MarinePak7
User Manual

MarinePak7 User Manual

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Warranty

NovAtel Inc. warrants that its GNSS products are free from defects in materials and workmanship, subject to the conditions set forth on our web site: novatel.com/products/novatel-warranty-and-return-policies.

Return Instructions

To return products, refer to the instructions found at: novatel.com/products/novatel-warranty-and-return-policies.

Proprietary Notice

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Notices

Changes or modifications to this equipment, not expressly approved by NovAtel Inc., could void the user's authority to operate this equipment.

FCC

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

WiFi

MarinePak7 contains a WiFi radio with the following approvals:

- FCC ID: Z64-WL18SBMOD

Global System Mobile Radio (GSM)

MarinePak7 contains a GSM radio with the following approvals:

- FCC ID: XMR201202M95

UHF Radio

MarinePak7 contains a UHF (Ultra High Frequency) radio with the following approvals:

- FCC ID: MRBSATEL-TA37

To maintain compliance with the limits of a Class A digital device, you must use shielded interface cables.

The MarinePak7 has been authorized for use in Mobile applications. At least 20 cm (8 inches) of separation between the MarinePak7 and the User must be maintained at all times.

Innovation, Science and Economic Development (ISED) Canada

MarinePak7 Class A digital device complies with Canadian ICES-003.

MarinePak7 appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

The MarinePak7 has been authorized for use in Mobile applications. At least 20 cm (8 inches) of separation between the MarinePak7 and the User must be maintained at all times.

Le MarinePak7 a été autorisé pour une utilisation dans les applications mobiles. Au moins 20 cm (8 pouces) de séparation entre le MarinePak7 et l'utilisateur doit être maintenue à tous fois.

Global System Mobile Radio (GSM)

MarinePak7 contains a GSM radio with the following approvals:

- IC: 10224A-201606M95

UHF Radio

MarinePak7 contains a UHF (Ultra High Frequency) radio with the following approvals:

- IC: 24122A-SATELTA37

WiFi

MarinePak7 contains a WiFi radio with the following approvals:

- IC: 451I-WL18SBMOD

European Union (EU) / United Kingdom (UK)

Global System Mobile Radio (GSM)

NovAtel Inc. declares that the MarinePak7 GSM radio is in compliance with:

1. Directive 2014/53/EU (Radio Equipment).
2. UK Regulations S.I. 2017/1206

The full text of the EU Declaration of Conformity may be obtained from the NovAtel web site at:

novatel.com/products/novatel-compliance/eu-declaration-of-conformity

The full text of the UK Declaration of Conformity may be obtained from the NovAtel web site at:

novatel.com/products/novatel-compliance/uk-declaration-of-conformity

Radio Information

Description of Service: GSM

Operational Frequency:

> **900 MHz**
>
> (Uplink) 890-915 MHz
>
> (Downlink) 935-960 MHz
>
> **1800 MHz**
>
> (Uplink) 1710.2 - 1784.8 MHz
>
> (Downlink) 1805.2 - 1879.8 MHz

Modulation: GMSK

Rated Power: 35 dBm e.i.r.p.

UHF Radio

NovAtel Inc. declares that the MarinePak7 UHF radio is in compliance with:

1. Directive 2014/53/EU (Radio Equipment).
2. UK Regulations S.I. 2017/1206

The full text of the EU Declaration of Conformity may be obtained from the NovAtel web site at:

novatel.com/products/novatel-compliance/eu-declaration-of-conformity

The full text of the UK Declaration of Conformity may be obtained from the NovAtel web site at:

novatel.com/products/novatel-compliance/uk-declaration-of-conformity

Radio Information

Description of Service: UHF

Operational Frequency: 410 - 475 MHz

Modulation: GMSK/4-GFSK

Rated Power: 30 dBm e.i.r.p.

WiFi

NovAtel Inc. declares that the MarinePak7 WiFi transceiver is in compliance with:

1. Directive 2014/53/EU (Radio Equipment).

2. UK Regulations S.I. 2017/1206

The full text of the EU Declaration of Conformity may be obtained from the NovAtel web site at:

novatel.com/products/novatel-compliance/eu-declaration-of-conformity

The full text of the UK Declaration of Conformity may be obtained from the NovAtel web site at:

novatel.com/products/novatel-compliance/uk-declaration-of-conformity

Radio Information

Description of Service: WiFi (802.11b/g/n)

Operational Frequency: 2400 - 2480 MHz

Modulation: OFDM

Rated Power: 17.4 dBm e.i.r.p.

RoHS

The MarinePak7 is in conformity with Directive 2011/65/EU of the European Parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

The MarinePak7 is in conformity with:

1. Directive 2011/65/EU of the European Parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

2. the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (Amendment) Regulations 2012 (S.I. 2012/3032).

WEEE Notice

If you purchased your MarinePak7 product in Europe or the United Kingdom, please return it to your dealer or supplier at the end of its life. The objectives of NovAtel's environment policy are, in particular, to preserve, protect and improve the quality of the environment, protect human health and utilise natural resources prudently and rationally. Sustainable development advocates the reduction of wasteful consumption of natural resources and the prevention of pollution. Waste electrical and electronic equipment (WEEE) is a regulated area. Where the generation of waste cannot be avoided, it should be reused or recovered for its material or energy. WEEE products may be recognized by their wheeled bin label

( ).

See novatel.com/products/novatel-compliance/novatel-environmental-compliance for more information.

Ethernet Port

> The Ethernet port is a safety extra-low voltage (SELV) circuit only and is suitable for connection within a building only. Do not connect them to Telecommunication Network voltage (TNV) circuits.

Customer Support

NovAtel Knowledge Base

If you have a technical issue, visit the NovAtel Support page at novatel.com/support/. Through the *Support* page, you can contact Customer Support, find papers and tutorials or download current manuals and the latest firmware.

Before Contacting Customer Support

Before contacting NovAtel Customer Support about a software problem, perform the following steps:

> (i) If logging data over an RS-232 serial cable, ensure that the configured baud rate can support the data bandwidth. NovAtel recommends a minimum baud rate of 230400 bps.

1. Use the Web UI to download the action logs from the internal data storage.

   For information about downloading the action logs, refer to *Logging* on page 94.

2. Send the data file to NovAtel Customer Support: support.novatel@hexagon.com

3. You can also perform a factory reset of the receiver to clear any unknown settings.

   For information about using the LCD UI to perform a factory reset, refer to *System Configuration* on page 60.

> (i) A factory reset will erase all user settings. You should know your configuration and be able to reconfigure the receiver before you perform a factory reset.

If you are having a hardware problem, send a list of the troubleshooting steps taken and the results.

Contact Information

Log a support request with NovAtel Customer Support using one of the following methods:

Log a Case and Search Knowledge:

Website: novatel.com/support/

Log a Case, Search Knowledge and View Your Case History: (login access required)

Web Portal: https://novatelsupport.force.com/community/login

E-mail:

support.novatel@hexagon.com

Telephone:

U.S. and Canada: 1-800-NOVATEL (1-800-668-2835)

International: +1-403-295-4900

Chapter 1 Introduction

Global Navigation Satellite System (GNSS) positioning observes range measurements from orbiting GNSS satellites. From these observations, the receiver can compute position and velocity with high accuracy. With Precise Point Positioning (PPP) and Oceanix corrections, or differential GNSS, positioning can be accurate to within a few centimetres. For a detailed discussion of GNSS, refer to NovAtel's book Introduction to GNSS available from our web site.

The MarinePak7 is a high-performance GNSS receiver capable of receiving and tracking different combinations of GNSS signals and integrated L-band on 555 channels. GPS, GLONASS, Galileo, BeiDou, QZSS and SBAS support are standard and the MarinePak7 adaptability offers multi-constellation, multi-frequency, and size configurations for any application requirement.

Excellent acquisition and re-acquisition times allow this receiver to operate in environments where very high dynamics and frequent interruption of signals can be expected. The MarinePak7 options include integrated radio and dual input heading options to provide a tightly integrated and rugged solution for any application.

MarinePak7 output is compatible with NovAtel's Waypoint post-processing software. Visit our web site at novatel.com for details.

1.1 MarinePak7 Connectors
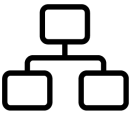
The MarinePak7 connectors are used to connect other components in the GNSS system to the MarinePak7.

Figure 1: MarinePak7 Connectors

Table 1: MarinePak7 Connectors

Label	Connector Type	Description
GNSS1	TNC	Primary GNSS antenna
GNSS2	TNC	Secondary GNSS antenna
GSM	SMA	GSM (cellular modem) antenna

Label	Connector Type	Description
UHF	TNC	UHF radio antenna
DC	4-pin LEMO	Receiver power supply
(Ethernet icon)	RJ45	Ethernet network
COM 1	DB9 Male	RS-232/RS-422 serial port
COM 2	DB9 Male	RS-232/RS-422 serial port
COM 3	DB9 Male	RS-232/RS-422 serial port
PPS	SMA	Pulse Per Second (PPS) output
I/O	12-pin LEMO	Input and output signals: • PPS (Pulse Per Second) output • EVENT Input • EVENT Output
(Ground icon)	Screw Terminal	Receiver grounding point
(USB icon)	USB Type A	USB Host connector*
(WiFi icon)	SMA	WiFi antenna*

> ⓘ   The USB and WiFi antenna connectors are on the front of the MarinePak7.

1.2 Manual Scope

This manual contains information about the installation and operation of the MarinePak7 system. It is beyond the scope of this manual to provide details on service or repair. For any customer-service related inquiries, refer to *Customer Support* on page 12.

1.2.1 Conventions

The following conventions are used in this manual:

Information that supplements or clarifies text.

A caution that actions, operation or configuration may lead to incorrect or improper use of the hardware.

A warning that actions, operation or configuration may result in regulatory noncompliance, safety issues or equipment damage.

Chapter 2   MarinePak7 Installation

This chapter provides instructions to install the MarinePak7.

2.1   System Components

The MarinePak7 system includes the following components:

- MarinePak7 enclosure
- 1 x 12 VDC, power supply (p/n: 40023144)
- 1 x UK power supply cable (p/n: 60723209)
- 1 x US power supply cable (p/n: 60723210)
- 1 x EU power supply cable (p/n: 60723211)
- 3 x DB9 to DB9 serial data cables (p/n: 60723208)
- 1 x RJ45 Ethernet cable (p/n: 60723207)

2.1.1   Optional Accessories

The following items are available to buy separately from NovAtel:

- Inspired Energy 7.2 VDC lithium ion battery pack (p/n: 40123423)
- External DC Power cable (p/n: 60754003)
- High density Expansion Port Data cable (p/n: 60323153)
- PPS cable (SMA to BNC) (p/n: 60423065)

Refer to *Additional Equipment Required* below for other equipment needed that is not included with the MarinePak7.

2.2   Additional Equipment Required

For the receiver to perform optimally, the following user-supplied additional equipment is required:

- At least one quality, dual-frequency GNSS antenna (such as the NovAtel V560 Marine Antenna). A second GNSS antenna is required to use the MarinePak7 ALIGN heading functionality.

  See the NovAtel website (novatel.com/products/antennas) for information on a variety of quality antennas available to meet your form factor and performance needs.

- A quality coaxial cable with a TNC male connector on the receiver end for each GNSS antenna. Interconnect adapter cables depending on site installation.

- In order to access the Web UI, a computer/tablet/smartphone with WiFi and a web browser or a computer with an Ethernet, RS-232 DB-9 or RS-422 DB-9 port.

- A power cable with 4 Amp fuse.

- A UHF antenna (UHF models only)

- A cellular antenna

2.3 MarinePak7 Cables

To prevent damage to both the receiver and the cables, each connector can be inserted in only one way.

Furthermore, the connectors used to mate the cables to the receiver require careful insertion and removal. Observe the following when handling cables.

- Use the appropriate cable for the MarinePak7 connector.
- Insert the connector until it is on straight and secure.
- To remove a cable, grasp it by the connector.

Do not pull directly on a cable.

Table 2: MarinePak7 Cables

Cable Name	NovAtel Part Number	Included with MarinePak7	Purpose
RS-232 Serial Data cable (2 m)	60723208	Included	Communication with MarinePak7 via the COM1, COM2 or COM3 port.
Ethernet cable (2 m)	60723207	Included	Communication with MarinePak7 via the Ethernet port.
Power Supply cable (UK)	60723209	Included	Connect the MarinePak7 Power Supply to the mains supply.
Power Supply cable (US)	60723210 (US)	Included	Connect the MarinePak7 Power Supply to the mains supply.
Power Supply Cable	60723211 (EU)	Included	Connect the MarinePak7 Power Supply to the mains supply.
External DC Power cable	60754003	Optional	Connect the MarinePak7 to a DC power supply.
High Density Expansion Port Data cable	60323153	Optional	Connect to the signals available on the I/O port.
PPS cable (SMA to BNC) (17 cm)	60423065	Optional	Connect the Pulse Per Second output to another device.

2.4 Selecting a GNSS Antenna

An active antenna is required because its Low Noise Amplifier (LNA) boosts the power of the incoming signal to compensate for the line loss between the antenna and the receiver.

An L-band capable antenna is required to receive broadcast Oceanix corrections. A compatible GNSS\IALA antenna is required if MSK beacon corrections are required. The NovAtel V560 marine antenna is an example of an antenna that can receive GNSS, L-band and MSK beacon signals.

NovAtel offers a variety of GNSS antennas with band pass filtering and an LNA (refer to our web site: novatel.com/products/antennas for details of available antennas). The GNSS antenna chosen depends on the particular application. Each model offers exceptional phase center stability and a significant measure of immunity against multipath interference. Each antenna has an environmentally sealed radome and all meet the European Union's Restriction of Hazardous Substances (RoHS) and Waste Electrical and Electronic Equipment (WEEE).

For optimum GNSS tracking and Oceanix L-band reception, a cascaded antenna gain of +25 dB to +35 dB is recommended.

> A dual frequency capable GNSS antenna is required to use SPAN, RTK or ALIGN.

2.5   Choosing a Coaxial Cable

An appropriate coaxial cable matches the impedances of the antenna and receiver (50 ohms) and has a line loss not exceeding 10.0 dB. If the limit is exceeded, excessive signal degradation may occur and the receiver may not meet performance specifications. NovAtel offers several coaxial cables to meet GNSS antenna interconnection requirements, including:

- 5, 15, or 30 m antenna cables with TNC male connectors on both ends (NovAtel part numbers C006, C016 and C032 respectively)

> For more information about antenna cabling, including using cables longer than 30 m and in-line amplifiers, refer to APN-077: RF Equipment Selection and Installation available from (hexagondownloads.blob.core.windows.net/public/Novatel/assets/Documents/Bulletins/APN-077-RFEquipmentSelection/APN-077-RFEquipmentSelection.pdf).

> NovAtel recommends using high-quality coaxial cables because an impedance mismatch is possible when using lower quality cables and this produces reflections in the cable that increases signal loss. Although other high-quality antenna cables can be used, the performance specifications of the OEM7 receivers are warranted only when used with NovAtel supplied accessories.

2.6   Installation Overview

Complete the following steps to connect and power a MarinePak7.

Figure 2: MarinePak7 Configuration Example
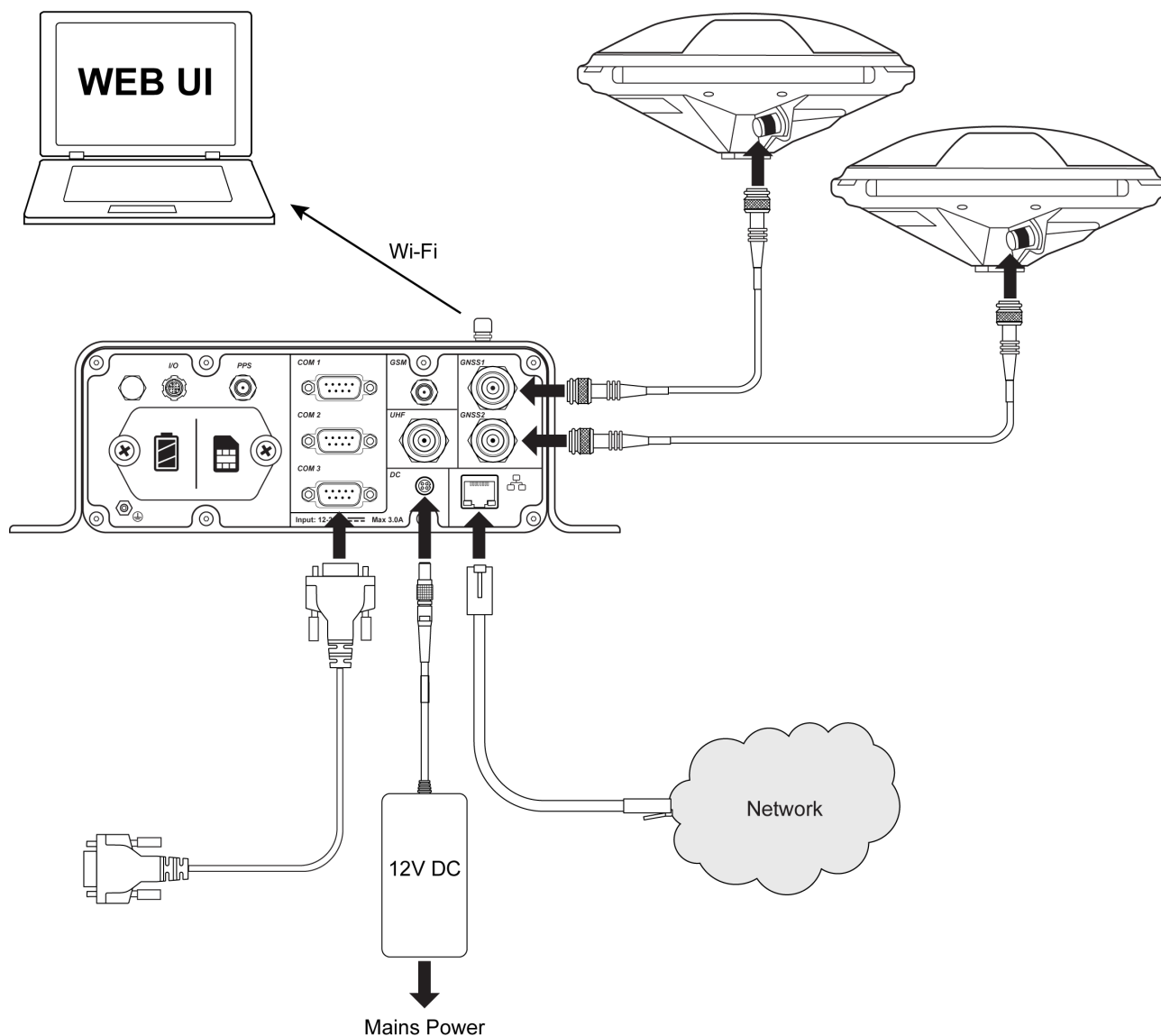
1. Mount the GNSS antennas (user supplied) on a secure, stable structure with an unobstructed view of the sky from horizon to horizon.

   Refer to *Mounting the GNSS Antenna* on the next page for more information.

2. Mount MarinePak7 in the desired location.

   Refer to *Mounting the MarinePak7* on the next page for more information.

3. Use a coaxial cable to connect a GNSS antenna to the **GNSS1** TNC connector on the MarinePak7.

4. If using two GNSS antennas with the MarinePak7, use a second coaxial cable to connect the secondary GNSS antenna to the **GNSS2** TNC connector.

5. Connect the WiFi antenna to the WiFi port on the front of the MarinePak7.

6. If the MarinePak7 is using a UHF radio to receive correction data, connect a coaxial cable from the UHF antenna to the **UHF** TNC connector on the MarinePak7.

7. If the MarinePak7 is using a cellular modem to receive correction data, connect a coaxial cable from the cellular antenna to the **GSM** SMA connector on the MarinePak7.

    Refer to *Cellular Antenna Installation* on page 24 for more information.

8. If the MarinePak7 communicates to other system devices using a network connection, connect an Ethernet cable from the network device to the RJ45 jack on the MarinePak7.

9. If the MarinePak7 communicates with other systems devices using a serial cable, connect a serial cable from the device to one of the COM DB-9 connectors on the MarinePak7.

10. If using the MarinePak7 I/O signals (PPS, EVENTIN, EVENTOUT), connect a cable from the **I/O** port on the MarinePak7 to the devices using the I/O signal.

11. Connect the 12 VDC power supply to the 4 pin **DC** connector on the back of the MarinePak7 and then connect the power supply to the mains outlet.

    Once power is detected the MarinePak7 will automatically detect the charge state of the internal lithium battery and begin recharging.

    The MarinePak7 can also be powered from the internal battery or an alternate DC power source. Refer to *Connect Power to the MarinePak7* on page 22 for information about other powering options.

12. Briefly press the ⏻ button on the front of the MarinePak7 to power up the receiver.

    When the receiver is ready for normal operation the UI screen displays the Position Status (Home) screen.

2.7   Mounting the GNSS Antenna

When installing the antenna:

*   Choose an antenna location with a clear view of the sky so that each satellite above the horizon can be tracked without obstruction.
*   Mount the antenna on a secure, stable structure capable of safe operation in the specific environment.

2.8   Mounting the MarinePak7

Mount the MarinePak7 on a secure, stable surface. For general applications, secure the MarinePak7 using four screws fastened through the holes in the MarinePak7 mounting shroud. See *Figure 9: MarinePak7 Mounting Shroud Tabs* on page 109 for the dimensions and location of the mounting holes.

For high vibration installations, NovAtel recommends mounting the MarinePak7 using four screws fastened through the holes in the MarinePak7 mounting shroud or the mounting holes provided on the base of the receiver. See *Figure 10: MarinePak7 Mounting Holes* on page 110 for the location of the mounting holes. Vibration dampeners or isolators (user supplied) may be used for additional vibration suppression.

Ensure a 15-25 mm minimum clearance all around the MarinePak7 to allow for air flow.

> ⓘ   The maximum threaded depth of the holes in the MarinePak7 enclosure is 7 mm.

> ⓘ   A suitable thread lock compound is recommended for installations in high vibration environments.

2.8.1 MarinePak7 Siting Guidelines

- Ensure adequate ventilation.

- Avoid locations that experience excessive vibration.

- Avoid exposure to high temperatures.

- Shield the MarinePak7 from direct sunlight.

- Mount the MarinePak7 securely to prevent movement.

- Ensure there is easy access to the front panel.

- Ensure adequate access to the rear panel. Avoid mounting in a recess and have sufficient slack left in cables (power, interface and coaxial) for the MarinePak7 to be removed without disconnection.

- Ensure all bends in the coaxial cables are maintained above the minimum bend radius.

- Use short tails of flexible coaxial cable (e.g. LMR240) with appropriate connections to connect antenna coaxial cables to the MarinePak7.

- The MarinePak7 must be Earthed by connecting it to (a ships) ground using the grounding point on the rear of the receiver.

- After the MarinePak7 is installed, the rear panel of the receiver should be accessed only during maintenance.

2.8.2 Ceiling Mount

The MarinePak7 is shipped with the mounting shroud installed on the top of the MarinePak7. In this position, the MarinePak7 can be secured to a flat surface, such as a shelf, using four screws. The mounting shroud can be moved to the bottom of the MarinePak7 to allow the MarinePak7 to be mounted on a ceiling.

To ceiling mount the MarinePak7:

1. Prepare the ceiling mount location by drilling four holes that match the mounting holes in the MarinePak7 mounting shroud. See *Figure 9: MarinePak7 Mounting Shroud Tabs* on page 109 for the location of the mounting holes.

2. Remove the eight screws (four on each side) that attach the mounting shroud to the MarinePak7.

3. Turn the MarinePak7 over and place the mounting shroud on the bottom of the MarinePak7.

4. Align the holes in the mounting shroud with the threaded holes in the sides of the MarinePak7.

5. Secure the mounting shroud to the MarinePak7 using the screws removed in Step 2. The torque of the screws should not exceed 2 Nm (17 inch-lb).

> ⓘ   A suitable thread lock compound is recommended for installations in high vibration environments.

6. Hold the MarinePak7 against the ceiling and secure it using four screws fastened through the holes in the MarinePak7 mounting shroud.

2.9   Connect Power to the MarinePak7

The MarinePak7 can be powered by a 120/240 VAC mains supply, a 12 to 24 VDC supply or the internal lithium battery.

> (i) The MarinePak7 must always be used with a shielded power cable when the system is not operating from the internal battery pack.

> (i) The MarinePak7 will use the internal battery as a backup power supply if there is an interruption to the AC or DC power supply.

2.9.1   Connect the MarinePak7 to AC Power Source

To power the MarinePak7 from a 120/240 VAC mains supply, use the 12 VDC power adapter included with the MarinePak7.

1. Connect the 4 pin LEMO connector of the 12 VDC power adapter to the **DC** connector on the MarinePak7.
2. Connect the AC power plug on the 12 VDC power adapter to the mains supply.
3. Connect the vessel ground to the ground screw on the back of the MarinePak7.

2.9.2   Connect the MarinePak7 to a DC Power Source

The MarinePak7 can be powered by a DC power source that provides a voltage of 12 to 24 VDC.

