

# **LD8**

## Installation Manual

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# 1 Introduction

It will help to have the following items available when consulting this document:

- LD8 and associated equipment shipped to site
- The Delivery note provided within the shipment
- [LD8 Operations Manual](#)
- [Antenna and Coaxial Cable Installation](#)
- [LD8 FAQs](#) and [Quick Guides](#), available from <https://help.veripos.com>.

## 1.1 Scope

This installation manual provides the information necessary to install the Hexagon | Veripos LD8 receiver and covers these key aspects:

- Antenna installation
- Coaxial cabling
- DC Power requirements
- LD8 mounting
- System interfacing
- Ancillary equipment provided with the LD8

### 1.1.1 Preamble

Details are provided to assist in locating and connecting equipment ready to be commissioned. Read this manual in conjunction with the *Delivery note* provided for your particular installation.

This manual is split into the following sections:

1. [Introduction](#) - Details the purpose of the manual, conventions and abbreviations.
2. [LD8 system](#) - Describes the LD8 interface panel and provides technical data.
3. [LD8 installation](#) - Covers LD8 installation and provides antenna & cabling guidelines.
4. [Reference information](#) - Provides detailed technical specifications.
5. [Contact information](#) - Contains contact information for Veripos Support.

## 1.2 Veripos Support

Veripos Support is a service provided as first point of contact for all Veripos technical enquiries and fault reports. It is manned 24 hours per day, 365 days per year. Full contact details are listed in the [Contact information](#) section.

For support cases Veripos recommend that initial contact is made via [support.veripos@hexagon.com](mailto:support.veripos@hexagon.com), or by raising a ticket on VOSS <https://help.veripos.com>. With either method Veripos Support will be immediately notified and can begin providing assistance.

### 1.3 Terms and abbreviations

AC	Alternating Current
AltBOC	Alternative BOC modulation
APEX	Veripos high accuracy positioning solution
ARP	Antenna Reference Point
BEIDOU	Chinese GNSS
BOC	Binary Offset Carrier
BNC	Bayonet Neill–Concelman
C-O	Computed Minus Observed
CAN	Controller Area Network
cm	Centimetre
CTS	Clear to Send
dB	Decibel
DC	Direct Current
DCE	Data Communications Equipment
DGPS	Differential GPS
DP	Dynamic Positioning
DSUB	A electrical connector type
EU	European Union
GALILEO	European commissioned GNSS
GLONASS	GLObal Navigation Satellite System - Russian commissioned GNSS
GNSS	Global Navigation Satellite System
GPS	Global Positioning System - United States GNSS
IEC	International Electrotechnical Commission
IP	Internet Protocol
IPv4	Internet Protocol Version 4
kg	Kilogram
lb	Pound (unit of measuring weight)
L-band	Signal transmitted to carry correction data to mobile users
LD8	Veripos receiver containing combined L-band and GNSS card
LED	Light Emitting Diode
LNA	Low Noise Amplifier
LVC MOS	Low Voltage Complementary Metal Oxide Semiconductor
MHz	Megahertz
MM	Millimetre
PPP	Precise Point Positioning
PPS	Pulse Per Second
PWR	Power
QZSS	Quasi-Zenith Satellite System - Japanese commissioned GNSS
RF	Radio Frequency

RJ45	A physical network interface standard used in telecommunications
RTK	Real-time Kinematic
RTS	Request to Send
SAL M12	Sensor Actor Line
SBAS	Satellite Based Augmentation System
SMA	Sub-Miniature version A
TCP	Transmission Control Protocol
TNC	A threaded type of RF coaxial connector
UART	Universal Asynchronous Receiver-Transmitter
UI	User Interface
Ultra	Veripos high accuracy positioning solution
UNC	Unified National Coarse Thread
USB	Universal Serial Bus
VAC	Voltage Alternating Current
VDC	Volts Direct Current
VDOP	Vertical Dilution of Precision
VOSS	Veripos Online Support System
VSAT	Very Small Aperture Terminal
WEEE	Waste Electrical and Electronic Equipment

## 1.4 Equipment care

This section summarizes safety guidelines when installing the LD8 unit.

### 1.4.1 Unpacking and inspection

Carefully unpack and inspect the unit. If the equipment appears damaged, then return it using the original packaging. Responsibility for damage will not be accepted if the approved packaging is not used. Ensure all the major items and the ancillary equipment are supplied. If any items are found to be missing, contact the system supplier or Veripos as soon as possible.

### 1.4.2 Safety warnings

Always observe the following safety precautions:

- Disconnect electrical power from the DC power supply.
- Ensure adequate air circulation to ventilate the unit, especially to the sides, to avoid heat build-up.
- Connect only to a power supply with a voltage corresponding to that marked on the unit.
- **Always** disconnect the LD8 and associated equipment from the power supply when connecting equipment.
- Never use the equipment in damp or wet conditions.
- Avoid excessive heat, humidity, dust or vibration.
- Do not use the equipment where it may be subjected to dripping or splashing liquids.
- Always use the power connections supplied with the unit.
- Before replacing a fuse, **disconnect the equipment from the power supply**.

### 1.4.3 Installation

During installation ensure the following:

- DC power supply is disconnected. The power connection is easily accessed on the unit rear.
- The unit is secured using the holes in the base plate. Position the unit to ensure there is ample spacing for access to the interface panel and adequate ventilation during normal operation.
- All cables are routed safely to avoid sharp edges, bends and pinches.
- Only the cables specified within this manual are used for interconnection of the equipment.

### 1.4.4 Maintenance

Clean the unit using a clean dry cloth only. Do not wet the unit or allow the penetration of water. Do not use solvents to clean the unit.

### 1.4.5 Servicing

This unit contains no user-serviceable parts. Please refer all repairs to a qualified service agent or [Veripos](#).

### 1.4.6 Fault diagnosis

Follow the guidance in this document to correctly install the LD8. Where the LD8 does not perform as indicated firstly check all connections before contacting your supplier or [Veripos](#) for assistance.

## 1.5 Document conventions

### 1.5.1 Typographical conventions

*Italic* or **bold** text is used to emphasize certain information. *Italic* is also used in cross-references to other parts of the document and to other documents.

**Bold** text is also used for indicators and touch screen “push-buttons” commands.

[Blue](#) text is used for hyperlinking to other sections within this document or to external documents or websites.

***Bold italic*** text is used when display screens are mentioned in text.

`Monospace` text is used for input/output strings to/from the device.

### 1.5.2 Special Notices



#### **WARNING**

A warning indicates the risk of bodily harm or serious damage to the hardware.



#### **CAUTION**

A caution indicates the risk of damaging the hardware or adversely impacting the operation of the system.



#### **NOTE**

A note contains important information to help you make better use of the system.

