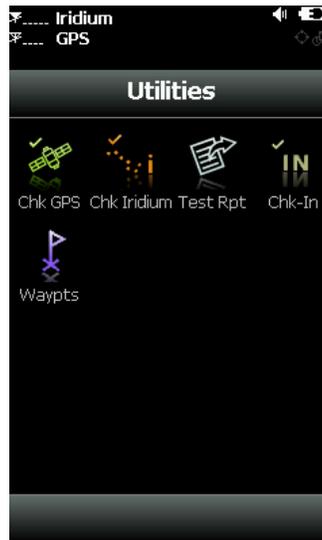
Powering the ts off will not cancel the emergency mode. User MUST select Cancel 911 option to cancel emergency.

Utilities Menu

UTILITIES

The Utilities menu provides six options used mainly to check for proper hardware operation and network setup.

Chk GPS

The Chk GPS forces the SHOUT ts to turn on its GPS receiver and to continuously update and display GPS data in real-time. The GPS receiver remains on until user leaves this screen by pressing the back button. The Reset Ephemeris key is used to force the ts to erase saved ephemeris in its memory and download a new set of ephemeris data. User must be careful not to deplete the battery power by staying on this option for too long.

The accuracy of the position can be monitored by observing the HACC. HACC stands for horizontal accuracy in meters. HACC is defined as the radius of a circle centered on the true value that contains the GPS measurement. Thus, a position fix with ten meters HACC accuracy indicates that it is within ten meters of the true position—the higher the HACC value, the less accurate the GPS measurement.

The Check GPS option is a good indicator of whether or not the GPS receiver has sufficient signal to initiate a Way Point or a Test Report when located in a challenging environment; e.g., in dense foliage or around urban settings with tall buildings. HACC can be monitored in real-time to make sure it converges to a small and stable value (usually less than 25 meters). At which point, it is certain that a 3-D fix can be obtained with the most current ephemeris data being updated and saved. User can then go back to the Utilities menu to send a test report. When the

GPS receiver cannot acquire a fix, HACC gradually increases and, at some point, stops at a value of 4294967.500. It is an indication that the surrounding obstructions prevent the GPS receiver from obtaining a fix and user should move on to a different location.

Chk Iridium

The Chk Iridium forces the SHOUT ts to turn on its Iridium transceiver and continuously update and display signal strength in real-time. The Iridium transceiver remains on until user leaves this screen by pressing the back button. User must be careful not to deplete the battery power by staying on this option for too long.

Test Rpt

When the Test Rpt option is selected, the SHOUT ts immediately turns the GPS receiver on to update its location data. The location information is continuously updated and displayed in real-time whether there is a valid fix or not. Similar to the Chk GPS option, HACC can be monitored to see if a valid fix is possible. Once a valid fix is obtained, the GPS receiver is turned off and the most recent 3-D fix information is displayed on the screen. This information called test report can be forced to send to a NOC server by pressing Send. A test report has the same format as a regular position report and is treated as such by a NOC. Sending a test report will not disrupt or change the tracking reporting rate.

Test Rpt option is a good diagnostic tool used to ensure proper operation of the GPS receiver and the Iridium transceiver. It can also be used to manage battery life by turning off tracking mode and strategically sending on-demand location reports. It can be considered as "manual tracking mode".

Chk-In

The Chk-In allows user to send a quick message with a single, easy-accessed button. When the Chk-In button is pressed, a second screen will appear requesting confirmation. Once confirmed, the SHOUT ts sends out a reserved canned message code representing a Chk-In message. If Texting/Inc GPS option is enabled, GPS location will be attached to the Chk-In message. Chk-In messages with GPS location takes longer to complete since the ts has to acquire a GPS fix first.

Waypts

The Waypts menu is used to acquire, view, save, delete or send a waypoint to a NOC. The ts can save up to 1,000 waypoints in its circular memory. SatTerm can be used to retrieve waypoints saved on the ts.

