LD2

Installation Manual

VERIPOS

Table of contents

1 Introduction

1.1 General

This manual contains the information required to install the Veripos LD 2 Unit. It covers installation of:

- antennas
- coaxial and data cables
- LD2 receiver and power requirement
- housings and ancillary equipment provided with the LD2.

It is aimed at engineers who will be installing the hardware and equipment supplied by VERIPOS with the LD2.

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 LD2 and associated equipment shipped to site.
- Equipment packing list included with the equipment packing sent to site.
- This LD2 Installation manual / manuals and software on CD ROM.
- The VERIPOS guide “Antenna & Coaxial Cable Installation” provided with VERIPOS installation documentation.
- Interactive training modules and VERIPOS Product literature on CD ROM.

1.1.1 Veripos

VERIPOS was formed in 1989 to supply GPS augmentation services, in the form of differential GPS corrections, to vessels in the offshore oil and gas industry. Owned by Subsea 7, the VERIPOS product line operates world-wide, providing data broadcast and support services for precise positioning applications.

At VERIPOS it is our mission is to be a market leader in the supply of pre-cise navigation and positioning services and solutions, through innovative application of technology, continuous product development and operational excellence, whilst creating maximum value for both our customers and our parent company.

The mainstay of VERIPOS is the provision of data broadcast services for the purpose of enhancing accuracy, reliability and integrity of precise navigation and positioning. VERIPOS offers a range of such services to meet different client requirements, providing accuracy of up to 10 cm.

The greatest products will not, by themselves, ensure the best solution for the client. Many factors contribute to optimum operational and commercial effectiveness, from the provision of fit-for-purpose products maintained at a high level of operability to rapid, reliable delivery and a high standard of user support.

VERIPOS aims to meet all of these requirements without compromise. At the centre of our business philosophy is an unwavering commitment to provide superior quality while giving appropriate consideration to health, safety and the protection of the environment. From project planning to preventative maintenance, every aspect of our service is designed towards delivering products to our clients in the most professional manner possible.

1.1.2 LD2 Integrated mobile

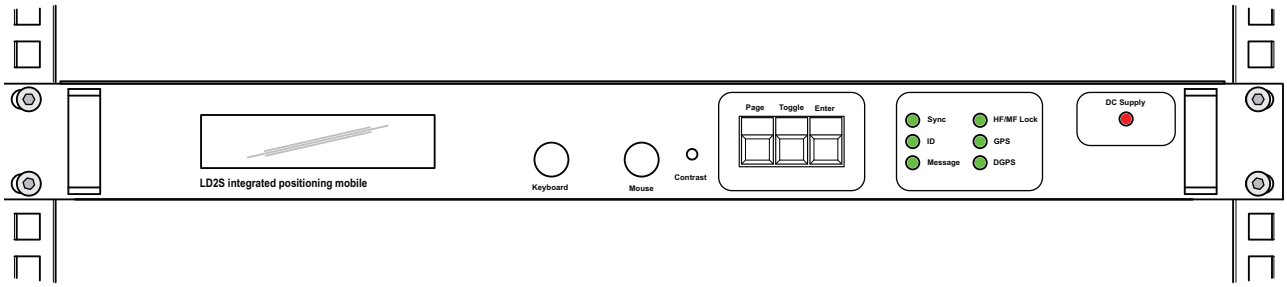


Figure 1. Fornt Panel og the LD2S Unit

The VERIPOS LD2 receiver 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 LD2 integrated mobile unit is manufactured to the highest specifications and is certified to IEC 60945.

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

The LD2 is provided in a number of variants[1], from basic satellite receiver to fully integrated mobile positioning unit with demodulator and multi-frequency GNSS receiver.

The LD2 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.

LD2 variants may be used as a sensor to output received data and GNSS measurements to external processing or quality control software such as the VERIPOS Verify QC suite.

The LD2 has a small liquid crystal display (LCD) and a key-pad with three user keys to allow quick and easy user setup.

In addition to calculating position the LD2 can output all received data in standard formats such as RTCM and NMEA.

The LD2 is exceptionally flexible. For most variants overall operating status can be determined using the front panel LED’s and the LCD.

The LD2 can be used with both VERIPOS high and low-power satellite transmissions.

1. Variants are described in the “Reference Information” chapter.

1.2 Scope

This manual contains the information required for the installation of the Veripos LD2 unit. For information on the operation of the LD2 see the LD2 Operations manual (AB-V-MA-00512) and the Verify DP Operations manual (AB-V-MA-00514). Information on related products can be found in the Veripos Verify QC manual (AB-V-MA-00511).

1.3 Target groups

The target group for the this manual can be specified as skilled qualified electricians.

1.4 Contents

Chapter	Contents
1. Introduction	This chapter specifies the purpose and target groups for the manual. It also contains list of used abbreviations and a specification of the document conventions.
2. Safety	This chapter specifies safety instructions to follow when operating and maintaining system.
3. Interfaces	This chapter describes the interfaces in detail on the front and back side of the LD2 unit. It also shows the LD2 display menu structure.
4. Preparation	This chapter shows the preparations before installation, including delivery specification, information of associated hardware, possible configuration alternatives and a few other things to consider prior to installation
5. Installation	This chapter describes the installation procedures for both antennas and the LD2 unit.
6. Configuration	This chapter describes how to configure the LD2 unit properly after installation.
7. Technical data	This chapter describes the technical data for the LD2 unit and its associated components.
8. Reference Information	This chapter contains reference information, inluding cable specifications, cable termination instructions, download link frequencies, NMEA messages, reference station listings etc.
9. Contact Information	This chapter contains phone and fax numbers, e-mail address and postal adress to Veripos Head office and the Helpdesk.

This manual provides guidance for engineers to install a VERIPOS LD2/LD2S receiver on to a vessel. Details are provided to assist in locating and connecting equipment ready to be commissioned.

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

The manual covers installation of LD2 receiver variants.

1.4.1 Recommended process for installer

Use this manual as a guide when installing the LD2.

VERIPOS also provide detailed instructions when installing the antennas and cabling. Refer to the VERIPOS document: “Antenna & Coaxial Cable Installation” (GD-GL-VER-EQP-801) provided with VERIPOS installation documentation.

1. Locate the ‘Equipment Packing List’ sent with the LD2 and associated equipment.
2. Use the equipment packing list to confirm all components are included.
3. The chapter *8 Reference Information* contains a table of LD2 variants, siting guidance and a table containing part numbers to aid identification. Use to clarify what parts are associated with the LD2 unit that require to be installed (see example in chapter *8 Reference Information*).
4. Follow the guidance in this manual to correctly install the LD2 receiver

1.5 Terms and abbreviations

A	Ampere
ADE	Above Deck Equipment
BDE	Below Deck Equipment
BER	Bit Error Rate
bps	Bits Per Second
CoG	Course Over Ground
CR	Carriage Return
DGPS	Differential GPS
DOP	Dilution of Precision
DP	Dynamic Positioning
EGNOS	European Geostationary Navigation Overlay Service
GDOP	Geometric Dilution of Precision
GLONASS	Global Navigation Satellite System – Russian equivalent to GPS
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
HDOP	Horizontal Dilution of Precision
HF	High Frequency Radio used to transmit correction data
Hz	Hertz
KPH	Kilometers per Hour
LAN	Local Area Network
LED	Light Emitting Diode
LF	Line Feed
LNA	Low Noise Amplifier
L-band	Methods of transmitting correction data to mobile users
LCD	Liquid Crystal Display

LD2	Unit containing GPS card, demodulator and PC processor
LD3 / LD3S	Unit containing GPS card and demodulator
MF	Medium Frequency Radio used to transmit correction data
MHz	Mega-Hertz
MPH	Miles per Hour
m/s	Metres per second
MSAS	Multi-functional Satellite Augmentation System
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
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
SNF	Service Notification Form
SNR	Signal to Noise Ratio
Spotbeam	High Power L-Band Signal
Standard / Std	Veripos Single Frequency DGPS System
Standard+ / Std+	Veripos Dual Frequency DGPS System
SV	Space Vehicle
TTL	Transistor-Transistor Logic
Ultra	Veripos High Accuracy Positioning Systems
USB	Universal Serial Bus
UTC	Coordinated Universal Time
V	Volt
VDOP	Vertical Dilution of Precision
VERIPOS	Global DGPS service provider
VGA	Video Graphic Array
VOSS	VERIPOS Online Support System
W	Watt
WAAS	Wide Area Augmentation System
WEEE	Waste Electrical and Electronic Equipment

1.6 Document conventions

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

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.

NOTE

A note shows important information that helps you make better use of the system.

1.7 References

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

- "Antenna & Coaxial Cable Installation Guide"
- LD2 Operations manual
- VERIPOS Online support system:

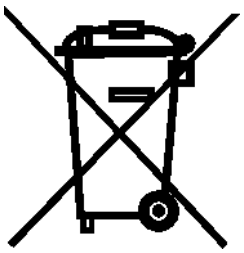
  http://help.veripos.com

1.8 Waste electrical and electronic equipment

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 WEEE requirements.

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

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 waste equipment 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.



1.9 Disclaimer

VERIPOS accepts no responsibility for any damage or injury to the system, ship or personnel caused by drawings, instructions or procedures not prepared by VERIPOS.

Contents of this manual are subject to change without notice.

Every effort has been made to ensure accuracy of the information contained within this manual. Please advise VERIPOS of errors you may encounter. Thank you.

VERIPOS assume no responsibility for errors or omissions contained within this manual.

2 Safety

2.1 General

Safety is the responsibility of the individual carrying out the work and all persons involved in the operation.

- On arrival at the worksite contact the wheel house for a site specific safety induction.
- Follow all VERIPOS/Subsea 7 safety rules and any safety rules applying at the work site.
- Obtain all permits relevant to the job prior to any work commencing.
- Were necessary the safety check-list contained in chapter *Reference Information* should be completed, if applicable.

2.2 Working aloft on bridge tops or masts

The following guidelines are for information only and are not meant to be used as a basis for all work at height. **Always follow your company's own procedures and guidelines for working at height first**.

Make sure you are properly trained for working at height, that you are familiar with the safety equipment and how to use it effectively.

NOTE

If you feel that you are inadequately trained for the job in hand, contact your supervisor immediately. Never attempt working at height if you are not comfortable or are not properly trained.

2.3 Loading/unloading equipment

The following guidelines are aimed at reducing the risks associated with the lifting and loading of the equipment associated with this manual.

1. Before carrying equipment across to the vessel it's a good idea to check the route for obstacles and trip hazards first. This can be combined with a trip to the wheelhouse to liaise with the person on watch to inform them of your arrival.
2. Always follow manual lifting techniques and never carry too much in one go. Bend with your knees and keep your back straight. Do not twist your back when carrying a heavy load.
3. It may be necessary to keep one hand free whilst crossing the gangway so unpacking the equipment and carrying it as smaller items may be more sensible. Alternatively, get some help from ship's personnel and use a crane if at all possible.

4. Always pay attention to your surroundings when carrying equipment. Scan the floor for trip hazards as you walk and be careful on stairways. Always try to keep one hand free for ascending/descending stairs, although in some cases this isn’t always possible.

2.4 Housekeeping on the job

Any offshore vessel is capable of moving whilst tied to the dock. Therefore, in order to maintain a safe working environment it is necessary to keep the work area clean and clutter free.

This is a preventative measure aimed at reducing the risk of tripping and falling whilst performing the installation work associated with this manual.

1. Before commencing the installation, organise the equipment and store in an area where it won't interfere with other people and their work. Store boxes and transit cases in a separate location out of the way.
2. Avoid leaving tools and small parts on the floor where they can be stepped on, slipped on or tripped over.
3. If lifting floor tiles, be sure to replace them as soon as possible or mark the area off to prevent falls.
4. Take a periodic break to tidy up and reorganise parts and tools if the work area becomes cluttered.

3 System description

This section gives an outline description of the VERIPOS LD2/LD2S receiver and the components, used for LD2 and variants which may be supplied. This section gives overall information and details as follows:

- Equipment technical data
- Mechanical dimensions
- Electrical specification
- Processor
- GNSS Receiver[1)]
- L band receiver
- Details on the HF/MF demodulator[1)]
- The data interfaces including serial ports
- Antennas[1)]

3.1 Description

The VERIPOS LD2/LD2S receiver is a multi-purpose unit built on a modular design. It is constructed using a standard chassis which can house combinations of electronic modules. Variants are possible, not only in choice in the combination of modules installed but also in the specification of individual modules.

This delivers a very flexible design which can be tailored to a variety of user requirements, giving benefits in both cost and performance. It enables the unit to be updated to take advantage of innovations which enhance performance.

The core modules in the LD2/LD2S are:

- Power Supply & Controller Unit
- Processor
- GPS receiver (optional)
- L-band receiver (optional)
- HF/MF receiver (optional)

NOTE

The LD2 range has variants that include the LD2S – a different L-band card. These are clearly identified – the “LD2S” name appears on the front panel.