## 1.6 LD8 Notices

The following notices apply to the LD8:

### 1.6.1 Waste electrical and electronic equipment

The Waste Electrical and Electronic Equipment Directive (hereinafter referred to as the “WEEE directive”) places an obligation on EU-based manufacturers, distributors, retailers and importers to take-back electronics products at the end of their useful life. A sister directive, RoHS (Restriction of Hazardous Substances) complements the WEEE directive by banning the presence of specific hazardous substances in the products at the design phase. The WEEE directive covers all Veripos products imported into the EU as of August 13, 2005. EU-based manufacturers, distributors, retailers and importers are obliged to finance the costs of recovery from municipal collection points, reuse, and recycling of specified percentages per the requirements contained in the WEEE Directive.

#### Instructions for disposal of WEEE by users in the European Union

Products which have the undernoted symbol located on either the product itself or its packaging indicates that the product must not be disposed of with other waste. Instead, it is the user’s responsibility to dispose of the product by handing it over to a designated collection point for the recycling of WEEE. The symbol shown below is on the product or on its packaging, which indicates that this product must not be disposed of with other waste. Instead, it is the user’s responsibility to dispose of their waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment.

The separate collection and recycling of your WEEE at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about recycling centres, please contact the local city office, the household waste disposal service or the product supplier.





### 1.6.2 FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

LD8 has been tested and found to comply with the radiated and conducted emission limits for a Class B digital device. The Class B limits are designed to provide reasonable protection against harmful interference in a residential installation.

The equipment listed generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient or relocate the LD8
- Increase the separation between the equipment and the LD8
- Connect the equipment to an outlet on a circuit different from that to which the LD8 is connected
- Consult Veripos for help

**CAUTION**

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

**WARNING**

The LD8 has been authorised for use in mobile applications. At least 20 cm (8 inches) of separation between the LD8 and the User must be maintained during normal operation.

**WARNING**

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

#### 1.6.2.1 Wi-Fi

LD8 contains a Wi-Fi radio with the following approval:

- FCC ID: UTU-01019715

### **1.6.3 European Union / United Kingdom (UK)**

#### **1.6.3.1 Radio Equipment Directive**

Veripos declares that the LD8 including its Wi-Fi transceiver is in compliance with:

1. EU Directive 2014/53/EU
2. UK Regulations S.1. 2017/1206

The full text of either the UK or EU Declaration of Conformity may be obtained from Veripos upon request.

#### **1.6.3.2 ROHS**

The LD8 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.

## 1.7 Disclaimer

### Hexagon Autonomy & Positioning division proprietary data

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## 2 LD8 system

This section provides an outline description of the Veripos LD8 receiver including details on the different connectors, LED indicators and also lists information on the internal GNSS receiver.

### 2.1 System overview

The LD8 is a high precision system, built into a lightweight, compact and environmentally protected enclosure and designed to operate reliably in the most demanding of marine environments. Key system features:

- Supports decimetre level multi-constellation positioning with Veripos Apex and Ultra PPP correction services
- Compatible with Veripos Quantum software
- EN60945 Marine Certified
- 555 channels, all constellation, multi frequency tracking
- Simultaneously track up to 3 Veripos correction service satellites
- ALIGN® GNSS heading solution
- Supports RTK operation
- Multiple communication interfaces for easy installation
- WebUI configuration utility

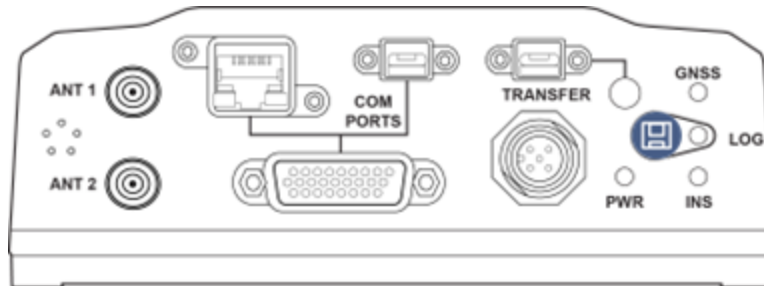


## 2.2 Connectors, LEDs and I/O ports




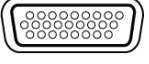


The LD8 can communicate with other devices, using serial or Ethernet ports.

### 2.2.1 Interface panel

The LD8 interface panel has several connectors for interfacing with the unit:

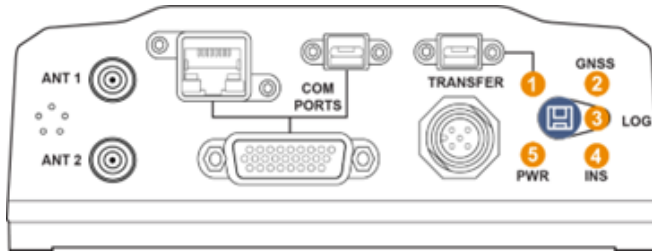


### 2.2.2 Connector types

Connector	Label	Connector type	Description
	ANT 1	SMA	Primary GNSS connector. Used for the POSITION reference antenna and the L-band correction signals
	ANT 2	SMA	Secondary GNSS antenna ONLY used for GNSS HEADING systems.
	COM PORTS	RJ45	Ethernet network 100 / 1000
		USB Micro A/B	A USB 2.0 port used to communicate from a computer to the receiver using a USB cable
		High Density 26 pin D-Type	Provides access to communication signals on the receiver. This includes: <ul style="list-style-type: none"> <li>• 1 Pulse Per Second output (+3.3 volts pulses)</li> <li>• Three bi-directional serial ports <ul style="list-style-type: none"> <li>• COM1 RS-422/RS-232 user selectable</li> <li>• COM2 RS-422/RS-232 user selectable</li> <li>• COM3 RS-232</li> </ul> </li> </ul>
	TRANSFER	USB Micro A/B	Currently not supported
	PWR	SAL M12 5 Pin	+9 to +36 VDC power input. Multipole connector

### 2.2.3 LEDs

There are five LED indicators used to communicate the receiver status to the user:



LED	Description
1. TRANSFER	Used for transferring logged data
2. GNSS	Indicates the position status of the receiver.
3. LOG	Indicates the status of logging to the receiver internal memory
4. INS	Not currently supported
5. PWR	Indicates the power status

### 2.2.4 Serial Ports

The LD8 has three serial ports: COM1, COM2 and COM3, accessible via the High Density 26 pin D-Type connector. Refer to the [High Density 26 Pin D-Type connector](#) section for more details.

Port	RS-232	RS-422	Flow control
COM1	Yes	Yes	RTS/CTS
COM2	Yes	Yes	No
COM3	Yes	No	No

### 2.2.5 USB ports

The **COM** USB port is available for data output. The **TRANSFER** USB port is currently not supported and should not be used.

### 2.2.6 Ethernet

The LD8 has an RJ45 socket that supports 10/100Base-TX Ethernet for interfacing to other IP enabled systems. The Ethernet port supports IPv4 Internet layer.

### 2.2.7 Power

The systems power input is required to be 9 to 36 Volts DC, using less than 1 Amp at 12 volts operation. On power up there is a 1.5 Amp in-rush (for a 12VDC power supply).



