

# SHOUT USER'S GUIDE

Version 1.0

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POWERED by IRIDIUM™

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# | Glossary


AES	Advanced Encryption Standard
BIS	Bureau of Industry and Security
CE	Conformite Europeene
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
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
POP	Post Office Protocol
RF	Radio Frequency
RUDICS	Router-Based Unrestricted Digital Internetworking Connectivity Solution
SBAS	Satellite Based Augmentation System
SBD	Short Burst Data
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 is a handheld, global, two-way satellite messaging and personal tracking device. It utilizes Iridium's short burst data (SBD) service to provide location information determined by a GPS receiver, two-way inbound and outbound status, text messaging, and emergency/alert notifications. The SHOUT 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 is designed with ultra-low power consumption electronics drawing less than 35 $\mu$ A during sleep. With an internal 2.3 A-Hr rechargeable Li-Ion battery and depending on the environmental conditions, it can send a position report every ten minutes for up to eleven days (about 1,600 reports). User is recommended to read the Power Consumption section on page 26 to learn about the impact of blocked antennas on the number of reports. The SHOUT is equipped with an LCD and on-screen keyboards supporting transmission of free-text, canned messages and a combination of free-text and canned messages. 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 offers a variety of services including:

- **Normal Tracking** — The SHOUT can be programmed to automatically wake up and send a position report at a set interval ranging from once every minute to once a day.
- **Emergency Alert** — When the emergency button  is pushed, the SHOUT immediately sends alerts to a designated corporate e-mail, home e-mail and/or central monitoring center. The home base and the user can then communicate to define further specifics of the situation and a response to the emergency.
- **Free-Text Messaging** — The SHOUT allows users to send free-text via three different sets of on-screen keyboards.
- **Canned Text Messaging** — The SHOUT allows users to send canned

(pre-defined) messages. Up to 600 pre-defined messages stored in memory can be retrieved and sent. 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 SHOUT lets users 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 SHOUT allows a quick check-in message to be sent using a single soft key.

**IMPORTANT:** NAL Research can enable the SHOUT for use on the DoD EMSS Gateway. However, accessing the EMSS Gateway is not authorized until the SHOUT 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. See <https://sbd.pac.disa.mil> for more information regarding EMSS service provisioning.

**IMPORTANT:** Users should not disassemble the SHOUT for repair or services. The warranty is voided if the SHOUT is disassembled. It should be returned to NAL Research for services by calling 703-392-1136 x207 or e-mailing [contact@nalresearch.com](mailto:contact@nalresearch.com).

# Using the SHOUT Device


## DEVICE DESCRIPTION


The SHOUT comprises of eight buttons, three LEDs and a USB port. The buttons are used to power up the device, access the menus, initiate Check-In and Way Point functions and activate emergency notification. The USB port is for charging, firmware update and parameter setting (in addition to using the menu).



- ① Power/Enter: 1. Turns device ON/OFF when hold down for two seconds or  
2. Used to select highlighted item on the menu.
- ② Arrow Up/Down/Right: Used to navigate the cursor.  
② Arrow Left: 1. Used to navigate the cursor or  
2. Used to go back to the previous menu.
- ③ Check-In Soft Key: Used to access the Check-In feature.
- ④ Way Point Soft Key: Used to access the Way Point features.
- ⑤ Emergency: Used to send an emergency alert/notification.
- ⑥ Guard: Protects emergency button from being accidentally activated.
- ⑦ LEDs: Displays power, message and emergency status.
- ⑧ Antenna: Iridium antenna (do not block).
- ⑨ Antenna: GPS antenna (do not block).
- ⑩ USB Port: Used to charge the battery, update firmware or setup operating parameters using a computer.

## CHARGING THE BATTERY

The SHOUT package includes manuals, software, an AC wall adapter, and a standard USB-to-mini USB cable. The SHOUT is shipped with the internal Lithium-Ion battery partially charged. Users should fully charge the SHOUT before use. There are two ways of charging the SHOUT. One is to use the supplied AC wall adapter. The other is to connect to a standard USB port on a computer. 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. A USB 1.0 should be able to charge the SHOUT in about a day assuming the port is capable of producing an output current of 100mA. USB 2.0 can charge in about four hours assuming the current output of 1.5A. NAL Research offers 12VDC and 24-36VDC chargers sold as separate items. For pocket size solar charges, NAL Research recommends any of the Solio® ([www.solio.com](http://www.solio.com)) and RAYvolution® ([www.rayvolution.com](http://www.rayvolution.com)) products. While using the SHOUT, a low battery warning message will appear when remaining power is less than 10%. The unit will go into low power mode by blinking the power LED  instead of solid green. User can further reduce power consumption by turning the LCD backlight off.

The SHOUT has a battery icon  on the LCD screen indicating the charging status. When charging is complete the icon should show five bars (not counting the last battery icon). The device can be safely operated and does not need to be turned off while charging; however, the battery icon will not correctly display the charging status unless the unit is off. The charging cycle will complete quicker while the device is shut down. **IMPORTANT: DO NOT** allow the battery to be totally depleted before each recharge.






### WARNING!







All batteries can cause property damage, injury or burns if a conductive material, such as jewelry, keys or beaded chains, 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.

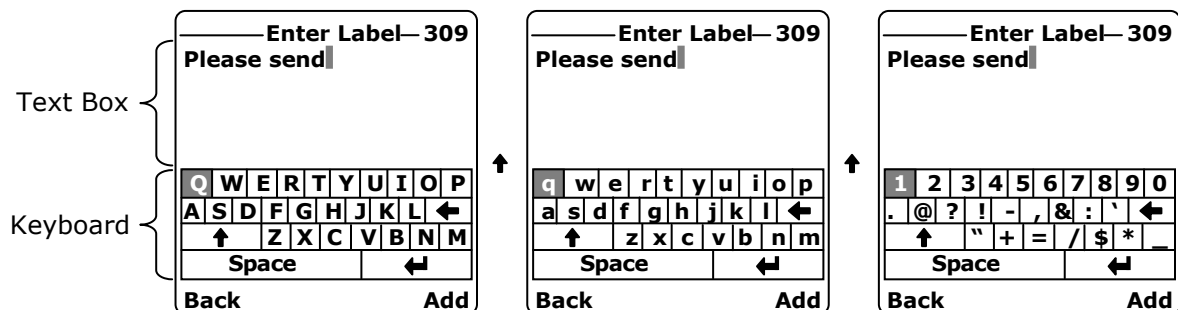
Users should not disassemble the SHOUT for replacing battery. It should be returned to NAL Research for services. Risk of explosion if battery is replaced with an incorrect type. Dispose of the batteries according to local, state and federal regulations or laws.

