RAVEN

MARINE

Bluetooth Pilot Interface Operation Manual

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Change History

Revision	Date	Description
I	09/26/2012	Added beeper control commands
H	05/8/2012	Updated to new style and Raven Marine logo
G	12/02/2011	Added *Query Battery Capacity* message
F	11/23/2010	Updated to Raven Aerostar logo
E	06/29/2010	Corrected minor errors, added minor enhancements
D	06/30/2009	Added new messages and new sections
C	03/23/2009	Corrected date on title page, replaced contact info with reference to contact info
B	01/13/2009	Added PERF and SIGINTERVAL messages; updated BPI photo on p. 4
A	08/29/2008	First Release

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1 The Raven Bluetooth Pilot Interface (BPI)

The Raven Industries Bluetooth Pilot Interface (BPI) is a Bluetooth wireless device that translates data from an AIS Pilot Port Interface (PPI) plug found on a ship and transmits that AIS data to a computer via a Bluetooth or USB serial data link.

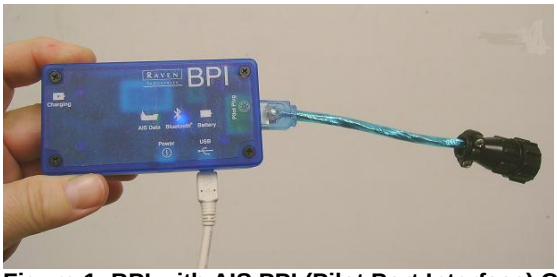

Figure 1: BPI with AIS PPI (Pilot Port Interface) Cable

The BPI has the following features:

- Rechargeable Battery allows for 20+ hours of operation on a single charge. Actual battery life depends on many factors, including temperature, range, and BPI age.
- LED indicators for
  - Wireless connection status – Blue LED
  - Power, including low power indication – Red LED
  - Pilot Plug data status – Green LED
  - Unit recharge status – Yellow LED
- On-Off Switch
- Wire Wizard – the BPI auto-corrects for wiring errors on the Pilot Plug.
- Auto Baud – the BPI detects PPI signals at 9600, 19200 and 38400 baud and converts them to a standard 38400 baud output.
- USB Connector provides backup communications path for AIS data.
- Supports Night Mode, which dims the LED status lights at night.
- BPI firmware can be updated in the field with supplied software.
- 7 Pin SATA Connector to connect BPI to Pilot Plug using Raven supplied cable.
- Class I Bluetooth Wireless Data Link with range up to 100 meters open air. See the notes under the Operation section for restrictions on Bluetooth transmit distance.
- Soft Shutdown after 60 minutes with no AIS data to conserve battery life
- Low Weight: 3.6 oz
- Small Size: Dimensions: 4” x 2” x 1

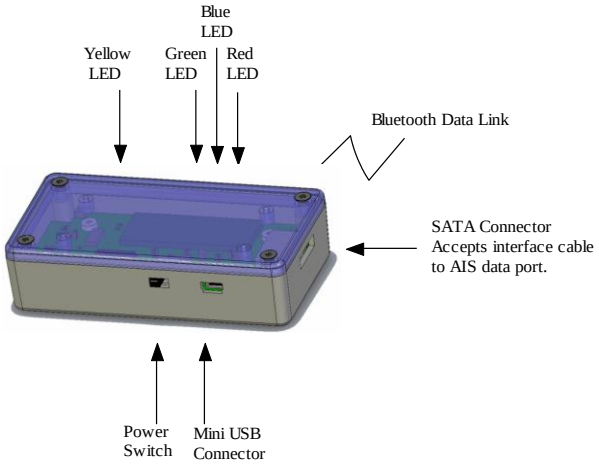

Figure 2: Overview of the BPI

1.1 BPI Cables and Adapters

The Raven BPI connects to the Ship's AIS Pilot Plug Interface (PPI) and provides AIS data to the laptop. The BPI kit contains the items pictured and listed below.