#### CAUTION

**If the voltage supplied is below the minimum specification, the receiver will automatically shut down.**

**If the voltage supplied is above the maximum specification, the receiver may be permanently damaged, voiding the warranty.**

**CAUTION**

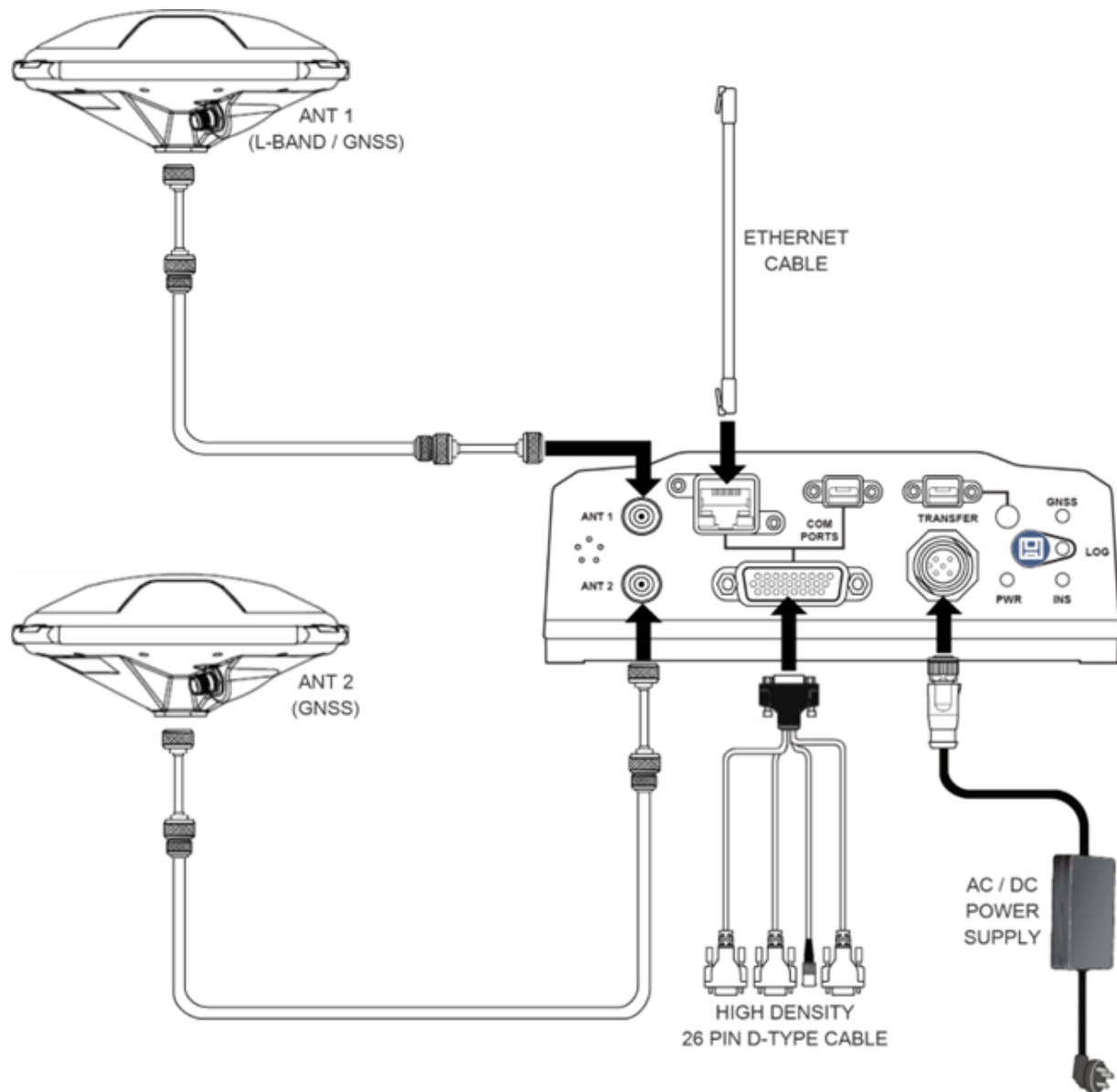
The supply must be capable of providing enough current to operate the LD8, including the initial inrush transient. The AC / DC power adapter should be protected with a 6 Amp fuse. The DC supply can be current limited to 6 Amp with an external fuse.

## 3 LD8 installation

This section provides guidance on the installation of the LD8 receiver. In the event of difficulty contact your supplier or Veripos (<https://help.veripos.com>).

### 3.1 LD8 schematic example

The schematic shown below is one example of an antenna setup arrangement. Please be aware that other antenna configurations are possible. For long-term installations, always contact to obtain setup drawings specific to your installation, as these may differ from the example below.





## 3.2 Location guidelines

When choosing installation locations, the following requirements should be taken under consideration:

1. Ensure adequate ventilation for free air flow to the main unit. This is especially important when working in hot or humid conditions. See section Ventilation Requirements for more details.
2. Locate unit in areas free from excessive dust or smoke.
3. Avoid locations that experience excessive vibration.
4. Avoid exposure to high temperatures.
5. Shield the unit from direct sunlight.
6. Mount the unit securely to prevent movement.
7. Ensure there is easy access to the interface panel.
8. Avoid mounting the receiver in confined spaces. Ensure sufficient slack remains in unit cabling to allow the rear of the unit to allow easy access.
9. Ensure all bends in coaxial cables are maintained above minimum bend radiuses.
10. Use short tails of flexible coaxial cable (e.g. LMR-240). Ensure sufficient strain relief on the main antenna coaxial to avoid stress being placed on coaxial connectors.

