LD6 Operations Manual

Version 101

VERIPOS

CONTENTS

1. INTRODUCTION

1.1 GENERAL

For installation guidance please see the *LD6 Installation manual*.

Throughout this manual reference will be made to the VERIPOS Helpdesk. The Helpdesk is provided by VERIPOS and is the first point of contact for technical enquiries and assistance. It is manned 24 hours per day, 365 days per year.

Details are in the *Contact Information* chapter.

1.2 SCOPE

This manual comprises of information on LD6 connections, general operation and data inputs/outputs via COM and IP ports.

Please be aware that this manual covers the operation of the LD6 receiver running software version 101.02.00.01 only, known as LD6 'B' variants. LD6's on this software version are equipped with a NovAtel OEM615 GNSS card. Some aspects of this version differ from the previous LD6 software versions. For operation of the LD6 on any other software versions, please refer to the appropriate Operations Manual.

Manuals are available for download at https://help.veripos.com.

1.2.1 Contents

Chapter	Contents
1. Introduction	This chapter specifies the purpose and target group for this manual. It also contains a list of used abbreviations and a specification of the document conventions.
2. Operation	This chapter describes the interfaces in detail, the initial start-up, the status indicators and possible corrective actions and how to shut the system down safely.
3. VERIPOS Software Compatibility	This chapter states compatible and non-compatible VERIPOS software.
4. Troubleshooting	This chapter describes basic fault tracing and a detailed description on how to report problems or operating queries to the VERIPOS Helpdesk.
5. Reference information	This chapter comprises additional information for configuration, station ID listings and a list of the serial and IP port designations.
6. Contact information	This chapter contains contact information details about the VERIPOS Helpdesk and VERIPOS offices worldwide.

1.3 TERMS AND ABBREVIATIONS

Apex	VERIPOS PPP GNSS service
BER	Bit Error Rate
CoG	Course over Ground
CR	Carriage Return
CRP	Central Reference Point
DGNSS	Differential GNSS
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
HDT	NMEA message format containing heading information
Hz	Hertz
IMU	Integrated Mobile Unit
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
LD6	Unit containing GPS card, demodulator and PC processor
MF	Medium Frequency Radio used to Transmit Correction Data
MHz	Mega-Hertz
MMI	Man-Machine Interface
MPH	Miles per Hour
m/s	Metres per Second
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
PVA	Position, Velocity & Attitude
RoHS	Restriction of Hazardous Substances
RMS	Root Mean Square
RTCM	Radio Technical Commission for Maritime Services
SAL	Service Access License
SBAS	Satellite Based Augmentation System
SD	Standard Deviation
SDRAM	Synchronous Dynamic Random Access Memory
SNR	Signal to Noise
SOG	Speed over Ground
Spotbeam	High Power LBAND Signal
Standard / Std	VERIPOS Single frequency DGPS system
SV	Space Vehicle
Ultra	VERIPOS PPP GNSS service
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
WER	Word Error Rate

1.4 DOCUMENT CONVENTIONS

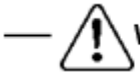
1.4.1 Typographical Conventions

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

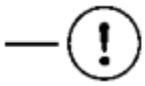
Bold text is also used for indicators and touch screen "push-button" commands.

“Text within quotes” is used when display screens are mentioned in text. `Monospace` text is used for input/output strings to/from the device.

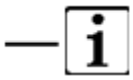
1.4.2 Special Notices



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



A caution indicates the risk of damaging the hardware.



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

1.5 VERIPOS HELPDESK

VERIPOS encourage all users to promptly report problems or operating queries to the Helpdesk so that they may receive assistance.

The VERIPOS Helpdesk is the first point of contact for technical enquiries and fault reports. It is manned 24 hours per day, 365 days per year.

Helpdesk contact details are in the *Contact Information* chapter.

For assistance with basic troubleshooting, see the *Troubleshooting* chapter. We recommend initial contact is made by email to the Helpdesk.

Users can also create a fault ticket on the website. This will ensure contact details and the description of the fault are correctly recorded.

The duty operator is trained to provide direct assistance with most queries and problems and can request technical staff to provide support for more complex issues.

1.6 VERIPOS ONLINE SUPPORT SYSTEM (VOSS)

VERIPOS have an online customer support system called VOSS (VERIPOS Online Support System).

VERIPOS recommend users to frequently view the announcements made on this system.

VOSS includes a facility for raising fault tickets which are then automatically submitted to the VERIPOS Helpdesk.

The VOSS url is: **https://help.veripos.com**

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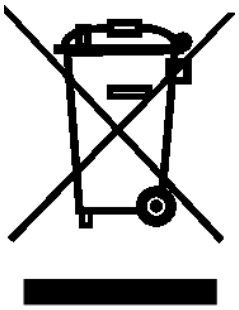
1.8 WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT

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

Instructions for disposal of WEEE by users in the European Union

Products which have the undernoted symbol located on either the product itself or its packaging indicates that the product must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of the product by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment (hereinafter referred to as "WEEE").

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



2. LD6 OPERATION

The controls for working with the LD6 are all available via the touch screen front panel.

Use the LD6 touch screen to configure the unit.

LD6 IMU

Description

The LD6 Integrated Mobile Unit (IMU) is used offshore on vessels to provide high precision Satellite Positioning Services from VERIPOS.

The LD6 can optionally be equipped to run Verify QC software or the Orion DP software. It can be fitted with modules to receive the following;

- GNSS satellite positioning data
- L-Band satellite positioning augmentation data from geostationary satellite transmissions
- Optional MF Beacon positioning augmentation data
- Optional UHF positioning augmentation data

NOTE

LD6 IMU's on this software version must have a minimum of 4GB RAM fitted.

The LD6 supports all VERIPOS position augmentation data services.

The LD6 supports switching between high accuracy PPP solutions (subject to settling before position is output).

When configured the LD6 automatically selects the best available solution for output, with automatic fall-back to the next best solution.
Multiple messages are supported with configurable outputs of position data from the ports in NMEA format (V3).

For timing, a ZDA message can be output for use with 1PPS output.

The LD6 supports RS 232 and 422 output from galvanic isolated ports and output to LAN.

2.1 VERSIONS

Different version 101 build numbers may exist (for example, 101.2.0.1 or 101.2.0.3), however these will be referred to within this manual collectively as 'Version 101'. LD6 systems on software version 101 are supplied with NovAtel OEM615 GNSS receiver cards, capable of providing a corrected solution in NMEA format.

Version 101 LD6 systems can compute GPS and GLONASS VERIPOS services (Ultra^2, Apex^2 and Standard^2).

The table below shows details the LD6 GNSS variants:

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

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

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

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

2.2 DO'S AND DON'TS FOR LD6

DO's

- **Do** use **Shutdown** control (in the ***Actions*** menu) for the LD6 BEFORE turning off the power. Wait until the LD6 screen is blank before disconnecting power.
- **Do** take care not to obstruct the side ventilation panels for the fan assisted cooling tunnel.
- **Do** only connect the LAN Crossover network adapter (where required) to an LD6 LAN port. The adapter wiring is not compatible with serial COM ports.
- **Do** connect external monitor (where required) to the rear VGA connector prior to switching on the LD6. If a monitor is connected after LD6 is switched on, it will not be detected.

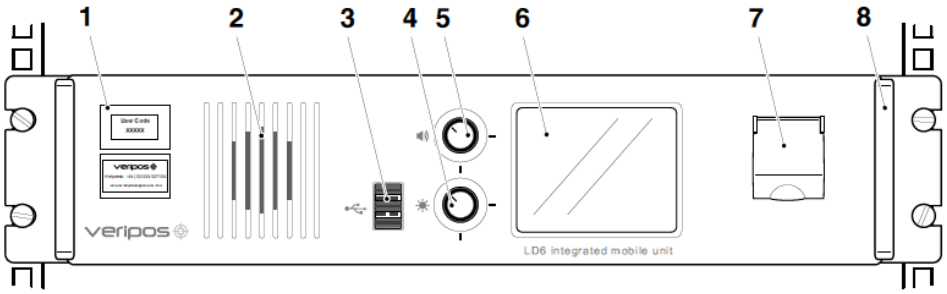
DON'TS

- **Don't** load software onto the LD6 not issued from VERIPOS e.g. as part of the LD6 build. Doing so could seriously compromise system performance.
- **Don't** insert USB memory device unless first scanned with up to date virus scanning software.
- **Don't** activate the pin reset buttons on the rear of the unit unless directed by a VERIPOS representative.
- **Don't** remove the QC dongle when using the Verify QC software is running on-board the LD6.
- **Don't** use a pen or any other sharp object to operate the touch screen as this could cause damage.

2.3 FRONT AND REAR PANEL OVERVIEW

2.3.1 Front Panel

Fig.3 LD6 IMU



LD6 Front Panel Controls

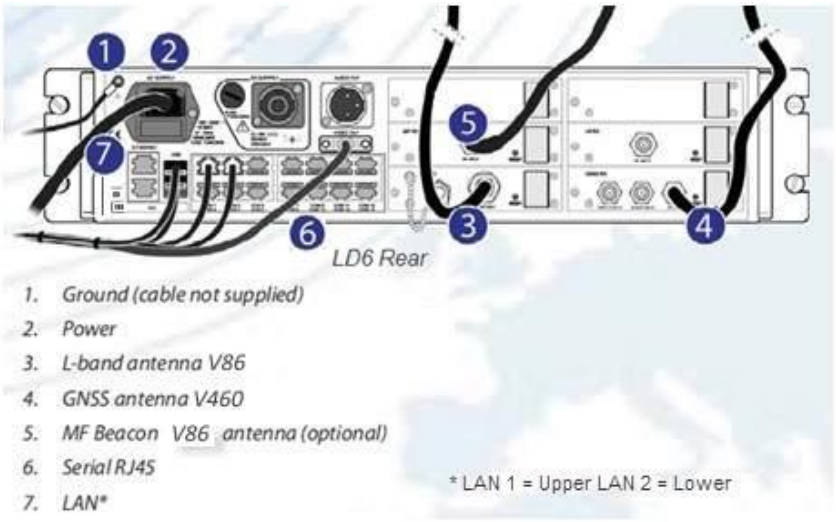
1	Labels with Unit ID (above) and phone number to Helpdesk (below)
2	Front panel speaker
3	3 x USB 2.0 sockets
4	Screen brightness control
5	Volume control (press to mute/un-mute)
6	Colour touchscreen display
7	Front panel power on/off switch (with security cover)
8	Removable handle (one on each side)

LD6 front panel controls

NOTE

There is currently no audio features enabled on the LD6.

2.3.2 Rear Panel



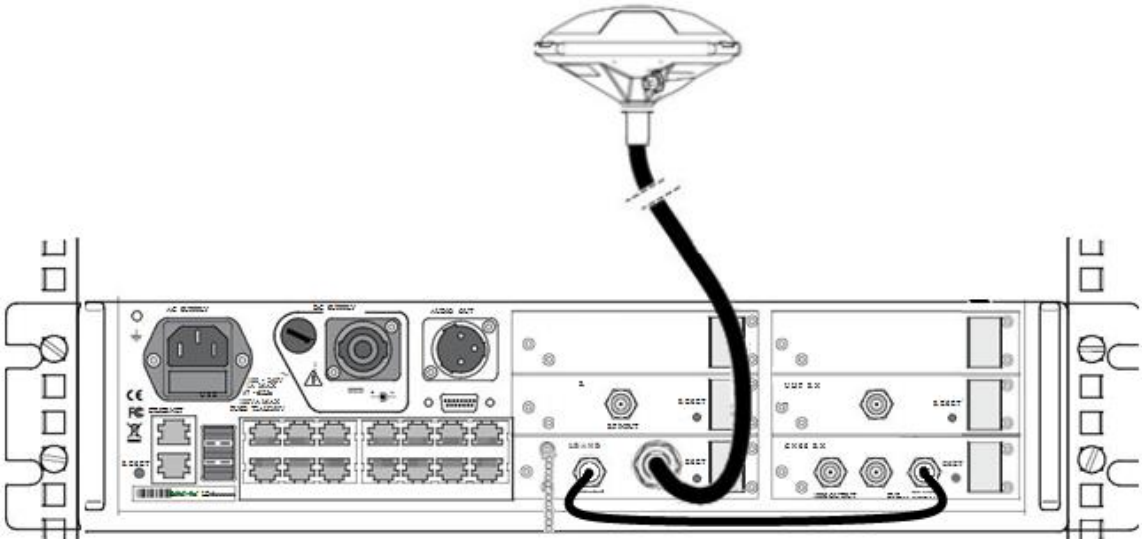
LD6 rear panel connections

NOTE

Previously, a GA-530 GNSS antenna may have been supplied if GLONASS was not required. The V460 is the standard antenna currently supplied for GNSS signals on an LD6 regardless of whether GLONASS is required or not.

The Video out connection is only used with Verify-QC and Orion software.

If using a combined L-BAND / GNSS antenna (e.g. V460) connect it to the input to the L-BAND receiver card. Remove the terminator from the RF out of the L-BAND card and link the GNSS card RF in to the L-BAND RF out connector, using the lead which is supplied.



LD6 antenna connection using a combined GNSS & LBAND antenna

2.4 LD6 START-UP

Confirm the LD6 has been correctly installed.

Where required refer to the *LD6 Installation Manual* and the *Antenna & Coaxial Cable Installation Guide*.

These documents are provided with the unit or may be downloaded in .pdf format from the VERIPOS online support system (VOSS) at:

https://help.veripos.com

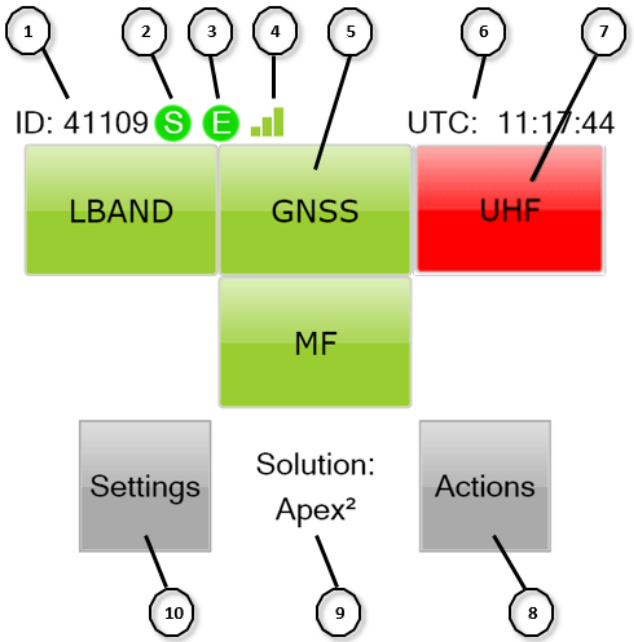
Plug in power to the rear of the unit. Turn on power switch.

Wait a few minutes while a self-test is performed.

Following successful test you will see the main or home screen.

The LD6 is disabled when first started. Before a beam is selected and the unit is enabled the ***LBAND*** icon will be red.

If there is a problem refer to the *Troubleshooting* chapter in this manual.



LD6 Home Screen

Key

1. LD6 unit ID
2. S – L-BAND beam Synch Green = yes, Red = not synched with beam
3. E – VERIPOS corrections Green = enabled Red = not enabled
4. L-BAND signal strength indicator. These signal strength bars have three states:

No. of Signal Strength Bars	Signal Strength (dB/Hz)
0	0 (No Sync)
1	<32.5
2	32.5 to 36.5
3	>36.5

5. Touch screen buttons to access **L-BAND** card, **GNSS** card, *optiona*l **MF** (Beacon SBX receiver) and **UHF** ADL cards, information and controls. Buttons provide access to each receiver (as fitted).

6. LD6 time display (UTC)

7. Buttons in red indicates the cards have configuration or fault condition and are not working to correct limits.

8. **Actions** – Shut down, Log Off, Reboot, Factory Reset or LD6 Screen calibration of screens 1 and 2, Launch Apps.

9. **Solutions** – Displays LD6 solution status.

10. **Settings** –Set up of position output ports, network configuration and provides general status information.

The above Home Screen shows an enabled LD6 touch screen. Four of the six rear bays are equipped with receiver cards. Two bays are for future use.

The home page of the LD6 touch screen displays the Unit ID number (top left).

The time is shown in Coordinated Universal Time (UTC), 24 hour format (top right).

Each of the four upper touch screen buttons correspond to a receiver or card housed in bays accessed from the rear of the LD6. LD6 units may not have all cards fitted.

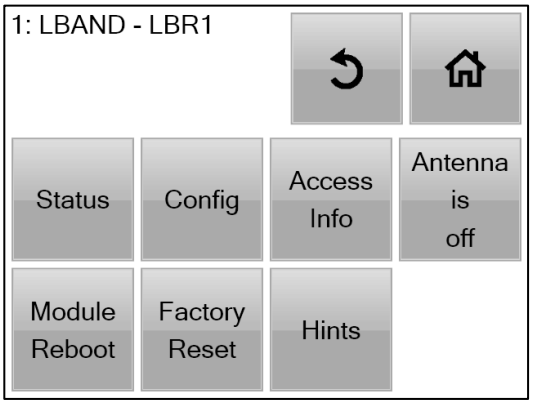
NOTE

The LD6 Home Screen will only display receiver module icons which are installed.

Configuration of each installed and working receiver card is done using the touch screen front panel. Select the corresponding on screen button.

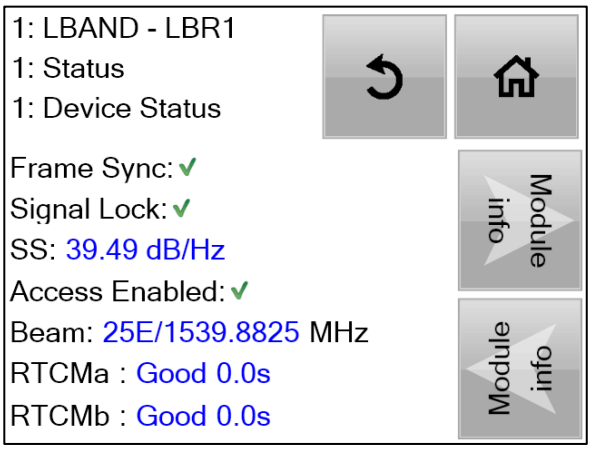
2.5 L-BAND RECEIVER

This section describes how to view L-Band status information and configure L-Band settings as required.



2.5.1 Status – L-Band

To view L-Band status, from the Home screen, press ***LBAND / Status***:

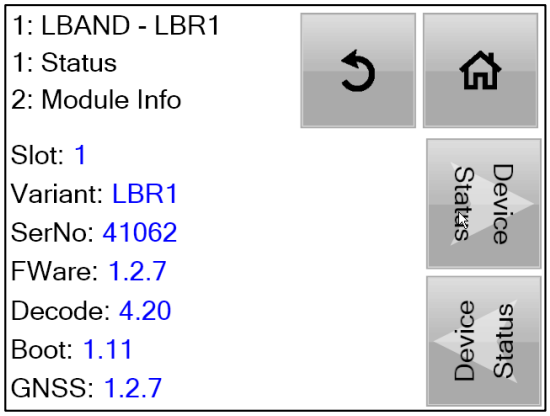


Confirm '***Frame Sync'***, '***Signal Lock'*** and beam settings for the selected beam.

