

LD6

Installation Manual

VERIPOS



LD6 Installation Manual AB-V-MA-00520

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# 1. INTRODUCTION

# 1.1 GENERAL

This document provides the information required to install an LD6.

When consulting this document it will help the installer to have available the following items to assist in assessing and planning the work:

- The VERIPOS LD6 and associated equipment shipped to site
- The 'Equipment Packing list' (included with the equipment packing sent to site)
- The LD6 Operations manual
- The VERIPOS document "Antenna and Coaxial Cable Installation" provided with VERIPOS installation documentation
- Interactive training modules and VERIPOS product literature on CD ROM.

# 1.2 LD6 INTEGRATED MOBILE UNIT



Figure 1. The VERIPOS LD6 Receiver

The VERIPOS LD6 is easy to install and operate. It is an effective, flexible unit that ensures reliable reception of VERIPOS services with superior positioning from metre to decimetre level accuracy.

The LD6 integrated mobile unit is manufactured to the highest specifications and is certified to EN60945:2002 [5].

It is designed as a standardised, upgradeable L-band receiver that is simple to operate and maintain.

The LD6 is provided in a number of versions and can be upgraded as required to generate any VERIPOS proprietary position solution depending on the data subscriptions enabled.

The LD6 is modular and can be upgraded as required from a "black box" mode to generating any VERIPOS proprietary position solution depending on the data subscriptions enabled.

LD6 systems may be used as a sensor to output received data and GNSS measurements to external processing or quality control software such as the VERIPOS DP Orion or Verify QC.



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The LD6 has a 3.5" (9 cm) colour VGA touchscreen that allows quick and easy user setup.

In addition to calculating position, the LD6 can output all received data in standard formats such as RTCM and NMEA.

The LD6 is exceptionally flexible, with overall operating status available from the front panel display.

# 1.3 SCOPE

The purpose of this manual is to provide the necessary information to perform the installation of the VERIPOS LD6 Integrated mobile unit. It covers installation of:

- Antennas
- Coaxial and data cables
- LD6 receiver and power requirement
- Housings and ancillary equipment provided with the LD6.

#### 1.3.1 Contents

This manual provides guidance for engineers to install a VERIPOS LD6 receiver on a vessel.

Details are provided to assist in locating and connecting equipment ready to be commissioned. The manual covers installation of the LD6 receiver.

Read this manual in conjunction with the specific 'Scope of Supply' or Equipment Packing List' for your particular installation.

	Chapter	Contents
1.	Introduction	This chapter specifies the purpose and target group for the manual. It also contains a list of used abbreviations and a specification of the document conventions.
2.	System description	This chapter describes the interface in detail on the front and back side of the LD6 unit.
3.	Installation	This chapter covers the installation of the LD6 unit as well as cabling guidelines.
4.	Reference information	n This chapter comprises additional information such as Technical Specifications, cable specifications, connector termination and connector pin assignments.
5.	Contact information	This chapter contains contact information details about the VERIPOS Helpdesk and VERIPOS offices worldwide.



1.4

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**TERMS AND ABBREVIATIONS** 

Ampere

AC	Alternating Current
Apex	Veripos PPP DGNSS service
ARP	Antenna Reference Point
AWG	American Wire Gauge
BDE	Below Deck Equipment
BeiDou	Chinese GNSS constellation
BER	Bit Error Rate
bps	Bits Per Second
CoG	Course Over Ground
DC	Direct Current
DGPS	Differential GPS
DGNSS	Differential GNSS
DOP	Dilution of Precision
DP	Dynamic Positioning
EGNOS	European Geostationary Navigation Overlay Service
EIA	Electronics Industry Association (this document uses the previous
	terminology "RS" that is generally recognized in the industry)
EMC	ElectroMagnetic Compatibility
Galileo	European GNSS constellation
GDOP	Geometric Dilution of Precision
GLONASS	Global Navigation Satellite System – Russian equivalent to
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
HDOP	Horizontal Dilution of Precision
HDT	NMEA message containing heading information
HF	High Frequency Radio – used to transmit correction data
Hz	Hertz
Kgf	Kilogramme Force
KHz	Kilohertz
KPH	Kilometres per Hour
LAN	Local Area Network
LNA	Low Noise Amplifier
L-Band	Method of transmitting correction data to mobile users
LCD	Liquid Crystal Display



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	MF	Medium Frequency Radio used to transmit correction data
	MHz	Mega-Hertz
	NMEA	National Marine Electronics Association
	N/A	Not applicable
	PDOP	Positional Dilution of Precision
	PPP	Precise Point Positioning
	PPS	Pulse per Second
	PRN	Pseudo Random Noise
	QZSS	Japanese GNSS constellation
	RF	Radio Frequency
	RMS	Root Mean Square
	RoHS	Restrictions of Hazardous Substances
	RTCM	Radio Technical Commission for Maritime Services
	SAL	Service Access License
	SBAS	Satellite Based Augmentation System
	SD	Standard Deviation
	SNR	Signal to Noise Ratio
	Spotbeam	High Power L-Band Signal
	SV	Space Vehicle
	UHF	Ultra High Frequency
	Ultra	Veripos High Accuracy Positioning Systems
	USB	Universal Serial Bus
	UTC	Coordinated Universal Time
	V	Volt
	VDOP	Vertical Dilution of Precision
	VERIPOS	Precise navigation and positioning solutions service provider
	VGA	Video Graphic Array
	VOSS	VERIPOS Online Support System
	W	Watt
	WAAS	Wide Area Augmentation System
	WEEE	Waste Electrical and Electronic Equipment



# 1.5 LD6 SAFETY SUMMARY

This section summarizes safety guidelines when installing the LD6 unit.

#### 1.5.1 Unpacking and inspection

Carefully unpack the unit and retain packaging to return the equipment where required.

Inspect the unit. If the equipment appears damaged return it using the original packaging. Responsibility for damage is not accepted if the approved packaging is not used.

Ensure all items and ancillary equipment is present. Contact your supplier or VERIPOS where this is not the case (see contacts in the *Contact information* chapter).

#### 1.5.2 Safety symbols

Please see section 1.6 Document conventions later in this manual.

#### 1.5.3 Safety warnings

Always observe the following safety precautions:

- Disconnect power from both AC and DC inlets on the rear panel to isolate the equipment before working on it.
- Never use a detachable AC/DC supply cord with inadequate rating.
- If the equipment is used in a manner not specified by VERIPOS, the protection provided by the equipment may be impaired.
- Ensure adequate air circulation to ventilate the unit especially to the sides to avoid heat build-up.
- Only connect to an earthed power supply. *The LD6 unit is class 1 construction and must be earthed*.
- Connect only to a power supply with a voltage corresponding to that marked on the unit.
- **Always** disconnect the LD6 and associated equipment from the mains when connecting equipment, inserting/removing modules by removing the AC/DC supply and ancillary connections before removing from the rack.



There is a retention clip which, when used, prevents accidental removal of the AC power plug.

- The equipment is heavy: use handles where provided.
- The equipment is for use in moderate climates only. Never use the equipment in damp or wet conditions.
- Avoid excessive heat, humidity, dust and vibration.
- Do not use where the equipment may be subjected to liquids.
- Always use the power connections supplied with the unit. See the *Reference information* chapter for details.
- Before replacing a fuse disconnect the equipment from both AC and DC supplies.

#### 1.5.4 Installation

Ensure the AC and/or DC power supplies are disconnected during installation. The power connections are easily accessed on the rear of the unit (see *Figure 4* in the *System Description* chapter).

