

## HawkEye Personal Tracker User's Guide

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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
USB	Universal Serial Bus

# | Introduction

The HawkEye PT 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 HawkEye PT 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 HawkEye PT is 100% backward compatible with the HawkEye PT. In this document, the terms HawkEye PT and HawkEye PT are used interchangeably.

The HawkEye PT is designed with ultra-low power consumption electronics drawing less than 35A 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 eight days (more than 1,200 reports). User is recommended to read Appendix C to learn about the impact of blocked antennas on the number of reports. The HawkEye PT is equipped with a high resolution color LCD 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 HawkEye PT offers a variety of services including:

- **Normal Tracking** — The HawkEye PT 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 911 button is pushed, the HawkEye PT immediately sends alerts to a designated corporate e-mail, home e-mail and/or 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 HawkEye PT allows users to send free-text via three different sets of on-screen keyboards.
- **Waypoint Tracking** — The HawkEye PT 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 HawkEye PT allows a quick check-in message to be sent using a single soft key.

**IMPORTANT:** Blue Sky Network can enable the HawkEye PT for use on the DoD EMSS Gateway. However, accessing the EMSS Gateway is not authorized until the HawkEye PT 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 Blue Sky Network for repair. Please see webpage <https://sbd.pac.disa.mil> for more information regarding DoD EMSS service provisioning.

**IMPORTANT:** Users should not disassemble the HawkEye PT for repair or services. The warranty is voided if the HawkEye PT is disassembled. It should be returned to Blue Sky Network for services by calling 858-551-3894 or e-mailing [support@blueskynetwork](mailto:support@blueskynetwork).



# Using the HawkEye Personal Tracker

## DEVICE DESCRIPTION

The HawkEye PT has eight buttons, one LED and a USB port. The buttons are used to power up the device, access the menus for parameter setting, initiate Check-In and Way Point functions and activate emergency notification. The USB port is for charging, firmware update and parameter setting.



- ① Power/Enter: 1. Turns device ON/OFF when hold down for two seconds or  
2. Used to select highlighted item on a 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 USB Port: Used to charge the battery, update firmware or setup operating parameters using a computer.
- ⑥ Emergency: Used to send an emergency 911 alert/notification.
- ⑦ Guard: Protects emergency button from being accidentally activated.
- ⑧ LED: Displays tracking and emergency statuses.
- ⑨ Antenna: Embedded GPS antenna (DO NOT BLOCK).
- ⑩ Antenna: External Iridium antenna\* (DO NOT BLOCK).

**\*IMPORTANT:** For best performance, Blue Sky Network only recommends the use of the Sarantel SL3104 decafililar antenna ([www.sarantel.com](http://www.sarantel.com)). Performance degradation including dropped coverage and shortened battery life can occur if a different antenna is used. Blue Sky Network will void the warranty if the HawkEye PT is replaced with a non-Sarantel antenna.

## CHARGING THE BATTERY


The HawkEye PT package includes manuals, software, an AC wall adapter, and a standard USB-to-mini USB cable. The HawkEye PT is shipped with its internal Lithium-Ion battery partially charged. User should fully charge the HawkEye PT before use. There are two ways of charging the HawkEye PT. One is to use the supplied AC wall adapter. The other is to connect to a standard USB device—make sure to use the USB cable provided with the HawkEye PT. 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 HawkEye PT 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. Blue Sky Network offers 12VDC and 24-36VDC chargers sold as separate items. For pocket size solar charges, Blue Sky Network recommends any of the Solio® ([www.solio.com](http://www.solio.com)) products. While using the HawkEye PT, a low battery warning message will appear when remaining power is less than 10%.



### 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.

Users should not disassemble the HawkEye Personal Tracker for replacing battery. It should be returned to Blue Sky Network for services. Risk of explosion if battery is replaced with an incorrect type. Dispose of the batteries (HawkEye Personal Tracker) according to local, state and federal regulations or laws.







The HawkEye PT has a battery status icon  on the top right corner of its 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. The charging cycle will complete quicker while the device is shut down.