## BASIC NAVIGATION

The SHOUT can be turned on by holding down the power button  for approximately two seconds. The power LED will light up and turn solid green. Once the device is on, the enter button  can be pressed to access the "Main Menu". The arrow buttons are used to move the cursor to different menu items and the enter button is used to select the highlighted item. Each menu or menu item has a BACK button , which returns the device to the previously accessed screen. On most menus, frequently used options are programmed into two soft keys allowing quick and easy access. The SHOUT can be turned off at anytime by holding down the power button for approximately two seconds. Manually turning off the device does not necessarily mean the tracking mode is turned off. Enabling and disabling tracking mode can be accomplished under the "Tracking ON/OFF" menu. When tracking is on and the device sleeps in between reports, the power LED flashes once every three seconds. The power LED can be deactivated in between reports (during sleep) to preserve the battery by setting "Unit Settings"/"LED Display"/"Power LED Sleep" to off. The device automatically turns itself off 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. Pictures below are example of the keyboards for entering waypoint labels. The up key  can be pressed repeatedly to switch between the keyboards. The four arrow buttons  on the SHOUT are for navigating around the keyboards and enter button  is for selecting a highlighted character. While entering text, the position of the cursor in the text box is shown as a thin, solid rectangular block. The entered text can be edited by pressing the up arrow button until the cursor exits the keyboard into the text box and begins to blink. The four arrow buttons can again be used to navigate and to place over a character to be corrected. Pressing the enter button takes user back to the keyboard exiting the text box. The number displayed on the right corner of the LCD indicates the remaining allowable number of characters that can be entered into the text box.





## **NETWORK OPERATING CENTER (NOC)**

The SHOUT comprises of a 9601 transceiver board 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). It can be provisioned by any Iridium airtime service provider including the DoD DISA EMSS office to send messages and reports to five different destinations (a combination of e-mail addresses, IP addresses and other mobile devices). This is a feature offered by the Iridium satellite network. While in the field, the SHOUT can also accept real-time text messages and commands from a NOC.

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

Upon request, NAL Research provides the Server for Trackers software with the intent of letting users install on their NOCs to retrieve NAL Research's formatted GPS reports from the remote SHOUT. In addition, the program allows a NOC to communicate with modems attached to its serial ports, to communicate with POP3/SMTP servers, to communicate using the Iridium SBD DirectIP protocol, and to act as a RUDICS server/client to support incoming and outgoing communications with the trackers. Under certain circumstances, NAL Research will release proprietary GPS report format for developers to implement into software more specific to their applications.

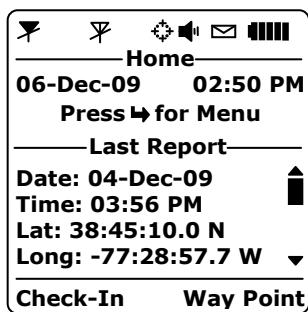
Along with the Server for Tracker software, SatTerm software is included for users to set up the SHOUT operating parameters, Address Book and Canned Messages. Most of the operating parameters can be set with the SHOUT on-screen menus. However, more sophisticated features such as encryption must be carried out via SatTerm and a connected computer to the SHOUT. For address book and canned messages, the SHOUT sends only short codes instead of the message body to a NOC server. Short codes are then mapped to the real addresses or canned messages with a lookup table saved on the NOC server during setup. Therefore, when SatTerm is used to enter address book and canned messages, SatTerm will synchronize short codes between the SHOUT and NOC server.

NAL Research has a mapping/navigation NOC server available for SHOUT users. Application developers can call to inquire on how to setup a demo account. The server is to be used for demonstration and developmental purposes only. 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 the server.

## HOME SCREEN

Immediately after powered up, the SHOUT will display the NAL Research logo followed by the "Home" screen. Multiple status icons will be shown along the top of the screen. Some icons will not appear until a process is initiated such as sending or receiving a message.










## Icons

✖ denotes the Iridium transceiver is off.

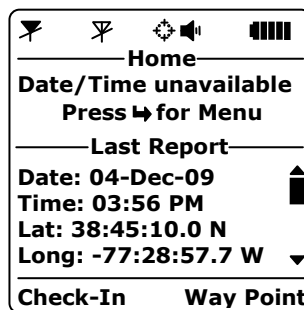
✔ denotes: (1) the Iridium transceiver is on with real-time signal strength represented by the number of vertical bars and (2) SBD message transmission is in progress. The signal strength can range from the lowest of zero to the highest of five bars. The Iridium transceiver is always kept off to preserve the battery until a message is required to be transmitted. During transmission, the antenna must have a clear view of the sky. The SHOUT cannot send reports from inside a building.


✖ denotes the GPS receiver is off.

✔ 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. The GPS receiver is always kept off to preserve the battery until time, date or position information is needed. Although the GPS receiver is quite sensitive and 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.

-  denotes tracking mode is off.
-  denotes tracking mode is on.
-  denotes the audio alert is off.
-  denotes the audio alert is on.
-  denotes unread message(s) is in the Inbox.
-  denotes message(s) is queued in the Outbox ready to be sent.
-  is the battery indicator with five bars being fully charged.

