



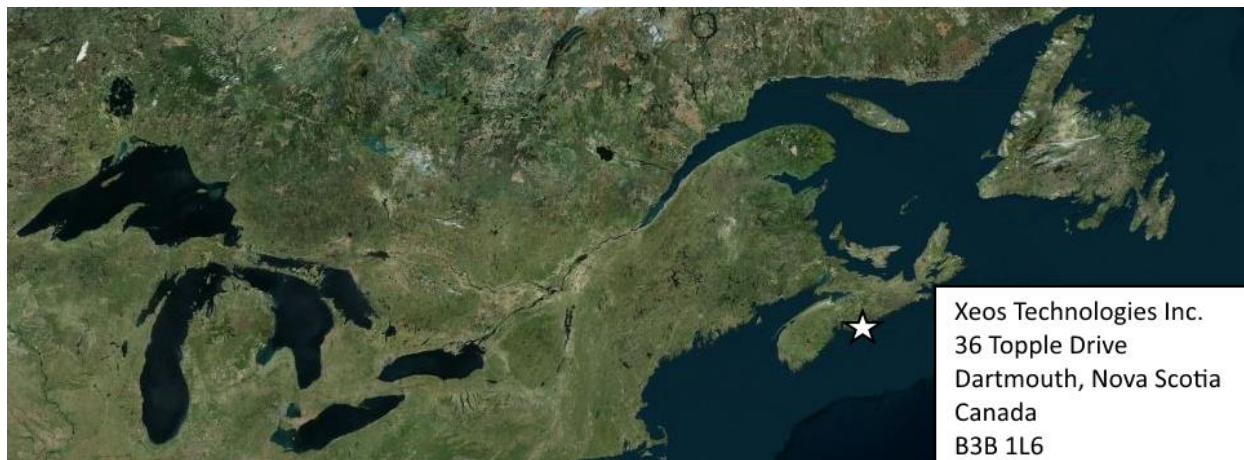
Hermes User Manual

Handheld Iridium/GPS/NMEA Asset Tracker



Version 1.2
August 2020

Shipped From



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Version History

Version No.	Date	Description
1.0	August 2019	Base document
1.0.1	October 2019	Minor edits
1.1	January 2020	Changes to screen display
1.2	August 2020	Low Battery/power off additions

Regular checks for the latest manual are suggested. Be sure to check [Xeos Technologies' manuals page](#) to compare versions and download the latest version.

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General Description

The Hermes is a handheld asset tracking beacon which continuously monitors for asset location and reports and receives location via the Iridium satellite network. Hermes makes use of the bi-directional, global, real time Iridium Satellite Short Burst Data (SBD) network in combination with GPS position location.

Inside the Hermes is a 9603 Iridium satellite Short Burst Data core radio transceiver, a specialized low-power Xeos digital controller with GPS, Iridium & GPS antennas, and rechargeable Lithium battery.

While the Hermes is intended for recovery of remote deployments, Xeos Technologies Inc. (Xeos) manufactures other products for fixed location monitoring and remote tracking and surveillance.

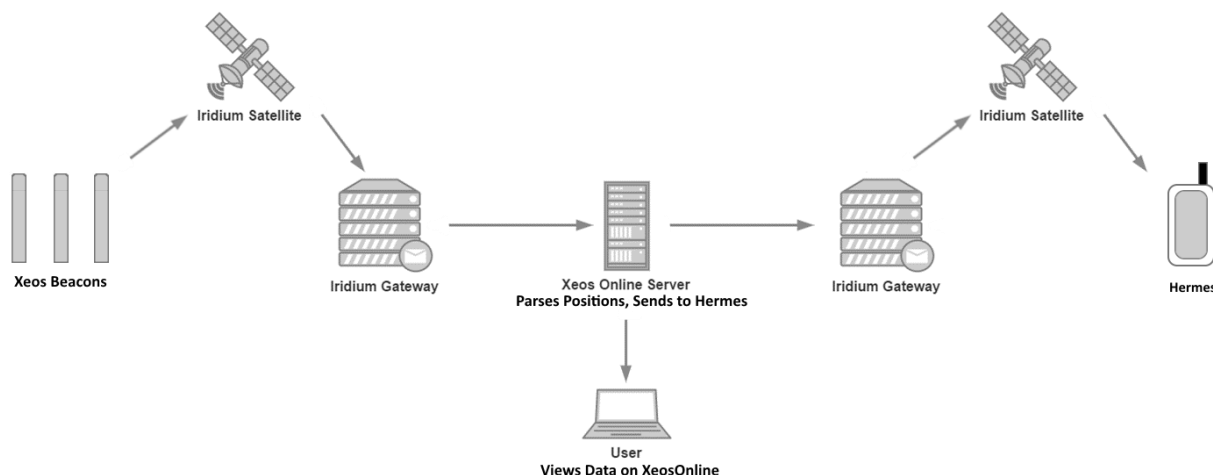
See www.xeostech.com for details or call (902)-444-7650.