1. Connect a cable with a 4 pin LEMO connector on one end to the **DC** connector on the MarinePak7.
2. Connect the other end of the cable to a DC power source that provides 12 to 24 VDC.
3. Connect the vessel ground to the ground screw on the back of the MarinePak7.

For the pinout of the DC connector, see *Table 26: DC Pinout* on page 119.

An optional DC power cable is available as an accessory. See *DC Power Cable* on page 123 for information about this cable.

2.9.3   Power on the MarinePak7

To power on the MarinePak7, press (and release) the power button on the front panel. The MarinePak7 boot process starts and the NovAtel loading screens appear on the display.

2.9.4   Power off the MarinePak7

To power off the MarinePak7, press and release the power button on the front panel. The MarinePak7 shuts down to a zero power state.

> (i) The MarinePak7 requires a soft shutdown. Avoid removing all power sources before powering off the MarinePak7 using the power button.

2.9.5   MarinePak7 Internal Battery

If the MarinePak7 has the optional Inspired Energy 7.2 VDC lithium ion battery pack, the MarinePak7 can be powered from the internal battery if an AC or DC power source is not available.

When an AC or DC power source is connected to the MarinePak7, the receiver checks the battery charge capacity and recharges the battery if necessary. The battery is charged whether the MarinePak7 is turned on or off. If the power source fails, the MarinePak7 will automatically switch to the internal battery and use the battery until the power source is restored.

Replacing the Internal Battery

The MarinePak7 must only be used with the Inspired Energy ND2037HD34 battery pack. A replacement battery assembly can be purchased from your NovAtel dealer. For battery specifications, refer to *Table 13: Battery Specifications* on page 111.

To replace the internal battery:

1. Use the ⏻ button to power down the MarinePak7.
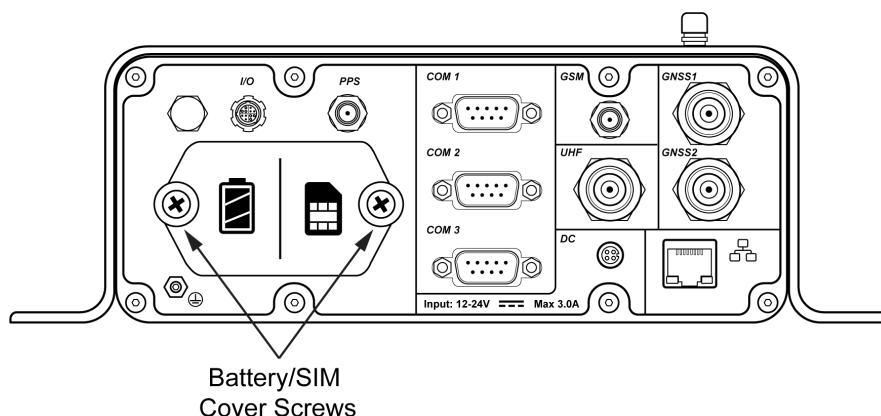
2. Remove the Battery/SIM cover.

Figure 3: Battery/SIM Cover

Battery/SIM
Cover Screws

3. Remove the battery.

4. Insert the new battery.

5. Replace the Battery/SIM cover.

6. Use the ⏻ button to power on the MarinePak7.

2.10   Cellular Antenna Installation

The MarinePak7 has a cellular antenna port to facilitate the connection of an external cellular antenna. An external antenna must be connected to this port to use the integrated cellular radio.

Figure 4: Connect the Cellular Antenna
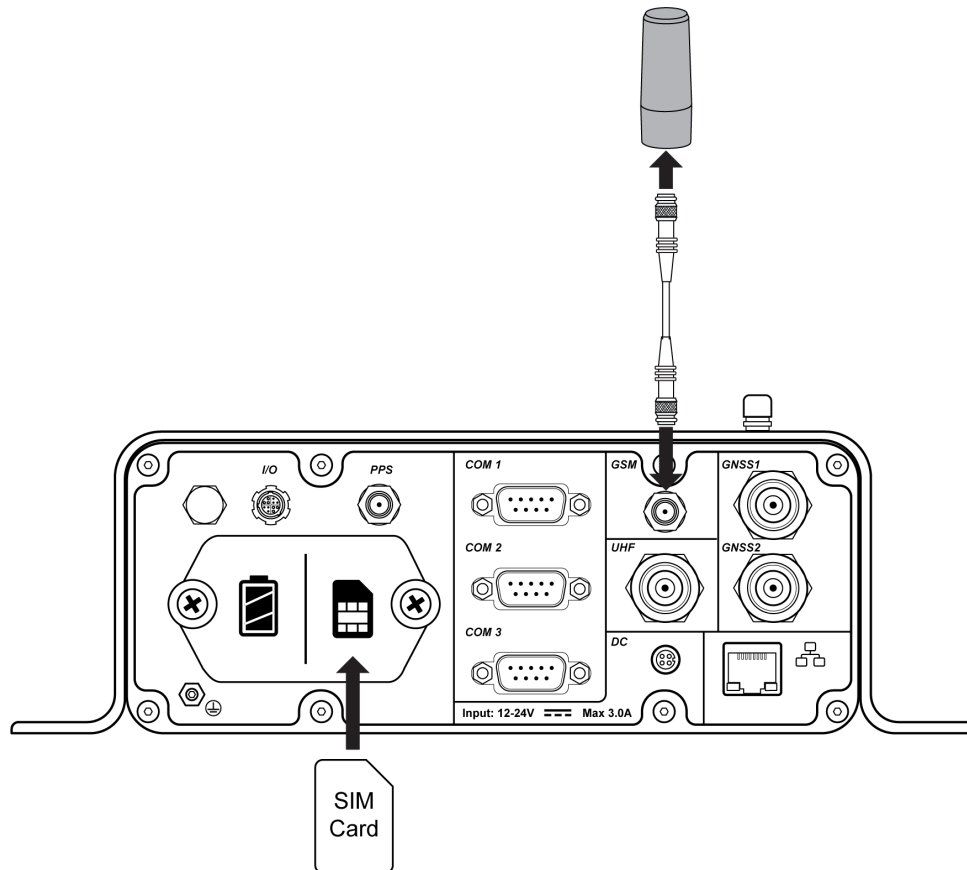
1. Remove the Battery\SIM card cover.

2. Remove lithium battery from the compartment (if installed).

3. Insert the SIM card into position.

4. Replace lithium battery (if available) and replace the Battery\SIM card cover.

5. Use a coaxial cable with an SMA connector to connect an antenna to the GSM port on the back of the MarinePak7.

> (i) Ensure the cellular antenna is installed at least 30 cm away from the MarinePak7. If the cellular antenna is closer than 30 cm, the GNSS positioning accuracy may be degraded.

2.11   Communication with the MarinePak7

The MarinePak7 can communicate in a number of ways:

- LCD User Interface
- WiFi
- Ethernet port
- Serial COM ports
- GSM modem
- UHF radio
- USB host port

The communication methods listed above are used to configure the receiver, monitor receiver status, retrieve data and receive corrections data.

2.11.1   LCD User Interface

The LCD screen and navigation buttons on the front of the MarinePak7 are used to monitor the receiver status, access receiver data and configure the MarinePak7. For information about using the LCD User Interface, see *LCD User Interface* on page 27.

2.11.2   WiFi

The MarinePak7 provides a WiFi access point which can be accessed by a WiFi capable smartphone, tablet or computer. From a device connected to the WiFi network, the Web User Interface can be used to monitor and configure the MarinePak7. For information about using the Web User Interface, see *Web User Interface* on page 64.

2.11.3   Ethernet Port

The MarinePak7 has an RJ45 socket that supports 10Base-T/100Base-TX Ethernet for communications with external data communications equipment such as computers and data loggers. The Ethernet port supports IPv4 Internet layer, TCP/IP transport, ping and connection from a Telnet client. Users can conduct remote debugging and accept MRTCA (modified RTCA) data. The MarinePak7 is also equipped with NTRIP Version 2.0 (Networked Transport of RTCM via Internet Protocol) client and server capability.

The Ethernet configuration can be viewed and modified from the LCD UI (see *Network Status* on page 57) or Web UI (see *System* on page 98).

2.11.4   ICOM Ports

ICOM ports are virtual ports used for Ethernet or WiFi connections. The ICOM1, ICOM2 and ICOM3 ports are user configurable.

The ICOM port configuration can be viewed and modified from the LCD UI (see *Net Port Status* on page 54) or Web UI (see *Net Ports* on page 91).

2.11.5   Serial COM Ports

The serial communication ports (COM ports) are used to communicate between the receiver and other components in the GNSS system. They are also used to communicate with external data communications equipment such as computers and data loggers. The COM ports can be configured to use either RS-232 or RS-422.

The COM port configuration can be viewed and modified from the LCD UI (see *Serial Status* on page 49) or Web UI (see *Serial Ports* on page 86).

2.11.6   GSM Cellular Modem

A GSM cellular radio modem is optionally available on the MarinePak7. This cellular modem is used to receive RTK correction data.

The GSM cellular modem status can be viewed from the LCD UI (see *GSM Status* on page 48) or Web UI (see *GSM* on page 100).

2.11.7   UHF Radio

A UHF radio is available on some models of the MarinePak7 which operates in the 410-475 MHz and 902-928 MHz bands. This radio is typically used to receive RTK correction data.

The UHF radio configuration can be viewed and modified from the LCD UI (see *UHF Status* on page 45) or Web UI (see *UHF Radio* on page 82).

2.11.8   Universal Serial Bus (USB) Port

The USB port is used to retrieve system data and logs that have been stored on the internal memory. For information about retrieving data logs using the USB port, see *Log Actions* on page 95.

The USB port can also be used to upload software to the MarinePak7.

Chapter 3   Configure the MarinePak7 Using the LCD UI

This chapter describes how to configure the MarinePak7 and monitor receiver status using the LCD User Interface (LCD UI).

3.1   LCD User Interface

The MarinePak7 LCD UI consists of an LCD screen and several navigation buttons.

Figure 5: MarinePak7 UI Screen

Table 3: MarinePak7 UI Navigation Buttons

Keypad Button		Description
▶	Right Button	Press to advance the UI status screen to the next screen. Press to select a configuration parameter.
◀	Left Button	Press to return to the previous status screen. Press to select a configuration parameter.
▲	Up Button	Press to select a configuration parameter.
▼	Down Button	Press to select a configuration parameter.
↰	Back Button	Press to return to the previous screen. Press to return to the status screen.

Keypad Button		Description
☑	Enter Button	Press from a status screen to access the configuration screen. Press to access a configuration sub-level parameter. (Applicable screen only) Press to apply and save settings to the receiver.
🏠	Home Button	Press from any screen to return to the Position Status (Home) screen.
⏻	Power Button	Press to power on or power off the MarinePak7.

3.2   Position Status

The Position Status (Home) screen displays the position status of the MarinePak7.
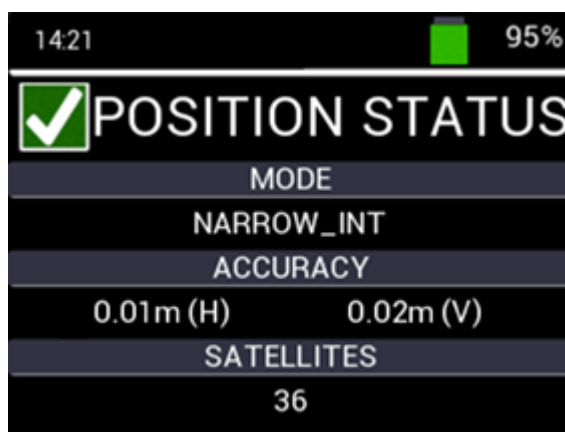
Position Status Indicator	Icon displays GREEN when the receiver reports SOLUTION_COMPUTED. Icon displays RED when any other Solution Status is reported from the receiver. See *Table 4: Solution Status* on the next page.
Mode	The active position mode type. See *Table 5: Position Type* on page 30.
Accuracy	2D = The horizontal standard deviation (RMS) Height = The vertical standard deviation (RMS)
Satellites	The number of satellites used in the position solution.

Table 4: Solution Status

| Status	Description
SOL_COMPUTED	Solution computed
INSUFFICIENT_ OBS	Insufficient observations
NO_ CONVERGENCE	No convergence
SINGULARITY	Singularity at parameters matrix
COV_TRACE	Covariance trace exceeds maximum (trace > 1000 m)
TEST_DIST	Test distance exceeded (maximum of 3 rejections if distance >10 km)
COLD_START	Not yet converged from cold start
V_H_LIMIT	Height or velocity limits exceeded (in accordance with export licensing restrictions)
VARIANCE	Variance exceeds limits
RESIDUALS	Residuals are too large
INTEGRITY_ WARNING	Large residuals make position unreliable
PENDING	When a FIX position command is entered, the receiver computes its own position and determines if the fixed position is valid PENDING implies there are not enough satellites currently tracked to verify if the FIX POSITION entered into the receiver is valid. Under normal conditions, you should only see PENDING for a few seconds on power-up before the GNSS receiver has locked onto its first few satellites. If your antenna is obstructed (or not connected) and you have entered a FIX POSITION command, then you may see PENDING indefinitely.
INVALID_FIX	The fixed position, entered using the FIX position command, is not valid
UNAUTHORIZED	Position type is unauthorized
INVALID_RATE	The selected logging rate is not supported for this solution type.

Table 5: Position Type

Mode	Description
NONE	No solution
FIXEDPOS	Position has been fixed by the user entering the position or by position averaging.
FIXEDHEIGHT	Height has been constrained by the user entered height.
DOPPLER_VELOCITY	Velocity computed using instantaneous Doppler
SINGLE	Solution calculated using only data supplied by the GNSS satellites
PSRDIFF	Solution calculated using pseudorange differential (DGPS, DGNSS) corrections
WAAS	Solution calculated using corrections from an SBAS satellite
PROPAGATED	Propagated by a Kalman filter without new observations
L1_FLOAT	Single-frequency RTK solution with unresolved, float carrier phase ambiguities
NARROW_FLOAT	Multi-frequency RTK solution with unresolved, float carrier phase ambiguities
L1_INT	Single-frequency RTK solution with carrier phase ambiguities resolved to integers
WIDE_INT	Multi-frequency RTK solution with carrier phase ambiguities resolved to wide-lane integers
NARROW_INT	Multi-frequency RTK solution with carrier phase ambiguities resolved to narrow-lane integers
RTK_DIRECT_INS	RTK status where the RTK filter is directly initialized from the INS filter
INS_SBAS	INS position, where the last applied position update used a GNSS solution computed using corrections from an SBAS (WAAS) solution
INS_PSRSP	INS position, where the last applied position update used a single point GNSS (SINGLE) solution
INS_PSRDIFF	INS position, where the last applied position update used a pseudorange differential GNSS (PSRDIFF) solution
INS_RTKFLOAT	INS position, where the last applied position update used a floating ambiguity RTK (L1_FLOAT or NARROW_FLOAT) solution

Mode	Description
INS_RTKFIXED	INS position, where the last applied position update used a fixed integer ambiguity RTK (L1_INT, WIDE_INT or NARROW_INT) solution
PPP_ CONVERGING	Converging Oceanix solution
PPP	Converged Oceanix solution
OPERATIONAL	Solution accuracy is within UAL operational limit
WARNING	Solution accuracy is outside UAL operational limit but within warning limit
OUT_OF_ BOUNDS	Solution accuracy is outside UAL limits
INS_PPP_ CONVERGING	INS position, where the last applied position update used a converging Oceanix PPP (PPP_CONVERGING) solution
INS_PPP	INS position, where the last applied position update used a converged Oceanix PPP (PPP) solution

3.2.1 Position Configuration

To access Position configuration from the Position Status screen, press the **Enter** button on the keypad.
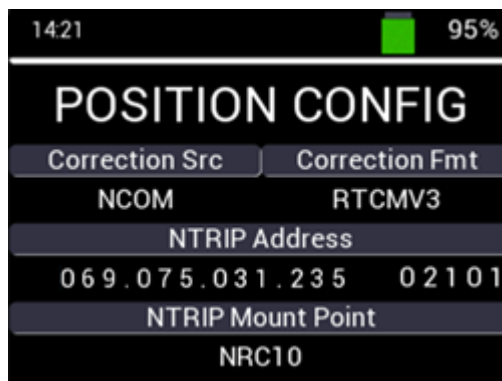
Press the **Up** and **Down** buttons on the keypad to move between configuration settings. Move to the parameter that is to be configured and press the **Enter** button to enable EDIT MODE<>. Use the arrow buttons to change the configuration. Press the **Enter** button to save the configuration.

Correction Src

Press the **Left** or **Right** button on the keypad to scroll through the correction source options.

MSK	Enable the MSK DGPS receiver module and RTCM correction format (Receive only).
UHF	Enable the Satel UHF radio module (Receive only).

GSM	Enable the GSM module and cellular corrections (subscription required) (Receive only).
NCOM	Enable the MarinePak7 NCOM port.

> ⓘ Only one module (MSK, UHF, GSM or NCOM) can be enabled at once. The other unused modules are placed into a low power state to reduce power consumption.

Correction Fmt

Press the **Left** or **Right** button on the keypad to scroll through the correction format options.

NOVX	NOVATELX correction format
RTCMV3	RTCMV3 RTK correction format
RTCMV2	RTCMV2 DGPS correction format (MSK only)
CMR	CMR correction format

NTRIP Mount Point

Press the **Left** or **Right** button to select the predefined NTRIP mount point. The values for the **NTRIP Address** change to show the IP address and port configured for the mount point.

The NTRIP mount point cannot be configured using the LCD UI. You must use the MarinePak7 Web User Interface to configure the NTRIP mount point settings. See *NTRIP Tile* on page 78.

Press the **Enter** button on the keypad to apply the new settings. An *OK Settings Applied* confirmation screen is displayed and the new settings are saved to the receiver NVRAM.

Press the **Back** button or **Home** button on the keypad to return to the Position Status screen.

3.2.2 Base Station Configuration

> ⓘ The Base Station configuration screen is only available when the RTK mode is set to **BASE** on the *System Configuration* screen (see *System Configuration* on page 60).

Use the Base Station configuration screen to enter the coordinates of the location of the MarinePak7 when it is configured to be a static base station. The coordinates are referenced to the phase center of the primary GNSS antenna connected to the MarinePak7.

To access Base Station configuration from the Position Status screen, press the **Enter** button on the keypad.
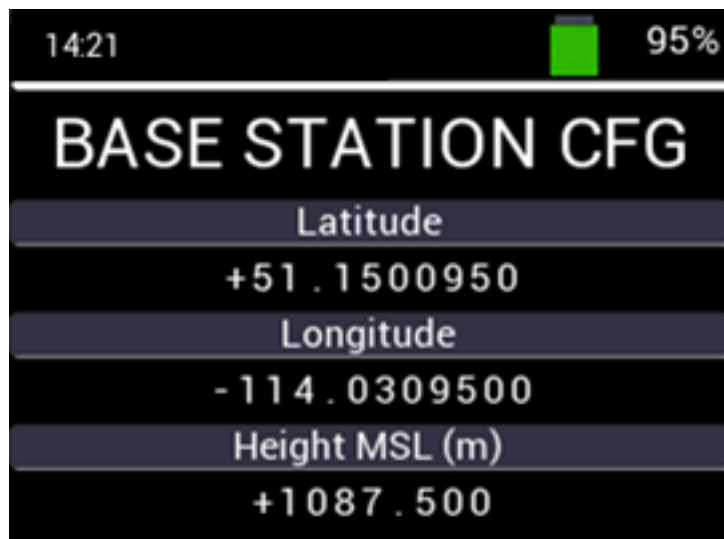
Press the **Up** and **Down** buttons on the keypad to move between configuration settings. Move to the parameter that is to be configured and press the **Enter** button to enable EDIT MODE<>. Use the arrow buttons to change the configuration. Press the **Enter** button to save the configuration.

Latitude

Use the **Up** and **Down** buttons to change the latitude of the MarinePak7.

The value range for the latitude is -90 to +90 (degrees).

Longitude

Use the **Up** and **Down** buttons to change the longitude of the MarinePak7.

The value range for the longitude is -180 to +180 (degrees).

Height (MSL)

Use the **Up** and **Down** buttons to change the height of the MarinePak7 relative to mean sea level.

The value range for the height is -1000 to +20000000 (metres)

After entering the base station coordinates, the position type will display FIXEDPOS and correction messages will start transmitting from the selected output port.

3.3   Heading Status

The Heading Status screen provides the real-time ALIGN heading measurement and standard deviation.
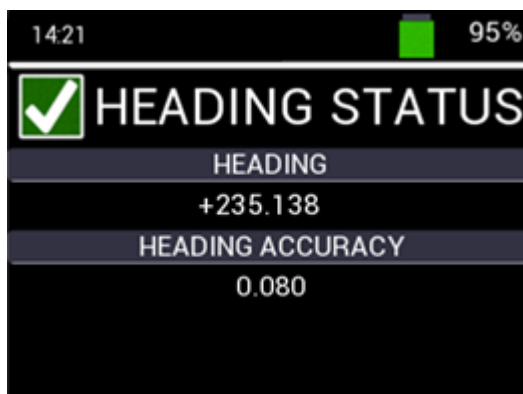
To access the Heading Status screen, press the **Right** button from the Position Status (Home) screen.
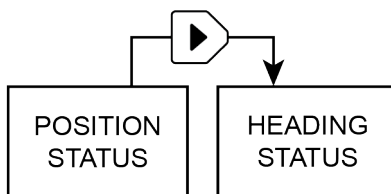
Heading Status Indicator	Displays GREEN when a Heading solution has been computed.
	Displays RED if there is no valid Heading solution.
Heading	Heading in degrees (0° to 359.999°)
Heading Accuracy	Heading standard deviation in degrees

3.3.1 Heading Configuration

From the Heading Status screen, press the **Enter** button on the keypad to access the Heading configuration screen.

Press the **Up** and **Down** buttons on the keypad to move between configuration settings. Move to the parameter that is to be configured and press the **Enter** button to enable EDIT MODE<>. Use the arrow buttons to change the configuration. Press the **Enter** button to save the configuration.

Heading Offset

The Heading Offset parameter is used to add an offset in the heading values reported by the MarinePak7.

The unmodified heading value represents the angle from True North of the base to rover vector in a clockwise direction. In some installations, it may not be possible to place the rover antenna in the desired location, for instance to match the forward-facing direction of the vessel. A Heading Offset can help to account for that difference between heading output and the vessels forward direction of travel. It is up to the user to accurately determine the offset to be applied to suit their scenario.

| Heading (True North)	Offset added to heading output.
	-180 to +180 (Degrees)

3.4   INS Status

The INS Status screen provides information about the INS (SPAN) solution.

> ⓘ   The INS screen is only visible when the MarinePak7 is loaded with a SPAN firmware model.

> ⓘ   The INS Status and INS CONFIG screens are not visible when the MarinePak7 is in Base Station mode. You must change the MarinePak7 mode to Rover on the *System Configuration* screen (see *System Configuration* on page 60) to access INS screens.
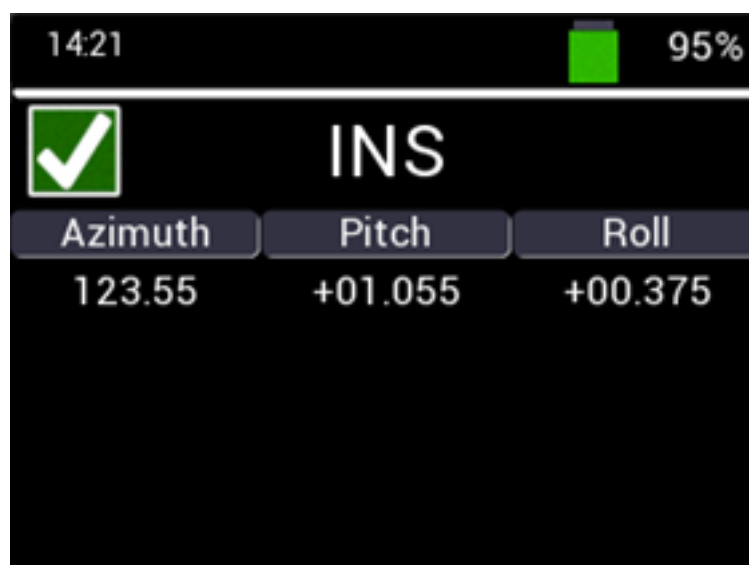
To access the INS Status screen from the Home screen, press the **Right** button 2 times.
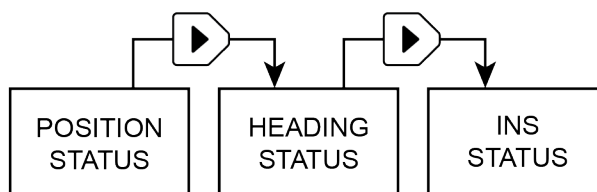
SPAN Status Indicator	Displays GREEN when a SPAN solution has been computed. Displays RED when a valid SPAN solution is not available.
Azimuth	Left-handed rotation around z-axis in degrees clockwise from North. This is the inertial azimuth calculated from the IMU gyros and the SPAN filters. Range is +0 to +359.99 degrees.
Pitch	Right-handed rotation from local level around x-axis in degrees calculated from the IMU gyros and the SPAN filters. Range is -180.00 to +180.00 degrees.
Roll	Right-handed rotation from local level around y-axis in degrees calculated from the IMU gyros and the SPAN filters. Range is -180.00 to +180.00 degrees.