A waypoint is a GPS location that user wants to identify and mark with a specific name tag for future reference. When New is selected, the SHOUT ts immediately

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turns the GPS receiver on to acquire a fix. User then has the options to go back without further action, to re-acquire a new GPS fix, to label the point, or to save the waypoint. Selecting the Label option will bring up a full keyboard allowing user to enter the waypoint label. The Add option saves the waypoint into the ts' non-volatile memory for later retrieval. After saving a waypoint, user can also send it to a NOC server. The server differentiates waypoint report from normal tracking report by their short codes.

Settings Menu

SETTINGS

The Settings menu allows user to view and customize the SHOUT ts hardware settings.
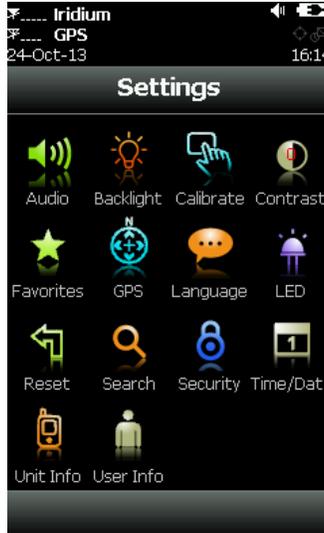
Audio

The Audio option is used to change the frequency, tone, mute setting of a variety of audio alerts including incoming messages, general error, geofences and man down locator alert. In addition to the individual settings, all audio can be muted through a single setting (except the locator alert). The 🔇 icon will appear on top of the screen if Mute All is on. User can test the audio volume and sound before selecting by using Preview.

Backlight

The Backlight option is used to set the period of inactivity after which the SHOUT ts turns the LCD backlight off. Setting the backlight to Always On is recommended for night time use.

Calibrate

A resistive touchscreen drifts slowly over time and needs to be recalibrated once in a while. Calibrate option allows users to either reset the calibration back to factory settings or to recalibrate specific to the condition of the touchscreen. In case the ts is accidently recalibrated with erroneous settings and user is unable to use the touchscreen to recalibrate or reset to factory settings, with the ts powered off hold the power button for ~7 seconds or until the reset calibration screen comes up. DO NOT connect the ts' USB port to any device.

Contrast

The Contrast option is used to change the LCD brightness. Slide the contrast bar to the desired setting and press back to accept.

Favorites   The Favorites option lets user select any icon to appear on the bottom of the home screen. This allows quick and easy access to the most frequently used options. A maximum of four active favorite icons are allowed. The icons will appear in the order selected.

GPS   The GPS menu provides access to the Position Format and Position Model options. Position Format is used to select one of four different GPS position formats to be *displayed on the LCD screen*. This option is not to be confused with the Format option under Tracking, which defines the format of position report to be *transmitted to a NOC*.

Position Model is used to formulate the static and dynamic characteristics of the GPS receiver. By default, Portable model is used; this is suitable for most applications. However, for those requiring functionality at high altitudes, speeds, or accelerations, an alternate model should be selected.

- Portable (default setting): Suitable for most situations; for applications with low accelerations; maximum altitude of 12 km; maximum velocity of 310 m/sec; maximum vertical velocity of 50 m/sec; sanity check type: altitude and velocity; maximum position deviation: medium.

- Stationary: Used in timing applications (antenna must be stationary) or other stationary applications; velocity is constrained to 0 m/s; zero dynamics assumed; maximum altitude of 9 km; maximum velocity of 10 m/sec; maximum vertical velocity of 6 m/sec; sanity check type: altitude and velocity; maximum position deviation: small.

- Pedestrian: Applications with low acceleration and low speed, as a pedestrian would move; assuming low accelerations; maximum altitude of 9 km; maximum velocity of 30 m/sec; maximum vertical velocity of 20 m/sec; sanity check type: altitude and velocity; maximum position deviation: small.

- Automotive: Used for applications that can be compared with the dynamics of a passenger car; assuming low vertical acceleration; maximum altitude of 6 km; maximum velocity of 84 m/sec; maximum vertical velocity of 15 m/sec; sanity check type: altitude and velocity; maximum position deviation: medium.

- Sea: Recommended for applications at sea; assuming zero vertical velocity; maximum altitude of 500 m; maximum velocity of 25 m/sec; maximum vertical velocity of 5 m/sec; sanity check type: altitude and velocity; maximum position deviation: medium.

