



MarinePak7 User Manual

MarinePak7 User Manual

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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.

NovAtel Knowledge Base

If you have a technical issue, visit the NovAtel Support page at <u>novatel.com/support/</u>. 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:

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.

- Use the Web UI or NovAtel Application Suite to download the action logs from the internal data storage.
 For information about downloading the action logs, refer to *Logging* on page 103.
- 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 69.



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: shop.novatel.com/novatelstore/s/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. 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

Label	Connector Type	Description
GNSS2	TNC	Secondary GNSS antenna
GSM	SMA	GSM (cellular modem) antenna
UHF	TNC	UHF radio antenna
DC	4-pin LEMO	Receiver power supply
	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
		Input and output signals:
I/O	12-pin LEMO	 PPS (Pulse Per Second) output
		EVENT Input
		EVENT Output
	Screw Terminal	Receiver grounding point
•	USB Type A	USB Host connector*
•))	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 13.

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.

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 (<u>novatel.com/products/antennas</u>) 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.

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	Included	Connect the MarinePak7 Power Supply to the mains supply.
Power Supply Cable (EU)	60723211	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.

Table 2: MarinePak7 Cables

2.4 Select 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. The NovAtel GNSS-850 and GPS-713-GGGL are examples of antennas that can receive GNSS and L-band signals. 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: <u>novatel.com/products/antennas</u> 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 Choose 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 Mount the GNSS Antenna on the next page for more information.

2. Mount MarinePak7 in the desired location.

Refer to Mount 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 26 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 signals.
- 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.

When the optional internal lithium battery is installed, the MarinePak7 will automatically detect the charge state of the battery and begin recharging the battery after the MarinePak7 detects power.

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 24 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.

) The 🕛 button must be pressed after any power failure.

2.7 Mount 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 Mount 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 123 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 124 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.



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:

- 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 123 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.
- Secure the mounting shroud to the MarinePak7 using the screws removed in Step 2. The torque of the screws should not exceed 2 N•m (17 inch-lb).



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

 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.

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

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.

- 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 27: DC Pinout on page 133.

An optional DC power cable is available as an accessory. See *DC Power Cable* on page 137 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.

The 🖰 button must be pressed after any power failure.

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.

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 14: Battery Specifications* on page 125.

To replace the internal battery:

- 1. Use the **U** button to power down the MarinePak7.
- 2. Remove the Battery/SIM cover.



Figure 3: Battery/SIM Cover

- 3. Remove the battery.
- 4. Insert the new battery.
- 5. Replace the Battery/SIM cover.
- 6. Use the **U** button to power on the MarinePak7.

Consult the battery manufacturer's website for information about safe handling and transport of the battery.

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.

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 34.

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, Web User Interface can be used to monitor and configure the MarinePak7. For information about using Web User Interface, see *Web User Interface* on page 74.

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. 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 65), Web UI (see *System* on page 108) or NovAtel Application Suite.

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 62), Web UI (see *Net Ports* on page 101) or NovAtel Application Suite.

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 58), Web UI (see *Serial Ports* on page 96) or NovAtel Application Suite.

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 57) or Web UI (see *GSM* on page 109).

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 54) or Web UI (see *UHF Radio* on page 92).

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. When a USB stick is inserted into the USB port, the most recent log file is automatically downloaded onto the USB stick.

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

2.12 Configure and Monitor the MarinePak7

There are several user interfaces available to monitor and configure the MarinePak7.

2.12.1 LCD User Interface

The LCD User Interface (LCD UI) consists of the LCD screen and buttons on the front of the MarinePak7. Most monitoring and configuration tasks can be performed from the LCD UI.

You do not require any other equipment or a connection to the MarinePak7 to use the LCD UI.

For information about using the LCD UI, refer to Configure the MarinePak7 Using the LCD UI on page 34.

2.12.2 Web User Interface

The Web User Interface (Web UI) is a browser-based tool used to monitor, configure and update the MarinePak7.

To use the Web UI, you require a WiFi capable device that can run a web browser and a WiFi connection to the MarinePak7.

For information about using the Web UI, refer to Web User Interface on page 74.

2.12.3 NovAtel Application Suite

NovAtel Application Suite is set of computer based tools used to configure, monitor, troubleshoot and update NovAtel receivers, including the MarinePak7.

To use NovAtel Application Suite, you require a Windows[®] 10/11 or Linux (Ubuntu 20.04 +) based computer and an Ethernet connection to the MarinePak7.

For information about using NovAtel Application Suite with the MarinePak7, refer to *NovAtel Application Suite* on page 113.

2.12.4 Comparison of User Interface Functionality

The following table compares the functionality available in the LCD UI, Web UI and NovAtel Application Suite.