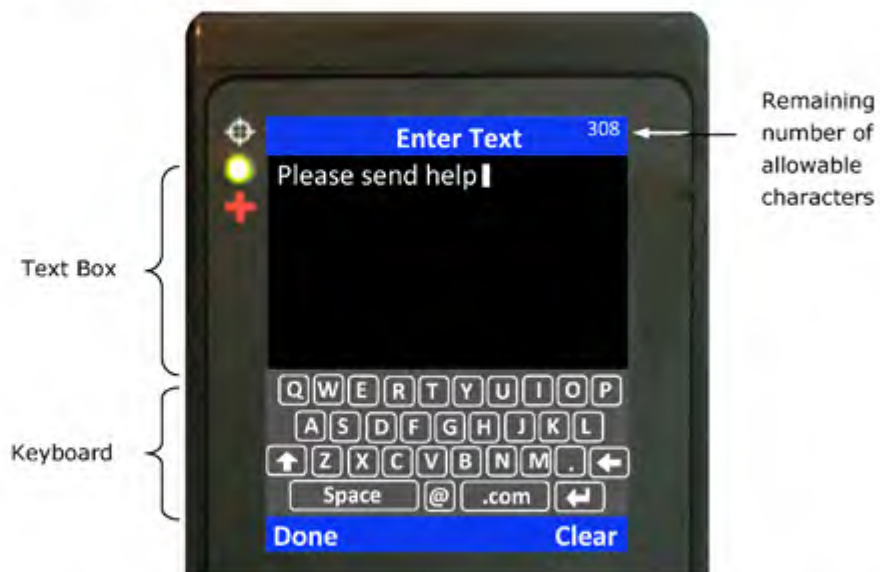


## BASIC NAVIGATION

HawkEye PT can be turned on by holding down the power/enter  button for approximately two seconds. Once the device is on, the arrow   buttons can be used to position the cursor over a menu icons and the enter  button can be used to select the highlighted icon. Each menu 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 HawkEye PT can be turned off at anytime by holding down the power/enter button for approximately two seconds. 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 menu. 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. Picture below is an example of a keyboard for entering waypoint labels. The up  key can be pressed repeatedly to switch between the keyboards. The four arrow     buttons on the HawkEye PT 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 HawkEye PT comprises of a 9602 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 Blue Sky Network or any certified 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). While in the field, the HawkEye PT 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 the Internet, to an Iridium transceiver or to any wireless device. A NOC is required to receive and implement the logic necessary for analyzing the HawkEye PT messages and determine the appropriate response.

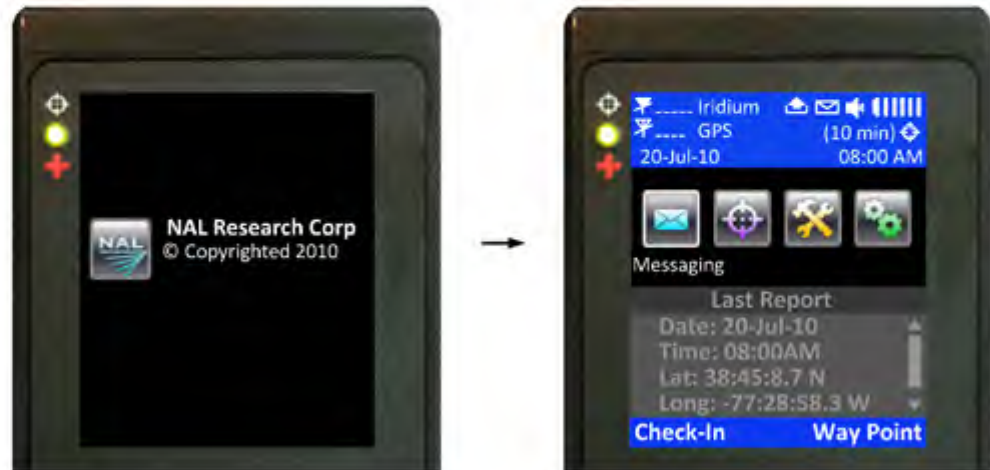
## **SATTERM SOFTWARE**

Along with the Server for Tracker software, SatTerm software is included for users to set up the HawkEye PT operating parameters. Most of the operating parameters can be set using the HawkEye PT on-screen menus. However, more sophisticated features such as encryption must be carried out via SatTerm and a connected computer to the HawkEye PT. For address book and canned messages, the HawkEye PT 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 HawkEye PT and the NOC server.



# | Home Screen

**HOME SCREEN** Immediately after powered up, the HawkEye PT momentarily displays a NAL Research logo followed by the home screen. Device status symbols will be shown along the top 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. The Iridium transceiver is always kept off to preserve battery life until a message is required to be transmitted.

📶 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. During transmission, the antenna must have a clear view of the sky. The HawkEye PT cannot send 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 HawkEye PT 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.