The installation procedure for LD2 and LD2S units are identical.

1. LD2 variant model supplied may optionally include these items. See variants list in the *Reference Information* chapter.

Examples of LD2/LD2S variants:

- Equipped with an L-band card and using VERIPOS correction services an LD2 demodulator can receive GPS corrections transmitted by geo-stationary satellites and output them in RTCM format to the users equipment.
- Variant LD2 models with a GPS receiver card can deliver a full DGPS positioning system, capable of computing multi-reference DGPS and may use VERIPOS Ultra solutions capable of outputting position data in NMEA format.
- Variants that use on-board Verify DP software (using a display and keyboard) produce a simple but detailed QC position display specifically designed for DP work.
- Variants with an HF/MF module*) installed allow the LD2 to be capable of receiving corrections directly from local VERIPOS reference stations (where subscribed and available).

*) HF/MF is frequently used as a back up to satellite-based corrections. It is especially useful for vessels operating close to large structures which may block the satellite antennas.

3.2 Installation

Details of what is to be installed specific to your installation are in the 'Equipment Packing List' or 'Scope of Supply'.

The equipment packing list is shipped with the equipment. This is used to confirm the equipment shipped is present and is used for reference when planning the installation in conjunction with this installation manual.

LD2/LD2S variants have only a minor impact on installation work.

Installation work varies for:

- The types of antenna(s) to be installed.
- The connections made for input of data to or output of data from the LD2/LD2S receiver.
- The attachment of a screen and keyboard/mouse for basic QC information (where Verify DP is specified).
- The attachment of data connection to a PC when used for QC analysis (where Verify QC is specified or presentation required to another QC system).

Typical LD2/LD2S variants:

- Type of L-band card installed.
- Optional inclusion of an HF/MF card.
- Optional inclusion of a GPS card (usually included) single or dual frequency.
- Optional inclusion of QC software onboard/on separate PC.

The LD2/LD2S variant installed only impacts the work when configuring and operating the LD2.

When installing hardware these differences only assist in understanding the type of connections for antennas and port connections to be put in place prior to commissioning the LD2/LD2S variant.

See the *Reference Information* chapter for a table showing the LD2 and LD2S variant configurations.

LD2S installation – Schematic example

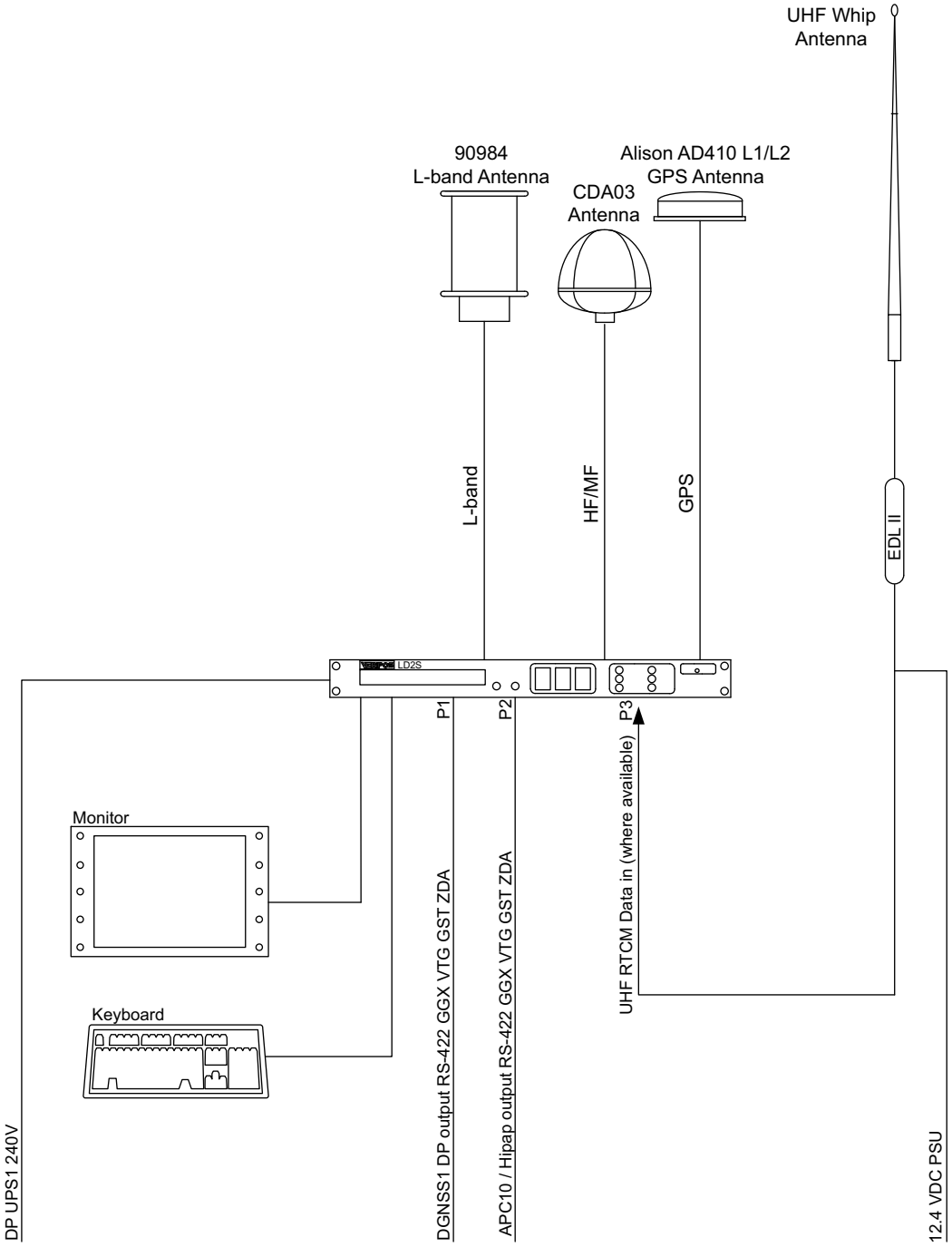


Figure 2. Example of an Installation Drawing for an LD2S

4 Installation

This chapter provides guidance on the installation of the LD2 receiver variants.

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

Any pre-installation checks should include safety considerations. See the Safety checklist provided in chapter *Reference Information* where required.

Topic	Notes
Confirm location of LD2 and associated equipment.	Ensure adequate access and cooling, correct mountings.
Confirm antenna location.	Follow siting guidance for antennas, any mounting frames required, offset measurements to CRP/other.
Confirm coaxial cable type and route.	Pre-terminated cables preferred, access routes, correct fixtures and grounding points.
Ancillary equipment.	Coaxial pig tails, serial cables and power leads.
Power.	Availability, suitability, cabling.

The following covers a typical order of work for installation of the LD2 receiver and variants:

- Siting the LD2 receiver
- Antenna Installation
- Cabling and connections between antenna and the below-decks equipment
- Fitting of hardware and software
- Interfacing of hardware and software to DP and other external peripherals

4.1 Siting the LD2/LD2S receiver

The location and mounting arrangements for all LD2 equipment must be discussed and agreed with the vessel owners/charterers prior to any installation work commencing.

The LD2 unit can be 19” rack mounted or can be fixed to a part of the vessel structure such as a shelf, desk or cabinet **with suitable ventilation** (see example below).

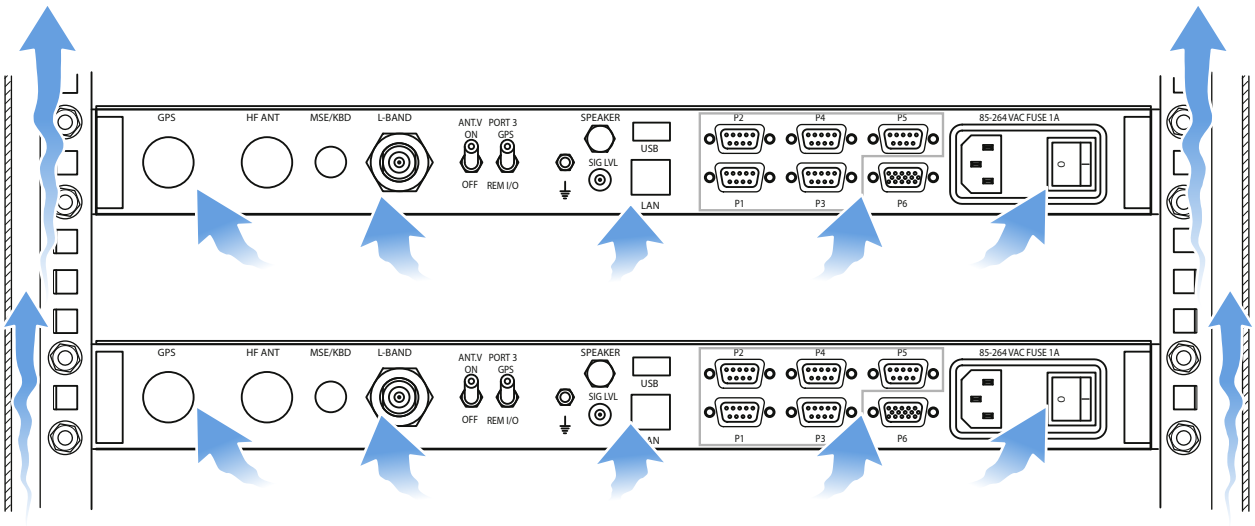


Figure 3. Rack Mounted LD2S Units with Suitable Ventilation

Permission may be required where the LD2 is to be fitted to ship's furniture if a rack is not available.

4.2 Antenna installation

This section provides general guidance on installation of antennas and cabling when installing the LD2 receiver.

NOTE

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.

- All radar systems should be switched off and isolated/tagged out during the installation period.
- Antenna mounting locations must be discussed and agreed with coaxial cable routes checked to ensure a satisfactory installation.
- Permit(s) to work should be raised as necessary at the worksite for all work at height, including the wheelhouse/bridge roof. This should be obtained from the person on watch in the wheelhouse/bridge.
- Perform a risk assessment to evaluate and minimise the risks involved with the installation of the LD2 and associated hardware. Immediately prior to work commencing carry out a briefing session to ensure that all personnel involved in the installation are fully aware of the work to be undertaken and the risks involved.
- Where the installing engineer needs to operate in an area near the vessel's Inmarsat dome, the separation distance specified by the dome manufacturer must be maintained or the Inmarsat system switched off during installation work.

4.2.1 GNSS antenna

The GNSS antenna receives transmissions from GPS and (optionally) GLONASS satellites.

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

For more details please refer to VERIPOS document “Antenna & Coaxial Cable Installation Guide” (GD-GL-VER-EQP-801), provided as part of the installation documentation.

4.2.1.1 General

The GNSS/GPS 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 4. ***Good Installation*** *– Antennas Installed at top of Mast on Retractable Mast Extensions with Good Spacing.*

During installation observe the following guidelines:

- Offsets to the GPS antennas must be measured by a competent person to ensure no errors are introduced to the DP, Survey or Navigation systems.
- The omni-directional Spotbeam 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.
- 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.

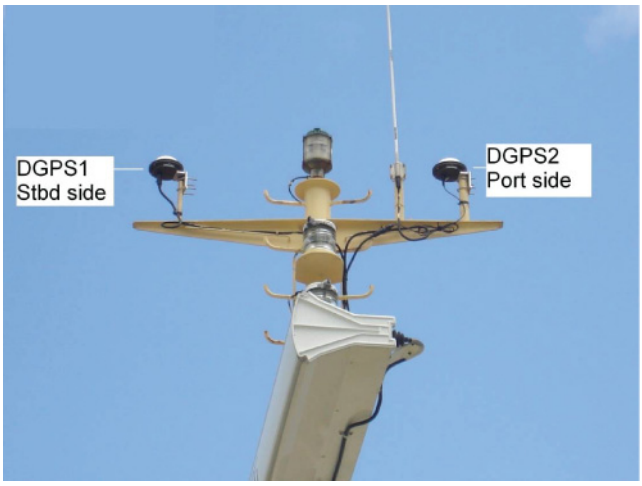


Figure 5. ***Good Installation*** *– AD410 GNSS Antennas Installed on top of the Mast, Minor Signal Masking from Mast Light at low Elevations*

Antennas that cannot be installed directly at the top of the mast/ships structure – it may be necessary to fit the unit to a pole (60 mm (2.36 in) diameter). It is essential that the pole and its mounting are sufficiently strong for this purpose. Arrangements must be approved for suitability to withstand vibration and wind. Securing bolts should be protected with self amalgamating tape to provide protection from the environment.

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 6. Examples Antenna Fixing Arrangements

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.

Figure 7. 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.