For reliable operation the SS values should be **≥ 38.0dB/Hz.**

2.5.1.1 Module Info – L-Band

From the L-Band Status page, press ***Module Info***:



The ***Module Info*** screen shows:

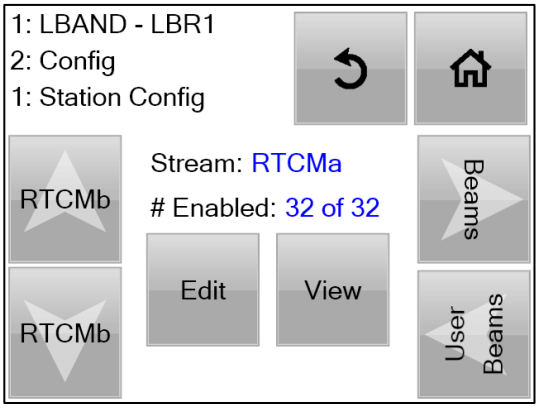
- **Slot –** Indicates which LD6 module bay the L-Band card is physically installed in.
- **Variant –** Details of the L-Band card model installed.
- **SerNo –** Serial number of the L-Band card installed.
- **FWare –** Firmware version currently installed on the L-Band card.
- **Decode** – Decoder version currently installed on the L-Band card.
- **Boot –** Bootloader version currently installed on the L-Band card.

NOTE

L-Band firmware is updated automatically when LD6 software is updated, therefore there should be no requirements for users to manually upgrade L-Band firmware.

2.5.2 L-Band Configuration

To make changes to the L-Band, go to ***Home / LBAND / Config***.



2.5.2.1 Beams

Preparation

To receive VERIPOS corrections select a geostationary satellite beam that covers the area of operation for the vessel. See the L-band Coverage Map for beam footprints.

Up to date copies and service update information available on VERIPOS online support system (VOSS) at:

https://help.veripos.com

You need to know the VERIPOS beam(s) that cover the general area of operation for the vessel.

To ensure correct beam selection when configuring the LD6 use the **VeriChart** program.

This is a free download from VOSS and allows VERIPOS users to generate their own regional chart information.

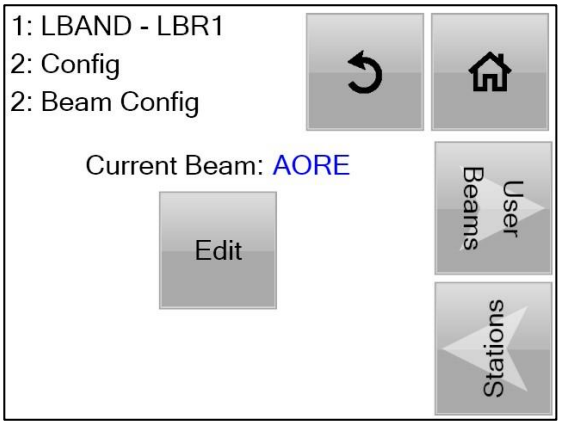
Beam

A chart showing the beam names and coverage is available in the *Reference information* chapter – 'L-band Coverage Chart.

Beam	Coverage
143.5E	Asia, Australasia, Indian Ocean
IOR	Asia, Indian Ocean, East Africa, Persian Gulf, Caspian Sea
25E	North Sea, Mediterranean Sea, Africa, Persian Gulf, Caspian Sea
AORW	North America, Gulf of Mexico, South America
98W	North America, Gulf of Mexico, South America

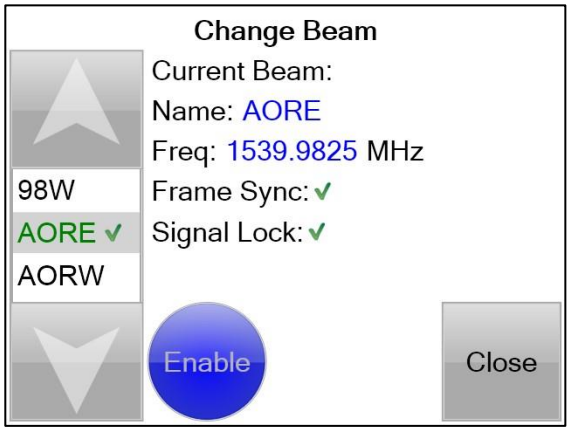
Up to date beam coverage charts are available on VOSS.

Press the ***Beams*** button to view or amend the Beam selected. If the correct regional Beam is shown no edit is required.



If "***No Beam***" or the incorrect regional beam is shown, select ***Edit*** and select the beam for your work region.

Use the up/down on-screen arrows to highlight and select the beam required.



When the required beam name is highlighted, touch the ***Enable*** button, and then ***Close***.

Return to the LD6 ***Home*** page.

The 'S' (Sync) icon will turn from red to green when a usable beam is correctly selected and signals are received.

If the beam has been changed, L-Band beam status can be checked as described in Section 2.5.1.

2.5.2.2 User Beams

User Beams should only be selected under direction from VERIPOS.

User Beams are not used during normal LD6 operation. Custom entry of a user Beam is provided to allow the user to manually configure a Beam frequency and bit rate for reception of VERIPOS L-BAND corrections.

Full instructions regarding User Beam entry can be found in Section 4 of this manual.

2.5.2.3 Edit L-Band Reference Stations

Once the LD6 is enabled, the VERIPOS reference station RTCM information is available.

The LD6 L-BAND card outputs two data streams of RTCM corrections:-
RTCMa and ***RTCMb***.

These may be configured independently and both may be selected for output on the LD6 COM or LAN ports.

RTCMa is additionally used internally, providing correction information to the LD6 internal position computation.

Recommendation

On the ***RTCMa*** data stream all reference stations should be enabled. The LD6 internal calculations will determine automatically the best stations for use.

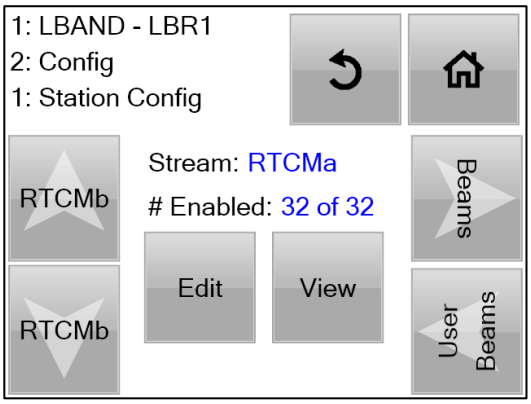
Use ***RTCMb*** to provide output of corrections to third party equipment. Depending on the application it may be desirable for the user to select only the appropriate stations for this equipment.

The following section describes this process.

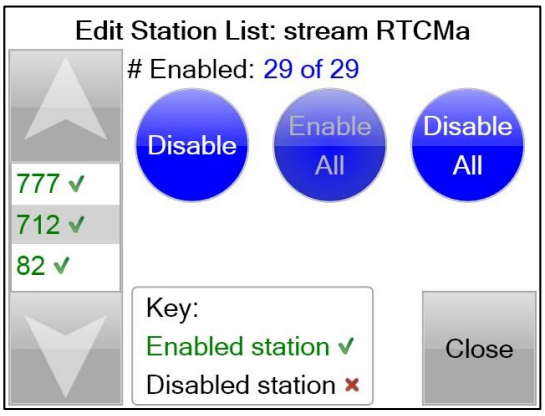
Refer to a list of all VERIPOS stations showing their station number, name and region which can be downloaded from https://help.veripos.com.

To enable or disable station(s):

From the home screen select **LBAND/ Config** and select ***RTCMa*** or ***RTCMb*** then touch ***Edit*.**



Use the up/down arrows to highlight the station number and the disable button to remove it from use.



When finished editing touch the ***Close*** button.

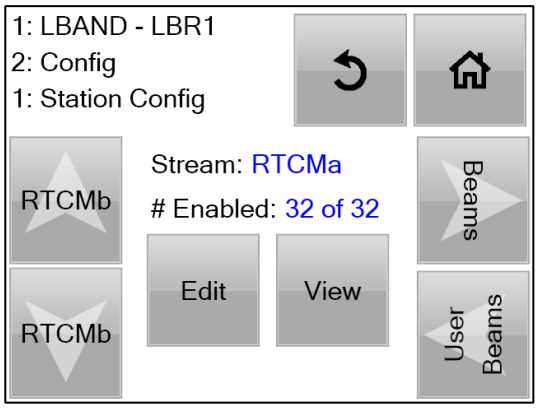
The above process can be carried out for both RTCMa and RTCMb data streams.

NOTE

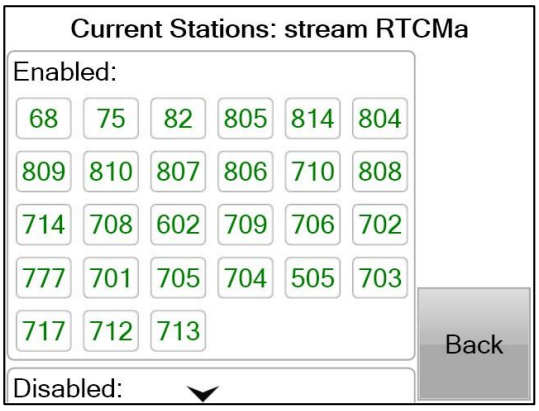
Reference stations on RTCMa are used internally and are also available for output to other devices. VERIPOS recommend in most cases that all stations are enabled. The LD6 will use the **closest six** (maximum) stations provided they are within 1500km of the users current location.

2.5.2.4 View L-Band Reference Stations

To view stations go to ***LBAND/ Config*** and select the RTCM data stream required and touch the view button.



Slide your finger up and down on the touch screen to view more stations available on the Beam or to view the list of Disabled stations.



2.5.3 Access Info – L-Band

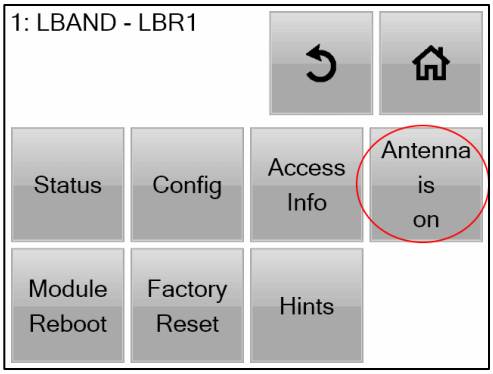
The ***Access Info*** page shows details of the VERIPOS services which the LD6 is currently enabled for. This page is accessible from ***Home/ LBAND/ Access Info:***

NOTE

If the LD6 is disabled, the ***Access State*** field will say "Disabled". Disabled units will list the services which the LD6 was last enabled for.

2.5.4 Antenna Voltage – L-Band

Antenna power must be toggled **On** (***Home/ LBAND/ Antenna is off***) when the L-BAND card is directly connected to an L-BAND antenna. The Antenna power should be toggled off where the LD6 is connected to a powered signal splitter or other external equipment such as a tracking dish.



2.5.5 Enable for VERIPOS Corrections

Tel. +44 1224 965900 Email: helpdesk@veripos.com

Go to the LD6 Access Code page ***LBAND/ Access Info.***

Contact the VERIPOS Helpdesk to request the unit is enabled and quote:

- Unit ID
- Service Access Licence (SAL) number
- Provide details of the type of Service(s) you require, e.g. **Standard**, **Standard²**, **Ultra, Ultra², Apex, Apex²** and **DP Orion**

NOTE

Only when the L-BAND receiver has Sync (**S**) to a valid beam will it display access code information or allow you to enable/disable the LD6.

The Helpdesk will enable the requested services for the LD6 over the air.

If after requesting the LD6 to be enabled the ***Access Info*** page still shows **Disabled**, confirm the LD6 still has Sync (**S** on the Home screen) and contact the VERIPOS Helpdesk. They can then resend the enable command over the air.

2.5.6 Module Reboot – L-Band

Access this option via ***Home/ LBAND/ Module Reboot.*** Pressing ***Module Reboot*** will reboot the L-Band card only, the LD6 will not reboot.

2.5.7 Factory Reset – L-Band

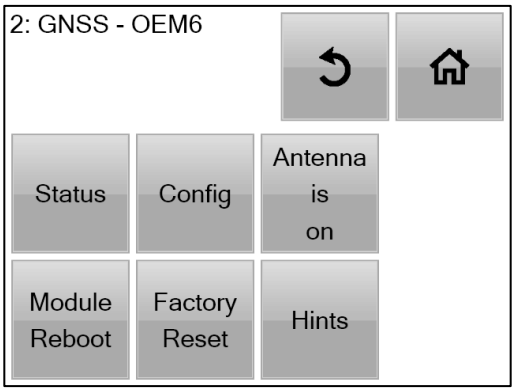
Use only under instruction from a VERIPOS engineer.

2.5.8 Hints – L-Band

Provides general guidance information where available.

2.6 GNSS RECEIVER

The LD6 GNSS menu is used to check GNSS status and to configure position calculations etc.



2.6.1 GNSS Receiver Status

The GNSS ***Status*** menu is accessed via ***Home/ GNSS/ Status***.

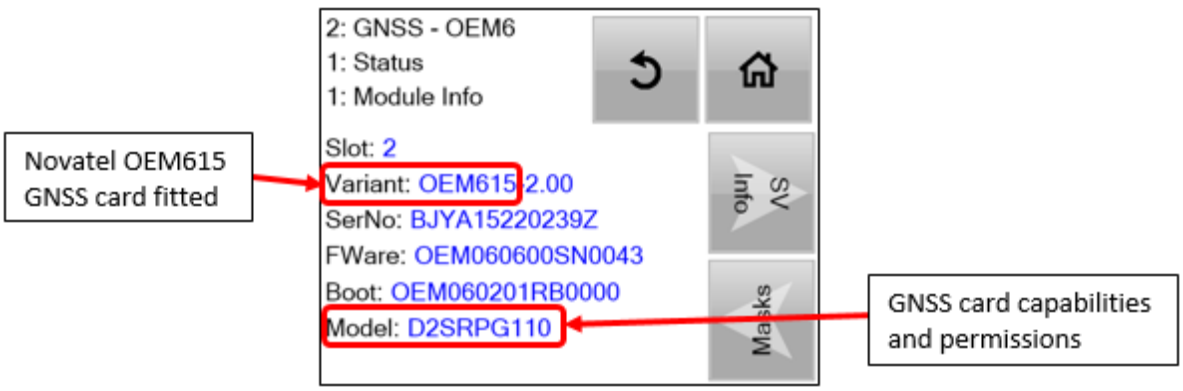
2.6.1.1 Module Info

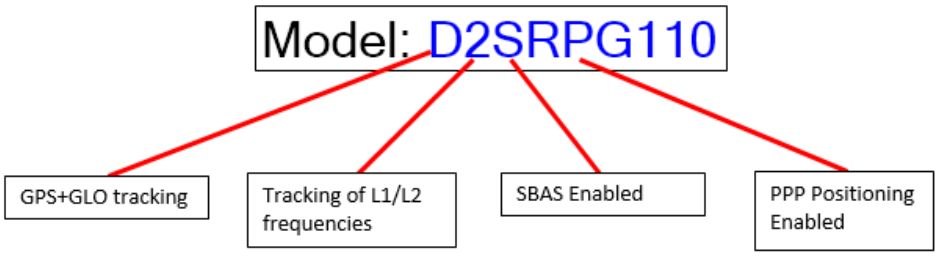
From the Home screen touch the ***GNSS/ Status*** button to view the ***Module Info*** screen.

The ***Module Info*** screen shows:

- **Slot –** Indicates which LD6 module bay the GNSS card is physically installed in.
- **Variant –** Details of the GNSS card model installed.
- **SerNo –** Serial number of the GNSS card installed.
- **FWare –** Firmware version currently installed on the GNSS card.
- **Boot –** Bootloader version currently installed on the GNSS card.
- **Model –** Provides details relating to the GNSS card capabilities and permissions. All LD6 receivers running software version 101 have the below standard default permissions.

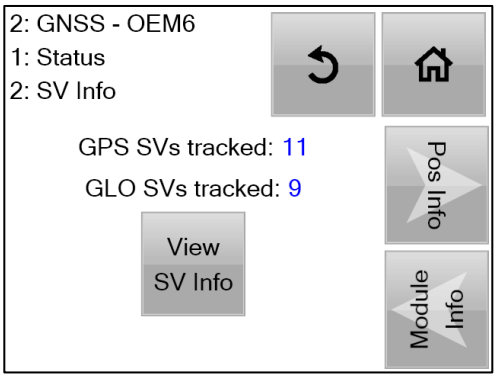
NovAtel GNSS receivers are identifiable by the ***Variant*** within the ***Module Info*** page.





2.6.1.2 SV Info

The ***SV Info*** screen shows the current number of satellites (SV's) being tracked from the GPS and GLONASS constellations.

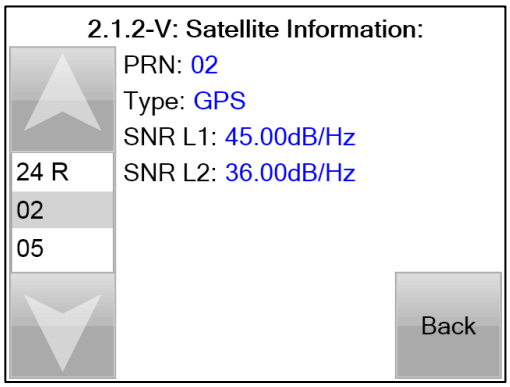


Example screen shows a GNSS card which has capability to receive both GPS and GLONASS satellite signals.

NOTE

All LD6 receivers with NovAtel GNSS cards fitted are capable of tracking both GPS and GLONASS.

Touch ***View SV Info*** to view each satellite in the constellation(s) in turn.



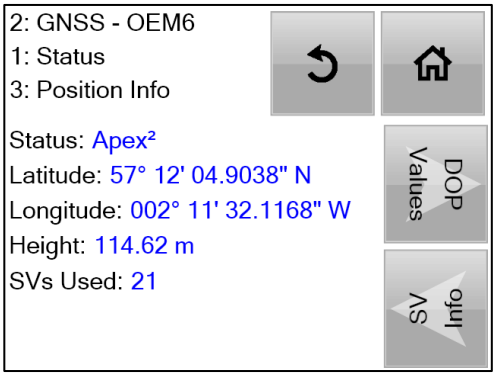
Move between SV's using the ***Up/Down*** arrows and return to the previous screen with the ***Back*** button.

Tracked GLONASS satellites will be displayed as "**R**" in the SV number field.