> ℹ️ In a typical vessel installation, azimuth represents vessel heading, pitch represents vessel pitch and roll represents vessel pitch.

3.4.1   INS Configuration

From the INS Status screen, press the **Enter** button to access the INS Config screen.

Use the **Up** and **Down** buttons to select the INS configuration option. Move to the parameter that is to be configured and press the **Enter** button to enable EDIT MODE<>. Use the arrow buttons to change the configuration. Press the **Enter** button to save the configuration.

Antenna Lever Arm XYZ

Use these settings to enter the antenna lever arm measurements for the SPAN installation.

|	Antenna	X Axis	Y Axis	Z Axis
1	**Primary Antenna** Offset from the IMU center of navigation to the phase center of the primary GNSS antenna.	Offset from IMU to primary GNSS antenna along the X-axis -100 to +100 (m)	Offset from IMU to primary GNSS antenna along the Y-axis -100 to +100 (m)	Offset from IMU to primary GNSS antenna along the Z-axis -100 to +100 (m)
2	**Secondary Antenna** Offset from the IMU center of navigation to the phase center of the secondary GNSS antenna.	Offset from IMU to secondary GNSS antenna along the X-axis -100 to +100 (m)	Offset from IMU to secondary GNSS antenna along the Y-axis -100 to +100 (m)	Offset from IMU to secondary GNSS antenna along the Z-axis -100 to +100 (m)

Rotation (deg), Position XYZ (m) Offsets

Use these settings to enter the IMU rotation and position offsets.

Offset		X Axis	Y Axis	Z Axis
R	Rotation from the IMU body frame to the vessel frame.	X rotation offset from IMU origin -180 to +180 (deg)	Y rotation offset from IMU origin -180 to +180 (deg)	Z rotation offset from IMU origin -180 to +180 (deg)
P	Offset from the IMU center of navigation.	X-axis offset from IMU -100 to +100 (m)	Y-axis offset from IMU -100 to +100 (m)	Z-axis offset from IMU -100 to +100 (m)

3.5   GNSS Status

The GNSS Status screen provides information about the GNSS solution.
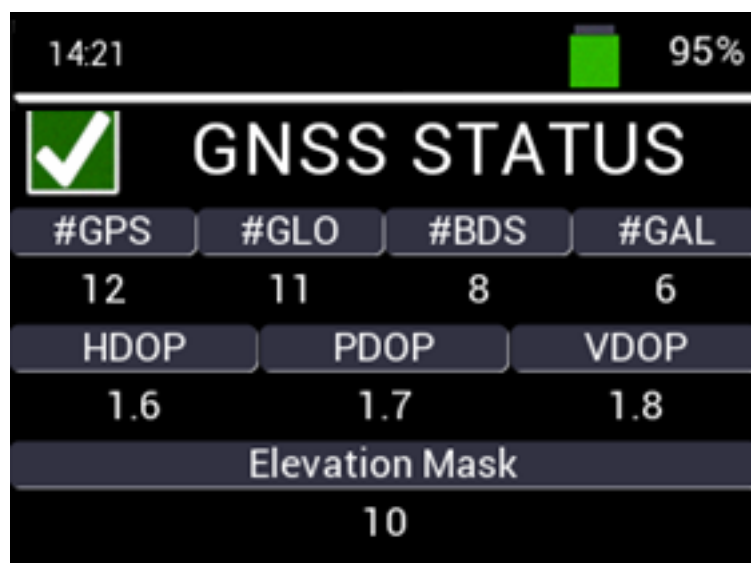
To access the GNSS Status screen from the Position Status (Home) screen, press the **Right** button until the GNSS Status screen displays.
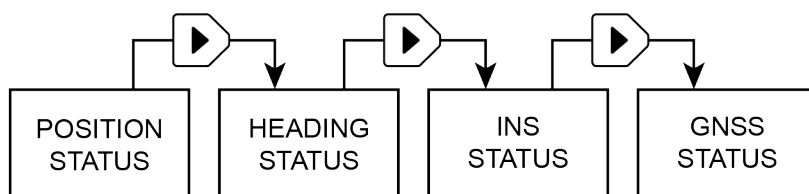
Status Indicator	The status indicator is GREEN when the receiver is tracking >4 healthy satellites. The status indicator displays RED when there are less than 4 satellites tracked and the receiver is unable to compute a valid position.
#GPS	The number of GPS satellites being tracked.
#GLO	The number of GLONASS satellites being tracked.

#BDS	The number of BeiDou satellites being tracked.
#GAL	The number of Galileo satellites being tracked.
HDOP	The real-time Horizontal Dilution of Precision value.
PDOP	The real-time Position Dilution of Precision value.
VDOP	The real-time Vertical Dilution of Precision value.
Elevation Mask	The current satellite elevation mask in degrees (where 0 degrees is the horizon and 90 degrees is directly overhead). Satellites below the elevation mask are not tracked.

3.5.1   GNSS Configuration

From the GNSS Status screen, press the **Enter** button on the keypad to access the GNSS configuration screen.

Press the **Up** and **Down** buttons on the keypad to move between configuration settings. Move to the parameter that is to be configured and press the **Enter** button to enable EDIT MODE<>. Use the arrow buttons to change the configuration. Press the **Enter** button to save the configuration.

PPS Control

Press the **Left** or **Right** button to select the polarity of the PPS pulse on the PPS output.

OFF	Disables the PPS output.
NEG	Set the polarity of the PPS pulse to negative. (default = NEG) Generates a normally high, active low pulse with the falling edge as the reference.
POS	Set the polarity of the PPS pulse to positive. Generates a normally low, active high pulse with the rising edge as the reference.

Elevation Mask

Press the **Right** and **Left** buttons to change the value of the Elevation Mask. The value range is 0 to 90 degrees where 90 degrees is directly overhead and 0 degrees is the horizon (default = 5 degrees). Satellites below the Elevation Mask are not tracked.

Press the **Enter** button to accept setting changes.

To return to the GNSS Status screen, press the **Back** button. To return to the Position Status screen, press the **Home** button.
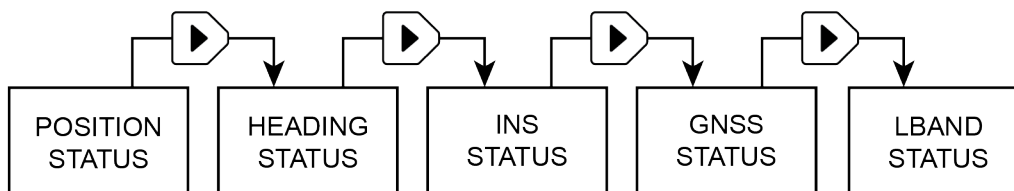
3.6   LBAND Status

> (i)   The LBAND Status and LBAND Configuration screens are not visible when the MarinePak7 is in Base Station mode. You must change the MarinePak7 mode to Rover on the *System Configuration* screen (see *System Configuration* on page 60) to access LBAND screens.

The LBAND Status screen provides information about the received L-band signals.
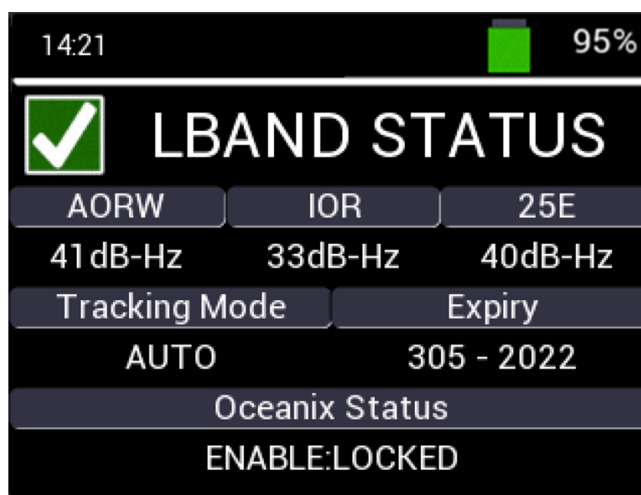
To access the LBAND Status screen from the Home screen, press the **Right** button until the LBAND Status screen displays.


LBAND Status Indicator	Displays GREEN when there is a valid Oceanix subscription and the receiver has successfully locked onto at least 1 beam.
	Displays RED if there is no valid Oceanix subscription or the receiver has failed to lock onto at least 1 beam.
Tracked Beam IDs	Displays the name(s) of the transmission beam(s).
	Up to 3 beam IDs will be displayed when the tracking mode is set to AUTO. Only one beam ID is displayed when a beam is manually selected.
Tracked beam C/No	Displays the real-time C/No (dB-Hz) levels of the transmission beam(s) the MarinePak7 is tracking.

Tracking Mode	Displays the current tracking mode.
	AUTO − The receiver searches for multiple L-band beams on the L-band channels.
	MANUAL − The receiver assigns the specified beam on the first L-band channel and makes the other L-band channels IDLE.
Expiry	Displays the last day of the year for which service is available. Service expires at the end of this UTC day.
	For example, if the expiry is shown as 305 - 2022, then the service will expire on November 1, 2022 at 24:00 UTC.
Oceanix Status	Displays the status of the Oceanix subscription.
	Access
	ENABLE − Subscription is valid
	DISABLE − Subscription is not valid
	Status
	NO_SIGNAL − None of the decoders have received data in the last 30 seconds.
	SEARCH − At least one decoder is receiving data and is searching for the format.
	LOCKED − At least one decoder has locked onto the format.

3.6.1 LBAND Configuration

From the LBAND Status screen, press the **Enter** button to access the LBAND Config screen.
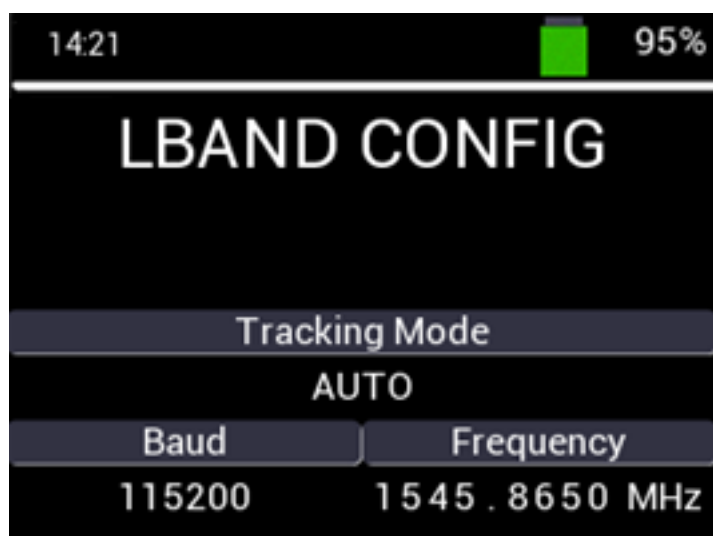
Press the **Up** and **Down** buttons to change between the LBAND options available. Move to the parameter that is to be configured and press the **Enter** button to enable EDIT MODE<>. Use the arrow buttons to change the configuration. Press the **Enter** button to save the configuration.

Tracking Mode

Press either the **Left** and **Right** buttons to select the Beam option.

AUTO	The receiver searches for multiple L-band beams on the L-band channels based on AUTO selection criteria.
	If the receiver position is known, the AUTO selection criteria is a ranking of granted access L-band beams by descending elevation angle.
	If the receiver position is not known, the AUTO selection criteria is a ranking of granted access L-band beams in the order they appear in the stored beam table.
MANUAL	The receiver is configured manually by selecting on the *Frequency* and *Baud* rate of the beam..

Baud

Use this option to manually select the L-band data stream baud rate. This option is only available when the tracking mode is set to *MANUAL*.

Press either the **Left** or **Right** buttons to select the baud rate option. See *Table 6: L-band Satellites* below.

Frequency

Use this option to manually select the L-band frequency. This option is only available when the tracking mode is set to MANUAL.

Press the **Enter** button to enable frequency input. Use the **Left** or **Right** buttons to select the required digit to change, then use the **Up** and **Down** buttons to change the value of the digit. When the user frequency is displayed, press the **Enter** button to save to receiver.

The input range for Beam Frequency is 1525.0000 to 1559.9999. See *Table 6: L-band Satellites* below.

Table 6: L-band Satellites

Satellite	Baud	Frequency	Location
AORW	1200 baud	1545.8450 MHz	54.00° west longitude
IOR	1200 baud	1545.8650 MHz	64.50° east longitude
25E	1200 baud	1545.8250 MHz	25.00° east longitude
143.5E	1200 baud	1545.8350 MHz	143.50° east longitude
98W	1200 baud	1545.8650 MHz	98.00° west longitude

After the configuration options have been set, press the **Enter** button to accept the changes and save the LBAND settings to the receiver.

Press the **Back** button to return to the LBAND Status screen or press the **Home** button to return to the Position Status screen.

3.6.2 Enabling Oceanix Correction Services

With correction data from Oceanix Correction Services and NovAtel's Precise Point Positioning (PPP) algorithm, the MarinePak7 can achieve centimetre-level positioning accuracy.

To use Oceanix Correction Services and obtain a PPP solution, perform the following steps.

1. Ensure the GNSS system has the required components. See *Required Hardware* below.

2. Ensure the MarinePak7 has a model that supports Oceanix Correction Services. See *Receiver Models Needed for Oceanix Correction Services* below.

3. Enable L-band tracking on the MarinePak7. See *Enable L-band Tracking* below.

4. Obtain a subscription to Oceanix Correction Services. See *Oceanix Subscriptions* on the next page.

Required Hardware

The GNSS system requires the following components:

- A MarinePak7 receiver

- A GNSS antenna capable of receiving L-band signals.

  For the best Oceanix performance, select a GNSS antenna that provides full GNSS signal support. (i.e., GPS L1/L2/L5, GLONAS L1/L2, Galileo E1/E5a/E5b/E6 and BeiDou B1C/B2a/B2b/B3)

  Refer to our web site novatel.com/products/gps-gnss-antennas for information about NovAtel L-band-capable antennas.

- Receiver firmware that is compatible with Oceanix Correction Services (firmware version 1.2.0 or later).

For instructions on upgrading the MarinePak7 receiver firmware, refer to *Firmware* on page 101.

Receiver Models Needed for Oceanix Correction Services

Specific receiver models are required to use the correction data provided by Oceanix Correction Services.

To check the model of the receiver:

1. Navigate to the SYSTEM INFO screen. The receiver model is shown in the MODEL field.

2. Check the receiver model shown in the MODEL field. The first four letters of the receiver model must be FDN-P or FDN-R.

> ⓘ An R model is required to unlock the RTK bridging functionality.

3. If the receiver does not have the model required, contact your local NovAtel sales representative to upgrade the receiver model.

Enable L-band Tracking

The receiver must be powered and tracking the L-band signal from an Oceanix satellite prior to the planned activation time. To enable L-band tracking:

1. Navigate to the LBAND STATUS screen.

2. Press the **Enter** button to access the LBAND CONFIG screen.

3. Change the **Tracking Mode** parameter to **AUTO**.

4. Press the **Back** button to return to the LBAND STATUS screen.

5. When the MarinePak7 is receiving L-band signals, the satellites being tracked are shown on the LBAND STATUS screen.

Oceanix Subscriptions

A subscription is required to use Oceanix Correction Services for near shore applications. Near shore applications are defined as vessels operating within 10 km of shore.

For more information about Oceanix services, visit novatel.com/products/gps-gnss-correction-services/oceanix-correction-services.

Obtain a Subscription

To obtain a subscription, contact your local NovAtel sales representative.

The Product Serial Number (PSN) is needed to obtain an Oceanix subscription. To obtain the PSN, navigate to the SYSTEM INFO screen. The PSN is shown in the Serial Number field.

Verify the Subscription Status

After a subscription is purchased, the subscription activation signal can be broadcast at the time of the service activation (default), or at a specified start date and time (upon user request).

> ⓘ   The receiver must be configured to track the Oceanix signal prior to the subscription start time. See *Enable L-band Tracking* on the previous page.

To confirm the Oceanix subscription status, navigate to the LBAND STATUS screen. The Oceanix Status field displays the subscription status.

The first field should be **ENABLE** to indicate the Oceanix subscription is valid. The second field should be **LOCKED** to indicate the decoder is locked to the data format.

Monitor PPP Convergence

The PPP position calculated using Oceanix Correction Services is not ready for use until the PPP solution has converged.

To monitor the PPP convergence, navigate to the POSITION STATUS. The position type is shown in the MODE field.

Initially the position type will report *PPP_CONVERGING*. After the PPP solution has converged, the position type will change to *PPP*.
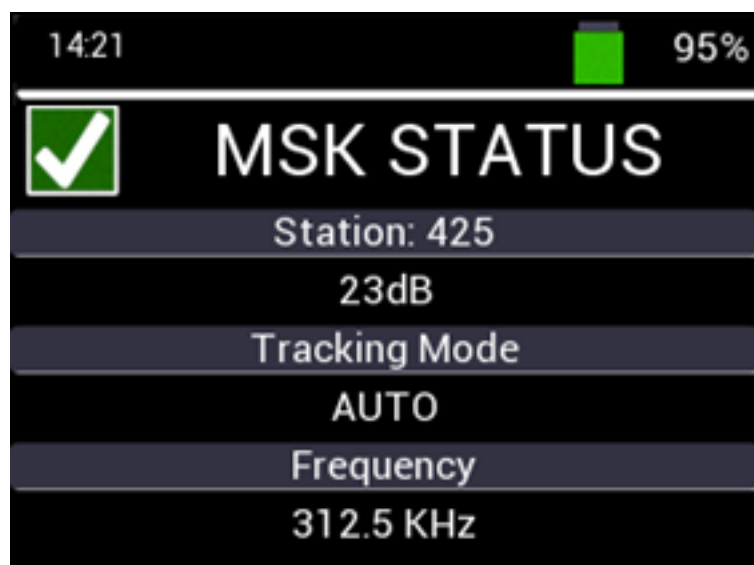
3.7 MSK Status

> ⓘ   The MSK Status and MSK Configuration screens are not visible when the MarinePak7 is in Base Station mode. You must change the MarinePak7 mode to **Rover** on the System Configuration screen (see *System Configuration* on page 60) to access MSK screens.
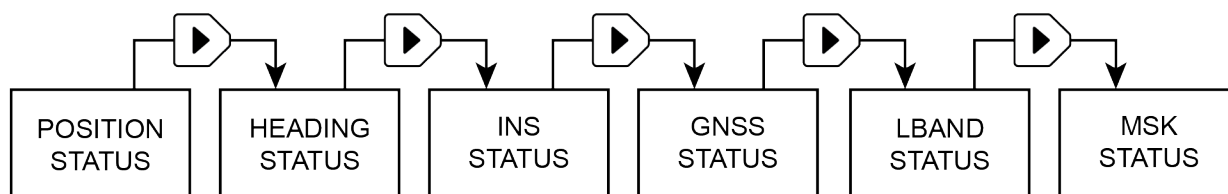
> ⓘ   To enable the MSK module, the correction source (*Correction Src*) must be set to **MSK** on the Position Configuration screen (see *Position Configuration* on page 31).

The MSK status screen provides the status of the MSK beacon module.

To access the MSK Status screen from the Home screen, press the **Right** button until the MSK Status screen displays.

Status Indicator	Displays green when the MSK module is locked onto a valid correction source.
	Displays red when the MSK module is not active or not locked onto a valid correction source.
Station	The station ID of the DGPS corrections source being received.
MSK Signal Strength	The signal strength of the signal being received by the MSK module.
Tracking Mode	The tracking mode active on the MSK module (Auto or Manual).
Frequency	The tuned MSK frequency setting of the MSK module.

3.7.1 MSK Configuration

From the MSK Status screen, press the **Enter** button to access the MSK Config screen.
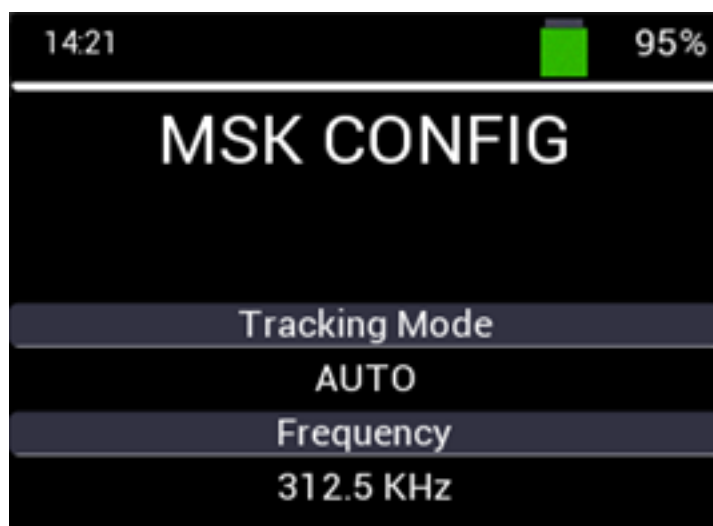
Use the **Up** and **Down** buttons to select the MSK configuration option. Move to the parameter that is to be configured and press the **Enter** button to enable EDIT MODE<>. Use the arrow buttons to change the configuration. Press the **Enter** button to save the configuration.

Tracking Mode

When selected, press the **Right** or **Left** button to select a tracking mode option.

Auto	Automatic MSK search mode.
Manual	Manual tune mode. Requires manual frequency tuning.

Frequency

This option is only available when MANUAL mode is selected.

Press the **Right** or **Left** button to change the value of the Beacon Frequency. This value ranges from 283.5 kHz to 325 kHz.

After the configuration options have been set, press the **Enter** button to accept the changes and save the setting to the receiver.

Press the **Back** button to return to the MSK Status screen or press the **Home** button to return to the Position Status screen.

3.8   UHF Status

> (i) The UHF module is available only on select MarinePak7 models. The UHF Status and UHF Configuration screens are not available on MarinePak7 models without the UHF module.

> (i) The UHF Status and UHF Configuration screens are not visible when the MarinePak7 is in Base Station mode. You must change the MarinePak7 mode to **Rover** on the System Configuration screen (see *System Configuration* on page 60) to access UHF screens.
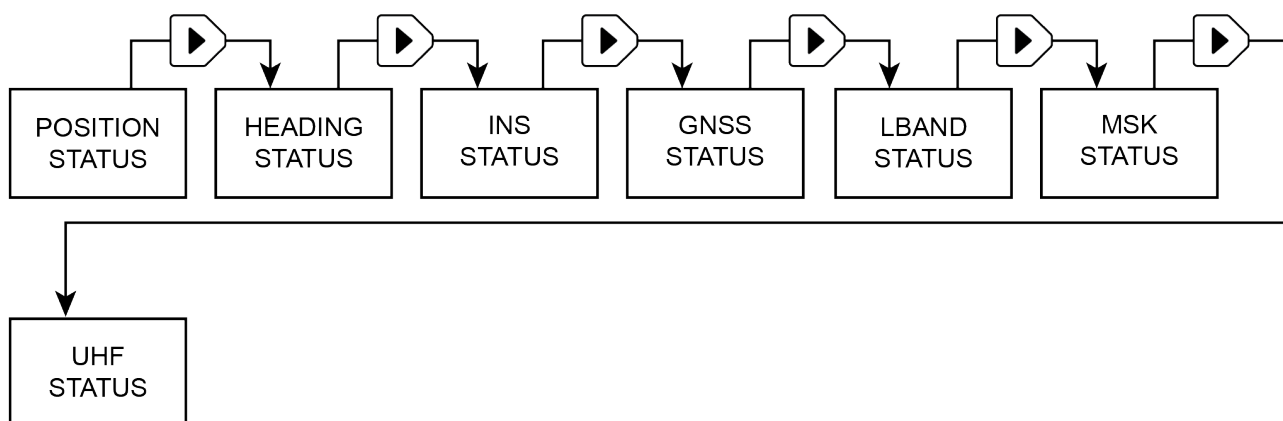
> To enable the UHF module, the correction source (*Correction Src*) must be set to **UHF** on the Position Configuration screen (see *Position Configuration* on page 31).

This screen display the status of the UHF radio module.
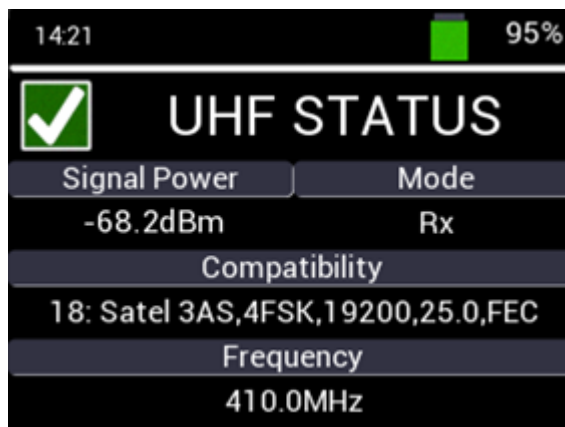
To access the UHF Status screen from the Home screen, press the **Right** button until the UHF Status screen displays.