Theory of Operation

The Hermes is intended for the recovery of other Xeos products on deployment. Utilizing XeosOnline's message forwarding system, up to 10 devices can be set to forward location information to the Hermes.

The internal GPS of the Hermes determines its own location, and derives the bearing and distance between the Hermes and forwarded deployed assets. The most recent position of each deployed asset is stored and can be cycled through on the display of the Hermes. The position of the Hermes is also updated regularly to make bearing and distance as accurate as possible.

When coupled with a chart plotter and appropriate cable, the Hermes can output position data of its own position or those of the tracked assets as a standard NMEA-0183 TLL message for added tracking ability.

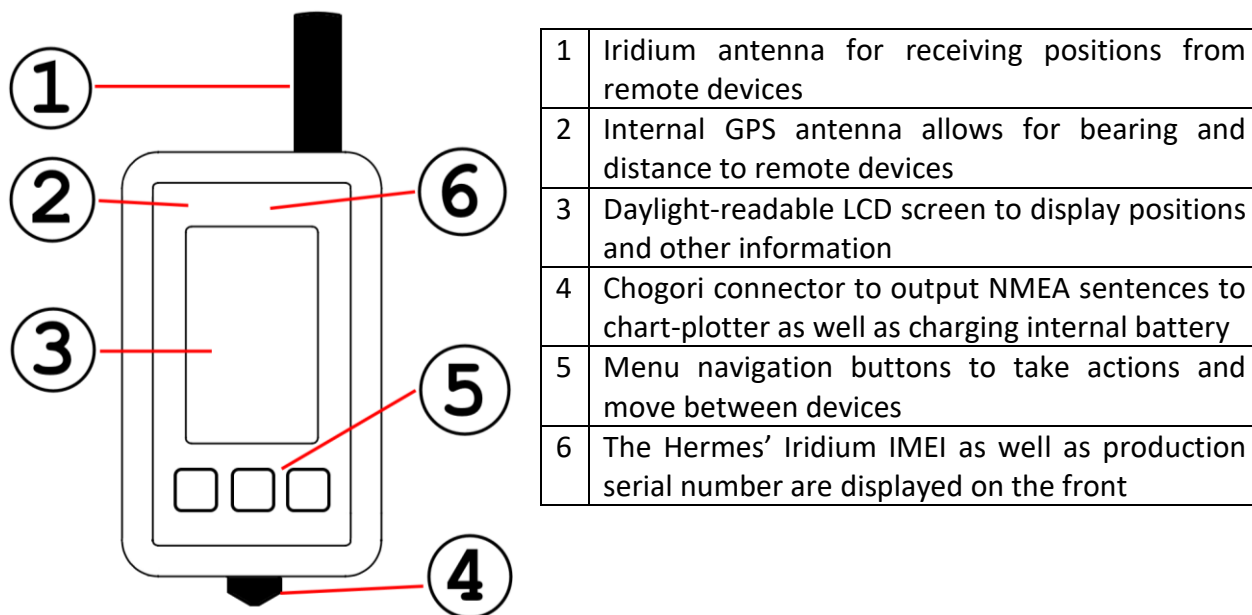


MESSAGE SENDING ORDER OF OPERATION

Preliminary Setup

Outside Diagram

Shown below are key sections of the Hermes:



Setting up your Iridium Account

Hermes makes use of the Iridium satellite system's (www.iridium.com) Short Burst Data (SBD) service for the 9603 transceiver. This service is a global, two-way, real-time, email-based data delivery service that has a maximum outbound (from Hermes) message size of 340 bytes and a maximum inbound (to Hermes) message size of 270 bytes.

Hermes end users must set up an approved data delivery account with their preferred service provider. Xeos is an Iridium VAR and can provide Iridium service if you wish.

Setting up service requires the International Mobile Equipment Identity (IMEI) number. Each 9603 has a unique IMEI number that must be registered with a preferred service provider. Xeos will make these numbers available when the product is delivered.

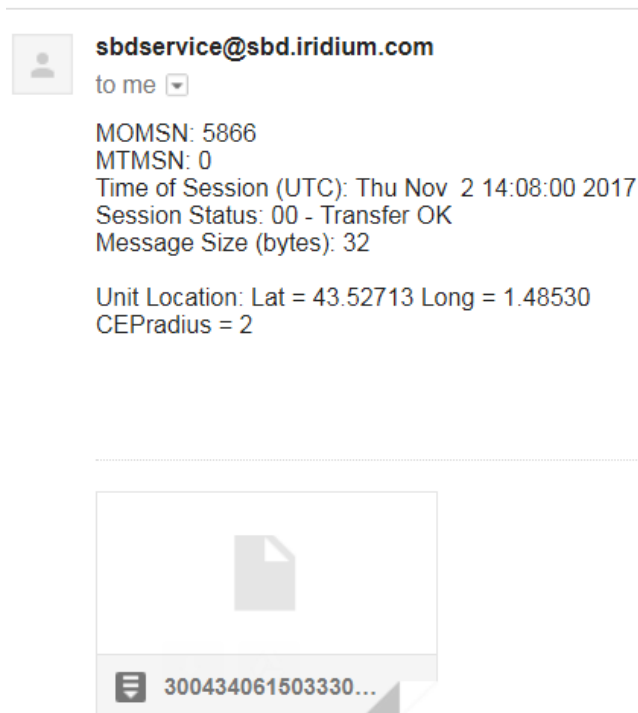
Each IMEI number is capable of being associated with up to five (5) unique email addresses. This may vary between service providers. When registering your IMEI number, please provide the service provider with the temporary Xeos testing account email address. You may contact Xeos for this email. Setting up this email address allows for better technical support during the initial learning period for the product.

