Verify DPx Installation Manual

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Manual Title:

Verify DPx Installation Manual

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CONTENTS

1. INTRODUCTION

1.1 GENERAL

This document provides the information required to install a Verify DPx system.

The system comprises a Verify DPx Touch Screen Computer and an associated LD3 (or LD3S) Integrated Positioning Mobile Unit.

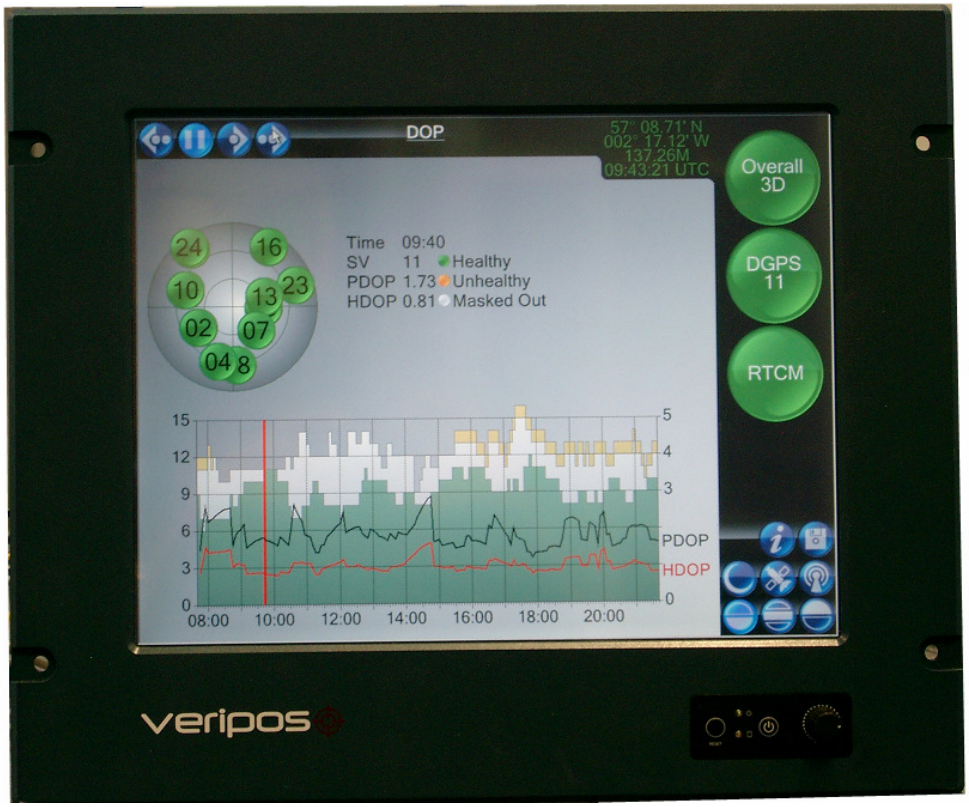
When consulting this document it will help the installer to have available the following items to assist in assessing and planning the work.

- The Verify DPx computer, LD3 (or LD3S) Integrated Positioning Mobile Unit and associated equipment shipped to site
- Equipment Packing List included with the equipment shipped to site
- This Verify DPx Installation Manual together with the separate operating manuals for the Verify DPx System and the LD3 (or LD3S) receiver.
- The VERIPOS Document Antenna & Coaxial Cable Installation (GD-GL-VER-EQP-801)
- 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 worldwide, 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 precise 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 10cms.
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.

1.2 VERIFY DPX SYSTEM DESCRIPTION



Verify DPx is a positioning system developed by VERIPOS primarily to meet the needs of DP operators. The system comprises an LD3 (or LD3S) Integrated Positioning Mobile together with a Touch Screen Panel PC running VERIPOS Verify DPx software. This software adds enhanced monitoring, QC and configuration facilities to the system.

The VERIPOS LD3 (or LD3S) is a small, light weight and economical receiver which is configured as an Integrated Positioning Mobile, complete with internal L1 GPS receiver.

It can receive VERIPOS Standard Service L-Band GPS Augmentation services from both high and low power satellites. The unit computes DGPS position solutions using single or multiple reference stations. The positions are computed within the GPS receiver and are output in NMEA format for use by the user's equipment.

The unit may optionally include a dual channel MF receiver which can accept correction data from two IALA MF Beacons. These corrections are used by the internal GPS receiver if it loses L-band corrections. Units that are enabled for IALA corrections are marked LID3 or LID3S.

The system provides real time status display for both GPS and correction data. It enables the operator to quickly and effectively assess position quality. It provides warnings of any fault conditions and maintains a 48 hour rolling log of significant events.

It provides simple controls for performing basic configuration of the positioning system. This is required when moving to a new operating region or enabling/disabling services.
The Touch-Screen Panel PC runs the Windows XP Embedded operating system and uses solid state storage. It has a 15" LCD display and is panel mounted for use in a DP console.

Alternatively, it may be mounted on a desktop or suspended from the roof using the brackets provided. A 19" rack-mount adapter is also available.

During normal operation the touch screen is used for all operator interaction – no keyboard or mouse is required.

1.3 WHAT THIS DOCUMENT COVERS

The purpose of this manual is to provide the necessary information to perform the installation of the VERIPOS Verify DPx Positioning System.

It covers installation of:

- Antennas
- Coaxial cables
- LD3 (or LD3S) receiver
- Verify DPx Computer

It is aimed at engineers who will be installing the hardware and peripheral equipment supplied with the Verify DPx System.

1.4 CONTENTS

This manual provides guidance to engineers installing a VERIPOS Verify DPx System on to a vessel.

Details are provided to assist in identifying the best locations for the system components and for correctly connecting the equipment ready for commissioning.

Read this manual and refer to the Scope of Supply or Equipment Packing List for your particular installation.

The manual covers installation of the Verify DPx Computer and LD3 (or LD3S) receiver variants.

Recommended process for installer

Use this manual as a guide when installing the Verify DPx System.

VERIPOS also provide detailed instructions for installing the antennas and cabling. Refer to 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 Verify DPx Computer, LD3 (or LD3S) receiver and associated equipment

2. Use Equipment Packing List to confirm all components are available

3. Follow the guidance in this Manual to correctly install the Verify DPx Computer and LD3 (or LD3S) receiver

1.5 TERMS AND ABBREVIATIONS

ADE	Above Deck Equipment
BDE	Below Deck Equipment
BER	Bit Error Rate
CoG	Course over Ground
CR	Carriage Return
DGPS	Differential GPS
DOP	Dilution of Precision
DP	Dynamic Positioning
EGNOS	European Geostationary Navigation Overlay System
GDOP	Geometry 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
KPH	Kilometres per Hour
LAN	Local Area Network
LF	Line Feed
LNA	Low Noise Amplifier
L-Band	Methods of transmitting Correction data to mobile users
LCD	Liquid Crystal Display
LD3	Unit containing GPS card, demodulator and PC processor
LVTTL	Low Voltage Transistor Transistor Logic
MF	Medium Frequency Radio used to Transmit Correction Data
MPH	Miles per Hour
m/s	Metres per Second
MSAS	Multi-functional Satellite Augmentation System
NMEA	National Marine Electronics Association
PDOP	Positional Dilution of Precision
PPP	Precise Point Positioning
PPS	Pulse per Second
PRN	Pseudo Random Noise
RMS	Root Mean Square
RTCM	Radio Technical Commission for Maritime Services
SBAS	Satellite Based Augmentation System
SD	Standard Deviation
SDRAM	Synchronous Dynamic Random Access Memory
SNF	Signal Notification Form
SNR	Signal to Noise
Spotbeam	High Power L-Band Signal
Standard	VERIPOS Single frequency DGPS system
Standard+	VERIPOS Dual frequency DGPS system
SV	Space Vehicle
Ultra	VERIPOS High accuracy positioning systems
USB	Universal Serial Bus
UTC	Coordinated Universal Time
VDOP	Vertical Dilution of Precision
VGA	Video Graphic Array
VOSS	VERIPOS Online Support System
WAAS	Wide Area Augmentation System
WEEE	Waste Electrical and Electronic Equipment

1.6 DOCUMENT CONVENTIONS

1.7 REFERENCES

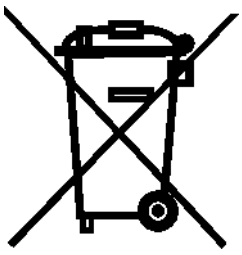
Please read this manual and refer to the following information where required:

- Antenna & Coaxial Cable Installation (GD-GL-VER-EQP-801)
- LD3 Operations Manual printed and on CD ROM
- Verify DPx Operations Manual printed and on CD ROM
- VERIPOS Online Support System (VOSS) 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.

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.



2. SAFETY

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 the Appendices should be completed.

2.1 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.

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.

2.2 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.

2.3 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.

2.4 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 any errors.

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

3. VERIFY DPX SYSTEM

This section gives an outline description of the VERIPOS Verify DPx System and the components used in installation variants which may be supplied.

The section contains details summarizing:

- Description of LD3 (or LD3S) Integrated Mobile
- Technical Specification for the LD3 (or LD3S)
- Description of the Verify DPx Computer
- Technical Specification for the Verify DPx Computer
- Antennas
- Coaxial Cables

3.1 DESCRIPTION OF LD3 (OR LD3S)

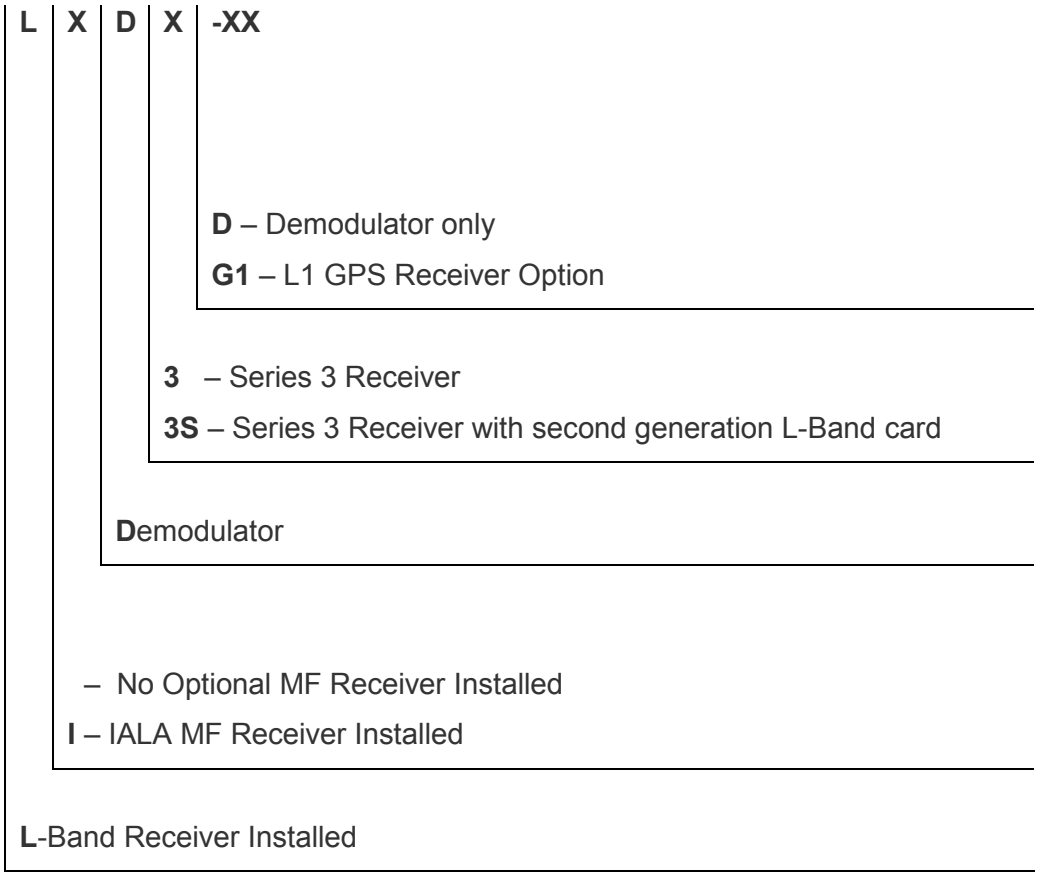
The VERIPOS LD3 (or LD3S) is a small, light weight and economical receiver which can be configured as an Integrated Positioning Mobile, complete with internal L1 GPS receiver.

The power input to the unit is 11 - 36VDC. An external PSU is required.
VERIPOS normally supply a suitable AC power supply.

The unit incorporates front panel LED indicators for status monitoring but it has no integral keyboard or alphanumeric display. Configuration is performed using the Verify DPx Computer.

Note: Some additional configuration may be required during commissioning. If needed, this is performed using VERIPOS utility software.

The LD3 (or LD3S) is available in various models, according to the user's requirements. The options installed are indicated by the model number as shown below:



Note that LD3 and LD3S models differ only in the model of L-band card installed.

Verify DPx systems use either LD3-G1 (LD3S-G1) or LID3-G1 (LID3S-G1) models.

All of these models can receive VERIPOS Standard Service L-Band GPS Augmentation services from both high and low power satellites. They can compute DGPS position solutions using single or multiple reference stations. The positions are output in NMEA format for use by the user's equipment.

Model LID3-G1 (or LID3S-G1) includes the optional dual channel MF receiver which can accept correction data from two IALA MF Beacons, provided that the vessel is within the operational range of an IALA Station. These corrections are used by the internal GPS receiver if it loses L-band corrections.

