

VersaPNT

Getting Started Guide



Document Part No.: 1228-5000-0057

Revision: 5

Date: 29-March-2023



About this Guide

This Getting Started Guide is a supplement to the main user manual for VersaPNT. The latest version of the main user manual can be found online under manuals.orolia.com.

© 2023 Spectracom. An Orolia brand.
Orolia USA, Inc.

CONTENTS

About this Guide	2
Product Overview	1
1.1 Interfaces Overview	1
1.1.1 Input Timing Interfaces	2
1.1.2 Output Timing Interfaces	2
1.1.3 Navigation Inputs & Outputs	2
1.1.4 Other Interfaces	3
1.2 Connectors and their Pinouts	4
1.2.1 Power Connector	4
1.2.2 Input/Output Connector	5
1.2.3 Ethernet Connector	6
1.2.4 Optional I/O Connector	6
1.2.5 Coaxial Connectors	7
1.3 Included Cables	8
1.4 Status LEDs	10
1.4.1 Blinking Intervals	10
1.4.2 LED Lighting Patterns	10
1.4.3 Legend, individual LEDs	11
1.4.3.1 LED Patterns during Boot Sequence	12
1.4.4 Blackout Mode	12
1.5 The VersaPNT Web UI	12
1.5.1 The Web UI HOME Screen	13
Quick Start	15
2.1 Network Setup	17
2.2 Zero Configuration Setup	21
2.2.1 Using Zeroconf	22
2.3 Assigning I/O Pins	23
2.3.1 Signal Types	24
2.3.2 I/O Signal Mapping Table	24
2.4 INS Configuration	29

2.4.1 "NMEA Output" Tab	30
2.4.2 "Calibration" Tab/Antenna Installation	31
2.4.3 "Log" Tab	31
2.4.4 "FIR Filter" Tab	31
2.4.5 "Coning/Sculling" Tab	32
2.4.6 "Frame Rotation" Tab	33
2.5 INS Initialization	34
2.6 INS Expert Mode	35
2.7 VICTORY Configuration	36
SAFETY	37
3.1 SAFETY: Before You Begin Installation	37
3.2 Regulatory Compliance	38
Technical Support	40
3.3 Regional Contact	40

Product Overview

This section is designed to help you become familiar with the structure, features, and functions of the VersaPNT.

1.1 Interfaces Overview

All of VersaPNT's interfaces are integrated into the unit's connectors, which are located on the front panel:

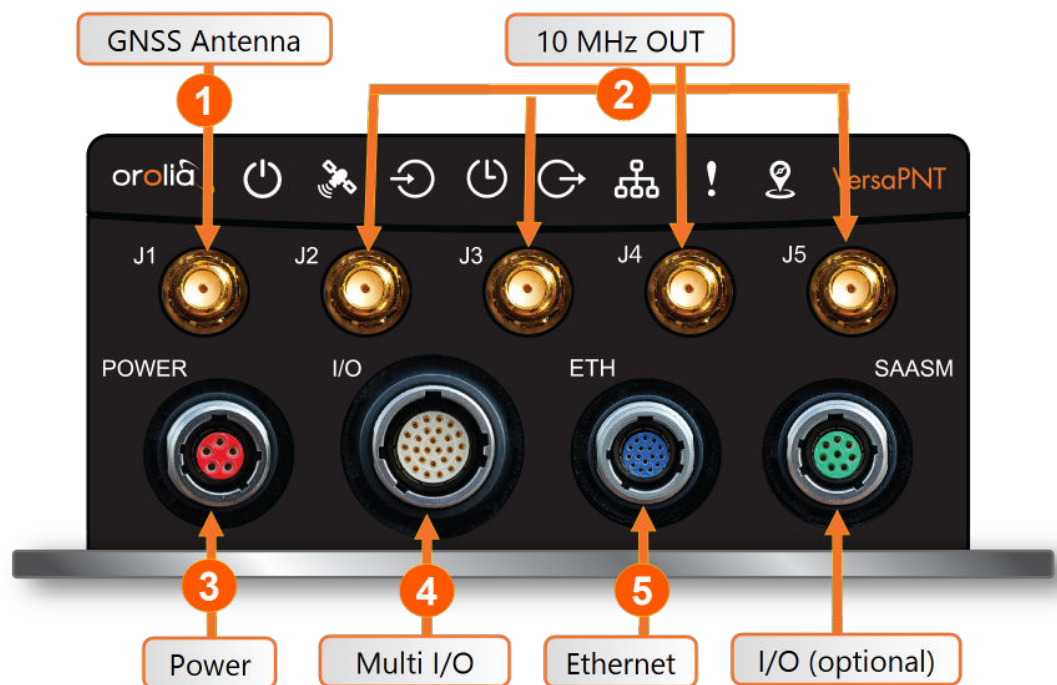


Figure 1-1: VersaPNT front panel connectors



Note: VersaPNT is highly configurable and the connections can be adjusted many different ways. Your interface configuration may vary based on options you selected during the ordering process.

The following interfaces are provided:

1.1.1 Input Timing Interfaces

Table 1-1: VersaPNT timing inputs (default setup)

INPUT SIGNAL	Total available	DCLS		RS-232	RS-485	ETH	Connector No. (see Fig. above)
		TTL	10V				
1PPS	(1)	1					4
ASCII/HaveQuick/IRIG B	(1)				1		4
ASCII/NMEA	(1)			1			4
GNSS (GPS) antenna connection	(1)	SMA					1
Network Interface (10/100/1000bT): NTP (Stratum 2), PTP	(2)					1	5

All **Multi I/O** interfaces (connector no. 4) are software-configurable, see ["Assigning I/O Pins" on page 23](#).

1.1.2 Output Timing Interfaces

Table 1-2: VersaPNT timing outputs (default setup)

OUTPUT SIGNAL	Total available	DCLS		RS-232	RS-485	ETH	Connector No. (see Fig. above)
		TTL	10V				
10 MHz	(4)	SMA					2
1PPS	(2)	1	1				4
ASCII/HaveQuick	(1)				1		4
ASCII/NMEA	(1)			1			4
NTP server, PTP v2 master	(1)					1	5

All **Multi I/O** interfaces (connector no. 4) are software-configurable, see ["Assigning I/O Pins" on page 23](#).

1.1.3 Navigation Inputs & Outputs

The following VersaPNT options apply to the INS option board. The standard INS OUT connection will communicate your position and navigation information, while the Options 1-8 provide additional information via the multi I/O connector:

Table 1-3: Navigation input and output options

SIGNAL TYPE	Option Number/ Channel Position	DCLS	RS- 232	RS-422 (n or p)	Connector No. (see Fig. above)
		TTL			
NMEA OUT	Channel 4		1		4
PPS IN	Option & Channel 1	1			4
PPS OUT	Option & Channel 2	1			4
GPS IN	Option & Channel 3		1		4
GPS OUT	Option & Channel 4		1		4
IMU IN	Option & Channel 5			1 (p)	4
IMU IN	Option & Channel 6			1 (n)	4
IMU OUT	Option & Channel 7			1 (p)	4
IMU OUT	Option & Channel 8			1 (n)	4
INS OUT	Channels 1, 4, & 6		1		4

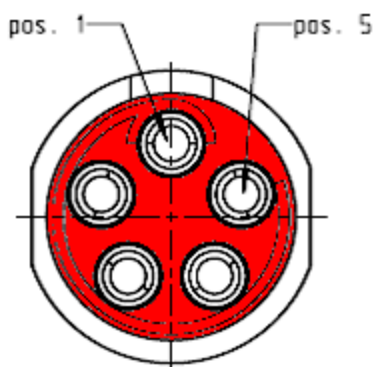
1.1.4 Other Interfaces

» USB serial equivalent: CLI interface (Connector 4)

1.2 Connectors and their Pinouts

All of VersaPNT's connectors are provided at the front panel of the unit, below the Status LEDs.

1.2.1 Power Connector



Note: View in mating direction from front.

Table 1-4: Power connector pinout

Pin	Signal
1	V _{Main} (10 to 32 V)
2	-not used-
3	V _{Standby} (10 to 32 V)
4	GND (to Standby)
5	GND (to Main)

This product is designed to handle a **maximum voltage of up to 32 V_{DC}**. Power supplies with higher voltage or transient/ cranking power will require a power conditioner or surge blocker.



Caution: Reversed polarity can blow an internal fuse that protects the product from damage. Use care when building power cables.

Test any new cables to safely power the unit before connecting your VersaPNT to any other inputs or outputs (such as a GNSS antenna), and before grounding your unit to a vehicle.