**Date/Time** After powered up, the SHOUT momentarily turns the GPS receiver on to retrieve the current date and time, which can be observed by the on/off flickering of the GPS antenna icon. The date and time formats can be set using options under "Main Menu"/"Unit Settings"/"Time and Date". 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 can recall the correct date and time. The message "Date/Time unavailable" will be displayed if the SHOUT is unable to restore information from the GPS receiver.



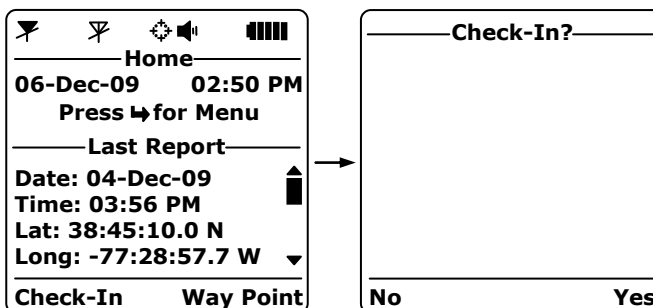
Immediately below the current date and time, the SHOUT displays the message "Press ↵ for Menu". This message will be replaced with "GPS: Looking for sats." or "IRD: Sending message" when the SHOUT is acquiring GPS information or sending an SBD message, respectively. The  button can still be pressed to enter the "Main Menu".

**Last Report** The "Home" 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 on the "Home"

screen even if a message was sent successfully. With limited space on the LCD screen, only date, time, latitude and longitude are visible. Additional information can be seen by pressing the arrow down button (▼). The last report information is saved on the SHOUT's non-volatile memory. Therefore, even if the battery power is removed, the information can still be restored. All displayed GPS parameters are self-explanatory except Vvel, which stands for vertical velocity.

**Check-In  
(Soft Key)**

Check-In soft key allows user to send a quick message with a single, easy-accessed button. When the Check-In button is pressed from the "Home" screen, a second screen will appear requesting for confirmation as shown in the figure below. Once confirmed, the SHOUT sends out a short code representing a Check-In message. If "Unit Settings"/ "Include GPS" option is turned on then GPS location will be attached to the Check-In message. Check-In messages with GPS location will take longer to complete since the SHOUT has to acquire a GPS fix. Depending on the validity of the stored ephemeris data, it could take an additional 29 seconds for a cold-start fix. Check-In message uses the same canned message's short code format.

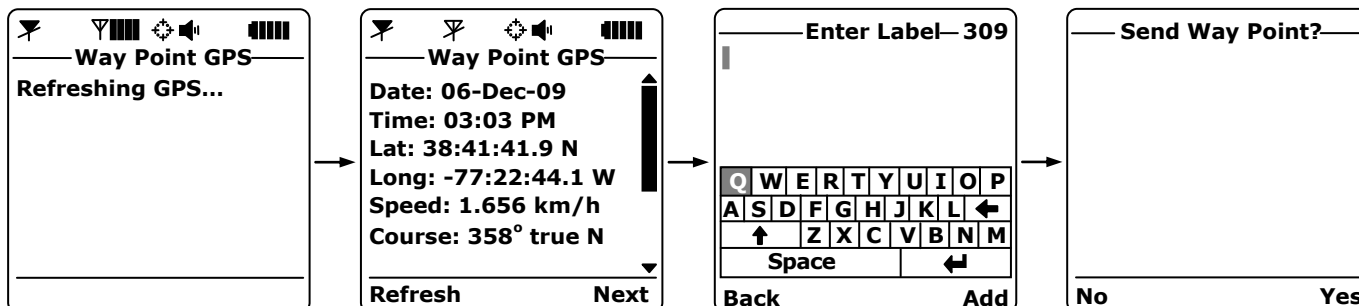


**Way Point  
(Soft Key)**


A waypoint is a GPS location that user wants to identify and mark with a specific name tag for future reference. When the Way Point soft key is pressed from the "Home" screen, the SHOUT immediately turns the GPS receiver on to acquire a fix. Once a valid GPS is obtained and displayed on the screen, the GPS receiver is turned off. User then has the options to go back to the "Home" screen without further action, to refresh or re-acquire a new GPS fix or to save the waypoint. Selecting the Next option will bring up a full keyboard allowing user to enter the waypoint label. Use the ↑ key to toggle between the keyboards.

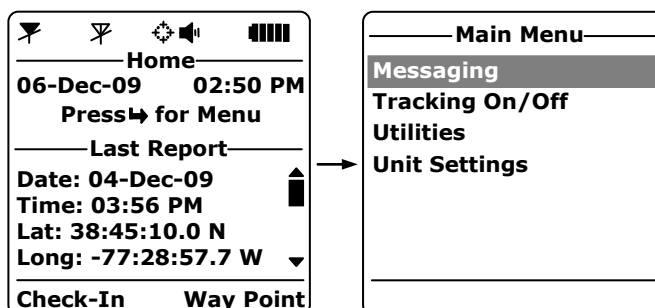
The waypoint label can be up to 309 characters long. As each character is entered the remaining allowable number of characters for the label is displayed on the top of the LCD. The Add option saves the waypoint in to the SHOUT's non-volatile memory for later retrieval. The SHOUT can store up to 1,000 waypoints. The

oldest point is overwritten as the memory becomes full. After saving a waypoint, user can also send it to a NOC server. The server differentiates Way Point report from normal tracking report by the short code.



## MAIN MENU

From the "Home" screen, the "Main Menu" can be accessed by pressing the enter button . The "Main Menu" will appear with four different options to select from as shown in the figure below.