Functionality	LCD UI	Web UI	NovAtel Application Suite
View positioning status – mode, accuracy, satellites used	~	*	*
View receiver position – latitude, longitude, height, datum			>
View ALIGN heading status – heading, heading accuracy	~	*	~
View ALIGN heading status – heading, heading accuracy, pitch, pitch accuracy, baseline			>
View SPAN INS attitude – roll, pitch, azimuth	v	•	*
View SPAN INS status – solution status, roll, pitch, azimuth, velocity, position			>
View satellites tracked, DOP, elevation mask	v	>	>
View L-band satellites tracked		*	*
View sky map of satellites tracked			*
View satellite carrier-to-noise ratio (C/No) and lock time			>
View graph of received GNSS signals and check for interference signals			>
View PPP Corrections status	~	*	*
View MSK radio status	~	*	
View UHF radio status	~	*	
View GSM radio status	~	~	
View serial port status	~	~	~

Table 3: User Interface Functionality

Functionality		Web UI	NovAtel Application Suite
View ICOM port status	~	~	~
View NCOM port status			~
View Ethernet network status	~	~	~
View WiFi status	~	~	
View antenna LNA status	~	~	
View voltage and current provided to antenna			~
View logging status	~	~	~
View logs stored on internal memory		~	~
View internal memory usage		~	~
View LCD screen brightness		~	
View receiver information – model, serial number, firmware version, software version		~	~
View optional battery status		~	
View MarinePak7 CPU usage		~	~
View receiver temperature			~
View receiver interference status			~
View receiver event messages			v
Configure receiver as rover or base station		~	~
Configure base station position – manually set position		~	~
Configure base station position – automatically determine position			~
Configure base station output format and output port			~

Functionality		Web UI	NovAtel Application Suite
Configure base station antenna phase center offsets			>
Configure rover for RTK positioning		>	>
Configure rover for DGPS positioning	~	~	
Configure rover for PPP positioning – Oceanix corrections via L- band	~	>	>
Configure rover for PPP positioning – Oceanix corrections via NTRIP			>
Configure rover for SBAS positioning			>
Configure rover antenna phase center offsets			>
Configure ALIGN heading offset	~	v	~
Configure ALIGN - heading offset, pitch offset, data output rate			v
Configure INS – antennas offsets, IMU rotations, position offset		~	~
Configure INS – IMU type, antenna offsets, IMU rotations, position offset			v
Configure PPS output		•	>
Configure elevation mask		>	>
Configure MSK radio	~	v	
Configure UHF radio		~	
Configure serial ports		~	v
Configure logging for serial port		v	>
Configure ICOM ports		~	~
Configure logging for ICOM port		~	~
Configure NCOM ports		~	~

Functionality	LCD UI	Web UI	NovAtel Application Suite
Configure logging for NCOM ports			*
Configure Ethernet network connection	~	*	>
Enable/disable WiFi	>	>	
Enable/disable antenna LNA	>	>	
Factory reset the receiver	>		>
Enable/disable logging	>	>	>
Configure logging to internal memory		>	>
Configure logging to UI computer			*
Download logs from internal memory		*	>
Delete logs from internal memory	*	*	>
Set LCD display brightness		*	
Updated MarinePak7 firmware		*	
Enter Authorization code to change receiver model			>
Configure filters to mitigate interference signals (optional feature)			v
Calibrate spoofing detection			~

Configuration changes applied outside of the MarinePak7 LCD UI or Web UI may not be reflected on the MarinePak7 user interfaces.

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 4: MarinePak7 UI Navigation Buttons

Keypad Button		Description
	Pight Button	Press to advance the UI status screen to the next screen.
Right Button		Press to select a configuration parameter.
	L oft 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.
	Daok Dation	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.
٩	Power Button	Press to power on or power off the MarinePak7.

At the top of all LCD UI screens are two status information fields.

- In the top left corner of the LCD screen is the current time.
- In the top right corner is the current charge level of the optional internal battery.

When the internal battery is at a low charge level, it may take additional time for the battery to charge sufficiently to show the charge status on the LCD display.

3.2 Position Status

The Position Status (Home) screen displays the position status of the MarinePak7.



Position Status	Icon displays GREEN when the receiver reports SOLUTION_COMPUTED.
Indicator	Icon displays RED when any other Solution Status is reported from the receiver. See <i>Table 5: Solution Status</i> on the next page.
Mode	The active position mode type. See <i>Table 6: Position Type</i> on page 37.

Accuracy	H = The horizontal standard deviation (RMS) V = The vertical standard deviation (RMS)
Satellites	The number of satellites used in the position solution.

Table 5: 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
	When a FIX position command is entered, the receiver computes its own position and determines if the fixed position is valid
PENDING	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.
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
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

Table 6: Position Type

Mode	Description
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 and CMR+ correction formats

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 88.

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 69).

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.

14:21 95%
BASE STATION CFG
Latitude
+51.1500950
Longitude
-114.0309500
Height MSL (m)
+1087.500

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.
neading Status mulcator	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.

Hooding (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 69) to access INS screens.

14:21		95%
\checkmark	INS	
Azimuth	Pitch	Roll
123.55	+01.055	+00.375

To access the INS Status screen from the Home screen, press the **Right** button 2 times.



SPAN Status	Displays GREEN when a SPAN solution has been computed.		
Indicator	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.		

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.

14:21		95%			
11	INS CONFIG				
Antenna	a Lever Arm X۱	/Z (m)			
1+002.150	+000.750	+003.200			
2-002.100	+000.750	+003.200			
Rotation (deg)), Position XYZ	(m) Offsets			
R +000.00	+000.000	+001.500			
P+000.00	+000.000	+000.000			

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)

The MarinePak7 uses the default standard deviation values for the antenna lever arm offsets. For the Primary and Secondary GNSS antenna offsets, the standard deviation defaults are set to 10% of the offset value (up to a maximum of 10 metres).

