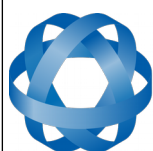


**ADVANCED  
NAVIGATION**

# ILU Reference Manual





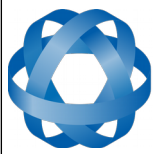
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## 1 Revision History

Version	Date	Changes
1.2	14/12/2016	Updated firmware changelog, section 2 Updated IP address for WiFi access, section 5.2 Updated IP address for Ethernet port 2 access, section 5.4
1.1	08/06/2016	Corrected error in part numbers description, section 6
1.0	17/09/2015	Initial Release

*Table 1: Revision history*



## 2 Firmware Changelog

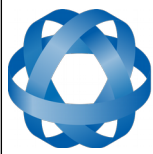
Version	Date	Changes
1.81	14/12/2016	IP subnets updated to less commonly used subnets Log file size split Altitude changed to 3 decimal places in NMEA strings Bug fix for memory leak on NTRIP failed connections Improvements to NTP and PTP timing Bug fix for raw sensors display not updating when overrange occurs Added option to disable WiFi Internal bugfixes and stability improvements
1.0	17/09/2015	Initial Release
0.5	11/05/2015	Beta Release

Table 2: Firmware changelog

### 3 Hardware Changelog

Version	Date	Changes
1.0	24/02/2015	Initial Release

*Table 3: Hardware changelog*

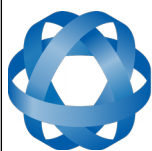


## **4 Introduction**

The ILU (Interface and Logging Unit) is a device server that interfaces to any of Advanced Navigation's systems and provides data logging, a web interface, a time synchronisation server and a wide variety of different industry standard data input/output options.

The ILU has no accompanying software and is fully managed through its web user interface available over WiFi and the ethernet ports.

If you have any questions please contact [support@advancednavigation.com.au](mailto:support@advancednavigation.com.au).



## 5 Quick Start Guide

Connect to the ILU web interface through the WiFi, Ethernet port 1 or Ethernet port 2 using the instructions below.

### 5.1 Default username and password

The web interface is protected by a username and password. The factory default username and password is listed below.

Username	Password
admin	password

Table 4: Default username and password

### 5.2 WiFi Access Point

The factory default WiFi SSID and password are listed below.

Access Point SSID	Access Point Password
an-ilu	password

Table 5: WiFi access point default settings

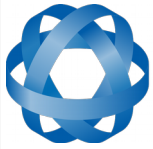
To connect to the WiFi access point follow the steps below.

1. Power on the ILU and wait 30 seconds for it to boot.
2. Connect to the ILU WiFi access point using the SSID and password listed above in Table 5.
3. Open a web browser and type in the address <http://10.146.102.1>
4. When prompted enter the default username and password listed in section 5.1.

### 5.3 Ethernet Port 1

By default Ethernet port 1 runs a DHCP client which means this port is intended to be connected to a router. To connect over Ethernet port 1 follow the steps below.

1. Connect ILU Ethernet port 1 to your router with a standard Ethernet cable.
2. Power on the ILU.
3. Install zeroconf (Apple Bonjour) from one of the links below.  
<https://www.advancednavigation.com.au/Bonjour.msi> (32-bit installer)  
<https://www.advancednavigation.com.au/Bonjour64.msi> (64-bit installer)
4. Open a web browser and type in the address <http://an-ilu.local>
5. When prompted enter the default username and password listed in section 5.1.



## 5.4 Ethernet Port 2

By default Ethernet port 2 runs a DHCP server which means this port is intended to be connected directly to your computer. To connect over Ethernet port 2 follow the steps below.

1. Connect ILU Ethernet port 2 directly to your computer with a standard Ethernet cable. A crossover cable is not required as the port has automatic crossover.
2. Power on the ILU.
3. Open a web browser and type in the address <http://10.146.101.1>
4. When prompted enter the default username and password listed in section 5.1.



## 6 Part Numbers and Ordering Options

### 6.1 Standalone Unit

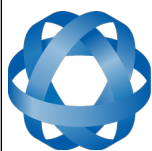
Part Number	Description	Notes
ILU	Interface and Logging Unit	Interface and Logging Unit No cables included. Requires either ILU-ACDC-PWR or ILU-CAR-12V power cable. Requires additional cable to interface to other systems.

Table 6: Standalone unit part numbers

### 6.2 Accessories

Part Number	Description	Notes
ILU-CBL-ODU	ILU cable for Spatial, Spatial Dual or Orientus	2 metre ILU to ODU cable for Spatial, Spatial Dual or Orientus. Supplies power. See section 7.7.
ILU-CBL-FOG	ILU cable for Spatial FOG or Spatial FOG Dual	2 metre ILU to Glenair cable for Spatial FOG or Spatial FOG Dual. Supplies power. See section 7.8.
ILU-CAR-12V	12V car cigarette lighter power supply for ILU	3 metre car cigarette lighter to ILU power connector cable.
ILU-ACDC-PWR	100-240V AC power supply for ILU	100 - 240V AC IEC power supply for ILU. 1.2 metre cable length. Included with standalone unit.
S40B0C-P02MJG0-50GS	ILU power connector unterminated	Unterminated ILU power connector. Solder bucket terminals suit 20 to 26AWG wire. Gland fits 5mm diameter round cable.