2.6.1.3 Position Info

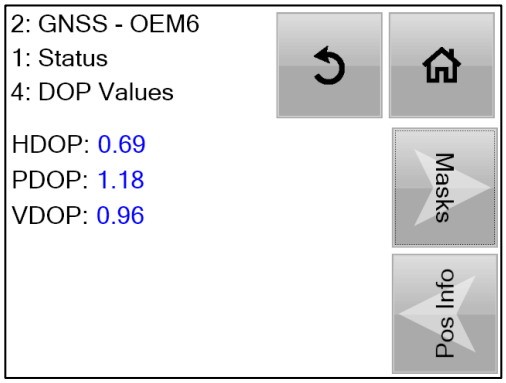
The ***Pos Info*** page displays the following information regarding the solution being calculated by the LD6:

- **Status –** States the solution currently calculated by the LD6 e.g. Apex, Ultra.
- **Latitude –** In DD° MM' SS.SSSS" format (WGS84)
- **Longitude –** DDD° MM' SS.SSSS" format (WGS84)
- **Height –** Antenna height (WGS84)
- **SVs Used –** Total number of GNSS satellites used in the solution (May be GPS only or GPS + GLONASS)



2.6.1.4 DOP Values

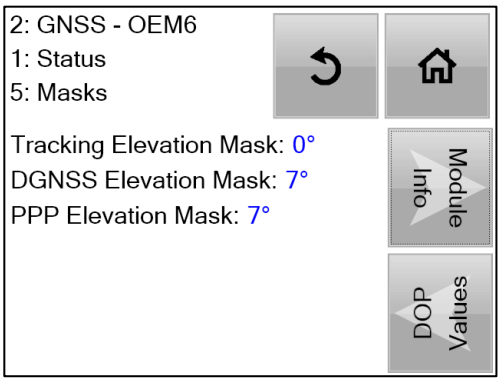
DOP values are shown for HDOP, PDOP and VDOP. DOP's are a measure of the geometrical strength of the GNSS satellites in view. Low DOP values indicate good satellite geometry.



2.6.1.5 Masks

Displays the following LD6 elevation masks:

- **Tracking Elevation Mask –** The LD6 will track all available satellites down to this elevation.
- **DGNSS Elevation Mask –** The LD6 will only use available satellites above this elevation in any DGNSS solutions e.g. VERIPOS Standard.
- **PPP Elevation Mask –** The LD6 will only use available satellites above this elevation in any PPP solutions e.g. VERIPOS Apex, Ultra.

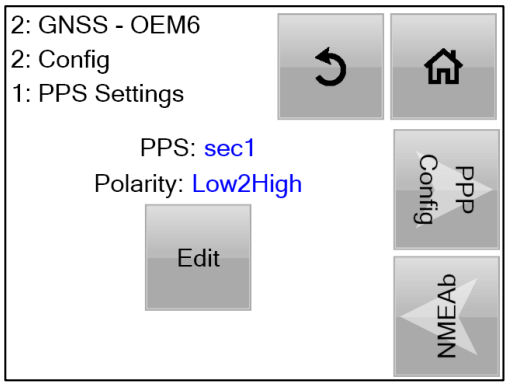


NOTE

These elevation masks are pre-configured and cannot be changed.

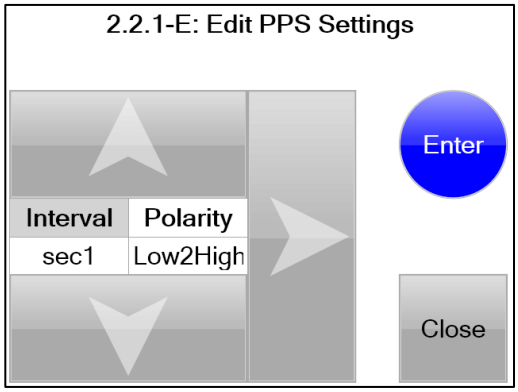
2.6.2 Config - GNSS

2.6.2.1 PPS Setting



The PPS (Pulse Per Second) settings can be edited to match the required polarity of the receiving system e.g. Multbeam.

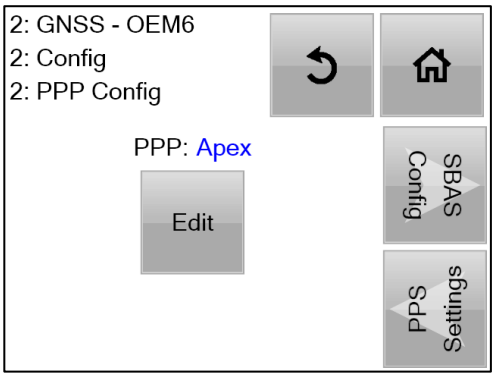
Use the ***Edit*** button, arrow keys and ***Enter*** button to amend settings of pulse polarity characteristics between Low-to-High and High-to-Low.



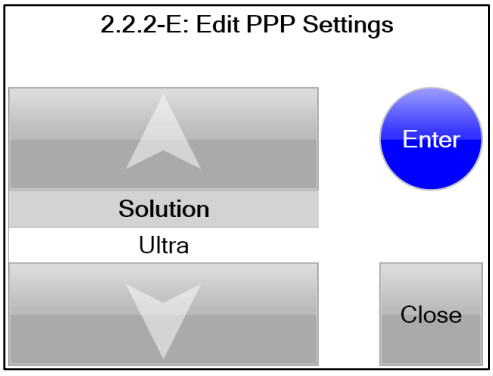
Touch ***Close*** when finished.

2.6.2.2 PPP Config

Use the ***PPP Config*** page to set which PPP calculation you wish to output from the LD6. The available options are ***Apex*** or ***Ultra***.



Touch ***Edit*** then use the arrow icons to select the desired PPP solution. Press ***Enter*** to confirm the selection and then ***Close***.

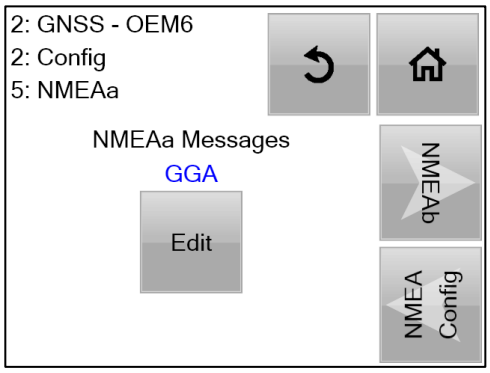


NOTE

The LD6 will need to be enabled for the correct access code in order to be able to output the selected solution.

After changing the PPP solution, the newly selected solution will then have to re-converge. It is recommended not to change the PPP solution during vessel operations.

2.6.2.3 NMEAa / NMEAb / NMEAc Configuration



These pages allow the user to select the NMEA position messages required to be output from the LD6.

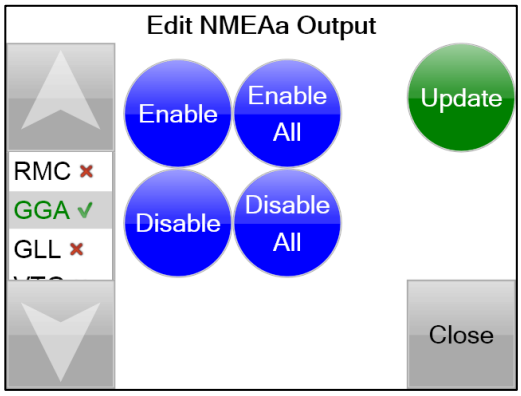
NMEAa, NMEAb and **NMEAc** are configured independently and are all available to output via COM or LAN interface. All three will output the same position calculation e.g. Apex[2] but specific messages on each can be configured based on the vessel system(s) requirements.

The LD6 will always output the best available position, for example, if the LD6 is configured to calculate an Apex solution and Apex fails, the output will automatically output the next best available position e.g. VERIPOS Standard or 3rd Party (e.g. IALA or SBAS).

NOTE

Use of IALA requires an MF receiver card to be fitted to the LD6.

Use the arrow icons to scroll through the available NMEA messages and touch either ***Enable*** or ***Disable*** to ensure the correct message types are used.



The available NMEA message types are:

GGA	GLL	VTG	ZDA	GST
GSA	GSV	GRS	RMC	

Details of all the available NMEA message types are available in Section 4.

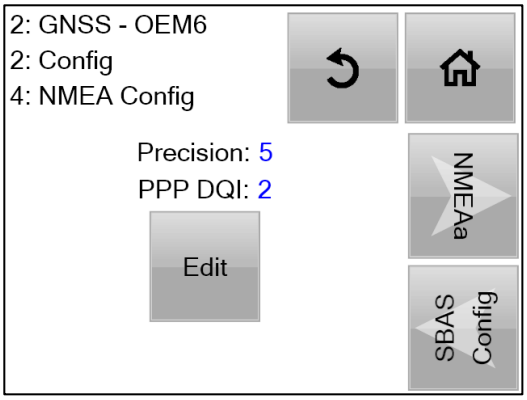
NOTE

It is recommended to enable only the messages which the receiving vessel system requires.

2.6.2.4 NMEA Config

This menu allows the user to configure some of the characteristics of the GGA message.

The two available options are ***Precision*** and ***PPP DQI***.



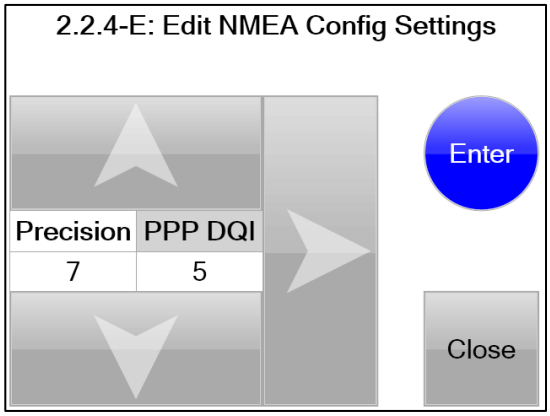
Precision
The number of decimal places in the latitude and longitude fields of the GGA message. Values between **5** and **8** can be selected. Default is **5**.

PPP DQI
The default PPP DQI value is **2**. This option relates to the output of Apex or Ultra (PPP) solutions. PPP solutions offer a higher positional accuracy compared to single frequency DGNSS (e.g. VERIPOS Standard).

One of the fields in the GGA string is the solution DQI (Differential Quality Indicator).

If the PPP DQI setting is set to **2** on this page, the DQI value in the GGA output will be **2** for all corrected solutions.

If the PPP DQI setting is set to **5** on this page, the DQI value in the GGA output will be **2** for all Differential solutions (e.g. VERIPOS Standard, 3rd Party) but will be **5** for PPP solutions.

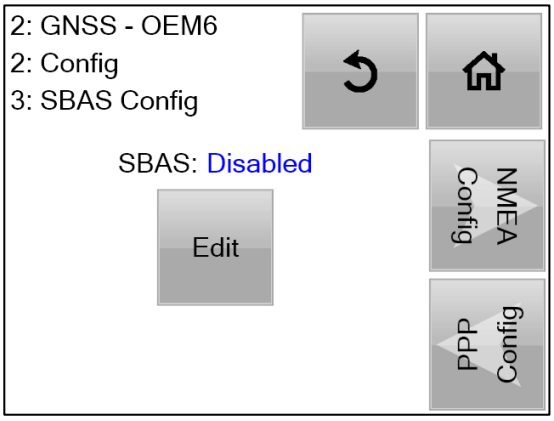


Use the ***Up/ Down*** arrows to change the values and the ***Right*** arrow to change between the ***Precision*** and ***PPP DQI*** fields.

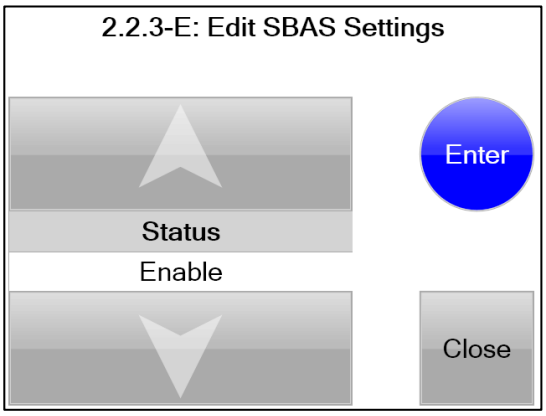
Press ***Enter*** to confirm the changes then ***Close***.

2.6.2.5 SBAS Config

This page allows the SBAS solution to be enabled or disabled as required. SBAS is ***Disabled*** by default. The page below displays the current SBAS status:

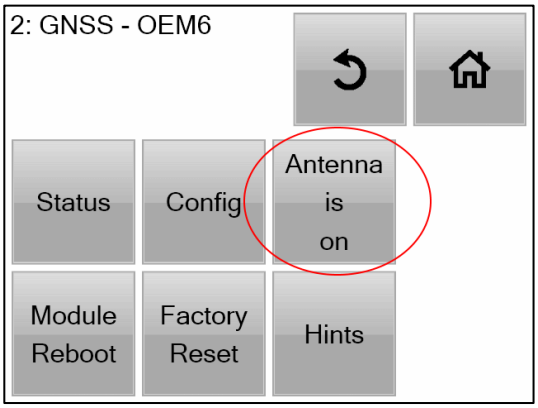


To change SBAS, touch ***Edit***, then use the arrow icons to either ***Enable*** or ***Disable***. Touch ***Enter*** to confirm the change followed by ***Close***.



2.6.3 Antenna Voltage - GNSS

Antenna power must be toggled **On** (***Home/GNSS/Antenna is off***) when the GNSS card is **directly** connected to a GNSS antenna. The Antenna power should be toggled off where the LD6 is connected to a powered signal splitter.



2.6.4 Module Reboot - GNSS

The ***Module Reboot*** option with the GNSS menu will perform a reboot of the GNSS card only (not the entire LD6 receiver).

NOTE

There will be a loss of positioning while a GNSS module reboot is taking place.

2.6.5 Factory Reset - GNSS

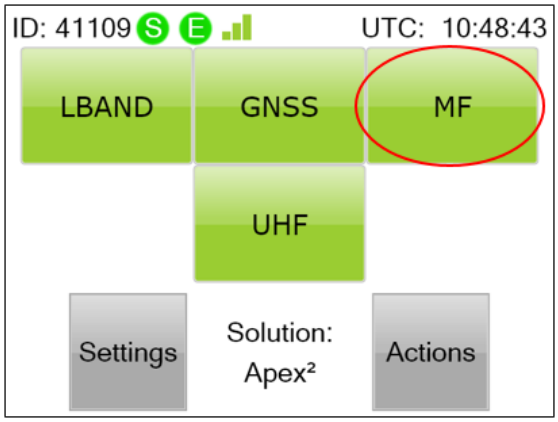
Use only under instruction from a VERIPOS engineer.

2.6.6 Hints - GNSS

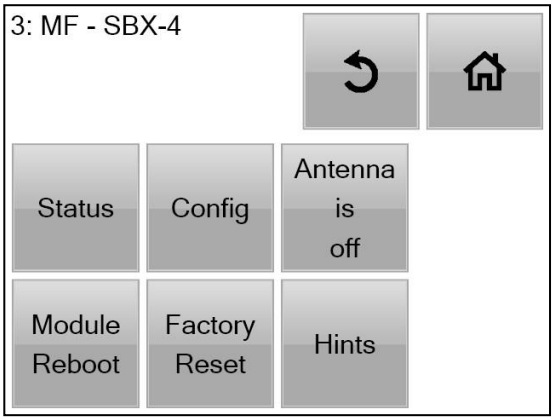
Provides hints where available.

2.7 MF RECIEVER

The MF SBX-4 card (where fitted) allows for reception of non-VERIPOS MF Marine Beacon and IALA differential corrections.

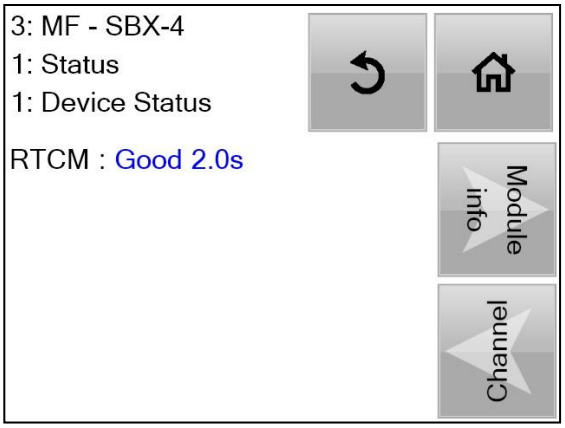


Access from ***Home/ MF***:



2.7.1 Status - MF

Touch the ***Status*** icon. This shows the device status screens for the MF card (MF-SBX4) and gives access to MF card Module info and available channels for correction data.

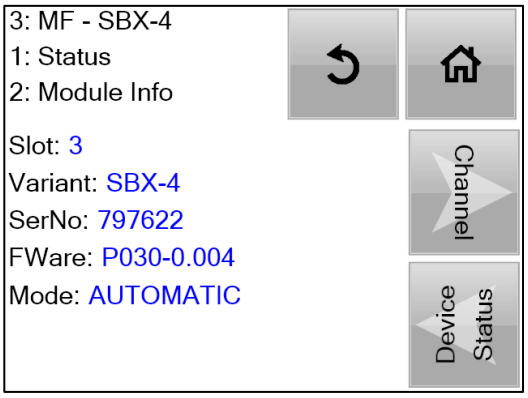


The RTCM entry shows the correction age in seconds. In normal use this will correct every few seconds.

If the MF RTCM signal is lost the time will increment up to 300 seconds then show >300 s.

2.7.1.1 Module Info

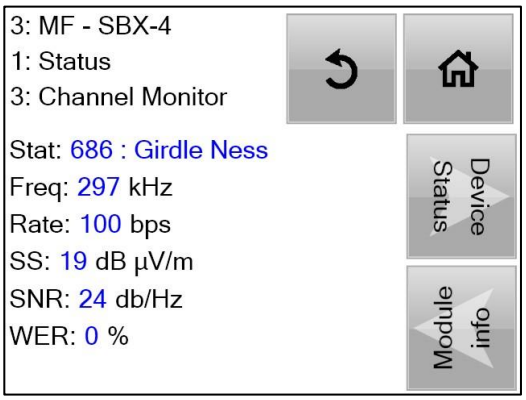
Touch the arrow to display the MF module information.



This gives information on whether the MF receiver is in AUTOMATIC or MANUAL mode as well as the serial and firmware numbers for the SBX-4 MF receiver card.

2.7.1.2 Channel

Touching the ***Channel*** arrow shows the Channel Monitor screen with information on the channel selected – Station, Frequency, Bit rate, Signal strength (SS), Signal to noise ratio (SNR) and Word error rate (WER).



A typical MF channel values range is shown in the screen above.

Stat:	Unique numerical ID number and name of station
Freq:	Frequency of the received station
Rate:	Data baud rate of the received transmission
SS:	The signal strength received in dB µV/m
SNR:	The current signal to noise ratio in dB/Hz
WER:	The word error rate

2.7.2 Config - MF

Use ***Home/ MF/ Config*** to edit the operating mode of the SBX-4 card between ***Automatic*** and ***Manual***.