Understanding Position Information

There are two types of position information which will be sent via the Iridium Gateway.

Iridium Doppler position

The Iridium Gateway calculates the Iridium transceivers' position on earth when it receives a transmission, using Doppler technology. As a result, it is often very inaccurate. This location is only visible to users getting emails directly from the device, as opposed to emails forwarded by XeosOnline. An example of a "raw" Iridium message via email is below and will always have the IMEI of the device in the subject line, regardless of its name on XeosOnline.



sbdservice@sbd.iridium.com	All messages from Iridium devices come from this address.
MOMSN: 5866	Mobile Originating Message Serial Number; each individual message has its own incrementing serial number. A mobile originating message is one that comes from the Iridium device.
MTMSN: 0	Mobile Terminating Message Serial Number; like the MOMSN, messages to Iridium devices (like commands) also have an incrementing serial number. Since the message in the example is from an Iridium device, the MT number is zero.
Time of Session (UTC)	The time the message arrived at the Iridium Gateway
Session Status	Each message will have a code determined by how well the message was received; codes 00, 01 and 02 are acceptable

	and will always have their code name (ex. Transfer OK) next to this number.
Message Size (bytes)	The size of the actual message sent by the Iridium device, which is in the attachment in the email.
*Unit Location	The Doppler position of the device as estimated by Iridium's network. It is NOT the GPS position measured by the device.
*CEPradius = 2	The numerical value of how accurate the above position is; with a value of 2, This means that using the Lat/Long that the body has supplied, Iridium is 80% confident (always 80%) that the device sending the message is within a circle, 2 kilometers in radius, with the Lat/Long given as the center of that circle. The higher the CEPradius value, the larger the circle and therefore the less accurate that position.

*These items can be enabled/disabled by your Iridium provider if desired.

Global Positioning System

Location information generated by the device itself is embedded in the SBD attachment sent via the Iridium Gateway and can only be seen through the XeosOnline system or situations where the position information is sent in a plain-text format (XeosOnline message forwarder or using the **\$msgenable** command). This position information is accurate to within several feet of the true position.

Timestamp: 2018-04-11T19:20:10.001Z, BatteryV: 10.38, Latitude: 44.714227, Longitude: -63.604954, Vul: 11.88

Integrating Beacons with the Hermes

The Hermes is designed to receive messages from Xeos beacons through the use of XeosOnline's forwarder system. Therefore, all beacons intended to be used with the Hermes must be activated on the Iridium network and set to send messages to XeosOnline by the Iridium provider. The Hermes must also be activated on the Iridium network to receive messages.

XeosOnline

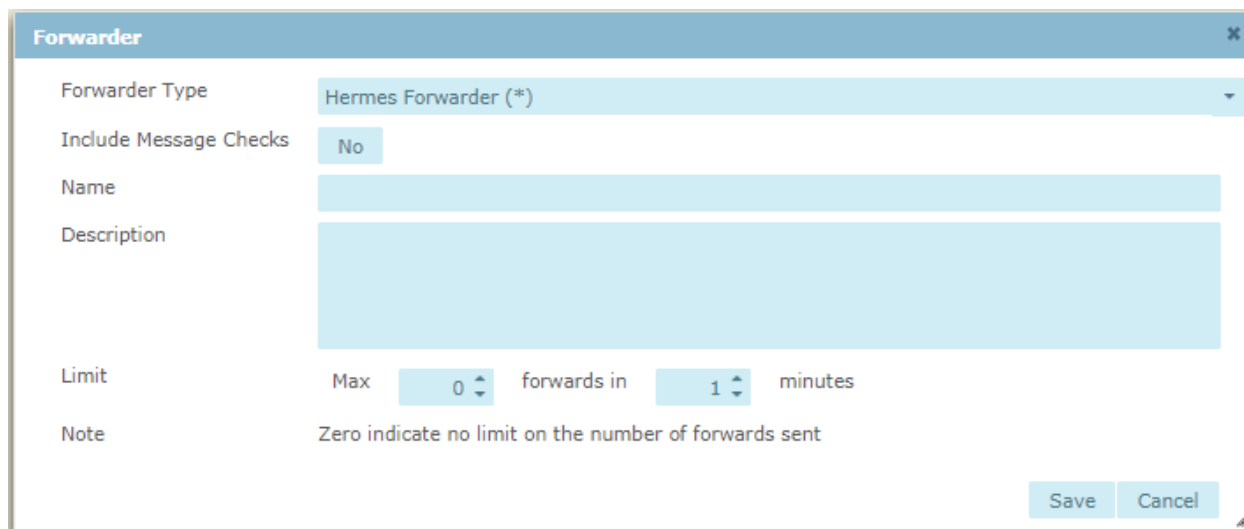
The connection between devices is entirely controlled on XeosOnline. A maximum of ten devices can be set via the forwarder system to send position messages to the Hermes at one time.