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)
Р	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)

The MarinePak7 uses the default standard deviation values for the rotations from IMU body frame to vessel frame. The default standard deviation for IMU body rotation is 3 degrees.

The MarinePak7 uses the default standard deviation values for the offsets from IMU center of navigation. For the IMU offsets, the standard deviation defaults are set to 10% of the offset value (up to a maximum of 10 metres).

For the ANT1, ANT2, EXTERNAL and GIMBAL translations, the standard deviation defaults are set to 10% of the translation value (up to a max of 10 metres).

3.5 GNSS Status

The GNSS Status screen provides information about the GNSS solution.

14:21			95%
\checkmark	GNSS	ST/	ATUS
#GPS	#GLO	#BDS	S J #GAL
12	11	8	6
HDOP	PD	OP	VDOP
1.6	1.6 1.		1.8
Elevation Mask			
10			

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)
INEG	Generates a normally high, active low pulse with the falling edge as the reference.
POS	Set the polarity of the PPS pulse to positive.
FUS	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

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 69) 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	Displays GREEN when there is a valid Oceanix subscription and the receiver has successfully locked onto at least 1 beam.
Status Indicator	Displays RED if there is no valid Oceanix subscription or the receiver has failed to lock onto at least 1 beam.

Trooked	Displays the name(s) of the transmission beam(s).
Beam IDs	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.
	Displays the current tracking mode.
Tracking	AUTO – The receiver searches for multiple L-band beams on the L-band channels.
Mode	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 for which service is available. Service expires at the end of this UTC day.
	The Expiry date is shown as the Julian day and year. For example, if the expiry is shown as 305 - 2022, then the service will expire on November 1, 2022 at 24:00 UTC.
	Displays the status of the Oceanix subscription.
	Access
Oceanix Status	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.

14:21	95%
LBAND	CONFIG
Trackin	g Mode
AU	то
Baud	Frequency
1200	1545.8650 MHz

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.

	The receiver searches for multiple L-band beams on the L-band channels based on AUTO selection criteria.
Αυτο	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 <i>Frequency</i> and <i>Baud</i> rate of the beam.

Baud

This option is only available when the tracking mode is set to MANUAL.

Use this option to manually select the L-band data stream baud rate.

Press either the Left or Right buttons to select the baud rate option. See Table 7: L-band Satellites below.

Frequency

This option is only available when the tracking mode is set to MANUAL.

Use this option to manually select the L-band frequency.

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 7: L-band Satellites below.

Satellite	Baud	Frequency	Location
AORW	1200 bps	1545.8450 MHz	54.00° west longitude
IOR	1200 bps	1545.8650 MHz	83.50° east longitude
25E	1200 bps	1545.8250 MHz	25.00° east longitude
143.5E	1200 bps	1545.8350 MHz	143.50° east longitude
98W	1200 bps	1545.8650 MHz	98.00° west longitude

Table 7: L-band Satellites

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 on the next page.
- 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, GLONASS L1/L2, Galileo E1/E5a/E5b/E6 and BeiDou B1C/B2a/B2b/B3)

Refer to our web site <u>novatel.com/products/gps-gnss-antennas</u> 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 111.

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.

The OEM7 feature Subscription Managed Channel Configuration (SMCC) is not applicable to the MarinePak7 and is disabled by default.

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.
- 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 60 km of shore.

For more information about Oceanix services, visit <u>novatel.com/products/gps-gnss-correction-</u> 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* above.

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 69) 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 38).

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.

14:21	95%
MSK CONFIG	
Tracking Mode	
AUTO	
Frequency	
312.5 KHz	

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 settings 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

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.

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 69) 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 38).

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 received UHF 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
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 69) to access the 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 38).

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.



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 <i>Receive or Transmit Protocol</i> on the next page.

3.10.1 Serial Configuration

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

14:21	l				95%	14:21					95%
SERIAL CONFIG							SER	IAL	CO	NFIG	
COM1							CO	М1			
232	11520	00 8N1		NMEA		232	11520	0 8N1		INS OUT	Г
	N	MEA Mes	sages	s-Hz			IN	IS Mess	ages-	Hz	
GGA	1	GLL	1	ZDA	1	HVE	NEW	TSS	1	PVA	20
RMC	1	GSV	1	GST	1	PRH	1				
HDT	1	VTG	1	RMC	1						

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 hita	7	7 data bits
Data bits	8	8 data bits (default)
	N	No parity (default)
Parity	E	Even parity
	0	Odd parity
Stop bite	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 ISA-100C IMU is connected to the port
μIMU	μIMU	Rover	Select when a SPAN $\mu \text{IMU-IC}$ IMU is connected to the port
	INS OUT	Rover	Outputs INS messages
CMR IN	-	Rover	Accepts CMR and 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.

14:21		95%
NET	PORT S	TATUS
	ICOM1	
TCP	3001	INS OUT
	ICOM2	
TCP	3002	NMEA OUT
	ICOM3	
TCP	3003	NMEA OUT

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.

14:21					95%	14:21	1				95%
NET PORT CONFIG					Ν	IET F	POR	ГСС	DNFI	G	
ICOM1								ICO	M1		
				NMEA OU	т	UDP	192.168.	072.123	03001	INS	OUT
	N	MEA Mes	sages	s-Hz			AI I	IS Mess	sages-l	Hz	
GGA	1	GLL	1	ZDA	1	HVE	NEW	TSS	1	PVA	1
RMC	1	GSV	1	GST	1	PRH	1				
HDT	1	VTG	1	GSA	1						

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 Endpoint 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.