Ensure that the unit is secured within the rack by the supplied brackets and fittings. Position the unit to ensure there is ample spacing for ventilation of the unit and access to front and rear during normal operation.

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Ensure all cables are routed safely to avoid sharp edges, bends and pinches.

Ensure only the specified cables are used for interconnection of the equipment.

Permanently connect the vessels' protective earth to the protective bonding connection on the unit.

#### 1.5.5 Maintenance

Clean the unit using a clean dry cloth only. Do not wet the unit or allow moisture to penetrate the unit. Do not use solvents to clean the unit.

Fuses must only be replaced using a fuse of the type and rating as marked.

If a replacement fuse fails: immediately contact your local service agent. *Do not* replace the fuse with one of a higher value.

#### 1.5.6 Servicing

This unit contains no user-serviceable parts. Please refer all repairs to a qualified service agent or to VERIPOS. See the *Reference information* chapter for details.

#### 1.5.7 Fault diagnosis

Follow the guidance in this document to correctly install the LD6. Where the LD6 does not perform as indicated please first check all connections before contacting your supplier or VERIPOS for assistance (contact details in the *Reference information* chapter).



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#### 1.6.1 Typographical conventions

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

Bold text is also used for indicators and touch screen "push-buttons" commands.

"Text within quotes" is used when display screens are mentioned in text. Monospace text

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

#### 1.6.2 Special Notices

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





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# 1.7 REFERENCES

Please read this manual and refer to the following information where required:

- Antenna & Coaxial Cable Installation manual.
- LD6 Operations manual. Ensure manual is valid for LD6 version in-use!
- LD6 Quick Guide.

Information is available at VERIPOS Online Support System (VOSS):

https://help.veripos.com



# 1.8 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 their waste equipment by handing it over to a designated collection point for the recycling of WEEE.

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.



1.8.1 Replacement of Battery

Risk of explosion if battery is replaced by an incorrect type.

Where replacement of the battery unit in the LD6 is required, please carefully dispose of the LD6 battery as hazardous waste in line with local regulations that apply.



# 1.9 DISCLAIMER

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# 2. SYSTEM DESCRIPTION

This section gives an outline description of the VERIPOS LD6 receiver and the components used for LD6 that may be supplied.

This section gives overall information and details as follows:

- LD6 Receiver Overview
- Hardware Versions
- Controls, Connectors and I/O Ports

# 2.1 LD6 RECEIVER OVERVIEW

The VERIPOS LD6 receiver is a multi-purpose unit built on a modular design. A touchscreen colour control panel is used to set up the unit and display information. Various combinations of modules can be installed. Contact VERIPOS for further information.



Figure 2. The VERIPOS LD6 Receiver

LD6 comprises:

- Housing with power supply
- Controller
- Interfaces for data output
- Cooling
- Display/control touchscreen interface

Modules (optional):

- Single input GNSS receiver
- L-Band receiver
- MF beacon receiver
- UHF receiver



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# 2.2 LD6 VERSIONS

Different version LD6 systems exist, all capable of providing a corrected solution in NMEA format. The menu structure and general operation may vary depending on the LD6 software version. Refer to the relevant LD6 Operations Manual for the software version running on your LD6, available on <u>VOSS</u>. This section will provide an overview of the different LD6 models and capabilities.

#### 2.2.1 LD6 Version 8 & Version 50

LD6 systems on either software version 8 or 50 are supplied with Septentrio AsteRx2 GNSS receiver cards and both are capable of computing GPS and GLONASS VERIPOS services (Ultra<sup>2</sup>, Apex<sup>2</sup> and Standard<sup>2</sup>).

#### 2.2.2 LD6 Version 101

LD6 systems on software version 101 are supplied with NovAtel OEM615 GNSS receiver cards and are capable of computing GPS and GLONASS VERIPOS services (Ultra<sup>2</sup>, Apex<sup>2</sup> and Standard<sup>2</sup>).

#### 2.2.3 LD6 Version 105

Different version 105 build numbers may exist (for example, 105.03.00.10 or 105.03.00.11); however, these will collectively be referred to within this manual as 'Version 105'. LD6 systems on software version 105 feature either a NovAtel OEM617D or OEM7720 GNSS receiver card, and both are capable of providing a corrected solution in NMEA format.

Both NovAtel OEM617D or OEM7720 GNSS receiver cards feature GPS, GLONASS, Galileo and QZSS GNSS tracking capabilities, with the OEM7720 GNSS receiver card additionally capable of tracking Beidou. The multi-constellation tracking abilities of both cards allow for the computing of VERIPOS's *Apex*<sup>5</sup> service. The software version 105 LD6 can also compute all other VERIPOS solutions, e.g. Ultra<sup>2</sup>, Apex<sup>2</sup>, Standard<sup>2</sup> etc.

Software Version	GNSS Variant	Tracking Capabilities	
8 (or) 50	Septentrio AsteRx2	GPS & GLONASS	
101	NovAtel OEM615	GPS & GLONASS	
105	NovAtel OEM617D	GPS, GLONASS, Galileo & QZSS	
105	NovAtel OEM7720	GPS, GLONASS, Galileo, QZSS & Beidou	

The table below shows details the LD6 GNSS variants:

LD6 systems with an MF module<sup>\*</sup> installed allow the LD6 to be capable of receiving third party corrections directly from local reference stations (where available).

LD6 systems with UHF module\* installed allow the LD6 to receive corrections by UHF broadcast (where available).

\*An on-screen icon for each receiver card will be shown when the LD6 has that particular receiver card installed.

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# 2.3 CONTROLS, CONNECTORS AND I/O PORTS

The controls etc. are detailed in this chapter.



- 1. Labels with Unit ID (above) and phone number to Helpdesk (below)
- 2. Front panel speaker
- 3. 3 x USB 2.0 sockets
- 4. Screen brightness control
- 5. Volume control (press to mute/un-mute)
- 6. Colour touchscreen display
- 7. Front panel power on/off switch (with security cover)
- 8. Removable handle (one on each side).



Figure 4. LD6 Rear Panel

- 1. Earth bonding connector
- 2. 2 x Ethernet LAN ports
- 3. AC power input (with fuse)
- 4. 3 x USB 2.0 sockets
- 5. DC power input (with fuse)
- 6. 14 x Serial outlet ports (RS-232/422)
- 7. Mono audio outlet
- 8. Screen VGA/SVGA/XVGA/SXVGA output
- 9. 6 x Optional module bays with antenna connections

# 3. INSTALLATION

This section provides guidance on the installation of the LD6 receiver.

Contact your supplier or VERIPOS with questions or for advice when installing this equipment.

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# 3.1 INSTALLATION

Installation work for the LD6 varies for:

- The types of antenna(s) to be installed
- The LD6 version in-use.

Examples are shown below to illustrate arrangement of typical installation of antennas and position output from the LD6.



The diagrams shown in this section are examples of possible antenna setup arrangements. Please be aware that other antenna configurations are possible. For long-term installations, *always* contact VERIPOS to obtain setup drawings specific to your installation as these may differ from those shown in this section.

# 3.1.1 LD6 Installation – Schematic Example 1



Figure 5. Example of an Installation Drawing for an LD6



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# 3.1.2 LD6 Installation – Schematic Example 2



Figure 6. Example of an Installation Drawing for an LD6 – Shared L-Band & MF antenna

# NOTE

The splitter used in the Figure 6 configuration will be supplied by VERIPOS. Normal GNSS splitters will not allow MF signals to pass through.