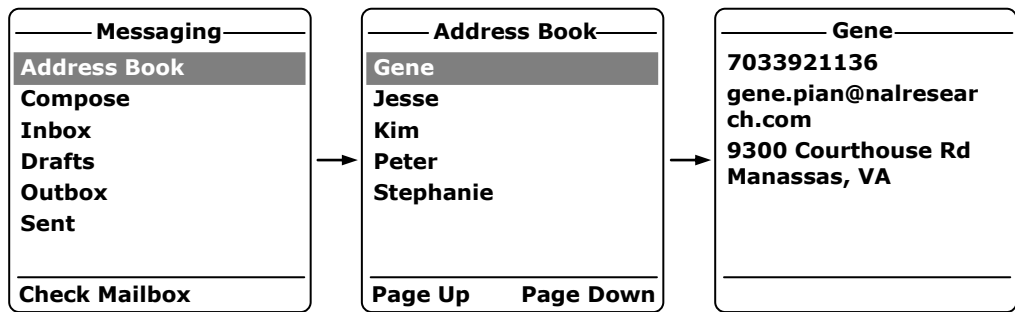
**Messaging** The "Messaging" menu allows user to compose, save, view, and send canned and free-text messages and Address Book contacts. There are six options under the "Messaging" menu and a Check Mailbox soft key.

**Address Book** The "Address Book" lists contacts created and saved into the SHOUT's memory using NAL Research's SatTerm software. During setup SatTerm requires connectivity between the SHOUT 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.

The SHOUT can save 1,200 contacts in memory with a maximum contact name of 30 characters long. Each contact has its data stored in a three-line format. The first line can have up to 30 characters, the second can have 50 characters and the third can have 30 characters.

The information contained in each line is defined by developers.

Figure below displays an example of the formatted Address Book contact defined by the NAL Research's NOC server. The first line has a contact phone number, the second line has an e-mail address and the third line has a home address. Upon receiving a free-text or canned message from the SHOUT referenced to a specific Address Book contact, the NAL Research's NOC server forwards the message to the e-mail address listed in the second line of the Address Book contact. As shown here, application developers can define their own set of rules with information contained in the Address Book contact so that their NOC servers can use to determine the appropriate response.



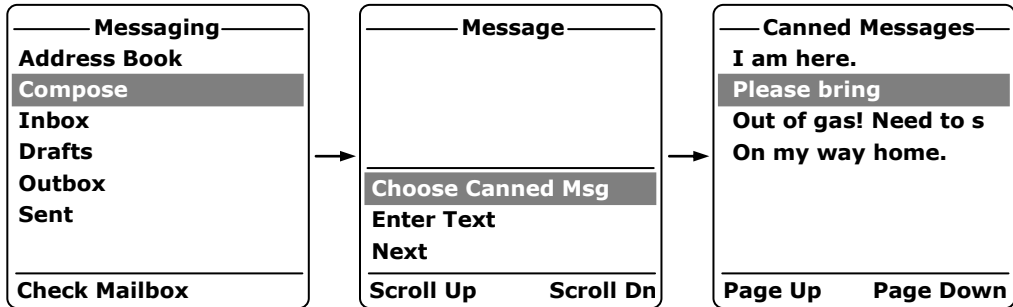
**Compose  
(Canned and  
Free-Text)**

The "Compose" menu allows user to edit and send canned messages, free-text messages or a combination of canned and free-text messages to a NOC server. When "Compose" is selected, a "Message" menu appears with three options to choose from—"Choose Canned Msg", "Enter Text" and "Next".

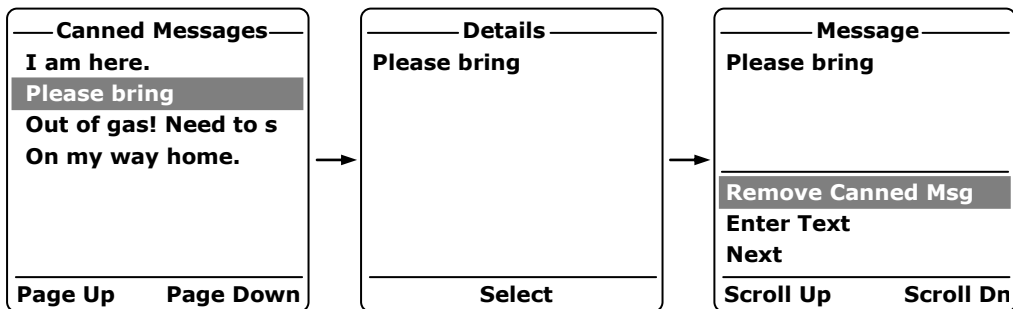
The "Choose Canned Msg" has a list of canned messages user can select to send to a NOC. Sending canned messages saves bandwidth because it is only short codes that are transmitted instead of the entire message body. SatTerm is used to create and save canned messages into the SHOUT's memory. During setup SatTerm requires connectivity between the SHOUT and a NOC to synchronize the lookup table of short codes. As with the Address Book, short codes are used to map real canned messages to a lookup table located at a NOC. The short codes are defined by application developers.

The SHOUT can store up to 600 canned messages. Figure below displays examples of a few canned messages entered using SatTerm.

Each message is shown on a single line. Some canned messages are too long and can only be partially displayed on the LCD screen. User can navigate with the arrow up/down buttons (▼) (▲) and press the enter button (↵) to show the entire message on the "Details" screen.

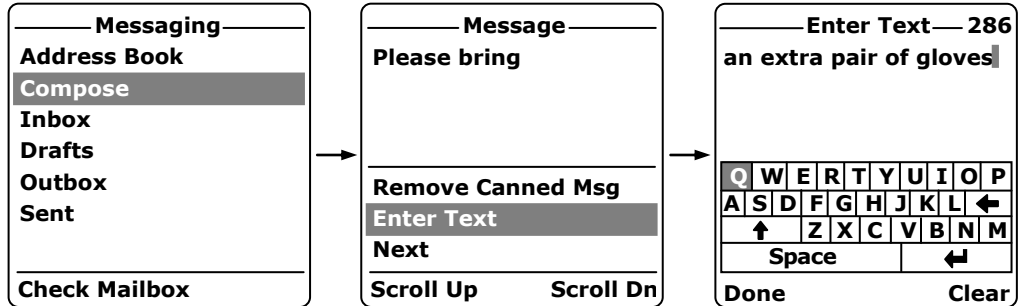


When a canned message is selected from the list, for example 'Please bring' as shown in the figure above, the "Details" screen appears to show the complete message. User has the option to pick a canned message by pressing the enter button or the BACK button to go back to the original list. If the enter button is pushed, the "Message" menu will re-appear with the selected canned message displayed in the text box. Scroll Up and Scroll Dn soft keys are used to view part of the canned message that does not fit inside the text box. "Remove Canned Msg" deletes the message from the text box at anytime even after free-text is entered.