1.2.2 Input/Output Connector

VersaPNT has a 26-pin input/output connector that offers 8 software-configurable CHANNELS, plus one fixed DCLS channel, and a USB interface. To learn more about types of interfaces and signals, and how to configure them, see ["Assigning I/O Pins" on page 23](#).

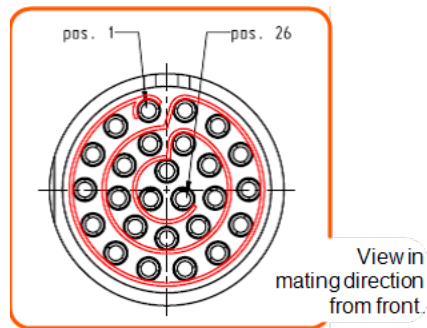
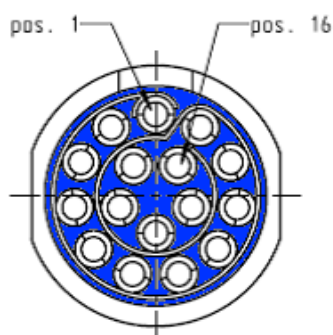


Table 1-5: Default I/O connector pinout

Pin	Channel	Signal	Pin	Channel	Signal
1	0	1PPS output (5V)	15	7	Have Quick output (RS-485 signal +)
2		GND	16		GND
3	1	Have Quick input (RS-485 signal +)	17	8	Have Quick output (RS-485 signal -)
4		GND	18		GND
5	2	Have Quick input (RS-485 signal -)	19	9 (USB dedicated)	GND
6		GND	20		GND
7	3	1PPS output (10 V)	21		Not connected
8		GND	22		GND
9	4	ASCII output (RS-232)	23		USB D-
10		GND	24		GND
11	5	1PPS input	25		USB D+
12		GND	26		GND
13	6	ASCII input (RS-232)			
14		GND			

1.2.3 Ethernet Connector



Note: View in mating direction from front.

The Ethernet connector provides two 1GbE network connections, using 8 wires (pinout below).

Table 1-6: Ethernet connector pinout

Pin	Signal	Pin	Signal
1	Ethernet_1 A+	9	Ethernet_2 A+
2	Ethernet_1 A-	10	Ethernet_2 A-
3	Ethernet_1 B+	11	Ethernet_2 B+
4	Ethernet_1 B-	12	Ethernet_2 B-
5	Ethernet_1 C+	13	Ethernet_2 C+
6	Ethernet_1 C-	14	Ethernet_2 C-
7	Ethernet_1 D+	15	Ethernet_2 D+
8	Ethernet_1 D-	16	Ethernet_2 D-

It is also possible to wire your connector to 100MbE, using only 4 wires. Contact Tech Support for more information.

1.2.4 Optional I/O Connector

The Optional I/O connector ("SAASM" or "FILL/Z") is used in conjunction with the Option Board that is available for VersaPNT. If the unit is not equipped with an Option Board, this connector is not used.

1.2.5 Coaxial Connectors

VersaPNT offers five (5) coaxial connectors. Standard configuration includes the **GNSS antenna** input connector and (4) **10 MHz sinewave** outputs. (Certain models may have variation on this setup. Refer to your purchase order for information on your VersaSync model.)

The coaxial connectors (aside from the GNSS connection) produce a 10MHz output that can be simultaneously disabled through the Web UI.

All coaxial connectors are **standard SMA connectors** (recommended torque value: 8-10 in-lbs).

ETHERNET connector wiring:

- » 1 through 8: A Ethernet Connect, 4 pairs, 1000bT (in the software, eth0)
- » 9 through 16: B Ethernet Connect, 4 pairs, 1000bT (in the software, eth1)

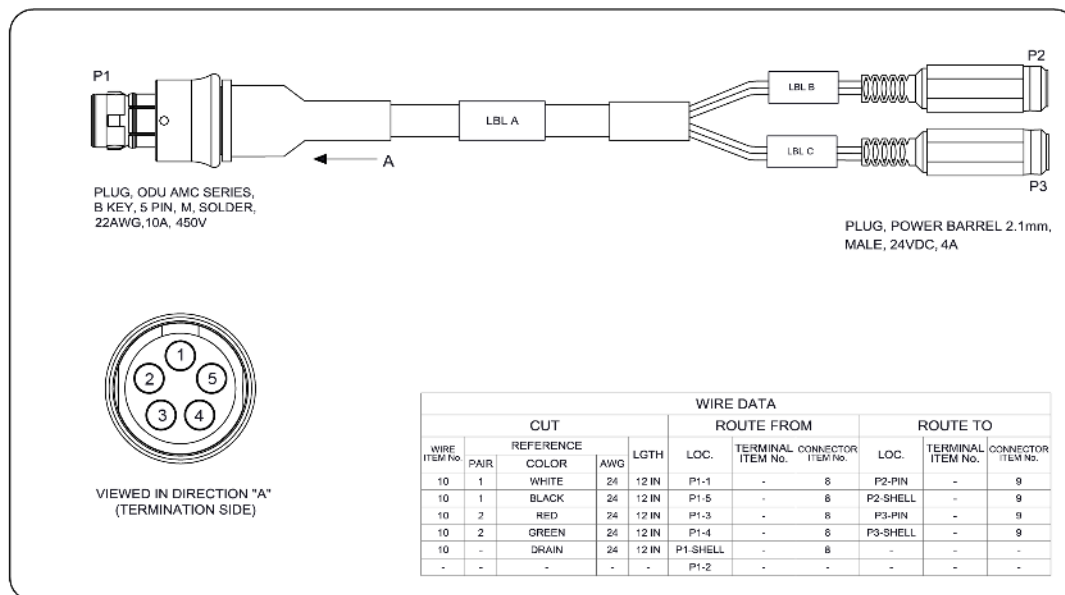
POWER connector pinout

- » 1: V_{Main} , 10 to 32 V_{DC}
- » 2: -not used-
- » 3: $V_{Standby}$, 10 to 32 V_{DC} (Standby Power)
- » 4: Ground return, standby power
- » 5: Ground return, main power

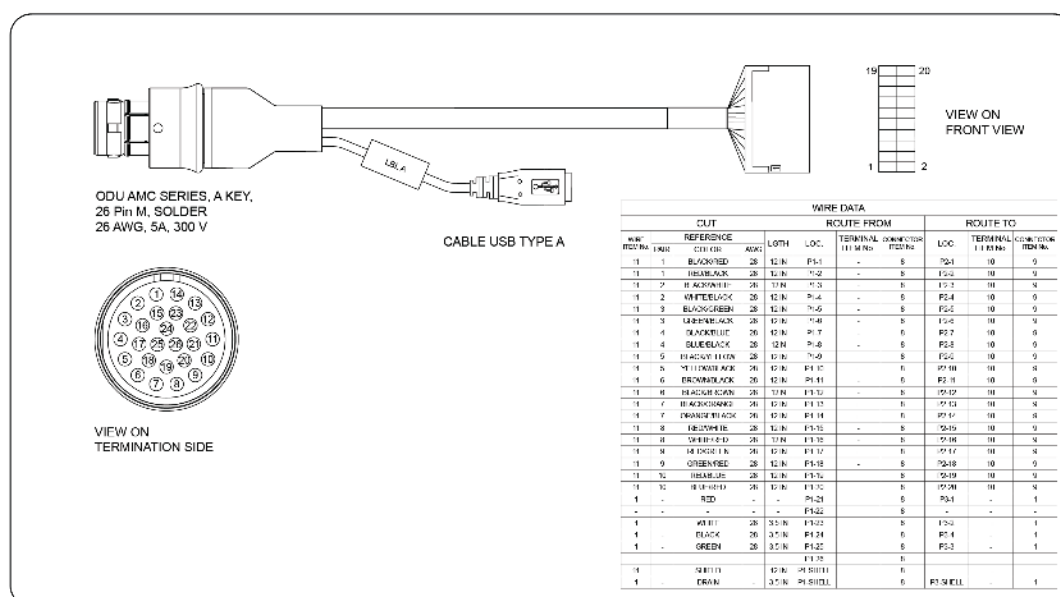
1.3 Included Cables

The VersaPNT Evaluation Kit contains the following cables (antenna cable not shown):