Figure 3: BPI Kit Components

- AC adapter for charging the BPI. You can plug the USB cable into a laptop or the AC adapter for charging.
- USB cable for charging the BPI and for hard-wire access to the AIS data. The USB cable can be plugged into the laptop or the AC adapter, shown above, to charge the battery.
- 0.5-foot PPI cable and a 5.5-foot PPI cable
    - The 0.5-foot cable has been replaced with a 2-foot cable in newer systems.
- Loopback adapter attached to the shorter PPI cable. The loopback adapter lets the pilot verify that the Raven equipment is working.

1.2 BPI LED Status Lights

The BPI has 4 Light Emitting Diodes (LEDs) to indicate battery charging, AIS Data activity, Bluetooth connectivity and battery level status.

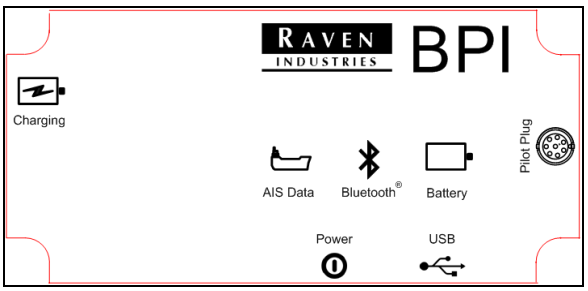

Figure 4: Top view of BPI

Yellow LED – Charging:
Solid ……. Battery is charging
Off ……. Battery is fully charged or external power via USB cable is not present

Green LED - AIS Data:
Solid ……. Receiving AIS data from properly wired Pilot Plug Interface
Off ……. BPI off or in standby
Flash Codes … 3 – receiving AIS data - Pilot Plug is incorrectly wired or has wrong baud rate
2 – BPI is in loopback mode
1 – BPI is searching for data on one of the various wire-pair combinations

NOTE

- *If no AIS data is received for 10 seconds the BPI begins scanning*
- *See BPI message, 'Query PPI State', to determine details of incorrect wiring or wrong baud rate*

Blue LED – Bluetooth:
Solid ……. Paired and connected
Off ……. BPI off or in standby
Flash Codes … 3 – Initializing
2 – Waiting for pairing with host device
1 – Paired, but not connected

NOTE

- *Users should wait for 2 blinks before attempting to pair to the BPI over the Bluetooth connection*
- *After cycling power on the BPI, the unit goes to 2 blinks, even if the device is paired. The attached computer automatically restores the connection from 2 blinks.*

Red LED – Battery:
Solid ……. Battery charge has greater than 5 hours charge remaining
Off ……. BPI is off or in standby
Flash Codes … 2 – Battery communications error
1 – Battery charge is low

2 Ship's AIS and the Raven BPI

As part of the Safety of Life at Sea (SOLAS) procedures, all commercial and passenger ships over a certain size or number of passengers are required to transmit their location and vessel information using a Coast Guard approved AIS (Automated Identification System) transponder. This information is received by all other vessels within radio distance by the ship's AIS receiver and converted into signals for local use.

Pilots can use this AIS information, in conjunction with special software, to show not only the location of the vessel they are on (known as the Local Vessel) but the location, size, course and speed of all remote SOLAS vessels.

The AIS signal is made available for ship pilots on a standardized 9 pin connector. The AIS standard defines all operating characteristics of the plug (known as a Pilot Plug Interface, or PPI) including size, location, voltage levels, pins and baud rates.

Many pilots have discovered, however, that often times the PPI has not been configured properly. Common installation errors include wrong baud rates, swapped transmit and send lines, and even missing wires. When this happens most off-the-shelf AIS and 422 signal converters do not work properly and pilots are left without critical AIS data.

The BPI solves wiring issues by scanning all possible combinations of wires and baud rates until it locates valid AIS messages. It then "locks" onto the AIS data stream and re-transmits the data over a standardized Bluetooth or USB serial data path.

Both the USB and Bluetooth ports appear as standard RS232 serial ports on the host machine. All BPI messages are handled on both the USB and Bluetooth ports. Raven recommends that the firmware should only be updated over the USB port, as is done by the Raven-supplied software utility, BpiTest.