Note:

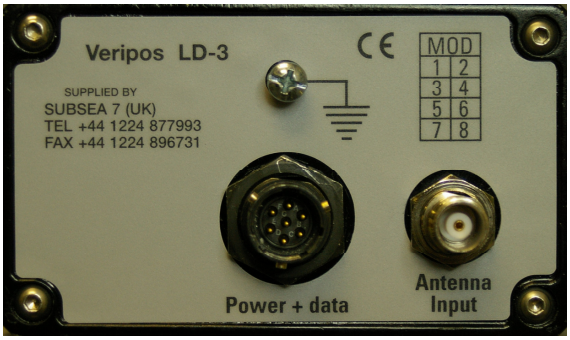
LD3 types are marked on the front of the receiver bottom left hand side.

LD3-G1 (and LD3S-G1) models are fitted with a single antenna input connector. (They can be special ordered with separate GPS and L-band antenna inputs.)

LID3-G1 (and LID3S-G1) models are fitted with separate GPS and L-band antenna inputs as standard.

Neither the LD3-G1 (LD3S-G1) nor the LID3-G1 (LID3S-G1) can receive VERIPOS HF reference stations.

The LD3 (or LD3S) can be fitted with one or two coaxial input connectors:



Single Coax connector

Dual Coax connector

1. Single coaxial connector

   LD3-G1 (or LD3S-G1) units with a single coaxial connector can only receive correction signals from high power satellites. A combined GPS and DGPS omni-directional antenna must be used. This receives signals from both the geo-stationary communications satellite and the GPS satellites.

2. Dual Coaxial connectors

One connector is used for the L-Band receiver and one for the GPS receiver. Depending on antenna choice the L-Band input may receive corrections from high or low power transmissions.

2.1. For LD3-G1 (or LD3S-G1) units - the GPS input may be used with a standard GPS antenna.

2.2. For LID3-G1 (or LID3S-G1) units - the GPS input may be used with a dual-band antenna to receive both GPS signals and correction signals from IALA MF Beacons.

Note: When used with a combined GPS and DGPS antenna (such as the CDA3) an antenna splitter is required.

3.2 TECHNICAL SPECIFICATION FOR LD3 (OR LD3S)

Certification: IEC 60945

Environmental Specification for LD3 (or LD3S)

Enclosure material	Aluminium
Enclosure protection	IP – 53
Operating Temperature Range	5˚C - 40˚C
Recommended operating temperature range	+20 - + 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 200 mm Standard Compass 300 mm

3.2.1 Mechanical

LD3 (or LD3S)
Receiver Size: 111mm × 66mm × 186mm (4.37” × 2.60” × 7.32”)
(These are the box dimensions. Allow additional clearance for connectors and optional mounting plate – see Appendix)

Weight: 1.15 kg (2.54 lb)
(Exact weight varies according to options installed)

3.2.2 Electrical

LD3 (or LD3S)
Input Voltage: 11-36 VDC
Power Consumption: 5W Typical
External PSU (typical): Input: 100-240VAC 47-63Hz.

3.2.3 Demodulator

LD3 (or LD3S) - 1525MHz to 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.

3.2.4 Panel Connectors

- **Control** – 7-pin Amphenol circular female connector, mounted on front panel

  This connector provides two bi-directional RS232 interfaces for:

  Demodulator configuration

GPS receiver configuration

Note: The GPS receiver Configuration port is also used to provide raw GPS data when interfacing to a VERIPOS Verify QC computer system.

If required, a 1pps timing pulse can also be output from this connector.

- **Power + data** – 7-pin Amphenol circular male connector, mounted on rear panel

  This connector is used for power input and also for RS232 output:

  DC power in
  NMEA out
  RTCM out

- **Antenna Input** (Units with single coaxial connector) – TNC female

  L-Band in and GPS in (use a combined GPS / DGPS antenna)

- **GPS Input** (Units with two coaxial connectors) – TNC female

  GPS in and IALA MF in (use a combined GPS / Beacon antenna)

- **L-Band Input** (Units with two coaxial connectors) – TNC female

  L-Band in

When used in the Verify DPx system, all data and power connections to the LD3 (or LD3S) are made using a special cable harness. See the Appendix for details.

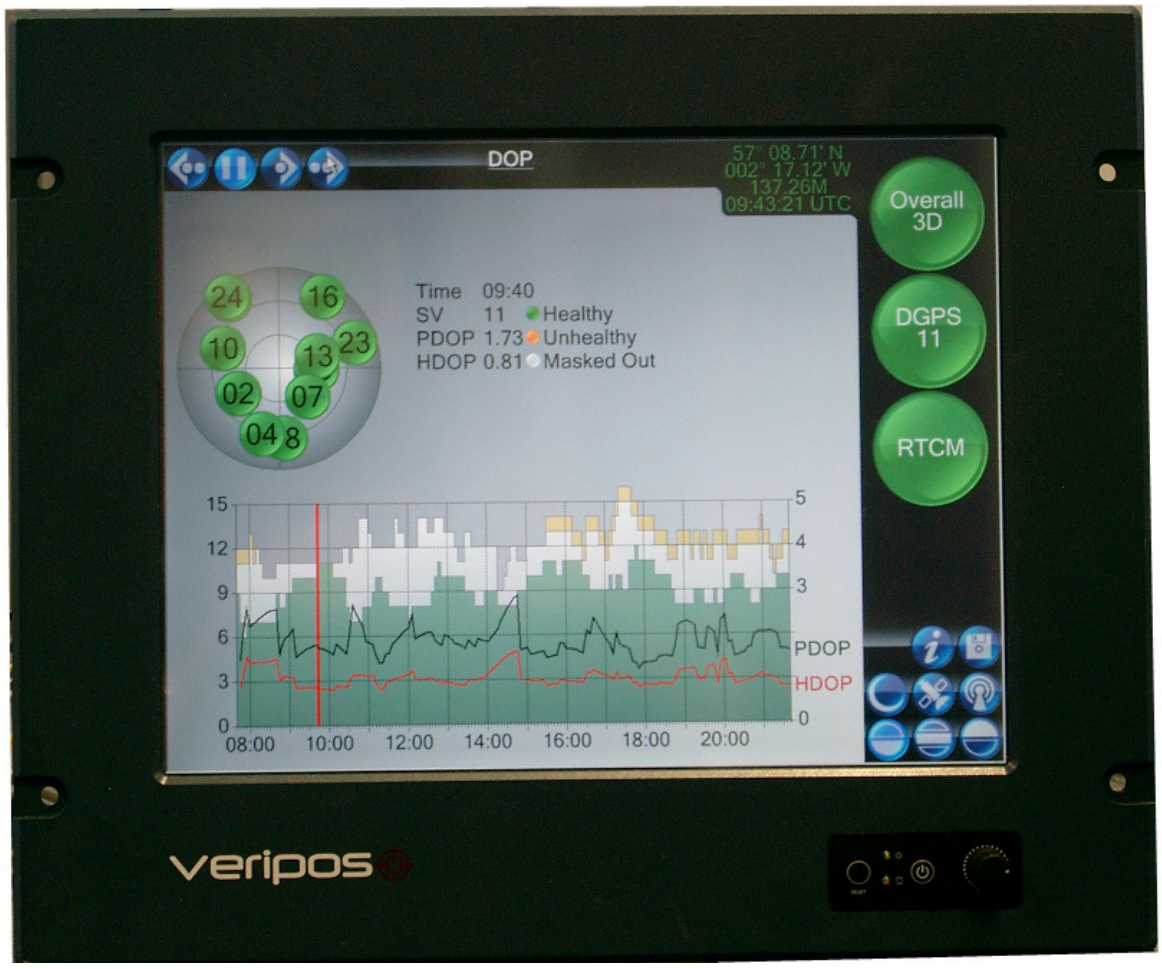
3.2.5 GPS receiver

Magellan* DG14

12 channel L1 C/A code and carrier
2 SBAS channels (WAAS/EGNOS/MSAS)
2 Beacon channels
Edge and Strobe correlator multipath mitigation
Standard NMEA-0183 V3.0 output
Differential base and remote RTCM V2.2
Raw data output (code and carrier)
1PPS (5V TTL)
Position and raw data update rates selectable up to 20Hz
Kalman Filter
2 x bi-directional RS-232 serial ports up to 115200 bps
Operating temp: -30°C to +70°C
Power Consumption: 1.2W

* Magellan purchased Thales Navigation (including Ashtech) in 2006 so all products now default to the Magellan manufacturer's name.

3.3 DESCRIPTION OF VERIFY DPX COMPUTER



All connectors are mounted at the bottom rear of the Panel PC

The Verify DPx Computer is a Touch-Screen Panel PC running the Windows XP embedded operating system with solid state storage. It has a 15" LCD display.
It is designed for mounting in a DP console. Alternatively, it may be mounted on a desktop, from the roof or in a 19" rack. Mounting hardware is available for all these options.
Detailed dimensional drawings are provided in the appendix.

The power switch, power indicator and backlight intensity control are mounted on the front panel. Note that the display may appear to be blank if the intensity control is set fully anti-clockwise.

During normal operation the touch screen is used for all operator interaction. A keyboard and mouse are only required during commissioning and maintenance but the installer should ensure that they can be easily connected when required. They are connected to a single PS/2 port on the computer using a “Y” cable which is supplied with the system.

All connectors are mounted on a single panel on the base of the unit. The power input is 24VDC, connected via screw terminals. An external AC power supply unit is provided with the system.

The system software is provided on a Compact Flash memory card which is fitted in a socket on the connector panel. It may be necessary to replace the card when performing software upgrades.

The computer is interfaced to the LD3 (or LD3S) receiver using the three 9-pin D Sub-miniature connectors. These are labelled Com1, Com2 and Com4. They carry RS232 signals and are all connected using a single prefabricated cable harness. (See appendix for harness details.)

Some systems are specified with a heading input from the vessel’s gyro. The NMEA gyro data is input to one of the USB ports, using a USB to serial converter.

The second USB port is used occasionally to connect an external storage device. (Usually a flash memory “USB Key”) This facilitates the entry of the software license key and enables the operator to archive logged files for troubleshooting and QC analysis.

Power controls are mounted on the front of the DPx unit as in illustration bellow.

3.4 TECHNICAL SPECIFICATION FOR VERIFY DPX COMPUTER

3.4.1 Mechanical

Typical: Overall dimensions:
Width: 412 mm (16.22 inches)
Height: 345mm (13.58 inches)
Depth: 79.7mm (3.14 inches) [Allow additional space behind unit for ventilation.]
Weight: 8.5kg (18.7lb) with mounting bracket

See appendix for full dimensional drawings, including panel cut out dimensions, brackets for desk/roof mounting and adapter for 19" rack mount.

3.4.2 Environmental

Operating temperature: -10 to 55 deg C
Operating humidity: 5% to 95% (non-condensing)
Anti-vibration: 5Hz~500Hz / 1Grms / 3 axis
Anti-shock: 15G, 11ms duration

3.4.3 Display

15" (diagonal) TFT touch screen

Pixel Number: 1024 × 768
Contrast ratio: 350:1 (typical)
Light Intensity: 400 cd/m^2 (typical)
Viewable angle: -85~85 (Horizontal); -80~70 (Vertical)
Max Colours: 8 bits

3.4.4 Input /Output Connectors

Serial (COM) ports: 2 × RS232; 1 × RS232/422/485
USB: 2 × USB Type-A receptacle
Ethernet LAN: 1 × RJ45 10/100 Mbps
Keyboard / Mouse: 1 × PS/2
RGB Out: 1 × VGA 15pin DSub (Female)
Compact Flash: 1 × Type I/II CF socket (live removal/insertion not supported)
DC power: DC terminal block

3.4.5 Power

24v DC Power Supply input on screw terminals.
Typical consumption of 45W in normal operation.

3.5 ANTENNAS

CDA-3 combined antenna is used with most Verify DPx systems

This can receive all the signals used by the LD3 (or LD3S):

- Single frequency GPS signals
- L-Band correction signals from geo-stationary satellites
- IALA MF correction signals

Only a single 50 ohm coaxial cable is required.

Specification for CDA-3 Antenna

GPS Freq. Range: L1 (1575 MHz ± 20 MHz)
GPS LNA Gain: 27 dB
L-band Freq. Range: 1525 to 1585 MHz
L-band LNA Gain: 28 dB
Beacon Freq. Range: 283.5 to 325 kHz
Beacon LNA Gain: 34 dB
Dimensions: 141 mm dia x 127 mm H
(5.57” dia 5.00” H)
Weight: 0.478 kg (1.1 lb)
Antenna Connector: TNC-socket
Enclosure: polycarbonate
Mounting Thread: 1-14-UNS-2B
Input Voltage: 5.0 to 15.0 VDC
Input Current: 50 to 60 mA
Operating Temp.: -40°C to +85°C
Storage Temp.: -40°C to +85°C
Relative Humidity: 100% condensing

3.6 COAXIAL CABLES

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 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.

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)

Environmental Specifications		
Performance Property	°F	°C
Installation Temperature Range	-40/+185	-40/+85
Storage Temperature Range	-94/+185	-70/+85
Operating Temperature Range	-40/+185	-40/+85

Electrical Specifications			
Performance Property	Units	US	(metric)
Cutoff Frequency	GHz	16.2	
Velocity of Propagation	%	85	
Dielectric Constant	NA	1.38	
Time Delay	nS/ft (nS/m)	1.20	(3.92)
Impedance	ohms	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	ohms/1000ft (/km)	1.39	(4.6)
Outer Conductor	ohms/1000ft (/km)	1.65	(5.4)
Voltage Withstand	Volts DC	2500	
Jacket Spark	Volts RMS	8000	
Peak Power	kW	16	

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.