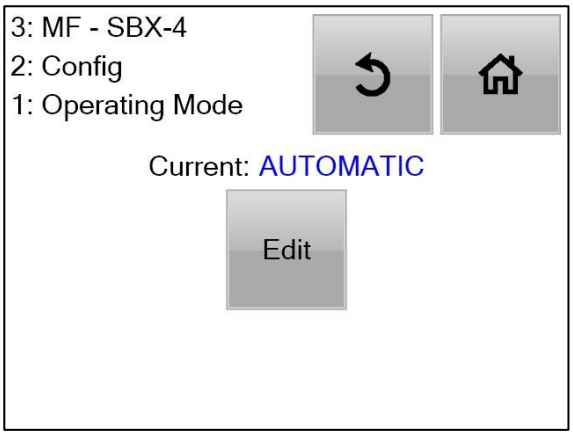
VERIPOS recommend the use of **AUTOMATIC** mode.

Operating mode options:

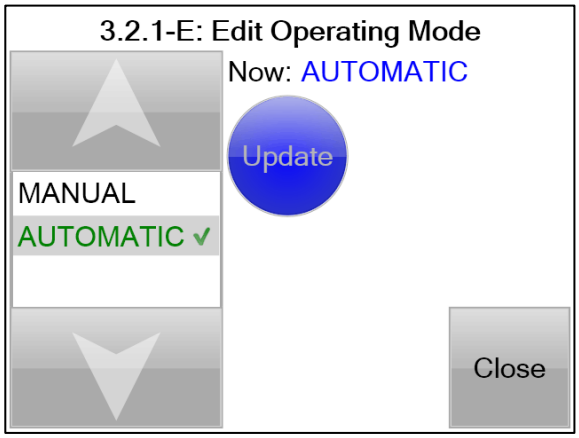
AUTOMATIC Searches for strongest signal

MANUAL User entered frequency and bit rate

To change operating mode, touch the ***Edit*** button to amend the card channel setting.

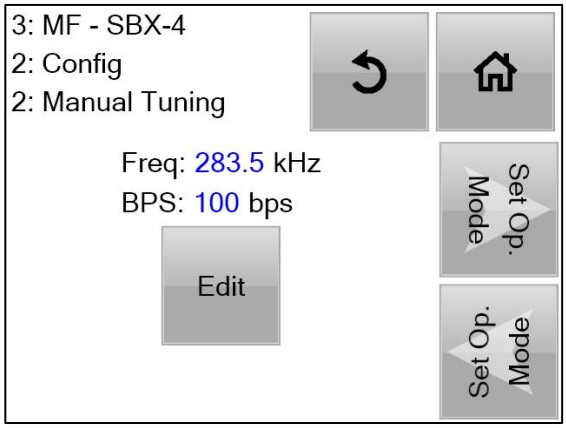


AUTOMATIC is selected from the options using the arrows and ***Update*** button.

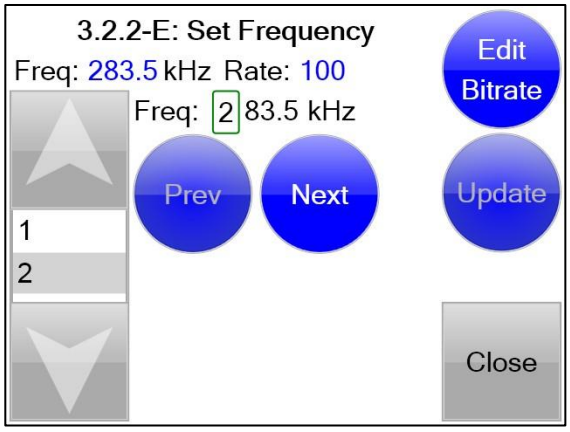


2.7.2.1 MANUAL Frequency Input

When selecting a manual frequency, first select the MANUAL mode and touch ***Update*** then ***Close***.



Next use the ***Manual Tuning*** arrow on the right to ***Edit*** the Frequency and then the ***Bitrate*** for the channel required.



When the Bitrate is entered press ***Update*** button then touch ***Close***.

2.7.3 Antenna Voltage - MF

Antenna power must be toggled **On** (***Home/ MF/ Antenna is off***) when the MF card is **directly** connected to an MF antenna. The Antenna power should be toggled off where the LD6 is connected to a powered signal splitter.

2.7.4 Module Reboot - MF

The ***Module Reboot*** option with the MF menu will perform a reboot of the MF card only (not the entire LD6 receiver).

2.7.5 Factory Reset – MF

Should only be used under instruction by VERIPOS.

2.7.6 Hints - MF

Provides hints where available.

2.8 UHF RECEIVER

The UHF receiver card is an optional receiver.

The card comes preconfigured for use with Petrobras systems.

Channels 1 to 9 have channels as specified by Petrobras but can be reconfigured if required.

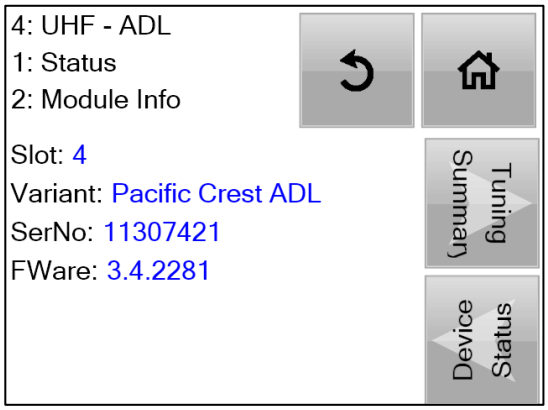
Channels 10 to 16 are available for user configuration.

Touch the onscreen UHF button to display ***Status*** and ***Config*** options.

2.8.1 Status – UHF

2.8.1.1 Module Info

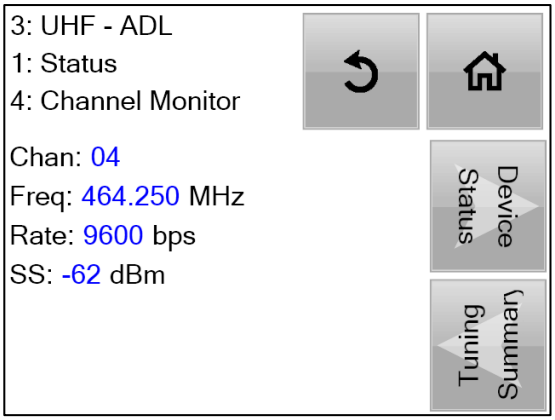
Go to ***Home/ UHF/ Status/ Module Info***



Displays the UHF card serial number and firmware version.

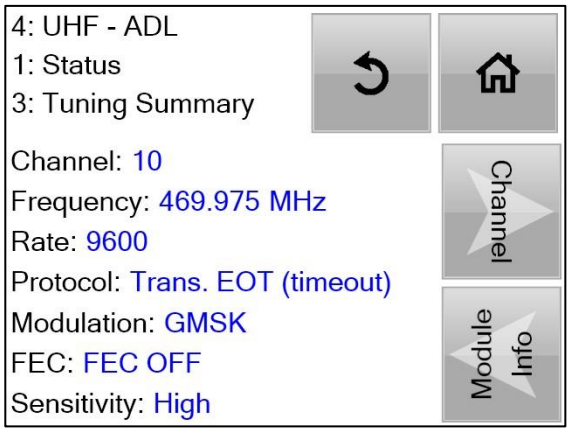
2.8.1.2 Channel Monitor

UHF/ Status/ Channel shows the Channel number, Frequency and rate. It is useful to monitor the UHF signal strength.



2.8.1.3 Tuning Summary

Displays the Channel number used, Frequency entered, baud rate, protocol, Modulation, FEC and Sensitivity.



2.8.1.4 Device Status

Displays the time in seconds elapsed from the last RTCM string received.

The value provides the clearest indication of the UHF link.

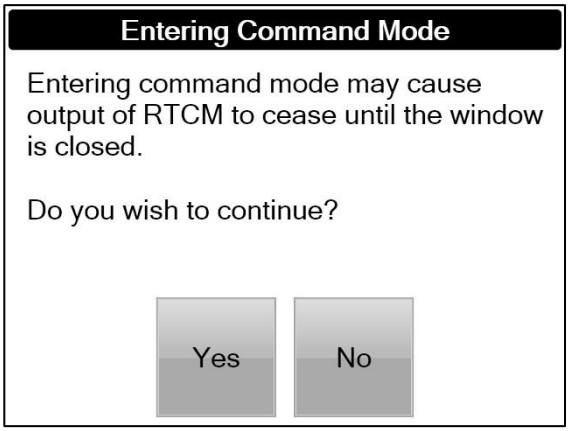
Correction age >60 seconds – UHF main screen Icon will turn Green to Amber.

Correction age >90 seconds – UHF main screen Icon will turn Red.

Where the UHF RTCM signal is lost the time will increment up to 300 seconds then show >300 s.

2.8.2 Configuration

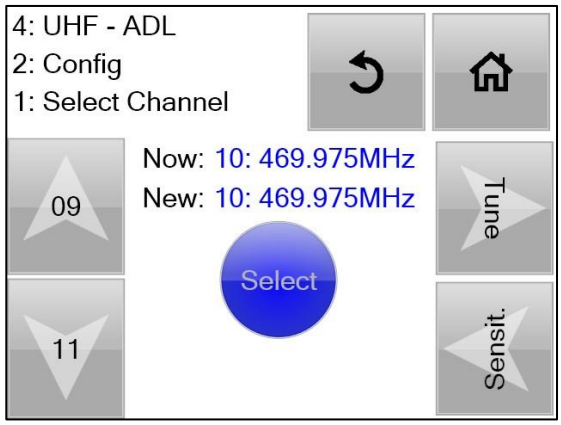
Configuration is accessed from ***Home/ UHF/ Config***.



NOTE

When amending the UHF receiver card configuration the output of UHF RTCM data is interrupted.

Amend the Frequency, Channel, Forward Error Correction, Sensitivity and Link Speed using the onscreen arrows and buttons.



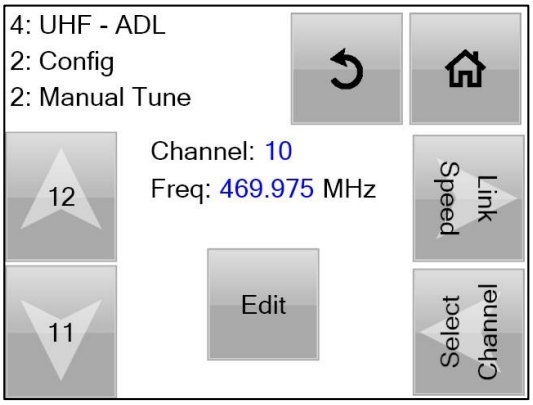
Selection of existing Frequencies against channel numbers can be made if suitable.
Home/ UHF/ Config/ Yes

Use the ***up/down*** arrows to select from the pre-entered channel numbers and associated frequencies.

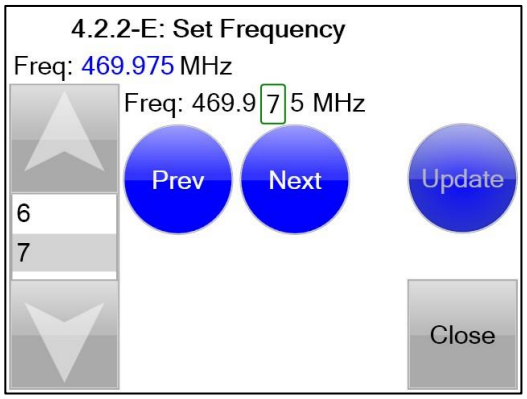
2.8.2.1 Manual Frequency Entry

To manually enter details for a UHF frequency:

Home/ UHF/ Config/ Yes/ Tune/ Edit



Select using the Arrows to show the required Channel number then press the ***Edit*** button.



Use the ***Arrows***, ***Previous*** and ***Next*** buttons to enter the Frequency required.

When entered touch the ***Update*** button then the ***Close*** button.

The Manually entered channel can then be selected for use;

Home/ UHF/ Config/ Yes.

Select the channel number / frequency combination required and touch ***Select***.

2.8.2.2 Link Speed, FEC and Sensitivity

Amend the link speed from ***Home/ UHF/ Config/ Yes/ Tune/ Link Speed.***

Use the onscreen controls to select:

- Select **Link Speed** of 4800 or 9600 bps.
- ***Forward Error Correction (FEC)*** on or off
- Switch ***Sensitivity*** between Low, Medium and High.

When finished entering information return to the ***Status*** section (***Home/ UHF/ Status***) to review the RTCM data delay and channel settings applied.

2.8.3 Module Reboot - UHF

The module reboot will reboot the UHF module without disruption to the other receiver cards.

Only use when the UHF module is not operating correctly.

2.8.4 Factory Reset - UHF

This function should only be used under direction of a VERIPOS representative.

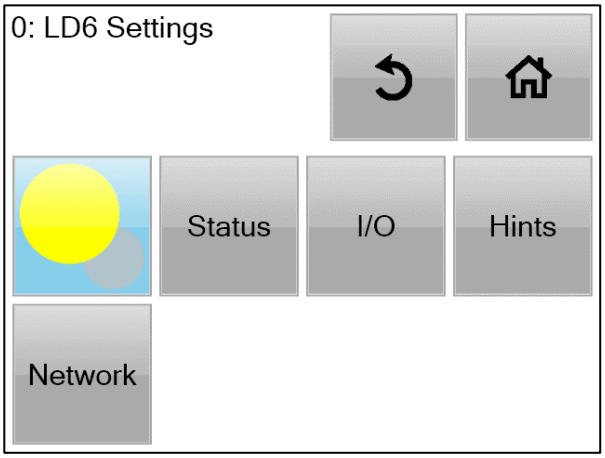
2.8.5 Hints – UHF

Provides advice where available.

2.9 SETTINGS

The ***Settings*** menu is used to view and configure general LD6 settings which are not specific to any one receiver module.

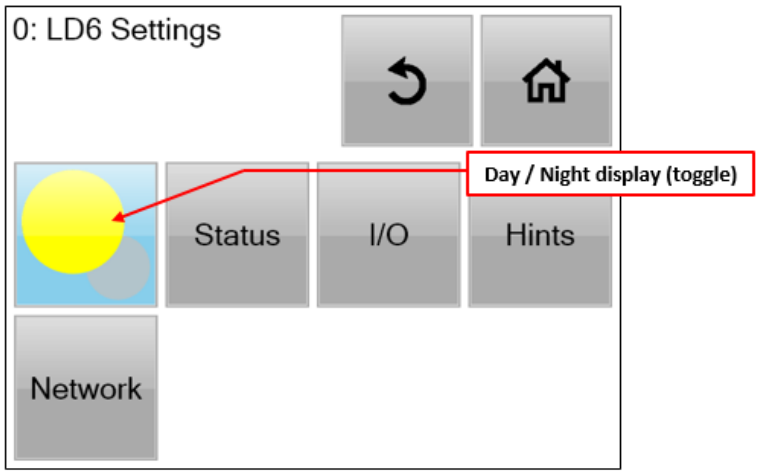
Access from ***Home/ Settings*.**



This section provides information on the controls to:

- View LD6 Status
- Configure serial I/O ports
- View and configure IP Network settings
- Day / Night screen toggle

2.9.1 Day / Night Mode

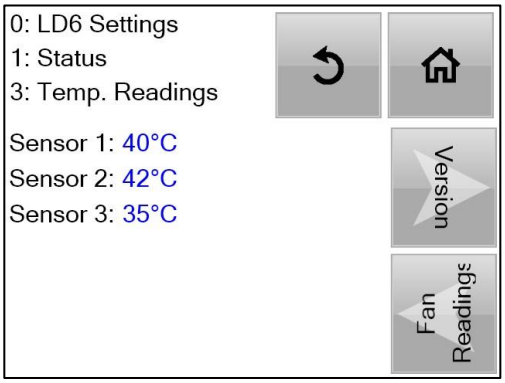


Day/ Night toggle setting of the LD6 screen, press the yellow “dot” button to switch screen display between night and day settings.

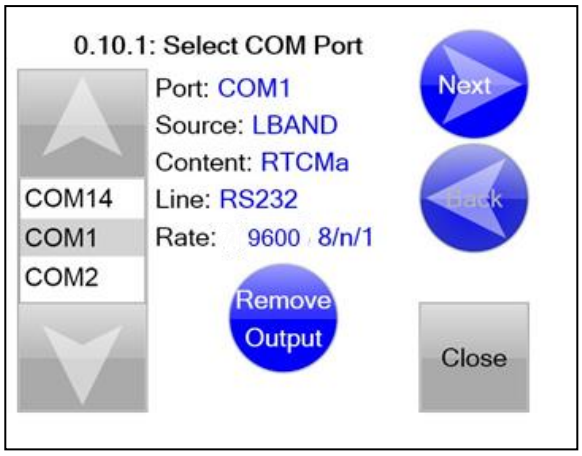
2.9.2 Status

This provides access to overall system status for the LD6; use the right hand side arrow keys to review:

- LD6 system version
- Fan speeds
- Temperature sensor readings
- System resource



2.9.3 I/O – Input Output COM Port Setup



This is used to access configuration of the fourteen com ports
Default port settings are:

PORT	Device /Data Stream	Protocol	LAN
COM1	LBAND - RTCMa	RS232 9600 8N1	9001
COM2	GNSS - NMEAa	RS232 9600 8N1	19016
COM3	GNSS – Raw	RS232 115200 8N1	9012
COM4	LBAND - RTCMb	RS232 9600 8N1	9002
COM5	MF - RTCM	RS232 9600 8N1	9031
COM6	UHF – RTCM	RS232 9600 8N1	9051

COM ports 7-14 are not configured by default. VERIPOS recommend using the default port settings wherever practical.

Changes to default port settings should be recorded so that they may easily be re-instated if it becomes necessary to replace a unit or perform a factory reset.

When the MF and UHF receiver modules are installed **COM5** and **COM6** is configured by default.

2.9.3.1 LD6 Default COM Port – Settings

COM1 – L-BAND RTCMa Output – VERIPOS Corrections

The ***L-BAND - RTCMa*** output is typically used to provide corrections to Verify QC or other VERIPOS Equipment.

The same RTCM data is supplied to the LD6 internal calculations.

VERIPOS recommend that all reference stations are enabled on RTCMa. All VERIPOS algorithms are designed to automatically select the optimum stations for use in the calculation.

COM2 – GNSS NMEAa Output

The ***GNSS NMEAa*** output is the primary NMEA position and can be used to provide position data to the users' equipment.

The choice of NMEA messages are configured using the ***GNSS/ Config*** menu. By default, the NMEA **GGA** message is configured.

NOTE

If no NMEA messages are enabled on NMEAa, the GNSS icon on the LD6 Home screen will be red.

COM3 – GNSS Raw Output

The ***GNSS Raw*** output is only used when connecting the LD6 to VERIPOS Verify QC software running on a separate PC.

NOTE

The GNSS Raw output requires 2-way communication between the LD6 and Verify QC software. Ensure serial cable used is wired correctly for 2-way data communication.

COM4 – L-Band RTCMb Output – VERIPOS Corrections

The **L-Band - RTCMb** output is typically used to provide corrections to users' equipment.

All available reference stations are enabled by default however the user can enable/disable only the reference station(s) required if necessary. Unlike RTCMa, RTCMb is not used internally by the LD6 therefore disabling stations on RTCMb do not affect any NMEA position outputs from the LD6.