- ⊗ denotes tracking mode is off when the tracking symbol is dimmed blue.
- ⊕ denotes tracking mode is on when the tracking symbol is bright white. Next to the tracking symbol is the countdown timer to the next report.
- 🔇 denotes all the audio alerts are off.
- 🔊 denotes the 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.
- 🔋 is the battery indicator with five bars being fully charged. failed to send.

**Date/Time** The current time and date are displayed with the formats defined using the Settings/Time and Date menu. 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 HawkEye PT can recall the correct date and time. The message "Date/Time unavailable" is displayed when the HawkEye PT is unable to restore information from the GPS receiver.

**Home Icons** Immediately below date and time, the HawkEye PT displays four main icons each representing a menu option—Messaging, Tracking, Utilities and Settings. Detailed descriptions of each of these menu options are included in the next section. The arrow ⏪ ⏩ buttons are used to place the cursor over an icon. The perimeter of an icon lights up and a label underneath it appears when the cursor is placed over it. The enter ⏴ button is used to select the menu option.






**Last Report** The last successful report sent by tracking or emergency notification is displayed in the text box below the main icons. 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, longitude and altitude are visible in dimmed gray text. Additional information can be seen by pressing the arrow down button. After the arrow button is pressed the text will change from gray to bright white for better readability. Displayed text can be changed back to gray by repeatedly pressing the left arrow (◀) button. The Last Report information is saved on the HawkEye PT's non-volatile memory. Even if 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 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. Once confirmed, the HawkEye PT sends out a short code representing a Check-In message. If Settings/Include GPS option is enabled, GPS location will be attached to the Check-In message. Check-In messages with GPS location takes longer to complete since the HawkEye PT has to acquire a GPS fix first. Depending on the validity of the stored ephemeris data or the Accuracy setting, it could take an additional 29 seconds. 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 HawkEye PT immediately turns the GPS receiver on to acquire a fix. User then has the options to go back to the home screen without further

action, to 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.

A waypoint label can have up to 309 characters long. As each character is entered the remaining allowable number of characters for the label is displayed on top of the LCD. The Add option saves the waypoint into the HawkEye PT's non-volatile memory for later retrieval. The HawkEye PT 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 their short codes.

# | Quick Start

Before use, airtime must first be purchased from Blue Sky Network or from any of Iridium certified airtime resellers. The HawkEye PT's IMEI number must be registered by an airtime reseller to "point" to a NOC server. User is recommended to read the remaining of the manual to learn how to operate the HawkEye PT as a messaging device. However, as a tracking device, user can quickly set up the HawkEye PT with just three simple steps:

1. Go to Report Rate menu to set the reporting frequency .
2. Go to Track On/Off menu to enable tracking . The HawkEye PT is now intracking mode and is ready to send position reports at a rate chosen in Step 1.
3. Press the power On/Off  button to put the HawkEye PT to "sleep" in between reports. Or, if the power On/Off button is not pressed, the HawkEye PT will automatically put itself to sleep after 90 seconds of inactivity.

**IMPORTANT:** Blue Sky Network can enable the HawkEye PT for use on the DoD EMSS Gateway. However, accessing the EMSS Gateway is not authorized until the HawkEye PT 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 Blue Sky Network for repair. Please see webpage <https://sbd.pac.disa.mil> for more information regarding DoD EMSS service provisioning.

# | Messaging Menu

## MESSAGING



The Messaging menu allows user to compose, save, view, and send free-text messages. There are six options under the Messaging menu including Compose, Inbox, Drafts, Outbox and Sent and a Check Mailbox soft key.








## Compose



The Compose menu allows user to edit and send messages, free text messages to a NOC server. Three on-screen keyboards are available for information to be entered or modified. The up  key can be pressed repeatedly to switch between the keyboards. When Compose is selected, the Message menu appears with three options to choose from—Choose Canned Msg, Enter Text and Next.

Enter Text option lets user create free-text messages with three on-screen keyboards. Each free-text message is allowed to have up to 309 characters because the Iridium 9602 limits outbound messages to 340 characters. These 309 characters are shared between a free-text message and any additional e-mail addresses attached to it (including the semi-colon or space used as 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 (see detailed description in the next section).



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 Enter Emails options. Enter Emails opens on-screen keyboards allowing user to enter e-mail addresses separated by a semi-colon. 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 HawkEye PT 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, a Success screen will appear to indicate that the message has been added to the Outbox. The HawkEye PT must be held with the antennas having full view of the sky. If the Settings/Include GPS option is turned on then GPS location will be added to the message. Messages with GPS location takes longer to complete since the HawkEye PT has to acquire a GPS fix.