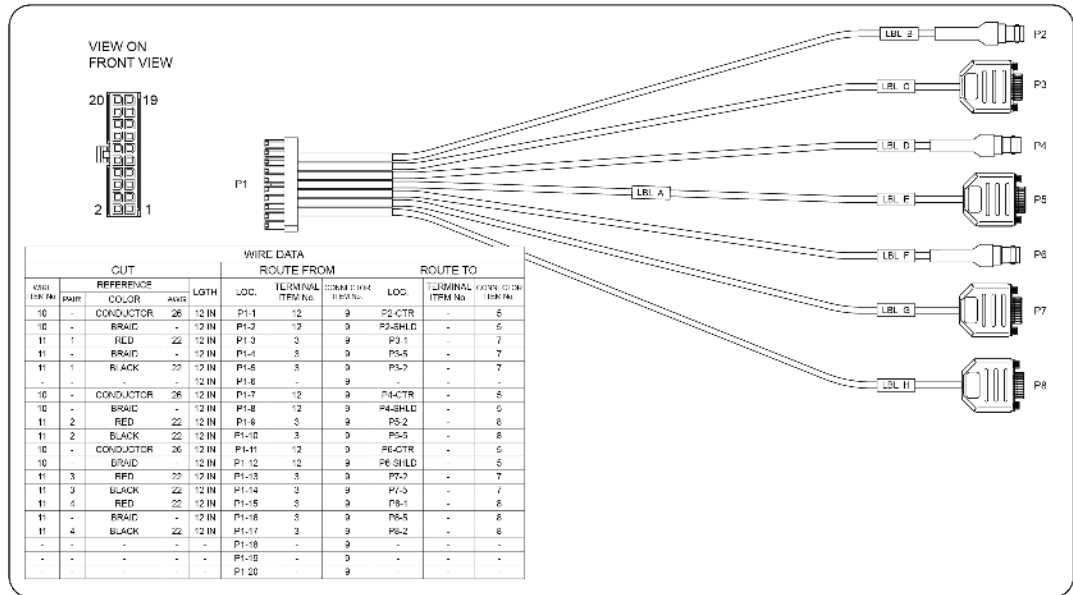
Power Cable



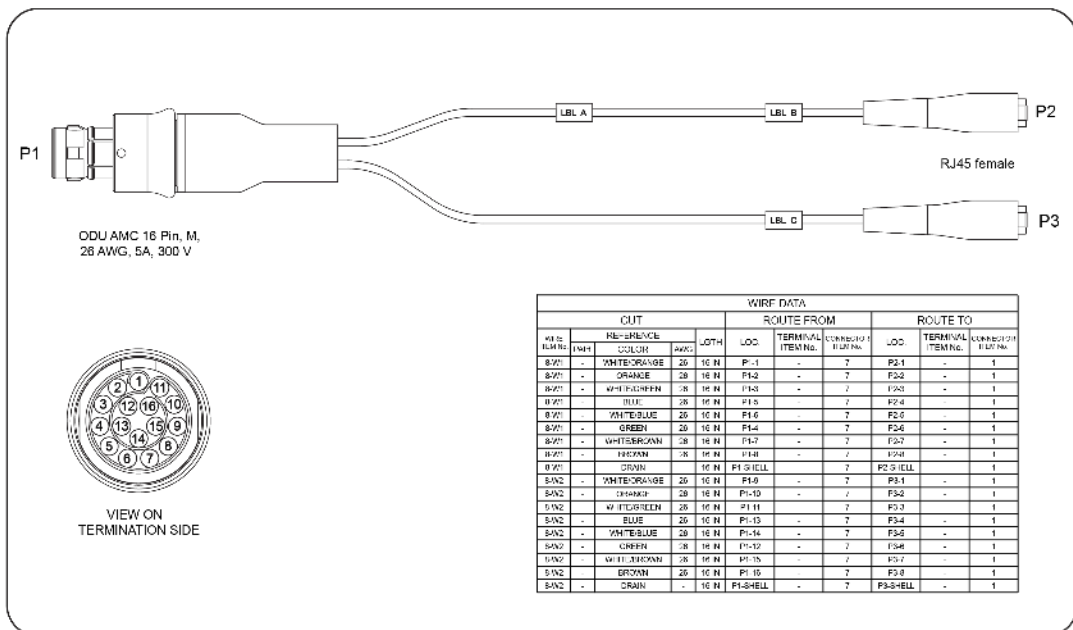
I/O Cable



I/O Breakout Cable



Ethernet Data Cable



1.4 Status LEDs

VersaPNT's front panel status LEDs provide a real-time status overview: Eight (8) LEDs indicate the unit's current operating state:



The LEDs can be disabled, see ["Blackout Mode" on page 12](#).

1.4.1 Blinking Intervals






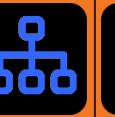


The status LEDs can communicate five different operating states:

- » "OFF"
- » "ON"
- » "FAST": blinking interval @ 8Hz
- » "SLOW": blinking interval @ 2Hz
- » "HEARTBEAT": sinus-shaped interval @ 1Hz

1.4.2 LED Lighting Patterns




The table below indicates LED status light patterns for common VersaPNT operating statuses.




Table 1-7: Common light patterns

								
Start-up	HEARTB.	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Acquir- ing fix	ON	FAST	FAST	FAST	FAST	FAST	HEARTB.	SLOW.
Soft- ware upgrade	FAST	OFF	OFF	FAST	OFF	FAST	HEARTB.	OFF

1.4.3 Legend, individual LEDs

Table 1-8: Legend for Status LEDs

Icon	Light	Meaning
	OFF	No power
	HEARTBEAT	Booting
	ON	Powered
	OFF	No GNSS reception (0 satellites)
	HEARTBEAT	GNSS acquisition in process (≥ 1 satellite(s), or 1PPS OK, or Time OK)
	SLOW	Jamming detected
	FAST	Antenna short circuit
	ON	GNSS is available as reference (1PPS and Time OK)
	OFF	Inputs not detected/all inputs are disabled
	FAST	1 or more input is missing, or invalid timing on 1 or more input detected
	ON	Inputs are enabled
	OFF	Unit is in Holdover (valid)
	ON	System Clock OK (valid)
	FAST	Invalid Time (Holdover period exceeded, or oscillator damaged)
	OFF	No output signal(s) detected/all outputs are disabled
	FAST	Malfunction detected (short circuit, or overload)
	ON	Outputs are enabled

Icon	Light	Meaning
	OFF	No network detected
	FAST	Network malfunction detected (e.g., no auto-negotiation)
	ON	Network OK, configuration OK
	OFF	Unit OK
	FAST	Unit requires attention; check other status LEDs, see Web UI
	HEARTBEAT	See table "LED Lighting Patterns" on page 10
	OFF	No position and navigation solution
	SLOW	Solution is in the Initializing state or the Aligning state
	ON	System is Aligned and represents the best solution



Note: Older hardware models may have a temperature symbol instead of the Position and Navigation symbol in the far right LED position. If you have a software version installed that is later than 1.4.0.a, this LED symbol will reflect the Position and Navigation status. The temperature alarms are now incorporated into the Fault LED status light.

1.4.3.1 LED Patterns during Boot Sequence

For the first five seconds after power-up all LEDs will be OFF. Then the Power LED will be blinking before it will be lit permanently. If you have configured your unit to operate in Blackout Mode, this will take effect once the blinking cycle ends.

1.4.4 Blackout Mode

All LEDs can be turned off via the Web UI.

The LED brightness level can be set from **63** (as bright as possible) to **0** (not visible).

To disable all LED activity via the WebUI:

- » Navigate to **MANAGEMENT > OTHER: LED Configuration**, and set the Brightness level to "0".

1.5 The VersaPNT Web UI

VersaPNT has an integrated web user interface (referred to as "Web UI" throughout this documentation) that can be accessed from a computer over a network connection, using a

standard web browser. The Web UI is the most complete way to configure the unit, and for status monitoring during everyday operation.



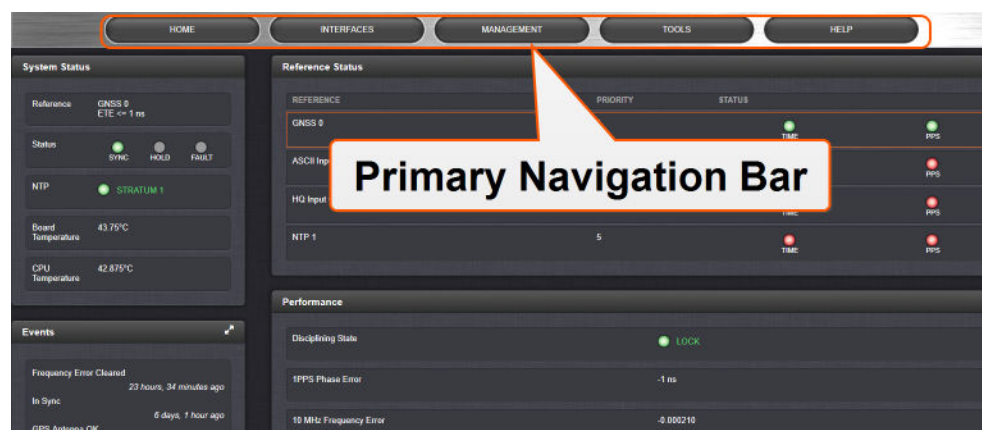
Note: If you prefer, an integrated Command-Line Interpreter interface (CLI) allows the use of a subset of commands.