Table 7: Accessories part numbers



## 7 Specifications

### 7.1 Mechanical Drawings

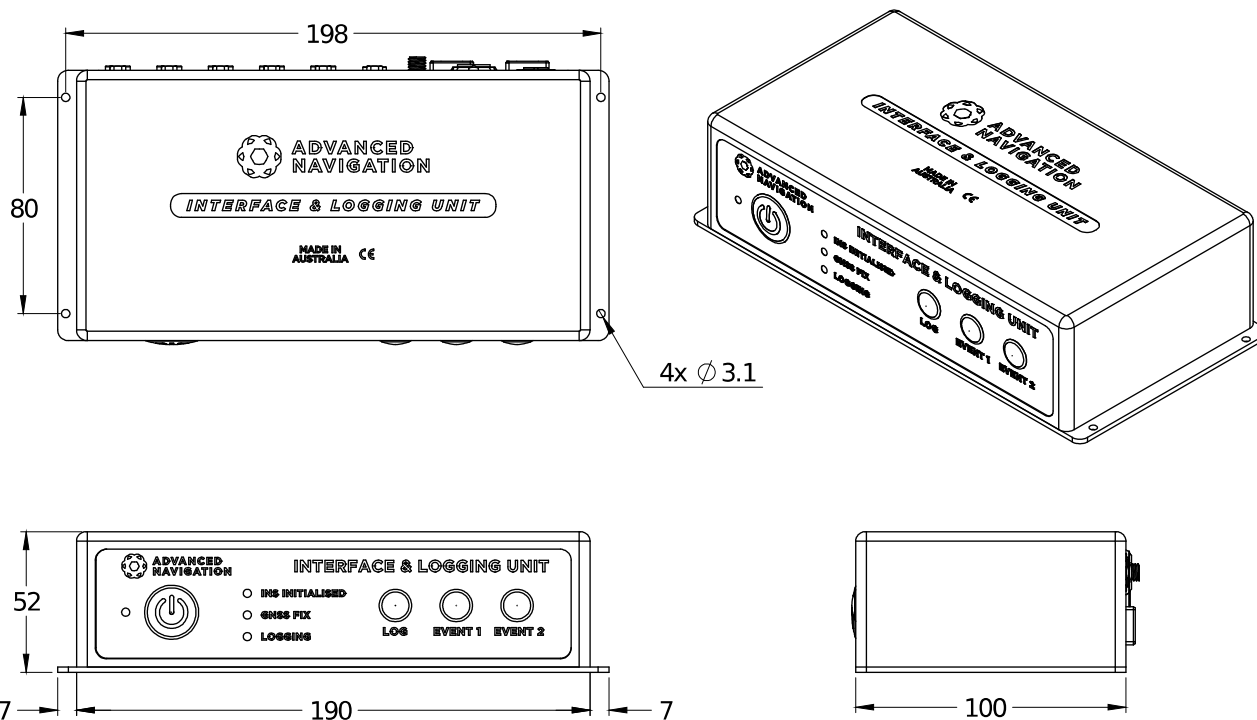


Illustration 1: Mechanical drawings of interface and logging unit

## 7.2 Interfaces Specifications

Parameter	Value
RS232/RS422 Ports	6
Baud Rates	1200 to 1M baud
Ethernet Ports	2
Ethernet Features	Gigabit Hardware PTP
CAN Ports	1
GPIO Pins	8
Encoder Inputs	2 Differential Quadrature 2 Standard Quadrature 4 Frequency
WiFi	802.11b 802.11g 802.11n

Table 8: Interfaces specifications

## 7.3 Protocols Specifications

Parameter	Value
Supported Protocols	NMEA 0183 NMEA 2000 TSS Simrad Novatel Trimble Hemisphere Topcon Ashtech IxSea Applanix Raw Binary (logging) Raw ASCII (logging)
Supported Output Data Rates	Up to 1000 Hz
Logging Capacity	64GB (128GB option)
Simultaneous Logging	16 sources
Corrections	NTRIP Client

Table 9: Protocols specifications

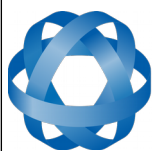
## 7.4 Hardware Specifications

Parameter	Value
Operating Voltage	9 to 36 V
Input Protection	-40 to 100 V
Power Consumption	3.5 Watts
Operating Temperature	-40 to 85 °C
Environmental Protection	IP68 MIL-STD-810G
Shock Limit	40 g
Dimensions	204x100x52 mm
Weight	550 g

Table 10: Hardware specifications

## 7.5 Electrical Specifications

Parameter	Minimum	Typical	Maximum
<b>Power Supply</b>			
Input Supply Voltage	9 V		36 V
Input Protection Range	-40 V		100 V
<b>RS232</b>			
Tx Voltage Low		-5.4 V	-5 V
Tx Voltage High	5 V	5.4 V	
Tx Short Circuit Current			±60 mA
Rx Threshold Low	0.6 V	1.2 V	
Rx Threshold High		1.5 V	2.0 V
<b>RS422</b>			
Tx Differential Output	1.5 V		
Tx Short Circuit Current			±250 mA
Rx Differential Threshold	-0.2 V		-0.05 V
<b>GPIO</b>			
Output Voltage Low	0 V		0.3 V
Output Voltage High	4.8 V		5 V
Output Current			5 mA
Input Voltage	-20 V		20 V
Input Threshold Low			1.5 V
Input Threshold High	3.5 V		



Parameter	Minimum	Typical	Maximum
<b>1PPS Output</b>			
Output Voltage Low	0 V		0.1 V
Output Voltage High	2.4 V		3.3 V
Output Current			50 mA
<b>Encoder Inputs</b>			
Input Voltage Range	-25 V		25 V
Input Threshold Low (Single Ended Input)			2.3 V
Input Threshold High (Single Ended Input)	2.7 V		
Input Threshold (Differential Input)	-0.2 V		0.2 V
<b>CAN</b>			
Input Voltage Range	-60 V		60 V
Differential Output Voltage (Dominant)	1.5 V	2.2 V	3.0 V
Differential Output Voltage (Recessive)	-0.5 V	0 V	0.05 V
Differential Input Voltage Threshold	0.5 V		0.9 V

Table 11: Electrical specifications

## 7.6 Connectors Pin-out

The ILU contains 11 different connectors on the back panel, please see Illustration 2. The pin-out for these connectors is detailed below. Advanced Navigation stocks pre-terminated cables for the power and INS connectors. The other 9 connectors are industry standard with connectors and cables widely available.