# 3.2 SITING THE LD6 RECEIVER

The LD6 (2U) unit is recommended to be housed in a 19" rack with suitable ventilation.

### 3.2.1 Ventilation Requirements

The unit is designed to be ventilated at the sides. Each side of the unit should have > 55 mm clearance.



Figure 7. Rack mounted LD6 receiver with suitable ventilation

# 3.2.2 LD6 siting guides

- 1. Ensure adequate ventilation above and especially to the vents for free air flow to the unit.
- 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 front panel.
- 8. Ensure adequate access to the rear panel. Avoid mounting in a recess and have sufficient slack to be left in cables (power, interfacing and coaxial) for LD6 unit to be removed without disconnection.
- 9. All bends in coaxial cables to be maintained above minimum bend radius.
- 10. Use short tails of flexible coaxial cable (e.g. LMR 240) with appropriate converter connections to connect antenna coaxial cables to the LD6. Support the antenna coaxial cable weight to avoid stress being placed on the rear coaxial connectors.
- 11. Connect the unit to a ships ground using the grounding point on the rear of the LD6.

# 3.2.2.1 General Guidance on Rack Cable Installation

- Run power cabling to the LD6 up the opposite side of the rack from that used for coaxial cables.
- Data cables should not be run next to the power cable.
- Secure all cables neatly with tie wraps. Do not apply excess pressure avoid damaging the cables.
- Use the protective bonding connection on the back panel of the LD6 and 12-14 AWG earth cable to attach to the ship's superstructure or electrical system ground.



Figure 8. LD6 with L-Band antenna and GNSS antenna connected



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# 3.3 ANTENNA INSTALLATION

This section provides general guidance on installation of antennas and cabling when installing the LD6 receiver.

It is very important to the ongoing performance of your system that a high-quality installation is performed. There should be no compromise on quality to ensure ongoing correct performance.

#### 3.3.1 Antennas

The antennas for use with the LD6 are summarized below.

Туре	Detail	LD6 Rx Card Connection
GNSS Receives position signals from GNSS satellites		TNC
L-Band (Spot) Receives VERIPOS corrections from geostationary satellites		N-type
MF option Receives non-VERIPOS corrections from local MF Beacon transmitters		TNC
UHF option Receives non-VERIPOS corrections from local UHF radio transmitters		BNC

\* The V460 and V86 (and optionally FUC/6) antennas are the models currently supplied by VERIPOS. The other antenna models shown are some of those which may have previously been supplied with the LD6.





Antenna Name	Main Signal	Other Signal	Antenna Connection Type
V460*	Dual Freq. GNSS (GPS, GLONASS, Galileo, BeiDou, QZSS)	L-Band, MF	TNC
AD491	Dual Freq. GNSS (GPS, GLONASS)	L-Band	N-type
V86*	L-Band	MF	N-Type
90984	L-Band	-	N-type
A31	MF	L-Band & L1 GPS	TNC
FUC/6	UHF	-	N-type



### 3.3.2 GNSS antenna

The GNSS antenna receives transmissions from multiple GNSS satellites.

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

For more details please refer to VERIPOS "Antenna & Coaxial Cable Installation Manual".

#### 3.3.2.1 General

The GNSS antenna is used for vessel positioning and therefore its mounting location is of high importance to the system. It should be mounted high on the mast with a clear view of the sky in both the horizontal and vertical directions. If the antenna does not have a full view of the sky there will be times when signals will be blocked, resulting in degraded performance of the system.



Figure 10. Good Installation – Antennas Installed at top of Mast on Retractable Mast Extensions with Good Spacing.

During installation observe the following guidelines:

- Offsets to the GNSS antennas must be measured by a competent person to ensure 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 Radar transmissions, Inmarsat-B Dome transmissions, VSAT transmissions or high power HF whip/wire antenna.





Figure 11. Good installation – GNSS antennas installed on top of the mast, minor signal masking from mast light at low elevations

If antennas cannot be installed directly at the top of the mast/ships structure, it is essential that the mounting point is sufficiently strong for this purpose. Arrangements must be able to withstand vibration and wind.

Alternatively a pole can be used with a 5/8"x11 UNC threaded end (standard marine mount). The pole can be attached by welding or using "U" clamps as above. This method allows the GNSS/GPS antenna to be mounted without the need for the bracket. Ensure that grease is applied to the threads when installing the antenna.



Figure 12. Antenna fixing arrangement examples

Fit the antenna to the bracket and clamp the bracket to the mounting pole or the mast using "U"-bolts. When mounting the antenna on an extension pole fit the antenna to the pole first for ease of handling at height.



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Figure 13. Antenna with extension pole

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, approximately150–220 mm (6 to 8in) 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 Guide" (GD-GL-VER-EQP-801).

#### 3.3.3 L-Band Antenna



Figure 14. L-Band antenna

The Omni-directional L-Band antenna must be positioned with a clear view of the sky. Signals received by this antenna come from geostationary satellites. If the antenna is blocked by any part of the vessel e.g. mast, derrick or any other structure/antenna it may lose signal on certain vessel headings, resulting in degraded performance of the system.

The L-band antenna receives VERIPOS correction data from geostationary satellite transmissions.

Installation guidance is similar to that for sighting the GNSS antenna.

Take care when sighting to avoid areas where part of the vessel structure or another antenna could partially mask the antenna's view of the sky.

For further guidance regarding the antenna installation, refer to the "VERIPOS Antenna and Coaxial Cable Installation Guide" provided with equipment.



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#### 3.3.3.1 Interface to Vessel Communication System (Inmarsat)

This section describes the way in which a vessel communication system such as Inmarsat may be incorporated with the antennas to the LD6, for provision of VERIPOS corrections.

Refer to the 'Scope of Supply' and 'Equipment Packing List' documentation for details where systems make use of this way of delivering L-band correction signals to the LD6.

Where a vessel is fitted with an Inmarsat Communications system, this may be used to receive the VERIPOS L-band correction signals in place of an Omni-directional (SPOT) antenna.

Considerations

- The Inmarsat Communications system uses a high gain steerable dish antenna. It can receive low power transmissions from the satellite.
- The Inmarsat narrow beam dish antenna is generally less vulnerable to interference. However it may be prone to signal blockage when mounted lower on a vessel superstructure.
- Different Inmarsat Communications systems use different communication satellites. For example:
  - Fleet 55 or 77 use AORE, AORW and IOR
  - Fleet Broadband use 25E, 143.5E and 98W.

When interfacing an LD6 to Inmarsat equipment the VERIPOS L-band input is connected to the Inmarsat BDE.

Some Inmarsat models – e.g. Fleet 77 – have a dedicated output (usually labelled "DGPS output"). This is used to make a direct connection to the VERIPOS L-band input.

Where a dedicated output is not present a directional coupler can be inserted between the Inmarsat antenna (dome) cable and the Inmarsat BDE to provide an output for the LD6.

The Inmarsat system must be turned off before installing a directional coupler.



Figure 15. Directional coupler

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#### 3.3.3.2 Disabling L-Band voltage:

It is recommended to disable the voltage on the L-Band connector when interfacing the LD6 to a vessel Inmarsat system.

Damage may occur if the L-Band antenna voltage is set to "ON" in the MMI when connected to an Inmarsat Communications system.

The voltage on the L-Band connection can be turned off using the LD6 MMI. Follow instructions in the LD6 Operations manual (AB-V-MA-00521) to disable voltage output in software.