1.5.1 The Web UI HOME Screen

The **HOME** screen of the VersaPNT web user interface ("Web UI") provides comprehensive status information at a glance, including:

- » vital **system** information
- » current status of the **references**
- » key **performance**/accuracy data
- » major **log events**.

The **HOME** screen can be accessed from anywhere in the Web UI, using the HOME button in the **Primary Navigation Bar**:



The **Primary Navigation Bar** provides access to all menus:

- » **HOME:** Return to the HOME screen (see above)
- » **INTERFACES:** Access the configuration pages for ...
 - » ... references (e.g., GNSS, NTP)
 - » ... outputs (e.g. 10 MHz, PPS, NTP) and
 - » ... installed input/output option cards.
- » **MANAGEMENT:** Access the NETWORK setup screens, and OTHER setup screens e.g., to configure Reference Priorities, System Time, and the Oscillator.

- » **TOOLS:** Opens a drop-down menu for access to the system maintenance screens and system logs.
- » **HELP:** Provides Orolia Service Contact Information and high-level system configurations you may be required to furnish when contacting Orolia Service.

Quick Start

During the procedure described below, you will connect the **Power** cable, the **Multi I/O** cable, and the **Ethernet** cable to the unit. These cables are included in the Evaluation kit. If you plan to use your own cables, some of these instructions may not apply.

The step-by-step instructions below outline the VersaPNT installation and configuration process:

1. **Install VersaPNT** in the designated vehicle:
 - » Choose a mounting location within reach of your antenna and networking cables
 - » A location near the center of gravity of the vehicle is recommended.
 - » It is recommended to orient the unit so that the rear panel of the unit (the opposite of the connector face) points in the direction of travel. Other orientations (including upside down) are possible, but will require Frame Rotation calculations (see [""Frame Rotation" Tab" on page 33](#)).
 - » Optionally, ground the unit by connecting the DC negative terminals to the chassis of the unit, and to the vehicle metallic structure.
 - » The mounting plate should be in direct contact with the unit base plate, and the mounting surface is even and heat conductive.
2. **Connect the power supply.** The unit will power up, and the ON/OFF status LED will pulsate.

Requirement	Action	Evaluation kit cable
Power up	Connect 12 V _{DC} to the power connector.	Attach a cable and apply 12 V _{DC} to the plug labeled "Main" (CA08R-CRPB-0002)



Caution: If your unit does not power up, there may be a problem with your cables. If this is your first installation using your cables, check the polarity of the wires and confirm that the unit will power up normally before proceeding with these steps or making any other connections.

3. **Install the GNSS antenna(s).** Follow your antenna manufacturer's instructions. See [""Calibration" Tab/Antenna Installation" on page 31](#) for specifications.
4. **Wire the antenna cables and interface cables.** (Most customers will require the Multi I/O and Ethernet cables for these connections.)

- » **USB:** Connect the **Multi I/O** connector to the VersaPNT unit. If you are using the Evaluation Kit, connect the Multi I/O USB output to a PC. Install a **terminal emulator** program on the PC (e.g., TeraTerm® or PuTTY®).
- » **Ethernet:** Connect the **Ethernet** cable to the ETH port of the unit. If you are using the Evaluation Kit, connect at least one of the two I/O cable Ethernet ports (ETH0 or ETH1) to a network switch/hub, or to the PC mentioned above (using a standard Ethernet patch cable, or a crossover cable).

Requirement	Action	Evaluation kit cable
USB connection	Connect USB to the Multi I/O connector.	Connect the USB connector to a PC with a terminal emulator program (CA08R-CRUB-0002)
Network connection	Connect at least one of the two Ethernet connectors to a network.	Connect the RJ45 jack labeled ETH0 or ETH1 to a network hub/switch or directly to a PC (CA08R-CRET-0002)

For pinout tables, see "[Connectors and their Pinouts](#)" on page 4.

5. **Establish a network connection** so as to allow access to the web user interface ("Web UI"). See "[Network Setup](#)" on the facing page for information on the USB driver installation and network address configuration.



Note: On a DHCP network, you can also use Zeroconf to access the Web UI (see "[Zero Configuration Setup](#)" on page 21).

6. Using the Web UI, **configure** the following:
 - » Software-configurable I/O pins, see "[Assigning I/O Pins](#)" on page 23.
 - » INS settings, see "[INS Configuration](#)" on page 29:
 - » IMU data output settings (output format, position type, polling frequency)
 - » Calibration settings: antenna offsets
 - » Data log settings
 - » FIR filter settings
 - » Coning and sculling error compensation settings
 - » Frame rotation configuration (if required).

This list covers the standard configuration options. More complex configurations can be generated using the "[INS Expert Mode](#)" on page 35.

- » Other VersaPNT INTERFACES settings and MANAGEMENT settings e.g., network settings, reference priorities (see main product user manual).

2.1 Network Setup

After making the connections outlined in the Quick Start list, the following information will help you to establish a network connection.

VersaPNT has a **Command Line Interpreter** ("CLI"). The CLI is available either through the USB serial or Ethernet direct VersaPNT-to-PC connections.

The **web user interface** ("Web UI") is used to configure and monitor the unit. The Web UI is available through one of the Ethernet ports via a network connection.

Default settings:

VersaPNT network settings default to static IP addresses. The Ethernet ports come pre-configured with IP addresses as follows:

Eth0 - 192.168.1.1

Eth1 - 192.168.1.2

Default subnet mask: 255.255.255.0



Note: VersaPNT supports **zeroconf**: If you have a DHCP-enabled network, you can use zeroconf for initial setup. For more information, see "Zero Configuration Setup" on page 21. Otherwise follow the instructions below for conventional setup.

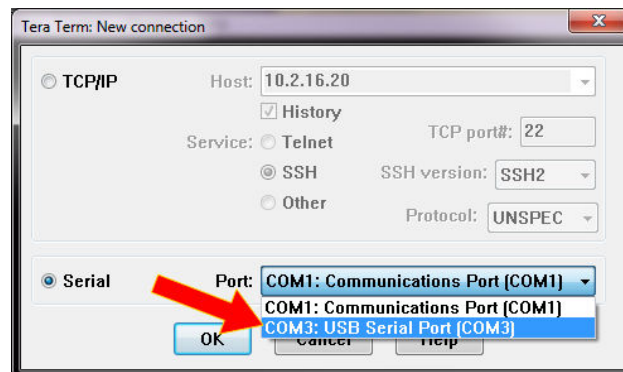
Network connection:

1. USB Driver

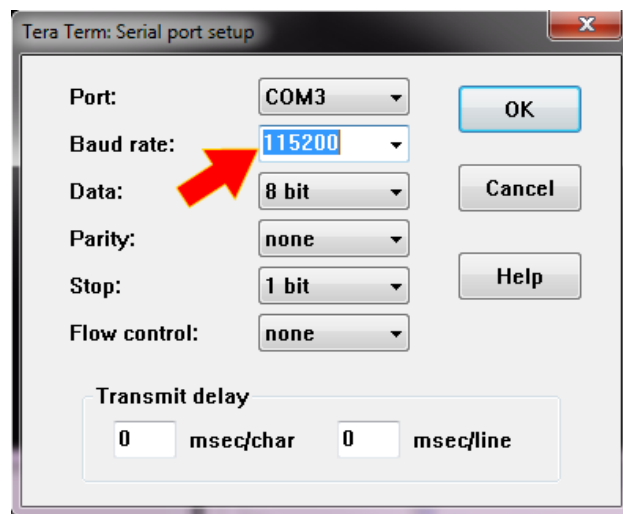
- » If you are using a USB connection through the multi I/O connector, driver installation may be necessary. On the PC connected to your unit, new hardware (the USB interface) will be detected. The correct driver should be installed automatically. If not, download the driver from www.ftdichip.com/Drivers/VCP.htm, and install it manually via the instructions for your operating system.