Status Indicator	Displays GREEN when the UHF module is locked onto a UHF channel.
Signal Power	Displays the UHF reception signal power.
Mode	Displays the mode to which the UHF radio is set: RX (Receive).
Compatibility	Displays the current UHF radio compatibility mode.
Frequency	Displays the radio frequency of the selected UHF channel.

3.8.1   UHF Configuration

From the UHF Status screen, press the **Enter** button to access the UHF configuration screen.
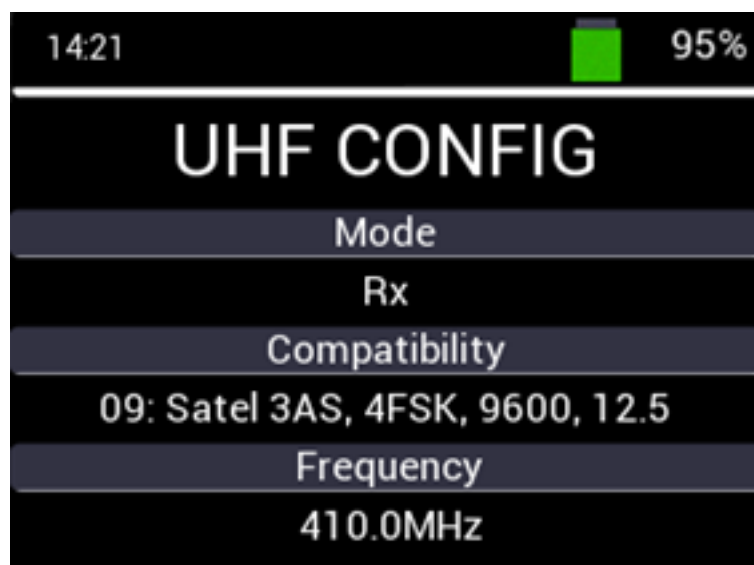
Use the **Up** and **Down** buttons to navigate between the configuration options. Move to the parameter that is to be configured and press the **Enter** button to enable EDIT MODE<>. Use the arrow buttons to change the configuration. Press the **Enter** button to save the configuration.

Compatibility Mode

Use the **Left** and **Right** buttons to select the UHF radio modem protocol.

Compatibility Mode	Protocol	Modulation	Link Rate (bps), Channel Spacing (kHz)	FEC
0	PacCrest	GMSK	4800,12.5	ON
1	PacCrest	GMSK	4800,12.5	OFF
2	PacCrest	4FSK	9600,12.5	ON
3	PacCrest	4FSK	9600,12.5	OFF
4	PacCrest FST	4FSK	9600,12.5	ON
5	PacCrest FST	4FSK	9600,12.5	OFF
6	Trimtalk	GMSK	4800,12.5	
7	Trimtalk	GMSK	8000,12.5	
8	Satel 3AS	4FSK	9600,12.5	ON
9	Satel 3AS	4FSK	9600,12.5	OFF
10	PacCrest	GMSK	9600,25.0	ON

Compatibility Mode	Protocol	Modulation	Link Rate (bps), Channel Spacing (kHz)	FEC
11	PacCrest	GMSK	9600,25.0	OFF
12	PacCrest	4FSK	19200,25.0	ON
13	PacCrest	4FSK	19200,25.0	OFF
14	PacCrest FST	4FSK	19200,25.0	ON
15	PacCrest FST	4FSK	19200,25.0	OFF
16	Trimtalk	GMSK	9600,25.0	
17	Trimtalk	GMSK	16000,12.5	
18	Satel 3AS	4FSK	19200,25.0	ON
19	Satel 3AS	4FSK	19200,25.0	OFF

Frequency

Use the **Left** and **Right** buttons to set the radio frequency of the selected UHF channel (410.000 MHz to 475.000 MHz).

After the configuration options have been set, press the **Enter** button to accept the changes and save the settings to the receiver.

Press the **Back** button to return to the UHF Status screen or press the **Home** button to return to the Position Status screen.

3.9   GSM Status

The GSM Status screen is not visible when the MarinePak7 is in Base Station mode. You must change the MarinePak7 mode to Rover on the *System Configuration* screen (see *System Configuration* on page 60) to access GSM Status screen.

To enable the GSM module, the correction source (*Correction Src*) must be set to **GSM** on the Position Configuration screen (see *Position Configuration* on page 31).

This screen displays the status of the GSM cellular modem.
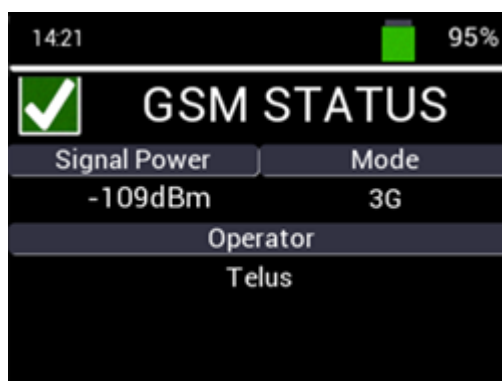
To access the GSM Status screen from the Home screen, press the **Right** button until the GSM Status screen displays.
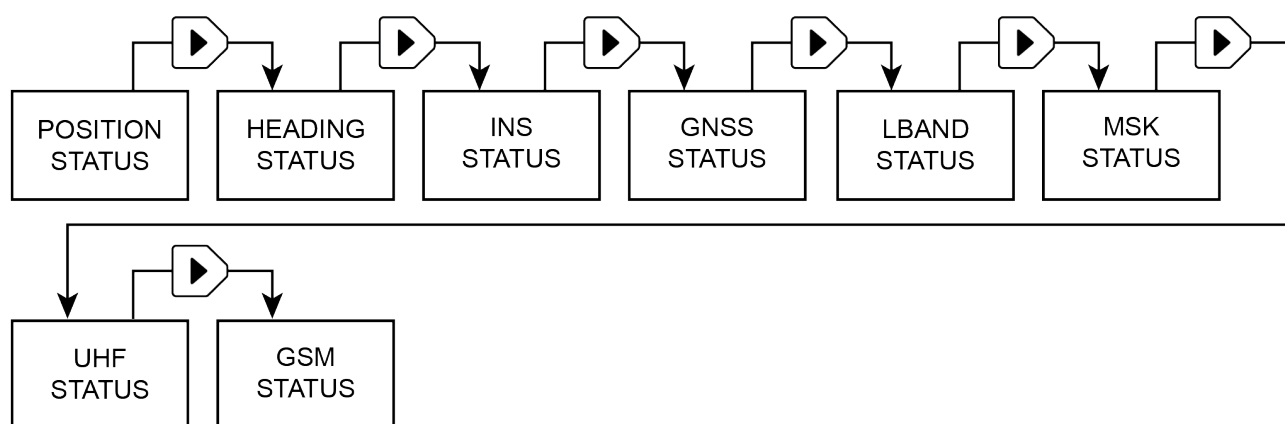
> ⓘ For MarinePak7 models without the UHF module, the GSM Status screen follows the MSK Status screen.

Signal Power	Displays the signal strength of the received cellular signal.
Mode	Displays the cellular connection mode (GPRS/3G/4G).
Operator	Displays the cellular network operator.

3.10   Serial Status

The Serial Status screen displays the status of the receiver's serial (COM) ports.
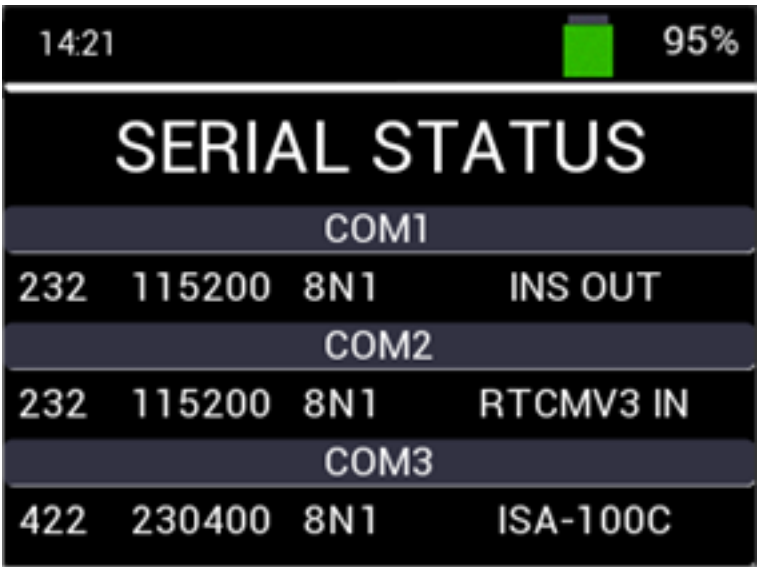
To access the Serial Status screen from the Home screen, press the **Right** button until the Serial Status screen displays.
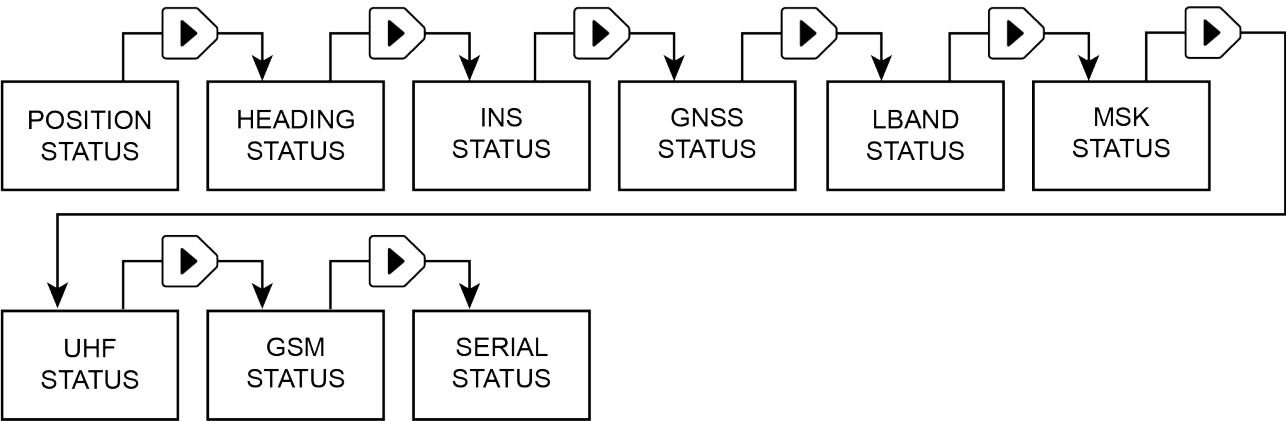
ⓘ	For MarinePak7 models without the UHF module, the GSM Status screen follows the MSK Status screen.

The following parameters are available for each serial port.

Serial Line Standard	Displays the COM port line standard (RS232/RS422).
Baud Rate	Displays the COM port baud rate.
Serial Protocol Settings	Displays the COM port communication settings (data bits, parity, stop bits).
Receive or Transmit Protocol	Displays the receive or transmit interface mode. The interface mode determines the type of messages the serial port accepts or transmits. See *Receive or Transmit Protocol* on page 52.

3.10.1 Serial Configuration

From the Serial Status screen, press the **Enter** button to access the Serial configuration screen.

Use the **Up** and **Down** buttons to navigate between the configuration options. Move to the parameter that is to be configured and press the **Enter** button to enable EDIT MODE<>. Use the arrow buttons to change the configuration. Press the **Enter** button to save the configuration.

COM Port Selection

Use the **Left** or **Right** button to select the COM port configuration.

Line Standard

Use the **Left** or **Right** button to select RS232 or RS422 as the COM port line standard. (default = RS232)

Baud Rate

Use the **Left** or **Right** button to select the baud rate used by the COM port. The available baud rates are: 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800.

Port settings

1. Use the **Left** or **Right** button to select the port.
2. Press the **Enter** button to access the parameter options.
3. Use the **Left** or **Right** button to select the required parameter.
4. Press the **Enter** button to confirm selection and return to the port.

Data bits	7	7 data bits
	8	8 data bits (default)
Parity	N	No parity (default)
	E	Even parity
	O	Odd parity
Stop bits	1	1 stop bit (default)
	2	2 stop bits

Receive or Transmit Protocol

Use the **Left** or **Right** button to select the required receive or transmit protocol.

Rx Protocols	Tx Protocols	Receiver Mode	Description
NONE	NONE	Base and Rover	Disables transmit and receive on the port.
–	NMEA OUT	Rover	Outputs NMEA messages
–	CMR OUT	Base	Outputs CMR correction messages
–	RTCMV3 OUT	Base	Outputs RTCMV3 correction messages
–	NOVX OUT	Base	Outputs NOVATELX correction messages
CONFIG	CONFIG	Base and Rover	Enables direct communication with the OEM7 GNSS receiver via COM1 to COM3
ISA100C	ISA100C	Rover	Select when a SPAN ISA100C IMU is connected to the port
µIMU	µIMU	Rover	Select when a SPAN µIMU IMU is connected to the port
	INS OUT	Rover	Outputs INS messages
CMR IN	–	Rover	Accepts CMR corrections (External Source)
RTCMV3 IN	–	Rover	Accepts RTCMV3 corrections (External Source)
NOVX IN	–	Rover	Accepts NOVATELX corrections (External Source)

NMEA Messages

When you select NMEA as the output protocol, you need to choose the NMEA messages and data output rate.

When NMEA is highlighted, press the **Enter** button to access the NMEA message selection option. Use the **Left** or **Right** button to scroll through the NMEA messages available. Select the required message and press the **Enter** button to access message output rate options.

GGA	Global Position System Fix Data and Undulation
GLL	Geographic Position
GSA	GPS DOP on Active Satellites

GST	Pseudorange Measurement Noise Statistics
GSV	GPS Satellites in View
HDT	NMEA Heading Log (ALIGN)
RMC	GPS Specific Information
VTG	Track Made Good and Ground Speed
ZDA	UTC Time and Date

When an NMEA message is selected, a message output frequency option is displayed next to the message. The default parameter is 1 Hz. Highlight the frequency parameter and set the required output rate in Hz. The available message output rates (Hz) are 1, 2, 5, 10, 20, 50, 100, 200.

> Availability of the 20 Hz, 50 Hz, 100 Hz and 200 Hz messages is Receiver Model dependent.
>
> 50 Hz, 100 Hz and 200 Hz messages are available only for INS Output.

INS Messages

When INS Out is selected , the INS message types and output rate must also be selected in a subsequent operation.

When INS OUT is highlighted, press the **Enter** button to access the INS message selection option. Use the **Left** or **Right** button to scroll through the INS messages available. Select the required message and press the **Enter** button to access message output rate options. The available message types are:

HVE	SPAN Heave message
PVA	SPAN INSPVA message
PRH	SPAN PASHR, NMEA, Inertial Attitude Data
TSS	SPAN TSS1 Protocol for Heave, Roll and Pitch

When an INS message is selected, a message output frequency option is displayed next to the message. The default parameter is 1 Hz. Highlight the frequency parameter and set the required output rate in Hz. The available message output rates (Hz) are 1, 2, 5, 10, 20, 50, 100, 200.

> For the HVE message (SPAN Heave), only the ONNEW option is available. This option outputs the message when the message is updated.

After the configuration options have been set, press the **Enter** button to accept the changes and save the settings to the receiver.

Press the **Back** button to return to the Serial Status screen or press the **HOME** button to return to the Position Status screen.

3.11   Net Port Status

The Net Port Status screen displays the status of the network port (ICOM port) the receiver uses to communicate through the Ethernet connection.
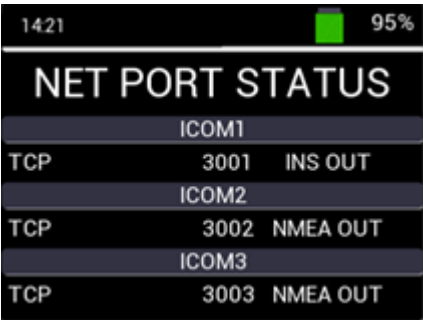
To access the Network Status screen from the Home screen, press the **Right** button until the Net Port Status screen displays.
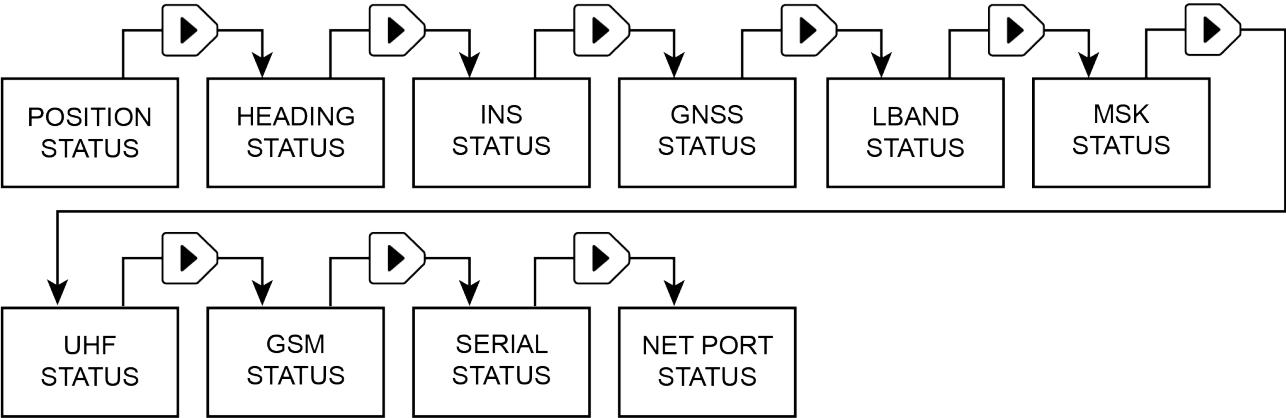
> ⓘ For MarinePak7 models without the UHF module, the GSM Status screen follows the MSK Status screen.

The following parameters are available for each ICOM port.

Protocol	The protocol used by the ICOM port.
Port Number	The network port number.
Rx or Tx Protocol	Displays the receive or transmit protocol. The protocol determines the type of messages the ICOM port accepts or transmits.

3.11.1   Net Port Configuration

From the Net Port Status screen, press the **Enter** button to access the Net Port configuration screen.
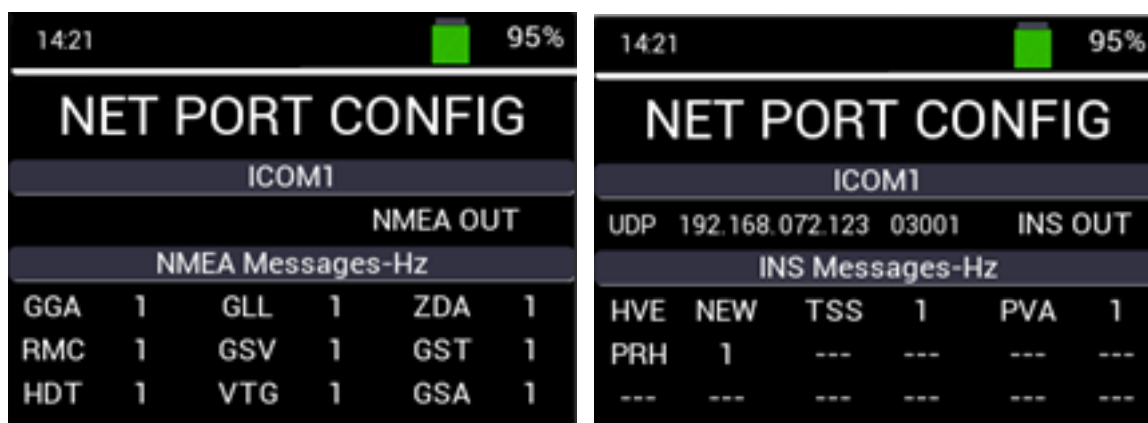
Use the **Up** and **Down** buttons to navigate between the configuration options. Move to the parameter that is to be configured and press the **Enter** button to enable EDIT MODE<>. Use the arrow buttons to change the configuration. Press the **Enter** button to save the configuration.

ICOM Port

Use the **Left** or **Right** button to select the ICOM port to which the settings apply (ICOM1, ICOM2, ICOM3).

Net Port Mode (TCP/UDP)

Use the **Left** or **Right** button to select TCP or UDP as the port mode.

UDP IP Address

Use the **Left** or **Right** button to set the UDP IP address.

TCP/UDP Port

Use the **Left** or **Right** button to set the TCP/UDP port.

Rx or Tx Protocol

Use the **Left** or **Right** button to select the protocol accepted through the ICOM port.

Rx Protocols	Tx Protocols	Receiver Mode	Description
NONE	NONE	Base and Rover	Disables transmit and receive on the port
–	NMEA OUT	Rover	Outputs only NMEA messages
	INS OUT	Rover	Outputs only SPAN INS messages
CONFIG	CONFIG	Base and Rover	Enables direct communication with MarinePak7 via ICOM Ports

NMEA Messages

When selecting NMEA as the output protocol, choose the NMEA messages and data output rate as a subsequent configuration step.

When NMEA is highlighted, press the **Enter** button to access the NMEA message selection option. Use the **Left** or **Right** button to scroll through the NMEA messages available. Select the required message and press the **Enter** button to access message output rate options.

GGA	Global Position System Fix Data and Undulation
GLL	Geographic Position
GSA	GPS DOP on Active Satellites
GST	Pseudorange Measurement Noise Statistics
GSV	GPS Satellites in View
HDT	NMEA Heading Log (ALIGN)
RMC	GPS Specific Information
VTG	Track Made Good and Ground Speed
ZDA	UTC Time and Date

Press the **Enter** button to access the data output rate options. The available data output rates (in Hz) are: 1, 2, 5, 10, 20, 50, 100.

> ⓘ   Availability of the 20 Hz, 50 Hz and 100 Hz messages is Receiver Model dependent.
>
> 50 Hz and 100 Hz messages are available only for INS Output.

INS Messages

When you select INS OUT as the output protocol, you need to choose the INS messages and data output rate.

When INS OUT is highlighted, press the **Enter** button to access the INS message selection option. Use the **Left** or **Right** button to scroll through the INS messages available. Select the required message and press the **Enter** button to access message output rate options.

HVE	SPAN Heave message
PVA	SPAN INSPVA message
PRH	SPAN PASHR, NMEA, Inertial Attitude Data
TSS	SPAN TSS1 Protocol for Heave, Roll and Pitch

When an INS message is selected a message output frequency option will be displayed next to the message. The default parameter is 1 Hz. Highlight the frequency parameter and set the required output rate in Hz. The available message output rates (in Hz) are 1, 2, 5, 10, 20, 50, 100, 200.

> ⓘ   For the HVE message (SPAN Heave), the ONNEW option is available. This option outputs the message when the message is updated.

After all the configuration options have been set, press the **Enter** button to accept the changes and save the settings to the receiver.

Press the **Back** button to return to the Net Port Status screen. Press the **HOME** button to return to the Position Status screen.

3.12 Network Status

The Network Status screen displays the status of the receiver's network connection.
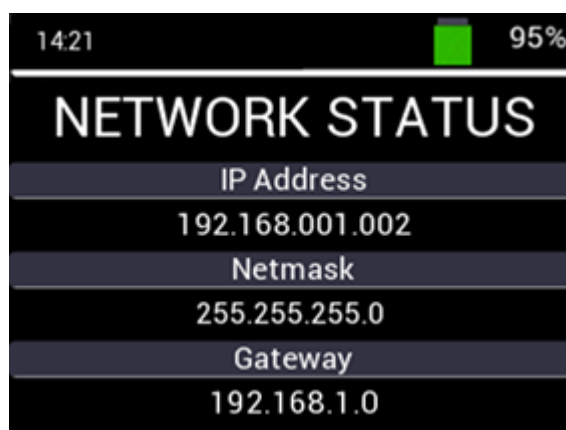
To access the Network Status screen from the Home screen, press the **Right** button until the Network Status screen displays.
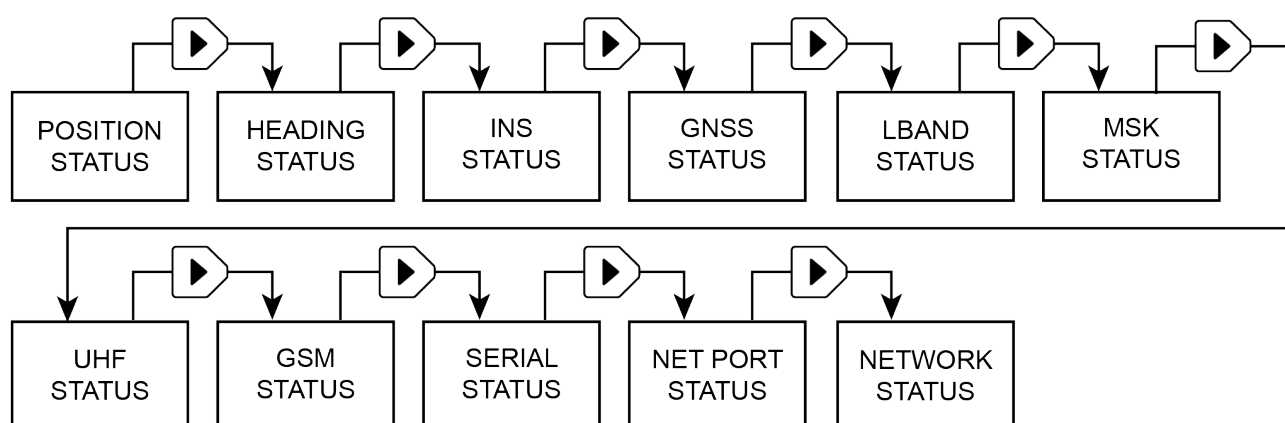
ⓘ For MarinePak7 models without the UHF module, the GSM Status screen follows the MSK Status screen.