## Inbox



The Inbox folder contains all incoming read and unread messages with the newest message on top of the list. Read messages have a white opened envelope icon next to them. Unread messages have a green closed envelope icon next to them. The arrow buttons are used to place the cursor over a message and the enter button is used to read highlighted message. The message icon will appear on top of the home screen when an unread message(s) is in the Inbox. The speaker will provide an audible alert for all new incoming messages. The HawkEye PT can store up to 690 messages in the Inbox.

## Drafts

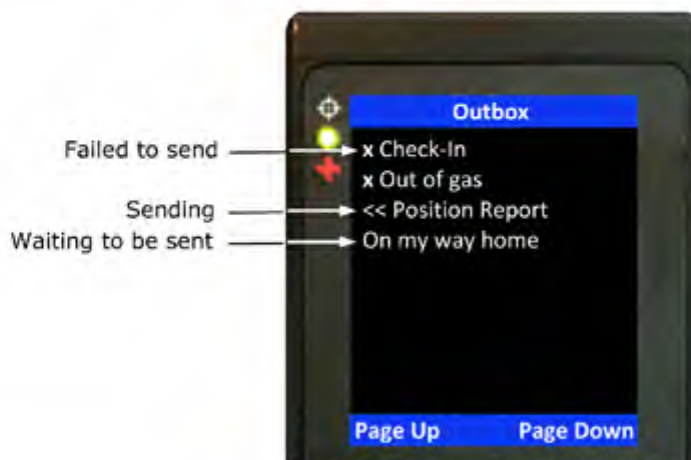


The Drafts folder contains draft messages saved under the Compose menu. The HawkEye PT can store an approximately 190 draft messages with the newest message displayed on top and the oldest message displayed on bottom of the list. The arrow up/down buttons are used to place the cursor over a draft message. The enter button is used to recall and display the highlighted message content. Options/Edit takes user back to the Compose menu for editing and Options/Delete removes the message from the Drafts folder. If Send is selected, a Success screen will appear to indicate that the message has been added to the Outbox. The HawkEye PT must then be held in a position with the antennas having full view of the sky. If the Settings/Include GPS option is turned on then GPS location will be attached to the message. Messages with GPS location can take longer to complete since the HawkEye PT has to acquire a GPS position.


## 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 next to it. A message failed to send has an X symbol. And a message in queue waiting to be sent has no symbol. 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 ~170 messages with the oldest message on top of the list.





For each message queued in the Outbox, the HawkEye PT attempts up to three times to transmit. After three failures, the message will be dequeued to avoid draining the battery. User has to manually requeue a message. If the HawkEye PT is at a location not suited for transmission, user has to monitor the Outbox and repeatedly requeue until the message is successfully transmitted. The  symbol appears on top of the home screen when there is a queued or dequeued message(s) in the Outbox.

**NOTE:** HawkEye PT will NOT resend “failed messages” even after the Iridium signal becomes available. User has to manually requeue a failed message(s) in order to resend. This is to prevent unintentional depletion of battery power in case there is large number of failed messages in the Outbox. Failed Cancel 911 message also needs to be requeued.

### Sent



The Sent folder contains messages successfully sent to a NOC server. When the enter button is pressed on a 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 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 in the Header menu, Delete permanently removes the message from the Sent folder. The HawkEye PT can store ~580 messages in the Sent folder with the newest message displayed on top of the list.

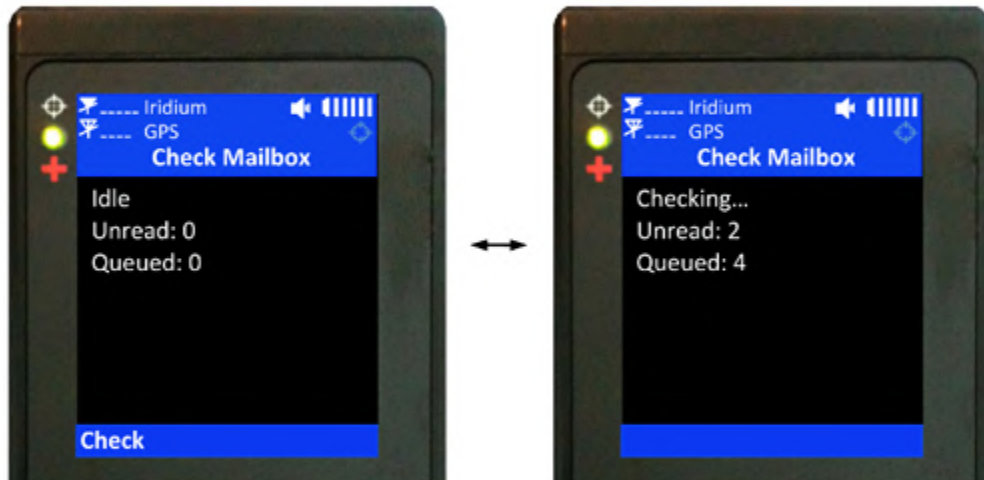
### Check Mailbox (Soft Key)