2. Network Address

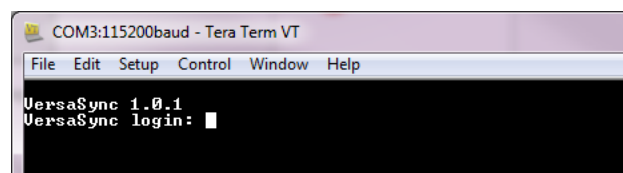
- a. Start the terminal emulator program on the PC. Select the COM port that is assigned to the USB interface:



Access the CLI via ssh or telnet: The required port configuration is 115200 8N1:



Press the **Return** key, and enter the login credentials:



Note: The default login credentials are:

User name = spadmin

Password = admin123 (will not be displayed on the screen)



Note: For your reference, the command `helpcli` produces a list of available commands. Press the `space` key to display the next page, or the `b` key to display the previous page.



Note: Should it become necessary to leave the command help mode (indicated by a command line prompt `:"`), press `Q`, or `Ctrl C`.

- b. If you are on a DHCP-enabled network, you **can assign an IP address by enabling DHCP on your unit**. Use the `dhcp4set <x>` on command, (`x` being 0/1 for ETH0 and ETH1, respectively).

Retrieve the IP address assigned to VersaPNT by typing the `net4` command. The command should return the network settings, including the IP address.

```

COM3:115200baud - Tera Term VT
File Edit Setup Control Window Help
VersaSync 1.0.1
VersaSync login: spadmin
Password:
Spectracon VersaSync Version 1.0.1
Hash 7842cf5de720
VersaSync:~$ net4
Hostname: VersaSync
Main IPv4 default gateway (eth0): 10.2.1.1
eth0
  ip: 10.2.100.167/16
  dhcp4: Enabled
  dc4: 10.2.1.1
  dns1: 10.1.1.26
  dns2: 10.1.1.27
eth1 <Disabled>
  mac: 00:0c:ec:0d:00:19
  ip: 0.0.0.0/0
  dhcp4(eth1): Enabled
  dc4: 0.0.0.0
VersaSync:~$
  
```

- c. If you are NOT on a DHCP-enabled network, your unit's **IP address is set to the default** for each Ethernet port (unless you have assigned a new static IP address). You can access the unit via the default address with a PC configured to the same subnet mask (255.255.255.0).
- d. You can **set a static IP address through the CLI** using the command: `ip4set <x>.<IP address>.<subnet mask>` Example: `ip4set 0 10.2.100.245 255.255.0.0`

If required, also set your gateway address: `gw4set <x> <gateway address>`.

Or, follow the steps below to set an IP address through the Web UI.

3. Log In to the Web UI

- a. On a PC connected to VersaPNT via ETH0 or ETH1, start a web browser.
- b. Navigate to the IP address obtained or assigned in Step 2.

- c. Login to the VersaPNT Web UI, using the same credentials as mentioned above.
- d. If so required, you can also change VersaPNT's IP configuration (address, subnet, gateway, ...):
 - i. Navigate to **MANAGEMENT > Network Setup**.
 - ii. In the **Ports** panel on the right, click the GEAR button next to ETH0 or ETH1: The **Edit Ethernet Port Settings** panel will open.



Setting	Value
Enable eth0	<input checked="" type="checkbox"/>
Enable DHCPv4	<input type="checkbox"/>
Static IPv4 Address	10.2.100.8
Netmask	255.255.0.0
IPv4 Gateway	10.2.1.1
Domain	int.orolia.com
DNS Primary	10.1.1.26
DNS Secondary	10.1.1.27
MTU	1500

- iii. If necessary, disable DHCP by unchecking **Enable DHCP**.
 - iv. Click submit, and start a new Web UI session by entering the new IP address into your browser and logging in.
- e. You have now established a network connection with VersaPNT. To continue with other configurations e.g., NTP settings, references, outputs, etc., see the full user manual: manuals.orolia.com.

2.2 Zero Configuration Setup

As an alternative to conventional network configuration, VersaPNT can also be set up using the zero-configuration networking technology ("zeroconf").



Note: You can use Zeroconf on either Ethernet port if DHCP is enabled. Zeroconf must be used with a DHCP server.

When using zeroconf, a TCP/IP network will be created automatically, i.e. without the need for manual configuration: Once VersaPNT's ETH connector is connected to a network, you can directly access the VersaPNT Web UI, using a standard web browser, without any configuration.

Zeroconf can be used to connect to the unit through the Web UI:

- » when you need to identify the IP address assigned to your unit through DHCP (DHCP must be enabled through the Web UI or CLI)
- » in circumstances when your unit is not connected directly to a PC
- » when you wish to access the Web UI of your VersaPNT without using the CLI commands or serial connection
- » anytime the IP address of a unit is not known

2.2.1 Using Zeroconf

Connect to the Web UI of your VersaPNT unit in these steps:

1. Check the serial number label on the side of the unit, and write down the last 6 digits of the **MAC O** address: e.g., "0C 00 19". Note that you will use the same MAC address for either Ethernet port.
2. Connect the VersaPNT to a router on your LAN via the ETH connector.
3. Connect the power supply to the VersaPNT unit.
4. On a connected computer, open your web browser and in the URL field type the following:

`versapnt-[xxxxxx].local/`

where the [xxxxxx] of the hostname are the last six digits of the MAC O address you copied from the serial number label on the unit.

You should now be prompted for a username and password. The factory default credentials are:

Username: **spadmin**

Password: **admin123**



Note: If you do not have physical access to the unit, you can obtain the MAC O address by accessing VersaPNT's CLI via the I/O connector USB port, using e.g., the `ifconfig` command.

Once you logged into the VersaPNT via zeroconf, you can retrieve the DHCP address for future use:

- » Navigate to **MANAGEMENT: NETWORK > Network Setup**. In the **Ports** panel, click on the information button next to each Ethernet port. The popup window will display the assigned DHCP IP address for the selected port.

2.3 Assigning I/O Pins

VersaPNT's I/O connector is software configurable, i.e. the pin interfaces and the signal modulations can be configured by the user via the VersaPNT Web UI.

The software-configurable 26-pin I/O connector comprises 9 user-configurable Channels, plus one fixed USB interface. Channels can be used for the following input or output interfaces:



Figure 2-1: I/O configuration options

2.3.1 Signal Types

The table below shows the maximum number of available interfaces for each signal type. Note that you can assign only one signal for each pin pair, hence only four to nine input and output signals can be transmitted/received at any given time.

Table 2-1: Available signal types

	DCLS, TTL	DCLS, 10V	RS485	RS 485, 120 Ω	RS232
PPS	out (5), in (2)	out (1), in (1)	out (4), in (4)	in (4)	
IRIG	out (5), in (2)	out (1), in (1)	out (4), in (4)	in (4)	
HQ	out (5), in (2)	out (1), in (1)	out (4), in (4)	in (4)	
GPIO	out (5)	out (1)			
ASCII			out (4), in (4)	in (4)	out (3), in (3)
INS					out (1)

Note: ASCII Time Code is abbreviated in the UI as **ATC**.

DCLS Signal Lines

Up to six TTL (5V) or 10 V **DCLS** outputs and three DCLS inputs are available for e.g., 1PPS, xPPS, IRIG, HaveQuick, ASCII ToD signal transmission.

Single-ended Serial Lines

VersaPNT provides up to 3 RX and 3 TX **RS232** interfaces for e.g., ASCII ToD – NMEA 0183 (ICD-GPS-153).

Differential Serial Lines

Up to four differential serial lines are available. Each of them can be set to **RS485** electrical standard, and used as input or output. For specific PNT applications, two of these signals can be set to four RS422 channels. PPS or Time-of-Day messages are available, as well as HAVE QUICK and other formats. Note that this kind of interface uses two Channels.

Non-Configurable Pins

Channel # 0 provides a DCLS TTL output signal that is not user-configurable.

Also note that **pins # 19 through 26** are reserved for the USB command line interface.

2.3.2 I/O Signal Mapping Table

Each Channel (i.e., each pin pair e.g., "3&4" = Channel 1) can serve as only one interface, and not all combinations are possible due to the internal multiplexer architecture.

The table below illustrates the signal combinations that can be assigned to the 18 configurable pins.