An L-Band antenna will not function if the voltage is "OFF".

#### 3.3.4 MF Beacon Antenna

NOTE

The installation of an MF antenna is determined by the use of an MF receiver card.

This section provides general guidance on the installation of an MF antenna.



Figure 16. MF/ L-Band antenna – V86

#### 3.3.4.1 General Guidelines for MF Antenna Installation

- The MF Antenna supplied may be a V86 antenna, identical to the L-Band Antenna. However for use with MF only the antenna mounting requirements are different from an L-Band antenna.
- The antenna must be fitted with clearance from bulkheads and major metal structures.
- For MF use only it need not be mounted as high as other antennas as it does not require line of sight to the MF Beacon signal source.
- The antenna is supplied with an angle bracket and U-Bolts for mounting.
- The antenna mounting point has a 5/8"x11 UNC Thread. As a result a mounting pole can be used with the antenna if desired.



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# 3.4 COAXIAL CABLE INSTALLATION

VERIPOS recommend and supply pre-terminated LMR coaxial cables as they give the best performance in permanent installations. Label each cable carefully at top and bottom identifying the antenna attached.

#### 3.4.1 Times LMR 400

This cable is recommended for the main cable run to the antenna. The main run should be a single cable, joins are not recommended. If possible, measure the cable run and order a pre-terminated cable. These have proved to be more reliable in service.

The use of LMR-400-DB (direct burial) cable is recommended as this contains a waterblock, which will prevent water from contaminating the whole cable if the casing is accidentally cut.

See the *Reference information* chapter for detailed specifications of the Times LMR 400 coaxial cable.

#### 3.4.2 Times LMR 240

This cable is recommended for use in short runs and is the cable used for the preterminated tail used between the main cable run and the antennas or below decks equipment.

See the *Reference information* chapter for detailed specifications of the Times LMR 240 coaxial cable.

#### 3.4.3 Maximum Recommended Cable Lengths

The signals received by the antennas will deteriorate at different rates as they are transmitted through coaxial cable. As a result VERIPOS recommend a maximum cable length.

The following table details the maximum length for each signal type.

	L1 GNSS Only	L1/L2 GNSS	L-BAND	MF/HF
RG213	40m / 125 ft	30m / 110 ft	65m / 210 ft	100m / 328 ft
LMR400	70m / 235 ft	52m / 175 ft	120m / 390 ft	200m / 656 ft
LDF4-50	130m / 425 ft	110m / 360 ft	210m / 700 ft	350m / 1148 ft

Longer cable runs may be achievable with the use of in-line amplifiers. Contact VERIPOS for guidance.

#### 3.4.4 General

- VERIPOS recommended cable for the antenna runs is LMR 400.
- Terminated tails of LMR 240 are used at either end for ease of attachment to hardware.



Figure 17. Terminated tails of LMR240



Document	title:
Document	No.

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 B and VSAT domes.
- 3. The cable avoids fluorescent lights.
- 4. 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 reterminate 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 damage the cable jacket.
- 8. All connectors and couplers are properly sealed from the environment with selfamalgamating tape and electrical tape.
- 9. Stress loops are fitted to prevent excess force on the connectors, in particular the antenna connectors.
- 10. The maximum bend radius for the cable is not exceeded.

Once cables are in place seal all connections with self-amalgamating tape for protection against the marine environment.



Figure 18. Typical cable installation in bridge and mast area.

For more detailed guidance please refer to VERIPOS document "Antenna and Coaxial Cable Installation Manual" and cable manufacturers' documentation.



# 3.5 COAXIAL CONNECTIONS TO LD6 MODULES

This section details the coaxial cable connections to the LD6 IMU.

#### 3.5.1 Common Coaxial Connections

In most installations up to four types of connections to antennas may be connected to the rear of the LD6. These are:

- 1. L-Band
- 2. MF (Beacon SBX)
- 3. UHF
- 4. GNSS



Figure 19. Example of antenna connections on an LD6

Signal Type	LD6	Antenna*	
	Connection		
L-Band	N-type	V86	
MF	TNC	V86	
UHF	BNC	FUC/6	
GNSS	TNC	V460	

\*Other antenna types are available. The antenna types listed are those currently supplied with the LD6 as standard.



The LD6 will not function correctly if the antenna connections for GNSS and L-Band are reversed.

Confirm the GNSS antenna is connected to the GNSS port and the Spotbeam/Inmarsat Interface is connected to the L-Band port.





Figure 20. L-Band antenna and GNSS antenna installation

# 3.5.2 Combined L-Band/ GNSS Antenna

There is an option to use a combined GNSS and L-band antenna with the LD6 unit. To utilise this option the combined GNSS/ L-Band antenna is connected to the L-Band Input. A short coaxial cable terminated with TNC Plugs is then connected between the L-Band module RF Output and the GNSS module RF Input (as shown below).



Figure 21. LD6 with Combined GNSS/L-Band antenna and link cable connected



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# 3.6 INTERFACE





Figure 22. Rear connection of the LD6

- 1. AC power connector
- 2. DC power connector
- 3. Ethernet connectors
- 4. Serial connectors (COM1 COM6)
- 5. Serial connectors (COM7 COM14)

# 3.6.2 COM 1 – COM 14

The LD6 has 14 serial Com ports (RJ45 female connectors RS-232/422 protocol) on rear panel, COM 1 to COM 14. Pin-outs are detailed in the Reference information chapter.

The LD6 ports may be configured in software to perform various functions. Use of ports and external equipment interfaced is specific to each installation.

When connecting to RS-232 devices the cable type must be selected in accordance with the RS-232 specification. Longer runs may require low capacitance cable.

Some interfaced equipment, e.g. DP consoles and gyros (position input) may use the RS-422 protocol.

COM Port	Source	Content	Format	Rate (bps)
COM1	L-Band	RTCMa	RS232	9600
COM2	Solution	OUT1	RS232	9600
COM3	GNSS	Raw	RS232	115200
COM4	L-Band	RTCMb	RS232	9600
COM5	GNSS (ZDA)	NMEA	RS232	9600
COM6	MF	RTCM	RS232	4800
COM7	UHF	RTCM	RS232	38400

LD6 Software version 50.1.0.7 & below

#### LD6 Software version 101.0.0.9 & above

COM Port	Source	Content	Format	Rate (bps)
COM1	L-Band	RTCMa	RS232	9600
COM2	GNSS	NMEAa	RS232	9600
COM3	GNSS	Raw	RS232	115200
COM4	L-Band	RTCMb	RS232	9600
COM5	MF	RTCM	RS232	9600
COM6	UHF	RTCM	RS232	9600

See the *Reference information* chapter for pin-out details and contact VERIPOS for advice where required.

#### 3.6.3 1PPS Output Option

Some LD6 systems provide a facility for output of a 1PPS (one pulse per second) signal, used by external equipment for accurate time synchronisation to navigation systems or multi-beam sonar.

#### 3.6.4 Ethernet Interface

Two Ethernet RJ45 connectors are fitted on the LD6 rear panel. These can have static or DHCP addresses (see table below).

Specific guidance for interconnect to vessel equipment can be provided. Contact the VERIPOS Helpdesk for advice.

The LAN ports have default fixed IP addresses:

- 192.168.2.2 (Upper port)
- 192.168.3.3 (Lower port)

When attaching the LD6 directly to the PC, VERIPOS recommend that RJ45 patch cables using the RJ45 crossover module supplied are attached to the PC LAN port, which is assigned a fixed IP address of 192.168.2.4 (assuming LD6 LAN1 is used).