There are four ways the HawkEye PT initiates a mailbox check for any pending messages at the Iridium gateway:

1. User can manually force the HawkEye PT to check the mailbox at anytime by pressing the Check Mailbox soft key under the Messaging menu.
2. User can manually force the HawkEye PT to check the mailbox at anytime using the Utilities/Check Mailbox menu.
3. When tracking mode is enabled, the HawkEye PT automatically checks the mailbox each time it wakes up to send a position report.
4. When tracking mode is enabled and in addition to checking the mailbox each time it wakes up to send a report, the HawkEye PT also automatically wakes up and checks the mailbox at a preset mailbox check rate. The mailbox check rate is set using the Report Rate menu option. A position report will not be sent when the HawkEye PT 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 HawkEye PT shows the number of Unread messages in the Inbox and the number of messages still Queued at the Iridium gateway to be downloaded.



# Tracking Menu

## TRACKING





The Tracking menu allows user to enable the HawkEye PT tracking mode, disable the tracking mode, set the reporting rate, set the mailbox check rate, cancel the emergency 911 signal, view the unit reporting data, set GPS location accuracy, and set the position report format.



## Track On/Off



Track On/Off option is used to set the HawkEye PT tracking mode. When Enable Tracking is selected, the tracking symbol  changes from dimmed blue to bright white. The HawkEye PT 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 set under the Report Rate option. A countdown timer to the next report is displayed inside the parentheses next to the tracking symbol. When tracking is enabled and the HawkEye PT sleeps in between reports, the status LED  flashes once every five seconds. It can be turned off during sleep to reduce power consumption by using Settings/LED option. The emergency 911 button can be activated at anytime during tracking mode or non-tracking mode. The HawkEye PT can also be powered up at anytime and be used as a messaging device.

When wake up to transmit a location report, the HawkEye PT 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. 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 HawkEye PT will consume more battery power and the total number of reports is significantly reduced. User is encouraged read the Power Consumption section.



When Tracking is On, the tracking symbol changes from blue to white. Countdown timer to next report is shown inside the parentheses.

**NOTE:** When the HawkEye PT is in the middle of sending a report and user forces it to power off by holding down the power (⏻) button, the HawkEye PT will attempt to complete sending the report before shutting down. A warning message will appear on the LCD screen and will remain until either a position report is sent or failed to send. User can go back to the home screen by simply pressing the BACK button.

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

### Report Rate




Report Rate option is used to set the report frequency (time between reports) when Track On/Off is enabled. Once a report rate is selected, a new menu appears requesting for mailbox check rate. The mailbox check rate can be the same as the report rate. In this case, the HawkEye PT checks the mailbox each time it wakes up to send a report. If the mailbox check rate is different than the report rate, the HawkEye PT will wake up in between reports to check the mailbox without sending a position report. The HawkEye PT only offers the mailbox check rates that are evenly divisible to the report rate.


**IMPORTANT:** The total number of reports the HawkEye PT can send with a fully charged battery depends on three settings—the report rate, the mailbox check rate and the Accuracy. User is encouraged to read the Power Consumption section for details on how these settings can affect the HawkEye PT performance.




## Cancel 911



After the red emergency  button on the back of the HawkEye PT is pressed, user can deactivate the emergency alert by selecting the Cancel 911 option. A screen will appear with two options to choose from: (i) With Gateway Ack or (ii) Without Gateway Ack.