COM5 – MF RTCM Output

The **MF – RTCM** output provides RTCM correction data from the MF (IALA) reference station currently in use.

MF corrections are generally only used as a backup when VERIPOS corrections are unavailable or disabled.

COM6 – UHF RTCM Output

The **UHF – RTCM** output provides RTCM data from the UHF station when in use. The addition of UHF corrections has primarily been designed to support the Petrobras UHF chain in Brazil. Users considering other applications should consult the VERIPOS Helpdesk for advice.

Further details for all ports are given in Section 4.

2.9.3.2 LD6 Available I/O Options

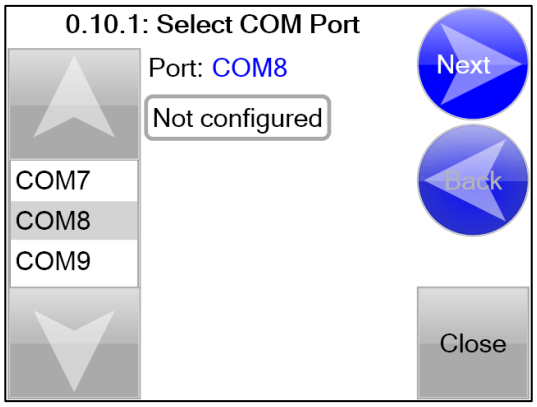
Device	*Data Stream*	*Function*
LBAND:LBR1	**RTCMa**	Primary output of RTCM data from L-Band receiver. The same data stream is used by the internal computations.
	RTCMb	Secondary output of RTCM data from L-Band receiver.
	Config	*Use only under Veripos Guidance*
GNSS:NovAtel OEM6	NMEAa	NMEA data output. Set to GGA by default
	NMEAb	NMEA data output. Set to ZDA by default
	NMEAc	NMEA data output. Set to ZDA by default
	Raw	Raw GNSS data. Only for use with Verify QC.
MF:SBX4	RTCM	RTCM data from MF receiver.
	Config	*Use only under Veripos Guidance*
UHF:PacificCrest	RTCM	RTCM data from UHF receiver.
	Config	*Use only under Veripos Guidance*
Ext RTCM 1	Veripos	External Veripos RTCM data input
Ext RTCM 2	Veripos	External Veripos RTCM data input
Gyro Input	HDT / THS	Gyro heading input, for use with Orion. Must be in NMEA HDT or THS format.

2.9.3.3 NMEA Position Output – Via COM

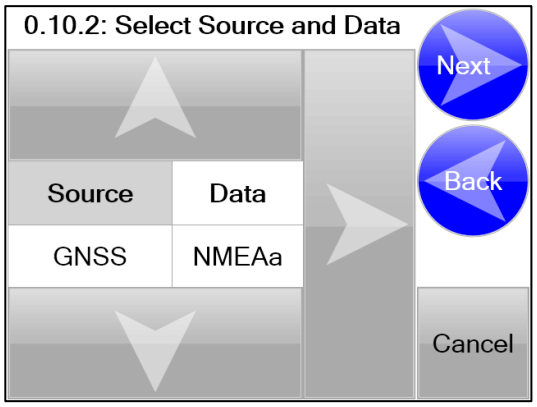
Before configuring any output of an NMEA position, you must have first selected which NMEA message types are required by the receiving system.

Please refer to Section 4 for details regarding selection of NMEA message types.

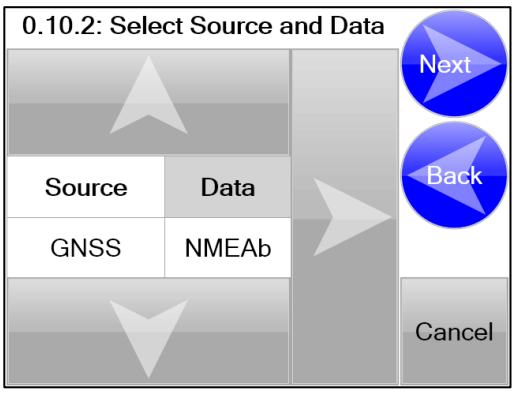
Go to ***Home/ Settings/ I/O*** and use the arrow icons to navigate to an unused COM port.



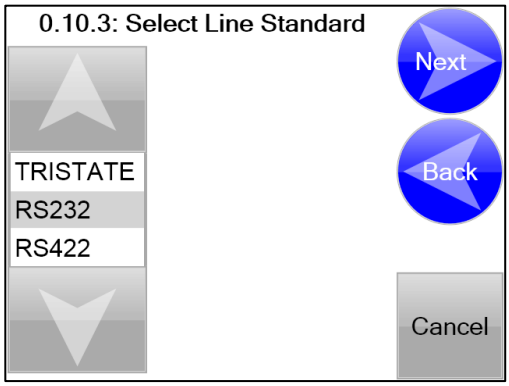
Touch ***Next*** then use the ***Up/Down*** arrow icons to select ***GNSS*** in the ***Source*** field.



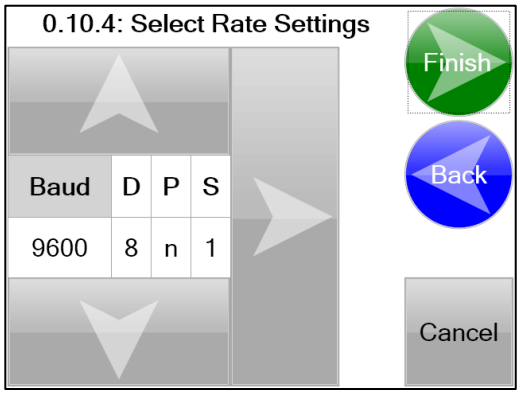
Use the ***Right*** arrow to move to the ***Data*** field then use the ***Up/ Down*** icons to select ***NMEAa***, ***NMEAb*** or ***NMEAc***.



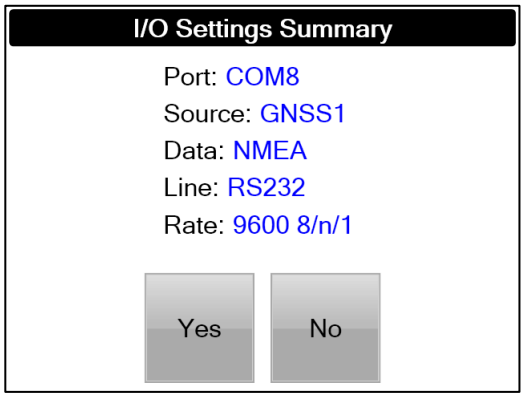
Touch ***Next*** then select the required data protocol e.g. ***RS232*** or ***RS422.***.



Touch ***Next*** then select the required baud rate, data bit, stop bit and parity settings using the arrow icons.



Finally, touch ***Finish***. A summary of the I/O port settings will be displayed. Touch ***Yes*** to apply settings.



For details of LD6 COM pin-outs, refer to Section 4.

2.9.3.4 External RTCM Inputs

As detailed in Section 2.9.3.2, it is possible to input RTCM correction data to the LD6 from external sources.

It is possible to configure up to two Ext RTCM inputs. Only one RTCM data source will be used at any one time. Each data source will be designated with a priority level. The priority for VERIPOS RTCM corrections are as follows:

1. RTCMa (LD6 L-Band) **PRIMARY**
2. Ext RTCM 1 **SECONDARY**
3. Ext RTCM 2 **TERTIARY**

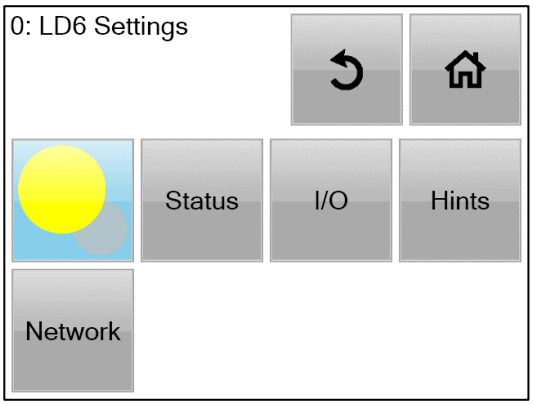
NOTE

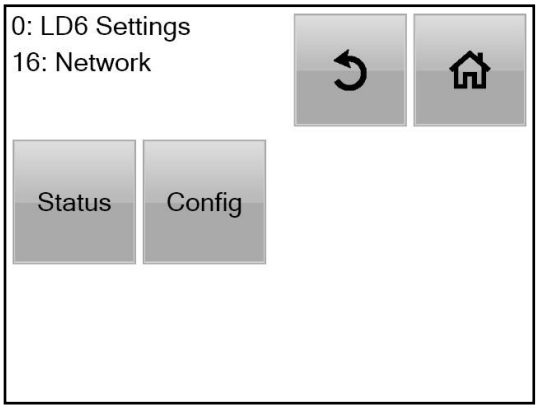
Any non-VERIPOS corrections available (e.g. on-board MF or UHF) will only be used in the event that all VERIPOS correction sources have failed or are disabled.

The LD6 is only able to receive VERIPOS RTCM corrections from external devices through serial connection, it will not use external 3rd Party RTCM corrections.

2.9.4 Network

Touch the ***Network*** button in the Settings menu to open the Network page.

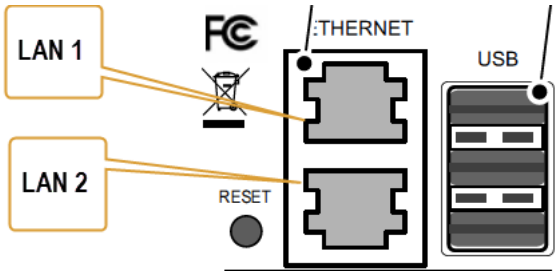




2.9.4.1 LD6 LAN Ports

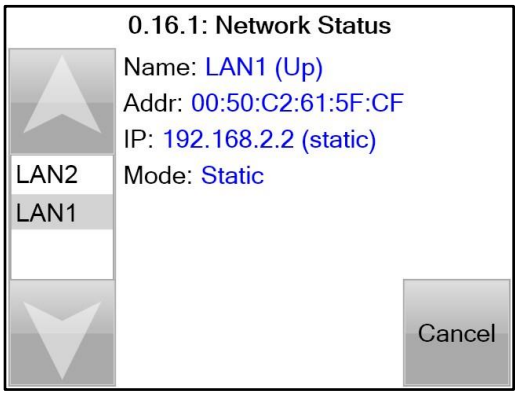
There are two RJ45 LAN ports mounted under the power connector on the extreme left of the rear panel labelled “Ethernet”.

The upper port is LAN1, the lower port is LAN2.



2.9.4.2 Network Status

Touch ***Settings/ Network/ Status*** button to display the current settings of the ports.



The ***Up/Down*** arrows may be used to switch between LAN1 and LAN2. The following information is displayed:

- **Name** LAN1 or LAN2
  (Up = Connected, Down = Disconnected)
- **Addr** MAC address of network interface card
- **IP** Current IP address of LAN port
- **Mode** Static or DHCP
  Static = Fixed IP which can be set by user
  DHCP = Dynamic IP, normally assigned by a DHCP server

If an IP is assigned from the server, it is displayed followed by “(auto)”.

If no IP is assigned from the server, the LAN port falls back to the static IP. The static IP is displayed followed by “(fallback)”.

2.9.4.3 Network Configuration

From the ***Network*** menu touch the ***Config*** button to open the configuration page.

Use the ***Up/Down*** arrows to switch between LAN1 and LAN2. The display shows the port name, current IP and current mode.

To change the current configuration, touch the ***Next*** button.

Use the ***Up/Down*** arrows to change the mode if required, then touch the Next button to move to the next setting. It is necessary to cycle through all four pages in order to reach the "Finish" button which is used to accept the changes.

These pages allow the user to set:

Set	Description
Mode	Choose between Static or DHCP – Veripos recommend use of Static
Static Address	To Set Static / Fallback address
Subnet Mask	To set the Subnet Mask info
Gateway Address	Where required – Use Finish button to confirm changes.

2.9.4.4 LAN Default Settings

The LAN default settings are as follows:

Mode: STATIC

Static IP (LAN1): **192.168.002.002**

Static IP (LAN2): **192.168.003.003**

Subnet Mask: **255.255.255.000**

Gateway Address (LAN1): **192.168.002.001**

Gateway Address (LAN2) **192.168.003.001**

2.9.4.5 LAN Connection to Verify QC

Ethernet is the preferred method of interfacing to Verify QC. All interfaces can be supported using a single CAT5e or CAT6 network cable.

Cable runs typically encountered on vessels fall within the Ethernet specification. This contrasts to using RS232 where multiple cables are required and longer runs may pose problems when high baud rates are required [e.g. for GNSS Raw data].

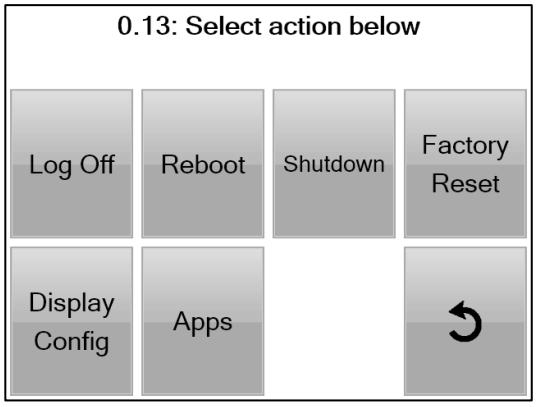
2.9.4.6 LAN Interface – TCP Port Numbers

All I/O signals which are available on the COM ports can also be interfaced via the LAN. The table below shows the TCP port number which outputs and inputs are available on:

Port	Port number	Notes
L-Band RTCMa	9001	
L-Band RTCMb	9002	
L-Band control	9003	
GNSS Raw	9012	
GNSS NMEAa	19016	
GNSS NMEAb	19017	
GNSS NMEAc	19018	
MF RTCM	9031	If card present
UHF RTCM	9051	If card present

2.10 ACTIONS

From the Home page select ***Actions***. This displays the menu below



NOTE

The ***Apps*** icon will only be displayed if an external monitor has been connected to the LD6.

Certain actions, e.g. Factory Reset, should only be undertaken under instruction from a VERIPOS technician.

2.10.1 Log Off

Should only be used under instruction from VERIPOS.

2.10.2 Reboot

Will perform a system restart of the LD6. Positioning will be lost while LD6 is rebooting.

2.10.3 Shutdown

Will shut down the LD6 system. Once the system shuts down the power switch on the front of the LD6 should be switched off to ensure fans are powered off.

NOTE

The LD6 should **always** be shut down via this icon before being switched off.

2.10.4 Factory Reset

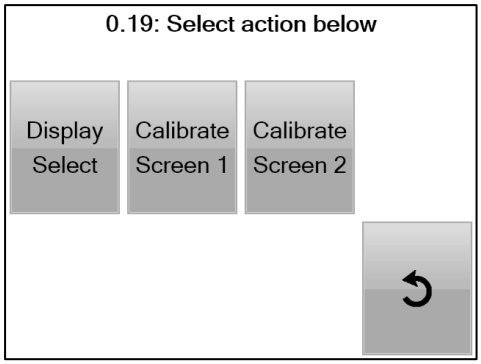
Should only be used under instruction from VERIPOS and will reset all values back to default. This action is password protected.

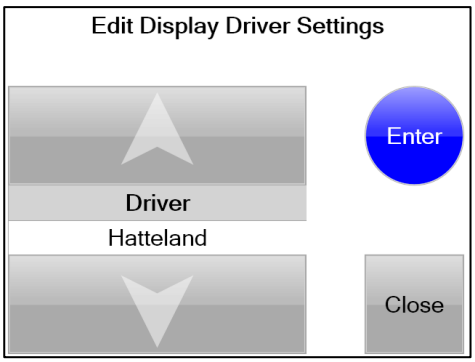
2.10.5 Display Config

2.10.5.1 Display Select

The ***Display Select*** menu is only relevant when a touch-screen enabled external monitor is connected to the LD6. This setting allows the correct drivers to be installed. The supported touch-screen monitors are ***Hatteland*** and ***Norco***. For use with other monitors it is recommended to contact VERIPOS for further advice.

Select the appropriate drivers for the monitor in use using the *Up/Down* arrows then press ***Enter***.





NOTE

After editing the Display select settings, a reboot will be required to ensure settings are applied resulting in a temporary loss of positioning.

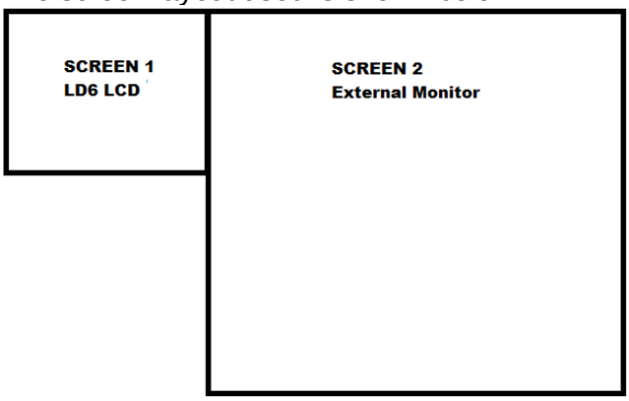
2.10.5.2 Dual Monitor Screen Layout

When an external monitor is attached, the external monitor effectively becomes an extension of The LD6 screen. The LD6 screen is *always* defined as screen 1 and the external screen is screen 2.

A mouse can be used to control both screen 1 and screen 2. To move the mouse from the LD6 screen on to the external monitor, drag the mouse to the right.

To move the mouse from the external monitor to the LD6 screen, drag the mouse to the top left of the monitor.

The screen layout used is shown below:



2.10.5.3 Calibrate Screen 1 / 2

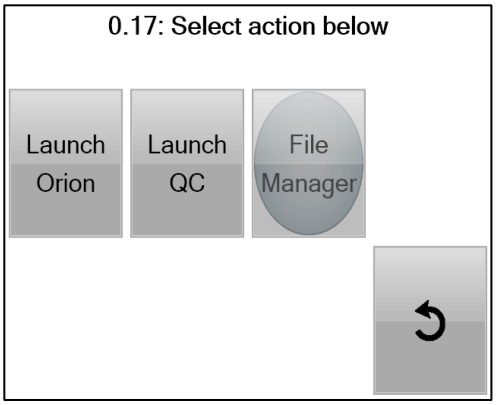
Touch these buttons when displayed and follow the instructions to calibrate the touchscreen.

NOTE

The **Calibrate Screen 2** will only appear when an external monitor has been connected.

2.10.6 Apps

The Apps button is where the on-board applications can be launched:



NOTE

The ***Apps*** icon will only appear when a VGA monitor has been connected to the LD6.

2.10.6.1 Launch Orion

This will launch the VERIPOS DP Orion software. Orion will be displayed on the attached VGA monitor.

Please refer to the *Orion Operations manual* for further information regarding the use of Orion. This manual is available at https://help.veripos.com.

2.10.6.2 Launch QC

This will launch the VERIPOS Verify QC software. Verify QC will be displayed on the attached VGA monitor.