IP Address	IP address of the receiver.
Netmask	Netmask for the receiver.
Gateway	IP address for the gateway.

3.12.1 Network Configuration

From the Network Status screen, press the **Enter** button to access the Network configuration screen.
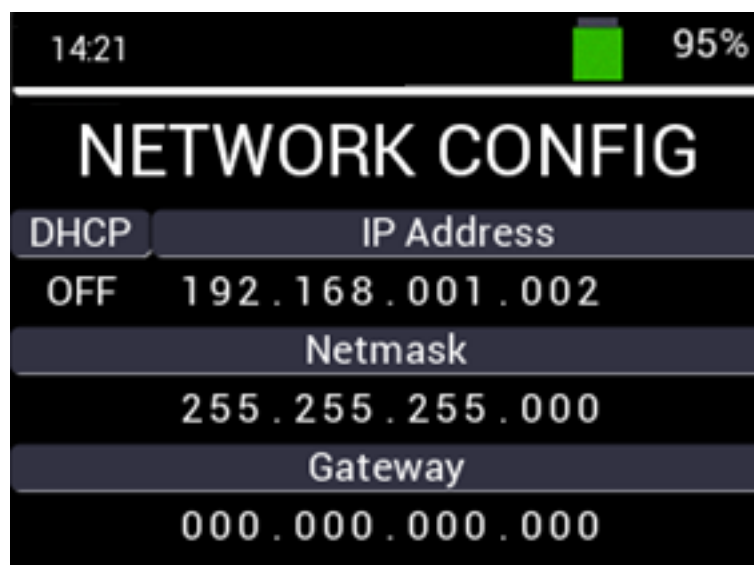
Use the **Up** and **Down** buttons to navigate between the configuration options. Move to the parameter that is to be configured and press the **Enter** button to enable EDIT MODE<>. Use the arrow buttons to change the configuration. Press the **Enter** button to save the configuration.

DHCP Mode

Use the **Left** or **Right** button to select the DHCP mode.

ON	Use Dynamic IP address
OFF	Use Static IP address

IP Address

The IP Address is only configurable if the DHCP Mode is set to **OFF**.

Use the **Left** and **Right** buttons to move between digits.

Use the **Up** and **Down** buttons to change the value of each digit.

Press the **Enter** button to save the IP Address and return to Network Config screen.

Netmask

The Netmask is only configurable if the DHCP Mode is set to **OFF**.

Use the **Left**and **Right** buttons to move between digits.

Use the **Up** and **Down** buttons to change the value of each digit.

Press the **Enter** button to save the Netmask and return to Network Config screen.

Gateway

The Gateway is only configurable if the DHCP Mode is set to **OFF**.

Use the **Left**and **Right** buttons to move between digits.

Use the **Up** and **Down** buttons to change the value of each digit.

Press the **Enter** button to save the Gateway IP address and return to Network Config screen.

After all the configuration options have been set, press the **Enter** button to accept the changes and save the settings to the receiver.

Press the **Back** button to return to the Network Status screen. Press the **HOME** button to return to the Position Status screen.

3.13   System Status
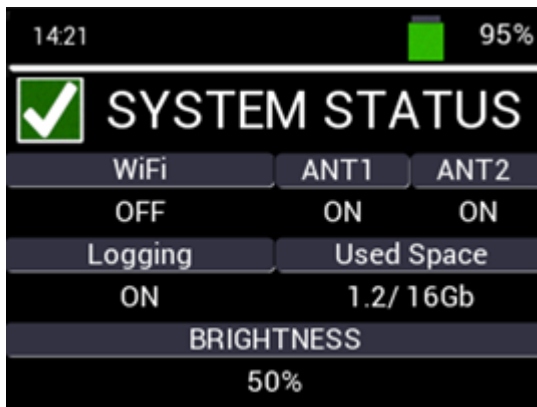
To access the System Status screen from the Home screen, press the **Right** button until the System Status screen displays.
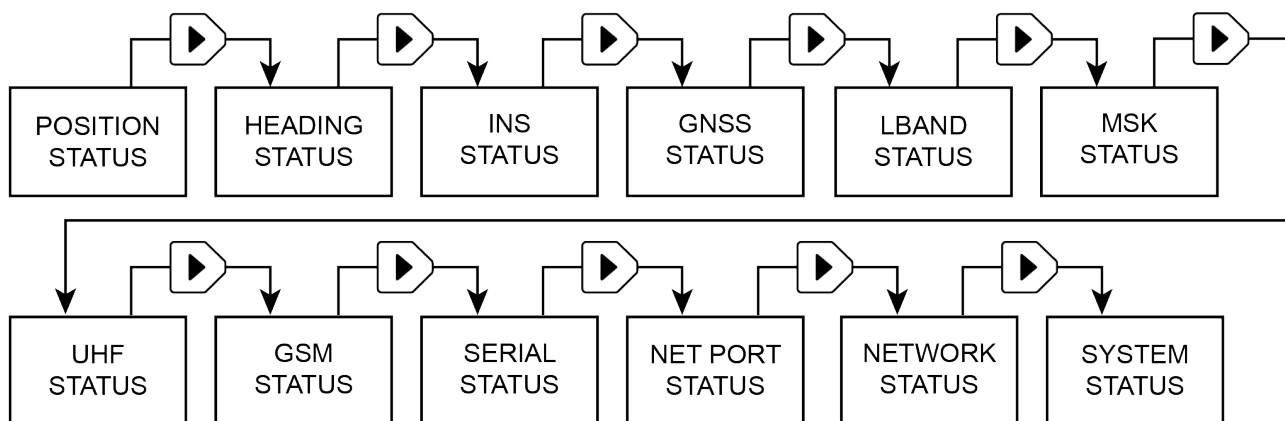
> (i) For MarinePak7 models without the UHF module, the GSM Status screen follows the MSK Status screen.

WiFi	Wi-Fi status (On or Off).
ANT1	LNA DC power (antenna power) status for the GNSS1 port (On or Off). (For the primary GNSS (RF1) and MSK beacon antenna.)
ANT2	LNA DC power (antenna power) status for the GNSS2 port (On or Off). (For the secondary GNSS (RF2) antenna.)
Logging	Internal logging status (On or Off).
Used Space	Displays the amount of internal memory used for logging (in GB). For example, **1.2/16.0** equates to 1.2 GB used out of 16.0 GB available.
Brightness	Shows the LCD lighting intensity (10% to 100%).

3.13.1   System Configuration

From the System Status screen, press the **Enter** button to access the System configuration screen.
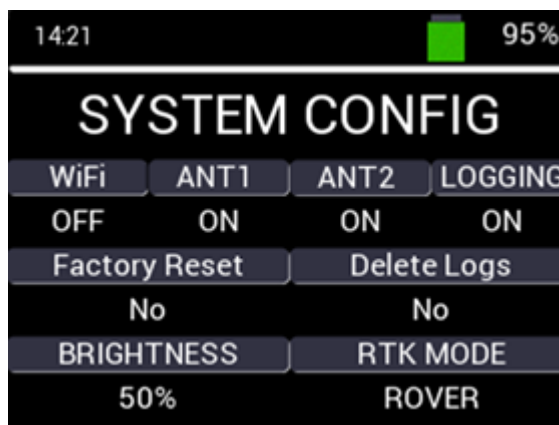
Use the **Up** and **Down** buttons to navigate between the configuration options. Move to the parameter that is to be configured and press the **Enter** button to enable EDIT MODE<>. Use the arrow buttons to change the configuration. Press the **Enter** button to save the configuration.

WiFi

1. Press the **Left** or **Right** button to highlight the WiFi option.

2. Press the **Enter** button to access the On and Off option.

3. Press the **Left** or **Right** button to make a selection.

   On   Enables WiFi.

   Off   Disables WiFi.

4. Press the **Enter** button to confirm the selection.

ANT1

1. Press the **Left** or **Right** button to highlight the ANT1 option.

2. Press the **Enter** button to access the On and Off option.

3. Press the **Left** or **Right** button to make a selection.

   On   Enables antenna power to the GNSS1 port. This port connects to the primary GNSS \ MSK beacon antenna.

   Off   Disables power to the GNSS1 port.

4. Press the **Enter** button to confirm the selection.

ANT2

1. Press the **Left** or **Right** button to highlight the ANT2 option.

2. Press the **Enter** button to access the On and Off option.

3. Press the **Left** or **Right** button to make a selection.

> **On**   Enables antenna power to the GNSS2 port. This port connects to the secondary GNSS antenna.
>
> **Off**   Disables power to the GNSS2 port.

4. Press the **Enter** button to confirm the selection.

Logging

1. Press the **Left** or **Right** button to highlight the option.
2. Press the **Enter** button to access the On and Off option.
3. Press the **Left** or **Right** button to make a selection.

> **On**   Enables receiver logging.
>
> **Off**   Disables receiver logging.

4. Press the **Enter** button to confirm the selection.

Factory Reset

To perform a factory reset of the receiver, press the **Enter** button. A confirmation screen appears.

- To confirm and initiate a factory reset, press the **Enter** button.
- To cancel a factory reset press the **Back** button.

Delete Logs

1. Press the **Left** or **Right** button to highlight the Delete Logs option.
2. Press the **Enter** button to access the On and Off option.
3. Press the **Left** or **Right** button to make a selection.

> **Yes**   Remove previously saved logs from the internal memory.
>
> **No**   Do not delete logs.

4. Press the **Enter** button to confirm the selection.

Brightness Control

Press the **Left**, **Right**, **Up** or **Down** button to select the brightness level options. The brightness is incremented in 10% steps.

RTK Mode

This option sets the receiver to either RTK rover mode or RTK base station mode. By default, the receiver is set to rover mode.

RTK Mode	Solution Type	Description
ROVER	NARROW_INT SINGLE PPP	NARROW_INT is achieved when compatible and valid RTK corrections are received.
BASE	FIXEDPOS	FIX position solution is achieved when the base station coordinates are input into the *Base Station Configuration* on page 32 screen. ⓘ The correction source, type and baud rate must first be set while receiver is in ROVER mode.

After all the configuration options have been set, press the **Enter** button to accept the changes and save the settings to the receiver.

Press the **Back** button to return to the System Status screen or press the **HOME** button to return to the Position Status screen.

3.14   System Information

14:21   95%

SYSTEM INFO

Model

FDDRYNTBNS3A

Software   Firmware

1.3.0   OM7MR0814RN0000

SerialNumber

XMYX20400500W

To access the System Information screen from the Home screen, press the **Right** button until the System Info screen displays.
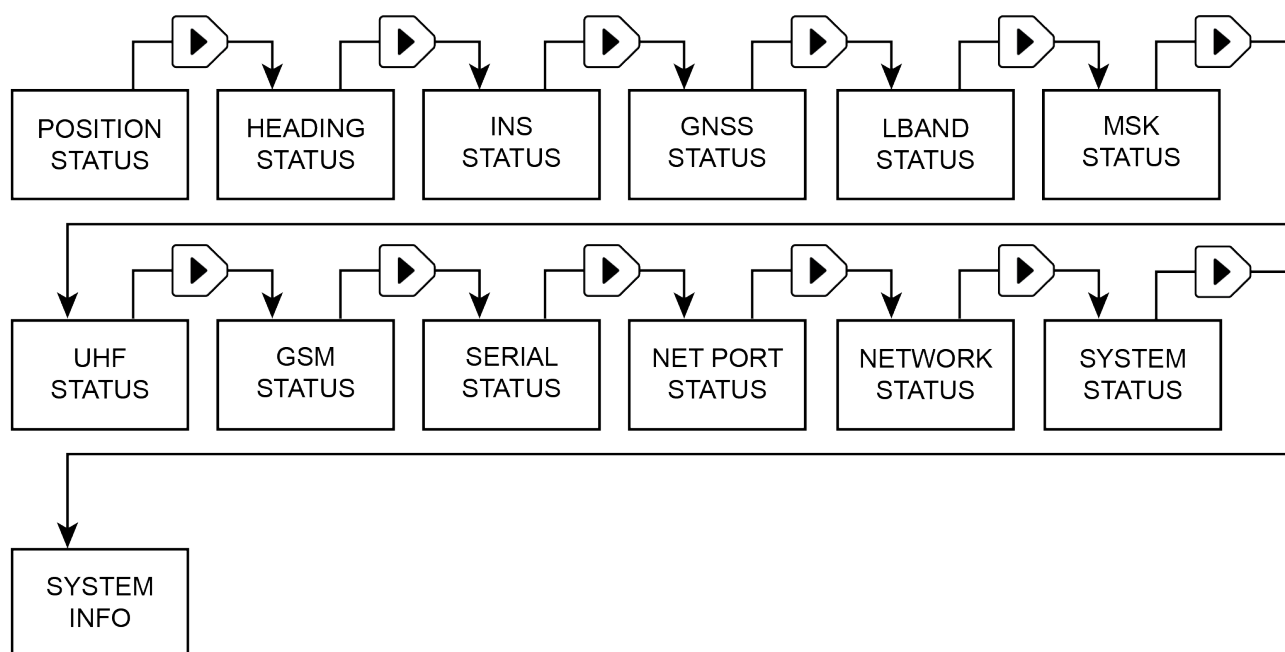
ℹ️ For MarinePak7 models without the UHF module, the GSM Status screen follows the MSK Status screen.

Model	Displays the purchased firmware model of the OEM7720 GNSS receiver.
Software	Displays the MarinePak7 software version.
Firmware	Displays the firmware version of the OEM7720 GNSS receiver.
Serial Number	Displays the Product Serial Number (PSN) for the MarinePak7. The PSN is required when ordering Oceanix subscriptions.

Chapter 4 Web User Interface

The Web User Interface (Web UI) provides access to the MarinePak7 via a WiFi connection.

Once communication has been established with the receiver, the NovAtel Web UI can be opened using a web browser.

4.1 Open the Web UI

Once the MarinePak7 is connected and powered, use a WiFi capable device to locate the MarinePak7 in the list of detected WiFi Networks and establish a connection. The MarinePak7 SSID is printed on a label on the side of the receiver. The format of the SSID is MarinePak7-<Receiver PSN>, e.g. "MarinePak7-ABCDEF1234567".

A prompt for a password will appear. The default password is **MarinePak7**.

> Cookies should always be on and never blocked on the browser being used to connect to the WiFi network.

After a WiFi connection is established, open a web browser and navigate to the receiver's URL, which is 192.168.3.1 by default. The receiver Web UI home page opens.

4.2 Web UI Menu

Select an option from the side menu to open the corresponding windows.

NovAtel

MENU

- 🏠 Dashboard
- 📍 **GNSS Receiver**
- ◎ LBand
- 📶 UHF Radio
- 📡 MSK Beacon
- ⚕ Serial Ports
- ⚕ Net Ports
- ▢ Logging
- ⅄ System

4.3   Dashboard

The tiles on the Dashboard provide an overview of the receiver operational status.

4.3.1   General Status Tile

Provides the GNSS and logging status.

GNSS	Displays green when the receiver is tracking more than 4 healthy satellites. Displays red when the receiver is tracking less than 4 healthy satellites. When the icon is red, the receiver cannot compute a valid position.
Position	Displays green when a position is being generated and a valid solution is computed (SOL_COMPUTED). Displays red when a solution status other than SOL_COMPUTED is reported from the receiver.
L-BAND	Displays green when the receiver has successfully locked onto at least 1 beam. Displays red when the receiver has failed to lock onto at least 1 beam. If the L-band status icon is red, check that you have a valid PPP (Oceanix or Veripos) subscription activated on the system. Ensure a multi-constellation, multi-frequency L-band compatible GNSS antenna is connected to the RF1 connector of the MarinePak7.
Heading	Displays green when a Heading solution has been computed. Displays red when there is no valid Heading solution. If the Heading status icon is red, check that a compatible GNSS antenna is connected to the RF2 connector of the MarinePak7. Also check that both antennas have a clear view of the sky and can track common satellites.
Logging	Displays [icon] when data logging is inactive. Displays [icon] when data logging is active.

4.3.2 Module Status Tile

Provides the status of the radio frequency modules in the MarinePak7. Only one radio frequency module can be activated at a time.
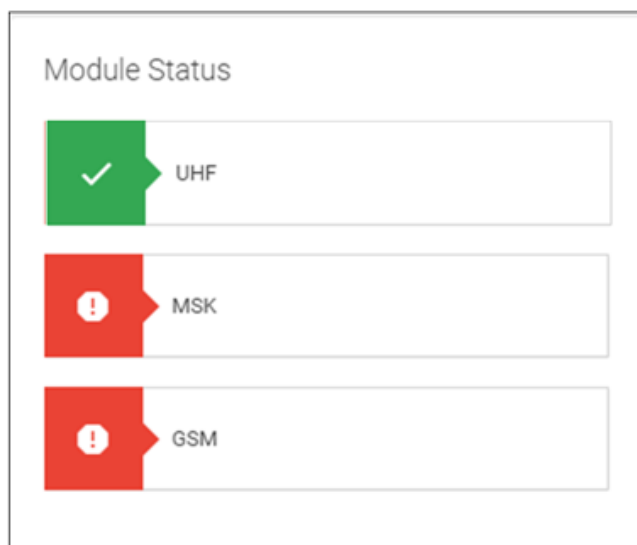
UHF	Displays green when the UHF module is active and locked onto a UHF channel.
	Displays red when the UHF module is not active.
MSK	Displays green when the MSK module is locked onto a valid correction source.
	Displays red when the MSK module is not active or not locked onto a valid correction source.
GSM	Displays green when the GSM cellular modem is active.
	Display red when the GSM cellular modem is not active.

4.4 GNSS Receiver

This page has several tiles that provide detailed information about the GNSS receiver.

From this page, the MarinePak7 configuration settings can be adjusted.

4.4.1 GNSS Status Tile

The GNSS Status tile provides information about the satellites used in the solution and the solution DOP values.

GNSS Status	A green circle in the top right corner indicates GNSS tracking is healthy. A red circle is a warning that satellite tracking has fallen below the minimum required to obtain a computed solution (SOL_COMPUTED).
GPS Satellites	Number of GPS satellites used in the solution.
GLO Satellites	Number of GLONASS satellites used in the solution.
BDS Satellites	Number of BeiDou satellites used in the solution.
GAL Satellites	Number of Galileo satellites used in the solution.
HDOP	Horizontal Dilution of Precision of the computed solution.
PDOP	Position Dilution of Precision of the computed solution.
VDOP	Vertical Dilution of Precision of the computed solution.

4.4.2   Position Status Tile

The Position Status tile provides information about the computed solution.

Position Status	A green circle in the top right corner indicates a position is being generated and a valid solution is computed (SOL_COMPUTED). A red circle indicates a solution status other than SOL_COMPUTED is reported from the receiver.
Accuracy 2D	The horizontal standard deviation (RMS).
Accuracy Height	The vertical standard deviation (RMS).
Satellites	The number of satellites used in the computed solution.
Mode	The active position mode type. See *Table 5: Position Type* on page 30.

4.4.3   INS Status Tile

The INS Status tile provides information about the INS (SPAN) solution.
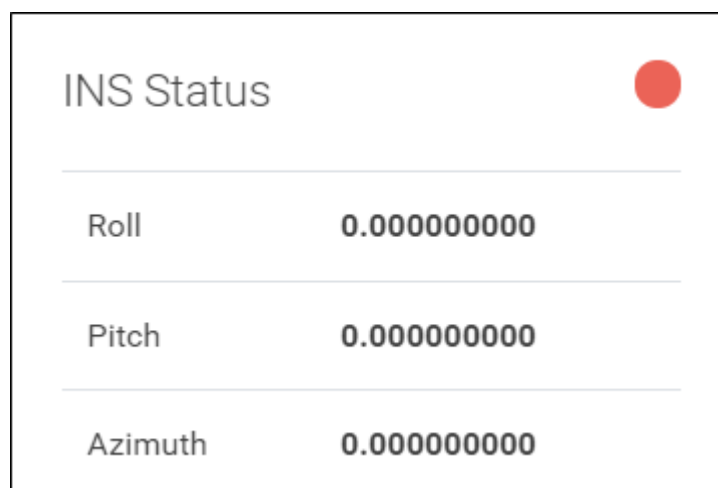
INS Status	A green circle in the top right corner indicates a SPAN solution has been computed. A red circle indicates a valid SPAN solution is not available.
Roll	Roll of the vessel.
Pitch	Pitch of the vessel.
Azimuth	Heading of the vessel.

4.4.4 Heading Status Tile

The Heading Status tile displays the current ALIGN Heading solution.
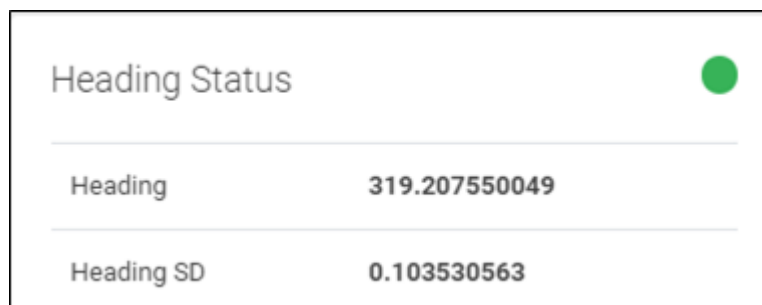
Heading Status	A green circle in the top right corner indicates GNSS Heading status is healthy. A red circle indicates that no Heading updates are being generated.
Heading	Heading (True North)
Heading SD	Heading standard deviation

4.4.5 GNSS Receiver Details Tile

The GNSS Receiver Details tile displays information about the OEM7720 GNSS receiver board in the MarinePak7.

GNSS Receiver Details	
Serial Number	DMMU20040097S
Firmware Version	OM7MR0702RN0000
H/W Version	OEM7720-1.01
Model	FDDRYNTBNA

Serial Number	Serial number of GNSS receiver board inside the MarinePak7.
Firmware Version	Firmware version of the GNSS receiver board.
H/W Version	Hardware version of the GNSS receiver board in the format: P-R Where P = hardware platform R = hardware revision Example: OEM7720-1.01
Model	Firmware model loaded on the GNSS receiver board.

4.4.6 Receiver Configurable Parameters Tile

This tile displays the active differential position configuration settings.

Receiver Configurable Parameters			
Correction Source	**Correction Format**	**Elevation mask**	
UHF	RTCMV3	00.0	

Click the **Edit** icon ( ) to enter the configuration window.

Edit Receiver Configuration

Correction Source

UHF

Correction Format

RTCMV3

Elevation mask

10

Save changes   Cancel

To configure the receiver parameters:

1. From the **Correction Source** drop-down menu, select the source.

MSK	Enable the MSK DGPS receiver module and RTCM correction format (Receive only).
UHF	Enable the Satel UHF radio module (Receive only).
GSM	Enable the GSM module and cellular corrections (subscription required) (Receive only).
NCOM	Enable the MarinePak7 NCOM port.

2. From the **Correction Format** drop menu, select the correction format used.

NOVX	NOVATELX correction format
RTCMV3	RTCMV3 RTK correction format
RTCMV2	RTCMV2 DGPS correction format (MSK only)
CMR	CMR correction format

3. In the **Elevation mask** box, enter the elevation mask.

   The value range is +90.0 degrees where 90 degrees is directly overhead and 0 degrees is the horizon (default = +5 Degrees). Satellites below the Elevation Mask are not tracked.

4. Click the **Save changes** button.

4.4.7   RTK Tile

The RTK tile indicates whether the MarinePak7 is configured as an RTK Rover or RTK Base.

When the MarinePak7 is enabled as an RTK Base, the Base Station latitude, longitude and height coordinates are displayed, RTK correction output is enabled and the Position Status mode is set to FIXEDPOS.

To configure the MarinePak7 as an RTK Rover (receive RTK corrections):

1. Click the **Edit** icon (✏) to enter the configuration window.
2. Click the **Enabled** drop down menu and select **Rover**.

3. Click the **Save changes** button.

To configure the MarinePak7 as an RTK Base (generate and send RTK corrections):

1. Click the **Edit** icon (✏) to enter the configuration window.
2. Click the **Enabled** drop down menu and select **Base**.

Edit RTK Configuration

Enabled

Base

Latitude

+51.1500950

Longitude

-114.0309500

Height MSL (m)

+1087.50

Save changes   Cancel

3. In the **Latitude** field, enter the latitude of the MarinePak7. The value range for the latitude is -90 to +90 (degrees).

4. In the **Longitude** field, enter the longitude of the MarinePak7. The value range for the longitude is -180 to +180 (degrees).

5. In the **Height MSL** field, enter the height of the MarinePak7 relative to mean sea level. The value range for the height is -1000 to +20000000 (metres).

> (i) For the Latitude, Longitude and Height values, use the location of the phase center of the GNSS antenna.