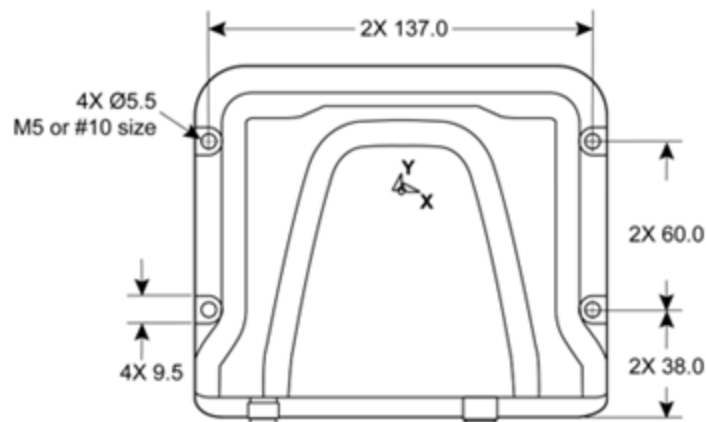
## 3.3 Mounting



### NOTE

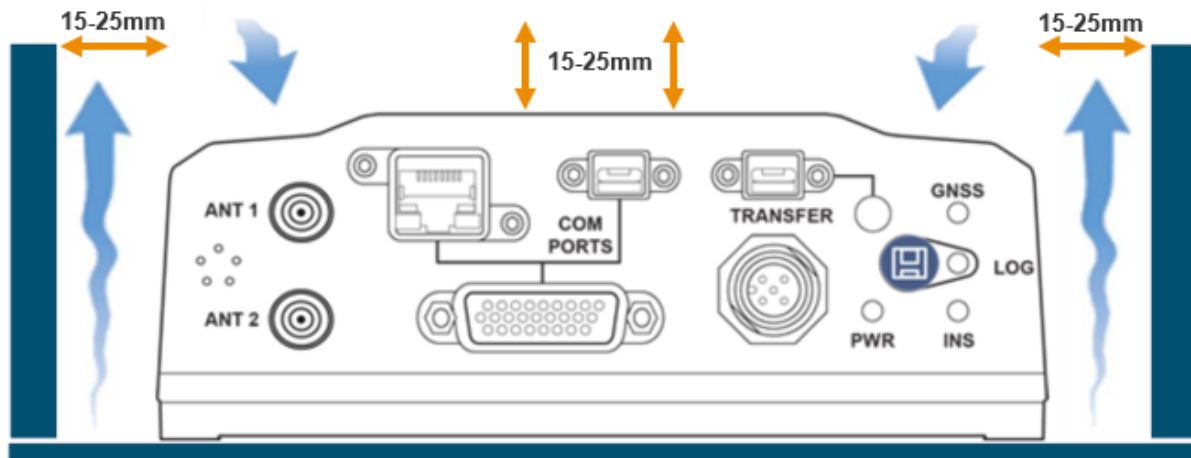
Before mounting the LD8 take a note of the system serial number, which typically starts with 'NMPL' and which can be found on the underside of the unit. This will be required for logging into the system, as covered in the [LD8 Operations Manual](#).

Mount the LD8 on a secure, stable surface. The unit can be secured via four M5 mounting holes (imperial size #10), as shown in the figure below. Take care not to overtighten as this will result in damage to the housing. Note that the torque of the screws should not exceed 15 inch-lb.



### 3.4 Ventilation requirements

The LD8 needs 15-25mm clearance all-round to allow an adequate flow of air:



### 3.5 Antenna installation

This section provides general guidance on installation of antennas and cabling.

It is very important to the on-going performance of your system that a high-quality installation is performed, as this will ensure optimum performance and reliability.



#### NOTE

After equipment installation it is recommended that a calibration survey is carried out to compute the heading offset (also referred to a C-O) and the position offset (Primary GNSS antenna). The position offset and heading offset should be entered within the navigation or DP software.

#### 3.5.1 GNSS / L-band antenna installation guidelines

The GNSS antenna receives both multi-constellation and L-band communication satellites (used for Veripos Correction Signals).

This section describes best practice when positioning and installing your GNSS antenna/s.

For more details please refer to Veripos document [Antenna and Coaxial Cable Installation](#) provided as part of the installation documentation.

Antennas should be located with a clear 360° view of the sky. The best way to ensure this is to mount the antenna at the highest possible location. If the GNSS antenna does not have good satellite visibility, there will be times when system performance is degraded.



*Examples of good installations – Antennas placed at top of mast with good spacing*

During installation observe the following guidelines:

- Offsets to the GNSS antennas must be measured carefully to ensure that no errors are introduced to the DP, Survey or Navigation systems.
- Care must be taken to ensure that antennas are not installed in the direct path of transmissions from vessel radar, Inmarsat systems, VSAT systems or high-power HF (whip/wire antennas).
- If the antennas cannot be installed directly at the top of the vessel mast or structure, it is essential that the mounting point is sufficiently strong for this purpose. The installation must be able to withstand vibration and wind over a period of many years of operation.
- Stainless steel brackets and mounts are recommended to mitigate the effects of saltwater corrosion.
- A mounting pole can be used with a 5/8"x11 UNC threaded end (standard marine mount). The pole can be attached by welding, or by using "U" clamps as above. This method allows the antenna to be mounted without the need for a bracket.
- Ensure that grease (such as copper slip) is applied to the threads when installing the antenna.
- Fit the antenna to the bracket and clamp the bracket to the mounting pole or the mast by using U-clamps. When mounting the antenna on an extension pole, fit the antenna to the pole first for ease of handling at height.
- If the threaded pole is already installed up the mast, use a small length of coaxial cable attached to the N-type connector as a safety lanyard for the antenna.
- Carefully connect the coaxial cable following manufacturers' guidelines. Form cable below the antenna into a small loop, approximately 150–220 mm (6 to 8 inch) in diameter.
- Attach the loop to the mounting pole under the antenna to provide strain relief from the cable.

For more detailed guidance please refer to the Veripos document [Antenna and Coaxial Cable Installation](#).

### 3.5.2 Placement for heading antennas

Careful consideration for the placement of the primary and secondary antennas is required to maximise the LD8 GNSS heading accuracy.

#### 3.5.2.1 Antenna separation

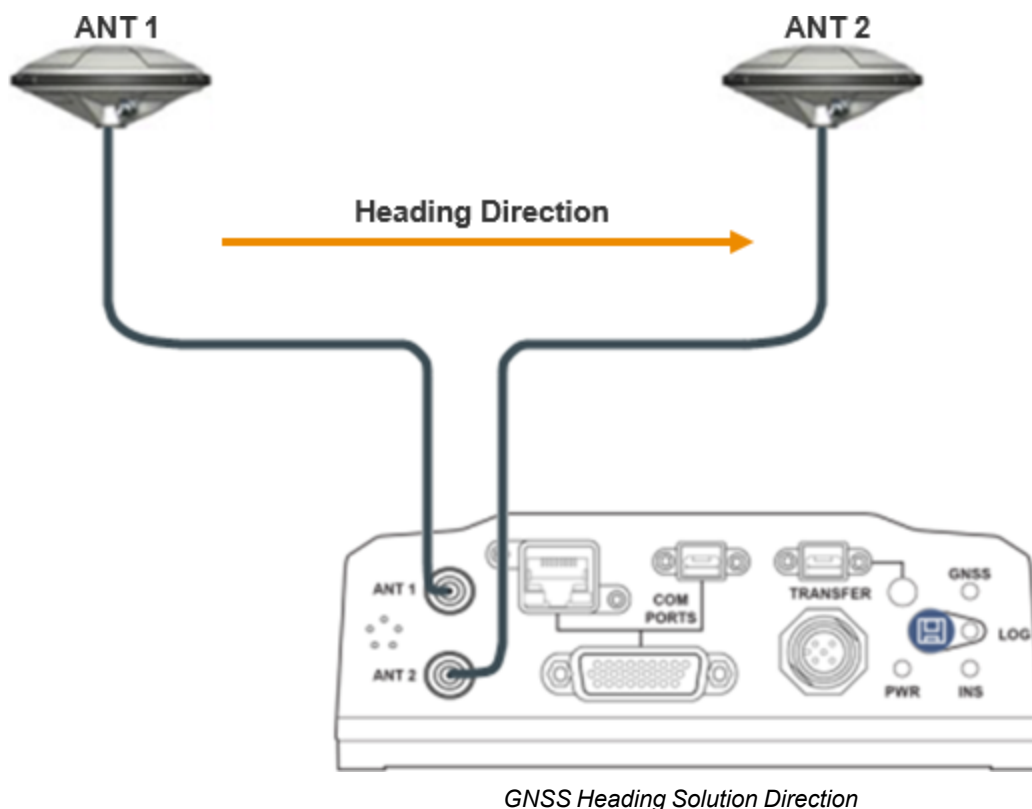
The GNSS heading solution accuracy is largely determined by the distance (or baseline) between the primary and secondary antennas. The larger the baseline, the better the heading precision will be.