14:21 95%
NETWORK STATUS
IP Address
192.168.001.002
Netmask
255.255.255.0
Gateway
192.168.1.0

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.

14:21	95%			
NETWORK CONFIG				
DHCP	IP Address			
OFF	192.168.001.002			
	Netmask			
	255.255.255.000			
Gateway				
	000.000.000.000			

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 the 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 the 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 the 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

14:21		95%	
V SYSTEM STATUS			
WiFi	ANT1	ANT2	
OFF	ON	ON	
Logging	Used Space		
ON	1.2/16Gb		
BRIGHTNESS			
50%			

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



For MarinePak7 models without the UHF module, the GSM Status screen follows the MSK Status screen.

WiFi	WiFi status (On or Off).
ANT1	LNA DC power (antenna power) status for the GNSS1 port (On or Off). (For the primary GNSS and MSK beacon antenna.)

ANT2	LNA DC power (antenna power) status for the GNSS2 port (On or Off). (For the secondary GNSS 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.

14:21			95%	
SYSTEM CONFIG				
WiFi	ANT1	ANT2	LOGGING	
OFF	ON	ON	ON	
Factory Reset		Delete Logs		
No		No		
BRIGHTNESS		RTK MODE		
50%		ROVER		

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.

A factory reset does not change the IP address configured on the MarinePak7.

Delete Logs

- 1. Press the Left or Right button to highlight the Delete Logs option.
- 2. Press the Enter button to access the Yes and No options.

- 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	NARROW_INT is achieved when compatible and valid RTK corrections are received.
	SINGLE	
	PPP	
BASE	FIXEDPOS	FIX position solution is achieved when the base station coordinates are input into the <i>Base Station Configuration</i> on page 39 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



To access the System Information screen from the Home screen, press the **Right** button until the System Info screen displays.



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 and Authorization codes.	

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.

Nov Atel		
MEN	U	
♠	Dashboard	
9	GNSS Receiver	
٢	LBand	
^у с.	UHF Radio	
Ŷ	MSK Beacon	
ŵ	Serial Ports	
Ŷ	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.

General Status	
GNSS	L-BAND
✓ Position	✓ Heading
	Logging

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) subscription activated on the system. Ensure a multi-constellation, multi-frequency L-band compatible GNSS antenna is connected to the GNSS1 connector on 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 GNSS2 connector on the MarinePak7. Also check that both antennas have a clear view of the sky and can track common satellites.		
Logging	Displays when data logging is inactive.		

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.

Module Status
UHF
. MSK
. GSM

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	•
GPS Satellites	7
GLO Satellites	4
BDS Satellites	7
GAL Satellites	5
HDOP	1.2440
PDOP	2.5300
VDOP	2.2030

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	lites 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.

Positior	n Status	•
Accurac	y 2D	0.0290
Accurac	y Height	0.0574
Satellite	S	16
Mode		PPP

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 in metres (RMS).	
Accuracy Height	The vertical standard deviation in metres (RMS).
Satellites The number of satellites used in the computed solution.	
Mode	The active position mode type. See <i>Table 6: Position Type</i> on page 37.

4.4.3 INS Status Tile

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

INS Status		
Roll	0.00000000	
Pitch	0.00000000	
Azimuth	0.00000000	

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 in degrees.	
Pitch	Pitch of the vessel in degrees.	
Azimuth	Heading of the vessel in degrees.	

4.4.4 Heading Status Tile

The Heading Status tile displays the current ALIGN Heading solution.

Heading Status		٠
Heading	319.207550049	
Heading SD	0.103530563	

Heading Status	A green circle in the top right corner indicates GNSS Heading status is healthy.
Heading Status	A red circle indicates that no Heading updates are being generated.
Heading	Heading in degrees relative to True North.
Heading SD	Heading standard deviation in degrees.

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 Deta	ails
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	Version of the firmware installed on the GNSS receiver board.
	Hardware version of the GNSS receiver board in the format:
	P-R
H/W Vorsion	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 Format	Elevation mask	
RTCMV3	00.0	
	Correction Format RTCMV3	Correction Format Elevation mask RTCMV3 00.0

Click the Edit icon (\checkmark) 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 and CMR+ correction formats		

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.

RTK				1
Enabled	Latitude	Longitude	Height MSL (m)	
Rover				
RTK				1
Enabled	Latitude	Longitude	Height MSL (m)	
Base	+51.1500950	-114.0309500	+1087.500	

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 (\checkmark) to enter the configuration window.
- 2. Click the **Enabled** drop down menu and select **Rover**.

bled		
Rover	 	
Base		
Rover		
	Save changes	Cancel

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).

For the Latitude, Longitude and Height values, use the location of the phase center of the GNSS antenna connected to the GNSS1 port on the MarinePak7.

6. Click the Save changes button.

4.4.8 INS Tile

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

NS				/
Lever Arm 1	Lever Arm 2	Rotation Offset	Position Offset	
+001.500	+001.500	+000.230	+000.000	
+000.230	+002.450	+000.550	+000.000	
+001 000	+001.100	+001.600	+000.000	

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

Lever Arm 1			
+001.500			
+000.230			
+001.000			
Lever Arm 2			
+001.500			
+002.450			
+001.100			
Rotation Offset			
+000.230			
+000.550			
+001.600			
Position Offset			
+000.000			
+000.000			
+000.000			

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.