6. Click the **Save changes** button.

4.4.8   INS Tile

The INS tile displays the SPAN Lever Arm and INS Offset configuration.

Click the **Edit** icon ( ) to enter the configuration window.

To configure the INS parameters:

1. In the **Lever Arm 1** text boxes, enter the offsets from the IMU center of navigation to the phase center of the primary GNSS antenna. The range for the Lever Arm 1 offsets is -100 to +100 (metres).

    The first box is the X-axis offset from the IMU to the primary GNSS antenna.

The second box is the Y-axis offset from the IMU to the primary GNSS antenna.

The third box is the Z-axis offset from the IMU to the primary GNSS antenna.

2. In the **Lever Arm 2** text boxes, enter the offsets from the IMU center of navigation to the phase center of the secondary GNSS antenna. The range for the Lever Arm 2 offsets is -100 to +100 (metres).

The first box is the X-axis offset from the IMU to the secondary GNSS antenna.

The second box is the Y-axis offset from the IMU to the secondary GNSS antenna.

The third box is the Z-axis offset from the IMU to the secondary GNSS antenna.

3. In the **Rotation Offset** text boxes, enter the rotation from the IMU body frame to the vessel frame. The range for the Rotation Offsets is -180 to +180 (degrees).

The first box is the X-axis rotation offset from the IMU body frame.

The second box is the Y-axis rotation offset from the IMU body frame.

The third box is the Z-axis rotation offset from the IMU body frame.

4. In the **Position Offset** text boxes, enter the offset from the IMU center of navigation. The range for the Position Offsets is -100 to +100 (metres).

The first box is the X-axis offset from the IMU.
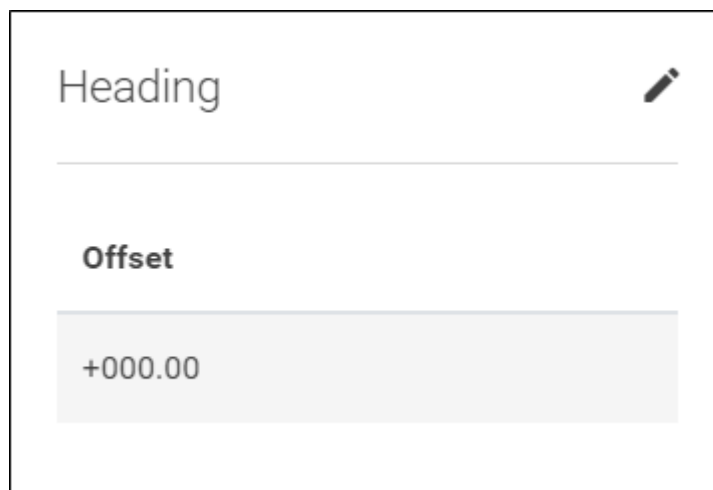
The second box is the Y-axis offset from the IMU.

The third box is the Z-axis offset from the IMU.

5. Click the **Save changes** button.

4.4.9 Heading Offset Tile
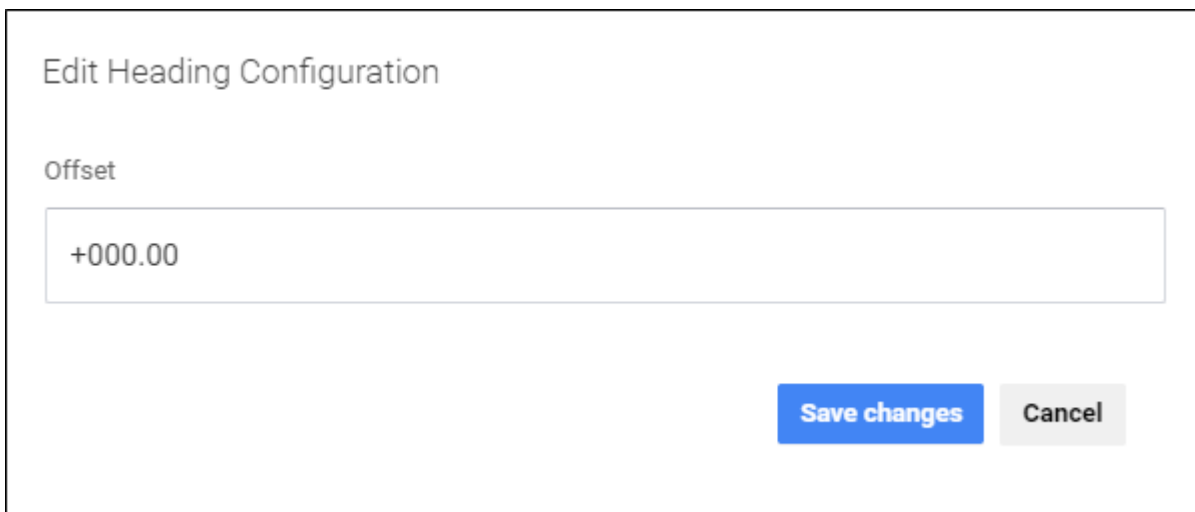
The Heading tile displays the Heading Offset configuration.

The Heading Offset parameter is used to add an offset in the heading values reported by the MarinePak7.

In some installations, it may not be possible to place the rover antenna in the desired location, for instance to match the forward-facing direction of the vessel. A Heading Offset can adjust the heading output to be aligned with the vessels forward direction of travel.

Click the **Edit** icon ( ) to open the configuration window.

1. In the **Offset** field, enter the angular offset to be added to heading output. The range is -180 to +180 (degrees).

2. Click the **Save changes** button.

4.4.10   PPS Tile

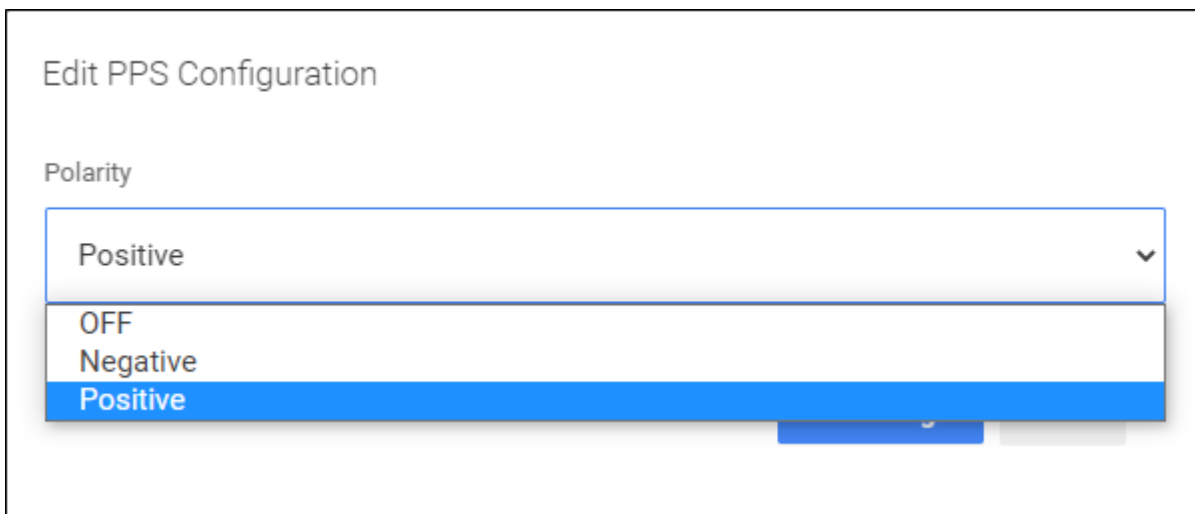The PPS tile displays the polarity setting for the PPS signal.

Click the **Edit** icon (✏) to enter the configuration window.

1. From the **Polarity** drop-down menu, select the polarity of the pulse generated on the PPS output.

OFF	Disables the PPS output.
NEGATIVE	Set the polarity of the PPS pulse to negative. (default = NEGATIVE) Generates a normally high, active low pulse with the falling edge as the reference.
POSITIVE	Set the polarity of the PPS pulse to positive. Generates a normally low, active high pulse with the rising edge as the reference.

2. Click the **Save changes** button.

4.4.11 Ethernet Tile

The Ethernet tile displays the Ethernet configuration for the MarinePak7.

Click the **Edit** icon (✎) to enter the configuration window.

Edit Ethernet Configuration

IP

192.168.5.2

Subnet Mask

255.255.255.0

Gateway

192.168.5.0

DHCP

OFF

ON
OFF

Save changes   Cancel

> ⓘ   The IP, Subnet Mask and Gateway parameters are editable only when DHCP is set to OFF.

1. In the **IP** box, enter the IP address for the MarinePak7.

2. In the **Subnet Mask** box, enter the subnet for the MarinePak7.

3. In the **Gateway** box, enter the IP address for the Gateway used by the MarinePak7.

4. Click the **DHCP** drop menu and select the DHCP mode used by the MarinePak7.

    Select **ON** to enable DHCP and use dynamic IP addresses.

    Select **Off** to disable DHCP and use static IP addresses.

5. Click the **Save changes** button.

4.4.12   NTRIP Tile

The NTRIP tile displays the active NTRIP configuration.

Click the **Edit** icon (✏) to open the configuration options window.

1. In the **IP** box, enter the IP address of the NTRIP service.

2. In the **IP_port** box, enter the IP port of the NTRIP service.

3. In the **User Name** box, enter the user name for the NTRIP service.

4. In the **Password** box, enter the password for the NTRIP service.

5. Click the **Mount Point** drop menu and select the mount point of the NTRIP service.

6. Click the **Save changes** button.

4.5 L-Band

The L-band page provides information about the Oceanix subscription and L-band signal strength. The parameters for L-band tracking can be changed from this page.

4.5.1 L-Band Status Tile

This tile provides status information about the L-band signals.

Oceanix Status	Displays ENABLE when there is a valid Oceanix subscription and the receiver has successfully locked onto at least 1 beam. Displays DISABLE if there is no valid Oceanix subscription or the receiver has failed to lock onto at least 1 beam.
Signal strength	Displays the names of the transmission beams the MarinePak7 is tracking. Up to 3 beam IDs are displayed when the tracking mode is set to AUTO. Only one beam ID is displayed when a beam is manually selected. For each beam tracked, the real-time C/No (dB-Hz) levels of the transmission beams are shown below the beam ID.

4.5.2   L-Band Details Tile

Subscription Type	Displays the type of Oceanix subscription.
PAC	Displays the Product Activation Code (PAC) for the MarinePak7. The PAC is required when ordering Oceanix subscriptions.
OEM Serial Number	Displays the serial number of the OEM7720 GNSS receiver board in the MarinePak7.

4.5.3   L-Band Configuration Tile

The L-band configuration tile displays the receiver's active Oceanix configuration status.

To change the Oceanix configuration, click the **Edit** icon (✏) to enter the configuration menus.

1. Click the **Tracking Mode** drop menu and select the mode.

Auto	The receiver searches for multiple L-band beams on the L-band channels.
	If the receiver position is known, the AUTO selection criteria is a ranking of granted access L-band beams by descending elevation angle.
	If the receiver position is not known, the AUTO selection criteria is a ranking of granted access L-band beams in the order they appear in the stored beam table (see *LBAND Configuration* on page 40 for the available beams).
Manual	The receiver assigns the specified beam on the first L-band channel and makes the other L-band channels IDLE.

If the Tracking Mode is set to **Manual**, use steps 2 and 3 to configure the L-band channel.

2. Click the **Baudrate** drop menu and select the Baud Rate in bps.
   Leave this text box blank to use the default baud rate.

3. In the **Frequency** text box, enter the Beam Frequency in MHz.
   Leave this text box blank to use the default frequency.

4. Click the **Save changes** button.

4.6   UHF Radio

The UHF Radio page displays information about the UHF radio.

4.6.1   UHF Radio Status Tile

This tile provides status information about the UHF radio

Status	A green circle in the top right indicates the UHF module is active and locked onto a UHF channel. Displays red when the UHF module is inactive or not locked onto a UHF channel.
Signal Strength	Received UHF signal strength.
Mode	UHF radio mode.
Protocol	UHF radio protocol.
Data Rate	UHF radio transmission baud rate.
FEC	Forward Error Correction (FEC) setting.
Frequency	UHF frequency.

4.6.2   UHF Radio Configuration Tile

The UHF Radio Configuration tile displays the UHF radio configuration status.

Click the **Edit** icon (✎) to open the configuration options window.

1. Click the **Mode** drop menu and select **Rx** to set the UHF radio to receive mode.

2. Click the **Compatibility** drop menu and select the radio compatibility mode. See the compatibility mode descriptions in the following table.

3. Click the **Frequency** drop menu and select the frequency used by the radio module.

4. Click the **Save changes** button.

Compatibility Mode	Protocol	Modulation	Link Rate (bps), Channel Spacing (kHz)	FEC
0	PacCrest	GMSK	4800,12.5	ON
1	PacCrest	GMSK	4800,12.5	OFF
2	PacCrest	4FSK	9600,12.5	ON
3	PacCrest	4FSK	9600,12.5	OFF

Compatibility Mode	Protocol	Modulation	Link Rate (bps), Channel Spacing (kHz)	FEC
4	PacCrest FST	4FSK	9600,12.5	ON
5	PacCrest FST	4FSK	9600,12.5	OFF
6	Trimtalk	GMSK	4800,12.5	
7	Trimtalk	GMSK	8000,12.5	
8	Satel 3AS	4FSK	9600,12.5	ON
9	Satel 3AS	4FSK	9600,12.5	OFF
10	PacCrest	GMSK	9600,25.0	ON
11	PacCrest	GMSK	9600,25.0	OFF
12	PacCrest	4FSK	19200,25.0	ON
13	PacCrest	4FSK	19200,25.0	OFF
14	PacCrest FST	4FSK	19200,25.0	ON
15	PacCrest FST	4FSK	19200,25.0	OFF
16	Trimtalk	GMSK	9600,25.0	
17	Trimtalk	GMSK	16000,12.5	
18	Satel 3AS	4FSK	19200,25.0	ON
19	Satel 3AS	4FSK	19200,25.0	OFF

4.7   MSK Beacon

This page displays the MSK Radio Beacon details and settings.

4.7.1   MSK Beacon Status Tile

This tile provides information about the received MSK Beacon signal.

Status	A green circle in the top right corner indicates the MSK module is active and locked onto a valid correction source. Displays red when the MSK module is not active or not locked onto a valid correction source.
Signal Strength	The Signal to Noise Ratio of the signal being received by the MSK module.
Station	The station ID of the DGPS corrections source being received.
Frequency	The frequency setting of the MSK module.

4.7.2 MSK Beacon Configuration Tile

This tile displays the MSK Beacon configuration status.

Click the **Edit** icon (✐) to enter the configuration window.

Mode	Auto	Automatically searches and uses the highest quality MSK beacon data stream.
	Manual	Manually select the MSK transmission frequency.
Frequency	283.5 - 325.0 kHz	Enter the MSK transmission frequency. (Manual Mode only.)

4.8 Serial Ports

The Serial Ports page displays the serial port configuration and the logs configured to be output from the selected serial ports. These parameters can also be edited from this page.

4.8.1 COM Ports Tile

The COM Ports tile displays the COM port configuration for the receiver's serial ports.

Click the **Edit** icon (✎) to open the COM port configuration window.

I/O	See *Table 7: I/O Parameters* on the next page	Select the Rx/Tx protocol used for this COM port.
Line Standard	RS232	Use RS232 protocol on this COM port.
	RS422	Use RS422 protocol on this COM port.
Baud rate	2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800	Select the baud rate used on this COM port.
Stop Bits	1	Use one stop bit
	2	Use two stop bits
Parity	None	Use no parity
	Even	Use even parity
	Odd	Use odd parity
Data Bits	7	Use seven data bits
	8	Use eight data bits

Table 7: I/O Parameters

Rx Protocols	Tx Protocols	Receiver Mode	Description
None	None	Base and Rover	Disables transmit and receive on the port.
–	NMEA OUT	Rover	Outputs NMEA messages
–	CMR OUT	Base	Outputs CMR correction messages
–	RTCMV3 OUT	Base	Outputs RTCMV3 correction messages
–	NOVX OUT	Base	Outputs NOVATELX correction messages
CONFIG	CONFIG	Base and Rover	Enables direct communication with MarinePak7 via COM1 to COM3
ISA100C	ISA100C	Rover	Select when a SPAN ISA100C IMU is connected to the port
µIMU	µIMU	Rover	Select when a SPAN µIMU IMU is connected to the port
	INS OUT	Rover	Outputs INS messages
CMR IN	–	Rover	Accepts CMR corrections (External Source)
RTCMV3 IN	–	Rover	Accepts RTCMV3 corrections (External Source)
NOVX IN	–	Rover	Accepts NOVATELX corrections (External Source)

4.8.2 Log List Tile

The Log List tile displays the logs currently being output on the COM ports.

	Port Name	Message ID	Period (Hz)	
✎	COM2	GPGGA	20	🗑
✎	COM2	GPVTG	20	🗑
✎	COM1	HEAVE		🗑
✎	COM1	INSPVAA	20	🗑
✎	COM1	TSS1	50	🗑

Loglist

To add a log to output, click the **Add** icon (➕) to open the Add Log Configuration window.

Add Log Configuration

Port Name

COM2

Message ID

GPGGA

Period (Hz)

1

Save changes   Cancel

To modify a log being output, click the **Edit** icon (✎) to open the Edit Log Configuration window.

Edit Log Configuration

Port Name

COM2

Message ID

GPGGA ⌄

Period (Hz)

1 ⌄

Save changes   Cancel

To remove a log from the Log List, click the **Delete** icon (▌).

Port Name	COM1, COM2, COM3	Select the COM port from which the log is output. The COM port cannot be changed from the Edit Log Configuration window.
Message ID	Message ID of the log	Select the Message ID of the log to be output on this COM port. The logs can be NMEA or INS logs. For the list of the logs available, see *Table 8: NMEA Message IDs* below and *Table 9: INS Message IDs* on the next page.
Period (Hz)	1, 2, 5, 10, 20, 50, 100, 200	Enter the frequency, in Hertz, at which the log is output. ⓘ Availability of the 20 Hz, 50 Hz, 100 Hz and 200 Hz messages is Receiver Model dependent. ⓘ 50 Hz, 100 Hz and 200 Hz message are available only for INS output messages.

Table 8: NMEA Message IDs

NMEA Messages	Description
GGA	Global Position System Fix Data and Undulation
GLL	Geographic Position
VTG	Track Made Good and Ground Speed

NMEA Messages	Description
ZDA	UTC Time and Date
GST	Estimated Error in Position Solution
HDT	Heading
GSA	GNSS DOP on Active Satellites
GSV	GNSS Satellites in View
GRS	GNSS Range Residuals for Each Satellite
RMC	GNSS Specific Information

Table 9: INS Message IDs

INS Message	Description
HVE	SPAN Heave message
PVA	SPAN INSPVA message
PRH	SPAN PASHR, NMEA, Inertial Attitude Data
TSS	SPAN TSS1 Protocol for Heave, Roll and Pitch

4.9 Net Ports

This page displays the ICOM port configuration. These parameters can also be edited from this page.

4.9.1 NET Ports Tile

The NET Ports tile displays the configuration for the receiver's network (ICOM) ports.

	Name	Protocol	IP Address	Port	I/O
✎	ICOM1	UDP	172.100.50.10	3001	INS OUT
✎	ICOM2	TCP	-	3002	NMEA OUT
✎	ICOM3	TCP	-	3003	CONFIG

NET Ports

Click the **Edit** icon (✎) next to the ICOM port to open the NET port configuration window.

1. Click the **Protocol** drop menu and select the protocol used for this ICOM port.

TCP	Use TCP
UDP	Use UDP

2. The **Port** box displays the port number assigned to the ICOM port.
3. Click the **I/O** drop menu and select the message protocol used for this ICOM port.

NMEA OUT	Output NMEA message types.
INS OUT	Output INS message types.
CONFIG	Enables direct communication with OEM7 GNSS receiver via ICOM ports.
NONE	Disables receive and transmit on the port.

4. Click the **Save changes** button.

4.9.2   Net Ports Log List Tile

The Log List tile displays the logs currently being output on each ICOM port.

To add a log to output, click the **Add** icon (⊞) to open the Add Log Configuration window.

To modify a log being output, click the **Edit** icon (✎) to open the Edit Log Configuration window.

To remove a log from the Log List, click the **Delete** icon (▮).

Port Name	ICOM1, ICOM2, ICOM3	If adding a log to an ICOM port, select the ICOM port to configure. If editing, this field displays the name of the ICOM port.
Message ID	Message ID of the log	Select the Message ID of the log to be output on this COM port. The logs can be NMEA or INS logs. For the list of the logs available, *Table 8: NMEA Message IDs* on page 90 and *Table 9: INS Message IDs* on page 91.
Period (Hz)	1, 2, 5, 10, 20, 50, 100, 200	Enter the frequency, in Hertz, at which the log is output. (i) Availability of the 20 Hz, 50 Hz, 100 Hz and 200 Hz messages is Receiver Model dependent. (i) 50 Hz, 100 Hz and 200 Hz message are available only for INS output messages.

4.10   Logging

The Logging tab provides information about the internal data storage and the logs configured to be stored.

4.10.1   Global Logging Status

The Global Logging Status tile controls whether logging to the MarinePak7 is enabled or disabled.

Setting the Global Logging Status to **OFF** disables user selected logs from being stored.
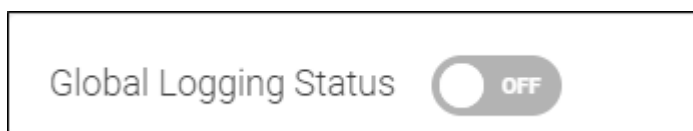
Setting the Global Logging Status to **ON** enables data logging. The MarinePak7 will log all messages listed in the Log list window.
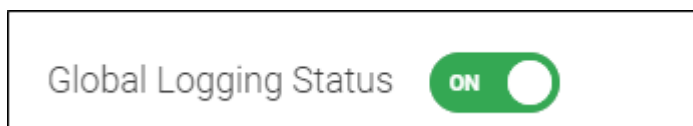
4.10.2   Usage Details

This tile provides the current internal memory used and the maximum capacity of the internal data storage allocated for data logging.
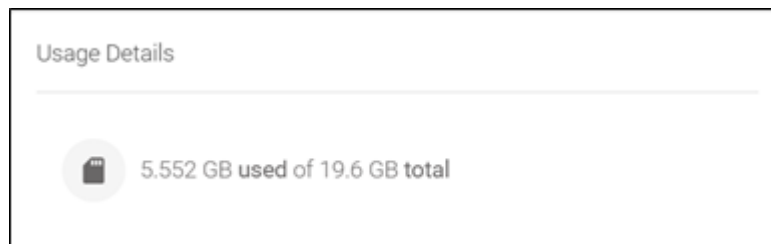
4.10.3 Disk Usage

This tile provides a graphic representation of the percentage of disk space used.
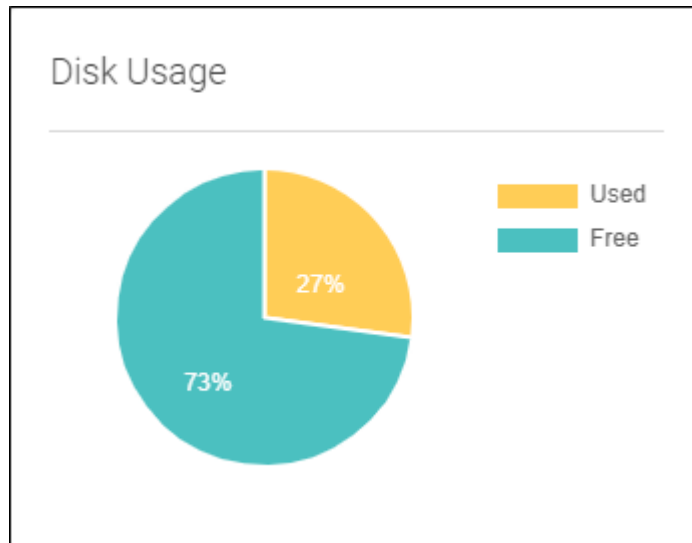
4.10.4 Log Actions

Use this tile to download the logs stored on internal data storage or delete stored logs from internal data storage.
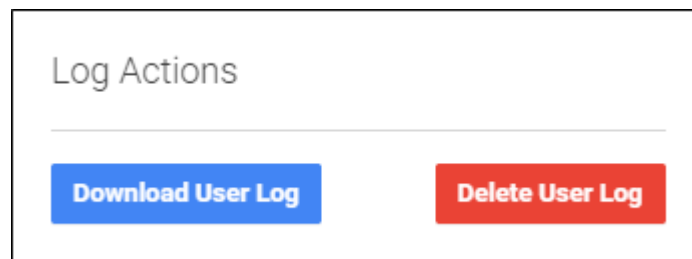
To download the logs:

1. Insert a USB stick into the USB port on the front of the MarinePak7.

2. Click the **Download User Log** button.
   The Select Log File to Download window appears.
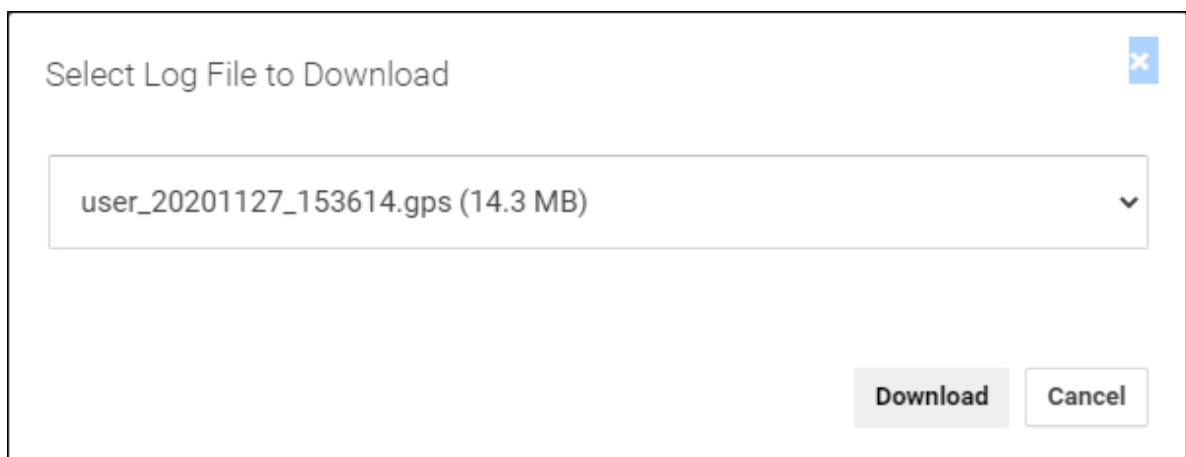
3. Click the drop down menu and select the log file to download.