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)

Environmental Specifications		
Performance Property	°F	°C
Installation Temperature Range	-40/+185	-40/+85
Storage Temperature Range	-94/+185	-70/+85
Operating Temperature Range	-40/+185	-40/+85

Electrical Specifications			
Performance Property	Units	US	(metric)
Cutoff Frequency	GHz	16.2	
Velocity of Propagation	%	85	
Dielectric Constant	NA	1.38	
Time Delay	nS/ft (nS/m)	1.20	(3.92)
Impedance	ohms	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	ohms/1000ft (/km)	1.39	(4.6)
Outer Conductor	ohms/1000ft (/km)	1.65	(5.4)
Voltage Withstand	Volts DC	2500	
Jacket Spark	Volts RMS	8000	
Peak Power	kW	16	

3.7 SCOPE OF SUPPLY

The equipment details for the specific installation are contained in the Equipment Packing List which accompanies the shipment.

For a single positioning system, the shipment would typically include:

Verify DPx Touch Screen Computer with power supply and mounting brackets

Keyboard and mouse with “Y” connection harness

Amplicon USB-232U converter with type A to type B USB cable (Optional)

Main computer interface cable harness

LD3 (or LD3S) Integrated Positioning Mobile with power supply (See section 3.1 for details of model numbers)

2 × coaxial cable pigtails (LMR-240)

Main antenna coaxial cable (LMR-400)

CDA3 combined antenna with right-angled mounting bracket.

4. 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 for reference when planning the installation in conjunction with this installation manual.

Installation depends upon;

- type and number of Antenna(s) to be installed
- number of coaxial cables to be installed
- the connection made for output of position data from the LD3 (or LD3S) receiver
- whether a gyro is interfaced to the Verify DPx computer

If any questions arise during installation or more guidance is needed, please contact your supplier or VERIPOS.

Any pre-installation check list should include safety considerations.
If required see the Safety checklist provided in the Appendix.

Topic	Notes
Confirm location of Verify DPx computer	Ensure the DPO has a clear view of the screen from his normal work station and can easily reach the touch screen. Check the cable route to the LD3 (or LD3S).
Confirm location of LD3 (or LD3S) 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 and other point on the vessel.
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

For guidance on Verify DPx configuration and use see the Verify DPx Operations Manual
For guidance on LD3 (or LD3S) configuration and use see the LD3 (or LD3S) Operations Manual – copies at http://help.veripos.com .

The sections follow a typical order of work for installation of the Verify DPx System:

- Choosing a location for the Verify DPx Computer
- Choosing a location for the LD3 (or LD3S) receiver

- Antenna Installation
- Coaxial Cable Installation
- LD3 (or LD3S) Installation
- Verify DPx Computer Installation

4.1 CHOOSING A LOCATION FOR THE VERIFY DPX COMPUTER

The primary consideration in deciding the location of the DPx computer is to make it easily accessible to the DPO. The system is designed for continuous monitoring of positioning quality so it must be visibly from the operator's main work station.

The operator interacts with the system using a touch screen so the display must be within easy reach.

The computer uses a conventional LCD display so it must be shielded from direct sunlight to maintain legibility.

Some additional factors should also be considered:

- Physical mounting (see appendix for full dimensional drawings) :

  The PC is mounted in a standard marine panel 412mm wide by 346mm high and is suitable for installation directly into a console.
  The minimum clearance required behind the panel is 69.7mm. Additional clearance is required across most of the rear to allow for air circulation through the ventilation slots.

  A bracket is supplied which is suitable for either bench or roof mounting.
  It permits the screen to be adjusted through a total of 40 degrees – see drawings in appendix.

  An optional adapter panel can be provided for mounting the unit in a 19" rack.

- Power

  The power input to the Panel PC is 24VDC and typical consumption is 45watts.
  An external PSU is supplied with the unit. This requires an AC supply of 90-265v, 50 or 60 Hz. It should be connected to a source of clean power, preferably from the vessel's UPS system.

  A grounding screw is provided on the rear of the unit. This must be connected to the ship's ground.

- Environmental

  The unit is ruggedly constructed and intended for marine applications but it should be protected from excessive heat and vibration. It has no fan but the rear ventilation slots should not be obstructed.

- Interfacing

  The computer is interfaced to the LD3 (or LD3S) Positioning Mobile unit using a special cable harness. (See drawing in appendix.) The main section of the cable is

10m in length. Where possible, the DPx computer and LD3 (or LD3S) unit should be positioned so that this cable can be easily installed between them. Note that both ends of the harness are terminated with multiple connectors – it cannot easily be passed through a small aperture. (Contact VERIPOS if a longer cable is needed.)

The system may optionally be specified with a heading input. This uses NMEA heading data from the vessel's gyro which is interfaced to a computer USB port. An Amplicon USB-232U converter is required. This is a line powered USB-to-serial converter. The necessary driver is pre-installed in the supplied software.

The installer should consider the cable routing between the gyro and computer. Some gyros use the RS422 or RS485 interface rather than RS232. In this case an additional RS232-to-RS422 converter will be required.

- Keyboard and Mouse

  The touch screen interface is used for all normal operation but a keyboard and mouse are required during initial commissioning and may be needed later for fault finding. They are connected to a single PS2 connector on the rear of the computer, using a "Y" cable supplied by VERIPOS.
  When installed in a console, the rear panel may not be readily accessible. In this case, the user should make provision to easily connect a keyboard and mouse. (This typically requires an extension cable to be run from the rear panel to some accessible location.)

- USB External Storage

  It is occasionally necessary to connect a USB flash storage device (USB Key) to the spare USB port on the rear panel of the computer. (This is necessary when entering a license code or to archive logging data for offline processing for fault diagnosis or QC.)
  When installed in a console, the rear panel may not be readily accessible. In this case, the user should make provision to easily connect a USB device. (This typically requires an extension cable to be run from the rear panel to some accessible location.)

- Slave Display

  Although rarely needed, the installer should be aware that the computer has a VGA output which may be used to drive a slave display. (The slave screen would be for display only; it would have no touch screen facility.)

4.2 CHOOSING A LOCATION FOR THE LD3 (OR LD3S)

The location and mounting arrangements for all LD3 (or LD3S) equipment must be discussed and agreed with the vessel owners/charterers prior to any installation work commencing.

The LD3 (or LD3S) is a very small, light-weight unit so it can be mounted in any convenient location.
It has no fan or ventilation slots so it may be mounted in any attitude.

If rack mounting is required, a suitable shelf unit must be provided. This can be supplied by VERIPOS, if required.

The unit has a power consumption of only 4W so it will have little impact on the environment of adjacent equipment. It requires a DC input of 11 – 36v so a small external PSU may be required. This is normally supplied by VERIPOS and should be located close to the LD3 (or LD3S). The PSU requires a source of clean AC power. If possible, it should be connected to the vessel's UPS system.

The main considerations when selecting the mounting site:

- Ease of access for coaxial cable(s) so that the cable bend radius is within limits.
- Length and routing of cable harness between LD3 (or LD3S) and DPx computer
- Ease of routing of interface cable from LD3 (or LD3S) to DP system.
- A nearby source of clean AC (or DC) power.
- A nearby grounding point for the chassis.
- The front panel should be easily visible to the operator (for viewing status LED's)
- The location must not be subject to high temperatures, excessive vibration or dust.
- The unit should be shielded from direct sunlight

4.3 ANTENNA INSTALLATION

This section provides general guidance on installation of antennas and cabling when installing the LD3 (or LD3S) receiver.

It is very important to the ongoing performance of your system that a high a quality installation is performed. This will ensure optimum performance and reliability.

Before commencing hardware installation, the following preliminary steps must be completed:

- Antenna mounting locations must be discussed and agreed with vessel personnel.
- Coaxial cable routes should be checked for obstructions, through-bulkhead access and suitable attachment points.
- 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.
- All radar systems should be switched off and isolated/tagged out during the installation period.
- If the installing engineer needs to operate in an area near the vessel's Inmarsat dome, he must either maintain the separation distance specified by the

manufacturer or else the system must be switched off and isolated/tagged out during the installation period.

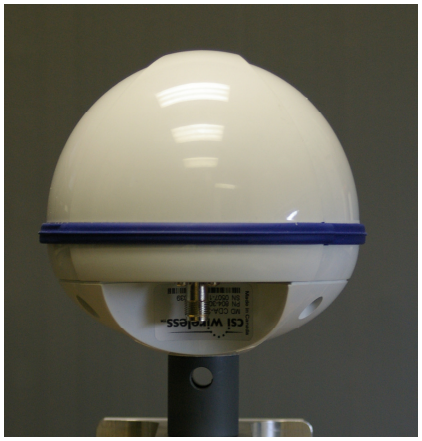
- A risk assessment must be performed to evaluate and minimise the risks involved with the installation of the antennas and associated hardware. Immediately prior to work commencing a briefing session must be held to ensure that all personnel involved in the installation are fully aware of the work to be undertaken and the risks involved.

The Verify DPx System is normally shipped with a CDA-3 combined antenna.
This can receive all the signals which are required, using only a single coaxial cable:

Single frequency GPS signals
L-Band correction signals from geo-stationary satellites
IALA MF correction signals

(Other antennas may be used if the user has special requirements. This should be discussed with the VERIPOS Operations during initial system specification.)

Note: When using the CDA-3 antenna with an LD3 (or LD3S) which has separate L-Band and GPS antenna inputs, an external RF splitter is required.



CDA-3 GNSS Combined Antenna

The CDA-3 antenna has a threaded base which is designed to accept a standard 5/8" x 11 UNC tripod mount. VERIPOS supply a right angled mounting bracket which is attached to the mast using "U" bolts. The antenna is secured to the top plate using a 5/8" bolt.

The user may also choose to fabricate a custom bracket or mount the antenna directly to a threaded pole. Caution is required – the antenna may be damaged if the securing screw is too long.

For guidance on the choice of antenna location and details of other antennas, please refer to VERIPOS Document **"Antenna & Coaxial Cable Installation"** (GD-GL-VER-EQP-801), provided as part of the installation documentation.

WARNING: The above document includes details of the procedure for interfacing to the vessel's Inmarsat system. This may be beneficial in some special circumstances, as detailed in the document.
For all LD3 (or LD3S) units, a DC block must be fitted between the unit and the Inmarsat connection. **Damage can occur if this is omitted.**

DC block

The illustration shows a typical DC block. This should be included in the installation kit if an Inmarsat connection is planned. (If it cannot be located, contact VERIPOS.)
It has "N" type connectors so it is fitted between the LD3 (or LD3S) L-Band pigtail and the main coax.

Note that the Inmarsat cannot be interfaced to an LD3-G1 (or LD3S-G1) unless it is ordered with the optional dual antenna inputs. (Separate coax connector for L-Band input.)

4.4 COAXIAL CABLE INSTALLATION

The main run should be a single cable, joins must be avoided.

As noted earlier in the manual, VERIPOS recommend the use of LMR 400 cable for the main cable runs. Where possible, it is recommended that the user should measure the cable runs and order pre-terminated cables. These have proved more reliable in service.

Coaxial pigtails of smaller diameter cable will be required at both ends of the cable run. LMR 240 cable is recommended for this purpose. The pigtails are more flexible than the main cable so they facilitate routing and reduce the strain on the connectors. They are also used to convert from the "N" type connectors used on the LMR 400 to the TNC connectors fitted to the LD3 (or LD3S) and (most) antennas.

Please refer to VERIPOS Document **"Antenna & Coaxial Cable Installation"** (GD-GL-VER-EQP-801), provided as part of the installation documentation.
This document provides general guidance on cable routing, maximum acceptable cable lengths and (if required) cable termination.

4.5 LD3 (OR LD3S) INSTALLATION

This section describes the mechanical installation of the LD3 (or LD3S) and the cable connections.
The installation site should have been chosen according the to guidelines described in section 4.1

General guidelines for cable installation

- Avoid running coaxial or data cables parallel to power cables.
- Secure all cables neatly with tie wraps. Do not apply excess pressure - avoid damaging the cables.

4.5.1 Mechanical Installation

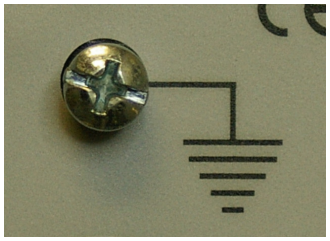
The LD3 (or LD3S) case is formed from a box-section aluminium extrusion, fitted with end plates. The bottom of the case has two slots which can accept M4 half-height nuts. These nuts can be used for securing the unit.

The unit can be supplied ready-mounted on a base plate which allows it to be easily secured on any flat surface. See Appendix.

The external power supply unit should be mounted nearby.

4.5.2 Grounding the LD3 (or LD3S) chassis

Use 12 to 14 AWG earth cable and ring connectors to ground the LD3 (or LD3S) chassis to the ship's superstructure.