- Airborne < 1g: Used for applications that have to handle a higher dynamic range than a car and higher vertical accelerations; no 2D position fixes supported; maximum altitude of 50 km; maximum velocity of 100 m/sec; maximum vertical velocity of 100 m/sec; sanity check type: altitude; maximum position deviation: large.

- Airborne < 2g: Recommended for typical airborne environment; no 2D position fixes supported; maximum altitude of 50 km; maximum velocity of 250 m/sec; maximum vertical velocity of 100 m/sec; sanity check type: altitude; maximum position deviation: large.

- Airborne < 4g: Only recommended for an extreme dynamic environment; no 2D position fixes supported; maximum altitude of 50 km; maximum velocity of 500 m/sec; maximum vertical velocity 100 m/sec; sanity check type: altitude; maximum position deviation: large.

Language

Only English is available for this firmware version.

LED

The SHOUT ts has a status LED on the bottom left corner to alert user of whether the device is in emergency mode, tracking mode, geofence tracking, mailbox check or call out. Except for the Emergency mode, the LED flashes once every five seconds when other modes are enabled and the device sleeps. The LED turns solid green when the Emergency mode is enabled. The LED can be turned off for either of these two cases to save battery power using the LED option.

Reset

The Reset option restores all setup parameters back to the manufacturer's settings. When Reset is selected, a screen will appear with the current settings and user will be asked to confirm whether or not to reset these current settings back to the manufacturer's default settings.

Search

The Search option allows user to set the search parameters for canned messages, contact list and mailboxes.

Security

The Security option is used to enable or disable the power up PIN code and Access Control List PIN code and to setup the Access Control List. The PIN code can be up to a four-digit number.

The Access Control List (ACL) allows user to set which menu icons are visible. If a menu option is disabled in the ACL, it will also be removed from the favorites.

Time/Date   The Time/Date option is used to select UTC time and date formats to be displayed on the LCD screen for all menus. Local time zone can also be set.

Unit Info   The Unit Info option displays the model number, Iridium module's IMEI number, Iridium FCC ID, Iridium IC ID, ts' firmware version and ts' bootloader version.
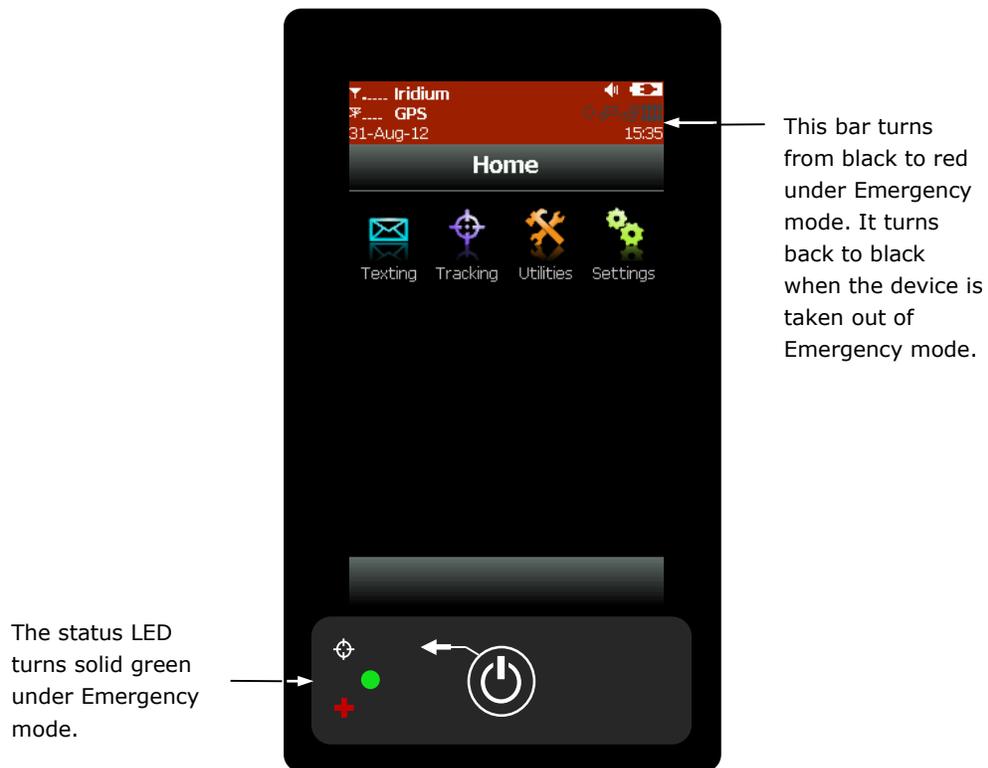
User Info   The User Info option displays user information entered using SatTerm software.