Table 2-2: I/O signal mapping to Channels

					Channel									
					0	1	2	3	4	5	6	7	8	9
					Pin Position									
					1 & 2	3 & 4	5 & 6	7 & 8	9 & 10	11 & 12	13 & 14	15 & 16	17 & 18	19-25
Time & Frequency	Signal	Message Type	I/O	Type Filter	Electr. Level									
	PPS		out	DCLS	TTL	Y	Y	Y			Y	Y		
	IRIG		out	DCLS	TTL	Y	Y	Y			Y	Y		
	HQ		out	DCLS	TTL	Y	Y	Y			Y	Y		
	GPIO		out	DCLS	TTL	Y	Y	Y			Y	Y		
	ATC		out	RS232			Y		Y	Y				
	PPS		out	RS485			Y		Y	Y			Y	
	IRIG		out	RS485			Y		Y	Y			Y	
	HQ		out	RS485			Y		Y	Y			Y	
	ATC		out	RS485			Y		Y	Y			Y	
	PPS		in	RS485			Y		Y	Y			Y	
	PPS		in	RS485	Load		Y		Y	Y			Y	
	IRIG		in	RS485			Y		Y	Y			Y	
	IRIG		in	RS485	Load		Y		Y	Y			Y	
	HQ		in	RS485			Y		Y	Y			Y	
	HQ		in	RS485	Load		Y		Y	Y			Y	
	ATC		in	RS485			Y		Y	Y			Y	
	ATC		in	RS485	Load		Y		Y	Y			Y	
	ATC		in	RS232			Y				Y			
	PPS		out	DCLS	10V			Y						
	IRIG		out	DCLS	10V			Y						
	HQ		out	DCLS	10V			Y						
	GPIO		out	DCLS	10V			Y						
	PPS		in	DCLS	10V				Y					
	IRIG		in	DCLS	10V				Y					
	HQ		in	DCLS	10V				Y					
	PPS		in	DCLS	TTL					Y			Y	
	IRIG		in	DCLS	TTL					Y			Y	
	HQ		in	DCLS	TTL					Y			Y	
	ATC EVENT		out	RS232					Y					
	GPIO EVENT		in	DCLS	TTL					Y				
	CAN BUS		in/out										Y	
Navigation	NMEA		out	RS232					Y					
	OPT 1-PPS		in	DCLS	TTL	Y								
	OPT 2-PPS		out	DCLS	TTL		Y							
	OPT 3-GPS		in	RS232				Y						
	OPT 4-GPS		out	RS232					Y					
	OPT 5-IMU		in	RS422p						Y				
	OPT 6-IMU		in	RS422n							Y			
	OPT 7-IMU		out	RS422p								Y		
	OPT 8-IMU		out	RS422n									Y	
	INS (legacy)		out	RS232		Y			Y	Y				
	INS (legacy)		in	RS232		Y			Y	Y				

Occupied - USB

Notes:

Pins to Channels (e.g., pins 3 & 4= Channel 1)

green = Signal Message Type can be assigned to this Channel (RS485 requires two Channels)

red = This Signal Message type cannot be assigned to this Channel

ATC = ASCII Time Code

Configuring a new Input or Output

1. In the VersaPNT Web UI, navigate to **MANAGEMENT > NETWORK: Pin Layout**. The **Pin Layout** screen will be displayed.

2. Prior to assigning the new output, identify a pin pair in the pin **Layout** table that is not used (Signal = "None") or not needed. You can **Delete** it, but you may also simply assign the new PPS Output as described below, thus overwriting the existing Input or Output.
3. Add a pin configuration by clicking the PLUS icon in the top-right corner. The **Add Pin** window will display.
4. Start with the **Type Filter** drop-down menu (second line in the window) and select a signal type.
5. From the **Signal** drop-down menu, select a signal.
6. From the **Pins** drop-down menu in line 3, select the pin pair you chose in Step 2. (Note that you will need 4 pins if you selected a RS485 signal Type.)
7. Click **Submit**.
8. In the **Actions** panel, click **Apply Changes**.

Navigation Pinout Configuration

VersaPNT has navigation-specific options that can be configured through the multi I/O connector "[I/O signal mapping to Channels](#)" on the previous page

To configure INS IN or OUT via RS232, follow the steps for "[Configuring a new Input or Output](#)" on the previous page.

To configure any of the navigation options listed in the following chart(Options 1-8):

1. Navigate to **MANAGEMENT > NETWORK > Pin Layout** as above and click to PLUS sign in the top right corner..
2. Under **Signal**, select **OPTION**.
3. Select the correct **Pins** from the drop-down menu that correspond to the Option number.
4. You can then click Submit. Be sure to also **Apply Changes** in the Actions menu.

SIGNAL TYPE	Option Number/ Channel Position	Pins	DCLS	RS- 232	RS-422 (n or p)
			TTL		
NMEA OUT	Channel 4	9 & 10		1	
PPS IN	Option 1 & Channel 1	3 & 4	1		
PPS OUT	Option 2 & Channel 2	5 & 6	1		
GPS IN	Option 3 & Channel 3	7 & 8		1	
GPS OUT	Option 4 & Channel 4	9 & 10		1	
IMU IN	Option 5 & Channel 5	11 & 12			1 (p)

SIGNAL TYPE	Option Number/ Channel Position	Pins	DCLS	RS- 232	RS-422 (n or p)
			TTL		
IMU IN	Option 6 & Channel 6	13 & 14			1 (n)
IMU OUT	Option 7 & Channel 7	15 & 16			1 (p)
IMU OUT	Option 8 & Channel 8	17 & 18			1 (n)
INS OUT (legacy)	Channels 1, 4, & 6	(3 & 4), (9 & 10), or (11 & 12)		1	

Restoring the Default I/O Configuration

VersaPNT is shipped with a default I/O configuration that you can be customized. However, if required you can restore the default configuration at any time after applying changes.

The following illustration shows the **default I/O pin configuration**:

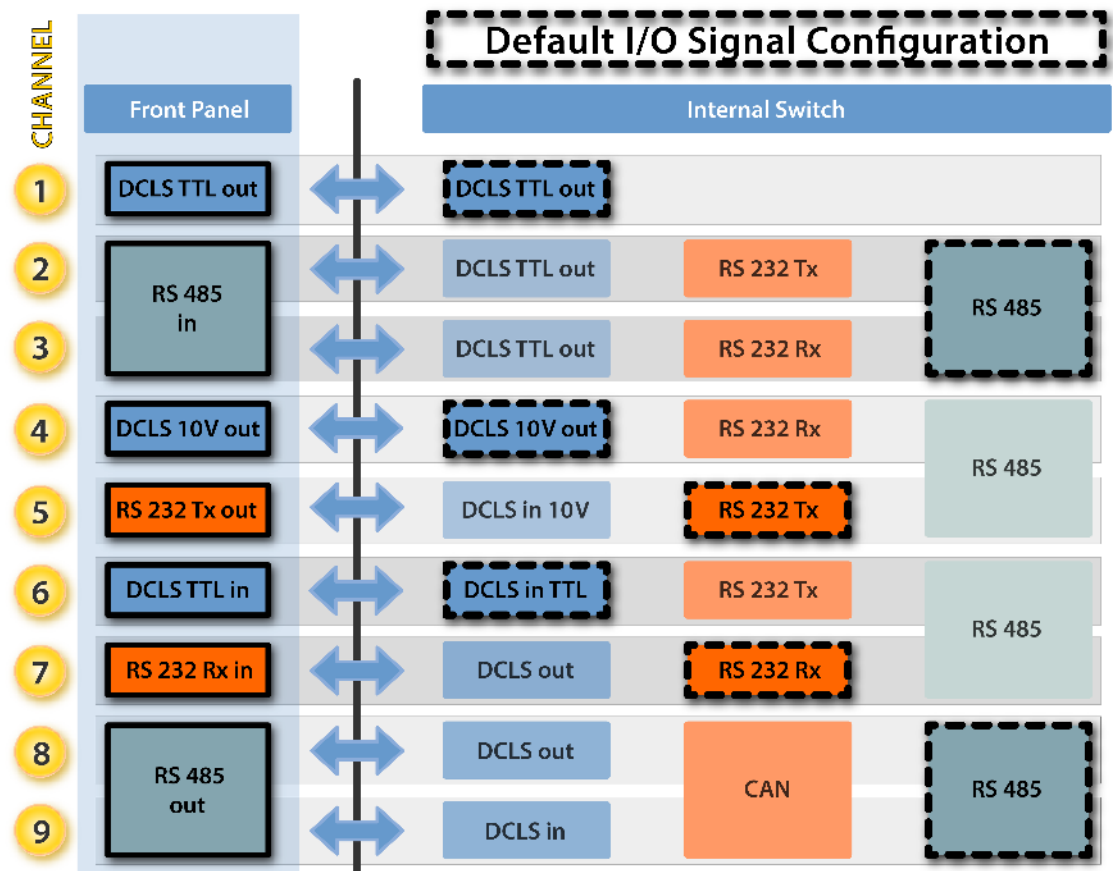


Figure 2-2: Default I/O configuration

To restore the default I/O pin configuration:

- A. Navigate to the **MANAGEMENT: NETWORK > Pin Layout** screen.
- B. In the **Actions** panel on the left, click **Restore Default Layout**.