Forwarders can be created via the **Admin** tab on the top-right of the page on XeosOnline.

Hermes Forwarder Setup

Creating a Forwarder

1. To create a forwarder, click on **+ New**
2. The Forwarder dialog will appear

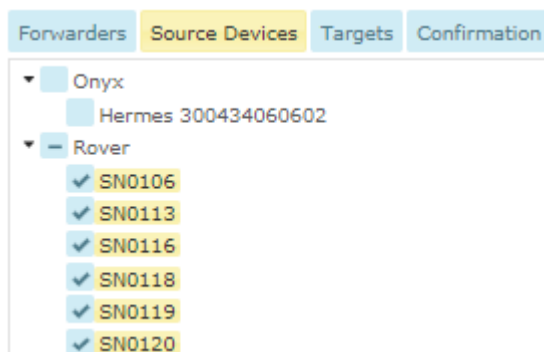


3. **Forwarder Type** will present several options from a drop-down menu.
 - a. Choose **Hermes Forwarder**
4. **Name:** Give the Forwarder a meaningful name
5. **Description:** Record any additional details about the Forwarder (optional)
6. **Limit:** Leave at no limit (default)
7. **Click Save**

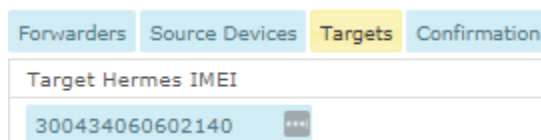
Adding Devices and Targets to Forwarders

Once a Forwarder has been created, devices and targets can be added.

1. Select a Forwarder from the list **Hermes Forwarder**
2. Click **→ Next** and the **Source Devices** tab will appear. Select the devices you wish to forward



3. Click **→ Next** again, the target to receive messages is available. The Hermes IMEI is entered here.



4. Click **→ Next** and you will be prompted to save the additions to your forwarder. Additionally, the Test Forwarder button will send a test message to the Hermes to be received by the device, confirming its Iridium connectivity.

Deployment of the Hermes

The Hermes contains GPS and Iridium antennas, as well as a rechargeable lithium battery. No external equipment is required for use, but is recommended for longer deployments and searches:

- A combination NMEA/Charge cable for output and recharging via wall outlet
- A device to receive NMEA messages from the Hermes for chart-plotting
- An RS-422 converter if sending NMEA strings to a computer

To deploy the Hermes, ensure that the top of the device, which is where the antennas are located, has a clear view of the sky. Outside on the deck of a boat would be sufficient.

Testing the Installation

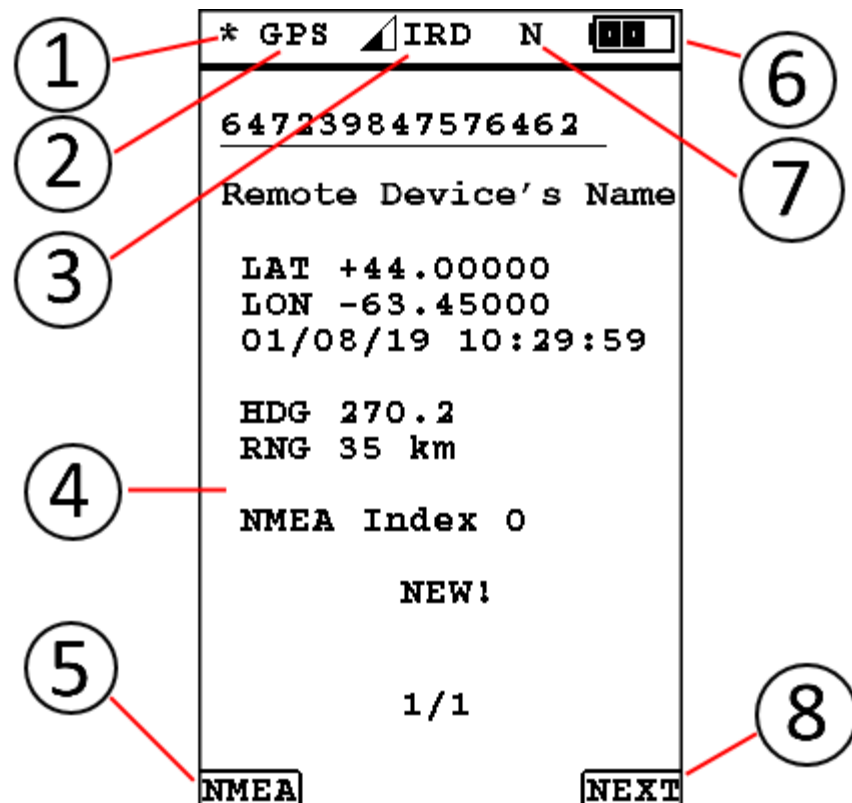
Test the installation by checking the destinations to which the Iridium account is sending notifications. XeosOnline will display the last known position of the Hermes as well as the timestamp of the GPS position. As beacon positions are sent, Hermes will receive and display those positions, and overwrite previous positions as they are received.