Heading	
Offset	
+000.00	

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 (\checkmark) to open the configuration window.

Edit Heading Configuration		
Offset		
+000.00		
	Save changes	Cancel

- 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.

PPS		1
Polarity		
Positive		

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

all PPS Configuration	
olarity	
Positive	~
OFF	
Negative	
Positive	

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

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

Ethernet				/
IP	Subnet Mask	Gateway	DHCP	
192.168.5.2	255.255.255.0	192.168.5.0	OFF	

Click the **Edit** icon (\checkmark) 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		
UFF	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.

NTRIP					/
IP	IP_port	User Name	Password	Mount Point	
069.075.031.235	02101	User	NovAtel	NA	

Click the Edit icon (\checkmark) to open the configuration options window.

069.075.031.235	
IP_port	
02101	
User Name	
User	
Password	
NovAtel	
Mount Point	
NA	

- 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.

Status			
Oceanix Status	ENABLE		
	AORE	25E	AORW
Signal strength	0.000	36.743	33.401

Oceanix	Displays ENABLE when there is a valid Oceanix subscription and the receiver has successfully locked onto at least 1 beam.
Status	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

Details	
Subscription Type	TERM
PAC	QY487:6784:1821
OEM Serial Number	DMMU18340051U

Subscription Type	Displays the type of Oceanix subscription.
PAC	Displays the Product Activation Code (PAC) for the MarinePak7.
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.

Configurable Parameters			
	Tracking Mode	Baudrate	Frequency
1	Auto	1200	0.0

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

Edit Configuration			
Tracking Mode			
Auto			•
Baudrate			
1200			•
Frequency			
0.0			
		Save changes	Cancel

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 <i>LBAND Configuration</i> on page 48 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	•
Signal Strength	0
Mode	Rx
Protocol	Satel 3AS
Data Rate	19200
FEC	ON
Frequency	458.7000 MHz

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.

Configurable Parameters			
	Mode	Compatibility	Frequency
1	Rx	18: Satel 3AS,4FSK,19200,25.0,FEC	458.7000

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

Mode	
Rx	
Compatibility	
18: Satel 3AS,4FSK,19200,25.0,FEC	
Frequency	
458.7000	
	Course de la cours

- 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

Compatibility Mode	Protocol	Modulation	Link Rate (bps), Channel Spacing (kHz)	FEC
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
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		
Signal Strength	-7 dB	
Station	1024	
Frequency	285.5 kHz	

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.

Configurable Parameters				
		Mode	Frequency	
	1	AUTO	285.5 kHz	

Click the Edit icon (\checkmark) to enter the configuration window.

Edit Configuration		
Mode		
Auto		•
Frequency		
297.5		
	Save changes	Cancel

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.

COM Ports							
	Port	I/O	Line Standard	Baudrate	Stop Bits	Parity	Data Bits
/	COM1	INS OUT	RS232	460800	1	None	8
/	COM2	NMEA OUT	RS422	115200	1	None	8
1	COM3	IMU uIMU	RS232	230400	1	None	8

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

Edit Configuration	com1
1/0	
NMEA OUT	~
Line Standard	
RS232	~
Baudrate	
115200	~
Stop Bits	
1	~
Parity	
None	~
Data Bits	
8	~
	Save changes Cancel

Ι/Ο	See <i>Table 8: I/O Parameters</i> on the next page	Select the Rx/Tx protocol used for this COM port.
Line	RS232	Use RS232 protocol on this COM port.
Standard	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
	None	Use no parity
Parity	Even	Use even parity
	Odd	Use odd parity
Data Bite	7	Use seven data bits
	8	Use eight data bits

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 ISA-100C IMU is connected to the port
μIMU	μIMU	Rover	Select when a SPAN $\mu\text{IMU-IC}$ IMU is connected to the port
	INS OUT	Rover	Outputs INS messages
CMR IN	-	Rover	Accepts CMR and CMR+ corrections (External Source)
RTCMV3 IN	-	Rover	Accepts RTCMV3 corrections (External Source)
NOVX IN	-	Rover	Accepts NOVATELX corrections (External Source)

Table 8: I/O Parameters

4.8.2 Log List Tile

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

Loglist				Ð
	Port Name	Message ID	Period (Hz)	
/	COM2	GPGGA	20	
/	COM2	GPVTG	20	
/	COM1	HEAVE		
/	COM1	INSPVAA	20	•
/	COM1	TSS1	50	•

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

Port Name	
COM2	
Message ID	
GPGGA	
Period (Hz)	
1	
Rouge advances	Cancel

To modify a log being output, click the Edit icon (\checkmark) 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 <i>Table 9: NMEA Message IDs</i> below and <i>Table 10: INS Message IDs</i> below.

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 9: NMEA Message IDs

NMEA Messages	Description
GGA	Global Position System Fix Data and Undulation
GLL	Geographic Position
VTG	Track Made Good and Ground Speed
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 10: 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.