Apply a small amount of silicon grease to the threads on the outer shell of all electrical connectors leaving the rest of the shell clean and dry. Wipe off excess and attach the connector to the antenna leaving the N-type connectors tight. Avoid cross threading. Finally, wipe off any excess grease from the connector shell and apply tape around the connectors to prevent water ingress.

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).

4.2.2 L-band antenna

Figure 8. L-band Antenna

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

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

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

For more detailed guide to siting please refer to VERIPOS Antenna and Coaxial Cable Installation Guide provided with equipment.

4.2.2.1 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 LD2, for provision of VERIPOS corrections.

Refer to the 'Scope of Supply' and 'Equipment Packing List' documentation for details where variants make use of this way of delivering L-band correction signals to the LD2.

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 steer able 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.
- The Inmarsat communications system uses four satellites (POR, IOR, AORE and AORW).

When interfacing an LD2 to Inmarsat equipment the VERIPOS L-band input is connected to the Inmarsat below deck equipment (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 LD2.

WARNING

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

Figure 9. Directional Coupler

Procedure to attach to Inmarsat when no dedicated output available

1. With the Inmarsat turned off, disconnect the dome cable at the BDE.
2. Connect the coaxial cable from the Inmarsat antenna to the input port of the directional coupler.
3. Connect the output port of the coupler to the Inmarsat BDE using appropriate coaxial cable or a male-male N-type converter.
4. Connect the attenuated output port (usually -10 dB or -20 dB) of the coupler to the L-band input of the LD2 using coaxial cable.

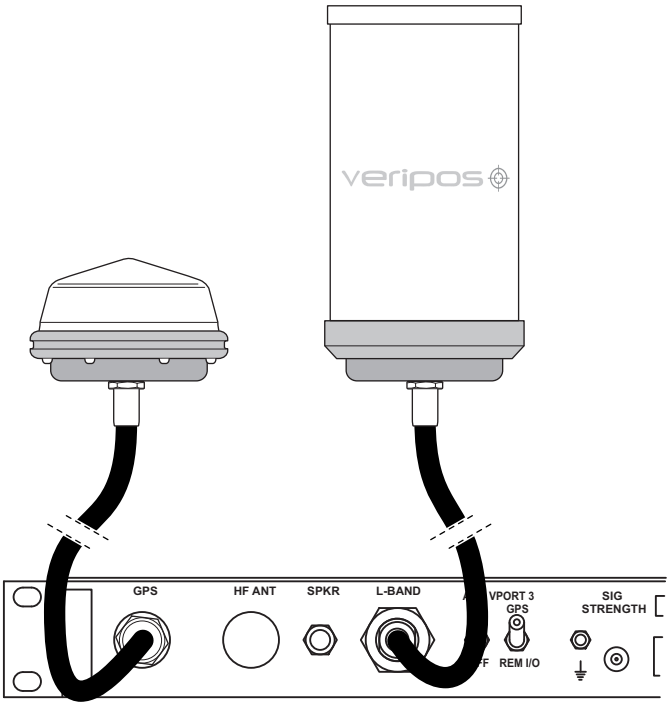


Figure 10. GPS Antenna and L-band Antenna Installation

WARNING

The L-band input socket on the LD2 output is 5 VDC. To avoid possible damage isolate the DC supply must be from the Inmarsat connection before the LD2 is turned on (voltage powers a low noise amplifier (LNA) in an omni-directional SPOT antenna).

Procedure

Disable the 5 V output on the LD2 by setting the “Ant. V” switch on the back panel to OFF (most LD2 units have this switch).

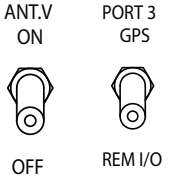


Figure 11. Set the Ant. V Switch to OFF

If no rear switch is fitted on the LD2 use a DC block installed between the systems.

Consult VERIPOS for advice or guidance on a suitable block.

Figure 12. DC Block

4.2.3 HF/MF antenna

The installation of an HF/MF antenna is determined by the variant supplied to be installed.

LD2 variants which require this antenna will be detailed in the 'Equipment Packing List' documentation. Refer to the variant list in the *Reference Information* chapter to confirm the appropriate equipment for the LD2 variant is received.

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

Should a UHF antenna be required please refer to the detailed antenna installation documentation or contact VERIPOS Helpdesk for advice.

For detailed installation guidance please refer to the VERIPOS document "Antenna and Coaxial Cable Installation Guide" (GD-GL-VER-EQP-801) provided as part of the installation documentation.

Figure 13. Typical HF/MF Anrenna – Magellan DHM5000

4.2.3.1 General guidelines for HF/MF antenna installation

- The HF antenna **must** be fitted in an open space attached to a vertical or horizontal rail. It need not be mounted as high as other antennas.
- A mounting pole can be used with the antenna secured by "U"-bolts.
- Once the HF antenna has been positioned and secured it must be earthed to the ship's structure. This is **essential** for good HF system performance. Use earthing cable (12/14 AWG) to the closest available metal fixing point of the ship's structure.

Typical grounding points:

- an existing bolt on the vessels superstructure
- a clamp used to strap the earth wire to a suitable metal surface.

When attaching the earth wire ensure that the metal surface is clear of all rust to provide good electrical contact. When the connection is secure it should be painted-over or wrapped in self-amalgamating tape to limit corrosion. Care must be taken when taping the connection to ensure moisture cannot enter. For additional protection use electrical tape over the self-amalgamating tape to maintain the integrity of the connection.

For more detailed guidance please refer to VERIPOS document “Antenna and Coaxial Cable Installation Guide” (GD-GL-VER-EQP-801), provided with installation documentation.

4.3 Coaxial cable installation

VERIPOS recommend and supply pre-terminated LMR coaxial cables as they give the best performance in permanent installations.

4.3.1 Safe working

Before commencing work raise the necessary “work permit” with vessel operators. Ensure that all transmitting radar systems are turned off and isolated at source. When working at height ensure all tools and equipment are secure.

See the *Reference Information* chapter for an optional safety check sheet.

4.3.2 General

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

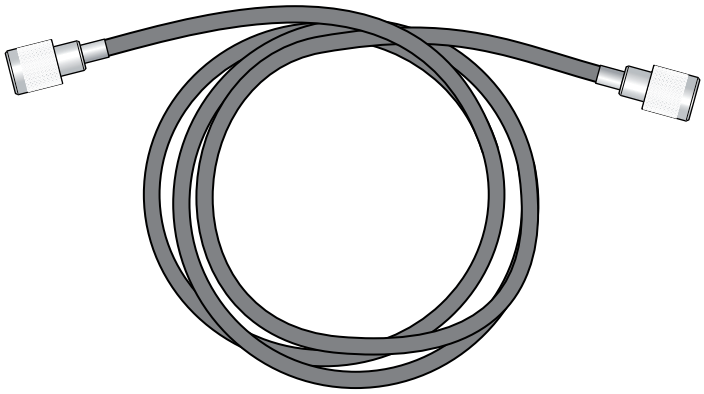


Figure 14. Terminated Pigtails of LMR 240

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 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 bulk head 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 damage the cable jacket.
8. All connectors and couplers are properly sealed from the environment with silicon grease, self-amalgamating tape and electrical tape.
9. Stress loops are fitted to prevent excess force on the connectors, in particular the antenna connectors.
10. The **minimum 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 15. Typical Cable Installation in Bridge and Mast Area

For more detailed guidance please refer to VERIPOS document “Antenna and Coaxial Cable Installation Guide” (GD-GL-VER-EQP-801) and cable manufacturers’ documentation.

4.4 LD2 installation

This section describes how to install the LD2 receiver below desk equipment (BDE). The LD2 is designed to be installed in a 19" equipment rack.

Variants may be supplied e.g. the LD2 comes pre-installed in a small rack.

Where a suitable rack is used the LD2 and variants may be desk or shelf mounted.

Always ensure the LD2 unit is installed following the recommended cooling and ventilation guidelines (refer to the *Reference Information* chapter for details).

Installation practice outlined in this manual and the "Antenna and Coaxial Cable Installation Guide" should be followed.

WARNING

Before applying power to the LD2 unit ensure the "ANT. V" toggle switch on the rear panel (if fitted) is:

"OFF" if the unit's L-band input is connected to the Inmarsat system

"ON" if the unit's L-band input is connected to a SPOT antenna.

Damage may occur if the switch is set "ON" when connected to an Inmarsat antenna.

A SPOT antenna will not function if the switch is set to "OFF".

Notes:

1. *Both toggles on the rear panel are aircraft-style switches – the toggle must be pulled slightly away from the panel before the switch position may be changed.*
2. *When installing an LD2S unit the power to the rear L-band input connector is controlled in software as well as setting the toggle switch on the rear of the unit to ON.*

4.4.1 LD2 variants

The exact model variant of the LD2 receiver is described in the 'Scope of Supply' and 'Equipment Packing List' documentation as agreed between VERIPOS and the customer.

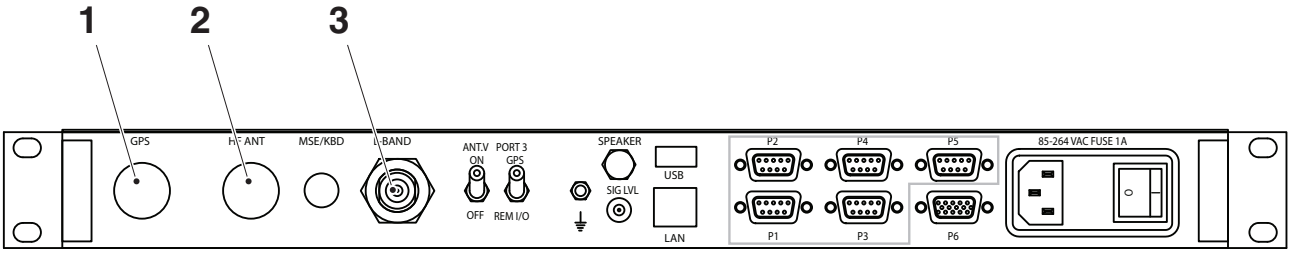
The LD2 variant to be installed will concern the installer when connecting to antennas, display screens and mouse/keyboard.

Rear mounted connectors can be used with suitable cabling to make all connections.

Where an LD2 has been supplied with the Verify DP software option, the monitor, mouse and keyboard used must be sited close to the LD2. Cabling for these may influence siting of the equipment.

4.4.2 Coaxial connections to antennas

In most installations up to three types of connections to antennas may be connected to the rear of the LD2. These are:



1. GNSS/GPS
2. MF/HF
3. L-band or combined GPS/L-band

4.4.2.1 GNSS/GPS antenna

In installations where a GPS antenna is provided in the ‘Equipment Packing List’ a connection will be made to this rear input. Consult the variant list in the *Reference information* chapter to confirm which system is to be applied.

4.4.2.2 MF/HF antenna

This is an optional connection used by some variants. Consult the variant list in the *Reference information* chapter to confirm which system is to be applied.

The input is connected to an HF/MF antenna.

With the LD2 unit secured in position coaxial cables can be connected to the rear panel. Use coaxial pig tails which allow greater flexibility and helps to maintain system performance.

4.4.2.3 L -band antenna

In installations where an L-band antenna is provided in the ‘Equipment Packing List’ a connection will be made to this rear input. Consult the variant list in the *Reference information* chapter to confirm which system is to be applied.

Variant

Option for use of combined GNSS and L-band antenna. This antenna will provide separate connections to the GPS and L-band rear connectors on the LD2.

4.4.3 Recommended installation practice

When rack mounting an LD2 the coaxial cables should be secured to the left vertical structure of the rack (viewed from the rear).