Hermes Power-On

The Hermes is powered on by holding in the farthest right interaction button for several seconds. While this button is depressed, the screen will prompt the user to hold that position until the device is on. This screen displays the Hermes' firmware and hardware revisions as well.

Hermes Display and Buttons

The Hermes uses a daylight-readable LCD screen for display of beacon location, the Hermes' own location and status and navigation of the interface.



1	Field to show if a new position on any device is available
2	Show status of the Hermes' internal GPS
3	Show Hermes' Iridium connection status and strength
4	Important information for a page is displayed in the main section
5	Action that will be taken if button 1 is pressed
6	Battery status/health indicator
7	Displays if NMEA is being output from the connector
8	Action that will be taken if button 3 is pressed

Iridium

Iridium is a critical feature of the Hermes; without a connection to the Iridium network, the Hermes' position data cannot be transmitted out, and positions of other beacons cannot be received.

The Hermes' Iridium modem is always in an active state. The LCD displays the Iridium signal strength on the top of the screen. If there is an exclamation point, the Iridium modem is not connected to the Iridium network.



Pictured: Iridium Strength Bars; no signal, not registered, low signal, full signal

Internal GPS

While the Hermes will function with its own GPS inoperable, the internal GPS can be used to acquire a bearing and distance between the Hermes and the device currently displayed on the LCD.

The display will show the Lat/Long in decimal degrees of the Hermes on the "My Location" page. When the GPS has a position for this screen, **GPS** will be displayed at the top of the screen.

The Hermes' internal GPS updates every 30 seconds, and transmit its most recent position over Iridium every 30 minutes. If the Hermes has not acquired an updated fix after 15 minutes, the GPS logo will appear as a strikeout.



Pictured: Hermes GPS has not been updated, Hermes GPS has a current position

NMEA Output

The Hermes has the ability to output NMEA-0183 TLL (Target Latitude and Longitude) signals from its bottom Chogori connector to a connected chart-plotter.

If the Hermes is not connected to the chart-plotter when a new position arrives, pressing the **NMEA** button while viewing the position on-screen will output the appropriate string of that position from the port. At that time, an **N** will momentarily appear on the screen between the Iridium and battery symbols on the display.

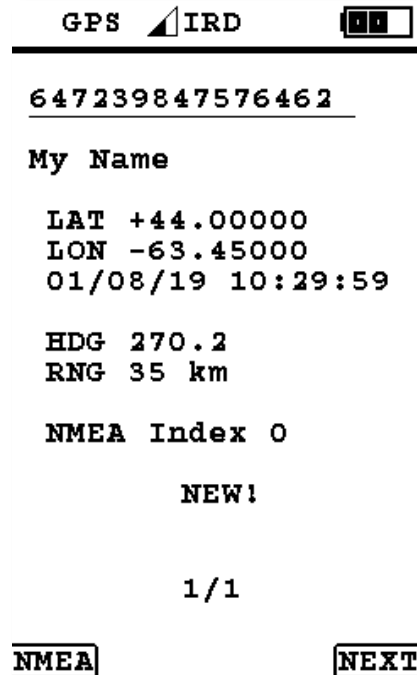
If a new position from a beacon arrives while connected to the chart-plotter, the position is immediately pushed from the NMEA port.

Received Messages from Beacons

As messages are received from remote devices, the Hermes will update the NMEA index for that particular device to display the time and location of the most recent position. If a new position

arrives, an asterisk (*) will appear in the top-left corner of the screen until the new position is viewed.

New positions are marked ***NEW*** in the display when viewed. Consequently, positions from devices that are older than 10 minutes are marked ***Stale*** in the same location.



Remote Position Readout	
64723984757662	The 15-digit number of the remote device being tracked
My Name	The first 10 digits of the name given to the device on XeosOnline. If the name on XeosOnline is its IMEI, the last 10 digits are displayed
LAT	The latitude of the position of the remote device in decimal degrees
LON	The longitude of the position of the remote device in decimal degrees
01/08/19 10:29:59	Day/Month/Year, Hour/Minute/Second of position received
HDG	Heading between the Hermes and remote device in degrees in relation to True North
RNG	Range; distance between Hermes position and remote device in meters/km
NEW/Stale	These messages appear if a position is being seen for the first time (NEW) or if the position is older than 10 minutes (Stale)
NMEA Index	Each device is assigned an NMEA index which stays with the device as new positions arrive
1/1	Shows what page is being displayed out of all devices

Battery Indicator

The Hermes will display the overall level of charge in its internal battery when in use, descending as the device discharges.