3 USB Operation

You can get data from the BPI over the Bluetooth link or over the USB cable. Users must install drivers to use the USB port on the BPI. Drivers should either have been included with the BPI or are available from FTDI at http://www.ftdichip.com/Drivers/VCP.htm. Also, you can call Raven to find out how to get these drivers from the Raven FTP site.

To install the USB drivers:

1) Download the USB drivers, if necessary.
2) Power on the BPI and plug it into the host machine.
3) Windows should recognize that a new device has been found and prompt you for the driver location.
4) Follow the steps on the “Found New Hardware” wizard to install the drivers for the BPI.
5) Once the driver has been installed, unplug the BPI from the USB connector, wait a few seconds then plug the device back in.
6) Windows should now recognize the BPI as a “Raven BPI” and install the correct drivers. The BPI should be ready to use.

To determine which serial port the BPI is using under Windows XP:

1) Install the drivers using the method above.
2) Open the Windows Device Manager by selecting Start -> Control Panel -> Administrative Tools -> Computer Management.
3) Select Device Manager in the left hand tree view.
4) In the right hand view, select “Ports (COM & LPT)”.
5) Look for the port labeled “USB Serial Port”. The serial port is also listed in parenthesis. Example: “USB Serial Port (COM58)”.

4 Bluetooth Operation

To install the Bluetooth device, the user must install a Bluetooth adapter on the host machine (many laptops have a built-in Bluetooth radio). The device also requires Bluetooth manager software. Computers running Microsoft® Windows® XP and later normally have a default Bluetooth manager installed. Raven pre-installed systems do not use the default Windows XP Bluetooth Manager. Users of Raven systems should consult the Quick Start Guide for instructions on configuring the BPI to use the Bluetooth serial interface if their system has not already been pre-configured by Raven.

4.1 Bluetooth Performance: Class 1, 2, and 3

Bluetooth is a widely adopted wireless communication standard operating in the unregulated 2.4 gigahertz frequency range. This frequency range is used by many un-regulated wireless devices such as Wi-Fi, cordless phones, microwave ovens and portable radios, to name a few.

Bluetooth devices are categorized based on their maximum transmit power. In general, a device with higher transmit power will have a longer range. However, higher transmit power also consumes more power, thus decreasing battery life.

Class III devices have the lowest transmit power and thus the longest battery life. Class I devices have the highest transmit power and, thus, the lowest battery life. Class II devices have transmit power somewhere in the middle.

The BPI uses a Class I Bluetooth module with up to 4 milliwatts of transmit power. In order to maximize battery life, the BPI incorporates dynamic power management which automatically lowers transmit power to conserve battery life.

The BPI Bluetooth module is rated for greater than 100 meters of connection distance with no obstructions. However, the BPI's actual reliable transmit distance is impacted by nearby reflective surfaces, such as walls and by the presence of interference sources.

Note that for reliable operation both Bluetooth radios (BPI and remote host) must use a Class I Radio. Also note that the Bluetooth radios integrated in many laptops are Class II, which have a much shorter range than the BPI. If your laptop has a Class II Bluetooth radio, Raven recommends adding an after-market Class I Bluetooth adapter for best performance.

Below are the transmit power levels and approximate ranges of the 3 classes of Bluetooth transmitters.

Class	Power	Distance
Class 1	100 mW	100 meters
Class 2	2.5 mW	10 meters
Class 3	1.0 mW	1 meters

4.2 Bluetooth Connection

To configure a remote host to communicate with the BPI you must run a Bluetooth manager. Microsoft Windows XP and later version ship with a default Bluetooth manager. The following information is presented to help users understand the Bluetooth connection.

Users of Raven pre-installed systems can refer to the BPI Quick Start Guide for instructions on configuring the BPI for use over Bluetooth.

In general, setting up a Bluetooth connection is a 3-step process:

1) Power on the BPI and wait for the blue LED to enter a 2-blink mode, indicating it is ready for remote pairing.
2) Initiate a Bluetooth Device Scan on the remote device.
3) The result of the scan is a list of available Bluetooth devices. Select the BPI you wish to communicate with and configure the connection.