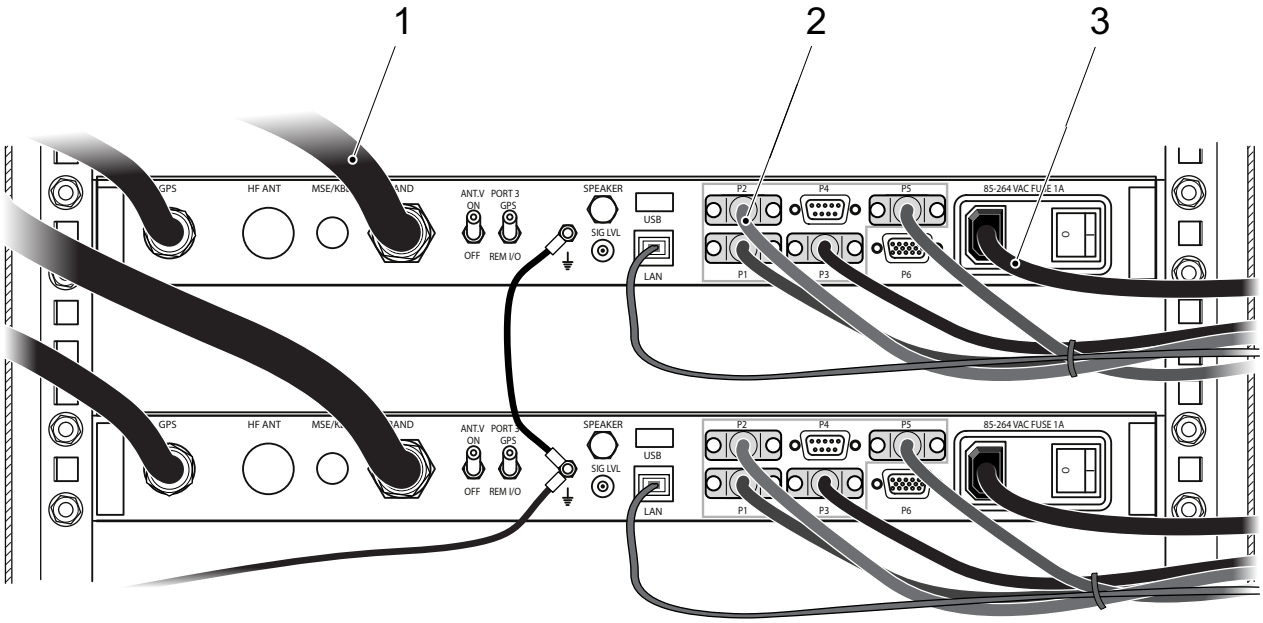


Figure 16. Recommended Cable Routing for Rack Mounted LD2 Units

- Power cable (3) runs are installed discrete from coaxial cables (1).
- Serial cables etc. (2) to opposite side of unit from coaxial (1) runs.

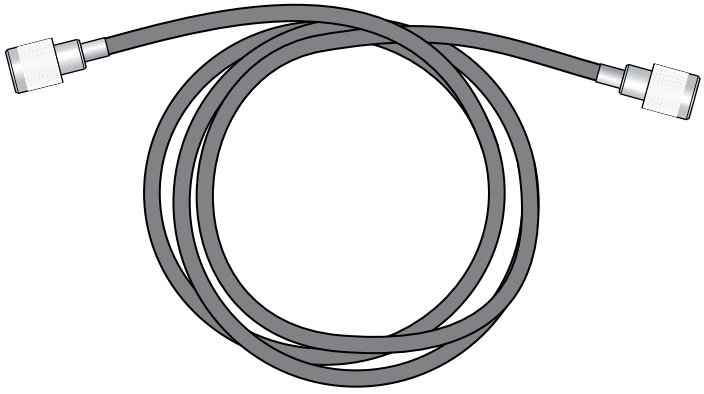


Figure 17. Pig Tail Coaxial Cable

CAUTION

Confirm the GPS/GNSS antenna is connected to the GPS port and the spotbeam antenna/Inmarsat interface is connected to the L-band port.

The LD2 will not function correctly if the antenna connections for GPS and L-band are reversed

4.4.3.1 General guidance on rack cable installation

- Run power cabling to the LD2 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 data connections using the jack screws on the connector housings.
- Secure all cables neatly with tie wraps. Do not apply excess pressure – avoid damaging the cables.
- Use the grounding pin on the back panel of the LD2 and 12–14 AWG earth cable to attach to the ship's superstructure or electrical system ground.

4.5 User interface

This section details how to install the equipment used for variants that use Verify DP. Verify DP provides a simple QC system commonly used in DP applications.

4.5.1 Verify DP display, keyboard and mouse

For variants of LD2 as detailed in the 'Scope of Supply' or 'Equipment Packing List' documentation.

Where **Verify DP** is used with the LD2 it will be necessary to install the associated monitor, keyboard and mouse in a suitable location near the DP console.

Consult the DP operator when selecting a location – they require a clear view of the screen without moving from their normal operating position.

The display monitor for **Verify DP** is connected to port P6 on the rear panel of the LD2 using a standard VGA cable.

Keyboard and mouse are connected to PS2 ports on the LD2 front or rear panel.

If possible, the LD2 should be installed close to the monitor location.

Where not feasible, a KVM extender will be required. Please contact the VERIPOS Helpdesk for guidance.

4.5.2 Serial ports P1 – P5

The LD2 has five serial I/O ports (D9 female connectors RS-232 protocol) on rear panel, P1 to P5. Pin-outs are detailed in the *Reference information* chapter and on the rear left hand side top plate of the LD2.

The LD2 ports may be configured in software to perform various functions. Use of ports and external equipment interfaced is specific to each installation. An interfacing plan will be prepared by the client and included in the 'Equipment Packing List' documentation. If this is not available contact the VERIPOS Helpdesk for assistance.

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.

Where required and specified fit an RS-232 to RS-422 converter (details in the *Reference information* chapter) between the LD2 and the interfaced equipment. The converter should normally be placed adjacent to the LD2.

RS-422 protocol has better noise immunity and supports longer cable runs. The cable used should be in accordance with the RS-422 specification.

4.5.3 USB port

For some LD2 installations which include **Verify DP** this may be used to input heading data from a gyro. The LD2 may use the USB port on the rear panel to connect to the gyro.

To attach to the gyro a USB to serial converter (see the *Reference information* chapter) may be supplied with your equipment. These converters use a software driver and a specific model is required to ensure compatibility.

VERIPOS recommend and supply a proven USB–232U converter which is line powered.

Contact the VERIPOS Helpdesk where assistance is required.

4.5.4 1PPS output option

Some LD2 variants provide a facility for output of a 1pps (pulse per second) signal, used by external equipment for accurate time synchronisation to navigation systems or multi-beam sonar.

Details of any 1pps output requirement and equipment will be included in the ‘Scope of Supply’.

4.5.4.1 Background

The 1pps signal is derived directly from the internal GPS receiver and is output from the LD2 on pin 1 of port P1. Exact specification of the signal will vary according to the model of GPS receiver installed in the LD2.

VERIPOS use a **breakout harness** running the 1pps signal on a separate coaxial cable. If connected using the same cable as the RS-232 output, also presented on P1 the signal is susceptible to degradation (the pulse is narrow and the amplitude may be as low as 2.5 volts).

The harness can be supplied from VERIPOS or users can construct one. A schematic for this harness is provided below.

NOTE

RG58 cable can be used for the main cable run but is subject to length limitations. Some signal conditioning and/or isolation may in addition be required at the client equipment. Contact VERIPOS Helpdesk for advice.

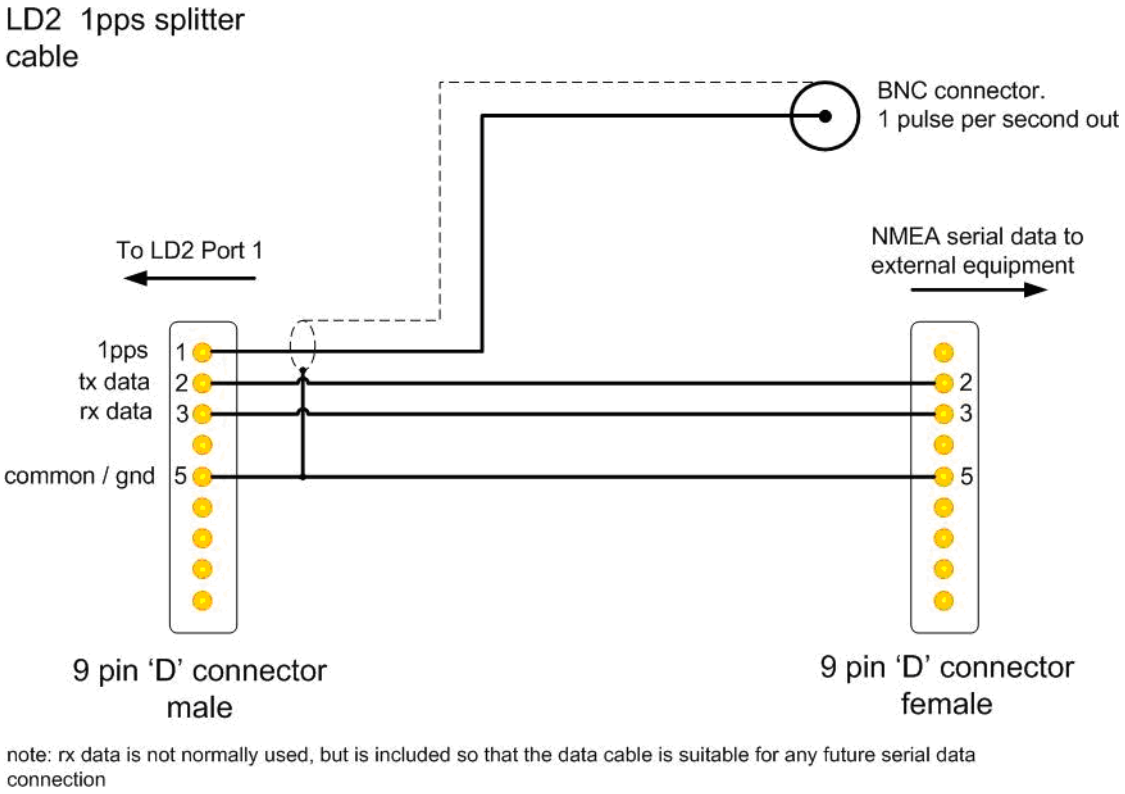


Figure 18. Port 1 LD2 1PPS Breakout Harness Schematic

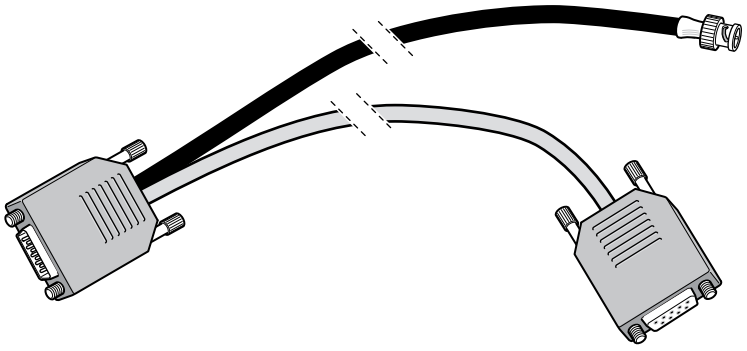


Figure 19. A Typical LD2 Port 1 1PPS Harness

4.5.5 Ethernet interface

An Ethernet RJ45 connector is fitted on the LD2 rear panel. See the *Reference information* chapter for details.

Specific guidance for interconnect to vessel equipment will be provided. Please consult this or contact the VERIPOS Helpdesk for advice.

4.6 Equipment rack

This section provides guidance on locating and installing an equipment rack to house the LD2 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.

4.6.1 Rack installed LD2 variant – Guidance on installation

LD2 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 pigtails for attaching the GPS and L-band inputs to the rear of the LD2.

The location of the rack must be selected using the same criteria as previously described for the LD2, with particular consideration for ventilation and access.

Before securing the rack base plate check that the LD2 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 LD2 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.

NOTE

To prevent problems of interference or increased heat dissipation no additional equipment should be mounted in this rack without first consulting VERIPOS.

4.7 Power and cabling

This section details the type and typical source for power supply to the LD2.

Power requirement of the LD2:

Input voltage	85–264 VAC, 50–60 Hz
Power consumption	20 W
Fuse	250 V / 1 A anti surge 20 mm (IEC 60945 EMC certified)

LD2 units are supplied with standard IEC C13 power cables.

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 LD2.

4.8 Interface cabling

This section details the types of data cables connected to systems and used by DP systems on the vessel. Part numbers are listed in the *Reference information* chapter.

Data interface cables from the LD2 will use RS-232 protocol.

Connection to vessel DP systems will be detailed in the 'Scope of Supply' or 'Equipment Packing List' documentation.

The data interface cabling attaches to the LD2 ports for input and output of data.

There are (on rear panel):

5 x RS-232 ports	Port 1: NMEA output Port 2: RTCM (primary) Port 3: Remote I/O (with NMEA output in some cases) Port 4: RTCM (secondary) Port 5: GPS I/O (with NMEA output in some cases)
1 x VGA display port	Port 6: VGA video output
1 x RJ45 port	LAN port with full network connectivity
1 x USB port	250 V / 1 A anti surge 20 mm (IEC 60945 EMC certified)

Standard PS/2 connections (on both front and rear panel) for an optional external keyboard with touchpad or mouse.

Cables used by VERIPOS for interconnect are listed in the *Reference information* chapter.

Ensure cable installation standards for the vessel are met.

4.9 Antennas and cabling

Please refer to the VERIPOS document "Antenna and Coaxial Cable Installation" provided with the installation documentation.

Copies of documentation in electronic format may be requested from the VERIPOS Helpdesk or see:

http://help.veripos.com

4.9.1 Antennas

Three classes of antenna may be used.

Details of those used for your LD2 variant are detailed in the ‘Scope of Supply’ and ‘Equipment Packing List’ documentation.