Additional Features

EMERGENCY (911) BUTTON

The emergency 911 button 🔴 locates underneath a rotating guard in the back of the SHOUT ts. It can be used at any time regardless of the tracking status (enabled or disabled) or power status (on or off). When pressed, the emergency LED ✚ immediately turns solid green to indicate that the device is in emergency mode. The device then attempts to quickly send three consecutive reports. Because these reports are sent quickly, a GPS fix may not be immediately available; however, the emergency indication flag will be set. After sending the first three emergency reports, the ts reverts back to the default emergency time-between-reports (TBR) of two minutes. The LED can be deactivated to extend the battery life by using the Settings > LED menu. If the LCD screen is on during emergency activation, the black bar across the top of the screen will turn red. During emergency a NOC can send an acknowledgement back to the ts.

This bar turns from black to red under Emergency mode. It turns back to black when the device is taken out of Emergency mode.

The status LED turns solid green under Emergency mode.

STATUS LED

There is one status LED on the bottom left of the SHOUT ts. The LED turns solid green when the ts is in emergency mode, which can be turned off to save power using Settings > LED menu. During normal tracking, it flashes once every five

seconds when the ts sleeps. Again, it can be turned off to save power using Settings > LED menu.

POWERING DOWN

The SHOUT ts can be powered down by holding the power On/Off button for approximately two seconds. A power down screen will appear with a message indicating tracking and messaging will be completely turned off. The screen stays on for approximately ten seconds before shutting down. User can press "Turn Off" to power down the ts immediately, press "Lock" to go back to the power up screen, or press "Cancel" to return to the previous screen.

Appendix A: PMS Features

TRACKING

The SHOUT ts is capable of sending position reports in PECOS Message Structure (PMS). PMS complies with the Blue Force Tracking Data Format Specification as defined in the document PECOS 200907-001 Version 1.7. The ts is shipped without PMS features activated and can only be enabled by NAL Research at the request of an authorized user. When PMS is enabled, the Format menu has an additional option called PECOS as shown in the figure below.
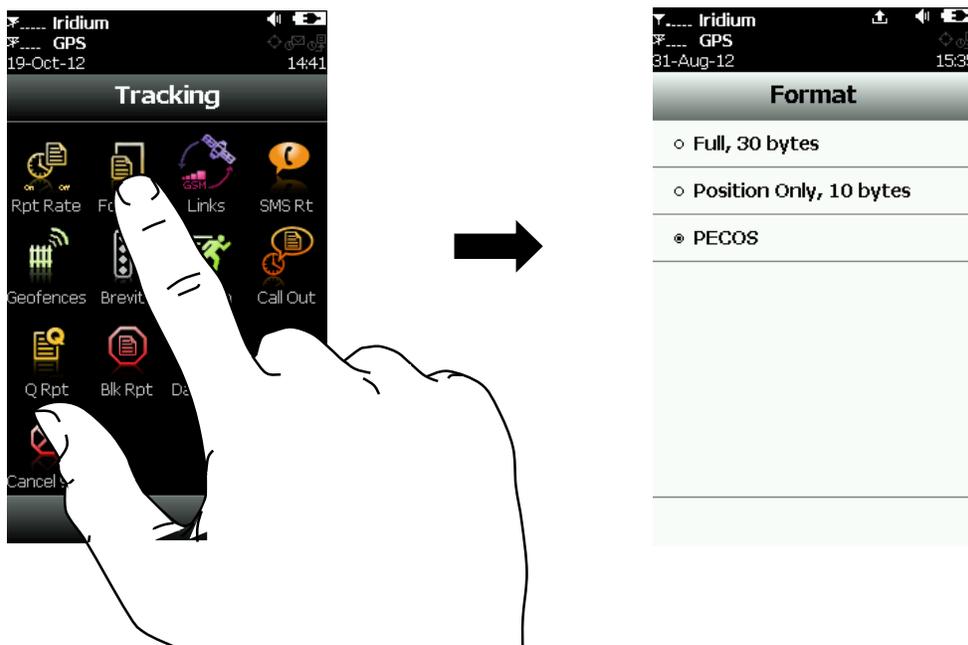
Brevity