To ensure a secure Bluetooth connection, a remote host must discover certain information about the BPI. This process is known as “Pairing”. After the BPI has been paired with a remote host the user does not have to enter any additional information to use the BPI over the Bluetooth connection (expect perhaps for entering the pass code, see below). In addition, the Bluetooth manager assigns a serial port unique to the BPI – this serial port will always be used when communicating with that particular BPI even if power is cycled many times.

The BPI Bluetooth connection exists in one of 3 states:

State	Blue LED	Description
Not Paired	2 Blinks	The BPI is either not associated with a remote device or the BPI power has been cycled since the last connection. Any remote user can attach to the BPI and begin communicating.
Paired	1Blink	The BPI had been communicating with the remote host, but the serial connection is not currently open. Only the remote host that was communicating with the BPI can continue to do so.
Communicating	Solid	The BPI has established a data channel with a remote host.

For additional security, the Bluetooth manager may require you to enter a security code known as a pass code. The default pass code for the BPI is “12345”. The pass code can be configured using the BTKEY command as outlined in the section, 'Set BPI Bluetooth Security Key'.

The default Windows XP Bluetooth manager requires you to enter the pass code each time the connection is opened. This is not true of all Bluetooth managers, many of which remember the entered pass code and transparently restore the connection when the port is opened by the software.

After the Bluetooth connection has been setup, you can refer to the Bluetooth manager to determine which serial port the BPI is using on the remote host.

4.3 Bluetooth Name

The scan results, as returned by your Bluetooth manager, display both a MAC address and the name of the device.

The MAC address is a fixed number that uniquely identifies each Bluetooth device. The BPI has a label on the back of the unit showing the MAC address of your BPI. If the label falls off, you can also find the MAC address using a serial program and the DID message, or there is also an internal label on the Bluetooth antenna if you open the lid of the device.

The BPI also has what is known as a “Friendly” name that shows up on the Bluetooth scan. The default for the BPI is “Raven-BPI”. You can set this name using the NAME command (see messages section).

NOTE

Windows allows users to “re-name” Bluetooth devices after the scan. Windows remembers any name you put in the manager but does NOT inform the BPI of this change.

- *If you rename the BPI after the scan using the NAME command to the BPI, the name does not change in the Bluetooth manager.*
- *If you rename the BPI in the Bluetooth manager, this name is not stored on the BPI.*
- *Pilot Groups should contact Raven if they wish their default name to be changed.*

5 AIS Operation

To connect the BPI to the Pilot Plug:

1) Connect the AIS cable to the BPI unit. Use either the short or the long cable, depending on how far away the PPI is from the BPI.
2) Connect the AIS cable to the Pilot Plug.
3) Power on the BPI by sliding the On/Off switch away from the AIS connector.
4) The BPI automatically begins scanning for signals and lock onto the correct pins.

A full scan of the plug takes about 15 seconds.