Typical examples of each of three classes of antenna in use are:

Type	Detail	Connection
GNSS/GPS	Receives signals from GPS / GLONASS satellites.	Connected to the rear LD2 “GPS” input (where applied.
L-band (SPOT)	Receives VERIPOS corrections from geo-stationary satellite(s).	Connected to the rear LD2 “L-band” input.
HF/MF	Receives corrections direct from local stations by radio trans-mission.	Connected to the rear LD2 “HF” input (where applied).

Figure 20. L1 / L2 GNSS Antenna – L-band Antenna – MF / HF Antenna

Notes:

GPS antennas can be either single or dual frequency.

Some antennas combine two or all of the above functions within a single antenna. Where these are used splitters are provided so signals from the antenna coaxial cable are routed to respective individual inputs on the LD2.

Refer to ‘Scope of Supply’ and to the VERIPOS document “Antenna and Coaxial Cable Installation” for additional information.

4.9.2 Cable

Details of the specific types for your installation are detailed in the ‘Scope of Supply’ and ‘Equipment Packing List’ documentation.

VERIPOS recommend and supply prefabricated LMR400 coaxial cable for all main antenna cable runs. N-type connectors are used with this cable.

Attachment to antenna and below decks equipment

A tail of LMR240 coaxial cable is fitted at either end between the main cable and antenna and the main cable and LD2 units. This cable is flexible with a smaller bend radius than LMR400, making terminal alignment easier and reduces stress on connections.

The tails are also used to adapt from N-type connectors of the LMR400 to TNC connectors, used on some antennas and inputs of the LD2.

Refer to ‘Scope of Supply’ and to the VERIPOS document “Antenna and Coaxial Cable Installation” for additional information.

NOTE

When ordering additional tails specify both the gender (M/F) and the connector type (N or TNC) for each end of a cable.

5 Technical data

5.1 Certification

IEC 60945.

5.2 Evironmental specification

Enclosure material	Steel
Enclosure protection	IP – 53
Operating temperature range	+5 to +40 °C
Recommended operating temperature range	+20 to +25 °C
Operating humidity	Max. 95% non-condensing
Storage temperature range	-20 to +60 °C
Storage humidity	< 55%
Vibration testing	EN 60945
Compass safe distance	
Steering magnetic	0.75 m
Standard compass	1.05 m

5.3 I/O ports

For details on all LD2 ports see chapter *Reference Information* and later in this section.

For most installations:

- port 1 output is used for NMEA messages
- port 2 output is used for RTCM messages
- there is one LAN port (10BaseT) and one USB port
- LD2 serial ports are RS-232.

With the recommended adapter (see *Reference Information* for details) port output can be converted to RS-422.

5.4 Antenna cable - specification

VERIPOS recommend use of Times Microwave coaxial LMR cable for installation of all antennas. See chapter *Reference Information* for details of types and specification.

5.5 Mechanical

Receiver size	19in. rack mounted x 1U height x 32 cm depth
Weight	5 kg/11 lb
Display	2 lines x 20 character back lit liquid crystal display

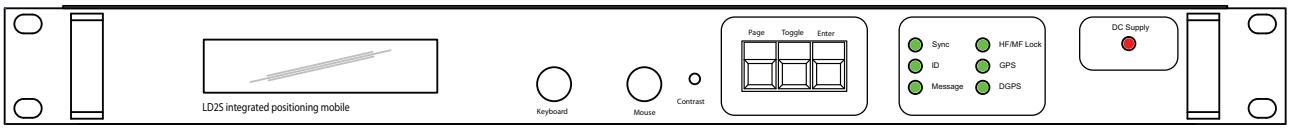


Figure 21. LD2S Front Panel

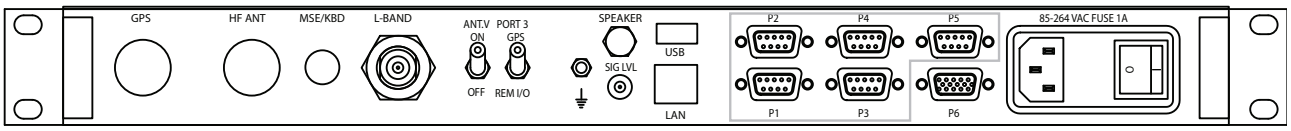


Figure 22. LD2S Rear Panel

5.6 Electrical

Input voltage	85–264 VAC
Power consumption	20 W
Fuse	250 V/1 A anti surge 20 mm
IEC 60945 EMC certified	

5.7 Demodulator

- 1525–1559 MHz input from L-band antenna or tapped L-band output from Inmarsat B terminals.
- Acquisition time from switch-on typically < 20 seconds.
- Re-acquisition time typically < 10 seconds.

5.8 HF/MF demodulator

The LD2 variant may optionally have this card installed. See the ‘Scope of Supply’/’Equipment Packing List’ documentation.

- 2 channel HF/MF demodulator in the frequency band 1.6–3.5 MHz.
- RTCM output.
- Compatible with VERIPOS Standard HF and third party MF transmissions.

5.9 Data interfaces

- 5 x RS232 Ports:
  - Port 1: NMEA out.
  - Port 2: RTCM (Primary).

- Port 3: Remote in/out (NMEA out in some LD2 configurations).
- Port 4: RTCM out (Secondary).
- Port 5: GPS in/out (NMEA out in some LD2 configurations).

- 1 x VGA video output.
- 1 x RJ45 LAN port with full network connectivity.
- 1 x USB port.
- Front and rear connections for optional external keyboard with mouse or touchpad.

5.10 Antenna

For details 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 the VERIPOS document "Antenna & Coaxial Cable Installation".

5.11 PC/104 board

- 300 MHz Geode processor.
- 256 Mb SDRAM.
- 64 Mb or 1 Gb Compact Flash card depending on program being supported.

5.12 GNSS receiver

The GNSS receiver for the LD2/LD2S receives GPS broadcast information. Optional OEM GNSS cards can be installed in the LD2.

5.13 Scope of supply

The equipment details for your particular installation are contained in the 'Equipment Packing List' documentation which accompanies the LD2 receiver and associated equipment to be installed.

The reference table below summarizes the most frequently used variants of the LD2 receiver.

<table>
<tr><th rowspan="2">Variant</th><th colspan="3">Antenna types</th></tr>
<tr><th>GNSS</th><th>L-band</th><th>HF/MF</th></tr>
<tr><td>LiD2-G1</td><td rowspan="4">AD419
(p/n 1234)
or
PGA-1
(p/n 2345)</td><td rowspan="4">90984</td><td rowspan="2">A30</td></tr>
<tr><td>LiD2-G2</td></tr>
<tr><td>LHD2-G1</td><td rowspan="2">DHM5000</td></tr>
<tr><td>LHD2-G2</td></tr>
</table>

Further details on LD2 variants and part numbers are detailed in chapter *Reference Information*.

6 Contact information

6.1 VERIPOS UK

Prospect Road
Arnhall Business Park
Westhill
Aberdeenshire, AB32 6FE
United Kingdom

6.1.1 Helpdesk

Helpdesk telephone	+44 (0)1224 527104
Helpdesk facsimile	+44 (0)1224 748204
VERIPOS UK Operations project management	+44 (0)1224 526000
Helpdesk e-mail	veripos.helpdesk@subsea7.com
VERIPOS Online support	http://help.veripos.com

NOTE

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.

6.2 Additional VERIPOS offices:

15990 North Barker's Landing
Suite 200
Houston, Texas 77079
USA

2E Capital Building
No 39 Tampines Street 92, #02-01
Singapore
528883

Subsea 7 (do Brasil)
Avenida prefeito Aristeu Ferreira da Silva, 1256
27930-070 Novo Cavaleiro – RJ
Brazil

Calle 64 No. 26, Fracc. Justo Sierra
Entre Av. Justo Sierra Y 31-B
Cuidad Del Carmen, Campeche
Mexico

7 Reference information

7.1 Safety check list

Protective equipment	Ref*	Y	N
Hard hats.	10		
Safety footwear.	–		
Eye protection.	10		
Hearing protection.	–		
PPE in accordance with PTW.	1		
Safety equipment fit for purpose.	8		
Respiratory protection.	–		
Additional warm clothing.	5		

Housekeeping	Ref*	Y	N
Walkways – clear.	–		
Work area – no debris.	–		
Escape routes – clear.	–		
Emergency access – work area.	–		
Fire fighting equipment – available.	–		
Life saving equipment – available.	–		

Safety awareness	Ref*	Y	N
Management safety objectives?	–		
Is safety monitored regularly?	–		
When was last safety exercise?	–		
Are safety procedures in place?	–		
Is first aid equipment in place?	–		
Is work permit system in use?	–		

Befor working at height	Ref*	Y	N
Obtain permit to work at height.	1		
Switch-off ALL transmitting devices.	2		
Obtain ships radio for communications.	1		
Work area exhaust fume free?	3		
Carry out risk assessment.	4		
Harness with double lanyard.	6		
Auto snap hooks – double release.	7		
Test snap hooks for “roll out”.	7		
Safety equipment – visually fit for use.	8		
Safety equipment – all certified.	9		
Hard hat – chin strap fitted and used.	10		
Use “fall arrest” equipment or use in-place “latchways” system.	11 11		
Carry out tool box talk (TBT).	4		

When working at height	Ref*	Y	N
Anchor point above head height.	12		
Do not connect snap hook back to lanyard.	13		
Do not climb carrying equipment.	14		
Secure tools from falling.	15		
Carry tools in a closed tool bag.	15		
Never climb alone.	16		
Spotter positioned on main deck.	16		
Keep deck below work area clear.	17		

7.1.1 Safety check list reference details

Item	Task
1.	Before commencing any work at height obtain a permit to work from the watchkeeper in the wheelhouse. Obtain a portable radio tuned to the vessel frequency to maintain communications with the vessel watchkeeper.
2.	Confirm that all transmitting devices are switched off and tagged out.
3.	Check work area is free from exhaust stack smoke. If exhaust fumes become an issue discuss alternatives with watchkeeper.
4.	Conduct and record a risk assessment involving all personnel involved in the system installation.
5.	Check conditions at work area. If required put on additional clothing appropriate to the prevailing weather conditions. Do not wear bulky clothing which can snag on vessel structure, sundry steelwork, ladders or rigging.
6.	Use an approved safety harness with a double lanyard providing 100% tie-off.

Item	Task
7.	Check snap hooks are auto type with double release mechanism (minimum). Test snap hooks for “roll out” prior to commencing work at height. If possible use auto locking carabiners instead of snap hooks.
8.	Inspect safety equipment prior to use for tears, cuts, frays, damaged stitching, burns, dry rot, salt water damage, solar radiation damage, paint damage, cracked or bluing D-rings, rust, corrosion and deformation. If in doubt, don’t take the risk.
9.	Test safety equipment for compatibility prior to commencing work at height. Never rely on sub-standard or incompatible equipment to keep you safe. If in doubt, don’t take the risk.
10.	Hard hat and safety glasses should be worn strapped securely at all times.
11.	Use fall arrest equipment when climbing. If a vertical system is in place on the ladders, use it. That’s why it’s there.
12.	Always tie off above your head when working and ensure the anchor point will support a minimum force of 2268 Kg or 5000 lbs. Perform a clearance calculation before tying off to an anchor point. Take into account the length of the lanyard (fully deployed) + your own height + safety margin.
13.	Never connect a snap hook directly back to the lanyard itself. This can lead to forced disengagement of the snap hook. If possible use auto locking carabineers that are approved for connection back to the lanyard. If in doubt, verify correct usage of safety equipment, including connectors before use.
14.	Do not climb masts or ladders carrying equipment. Use a pouch and hauling line or separate lanyard to keep hands free for climbing.
15.	Be careful not to drop tools whilst working. A falling tool poses a health and safety risk to people working below and in certain circumstances could even kill someone. Use a tool strap/lanyard to secure them to your wrist, belt or the mast platform you are working on. Always carry tools in a closed tool bag or backpack to avoid injury when climbing and prevent dropping the tools accidentally.
16.	Never climb alone. Always have a spotter at main deck level to keep an eye on you.
17.	Do not stand underneath someone working aloft. Make an effort to keep the area below clear from traffic (barrier off) and be aware of activity overhead.

7.2 Cabling and connectors

This section contains details on the cable termination used for connection to antennas.

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

7.2.1 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 water-block, which will prevent water from contaminating the whole cable if the casing is accidentally cut.

7.2.1.1 Electrical specifications

Performance Property	Units	US	(metric)
Cutoff frequency	GHz	16.2	
Velocity of propagation	%	85	
Dielectric constant	N/A	1.38	
Time delay	nS/ft (nS/m)	1,20	(3,92)
Impedance	Ω	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 Outer conductor	 Ω/1000 ft (/km) Ω/1000 ft (/km)	 1,39 1,65	 (4,6) (5,4)
Voltage withstand	VDC	2500	
Jacket spark	Vrms	8000	
Peak power	kW	16	

7.2.1.2 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)
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)

7.2.1.3 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 +1851	-40 to +85

7.2.2 Times LMR 240

This cable is recommended for use for short runs and is the cable used with our pre-terminated pig tails for use with mast-head antennas and below decks equipment.