Reloading the Current I/O Configuration

To reload the currently used I/O configuration after adding pin layout changes, but before clicking **Apply Changes**:

- A. Navigate to the **MANAGEMENT: NETWORK > Pin Layout** screen.
- B. In the **Actions** panel on the left, click **Reload Layout**.

2.4 INS Configuration

VersaPNT is equipped with a GPS-aided high-performance Inertial Navigation System (INS). This MEMS-based unit incorporates 3-axis accelerometers, gyros, magnetometer (all of which 3-axis), as well as a barometric pressure sensor, a temperature sensor and two separate 50-channel L1 GPS receivers.

To configure the INS:

1. In the VersaPNT Web UI, navigate to **MANAGEMENT > NETWORK: INS Setup (1)**. The INS screen will appear:



The INS screen has two panels:

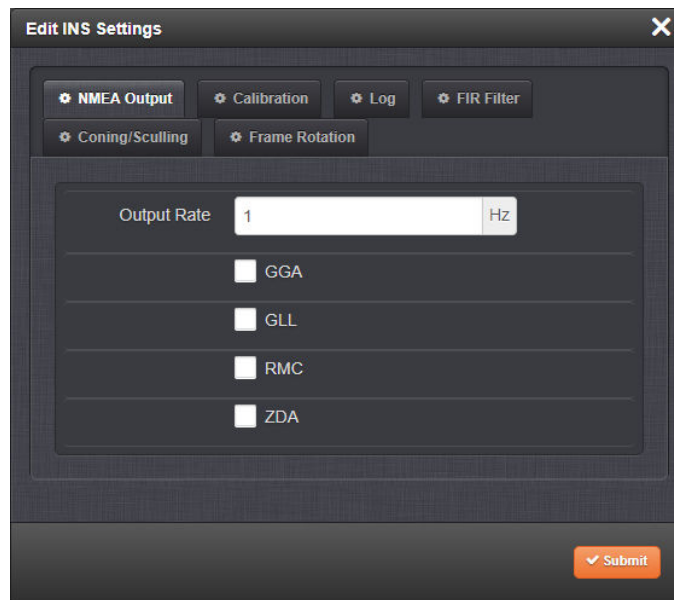
» **Actions:**

- » Toggle ON/OFF **Expert Mode**, which allows you to write directly into the configuration file.
- » Toggle ON/OFF Panacea Support.
- » **Restore the Default INS Configuration**

» **Status:** This panel lists INS configuration settings and status messages.

- » INS Mode [aligned, aligning, initializing, none]: **The INS mode should read "aligned" for accurate navigation.**
- » GPS Fix [3D, 2D, no fix, time only]: For accurate positioning, the unit needs a 3D fix (at least 4 satellites).
- » Num Sats: The number of tracked satellites

2. In the INS **Status** panel, click the GEAR icon (2). The **Edit INS Settings** window opens:



This window is used to configure the INS. The window has six tabs which are described below:

2.4.1 "NMEA Output" Tab

Each different ASCII output message type has its own unique 5 character heading so that it can easily be distinguished in the data stream.

Output Rate: [1-100 Hz] The chosen rate of NMEA output.

NMEA Type: Select any or all of the following five NMEA message types:

Table 2-3: NMEA output options

Header	Output Type
GGA	Global Positioning System Fix Data
GLL	Geographic Position - Latitude/Longitude
RMC	Recommended Minimum Specific Data
THS	True Heading and Status
ZDA	Time & Date

In order to output NMEA messages, you must configure both the settings in this NMEA Output tab, AND the pinout configuration of the Multi I/O connector. NMEA Out is only available on Channel 4 (see ["Assigning I/O Pins" on page 23](#)).

2.4.2 "Calibration" Tab/Antenna Installation

The screenshot shows the 'Edit INS Settings' window with the 'Calibration' tab selected. The window contains the following elements:

- Buttons at the top: NMEA Output, Calibration (selected), Log, FIR Filter, Coning/Sculling, and Frame Rotation.
- Input fields for 'Antenna 1 Offset X', 'Antenna 1 Offset Y', and 'Antenna 1 Offset Z', each with a value of '0' and a unit of 'm'.
- A checkbox labeled 'Antenna 2' which is currently unchecked.
- A 'Submit' button at the bottom right.

Single Antenna Installations

Should only one GNSS antenna be used, the antenna can be installed at any location on the vehicle with an unobstructed view of the sky.

- » **Antenna 1 Offset X:** [m] The X-offset from the X-Y-Z etching on the VersaPNT lid to the GNSS antenna number 1.
- » **Antenna 1 Offset Y:** [m] The Y-offset from the X-Y-Z etching on the VersaPNT lid to the GNSS antenna number 1.
- » **Antenna 1 Offset Z:** [m] The Z-offset from the X-Y-Z etching on the VersaPNT lid to the GNSS antenna number 1.

2.4.3 "Log" Tab

You can configure your unit to stop logging events in this tab or to change the file name that your logs are stored in.

- » **Log To CSV File:** [checkbox: OFF] Select ON to log to a comma-separated values file.
- » **File Name:** Change the file name and the path to its location if a log file other than the default one shall be used.

2.4.4 "FIR Filter" Tab

Prior to sending the IMU sensor data to the INS Kalman filter it can be processed by a finite impulse response filter. To configure the FIR filter, use the following settings (for additional information, see the [OEM documentation](#)):

- » **Mag Window Size** (default 400 Hz): Define the number of magnetometer samples at the IMU rate which will be averaged for each output measurement.
- » **Accel Window Size** (default 400 Hz): Define the number of acceleration sensor samples at the IMU rate which will be averaged for each output measurement.
- » **Gyro Window Size** (default 400 Hz): [Range:] Define the number of gyroscope samples at the IMU rate which will be averaged for each output measurement.
- » **Temp Window Size** (default 400 Hz): [Range:] Define the number of temperature sensor samples at the IMU rate which will be averaged for each output measurement.
- » **Pres Window Size** (default 400 Hz): [Range:] Define the number of pressure sensor samples at the IMU rate which will be averaged for each output measurement.

The **Filter Mode** parameters for each sensor select which output quantities the filtering should be applied to. Filtering can be applied to either the uncompensated IMU measurements, compensated (HSI and biases compensated by onboard filters, if applicable), or both.

- » **Mag Filter Mode:** [No Filtering/Uncompensated/Compensated/(Uncompensated/Compensated)]
- » **Accel Filter Mode:** [No Filtering/Uncompensated/Compensated/(Uncompensated/Compensated)]
- » **Gyro Filter Mode:** [No Filtering/Uncompensated/Compensated/(Uncompensated/Compensated)]
- » **Temp Filter Mode:** [No Filtering/Uncompensated/Compensated/(Uncompensated/Compensated)]
- » **Pres Filter Mode:** [No Filtering/Uncompensated/Compensated/(Uncompensated/Compensated)]

2.4.5 "Coning/Sculling" Tab

The IMU's coning and sculling algorithms can be configured to operate in multiple frames and with different compensations applied. The IMU computes and accumulates the coning and sculling integrals which track the delta angle and delta velocity.

Integration Frame: [Body Frame/NED Frame/ECEF Frame] This setting selects the reference frame used for coning and sculling. Note that using any frame other than the body frame will rely on the onboard Kalman filter's attitude estimate. The factory default state is to integrate in the sensor body frame.

Gyro Compensation: [checkbox: OFF] This setting selects the compensation to be applied to the angular rate measurements before integration. If set to ON, the Kalman filter's real-time estimate of the gyro biases will be used to compensate the IMU measurements before integration. For additional information, see the [OEM documentation](#).

To configure the compensation (if set to ON), the INS needs to be operated in Expert Mode.

Acceleration Compensation: [checkbox: OFF] This setting selects the compensation to be applied to the acceleration measurements before integration. If set to ON, the Kalman filter's real-time estimate of the accel biases will be used to compensate the IMU measurements before integration.