Additionally, the Hermes will display in the same location if the battery is receiving power externally for charging.

If at any point the battery charging enters into a fault state, the battery icon displays an appropriate indicator.



Pictured: Hermes battery before charge reading, partial charge, when charging, when a charging fault has occurred.

Low Battery Screen (Version 1.0.2 and Up)

The Hermes as of version 1.0.2 is designed to power off if the internal voltage reaches a low threshold of 3.2 Volts (3.0 Volts for previous versions). When this threshold is reached, a Low Battery message will appear on the screen for five seconds, before the device powers itself off. If the device is turned on after this point, the process will repeat; the battery at this point requires a recharge.

Always ensure the battery is fully charged before deployments, and especially before storage to prolong the life of the battery. The Hermes can be used while plugged into a charger.

Messages from the Hermes

There are several messages sent from the Hermes to XeosOnline, depending on setup and conditions. Below are examples of the most common Mobile Originating messages.

Settings Summary Message

On startup, the Hermes will send a summary of timers and a short list of GPS and Iridium settings. These settings do not need to be manipulated in most use-cases.

Flags: Unsolicited, IRD Normal Timing: 3600sec, IRD Alarm Timing: 60sec, GPS Normal Timing: 3600sec, GPS Alarm Timing: 20sec, GPS Retry Qty: 2, GPS Retry Delay: 20min, GPS Max On Normal: 100sec, GPS Max On Poor: 30sec, GPS Max Backlog: 40, GPS Max Fix Per Message: 24, Ird Retry Qty: 2, Ird Retry Delay: 2min, Accelerometer Threshold: 100

Version (Type V)

The **\$ver** command will return a summary of both firmware and hardware versions:

Ascii: 08010000,V,Hermes v1.26-5567. dev:6 Hw:255.255-65535 SN=4294967295 GPS: IRD:TA12003 Reset: Count=164, Current=(BP), Prev=(cleared)

Version Readout	
08010000	Timestamp in UTC (Month/Day/Hour)
V	Type of message (Version)
Firmware Version	Product; Major, minor, build of firmware

Hardware Revision	Hardware revision, set during assembly
Serial	The unit's serial number
GPS Version	Firmware version of GPS chip
Iridium Version	Firmware version of Iridium modem
Reset Count	The number of resets since firmware was uploaded
Current	Cause of last power off
Previous	Cause of previous power off, not used in Hermes

Position

Typical position messages are sent in compressed binary format (Message Type 10) to save on data usage and are parsed in XeosOnline, placing its full contents in the Message and Location Logs.

Timestamp: 2019-03-25T18:36:11.001Z, BatteryV: 11.91, Latitude: 44.714272, Longitude: -63.604870, Voltage Unloaded: 12.06

Message Log Readout	
Timestamp	Date and time in UTC of the latest position reading
BatteryV: 11.91	Loaded voltage of the power supply; minimum battery voltage observed during the previous Iridium transmission
44.714272	Latitude of fix, decimal degrees
-63.604870	Longitude of fix, decimal degrees
Voltage Unloaded: 12.06	Unloaded voltage of power supply; battery voltage data from measurement taken just prior to the turning on of the Iridium modem

Timestamp ▾	Latitude	Longitude	Alarm	Bearing ↕	Speed (km/h) ↕	Speed (knots) ↕	Altitude (m) ↕	SNR ↕
Mar 25 2019 06:36:08.001 PM	44.714400	-63.604902	false	0.0	0.000	0.000	0.0	44

Location Log Readout	
Timestamp	Date and time in UTC of this specific position reading
44.714400	Latitude of fix, decimal degrees
-63.604902	Longitude of fix, decimal degrees
Alarm: False	Indicates if the device has determined if it is in an alarm state
Bearing	Direction of movement determined by device
Speed (km/h)	Speed measurement in kilometers per hour
Speed (knots)	Speed measurement in knots
Altitude	Not used
SNR	SNR (Signal-to-noise ratio) of GPS Fix, higher is better (>37 is good)