### 3.6.4.1 LAN Port Table

The available messages are:

LD6 Software version 50.1.0.7 & below

Port	Function	Description
9001	RTCMa	Primary RTCM correction data from the
		L-Band module
9002	RTCMb	Secondary RTCM correction data from the
		L-Band module
9003	L-Band Config	Used to connect to the L-Band card to
		retrieve L-Band status information and/or
		send commands
9011	GNSS NMEA	NMEA data directly from the GNSS card –
		ZDA as default
9012	GNSS Raw	Raw GNSS data for interfacing to Verify QC
9031	MF RTCM	RTCM correction data from the MF module,
		if installed
9051	UHF RTCM	RTCM correction data from the UHF module,
		if installed
19016	SOLUTIONS: OUT1	LD6 Internal solution. Out1
19017	SOLUTIONS: OUT2	LD6 Internal solution. Out2
19018	SOLUTIONS: OUT3	LD6 Internal solution. Out3

#### LD6 Software version 101.0.0.9 & above

Port	Function	Description
9001	RTCMa	Primary RTCM correction data from the
		L-Band module
9002	RTCMb	Secondary RTCM correction data from the
		L-Band module
9003	L-Band Config	Used to connect to the L-Band card to
		retrieve L-Band status information and/or
		send commands
9012	GNSS Raw	Raw GNSS data for interfacing to Verify QC*
9031	MF RTCM	RTCM correction data from the MF module,
		if installed
9051	UHF RTCM	RTCM correction data from the UHF module,
		if installed
19016	GNSS NMEAa	LD6 Internal solution. NMEAa
19017	GNSS NMEAb	LD6 Internal solution. NMEAb
19018	GNSS NMEAc	LD6 Internal solution. NMEAc

\*LD6's on software version 103.0.0.8 and above are not compatible with Verify QC.



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#### Interface Cabling

This section details the types of data cables connected to systems and used by systems on the vessel.

Data interface cables from the LD6 will use RJ45 connectors.

The data interface cabling attaches to the LD6 ports for input and output of data. Cables and adapters supplied:

1 x RJ45 patch cable



RJ45 –DB9 female serial converters (Qty. supplied varies dependent upon requirements)



#### 1 x RJ45female/female crossover module



Figure 23. Cables and adapters supplied



Document title:

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# 3.7 EQUIPMENT RACK

This section provides guidance on locating and installing an equipment rack to house the LD6 including ventilation, securing the unit and instilling measures to limit vibration. It also details what may optionally be pre-installed in the rack.

Rack specification will vary for each installation to suit the application.

The 'Scope of Supply' and 'Equipment Packing List' documentation will detail what is provided. Use in conjunction with guidance in this section.

#### 3.7.1 Rack Installed LD6 System – Guidance on Installation

LD6 units may be supplied pre-installed in small (usually 6U) racks.

The rack is secured on an aluminium base plate using high quality anti-vibration mounts. The user must securely anchor the base plate to the deck using the fixing slots provided.

Typically shipment will include coaxial tails for attaching the GNSS and L-band inputs to the rear of the LD6.

The location of the rack must be selected using the same criteria as previously described for the LD6, with particular consideration for ventilation and access.

Before securing the rack base plate check that the LD6 rear connectors and switches are easily accessible in the chosen location.

Ventilation slots and apertures must not be obscured.

Earth connection on the rear of the LD6 must be connected to ship's ground. The rack frame and base plate should be individually grounded.

Power supply for the units should be taken from a clean-power source as detailed in the 'Scope of Supply' or 'Equipment Packing List' documentation. Typically this is derived from an UPS (Uninterruptible Power Supply) system.

# 

To prevent problems such as overheating or interference, **no additional** equipment should be mounted in this rack without first consulting VERIPOS.



# 3.8 POWER AND CABLING

This section details the type and typical source for power supply to the LD6.

Power requirement of the LD6:

Input voltage	100–240 VAC, 50/60 Hz or 12–24 VDC
Power consumption	100 W max
AC fuse	250 V / 2 A Time-lag 20 mm T2AH250V
DC fuse	250 V / 10 A Time-lag 20 mm T10AH250V

Units are supplied as standard with an IEC C13 rewireable AC power cable. See the *Reference information* chapter for details.

Where a DC power supply is to be used on LD6 units running software version **50.0.0.2** or **above**, an external DC filter unit should be used. Contact VERIPOS if a DC filter unit is required. Further details of the DC filter unit can be found in **section 4.2.2.1**.

The units should be connected to a clean-power source and usually the vessels UPS system.

Contact VERIPOS Helpdesk if advice is needed on power supplies to the LD6.

Document title:

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# 4. **REFERENCE INFORMATION**

# 4.1 TECHNICAL SPECIFICATIONS

This equipment is for indoor use only and meets performance specification within an ambient temperature range of -15 °C to +55 °C and a maximum relative humidity of 95%.

Equipment complies with EN60945:2002 [5] for "protected" equipment.

Cable specifications: Please refer to the Reference information chapter for details.

#### 4.1.1 Mechanical

All LD6 systems.



Figure 24. LD6 Overview with power inlet warning sign

Receiver size

Dimensions Weight (max)

# 4.1.2 Environmental

Enclosure material Operating temperature range Operating humidity Storage temperature range Storage humidity 2U height Fit 19" rack 460 mm x 440 mm x 89 mm 10 kg / 25 lb

Aluminium -15 °C to +55 °C Up to 95% non-condensing -20 °C to +60 °C Up to 95% non-condensing

# 4.1.2.1 Safety Considerations

Although the test conditions for the LD6 units provide for a maximum operating temperature of 55 °C, continuous operation of all electronic components should if possible take place at ambient temperatures of only 25 °C. This is a prerequisite for long life and low service costs.



#### 4.1.3 Electrical

AC power input	100–240 VAC
DC power input	12–24 VDC
Power consumption	100 W max.
AC power connector	IEC Connector C13, rewireable, straight
	(see the Reference information chapter for
	details)
DC power connector	Neutrik NL4FX
Display	9 cm (3.5") colour touchscreen control
IEC	60945 EMC certified
AC fuse	T2AH250V
Manufacturer	Littlefuse
Manufacturer's part number	0215002.P
DC fuse	T10AH250V
Manufacturer	Littlefuse
Manufacturer's part number	0215010.P
Manufacturer Manufacturer's part number	Littlefuse 0215010.P
•	

# 4.1.4 Compass Safe Distance

Conforms to IEC 60945.

# 4.1.4.1 Serial Ports

Serial ports:	14 bi-directional (if configured for applicable data stream)
Format:	RS232 or RS422 (switchable)
Interface type:	DB9 (via RJ45 to DB9 adaptor)
Baud rates:	1200 to 115200

See the Reference information chapter for pin-outs.



Not all data streams are compatible with all baud rates.

# 4.1.4.2 Ethernet Interfaces

LAN ports:	2
Data transfer type:	10/100 Mbps
Interface type:	RJ45

Typically the LAN output(s) are used in conjunction with Verify QC, Orion DP or Quantum software running on a PC.

#### 4.1.4.3 USB Ports

Three external USB ports on rear panel and three external USB ports on front panel with Microsoft Windows class drivers supporting the following types of USB device:

- Mouse
- Keyboard
- Connection to a compatible touchscreen monitor
- Memory stick
- Verify QC USB dongle

#### 4.1.4.4 Monitor Video Port

One external rear-mounted VGA/SVGA/XVGA/SXVGA video port.