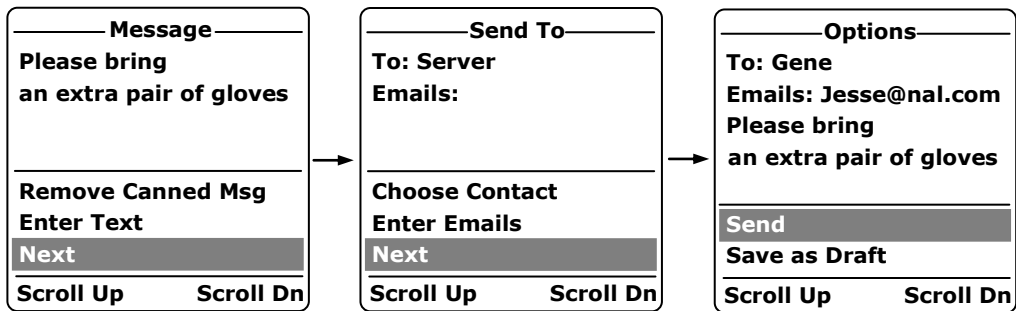
"Enter Text" lets user create free-text messages with the on-screen keyboards. Each free-text message is allowed to have up to 309 characters. However, these 309 characters are shared between a free-text message and any additional e-mail addresses attached to it (including the semi-colon e-mail address separator). Long e-mail addresses or multiple e-mail addresses will reduce the number of characters available for the free-text message (please see detailed

description in the next section). If a canned message is previously selected and appears in the text box then entered free-text will be attached to the canned message.





After finish composing a message, the "Next" option is used to send the message to a NOC server. A contact selected from the Address Book and e-mail addresses to whom the message is destined must be entered through the "Choose Contact" and "Enter Emails" options. "Choose Contact" opens the "Address Book" screen. "Enter Emails" opens on-screen keyboards allowing user to enter any e-mail addresses separated by semi-colons. The total number of characters of all e-mail addresses including the semi-colons must be less than the difference between 309 and the number of characters in the free-text message. The SHOUT keeps track of the limit and will prevent user from entering e-mail addresses longer than allowed.

Once all required information is entered, user can either send the message or save as draft. If send is selected, the SHOUT must be held in a position with the antennas having full view of the sky. If the "Main Menu"/"Unit Setting"/"Include GPS" is turned on then GPS location will be attached to the message. Messages with GPS location can take an additional 29 seconds longer to complete since the SHOUT has to acquire a GPS fix.



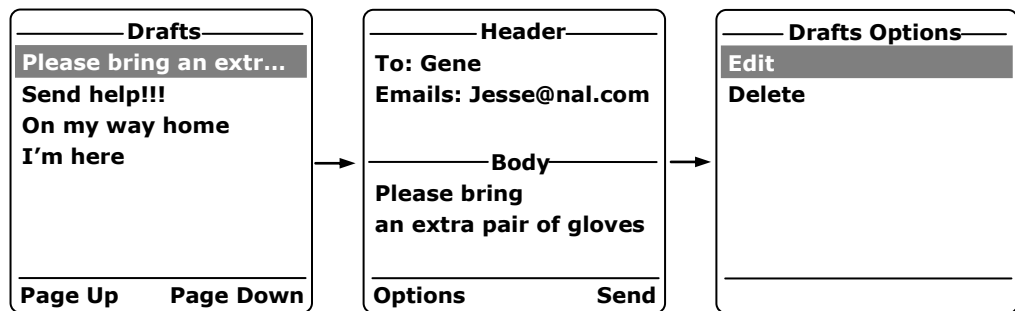


## Inbox

The Inbox folder contains all incoming read and unread messages. The arrow up/down buttons are used to place the cursor over a message and the enter button is used to read the highlighted message. The message icon  will appear on top of the "Home" screen and the message LED  will turn solid green when there are unread messages in the Inbox. The speaker will also provide an audible alert of incoming messages. The SHOUT can store ~690 messages in the Inbox.

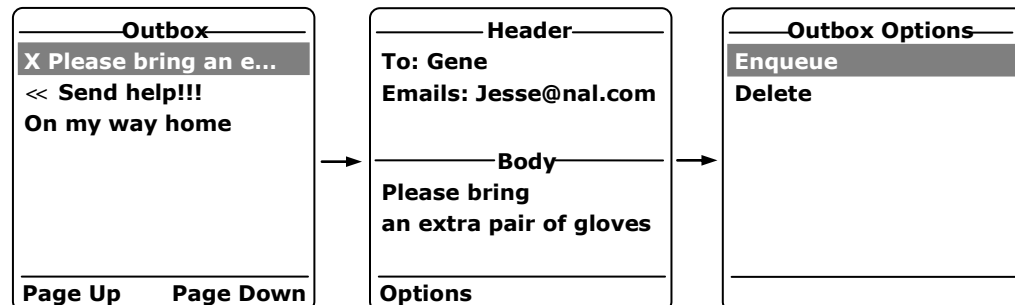
## Drafts

The Drafts folder contains draft messages saved under the "Compose" menu. The SHOUT can store an approximately 190 draft messages. The arrow up/down buttons are used to place the cursor over a draft message. The enter button is used to recall and display the highlighted message content. "Options"/"Edit" take user back to the "Compose" menu for editing and "Delete" removes the message from the Drafts folder. When the "Send" button is pressed, another screen will appear asking user for confirmation.