7.2.2.1 Electrical specifications

Performance Property	Units	US	(metric)
Cutoff frequency	GHz	16.2	
Velocity of propagation	%	85	
Dielectric constant	N/A	1.38	
Time delay	nS/ft (nS/m)	1,20	(3,92)
Impedance	Ω	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 Outer conductor	 Ω/1000 ft (/km) Ω/1000 ft (/km)	 1,39 1,65	 (4,6) (5,4)
Voltage withstand	VDC	2500	
Jacket spark	Vrms	8000	
Peak power	kW	16	

7.2.2.2 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)

7.2.2.3 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 +1851	-40 to +85

7.2.3 Times Microwave LMR 400

Manufacturer: **www.timesmicrowave.com**

Diameter	0.375” / 9.53 mm
Impedance	50 Ω
Attenuation dB/100 ft @ 1500 MHz	5.1
Attenuation dB/100 m @ 1500 MHz	16.8
Velocity of propagation	85%
Minimum bend radius (installation)	1.0” / 25.4 mm
Minimum bend radius (repeated)	4.0” / 101.6 mm

7.2.4 LMR 400 – Times Microwave TC-400-NM N-type male connector

The Times Microwave TC-400-NM connector comes with the following parts:

To properly terminate LMR 400 cable with the TC-400-NM connector, the following tools should be used:

Times Microwave cable cutting tool:

P/n: CCT-01

Times Microwave LMR 400 cable prep tool:

P/n: ST-400C

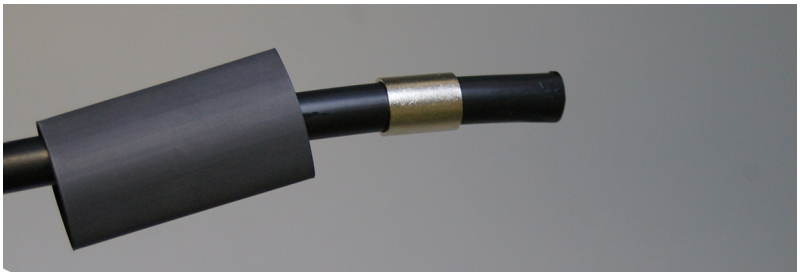
Times Microwave deburring tool:

P/n: DBT-01

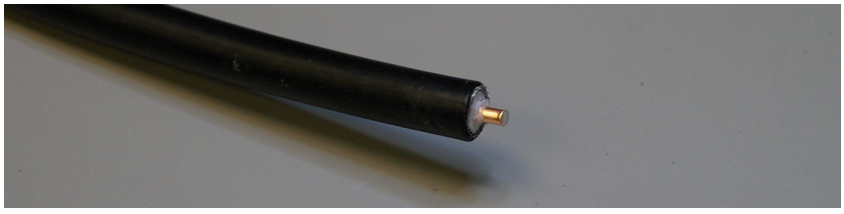
Times Microwave LMR 300/400 crimp tool:

P/n: CT-300/400

1. Slide adhesive lined heat shrink and crimp collar onto cable.



2. Use side **1** of the cable prep tool to expose the centre conductor by inserting cable into tool and rotating tool clockwise until no resistance can be felt.



If the cable prep tool is not available, carefully trim cable to the following dimensions:

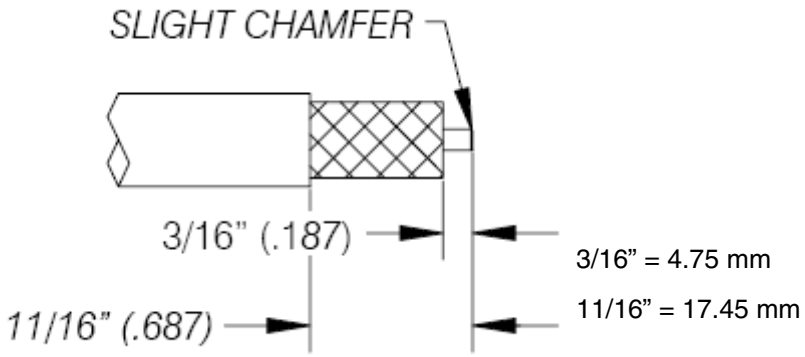
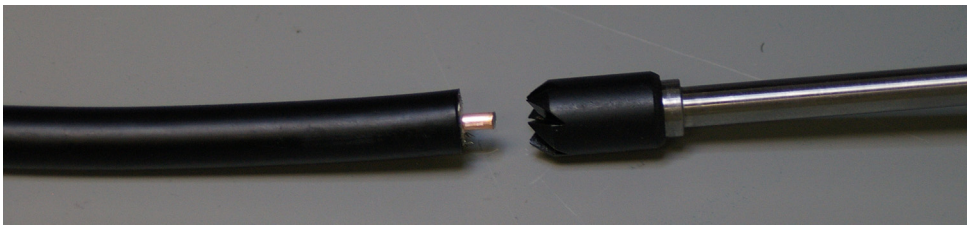
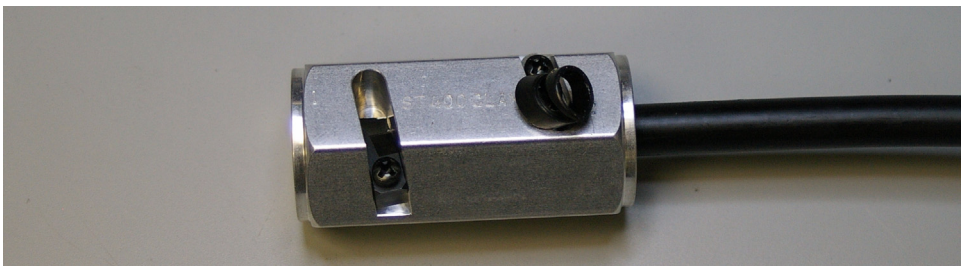


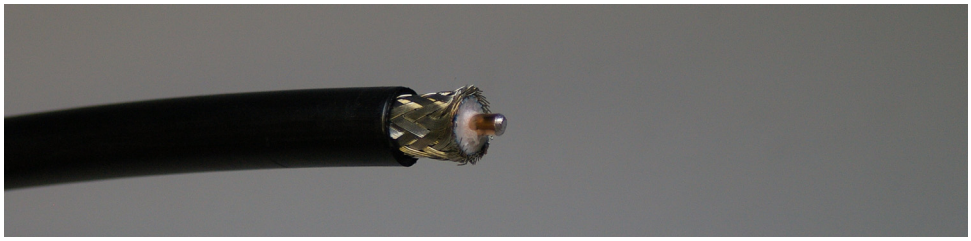
Diagram courtesy of Times Microwave
http://www.timesmicrowave.com/content/pdf/install/in-188.pdf

3. Remove any residual plastic from centre conductor before deburring with deburring tool or a fine metal file.

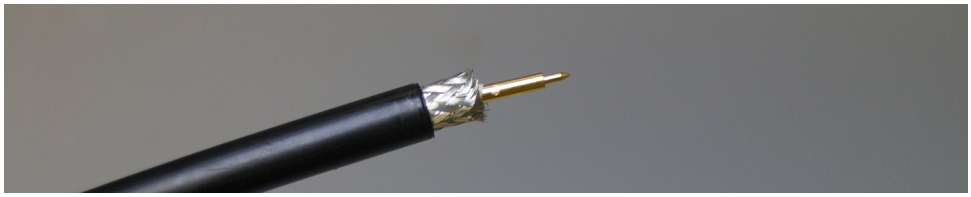


4. Trim cable jacket using side **2** of the cable prep tool by inserting cable and rotating tool clockwise until no resistance can be felt.



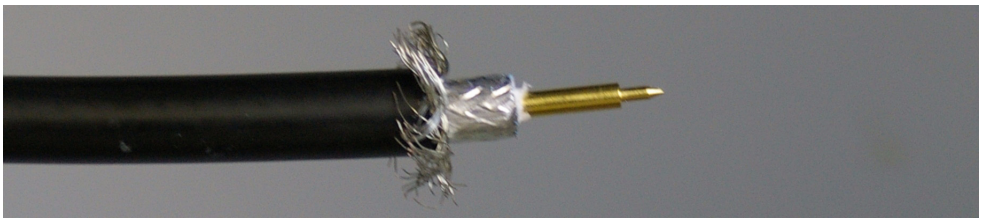


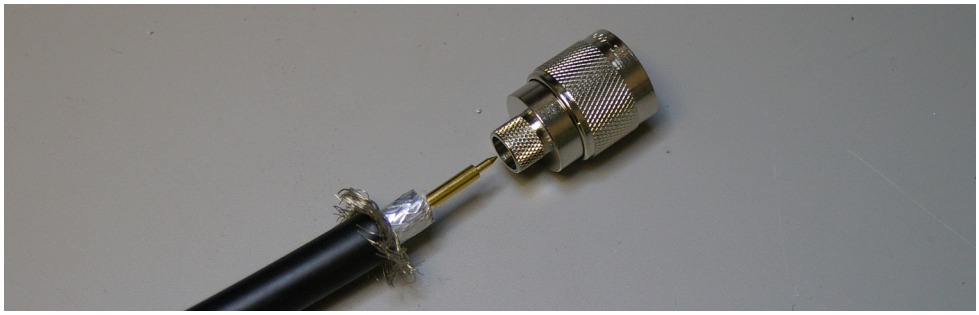
5. Slide centre pin over centre conductor and seat firmly against cable dielectric. Solder in place by applying a minimal amount of solder to the hole in the side of the pin.

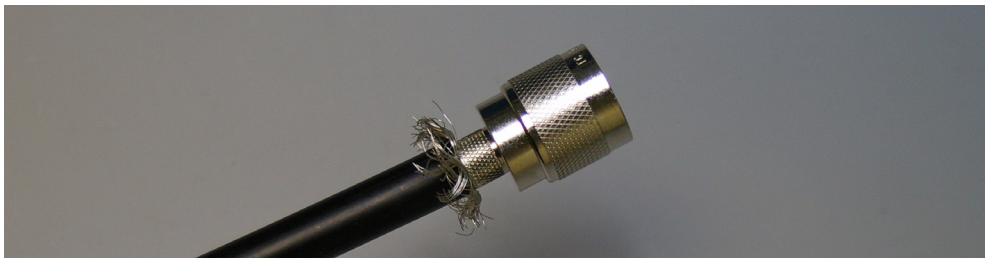


The soldering iron should be set to a high heat setting and tinned before being applied to the centre pin. The application of heat should be done carefully since too little will result in a poorly soldered joint, which will adversely affect performance, and applying too much will melt the dielectric.

6. Flare the braid and check to make sure no aluminium foil is touching the centre pin. Insert cable, centre pin and aluminium foil into connector body making sure that the braid remains outside.

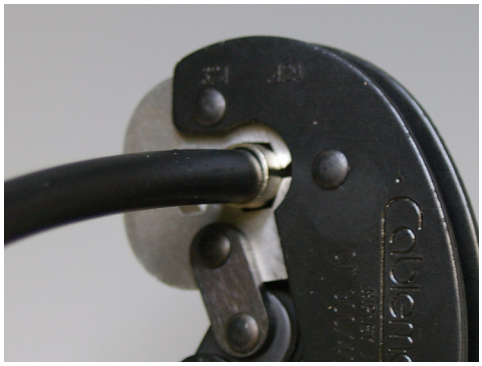


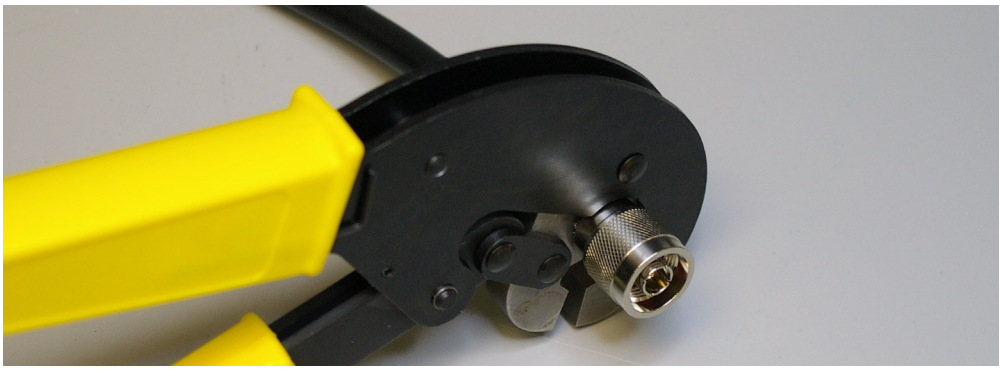




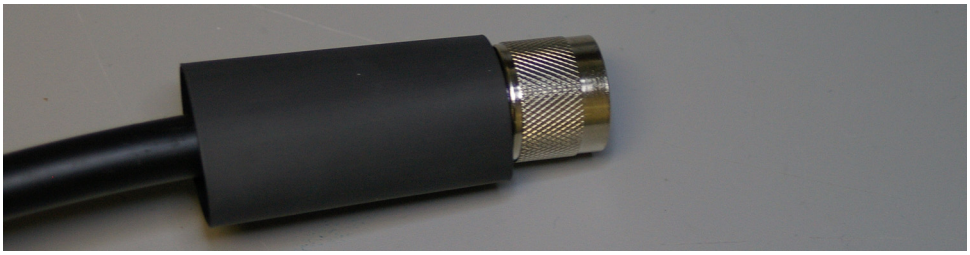
7. Slide crimp collar over braid and trim excess braid carefully.