#### 4.1.4.5 **Power Supplies**

LD6 can operate from 110/240 VAC and / or 12/24 VDC supply. The LD6 can run on an AC or DC supply or both. If both are used this provides redundancy in case one supply fails.

#### 4.1.5 Antennas

For details on the types of antennas for your installation, please refer to the 'Equipment Packing List' documentation.

Further details and instructions on antenna installation are provided in chapter 3 *Installation*.

Antenna Name	Main Signal	Other Signal
V460	L1/L2 GNSS	L-Band, MF Beacon
V86	L-Band	MF
FUC/6	UHF	-



The antennas mentioned above are those typically currently supplied with the LD6. LD6's have been supplied with other antenna types in the past. Please refer to **section 4.1.7** for information regarding legacy antennas.



# 4.1.6 Summary Specification of Antennas

4.1.6.1	V460	
L-Band		
GPS L1 / L	_2 / L5	
GLONASS	S L1 / L2	
Galileo E1	/ E5	
BeiDou B1	/ B2	
QZSS L1C	C / L2L	
Fitted with	h a narrow band filter f	or interference rejection
LNA gain		45dB
DC Voltag	e input	3.0 to 15.0V
RF input c	onnector	TNC socket
Material		Weather proof polymer plastic
Mount		5/8" tripod thread connector
Temperatu	ure range	-55 to +85°C
Certificatio	n	IEC 60945
Diameter		7.5" / 19.05cm
Weight		1.6lbs / 0.73kg

# 4.1.6.2 V460 Phase Centre Details

The diagram below shows the antenna reference point (ARP) from which the phase centre values are measured. It also shows the V460 vertical (Up) phase centre values for the GNSS L1 and L2 frequencies:



The below diagram shows the ARP at the antenna base and the antenna North alignment reference:



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

	Relative to A	ntenna Reference Po	oint (ARP)
GNSS Frequency	North (mm)	East (mm)	Up (mm)
L1	2.78	-1.27	55.25
L2	0.82	-1.09	64.15



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#### 4.1.6.3 V86

A gain	36dB
DC Voltage input	5.0 to 15.0V
Fitted with a narrow band filter for	or interference rejection
RF input connector	N-type female
Material	Weather proof polymer plastic
Mounting	Standard land survey 5/8" tripod thread connector
Temperature range	-50°C to +85° storage,
	-40°C to +70°C operating
Certification	IEC 60945
Diameter	14.25cm

# 4.1.6.4 FUC/6

Technical Specifications	
Gain over 1/2 wave dipole	6 dB
V.S.W.R.	Better than 1.5:1 over the operating band
Max input power rating	150 W
Input impedance	50 ohm
Bandwidth	+2% of centre frequency
Polarisation	Vertical
Half power beamwidth	18°
Connection	450 mm length of RG213 fitted with N-type socket
	and PVC sleeve
Encapsulation	Reinforced tapered glass fibre tube
Mounting brackets	CVB type – supplied
Mounting stub	1³/₄" x10 swg aluminium alloy tube HE30TF
Length	10ft (3.05 m)
Weight	3 kg
Windloading	12.2 kgf (27 zlbf)@wind velocity of 160 Kph



# 4.1.7 Legacy Antennas

# 4.1.7.1 AD491

#### Features

Combined L1/L2 GNSS and DGPS antenna with interdigital filters

Ruggedized marine antenna

Omni-directional Patch antenna

Integrated cavity filter for interference rejection

# Technical specifications

Antenna radiation pattern	Omni-directional hemispherical
Antenna polarisation	RHC
Antenna frequency	L1/L2 GPS, L1/L2 GLONASS, L-Band DGPS
Supply voltage	+5 to +20 VDC
Supply current	50 mA typical
LNA gain	45 ±2 dB
Operating temperature	-30 to +70 °C
Connector type	N-type
Maximum cable length	52 m of LMR400 / 30 m of RG213
Weight	3.2 kg
Dimensions	
-height	111 mm
-diameter	210 mm
Mounting	5/8"x11 UNC



# 4.1.7.2 A31

Main	
MF Beacon frequency range	283.5 – 325 kHz
Beacon LNA gain	30 dB
Options	
L-Band frequency range	1.555 – 1.585 GHz (L1)
L-Band LNA gain	30 dB
GNSS reception	GPS,
GNSS frequency	1.575 GHz (L1)
GNSS LNA gain	30 dB
GNSS LNA noise	<2.0 dB
Power Input	
Input voltage	+5 to +12 VDC
Input current	50–60 mA
Mechanical	
Enclosure	Lexan
Dimensions	
-height	10.4 cm (4.1")
-diameter	14.5 cm (5.7")
Weight	0.73 kg (1.62 lbs)
Mount	1" coarse thread (5/8" adapter available)
RF connector	TNC
Environmental	
Storage temperature	-40 to +85 °C (-40 to +185 °F)
Operating temperature	-30 to +70 °C (-22 to +158 °F)
Enclosure rating	IP69K
Shock and vibration	EP455
Humidity	95% non-condensing



#### 4.1.7.3 90984

## Features

Ruggedized marine antenna

Omni-directional helical antenna gives good performance in Veripos spot beam coverage

Integrated cavity filter for interference rejection - Output at L-band (no downconverter)

#### **Technical specifications**

Antenna radiation pattern	Omni-directional
Antenna polarisation	RHC
Antenna frequency	1525–1559 MHz
Antenna gain	4 dBiC at zenith
	0 dBiC at 20° above horizon
Filter rejection	>50 dB (DC–1450 MHz
	>55 dB (1625–1661 MHz
Supply voltage	+5 to +20 VDC
Supply current	38 mA typical
LNA gain	30 dB
Operating temperature	-20 to +60 °C
Connector type	N-type
Maximum cable length	120 m of LMR400 / 50 m of RG213
Weight	1.4 kg
Dimensions	
-height	285 mm
-diameter	110 mm
Mounting	4 off 7mm dia holes at 46.5mm centres
	(two U-clamps supplied for 1 inch pole mounting)



### 4.1.8 Antenna Cables – Specifications

Typically VERIPOS provide with the system pre-terminated cables and tails for use with both L-band and GNSS/GPS antennas (see the 'Equipment Packing List').

VERIPOS recommend use of Times Microwave coaxial LMR cable for installation of all antennas. See **section 3.3** for further details.

### 4.1.9 Summary Specification of Module Receiver cards

#### 4.1.9.1 L-Band Module (LBR-1)

Single channel L-Band modem.