The table below details the GNSS heading precision, which relate to the antenna separation baseline. Veripos recommend a minimum baseline of 2m.

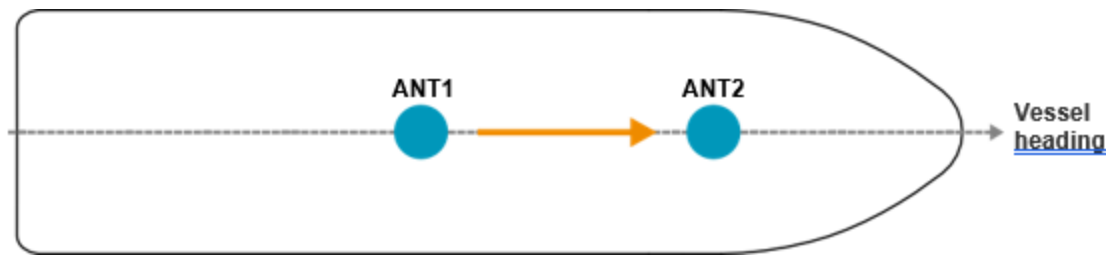
Baseline	Static GNSS Heading Precision
2m	0.08°
4m	0.05°
10m	0.02°

#### 3.5.2.2 Antenna orientation and height

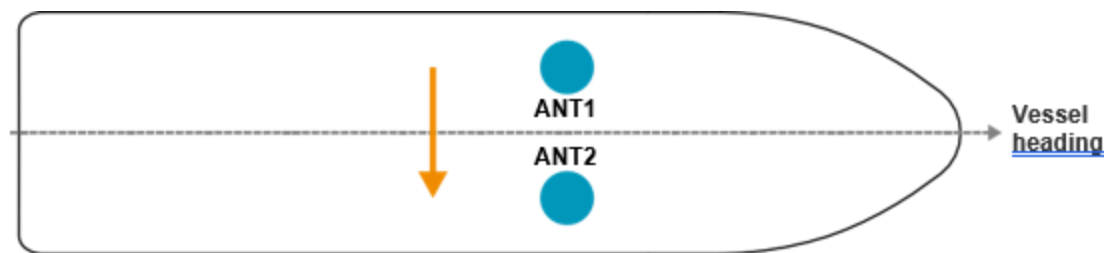
The heading direction is computed from **ANT 1** to **ANT 2** as illustrated below:



Assuming the antennas are mounted along the vessel centreline, with ANT 1 being the furthest forward antenna, the GNSS heading would closely reflect the vessel heading. In the below example, a small heading alignment correction would need to be applied in the navigation system software.

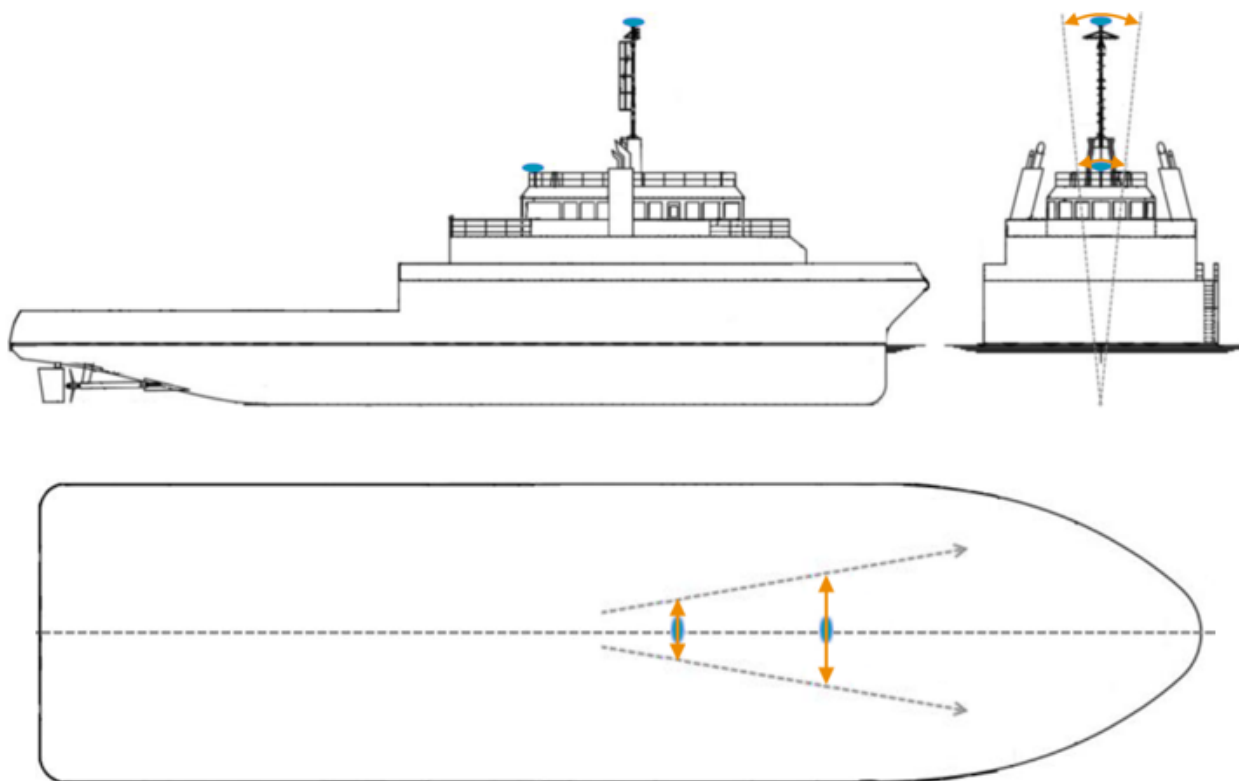


In the next example, Antenna 1 and Antenna 2 are installed perpendicular to vessel North with the Antenna 1 at the Starboard side and Antenna 2 at the Port side. A larger correction offset (C-O) would be required in the navigation system software to align the GNSS heading to vessel North.


**NOTE**

The above examples are simplified for illustration purposes. To achieve optimal heading accuracies a calibration must also be conducted.