8. Use the crimp tool to crimp the collar onto the connector, making sure it's as tight to the back of the connector body as possible. Do not crimp rear of crimp collar.





9. Slide the adhesive lined heat shrink onto the back of the connector, applying heat from a heat gun or gas soldering iron to seal.



7.2.5 LMR400 – Times Microwave TC-400-TM TNC male connector

The Times Microwave TC-400-TM connector comes with the following parts:

The termination procedure for the TC-400-NM connector above can be followed, substituting the relevant parts where appropriate.

7.3 Interface and serial port information

This details the pin out details for the LD2 receiver connections.

Ports 1 to 5 on the rear panel are 9 way D-type female plus 1 USB port. Serial port connectors have performance characteristics for RS-232.

LD2 I/O ports

Port	Type	Data on pins
1	RS-232	1 – 1PPS out (GPS Rx / VERIPOS) 2 – NMEA out (GPS Rx / VERIPOS) 3 – Ex RTCM in (GPS Rx) 5 – Signal ground
2	RS-232	2 – RTCM out / NMEA out (primary) 5 – Signal ground
3	RS-232	2 – Remote I/O / NMEA out (VERIPOS) 3 – Remote I/O in 5 – Signal ground
4	RS-232	2 – RTCM out (secondary) 8 – Message / Test out to Verify QC 5 – Signal ground
5	RS-232	2 – GPS out 3 – GPS in 5 – Signal ground
USB		Ext gyro in / RTCM in
LAN	10BaseT	(RJ45 convention) Port 4992 – Raw GPS[4] Port 4993 – Port 2 messages Port 9013 – NMEA out on Port A Port 9015 – NMEA out on Port B

Notes:

1. *Corrections are output in RTCM v2 format.*
2. *The MF RTCM data is only available on the LAN on socket 5994, when selected on firmware versions 5.83 and above.*
3. *Where an Ethernet connection is used the IP address of the LD2 variant should be configured in the same domain as the connected computer.*
4. *Port 4992 – only active if P5 is set to "OFF" and P1 is set to "LOCAL".*
5. *Equipment reboot off/on is reqired for LAN port changes to take effect.*

7.3.1 Notes on use with gyro / range and bearing

I/O configuration values to be used:

Data	Address	Port
VDP aux	127.0.0.1	5001
Gyro (HDT) serial port 3	127.0.0.1	4990
Gyro (HDT) USB	127.0.0.1	4997

7.4 LD2 siting guidelines

When choosing a location for the LD2 and variants the following requirements are **mandatory**:

1. Ensure adequate ventilation – above and especially to the vents for free air flow to the unit. This is important when working in hot or humid regions.
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 LD2 unit to be removed without disconnection.
9. All bends in coaxial cables to be maintained above minimum bend radius.
10. Use short pig tails of flexible coaxial cable (e.g. RG213) with appropriate converter connections to connect antenna coaxial cables to the LD2. 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 LD2.

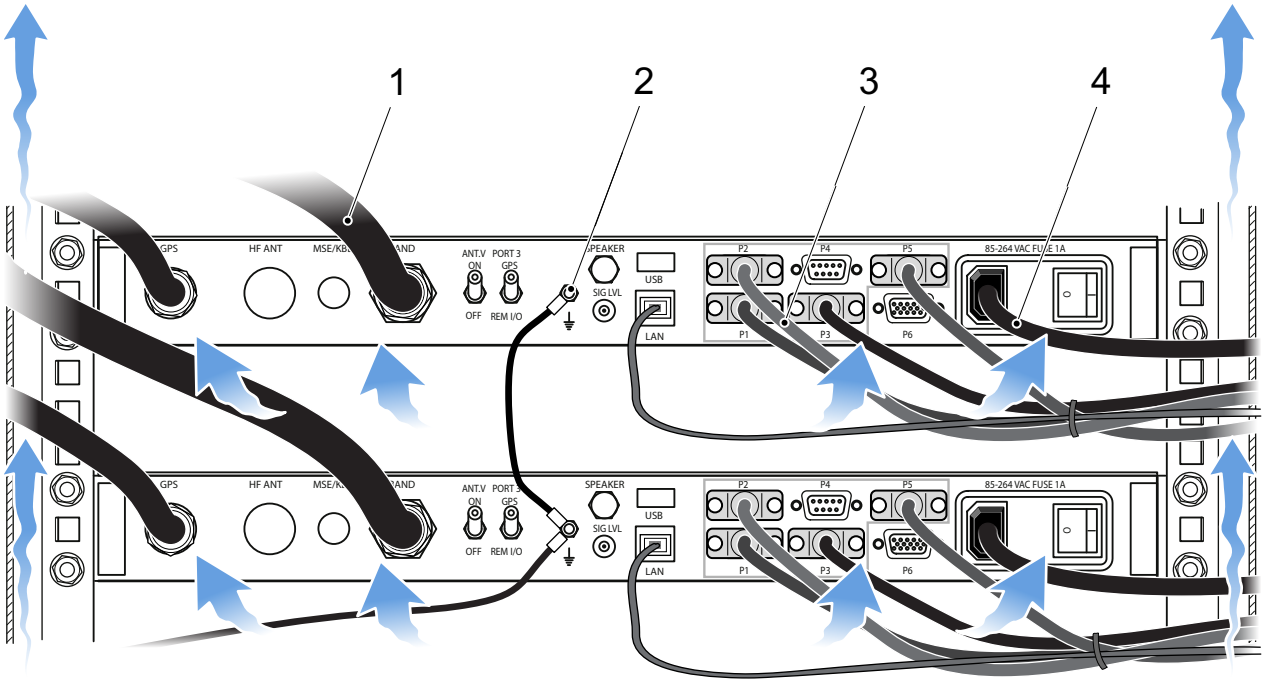


Figure 23. Rack Mounted LD2 Units with Clear Ventilation and Correct Cabling Practice and Earthing

1. Coaxial cables to the antennas.
2. Earthing cables – connected to ships ground.
3. Signal cables – to opposite side of unit from coaxial runs.
4. Power cable runs are installed discrete from coaxial cables.

7.5 LD2 variants and parts list

The following two tables are not exhaustive.

The 'Equipment Packing List' for your installation provides details.

7.5.1 Units with L-band demodulator

v2.0 14/05/2009	**LD2 Variants**													
Item	**Part No.**	**LD2-D**	**LD2-G1**	**LD2-GG1**	**LHD2-G1**	**LiD2-G1**	**LHD2-GG1**	**LiD2-GG1**	**LD2-G2**	**LD2-GG2**	**LHD2-G2**	**LiD2-G2**	**LHD2-GG2**	**LiD2-GG2**
Integrated mobile unit		1	1	1	1	1	1	1	1	1	1	1	1	1
L-band demodulator		1	1	1	1	1	1	1	1	1	1	1	1	1
L1 single-frequency GPS receiver		-	1	1	1	1	1	1	-	-	-	-	-	-
L1/L2 dual-frequency GPS receiver		-	-	-	-	-	-	-	1	1	1	1	1	1
GLONASS receiver		-	-	1	-	-	1	1	-	1	-	-	1	1
2 x channel HF/IALA demodulator		-	-	-	1	-	1	-	-	-	1	-	1	-
SBX4 IALA card		-	-	-	-	1	-	1	-	-	-	1	-	1
AD410 antenna *)		-	1	1	1	1	1	1	1	1	1	1	1	1
90984 L-band antenna		1	1	1	1	1	1	1	1	1	1	1	1	1
1DHM5000 HF antenna		-	-	-	1	-	1	-	-	-	1	-	1	-
CDA3 antenna		-	-	-	-	1	-	1	-	-	-	1	-	1
LMR400 low loss 30 m cable	VI-C- 0010	1	2	2	3	3	3	3	1	2	3	3	3	3
2 m cable tail	VI-C- 0011	2	4	4	6	6	6	6	4	4	6	6	6	6
*) or equivalenet – see optional antennas and description below:														
AD490 (GPS)														
AD491 (GPS + GLONASS)														
AD251 (LI only)														
PGA-1 (GPS + GLONASS)														
Same hardware used – GPS / GLONASS access s/w controlled														

7.5.2 Units with L-band demodulator model S

v2.0 14/05/2009	**LD2 Variants**													
Item	**Part No.**	**LD2S-D**	**LD2S-G1**	**LD2S-GG1**	**LHD2S-G1**	**LiD2S-G1**	**LHD2S-GG1**	**LiD2S-GG1**	**LD2S-G2**	**LD2S-GG2**	**LHD2S-G2**	**LiD2S-G2**	**LHD2S-GG2**	**LiD2S-GG2**
Integrated mobile unit		1	1	1	1	1	1	1	1	1	1	1	1	1
L-band demodulator model S		1	1	1	1	1	1	1	1	1	1	1	1	1
L1 single-frequency GPS receiver		-	1	1	1	1	1	1	-	-	-	-	-	-
L1/L2 dual-frequency GPS receiver		-	-	-	-	-	-	-	1	1	1	1	1	1
GLONASS receiver		-	-	1	-	-	1	1	-	1	-	-	1	1
2 x channel HF/IALA demodulator		-	-	-	1	-	1	-	-	-	1	-	1	-
SBX4 IALA card		-	-	-	-	1	-	1	-	-	-	1	-	1
AD410 antenna *)		-	1	1	1	1	1	1	1	1	1	1	1	1
90984 L-band antenna		1	1	1	1	1	1	1	1	1	1	1	1	1
1DHM5000 HF antenna		-	-	-	1	-	1	-	-	-	1	-	1	-
CDA3 antenna		-	-	-	-	1	-	1	-	-	-	1	-	1
LMR400 low loss 30 m cable	VI-C- 0010	1	2	2	3	3	3	3	1	2	3	3	3	3
2 m cable tail	VI-C- 0011	2	4	4	6	6	6	6	4	4	6	6	6	6
*) or equivalenet – see optional antennas and description below:														
AD490 (GPS)														
AD491 (GPS + GLONASS)														
AD251 (LI only)														
PGA-1 (GPS + GLONASS)														
Same hardware used – GPS / GLONASS access s/w controlled														

Example – VERIPOS Equipment Packing List

VERIPOS Project Number:	**351xxxxxxx**
VERF Number: **VERF**	**26xx**
Client PO/REF Number:	**LO010xxxx (7xxxx)**
Additional Information:	**Ensure client ref no. appears on packaging and all paperwork**
Send Manifest To:	**A Client**

Sent By: **AN Other**

Item Number	SAP Number	Description	Part Number	Serial Number
1		LiD2-GG1 Demodulator	LiD2-GG1	Xxxxx
2	Xxxxxxxx	AD410 Antenna	VI-A-0011	Xxxx
3	Xxxxxxxx	90984 Antenna	VI-A-0013	Xxxx
4	Xxxxxxxx	CDA3 Antenna	VI-A-0015	xxxx-yyyy-zzzz
5		6U Equipment rack Black	VI-E-0011	
6		Rack Mount Keyboard/mouse	VI-V-0031	
7		3 x Cable 2m NM to NM tails	VI-C-0011	
8		3 x Cable 2m NM to TM tails	VI-C-0012	
9		3 x Cable 30m NF to NF	VI-C-0012	
10		3 x RS232 to 422 converter	VI-C-0010	
11		Set Paper Manuals		
12		Training CD		
13		Manual CD		
14		Wooden Shipping Crates		