NET Ports					
	Name	Protocol	IP Address	Port	1/0
/	ICOM1	UDP	172.100.50.10	3001	INS OUT
/	ICOM2	TCP		3002	NMEA OUT
/	ICOM3	TCP	-	3003	CONFIG

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

Edit Configuration	ICOM	2
Protocol		
TCP		~
Port		
3002		
1/0		
NMEA OUT		~
	Save changes Cance	4

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

ТСР	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.

Loglist				Ð
	Port Name	Message ID	Period (Hz)	
/	ICOM2	GPGGA	20	
/	ICOM2	GPHDT	10	
/	ICOM1	INSPVAA	50	
/	ICOM1	PASHR	50	

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

Add Log Configuration	
Port Name	
ICOM1	~
Message ID	
HEAVE	~
Save changes	Cancel

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

Port Name		
ICOM1		
Message ID		
INSPVAA		~
Period (Hz)		
1		~

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, <i>Table 9: NMEA Message IDs</i> on page 100 and <i>Table 10: INS Message IDs</i> on page 100.
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.

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.

Usage Details		
5.552 GB used of 19.6 GB total		

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.

Log Actions	
Download User Log	Delete User Log

To download the logs:

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

Select Log File to Download		×
user_20201127_153614.gps (14.3 MB)		~
	Download	Cancel

- 2. Click the drop down menu and select the log file to download.
- 3. Click the **Download** button.

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

To delete the stored logs:

r

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.

Loglis	t				٥
	Message ID	Туре	Trigger	Period	
1	RAWEPHEM	Binary	ONCHANGED		
1	ITDETECTSTATUS	Binary	ONCHANGED		
1	BESTPOS	Binary	ONTIME	1	
1	RANGE	Binary	ONTIME	1	

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	
Туре	
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	
Туре	
ASCII	~
Trigger	
ONTIME	~
Period	
1	
	Save changes Cancel

To remove a log from the Log List, click the Delete icon (\blacksquare).

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 <u>docs.novatel.com/OEM7/Content/Logs/OEM7_Core_</u> Logs.htm.		
Туре	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 <u>docs.novatel.com/OEM7/Content/Logs/OEM7_Core_Logs.htm</u> . Use the ONTIME trigger only for NMEA logs.		
	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.		
Period		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.

🗢 Wifi	
Password	MarinePak7
Country	GB

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.

		~
Save changes	Cancel	
	Save changes	Save changes Cancel

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.

G SM	Off
Signal strength	0 dbm
Mode	GPRS
Provider	No Current Provider

Statua	Displays On when the GSM cellular modem is active.		
Status	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.

Screen	1
Brightness	50%

To change the LCD screen brightness:

1. Click the **Edit** icon (\checkmark).

The Edit Screen Configuration dialog box appears.

Edit Screen Configuration		
50%		
Save changes	Cancel	

- 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.

Firmware		
Version	1.0.0	Update Firmware
Last update	2020-10-07 15:34:51	

To update the firmware on the MarinePak7:

- 1. Obtain the new firmware file by downloading the firmware file from <u>novatel.com/support/support-</u> 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.

Upload Firmware		
Select firmware file Choose File release_1.0.0.mrx		
	Install	Cancel

- 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.

NovAtel Application Suite is set of computer based tools used to configure, monitor, troubleshoot and update NovAtel receivers, including the MarinePak7. It runs on a Windows[®] 10/11 or Linux (Ubuntu 20.04 +) based computer and communicates to the MarinePak7 using an Ethernet connection.

NovAtel Application Suite includes the following tools.

Manage

The Manage tool is a graphic interface that allows you to configure and monitor the MarinePak7.

To use Manage, the MarinePak7 must be physically connected to the computer running Manage using an Ethernet connection. The communication parameters used to communicate with the receiver must also be defined in Manage.

To start Manage, click the Manage icon on the NovAtel Application Suite main window.

• Playback

Playback allows you to view the information stored in a log file using the Playback interface. The Playback interface uses the same status tiles that are available in the Manage tool allowing you to quickly and easily review the receiver information stored in the log file.

To start Playback session, click the **Playback** icon on the NovAtel Application Suite main window.

Convert

Convert is a tool that converts NovAtel logs from one format to another. Convert accepts ASCII, BINARY and ABBREVIATED ASCII formats and converts them to ASCII, BINARY, ABBREVIATED ASCII, RINEX or KML formats.

To start Convert, click the **Convert** icon on the NovAtel Application Suite main window.

GRIT Monitor

GRIT Monitor provides easy access to the GRIT features available on the MarinePak7. With GRIT Monitor you can detect and monitor jamming, interference or spoofing signals on the MarinePak7. With the optional mitigation feature, you can also mitigate interference allowing the receiver to maintain robust positioning.

To use GRIT Monitor, the MarinePak7 must be physically connected to the computer running GRIT Monitor using an Ethernet connection. The communication parameters used to communicate with the receiver must also be defined in GRIT Monitor.

To start GRIT Monitor, click the **GRIT Monitor** icon on the *NovAtel Application Suite* main window.

5.1 Install NovAtel Application Suite

The latest version of NovAtel Application Suite software is available from the NovAtel web page. To install NovAtel Application Suite:

1. Download the NovAtel Application Suite installation file from the NovAtel web page: novatel.com/support/support-materials/software-downloads.

- 2. Once downloaded, open the installation file to start the installation wizard.
- 3. Follow the wizard to install NovAtel Application Suite.