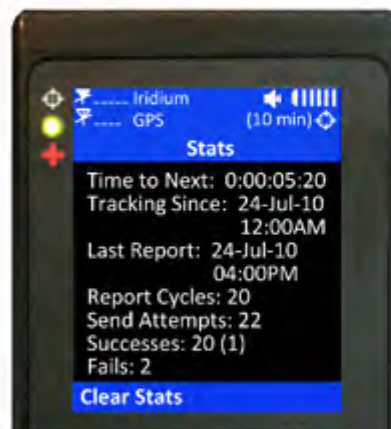
When With Gateway Ack is selected and confirmed, the cancellation message is queued in the Outbox to be transmitted. If the cancellation message is successfully transmitted and acknowledged by the Iridium gateway, the emergency mode ends, the emergency LED  is turned off and the top and bottom bars turn from red to blue. Powering the HawkEye PT off will not cancel the emergency mode. User **MUST** select Cancel 911 option to cancel emergency.

When Without Gateway Ack is selected and confirmed, the cancellation message is queued in the Outbox to be transmitted. The emergency mode ends immediately, the emergency LED  is turned off and the top and bottom bars turn from red to blue.

## Stats



When Track On/Off is enabled, the HawkEye PT monitors useful statistics which are displayed under the Stats screen. Data are cumulative over all tracking cycles. Displayed data can be manually reset at anytime using the Clear Stats soft key. A countdown timer to the next report is shown beside Time to Next and is replaced with Off when Track On/Off is disabled. The number of Successes represents the total number of position reports successfully transmitted to the Iridium network both with valid and invalid position fix. The number inside the parentheses next to Successes represents the number of position reports successfully transmitted but with invalid GPS fix. The number of Fails represents the total number of valid position reports failed to send to the Iridium network.



## Accuracy



Accuracy option allows user to select either Standard or Best accuracy when acquires a 3-D GPS fix. For Standard setting, the HawkEye PT acquires 3-D fix using saved ephemeris data in its non-volatile memory. The ephemeris is updated only when becomes invalid. For Best setting, the HawkEye PT always updates the ephemeris data first before attempting to obtain a 3-D fix. The Best setting takes longer for a 3-D fix. However, the probability of obtaining position accuracy to within 2.5 meters is much higher than for the Standard setting. Best setting is not recommended when operated in environments with limited view of the sky such as under heavy foliage. Choosing Best accuracy setting can significantly reduce the total number of reports on a fully charged battery because of longer GPS acquisition time. Choosing Best accuracy is the same as setting the report rate to more than two hours. For both cases, the HawkEye PT has to update the ephemeris data. Again, as a reminder, user is encouraged to read the Power Consumption section.

## Format



The HawkEye PT can transmit position reports in either 30-byte format or 10-byte format. 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. The latitude and longitude are recorded with ~0.18 meters resolution.

# Utilities Menu

## UTILITIES



The Utilities menu provides six options used mainly to check for proper hardware and network setup. These include Check GPS, Check Iridium, send Test Report, Check Mailbox, Check-In and Way Points.



## Check GPS



Resetting Ephemeris is recommended when you first start using the device. Check GPS option forces the HawkEye PT 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 Reset Ephemeris soft key is used to force the HawkEye PT 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.

Check GPS option is a good indicator of letting user know whether or not 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 30 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 indicative that the surrounding obstructions prevent the GPS receiver from obtaining a fix and user should move on to a different location.

### Check Iridium



Check Iridium option forces the HawkEye PT to turn on its Iridium transceiver and continuously update and display signal strength information 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 Report



When the Test Report option is selected, the HawkEye PT immediately turns the GPS receiver on to refresh 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 Check 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 the Send soft key. A test report has the same format as a regular position 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 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 send on-demand location reports. It can be considered as "manual tracking mode".

### Check Mailbox



Detailed description of this option can be found on page 22.

### Check-In



Detailed description of this option can be found on page 14.

### Way Points



The Way Points menu is used to acquire, view, save, delete or send a waypoint to a NOC. Choosing the New option is the same as pressing the Way Point soft key on the home screen (see page 14 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 label can be edited, sent/re-send or erased. The HawkEye PT can save up to 1,000 way points in its circular memory. SatTerm can be used to retrieve waypoints saved on the HawkEye PT.

# Settings Menu

## SETTINGS




The Settings menu allows user to view and configure the HawkEye PT hardware settings. There are twelve options available.



### Audio



Audio option is used to change the alert frequency and tone, mute incoming message alert and mute all audio feedback. The  icon will appear on the home screen if Mute All is on. User can test the audio volume and sound before selecting by using the Preview soft key.

### Contrast



Contrast option is used to change the LCD contrast by pressing the arrow up and down buttons. Press the enter button to select the setting and press the BACK button to go back to the Settings menu without change.