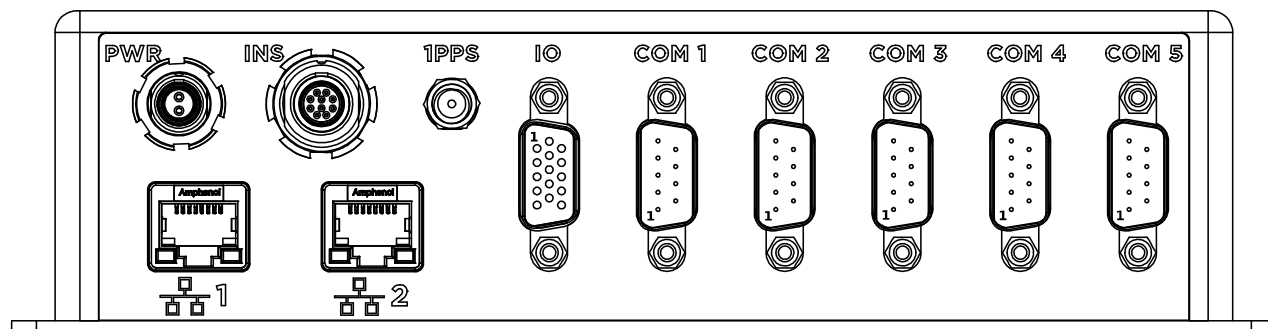
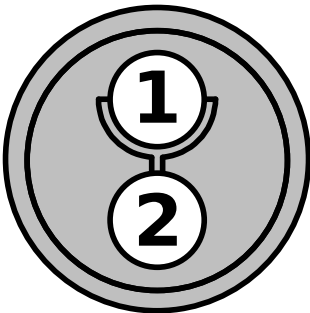


Illustration 2: ILU back panel connectors

### 7.6.1 Power Connector

The power connector is labelled “PWR” in Illustration 2. The socket is an ODU G80B0C-P02LJG0-0000 and the mating connector is an ODU S40B0C-P02MJG0-50GS. Advanced Navigation stocks a 100-240V power supply with this connector, a car cigarette lighter power supply with this connector and the unterminated connector. Please see section

6.2 for ordering details. The pin-out is listed below.



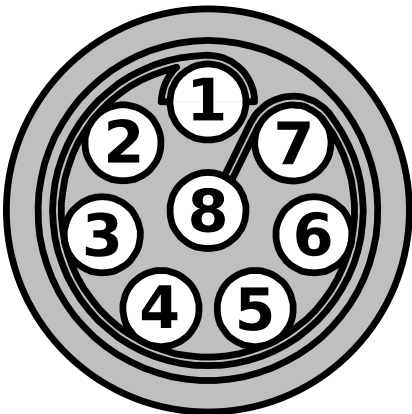
*Illustration 3: Power connector socket pins*

Pin	Function
1	Ground
2	Power Supply

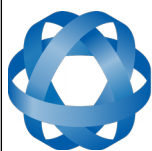
*Table 12: Power connector pin allocation table*

### 7.6.2 INS Connector

The INS connector is intended to be connected to an Advanced Navigation Spatial, Spatial Dual, Spatial FOG or Spatial FOG Dual. It carries RS232 or RS422 communication, 1PPS for synchronisation (over GPIO 1) and also power for the unit connected. The socket is an ODU G81B0C-P08LFG0-0000 and the mating connector is an ODU S41B0C-P08MFG0-50GS. Advanced Navigation stocks two different pre-terminated cable variants. One cable is for connection to Spatial, Spatial Dual or Orientus, see section 7.7. The second cable is for connection to Spatial FOG or Spatial FOG Dual, see section 7.8. Please see section 6.2 for ordering details. The connector pin-out is listed below. The selection of RS232 or RS422 is software configurable.



*Illustration 4: INS connector socket pins*



Pin	Function
1	Signal Ground
2	RS422 Rx(-)
3	RS422 Tx(-)
4	RS232 Rx / RS422 Rx(+)
5	RS232 Tx / RS422 Tx(+)
6	1PPS Input
7	Power Supply
8	Power Ground

Table 13: INS connector pin allocation table

### 7.6.3 IO Connector

The IO connector contains the GPIO, CAN and encoder signals. The socket is a standard female D Sub HD 15 connector and the mating connector is a standard male D Sub HD 15 connector. The connector pin-out is listed below.

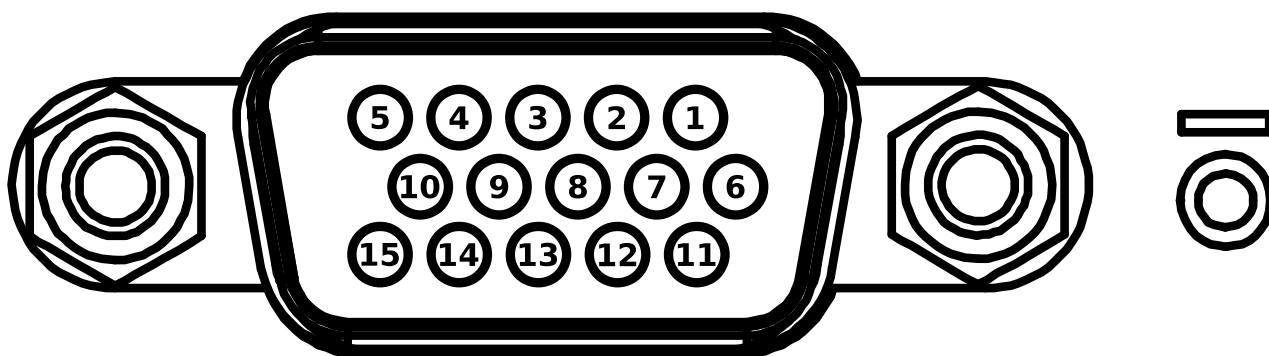
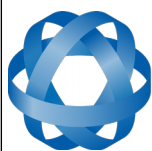


Illustration 5: IO connector socket pins

Pin	Function
1	Encoder 1 (Phase A) (+)
2	Encoder 2 (Phase A) (+)
3	Encoder 1 (Phase B) (+)
4	Encoder 2 (Phase B) (+)
5	5 Volt Output, see section 7.6.3.2
6	Encoder 1 (Phase A) (-), see section 7.6.3.1
7	Encoder 2 (Phase A) (-), see section 7.6.3.1
8	Encoder 1 (Phase B) (-), see section 7.6.3.1
9	Encoder 2 (Phase B) (-), see section 7.6.3.1
10	Ground



Pin	Function
11	GPIO 1
12	GPIO 2
13	CAN Hi
14	CAN Lo
15	Ground

Table 14: IO connector pin allocation table

#### 7.6.3.1 Differential or Single Ended Encoders

Please note that the encoder inputs can be used as either differential or single ended (non-differential). When using the pins as single ended the signal should be connected to the (+) pins and the (-) pins should be left disconnected.