2.4.6 "Frame Rotation" Tab

By default VersaPNT will output the heading, pitch, and roll with respect to the VersaPNT reference frame as it is shown on the etching on the lid of the unit. To ensure that the output is consistent with the attitude of the vehicle VersaPNT is used in, you will need to align the unit to the unit such that the X-axis points out the front of the vehicle (bow), the Y-axis points out the right (starboard), and the Z-axis points down. If it is not possible to orient VersaPNT in this configuration with respect to the vehicle, then you will need to use the Reference Frame Rotation to set the relative orientation of the unit with respect to the vehicle.

Please note: Some VersaPNT units were released with incorrect axis chassis markings. For the purpose of these instructions, the correct default X-Y-Z orientation at startup is:

- » The X-axis pointing toward the back of the unit (along the cover, from the connections side to the back)
- » The Y-axis pointing toward the right when looking at the connections face
- » The z-axis pointing down.

The frame rotation matrix allows for the transformation of measured acceleration, magnetic, and angular rates from the VersaPNT body frame to any other arbitrary frame of reference. The frame rotation matrix allows for the sensor to be placed in any arbitrary orientation with respect to the user's desired body coordinate frame. This register can also be used to correct for any orientation errors due to mounting VersaPNT on the user's vehicle or platform.

$$\begin{Bmatrix} X \\ Y \\ Z \end{Bmatrix}_U = \begin{bmatrix} C00 & C01 & C02 \\ C10 & C11 & C12 \\ C20 & C21 & C22 \end{bmatrix} \cdot \begin{Bmatrix} X \\ Y \\ Z \end{Bmatrix}_B$$

The variables $\{X, Y, Z\}_{Body}$ are a measured parameter such as acceleration in the body reference frame with respect to the VersaPNT unit. The variables $\{X, Y, Z\}_U$ are a measured parameter such as acceleration in the user's frame of reference. The reference frame rotation register thus needs to be loaded with the transformation matrix that will transform measurements from the body reference frame of the VersaPNT unit to the desired user frame of reference.



Note: The matrix C in the Reference Frame Rotation Register must be an orthonormal, right-handed matrix. The sensor will output an error if the tolerance is not within $1e-5$. The sensor will also report an error if any of the parameters are greater than 1 or less than -1.



Parameter	Value
$c[0,0]$	1
$c[0,1]$	0
$c[0,2]$	0
$c[1,0]$	0
$c[1,1]$	1
$c[1,2]$	0
$c[2,0]$	0
$c[2,1]$	0
$c[2,2]$	1

2.5 INS Initialization

When an initial heading and location are not set in the VersaPNT when powering on the unit, it is important that the first movement of the vehicle is in the forward direction. To ensure this will always be the case, it is recommended that the driver back into the location where you plan to start your vehicle.

To activate initialization:

1. Position or park so that your first motion will be forward to prevent INS confusion.
2. After vehicle and unit startup, drive forward for 30 to 60 seconds

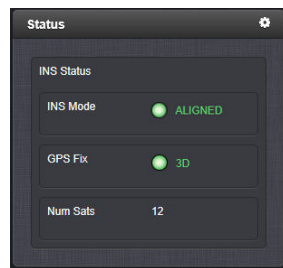
3. Stop vehicle motion for at least 30 seconds. This will assist calibration and help the VersaPNT obtain additional readings.

There are four possible INS modes:

- » **Aligned** indicates the solution is reliable and GNSS verified
- » **Aligning** indicates either that the current solution is outside the range of validity, or that the INS is working to develop a solution
- » **Initializing** indicates that the system is beginning to access information on position and navigation.
- » **None** indicates that no INS solution is currently available. This message also occurs at startup.

The goal of initialization is to reach an **Aligned** state before dependence on your solution.

To verify your INS status in the WebUI, navigate to **MANAGEMENT > INS Setup > Status**. In the Status panel, **INS Mode** will indicate your current alignment state.



2.6 INS Expert Mode

Advanced INS configuration is possible via the INS Expert Mode, which allows you to write directly into the configuration file.



Caution: INS Expert Mode should only be utilized by advanced users, as incorrectly altering the configuration file can cause NTP to stop working (if NTP is configured as an input reference, VersaPNT could lose synchronization).

To access the INS Expert Mode, navigate to **MANAGEMENT > INS Setup**. The switch for the INS Expert Mode is in the **ACTIONS** panel.



Caution: Any configurations made in **INS Expert Mode** will be lost as soon as **INS Expert Mode** is disabled. If changes are made to the INS configuration file while in the Expert mode, Expert mode should remain enabled from that point forward.



Note: For guidance or support on the configuration of INS Expert Mode, contact support@oroliads.com.

The INS configuration file can be reset back by clicking **Restore Default INS Configuration**.








2.7 VICTORY Configuration

VersaPNT is equipped with an interface that complies with the VICTORY (Vehicular Integration for C4ISR/EW Interoperability) standard. The use of the VICTORY interface is optional. Prior to using it, however, the interface needs to be configured.

To configure the VICTORY interface, see the separate document "VICTORY Configuration".

SAFETY

Table 3-1: Safety symbols used on this product or in this document

Symbol	Signal word	Definition
	DANGER!	Potentially dangerous situation which may lead to personal injury or death! Follow the instructions closely.
	CAUTION!	Potential equipment damage or destruction! Follow the instructions closely.
	NOTE	Tips and other useful or important information.
	ESD	Risk of Electrostatic Discharge! Avoid potential equipment damage by following ESD Best Practices.
	CHASSIS GROUND	This symbol is used for identifying the functional ground of an I/O signal. It is always connected to the instrument chassis.
	Analog Ground	Shows where the protective ground terminal is connected inside the instrument. Never remove or loosen this screw!
	Recycle	Recycle the mentioned components at their end of life. Follow local laws.

3.1 SAFETY: Before You Begin Installation



DANGER! If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

**DANGER! — INSTALLATION OF EQUIPMENT:**

Installation of this product is to be done by authorized service personnel only. This product is not to be installed by users/operators without legal authorization.

Installation of the equipment must comply with local and national electrical codes.

**DANGER! — DO NOT OPEN EQUIPMENT, UNLESS AUTHORIZED:**

The interior of this equipment does not have any user serviceable parts. Contact Orolia Technical Support if this equipment needs to be serviced. Do not open the equipment. Follow Orolia Safety Instructions, and observe all local electrical regulatory requirements.



Caution: Electronic equipment is sensitive to Electrostatic Discharge (ESD). Observe all ESD precautions and safeguards when handling equipment.

3.2 Regulatory Compliance

This product has been tested and found to be in compliance with the following regulatory publications:

MIL compliance

- » Tested in accordance with MIL-STD-810G:
 - » MIL-STD 810G, 506.6
 - » MIL-STD 810G, 509.6
 - » MIL-STD 810G, 516.7
 - » MIL-STD 810G, 514.7

- » MIL-461F Testing (EMI/EMC):
 - » MIL-STD-461F CE102 Conducted Emissions, Power Leads
 - » Note: Frequency Range: 10 kHz to 10 MHz; Test Limits: Figure CE102-1
 - » MIL-STD-461F CS101 Conducted Susceptibility, Power Leads
 - » Note: Frequency: 30 Hz to 150 kHz; Test Levels: Figure CS101-1 (Curve #2)
 - » MIL-STD-461F RE102 Radiated Emissions, Electric Field
 - » Note: Frequency Range: 10 kHz to 18 GHz; Test Limits: Figure RE102-3
 - » MIL-STD-461F CS114 Conducted Susceptibility, Bulk Cable Injection
 - » Note: Frequency Range: 10 kHz to 200 MHz

FCC compliance

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 user documentation, 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/her own expense.

Other compliance

- » EN 60068-2-6
- » RoHS, WEEE compliant.

Technical Support

To request technical support for your VersaPNT unit, please contact the ["Orolia_DS_Support" email](#).

Phone support is available during regular office hours under the telephone numbers listed below.

To speed up the diagnosis of your VersaPNT, please send us:

- » the current **product configuration** (navigate to TOOLS > Upgrade/Backup > System Configuration panel), and
- » the **events log**.

Thank you for your cooperation.

3.3 Regional Contact

Orolia operates globally and has offices in several locations around the world. The Orolia (Spectracom) main offices are listed below:

Table 3-2: Orolia contact information

Country	Location	Phone	Address
France	Les Ulis	+33 (0)1 64 53 39 80	Orolia France Parc Technopolis – Bat. Sigma 3, Avenue du Canada 91974 Les Ulis Cedex
USA	West Henrietta, NY	+1 585 321 5800	Orolia USA 45 Becker Rd, Suite A West Henrietta, NY 14586

Additional regional contact information can be found on the [Contact page](#) of the Orolia website.