Ground connection on rear panel of LD3 (or LD3S)

4.5.3 Antenna Inputs (Coaxial cables, TNC connectors.)

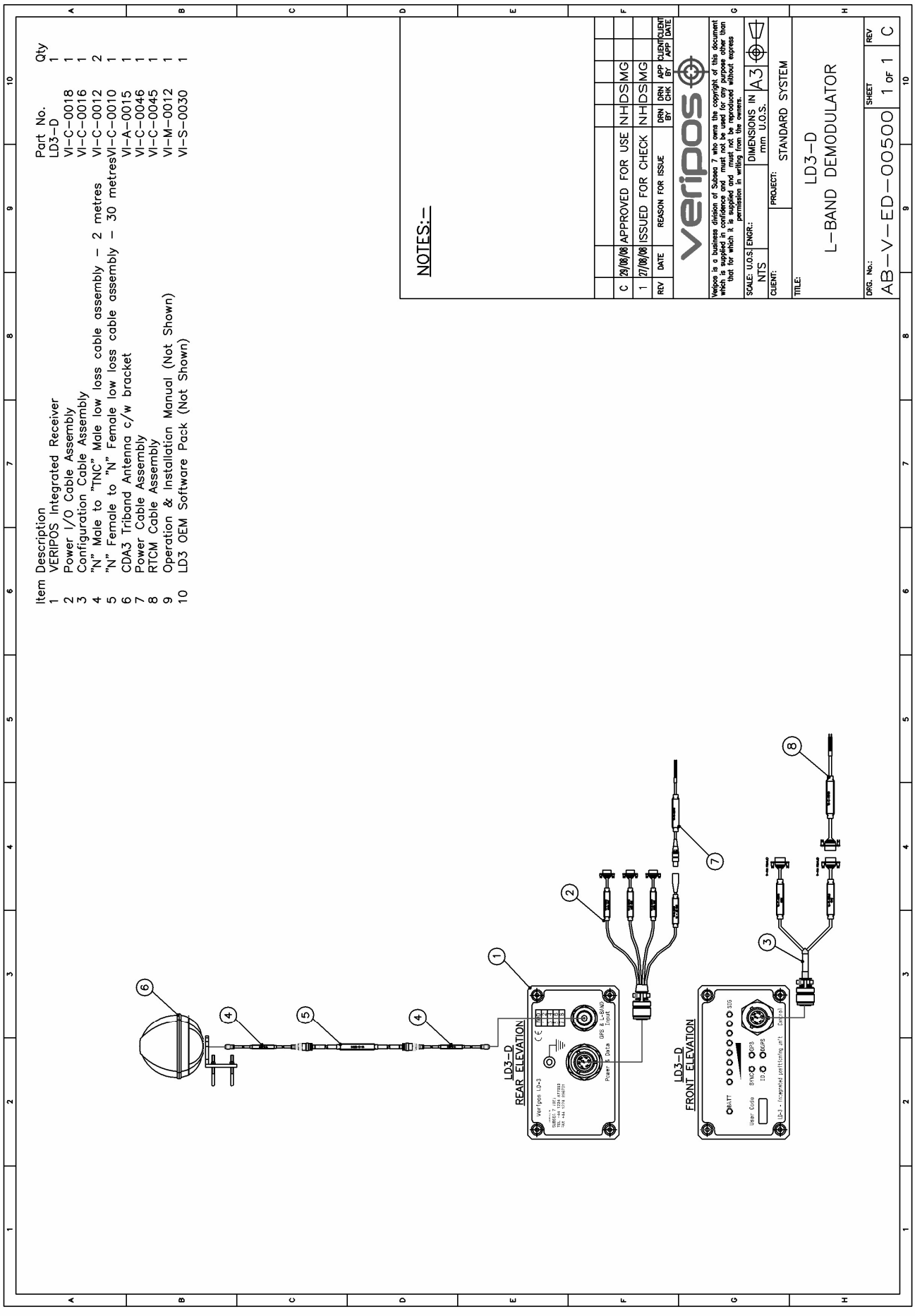
The exact model of LD3 (or LD3S) receiver is described in the Scope of Supply as agreed between VERIPOS and the customer.

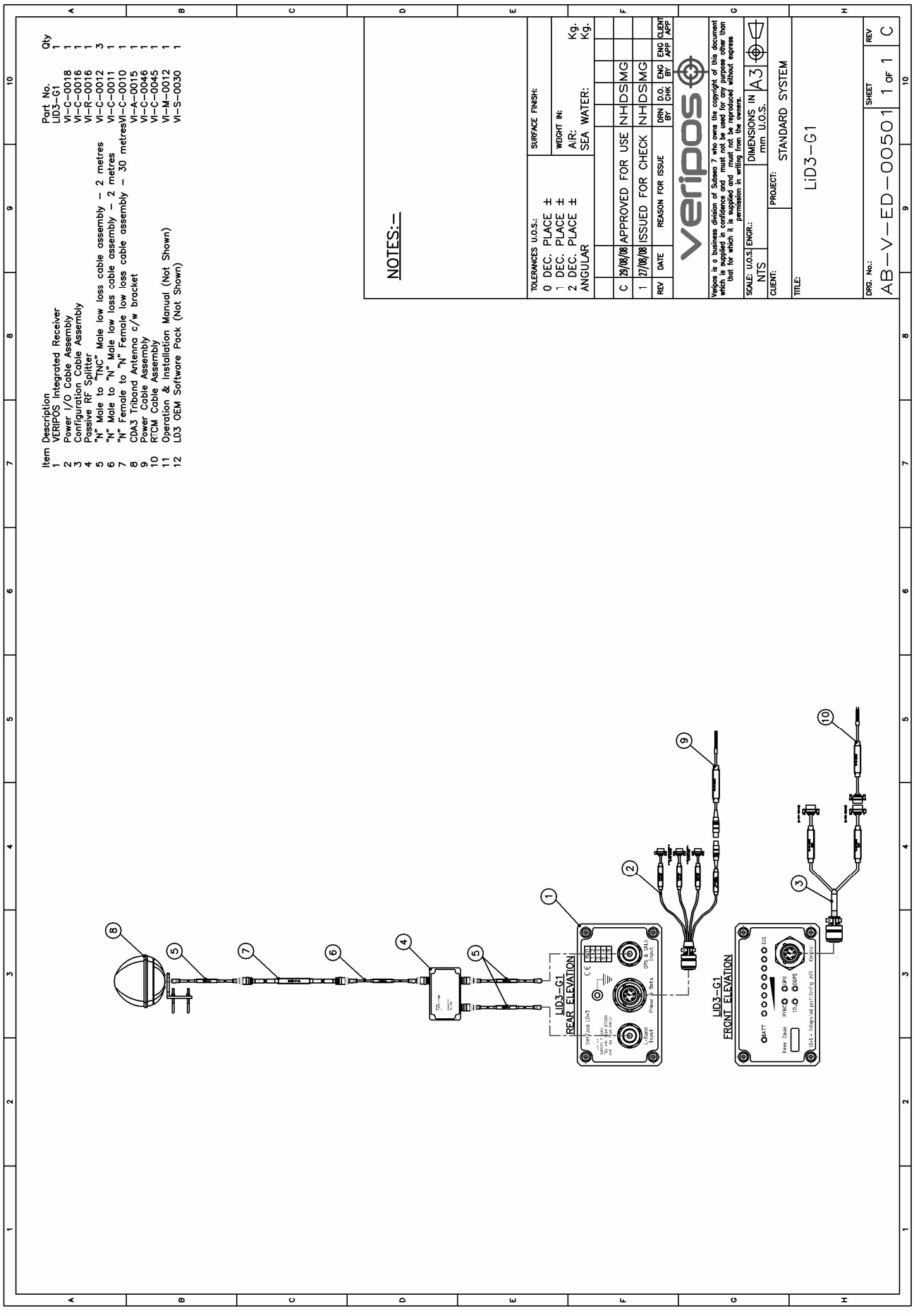
The installer must be aware of LD3 (or LD3S) variant and antenna types which he is installing since this affects how the coaxial cables are connected.

The LD3-G1 (or LD3S-G1) and LID3-G1 (or LID3S-G1) units used with Verify DPx Systems are usually shipped with CDA3 tri-band antennas.

Note: If used with an LD3 (or LD3S) having separate L-Band and GPS antenna inputs an external RF splitter is required. (See diagrams below.)

Below are two examples of installation drawings for LD3 (or LD3S) units. The first shows a unit with a single antenna input; the second shows one with dual antenna inputs.


Item Description Part No. Qty
1 VERIPOS Integrated Receiver LD3-D 1
2 Power I/O Cable Assembly VI-C-0018 1
3 Configuration Cable Assembly VI-C-0016 1
4 "N" Male to "TNC" Male low loss cable assembly - 2 metres VI-C-0012 2
5 "N" Female to "N" Female low loss cable assembly - 30 metres VI-C-0010 1
6 CDA3 Triband Antenna c/w bracket VI-A-0015 1
7 Power Cable Assembly VI-C-0046 1
8 RTCM Cable Assembly VI-C-0045 1
9 Operation & Installation Manual (Not Shown) VI-M-0012 1
10 LD3 OEM Software Pack (Not Shown) VI-S-0030 1
NOTES:-
REV DATE REASON FOR ISSUE DRN BY CHK APP BY CLIENT APP CLIENT DATE
C 29/08/08 APPROVED FOR USE NH DS MG
1 27/08/08 ISSUED FOR CHECK NH DS MG
Veripos is a business division of Subsea 7 who owns the copyright of this document which is supplied in confidence and must not be used for any purpose other than that for which it is supplied and must not be reproduced without express permission in writing from the owners.
SCALE: U.O.S. ENGR.: NTS
DIMENSIONS IN mm U.O.S. A3
CLIENT:
PROJECT: STANDARD SYSTEM
TITLE: LD3-D L-BAND DEMODULATOR
DRG. No.: AB-V-ED-00500
SHEET 1 OF 1
REV C
LD3-D REAR ELEVATION
LD3-D FRONT ELEVATION


Item Description Part No. Qty
1 VERIPOS Integrated Receiver LID3-G1 1
2 Power I/O Cable Assembly VI-C-0018 1
3 Configuration Cable Assembly VI-C-0016 1
4 Passive RF Splitter VI-R-0016 1
5 "N" Male to "TNC" Male low loss cable assembly - 2 metres VI-C-0012 3
6 "N" Male to "N" Male low loss cable assembly - 2 metres VI-C-0011 1
7 "N" Female to "N" Female low loss cable assembly - 30 metres VI-C-0010 1
8 CDA3 Triband Antenna c/w bracket VI-A-0015 1
9 Power Cable Assembly VI-C-0046 1
10 RTCM Cable Assembly VI-C-0045 1
11 Operation & Installation Manual (Not Shown) VI-M-0012 1
12 LD3 OEM Software Pack (Not Shown) VI-S-0030 1
NOTES:-
TOLERANCES U.O.S.:
0 DEC. PLACE ±
1 DEC. PLACE ±
2 DEC. PLACE ±
ANGULAR
SURFACE FINISH:
WEIGHT IN:
AIR: Kg.
SEA WATER: Kg.
REV DATE REASON FOR ISSUE DRN BY D.O. CHK ENG BY ENG APP CLIENT APP
C 29/08/08 APPROVED FOR USE NHDS MG
1 27/08/08 ISSUED FOR CHECK NHDS MG
veripos
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SCALE: U.O.S. ENGR.: NTS
DIMENSIONS IN mm U.O.S. A3
CLIENT:
PROJECT: STANDARD SYSTEM
TITLE: LiD3-G1
DRG. No.: AB-V-ED-00501
SHEET 1 OF 1
REV C
LID3-G1 REAR ELEVATION
LID3-G1 FRONT ELEVATION

The following table lists various antennas and indicates how their cables should be connected to the LD3 (or LD3S) units. Where your supplied equipment is not shown please contact VERIPOS.

Antenna Type	LD3 (or LD3S) Single antenna I/P	LD3 (or LD3S) Dual antenna I/Ps	
	Antenna Input	GPS Input	L-Band Input
CDA-3	X	X (note 1)	X (note 1)
90984			X
Feed from Inmarsat			X
AD251		X (note 2)	
A30	X	X (note 1)	X (note 1)
AD410		X (note 2) (note 3)	

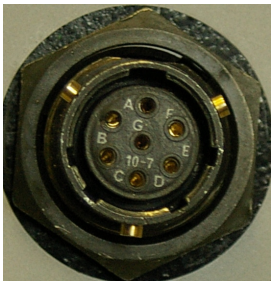
Note 1: An external passive RF splitter is required – details in Antennas & coaxial cabling guide.
Note 2: Not recommended for LID3S-G1 (Does not support IALA Beacon receiver)
Note 3: The AD410 is a dual frequency antenna.

The above table includes details for connecting to the vessel's Inmarsat system. For model LD3-G1 (or LD3S-G1), this is only possible if the unit is ordered with the dual antenna option. (Separate coax connector for L-Band input.)

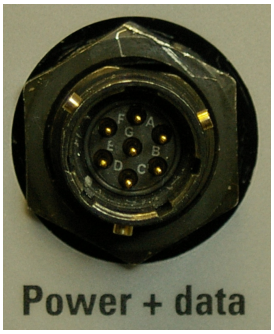
WARNING: For all LD3 (or LD3S) units a DC block must be fitted between the unit and the Inmarsat connection. **Damage can occur if this is omitted.**

4.5.4 Power and Data Cables

All the power and I/O functions of the LD3 (or LD3S) are combined in two 7-pin Amphenol circular connectors which are mounted on the front and rear panels. These are shown below.

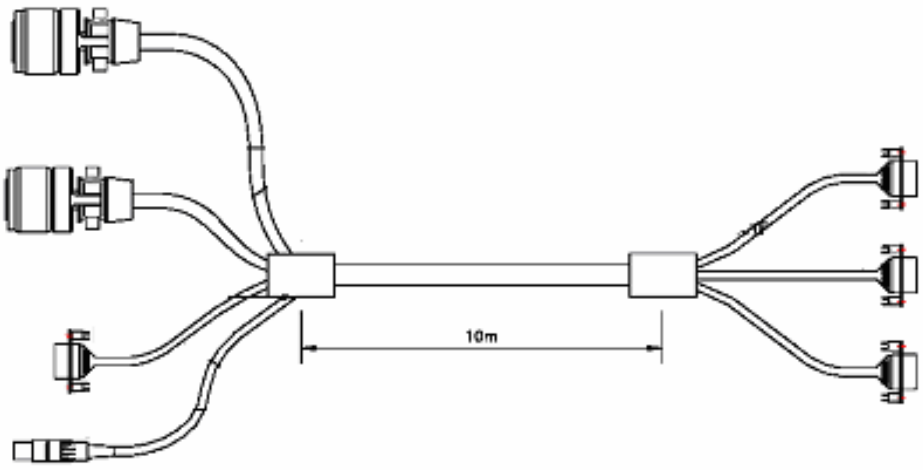


Front panel connector
Control



Rear panel connector
Power + data

When used with a DPx system, a special cable harness may be supplied as shown below (A full harness wiring diagram is provided in the appendix):



LD3 (or LD3S) Connections **DPx connections**

At the DPx end, the cable is terminated in three 9-pin D Sub-miniature connectors labelled Com1, Com2 and Com4. These are connected to the correspondingly labelled sockets on the computer.