### Backlight



Backlight option is used to set the period of inactivity after which time the HawkEye PT turns the LCD backlight off. The HawkEye PT consumes approximately 40mA less with the LCD backlight set to Always Off. Setting the backlight to Always On is recommended for night time use.

### LED



The HawkEye PT has a single status LED  on the top left corner to alert user of whether the device is in tracking mode or emergency mode. The LED flashes once every five seconds when Track On/Off is enabled and the device sleeps (in between tracking reports). The LED turns solid green when Emergency mode is enabled regardless of whether the device is on or off. The LED can be turned off for either of these two cases to save battery power using the LED option. The HawkEye PT consumes approximately 3mA less with the LED disabled during emergency and 125A less with LED disabled during tracking mode.



**Include GPS** Always should be set to on. Include GPS option forces the HawkEye PT to attach GPS location to Check-In, canned and free-text messages. Under default setting, these messages do not have GPS information included. Messages with GPS location included can take longer to complete since the HawkEye PT has to acquire a GPS fix first. Depending on the validity of the stored ephemeris data or the Accuracy setting, it could take an additional 29 seconds.



**Format** Format option is used to select one of three 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.



**Time and Date** Time and 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.



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



**User Info** User Info option displays user information entered using SatTerm software.



**Unit Info** Unit Info option displays the internal 9602 module's IMEI number, Iridium FCC ID, Iridium IC ID and the HawkEye PT's firmware version.



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





**Reset** 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.



# Additional Features

## EMERGENCY (911) BUTTON


The red emergency 911 button  is located underneath a rotating guard in the back of the HawkEye PT. It can be used at anytime regardless of the tracking status (enabled or disabled) or the power status (on or off) of the device. When pressed, the emergency LED  immediately turns solid green to indicate that the device is in emergency mode. The LED can be deactivated to extend the battery life by using the Settings/LED/Power LED emergency option. If the LCD screen is on during emergency activation, the blue bars across the top and bottom of the screen turn red. The device sends three consecutive reports to a NOC as quickly as possible. After sending the first three emergency reports, the HawkEye PT reverts back to the default emergency time-between-reports (TBR) of two minutes. During emergency a NOC can send an acknowledgement back to the HawkEye PT.



## STATUS LED

There is one status LED on the top left of the HawkEye PT. The LED turns solid green when the HawkEye PT is in emergency mode, which can be deactivated to save power using Settings/LED/Power LED Emergency option. It flashes once every five seconds when the HawkEye PT is off and tracking is enabled. Again, it can be deactivated to save power using Setting/LED/Power LED Tracking option.

## POWERING DOWN

The HawkEye PT 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 the tracking mode setting. If tracking is enabled, track report rate and check mailbox rate will be shown. The screen stays on for approximately ten seconds before shutting down to sleep. User can put the HawkEye PT in sleep mode immediately by pressing the left soft key. If tracking is disabled, user can

wait for ten seconds for the HawkEye PT to turn itself off or by pressing the left soft key to turn it off immediately.





# Appendix A: PMS Features

## TRACKING



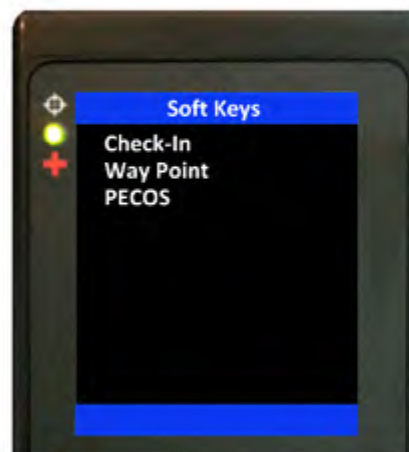
The Hawkeye PT is capable of sending position reports in PECOS Message Structure (PMS). The PMS complies with the Blue Force Tracking Data Format Specification as defined in the document PECOS 200708-001 Version 1.3. The Hawkeye PTs are shipped without PMS features activated and can only be enabled by Blue Sky Network 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.