#### 7.6.3.2 5 Volt Output

The 5 volt output is intended for powering encoders and other auxiliary equipment. It is protected by a 400mA current limit.

#### 7.6.4 COM Connectors

Each COM connector carries a standard RS232 or RS422 serial port. Each port can be software configured to operate in RS232 mode or RS422 mode. The RS232 connector is industry standard and compatible with third party equipment. The sockets are a standard male D Sub 9 connector and the mating connector is a standard female D Sub 9 connector. The connector pin-out is listed below.

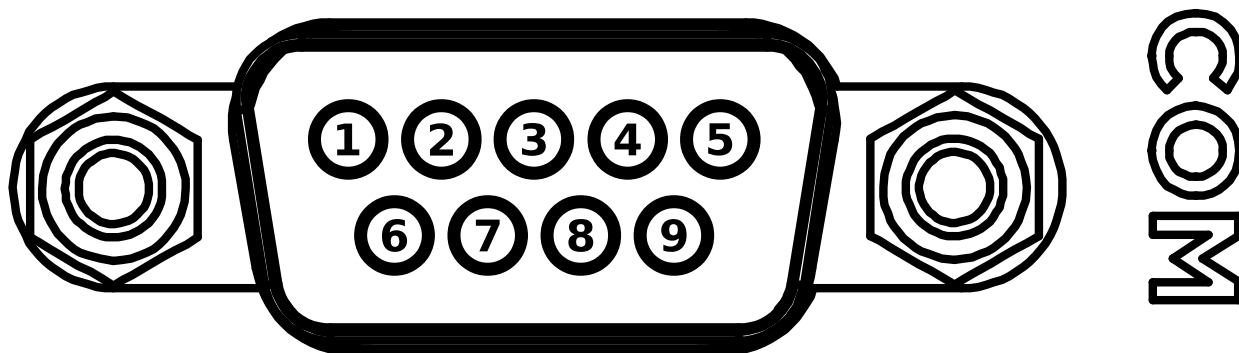
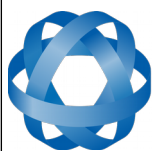


Illustration 6: COM connectors socket pins

Pin	Function
1	Not Connected
2	RS232 Rx / RS422 Rx (+)
3	RS232 Tx / RS422 Tx (+)





Pin	Function
4	Not Connected
5	Ground
6	Not Connected
7	RS422 Tx (-)
8	RS422 Rx (-)
9	Not Connected

Table 15: COM connectors pin allocation table

#### 7.6.4.1 RS422 Mode

When operating the port in RS422 mode please be aware that unlike RS232 there is no industry standard pin allocation for RS422 and there is variation across different manufacturers RS422 pin allocation so adaptors may be required when connecting to some third party RS422 equipment.

## 7.7 ILU to ODU Cable

The ILU to ODU cable is required to connect a Spatial, Spatial Dual or Orientus device to the ILU. Please see section 6.2 for ordering information.

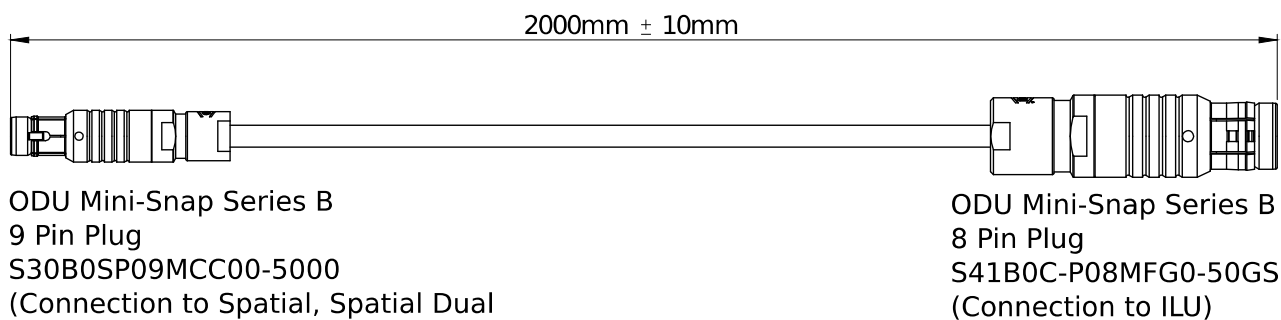
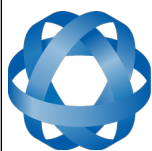


Illustration 7: ILU to ODU cable



ODU 9 Pin	Colour	Function	ODU 8 Pin
1	Black	Signal Ground	1
2	Brown	Power Supply	7
3	White	ILU 1PPS Input (GPIO 1)	6
4	Green	GPIO2	
5	Red	RS232 Tx / RS422 Tx (+)	5
6	Orange	RS232 Rx / RS422 Rx (+)	4
7	Yellow	RS422 Tx (-)	3
8	Blue	RS422 Rx (-)	2
9	Pink	Power Ground	8

Table 16: ILU to ODU cable pin allocation table

## 7.8 ILU to Glenair Cable

The ILU to Glenair cable is required to connect a Spatial FOG or Spatial FOG Dual device to the ILU. Please see section 6.2 for ordering information.