At the LD3 (or LD3S) end, the cable is terminated in two 7-pin circular connectors, a small 3-pin circular connector and a 9-pin D Sub-miniature connector

Connect the 7-pin circular plugs to the front and rear panel connectors on the unit. (One is male and the other female so they cannot be confused.)

The 3-pin circular miniature plug carries the DC power input to the unit. Connect this to the matching cable socket on the external 12V DC power unit (supplied with the LD3 (or LD3S)).

If a cable harness is not supplied as above 2 separate cable harnesses will be supplied. However the connections to the LD3 are the same as above.

The 9-pin D Sub-miniature connector provides the NMEA Position Output from the LD3 (or LD3S). It is labelled “NMEA OUT”.
This is an RS232 signal and will normally be interfaced to the DP system. The output is on pin 2 with the signal ground on pin 5.
The interface cable will be supplied by the installer and must be selected in accordance with the RS232 specification. This requires the use of low capacitance cable for longer runs.

(If the length exceeds that recommended for RS232, then it may be necessary to convert to RS422 for the main cable run.)

Some DP systems may require use of the RS422 protocol. In this case, fit an RS232 to RS422 converter between the LD3 (or LD3S) and the interfaced equipment.
The converter should be placed adjacent to the LD3 (or LD3S) since transmissions using the RS422 protocol have better noise immunity and support longer cable runs. The cable should be selected in accordance with the RS422 specification.

4.6 INSTALLING DPX COMPUTER

Warning: The DPx computer is robustly constructed but it requires careful handling during installation to prevent damage to the touch screen display.

The installation location should have been chosen during the pre-installation survey after considering operational, environmental and interfacing requirements as described in section 4.1.
Please refer back to this section to review the detailed requirements for choosing the optimum installation site.

During final installation, the installer should be especially aware of the following:

- There must be sufficient space behind the computer to allow a free flow of air through the rear ventilation slots.
- The external AC power supply unit must be mounted nearby and will require a source of clean power.
- The grounding screw on the rear panel must be connected to the vessel’s ground.
- The computer will be connected to the LD3 (or LD3S) Positioning Mobile using a prefabricated cable harness. The routing for this cable should have been decided during the initial planning. Verify that the supplied cable is long enough to run between the equipment locations and that there are no obstructions to the route.
- All connections are made to a panel on the bottom of the computer. There must be adequate access to this panel for service requirements.
  (The system software is loaded on a CF memory card which is inserted in this panel. System upgrades may require this card to be replaced.)

The unit may be mounted:

Directly into a console
On brackets attached to desktop or roof
Into a 19” rack (using special adapter panel.)

Dimensional drawings of the unit, panel cut-out and mounting hardware are provided in the appendix.

NOTE: Before fully mounting and interfacing the unit, it is recommended that the installer should temporarily secure it in the intended location, apply power and request the bridge crew to confirm that the location is ergonomically satisfactory:

- *The DPO can easily read the screen from his usual work station (Best checked with a display on screen due to limitations of viewing angle)*
- *He can easily reach the touch screen*
- *The screen is sheltered from direct sunlight*

If this check is satisfactory, final installation may commence. If the crew have any reservations, review the alternative mounting arrangements listed above

4.6.1 Mechanical

Mount the unit using whichever hardware was selected.
Consult the appendix for dimensions of cut-outs etc.

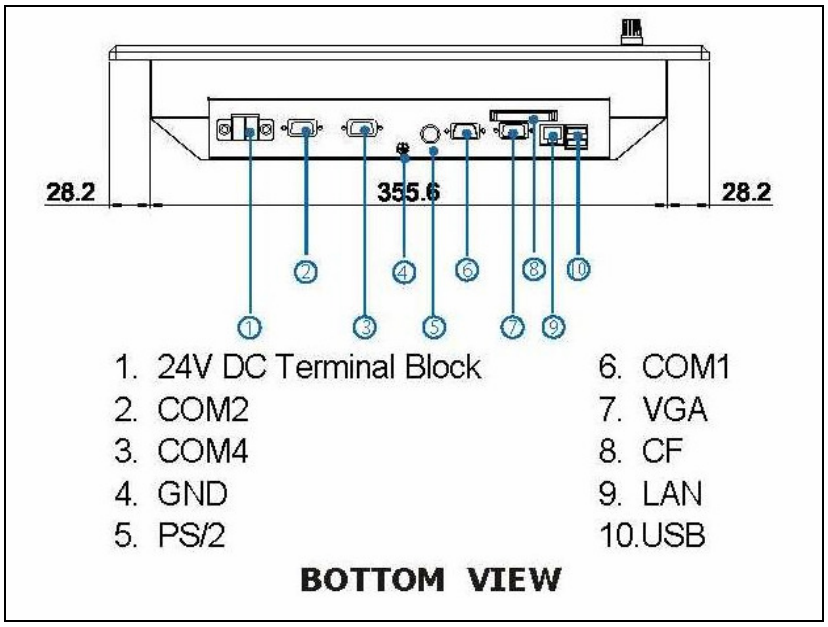
4.6.2 Power

Connect the ground screw on the computer connector panel to the vessel's ground. (See diagram of connector panel below.)

Mount the external PSU in a suitable location nearby and connect the output cable to the DC input terminals on the computer connector panel, ensuring that the polarity is correct.

Connect AC input of the external power supply to a source of clean power (preferably the ship's UPS) using the supplied power cable.

4.6.3 Interface Panel PC to LD3 (or LD3S)



Connector panel

The cable harness supplied incorporates all the required interface signals between the DPx system and the LD3 (or LD3S). If the special cable harness is supplied as on page 30, connect the three D sub-miniature connectors (labelled COM1, COM2 and COM4) to corresponding sockets on the connector panel. If two separate cable harnesses are supplied connect the D sub-miniatures as follows GPS to Com1, RTCM to Com2 and OEM to Com4.

Secure all connectors by fully tightening the jack screws.
Secure to cable harness to minimise any stress on the connectors.

4.6.4 Gyro Interface

The system may optionally be specified with a heading input. This uses NMEA heading data from the vessel's gyro which is interfaced to a computer USB port.

An Amplicon USB-232U converter is required and is shipped with the system when specified. This is a line powered USB-to-serial converter and the driver is pre-installed.

(Note: Installer should not substitute a different model of converter as there may be software driver conflicts.)

The converter must be connected to the computer using a type A to type B USB cable. This will be supplied in the shipment.

If the gyro has an RS232 output, it may be connected directly to the converter, which uses the standard RS232 pin-out convention.

Some gyros use the RS422 or RS485 interface rather than RS232. In this case, an additional RS232-to-RS422 converter will be required. Contact VERIPOS for details.

The interface cable from the gyro to the converter will be provided by the installer and should be chosen in accordance with the interface specification. (RS232 and RS422 require different cable types.)

Note: The USB design provides no way to secure the connector. It is very important that the installer secures the cable to minimise the strain on the connector.

4.6.5 Keyboard and Mouse

The touch screen interface is used for all normal operation but a keyboard and mouse are required during initial commissioning and may be needed later for fault finding. They are connected to a single PS2 connector on the rear of the computer, using a "Y" cable supplied by VERIPOS.

Note: When installed in a console, the rear panel may not be readily accessible. In this case, the installer must make provision to easily connect a keyboard and mouse. (This typically requires an extension cable to be run from the rear panel to some accessible location.)

Note: The PS/2 design provides no way to secure the connector. It is very important that the installer secures the cable to minimise the strain on the connector.

4.6.6 USB External Storage

During commissioning it will be necessary to enter a license code into the computer. This is most easily accomplished by loading a file from a USB flash storage device (USB Key) which is connected to the spare USB port on the rear panel of the computer.

This connection is also necessary in order to archive logging data for offline processing. This may be required for fault diagnosis or QC.

Note 1: When installed in a console, the rear panel may not be readily accessible. In this case, the installer should make provision to easily connect a USB device. This typically requires an extension cable to be run from the rear panel to some accessible location. It is very important that the installer secures the cable to minimise the strain on the connector.

4.6.7 Slave Display

Although rarely needed, the installer should be aware that the computer has a VGA output which may be used to drive a slave display. (The slave screen would be for display only; it would have no touch screen capability.) The connector is a standard 15 pin D Sub-miniature.

APPENDIX I.

CONTACTS LIST

VERIPOS 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.

VERIPOS Helpdesk Telephone: +44 (0) 1224 527104

VERIPOS Helpdesk Facsimile: + 44 (0) 1224 748204

VERIPOS Helpdesk E-mail: veripos.helpdesk@subsea7.com

VERIPOS Online Support Site (VOSS): http://help.veripos.com

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

Additional VERIPOS office addresses are listed below: -

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

Greenwell Road
East Tullos
Aberdeen, AB12 3AX
United Kingdom

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

APPENDIX II.

SAFETY CHECKLIST

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?	-		

BEFORE 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 Equip. – Visually Fit for Use	8		
Safety Equipment – All Certified	9		
Hard Hat – Chin Strap fitted and Used	10		
Use “Fall Arrest” Equipment or	11		
Use in-place “Latchways” System	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		

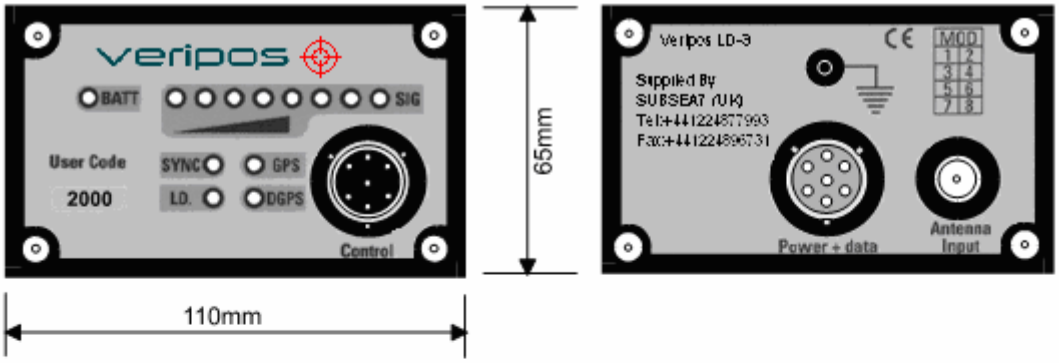
Safety Check List Reference Details

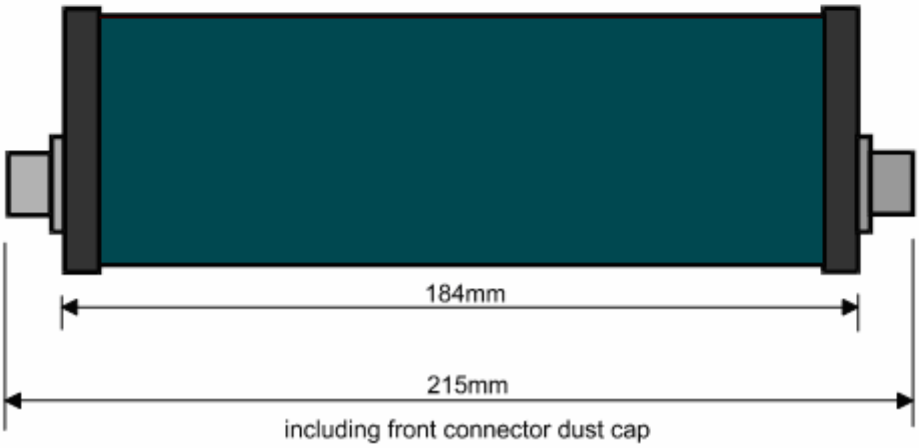
Item	Task
1.	Before commencing any work at height obtain a Permit to Work from the Watchkeeper in the Wheelhouse. Obtain a portable radio tuned to the vessel frequency to maintain communications with the vessel Watchkeeper.
2.	Confirm that all transmitting devices are switched off and tagged out.
3.	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.
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 2268Kg or 5000lbs. 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.

APPENDIX III.