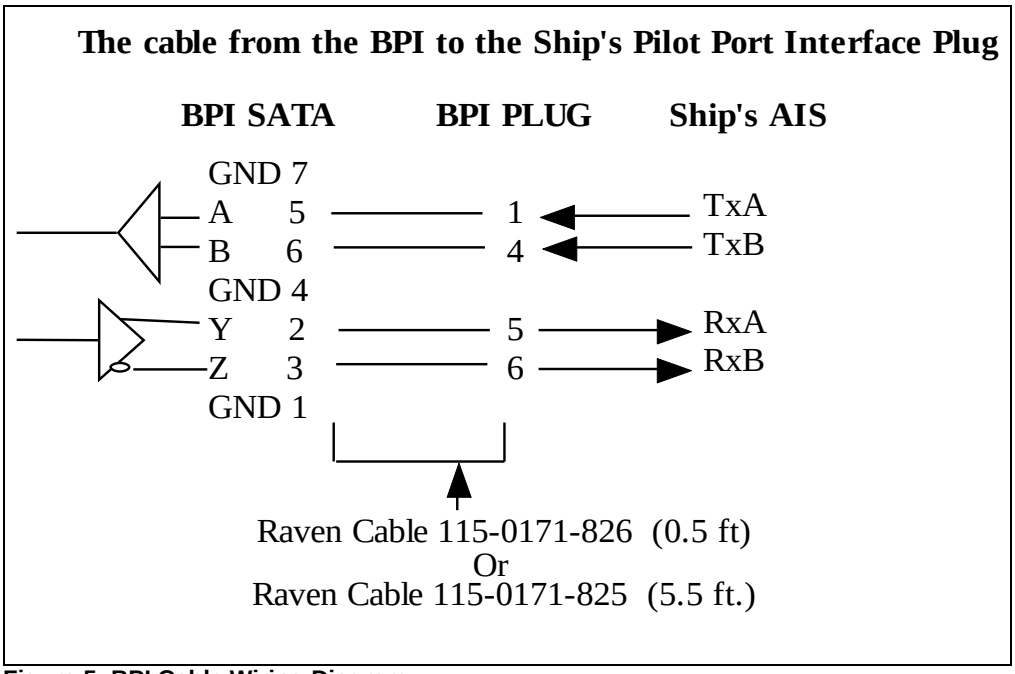

Figure 5: BPI Cable Wiring Diagram

6 Soft Shutdown

Occasionally a user may neglect to power off the BPI and the battery will go dead before the next use. To prevent this, the BPI incorporates a soft shutdown feature which turns off most internal hardware after a set period of time with no AIS data from the PPI.

When the BPI is in this state, no status lights are illuminated and the battery uses a very small amount of current.

To return to normal operation you must cycle the on/off switch.

The default time before shutdown is 60 minutes. This time can be changed with the STANDBY_MIN command message shown in the Command Messages section.

7 Low-Charge Shutdown

The BPI automatically shuts down when the charge declines to 2 or 3 percent. You must apply power to the BPI via the USB cable to get the BPI to turn back on. This behavior of the BPI prevents a deep discharge of the battery.

8 BPI Messages

BPI operation can be customized via a set of command messages. In addition to forwarding AIS data, the BPI also reports events of significance, such as scan state and battery status.

All commands are supported over any serial link - Bluetooth, USB, or AIS. Events are not reported on the AIS port.

8.1 Message Protocol

The messages use the Raven Starlink proprietary NMEA format and follow the NMEA sentence rules, including checksum, carriage return, and line feed ASCII control characters.

EXAMPLE: $PSLIQ,BPI,NAME *cc

In the example

- $PSLIQ represents a Starlink proprietary query message.
- BPI indicates the BPI device family.
- NAME indicates the type of query information desired.
- *cc indicates the checksum, per NMEA.
- For NMEA compliance, there is a carriage return, 0x0d, and line feed, 0x0a, after the checksum.

All configurable parameters are saved across power cycles in non-volatile EEPROM.

NOTE

The BPI rejects parameter changes silently if the battery is low and the BPI is not on the AC charger. This is to prevent corruption of the EEPROM that can occur if power is lost during an EEPROM write. When changing parameters Raven recommends users use the USB connection.

8.2 Command Messages and Related Query Messages

The BPI responds to each command with a response, as indicated below. Some command messages have corresponding Query messages and some do not.

Set BPI Name
Get or set the BPI friendly name to be displayed as the result of a Bluetooth scan.

See the note under "Bluetooth Names" for more information on Bluetooth names.

$PSLIS,BPI,NAME,friendlyName
$PSLIQ,BPI,NAME
$PSLIR,BPI,NAME,friendlyName

friendlyName	User-friendly device name for the BPI when making a Bluetooth connection from a PC. Default is "Raven-BPI"

Set BPI Bluetooth Security Key
Get or set the Bluetooth pass code.

The BPI will not set the Bluetooth security key until the power is cycled on the BPI.

$PSLIS,BPI,BTKEY,key
$PSLIQ,BPI,BTKEY
$PSLIR,BPI,BTKEY,key

key	5-digit Bluetooth security key. Default is 12345. Pass code is limited to 8 digits.