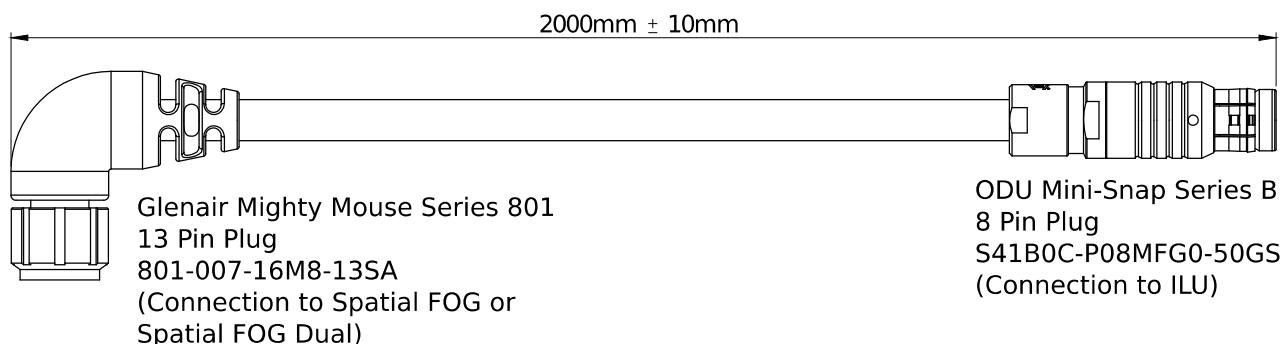
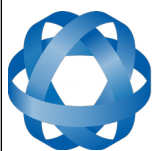
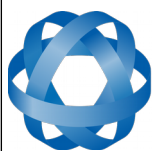


Illustration 8: ILU to Glenair cable



Glenair Pin	Colour	Function	ODU 8 Pin
1	Black	ILU 1PPS Input (GPIO 1)	6
2	Brown	GPIO 2	
3	Red	Signal Ground	1
4	Orange	Power Ground	8
5	Yellow	Power Supply	7
6	Green	RS232 Rx / RS422 Rx (+)	4
7	Blue	RS422 Rx (-)	2
8	Violet	RS232 Tx / RS422 Tx (+)	5
9	Grey	RS422 Tx (-)	3
10	White	Auxiliary RS232 Tx	
11	White/Black	Auxiliary RS232 Rx	
12	White/Brown	GNSS RS232 Rx	
13	White/Red	GNSS RS232 Tx	

Table 17: ILU to Glenair cable pin allocation table



## **8 Operation**

### **8.1 Power On**

The ILU powers on as soon as power is connected to it. To power it off hold the power button on the front panel for 4 seconds or disconnect the power lead.

### **8.2 Connection**

Connection to the ILU web interface can be made over WiFi, Ethernet port 1 or Ethernet port 2. Please follow the instructions of the quick start guide in section 5 to establish a connection with the ILU and access the web interface.

### **8.3 Web Interface**

The ILU user interface is accessed through a web browser. Upon logging into the ILU you will see the home page shown below in Illustration 9.

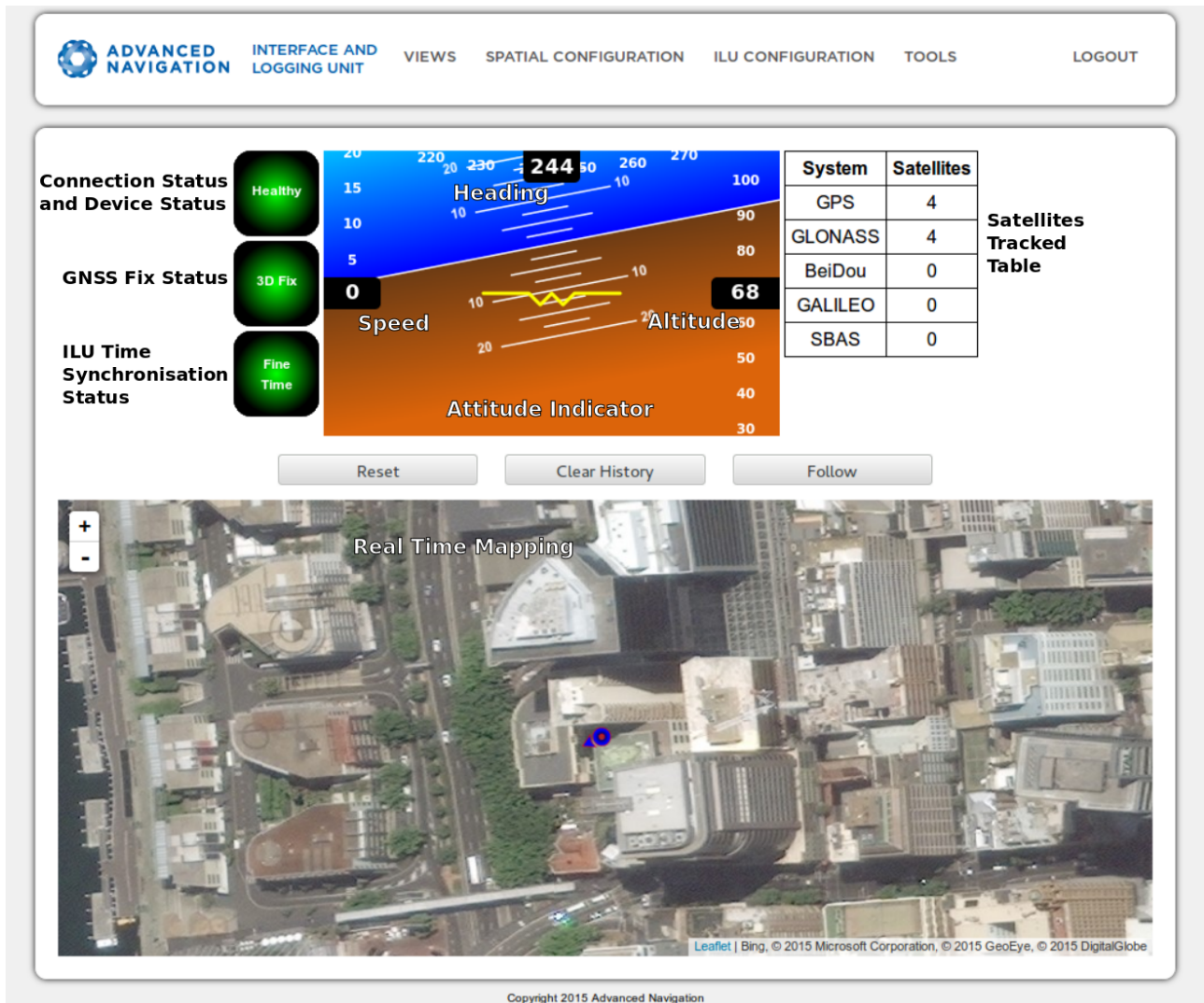
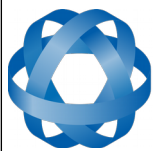


Illustration 9: Screenshot of ILU home page with features labelled

### 8.3.1 Status Indicators

The three status indicators provide the full status of the system and the device connected to it.