- Frequency range 1525–1559 MHz
- Baud rate 1200

#### **Power Consumption**

1.25W (not including any active antenna)
3.5mW
-40 to +70°C
-55 to +85°C



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#### 4.1.9.2 **GNSS Module (AsteRx2)**

#### **Product Features:**

Dual-frequency L1/L2 code/carrier tracking of GPS and GLONASS signals 48 hardware channels for simultaneous tracking of all visible satellites in GPS and **GLONASS** constellations A 'Posteriori Multipath Estimator' technique (APME) Differential GPS (base station and rover) Includes up to three SBAS channels (EGNOS, WAAS, other) x PPS output (x = 1, 2, 5, 10) Two event markers **RAIM** included Raw data output (code, carrier, navigation data)

#### **Technical specifications**

General	
Operating temperature	-40 to +70 °C
Storage temperature	-40 to +85 °C
Humidity	5% to 95% (non condensing)
1PPS accuracy	10 nsec
Event accuracy	<10 nsec
Measurement precision	
C/A pseudo ranges	5 cm (GPS)
	0.16 m (GPS)
	7 cm (GLONASS)
	0.25 m (GLONASS)
GPS P2 pseudo ranges	0.1 m
GLONASS P pseudo ranges	0.1 m
L1 carrier phase	1 mm
L2 carrier phase	1 mm
L1/L2 Doppler	0.02 Hz
Time to first fix	
Cold start	<45 sec
Warm start	<20 sec
Re-acquisition avg	1.2 sec
Tracking performance (C/N 0 threshold)	
- tracking	26 dB-Hz
- acquisition	33 dB-Hz
- acceleration	10 g
- jerk	4 g/sec



Document title:

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# 4.1.9.3 GNSS Module AsteRx2e

#### **Product features:**

- Dual-frequency L1/L2 code/carrier tracking of GPS and GLONASS signals
- 136 hardware channels for simultaneous tracking of all visible satellites in GPS and GLONASS constellations
- A 'Posteriori Multipath Estimator' technique (APME) differential GPS (base station and rover)
- Includes up to three SBAS channels (EGNOS, WAAS, other)
- Innovative and flexible power management under user control
- x PPS output (x = 1, 2, 5, 10)
- Two event markers
- RAIM included
- Raw data output (code, carrier, navigation data)
- Highly compact and detailed 'Septentrio Binary Format' (SBF) output

#### **Technical Specifications:**

Operating Temperature	-40 to +70°C
Storage Temperature	-40 to +85°C
Humidity	5% to 95% (non-condensing)
1PPS Accuracy	10 nsec
Event Accuracy	<10 nsec
Measurement Precision	
C/A Pseudo Ranges	5cm (GPS)
	0.16m (GPS)
	7cm (GLONASS)
	0.25m (GLONASS)
GPS P2 Pseudo Ranges	0.1m
GLONASS P Pseudo Ranges	0.1m
L1 Carrier Phase	1mm
L2 Carrier Phase	1mm
L1/L2 Doppler	0.02 Hz
Time to First Fix	
Cold Start	<45sec
Warm Start	<20sec
Re-acquisition (Avg.)	1.2sec
Tracking Performance (C/N 0 Threshold)	
Tracking	26dB Hz
Acquisition	33dB Hz
Acceleration	10g
Jerk	4g/sec



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# 4.1.9.4 GNSS Module (Novatel OEM615)

#### **Product features:**

Dual frequency L1/L2 tracking of GPS & GLONASS signals Multipath mitigating technology 120 channels SBAS Tracking Novatel ASCII and binary logging

#### **Technical Specifications:**

Operating Temperature	-40 to +85°C
Storage Temperature	-55 to +95°C
Humidity	95% non-condensing

#### **Measurement Precision (RMS)**

L1 C/A Code	4cm (GPS), 8cm (GLO)
L1 Carrier Phase	0.5mm (GPS), 1mm (GLO)
L2 P(Y) Code	8cm (GPS, 8cm (GLO)
L2 Carrier Phase	1mm (GPS), 1mm (GLO)
L2C Code	8cm (GPS), 8cm (GLO)
L2 Carrier Phase	1mm (GPS), 1mm (GLO)

#### Time to First Fix

Cold Start	<50sec
Hot Start	<35sec

#### **Signal Reacquisition**

L1	<0.5sec (Avg)
L2	<1sec (Avg)

**Time Accuracy** 

20ns RMS



# 4.1.9.5 GNSS Novatel OEM 617D

Product features:	
Dual frequency L1/L2 tracking of GPS, GLONASS, Galileo* & BeiDou signa	ls
Multipath mitigating technology	
120 channels	
SBAS Tracking	
Novatel ASCII and binary logging	

#### **Technical Specifications:**

Operating Temperature	-40 to +85°C
Storage Temperature	-55 to +95°C
Humidity	95% non-condensing

#### **Horizontal Position Accuracy (RMS)**

Single point L1	1.5m
Single point L1/L2	1.2m
SBAS	0.6m

#### Time to First Fix

Cold Start	<50sec
Hot Start	<35sec

#### **Signal Reacquisition**

L1	<0.5sec (Avg)
L2	<1sec (Avg)

#### **Time Accuracy**

20ns RMS

\*Galileo tracking is not currently supported on the LD6 but will be added in a future software release.



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### 4.1.9.6 MF Module (MF Module SBX-4)

The LD6 system may optionally have this card installed. A two channel MF demodulator compatible with third party MF beacon transmissions.

#### **Operating specifications**

Channels Frequency range Channel spacing Demodulation MSK bit rates Operating modes Cold start time Re-acquisition time Sensitivity Out of band rejection Spurious response Ripple (in-band) Dynamic range Frequency offset Antenna input impedance 2-channel parallel tracking 283.5 to 325.0 kHz 500 Hz Minimum shift keying (MSK) 50, 100 and 200 bps Manual, automatic and database <1 minute typical <2 seconds typical 2.5  $\mu$ V/m for 6 dB SNR@200 bps 60 dB <204 kHz and >404 kHz <-55 dB (0.1 to 1.6 MHz) 3 dB 100 dB 61 dB ±1 dB@f0 ±400 Hz 50 ohm



# 4.1.9.7 UHF Module ADL Foundation

Optional single channel data receiver module.

Operating specifications	
Power	
External	6.0-30.0 VDC ±0.50 VDC
During Rx	0.6 W nominal
During Tx	6 W nominal @ 1 W output
Antenna	
External	50 ohm MMCX
Modem specifications	
Link rate/modulation	19200 bps/4FSK
	9600 bps/4FSK
	19200 bps/GMSK
	16000 bps/GMSK
	9600 bps/GMSK
	8000 bps/GMSK
	4800 bps/GMSK
Link protocols	Transparent EOT/EOC, Packet-switched,
Trimble®, SATEL®, OEM-specification	
Forward error correction	Yes
Radio specifications	
Frequency bands	390–430 and 430–470 MHz
Frequency control	Synthesized 12.5 kHz tuning resolution
Frequency stability	±1 ppm
Channel bandwidth	12.5 and 25 kHz, software derived
RF transmitter output	0.0 W (Rx only) and 0.1–1 W
	(programmable)
Sensitivity	-110 dBm BER 10 <sup>-5</sup>
Type certification	All models are type accepted and certified
	for operation in the U.S., Canada, and
	Europe
Environmental specifications	
Operating temperature	
- Receiver	-40 to +85 °C (-40 to +185 °F)
- Transmitter	-40 to +65 °C (-40 to +149 °F)
Storage temperature	-55 to +85 °C (-67 to +185 °F)
Vibration specification	MIL-STD-810F
Mechanical specifications	
Dimensions	
- Length	7.6 cm (3.0")
- Width	5.6 cm (2.2")
- Height	1.1 cm (0.4")
Weight	70 grams (2.5 oz.)

# 4.2 CABLING AND CONNECTORS

This section contains details on the AC and DC power connectors and the cable termination used for connection to antennas.

When working with these connectors and power, please refer to **section 1.5** LD6 Safety summary.

VERIPOS recommend that prefabricated main cables and coaxial tails are used for connection of antenna to the VERIPOS below decks equipment.