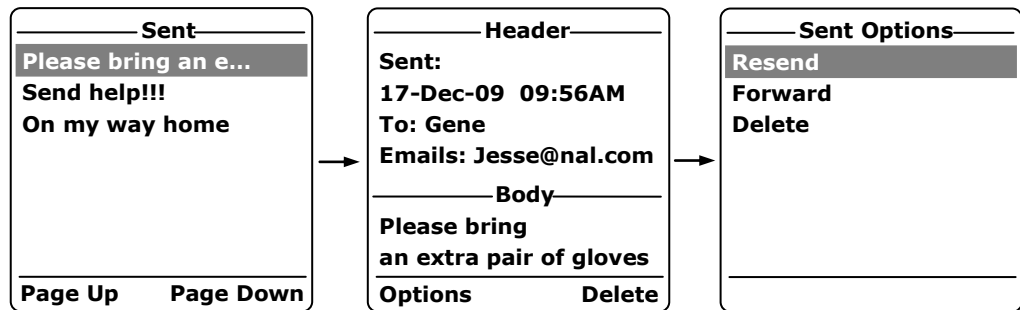
## Outbox

The Outbox folder contains either messages in queue ready to be sent or messages failed to send. A message *in the process* of being sent has a << symbol to its left. A message *failed* to send has an X symbol next to it. And a message *in queue* to be sent has no symbol next to it. Once a message is failed to send, it can stay in the Outbox until user decides to either resend ("Enqueue") or delete. The Outbox can store an approximately 170 messages.



## Sent

The Sent folder contains messages successfully sent to a NOC server. When the Enter button is pressed on the highlighted message, detailed information about the message appears. The message can be deleted with the Delete soft key. Or the Options soft key can be selected to resend, forward or delete the message. "Resend" puts the message back on the bottom of the SHOUT 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. Same as the Delete soft key on the "Header" menu, Delete permanently removes the message from the Sent folder. The SHOUT can store an approximately 580 messages in the Sent folder.

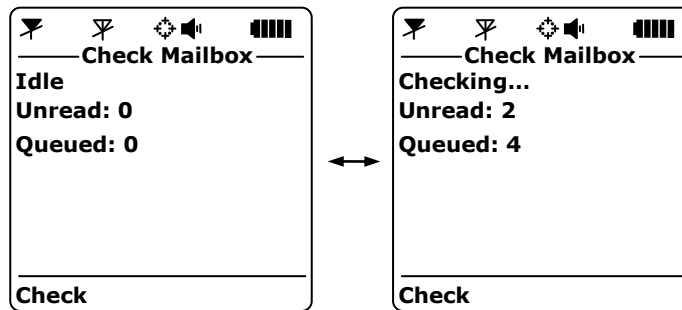


## Check Mailbox (Soft Key)


There are three ways the SHOUT initiates a mailbox check.

1. User can manually force the SHOUT to check the mailbox by pressing the Check Mailbox soft key or using the "Utilities"/"Check Mailbox" menu. The description for both of these options is given in the paragraph below.
2. The SHOUT automatically checks the mailbox each time it wakes up to send a tracking report.
3. The SHOUT automatically wakes up and checks the mailbox at a set mailbox check rate. A tracking report will not be sent when the SHOUT wakes up to check the Mailbox unless the mailbox check rate coincides with the tracking report rate.

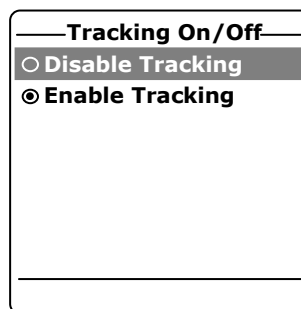
The "Check Mailbox" soft key menu can either be "Idle" or "Checking..." the Iridium gateway for any pending messages available to be downloaded. As the messages are received, the SHOUT shows the number of Unread messages in the Inbox and the number of message still Queued to be downloaded.




## Tracking On/Off

The "Tracking On/Off" menu allows user to enable or disable the SHOUT tracking mode. As soon as "Enable Tracking" is selected, the SHOUT immediately turns the GPS receiver on to acquire a GPS fix and then initiates an SBD transmission. The next tracking report is sent automatically based on the reporting rate set under "Unit Settings"/"Report Frequency" menu. When tracking is enabled and the SHOUT is asleep, the power LED  flashes once every three seconds. It can be turned off during sleep to extend the life of the battery by using "Unit Settings"/"LED Display" menu. The SHOUT can still be powered up at anytime and be used as a text messaging device during tracking mode on.

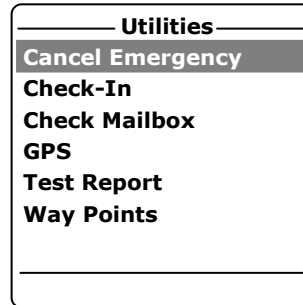
When wake up to transmit a location report, the SHOUT antennas must have full view of the sky; otherwise, it will fail to send. A missed report will not be resent. The entire reporting duration can take up to two minutes depending on the Iridium satellite visibility and the validity of the GPS ephemeris data. Ephemeris data saved on the GPS receiver is valid for approximately two hours allowing the receiver to obtain a hot-start fix (less than 1 second). Data older than two hours forces the GPS receiver into either a warm-start or cold-start fix (about 29 seconds).





**NOTE:** When the SHOUT is in the process of sending a report and user forces the SHOUT to power off by holding down the power button , the LCD screen will go blank with only message "Sleeping..." displayed. At this point, the SHOUT continues to attempt to transmit the report before going to sleep mode. User can go back to the "Home" screen by simply pressing the BACK button.

## Utilities

The "Utilities" menu has six useful features. "Check-In" and "Check Mailbox" can be accessed here through the menus or they can also be found under the "Home" screen and the "Messaging" menu soft keys. "Way Points" menu has three options—New, List and Delete All. Part of the "Way Point" options, New, can be found on the "Home" screen soft key.