Antenna 1 and Antenna 2 should be installed at similar heights to ensure consistent heading. If this is not done the heading solution will be noisy, due to each antenna being subject to different amounts of vessel motion (such as vessel roll):



*The effect of vessel motion when antennas (blue) are mounted at different heights*

### 3.6 Coaxial cable installation

Veripos can supply pre-terminated LMR type coaxial cables. The LMR cable type has been found to give the best overall technical and cost-effective performance. When cables are supplied by Veripos they will be supplied with 2m tails to allow for connection from main cable run to the antenna and the receiver.

#### 3.6.1 Maximum recommended cable lengths

The various GNSS and differential signals will be attenuated at different rates depending on the signal type and the quality of the coaxial cable.

The following table shows the maximum recommended cable length for signal types and for three types of coaxial cable. It is best practice to use lower loss cable, before resorting to the use of inline amplifiers.

	L1 GNSS Only	L1/L2 GNSS	L-band
<b>RG213 (M17/163-00001)</b>	40 m / 130 ft	30 m / 100 ft	65 m / 215 ft
<b>LMR-400</b>	70 m / 230 ft	52 m / 170 ft	120 m / 395 ft
<b>LDF4-50</b>	130 m / 425 ft	110 m / 360 ft	210 m / 690 ft

### 3.6.2 General cable guidance

The Veripos recommended cable for the antenna runs is LMR-400. It is highly recommended that LMR-240 (thinner and more flexible) terminated tails are used at both ends of the LMR-400 cable to ease the attachment to antennas and receiver RF connectors.



*Terminated tails of LMR-240*

When running multiple coaxial cables Veripos recommend labelling to ensure cables are attached to the correct antennas and equipment.

Survey the route of the antenna cabling to ensure:

1. The total length of the cable run does not exceed the supplied cable length for this installation. Contact your supplier or Veripos if this is the case.
2. The cable does not cross or run parallel with any **single phase or three phase mains cable** (110 VAC, 220 VAC or 440 VAC) or any **high-power RF cables** leading to transmitting devices such as Inmarsat and VSAT domes.
3. The cable **avoids the proximity to fluorescent lighting and wiring**.
4. The cable is not placed under tension. A **support wire** is used where the cable run has to cross a free space and does not rely solely on cable ties for support.
5. Sufficient space is available in the selected cable entry through the bulkhead, for the connectors to pass through without damage. If the connector cannot pass through the cable entry it may be necessary to cut the connector off and re-terminate once the cable has been passed through.
6. The cable is **not pinched**.
7. The route is **free from all burrs or sharp edges** that could cut the cable jacket over time and lead to water ingress.
8. All **connectors and couplers are completely sealed** from the environment with overlapping layers of self-amalgamating tape and finished with layers of electrical tape or Scotchkote.
9. **Stress loops** are fitted to prevent excess force on the connectors, in particular on the antenna connectors.
10. The **minimum bend radius** for the cable is not exceeded.



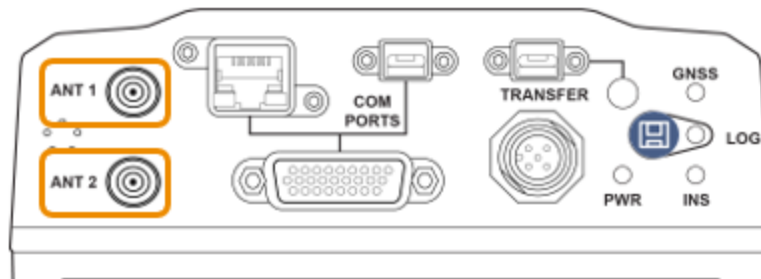
*Typical cable installation in a bridge mast area*

## 3.7 Antennas

This section details the antenna connections made to the LD8.

### 3.7.1 Coaxial cables to antennas

The LD8 contains a GNSS receiver capable of tracking L-band. Additionally, a GNSS antenna is required to be connected to Antenna 2 for computation of a valid GNSS heading. Antenna 2 cannot be used for receiving differential corrections or positioning.



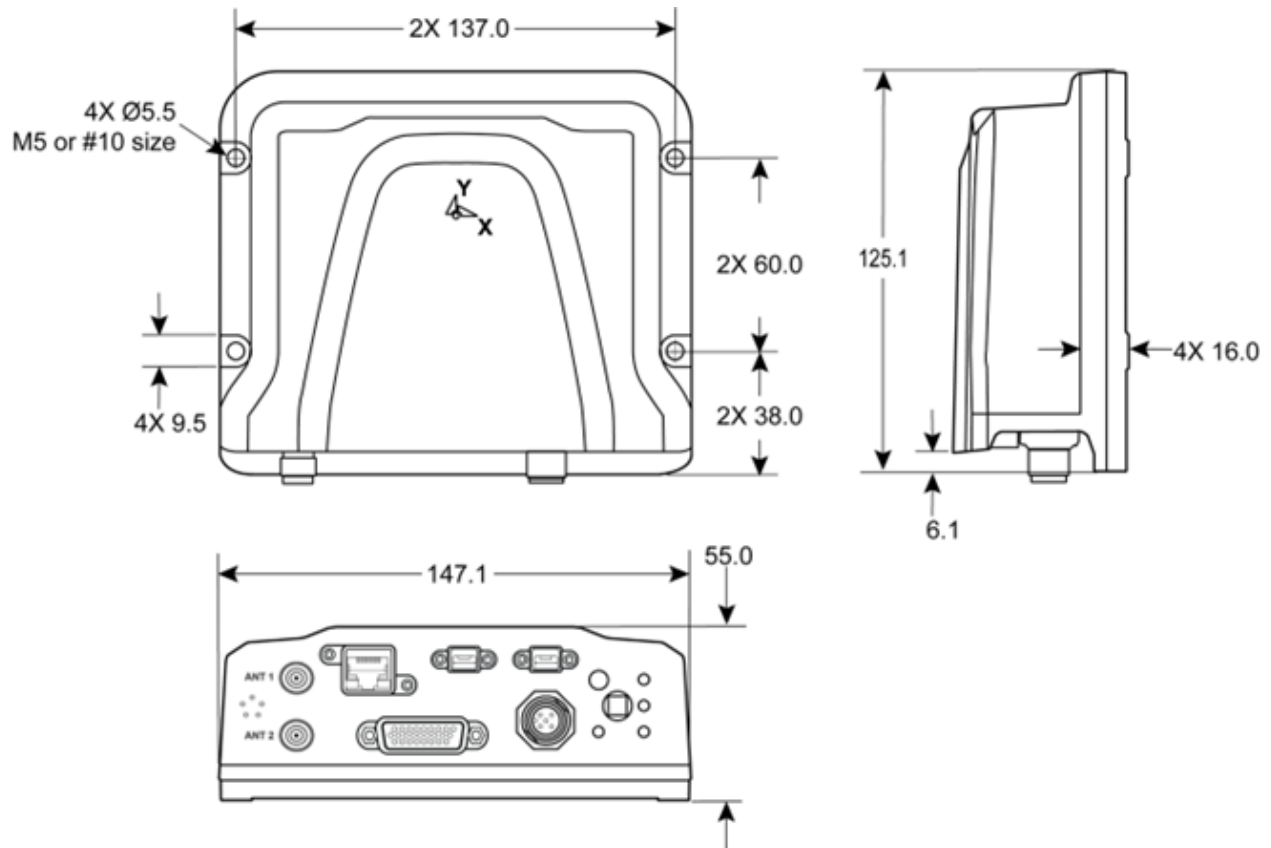
*Interface panel of LD8 with two GNSS antenna connectors*



## 4 Reference information

### 4.1 Technical specifications

#### 4.1.1 Dimensions in mm



#### 4.1.2 Mechanical specifications

The LD8 is sealed to the IPX7, IP6X & IP67 specifications.