MECHANICAL DETAILS – LD3 (OR LD3S) RECIEVER

LD3 (or LD3S) DIMENSIONS



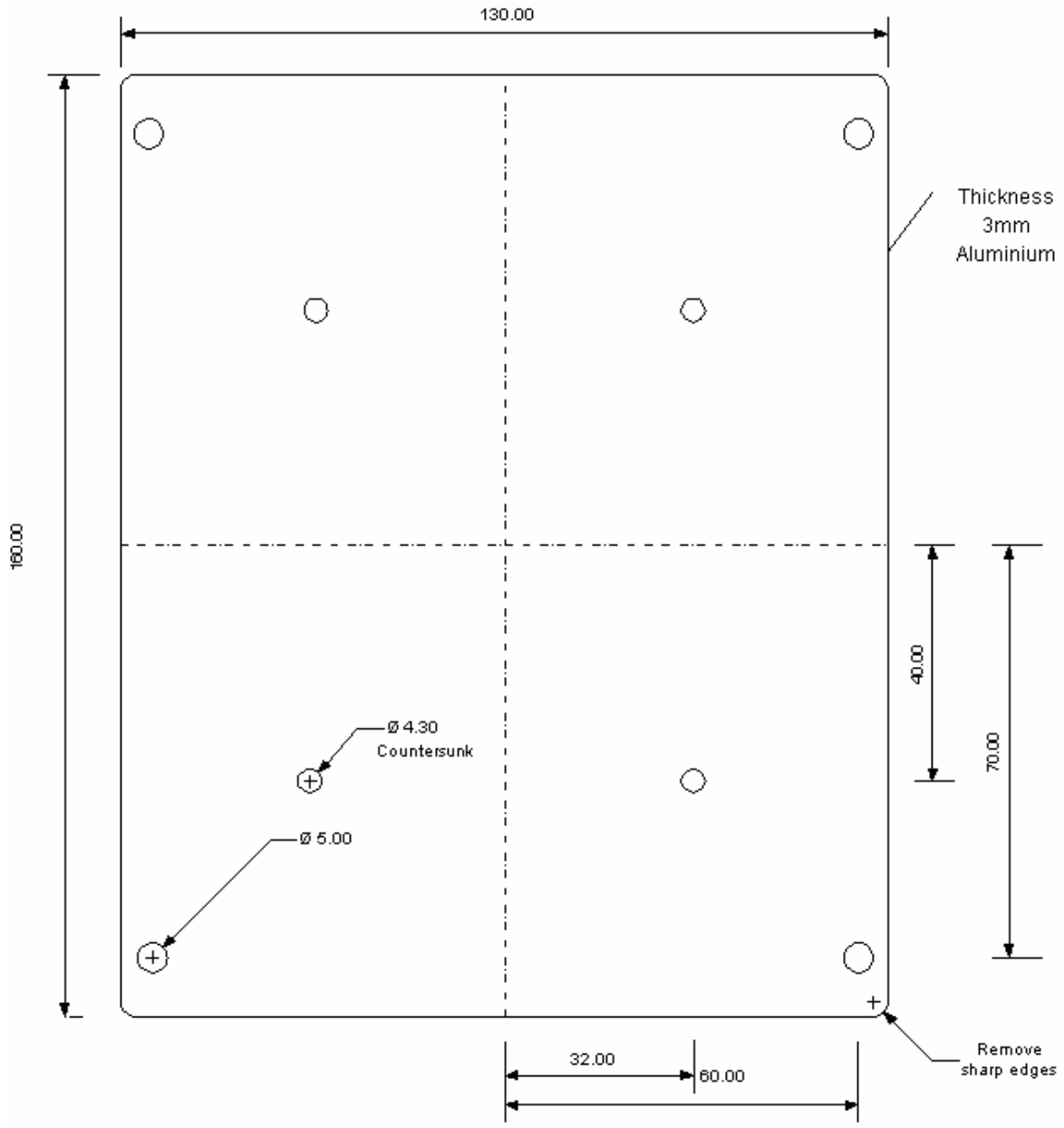


All dimensions are metric. US Standard dimensions are as follows:

110mm	=	4.33”
65mm	=	2.56”
184mm	=	7.24”
215mm	=	8.46”

LD3 (or LD3S) MOUNTING PLATE DIMENSIONS

The plate is secured to the receiver by four M4x5 CSK screws and half height nuts.



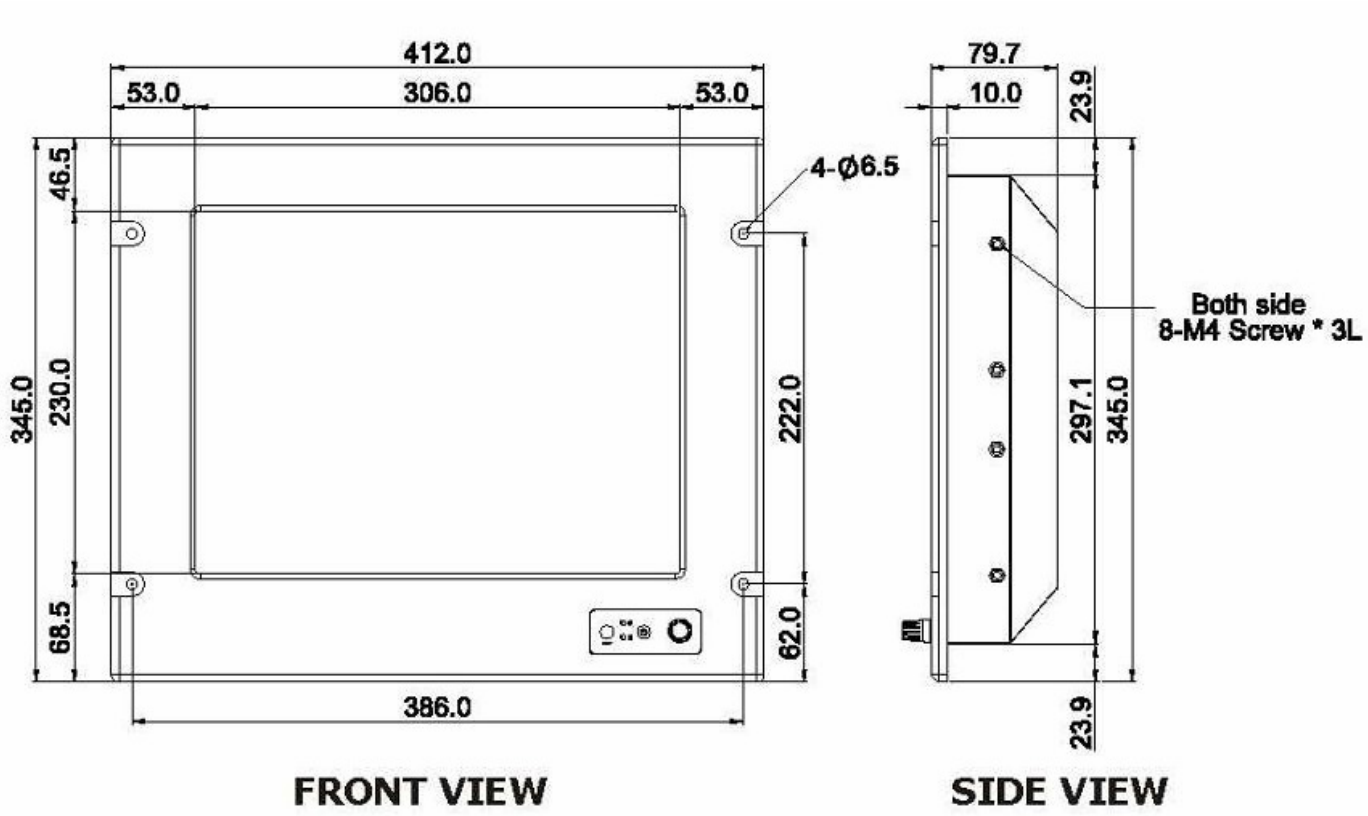
All dimensions are metric. US Standard dimensions are as follows:

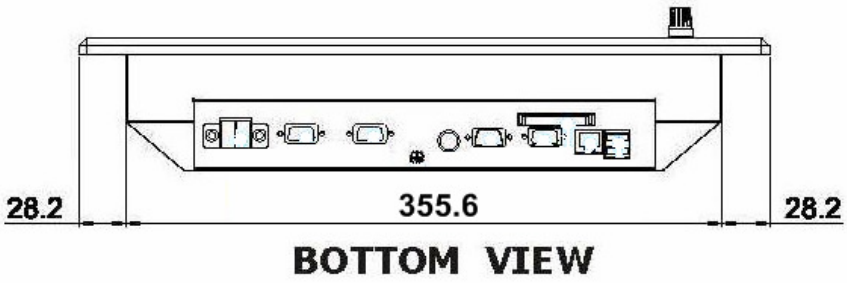
130mm	=	5.12”
160mm	=	6.3”
70mm	=	2.76”
40mm	=	1.57”
32mm	=	1.26”
60mm	=	2.36”
4.3mm	=	0.17”
5mm	=	0.2”
3mm	=	0.12”

APPENDIX IV.

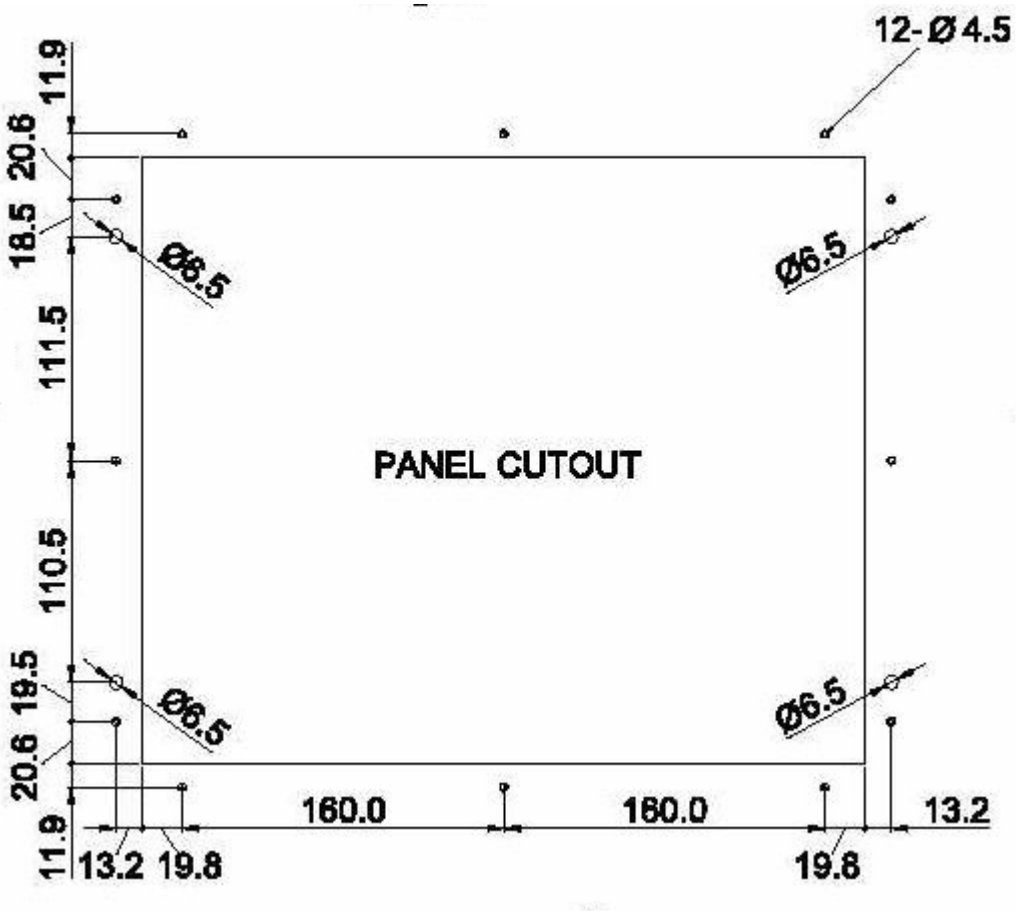
MECHANICAL DETAILS – VERIFY DPX COMPUTER