5.2 Create a Device

Before a Manage or GRIT Monitor session can be started with a receiver, a Device must be added for the receiver on the *Devices* window. A Device contains the connection type (Ethernet) and communication parameters used to communicate with a receiver.

- 1. Start NovAtel Application Suite.
- 2. Start Manage or GRIT Monitor.
- 3. Click the Add Device button.

The New Connection dialog box opens.

4. In the Connection Name box, enter a name for the Device.

This name is used to identify this Device on the Devices window and on the *Status*, *Configuration* and *Dashboard* windows.

5. Click the **Network** button.

The New Connection dialog expands to show the network connection parameters.

6. If specifying the connected device by its IP address, click the **IP Address** option and enter the IP address of the receiver in the **IP Address** box.

If specifying the connected device by its host name, click the **Host Name** option and enter the host name of the device in the **Host Name** box.

7. In the Port box, enter the port used to communicate with the receiver.

The MarinePak7 uses port 3007.

8. Click the button (TCP or UDP) for the protocol used for communication with the receiver.



9. Click the Add button.

A new Device labeled with the name entered in the *Connection Name* box is added to the *Devices* window.

5.3 Start a Manage or GRIT Monitor Session

- 1. Connect the computer running NovAtel Application Suite to the MarinePak7 using an Ethernet connection.
- 2. Start NovAtel Application Suite.
- 3. Start Manage or GRIT Monitor.

- 4. Open the Device that matches the receiver connected.
- 5. Click the **Connect** button.

The device box changes to show Disconnect and Open buttons.

6. Click the **Open** button.

5.4 More Information

For information about using the tools available in NovAtel Application Suite, refer to the help file in NovAtel Application Suite or the online documentation at docs.novatel.com/Tools/Content/ToolsSuite/Overview.htm.

The following MarinePak7 features can only be accesses using NovAtel Application Suite.

- Configure Oceanix PPP corrections over NTRIP (Manage) refer to PPP Corrections over NTRIP on docs.novatel.com/Tools/Content/Manage/ConfigurationWizardReceive.htm
- Set the phase center offsets for the base station antenna (Manage) refer to *Base Antenna Phase Center Offset* on docs.novatel.com/Tools/Content/Manage/ConfigurationWizardReceive.htm
- Set the phase center offsets for the rover antenna (Manage) refer to *Rover Antenna Phase Center Offset* on docs.novatel.com/Tools/Content/Manage/ConfigurationWizardReceive.htm
- View interference, jamming and spoofing events and signals detected by the receiver (GRIT Monitor) refer todocs.novatel.com/Tools/Content/GRIT/Overview.htm
- Configure filters to mitigate interference and jamming signals (GRIT Monitor) refer to docs.novatel.com/Tools/Content/GRIT/Overview.htm

Advanced users can send additional commands to the MarinePak7 using the *Terminal* window inside Manage and GRIT Monitor. Contact NovAtel support for advice when using this feature as some commands may interfere with MarinePak7 operation.

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	
NovAtol Part Number	MP7720	
	MP7720U	

Table 11: MarinePak7 Physical Description

See the following sections for more information about the MarinePak7:

- MarinePak7 Performance Specifications on the next page
- MarinePak7 Mechanical Specifications on page 121
- MarinePak7 Electrical and Environmental Specifications on page 125
- MarinePak7 Data Communications Specifications on page 127
- MarinePak7 Strobe Specifications on page 129
- MSK Beacon Receiver Specifications on page 130
- GSM Specifications on page 130
- UHF Radio Specifications on page 131
- MarinePak7 Connectors on page 131

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

- Serial Data Cable on page 135
- Power Supply on page 136
- DC Power Cable on page 137

A.1 MarinePak7 Performance Specifications

All specifications subject to GNSS system characteristics.

	Single point L1	1.5 m RMS	
	Single point L1/L2	1.2 m RMS	
Desition Accuracy ¹	SBAS ²	60 cm RMS	
Position Accuracy	DGPS	40 cm RMS	
	Oceanix ³	2.5 cm (95%)	
	RTK	1 cm + 1 ppm RMS	
	GPS	L1 C/A, L1C, L2C, L2P, L5	
	GLONASS	L1 C/A, L2 C/A, L2P, L3, L5 ⁴	
	Galileo	E1, E5 AltBOC, E5a, E5b	
Signals Tracked	BeiDou	B1I, B1C, B2I, B2a, B2b	
(GNSS1)	NavIC (IRNSS)	L5	
	QZSS	L1 C/A, L1C, L1S, L2C, L5	
	SBAS	L1, L5	
	L-band	Up to 5 channels ⁵	
	GPS	L1 C/A, L1C, L2C, L2P, L5	
	GLONASS	L1 C/A, L2 C/A, L2P, L3, L5 ⁴	
Signals Tracked	Galileo	E1, E5 AltBOC, E5a, E5b	
(GNSS2)	BeiDou	B1I, B1C, B2I, B2a, B2b	
	NavIC (IRNSS)	L5	
	QZSS	L1 C/A, L1C, L1S, L2C, L5	

er Performance
3

¹Typical values under ideal, open sky conditions.

²GPS-only.

³Requires a subscription to Oceanix correction services.

 $^4\mbox{Although}$ hardware capable, GLONASS L5 is currently not available.

⁵Currently the receiver can track up to 3 L-band channels.