Set Event Messages On/Off
Turn event status messages on or off. See later section, Event Messages.

$PSLIS,BPI,EVENT,eventState
$PSLIQ,BPI,EVENT
$PSLIR,BPI,EVENT,eventState

eventState	ON to enable event messages. OFF to disable event messages. Default is ON.

Set Number of Minutes until Soft Shutdown

Get or set the amount of time without any AIS data before the BPI shuts down all internal hardware to conserve battery life.

See the “Soft Shutdown” section for more details on this feature.

$PSLIS,BPI,STANDBY_MIN,minutesUntilShutdown
$PSLIQ,BPI,STANDBY_MIN
$PSLIR,BPI,STANDBY_MIN, minutesUntilShutdown

minutesUntilShutdown	Number of minutes from the last received AIS message (or startup) before the BPI shuts itself off. A value of 0 disables this feature. Valid values are 10…300. Default is 60 minutes.

Reset Command

This command restarts the BPI system, but does not change any saved settings. There is no response message.

$PSLIS,BPI,RESET

Factory Default Command

This command restarts the BPI system with the factory default configuration values. Any previously changed configuration values will be lost. Issuing this command causes loss of the Bluetooth connection, if there is one. This command can be issued via the Bluetooth or USB link, but the USB link is preferable, since the USB link works regardless of the state of the Bluetooth link. After issuing this command via the USB link, you will have to close and reopen the USB device. There is no response message. You must cycle the power on the BPI after this command.

$PSLIS,BPI,SETFACTORYDEFAULT

Loopback Mode

The loopback command places the BPI into a known state for utilizing the loopback test adapter attached to the Raven PPI cable. In this mode, messages sent over the USB and Bluetooth ports are transmitted out the AIS plug and the loopback adapter routes these messages back into the BPI. The BPI turns off event-reporting while in loopback mode.

$PSLIS,BPI,LOOPBACK,state
$PSLIR,BPI,LOOPBACK,state

state	ON to force the BPI into LOOPBACK mode. OFF to return to normal scan operation. Default is OFF.

Force AIS Lock Mode

Force the BPI to lock onto the wire pairs and baud specified by the AIS standard.

Placing the BPI in this mode also disables the soft shutdown feature described earlier.

$PSLIS,BPI,FORCE_AIS,state
$PSLIR,BPI,FORCE_AIS,state

state	ON to force the BPI to lock onto the AIS wire pairs and Baud. OFF to return to normal scan operation. Default is OFF.

Night mode for Status LED Lights

The status LED lights can be too bright at night. To dim them, send the following command with state = ON. To return to Day mode, let state = OFF.

This command has no effect on the charging (yellow) LED.

$PSLIS,BPI,NIGHTMODE,state
$PSLIQ,BPI,NIGHTMODE
$PSLIR,BPI,NIGHTMODE,state

state	On to dim the blue, red and green LED indicators. OFF to return to day brightness. Default is OFF.

Adjust Individual LED Brightness

The values for the day and night mode brightness (see Night mode for status LED lights, above) can be controlled using the following individual LED commands.

$PSLIS,BPI, led,dayValue,nightValue

led	LED to set. One of: RED GREEN BLUE Yellow LED brightness cannot be set.
dayValue	PWM duty cycle for day Mode. Higher is brighter. Valid values are 10...254. Default is 220 for all LED status lights.
nightValue	PWM duty cycle for night Mode. Higher is brighter. Valid values are 10...254. Default is 20 for all LED status lights.

Beeper Control

The BPI has an audible beeper that, if enabled, will sound at the configured beep pattern and duration when the Bluetooth connection is broken.

You can enable or disable the beeper using the command below.

$PSLIS,BPI,BEEP_ENABLE,enable/disable

enable	1
disable	0

You can configure the audio pattern, duration, and pitch using the command below.