#### 8.3.1.1 Time Synchronisation Indicator

Every time the ILU powers off its time becomes invalid. On power up the system will acquire time either through the network (NTP or PTP), the navigation device it is connected to or a peripheral device (i.e. NMEA). There are three levels of time synchronisation on the ILU.

Time Status	Time Accuracy	Requirement
Time Invalid	Invalid	
Coarse Time	< 250 ms Not disciplined	INS GNSS Fix or Network Time Protocol or NMEA
Fine Time	< 100 ns Disciplined	INS 1PPS Input or Precision Time Protocol

Table 18: Time accuracy levels

With a Spatial, Spatial Dual, Spatial FOG or Spatial FOG Dual connected the time will automatically be initialised to fine time about a minute after the system has a GNSS fix.

### 8.3.2 Menus

The web interface and menus dynamically reconfigure based upon the device connected to the INS port. The menus shown below are based on a connection to a Spatial device.

#### 8.3.2.1 Views Menu

The views menu provides a number of different graphical data displays for viewing data from the connected Advanced Navigation device.

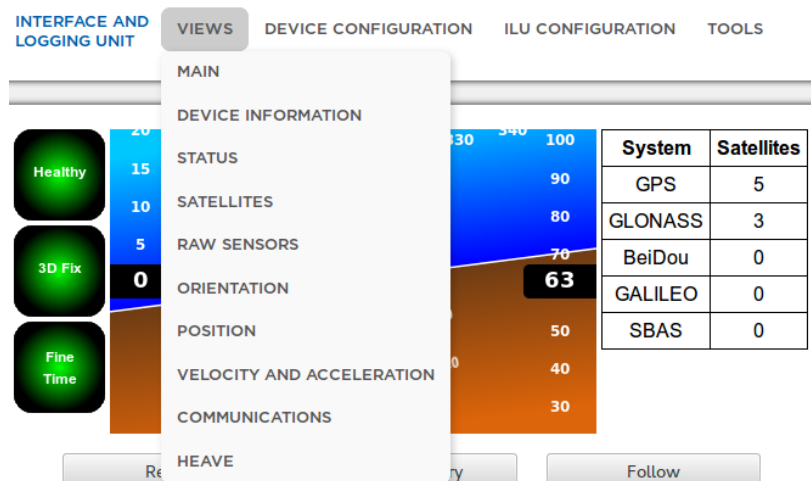


Illustration 10: Screenshot of views menu

#### 8.3.2.2 Device Configuration Menu

The device configuration menu provides several dialogues for configuration of the connected Advanced Navigation device.

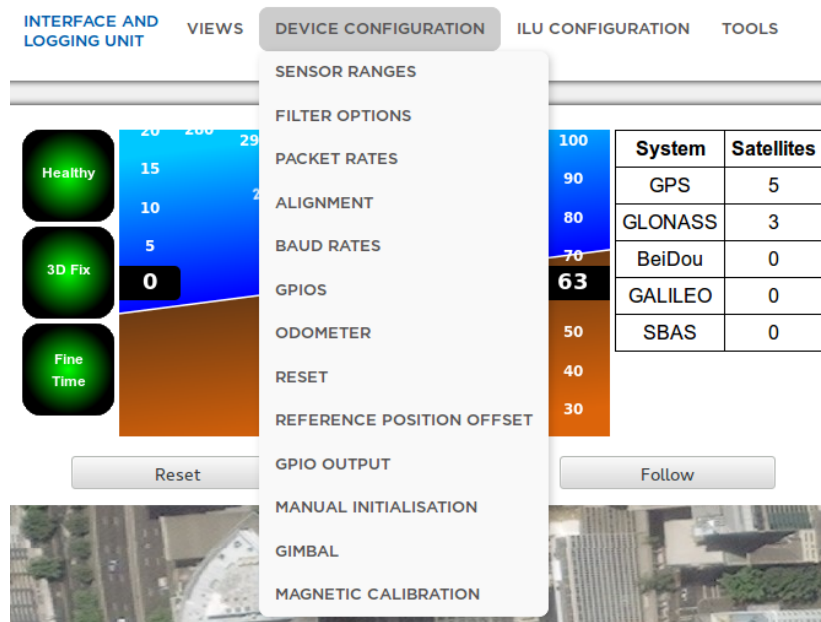
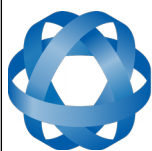


Illustration 11: Screenshot of device configuration menu

### 8.3.2.3 ILU Configuration Menu

The ILU configuration menu contains all the different dialogues for configuration of the ILU itself.

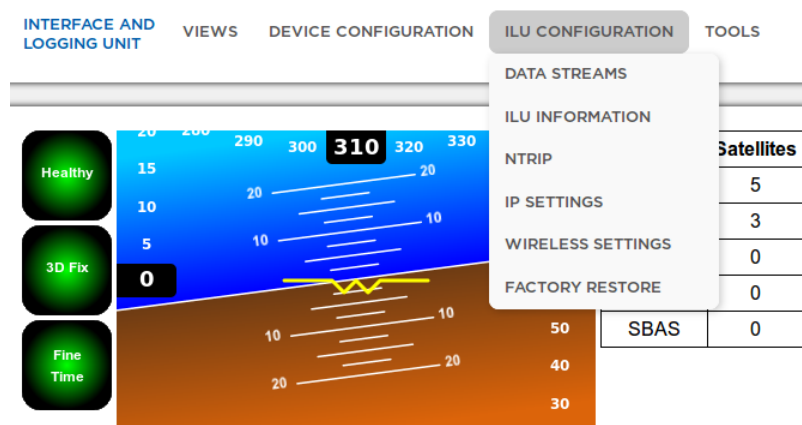


Illustration 12: Screenshot of ILU configuration menu

### 8.3.2.4 Tools Menu

The tools menu provides dialogues for updating the connected device firmware, the ILU firmware and a file manager page for log files.