Please refer to the *Verify QC for LD6 Operations manual* for further information regarding the use of Verify QC on-board LD6. This manual is available at https://help.veripos.com.

NOTE

An enabled Verify QC dongle must be installed in one of the LD6 USB ports before Verify QC will launch.

2.11 ARCHIVING DATA

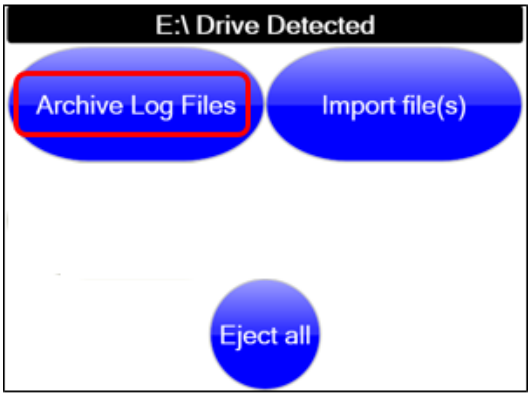
In the event of any receiver issues, such as loss of solution, it is possible to archive the raw GNSS and RTCM data in a VERIPOS proprietary format. These files can then be sent to VERIPOS for analysis in order to determine the cause of any issues.

The last 72 hours of data will be retained, then the oldest data will be overwritten.

CAUTION

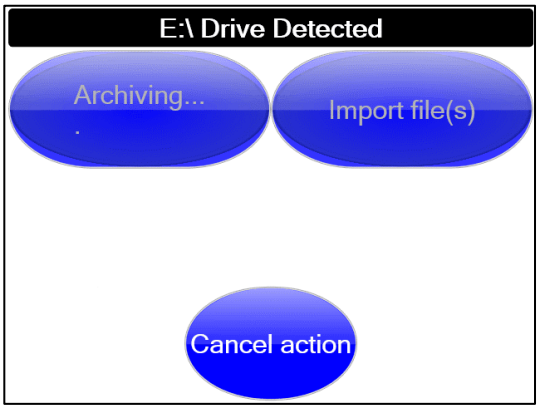
Always perform a virus scan on the USB memory stick before inserting into the LD6.

To archive LD6 data, insert a USB memory stick into an available LD6 USB socket. The screen below will appear:



Select ***Archive Log Files*** to commence archiving the raw logged data to the USB memory stick.

The screen will now show that the data is currently being archived and an option to cancel the operation will be available if required:



The data archive may take several minutes and is complete when the ***Eject all*** icon becomes available.

Before removing the USB memory stick from the LD6, ensure that ***Eject all*** is pressed. This will then allow the USB memory stick to be safely removed.

2.12 USE OF EXTERNAL TOUCHSCREEN MONITORS

A touchscreen monitor can be connected to the LD6. The VERIPOS *Orion* software can then be operated using the touchscreen monitor.

Verify QC is not designed to be operated via touchscreen therefore a keyboard and mouse will be required for operation and configuration of Verify QC.

Touchscreen monitors require both VGA and USB connection to the LD6. VERIPOS recommend the use of USB 2.0 cables, up to a maximum length of 5 metres.

The LD6 supports the use of *NORCO* and *HATTELAND* touchscreen monitors. Refer to **Section 2.10.5** for information on touchscreen display configuration.

3. VERIPOS SOFTWARE COMPATIBILITY

LD6 IMU's running software version 101.02.00.01 are compatible with the following VERIPOS software:

Compatible VERIPOS Software	Compatible Software Version
Orion DP	2.0.3.38
Verify QC	1.20

LD6 IMU's running software version 101.02.0.01 are **NOT** compatible with the following VERIPOS software:

- Quantum
- Verify QC versions older than 1.20

NOTE

If using an LD6 on software version **101.0.0.9**, Verify QC version **1.13** should be used. Verify QC version 1.20 is **NOT** compatible with 101.0.0.9.

4. TROUBLESHOOTING

The LD6 uses a touch screen to access an embedded Windows XP operating system.

The system contains no user-serviceable parts.

The cover should not be removed except under the guidance of a VERIPOS engineer, first ensuring that **the unit is isolated from all AC and DC power supplies**.

Problems experienced when using the LD6 system relate to antenna connectivity, correction signal reception, configuration errors or relate to the GNSS satellite positioning signal reception for inclusion in calculating a position solution.

Use this section to assist with any problems encountered when using LD6 NovAtel.

4.1 HARDWARE

Hardware fault finding should be limited to checking the security of connectors and checking supply voltage.

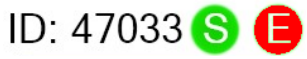
It is **strongly recommended** before detailed investigation is undertaken to first check coaxial cable integrity and correct location of antennas.

This manual provides some guidance for troubleshooting the LD6 IMU.

4.2 POWER FAULTS

Fault	Reason	Remedy
Screen blank	Shutdown has been activated from Action menu but the power switch in on	Toggle the power switch. This will reboot the unit and the MMI should appear.
	External supply fault, disconnected or switched off	Check power to the LD6. Adjust screen brightness using the control on the left side of the LD6. Check power connections to the unit for physical and electrical integrity.
	Fault in AC/DC supply.	Disconnect the power supply. Check voltages to and from unit. The LD6 AC is 110/240 V. DC power 12–24 VDC. Reconnect power and allow LD6 to restart.
	LD6 fault.	If the PSU voltage is correct contact the VERIPOS Helpdesk.
	Screen brightness turned down	Use the brightness control knob to increase screen brightness.

4.3 ENABLE \ DISABLE FAULTS

Fault	Reason	Remedy
Enable indicator shows red. 	Unit disabled; Access code incorrect.	Contact VERIPOS helpdesk for appropriate enable code. Repeat entry of code. Use Quick Guide. Disconnect unit from power for one minute. Reconnect and allow to initialise, then repeat entry of code.
Unable to enter an Access code. 	Not receiving LBAND signal. 'Sync' icon is Red.	Unit needs to receive a beam (LBAND frequency) for the global work region before it can be enabled / disabled. Ensure LBAND antenna is connected, has a clear view of sky to equator. Use the Quick Guide to select and confirm a valid regional satellite beam has been selected for the work area.

4.4 LBAND SIGNAL FAULTS

Fault	Reason	Remedy
Sync indicator shows red. 	No sync with satellite beam No beam being received. Unit requires a restart	Use the 'L-band Coverage Map' (in Section 4) to check which beam is correct for current location. Go to **LBAND/Config/Beams** to check and, if required, amend to the correct regional beam. **Where L-BAND signal** is derived from vessel's Inmarsat. – Unit may have lost beam lock or has switched to a different geostationary satellite. Confirm the Inmarsat is tracking the correct satellite. Check the correct frequency is entered - refer to Section 4 of this manual. Contact Helpdesk.
	Vessel has moved to a new work region - beam used has not been changed	Check which beam is selected at **LBAND/Status/ Device Status**. If necessary consult the L-band Coverage Map and if required select the regional beam.
	Antenna blockage	Visually check whether the path between the antenna and satellite is subject to blockage. This can occur when the vessel is in port and/or alongside a large structure. Blockage can also be caused by the vessel's own superstructure. This may be eliminated by changing the heading.
	Interference	Investigate any source of L-BAND transmissions and high power transmissions of other frequencies. If possible shut down possible sources to eliminate them.
	Antenna disconnected or inoperative	Visually check antenna and cable for DC power and damage. Check coaxial connections and inspect antenna for damage.

For Verify QC, consult the *Verify QC Operations Manual* for guidance on its' use where provided in conjunction with the LD6.
For problems relating to antennas or cables, see the *LD6 Installation manual* and the *Antennas & Coaxial Cable Installation guide* before installing replacement equipment and for a general guide to equipment installation.

4.5 VERIPOS HELPDESK

For assistance with basic troubleshooting please refer to the section in this manual.

VERIPOS encourage all users to report problems or operating queries to the Helpdesk so that they may receive assistance.

For general help please see the extensive library of FAQ and reference material on the VERIPOS Online support system, VOSS at:

https://help.veripos.com

The VERIPOS Helpdesk is the first point of contact for technical enquiries and fault reports. It is manned 24 hours per day, 365 days per year. Helpdesk contact details are in the *Contact information* chapter. VERIPOS recommend initial contact is made by email.

You can also create a fault ticket accessed from the VOSS. Using this system will ensure contact details, fault description etc. are correctly recorded and you can track progress without using email.

The Helpdesk is trained to provide assistance to most queries. They can request technical staff to provide support for complex issues.

To ensure a rapid response, initial communication should include the following information:

- **User's name**
- **Telephone number**

If possible, choose a phone near the equipment.

- **Email address**
- **Full vessel name**

Correct identification is important; VERIPOS may have installation drawings.

- Name of **parent company**
- **User Code** (on front panel) and current 'Access code' of LD6, see the Operation chapter for details.
- **Current status** of the LD6

- Brief **description of other VERIPOS hardware and software installed**
- Vessel's current **operating region** and lat/long.
- **Vessel's status**

Is it alongside, in transit, in operation, or shut down due to fault?

- **History of fault** including time when a problem occurred.

- Is this a new installation which has not yet been fully commissioned?
- Did a problem suddenly arise with a system which was previously operational?
- Did the system cease working after moving to a new region?

- **Description of fault**

Once basic information has been received the Helpdesk will raise a fault ticket. Users can access the ticket from the VOSS site.

5. REFERENCE INFORMATION

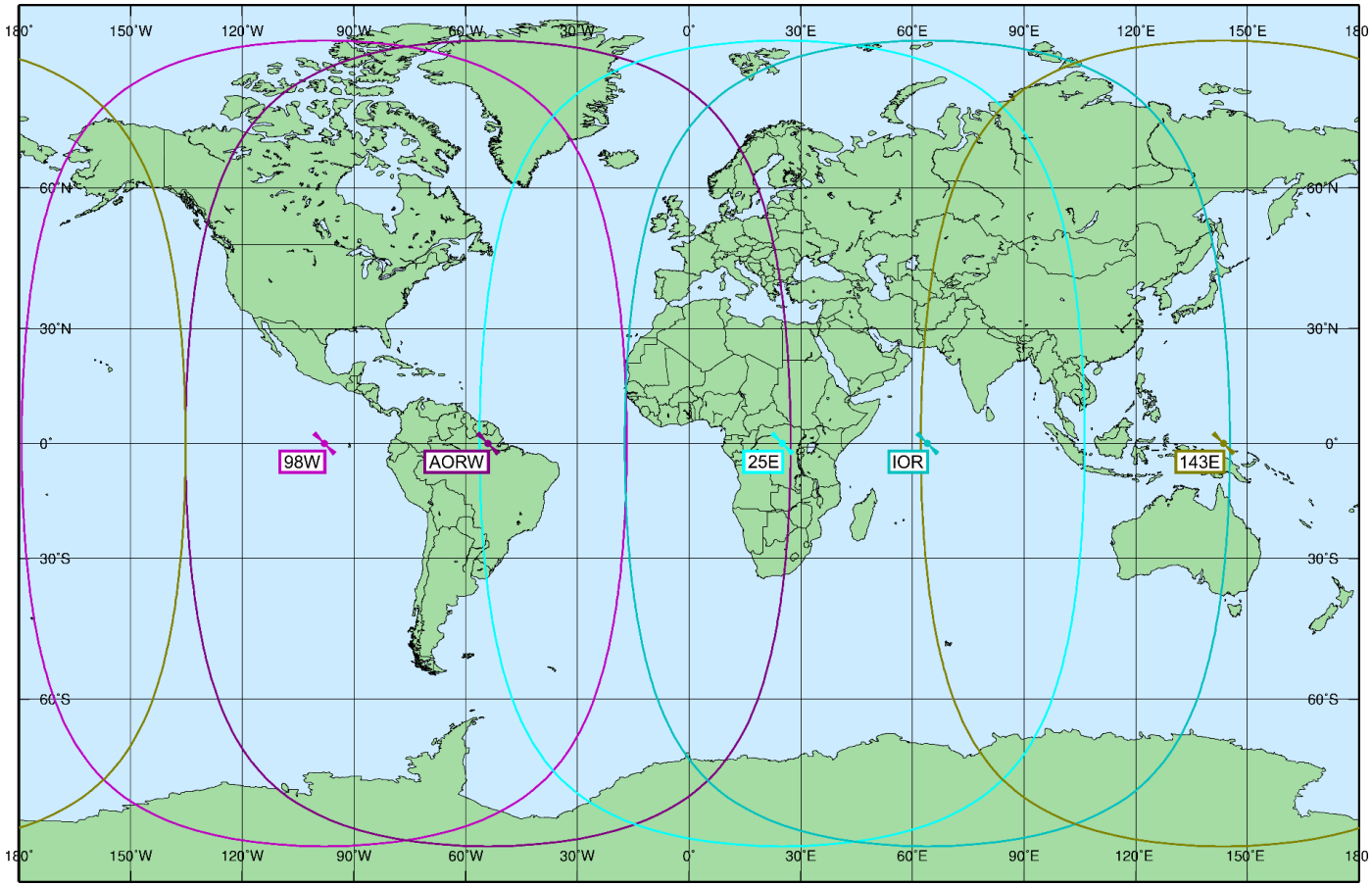
5.1 SERVICE ACCESS LICENCE

VERIPOS correction signals are provided as a chargeable service.

In order to receive this service the user must first arrange a **Service Access License** (SAL). This takes the form of a contract which is agreed between the user's company and the VERIPOS Operations department.

The equipment cannot be used until an enable code is obtained from the VERIPOS Helpdesk. The Helpdesk is not authorised to issue a code unless an active SAL exists and its number can be determined. To avoid delays the user should keep a record of the SAL number associated with his unit.

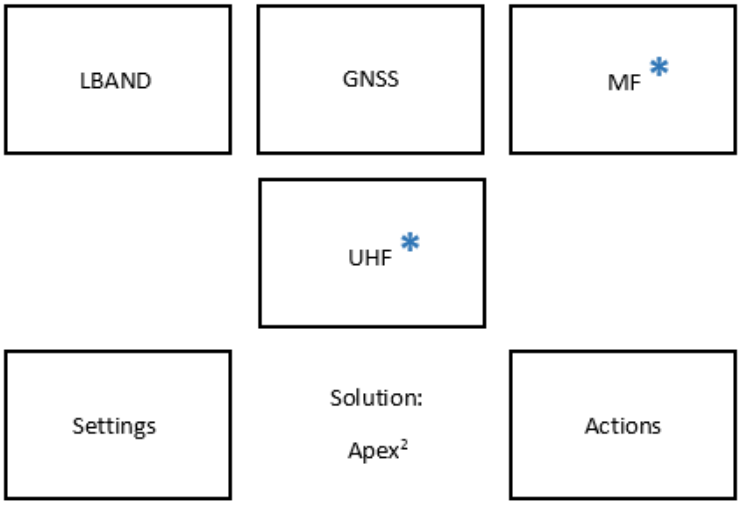
5.2 L-BAND COVERAGE MAP



An up-to-date VERIPOS L-band Coverage Map can be found on the VERIPOS Online support system at https://help.veripos.com.