### Cancel Emergency

After the emergency button  is pressed, user may deactivate the emergency alert by selecting "Cancel Emergency". A screen will appear requesting for confirmation. Once confirmed, the cancellation message is queued to be transmitted. If the cancellation message is successfully transmitted and acknowledged by the Iridium gateway, the emergency mode ends and the SHOUT emergency LED  is turned off. Power off the SHOUT will not cancel the Emergency mode.

### Check-In

This option can also be found on the "Home" screen under one of the soft keys (see detailed description on page 12).

### Check Mailbox

This option can also be found on the "Messaging" menu under one of the soft keys (see description on page 17).

### GPS

The "GPS" option forces the SHOUT to turn on its GPS receiver and to continuously update and display GPS data in real-time whether there is a valid fix or not. The GPS receiver remains on until user leaves this screen by pressing the BACK button. The arrow up/down buttons can be used to view part of GPS information that does not fit on the screen.

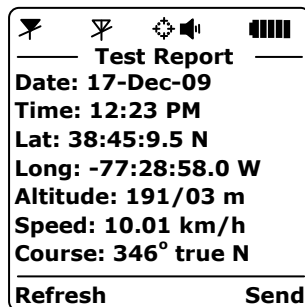
At the bottom of the list, the accuracy of the position fix can be monitored by observing the HACC. HACC stands for horizontal accuracy in meters. HACC is defined as the radius of a circle centered on the true value that contains the GPS measurement. Thus, a position fix with ten meters HACC accuracy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

meters of the true position—the higher the HACC value, the less accurate the GPS measurement.

“GPS” option is a good indicator letting user know whether or not to initiate a “Way Point” or a “Test Report” at a challenging location; e.g. under heavy foliage or inside a building. HACC can be monitored in real-time to make sure it converges to a small and stable value (usually less than 30 meters). At which point, it is certain that a 3-D fix can be obtained with the most current ephemeris data. User can then go back to “Utilities” menu to send a 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 indicative that the surrounding obstructions prevent the GPS receiver from obtaining a fix and user should move on to a different location.

### Test Report

When the “Test Report” option is selected, the SHOUT immediately turns the GPS receiver on to refresh its location data. The GPS information is continuously updated and displayed in real-time whether there is a valid fix or not. Similar to the “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 information is displayed on the screen. This information called test report can be forced to send to a NOC server by pressing the Send soft key. A test report has the same format as a regular tracking report and is being treated as such by a NOC. Sending a test report will not disrupt or change the tracking reporting rate.

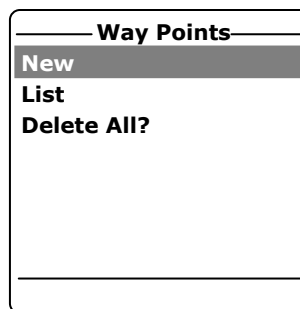


“Test Report” is a good diagnostic tool used to ensure proper operation of the GPS receiver and Iridium transceiver. It can also be used to manage battery life by turning off tracking mode and strategically send on-demand location reports only. It can be considered as “manual

tracking mode”.

### Way Points


The “Way Points” menu is used to acquire, view, save, delete or send a waypoint to a NOC server. Choosing the “New” option is the same as pressing the Way Point soft key on the “Home” screen (see page 12 for detailed description). A list of saved waypoints can be displayed and viewed by selecting the “List” option. After selecting the “List” option, any saved waypoint can be edited, sent/re-send or erased. In addition, SatTerm can be used to retrieve all waypoints saved on the SHOUT by a computer.



### Unit Settings

The “Unit Settings” menu allows user to configure the SHOUT operating parameters. There are thirteen options under “Uniting Settings”.

#### Audio Alert

Used to change the alert tone and frequency, mute incoming message alert and mute all audio feedback. The  icon will appear on the “Home” screen if “Mute All” is on. User can also test the audio volume and frequency before selecting.

#### Backlight

Used to set the period of inactivity after which time the SHOUT turns the LCD backlight off. The SHOUT consumes approximately 10mA less with the LCD backlight set as “Always off”. Setting the backlight to “Always on” is recommended for night time use.



#### Contrast


Used to change the LCD contrast by pressing the arrow up and down buttons. Press the BACK button to select the setting.

#### Include GPS

Forces the SHOUT to attach GPS location to Check-In, canned and free-text messages. Under default setting, these messages do not have GPS information included.


#### LED Display

Used to turn the message LED  on/off, power LED  on/off during

awake and power LED  on/off during sleep. The SHOUT consumes approximately 3mA less with the message LED disabled, 3mA less with power LED disabled during awake and 125µA less with power LED disabled in between reports (sleep) during tracking mode.

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

**Position Format** Used to select one of three different GPS position format to be displayed on the LCD screen.

**Reporting Rate** Used to set the reporting rate when "Tracking On/Off" is enabled. Once a reporting rate is selected with the enter button , a new menu appears requesting for mailbox check rate. The mailbox check rate can be the same as the reporting rate. In this case, the SHOUT checks the mailbox each time it wakes up to send a report. If the mailbox check rate is different than the reporting rate, the SHOUT will wake up in between reports to check the mailbox without sending a tracking report. The SHOUT only offers the mailbox check rates that are evenly divisible to the reporting rate.



**Reset to Defaults** Reset all parameters to manufacturer's settings.

**Soft Keys** When tracking mode is enabled and the SHOUT is off (sleeps between reports), either the "Check-In" or "Way Point" feature can be activated by pressing one of these two soft keys without pressing the power button first. This feature can be disabled to prevent accidental powered up and, thus, forcing user to turn the SHOUT on first by pressing the power button before activating the soft keys.

**Time and Date** Used to select time and date formats to be displayed on the LCD. Local time zone can also be set.




**Unit Information** Displays SHOUT's IMEI number and firmware version.

**User Information** Displays user information entered using SatTerm.

**Emergency Button** The emergency button  is located underneath a rotating guard on the top right corner of the SHOUT. When pressed, the emergency LED  starts to blink. The device sends three consecutive reports to a NOC as quickly as possible. After

sending the first three emergency reports, the SHOUT reverts back to the default emergency time-between-reports (TBR) of two minutes. During emergency a NOC can send an acknowledgement back to the SHOUT and, if successfully received by the SHOUT, the emergency LED turns solid green. The reporting rate remains either at the default emergency TBR or the "Unit Settings"/"Reporting Rate" TBR, depending on the type of acknowledgement.