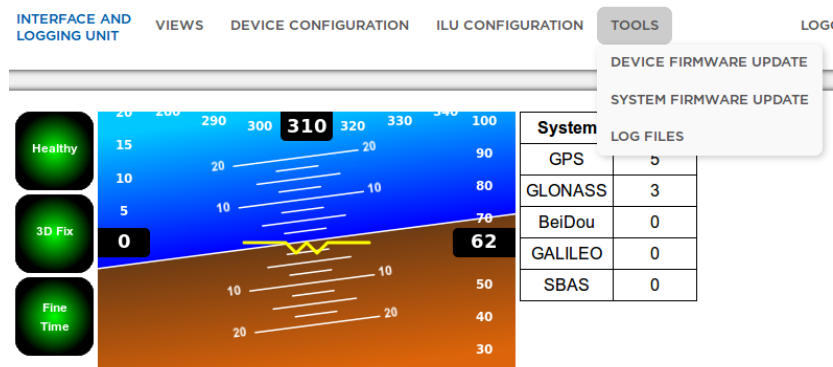
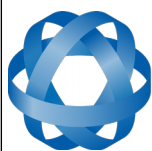


Illustration 13: Screenshot of ILU tools menu

## 8.4 Data Input/Output Configuration Example

1. Under the ILU Configuration menu, open the Data Streams page.

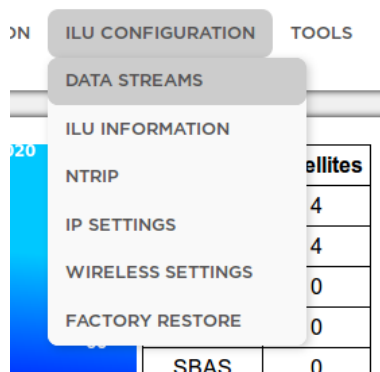


Illustration 14: Data streams in menu

2. The data streams page provides the ability to configure all of the input and output devices of the ILU.





## Data Streams

Port	Output Function	Input Function	Logging
<a href="#">INS</a>	ANPP	ANPP	Enabled
<a href="#">COM1</a>	Inactive	Inactive	Disabled
<a href="#">COM2</a>	Inactive	Inactive	Disabled
<a href="#">COM3</a>	Inactive	Inactive	Disabled
<a href="#">COM4</a>	Inactive	Inactive	Disabled
<a href="#">COM5</a>	Inactive	Inactive	Disabled
<a href="#">TCP 16718</a>	ANPP	ANPP	Disabled
<a href="#">TCP 1095</a>	Inactive	Inactive	Enabled

[Add](#)

*Illustration 15: Data streams page*

- Click on the applicable port. In this example we will select the COM1 serial port. You will be presented with the page shown below.

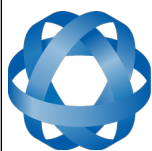
## Port Configuration

Port: [COM1](#) Output Function: [Inactive](#) Input Function: [Inactive](#)  
Baud Rate: [115200](#) Logging: [Disabled](#) Serial Mode: [RS232](#)

[Save](#)

*Illustration 16: COM1 port configuration page*

- In this example we will configure the port output for NMEA timing (GPZDA) and navigation data (GPRMC). Select NMEA as the output function and the NMEA output options appear.



### Port Configuration

Port:  Output Function:  Input Function:   
 Baud Rate:  Logging:  Serial Mode:

### NMEA Output Options

Message	Rate (Hz)	Message	Rate (Hz)
GPGBA	<input type="text" value="Disabled"/>	GPGLL	<input type="text" value="Disabled"/>
GPBNS	<input type="text" value="Disabled"/>	GPBGA	<input type="text" value="Disabled"/>
GPBVS	<input type="text" value="Disabled"/>	GPBHG	<input type="text" value="Disabled"/>
<input type="text" value="GPBHM"/>	<input type="text" value="Disabled"/>	<input type="text" value="GPBHT"/>	<input type="text" value="Disabled"/>
GPBEV	<input type="text" value="Disabled"/>	GPBMC	<input type="text" value="10"/>
GPBRT	<input type="text" value="Disabled"/>	GPBVG	<input type="text" value="Disabled"/>
GPBZA	<input type="text" value="1"/>	PASHR	<input type="text" value="Disabled"/>

Note: Changing NMEA output rates can change packet periods.

*Illustration 17: Port configuration page with NMEA output options displayed*

- We want timing at 1Hz and navigation at 10Hz so we set GPZDA to 1 and GPRMC to 10. Click save and the configuration is complete and active immediately.

## 8.5 Logging Data

The ILU can log data from many different sources simultaneously. By default the ILU is set to automatically log data from the INS system connected to it. Logging starts automatically at power on if it is enabled.

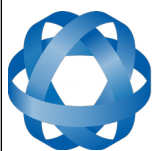
### 8.5.1 File Naming

When the ILU has valid time from a network or the connected INS device the log file name will consist of the date and time the log file was started. For example the log file COM1\_15-09-12\_15-24-02.anpp would have been started at 3:24:02pm on the 12<sup>th</sup> September 2015.

When the ILU has invalid time the log file names will consist of a number. i.e. COM1\_0001.bin. If the ILU initialises its time while it is recording a log file it will rename the log file to the correct date time at which it was started.

### 8.5.2 Logging Control

The logging indicator on the front of the unit indicates whether the unit is currently logging data. The log button on the front of the unit can be used to start and stop logging at any time, please see Illustration 18. When the button is pressed to stop



logging the current log files will be closed and logging will cease. When the button is pressed again new log files will be started. There is no upper limit on a single log file size. The only limit is that logging will stop when the system runs out of space.