$PSLIS,BPI,BEEPER,pattern,duration,pitch

pattern	1 = on continuously 2 = half-second on, half-second off 3 = one short beep 4 = two short beeps 5 = three short beeps 6 = frequency change 1 7 = frequency change 2
duration	1 to 120 seconds
pitch	0 to 114, high-to-low (0 is high, 114 is low)

You can test the configured beeper with the command below.

$PSLIS,BPI,BEEPER_TEST

To stop the test, issue the following command.

$PSLIS,BPI,BEEPER

8.3 Event Messages

Event messages are sent unsolicited by the BPI. Event messages are on by default, but can be turned off by using the 'Set Event Messages On/Off' command described earlier in this document. Each of these messages has a corresponding query message as described later in the section, Stand-Alone Query Messages.

The following messages are events.

PPI State Response
The BPI sends this response automatically each 10 seconds. See the description of the PPI response message under section, Stand-Alone Query Messages -> Query PPI State.

Battery Parameters Response
The BPI sends this response automatically each 10 seconds. See the description the Battery response message under section, Stand-alone Query Messages -> Query Battery Parameters.

Performance Response
This event reports how efficiently the BPI is operating. The BPI sends this response automatically each 10 seconds.

$PSLIR,BPI,PERF,[timeFor1000Loops,[SignalStrenghInDbm],[BER],[422DeltaV]*cc

timeFor1000Loops	Time for the microprocessor to complete 1000 main loop iterations, in milliseconds.
SignalStrenghInDbm	Bluetooth transmit power, in dbm. This value will only be valid if signal monitoring is on and the Bluetooth serial port is open.
BER	Bluetooth radio Bit Error Rate, in PPM. This value will only be valid if signal monitoring is on and the Bluetooth serial port is open.
422DeltaV	RS422 signal strength, in millivolts (valid locked) Only valid while the AIS signal is locked. Because the signal measurement is not synchronized with incoming data, this measurement may be 0 even with a valid connection.

Wire Wizard Scan Results

The BPI analyzes each of the 6 wire pairs for one second during a scan. When the BPI completes a scan of the AIS port it reports the results.

$PSLIR,BPI,SCAN,signalOne,signalTwo,voltage,positiveSamples,negativeSamples,baudMask

signalOne	First signal wire. One of the BPI-defined input wires (TXA, TXB, etc.)
signalTwo	Second signal wire. One of the BPI-defined input wires (TXA, TXB, etc.)
voltage	Measured Peak-to-Peak voltage, in millivolts
positiveSamples	Number of measurements that had a positive voltage (signalTwo > signalOne).
negativeSamples	Number of measurements that had a negative voltage (signalTwo < signalOne). By comparing these two numbers you can get an idea of the numbers of marks (logical 1's) and spaces (logical 0's) on the data lines.
baudMask	A bitmask of possible baud rates for this pair. 0x01 – 9600 Baud found 0x02 – 19200 Baud found 0x04 – 38400 Baud found 0x08 – 9600 reversed Baud found 0x10 – 19200 reversed Baud found 0x20 – 38400 reversed Baud found .

8.4 Stand-Alone Query Messages

These messages do not have a corresponding command or 'Set' message and are query-only.

Query Battery Parameters

Query the state of the internal BPI battery. Reported battery results are based on an internal battery monitor. The internal battery monitor "learns" the battery under operation and can, especially when new, report inaccurate charge values.

This message is also sent as an event once every 10 seconds.

$PSLIQ,BPI,BATTERY*cc

$PSLIR,BPI,BATTERY,charge,voltage,averageCurrent,charging,minutesToEmpty,minutesToFull*cc

charge	Current estimated battery charge, as percentage from 0..100.
voltage	Battery output voltage, in Volts
averageCurrent	Average battery output current, in milliamps
charging	Battery reported Charging Status 1 = Charging 0 = Not Charging Note that this flag may not match the charging LED.
minutesToEmpty	Minutes to empty at current discharge rate. If the battery is charging, will report as 65535.
minutesToFull	Minutes to fully charge the battery at current charge rate. Reported as 65535 if the battery is not charging and the charge is less than 100%. If not charging and 100% charged, this value is 0.