Panel PC Dimensions

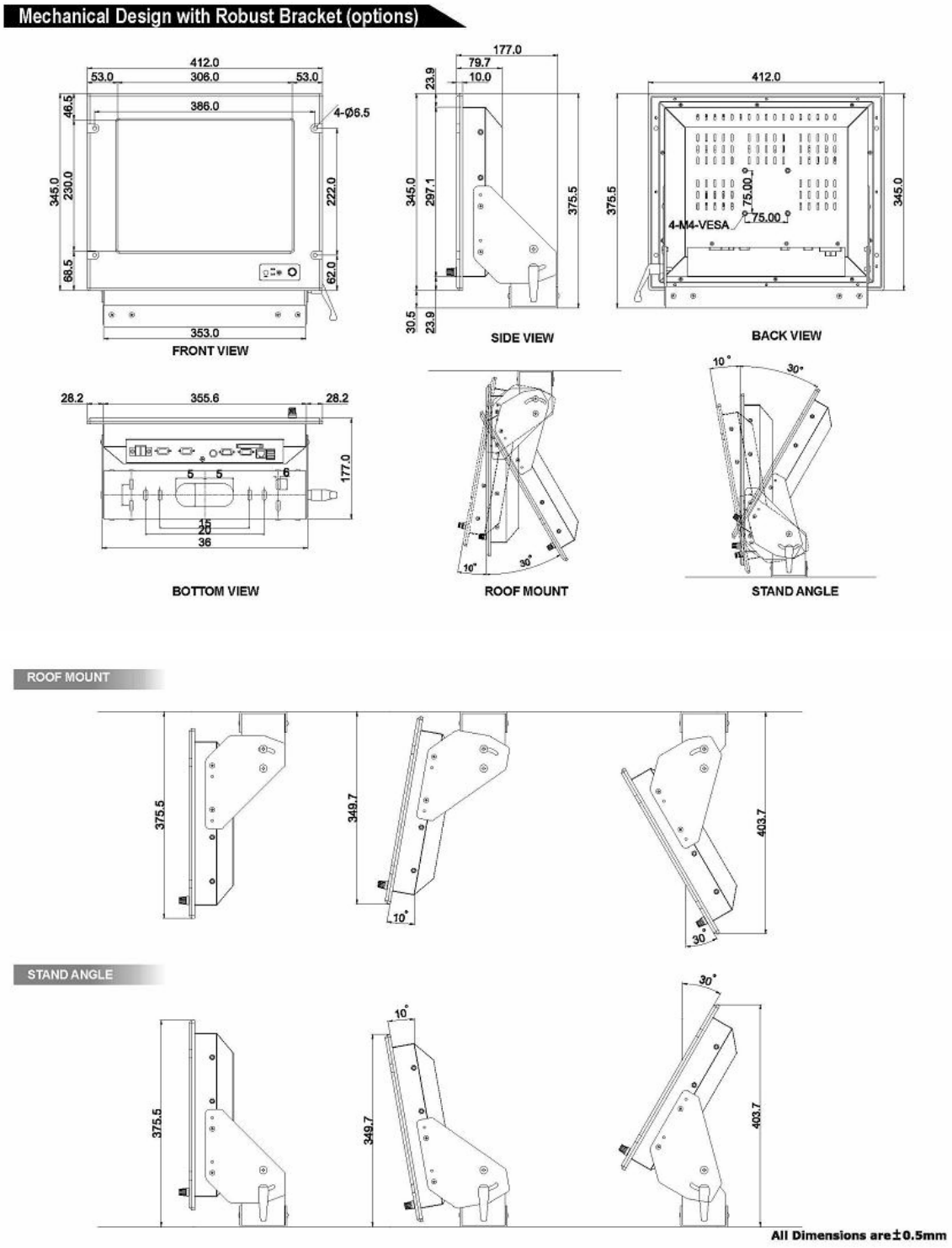




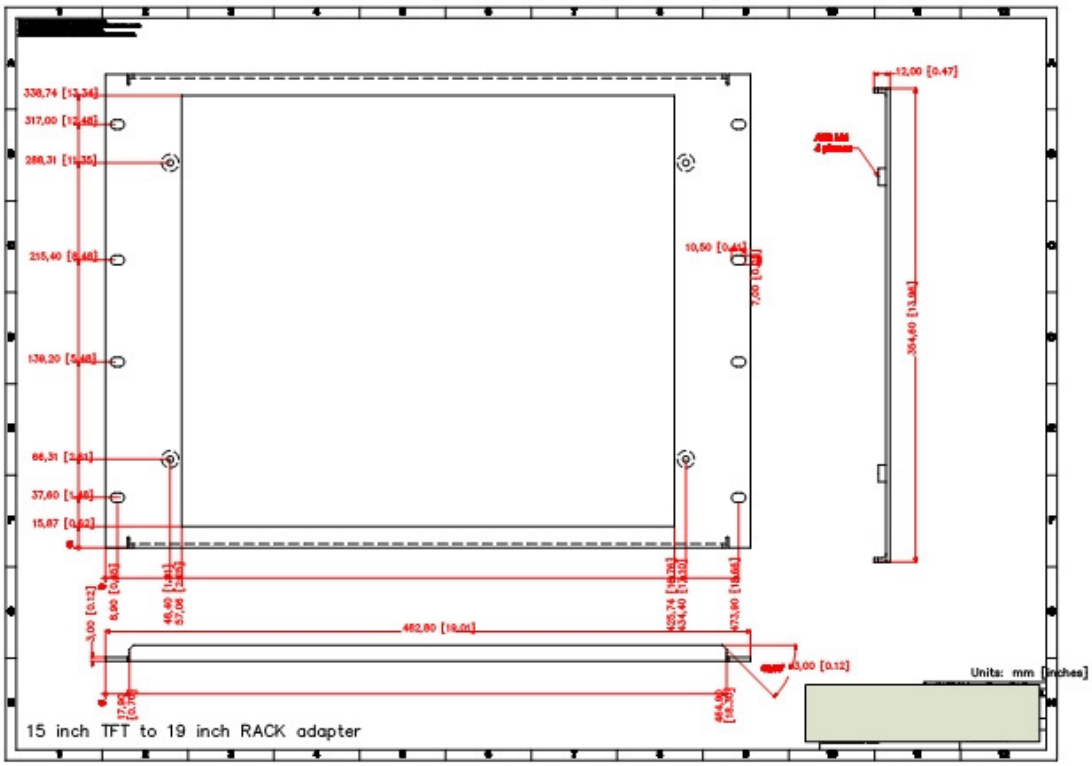
PANEL CUTOUT



MOUNTING BRACKETS

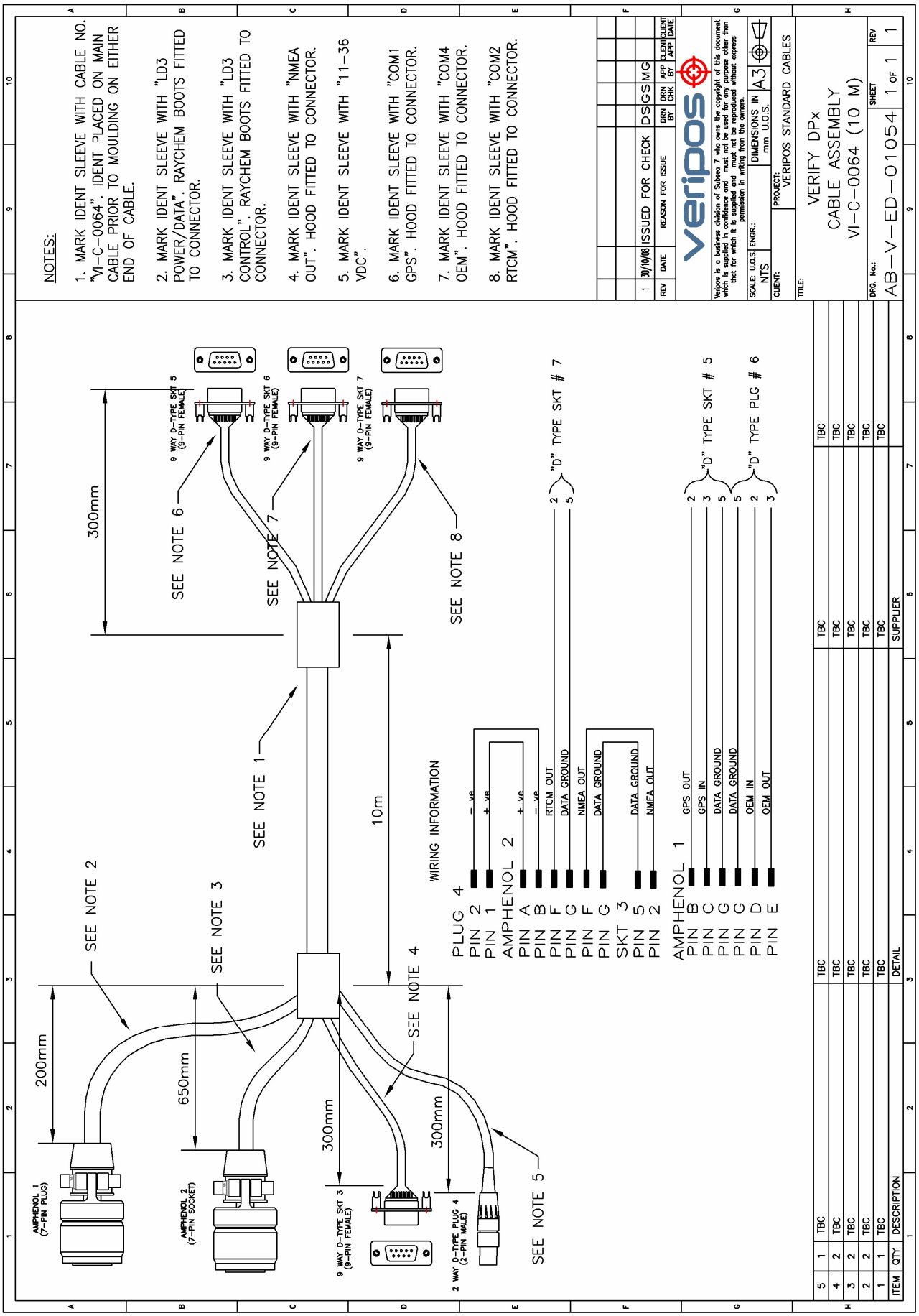


Adapter Plate for 19 Inch Rack Mounting



APPENDIX V.

CABLE HARNESSES


NOTES:
1. MARK IDENT SLEEVE WITH CABLE NO. "VI-C-0064". IDENT PLACED ON MAIN CABLE PRIOR TO MOULDING ON EITHER END OF CABLE.
2. MARK IDENT SLEEVE WITH "LD3 POWER/DATA". RAYCHEM BOOTS FITTED TO CONNECTOR.
3. MARK IDENT SLEEVE WITH "LD3 CONTROL". RAYCHEM BOOTS FITTED TO CONNECTOR.
4. MARK IDENT SLEEVE WITH "NMEA OUT". HOOD FITTED TO CONNECTOR.
5. MARK IDENT SLEEVE WITH "11-36 VDC".
6. MARK IDENT SLEEVE WITH "COM1 GPS". HOOD FITTED TO CONNECTOR.
7. MARK IDENT SLEEVE WITH "COM4 OEM". HOOD FITTED TO CONNECTOR.
8. MARK IDENT SLEEVE WITH "COM2 RTCM". HOOD FITTED TO CONNECTOR.
REV 1 DATE 30/10/08 REASON FOR ISSUE ISSUED FOR CHECK DRN BY DS CHK GS APP BY MG CLIENT APP CLIENT DATE
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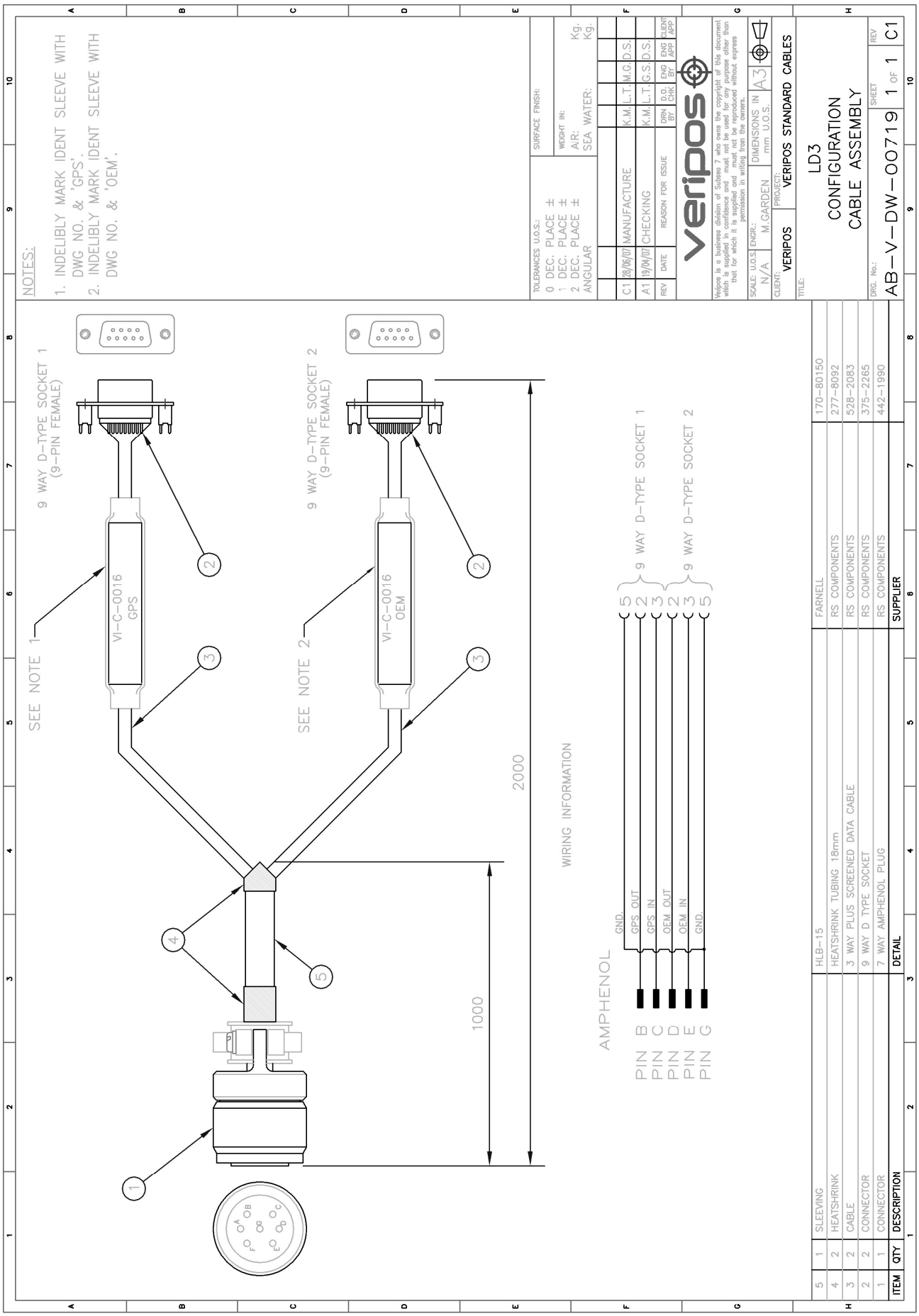
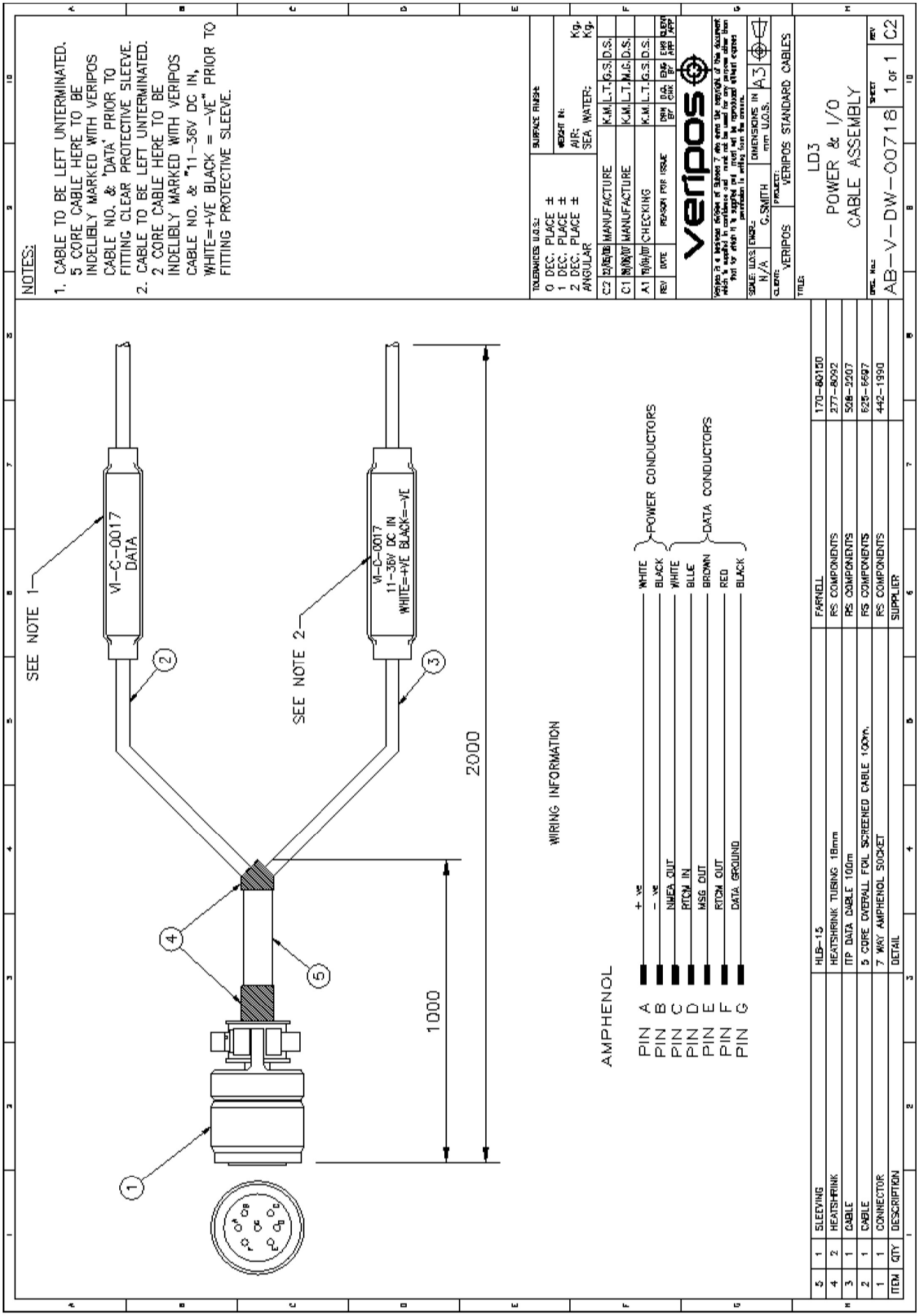
SCALE: U.O.S. ENGR.: NTS
DIMENSIONS IN mm U.O.S.
A3
CLIENT:
PROJECT: VERIPOS STANDARD CABLES
TITLE: VERIFY DPx CABLE ASSEMBLY VI-C-0064 (10 M)
DRG. No.: AB-V-ED-01054
SHEET 1 OF 1
REV 1
SEE NOTE 1
SEE NOTE 2
SEE NOTE 3
SEE NOTE 4
SEE NOTE 5
SEE NOTE 6
SEE NOTE 7
SEE NOTE 8
200mm
650mm
300mm
300mm
300mm
10m
AMPHENOL 1 (7-PIN PLUG)
AMPHENOL 2 (7-PIN SOCKET)
9 WAY D-TYPE SKT 3 (9-PIN FEMALE)
2 WAY D-TYPE PLUG 4 (2-PIN MALE)
9 WAY D-TYPE SKT 5 (9-PIN FEMALE)
9 WAY D-TYPE SKT 6 (9-PIN FEMALE)
9 WAY D-TYPE SKT 7 (9-PIN FEMALE)
WIRING INFORMATION
PLUG 4
PIN 2 - ve
PIN 1 + ve
AMPHENOL 2
PIN A + ve
PIN B - ve
PIN F RTCM OUT
PIN G DATA GROUND
PIN F NMEA OUT
PIN G DATA GROUND
SKT 3
PIN 5 DATA GROUND
PIN 2 NMEA OUT
"D" TYPE SKT # 7
2
5
AMPHENOL 1
PIN B GPS OUT
PIN C GPS IN
PIN G DATA GROUND
PIN G DATA GROUND
PIN D OEM IN
PIN E OEM OUT
"D" TYPE SKT # 5
2
3
5
5
"D" TYPE PLG # 6
2
3
ITEM QTY DESCRIPTION DETAIL
5 1 TBC
4 2 TBC
3 2 TBC
2 2 TBC
1 1 TBC
SUPPLIER
TBC
TBC
TBC
TBC
TBC
TBC