4. Click the **Download** button.

    The default location the file is downloaded to is *OS (C:)\Users\[user]\Downloads*.

To delete the stored logs:

1. Click the **Delete User Log** button.
    The Select Log File to Delete window appears.

Select User Log file to Delete   ✕

user_20201127_153614.gps (14.3 MB)   ⌄

                                                    Delete   Cancel
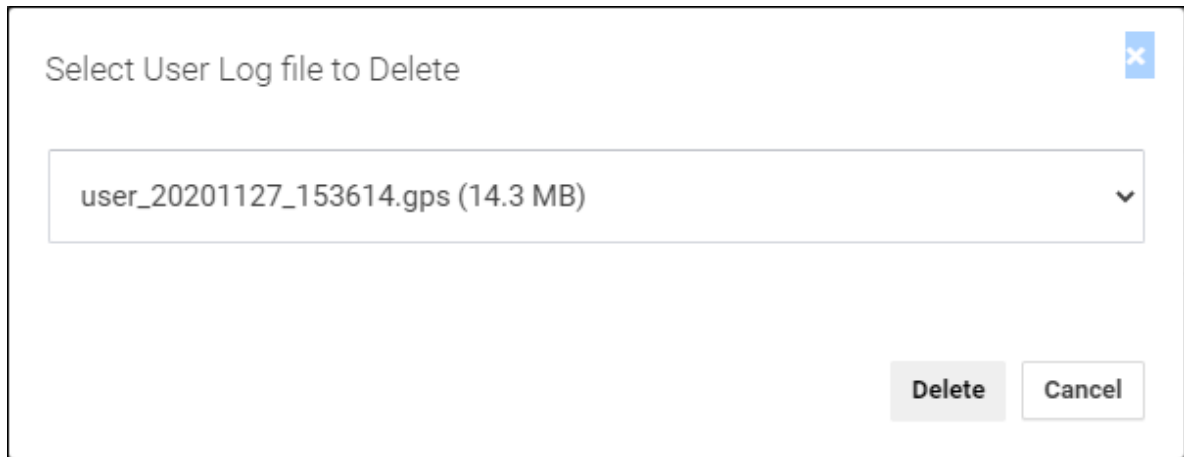
2. Click the drop down menu and select the log file to delete.

3. Click the **Delete** button.

    A confirmation window appears.
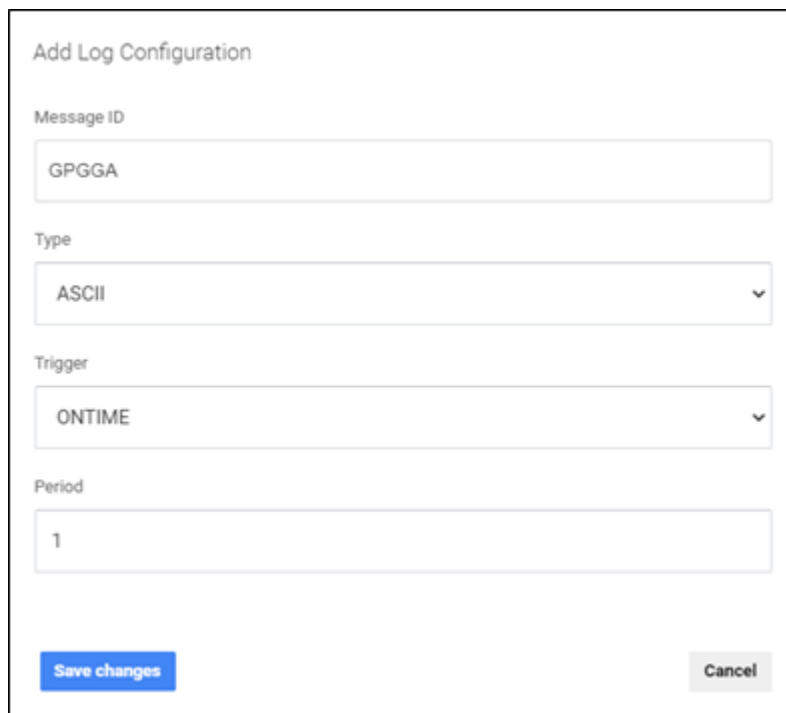
4. Click the **Delete** button.

4.10.5   Log List

The Log List shows the logs that are being saved to internal data storage.

	Message ID	Type	Trigger	Period	
✏	RAWEPHEM	Binary	ONCHANGED		🗑
✏	ITDETECTSTATUS	Binary	ONCHANGED		🗑
✏	BESTPOS	Binary	ONTIME	1	🗑
✏	RANGE	Binary	ONTIME	1	🗑

Loglist   ➕
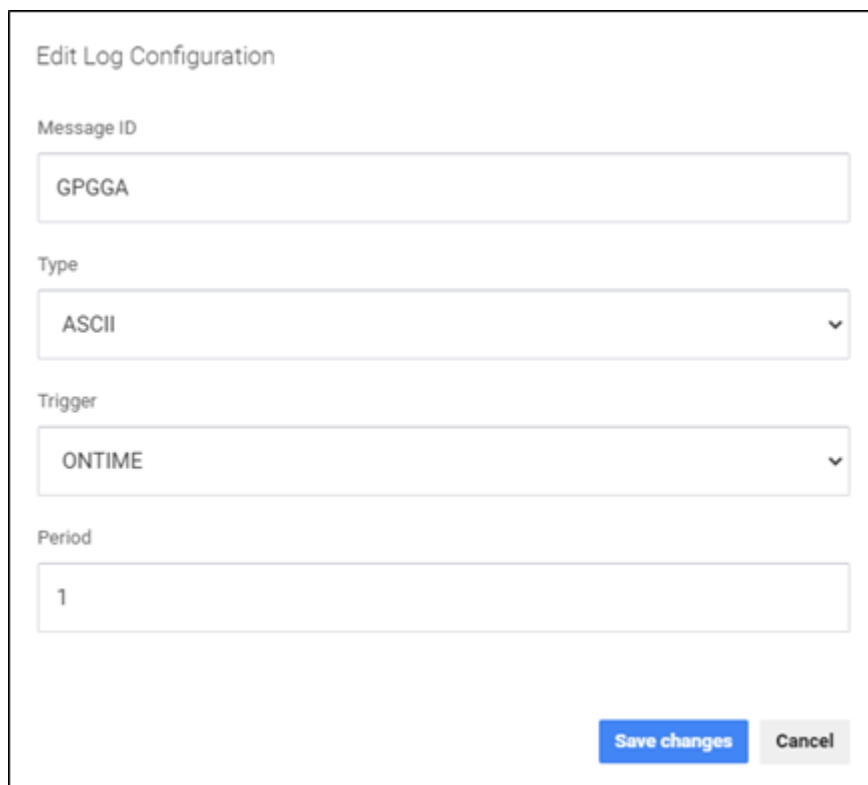
To add a log to save to internal storage, click the **Add** icon (➕) to open the Add Log Configuration window.

Add Log Configuration

Message ID

GPGGA

Type

ASCII

Trigger

ONTIME

Period

1

Save changes   Cancel

To modify a log being saved to internal storage, click the **Edit** icon (✏) for the log to change to open the Edit Log Configuration window.

Edit Log Configuration

Message ID

GPGGA

Type

ASCII

Trigger

ONTIME

Period

1

Save changes   Cancel

To remove a log from the Log List, click the **Delete** icon (▮).

Message ID	Message ID of the log	Select the Message ID of the log to be output on this COM port. The logs can be NMEA standard or NovAtel logs. For the list of the logs available, see docs.novatel.com/OEM7/Content/Logs/OEM7_Core_Logs.htm.
Type	ASCII, Binary	Select the output format for the log.
Trigger	ONTIME, ONCE, ONNEW, ONCHANGED, ONNEXT, ONMARK	Select the method to determine when a new log is generated. For more information about the trigger types, see docs.novatel.com/OEM7/Content/Logs/OEM7_Core_Logs.htm. Use the ONTIME trigger only for NMEA logs.
Period	1, 2, 5, 10, 20, 50, 100, 200	If the ONTIME Trigger is selected, enter the frequency, in Hertz, at which the log is output. ⓘ Availability of the 20 Hz, 50 Hz, 100 Hz and 200 Hz messages is Receiver Model dependent. ⓘ 50 Hz, 100 Hz and 200 Hz message are available only for INS output messages.

4.11   System

This page provides information about the MarinePak7 system and provides access to the firmware upload feature.

4.11.1   Status

The Status tile displays status information about the battery charge level and CPU load.
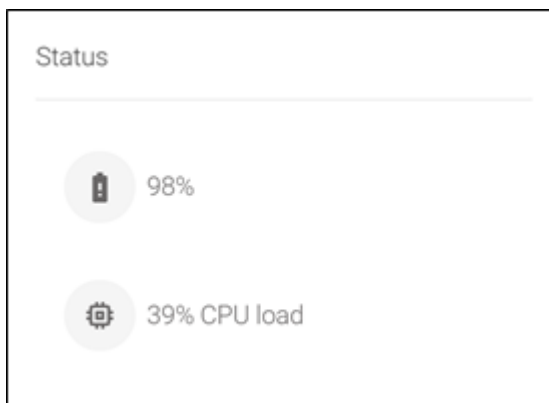
4.11.2   WiFi

The WiFi tile provides information about the WiFi module and allows you to enable or disable the WiFi radio.
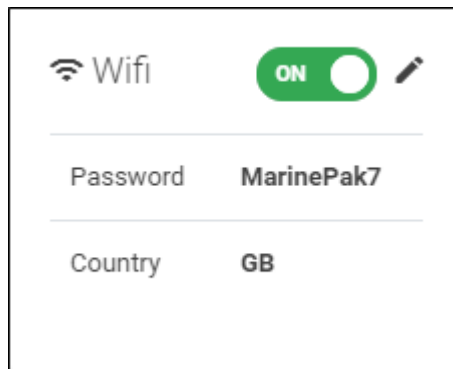
To enable WiFi, set the WiFi switch to **On**.

To disable WiFi, set the WiFi switch to **Off**.

To edit the WiFi password and country of origin:

1. Click the **Edit** icon (✎). The Edit Wifi Configuration window appears.

2. In the **Password** box, enter the password used to access the MarinePak7 WiFi.

    The default password is MarinePak7.

3. In the **Country** box, enter the country in which the MarinePak7 is operating.

4. Click the **Save changes** button.

4.11.3   Antenna ANT1

The Antenna ANT1 tile is used to enable or disable antenna power to the GNSS1 antenna port on the MarinePak7. This port is used for the primary GNSS antenna input and the MSK beacon input.

To enable antenna power on the GNSS1 antenna port, set the switch to **On**.

To disable antenna power on the GNSS1 antenna port, set the switch to **Off**.

4.11.4   Antenna ANT2

The Antenna ANT2 tile is used to enable or disable antenna power to the GNSS2 antenna port on the MarinePak7. This port is used for the secondary GNSS antenna input.

To enable antenna power on the GNSS2 antenna port, set the switch to **On**.

To disable antenna power on the GNSS2 antenna port, set the switch to **Off**.

4.11.5 GSM

The GSM tile provides information about the GSM (cellular) radio.
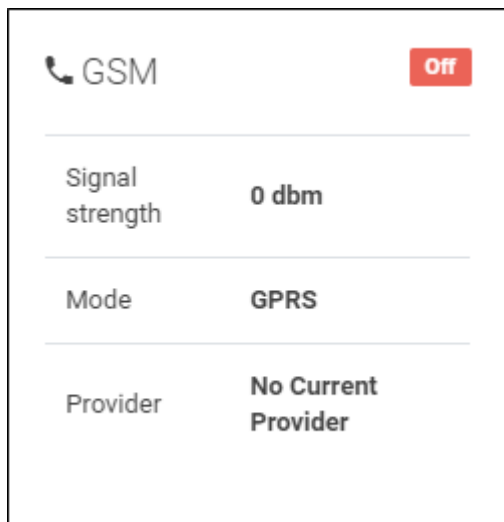
Status	Displays On when the GSM cellular modem is active.
	Display Off when the GSM cellular modem is not active.
Signal Strength	Displays the signal strength of the cellular reception.
Mode	Displays the cellular connection mode.
Operator	Displays the cellular network operator

4.11.6 Screen

The Screen tile displays the brightness setting of the LCD interface screen.
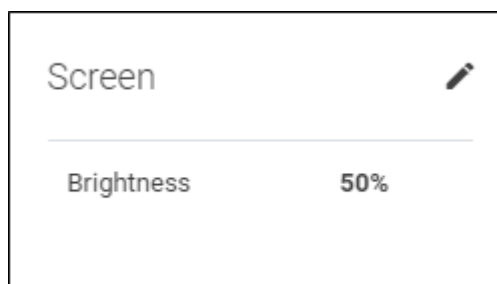
To change the LCD screen brightness:

1. Click the **Edit** icon (✏).

   The Edit Screen Configuration dialog box appears.
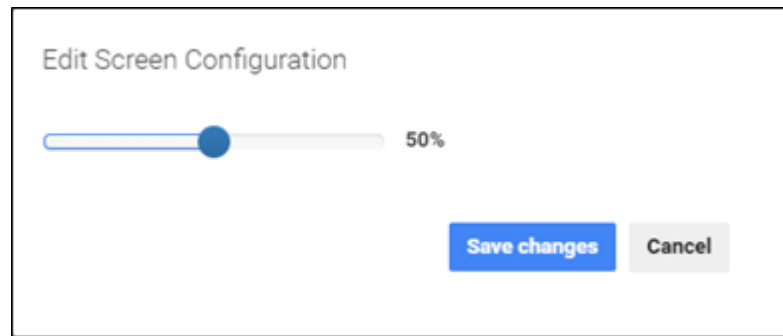
2. Use the slider to set the LCD screen brightness.

3. Click the **Save changes** button.

4.11.7   Firmware

The Firmware tile displays the current firmware version installed on the MarinePak7 and can be used to update the firmware.

To update the firmware on the MarinePak7:

1. Obtain the new firmware file by downloading the firmware file from novatel.com/support/support-materials/firmware-download.

2. Copy the firmware file to the local drive of the device running the Web User Interface.

3. On the **Firmware** tile, click the **Update Firmware** button.
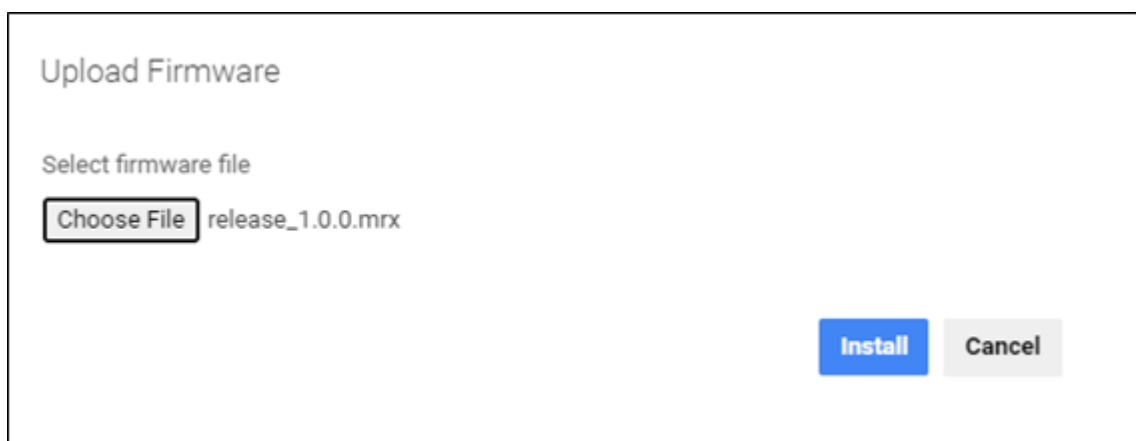
4. Click the **Choose File** button.

5. Navigate to the location of the new firmware file and select the file.

6. Click the **Open** button.

7. Click the **Install** button.

    Once the upload is complete, the MarinePak7 will restart.

APPENDIX A   MarinePak7 Technical Specifications

Table 10: MarinePak7 Physical Description

Size	198 mm x 199.5 mm x 80 mm (without shroud)
	198 mm x 254 mm x 80 mm (with shroud)
Weight	3 kg
NovAtel Part Number	MP7720
	MP7720U

See the following sections for more information about the MarinePak7:

- *MarinePak7 Performance Specifications* on the next page
- *MarinePak7 Mechanical Specifications* on page 107
- *MarinePak7 Electrical and Environmental Specifications* on page 111
- *MarinePak7 Data Communications Specifications* on page 113
- *MarinePak7 Strobe Specifications* on page 115
- *MSK Beacon Receiver Specifications* on page 116
- *GSM Specifications* on page 116
- *UHF Radio Specifications* on page 117
- *MarinePak7 Connectors* on page 117

For information about the cables available for the MarinePak7, see the following:

- *Serial Data Cable* on page 121
- *Power Supply* on page 122
- *DC Power Cable* on page 123

A.1   MarinePak7 Performance Specifications

All specifications subject to GNSS system characteristics.

Table 11: MarinePak7 Receiver Performance

Position Accuracy[1]	Single point L1	1.5 m RMS
	Single point L1/L2	1.2 m RMS
	SBAS[2]	60 cm RMS
	DGPS	40 cm RMS
	Oceanix[3,4]	2.5 cm (95%)
	RTK	1 cm + 1 ppm RMS
Signals Tracked Primary Antenna (GNSS1)	GPS	L1 C/A, L1C, L2C, L2P, L5
	GLONASS	L1 C/A, L2 C/A, L2P, L3, L5[5]
	Galileo	E1, E5 AltBOC, E5a, E5b
	BeiDou	B1I, B1C, B2I, B2a, B2b
	NavIC (IRNSS)	L5
	QZSS	L1 C/A, L1C, L2C, L5
	SBAS	L1, L5
	L-band	Up to 5 channels[6]

---

[1]Typical values. All position and velocity RMS values are based on Horizontal position accuracy. Performance specifications are subject to GNSS system characteristics, Signal-in-Space (SIS) operational degradation, ionospheric and tropospheric conditions, satellite geometry, baseline length, multipath effects and the presence of intentional or unintentional interference sources.
[2]GPS-only.
[3]Requires a Oceanix subscription which is available direct from NovAtel (novatel.com/products/correction-services/oceanix-correction-services).
[4]Performance dependent on local observing conditions.
[5]Although hardware capable, GLONASS L5 is currently not available.
[6]Currently the receiver can track up to 3 L-band channels.

Signals Tracked Secondary Antenna (GNSS2)	GPS	L1 C/A, L1C, L2C, L2P, L5
	GLONASS	L1 C/A, L2 C/A, L2P, L3, L5[5]
	Galileo	E1, E5 AltBOC, E5a, E5b
	BeiDou	B1I, B1C, B2I, B2a, B2b
	NavIC (IRNSS)	L5
	QZSS	L1 C/A, L1C, L2C, L5
Time to First Fix	Hot: <19 s (almanac and recent ephemeris saved and approximate position and time entered) Cold: <40 s (no almanac or ephemeris and no approximate position or time)	
Signal Reacquisition	<0.5 s L1 (typical) <1.0 s L2 (typical)	
Data Rates	Measurements	Up to 20 Hz
	Position	Up to 20 Hz
Time Accuracy[1]	20 ns RMS	
Velocity Accuracy	<0.03 m/s RMS	

[1]Time accuracy does not include biases due to RF or antenna delay.

			Code	Carrier
Measurement Precision	GPS	L1 C/A	4 cm	0.5 mm
		L2 P(Y)	8 cm	1.0 mm
		L2C	8 cm	0.5 mm
		L5	3 cm	0.5 mm
	GLONASS	L1 C/A	8 cm	1.0 mm
		L2 P	8 cm	1.0 mm
		L2 C/A	8 cm	1.0 mm
	Galileo	E1	3 cm	0.5 mm
		E5a	3 cm	0.75 mm
		E5b	3 cm	0.75 mm
		E5 AltBOC	3 cm	0.75 mm
	BeiDou	B1I	4 cm	0.5 mm
		B1C	3 cm	0.5 mm
		B2I	4 cm	0.5 mm
		B2a	3 cm	0.5 mm
		B2b[1]	3 cm	0.5 mm
ALIGN Heading Accuracy	Baseline = 2 m	0.08 degrees		
	Baseline = 4 m	0.05 degrees		
Heave Performance[2]	Instantaneous Heave	5 cm or 5%		
	Delayed Heave	3.5 cm or 3.5%		
	Post-Processed Heave[3]	2.5 cm or 2.5%		
Velocity Limit	515 m/s[4]			

[1]Under good CNO conditions, e.g. 44 dbHz
[2]Requires SPAN Marine profile
[3]Post-processing results using Waypoint Inertial Explorer.
[4]Export licensing restricts operation to a maximum of 515 metres per second, message output impacted above 500 m/s.