#### 4.2.1 AC Power Connector



Figure 25. IEC Connector C13, Rewireable, Straight

#### Description

Cord connectors (rewireable) Screw-on mounting Connector, pin temperature 70 °C, protection class I Cable Substitute for type P587

#### Approvals

VDE license number: 40010732 UL license number: E96454 CSA license number: 56242

#### **Technical data**

Ratings IEC	10 A / 250 VAC; 50 Hz
Ratings UL/CSA	15 A / 250 VAC; 60 Hz
Dielectric strength	> 2 kVAC between L-N
	> 2 kVAC between L/N-PE (1 min/50 Hz)
Allowable operation temp.	-25 °C to 70 °C
Protection class	Suitable for appliances with protection class 1 acc. to IEC 61140
Terminal	Cable
Connector	C13 acc. to IEC/EN 60320-1, UL 498, CSA C22.2 no.42 (for cold conditions) pin-temperature 70 °C, 10 A, protection class 1





Figure 26. AC power cable installation

\*) Use PVC flexible cord in accordance with IEC 60227 (H03VV-F or H03VVH2-F). The temperature rating of the cord is 60 °C or higher and core conductor area of 0.5 mm2 is required for AC rated current to 3 A and a cable length not greater than 2 m.

#### 4.2.1.1 Termination Instructions

- Ensure all equipment is isolated from power supply before work.
- Prepare the power cable ends to match the connector dimensions (above), baring the ground, neutral and live wires for 8 mm and doubling back the cable (shown above).
- Unscrew the plug and separate in to three parts; base with cable terminations, cover plate and flexible cable grommet.
- Separate the flexible cable grommet from the base and place over the cable, ensuring it is the correct way round.
- Unscrew the two cable retainer screws and place the cable in position.
- Fasten the screw connections, ensuring the correct connections (shown in Figure 21 above) are connected to the corresponding live, neutral and ground cables and that a firm connection is made.
- Fasten the two cable retainer screws.
- Refit the two plug halves and secure using the cover plate screw.
- Check that the cable is held in place before use.

# 4.2.2 DC Power Connector



If using an **LD6 running software version 50.0.0.2 or above**, a DC filter unit must be used. Refer to section **4.2.2.1** for further information.

The DC power connector is a Neutrik NL4FX.

Details on this connector including its termination are below. Alternatively you may use a Switchcraft HPCC4F connector.



Figure 27. Neutrik NL4FX power connector

The connector comprises three parts for assembly. The positive connection should be made to 1+, the negative connection to 1-. Positive terminals (1+ and 2+) should be linked together inside the connector. Negative terminals (1- and 2-) should also be linked together inside the connector.

Prepare the cable as shown below (measurements are in millimetres).



Figure 28. DC power cable preparation



NOTE\_

These cables are not provided with the equipment as standard however can be provided pre-assembled by request. Please contact VERIPOS Helpdesk if a pre-assembled cable is required.



### 4.2.2.1 DC Filter Unit

LD6 IMU's running software version **50.0.0.2 and above** require an external DC filter unit when connected to a DC power source.

Please contact VERIPOS if a DC filter unit is required.

The DC filter unit should be connected to the vessel Earth point and to the LD6 chassis, as shown in Fig. 29 (below):



Figure 29. DC Filter Unit

# 4.2.3 Times LMR 400 Coaxial Cable

# 4.2.3.1 Electrical Specifications

Performance Property	Units	US		(Metric)
Velocity of propagation	%		85	
Dielectric constant	N/A	1	.38	
Time delay	nS/ft (nS/m)	1.20	(3.	92)
Impedance	ohms	50		
Capacitance	pF/ft (pF/m)	23.9	(7	8.4)
Inductance	uH/ft (uH/m)	0.060	(0	.20)
Shielding effectiveness	dB	>	>90	
DC resistance Inner conductor Outer conductor	ohms/1000 ft (/km) ohms/1000 ft (/km)	1.39 1.65	(4	4.6) 5.4)
Voltage withstand	VDC	2500		
Jacket spark	Vrms	8000		
Peak power	kW	16		

# 4.2.3.2 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)
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)

# 4.2.3.3 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 +1851	-40 to +85

# 4.2.4 Times LMR 240 Coaxial Cable

# 4.2.4.1 Electrical Specifications

Performance Property	Units	US	(Metric)
Velocity of propagation	%	8	4
Dielectric constant	N/A	1.4	42
Time delay	nS/ft (nS/m)	1.21	(3.97)
Impedance	Ohms	5	0
Capacitance	pF/ft (pF/m)	24.2	(79.4)
Inductance	uH/ft (uH/m)	0.060	(0.20)
Shielding effectiveness	dB	>9	90
DC resistance			
Inner conductor	Ohms/1000ft (/km)	3.2	(10.5)
Outer conductor	Ohms/1000ft (/km)	3.89	(12.8)
Voltage withstand	Volts DC	15	00
Jacket spark	Volts RMS	50	00
Peak power	kW	5	.6

# 4.2.4.2 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)
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)

# 4.2.4.3 Environmental Specifications

Performance Property	°F	O°
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



#### 4.2.5 LMR 400 – Times Microwave TC-400-NM N-Type Male Connector

The below connectors are those most commonly used by VERIPOS. For further information, such as connector termination instructions, please refer to the "Antenna and Coaxial Cable Installation Manual".

#### LMR400 Connectors

- Times Microwave EZ-400-NF (N-Type Female connector)
- Times Microwave TC-400-NMH-X (N-Type Male connector)

#### LMR240 Connectors

- Times Microwave EZ-240-NMH-H (N-Type Male connector)
- Times Microwave EZ-240-TM-X (TNC Male connector)



Other connector or cable types may be used, depending on vessel operating region, cable run length etc. More detailed information is available in the "Antenna and Coaxial Cable Installation Manual".



# 4.3 INTERFACE AND SERIAL PORT INFORMATION

This details the pin out details for the LD6 receiver connections.

Ports COM 1 to COM 14 on the rear panel are 8 pin RJ45 female connectors.

### 4.3.1 LD6 COM Ports

Default configuration for each COM port is:

- 1 startbit
- 8 databits
- No parity
- 1 stopbit

This information may be required when interfacing to ships systems using RS-232/422 standards.

RJ45	Function		
Pin	RS-232	RS-422	
1	No internal connection	No internal connection	
2	No external connection	TxD (+)	
3	No internal connection	No internal connection	
4	TxD	TxD(-)	
5	RxD	RxD(+)	
6	Signal ground	Signal ground	
7	No external connection	RxD(-)	
8	No internal connection	No internal connection	

DB9	Function	
Pin	RS-232	RS-422
1	Not connected	Not connected
2	TxD	TxD(-)
3	RxD	RxD(+)
4	Not connected	Not connected
5	Signal ground	Signal ground
6	Not connected	Not connected
7	Not connected	TxD(+)
8	Not connected	RxD(-)
9	Not connected	Not connected

Document title:

Document No.

# 5. CONTACT INFORMATION

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

# 5.1 VERIPOS HELPDESK

Helpdesk telephone	+44 (0)1224 965900
Helpdesk email	helpdesk@veripos.com
VERIPOS Online Support	https://help.veripos.com



If shipping equipment back to VERIPOS, please contact the Helpdesk who will provide the current shipping address, according to the user's area of operations.

# 5.2 VERIPOS OFFICE LOCATIONS

# 5.2.1 VERIPOS UK



Veripos House 1B Farburn Terrace Dyce, Aberdeen AB21 7DT United Kingdom

# 5.2.2 Additional VERIPOS Offices

For up to date locations for other VERIPOS offices worldwide, please visit <u>www.veripos.com</u> .