With PMS enabled, user has the option to select any one of sixteen Brevity Codes (0000 through 1111) to be included in the PMS tracking reports. These codes are represented by A(z), B, C(z) and D and can be selected via the touchscreen. Each code will light up as a green dot inside the Brevity icon when selected.

Compose

With PMS enabled, the Compose menu does not allow user to enter an e-mail address(es) from the keyboard. The address(es) must be chosen from the contact list.

Contacts

With PMS enabled, the Contacts menu allows user to enter and save a contact(s) via the keyboard. The contact(s) can only have two fields—Name and IMEI number.

Appendix B: Upgrading the Firmware

The SHOUT ts firmware can be upgraded using a computer connected to the USB port of the device. The device drivers support Windows XP, Windows Vista and Windows 7. Follow the following steps to upgrade the firmware:

1. Run the NAL USB Firmware Loader program.

2. With a USB cable attached to a computer and the device, press the "Start Flash Mode" button.
3. Wait until it activates and then press the "Browse" button.
4. Browse and select a valid NAL device BIN file. NAL Research makes the BIN file available upon request.
5. Once the BIN file is loaded, press the "Program" button.
6. Wait for the programming to complete.
7. A message box will pop up indicating the loading is complete.
8. The new firmware is now loaded on the device. It may take a few moments for the memory to initialize after the upgrade.

Appendix C: Power Consumption

The SHOUT ts has an internal 1.95 A-Hr Li-Ion rechargeable battery. When both the Iridium and GPS antennas have clear view of the sky and the battery is fully charged, the ts is capable of sending more than 1,500 tracking reports with the following settings: (1) report rate of less than two hours, and (2) mailbox check rate and the report rate are the same. Blocked or partially blocked antennas will force the ts to retry multiple SBD transmissions for each report and, as a result, can significantly reduce the overall number of reporting cycles.

The ts saves valid ephemeris data after each 3-D fix. The data is used to reduce acquisition time in the next reporting cycle from cold-start to hot-start. If the ephemeris data is older than two hours (time between reports is set for more than two hours), the GPS receiver will go through cold-start each time it wakes up to send a report. As a result, the ts configured for report rate of more than two hours can only send ~750 tracking reports.

IMPORTANT: Data presented here are only <u>estimates</u> and are highly dependent on the operating environment and antenna type. Data are based on measurements made with multiple ts devices placed on the roof of NAL Research's facility with no blockage.

Each time the ts wakes up to send a report, it has two minutes to acquire a GPS fix and send an SBD message. Assuming the ephemeris data is valid (less than two hours old or time-between-reports is less than two hours), the GPS receiver takes about 5 seconds for a position fix drawing approximately 55mA. The Iridium transceiver takes about 15 seconds to transmit an SBD message drawing an average current of 190mA. The ts circuit draws about 60mA during 20-second reporting cycle. The entire reporting cycle consumes ~1.12 mA-Hr of battery power. If the Iridium antenna is blocked or an overhead Iridium satellite is not available, the Iridium can potentially stay on for another 100 seconds in attempting to send a report. This results in additional consumption of 9.7 mA-Hr or 11 mA-Hr total. A missed report consumes ~8.5 times more power than a 'normal' transmitted report.