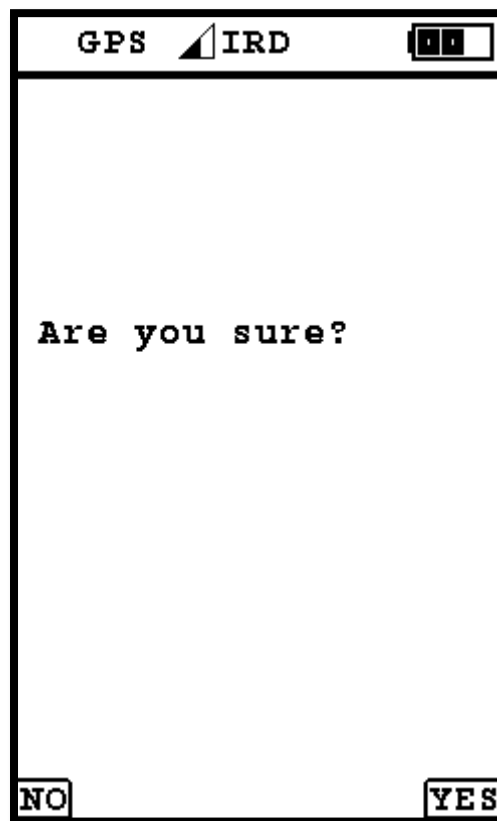
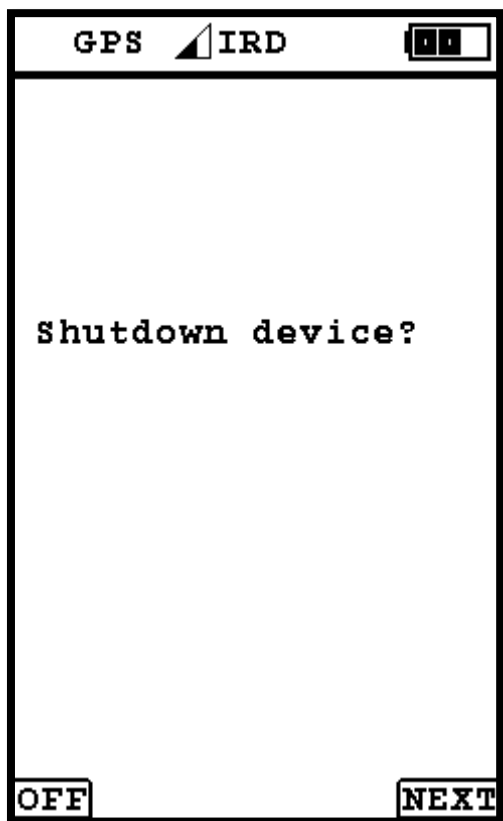
Testing the Hermes

1. Once the Hermes firmware has been updated, please test its ability to transmit.
2. Make sure the Hermes has an active Iridium account. Xeos can setup an account for you if you do not currently have one. Ensure you have access to one of the email addresses to which messages are sent.
3. Place the Hermes outside in a location where it has a clear view of the sky and connect it to an external power source.
4. Check the email account to see if a transmission has been received. If no message is received within 20 minutes, please check operating manual to ensure it is setup as required.
5. If no message is received, please contact Xeos for assistance in troubleshooting.
6. DO NOT redeploy the Hermes until you have confirmed Iridium transmission.

Shutdown

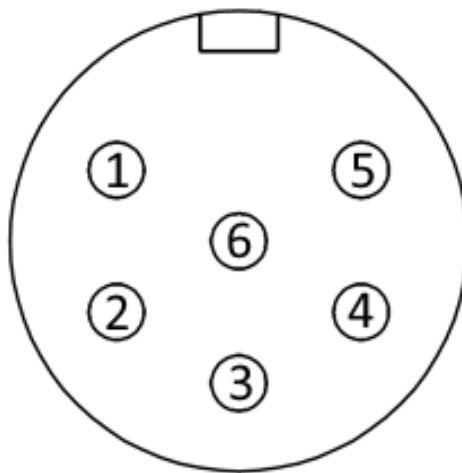
The last page of the Hermes screen will prompt the user to shut down the device. If this is not desired, the **NEXT** button will cycle back to the first page.

If the Hermes is to be shut off, the OFF option will be used. A second confirmation page will be displayed to ensure the choice to turn off is intentional, with **YES** being on the opposite button.