Important
If any of the variable fields above are unknown or invalid, the value will be -1.

Query Battery Capacity

Query the state of the battery capacity in mA-hours. This command is useful in identifying batteries that have capacity issues not revealed by the percent charged value. The new capacity of the battery is 1200 mA-hours, but can degrade over time.

This message is also sent as an event once every 10 seconds.

$PSLIQ,BPI,BATCAPACITY*cc

$PSLIR,BPI,BATCAPACITY, remainingCapacity, fullCapacity, cycleCount*cc

remainingCapacity	remaining available capacity of the battery, in mA-hours
fullCapacity	estimated capacity of the battery if fully charged, in mA- hours
cycleCount	number of full charge/discharge cycles on the battery

Query Device ID

$PSLIQ,BPI,DID*cc

$PSLIR,BPI,DID,modelName,fwver,fwChecksum,hwver,nnnnnnnnnnn,btkey*cc

modelName	"Raven-BPI". The model name cannot be changed. The model name and the user-friendly name used in the set NAME message are initially the same, but the user-friendly name can be changed.
fwver	firmware version
fwChecksum	firmware checksum
hwver	hardware version
nnnnnnnnnnn	12-digit MAC address of Bluetooth module This value may be "?????" while the Bluetooth module is initializing.
btkey	Bluetooth security key

Query PPI State

Query the current status of the AIS connection.

This message is also sent as an event once every 10 seconds or during a scan whenever a line scan is completed.

$PSLIQ,BPI,PPI

$PSLIR,BPI,PPI,baud,rxa,rxb,state,lockState*cc

baud	Current Baud rate. One of 9600,19200,38400
rxa	Current Line attached to the RXA input of the BPI. See Signal Section for description of BPI lines.
rxb	Current Line attached to the RXB input of the BPI. See Signal Section for description of BPI lines.
state	Current search State. One of: Data Found Data Search
lockState	Current Lock State. One of: Wiring Error Wiring ??? Wiring Ok

Example: $PSLIR,BPI,PPI,38400,AIS TXB,AIS TXA,Data Found,Wiring Ok*38

See section, AIS Operation, for a wiring diagram of the BPI interface to the Ship's AIS plug.

8.5 Diagnostic Messages

These messages are designed for isolating faults with the BPI and are not intended for general use.

Reset Battery Monitor

This command clears all stored battery-monitor parameters. It is intended for use when the internal battery is replaced.

$PSLIS,BPI,RESET_BATTERY

Reset Bluetooth Module

This command resets the internal Bluetooth device to factory defaults. It is intended for use by Raven technical staff to help clear any Bluetooth connection issues.

$PSLIS,BPI, RESET_BT

Bluetooth AT Command Mode

When in the AT Command mode, messages from the USB port are forwarded to the Bluetooth device and messages from the Bluetooth device are forwarded to the USB port. It is intended for debugging of the Bluetooth device.

$PSLIS,BPI,ATCOMMAND,state
$PSLIR,BPI,ATCOMMAND,state

state	ON to turn on ATCOMMAND mode Off to turn mode off.

Begin a New Data Scan

$PSLIS,BPI,BEGIN_SCAN

Force the BPI to begin an AIS data scan, regardless of lock status.

This event is used by Raven internally for diagnostic purposes related to searching for valid AIS data on the PPI port.

By default, the BPI automatically searches for data by trying different wire-pair combinations and baud rates. Baud rates are: 9600, 19200, and 38400.

Signal Interval

The BPI can dynamically measure the Bluetooth signal strength and Bit Error Rate (BER). However, to perform the necessary measurement, the Bluetooth data stream must be paused for an extended period which results in dropped messages.

Raven does not recommend measuring signal strength during normal operation.

$PSLIS,BPI,SIGINTERVAL,[secondsBetweenMeasurement]*cc
$PSLIQ,BPI,SIGINTERVAL
$PSLIR,BPI,SIGINTERVAL,[measInterval]

measInterval	Interval between signal strength and BER measurements, in seconds. 0 means this feature is off. The default is 0.