Equipment complies with **EN60945** Protected Equipment - 4th Edition.

#### 4.1.3 Compass safe distance

Conforms to IEC 60945.

#### 4.1.4 Enviromental specifications

Operating temperature range: -40°C to +75°C

Storage temperature range: -40°C to +85°C

Maximum relative humidity: 95% non-condensing

#### 4.1.5 Safety considerations

Though the test conditions for the LD8 unit provide for a maximum operating temperature of +75 °C, continuous operation of all electronic components should, if possible, take place at ambient temperatures of only +25 °C.

#### 4.1.6 Electrical specifications

Voltage: +9 to +36 VDC

Power consumption: 3.95 W typical, all constellations, all frequencies, plus L-band



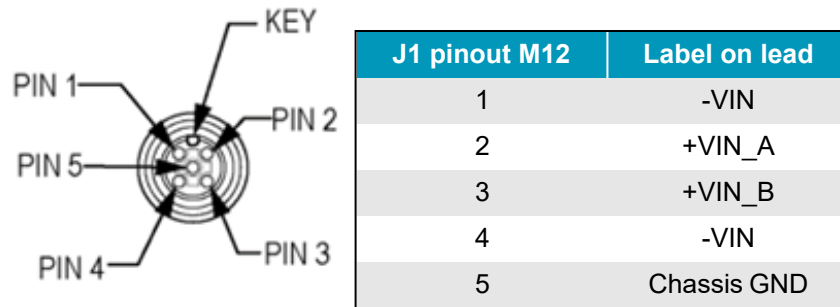
##### **NOTE**

These are typical values using serial ports without interference mitigation. These values can change with the number of satellites in view, firmware version, data logging rates and features in use. Use them as a guide for what you might expect, but not as absolute values

Inrush current: 1.5 A for less than 1.3 ms (@ 12 V; typical)

## 4.2 Cabling and connectors

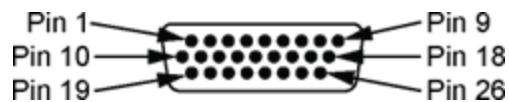
### 4.2.1 Power cable



### 4.2.2 High Density 26 Pin D-Type connector

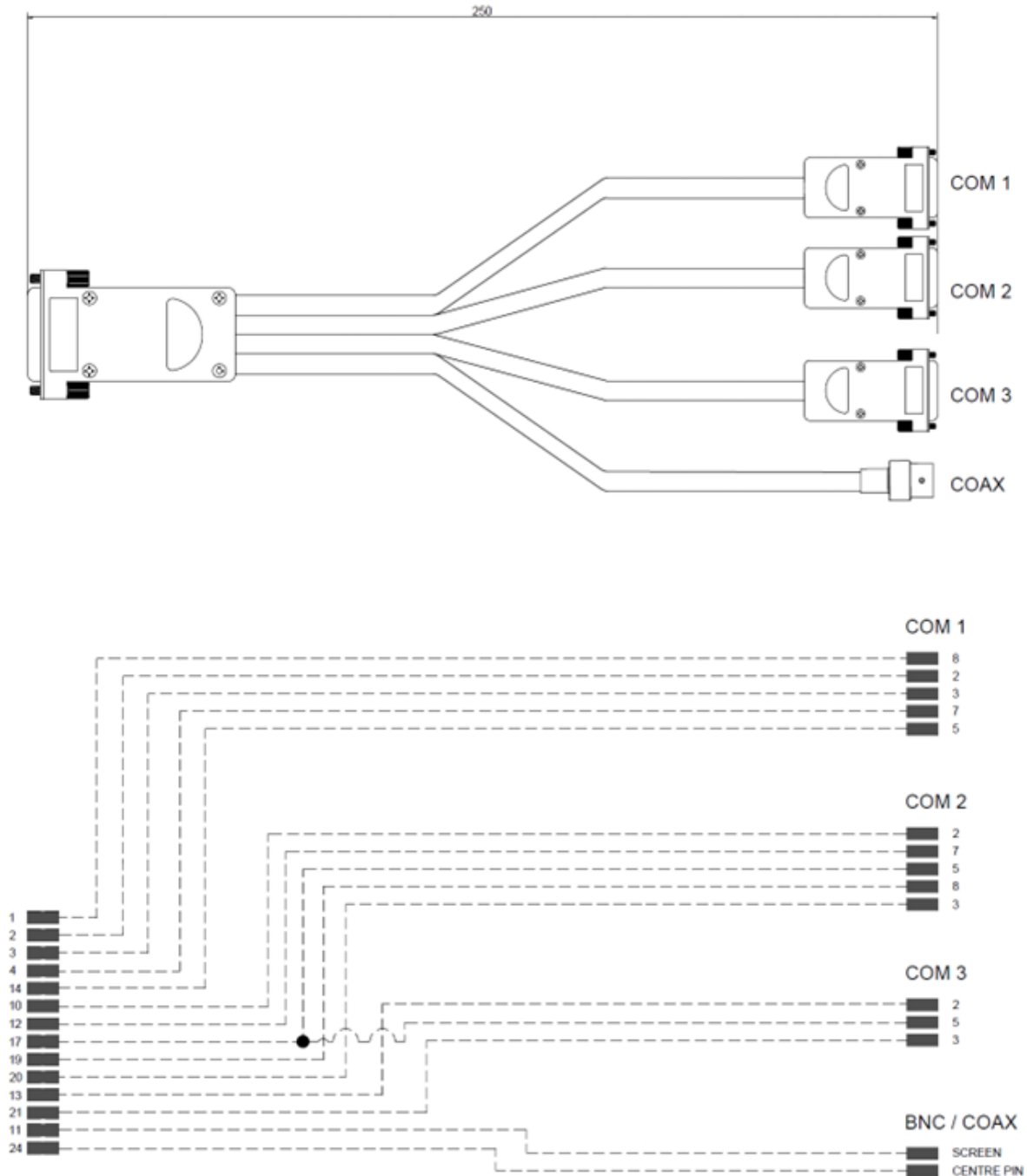
PIN	Description		
	Function	RS232	RS422
1	COM1	RTS	TX-
2	COM1	TX	TX+
3	COM1	RX	RX+
4	COM1	CTS	RX-
10	COM2	TX	TX+
11		GND	
12	COM2		RX-
13	COM3	TX	
14		GND	
17		GND	
19	COM2		TX-
20	COM2	RX	RX+
21	COM3	RX	
24	PPS @ 3.3V		

The 26-way high density D-type connector pin diagram is shown below (view looking into connector):



### 4.2.3 I/O cable

The interfacing cable connects to the high density 26 pin D-type connector which splits to three 9 pin D-type connectors (female) and a BNC female. The three comport connectors are configured as standard RS232 9-pin connections (DCE).