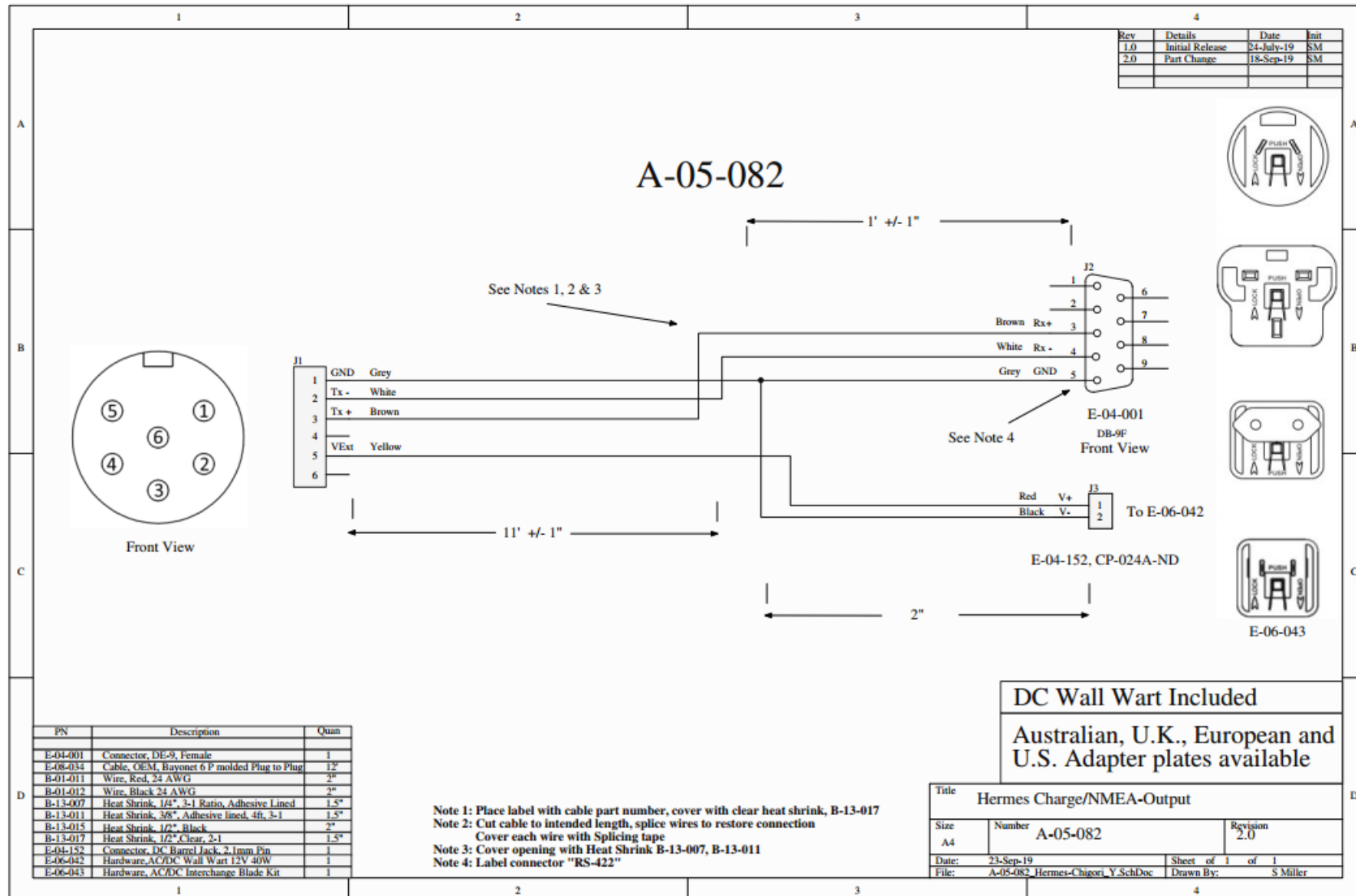
Pinout Diagram – Chogori NMEA/Charge Connector

Pin	Purpose
1	Ground (-)
2	Tx -
3	Tx +
4	No Connection
5	External Positive (Charge)
6	No Connection



Appendix A: Cable Drawings

A-05-082: Hermes Charge/NMEA



Appendix B: Specifications

Mechanical	
Connector	Chogori
IP Rating	IP-67
Power Supply	Internal Lithium Ion 18650 battery
GPS Hardware	Xeos Technologies 48 channel GPS (SiRFStarIV)
GPS Antenna	Integrated
Iridium Hardware	9603 Iridium modem
Iridium Antenna	Maxtena Helicore Iridium antenna
Dimensions (Length, Width, Height)	3.2" x 1.2" x 4.6"
Weight	270g
Operating Frequency	1616 – 1626.5 MHz
Operating Temperature	-20° C to 40° C
Electrical	
Supply Input	3.6V nominal, at max charge 4.2V
Battery Capacity	3Ah
Charging Current (12V)	200 - 250mA

The Hermes uses ChibiOS Real-Time Operating System (RTOS). For more information, visit www.chibios.org

Appendix C: Installing the RS-422 Driver

1. Navigate to the following link for the Virtual COM Port Drivers for the [FTDI Chip](#)
2. Choose the appropriate version of the driver for the operating system used
3. After installing, plug in the RS-422 cable
4. Enter the computer's device manager or equivalent and confirm the cable is registered as connected.

Warranty, Support and Limited Liability

Xeos Technologies Inc. warrants the Hermes to be free of defects in material or manufacturing for a period of one year following delivery. Liability is limited to repair or replacement of the defective part and will be done free of charge.

LIMITED WARRANTY: Xeos Technologies Inc. warrants that the product will perform substantially in accordance with the accompanying written materials for a period of one year from the date of receipt.

CUSTOMER REMEDIES: Xeos Technologies Inc. entire liability and your exclusive remedy shall be at Xeos Technologies Inc. option, either (a) return of the price paid or (b) repair or replacement of the product that does not meet Xeos Technologies Inc. Limited Warranty and that is returned to Xeos Technologies Inc. with a copy of your receipt. This Limited Warranty is void if failure of the product has resulted from accident, abuse, or misapplication. Any replacement product will be warranted for the remainder of the original warranty period or ninety (90) days, whichever is longer.

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NO LIABILITY FOR CONSEQUENTIAL DAMAGES: In no event shall Xeos Technologies Inc. or its suppliers be liable for any damages whatsoever (including, without limitation, damages for loss of equipment, for loss of business profits, business interruption, loss of business information, or other pecuniary loss) arising out of the use of or inability to use this Xeos Technologies Inc. product, even if Xeos Technologies Inc. has been advised of the possibility of such damages.