Illustration 18: Logging button on the front panel of the ILU

### 8.5.3 Logging Configuration

1. Under the ILU Configuration menu, open the Data Streams page.

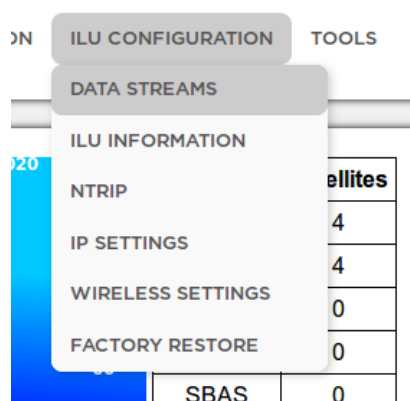
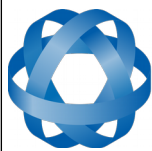


Illustration 19: Data streams in menu

2. The data streams page shows a list of all the ports and the far right column indicates whether logging is enabled on each port. Click on the port you would like to enable logging on.



## Data Streams

Port	Output Function	Input Function	Logging
<a href="#">INS</a>	ANPP	ANPP	Enabled
<a href="#">COM1</a>	Inactive	Inactive	Disabled
<a href="#">COM2</a>	Inactive	Inactive	Disabled
<a href="#">COM3</a>	Inactive	Inactive	Disabled
<a href="#">COM4</a>	Inactive	Inactive	Disabled
<a href="#">COM5</a>	Inactive	Inactive	Disabled
<a href="#">TCP 16718</a>	ANPP	ANPP	Disabled
<a href="#">TCP 1095</a>	Inactive	Inactive	Enabled

*Illustration 20: Data streams page*

3. Set logging to enabled and click save.

## Port Configuration

Port:	<input type="text" value="COM1"/>	Output Function:	<input type="text" value="Inactive"/>	Input Function:	<input type="text" value="Inactive"/>
Baud Rate:	<input type="text" value="115200"/>	Logging:	<input type="text" value="Disabled"/>	Serial Mode:	<input type="text" value="RS232"/>

*Illustration 21: Port configuration page*

### 8.5.4 Managing Log Files

1. In the Tools menu, open the Log Files page.

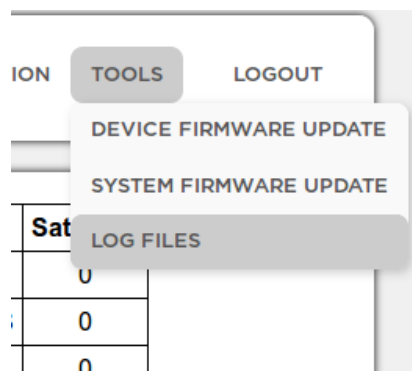


Illustration 22: Log files in menu

2. The log files page displays all the log files currently on the device. The log files currently being logged are highlighted in green. Click on the file name of a log file to download it.

### Log Files

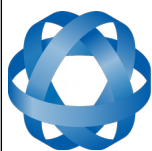
<div>Select All</div> <div>Delete Selected</div> <div>Download Selected</div>		
Used: 61.6 MB      Available: 58.5 GB      Size: 58.6 GB		
	Filename	Size
<input checked="" type="checkbox"/>	<a href="#">COM2 15-09-17 05-28-47.bin</a>	144.6 KB
<input checked="" type="checkbox"/>	<a href="#">Spatial 15-09-17 05-28-47.anpp</a>	135.2 KB
<input type="checkbox"/>	<a href="#">COM2 15-09-17 05-25-48.bin</a>	203.3 KB
<input type="checkbox"/>	<a href="#">Spatial 15-09-17 05-20-30.anpp</a>	3.6 MB
<input type="checkbox"/>	<a href="#">Spatial 15-09-17 04-18-33.anpp</a>	3.0 MB
<input type="checkbox"/>	<a href="#">Spatial 15-09-17 04-18-08.anpp</a>	166.6 KB

Illustration 23: Log Files page

## 8.6 NTRIP Client

When the ILU is connected to a network that has access to the internet, it can stream differential corrections from an NTRIP network corrections service to the INS device to offer higher accuracy differential or RTK positioning.

1. In the ILU Configuration menu, open the NTRIP page.
2. Enter the details provided by your NTRIP network corrections service provider.



### NTRIP Configuration

Enabled: ☒

Host:  Port:

Username:  Password:

Mountpoint:  Connection: Connected

Successfully Connected

Illustration 24: NTRIP configuration page

## 8.7 Connecting with Spatial Manager

Spatial Manager can easily connect to the connected device through the ILU over a network connection. Please follow the steps below to connect.

1. In the Tools menu, click on the Network Connect dialogue.
2. Type in the address used to connect to the ILU web page and the port 16718 and press connect.

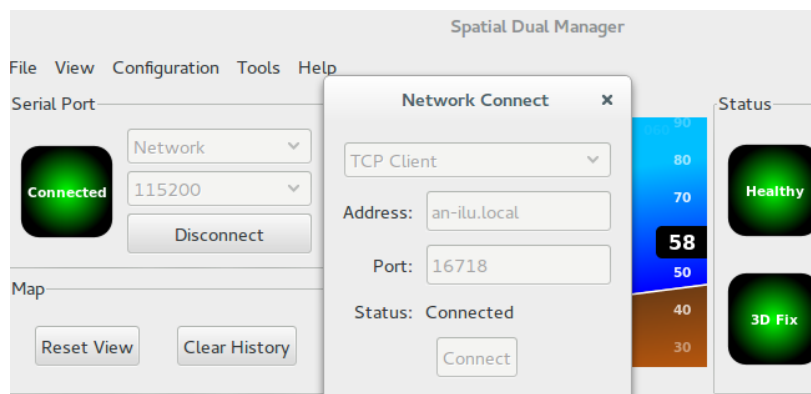
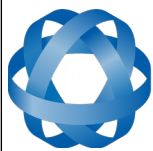


Illustration 25: Spatial Manager ILU connection



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