7.5.3 Ancillary equipment list with part numbers

Item	Comments	Part No.
Couplers used with Inmarsat		
Rojone coupler		AMA-1255-10-1W
Rojone coupler		AMA-1255-20-1W
Rojone coupler		AMA-1255-30-1W
Rojone Power Divider		AMA-2255-2N
Inline GPS Amplifier		LA-21-L1L2-N
RF Switch		477-4632
Passive RF Splitter		SPLIT2N-PRO
Antennas		
AD251 – GPS Antenna		AD251
AD410 – GPS Antenna		AD410
PGA1 – GPS Antenna		T1730026
90984 – L-band Antenna		90984/3/1
DHM5000 – HF/MF Antenna		P010504
CDA3 – GPS Antenna		-
A30 Antenna – GPS Antenna		A30
HF Antenna and Bracket		P0101503
LD2 Optional cards / Upgrades		
HF Card		P0101504
L2 Upgrade Card		T1721002UP
GLONASS Upgrade L1/L2		T1721003UP
GLONASS Upgrade L1		T1721001
EDLII		
2 m Interface Cable		
460–470MHz 6dB Gain Antenna		
100–240 V PSU		
Antenna Mounting Kit		
EDLII Mounting Kit		
Freight		
Coaxial cable Assemblies		
30 m NF–NF Cable Assembly LMR400		VI-C-0010
2 m tail (NM–NM) LMR240		VI-C-0011
2 m tail (NM–TM) LMR240		VI-C-0012
Earth Braid Cable Assembly		VI-C-0015

Item	Comments	Part No.
Ethernet Straight Cable 2 m		44878
RS-232 Serial Cable Assembly		31525
RS-232 Serial Null Modem Cable Assembly		SPEC044172
RS-232 Serial Null Modem 'Y' Cable Assembly		SPEC044188
40 m NF–NF Cable Assembly LMR400		VI-C-0030
50 m NF–NF Cable Assembly LMR400		VI-C-0031
40 m Antenna Cable Assembly LMR400		VI-C-0030
50 m Antenna Cable Assembly LMR400		VI-C-0031
30 m NF–NM LMR400		VI-C-0039
20 m NF–TM LMR400		VI-C-0040
90 cm NM–NM		VI-C-0041
2 m tail (NF–NM) LMR240		VI-C-0042
2 m tail (NF–TM) LMR240		VI-C-0043
10 m NM–NM LMR400		VI-C-0044
200 m NF–NF LMR400		VI-C-0047
30 m Turck Cable		A02542
60 m NF–NF cable assembly		VI-C-0060
Ethernet Straight Cable 5 m		44880
Ethernet Crossover Cable 2 m		44943
Ethernet Crossover Cable 5 m		44945
Monitor 17" Flatscreen		17" Monitor
VESA Wall Mount LCD Swing Arm Wall Bracket		40765
Keyboard / Mouse Cable Assemblies		
1 m Female to Male Cable (PS2/HD VGA)		33751
3 m Female to Male Cable (PS2/HD VGA)		33753
5 m Female to Male Cable (PS2/HD VGA)		33754
10 m Female to Male Cable (PS2/HD VGA)		33756

Item	Comments	Part No.
Options for Verify DP Monitor & Keyboard		
1 m Female to Male VGA Cable		37361
3 m Female to Male VGA Cable		37363
5 m Female to Male VGA Cable		37364
10 m Female to Male VGA Cable		37366
15 m Female to Male VGA Cable		37367
3 m Female to Male PS/2 Cable		33462
5 m Female to Male PS/2 Cable		33463
10 m Female to Male PS/2 Cable		33465
15 m Female to Male PS/2 Cable		33466
1U Rack Mounted Keyboard		
PC Options for Verify QC		
PC 1		HT 205P4 STD
2U PC		2U PC
PC 2		DC7900
Port Powered RS-232 – RS-422 Converter		IC1474A-F
2002		UPC 2000 (M&C 16-62-64)
3002		UPC 3002 (M&C 19-63-70)
Serial Port Equipment		
SDS 16 Port Terminal Server		-
Equipment for Keyboard & Mouse		
ACU1009A		-
ACU1001A		-
Rack Equipment		
6U Rack Mounted Enclosure		600D 6U
Rack Shock Mount		L64-BAM-40
M6 Captive Nut C/W Washer & Set Screw		542-5426
M4 x 40 mm S/S Socket Head Capscrew		
M4 S/S Nylock Nut		
M5 x 16 mm S/S PO21 CSK Screw		
M5 S/S Plain Washer		
M5 S/S Nylock Nut		
M6 x 25 mm S/S Grubscrew		

Item	Comments	Part No.
Panel Mounting Rail		AB-V-ED-01232
Slide Rails (tray support and bracket) to suit above rack		
Rack Wiring		
LMR240 TNCM-NM/RA 0.12 m		VI-C-0066
Antenna Mounts		
Rt angle bracket mounting for Antennas AD410, CDA3		-
Flat mounting bracket for L-band Antenna 90984		-
Mounting bracket DHM5000 HF		-
U bolts (pair)		-

7.5.4 LD2 / LD2S variant descriptions

7.5.4.1 LD2-G1 description

The LD2 is VERIPOS' latest generation of user hardware and provides a comprehensive integrated mobile solution designed for offshore GNSS positioning applications. The LD2-G1 consists of an L-band demodulator, used for reception of the satellite-based augmentation data, and a single-frequency (L1) GPS receiver used for making range observations.

It is also possible to access SBAS services such as EGNOS, WAAS and MSAS.

The LD2 can be used to derive all of the different VERIPOS solutions or simply act as a sensor from which all raw data is output into external processing. Set-up of the unit and services required can be carried out by the user via a simple control panel on the front of the unit, which is contained in a robust 19" x 1U casing.

The LD2 - G1 has the following functionality:

- L1 GPS reception
- VERIPOS L-band satellite reception
- input of external RTCM sources such as UHF
- internal calculation of high and standard precision position solutions with multiple levels of fall-back/back-up
- multiple serial, USB and Ethernet interfaces for input and output of data
- internal QC software via Verify-DP.

7.5.4.2 LD2-GG1 description

The LD2 is VERIPOS' latest generation of user hardware and provides a comprehensive integrated mobile solution designed for offshore GNSS positioning applications. The LD2-GG1 consists of an L-band demodulator, used for reception of the satellite-based augmentation data, and a single-frequency (L1) GPS/GLONASS receiver used for making range observations.

It is also possible to access services such as EGNOS, WAAS and MSAS.

The LD2 can be used to derive all of the different VERIPOS solutions or simply act as a sensor from which all raw data is output into external processing. Set-up of the unit and services required can be carried out by the user via a simple control panel on the front of the unit, which is contained in a robust 19" x 1U casing.

The LD2 - GG1 has the following functionality:

- L1 GPS reception
- GLONASS reception
- VERIPOS L-band satellite reception
- input of external RTCM sources such as UHF
- internal calculation of high and standard precision position solutions with multiple levels of fall-back/back-up
- multiple serial, USB and Ethernet interfaces for input and output of data
- internal QC software via Verify-DP.

7.5.4.3 LD2-G2 description

The LD2 is VERIPOS' latest generation of user hardware and provides a comprehensive integrated mobile solution designed for offshore GNSS positioning applications. The LD2-G2 consists of an L-band demodulator, used for reception of the satellite-based augmentation data, and a dual-frequency (L1/L2) GPS receiver used for making range observations.

The LD2 can be used to derive all of the different VERIPOS solutions or simply act as a sensor from which all raw data is output into external processing. Set-up of the unit and services required can be carried out by the user via a simple control panel on the front of the unit, which is contained in a robust 19" x 1U casing.

The LD2-G2 has the following functionality:

- L1/L2 GPS reception
- VERIPOS L-band satellite reception
- input of external RTCM sources such as UHF
- internal calculation of high and standard precision position solutions with multiple levels of fall-back/back-up
- multiple serial, USB and Ethernet interfaces for input and output of data
- internal QC software via Verify-DP.

7.5.4.4 LD2-GG2 description

The LD2 is VERIPOS' latest generation of user hardware and provides a comprehensive integrated mobile solution designed for offshore GNSS positioning applications. The LD2-GG2 consists of an L-band demodulator, used for reception of the satellite-based augmentation data, and a dual-frequency (L1/L2) GPS/GLONASS receiver used for making range observations.

The LD2 can be used to derive all of the different VERIPOS solutions or simply act as a sensor from which all raw data is output into external processing. Set-up of the unit and services required can be carried out by the user via a simple control panel on the front of the unit, which is contained in a robust 19" x 1U casing.

The LD2-GG2 has the following functionality:

- L1/L2 GPS reception
- GLONASS reception
- VERIPOS L-band satellite reception
- input of external RTCM sources such as UHF
- internal calculation of high and standard precision position solutions with multiple levels of fall-back/back-up
- multiple serial, USB and Ethernet interfaces for input and output of data
- internal QC software via Verify-DP.

7.5.4.5 LiD2-G1 description

The LD2 is VERIPOS' latest generation of user hardware and provides a comprehensive integrated mobile solution designed for offshore GNSS positioning applications. The LiD2-G1 consists of an L-band demodulator, used for reception of the satellite-based augmentation data, a single-frequency (L1) GPS receiver used for making range observations and an integrated two-channel IALA beacon receiver allows access to the free-to-air coastguard operated DGPS stations around many of the coastlines of the world. It is also possible to access SBAS services such as EGNOS, WAAS and MSAS.

The LD2 can be used to derive all of the different VERIPOS solutions or simply act as a sensor from which all raw data is output into external processing. Set-up of the unit and services required can be carried out by the user via a simple control panel on the front of the unit, which is contained in a robust 19" x 1U casing.

The LiD2-G1 has the following functionality:

- L1 GPS reception
- VERIPOS L-band satellite reception
- input of external RTCM sources such as UHF
- internal calculation of high and standard precision position solutions with multiple levels of fall-back/back-up
- multiple serial, USB and Ethernet interfaces for input and output of data
- internal QC software via Verify-DP.

7.5.4.6 LiD2-GG1 Description

The LD2 is VERIPOS' latest generation of user hardware and provides a comprehensive integrated mobile solution designed for offshore GNSS positioning applications. The LiD2-GG1 consists of an L-band demodulator, used for reception of the satellite-based augmentation data, a single-frequency (L1) GPS/GLONASS receiver used for making range observations and an integrated two-channel IALA beacon receiver allows access to the free-to-air coastguard operated DGPS stations around many of the coastlines of the world. It is also possible to access SBAS services such as EGNOS, WAAS and MSAS.

The LD2 can be used to derive all of the different VERIPOS solutions or simply act as a sensor from which all raw data is output into external processing. Set-up of the unit and services required can be carried out by the user via a simple control panel on the front of the unit, which is contained in a robust 19” x 1U casing.

The LiD2-GG1 has the following functionality:

- L1 GPS reception
- GLONASS reception
- VERIPOS L-band satellite reception
- input of external RTCM sources such as UHF
- internal calculation of high and standard precision position solutions with multiple levels of fall-back/back-up
- multiple serial, USB and Ethernet interfaces for input and output of data
- internal QC software via Verify-DP.

7.5.4.7 LiD2-G2 description

The LD2 is VERIPOS’ latest generation of user hardware and provides a comprehensive integrated mobile solution designed for offshore GNSS positioning applications. The LiD2-G2 consists of an L-band demodulator, used for reception of the satellite-based augmentation data, a dual-frequency (L1/L2) GPS receiver used for making range observations and an integrated two-channel IALA beacon receiver allows access to the free-to-air coastguard operated DGPS stations around many of the coastlines of the world.

The LD2 can be used to derive all of the different VERIPOS solutions or simply act as a sensor from which all raw data is output into external processing. Set-up of the unit and services required can be carried out by the user via a simple control panel on the front of the unit, which is contained in a robust 19” x 1U casing.

The LiD2 - G2 has the following functionality:

- L1/L2 GPS reception
- VERIPOS L-band satellite reception
- input of external RTCM sources such as UHF
- internal calculation of high and standard precision position solutions with multiple levels of fall-back/back-up
- multiple serial, USB and Ethernet interfaces for input and output of data
- internal QC software via Verify-DP.

7.5.4.8 LiD2-GG2 description

The LD2 is VERIPOS' latest generation of user hardware and provides a comprehensive integrated mobile solution designed for offshore GNSS positioning applications. The LiD2-GG2 consists of an L-band demodulator, used for reception of the satellite-based augmentation data, a dual-frequency (L1/L2) GPS/GLONASS receiver used for making range observations and an integrated two-channel IALA beacon receiver allows access to the free-to-air coastguard operated DGPS stations around many of the coastlines of the world.

The LD2 can be used to derive all of the different VERIPOS solutions or simply act as a sensor from which all raw data is output into external processing. Set-up of the unit and services required can be carried out by the user via a simple control panel on the front of the unit, which is contained in a robust 19" x 1U casing.

The LiD2-GG2 has the following functionality:

- L1 GPS reception
- GLONASS reception
- VERIPOS L-band satellite reception
- input of external RTCM sources such as UHF
- internal calculation of high and standard precision position solutions with multiple levels of fall-back/back-up
- multiple serial, USB and Ethernet interfaces for input and output of data
- internal QC software via Verify-DP.