A.2   MarinePak7 Mechanical Specifications

- *Figure 6: MarinePak7 Dimensions – Top* below
- *Figure 7: MarinePak7 Dimensions – Front* below
- *Figure 8: MarinePak7 Dimensions – Back* on the next page
- *Figure 9: MarinePak7 Mounting Shroud Tabs* on page 109
- *Figure 10: MarinePak7 Mounting Holes* on page 110

Figure 6: MarinePak7 Dimensions – Top
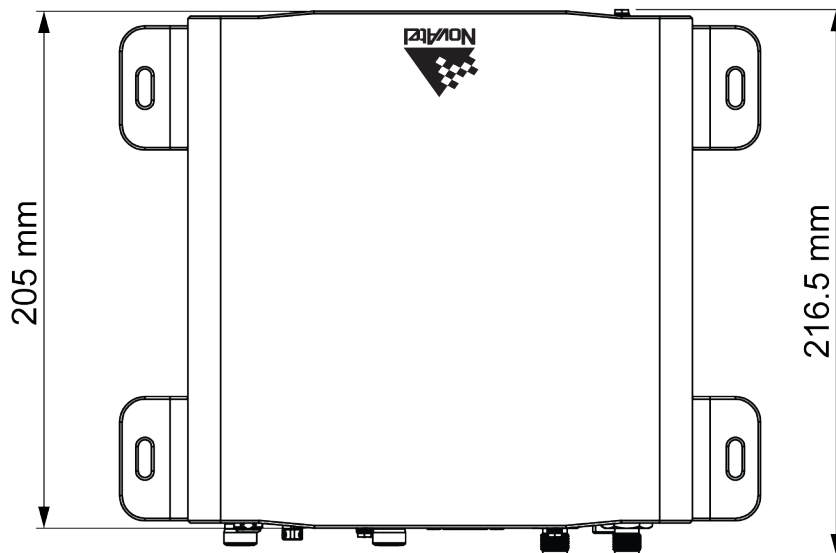
Figure 7: MarinePak7 Dimensions – Front
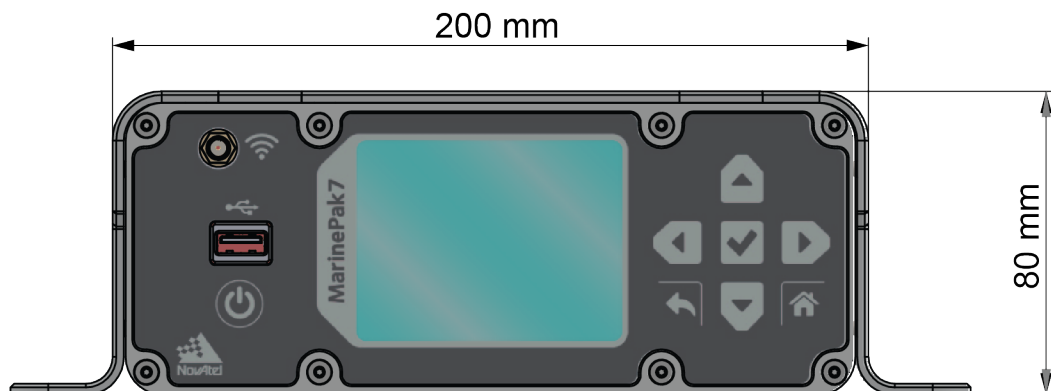
Figure 8: MarinePak7 Dimensions – Back
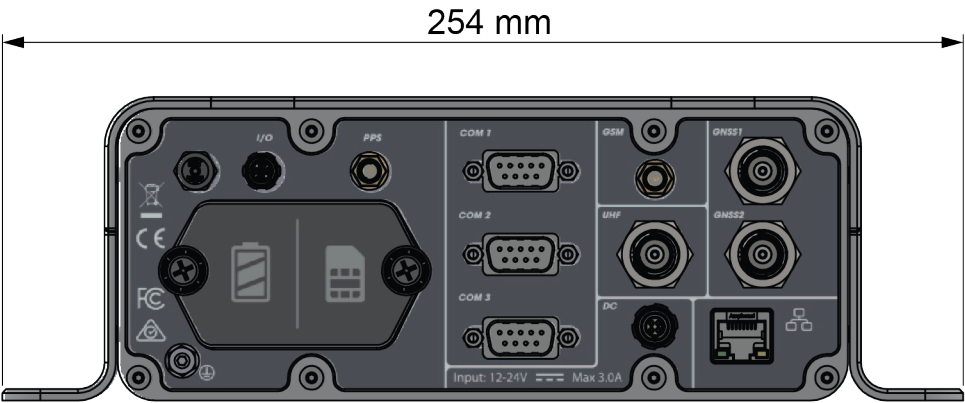
Figure 9: MarinePak7 Mounting Shroud Tabs

Figure 10: MarinePak7 Mounting Holes

90.5 mm

120 mm
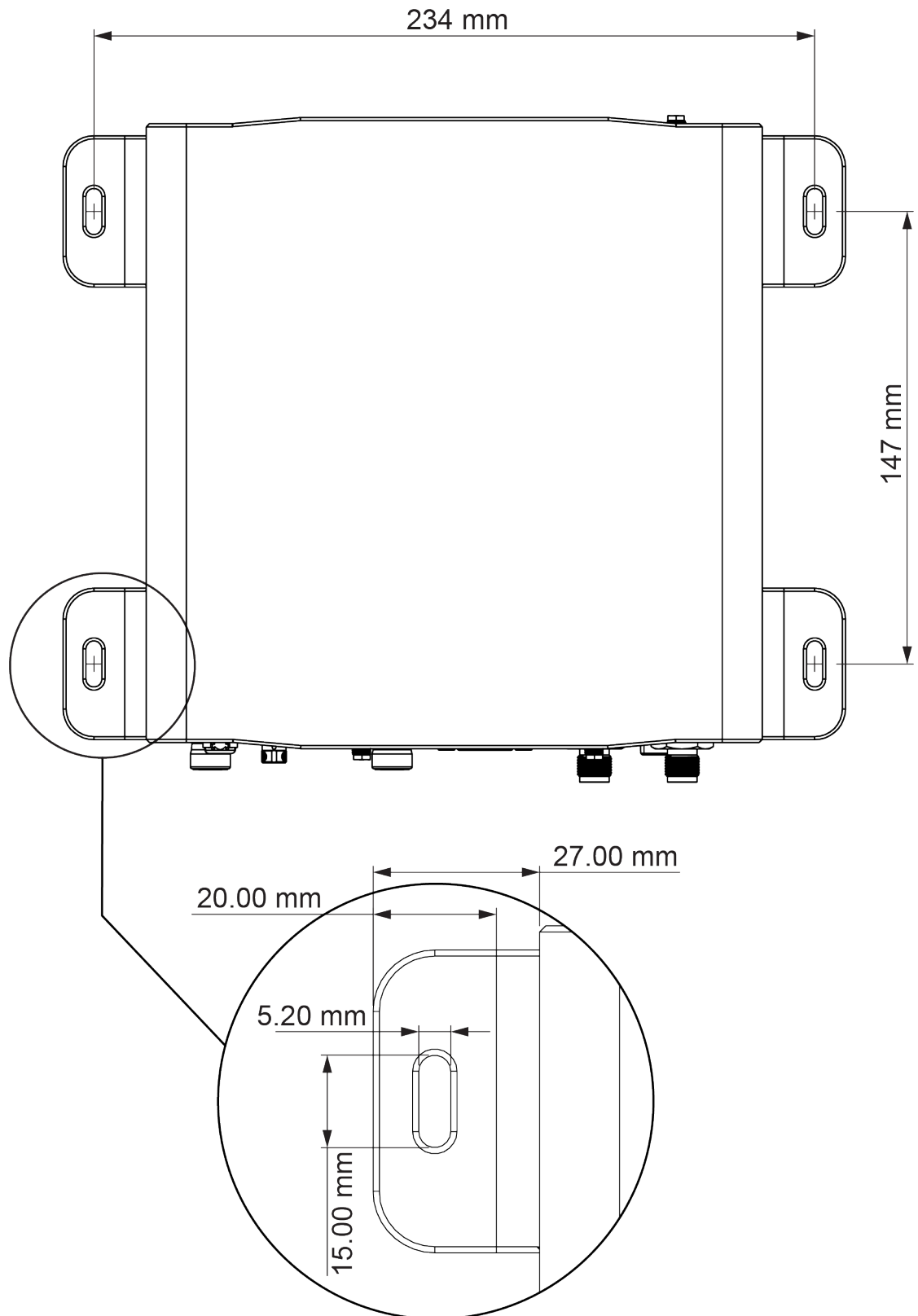
4 x M4 x 8mm
Mounting points
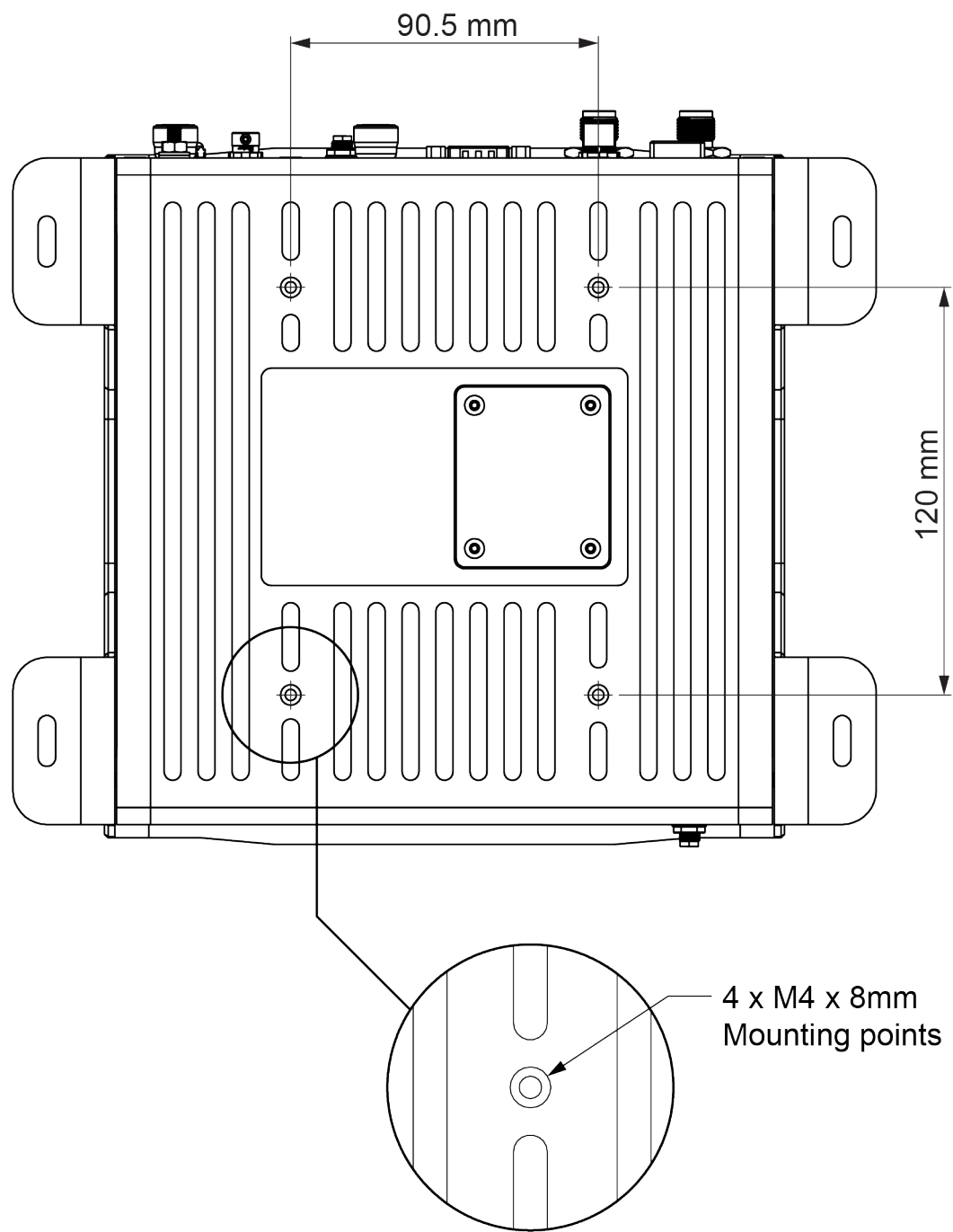
A.3   MarinePak7 Electrical and Environmental Specifications

Table 12: MarinePak7 Power Requirements

Voltage		12 – 24 VDC
Power Consumption	Minimum	6 W
	Typical	12 W
	Maximum (In Charge State)	36 W

Table 13: Battery Specifications

Manufacturer	Inspired Energy
Part number	ND2037HD34
Type	Rechargeable Lithium Ion
Voltage (nominal)	7.2 V
Capacity (nominal)	6.8 Ah
Energy (nominal)	49.0 Wh
Discharge current (maximum)	8 A
Discharge power (maximum)	38.4 W
Length (maximum)	151.30 mm
Width (maximum)	42.40 mm
Height (maximum)	22.80 mm
Weight (typical)	0.230 Kg
Connector	Tyco 5-way

Table 14: MarinePak7 Environmental Specifications

Operating Temperature	-15°C to +55°C
Storage Temperature	-20°C to +60°C

Humidity	95% non-condensing
Waterproof	IEC 60529 IPX7
Dust	IEC 60529 IP6X
Vibration (operating)	IEC 60945

Table 15: MarinePak7 Regulatory Compliance

Compliance	FCC, CE, IEC 60945 (Protected), AZ/NSZ

Table 16: MarinePak7 RF Input/LNA Power Output

Antenna Connectors	TNC female, 50 Ω nominal impedance	
Cascaded antenna LNA gain (before receiver)	HDR disabled +15 dB to + 40 dB, 26 dB typical	
	HDR enabled +20 dB to + 40 dB, 30 dB typical	
RF Input Frequencies	GPS L1: GPS L2: GPS L5:	1575.42 MHz 1227.60 MHz 1176.45 MHz
	GLONASS L1: GLONASS L2: GLONASS L3:	1593-1610 MHz 1237-1254 MHz 1202.025 MHz
	Galileo E1: Galileo E5a: Galileo E5b: Galileo E5:	1575.42 MHz 1176.45 MHz 1207.14 MHz 1191.795 MHz
	BeiDou B1I: BeiDou B1C: BeiDou B2I: BeiDou B2a:	1561.098 MHz 1575.42 MHz 1207.14 MHz 1176.45 MHz
	L-Band: 1525 to 1560 MHz	
LNA Power	+12.0 VDC ±5%, 0 mA to 500 mA.	

A.4   MarinePak7 Data Communications Specifications

Table 17: Data Communications Interfaces

COM1	
Electrical format	RS-232/RS-422
Data rates[1]	2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 or 460800 bit/s Default = 9600
Signals supported	COM1_Tx, COM1_Rx, COM1_RTS, COM1_CTS (RS-232) COM1_Tx+, COM1_Tx-, COM1_Rx+, COM1_Rx- (RS-422)
Port	DB9 male
COM2	
Electrical format	RS-232/RS-422
Data rates[1]	2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 or 460800 bit/s Default = 9600
Signals supported	COM2_Tx, COM2_Rx (RS-232) COM2_Tx+, COM2_Tx-, COM2_Rx+, COM2_Rx- (RS-422)
Port	DB9 male
COM3	
Electrical format	RS-232/RS-422
Data rates[1]	2400, 4800, 9600 (default), 19200, 38400, 57600, 115200, 230400 or 460800 bit/s Default = 9600
Signals supported	COM3_Tx, COM3_Rx (RS-232) COM3_Tx+, COM3_Tx-, COM3_Rx+, COM3_Rx- (RS-422)
Port	DB9 male
USB	
Electrical format	Conforms to USB 2.0

---

[1]Data rates higher than 115200 bit/s are not supported by standard PC hardware. Special PC hardware may be required for higher rates, including 230400 bit/s and 460800 bit/s.

Data rates	Hi-speed (480 Mb/s)
Port	USB Type A
ETHERNET	
Physical layer	10BASE-T/100BASE-TX
Port	RJ45
WiFi	
WiFi module	Texas Instruments WL1835MOD
Band	2400 MHz
Transmission power (max)	0.0549 W
Security	WPA2
Encryption	AES
Port	SMA 50Ω

A.5 MarinePak7 Strobe Specifications

The MarinePak7 strobe signals are available on the I/O connector and COM ports.

Table 18: MarinePak7 Strobes Description

Strobes	Input/Output	Factory Default	Comment
EVENT_IN	Input Leading edge triggered	Active low	Input marks for which a pulse greater than 150 ns triggers certain logs to be generated. (Refer to the MARKxPOS and MARKxTIME logs and ONMARK trigger.) Polarity is configurable using the EVENTINCONTROL command.
EVENT_ OUT	Output	Active low	Programmable variable frequency outputs ranging from 0 Hz to 50 MHz. These outputs are configured using the EVENTOUTCONTROL command.
PPS	Output	Active low	A time synchronization output. This is a pulse where the leading edge is synchronized to the receiver calculated GNSS time. The polarity, period and pulse width can be configured using the Web UI (*GNSS Receiver* on page 66) or the LCD UI (*GNSS Configuration* on page 38).

Table 19: MarinePak7 Strobe Electrical Specifications

Strobe	Level	Minimum	Maximum	Current
EVENTIN	V_{IL}		0.8 V	–
	V_{IH}	1.7 V		
EVENTOUT	V_{OL}		0.2 V	8 mA
	V_{OH}	3.1 V		
PPS	V_{OL}		0.6 V	120 mA
	V^{OH}	5.4 V		

A.6   MSK Beacon Receiver Specifications

Table 20: Receiver Module

Channels	2-channel parallel tracking
Frequency range	283.5 to 325.0 kHz
Channel spacing	500 Hz
Demodulation	Minimum Shift Keying (MSK)
MSK bit rates	50, 100 and 200 bps
Cold start time	< 1 minute typical
Reacquisition time	< 2 seconds typical
Impedance	50 Ω
Output protocol	RTCM SC-104, NMEA 0183

A.7   GSM Specifications

Table 21: GSM/GPRS Specifications

GSM module	Quectel M95
Bands (US)	850/1900 MHz
Transmission power – 850 MHz (max)	0.949 W
Transmission power – 1900 MHz (max)	0.9908 W
GSM module	Quectel M95
Bands (EU)	900/1800 MHz
Transmission power (max) – 900 MHz	0.5598 W
Transmission power (max) – 1800 MHz	0.4423 W
Data	GPRS Class 12 (max 85.6 kbps uplink & downlink)
Port	SMA 50Ω

A.8   UHF Radio Specifications

The UHF radio module is a Satel TR49.

Table 22: Transceiver Module

UHF module	SATEL TR49
Band	410 – 475 MHz
Transmission power (max)	1 W
UHF module	SATEL TR49
Band	902 – 928 MHz[1]
Transmission power (max)	1 W
Modulation	4-GFSK, GMSK
Port	TNC 50Ω

A.9   MarinePak7 Connectors

The following tables provide the pinouts for the MarinePak7 connectors.

A.9.1   COM Ports
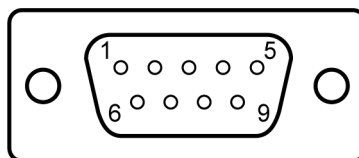
Table 23: COM1 Pinout

RS-232				RS-422		
Pin	Signal Name	Description		Pin	Signal Name	Description
1	EVENTOUT1	Programmable variable frequency output ranging from 0 Hz to 50 MHz		1	EVENTOUT1	Programmable variable frequency output ranging from 0 Hz to 50 MHz
2	RxD	Receive data		2	RxD+	Receive data – positive

---

[1]For Australia, only 915-928 MHz is allowed

RS-232				RS-422		
Pin	Signal Name	Description		Pin	Signal Name	Description
3	TxD	Transmit data		3	TxD+	Transmit data – positive
4	NC	No connection		4	NC	No connection
5	GND	Signal ground		5	GND	Signal ground
6	NC	No connection		6	NC	No connection
7	RTS	Request to Send		7	TxD-	Transmit data – negative
8	CTS	Clear to Send		8	RxD-	Receive data – negative
9	NC	No connection		9	NC	No connection

Table 24: COM2 Pinout

RS-232				RS-422		
Pin	Signal Name	Description		Pin	Signal Name	Description
1	EVENTIN2	Input mark for which a pulse greater than 150 ns triggers certain logs to be generated		1	EVENTIN2	Input mark for which a pulse greater than 150 ns triggers certain logs to be generated
2	RxD	Receive data		2	RxD+	Receive data – positive
3	TxD	Transmit data		3	TxD+	Transmit data – positive
4	NC	No connection		4	NC	No connection
5	GND	Signal ground		5	GND	Signal ground
6	NC	No connection		6	NC	No connection
7	RTS	Request to Send		7	TxD-	Transmit data – negative
8	CTS	Clear to Send		8	RxD-	Receive data – negative
9	NC	No connection		9	NC	No connection

Table 25: COM3 Pinout

RS-232				RS-422		
Pin	Signal Name	Description		Pin	Signal Name	Description
1	EVENTOUT3	Programmable variable frequency output ranging from 0 Hz to 50 MHz		1	EVENTOUT3	Programmable variable frequency output ranging from 0 Hz to 50 MHz
2	RxD	Receive data		2	RxD+	Receive data – positive
3	TxD	Transmit data		3	TxD+	Transmit data – positive
4	NC	No connection		4	NC	No connection
5	GND	Signal ground		5	GND	Signal ground
6	NC	No connection		6	NC	No connection
7	RTS	Request to Send		7	TxD-	Transmit data – negative
8	CTS	Clear to Send		8	RxD-	Receive data – negative
9	NC	No connection		9	NC	No connection

A.9.2 DC Power Port

Table 26: DC Pinout

Pin	Signal Name	Description
1	PWR	Power input
2	PWR	Power input
3	GND	Ground
4	GND	Ground

A.9.3   I/O Port
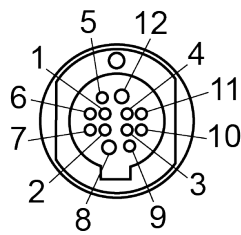
Table 27: I/O Pinout

Pin	Signal Name	Description
1	Reserved	Reserved
2	Reserved	Reserved
3	GND	Signal ground
4	Reserved	Reserved
5	Reserved	Reserved
6	GND	Signal ground
7	EVENTOUT4	Programmable variable frequency output ranging from 0 Hz to 50 MHz
8	EVENTIN1	Input mark for which a pulse greater than 150 ns triggers certain logs to be generated
9	Reserved	Reserved
10	Reserved	Reserved
11	PPS	Pulse Per Second (PPS) output
12	GND	Ground

A.10   Serial Data Cable

This cable connects a device with a DB9 serial port, such as a computer, to the COM1, COM2 or COM3 port on the MarinePak7.
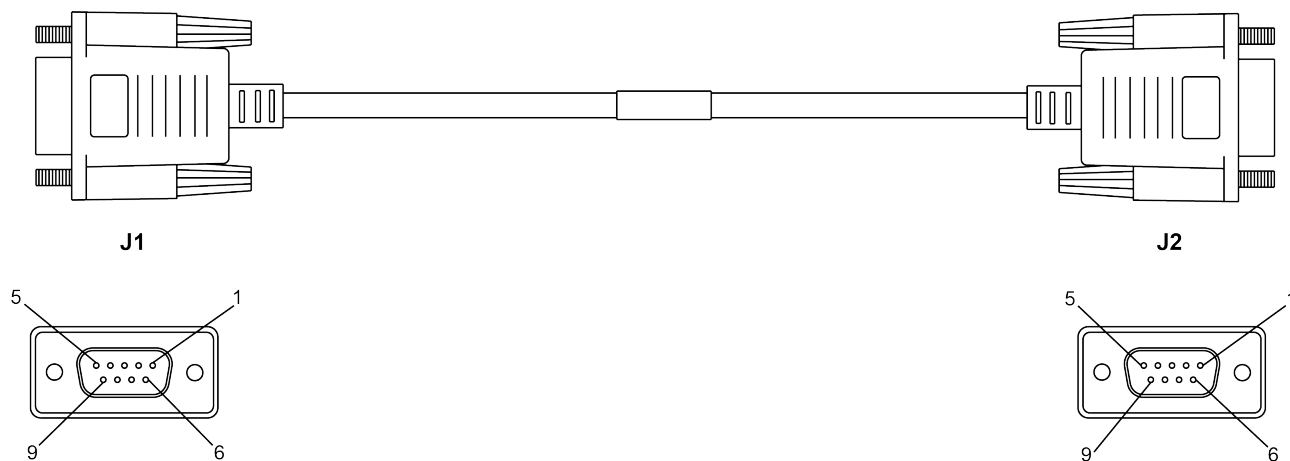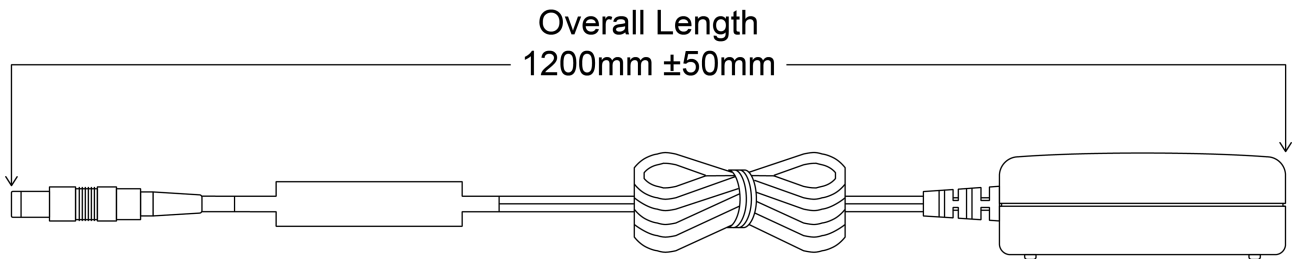
Figure 11: Serial Data Cable

J1   J2

Table 28: Serial Data Cable Pinout

DB9 (J1)	DB9 (J2)
2	3
3	2
4	1 & 6
5	5
1 & 6	4
7	8
8	7

A.11   Power Supply

The Power Supply connects the MarinePak7 to the mains supply. The connector on the mains supply side of the Power Supply varies depending on the region in which the Power Supply is intended to be used.

Figure 12: Power Supply

A.12   DC Power Cable

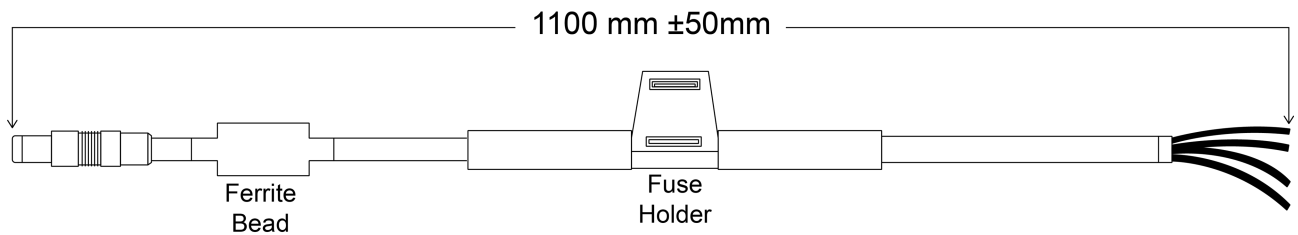This cable connects the MarinePak7 to a DC power supply.

Figure 13: DC Power Cable

Table 29: DC Power Cable Pinout

Connector A Pin	Signal Name	Flying Lead Wire Color
1	Power	Black
2	Power	Red
3	GND	Blue
4	GND	White

The fuse holder contains a 4 A fuse which is detailed in the following table.

Table 30: Fuse Specifications

Fuse Type	Specifications		Part Number
Mini Blade	4 Amp	32 Volt	Littelfuse 0297004.WXNV

> ⓘ   Only trained personal are permitted to change the fuse.