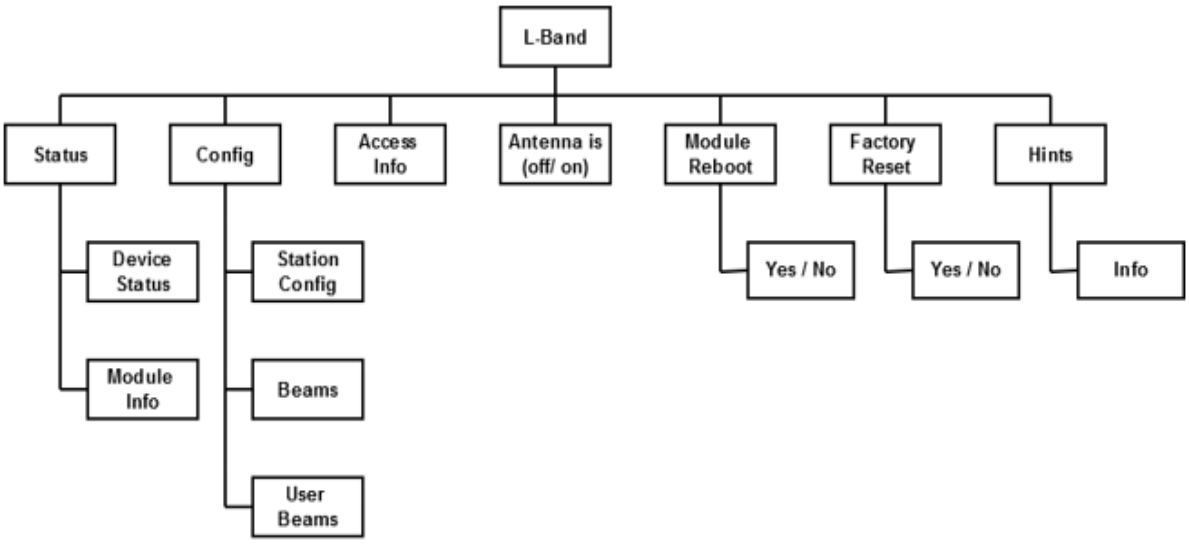
5.3 LD6 MENU STRUCTURE

5.3.1 Home Screen

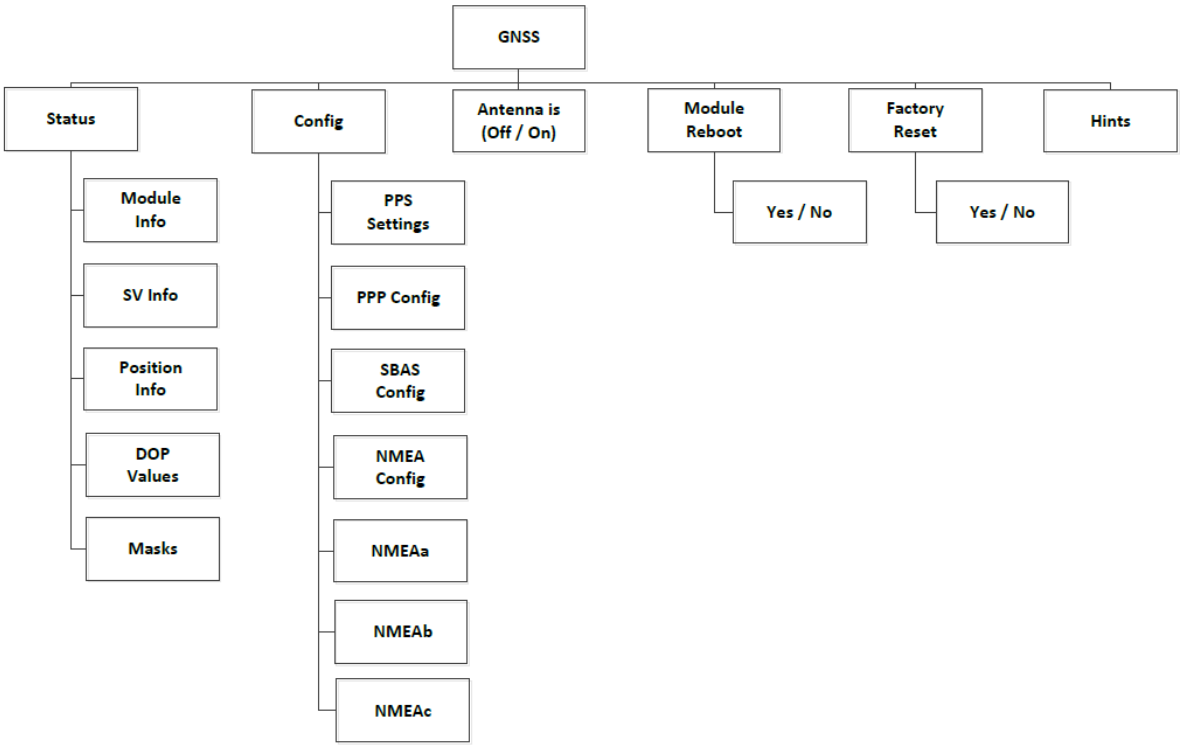


* Icon appears only if relevant receiver card is fitted

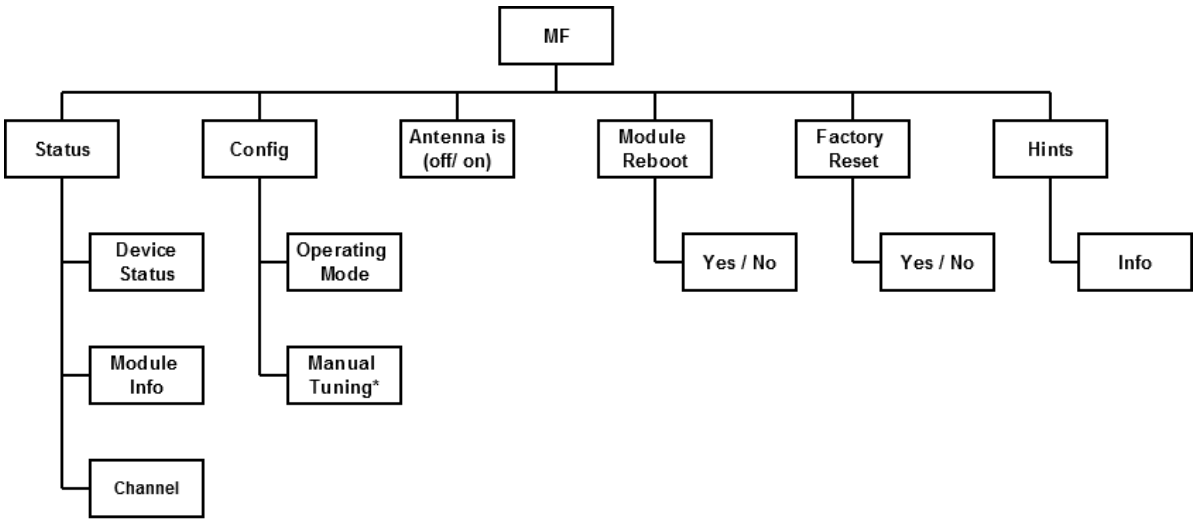
5.3.2 L-BAND



5.3.3 GNSS

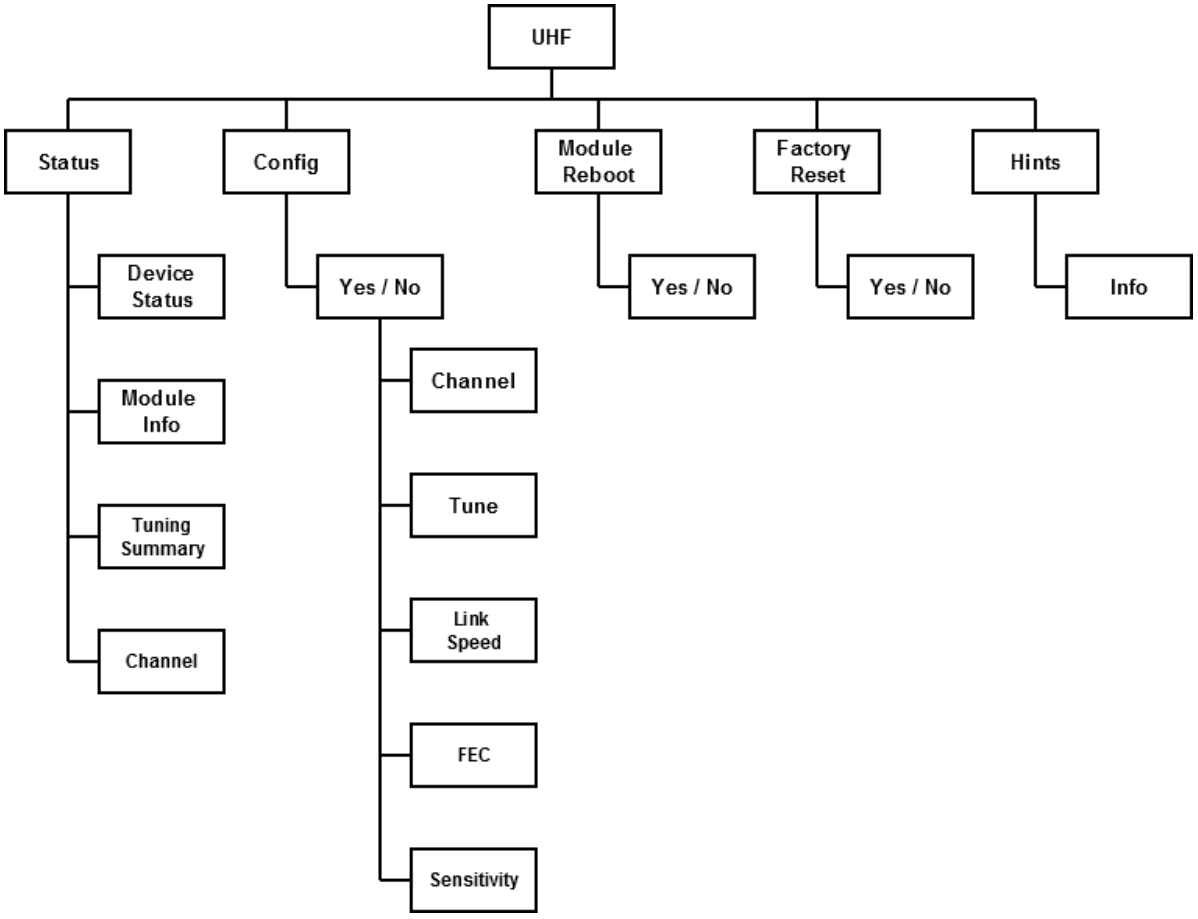


5.3.4 MF

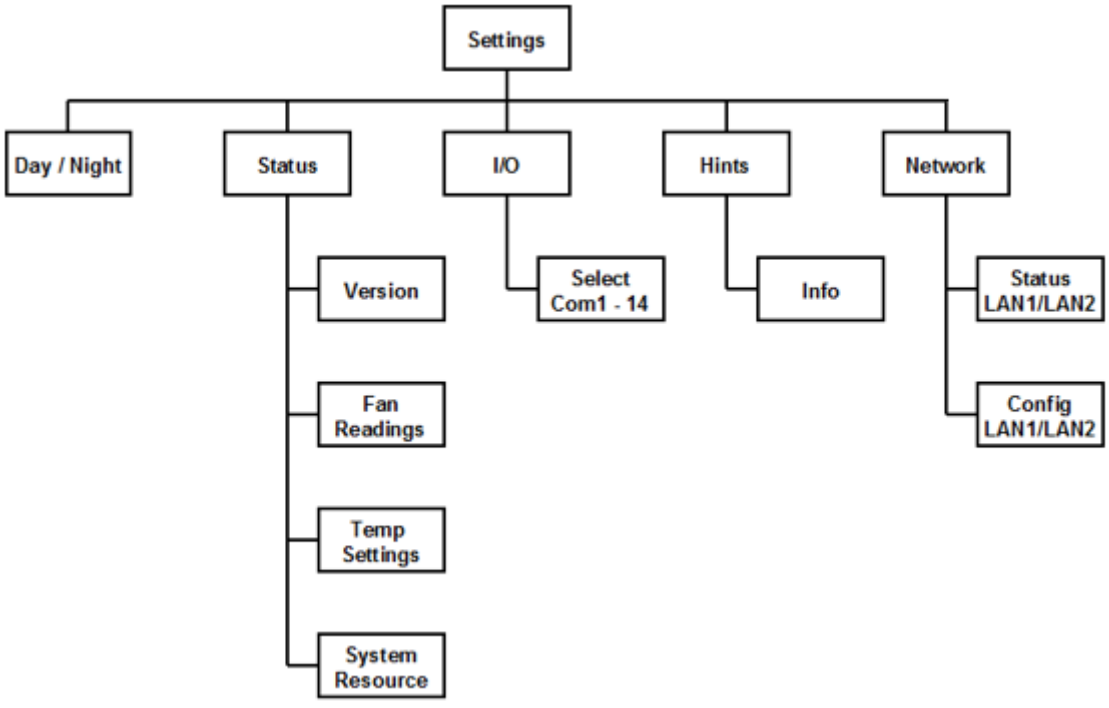


* Manual Tuning page is only available whenin Manual Mode

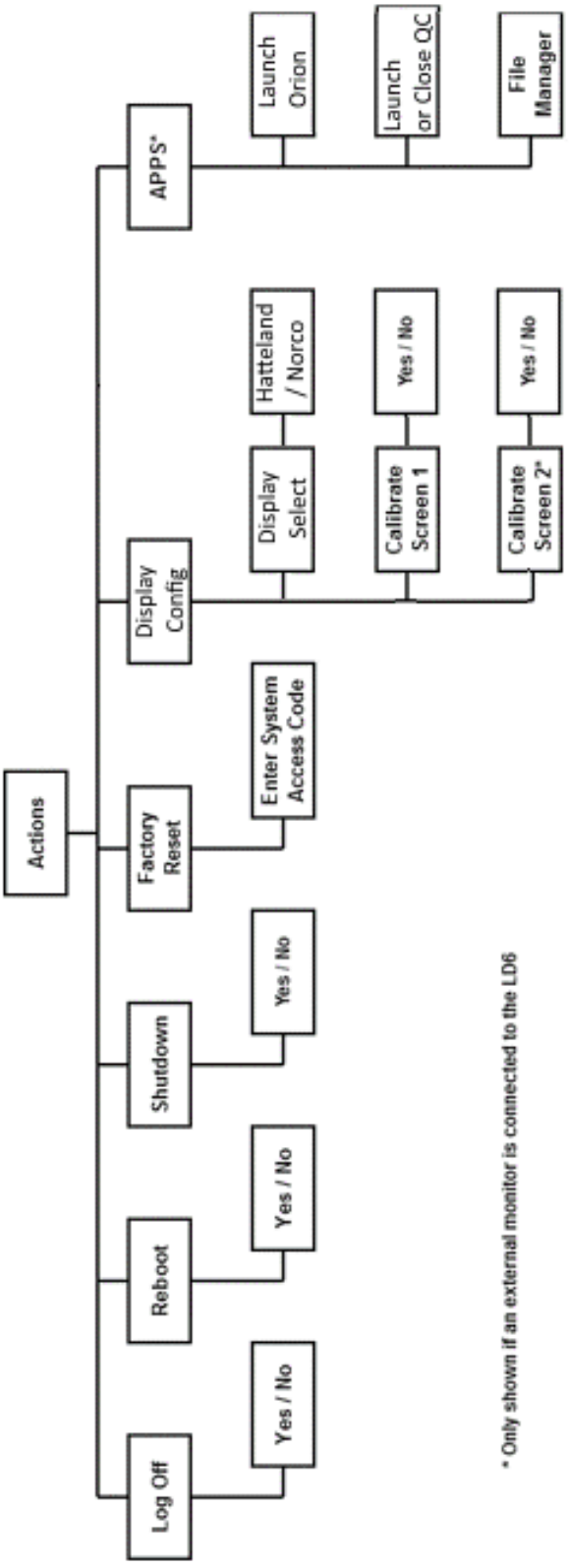
5.3.5 UHF



5.3.6 Settings



5.3.7 Actions

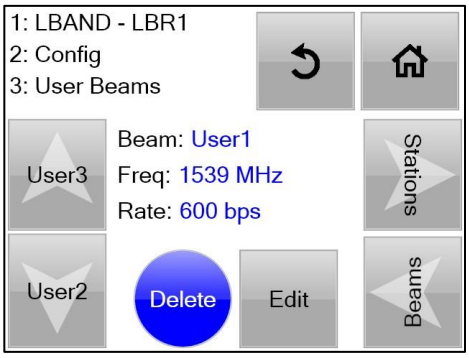

Actions
APPS*
Launch Orion
Launch or Close QC
File Manager
Display Config
Display Select
Hatteland / Norco
Calibrate Screen 1
Yes / No
Calibrate Screen 2*
Yes / No
Factory Reset
Enter System Access Code
Shutdown
Yes / No
Reboot
Yes / No
Log Off
Yes / No
* Only shown if an external monitor is connected to the LD6

5.4 ADD USER BEAM

The ‘User Beam’ facility is provided for the manual entry of new satellite beams to receive VERIPOS corrections.

Use this channel for your work region ONLY when advised by VERIPOS.

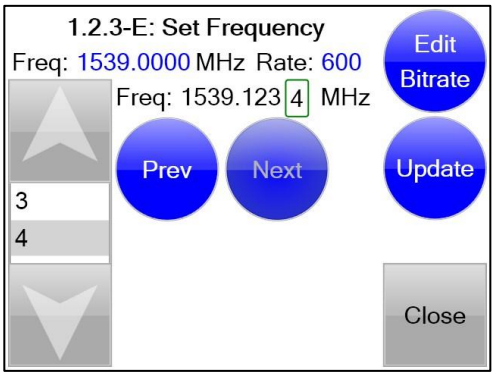
Go to ***LBand/ Config/ Beams User Beams/ Edit***



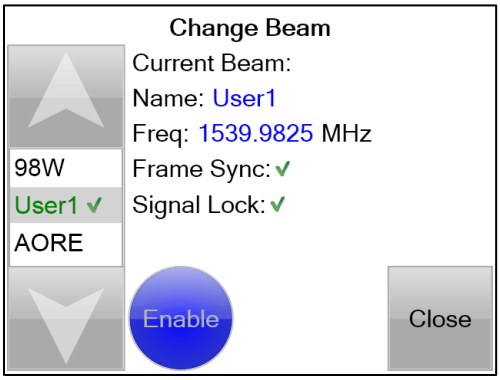
Use the Arrow buttons to Select from pre-set names, ‘User 1-3’.

Where a new beam frequency needs to be entered:

On the **User beam** to edit (User1 – 3), touch ***Edit*** and use the ***Arrow*** buttons / ***Next*** to enter the frequency and Bitrate (normally 1200).

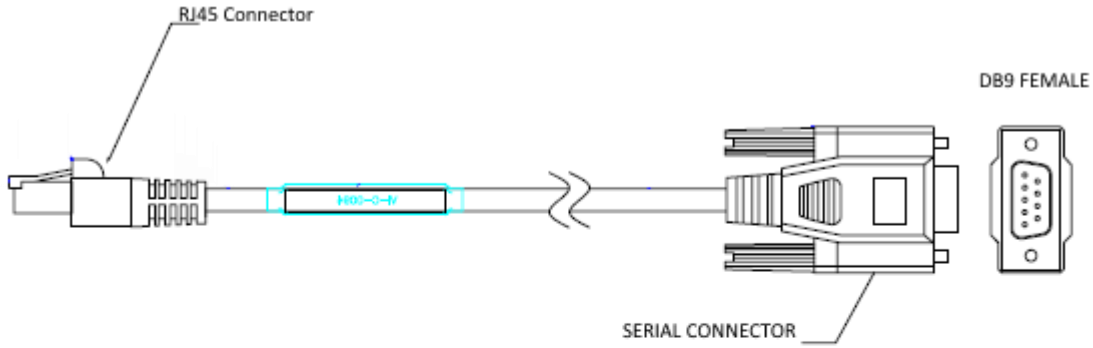


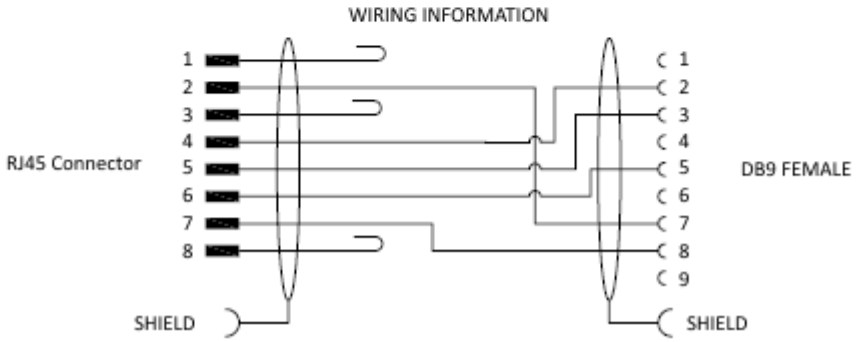
Touch ***Update*** to enter the frequency. Finally navigate to ***Home / LBAND /Config / Beams*** and ***Enable*** the User beam as required.



5.5 COM AND LAN PORT INFORMATION

5.5.1 LD6 Serial Cable Wiring





DB9	RS-232	RS422
1	Not connected	Not connected
2	TxD	Tx(-)
3	RxD	Rx(+)
4	Not connected	Not connected
5	Signal ground	Signal Ground
6	Not connected	Not connected
7	Not connected	Tx(+)
8	Not connected	Rx(-)
9	Not connected	Not connected

NOTE

The LD6 is the transmitting device.

5.6 QUALITY STANDARDS

A number of standards offer marine satellite navigation system users DGNSS (DGPS/DGPS+DGLONASS) quality information. The most well-known and frequently referred to standards are:

1. UKOOA
2. NMEA-0183

Each standard is explained in more detail in the following sections.

NMEA have recently introduced the NMEA-2000 interface standard. This standard falls outside the scope of this document. See www.nmea.org for further information.

References

[1] Guidelines for the use of Differential GPS in offshore surveying, UKOOA, 1994

[2] NMEA 0183 Standard for interfacing marine electronic devices, version 3.01, January 1, 2002

[3] Guidelines on the use of DGPS as a positioning reference in control systems, IMCA M 141, October 1997

UKOOA STANDARD

The UK Offshore Operator Association (UKOOA) issued 'Guidelines for the use of Differential GPS in offshore surveying' in 1994. These guidelines set out what is generally regarded as good practise in the offshore industry. They are not mandatory and operators are free to adopt different guidelines or standards.