## Soft Keys



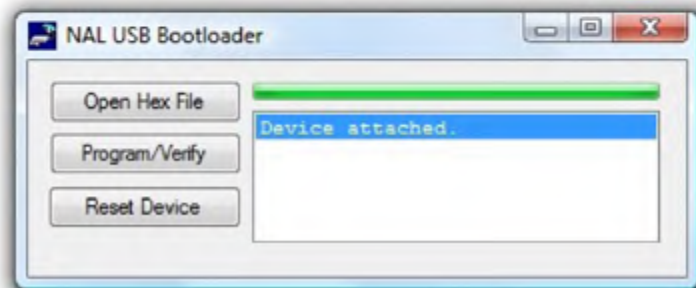
When the PECOS format is enabled using the Tracking/Format menu, the Check-In and Way Point features are replaced with the Brevity Code at the bottom of the home screen. User can override the Brevity Code soft keys and revert back to the Check-In and Way Point soft keys by going to the Settings/Soft Keys/PECOS menu to turn the PECOS soft keys off. After turning the PECOS soft keys off, the Brevity Code setting can only be configured through the Tracking/Brevity Code menu.



# Appendix B: Upgrading the Firmware

The HawkEye PT firmware can be upgraded using a PC connected to the USB port of the device. The device drivers support Windows XP, Windows Vista and Windows 7.

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. Blue Sky Network 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.

# | Appendix C: Power Consumption

The HawkEye PT 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 HawkEye PT is capable of sending more than 1,200 tracking reports with the following settings: (1) report rate of less than two hours, (2) mailbox check rate and the report rate are the same and (3) Standard Accuracy. Blocked or partially blocked antennas will force the HawkEye PT to retry multiple SBD transmissions for each report and, as a result, can significantly reduce the overall number of reporting cycles.

The HawkEye PT 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 HawkEye PT configured for report rate of more than two hours and Standard Accuracy can only send ~750 tracking reports. Setting the Accuracy to Best also reduces the number of tracking reports to ~750 regardless of the report rate setting.

**IMPORTANT:** Data presented here are only estimates and are highly dependent on the operating environment, accuracy setting and antenna type. Data are based on measurements made with multiple HawkEye PT devices placed on the roof of Blue Sky Network's facility with no blockage.

Each time the HawkEye PT 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) and the Accuracy option is set to Standard, the GPS receiver takes about 10 seconds for a position fix drawing approximately 55mA. The Iridium transceiver takes about 10 seconds to transmit an SBD message drawing an average current of 110mA. The HawkEye PT circuit draws about 125mA during 25-second reporting cycle. The entire reporting cycle consumes ~1.32 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. A missed report consumes ~8.5 times more power than a 'normal' transmitted report.



# Appendix D: Design Specifications

The HawkEye PT comprises of a 9602 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:	4.0" x 2.2" x 0.8" (102 mm x 56 mm x 20 mm)
Weight:	~6.5 oz (184 g)
Enclosure:	Hard anodized aluminum housing/EMI shielding
Connector:	USB
Antennas:	Helix for Iridium and patch for GPS
Keyboard:	Seven buttons
Emergency:	Guarded button
LED:	One status LED (power, tracking and emergency)

## Electrical Specifications

Main Input Voltage:	3.0VDC to 5.0VDC
Peak Current:	1.5A @ 4.2VDC
Battery Type:	Lithium Ion
Battery Capacity:	1.95 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 or 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) -144 dBm (cold-start)

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

Operating Temperature:	-40°F to +185°F (-40°C to +85°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

# Appendix E: Standard Compliance

The HawkEye PT has an internal Iridium 9602 transceiver. The 9602 is tested to the regulatory and technical certifications shown below. It is assigned to the FCC Identifier Q639602. The 9602 and, therefore, the HawkEye PT must not be readily accessible to human subjects closer than 20 centimeters.

REGULATORY APPROVALS	RADIO TESTS	EMC TESTS	MECHANICAL/ ELECTRICAL TESTS
CE	ETSI EN 301 441 V1.1.1 (2000-05)	ETSI EN 301 489-1 V1.4.1 (2002-08)	EN60950-1:2001 Part 1
FCC	FCC CFR47 Parts 2, 15, and 25	ETSI EN 301 489-20 V1.2.1 (2002-11)	UL60950-1 Part 1
Industry Canada	Industry Canada RSS170 Issue 1, Rev 1, November 6, 1999	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	



# | Appendix F: Export Compliance

The HawkEye PT is controlled by the export laws and regulations of the United States of America (US). It is the policy of Blue Sky Network to fully comply with all U.S. export and economic sanction laws and regulations. The export of Blue Sky Network products, services, hardware, software and technology must be made only in accordance with the laws, regulations and licensing requirements of the U.S. Government. Blue Sky Network 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 Blue Sky Network.

The export and re-export of Blue Sky Network 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.