NOTES:
1. INDELIBLY MARK IDENT SLEEVE WITH DWG NO. & 'GPS'.
2. INDELIBLY MARK IDENT SLEEVE WITH DWG NO. & 'OEM'.
9 WAY D-TYPE SOCKET 1 (9-PIN FEMALE)
9 WAY D-TYPE SOCKET 2 (9-PIN FEMALE)
SEE NOTE 1
SEE NOTE 2
VI-C-0016 GPS
VI-C-0016 OEM
2000
1000
WIRING INFORMATION
AMPHENOL
PIN B GND
PIN C GPS OUT
PIN D GPS IN
PIN E OEM OUT
PIN F OEM IN
PIN G GND
9 WAY D-TYPE SOCKET 1
9 WAY D-TYPE SOCKET 2
LD3
CONFIGURATION
CABLE ASSEMBLY
AB-V-DW-00719
VERIPOS STANDARD CABLES
ITEM QTY DESCRIPTION SUPPLIER
5 1 SLEEVING HLB-15 FARNELL 170-80150
4 2 HEATSHRINK HEATSHRINK TUBING 18mm RS COMPONENTS 277-8092
3 2 CABLE 3 WAY PLUS SCREENED DATA CABLE RS COMPONENTS 528-2083
2 2 CONNECTOR 9 WAY D TYPE SOCKET RS COMPONENTS 375-2265
1 1 CONNECTOR 7 WAY AMPHENOL PLUG RS COMPONENTS 442-1990



ITEM	QTY	DESCRIPTION	SUPPLIER	FARNELL
5	1	SLEEVING	DETAIL	HLB-15	170-8015O
4	2	HEATSHRINK	RS COMPONENTS	HEATSHRINK TUBING 18mm	277-8092
3	1	CABLE	RS COMPONENTS	ITP DATA CABLE 100m	508-2207
2	1	CABLE	RS COMPONENTS	5 CORE OVERALL FOIL SCREENED CABLE 100m.	625-6697
1	1	CONNECTOR	RS COMPONENTS	7 WAY AMPHENOL SOCKET	442-1990

APPENDIX VI.

PARTS LIST

COMPONENT ITEMS

NOMENCLATURE

V I X - XXXX

Sequential Number (0010 – 9999)

A **– Antenna Assembly**
C **– Cable Component**
D **– Data Component**
E **– Enclosure Component**
M **– Manuals (All Literature & Documentation)**
R **– RF Component**
S **– Software Component**
V **– Control and Display Component**

Component Item

V**ERIPOS**

ANTENNAS

Part No.	Description	DWG (Dimensional)
VI-A-0010	AD251 – L1 GPS	AB-V-ED-01204
VI-A-0011	AD410 – L1 / L2 GPS & GLONASS	AB-V-ED-01205
VI-A-0013	90984 – L-Band	AB-V-ED-01203
VI-A-0014	DHM5000 – MF & HF	AB-V-ED-01202
VI-A-0015	CDA3 – Tri-band, L-Band, MF and L1 GPS	AB-V-ED-01206
VI-A-0016	PGA1 – L1 / L2 GPS & GLONASS	AB-V-ED-01231
VI-A-0017	A30 – Tri-Band, L-Band, MF and L1 GPS	AB-V-ED-01235

CABLES

Part No.	Description	DWG (GA)
VI-C-0010	30 Metre LMR 400 DB Assembly NF-NF	AB-V-ED-01000
VI-C-0011	2 Metre LMR 240 DB Assembly NM-NM	AB-V-ED-01001
VI-C-0012	2 Metre LMR 240 DB Assembly NM-TNCM	AB-V-ED-01002
VI-C-0015	Earth Braid Assembly	AB-V-ED-01005
VI-C-0016	LD3 Configuration Cable	AB-V-ED-01006
VI-C-0017	LD3 Power I/O	AB-V-ED-01007
VI-C-0018	LD3 Power I/O	AB-V-ED-01008
VI-C-0019	LD3 Power C/W Encapsulated PSU	AB-V-ED-01009
VI-C-0021	RS232	AB-V-ED-01011
VI-C-0022	RS232 Null Modem	AB-V-ED-01012
VI-C-0023	RS232 Null Modem “Y”	AB-V-ED-01013
VI-C-0024	LD3 Modified Power I/O	AB-V-ED-01014
VI-C-0029	30 Metre LMR 400 DB Assembly NF-NM	AB-V-ED-01019
VI-C-0030	40 Metre LMR 400 DB Assembly NF-NF	AB-V-ED-01020
VI-C-0031	50 Metre LMR 400 DB Assembly NF-NF	AB-V-ED-01021
VI-C-0032	100 Metre LMR 400 DB Assembly NF-NF	AB-V-ED-01022
VI-C-0033	80 Metre LMR 400 DB Assembly NF-NF	AB-V-ED-01023

CABLES CONT.

Part No.	Description	DWG (GA)
VI-C-0040	20 Metre LMR 400 DB Assembly NF-TNCM	AB-V-ED-01030
VI-C-0041	900 mm LMR 240 DB NM-NM	AB-V-ED-01031
VI-C-0042	2 Metre LMR 240 DB Assembly NF-NM	AB-V-ED-01032
VI-C-0043	2 Metre LMR 240 DB Assembly NF-TNCM	AB-V-ED-01033
VI-C-0044	10 Metre LMR 400 DB Assembly NM-NM	AB-V-ED-01034
VI-C-0045	LD3 RTCM	AB-V-ED-01035
VI-C-0046	LD3 Power	AB-V-ED-01036
VI-C-0047	200 Metre LMR 400 DB Assembly NF-NF	AB-V-ED-01037
VI-C-0048	300 Metre Sucor IS Comp NF-NF	AB-V-ED-01038
VI-C-0049	30 Metre Truck	AB-V-ED-01039
VI-C-0050	2 Metre Truck	AB-V-ED-01040
VI-C-0058	65 Metre LMR 400 DB Assembly NF-NM	AB-V-ED-01048
VI-C-0059	60 Metre LMR 400 DB Assembly NF-NM	AB-V-ED-01049
VI-C-0060	60 Metre LMR400 DB Assembly NF-NF	AB-V-ED-01050
VI-C-0066	100mm LMR240 Assembly NM-TNCM RA	AB-V-ED-01056

DATA COMPONENTS

Part No.	Description	DWG (Dimensional)
VI-D-0010	**Port Powered RS232-422 Converter**	
VI-D-0012	**Port Powered Inline RS232 Opto Isolator**	
VI-D-0016	**Repeater**	
VI-D-0017	**Repeater**	

ENCLOSURE COMPONENTS

Part No.	Description	DWG (Dimensional)
VI-E-0032	**GPS Antenna Mounting Bracket**	**AB-V-ED-01229**
VI-E-0033	**LD3 Receiver Mounting Plate**	**AB-V-ED-xxxxx**
VI-E-0034	**L-Band Antenna Mounting Plate**	**AB-V-ED-01230**
VI-E-0049	**LID3-G! DPx 6U Rack Mount Plate**	**AB-V-ED-xxxxx**
VI-E-0050	**2U Cantilever Shelf (LD3 –Mount)**	**AB-V-ED-xxxxx**
VI-E-0150	**2U Dual RF Switch plate Assembly**	**AB-V-ED-01226**

MANUALS

Part No.	Description	Document
VI-M-0011	**Under review**	**AB-V-MA-xxxxx**
VI-M-0012	**LD3-Operation & Maintenance Manual**	**AB-V-MA-xxxxx**
VI-M-0013	**Under review**	**AB-V-MA-xxxxx**
VI-M-0014	**Under review**	**AB-V-MA-xxxxx**

RF COMPONENTS

Part No.	Description	DWG (GA)
VI-R-0010	**-10 dB Directional Coupler**	**AB-V-ED-01233**
VI-R-0011	**-20 dB Directional Coupler**	**AB-V-ED-01233**
VI-R-0012	**-30 dB Directional Coupler**	**AB-V-ED-01233**
VI-R-0013	**Power Divider**	**AB-V-ED-01238**
VI-R-0014	**L1/L2 GPS Inline Amplifier**	**AB-V-ED-01236**
VI-R-0015	**RF Splitter**	**AB-V-ED-01234**
VI-R-0016	**SPST Coaxial Switch Assembly NM-2 NM**	**AB-V-ED-xxxxx**
VI-R-0040	**Lightening Arrestor**	**AB-V-ED-xxxxx**
VI-R-0041	**Gas Capsules**	**AB-V-ED-xxxxx**
VI-R-0050	**UHF Data Modem**	**AB-V-ED-01241**

SOFTWARE

Part No.	Description	Image
VI-S-0015	**E Learning Modules**	**X**
VI-S-0016	**Verichart**	**X**
VI-S-0017	**DGPS Reporter**	**X**
VI-S-0030	**LD3 OEM Software Bundle**	**X**

STANDARD SYTEMS

The following section details what are considered standard systems for use in a DP environment c/w the associated scope of supply.

Description	DWG
Dual LiD3-G1 c/w Verify DPx	**AB-V-ED-00505**
Single LiD3-G1 - c/w Verify DPx	**AB-V-ED-00502**
LiD3-G1 - c/w DPx + LiD2-GG1 - c/w	**AB-V-ED-00539**
LiD3-G1 + LiD2-G2	**AB-V-ED-00540**
LiD3-G1 - c/w DPx + LiD2-G2 - c/w	**AB-V-ED-00541**
LiD3-G1 + LiD2-GG2	**AB-V-ED-00542**
LiD3-G1 - c/w DPx + LiD2-GG2 - c/w	**AB-V-ED-00543**