Appendix D: Design Specifications

Mechanical Specifications

Dimensions:	4.1" x 2.3" x 0.9" (104 mm x 58 mm x 23 mm)
Weight:	~7.2 oz (204 g)
Enclosure:	Hard anodized aluminum housing/EMI shielding
Connector:	micro USB
Antennas:	Iridium and GPS
Key:	One button power button
Emergency:	Guarded button
LED:	One status LED
Screen:	3.0" TFT 400 x 240

Electrical Specifications

Main Input Voltage:	5.0VDC
Peak Current:	1.5A @ 5.0VDC
Battery Type:	Lithium Ion
Battery Capacity:	1.95 A-Hr
Charging Voltage:	USB 1.0, USB 2.0 or 5VDC
Rechargeable Cycles:	500 times
Power Consumption:	See previous section

Iridium Transceiver

Operating Frequency:	1616 to 1626 MHz
Duplexing Method:	TDD
Multiplexing Method:	TDMA/FDMA
Link Margin Downlink:	13 dB average (free space)
Link Margin Uplink:	7 dB average (free space)

GPS Receiver

GPS Receiver:	u-blox NEO-6Q
Receiver Type:	L1, C/A, 50-channel
Update Rate:	4 Hz
Accuracy:	2.5 m CEP (position)
	2.0 m CEP (SBAS)
Acquisition:	29 seconds cold-start
	29 seconds warm-start
	<1 second hot-start

Sensitivity: −160 dBm (tracking)

                                          −160 dBm (reacquisition)

                                          −147 dBm (cold-start)

Environmental Specifications (Electronics)

Operating Temperature: −4°F to +140°F (−20°C to +60°C)

Operating Humidity: ≤ 75% RH

Storage Temperature: −4°F to +140°F (−20°C to +60°C)

Storage Humidity: ≤ 93% RH

Environmental Specifications (Battery)

Operating Temperature: −4°F to +140°F (−20°C to +60°C)

Operating Humidity: ≤ 90% RH

Storage Temperature: −4°F to +140°F (−20°C to +60°C)

Storage Humidity: ≤ 95% RH

Charge Temperature: 32°F to +113°F (0°C to +45°C)

Environmental Specifications (LCD)

Operating Temperature: −4°F to +131°F (−20°C to +55°C)

Operating Humidity Range: ≤ 90% RH

Storage Temperature Range: −4°F to +185°F (−20°C to +85°C)

Storage Humidity Range: ≤ 95% RH

Appendix E: Standard Compliance

The SHOUT ts has an internal Iridium 9602. The 9602 is tested to the regulatory and technical certifications shown below. It is assigned to the FCC Identifier Q639602.

Regulatory Approvals	Radio Tests	EMC Tests	Mechanical/ Electrical Tests
CE FCC Industry Canada	ETSI EN 301 441 V1.1.1 (2000-05) FCC CFR47 Parts 2, 15, and 25 Industry Canada RSS170 Issue 1, Rev 1, November 6, 1999	ETSI EN 301 489-1 V1.4.1 (2002-08) ETSI EN 301 489-20 V1.2.1 (2002-11) EN61000-4-2: 1995/A2:2001 Part 4.2 EN61000-4-3: 2002 Part 4.3 EN61000-4-4: 1995/A1:2001/A2:2001 Part 4.4 EN61000-4-6: 1996/A1: 2001 Part 4.6 EN55022: 1998/A1: 2000/A2: 2003	EN60950-1:2001 Part 1 UL60950-1 Part 1

Appendix F: Export Compliance

The SHOUT ts is controlled by the export laws and regulations of the United States of America (US). It is the policy of NAL Research to fully comply with all U.S. export and economic sanction laws and regulations. The export of NAL Research products, services, hardware, software and technology must be made only in accordance with the laws, regulations and licensing requirements of the U.S. Government. NAL Research customers must also comply with these laws and regulations. Failure to comply can result in the imposition of fines and penalties, the loss of export privileges, and termination of your contractual agreements with NAL Research.

The export and re-export of NAL Research products and services are subject to regulation by the Export Administration Regulations (15 CFR 730-744), as administered by the U.S. Department of Commerce, Bureau of Industry and Security ("BIS"). See: http://www.bxa.doc.gov for further information on BIS and the Export Administration Regulations (EAR). Additional export restrictions are administered by the U.S. Department of the Treasury's Office of Foreign Asset Controls ("OFAC"). See: http://www.ustreas.gov/ofac for further information on OFAC and its requirements.