## LEDs

There are three LEDs across the top of the SHOUT. The power LED  turns solid green when the SHOUT is powered up and flashes when the SHOUT is off and tracking is enabled. The message LED  turns solid green when unread message(s) is in the Inbox. Description for the emergency LED  is stated above and will not be repeated here. Power and message LEDs can be deactivated to reduce power consumption using "Unit Settings"/"LED Display" menu.



# Upgrading the SHOUT Firmware

The SHOUT firmware can be upgraded using a PC connected to the USB port of the device. The device drivers support Windows XP and Windows Vista.

1. With a USB cable attached to a computer and the device, run SatTerm.
2. In the terminal, type '+++' to switch the device into Command Mode.
3. Wait until the "Command Mode" text appears in the terminal.
4. In Command Mode, type 'AT^FFW' and press enter to switch the device into Programming Mode.
5. Run the NAL USB Bootloader program.



6. Press the "Open Hex File" button.
7. Browse and select a valid NAL device HEX file. NAL Research makes the HEX file available upon request.
8. Once the HEX file is loaded, press the "Program/Verify" button.
9. Wait for the programming to complete.
10. Press the "Reset Device" button.
11. The new firmware is now loaded on the device.

# Power Consumption

The SHOUT has an internal 2.3 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 SHOUT is capable of sending more than 1,600 normal tracking reports or eleven days with a reporting rate of 10 minutes. The data are based on measurements made with multiple SHOUT devices placed on the roof of NAL Research's facility with no blockage.

As mentioned in the previous section, the SHOUT can be charged by most of handheld solar chargers. For example, the RAYvolution® device with 1.0 A-Hr internal Li-Ion battery can add ~400 reports to the SHOUT and the Solio® MAG™ with 1.8 A-Hr internal Li-Ion battery can add ~700 reports. These solar charger performances are only estimates and are highly dependent on the operating environment as well as the age of the chargers. They do have finite number of rechargeable cycles of around 500 times.



RAYvolution® solar charger



Solio® MAG™ solar charger

**IMPORTANT:** Blocked or partially blocked antennas will force the SHOUT to retry multiple SBD transmissions for each report and, as a result, can significantly reduce the overall number of reports.

Each time the SHOUT wakes up to send a report, it has two minutes to acquire a GPS fix and send an Iridium SBD message. Assuming the ephemeris data is valid (less than two hours old or time-between-reports is less than two hours), the SHOUT microcontroller takes about 10 seconds for a GPS fix and processes the data drawing approximately 120mA. The Iridium transceiver takes about 10 seconds to transmit an SBD message drawing an average current of 350mA. The entire reporting cycle takes 20 seconds consuming ~1.3 mA-Hr of battery power. If the Iridium antenna is blocked or an overhead Iridium satellite is not available, the Iridium transceiver 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. As shown here, a missed report consumes ~8.5 times more power than a 'normal' transmitted report.

The current drawn by the SHOUT is given below for various operating scenarios. Performance characteristics listed are only estimates and can be different from device to device due to manufacturing variations in electronic components. In addition, these measurements were made in a controlled environment at room temperature.

1. In tracking mode, the SHOUT draws ~85 $\mu$ A in between reports with power LED off. The current drawn drops to ~31 $\mu$ A after 15 minutes.
2. In tracking mode, the SHOUT draws ~210 $\mu$ A in between reports with power LED blinking. The power LED can be turned off between reports via "Unit Settings" menu.
3. In tracking mode, the SHOUT draws an additional 55mA when the GPS receiver is on.
4. In tracking mode, the SHOUT draws an additional 350mA when the Iridium transceiver is on.
5. In input mode, the SHOUT draws ~95mA when ON with power LED on and LCD backlight on. Under this setting, the device can continuously stay on for ~24 hours.
6. In input mode, the SHOUT draws ~87mA when ON with power LED on, LCD backlight off. Under this setting, the device can continuously stay on for about 26 hours.
7. In input mode, the SHOUT draws ~84mA when ON with power LED off, LCD backlight off. Under this setting, the device can continuously stay on for about 27 hours.

# Design Specifications

The SHOUT comprises of a 9601 Iridium modem, a u-blox GPS receiver, a GPS and an Iridium antennas, a Li-Ion battery, an LCD and an NAL Research controller board. It is designed to operate with the Iridium network using SBD only.

## Mechanical Specifications

Dimensions:	4.41" x 2.35" x 1.27" (112mm x 60mm x 32mm)
Weight:	0.77 lb (0.35 kg)
Enclosure:	Hard anodized aluminum housing/EMI shielding
Connector:	USB
Antennas:	Quad-helix for Iridium and patch for GPS
Keyboard:	Seven buttons
Emergency:	Guarded button
LED:	Three status LEDs (power, message and emergency)

## Electrical Specifications

Main Input Voltage:	3.0VDC to 5.0VDC
Peak Current:	1.5A @ 4.2VDC
Battery Type:	Lithium Ion
Battery Capacity:	2.3 A-Hr
Charging Voltage:	USB 1.0, USB 2.0 or 4–5VDC
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 5Q
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)  
-144 dBm (cold-start)

#### **Environmental Specifications (Electronics)**

Operating Temperature: -31°F to +158°F (-35°C to +70°C)  
Operating Humidity: ≤ 75% RH  
Storage Temperature: -40°F to +185°F (-40°C to +85°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 +95°F (-20°C to +35°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: -40°F to +185°F (-40°C to +85°C)  
Storage Humidity Range: ≤ 95% RH

# Standard Compliance

The 9601 is tested to the regulatory and technical certifications shown below:

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

# Export Compliance Information

The SHOUT 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.