These guidelines are now dated in certain areas due to advancements in positioning technology and algorithms. However, they contain useful suggestions for quality monitoring as indicated below [see 1]: -

> *"To assist DGPS operators and client representatives to monitor the quality of the DGPS system in real-time the following information should be continuously available:*
> - *Pseudo-range residuals of all SV's and observation weight values used*
> - *Unit variance*
> - *Number of satellites in view and number used in solution*
> - *Redundancy of least squares solution*
> - *DOP values (HDOP, PDOP and VDOP)*
> - *Latency of differential correction data*
> - *Position comparisons derived from different reference stations*
> - *Derived antenna height with respect to "known" height*
> - *Monitor station information, especially position error measured at the monitor station. All data should be time tagged*
> - *Maximum external reliability figure and observation carrying it"*

The UKOOA guidelines present a set of test statistics and quality measures recommended for use with DGPS. In its final recommendations [see 1] it states: -

"It is essential to assess the precision and reliability of each position in order to ensure the quality of the DGPS measurements. Thus is recommends that the following processing steps be implemented: -

- *w-test for outliers carried out for each position fix*
- *F-test for unit variance carried out for each position fix*
- *When no more outliers are identified in any fix, precision and reliability measures will be calculated:*
  - *Precision: a-posteriori error ellipse*
  - *Reliability: external reliability (positional MDE using a power of test of 80%)"*

Where accuracy and precision statistical parameters are generated these all represent a 95% (2σ) confidence region.

Appendix A of the UKOOA guidelines emphasises this by listing 'Suggested parameters to be specified by a system user for typical marine survey operations' and states that 'In order to carry out rigorous QC, the covariance matrix generated by the least squares computation should be used to generate test statistics and quality measures'.

It recommends the following Test Statistics:

1. w-test — used to detect outliers
2. F-test — used to verify the model which is being used to account for 'errors' in the DGPS observations

It recommends also the following Quality Measures:

1. Error Ellipse — an approximate graphical representation of the positional standard deviation in two dimensions
2. External Reliability — the effect of the maximum MDE (Marginally Detectable Error) on the computed position

These recommendations are particularly aimed at survey applications but could be applied equally to DP applications.

NMEA-0183 STANDARD

The National Marine Electronics Association (NMEA) has developed a specification defining the interface between various pieces of marine electronic equipment. The standard permits marine electronics to send information to computers and to other marine equipment via a serial interface. A full copy of this standard is available for purchase at their web site (www.nmea.org). The current version of the standard is 3.01.

GPS receiver communication is defined within this specification. The idea of NMEA is to send a line of data called a sentence that is totally self-contained and independent from other sentences. There are standard sentences for each device category and in addition NMEA permits hardware manufactures to define their own proprietary sentences for whatever purpose they see fit. All standard sentences have a two letter prefix defining the device using that sentence type. For GPS receivers the prefix is GP followed by a three letter sequence defining the sentence contents. All proprietary sentences begin with the letter P and are followed with 3 letters identifying the manufacturer controlling that sentence.

NMEA consists of sentences, the first word of which, called a data type, defines the interpretation of the rest of the sentence. Each data type has its own unique interpretation and is defined in the NMEA standard. Each sentence begins with a '$' and ends with a carriage return/line feed sequence no longer than 80 characters of visible text (plus the line terminators). The data is contained within this single line with data items separated by commas. The data itself is ASCII text and may extend over multiple sentences in certain specialized instances but is normally fully contained in one variable length sentence. The data may vary in the amount of precision contained in the sentence. For example time might be indicated to decimal parts of a second or location may be shown with 3 or even 5 digits after the decimal point. Programs reading the data should only use the commas to determine the field boundaries and not depend on column positions. There is a provision for a checksum at the end of each sentence which may or may not be checked by the unit reading the data. The checksum field consists of a '*' and two hex digits representing the exclusive OR of all characters between, but not including, the '$' and '*'. A checksum is required on some sentences.

There have been several changes to the standard but for GPS use the only ones that are likely to be encountered are 1.5 and 2.0 through 2.3. Version 2.3 added a mode indicator to several sentences used to indicate the kind of fix the receiver currently has. The value can be A=autonomous, D=differential, E=Estimated, N=not valid, S=Simulator. Sometimes there can be a null value as well. Only the A and D values correspond to an active and reliable sentence. This mode character has been added to the RMC, RMB, VTG, and GLL, sentences and optionally some others including the BWC and XTE sentences.

The hardware interface for GPS receivers is designed to meet the NMEA requirements. They are compatible also with most computer serial ports using RS232 protocols, however strictly speaking the NMEA standard is not RS232. They recommend conformance to EIA-422. The interface speed generally can be adjusted but the NMEA standard is 4800 baud with 8 bits of data, no parity, and one stop bit. All GPS receivers supporting NMEA should support this speed. Note that, at a baud rate of 4800, you can easily send enough data to more than fill a full second of time.

At 4800 baud 480 characters per second can be sent. As an NMEA sentence can be as long as 82 characters this can be limited to less than six different sentences. The actual

limit is determined by the specific sentences used and it is easy to overrun the capabilities for rapid sentence response.

A cable is required to connect to the GPS receiver output. Data can be output also via Ethernet or wireless connection. For general NMEA use with a GPS receiver only two wires are required in the cable, data out from the GPS receiver and ground.

5.7 NMEA SENTENCES

This section describes the message structure of the following LD6 NMEA output messages:

GGA	GLL	VTG*	ZDA	GST*	GSA
GSV	GRS*	RMC*	HDT	THS	

NOTE

*Message talker ID will differ depending on calculation being computed. For example, a GPS only solution such as Ultra will begin *GP*xxx, whereas a solution utilising more than one constellation (e.g. GPS+GLONASS) such as Ultra[2] will begin *GN*xxx.

NMEA GGA Sentence

The NMEA GGA sentence contains time and position fix related data for a GPS system. It includes basic quality information, which is limited to 'Fix Quality', 'Number of Satellites in Use', 'HDOP' and 'Age of Differential GPS Data'.

Structure and Example: -

$GPGGA,hhmmss.ss,ddmm.mmm,a,dddmm.mmm,b,q,xx,p.p,a.b,M,c.d,M,x.x,nnnn*hh<CR><LF>
$GPGGA,123519,4807.0378783,N,01131.0054784,E,1,08,0.9,545.4,M,46.9,M,,*47

GGA sentence defined: -

GGA	Global Positioning System Fix Data
hhmmss.ss	UTC of position
ddmm.mmm	latitude of position
a	N or S, latitude hemisphere
dddmm.mmm	longitude of position
b	E or W, longitude hemisphere
q	GPS Quality indicator (0 = invalid, 1 = GPS SPS, 2 = DGPS fix, 3 = GPS PPS, 4 = Fixed RTK, 5 = Float RTK, 6 = Estimated (dead reckoning), 7 = Manual Input Mode, 8 = Simulation Mode
xx	number of satellites in use
p.p	horizontal dilution of precision
a.b	antenna altitude above mean-sea-level
M	units of antenna altitude, meters
c.d	Geoidal height
M	units of geoidal height, meters
x.x	age of differential GPS data
nnnn	Differential reference station ID, 0000 to 1023
*hh<CR><LF>	checksum, carriage return and line feed

NMEA GLL Sentence

The NMEA GLL sentence provides 2D position data.

Structure and Example:
$GPGLL,ddmm.mmmmmmm ,a, dddmm.mmmmmmm ,b,hhmmss.ss,S,I*cc<CR><LF>
$GPGLL,5708.7104685,N,00217.1169613,W,062859.00,A,D*72

GLL sentence defined:
GLL = Geographic position - Latitude and Longitude

ddmm.mmmmmmm	latitude of position
a	N or S
dddmm.mmmmmmm	longitude of position
b	E or W
hhmmss.ss	UTC of position
S	status (A = data valid ; V = data not valid)
I	mode indicator (A = Autonomous, D = Differential, E = Estimated, M = Manual, S = Simulator, N = data Not valid)
*cc<CR><LF>	checksum, carriage return and line feed

NMEA VTG Sentence

The NMEA VTG sentence provides the actual course and speed relative to the ground.

Structure and Example:

$GPVTG,p.p,T,q.q,M,r.r,N,s.s,K,u*hh<CR><LF>

$GPVTG,054.7,T,034.4,M,005.5,N,010.2,K*33

VTG sentence defined:

VTG = Course over ground and ground speed

p.p	course over ground
T	degrees True
q.q	course over ground
M	degrees Magnetic
r.r	speed over ground
N	knots
s.s	speed over ground
K	km/hr
U	mode indicator (A = Autonomous, D = Differential, E = Estimated)
*hh<CR><LF>	checksum, carriage return and line feed

Note that, as of the 2.3 release of NMEA, there is a new field in the VTG sentence at the end just prior to the checksum. Receivers that don't have a magnetic deviation (variation) table built in will null out the Magnetic track made good.

NMEA ZDA Sentence

The NMEA ZDA sentence provides time and time zone information.

Structure and Example:

$GPZDA,hhmmss.ss,dd,mm,yyyy,xx,yy*hh<CR><LF>
$GPZDA,201530.00,04,07,2002,00,00*6E

ZDA sentence defined:

ZDA = Time & Date

hhmmss.ss	UTC time in hours, minutes, seconds of the GPS position
dd,mm,yyy	Day,Month,Year (UTC)
xx	local zone hours (00 to +/-13 hrs)
yy	local zone minutes (00 to 59)
*hh<CR><LF>	checksum, carriage return and line feed

NMEA GST Sentence

The NMEA GST sentence provides error statistics of the position fix. These statistics follow from the position calculation process.

Structure and Example:

$GPGST,hhmmss.ss,a.a,b.b,c.c,d.d,e.e,f.f,g.g*hh<CR><LF>
$GPGST,024603.00,3.2,6.6,4.7,47.3,5.8,5.6,22.0*58

GST sentence defined:

GST = GNSS Pseudo-range Error Statistics

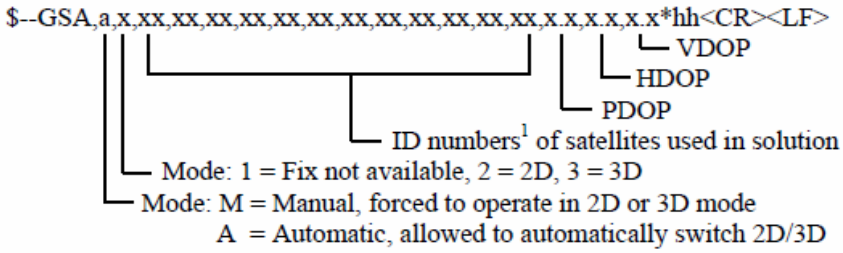
hhmmss.ss	UTC time in hours, minutes, seconds of the GPS position
a.a	RMS value of the standard deviation of the range inputs to the navigation process. Range inputs include pseudo-ranges and differential DGNSS corrections
b.b	Standard deviation of semi-major axis of error ellipse (meters)
c.c	Standard deviation of semi-minor axis of error ellipse (meters)
d.d	Orientation of semi-major axis of error ellipse (meters)
e.e	Standard deviation of latitude error (meters)
f.f	Standard deviation of longitude error (meters)
g.g	Standard deviation of altitude error (meters)
*hh<CR><LF>	checksum, carriage return and line feed

NMEA GSA Sentence

GSA sentence defined:

GNSS DOP and Active Satellites
GNSS receiver operating mode, satellites used in the navigation solution reported by the GGA or GNS sentence, and DOP values.

If only GPS, GLONASS, etc. is used for the reported position solution the talker ID is GP, GL, etc. and the DOP values pertain to the individual system. If GPS, GLONASS, etc. are combined to obtain the reported position solution multiple GSA sentences are produced, one with the GPS satellites, another with the GLONASS satellites, etc. Each of these GSA sentences shall have talker ID GN, to indicate that the satellites are used in a combined solution and each shall have the PDOP, HDOP and VDOP for the combined satellites used in the position.



Notes:

1) Satellite ID numbers. To avoid possible confusion caused by repetition of satellite ID numbers when using multiple satellite systems, the following convention has been adopted:

a) GPS satellites are identified by their PRN numbers, which range from 1 to 32.

b) The numbers 33-64 are reserved for WAAS satellites. The WAAS system PRN numbers are 120-138. The offset from NMEA WAAS SV ID to WAAS PRN number is 87. A WAAS PRN number of 120 minus 87 yields the SV ID of 33. The addition of 87 to the SV ID yields the WAAS PRN number.

c) The numbers 65-96 are reserved for GLONASS satellites. GLONASS satellites are identified by 64+satellite slot number. The slot numbers are 1 through 24 for the full GLONASS constellation of 24 satellites, this gives a range of 65 through 88. The numbers 89 through 96 are available if slot numbers above 24 are allocated to on-orbit spares.

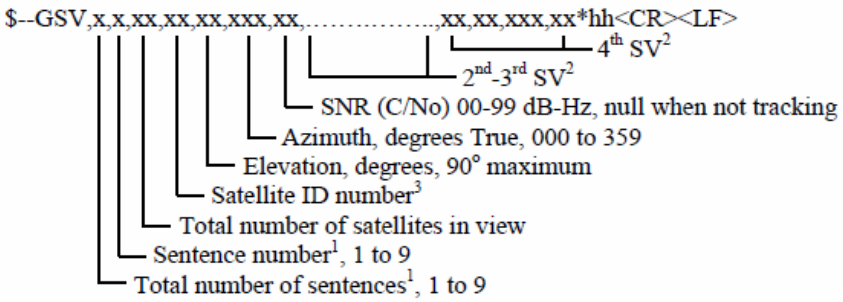
NMEA GSV Sentence

GSV sentence defined:

GNSS Satellites in View

Number of satellites (SV) in view, satellite ID numbers, elevation, azimuth, and SNR value. Four satellites maximum per transmission. Total number of sentences being transmitted and the number of the sentence being transmitted are indicated in the first two fields.

If multiple GPS, GLONASS, etc. satellites are in view, use separate GSV sentences with talker ID GP to show the GPS satellites in view and talker GL to show the GLONASS satellites in view, etc. The GN identifier shall not be used with this sentence.



Notes:

1) Satellite information may require the transmission of multiple sentences all containing identical field formats when sending a complete message. The first field specifies the total number of sentences, minimum value 1.

The second field identifies the order of this sentence (sentence number), minimum value 1. For efficiency it is recommended that null fields be used in the additional sentences when the data is unchanged from the first sentence.

2) A variable number of "Satellite ID-Elevation-Azimuth-SNR" sets are allowed up to a maximum of four sets per sentence. Null fields are not required for unused sets when less than four sets are transmitted.

3) Satellite ID numbers. To avoid possible confusion caused by repetition of satellite ID numbers when using multiple satellite systems, the following convention has been adopted:

a) GPS satellites are identified by their PRN numbers, which range from 1 to 32.

b) The numbers 33-64 are reserved for WAAS satellites. The WAAS system PRN numbers are 120-138. The offset from NMEA WAAS SV ID to WAAS PRN number is 87. A WAAS PRN number of 120 minus 87 yields the SV ID of 33. The addition of 87 to the SV ID yields the WAAS PRN number.

c) The numbers 65-96 are reserved for GLONASS satellites. GLONASS satellites are identified by 64+satellite slot number. The slot numbers are 1 through 24 for the full GLONASS constellation of 24 satellites, this gives a range of 65 through 88. The numbers 89 through 96 are available if slot numbers above 24 are allocated to on-orbit spares.

NMEA GRS Sentence

GNSS Range Residuals

This sentence is used to support Receiver Autonomous Integrity Monitoring (RAIM). Range residuals can be computed in two ways for this process. The basic measurement integration cycle of most navigation filters generates a set of residuals and uses these to update the position state of the receiver.
These residuals can be reported with GRS, but because of the fact that these were used to generate the navigation solution they should be recomputed using the new solution in order to reflect the residuals for the position solution in the GGA or GNS sentence.
The MODE field should indicate which computation method was used. An integrity process that uses these range residuals would also require GGA or GNS, GSA, and GSV sentences to be sent.
If only GPS, GLONASS, etc. is used for the reported position solution the talker ID is GP, GL, etc. and the range residuals pertain to the individual system. If GPS, GLONASS, etc. are combined to obtain the position solution multiple GRS sentences are produced, one with the GPS satellites, another with the GLONASS satellites, etc. Each of these GRS sentences shall have talker ID “GN”, to indicate that the satellites are used in a combined solution. It is important to distinguish the residuals from those that would be produced by a GPS-only, GLONASS-only, etc. position solution. In general the residuals for a combined solution will be different from the residual for a GPS-only, GLONASS-only, etc. solution.

$--GRS,hhmmss.ss,x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x*hh<CR><LF>

Range residuals in meters for satellites used in the navigation solution1,2.
Order must match order of the satellite ID3 numbers in GSA.
When GRS is used GSA and GSV are generally required.

Mode: 0 = residuals were used to calculate the position given in the matching GGA or GNS sentence
1 = residuals were recomputed after the GGA or GNS position was computed

UTC time of the GGA or GNS fix associated with this sentence

Notes:

1) If the range residual exceeds +99.9 meters, then the decimal part is dropped, resulting in an integer (-103.7 becomes -103). The maximum value for this field is +999.

2) The sense or sign of the range residual is determined by the order of parameters used in the calculation.
The expected order is as follows: range residual = calculated range - measured range.

3) When multiple GRS sentences are being sent then their order of transmission must match the order of corresponding GSA sentences.
Listeners shall keep track of pairs of GSA and GRS sentences and discard data if pairs are incomplete.

NMEA RMC Sentence

NMEA has its own version of essential gps pvt (position, velocity, time) data. It is called RMC, The Recommended Minimum, which will look similar to:
$GPRMC,123519,A,4807.038,N,01131.000,E,022.4,084.4,230394,003.1,W*6A
Where:

RMC	Recommended Minimum sentence C
123519	Fix taken at 12:35:19 UTC
A	Status A=active or V=Void.
4807.038,N	Latitude 48 deg 07.038' N
01131.000,E	Longitude 11 deg 31.000' E
022.4	Speed over the ground in knots
084.4	Track angle in degrees True
230394	Date - 23rd of March 1994
003.1,W	Magnetic Variation
*6A	The checksum data, always begins with *

Note that, as of the 2.3 release of NMEA, there is a new field in the RMC sentence at the end just prior to the checksum. For more information on this field.

NMEA HDT Sentence.

The NMEA HDT sentence provides heading information which can be input to the LD6 for displaying on the DP Orion software.

$GPHDT,xxx.xx,T*hh<CR><LF>

where:

$GPHDT – is the message name stating it is a GPS heading (true) message

xxx.xx – this is the heading

T – states the heading is true

*hh – is the check sum for the message

NMEA THS Sentence

The NMEA THS provides heading information which can be input to the LD6 for displaying on the DP Orion software. This sentence includes a “mode indicator” field providing critical safety related information about the heading data.

$GPTHS,x.x,a*hh<CR><LF>

Where:

$GPTHS - is the message name stating it is a GPS heading (true) message

x.x – Heading value (True)

a – Mode indicator

*hh – Checksum

Notes:

1) Mode indicator:

   A = Autonomous

   E = Estimated (dead reckoning)

   M = Manual Input

   S = Simulator

   V = Data not valid (including standby)

6. 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

Helpdesk telephone	+44 (0)1224 965900
Helpdesk e-mail	helpdesk@veripos.com
VERIPOS Online support	https://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.

UK VERIPOS office address (Headquarters):

	Veripos House 1B Farburn Terrace Dyce, Aberdeen. AB21 7DT Scotland, UK

For up to date information on other VERIPOS offices worldwide visit **www.veripos.com**