## 5 Contact information

All initial contacts regarding technical or support issues should be initially addressed to Veripos Support. Where appropriate Support will refer issues to the regional operations and engineering teams.

### 5.1 Veripos Support details

<b>Veripos Support website</b>	<a href="https://veripos.com/support">https://veripos.com/support</a>
<b>Veripos Support telephone</b>	+44 1224 965900
<b>Veripos Support e-mail</b>	<a href="mailto:support.veripos@hexagon.com">support.veripos@hexagon.com</a>

## 6 Appendix

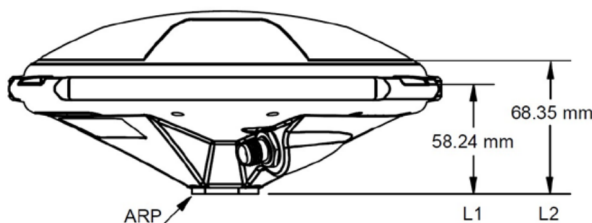
### 6.1 Summary specification of antennas

#### 6.1.1 Veripos V560 combined GNSS & L-band antenna

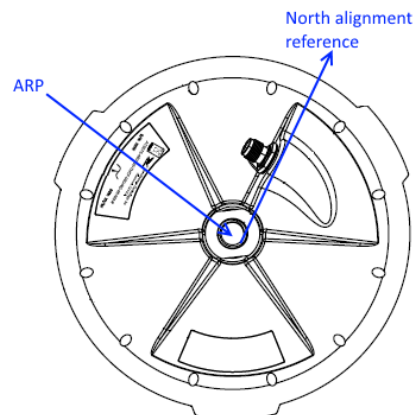
<b>L-band/GPS/GLONASS:</b>	1525-1610 MHz
<b>GPS L2/GLONASS L2:</b>	1160-1252 MHz
(complete with a narrow band filter for interference rejection)	
<b>LNA Gain:</b>	45db
<b>DC Voltage input:</b>	3.0 to 15.0V
<b>RF Input Connector:</b>	TNC female (note cable RF connector – TNC male)
<b>Material:</b>	Weather Proof Polymer Plastic
<b>Mount:</b>	5/8" Tripod Tread Connector
<b>Temperature Range:</b>	-55 to +85°C
<b>Certification:</b>	IEC 60945
<b>Diameter:</b>	7.5" / 19.05cm
<b>Height:</b>	3.17" / 8.05cm
<b>Weight:</b>	1.6lbs / 0.73kg

#### 6.1.2 V560 phase centre offsets

The diagram on the left shows the antenna reference position (ARP) vertical offset from the GNSS L1 and L2 frequencies phase centres, and the diagram on the right shows ARP at the antenna base and the antenna North alignment reference:



*V560 phase centre values above ARP*



*V560 ARP & North alignment reference*

The table below details the North, East and Up phase centre values for GNSS L1 and L2 frequencies:

GNSS Frequency	Relative to Antenna Reference Point (ARP)		
	North (mm)	East (mm)	Up (mm)
<b>L1</b>	-0.34	-0.53	58.24
<b>L2</b>	0.11	-0.76	68.35

## 6.2 Summary specification of cabling

With the system Veripos typically provide pre-terminated cables and tails for use with both L-band and GNSS antennas (see the *Delivery note*). Veripos recommend use of Times Microwave coaxial LMR cable for installation of all antennas.

### 6.2.1 Times LMR-400 coaxial cable

#### 6.2.1.1 Electrical specifications

Performance property	Units	US	(metric)
Attenuation @1.5GHz:			
	30.77m (100ft.)	5.1dB	
	100m	16.8dB	
Velocity of propagation	%	85	
Dielectric constant	N/A	1.38	
Time delay	nS/ft (nS/m)	1.20	(3.92)
Impedance		50	
Capacitance	pF/ft (pF/m)	23.9	(78.4)
Inductance	uH/ft (uH/m)	0.060	(0.20)
Shielding effectiveness	dB	>90	
DC resistance			
Inner conductor	/1000 ft (/km)	1.39	(4.6)
Outer conductor	/1000 ft (/km)	1.65	(5.4)
Voltage withstand	VDC	2500	
Jacket spark	Vrms	8000	
Peak power	kW	16	

#### 6.2.1.2 Mechanical specifications

Performance property	Units	US	(metric)
Bend radius, installation	in. (mm)	1.00	(25.4)
Bend radius repeated	in. (mm)	4.0	(101.6)
Bending moment	ft-lb (N-m)	0.5	(0.68)

Performance property	Units	US	(metric)
Weight	lb/ft (kg/m)	0.068	(0.10)
Tensile strength	lb (kg)	160	(72.6)
Flat plate crush	lb/in. (kg/mm)	40	(0.71)

### 6.2.1.3 Environmental specifications

Performance property	°F	°C
Installation temperature range	-40 to +185	-40 to +85
Storage temperature range	-94 to +185	-70 to +85
Operating temperature range	-40 to +185	-40 to +85

## 6.2.2 Times LMR-240 coaxial cable

### 6.2.2.1 Electrical specifications

Performance property	Units	US	(metric)
Attenuation @1.5GHz:			
30.77m (100ft.)	9.9dB		
100m	32.4dB		
Velocity of propagation	%	84	
Dielectric constant	N/A	1.42	
Time delay	nS/ft (nS/m)	1.21	(3.97)
Impedance		50	
Capacitance	pF/ft (pF/m)	24.2	(79.4)
Inductance	uH/ft (uH/m)	0.060	(0.20)
Shielding effectiveness	dB	>90	
DC resistance			
Inner conductor	/1000 ft (/km)	3.2	(10.5)
Outer conductor	/1000 ft (/km)	3.89	(12.8)
Voltage withstand	VDC	1500	
Jacket spark	Vrms	5000	
Peak power	kW	5.6	

### 6.2.2.2 Mechanical specifications

Performance property	Units	US	(metric)
Bend radius, installation	in. (mm)	0.75	(19.1)
Bend radius repeated	in. (mm)	2.5	(63.5)
Bending moment	ft-lb (N-m)	0.25	(0.34)



Performance property	Units	US	(metric)
Weight	lb/ft (kg/m)	0.034	(0.05)
Tensile strength	lb (kg)	80	(36.3)
Flat plate crush	lb/in. (kg/mm)	20	(0.36)

### 6.2.2.3 Environmental specifications

Performance property	°F	°C
Installation temperature range	-40 to +185	-40 to +85
Storage temperature range	-94 to +185	-70 to +85
Operating temperature range	-40 to +185	-40 to +85