Time to First Fix ¹	Hot: <20 s (almanac and recent ephemeris saved and approximate position and time entered)			
	Cold: <34 s (no almanac or ephemeris and no approximate position or time)			
Signal Passauisition	<0.5 s L1 (typical)			
Signal Neacquisition	<1.0 s L2 (typical)			
Data Patas	Measurements	Up to 20 Hz		
Data Nales	Position	Up to 20 Hz		
Time Accuracy ²	<5 ns RMS			
Velocity Accuracy	<0.03 m/s RMS			

¹Cold start: no almanac or ephemerides and no approximate position or time. Hot start: almanac and recent ephemerides saved and approximate position and time entered.

²Time accuracy does not include biases due to RF or antenna delay.

			Code	Carrier
	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
		L1 C/A	8 cm	1.0 mm
	GLONASS	L2 P	8 cm	1.0 mm
		L2 C/A	8 cm	1.0 mm
Measurement Precision	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	Baseline = 2 m	0.08 degrees RMS		
Accuracy ²	Baseline = 4 m	0.05 degrees RMS		

¹Under good CNO conditions, e.g. 44 dbHz

²Typical values under ideal, open sky conditions.

Heave Performance ¹	Instantaneous Heave	5 cm or 5%
	Delayed Heave	3.5 cm or 3.5%
	Post-Processed Heave ²	2.5 cm or 2.5%
Velocity Limit	600 m/s ³	

¹Requires SPAN Marine profile

²Post-processing results using Waypoint Inertial Explorer.

³Export licensing restricts operation to a maximum of 600 metres per second, message output impacted above 585 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 123
- Figure 10: MarinePak7 Mounting Holes on page 124



Figure 6: MarinePak7 Dimensions – Top







Figure 8: MarinePak7 Dimensions – Back







Figure 10: MarinePak7 Mounting Holes

A.3 MarinePak7 Electrical and Environmental Specifications

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

Table 13: MarinePak7 Power Requirements

Manufacturer	Inspired Energy
Part number	ND2037HD34
Туре	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: Battery Specifications

Table 15: 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 16.	MarinoPak7	Regulatory	Compliance
Table 10.	wainer aki	Regulatory	Compliance

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

Table 17: MarinePak7 RF Input/LNA Power Output

Antenna Connectors	TNC female, 50 Ω nominal impedance		
Cascaded antenna LNA gain	HDR disabled +15 dB to + 40 dB, 26 dB typical		
(before receiver)	HDR enabled +20 dB to + 40 dB, 30 dB typical		
	GPS L1:	1575.42 MHz	
	GPS L2:	1227.60 MHz	
	GPS L5:	1176.45 MHz	
	GLONASS L1:	1593-1610 MHz	
	GLONASS L2:	1237-1254 MHz	
	GLONASS L3:	1202.025 MHz	
	Galileo E1:	1575.42 MHz	
RF Input Frequencies	Galileo E5a:	1176.45 MHz	
	Galileo E5b:	1207.14 MHz	
	Galileo E5:	1191.795 MHz	
	BeiDou B1I:	1561.098 MHz	
	BeiDou B1C:	1575.42 MHz	
	BeiDou B2I:	1207.14 MHz	
	BeiDou B2a:	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 18:	Data	Communications	Interfaces
-----------	------	----------------	------------

СОМ1				
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			
	COM2_Tx, COM2_Rx (RS-232)			
Signals supported	COM2_Tx+, COM2_Tx-, COM2_Rx+, COM2_Rx- (RS-422)			
Port	DB9 male			
СОМЗ				
Electrical format	RS-232/RS-422			
Data rates ¹	2400, 4800, 9600 (default), 19200, 38400, 57600, 115200, 230400 or 460800 bit/s Default = 9600			
	COM3_Tx, COM3_Rx (RS-232)			
Signals supported	COM3_Tx+, COM3_Tx-, COM3_Rx+, COM3_Rx- (RS-422)			
Port	DB9 male			
USB				
Electrical format	Conforms to USB 2.0			
Data rates	Hi-speed (480 Mb/s)			
Port	USB Type A			

¹Data 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.

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.

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 (<i>GNSS Receiver</i> on page 77) or the LCD UI (<i>GNSS Configuration</i> on page 46).	

Table 19: MarinePak7 Strobes Description

Table 20: 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		
DDC	V _{OL}		0.6 V	120 m A
	VOH	5.4 V		120111A

A.6 MSK Beacon Receiver Specifications

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

Table 21: Receiver Module

A.7 GSM Specifications

Table 22:	GSM/GPRS	Specifications
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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.

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

	Table 23:	Transceiver	Module
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A.9 MarinePak7 Connectors

The following tables provide the pinouts for the MarinePak7 connectors.

A.9.1 COM Ports



The MarinePak7 COM ports are DB9 male connectors.

Table 24: 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	

¹For Australia, only 915-928 MHz is allowed

	RS-232			RS-422			
Pin	Signal Name	Description	I		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 25: 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		

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		

Table 26: COM3 Pinout

A.9.2 DC Power Port



Table 27: 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



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

Table 28: I/O Pinout

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.





Table	29:	Serial	Data	Cable	Pinout
		•••••			

DB9 Female (J1)	DB9 Female (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.



A.12 DC Power Cable

This cable connects the MarinePak7 to a DC power supply.



Figure 13: DC Power Cable

Table 30: 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 31: 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.

